Machine Automation Controller
NJ-series
CPU Unit
Hardware

User’s Manual

NJ501-□□□□
NJ301-1□□□
NJ101-□□□□
NJ-P□3001
CJ1W-ID□□□/IA□□□
CJ1W-INT01
CJ1W-IDP01
CJ1W-OC□□□/OD□□□/OA□□□
CJ1W-MD□□□
CJ1W-B7A□□
NOTE

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Introduction

Thank you for purchasing an NJ-series CPU Unit. This manual contains information that is necessary to use the NJ-series CPU Unit. Please read this manual and make sure you understand the functionality and performance of the NJ-series CPU 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.

- NJ-series CPU Units
  - NJ501-□5□□
  - NJ501-□4□□
  - NJ501-□3□□
  - NJ301-12□□
  - NJ301-11□□
  - NJ101-10□□
  - NJ101-90□□

Part of the specifications and restrictions for the CPU Units are given in other manuals. Refer to Relevant Manuals on page 2 and Related Manuals on page 39.
The following table provides the relevant manuals for the NJ-series CPU Units. Read all of the manuals that are relevant to your system configuration and application before you use the NJ-series CPU Unit.

Most operations are performed from the Sysmac Studio Automation Software. Refer to the Sysmac Studio Version 1 Operation Manual (Cat. No. W504) for information on the Sysmac Studio.

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*1 Refer to the NJ/NX-series Troubleshooting Manual (Cat. No. W503) for the error management concepts and the error items. However, refer to the manuals that are indicated with triangles for details on errors corresponding to the products with the manuals that are indicated with triangles.
Mounting Units

4-3 Mounting Units

4-3-1 Connecting Controller Components

The Units that make up an NJ-series Controller can be connected simply by pressing the Units together and locking the sliders by moving them toward the back of the Units. The End Cover is connected in the same way to the Unit on the far right side of the Controller.

1 Join the Units so that the connectors fit exactly.

2 The yellow sliders at the top and bottom of each Unit lock the Units together. Move the sliders toward the back of the Units as shown below until they click into place.

Precautions for Correct Use

- The sliders on the tops and bottoms of the Power Supply Unit, CPU Unit, I/O Units, Special I/O Units, and CPU Bus Units must be completely locked (until they click into place) after connecting the adjacent Unit connectors.
Special Information

Special information in this manual is classified as follows:

![Note]

**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.

![Addition Information]

**Additional Information**
Additional information to read as required. This information is provided to increase understanding or make operation easier.

![Version Information]

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

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**Note** References are provided to more detailed or related information.

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**Precaution on Terminology**

In this manual, “download” refers to transferring data from the Sysmac Studio to the physical Controller and “upload” refers to transferring data from the physical Controller to the Sysmac Studio.

For the Sysmac Studio, synchronization is used to both upload and download data. Here, “synchronize” means to automatically compare the data for the Sysmac Studio on the computer with the data in the physical Controller and transfer the data in the direction that is specified by the user.
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1. Introduction to NJ-series Controllers
2. System Configuration
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Safety Precautions

Definition of Precautionary Information

The following notation is used in this manual to provide precautions required to ensure safe usage of an NJ-series Controller. The safety precautions that are provided are extremely important to safety. Always read and heed the information provided in all safety precautions. The following notation is used.

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

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

Precautions for Safe Use
Indicates precautions on what to do and what not to do to ensure safe usage of the product.

Precautions for Correct Use
Indicates precautions on what to do and what not to do to ensure proper operation and performance.
**Symbols**

- **The circle and slash symbol indicates operations that you must not do.** The specific operation is shown in the circle and explained in text. This example indicates prohibiting disassembly.

- **The triangle symbol indicates precautions (including warnings).** The specific operation is shown in the triangle and explained in text. This example indicates a precaution for electric shock.

- **The triangle symbol indicates precautions (including warnings).** The specific operation is shown in the triangle and explained in text. This example indicates a general precaution.

- **The filled circle symbol indicates operations that you must do.** The specific operation is shown in the circle and explained in text. This example shows a general precaution for something that you must do.

- **The triangle symbol indicates precautions (including warnings).** The specific operation is shown in the triangle and explained in text. This example indicates a precaution for high temperatures.
Safety Precautions

Warnings

**WARNING**

### During Power Supply

- 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 Power Supply 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.

### 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, 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 all outputs from Basic Output Units in the following cases. The slaves will operate according to the settings in the slaves.
  - If an error occurs in the power supply
  - If the power supply connection becomes faulty
  - If a CPU watchdog timer error or CPU reset occurs
  - If a major fault level Controller error 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.

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 controls with monitoring of external power supply voltage as required so that the system operates safely in such a case.
Safety Precautions

Unintended outputs may occur when an error occurs in variable memory or in memory used for CJ-series Units. 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.

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.

The NJ-series Controller continues normal operation for a certain period of time when a momentary power interruption occurs. This means that the NJ-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.

Voltage and Current Inputs

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.

Download

Always confirm safety at the destination before you transfer a user program, configuration data, setup data, device variables, or values in memory used for CJ-series Units from the Sysmac Studio. The devices or machines may perform unexpected operation regardless of the operating mode of the CPU Unit.

Actual Operation

Check the user program, data, and parameter settings for proper execution before you use them for actual operation.
Safety Precautions

Cautions

⚠️ Caution

Application

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.

Wiring

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.

EtherCAT Communications

If the cable redundancy function is enabled, always write a program to confirm that the network is in the cable redundancy status. If the program is not written, you cannot check that the network is not in the cable redundancy status due to a disconnection on the ring topology.

Use the _EC_RingBreaking system-defined variable to confirm that the network is in the cable redundancy status.

✅ Version Information

The cable redundancy function can be used with project unit version 1.40 or later.
Precaution on Error Message That Says an Instruction May Cause Unintended Operation

Instructions may result in unexpected operation and affect the system if you clear the selection of the Detect an error when an in-out variable is passed to specific instruction argument Check Box in the Program Check Area. Always confirm that the conditions for use that are given in the NJ/NX-series Instructions Reference Manual (Cat. No. W502) are met before you clear the selection of this check box.

Version Information

This error message is displayed by and the above option setting is available on Sysmac Studio version 1.02.
Disassembly and Dropping

- 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.

Mounting

- The sliders on the tops and bottoms of the Power Supply Unit, CPU Unit, I/O Units, and other Units must be completely locked (until they click into place) after connecting the adjacent Unit connectors.

Installation

- Always connect to a ground of 100 Ω or less when installing the Units.
- If the LG and GR terminals are connected, make sure to connect them firmly. The LG terminal that is a noise-filtered neutral terminal, has a half electrical potential of the input voltage. Therefore, if you touch the metallic part of the LG terminal, GR terminal, or Controller, while the GR terminal is not grounded, it may result in electrical shock.

Wiring

- Follow the instructions in this manual to correctly perform wiring. Double-check all wiring and switch settings before turning ON the power supply.
- Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals.
- 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, expansion cables, and other items with locking devices are properly locked into place.
- Always remove any dustproof labels that are on the top of the Units when they are shipped before you turn ON the power supply. If the labels are not removed, heat will accumulate and malfunctions may occur.
- Before you connect a computer to the CPU Unit, disconnect the power supply plug of the computer from the AC outlet. Also, if the computer has an FG terminal, make the connections so that the FG terminal has the same electrical potential as the GR terminal on the Power Supply Unit. A difference in electrical potential between the computer and Controller may cause failure or malfunction.
- If the external power supply to an 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.
### Precautions for Safe Use

#### Task Design

- If the following variables are specified for a condition expression when the execution condition is a condition expression for a variable, event tasks may not be executed when conditions are met or event tasks may be executed when conditions are not met.
  - Structure members whose data size is 16 bits or more, except for system-defined variables for motion control
  - Array elements whose data size is 16 bits or more

For information on event task execution conditions, refer to the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501).

#### Power Supply Design

- Do not exceed the rated supply capacity of the Power Supply Units in the NJ-series Controller. The rated supply capacities are given in the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500).
  
  If the capacity is exceeded, operation may stop, malfunctions may occur, or data may not be backed up normally for power interruptions.
  
  Use NJ-series Power Supply Units for both the NJ-series CPU Rack and Expansion Racks.
  
  Operation is not possible if a CJ-series Power Supply Unit is used with an NJ-series CPU Unit or an NJ-series Power Supply Unit is used with a CJ-series CPU Unit.

- Do not apply voltages or connect loads to the Output Units or slaves in excess of the maximum 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 manuals for surge current specifications. Refer to the *NJ-series CPU Unit Hardware User’s Manual* (Cat. No. W500) 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 Power Supply Unit. Use the adjustment on the tester to gradually increase and decrease the voltage.

- Apply the voltage between the Power Supply Unit's L1 or L2 terminal and the GR terminal when testing insulation and dielectric strength.

- Do not supply AC power from an inverter or other device with a square-wave output. Internal temperature rise may result in smoking or burning. Always input a sinusoidal wave with the frequency that is given in the *NJ-series CPU Unit Hardware User’s Manual* (Cat. No. W500).

- Install external breakers and take other safety measures against short-circuiting in external wiring.
Precautions for Safe Use

Turning ON the Power Supply

- It takes up to approximately 10 to 20 s to enter RUN mode after the power is turned ON. The outputs during this time behave according to the slave or Unit specifications. Use the RUN output on the Power Supply Unit, for example, to implement fail-safe circuits so that external devices do not operate incorrectly.

- 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 you transfer data from a backup file on an SD Memory Card to the Controller when the power supply is turned ON, properly select the data groups to transfer. If the data for an unintended data group is transferred to the Controller, it may cause the equipment to operate unpredictably.

- In the CPU Unit with unit version 1.05 or earlier, never turn OFF the power supply to the Controller until RUN mode is entered after the power is turned ON. If the power supply is turned OFF, a Battery-backup Memory Check Error may occur at next time you start operation. If a Battery-backup Memory Check Error occurs, the variables retained are set to their initial values and the Holding, DM and EM Areas in memory used for CJ-series Units are cleared to all zeros. If you want to resume the operation, reload the correct data for the variables retained and CJ-series Unit memory, as required.

Turning OFF the Power Supply

- Never turn OFF the power supply to the Controller when the BUSY indicator is flashing. While the BUSY indicator is lit, the user program and settings in the CPU Unit are being backed up in the built-in non-volatile memory. This data will not be backed up correctly if the power supply is turned OFF. Also, a major fault level Controller error will occur the next time you start operation, and operation will stop.

- Do not turn OFF the power supply or remove the SD Memory Card while SD Memory Card access is in progress (i.e., while the SD BUSY indicator flashes). Data may become corrupted, and the Controller will not operate correctly if it uses corrupted data. To remove the SD Memory Card from the CPU Unit while the power supply is ON, press the SD Memory Card power supply switch and wait for the SD BUSY indicator to turn OFF before you remove the SD Memory Card.

- Always turn OFF the power supply to the Controller before you attempt any of the following.
  - Mounting or removing I/O Units or the CPU Unit
  - Assembling the Units
  - Setting DIP switches or rotary switches
  - Connecting cables or wiring the system
  - Connecting or disconnecting the connectors

The Power Supply Unit may continue to supply power to the rest of the Controller for a few seconds after the power supply turns OFF. The PWR indicator is lit during this time. Confirm that the PWR indicator is not lit before you perform any of the above.
Precautions for Safe Use

Operation

• 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 setting of the Startup Mode)
  • Changing the user program or settings
  • Changing set values or present values
  • Forced refreshing

• After you change any slave or Unit settings, carefully check the safety of the controlled system before you restart the Unit.

• If two different function modules are used together, such as when you use CJ-series Basic Units and EtherCAT slaves, take suitable measures in the user program and external controls to ensure that safety is maintained in the controlled system if one of the function modules stops. The relevant outputs will behave according to the slave or Unit specifications if a partial fault level error occurs in one of the function modules.

• Always confirm safety at the connected equipment before you reset Controller errors with an event level of partial fault or higher for the EtherCAT Master Function Module.

  When the error is reset, all slaves that were in any state other than Operational state due to a Controller error with an event level of partial fault or higher (in which outputs are disabled) will go to Operational state and the outputs will be enabled.

  Before you reset all errors or restart a slave, confirm that no Controller errors with an event level of partial fault have occurred for the EtherCAT Master Function Module.

• Always confirm safety at the connected equipment before you reset Controller errors for a CJ-series Special Unit. When a Controller error is reset, the Unit where the Controller error with an event level of observation or higher will be restarted.

  Before you reset all errors, confirm that no Controller errors with an event level of observation or higher have occurred for the CJ-series Special Unit. Observation level events do not appear on the Controller Error Tab Page, so it is possible that you may restart the CJ-series Special Unit without intending to do so.

  You can check the status of the \texttt{CJB_UnitErrSta[0,0]} to \texttt{CJB_UnitErrSta[3,9]} error status variables on a Watch Tab Page to see if an observation level Controller error has occurred.

• Always confirm safety at the connected equipment before you perform the following operations when the device output hold configuration is set to enable. The equipment may operate unexpectedly because the last status for outputs is retained.
  • Changing the operating mode of the CPU Unit
  • When downloaded
Precautions for Safe Use

Battery Backup

• The user program and initial values for the variables are stored in non-volatile memory in the CPU Unit. The present values of variables with the Retain attribute and the values of the Holding, DM, and EM Areas in the memory used for CJ-series Units are backed up by a Battery. If the Battery is not connected or the Battery is exhausted, the CPU Unit detects a Battery-backup Memory Check Error. If that error is detected, variables with a Retain attribute are set to their initial values and the Holding, DM, and EM Areas in memory used for CJ-series Units are cleared to all zeros. Perform thorough verifications and provide sufficient measures to ensure that the devices perform safe operation for the initial values of the variables with Retain attributes and the resulting operation.

• The absolute encoder home offsets are backed up by a Battery. If the CPU Unit detects a low battery voltage or the absence of a mounted battery when the power supply to the Controller is turned ON, the absolute encoder home offsets are cleared to zeros and an Encoder Home Offset Read Error occurs. Reset the error and perform homing to define home. If you do not define home, unintended operation of the controlled system may occur.

Debugging

• Forced refreshing ignores the results of user program execution and refreshes I/O with the specified values. If forced refreshing is used for inputs for which I/O refreshing is not supported, the inputs will first take the specified values, but they will then be overwritten by the user program. This operation differs from the force-set/reset functionality of the CJ-series PLCs.

• You cannot upload or download information for forced refreshing with the Sysmac Studio. After downloading data that contains forced refreshing, change to RUN mode and then use the Sysmac Studio to perform the operation for forced refreshing. Depending on the difference in the forced status, the control system may operate unexpectedly.

• Do not specify the same address for the AT specification for more than one variable. Doing so would allow the same entity to be accessed with different variable names, which would make the user program more difficult to understand and possibly cause programming mistakes.

General Communications

• When you use data link communications, check the error information that is given in _ErrSta (Controller Error Status) to make sure that no error has occurred in the source device. Create a user program that uses reception data only when there is no error in the source device. If there is an error in the source device, the data for the data link may contain incorrect values.

• Unexpected operation may result if inappropriate data link tables are set. Even if appropriate data link tables have been set, confirm that the controlled system will not be adversely affected before you transfer the data link tables. The data links start automatically after the data link tables are transferred.

• All CPU Bus Units are restarted when routing tables are transferred from Support Software to the CPU Unit. Confirm that the system will not be adversely affected by restarting before you transfer the routing tables.

• Tag data links will stop between related nodes while tag data link parameters are transferred during Controller operation. Confirm that the system will not be adversely affected before you transfer the tag data link parameters.
Precautions for Safe Use

EtherNet/IP Communications

- Make sure that the communications distance, number of nodes connected, and method of connection for EtherNet/IP are within specifications. Do not connect EtherNet/IP communications to EtherCAT or other networks. An overload may cause the network to fail or malfunction.

- All related EtherNet/IP nodes are reset when you transfer settings for the built-in EtherNet/IP port (including IP addresses and tag data links settings). The settings can only be enabled after the reset. Confirm that the system will not be adversely affected by resetting nodes before you transfer the settings.

- If EtherNet/IP tag data links (cyclic communications) are used with a repeating hub, the communications load on the network will increase. This will increase collisions and may prevent stable communications. Do not use repeating hubs on networks where tag data links are used. Use an Ethernet switch instead.
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 communications 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, the CPU Unit is restarted and communications with the EtherCAT slaves are cut off. During that period, the slave outputs behave according to the slave specifications. 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.

- If the Fail-soft Operation parameter is set to stop operation, process data communications will stop for all slaves when an EtherCAT communications error is detected in a slave. At that time, the Servo Drive will operate according to the Servo Drive specifications. Make sure that the Fail-soft Operation parameter setting results in safe operation when a device error occurs.

- 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 noise occurs or an EtherCAT slave is disconnected from the network, any current communications frames may be lost. If frames are lost, slave I/O data is not communicated, and unintended operation may occur. The slave outputs will behave according to the slave specifications. Refer to the manual for the slave. If a noise countermeasure or slave replacement is required, perform the following processing.
  
  - 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. Refer to the NJ/NX-series CPU Unit Built-in EtherCAT Port User’s Manual (Cat. No. W505) for details.

- When an EtherCAT slave is disconnected, communications will stop and control of the outputs will be lost not only for the disconnected slave, but for all slaves connected after it through to the physical end node. Confirm that the system will not be adversely affected before you disconnect a slave.

- I/O data communications of NX bus are not always established immediately after the power supply is turned ON. Use the system-defined variables and the EtherCAT Coupler Unit device variables in the user program to confirm that I/O data communications are established before attempting control operations.

- You cannot use standard Ethernet hubs or repeater hubs with EtherCAT communications. If you use one of these, a major fault level error or other error may occur.

- Confirm that all of the slaves are connected before you set the transmission delay time by the actual measurement. If the transmission delay time is exceeded from the set values due to the changes of the unit configuration, such as when the disabled slave is connected to the actual configuration after the setting, it may cause illegal communications with slaves.

- If you use the cable redundancy function while slaves from other manufacturers are connected on the ring topology, disconnect and connect communications cables that are connected to the slaves from other manufacturers on the ring topology or turn OFF and ON the power supply to the slaves from other manufacturers. Use the Frame reception timeout count in the Master Diagnosis/Statistics Information to confirm that frames are not lost consecutively.

- If you use the cable redundancy function, confirm that the task execution time is within the task period while the cable for the end port of the ring is disconnected. When a disconnection occurred on the ring topology, the transmission delay time is increased and the task execution time may be longer.
Precautions for Safe Use

Version Information

The cable redundancy function can be used with project unit version 1.40 or later.

Motion Control

• Confirm the axis number carefully before you perform an MC Test Run.

• The motor is stopped if communications are interrupted between the Sysmac Studio and the CPU Unit during an MC Test Run. Connect the communications cable between the computer and CPU Unit securely and confirm that the system will not be adversely affected before you perform an MC Test Run.

• Always execute the Save Cam Table instruction if you change any of the cam data from the user program in the CPU Unit or from the Sysmac Studio. If the cam data is not saved, the previous condition will be restored when the power is turned ON again, possibly causing unexpected machine operation.

• The positive drive prohibit input (POT), negative drive prohibit input (NOT), and home proximity input (DEC) of the Servo Drive are used by the MC Function Module as the positive limit input, negative limit input, and home proximity input. Make sure that the signal widths for all of these input signals are longer than the control period of the MC Function Module. If the input signal widths are shorter than the control period, the MC Function Module may not be able to detect the input signals, resulting in incorrect operation.

• If you make any changes in the Detailed Settings Area of the Axis Basic Settings Display of the Sysmac Studio, make sure that the devices or machines perform the expected operation before you start actual operation. If the relationship between the functions of the Motion Control Function Module and the EtherCAT slave process data that is assigned to the axes is not correct, the devices or machines may perform unexpected operation.

• Always use the axis at a constant velocity for the MC_DigitalCamSwitch (Enable Digital Cam Switch) instruction. If you set the Count Mode to Rotary Mode, the following operation will occur if you use OnCompensation or OffCompensation and the axis velocity changes abruptly.
  • If the value of OnCompensation or OffCompensation is equivalent to the time for half a rotation or more, InOperation will be FALSE.
  • If the value of OnCompensation results in exceeding LastOnPosition, the output timing will be unstable.

  FirstOnPosition LastOnPosition

  OnCompensation

  FirstOnPosition after compensation

  • If the value of OffCompensation results in exceeding FirstOnPosition, the output timing will be unstable.

  FirstOnPosition LastOnPosition

  OffCompensation

  LastOnPosition after compensation

• Use the NX_AryDOutTimeStamp (Write Digital Output Array with Specified Time Stamp) instruction only after you confirm that InOperation from the MC_DigitalCamSwitch (Enable Digital Cam Switch) instruction is TRUE.

• If you change the unit conversion settings, perform homing again. If you do not perform homing, unintended operation of the controlled system may occur.
Precautions for Safe Use

Restoring Data

• You cannot back up, restore, or compare some or all of the settings for certain slaves and Units. Also, you cannot back up, restore, or compare data for disabled slaves or Units. After you restore data, sufficiently confirm that operation is correct before you start actual operation.

• The absolute encoder home offsets are backed up with a Battery in the CPU Unit as absolute encoder information. If any of the following conditions is met, clear the absolute encoder home offsets from the list of data items to restore, and then restore the data. Then, define the absolute encoder home again. If you do not define home, unintended operation of the controlled system may occur.
  • The Servomotor or Servo Drive was changed since the data was backed up.
  • The absolute encoder was set up after the data was backed up.
  • The absolute data for the absolute encoder was lost.

Transferring Programs

• When you use the program transfer from SD Memory Card whose Startup Mode setting is set to RUN mode, the operating mode changes to RUN after the transfer is completed regardless of the status and setting before the transfer. Use this function after you confirm that system startup does not cause any problem.

Battery Replacement

• 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.

• UL standards require that only an experienced engineer replace the Battery. Make sure that an experienced engineer is in charge of Battery replacement.

• Apply power for at least five minutes before changing the Battery. Install a new Battery within five minutes (at 25°C) of turning OFF the power supply. If power is not supplied for at least 5 minutes, the saved data may be lost.

• We recommend 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 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.

After you replace the Battery, connect the Sysmac Studio and clear the Low Battery Voltage error.

Unit Replacement

• Make sure that the required data, including the user program, configurations, settings, variables, and memory used for CJ-series Units, is transferred to a CPU Unit that was replaced and to externally connected devices before restarting operation.

Be sure to include the tag data link settings, routing tables, and other CPU Bus Unit data, which are stored in the CPU Unit.

• The absolute encoder home offsets are backed up with a Battery in the CPU Unit as absolute encoder information. When you change the combination of the CPU Unit and Servomotor, e.g., when you add or replace a Servomotor, define the absolute encoder home again.

• The performance may be different if the hardware revisions are different. Before you transfer the user program, data, and parameter settings to the CPU Units with the different hardware revisions, check them for proper execution and then use them for actual operation.
Disposal

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

- 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 CPU Unit contains 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 to the State of California, USA.
Precautions for Correct Use

Storage and Installation

- Follow the instructions in this manual to correctly perform installation.
- Do not operate or store the Controller in the following locations. Operation may stop or malfunctions may occur.
  - 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

- An I/O bus check error will occur and the Controller will stop if an I/O Connecting Cable’s connector is disconnected from the Rack. Be sure that the connectors are secure.
Precautions for Correct Use

**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.
- For EtherCAT and EtherNet/IP, use the connection methods and cables that are specified in the *NJ/NX-series CPU Unit Built-in EtherCAT Port User’s Manual* (Cat. No. W505) and the *NJ/NX-series CPU Unit Built-in EtherNet/IP Port User’s Manual* (Cat. No. W506). Otherwise, communications may be faulty.
- Use the rated power supply voltage for the Power Supply Units. 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.
- Do not touch the terminals on the Power Supply Unit immediately after turning OFF the power supply. Residual voltage may cause electrical shock.
- 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 the capacity of the reed switches is too low, surge current may fuse the contacts.

**Operation**

- Confirm the device output hold configuration before you change the operating mode of the CPU Unit or execute the download.

**Error Processing**

- In applications that use the results of instructions that read the error status, consider the affect on the system when errors are detected and program error processing accordingly. For example, even the detection of a minor error, such as Battery replacement during operation, can affect the system depending on how the user program is written.
- If you change the event level of a Controller error, the output status when the error occurs may also change. Confirm safety before you change an event level.

**Restoring and Automatically Transferring Data**

- When you edit the restore command file or the automatic transfer command file, do not change anything in the file except for the “yes” and “no” specifications for the selectable data groups. If you change anything else in the file, the Controller may perform unexpected operation when you restore or automatically transfer the data.
- To prevent an unexpected restoration, set to enter the password for each execution before the restore operation.

**Transferring Programs**

- If you use the program transfer from SD Memory Card, set to enter the password for each execution to prevent an unexpected program transfer.
Precautions for Correct Use

Replacing Slaves and Units

• If you replace a slave or Unit, refer to the operation manual for the slave or Unit for information on the data required for individual slaves or Units and redo the necessary settings.

Task Settings

• If a Task Period Exceeded error occurs, shorten the programs to fit in the task period or increase the setting of the task period.

Motion Control

• Use the system-defined variable in the user program to confirm that EtherCAT communications are established before you attempt to execute motion control instructions. Motion control instructions are not executed normally if EtherCAT communications are not established.

• Use the system-defined variables to monitor for errors in communications with the slaves that are controlled by the motion control function module. Motion control instructions are not executed normally if an error occur in slave communications.

• Before you start an MC Test Run, make sure that the operation parameters are set correctly.

• Do not download motion control settings during an MC Test Run.

EtherCAT Communications

• If you need to disconnect the cable from an EtherCAT slave during operation, first disconnect the software connection to the EtherCAT slave or disable the EtherCAT slave and all of the EtherCAT slaves that are connected after it.

• Set the Servo Drives to stop operation if an error occurs in EtherCAT communications between the Controller and a Servo Drive.

• Make sure that all of the slaves to be restored are participating in the network before you reset a Network Configuration Verification Error, Network Configuration Verification Error (Mismatched Slave), Network Configuration Verification Error (Slave Unconnected), Network Configuration Verification Error (Unnecessary Slave Connected), Network Configuration Verification Error (Incorrect Ring Wiring), Process Data Communications Error, Illegal Slave Disconnection Detected or Link OFF Error in the EtherCAT Master Function Module. If any slave is not participating when any of these errors is reset, the EtherCAT Master Function Module may access salve with a different node address than the specified node address or the error may not be reset correctly.

• Always use the specified EtherCAT slave cables. If you use any other cable, the EtherCAT master or the EtherCAT slaves may detect an error and one of the following may occur.
  • Continuous refreshing of process data communications will not be possible.
  • Continuous refreshing of process data communications will not end during the set cycle.

Battery Replacement

• Be sure to install a replacement 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.

• When you replace the Battery, use the CJ1W-BAT01 Battery Set.
SD Memory Cards

• Insert the SD Memory Card all the way.
• Do not turn OFF the power supply to the Controller during SD Memory Card access. The files may be corrupted.
  If there is a corrupted file in the SD Memory Card, the file is automatically deleted by the restoration function when the power supply is turned ON.
• If you use an OMRON SD Memory Card, the end of the life of the SD Memory Card can be detected in the following ways.
  • _Card1Deteriorated (SD Memory Card Life Warning Flag) system-defined variable
  • SD Memory Card Life Exceeded event in the event log
When the end of the life is detected in any of the above ways, replace the SD Memory Card.

Online Editing

When performing online editing in combination of a CPU Unit with a unit version of 1.04 or later and Sysmac Studio version 1.05 or higher, the CPU Unit saves a program updated by the online editing to built-in non-volatile memory. Sysmac Studio shows a message that it is in a backup operation. Do not turn OFF the power supply to the Controller while this message is displayed. If the power supply to the Controller is turned OFF, a Controller error will occur when the power supply is turned ON next time.

Debugging

• If you use data tracing to sample following variables, correct data may not be sampled.
  • Structure members whose data size is 16 bits or more, except for system-defined variables for motion control
  • Array elements whose data size is 16 bits or more
For information on data tracing, refer to the NJ/NX-series CPU Unit Software User’s Manual (Cat. No. W501).
Regulations and Standards

Conformance to EU Directives

### Applicable Directives

- EMC Directive
- Low Voltage Directive

### Concepts

#### EMC Directive

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.*

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.

* 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 NJ-series Controllers comply with EU Directives. To ensure that the machine or device in which the NJ-series Controller is used complies with EU Directives, the Controller must be installed as follows:

- The NJ-series Controller must be installed within a control panel.
- You must use the power supply in SELV specifications for the DC power supplies connected to DC Power Supply Units and I/O Units.
- NJ-series Controllers that comply with EU Directives also conform to the Common Emission Standard (EN 61000-6-4). 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 complies with EU Directives.
Conformance to KC Certification

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

A급 기기 (업무용 방송통신기기재)
이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.
Class A Device (Broadcasting Communications Device for Office Use)

This device obtained EMC registration for office use (Class A), and it is intended to be used in places other than homes. Sellers and/or users need to take note of this.

Conformance to Shipbuilding Standards

The NJ-series Controllers comply with the following shipbuilding standards. Applicability to the shipbuilding standards is based on certain usage conditions. It may not be possible to use the product in some locations. Contact your OMRON representative before attempting to use a Controller on a ship.

Usage Conditions for NK and LR Shipbuilding Standards

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

Noise Filter

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cosel Co., Ltd.</td>
<td>TAH-06-683</td>
</tr>
</tbody>
</table>

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/.
Versions

Hardware revisions and unit versions are used to manage the hardware and software in NJ-series Units and EtherCAT slaves. The hardware revision or unit version is updated each time there is a change in hardware or software specifications. Even when two Units or EtherCAT slaves have the same model number, they will have functional or performance differences if they have different hardware revisions or unit versions.

You can check versions on the ID information indications or with the Sysmac Studio.

Checking Unit Versions on ID Information Indications

The unit version is given on the ID information indication on the side of the product. The ID information on an NJ-series NJ501-□□□□□ CPU Unit is shown below.

Note The hardware revision is not displayed for the Unit that the hardware revision is in blank.

![ID information indication](image)

Unit model: NJ501-□□□□□
Unit version: □□□□□
Hardware revision: □□□
Lot No.: DDMYY□
Serial number: □□□□□□□□□
MAC address: □□□□□□□□□□□□□□□□
### Checking Unit Versions with the Sysmac Studio

You can use the Sysmac Studio to check unit versions. The procedure is different for Units and for EtherCAT slaves.

#### Checking the Unit Version of a Unit

You can use the Production Information while the Sysmac Studio is online to check the unit version of a Unit. You can do this for the CPU Unit, CJ-series Special I/O Units, and CJ-series CPU Bus Units. You cannot check the unit versions of CJ-series Basic I/O Units with the Sysmac Studio.

Use the following procedure to check the unit version.

1. Double-click **CPU/Expansion Racks** under **Configurations and Setup** in the Multiview Explorer. Or, right-click **CPU/Expansion Racks** under **Configurations and Setup** and select **Edit** from the menu.
   
The Unit Editor is displayed.

2. Right-click any open space in the Unit Editor and select **Production Information**.
   
The Production Information Dialog Box is displayed.

#### Changing Information Displayed in Production Information Dialog Box

1. Click the **Show Detail** or **Show Outline** Button at the lower right of the Production Information Dialog Box.
   
The view will change between the production information details and outline.

   - **Outline View**
   - **Detail View**

The information that is displayed is different for the Outline View and Detail View. The Detail View displays the unit version, hardware version, and software versions. The Outline View displays only the unit version.

**Note** The hardware revision is separated "/" and displayed on the right of the hardware version. The hardware revision is not displayed for the Unit that the hardware revision is in blank.
● Checking the Unit Version of an EtherCAT Slave

You can use the Production Information while the Sysmac Studio is online to check the unit version of an EtherCAT slave. Use the following procedure to check the unit version.

1. Double-click EtherCAT under Configurations and Setup in the Multiview Explorer. Or, right-click EtherCAT under Configurations and Setup and select Edit from the menu.

   The EtherCAT Tab Page is displayed.

2. Right-click the master on the EtherCAT Tab Page and select Display Production Information.

   The Production Information Dialog Box is displayed.

   The unit version is displayed after “Rev.”

● Changing Information Displayed in Production Information Dialog Box

1. Click the Show Detail or Show Outline Button at the lower right of the Production Information Dialog Box.

   The view will change between the production information details and outline.

---

**Unit Versions of CPU Units and Sysmac Studio Versions**

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

Refer to A-7 Version Information for the relationship between the unit versions of the CPU Units and the Sysmac Studio versions, and for the functions that are supported by each unit version.
The followings are the manuals related to this manual. Use these manuals for reference.

<table>
<thead>
<tr>
<th>Manual name</th>
<th>Cat. No.</th>
<th>Model numbers</th>
<th>Application</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJ-series CPU Unit Hardware User’s Manual</td>
<td>W500</td>
<td>NJ501-□□□□□□</td>
<td>Learning the basic specifications of the NJ-series CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided.</td>
<td>An introduction to the entire NJ-series system is provided along with the following information on the CPU Unit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NJ301-□□□□□□</td>
<td></td>
<td>• Features and system configuration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NJ101-□□□□□□</td>
<td></td>
<td>• Introduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Part names and functions</td>
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<td></td>
<td>• General specifications</td>
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<td>• Installation and wiring</td>
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<td></td>
<td>• Maintenance and inspection</td>
</tr>
<tr>
<td>NJ/NX-series CPU Unit Software User’s Manual</td>
<td>W501</td>
<td>NX701-□□□□□□</td>
<td>Learning how to program and set up an NJ/NX-series CPU Unit. Mainly software information is provided.</td>
<td>The following information is provided on a Controller built with an NJ/NX-series CPU Unit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NX102-□□□□□□</td>
<td></td>
<td>• CPU Unit operation</td>
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<tr>
<td></td>
<td></td>
<td>NX1P2-□□□□□□</td>
<td></td>
<td>• CPU Unit features</td>
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<tr>
<td></td>
<td></td>
<td>NJ501-□□□□□□</td>
<td></td>
<td>• Initial settings</td>
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<tr>
<td></td>
<td></td>
<td>NJ301-□□□□□□</td>
<td></td>
<td>• Programming based on IEC 61131-3 language specifications</td>
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<tr>
<td></td>
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<td>NJ101-□□□□□□</td>
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<tr>
<td>NJ/NX-series Instruc- tions Reference Manual</td>
<td>W502</td>
<td>NX701-□□□□□□</td>
<td>Learning detailed specifications on the basic instructions of an NJ/NX-series CPU Unit.</td>
<td>The instructions in the instruction set (IEC 61131-3 specifications) are described.</td>
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<td>NX102-□□□□□□</td>
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<td>NJ101-□□□□□□</td>
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<tr>
<td>NJ/NX-series CPU Unit Motion Control User’s Manual</td>
<td>W507</td>
<td>NX701-□□□□□□</td>
<td>Learning about motion control settings and programming concepts.</td>
<td>The settings and operation of the CPU Unit and programming concepts for motion control are described.</td>
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<td>NX102-□□□□□□</td>
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<tr>
<td>NJ/NX-series Motion Control Instructions Reference Manual</td>
<td>W508</td>
<td>NX701-□□□□□□</td>
<td>Learning about the specifications of the motion control instructions.</td>
<td>The motion control instructions are described.</td>
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<td>NJ101-□□□□□□</td>
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<tr>
<td>NJ/NX-series CPU Unit Built-in EtherCAT® Port User’s Manual</td>
<td>W505</td>
<td>NX701-□□□□□□</td>
<td>Using the built-in EtherCAT port on an NJ/NX-series CPU Unit.</td>
<td>Information on the built-in EtherCAT port is provided. This manual provides an introduction and provides information on the configuration, features, and setup.</td>
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<td>NJ101-□□□□□□</td>
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<tr>
<td>NJ/NX-series CPU Unit Built-in EtherNet/IP™ Port User’s Manual</td>
<td>W506</td>
<td>NX701-□□□□□□</td>
<td>Using the built-in EtherNet/IP port on an NJ/NX-series CPU Unit.</td>
<td>Information on the built-in EtherNet/IP port is provided. Information is provided on the basic setup, tag data links, and other features.</td>
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<td>NJ101-□□□□□□</td>
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<tr>
<td>NJ/NX-series</td>
<td>W588</td>
<td>NX102-□□□□□□</td>
<td>Using the OPC UA.</td>
<td>Information on the OPC UA is provided.</td>
</tr>
<tr>
<td>CPU Unit OPC UA User’s Manual</td>
<td></td>
<td>NX501-□□□□□□</td>
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<td>NX102-□□□□□□</td>
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<td>NJ301-□□□□□□</td>
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<td></td>
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<td>NJ101-□□□□□□</td>
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</tr>
<tr>
<td>NJ-series NJ Robotics CPU Unit User’s Manual</td>
<td>W539</td>
<td>NJ501-□□□□□□</td>
<td>Controlling robots with NJ-series CPU Units.</td>
<td>Describes the functionality to control robots.</td>
</tr>
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</tr>
<tr>
<td>Manual name</td>
<td>Cat. No.</td>
<td>Model numbers</td>
<td>Application</td>
<td>Description</td>
</tr>
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</tr>
<tr>
<td>NJ/NX-series Troubleshooting Manual</td>
<td>W503</td>
<td>NX701-702-703</td>
<td>Learning about the errors that may be detected in an NJ/NX-series Controller.</td>
<td>Concepts on managing errors that may be detected in an NJ/NX-series Controller and information on individual errors are described.</td>
</tr>
<tr>
<td>Sysmac Studio Version 1 Operation Manual</td>
<td>W504</td>
<td>SYSMAC-SE2-000-000</td>
<td>Learning about the operating procedures and functions of the Sysmac Studio.</td>
<td>Describes the operating procedures of the Sysmac Studio.</td>
</tr>
<tr>
<td>CNC Operator Operation Manual</td>
<td>O032</td>
<td>SYSMAC-RTNC0-000-000</td>
<td>Learning an introduction of the CNC Operator and how to use it.</td>
<td>An introduction of the CNC Operator, installation procedures, basic operations, connection operations, and operating procedures for main functions are described.</td>
</tr>
<tr>
<td>NX-series EtherCAT® Coupler Unit User's Manual</td>
<td>W519</td>
<td>NX-ECC0-000-000-000</td>
<td>Learning how to use an NX-series EtherCAT Coupler Unit and EtherCAT Slave Terminals.</td>
<td>The following items are described: the overall system and configuration methods of an EtherCAT Slave Terminal (which consists of an NX-series EtherCAT Coupler Unit and NX Units), and information on hardware, setup, and functions to set up, control, and monitor NX Units through EtherCAT.</td>
</tr>
<tr>
<td>NA-series Programmable Terminal Software User’s Manual</td>
<td>V118</td>
<td>NA5-000-000-000-000</td>
<td>Learning about NA-series PT pages and object functions.</td>
<td>Describes the pages and object functions of the NA-series Programmable Terminals.</td>
</tr>
<tr>
<td>NS-series Programmable Terminals Programming Manual</td>
<td>V073</td>
<td>NS15-000-000-000-000</td>
<td>Learning how to use the NS-series Programmable Terminals.</td>
<td>Describes the setup methods, functions, etc. of the NS-series Programmable Terminals.</td>
</tr>
</tbody>
</table>
## Terminology

