

NX-series CPU Units

Safety Precautions

Thank you for purchasing an NX-series Controller. To ensure the safe usage of the NX-series Controller, read and understand this document, the manuals for the CPU Unit and the manuals for all other Units in the Controller. Contact your OMRON representative and make sure that you use the most recent version of each manual. Keep this document and all relative manuals in a safe place, and make sure that they are delivered to the final user of the Controller.

OMRON Corporation

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Safety Precautions


■ Definition of Precautionary Information


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


 **Caution** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.


■ Safety Precautions












 **WARNING**

Do not touch any of the terminals or terminal blocks while the power is being supplied. Doing so may result in electric shock. 





Do not attempt to take any Unit apart. In particular, high-voltage parts are present in the Unit 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. 

Provide safety measures in external circuits to ensure safety in the system if an abnormality occurs due to malfunction of the CPU Unit, slaves, or Units 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 Controller 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. 
The CPU Unit will turn OFF digital outputs on the CPU Rack in the following cases. <ul style="list-style-type: none"> • While the CPU Unit is on standby until RUN mode is entered after the power is turned ON • If an error occurs in the power supply • If a system initialization error occurs Digital outputs on the CPU Rack will produce outputs according to the settings in the following cases. <ul style="list-style-type: none"> • If a CPU Unit error or CPU Unit reset occurs • If a major fault level Controller error occurs External safety measures must be provided to ensure safe operation of the system in such cases. 
If there is interference in remote I/O communications or if a major fault level error occurs, output status will depend on the products that are used. Confirm the operation that will occur when there is interference in communications or a major fault level error, and implement safety measures. Correctly set all of the settings in the slaves and Units. 
If external power supplies for Units, 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 controls with monitoring of external power supply voltage as required so that the system operates safely in such a case. 
Unintended outputs may occur when an error occurs in variable memory. As a countermeasure for such problems, external safety measures must be provided to ensure safe operation of the system. 
Provide measures in the communications system and user program to ensure safety in the overall system even if errors or malfunctions occur in data link communications or remote I/O communications. 
The NX-series Controller continues normal operation for a certain period of time when a momentary power interruption occurs. This means that the NX-series Controller may receive incorrect signals from external devices that are also affected by the power interruption. Accordingly, take suitable actions, such as external fail-safe measures and interlock conditions, to monitor the power supply voltage of the external device as required. 
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. 
Make sure that the voltages and currents that are input to the slaves and Units are within the specified ranges. Inputting voltages or currents that are outside of the specified ranges may cause accidents or fire. 
Always confirm safety at the destination before you transfer a user program, configuration data, setup data, or device variables from the Sysmac Studio. The devices or machines may perform unexpected operation regardless of the operating mode of the CPU Unit. 
Check the user program, data, and parameter settings for proper execution before you use them for actual operation. 

 **Caution**

Do not touch any Unit when power is being supplied or immediately after the power supply is turned OFF. Doing so may result in burn injury. 
Be sure that all terminal screws and cable screws are tightened to the torque specified in the relevant manuals. The loose screws may result in fire or malfunction. 
When you connect a computer or other peripheral device to a Controller that has a non-isolated DC Power Supply Unit, either ground the 0-V side of the external power supply for the Unit power supply or do not ground it at all. If the peripheral devices are grounded incorrectly, the external power supply may be short-circuited. Never ground the 24-V side of the power supply. 
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 and Disassembly/Mounting/Wiring

- Do not attempt to disassemble, repair, or modify any Units. Doing so may result in malfunction or fire.
- Do not drop any Unit or subject it to abnormal vibration or shock. Doing so may result in Unit malfunction or burning.
- 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 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.
- Do not write on the Unit with ink within the restricted region that is shown in the relevant manuals. 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 Unit.
- There is metal inside the End Cover. Be careful not to drop the End Cover when you handle it because it is heavier than its appearance.
- Always connect to a ground of 100 Ω or less when installing the Units.
- Follow the instructions in the relevant manuals to correctly perform wiring. Double-check all wiring and switch settings before turning ON the power supply.
- Use the methods that are specified in the relevant manuals for wiring the terminal blocks.
- Use crimp terminals for wiring the M3 screw terminal blocks. Do not connect bare stranded wires directly to the M3 screw terminal blocks.
- Use the correct wiring parts and tools when you wire the system. Otherwise, cables may be disconnected to cause short-circuit or wire breakage.
- Do not pull on the cables or bend the cables beyond their natural limit. Do not place heavy objects on top of the cables or other wiring lines. Doing so may break the cables.
- Mount terminal blocks and connectors only after checking the mounting location carefully.
- Be sure that the terminal blocks and communications cables with tightening screws or locking devices are properly tightened to or locked into place.

