

Machine Automation Controller  
NX-series  
**EtherCAT® Slave Unit**

## User's Manual

NX-ECT101


EtherCAT Slave Unit



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# Introduction

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Thank you for purchasing an NX-series EtherCAT Slave Unit.

This manual contains information that is necessary to use the NX-series EtherCAT Slave Unit. Please read this manual and make sure you understand the functionality and performance of the EtherCAT Slave 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

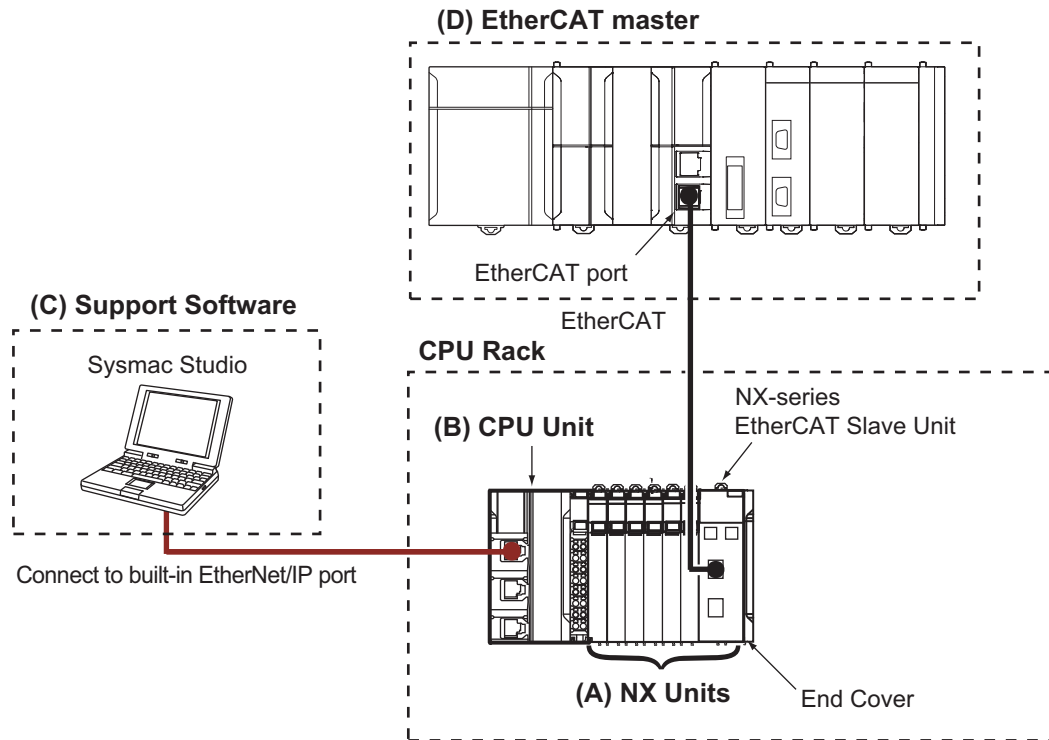
This manual covers the following products.

- NX-series EtherCAT Slave Unit  
NX-ECT101

# Relevant Manuals

To use the NX-series EtherCAT Slave Unit, you must refer to the manuals for all related products. Read all of the manuals that are relevant to your system configuration and application before you use the NX-series EtherCAT Slave Unit.

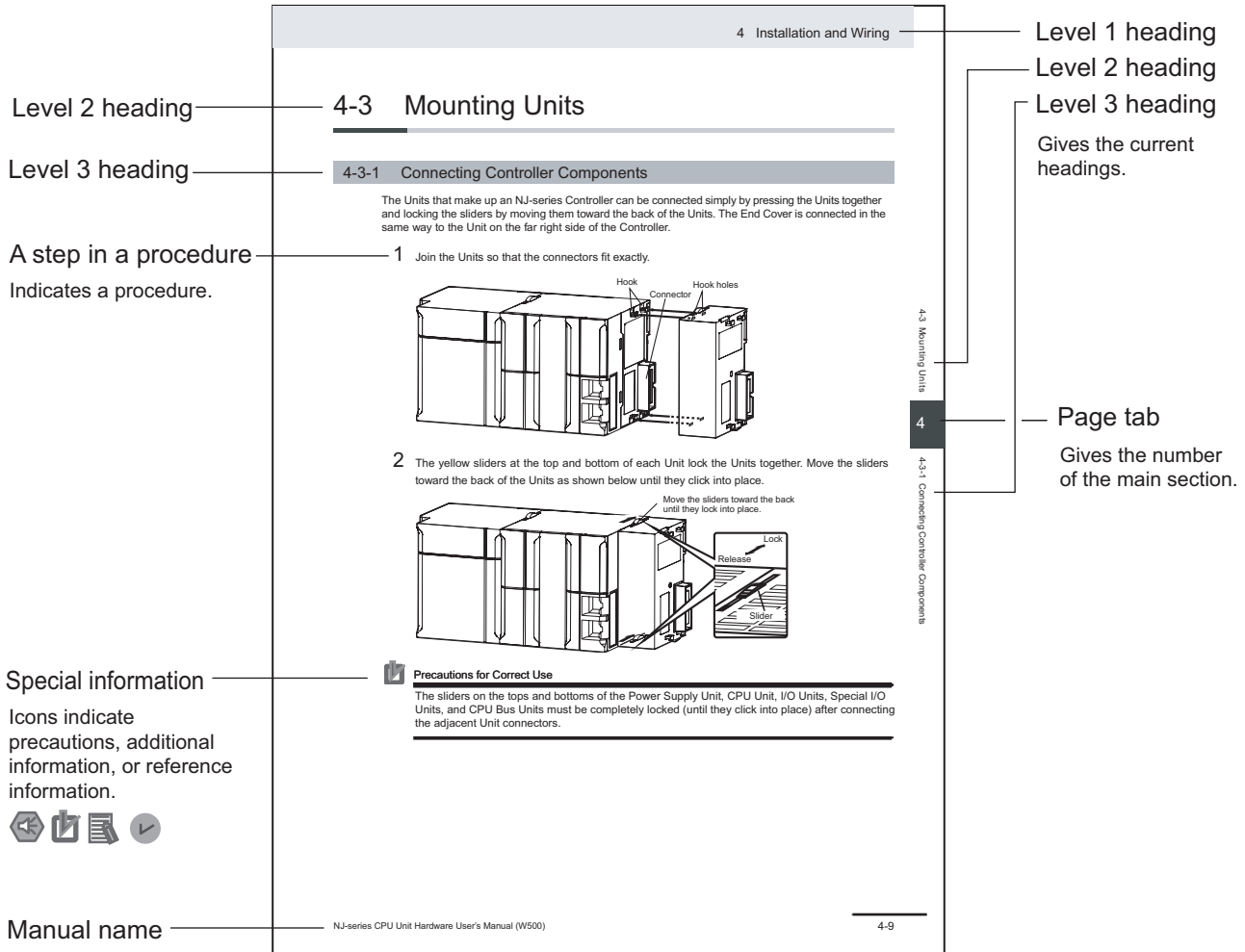
|  | System configuration                           |                                   |  |  |   | (C)<br>Support<br>Soft-<br>ware | All Units             |                       |  |
|--|--|-----------------------------------|--|--|---|---------------------------------|-----------------------|-----------------------|--|
|  | (A) NX Units                                   |                                   | (B) CPU Units                                      |  |   |                                 |                       |                       | (D) Ether-<br>CAT master                     |
|  | NX-series EtherCAT Slave Unit<br>User's Manual | User's manuals for other NX Units | NX-series NX102 CPU Unit<br>Hardware User's Manual | NX-series NX1P2 CPU Unit<br>Hardware User's Manual | NJ/NX-series CPU Unit<br>Software User's Manual |                                 |                       |                       | User's manual for the EtherCAT master to use |
| Learning about NX Units  |  |                                   |  |  |   |                                 |                       |                       |  |
| Specifications   | <input type="radio"/>                          | <input type="radio"/>             |  |  |   |                                 |                       |                       |  |
| Functionality  | <input type="radio"/>                          | <input type="radio"/>             |  |  |   |                                 |                       |                       |  |
| Application procedures   | <input type="radio"/>                          | <input type="radio"/>             |  |  |   |                                 |                       |                       |  |
| Wiring I/O power supply terminals and power supply terminals         | <input type="radio"/>                          | <input type="radio"/>             |  |  |   |                                 |                       | <input type="radio"/> |  |
| Learning about CPU Racks of NX-series CPU Units                      |  |                                   |  |  |   |                                 |                       |                       |  |
| Specifications   |  |                                   | <input type="radio"/>                              | <input type="radio"/>                              | <input type="radio"/>                           |                                 |                       |                       |  |
| System configuration   |  |                                   | <input type="radio"/>                              | <input type="radio"/>                              | <input type="radio"/>                           |                                 |                       |                       |  |
| Power supply system  |  |                                   | <input type="radio"/>                              | <input type="radio"/>                              |   |                                 |                       | <input type="radio"/> |  |
| Application procedures   |  |                                   | <input type="radio"/>                              | <input type="radio"/>                              | <input type="radio"/>                           |                                 |                       |                       |  |
| Installation procedures  |  |                                   | <input type="radio"/>                              | <input type="radio"/>                              |   |                                 |                       |                       |  |
| Support Software connection procedures                               |  |                                   |  |  | <input type="radio"/>                           |                                 |                       |                       |  |
| Performance calculations   | <input type="radio"/>                          |                                   |  |  | <input type="radio"/>                           |                                 |                       |                       | <input type="radio"/>                        |
| Making settings  |  |                                   |  |  |   |                                 | <input type="radio"/> |                       |  |
| Learning about EtherCAT master                                       |  |                                   |  |  |   | <input type="radio"/>           |                       |                       |  |
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| Troubleshooting CPU Racks  |  |                                   | <input type="radio"/>                              | <input type="radio"/>                              | <input type="radio"/>                           |                                 | <input type="radio"/> |                       |  |
| Troubleshooting NX Units   | <input type="radio"/>                          | <input type="radio"/>             |  |  |   |                                 |                       |                       |  |
| Performing NX Unit maintenance                                       | <input type="radio"/>                          | <input type="radio"/>             |  |  |   |                                 |                       |                       |  |
| Referencing data lists for NX Unit power consumptions, weights, etc. |  |                                   |  |  |   |                                 |                       |                       | <input type="radio"/>                        |



# Manual Structure

## Page Structure

The following page structure is used in this manual.



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.

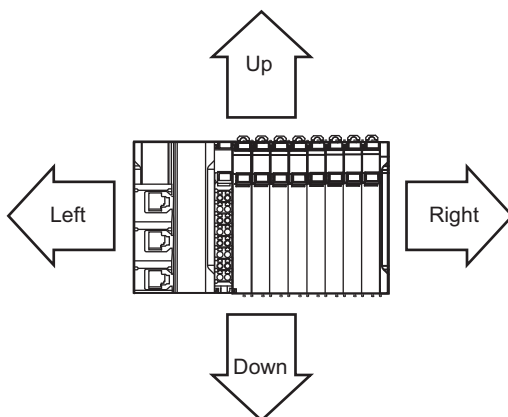


### Version Information

Information on differences in specifications and functionality for Controller with different unit versions and for different versions of the Sysmac Studio is given.

## Precaution on Terminology

- In this manual, "download" refers to transferring data from the Support Software to a physical device and "upload" refers to transferring data from a physical device to the Support Software.
- In this manual, the directions in relation to the Units are given in the following figure, which shows upright installation.



- This user's manual refers to "NY-series IPC Machine Controller Industrial Panel PCs and Industrial Box PCs" as simply "Industrial PCs" or as "NY-series Industrial PCs".
- This user's manual refers to the "built-in EtherCAT port on an NJ/NX-series Controller" or "built-in EtherCAT port on an NY-series Industrial PC" as simply a "built-in EtherCAT port".
- This user's manual may omit manual names and manual numbers in places that refer to the user's manuals for CPU Units and Industrial PCs. The following table gives some examples.  
Examples:

| Manual name  | Omitted contents  | Common text            |
|--|---|------------------------|
| NJ/NX-series CPU Unit Software User's Manual   | Software user's manual for the connected CPU Unit or Industrial PC                      | Software User's Manual |
| NY-series IPC Machine Controller Industrial Panel PC / Industrial Box PC Software User's Manual                |   |                        |
| NJ/NX-series CPU Unit Built-in EtherCAT® Port User's Manual  | User's manual for the built-in EtherCAT port on the connected CPU Unit or Industrial PC | Built-in EtherCAT port |
| NY-series IPC Machine Controller Industrial Panel PC / Industrial Box PC Built-in EtherCAT® Port User's Manual |   |                        |

- If the manual names and manual numbers for CPU Units are omitted, refer to *Related Manuals* on page 31 to determine the appropriate manual based on the common text for the omitted contents.
- This user's manual shows the indexes and subindexes of the objects as "index:subindex hex". For example, the object with the index 10F3 hex and subindex 04 hex is shown as "10F3:04 hex".
- This user's manual may describe the specifications when the NX Unit is connected to the following Units to which this Unit cannot be connected.
  - a) NX-series Communications Coupler Unit
  - b) NX-series Communication Control Unit
 With this Unit, it is not necessary to read these specifications when the NX Unit is connected to these Units.



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# Terms and Conditions Agreement

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## Warranty, Limitations of Liability

### Warranties

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- **Exclusive Warranty**

Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied.

- **Limitations**

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE.

Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right.

- **Buyer Remedy**

Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty.

See <http://www.omron.com/global/> or contact your Omron representative for published information.

### Limitation on Liability; Etc

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OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY

WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY.

Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.

## Application Considerations

### Suitability of Use

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

### Programmable Products

Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.

## Disclaimers

### Performance Data

Data presented in Omron Company websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Omron's test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.

### Change in Specifications

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may



be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

## **Errors and Omissions**

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

## **Statement of security responsibilities for assumed use cases and against threats**

OMRON SHALL NOT BE RESPONSIBLE AND/OR LIABLE FOR ANY LOSS, DAMAGE, OR EXPENSES DIRECTLY OR INDIRECTLY RESULTING FROM THE INFECTION OF OMRON PRODUCTS, ANY SOFTWARE INSTALLED THEREON OR ANY COMPUTER EQUIPMENT, COMPUTER PROGRAMS, NETWORKS, DATABASES OR OTHER PROPRIETARY MATERIAL CONNECTED THERETO BY DISTRIBUTED DENIAL OF SERVICE ATTACK, COMPUTER VIRUSES, OTHER TECHNOLOGICALLY HARMFUL MATERIAL AND/OR UNAUTHORIZED ACCESS.

It shall be the users sole responsibility to determine and use adequate measures and checkpoints to satisfy the users particular requirements for (i) antivirus protection, (ii) data input and output, (iii) maintaining a means for reconstruction of lost data, (iv) preventing Omron Products and/or software installed thereon from being infected with computer viruses and (v) protecting Omron Products from unauthorized access.



# Safety Precautions

## Definition of Precautionary Information





The following notation is used in this manual to provide precautions required to ensure safe usage of the NX-series EtherCAT Slave Units.

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

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

## 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, Industrial PC, 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 or Industrial PC will turn OFF all outputs from Output Units in the following cases. The remote I/O slaves will operate according to the settings in the slaves.

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



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

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



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



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



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

---

## Voltage and Current Inputs

---

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

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

---



---

## Transferring

---

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

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

---



## Cautions

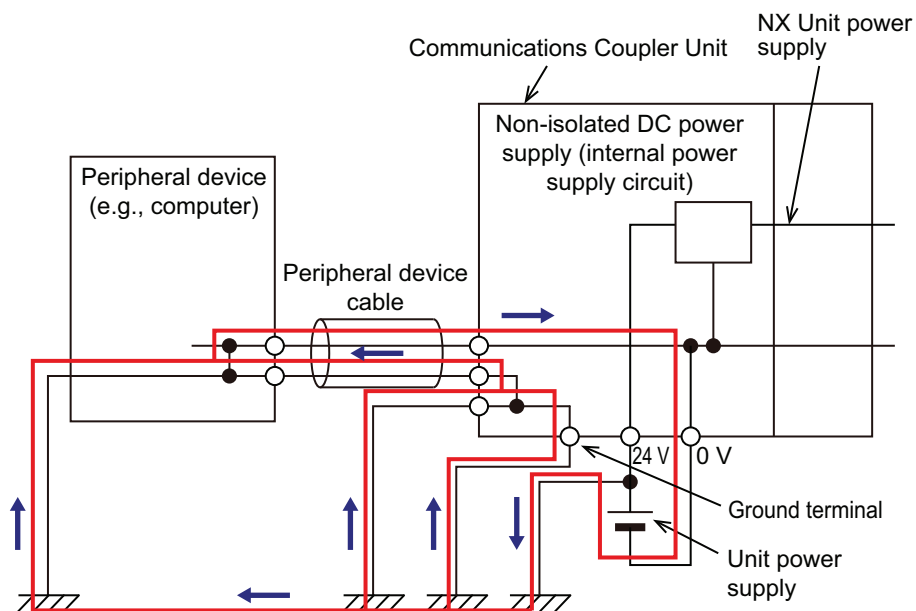
### ⚠ Caution

#### Wiring

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

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

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



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



#### Online Editing

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



# Precautions for Safe Use

## Transporting

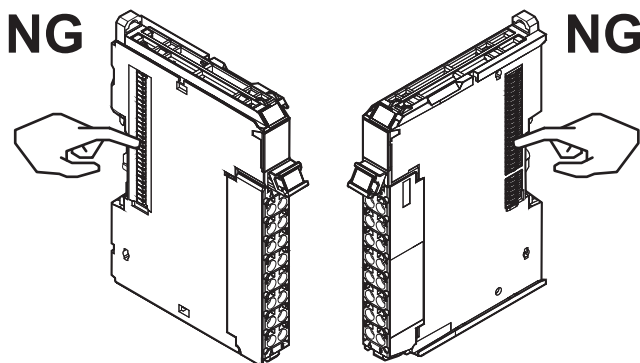
- When transporting any Unit, use the special packing box for it.  
Also, do not subject the Unit to excessive vibration or shock during transportation.
- Do not drop any Unit or subject it to abnormal vibration or shock.  
Doing so may result in Unit malfunction or burning.

## Mounting

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

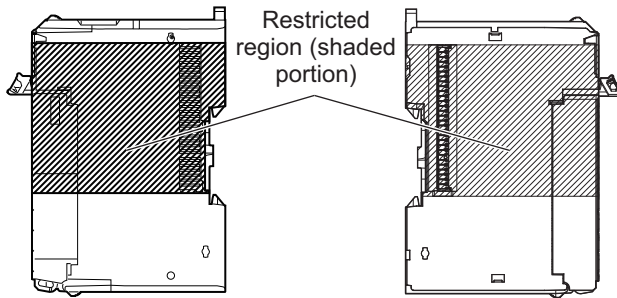
## Installation

- Always turn OFF the power supply before installing the Unit. If the power supply is not OFF, the Unit may malfunction or may be damaged.
- Always turn OFF the Unit power supply and I/O power supply before you remove the NX Unit.
- Do not apply labels or tape to the Unit. When the Unit is installed or removed, adhesive or scraps may adhere to the pins in the NX bus connector, which may result in malfunctions.
- Do not touch the pins in the NX bus connector on the Unit. Dirt may adhere to the pins in the NX bus connector, which may result in malfunctions.



Example: NX Unit (12 mm width)

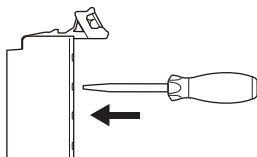
- Do not write on an NX Unit with ink within the restricted region that is shown in the following figure. Also do not get this area dirty. When the Unit is installed or removed, ink or dirt may adhere to the pins in the NX bus connector, which may result in malfunctions in the CPU Rack or the Slave Terminal.  
Refer to the user's manual for the connected CPU Unit, Communications Coupler Unit, or Communication Control Unit for details on the restricted region on the CPU Unit, Communications Coupler Unit, or Communication Control Unit.



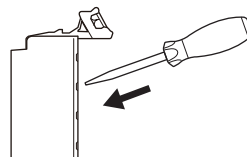
## Wiring

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

**NG**

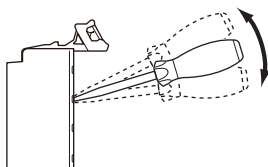


**OK**

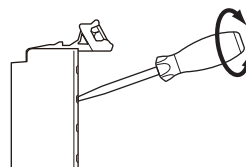


- When you insert a flat-blade screwdriver into a release hole on a screwless clamping terminal block, press it down with a force of 30N or less. Applying excessive force may damage the terminal block.
- Do not incline or twist the flat-blade screwdriver while it is in a release hole on a screwless clamping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

**NG**



**NG**



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

## Power Supply Design

---

- Use all Units within the I/O power supply ranges that are given in the specifications.
- The I/O power supply current for the CPU Rack with an NX-series CPU Unit should be within the range specified for the CPU Unit model. For example, use the NX1P2 CPU Unit with a current of 4 A or less. Using the currents that are outside of the specifications may cause failure or corruption. Refer to the user's manual for the connected CPU Unit for the I/O power supply current for the CPU Unit model.
- 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.

## Transferring

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

## 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 the Support Software.
- Always turn OFF the external power supply to the Units before attempting any of the following.
  - a) Mounting or removing an NX Unit, Communications Coupler Unit, CPU Unit, Industrial PC, or Communication Control Unit
  - b) Assembling Units
  - c) Setting DIP switches or rotary switches
  - d) Connecting or wiring cables
  - e) Attaching or removing terminal blocks or connectors

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

## Operation

---

- Confirm that the controlled system will not be adversely affected before you perform any of the following operations.
  - a) Changing the operating mode of the CPU Unit or Industrial PC (including changing the setting of the Operating Mode at Startup)
  - b) Changing the user program or settings
  - c) Changing set values or present values
  - d) Forced refreshing
- Always sufficiently check the safety at the connected devices before you change the settings of a slave or Unit.

## 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.

## Using the EtherCAT Slave Unit

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- The I/O data set to transfer from the EtherCAT master to the CPU Unit and the I/O data set to transfer from the CPU Unit to the EtherCAT master may not be updated according to the state of the EtherCAT communications or NX bus.

When you use the I/O data of the EtherCAT Slave Unit for a user program, create the user program so that the following statuses of the *EtherCAT Slave Status Information* and *NX Unit Status Information* that are held by the EtherCAT Slave Unit are used as the interlock condition.

- a) *Data from CPU Unit to EtherCAT Master Valid*

b) *Data from EtherCAT Master to CPU Unit Valid*

## EtherCAT Communications

- Make sure that the communications distance, number of nodes connected, and method of connection for EtherCAT are within specifications.  
Do not connect EtherCAT Slave 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, use the Sysmac Studio to check the slave revision settings in the master and the actual slave revisions, and then make sure that functionality is compatible in the slave manuals or other references. You can check the actual slave revisions from the Sysmac Studio or on slave nameplates.
- After you transfer the user program to the built-in EtherCAT port on the NJ/NX-series CPU Unit, the built-in EtherCAT port 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 Input Data Invalid system-defined variable as an interlock condition in the user program.  
Set the *PDO communications timeout detection count* setting in the EtherCAT master to at least 2. For details, refer to the user's manual for the built-in EtherCAT port on the connected CPU Unit or Industrial PC.
- If you disconnect the cable from an EtherCAT slave or turn OFF the power supply of 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 Input Data Invalid system-defined variable as an interlock condition in the user program.  
Set the *PDO communications timeout detection count* setting in the EtherCAT master to at least 2. For details, refer to the user's manual for the built-in EtherCAT port on the connected CPU Unit or Industrial PC.

# Precautions for Correct Use

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## Storage, Mounting, and Wiring

---

- Follow the instructions in this manual to correctly perform installation and wiring.
- Do not operate or store the Units in the following locations. Doing so may result in malfunction, in operation stopping, or in burning.
  - Locations subject to direct sunlight
  - Locations subject to temperatures or humidity outside the range specified in the specifications
  - Locations subject to condensation as the result of severe changes in temperature
  - Locations subject to corrosive or flammable gases
  - Locations subject to dust (especially iron dust) or salts
  - Locations subject to exposure to water, oil, or chemicals
  - Locations subject to shock or vibration
- Take appropriate and sufficient countermeasures during installation in the following locations.
  - Locations subject to strong, high-frequency noise
  - Locations subject to static electricity or other forms of noise
  - Locations subject to strong electromagnetic fields
  - Locations subject to possible exposure to radioactivity
  - Locations close to power lines
- Before touching a Unit, be sure to first touch a grounded metallic object in order to discharge any static build-up.
- Use the rated power supply voltage for the Units that supply power. Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied in places where the power supply is unstable.
- Install the Units away from sources of heat and ensure proper ventilation. Not doing so may result in malfunction, in operation stopping, or in burning.
- Do not allow foreign matter to enter the openings in the Unit. Doing so may result in Unit burning, electric shock, or failure.

## Actual Operation

---

- 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

---

- 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 CPU Unit, Communications Coupler Unit, Communication Control Unit, or NX Units.

## Using the EtherCAT Slave Unit

---

- The EtherCAT Slave Unit can be connected to the NX-series CPU Unit only. It cannot be connected to the NX bus of the following Units.
  - a) NX-series Communications Coupler Unit
  - b) NX-series Communication Control Unit
- To exchange the data correctly between the EtherCAT master and CPU Unit through the EtherCAT Slave Unit, the allocation setting rules need to be satisfied for the data to share. Configure the PDO settings and I/O allocation settings for the data to share so that the rules are satisfied.
- When the setting rules for data exchange between the CPU Unit and EtherCAT master are satisfied and the data sizes do not match between the PDO entry and I/O entry that are allocated to the I/O data set to exchange, the data will be exchanged only in the range where the data sizes match. At this time, an error will be detected. When the mismatched allocation settings are made intentionally, change the event level of the corresponding error to observation.

## EtherCAT Communications

---

- Do not disconnect the EtherCAT communications cables during operation. The outputs will become unstable.

# Regulations and Standards

## Conformance to EU Directives

### Applicable Directives

- EMC Directives
- Low Voltage Directive

### Concepts

#### ● EMC Directives

OMRON devices that comply with EU 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 EU 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 61010-2-201.

#### ● Conformance to EU Directives

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

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

EMC standard compliance was confirmed for the recommended Power Supplies. Refer to the user's manual for the connected CPU Unit for information on the recommended Power Supplies for the CPU Rack of the NX-series CPU Unit.

- NX-series Units that comply with EU Directives also conform to the Common Emission Standard (EN 61131-2). Radiated emission characteristics (10-m regulations) may vary depending on the configuration of the control panel used, other devices connected to the control panel, wiring, and other conditions.

You must therefore confirm that the overall machine or equipment in which the NX-series Units are used complies with EU Directives.

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

### Conformance to UL and CSA Standards

Some NX-series products comply with UL and CSA standards.

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

### Conformance to Shipbuilding Standards

Some NX-series products comply with shipbuilding standards.

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

For usage conditions for shipbuilding standards, refer to *Conformance to Shipping Standards* in the user's manual for the CPU Unit or Communications Coupler Unit that the NX Units are connected to. Note that the usage conditions are provided in the relevant user's manuals for Units whose conformance to shipbuilding standards is confirmed.

### Conformance to KC Certification

When you use this product in South Korea, observe the following precautions.

#### 사용자 안내문

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

This product meets the electromagnetic compatibility requirements for business use. There is a risk of radio interference when this product is used in home.

### 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 Support Software versions.

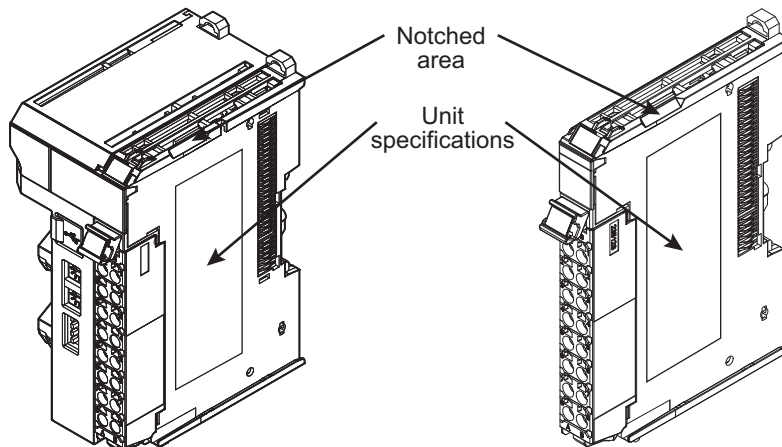
## Unit Versions

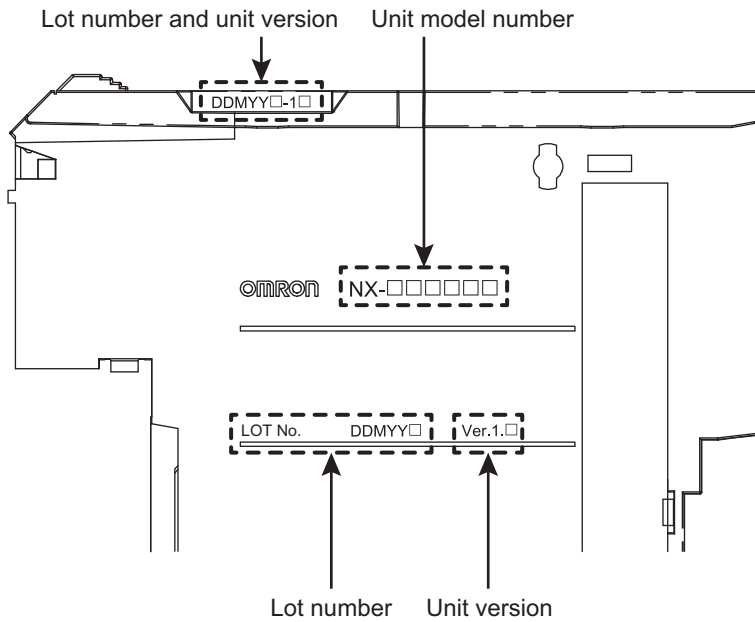
A “unit version” has been introduced to manage the Units in the NX Series according to differences in functionality accompanying Unit upgrades.

An example is provided below for Communications Coupler Units and NX Units. For the notation that is used for the unit versions of CPU Units or Industrial PCs and the confirmation method for unit versions, refer to the user’s manual for each Unit.

## 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.<br>DDMY□: Lot number, □: Used by OMRON.<br>“M” gives the month (1 to 9: January to September, X: October, Y: November, Z: December) |

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

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

## Confirming Unit Versions with the Support Software

If your NX Unit is connected to a CPU Unit, refer to the user’s manual of the connected CPU Unit for the confirmation method for the unit version of the NX Unit.

## Unit Versions and Support Software Versions

The functions that are supported depend on the unit version of the Unit. The version of Support Software that supports the functions that were added for an upgrade is required to use those functions. Refer to *A-8 Version Information* on page A-65 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  | Application  | Description   |
|---|----------|--|--|---|
| NX-series<br>EtherCAT Slave Unit<br>User's Manual | W626     | NX-ECT101  | Learning how to use an NX-series EtherCAT Slave Unit.  | The hardware, setup methods, and functions of the NX-series EtherCAT Slave Unit are described.  |
| NX-series<br>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<br>System Units<br>User's Manual        | W523     | NX-PD1□□□<br>NX-PF0□□□<br>NX-PC0□□□<br>NX-TBX01                                  | Learning how to use NX-series System Units.  | The hardware and functions of the NX-series System Units are described.   |
| Sysmac Studio Version 1<br>Operation Manual       | W504     | SYSMAC<br>-SE2□□□  | Learning about the operating procedures and functions of the Sysmac Studio.  | Describes the operating procedures of the Sysmac Studio.  |
| NJ/NX-series<br>Troubleshooting Manual            | W503     | NX701-□□□□<br>NX102-□□□□<br>NX1P2-□□□□<br>NJ501-□□□□<br>NJ301-□□□□<br>NJ101-□□□□ | Learning about the errors that may be detected in an NJ/NX-series Controller.  | Concepts on managing errors that may be detected in an NJ/NX-series Controller and information on individual errors are described.  |
| NY-series<br>Troubleshooting Manual               | W564     | NY532-□□□□<br>NY512-□□□□   | Learning about the errors that may be detected in an NY-series Industrial PC.  | Concepts on managing errors that may be detected in an NY-series Controller and information on individual errors are described.   |
| NX-series CPU Unit<br>Hardware User's Manual      | W535     | NX701-□□□□   | Learning the basic specifications of the NX701 CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided. | An introduction to the entire NX701 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>• Introduction</li> <li>• Part names and functions</li> <li>• General specifications</li> <li>• Installation and wiring</li> <li>• Maintenance and inspection</li> </ul> |

| Manual name  | Cat. No. | Model                                  | Application   | Description  |
|--|----------|--|---|--|
| NX-series<br>NX102 CPU Unit<br>Hardware<br>User's Manual                             | W593     | NX102-□□□□                             | Learning the basic specifications of the NX102 CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided.                | An introduction to the entire NX102 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>• Introduction</li> <li>• Part names and functions</li> <li>• General specifications</li> <li>• Installation and wiring</li> <li>• Maintenance and inspection</li> </ul>                |
| NX-series<br>NX1P2 CPU Unit<br>Hardware<br>User's Manual                             | W578     | NX1P2-□□□□                             | Learning the basic specifications of the NX1P2 CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided.                | An introduction to the entire NX1P2 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>• Introduction</li> <li>• Part names and functions</li> <li>• General specifications</li> <li>• Installation and wiring</li> <li>• Maintenance and inspection</li> </ul>                |
| NJ-series CPU Unit<br>Hardware User's Manual   | W500     | NJ501-□□□□<br>NJ301-□□□□<br>NJ101-□□□□ | Learning the basic specifications of the NJ-series CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided.            | An introduction to the entire NJ-series system is provided along with the following information on the CPU Unit. <ul style="list-style-type: none"> <li>• Features and system configuration</li> <li>• Introduction</li> <li>• Part names and functions</li> <li>• General specifications</li> <li>• Installation and wiring</li> <li>• Maintenance and inspection</li> </ul>            |
| NY-series<br>IPC Machine Controller<br>Industrial Panel PC<br>Hardware User's Manual | W557     | NY532-□□□□                             | Learning the basic specifications of the NY-series Industrial Panel PCs, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided. | An introduction to the entire NY-series system is provided along with the following information on the Industrial Panel PC. <ul style="list-style-type: none"> <li>• Features and system configuration</li> <li>• Introduction</li> <li>• Part names and functions</li> <li>• General specifications</li> <li>• Installation and wiring</li> <li>• Maintenance and inspection</li> </ul> |

| Manual name  | Cat. No. | Model  | Application   | Description  |
|--|----------|--|---|--|
| NY-series<br>IPC Machine Controller<br>Industrial Box PC<br>Hardware User's Manual   | W556     | NY512-□□□□   | Learning the basic specifications of the NY-series Industrial Box PCs, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided. | An introduction to the entire NY-series system is provided along with the following information on the Industrial Box PC. <ul style="list-style-type: none"> <li>• Features and system configuration</li> <li>• Introduction</li> <li>• Part names and functions</li> <li>• General specifications</li> <li>• Installation and wiring</li> <li>• Maintenance and inspection</li> </ul> |
| NJ/NX-series CPU Unit<br>Software User's Manual  | W501     | NX701-□□□□<br>NX102-□□□□<br>NX1P2-□□□□<br>NJ501-□□□□<br>NJ301-□□□□<br>NJ101-□□□□ | Learning how to program and set up an NJ/NX-series CPU Unit. Mainly software information is provided.   | The following information is provided on a Controller built with an NJ/NX-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>   |
| NY-series<br>IPC Machine Controller<br>Industrial Panel PC / Industrial<br>Box PC<br>Software User's Manual                      | W558     | NY532-□□□□<br>NY512-□□□□   | Learning how to program and set up the Controller functions of an NY-series Industrial PC.  | The following information is provided on the NY-series Controller functions. <ul style="list-style-type: none"> <li>• Controller operation</li> <li>• Controller features</li> <li>• Controller settings</li> <li>• Programming based on IEC 61131-3 language specifications</li> </ul>  |
| NJ/NX-series<br>CPU Unit<br>Built-in EtherCAT® Port<br>User's Manual   | W505     | NX701-□□□□<br>NX102-□□□□<br>NX1P2-□□□□<br>NJ501-□□□□<br>NJ301-□□□□<br>NJ101-□□□□ | Using the built-in EtherCAT port on an NJ/NX-series CPU Unit.   | Information on the built-in EtherCAT port is provided. This manual provides an introduction and provides information on the configuration, features, and setup.  |
| NY-series<br>IPC Machine Controller<br>Industrial Panel PC<br>/ Industrial<br>Box PC<br>Built-in EtherCAT® Port<br>User's Manual | W562     | NY532-□□□□<br>NY512-□□□□   | Using the built-in EtherCAT port in an NY-series Industrial PC.   | Information on the built-in EtherCAT port is provided. This manual provides an introduction and provides information on the configuration, features, and setup.  |
| NJ/NX-series Instructions<br>Reference Manual  | W502     | NX701-□□□□<br>NX102-□□□□<br>NX1P2-□□□□<br>NJ501-□□□□<br>NJ301-□□□□<br>NJ101-□□□□ | Learning detailed specifications on the basic instructions of an NJ/NX-series CPU Unit.   | The instructions in the instruction set (IEC 61131-3 specifications) are described.  |
| NY-series<br>Instructions Reference<br>Manual  | W560     | NY532-□□□□<br>NY512-□□□□   | Learning detailed specifications on the basic instructions of an NY-series Industrial PC.   | The instructions in the instruction set (IEC 61131-3 specifications) are described.  |

# 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.   |
| CPU Rack                               | ---          | A rack to which a CPU Unit is mounted. For NX-series CPU Units to which NX Units can be connected, a CPU Rack has a CPU Unit with NX Units and an End Cover mounted to it.      |
| 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.   |
| I/O port                               | ---          | A logical interface that is used by the NJ/NX-series CPU Unit or NY-series Industrial PC to exchange data with an external device (slave or Unit).                              |
| I/O map settings                       | ---          | Settings that assign variables to I/O ports. Assignment information between I/O ports and variables.  |
| I/O refreshing                         | ---          | Cyclic data exchange with external devices that is performed with predetermined memory addresses.   |
| NX bus                                 | ---          | The NX-series internal bus.   |
| NX message communications              | ---          | Message communications to access NX objects.  |
| PDO communications                     | ---          | An acronym for process data communications.   |
| SDO communications                     | ---          | One type of EtherCAT communications in which service data objects (SDOs) are used to transmit information whenever required.  |
| Slave Information Interface            | SII          | Slave information that is stored in non-volatile memory in the slave.   |
| index                                  | ---          | Address of an object within an application process.   |
| 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.   |
| subindex                               | ---          | Sub-address of an object within the object dictionary.  |
| receive PDO                            | RxPDO        | A process data object received by an EtherCAT slave.  |
| Sync Manager                           | SM           | Collection of control elements to coordinate access to concurrently used objects.   |
| 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.                        |
| transmit PDO                           | TxPDO        | A process data object sent from an EtherCAT slave.  |
| task period                            | ---          | The interval at which the primary periodic task or a periodic task is executed.<br>Refer to the software user's manual for the connected CPU Unit or Industrial PC for details. |
| 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.  |

| Term                              | Abbreviation | Description   |
|-----------------------------------|--------------|---|
| device profile                    | ---          | A collection of device dependent information and functionality providing consistency between similar devices of the same device type.   |
| device variable                   | ---          | A variable that is used to access a specific device through an I/O port by an NJ/NX-series CPU Unit or NY-series Industrial PC. Process data on an EtherCAT slave is allocated to this variable. For NX-series CPU Units to which NX Units can be connected, I/O data for the NX Units on a CPU Unit is allocated. A user application on a CPU Unit or Industrial PC accesses a device that can be connected, by directly reading and writing this device variable. |
| network configuration information | ---          | The EtherCAT network configuration information held by the EtherCAT master.   |
| primary periodic task             | ---          | The task with the highest priority. Refer to the software user's manual for the connected CPU Unit or Industrial PC for details.  |
| Pre-Operational                   | ---          | A state in EtherCAT communications where only SDO communications are possible with the slaves, i.e., no I/O can be performed.   |
| process data                      | ---          | Collection of application objects designated to be transferred cyclically or acyclically for the purpose of measurement and control.  |
| process data object               | PDO          | A structure that describes the mappings of parameters that have one or more process data entities.  |
| 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.   |

# 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>W626-E1-01</b> |
|-----------------|-------------------|

↑  
Revision code

| Revision code | Date      | Revised content     |
|---------------|-----------|---------------------|
| 01            | June 2022 | Original production |

# 1

# Features and System Configuration

This section provides an introduction to EtherCAT, an overview of features, system configurations, Unit models and functions of the EtherCAT Slave Unit, as well as relevant Support Software.

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|            |   |            |
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| 1-1-2      | Types of EtherCAT Communications .....              | 1-3        |
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| 1-4-1      | Unit Model .....                                    | 1-9        |
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# 1-1 Introduction to EtherCAT

EtherCAT (Ethernet Control Automation Technology) is a high-performance industrial network system that enables faster and more efficient communications based on Ethernet.

Each node achieves a short communications cycle time by transmitting Ethernet frames at high speed. Although EtherCAT is a unique communications protocol, standard Ethernet technology is used for the physical layer, which means you can use Ethernet cables for wider application.

The effectiveness of EtherCAT can be fully utilized not only in large control systems that require high processing speeds and system integrity, but also in small and medium control systems.

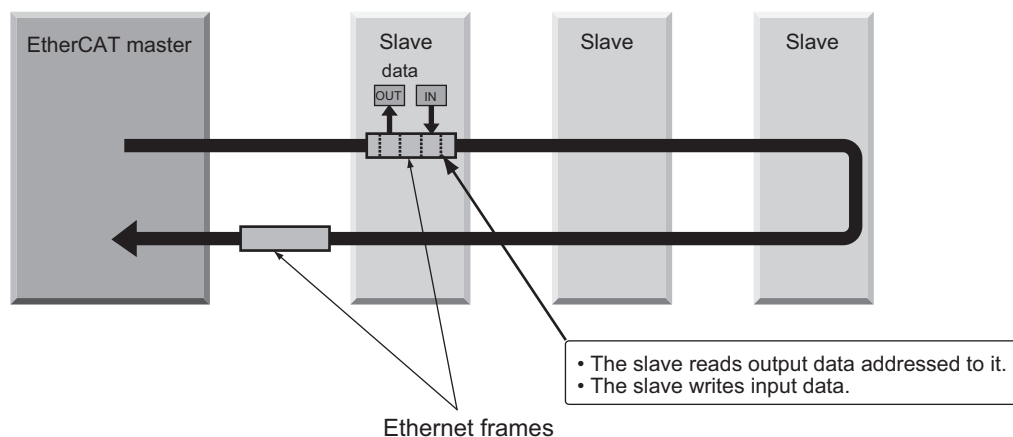
## 1-1-1 How EtherCAT Works

With EtherCAT, Ethernet frames pass through all of the slave nodes.

When a frame passes through a slave node, the slave node reads and writes the data in the area that is allocated to it in the frame in a few nanoseconds.

The Ethernet frames that are transmitted by the EtherCAT master pass through all EtherCAT slaves without stopping. The last slave returns all of the frames, which again pass through all of the slaves before returning to the EtherCAT master.

This mechanism ensures high speed and realtime data transmission.

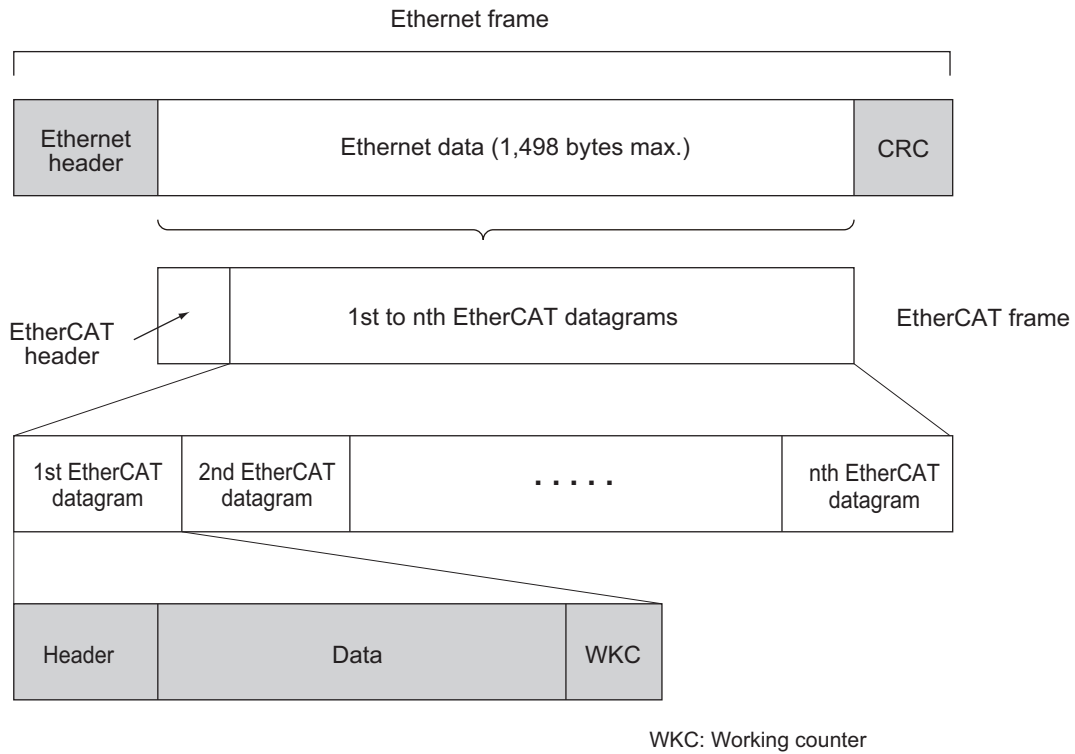


The data exchanges that are cyclically performed between the EtherCAT master and EtherCAT slaves use EtherCAT datagrams that are stored directly in the Ethernet frames.

Each EtherCAT datagram consists of a header (including the data length and one or more slave addresses), data, and a working counter (i.e., check bits).

If you think of an Ethernet frame as a train, the EtherCAT datagrams would be the cars of the train.





## 1-1-2 Types of EtherCAT Communications

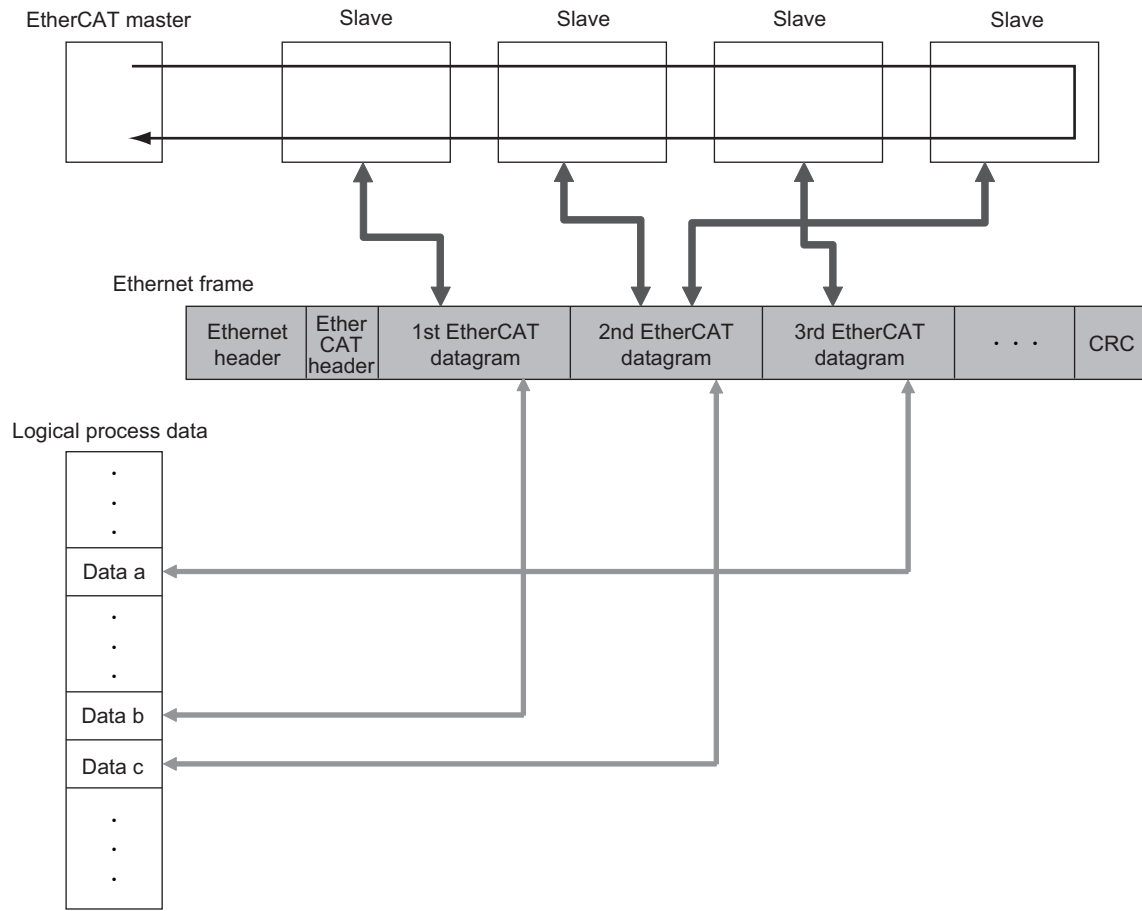
The following two types of communications are available with EtherCAT.

PDO communications are executed in each EtherCAT communications cycle to refresh data continuously. SDO communications are executed between PDO communications.

### Process Data Communications (PDO Communications)

PDO communications transfers process data cyclically and in realtime.

The EtherCAT master maps the logical process data space to the nodes to achieve cyclic communications between the EtherCAT master and slaves.



## Mailbox Communications (SDO Communications)

SDO communications is used to perform message communications.

Whenever necessary, the EtherCAT master sends a command to a slave, and then the slave returns a response to the EtherCAT master.

The following data communications can be performed.

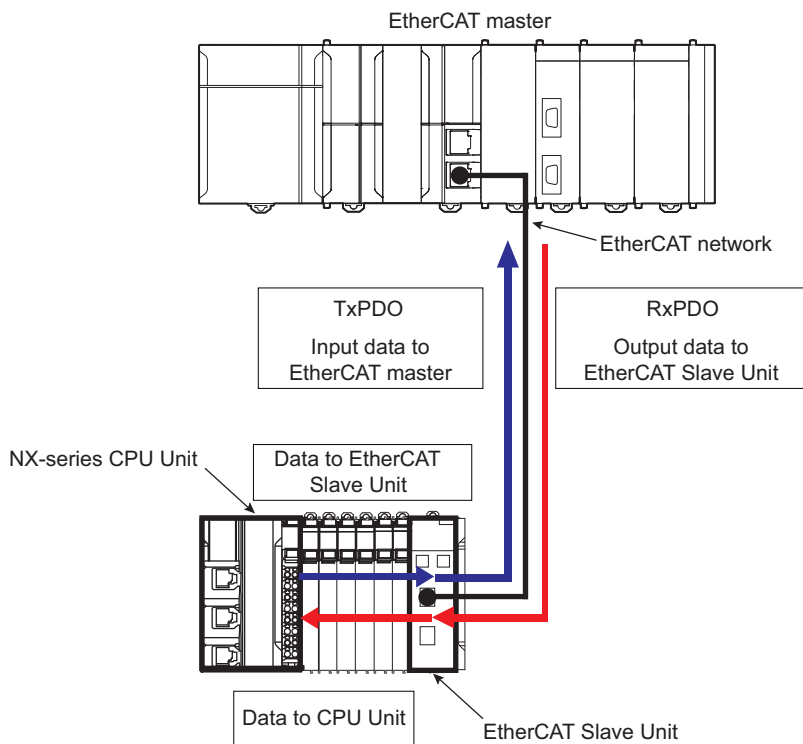
- Reading and writing process data
- Setting slaves
- Monitoring slave status

## 1-2 EtherCAT Slave Unit Features

The NX-series EtherCAT Slave Unit has the following features.

### Data Exchange Between EtherCAT Master and CPU Unit

Through the EtherCAT Slave Unit, the data can be exchanged over the EtherCAT network between the EtherCAT master and the NX-series CPU Unit which is connected to the EtherCAT Slave Unit. The amount of data that can be exchanged is up to 1,200 bytes for TxPDOs and up to 1,200 bytes for RxPDOs.



### Adjustable Data Exchange Sizes

For the data to exchange between the NX-series CPU Unit and EtherCAT master, the following types of data can be allocated up to 1,200 bytes in total for both TxPDOs and RxPDOs.

This allows the adjustment of the data size according to the application.

| Type of data                 | Allocatable number |
|------------------------------|--------------------|
| (a) Data in unit of 30 bytes | 0 to 40 data       |
| (b) Data in unit of 10 bytes | 0 to 10 data       |
| (c) Data in unit of 4 bytes  | 0 to 32 data       |

Example 1:

When 40 data of type (a) only are allocated, the data exchange size is as follows.

$$30 \text{ bytes} \times 40 \text{ data} = 1,200 \text{ bytes}$$

Example 2:

When 20 data of type (a) and 32 data of type (c) are allocated, the data exchange size is as follows.  
 $(30 \text{ bytes} \times 20 \text{ data}) + (4 \text{ bytes} \times 32 \text{ data}) = 728 \text{ bytes}$

The following shows the data types of these three types of data.

| Type of data                 | Data type                         |
|------------------------------|-----------------------------------|
| (a) Data in unit of 30 bytes | UINT array (ARRAY[0..14] OF UINT) |
| (b) Data in unit of 10 bytes | BYTE array (ARRAY[0..9] OF BYTE)  |
| (c) Data in unit of 4 bytes  | UDINT                             |

## Troubleshooting With Event Codes

The EtherCAT Slave Unit supports the event logs in the NJ/NX/NY-series Controllers and troubleshooting on the Sysmac Studio and NA-series HMI.

- **Troubleshooting from NX-series CPU Unit**

The cause of errors in the EtherCAT Slave Unit can be identified from the event codes and error descriptions that are read from the Sysmac Studio and NA-series HMI connected to the NX-series CPU Unit.

This allows you to reduce the recovery work when an error occurs.

- **Troubleshooting from EtherCAT master**

The notification of error status to the EtherCAT master acts as a trigger to read the *Diagnosis History* (10F3 hex) CoE object of the EtherCAT Slave Unit, and allows you to check errors that occur in the EtherCAT Slave Unit.

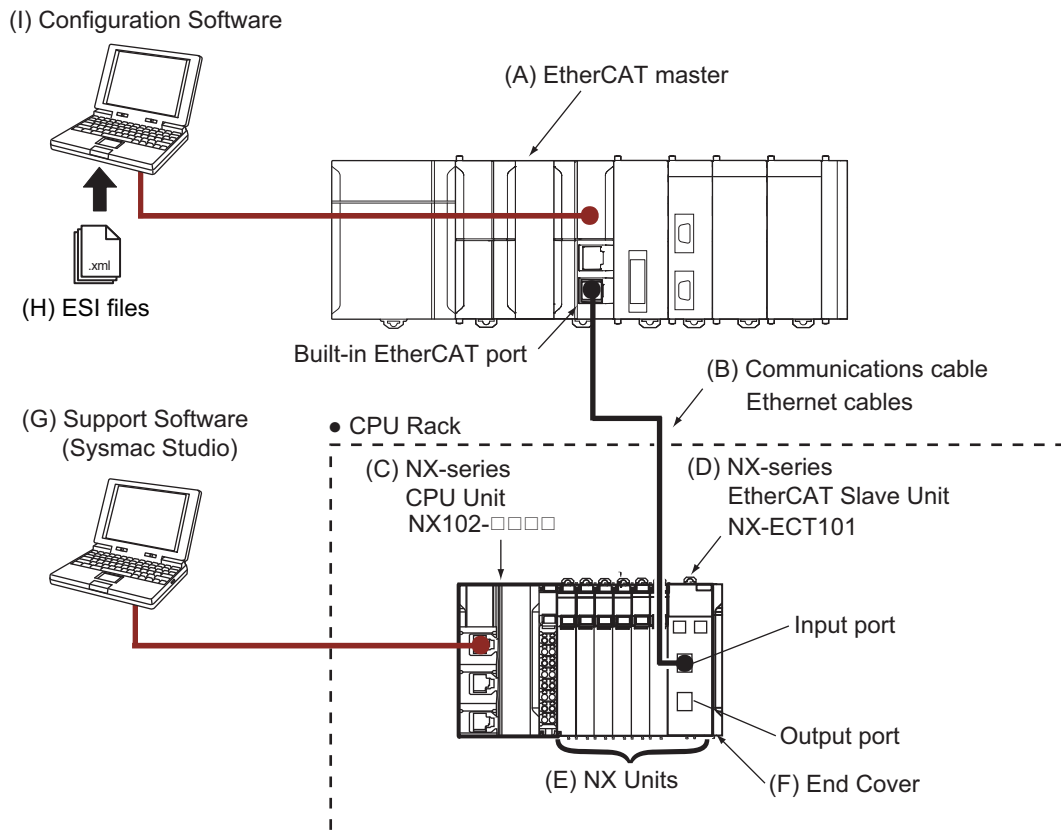
The notification of error status is made with the new messages available or the Sysmac error status. This allows you to use this manual to view and correct errors.

## 1-3 System Configuration

An example of a system configuration for an NX-Series EtherCAT Slave Unit is shown below.

The following figure shows an example when an NX-series NX102 CPU Unit is used for the NX-series CPU Unit.

Refer to the user's manual for the connected CPU Unit when an NX-series CPU Unit other than the NX102 CPU Unit is used.



| Letter | Item                                      | Description  |
|--------|---|--|
| (A)    | EtherCAT master* <sup>1</sup>             | The EtherCAT master manages the EtherCAT network, monitors the status of the slaves and exchanges I/O data with the slaves.  |
| (B)    | Communications cable                      | Use a double-shielded cable with aluminum tape and braiding of category 5 (100BASE-TX) or higher, and use straight wiring.   |
| (C)    | NX-series CPU Unit* <sup>2</sup>          | The Unit that serves as the center of control for a Machine Automation Controller. It executes tasks, refreshes I/O for other Units and slaves, etc. NX Units can be connected to an NX102 CPU Unit.   |
| (D)    | NX-series EtherCAT Slave Unit (NX-ECT101) | The NX-series EtherCAT Slave Unit can perform the following functions over an EtherCAT network. <ul style="list-style-type: none"> <li>• Process data communications with the EtherCAT master</li> <li>• Message communications (SDO communications) with the EtherCAT master</li> <li>• Exchange data between the NX-series CPU Unit and the EtherCAT master</li> </ul> |

| Letter | Item                                   | Description   |
|--------|--|---|
| (E)    | NX Units                               | The NX Units perform I/O processing with connected external devices. The NX Units exchange data with the CPU Unit through I/O refreshing. The NX-ECT101 is applicable to an NX Unit.  |
| (F)    | End Cover                              | The End Cover is attached to the end of the CPU Rack.   |
| (G)    | Support Software (Sysmac Studio)<br>*3 | A computer software application for setting, programming, debugging, and troubleshooting NJ/NX/NY-series Controllers.<br>For an NX102 CPU Unit, this application performs setting operation by making a connection to a built-in EtherNet/IP port.  |
| (H)    | ESI (EtherCAT Slave Information) file  | The ESI file contains information that is unique to an EtherCAT slave in XML format. You can load an ESI file into the EtherCAT master Configuration Software to easily allocate slave process data and make other settings.<br>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. |
| (I)    | Configuration Software                 | Configuration Software runs on a personal computer and it is used to configure the EtherCAT network and EtherCAT slaves.  |

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

\*2. Refer to *A-8 Version Information* on page A-65 for information on the unit versions of the NX-series CPU Unit that can use the NX-series EtherCAT Slave Units.

\*3. Refer to *A-8 Version Information* on page A-65 for information on the versions of the Sysmac Studio that you can use to configure the NX-series EtherCAT Slave Units.



### Precautions for Correct Use

The EtherCAT Slave Unit can be connected to the NX-series CPU Unit only. It cannot be connected to the NX bus of the following Units.

- NX-series Communications Coupler Unit
- NX-series Communication Control Unit

# 1-4 Model, Functions, and Support Software

This section describes the model, list of functions, and Support Software of the EtherCAT Slave Unit.

## 1-4-1 Unit Model

This section provides the Unit model of the EtherCAT Slave Unit.

Refer to *2-1 Specifications* on page 2-2 for details on the specifications of the EtherCAT Slave Unit.

| Model     | External connection terminals | Refreshing method            | Send/receive PDO data sizes*1  | I/O refreshing method |
|-----------|-------------------------------|------------------------------|--|-----------------------|
| NX-ECT101 | RJ45 × 2                      | Free-Run Mode (Asynchronous) | <ul style="list-style-type: none"> <li>Data input by the EtherCAT master (TxPDOs) 1,204 bytes max.</li> <li>Data output by the EtherCAT master (RxPDOs) 1,200 bytes max.</li> </ul> <p>Data size that can be exchanged between the EtherCAT master and CPU Unit</p> <ul style="list-style-type: none"> <li>TxPDOs: 1,200 bytes max.</li> <li>RxPDOs: 1,200 bytes max.</li> </ul> | Free-Run refreshing   |

\*1. TxPDO is the data to send from the EtherCAT Slave Unit to the EtherCAT master. RxPDO is the data received by the EtherCAT Slave Unit from the EtherCAT master.

The following shows the contents of the TxPDO data.

- I/O data set from the CPU Unit to the EtherCAT master: 1,200 bytes or less
- Status to notify the EtherCAT master: 4 bytes or less

## 1-4-2 List of Functions

The following shows the list of functions of the EtherCAT Slave Unit.

| Function name                                      | Description   | Reference  |
|--|---|--|
| Data exchange between EtherCAT master and CPU Unit | <p>This function is used to transfer the data from the EtherCAT master to the CPU Unit and transfer the data from the CPU Unit to the EtherCAT master.</p> <p>The data exchange with the EtherCAT master is performed through the PDO communications.</p> <p>The data exchange with the CPU Unit is performed through the I/O refreshing of the NX bus.</p> | <ul style="list-style-type: none"> <li>5-1 I/O Data of EtherCAT Slave Unit and Data Exchange on page 5-2</li> <li>7-4 Process Data Objects (PDOs) on page 7-5</li> <li>6-1 Data Exchange between the EtherCAT Slave Unit and the CPU Unit on page 6-2</li> </ul> |

| Function name               | Description  | Reference   |
|-----------------------------|--|---|
| Sysmac device functionality | <p>The EtherCAT Slave Unit is a Sysmac device that is designed to achieve optimum functionality and ease of operation when combined with an NJ/NX/NY-series Controller and the Sysmac Studio. This is called Sysmac device functionality.</p> <p>The following functions are provided.</p> <ul style="list-style-type: none"> <li>• Error occurrence notifications based on the Sysmac Error Status</li> <li>• Saving node address settings</li> <li>• Verifying the EtherCAT network configuration using serial numbers</li> <li>• SII data checking</li> </ul> | 7-7-2 <i>Sysmac Device Functionality</i> on page 7-22       |
| Changing event levels       | This function allows you to change the level of errors that occur in the EtherCAT Slave Unit.  | 6-5-1 <i>Setting for Changing Event Levels</i> on page 6-22 |

## 1-4-3 Support Software

The Support Software used for the EtherCAT Slave Unit depends on the scope of the system configuration.

See below.

| Scope of system configuration    | Support Software  |
|----------------------------------|---|
| Ether CAT system* <sup>1</sup>   | Configuration Software which support the EtherCAT master used. It depends on the EtherCAT master. When the built-in EtherCAT ports on the NJ/NX-series CPU Unit and NY-series Industrial PC are used for the EtherCAT master, the Sysmac Studio is used for the Support Software. |
| CPU Rack of NX-series Controller | The Sysmac Studio is used.  |

\*1. Network system configured with the EtherCAT devices.

Refer to *1-3 System Configuration* on page 1-7 for information on the Support Software for the system configuration.

Refer to *A-8 Version Information* on page A-65 for information on the Support Software versions.



# 2

## Specifications and Operating Procedures

This section describes the general specifications, individual specifications, and operating procedures of the EtherCAT Slave Unit.

---

|            |                                   |            |
|------------|-----------------------------------|------------|
| <b>2-1</b> | <b>Specifications .....</b>       | <b>2-2</b> |
| 2-1-1      | General Specifications .....      | 2-2        |
| 2-1-2      | Individual Specifications .....   | 2-2        |
| <b>2-2</b> | <b>Operating Procedures .....</b> | <b>2-5</b> |

## 2-1 Specifications

### 2-1-1 General Specifications

This section provides the general specifications of the EtherCAT Slave Unit.

| 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 IEC 61010-2-201.  |
|                       | Noise immunity                                      | Conforms to IEC 61000-4-4, 2 kV (power supply line)   |
|                       | Overvoltage category                                | Category II: Conforms to IEC 61010-2-201.   |
|                       | EMC immunity level                                  | Zone B  |
|                       | Vibration resistance                                | Conforms to IEC 60068-2-6.<br>5 to 8.4 Hz with amplitude of 3.5 mm,<br>8.4 to 150 Hz, acceleration of 9.8 m/s <sup>2</sup><br>100 min each in X, Y, and Z directions (10 sweeps of 10 min each = 100 min total) |
|                       | Shock resistance                                    | Conforms to IEC 60068-2-27, 147 m/s <sup>2</sup> , 3 times each in X, Y, and Z directions   |
| Insulation resistance | Refer to the individual specifications of NX Units. |   |
| Dielectric strength   | Refer to the individual specifications of NX Units. |   |
| Applicable standards  |   | cULus: Listed (UL61010-2-201), EU: EN 61131-2, RCM, KC (KC Registration), EAC, and UKCA   |

**Note 1.** The gravitational acceleration of vibration resistance and shock resistance is  $G=9.8\text{m/s}^2$ .

**Note 2.** The specifications of insulation resistance and dielectric strength vary with NX Unit Models.

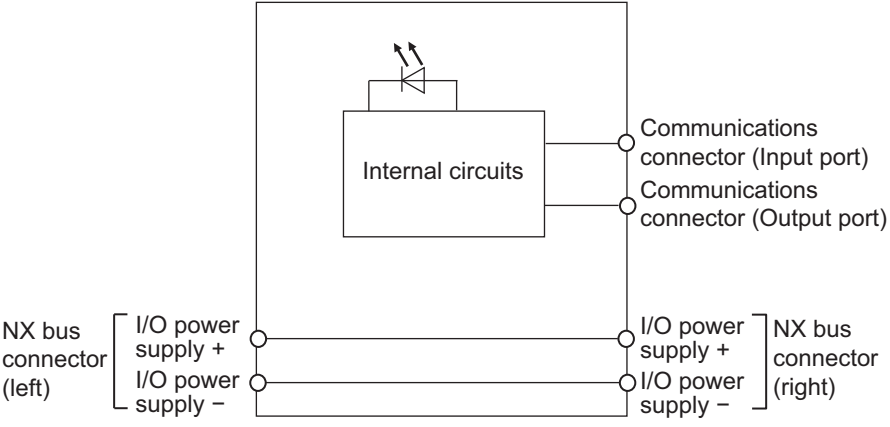
**Note 3.** Refer to the OMRON website ([www.ia.omron.com](http://www.ia.omron.com)) or ask your OMRON representative for the most recent applicable standards for each model.