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>absolute encoder home offset</strong></td>
<td>This data is used to restore in the CPU Unit the actual position of a Servo Drive with an absolute encoder. The offset is the difference between the command position after homing and the absolute data that is read from the absolute encoder.</td>
</tr>
<tr>
<td><strong>array specification</strong></td>
<td>One of the variable specifications. An array variable contains multiple elements of the same data type. The elements in the array are specified by serial numbers called subscripts that start from the beginning of the array.</td>
</tr>
<tr>
<td><strong>AT</strong></td>
<td>One of the attributes of a variable. This attribute allows the user to specify what is assigned to a variable. An I/O port or an address in memory used for CJ-series Units can be specified.</td>
</tr>
<tr>
<td><strong>axes group</strong></td>
<td>A functional unit that groups together axes within the Motion Control Function Module.</td>
</tr>
<tr>
<td><strong>Axes Group Variable</strong></td>
<td>A system-defined variable that is defined as a structure and provides status information and some of the axes parameters for an individual axes group. An Axes Group Variable is used to specify an axes group for motion control instructions and to monitor the command interpolation velocity, error information, and other information for the axes group.</td>
</tr>
<tr>
<td><strong>axis</strong></td>
<td>A functional unit within the Motion Control Function Module. An axis is assigned to the drive mechanism in an external Servo Drive or the sensing mechanism in an external Encoder Input Slave Unit.</td>
</tr>
<tr>
<td><strong>Axis Variable</strong></td>
<td>A system-defined variable that is defined as a structure and provides status information and some of the axis parameters for an individual axis. An Axis Variable is used to specify an axis for motion control instructions and to monitor the command position, error information, and other information for the axis.</td>
</tr>
<tr>
<td><strong>basic data type</strong></td>
<td>Any of the data types that are defined by IEC 61131-3. They include Boolean, bit string, integer, real, duration, date, time of day, date and time, and text string data types. &quot;Basic data type&quot; is used as opposed to derivative data types, which are defined by the user.</td>
</tr>
<tr>
<td><strong>cam data variable</strong></td>
<td>A variable that represents the cam data as a structure array. A cam data variable is an array structure that consists of phases and displacements.</td>
</tr>
<tr>
<td><strong>CJ-series Unit</strong></td>
<td>Any of the CJ-series Units that can be used with an NJ-series Controller.</td>
</tr>
<tr>
<td><strong>Communications Coupler Unit</strong></td>
<td>The generic name of an interface unit for remote I/O communications on a network between NX Units and a host network master. For example, an EtherCAT Coupler Unit is a Communications Coupler Unit for an EtherCAT network.</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>One of the attributes of a variable. If you specify the Constant attribute for a variable, the value of the variable cannot be written by any instructions, ST operators, or CIP message communications.</td>
</tr>
<tr>
<td><strong>Controller</strong></td>
<td>The range of devices that are directly controlled by the CPU Unit. In the NJ-series System, the Controller includes the CPU Rack, Expansion Racks, and EtherCAT slaves (including general-purpose slaves and Servo Drives).</td>
</tr>
<tr>
<td><strong>Controller error</strong></td>
<td>Errors that are defined by the NJ-series System. “Controller error” is a collective term for major fault level, partial fault level, minor fault level, and observation Controller events.</td>
</tr>
<tr>
<td><strong>Controller event</strong></td>
<td>One of the events in the NJ-series System. Controller events are errors and information that are defined by the system for user notification. A Controller event occurs when the system detects a factor that is defined as a Controller event.</td>
</tr>
<tr>
<td><strong>Controller information</strong></td>
<td>Information that is defined by the NJ-series System that is not an error. It represents an information Controller event.</td>
</tr>
<tr>
<td><strong>CPU Unit</strong></td>
<td>The Unit that serves as the center of control for a Machine Automation Controller. The CPU Unit executes tasks, refreshes I/O for other Units and slaves, etc. The NJ/NX-series CPU Units include the NX701-□□□□□□, NX1P2-□□□□□□ and NJ501-□□□□□□.</td>
</tr>
<tr>
<td><strong>derivative data type</strong></td>
<td>A data type that is defined by the user. Structures, unions, and enumerations are derivative data types.</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
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<td>------------------------------------</td>
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<tr>
<td>device</td>
<td>A general term for any Unit or slave that is refreshed by the I/O refreshing that is performed by the CPU Unit. Specifically, it refers to EtherCAT slaves, NX Units on the CPU Unit, built-in I/O, Option Boards, and CJ-series Units.</td>
</tr>
<tr>
<td>device output</td>
<td>An output for any Unit or slave that is refreshed by the I/O refreshing that is performed by the CPU Unit.</td>
</tr>
<tr>
<td>device variable</td>
<td>A variable that is used to access a specific device through an I/O port.</td>
</tr>
<tr>
<td>download</td>
<td>To transfer data from the Sysmac Studio to the Controller with the synchronization operation of the Sysmac Studio.</td>
</tr>
<tr>
<td>edge</td>
<td>One of the attributes of a variable. This attribute makes a BOOL variable pass TRUE to a function block when the variable changes from FALSE to TRUE or when it changes from TRUE to FALSE.</td>
</tr>
<tr>
<td>enumeration</td>
<td>One of the derivative data types. This data type takes one item from a prepared name list of enumerators as its value.</td>
</tr>
<tr>
<td>enumerator</td>
<td>One of the values that an enumeration can take expressed as a character string. The value of an enumeration is one of the enumerators.</td>
</tr>
<tr>
<td>EtherCAT Master Function Module</td>
<td>One of the function modules. This function module controls the EtherCAT slaves as the EtherCAT master.</td>
</tr>
<tr>
<td>EtherNet/IP Function Module</td>
<td>One of the function modules. This function module controls the built-in EtherNet/IP port.</td>
</tr>
<tr>
<td>event log</td>
<td>A function that recognizes and records errors and other events.</td>
</tr>
<tr>
<td>Event Setup</td>
<td>Settings that define user-defined errors and user-defined information.</td>
</tr>
<tr>
<td>event task</td>
<td>A task that executes a user program only once when the task execution conditions are met.</td>
</tr>
<tr>
<td>FB</td>
<td>An acronym for “function block.”</td>
</tr>
<tr>
<td>forced refreshing</td>
<td>Forcing the refreshing of an input from an external device or an output to an external device, e.g., when the user debugs a program. Addresses that are subject to forced refreshing can still be overwritten from the user program.</td>
</tr>
<tr>
<td>FUN</td>
<td>An abbreviation for “function.”</td>
</tr>
<tr>
<td>function</td>
<td>A POU that is used to create an object that determines a unique output for the same input, such as for data processing.</td>
</tr>
<tr>
<td>function block</td>
<td>A POU that is used to create an object that can have a different output for the same input, such as for a timer or counter.</td>
</tr>
<tr>
<td>function module</td>
<td>One of the functional units of the software configuration of the CPU Unit.</td>
</tr>
<tr>
<td>general-purpose slave</td>
<td>Any of the EtherCAT slaves that cannot be assigned to an axis.</td>
</tr>
<tr>
<td>global variable</td>
<td>A variable that can be read or written from all POUs (programs, functions, and function blocks).</td>
</tr>
<tr>
<td>I/O map settings</td>
<td>Settings that assign variables to I/O ports. Assignment information between I/O ports and variables.</td>
</tr>
<tr>
<td>I/O port</td>
<td>A logical interface that is used by the CPU Unit to exchange data with an external device (slave or Unit).</td>
</tr>
<tr>
<td>I/O refreshing</td>
<td>Cyclic data exchange with external devices that is performed with predetermined memory addresses.</td>
</tr>
<tr>
<td>information</td>
<td>One of the event levels for Controller events or user-defined events. These are not errors, but appear in the event log to notify the user of specific information.</td>
</tr>
<tr>
<td>Initial Value</td>
<td>One of the attributes of a variable. The variable is set to the initial value in the following situations.</td>
</tr>
<tr>
<td>inline ST</td>
<td>ST programming that is included within a ladder diagram program.</td>
</tr>
<tr>
<td>instruction</td>
<td>The smallest unit of the processing elements that are provided by OMRON for use in POU algorithms. There are ladder diagram instructions (program inputs and outputs), function instructions, function block instructions, and ST statements.</td>
</tr>
<tr>
<td>literal</td>
<td>A constant expression that is used in a user program.</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>local variable</td>
<td>A variable that can be accessed only from inside the POU in which it is defined. “Local variable” is used as opposed to “global variable.” Local variables include internal variables, input variables, output variables, in-out variables, and external variables.</td>
</tr>
<tr>
<td>main memory</td>
<td>The memory inside the CPU Unit that is used by the CPU Unit to execute the OS and user program.</td>
</tr>
<tr>
<td>major fault level Controller error</td>
<td>An error for which all NJ-series Controller control operations stop. The CPU Unit immediately stops user program execution and turns OFF the loads for all slaves and Units (including remote I/O).</td>
</tr>
<tr>
<td>MC Test Run</td>
<td>A function to check motor operation and wiring from the Sysmac Studio.</td>
</tr>
<tr>
<td>memory used for CJ-series units</td>
<td>A type of I/O memory specified as the assignment destination of variables when accessing a CJ-series Unit and CJ-series network. It can be accessed only with variables with an AT attribute.</td>
</tr>
<tr>
<td>minor fault level Controller error</td>
<td>An error for which part of the control operations for one of the function modules in the NJ-series Controller stop. An NJ-series CPU Unit continues operation even after a minor fault level Controller error occurs.</td>
</tr>
<tr>
<td>Motion Control Function Module</td>
<td>One of the function modules. The MC Function Module performs motion control based on commands from the motion control instructions that are executed in the user program.</td>
</tr>
<tr>
<td>motion control instruction</td>
<td>A function block instruction that executes motion control. The Motion Control Function Module supports instructions that are based on function blocks for PLCopen® motion control as well as instructions developed specifically for the Motion Control Function Module.</td>
</tr>
<tr>
<td>namespace</td>
<td>A system that is used to group and nest the names of functions, function block definitions, and data types.</td>
</tr>
<tr>
<td>Network Publish</td>
<td>One of the attributes of a variable. This attribute allows you to use CIP message communications or tag data links to read/write variables from another Controller or from a host computer.</td>
</tr>
<tr>
<td>NX Units</td>
<td>Any of the NX-series Units that perform I/O processing with connected external devices. The Communications Coupler Units are not included with the NX Units.</td>
</tr>
<tr>
<td>observation</td>
<td>One of the event levels for Controller events or user-defined events. These are minor errors that do not affect control operations, but appear in the event log to notify the user of specific information.</td>
</tr>
<tr>
<td>partial fault level Controller error</td>
<td>An error for which all of the control operations for one of the function modules in the NJ-series Controller stop. An NJ-series CPU Unit continues operation even after a partial fault level Controller error.</td>
</tr>
<tr>
<td>PDO communications</td>
<td>An abbreviation for process data communications. Data is exchanged between the master and slaves on a process data communications cycle. (The process data communications cycle is the same as the task period of the primary periodic task.)</td>
</tr>
<tr>
<td>periodic task</td>
<td>A task for which user program execution and I/O refreshing are performed each period.</td>
</tr>
<tr>
<td>PLC Function Module</td>
<td>One of the function modules. This function module executes the user program, sends commands to the Motion Control Function Module, and provides an interface to the USB and SD Memory Card.</td>
</tr>
<tr>
<td>POU</td>
<td>An acronym for “program organization unit.” A POU is a unit in a program execution model that is defined in IEC 61131-3. A POU contains an algorithm and a local variable table and forms the basic unit used to build a user program. There are three types of POUs: programs, functions, and function blocks.</td>
</tr>
<tr>
<td>primary periodic task</td>
<td>The task with the highest priority.</td>
</tr>
<tr>
<td>process data communications</td>
<td>One type of EtherCAT communications in which process data objects (PDOs) are used to exchange information cyclically and in realtime. Process data communications are also called PDO communications.</td>
</tr>
<tr>
<td>program</td>
<td>Along with functions and function blocks, one of the three types of POUs. Programs are assigned to tasks to execute them.</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>project unit version</td>
<td>A unit version to be set for the project. It is set for the project in the Select Device Area of the Project Properties Dialog Box on the Sysmac Studio.</td>
</tr>
<tr>
<td>Range Specification</td>
<td>One of the variable specifications. You can specify a range for a variable in advance. The variable can take only values that are in the specified range.</td>
</tr>
</tbody>
</table>
| Retain                           | One of the attributes of a variable. The values of variables with a Retain attribute are held at the following times. (Variables without a Retain attribute are set to their initial values.)  
  - When power is turned ON after a power interruption  
  - When the CPU Unit changes to RUN mode  
  - When you specify to not initialize the values when the user program is transferred |
<p>| SDO communications              | One type of EtherCAT communications in which service data objects (SDOs) are used to transmit information whenever required.                  |
| Servo Drive/encoder input slave  | Any of the EtherCAT slaves that is assigned to an axis. In the NJ-series System, it would be a Servo Drive or Encoder Input Slave Unit.          |
| slave                            | A device that performs remote I/O for a master.                                                                                               |
| slave and Unit configurations    | A generic term for the EtherCAT configuration and Unit configuration.                                                                            |
| Slave Terminal                  | A building-block remote I/O terminal to which a Communications Coupler Unit and NX Units are mounted. A Slave Terminal is one type of slave.      |
| Special Unit Setup              | A generic term for the settings for a Special Unit, including the settings in allocated DM Area words.                                         |
| structure                        | One of the derivative data types. It consists of multiple data types placed together into a layered structure.                               |
| synchronization                  | A function that automatically compares the information in the NJ-series Controller with the information in the Sysmac Studio, displays any differences and locations in a hierarchical form, and can be used to synchronize the information. |
| Sysmac Studio                    | A computer software application for setting, programming, debugging, and troubleshooting NJ-series Controllers. It also provides operations for motion control and a Simulator. |
| system common processing        | System processing that is performed by the CPU Unit to perform I/O refreshing and the user program execution within a task. Exclusive control of variables between tasks, data trace processing, and other processing is performed. |
| system service                   | Processing that is performed by the CPU Unit in unused time between task processing. The system service includes communications processing, SD Memory Card access processing, self-diagnosis processing, and other processing. |
| system-defined variable          | A variable for which all attributes are defined by the system and cannot be changed by the user.                                                |
| task                             | An attribute that defines when a program is executed.                                                                                          |
| task period                      | The interval at which the primary periodic task or a periodic task is executed.                                                               |
| union                            | One of the derivative data types. It allows you to handle the same data as different data types.                                               |
| Unit configuration               | The configuration information for the Units that are set on the Sysmac Studio. This information tells what Unit models are connected to the CPU Unit and where they are connected. |
| upload                           | To transfer data from the Controller to the Sysmac Studio with the synchronization operation of the Sysmac Studio.                             |
| user program                     | All of the programs in one project.                                                                                                             |
| user-defined event               | One of the events in the NJ-series System. These events are defined by the user. “User-defined events” is a generic term for user-defined errors and user-defined information. |
| user-defined variable            | A variable for which all of the attributes are defined by the user and can be changed by the user.                                              |
| variable                         | A representation of data, such as a numeric value or character string, that is used in a user program. You can change the value of a variable by assigned the required value. “Variable” is used as opposed to “constant,” for which the value does not change. |</p>
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>variable memory</td>
<td>A memory area that contains the present values of variables that do not have AT specifications. It can be accessed only with variables without an AT attribute.</td>
</tr>
</tbody>
</table>
A manual revision code appears as a suffix to the catalog number on the front and back covers of the manual.

<table>
<thead>
<tr>
<th>Revision code</th>
<th>Date</th>
<th>Revised content</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>July 2011</td>
<td>Original production</td>
</tr>
<tr>
<td>02</td>
<td>March 2012</td>
<td>• Added information on the NJ301-□□□□.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Added information on the functions supported by unit version 1.01 of the CPU Units.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Corrected mistakes.</td>
</tr>
<tr>
<td>03</td>
<td>May 2012</td>
<td>• Made changes accompanying release of unit version 1.02 of the CPU Unit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Added information on the functions supported by unit version 1.01 of the CPU Units.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Corrected mistakes.</td>
</tr>
<tr>
<td>04</td>
<td>August 2012</td>
<td>• Made changes accompanying release of unit version 1.03 of the CPU Unit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Made changes accompanying release of unit version 1.01 of the CPU Units.</td>
</tr>
<tr>
<td>05</td>
<td>February 2013</td>
<td>• Made changes accompanying release of unit version 1.04 of the CPU Unit.</td>
</tr>
<tr>
<td>06</td>
<td>April 2013</td>
<td>• Added information on the NJ501-□□□□.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Made changes accompanying release of unit version 1.05 of the CPU Unit.</td>
</tr>
<tr>
<td>07</td>
<td>June 2013</td>
<td>• Made changes accompanying release of unit version 1.06 of the CPU Unit.</td>
</tr>
<tr>
<td>08</td>
<td>September 2013</td>
<td>• Made changes accompanying release of unit version 1.07 of the CPU Unit.</td>
</tr>
<tr>
<td>09</td>
<td>December 2013</td>
<td>• Made changes accompanying release of unit version 1.08 of the CPU Unit.</td>
</tr>
<tr>
<td>10</td>
<td>July 2014</td>
<td>• Corrected mistakes.</td>
</tr>
<tr>
<td>11</td>
<td>January 2015</td>
<td>• Made changes accompanying release of unit version 1.10 of the CPU Unit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Corrected mistakes.</td>
</tr>
<tr>
<td>12</td>
<td>April 2015</td>
<td>• Added information on the NJ101-□□□□.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Corrected mistakes.</td>
</tr>
<tr>
<td>13</td>
<td>October 2015</td>
<td>• Made changes accompanying release of unit version 1.11 of the CPU Unit.</td>
</tr>
<tr>
<td>14</td>
<td>April 2016</td>
<td>• Made changes accompanying release of unit version 1.12 of the CPU Unit.</td>
</tr>
<tr>
<td>15</td>
<td>October 2016</td>
<td>• Made changes accompanying release of unit version 1.13 of the CPU Unit.</td>
</tr>
<tr>
<td>16</td>
<td>April 2017</td>
<td>• Made changes accompanying release of unit version 1.14 of the CPU Unit.</td>
</tr>
<tr>
<td>17</td>
<td>June 2017</td>
<td>• Made changes accompanying release of unit version 1.15 of the CPU Unit.</td>
</tr>
<tr>
<td>18</td>
<td>October 2017</td>
<td>• Made changes accompanying release of unit version 1.16 of the CPU Unit.</td>
</tr>
<tr>
<td>19</td>
<td>January 2018</td>
<td>• Made changes accompanying release of unit version 1.17 of the CPU Unit.</td>
</tr>
<tr>
<td>20</td>
<td>April 2018</td>
<td>• Corrected mistakes.</td>
</tr>
<tr>
<td>Revision code</td>
<td>Date</td>
<td>Revised content</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 21            | July 2018    | • Added information on the hardware revision.  
• Made changes accompanying release of unit version 1.19 of the CPU Unit.  
• Made changes accompanying the transfer of explanation for event codes and errors to the *NJ/NX-series Troubleshooting Manual*. |
| 22            | January 2019 | • Made changes accompanying release of unit version 1.20 of the CPU Unit.  
• Corrected mistakes.                                                                                                                                                                                                   |
| 23            | April 2019   | • Made changes accompanying release of unit version 1.21 of the NJ501-1□00, NJ301-□□□□□□, and NJ101-□□□□0.                                                                                                           |
| 24            | July 2019    | • Made changes accompanying release of unit version 1.40 of the NJ501-1□00, NJ301-□□□□□□, and NJ101-□□□□0.  
• Made changes accompanying release of unit version 1.21 of the NJ501-4□00, NJ501-4□10, NJ501-1340, and NJ501-5300. |
Revision History
Introduction to NJ-series Controllers

This section describes the features, basic system configuration, specifications, and overall operating procedure of an NJ-series Controller.

1-1 The NJ-series Controllers ................................................. 1-2
1-1-1 Features ...................................................................... 1-2
1-1-2 Introduction to the System Configurations .................. 1-4
1-2 Specifications ............................................................... 1-7
1-3 Overall Operating Procedure for the NJ-series Controller 1-12
1-3-1 Overall Procedure ...................................................... 1-12
1-3-2 Procedure Details ....................................................... 1-13
The SYSMAC NJ-series Controllers are next-generation machine automation controllers that provide the functionality and high-speed performance that are required for machine control. They provide the safety, reliability, and maintainability that are required of industrial controllers.

The NJ-series Controllers provide the functionality of previous OMRON PLCs, and they also provide the functionality that is required for motion control. Synchronized control of I/O devices on high-speed EtherCAT can be applied to safety devices, vision systems, motion equipment, discrete I/O, and more.

OMRON offers the new Sysmac Series of control devices designed with unified communications specifications and user interface specifications. The NJ-series Machine Automation Controllers are part of the Sysmac Series. You can use them together with EtherCAT slaves, other Sysmac products, and the Sysmac Studio Automation Software to achieve optimum functionality and ease of operation. With a system that is created from Sysmac products, you can connect components and commission the system through unified concepts and usability.

### 1-1-1 Features

#### Hardware Features

- **Standard-feature EtherCAT Control Network Support**
  
  All CPU Units provide an EtherCAT master port for EtherCAT communications. EtherCAT is an advanced industrial network system that achieves faster, more-efficient communications. It is based on Ethernet. Each node achieves a short fixed communications cycle time by transmitting Ethernet frames at high speed. The standard-feature EtherCAT control network allows you to connect all of the devices required for machine control (e.g., I/O systems, Servo Drives, Inverters, and machine vision) to the same network.

- **Support for EtherCAT Slave Terminals**
  
  You can use EtherCAT Slave Terminals to save space. You can also flexibly build systems with the wide variety of NX Units.
Introduction to NJ-series Controllers

1-1 The NJ-series Controllers

1-1-1 Features

- Achieving a Safety Subsystem on EtherCAT
  You can use NX-series Safety Control Units to integrate safety controls in a sequence and motion control system as a subsystem on EtherCAT.

Version Information

A CPU Unit with unit version 1.06 or later and Sysmac Studio version 1.07 or higher are required to use the NX-series Safety Control Units.

- CJ-series Units
  In addition to EtherCAT network slaves, you can also mount CJ-series Basic I/O Units and Special Units on the I/O bus.

- Standard-feature EtherNet/IP Communications Port
  All CPU Units provide an EtherNet/IP port for EtherNet/IP communications. EtherNet/IP is a multi-vendor industrial network that uses Ethernet. You can use it for networks between Controllers or as a field network. The use of standard Ethernet technology allows you to connect to many different types of general-purpose Ethernet devices.

- Standard-feature USB Port
  You can connect the computer that runs the Support Software directly to the CPU Unit.

- Standard-feature SD Memory Card Slot
  You can access an SD Memory Card that is mounted in the CPU Unit from the user program.

- Highly Reliable Hardware
  The NJ-series Controllers provide the hardware reliability and RAS functions that you expect of a PLC.

Software Features

- Integrated Sequence Control and Motion Control
  An NJ-series CPU Unit can perform both sequence control and motion control. You can simultaneously achieve both sequence control and multi-axes synchronized control. Sequence control, motion control, and I/O refreshing are all executed in the same control period. The same control period is also used for the process data communications cycle for EtherCAT. This enables precise sequence and motion control in a fixed period with very little deviation.

- Multitasking
  You assign I/O refreshing and programs to tasks and then specify execution conditions and execution order for them to flexibly combine controls that suit the application.

- Programming Languages Based on the IEC 61131-3 International Standard
  The NJ-series Controllers support language specifications that are based on IEC 61131-3. To these, OMRON has added our own improvements. Motion control instructions that are based on PLCopen® standards and an instruction set (POUs) that follows IEC rules are provided.

- Programming with Variables to Eliminate Worrying about the Memory Map
  You access all data through variables in the same way as for the advanced programming languages that are used on computers. Memory in the CPU Unit is automatically assigned to the variables that you create so that you do not have to remember the physical addresses.
A Wealth of Security Features
The many security features of the NJ-series Controllers include operation authority settings and restriction of program execution with IDs.

Complete Controller Monitoring
The CPU Unit monitors events in all parts of the Controller, including mounted Units and EtherCAT slaves. Troubleshooting information for errors is displayed on the Sysmac Studio or on an NS-series PT. Events are also recorded in logs.

Sysmac Studio Automation Software
The Sysmac Studio provides an integrated development environment that covers not only the Controller, but also covers peripheral devices and devices on EtherCAT. You can use consistent procedures for all devices regardless of the differences in the devices. The Sysmac Studio supports all phases of Controller application, from designing through debugging, simulations, commissioning, and changes during operation.

A Wealth of Simulation Features
The many simulation features include execution, debugging, and task execution time estimates on a virtual controller.

1-1-2 Introduction to the System Configurations

Basic System Configurations
The NJ-series basic configurations include the EtherCAT network configuration, CJ-series Unit configuration, and the Support Software.

EtherCAT Network Configuration
You can use the built-in EtherCAT port to connect to EtherCAT Slave Terminals, to general-purpose slaves for analog and digital I/O, and to Servo Drives and encoder input slaves. An EtherCAT network configuration enables precise sequence and motion control in a fixed cycle with very little deviation.

CJ-series Unit Configuration
In addition to the EtherCAT network, you can mount CJ-series Basic I/O Units and Special Units. CJ-series Units can be mounted both to the CPU Rack where the CPU Unit is mounted and to Expansion Racks.

Support Software
The Support Software is connected to the peripheral USB port on the CPU Unit with a commercially available USB cable. You can also connect it through an Ethernet cable that is connected to the built-in EtherNet/IP port.

Refer to 3-7-2 Connection for details on the connection configuration of the Support Software.
Additional Information

You can connect the Sysmac Studio directly to the Communications Coupler Unit to set up the Slave Terminal. Refer to the *NX-series EtherCAT Coupler Units User’s Manual* (Cat. No. W519) for details.

- **Network Configurations**
  - Host computers, HMI, and other NJ-series Controllers are connected to the built-in EtherNet/IP port on the CPU Unit or to a CJ1W-EIP21 EtherNet/IP Unit.
  - A DeviceNet network is connected to a DeviceNet Unit. A serial communications network is connected to a Serial Communications Unit.
Refer to the NJ/NX-series CPU Unit Software User’s Manual (Cat. No. W501) for details on the network configuration.

- **Support Software**
  You can use the following Support Software to set up, monitor, and debug an NJ-series Controller.

**Sysmac Studio**

The Sysmac Studio is the main Support Software that you use for an NJ-series Controller. On it, you can set up the Controller configurations, parameters, and programs, and you can debug and simulate operation.

**Other Support Software**

The following Support Software is also included in the Sysmac Studio Software Package Standard Edition.

<table>
<thead>
<tr>
<th>Configuration software</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sysmac Studio</td>
<td>The Sysmac Studio is used for sequence control, motion control, and all other operations except those described below.</td>
</tr>
<tr>
<td>Network Configurator</td>
<td>The Network Configurator is used for tag data links on EtherNet/IP ports or Units.*1</td>
</tr>
<tr>
<td>CX-Integrator</td>
<td>The CX-Integrator is used for remote I/O communications with a DeviceNet Unit or CompoNet Master Unit.</td>
</tr>
<tr>
<td>CX-Protocol</td>
<td>The CX-Protocol is used for protocol macros with Serial Communications Units.</td>
</tr>
<tr>
<td>CX-Designer</td>
<td>The CX-Designer is used to create screens for NS-series PTs.</td>
</tr>
</tbody>
</table>

*1 If the NJ/NX-series Controller is a target device, you may also use Sysmac Studio version 1.10 or higher. Use the Network Configurator if a CS/CJ-series PLC operates as the originator device.
This section gives the main specifications of the NJ-series Controllers.

<table>
<thead>
<tr>
<th>Item</th>
<th>NJ501-</th>
<th>NJ301-</th>
<th>NJ101-</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Processing time</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruction execution times</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LD instruction</td>
<td>1.2 ns (1.9 ns or less)*1</td>
<td>2.0 ns (3.0 ns or less)*2</td>
<td>3.3 ns (5.0 ns or less)*3</td>
</tr>
<tr>
<td>Math instructions (for long real data)</td>
<td>26 ns or more*4</td>
<td>42 ns or more*5</td>
<td>70 ns or more*6</td>
</tr>
<tr>
<td><strong>Program capacity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program capacity*7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>20 MB</td>
<td>5 MB</td>
<td>3 MB</td>
</tr>
<tr>
<td>Quantity</td>
<td>3,000</td>
<td>750</td>
<td>450</td>
</tr>
<tr>
<td>Number of POU instances</td>
<td>9,000 (*)</td>
<td>3,000 (*)</td>
<td>1,800</td>
</tr>
<tr>
<td><strong>Memory capacity for variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retain attributes*8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>2 MB</td>
<td>0.5 MB</td>
<td></td>
</tr>
<tr>
<td>Number of variables</td>
<td>10,000</td>
<td>5,000 (*)</td>
<td></td>
</tr>
<tr>
<td>No Retain attributes*9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>4 MB</td>
<td>2 MB</td>
<td></td>
</tr>
<tr>
<td>Number of variables</td>
<td>180,000 (*)</td>
<td>90,000 (*)</td>
<td>22,500</td>
</tr>
<tr>
<td><strong>Data types</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of data types</td>
<td>2,000</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td><strong>Memory for CJ-series Units</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CIO Area</td>
<td>6,144 words (CIO 0 to CIO 6143)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work Area</td>
<td>512 words (W0 to W511)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holding Area</td>
<td>1,536 words (H0 to H1535)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DM Area</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32,768 words (D0 to D32767)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EM Area</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32,768 words × 25 banks (E0_00000 to E18_32767)</td>
<td>32,768 words × 4 banks (E0_00000 to E3_32767)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Motion control</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Number of controlled axes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum number of controlled axes</td>
<td>64 axes</td>
<td>32 axes</td>
<td>16 axes</td>
</tr>
<tr>
<td>Motion control axes</td>
<td>64 axes</td>
<td>32 axes</td>
<td>16 axes</td>
</tr>
<tr>
<td>Single-axis positioning control axes</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum number of used real axes</td>
<td>64 axes</td>
<td>32 axes</td>
<td>16 axes</td>
</tr>
<tr>
<td>Used motion control servo axes</td>
<td>64 axes</td>
<td>32 axes</td>
<td>16 axes</td>
</tr>
<tr>
<td>Used single-axis position control servo axes</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum number of axes for linear interpolation axis control</td>
<td>4 axes per axes group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of axes for circular interpolation axis control</td>
<td>2 axes per axes group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum number of axes groups</td>
<td>32 axes groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motion control period</td>
<td>The same control period as that is used for the process data communications cycle for EtherCAT.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cams</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of cam data points</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum points per cam table</td>
<td>65,535 points</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum points for all cam tables</td>
<td>1,048,560 points</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum number of cam tables</td>
<td>640 tables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position units</td>
<td>Pulse, mm, μm, nm, degree, and inch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Override factors</td>
<td>0.00% or 0.01% to 500.00%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Introduction to NJ-series Controllers

<table>
<thead>
<tr>
<th>Item</th>
<th>NJ501-</th>
<th>NJ301-</th>
<th>NJ101-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral USB port</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supported services</td>
<td>Sysmac Studio connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical layer</td>
<td>USB 2.0-compliant B-type connector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission distance</td>
<td>5 m max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of ports</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical layer</td>
<td>10BASE-T/100BASE-TX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frame length</td>
<td>1,514 bytes max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Media access method</td>
<td>CSMA/CD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modulation</td>
<td>Baseband</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topology</td>
<td>Star</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baud rate</td>
<td>100 Mbps (100Base-TX)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission media</td>
<td>STP (shielded, twisted-pair) cable of Ethernet category 5, 5e or higher</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum transmission distance between Ethernet switch and node</td>
<td>100 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum number of cascade connections</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Built-in EtherNet/IP port

<table>
<thead>
<tr>
<th>CIP service: Tag data links (cyclic communications)</th>
<th>NJ501-</th>
<th>NJ301-</th>
<th>NJ101-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of connections</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packet interval*11</td>
<td>Can be set for each connection. 1 to 10,000 ms in 1-ms increments (*)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permissible communications band</td>
<td>3,000 pps<em>12 (including heartbeat) (</em>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum number of tag sets</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tag types</td>
<td>Network variables, CIO, Work, Holding, DM, and EM Areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of tags per connection (i.e., per tag set)</td>
<td>8 (7 tags if Controller status is included in the tag set.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum number of tags</td>
<td>256</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum link data size per node (total size for all tags)</td>
<td>19,200 bytes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum data size per connection</td>
<td>600 bytes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum number of registrable tag sets</td>
<td>32 (1 connection = 1 tag set)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum tag set size</td>
<td>600 bytes (Two bytes are used if Controller status is included in the tag set.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-cast packet filter*13</td>
<td>Supported</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CIP message service: Explicit messages

<table>
<thead>
<tr>
<th>Item</th>
<th>NJ501-</th>
<th>NJ301-</th>
<th>NJ101-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 3 (number of connections)</td>
<td>32 (clients plus server)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum number of clients that can communi-</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cate at one time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum number of servers that can commu-</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nicate at one time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of TCP sockets</td>
<td>30 (*)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Built-in Ether-Net/IP Port

<table>
<thead>
<tr>
<th>Item</th>
<th>NJ501-</th>
<th>NJ301-</th>
<th>NJ101-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Built-in Ether-Net/IP port</td>
<td>OPC UA Server*14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support Profile/Model</td>
<td>UA 1.02 Micro Embedded Device Server Profile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Default Endpoint/Port</td>
<td>opc.tcp://192.168.250.1:4840/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum number of sessions (Client)</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Maximum number of Monitored Items per server</td>
<td>2000</td>
<td>5000</td>
<td>5000</td>
</tr>
<tr>
<td>Sampling rate of the Monitored Items (ms)</td>
<td>0, 50, 100, 250, 500, 1000, 2000, 5000, 10000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>if set to 0 (zero), it is assumed that is set to 50.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum number of Subscriptions per server</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Maximum number of variables to open as OPC UA objects</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Structure’s definitions able to open</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Variables unable to open</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Variable which size are over 1024Bytes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Double and over dimensional array of structures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Structures includes double and over dimensional array</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Structures nested 4 and over</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Unions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Array which index number don’t start from 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Array which element is over 1024</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Structures which members are over 100.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security Policy/Mode</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sign - Basic128Rsa15</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sign - Basic256</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sign - Basic256Sha256</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SignAndEncrypt - Basic128Rsa15</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SignAndEncrypt - Basic256</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SignAndEncrypt - Basic256Sha256</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Authentication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application Authentication</td>
<td>X.509</td>
</tr>
<tr>
<td></td>
<td>Trusted certification: 32</td>
</tr>
<tr>
<td></td>
<td>Issuer certification: 32</td>
</tr>
<tr>
<td></td>
<td>Rejected certification: 32</td>
</tr>
<tr>
<td>User Authentication</td>
<td>User name / Password</td>
</tr>
<tr>
<td></td>
<td>Anonymous</td>
</tr>
</tbody>
</table>

---

*14 OPC UA Server supported only for NJ501- and NJ301-.
### Built-in EtherCAT Port

<table>
<thead>
<tr>
<th>Item</th>
<th>NJ501-10</th>
<th>NJ301-11</th>
<th>NJ101-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications standard</td>
<td>IEC 61158 Type12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EtherCAT master specifications</td>
<td>Class B (Feature Pack Motion Control compliant)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical layer</td>
<td>100BASE-TX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modulation</td>
<td>Baseband</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duplex mode</td>
<td>Auto</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topology</td>
<td>Line, daisy chain, branching, and ring*15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission media</td>
<td>Twisted-pair cable of category 5 or higher (double-shielded straight cable with aluminum tape and braiding)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum transmission distance between nodes</td>
<td>100 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum number of slaves</td>
<td>192</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>Range of node addresses that can be set</td>
<td>1 to 192</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum process data size</td>
<td>Inputs: 5,736 bytes, Outputs: 5,736 bytes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum process data size per slave</td>
<td>Inputs: 1,434 bytes, Outputs: 1,434 bytes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communications cycle</td>
<td>500, 1,000, 2,000, or 4,000 μs (*)</td>
<td></td>
<td>1,000, 2,000, or 4,000 μs</td>
</tr>
<tr>
<td>Sync jitter</td>
<td>1 μs max.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Serial Communications

<table>
<thead>
<tr>
<th>Item</th>
<th>---</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications method</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synchronization method</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baud rate</td>
<td>---</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Unit Configuration

<table>
<thead>
<tr>
<th>Item</th>
<th>NJ501-10</th>
<th>NJ301-11</th>
<th>NJ101-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of connectable Units</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum number of CJ Units per CPU Rack</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum number of NX Units per CPU Rack</td>
<td></td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Maximum number of CJ Units for entire controller</td>
<td></td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Maximum number of NX Units for entire controller</td>
<td>4,096</td>
<td>(On EtherCAT Slave Terminals)</td>
<td>400</td>
</tr>
<tr>
<td>Maximum number of Expansion Racks</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I/O capacity</td>
<td>Maximum number of I/O points on CJ-series Units</td>
<td>2,560</td>
<td></td>
</tr>
<tr>
<td>Power Supply Unit for CPU Rack and Expansion Racks</td>
<td>Model</td>
<td>NJ-P3001</td>
<td></td>
</tr>
<tr>
<td>Power OFF detection time</td>
<td>AC power supply</td>
<td>30 to 45 ms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DC power supply</td>
<td>22 to 25 ms</td>
<td></td>
</tr>
<tr>
<td>Option Board</td>
<td>Number of slots</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Built-In I/O</td>
<td>Number of points</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of points</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Load short-circuit protection</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>

### Internal Clock

<table>
<thead>
<tr>
<th>Item</th>
<th>---</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>At ambient temperature of 55°C: −3.5 to +0.5 min error per month</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>At ambient temperature of 25°C: −1.5 to +1.5 min error per month</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>At ambient temperature of 0°C: −3 to +1 min error per month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retention time of built-in capacitor</td>
<td>---</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

*1 When the hardware revision for the Unit is A or B, the processing time is 1.1 ns (1.7 ns or less).
*2 When the hardware revision for the Unit is A, the processing time is 1.6 ns (2.5 ns or less).
*3 When the hardware revision for the Unit is A, the processing time is 3.0 ns (4.5 ns or less).
*4 When the hardware revision for the Unit is A or B, the value is 24 ns or more.
*5 When the hardware revision for the Unit is A, the value is 35 ns or more.
*6 When the hardware revision for the Unit is A, the value is 63 ns or more.
*7 Execution objects and variable tables (including variable names)
*8 Does not include Holding, DM, and EM Area memory for CJ-series Units.
*9 Does not include CIO and Work Area memory for CJ-series Units.
*10 Refer to the NJ/NX-series CPU Unit Motion Control User’s Manual (Cat. No. W507) for descriptions of axes.
*11 Data will be refreshed at the set interval, regardless of the number of nodes.
*12 "pps" means packets per second, i.e., the number of communications packets that can be sent or received in one second.
*13 As the EtherNet/IP port implements the IGMP client, unnecessary multi-cast packets can be filtered by using an Ethernet switch that supports IGMP Snooping.
*14 The Unit that corresponds to the OPC UA is an NJ501-1□□0 CPU Unit with unit version 1.17 or later.
*15 A ring topology can be used with project unit version 1.40 or later.
*16 However, for project unit version earlier than 1.40, the data must be within four frames.

Note Items that are marked with asterisks in the table are improvements that were made during version upgrades. Refer to A-7 Version Information for information on version upgrades.
1-3 Overall Operating Procedure for the NJ-series Controller

This section gives the overall operating procedure of the NJ-series Controllers and then describes it in more detail.

1-3-1 Overall Procedure

The overall procedure to use an NJ-series Controller is given below.