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

■ Power Supply Design, Turning ON the Power Supply, and Turning OFF the Power Supply

- Select an external power supply with sufficient capacity by considering the power supply capacity or inrush current when the power is turned ON that is specified in the relevant manuals. Otherwise, the external power supply may not be turned ON or malfunction due to unstable power supply voltage.
- Use all Units within the I/O power supply ranges that are given in the specifications.
- 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 ratings.
- Surge current occurs when the power supply is turned ON. When selecting fuses or breakers for external circuits, consider the above precaution and allow sufficient margin in shut-off performance. Refer to the relevant manual for surge current specifications.
- If the full dielectric strength voltage is applied or turned OFF using the switch on the tester, the generated impulse voltage may damage the Unit. Change the applied voltage gradually using the adjuster on the Tester.
- Install external breakers and take other safety measures against short-circuiting and overcurrents in external wiring.
- Startup takes approximately 20 seconds, from when the power supply is turned ON to when it enters RUN mode. During that time, digital outputs on the CPU Rack will be OFF. The slave outputs behave according to the setting values. Use the system-defined variables and the NX Unit device variables in the user program to confirm that I/O data communications are established before attempting control operations. External communications are also not performed during startup.
- Configure the external circuits so that the power supply to the control system turns ON only after the power supply to the Controller has turned ON. If the power supply to the Controller is turned ON after the control power supply, temporary errors may result in incorrect control system signals because the output terminals on Output Units may momentarily turn ON when power supply is turned ON to the Controller.
- If the Unit power supply is turned OFF before the I/O power supply for the control system is turned OFF, the output terminals of Output Units may malfunction and the control system may perform incorrect output temporarily. To avoid this problem, configure the external circuit to make sure that the Unit power supply is turned OFF only after the power supply for the control system is turned OFF.
- Never turn OFF the power supply to the Controller during the following periods.
 - While the BUSY indicator flashes
 - While SD Memory Card access is in progress (i.e., while the SD BUSY indicator flashes)
 - While data or the user program is transferred from the Support Software
- Always turn OFF the power supply to the Controller before you attempt any of the following.
 - Mounting or removing the Units
 - Assembling the Units
 - Setting DIP switches or rotary switches
 - Connecting cables or wiring the system
 - Connecting or disconnecting the terminal blocks or connectors
 The power supply circuit in the CPU Unit may continue to supply power to the Controller for a few seconds after the power supply turns OFF. The POWER indicator is lit during this time. Confirm that the POWER indicator is not lit before you perform any of the above actions.

■ Actual Operation and Battery Backup

- Confirm that no adverse effect will occur in the system before you attempt any of the following.
 - Changing the operating mode of the CPU Unit (including changing the Startup Mode)
 - Changing the user program or settings
 - Changing set values or present values
 - Forced refreshing
 - Starting the Controller when the Battery is exhausted
 - Restarting the Controller after changing slave or Unit settings
 - Transferring SD Memory Card backup files

- If you use the clock data in the user program and turn OFF the power supply for a long time, use a Battery which is sold separately.

The Battery is not mounted when the product is at factory setting. The clock data is retained by the built-in capacitor. The capacitor is charged while the power is supplied and discharged while the power is not supplied. If the power OFF time rate is high, the clock data is initialized and malfunctions may occur in the program for which the clock data is used.

- If you use the Battery, connect the Sysmac Studio and set the **Battery-related error detection** to **Use**. The **Battery-related error detection** is set to **Do not use** at the factory setting because the Battery is not built in. If the **Battery-related error detection** is set to **Do not use**, an error cannot be detected when the Battery is exhausted and malfunctions may occur in the program for which the clock data is used.

■ Mounting the Battery/Battery Replacement/Unit Replacement/Disposal

- The Battery may leak, rupture, heat, or ignite. Never short-circuit, charge, disassemble, heat, or incinerate the Battery or subject it to strong shock.
- Dispose of any Battery that has been dropped on the floor or otherwise subjected to excessive shock. Batteries that have been subjected to shock may leak if they are used.
- We recommend mounting or replacing the Battery with the power turned OFF to prevent the CPU Unit's sensitive internal components from being damaged by static electricity and to prevent malfunctions. The Battery can be mounted or replaced without turning OFF the power supply. To do so, always touch a grounded piece of metal to discharge static electricity from your body before you start the procedure. If the Low Battery Voltage error occurs after you mount the Battery, connect the Sysmac Studio and clear the error.
- Dispose of the Units and Batteries according to local ordinances as they apply.