### 2-1-2 Individual Specifications

This section provides the individual specifications of the EtherCAT Slave Unit.

| Item      | Specification       |
|-----------|---------------------|
| Unit name | EtherCAT Slave Unit |
| Model     | NX-ECT101           |

| Item  | Specification  |  |
|---|--|--|
| Transmission specifications                       | Communications protocol  | EtherCAT protocol (only for slave)   |
|   | Modulation   | Baseband   |
|   | Baud rate  | 100 Mbps   |
|   | Physical layer   | 100BASE-TX (IEEE 802.3)  |
|   | Topology   | Depends on the specifications of the EtherCAT master* <sup>1</sup>   |
|   | Transmission media   | Category 5 or higher twisted-pair cable (Recommended cable: double-shielded cable with aluminum tape and braiding)   |
|   | Transmission distance  | Distance between nodes: 100 m or less  |
|   | Send/receive PDO data sizes* <sup>2</sup>  | <ul style="list-style-type: none"> <li>Data input by the EtherCAT master (TxPDOs)<br/>1,204 bytes max.</li> <li>Data output by the EtherCAT master (RxPDOs)<br/>1,200 bytes max.</li> </ul> <p>Data size that can be exchanged between the EtherCAT master and CPU Unit</p> <ul style="list-style-type: none"> <li>TxPDOs: 1,200 bytes max.</li> <li>RxPDOs: 1,200 bytes max.</li> </ul> |
|   | Mailbox  | Emergency messages and SDO requests  |
|   | Mailbox data size  | <ul style="list-style-type: none"> <li>Input: 400 bytes max.</li> <li>Output: 400 bytes max.</li> </ul>  |
|   | Refreshing method  | Free-Run Mode  |
| Setting range of Explicit Device ID* <sup>3</sup> | <ul style="list-style-type: none"> <li>Hardware switch setting: 1 to 255</li> <li>Software setting: 1 to 65,535</li> </ul>   |  |
| I/O refreshing method                             | Free-Run refreshing  |  |
| External connection terminals                     | EtherCAT communications connector <ul style="list-style-type: none"> <li>RJ45 × 2 (shielded)</li> <li>IN: EtherCAT input data, OUT: EtherCAT output data</li> </ul>  |  |
| Dimensions  | 30 × 100 × 71 mm (W × H × D)   |  |
| Isolation method                                  | Between communications connector and NX bus: Pulse transformer   |  |
| Insulation resistance                             | 20 MΩ min. between isolated circuits (at 100 VDC)  |  |
| Dielectric strength                               | 510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.   |  |
| I/O power supply method                           | No supply  |  |
| Current capacity of I/O power supply terminals    | Without I/O power supply terminals   |  |
| NX Unit power consumption                         | <ul style="list-style-type: none"> <li>Connected to a CPU Unit<br/>1.75 W</li> </ul> <p>Connection to a Communications Coupler Unit or a Communication Control Unit is not possible.</p>   |  |
| Current consumption from I/O power supply         | No consumption   |  |
| Weight  | 110 g  |  |
| Installation orientation and restrictions         | Installation orientation: <ul style="list-style-type: none"> <li>Connected to a CPU Unit<br/>Possible in upright installation.</li> </ul> <p>Restrictions: No restrictions</p> <p>Connection to a Communications Coupler Unit or a Communication Control Unit is not possible.</p> |  |

| Item           | Specification  |
|----------------|--|
| Circuit layout |  <p>The diagram illustrates the internal circuitry of the EtherCAT Slave Unit. It features a central 'Internal circuits' block with a diode symbol above it. The unit is connected to two 'NX bus connector' ports, one on the left and one on the right. Each connector has two terminals: 'I/O power supply +' and 'I/O power supply -'. Additionally, there are two 'Communications connector' ports: 'Input port' and 'Output port'.</p> |

- \*1. The EtherCAT Slave Unit conforms to the EtherCAT standards. Confirm the specifications of the connected EtherCAT master for the support topology. Note that the EtherCAT Slave Unit supports the ring topology.
- \*2. TxPDO is the data to send from the EtherCAT Slave Unit to the EtherCAT master. RxPDO is the data received by the EtherCAT Slave Unit from the EtherCAT master.  
The following shows the contents of the TxPDO data.
  - I/O data set from the CPU Unit to the EtherCAT master: 1,200 bytes or less
  - Status to notify the EtherCAT master: 4 bytes or less
- \*3. The setting range of ID depends on the specifications of the connected EtherCAT master. Confirm the specifications of the EtherCAT master for the setting range of ID for the EtherCAT master.

## 2-2 Operating Procedures

The basic operating procedures for the EtherCAT Slave Unit are described below.

First, use the Sysmac Studio to make the Unit configuration and settings for the CPU Rack of the NX-series Controller to which the EtherCAT Slave Unit is registered.

Then, use the EtherCAT master Configuration Software to incorporate the NX-series Controller into the EtherCAT network.

The following shows the details on the basic operating procedures.

| Procedure | Item   | Description                              | Reference  |  |
|-----------|--|--|--|--|
| 1         | Programming and Setting the CPU Rack         | Creating a project                       | Create a project in the Sysmac Studio.   | <i>Sysmac Studio Version 1 Operation Manual (Cat. No. W504)</i>  |
|           |  | Registering variables and programming    | <ul style="list-style-type: none"> <li>Register global variables for accessing the I/O data of the EtherCAT Slave Unit.</li> <li>Register local variables, etc. to use in the program.</li> <li>Create the user program using the registered variables.</li> </ul> | <i>NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501)</i>  |
|           |  | Creating the Unit configuration          | Register the EtherCAT Slave Unit in the Unit configuration of the CPU Rack.<br>Set the device name of the EtherCAT Slave Unit as necessary.  | <i>Sysmac Studio Version 1 Operation Manual (Cat. No. W504)</i>  |
|           |  | Setting the Unit I/O allocation          | Allocate the I/O data for I/O refreshing between the CPU Unit and EtherCAT Slave Unit to the EtherCAT Slave Unit.<br>Allocate the I/O data to exchange between the CPU Unit and EtherCAT master according to the setting rules for the exchange.                   | <ul style="list-style-type: none"> <li><i>Section 5 Mechanism of I/O Data Exchange and Data to Share</i> on page 5-1</li> <li><i>6-3 Specifications of I/O Data</i> on page 6-7</li> <li><i>6-4 Setting I/O Allocations with the Sysmac Studio</i> on page 6-17</li> </ul> |
|           |  | Setting the Unit                         | Configure the Unit operation settings for the EtherCAT Slave Unit as necessary.  | <i>6-5 Unit Settings</i> on page 6-22  |
|           |  | Allocating global variables to I/O ports | Allocate the registered global variables to the I/O ports of the EtherCAT Slave Unit on the I/O Map.   | <i>Sysmac Studio Version 1 Operation Manual (Cat. No. W504)</i>  |
| 2         | Setting and Installing the CPU Rack Hardware | Setting Explicit Device ID               | Use the ID switch of the EtherCAT Slave Unit to set the Explicit Device ID.* <sup>1</sup>  | <i>3-3 ID Switch</i> on page 3-7   |
|           |  | Installation                             | Install the EtherCAT Slave Unit on the CPU Rack.   | <i>4-1 Installing Units</i> on page 4-2  |
|           |  | Wiring                                   | Wire the power supply to the CPU Rack.   | Hardware user's manual for NX-series CPU Unit to connect   |

| Procedure | Item   | Description  | Reference   |  |
|-----------|--|--|---|--|
| 3         | Down-loading the User Program and Settings to the CPU Rack | Turning ON power to the NX-series Controller           | Turn ON the power supply to the NX-series Controller.   | Hardware user's manual for NX-series CPU Unit to connect   |
|           |  | Online connection from Sysmac Studio                   | Place the Sysmac Studio online with the NX-series Controller.   | <i>Sysmac Studio Version 1 Operation Manual (Cat. No. W504)</i>  |
|           |  | Downloading  | Download the user program, Unit configuration, and EtherCAT Slave Unit settings to the actual device. Use the <i>synchronization</i> operation of the Sysmac Studio to download the data. After the synchronization process is completed, the EtherCAT Slave Unit is restarted to enable the settings.  | <i>Sysmac Studio Version 1 Operation Manual (Cat. No. W504)</i>  |
| 4         | Checking Operation of the CPU Rack                         | Checking for error                                     | Check whether an error occurs in the NX-series Controller by the following means. <ul style="list-style-type: none"> <li>• Indicators</li> <li>• Troubleshooting with the Sysmac Studio or NA-series HMI</li> </ul>   | <i>Section 8 Troubleshooting on page 8-1</i>   |
|           |  | Checking operation using the user program and I/O data | Use the Sysmac Studio to check the operations of user program and I/O data.   | <i>NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501)</i>  |
| 5         | Setting the EtherCAT Master                                | Installing the ESI files                               | Install the ESI file of the EtherCAT Slave Unit into the Configuration Software.  | User's manual for the EtherCAT master to use   |
|           |  | Turning ON the power supply to the EtherCAT master     | Turn ON the power supply to the EtherCAT master.  | User's manual for the EtherCAT master to use   |
|           |  | Creating the network configuration information         | Create the network configuration information as follows. <ul style="list-style-type: none"> <li>• EtherCAT network configuration</li> <li>• PDO setting of EtherCAT Slave Unit</li> <li>• Setting of EtherCAT Slave Unit as an EtherCAT slave</li> <li>• EtherCAT master setting</li> </ul> For the I/O data to exchange between the CPU Unit and EtherCAT master, set the PDO according to the setting rules for the exchange. | <ul style="list-style-type: none"> <li>• User's manual for the EtherCAT master to use</li> <li>• <i>Section 5 Mechanism of I/O Data Exchange and Data to Share on page 5-1</i></li> <li>• <i>7-4 Process Data Objects (PDOs) on page 7-5</i></li> <li>• <i>7-5 PDO Settings and Specifications on page 7-8</i></li> <li>• <i>7-8 Settings as an EtherCAT Slave on page 7-25</i></li> </ul> |
|           |  | Creating the communication settings                    | Create the EtherCAT master's network communication settings.  | User's manual for the EtherCAT master to use   |
|           |  | Downloading the settings to the EtherCAT master        | Download the network configuration information and communication settings to the EtherCAT master.   | User's manual for the EtherCAT master to use   |

| Procedure | Item  | Description  | Reference   |   |
|-----------|---|--|---|---|
| 6         | Connecting to the EtherCAT Master and Starting Communications | Wiring   | Turn OFF the power supply to the EtherCAT master and EtherCAT Slave Unit.<br>Connect the EtherCAT master and EtherCAT Slave Unit with the communications cable. | 4-3 <i>EtherCAT Network Wiring</i> on page 4-4  |
|           |   | Turning ON the power supply                            | Turn ON the power supply to the EtherCAT master and EtherCAT Slave Unit.  | <ul style="list-style-type: none"> <li>User's manual for the EtherCAT master to use</li> <li>Hardware user's manual for NX-series CPU Unit to connect</li> </ul>            |
|           |   | Starting EtherCAT communications                       | Enable EtherCAT network communications.   | User's manual for the EtherCAT master to use  |
| 7         | Checking Operation  | Checking for error                                     | Check for errors in the EtherCAT master and EtherCAT Slave Unit.  | <ul style="list-style-type: none"> <li>User's manual for the EtherCAT master to use</li> <li><i>Section 8 Troubleshooting</i> on page 8-1</li> </ul>                        |
|           |   | Checking operation using the user program and I/O data | Check the operations of the user program and I/O data in the EtherCAT master and EtherCAT Slave Unit.   | <ul style="list-style-type: none"> <li>User's manual for the EtherCAT master to use</li> <li><i>NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501)</i></li> </ul> |

\*1. The software can also be used to set the Explicit Device ID. However, the setting method depends on the EtherCAT master specifications. For the software setting method, refer to the user's manual for the EtherCAT master to use.





# 3

## Part Names and Functions

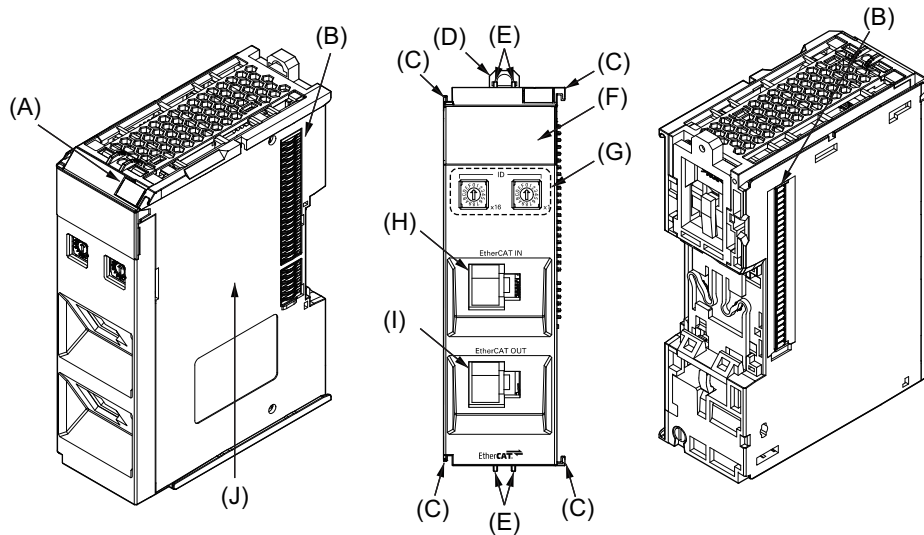
This section describes the names and functions of the parts of the EtherCAT Slave Unit.

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|            |   |            |
|------------|---|------------|
| <b>3-1</b> | <b>Parts and Names .....</b>                | <b>3-2</b> |
| <b>3-2</b> | <b>Indicators .....</b>                     | <b>3-3</b> |
| 3-2-1      | TS Indicator .....                          | 3-3        |
| 3-2-2      | RUN Indicator and ERR Indicator .....       | 3-4        |
| 3-2-3      | L/A IN Indicator and L/A OUT Indicator..... | 3-5        |
| 3-2-4      | Indicator Flashing Patterns.....            | 3-5        |
| <b>3-3</b> | <b>ID Switch .....</b>                      | <b>3-7</b> |

## 3-1 Parts and Names

This section describes the names and functions of the parts of the EtherCAT Slave Unit.



| Letter | Name                                      | Function   |
|--------|---|--|
| (A)    | Marker attachment location                | The location where a marker is attached. A marker made by OMRON is installed for the factory setting. A commercially available marker can also be installed. |
| (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 hook                   | This hook is 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 and connection status of the input port and output port of the EtherCAT.                        |
| (G)    | ID switch                                 | This switch sets the Explicit Device ID for the EtherCAT Slave Unit on the EtherCAT network as a two-digit hexadecimal value.                                |
| (H)    | Communications connector<br>(Input port)  | This communications connector is the input port to connect the communications cable for the EtherCAT network.  |
| (I)    | Communications connector<br>(Output port) | This communications connector is the output port to connect the communications cable for the EtherCAT network.   |
| (J)    | Unit specifications                       | The specifications of the Unit are given.  |

Refer to *Installation* in the hardware user's manual for the connected CPU Unit for details on attaching markers.

Refer to *3-2 Indicators* on page 3-3 for details on the indicators.

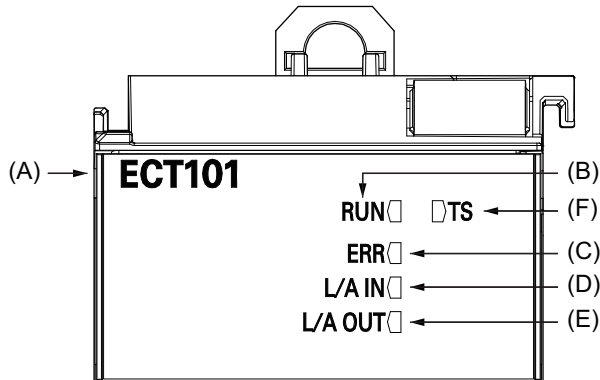
Refer to *3-3 ID Switch* on page 3-7 for details on the ID switch.

Refer to *4-3-4 Specifications and Pin Arrangements of Communications Connectors* on page 4-8 for details on the communications connectors.

## 3-2 Indicators

The EtherCAT Slave Unit has indicators that show the current operating status of the Unit and connection status of the input port and output port of the EtherCAT.

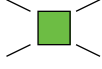
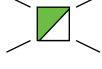
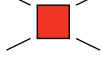


This section describes the names and functions of the indicators.



| Letter | Name                     | Function  |
|--------|--------------------------|---|
| (A)    | Model number indications | Gives the model number of the NX Unit, without the prefix.<br>For example, ECT101 is given for the NX-ECT101.<br>The text is green. |
| (B)    | RUN                      | The RUN indicator shows the operating status of EtherCAT communications for the EtherCAT Slave Unit.                                |
| (C)    | ERR                      | The ERR indicator provides information on errors in the EtherCAT Slave Unit as an EtherCAT slave.                                   |
| (D)    | L/A IN                   | The L/A IN indicator shows the link activity of the EtherCAT input port.  |
| (E)    | L/A OUT                  | The L/A OUT indicator shows the link activity of the EtherCAT output port.  |
| (F)    | TS                       | The TS indicator shows the current status of the EtherCAT Slave Unit as an NX Unit and its communications status with the CPU Unit. |

### 3-2-1 TS Indicator

The TS indicator shows the current status of the EtherCAT Slave Unit as an NX Unit and its communications status with the CPU Unit.

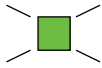
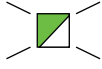

| Color | Status  | Meaning  |
|-------|---|--|
| Green |  | Lit <ul style="list-style-type: none"> <li>The Unit is operating normally.</li> <li>The Unit is ready for I/O refreshing.</li> </ul>   |
|       |  | Flashing (at 2-s intervals) <ul style="list-style-type: none"> <li>Initializing</li> <li>Restarting is in progress for the Unit.</li> <li>Downloading</li> </ul>   |
| Red   |  | Lit <ul style="list-style-type: none"> <li>Malfunction of CPU Unit</li> <li>Non-volatile Memory Hardware Error</li> <li>Control Parameter Error in Master</li> <li>NX Unit Processing Error</li> <li>NX Unit Clock Not Synchronized Error</li> </ul> |
|       |  | Flashing (at 1-s intervals) <ul style="list-style-type: none"> <li>NX Unit I/O Communications Error</li> </ul>   |
| ---   |  | Not lit <ul style="list-style-type: none"> <li>No Unit power supply</li> <li>Restarting is in progress for the Unit.</li> <li>Waiting for initialization to start</li> </ul>   |

### 3-2-2 RUN Indicator and ERR Indicator

This section describes the RUN indicator and ERR indicator.

#### RUN Indicator

The RUN indicator shows the operating status of EtherCAT communications for the EtherCAT Slave Unit.




| Color | Status <sup>*1</sup>  | Meaning                                |
|-------|---|--|
| Green |  | Lit<br>Operational state               |
|       |  | Single flash<br>Safe-Operational state |
|       |   | Blinking<br>Pre-Operational state      |
| ---   |  | Not lit<br>Init state                  |

\*1. Refer to 3-2-4 *Indicator Flashing Patterns* on page 3-5 for the flashing patterns of the indicator.

For details on EtherCAT states, refer to 7-3 *Transitions of Communications States* on page 7-4.

#### ERR Indicator

The ERR indicator provides information on errors in the EtherCAT Slave Unit as an EtherCAT slave.




| Color | Status*1  | Meaning  |
|-------|---|--|
| Red   |    | Lit<br>Hardware failure  |
|       |    | Blinking <ul style="list-style-type: none"> <li>• SII Verification Error</li> <li>• Mailbox Setting Error</li> <li>• RxPDO Setting Error</li> <li>• TxPDO Setting Error</li> <li>• PDO WDT Setting Error</li> <li>• TxPDO Mapping Error</li> <li>• RxPDO Mapping Error</li> <li>• Illegal State Transition Request Received</li> <li>• Error State Transition Received</li> <li>• DC Mode Not Supported</li> <li>• Incorrect PDO Entry Order M to C</li> <li>• Incorrect PDO Entry Order C to M</li> <li>• Illegal PDO Entry Added M to C</li> <li>• Illegal PDO Entry Added C to M</li> <li>• PDO Entry Data Capacity Exceeded M to C</li> <li>• PDO Entry Data Capacity Exceeded C to M</li> <li>• Incorrect RxPDO Mapping Order</li> <li>• Incorrect TxPDO Mapping Order</li> <li>• SM Event Mode Setting Error</li> <li>• FreeRun Setting Error</li> </ul> |
|       |   | Single flash<br>NX Unit Restart  |
|       |   | Double flash<br>Process Data WDT Error   |
|       |   | Flickering<br>ESC Error  |
| ---   |  | Not lit<br>No error related to EtherCAT  |

\*1. Refer to 3-2-4 *Indicator Flashing Patterns* on page 3-5 for the flashing patterns of the indicator.

### 3-2-3 L/A IN Indicator and L/A OUT Indicator

The L/A IN indicator shows the link activity of the EtherCAT input port.

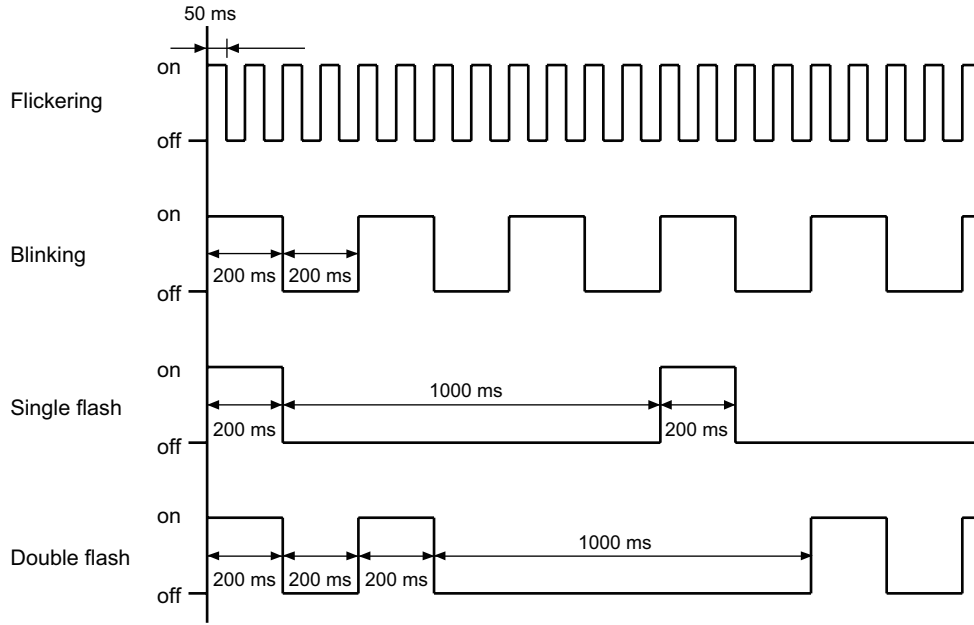
The L/A OUT indicator shows the link activity of the EtherCAT output port.

| Color | Status*1  | Meaning   |
|-------|---|---|
| Green |  | Lit<br>A link was established in the physical layer.                      |
|       |  | Flickering<br>A link was established and communications are in operation. |
| ---   |  | Not lit<br>A link was not established in the physical layer.              |

\*1. Refer to 3-2-4 *Indicator Flashing Patterns* on page 3-5 for the flashing patterns of the indicator.

### 3-2-4 Indicator Flashing Patterns

The flashing patterns for flickering, blinking, single flash, and double flash are given below.



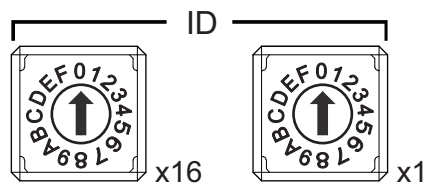
## 3-3 ID Switch

The ID switch sets the Explicit Device ID which is used to enable the EtherCAT master to recognize the EtherCAT Slave Unit on the EtherCAT network.

This manual abbreviates the Explicit Device ID as ID for indication.

For the built-in EtherCAT ports on the NJ/NX-series CPU Unit and NY-series Industrial PC, the ID of EtherCAT Slave Unit is used as the node address.

The following shows the ID switch.



The ID is set with the two-digit hexadecimal ID switches. The left switch sets the upper digit, and the right switch sets the lower digit.

There are two methods to set the ID: setting with ID switch and setting with software.

- **Setting the ID with the ID switch**

Use the ID switch to set the ID in the range from 1 to 255. If you set the ID switch to 00 hex, the setting is made with the software.

Setting range: 01 to FF hex (1 to 255)

The ID is set to 00 hex (0) at the factory.

- **Setting the ID with the software**

To set the ID with the software, set the ID switch to 00 hex. Use the EtherCAT master Configuration Software to set the ID.

Setting range: 1 to 65,535

The setting range of ID depends on the specifications of the connected EtherCAT master. Check the specifications of the EtherCAT master for the supported ID setting range of the EtherCAT master.



### Precautions for Correct Use

- The ID that is set with the ID switch or software is read only once when the Unit power supply is turned ON or the Unit is restarted. Even if the setting is changed after the Unit power supply is turned ON or after the Unit is restarted, the new setting will not be used until the next time when the power is turned ON or the Unit is restarted.
- An error may occur on the EtherCAT master if the same ID is set for more than one slave present on the EtherCAT network.
- An error may occur on the EtherCAT master if the ID is not within the setting range specified for the EtherCAT master.



### Additional Information

The ID is loaded to the register 0012 hex of the EtherCAT slave controller for the EtherCAT Slave Unit when the power supply to the EtherCAT Slave Unit is turned ON.





# 4

## Installation and Wiring

This section describes how to install the EtherCAT Slave Unit, the type of power supply to use, its wiring method, and how to wire the EtherCAT network.

---

|            |  |            |
|------------|--|------------|
| <b>4-1</b> | <b>Installing Units.....</b>   | <b>4-2</b> |
| <b>4-2</b> | <b>Power Supply Type and Wiring .....</b>                              | <b>4-3</b> |
| <b>4-3</b> | <b>EtherCAT Network Wiring.....</b>                                    | <b>4-4</b> |
| 4-3-1      | Installation Standards.....  | 4-4        |
| 4-3-2      | Installation Precautions .....   | 4-4        |
| 4-3-3      | Preparations for Installation.....                                     | 4-4        |
| 4-3-4      | Specifications and Pin Arrangements of Communications Connectors ..... | 4-8        |
| 4-3-5      | Connecting Communications Cables and Connectors.....                   | 4-8        |
| 4-3-6      | Connecting Communications Cables to Units .....                        | 4-8        |

## 4-1 Installing Units

---

Refer to *Installation* in the hardware user's manual for the connected CPU Unit for information on installing NX Units, including the EtherCAT Slave Unit.



### Precautions for Correct Use

---

The EtherCAT Slave Unit can be connected to the NX-series CPU Unit only. It cannot be connected to the NX bus of the following Units.

- NX-series Communications Coupler Unit
  - NX-series Communication Control Unit
- 

- **Restrictions on installation orientation**

The EtherCAT Slave Unit can be connected to the NX-series CPU Unit only.

Therefore, the EtherCAT Slave Unit can be installed only in the upright orientation according to the NX-series CPU Unit.

- **Restrictions on adjacent NX Units**

There are no restrictions.

## 4-2 Power Supply Type and Wiring

---

Only the NX Unit power supply is used to supply power to the EtherCAT Slave Unit.

The method for supplying power to the EtherCAT Slave Unit and the wiring method depend on the specifications for the CPU Unit to which NX Units are connected. Refer to *Designing the Power Supply System* and *Wiring* in the hardware user's manual for the connected CPU Unit for details on the method for supplying power to the EtherCAT Slave Unit and the wiring method.



### Additional Information

---

It is not necessary to supply I/O power to the EtherCAT Slave Unit.

---

## 4-3 EtherCAT Network Wiring

This section describes how to install the EtherCAT network.

### 4-3-1 Installation Standards

To ensure that the EtherCAT communication network is installed properly, refer to IEC 61784-5-12 standard in conjunction with IEC 61918.

### 4-3-2 Installation Precautions

Basic precautions for the installation of EtherCAT networks are provided below.

#### Precautions when Installing a Network

- When you install an EtherCAT network, take sufficient safety precautions and perform the installation according to all applicable standards and specifications. An expert well versed in safety measures and the standards and specifications should be asked to perform the installation.
- Do not install EtherCAT network equipment near sources of noise.
- If the network must be installed in an area with noise, take steps to address the noise, such as placing equipment in metal cases.

#### Precautions when Installing Communications Cables

- Check the following items on the communications cables that are used in the network.
  - Are there any breaks?
  - Are there any shorts?
  - Are there any connector problems?
- When you connect the cable to the communications connectors on devices, firmly insert the communications cable connector until it locks in place.
- Do not lay the communications cables together with high-voltage lines.
- Do not lay the communications cable near devices that generate noise.
- Do not lay the communications cables in locations subject to high temperatures or high humidity.
- Do not lay the communications cables in locations subject to excessive dust, oil mist, or other contaminants.
- There are limitations on the bending radius of communications cables. Check the specifications of the communications cable for the bending radius.

### 4-3-3 Preparations for Installation


Prepare the following devices.

| Product   | Remarks   |
|---|---|
| Twisted-pair cable (Cables with the following connectors can also be used.) | 100BASE-TX (Category 5 or higher)<br>Double shielding with aluminum tape and braiding |
| RJ45 connectors   | Shielded  |

Recommended products are given in the following tables.

## Cables with Connectors

### ● Sizes and Conductor Pairs: AWG 26 × 4 Pairs





| Product name  | Manufacturer      | Cable length [m] | Model                | Contact information           |
|---|-------------------|------------------|----------------------|-------------------------------|
| <b>Cable with Connectors on Both Ends (RJ45/RJ45)</b><br><b>Standard RJ45 plugs<sup>*1</sup></b><br><b>Cable Sheath material: LSZH<sup>*2</sup></b><br><b>Cable color: Yellow<sup>*3</sup></b><br> | OMRON Corporation | 0.3              | XS6W-6LSZH8SS30CM-Y  | OMRON Customer Service Center |
|   |                   | 0.5              | XS6W-6LSZH8SS50CM-Y  |                               |
|   |                   | 1                | XS6W-6LSZH8SS100CM-Y |                               |
|   |                   | 2                | XS6W-6LSZH8SS200CM-Y |                               |
|   |                   | 3                | XS6W-6LSZH8SS300CM-Y |                               |
|   |                   | 5                | XS6W-6LSZH8SS500CM-Y |                               |

\*1. Cables are available in the following lengths: 0.2, 0.3, 0.5, 1, 1.5, 2, 3, 5, 7.5, 10, 15, and 20 m. Refer to the *Industrial Ethernet Connectors Catalog* (Cat. No. G019) for details.

\*2. This is the Low Smoke Zero Halogen cable for in-cabinet use. Although the LSZH cable is single shielded, its communications and noise characteristics meet the standards. PUR cables for out-of-cabinet use are also available.

\*3. Cables colors are available in blue, yellow, or green.

### ● Sizes and Conductor Pairs: AWG 22 × 2 Pairs

| Product name  | Manufacturer      | Cable length [m] | Model            | Contact information           |
|---|-------------------|------------------|------------------|-------------------------------|
| <b>Cable with Connectors on Both Ends (RJ45/RJ45)</b><br><b>Rugged RJ45 plug<sup>*1</sup></b><br><b>Cable color: Light blue</b><br>  | OMRON Corporation | 0.3              | XS5W-T421-AMD-K  | OMRON Customer Service Center |
|   |                   | 0.5              | XS5W-T421-BMD-K  |                               |
|   |                   | 1                | XS5W-T421-CMD-K  |                               |
|   |                   | 2                | XS5W-T421-DMD-K  |                               |
|   |                   | 5                | XS5W-T421-GMD-K  |                               |
|   |                   | 10               | XS5W-T421-JMD-K  |                               |
| <b>Cable with Connectors on Both Ends (M12 Straight/M12 Straight)</b><br><b>Shield Strengthening cable<sup>*2</sup></b><br><b>M12/Smartclick connectors</b><br><b>Cable color: Black</b><br>               | OMRON Corporation | 0.5              | XS5W-T421-BM2-SS |                               |
|   |                   | 1                | XS5W-T421-CM2-SS |                               |
|   |                   | 2                | XS5W-T421-DM2-SS |                               |
|   |                   | 3                | XS5W-T421-EM2-SS |                               |
|   |                   | 5                | XS5W-T421-GM2-SS |                               |
|   |                   | 10               | XS5W-T421-JM2-SS |                               |
| <b>Cable with Connectors on Both Ends (M12 Straight/RJ45)</b><br><b>Shield Strengthening cable<sup>*2</sup></b><br><b>M12/Smartclick connector and rugged RJ45 plug</b><br><b>Cable color: Black</b><br> | OMRON Corporation | 0.5              | XS5W-T421-BMC-SS |                               |
|   |                   | 1                | XS5W-T421-CMC-SS |                               |
|   |                   | 2                | XS5W-T421-DMC-SS |                               |
|   |                   | 3                | XS5W-T421-EMC-SS |                               |
|   |                   | 5                | XS5W-T421-GMC-SS |                               |
|   |                   | 10               | XS5W-T421-JMC-SS |                               |
| <b>Cable with Connectors on Both Ends (RJ45/RJ45)</b><br><b>Rugged standard plugs<sup>*3</sup></b><br><b>Cable color: Yellow</b><br>   | 3M Japan Limited  | 0.25             | 3RHS4-1100-0.25M | 3M Japan Limited              |
|   |                   | 0.5              | 3RHS4-1100-0.5M  |                               |
|   |                   | 1                | 3RHS4-1100-1M    |                               |
|   |                   | 2                | 3RHS4-1100-2M    |                               |
|   |                   | 5                | 3RHS4-1100-5M    |                               |
|   |                   | 10               | 3RHS4-1100-10M   |                               |

\*1. Cables are available in the following lengths: 0.3, 0.5, 1, 2, 3, 5, 10, and 15 m. Refer to the *Industrial Ethernet Connectors Catalog* (Cat. No. G019) for details.

\*2. For details, contact your OMRON representative.

\*3. Cables are available from 0.25 m to 100 m. Ask the manufacturer for details on the models that are not described in the table.

## Cables and Connectors

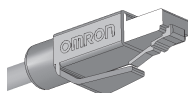
### ● Sizes and Conductor Pairs: AWG 24 × 4 Pairs

| Part name       | Manufacturer              | Model                        | Contact information                       |
|-----------------|---------------------------|------------------------------|---|
| Cables          | Hitachi Metals, Ltd.      | NETSTAR-C5E SAB 0.5<br>× 4P* | Planning Department,<br>Kanetsu Co., Ltd. |
|                 | Kuramo Electric Co., Ltd. | KETH-SB*                     | Kuramo Electric Co., Ltd.                 |
| RJ45 Connectors | Panduit Corporation       | MPS588*                      | Panduit Corporation US<br>Headquarters    |

\* We recommend that you use combinations of the above Cables and Connectors.

### ● Sizes and Conductor Pairs: AWG 22 × 2 Pairs

| Part name                | Manufacturer              | Model         | Contact information           |
|--------------------------|---------------------------|---------------|-------------------------------|
| Cables                   | Kuramo Electric Co., Ltd. | KETH-PSB-OMR* | Kuramo Electric Co., Ltd.     |
|                          | JMACS Japan Co., Ltd.     | PNET/B*       | JMACS Japan Co., Ltd.         |
| RJ45 Assembly Connectors | OMRON Corporation         | XS6G-T421-1*  | OMRON Customer Service Center |



\* We recommend that you use combinations of the above Cables and Connectors.

| Part name                | Manufacturer     | Model             | Contact information |
|--------------------------|------------------|-------------------|---------------------|
| Cables                   | 3M Japan Limited | 79100-IE4P-F1-YE* | 3M Japan Limited    |
| RJ45 Assembly Connectors |                  | 3R104-1110-000AM* |                     |

\* We recommend that you use combinations of the above Cables and Connectors.



### Precautions for Correct Use

- The maximum length between nodes is 100 m. However, some cables are specified for less than 100 m. Generally speaking, if the conductors are twisted wire rather than solid wire, transmission performance will be lower, and reliable communications may not be possible at 100 m. Confirm details with the cable manufacturer.
- When selecting a connector, confirm that it is applicable to the cable that will be used. Confirm the following items: Conductor size, conductor type (solid wire or twisted wire), number of twisted pairs (2 or 4), outer diameter, etc.



### Additional Information


If an Ethernet cable of category 5 or higher is used, communications will be possible even if the cable is not shielded. However, we recommend a cable with double, aluminum tape and braided shielding to ensure sufficient noise immunity.

### 4-3-4 Specifications and Pin Arrangements of Communications Connectors

#### Connector Specifications

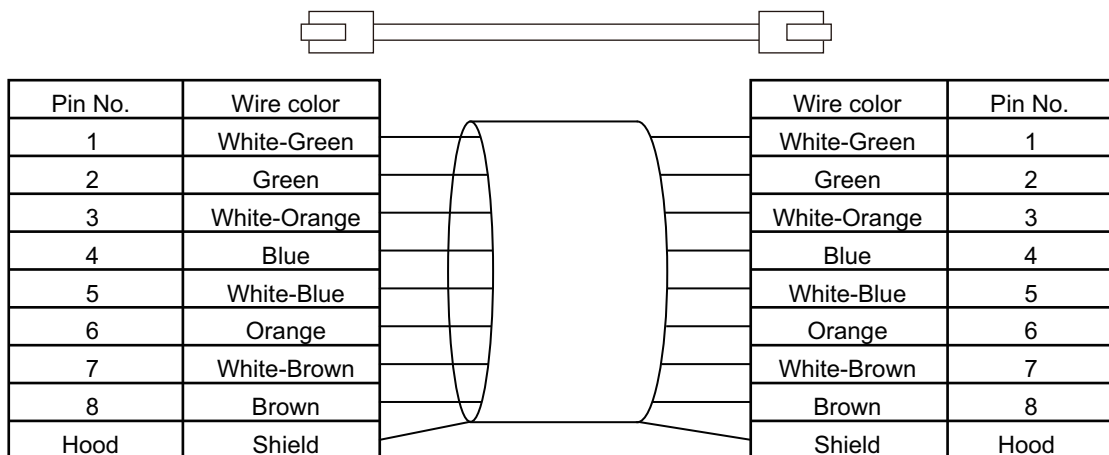
| Specification              | Description  |
|----------------------------|--|
| Electrical characteristics | Conforms to IEEE 802.3 standards.                    |
| Connector structure        | RJ45 8-pin modular connector (Conforms to ISO 8877.) |

#### Pin Arrangement

| Appearance  | Pin No. | Signal name         | Abbreviation | Signal direction |
|---|---------|---------------------|--------------|------------------|
|  | 1       | Transmission data + | TD+          | Output           |
|   | 2       | Transmission data - | TD-          | Output           |
|   | 3       | Reception data +    | RD+          | Input            |
|   | 4       | Not used.           | ---          | ---              |
|   | 5       | Not used.           | ---          | ---              |
|   | 6       | Reception data -    | RD-          | Input            |
|   | 7       | Not used.           | ---          | ---              |
|   | 8       | Not used.           | ---          | ---              |
|   | Hood    | Frame ground        | FG           | ---              |

### 4-3-5 Connecting Communications Cables and Connectors

Use straight wiring to attach the connectors to the communications cable.



**Note 1.** Connect the cable shield to the connector hood at both ends of the cable.

**Note 2.** There are two connection methods for Ethernet: T568A and T568B. The T568A connection method is shown above, but the T568B connection method can also be used.

### 4-3-6 Connecting Communications Cables to Units

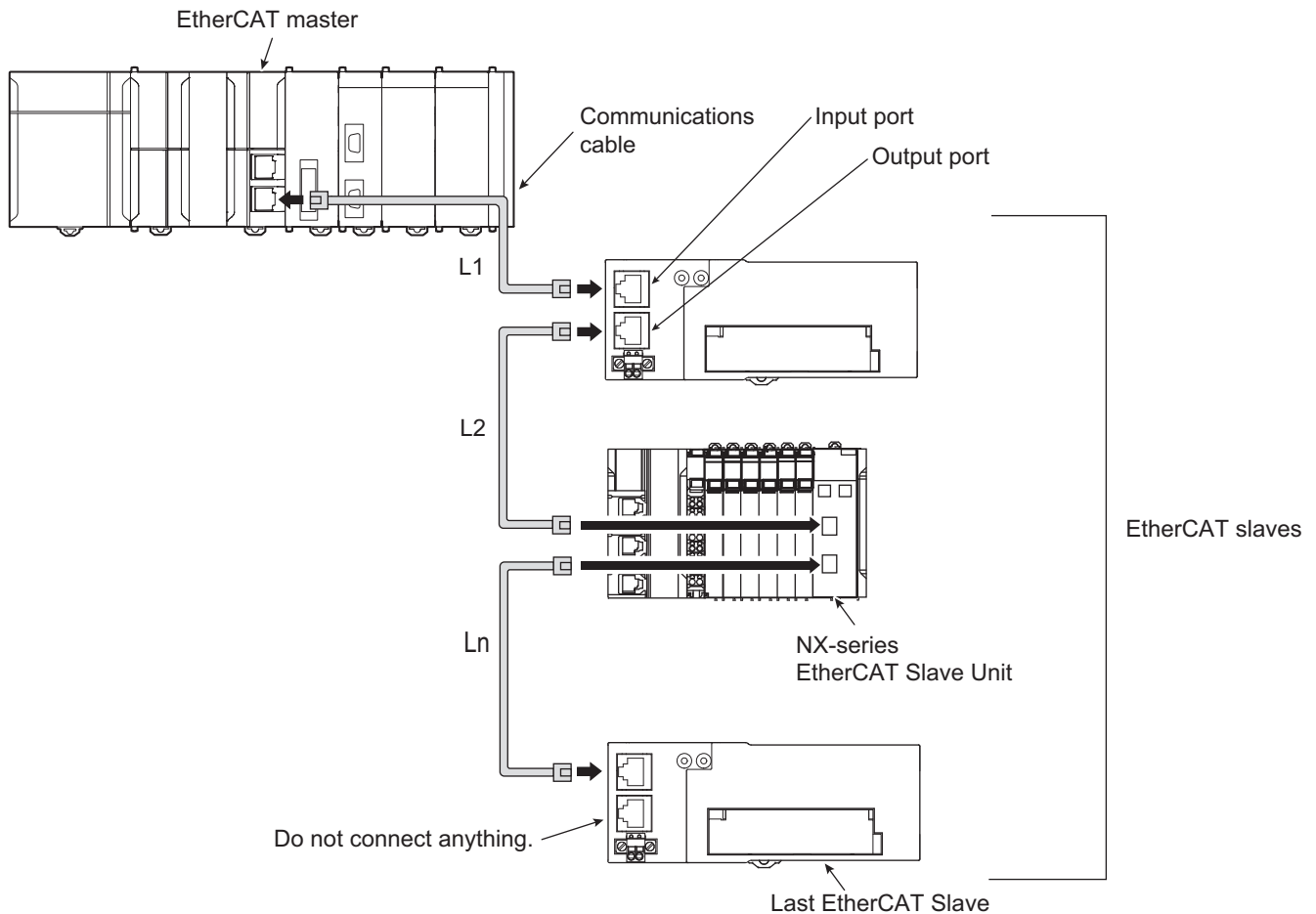
Cable connections can be made freely in EtherCAT networks.

The following example shows daisy-chain connections.



Connect the communications cable from the EtherCAT master to the input port on the first slave, and then connect another communications cable from the output port on the same slave to the input port on the next slave.

Do not connect anything to the output port of the EtherCAT slave at the end of the network.



The cable length between the EtherCAT master and slave and between each slave (L1, L2 ... Ln in the figure) must be 100 m or less.

Firmly connect the communications cable connector until it clicks into place.



#### Precautions for Correct Use

- When you install the communications cables, observe the cable specifications (e.g., bending radius) of the cable manufacturer.
- Do not disconnect the communications cables from the EtherCAT Slave Units during operation. The outputs from the EtherCAT master may become unstable.



# 5

## Mechanism of I/O Data Exchange and Data to Share

This section describes the mechanism of I/O data exchange of the EtherCAT Slave Unit, data to share between the CPU Unit and EtherCAT master, and setting rules for data exchange.

---

|            |   |            |
|------------|---|------------|
| <b>5-1</b> | <b>I/O Data of EtherCAT Slave Unit and Data Exchange .....</b>                    | <b>5-2</b> |
| 5-1-1      | Overview of I/O Data of EtherCAT Slave Unit .....                                 | 5-2        |
| 5-1-2      | Overview of Each Data.....  | 5-4        |
| <b>5-2</b> | <b>Data to Share between CPU Unit and EtherCAT Master and Data Exchange .....</b> | <b>5-5</b> |
| 5-2-1      | Data from the EtherCAT Master to the CPU Unit .....                               | 5-5        |
| 5-2-2      | Data from the CPU Unit to the EtherCAT Master .....                               | 5-6        |
| <b>5-3</b> | <b>Setting Rules for Data Exchange.....</b>                                       | <b>5-9</b> |
| 5-3-1      | Combination of Data.....  | 5-9        |
| 5-3-2      | Total Amount of Data .....  | 5-9        |
| 5-3-3      | Type of Entry .....   | 5-10       |
| 5-3-4      | Order of Entry.....   | 5-10       |
| 5-3-5      | Matched Amount of Data.....   | 5-11       |
| 5-3-6      | Allocation Order to Sync Manager .....  | 5-12       |

## 5-1 I/O Data of EtherCAT Slave Unit and Data Exchange

---

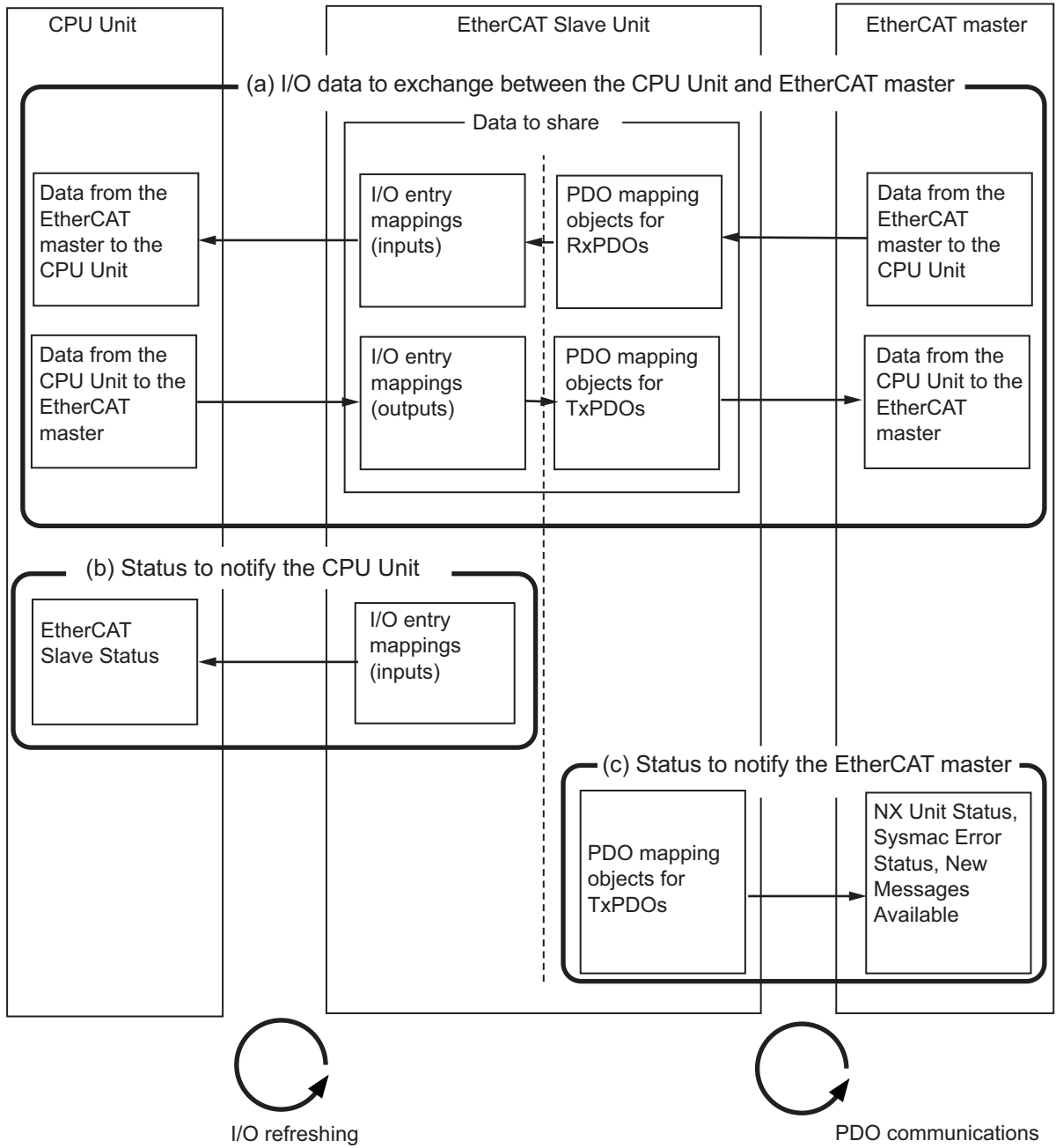
This section describes an overview of the I/O data and data exchange between the EtherCAT Slave Unit and CPU Unit and between the EtherCAT Slave Unit and EtherCAT master.

### 5-1-1 Overview of I/O Data of EtherCAT Slave Unit

There are the following three types of I/O data provided by the EtherCAT Slave Unit when they are classified by the type of data function.

- (a) I/O data to exchange between the CPU Unit and EtherCAT master
- (b) Status to notify the CPU Unit
- (c) Status to notify the EtherCAT master

The following figure and table show an overview of the I/O data and data exchange.



| Letter | Type of data function   | Data  | Data exchange destination | How data exchanges           |
|--------|---|---|---------------------------|------------------------------|
| (a)    | I/O data to exchange between the CPU Unit and EtherCAT master | Data from the EtherCAT master to the CPU Unit   | CPU Unit                  | PDO communications           |
|        |   | Data from the CPU Unit to the EtherCAT master   | EtherCAT master           | I/O refreshing of the NX bus |
| (b)    | Status to notify the CPU Unit                                 | EtherCAT Slave Status   | CPU Unit                  | I/O refreshing of the NX bus |
| (c)    | Status to notify the EtherCAT master                          | <ul style="list-style-type: none"> <li>NX Unit Status</li> <li>New Messages Available</li> <li>Sysmac Error Status</li> </ul> | EtherCAT master           | PDO communications           |

The following describes an overview of the data for each type of data function.

## 5-1-2 Overview of Each Data

The following shows an overview of each type of data function.

### I/O Data to Exchange between the CPU Unit and EtherCAT Master

This I/O data is exchanged between the CPU Unit and EtherCAT master through the EtherCAT Slave Unit. The exchangeable data size is 1,200 bytes or less for both TxPDOs and RxPDOs.

The I/O data to exchange between the CPU Unit and EtherCAT master has different object systems for the data handled between the EtherCAT master and EtherCAT Slave Unit and that handled between the CPU Unit and EtherCAT Slave Unit. The following shows the details.

| Data   | Object system                      |
|--|------------------------------------|
| Data between EtherCAT master and EtherCAT Slave Unit | PDO mapping objects of CoE objects |
| Data between CPU Unit and EtherCAT Slave Unit        | I/O entry mappings of NX objects   |

To enable the data exchange between the data with different object systems, the EtherCAT Slave Unit has the data shared between the EtherCAT master and CPU Unit. Refer to *5-2 Data to Share between CPU Unit and EtherCAT Master and Data Exchange* on page 5-5 for the data to share between the EtherCAT master and CPU Unit.

### Status to Notify the CPU Unit

The following shows the target data and contents.

| I/O entry mapping name            | Description   |
|-----------------------------------|---|
| EtherCAT Slave Status Information | The status information of the EtherCAT Slave Unit as an EtherCAT slave. |

Refer to *6-3 Specifications of I/O Data* on page 6-7 for details on these data.

### Status to Notify the EtherCAT Master

The following shows the target data and contents.

| PDO mapping object name            | Description  |
|------------------------------------|--|
| NX Unit Status Information         | The status information as an NX Unit of the EtherCAT Slave Unit.                               |
| New Messages Available Information | Indicates the new messages available. This notification indicates the update of the error log. |
| Sysmac Error Status Information    | Indicates the Sysmac error status.   |

Refer to *7-5 PDO Settings and Specifications* on page 7-8 for details on these data.

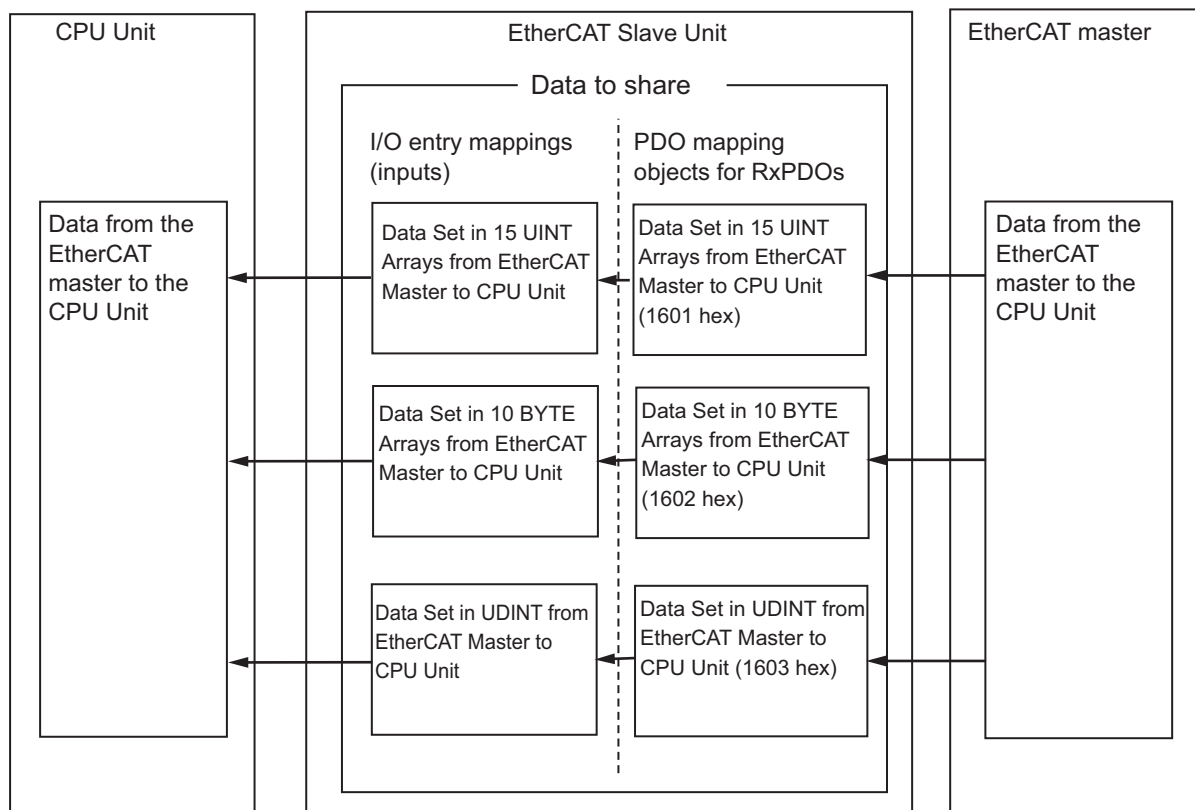
## 5-2 Data to Share between CPU Unit and EtherCAT Master and Data Exchange

This section describes the following data provided by the EtherCAT Slave Unit and shared between the EtherCAT master and CPU Unit and the data exchange for each data.

- Data from the EtherCAT master to the CPU Unit
- Data from the CPU Unit to the EtherCAT master

### 5-2-1 Data from the EtherCAT Master to the CPU Unit

The EtherCAT Slave Unit stores the data from the EtherCAT master in the target PDO mapping objects for RxPDOs, and reflects the data to the target I/O entry mappings. This allows the data from the EtherCAT master to be sent to the CPU Unit through the EtherCAT Slave Unit. The following shows the data to share. The data to share is exchanged in the combinations of the I/O entry mappings and PDO mapping objects shown in the following figure and table.



| Data exchanged with the CPU Unit                            |                   |             | Direction of data | Data exchanged with the EtherCAT master                     |             |                         |             |
|---|-------------------|-------------|-------------------|---|-------------|-------------------------|-------------|
| I/O entry mapping   | I/O entry         |             |                   | PDO mapping object  |             | PDO entry <sup>*1</sup> |             |
|   | Name              | Index (hex) |                   | Name  | Index (hex) | Name                    | Index (hex) |
| Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit | UINTs Data M to C | 6000        | ←                 | Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit | 1601        | UINTs Data M to C       | 7000        |
| Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit | BYTES Data M to C | 6001        | ←                 | Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit | 1602        | BYTES Data M to C       | 7001        |

| Data exchanged with the CPU Unit                   |                   |             | Direction of data | Data exchanged with the EtherCAT master            |             |                   |             |
|--|-------------------|-------------|-------------------|--|-------------|-------------------|-------------|
| I/O entry mapping                                  | I/O entry         |             |                   | PDO mapping object                                 |             | PDO entry*1       |             |
|  | Name              | Index (hex) |                   | Name   | Index (hex) | Name              | Index (hex) |
| Data Set in UDINT from EtherCAT Master to CPU Unit | UDINT Data M to C | 6002        | ←                 | Data Set in UDINT from EtherCAT Master to CPU Unit | 1603        | UDINT Data M to C | 7002        |

\*1. In this manual, the application object is called a *PDO entry* for explanation.

An I/O entry mapping defines a collection of I/O data. The I/O data assigned to an I/O entry mapping is called an I/O entry. The I/O entry mappings are assigned to the EtherCAT Slave Unit, and the I/O allocation settings are downloaded to the CPU Unit.

A PDO mapping object defines a set of I/O data. The I/O data assigned to a PDO mapping object is called a PDO entry. The PDO mapping objects are assigned to the Sync Manager of the EtherCAT Slave Unit, and the settings are downloaded to the EtherCAT master.

Refer to the following for details on these data and the setting method.

- Data exchanged with the CPU Unit:  
*6-3 Specifications of I/O Data* on page 6-7
- Data exchanged with the EtherCAT master:  
*7-5 PDO Settings and Specifications* on page 7-8

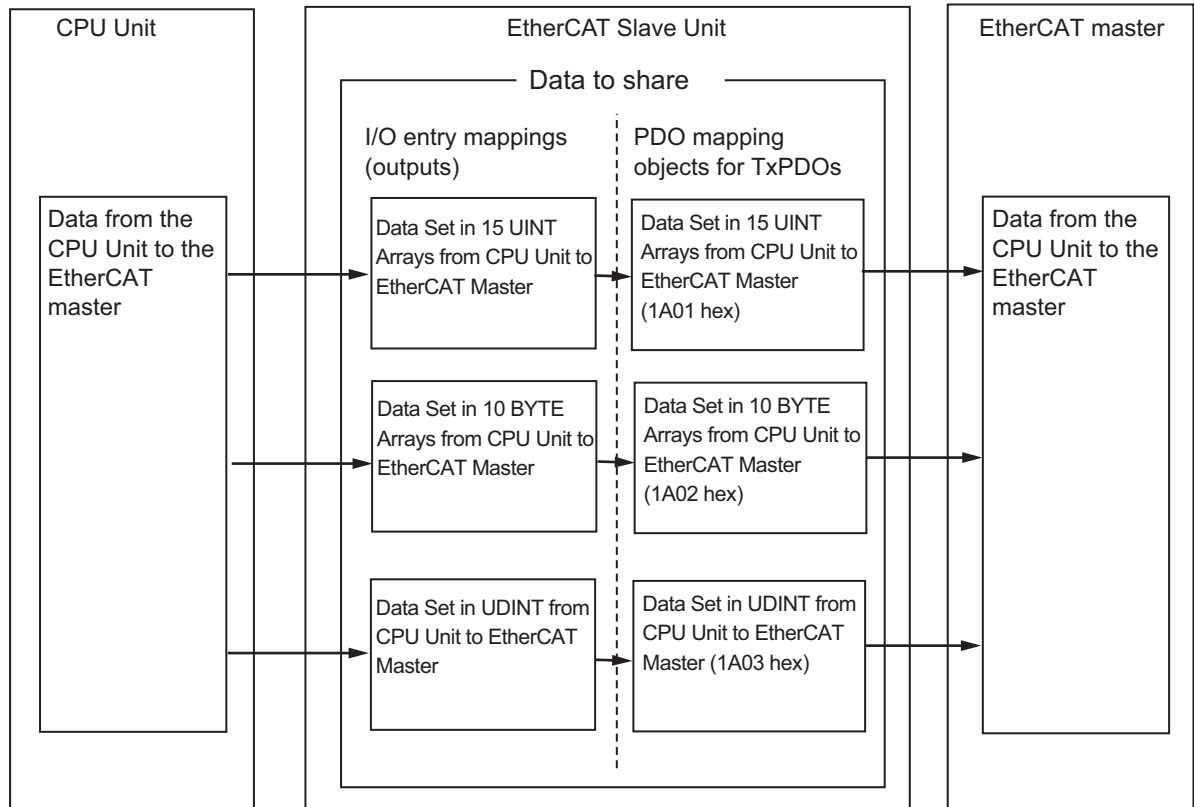
### ● Setting Rules for Correct Data Exchange

To exchange the data correctly between the EtherCAT master and CPU Unit through the EtherCAT Slave Unit, the allocation setting rules need to be satisfied for the data to share. Refer to *5-3 Setting Rules for Data Exchange* on page 5-9 for details on the setting rules for data exchange.

## 5-2-2 Data from the CPU Unit to the EtherCAT Master

The EtherCAT Slave Unit stores the data from the CPU Unit in the target I/O entry mappings, and reflects the data to the target PDO mapping objects for TxPDOs. This allows the data from the CPU Unit to be sent to the EtherCAT master through the EtherCAT Slave Unit. The following shows the shared data. The data to share is exchanged in the combinations of the I/O entry mappings and PDO mapping objects shown in the following figure and table.





| Data exchanged with the CPU Unit                            |                   |             | Direction of data | Data exchanged with the EtherCAT master                     |      |                         |      |
|---|-------------------|-------------|-------------------|---|------|-------------------------|------|
| I/O entry mapping   | I/O entry         |             |                   | PDO mapping object  |      | PDO entry <sup>*1</sup> |      |
|   | Name              | Index (hex) | Name              | Index (hex)   | Name | Index (hex)             |      |
| Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | UINTs Data C to M | 7000        | →                 | Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | 1A01 | UINTs Data C to M       | 6000 |
| Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master | BYTEs Data C to M | 7001        | →                 | Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master | 1A02 | BYTEs Data C to M       | 6001 |
| Data Set in UDINT from CPU Unit to EtherCAT Master          | UDINT Data C to M | 7002        | →                 | Data Set in UDINT from CPU Unit to EtherCAT Master          | 1A03 | UDINT Data C to M       | 6002 |

\*1. In this manual, the application object is called a *PDO entry* for explanation.

An I/O entry mapping defines a collection of I/O data. The I/O data assigned to an I/O entry mapping is called an I/O entry. The I/O entry mappings are assigned to the EtherCAT Slave Unit, and the I/O allocation settings are downloaded to the CPU Unit.

A PDO mapping object defines a set of I/O data. The I/O data assigned to a PDO mapping object is called a PDO entry. The PDO mapping objects are assigned to the Sync Manager of the EtherCAT Slave Unit, and the settings are downloaded to the EtherCAT master.

Refer to the following for details on these data and the setting method.

- Data exchanged with the CPU Unit:  
*6-3 Specifications of I/O Data* on page 6-7
- Data exchanged with the EtherCAT master:  
*7-5 PDO Settings and Specifications* on page 7-8

### ● **Setting Rules for Correct Data Exchange**

To exchange the data correctly between the EtherCAT master and CPU Unit through the EtherCAT Slave Unit, the allocation setting rules need to be satisfied for the data to share. Refer to *5-3 Setting Rules for Data Exchange* on page 5-9 for details on the setting rules for data exchange.

## 5-3 Setting Rules for Data Exchange

This section describes the rules required for data exchange between the CPU Unit and EtherCAT master.

The rules are specified for the following items.

- Combination of data
- Total amount of data
- Type of entry
- Order of entry
- Matched amount of data
- Allocation order to Sync Manager

### 5-3-1 Combination of Data

The I/O entry mapping and PDO mapping object must be combined with the same name for allocation. Refer to the table in 5-2 *Data to Share between CPU Unit and EtherCAT Master and Data Exchange* on page 5-5 for details on the possible combination of I/O entry mappings and PDO mapping objects for data exchange.

If the rule is not satisfied, the relevant error occurs among the following errors.

- *Data Size Mismatched between PDO Entry and I/O Entry M to C* (39170000 hex)
- *Data Size Mismatched between PDO Entry and I/O Entry C to M* (39160000 hex)

Examples:

OK:

The following shows the combination of the data sets with the same name, and the data can be exchanged.

| I/O entry mapping   | PDO mapping object  |             |
|---|---|-------------|
|   | Name  | Index (hex) |
| Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit | Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit | 1601        |

NG:

The following shows the combination of the data sets with different names, and the data cannot be exchanged.

| I/O entry mapping   | PDO mapping object  |             |
|---|---|-------------|
|   | Name  | Index (hex) |
| Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit | Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit | 1602        |

### 5-3-2 Total Amount of Data

The following shows the total amount of data that can be exchanged between the EtherCAT master and CPU Unit.

- Data from the EtherCAT master to the CPU Unit: 1,200 bytes or less
- Data from the CPU Unit to the EtherCAT master: 1,200 bytes or less

Allocate the following so that this rule is satisfied.

- I/O entry mappings and I/O entries
- PDO mapping objects and PDO entries

If the rule is not satisfied, the relevant error occurs among the following errors.

- *I/O Entry Data Capacity Exceeded M to C* (391D0000 hex)
- *I/O Entry Data Capacity Exceeded C to M* (391C0000 hex)
- *PDO Entry Data Capacity Exceeded M to C* (392C0000 hex)
- *PDO Entry Data Capacity Exceeded C to M* (392D0000 hex)

### 5-3-3 Type of Entry

The I/O entry that can be allocated to each I/O entry mapping is predetermined. Also, the PDO entry that can be allocated to each PDO mapping object is predetermined. Allocate the types of entries that can be allocated to the I/O entry mappings and PDO mapping objects. Refer to the table in 5-2 *Data to Share between CPU Unit and EtherCAT Master and Data Exchange* on page 5-5 for the types of entries that can be allocated.

If the rule is not satisfied, the relevant error occurs among the following errors.

- *Illegal I/O Entry Added M to C* (391B0000 hex)
- *Illegal I/O Entry Added C to M* (391A0000 hex)
- *Illegal PDO Entry Added M to C* (391E0000 hex)
- *Illegal PDO Entry Added C to M* (391F0000 hex)

Examples:

OK:

In the following case, the data can be exchanged because the I/O entry can be allocated to the I/O entry mapping.

| I/O entry mapping   | Allocated I/O entry |             |
|---|---------------------|-------------|
|   | Name                | Index (hex) |
| Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | UINTs Data C to M   | 7000        |

NG:

In the following case, the data cannot be exchanged because the I/O entry cannot be allocated to the I/O entry mapping.

| I/O entry mapping   | Allocated I/O entry |             |
|---|---------------------|-------------|
|   | Name                | Index (hex) |
| Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | BYTES Data C to M   | 7001        |

### 5-3-4 Order of Entry

For the data to exchange, there is an entry order of I/O entries that can be assigned to I/O entry mappings and PDO entries that can be assigned to PDO mapping objects. This entry order needs to be set so that the forward feed and ascending order are applied to subindexes.