<table>
<thead>
<tr>
<th>Step 1. Software Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design the overall system configuration, task configuration, programs, and variables.</td>
</tr>
<tr>
<td>Step 1-1 Designing I/O and Processing</td>
</tr>
<tr>
<td>Step 1-2 Designing Tasks</td>
</tr>
<tr>
<td>Step 1-3 Designing Programs</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2. Software Setups and Programming</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create the system configurations that you designed in step 1 on the Support Software and assign the variables. Create the tasks and programs, and debug them, e.g., with simulations.</td>
</tr>
<tr>
<td>Step 2-1 Slave and Unit Configurations</td>
</tr>
<tr>
<td>Step 2-2 Controller Setup</td>
</tr>
<tr>
<td>Step 2-3 Programming</td>
</tr>
<tr>
<td>Step 2-4 Offline Debugging</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 3. Mounting and Setting Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount the Units and make the required hardware settings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 4. Wiring</th>
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</thead>
<tbody>
<tr>
<td>Connect the network cables and wire the I/O.</td>
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</table>

<table>
<thead>
<tr>
<th>Step 5. Confirming Operation and Starting Actual System Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect the Support Software to the physical system and download the project. Check operation on the physical system and then start actual system operation.</td>
</tr>
</tbody>
</table>
### 1-3-2 Procedure Details

#### Step 1. Software Design

<table>
<thead>
<tr>
<th>Step 1-1 Designing I/O and Processing</th>
<th>Description</th>
<th>Reference</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>• External I/O devices and unit configuration</td>
<td>Section 3 Configuration Units (page 3-1)</td>
</tr>
<tr>
<td></td>
<td>• Refresh periods for external devices</td>
<td></td>
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<tr>
<td></td>
<td>• Program contents</td>
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</table>

<table>
<thead>
<tr>
<th>Step 1-2 Designing Tasks</th>
<th>Description</th>
<th>Reference</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>• Task configuration</td>
<td>NJ/NX-series CPU Unit Software User’s Manual</td>
</tr>
<tr>
<td></td>
<td>• Relationship between tasks and programs</td>
<td>(Cat. No. W501)</td>
</tr>
<tr>
<td></td>
<td>• Task periods</td>
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</tr>
<tr>
<td></td>
<td>• Slave and Unit refresh times</td>
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<tr>
<td></td>
<td>• Exclusive control methods for variables between tasks</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 1-3 Designing Programs</th>
<th>Description</th>
<th>Reference</th>
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<tbody>
<tr>
<td>POU (Program Organization Unit) Design</td>
<td>• Programs</td>
<td>NJ/NX-series CPU Unit Software User’s Manual</td>
</tr>
<tr>
<td></td>
<td>• Functions and function blocks</td>
<td>(Cat. No. W501)</td>
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<tr>
<td></td>
<td>• Determining the algorithm languages</td>
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</table>

<table>
<thead>
<tr>
<th>Variable Design</th>
<th>Description</th>
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<tr>
<td></td>
<td>• Defining variables that you can use in more than one POU and variables</td>
<td>NJ/NX-series CPU Unit Software User’s Manual</td>
</tr>
<tr>
<td></td>
<td>that you use in only specific POUs</td>
<td>(Cat. No. W501)</td>
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<tr>
<td></td>
<td>• Defining the variables names for the device variables that you use</td>
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<tr>
<td></td>
<td>to access slaves and Units</td>
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<tr>
<td></td>
<td>• Defining the attributes of variables, such as the Name and Retain</td>
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<tr>
<td></td>
<td>attributes</td>
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<tr>
<td></td>
<td>• Designing the data types of variables</td>
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</tbody>
</table>

#### Step 2. Software Setups and Programming

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Sysmac Studio Operations</th>
<th>Reference</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>New Project Button Insert Controller</td>
</tr>
<tr>
<td>Project Creation</td>
<td>1. Create a project in the Sysmac Studio.</td>
<td></td>
<td>Sysmac Studio Version 1 Operation Manual (Cat. No. W504)</td>
</tr>
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</tbody>
</table>
The following **Controller Configurations and Setup** and the **Programming and Task Settings** can be performed in either order.

<table>
<thead>
<tr>
<th>Step 2-1 Slave and Unit Configurations</th>
<th>1. Creating the slave configuration and Unit configuration either offline or online. (For online configuration, make the online connection that is described in step 5.)</th>
<th>EtherCAT Slave Setting Editor Unit Editor</th>
<th>NJ/NX-series CPU Unit Software User’s Manual (Cat. No. W501)  NX-series EtherCAT Coupler Unit User’s Manual (Cat. No. W519)</th>
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</thead>
<tbody>
<tr>
<td>2. Setting up any Slave Terminals that are used.</td>
<td></td>
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</tr>
<tr>
<td>2) Assigning Device Variables to I/O Ports</td>
<td>Registering device variables in variable tables (Variable names are user defined or automatically created.)</td>
<td>I/O Map</td>
<td>NJ/NX-series CPU Unit Software User’s Manual (Cat. No. W501)</td>
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</tr>
<tr>
<td>(The following step is for motion control.)</td>
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<tr>
<td>3) Creating the Axes and Assigning Them to the Servo Drive/Encoder Input Slaves</td>
<td>Creating the axes and setting them as real axes or virtual axes. Creating axes groups to perform interpolated axes control.</td>
<td>Configurations and Setup – Motion Control Setup</td>
<td>NJ/NX-series CPU Unit Software User’s Manual (Cat. No. W501)</td>
</tr>
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<tr>
<td>Step 2-2 Controller Setup</td>
<td>Setting the following parameters from the Sysmac Studio</td>
<td></td>
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</tr>
<tr>
<td>Setting the initial values for the PLC Function Module</td>
<td>Configurations and Setup – Controller Setup – Operation Settings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial settings for Special Units</td>
<td>Configurations and Setup – CPU/Expansion Racks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(To use motion control) Setting the initial settings for the Motion Control Function Module</td>
<td>Configurations and Setup – Motion Control Setup</td>
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<tr>
<td>Setting the initial values for the EtherCAT Function Module</td>
<td>Configurations and Setup – EtherCAT</td>
<td></td>
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</tr>
<tr>
<td>Setting the initial values for the EtherNet/IP Function Module</td>
<td>Configurations and Setup – Controller Setup – Built-in EtherNet/IP Port Settings</td>
<td></td>
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</tr>
</tbody>
</table>
### Step 2-3 Programming

| 1) Registering Variables | • Registering the variables used by more than one POU in the global variable table with Sysmac Studio  
• Registering the local variable table for each program  
• Registering the local variable table for each function block and function | Global Variable Table Editor  
Local Variable Table Editor | Sysmac Studio Version 1 Operation Manual (Cat. No. W504)  
NJ/NX-series CPU Unit Software User’s Manual (Cat. No. W501) |
|---|---|---|---|
| 2) Writing Algorithms for POUs | Writing the algorithms for the POUs (programs, function blocks, and functions) in the required languages | Programming Editor | NJ/NX-series CPU Unit Software User’s Manual (Cat. No. W501)  
| 3) Setting the Tasks | Making task settings | Configurations and Setup – Task Settings | NJ/NX-series CPU Unit Software User’s Manual (Cat. No. W501) |

### Step 2-4 Offline Debugging

Checking the algorithms and task execution times on the Simulator (virtual controller)

NJ/NX-series CPU Unit Software User’s Manual (Cat. No. W501)

### Step 3. Mounting and Setting Hardware

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
</table>
| 1. Mounting | • Connecting adjacent Units  
• Mounting to DIN Track | 4-3 Mounting Units (page 4-10) |
| 2. Setting Hardware | • Setting the node addresses of the EtherCAT slaves  
• Setting unit numbers on the rotary switches on the front of the Special Units | Operation manuals for the EtherCAT slaves and Special Units |
Introduction to NJ-series Controllers

### Step 4. Wiring

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
</table>
| 1. Connecting Ethernet Cable | • Connecting the built-in EtherCAT port  
• Connecting the built-in EtherNet/IP port | 4-4 Wiring (page 4-27) |
| 2. Wiring I/O | • Wiring I/O to EtherCAT slaves  
• Wiring Basic I/O Units and Special Units  
• Checking wiring | Operation manuals for EtherCAT Slave Units and 4-4 Wiring (page 4-27)  
Sysmac Studio Version 1 Operation Manual (Cat. No. W504) |
| 3. Connecting the Computer That Runs the Sysmac Studio | • Connecting USB Cable  
• Connecting the built-in EtherNet/IP port | Sysmac Studio Version 1 Operation Manual (Cat. No. W504) |

### Step 5. Checking Operation and Starting Operation on the Actual System

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Sysmac Studio Operations</th>
<th>Reference</th>
</tr>
</thead>
</table>
| 1. Online Connection to Sysmac Studio and Project Download | Turn ON the power supply to the Controller and place the Sysmac Studio online. Then, download the project.*  
(Perform this step before you create the slave configuration or Unit configuration from the mounted Units in step 2-1.) | Controller – Communications Setup  
| 2. Operation Check on Controller | 1. Check the wiring by using forced refreshing of real I/O from the I/O Map or Watch Tab Page.  
2. For motion control, use the MC Test Run operations in PROGRAM mode to check the wiring. Then check the motor rotation directions for jogging, travel distances for relative positioning (e.g., for electronic gear settings), and homing operation.  
3. Change the Controller to RUN mode and check the operation of the user program. | | NJ/NX-series CPU Unit Software User’s Manual (Cat. No. W501) |
| 3. Actual Controller Operation | Start actual operation. | |

* Use the Synchronize Menu of the Sysmac Studio to download the project.
This section describes the basic system configuration and devices used for NJ-series Controllers.

2-1 Basic System Configuration ........................................ 2-2
  2-1-1 EtherCAT Network Configuration .......................... 2-4
  2-1-2 CJ-series Unit Configuration ................................. 2-5
2-2 Connecting to the Sysmac Studio ............................... 2-19
2-3 Network Configuration ............................................ 2-20
2-1 Basic System Configuration

System Configuration

An NJ-series Controller supports the following two types of configurations.

(1) Basic Configurations
The basic configurations include the CPU Unit and the Configuration Units that are controlled directly by the CPU Unit. There are two basic configurations.

- EtherCAT network configuration
- CJ-series Unit configuration

(2) Other Network Configurations
These are the configurations of the systems that are connected to the CPU Unit's built-in Ether-Net/IP port and Communications Units.

- EtherCAT Network Configuration
With an NJ-series CPU Unit, you can use an EtherCAT network as a basic system. With the EtherCAT network system of the NJ-series CPU Unit, the period for sequence processing and motion processing in the CPU Unit is the same as the EtherCAT communications period. This enables high-precision sequence control and motion control with a constant period and little fluctuation.

For information on EtherCAT, refer to the NJ/NX-series CPU Unit Built-in EtherCAT Port User's Manual (Cat. No. W505).

- CJ-series Unit Configuration
CPU Rack
The CPU Rack consists of the following items.

- NJ-series CPU Unit
- NJ-series Power Supply Unit
- CJ-series Configuration Units*
  CJ-series Basic I/O Units, Special I/O Units, and CPU Bus Units
- I/O Control Unit
  An I/O Control Unit is required to connect an Expansion Rack.
- End Cover

* Some CJ-series Configuration Units cannot be used with an NJ-series CPU Unit.

Refer to CJ-series Configuration Units on page 2-11 for information on the models you can use with an NJ-series CPU Unit.

Expansion Racks
You can connect an Expansion Rack to an NJ-series CPU Rack or to another Expansion Rack. A CPU Unit cannot be mounted to an Expansion Rack. The rest of the configuration is the same as for an NJ-series CPU Rack.
2 System Configuration

2.1 Basic System Configuration

NJ-series CPU Unit Hardware User’s Manual (W500)
2-1-1 EtherCAT Network Configuration

The EtherCAT network configuration consists of an NJ-series CPU Unit, an NJ-series Power Supply Unit, a CJ-series End Cover, and the EtherCAT slaves.
You use the built-in EtherCAT master port on the NJ-series CPU Unit to connect EtherCAT slaves.
For information on the system configuration of an EtherCAT network, refer to the *NJ/NX-series CPU Unit Built-in EtherCAT Port User’s Manual* (Cat. No. W505).
2-1-2 CJ-series Unit Configuration

The CJ-series Unit configuration consists of the CJ-series Units that are connected. It includes the CJ-series Units on the CPU Rack and Expansion Racks.

CPU Rack

The CPU Rack consists of an NJ-series CPU Unit, an NJ-series Power Supply Unit, CJ-series Configuration Units, and a CJ-series End Cover. Up to 10 CJ-series Configuration Units can be connected.

* The I/O Control Unit is required only to connect an Expansion Rack. It must be connected immediately to the right of the CPU Unit.

Even though the NJ-series Controllers do not have Backplanes, the term “slot” is still used to refer to the location of Units. Slot numbers are assigned in order to Units from left to right on the CPU Rack (slot 0, slot 1, slot 2, etc.).

<table>
<thead>
<tr>
<th>Name</th>
<th>Configuration</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJ-series Units</td>
<td>NJ-series CPU Units (One End Cover is provided with each Unit.)</td>
<td>One required for every CPU Rack.</td>
</tr>
<tr>
<td></td>
<td>NJ-series Power Supply Unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD Memory Card</td>
<td></td>
</tr>
<tr>
<td>CJ-series Units</td>
<td>I/O Control Unit</td>
<td>Required to connect an Expansion Rack. Must be connected immediately to the right of the CPU Unit.</td>
</tr>
<tr>
<td></td>
<td>End Cover</td>
<td>Must be connected to the right end of the CPU Rack. One End Cover is provided with the CPU Unit. (A Controller error in the major fault level will occur if the End Cover is not connected to the right end.)</td>
</tr>
<tr>
<td></td>
<td>CJ-series Basic I/O Units</td>
<td>A total of up to 10 Units can be connected to the CPU Rack and to each of the Expansion Racks. (A Controller error in the major fault level will occur if 11 or more Units are connected.)</td>
</tr>
<tr>
<td></td>
<td>CJ-series Special I/O Units</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CJ-series CPU Bus Units</td>
<td></td>
</tr>
</tbody>
</table>

![Diagram of CPU Rack and Units configurations]
● Units

NJ-series CPU Units

<table>
<thead>
<tr>
<th>Model</th>
<th>I/O capacity/Maximum number of Configuration Units (Maximum number of Expansion Racks)</th>
<th>Program capacity</th>
<th>Memory capacity for variables</th>
<th>Number of motion axes</th>
<th>Database connection service</th>
<th>GEM Services</th>
<th>Robotic control</th>
<th>Num-</th>
<th>Current consumption</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5 VDC</td>
<td>24 VDC</td>
</tr>
<tr>
<td>NJ501-1500</td>
<td>2,560 points/40 Units (3 Expansion Racks)</td>
<td>20 MB</td>
<td>2 MB: Retained during power interruptions.</td>
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<td>4 MB: Not retained during power interruptions.</td>
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</table>

**Note**  
A CJ-series Power Supply Unit cannot be used to supply power to an NJ-system CPU Rack or Expansion Rack.

If you connect a CJ-series Power Supply Unit to a CPU Rack, an Incorrect Power Supply Unit Connected error will occur, and the CPU Unit will not operate. The RUN indicator will flash at a 3-s interval and the ERROR indicator will light.

If you connect the Power Supply Unit to an Expansion Rack, operation is performed without error detection. Normal operation, however, may be unstable due to insufficient supplied power. Also, an Internal NJ-series Bus Check Error (i.e., a Controller error in the major fault level) may occur when the power is interrupted.

**Note**  
The Power Supply Unit may continue to supply power to the rest of the Controller for a few seconds after the power supply turns OFF and the PWR indicator is lit during this time. If the NJ-series NJ-PD3001 Power Supply Unit is used, confirm that the PWR indicator is not lit when the power supply is tuned ON again after the power supply turns OFF.
Precautions for Safe Use

- Do not use the Power Supply Units in the system beyond the rated supply capacity ranges. Doing so may result in operation stopping, incorrect operation, or failure to correctly back up required data at power interruptions.
- Use only NJ-series Power Supply Units on NJ-series CPU Racks and Expansion Racks. Operation is not possible if you use a CJ-series Power Supply Unit with an NJ-series CPU Unit or an NJ-series Power Supply Unit with a CJ-series CPU Unit.

SD Memory Card

<table>
<thead>
<tr>
<th>Model</th>
<th>Card type</th>
<th>Capacity</th>
<th>Format</th>
<th>Number of over-writes</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMC-SD291</td>
<td>SD Card</td>
<td>2 GB</td>
<td>FAT16</td>
<td>100,000</td>
</tr>
<tr>
<td>HMC-SD491</td>
<td>SDHC Card</td>
<td>4 GB</td>
<td>FAT32</td>
<td>100,000</td>
</tr>
<tr>
<td>HMC-SD1A1*1</td>
<td></td>
<td>16 GB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 This can be used for a CPU Unit with unit version 1.21 or later.

Note Refer to 3-2-1 Models and Specifications for details on SD Memory Cards.

I/O Control Unit

<table>
<thead>
<tr>
<th>Model</th>
<th>Specifications</th>
<th>Current consumption</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>CJ1W-IC101</td>
<td>An I/O Control Unit is required to connect an NJ-series Expansion Rack to an NJ-series CPU Rack. The I/O Control Unit must be connected immediately to the right of the CPU Unit. Connect to the I/O Interface Unit (CJ1W-II101) on the Expansion Rack with a CS/CJ-series I/O Connecting Cable.</td>
<td>0.02 A</td>
<td>70 g max.</td>
</tr>
</tbody>
</table>

End Cover

<table>
<thead>
<tr>
<th>Model</th>
<th>Specifications</th>
<th>Current consumption</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>CJ1W-TER01</td>
<td>The End Cover must be connected to the right end of the NJ-series CPU Rack. (A Controller error in the major fault level will occur if the End Cover is not connected to the right end of the Rack.) One End Cover is provided with the CPU Unit and with an I/O Interface Unit.</td>
<td>Included with the CPU Unit or Expansion Unit.</td>
<td></td>
</tr>
</tbody>
</table>
Recommended Communications Cables for EtherCAT and EtherNet/IP

EtherCAT communications are performed in accordance with the 100BASE-TX standard. Refer to the *NJ/NX-series CPU Unit Built-in EtherCAT Port User’s Manual* (Cat. No. W505) for recommended cables.

EtherNet/IP communications are performed in accordance with the 100BASE-TX or 10BASE-T standard. Refer to the *NJ/NX-series CPU Unit Built-in EtherNet/IP Port User’s Manual* (Cat. No. W506) for recommended cables.

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN Track</td>
<td>PFP-50N</td>
<td>Track length: 50 cm, height: 7.3 mm</td>
</tr>
<tr>
<td></td>
<td>PFP-100N</td>
<td>Track length: 1 m, height: 7.3 mm</td>
</tr>
<tr>
<td></td>
<td>PFP-100N2</td>
<td>Track length: 1 m, height: 16 mm</td>
</tr>
<tr>
<td></td>
<td>PFP-M</td>
<td>Stopper to prevent Units from moving on the track. Two each are provided with the CPU Unit and with an I/O Interface Unit.</td>
</tr>
<tr>
<td>Connecting cable for peripheral USB port (to connect the Sysmac Studio)</td>
<td>Commercially available USB cable</td>
<td>USB 2.0 certified cable (A connector - B connector). 5.0 m max.</td>
</tr>
<tr>
<td>Battery Set</td>
<td>CJ1W-BAT01</td>
<td>For CJ2 CPU Unit</td>
</tr>
<tr>
<td>Sysmac Studio Standard Edition</td>
<td>SYSMAC-SE□□□□</td>
<td>The Sysmac Studio is a Support Software package that provides an integrated development environment to design, program, debug, and maintain SYSMAC NJ-series Controllers. The following Support Software is included.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sysmac Studio</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Network Configurator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CX-Integrator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CX-Protocol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CX-Designer</td>
</tr>
</tbody>
</table>
CJ-series Expansion Racks can be connected to the CPU Rack to expand the number of Units in the System beyond the CPU Rack. Up to 10 I/O Units can be mounted to each Expansion Rack and a total of 3 Expansion Racks can be connected.

Mount an I/O Control Unit immediately to the right of the CPU Unit, and mount the I/O Interface Unit immediately to the right of the Power Supply Unit on the Expansion Rack. Mounting them in other locations may cause malfunctions.

Use an NJ-series Power Supply Unit as the power supply for an Expansion Rack in an NJ-series System.
A CJ-series Power Supply Unit cannot be used to supply power on an NJ-system Expansion Rack.
Maximum Number of Expansion Racks

<table>
<thead>
<tr>
<th>Expansion pattern</th>
<th>Maximum number of Racks</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJ-series CPU Rack plus CJ-series Expansion Racks</td>
<td>3 Racks</td>
<td>The total length of I/O Connecting Cable between the CPU Rack and an Expansion Rack, and between all Expansion Racks, must be no more than 12 m.</td>
</tr>
</tbody>
</table>

Units

Units for CJ-series Expansion Racks

<table>
<thead>
<tr>
<th>Rack</th>
<th>Configuration</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJ-series Expansion Racks</td>
<td>NJ-series Power Supply Unit</td>
<td>One required for each Expansion Rack.*</td>
</tr>
<tr>
<td></td>
<td>I/O Interface Unit (one End Cover included.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CJ-series Basic I/O Units</td>
<td>A total of up to 10 Units can be connected to the CPU Rack and to each of the Expansion Racks. (A Controller error in the major fault level will occur if 11 or more Units are connected.)</td>
</tr>
<tr>
<td></td>
<td>CJ-series Special I/O Units</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CJ-series CPU Bus Units</td>
<td></td>
</tr>
<tr>
<td>End Cover</td>
<td></td>
<td>Must be connected to the right end of the Expansion Rack. (One End Cover is provided with the I/O Interface Unit. A Controller error in the major fault level will occur if the End Cover is not connected to the right end.)</td>
</tr>
<tr>
<td>CS/CJ-series I/O Connecting Cable</td>
<td></td>
<td>Required to connect the I/O Interface Unit to the I/O Control Unit or previous I/O Interface Unit.</td>
</tr>
</tbody>
</table>

* A CJ-series I/O Control Unit is required on the NJ-series CPU Rack.

NJ-series Power Supply Units

<table>
<thead>
<tr>
<th>Model</th>
<th>Power supply voltage</th>
<th>Output current</th>
<th>Output capacity</th>
<th>RUN output</th>
<th>CPU Rack</th>
<th>Expansion Racks</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5 VDC</td>
<td>24 VDC</td>
<td>30 W</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>NJ-PA3001</td>
<td>100 to 240 VAC</td>
<td>6.0 A</td>
<td>1.0 A</td>
<td>30 W</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>NJ-PD3001</td>
<td>24 VDC</td>
<td>6.0 A</td>
<td>1.0 A</td>
<td>30 W</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Note Use an NJ-series Power Supply Unit as the power supply for an NJ-series Expansion Rack. A CJ-series Power Supply Unit cannot be used for an NJ-series Expansion Rack.

I/O Interface Unit

<table>
<thead>
<tr>
<th>Model</th>
<th>Specifications</th>
<th>Current consumption</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5 VDC</td>
<td>24 VDC</td>
</tr>
<tr>
<td>CJ1W-II101</td>
<td>One Interface Unit is required for each CJ-series Expansion Rack. One End Cover is provided with each Unit.</td>
<td>0.13 A</td>
<td>---</td>
</tr>
</tbody>
</table>

* Includes the weight of the End Cover.
End Cover

<table>
<thead>
<tr>
<th>Model</th>
<th>Specifications</th>
<th>Current consumption</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>CJ1W-TER01</td>
<td>The End Cover must be connected to the right end of the CJ-series Expansion Rack. An End Cover Missing error (a Controller error in the major fault level) will occur if the End Cover is not connected to the right end of the Rack. One End Cover is provided with the CPU Unit and with an I/O Interface Unit.</td>
<td>5 VDC:</td>
<td>24 VDC:</td>
</tr>
</tbody>
</table>

CS/CJ-series I/O Connecting Cables

<table>
<thead>
<tr>
<th>Model</th>
<th>Specifications</th>
<th>Current consumption</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS1W-CN313</td>
<td>An I/O Connecting Cable connects an I/O Control Unit (CJ1W-IC101) to an I/O Interface Unit (CJ1W-II101), or connects an I/O Interface Unit to another I/O Interface Unit.</td>
<td>0.3 m</td>
<td></td>
</tr>
<tr>
<td>CS1W-CN713</td>
<td>An I/O Connecting Cable connects an I/O Control Unit (CJ1W-IC101) to an I/O Interface Unit (CJ1W-II101), or connects an I/O Interface Unit to another I/O Interface Unit.</td>
<td>0.7 m</td>
<td></td>
</tr>
<tr>
<td>CS1W-CN223</td>
<td>An I/O Connecting Cable connects an I/O Control Unit (CJ1W-IC101) to an I/O Interface Unit (CJ1W-II101), or connects an I/O Interface Unit to another I/O Interface Unit.</td>
<td>2 m</td>
<td></td>
</tr>
<tr>
<td>CS1W-CN323</td>
<td>An I/O Connecting Cable connects an I/O Control Unit (CJ1W-IC101) to an I/O Interface Unit (CJ1W-II101), or connects an I/O Interface Unit to another I/O Interface Unit.</td>
<td>3 m</td>
<td></td>
</tr>
<tr>
<td>CS1W-CN523</td>
<td>An I/O Connecting Cable connects an I/O Control Unit (CJ1W-IC101) to an I/O Interface Unit (CJ1W-II101), or connects an I/O Interface Unit to another I/O Interface Unit.</td>
<td>5 m</td>
<td></td>
</tr>
<tr>
<td>CS1W-CN133</td>
<td>An I/O Connecting Cable connects an I/O Control Unit (CJ1W-IC101) to an I/O Interface Unit (CJ1W-II101), or connects an I/O Interface Unit to another I/O Interface Unit.</td>
<td>10 m</td>
<td></td>
</tr>
<tr>
<td>CS1W-CN133B2</td>
<td>An I/O Connecting Cable connects an I/O Control Unit (CJ1W-IC101) to an I/O Interface Unit (CJ1W-II101), or connects an I/O Interface Unit to another I/O Interface Unit.</td>
<td>12 m</td>
<td></td>
</tr>
</tbody>
</table>

CJ-series Configuration Units

- **Maximum Number of Units**
  
  A maximum of 10 Units can be connected to the CPU Rack for an NJ-series CPU Unit or to an Expansion Rack. There are no restrictions in the number of each model of Unit based on location.

- **Note**
  
  If you connect more than the maximum number of Units to a CPU Rack or Expansion Rack, an Incorrect Unit/Expansion Rack Connection error (a major fault level Controller error) will occur, and the CPU Unit will not operate.
## Models of Configuration Units

The Configuration Units with which the NJ-series CPU Unit can exchange data are classified into three groups. The number of Units that can be mounted depends on the type of Unit.

<table>
<thead>
<tr>
<th>Units</th>
<th>Description</th>
<th>Unit identification method</th>
<th>Number of mountable Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic I/O Units</td>
<td>Basic I/O Units are used for discrete inputs and outputs.</td>
<td>Identified by the CPU Unit according to mounting position.</td>
<td>Up to 40 Basic I/O Units can be mounted.</td>
</tr>
<tr>
<td>Special I/O Units</td>
<td>Special I/O Units are more advanced than Basic I/O Units. They support functions other than discrete inputs and outputs. Examples: Analog I/O Units and High-speed Counter Units Special I/O Units have a smaller area for exchanging data with the CPU Unit than CPU Bus Units (including Network Communications Units).</td>
<td>Identified by the CPU Unit using unit numbers 0 to 95 set with the rotary switches on the front panel of the Unit.</td>
<td>Up to 40 Special I/O Units can be mounted. (Depending on the model, 1 to 4 unit numbers are used for one Unit.)</td>
</tr>
<tr>
<td>CPU Bus Units</td>
<td>CPU Bus Units are advanced Units that exchange data with the CPU Unit via the CPU bus. Examples: Network Communications Units and Serial Communications Units CPU Bus Units have a larger area for exchanging data with the CPU Unit than Special I/O Units.</td>
<td>Identified by the CPU Unit using unit number 0 to F set with the rotary switch on the front panel of the Unit.</td>
<td>Up to 16 CPU Bus Units can be mounted.</td>
</tr>
</tbody>
</table>
CJ-series Configuration Units

CJ-series Basic I/O Units

Input Units

<table>
<thead>
<tr>
<th>Name</th>
<th>Specifications</th>
<th>Model</th>
<th>Number of bits allocated</th>
<th>Response time*1</th>
<th>Current consumption (A)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Input Units</td>
<td>Terminal block 12 to 24 VDC, 8 inputs</td>
<td>CJ1W-ID201 16</td>
<td>20 μs max.</td>
<td>400 μs max.</td>
<td>0.08 ---</td>
<td>110 g max.</td>
</tr>
<tr>
<td></td>
<td>Terminal block 24 VDC, 16 inputs</td>
<td>CJ1W-ID211 16</td>
<td>20 μs max.</td>
<td>400 μs max.</td>
<td>0.08 ---</td>
<td>110 g max.</td>
</tr>
<tr>
<td></td>
<td>CJ1W-ID212 16</td>
<td>15 μs max.</td>
<td>90 μs max.</td>
<td>0.13 ---</td>
<td>110 g max.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fujitsu connector 24 VDC, 32 inputs</td>
<td>CJ1W-ID231*2 32</td>
<td>20 μs max.</td>
<td>400 μs max.</td>
<td>0.09 ---</td>
<td>70 g max.</td>
</tr>
<tr>
<td></td>
<td>MIL connector 24 VDC, 32 inputs</td>
<td>CJ1W-ID232*2 32</td>
<td>20 μs max.</td>
<td>400 μs max.</td>
<td>0.09 ---</td>
<td>70 g max.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CJ1W-ID233*2 32</td>
<td>15 μs max.</td>
<td>90 μs max.</td>
<td>0.20 ---</td>
<td>70 g max.</td>
</tr>
<tr>
<td></td>
<td>Fujitsu connector 24 VDC, 64 inputs</td>
<td>CJ1W-ID261*2 64</td>
<td>120 μs max.</td>
<td>400 μs max.</td>
<td>0.09 ---</td>
<td>110 g max.</td>
</tr>
<tr>
<td></td>
<td>MIL connector 24 VDC, 64 inputs</td>
<td>CJ1W-ID262*2 64</td>
<td>120 μs max.</td>
<td>400 μs max.</td>
<td>0.09 ---</td>
<td>110 g max.</td>
</tr>
<tr>
<td>AC Input Units</td>
<td>Terminal block 200 to 240 VAC, 8 inputs</td>
<td>CJ1W-IA201 16</td>
<td>10 μs max.</td>
<td>40 μs max.</td>
<td>0.08 ---</td>
<td>130 g max.</td>
</tr>
<tr>
<td></td>
<td>Terminal block 100 to 120 VAC, 16 inputs</td>
<td>CJ1W-IA111 16</td>
<td>10 μs max.</td>
<td>40 μs max.</td>
<td>0.09 ---</td>
<td>130 g max.</td>
</tr>
<tr>
<td>Interrupt Input Unit</td>
<td>Terminal block 24 VDC, 16 inputs</td>
<td>CJ1W-INT01*3, *4 16</td>
<td>0.05 ms max.</td>
<td>0.5 ms max.</td>
<td>0.08 ---</td>
<td>110 g max.</td>
</tr>
<tr>
<td>Quick-response Input Unit</td>
<td>Terminal block 24 VDC, 16 inputs</td>
<td>CJ1W-IDP01 16</td>
<td>0.05 ms max.</td>
<td>0.5 ms max.</td>
<td>0.08 ---</td>
<td>110 g max.</td>
</tr>
<tr>
<td>B7A Interface Units</td>
<td>64 inputs</td>
<td>CJ1W-B7A14 64</td>
<td>---</td>
<td>---</td>
<td>0.07 ---</td>
<td>80 g max.</td>
</tr>
</tbody>
</table>

*1 This is the input response time when no filter (i.e., 0 ms) is set. There is no filter setting for the CJ1W-INT01/IDP01. (The time is always 0 ms.)

*2 The cable-side connector is not provided with Units equipped with cables. Purchase the connector separately (Refer to 4-4-4 Wiring CJ-series Basic I/O Units with Connectors.), or use an OMRON Connector-Terminal Block Conversion Unit or I/O Relay Terminal (Refer to 4-4-5 Connecting to Connector-Terminal Block Conversion Units or I/O Relay Terminals.).

*3 An Interrupt Input Unit can be connected only in a CPU Rack. These Units must be mounted to slots 0 to 4 on the CPU Rack. An Incorrect Unit/Expansion Rack Connection error (major fault level Controller error) will occur if an Interrupt Input Unit is connected in other slots on the CPU Rack or to any slots on an Expansion Rack. Up to two Interrupt Input Units can be connected.

*4 Interrupt Input Units can be used as normal Basic I/O Units. They cannot be used to start I/O interrupt tasks.
### Output Units

<table>
<thead>
<tr>
<th>Name</th>
<th>Specifications</th>
<th>Model</th>
<th>Number of bits allocated</th>
<th>Current consumption (A)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Relay Output Units</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminal block, 250 VAC/24 VDC, 2 A; 8 points, independent contacts</td>
<td>CJ1W-OC201</td>
<td>16</td>
<td>0.09</td>
<td>0.048 (0.006 × Number of ON outputs)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CJ1W-OC211</td>
<td>16</td>
<td>0.11</td>
<td>0.096 (0.006 × Number of ON outputs)</td>
</tr>
<tr>
<td><strong>Triac Output Unit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminal block, 250 VAC, 0.6 A; 8 points</td>
<td>CJ1W-OA201</td>
<td>16</td>
<td>0.22</td>
<td>---</td>
</tr>
<tr>
<td><strong>Transistor Output Units</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sinking outputs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminal block, 12 to 24 VDC, 2 A; 8 outputs</td>
<td>CJ1W-OD203</td>
<td>16</td>
<td>0.10</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Terminal block, 12 to 24 VDC, 0.5 A; 8 outputs</td>
<td>CJ1W-OD211*1</td>
<td>16</td>
<td>0.10</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Terminal block, 24 VDC, 0.5 A; 16 outputs</td>
<td>CJ1W-OD213*1</td>
<td>16</td>
<td>0.15</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Fujitsu connector, 12 to 24 VDC, 0.5 A; 32 outputs</td>
<td>CJ1W-OD231*2</td>
<td>32</td>
<td>0.14</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>MIL connector, 12 to 24 VDC, 0.5 A; 32 outputs</td>
<td>CJ1W-OD233<em>1</em>2</td>
<td>32</td>
<td>0.14</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>MIL connector, 24 VDC, 0.5 A; 32 outputs</td>
<td>CJ1W-OD234<em>1</em>2</td>
<td>32</td>
<td>0.22</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Fujitsu connector, 12 to 24 VDC, 0.3 A; 64 outputs</td>
<td>CJ1W-OD261*2</td>
<td>64</td>
<td>0.17</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>MIL connector, 12 to 24 VDC, 0.3 A; 64 outputs</td>
<td>CJ1W-OD263*2</td>
<td>64</td>
<td>0.17</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Sourcing outputs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminal block, 24 VDC, 0.5 A; 8 outputs, load short-circuit protection and disconnected line detection</td>
<td>CJ1W-OD202</td>
<td>16</td>
<td>0.11</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Terminal block, 24 VDC, 0.5 A; 16 outputs, load short-circuit protection</td>
<td>CJ1W-OD212</td>
<td>16</td>
<td>0.10</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>MIL connector, 24 VDC, 0.5 A; 32 outputs, load short-circuit protection</td>
<td>CJ1W-OD232*2</td>
<td>32</td>
<td>0.15</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>MIL connector, 12 to 24 VDC, 0.3 A; 64 outputs</td>
<td>CJ1W-OD262*2</td>
<td>64</td>
<td>0.17</td>
<td>---</td>
</tr>
<tr>
<td><strong>B7A Interface Units</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>64 outputs</td>
<td>CJ1W-B7A04</td>
<td>64</td>
<td>0.07</td>
<td>---</td>
</tr>
</tbody>
</table>

*1 The ON/OFF response time for the CJ1W-OD213/CJ1W-OD234 is shorter than for the CJ1W-OD211/CJ1W-OD233, as shown below.
  - ON response time: 0.1 ms improved to 0.015 ms
  - OFF response time: 0.8 ms improved to 0.08 ms

*2 The cable-side connector is not provided with Units equipped with cables. Purchase the connector separately (Refer to 4-4-4 Wiring CJ-series Basic I/O Units with Connectors.), or use an OMRON Connector-Terminal Block Conversion Unit or I/O Relay Terminal (Refer to 4-4-5 Connecting to Connector-Terminal Block Conversion Units or I/O Relay Terminals.).
### Mixed I/O Units

<table>
<thead>
<tr>
<th>Name</th>
<th>Specifications</th>
<th>Model</th>
<th>Number of bits allocated</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sinking</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-VDC Input/Transistor Output Units</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Fujitsu connector</em></td>
<td>Inputs: 24 VDC, 16 inputs</td>
<td>CJ1W-MD231*</td>
<td>32</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>Outputs: 12 to 24 VDC, 0.5 A; 16 outputs</td>
<td></td>
<td></td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>90 g max.</td>
</tr>
<tr>
<td><em>Fujitsu connector</em></td>
<td>Inputs: 24 VDC, 32 inputs</td>
<td>CJ1W-MD261*</td>
<td>64</td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td>Outputs: 12 to 24 VDC, 0.3 A; 32 outputs</td>
<td></td>
<td></td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>110 g max.</td>
</tr>
<tr>
<td><strong>MIL connector</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inputs: 24 VDC, 16 inputs</td>
<td>Outputs: 12 to 24 VDC, 0.5 A; 16 outputs</td>
<td>CJ1W-MD233*</td>
<td>32</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>90 g max.</td>
</tr>
<tr>
<td>Inputs: 24 VDC, 32 inputs</td>
<td>Outputs: 12 to 24 VDC, 0.3 A; 32 outputs</td>
<td>CJ1W-MD263*</td>
<td>64</td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>110 g max.</td>
</tr>
<tr>
<td><strong>TTL I/O Units</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>MIL connector</em></td>
<td>Inputs: TTL (5 VDC), 32 inputs</td>
<td>CJ1W-MD563*</td>
<td>64</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>Outputs: TTL (5 VDC, 35 mA), 32 outputs</td>
<td></td>
<td></td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>110 g max.</td>
</tr>
<tr>
<td><strong>B7A Interface Units</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32 inputs, 32 outputs</td>
<td></td>
<td>CJ1W-B7A22</td>
<td>64</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>80 g max.</td>
</tr>
</tbody>
</table>

* The cable-side connector is not provided with Units equipped with cables. Purchase the connector separately (Refer to 4-4-4 Wiring CJ-series Basic I/O Units with Connectors.), or use an OMRON Connector-Terminal Block Conversion Unit or I/O Relay Terminal (Refer to 4-4-5 Connecting to Connector-Terminal Block Conversion Units or I/O Relay Terminals.).
### CJ-series Special I/O Units