廢電池請回收

- The following information must be displayed for all products that contain primary lithium batteries with a perchlorate content of 6 ppb or higher when shipped to or transported through the State of California, USA. Perchlorate Material - special handling may apply. See www.dtsc.ca.gov/hazardouswaste/perchlorate.
- The Battery is a primary lithium battery with a perchlorate content of 6 ppb or higher. Place the above information on the individual boxes and shipping boxes when shipping finished products that contain a CPU Unit with a mounted Battery to the State of California, USA.

Precautions for Correct Use

■ Unpacking

- This product is packaged with special tape to prevent product tampering and to indicate that the package has been opened. Please make sure that the package has not been opened before use.

■ Storage and Installation

- Follow the instructions in the relevant manual to correctly perform installation.
- Do not operate or store the Controller in the following locations. Doing so may result in burning, in operation stopping, or in malfunction.
 - 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 when installing the Controller 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.
- Install the Controller away from sources of heat and ensure proper ventilation. Not doing so may result in malfunction, in operation stopping, or in burning.

■ Mounting

- When you install the Unit, be careful not to touch or bump the pins in the NX bus connector and X bus connector.
- When you handle the Unit, be careful not to apply stress to the pins in the NX bus connector and X bus connector. If the Unit is installed and the power supply is turned ON when the connector pins are deformed, contact failure may cause malfunctions.
- Mount a cover at the left end of the X Bus Unit to prevent foreign matter from entering the Unit. Signal short circuits or contact failure may cause malfunctions.
- Always mount an End Cover to the end of the CPU Rack to protect the last Unit on the CPU Rack. Always secure the End Cover with End Plates at both sides. If you do not secure it, the Unit may be damaged or malfunction.

■ Wiring

- Do not allow foreign matter to enter the openings in the Unit. Doing so may result in Unit burning, electric shock, or failure.
- Do not allow wire clippings, shavings, or other foreign material to enter any Unit. Otherwise, Unit burning, failure, or malfunction may occur. Cover the Units or take other suitable countermeasures, especially during wiring work.
- Use the connection methods and applicable cables for EtherCAT and EtherNet/IP that are specified in the relevant manuals. Otherwise, communications may be faulty.
- 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.

- Make sure that the current capacity of the wire is sufficient. Otherwise, excessive heat may be generated. When cross-wiring terminals, the total current for all the terminals will flow in the wire. When wiring cross-overs, make sure that the current capacity of each of the wires is not exceeded.
- If you use reed switches for the input contacts for AC Input Units, use switches with a current capacity of 1 A or greater. If reed switches with smaller allowable currents are used, the contacts may fuse due to surge currents.

■ Battery

- Be sure to mount a Battery within two years of the production date shown on the Battery label.
- Turn ON the power after replacing the Battery for a CPU Unit that has been unused for a long time. Leaving the CPU Unit unused again without turning ON the power even once after the Battery is replaced may result in a shorter Battery life.
- If you use the Battery, use the CJ1W-BAT01 Battery Set which is sold separately.

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/.

Relevant Manuals

Refer to Hardware manual or Software manual for other related manuals.

Model numbers and manual name	Cat. No.	
NX502-□□□□ NX-series NX502 CPU Unit Hardware User's Manual	W631	
NX701-□□□□ NX502-□□□□ NX102-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□ NX1P2-□□□□	NJ/NX-series CPU Unit Software User's Manual	W501
	NJ/NX-series CPU Unit Motion Control User's Manual	W507
	NJ/NX-series CPU Unit Built-in EtherCAT® Port User's Manual	W505
	NJ/NX-series CPU Unit Built-in EtherNet/IP™ Port User's Manual	W506
	NJ/NX-series Troubleshooting Manual	W503
SYSMAC-SE2□□□	Sysmac Studio Version 1 Operation Manual	W504
NX-ECC20□	NX-series EtherCAT® Coupler Unit User's Manual	W519

SUITABILITY FOR 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.

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Note: Specifications subject to change without notice. Printed in Japan