If the rule is not satisfied, the relevant error occurs among the following errors.

- *Incorrect I/O Entry Order M to C* (39190000 hex)
- *Incorrect I/O Entry Order C to M* (39130000 hex)
- *Incorrect PDO Entry Order M to C* (39140000 hex)

- *Incorrect PDO Entry Order C to M* (39150000 hex)

Examples:

OK:

In the following case, the data can be exchanged because I/O entries are assigned to the I/O entry mapping in a correct order.

| I/O entry mapping   | Allocated I/O entry order |             |                |
|---|---------------------------|-------------|----------------|
|   | Name                      | Index (hex) | Subindex (hex) |
| Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | UINTs 01 C to M           | 7000        | 01             |
|   | UINTs 02 C to M           | 7000        | 02             |
|   | UINTs 03 C to M           | 7000        | 03             |
|   | UINTs 04 C to M           | 7000        | 04             |

NG:

In the following case, the data cannot be exchanged because I/O entries are not assigned to the I/O entry mapping in ascending order.

| I/O entry mapping   | Allocated I/O entry order |             |                |
|---|---------------------------|-------------|----------------|
|   | Name                      | Index (hex) | Subindex (hex) |
| Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | UINTs 01 C to M           | 7000        | 01             |
|   | UINTs 03 C to M           | 7000        | 03             |
|   | UINTs 02 C to M           | 7000        | 02             |
|   | UINTs 04 C to M           | 7000        | 04             |

In the following case, the data cannot be exchanged because I/O entries are not assigned to the I/O entry mapping from the beginning of the subindex.

| I/O entry mapping   | Allocated I/O entry order |             |                |
|---|---------------------------|-------------|----------------|
|   | Name                      | Index (hex) | Subindex (hex) |
| Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | UINTs 02 C to M           | 7000        | 02             |
|   | UINTs 03 C to M           | 7000        | 03             |
|   | UINTs 04 C to M           | 7000        | 04             |

### 5-3-5 Matched Amount of Data

Allocate the following items so that the amount of data exchanged between the EtherCAT master and CPU Unit matches.

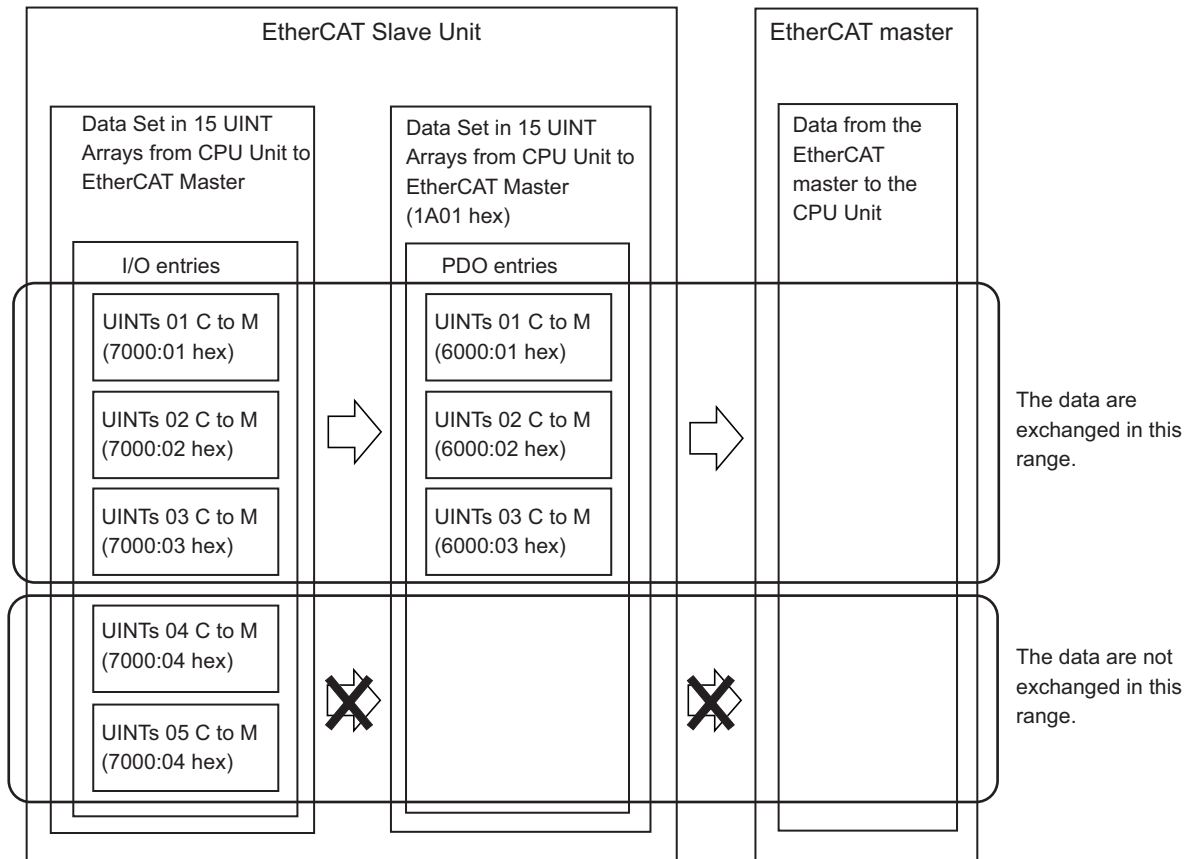
- I/O entry mappings and I/O entries
- PDO mapping objects and PDO entries

If the rule is not satisfied, the relevant error occurs among the following errors.

- *Data Size Mismatched between PDO Entry and I/O Entry M to C* (39170000 hex)
- *Data Size Mismatched between PDO Entry and I/O Entry C to M* (39160000 hex)

## Data Exchange when the Data Sizes Do Not Match

When the data sizes do not match with the other rules satisfied, the data will be exchanged only in the range where the data sizes match. The following shows the details.



If the allocation is set with the amount of data intentionally inconsistent for the purpose of future device expansion, change the event level of the corresponding error from minor fault to observation.

### 5-3-6 Allocation Order to Sync Manager

Of the exchange data, the allocation order to Sync Managers for the PDO mapping objects must be in ascending order of indexes.

If the rule is not satisfied, the relevant error occurs among the following errors.

- *Incorrect RxPDO Mapping Order* (392E0000 hex)
- *Incorrect TxPDO Mapping Order* (392F0000 hex)

Examples:

OK:

The data can be exchanged because the allocation order to Sync Manager for the PDO mapping object is in ascending order of index.

| Allocation order to Sync Manager for the PDO mapping object |             |
|---|-------------|
| Name  | Index (hex) |
| NX Unit Status Information                                  | 1A00        |
| Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | 1A01        |
| Data Set in UDINT from CPU Unit to EtherCAT Master          | 1A03        |

NG:

The data cannot be exchanged because the allocation order to Sync Manager for the PDO mapping object is not in ascending order of index.

| Allocation order to Sync Manager for the PDO mapping object |             |
|---|-------------|
| Name  | Index (hex) |
| Data Set in UDINT from CPU Unit to EtherCAT Master          | 1A03        |
| NX Unit Status Information                                  | 1A00        |
| Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | 1A01        |



#### Additional Information

When the built-in EtherCAT ports on the NJ/NX-series CPU Unit and NY-series Industrial PC are used for the EtherCAT master, it is not necessary to consider the allocation order to Sync Managers.





# 6

## Data Exchange with the CPU Unit and Unit Settings

This section describes the following items.

- Data exchange between the EtherCAT Slave Unit and CPU Unit
- Of the data that the EtherCAT Slave Unit has, I/O data for exchange with the CPU Unit and I/O allocation settings
- Unit operation settings for the EtherCAT Slave Unit

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|            |  |             |
|------------|--|-------------|
| <b>6-1</b> | <b>Data Exchange between the EtherCAT Slave Unit and the CPU Unit.....</b> | <b>6-2</b>  |
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## 6-1 Data Exchange between the EtherCAT Slave Unit and the CPU Unit

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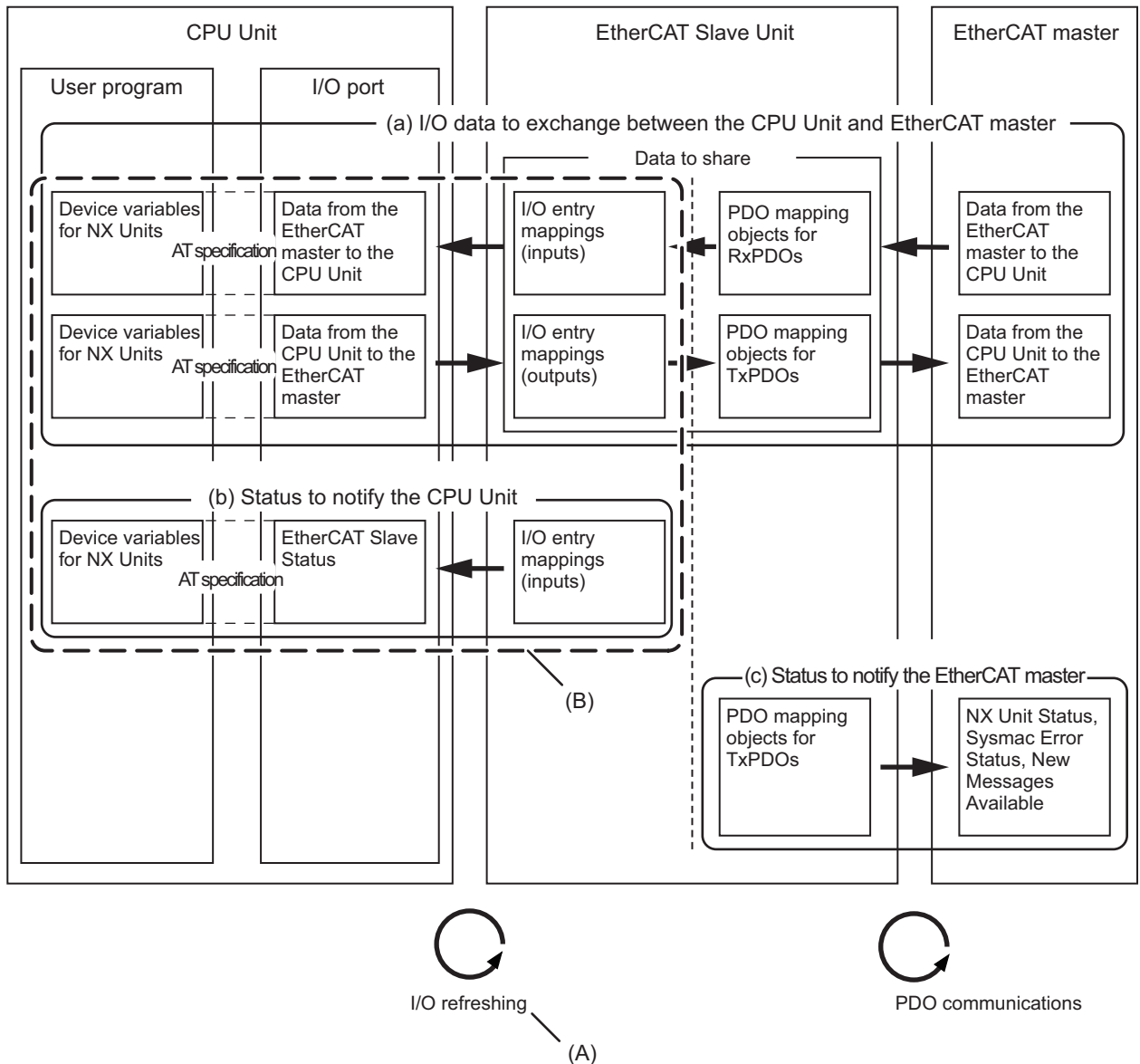
Data exchange between the EtherCAT Slave Unit and CPU Unit uses the I/O port of the CPU Unit allocated to the EtherCAT Slave Unit. Use device variables for NX Units from the user program to access the I/O ports with AT specifications.

Refer to *6-3 Specifications of I/O Data* on page 6-7 for details on the I/O data specifications.

### 6-1-1 Data Flow

The CPU Units and NX-series EtherCAT Slave Units exchange data as shown in the chart below.

- (A) in the chart: The I/O refreshing is used to exchange the data from the CPU Unit to the EtherCAT master.
- (B) in the chart: The data to exchange using the I/O refreshing is the I/O entries that are allocated to the I/O entry mappings in the I/O allocation settings. Use device variables for NX Units from the user program to access the I/O ports that are defined for I/O entries with AT specifications.


 Data Flow between EtherCAT Slave Unit and CPU Unit


## Device Variables for NX Units

The device variables for NX Units are variables for which AT is specified for the I/O port explained below. The user program uses device variables for NX Units to access the configuration Unit such as an EtherCAT Slave Unit.

Refer to *How to Create Device Variables for NX Units* on page 6-4 for allocation of the device variables for NX Units to the I/O port.

### ● I/O Port

An I/O port is a logical interface for data exchange by a CPU Unit with an EtherCAT Slave Unit or other configuration Unit.

An I/O port has a unique pre-defined name for each unit model and function.

An I/O port is automatically created by preparing the Unit configuration with Sysmac Studio.

Refer to *6-3 Specifications of I/O Data* on page 6-7 for details on the I/O ports defined for the EtherCAT Slave Unit.

### ● Data for Exchange between the CPU Unit and EtherCAT Master

The I/O data to exchange between the CPU Unit and EtherCAT master.

There are the data to transfer from the CPU Unit to EtherCAT master and the data to transfer from the EtherCAT master to CPU Unit. For each of them, three types of I/O data can be used.

Because the I/O entries can be added or deleted, you can adjust the data size of the data to exchange by increasing and decreasing I/O entries of the data type used in the user program.

### ● EtherCAT Slave Status Information

This data indicates the status of the EtherCAT Slave Unit as an EtherCAT slave. The CPU Unit accesses the EtherCAT Slave Unit to read the data.

## 6-1-2 Accessing from the User Program

Use device variables for NX Units from the user program to access the I/O ports with AT specifications and exchange various types of information.

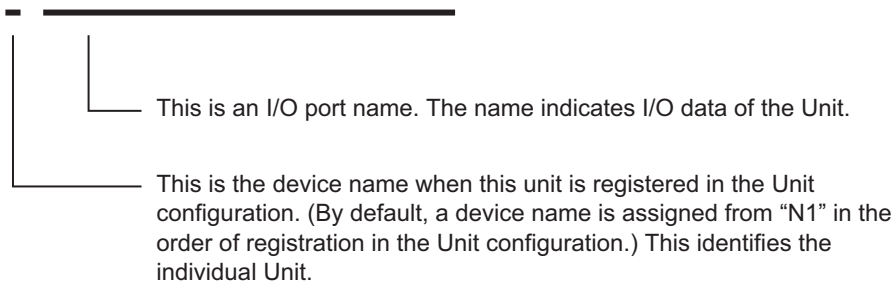
### How to Create Device Variables for NX Units

Use **I/O Map** in Sysmac Studio to allocate device variables for NX Units to an I/O port. Specify variable names using one of the methods shown below.

- a. Select and allocate existing variables.
- b. Input a new variable name.
- c. Automatically create with Create Device Variable.

The following shows the structure of a variable name created automatically with method (c).

**\*\_EtherCAT\_Slave\_Status**



Refer to the *Sysmac Studio Version 1 Operation Manual (Cat. No. W504)* for creating device variables for NX Units.

## 6-2 I/O Refreshing for EtherCAT Slave Units

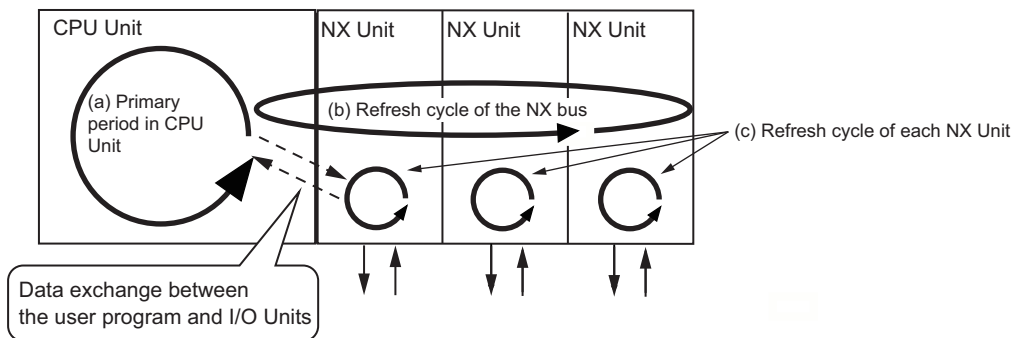
This section describes I/O refreshing for the NX Units.

### 6-2-1 I/O Refreshing from CPU Units to NX Units

An NX-series CPU Unit cyclically performs I/O refreshing with the NX Units.

The following period and two cycles affect operation of the I/O refreshing between the CPU Unit and the NX Units.

- a. Primary period in CPU Unit
- b. Refresh cycle of the NX bus
- c. Refresh cycle of each NX Unit



The following operation occurs.

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

Refer to the *NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501)* for detailed information on I/O refreshing between the CPU Unit and the NX Units.

Refer to *7-9 Communications Performance* on page 7-26 for the I/O response time of the EtherCAT Slave Unit.

### 6-2-2 I/O Refreshing Methods

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

#### Types of I/O Refreshing Methods

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

In the EtherCAT Slave Unit, the following Free-Run refreshing is always used.

| I/O refreshing method | 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. |

### Setting the I/O Refreshing Methods

Because the EtherCAT Slave Unit supports only the Free-Run refreshing, it is not necessary to set the I/O refreshing method.

## 6-3 Specifications of I/O Data

This section describes the I/O data of the EtherCAT Slave Unit.

### 6-3-1 Allocatable I/O Data

This section describes the allocatable I/O data in the EtherCAT Slave Unit.

You can allocate seven I/O entry mappings to the I/O allocation settings for the EtherCAT Slave Unit. Among the I/O entry mappings, only the *EtherCAT Slave Status Information* is fixed for allocation, and the allocation cannot be canceled. The other allocations can be canceled.

The factory setting of I/O entry mappings as follows.

An I/O entry means the I/O data described below. An I/O entry mapping means a collection of I/O entries.

List of I/O entry mappings

| I/O entry mapping name                                      | I/O entry mapping   |                                  |               | I/O entry     |                 |                   |
|---|---|----------------------------------|---------------|---------------|-----------------|-------------------|
|   | Description   | Se-lection                       | Default       | Edit-ing      | Default entries | Maxi-mum en-tries |
| Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit | This I/O data set is transferred from the EtherCAT master to CPU Unit. Up to 40 data in 15 UINT arrays can be registered. Each data size is 30 bytes. | Possi-ble                        | Selected      | Possi-ble     | 6               | 40                |
| Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit | This I/O data set is transferred from the EtherCAT master to CPU Unit. Up to 10 data in 10 BYTE arrays can be registered. Each data size is 10 bytes. | Possi-ble                        | Not se-lected | Possi-ble     | 2               | 10                |
| Data Set in UDINT from EtherCAT Master to CPU Unit          | This I/O data set is transferred from the EtherCAT master to CPU Unit. Up to 32 UDINT data can be registered. Each data size is 4 bytes.              | Possi-ble                        | Not se-lected | Possi-ble     | 4               | 32                |
| EtherCAT Slave Status Information                           | The I/O data set that is sent from the EtherCAT Slave Unit to the CPU Unit. It indicates the status of the EtherCAT Slave Unit as an EtherCAT slave.  | Not possi-ble (fixed selec-tion) | Selected      | Not possi-ble | 1               | 1                 |
| Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | This I/O data set is transferred from the CPU Unit to EtherCAT master. Up to 40 data in 15 UINT arrays can be registered. Each data size is 30 bytes. | Possi-ble                        | Selected      | Possi-ble     | 6               | 40                |
| Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master | This I/O data set is transferred from the CPU Unit to EtherCAT master. Up to 10 data in 10 BYTE arrays can be registered. Each data size is 10 bytes. | Possi-ble                        | Not se-lected | Possi-ble     | 2               | 10                |

| I/O entry mapping                                  |  |            |               | I/O entry |                 |                   |
|--|--|------------|---------------|-----------|-----------------|-------------------|
| I/O entry mapping name                             | Description  | Selec-tion | Default       | Edit-ing  | Default entries | Maxi-mum en-tries |
| Data Set in UDINT from CPU Unit to EtherCAT Master | This I/O data set is transferred from the CPU Unit to EtherCAT master. Up to 32 UDINT data can be registered. Each data size is 4 bytes. | Possi-ble  | Not se-lected | Possi-ble | 4               | 32                |

A specific I/O entry is allocated to the I/O entry mapping for each NX Unit model.

The following shows the relationship between the I/O entry mappings of the EtherCAT Slave Unit and the I/O entries allocated to each of them. The I/O entry type that can be allocated to the I/O entry mapping is fixed. Different type of I/O entry cannot be allocated.

#### List of I/O entry mappings and applicable I/O entries

| I/O entry mapping   | I/O entry              |                | Reference   |
|---|------------------------|----------------|---|
|   | I/O entry mapping name | I/O entry name |   |
| Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit | UINTs Data M to C      | 6000           | <i>Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit on page 6-9</i>  |
| Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit | BYTES Data M to C      | 6001           | <i>Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit on page 6-9</i>  |
| Data Set in UDINT from EtherCAT Master to CPU Unit          | UDINT Data M to C      | 6002           | <i>Data Set in UDINT from EtherCAT Master to CPU Unit on page 6-10</i>          |
| EtherCAT Slave Status Information                           | EtherCAT Slave Status  | 6003           | <i>EtherCAT Slave Status Informa-tion on page 6-12</i>                          |
| Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | UINTs Data C to M      | 7000           | <i>Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master on page 6-11</i> |
| Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master | BYTES Data C to M      | 7001           | <i>Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master on page 6-11</i> |
| Data Set in UDINT from CPU Unit to EtherCAT Master          | UDINT Data C to M      | 7002           | <i>Data Set in UDINT from CPU Unit to EtherCAT Master on page 6-12</i>          |

### 6-3-2 I/O Data Details

This section describes the details of the allocatable I/O data for each I/O entry mapping.

#### I/O Data Set from the EtherCAT Master to the CPU Unit

The following three types of I/O entry mappings are provided for the I/O data transferred from the EtherCAT master to CPU Unit.

- Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit
- Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit



- Data Set in UDINT from EtherCAT Master to CPU Unit

You can select or deselect any I/O entry mapping.

The EtherCAT Slave Unit exchanges data for I/O entries allocated to the selected I/O entry mappings with the CPU Unit.

### ● Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit

This I/O data set is transferred from the EtherCAT master to CPU Unit.

Up to 40 data in 15 UINT arrays can be registered. Each data size is 30 bytes.

This I/O entry mapping is selected by default, and the data size is 180 bytes.

*UINTs 01 M to C to UINTs 06 M to C* of the I/O entries are registered by default.

The values of the I/O data *UINTs Data M to C* (7000 hex) of the CoE object are reflected to the following I/O entries.

The following table shows the I/O entries that can be registered to this I/O entry mapping.

| Data name       | Description   | Data type             | Size     | De-fault*1 | Data range*1         | I/O port name   | Index (hex) | Sub-index (hex) |
|-----------------|---|-----------------------|----------|------------|----------------------|-----------------|-------------|-----------------|
| UINTs 01 M to C | Data 01 that is transferred from EtherCAT master to CPU Unit. The value of the CoE object 7000:01 hex is reflected. | ARRAY [0..14] OF UINT | 30 bytes | 0000 hex   | 0000 hex to FFFF hex | UINTs 01 M to C | 6000        | 01              |
| UINTs 02 M to C | Data 02 that is transferred from EtherCAT master to CPU Unit. The value of the CoE object 7000:02 hex is reflected. | ARRAY [0..14] OF UINT | 30 bytes | 0000 hex   | 0000 hex to FFFF hex | UINTs 02 M to C |             | 02              |
| :               |   |                       |          |            |                      |                 |             | :               |
| UINTs 40 M to C | Data 40 that is transferred from EtherCAT master to CPU Unit. The value of the CoE object 7000:28 hex is reflected. | ARRAY [0..14] OF UINT | 30 bytes | 0000 hex   | 0000 hex to FFFF hex | UINTs 40 M to C |             | 28              |

\*1. Default values or data ranges for each element of the array.

### ● Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit

This I/O data set is transferred from the EtherCAT master to CPU Unit.

Up to 10 data in 10 BYTE arrays can be registered. Each data size is 10 bytes.

This I/O entry mapping is not selected by default, and the data size is 0 byte.

*BYTES 01 M to C* and *BYTES 02 M to C* of the I/O entries are registered by default.

The values of the I/O data *BYTES Data M to C* (7001 hex) of the CoE object are reflected to the following I/O entries.

The following table shows the I/O entries that can be registered to this I/O entry mapping.

| Data name          | Description  | Data type                  | Size        | De-fault*1 | Data range*1        | I/O port name      | Index (hex) | Subindex (hex) |
|--------------------|--|----------------------------|-------------|------------|---------------------|--------------------|-------------|----------------|
| BYTES 01<br>M to C | Data 01 that is transferred from EtherCAT master to CPU Unit.<br>The value of the CoE object 7001:01 hex is reflected. | ARRAY<br>[0..9] OF<br>BYTE | 10<br>bytes | 00<br>hex  | 00 hex to<br>FF hex | BYTES 01<br>M to C | 6001        | 01             |
| BYTES 02<br>M to C | Data 02 that is transferred from EtherCAT master to CPU Unit.<br>The value of the CoE object 7001:02 hex is reflected. | ARRAY<br>[0..9] OF<br>BYTE | 10<br>bytes | 00<br>hex  | 00 hex to<br>FF hex | BYTES 02<br>M to C |             | 02             |
| :                  |  |                            |             |            |                     |                    |             | :              |
| BYTES 10<br>M to C | Data 10 that is transferred from EtherCAT master to CPU Unit.<br>The value of the CoE object 7001:0A hex is reflected. | ARRAY<br>[0..9] OF<br>BYTE | 10<br>bytes | 00<br>hex  | 00 hex to<br>FF hex | BYTES 10<br>M to C |             | 0A             |

\*1. Default values or data ranges for each element of the array.

### ● Data Set in UDINT from EtherCAT Master to CPU Unit

This I/O data set is transferred from the EtherCAT master to CPU Unit.

Up to 32 UDINT data can be registered. Each data size is 4 bytes.

This I/O entry mapping is not selected by default, and the data size is 0 byte.

*UDINT 01 M to C* to *UDINT 04 M to C* of the I/O entries are registered by default.

The values of the I/O data *UDINT Data M to C* (7002 hex) of the CoE object are reflected to the following I/O entries.

The following table shows the I/O entries that can be registered to this I/O entry mapping.

| Data name          | Description  | Data type | Size       | De-fault            | Data range                              | I/O port name      | Index (hex) | Subindex (hex) |
|--------------------|--|-----------|------------|---------------------|---|--------------------|-------------|----------------|
| UDINT 01<br>M to C | Data 01 that is transferred from EtherCAT master to CPU Unit.<br>The value of the CoE object 7002:01 hex is reflected. | UDINT     | 4<br>bytes | 00000<br>000<br>hex | 00000000<br>hex to<br>FFFFFFFF<br>F hex | UDINT 01<br>M to C | 6002        | 01             |
| UDINT 02<br>M to C | Data 02 that is transferred from EtherCAT master to CPU Unit.<br>The value of the CoE object 7002:02 hex is reflected. | UDINT     | 4<br>bytes | 00000<br>000<br>hex | 00000000<br>hex to<br>FFFFFFFF<br>F hex | UDINT 02<br>M to C |             | 02             |
| :                  |  |           |            |                     |   |                    |             | :              |
| UDINT 32<br>M to C | Data 32 that is transferred from EtherCAT master to CPU Unit.<br>The value of the CoE object 7002:20 hex is reflected. | UDINT     | 4<br>bytes | 00000<br>000<br>hex | 00000000<br>hex to<br>FFFFFFFF<br>F hex | UDINT 32<br>M to C |             | 20             |

### I/O Data Set from the CPU Unit to the EtherCAT Master

The following three types of I/O entry mappings are provided for the I/O data transferred from the CPU Unit to EtherCAT master.

- Data Set in 15 UDINT Arrays from CPU Unit to EtherCAT Master
- Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master

- Data Set in UDINT from CPU Unit to EtherCAT Master

You can select or deselect any I/O entry mapping.

The EtherCAT Slave Unit exchanges data for I/O entries allocated to the selected I/O entry mappings with the CPU Unit.

### ● Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master

This I/O data set is transferred from the CPU Unit to EtherCAT master.

Up to 40 data in 15 UINT arrays can be registered. Each data size is 30 bytes.

This I/O entry mapping is selected by default, and the data size is 180 bytes.

*UINTs 01 C to M* to *UINTs 06 C to M* of the I/O entries are registered by default.

The following I/O entry values are reflected to the I/O data *UINTs Data C to M* (6000 hex) of the CoE object.

The following table shows the I/O entries that can be registered to this I/O entry mapping.

| Data name          | Description   | Data type                   | Size        | De-fault*1  | Data range*1               | I/O port name      | Index (hex) | Sub-index (hex) |
|--------------------|---|-----------------------------|-------------|-------------|----------------------------|--------------------|-------------|-----------------|
| UINTs 01<br>C to M | Data 01 that is transferred from CPU Unit to EtherCAT master.<br>The value is reflected to 6000:01 hex of the CoE object. | ARRAY<br>[0..14] OF<br>UINT | 30<br>bytes | 0000<br>hex | 0000 hex<br>to FFFF<br>hex | UINTs 01<br>C to M | 7000        | 01              |
| UINTs 02<br>C to M | Data 02 that is transferred from CPU Unit to EtherCAT master.<br>The value is reflected to 6000:02 hex of the CoE object. | ARRAY<br>[0..14] OF<br>UINT | 30<br>bytes | 0000<br>hex | 0000 hex<br>to FFFF<br>hex | UINTs 02<br>C to M |             | 02              |
| :                  |   |                             |             |             |                            |                    |             | :               |
| UINTs 40<br>C to M | Data 40 that is transferred from CPU Unit to EtherCAT master.<br>The value is reflected to 6000:28 hex of the CoE object. | ARRAY<br>[0..14] OF<br>UINT | 30<br>bytes | 0000<br>hex | 0000 hex<br>to FFFF<br>hex | UINTs 40<br>C to M |             | 28              |

\*1. Default values or data ranges for each element of the array.

### ● Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master

This I/O data set is transferred from the CPU Unit to EtherCAT master.

Up to 10 data in 10 BYTE arrays can be registered. Each data size is 10 bytes.

This I/O entry mapping is not selected by default, and the data size is 0 byte.

*BYTES 01 C to M* and *BYTES 02 C to M* of the I/O entries are registered by default.

The following I/O entry values are reflected to the I/O data *BYTES Data C to M* (6001 hex) of the CoE object.

The following table shows the I/O entries that can be registered to this I/O entry mapping.

| Data name          | Description   | Data type                  | Size        | De-<br>fault | Data<br>range*1     | I/O port<br>name*1 | Index<br>(hex) | Subin-<br>dex<br>(hex) |
|--------------------|---|----------------------------|-------------|--------------|---------------------|--------------------|----------------|------------------------|
| BYTES 01<br>C to M | Data 01 that is transferred from CPU Unit to EtherCAT master.<br>The value is reflected to 6001:01 hex of the CoE object. | ARRAY<br>[0..9] OF<br>BYTE | 10<br>bytes | 00<br>hex    | 00 hex to<br>FF hex | BYTES 01<br>C to M | 7001           | 01                     |
| BYTES 02<br>C to M | Data 02 that is transferred from CPU Unit to EtherCAT master.<br>The value is reflected to 6001:02 hex of the CoE object. | ARRAY<br>[0..9] OF<br>BYTE | 10<br>bytes | 00<br>hex    | 00 hex to<br>FF hex | BYTES 02<br>C to M |                | 02                     |
| :                  | :   | :                          | :           | :            | :                   | :                  |                | :                      |
| BYTES 10<br>C to M | Data 10 that is transferred from CPU Unit to EtherCAT master.<br>The value is reflected to 6001:0A hex of the CoE object. | ARRAY<br>[0..9] OF<br>BYTE | 10<br>bytes | 00<br>hex    | 00 hex to<br>FF hex | BYTES 10<br>C to M |                | 0A                     |

\*1. Default values or data ranges for each element of the array.

### ● Data Set in UDINT from CPU Unit to EtherCAT Master

This I/O data set is transferred from the CPU Unit to EtherCAT master.

Up to 32 UDINT data can be registered. Each data size is 4 bytes.

This I/O entry mapping is not selected by default, and the data size is 0 byte.

*UDINT 01 C to M* to *UDINT 04 C to M* of the I/O entries are registered by default.

The following I/O entry values are reflected to the I/O data *UDINT Data C to M* (6002 hex) of the CoE object.

The following table shows the I/O entries that can be registered to this I/O entry mapping.

| Data name          | Description   | Data type | Size       | De-<br>fault        | Data<br>range                           | I/O port<br>name   | Index<br>(hex) | Subin-<br>dex<br>(hex) |
|--------------------|---|-----------|------------|---------------------|---|--------------------|----------------|------------------------|
| UDINT 01<br>C to M | Data 01 that is transferred from CPU Unit to EtherCAT master.<br>The value is reflected to 6002:01 hex of the CoE object. | UDINT     | 4<br>bytes | 00000<br>000<br>hex | 00000000<br>hex to<br>FFFFFFFF<br>F hex | UDINT 01<br>C to M | 7002           | 01                     |
| UDINT 02<br>C to M | Data 02 that is transferred from CPU Unit to EtherCAT master.<br>The value is reflected to 6002:02 hex of the CoE object. | UDINT     | 4<br>bytes | 00000<br>000<br>hex | 00000000<br>hex to<br>FFFFFFFF<br>F hex | UDINT 02<br>C to M |                | 02                     |
| :                  | :   | :         | :          | :                   | :                                       | :                  |                | :                      |
| UDINT 32<br>C to M | Data 32 that is transferred from CPU Unit to EtherCAT master.<br>The value is reflected to 6002:20 hex of the CoE object. | UDINT     | 4<br>bytes | 00000<br>000<br>hex | 00000000<br>hex to<br>FFFFFFFF<br>F hex | UDINT 32<br>C to M |                | 20                     |

## EtherCAT Slave Status Information

The I/O data set of the EtherCAT slave status data that is sent from the EtherCAT Slave Unit to the CPU Unit.

This I/O entry mapping is fixed for selection, and the selection cannot be canceled. The data size is 2 bytes.

The data shown in the following table are fixed for allocation to this I/O entry mapping. You cannot add or delete the data.

| Data name             | Description   | Data type | Size    | De-<br>fault | Data<br>range        | I/O port<br>name      | Index<br>(hex) | Subin-<br>dex<br>(hex) |
|-----------------------|---|-----------|---------|--------------|----------------------|-----------------------|----------------|------------------------|
| EtherCAT Slave Status | Indicates the status of the EtherCAT Slave Unit as an EtherCAT slave. | WORD      | 2 bytes | 0200 hex     | 0000 hex to FFFF hex | EtherCAT Slave Status | 6003           | 01                     |

The meaning of each bit in *EtherCAT Slave Status* is as follows.

| Bit | Data name                                       | Description   | Data type | I/O port name                                   |
|-----|---|---|-----------|---|
| 0   | SDO Communications Enabled                      | Indicates whether the SDO communications with the EtherCAT master is enabled.<br>TRUE: Enabled<br>FALSE: Disabled   | BOOL      | SDO Communications Enabled                      |
| 1   | Data from EtherCAT Master to CPU Unit Valid     | Indicates whether the data from the EtherCAT master to the CPU Unit is valid.<br>TRUE: Valid<br>FALSE: Invalid  | BOOL      | Data from EtherCAT Master to CPU Unit Valid     |
| 2   | Data from CPU Unit to EtherCAT Master Valid     | Indicates whether the data from the CPU Unit to the EtherCAT master is valid.<br>TRUE: Valid<br>FALSE: Invalid  | BOOL      | Data from CPU Unit to EtherCAT Master Valid     |
| 3-5 | Reserved  | Reserved  | ---       | ---   |
| 6   | IN Port Link ON                                 | Indicates a link status of the input port on the EtherCAT slave.<br>TRUE: Link ON<br>FALSE: Link OFF  | BOOL      | IN Port Link ON                                 |
| 7   | OUT Port Link ON                                | Indicates a link status of the output port on the EtherCAT slave.<br>TRUE: Link ON<br>FALSE: Link OFF   | BOOL      | OUT Port Link ON                                |
| 8   | New Message Data Available from EtherCAT Master | Indicates whether the NX object (5000 hex) has any new message data from the EtherCAT master. <ul style="list-style-type: none"> <li>TRUE: New message data available from EtherCAT master to NX object (5000 hex)</li> <li>FALSE: New message data to NX object (5000 hex) from EtherCAT master not available</li> </ul> The operations indicated by the value change are as follows. <ul style="list-style-type: none"> <li>FALSE → TRUE: The message data is written from the EtherCAT master to the NX object (5000 hex).</li> <li>TRUE → FALSE: The message data is read by the CPU Unit from the NX object (5000 hex).</li> </ul> | BOOL      | New Message Data Available from EtherCAT Master |

| Bit   | Data name                                      | Description   | Data type | I/O port name                                  |
|-------|--|---|-----------|--|
| 9     | Ready to Write Message Data to EtherCAT Master | <p>Indicates whether the message data from the CPU Unit to the EtherCAT master can be written to the NX object (5001 hex).</p> <ul style="list-style-type: none"> <li>• TRUE: Ready to write message data to EtherCAT master</li> <li>• FALSE: Not ready to write message data to EtherCAT master</li> </ul> <p>The operations indicated by the value change are as follows.</p> <ul style="list-style-type: none"> <li>• FALSE → TRUE: The message data is read by the EtherCAT master from the NX object (5001 hex).</li> <li>• TRUE → FALSE: The message data is written by the CPU Unit to the NX object (5001 hex).</li> </ul> | BOOL      | Ready to Write Message Data to EtherCAT Master |
| 10-15 | Reserved                                       | Reserved  | ---       | ---  |

### 6-3-3 Precautions for the I/O Data Size

When editing the I/O allocation settings, be careful so that the I/O data size does not exceed the restrictions described below.

- Restrictions on EtherCAT Slave Unit

The I/O data to exchange between the EtherCAT master and CPU Unit must not exceed 1,200 bytes both for inputs and outputs.

- Restrictions on CPU Unit

The total size of the I/O data in the NX Unit connected to the CPU Unit must not exceed the *maximum NX bus I/O data size* of the CPU Unit.

Refer to the hardware user's manual for each CPU Unit for the *maximum NX bus I/O data size* of the CPU Unit.

### 6-3-4 Allocation Examples of I/O Entry Mappings and I/O Entries

This section provides allocation examples of the I/O entry mappings and I/O entries for the I/O data to exchange between the EtherCAT master and CPU Unit.

The Edit I/O Allocation Settings Pane of the Sysmac Studio is used to set allocations. Refer to *6-4 Setting I/O Allocations with the Sysmac Studio* on page 6-17 for the operation.



#### Precautions for Correct Use

If the settings of I/O entry mappings and I/O entries do not conform to the rules, the data exchange between the EtherCAT Slave Unit and CPU Unit will not start.  
Refer to *5-3 Setting Rules for Data Exchange* on page 5-9 for the rules.

- **When using the Unit with the factory setting**

In this case, the I/O allocation settings do not need to be changed.

| I/O entry mapping   |           | I/O entry                             |                            |          |                    |
|---|-----------|---------------------------------------|----------------------------|----------|--------------------|
| I/O entry mapping name                                      | Select-ed | I/O entry to allocate                 | Size (bytes) <sup>*1</sup> | Quantity | Total size (bytes) |
| Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit | Selected  | UINTs 01 M to C to<br>UINTs 06 M to C | 30                         | 6        | 180                |

| I/O entry mapping   |               | I/O entry                             |                            |           |                    |
|---|---------------|---------------------------------------|----------------------------|-----------|--------------------|
| I/O entry mapping name                                      | Select-ed     | I/O entry to allocate                 | Size (bytes) <sup>*1</sup> | Quan tity | Total size (bytes) |
| Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit | Not se-lected | ---                                   | 10                         | 0         | 0                  |
| Data Set in UDINT from EtherCAT Master to CPU Unit          | Not se-lected | ---                                   | 4                          | 0         | 0                  |
| Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | Selected      | UINTs 01 C to M to<br>UINTs 06 C to M | 30                         | 6         | 180                |
| Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master | Not se-lected | ---                                   | 10                         | 0         | 0                  |
| Data Set in UDINT from CPU Unit to EtherCAT Master          | Not se-lected | ---                                   | 4                          | 0         | 0                  |

\*1. Indicates the size of each I/O entry.

- **When using the UINT arrays only at a maximum**

In this case, add the I/O entries in UINT arrays to the I/O entry mappings.

| I/O entry mapping   |               | I/O entry                             |                            |           |                    |
|---|---------------|---------------------------------------|----------------------------|-----------|--------------------|
| I/O entry mapping name                                      | Select-ed     | I/O entry to allocate                 | Size (bytes) <sup>*1</sup> | Quan tity | Total size (bytes) |
| Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit | Selected      | UINTs 01 M to C to<br>UINTs 40 M to C | 30                         | 40        | 1,200              |
| Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit | Not se-lected | ---                                   | 10                         | 0         | 0                  |
| Data Set in UDINT from EtherCAT Master to CPU Unit          | Not se-lected | ---                                   | 4                          | 0         | 0                  |
| Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | Selected      | UINTs 01 C to M to<br>UINTs 40 C to M | 30                         | 40        | 1,200              |
| Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master | Not se-lected | ---                                   | 10                         | 0         | 0                  |
| Data Set in UDINT from CPU Unit to EtherCAT Master          | Not se-lected | ---                                   | 4                          | 0         | 0                  |

\*1. Indicates the size of each I/O entry.

- **When using the BYTE arrays and UDINT data in addition to the UINT arrays**

In this case, change the I/O entry mappings of BYTE arrays and UDINT data from “not selected” to “selected”.

Then, add the I/O entries to each I/O entry mapping.

| I/O entry mapping   |           | I/O entry                             |                            |           |                    |
|---|-----------|---------------------------------------|----------------------------|-----------|--------------------|
| I/O entry mapping name                                      | Select-ed | I/O entry to allocate                 | Size (bytes) <sup>*1</sup> | Quan tity | Total size (bytes) |
| Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit | Selected  | UINTs 01 M to C to<br>UINTs 10 M to C | 30                         | 10        | 300                |
| Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit | Selected  | BYTES 01 M to C to<br>BYTES 10 M to C | 10                         | 10        | 100                |
| Data Set in UDINT from EtherCAT Master to CPU Unit          | Selected  | UDINT 01 M to C to<br>UDINT 30 M to C | 4                          | 30        | 120                |
| Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | Selected  | UINTs 01 C to M to<br>UINTs 10 C to M | 30                         | 10        | 300                |

| I/O entry mapping   |           | I/O entry                          |                            |           |                    |
|---|-----------|------------------------------------|----------------------------|-----------|--------------------|
| I/O entry mapping name                                      | Select-ed | I/O entry to allocate              | Size (bytes) <sup>*1</sup> | Quan tity | Total size (bytes) |
| Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master | Selected  | BYTES 01 C to M to BYTES 10 C to M | 10                         | 10        | 100                |
| Data Set in UDINT from CPU Unit to EtherCAT Master          | Selected  | UDINT 01 C to M to UDINT 30 C to M | 4                          | 30        | 120                |

\*1. Indicates the size of each I/O entry.



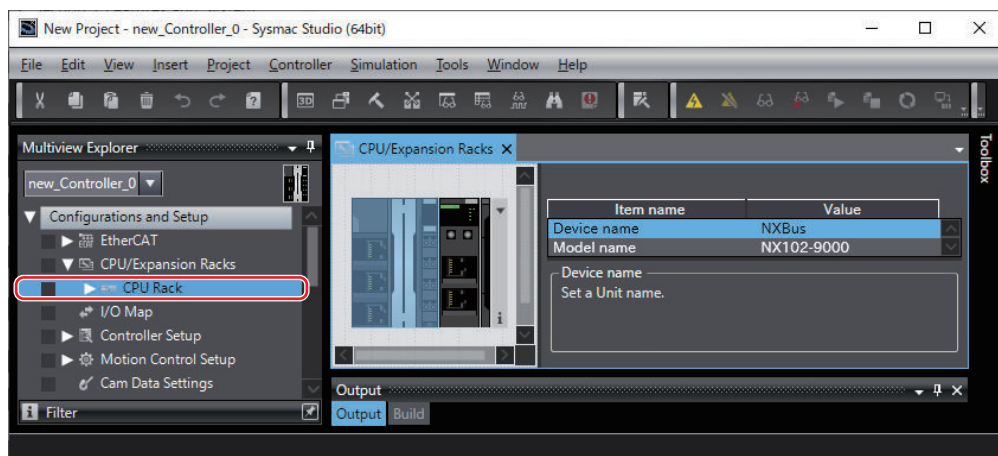
## 6-4 Setting I/O Allocations with the Sysmac Studio

Configure the I/O allocation settings of the EtherCAT Slave Unit from the Sysmac Studio. This section describes how to display the Edit I/O Allocation Settings Pane and how to configure the I/O allocation settings.

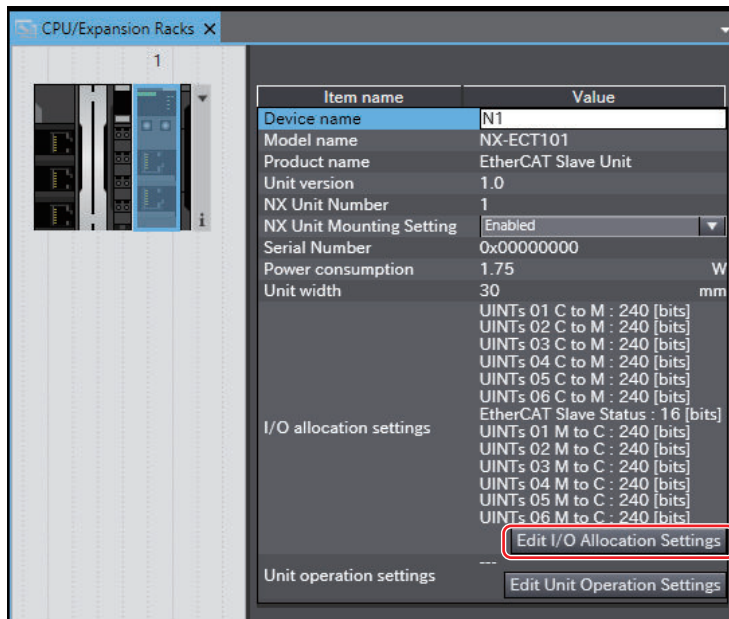
### 6-4-1 Displaying the Edit I/O Allocation Settings Pane

This section describes the method for displaying the Edit I/O Allocation Settings Pane of the EtherCAT Slave Unit.

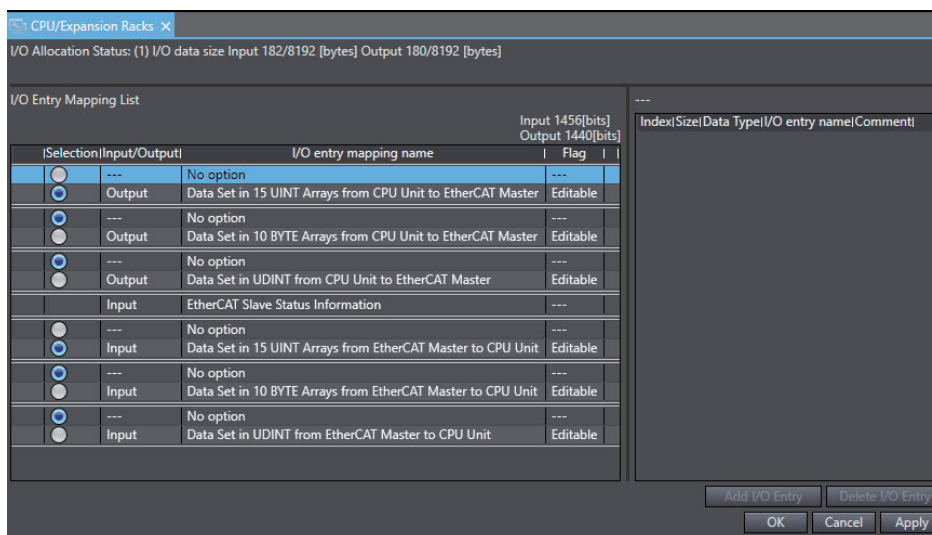
- 1 In the Multiview Explorer, double-click the CPU Rack to which the target EtherCAT Slave Unit is connected.  
Open the CPU and Expansion Racks Tab Page.



- 2 On the CPU and Expansion Racks Tab Page, select the target EtherCAT Slave Unit, and click the **Edit I/O Allocation Settings** button in the Unit Settings Pane.



The Edit I/O Allocation Settings Pane is displayed.

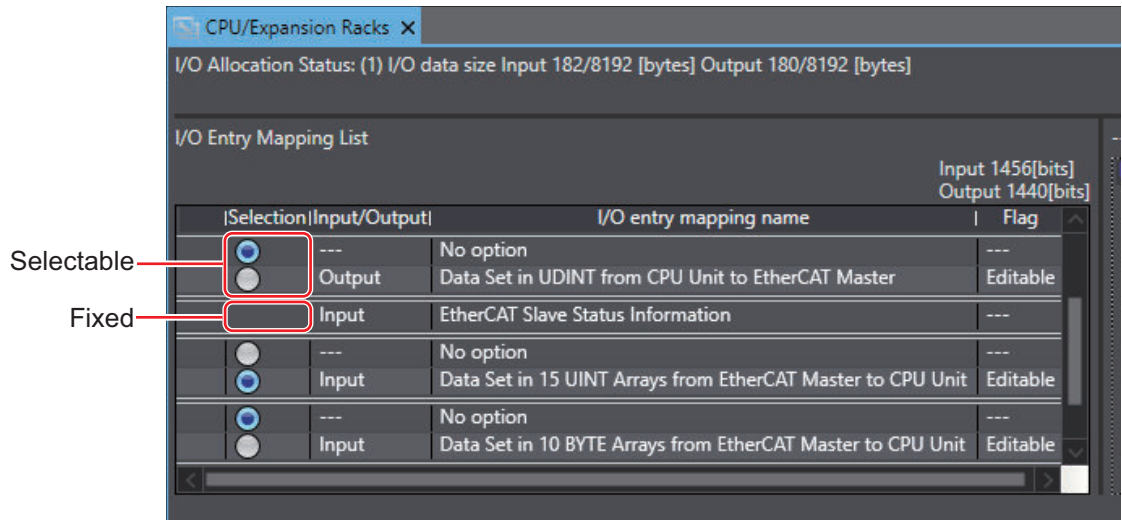


## 6-4-2 Editing the I/O Allocation Settings

This section describes the operating procedure for the I/O allocation settings of the EtherCAT Slave Unit.

- 1 Display the Edit I/O Allocation Settings Pane.  
For how to display the pane, refer to *6-4-1 Displaying the Edit I/O Allocation Settings Pane* on page 6-17.
- 2 Select the I/O entry mapping to use.  
Use the **I/O Entry Mapping List** on the left side of the Edit I/O Allocation Settings Pane. You can select use or not use for the I/O entry mapping that is provided with the option button in the selection field.

The I/O entry mapping that is not provided with the option button in the selection field is fixed to use. You cannot select not use.

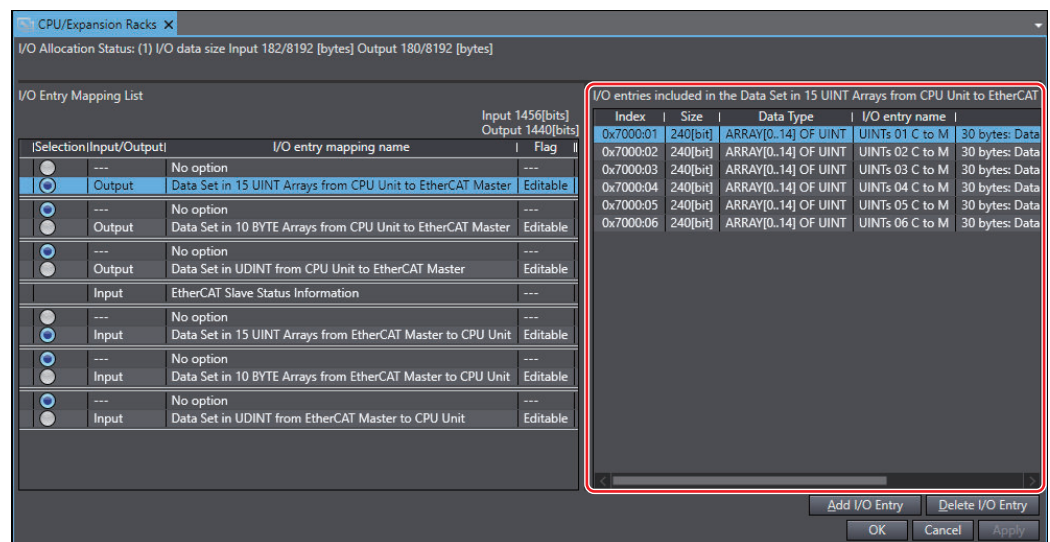


### 3 Select the I/O entry to use.

1) Use the **I/O entries included in xxxx** on the right side of the Edit I/O Allocation Settings Pane.

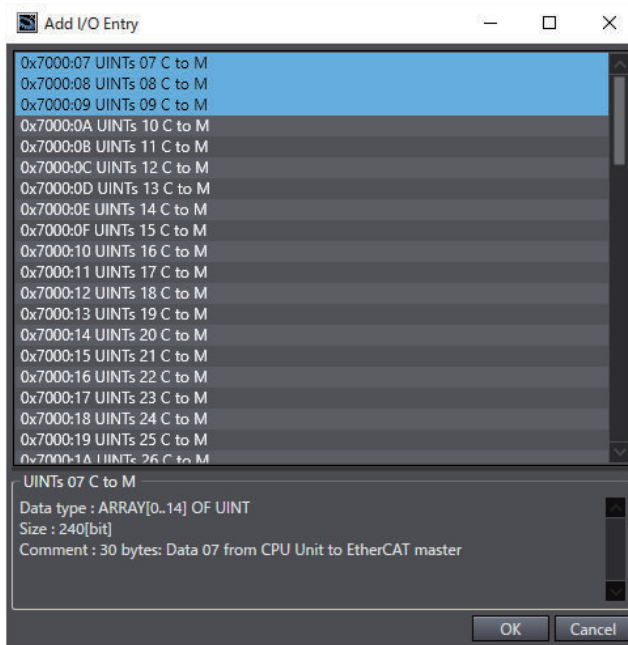
xxxx of the **I/O entries included in xxxx** is an I/O entry mapping name selected on the left side of the pane.

The allocated I/O entries are displayed in the **I/O entries included in xxxx**.

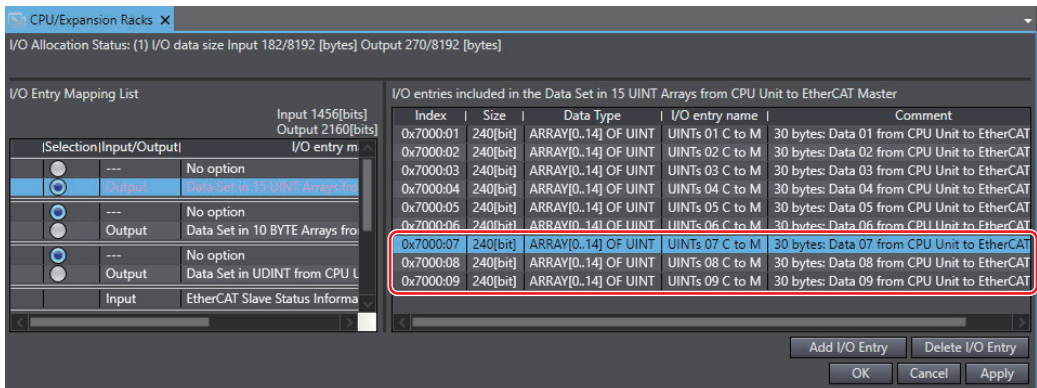


2) Add the I/O entry.

In the pane displayed by clicking the **Add I/O Entry** button, select the I/O entry to add, and then click the **OK** button.

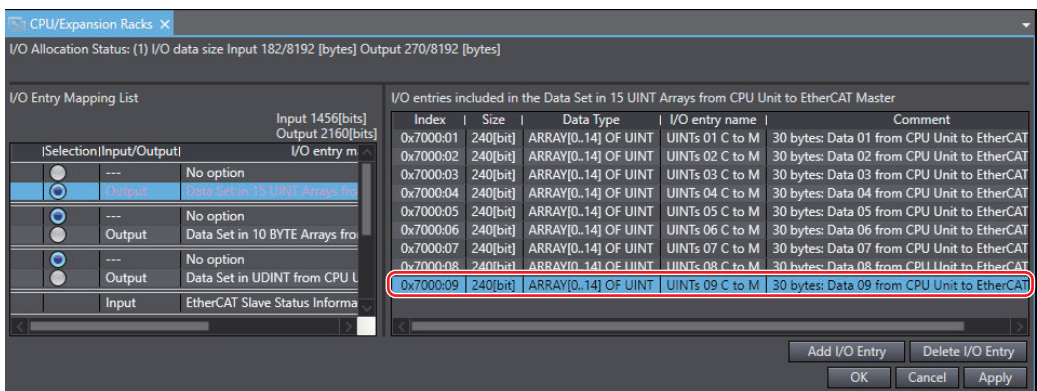


The I/O entry is added.

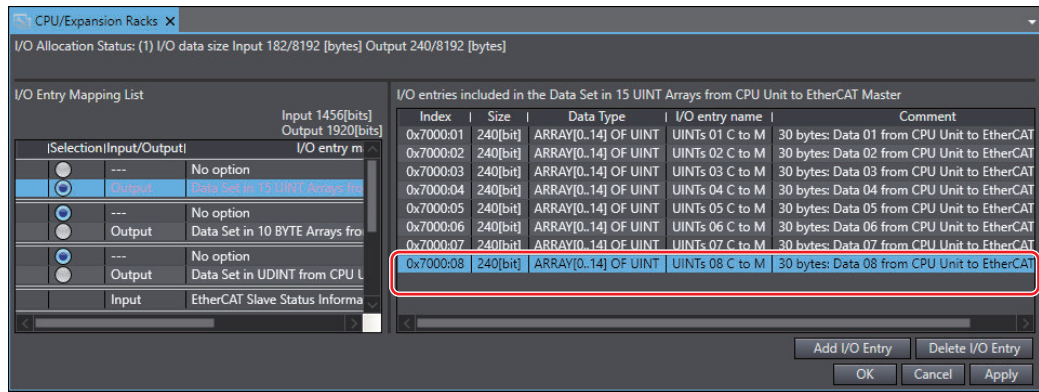


### 3) Delete the I/O entry.

Select the I/O entry to delete, and then click the **Delete I/O Entry** button.

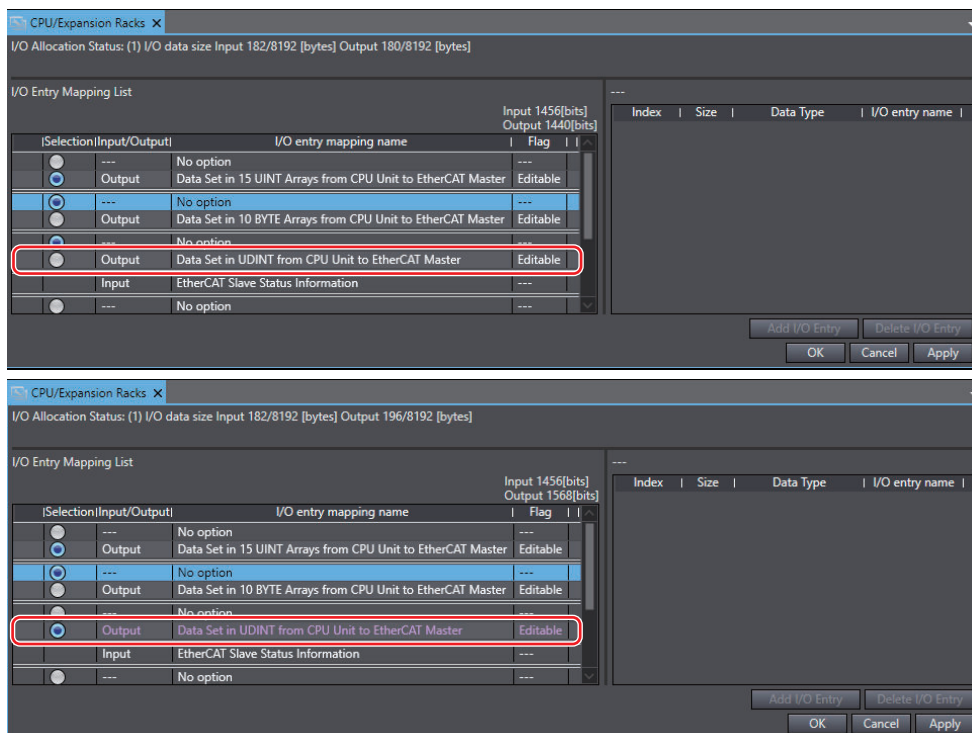


The I/O entry is deleted.



### Additional Information

When you change the I/O allocation settings from the factory settings, the display color of the corresponding I/O entry mapping line changes in the I/O Entry Mapping List.



- 4 Click the **OK** button or **Apply** button in the Edit I/O Allocation Settings Pane.  
The settings in the Edit I/O Allocation Settings Pane are enabled, and the pane returns to the CPU and Expansion Racks Tab Page.
- 5 Transfer the contents of the I/O allocation settings to the CPU Unit. Use the *synchronization* operation of the Sysmac Studio to transfer the data.  
Refer to the *Sysmac Studio Version 1 Operation Manual (Cat. No. W504)* for the transfer method with the *synchronization* operation of the Sysmac Studio.

## 6-5 Unit Settings

This section shows the setting descriptions, setting ranges, and default values of the Unit operation settings for the EtherCAT Slave Unit.

The changed settings are reflected after the Unit restart.



### Precautions for Safe Use

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

### 6-5-1 Setting for Changing Event Levels

You can change the event levels that are assigned to each Controller event.

#### Setting Contents

| Setting name        | Description           | Default     | Setting range           |
|---------------------|-----------------------|-------------|-------------------------|
| Event Level Setting | Set the event levels. | Minor Fault | Minor fault/observation |

Refer to *8-3-3 Error Table* on page 8-10 for events that have changeable event levels.

Refer to the *NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501)* for details on changing event levels.

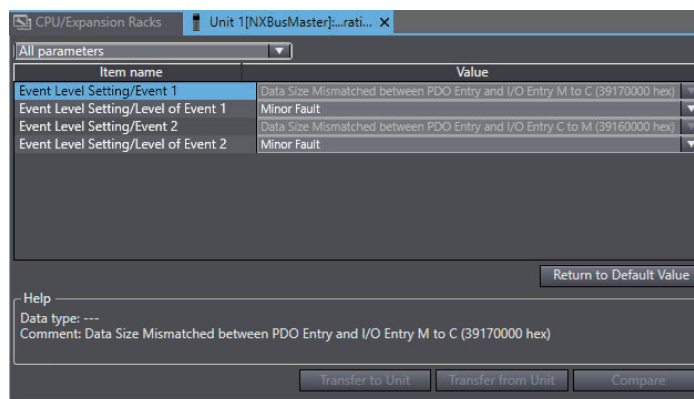
#### Procedure to Change an Event Level

Use the Sysmac Studio to change an event level setting.

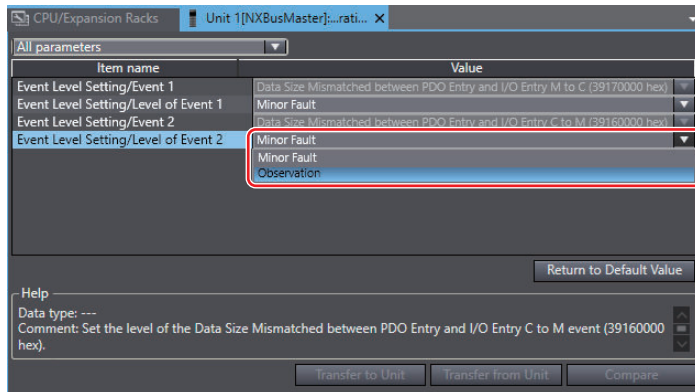
After you change an event level, always transfer the operation settings to the Controller.

- 1 On the CPU and Expansion Racks Tab Page, select the Unit for which to change the event level and click the **Edit Unit Operation Settings** button.

The Edit Unit Operation Settings Tab Page is displayed.



- 2** From the events for which Event Level Setting is displayed, select the event for which you want to change the level, and then select a level from the list in the Value field.



- 3** After you make the change, go online and click the **Transfer to Unit** button to transfer the change to the Controller.  
The specified event level is changed.





# 7

## EtherCAT Communications

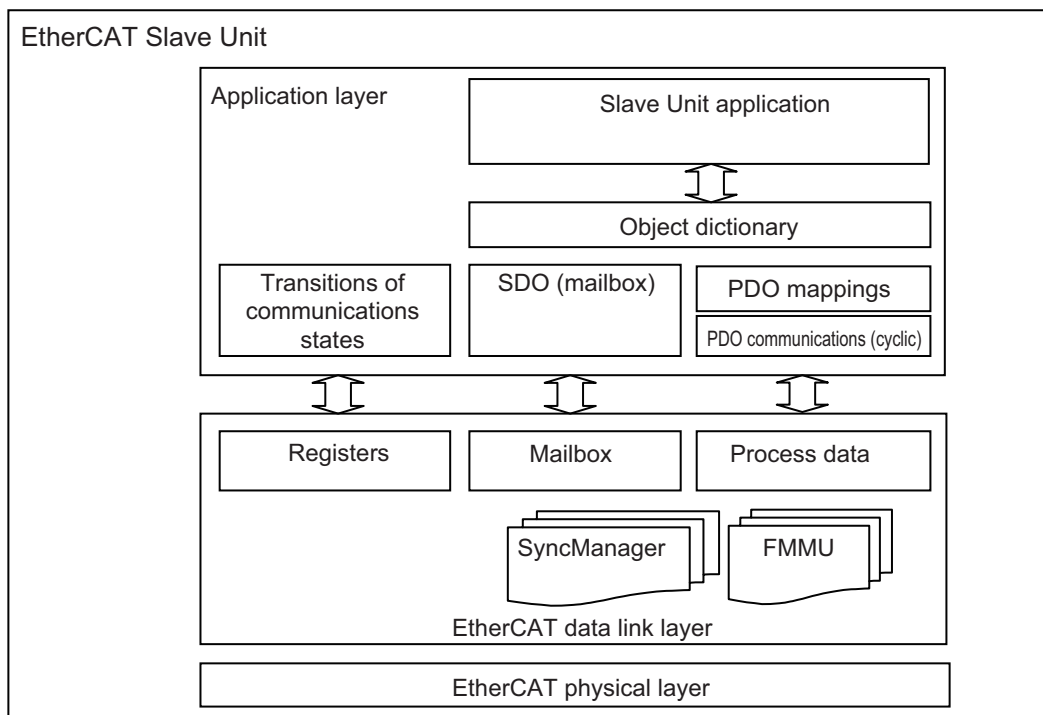
This section describes an overview of EtherCAT communications, data exchange with PDOs and SDOs of the EtherCAT Slave Unit, setting items, and communications performance.