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Specifications</th>
<th>Model</th>
<th>Unit No.</th>
<th>Number of words allocated</th>
<th>Words allocated in DM Area</th>
<th>Number of mountable Units</th>
<th>Current consumption (A)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Special I/O Units</strong></td>
<td>Analog Input Unit with Universal Inputs</td>
<td>4 inputs, fully universal</td>
<td>CJ1W-AD04U</td>
<td>0 to 95</td>
<td>10 words</td>
<td>100 words</td>
<td>40 Units</td>
<td>0.32</td>
<td>150 g max.</td>
</tr>
<tr>
<td></td>
<td>Analog Input Units</td>
<td>8 inputs (4 to 20 mA, 1 to 5 V, etc.)</td>
<td>CJ1W-AD081-V1</td>
<td>0 to 95</td>
<td>10 words</td>
<td>100 words</td>
<td>40 Units</td>
<td>0.42</td>
<td>140 g max.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 inputs (4 to 20 mA, 1 to 5 V, etc.)</td>
<td>CJ1W-AD041-V1</td>
<td>0 to 95</td>
<td>10 words</td>
<td>100 words</td>
<td>40 Units</td>
<td>0.42</td>
<td>140 g max.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 inputs (4 to 20 mA, 1 to 5 V, etc.)</td>
<td>CJ1W-AD042</td>
<td>0 to 95</td>
<td>10 words</td>
<td>100 words</td>
<td>40 Units</td>
<td>0.52</td>
<td>150 g max.</td>
</tr>
<tr>
<td></td>
<td>Analog Output Units</td>
<td>4 outputs (1 to 5 V, 4 to 20 mA, etc.)</td>
<td>CJ1W-DA041</td>
<td>0 to 95</td>
<td>10 words</td>
<td>100 words</td>
<td>40 Units</td>
<td>0.12</td>
<td>150 g max.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 outputs (1 to 5 V, 4 to 20 mA, etc.)</td>
<td>CJ1W-DA021</td>
<td>0 to 95</td>
<td>10 words</td>
<td>100 words</td>
<td>40 Units</td>
<td>0.12</td>
<td>150 g max.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 outputs (1 to 5 V, 0 to 10 V, etc.)</td>
<td>CJ1W-DA08V</td>
<td>0 to 95</td>
<td>10 words</td>
<td>100 words</td>
<td>40 Units</td>
<td>0.14</td>
<td>150 g max.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 outputs (4 to 20 mA)</td>
<td>CJ1W-DA08C</td>
<td>0 to 95</td>
<td>10 words</td>
<td>100 words</td>
<td>40 Units</td>
<td>0.14</td>
<td>150 g max.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 outputs (1 to 5 V, 0 to 10 V, etc.)</td>
<td>CJ1W-DA042V</td>
<td>0 to 95</td>
<td>10 words</td>
<td>100 words</td>
<td>40 Units</td>
<td>0.40</td>
<td>150 g max.</td>
</tr>
<tr>
<td></td>
<td>Analog I/O Unit</td>
<td>4 inputs (1 to 5 V, 4 to 20 mA, etc.)</td>
<td>CJ1W-MAD42</td>
<td>0 to 95</td>
<td>10 words</td>
<td>100 words</td>
<td>40 Units</td>
<td>0.58</td>
<td>150 g max.</td>
</tr>
<tr>
<td></td>
<td>Analog Input Unit with Universal Inputs</td>
<td>4 inputs, fully universal Resolution: 1/256,000, 1/64,000, 1/16,000</td>
<td>CJ1W-PH41U</td>
<td>0 to 95</td>
<td>10 words</td>
<td>100 words</td>
<td>40 Units</td>
<td>0.30</td>
<td>150 g max.</td>
</tr>
<tr>
<td></td>
<td>Analog Current Input Unit</td>
<td>DC voltage or DC current, 2 inputs</td>
<td>CJ1W-PDC15</td>
<td>0 to 95</td>
<td>10 words</td>
<td>100 words</td>
<td>40 Units</td>
<td>0.18</td>
<td>150 g max.</td>
</tr>
<tr>
<td><strong>Temperature Control Units</strong></td>
<td>2 control loops, thermocouple inputs, NPN outputs, heater burnout detection</td>
<td></td>
<td>CJ1W-TC003</td>
<td>0 to 94 (uses words for 2 unit numbers)</td>
<td>20 words</td>
<td>200 words</td>
<td>40 Units</td>
<td>0.25</td>
<td>150 g max.</td>
</tr>
<tr>
<td></td>
<td>2 control loops, thermocouple inputs, PNP outputs, heater burnout detection</td>
<td></td>
<td>CJ1W-TC004</td>
<td>0 to 94 (uses words for 2 unit numbers)</td>
<td>20 words</td>
<td>200 words</td>
<td>40 Units</td>
<td>0.25</td>
<td>150 g max.</td>
</tr>
<tr>
<td></td>
<td>2 control loops, temperature-resistance thermometer inputs, NPN outputs, heater burnout detection</td>
<td></td>
<td>CJ1W-TC103</td>
<td>0 to 94 (uses words for 2 unit numbers)</td>
<td>20 words</td>
<td>200 words</td>
<td>40 Units</td>
<td>0.25</td>
<td>150 g max.</td>
</tr>
<tr>
<td></td>
<td>2 control loops, temperature-resistance thermometer inputs, PNP outputs, heater burnout detection</td>
<td></td>
<td>CJ1W-TC104</td>
<td>0 to 94 (uses words for 2 unit numbers)</td>
<td>20 words</td>
<td>200 words</td>
<td>40 Units</td>
<td>0.25</td>
<td>150 g max.</td>
</tr>
<tr>
<td></td>
<td>ID Sensor Units</td>
<td></td>
<td>V680-series single-head type</td>
<td>CJ1W-V680C11</td>
<td>0 to 95</td>
<td>10 words</td>
<td>100 words</td>
<td>40 Units</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>V680-series two-head type</td>
<td>CJ1W-V680C12</td>
<td>0 to 94</td>
<td>100 words</td>
<td>40 Units</td>
<td>0.32</td>
<td>130 g max.</td>
</tr>
<tr>
<td></td>
<td>High-speed Counter Unit</td>
<td>Number of counter channels: 2, Maximum input frequency: 500 kHz, line driver compatible</td>
<td>CJ1W-CT021</td>
<td>0 to 92 (uses words for 4 unit numbers)</td>
<td>40 words</td>
<td>400 words</td>
<td>24 Units</td>
<td>0.28</td>
<td>100 g max.</td>
</tr>
</tbody>
</table>
### Special I/O Units

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Specifications</th>
<th>Model</th>
<th>Unit No.</th>
<th>Number of words allocated</th>
<th>Words allocated in DM Area</th>
<th>Number of mountable Units</th>
<th>Current consumption (A)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CompoNet Master Units</td>
<td></td>
<td>CJ1W-CRM21*1</td>
<td>0 to 94 (uses words for 2 unit numbers)</td>
<td>20 words</td>
<td>None</td>
<td>40 Units</td>
<td>0.40 VDC</td>
<td>130 g max.</td>
</tr>
<tr>
<td></td>
<td>CompoNet remote I/O Units</td>
<td>Communications mode 0: 128 inputs and 128 outputs for Word Slaves</td>
<td></td>
<td>0 to 92 (uses words for 4 unit numbers)</td>
<td>40 words</td>
<td>None</td>
<td>24 Units</td>
<td>0.40 VDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Communications mode 1: 256 inputs and 256 outputs for Word Slaves</td>
<td></td>
<td>0 to 88 (uses words for 8 unit numbers)</td>
<td>80 words</td>
<td>None</td>
<td>12 Units</td>
<td>0.40 VDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Communications mode 2: 512 inputs and 512 outputs for Word Slaves</td>
<td></td>
<td>0 to 88 (uses words for 8 unit numbers)</td>
<td>80 words</td>
<td>None</td>
<td>12 Units</td>
<td>0.40 VDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Communications mode 3: 256 inputs and 256 outputs for Word Slaves, 128 inputs</td>
<td></td>
<td>0 to 95 (uses words for 1 unit number)</td>
<td>10 words*2</td>
<td>None*2</td>
<td>40 Units</td>
<td>0.40 VDC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>and 128 outputs for Bit Slave Units</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Communications mode 8: 1,024 inputs and 1,024 outputs max. for Word Slaves</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>and 256 inputs and 256 outputs max. for Bit Slave Units</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 A CPU Unit with unit version 1.01 or later and Sysmac Studio version 1.02 or higher are required. Refer to A-7 Version Information for information on versions.

*2 In addition, up to 208 other words are allocated depending on the number of Slave Units to which words are allocated and their I/O capacity. Use the CX-Integrator to allocate words.
### CJ-series CPU Bus Units

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Specifications</th>
<th>Model</th>
<th>Unit No.</th>
<th>Number of words allocated</th>
<th>Maximum number of Units*1</th>
<th>Current consumption (A)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPU Bus Units</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5 VDC</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Serial Communications Units</td>
<td>Two RS-232C ports High-speed models</td>
<td>CJ1W-SCU22</td>
<td>0 to F</td>
<td>25 words</td>
<td>16 Units</td>
<td>0.28*1</td>
<td>0.40</td>
<td>160 g max.</td>
</tr>
<tr>
<td></td>
<td>Two RS-422A/485 ports High-speed models</td>
<td>CJ1W-SCU32</td>
<td>0 to F</td>
<td>25 words</td>
<td>16 Units</td>
<td>0.36*1</td>
<td>0.40</td>
<td>120 g max.</td>
</tr>
<tr>
<td></td>
<td>One RS-232C port and one RS-422A/485 port High-speed models</td>
<td>CJ1W-SCU42</td>
<td>0 to F</td>
<td>25 words</td>
<td>16 Units</td>
<td>0.29</td>
<td>0.41</td>
<td>140 g max.</td>
</tr>
<tr>
<td>DeviceNet Unit</td>
<td>DeviceNet remote I/O, 2,048 points; User-specified allocations are possible without the CX-Integrator.</td>
<td>CJ1W-DRM21</td>
<td>0 to F</td>
<td>25 words</td>
<td>16 Units</td>
<td>0.29</td>
<td>0.41</td>
<td>118 g max.*2</td>
</tr>
<tr>
<td>EtherNet/IP Unit</td>
<td>Tag data links, CIP message communications, FTP server, etc.</td>
<td>CJ1W-EIP21*3</td>
<td>0 to F</td>
<td>25 words</td>
<td>4 Units</td>
<td>0.34</td>
<td>0.41</td>
<td>94 g max.</td>
</tr>
<tr>
<td>EtherCAT Slave Unit</td>
<td>EtherCAT communications, Baud rate 100 Mbps</td>
<td>CJ1W-ECT21</td>
<td>0 to F</td>
<td>25 words</td>
<td>16 Units</td>
<td>0.34</td>
<td>0.41</td>
<td>97 g max.</td>
</tr>
</tbody>
</table>

*1 Increases by 0.15 A/Unit when an NT-AL001 RS-232C/RS-422A Link Adapter is used. Increases by 0.04 A/Unit when a CJ1W-CIF11 RS-422A Converter is used.

*2 Includes the weight of accessory connectors.

*3 Use an EtherNet/IP Unit with a unit version of 2.1 or later. Also use a CPU Unit with unit version 1.01 or later and Sysmac Studio version 1.02 or higher. Refer to A-7 Version Information for information on version upgrades.
2-2 Connecting to the Sysmac Studio

Connect the NJ-series CPU Unit and the Sysmac Studio through USB or EtherNet/IP. Refer to 3-7-2 Connection for information on how to make the connection between the NJ-series CPU Unit and the Sysmac Studio.
You can make networks in the following layers with an NJ-series Controller.

For details on communications networks that you can connect to, refer to the *NJ/NX-series CPU Unit Software User's Manual* (Cat. No. W501).
### 2.3 Network Configuration

<table>
<thead>
<tr>
<th>Connection</th>
<th>Connection method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sysmac Studio</td>
<td>Use USB or the built-in EtherNet/IP port.</td>
</tr>
<tr>
<td>Between Controllers</td>
<td><strong>NJ-series Controller or CJ-series PLC</strong></td>
</tr>
<tr>
<td></td>
<td>Use the built-in EtherNet/IP port or a port on an EtherNet/IP Unit.<strong>¹</strong></td>
</tr>
<tr>
<td>Devices</td>
<td><strong>Servo Drives, general-purpose slaves and Vision Systems</strong></td>
</tr>
<tr>
<td></td>
<td>Use the built-in EtherCAT port.</td>
</tr>
<tr>
<td></td>
<td><strong>Ethernet communications devices</strong></td>
</tr>
<tr>
<td></td>
<td>Use the built-in EtherNet/IP port or a port on an EtherNet/IP Unit.<strong>¹</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Serial-communications devices</strong></td>
</tr>
<tr>
<td></td>
<td>Mount a Serial Communications Unit and use RS-232C port or RS-422A/485 ports.</td>
</tr>
<tr>
<td></td>
<td><strong>DeviceNet slaves</strong></td>
</tr>
<tr>
<td></td>
<td>Mount a DeviceNet Unit and use DeviceNet.</td>
</tr>
<tr>
<td></td>
<td><strong>CompoNet slaves</strong></td>
</tr>
<tr>
<td></td>
<td>Mount a CompoNet Master Unit and use CompoNet.</td>
</tr>
<tr>
<td>Programmable Terminals</td>
<td>Use the built-in EtherNet/IP port or a port on an EtherNet/IP Unit.<strong>¹</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Connections to BOOTP server, DNS server, or NTP server</strong></td>
</tr>
<tr>
<td></td>
<td>Use the built-in EtherNet/IP port or a port on an EtherNet/IP Unit.<strong>¹</strong></td>
</tr>
</tbody>
</table>

**¹** Use a CJ-series EtherNet/IP Unit with a unit version of 2.1 or later.
Also use CPU Units with unit version 1.01 or later and Sysmac Studio version 1.02 or higher.
Refer to A-7 Version Information for information on version upgrades.
Configuration Units

This section describes the configuration devices in the CJ-series Unit configuration.

3-1 CPU Units .................................................. 3-2
   3-1-1 Models and Specifications .......................... 3-2
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   3-7-1 Model Numbers .................................... 3-33
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## 3-1 CPU Units

### 3-1-1 Models and Specifications

<table>
<thead>
<tr>
<th>Type of Unit</th>
<th>Model</th>
<th>I/O capacity/Maximum number of Configuration Units (Maximum number of Expansion Racks)</th>
<th>Program capacity</th>
<th>Memory capacity for variables</th>
<th>Number of motion axes</th>
<th>Database connection service</th>
<th>GEM Services</th>
<th>Robot control</th>
<th>Numerical control</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJ501 CPU Units</td>
<td>NJ501-1500</td>
<td>2,560 points/40 Units (3 Expansion Racks)</td>
<td>20 MB</td>
<td>2 MB: Retained during power interruptions</td>
<td>64</td>
<td>Not supported.</td>
<td>Not supported.</td>
<td>Not supported.</td>
<td>Not supported.</td>
</tr>
<tr>
<td></td>
<td>NJ501-4310</td>
<td></td>
<td></td>
<td></td>
<td>64</td>
<td>Not supported.</td>
<td>Not supported.</td>
<td>Not supported.</td>
<td>Not supported.</td>
</tr>
<tr>
<td>NJ301 CPU Units</td>
<td>NJ301-1200</td>
<td></td>
<td>5 MB</td>
<td>0.5 MB: Retained during power interruptions.</td>
<td>8</td>
<td>Supported.</td>
<td>Not supported.</td>
<td>Not supported.</td>
<td>Supported.</td>
</tr>
<tr>
<td></td>
<td>NJ301-1100</td>
<td></td>
<td></td>
<td>2 MB: Not retained during power interruptions.</td>
<td>4</td>
<td>Not supported.</td>
<td>Not supported.</td>
<td>Not supported.</td>
<td>Supported.</td>
</tr>
<tr>
<td></td>
<td>NJ101-9000</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>Not supported.</td>
<td>Not supported.</td>
<td>Not supported.</td>
<td>Not supported.</td>
</tr>
</tbody>
</table>
3-1-2 Components and Functions

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15)
<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slider</td>
<td>Holds the Units together.</td>
</tr>
<tr>
<td>2</td>
<td>SD Memory Card connector</td>
<td>Connects the SD Memory Card to the CPU Unit.</td>
</tr>
<tr>
<td>3</td>
<td>CPU Unit operation indicators</td>
<td>Shows the operation status of the CPU Unit. Refer to CPU Unit Operation Status Indicators on page 3-5.</td>
</tr>
<tr>
<td>4</td>
<td>SD Memory Card power supply switch</td>
<td>Turns OFF the power supply so that you can remove the SD Memory Card.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Refer to 3-2 SD Memory Cards.</td>
</tr>
<tr>
<td>5</td>
<td>DIP switch</td>
<td>Used in Safe Mode*1 or when backing up data.*2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Normally, turn OFF all of the pins.</td>
</tr>
<tr>
<td>6</td>
<td>Battery connector</td>
<td>Connector to mount the backup battery.</td>
</tr>
<tr>
<td>7</td>
<td>Battery</td>
<td>Battery for backup.</td>
</tr>
<tr>
<td>8</td>
<td>Peripheral USB port</td>
<td>Connects to the Sysmac Studio via a USB cable.</td>
</tr>
<tr>
<td>9</td>
<td>Built-in EtherNet/IP port (port 1)</td>
<td>Connects the built-in EtherNet/IP with an Ethernet cable.</td>
</tr>
<tr>
<td>10</td>
<td>Built-in EtherNet/IP port operation indicators</td>
<td>Shows the operation status of the built-in EtherNet/IP. Refer to Built-in EtherNet/IP Port (Port 1) Indicators on page 3-7.</td>
</tr>
<tr>
<td>11</td>
<td>Unit connector</td>
<td>Connects to another Unit.</td>
</tr>
<tr>
<td>12</td>
<td>ID information indication</td>
<td>Shows the ID information of the CPU Unit.</td>
</tr>
<tr>
<td>13</td>
<td>Built-in EtherCAT port (port 2)</td>
<td>Connects the built-in EtherCAT with an Ethernet cable.</td>
</tr>
<tr>
<td>14</td>
<td>Built-in EtherCAT port operation indicators</td>
<td>Shows the operation status of the built-in EtherCAT. Refer to Built-in EtherCAT Port (Port 2) Indicators on page 3-8.</td>
</tr>
<tr>
<td>15</td>
<td>DIN Track mounting pins</td>
<td>Secures the Unit to a DIN Track.</td>
</tr>
</tbody>
</table>

*1 To use Safe Mode, set the DIP switch as shown below and then turn ON the power supply to the Controller.

*2 Refer to the NJ/NX-series CPU Unit Software User’s Manual (Cat. No. W501) for details on backing up data.

If the power supply to the Controller is turned ON with the CPU Unit in Safe Mode, the CPU Unit will start in PROGRAM mode. Use the Safe Mode if you do not want to execute the user program when the power supply is turned ON or if it is difficult to connect the Sysmac Studio.

Use the Safe Mode when it is difficult to connect the Sysmac Studio. For information on Safe Mode, refer to the NJ/NX-series Troubleshooting Manual (Cat. No. W503).
CPU Unit Operation Status Indicators

You can check the CPU Unit status with the indicators at the top of the front panel of the CPU Unit. The following table describes these indicators.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Color</th>
<th>Status</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUN</td>
<td>Green</td>
<td>Lit</td>
<td>The CPU Unit is in normal operation in RUN mode. (The user program is in execution.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flashing (3-s intervals)</td>
<td>An Incorrect Power Supply Unit Connected error occurred. (A CJ-series Power Supply Unit is connected in the CPU Rack.) The CPU Unit will not operate and the ERROR indicator will light.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flashing (1-s intervals)</td>
<td>The CPU Unit is starting (entering RUN mode or PROGRAM mode at startup).</td>
</tr>
</tbody>
</table>
|           | Not lit | | Operation is stopped in PROGRAM mode, when a CPU Unit reset is in progress, or when any of the following errors occurs.  
• Controller error in the major fault level  
• CPU error (WDT error) |
| ERROR     | Red   | Lit    | Self-diagnosis found one of the following errors.  
• Controller error in the major fault level  
• CPU error (WDT error)  
The CPU Unit operation will stop, and all outputs will turn OFF. |
|           |       | Flashing (1-s intervals) | Self-diagnosis found one of the following errors.  
• Controller error in the partial fault level (an error in which all control of a Function Module is disabled)  
• Controller error in the minor fault level (an error in which partial control of a Function Module is disabled)  
CPU Unit operation will continue for either of these errors.  
Operation will stop for the Function Module in which a Controller error in the partial fault level occurred.  
Operation will continue for the Function Module in which a Controller error in the minor fault level occurred. |
<p>|           | Not lit | | The CPU Unit is in normal operation, a CPU reset is in progress, or monitored information occurred. (CPU Unit operation will continue.) |
| BUSY      | Yellow | Flashing | Built-in non-volatile memory access in progress. |
|           | Not lit | | Other than the above. |</p>
<table>
<thead>
<tr>
<th>Indicator</th>
<th>Color</th>
<th>Status</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD PWR</td>
<td>Green</td>
<td>Lit</td>
<td>Power is being supplied to the SD Memory Card and the SD Memory Card can be used.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flashing</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not lit</td>
<td>The power supply for the SD Memory Card is stopped, an SD Memory Card is not mounted, or the file format of the mounted SD Memory Card is not supported.</td>
</tr>
<tr>
<td>SD BUSY</td>
<td>Yellow</td>
<td>Lit</td>
<td>SD Memory Card access in progress.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not lit</td>
<td>SD Memory Card access not in progress</td>
</tr>
</tbody>
</table>

**Precautions for Safe Use**

- Do not turn OFF the power supply to the Controller while the BUSY indicator flashes. While the BUSY indicator is lit, the user program and settings in the CPU Unit are being backed up in the built-in non-volatile memory. The data will not be backed up if the power supply is turned OFF. The next time that the Controller is started, a Controller error in the major fault level will occur and operation will stop.

- Do not turn OFF the power supply or remove the SD Memory Card while SD Memory Card access is in progress (i.e., while the SD BUSY indicator flashes). Data may become corrupted, and the Controller will not operate correctly if it uses corrupted data. To remove an SD Memory Card from the CPU Unit when power is supplied to the CPU Unit, press the SD Memory Card power supply switch and wait for the SD PWR indicator to turn OFF before you remove the SD Memory Card.
## Built-in EtherNet/IP Port (Port 1) Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Color</th>
<th>Status</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>NET RUN</td>
<td>Green</td>
<td>Lit</td>
<td>Normal startup status.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flashing</td>
<td>Ethernet communications are in progress.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Tag data link connection establishment in progress.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• IP address acquisition with BOOTP in progress.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not lit</td>
<td>You cannot perform Ethernet communications.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The power supply is OFF or the CPU Unit was reset.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• A MAC address error or communications Controller error occurred.</td>
</tr>
<tr>
<td>NET ERR</td>
<td>Red</td>
<td>Lit</td>
<td>An error for which the user cannot recover operation occurred.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flashing</td>
<td>An error for which the user can recover operation occurred</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• An error occurred in TCP/IP communications or CIP communications.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• FTP server setting error, NTP server setting error, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Tag data link setting error, tag data link verification error, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not lit</td>
<td>There are no Ethernet communications errors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The power supply is OFF or the CPU Unit was reset.</td>
</tr>
<tr>
<td>LINK/ACT</td>
<td>Yellow</td>
<td>Lit</td>
<td>The link was established.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flashing</td>
<td>The link is established, and data communications are in progress.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not lit</td>
<td>A link was not established.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The cable is not connected.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The power supply is OFF or the CPU Unit was reset.</td>
</tr>
</tbody>
</table>
### Built-in EtherCAT Port (Port 2) Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Color</th>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NET RUN</td>
<td>Green</td>
<td>Lit</td>
<td>EtherCAT communications are in progress.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Inputs and outputs for I/O data are in operation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flashing</td>
<td>EtherCAT communications are being established. This indicator shows either of the following conditions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Only message communications are in operation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Only message communications and I/O data inputs are in operation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not lit</td>
<td>EtherCAT communications are stopped.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The power supply is OFF or the CPU Unit was reset.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• A MAC address error, communications Controller error, or other error occurred.</td>
</tr>
<tr>
<td>NET ERR</td>
<td>Red</td>
<td>Lit</td>
<td>A hardware error or unrecoverable error occurred, such as for exception processing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flashing</td>
<td>A recoverable error occurred.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not lit</td>
<td>There are no errors.</td>
</tr>
<tr>
<td>LINK/ACT</td>
<td>Yellow</td>
<td>Lit</td>
<td>A link was established.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flashing</td>
<td>Data communications are in progress after establishing link. Flashes every time data is sent or received.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not lit</td>
<td>The link was not established.</td>
</tr>
</tbody>
</table>

### DIP Switch

Use the CPU Unit with all the DIP switch pins turned OFF.

**Additional Information**

The DIP switch is not used to write-protect the user program of the NJ-series Controller. Set write-protection in the Startup Write Protection Settings in the CPU Unit Protection Settings from the Sysmac Studio.
### Battery

The following Battery is built in as a standard feature.

<table>
<thead>
<tr>
<th>Model</th>
<th>Appearance</th>
<th>Specifications</th>
</tr>
</thead>
</table>
| CJ1W-BAT01    | ![Battery](image) | Effective life (i.e., maximum life expectancy): 5 years\(^*1\)  
* The Battery installed at the time of purchase is only for monitoring purpose to test the battery backup function. The Battery is exhausted depending on the period from factory checking to actual operation, thus it may not satisfy specified battery lifetime.  
*1 The battery installed at the time of purchase is only for monitoring purpose to test the battery backup function. The Battery is exhausted depending on the period from factory checking to actual operation, thus it may not satisfy specified battery lifetime.

### ID Information Indication

You can check the followings in the ID information indications on the right side of the CPU Unit.

![ID Information Indication](image)

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unit model</td>
<td>Shows the model of the CPU Unit.</td>
</tr>
<tr>
<td>2</td>
<td>Unit version</td>
<td>Shows the unit version of the CPU Unit.</td>
</tr>
<tr>
<td>3</td>
<td>Hardware revision</td>
<td>Shows the hardware revision of the CPU Unit. *1</td>
</tr>
<tr>
<td>4</td>
<td>Lot number and serial number</td>
<td>Shows the lot number and the serial number of the CPU Unit.</td>
</tr>
</tbody>
</table>
|        | DDMYY: Lot number,  
xxxx: Serial number  
M is 1 to 9 for January to September, X for October, Y for November, and Z for December.  |
| 5      | MAC addresses               | Shows the MAC addresses of the built-in ports on the CPU Unit.            |

*1 The hardware revision is not displayed for the Unit that the hardware revision is in blank.
3-2 SD Memory Cards

3-2-1 Models and Specifications

SD cards and SDHC cards are supported, but use one of the following OMRON Cards. OMRON is not responsible for the operation, performance, or write life of any other SD or SDHC card.

<table>
<thead>
<tr>
<th>Model</th>
<th>Card type</th>
<th>Capacity</th>
<th>Format</th>
<th>Number of overwrites</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMC-SD291*1</td>
<td>SD Card</td>
<td>2 GB</td>
<td>FAT16</td>
<td>100,000</td>
<td>2 g max.</td>
</tr>
<tr>
<td>HMC-SD491</td>
<td>SDHC Card</td>
<td>4 GB</td>
<td>FAT32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HMC-SD1A1*2</td>
<td>SDHC Card</td>
<td>16 GB</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 You cannot use an HMC-SD291 for the NJ501-□□□□ CPU Unit with the hardware revision A and unit version 1.15 or later.

*2 This can be used for a CPU Unit with unit version 1.21 or later.

Precautions for Correct Use

When you use the SD Memory Card that "MR□" is displayed on the back side with an NJ501-□□□□ CPU Unit, be sure to use the unit version 1.13 or later.

Additional Information

Write Protection Key
You will not be able to write to the SD Memory Card if the key is set to the LOCK position. (Use this setting to prevent overwriting.)
3-2-2  Purpose

You can use the SD Memory Card for the following applications.

• Read and write files in the SD Memory Card with instructions.
• Read and write files in the SD Memory Card from an FTP client on EtherNet/IP.
• Back up, restore, and verify data in the Controller.
• Transfer data from the SD Memory Card to the Controller when the power is turned ON.

Version Information

A CPU Unit with unit version 1.03 or later and Sysmac Studio version 1.04 or higher are required to use the SD Memory Card backup functions and automatic transfer from SD Memory Cards.
Before Using an SD Memory Card

- Keep the following precautions because an SD Memory Card may become unusable.
  - Do not turn OFF the power supply to the Controller while the SD BUSY indicator is lit (i.e., while SD Memory Card access is in progress). The SD BUSY indicator is lit when the SD Memory Card is accessed from user the programming or from a computer through FTP.
  - Do not remove the SD Memory Card while the SD BUSY indicator is lit or the SD PWR indicator is lit (i.e., while SD Memory Card power is supplied). Press the SD Memory Card power supply switch and confirm that the SD BUSY indicator or SD PWR indicator is not lit before you remove the SD Memory Card.
  - Never insert the SD Memory Card facing the wrong way. If the SD Memory Card is inserted forcibly, it may become unusable.
  - To format the SD Memory Card (e.g., to delete all of the data), insert the SD Memory Card in the CPU Unit and perform the operation from the Sysmac Studio.
  - The SD Memory Card uses flash memory, and so its service life is limited. When the end of the SD Memory Card's service life approaches, the ability to write data is lost, and data is sometimes not retained after writing. The service life depends on the size of the data that is written and on the ambient temperature. For the unlikely event that data is lost, it is recommended to periodically back up data.
  - The service life may be extremely short if a non-OMRON SD Memory Card is used. Also, operation may be affected due to deterioration in writing performance.
  - If you use an OMRON SD Memory Card, the end of the life of the SD Memory Card can be detected in the following ways.
    - System-defined variable _Card1Deteriorated (SD Memory Card Life Warning Flag)
    - SD Memory Card Life Exceeded (Observation) event in the event log

Installing the SD Memory Card

1. Pull the left side of the SD Memory Card cover forward and remove from the Unit.

2. Insert the SD Memory Card with the label facing to the left. (Insert the SD Memory Card with the label facing the triangle on the CPU Unit.)
Removing the SD Memory Card

1. Press the SD Memory Card power supply switch (SD PWR). The SD Memory Card will be ejected from the compartment.

2. Press the SD Memory Card after the SD BUSY indicator is no longer lit.

3. Pull out the SD Memory Card.

4. Close the Memory Card cover when an SD Memory Card is not being used.
3-3  Power Supply Units

3-3-1  Models and Specifications

Use an NJ-series Power Supply Unit to supply power to an NJ-series CPU Rack or Expansion Rack.

**Precautions for Correct Use**

- Do not use the Power Supply Units in the system beyond the rated supply capacity range given in the following specifications. Doing so may result in operation stopping, incorrect operation, or failure to correctly back up required data at power interruptions.
- Use only NJ-series Power Supply Units on NJ-series CPU Racks and Expansion Racks. Operation is not possible if you use a CJ-series Power Supply Unit with an NJ-series CPU Unit or an NJ-series Power Supply Unit with a CJ-series CPU Unit.

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NJ-series Power Supply Units</strong></td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>NJ-PA3001</td>
</tr>
<tr>
<td></td>
<td>NJ-PD3001</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>100 to 240 VAC (wide-range), 50/60 Hz</td>
</tr>
<tr>
<td>Operating voltage and frequency ranges</td>
<td>85 to 264 VAC, 47 to 63 Hz</td>
</tr>
<tr>
<td>Power consumption</td>
<td>120 VA max.</td>
</tr>
<tr>
<td></td>
<td>60 W max.</td>
</tr>
<tr>
<td>Inrush current*1</td>
<td>At 100 VAC:</td>
</tr>
<tr>
<td></td>
<td>20 A/8 ms max. for cold start at room temperature</td>
</tr>
<tr>
<td></td>
<td>At 200 VAC:</td>
</tr>
<tr>
<td></td>
<td>40 A/8 ms max. for cold start at room temperature</td>
</tr>
<tr>
<td></td>
<td>At 24 VDC:</td>
</tr>
<tr>
<td></td>
<td>30 A/20 ms max. for cold start at room temperature</td>
</tr>
<tr>
<td>Output capacity*2</td>
<td>5 VDC, 6.0 A (including supply to CPU Unit using CPU Rack)</td>
</tr>
<tr>
<td></td>
<td>5 VDC, 6.0 A (using Expansion Rack)</td>
</tr>
<tr>
<td></td>
<td>24 VDC, 1.0 A</td>
</tr>
<tr>
<td></td>
<td>Total: 30 W max.</td>
</tr>
<tr>
<td>Output terminal (service supply)</td>
<td>Not provided</td>
</tr>
<tr>
<td>RUN output*3</td>
<td>Contact configuration: SPST-NO</td>
</tr>
<tr>
<td></td>
<td>Switch capacity: 250 VAC, 2 A (resistive load)</td>
</tr>
<tr>
<td></td>
<td>120 VAC, 0.5 A (inductive load), 24 VDC, 2A (resistive load)</td>
</tr>
<tr>
<td>Replacement notification function</td>
<td>Not provided.</td>
</tr>
<tr>
<td>Insulation resistance*4</td>
<td>20 MΩ min.</td>
</tr>
<tr>
<td></td>
<td>(at 500 VDC) between AC external and GR terminals</td>
</tr>
<tr>
<td></td>
<td>20 MΩ min.</td>
</tr>
<tr>
<td></td>
<td>(at 500 VDC) between DC external and GR terminals</td>
</tr>
<tr>
<td>Dielectric strength<em>4</em>5</td>
<td>2,300 VAC 50/60 Hz for 1 min between AC external and GR terminals</td>
</tr>
<tr>
<td></td>
<td>Leakage current: 10 mA max.</td>
</tr>
<tr>
<td></td>
<td>1,000 VAC 50/60 Hz for 1 min between DC external and GR terminals</td>
</tr>
<tr>
<td></td>
<td>Leakage current: 10 mA max.</td>
</tr>
<tr>
<td>Noise immunity</td>
<td>2 kV on power supply line (Conforms to IEC 61000-4-4.)</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>5 to 8.4 Hz, 3.5-mm amplitude, 8.4 to 150 Hz, acceleration: 9.8 m/s² in X, Y, and Z directions for 100 minutes (Time coefficient: 10 minutes × coefficient factor 10 = total time 100 min.) (according to IEC 60068-2-6)</td>
</tr>
</tbody>
</table>
### 3-3  Power Supply Units

#### 3-3-1  Models and Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shock resistance</td>
<td>147 m/s² 3 times each in X, Y, and Z directions (Relay Output Unit: 100 m/s²) (according to IEC 60068-2-27)</td>
</tr>
<tr>
<td>Ambient operating temperature</td>
<td>0 to 55°C</td>
</tr>
<tr>
<td>Ambient operating humidity</td>
<td>10% to 90% (with no condensation)</td>
</tr>
<tr>
<td>Atmosphere</td>
<td>Must be free from corrosive gases.</td>
</tr>
<tr>
<td>Ambient storage temperature</td>
<td>−20 to 75°C</td>
</tr>
</tbody>
</table>

*1 The AC and DC values above are given for a cold start, and the AC values are at room temperature. The AC inrush control circuit uses a thermistor element with a low-temperature current control characteristic. If the ambient temperature is high or the Controller is hot-started, the thermistor will not be sufficiently cool, and the inrush current given in the table may be exceeded by up to twice the given value. The DC inrush control circuit uses a capacitor-charging delay circuit. If the power is OFF for only a short time for a hot-start, the capacitor will not sufficiently discharge and the inrush current given in the table may be exceeded by up to twice the given value. An inrush current of approximately 4 A may occur and continue for 1 s when the power is turned ON. When selecting fuses, breakers, and external DC power supply devices for external circuits, allow sufficient margin in shut-off performance.

*2 Internal components in the Power Supply Unit will deteriorate or be damaged if the Power Supply Unit is used for an extended period of time exceeding the power supply output capacity or if the outputs are shorted.

*3 Supported only when mounted to CPU Rack.

*4 The tests can also be performed with the LG terminal and GR terminal connected to each other.

*5 Change the applied voltage gradually using the adjuster on the Tester. If the full dielectric strength voltage is applied or turned OFF using the switch on the Tester, the generated impulse voltage may damage the Power Supply Unit.
3-3-2 Components and Functions

NJ-PA3001

Supply 100 to 240 VAC (allowable: 85 to 264 VAC).
The NJ-PA3001 has a wide input range, so it does not have voltage switching terminals.

AC Input

Supply 24 VDC (allowable: 19.2 to 28.8 VDC.)

LG terminal is a noise-filtered neutral terminal to increase noise resistance.

GR terminal is a ground terminal to prevent electrical shock.
3-3-3 Selecting a Power Supply Unit

First select the Power Supply Unit according to whether it can be used on the CPU Rack, the power supply voltage, and the need for a RUN output. Then check the following table to make sure that the current consumption and power consumption requirements of each Rack are met.

### Calculating Unit Current Consumption

The amount of current/power that can be supplied to the Units mounted in a Rack is limited by the capacity of the Rack’s Power Supply Unit. Refer to the following tables when designing your system so that the total current consumption of the mounted Units does not exceed the maximum current for each voltage group and the total power consumption does not exceed the maximum power supplied by the Power Supply Unit.

Refer to CPU Rack on page 2-5, Expansion Racks on page 2-9, and CJ-series Configuration Units on page 2-11 for the current consumptions of the Units to use in the Unit current consumption calculations.

#### Maximum Current and Power Supplied by Power Supply Units

The following table shows the maximum currents and power that can be supplied by Power Supply Units in CPU Racks and Expansion Racks.

<table>
<thead>
<tr>
<th>Model</th>
<th>Power supply voltage</th>
<th>Output current</th>
<th>Output capacity</th>
<th>RUN output</th>
<th>Replacement notification function</th>
<th>CPU Rack</th>
<th>Expansion Racks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5-VDC CPU Rack*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5-VDC Expansion Rack</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 VDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NJ-PA3001</td>
<td>100 to 240 VAC</td>
<td>6.0 A</td>
<td>6.0 A</td>
<td>1.0 A</td>
<td>30 W</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>NJ-PD3001</td>
<td>24 VDC</td>
<td>6.0 A</td>
<td>6.0 A</td>
<td>1.0 A</td>
<td>30 W</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

* Including supply to the CPU Unit.

Refer to CPU Rack on page 2-5, Expansion Racks on page 2-9, and CJ-series Configuration Units on page 2-11 for Unit current consumptions. Refer to Rack Current Consumption and Width Display on page 3-19 for the procedure to check the current and power consumptions for each Rack from the Sysmac Studio.

**Note 1** When calculating current/power consumption in a CPU Rack, be sure to include the power required by the CPU Unit itself, as well as the I/O Control Unit if one or more Expansion Racks is connected.
Be sure to include the power required by the I/O Interface Unit when calculating current/power consumption in an Expansion Rack.

<table>
<thead>
<tr>
<th>Model</th>
<th>Output current 5-VDC CPU Rack*</th>
<th>Output current 5-VDC Expansion Rack</th>
<th>Output current 24 VDC</th>
<th>Output capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJ-PA3001</td>
<td>6.0 A</td>
<td>6.0 A</td>
<td>1.0 A</td>
<td>30 W</td>
</tr>
<tr>
<td>NJ-PD3001</td>
<td>6.0 A</td>
<td>6.0 A</td>
<td>1.0 A</td>
<td>30 W</td>
</tr>
</tbody>
</table>

* Including supply to the CPU Unit.

● Example Calculations

Example 1: In this example, the following Units are mounted to a CPU Rack with an NJ-PA3001 Power Supply Unit.

<table>
<thead>
<tr>
<th>Model</th>
<th>Output current</th>
<th>Quantity</th>
<th>Voltage group</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Unit</td>
<td>NJ501-1500</td>
<td>1 unit</td>
<td>5-V</td>
</tr>
<tr>
<td>I/O Control Unit</td>
<td>CJ1W-IC101</td>
<td>1 unit</td>
<td>24-V</td>
</tr>
<tr>
<td>Input Units</td>
<td>CJ1W-ID211</td>
<td>2 units</td>
<td>5-V</td>
</tr>
<tr>
<td></td>
<td>CJ1W-ID231</td>
<td>2 units</td>
<td>24-V</td>
</tr>
<tr>
<td>Output Unit</td>
<td>CJ1W-OC201</td>
<td>2</td>
<td>5-V</td>
</tr>
<tr>
<td>Special I/O Unit</td>
<td>CJ1W-DA041</td>
<td>1</td>
<td>24-V</td>
</tr>
<tr>
<td>CPU Bus Unit</td>
<td>CJ1W-SCU22</td>
<td>1</td>
<td>5-V</td>
</tr>
</tbody>
</table>

Current consumption:

\[
\text{Calculation: } 1.90 \text{ A} + 0.02 \text{ A} + 0.08 \text{ A} \\
\quad + 0.09 \text{ A} + 0.09 \text{ A} + 0.09 \text{ A} + 0.12 \text{ A} + 0.28 \text{ A} = 0.048 \text{ A} \\
\text{Result: } 2.84 \text{ A} (\leq 6.0 \text{ A})  \\
\text{Power consumption:

\[
\text{Calculation: } 2.84 \text{ A} \times 5 \text{ V} = 14.2 \text{ W}  \\
\text{Result: } 14.2 \text{ W} + 2.30 \text{ W} = 16.5 \text{ W} (\leq 30 \text{ W})
\]

Example 2: In this example, the following Units are mounted to a CJ-series Expansion Rack with an NJ-PA3001 Power Supply Unit.