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## 7-1 Structure of CAN Application Protocol over EtherCAT (CoE)

EtherCAT allows the use of multiple protocols for communications. However, the EtherCAT Slave Unit uses the *CAN application protocol over EtherCAT (CoE)* as the device profile for the *CAN application protocol*. The CoE is a communications interface that is designed to provide compatibility with EtherCAT devices. The CAN application protocol is an open network standard.

The following figure shows how the CoE is structured for an EtherCAT Slave Unit.



The object dictionary for the CAN application protocol is broadly divided into PDOs (process data objects) and SDOs (service data objects).

PDOs are contained in the object dictionary. The PDOs can be mapped in the object dictionary. The process data is defined by the PDO mappings. The PDOs are used in PDO communications for periodic exchange of process data.

SDOs are the objects that can be read and written. SDOs are used in non-periodic SDO communications (event-driven message communications).

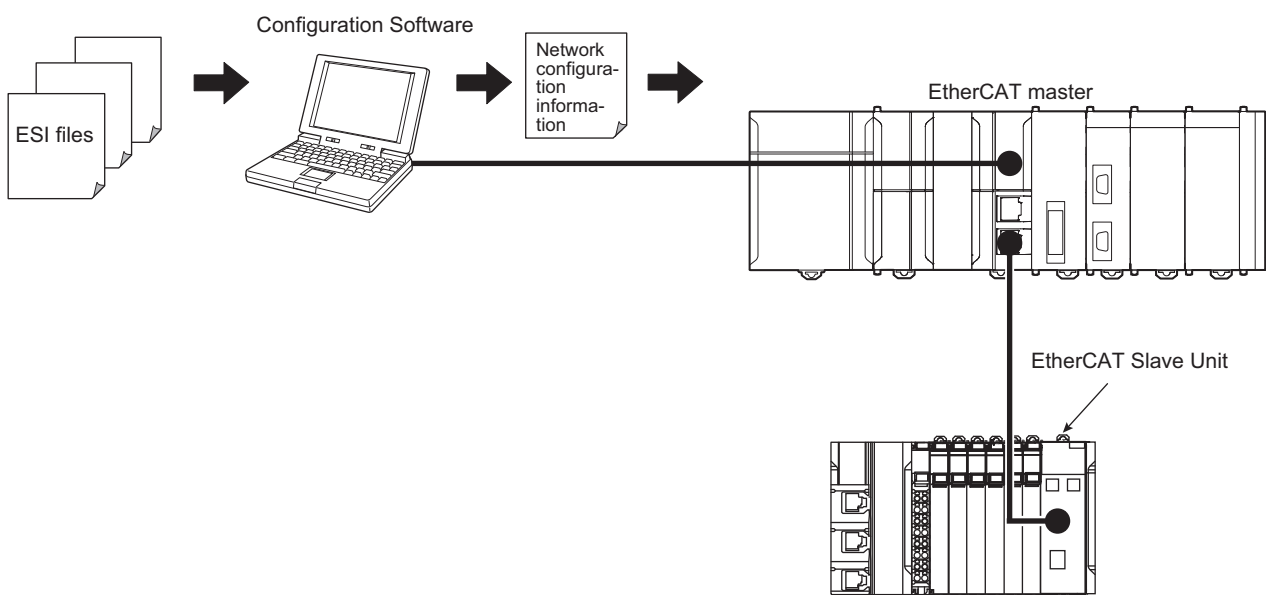
If you use the CoE interface to set the object dictionary for PDOs and SDOs, you can provide EtherCAT devices with the same device profiles as the CAN application protocol.

## 7-2 EtherCAT Slave Information Files (ESI Files)

The setting information for an EtherCAT slave is provided in an ESI file (EtherCAT Slave Information). The EtherCAT communications settings are defined based on the ESI files of the connected slaves and the network connection information.

You can create the network configuration information by installing ESI files into the network setup software (Configuration Software).

You can download the network configuration information to the EtherCAT master to configure the EtherCAT network.



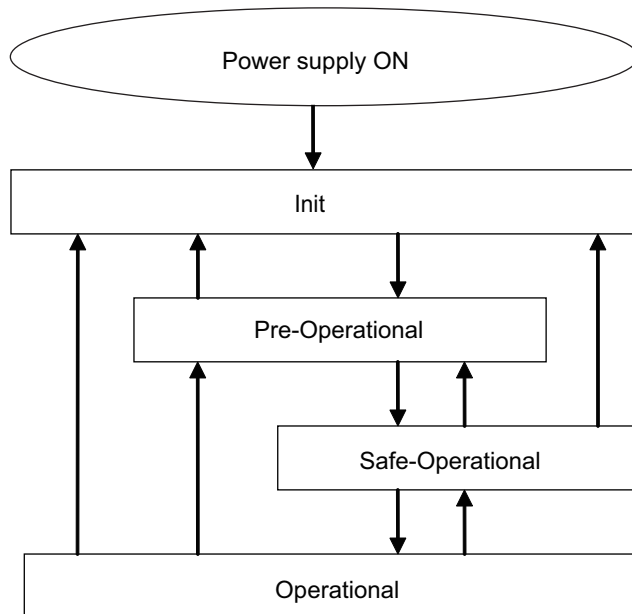
Communications are started according to the communications settings and the network configuration based on the ESI files that are installed.

ESI files for the EtherCAT Slave Units can be downloaded from the OMRON website (<http://www.ia.omron.com/>).

## 7-3 Transitions of Communications States

The state transition model for communications control of the EtherCAT Slave Units is controlled by the EtherCAT master.

The following figure shows the communications state transitions from when the power supply is turned ON.



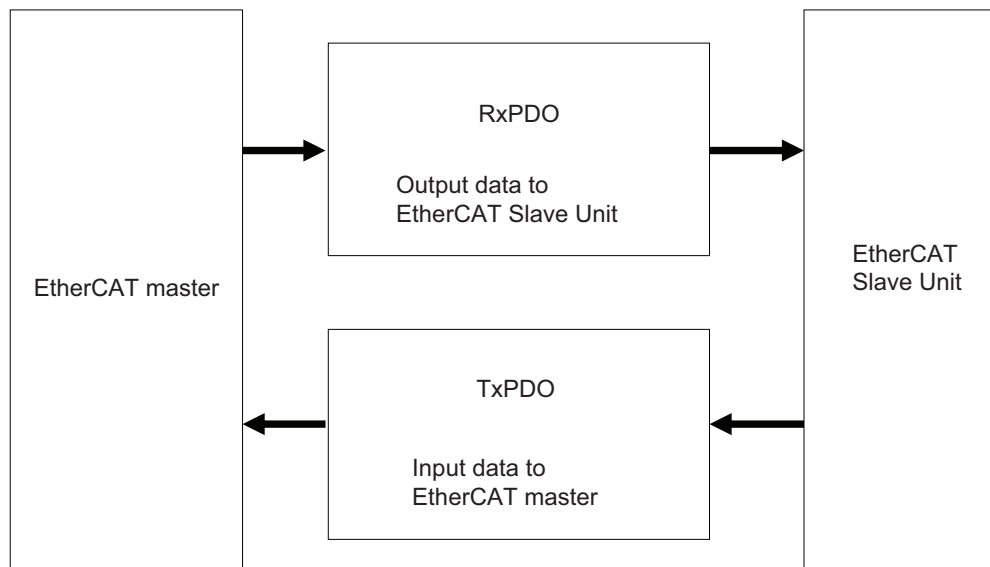
| Status           | SDO communications | Sending PDOs | Receiving PDOs | Description  |
|------------------|--------------------|--------------|----------------|--|
| Init             | Not possible       | Not possible | Not possible   | Communications are being initialized. Communications are not possible.   |
| Pre-Operational  | Possible           | Not possible | Not possible   | Only SDO communications (message communications) are possible in this state.<br>This state is entered after initialization is completed. It is used to initialize network settings.                      |
| Safe-Operational | Possible           | Possible     | Not possible   | In this state, both SDO communications (message communications) and sending PDOs are possible.<br>Receiving PDOs are not possible.<br>Information, such as status, is sent from the EtherCAT Slave Unit. |
| Operational      | Possible           | Possible     | Possible       | This is the normal state for communications.<br>PDO communications are used to control the I/O data.   |

## 7-4 Process Data Objects (PDOs)

This section describes the process data objects that are used by the EtherCAT Slave Unit.

### 7-4-1 Overview of Process Data Objects

Process data objects (PDOs) are used to transfer data during cyclic communications in realtime. There are two types of process data objects (PDOs): the RxPDOs, which are used by the EtherCAT Slave Unit to receive data from the EtherCAT master; and the TxPDOs, which are used by the EtherCAT Slave Unit to send data to the EtherCAT master.



The EtherCAT application layer can hold more than one object to enable the transfer of various process data of the EtherCAT Slave Unit.

The contents of the process data are defined in the PDO mapping objects.

### 7-4-2 PDO Mappings

This section describes the mechanism of PDO mapping in EtherCAT and the PDO mappings of the EtherCAT Slave Unit.

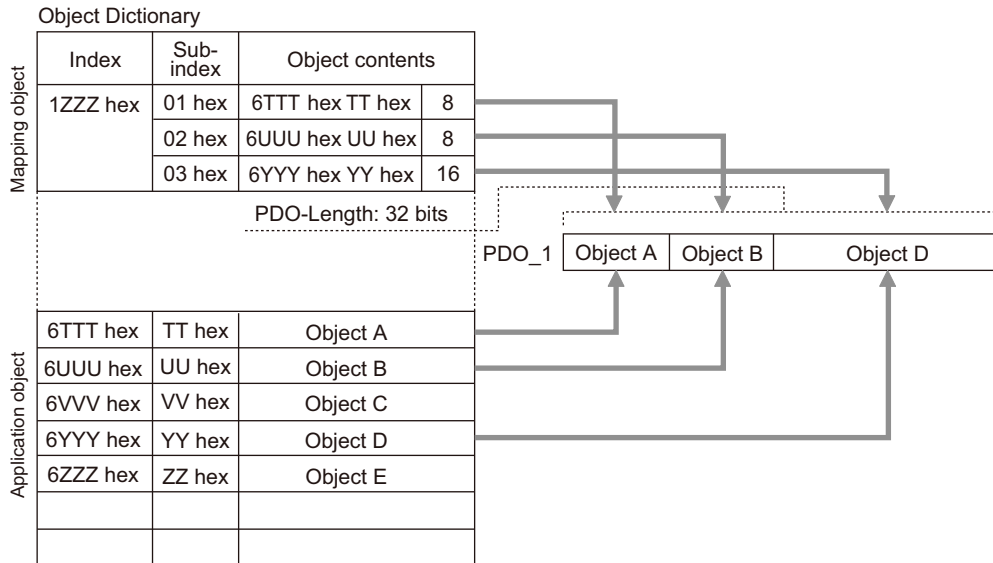
#### PDO Mapping Scheme in EtherCAT

The PDO mapping scheme in EtherCAT is described below.

Three application objects (A, B, and D) are allocated to the PDO mapping object (name: PDO\_1) at index 1ZZZ hex.

As described here, PDO mapping shows how application objects are assigned to PDO mapping objects.

Indexes and subindexes are also assigned to application objects.



Application objects define the I/O data allocated to the PDO mapping objects. The PDO mapping objects define these I/O data sets.

## PDO Mapping with EtherCAT Slave Units

PDO mapping objects contain the I/O data provided by the EtherCAT Slave Units.

PDO mapping objects for the RxPDOs are managed in the object dictionary from indexes 1600 hex to 1602 hex, and for the TxPDOs from indexes 1A00 hex to 1BFF hex.

The EtherCAT Slave Unit has the following PDO mapping objects.

- An object for which an application object
- An object for which the allocation of an application object

In the subsequent sections of this manual, the application object is called a PDO entry for explanation. The PDO mapping object of the EtherCAT Slave Unit for which the PDO entry can be allocated, the PDO entry is allocated by default (factory setting).

You can change the PDO entry from the default value. For example, for the PDO mapping object that indicates the data to exchange between the CPU Unit and EtherCAT master, change the PDO entry, and define the data size and data type for exchange.

Refer to *7-5 PDO Settings and Specifications* on page 7-8 for details on the PDO mapping method, PDO mapping objects, and PDO entries for the EtherCAT Slave Unit.

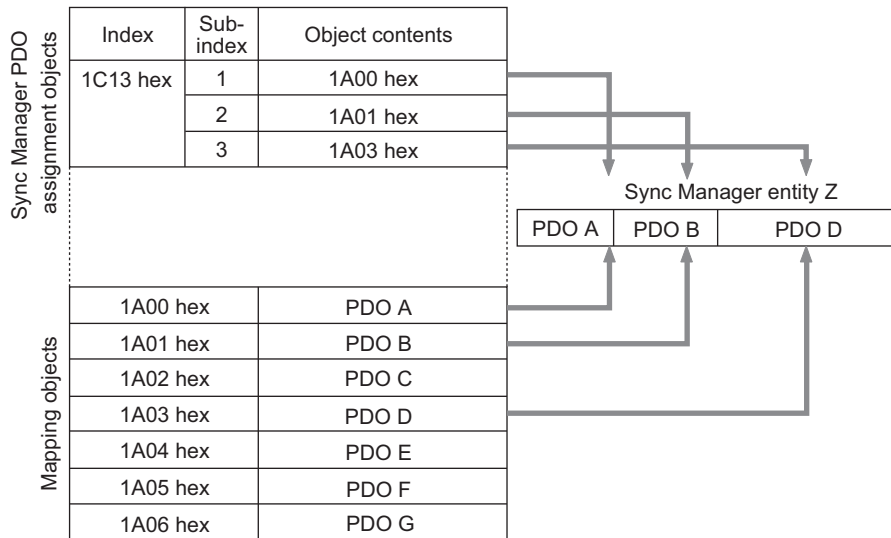
### 7-4-3 Assigning PDOs

This section describes the mechanism of PDO allocation of the EtherCAT slave and the PDO allocation to the EtherCAT Slave Unit.

## Scheme for Assigning PDOs to EtherCAT Slaves

You can assign more than one PDO mapping objects for the PDO allocation to an EtherCAT slave. Allocate the PDO mapping objects to the index 1C12 hex (for RxPDO) and index 1C13 hex (for TxPDOs) of the Sync Manager objects.

The following example shows how PDOs are assigned.



In this example, three PDO mapping objects (PDO A, PDO B, and PDO D) are allocated to index 1C13 hex (for TxPDOs).

Similarly, a PDO (for the RxPDO) is assigned to the index 1C12 hex.

These assignments determine the PDOs to use for communications between the EtherCAT master and slave.

## Assigning PDOs to EtherCAT Slave Units

The EtherCAT Slave Unit has the following PDO mapping objects.

- An object that can be allocated to the Sync Manager
- An object that is fixed for the allocation to the Sync Manager

In the EtherCAT Slave Unit, PDOs are assigned by default (factory setting). These PDOs determine both the RxPDOs and TxPDOs that are used for communications with the EtherCAT master.

For the PDO mapping object that can be allocated to the Sync Manager, you can change the allocation from the default value. For example, for the PDO mapping object that indicates the data to exchange between the CPU Unit and EtherCAT master, change the allocation to the Sync Manager, and define the data set for exchange.

Refer to *7-5 PDO Settings and Specifications* on page 7-8 for details on the PDO allocation method to the EtherCAT Slave Unit and PDO mapping objects.

## 7-5 PDO Settings and Specifications

This section describes the PDO settings and specifications of the EtherCAT Slave Unit.

The following items are described for the PDO specifications.

- Specifications of send/receive PDO data sizes
- Setting rules for data exchange
- PDO mapping objects and PDO entries that can be allocated
- Details of PDO mapping objects and PDO entries

### 7-5-1 PDO Settings

For the PDO settings to the EtherCAT Slave Unit, perform the following items explained in *7-4 Process Data Objects (PDOs)* on page 7-5.

| Item   | Description   |
|--|---|
| PDO allocation<br>(PDO mapping object selection) | Allocate the PDO mapping objects for the EtherCAT Slave Unit to the Sync Manager.<br>Allocate the PDO mapping objects of RxPDO to the index 1C12 hex (for RxPDOs) of the Sync Manager.<br>Allocate the PDO mapping objects of TxPDO to the index 1C13 hex (for TxPDOs) of the Sync Manager.<br>In the following descriptions, this work is called <i>PDO mapping object selection</i> . |
| PDO mapping<br>(PDO entry registration)          | Allocate the corresponding application objects to the PDO mapping objects.<br>In the following descriptions, this work is called <i>PDO entry registration</i> .<br>In this manual, the application object is called a <i>PDO entry</i> .   |

The methods for selecting the PDO mapping object and registering the PDO entry depend on the EtherCAT master to use. For example, the Sysmac Studio is used for the built-in EtherCAT port on NJ/NX-series CPU Unit. Refer to the user's manual for the EtherCAT master to use for the method for selecting the PDO mapping object and registering the PDO entry for the EtherCAT master.

The following describes the details on the PDO mapping object selection and PDO entry registration.

- **PDO mapping object selection**

Select the PDO mapping objects to allocate to the Sync Managers.

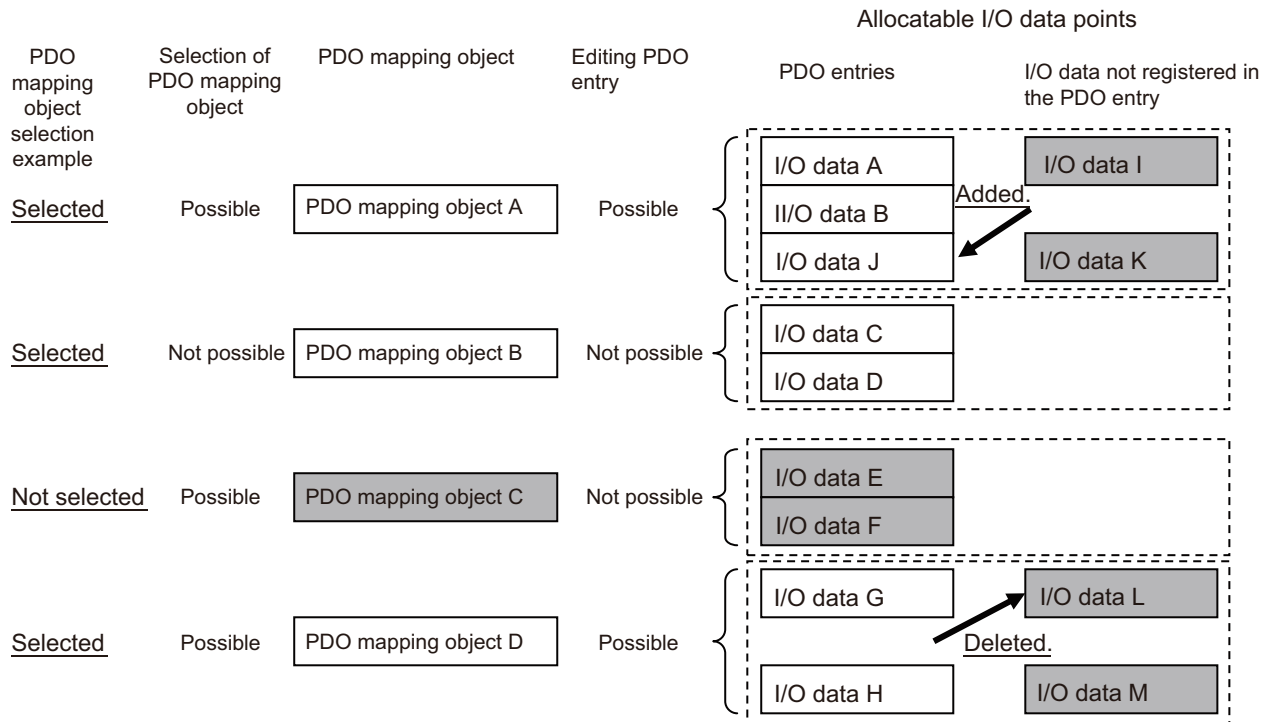
The I/O data for a PDO entry included in the selected PDO mapping objects are exchanged using the PDO communications. Default values are assigned to the PDO mapping object selections.

Change the PDO mapping objects to select as necessary. The PDO mapping object with a fixed selection cannot be removed from the Sync Manager.

- **PDO entry registration**

Default values are assigned to the PDO entries in each PDO mapping object. Some PDO mapping objects allow you to added or delete the PDO entries. Also, the I/O data that you can assign to each PDO mapping object is predetermined. Change the PDO entries as necessary.





## 7-5-2 Specifications of Send/Receive PDO Data Sizes

The following shows the specifications of the PDO data sizes that can be sent and received by the EtherCAT Slave Unit. Set the PDOs so that these specifications are satisfied.

- Data input by the EtherCAT master (TxPDOs)  
1,204 bytes max.
- Data output by the EtherCAT master (RxPDOs)  
1,200 bytes max.

The following shows the contents of the TxPDO data.

- I/O data set from the CPU Unit to the EtherCAT master: 1,200 bytes or less
- Status to notify the EtherCAT master: 4 bytes or less

## 7-5-3 Setting Rules for Data Exchange

The EtherCAT Slave Unit has PDOs of the I/O data to exchange between the CPU Unit and EtherCAT master.

To exchange the data correctly, the PDOs must be set so that the setting rules are satisfied according to the data exchange mechanism. Refer to *Section 5 Mechanism of I/O Data Exchange and Data to Share* on page 5-1 for the data exchange mechanism between the CPU Unit and EtherCAT master and the setting rules.

## 7-5-4 PDO Mapping Objects and PDO Entries That Can Be Allocated

The following table shows the PDO mapping objects that can be allocated to the EtherCAT Slave Unit.

| PDO mapping object |             |   |   | Selection of PDO mapping object |              | Change of PDO entry |                 |                 |
|--------------------|-------------|---|---|---------------------------------|--------------|---------------------|-----------------|-----------------|
| PDO type           | Index (hex) | Object name   | Description   | Selection                       | Default      | Editing             | Default entries | Maximum entries |
| RxPDO              | 1601        | Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit | This I/O data set is transferred from the EtherCAT master to CPU Unit. Up to 40 data in 15 UINT arrays can be registered. Each data size is 30 bytes. | Possible                        | Selected     | Possible            | 6               | 40              |
|                    | 1602        | Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit | This I/O data set is transferred from the EtherCAT master to CPU Unit. Up to 10 data in 10 BYTE arrays can be registered. Each data size is 10 bytes. | Possible                        | Not selected | Possible            | 2               | 10              |
|                    | 1603        | Data Set in UDINT from EtherCAT Master to CPU Unit          | This I/O data set is transferred from the EtherCAT master to CPU Unit. Up to 32 UDINT data can be registered. Each data size is 4 bytes.              | Possible                        | Not selected | Possible            | 4               | 32              |
| TxPDO              | 1A00        | NX Unit Status Information                                  | The status information as an NX Unit of the EtherCAT Slave Unit.  | Not possible*1                  | Selected     | Not possible        | 6               | 6               |
|                    | 1A01        | Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | This I/O data set is transferred from the CPU Unit to EtherCAT master. Up to 40 data in 15 UINT arrays can be registered. Each data size is 30 bytes. | Possible                        | Selected     | Possible            | 6               | 40              |
|                    | 1A02        | Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master | This I/O data set is transferred from the CPU Unit to EtherCAT master. Up to 10 data in 10 BYTE arrays can be registered. Each data size is 10 bytes. | Possible                        | Not selected | Possible            | 2               | 10              |
|                    | 1A03        | Data Set in UDINT from CPU Unit to EtherCAT Master          | This I/O data set is transferred from the CPU Unit to EtherCAT master. Up to 32 UDINT data can be registered. Each data size is 4 bytes.              | Possible                        | Not selected | Possible            | 4               | 32              |
|                    | 1BFE        | New Messages Available Information                          | Indicates the new messages available. This notification indicates the update of the error log.  | Possible                        | Selected     | Not possible        | 2               | 2               |
|                    | 1BFF        | Sysmac Error Status Information                             | Indicates the Sysmac error status.  | Possible                        | Not selected | Not possible        | 1               | 1               |

\*1. *NX Unit Status Information* (1A00 hex) must be allocated. If it is not allocated, *TxPDO Mapping Error* (35090000 hex) occurs.

The following table shows the PDO entries corresponding to these PDO mapping objects. The PDO entry type that can be registered to the PDO mapping object is fixed. Different type of PDO entry cannot be registered.

| PDO mapping object |             |   | PDO entry   |                   | Reference   |
|--------------------|-------------|---|-------------|-------------------|---|
| PDO type           | Index (hex) | Object name   | Index (hex) | Object name       |   |
| RxPDO              | 1601        | Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit | 7000        | UINTs Data M to C | <i>Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit on page 7-11</i> |
|                    | 1602        | Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit | 7001        | BYTEs Data M to C | <i>Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit on page 7-12</i> |
|                    | 1603        | Data Set in UDINT from EtherCAT Master to CPU Unit          | 7002        | UDINT Data M to C | <i>Data Set in UDINT from EtherCAT Master to CPU Unit on page 7-13</i>          |
| TxPDO              | 1A00        | NX Unit Status Information                                  | 6003        | NX Unit Status    | <i>NX Unit Status Information on page 7-17</i>                                  |
|                    | 1A01        | Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | 6000        | UINTs Data C to M | <i>Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master on page 7-14</i> |

| PDO mapping object |             |   | PDO entry   |   | Reference   |
|--------------------|-------------|---|-------------|---|---|
| PDO type           | Index (hex) | Object name   | Index (hex) | Object name   |   |
|                    | 1A02        | Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master | 6001        | BYTEs Data C to M   | <i>Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master</i> on page 7-15 |
|                    | 1A03        | Data Set in UDINT from CPU Unit to EtherCAT Master          | 6002        | UDINT Data C to M   | <i>Data Set in UDINT from CPU Unit to EtherCAT Master</i> on page 7-16          |
|                    | 1BFE        | New Messages Available Information                          | 10F3        | Diagnosis History<br>Subindex 04 hex:<br>New Messages Available | <i>New Messages Available Information</i> on page 7-18                          |
|                    | 1BFF        | Sysmac Error Status Information                             | 2002        | Sysmac Error<br>Subindex 01 hex:<br>Sysmac Error Status         | <i>Sysmac Error Status Information</i> on page 7-19                             |

The following describes the details on the PDO mapping object and PDO entry.

## 7-5-5 Details of PDO Mapping Objects and PDO Entries

This section describes the details on the PDO mapping objects and PDO entries that can be allocated to the EtherCAT Slave Unit.

The descriptions are provided for the following each data type shown in *Section 5 Mechanism of I/O Data Exchange and Data to Share* on page 5-1.

- I/O data set from the EtherCAT master to the CPU Unit (RxPDO)
- I/O data set from the CPU Unit to the EtherCAT master (TxPDO)
- Status to notify the EtherCAT master (TxPDO)

### I/O Data Set from the EtherCAT Master to the CPU Unit (RxPDO)

The following three types of PDO mapping objects are provided for the I/O data set to transfer from the EtherCAT master to CPU Unit.

- Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit
- Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit
- Data Set in UDINT from EtherCAT Master to CPU Unit

This section describes the details of each PDO mapping object.

#### ● Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit

This I/O data set is transferred from the EtherCAT master to CPU Unit.

Up to 40 data in 15 UINT arrays can be registered. Each data size is 30 bytes.

This PDO mapping object is selected by default, and the data size is 180 bytes.

The following table shows the details on the corresponding PDO entries.

*UINTs 01 M to C to UINTs 06 M to C* of the PDO entries are registered by default.

The following PDO entry values are reflected to the I/O data *UINTs Data M to C* (6000 hex) of the NX object.

| Index (hex) | Subindex (hex)      | Object name     | Default <sup>*1</sup> | Data range <sup>*1</sup> | Size     | Data type             | Description   | I/O port name <sup>*2</sup> |
|-------------|---------------------|-----------------|-----------------------|--------------------------|----------|-----------------------|---|-----------------------------|
| 7000        | 01                  | UINTs 01 M to C | 0000 hex              | 0000 hex to FFFF hex     | 30 bytes | ARRAY [0..14] OF UINT | Data 01 that is transferred from EtherCAT master to CPU Unit. The value is reflected to 6000:01 hex of the NX object. | UINTs 01 M to C             |
|             | 02                  | UINTs 02 M to C | 0000 hex              | 0000 hex to FFFF hex     | 30 bytes | ARRAY [0..14] OF UINT | Data 02 that is transferred from EtherCAT master to CPU Unit. The value is reflected to 6000:02 hex of the NX object. | UINTs 02 M to C             |
|             | 03                  | UINTs 03 M to C | 0000 hex              | 0000 hex to FFFF hex     | 30 bytes | ARRAY [0..14] OF UINT | Data 03 that is transferred from EtherCAT master to CPU Unit. The value is reflected to 6000:03 hex of the NX object. | UINTs 03 M to C             |
|             | Subindexes 04 to 27 |                 |                       |                          |          |                       |   |                             |
|             | 28                  | UINTs 40 M to C | 0000 hex              | 0000 hex to FFFF hex     | 30 bytes | ARRAY [0..14] OF UINT | Data 40 that is transferred from EtherCAT master to CPU Unit. The value is reflected to 6000:28 hex of the NX object. | UINTs 40 M to C             |

\*1. Default values or data ranges for each element of the array.

\*2. The I/O port name to be a logical interface that is used by the NJ/NX-series CPU Unit and NY-series Industrial PC to exchange data with an external device (slave or Unit). It is used when the built-in EtherCAT ports on the NJ/NX-series CPU Unit and NY-series Industrial PC are used for the EtherCAT master.



#### Precautions for Correct Use

- Do not register the PDO entries other than *UINTs Data M to C (7000 hex) to Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit (1601 hex)*. If a PDO entry other than the corresponding PDO entry is registered, an *Illegal PDO Entry Added M to C (391E0000 hex)* error occurs.
- When you register the PDO entry of *UINTs Data M to C (7000 hex) to Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit (1601 hex)*, set the subindex to be forward feed or ascending order for registration. If the subindex is registered in an incorrect order, an *Incorrect PDO Entry Order M to C (39140000 hex)* error occurs.

#### ● Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit

This I/O data set is transferred from the EtherCAT master to CPU Unit.

Up to 10 data in 10 BYTE arrays can be registered. Each data size is 10 bytes.

This PDO mapping object is not selected by default, and the data size is 0 byte.

The following table shows the details on the corresponding PDO entries.

*BYTES 01 M to C* and *BYTES 02 M to C* are registered by default.

The following PDO entry values are reflected to the I/O data *BYTES Data M to C (6001 hex)* of the NX object.

| Index (hex) | Subindex (hex)      | Object name     | Default* <sup>1</sup> | Data range* <sup>1</sup> | Size     | Data type            | Description   | I/O port name* <sup>2</sup> |
|-------------|---------------------|-----------------|-----------------------|--------------------------|----------|----------------------|---|-----------------------------|
| 7001        | 01                  | BYTES 01 M to C | 00 hex                | 00 hex to FF hex         | 10 bytes | ARRAY [0..9] OF BYTE | Data 01 that is transferred from EtherCAT master to CPU Unit. The value is reflected to 6001:01 hex of the NX object. | BYTES 01 M to C             |
|             | 02                  | BYTES 02 M to C | 00 hex                | 00 hex to FF hex         | 10 bytes | ARRAY [0..9] OF BYTE | Data 02 that is transferred from EtherCAT master to CPU Unit. The value is reflected to 6001:02 hex of the NX object. | BYTES 02 M to C             |
|             | 03                  | BYTES 03 M to C | 00 hex                | 00 hex to FF hex         | 10 bytes | ARRAY [0..9] OF BYTE | Data 03 that is transferred from EtherCAT master to CPU Unit. The value is reflected to 6001:03 hex of the NX object. | BYTES 03 M to C             |
|             | Subindexes 04 to 09 |                 |                       |                          |          |                      |   |                             |
|             | 0A                  | BYTES 10 M to C | 00 hex                | 00 hex to FF hex         | 10 bytes | ARRAY [0..9] OF BYTE | Data 10 that is transferred from EtherCAT master to CPU Unit. The value is reflected to 6001:0A hex of the NX object. | BYTES 10 M to C             |

\*1. Default values or data ranges for each element of the array.

\*2. The I/O port name to be a logical interface that is used by the NJ/NX-series CPU Unit and NY-series Industrial PC to exchange data with an external device (slave or Unit). It is used when the built-in EtherCAT ports on the NJ/NX-series CPU Unit and NY-series Industrial PC are used for the EtherCAT master.



### Precautions for Correct Use

- Do not register the PDO entries other than *BYTES Data M to C (7001 hex)* to *Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit (1602 hex)*. If a PDO entry other than the corresponding PDO entry is registered, an *Illegal PDO Entry Added M to C (391E0000 hex)* error occurs.
- When you register the PDO entry of *BYTES Data M to C (7001 hex)* to *Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit (1602 hex)*, set the subindex to be forward feed or ascending order for registration. If the subindex is registered in an incorrect order, an *Incorrect PDO Entry Order M to C (39140000 hex)* error occurs.

### ● Data Set in UDINT from EtherCAT Master to CPU Unit

This I/O data set is transferred from the EtherCAT master to CPU Unit.

Up to 32 UDINT data can be registered. Each data size is 4 bytes.

This PDO mapping object is not selected by default, and the data size is 0 byte.

The following table shows the details on the corresponding PDO entries.

*UDINT 01 M to C* to *UDINT 04 M to C* are registered by default.

The following PDO entry values are reflected to the I/O data *UDINT Data M to C (6002 hex)* of the NX object.

| Index (hex) | Subindex (hex)    | Object name        | Default         | Data range                         | Size    | Data type | Description   | I/O port name* <sup>1</sup> |
|-------------|-------------------|--------------------|-----------------|------------------------------------|---------|-----------|---|-----------------------------|
| 7002        | 01                | UDINT 01<br>M to C | 00000000<br>hex | 00000000 hex<br>to<br>FFFFFFFF hex | 4 bytes | UDINT     | Data 01 that is transferred from EtherCAT master to CPU Unit. The value is reflected to 6002:01 hex of the NX object. | UDINT 01 M to C             |
|             | 02                | UDINT 02<br>M to C | 00000000<br>hex | 00000000 hex<br>to<br>FFFFFFFF hex | 4 bytes | UDINT     | Data 02 that is transferred from EtherCAT master to CPU Unit. The value is reflected to 6002:02 hex of the NX object. | UDINT 02 M to C             |
|             | 03                | UDINT 03<br>M to C | 00000000<br>hex | 00000000 hex<br>to<br>FFFFFFFF hex | 4 bytes | UDINT     | Data 03 that is transferred from EtherCAT master to CPU Unit. The value is reflected to 6002:03 hex of the NX object. | UDINT 03 M to C             |
|             | Subindex 04 to 1F |                    |                 |                                    |         |           |   |                             |
|             | 20                | UDINT 32<br>M to C | 00000000<br>hex | 00000000 hex<br>to<br>FFFFFFFF hex | 4 bytes | UDINT     | Data 32 that is transferred from EtherCAT master to CPU Unit. The value is reflected to 6002:20 hex of the NX object. | UDINT 32 M to C             |

\*1. The I/O port name to be a logical interface that is used by the NJ/NX-series CPU Unit and NY-series Industrial PC to exchange data with an external device (slave or Unit). It is used when the built-in EtherCAT ports on the NJ/NX-series CPU Unit and NY-series Industrial PC are used for the EtherCAT master.



#### Precautions for Correct Use

- Do not register the PDO entries other than *UDINT Data M to C* (7002 hex) to *Data Set in UDINT from EtherCAT Master to CPU Unit* (1603 hex). If a PDO entry other than the corresponding PDO entry is registered, an *Illegal PDO Entry Added M to C* (391E0000 hex) error occurs.
- When you register the PDO entry of *UDINT Data M to C* (7002 hex) to *Data Set in UDINT from EtherCAT Master to CPU Unit* (1603 hex), set the subindex to be forward feed or ascending order for registration. If the subindex is registered in an incorrect order, an *Incorrect PDO Entry Order M to C* (39140000 hex) error occurs.

## I/O Data Set from the CPU Unit to the EtherCAT Master (TxPDO)

The following three types of PDO mapping objects are provided for the I/O data set to transfer from the CPU Unit to the EtherCAT master.

- Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master
- Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master
- Data Set in UDINT from CPU Unit to EtherCAT Master

This section describes the details of each PDO mapping object.

### ● Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master

This I/O data set is transferred from the CPU Unit to EtherCAT master.

Up to 40 data in 15 UINT arrays can be registered. Each data size is 30 bytes.

This PDO mapping object is selected by default, and the data size is 180 bytes.

The following table shows the details on the corresponding PDO entries.

*UINTs 01 C to M* to *UINTs 06 C to M* are registered by default.

The values of the I/O data *UINTs Data C to M* (7000 hex) of the NX object are reflected to the following PDO entries.

| Index (hex) | Sub-index (hex)     | Object name     | Default* <sup>1</sup> | Data range* <sup>1</sup> | Size     | Data type             | Description   | I/O port name* <sup>2</sup> |
|-------------|---------------------|-----------------|-----------------------|--------------------------|----------|-----------------------|---|-----------------------------|
| 6000        | 01                  | UINTs 01 C to M | 0000 hex              | 0000 hex to FFFF hex     | 30 bytes | ARRAY [0..14] OF UINT | Data 01 that is transferred from CPU Unit to EtherCAT master. The value of 7000:01 hex of the NX object is reflected. | UINTs 01 C to M             |
|             | 02                  | UINTs 02 C to M | 0000 hex              | 0000 hex to FFFF hex     | 30 bytes | ARRAY [0..14] OF UINT | Data 02 that is transferred from CPU Unit to EtherCAT master. The value of 7000:02 hex of the NX object is reflected. | UINTs 02 C to M             |
|             | 03                  | UINTs 03 C to M | 0000 hex              | 0000 hex to FFFF hex     | 30 bytes | ARRAY [0..14] OF UINT | Data 03 that is transferred from CPU Unit to EtherCAT master. The value of 7000:03 hex of the NX object is reflected. | UINTs 03 C to M             |
|             | Subindexes 04 to 27 |                 |                       |                          |          |                       |   |                             |
|             | 28                  | UINTs 40 C to M | 0000 hex              | 0000 hex to FFFF hex     | 30 bytes | ARRAY [0..14] OF UINT | Data 40 that is transferred from CPU Unit to EtherCAT master. The value of 7000:28 hex of the NX object is reflected. | UINTs 40 C to M             |

\*1. Default values or data ranges for each element of the array.

\*2. The I/O port name to be a logical interface that is used by the NJ/NX-series CPU Unit and NY-series Industrial PC to exchange data with an external device (slave or Unit). It is used when the built-in EtherCAT ports on the NJ/NX-series CPU Unit and NY-series Industrial PC are used for the EtherCAT master.



### Precautions for Correct Use

- Do not register the PDO entries other than *UINTs Data C to M* (6000 hex) to *Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master* (1A01 hex). If a PDO entry other than the corresponding PDO entry is registered, an *Illegal PDO Entry Added C to M* (391F0000 hex) error occurs.
- When you register the PDO entry of *UINTs Data C to M* (6000 hex) to *Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master* (1A01 hex), set the subindex to be forward feed or ascending order for registration. If the subindex is registered in an incorrect order, an *Incorrect PDO Entry Order C to M* (39150000 hex) error occurs.

### ● Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master

This I/O data set is transferred from the CPU Unit to EtherCAT master.

Up to 10 data in 10 BYTE arrays can be registered. Each data size is 10 bytes.

This PDO mapping object is not selected by default, and the data size is 0 byte.

The following table shows the details on the corresponding PDO entries.

*BYTES 01 C to M* and *BYTES 02 C to M* are registered by default.

The values of the I/O data *BYTES Data C to M* (7001 hex) of the NX object are reflected to the following PDO entries.

| Index (hex) | Subindex (hex)      | Object name     | Default <sup>*1</sup> | Data range <sup>*1</sup> | Size     | Data type            | Description   | I/O port name <sup>*2</sup> |
|-------------|---------------------|-----------------|-----------------------|--------------------------|----------|----------------------|---|-----------------------------|
| 6001        | 01                  | BYTES 01 C to M | 00 hex                | 00 hex to FF hex         | 10 bytes | ARRAY [0..9] OF BYTE | Data 01 that is transferred from CPU Unit to EtherCAT master. The value of 7001:01 hex of the NX object is reflected. | BYTES 01 C to M             |
|             | 02                  | BYTES 02 C to M | 00 hex                | 00 hex to FF hex         | 10 bytes | ARRAY [0..9] OF BYTE | Data 02 that is transferred from CPU Unit to EtherCAT master. The value of 7001:02 hex of the NX object is reflected. | BYTES 02 C to M             |
|             | 03                  | BYTES 03 C to M | 00 hex                | 00 hex to FF hex         | 10 bytes | ARRAY [0..9] OF BYTE | Data 03 that is transferred from CPU Unit to EtherCAT master. The value of 7001:03 hex of the NX object is reflected. | BYTES 03 C to M             |
|             | Subindexes 04 to 09 |                 |                       |                          |          |                      |   |                             |
|             | 0A                  | BYTES 10 C to M | 00 hex                | 00 hex to FF hex         | 10 bytes | ARRAY [0..9] OF BYTE | Data 10 that is transferred from CPU Unit to EtherCAT master. The value of 7001:0A hex of the NX object is reflected. | BYTES 10 C to M             |

\*1. Default values or data ranges for each element of the array.

\*2. The I/O port name to be a logical interface that is used by the NJ/NX-series CPU Unit and NY-series Industrial PC to exchange data with an external device (slave or Unit). It is used when the built-in EtherCAT ports on the NJ/NX-series CPU Unit and NY-series Industrial PC are used for the EtherCAT master.



### Precautions for Correct Use

- Do not register the PDO entries other than *BYTES Data C to M* (6001 hex) to *Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master* (1A02 hex). If a PDO entry other than the corresponding PDO entry is registered, an *Illegal PDO Entry Added C to M* (391F0000 hex) error occurs.
- When you register the PDO entry of *BYTES Data C to M* (6001 hex) to *Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master* (1A02 hex), set the subindex to be forward feed or ascending order for registration. If the subindex is registered in an incorrect order, an *Incorrect PDO Entry Order C to M* (39150000 hex) error occurs.

### ● Data Set in UDINT from CPU Unit to EtherCAT Master

This I/O data set is transferred from the CPU Unit to EtherCAT master.

Up to 32 UDINT data can be registered. Each data size is 4 bytes.

This PDO mapping object is not selected by default, and the data size is 0 byte.

The following table shows the details on the corresponding PDO entries.

*UDINT 01 C to M* to *UDINT 04 C to M* are registered by default.

The values of the I/O data *UDINT Data C to M* (7002 hex) of the NX object are reflected to the following PDO entries.



| Index (hex) | Subindex (hex)    | Object name     | Default      | Data range                   | Size    | Data type | Description   | I/O port name*1 |
|-------------|-------------------|-----------------|--------------|------------------------------|---------|-----------|---|-----------------|
| 6002        | 01                | UDINT 01 C to M | 00000000 hex | 00000000 hex to FFFFFFFF hex | 4 bytes | UDINT     | Data 01 that is transferred from CPU Unit to EtherCAT master. The value of 7002:01 hex of the NX object is reflected. | UDINT 01 C to M |
|             | 02                | UDINT 02 C to M | 00000000 hex | 00000000 hex to FFFFFFFF hex | 4 bytes | UDINT     | Data 02 that is transferred from CPU Unit to EtherCAT master. The value of 7002:02 hex of the NX object is reflected. | UDINT 02 C to M |
|             | 03                | UDINT 03 C to M | 00000000 hex | 00000000 hex to FFFFFFFF hex | 4 bytes | UDINT     | Data 03 that is transferred from CPU Unit to EtherCAT master. The value of 7002:03 hex of the NX object is reflected. | UDINT 03 C to M |
|             | Subindex 04 to 1F |                 |              |                              |         |           |   |                 |
|             | 20                | UDINT 32 C to M | 00000000 hex | 00000000 hex to FFFFFFFF hex | 4 bytes | UDINT     | Data 32 that is transferred from CPU Unit to EtherCAT master. The value of 7002:20 hex of the NX object is reflected. | UDINT 32 C to M |

\*1. The I/O port name to be a logical interface that is used by the NJ/NX-series CPU Unit and NY-series Industrial PC to exchange data with an external device (slave or Unit). It is used when the built-in EtherCAT ports on the NJ/NX-series CPU Unit and NY-series Industrial PC are used for the EtherCAT master.



#### Precautions for Correct Use

- Do not register the PDO entries other than *UDINT Data C to M* (6002 hex) to *Data Set in UDINT from CPU Unit to EtherCAT Master* (1A03 hex). If a PDO entry other than the corresponding PDO entry is registered, an *Illegal PDO Entry Added C to M* (391F0000 hex) error occurs.
- When you register the PDO entry of *UDINT Data C to M* (6002 hex) to *Data Set in UDINT from CPU Unit to EtherCAT Master* (1A03 hex), set the subindex to be forward feed or ascending order for registration. If the subindex is registered in an incorrect order, an *Incorrect PDO Entry Order C to M* (39150000 hex) error occurs.

## Status to Notify the EtherCAT Master (TxPDO)

The following three types of PDO mapping objects are provided for the status to notify the EtherCAT master from the EtherCAT Slave Unit.

- NX Unit Status Information
- New Messages Available Information
- Sysmac Error Status Information

This section describes the details of each PDO mapping object.

### ● NX Unit Status Information

The status information as an NX Unit of the EtherCAT Slave Unit.

This PDO mapping object is fixed, and the data size is 2 bytes.

The following table shows the details on the corresponding PDO entry.

This PDO entry is fixed and cannot be changed.



### Precautions for Correct Use

*NX Unit Status Information* (1A00 hex) must be allocated. If it is not allocated, *TxPDO Mapping Error* (35090000 hex) occurs.

| Index (hex) | Sub-index (hex) | Object name                                 | Default | Data range    | Size    | Data type | Description  | I/O port name*1                             |
|-------------|-----------------|---|---------|---------------|---------|-----------|--|---|
| 6003        | 01              | NX Message Communications Enabled           | FALSE   | TRUE or FALSE | 1 bit   | BOOL      | Indicates whether NX message communications between the CPU Unit and EtherCAT Slave Unit is enabled. <ul style="list-style-type: none"> <li>• TRUE: NX message communications with the CPU Unit is enabled</li> <li>• FALSE: NX message communications with the CPU Unit is disabled</li> </ul>  | NX Message Communications Enabled           |
|             | 02              | Data from CPU Unit to EtherCAT Master Valid | FALSE   | TRUE or FALSE | 1 bit   | BOOL      | Indicates whether the data from the CPU Unit to the EtherCAT master is valid. <ul style="list-style-type: none"> <li>• TRUE: Valid</li> <li>• FALSE: Invalid</li> </ul>  | Data from CPU Unit to EtherCAT Master Valid |
|             | 03              | Data from EtherCAT Master to CPU Unit Valid | FALSE   | TRUE or FALSE | 1 bit   | BOOL      | Indicates whether the data from the EtherCAT master to the CPU Unit is valid. <ul style="list-style-type: none"> <li>• TRUE: Valid</li> <li>• FALSE: Invalid</li> </ul>  | Data from EtherCAT Master to CPU Unit Valid |
|             | 04              | New Message Data Available from CPU Unit    | FALSE   | TRUE or FALSE | 1 bit   | BOOL      | Indicates whether new message data is written to the <i>Message Data from the CPU Unit to the EtherCAT Master</i> (3000 hex) CoE object from the CPU Unit. <ul style="list-style-type: none"> <li>• TRUE: New message data available from CPU Unit</li> <li>• FALSE: New message data not available from CPU Unit</li> </ul> <p>FALSE → TRUE: The new message data is written from the CPU Unit.<br/>TRUE → FALSE: The message data is read from the EtherCAT master.</p>                                | New Message Data Available from CPU Unit    |
|             | 05              | Ready to Write Message Data to CPU Unit     | TRUE    | TRUE or FALSE | 1 bit   | BOOL      | Indicates whether the message data from the EtherCAT master to the CPU Unit can be written to the <i>Message Data from EtherCAT master to CPU Unit</i> (3001 hex) CoE object. <ul style="list-style-type: none"> <li>• TRUE: Ready to write the message data to the CPU Unit.</li> <li>• FALSE: Not ready to write the message data to the CPU Unit.</li> </ul> <p>FALSE → TRUE: The message data is read from the CPU Unit.<br/>TRUE → FALSE: The message data is written from the EtherCAT master.</p> | Ready to Write Message Data to CPU Unit     |
| ---         | ---             | ---   | ---     | ---           | 11 bits | ---       | Reserved   | ---   |

\*1. The I/O port name to be a logical interface that is used by the NJ/NX-series CPU Unit and NY-series Industrial PC to exchange data with an external device (slave or Unit). It is used when the built-in EtherCAT ports on the NJ/NX-series CPU Unit and NY-series Industrial PC are used for the EtherCAT master.

### ● New Messages Available Information

Indicates the new messages available. This notification indicates the update of the error log.

This PDO mapping object is selected by default, and the data size is 1 byte.  
The following table shows the details on the corresponding PDO entry.  
This PDO entry is fixed and cannot be changed.

The notification of the new messages available to the EtherCAT master acts as a trigger to read the *Diagnosis History* (10F3 hex) CoE object of the EtherCAT Slave Unit, and allows you to check errors that occur in the EtherCAT Slave Unit.

This allows you to use this manual to view and correct errors.

| Index (hex) | Sub-index (hex) | Object name            | Default | Data range    | Size   | Data type | Description  | I/O port name*1        |
|-------------|-----------------|------------------------|---------|---------------|--------|-----------|--|------------------------|
| 10F3        | 04              | New Messages Available | FALSE   | TRUE or FALSE | 1 bit  | BOOL      | This tells whether the error log is updated.<br><ul style="list-style-type: none"> <li>TRUE: The error log is updated.</li> <li>FALSE: The error log is not updated.</li> </ul> <p>The error log is updated at the following times.<br/>The status changes to TRUE when the error log is updated.<br/>The status changes to FALSE when the subindex number of the most recent error log is written to sub-index 03 hex (Newest Acknowledged Message) by the EtherCAT master.</p> | New Messages Available |
| ---         | ---             | ---                    | ---     | ---           | 7 bits | ---       | Reserved   | ---                    |

\*1. The I/O port name to be a logical interface that is used by the NJ/NX-series CPU Unit and NY-series Industrial PC to exchange data with an external device (slave or Unit). It is used when the built-in EtherCAT ports on the NJ/NX-series CPU Unit and NY-series Industrial PC are used for the EtherCAT master.

## ● Sysmac Error Status Information

Indicates the Sysmac error status.

The Sysmac error status has error level information that is commonly defined for all Sysmac devices.

This PDO mapping object is not selected by default, and the data size is 0 byte.

The following table shows the details on the corresponding PDO entry.

This PDO entry is fixed and cannot be changed.

Refer to *Error Occurrence Notifications Based on the Sysmac Error Status* on page 7-22 for details on the use of the Sysmac error status.

| Index (hex) | Sub-index (hex) | Object name         | Default | Data range       | Size   | Data type | Description   | I/O port name*1     |
|-------------|-----------------|---------------------|---------|------------------|--------|-----------|---|---------------------|
| 2002        | 01              | Sysmac Error Status | 00 hex  | 00 hex to FF hex | 1 byte | USINT     | Indicates the Sysmac error status of the EtherCAT Slave Unit.<br>The bit configuration is described immediately below this table. | Sysmac Error Status |

\*1. The I/O port name to be a logical interface that is used by the NJ/NX-series CPU Unit and NY-series Industrial PC to exchange data with an external device (slave or Unit). It is used when the built-in EtherCAT ports on the NJ/NX-series CPU Unit and NY-series Industrial PC are used for the EtherCAT master.

### Bit Configuration of Sysmac Error Status:

The following table shows the bit configuration.

| Bit    | Data name   | Description  | I/O port name <sup>*1</sup> |
|--------|-------------|--|-----------------------------|
| 0 to 3 | (Reserved)  | ---  | ---                         |
| 4      | Observation | <p>Indicates the error status of the observation among the event levels.</p> <ul style="list-style-type: none"> <li>• TRUE: Error</li> <li>• FALSE: No error</li> </ul> <p>The error log is updated at the following times.</p> <ul style="list-style-type: none"> <li>• The status changes to TRUE when an error occurs.</li> <li>• The status changes to FALSE when the error is reset.</li> </ul> <p>Even if the cause of the error has been removed, you must reset the error for the status to change to FALSE.</p> | Observation                 |
| 5      | Minor fault | <p>Indicates the error status of the minor fault among the event levels.</p> <ul style="list-style-type: none"> <li>• TRUE: Error</li> <li>• FALSE: No error</li> </ul> <p>The error log is updated at the following times.</p> <ul style="list-style-type: none"> <li>• The status changes to TRUE when an error occurs.</li> <li>• The status changes to FALSE when the error is reset.</li> </ul> <p>Even if the cause of the error has been removed, you must reset the error for the status to change to FALSE.</p> | Minor Fault                 |
| 6 to 7 | (Reserved)  | ---  | ---                         |

\*1. The I/O port name to be a logical interface that is used by the NJ/NX-series CPU Unit and NY-series Industrial PC to exchange data with an external device (slave or Unit). It is used when the built-in EtherCAT ports on the NJ/NX-series CPU Unit and NY-series Industrial PC are used for the EtherCAT master.

## 7-6 Service Data Objects (SDOs)

This section describes the service data objects that are supported by the EtherCAT Slave Unit.

### 7-6-1 Introduction

EtherCAT Slave Units support SDO communications.

The EtherCAT master can read and write data from and to entries in the object dictionary with SDO communications to make parameter settings and monitor status.

Refer to *A-6 CoE Objects* on page A-33 for the objects that you can use with SDO communications.

### 7-6-2 Abort Codes

The following table lists the abort codes for the SDO communications errors.

| Value        | Meaning  |
|--------------|--|
| 06010000 hex | Unsupported access to an object.   |
| 06010002 hex | Attempt to write to a read-only object.  |
| 06010003 hex | Writing cannot be made to the subindex. To make writing, write 0 to the subindex 00 hex. |
| 06020000 hex | The object does not exist in the object directory.                                       |
| 06040041 hex | The object cannot be mapped to the PDO.  |
| 06040042 hex | Number/length of mapped objects exceeds PDO length.                                      |
| 06070010 hex | Data type does not match, length of service parameter does not match.                    |
| 06090011 hex | Missing subindex.  |
| 06090030 hex | Value of parameter exceeded range (only for write access).                               |
| 08000021 hex | The data cannot be read and written due to internal status.                              |
| 08000022 hex | The data cannot be read and written in this status.                                      |

## 7-7 Communications Mode and Sysmac Device Functionality

This section describes the communications mode of EtherCAT communications and Sysmac device functionality supported by the EtherCAT Slave Unit.

### 7-7-1 Communications Mode

The EtherCAT Slave Unit supports the following communications mode for the communications mode between the master and slaves for EtherCAT communications.

- Free-Run Mode

In Free-Run Mode, the slave processes the I/O (i.e., refreshes the I/O data) asynchronous to the communications cycle of the master.

### 7-7-2 Sysmac Device Functionality

“Sysmac devices” is a generic name for EtherCAT slaves and other OMRON control components that were designed with the same communications and user interface specifications.

You can use the EtherCAT Slave Unit together with NJ/NX/NY-series Machine Automation Controllers and the Sysmac Studio Automation Software to achieve optimum functionality and ease of operation.

This is called Sysmac device functionality.

EtherCAT slaves that are Sysmac devices have unique Sysmac device functionality. The EtherCAT Slave Unit has the functionality.

This section describes the Sysmac device functionality of the EtherCAT Slave Unit.

## Error Occurrence Notifications Based on the Sysmac Error Status

You can notify the EtherCAT master of error status and level based on the Sysmac error status in the following PDO mapping object of the EtherCAT Slave Unit.

This PDO mapping object is not selected by default. If you want to monitor the notification of error status and level in the EtherCAT Slave Unit from the EtherCAT master, select this PDO mapping object.

| PDO mapping object              |             | Application object (PDO entry) |             |                |
|---------------------------------|-------------|--------------------------------|-------------|----------------|
| Object name                     | Index (hex) | Object name                    | Index (hex) | Subindex (hex) |
| Sysmac Error Status Information | 1BFF        | Sysmac Error Status            | 2002        | 01             |

The Sysmac error status has error level information that is commonly defined for all Sysmac devices.

The notification of the Sysmac error status to the EtherCAT master acts as a trigger that allows you to use the troubleshooting functions on the Sysmac Studio and NA-series HMI connected to the NX-series CPU Unit to view and correct errors that occur in the EtherCAT Slave Unit.

When an error occurs in the EtherCAT Slave Unit, it is notified to the NX-series CPU Unit. The notification to the NX-series CPU Unit acts as a trigger that allows you to use the troubleshooting functions on the Sysmac Studio and NA-series HMI to perform troubleshooting.

In addition, the following notification of error status to the EtherCAT master acts as a trigger to read the *Diagnosis History* (10F3 hex) CoE object of the EtherCAT Slave Unit, and allows you to check errors that occur in the EtherCAT Slave Unit.

- New messages available or Sysmac error status

This allows you to use this manual to view and correct errors.

Refer to *8-1 Error Notification and Check Methods* on page 8-2 for details on error notification and check method for the EtherCAT Slave Unit.

Refer to *Sysmac Error Status Information* on page 7-19 for details on the Sysmac error status.

## Saving Node Address Settings

This function is used to set EtherCAT node addresses on the built-in EtherCAT ports on the NJ/NX-series CPU Unit and NY-series Industrial PC from the Sysmac Studio.

If the ID switch of the EtherCAT Slave Unit is set to 00 hex (0), you can use the software setting that is set with the node address setting on the Sysmac Studio.

Place the Sysmac Studio online with the NJ/NX-series CPU Unit or the NY-series Industrial PC to set the node address from the Sysmac Studio.

For the procedure to set the node address from the Sysmac Studio, refer to the user's manual for the built-in EtherCAT port on the connected CPU Unit or Industrial PC.

Refer to *3-3 ID Switch* on page 3-7 for the ID switch setting of the EtherCAT Slave Unit.

## Verifying the EtherCAT Network Configuration Using Serial Numbers

The EtherCAT Slave Unit saves the serial numbers to the non-volatile memory in the Unit.

The built-in EtherCAT ports on the NJ/NX-series CPU Unit and NY-series Industrial PC use the serial numbers to verify the EtherCAT network configuration. The Sysmac Studio is used for verification.

A Network Configuration Verification Error occurs if the specified standard is not met.

This function detects when the EtherCAT Slave Unit was replaced so that you can remember to set the parameters for the EtherCAT Slave Unit.

Place the Sysmac Studio online with the NJ/NX-series CPU Unit or the NY-series Industrial PC to verify the EtherCAT network configuration using serial numbers from the Sysmac Studio.

Refer to the user's manual for the built-in EtherCAT port on the connected CPU Unit or Industrial PC for the procedure to verify the EtherCAT network configuration using the serial number from the Sysmac Studio.

## SII Data Checking

The EtherCAT Slave Unit checks the information in the SII (slave information interface).

The SII contains setting information that is unique to each EtherCAT slave. It is written to the non-volatile memory in the EtherCAT slave.

Because the EtherCAT Slave Unit is a Sysmac device, it checks the SII information at the slave. If the slave contains SII information that prevents it from operating, a SII Verification Error occurs to inform you that there is an error in the SII data.



**Precautions for Correct Use**

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Do not change the SII information with setting software from other manufacturers.

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## 7-8 Settings as an EtherCAT Slave

The following shows the settings of the EtherCAT Slave Unit as an EtherCAT slave.

The setting method depends on the EtherCAT master to use. Refer to the user's manual for the EtherCAT master to use for details on the setting method.

- **PDO Map Settings**

This setting is used to allocate the data of the EtherCAT Slave Unit that performs process data communications with the EtherCAT master.

Refer to *7-4 Process Data Objects (PDOs)* on page 7-5 for the PDO mapping objects and application objects that can be allocated to the EtherCAT Slave Unit.

- **Setting parameter**

This setting affects the parameter that is automatically set by the EtherCAT master when EtherCAT communications start or when a slave is reconnected.

The setting parameter for the EtherCAT Slave Unit is the following object.

| Object name | Index number (hex) | Subindex number (hex) | Size (Data type)*1 | Description  |
|-------------|--------------------|-----------------------|--------------------|--|
| Flags       | 10F3               | 05                    | 2 bytes (U16)      | This object specifies whether the notification of emergency message is provided to the EtherCAT master.<br>0000 hex: No notification<br>0001 hex: Notification<br>The default setting is 0000 hex. |

\*1. U16: Abbreviation of UNSINGED16.

- **Setting of Explicit Device ID**

Refer to *3-3 ID Switch* on page 3-7 for the Explicit Device ID setting of the EtherCAT Slave Unit.

## 7-9 Communications Performance

This section describes the PDO I/O response times and message response time for the EtherCAT Slave Unit.

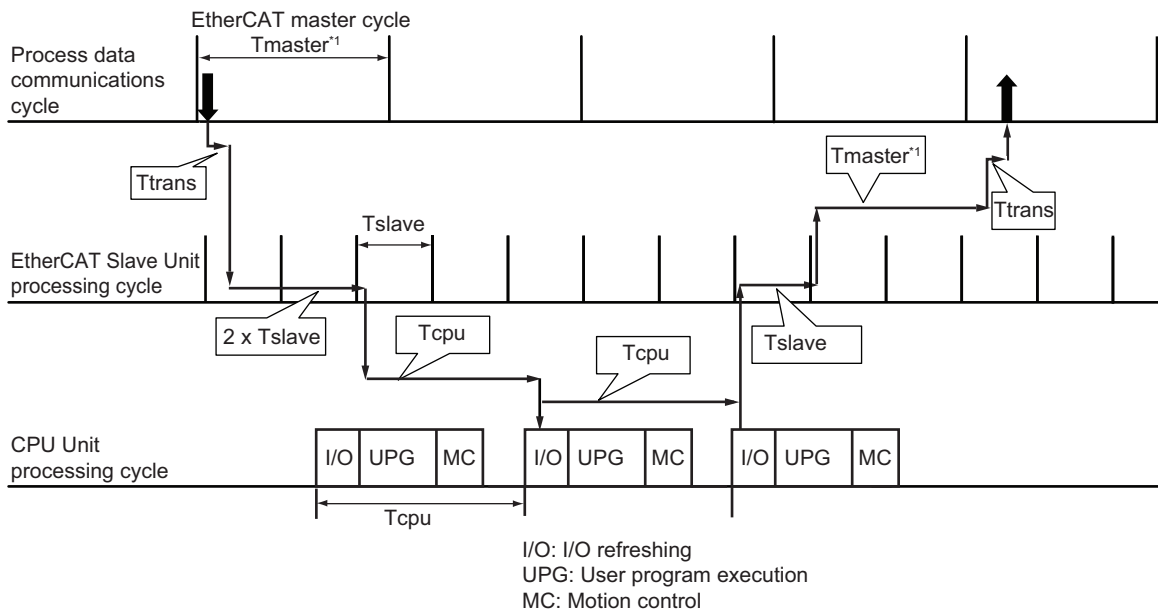
### 7-9-1 I/O Response Time

This section describes the method for calculating the maximum I/O response time of the EtherCAT Slave Unit.

The I/O response time is the time from when the NX-series CPU Unit processes the output data from the EtherCAT master until the EtherCAT master inputs the processed result.

#### Timing Chart for I/O Response Time

A timing chart for the I/O response time is provided below. Use this timing chart with the provided formula to determine the maximum I/O response time.



| Element           | Description  |
|-------------------|--|
| $T_{master}^{*1}$ | Cycle time of the EtherCAT master  |
| $T_{slave}$       | Processing time of the EtherCAT Slave Unit   |
| $T_{cpu}$         | Task period of the primary periodic task for the CPU Unit with a mounted EtherCAT Slave Unit |
| $T_{trans}$       | Transmission time of the EtherCAT master   |

\*1. For the cycle time of the EtherCAT master in this timing chart, it is assumed that the EtherCAT master cycle is the same as the process data communications cycle. Refer to the EtherCAT master manual about the relationship between these cycles.

## I/O Response Time Formula

A formula is provided below to calculate the I/O response time.

$$\text{Maximum I/O Response Time} = T_{\text{master}} + (3 \times T_{\text{slave}}) + (2 \times T_{\text{cpu}}) + (2 \times T_{\text{trans}})$$

The elements used in the maximum I/O response time formula are described below. Units of these elements are in ms.

- **T<sub>master</sub>**

Here, the cycle time of the EtherCAT master is assumed to be the same as the process data communications cycle.

Use the process data communications cycle that is set in the EtherCAT master.

- **T<sub>slave</sub>**

The following table shows the processing time of the EtherCAT Slave Unit.

The processing time depends on the total size of I/O data between the CPU Unit and EtherCAT Slave Unit.

| Total size of I/O data | Processing time |
|------------------------|-----------------|
| 800 bytes max.         | 1 ms            |
| 801 to 1,600 bytes     | 1.5 ms          |
| 1,601 bytes min.       | 2 ms            |

- **T<sub>cpu</sub>**

This is the time that is set for the task period of the primary periodic task in the CPU Unit that is connected to the EtherCAT Slave Unit.

- **T<sub>trans</sub>**

The transmission time of the EtherCAT master can be calculated with the formula below.

$$T_{\text{trans}} = ((1.24 \times \text{Number of EtherCAT slaves}) + (0.09 \times \text{EtherCAT frame length in bytes})) / 1000$$

The *Number of EtherCAT slaves* represents the number of EtherCAT slaves that are present on the same EtherCAT network. An EtherCAT Slave Unit is considered to be one EtherCAT slave.

The *EtherCAT frame length in bytes* represents the data byte size of the EtherCAT frame on the same EtherCAT network.

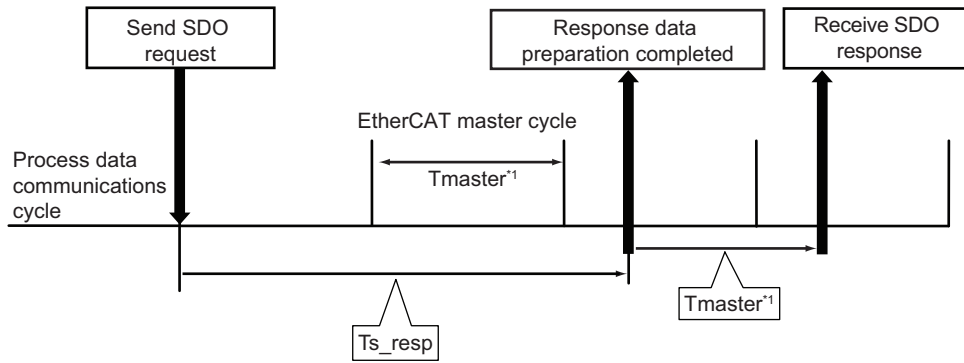
### 7-9-2 Message Response Time

This section describes the method for calculating the minimum SDO message response time of the EtherCAT Slave Unit.