<table>
<thead>
<tr>
<th>Model</th>
<th>Output current</th>
<th>Quantity</th>
<th>Voltage group</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O Interface Unit</td>
<td>CJ1W-II101</td>
<td>1</td>
<td>5-V</td>
</tr>
<tr>
<td>Input Unit</td>
<td>CJ1W-ID211</td>
<td>2</td>
<td>24-V</td>
</tr>
<tr>
<td>Output Unit</td>
<td>CJ1W-OD231</td>
<td>8</td>
<td>5-V</td>
</tr>
</tbody>
</table>

Current consumption:

\[
\text{Calculation: } 0.13 \text{ A} + 0.08 \text{ A} \times 2 + 0.14 \text{ A} \\
\quad \times 8 = 1.41 \text{ A} (\leq 6.0 \text{ A})  \\
\text{Result: } 1.41 \text{ A}  \\
\text{Power consumption:

\[
\text{Calculation: } 1.41 \text{ A} \times 5 \text{ V} = 7.1 \text{ W}  \\
\text{Result: } 7.1 \text{ W} (\leq 30 \text{ W})
\]
Additional Information

Rack Current Consumption and Width Display

The width, current consumption, and power consumption for each Rack are displayed on the right side of the CPU/Expansion Racks Tab Page in the Controller Configurations and Setup of the Sysmac Studio.

Click to display the information for the Rack.

If the capacity of a Power Supply Unit is exceeded, the display will turn red.
Calculating Power Consumption

The ambient operating temperature at the control panel where an NJ-series Controller is mounted must be no higher than 55°C.

This section describes how to calculate the power consumption of a CPU Rack or Expansion Rack for use in the thermal design of the control panel.

- Calculating Power Consumption

Use the following equation to calculate the average power consumption (W) of an NJ-series CPU Rack.

\[
W = \frac{W_{\text{Gross}}}{\eta} + W_{\text{IO\_ONOFF}}
\]

- Total Power Consumption of the Controller (W_Gross)

The Controller power consumption is calculated based on the total power consumption of the Units that are mounted in the CPU Unit and the power conversion rate of the Power Supply Unit.

\[
W_{\text{Gross}} = \frac{W_{\text{unit}}}{\eta}
\]

- \(W_{\text{unit}}\): Total power consumption of Units mounted to the CPU Rack. For details on the current consumption and voltage of individual Units, refer to CJ-series Configuration Units on page 2-11.

- \(\eta\): Power Supply Unit power conversion rate.
  
  The rate is 70% for the NJ Series, so use “0.7” in the calculation.

- Basic I/O Unit Power Consumption (W_IO_ONOFF)

The Basic I/O Unit power consumption is the total consumption for the Input Units and the Output Units.

- Input Units
  
  Rated input voltage \(\times\) Input current \(\times\) Number of input points

- Output Units
  
  Residual voltage \(\times\) Maximum load current \(\times\) Number of output points

**Note** For a CJ-series Basic I/O Unit with transistor outputs, use a residual voltage of 0.1 V in the calculation. For a CJ-series Basic I/O Unit with relay or triac outputs, use a residual voltage of 0 V in the calculation.
These examples show how to calculate the power consumption (W) for the following system.

### Total Power Consumption of the Controller (W\_Gross)

\[
W_{\text{Gross}} = (1.9 + 0.09 \times 2 + 0.17 \times 2 + 0.58 \times 2) \times 5 V \div 0.7 = 25.6 W
\]

### Basic I/O Unit Power Consumption (W\_IO\_ONOFF)

\[
W_{\text{IO\_ONOFF}} = 24 V \times 0.0041 A \times 64 \text{ points} \times 2 \text{ Units} + 0.1 V \times 6.4 A \times 2 \text{ Units} = 13.9 W
\]

### Average Power Consumption (W)

\[
W = W_{\text{Gross}} + W_{\text{IO\_ONOFF}} = 39.5 W
\]
## 3-4 CJ-series Basic I/O Units

### 3-4-1 Models and Specifications

#### ● Basic Input Units

<table>
<thead>
<tr>
<th>Type of Unit</th>
<th>Name</th>
<th>Specifications</th>
<th>Model</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Input Units</td>
<td>Terminal block, 12 to 24 VDC, 8 inputs</td>
<td>CJ1W-ID201</td>
<td>A-5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CJ1W-ID211, 16 inputs</td>
<td></td>
<td>A-6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fujitsu connector, 24 VDC, 32 inputs</td>
<td>CJ1W-ID231</td>
<td>A-8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MIL connector, 24 VDC, 32 inputs</td>
<td>CJ1W-ID232</td>
<td>A-9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fujitsu connector, 24 VDC, 64 inputs</td>
<td>CJ1W-ID261</td>
<td>A-11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MIL connector, 24 VDC, 64 inputs</td>
<td>CJ1W-ID262</td>
<td>A-13</td>
<td></td>
</tr>
<tr>
<td>AC Input Units</td>
<td>Terminal block, 200 to 240 VAC, 8 inputs</td>
<td>CJ1W-IA201</td>
<td>A-15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminal block, 100 to 120 VAC, 16 inputs</td>
<td>CJ1W-IA111</td>
<td>A-16</td>
<td></td>
</tr>
<tr>
<td>Interrupt Input Unit</td>
<td>Terminal block, 24 VDC, 16 inputs</td>
<td>CJ1W-INT01</td>
<td>A-17</td>
<td></td>
</tr>
<tr>
<td>Quick-response Input Unit</td>
<td>Terminal block, 24 VDC, 16 inputs</td>
<td>CJ1W-IDP01</td>
<td>A-18</td>
<td></td>
</tr>
</tbody>
</table>

#### ● Basic Output Units

<table>
<thead>
<tr>
<th>Type of Unit</th>
<th>Name</th>
<th>Specifications</th>
<th>Model</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Output Units</td>
<td>Relay Output Units</td>
<td>Terminal block, 250 VAC/24 VDC, 2 A, 8 independent contacts, 8 outputs</td>
<td>CJ1W-OC201</td>
<td>A-19</td>
</tr>
<tr>
<td></td>
<td>Terminal block, 250 VAC/24 VDC, 2 A, 16 outputs</td>
<td>CJ1W-OC211</td>
<td>A-20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Triac Output Unit</td>
<td>Terminal block, 250 VAC/24 VDC, 0.6 A, 8 outputs</td>
<td>CJ1W-OA201</td>
<td>A-21</td>
</tr>
<tr>
<td>Sinking outputs</td>
<td>Terminal block, 12 to 24 VDC, 2 A</td>
<td>8 outputs</td>
<td>CJ1W-OD201</td>
<td>A-22</td>
</tr>
<tr>
<td></td>
<td>Terminal block, 12 to 24 VDC, 0.5 A</td>
<td>8 outputs</td>
<td>CJ1W-OD203</td>
<td>A-23</td>
</tr>
<tr>
<td></td>
<td>Fujitsu connector, 12 to 24 VDC, 0.5 A</td>
<td>32 outputs</td>
<td>CJ1W-OD231</td>
<td>A-26</td>
</tr>
<tr>
<td></td>
<td>MIL connector, 12 to 24 VDC, 0.5 A</td>
<td>32 outputs</td>
<td>CJ1W-OD233</td>
<td>A-27</td>
</tr>
<tr>
<td></td>
<td>Fujitsu connector, 12 to 24 VDC, 0.3 A</td>
<td>64 outputs</td>
<td>CJ1W-OD261</td>
<td>A-30</td>
</tr>
<tr>
<td></td>
<td>MIL connector, 12 to 24 VDC, 0.3 A</td>
<td>64 outputs</td>
<td>CJ1W-OD263</td>
<td>A-32</td>
</tr>
<tr>
<td></td>
<td>Terminal block, 24 VDC, 2 A, load short-circuit protection, 8 outputs</td>
<td>CJ1W-OD202</td>
<td>A-34</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminal block, 24 VDC, 0.5 A, load short-circuit protection, 16 outputs</td>
<td>CJ1W-OD204</td>
<td>A-36</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fujitsu connector, 24 VDC, 0.5 A, load short-circuit protection, 32 outputs</td>
<td>CJ1W-OD232</td>
<td>A-38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MIL connector, 12 to 24 VDC, 0.3 A</td>
<td>64 outputs</td>
<td>CJ1W-OD262</td>
<td>A-39</td>
</tr>
</tbody>
</table>
### 3-4-2 Part Names and Functions

#### Basic Mixed I/O Units

<table>
<thead>
<tr>
<th>Type of Unit</th>
<th>Name</th>
<th>Specifications</th>
<th>Model</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed I/O Units</td>
<td>24-VDC Inputs/Transistor Output Units</td>
<td>Sinking output&lt;br&gt;Fujitsu connector&lt;br&gt;Inputs: 24 VDC&lt;br&gt;Outputs: 12 to 24 VDC, 0.5 A</td>
<td>CJ1W-MD231</td>
<td>A-41</td>
</tr>
<tr>
<td></td>
<td>MIL connector&lt;br&gt;Inputs: 24 VDC&lt;br&gt;Outputs: 12 to 24 VDC, 0.5 A</td>
<td></td>
<td>CJ1W-MD233</td>
<td>A-43</td>
</tr>
<tr>
<td></td>
<td>Fujitsu connector&lt;br&gt;Inputs: 24 VDC&lt;br&gt;Outputs: 12 to 24 VDC, 0.3 A</td>
<td></td>
<td>CJ1W-MD261</td>
<td>A-44</td>
</tr>
<tr>
<td></td>
<td>MIL connector&lt;br&gt;Inputs: 24 VDC&lt;br&gt;Outputs: 12 to 24 VDC, 0.3 A</td>
<td></td>
<td>CJ1W-MD263</td>
<td>A-46</td>
</tr>
<tr>
<td>Sourcing output</td>
<td>MIL connector&lt;br&gt;Input: 24 VDC&lt;br&gt;Outputs: 24 VDC, 0.5 A, load short-circuit protection</td>
<td></td>
<td>CJ1W-MD232</td>
<td>A-48</td>
</tr>
<tr>
<td>TTL I/O Units</td>
<td>24-VDC Inputs/Transistor Output Units</td>
<td>Sourcing output&lt;br&gt;MIL connector&lt;br&gt;Input: 24 VDC&lt;br&gt;Outputs: 24 VDC, 0.5 A, load short-circuit protection</td>
<td>CJ1W-MD563</td>
<td>A-50</td>
</tr>
<tr>
<td></td>
<td>Fujitsu connector&lt;br&gt;Inputs: 24 VDC&lt;br&gt;Outputs: 12 to 24 VDC, 0.3 A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MIL connector&lt;br&gt;Inputs: 24 VDC&lt;br&gt;Outputs: 12 to 24 VDC, 0.3 A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TTL I/O Units</td>
<td>Sourcing output&lt;br&gt;MIL connector&lt;br&gt;Input: 24 VDC&lt;br&gt;Outputs: 24 VDC, 0.5 A, load short-circuit protection</td>
<td>CJ1W-MD563</td>
<td>A-50</td>
</tr>
<tr>
<td></td>
<td>Fujitsu connector&lt;br&gt;Inputs: 24 VDC&lt;br&gt;Outputs: 12 to 24 VDC, 0.3 A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MIL connector&lt;br&gt;Inputs: 24 VDC&lt;br&gt;Outputs: 12 to 24 VDC, 0.3 A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TTL I/O Units</td>
<td>Sourcing output&lt;br&gt;MIL connector&lt;br&gt;Input: 24 VDC&lt;br&gt;Outputs: 24 VDC, 0.5 A, load short-circuit protection</td>
<td>CJ1W-MD563</td>
<td>A-50</td>
</tr>
<tr>
<td></td>
<td>Fujitsu connector&lt;br&gt;Inputs: 24 VDC&lt;br&gt;Outputs: 12 to 24 VDC, 0.3 A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MIL connector&lt;br&gt;Inputs: 24 VDC&lt;br&gt;Outputs: 12 to 24 VDC, 0.3 A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Eight/sixteen-point Units (18-pin Terminal Blocks)

![Diagram of I/O Unit with labels](image)

**Note** The CJ1W-OD202, CJ1W-OD204, and CJ1W-OD212 also have an ERR indicator for the load short-circuit alarm.
**Thirty-two-point Units with 40-pin Fujitsu Connector or MIL Connector**

- Thirty-two-point Units with 40-pin Fujitsu Connector or MIL Connector
- Thirty-two-point Units with 2 × 24-pin Fujitsu Connectors or 2 × 20-pin MIL Connectors
- Sixty-four-point Units with Two 40-pin Fujitsu Connectors or MIL Connectors

---

**Note:** Only the CJ1W-OD232 has an ERR indicator for the load short-circuit alarm.
### Quick-response Inputs

When you want to receive pulses that are shorter than the task period, use the CJ1W-IDP01 Quick-response Input Unit.

The quick-response inputs can receive pulses with a pulse width (ON time) of 0.05 ms for the CJ1W-IDP01 Quick-response Input Unit.

Inputs that are input to internal memory are cleared when the inputs are refreshed.
3-5  B7A Interface Ports

3-5-1  Overview

The B7A is a 1:1 transmission path that does not require a master. A total of 16 signals are transmitted using a two-conductor or three-conductor VCTF cable (maximum length: 500 m). The CJ1W-B7A□□ B7A Interface Unit is a CJ-series Basic I/O Unit that exchanges up to 64 points of I/O data mainly with B7A Link Terminals using a B7A transmission path.

The B7A Interface Unit and B7A Link Terminal can be used in the same way as a standard Basic I/O Unit and I/O Terminal without any need to worry about communications. This characteristic reduces the wiring when using more than one relatively remote sensor or actuator.

3-5-2  System Configuration

![System Configuration Diagram]

3-5-3  Models

<table>
<thead>
<tr>
<th>B7A Interface Unit</th>
<th>Specifications</th>
<th>I/O words allocated to Unit</th>
<th>Connectable B7A Link Terminals*</th>
</tr>
</thead>
<tbody>
<tr>
<td>CJ1W-B7A14</td>
<td>64 inputs (four B7A ports)</td>
<td>4 input words</td>
<td>Inputs: Four 16-point Input Terminals, two 32-point Input Terminals, or two 16-point Input Terminals and one 32-point Input Terminal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Outputs: Four 16-point Output Terminals or two 32-point Output Terminals</td>
</tr>
<tr>
<td>CJ1W-B7A04</td>
<td>64 outputs (four B7A ports)</td>
<td>4 output words</td>
<td></td>
</tr>
<tr>
<td>CJ1W-B7A22</td>
<td>32 inputs, 32 outputs (four B7A ports)</td>
<td>2 input words and 2 output words</td>
<td>Inputs: Two 16-point Input Terminals or one 32-point Input Terminal Outputs: Two 16-point Output Terminals or one 32-point Output Terminal or Two Mixed I/O Terminals (16 inputs/16 outputs)</td>
</tr>
</tbody>
</table>

* A 10-point B7A Link Terminal cannot be connected to a B7A Interface Unit. B7A Interface Units can be connected together.

Additional Information

Wireless transmissions are possible if B7AP Power Couplers are used on a B7A transmission path, reducing the wiring required for moving objects and rotating objects.
### 3-5-4 B7A Communications Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transmission method</strong></td>
<td>One-way time-sharing multiplex transmissions</td>
</tr>
<tr>
<td>Transmission delay (communications delay on transmission path)</td>
<td>High-speed 3 ms typical, 5 ms max.</td>
</tr>
<tr>
<td></td>
<td>Standard 19.2 ms typical, 31 ms max.</td>
</tr>
<tr>
<td><strong>Transmission points</strong></td>
<td></td>
</tr>
<tr>
<td>CJ1W-B7A14</td>
<td>64 inputs (4 ports)</td>
</tr>
<tr>
<td>CJ1W-B7A04</td>
<td>64 outputs (4 ports)</td>
</tr>
<tr>
<td>CJ1W-B7A22</td>
<td>32 inputs (2 ports), 32 outputs (2 ports)</td>
</tr>
<tr>
<td><strong>External power supply voltage</strong></td>
<td></td>
</tr>
<tr>
<td>External supply current*2</td>
<td></td>
</tr>
<tr>
<td>CJ1W-B7A14</td>
<td>40 mA min.</td>
</tr>
<tr>
<td>CJ1W-B7A04</td>
<td>150 mA min.</td>
</tr>
<tr>
<td>CJ1W-B7A22</td>
<td>80 mA min.</td>
</tr>
<tr>
<td><strong>Minimum input time</strong></td>
<td></td>
</tr>
<tr>
<td>High-speed</td>
<td>16 ms</td>
</tr>
<tr>
<td>Standard</td>
<td>2.4 ms</td>
</tr>
<tr>
<td><strong>Transmission distance</strong></td>
<td></td>
</tr>
<tr>
<td>High-speed</td>
<td>Power supply on one side (common power supply)*4 10 m max.</td>
</tr>
<tr>
<td></td>
<td>Power supply on both sides (separate power supplies)*5 50 m max. (with shielded cable)</td>
</tr>
<tr>
<td>Standard</td>
<td>Power supply on one side (common power supply)*4 100 m max.</td>
</tr>
<tr>
<td></td>
<td>Power supply on both sides (separate power supplies)*5 500 m max.</td>
</tr>
<tr>
<td><strong>Cables</strong></td>
<td></td>
</tr>
<tr>
<td>VCTF, 0.75 mm², 3 conductors (power supply on one side (common power supply))*4</td>
<td></td>
</tr>
<tr>
<td>VCTF, 0.75 mm², 2 conductors (power supply on both sides (separate power supplies))*5</td>
<td></td>
</tr>
<tr>
<td>Shielded cable, 0.75 mm², 3 conductors (power supply on one side (common power supply))*4</td>
<td></td>
</tr>
<tr>
<td>Shielded cable, 0.75 mm², 2 conductors (power supply on both sides (separate power supplies))*5</td>
<td></td>
</tr>
</tbody>
</table>

*1 We recommend OMRON S8□□-series Power Supply Units for the external power supplies.

*2 The capacity of the external supply current does not include the capacity required by the B7A Link Terminal.

*3 The minimum input time is the minimum time required by the B7A Interface Unit to read the input signals from the CPU Unit.

*4 When a common power supply is used, the B7A Interface Unit and B7A Link Terminal are supplied by the same external power supply.

*5 When separate power supplies are used, the B7A Interface Unit and B7A Link Terminal are supplied by separate external power supplies.
3-5-5 Common Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable Controllers</td>
<td>NJ Series</td>
</tr>
<tr>
<td>Unit classification</td>
<td>CJ-series Basic I/O Unit</td>
</tr>
<tr>
<td>Transmission delay</td>
<td>Standard (19.2 ms typical) or high-speed (3 ms typical), switchable (Switchable by using the setting switch on the front panel. Settings are read when power is turned ON or Unit is restarted.) Factory setting: Standard (19.2 ms typical)</td>
</tr>
<tr>
<td>Note</td>
<td>A transmission error will occur if B7A Link Terminals with different transmission delay times are connected to each other.</td>
</tr>
<tr>
<td>Transmission error input bit status processing</td>
<td>HOLD (The bit status from immediately before the transmission error is held.)</td>
</tr>
<tr>
<td>Settings</td>
<td>Front panel Setting switch: Standard (19.2 ms typical) or high-speed (3 ms typical), switchable</td>
</tr>
<tr>
<td>Indicators</td>
<td>5 LED indicators: RUN (B7A operating status), ERR1 (port 1 communications error), ERR2 (port 2 communications error), ERR3 (port 3 communications error), ERR4 (port 4 communications error)</td>
</tr>
<tr>
<td>Front panel connection</td>
<td>Connector with clamps</td>
</tr>
<tr>
<td>Current consumption</td>
<td>5 V DC: 70 mA max. (supplied from Power Supply Unit)</td>
</tr>
<tr>
<td>Weight</td>
<td>80 g max.</td>
</tr>
</tbody>
</table>

3-5-6 B7A Interface Port I/O Types

The B7A Interface Units are CJ-series Basic I/O Units.

The B7A Interface Ports use the following I/O types.

Access is performed from the user program using variables.

For information on how to allocate variables, refer to the **NJ/NX-series CPU Unit Software User’s Manual** (Cat. No. W501).

<table>
<thead>
<tr>
<th>Port number</th>
<th>I/O type</th>
<th>64-point Input Unit</th>
<th>64-point Output Unit</th>
<th>64-point I/O Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CJ1W-B7A14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Inputs</td>
<td>Outputs</td>
<td>Outputs</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Inputs</td>
<td>Outputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Inputs</td>
<td>Outputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Inputs</td>
<td>Outputs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3-5-7 Parts and Names

Indicators

- **CJ1W-B7A14**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Name</th>
<th>Color</th>
<th>Status</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUN</td>
<td>B7A operating status</td>
<td>Green</td>
<td>Lit</td>
<td>The B7A Unit is operating.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not lit</td>
<td>The B7A Unit is stopped.</td>
</tr>
<tr>
<td>ERR1</td>
<td>Port 1 transmission error</td>
<td>Red</td>
<td>Lit</td>
<td>A transmission error has occurred at port 1 of the B7A Unit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not lit</td>
<td>The Unit is operating normally.</td>
</tr>
<tr>
<td>ERR2</td>
<td>Port 2 transmission error</td>
<td>Red</td>
<td>Lit</td>
<td>A transmission error has occurred at port 2 of the B7A Unit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not lit</td>
<td>The Unit is operating normally.</td>
</tr>
</tbody>
</table>
### 3-30 Configuration Units

#### CJ1W-B7A04

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Name</th>
<th>Color</th>
<th>Status</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERR3</td>
<td>Port 3 transmission</td>
<td>Red</td>
<td>Lit</td>
<td>A transmission error has occurred at port 3 of the B7A Unit.</td>
</tr>
<tr>
<td></td>
<td>error</td>
<td></td>
<td></td>
<td>Not lit The Unit is operating normally.</td>
</tr>
<tr>
<td>ERR4</td>
<td>Port 4 transmission</td>
<td>Red</td>
<td>Lit</td>
<td>A transmission error has occurred at port 4 of the B7A Unit.</td>
</tr>
<tr>
<td></td>
<td>error</td>
<td></td>
<td></td>
<td>Not lit The Unit is operating normally.</td>
</tr>
</tbody>
</table>

#### CJ1W-B7A22

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Name</th>
<th>Color</th>
<th>Status</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUN</td>
<td>B7A operating status</td>
<td>Green</td>
<td>Lit</td>
<td>The B7A Unit is operating.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Not lit The B7A Unit is stopped.</td>
</tr>
<tr>
<td>ERR1</td>
<td>Port 3 transmission</td>
<td>Red</td>
<td>Lit</td>
<td>A transmission error has occurred at port 3 of the B7A Unit.</td>
</tr>
<tr>
<td></td>
<td>error</td>
<td></td>
<td></td>
<td>Not lit The Unit is operating normally.</td>
</tr>
<tr>
<td>ERR2</td>
<td>Port 4 transmission</td>
<td>Red</td>
<td>Lit</td>
<td>A transmission error has occurred at port 4 of the B7A Unit.</td>
</tr>
<tr>
<td></td>
<td>error</td>
<td></td>
<td></td>
<td>Not lit The Unit is operating normally.</td>
</tr>
</tbody>
</table>

#### Transmission Delay Switch

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
<th>Factory setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission delay</td>
<td>The same baud rate is set for all ports using this one switch.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Right: Standard (19.2 ms typical)</td>
<td>Standard</td>
</tr>
<tr>
<td></td>
<td>Left: High-speed (3 ms typical)</td>
<td></td>
</tr>
</tbody>
</table>

**Note** The switch setting is read when the power supply is turned ON. If the switch setting is changed after turning ON the power supply, the new setting is not used.
3-5-8 Transmission Error Processing

## B7A Interface Input Ports

The B7A Interface Unit detects transmission errors at the input ports. When a transmission error is detected at an input port, the corresponding indicator and Transmission Error Flag turn ON.

### Indicators

When transmission errors occur at B7A interface input ports, the ERR1 to ERR4 indicators on the front panel will turn ON according to the port where the error occurred.

<table>
<thead>
<tr>
<th>Port where error occurred</th>
<th>LED error indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CJ1W-B7A14</td>
</tr>
<tr>
<td></td>
<td>CJ1W-B7A04</td>
</tr>
<tr>
<td></td>
<td>CJ1W-B7A22</td>
</tr>
<tr>
<td>Port 1</td>
<td>ERR1</td>
</tr>
<tr>
<td>Port 2</td>
<td>ERR2</td>
</tr>
<tr>
<td>Port 3</td>
<td>ERR3</td>
</tr>
<tr>
<td>Port 4</td>
<td>ERR4</td>
</tr>
</tbody>
</table>

### Transmission Error Notification Variables

The following bits in the Basic I/O Unit Information system-defined variables that are allocated to the I/O ports of the Units will change to TRUE when a transmission error occurs.

**Example: Rack 0, Slot 0**

<table>
<thead>
<tr>
<th>B7A interface port</th>
<th>CJ1W-B7A14</th>
<th>CJ1W-B7A04</th>
<th>CJ1W-B7A22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port 1</td>
<td>_CJB_IOUnitInfo[0, 0, 0]</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Port 2</td>
<td>_CJB_IOUnitInfo[0, 0, 1]</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Port 3</td>
<td>_CJB_IOUnitInfo[0, 0, 2]</td>
<td>---</td>
<td>_CJB_IOUnitInfo[0, 0, 0]</td>
</tr>
<tr>
<td>Port 4</td>
<td>_CJB_IOUnitInfo[0, 0, 3]</td>
<td>---</td>
<td>_CJB_IOUnitInfo[0, 0, 1]</td>
</tr>
</tbody>
</table>

**Example: Rack 0, Slot 1**

<table>
<thead>
<tr>
<th>B7A interface port</th>
<th>CJ1W-B7A14</th>
<th>CJ1W-B7A04</th>
<th>CJ1W-B7A22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port 1</td>
<td>_CJB_IOUnitInfo[0, 1, 0]</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Port 2</td>
<td>_CJB_IOUnitInfo[0, 1, 1]</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Port 3</td>
<td>_CJB_IOUnitInfo[0, 1, 2]</td>
<td>---</td>
<td>_CJB_IOUnitInfo[0, 0, 0]</td>
</tr>
<tr>
<td>Port 4</td>
<td>_CJB_IOUnitInfo[0, 1, 3]</td>
<td>---</td>
<td>_CJB_IOUnitInfo[0, 0, 1]</td>
</tr>
</tbody>
</table>

### Transmission Error Input Status Processing

If a transmission error occurs at an input port, the status of the input bit in the CPU Unit variable from immediately before the transmission error is held. When transmission returns to normal, the signals that have been normally received will be input to the input bit.

## B7A Interface Output Ports

The B7A Interface Unit does not detect transmission errors at output ports. Detect output port transmission errors at the B7A Link Terminal that is connected to the B7A Interface Unit.
3-6  CJ-series I/O Control Units and I/O Interface Units

An I/O Control Unit and I/O Interface Units are used to connect Expansion Racks to the NJ-series CPU Rack to expand the system.

3-6-1 Models and Specifications

- **I/O Control Unit**

<table>
<thead>
<tr>
<th>Model</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>CJ1W-IC101</td>
<td>The I/O Control Unit is required to connect a CJ-series Expansion Rack to an NJ-series CPU Rack. The I/O Control Unit must be connected immediately to the right of the CPU Unit. Connect to the I/O Interface Unit (CJ1W-II101) on the first Expansion Rack with a CS/CJ-series I/O Connecting Cable.</td>
</tr>
</tbody>
</table>

- **I/O Interface Unit**

<table>
<thead>
<tr>
<th>Model</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>CJ1W-II101</td>
<td>One Interface Unit is required for each CJ-series Expansion Rack. One End Cover is provided with each Unit.</td>
</tr>
</tbody>
</table>

3-6-2 Component and Functions

- **CJ1W-IC101**
  - I/O Control Unit
  - Output connector for I/O Connecting Cable

- **CJ1W-II101**
  - I/O Interface Unit
  - Output connector for I/O Connecting Cable
  - Input connector for I/O Connecting Cable

### Precautions for Correct Use

Attach the enclosed cover to the I/O Connecting Cable connector on the I/O Interface Unit when it is not being used to protect it from dust.
The Sysmac Studio is a Support Software package that provides an integrated development environment to design, program, debug, and maintain SYSMAC NJ-series Controllers.

3-7-1 Model Numbers

The model numbers of the Sysmac Studio Standard Edition are given in the following table. The model numbers are different for the media and licenses.

<table>
<thead>
<tr>
<th>Product</th>
<th>Configuration software</th>
<th>Media</th>
<th>Number of user licenses</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sysmac Studio Standard Edition</td>
<td>• Sysmac Studio&lt;br&gt;The following Support Software is also included.&lt;br&gt;• Network Configurator&lt;br&gt;• CX-Integrator&lt;br&gt;• CX-Protocol&lt;br&gt;• CX-Designer</td>
<td>DVD</td>
<td>---</td>
<td>SYSMAC-SE200D</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Licenses</td>
<td>1</td>
<td>SYSMAC-SE201L</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>SYSMAC-SE203L</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td>SYSMAC-SE210L</td>
</tr>
</tbody>
</table>
3-7-2 Connection

With an NJ-series CPU Unit, you can connect the Sysmac Studio online in the following ways.

### Configuration

#### Connecting by USB

- **Direct Connection**
  
  ![Diagram of Direct Connection](#)

  The connection device does not need to be specified.

  **Note** Connect a computer and the CPU Unit with a USB 2.0 certified cable. Do not use a USB hub to connect them.

#### Connection with EtherNet/IP

- **1:1 Connection**
  
  ![Diagram of 1:1 Connection](#)

  A direct connection is made from the Sysmac Studio. The IP address and connection device do not need to be specified.

  - You can make the connection whether or not a switching hub is used.
  - Support for Auto-MDI enables the use of cross cables or straight cables if a direct connection is made.

- **1:N Connection**
  
  ![Diagram of 1:N Connection](#)

  Directly specify the IP address of the remote device.
Additional Information

The Sysmac Studio cannot connect online to an NJ-series CPU Unit in the following type of configuration.

- If the built-in EtherNet/IP port is not used, you cannot connect to an NJ-series CPU Unit on an EtherNet/IP network.

Example: Connection through an EtherNet/IP Unit

Example: Connection to NJ-series CPU Unit Routing through an EtherNet/IP Unit or Built-in Port

- You cannot route through any networks other than EtherNet/IP networks.
# Installation and Wiring

This section describes how to install and wire the CPU Unit and Configuration Units.

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4-1 Processing at Power ON and Power OFF

4-1-1 Power ON Operation

![WARNING]

It takes approximately 10 to 20 s to enter RUN mode after the power supply is turned ON. The outputs during this period will behave according to the slave and Unit specifications. Use the RUN output on the Power Supply Unit, for example, to implement fail-safe circuits so that external devices do not operate incorrectly.

Precautions for Safe Use

- Do not touch the terminal section while power is ON. Electrical shock may occur.
- Do not disassemble any of the Units. Particularly the Power Supply Units contain parts with high voltages when power is ON or immediately after power is turned OFF. Electrical shock may occur. There are also sharp internal parts that may cause injury.

Operation until Operation Ready Status

The CPU Unit will enter operation-ready status after the following time elapses once power supply to the Power Supply Unit starts.

The RUN indicator will flash at a 1-s interval until operation-ready status is entered. (During that time, the Controller will be in startup status.)

CPU Unit Startup Time at Power ON

It takes approximately 10 to 20 seconds for the CPU Unit to start up. The startup time depends on the slave/Unit configuration,*1 user program, SD Memory Card usage, SD Memory Card self-diagnosis usage,*2 etc.

*1 Some EtherCAT slaves can set a maximum standby time of 30 to 200 s. For the CPU Unit, however, operation-ready status exists as soon as the EtherCAT Master Function Module is functioning, regardless of the standby time of the EtherCAT Slaves. For the EtherCAT Master Function Module, slaves that do not start within the maximum waiting time are treated as having an error.

*2 This function performs self-diagnosis on the inserted SD Memory Card. This is executed if the SD Memory Card self-diagnosis setting is set to enable execution of self-diagnosis in the Operation Settings in the Controller Configurations and Setup in the Sysmac Studio.
The CPU Unit internally performs initialization when the power to the Controller is turned ON. The following processing is performed for initialization.

<table>
<thead>
<tr>
<th>Process</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self diagnosis at startup</td>
<td>Operation is monitored for the following errors: Power Supply Error, CPU Unit Reset, CPU Unit Watchdog Timer Error, and Incorrect Power Supply Unit Connected. *</td>
</tr>
<tr>
<td>Data check</td>
<td>The _RetainFail (Retention Failure Flag) system-defined variable changes to TRUE at the following time: when the values of variables for which the Retain attribute was set to retain the values and the values in DM, EM, and HR Areas in the memory used for CJ-series Units were not retained after a power interruption.</td>
</tr>
<tr>
<td>Detecting CJ-series Units</td>
<td>The CJ-series Units mounted in the Controller are detected.</td>
</tr>
<tr>
<td>Recording Power Turned ON and Power Interrupted events</td>
<td>The Power Turned ON and Power Interrupted events are recorded.</td>
</tr>
</tbody>
</table>

* Refer to the NJ/NX-series Troubleshooting Manual (Cat. No. W503) for information on the following errors: Power Supply Error, CPU Unit Reset, CPU Unit Watchdog Timer Error, and Incorrect Power Supply Unit Connected.

### Operating Mode at Startup

The system will immediately enter RUN mode if RUN mode (default) is set as the startup operating mode. The system will immediately enter PROGRAM mode if PROGRAM mode is set as the startup operating mode.

- **RUN Mode Set as Startup Mode**
  - Operating mode: RUN mode
  - Power: ON
  - RUN output on Power Supply Unit: ON
  - RUN indicator: Flashing

- **PROGRAM Mode Set as Startup Mode**
  - Operating mode: PROGRAM mode
  - Power: OFF
  - RUN output on Power Supply Unit: OFF
  - RUN indicator: Flashing

---

**Operating Mode at Startup**

- **RUN Mode Set as Startup Mode**
  - Operating mode: RUN mode
  - Power: ON
  - RUN output on Power Supply Unit: ON
  - RUN indicator: Flashing

- **PROGRAM Mode Set as Startup Mode**
  - Operating mode: PROGRAM mode
  - Power: OFF
  - RUN output on Power Supply Unit: OFF
  - RUN indicator: Flashing
4-1-2 Power OFF Operation

WARNING

The NJ-series Controller continues normal operation for a specific period of time even when a momentary power interruption occurs. The Controller may therefore receive incorrect signals from external devices that are affected by the momentary power interruption. Take suitable actions, such as external fail-safe measures and interlock conditions, to monitor the power supply voltage of the external devices as required.

Different operations will be performed when the power is turned OFF depending on whether the power interruption time is longer than the power OFF detection time, as described below.

The following table gives the voltage conditions for a power interruption.

<table>
<thead>
<tr>
<th>Power Supply Unit model</th>
<th>Power supply input</th>
<th>Power interruption voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJ-PA3001</td>
<td>100 to 200 VAC</td>
<td>85 VAC max.</td>
</tr>
<tr>
<td>NJ-PD3001</td>
<td>24 VDC</td>
<td>19.2 VDC max.</td>
</tr>
</tbody>
</table>

The setting ranges for the power OFF detection time are given in the following table.

<table>
<thead>
<tr>
<th>Power supply type</th>
<th>Power OFF detection time</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC power supply</td>
<td>30.5 to 45.5 ms</td>
</tr>
<tr>
<td>DC power supply</td>
<td>22.5 to 25.5 ms</td>
</tr>
</tbody>
</table>

Operation at Power OFF Operation

Execution of the user program is ended if a power interruption exceeds the power OFF detection time, as shown below. The processing after power interruption confirmation (described below) is performed, and then the system (i.e., CPU Unit) stops.

<table>
<thead>
<tr>
<th>Power supply type</th>
<th>Time required for a power interruption</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC power supply</td>
<td>45.5 ms or longer</td>
</tr>
<tr>
<td>DC power supply</td>
<td>25.5 ms or longer</td>
</tr>
</tbody>
</table>

As shown in the following figure, the system (i.e. CPU Unit) will stop even if the voltage recovers after the power interruption detection time.
Power interruption detection time: The time from when the input power supply voltage drops until a power interruption is detected. The power interruption is detected by the Power Supply Unit.

Power interruption detection delay time: The standby time from when the Power Supply Unit detects the power interruption until the CPU Unit starts processing after the power interruption is confirmed.

Power OFF detection time: The time from when the power supply voltage drops until the CPU Unit starts processing after the power interruption is confirmed. The CPU Unit continues to operate normally until the power interruption is confirmed.

### Momentary Power Interruption with Continued Operation

Execution of the user program will continue if a momentary power interruption is less than the following times.

<table>
<thead>
<tr>
<th>Power supply type</th>
<th>Momentary power interruption time with continued operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC power supply</td>
<td>30.5 ms max.</td>
</tr>
<tr>
<td>DC power supply</td>
<td>22.5 ms max.</td>
</tr>
</tbody>
</table>

**AC power supply**
- Voltage drop: AC 85 V max. (10 ms), DC 19.2 V max. (2 ms)
- Power interruption detected
- Power interruption confirmed
- Voltage recovery: disabled
- System resets (CPU Unit stops)

**DC power supply**
- Voltage drop: AC 85 V max. (10 ms), DC 19.2 V max. (2 ms)
- Power interruption detected
- Power interruption confirmed
- Voltage recovery: disabled
- System resets (CPU Unit stops)
### Processing after Power Interruption Is Confirmed

After a power interruption is confirmed, the CPU Unit performs the following processing and then stops.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O refresh</td>
<td>Load outputs are turned OFF. Tag data links stop.</td>
</tr>
<tr>
<td>SD Memory Card access in progress</td>
<td>Any writing is interrupted, files are closed, and the Card is unmounted.</td>
</tr>
<tr>
<td>Transferring user program (including online editing)</td>
<td>Interrupted. As a result, an error will occur the next time that the power is turned ON. The Controller will not operate.</td>
</tr>
<tr>
<td>User program execution</td>
<td>User program execution is aborted even during execution of an instruction.</td>
</tr>
<tr>
<td>Saving event log</td>
<td>The time that a power interruption occurs and the cause (primary power interruption of Power Supply Unit) of the interruption are recorded.</td>
</tr>
</tbody>
</table>

#### 4-1-3 Resetting the Controller from the Sysmac Studio

You can reset the CPU Unit from the Sysmac Studio. A reset from the Sysmac Studio performs the same operation as cycling the power supply of the Power Supply Unit. Resetting is possible, however, only when the CPU Unit is in PROGRAM mode. Confirm the following status before resetting the CPU Unit.

- Check the status of output loads.
- Make sure that SD Memory Card access is not in progress.
4-2 Fail-safe Circuits

WARNING

Provide safety measures in external circuits, including the following items, to ensure safety in the system if an abnormality occurs due to malfunction of the CPU Unit, other Units, or slaves or due to other external factors affecting operation. Not doing so may result in serious accidents due to incorrect operation.

- Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits.
- The 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 all outputs from Basic Output Units in the following cases. The remote I/O slaves will operate according to the settings in the slaves.
  - If a power supply error occurs.
  - When an Incorrect Power Supply Unit Connected error occurs.
  - When a CPU watchdog timer error or CPU reset occurs.
  - When a Controller error in the major fault level occurs.
  - While the CPU Unit is startup status 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.

- 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.
- Unintended outputs may be performed when an error occurs in variable memory or memory for CJ-series Units. 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 in the user program to ensure safety in the overall system even if errors or malfunctions occur in data link communications or remote I/O communications.
- If a communications interference occurs for remote I/O or if a major fault level error occurs, output status will be determined by the specifications of the external output device. Confirm the operating specifications for communications errors and major fault level errors and implement suitable safety measures. Correctly set all of the settings in the slaves and Units.
- You must implement fail-safe circuits to provide sufficient protection in the event that abnormal signals occur as the result of broken signal lines or momentary power interruptions. Not doing so may result in serious accidents due to incorrect operation.
4-2-1 Order of Powering Up the Controller and Controlled System

Outputs from Units, such as DC Output Units, may malfunction momentarily when the power to the Controller is turned ON. This may cause problems in the system if the Controller power supply is turned ON after the controlled system's power supply. To prevent possible malfunctions, add an external circuit that prevents the power supply to the controlled system from going ON before the power supply to the Controller itself.

Precautions for Safe Use

It takes approximately 10 to 20 s to enter RUN mode after the power supply is turned ON. During that time, outputs will be OFF or the values will be according to settings in the Units or slaves. Also, external communications cannot be performed. Use the RUN output on the Power Supply Unit, for example, to implement fail-safe circuits so that external devices do not operate incorrectly.