The message response time is the time from when the EtherCAT master sends the SDO data with the mailbox until it receives the SDO response from the target EtherCAT Slave Unit.

## Timing Chart for SDO Message Response Time

A timing chart for the SDO message response time is provided below. Use this timing chart with the provided formula to determine the minimum SDO message response time.



| Element   | Description                               |
|-----------|---|
| Ts_resp   | EtherCAT Slave Unit message response time |
| Tmaster*1 | Cycle time of the EtherCAT master         |

\*1. The cycle time of the EtherCAT master is assumed to be the same as the process data communications cycle. Refer to the EtherCAT master manual about the relationship between these cycles.

## Minimum SDO Message Response Time Formula

A formula is provided below to calculate the minimum SDO message response time.

|                                     |  |
|-------------------------------------|--|
| Minimum SDO Message Response Time = | $(((Ts\_resp / Tmaster) + 1^{*1}) \times Tmaster) + (((data\ byte\ size\ of\ response\ message) / 400) + 1^{*2}) \times Tmaster + Tmaster$ |
|-------------------------------------|--|

\*1. If Tmaster divides Ts\_resp evenly, there is no need to add 1 in the formula.

\*2. If 400 divides the *data byte size of response message* evenly, there is no need to add 1.

The elements used in the minimum SDO message response time formula are described below. Units of these elements are in ms.

- **Tmaster**

Here, the cycle time of the EtherCAT master is assumed to be the same as the process data communications cycle.

Use the process data communications cycle that is set in the EtherCAT master.

- **Ts\_resp**

This is the time from when the message request is received until the EtherCAT Slave Unit completes generating the response.

It is always 2 ms.

# 8

## Troubleshooting

This section describes the error information and corrections for errors that can occur when the EtherCAT Slave Units are used.

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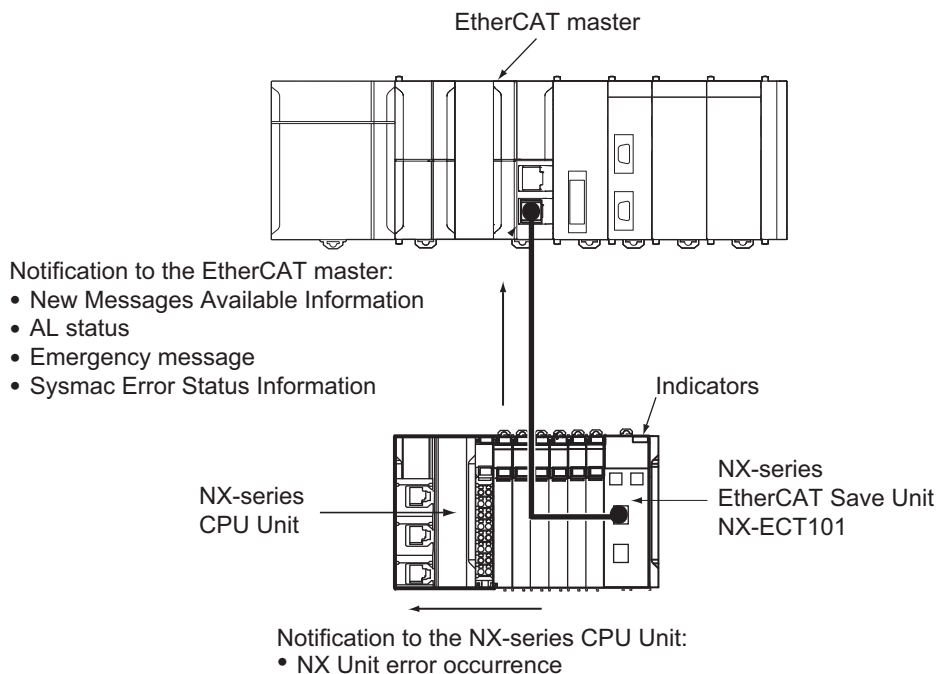
|            |  |             |
|------------|--|-------------|
| <b>8-1</b> | <b>Error Notification and Check Methods.....</b>                                       | <b>8-2</b>  |
| 8-1-1      | Error Notification Methods.....  | 8-2         |
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# 8-1 Error Notification and Check Methods

This section describes error notification, checking methods and procedures when an error has occurred in the EtherCAT Slave Unit.

## 8-1-1 Error Notification Methods

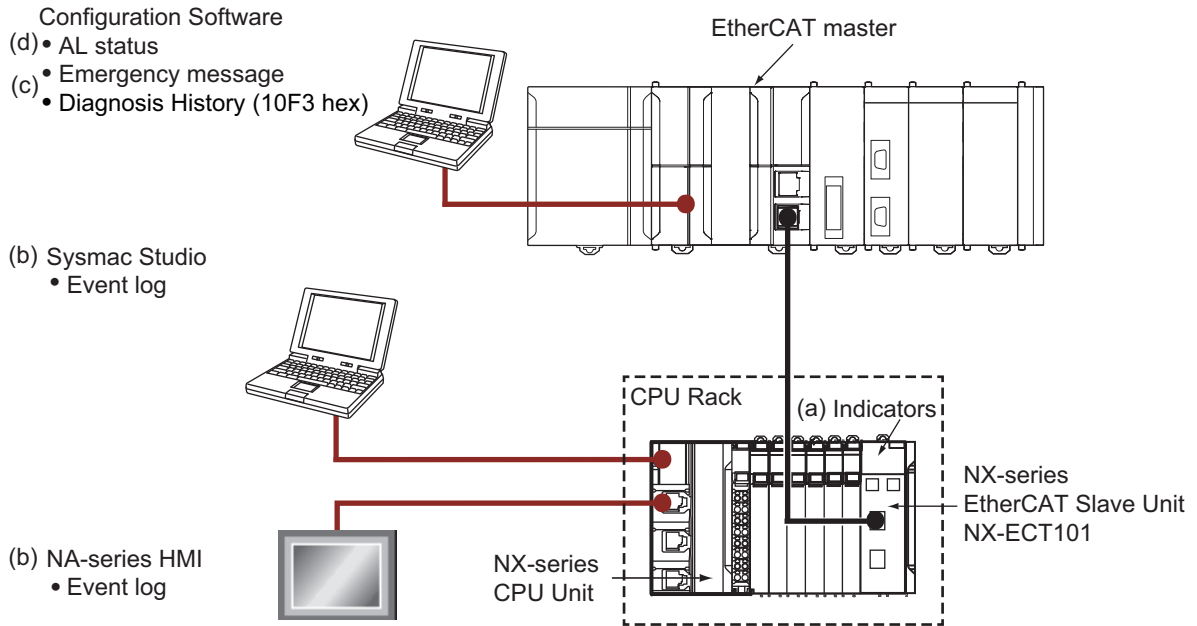
The EtherCAT Slave Unit uses the methods shown in the following figure and table to report the error occurrence to the CPU Unit or EtherCAT master. Monitor the notifications from the EtherCAT Slave Unit on the user applications of the CPU Unit or EtherCAT master, or visually. If an error occurs, use the methods explained in *8-1-2 How to Check for Errors* on page 8-3 to check the details on the error.



| Notification to | Notified information               | Description  | Notification setting  | How to check for errors  |
|-----------------|------------------------------------|--|---|--|
| CPU Unit        | NX Unit error occurrence           | This information reports whether current errors occurred in the EtherCAT Slave Unit. One of the following variables is used. <ul style="list-style-type: none"> <li>Device variable for NX Unit assigned to the <i>NX Unit Error Status</i> I/O port of the CPU Unit</li> <li>Element that is applicable to the EtherCAT Slave Unit with array specification in the <i>_NXB_UnitErrFlagTbl</i> system-defined variable in the CPU Unit</li> </ul> Refer to the <i>NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501)</i> for details on these variables. | For the device variable for NX Unit, assign the device variable to the I/O port. For the system-defined variable, no setting is required.   | Use this notification as a trigger to check the details on the error according to the method of (b) in <i>8-1-2 How to Check for Errors</i> on page 8-3. |
| EtherCAT master | New Messages Available Information | This information reports that a new error is registered in the <i>Diagnosis History</i> (10F3 hex) CoE object through the PDO communications. Refer to <i>New Messages Available Information</i> on page 7-18 for details on this information.   | The following PDO mapping object of this information is selected by default. <ul style="list-style-type: none"> <li><i>New Messages Available Information</i> (1BFE hex)</li> </ul>   | Use this notification as a trigger to check the details on the error according to the method of (c) in <i>8-1-2 How to Check for Errors</i> on page 8-3. |
|                 | AL status                          | This status reports errors related to EtherCAT communications. The ETG-defined method is used for the error detection and error code.  | No setting is required.   | Use this notification as a trigger to check the details on the error according to the method of (d) in <i>8-1-2 How to Check for Errors</i> on page 8-3. |
|                 | Emergency message                  | The emergency message reports errors related to EtherCAT communications and application level errors. The error code contains the CiA-defined error code, and an additional error code in the unique vendor area.  | No notification is set by default. To report the error, set the following CoE object to 0001 hex. <ul style="list-style-type: none"> <li><i>Flag</i> (10F3:05 hex)</li> </ul>   | Use this notification as a trigger to check the details on the error according to the method of (c) in <i>8-1-2 How to Check for Errors</i> on page 8-3. |
|                 | Sysmac Error Status Information    | This status contains the error level information of current errors in the EtherCAT Slave Unit that are commonly defined for the Sysmac devices. The PDO communications are used for notification. Refer to <i>Sysmac Error Status Information</i> on page 7-19 for details on this information.  | The following PDO mapping object of this information is not selected by default. <ul style="list-style-type: none"> <li><i>Sysmac Error Status Information</i> (1BFF hex)</li> </ul> To report the error, select this object. | Use this notification as a trigger to check the details on the error according to the method of (b) in <i>8-1-2 How to Check for Errors</i> on page 8-3. |

## 8-1-2 How to Check for Errors

Use the following methods to check the status of errors on the EtherCAT Slave Unit.



| Item | Checking method   | Information provided   | Reference for errors and troubleshooting  |
|------|---|--|---|
| (a)  | Checking the indicators   | The indicators provide the status of the EtherCAT Slave Unit and the level of the error.   | Refer to 8-2 <i>Checking for Errors and Troubleshooting with the Indicators</i> on page 8-6.                |
| (b)  | Checking with the troubleshooting functions of the Sysmac Studio and the NA-series HMI Troubleshooter | You can check for current Controller errors, event log (a log of past Controller errors), error sources, error causes and corrections. | Refer to 8-3 <i>Checking for Errors and Troubleshooting with the Troubleshooting Functions</i> on page 8-9. |
| (c)  | Checking with EtherCAT master Configuration Software  | You can check for emergency messages and the <i>Diagnosis History</i> (10F3 hex) CoE object.   | Refer to 8-4 <i>Checking for Errors and Troubleshooting with Emergency Messages</i> on page 8-56.           |
| (d)  | Checking with EtherCAT master Configuration Software  | You can check for the AL status.   | Refer to 8-5 <i>Checking for Errors and Troubleshooting with AL Status</i> on page 8-59.                    |



**Additional Information**

The time information of the *Diagnosis History* (10F3 hex) CoE object and the log of Controller errors that occurred in the EtherCAT Slave Unit is based on the System Time of the CPU Unit. The System Time of the CPU Unit is reflected to the *Timestamp* (10F8 hex) CoE object. Refer to A-6-4 *Communication Objects* on page A-34 for details on the *Timestamp* (10F8 hex) CoE object.

**8-1-3 Procedures to Check Errors**

The followings show the basic procedures to check for errors.

- 1** Check whether an error exists in the EtherCAT Slave Unit based on the information reported from the EtherCAT Slave Unit to the EtherCAT master.



- 2** If an error occurs in the EtherCAT Slave Unit, use one of the following means to identify the cause of the error.
- Identify the cause of the error by accessing the EtherCAT Slave Unit from the EtherCAT master
    - 1) Read the *Diagnosis History* (10F3 hex) CoE object
    - 2) AL status
    - 3) Emergency message
  - Identify the cause of the error by accessing the EtherCAT Slave Unit from the CPU Unit Troubleshooting functions
  - Check the indicators

## 8-2 Checking for Errors and Troubleshooting with the Indicators

The indicators of the EtherCAT Slave Unit can be used to check the errors in the EtherCAT Slave Unit. This section provides information for checking errors and troubleshooting with the indicators.

### 8-2-1 Indicators and Definition of Indicator Status

#### Indicators

The EtherCAT Slave Unit uses the following indicators.

| Name    | Function  |
|---------|---|
| RUN     | The RUN indicator shows the operating status of EtherCAT communications for the EtherCAT Slave Unit.                                |
| ERR     | The ERR indicator provides information on errors in the EtherCAT Slave Unit as an EtherCAT slave.                                   |
| L/A IN  | The L/A IN indicator shows the link activity of the EtherCAT input port.  |
| L/A OUT | The L/A OUT indicator shows the link activity of the EtherCAT output port.  |
| TS      | The TS indicator shows the current status of the EtherCAT Slave Unit as an NX Unit and its communications status with the CPU Unit. |

#### Definition of Indicator Status

Here, the following abbreviations are used to describe the status of the indicators.

| Abbrev. | Indicator status   |
|---------|--|
| Lit     | Lit  |
| Not Lit | Not lit  |
| FS ( )  | Flashing. The numeric value in parentheses is the flashing interval. |
| FK      | Flickering   |
| B       | Blinking   |
| SF      | Single flash   |
| DF      | Double flash   |
| ---     | Undefined  |

Refer to *3-2-4 Indicator Flashing Patterns* on page 3-5 for the flashing patterns of flickering, blinking, single flash, and double flash.

## 8-2-2 Primary Errors That the Indicators Show and Troubleshooting

| RUN     | ERR     | TS      |         | Cause   | Correction   |
|---------|---------|---------|---------|---|--|
|         |         | Green   | Red     |   |  |
| Lit     | Not Lit | Lit     | Not Lit | ---   | --- (This is the normal status.)   |
| FS (2s) | Not Lit | ---     | Not Lit | <ul style="list-style-type: none"> <li>Initializing</li> <li>Downloading</li> </ul>   | --- (Normal. Wait until the processing is completed.)  |
| Not Lit | Not Lit | Not Lit | Not Lit |   |  |
| Lit     | Lit     | ---     | ---     | This status is not present  |  |
| Not Lit | Not Lit | Not Lit | Not Lit | The Unit power supply is not supplied.  | Check the following items and supply the Unit power supply correctly.<br>[Check Items for Power Supply] <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 the 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> |
|         |         |         |         | <ul style="list-style-type: none"> <li>Waiting for initialization to start</li> <li>Restarting</li> </ul>   | --- (Normal. Wait until the processing is completed.)  |
|         |         |         |         | If you cannot resolve the problem after you check the above items and cycle the Unit power supply, the Unit may have a hardware failure. If this happens, replace the Unit. |  |
| Not Lit | Lit     | Not Lit | Lit     | Hardware failure  | If this error occurs after you cycle the Unit power supply, replace the Unit.  |
| Not Lit | Not Lit | Not Lit | Lit     | Malfunction of CPU Unit   | Cycle the CPU Unit power supply, or reset the Controller. If this error recurs after you make these corrections, replace the CPU Unit.   |
| Not Lit | Not Lit | Not Lit | Lit     | Non-volatile Memory Hardware Error  | Refer to Non-volatile Memory Hardware Error ( page 8-19).  |
| Not Lit | Not Lit | Not Lit | Lit     | Control Parameter Error in Master   | Refer to Control Parameter Error in Master ( page 8-21).   |
| Not Lit | Not Lit | Not Lit | Lit     | NX Unit Processing Error  | Refer to NX Unit Processing Error ( page 8-49).  |
| Not Lit | Not Lit | Not Lit | Lit     | NX Unit Clock Not Synchronized Error  | Refer to NX Unit Clock Not Synchronized Error ( page 8-52).  |
| Not Lit | Not Lit | Not Lit | FS (1s) | NX Unit I/O Communications Error  | Refer to NX Unit I/O Communications Error ( page 8-50).  |
| Lit     | Not Lit | Lit     | Not Lit | Data Size Mismatched between PDO Entry and I/O Entry M to C*1   | Refer to Data Size Mismatched between PDO Entry and I/O Entry M to C ( page 8-34).   |
| Lit     | Not Lit | Lit     | Not Lit | Data Size Mismatched between PDO Entry and I/O Entry C to M*1   | Refer to Data Size Mismatched between PDO Entry and I/O Entry C to M ( page 8-33).   |
| ---     | ---     | Not Lit | ---     | Incorrect I/O Entry Order M to C*1  | Refer to Incorrect I/O Entry Order M to C ( page 8-35).  |
| ---     | ---     | Not Lit | ---     | Incorrect I/O Entry Order C to M*1  | Refer to Incorrect I/O Entry Order C to M ( page 8-30).  |

| RUN | ERR | TS      |     | Cause                                     | Correction   |
|-----|-----|---------|-----|---|--|
|     |     | Green   | Red |   |  |
| --- | --- | Not Lit | --- | Illegal I/O Entry Added M to C*1          | Refer to Illegal I/O Entry Added M to C ( page 8-37).            |
| --- | --- | Not Lit | --- | Illegal I/O Entry Added C to M*1          | Refer to Illegal I/O Entry Added C to M ( page 8-36).            |
| --- | --- | Not Lit | --- | I/O Entry Data Capacity Exceeded M to C*1 | Refer to I/O Entry Data Capacity Exceeded M to C ( page 8-39).   |
| --- | --- | Not Lit | --- | I/O Entry Data Capacity Exceeded C to M*1 | I/O Entry Data Capacity Exceeded C to M ( page 8-38).            |
| --- | B   | ---     | --- | SII Verification Error                    | Refer to SII Verification Error ( page 8-20).                    |
| --- | B   | ---     | --- | Mailbox Setting Error                     | Refer to Mailbox Setting Error ( page 8-48).                     |
| --- | B   | ---     | --- | Illegal State Transition Request Received | Refer to Illegal State Transition Request Received ( page 8-27). |
| --- | B   | ---     | --- | Error State Transition Received           | Refer to Error State Transition Received ( page 8-28).           |
| --- | S   | ---     | --- | NX Unit Restart                           | Refer to NX Unit Restart ( page 8-55).                           |
| --- | F   | ---     | --- | ESC Error                                 | Refer to ESC Error ( page 8-20).                                 |
| B   | B   | ---     | --- | RxPDO Setting Error                       | Refer to RxPDO Setting Error ( page 8-22).                       |
| B   | B   | ---     | --- | TxPDO Setting Error                       | Refer to TxPDO Setting Error ( page 8-23).                       |
| B   | B   | ---     | --- | PDO WDT Setting Error                     | Refer to PDO WDT Setting Error ( page 8-24).                     |
| B   | B   | ---     | --- | TxPDO Mapping Error                       | Refer to TxPDO Mapping Error ( page 8-25).                       |
| B   | B   | ---     | --- | RxPDO Mapping Error                       | Refer to RxPDO Mapping Error ( page 8-26).                       |
| B   | B   | ---     | --- | DC Mode Not Supported                     | Refer to DC Mode Not Supported ( page 8-29).                     |
| B   | B   | ---     | --- | Incorrect PDO Entry Order M to C          | Refer to Incorrect PDO Entry Order M to C ( page 8-31).          |
| B   | B   | ---     | --- | Incorrect PDO Entry Order C to M          | Refer to Incorrect PDO Entry Order C to M ( page 8-32).          |
| B   | B   | ---     | --- | Illegal PDO Entry Added M to C            | Refer to Illegal PDO Entry Added M to C ( page 8-40).            |
| B   | B   | ---     | --- | Illegal PDO Entry Added C to M            | Refer to Illegal PDO Entry Added C to M ( page 8-41).            |
| B   | B   | ---     | --- | PDO Entry Data Capacity Exceeded M to C   | Refer to PDO Entry Data Capacity Exceeded M to C ( page 8-42).   |
| B   | B   | ---     | --- | PDO Entry Data Capacity Exceeded C to M   | Refer to PDO Entry Data Capacity Exceeded C to M ( page 8-43).   |
| B   | B   | ---     | --- | Incorrect RxPDO Mapping Order             | Refer to Incorrect RxPDO Mapping Order ( page 8-44).             |
| B   | B   | ---     | --- | Incorrect TxPDO Mapping Order             | Refer to Incorrect TxPDO Mapping Order ( page 8-45).             |
| B   | B   | ---     | --- | SM Event Mode Setting Error               | Refer to SM Event Mode Setting Error ( page 8-46).               |
| B   | B   | ---     | --- | FreeRun Setting Error                     | Refer to FreeRun Setting Error ( page 8-47).                     |
| S   | D   | ---     | --- | Process Data WDT Error                    | Refer to Process Data WDT Error ( page 8-53).                    |

\*1. The ERROR indicator of the CPU Unit flashes.

## 8-3 Checking for Errors and Troubleshooting with the Troubleshooting Functions

Error management on the NX Series is based on the methods used for the NJ/NX/NY-series Controllers. You can use the Sysmac Studio or NA-series HMI to check the meanings and troubleshooting procedures of errors that are in the scope managed by the CPU Unit. The scope managed by the CPU Unit includes the EtherCAT Slave Unit.

Refer to the troubleshooting manual for the connected CPU Unit for information on the error management methods of the NJ/NX/NY-series Controllers.

### 8-3-1 How to Check for Errors

#### Checking for Errors from the Sysmac Studio

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

Refer to the user's manual for the CPU Unit which is connected online for information on checking errors.

#### Checking for Errors from the NA-series HMI

You can check current errors and the log of past errors on the Troubleshooter screen with the NA-series HMI connected to the built-in EtherNet/IP port of the CPU Unit.

Refer to *Identifying and Resetting Errors with an HMI* in the *NJ/NX-series Troubleshooting Manual (Cat. No. W503)* for the procedure to check for errors using the HMI.



#### Additional Information

The Troubleshooter screen is installed on the NA-series HMI by default. Drawing and other works are not required at all.

### 8-3-2 Number of Errors That Can Be Checked

#### Current Errors

The following table shows the number of current errors that can be reported simultaneously by the EtherCAT Slave Unit.

| Event level | Number of simultaneous notifications | Applicable CoE object         |
|-------------|--------------------------------------|-------------------------------|
| Minor fault | 10 errors total                      | Sysmac Minor Fault (2004 hex) |
| Observation |                                      | Sysmac Observation (2003 hex) |

If the number of errors that occur simultaneously exceeds the maximum number of current errors that the EtherCAT Slave Unit can report, 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

The following table shows the number of past errors that can be recorded by the EtherCAT Slave Unit.

| Log category     | Event level | Recordable number of errors | Applicable CoE object        |
|------------------|-------------|-----------------------------|------------------------------|
| System event log | Minor fault | 32 errors total             | Diagnosis History (10F3 hex) |
|                  | Observation |                             |                              |
|                  | Information |                             |                              |
| Access event log | Minor fault | 5 errors total              | Not provided                 |
|                  | Observation |                             |                              |
|                  | Information |                             |                              |

When the number of past errors exceeds the recordable number of errors for the EtherCAT Slave Unit, the Unit overwrites the old error for recording.

### 8-3-3 Error Table

The errors (i.e., events) that occur in the EtherCAT Slave Unit are given below.



#### Additional Information

- Refer to the troubleshooting manual for the connected CPU Unit or Industrial PC for information on NJ/NX/NY-series event codes.
- In the common events for the NX Unit, *for Communications Coupler Units* are described, but the EtherCAT Slave Unit cannot be connected to the Communications Coupler Unit. It is not necessary to read descriptions *for Communications Coupler Units*.

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         |

| Symbol | Meaning                                       |
|--------|---|
| ○      | Event levels that are defined by the system.  |
| ⊙      | Event levels that can be changed by the user. |

**Note** ⊙ appears only for events for which the user can change the event level.

| Event code   | Event name                         | Meaning   | Assumed cause  | Level       |             |             |             |                  | Reference |
|--------------|------------------------------------|---|--|-------------|-------------|-------------|-------------|------------------|-----------|
|              |                                    |   |  | M<br>a<br>j | P<br>r<br>t | M<br>i<br>n | O<br>b<br>s | I<br>n<br>f<br>o |           |
| 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>  |             |             | ○           |             |                  | page 8-19 |
| 09450000 hex | ESC Error                          | An error occurred in the EtherCAT slave communications controller.        | <ul style="list-style-type: none"> <li>An error occurred in the EtherCAT slave communications controller.</li> </ul>   |             |             | ○           |             |                  | page 8-20 |
| 09460000 hex | SII Verification Error             | An error occurred in SII verification.                                    | <ul style="list-style-type: none"> <li>An error occurred in SII information.</li> </ul>  |             |             | ○           |             |                  | page 8-20 |
| 10410000 hex | Control Parameter Error in Master  | An error occurred in the control parameters that are saved in the master. | <p>For the NX bus of CPU Units</p> <ul style="list-style-type: none"> <li>The power supply to the CPU Unit was turned OFF while writing the Unit operation settings was in progress. Or there is an error in the area of the non-volatile memory in the CPU Unit in which the Unit operation settings for the relevant NX Unit are saved.</li> </ul> <p>For Communications Coupler Units</p> <ul style="list-style-type: none"> <li>The power supply to the Communications Coupler Unit was turned OFF while writing the Unit operation settings was in progress. Or there is an error in the area of the non-volatile memory in the Communications Coupler Unit in which the Unit operation settings for the relevant NX Unit are saved.</li> </ul> |             |             | ○           |             |                  | page 8-21 |
| 35050000 hex | RxPDO Setting Error                | An error was detected in the RxPDO settings. (AL-Status Code: 001D hex)   | <ul style="list-style-type: none"> <li>An error was detected in the RxPDO settings.</li> </ul>   |             |             | ○           |             |                  | page 8-22 |
| 35060000 hex | TxPDO Setting Error                | An error was detected in the TxPDO settings. (AL-Status Code: 001E hex)   | <ul style="list-style-type: none"> <li>An error was detected in the TxPDO settings.</li> </ul>   |             |             | ○           |             |                  | page 8-23 |
| 35070000 hex | PDO WDT Setting Error              | An incorrect PDO WDT setting was detected. (AL-Status Code: 001F hex)     | <ul style="list-style-type: none"> <li>An incorrect PDO WDT setting was detected.</li> </ul>   |             |             | ○           |             |                  | page 8-24 |
| 35090000 hex | TxPDO Mapping Error                | An incorrect TxPDO was set. (AL-Status Code: 0024 hex)                    | <ul style="list-style-type: none"> <li>An incorrect TxPDO was set, e.g., the index, subindex, or size was outside of the allowable range.</li> </ul>   |             |             | ○           |             |                  | page 8-25 |

| Event code   | Event name  | Meaning   | Assumed cause  | Level       |             |             |             |                  | Reference |
|--------------|---|---|--|-------------|-------------|-------------|-------------|------------------|-----------|
|              |   |   |  | M<br>a<br>j | P<br>r<br>t | M<br>i<br>n | O<br>b<br>s | I<br>n<br>f<br>o |           |
| 350A0000 hex | RxPDO Mapping Error   | An incorrect RxPDO was set. (AL-Status Code: 0025 hex)  | <ul style="list-style-type: none"> <li>An incorrect RxPDO was set, e.g., the index, subindex, or size was outside of the allowable range.</li> </ul>   |             |             | ○           |             |                  | page 8-26 |
| 350B0000 hex | Illegal State Transition Request Received                   | An incorrect state transition request was received. (AL-Status Code: 0011 hex)  | <ul style="list-style-type: none"> <li>An incorrect state transition request was received.</li> </ul>  |             |             | ○           |             |                  | page 8-27 |
| 350C0000 hex | Error State Transition Received                             | An unclear state transition request was received. (AL-Status Code: 0012 hex)  | <ul style="list-style-type: none"> <li>An unclear state transition request was received.</li> </ul>  |             |             | ○           |             |                  | page 8-28 |
| 35180000 hex | DC Mode Not Supported                                       | Unsupported DC Mode was set.  | <ul style="list-style-type: none"> <li>Unsupported DC Mode was set.</li> </ul>   |             |             | ○           |             |                  | page 8-29 |
| 39130000 hex | Incorrect I/O Entry Order C to M                            | In one of the I/O data sets from the CPU Unit to the EtherCAT master, the assignment order of the I/O entries is not forward feed or ascending order. | <ul style="list-style-type: none"> <li>The order of the I/O entries assigned to the I/O data set that is shown in the attached information is not forward feed or ascending order.</li> </ul>  |             |             | ○           |             |                  | page 8-30 |
| 39140000 hex | Incorrect PDO Entry Order M to C                            | In one of the I/O data sets from the EtherCAT master to the CPU Unit, the assignment order of the PDO entries is not forward feed or ascending order. | <ul style="list-style-type: none"> <li>In the I/O data set shown in the attached information, the assignment order of the PDO entries is not forward feed or ascending order.</li> </ul>   |             |             | ○           |             |                  | page 8-31 |
| 39150000 hex | Incorrect PDO Entry Order C to M                            | In one of the I/O data sets from the CPU Unit to the EtherCAT master, the assignment order of the PDO entries is not forward feed or ascending order. | <ul style="list-style-type: none"> <li>In the I/O data set shown in the attached information, the assignment order of the PDO entries is not forward feed or ascending order.</li> </ul>   |             |             | ○           |             |                  | page 8-32 |
| 39160000 hex | Data Size Mismatched between PDO Entry and I/O Entry C to M | In the I/O data set from the CPU Unit to the EtherCAT master, the data size between the assigned PDO entry and I/O entry does not match.              | <ul style="list-style-type: none"> <li>In the I/O data set from the selected CPU Unit to the EtherCAT master, the following data size does not match. <ul style="list-style-type: none"> <li>• PDO entry</li> <li>• I/O entry</li> </ul> </li> </ul> |             |             | ○           | ⊙           |                  | page 8-33 |



| Event code   | Event name  | Meaning   | Assumed cause  | Level       |             |             |             |                  | Reference |
|--------------|---|---|--|-------------|-------------|-------------|-------------|------------------|-----------|
|              |   |   |  | M<br>a<br>j | P<br>r<br>t | M<br>i<br>n | O<br>b<br>s | I<br>n<br>f<br>o |           |
| 39170000 hex | Data Size Mismatched between PDO Entry and I/O Entry M to C | In the I/O data set from the EtherCAT master to the CPU Unit, the data size between the assigned PDO entry and I/O entry does not match.              | <ul style="list-style-type: none"> <li>In the I/O data set from the selected EtherCAT master to the CPU Unit, the following data size does not match. <ul style="list-style-type: none"> <li>• PDO entry</li> <li>• I/O entry</li> </ul> </li> </ul> |             |             | ○           | ⊙           |                  | page 8-34 |
| 39190000 hex | Incorrect I/O Entry Order M to C                            | In one of the I/O data sets from the EtherCAT master to the CPU Unit, the assignment order of the I/O entries is not forward feed or ascending order. | <ul style="list-style-type: none"> <li>The order of the I/O entries assigned to the I/O data set that is shown in the attached information is not forward feed or ascending order.</li> </ul>  |             |             | ○           |             |                  | page 8-35 |
| 391A0000 hex | Illegal I/O Entry Added C to M                              | In one of the I/O data sets from the CPU Unit to the EtherCAT master, an illegal I/O entry is assigned.   | <ul style="list-style-type: none"> <li>In the I/O data set shown in the attached information, an illegal I/O entry is assigned.</li> </ul>   |             |             | ○           |             |                  | page 8-36 |
| 391B0000 hex | Illegal I/O Entry Added M to C                              | In one of the I/O data sets from the EtherCAT master to the CPU Unit, an illegal I/O entry is assigned.   | <ul style="list-style-type: none"> <li>In the I/O data set shown in the attached information, an illegal I/O entry is assigned.</li> </ul>   |             |             | ○           |             |                  | page 8-37 |
| 391C0000 hex | I/O Entry Data Capacity Exceeded C to M                     | The total amount of data of the I/O data set from the CPU Unit to the EtherCAT master exceeds 1,200 bytes.  | <ul style="list-style-type: none"> <li>The total amount of data of the I/O data set from the selected CPU Unit to the EtherCAT master exceeds 1,200 bytes.</li> </ul>  |             |             | ○           |             |                  | page 8-38 |
| 391D0000 hex | I/O Entry Data Capacity Exceeded M to C                     | The total amount of data of the I/O data set from the EtherCAT master to the CPU Unit exceeds 1,200 bytes.  | <ul style="list-style-type: none"> <li>The total amount of data of the I/O data set from the selected EtherCAT master to the CPU Unit exceeds 1,200 bytes.</li> </ul>  |             |             | ○           |             |                  | page 8-39 |
| 391E0000 hex | Illegal PDO Entry Added M to C                              | In one of the I/O data sets from the EtherCAT master to the CPU Unit, an illegal PDO entry is assigned.   | <ul style="list-style-type: none"> <li>In the I/O data set shown in the attached information, an illegal PDO entry is assigned.</li> </ul>   |             |             | ○           |             |                  | page 8-40 |

| Event code   | Event name                              | Meaning  | Assumed cause   | Level       |             |             |             |                  | Reference |
|--------------|---|--|---|-------------|-------------|-------------|-------------|------------------|-----------|
|              |   |  |   | M<br>a<br>j | P<br>r<br>t | M<br>i<br>n | O<br>b<br>s | I<br>n<br>f<br>o |           |
| 391F0000 hex | Illegal PDO Entry Added C to M          | In one of the I/O data sets from the CPU Unit to the EtherCAT master, an illegal PDO entry is assigned.            | <ul style="list-style-type: none"> <li>In the I/O data set shown in the attached information, an illegal PDO entry is assigned.</li> </ul>                                  |             |             | ○           |             |                  | page 8-41 |
| 392C0000 hex | PDO Entry Data Capacity Exceeded M to C | The total amount of data of the I/O data set from the EtherCAT master to the CPU Unit exceeds 1,200 bytes.         | <ul style="list-style-type: none"> <li>The total amount of data of the I/O data set from the selected EtherCAT master to the CPU Unit exceeds 1,200 bytes.</li> </ul>       |             |             | ○           |             |                  | page 8-42 |
| 392D0000 hex | PDO Entry Data Capacity Exceeded C to M | The total amount of data of the I/O data set from the CPU Unit to the EtherCAT master exceeds 1,200 bytes.         | <ul style="list-style-type: none"> <li>The total amount of data of the I/O data set from the selected CPU Unit to the EtherCAT master exceeds 1,200 bytes.</li> </ul>       |             |             | ○           |             |                  | page 8-43 |
| 392E0000 hex | Incorrect RxPDO Mapping Order           | The assignment order of the PDO mapping objects for RxPDOs assigned to the Sync Manager 2 (1C12 hex) is incorrect. | <ul style="list-style-type: none"> <li>The PDO mapping objects for RxPDOs assigned to the Sync Manager 2 (1C12 hex) are not in the ascending order of the index.</li> </ul> |             |             | ○           |             |                  | page 8-44 |
| 392F0000 hex | Incorrect TxPDO Mapping Order           | The assignment order of the PDO mapping objects for TxPDOs assigned to the Sync Manager 3 (1C13 hex) is incorrect. | <ul style="list-style-type: none"> <li>The PDO mapping objects for TxPDOs assigned to the Sync Manager 3 (1C13 hex) are not in the ascending order of the index.</li> </ul> |             |             | ○           |             |                  | page 8-45 |
| 39320000 hex | SM Event Mode Setting Error             | An SM Event Mode that is not supported was set.  | <ul style="list-style-type: none"> <li>An SM Event Mode that is not supported was set.</li> </ul>   |             |             | ○           |             |                  | page 8-46 |
| 39330000 hex | FreeRun Setting Error                   | The FreeRun is not set to three Buffer Modes.  | <ul style="list-style-type: none"> <li>The FreeRun is not set to three Buffer Modes.</li> </ul>   |             |             | ○           |             |                  | page 8-47 |
| 39340000 hex | Mailbox Setting Error                   | An incorrect mailbox setting was detected for the Sync Manager.  | <ul style="list-style-type: none"> <li>An incorrect mailbox setting was detected for the Sync Manager.</li> </ul>   |             |             | ○           |             |                  | page 8-48 |
| 40200000 hex | NX Unit Processing Error                | A fatal error occurred in an NX Unit.  | <ul style="list-style-type: none"> <li>An error occurred in the software.</li> </ul>  |             |             | ○           |             |                  | page 8-49 |

| Event code   | Event name                       | Meaning   | Assumed cause  | Level       |             |             |             |                  | Reference |
|--------------|----------------------------------|---|--|-------------|-------------|-------------|-------------|------------------|-----------|
|              |                                  |   |  | M<br>a<br>j | P<br>r<br>t | M<br>i<br>n | O<br>b<br>s | I<br>n<br>f<br>o |           |
| 80200000 hex | NX Unit I/O Communications Error | An I/O communications error occurred in an NX Unit. | <p>For the NX bus of CPU Units</p> <ul style="list-style-type: none"> <li>An error that prevents normal NX bus communications occurred in a CPU Unit.</li> <li>An 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 an NX Unit.</li> </ul> <p>For Communications Coupler Units</p> <ul style="list-style-type: none"> <li>An error that prevents normal NX bus communications occurred in a Communications Coupler Unit.</li> <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> |             |             | ○           |             |                  | page 8-50 |

| Event code   | Event name                           | Meaning  | Assumed cause  | Level       |             |             |             |                  | Reference |
|--------------|--------------------------------------|--|--|-------------|-------------|-------------|-------------|------------------|-----------|
|              |                                      |  |  | M<br>a<br>j | P<br>r<br>t | M<br>i<br>n | O<br>b<br>s | I<br>n<br>f<br>o |           |
| 80240000 hex | NX Unit Clock Not Synchronized Error | A time information error occurred in an NX Unit.                                     | For the NX bus of CPU Units <ul style="list-style-type: none"> <li>There is a hardware error in an NX Unit.</li> <li>There is a hardware error in a CPU Unit.</li> </ul> For Communications Coupler Units <ul style="list-style-type: none"> <li>There is a hardware error in an NX Unit.</li> <li>There is a hardware error in an EtherCAT Coupler Unit.</li> </ul>           |             |             | ○           |             |                  | page 8-52 |
| 85000000 hex | Process Data WDT Error               | Process data communications were stopped for more than the specified period of time. | <ul style="list-style-type: none"> <li>The EtherCAT communications cable is disconnected or broken.</li> <li>There is an error in the host controller.</li> </ul>  |             |             | ○           |             |                  | page 8-53 |
| 80220000 hex | NX Message Communications Error      | An error was detected in message communications and the message frame was discarded. | For the NX bus of CPU Units <ul style="list-style-type: none"> <li>The message communications load is high.</li> </ul> For Communications Coupler Units <ul style="list-style-type: none"> <li>The message communications load is high.</li> <li>The communications cable is disconnected or broken.</li> <li>Message communications were cutoff in communications.</li> </ul> |             |             |             | ○           |                  | page 8-54 |
| 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>   |             |             |             |             | ○                | page 8-55 |
| 94B80000 hex | NX Unit Restart                      | An NX Unit was restarted.  | <ul style="list-style-type: none"> <li>An NX Unit was restarted or a controller reset was executed.</li> </ul>   |             |             |             |             | ○                | page 8-55 |

### 8-3-4 Error Descriptions

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

#### How to Read Error Descriptions

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

The following shows the source and source details of the errors (events) that occur in the EtherCAT Slave Unit.

| Connecting destination of Support Software  | Source                          | Source details                    |
|---|---------------------------------|-----------------------------------|
| Following EtherCAT masters <ul style="list-style-type: none"> <li>Built-in EtherCAT port on NJ/NX-series CPU Unit</li> <li>Built-in EtherCAT port on NY-series Industrial PC</li> </ul> | EtherCAT Master Function Module | Node address of an EtherCAT slave |
| CPU Rack to which an EtherCAT Slave Unit is connected   | NX Bus Function Module          | NX Unit number                    |

|                                 |   |   |                       |  |                         |                                   |
|---------------------------------|---|---|-----------------------|--|-------------------------|-----------------------------------|
| <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>Log category</b>   | Tells which log the error is saved in. *2                                  |                         |                                   |
|                                 | <b>Recovery</b>   | Gives the recovery method. *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 Support Software or an HMI. *5, *6  |   |                       |  |                         |                                   |
| <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:

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

\*3. 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.

\*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.
- \*6. Refer to the appendices of the troubleshooting manual for the connected CPU Unit or Industrial PC for the applicable range of the HMI Troubleshooter.

### Error Descriptions

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This section describes the errors that occur in the EtherCAT Slave Unit.



#### Additional Information

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In the common events for the NX Unit, *for Communications Coupler Units* are described, but the EtherCAT Slave Unit cannot be connected to the Communications Coupler Unit. It is not necessary to read descriptions *for Communications Coupler Units*.

---

|                             |   |   |  |  |  |
|-----------------------------|---|---|--|--|--|
| <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 Support Software is connected and the system configuration.  | <b>Source details</b>   | Depends on where the Support Software is connected and the system configuration. | <b>Detection timing</b>  | When power is turned ON to the NX Unit |
| <b>Error attributes</b>     | <b>Level</b>  | Minor fault   |  | <b>Log category</b>  | System                                 |
|                             | <b>Recovery</b>   | For the NX bus of CPU Units<br>Cycle the power supply to the Unit or restart the NX bus.<br>For Communications Coupler Units<br>Cycle the power supply to the Unit or restart the Slave Terminal.<br>If the errors are detected in the Controller, reset all of the errors in the Controller.   |  |  |  |
| <b>Effects</b>              | <b>User program</b>   | Continues.  | <b>Operation</b>   | I/O refreshing is not performed for the NX Units. The EtherCAT communications stop in Init state, and do not accept the state transition request to Pre-Operational or other states. |  |
|                             | <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.  | For the NX bus of CPU Units<br>Cycle the power supply to the Unit or restart the NX bus. If the error persists even after you make the above correction, replace the relevant NX Unit.<br>For Communications Coupler Units<br>Cycle the power supply to the Unit or restart the Slave Terminal. If the error persists even after you make the above correction, replace the relevant NX Unit. |  | None   |  |
| <b>Attached information</b> | None  |   |  |  |  |
| <b>Precautions/Remarks</b>  | When this event occurs, the AL-Status Code indicates 0002 hex.<br>This event is not reported as a current error.<br>This event is not recorded in the system event log. |   |  |  |  |

|                                 |  |  |                                  |  |                         |  |
|---------------------------------|--|--|----------------------------------|--|-------------------------|--|
| <b>Event name</b>               | ESC Error  |  | <b>Event code</b>                | 09450000 hex   |                         |  |
| <b>Meaning</b>                  | An error occurred in the EtherCAT slave communications controller.               |  |                                  |  |                         |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration. |  | <b>Source details</b>            | Depends on where the Support Software is connected and the system configuration.   | <b>Detection timing</b> | When power is turned ON to the NX Unit |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault  |                                  | <b>Log category</b>  | System                  |  |
|                                 | <b>Recovery</b>  | Cycle the power supply to the EtherCAT Slave Unit. |                                  |  |                         |  |
| <b>Effects</b>                  | <b>User program</b>  | Continues.   | <b>Operation</b>                 | The NX Unit will continue to operate. The EtherCAT communications stop in Init state, and do not accept the state transition request to Pre-Operational or other states. |                         |  |
| <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>       |  |
|                                 | An error occurred in the EtherCAT slave communications controller.               |  | Replace the EtherCAT Slave Unit. |  | None                    |  |
| <b>Attached information</b>     | None   |  |                                  |  |                         |  |
| <b>Precautions/Remarks</b>      | When this event occurs, the emergency error code indicates 5600 hex.             |  |                                  |  |                         |  |

|                                 |  |  |                                  |  |                         |  |
|---------------------------------|--|--|----------------------------------|--|-------------------------|--|
| <b>Event name</b>               | SII Verification Error   |  | <b>Event code</b>                | 09460000 hex   |                         |  |
| <b>Meaning</b>                  | An error occurred in SII verification.   |  |                                  |  |                         |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |  | <b>Source details</b>            | Depends on where the Support Software is connected and the system configuration.   | <b>Detection timing</b> | When the EtherCAT communications are established |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault  |                                  | <b>Log category</b>  | System                  |  |
|                                 | <b>Recovery</b>  | Cycle the power supply to the EtherCAT Slave Unit. |                                  |  |                         |  |
| <b>Effects</b>                  | <b>User program</b>  | Continues.   | <b>Operation</b>                 | The NX Unit will continue to operate. The EtherCAT communications stop in Init state, and do not accept the state transition request to Pre-Operational or other states. |                         |  |
| <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>       |  |
|                                 | An error occurred in SII information.  |  | Replace the EtherCAT Slave Unit. |  | None                    |  |
| <b>Attached information</b>     | None   |  |                                  |  |                         |  |
| <b>Precautions/Remarks</b>      | When this event occurs, the AL-Status Code indicates 0014 hex.<br>When this event occurs, the emergency error code indicates 6140 hex. |  |                                  |  |                         |  |



|   |   |   |  |  |   |
|---|---|---|--|--|---|
| <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 Support Software is connected and the system configuration.  | <b>Source details</b>   | Depends on where the Support Software is connected and the system configuration.   | <b>Detection timing</b>  | When power is turned ON to the NX Unit  |
| <b>Error attributes</b>   | <b>Level</b>  | Minor fault   |  | <b>Log category</b>  | System  |
|   | <b>Recovery</b>   | <p>For the NX bus of CPU Units</p> <p>When Fail-soft Operation Is Set to <i>Stop</i><br/>Restart the NX Unit and then reset the error in the NX Bus Function Module.</p> <p>When Fail-soft Operation Is Set to <i>Fail-soft</i><br/>Restart the NX Unit and then reset the error in the NX Unit.</p> <p>For Communications Coupler Units</p> <p>When Fail-soft Operation Is Set to <i>Stop</i><br/>If the errors are detected in the Controller, restart the NX Unit and then reset all of the errors in the Controller.<br/>If the errors are not detected in the Controller, restart the NX Unit and then reset the error in the Communications Coupler Unit.</p> <p>When Fail-soft Operation Is Set to <i>Fail-soft</i><br/>Restart the NX Unit and then reset the error in the Communications Coupler Unit.</p> |  |  |   |
| <b>Effects</b>  | <b>User program</b>   | Continues.  | <b>Operation</b>   | I/O refreshing is not performed for the NX Units.<br>The EtherCAT communications are 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>   |
|   | For the NX bus of CPU Units   |   |  |  |   |
|   | The power supply to the CPU Unit was turned OFF while writing the Unit operation settings was in progress. Or there is an error in the area of the non-volatile memory in the CPU Unit in which the Unit operation settings for the relevant NX Unit are saved. |   | Download the Unit operation settings of the NX Unit again. If the error persists even after you make the above correction, replace the CPU Unit. |  | Do not turn OFF the power supply to the CPU Unit while transfer of the Unit operation settings for the NX Unit or save of NX Unit parameters by a message is in progress. |
|   | For Communications Coupler Units  |   |  |  |   |
| The power supply to the Communications Coupler Unit was turned OFF while writing the Unit operation settings was in progress. Or there is an error in the area of the non-volatile memory in the Communications Coupler Unit in which the Unit operation settings for the relevant NX Unit are saved. |   | Download the Unit operation settings of the NX Unit again. If the error occurs again even after you make the above correction, replace the Communications Coupler Unit.   |  | Do not turn OFF the power supply to the Communications Coupler Unit while transfer of the Unit operation settings for the NX Unit by the Support Software or save of NX Unit parameters by a message is in progress. |   |
| <b>Attached information</b>   | None  |   |  |  |   |

|                                 |  |  |                       |  |  |
|---------------------------------|--|--|-----------------------|--|--|
| <b>Precautions/Remarks</b>      | When this event occurs, the emergency error code indicates 5540 hex.   |  |                       |  |  |
| <b>Event name</b>               | RxPDO Setting Error  |  | <b>Event code</b>     | 35050000 hex   |  |
| <b>Meaning</b>                  | An error was detected in the RxPDO settings. (AL-Status Code: 001D hex)  |  |                       |  |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |  | <b>Source details</b> | Depends on where the Support Software is connected and the system configuration.   |  |
|                                 |  |  |                       | <b>Detection timing</b>  | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault  |                       | <b>Log category</b>  | System   |
|                                 | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.  |                       |  |  |
| <b>Effects</b>                  | <b>User program</b>  | Continues.   | <b>Operation</b>      | The NX Unit will continue to operate. The EtherCAT communications stop in Pre-Operational state, and do not accept the state transition request to Safe-Operational or other states. |  |
| <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>  |  |
|                                 | An error was detected in the RxPDO settings.   | Correct the RxPDO setting and then download the settings to the EtherCAT master again. |                       | Set the communications for the EtherCAT Slave Unit that are set in the EtherCAT master according to the ESI.   |  |
| <b>Attached information</b>     | None   |  |                       |  |  |
| <b>Precautions/Remarks</b>      | When this event occurs, the AL-Status Code indicates 001D hex.<br>When this event occurs, the emergency error code indicates A000 hex. |  |                       |  |  |

|                             |  |  |  |  |  |
|-----------------------------|--|--|--|--|--|
| <b>Event name</b>           | TxPDO Setting Error  |  | <b>Event code</b>  | 35060000 hex   |  |
| <b>Meaning</b>              | An error was detected in the TxPDO settings. (AL-Status Code: 001E hex)  |  |  |  |  |
| <b>Source</b>               | Depends on where the Support Software is connected and the system configuration.   | <b>Source details</b>  | Depends on where the Support Software is connected and the system configuration.                             | <b>Detection timing</b>  | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state |
| <b>Error attributes</b>     | <b>Level</b>   | Minor fault  |  | <b>Log category</b>  | System   |
|                             | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.  |  |  |  |
| <b>Effects</b>              | <b>User program</b>  | Continues.   | <b>Operation</b>   | The NX Unit will continue to operate. The EtherCAT communications stop in Pre-Operational state, and do not accept the state transition request to Safe-Operational or other states. |  |
|                             | <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>  |  |  |
|                             | An error was detected in the TxPDO settings.   | Correct the TxPDO setting and then download the settings to the EtherCAT master again. | Set the communications for the EtherCAT Slave Unit that are set in the EtherCAT master according to the ESI. |  |  |
| <b>Attached information</b> | None   |  |  |  |  |
| <b>Precautions/Remarks</b>  | When this event occurs, the AL-Status Code indicates 001E hex.<br>When this event occurs, the emergency error code indicates A000 hex. |  |  |  |  |

|                                 |  |  |                         |  |        |
|---------------------------------|--|--|-------------------------|--|--------|
| <b>Event name</b>               | PDO WDT Setting Error  |  | <b>Event code</b>       | 35070000 hex   |        |
| <b>Meaning</b>                  | An incorrect PDO WDT setting was detected. (AL-Status Code: 001F hex)  |  |                         |  |        |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |  | <b>Source details</b>   | Depends on where the Support Software is connected and the system configuration.   |        |
|                                 |  |  | <b>Detection timing</b> | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state   |        |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault  |                         | <b>Log category</b>  | System |
|                                 | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.  |                         |  |        |
| <b>Effects</b>                  | <b>User program</b>  | Continues.   | <b>Operation</b>        | The NX Unit will continue to operate. The EtherCAT communications stop in Pre-Operational state, and do not accept the state transition request to Safe-Operational or other states. |        |
| <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>  |        |
|                                 | An incorrect PDO WDT setting was detected.   | Correct the PDO WDT setting and then download the settings to the EtherCAT master again. |                         | Set the communications for the EtherCAT Slave Unit that are set in the EtherCAT master according to the ESI.   |        |
| <b>Attached information</b>     | None   |  |                         |  |        |
| <b>Precautions/Remarks</b>      | When this event occurs, the AL-Status Code indicates 001F hex.<br>When this event occurs, the emergency error code indicates A000 hex. |  |                         |  |        |

|                             |  |  |  |  |  |
|-----------------------------|--|--|--|--|--|
| <b>Event name</b>           | TxPDO Mapping Error  |  | <b>Event code</b>  | 35090000 hex   |  |
| <b>Meaning</b>              | An incorrect TxPDO was set. (AL-Status Code: 0024 hex)   |  |  |  |  |
| <b>Source</b>               | Depends on where the Support Software is connected and the system configuration.   | <b>Source details</b>  | Depends on where the Support Software is connected and the system configuration.                             | <b>Detection timing</b>  | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state |
| <b>Error attributes</b>     | <b>Level</b>   | Minor fault  |  | <b>Log category</b>  | System   |
|                             | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.  |  |  |  |
| <b>Effects</b>              | <b>User program</b>  | Continues.   | <b>Operation</b>   | The NX Unit will continue to operate. The EtherCAT communications stop in Pre-Operational state, and do not accept the state transition request to Safe-Operational or other states. |  |
|                             | <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>  |  |  |
|                             | An incorrect TxPDO was set, e.g., the index, subindex, or size was outside of the allowable range.   | Correct the TxPDO setting and then download the settings to the EtherCAT master again. | Set the communications for the EtherCAT Slave Unit that are set in the EtherCAT master according to the ESI. |  |  |
| <b>Attached information</b> | None   |  |  |  |  |
| <b>Precautions/Remarks</b>  | Be sure to assign 1A00 hex to TxPDO for the EtherCAT Slave Unit.<br>When this event occurs, the AL-Status Code indicates 0024 hex.<br>When this event occurs, the emergency error code indicates A000 hex. |  |  |  |  |

|                                 |  |  |                         |  |        |
|---------------------------------|--|--|-------------------------|--|--------|
| <b>Event name</b>               | RxPDO Mapping Error  |  | <b>Event code</b>       | 350A0000 hex   |        |
| <b>Meaning</b>                  | An incorrect RxPDO was set. (AL-Status Code: 0025 hex)   |  |                         |  |        |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |  | <b>Source details</b>   | Depends on where the Support Software is connected and the system configuration.   |        |
|                                 |  |  | <b>Detection timing</b> | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state   |        |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault  |                         | <b>Log category</b>  | System |
|                                 | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.  |                         |  |        |
| <b>Effects</b>                  | <b>User program</b>  | Continues.   | <b>Operation</b>        | The NX Unit will continue to operate. The EtherCAT communications stop in Pre-Operational state, and do not accept the state transition request to Safe-Operational or other states. |        |
| <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>  |        |
|                                 | An incorrect RxPDO was set, e.g., the index, subindex, or size was outside of the allowable range.                                     | Correct the RxPDO setting and then download the settings to the EtherCAT master again. |                         | Set the communications for the EtherCAT Slave Unit that are set in the EtherCAT master according to the ESI.   |        |
| <b>Attached information</b>     | None   |  |                         |  |        |
| <b>Precautions/Remarks</b>      | When this event occurs, the AL-Status Code indicates 0025 hex.<br>When this event occurs, the emergency error code indicates A000 hex. |  |                         |  |        |

|                                 |  |   |  |   |   |
|---------------------------------|--|---|--|---|---|
| <b>Event name</b>               | Illegal State Transition Request Received  |   | <b>Event code</b>  | 350B0000 hex  |   |
| <b>Meaning</b>                  | An incorrect state transition request was received. (AL-Status Code: 0011 hex)   |   |  |   |   |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   | <b>Source details</b>   | Depends on where the Support Software is connected and the system configuration. | <b>Detection timing</b>   | At EtherCAT communications state transition |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault   |  | <b>Log category</b>   | System                                      |
|                                 | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.                   |  |   |   |
| <b>Effects</b>                  | <b>User program</b>  | Continues.  | <b>Operation</b>   | The NX Unit will continue to operate. The EtherCAT communications retain the EtherCAT communications state when an error occurs.  |   |
| <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>   |   |
|                                 | An incorrect state transition request was received.  | Change states correctly according to EtherCAT specifications. |  | Change the EtherCAT communications state as following for the EtherCAT Slave Unit: Between Init state and Pre-Operational state, between Pre-Operational state and Safe-Operational state, or between Safe-Operational state and Operational state. |   |
| <b>Attached information</b>     | None   |   |  |   |   |
| <b>Precautions/Remarks</b>      | When this event occurs, the AL-Status Code indicates 0011 hex.<br>When this event occurs, the emergency error code indicates FF10 hex. |   |  |   |   |

|                                 |  |   |                       |   |        |
|---------------------------------|--|---|-----------------------|---|--------|
| <b>Event name</b>               | Error State Transition Received  |   | <b>Event code</b>     | 350C0000 hex  |        |
| <b>Meaning</b>                  | An unclear state transition request was received. (AL-Status Code: 0012 hex)   |   |                       |   |        |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |   | <b>Source details</b> | Depends on where the Support Software is connected and the system configuration.  |        |
|                                 | <b>Detection timing</b>  | At EtherCAT communications state transition                   |                       |   |        |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault   |                       | <b>Log category</b>   | System |
|                                 | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.                   |                       |   |        |
| <b>Effects</b>                  | <b>User program</b>  | Continues.  | <b>Operation</b>      | The NX Unit will continue to operate.<br>The EtherCAT communications retain the EtherCAT communications state when an error occurs.   |        |
| <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>   |        |
|                                 | An unclear state transition request was received.  | Change states correctly according to EtherCAT specifications. |                       | Change the EtherCAT communications state as following for the EtherCAT Slave Unit: Between Init state and Pre-Operational state, between Pre-Operational state and Safe-Operational state, or between Safe-Operational state and Operational state. |        |
| <b>Attached information</b>     | None   |   |                       |   |        |
| <b>Precautions/Remarks</b>      | When this event occurs, the AL-Status Code indicates 0012 hex.<br>When this event occurs, the emergency error code indicates FF11 hex. |   |                       |   |        |



|                             |   |   |  |  |  |
|-----------------------------|---|---|--|--|--|
| <b>Event name</b>           | DC Mode Not Supported   |   | <b>Event code</b>  | 35180000 hex   |  |
| <b>Meaning</b>              | Unsupported DC Mode was set.  |   |  |  |  |
| <b>Source</b>               | Depends on where the Support Software is connected and the system configuration.  | <b>Source details</b>   | Depends on where the Support Software is connected and the system configuration. | <b>Detection timing</b>  | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state |
| <b>Error attributes</b>     | <b>Level</b>  | Minor fault   |  | <b>Log category</b>  | System   |
|                             | <b>Recovery</b>   | Reset the error in the EtherCAT Slave Unit.   |  |  |  |
| <b>Effects</b>              | <b>User program</b>   | Continues.  | <b>Operation</b>   | The NX Unit will continue to operate. The EtherCAT communications stop in Pre-Operational state, and do not accept the state transition request to Safe-Operational or other states. |  |
|                             | <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>  |  |
|                             | Unsupported DC Mode was set.  | Correct the synchronization setting to FreeRun, and download the settings to the EtherCAT master. |  | Set the communications for the EtherCAT Slave Unit that are set in the EtherCAT master according to the ESI.   |  |
| <b>Attached information</b> | None  |   |  |  |  |
| <b>Precautions/Remarks</b>  | The EtherCAT Slave Unit does not support DC Mode.<br>When this event occurs, the emergency error code indicates A000 hex. |   |  |  |  |

|                                 |  |  |                       |  |                         |  |
|---------------------------------|--|--|-----------------------|--|-------------------------|--|
| <b>Event name</b>               | Incorrect I/O Entry Order C to M   |  | <b>Event code</b>     | 39130000 hex   |                         |  |
| <b>Meaning</b>                  | In one of the I/O data sets from the CPU Unit to the EtherCAT master, the assignment order of the I/O entries is not forward feed or ascending order.  |  |                       |  |                         |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |  | <b>Source details</b> | Depends on where the Support Software is connected and the system configuration.   | <b>Detection timing</b> | When power is turned ON to the NX Unit |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault  |                       | <b>Log category</b>  | System                  |  |
|                                 | <b>Recovery</b>  | Reset the I/O entry mapping with the I/O allocation settings.  |                       |  |                         |  |
| <b>Effects</b>                  | <b>User program</b>  | Continues.   | <b>Operation</b>      | I/O refreshing is not performed for the NX Units. The EtherCAT communications are 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 order of the I/O entries assigned to the I/O data set that is shown in the attached information is not forward feed or ascending order.  | Correct the assignment of I/O entries to the I/O data set that is shown in the attached information so that they are assigned in ascending order from the subindex 1. Download the corrected settings to the CPU Unit. |                       | Make the I/O allocation settings of the I/O data set that is shown in the attached information according to the NX-series EtherCAT Slave Unit User's Manual. |                         |  |
| <b>Attached information</b>     | Attached information 1: The relevant data sets in the following are not correct.<br>1601 hex: Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master<br>1602 hex: Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master<br>1603 hex: Data Set in UDINT from CPU Unit to EtherCAT Master |  |                       |  |                         |  |
| <b>Precautions/Remarks</b>      | The I/O entries to the I/O data set that is shown in the attached information must be assigned in ascending order from the subindex 1.<br>When this event occurs, the emergency error code indicates 6352 hex.   |  |                       |  |                         |  |

|                                 |  |   |                       |  |  |
|---------------------------------|--|---|-----------------------|--|--|
| <b>Event name</b>               | Incorrect PDO Entry Order M to C   |   | <b>Event code</b>     | 39140000 hex   |  |
| <b>Meaning</b>                  | In one of the I/O data sets from the EtherCAT master to the CPU Unit, the assignment order of the PDO entries is not forward feed or ascending order.  |   |                       |  |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |   | <b>Source details</b> | Depends on where the Support Software is connected and the system configuration.                                     |  |
|                                 |  |   |                       | <b>Detection timing</b>  | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state   |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault   |                       | <b>Log category</b>  | System   |
|                                 | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.   |                       |  |  |
| <b>Effects</b>                  | <b>User program</b>  | Continues.  |                       | <b>Operation</b>   | The NX Unit will continue to operate. The EtherCAT communications stop in Pre-Operational state, and do not accept the state transition request to Safe-Operational or other states. |
|                                 |  |   |                       |  |  |
| <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>  |  |
|                                 | In the I/O data set shown in the attached information, the assignment order of the PDO entries is not forward feed or ascending order.   | Correct the PDO entries of the I/O data set that is shown in the attached information so that they are assigned in ascending order from the subindex 1. Download the corrected settings to the EtherCAT master. |                       | Set the I/O data set shown in the attached information according to the NX-series EtherCAT Slave Unit User's Manual. |  |
| <b>Attached information</b>     | Attached information 1: Index of PDO mapping object (hex)  |   |                       |  |  |
| <b>Precautions/Remarks</b>      | The PDO entries to the I/O data set that is shown in the attached information must be assigned in ascending order from the subindex 1.<br>When this event occurs, the AL-Status Code indicates 0025 hex.<br>When this event occurs, the emergency error code indicates A000 hex. |   |                       |  |  |

|                                 |   |   |                       |  |                         |  |
|---------------------------------|---|---|-----------------------|--|-------------------------|--|
| <b>Event name</b>               | Incorrect PDO Entry Order C to M  |   | <b>Event code</b>     | 39150000 hex   |                         |  |
| <b>Meaning</b>                  | In one of the I/O data sets from the CPU Unit to the EtherCAT master, the assignment order of the PDO entries is not forward feed or ascending order.   |   |                       |  |                         |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.  |   | <b>Source details</b> | Depends on where the Support Software is connected and the system configuration.   | <b>Detection timing</b> | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state |
| <b>Error attributes</b>         | <b>Level</b>  | Minor fault   |                       | <b>Log category</b>  | System                  |  |
|                                 | <b>Recovery</b>   | Reset the error in the EtherCAT Slave Unit.   |                       |  |                         |  |
| <b>Effects</b>                  | <b>User program</b>   | Continues.  | <b>Operation</b>      | The NX Unit will continue to operate. The EtherCAT communications stop in Pre-Operational state, and do not accept the state transition request to Safe-Operational or other states. |                         |  |
| <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>  |                         |  |
|                                 | In the I/O data set shown in the attached information, the assignment order of the PDO entries is not forward feed or ascending order.  | Correct the PDO entries of the I/O data set that is shown in the attached information so that they are assigned in ascending order from the subindex 1. Download the corrected settings to the EtherCAT master. |                       | Set the I/O data set shown in the attached information according to the NX-series EtherCAT Slave Unit User's Manual.   |                         |  |
| <b>Attached information</b>     | Attached information 1: Index of PDO mapping object (hex)   |   |                       |  |                         |  |
| <b>Precautions/Remarks</b>      | <p>The PDO entries to the I/O data set that is shown in the attached information must be assigned in ascending order from the subindex 1.</p> <p>When this event occurs, the AL-Status Code indicates 0024 hex.</p> <p>When this event occurs, the emergency error code indicates A000 hex.</p> |   |                       |  |                         |  |

|                                 |  |   |                       |  |        |
|---------------------------------|--|---|-----------------------|--|--------|
| <b>Event name</b>               | Data Size Mismatched between PDO Entry and I/O Entry C to M  |   | <b>Event code</b>     | 39160000 hex   |        |
| <b>Meaning</b>                  | In the I/O data set from the CPU Unit to the EtherCAT master, the data size between the assigned PDO entry and I/O entry does not match.   |   |                       |  |        |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |   | <b>Source details</b> | Depends on where the Support Software is connected and the system configuration.   |        |
|                                 | <b>Detection timing</b>  | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state  |                       |  |        |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault   |                       | <b>Log category</b>  | System |
|                                 | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.   |                       |  |        |
| <b>Effects</b>                  | <b>User program</b>  | Continues.  | <b>Operation</b>      | The NX Unit will continue to operate.<br>The EtherCAT communications are not affected.<br>Transfer the data from the CPU Unit to the EtherCAT master in the range where the PDO entry matches the I/O entry. |        |
| <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>  |        |
|                                 | In the I/O data set from the selected CPU Unit to the EtherCAT master, the following data size does not match. <ul style="list-style-type: none"> <li>• PDO entry</li> <li>• I/O entry</li> </ul>  | In the I/O data set from the selected CPU Unit to the EtherCAT master, set the following data sizes to be matched. <ul style="list-style-type: none"> <li>• PDO entry</li> <li>• I/O entry</li> </ul> Correct the settings and then download the settings of the PDO mapping object to the EtherCAT master, and settings of the I/O entry mapping to the CPU Unit.<br>If the settings are intentionally inconsistent, change the level of this event to the observation level, and download the settings to the CPU Unit. |                       | In the I/O data set from the selected CPU Unit to the EtherCAT master, set the following data sizes to be matched. <ul style="list-style-type: none"> <li>• PDO entry</li> <li>• I/O entry</li> </ul>        |        |
| <b>Attached information</b>     | None   |   |                       |  |        |
| <b>Precautions/Remarks</b>      | In the I/O data set from the selected CPU Unit to the EtherCAT master, transfer the data in the range where the PDO entry matches the I/O entry.<br>When this event occurs, the emergency error code indicates FF31 hex.<br>You can change the level of this event to the observation level. |   |                       |  |        |

|                                 |  |   |                       |  |                         |  |
|---------------------------------|--|---|-----------------------|--|-------------------------|--|
| <b>Event name</b>               | Data Size Mismatched between PDO Entry and I/O Entry M to C  |   | <b>Event code</b>     | 39170000 hex   |                         |  |
| <b>Meaning</b>                  | In the I/O data set from the EtherCAT master to the CPU Unit, the data size between the assigned PDO entry and I/O entry does not match.   |   |                       |  |                         |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |   | <b>Source details</b> | Depends on where the Support Software is connected and the system configuration.   | <b>Detection timing</b> | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault   |                       | <b>Log category</b>  | System                  |  |
|                                 | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.   |                       |  |                         |  |
| <b>Effects</b>                  | <b>User program</b>  | Continues.  | <b>Operation</b>      | The NX Unit will continue to operate.<br>The EtherCAT communications are not affected.<br>Transfer the data from the EtherCAT master to the CPU Unit in the range where the PDO entry matches the I/O entry. |                         |  |
| <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>  |                         |  |
|                                 | In the I/O data set from the selected EtherCAT master to the CPU Unit, the following data size does not match.<br>• PDO entry<br>• I/O entry   | In the I/O data set from the selected EtherCAT master to the CPU Unit, set the following data sizes to be matched.<br>• PDO entry<br>• I/O entry<br>Correct the settings and then download the settings of the PDO mapping object to the EtherCAT master, and settings of the I/O entry mapping to the CPU Unit.<br><br>If the settings are intentionally inconsistent, change the level of this event to the observation level, and download the settings to the CPU Unit. |                       | In the I/O data set from the selected EtherCAT master to the CPU Unit, set the following data sizes to be matched.<br>• PDO entry<br>• I/O entry   |                         |  |
| <b>Attached information</b>     | None   |   |                       |  |                         |  |
| <b>Precautions/Remarks</b>      | In the I/O data set from the selected EtherCAT master to the CPU Unit, transfer the data in the range where the PDO entry matches the I/O entry.<br>When this event occurs, the emergency error code indicates FF30 hex.<br>You can change the level of this event to the observation level. |   |                       |  |                         |  |

|                                 |  |  |                         |  |        |
|---------------------------------|--|--|-------------------------|--|--------|
| <b>Event name</b>               | Incorrect I/O Entry Order M to C   |  | <b>Event code</b>       | 39190000 hex   |        |
| <b>Meaning</b>                  | In one of the I/O data sets from the EtherCAT master to the CPU Unit, the assignment order of the I/O entries is not forward feed or ascending order.  |  |                         |  |        |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |  | <b>Source details</b>   | Depends on where the Support Software is connected and the system configuration.   |        |
|                                 |  |  | <b>Detection timing</b> | When power is turned ON to the NX Unit   |        |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault  |                         | <b>Log category</b>  | System |
|                                 | <b>Recovery</b>  | Reset the I/O entry mapping with the I/O allocation settings.  |                         |  |        |
| <b>Effects</b>                  | <b>User program</b>  | Continues.   | <b>Operation</b>        | I/O refreshing is not performed for the NX Units. The EtherCAT communications are 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 order of the I/O entries assigned to the I/O data set that is shown in the attached information is not forward feed or ascending order.  | Correct the assignment of I/O entries to the I/O data set that is shown in the attached information so that they are assigned in ascending order from the subindex 1. Download the corrected settings to the CPU Unit. |                         | Make the I/O allocation settings of the I/O data set that is shown in the attached information according to the NX-series EtherCAT Slave Unit User's Manual. |        |
| <b>Attached information</b>     | Attached information 1: The relevant data sets in the following are not correct.<br>1A01 hex: Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit<br>1A02 hex: Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit<br>1A03 hex: Data Set in UDINT from EtherCAT Master to CPU Unit |  |                         |  |        |
| <b>Precautions/Remarks</b>      | The I/O entries to the I/O data set that is shown in the attached information must be assigned in ascending order from the subindex 1.<br>When this event occurs, the emergency error code indicates 6353 hex.   |  |                         |  |        |

|                                 |  |  |                       |   |  |  |
|---------------------------------|--|--|-----------------------|---|--|--|
| <b>Event name</b>               | Illegal I/O Entry Added C to M   |  | <b>Event code</b>     | 391A0000 hex  |  |  |
| <b>Meaning</b>                  | In one of the I/O data sets from the CPU Unit to the EtherCAT master, an illegal I/O entry is assigned.  |  |                       |   |  |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |  | <b>Source details</b> | Depends on where the Support Software is connected and the system configuration.                | <b>Detection timing</b>  | When power is turned ON to the NX Unit |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault  |                       | <b>Log category</b>   | System   |  |
|                                 | <b>Recovery</b>  | Reset the I/O entry mapping with the I/O allocation settings.  |                       |   |  |  |
| <b>Effects</b>                  | <b>User program</b>  | Continues.   | <b>Operation</b>      | I/O refreshing is not performed for the NX Units. The EtherCAT communications are not affected. |  |  |
| <b>System-defined variables</b> | <b>Variable</b>  | None   |                       | <b>Data type</b>  | ---  |  |
|                                 | <b>Name</b>  | ---  |                       |   |  |  |
| <b>Cause and correction</b>     | <b>Assumed cause</b>   | In the I/O data set shown in the attached information, an illegal I/O entry is assigned.                             |                       | <b>Correction</b>   | Correct the I/O data set shown in the attached information, and download it to the CPU Unit. |  |
|                                 | <b>Prevention</b>  | Set the I/O data set shown in the attached information according to the NX-series EtherCAT Slave Unit User's Manual. |                       |   |  |  |
| <b>Attached information</b>     | Attached information 1: The relevant data sets in the following are not correct.<br>1601 hex: Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master<br>1602 hex: Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master<br>1603 hex: Data Set in UDINT from CPU Unit to EtherCAT Master |  |                       |   |  |  |
| <b>Precautions/Remarks</b>      | The I/O entries that can be assigned to the I/O entry mapping of the EtherCAT Slave Unit are different for each I/O entry mapping.<br>When this event occurs, the emergency error code indicates 6350 hex.   |  |                       |   |  |  |



|                                 |  |  |  |  |  |
|---------------------------------|--|--|--|--|--|
| <b>Event name</b>               | Illegal I/O Entry Added M to C   |  | <b>Event code</b>  | 391B0000 hex   |  |
| <b>Meaning</b>                  | In one of the I/O data sets from the EtherCAT master to the CPU Unit, an illegal I/O entry is assigned.  |  |  |  |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   | <b>Source details</b>  | Depends on where the Support Software is connected and the system configuration. | <b>Detection timing</b>  | When power is turned ON to the NX Unit |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault  |  | <b>Log category</b>  | System                                 |
|                                 | <b>Recovery</b>  | Reset the I/O entry mapping with the I/O allocation settings.                                |  |  |  |
| <b>Effects</b>                  | <b>User program</b>  | Continues.   | <b>Operation</b>   | I/O refreshing is not performed for the NX Units. The EtherCAT communications are 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>  |  |
|                                 | In the I/O data set shown in the attached information, an illegal I/O entry is assigned.   | Correct the I/O data set shown in the attached information, and download it to the CPU Unit. |  | Set the I/O data set shown in the attached information according to the NX-series EtherCAT Slave Unit User's Manual. |  |
| <b>Attached information</b>     | Attached information 1: The relevant data sets in the following are not correct.<br>1A01 hex: Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit<br>1A02 hex: Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit<br>1A03 hex: Data Set in UDINT from EtherCAT Master to CPU Unit |  |  |  |  |
| <b>Precautions/Remarks</b>      | The I/O entries that can be assigned to the I/O entry mapping of the EtherCAT Slave Unit are different for each I/O entry mapping.<br>When this event occurs, the emergency error code indicates 6351 hex.   |  |  |  |  |

|                                 |   |   |   |   |   |  |
|---------------------------------|---|---|---|---|---|--|
| <b>Event name</b>               | I/O Entry Data Capacity Exceeded C to M   |   | <b>Event code</b>   | 391C0000 hex  |   |  |
| <b>Meaning</b>                  | The total amount of data of the I/O data set from the CPU Unit to the EtherCAT master exceeds 1,200 bytes.  |   |   |   |   |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.  |   | <b>Source details</b>   | Depends on where the Support Software is connected and the system configuration.                | <b>Detection timing</b>   | When power is turned ON to the NX Unit |
| <b>Error attributes</b>         | <b>Level</b>  | Minor fault   |   | <b>Log category</b>   | System  |  |
|                                 | <b>Recovery</b>   | Reset the I/O entry mapping with the I/O allocation settings. |   |   |   |  |
| <b>Effects</b>                  | <b>User program</b>   | Continues.  | <b>Operation</b>  | I/O refreshing is not performed for the NX Units. The EtherCAT communications are 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 total amount of data of the I/O data set from the selected CPU Unit to the EtherCAT master exceeds 1,200 bytes.   |   | For the I/O entries to register in the I/O data set from the selected CPU Unit to the EtherCAT master, set the total amount of data to be 1,200 bytes or less. Download the corrected settings to the CPU Unit. |   | Make the I/O allocation settings of the EtherCAT Slave Unit according to the NX-series EtherCAT Slave Unit User's Manual. |  |
| <b>Attached information</b>     | None  |   |   |   |   |  |
| <b>Precautions/Remarks</b>      | The total amount of data of the I/O data set from the CPU Unit to the EtherCAT master is 1,200 bytes or less.<br>When this event occurs, the emergency error code indicates 6354 hex. |   |   |   |   |  |

|                                 |   |   |                       |   |                         |  |
|---------------------------------|---|---|-----------------------|---|-------------------------|--|
| <b>Event name</b>               | I/O Entry Data Capacity Exceeded M to C   |   | <b>Event code</b>     | 391D0000 hex  |                         |  |
| <b>Meaning</b>                  | The total amount of data of the I/O data set from the EtherCAT master to the CPU Unit exceeds 1,200 bytes.  |   |                       |   |                         |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.  |   | <b>Source details</b> | Depends on where the Support Software is connected and the system configuration.  | <b>Detection timing</b> | When power is turned ON to the NX Unit |
| <b>Error attributes</b>         | <b>Level</b>  | Minor fault   |                       | <b>Log category</b>   | System                  |  |
|                                 | <b>Recovery</b>   | Reset the I/O entry mapping with the I/O allocation settings.   |                       |   |                         |  |
| <b>Effects</b>                  | <b>User program</b>   | Continues.  | <b>Operation</b>      | I/O refreshing is not performed for the NX Units. The EtherCAT communications are 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 total amount of data of the I/O data set from the selected EtherCAT master to the CPU Unit exceeds 1,200 bytes.   | For the I/O entries to register in the I/O data set from the selected EtherCAT master to the CPU Unit, set the total amount of data to be 1,200 bytes or less. Download the corrected settings to the CPU Unit. |                       | Make the I/O allocation settings of the EtherCAT Slave Unit according to the NX-series EtherCAT Slave Unit User's Manual. |                         |  |
| <b>Attached information</b>     | None  |   |                       |   |                         |  |
| <b>Precautions/Remarks</b>      | The total amount of data of the I/O data set from the EtherCAT master to the CPU Unit is 1,200 bytes or less.<br>When this event occurs, the emergency error code indicates 6355 hex. |   |                       |   |                         |  |

|                                 |   |   |                         |  |        |
|---------------------------------|---|---|-------------------------|--|--------|
| <b>Event name</b>               | Illegal PDO Entry Added M to C  |   | <b>Event code</b>       | 391E0000 hex   |        |
| <b>Meaning</b>                  | In one of the I/O data sets from the EtherCAT master to the CPU Unit, an illegal PDO entry is assigned.   |   |                         |  |        |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.  |   | <b>Source details</b>   | Depends on where the Support Software is connected and the system configuration.   |        |
|                                 |   |   | <b>Detection timing</b> | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state   |        |
| <b>Error attributes</b>         | <b>Level</b>  | Minor fault   |                         | <b>Log category</b>  | System |
|                                 | <b>Recovery</b>   | Reset the error in the EtherCAT Slave Unit.   |                         |  |        |
| <b>Effects</b>                  | <b>User program</b>   | Continues.  | <b>Operation</b>        | The NX Unit will continue to operate. The EtherCAT communications stop in Pre-Operational state, and do not accept the state transition request to Safe-Operational or other states. |        |
| <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>  |        |
|                                 | In the I/O data set shown in the attached information, an illegal PDO entry is assigned.  | Correct the I/O data set shown in the attached information, and download it to the EtherCAT master. |                         | Set the I/O data set shown in the attached information according to the NX-series EtherCAT Slave Unit User's Manual.   |        |
| <b>Attached information</b>     | Attached information 1: Index of PDO mapping object (hex)   |   |                         |  |        |
| <b>Precautions/Remarks</b>      | <p>The PDO entries that can be assigned to the PDO mapping object of the EtherCAT Slave Unit are different for each PDO mapping object.</p> <p>When this event occurs, the AL-Status Code indicates 0025 hex.</p> <p>When this event occurs, the emergency error code indicates A000 hex.</p> |   |                         |  |        |

|                             |  |   |  |  |  |
|-----------------------------|--|---|--|--|--|
| <b>Event name</b>           | Illegal PDO Entry Added C to M   |   | <b>Event code</b>  | 391F0000 hex   |  |
| <b>Meaning</b>              | In one of the I/O data sets from the CPU Unit to the EtherCAT master, an illegal PDO entry is assigned.  |   |  |  |  |
| <b>Source</b>               | Depends on where the Support Software is connected and the system configuration.   | <b>Source details</b>   | Depends on where the Support Software is connected and the system configuration.                                     | <b>Detection timing</b>  | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state |
| <b>Error attributes</b>     | <b>Level</b>   | Minor fault   |  | <b>Log category</b>  | System   |
|                             | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.   |  |  |  |
| <b>Effects</b>              | <b>User program</b>  | Continues.  | <b>Operation</b>   | The NX Unit will continue to operate. The EtherCAT communications stop in Pre-Operational state, and do not accept the state transition request to Safe-Operational or other states. |  |
|                             | <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>  |  |  |
|                             | In the I/O data set shown in the attached information, an illegal PDO entry is assigned.   | Correct the I/O data set shown in the attached information, and download it to the EtherCAT master. | Set the I/O data set shown in the attached information according to the NX-series EtherCAT Slave Unit User's Manual. |  |  |
| <b>Attached information</b> | Attached information 1: Index of PDO mapping object (hex)  |   |  |  |  |
| <b>Precautions/Remarks</b>  | The PDO entries that can be assigned to the PDO mapping object of the EtherCAT Slave Unit are different for each PDO mapping object.<br>When this event occurs, the AL-Status Code indicates 0024 hex.<br>When this event occurs, the emergency error code indicates A000 hex. |   |  |  |  |

|                                 |  |  |                       |  |                         |  |
|---------------------------------|--|--|-----------------------|--|-------------------------|--|
| <b>Event name</b>               | PDO Entry Data Capacity Exceeded M to C  |  | <b>Event code</b>     | 392C0000 hex   |                         |  |
| <b>Meaning</b>                  | The total amount of data of the I/O data set from the EtherCAT master to the CPU Unit exceeds 1,200 bytes.   |  |                       |  |                         |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |  | <b>Source details</b> | Depends on where the Support Software is connected and the system configuration.   | <b>Detection timing</b> | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault  |                       | <b>Log category</b>  | System                  |  |
|                                 | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.  |                       |  |                         |  |
| <b>Effects</b>                  | <b>User program</b>  | Continues.   | <b>Operation</b>      | The NX Unit will continue to operate. The EtherCAT communications stop in Pre-Operational state, and do not accept the state transition request to Safe-Operational or other states. |                         |  |
| <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 total amount of data of the I/O data set from the selected EtherCAT master to the CPU Unit exceeds 1,200 bytes.  | For the PDO entries to register in the I/O data set from the selected EtherCAT master to the CPU Unit, set the total amount of data to be 1,200 bytes or less. Download the corrected settings to the EtherCAT master. |                       | Set the I/O data set of the EtherCAT Slave Unit that is set in the EtherCAT master according to the NX-series EtherCAT Slave Unit User's Manual.                                     |                         |  |
| <b>Attached information</b>     | None   |  |                       |  |                         |  |
| <b>Precautions/Remarks</b>      | <p>The total amount of data of the I/O data set from the EtherCAT master to the CPU Unit is 1,200 bytes or less.</p> <p>When this event occurs, the AL-Status Code indicates 0025 hex.</p> <p>When this event occurs, the emergency error code indicates A000 hex.</p> |  |                       |  |                         |  |

|                                 |  |  |                       |  |  |
|---------------------------------|--|--|-----------------------|--|--|
| <b>Event name</b>               | PDO Entry Data Capacity Exceeded C to M  |  | <b>Event code</b>     | 392D0000 hex   |  |
| <b>Meaning</b>                  | The total amount of data of the I/O data set from the CPU Unit to the EtherCAT master exceeds 1,200 bytes.   |  |                       |  |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |  | <b>Source details</b> | Depends on where the Support Software is connected and the system configuration.   |  |
|                                 | <b>Detection timing</b>  | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state   |                       |  |  |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault  |                       | <b>Log category</b>  | System   |
|                                 | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.  |                       |  |  |
| <b>Effects</b>                  | <b>User program</b>  | Continues.   |                       | <b>Operation</b>   | The NX Unit will continue to operate. The EtherCAT communications stop in Pre-Operational state, and do not accept the state transition request to Safe-Operational or other states. |
|                                 |  |  |                       |  |  |
| <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 total amount of data of the I/O data set from the selected CPU Unit to the EtherCAT master exceeds 1,200 bytes.  | For the PDO entries to register in the I/O data set from the selected CPU Unit to the EtherCAT master, set the total amount of data to be 1,200 bytes or less. Download the corrected settings to the EtherCAT master. |                       | Set the I/O data set of the EtherCAT Slave Unit that is set in the EtherCAT master according to the NX-series EtherCAT Slave Unit User's Manual. |  |
| <b>Attached information</b>     | None   |  |                       |  |  |
| <b>Precautions/Remarks</b>      | <p>The total amount of data of the I/O data set from the CPU Unit to the EtherCAT master is 1,200 bytes or less.</p> <p>When this event occurs, the AL-Status Code indicates 0024 hex.</p> <p>When this event occurs, the emergency error code indicates A000 hex.</p> |  |                       |  |  |

|                                 |  |   |                       |  |                         |  |
|---------------------------------|--|---|-----------------------|--|-------------------------|--|
| <b>Event name</b>               | Incorrect RxPDO Mapping Order  |   | <b>Event code</b>     | 392E0000 hex   |                         |  |
| <b>Meaning</b>                  | The assignment order of the PDO mapping objects for RxPDOs assigned to the Sync Manager 2 (1C12 hex) is incorrect.   |   |                       |  |                         |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |   | <b>Source details</b> | Depends on where the Support Software is connected and the system configuration.   | <b>Detection timing</b> | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault   |                       | <b>Log category</b>  | System                  |  |
|                                 | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.   |                       |  |                         |  |
| <b>Effects</b>                  | <b>User program</b>  | Continues.  | <b>Operation</b>      | The NX Unit will continue to operate. The EtherCAT communications stop in Pre-Operational state, and do not accept the state transition request to Safe-Operational or other states. |                         |  |
| <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 PDO mapping objects for RxPDOs assigned to the Sync Manager 2 (1C12 hex) are not in the ascending order of the index.  | Correct the settings so that the index of the PDO mapping objects for RxPDOs assigned to the Sync Manager 2 (1C12 hex) becomes ascending order. Download the corrected settings to the EtherCAT master. |                       | Set the PDO mapping objects for RxPDOs of the EtherCAT Slave Unit that are set in the EtherCAT master according to the NX-series EtherCAT Slave Unit User's Manual.                  |                         |  |
| <b>Attached information</b>     | None   |   |                       |  |                         |  |
| <b>Precautions/Remarks</b>      | The index of the PDO mapping objects for RxPDOs assigned to the Sync Manager 2 (1C12 hex) of the EtherCAT Slave Unit must be in the ascending order.<br>When this event occurs, the AL-Status Code indicates 0025 hex.<br>When this event occurs, the emergency error code indicates A000 hex. |   |                       |  |                         |  |



|                                 |  |   |                         |   |  |
|---------------------------------|--|---|-------------------------|---|--|
| <b>Event name</b>               | Incorrect TxPDO Mapping Order  |   | <b>Event code</b>       | 392F0000 hex  |  |
| <b>Meaning</b>                  | The assignment order of the PDO mapping objects for TxPDOs assigned to the Sync Manager 3 (1C13 hex) is incorrect.   |   |                         |   |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |   | <b>Source details</b>   | Depends on where the Support Software is connected and the system configuration.  |  |
|                                 |  |   | <b>Detection timing</b> | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state  |  |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault   |                         | <b>Log category</b>   | System   |
|                                 | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.   |                         |   |  |
| <b>Effects</b>                  | <b>User program</b>  | Continues.  |                         | <b>Operation</b>  | The NX Unit will continue to operate. The EtherCAT communications stop in Pre-Operational state, and do not accept the state transition request to Safe-Operational or other states. |
|                                 |  |   |                         |   |  |
| <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 PDO mapping objects for TxPDOs assigned to the Sync Manager 3 (1C13 hex) are not in the ascending order of the index.  | Correct the settings so that the index of the PDO mapping objects for TxPDOs assigned to the Sync Manager 3 (1C13 hex) becomes ascending order. Download the corrected settings to the EtherCAT master. |                         | Set the PDO mapping objects for TxPDOs of the EtherCAT Slave Unit that are set in the EtherCAT master according to the NX-series EtherCAT Slave Unit User's Manual. |  |
| <b>Attached information</b>     | None   |   |                         |   |  |
| <b>Precautions/Remarks</b>      | The index of the PDO mapping objects for TxPDOs assigned to the Sync Manager 3 (1C13 hex) of the EtherCAT Slave Unit must be in the ascending order.<br>When this event occurs, the AL-Status Code indicates 0024 hex.<br>When this event occurs, the emergency error code indicates A000 hex. |   |                         |   |  |

|                                 |  |  |                         |  |        |
|---------------------------------|--|--|-------------------------|--|--------|
| <b>Event name</b>               | SM Event Mode Setting Error  |  | <b>Event code</b>       | 39320000 hex   |        |
| <b>Meaning</b>                  | An SM Event Mode that is not supported was set.  |  |                         |  |        |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |  | <b>Source details</b>   | Depends on where the Support Software is connected and the system configuration.   |        |
|                                 |  |  | <b>Detection timing</b> | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state   |        |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault  |                         | <b>Log category</b>  | System |
|                                 | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.  |                         |  |        |
| <b>Effects</b>                  | <b>User program</b>  | Continues.   | <b>Operation</b>        | The NX Unit will continue to operate. The EtherCAT communications stop in Pre-Operational state, and do not accept the state transition request to Safe-Operational or other states. |        |
| <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>  |        |
|                                 | An SM Event Mode that is not supported was set.  | Correct the synchronization setting and then download the settings to the EtherCAT master again. |                         | Set the communications for the EtherCAT Slave Unit that are set in the EtherCAT master according to the ESI.   |        |
| <b>Attached information</b>     | None   |  |                         |  |        |
| <b>Precautions/Remarks</b>      | When this event occurs, the AL-Status Code indicates 0028 hex.<br>When this event occurs, the emergency error code indicates A000 hex. |  |                         |  |        |

|                                 |  |  |  |  |  |
|---------------------------------|--|--|--|--|--|
| <b>Event name</b>               | FreeRun Setting Error  |  | <b>Event code</b>  | 39330000 hex   |  |
| <b>Meaning</b>                  | The FreeRun is not set to three Buffer Modes.  |  |  |  |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   | <b>Source details</b>  | Depends on where the Support Software is connected and the system configuration. | <b>Detection timing</b>  | When the EtherCAT communications move from Pre-Operational state to Safe-Operational state |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault  |  | <b>Log category</b>  | System   |
|                                 | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.  |  |  |  |
| <b>Effects</b>                  | <b>User program</b>  | Continues.   | <b>Operation</b>   | The NX Unit will continue to operate. The EtherCAT communications stop in Pre-Operational state, and do not accept the state transition request to Safe-Operational or other states. |  |
| <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 FreeRun is not set to three Buffer Modes.  | Correct the FreeRun setting to three Buffer Modes, and download the settings to the EtherCAT master. |  | Set the communications for the EtherCAT Slave Unit that are set in the EtherCAT master according to the ESI.   |  |
| <b>Attached information</b>     | None   |  |  |  |  |
| <b>Precautions/Remarks</b>      | <p>Make the FreeRun setting to three Buffer Modes.</p> <p>When this event occurs, the AL-Status Code indicates 0029 hex.</p> <p>When this event occurs, the emergency error code indicates A000 hex.</p> |  |  |  |  |

|                                 |  |   |  |   |  |  |
|---------------------------------|--|---|--|---|--|--|
| <b>Event name</b>               | Mailbox Setting Error  |   | <b>Event code</b>  | 39340000 hex  |  |  |
| <b>Meaning</b>                  | An incorrect mailbox setting was detected for the Sync Manager.  |   |  |   |  |  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |   | <b>Source details</b>  | Depends on where the Support Software is connected and the system configuration.  | <b>Detection timing</b>  | When the EtherCAT communications move from Init state to Pre-Operational state |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault                                 |  | <b>Log category</b>   | System   |  |
|                                 | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit. |  |   |  |  |
| <b>Effects</b>                  | <b>User program</b>  | Continues.                                  | <b>Operation</b>   | The NX Unit will continue to operate.<br>The EtherCAT communications stop in Init state, and do not accept the state transition request to Pre-Operational or other states. |  |  |
| <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>  |  |
|                                 | An incorrect mailbox setting was detected for the Sync Manager.  |   | Correct the mailbox setting and then download the settings to the EtherCAT master again. |   | Set the communications for the EtherCAT Slave Unit that are set in the EtherCAT master according to the ESI. |  |
| <b>Attached information</b>     | None   |   |  |   |  |  |
| <b>Precautions/Remarks</b>      | When this event occurs, the AL-Status Code indicates 0016 hex.<br>When this event occurs, the emergency error code indicates FF12 hex. |   |  |   |  |  |

|                                 |   |  |  |   |              |
|---------------------------------|---|--|--|---|--------------|
| <b>Event name</b>               | NX Unit Processing Error  |  | <b>Event code</b>  | 40200000 hex  |              |
| <b>Meaning</b>                  | A fatal error occurred in an NX Unit.   |  |  |   |              |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.  | <b>Source details</b>  | Depends on where the Support Software is connected and the system configuration. | <b>Detection timing</b>   | Continuously |
| <b>Error attributes</b>         | <b>Level</b>  | Minor fault  |  | <b>Log category</b>   | System       |
|                                 | <b>Recovery</b>   | <p>For the NX bus of CPU Units<br/>Cycle the power supply to the NX Unit and then reset the error in the NX Bus Function Module.</p> <p>For Communications Coupler Units<br/>Cycle the power supply to the NX Unit and then reset the error in the Communications Coupler Unit.</p>  |  |   |              |
| <b>Effects</b>                  | <b>User program</b>   | Continues.   | <b>Operation</b>   | I/O refreshing for the NX Unit stops.<br>The EtherCAT communications stop in Init state, and do not accept the state transition request to Pre-Operational or other states. |              |
| <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>   |              |
|                                 | An error occurred in the software.  | <p>For the NX bus of CPU Units<br/>Cycle the power supply to the Unit, restart the NX Unit, or restart the NX bus. If this error occurs again even after the above correction, contact your OMRON representative.</p> <p>For Communications Coupler Units<br/>Cycle the power supply to the Unit, restart the NX Unit, or restart the Slave Terminal. If this error occurs again even after the above correction, contact your OMRON representative.</p> |  | None  |              |
| <b>Attached information</b>     | <p>Attached information 1: System information</p> <p>Attached information 2: System information</p> <p>Attached information 3: System information</p> <p>Attached information 4: System information</p> |  |  |   |              |
| <b>Precautions/Remarks</b>      | <p>When this event occurs, the AL-Status Code indicates 0001 hex.</p> <p>When this event occurs, the emergency error code indicates 6150 hex.</p>   |  |  |   |              |

|                                 |  |   |                       |  |        |
|---------------------------------|--|---|-----------------------|--|--------|
| <b>Event name</b>               | NX Unit I/O Communications Error   |   | <b>Event code</b>     | 80200000 hex   |        |
| <b>Meaning</b>                  | An I/O communications error occurred in an NX Unit.  |   |                       |  |        |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |   | <b>Source details</b> | Depends on where the Support Software is connected and the system configuration.                       |        |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault   |                       | <b>Log category</b>  | System |
|                                 | <b>Recovery</b>  | <p>For the NX bus of CPU Units</p> <p>When Fail-soft Operation Is Set to <i>Stop</i><br/>Reset the error in the NX Bus Function Module.</p> <p>When Fail-soft Operation Is Set to <i>Fail-soft</i><br/>Reset the error in the NX Unit.</p> <p>For Communications Coupler Units</p> <p>When Fail-soft Operation Is Set to <i>Stop</i><br/>If the errors are detected in the Controller, reset all of the errors in the Controller.</p> <p>If the errors are not detected in the Controller, reset errors in the Communications Coupler Unit and NX Unit.</p> <p>When Fail-soft Operation Is Set to <i>Fail-soft</i><br/>Reset errors in the Communications Coupler Unit and NX Unit.</p> |                       |  |        |
| <b>Effects</b>                  | <b>User program</b>  | Continues.  | <b>Operation</b>      | I/O refreshing for the NX Unit stops.<br>The EtherCAT communications are 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>  |        |
|                                 | For the NX bus of CPU Units  |   |                       |  |        |
|                                 | An error that prevents normal NX bus communications occurred in a CPU Unit.  | Check the error that occurred in the CPU Unit and perform the required corrections.   |                       | Take preventive measures against the error that occurred in the CPU Unit.                              |        |
|                                 | An 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. | Wire the Unit power supply to the NX Units securely.  |                       | Wire the Unit power supply to the NX Units securely.   |        |
|                                 | The power cable for the Unit power supply is broken.   | If the power cable between the Unit power supply and the NX Units is broken, replace it.  |                       | None   |        |
|                                 | The voltage of the Unit power supply is outside the specified range, or the capacity of the Unit power supply is insufficient.     | Configure the power supply system configuration correctly according to the power supply design method.  |                       | Configure the power supply system configuration correctly according to the power supply design method. |        |
|                                 | There is a hardware error in an NX Unit.   | If the error persists even after you make the above correction, replace the NX Unit.  |                       | None   |        |

|                             |  |  |  |
|-----------------------------|--|--|--|
| <b>Cause and correction</b> | For Communications Coupler Units   |  |  |
|                             | An error that prevents normal NX bus communications occurred in a Communications Coupler Unit.                                     | Check the error that occurred in the Communications Coupler Unit and perform the required corrections. | Take preventive measures against the error that occurred in the Communications Coupler Unit. |
|                             | 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.   | If the power cable between the Unit power supply and the NX Units is broken, replace it.               | 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>  | When this event occurs, the emergency error code indicates FF20 hex.   |  |  |

|                             |  |  |   |   |                         |              |
|-----------------------------|--|--|---|---|-------------------------|--------------|
| <b>Event name</b>           | NX Unit Clock Not Synchronized Error   |  | <b>Event code</b>   | 80240000 hex  |                         |              |
| <b>Meaning</b>              | A time information error occurred in an NX Unit.   |  |   |   |                         |              |
| <b>Source</b>               | Depends on where the Support Software is connected and the system configuration.   |  | <b>Source details</b>   | Depends on where the Support Software is connected and the system configuration.  | <b>Detection timing</b> | Continuously |
| <b>Error attributes</b>     | <b>Level</b>   | Minor fault  |   | <b>Log category</b>   | System                  |              |
|                             | <b>Recovery</b>  | For the NX bus of CPU Units<br>Cycle the power supply to the Unit.<br>For Communications Coupler Units<br>Cycle the power supply to the Unit and then reset all of the errors in the Controller. |   |   |                         |              |
| <b>Effects</b>              | <b>User program</b>  | Continues.   | <b>Operation</b>  | I/O refreshing for the NX Unit stops.<br>The EtherCAT communications stop in Init state, and do not accept the state transition request to Pre-Operational or other states. |                         |              |
|                             | <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>       |              |
|                             | For the NX bus of CPU Units  |  |   |   |                         |              |
|                             | There is a hardware error in an NX Unit.   |  | If the error occurs only in a specific NX Unit, replace the relevant NX Unit.   |   | None                    |              |
|                             | There is a hardware error in a CPU Unit.   |  | If the error occurs in all of the NX Units mounted on a CPU Unit, replace the CPU Unit.                                       |   | None                    |              |
|                             | For Communications Coupler Units   |  |   |   |                         |              |
|                             | There is a hardware error in an NX Unit.   |  | If the error occurs only in a specific NX Unit, replace the relevant NX Unit.   |   | None                    |              |
|                             | There is a hardware error in an EtherCAT Coupler Unit.   |  | If the error occurs in all of the NX Units mounted on a Communications Coupler Unit, replace the Communications Coupler Unit. |   | None                    |              |
| <b>Attached information</b> | None   |  |   |   |                         |              |
| <b>Precautions/Remarks</b>  | When this event occurs, the AL-Status Code indicates 8004 hex.<br>When this event occurs, the emergency error code indicates FF21 hex. |  |   |   |                         |              |



|                                 |  |   |  |  |              |
|---------------------------------|--|---|--|--|--------------|
| <b>Event name</b>               | Process Data WDT Error   |   | <b>Event code</b>  | 85000000 hex   |              |
| <b>Meaning</b>                  | Process data communications were stopped for more than the specified period of time.   |   |  |  |              |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   | <b>Source details</b>   | Depends on where the Support Software is connected and the system configuration. | <b>Detection timing</b>  | Continuously |
| <b>Error attributes</b>         | <b>Level</b>   | Minor fault   |  | <b>Log category</b>  | System       |
|                                 | <b>Recovery</b>  | Reset the error in the EtherCAT Slave Unit.   |  |  |              |
| <b>Effects</b>                  | <b>User program</b>  | Continues.  | <b>Operation</b>   | The NX Unit will continue to operate.<br>The EtherCAT communications enter Safe-Operational state. |              |
| <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 EtherCAT communications cable is disconnected or broken.   | Connect the EtherCAT communications cable securely.   |  | Connect the EtherCAT communications cable securely.  |              |
|                                 | There is an error in the host controller.  | Check the operation of the host controller and take appropriate measures if there is a problem. |  | None   |              |
| <b>Attached information</b>     | None   |   |  |  |              |
| <b>Precautions/Remarks</b>      | When this event occurs, the AL-Status Code indicates 001B hex.<br>When this event occurs, the emergency error code indicates FF13 hex. |   |  |  |              |

|                                 |  |                             |  |  |  |                                  |
|---------------------------------|--|-----------------------------|--|--|--|----------------------------------|
| <b>Event name</b>               | NX Message Communications Error  |                             | <b>Event code</b>  | 80220000 hex   |  |                                  |
| <b>Meaning</b>                  | An error was detected in message communications and the message frame was discarded.   |                             |  |  |  |                                  |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration.   |                             | <b>Source details</b>  | Depends on where the Support Software is connected and the system configuration. | <b>Detection timing</b>  | During NX message communications |
| <b>Error attributes</b>         | <b>Level</b>   | Observation                 |  | <b>Log category</b>  | System   |                                  |
|                                 | <b>Recovery</b>  | ---                         |  |  |  |                                  |
| <b>Effects</b>                  | <b>User program</b>  | Continues.                  | <b>Operation</b>   | Not affected.  |  |                                  |
| <b>System-defined variables</b> | <b>Variable</b>  | None                        |  | <b>Data type</b>   | ---  |                                  |
|                                 | <b>Name</b>  | ---                         |  |  |  |                                  |
| <b>Cause and correction</b>     | <b>Assumed cause</b>   | For the NX bus of CPU Units |  | <b>Correction</b>  | <b>Prevention</b>  |                                  |
|                                 | The message communications load is high.   |                             | Reduce the number of times that instructions are used to send NX messages. |  | Reduce the number of times that instructions are used to send NX messages. |                                  |
|                                 | For Communications Coupler Units   |                             |  |  |  |                                  |
|                                 | The message communications load is high.   |                             | Reduce the number of times that instructions are used to send NX messages. |  | Reduce the number of times that instructions are used to send NX messages. |                                  |
|                                 | The communications cable is disconnected or broken.<br>This cause does not apply if attached information 2 is 0 (NX bus).  |                             | Connect the communications cable securely.                                 |  | Connect the communications cable securely.                                 |                                  |
|                                 | Message communications were cutoff by executing the followings in message communications. <ul style="list-style-type: none"> <li>• Transfer of parameters by the Support Software</li> <li>• Restoration of the backup data (if this error occurred in the EtherCAT Slave Terminal)</li> <li>• Disconnection of an EtherCAT slave (if this error occurred in the EtherCAT Slave Terminal)</li> </ul> |                             | ---  |  | ---  |                                  |
| <b>Attached information</b>     | Attached information 1: System information<br>Attached information 2: Type of communications where error occurred<br>0: NX bus<br>1: EtherCAT<br>2: Serial communications (USB)<br>3: EtherNet/IP<br>65535: Internal Unit communications (routing)   |                             |  |  |  |                                  |
| <b>Precautions/Remarks</b>      | When this event occurs, the emergency error code indicates FF22 hex.   |                             |  |  |  |                                  |

|                                 |  |                       |  |                         |                          |
|---------------------------------|--|-----------------------|--|-------------------------|--------------------------|
| <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 Support Software is connected and the system configuration.   | <b>Source details</b> | Depends on where the Support Software is connected and the system configuration. | <b>Detection timing</b> | When commanded from user |
| <b>Error attributes</b>         | <b>Level</b>   | Information           |  | <b>Log category</b>     | Access                   |
|                                 | <b>Recovery</b>  | ---                   |  |                         |                          |
| <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 1: Events that were cleared<br>1: The system event log was cleared.<br>2: The access event log was cleared. |                       |  |                         |                          |
| <b>Precautions/Remarks</b>      | When this event occurs, the emergency error code indicates FF00 hex.   |                       |  |                         |                          |

|                                 |  |                       |  |   |              |
|---------------------------------|--|-----------------------|--|---|--------------|
| <b>Event name</b>               | NX Unit Restart  |                       | <b>Event code</b>  | 94B80000 hex                                    |              |
| <b>Meaning</b>                  | An NX Unit was restarted.  |                       |  |   |              |
| <b>Source</b>                   | Depends on where the Support Software is connected and the system configuration. | <b>Source details</b> | Depends on where the Support Software is connected and the system configuration. | <b>Detection timing</b>                         | Continuously |
| <b>Error attributes</b>         | <b>Level</b>   | Information           |  | <b>Log category</b>                             | Access       |
|                                 | <b>Recovery</b>  | ---                   |  |   |              |
| <b>Effects</b>                  | <b>User program</b>  | Continues.            | <b>Operation</b>   | Operation starts after the restart is executed. |              |
| <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>                               |              |
|                                 | An NX Unit was restarted or a controller reset was executed.                     | ---                   |  | ---   |              |
| <b>Attached information</b>     | None   |                       |  |   |              |
| <b>Precautions/Remarks</b>      | When this event occurs, the AL-Status Code indicates 0060 hex.                   |                       |  |   |              |

## 8-4 Checking for Errors and Troubleshooting with Emergency Messages

The EtherCAT Slave Unit is able to report emergency messages to the EtherCAT master by using the SDO communications if it detects errors.

The emergency messages report errors related to EtherCAT communications and application level errors.

### 8-4-1 Enabling/Disabling Emergency Message Notification

You can use SDO communications to specify whether notification is provided with emergency messages. The applicable indexes are a subindex of 05 hex *Flags* in the *Diagnosis History* (10F3 hex) CoE object.

The settings are as follows:

| Setting value | Emergency message notification to EtherCAT master |
|---------------|---|
| 0000 hex      | No notification                                   |
| 0001 hex      | Notification                                      |

When the power supply is turned ON, the EtherCAT Slave Unit always starts with the *No notification* setting. If you want to use the EtherCAT Slave Unit with the *Notification* setting, enable the *Notification* every time you turn ON the power supply. The emergency messages are reported only when the Unit enters Pre-Operational or other states.

The following shows the format of the emergency message.

| Byte     | 0                    | 1 | 2        | 3 | 4          | 5 | 6 | 7 |
|----------|----------------------|---|----------|---|------------|---|---|---|
| Contents | Emergency error code |   | Reserved |   | Event code |   |   |   |

Refer to *8-4-3 Emergency Error Codes* on page 8-57 for information on the emergency error codes.

Refer to *8-3-3 Error Table* on page 8-10 for information on the event codes.

### 8-4-2 Error Logs

A log of the errors that were reported with emergency messages is saved in the non-volatile memory of the EtherCAT Slave Unit. This log can save up to 32 errors. You can read the errors with SDO communications. The indexes to read are from subindexes 06 to 25 hex (*Diagnosis Message 1* to 32) in the *Diagnosis History* (10F3) CoE object.

The error log saves errors sequentially from *Diagnosis Message 1* to *Diagnosis Message 32*. The count returns to *Diagnosis Message 1* on the 33rd error. Even if the setting is made so that emergency messages are not sent to the EtherCAT master or an emergency message cannot be sent, it is still saved in the error log. Note that a *Non-volatile Memory Hardware Error* (00200000 hex) is not saved in the error log.



#### Additional Information

When new error is registered in the error log, the subindex 04 hex *New Messages Available* in the *Diagnosis History* (10F3 hex) CoE object becomes TRUE.

Refer to the *Diagnosis History* (10F3 hex) CoE object in *A-6-4 Communication Objects* on page A-34 for the format of the error log.

### 8-4-3 Emergency Error Codes

The following table shows the emergency error codes used by the EtherCAT Slave Unit, their causes, and corrections.

Some emergency error codes indicate multiple errors by a single code. To identify the cause of the error for that code, read the event code that is stored in 4 to 7th bytes of the emergency message.

Use this document to check the error descriptions and corrections for the applicable event codes.

Alternatively, connect the Symac Studio or NA-series HMI to the CPU Unit, and use the troubleshooting function to identify the cause of the error.

| Emergency error code | Cause                                   | Error log record | Notification to EtherCAT master | Correction   |
|----------------------|---|------------------|---------------------------------|--|
| 5540 hex             | Control Parameter Error in Master       | Saved.           | Possible.                       | Refer to Control Parameter Error in Master ( page 8-21).       |
| 5600 hex             | ESC Error                               | Saved.           | Not possible.                   | Refer to ESC Error ( page 8-20).                               |
| 6140 hex             | SII Verification Error                  | Saved.           | Not possible.                   | Refer to SII Verification Error ( page 8-20).                  |
| 6150 hex             | NX Unit Processing Error                | Saved.           | Not possible.                   | Refer to NX Unit Processing Error ( page 8-49).                |
| 6350 hex             | Illegal I/O Entry Added C to M          | Saved.           | Possible.                       | Refer to Illegal I/O Entry Added C to M ( page 8-36).          |
| 6351 hex             | Illegal I/O Entry Added M to C          | Saved.           | Possible.                       | Refer to Illegal I/O Entry Added M to C ( page 8-37).          |
| 6352 hex             | Incorrect I/O Entry Order C to M        | Saved.           | Possible.                       | Refer to Incorrect I/O Entry Order C to M ( page 8-30).        |
| 6353 hex             | Incorrect I/O Entry Order M to C        | Saved.           | Possible.                       | Refer to Incorrect I/O Entry Order M to C ( page 8-35).        |
| 6354 hex             | I/O Entry Data Capacity Exceeded C to M | Saved.           | Possible.                       | I/O Entry Data Capacity Exceeded C to M ( page 8-38).          |
| 6355 hex             | I/O Entry Data Capacity Exceeded M to C | Saved.           | Possible.                       | Refer to I/O Entry Data Capacity Exceeded M to C ( page 8-39). |
| A000 hex             | RxPDO Setting Error                     | Saved.           | Not possible.                   | Refer to RxPDO Setting Error ( page 8-22).                     |
| A000 hex             | TxPDO Setting Error                     | Saved.           | Not possible.                   | Refer to TxPDO Setting Error ( page 8-23).                     |
| A000 hex             | PDO WDT Setting Error                   | Saved.           | Not possible.                   | Refer to PDO WDT Setting Error ( page 8-24).                   |
| A000 hex             | TxPDO Mapping Error                     | Saved.           | Not possible.                   | Refer to TxPDO Mapping Error ( page 8-25).                     |
| A000 hex             | RxPDO Mapping Error                     | Saved.           | Not possible.                   | Refer to RxPDO Mapping Error ( page 8-26).                     |
| A000 hex             | DC Mode Not Supported                   | Saved.           | Not possible.                   | Refer to DC Mode Not Supported ( page 8-29).                   |
| A000 hex             | Incorrect PDO Entry Order M to C        | Saved.           | Not possible.                   | Refer to Incorrect PDO Entry Order M to C ( page 8-31).        |
| A000 hex             | Incorrect PDO Entry Order C to M        | Saved.           | Not possible.                   | Refer to Incorrect PDO Entry Order C to M ( page 8-32).        |
| A000 hex             | Illegal PDO Entry Added M to C          | Saved.           | Not possible.                   | Refer to Illegal PDO Entry Added M to C ( page 8-40).          |
| A000 hex             | Illegal PDO Entry Added C to M          | Saved.           | Not possible.                   | Refer to Illegal PDO Entry Added C to M ( page 8-41).          |
| A000 hex             | PDO Entry Data Capacity Exceeded M to C | Saved.           | Not possible.                   | Refer to PDO Entry Data Capacity Exceeded M to C ( page 8-42). |

| Emergency error code | Cause   | Error log record | Notification to EtherCAT master | Correction   |
|----------------------|---|------------------|---------------------------------|--|
| A000 hex             | PDO Entry Data Capacity Exceeded C to M                     | Saved.           | Not possible.                   | Refer to PDO Entry Data Capacity Exceeded C to M ( page 8-43).                     |
| A000 hex             | Incorrect RxPDO Mapping Order                               | Saved.           | Not possible.                   | Refer to Incorrect RxPDO Mapping Order ( page 8-44).                               |
| A000 hex             | Incorrect TxPDO Mapping Order                               | Saved.           | Not possible.                   | Refer to Incorrect TxPDO Mapping Order ( page 8-45).                               |
| A000 hex             | SM Event Mode Setting Error                                 | Saved.           | Not possible.                   | Refer to SM Event Mode Setting Error ( page 8-46).                                 |
| A000 hex             | FreeRun Setting Error                                       | Saved.           | Not possible.                   | Refer to FreeRun Setting Error ( page 8-47).                                       |
| FF00 hex             | Event Log Cleared   | Saved.           | Not possible.                   | Refer to Event Log Cleared ( page 8-55).   |
| FF10 hex             | Illegal State Transition Request Received                   | Saved.           | Not possible.                   | Refer to Illegal State Transition Request Received ( page 8-27).                   |
| FF11 hex             | Error State Transition Received                             | Saved.           | Not possible.                   | Refer to Error State Transition Received ( page 8-28).                             |
| FF12 hex             | Mailbox Setting Error                                       | Saved.           | Not possible.                   | Refer to Mailbox Setting Error ( page 8-48).                                       |
| FF13 hex             | Process Data WDT Error                                      | Saved.           | Not possible.                   | Refer to Process Data WDT Error ( page 8-53).                                      |
| FF20 hex             | NX Unit I/O Communications Error                            | Saved.           | Possible.                       | Refer to NX Unit I/O Communications Error ( page 8-50).                            |
| FF21 hex             | NX Unit Clock Not Synchronized Error                        | Saved.           | Not possible.                   | Refer to NX Unit Clock Not Synchronized Error ( page 8-52).                        |
| FF22 hex             | NX Message Communications Error                             | Saved.           | Not possible.                   | Refer to NX Message Communications Error ( page 8-54).                             |
| FF30 hex             | Data Size Mismatched between PDO Entry and I/O Entry M to C | Saved.           | Possible.                       | Refer to Data Size Mismatched between PDO Entry and I/O Entry M to C ( page 8-34). |
| FF31 hex             | Data Size Mismatched between PDO Entry and I/O Entry C to M | Saved.           | Possible.                       | Refer to Data Size Mismatched between PDO Entry and I/O Entry C to M ( page 8-33). |

## 8-5 Checking for Errors and Troubleshooting with AL Status

The EtherCAT Slave Unit reports the status related to the EtherCAT communications to the EtherCAT master with the AL status.

The AL status reports errors related to EtherCAT communications.

### 8-5-1 Procedure for Checking AL Status Codes

The AL status is reported to the EtherCAT master through the register 0134 hex of the EtherCAT slave communications controller that is built in the EtherCAT Slave Unit. Check the AL status of the EtherCAT slave according to the specifications of the EtherCAT master.

### 8-5-2 AL Status Codes

The following table shows the AL status codes used by the EtherCAT Slave Unit, their causes, and corrections.

Some AL status codes indicate multiple errors by a single code. To identify the cause of the error for that code, read the error log from the *Diagnosis History* (10F3 hex) CoE object. Use this document to check the error descriptions and corrections for the applicable event codes.

Alternatively, connect the Symac Studio or NA-series HMI to the CPU Unit, and use the troubleshooting function to identify the cause of the error.

| AL status code | Status name                    | Cause                                     | Correction  |
|----------------|--------------------------------|---|---|
| 0001 hex       | Unspecified error              | NX Unit Processing Error                  | Refer to NX Unit Processing Error ( page 8-49)                  |
| 0002 hex       | No Memory                      | Non-volatile Memory Hardware Error        | Refer to Non-volatile Memory Hardware Error ( page 8-19)        |
| 0011 hex       | Invalid requested state change | Illegal State Transition Request Received | Refer to Illegal State Transition Request Received ( page 8-27) |
| 0012 hex       | Unknown requested state        | Error State Transition Received           | Refer to Error State Transition Received ( page 8-28)           |
| 0014 hex       | No valid firmware              | SII Verification Error                    | Refer to SII Verification Error ( page 8-20)                    |
| 0016 hex       | Invalid mailbox configuration  | Mailbox Setting Error                     | Refer to Mailbox Setting Error ( page 8-48)                     |
| 001B hex       | Sync manager watchdog          | Process Data WDT Error                    | Refer to Process Data WDT Error ( page 8-53)                    |
| 001D hex       | Invalid Output Configuration   | RxPDO Setting Error                       | Refer to RxPDO Setting Error ( page 8-22)                       |
| 001E hex       | Invalid Input Configuration    | TxPDO Setting Error                       | Refer to TxPDO Setting Error ( page 8-23)                       |
| 001F hex       | Invalid Watchdog Configuration | PDO WDT Setting Error                     | Refer to PDO WDT Setting Error ( page 8-24)                     |
| 0024 hex       | Invalid Input Mapping          | TxPDO Mapping Error                       | Refer to TxPDO Mapping Error ( page 8-25)                       |
| 0024 hex       | Invalid Input Mapping          | Illegal PDO Entry Added C to M            | Refer to Illegal PDO Entry Added C to M ( page 8-41)            |
| 0024 hex       | Invalid Input Mapping          | Incorrect PDO Entry Order C to M          | Refer to Incorrect PDO Entry Order C to M ( page 8-32)          |

| AL status code | Status name                   | Cause                                   | Correction  |
|----------------|-------------------------------|---|---|
| 0024 hex       | Invalid Input Mapping         | PDO Entry Data Capacity Exceeded C to M | Refer to PDO Entry Data Capacity Exceeded C to M ( page 8-43) |
| 0024 hex       | Invalid Input Mapping         | Incorrect TxPDO Mapping Order           | Refer to Incorrect TxPDO Mapping Order ( page 8-45)           |
| 0025 hex       | Invalid Output Mapping        | RxPDO Mapping Error                     | Refer to RxPDO Mapping Error ( page 8-26)                     |
| 0025 hex       | Invalid Output Mapping        | Incorrect PDO Entry Order M to C        | Refer to Incorrect PDO Entry Order M to C ( page 8-31)        |
| 0025 hex       | Invalid Output Mapping        | Illegal PDO Entry Added M to C          | Refer to Illegal PDO Entry Added M to C ( page 8-40)          |
| 0025 hex       | Invalid Output Mapping        | PDO Entry Data Capacity Exceeded M to C | Refer to PDO Entry Data Capacity Exceeded M to C ( page 8-42) |
| 0025 hex       | Invalid Output Mapping        | Incorrect RxPDO Mapping Order           | Refer to Incorrect RxPDO Mapping Order ( page 8-44)           |
| 0028 hex       | SyncMode not supported        | SM Event Mode Setting Error             | Refer to SM Event Mode Setting Error ( page 8-46)             |
| 0029 hex       | FreeRun needs 3Buffer Mode    | FreeRun Setting Error                   | Refer to FreeRun Setting Error ( page 8-47)                   |
| 0030 hex       | Invalid DC SYNC Configuration | DC Mode Not Supported                   | Refer to DC Mode Not Supported ( page 8-29)                   |
| 0060 hex       | Slave restarted locally       | NX Unit Restart                         | Refer to NX Unit Restart ( page 8-55)                         |
| 8004 hex       | CPU Unit error                | NX Unit Clock Not Synchronized Error    | Refer to NX Unit Clock Not Synchronized Error ( page 8-52)    |



## 8-6 Resetting Errors

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Current errors in the EtherCAT Slave Unit are retained, unless you reset them, until you cycle the power supply or restart the EtherCAT Slave Unit.

To reset errors, you must remove the cause of the current error. If you reset an error without removing the cause, the same error will occur again.



### Precautions for Correct Use

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Resetting the errors does not remove the cause of the error.

Always remove the cause of the error, and then reset the error. If you repeat resetting an error without removing the cause of the error, the same error will be newly registered in the error log.

---

Refer to the troubleshooting manual for the connected CPU Unit for information on how to reset current errors in the EtherCAT Slave Unit. You can also reset the current errors by writing values to the *Sysmac Error Status Clear* (2002:02 hex) CoE object. Refer to *Sysmac Error Status Clear* (2002:02 hex) in *A-6-7 Manufacturer-specific Object 1* on page A-49 for details on this object.



### Additional Information

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The ESI file of the EtherCAT Slave Unit specifies to write values to the *Sysmac Error Status Clear* (2002:02 hex) CoE object as an initialization command for moving from Pre-Operational state to Safe-Operational state.

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# Inspection and Maintenance

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

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|            |                                      |            |
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# 9-1 Cleaning and Inspection

This section describes daily maintenance and the cleaning and inspection methods.

Inspect the EtherCAT Slave Units daily or periodically in order to keep it in optimal operating condition.

## 9-1-1 Cleaning

Clean the EtherCAT Slave Units regularly as described below in order to keep it in optimal operating condition.

- Wipe the equipment over with a soft, dry cloth when performing daily cleaning.
- If dirt remains even after wiping with a soft, dry cloth, wipe with a cloth that has been wet with a sufficiently diluted detergent (2%) and wrung dry.
- A smudge may remain on the NX Unit from gum, vinyl, or tape that was left on for a long time. Remove the smudge when cleaning.



### Precautions for Correct Use

- Never use volatile solvents, such as paint thinner, benzene, or chemical wipes.
- Do not touch the NX bus connectors.

## 9-1-2 Periodic Inspections

Although the major components in NX Units have an extremely long life time, they can deteriorate under improper environmental conditions. Periodic inspections are thus required.

Inspection is recommended at least once every six months to a year, but more frequent inspections will be necessary in adverse 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.         |

| No. | Inspection item         | Inspection details   | Criteria   | Correction  |
|-----|-------------------------|--|--|---|
| 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%.<br>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 gases   | 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 until they touch the DIN track? | You must connect and fix the NX Units to the DIN track.                  | Connect the NX Units to each other along the hookup guides and insert them until they touch the DIN track.  |
|     |                         | Are there any damaged external wiring cables?  | No visible damage  | Check visually and replace cables if necessary.   |

## Tools Required for Inspections

### ● Required Tools

- Phillips screwdriver
- Flat-blade screwdriver

- Voltage tester or digital voltmeter
- Industrial alcohol and pure cotton cloth

### ● **Tools Required Occasionally**

- Oscilloscope
- Thermometer and hygrometer

## 9-2 Maintenance Procedures

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When you replace an EtherCAT Slave Unit, follow the procedure in the user's manual for the connected CPU Unit.







# Appendices

This section describes dimensions and objects that are implemented in the EtherCAT Slave Unit.

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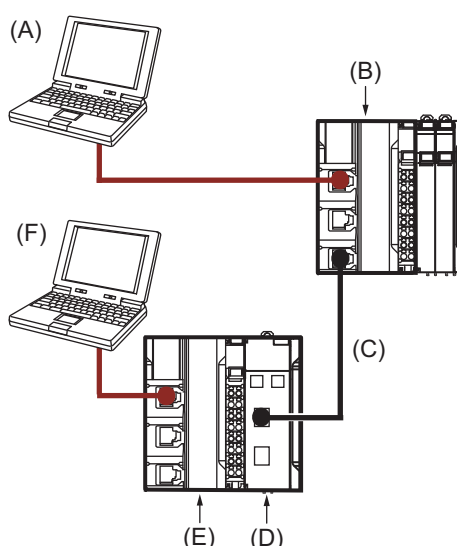
# A-1 Example of Operations for EtherCAT Slave Unit Communications

This section provides an example of operations for EtherCAT Slave Unit communications with an EtherCAT master.

In this example, the NX-series CPU Unit's built-in EtherCAT port is used as the EtherCAT master. Refer to the *NJ/NX-series CPU Unit Built-in EtherCAT Port User's Manual (Cat. No. W505)* for details on how to use the built-in EtherCAT port on the NX-series CPU Unit.

## A-1-1 System Configuration

The following configuration is used for this example.



| Letter | Configuration                          | Description   |
|--------|--|---|
| (A)    | Sysmac Studio (Configuration Software) | Used to set the EtherCAT master and EtherCAT network.                                     |
| (B)    | EtherCAT master (NX-series CPU Unit)   | EtherCAT master for (D).<br>It uses the built-in EtherCAT port on the NX-series CPU Unit. |
| (C)    | Communications cable                   | ---   |
| (D)    | NX-series EtherCAT Slave Unit          | NX-ECT101   |
| (E)    | NX-series CPU Unit                     | CPU Unit connecting the NX-ECT101 with the NX bus.  |
| (F)    | Sysmac Studio                          | Used to set the EtherCAT Slave Unit and CPU Rack.   |

## A-1-2 Setting Conditions of the EtherCAT Slave Unit

The following setting conditions are used in this example.

## I/O Allocation Settings of the EtherCAT Slave Unit

Set the following I/O allocations.

| Item   | I/O entry mapping name to be selected                       | I/O entry index to be registered |
|--------|---|----------------------------------|
| Output | Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | 7000:01 hex to 7000:06 hex       |
|        | Data Set in UDINT from CPU Unit to EtherCAT Master          | 7002:01 hex to 7002:04 hex       |
| Input  | EtherCAT Slave Status Information                           | 6003:01 hex                      |
|        | Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit | 6000:01 hex to 6000:06 hex       |
|        | Data Set in UDINT from EtherCAT Master to CPU Unit          | 6002:01 hex to 6002:04 hex       |

## PDO Mapping Settings of the EtherCAT Slave Unit

Set the following PDO mappings.

| Item   | PDO mapping object name to be selected                      | PDO entry index to be registered |
|--------|---|----------------------------------|
| Output | Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit | 7000:01 hex to 7000:06 hex       |
|        | Data Set in UDINT from EtherCAT Master to CPU Unit          | 7002:01 hex to 7002:04 hex       |
| Input  | NX Unit Status Information                                  | 6003:01 hex                      |
|        | Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | 6000:01 hex to 6000:06 hex       |
|        | Data Set in UDINT from CPU Unit to EtherCAT Master          | 6002:01 hex to 6002:04 hex       |
|        | New Messages Available Information                          | 10F3:04 hex                      |

## Explicit Device ID Setting of the EtherCAT Slave Unit



Use the ID switch of the EtherCAT Slave Unit to set the Explicit Device ID.

The following setting is made in this example.

| Item      | Setting value |
|-----------|---------------|
| ID switch | 01            |

### A-1-3 Flow of the Setting Procedure

Use the following procedure to establish EtherCAT Slave Unit communications with an EtherCAT master.

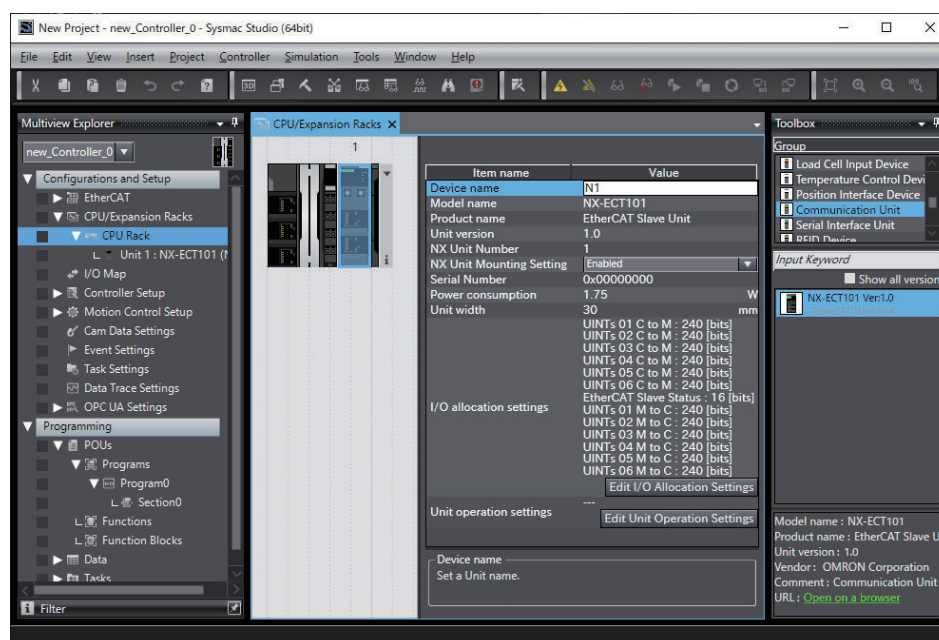
| Procedure   | Reference  |
|---|--|
| 1. Setting of NX-ECT101   | <i>A-1-4 EtherCAT Slave Unit Setting Procedure</i> on page A-5 |
|  |  |
| 2. Setting of EtherCAT master   | <i>A-1-5 EtherCAT Master Setting Procedure</i> on page A-7     |
|  |  |
| 3. Start of EtherCAT communications   | <i>A-1-6 Start EtherCAT Communications</i> on page A-9         |

## A-1-4 EtherCAT Slave Unit Setting Procedure

Use Sysmac Studio shown as (F) in the system configuration to create programs and make the EtherCAT Slave Unit settings. Refer to the *Sysmac Studio Version 1 Operation Manual (Cat. No. W504)* for the operating procedures of the Sysmac Studio.

- 1 Create a project in the Sysmac Studio.
- 2 Register variables for accessing the I/O data of the EtherCAT Slave Unit. Register the local variables or other variables to use in the program. Create the user program using the registered variables.
- 3 Select **Configurations and Setup - CPU/Expansion Racks - CPU Rack**, open the CPU and Expansion Racks Tab Page, and register the EtherCAT Slave Unit. Set the device name of the EtherCAT Slave Unit.

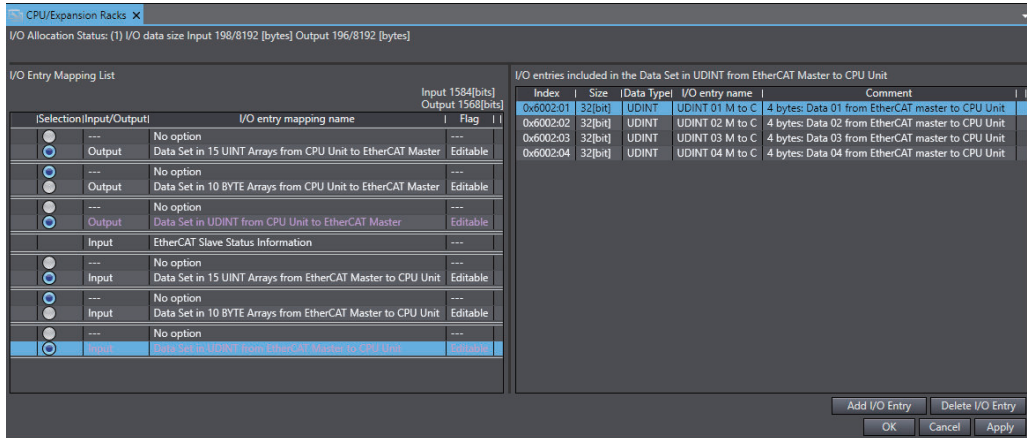
An example is shown below.



- 4 In the Edit I/O Allocation Settings Pane, set the I/O allocations according to the settings in *A-1-2 Setting Conditions of the EtherCAT Slave Unit* on page A-3 in *I/O Allocation Settings of the EtherCAT Slave Unit* on page A-4.

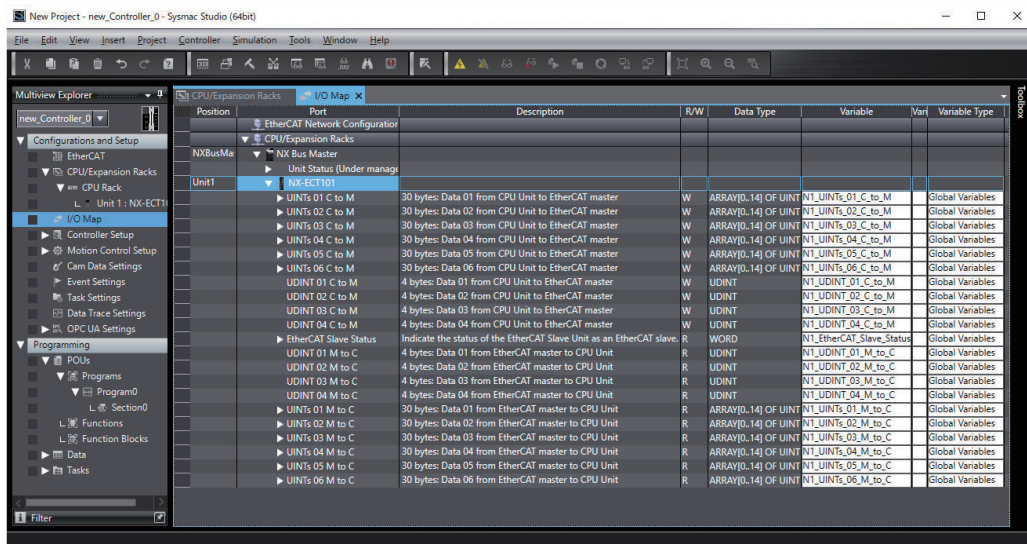
Refer to *6-4 Setting I/O Allocations with the Sysmac Studio* on page 6-17 for details on the I/O allocation settings with the Sysmac Studio.

An example is shown below.



**5** Allocate device variables on the I/O Map.

Refer to the *NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501)* for details on the I/O ports and device variables. An example is shown below where variable names are automatically created.



**6** With the power OFF, set the ID with the corresponding hardware switches. Refer to 3-3 *ID Switch* on page 3-7.

**7** Mount the EtherCAT Slave Unit to the CPU Rack. Refer to 4-1 *Installing Units* on page 4-2.

**8** Connect the communications cable between the EtherCAT master and EtherCAT Slave Unit. Refer to 4-3 *EtherCAT Network Wiring* on page 4-4.