Output Unit Failure

It is possible for an output to remain ON due to a malfunction in the internal circuitry of the Output Unit, such as a relay or transistor malfunction. Be sure to add any circuits necessary outside of the Controller to ensure the safety of the system in the event that an output fails to go OFF.

Power Supply Wiring and Emergency Stop Circuit

The following emergency stop circuit controls the power supply to the controlled system so that power is supplied to the controlled system only when the Controller is operating and the RUN output is ON. An external relay (CR1) is connected to the RUN output from the Power Supply Unit* as shown in the following diagram.

* A RUN output is provided only on the NJ-PA3001/-PD3001 Power Supply Unit.

- Electrical Diagram
Interlock Circuits

When the Controller controls an operation such as the clockwise and counterclockwise operation of a motor, provide an external interlock such as the one shown in the following example to prevent both the forward and reverse outputs from turning ON at the same time if required by the application.

This circuit prevents outputs MC1 and MC2 from both being ON at the same time even if both Controller outputs ON_MC1 and ON_MC2 are ON due to a malfunction.
### 4-3 Mounting Units

#### Precautions for Correct Use

- Follow the instructions in this manual to correctly perform installation.
- Do not operate or store the Controller in the following locations. Doing so may cause operation to stop or incorrect operation.
  - 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 dirt, dust, salt, and metal powder.
  - Locations subject to exposure to water, oil, or chemicals.
  - Locations subject to shock or vibration.
- Take appropriate and sufficient countermeasures when installing systems 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 supplies.

#### 4-3-1 Installation in a Control Panel

**Installation in Cabinets or Control Panels**

When the Controller is being installed in a cabinet or control panel, be sure to provide proper ambient conditions as well as access for operation and maintenance.

- **Temperature Control**
  
The ambient temperature within the enclosure must be within the operating range of 0 to 55°C. When necessary, take the following steps to maintain the proper temperature.
  - Provide enough space for good air flow.
  - Do not install the Controller directly above equipment that generates a large amount of heat such as heaters, transformers, or high-capacity resistors.
  - If the ambient temperature exceeds 55°C, install a cooling fan or air conditioner.
- **Accessibility for Operation and Maintenance**
  - To ensure safe access for operation and maintenance, separate the Controller as much as possible from high-voltage equipment and power machinery.
  - It will be easy to operate the Controller if it is mounted at a height of 1.0 to 1.6 m above the floor.

- **Improving Noise Resistance**
  - Do not mount the Controller in a control panel containing high-voltage equipment.
  - Install the Controller at least 200 mm away from power lines.
  - Ground the mounting plate between the Controller and the mounting surface.
  - When I/O Connecting Cables are 10 m or longer, connect the control panels in which Racks are mounted with heavier power wires (3 wires at least 2 mm² in cross-sectional area).

- **Controller Orientation**
  - Each Rack must be mounted in an upright position to provide proper cooling.
  - Do not install a Rack in any of the following positions.
Installation and Wiring

An NJ-series Controller must be mounted inside a control panel on DIN Track. Normally the CPU Rack is installed on top and the Expansion Racks under it.

- Consider the width of wiring ducts, wiring, ventilation, and Unit replacement when determining the space between Racks.
- When you install Racks vertically, allow at least 66 mm between any two adjacent Racks.

Additional Information

A Controller must be mounted on DIN Track. It cannot be mounted with screws.
• **Wiring Ducts**

Whenever possible, route I/O wiring through wiring ducts or raceways. Install mounting bracket so that it is easy to fish wire from the I/O Units through the duct. It is handy to have the duct at the same height as the Racks.

![Wiring Duct Example](image)

**Precautions for Correct Use**

Tighten terminal block screws and cable screws to the following torques.

- **Terminal Screws**
  - M4: 1.2 N·m
  - M3: 0.5 N·m

- **Cable Connector Screws**
  - M2.6: 0.2 N·m
Routing Wiring Ducts

Install the wiring ducts at least 20 mm away from the tops of the Racks and any other objects (e.g., ceiling, wiring ducts, structural supports, devices, etc.) to provide enough space for air circulation and replacement of Units.

- Breakers, fuses
- Power equipment such as transformers and magnetic relays
- Terminal blocks for power equipment
- Terminal blocks for Controller
- Expansion Rack
- CPU Rack

Expansion Rack

Fuses, relays, timers, etc. (Do not install devices that generate heat or power equipment.)
4-3-2 Connecting Controller Components

The Units that make up an NJ-series Controller can be connected simply by pressing the Units together and locking the sliders by moving them toward the back of the Units. The End Cover is connected in the same way to the Unit on the far right side of the Controller.

1 Join the Units so that the connectors fit exactly.

2 The yellow sliders at the top and bottom of each Unit lock the Units together. Move the sliders toward the back of the Units as shown below until they click into place.

---

**Precautions for Correct Use**

The sliders on the tops and bottoms of the Power Supply Unit, CPU Unit, I/O Units, Special I/O Units, and CPU Bus Units must be completely locked (until they click into place) after connecting the adjacent Unit connectors.
3. Attach the End Cover to the Unit on the far right side of the Rack.

**Additional Information**

There is no Backplane for the NJ-series. The Controller is constructed by connecting Units together using the connectors on the sides.

**Precautions for Correct Use**

- Always turn OFF the power supply before connecting Units to each other.
- Always turn OFF the power supply to the entire system before replacing a Unit.
- A maximum of 10 Units can be connected in any one CPU Rack or Expansion Rack. If you connect more than that number, an Incorrect Unit/Expansion Rack Connection error (a major fault level Controller error) will occur, and the NJ-series CPU Unit will not operate.
4-3-3 DIN Track Installation

Use the following procedure to install an NJ-series Controller on DIN Track.

1. Release the pins on the backs of the NJ-series Units.

2. Fit the back of the Controller onto the DIN Track by inserting the top of the track and then pressing in at the bottom of the Controller, as shown below.

3. Lock the pins.
Install a DIN Track End Plate on each end of the Controller. To install an End Plate, hook the bottom on the bottom of the track, rotate the Plate to hook the top of the Plate on the top of the track, and then tighten the screw to lock the Plate in place.

Additional Information

To remove Units, perform the steps above in reverse order.

Precautions for Safe Use

Always turn OFF the power supply to the Controller before attempting any of the following.
- Mounting or removing I/O Units or CPU Units
- Assembling the Units.
- Setting DIP switches or rotary switches.
- Connecting cables or wiring the system.
- Connecting or disconnecting the connectors.

The Power Supply Unit continues to supply power to the Controller for up to several seconds after the power supply is turned OFF. The PWR indicator remains lit as long as power is supplied. Make sure that the PWR indicator is not lit before you perform any of the above operations.
Use the DIN Track and DIN Track End Plates shown below. Secure each DIN Track inside a control panel with at least three screws.

- **DIN Track**
  
  Model numbers: PFP-50N (50 cm), PFP-100N (100 cm), PFP-100N2 (100 cm)

Secure the DIN Track to the control panel using M4 screws separated by 210 mm (6 holes) or less and using at least 3 screws. The tightening torque is 1.2 N·m.

- **PFP-M DIN Track End Plates** (2 required)

DIN Track and Accessories

<table>
<thead>
<tr>
<th>Model</th>
<th>Length 1</th>
<th>Length 2</th>
<th>Length 3</th>
<th>Length 4</th>
<th>Length 5</th>
<th>Length 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFP-100N2</td>
<td>1000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PFP-100N/50N</td>
<td>1000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Twenty-eight, 25 x 4.5 oblong holes

* PFP-50N dimensions are given in parentheses.
CS/CJ-series I/O Connecting Cables are used to connect the NJ-series CPU Rack and CJ-series Expansion Racks.

- **CS/CJ-series I/O Connecting Cables**
  - These connectors are equipped with easy-lock connectors.
  - Use them to connect the CPU Rack to an Expansion Rack or to connect two Expansion Racks.

<table>
<thead>
<tr>
<th>Model number</th>
<th>Cable length</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS1W-CN313</td>
<td>0.3 m</td>
</tr>
<tr>
<td>CS1W-CN713</td>
<td>0.7 m</td>
</tr>
<tr>
<td>CS1W-CN223</td>
<td>2 m</td>
</tr>
<tr>
<td>CS1W-CN323</td>
<td>3 m</td>
</tr>
<tr>
<td>CS1W-CN523</td>
<td>5 m</td>
</tr>
<tr>
<td>CS1W-CN133</td>
<td>10 m</td>
</tr>
<tr>
<td>CS1W-CN133B2</td>
<td>12 m</td>
</tr>
</tbody>
</table>

- The CS/CJ-series I/O Connecting Cables are used to connect the I/O Control Unit on the NJ-series CPU Rack to the I/O Interface Unit on a CJ-series Expansion Rack or to connect the I/O Interface Units on two CJ-series Expansion Racks.
- Install the Racks and select I/O Connecting Cables so that the total length of all I/O Connecting Cables does not exceed 12 m.
- The following diagram shows where each I/O Connecting Cable must be connected on each Rack. The Rack will not operate if the cables aren’t connected properly.
• The top and bottom of the connector are different. Be sure the connector is facing the correct direction before connecting it.

**Connecting the Easy-lock Connectors**

Insert the connector until it locks in place. The Controller will not operate properly if the connector is not inserted completely.

To remove the connector, press the tabs and pull on the connector.


**Precautions for Correct Use**

- When using an I/O Connecting Cable with a locking connector, be sure that the connector is firmly locked in place before using it.
- Always turn OFF the power supply to the Controller before connecting a cable.
- An I/O bus check error will occur and the Controller will stop if an I/O Connecting Cable’s connector is disconnected from the Rack. Be sure that the connectors are secure.
- A 63-mm hole will be required if the I/O Connecting Cable must pass through a hole when connecting an Expansion Rack.
- Do not bend the I/O Connecting cable past its natural bending radius or pull in it with excessive force.
- The cables can withstand a pulling force up to 49 N (11 lbs).
- The minimum bending radius is shown in the following diagram.

![Diagram showing minimum bending radius](image)

- Always attach the cover to the output connector (left side) on the last I/O Interface Unit on the last Expansion Rack to protect it from dust.

---

### 4-3-5 Assembled Appearance and Dimensions

The NJ-series Units, including the Power Supply Unit, the CPU Unit, and I/O Units, are connected to each other. An End Cover is connected to the right end.
### Dimensions

#### Power Supply Unit

<table>
<thead>
<tr>
<th>Model</th>
<th>Unit width (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJ-PA3001</td>
<td>70</td>
</tr>
<tr>
<td>NJ-PD3001</td>
<td>70</td>
</tr>
</tbody>
</table>

#### CPU Unit

<table>
<thead>
<tr>
<th>Model</th>
<th>Unit width (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJ501-1500</td>
<td>90</td>
</tr>
<tr>
<td>NJ501-1400</td>
<td></td>
</tr>
<tr>
<td>NJ501-1300</td>
<td></td>
</tr>
<tr>
<td>NJ501-4500</td>
<td></td>
</tr>
<tr>
<td>NJ501-4400</td>
<td></td>
</tr>
<tr>
<td>NJ501-4300</td>
<td></td>
</tr>
<tr>
<td>NJ501-4310</td>
<td></td>
</tr>
<tr>
<td>NJ501-1520</td>
<td></td>
</tr>
<tr>
<td>NJ501-1420</td>
<td></td>
</tr>
<tr>
<td>NJ501-1320</td>
<td></td>
</tr>
<tr>
<td>NJ501-4320</td>
<td></td>
</tr>
<tr>
<td>NJ301-1200</td>
<td></td>
</tr>
<tr>
<td>NJ301-1100</td>
<td></td>
</tr>
<tr>
<td>NJ101-1000</td>
<td></td>
</tr>
<tr>
<td>NJ101-9000</td>
<td></td>
</tr>
<tr>
<td>NJ101-1020</td>
<td></td>
</tr>
<tr>
<td>NJ101-9020</td>
<td></td>
</tr>
</tbody>
</table>

#### End Cover

<table>
<thead>
<tr>
<th>Model</th>
<th>Unit width (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CJ1W-TER01</td>
<td>14.7</td>
</tr>
</tbody>
</table>

Other Units come into two widths: 20 mm and 31 mm.

#### 20-mm-wide Units

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Unit width (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O Control Unit</td>
<td>CJ1W-IC101</td>
<td>20</td>
</tr>
<tr>
<td>32-point Basic I/O Units</td>
<td>CJ1W-ID231/ID232/ID233</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CJ1W-OD231/OD232/OD233/OD234</td>
<td></td>
</tr>
<tr>
<td>B7A Interface Units</td>
<td>CJ1W-B7A22/CJ1W-B7A14/CJ1W-B7A04</td>
<td></td>
</tr>
</tbody>
</table>
### 31-mm-wide Units

<table>
<thead>
<tr>
<th>Name</th>
<th>Model</th>
<th>Unit width (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O Interface Unit</td>
<td>CJ1W-II101</td>
<td>31</td>
</tr>
<tr>
<td>8-point and 16-point Basic I/O Units</td>
<td>CJ1W-ID201</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CJ1W-ID211/212</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CJ1W-IA111/201</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CJ1W-OD201</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CJ1W-OD211/212/213</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CJ1W-OC201/211</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CJ1W-OA201</td>
<td></td>
</tr>
<tr>
<td>32-point Basic I/O Units</td>
<td>CJ1W-MD231/232/233</td>
<td></td>
</tr>
<tr>
<td>64-point Basic I/O Units</td>
<td>CJ1W-INT01</td>
<td></td>
</tr>
<tr>
<td>Analog I/O Units</td>
<td>CJ1W-AD04U</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CJ1W-PH41U</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CJ1W-PDC15</td>
<td></td>
</tr>
<tr>
<td>Temperature Control Units</td>
<td>CJ1W-TC03/04-03/04</td>
<td></td>
</tr>
<tr>
<td>High-speed Counter Unit</td>
<td>CJ1W-CT021</td>
<td></td>
</tr>
<tr>
<td>ID Sensor Units</td>
<td>CJ1W-V680C11/12</td>
<td></td>
</tr>
<tr>
<td>Serial Communications Units</td>
<td>CJ1W-SCU22/32/42</td>
<td></td>
</tr>
<tr>
<td>EtherNet/IP Unit</td>
<td>CJ1W-EIP21</td>
<td></td>
</tr>
<tr>
<td>DeviceNet Unit</td>
<td>CJ1W-DRM21</td>
<td></td>
</tr>
<tr>
<td>CompoNet Master Unit</td>
<td>CJ1W-CRM21</td>
<td></td>
</tr>
<tr>
<td>PROFINET-IO Unit</td>
<td>CJ1W-PNT21</td>
<td></td>
</tr>
<tr>
<td>PROFIBUS-DP Master Unit</td>
<td>CJ1W-PRM21</td>
<td></td>
</tr>
<tr>
<td>PROFIBUS-DP Slave Unit</td>
<td>CJ1W-PRT21</td>
<td></td>
</tr>
<tr>
<td>EtherCAT Slave Unit</td>
<td>CJ1W-ECT21</td>
<td></td>
</tr>
</tbody>
</table>
• Design Example for Width W

Power Supply Unit: NJ-PA3001 (70 mm)
CPU Unit: NJ501-1500 (90 mm)
Basic I/O Units: CJ1W-ID231 (20 mm) × 2
Special I/O Units: CJ1W-AD081-V1 (31 mm) × 4
CPU Bus Unit: CJ1W-EIP21 (31 mm) × 1

\[
W = 70 + 90 + 20 \times 2 + 31 \times 4 + 31 \times 1 + 14.7 \text{(End Cover)} = 369.7 \text{ mm}
\]

Refer to Rack Current Consumption and Width Display on page 3-19 for the procedure to check the width of each Rack from the Sysmac Studio.

### Installation Dimensions

<table>
<thead>
<tr>
<th>DIN Track</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFP-100N2</td>
<td>16 mm</td>
</tr>
<tr>
<td>PFP-100N</td>
<td>7.3 mm</td>
</tr>
<tr>
<td>PFP-50N</td>
<td>7.3 mm</td>
</tr>
</tbody>
</table>
Installation Height

With a height of 90.0 mm, the CPU Unit is the highest component in an NJ-series CPU Rack. It is also higher than any Units on an Expansion Rack. When a cable is connected (such as a connecting cable to Support Software), however, even greater height is required. Allow sufficient depth in the control panel containing the Controller.
### 4-4-1 Power Supply Wiring

**AC Power Supply Units**

- **NJ-PA3001 Power Supply Unit**

![Diagram of AC Power Supply Units](image)

* The RUN output is ON when the CPU Unit is in RUN mode and OFF when the CPU Unit is in PROGRAM mode or a Controller error in the major fault level occurs.

---

**Additional Information**

The RUN output function is enabled only when mounted to a CPU Rack.
● AC Power Source
  • Supply 100 to 240 VAC.
  • Keep voltage fluctuations within the specified range:

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>Allowable voltage fluctuations</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 to 240 VAC</td>
<td>85 to 264 VAC</td>
</tr>
</tbody>
</table>

• If one power supply phase of the equipment is grounded, connect the grounded phase side to the L2/N terminal.

● Isolation Transformer
  The Controller's internal noise isolation circuits are sufficient to control typical noise in power supply lines. Noise between the Controller and ground can be significantly reduced by connecting a 1-to-1 isolation transformer. Do not ground the secondary coil of the transformer.

● Power Supply Capacity
  The power consumption will be 120 VA maximum, per Rack for the NJ-PA3001. When you select the power supply, consider that surge current will flow when the power is turned ON. Refer to 3-3-1 Models and Specifications for information on surge current specifications.

● RUN Output
  This output is ON when the CPU Unit is operating; it is OFF when the CPU Unit is in PROGRAM mode or a Controller error in the major fault level occurs.

  The RUN output can be used to control external systems, such as in an emergency stop circuit that turns OFF the power supply to external systems when the CPU Unit is not operating. (Refer to 4-2 Fail-safe Circuits for more information.)

<table>
<thead>
<tr>
<th>Item</th>
<th>NJ-PA3001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact form</td>
<td>SPST-NO</td>
</tr>
<tr>
<td>Maximum switching</td>
<td></td>
</tr>
<tr>
<td>capacity</td>
<td></td>
</tr>
<tr>
<td>240 VAC:</td>
<td>2 A for resistive loads</td>
</tr>
<tr>
<td>120 VAC:</td>
<td>0.5 A for inductive loads</td>
</tr>
<tr>
<td>24 VDC:</td>
<td>2 A for resistive loads</td>
</tr>
</tbody>
</table>
● Crimp Terminals
The terminals on the Power Supply Unit are M4, self-raising terminals with screws.

Precautions for Safe Use
- Use crimp terminals for wiring.
- Do not connect bare stranded wires directly to terminals.
- Tighten the terminal block screws to a torque of 1.2 N·m.
- Use crimp terminals (M4) having the dimensions shown below.
  - Crimp Terminals for AC Power Supplies

![Crimp Terminals Diagram]

- Always remove any dustproof labels that are on the top of the Units when they are shipped before you turn ON the power supply. If the labels are not removed, heat will accumulate and malfunctions may occur.

Precautions for Correct Use
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.

DC Power Supplies

- NJ-PD3001 Power Supply Unit

![DC Power Supplies Diagram]
DC Power Source
Supply 24 VDC. Keep voltage fluctuations within the specified range.

<table>
<thead>
<tr>
<th>Model</th>
<th>Allowable voltage fluctuation range</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJ-PD3001</td>
<td>19.2 to 28.8 VDC (24 VDC ±20%)</td>
</tr>
</tbody>
</table>

Power Supply Capacity
The maximum power consumption is 50 W (NJ-PD3001) per Rack.

When you select the power supply, consider that surge current will flow when the power is turned ON.

Refer to 3-3-1 Models and Specifications for information on surge current specifications.

RUN Output
This output is ON when the CPU Unit is operating; it is OFF when the CPU Unit is in PROGRAM mode or a Controller error in the major fault level occurs.

The RUN output can be used to control external systems, such as in an emergency stop circuit that turns OFF the power supply to external systems when the CPU Unit is not operating. (Refer to 4-2 Fail-safe Circuits for more information.)

Crimp Terminals
The terminals on the Power Supply Unit are M4, self-raising terminals with screws.

Precautions for Safe Use
- Use crimp terminals for wiring.
- Do not connect bare stranded wires directly to terminals.
- Tighten the terminal block screws to the torque of 1.2 N·m.
- Use crimp terminals (M4) having the dimensions shown below.

Crimp Terminals for DC Power Supplies

- Always remove any dustproof labels that are on the top of the Units when they are shipped before you turn ON the power supply. If the labels are not removed, heat will accumulate and malfunctions may occur.

Precautions for Correct Use
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.
4-4  Wiring

4-4-1  Power Supply Wiring

• GR terminal is a ground terminal to prevent electrical shock. Always ground the terminal.

• LG terminal is a noise-filtered neutral terminal to increase noise resistance, and it is effective in suppressing power supply common noise. The internal circuit is shown in the following figure. Ground the LG terminal alone or connect the LG terminal with the GR terminal.

• When you ground the LG terminal or connect the LG terminal with the GR terminal, it may cause to enter noise into devices or equipments. In this case, do not ground the LG terminal or connect the LG terminal with the GR terminal.

• Ground the GR and LD terminals with a ground resistance of less than 100 Ω using a 14-gauge wire (minimum cross-sectional area of 2 mm²).

• The ground wire should not be more than 20 m long.

• The NJ-/CJ-series Controllers are designed to be mounted so that they are isolated (separated) from the mounting surface to protect them from the effects of noise in the installation environment (e.g., the control panel).

• Do not share the Controller’s ground with other equipment or ground the Controller to the metal structure of a building. Doing so may worsen operation. Whenever possible, use an independent ground (with the ground pole separated by a minimum of 10 m from any other ground pole).

---

### Grounding

<table>
<thead>
<tr>
<th>Terminal name</th>
<th>Grounding type</th>
<th>Symbol</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>LG</td>
<td>Functional Grounding</td>
<td><img src="image" alt="Functional Grounding Symbol" /></td>
<td>Functional grounding is done to protect device and system functions, including prevention of noise from external sources, or prevention of noise from devices or equipment that could have harmful effects on other devices or equipment.</td>
</tr>
<tr>
<td>GR</td>
<td>Protective Grounding</td>
<td><img src="image" alt="Protective Grounding Symbol" /></td>
<td>Protective grounding is done to ensure safety. It is intended to prevent electrical shock by grounding the electrical potential that is generated by factors such as leakage, induction, or failure.</td>
</tr>
</tbody>
</table>

Power supply unit diagram:

- Power supply input terminal
- LG (Noise-filter neutral terminal)
- GR (Ground terminal)
- CPU Unit side

---

Grounding Terminals

<table>
<thead>
<tr>
<th>Terminal name</th>
<th>Symbol</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>LG</td>
<td><img src="image" alt="LG Symbol" /> Functional Grounding</td>
<td>Functional grounding is done to protect device and system functions, including prevention of noise from external sources, or prevention of noise from devices or equipment that could have harmful effects on other devices or equipment.</td>
</tr>
<tr>
<td>GR</td>
<td><img src="image" alt="GR Symbol" /> Protective Grounding</td>
<td>Protective grounding is done to ensure safety. It is intended to prevent electrical shock by grounding the electrical potential that is generated by factors such as leakage, induction, or failure.</td>
</tr>
</tbody>
</table>
• Ground to 100 Ω or less, and if possible use a separate ground from those of other devices. (Refer to figure (a) in the diagram below.)

• If using an independent ground is not possible, then use a common ground as shown in figure (b). Connect to the ground pole of the other device.

- Refer to 4-5-6 Grounding on page 4-57 for details on the grounding of the control panel.

**Precautions for Safe Use**

If the LG and GR terminals are connected, make sure to connect them firmly. The LG terminal that is a noise-filtered neutral terminal, has a half electrical potential of the input voltage. Therefore, if you touch the metallic part of the LG terminal, GR terminal, or Controller, while the GR terminal is not grounded, it may result in electrical shock.

**Crimp Terminals**

The terminals on the Power Supply Unit are M4, self-raising terminals with screws.

**Precautions for Safe Use**

- Use crimp terminals for wiring.
- Do not connect bare stranded wires directly to terminals.
- Tighten the terminal block screws to the torque of 1.2 N·m.
- Use crimp terminals (M4) having the dimensions shown below.

**Crimp Terminals for DC Power Supply**

When wiring an AC Power Supply Unit, if one power supply phase of the equipment is grounded, always connect the grounded phase to the L2/N terminal.

**4-4-2 Wiring the Built-in EtherCAT Port**

For information on wiring the built-in EtherCAT port, refer to the *NJ/NX-series CPU Unit Built-in EtherCAT Port User’s Manual* (Cat. No. W505).
4-4-3 Wiring CJ-series Basic I/O Units with Terminal Blocks

**Precautions for Wiring I/O Units**

- **I/O Unit Specifications**
  Double-check the specifications for the I/O Units. Be particularly careful of the following to prevent failure, damage, and fires.
  - Make sure that voltages of the external power supplies are within the ratings of the I/O Units.
  - Make sure that load currents are within the ratings of the Output Units.
  - Make sure that power supply terminals with polarity are connected correctly.

- **Electric Wires**
  The following wire gauges are recommended.

<table>
<thead>
<tr>
<th>Terminal Block Connector</th>
<th>Wire Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-terminal</td>
<td>AWG 22 to 18 (0.32 to 0.82 mm²)</td>
</tr>
</tbody>
</table>

- The current capacity of electric wire depends on factors such as the ambient temperature and insulation thickness as well as the gauge of the conductor.

- **Crimp Terminals**
  The terminals on the I/O Unit are M3, self-raising terminals with screws.

**Precautions for Safe Use**

- Use crimp terminals for wiring.
- Do not connect bare stranded wires directly to terminals.
- Tighten the terminal block screws to the torque of 0.5 N·m.
- Use crimp terminals (M3) having the dimensions shown below.

**Wiring**

- Make sure that all Units are connected properly.
- Do not allow wire clippings, shavings, or other foreign material to enter any Unit during wiring.
- To allow heat to dissipate, always remove any dustproof labels that are on the top of the Units before you turn ON the power supply.
• Wire the Units so that they can be easily replaced.
• Make sure that the I/O indicators are not covered by the wiring.
• Do not place the wiring for I/O Units in the same duct or raceway as power lines. Inductive noise can cause errors in operation.
• Tighten the terminal screws to the torque of 0.5 N·m.

● Terminal Blocks
• The I/O Units are equipped with removable terminal blocks. The lead wires do not have to be removed from the terminal block to remove it from an I/O Unit.
• After you complete wiring, check to see if the terminal block is securely locked.

4-4-4 Wiring CJ-series Basic I/O Units with Connectors

This section describes wiring for CJ-series Basic I/O Units with connectors (32- and 64-point Units). Depending on the connector, the following methods are used to connect these Units to external I/O devices.
• Use an OMRON Connecting Cable (equipped with a special connector) to connect to a Terminal Block or Relay Terminal.
• Use a special connector and make your own cable.
Precautions for Safe Use

- Do not apply voltages that exceeds the input voltages for Input Units or the maximum ratings of Output Units.
- When the power supply has positive and negative terminals, be sure to wire them correctly.
- Use the power supply in SELV specifications for the DC power supplies connected to DC I/O Units when required by EU Directives (low voltage).
- When connecting the connector to the I/O Unit, tighten the connector screws to a torque of 0.2 N·m.
- Turn ON the power after checking the connector's wiring.
- Do not pull the cable. Doing so will damage the cable.
- Bending the cable too sharply can damage or break wiring in the cable.

Additional Information

CJ-series Basic I/O Units with 32 or 64 points and Fujitsu connectors have the same connector pin allocations as the C200H High-density I/O Units and CS-series I/O Units with connectors to make them compatible.

Connecting to a Connector-Terminal Block Conversion Unit or I/O Relay Terminal

For details on using OMRON Connecting Cables equipped with special connectors to connect Basic I/O Units with connectors to OMRON Connector-Terminal Block Conversion Units or I/O Relay Terminals, refer to A-2-4 Connecting Connector-Terminal Block Conversion Units and I/O Relay Terminals.

Using User-made Cables with Connector

• Available Connectors

Use the following connectors when assembling a connector and cable.

CJ-series 32- and 64-point Basic I/O Units with Fujitsu Connectors

<table>
<thead>
<tr>
<th>Model</th>
<th>Specifications</th>
<th>Pins</th>
</tr>
</thead>
<tbody>
<tr>
<td>CJ1W-ID231</td>
<td>Input Unit, 24 VDC, 32 inputs</td>
<td>40</td>
</tr>
<tr>
<td>CJ1W-ID261</td>
<td>Input Unit, 24 VDC, 64 inputs</td>
<td></td>
</tr>
<tr>
<td>CJ1W-OD231</td>
<td>Transistor Output Unit with Sinking Outputs, 32 outputs</td>
<td></td>
</tr>
<tr>
<td>CJ1W-OD261</td>
<td>Transistor Output Unit with Sinking Outputs, 64 outputs</td>
<td></td>
</tr>
<tr>
<td>CJ1W-MD261</td>
<td>24-VDC Input/Transistor Output Units, 32 Inputs, 32 Outputs</td>
<td></td>
</tr>
<tr>
<td>CJ1W-MD231</td>
<td>24-VDC Input/Transistor Output Units, 16 Inputs, 16 Outputs</td>
<td>24</td>
</tr>
</tbody>
</table>

Applicable Cable-side Connectors

<table>
<thead>
<tr>
<th>Connection</th>
<th>Pins</th>
<th>OMRON set</th>
<th>Fujitsu parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solder-type</td>
<td>40</td>
<td>C500-CE404</td>
<td>Socket: FCN-361J040-AU</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Connector cover: FCN-360C040-J2</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>C500-CE241</td>
<td>Socket: FCN-361J024-AU</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Connector cover: FCN-360C024-J2</td>
</tr>
</tbody>
</table>
Installation and Wiring

Applicable Cable-side Connectors

<table>
<thead>
<tr>
<th>Connection</th>
<th>Pins</th>
<th>OMRON set</th>
<th>Fujitsu parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crimped</td>
<td>40</td>
<td>C500-CE405</td>
<td>FCN-363J040</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Connector cover: FCN-360C040-J2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Contacts: FCN-363J-AU</td>
</tr>
<tr>
<td>Pressure-welded</td>
<td>24</td>
<td>C500-CE242</td>
<td>FCN-363J024</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Connector cover: FCN-360C024-J2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Contacts: FCN-363J-AU</td>
</tr>
</tbody>
</table>

Applicable Units

<table>
<thead>
<tr>
<th>Model</th>
<th>Specifications</th>
<th>Pins</th>
</tr>
</thead>
<tbody>
<tr>
<td>CJ1W-ID232</td>
<td>Input Unit, 24 VDC, 32 inputs</td>
<td></td>
</tr>
<tr>
<td>CJ1W-ID233</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CJ1W-ID262</td>
<td>Input Unit, 24 VDC, 64 inputs</td>
<td></td>
</tr>
<tr>
<td>CJ1W-OD232</td>
<td>Transistor Output Unit with sourcing outputs, 32 outputs</td>
<td></td>
</tr>
<tr>
<td>CJ1W-OD262</td>
<td>Transistor Output Unit with sourcing outputs, 64 outputs</td>
<td></td>
</tr>
<tr>
<td>CJ1W-OD233</td>
<td>Transistor Output Unit with sinking outputs, 32 outputs</td>
<td></td>
</tr>
<tr>
<td>CJ1W-OD234</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CJ1W-OD263</td>
<td>Transistor Output Unit with sinking outputs, 64 outputs</td>
<td></td>
</tr>
<tr>
<td>CJ1W-MD263</td>
<td>24-VDC Input/Transistor Output Units, 32 inputs, 32 outputs</td>
<td></td>
</tr>
<tr>
<td>CJ1W-MD563</td>
<td>TTL Input/TTL Output Units, 32 inputs, 32 outputs</td>
<td></td>
</tr>
<tr>
<td>CJ1W-MD232</td>
<td>24-VDC Input/Transistor Output Units, 16 inputs, 16 outputs</td>
<td></td>
</tr>
<tr>
<td>CJ1W-MD233</td>
<td>24-VDC Input/Transistor Output Units, 16 inputs, 16 outputs</td>
<td></td>
</tr>
</tbody>
</table>

Applicable Cable-side Connectors

<table>
<thead>
<tr>
<th>Connection</th>
<th>Pins</th>
<th>OMRON set</th>
<th>DDK parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure-welded</td>
<td>40</td>
<td>XG4M-4030-T</td>
<td>FRC5-A040-3TOS</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>XG4M-2030-T</td>
<td>FRC5-A020-3TOS</td>
</tr>
</tbody>
</table>

Wire Size

We recommend using cable with wire gauges of AWG 24 or AWG 28 (0.2 mm² to 0.08 mm²). Use cable with external wire diameters of 1.61 mm max.

Wiring Procedure

The following wiring procedure is an example for Fujitsu connectors.

1. Check that each Unit is installed securely.

Precautions for Correct Use

Do not force the cables.
2 Cover the Unit while wiring to prevent wire clippings from entering the Unit. If there is a dustproof label on the top of the Unit, do not remove it before you wire the Unit. (Remove the label or other covering after wiring has been completed to allow air circulation needed for cooling.)

3 When solder-type connectors are being used, be sure not to accidentally short adjacent terminals. Cover the solder joint with heat-shrink tubing.

Precautions for Safe Use

If the external power supply to an Output Unit has polarity, connect it with the correct polarity. If the polarity is reversed, current may flow in the reverse direction and damage the connected devices regardless of the operation of the Controller.
4. Assemble the connector (purchased separately).

5. Insert the wired connector.

6. (Remove the label or other covering after wiring has been completed to allow air circulation needed for cooling.)

Tighten the connector lock screws to a torque of 0.2 N·m.
**4-4-5 Connecting to Connector-Terminal Block Conversion Units or I/O Relay Terminals**

OMRON Connecting Cable can be used to connect Basic I/O Units with Connectors to OMRON Connector-Terminal Block Conversion Units or to OMRON I/O Relay Terminals. For details, refer to A-2-4 Connecting Connector-Terminal Block Conversion Units and I/O Relay Terminals.

---

**Connection Examples**

- **Connector-Terminal Block Conversion Unit**
  - Basic I/O Unit
  - Connecting Cable
  - Connector-Terminal Block Conversion Unit
  - 40 or 60 terminals

- **I/O Relay Terminals**
  - Basic I/O Unit
  - Connecting Cable
  - I/O Relay Terminal
  - Connecting Cable
4-4-6 Connecting I/O Devices

**Input Devices**

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

- **DC Input Units**

  The following types of DC input devices can be connected.

  - **Contact output**

  - **Two-wire DC output**

  - **NPN open-collector output**

  - **NPN current output**

  - **PNP current output**

  - **Voltage output**

  - **Current regulator**

  - **0 V**

  - **7 mA**

  - **Sensor**

  - **Power Supply**

  - **Output**

  - **IN**

  - **COM**

  - **DC Input Unit**

- **The circuit below should NOT be used for I/O devices having a voltage output.**
● Precautions for Correct Use

When using a reed switch as the input contact for an AC Input Unit, use a switch with an allowable current of 1 A or greater. If reed switches with smaller allowable currents are used, the contacts may fuse due to surge currents.

● Precautions when Connecting a Two-wire DC Sensor

When using a two-wire sensor with a 24-VDC input device, check that the following conditions have been met. Failure to meet these conditions may result in operating errors.

1. Relation between voltage when the Controller is ON and the sensor residual voltage:
   \[ V_{ON} \leq V_{CC} - V_R \]

2. Relation between voltage when the Controller is ON and sensor control output (load current):
   \[ I_{OUT} \text{ (min)} \leq I_{ON} \leq I_{OUT} \text{ (max.)} \]
   \[ I_{ON} = \frac{(V_{CC} - V_R - 1.5 \text{ [Controller internal residual voltage]})}{R_{IN}} \]

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

\[ R \leq \frac{(V_{CC} - V_R)}{(I_{OUT} \text{ (min.)} - I_{ON})} \]

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

\( V_{CC} \): ON voltage to Input Unit
\( V_R \): Sensor output residual current
\( I_{ON} \): Input Unit ON current
\( I_{OUT} \): Sensor control current (load current)
\( R_{IN} \): Input Unit input impedance
(3) Relation between current when the Controller is OFF and sensor leakage current:

IOFF ≥ Ileak

Connect a bleeder resistor if Ileak is greater than IOFF. Use the following equation to calculate the bleeder resistance constant.

\[ R \leq \frac{(R_{IN} \times V_{OFF})}{(I_{leak} \times R_{IN} - V_{OFF})} \]

\[ \text{Power} W \geq \frac{(V_{CC} - VR)^2}{R} \times 4 \] [allowable margin]

(4) Precautions on Sensor Surge Current

An incorrect input may occur if a sensor is turned ON after the Controller has started up to the point where inputs are possible. Determine the time required for sensor operation to stabilize after the sensor is turned ON and take appropriate measures, such as inserting a timer delay into the user program after turning ON the sensor.

**Programming Example**

In this example, the sensor's power supply voltage is used as the input to SensorVcc. A timer delay (100 ms for an OMRON Proximity Sensor) is added to the user program to wait for sensor operation to stabilize. After the timer times out and then the SensorOK input changes to TRUE, a sensor input to the SensorIn input causes InData to change to TRUE.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Data type</th>
<th>Initial value</th>
<th>Address</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SensorVcc</td>
<td>BOOL</td>
<td>FALSE</td>
<td>IObus://rack#0/slot#0/Ch1_In/Ch1_In00</td>
<td>Sensor power supply voltage</td>
</tr>
<tr>
<td>SensorIn</td>
<td>BOOL</td>
<td>FALSE</td>
<td>IObus://rack#0/slot#0/Ch1_In/Ch1_In01</td>
<td>Input from sensor</td>
</tr>
<tr>
<td>SensorOK</td>
<td>BOOL</td>
<td>FALSE</td>
<td>---</td>
<td>Sensor stable operation flag</td>
</tr>
<tr>
<td>InData</td>
<td>BOOL</td>
<td>FALSE</td>
<td>---</td>
<td>Sensor input data valid flag</td>
</tr>
<tr>
<td>egPowerDelay</td>
<td>TON</td>
<td>---</td>
<td>---</td>
<td>Sensor input delay timer</td>
</tr>
</tbody>
</table>

\[ VR: \text{Sensor output residual current} \]
\[ I_{OUT}: \text{Sensor control current (load current)} \]
\[ I_{leak}: \text{Sensor leakage current} \]
\[ R: \text{Bleeder resistance} \]

\[ V_{CC}: \text{Controller ON voltage} \]
\[ V_{ON}: \text{Controller OFF voltage} \]
\[ I_{ON}: \text{Controller ON current} \]
\[ I_{OFF}: \text{Controller OFF current} \]
\[ R_{IN}: \text{Controller input impedance} \]
Output Wiring Precautions

- **Output Short-circuit Protection**
  If a load connected to the output terminals is short-circuited, output components and the printed circuit boards may be damaged. To guard against this, incorporate a fuse in the external circuit. Use a fuse with a capacity of about twice the rated output.

- **Transistor Output Residual Voltage**
  A TTL circuit cannot be connected directly to a transistor output because of the transistor’s residual voltage. It is necessary to connect a pull-up resistor and a CMOS IC between the two.

- **Output Surge Current**
  When connecting a transistor or triac output to an output device having a high surge current (such as an incandescent lamp), steps must be taken to avoid damage to the transistor or triac. Use either of the following methods to reduce the surge current.

For information on wiring the built-in EtherCAT port, refer to the *NJ/NX-series CPU Unit Built-in EtherNet/IP Port User's Manual* (Cat. No. W506).

**4-4-7 Wiring the Built-in EtherCAT Port**

Add a resistor that draws about 1/3 of the dark current consumed by the bulb.

Add a control resistor.