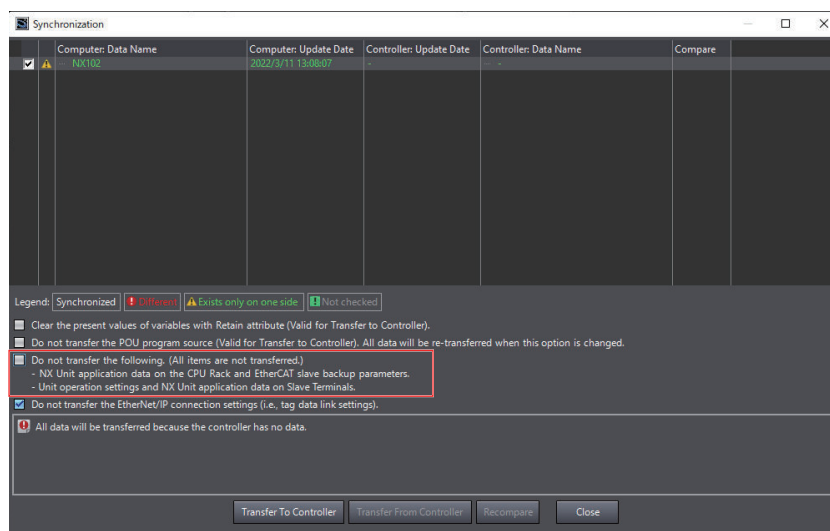
**9** Turn ON the power supply to the NX-series CPU Unit.

**10** Transfer the user program, CPU/Expansion Rack configuration, and settings for the EtherCAT Slave Unit to the NX-series CPU Unit. Use the *synchronization* operation of the Sysmac Studio to transfer the data.

To transfer the settings for the EtherCAT Slave Unit, clear the selection of the following check box on the Synchronization Pane.

Do not transfer the following. (All items are not transferred.)

- NX Unit application data on the CPU Rack and EtherCAT slave backup parameters.
- Unit operation settings and NX Unit application data on Slave Terminals.



After transferring the settings, the EtherCAT Slave Unit will automatically restart to enable the settings.

## A-1-5 EtherCAT Master Setting Procedure

The setting procedure of the EtherCAT master is provided below.

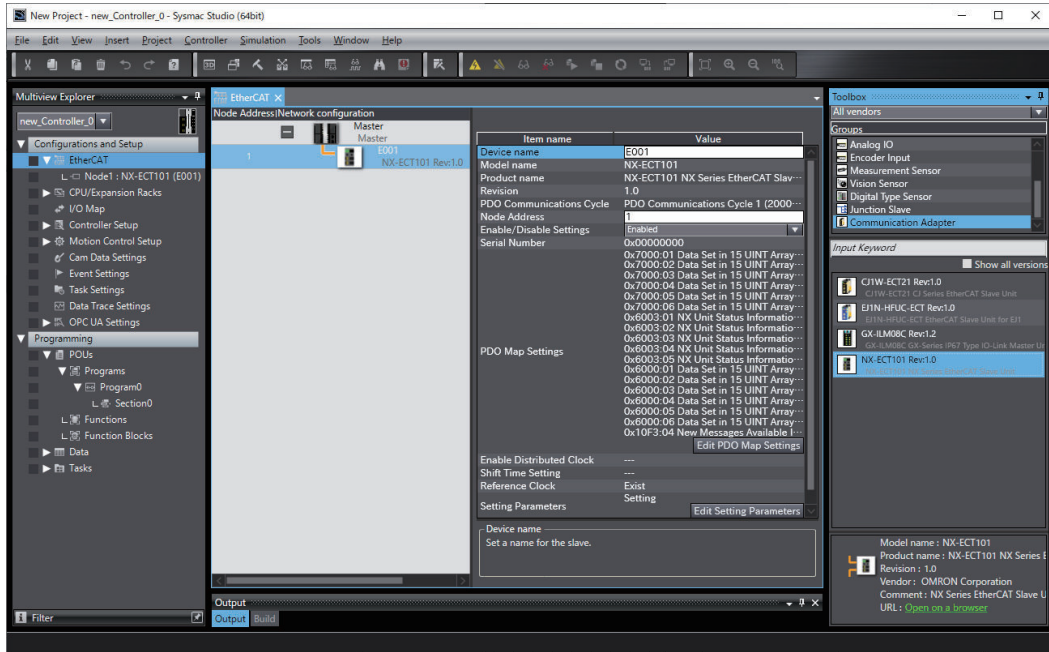
Use Sysmac Studio shown as (A) in the system configuration to set the EtherCAT master and Ether-CAT networks.

Refer to the *Sysmac Studio Version 1 Operation Manual (Cat. No. W504)* for the operating procedures of the Sysmac Studio.

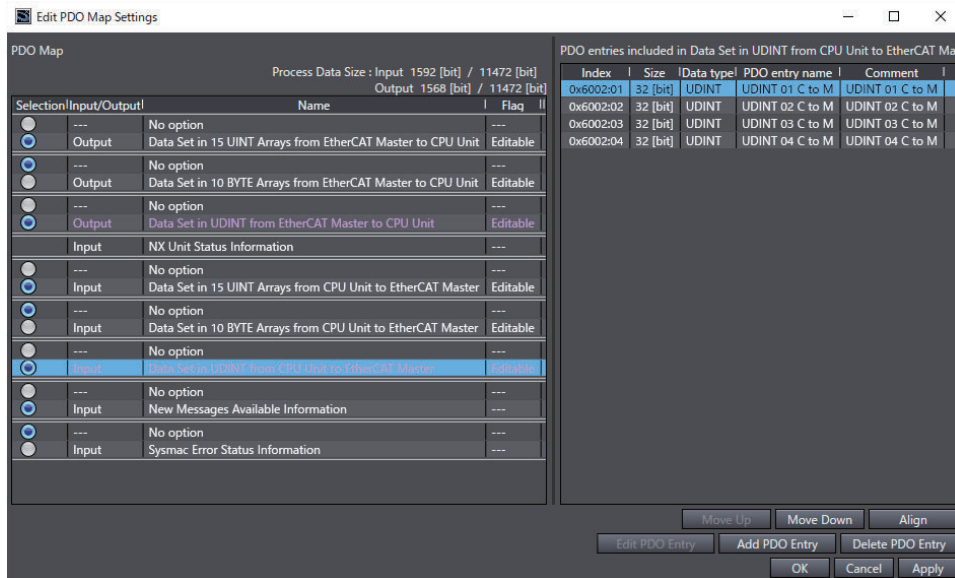
The ESI files for OMRON EtherCAT slaves are already installed in the Sysmac Studio. Update the Sysmac Studio to get the ESI files for the most recent EtherCAT Slave Unit.

- 1** Create a project in the Sysmac Studio.
- 2** Create the EtherCAT network configuration offline.
- 3** Register the EtherCAT Slave Unit in the network configuration and set the ID of the EtherCAT Slave Unit as the node address.

An example is shown below.



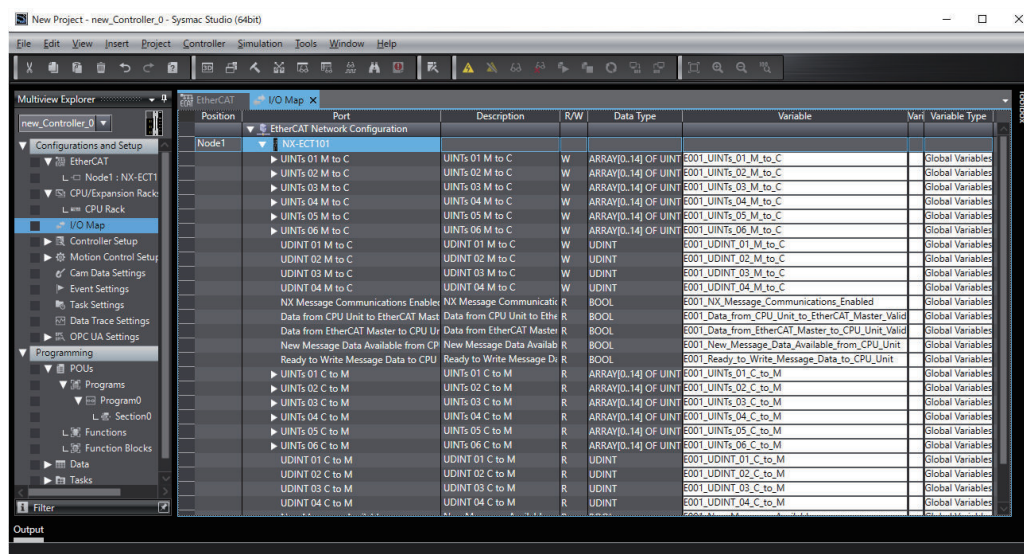
- 4 Set the PDO mapping of the EtherCAT Slave Unit. Click the **Edit PDO Map Settings** button. In the Edit PDO Map Settings window, set the PDO mapping according to the settings in *A-1-2 Setting Conditions of the EtherCAT Slave Unit* on page A-3 in *PDO Mapping Settings of the EtherCAT Slave Unit* on page A-4. An example is shown below.



- 5 Set the EtherCAT master parameters if necessary. Refer to the *NJ/NX-series CPU Unit Built-in EtherCAT Port User's Manual (Cat. No. W505)* for details on the parameters of the built-in EtherCAT port of the NJ/NX-series CPU Unit.
- 6 Assign the I/O data that is assigned in the PDO mapping settings to device variables. Assign the device variables to I/O ports in the **I/O Map**.



Refer to the *NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501)* for details on I/O ports and device variables. An example is shown below where variable names are automatically created.



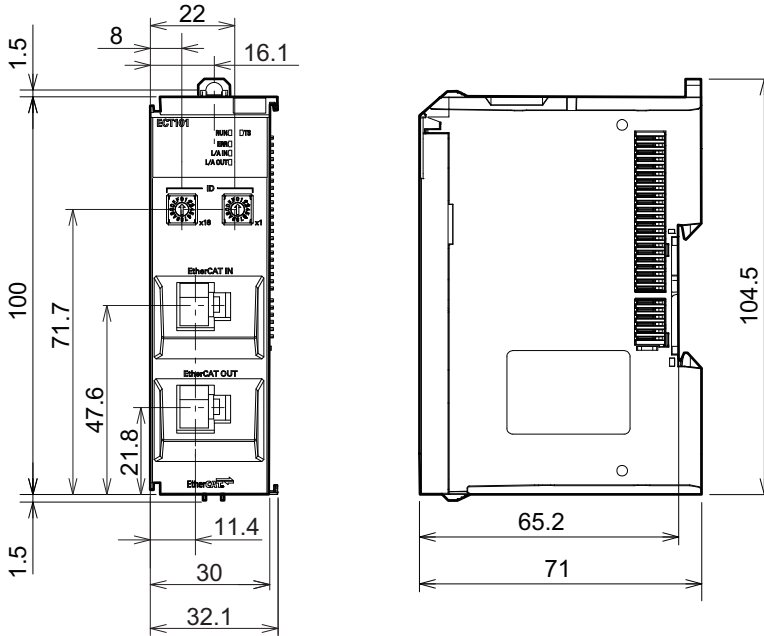
- 7 Create the user program using the device variables.
- 8 Turn ON the power supply to the EtherCAT master (NX-series CPU Unit).
- 9 Use the Sysmac Studio to set communications with the EtherCAT master (NX-series CPU Unit) and go online.
- 10 Transfer the network configuration information and user program to the EtherCAT master (NX-series CPU Unit). Use the *synchronization* operation of the Sysmac Studio to transfer the data.

## A-1-6 Start EtherCAT Communications

If the I/O allocation settings, PDO mapping settings, and Explicit Device ID settings are configured properly, EtherCAT communications should occur. Verify EtherCAT communications by checking the indicators and I/O data exchange.

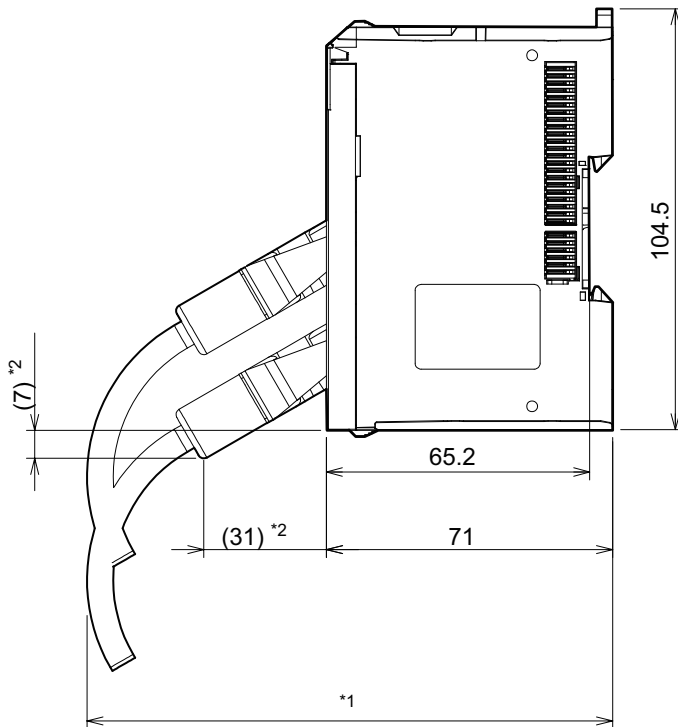
# A-2 Dimensions

## 30 mm Width



(Unit: mm)

## Installation Height



(Unit: mm)

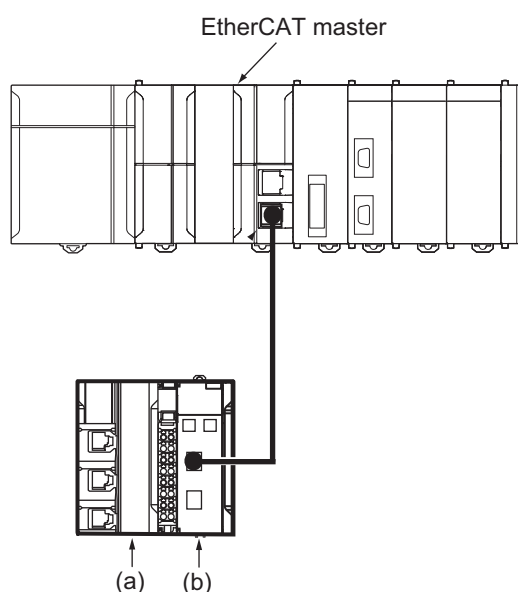
- \*1. Depends on the connector to use.
  - For MPS588-C: Approximately 120 mm
  - For XS6G-T421-1: Approximately 130 mm
- \*2. Dimension for XS6G-T421-1.
  - For MPS588-C, the connector does not protrude from the bottom of the Unit.

# A-3 Programming Example to Detect Valid Process Data

This section gives a programming example to confirm that the process data of the I/O data set to be transferred from the EtherCAT master to the CPU Unit is valid for an EtherCAT Slave Unit mounted to an NX-series CPU Unit.

## A-3-1 System Configuration

The system configuration is given below.



| Letter | Description         | Model      | Description  |
|--------|---------------------|------------|--|
| (a)    | NX-series CPU Unit  | NX102-□□□□ | CPU Unit connecting the NX-ECT101 with the NX bus.   |
| (b)    | EtherCAT Slave Unit | NX-ECT101  | <ul style="list-style-type: none"> <li>• NX Unit number: 1</li> <li>• Device name: N1</li> </ul> |

## A-3-2 Detection Method

For the method to confirm that the process data of the I/O data set to be transferred from the EtherCAT master to the CPU Unit is valid, use *Data from EtherCAT Master to CPU Unit Valid* in the *EtherCAT Slave Status* of the EtherCAT Slave Unit.

In addition, as a method for the CPU Unit to confirm that device variables are valid for an EtherCAT Slave Unit, use the *NX Unit I/O Data Active Status* and *NX Unit Error Status* that are managed by the NX Bus Function Module.

Refer to *EtherCAT Slave Status Information* on page 6-12 for the *EtherCAT Slave Status* of the EtherCAT Slave Unit. Refer to the *NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501)* for the *NX Unit I/O Data Active Status* and *NX Unit Error Status* that are managed by the NX Bus Function Module.

### A-3-3 Programming Example

In this example, the I/O data transferred from the EtherCAT master to the CPU Unit is copied to the I/O data set from the CPU Unit to the EtherCAT master after the following conditions are checked.

- The process data is valid for an EtherCAT Slave Unit.
- An EtherCAT Slave Unit is in a state where I/O data transmission is possible from the CPU Unit to the EtherCAT master.

A programming example is shown below.

#### Unit Operation Settings

Use the default values for the Unit operation settings.

#### I/O Map

The following table shows the variables that are assigned to the I/O Map on the Sysmac Studio.

| I/O port name                               | Variable name                                  | Description  | Data type             | Variable type   |
|---|--|--|-----------------------|-----------------|
| N1 NX Unit I/O Data Active Status           | NXBus_N1_NX_Unit_I_O_Data_Active_Status        | This variable is NX Unit I/O Data Active Status. This status tells whether I/O data in the NX Unit can be used for control. When the I/O data communications are enabled, this status is TRUE. | BOOL                  | Global variable |
| N1 NX Unit Error Status                     | NXBus_N1_NX_Unit_Error_Status                  | This variable is NX Unit Error Status. This status tells whether an error exists on the NX Unit. When an error occurs, this status is TRUE.  | BOOL                  | Global variable |
| Data from EtherCAT Master to CPU Unit Valid | N1_Data_from_EtherCAT_Master_to_CPU_Unit_Valid | Indicates whether the data from the EtherCAT master to the CPU Unit is valid.  | BOOL                  | Global variable |
| Data from CPU Unit to EtherCAT Master Valid | N1_Data_from_CPU_Unit_to_EtherCAT_Master_Valid | Indicates whether the data from the CPU Unit to the EtherCAT master is valid.  | BOOL                  | Global variable |
| UINTs 01 M to C                             | N1_UINTs_01_M_to_C                             | Data 01 that is transferred from EtherCAT master to CPU Unit.  | ARRAY [0..14] OF UINT | Global variable |
| UINTs 01 C to M                             | N1_UINTs_01_C_to_M                             | Data 01 that is transferred from CPU Unit to EtherCAT master.  | ARRAY [0..14] OF UINT | Global variable |

## Variable Table

External variables and internal variables that are used in the programming are given below.

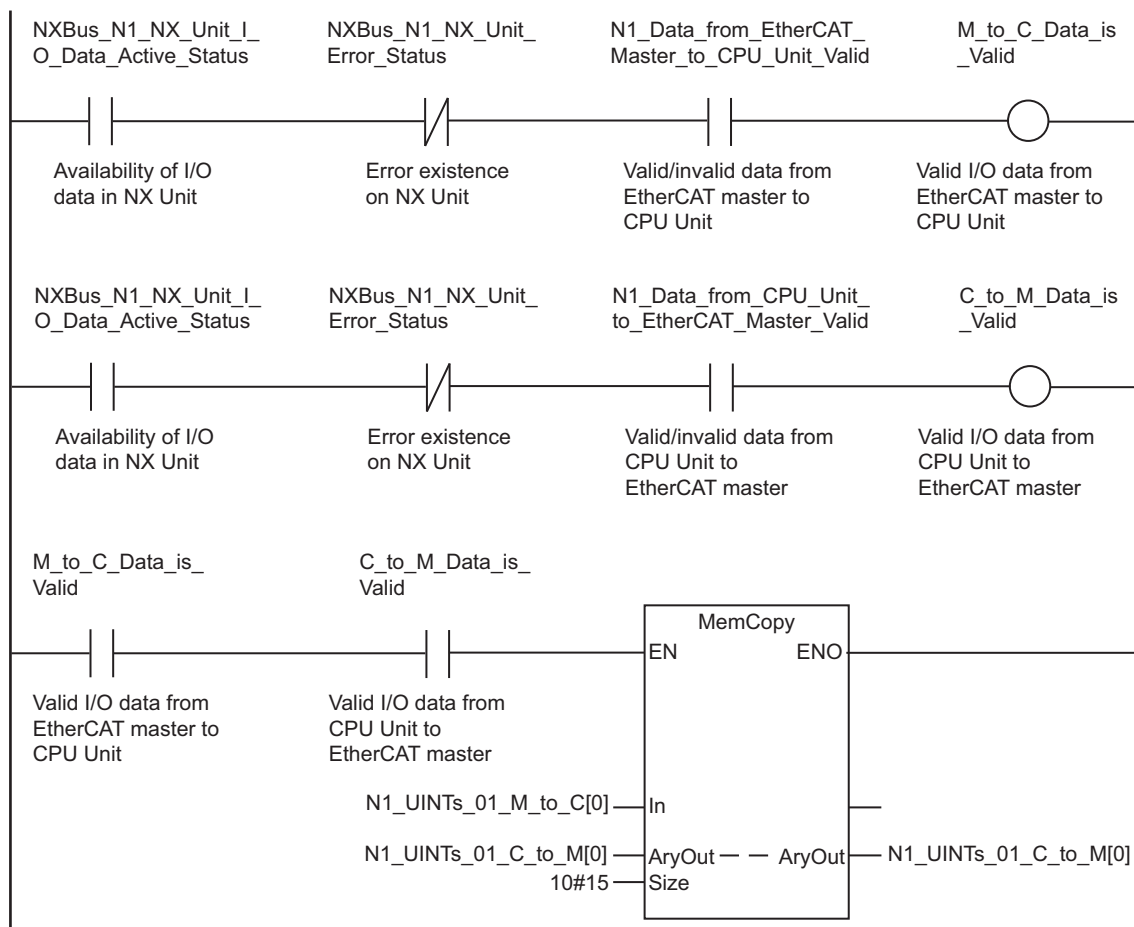
### ● External Variables

| Variable name                                  | Data type            | Initial value | AT   | Retain | Constant | Network publish | Description  |
|--|----------------------|---------------|--|--------|----------|-----------------|--|
| N1_UINTs_01_C_to_M                             | ARRAY[0..14] OF UINT | ---           | IOBus://unit#1/UINTs 01 C to M   | ---    | ---      | Do not publish. | Data 01 transferred from CPU Unit to EtherCAT master |
| N1_UINTs_01_M_to_C                             | ARRAY[0..14] OF UINT | ---           | IOBus://unit#1/UINTs 01 M to C   | ---    | ---      | Do not publish. | Data 01 transferred from EtherCAT master to CPU Unit |
| N1_Data_from_EtherCAT_Master_to_CPU_Unit_Valid | BOOL                 | ---           | IOBus://unit#1/EtherCAT Slave Status/Data from EtherCAT Master to CPU Unit Valid | ---    | ---      | Do not publish. | Valid/invalid data from EtherCAT master to CPU Unit  |
| N1_Data_from_CPU_Unit_to_EtherCAT_Master_Valid | BOOL                 | ---           | IOBus://unit#1/EtherCAT Slave Status/Data from CPU Unit to EtherCAT Master Valid | ---    | ---      | Do not publish. | Valid/invalid data from CPU Unit to EtherCAT master  |
| NXBus_N1_NX_Unit_I_O_Data_Active_Status        | BOOL                 | FALSE         | IOBus://unit#1/NX Unit I/O Data Active Status                                    | ---    | ---      | Do not publish. | Availability of I/O data in NX Unit                  |
| NXBus_N1_NX_Unit_Error_Status                  | BOOL                 | FALSE         | IOBus://unit#1/NX Unit Error Status  | ---    | ---      | Do not publish. | Error existence on NX Unit                           |

### ● Internal Variables

| Variable name        | Data type | Initial value | AT  | Retain | Constant | Description                                     |
|----------------------|-----------|---------------|-----|--------|----------|---|
| M_to_C_Data_is_Valid | BOOL      | FALSE         | --- | ---    | ---      | Valid I/O data from EtherCAT master to CPU Unit |
| C_to_M_Data_is_Valid | BOOL      | FALSE         | --- | ---    | ---      | Valid I/O data from CPU Unit to EtherCAT master |

## Ladder Programming



## ST Programming

```
// If I/O data in the NX Unit is available, no error exists on the NX Unit and data
// from the EtherCAT master to the CPU Unit is correct
IF NXBus_N1_NX_Unit_I_O_Data_Active_Status=TRUE AND NXBus_N1_NX_Unit_Error_Status=F
ELSE AND N1_Data_from_EtherCAT_Master_to_CPU_Unit_Valid=TRUE THEN
    // It is determined that data from the EtherCAT master to the CPU Unit can be u
    sed.
    M_to_C_Data_is_Valid:=TRUE;
ELSE
    // If even one of the conditions is not met, it is determined that data from th
    e EtherCAT master to the CPU Unit cannot be used.
    M_to_C_Data_is_Valid:=FALSE;
END_IF;

// If I/O data in the NX Unit is available, no error exists on the NX Unit and data
// from the CPU Unit to the EtherCAT master is correct
IF NXBus_N1_NX_Unit_I_O_Data_Active_Status=TRUE AND NXBus_N1_NX_Unit_Error_Status=F
```

```
ELSE AND N1_Data_from_CPU_Unit_to_EtherCAT_Master_Valid=TRUE THEN
    // It is determined that data from the CPU Unit to the EtherCAT master can be sent.
    C_to_M_Data_is_Valid:=TRUE;
ELSE
    // If even one of the conditions is not met, it is determined that data from the CPU Unit to the EtherCAT master cannot be sent.
    C_to_M_Data_is_Valid:=FALSE;
END_IF;

// If data from the EtherCAT master to the CPU Unit can be used and data from the CPU Unit to the EtherCAT master can be sent
IF M_to_C_Data_is_Valid=TRUE AND C_to_M_Data_is_Valid=TRUE THEN
    // Send data that is received from the EtherCAT master to the EtherCAT master.
    MemCopy(N1_UINTs_01_M_to_C[0], N1_UINTs_01_C_to_M[0], 10#15);
END_IF;
```

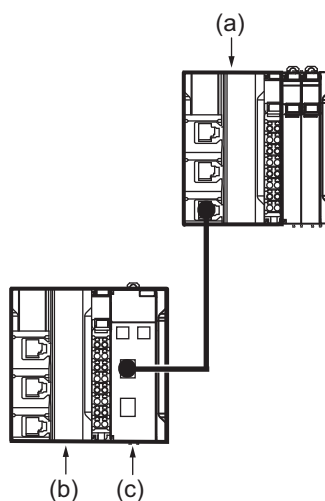


# A-4 Process Data Exchange in PROGRAM Mode

Regardless of the operating mode of the CPU Unit that is mounted with an EtherCAT Slave Unit, the EtherCAT Slave Unit continues to exchange process data with the EtherCAT master over the EtherCAT network. However, in the CPU Unit that is in PROGRAM mode, the execution of the user program stops and the execution results of the user program are not reflected to the process data value of the I/O data set to be transferred from the CPU Unit to the EtherCAT master. The EtherCAT Slave Unit does not indicate the transition of the CPU Unit to PROGRAM mode. When the operating mode of the CPU Unit is changed while the system is running, it is necessary to monitor this condition with the user program to determine if the process data of the I/O data set to be transferred from the CPU Unit to the EtherCAT master remains accurate.

## A-4-1 System Configuration

The system configuration is given below.



| Letter | Description         | Model      | Description  |
|--------|---------------------|------------|--|
| (a)    | NX-series CPU Unit  | NX102-□□□□ | NX-series CPU Unit to be used as an EtherCAT master.   |
| (b)    | NX-series CPU Unit  | NX102-□□□□ | CPU Unit connecting the NX-ECT101 with the NX bus.   |
| (c)    | EtherCAT Slave Unit | NX-ECT101  | <ul style="list-style-type: none"> <li>• NX Unit number: 1</li> <li>• Device name as an EtherCAT slave: E001</li> <li>• Device name as an NX Unit: N1</li> </ul> |

## A-4-2 Detection Method and Timing Considerations

This section describes the following items.

- The method for detecting transition of the CPU Unit to PROGRAM mode
- Consideration of detection timing

## Detection Method

In this section, pulses generated by the CPU Unit mounted with the EtherCAT Slave Unit are used for the method to detect the transition of the CPU Unit to PROGRAM mode. When pulses are stopped for the specified period of time, an error is detected. This shows the transition of the CPU Unit to PROGRAM mode.

Refer to the manuals for the EtherCAT master and the *NJ/NX-series CPU Unit Software User's Manual (Cat. No. W501)* for more information on creating the user program.

## Timing Considerations

When implementing this detection method, it is important to consider the maximum I/O response time of the EtherCAT Slave Unit. The programming example includes a timer instruction to detect that process data is not changing within a fixed amount of time. This time should be adjusted to a value that is more than the maximum I/O response time. Refer to *7-9-1 I/O Response Time* on page 7-26 for details on the maximum I/O response time.

### A-4-3 Programming Example for the EtherCAT Master

In this example, the NJ/NX-series CPU Unit's built-in EtherCAT port is used as the EtherCAT master. In the process data received by the EtherCAT master from the EtherCAT Slave Unit, the I/O data set to be transferred from the CPU Unit to the EtherCAT master is used to monitor pulses generated by the CPU Unit mounted with the EtherCAT Slave Unit. When the updated pulses are not detected for the specified period of time, it is considered that the user program execution of the CPU Unit has stopped and create user-defined errors.

The CPU Unit that is given in the following description indicates the CPU Unit connecting an EtherCAT Slave Unit with the NX bus. It is the CPU Unit for (b) in *A-4-1 System Configuration* on page A-17.

## Unit Operation Settings

Use the default values for the Unit operation settings.

## I/O Map

The following table shows the variables that are assigned to the I/O Map on the Sysmac Studio.

| I/O port name                               | Variable name                                    | Description   | Data type | Variable type   |
|---|--|---|-----------|-----------------|
| Data from CPU Unit to EtherCAT Master Valid | E001_Data_from_CPU_Unit_to_EtherCAT_Master_Valid | Indicates whether the data from the CPU Unit to the EtherCAT master is valid. | BOOL      | Global variable |
| UDINT 01 C to M                             | E001_UDINT_01_C_to_M                             | Data 01 that is transferred from CPU Unit to EtherCAT master.                 | UDINT     | Global variable |

## Variable Table

External variables and internal variables that are used in the programming are given below.

### ● External Variables

Use the global variables given in the table below as external variables.

| Variable name                                    | Data type             | Initial value | AT  | Retain | Constant                            | Network publish | Description  |
|--|-----------------------|---------------|---|--------|-------------------------------------|-----------------|--|
| _EC_PDSlavTbl                                    | ARRAY[1..192] OF BOOL | ---           | ---   | ---    | <input checked="" type="checkbox"/> | Do not publish. | Process Data Communicating Slave Table Indicates that a slave is in Operational state. |
| E001_UDINT_01_C_to_M                             | UDINT                 | 0             | ECAT://node#1/UDINT 01 C to M                             | ---    | ---                                 | Do not publish. | Data 01 transferred from CPU Unit to EtherCAT master                                   |
| E001_Data_from_CPU_Unit_to_EtherCAT_Master_Valid | BOOL                  | ---           | ECAT://node#1/Data from CPU Unit to EtherCAT Master Valid | ---    | ---                                 | Do not publish. | Valid/invalid data from CPU Unit to EtherCAT master                                    |

### ● Internal Variables

Internal variables for ladder programming and those for ST programming are different. Internal variables are described for each programming.

#### Internal variables for Ladder programming:

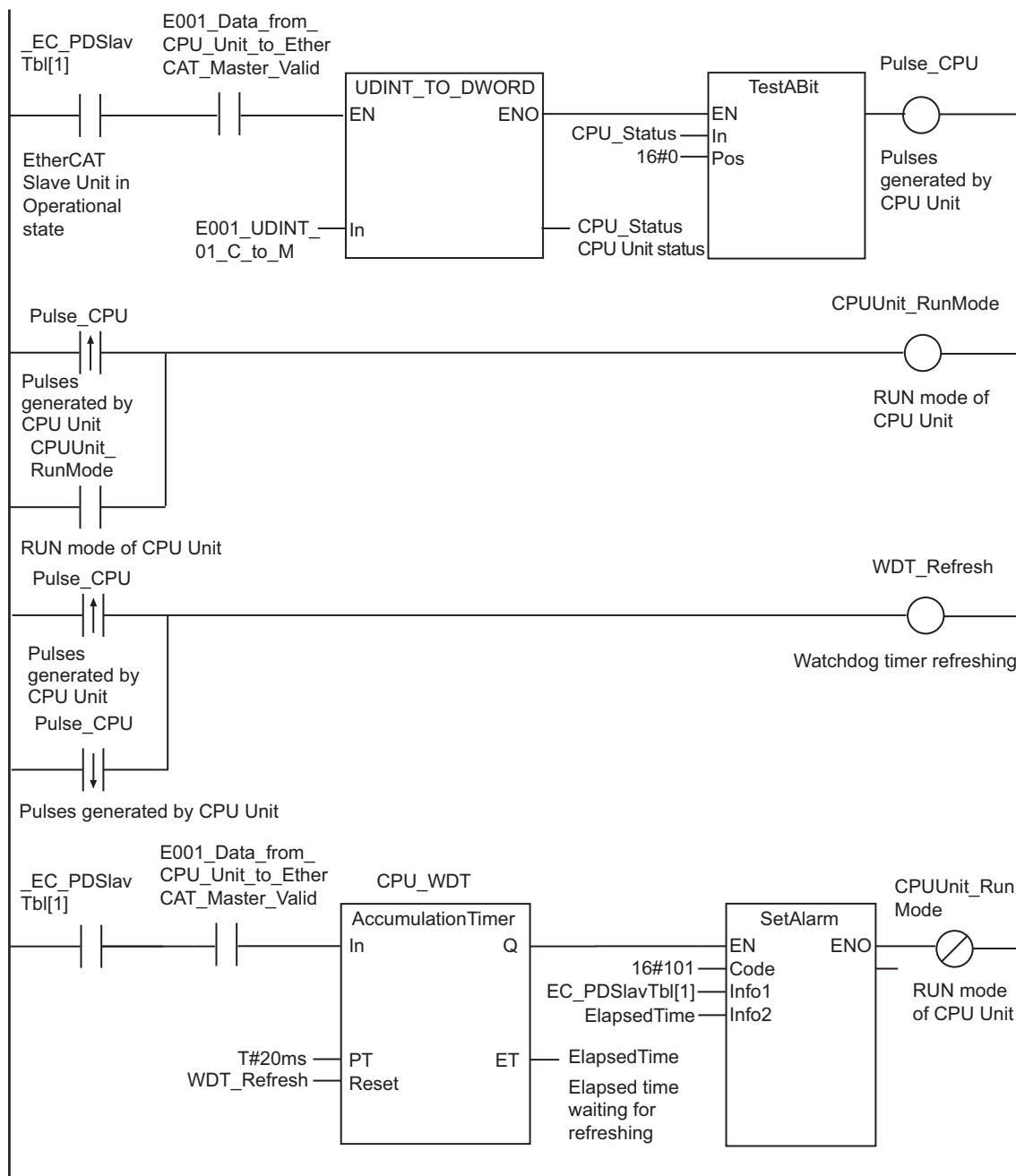
| Variable name    | Data type          | Initial value | AT  | Retain | Constant | Description                                      |
|------------------|--------------------|---------------|-----|--------|----------|--|
| CPU_Status       | DWORD              | 0             | --- | ---    | ---      | CPU Unit status                                  |
| Pulse_CPU        | BOOL               | ---           | --- | ---    | ---      | Pulses generated by CPU Unit                     |
| WDT_Refresh      | BOOL               | ---           | --- | ---    | ---      | Watchdog timer refreshing                        |
| CPU_WDT          | Accumulation-Timer | ---           | --- | ---    | ---      | Watchdog timer for monitoring pulses of CPU Unit |
| ElapsedTime      | TIME               | ---           | --- | ---    | ---      | Elapsed time waiting for refreshing              |
| CPUUnit_Run-Mode | BOOL               | FALSE         | --- | ---    | ---      | RUN mode of CPU Unit                             |

#### Internal variables for ST programming:

| Variable name | Data type | Initial value | AT  | Retain | Constant | Description     |
|---------------|-----------|---------------|-----|--------|----------|-----------------|
| CPU_Status    | DWORD     | 0             | --- | ---    | ---      | CPU Unit status |

| Variable name       | Data type         | Initial value | AT  | Retain | Constant | Description                                      |
|---------------------|-------------------|---------------|-----|--------|----------|--|
| Pulse_CPU           | BOOL              | ---           | --- | ---    | ---      | Pulses generated by CPU Unit                     |
| WDT_Refresh         | BOOL              | ---           | --- | ---    | ---      | Watchdog timer refreshing                        |
| CPU_WDT             | AccumulationTimer | ---           | --- | ---    | ---      | Watchdog timer for monitoring pulses of CPU Unit |
| ElapsedTime         | TIME              | ---           | --- | ---    | ---      | Elapsed time waiting for refreshing              |
| CPUUnit_RunMode     | BOOL              | FALSE         | --- | ---    | ---      | RUN mode of CPU Unit                             |
| WDTTimeup           | BOOL              | ---           | --- | ---    | ---      | Timeout for watchdog timer                       |
| R_TRIG_Pulse_CPU001 | R_TRIG            | ---           | --- | ---    | ---      | Pulse signal of CPU Unit                         |
| R_TRIG_Pulse_CPU002 | R_TRIG            | ---           | --- | ---    | ---      | Pulse signal of CPU Unit                         |
| Trigger             | BOOL              | ---           | --- | ---    | ---      | Pulse upward differentiation of CPU Unit         |
| RS_RunMode          | RS                | ---           | --- | ---    | ---      | RUN mode setting for CPU Unit                    |

## Ladder Programming



## ST Programming

```
// If an EtherCAT slave is in Operational state and only data from the CPU Unit to
EtherCAT master is valid (TRUE)
IF _EC_PDSlavTbl[1]=TRUE AND E001_Data_from_CPU_Unit_to_EtherCAT_Master_Valid=TRUE
THEN
    // Access the data set from the CPU Unit to EtherCAT master.
    CPU_Status:=UDINT_TO_DWORD(E001_UDINT_01_C_to_M);
    Pulse_CPU:=TestABit(CPU_Status,16#0);
```

```

END_IF;

// It is considered that the CPU Unit is in RUN mode by the pulse rising edge detection.
R_TRIG_Pulse_CPU001(Pulse_CPU, Trigger);
RS_RunMode(Trigger, FALSE, CPUUnit_RunMode);

// Monitor the pulse of the CPU Unit.
R_TRIG_Pulse_CPU002(Pulse_CPU, WDT_Refresh);

IF _EC_PDslavTbl[1]=TRUE AND E001_Data_from_CPU_Unit_to_EtherCAT_Master_Valid=TRUE
THEN
    CPU_WDT(TRUE, T#20ms, WDT_Refresh, WDTTimeUp, ElapsedTime);
    // If the pulse is not refreshed even the monitoring time has elapsed
    IF WDTTimeUp = TRUE THEN
        // It is considered that the user program execution of the CPU Unit has stopped and create a user-defined error.
        SetAlarm(16#101, ElapsedTime, _EC_PDslavTbl[1]);
        CPUUnit_RunMode:=FALSE;
    END_IF;
END_IF;

```

## A-4-4 Programming Example for the EtherCAT Slave

Use bit 0 of the I/O data set to be transferred from the CPU Unit for the EtherCAT Slave Unit to the EtherCAT master to transfer pulses generated by the CPU Unit mounted with the EtherCAT Slave Unit to the EtherCAT master.

The CPU Unit that is given in the following description indicates the CPU Unit connecting an EtherCAT Slave Unit with the NX bus. It is the CPU Unit for (b) in *A-4-1 System Configuration* on page A-17.

### Unit Operation Settings

Use the default values for the Unit operation settings.

### I/O Map

The following table shows the variables that are assigned to the I/O Map on the Sysmac Studio.

| I/O port name                               | Variable name                                  | Description  | Data type | Variable type   |
|---|--|--|-----------|-----------------|
| N1 NX Unit I/O Data Active Status           | NXBus_N1_NX_Unit_I_O_Data_Active_Status        | This variable is NX Unit I/O Data Active Status. This status tells whether I/O data in the NX Unit can be used for control. When the I/O data communications are enabled, this status is TRUE. | BOOL      | Global variable |
| N1 NX Unit Error Status                     | NXBus_N1_NX_Unit_Error_Status                  | This variable is NX Unit Error Status. This status tells whether an error exists on the NX Unit. When an error occurs, this status is TRUE.  | BOOL      | Global variable |
| Data from CPU Unit to EtherCAT Master Valid | N1_Data_from_CPU_Unit_to_EtherCAT_Master_Valid | Indicates whether the data from the CPU Unit to the EtherCAT master is valid.  | BOOL      | Global variable |
| UDINT 01 C to M                             | N1_UDINT_01_C_to_M                             | Data 01 that is transferred from CPU Unit to EtherCAT master.  | UDINT     | Global variable |

## Variable Table

External variables and internal variables that are used in the programming are given below.

### ● External Variables

Use the global variables given in the table below as external variables.

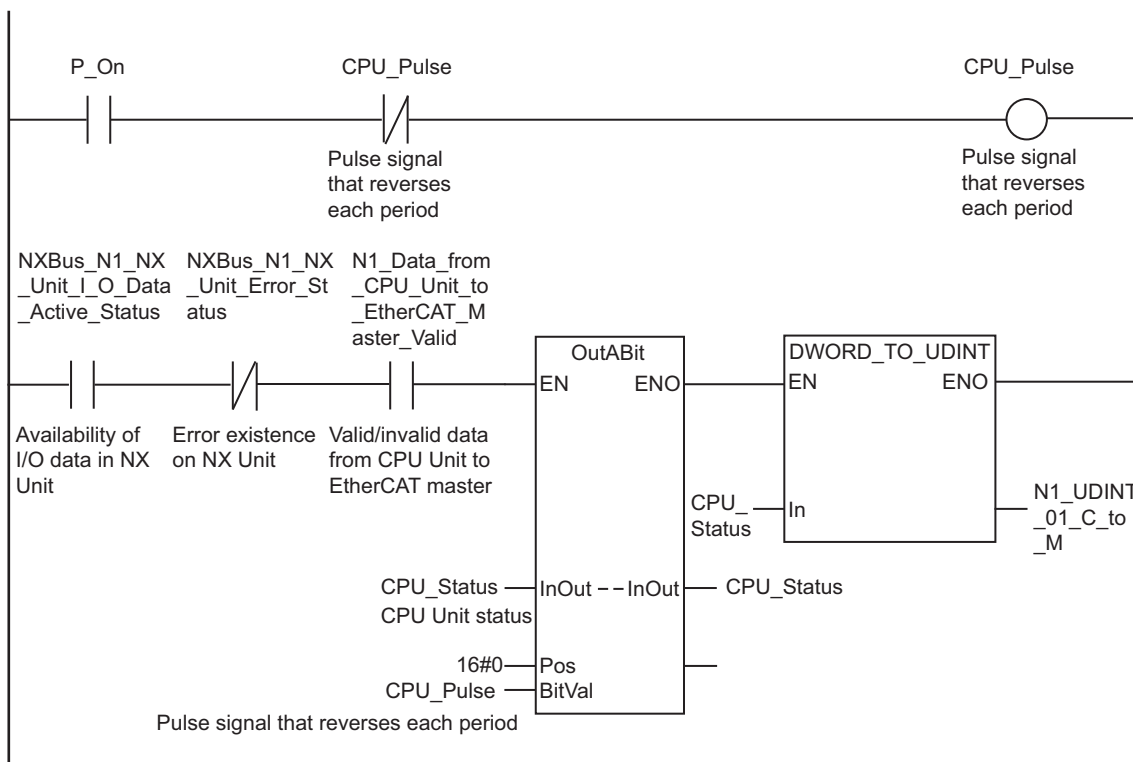
| Variable name                                  | Data type | Initial value | AT   | Retain | Constant | Network publish | Description   |
|--|-----------|---------------|--|--------|----------|-----------------|---|
| NXBus_N1_NX_Unit_I_O_Data_Active_Status        | BOOL      | FALSE         | IOBus://unit#1/NX Unit I/O Data Active Status                                    | ---    | ---      | Do not publish. | Availability of I/O data in NX Unit                 |
| NXBus_N1_NX_Unit_Error_Status                  | BOOL      | FALSE         | IOBus://unit#1/NX Unit Error Status  | ---    | ---      | Do not publish. | Error existence on NX Unit                          |
| N1_Data_from_CPU_Unit_to_EtherCAT_Master_Valid | BOOL      | ---           | IOBus://unit#1/EtherCAT Slave Status/Data from CPU Unit to EtherCAT Master Valid | ---    | ---      | Do not publish. | Valid/invalid data from CPU Unit to EtherCAT master |
| CPU_Status                                     | DWORD     | 0             | Not provided   | ---    | ---      | Do not publish. | CPU Unit status                                     |

| Variable name      | Data type | Initial value | AT                             | Retain | Constant | Network publish | Description  |
|--------------------|-----------|---------------|--------------------------------|--------|----------|-----------------|--|
| N1_UDINT_01_C_to_M | UDINT     | 0             | IOBus://unit#1/UDINT 01 C to M | ---    | ---      | Do not publish. | Data 01 transferred from CPU Unit to EtherCAT master |

● Internal Variables

| Variable name | Data type | Initial value | AT  | Retain | Constant | Description   |
|---------------|-----------|---------------|-----|--------|----------|---|
| CPU_Pulse     | BOOL      | FALSE         | --- | ---    | ---      | Pulse signal refreshed when CPU Unit is in RUN mode |

## Ladder Programming



## ST Programming

```
// Generate pulses during the user program execution.
CPU_Pulse := NOT CPU_Pulse;

// If I/O data in the NX Unit is available, no error exists on the NX Unit and data
// from the CPU Unit to EtherCAT master is valid
IF NXBus_N1_NX_Unit_I_O_Data_Active_Status AND NOT NXBus_N1_NX_Unit_Error_Status AND
```



```
D N1_Data_from_CPU_Unit_to_EtherCAT_Master_Valid THEN
  // Assign pulses to the data set from the CPU Unit to EtherCAT master.
  OutABit(CPU_Status,16#0,CPU_Pulse);
  N1_UDINT_01_C_to_M:=DWORD_TO_UDINT(CPU_Status);
END_IF;
```

# A-5 Data Exchange by Messages

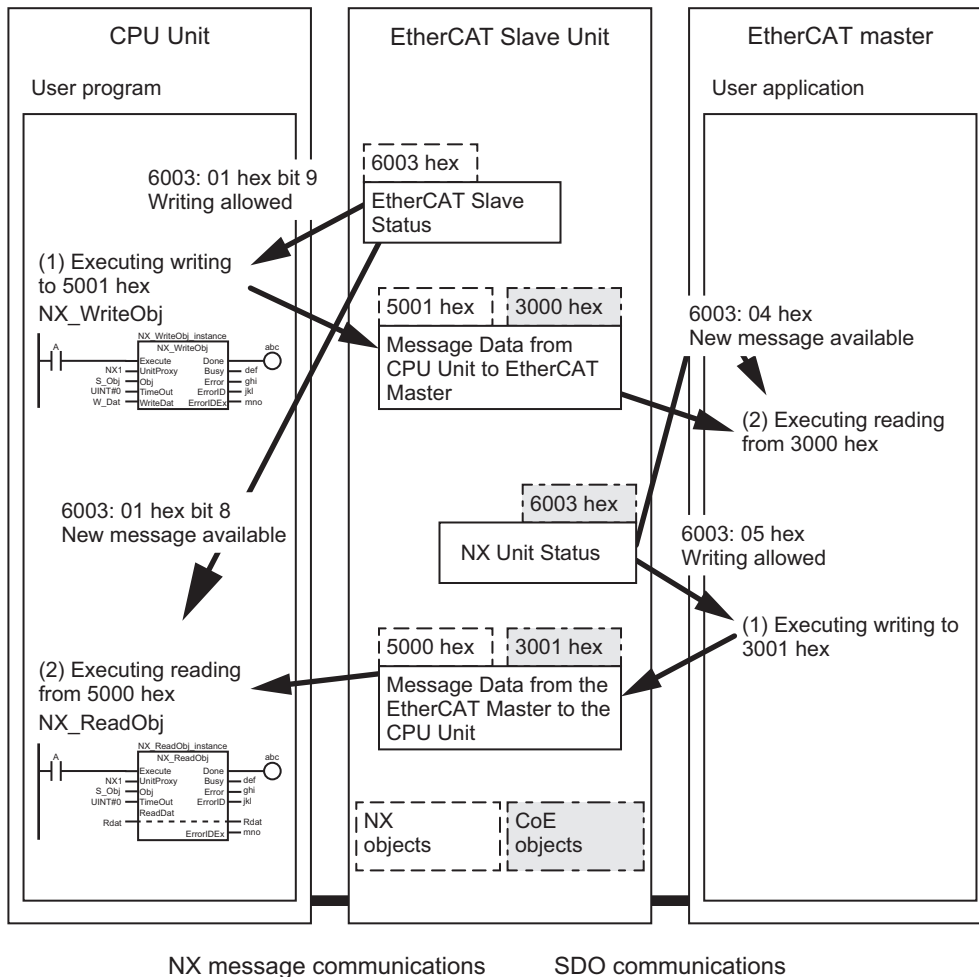
The EtherCAT Slave Unit can use messages to exchange the data between the EtherCAT master and CPU Unit.

This section describes an overview of the data exchange by messages and the CoE objects and NX objects to use for the data exchange.

## A-5-1 Overview of Data Exchange Methods by Messages

The following shows an overview of the data exchange methods by messages.

1. Either the EtherCAT master or CPU Unit writes the data to the message object of the EtherCAT Slave Unit.
2. After completion of writing, the other one reads the data from the message object of the EtherCAT Slave Unit.



To execute the message communications for the EtherCAT Slave Unit, create the program using the following flags as the execution conditions.

- For message communications from EtherCAT master: The *NX Message Communications Enabled* (6003:01 hex) CoE object

- For message communications from CPU Unit: *SDO Communications Enabled* (bit 0) of the *EtherCAT Slave Status* (6003:01 hex) NX object

## Data Exchange Method between EtherCAT Master and EtherCAT Slave Unit

The SDO communications are used to exchange the data between the EtherCAT master and EtherCAT Slave Unit by messages.

When the NJ/NX-series CPU Unit or NY-series Industrial PC is used for the EtherCAT master, you can use the following EtherCAT communications instruction to execute the SDO communications.

| Function name          | Instruction    | Description  |
|------------------------|----------------|--|
| Read EtherCAT CoE SDO  | EC_CoESDORead  | Reads data to the CoE objects in the specified slave on the EtherCAT network.  |
| Write EtherCAT CoE SDO | EC_CoESDOWrite | Writes data to the CoE objects in the specified slave on the EtherCAT network. |

Set the execution conditions for these instructions using a status indicating that the message communications from the EtherCAT master to EtherCAT Slave Unit is ready.

| Variable       | Name                                       | Description  | Data type              |
|----------------|--|--|------------------------|
| _EC_MBXSlavTbl | Message Communications Enabled Slave Table | This table indicates the slaves that can perform the message communications. Slaves are given in the table in the order of slave node addresses. The element for a slave is TRUE if message communications are enabled for it (Pre-operational, Safe-operational, or Operational state). | AR-RAY[1..192] OF BOOL |

Refer to the *NJ/NX-series Instructions Reference Manual (Cat. No. W502)* for details on the Read EtherCAT CoE SDO and Write EtherCAT CoE SDO instructions.

## Data Exchange Method between CPU Unit and EtherCAT Slave Unit

The following Read NX Unit Object instruction and Write NX Unit Object instruction are used to exchange the data between the CPU Unit and EtherCAT Slave Unit by messages.

| Function name        | Instruction | Description  |
|----------------------|-------------|--|
| Read NX Unit Object  | NX_ReadObj  | This instruction reads data from the NX objects in the EtherCAT Coupler Unit or NX Unit. |
| Write NX Unit Object | NX_WriteObj | This instruction writes data to the NX objects in the EtherCAT Coupler Unit or NX Unit.  |

Set the execution conditions for these instructions using a status indicating that the message communications between the CPU Unit to EtherCAT Slave Unit is ready.

A

| Variable              | Name                           | Description   | Data type               |
|-----------------------|--------------------------------|---|-------------------------|
| _NXB_UnitMsgActiveTbl | NX Unit Message Enabled Status | This status tells whether the NX Units on the CPU Unit can process message communications. This status is given as an array of BOOL data. The subscript of the array corresponds to the NX Unit number. A subscript of 0 indicates the NX Bus Function Module and it is always TRUE.<br>TRUE: Message communications possible<br>FALSE: Message communications not possible | ARRAY [0..32] OF BOOL*1 |

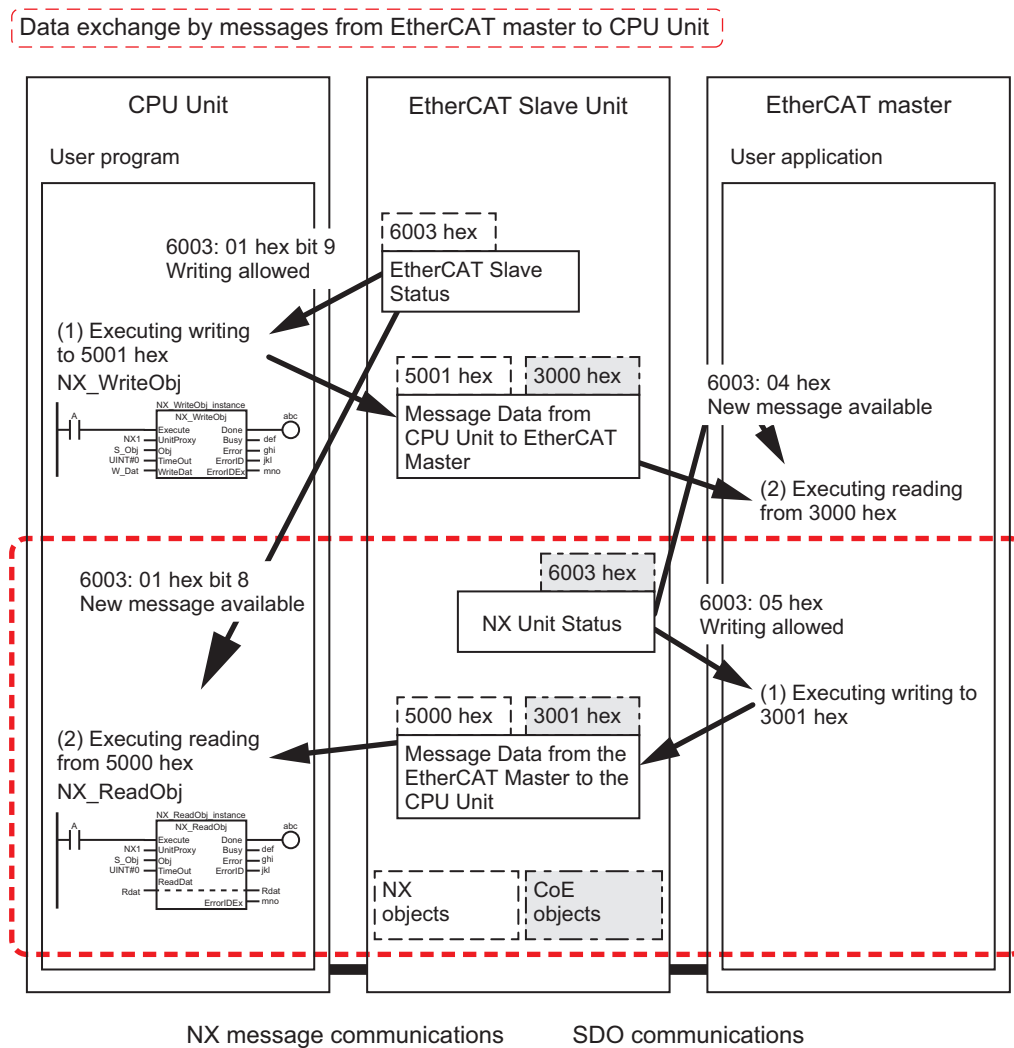
\*1. For the NX1P2 CPU Units, the data type is ARRAY [0..8] OF BOOL.

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

## A-5-2 Data Transfer from the EtherCAT Master to the CPU Unit

The EtherCAT master uses the *Ready to Write Message Data to CPU Unit* (6003:05 hex) CoE object as the execution condition to write the data to the *Message Data to CPU Unit* (3001:01 hex) CoE object.

The CPU Unit uses the *New Message Data Available from EtherCAT Master* (bit 8) of the *EtherCAT Slave Status* (6003:01 hex) NX object as the trigger to read the *Message Data from EtherCAT Master* (5000:01 hex) NX object.



## Objects to Use

The following shows the objects to use for the data transfer from the EtherCAT master to the CPU Unit.

- CoE objects for accessing from the EtherCAT master to EtherCAT Slave Unit

| Index (hex) | Sub-index (hex) | Object name                             | Data type             | Data size | Description   |
|-------------|-----------------|---|-----------------------|-----------|---|
| 6003        | 05              | Ready to Write Message Data to CPU Unit | BOOL                  | 1 bit     | Indicates whether the message data from the EtherCAT master to the CPU Unit can be written to the CoE object (3001 hex).  |
| 3001        | 01              | Message Data to CPU Unit                | ARRAY[0..199] OF BYTE | 200 bytes | The value written to this CoE object is reflected to the value of the NX object 5000 hex. Use the CoE object 6003:05 hex to determine whether the message data can be written to this CoE object. |

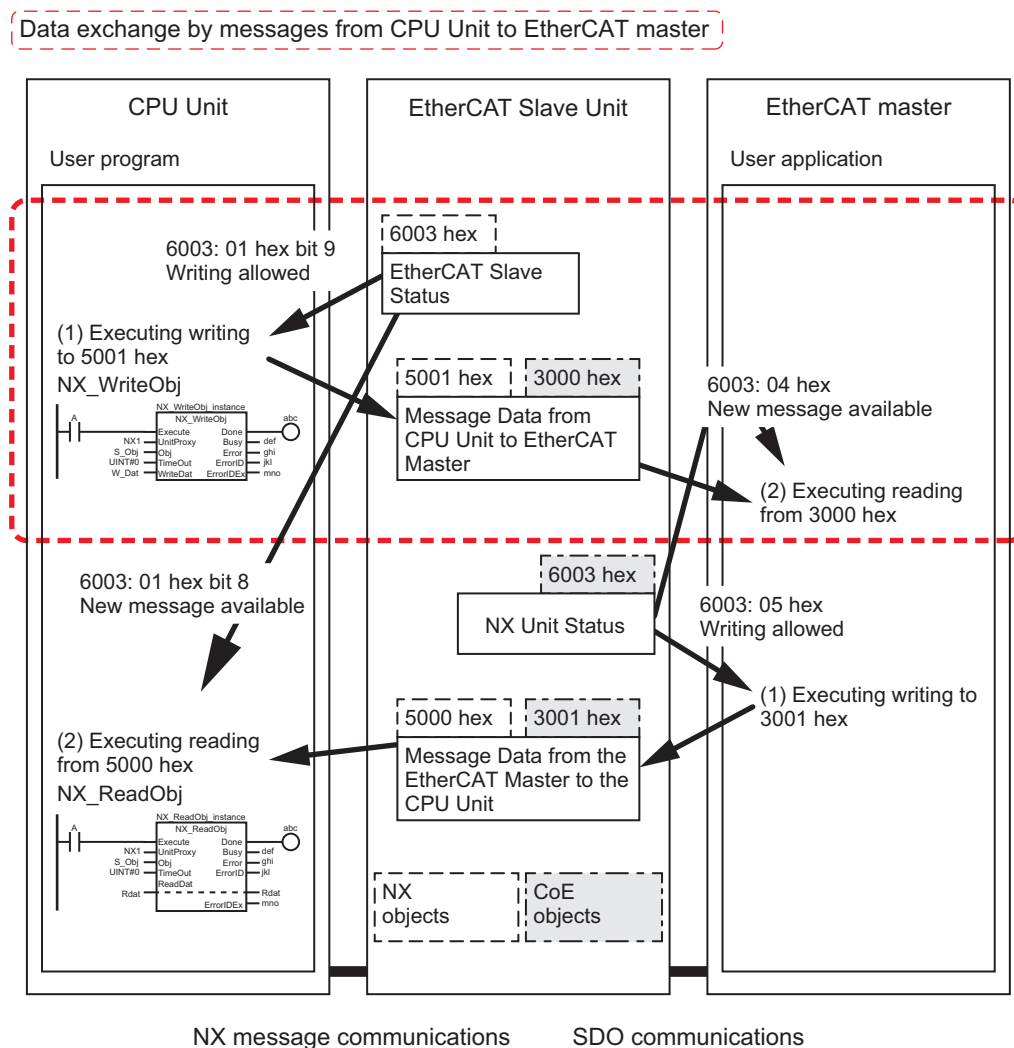
- NX objects for accessing from the CPU Unit to EtherCAT Slave Unit

| Index (hex) | Sub-index (hex) | Object name                       | Data type              | Data size | Description   |
|-------------|-----------------|-----------------------------------|------------------------|-----------|---|
| 6003        | 01              | EtherCAT Slave Status             | WORD                   | 2 bytes   | Indicates whether the NX object (5000 hex) has any new message data from the EtherCAT master. (Bit 8)   |
| 5000        | 01              | Message Data from EtherCAT Master | AR-RAY[0..199] OF BYTE | 200 bytes | The value of the CoE object 3001 hex is reflected to this NX object. Use the bit 8 of the NX object 6003:01 hex to determine whether there is a new message data in this NX object. |

### A-5-3 Data Transfer from the CPU Unit to the EtherCAT Master

The CPU Unit uses the *Ready to Write Message Data to EtherCAT Master* (bit 9) of the *EtherCAT Slave Status* (6003:01 hex) NX object as the execution condition to write the data to the *Message Data to EtherCAT Master* (5001:01 hex) NX object.

The EtherCAT Master uses the *New Message Data Available from CPU Unit* (6003:04 hex) CoE object as a trigger to read the *Message Data from CPU Unit* (3000:01 hex) CoE object.



## Objects to Use

The following shows the objects to use for the data transfer from the CPU Unit to the EtherCAT master.

- CoE objects for accessing from the EtherCAT master to EtherCAT Slave Unit

| Index (hex) | Sub-index (hex) | Object name                              | Data type              | Data size | Description  |
|-------------|-----------------|--|------------------------|-----------|--|
| 6003        | 04              | New Message Data Available from CPU Unit | BOOL                   | 1 bit     | Indicates whether the CoE object (3000 hex) has any new message data from the CPU Unit.  |
| 3000        | 01              | Message Data from CPU Unit               | AR-RAY[0..199] OF BYTE | 200 bytes | The value of the NX object 5001 hex is reflected to this CoE object. Use the CoE object 6003:04 hex to determine whether there is a new message data in this CoE object. |

- NX objects for accessing from the CPU Unit to EtherCAT Slave Unit

| Index (hex) | Subindex (hex) | Object name                     | Data type             | Data size | Description  |
|-------------|----------------|---------------------------------|-----------------------|-----------|--|
| 6003        | 01             | EtherCAT Slave Status           | WORD                  | 2 bytes   | Indicates whether the message data from the CPU Unit to the EtherCAT master can be written to the NX object (5001 hex). (Bit 9)  |
| 5001        | 01             | Message Data to EtherCAT Master | ARRAY[0..199] OF BYTE | 200 bytes | The value written to this NX object is reflected to the value of the CoE object 3000 hex. Use the bit 9 of the NX object 6003:01 hex to determine whether the message data can be written to this NX object. |



# A-6 CoE Objects

This section describes the CoE objects that are implemented in the EtherCAT Slave Unit.



## Precautions for Safe Use

Always sufficiently check the safety at the connected devices before you change the settings of the EtherCAT Slave Unit and restart it.

## A-6-1 Object Dictionary Area

The CAN application protocol over EtherCAT (CoE) is based on the object dictionary for the CAN application protocol.

All objects are assigned 4-digit hexadecimal indexes. The objects are structured in the following areas.

| Index                | Area                         | Description   |
|----------------------|------------------------------|---|
| 0000 hex to 0FFF hex | Data Type Area               | This area contains the data type definitions.   |
| 1000 hex to 1FFF hex | CoE Communications Area      | The objects in this area are defined for use by all servers that perform specialized communications.<br>PDO mapping objects   |
| 2000 hex to 2FFF hex | Manufacturer-specific Area 1 | The objects in this area are defined for all OMRON products.  |
| 3000 hex to 5FFF hex | Manufacturer-specific Area 2 | The objects in this area are defined for the EtherCAT Slave Unit.   |
| 6000 hex to 9FFF hex | Device Profile Area          | The objects in this area are defined by the CiA401 Generic I/O Module Device Profile (a profile that specifies the CAN application protocol interface for devices with digital I/O and analog I/O). |
| A000 hex to EFFF hex | Reserved Area                | This area is reserved for future use.   |
| F000 hex to FFFF hex | Modular Device-specific Area | The objects in this area are defined by modular devices.  |

## A-6-2 Data Type

The following data types are used in this profile.

| Data type           | Abbreviation        | Size      | Range of values                 |
|---------------------|---------------------|-----------|---------------------------------|
| Boolean             | BOOL                | 1 bit     | 0 (FALSE) or 1 (TRUE)           |
| Unsigned8           | U8                  | 1 byte    | 0 to 255                        |
| Unsigned16          | U16                 | 2 bytes   | 0 to 65,535                     |
| Unsigned32          | U32                 | 4 bytes   | 0 to 4,294,967,295              |
| Unsigned64          | U64                 | 8 bytes   | 0 to 18,446,744,073,709,551,615 |
| Visible string      | VS                  | ---       | ---                             |
| ARRAY[0..Y] OF BYTE | ARRAY[0..Y] OF BYTE | Y+1 bytes | ---                             |

## A-6-3 Format of Objects

This manual describes objects with the following format.

| Index (hex) | Subindex (hex) | Object name   | Default value     | Data range   | Unit   | Data attribute   | Size   | Access   | PDO mapping             | Complete access         |
|-------------|----------------|---------------|-------------------|--------------|--------|------------------|--------|----------|-------------------------|-------------------------|
| <Index>     | <Subindex>     | <Object name> | <Default setting> | <Data range> | <Unit> | <Data attribute> | <Size> | <Access> | <Possible/Not possible> | <Possible/Not possible> |

Items within the < > brackets are replaced with data. Each item has the following meaning.

| Item              | Description  |
|-------------------|--|
| Index             | This is the index of the object that is expressed as a four-digit hexadecimal number.  |
| Subindex          | This is the subindex of the 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 when the product is shipped from the factory.  |
| Data range        | For a read-only (RO) object, this is the range of the data that you can read. For a read/write (RW) object, this is the setting range of the data.   |
| Unit              | The unit is the physical units.  |
| Data attribute    | This is the timing when changes to writable objects are enabled.<br>A: Enabled at all times<br>B: When moving from Pre-Operational state to Safe-Operational state<br>C: When moving from Pre-Operational state to Init state<br>R: When the power supply is reset or the Unit is restarted<br>---: Write-prohibited |
| Size              | This is the size of the object in bytes.   |
| Access            | This data tells if the object is read-only or read/write.<br>RO: Read only<br>RW: Read/write   |
| PDO mapping       | This indicates if you can map the object to a PDO.   |
| Complete access*1 | This indicates whether the object allows complete access.  |

\*1. Complete access is used to read and write to a batch of objects. It allows you to read or write to all subindexes of an object.