---

*NJ-series CPU Unit Hardware User’s Manual (W500)*
### 4-4-8 Wiring B7A Interface Units

#### Terminal Arrangement

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Name</th>
<th>Function</th>
<th>Word</th>
<th>Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Port 1 power supply: V1</td>
<td>Connect to the + terminal of the B7A Link Terminal to be connected to port 1 (only when using a common power supply).</td>
<td>n</td>
<td>Connector with clamps</td>
</tr>
<tr>
<td>2</td>
<td>Port 1 signal: SIG1</td>
<td>Connect to the SIG terminal of the B7A Link Terminal to be connected to port 1.</td>
<td>n+1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Port 1 ground: G1</td>
<td>Connect to the – terminal of the B7A Link Terminal to be connected to port 1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Port 2 power supply: V2</td>
<td>Connect to the + terminal of the B7A Link Terminal to be connected to port 2 (only when using a common power supply).</td>
<td>n+2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Port 2 signal: SIG2</td>
<td>Connect to the SIG terminal of the B7A Link Terminal to be connected to port 2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Port 2 ground: G2</td>
<td>Connect to the – terminal of the B7A Link Terminal to be connected to port 2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Port 3 power supply: V3</td>
<td>Connect to the + terminal of the B7A Link Terminal to be connected to port 3 (only when using a common power supply).</td>
<td>n+3</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Port 3 signal: SIG3</td>
<td>Connect to the SIG terminal of the B7A Link Terminal to be connected to port 3.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Port 3 ground: G3</td>
<td>Connect to the – terminal of the B7A Link Terminal to be connected to port 3.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Port 4 power supply: V4</td>
<td>Connect to the + terminal of the B7A Link Terminal to be connected to port 4 (only when using a common power supply).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Port 4 signal: SIG4</td>
<td>Connect to the SIG terminal of the B7A Link Terminal to be connected to port 4.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Port 4 ground: G4</td>
<td>Connect to the – terminal of the B7A Link Terminal to be connected to port 4.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>+ power supply: V</td>
<td>Connect to the + terminal of the external power supply.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>– power supply: G</td>
<td>Connect to the – terminal of the external power supply.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note** Terminals V1, V2, V3, V4, and V are connected internally in the Unit, and terminals G1, G2, G3, G4, and G are connected internally in the Unit.
Preparing and Connecting Cables

Use the following procedure to prepare and connect the cables.

Precautions for Correct Use

Always turn OFF the Unit’s power supply and communications power supply before attaching or removing connectors.

1 Preparing the Covering

First, use the following procedure to prepare the cable.

(1) Strip approximately 10 mm of the sheath covering the signal lines to match the crimp terminals. Next, twist together the wires of each signal line firmly.

(2) Use vinyl tape or a heat-shrink tube to cover the end of the VCTF cable sheath, as shown in the following diagram.

2 Preparing Cable Signal Lines

Attach the crimp terminals to the cable’s signal lines.

(1) Attaching Crimp Terminals

Insert the end of the cable into the terminal and crimp.

(2) Insulate the stripped end of each signal line with vinyl tape or heat-shrink tubing.

Recommended Crimp Terminals for Cables

<table>
<thead>
<tr>
<th>Model</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI-series AI0.75-8GY (Product code: 3200519)</td>
<td>PHOENIX CONTACT</td>
</tr>
<tr>
<td>H0.75/14 (Product code: 046290)</td>
<td>Nihon Weidmuller Co., Ltd.</td>
</tr>
<tr>
<td>TE-0.75</td>
<td>NICHIFU Co., Ltd.</td>
</tr>
</tbody>
</table>
Precautions for Correct Use

Always use the specified crimp tool to attach the crimp terminals. If a crimp tool is not used, the cable will not be crimped properly, which may cause the cable to become detached from the terminal.

The following crimp tools are available.

<table>
<thead>
<tr>
<th>Model</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>UD6 (Product code: 1204436) or ZA3 Series</td>
<td>PHOENIX CONTACT</td>
</tr>
<tr>
<td>Crimper PZ1.5 (Product code: 900599)</td>
<td>Nihon Weidmuller Co., Ltd.</td>
</tr>
<tr>
<td>NH77</td>
<td>NICHIFU Co., Ltd.</td>
</tr>
</tbody>
</table>

3 Connecting Cables

Use the following procedure to connect cables to the connection terminals.

(1) Orient the connector properly, and then insert the signal lines fully into the back of each terminal hole in the connector, as shown in the following diagram. (The signal lines are secured in this way, without requiring the use of a tool.) If crimp terminals are not used on the signal lines, use a small flat-blade screwdriver to press down on the orange tab to insert the signal lines.

- Power Supply on One Side (Common Power Supply)

- Power Supply on Both Sides (Separate Power Supplies)
Additional Information

To remove the signal lines from the connector, press down on the orange tab while pulling out the signal line, as shown in the following diagram.

Precautions for Correct Use

To remove the connector from the Unit, fully unscrew the set screws from both sides of the connector, and then remove the connector. Forcibly pulling the connector while the set screws are still attached may damage the connector.
Connection Diagrams

Precautions for Correct Use

- Confirm that terminals are connected correctly. If connections are incorrect, the internal components of the B7A Interface Unit and B7A Link Terminal may be damaged.
- Route the signal lines in separate ducts both inside and outside the control panel to isolate them from power lines.
- Connect cables at a distance that is within the range given in the specifications.
- Always turn OFF the power to the CPU Unit and all other Units before connecting the communications cables.
- Always lay communications cables within ducts.

● Standard Mode

- Power Supply on One Side (Common Power Supply)

B7A Interface Unit

Transmission distance: 100 m max.

Transmission cable: VCTF 0.75mm² min.

12 to 24 V DC

B7A Link Terminal

- Power Supply on Both Sides (Separate Power Supplies)

B7A Interface Unit

Transmission distance: 500 m max.

Transmission cable: VCTF 0.75mm² min.

12 to 24 V DC

B7A Link Terminal
● **High-speed Mode**

**Note** If shielded cable is not used, the maximum transmission distance is 10 m regardless of whether a common or separate power supplies are used. (Use VCTF cable of 0.75 mm² or higher.)

- **Power Supply on One Side (Common Power Supply)**

![Diagram of B7A Interface Unit with 12 to 24 V DC connection and transmission distance of 50 m max.]

- **Power Supply on Both Sides (Separate Power Supplies)**

![Diagram of B7A Interface Unit with 12 to 24 V DC connection and transmission distance of 100 m max.]

Shielded cable: VCTF 0.75 mm² min. Ground
4-5 Control Panel Installation

To ensure system reliability and safety, the system must be designed and configured according to the installation environment (temperature, humidity, vibration, shock, corrosive gases, overcurrent, noise, etc.).

4-5-1 Temperature

Panels have been reduced in size due to space-saving and miniaturization in devices and systems, and the temperature inside the panel may be at least 10 to 15°C higher than outside the panel. Implement the following measures against overheating at the installation site and in the panel, and allow a sufficient margin for the temperature.

<table>
<thead>
<tr>
<th>High Temperatures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use the following cooling methods as required, taking into account the ambient temperature and the amount of heating inside the panel.</td>
</tr>
</tbody>
</table>

● Natural Cooling

Natural cooling relies on natural ventilation through slits in the panel, rather than using cooling devices such as fans or coolers. When using this method, observe the following points.

- Do not install the Controller at the top of the panel, where hot air tends to stagnate.
- To provide ventilation space above and below the Controller, leave sufficient distance from other devices, wiring ducts, etc.
- Do not mount the Units in the wrong direction (e.g., vertically or upside down). Doing so may cause abnormal heating in the Controller.
- Do not install the Controller directly above any heat-generating equipment, such as heaters, transformers, and devices with high resistance.
- Do not install the Controller in a location exposed to direct sunlight.

● Forced Ventilation (by Fan at Top of Panel)

Forced Ventilation Method
- Forced Air Circulation (by Fan in Closed Panel)

- Room Cooling (Cooling the Entire Room Where the Control Panel Is Located)

### Low Temperatures

The Controller may not start normally if the temperature is below 0°C when the power is turned ON. Maintain an air temperature of at least approximately 5°C inside the panel, by implementing measures such as installing a low-capacity space heater in the panel. Alternatively, leave the Controller power ON to keep the Controller warm.
4-5-2 Humidity

Rapid temperature changes can cause condensation to occur, resulting in malfunctioning due to short-circuiting. When there is a possibility of this occurring, take measures against condensation, such as leaving the Controller power ON at night or installing a heater in the control panel to keep it warmer.

Examples of Measures against Condensation

4-5-3 Vibration and Shock

The Controller is tested for conformity with the sine wave vibration test method (IEC 60068-2-6) and the shock test method (IEC 60068-2-27) of the Environmental Testing for Electrotechnical Products. It is designed so that malfunctioning will not occur within the specifications for vibration and shock. If, however, the Controller is to be used in a location in which it will be directly subjected to regular vibration or shock, then implement the following countermeasures:

- Either separate the control panel from the source of the vibration or shock, or secure the Controller and the panel with rubber padding to prevent vibration.
- Make the building or the floor vibration-resistant.
- To prevent shock when other devices in the panel such as electromagnetic contactors operate, secure either the source of the shock or the Controller with rubber padding.

4-5-4 Atmosphere

Using the Controller in any of the following locations can cause defective contact with connectors and corrosion of components. Implement countermeasures such as purging the air as required.

- In locations exposed to dust, dirt, salt, metal powder, soot, or organic solvents, use a panel with an airtight structure. Be careful of temperature increases inside the panel.
- In locations exposed to corrosive gas, purge the air inside the panel to clear the gas and then pressurize the inside of the panel to prevent gas from entering from outside.
- In locations where flammable gas is present, either use an explosion-protected construction or do not use the Controller.
4-5-5 Electrical Environment

When installing or wiring devices, make sure that there will be no danger to people and that noise will not interfere with electrical signals.

Controller Installation Location

Install the Controller as far away as possible from high-voltage (600 V or higher) and power devices to ensure safe operation and maintenance.

Arrangement of Controller and Units

Observe the following points.

- Place a Unit that does not generate much noise next to the CPU Unit, such as an Input Unit or Communications Unit.
- The coils and contacts in electromagnetic contactors and relays in an external circuit are sources of noise. Do not install them close to the Controller. Locate them at least 100 mm away from the Controller.
Wire Layout for the Power Supply System

Observe the following points when wiring the power supply system.

- Separate the Controller power supply from the I/O device power supply and install a noise filter near the Controller power supply feed section.
- Use an isolating transformer to significantly reduce noise between the Controller and the ground. Install the isolating transformer between the Controller power supply and the noise filter, and do not ground the secondary coil of the transformer.
- Keep the wiring between the transformer and the Controller as short as possible, twist the wires well, and keep the wiring separate from high-voltage and power lines.

![Power Supply System Diagram]

Wiring External I/O Signal Lines

Observe the following points when wiring external I/O signal lines.

- To absorb reverse electromotive force when an inductive load is connected to an output signal, connect a surge suppressor near the inductive load in an AC circuit, or connect a diode near the inductive load in a DC circuit.

![Input Signal Noise Countermeasures]

- Never bundle output signal lines with high-voltage or power lines, and do not route them in close proximity or parallel to such lines. If output signal lines must be routed in close proximity to such lines, place them in separate ducts or conduits and be sure to ground the ducts or conduits.

![Output Signal Noise Countermeasures]

- If the signal lines and power lines cannot be routed in separate ducts, use shielded cable. Connect the shield to the ground terminal at the Controller, and leave it unconnected at the input device.
• Wire the lines so that common impedance does not occur. Such wiring will increase the number of wires, so use common return circuits. Use thick wires with sufficient allowance for the return circuits, and bundle them with lines of the same signal level.
• For long I/O lines, wire the input and output signal lines separately.
• Use twisted-pair wires for pilot lamps (and particularly lamps with filaments).
• Use countermeasures, such as CR surge absorbers and diodes, for input device and output load device noise sources, as required.

### External Wiring

Wiring, and noise countermeasures in particular, are based on experience, and it is necessary to closely manage wiring based on experience and information in the manuals.

#### Wiring Routes

Each of the following combinations includes different signal types, properties, or levels. They will cause the signal-to-noise ratio to drop due to factors such as electrical induction. As a general rule when wiring, either use separate cables or separate wiring routes for these items. Future maintenance operations and changes to the system will also be made easier by carefully organizing the wiring from the start.

- Power lines and signal lines
- Input signals and output signals
- Analog signals and digital signals
- High-level signals and low-level signals
- Communications lines and power lines
- DC signals and AC signals
- High-frequency devices (such as Inverters) and signal lines (communications)

#### Wiring Methods

Observe the following points when wiring power supply and signal cables.

- When routing signal cables with differing characteristics through the same duct, always keep them separated.
- As much as possible, avoid routing multiple power supply lines through the same duct. If it cannot be avoided, then construct a partition between them in the duct and ground the partition.

![Partitioning Methods for Signal and Power Supply Cables](image)
• To avoid overheating the conduits when using conduits for wiring, do not place wires for a single circuit in separate conduits.

![Parallel Wiring (Single Phase)](image)

• Power cables and signal cables adversely affect each other. Do not wire them in parallel.

• Noise induction may occur if the Controller is installed in a panel that includes high-voltage devices. Wire and install them as far apart as possible. (Refer to Controller Installation Location on page 4-53.)

• Either install the Controller a minimum of 200 mm away from high-voltage lines or power lines, or place the high-voltage lines or power lines in metal tubing and completely ground the metal tubing to 100 Ω or less.

![Example: Separating Controller from Power Lines](image)

### Other Precautions

• Basic I/O Units have both plus and minus commons, so pay attention to the polarity when wiring.
4-5-6 Grounding

This section describes the earthing methods and precautions. Refer to 4-4-1 Power Supply Wiring on page 4-27 for details on the grounding of the Controller.

Considerations for Earthing Methods

Local potential fluctuations due to lightning or noise occurred by power devices will cause potential fluctuations between ground terminals of devices. This potential fluctuation may result in device malfunction or damage. To prevent this, it is necessary to suppress the occurrence of a difference in electrical potential between ground terminals of devices. You need to consider the earthing methods to achieve this objective.

The recommended earthing methods for each usage condition are given in the following table.

<table>
<thead>
<tr>
<th>Specification of communications cables for EtherCAT and EtherNet/IP</th>
<th>Earthing methods</th>
<th>Star earthing</th>
<th>Daisy chain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Connecting devices and noise sources to separate earth electrodes</td>
<td>Connecting devices and noise sources to a common earth electrode</td>
</tr>
<tr>
<td>The cable shield connected to the connector hood at both ends of the communications cable*1</td>
<td>Recommended</td>
<td>Recommended</td>
<td>Not recommended</td>
</tr>
<tr>
<td>The cable shield connected to the connector hood at only one end of the communications cable*2</td>
<td>Recommended</td>
<td>Recommended</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Neither EtherCAT nor EtherNet/IP used</td>
<td>Recommended</td>
<td>Recommended</td>
<td>Not recommended</td>
</tr>
</tbody>
</table>

*1 Use this cable when using EtherCAT or when using EtherNet/IP with 1000BASE-T.

*2 You can use either of cables when not using EtherCAT or when using EtherNet/IP with 100BASE-T or 10BASE-T.

Additional Information

- In a country or region where the earthing method is regulated, you must comply with the regulations. Refer to the applicable local and national ordinances of the place where you install the system, or other international laws and regulations.
- For details on wiring EtherCAT or EtherNet/IP, refer to the NJ/NX-series CPU Unit Built-in EtherCAT Port User’s Manual (Cat. No. W505) or the NJ/NX-series CPU Unit Built-in EtherNet/IP Port User’s Manual (Cat. No. W506).
- Ethernet switches are used with the EtherNet/IP. For information on the environmental resistance of the Ethernet switch to use, the grounding between Ethernet switches, or the specifications of cables, ask the Ethernet switch manufacturer.
Each of these earthing methods is given below.

- **Equipotential Bonding System**
  Equipotential bonding is an earthing method in which steel frames and building structures, metal ducts and pipes, and metal structures in floors are connected together and make connections to the earth trunk line to achieve a uniform potential everywhere across the entire building. We recommend this earthing method.

  The following figure shows an example of an equipotential bonding system.

  Connect the main earthing terminal and building structures together with equipotential bonding conductors and embed the mesh ground line in each floor.

  Connect the ground line of each control panel to the equipotential bonding system.

- **Star Earthing**
  If the earthing method used for the building is not equipotential bonding or the earthing system is unknown, choose a) from among the earthing methods given below.

  a) Connecting devices and noise sources to separate earth electrodes
     This is an earthing method to separately ground an earth electrode of the device that is connected with a communications cable or other devices and an earth electrode of a high-power device that could be a noise source, such as a motor or inverter. Each earth electrode must be ground to 100 \(\Omega\) or less.

     Connect the ground lines of the device that is connected with a communications cable and other devices as a bundle to a single earth electrode. Be sure that the earth electrode is separated by a minimum of 10 m from any other earth electrode of a device that could be a noise source.
b) Connecting devices and noise sources to a common earth electrode

This is an earthing method to connect the device that is connected with a communications cable, other devices, and a device that could be a noise source, to a common earth electrode. This earthing method is not recommended because the device that could be a noise source may interfere electromagnetically with other devices.

---

- **Daisy Chain**

  This is an earthing method to connect the device that is connected with a communications cable, other devices, and a device that could be a noise source using a daisy-chain topology to a common earth electrode.

  This earthing method is not recommended because the device that could be a noise source may interfere electromagnetically with other devices.
### Precautions for Grounding

#### General Precautions
- To prevent electrical shock, do not connect devices to ground poles (or steel frames) with non-equalized potential to which multiple devices are connected.
- Use a ground pole as close to the Controller as possible and keep the ground line as short as possible.
- If the same ground is used for both the signal lines and the enclosure, isolate the channel base (a grounded metal plate inside a control panel) with an insulating material.

#### Controller Ground Terminals

The NJ-series Controllers are designed to be mounted so that they are isolated (separated) from the mounting surface to protect them from the effects of noise in the installation environment (e.g., the control panel).

- **Protective ground terminal**: Always connected to the Controller chassis to prevent electrical shock.
- **Functional ground terminal**: Connected to a neutral point in the noise filter to provide a ground when power supply noise causes malfunctioning.

When the functional ground terminal is correctly grounded, it is generally effective in suppressing power supply common noise. Occasionally, however, grounding this terminal will result in picking up more noise, so be careful when using it.
● Grounding for AC Power Supply Units

When wiring to an AC Power Supply Unit, if one power supply phase of the equipment is grounded, always connect the grounded phase to the L2/N terminal.
This section describes the overview of methods for checking errors.

5-1 Overview of Troubleshooting ................. 5-2
5-1 Overview of Troubleshooting

You manage all of the errors that occur on the NJ-series Controller as events. This allows you to see what errors have occurred and find corrections for them with the same methods for the entire range of errors that is managed (i.e., CPU Unit, NX-series Slave Terminals, EtherCAT slaves,*1 and CJ-series Units).

*1 Only Sysmac devices are supported.

You can use the troubleshooting functions of the Sysmac Studio or the Troubleshooter on an HMI to quickly check for errors that have occurred and find corrections for them.

Refer to the NJ/NX-series Troubleshooting Manual (Cat. No. W503-E1-19 or later) for types of errors, meanings, specific corrections when errors occur and for troubleshooting information on the entire NJ-series Controller.
This section describes the required inspections and maintenance. It also describes the service lives and replacement procedures for the Battery and Power Supply Units.

6-1 Periodic Maintenance and Inspection 6-2
   6-1-1 Periodic Inspection ........................................ 6-2
   6-1-2 Unit Replacement Precautions .............................. 6-3

6-2 Replacing the Battery 6-4
   6-2-1 Battery Replacement ........................................ 6-4
   6-2-2 Operation without a Battery .............................. 6-7
Periodic Maintenance and Inspection

Daily or periodic inspections are required in order to maintain the Controller’s functions in peak operating condition.

6-1-1 Periodic Inspection

Although the major components in NJ-series Controllers have an extremely long life time, they can deteriorate under improper environmental conditions. Periodic inspections are thus required to ensure that the required conditions are being kept.

Inspection is recommended at least once every six months to a year, but more frequent inspections 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 Points

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Inspection</th>
<th>Criteria</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Source Power Supply</td>
<td>Check for voltage fluctuations at the power supply terminals.</td>
<td>The voltage must be within the allowable voltage fluctuation range.</td>
<td>Use a voltage tester to check the power supply at the terminals. Take necessary steps to bring voltage fluctuations within limits.</td>
</tr>
<tr>
<td>2</td>
<td>I/O Power Supply</td>
<td>Check for voltage fluctuations at the I/O terminals.</td>
<td>Voltages must be within specifications for each Unit.</td>
<td>Use a voltage tester to check the I/O power supply at the terminals. Take necessary steps to bring voltage fluctuations within limits.</td>
</tr>
<tr>
<td>3</td>
<td>Ambient environment</td>
<td>Check that the Controller is not in direct sunlight.</td>
<td>Not in direct sunlight</td>
<td>Protect the Controller if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check the ambient temperature. (Inside the control panel if the Controller is in a control panel.)</td>
<td>Relative humidity must be 10% to 90% with no condensation.</td>
<td>Use a hygrometer to check the humidity and ensure that the ambient humidity remains between 10% and 90%. Make sure that condensation does not occur due to rapid changes in temperature.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check for accumulation of dirt, dust, salt, metal powder, etc.</td>
<td>No accumulation</td>
<td>Clean and protect the Controller if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check for water, oil, or chemical sprays hitting the Controller.</td>
<td>No spray</td>
<td>Clean and protect the Controller if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check for corrosive or flammable gases in the area of the Controller.</td>
<td>No corrosive or flammable gases</td>
<td>Check by smell or use a sensor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check the level of vibration or shock.</td>
<td>Vibration resistance and shock resistance must be within specifications.</td>
<td>Install cushioning or shock absorbing equipment if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check for noise sources near the Controller.</td>
<td>No significant noise sources</td>
<td>Either separate the Controller and noise source or protect the Controller.</td>
</tr>
</tbody>
</table>
6-3  Periodic Maintenance and Inspection

6-1-2  Unit Replacement Precautions

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Inspection</th>
<th>Criteria</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Installation and wiring</td>
<td>Check that each Unit is connected and locked to the next Unit securely.</td>
<td>No looseness</td>
<td>Press the connectors together completely and lock them with the sliders.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check that cable connectors are fully inserted and locked.</td>
<td>No looseness</td>
<td>Correct any improperly installed connectors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check for loose screws in external wiring.</td>
<td>No looseness</td>
<td>Tighten loose screws with a Phillips-head screwdriver.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check crimp connectors in external wiring.</td>
<td>Adequate spacing between connectors</td>
<td>Check visually and adjust if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check for damaged external wiring cables.</td>
<td>No visible damage</td>
<td>Check visually and replace cables if necessary.</td>
</tr>
<tr>
<td>5</td>
<td>User-serviceable parts</td>
<td>Check whether the battery has reached its service life.</td>
<td>Service life expectancy is 5 years at 25°C. (From 0.75 to 5 years depending on model, and ambient temperature.)</td>
<td>Replace the battery when its service life has passed even if a battery error has not occurred. (Battery life depends upon the model, and ambient conditions.)</td>
</tr>
</tbody>
</table>

### Tools Required for Inspections

- **Required Tools**
  - Slotted and Phillips-head screwdrivers
  - Voltage tester or digital voltmeter
  - Industrial alcohol and clean cotton cloth

- **Tools Required Occasionally**
  - Oscilloscope
  - Thermometer and hygrometer (humidity meter)

### Precautions for Correct Use

- If you replaced the CPU Unit, transfer the user program and the variables with a Retain attribute (i.e., variables retained during power interruptions) that are required at startup, before you start operation. Unexpected accidents may occur depending on the relation between the user program and the status of variables retained during power interruptions.
- Routing tables, network parameters, and CPU Bus Unit system settings are stored in the CPU Unit. Be sure to reload this data if you replace the CPU Unit.
- If you replace a slave or Unit, refer to operation manual for the slave or Unit for information on the data required for individual slaves or Units and redo the necessary settings.
## 6-2 Replacing the Battery

The Battery in the NJ-series CPU Unit must be replaced periodically as preventative maintenance. (The Battery is a backup power supply for the CPU Unit's internal clock and the variables that are retained during power interruptions.) This section describes how to replace the Battery.

### 6-2-1 Battery Replacement

**Purpose of the Battery**

The Battery maintains the CPU Unit internal clock and the variables retained during power interruptions while the main power supply is OFF. If the Battery is not installed or Battery voltage drops too low, the internal clock will stop and the variables that are retained for power interruptions will be lost when the main power supply goes OFF.

### Battery Service Life and Replacement Period

<table>
<thead>
<tr>
<th>Model</th>
<th>Approx. maximum lifetime</th>
<th>Approx. minimum lifetime*</th>
<th>Approx. typical lifetime*</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJ501-□□□□</td>
<td>5 years</td>
<td>1.1 years</td>
<td>5 years</td>
</tr>
<tr>
<td>NJ301-□□□□</td>
<td>5 years</td>
<td>2 years</td>
<td>5 years</td>
</tr>
<tr>
<td>NJ101-□□□□</td>
<td>5 years</td>
<td>2 years</td>
<td>5 years</td>
</tr>
</tbody>
</table>

* The minimum lifetime is the memory backup time at an ambient temperature of 55°C. The typical lifetime is the memory backup time at an ambient temperature of 25°C.

![Memory Backup Time Graph](image)

* This graphic is for reference only. This is the value when the power ON time rate is 0% (power OFF).

### Additional Information

The Battery installed at the time of purchase is only for monitoring purpose to test the battery backup function. The Battery is exhausted depending on the period from factory checking to actual operation, thus it may not satisfy specified battery lifetime.
6-2 Replacing the Battery
6-2-1 Battery Replacement

Low Battery Indicators

If the Controller Setup has been set to detect a low-battery error, the ERROR indicator on the front of the CPU Unit will flash when the battery is nearly discharged.

If the ERROR indicator flashes, connect the Sysmac Studio, and then check the CPU Unit's Battery connection if the Sysmac Studio shows a Low Battery Voltage, Battery-backup Memory Check Error, or Real-Time Clock Stopped event. If the Battery is properly connected, replace the Battery with a new one as soon as possible.

Once a low-battery error has been detected, it will take 5 days (at an ambient temperature of 25°C) before the battery fails if power has been supplied at least once a day. Clock data and variables that are retained during power interruptions can be retained by ensuring that the CPU Unit power is not turned OFF until the Battery has been replaced.

Precautions for Correct Use

The Battery will lose its charge faster at high ambient temperatures.

- Replacement Battery

Use the CJ1W-BAT01 Battery Set.

Precautions for Correct Use

Be sure to install a replacement Battery within two years of the production date shown on the Battery label.

Production Date

OMRON
CJ1W-BAT01
08-06
Manufactured in June 2008.
Replacement Procedure

Use the following procedure to replace the battery when the previous battery has become completely discharged.

Precautions for Safe Use

We recommend replacing the battery with the power OFF to prevent the CPU Unit's sensitive internal components from being damaged by static electricity. The battery can be 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 starting the procedure.

After replacing the Battery, connect the Sysmac Studio and clear the Low Battery Voltage event.

1 Turn OFF the power supply to the Controller.
If the CPU Unit has not been ON, turn it ON for at least five minutes and then turn it OFF.

Additional Information

If power is not turned ON for at least five minutes before replacing the battery, the capacitor that backs up memory when the battery is removed will not be fully charged and memory may be lost before the new battery is inserted.

2 Open the compartment on the upper left of the CPU Unit and carefully draw out the battery.

Precautions for Safe Use

- Before you replace the Battery, you must first supply power to the Controller for at least 5 minutes, and then you must complete this procedure within five minutes at 25°C after turning OFF the power to the CPU Unit to ensure memory backup. If power is not supplied for at least 5 minutes, the saved data may be lost.
- Never short-circuit the battery terminals; never charge the battery; never disassemble the battery; and never heat or incinerate the battery. Doing any of these may cause the battery to leak, heat, ignite, or rupture.
- Never use a battery that has been dropped on the floor or otherwise subject to shock. It may leak.
- UL standards require that batteries be replaced by experienced technicians. Always place an experienced technician in charge or battery replacement.
- 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.
**Additional Information**

The Low Battery Voltage event is cleared automatically the next time the Controller is turned ON after replacing the Battery.

---

### 6-2-2 Operation without a Battery

NJ-series CPU Units do not support a battery-free operation function such as CJ-series CPU Units. If a Battery is not connected or the Battery voltage is too low, the following operation occurs.

- A *Low Battery Voltage*, *Battery-backup Memory Check Error*, and *Real-Time Clock Stopped* are detected.
- The system-defined variable `_RetainFail` (Power Retention Failure Flag) will be TRUE.

#### Retaining or Not Retaining Data in the CPU Unit

Data in the CPU Unit will be retained or not retained as described in the following table according to whether there is a Battery.

<table>
<thead>
<tr>
<th>Type of data</th>
<th>Power turned ON</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Battery</td>
</tr>
<tr>
<td>User program</td>
<td>Values before power interruption will be retained.</td>
</tr>
<tr>
<td>Controller Configurations and Setup</td>
<td>Values before power interruption will be retained.</td>
</tr>
<tr>
<td>Event log</td>
<td>Correct values</td>
</tr>
</tbody>
</table>

**Values of variables**

<table>
<thead>
<tr>
<th>AT (allocated memory) specification</th>
<th>Power turned ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Retain attribute</td>
<td>Initial values*</td>
</tr>
<tr>
<td>Retain attribute</td>
<td>Values before power interruption will be retained.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non-retained areas: CIO and Work Areas</th>
<th>Power turned ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retained areas: DM Area</td>
<td>Initial values*</td>
</tr>
<tr>
<td>Words allocated to Special Units (and device variables for Special Units)</td>
<td>Values before power interruption will be retained.</td>
</tr>
<tr>
<td>Words that are not allocated to Special Units</td>
<td>Values before power interruption will be retained.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Retained areas: Holding and EM Areas</th>
<th>Power turned ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-retained areas: CIO and Work Areas</td>
<td>Cleared to zeros.</td>
</tr>
<tr>
<td>Retained areas: Holding, DM, and EM Areas</td>
<td>Values before power interruption will be retained.</td>
</tr>
</tbody>
</table>

*If the initial value setting is blank, the initial value for the data type is used. For example, the initial value of BOOL data is FALSE and the initial value of integer data is 0. Refer to the *NJ/NX-series CPU Unit Software User’s Manual* (Cat. No. W501) for details on the initial values.*
# Appendices

The appendices provide the specifications of the Basic I/O Units, Unit dimensions, load short-circuit protection detection, line disconnection detection, and measures for EMC Directives.

## A-1 Specifications

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A-1 Specifications

This section gives the specifications of the NJ-series CPU Units.

<table>
<thead>
<tr>
<th>Item</th>
<th>NJ501-###</th>
<th>NJ301-###</th>
<th>NJ101-###</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enclosure</td>
<td>Mounted in a panel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grounding method</td>
<td>Ground to less than 100 Ω.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions (height \times depth \times width)</td>
<td>90 mm \times 90 mm \times 90 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>550 g (including the End Cover)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td>5 VDC 1.90 A (including SD Memory Card and End Cover)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operating environment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient operating temperature</td>
<td>0 to 55°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient operating humidity</td>
<td>10% to 90% (with no condensation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atmosphere</td>
<td>Must be free from corrosive gases.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient storage temperature</td>
<td>−20 to 75°C (excluding battery)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Altitude</td>
<td>2,000 m max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pollution degree</td>
<td>2 or less: Meets IEC 61010-2-201.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise immunity</td>
<td>2 kV on power supply line (Conforms to IEC 61000-4-4.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overvoltage category</td>
<td>Category II: Meets IEC 61010-2-201.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMC immunity level</td>
<td>Zone B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>Conforms to IEC 60068-2-6.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 to 8.4 Hz with 3.5-mm amplitude, 8.4 to 150 Hz, Acceleration of 9.8 m/s², 100 min in X, Y, and Z directions (10 sweeps of 10 min each = 100 min total)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock resistance</td>
<td>Conforms to IEC 60068-2-27.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>147 m/s², 3 times in X, Y, and Z directions (100 m/s² for Relay Output Units)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life*1</td>
<td>5 years at 25°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>CJ1W-BAT01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applicable standards*2</td>
<td>cULus, EU Directives, NK, LR and KC*3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 This is the value when the power ON time rate is 0% (power OFF).
*2 Refer to the OMRON website (http://www.ia.omron.com/) or contact your OMRON representative for the most recent applicable standards for each model.
*3 The KC complies with a CPU Unit with a unit version of 1.01 or later.
## A-2-1 Overview of Units

### Basic I/O Units

#### Basic Input Units

<table>
<thead>
<tr>
<th>Type of Unit</th>
<th>Name</th>
<th>Input specifications</th>
<th>Model</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Input Units</td>
<td>DC Input Units</td>
<td>Terminal block, 12 to 24 VDC</td>
<td>8 inputs</td>
<td>CJ1W-ID201 A-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Terminal block, 24 VDC</td>
<td>16 inputs</td>
<td>CJ1W-ID211 A-6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fujitsu connector, 24 VDC</td>
<td>32 inputs</td>
<td>CJ1W-ID231 A-8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MIL connector, 24 VDC</td>
<td>32 inputs</td>
<td>CJ1W-ID232 A-9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fujitsu connector, 24 VDC</td>
<td>64 inputs</td>
<td>CJ1W-ID261 A-11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MIL connector, 24 VDC</td>
<td>64 inputs</td>
<td>CJ1W-ID262 A-13</td>
</tr>
<tr>
<td>AC Input Units</td>
<td>Terminal block, 200 to 240 VAC</td>
<td>8 inputs</td>
<td>CJ1W-IA201 A-15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terminal block, 100 to 120 VAC</td>
<td>16 inputs</td>
<td>CJ1W-IA111 A-16</td>
<td></td>
</tr>
<tr>
<td>Interrupt Input Unit</td>
<td>Terminal block, 24 VDC</td>
<td>16 inputs</td>
<td>CJ1W-INT01 A-17</td>
<td></td>
</tr>
<tr>
<td>Quick-response Input Unit</td>
<td>Terminal block, 24 VDC</td>
<td>16 inputs</td>
<td>CJ1W-IDP01 A-18</td>
<td></td>
</tr>
</tbody>
</table>

#### Basic Output Units

<table>
<thead>
<tr>
<th>Type of Unit</th>
<th>Name</th>
<th>Output specifications</th>
<th>Model</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Output Units</td>
<td>Relay Output Units</td>
<td>Terminal block, 250 VAC/24 VDC, 2 A, 8 independent contacts</td>
<td>8 outputs</td>
<td>CJ1W-OC201 A-19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Terminal block, 250 VAC/24 VDC, 2 A</td>
<td>16 outputs</td>
<td>CJ1W-OC211 A-20</td>
</tr>
<tr>
<td></td>
<td>Triac Output Unit</td>
<td>Terminal block, 200 to 240 VAC</td>
<td>8 inputs</td>
<td>CJ1W-OA201 A-21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Terminal block, 12 to 24 VDC, 2 A</td>
<td>8 outputs</td>
<td>CJ1W-OA202 A-22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Terminal block, 12 to 24 VDC, 0.5 A</td>
<td>8 outputs</td>
<td>CJ1W-OA203 A-23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Terminal block, 12 to 24 VDC, 0.5 A</td>
<td>16 outputs</td>
<td>CJ1W-OA211 A-24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Terminal block, 24 VDC, 0.5 A</td>
<td>16 outputs</td>
<td>CJ1W-OA213 A-25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fujitsu connector, 12 to 24 VDC, 0.5 A</td>
<td>32 outputs</td>
<td>CJ1W-OA231 A-26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MIL connector, 12 to 24 VDC, 0.5 A</td>
<td>32 outputs</td>
<td>CJ1W-OA232 A-27</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MIL connector, 24 VDC, 0.5 A</td>
<td>32 outputs</td>
<td>CJ1W-OA234 A-28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fujitsu connector, 12 to 24 VDC, 0.3 A</td>
<td>64 outputs</td>
<td>CJ1W-OA261 A-30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MIL connector, 12 to 24 VDC, 0.3 A</td>
<td>64 outputs</td>
<td>CJ1W-OA263 A-32</td>
</tr>
<tr>
<td></td>
<td>Sourcing outputs</td>
<td>Terminal block, 24 VDC, 2 A, load short-circuit protection, line disconnection detection</td>
<td>8 outputs</td>
<td>CJ1W-OD202 A-34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Terminal block, 24 VDC, 0.5 A, load short-circuit protection</td>
<td>8 outputs</td>
<td>CJ1W-OD204 A-36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Terminal block, 24 VDC, 0.5 A, load short-circuit protection</td>
<td>16 outputs</td>
<td>CJ1W-OD212 A-37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MIL connector, 24 VDC, 0.5 A, load short-circuit protection</td>
<td>32 outputs</td>
<td>CJ1W-OD232 A-38</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MIL connector, 12 to 24 VDC, 0.3 A</td>
<td>64 outputs</td>
<td>CJ1W-OD262 A-39</td>
</tr>
</tbody>
</table>
● Basic Mixed I/O Units

<table>
<thead>
<tr>
<th>Type of Unit</th>
<th>Name</th>
<th>I/O specifications</th>
<th>Model</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic I/O Units</td>
<td>24-VDC Inputs/Transistor Output Units</td>
<td>Sinking output</td>
<td>CJ1W-MD231</td>
<td>A-41</td>
</tr>
<tr>
<td></td>
<td>Fujitsu connector</td>
<td>Inputs: 24 VDC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outputs: 12 to 24 VDC, 0.5 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MIL connector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inputs: 24 VDC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Outputs: 12 to 24 VDC, 0.5 A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sourcing output</td>
<td></td>
<td>CJ1W-MD233</td>
<td>A-43</td>
</tr>
<tr>
<td></td>
<td>Fujitsu connector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inputs: 24 VDC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Outputs: 12 to 24 VDC, 0.3 A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MIL connector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inputs: 24 VDC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Outputs: 12 to 24 VDC, 0.3 A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TTL I/O Units</td>
<td></td>
<td>CJ1W-MD563</td>
<td>A-50</td>
</tr>
<tr>
<td></td>
<td>Inputs: 5 VDC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Outputs: 5 VDC, 35 mA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reading External Connection and Terminal-Device Variable Diagrams

- I/O terminals in the external connection and terminal-device variable diagrams are shown as viewed from the front panel of the Unit.
- Terminal numbers A0 to A9 and B0 to B9 are used in this manual, but they are not printed on all Units.
- A0 to A20 and B0 to B20 are printed on the Units.
- The signal names of the terminals are the device variable names. The device variable names are the names that use “Jxx” as the device name.
## Basic Input Units with Terminal Blocks

### CJ1W-ID201 DC Input Unit (12 to 24-VDC, 8 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>8-point DC Input Unit with Terminal Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-ID201</td>
</tr>
<tr>
<td>Rated Input Voltage</td>
<td>12 to 24 VDC</td>
</tr>
<tr>
<td>Allowable Input Voltage Range</td>
<td>10.2 to 26.4 VDC</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>2.4 kΩ</td>
</tr>
<tr>
<td>Input Current</td>
<td>10 mA typical (at 24 VDC)</td>
</tr>
<tr>
<td>ON Voltage/ON Current</td>
<td>8.8 VDC min./3 mA min.</td>
</tr>
<tr>
<td>OFF Voltage/OFF Current</td>
<td>3 VDC max./1 mA max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)¹</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)¹</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>8 independent circuits</td>
</tr>
<tr>
<td>Number of Simultaneously ON Points</td>
<td>100% simultaneously ON</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>80 mA max.</td>
</tr>
<tr>
<td>Weight</td>
<td>110 g max.</td>
</tr>
</tbody>
</table>

### Circuit Configuration

![Circuit Diagram]

The ON response time will be 20 μs maximum and OFF response time will be 400 μs maximum even if the response time are set to 0 ms due to internal element delays.

*1 Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.