## A-6-4 Communication Objects

This section describes the communication objects of the EtherCAT Slave Unit.

| Index (hex) | Sub-index (hex) | Object name | Default value | Data range   | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------|-----------------|-------------|---------------|--------------|------|----------------|---------------|--------|--------------|-----------------|
| 1000        | ---             | Device Type | 00000000 hex  | 00000000 hex | ---  | ---            | 4 bytes (U32) | RO     | Not possible | Not possible    |

- This object gives the CoE device profile number for the EtherCAT Slave Unit.

| Index (hex) | Sub-index (hex) | Object name              | Default value | Data range | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------|-----------------|--------------------------|---------------|------------|------|----------------|---------------|--------|--------------|-----------------|
| 1008        | ---             | Manufacturer Device Name | NX-ECT101     | ---        | ---  | ---            | 20 bytes (VS) | RO     | Not possible | Not possible    |

- This object gives the model of the EtherCAT Slave Unit.

| Index (hex) | Sub-index (hex) | Object name                   | Default value   | Data range                                 | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------|-----------------|-------------------------------|---|--|------|----------------|---------------|--------|--------------|-----------------|
| 1009        | ---             | Manufacturer Hardware Version | "V1.00"<br>(padded with 15 spaces (character 20 hex)) | (padded with 20 spaces (character 20 hex)) | ---  | ---            | 20 bytes (VS) | RO     | Not possible | Not possible    |

- This object gives the hardware version of the EtherCAT Slave Unit in ASCII code.

| Index (hex) | Sub-index (hex) | Object name                   | Default value   | Data range | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------|-----------------|-------------------------------|---|------------|------|----------------|---------------|--------|--------------|-----------------|
| 100A        | ---             | Manufacturer Software Version | "V1.00"<br>(padded with 15 spaces (character 20 hex)) | ---        | ---  | ---            | 20 bytes (VS) | RO     | Not possible | Not possible    |

- This object gives the software version of the EtherCAT Slave Unit in ASCII code. Start with "V" (56 hex), and delimit three characters of ASCII codes with a period (2E hex), e.g. "V1.00". If it is composed of plural modules, delimit them with a space (20 hex) and return the version in 20 bytes or shorter which is filled from the head, e.g. "V1.00 V1.02 V1.01".

| Index (hex) | Sub-index (hex) | Object name       | Default value                   | Data range               | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------|-----------------|-------------------|---------------------------------|--------------------------|------|----------------|---------------|--------|--------------|-----------------|
| 1018        | ---             | Identity Object   | ---                             | ---                      | ---  | ---            | ---           | ---    | ---          | Possible        |
|             | 0               | Number of entries | 04 hex                          | 04 hex                   | ---  | ---            | 1 byte (U8)   | RO     | Not possible | ---             |
|             | 1               | Vendor ID         | 00000083 hex                    | 00000083 hex             | ---  | ---            | 4 bytes (U32) | RO     | Not possible | ---             |
|             | 2               | Product Code      | 00000017C hex                   | 00000017C hex            | ---  | ---            | 4 bytes (U32) | RO     | Not possible | ---             |
|             | 3               | Revision Number   | 00010000 hex                    | 00000000 to FFFFFFFF hex | ---  | ---            | 4 bytes (U32) | RO     | Not possible | ---             |
|             | 4               | Serial Number     | Every slave has a unique number | 00000000 to FFFFFFFF hex | ---  | ---            | 4 bytes (U32) | RO     | Not possible | ---             |

This object gives information on the EtherCAT Slave Unit.

- Subindex 01 hex gives the vendor's ID.
- Subindex 02 hex gives the value that is assigned to the EtherCAT Slave Unit.
- Subindex 03 hex gives the revision number of the EtherCAT Slave Unit.  
 Bits 16 to 31: These bits give the major revision number of the EtherCAT Slave Unit.  
 Bits 0 to 15: These bits give the minor revision number of the EtherCAT Slave Unit.
- Subindex 04 hex gives the serial number of the EtherCAT Slave Unit. This is a unique value for each product.

| Index (hex) | Sub-index (hex) | Object name                             | Default value | Data range       | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------|-----------------|---|---------------|------------------|------|----------------|---------------|--------|--------------|-----------------|
| 10E0        | ---             | Device Identification Reload            | ---           | ---              | ---  | ---            | ---           | ---    | ---          | Not possible    |
|             | 0               | Maximum supported Subindex              | 03 hex        | 03 hex           | ---  | ---            | 1 byte (U8)   | RO     | Not possible | ---             |
|             | 1               | Configured Station Alias register value | 0000 hex      | 0000 to FFFF hex | ---  | A              | 2 bytes (U16) | RW     | Not possible | ---             |
|             | 3               | Reload ID-selector value                | 0000 hex      | 0000 to FFFF hex | ---  | A              | 2 bytes (U16) | RW     | Not possible | ---             |

- Subindex 01 hex gives the software setting of the node address.

**When Writing:**

If the hardware setting value of the ID switch is set to 0, the value that you write to this object is the software setting value of the node address. (Set the value to write in the ESC register 0012 hex.)  
If the hardware setting value of the ID switch is set to a value other than 0, the hardware setting value of the ID switch is enabled. This causes an SDO communications error and returns abort code 08000021 hex.

**When Reading:**

If the hardware setting value of the ID switch is set to 0, the software setting (the value written to the ESC register 0012 hex) is given.

If the hardware setting value of the ID switch is set to a value other than 0, the hardware setting value of the ID switch is given.

- Subindex 03 hex gives the hardware setting of the ID switch.

**When Writing:**

If the hardware setting value of the ID switch is set to 0, an SDO communications error occurs and abort code 08000021 hex is returned, regardless of the write value.

If the hardware setting value of the ID switch is set to a value other than 0 and write value is 0000 hex, the hardware setting value of the ID switch is written to the ESC register 0012 hex.

If the write value is any other value than 0000 hex, an SDO communications error occurs and abort code 08000021 hex is returned.

**When Reading:**

This gives the hardware setting value of the ID switch.

| Index (hex) | Sub-index (hex) | Object name                 | Default value | Data range           | Unit | Data attribute | Size                            | Access | PDO mapping  | Complete access |
|-------------|-----------------|-----------------------------|---------------|----------------------|------|----------------|---------------------------------|--------|--------------|-----------------|
| 10F3        | ---             | Diagnosis History           | ---           | ---                  | ---  | ---            | ---                             | ---    | ---          | Not possible    |
|             | 00              | Number of entries           | 25 hex        | 25 hex               | ---  | ---            | 1 byte (U8)                     | RO     | Not possible | ---             |
|             | 01              | Maximum Messages            | 00 hex        | 00 to 20 hex         | ---  | ---            | 1 byte (U8)                     | RO     | Not possible | ---             |
|             | 02              | Newest Message              | 00 hex        | 00 hex, 06 to 25 hex | ---  | ---            | 1 byte (U8)                     | RO     | Not possible | ---             |
|             | 03              | Newest Acknowledged Message | 00 hex        | 00 hex, 06 to 25 hex | ---  | ---            | 1 byte (U8)                     | RW     | Not possible | ---             |
|             | 04              | New Messages Available      | FALSE         | FALSE, TRUE          | ---  | ---            | 1 bit                           | RO     | Possible     | ---             |
|             | 05              | Flags                       | 0000 hex      | 0000 to 0001 hex     | ---  | A              | 2 bytes (U16)                   | RW     | Not possible | ---             |
|             | 06              | Diagnosis Message 1         | ---           | ---                  | ---  | ---            | 24 bytes (ARRAY[0..23] OF BYTE) | RO     | Not possible | ---             |
|             | ...             | ...                         | ...           | ...                  | ...  | ...            | ...                             | ...    | ...          | ...             |
|             | 25              | Diagnosis Message 32        | ---           | ---                  | ---  | ---            | 24 bytes (ARRAY[0..23] OF BYTE) | RO     | Not possible | ---             |

- This object gives a maximum of 32 diagnosis messages. This object is used to enable or disable emergency messages.
- Subindex 01 hex (Maximum Messages) gives the number of error messages.
- Subindex 02 hex (Newest Message) gives the subindex number of the most recent diagnosis message.
- Subindex 03 hex (Newest Acknowledged Message) gives the number of the newest acknowledged message. The operations for reading and writing are different, as described in the following table.

| Reading/writing | Operation  |
|-----------------|--|
| Reading         | The subindex of the most recent error log record is returned (06 to 25 hex). If there are no records in the error log, 00 hex is returned. |

| Reading/<br>writing | Operation  |
|---------------------|--|
| Writing             | Write the number of the error log record between 06 and 25 hex. The value of subindex 04 hex (Newest Messages Available) changes to FALSE.<br>If you write 00 hex, the entire error log is cleared.<br>If you write values other than 00 hex and 06 to 25 hex, the abort code 06090030 hex is returned. If you write a subindex that does not have an error log record, the abort code 06090030 hex is returned. |

- Subindex 04 hex (New Messages Available) provides notification of new messages. It indicates if the error log has been updated. When the error log is updated, the value changes to 1 (TRUE). The value changes to 0 (FALSE) in the following cases.
  - a) Subindex 03 hex (Newest Acknowledged Message) gives the subindex number of the most recent error log record.
  - b) The error log has not been updated.
- Subindex 05 hex (Flags) is the control flags for the error logs. Use this to specify whether to use emergency messages to report error messages. Set this to 0001 hex to enable notification, or 0000 hex to disable notification. This is set to 0000 hex (no emergency notifications) when the power supply is turned ON. The error logs are saved for errors where the error log record to be given as saved in *8-4-3 Emergency Error Codes* on page 8-57 even if it is set to disable notification.
- Subindexes 06 hex to 25 hex give the diagnosis messages (from Diagnosis Message 1 to Diagnosis Message 32).  
 Subindex 06 hex (Diagnosis Message 1) to subindex 25 hex (Diagnosis Message 32) store up to 32 errors as they occur. The 33rd error causes the storage of errors to return to subindex 06 hex (Diagnosis Message 1).
- The following table gives the format of a diagnosis message.  
 The presence of the flag parameters 1 to 4 and detail parameters 1 to 4 and the quantity if they are present are determined depending on the event type. The bits 8 to 15 of the flag indicate the presence and quantity.

| Item               | Data type                         | Details   |
|--------------------|-----------------------------------|---|
| Diag Code          | U32                               | Bits 16 to 31: Emergency error code* <sup>1</sup><br>Bits 0 to 15: E800 hex   |
| Flags              | U16                               | Bits 8 to 15: Number of attached information of the event<br>Bits 4 to 7: Source of time information for Time Stamp <ul style="list-style-type: none"> <li>• 1: Local time stamp (CoE object index 10F8 hex)</li> </ul> Bits 0 to 3: Event level <ul style="list-style-type: none"> <li>• 0: Information</li> <li>• 1: Observation</li> <li>• 2: Minor fault</li> </ul> |
| Text ID            | U16                               | Upper 4 digits of the event code.* <sup>2</sup>   |
| Time Stamp         | UINT64                            | The time that the error occurred.* <sup>3</sup>   |
| Flag parameter 1   | U16                               | Bits 12 to 15: Fixed to 0<br>Bits 0 to 11: Data type of detail parameter 1* <sup>4</sup>  |
| Detail parameter 1 | (Depends on the flag parameter 1) | Attached information 1 of the event   |

| Item               | Data type                         | Details  |
|--------------------|-----------------------------------|--|
| Flag parameter 2   | U16                               | Bits 12 to 15: Fixed to 0<br>Bits 0 to 11: Data type of detail parameter 2*4 |
| Detail parameter 2 | (Depends on the flag parameter 2) | Attached information 2 of the event  |
| Flag parameter 3   | U16                               | Bits 12 to 15: Fixed to 0<br>Bits 0 to 11: Data type of detail parameter 3*4 |
| Detail parameter 3 | (Depends on the flag parameter 3) | Attached information 3 of the event  |
| Flag parameter 4   | U16                               | Bits 12 to 15: Fixed to 0<br>Bits 0 to 11: Data type of detail parameter 4*4 |
| Detail parameter 4 | (Depends on the flag parameter 4) | Attached information 4 of the event  |

\*1. Refer to 8-4-3 *Emergency Error Codes* on page 8-57 for details on the emergency error codes.

\*2. Refer to *Error Descriptions* on page 8-18 for details on the event codes for errors.

\*3. The System Time of the CPU Unit is used.

\*4. The following shows the meaning of each value.

| Value (hex) | Data type  |
|-------------|------------|
| 001         | Boolean    |
| 002         | Integer8   |
| 003         | Integer16  |
| 004         | Integer32  |
| 005         | Unsigned8  |
| 006         | Unsigned16 |
| 007         | Unsigned32 |
| 008         | Real32     |
| 011         | Real64     |
| 015         | Integer64  |
| 01B         | Unsigned64 |

| Index (hex) | Sub-index (hex) | Object name | Default value            | Data range   | Unit | Data attribute | Size             | Access | PDO mapping  | Complete access |
|-------------|-----------------|-------------|--------------------------|--|------|----------------|------------------|--------|--------------|-----------------|
| 10F8        | ---             | Timestamp   | 0000000000<br>000000 hex | 000000000000<br>0000 hex to<br>2FFFFFFFFF<br>FFFFF hex | ns   | ---            | 8 bytes<br>(U64) | RO     | Not possible | Not possible    |

- This object is the source of information on the error occurrence time that is recorded in the error log. The System Time of the CPU Unit is read.
- The time is indicated in an elapsed time from 1970/1/1, 0:00:00.

### A-6-5 PDO Mapping Objects

The PDO mapping objects for the EtherCAT Slave Unit are as follows.

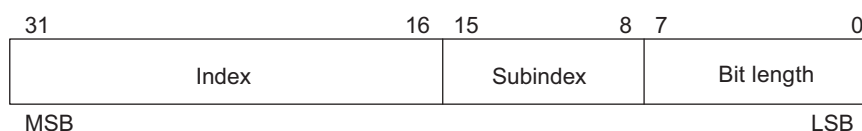
| Index (hex)  | Contents  | Reference   |
|--------------|---|---|
| 1601 to 1603 | Receive PDO mapping objects for data from the EtherCAT master to the CPU Unit | <i>Receive PDO Mapping Objects for Data from the EtherCAT Master to the CPU Unit</i> on page A-41 |



| Index (hex)  | Contents   | Reference  |
|--------------|--|--|
| 1A01 to 1A03 | Transmit PDO mapping objects for data from the CPU Unit to the EtherCAT master | <i>Transmit PDO Mapping Objects for Data from the CPU Unit to the EtherCAT Master</i> on page A-42 |
| 1A00         | Transmit PDO mapping object for NX Unit Status Information                     | <i>Transmit PDO Mapping Object for NX Unit Status Information</i> on page A-44                     |
| 1BFE         | Transmit PDO mapping object for New Messages Available Information             | <i>Transmit PDO Mapping Object for New Messages Available Information</i> on page A-44             |
| 1BFF         | Transmit PDO mapping object for Sysmac Error Status Information                | <i>Transmit PDO Mapping Object for Sysmac Error Status Information</i> on page A-45                |

These PDO mapping objects are writable only when the EtherCAT Slave Unit is in Pre-Operational state.

Subindexes 01 hex and on give the mapped application object information.



Bits 16 to 31: Index of the assigned object

Bits 8 to 15: Subindex of the assigned object

Bits 0 to 7: Bit length of the assigned object (i.e., a bit length of 32 bits is given as 20 hex)

## Receive PDO Mapping Objects for Data from the EtherCAT Master to the CPU Unit

The indexes from 1601 hex to 1603 hex are for receive PDO mapping objects for the data from the EtherCAT master to CPU Unit.

| Index (hex)             | Sub-index (hex) | Object name   | Default value | Data range                 | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------------------|-----------------|---|---------------|----------------------------|------|----------------|---------------|--------|--------------|-----------------|
| 1601                    | ---             | Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit | ---           | ---                        | ---  | ---            | ---           | ---    | ---          | Possible        |
|                         | 00              | Number of objects in this PDO                               | 06 hex        | 00 to 28 hex               | ---  | ---            | 1 byte (U8)   | RW     | Not possible | ---             |
|                         | 01              | 1st Output Object to be mapped                              | 700001F0 hex  | 700001F0 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |
|                         | 02              | 2nd Output Object to be mapped                              | 700002F0 hex  | 700002F0 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |
| Subindexes 03 to 27 hex |                 |   |               |                            |      |                |               |        |              |                 |

| Index (hex)             | Sub-index (hex) | Object name   | Default value | Data range                 | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------------------|-----------------|---|---------------|----------------------------|------|----------------|---------------|--------|--------------|-----------------|
|                         | 28              | 40th Output Object to be mapped                             | 700028F0 hex  | 700028F0 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |
| 1602                    | ---             | Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit | ---           | ---                        | ---  | ---            | ---           | ---    | ---          | Possible        |
|                         | 00              | Number of objects in this PDO                               | 02 hex        | 00 to 0A hex               | ---  | ---            | 1 byte (U8)   | RW     | Not possible | ---             |
|                         | 01              | 1st Output Object to be mapped                              | 70010150 hex  | 70010150 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |
|                         | 02              | 2nd Output Object to be mapped                              | 70010250 hex  | 70010250 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |
| Subindexes 03 to 09 hex |                 |   |               |                            |      |                |               |        |              |                 |
|                         | 0A              | 10th Output Object to be mapped                             | 70010A50 hex  | 70010A50 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |
| 1603                    | ---             | Data Set in UDINT from EtherCAT Master to CPU Unit          | ---           | ---                        | ---  | ---            | ---           | ---    | ---          | Possible        |
|                         | 00              | Number of objects in this PDO                               | 04 hex        | 00 to 20 hex               | ---  | ---            | 1 byte (U8)   | RW     | Not possible | ---             |
|                         | 01              | 1st Output Object to be mapped                              | 70020120 hex  | 70020120 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |
|                         | 02              | 2nd Output Object to be mapped                              | 70020220 hex  | 70020220 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |
| Subindexes 03 to 1F hex |                 |   |               |                            |      |                |               |        |              |                 |
|                         | 20              | 32nd Output Object to be mapped                             | 70022020 hex  | 70022020 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |

## Transmit PDO Mapping Objects for Data from the CPU Unit to the EtherCAT Master

The indexes from 1A01 hex to 1A03 hex are for transmit PDO mapping objects for data from the CPU Unit to the EtherCAT master.

| Index (hex) | Sub-index (hex)         | Object name   | Default value | Data range                 | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------|-------------------------|---|---------------|----------------------------|------|----------------|---------------|--------|--------------|-----------------|
| 1A01        | ---                     | Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master | ---           | ---                        | ---  | ---            | ---           | ---    | ---          | Possible        |
|             | 00                      | Number of objects in this PDO                               | 06 hex        | 00 to 28 hex               | ---  | ---            | 1 byte (U8)   | RW     | Not possible | ---             |
|             | 01                      | 1st Input Object to be mapped                               | 600001F0 hex  | 600001F0 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |
|             | 02                      | 2nd Input Object to be mapped                               | 600002F0 hex  | 600002F0 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |
|             | Subindexes 03 to 27 hex |   |               |                            |      |                |               |        |              |                 |
|             | 28                      | 40th Input Object to be mapped                              | 600028F0 hex  | 600028F0 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |
| 1A02        | ---                     | Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master | ---           | ---                        | ---  | ---            | ---           | ---    | ---          | Possible        |
|             | 00                      | Number of objects in this PDO                               | 02 hex        | 00 to 0A hex               | ---  | ---            | 1 byte (U8)   | RW     | Not possible | ---             |
|             | 01                      | 1st Input Object to be mapped                               | 60010150 hex  | 60010150 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |
|             | 02                      | 2nd Input Object to be mapped                               | 60010250 hex  | 60010250 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |
|             | Subindexes 03 to 09 hex |   |               |                            |      |                |               |        |              |                 |
|             | 0A                      | 10th Input Object to be mapped                              | 60010A50 hex  | 60010A50 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |
| 1A03        | ---                     | Data Set in UDINT from CPU Unit to EtherCAT Master          | ---           | ---                        | ---  | ---            | ---           | ---    | ---          | Possible        |
|             | 00                      | Number of objects in this PDO                               | 04 hex        | 00 to 20 hex               | ---  | ---            | 1 byte (U8)   | RW     | Not possible | ---             |
|             | 01                      | 1st Input Object to be mapped                               | 60020120 hex  | 60020120 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |
|             | 02                      | 2nd Input Object to be mapped                               | 60020220 hex  | 60020220 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |
|             | Subindexes 03 to 1F hex |   |               |                            |      |                |               |        |              |                 |
|             | 20                      | 32nd Input Object to be mapped                              | 60022020 hex  | 60022020 hex, 00000000 hex | ---  | ---            | 4 bytes (U32) | RW     | Not possible | ---             |

## Transmit PDO Mapping Object for NX Unit Status Information

The index 1A00 hex is for transmit PDO mapping object for NX Unit Status Information.

| Index (hex) | Sub-index (hex) | Object name                   | Default value | Data range   | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------|-----------------|-------------------------------|---------------|--------------|------|----------------|---------------|--------|--------------|-----------------|
| 1A00        | ---             | NX Unit Status Information    | ---           | ---          | ---  | ---            | ---           | ---    | ---          | Possible        |
|             | 00              | Number of objects in this PDO | 06 hex        | 06 hex       | ---  | ---            | 1 byte (U8)   | RO     | Not possible | ---             |
|             | 01              | 1st Input Object to be mapped | 60030101 hex  | 60030101 hex | ---  | ---            | 4 bytes (U32) | RO     | Not possible | ---             |
|             | 02              | 2nd Input Object to be mapped | 60030201 hex  | 60030201 hex | ---  | ---            | 4 bytes (U32) | RO     | Not possible | ---             |
|             | 03              | 3rd Input Object to be mapped | 60030301 hex  | 60030301 hex | ---  | ---            | 4 bytes (U32) | RO     | Not possible | ---             |
|             | 04              | 4th Input Object to be mapped | 60030401 hex  | 60030401 hex | ---  | ---            | 4 bytes (U32) | RO     | Not possible | ---             |
|             | 05              | 5th Input Object to be mapped | 60030501 hex  | 60030501 hex | ---  | ---            | 4 bytes (U32) | RO     | Not possible | ---             |
|             | 06              | 6th Input Object to be mapped | 0000000B hex  | 0000000B hex | ---  | ---            | 4 bytes (U32) | RO     | Not possible | ---             |

## Transmit PDO Mapping Object for New Messages Available Information

The index 1BFE hex is for transmit PDO mapping object for New Messages Available Information.

| Index (hex) | Sub-index (hex) | Object name                        | Default value | Data range   | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------|-----------------|------------------------------------|---------------|--------------|------|----------------|---------------|--------|--------------|-----------------|
| 1BFE        | ---             | New Messages Available Information | ---           | ---          | ---  | ---            | ---           | ---    | ---          | Possible        |
|             | 00              | Number of objects in this PDO      | 02 hex        | 02 hex       | ---  | ---            | 1 byte (U8)   | RO     | Not possible | ---             |
|             | 01              | 1st Input Object to be mapped      | 10F30401 hex  | 10F30401 hex | ---  | ---            | 4 bytes (U32) | RO     | Not possible | ---             |
|             | 02              | 2nd Input Object to be mapped      | 00000007 hex  | 00000007 hex | ---  | ---            | 4 bytes (U32) | RO     | Not possible | ---             |

## Transmit PDO Mapping Object for Sysmac Error Status Information

The index 1BFF hex is for transmit PDO mapping object for Sysmac Error Status Information.

| Index (hex) | Sub-index (hex) | Object name                     | Default value | Data range   | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------|-----------------|---------------------------------|---------------|--------------|------|----------------|---------------|--------|--------------|-----------------|
| 1BFF        | ---             | Sysmac Error Status Information | ---           | ---          | ---  | ---            | ---           | ---    | ---          | Possible        |
|             | 00              | Number of objects in this PDO   | 01 hex        | 01 hex       | ---  | ---            | 1 byte (U8)   | RO     | Not possible | ---             |
|             | 01              | 1st Input Object to be mapped   | 20020108 hex  | 20020108 hex | ---  | ---            | 4 bytes (U32) | RO     | Not possible | ---             |

## A-6-6 Sync Manager Communications Objects

The EtherCAT communications memory is set with objects 1C00 hex to 1C13 hex.

| Index (hex) | Sub-index (hex) | Object name                       | Default value | Data range | Unit | Data attribute | Size        | Access | PDO mapping  | Complete access |
|-------------|-----------------|-----------------------------------|---------------|------------|------|----------------|-------------|--------|--------------|-----------------|
| 1C00        | ---             | Sync Manager Communication Type   | ---           | ---        | ---  | ---            | ---         | ---    | ---          | Possible        |
|             | 00              | Number of used SM channels        | 04 hex        | 04 hex     | ---  | ---            | 1 byte (U8) | RO     | Not possible | ---             |
|             | 01              | Communication Type Sync Manager 0 | 01 hex        | 01 hex     | ---  | ---            | 1 byte (U8) | RO     | Not possible | ---             |
|             | 02              | Communication Type Sync Manager 1 | 02 hex        | 02 hex     | ---  | ---            | 1 byte (U8) | RO     | Not possible | ---             |
|             | 03              | Communication Type Sync Manager 2 | 03 hex        | 03 hex     | ---  | ---            | 1 byte (U8) | RO     | Not possible | ---             |
|             | 04              | Communication Type Sync Manager 3 | 04 hex        | 04 hex     | ---  | ---            | 1 byte (U8) | RO     | Not possible | ---             |

- The Sync Managers are set as follows:  
 SM0: Mailbox receive (EtherCAT master to EtherCAT Slave Unit)  
 SM1: Mailbox send (EtherCAT Slave Unit to EtherCAT master)  
 SM2: Process data output (EtherCAT master to EtherCAT Slave Unit)  
 SM3: Process data input (EtherCAT Slave Unit to EtherCAT master)

| Index (hex) | Sub-index (hex) | Object name                   | Default value | Data range | Unit | Data attribute | Size        | Access | PDO mapping  | Complete access |
|-------------|-----------------|-------------------------------|---------------|------------|------|----------------|-------------|--------|--------------|-----------------|
| 1C10        | ---             | Sync Manager 0 PDO Assignment | ---           | ---        | ---  | ---            | ---         | ---    | ---          | Possible        |
|             | 00              | Number of assigned PDOs       | 00 hex        | 00 hex     | ---  | ---            | 1 byte (U8) | RO     | Not possible | ---             |

- This object gives the number of PDO mappings that are used by Sync Manager 0.
- The Mailbox Receive Sync Manager does not have any PDOs.

| Index (hex) | Sub-index (hex) | Object name                   | Default value | Data range | Unit | Data attribute | Size        | Access | PDO mapping  | Complete access |
|-------------|-----------------|-------------------------------|---------------|------------|------|----------------|-------------|--------|--------------|-----------------|
| 1C11        | ---             | Sync Manager 1 PDO Assignment | ---           | ---        | ---  | ---            | ---         | ---    | ---          | Possible        |
|             | 00              | Number of assigned PDOs       | 00 hex        | 00 hex     | ---  | ---            | 1 byte (U8) | RO     | Not possible | ---             |

- This object gives the number of PDO mappings that are used by Sync Manager 1.
- The Mailbox Transmit Sync Manager does not have any PDOs.

| Index (hex) | Sub-index (hex) | Object name                                    | Default value | Data range                 | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------|-----------------|--|---------------|----------------------------|------|----------------|---------------|--------|--------------|-----------------|
| 1C12        | ---             | Sync Manager 2 PDO Assignment                  | ---           | ---                        | ---  | ---            | ---           | ---    | ---          | Possible        |
|             | 00              | Number of assigned RxPDOs                      | 01 hex        | 00 to 03 hex               | ---  | B              | 1 byte (U8)   | RW     | Not possible | ---             |
|             | 01              | 1st PDO Mapping object index of assigned RxPDO | 1601 hex      | 0000 hex, 1601 to 1603 hex | ---  | B              | 2 bytes (U16) | RW     | Not possible | ---             |
|             | 02              | 2nd PDO Mapping object index of assigned RxPDO | 0000 hex      | 0000 hex, 1602 to 1603 hex | ---  | B              | 2 bytes (U16) | RW     | Not possible | ---             |
|             | 03              | 3rd PDO Mapping object index of assigned RxPDO | 0000 hex      | 0000 hex, 1603 hex         | ---  | B              | 2 bytes (U16) | RW     | Not possible | ---             |

- This object gives the receive PDO that is used by Sync Manager 2.

| Index (hex) | Sub-index (hex) | Object name                                    | Default value | Data range                                   | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------|-----------------|--|---------------|--|------|----------------|---------------|--------|--------------|-----------------|
| 1C13        | ---             | Sync Manager 3 PDO Assignment                  | ---           | ---  | ---  | ---            | ---           | ---    | ---          | Possible        |
|             | 00              | Number of assigned TxPDOs                      | 03 hex        | 01 to 06 hex                                 | ---  | B              | 1 byte (U8)   | RW     | Not possible | ---             |
|             | 01              | 1st PDO Mapping object index of assigned TxPDO | 1A00 hex      | 1A00 hex                                     | ---  | B              | 2 bytes (U16) | RW     | Not possible | ---             |
|             | 02              | 2nd PDO Mapping object index of assigned TxPDO | 1A01 hex      | 0000 hex, 1A01 to 1A03 hex, 1BFE to 1BFF hex | ---  | B              | 2 bytes (U16) | RW     | Not possible | ---             |
|             | 03              | 3rd PDO Mapping object index of assigned TxPDO | 1BFE hex      | 0000 hex, 1A02 to 1A03 hex, 1BFE to 1BFF hex | ---  | B              | 2 bytes (U16) | RW     | Not possible | ---             |
|             | 04              | 4th PDO Mapping object index of assigned TxPDO | 0000F hex     | 0000 hex, 1A03 hex, 1BFE to 1BFF hex         | ---  | B              | 2 bytes (U16) | RW     | Not possible | ---             |
|             | 05              | 5th PDO Mapping object index of assigned TxPDO | 0000 hex      | 0000 hex, 1BFE to 1BFF hex                   | ---  | B              | 2 bytes (U16) | RW     | Not possible | ---             |
|             | 06              | 6th PDO Mapping object index of assigned TxPDO | 0000 hex      | 0000 hex, 1BFF hex                           | ---  | B              | 2 bytes (U16) | RW     | Not possible | ---             |

- This object gives the transmit PDO that is used by Sync Manager 3.

| Index (hex) | Sub-index (hex) | Object name                          | Default value | Data range               | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------|-----------------|--------------------------------------|---------------|--------------------------|------|----------------|---------------|--------|--------------|-----------------|
| 1C32        | ---             | Sync Manager 2 Synchronization       | ---           | ---                      | ---  | ---            | ---           | ---    | ---          | Possible        |
|             | 00              | Number of Synchronization Parameters | 05 hex        | 05 hex                   | ---  | ---            | 1 byte (U8)   | RO     | Not possible | ---             |
|             | 01              | Synchronization Type                 | 0000 hex      | 0000 hex                 | ---  | B              | 2 bytes (U16) | RW     | Not possible | ---             |
|             | 02              | Cycle Time                           | 00000000 hex  | 00000000 to FFFFFFFF hex | ns   | ---            | 4 bytes (U32) | RO     | Not possible | ---             |
|             | 04              | Synchronization Types supported      | 0001 hex      | 0001 hex                 | ---  | ---            | 2 bytes (U16) | RO     | Not possible | ---             |
|             | 05              | Minimum Cycle Time                   | 00000000 hex  | 00000000 hex             | ns   | ---            | 4 bytes (U32) | RO     | Not possible | ---             |

- This object gives the specifications of the EtherCAT communications mode for Sync Manager 2.
- Subindex 01 hex gives the EtherCAT communications mode for Sync Manager 2 of the EtherCAT Slave Unit.  
0000 hex: Free-Run Mode
- Subindex 02 hex gives the cycle time. In Free-Run Mode, the time between two local timer events is given.
- Subindex 04 hex gives the type of synchronization that is supported by the EtherCAT Slave Unit. It is 0001 hex for the EtherCAT Slave Unit.
- Subindex 05 hex gives the minimum cycle time that is supported by the EtherCAT Slave Unit. It is 0000 hex for the EtherCAT slaves.



| Index (hex) | Sub-index (hex) | Object name                          | Default value | Data range               | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------|-----------------|--------------------------------------|---------------|--------------------------|------|----------------|---------------|--------|--------------|-----------------|
| 1C33        | ---             | Sync Manager 3 Synchronization       | ---           | ---                      | ---  | ---            | ---           | ---    | ---          | Possible        |
|             | 00              | Number of Synchronization Parameters | 05 hex        | 05 hex                   | ---  | ---            | 1 byte (U8)   | RO     | Not possible | ---             |
|             | 01              | Synchronization Type                 | 0000 hex      | 0000 hex                 | ---  | B              | 2 bytes (U16) | RW     | Not possible | ---             |
|             | 02              | Cycle Time                           | 00000000 hex  | 00000000 to FFFFFFFF hex | ns   | ---            | 4 bytes (U32) | RO     | Not possible | ---             |
|             | 04              | Synchronization Types supported      | 0001 hex      | 0001 hex                 | ---  | ---            | 2 bytes (U16) | RO     | Not possible | ---             |
|             | 05              | Minimum Cycle Time                   | 00000000 hex  | 00000000 hex             | ns   | ---            | 4 bytes (U32) | RO     | Not possible | ---             |

- This object gives the specifications of the EtherCAT communications mode for Sync Manager 3.
- Subindex 01 hex gives the EtherCAT communications mode for Sync Manager 2 of the EtherCAT Slave Unit.  
0000 hex: Free-Run Mode
- Subindex 02 hex gives the cycle time. In Free-Run Mode, the time between two local timer events is given.
- Subindex 04 hex gives the type of synchronization that is supported by the EtherCAT Slave Unit. It is 0001 hex for the EtherCAT Slave Unit.
- Subindex 05 hex gives the minimum cycle time that is supported by the EtherCAT Slave Unit. It is 0000 hex for the EtherCAT slaves.

### A-6-7 Manufacturer-specific Object 1

| Index (hex) | Sub-index (hex) | Object name               | Default value | Data range   | Unit | Data attribute | Size        | Access | PDO mapping  | Complete access |
|-------------|-----------------|---------------------------|---------------|--------------|------|----------------|-------------|--------|--------------|-----------------|
| 2002        | ---             | Sysmac Error              | ---           | ---          | ---  | ---            | ---         | ---    | ---          | Not possible    |
|             | 00              | Number of entries         | 02 hex        | 02 hex       | ---  | ---            | 1 byte (U8) | RO     | Not possible | ---             |
|             | 01              | Sysmac Error Status       | 00 hex        | 00 to FF hex | ---  | ---            | 1 byte (U8) | RO     | Possible     | ---             |
|             | 02              | Sysmac Error Status Clear | 00 hex        | 00 to FF hex | ---  | A              | 1 byte (U8) | RW     | Not possible | ---             |

- This object gives the Sysmac error status for the EtherCAT Slave Unit.
- The assignments of bits in the Sysmac error status at subindex 01 hex are listed below. The applicable bit is 0 (FALSE) if no error exists, or 1 (TRUE) if an error exists.

Bits 6 to 7: Reserved

Bit 5: Minor Fault

Bit 4: Observation

Bits 0 to 3: Reserved

Refer to *Sysmac Error Status Information* on page 7-19 under *7-5 PDO Settings and Specifications* on page 7-8 for details on this status.

- Subindex 02 hex is used to clear the Sysmac Error Status. Write 01 hex to clear the Sysmac Error Status. If you write a value other than 01 hex, the command is invalid and the abort code 06090030 hex is returned. When a read is performed, 00 hex is given.

| Index (hex)             | Sub-index (hex) | Object name           | Default value | Data range   | Unit | Data attribute | Size                            | Access | PDO mapping  | Complete access |
|-------------------------|-----------------|-----------------------|---------------|--------------|------|----------------|---------------------------------|--------|--------------|-----------------|
| 2003                    | ---             | Sysmac Observation    | ---           | ---          | ---  | ---            | ---                             | ---    | ---          | Possible        |
|                         | 00              | Number of Observation | 00 hex        | 00 to 0A hex | ---  | ---            | 1 byte (U8)                     | RO     | Not possible | ---             |
|                         | 01              | Observation 1         | ---           | ---          | ---  | ---            | 12 bytes (ARRAY[0..11] OF BYTE) | RO     | Not possible | ---             |
| Subindexes 02 to 09 hex |                 |                       |               |              |      |                |                                 |        |              |                 |
|                         | 0A              | Observation 10        | ---           | ---          | ---  | ---            | 12 bytes (ARRAY[0..11] OF BYTE) | RO     | Not possible | ---             |

- This object gives observation level events that are detected by the EtherCAT Slave Unit.
- Subindex 00 hex gives the number of observations that are detected by the EtherCAT Slave Unit.
- Subindexes 01 hex to 0A hex give the error logs for up to 10 observations that currently exist. The combined total number of logs for observations and minor faults (2004 hex) that are detected by the EtherCAT Slave Unit is 10. If a minor fault is detected when there are a total of 10 minor faults and observations combined, the log for the most recent observation is deleted and the new minor fault is added. If an observation is detected when there are 10 logs for observations, the record for the most recent observation is deleted.
- Observations are stored in the order that they occur from subindexes 01 hex to 0A hex.
- The logs are cleared when 1 (TRUE) is written to the Sysmac Error Status Clear (02 hex) in the Sysmac Error Status (2002 hex).
- The following table gives the format of each log.

| Item                 | Data type | Details  |
|----------------------|-----------|--|
| Error code           | U32       | Event code (stored in little endian)   |
| Type of error detail | U32       | Byte 0: Attached information is not provided for 0, and attached information is provided for 1.<br>Byte 1: Attached information is not provided for 0, and attached information is provided for 4.<br>Byte 2 to 3: 0007 hex (fixed)              |
| Error detail         | U32       | When the occurring observation has no attached information 1, it indicates 0. When the attached information 1 is provided, it is indicated. Even if an error has two or more attached information, only the attached information 1 is indicated. |

Refer to 8-3 *Checking for Errors and Troubleshooting with the Troubleshooting Functions* on page 8-9 for the event codes.

| Index (hex)             | Sub-index (hex) | Object name           | Default value | Data range   | Unit | Data attribute | Size                             | Access | PDO mapping  | Complete access |
|-------------------------|-----------------|-----------------------|---------------|--------------|------|----------------|----------------------------------|--------|--------------|-----------------|
| 2004                    | ---             | Sysmac Minor Fault    | ---           | ---          | ---  | ---            | ---                              | ---    | ---          | Possible        |
|                         | 00              | Number of Minor Fault | 00 hex        | 00 to 0A hex | ---  | ---            | 1 byte (U8)                      | RO     | Not possible | ---             |
|                         | 01              | Minor Fault 1         | ---           | ---          | ---  | ---            | 12 bytes (AR-RA[0..1] OF BYTE)   | RO     | Not possible | ---             |
| Subindexes 02 to 09 hex |                 |                       |               |              |      |                |                                  |        |              |                 |
|                         | 0A              | Minor Fault 10        | ---           | ---          | ---  | ---            | 12 bytes (AR-RAY[0..11] OF BYTE) | RO     | Not possible | ---             |

- This object gives minor fault level events that are detected by the EtherCAT Slave Unit.
- Subindex 00 hex gives the number of minor faults that are detected by the EtherCAT Slave Unit.
- Subindexes 01 hex to 0A hex give the error logs for up to 10 minor faults that currently exist. The combined total number of logs for minor faults and observations (2003 hex) that are detected by the EtherCAT Slave Terminal is 10. If a minor fault is detected when there are a total of 10 minor faults and observations combined, the log for the most recent observation is deleted and the new minor fault is added. If a minor fault is detected when there are 10 logs for minor faults, the 11th log is not recorded.
- Minor faults are stored in the order that they occur from subindexes 01 hex to 0A hex.
- The logs are cleared when 1 (TRUE) is written to the Sysmac Error Status Clear (02 hex) in the Sysmac Error Status (2002 hex).
- The following table gives the format of each log.

| Item                 | Data type | Details   |
|----------------------|-----------|---|
| Error code           | U32       | Event code (stored in little endian)  |
| Type of error detail | U32       | Byte 0: Attached information is not provided for 0, and attached information is provided for 1.<br>Byte 1: Attached information is not provided for 0, and attached information is provided for 4.<br>Byte 2 to 3: 0007 hex (fixed)                 |
| Error detail         | U32       | When the occurring minor fault has no attached information 1, it indicates 0.<br>When the attached information 1 is provided, it is indicated. Even if an error has two or more attached information, only the attached information 1 is indicated. |

Refer to 8-3 *Checking for Errors and Troubleshooting with the Troubleshooting Functions* on page 8-9 for the event codes.

| Index (hex) | Sub-index (hex) | Object name         | Default value | Data range | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------|-----------------|---------------------|---------------|------------|------|----------------|---------------|--------|--------------|-----------------|
| 2100        | ---             | Error History Clear | 00000000 hex  | ---        | ---  | A              | 4 bytes (U32) | RW     | Not possible | Not possible    |

- This object is used to clear the diagnosis messages in the Diagnosis History (10F3 hex).
- The diagnosis messages are cleared only when you write a specific value. The designated value means “elcl.”

| MSB    |        | LSB    |        |
|--------|--------|--------|--------|
| l      | c      | l      | e      |
| 6C hex | 63 hex | 6C hex | 65 hex |

If you write a value other than the ones given, the result is invalid and the abort code is returned.

### A-6-8 Manufacturer-specific Object 2

| Index (hex) | Sub-index (hex) | Object name                | Default value | Data range | Unit | Data attribute | Size                              | Access | PDO mapping  | Complete access |
|-------------|-----------------|----------------------------|---------------|------------|------|----------------|-----------------------------------|--------|--------------|-----------------|
| 3000        | ---             | Message Data from CPU Unit | ---           | ---        | ---  | ---            | ---                               | ---    | ---          | Possible        |
|             | 00              | Number of entries          | 01 hex        | 01 hex     | ---  | ---            | 1 byte (U8)                       | RO     | Not possible | ---             |
|             | 01              | Message Data from CPU Unit | ---           | ---        | ---  | ---            | 200 bytes (ARRAY[0..199] OF BYTE) | RO     | Not possible | ---             |

Refer to A-5 *Data Exchange by Messages* on page A-26 for the functions of this object.

| Index (hex) | Sub-index (hex) | Object name              | Default value | Data range | Unit | Data attribute | Size                              | Access | PDO mapping  | Complete access |
|-------------|-----------------|--------------------------|---------------|------------|------|----------------|-----------------------------------|--------|--------------|-----------------|
| 3001        | ---             | Message Data to CPU Unit | ---           | ---        | ---  | ---            | ---                               | ---    | ---          | Possible        |
|             | 00              | Number of entries        | 01 hex        | 01 hex     | ---  | ---            | 1 byte (U8)                       | RO     | Not possible | ---             |
|             | 01              | Message Data to CPU Unit | ---           | ---        | ---  | ---            | 200 bytes (ARRAY[0..199] OF BYTE) | RW     | Not possible | ---             |

Refer to A-5 Data Exchange by Messages on page A-26 for the functions of this object.

## A-6-9 Device Profile Area

The following shows the objects of the device profile area for the EtherCAT Slave Unit.

| Index (hex)  | Contents                                      | Reference  |
|--------------|---|--|
| 6000 to 6002 | Data from the CPU Unit to the EtherCAT master | Data from the CPU Unit to the EtherCAT Master on page A-53 |
| 6003         | Data of NX Unit Status Information            | Data of NX Unit Status Information on page A-55            |
| 7000 to 7002 | Data from the EtherCAT master to the CPU Unit | Data from the EtherCAT Master to the CPU Unit on page A-56 |

Refer to 7-5 PDO Settings and Specifications on page 7-8 for details on the functions of these objects.

### Data from the CPU Unit to the EtherCAT Master

This object does not allow complete access.

The reading and writing specifications for this object are listed below.

- If the object is mapped to a PDO, reading and writing are not allowed.
- If the object is not mapped to a PDO, reading and writing depend on the communications control status. The specifications are given in the following table.

| Status           | Specification                                  |
|------------------|--|
| Pre-Operational  | Reading and writing are not allowed.           |
| Safe-Operational | Reading is allowed and writing is not allowed. |
| Operational      |  |

| Index (hex) | Sub-index (hex)         | Object name       | Default value*1 | Data range*1         | Unit | Data attribute | Size                             | Access | PDO mapping  | Complete access |
|-------------|-------------------------|-------------------|-----------------|----------------------|------|----------------|----------------------------------|--------|--------------|-----------------|
| 6000        | ---                     | UINTs Data C to M | ---             | ---                  | ---  | ---            | ---                              | ---    | ---          | Not possible    |
|             | 00                      | Number of entries | 28 hex          | 28 hex               | ---  | ---            | 1 byte (U8)                      | RO     | Not possible | ---             |
|             | 01                      | UINTs 01 C to M   | 0000 hex        | 0000 hex to FFFF hex | ---  | ---            | 30 bytes (ARRAY [0..14] OF UINT) | RO     | Possible     | ---             |
|             | 02                      | UINTs 02 C to M   | 0000 hex        | 0000 hex to FFFF hex | ---  | ---            | 30 bytes (ARRAY [0..14] OF UINT) | RO     | Possible     | ---             |
|             | Subindexes 03 to 27 hex |                   |                 |                      |      |                |                                  |        |              |                 |
|             | 28                      | UINTs 40 C to M   | 0000 hex        | 0000 hex to FFFF hex | ---  | ---            | 30 bytes (ARRAY [0..14] OF UINT) | RO     | Possible     | ---             |
| 6001        | ---                     | BYTES Data C to M | ---             | ---                  | ---  | ---            | ---                              | ---    | ---          | Not possible    |
|             | 00                      | Number of entries | 0A hex          | 0A hex               | ---  | ---            | 1 byte (U8)                      | RO     | Not possible | ---             |
|             | 01                      | BYTES 01 C to M   | 00 hex          | 00 hex to FF hex     | ---  | ---            | 10 bytes (ARRAY [0..9] OF BYTE)  | RO     | Possible     | ---             |
|             | 02                      | BYTES 02 C to M   | 00 hex          | 00 hex to FF hex     | ---  | ---            | 10 bytes (ARRAY [0..9] OF BYTE)  | RO     | Possible     | ---             |
|             | Subindexes 03 to 09 hex |                   |                 |                      |      |                |                                  |        |              |                 |

| Index (hex)             | Sub-index (hex) | Object name       | Default value*1 | Data range*1                 | Unit | Data attribute | Size                            | Access | PDO mapping  | Complete access |
|-------------------------|-----------------|-------------------|-----------------|------------------------------|------|----------------|---------------------------------|--------|--------------|-----------------|
|                         | 0A              | BYTES 10 C to M   | 00 hex          | 00 hex to FF hex             | ---  | ---            | 10 bytes (ARRAY [0..9] OF BYTE) | RO     | Possible     | ---             |
| 6002                    | ---             | UDINT Data C to M | ---             | ---                          | ---  | ---            | ---                             | ---    | ---          | Not possible    |
|                         | 00              | Number of entries | 20 hex          | 20 hex                       | ---  | ---            | 1 byte (U8)                     | RO     | Not possible | ---             |
|                         | 01              | UDINT 01 C to M   | 00000000 hex    | 00000000 hex to FFFFFFFF hex | ---  | ---            | 4 bytes (U32)                   | RO     | Possible     | ---             |
|                         | 02              | UDINT 02 C to M   | 00000000 hex    | 00000000 hex to FFFFFFFF hex | ---  | ---            | 4 bytes (U32)                   | RO     | Possible     | ---             |
| Subindexes 03 to 1F hex |                 |                   |                 |                              |      |                |                                 |        |              |                 |
|                         | 20              | UDINT 32 C to M   | 00000000 hex    | 00000000 hex to FFFFFFFF hex | ---  | ---            | 4 bytes (U32)                   | RO     | Possible     | ---             |

\*1. Default values or data ranges for each element when the object is an array.

Refer to *I/O Data Set from the CPU Unit to the EtherCAT Master (TxPDO)* on page 7-14 for the functions of each object.

## Data of NX Unit Status Information

This object does not allow complete access.

The reading and writing specifications for this object are listed below.

- If the object is mapped to a PDO, reading and writing are not allowed.
- If the object is not mapped to a PDO, reading and writing depend on the communications control status. The specifications are given in the following table.

| Status           | Specification                                  |
|------------------|--|
| Pre-Operational  | Reading and writing are not allowed.           |
| Safe-Operational | Reading is allowed and writing is not allowed. |
| Operational      |  |

| Index (hex) | Sub-index (hex) | Object name                                 | Default value | Data range    | Unit | Data attribute | Size         | Access | PDO mapping  | Complete access |
|-------------|-----------------|---|---------------|---------------|------|----------------|--------------|--------|--------------|-----------------|
| 6003        | ---             | NX Unit Status                              | ---           | ---           | ---  | ---            | ---          | ---    | ---          | Not possible    |
|             | 00              | Number of entries                           | 05 hex        | 05 hex        | ---  | ---            | 1 byte (U8)  | RO     | Not possible | ---             |
|             | 01              | NX Message Communications Enabled           | FALSE         | TRUE or FALSE | ---  | ---            | 1 bit (BOOL) | RO     | Possible     | ---             |
|             | 02              | Data from CPU Unit to EtherCAT Master Valid | FALSE         | TRUE or FALSE | ---  | ---            | 1 bit (BOOL) | RO     | Possible     | ---             |
|             | 03              | Data from EtherCAT Master to CPU Unit Valid | FALSE         | TRUE or FALSE | ---  | ---            | 1 bit (BOOL) | RO     | Possible     | ---             |
|             | 04              | New Message Data Available from CPU Unit    | FALSE         | TRUE or FALSE | ---  | ---            | 1 bit (BOOL) | RO     | Possible     | ---             |
|             | 05              | Ready to Write Message Data to CPU Unit     | TRUE          | TRUE or FALSE | ---  | ---            | 1 bit (BOOL) | RO     | Possible     | ---             |

Refer to *NX Unit Status Information* on page 7-17 for the functions of this object.

## Data from the EtherCAT Master to the CPU Unit

This object does not allow complete access.

The reading and writing specifications for this object are listed below.

- If the object is mapped to a PDO, reading and writing are not allowed.
- If the object is not mapped to a PDO, reading and writing depend on the communications control status. The specifications are given in the following table.

| Status           | Specification                                  |
|------------------|--|
| Pre-Operational  | Reading and writing are not allowed.           |
| Safe-Operational | Reading is allowed and writing is not allowed. |
| Operational      | Reading and writing are allowed.               |

| Index (hex) | Sub-index (hex) | Object name       | Default value <sup>*1</sup> | Data range <sup>*1</sup> | Unit | Data attribute | Size        | Access | PDO mapping  | Complete access |
|-------------|-----------------|-------------------|-----------------------------|--------------------------|------|----------------|-------------|--------|--------------|-----------------|
| 7000        | ---             | UINTs Data M to C | ---                         | ---                      | ---  | ---            | ---         | ---    | ---          | Not possible    |
|             | 00              | Number of entries | 28 hex                      | 28 hex                   | ---  | ---            | 1 byte (U8) | RO     | Not possible | ---             |



| Index (hex)             | Sub-index (hex) | Object name       | Default value*1 | Data range*1         | Unit | Data attribute | Size                             | Access | PDO mapping  | Complete access |
|-------------------------|-----------------|-------------------|-----------------|----------------------|------|----------------|----------------------------------|--------|--------------|-----------------|
|                         | 01              | UINTs 01 M to C   | 0000 hex        | 0000 hex to FFFF hex | ---  | ---            | 30 bytes (ARRAY [0..14] OF UINT) | RW     | Possible     | ---             |
|                         | 02              | UINTs 02 M to C   | 0000 hex        | 0000 hex to FFFF hex | ---  | ---            | 30 bytes (ARRAY [0..14] OF UINT) | RW     | Possible     | ---             |
| Subindexes 03 to 27 hex |                 |                   |                 |                      |      |                |                                  |        |              |                 |
|                         | 28              | UINTs 40 M to C   | 0000 hex        | 0000 hex to FFFF hex | ---  | ---            | 30 bytes (ARRAY [0..14] OF UINT) | RW     | Possible     | ---             |
| 7001                    | ---             | BYTES Data M to C | ---             | ---                  | ---  | ---            | ---                              | ---    | ---          | Not possible    |
|                         | 00              | Number of entries | 0A hex          | 0A hex               | ---  | ---            | 1 byte (U8)                      | RO     | Not possible | ---             |
|                         | 01              | BYTES 01 M to C   | 00 hex          | 00 hex to FF hex     | ---  | ---            | 10 bytes (ARRAY [0..9] OF BYTE)  | RW     | Possible     | ---             |
|                         | 02              | BYTES 02 M to C   | 00 hex          | 00 hex to FF hex     | ---  | ---            | 10 bytes (ARRAY [0..9] OF BYTE)  | RW     | Possible     | ---             |
| Subindexes 03 to 09 hex |                 |                   |                 |                      |      |                |                                  |        |              |                 |
|                         | 0A              | BYTES 10 M to C   | 00 hex          | 00 hex to FF hex     | ---  | ---            | 10 bytes (ARRAY [0..9] OF BYTE)  | RW     | Possible     | ---             |

| Index (hex) | Sub-index (hex)         | Object name       | Default value*1 | Data range*1                 | Unit | Data attribute | Size          | Access | PDO mapping  | Complete access |
|-------------|-------------------------|-------------------|-----------------|------------------------------|------|----------------|---------------|--------|--------------|-----------------|
| 7002        | ---                     | UDINT Data M to C | ---             | ---                          | ---  | ---            | ---           | ---    | ---          | Not possible    |
|             | 00                      | Number of entries | 20 hex          | 20 hex                       | ---  | ---            | 1 byte (U8)   | RO     | Not possible | ---             |
|             | 01                      | UDINT 01 M to C   | 00000000 hex    | 00000000 hex to FFFFFFFF hex | ---  | ---            | 4 bytes (U32) | RW     | Possible     | ---             |
|             | 02                      | UDINT 02 M to C   | 00000000 hex    | 00000000 hex to FFFFFFFF hex | ---  | ---            | 4 bytes (U32) | RW     | Possible     | ---             |
|             | Subindexes 03 to 1F hex |                   |                 |                              |      |                |               |        |              |                 |
|             | 20                      | UDINT 32 M to C   | 00000000 hex    | 00000000 hex to FFFFFFFF hex | ---  | ---            | 4 bytes (U32) | RW     | Possible     | ---             |

\*1. Default values or data ranges for each element when the object is an array.

Refer to *I/O Data Set from the EtherCAT Master to the CPU Unit (RxPDO)* on page 7-11 for the functions of each object.

## A-7 List of NX Objects

This section describes the NX objects of the EtherCAT Slave Unit.

The NX objects between the CPU Unit and EtherCAT Slave Unit are accessed using the Read NX Unit Object instruction and the Write NX Unit Object instruction.

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

### A-7-1 Format of NX 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.<br>RO: Read only<br>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.<br>Y: Enabled by restarting<br>N: Enabled at all times<br>---: Write-prohibited |               |            |      |           |        |                |                |

### A-7-2 Unit Information Objects

The following objects are related to 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       | 0000000<br>1 hex*4 | ---                            | ---  | UDINT                 | RO     | Not possible   | ---            |
|             | 06             | Unit Version      | *5                 | ---                            | ---  | UDINT                 | RO     | Not possible   | ---            |
|             | 07             | Serial Number     | *6                 | 00000000 to<br>FFFFFFFF<br>hex | ---  | UDINT                 | RO     | Not possible   | ---            |
| 1001        | ---            | Production Info   | ---                | ---                            | ---  | ---                   | ---    | ---            | ---            |
|             | 00             | Number of Entries | 4                  | 4                              | ---  | USINT                 | RO     | Not possible   | ---            |
|             | 01             | Lot Number        | *7                 | 00000000 to<br>FFFFFFFF<br>hex | ---  | UDINT                 | RO     | Not possible   | ---            |
|             | 02             | Hardware Version  | *8                 | ---                            | ---  | ARRAY [0..19] OF BYTE | RO     | Not possible   | ---            |
|             | 03             | Software Version  | *8                 | ---                            | ---  | ARRAY [0..19] OF BYTE | RO     | Not possible   | ---            |

- \*1. 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. Version numbers are assigned in ascending order from the earliest number of array elements. Any remainder elements are filled with spaces.

### A-7-3 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, Write NX Unit Object instruction, or other messages.

| Index (hex) | Subindex (hex) | Object name       | Default value <sup>*1</sup> | Data range <sup>*1</sup> | Unit | Data type             | Access | I/O allocation | Data attribute |
|-------------|----------------|-------------------|-----------------------------|--------------------------|------|-----------------------|--------|----------------|----------------|
| 6000        | ---            | UINTs Data M to C | ---                         | ---                      | ---  | ---                   | ---    | ---            | ---            |
|             | 00             | Number of Entries | 28                          | 28                       | ---  | USINT                 | RO     | Not possible   | ---            |
|             | 01             | UINTs 01 M to C   | 0000 hex                    | 0000 hex to FFFF hex     | ---  | ARRAY [0..14] OF UINT | RO     | Possible       | ---            |
|             | 02             | UINTs 02 M to C   | 0000 hex                    | 0000 hex to FFFF hex     | ---  | ARRAY [0..14] OF UINT | RO     | Possible       | ---            |
|             | :              | :                 | :                           | :                        | :    | :                     | :      | :              | :              |
|             | 28             | UINTs 40 M to C   | 0000 hex                    | 0000 hex to FFFF hex     | ---  | ARRAY [0..14] OF UINT | RO     | Possible       | ---            |

- \*1. Default values or data ranges for each element when the object is an array.

Refer to *Data Set in 15 UINT Arrays from EtherCAT Master to CPU Unit* on page 6-9 for the functions of this object.

| Index (hex) | Subindex (hex) | Object name       | Default value <sup>*1</sup> | Data range <sup>*1</sup> | Unit | Data type            | Access | I/O allocation | Data attribute |
|-------------|----------------|-------------------|-----------------------------|--------------------------|------|----------------------|--------|----------------|----------------|
| 6001        | ---            | BYTES Data M to C | ---                         | ---                      | ---  | ---                  | ---    | ---            | ---            |
|             | 00             | Number of Entries | 0A                          | 0A                       | ---  | USINT                | RO     | Not possible   | ---            |
|             | 01             | BYTES 01 M to C   | 00 hex                      | 00 hex to FF hex         | ---  | ARRAY [0..9] OF BYTE | RO     | Possible       | ---            |
|             | 02             | BYTES 02 M to C   | 00 hex                      | 00 hex to FF hex         | ---  | ARRAY [0..9] OF BYTE | RO     | Possible       | ---            |
|             | :              | :                 | :                           | :                        | :    | :                    | :      | :              | :              |
|             | 0A             | BYTES 10 M to C   | 00 hex                      | 00 hex to FF hex         | ---  | ARRAY [0..9] OF BYTE | RO     | Possible       | ---            |

- \*1. Default values or data ranges for each element when the object is an array.

Refer to *Data Set in 10 BYTE Arrays from EtherCAT Master to CPU Unit* on page 6-9 for the functions of this object.

| Index (hex) | Subindex (hex) | Object name       | Default value    | Data range                            | Unit | Data type | Accesses | I/O allocation | Data attribute |
|-------------|----------------|-------------------|------------------|---------------------------------------|------|-----------|----------|----------------|----------------|
| 6002        | ---            | UDINT Data M to C | ---              | ---                                   | ---  | ---       | ---      | ---            | ---            |
|             | 00             | Number of Entries | 20               | 20                                    | ---  | USINT     | RO       | Not possible   | ---            |
|             | 01             | UDINT 01 M to C   | 0000000<br>0 hex | 00000000<br>hex to<br>FFFFFFFF<br>hex | ---  | UDINT     | RO       | Possible       | ---            |
|             | 02             | UDINT 02 M to C   | 0000000<br>0 hex | 00000000<br>hex to<br>FFFFFFFF<br>hex | ---  | UDINT     | RO       | Possible       | ---            |
|             | :              | :                 | :                | :                                     | :    | :         | :        | :              | :              |
|             | 20             | UDINT 32 M to C   | 0000000<br>0 hex | 00000000<br>hex to<br>FFFFFFFF<br>hex | ---  | UDINT     | RO       | Possible       | ---            |

Refer to *Data Set in UDINT from EtherCAT Master to CPU Unit* on page 6-10 for the functions of this object.

| Index (hex) | Subindex (hex) | Object name           | Default value | Data range              | Unit | Data type | Accesses | I/O allocation | Data attribute |
|-------------|----------------|-----------------------|---------------|-------------------------|------|-----------|----------|----------------|----------------|
| 6003        | ---            | EtherCAT Slave Status | ---           | ---                     | ---  | ---       | ---      | ---            | ---            |
|             | 00             | Number of Entries     | 1             | 1                       | ---  | USINT     | RO       | Not possible   | ---            |
|             | 01             | EtherCAT Slave Status | 0200 hex      | 0000 hex to<br>FFFF hex | ---  | WORD      | RO       | Possible       | ---            |

Refer to *EtherCAT Slave Status Information* on page 6-12 for the functions of this object.

| Index (hex) | Subindex (hex) | Object name       | Default value*1 | Data range*1            | Unit | Data type                   | Accesses | I/O allocation | Data attribute |
|-------------|----------------|-------------------|-----------------|-------------------------|------|-----------------------------|----------|----------------|----------------|
| 7000        | ---            | UINTs Data C to M | ---             | ---                     | ---  | ---                         | ---      | ---            | ---            |
|             | 00             | Number of Entries | 28              | 28                      | ---  | USINT                       | RO       | Not possible   | ---            |
|             | 01             | UINTs 01 C to M   | 0000 hex        | 0000 hex to<br>FFFF hex | ---  | ARRAY<br>[0..14]<br>OF UINT | RW       | Possible       | ---            |
|             | 02             | UINTs 02 C to M   | 0000 hex        | 0000 hex to<br>FFFF hex | ---  | ARRAY<br>[0..14]<br>OF UINT | RW       | Possible       | ---            |
|             | :              | :                 | :               | :                       | :    | :                           | :        | :              | :              |
|             | 28             | UINTs 40 C to M   | 0000 hex        | 0000 hex to<br>FFFF hex | ---  | ARRAY<br>[0..14]<br>OF UINT | RW       | Possible       | ---            |

\*1. Default values or data ranges for each element when the object is an array.

Refer to *Data Set in 15 UINT Arrays from CPU Unit to EtherCAT Master* on page 6-11 for the functions of this object.

| Index (hex) | Subindex (hex) | Object name       | Default value*1 | Data range*1     | Unit | Data type            | Access | I/O allocation | Data attribute |
|-------------|----------------|-------------------|-----------------|------------------|------|----------------------|--------|----------------|----------------|
| 7001        | ---            | BYTES Data C to M | ---             | ---              | ---  | ---                  | ---    | ---            | ---            |
|             | 00             | Number of Entries | 0A              | 0A               | ---  | USINT                | RO     | Not possible   | ---            |
|             | 01             | BYTES 01 C to M   | 00 hex          | 00 hex to FF hex | ---  | ARRAY [0..9] OF BYTE | RW     | Possible       | ---            |
|             | 02             | BYTES 02 C to M   | 00 hex          | 00 hex to FF hex | ---  | ARRAY [0..9] OF BYTE | RW     | Possible       | ---            |
|             | :              | :                 | :               | :                | :    | :                    | :      | :              | :              |
|             | 0A             | BYTES 10 C to M   | 00 hex          | 00 hex to FF hex | ---  | ARRAY [0..9] OF BYTE | RW     | Possible       | ---            |

\*1. Default values or data ranges for each element when the object is an array.

Refer to *Data Set in 10 BYTE Arrays from CPU Unit to EtherCAT Master* on page 6-11 for the functions of this object.

| Index (hex) | Subindex (hex) | Object name       | Default value    | Data range                            | Unit | Data type | Access | I/O allocation | Data attribute |
|-------------|----------------|-------------------|------------------|---------------------------------------|------|-----------|--------|----------------|----------------|
| 7002        | ---            | UDINT Data C to M | ---              | ---                                   | ---  | ---       | ---    | ---            | ---            |
|             | 00             | Number of Entries | 20               | 20                                    | ---  | USINT     | RO     | Not possible   | ---            |
|             | 01             | UDINT 01 C to M   | 0000000<br>0 hex | 00000000<br>hex to<br>FFFFFFFF<br>hex | ---  | UDINT     | RW     | Possible       | ---            |
|             | 02             | UDINT 02 C to M   | 0000000<br>0 hex | 00000000<br>hex to<br>FFFFFFFF<br>hex | ---  | UDINT     | RW     | Possible       | ---            |
|             | :              | :                 | :                | :                                     | :    | :         | :      | :              | :              |
|             | 20             | UDINT 32 C to M   | 0000000<br>0 hex | 00000000<br>hex to<br>FFFFFFFF<br>hex | ---  | UDINT     | RW     | Possible       | ---            |

Refer to *Data Set in UDINT from CPU Unit to EtherCAT Master* on page 6-12 for the functions of this object.

## A-7-4 Other Objects

This section lists other objects.

| Index (hex) | Subindex (hex) | Object name                       | Default value*1 | Data range*1     | Unit | Data type              | Access | I/O allocation | Data attribute |
|-------------|----------------|-----------------------------------|-----------------|------------------|------|------------------------|--------|----------------|----------------|
| 5000        | ---            | Message Data from EtherCAT Master | ---             | ---              | ---  | ---                    | ---    | ---            | ---            |
|             | 00             | Number of Entries                 | 1               | 1                | ---  | USINT                  | RO     | Not possible   | ---            |
|             | 01             | Message Data from EtherCAT Master | 00 hex          | 00 hex to FF hex | ---  | ARRAY [0..199] OF BYTE | RO     | Not possible   | ---            |
| 5001        | ---            | Message Data to EtherCAT Master   | ---             | ---              | ---  | ---                    | ---    | ---            | ---            |
|             | 00             | Number of Entries                 | 1               | 1                | ---  | USINT                  | RO     | Not possible   | ---            |
|             | 01             | Message Data to EtherCAT Master   | 00 hex          | 00 hex to FF hex | ---  | ARRAY [0..199] OF BYTE | RW     | Not possible   | ---            |

\*1. Default values or data ranges for each element of the array.

Refer to *A-5 Data Exchange by Messages* on page A-26 for the functions of these objects.



## A-8 Version Information

This section provides version-related information when connecting Units to a CPU Unit. This section describes the relationships between the unit versions of each Unit and the CPU Unit, and Sysmac Studio version, and the specification changes for each unit version of each Unit.

### A

### A-8-1 Relationship between Unit Versions of Units

The relationship between the unit versions of each Unit and the CPU Unit, and Sysmac Studio version are shown below.

#### Interpreting the Version Combination Table

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

Refer to the user's manual for the CPU Unit for the models of CPU Unit to which NX Units can be connected.

| NX Unit                    |                            | Corresponding unit versions/versions                                 |  |
|----------------------------|----------------------------|--|--|
| Model                      | Unit version               | CPU Unit   | Sysmac Studio  |
| Model numbers of NX Units. | Unit versions of NX Units. | Unit versions of the CPU Unit that are compatible with the NX Units. | Sysmac Studio versions that are compatible with the NX Units and CPU Unit. |

#### Version Combination Table

- With the combinations of the unit versions/versions shown below, you can use the functions that are supported by the unit version of the Unit model. Use the unit versions/versions (or the later/higher unit versions/versions) that correspond to the NX Unit models and the unit versions. You cannot use the specifications that were added or changed for the relevant NX Unit models and the unit versions unless you use the corresponding unit versions/versions.
- Depending on the type and model of the Unit to which the NX Unit is connected, some Units do not have the corresponding versions given in the table. If a Unit does not have the specified version, support is provided by the oldest available version after the specified version. Refer to the user's manuals for the specific Units for the relation between models and versions.
- If you use the corresponding unit versions/versions given in the following table or later/higher versions, refer to the version information in the user's manual for the CPU Unit.

| NX Unit   |              | Corresponding unit versions/versions |               |
|-----------|--------------|--------------------------------------|---------------|
| Model     | Unit version | CPU Unit                             | Sysmac Studio |
| NX-ECT101 | Ver.1.0      | Ver.1.13                             | Ver.1.50      |





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