*2 Polarities of the input power supply can be connected in either direction.
**CJ1W-ID211 DC Input Unit (24 VDC, 16 Points)**

<table>
<thead>
<tr>
<th>Name</th>
<th>16-point DC Input Unit with Terminal Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-ID211</td>
</tr>
<tr>
<td>Rated Input Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Allowable Input Voltage Range</td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>3.3 kΩ</td>
</tr>
<tr>
<td>Input Current</td>
<td>7 mA typical (at 24 VDC)</td>
</tr>
<tr>
<td>ON Voltage/ON Current</td>
<td>14.4 VDC min./3 mA min.</td>
</tr>
<tr>
<td>OFF Voltage/OFF Current</td>
<td>5 VDC max./1 mA max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.) (^1)</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.) (^1)</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>16 (16 points/common, 1 circuit)</td>
</tr>
<tr>
<td>Number of Simultaneously ON Points</td>
<td>100% simultaneously ON (at 24 VDC) (Refer to the following illustration.)</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>80 mA max.</td>
</tr>
<tr>
<td>Weight</td>
<td>110 g max.</td>
</tr>
</tbody>
</table>

---

**Circuit Configuration**

**External connection and terminal-device variable diagram**

- Polarity of the input power supply can be connected in either direction.

---

\(^1\) The ON response time will be 20 μs maximum and OFF response time will be 400 μs maximum even if the response time are set to 0 ms due to internal element delays.

\(^2\) Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.
### CJ1W-ID212 DC Input Unit (24 VDC, 16 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>16-point DC Input Unit with Terminal Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-ID212</td>
</tr>
<tr>
<td>Rated Input Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Allowable Input Voltage Range</td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>3.3 kΩ</td>
</tr>
<tr>
<td>Input Current</td>
<td>7 mA typical (at 24 VDC)</td>
</tr>
<tr>
<td>ON Voltage/ON Current</td>
<td>14.4 VDC min./3 mA min.</td>
</tr>
<tr>
<td>OFF Voltage/OFF Current</td>
<td>5 VDC max./1 mA max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)*1</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)*1</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>16 (16 points/common, 1 circuit)</td>
</tr>
<tr>
<td>Number of Simultaneously ON Points</td>
<td>100% simultaneously ON (at 24 VDC) (Refer to the following illustration.)</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>130 mA max.</td>
</tr>
<tr>
<td>Weight</td>
<td>110 g max.</td>
</tr>
</tbody>
</table>

#### Circuit Configuration

![Circuit Diagram](image)

*1 The ON response time will be 15 μs maximum and OFF response time will be 90 μs maximum even if the response time are set to 0 ms due to internal element delays.

*2 Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.

---

#### External connection and terminal-device variable diagram

![External Connection Diagram](image)

- Polarity of the input power supply can be connected in either direction.
**CJ1W-ID231 DC Input Unit (24 VDC, 32 Points)**

<table>
<thead>
<tr>
<th>Name</th>
<th>32-point DC Input Unit with Fujitsu Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-ID231</td>
</tr>
<tr>
<td>Rated Input Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Allowable Input Voltage Range</td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>5.6 kΩ</td>
</tr>
<tr>
<td>Input Current</td>
<td>4.1 mA typical (at 24 VDC)</td>
</tr>
<tr>
<td>ON Voltage/ON Current</td>
<td>19.0 VDC min./3 mA min.</td>
</tr>
<tr>
<td>OFF Voltage/OFF Current</td>
<td>5 VDC max./1 mA max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>32 (16 points/common, 2 circuits)</td>
</tr>
<tr>
<td>Number of Simultaneously ON Points</td>
<td>75% (12 points/common) simultaneously ON (at 24 VDC) (Refer to the following illustration.)</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>90 mA max.</td>
</tr>
<tr>
<td>Weight</td>
<td>70 g max.</td>
</tr>
<tr>
<td>Accessories</td>
<td>None</td>
</tr>
</tbody>
</table>

**Circuit Configuration**

- The input power polarity can be connected in either direction.
- Be sure to wire both pins A9 and A18 (COM0), and set the same polarity for both pins.
- Be sure to wire both pins B9 and B18 (COM1), and set the same polarity for both pins.

---

![Circuit Diagram](image-url)
The ON response time will be 20 μs maximum and OFF response time will be 400 μs maximum even if the response times are set to 0 ms due to internal element delays.

* The ON response time will be 20 μs maximum and OFF response time will be 400 μs maximum even if the response times are set to 0 ms due to internal element delays.

**Note** Observe the following restrictions when connecting to a 2-wire sensor.
- Make sure the input power supply voltage is larger than the ON voltage (19 V) plus the residual voltage of the sensor (approx. 3 V).
- Use a sensor with a minimum load current of 3 mA min.
- Connect bleeder resistance if you connect a sensor with a minimum load current of 5 mA or higher.

### CJ1W-ID232 DC Input Unit (24 VDC, 32 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>32-point DC Input Unit with MIL Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-ID232</td>
</tr>
<tr>
<td>Rated Input Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Allowable Input Voltage Range</td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>5.6 kΩ</td>
</tr>
<tr>
<td>Input Current</td>
<td>4.1 mA typical (at 24 VDC)</td>
</tr>
<tr>
<td>ON Voltage/ON Current</td>
<td>19.0 VDC min./3 mA min.</td>
</tr>
<tr>
<td>OFF Voltage/OFF Current</td>
<td>5 VDC max./1 mA max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)*</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)*</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>32 (16 points/common, 2 circuits)</td>
</tr>
<tr>
<td>Number of Simultaneously ON Points</td>
<td>75% (12 points/common) simultaneously ON (at 24 VDC) (Refer to the following Illustration.)</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>90 mA max.</td>
</tr>
<tr>
<td>Weight</td>
<td>70 g max.</td>
</tr>
<tr>
<td>Accessories</td>
<td>None</td>
</tr>
</tbody>
</table>

**Circuit Configuration**

**Number of Simultaneously ON Points vs. Ambient Temperature Characteristics**

- 32 points at 40°C
- 28 points at 48°C
- 12 points/common at 55°C
- 10 points/common at 55°C

- **Ambient Temperature (°C):**
  - 0 to 10
  - 20 to 30
  - 40 to 50
  - 60 to 70

<table>
<thead>
<tr>
<th>Ambient Temperature (°C)</th>
<th>Number of Simultaneously ON Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 10</td>
<td>32 points</td>
</tr>
<tr>
<td>20 to 30</td>
<td>32 points</td>
</tr>
<tr>
<td>40 to 50</td>
<td>32 points</td>
</tr>
<tr>
<td>60 to 70</td>
<td>32 points</td>
</tr>
</tbody>
</table>

- **Input voltage:**
  - 24 VDC
  - 26.4 VDC

- **Internal circuits**
  - Input indicator
  - SW
  - 5.6 kΩ
  - 1000 pF

- **Connector row A**
  - Jxx_Ch1_In00
  - Jxx_Ch1_In15
  - COM0
  - COM1

- **Connector row B**
  - Jxx_Ch2_In00
  - Jxx_Ch2_In15
  - COM0
  - COM1

- **Input voltage:**
  - 24 VDC
  - 26.4 VDC

- **Number of simultaneously ON points**
  - 75% (12 points/common) simultaneously ON (at 24 VDC) (Refer to the following Illustration.)
The input power polarity can be connected in either direction.

Be sure to wire both pins 23 and 24 (COM0), and set the same polarity for both pins.

Be sure to wire both pins 3 and 4 (COM1), and set the same polarity for both pins.

* The ON response time will be 20 $\mu$s maximum and OFF response time will be 400 $\mu$s maximum even if the response times are set to 0 ms due to internal element delays.

### Note

Observe the following restrictions when connecting to a 2-wire sensor:

- Make sure the input power supply voltage is larger than the ON voltage (19 V) plus the residual voltage of the sensor (approx. 3 V).
- Use a sensor with a minimum load current of 3 mA min.
- Connect bleeder resistance if you connect a sensor with a minimum load current of 5 mA or higher.

### CJ1W-ID233 DC Input Unit (24 VDC, 32 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>32-point DC Input Unit with MIL Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-ID233</td>
</tr>
<tr>
<td>Rated Input Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Allowable Input Voltage Range</td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>5.6 kΩ</td>
</tr>
<tr>
<td>Input Current</td>
<td>4.1 mA typical (at 24 VDC)</td>
</tr>
<tr>
<td>ON Voltage/ON Current</td>
<td>19.0 VDC min./3 mA min.</td>
</tr>
<tr>
<td>OFF Voltage/OFF Current</td>
<td>5 VDC max./1 mA max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>32 (16 points/common, 2 circuits)</td>
</tr>
<tr>
<td>Number of Simultaneously ON Points</td>
<td>75% (12 points/common) simultaneously ON (at 24 VDC) (Refer to the following illustration.)</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>200 mA max.</td>
</tr>
<tr>
<td>Weight</td>
<td>70 g max.</td>
</tr>
<tr>
<td>Accessories</td>
<td>None</td>
</tr>
</tbody>
</table>
The ON response time will be 15 μs maximum and OFF response time will be 90 μs maximum even if the response times are set to 0 ms due to internal element delays.

**Note** Observe the following restrictions when connecting to a 2-wire sensor.
- Make sure the input power supply voltage is larger than the ON voltage (19 V) plus the residual voltage of the sensor (approximately 3 V).
- Use a sensor with a minimum load current of 3 mA min.
- Connect bleeder resistance if you connect a sensor with a minimum load current of 5 mA or higher.

**CJ1W-ID261 DC Input Unit (24 VDC, 64 Points)**

<table>
<thead>
<tr>
<th>Name</th>
<th>64-point DC Input Unit with Fujitsu Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-ID261</td>
</tr>
<tr>
<td>Rated Input Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Allowable Input Voltage Range</td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>5.6 kΩ</td>
</tr>
<tr>
<td>Input Current</td>
<td>4.1 mA typical (at 24 VDC)</td>
</tr>
<tr>
<td>ON Voltage/ON Current</td>
<td>19.0 VDC min./.3 mA min.</td>
</tr>
<tr>
<td>OFF Voltage/OFF Current</td>
<td>5 VDC max./1 mA max.</td>
</tr>
</tbody>
</table>
**ON Response Time**: 8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)

**OFF Response Time**: 8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)

**Number of Circuits**: 64 (16 points/common, 4 circuits)

**Number of Simultaneously ON Points**: 50% (16 points/common) simultaneously ON (at 24 VDC) (Refer to the following illustrations.)

**Insulation Resistance**: 20 MΩ between external terminals and the GR terminal (100 VDC)

**Dielectric Strength**: 1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.

**Internal Current Consumption**: 90 mA max.

**Weight**: 110 g max.

**Accessories**: None

---

**Circuit Configuration**

---

**External connection and terminal-device variable diagram**

- The input power polarity can be connected in either direction.
- Be sure to wire both pins A9 and A18 (COM0) of CN1, and set the same polarity for both pins.
- Be sure to wire both pins B9 and B18 (COM1) of CN1, and set the same polarity for both pins.

---

**Appendices**

- The ON response time will be 120 µs maximum and OFF response time will be 400 µs maximum even if the response times are set to 0 ms due to internal element delays.

**Note**: Observe the following restrictions when connecting to a 2-wire sensor.

- Make sure the input power supply voltage is larger than the ON voltage (19 V) plus the residual voltage of the sensor (approx. 3 V).
- Use a sensor with a minimum load current of 3 mA min.
- Connect bleeder resistance if you connect a sensor with a minimum load current of 5 mA or higher.
**CJ1W-ID262 DC Input Unit (24 VDC, 64 Points)**

<table>
<thead>
<tr>
<th>Name</th>
<th>64-point DC Input Unit with MIL Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-ID262</td>
</tr>
<tr>
<td>Rated Input Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Allowable Input Voltage Range</td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>5.6 kΩ</td>
</tr>
<tr>
<td>Input Current</td>
<td>4.1 mA typical (at 24 VDC)</td>
</tr>
<tr>
<td>ON Voltage/ON Current</td>
<td>19.0 VDC min./3 mA min.</td>
</tr>
<tr>
<td>OFF Voltage/OFF Current</td>
<td>5 VDC max./1 mA max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>64 (16 points/common, 4 circuits)</td>
</tr>
<tr>
<td>Number of Simultaneously ON Points</td>
<td>50% (8 points/common) simultaneously ON (at 24 VDC) (Refer to the following illustrations.)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>90 mA max.</td>
</tr>
<tr>
<td>Weight</td>
<td>110 g max.</td>
</tr>
<tr>
<td>Accessories</td>
<td>None</td>
</tr>
</tbody>
</table>

**Circuit Configuration**

![Circuit Diagram](image)

<table>
<thead>
<tr>
<th>Allocated CIO word</th>
<th>Signal name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wd m-1</td>
<td>Jxx,Ch1:In00, Jxx,Ch1:In15, COM1, SW</td>
</tr>
<tr>
<td>Wd m+1</td>
<td>Jxx,Ch2:In00, Jxx,Ch2:In15, COM1</td>
</tr>
<tr>
<td>Wd m+2</td>
<td>Jxx,Ch3:In00, Jxx,Ch3:In15, COM2</td>
</tr>
<tr>
<td>Wd m+3</td>
<td>Jxx,Ch4:In00, Jxx,Ch4:In15, COM2</td>
</tr>
</tbody>
</table>

**Number of Simultaneously ON Points vs. Ambient Temperature Characteristic**

- 64 points at 47°C
- 64 points at 35°C
- 64 points at 25°C

Input voltage: 20.4 VDC
- 12 points/common (total: 48 points) at 55°C
- 8 points/common (total: 40 points) at 55°C

Input voltage: 26.4 VDC
- 12 points/common (total: 48 points) at 55°C
- 8 points/common (total: 40 points) at 55°C
The ON response time will be 120 μs maximum and OFF response time will be 400 μs maximum even if the response times are set to 0 ms due to internal element delays.

**Note** Observe the following restrictions when connecting to a 2-wire sensor.

- Make sure the input power supply voltage is larger than the ON voltage (19 V) plus the residual voltage of the sensor (approx. 3 V).
- Use a sensor with a minimum load current of 3 mA min.
- Connect bleeder resistance if you connect a sensor with a minimum load current of 5 mA or higher.
● CJ1W-IA201 AC Input Unit (200 VAC, 8 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>8-point AC Input Unit with Terminal Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-IA201</td>
</tr>
<tr>
<td>Rated Input Voltage</td>
<td>200 to 240 VAC 50/60 Hz</td>
</tr>
<tr>
<td>Allowable Input Voltage Range</td>
<td>170 to 264 VAC</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>21 kΩ (50 Hz), 18 kΩ (60 Hz)</td>
</tr>
<tr>
<td>Input Current</td>
<td>9 mA typical (at 200 VAC, 50 Hz),</td>
</tr>
<tr>
<td></td>
<td>11 mA typical (at 200 VAC, 60 Hz)</td>
</tr>
<tr>
<td>ON Voltage/ON Current</td>
<td>120 VAC min./4 mA min.</td>
</tr>
<tr>
<td>OFF Voltage/OFF Current</td>
<td>40 VAC max./2 mA max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>18.0 ms max. (Default setting in Unit Information: 8 ms)*1</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>48.0 ms max. (Default setting in Unit Information: 8 ms)*1</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>8 (8 points/common, 1 circuit)</td>
</tr>
<tr>
<td>Number of Simultaneously ON Points</td>
<td>100% (8 points/common) simultaneously ON</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between external terminals and the GR terminal (500 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>2,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>80 mA max.</td>
</tr>
<tr>
<td>Weight</td>
<td>130 g max.</td>
</tr>
<tr>
<td>Accessories</td>
<td>None</td>
</tr>
</tbody>
</table>

**Circuit Configuration**

**Terminal Connections**

*1 Can be set to 0 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, or 32 ms in the Unit Information settings. When the response times have been set to 0 ms, the ON response time will be 10 ms maximum and the OFF response time will be 40 ms maximum due to internal element delays.

*2 Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.
**CJ1W-IA111 AC Input Unit (100 VAC, 16 points)**

<table>
<thead>
<tr>
<th>Name</th>
<th>16-point AC Input Unit with Terminal Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-IA111</td>
</tr>
<tr>
<td>Rated input voltage</td>
<td>100 to 120 VAC 50/60 Hz</td>
</tr>
<tr>
<td>Allowable Input Voltage Range</td>
<td>85 to 132 VAC</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>14.5 kΩ (50 Hz), 12 kΩ (60 Hz)</td>
</tr>
<tr>
<td>Input Current</td>
<td>7 mA typical (at 100 VAC, 50 Hz), 8 mA typical (at 100 VAC, 60 Hz)</td>
</tr>
<tr>
<td>ON Voltage/ON Current</td>
<td>70 VAC min./4 mA min</td>
</tr>
<tr>
<td>OFF Voltage/OFF Current</td>
<td>20 VAC max./2 mA max</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>18.0 ms max. (Default setting in Unit Information: 8 ms)</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>48.0 ms max. (Default setting in Unit Information: 8 ms)</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>16 (16 points/common, 1 circuit)</td>
</tr>
<tr>
<td>Number of Inputs ON Simultaneously</td>
<td>100% simultaneously ON (16 points/common)</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between external terminals and the GR terminal (500 VDC)</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>90 mA max.</td>
</tr>
<tr>
<td>Weight</td>
<td>130 g max.</td>
</tr>
<tr>
<td>Accessories</td>
<td>None</td>
</tr>
</tbody>
</table>

---

**Circuit Layout**

**External connection and terminal-device variable diagram**

*1 Can be set to 0 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, or 32 ms in the Unit Information settings. When the response times have been set to 0 ms, the ON response time will be 10 ms maximum and the OFF response time will be 40 ms maximum due to internal element delays.

*2 Use an input voltage of 90 VAC or higher when connecting 2-wire sensors.

*3 Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.
● CJ1W-INT01 Interrupt Input Unit (16 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>16-point Interrupt Input Unit with Terminal Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-INT01</td>
</tr>
<tr>
<td>Rated Input Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Allowable Input Voltage Range</td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>3.3 kΩ</td>
</tr>
<tr>
<td>Input Current</td>
<td>7 mA typical (at 24 VDC)</td>
</tr>
<tr>
<td>ON Voltage/ON Current</td>
<td>14.4 VDC min./3 mA min.</td>
</tr>
<tr>
<td>OFF Voltage/OFF Current</td>
<td>5 VDC max./1 mA max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>0.05 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>0.5 ms max.</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>16 (16 points/common, 1 circuit)</td>
</tr>
<tr>
<td>Number of Simultaneously ON Points</td>
<td>100% (16 points/common) simultaneously ON (24 VDC)</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between external terminals and GR terminal (at 100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between external terminals and GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>80 mA max.</td>
</tr>
<tr>
<td>Weight</td>
<td>110 g max.</td>
</tr>
<tr>
<td>Accessories</td>
<td>None</td>
</tr>
</tbody>
</table>

**Name**
- CJ1W-INT01

**Model**
- CJ1W-INT01

**Rated Input Voltage**
- 24 VDC

**Allowable Input Voltage Range**
- 20.4 to 26.4 VDC

**Input Impedance**
- 3.3 kΩ

**Input Current**
- 7 mA typical (at 24 VDC)

**ON Voltage/ON Current**
- 14.4 VDC min./3 mA min.

**OFF Voltage/OFF Current**
- 5 VDC max./1 mA max.

**ON Response Time**
- 0.05 ms max.

**OFF Response Time**
- 0.5 ms max.

**Number of Circuits**
- 16 (16 points/common, 1 circuit)

**Number of Simultaneously ON Points**
- 100% (16 points/common) simultaneously ON (24 VDC)

**Insulation Resistance**
- 20 MΩ between external terminals and GR terminal (at 100 VDC)

**Dielectric Strength**
- 1,000 VAC between external terminals and GR terminal for 1 minute at a leakage current of 10 mA max.

**Internal Current Consumption**
- 80 mA max.

**Weight**
- 110 g max.

**Accessories**
- None

---

**Circuit Configuration**

**External connection and terminal-device variable diagram**

- Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.

**Note**
- Interrupt Input Units can be used as normal Basic I/O Units. They cannot be used to start I/O interrupt tasks.

---

*The polarity can be connected in either direction.*
### CJ1W-IDP01 Quick-response Input Unit (16 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>16-point Quick-response Input Unit with Terminal Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-IDP01</td>
</tr>
<tr>
<td>Rated Input Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Allowable Input Voltage Range</td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>3.3 kΩ</td>
</tr>
<tr>
<td>Input Current</td>
<td>7 mA typical (at 24 VDC)</td>
</tr>
<tr>
<td>ON Voltage/ON Current</td>
<td>14.4 VDC min./3 mA min.</td>
</tr>
<tr>
<td>OFF Voltage/OFF Current</td>
<td>5 VDC max./1 mA max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>0.05 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>0.5 ms max.</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>16 (16 points/common, 1 circuit)</td>
</tr>
<tr>
<td>Number of Simultaneously ON Points</td>
<td>100% (16 points/common) simultaneously ON (24 VDC)</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between external terminals and GR terminal (at 100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between external terminals and GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>80 mA max.</td>
</tr>
<tr>
<td>Weight</td>
<td>110 g max.</td>
</tr>
<tr>
<td>Accessories</td>
<td>None</td>
</tr>
</tbody>
</table>

#### Circuit Configuration

- The input power supply polarity can be connected in either direction.
- With quick-response inputs, pulse inputs shorter than the CPU Unit's cycle time can be read by the CPU Unit.
- The pulse width (ON time) that can be read by the Quick-response Input Unit is 0.05 ms.
- Inputs read by the internal circuits are cleared when inputs are refreshed.
- Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.

#### External connection and terminal-device variable diagram

- [Diagram of external connection and terminal-device variable diagram]

---

A-18

NJ-series CPU Unit Hardware User’s Manual (W500)
**Basic Output Units**

- **CJ1W-OC201 Contact Output Unit (Independent Relays, 8 Points)**

<table>
<thead>
<tr>
<th>Name</th>
<th>8-point Contact Output Unit with Terminal Block (Independent Relays)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OC201</td>
</tr>
<tr>
<td>Max. Switching Capacity</td>
<td>2 A 250 VAC ($\cos \phi = 1$), 2 A 250 VAC ($\cos \phi = 0.4$), 2 A 24 VDC (16 A/Unit)</td>
</tr>
<tr>
<td>Min. Switching Capacity</td>
<td>1 mA 5 VDC</td>
</tr>
<tr>
<td>Relays</td>
<td>NY-24W-K-IE (Fujitsu Takamizawa Components, Ltd.), Cannot be replaced.</td>
</tr>
</tbody>
</table>

**Service Life of Relay**

- Electrical: 150,000 operations (24 VDC, resistive load)/100,000 operations (240 VAC, $\cos \phi = 0.4$, inductive load)
- Mechanical: 20,000,000 operations
  
  Service life will vary depending on the connected load. Refer to page A-52 for information on service life according to the load.

<table>
<thead>
<tr>
<th>ON Response Time</th>
<th>15 ms max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF Response Time</td>
<td>15 ms max.</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>8 independent contacts</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between external terminals and the GR terminal (500 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>2,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>90 mA 5 VDC max. 48 mA 24 VDC max. (6 mA × No. of ON points)</td>
</tr>
<tr>
<td>Weight</td>
<td>140 g max.</td>
</tr>
</tbody>
</table>

**Circuit Configuration**

- The input power supply polarity can be connected in either direction.

---

* Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.
### CJ1W-OC211 Contact Output Unit (16 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>16-point Contact Output Unit with Terminal Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OC211</td>
</tr>
<tr>
<td>Max. Switching Capacity</td>
<td>2 A 250 VAC (cosφ = 1), 2 A 250 VAC (cosφ = 0.4), 2 A 24 VDC (8 A/Unit)</td>
</tr>
<tr>
<td>Min. Switching Capacity</td>
<td>1 mA 5 VDC</td>
</tr>
<tr>
<td>Relays</td>
<td>NY-24W-K-IE (Fujitsu Takamizawa Components, Ltd.), Cannot be replaced.</td>
</tr>
</tbody>
</table>

#### Service Life of Relay
- **Electrical:** 150,000 operations (24 VDC, resistive load)/ 100,000 operations (240 VAC, cosφ = 0.4, inductive load)
- **Mechanical:** 20,000,000 operations

Service life will vary depending on the connected load. Refer to page A-52 for information on service life according to the load.

#### ON Response Time
15 ms max.

#### OFF Response Time
15 ms max.

#### Number of Circuits
16 points/common, 1 circuit

#### Insulation Resistance
20 MΩ between external terminals and the GR terminal (500 VDC)

#### Dielectric Strength
2,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.

#### Internal Current Consumption
- 110 mA 5 VDC max.
- 96 mA 24 VDC max. (6 mA × No. of ON points)

#### Weight
170 g max.

![Circuit Configuration Diagram](image)

#### External connection and terminal-device variable diagram
- Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.
CJ1W-OA201 Triac Output Unit (8 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>8-point Triac Output Unit with Terminal Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OA201</td>
</tr>
<tr>
<td>Max. Switching Capacity</td>
<td>0.6 A 250 VAC, 50/60 Hz (2.4 A/Unit)</td>
</tr>
<tr>
<td>Max. Inrush Current</td>
<td>15 A (pulse width: 10 ms max.)</td>
</tr>
<tr>
<td>Min. Switching Capacity</td>
<td>50 mA 75 VAC</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>1.5 mA (200 VAC) max.</td>
</tr>
<tr>
<td>Residual Voltage</td>
<td>1.6 VAC max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>1 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>1/2 of load frequency + 1 ms or less.</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>8 (8 points/common, 1 circuit)</td>
</tr>
<tr>
<td>Surge Protector</td>
<td>C.R Absorber + Surge Absorber</td>
</tr>
<tr>
<td>Fuses</td>
<td></td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>5 A (1/common, 1 used)</td>
</tr>
<tr>
<td></td>
<td>The fuse cannot be replaced by the user.</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>2,000 VAC between the external terminals and</td>
</tr>
<tr>
<td></td>
<td>the GR terminal for 1 minute at a leakage</td>
</tr>
<tr>
<td></td>
<td>current of 10 mA max.</td>
</tr>
<tr>
<td>Internal Current Consump-</td>
<td>220 mA max.</td>
</tr>
<tr>
<td>tion</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>150 g max.</td>
</tr>
</tbody>
</table>

Circuit Configuration

External connection and terminal-device variable diagram

* Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.
CJ1W-OD201 Transistor Output Unit (8 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>8-point Transistor Output Unit with Terminal Block (Sinking Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OD201</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>12 to 24 VDC</td>
</tr>
<tr>
<td>Operating Load Voltage Range</td>
<td>10.2 to 26.4 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>2.0 A/point, 8.0 A/Unit</td>
</tr>
<tr>
<td>Maximum Inrush Current</td>
<td>10 A/point, 10 ms max.</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td>Residual Voltage</td>
<td>1.5 V max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>0.5 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>1.0 ms max.</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between the external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>8 (4 points/common, 2 circuits)</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>90 mA max.</td>
</tr>
<tr>
<td>Fuse</td>
<td>6.3 A (1/common, 2 used)</td>
</tr>
<tr>
<td></td>
<td>The fuse cannot be replaced by the user.</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>12 to 24 VDC, 10 mA min.</td>
</tr>
<tr>
<td>Weight</td>
<td>110 g max.</td>
</tr>
</tbody>
</table>

Circuit Configuration

External connection and terminal-device variable diagram

* Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.
**CJ1W-OD203 Transistor Output Unit (8 Points)**

<table>
<thead>
<tr>
<th>Name</th>
<th>8-point Transistor Output Unit with Terminal Block (Sinking Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OD203</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>12 to 24 VDC</td>
</tr>
<tr>
<td>Operating Load Voltage Range</td>
<td>10.2 to 26.4 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>0.5 A/point, 4.0 A/Unit</td>
</tr>
<tr>
<td>Maximum Inrush Current</td>
<td>4.0 A/point, 10 ms max.</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td>Residual Voltage</td>
<td>1.5 V max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>0.1 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>0.8 ms max.</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between the external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>8 (8 points/common, 1 circuit)</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>100 mA max.</td>
</tr>
<tr>
<td>Fuse</td>
<td>None</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>10.2 to 26.4 VDC, 20 mA min.</td>
</tr>
<tr>
<td>Weight</td>
<td>110 g max.</td>
</tr>
</tbody>
</table>

**Circuit Configuration**

*Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.*
## **CJ1W-OD211 Transistor Output Unit (16 Points)**

<table>
<thead>
<tr>
<th>Name</th>
<th>16-point Transistor Output Unit with Terminal Block (Sinking Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OD211</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>12 to 24 VDC</td>
</tr>
<tr>
<td>Operating Load Voltage Range</td>
<td>10.2 to 26.4 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>0.5 A/point, 5.0 A/Unit</td>
</tr>
<tr>
<td>Maximum Inrush Current</td>
<td>4.0 A/point, 10 ms max.</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td>Residual Voltage</td>
<td>1.5 V max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>0.1 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>0.8 ms max.</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between the external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>16 (16 points/common, 1 circuit)</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>5 VDC 100 mA max.</td>
</tr>
<tr>
<td>Fuse</td>
<td>None</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>10.2 to 26.4 VDC, 20 mA min.</td>
</tr>
<tr>
<td>Weight</td>
<td>110 g max.</td>
</tr>
</tbody>
</table>

### Circuit Configuration

External connection and terminal-device variable diagram

- When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if the polarity is reversed.

* Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.
### CJ1W-OD213 Transistor Output Unit (16 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>16-point Transistor Output Unit with Terminal Block (Sinking Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OD213</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Operating Load Voltage Range</td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>0.5 A/point, 5.0 A/Unit</td>
</tr>
<tr>
<td>Maximum Inrush Current</td>
<td>4.0 A/point, 10 ms max.</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td>Residual Voltage</td>
<td>1.5 V max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>15 μs max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>80 μs max.</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between the external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>16 (16 points/common, 1 circuit)</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>5 VDC 150 mA max.</td>
</tr>
<tr>
<td>Fuse</td>
<td>None</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>20.4 to 26.4 VDC, 55 mA min.</td>
</tr>
<tr>
<td>Weight</td>
<td>110 g max.</td>
</tr>
</tbody>
</table>

#### Circuit Configuration

![Circuit Diagram]

#### External connection and terminal-device variable diagram

<table>
<thead>
<tr>
<th>Signal name</th>
<th>Connector pin*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jxx_Ch1_Out00</td>
<td>B0</td>
</tr>
<tr>
<td>Jxx_Ch1_Out01</td>
<td>B1</td>
</tr>
<tr>
<td>Jxx_Ch1_Out02</td>
<td>B2</td>
</tr>
<tr>
<td>Jxx_Ch1_Out03</td>
<td>B3</td>
</tr>
<tr>
<td>Jxx_Ch1_Out04</td>
<td>A1</td>
</tr>
<tr>
<td>Jxx_Ch1_Out05</td>
<td>A2</td>
</tr>
<tr>
<td>Jxx_Ch1_Out06</td>
<td>A3</td>
</tr>
<tr>
<td>Jxx_Ch1_Out07</td>
<td>A4</td>
</tr>
<tr>
<td>Jxx_Ch1_Out08</td>
<td>B4</td>
</tr>
<tr>
<td>Jxx_Ch1_Out09</td>
<td>B5</td>
</tr>
<tr>
<td>Jxx_Ch1_Out10</td>
<td>A5</td>
</tr>
<tr>
<td>Jxx_Ch1_Out11</td>
<td>A6</td>
</tr>
<tr>
<td>Jxx_Ch1_Out12</td>
<td>B6</td>
</tr>
<tr>
<td>Jxx_Ch1_Out13</td>
<td>B7</td>
</tr>
<tr>
<td>Jxx_Ch1_Out14</td>
<td>A7</td>
</tr>
<tr>
<td>Jxx_Ch1_Out15</td>
<td>B8</td>
</tr>
<tr>
<td>COM</td>
<td>A8</td>
</tr>
</tbody>
</table>

* Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.

* When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if the polarity is reversed.
### CJ1W-OD231 Transistor Output Unit (32 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>32-point Transistor Output Unit with Fujitsu Connector (Sinking Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OD231</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>12 to 24 VDC</td>
</tr>
<tr>
<td>Operating Load Voltage Range</td>
<td>10.2 to 26.4 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>0.5 A/point, 2.0 A/common, 4.0 A/Unit</td>
</tr>
<tr>
<td>Maximum Inrush Current</td>
<td>4.0 A/point, 10 ms max.</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td>Residual Voltage</td>
<td>1.5 V max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>0.1 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>0.8 ms max.</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between the external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>32 (16 points/common, 2 circuits)</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>5 VDC 140 mA max.</td>
</tr>
<tr>
<td>Fuse</td>
<td>None</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>10.2 to 26.4 VDC, 30 mA min.</td>
</tr>
<tr>
<td>Weight</td>
<td>70 g max.</td>
</tr>
<tr>
<td>Accessories</td>
<td>None</td>
</tr>
</tbody>
</table>

#### Circuit Configuration

<table>
<thead>
<tr>
<th>Signal name</th>
<th>Allocated CIO word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jxx_Ch1_Out00 to Jxx_Ch1_Out15</td>
<td>Wd m+1</td>
</tr>
<tr>
<td>+V</td>
<td></td>
</tr>
<tr>
<td>COM0</td>
<td></td>
</tr>
<tr>
<td>COM0</td>
<td></td>
</tr>
<tr>
<td>Jxx_Ch2_Out00 to Jxx_Ch2_Out15</td>
<td>Wd m+1</td>
</tr>
<tr>
<td>+V</td>
<td></td>
</tr>
<tr>
<td>COM1</td>
<td></td>
</tr>
<tr>
<td>COM1</td>
<td></td>
</tr>
</tbody>
</table>

Diagram showing the circuit configuration with output indicators and signal names connected to CIO words and power supplies.
### CJ1W-OD233 Transistor Output Unit (32 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>32-point Transistor Output Unit with MIL Connector (Sinking Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OD233</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>12 to 24 VDC</td>
</tr>
<tr>
<td>Operating Load Voltage Range</td>
<td>10.2 to 26.4 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>0.5 A/point, 2 A/common, 4 A/Unit</td>
</tr>
<tr>
<td>Maximum Inrush Current</td>
<td>4.0 A/point, 10 ms max.</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td>Residual Voltage</td>
<td>1.5 V max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>0.1 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>0.8 ms max.</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between the external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>32 (16 points/common, 2 circuits)</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>140 mA max.</td>
</tr>
<tr>
<td>Fuse</td>
<td>None</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>12 to 24 VDC, 30 mA min.</td>
</tr>
<tr>
<td>Weight</td>
<td>70 g max.</td>
</tr>
</tbody>
</table>

- When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if the polarity is reversed.
- Be sure to wire both terminals A9 and A19 (COM0).
- Be sure to wire both terminals B9 and B19 (COM1).
- Be sure to wire both terminals A10 and A20 (+V).
- Be sure to wire both terminals B10 and B20 (+V).
## CJ1W-OD234 Transistor Output Unit (32 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>32-point Transistor Output Unit with MIL Connector (Sinking Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OD234</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Operating Load Voltage Range</td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>0.5 A/point, 2 A/common, 4 A/Unit</td>
</tr>
<tr>
<td>Maximum Inrush Current</td>
<td>4.0 A/point, 10 ms max.</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td>Residual Voltage</td>
<td>1.5 V max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>15 μs max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>80 μs max.</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between the external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>32 (16 points/common, 2 circuits)</td>
</tr>
</tbody>
</table>

- When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if the polarity is reversed.
- Be sure to wire both terminals 23 and 24 (COM0).
- Be sure to wire both terminals 3 and 4 (COM1).
- Be sure to wire both terminals 21 and 22 (+V).
- Be sure to wire both terminals 1 and 2 (+V).
<table>
<thead>
<tr>
<th>Internal Current Consumption</th>
<th>220 mA max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuse</td>
<td>None</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>20.4 to 26.4 VDC, 110 mA min.</td>
</tr>
<tr>
<td>Weight</td>
<td>70 g max.</td>
</tr>
</tbody>
</table>

### Circuit Configuration

- When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if the polarity is reversed.
- Be sure to wire both terminals 23 and 24 (COM0).
- Be sure to wire both terminals 3 and 4 (COM1).
- Be sure to wire both terminals 21 and 22 (+V).
- Be sure to wire both terminals 1 and 2 (+V).
## CJ1W-OD261 Transistor Output Unit (64 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>64-point Transistor Output Unit with Fujitsu Connectors (Sinking Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OD261</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>12 to 24 VDC</td>
</tr>
<tr>
<td>Operating Load Voltage Range</td>
<td>10.2 to 26.4 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>0.3 A/point, 1.6 A/common, 6.4 A/Unit</td>
</tr>
<tr>
<td>Maximum Inrush Current</td>
<td>3.0 A/point, 10 ms max.</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td>Residual Voltage</td>
<td>1.5 V max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>0.5 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>1.0 ms max.</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between the external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>64 (16 points/common, 4 circuits)</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>5 VDC, 170 mA max.</td>
</tr>
<tr>
<td>Fuse</td>
<td>None</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>10.2 to 26.4 VDC, 50 mA min.</td>
</tr>
<tr>
<td>Weight</td>
<td>110 g max.</td>
</tr>
<tr>
<td>Accessories</td>
<td>None</td>
</tr>
</tbody>
</table>

### Circuit Configuration

![Circuit Diagram](image-url)

**Signal name**

- Jxx_Ch1_Out00
- Jxx_Ch1_Out15
- Jxx_Ch2_Out00
- Jxx_Ch2_Out15
- Jxx_Ch3_Out00
- Jxx_Ch3_Out15
- Jxx_Ch4_Out00
- Jxx_Ch4_Out15

**Allocated CIO word**

<table>
<thead>
<tr>
<th>Wd m</th>
<th>Connector row A</th>
<th>Connector row B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wd m+1</td>
<td>CN1</td>
<td></td>
</tr>
<tr>
<td>Wd m+2</td>
<td>CN2</td>
<td></td>
</tr>
<tr>
<td>Wd m+3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Allocated signals**

- +V
- COM0
- COM1
- COM2
- COM3
When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if the polarity is reversed.

- Be sure to wire both terminals A9 and A19 (COM0) of CN1.
- Be sure to wire both terminals B9 and B19 (COM1) of CN1.
- Be sure to wire both terminals A10 and A20 (+V) of CN1.
- Be sure to wire both terminals B10 and B20 (+V) of CN1.

When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if the polarity is reversed.

- Be sure to wire both terminals A9 and A19 (COM2) of CN2.
- Be sure to wire both terminals B9 and B19 (COM3) of CN2.
- Be sure to wire both terminals A10 and A20 (+V) of CN2.
- Be sure to wire both terminals B10 and B20 (+V) of CN2.
## CJ1W-OD263 Transistor Output Unit (64 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>64-point Transistor Output Unit with MIL Connectors (Sinking Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OD263</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>12 to 24 VDC</td>
</tr>
<tr>
<td>Operating Load Voltage</td>
<td>10.2 to 26.4 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>0.3 A/point, 1.6 A/common, 6.4 A/Unit</td>
</tr>
<tr>
<td>Minimum Inrush Current</td>
<td>3.0 A/point, 10 ms max.</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td>Residual Voltage</td>
<td>1.5 V max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>0.5 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>1.0 ms max.</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between the external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>64 (16 points/common, 4 circuits)</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>170 mA max.</td>
</tr>
<tr>
<td>Fuse</td>
<td>None</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>12 to 24 VDC, 50 mA min.</td>
</tr>
<tr>
<td>Weight</td>
<td>110 g max.</td>
</tr>
</tbody>
</table>

### Circuit Configuration

![Circuit Configuration Diagram](image_url)

- **Signal name**
  - Jxx_Ch1_Out00
  - Jxx_Ch1_Out15
  - Jxx_Ch2_Out00
  - Jxx_Ch2_Out15
  - Jxx_Ch3_Out00
  - Jxx_Ch3_Out15
  - Jxx_Ch4_Out00
  - Jxx_Ch4_Out15

- **Allocated CIO word**
  - Wd m
  - Wd m+1
  - Wd m+2
  - Wd m+3

- **Output Indicator**
  - CN1
  - CN2
  - SW
When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if the polarity is reversed.

- Be sure to wire both terminals 23 and 24 (COM0) of CN1.
- Be sure to wire both terminals 3 and 4 (COM1) of CN1.
- Be sure to wire both terminals 21 and 22 (+V) of CN1.
- Be sure to wire both terminals 1 and 2 (+V) of CN1.

### CN1

<table>
<thead>
<tr>
<th>Connector pin</th>
<th>Allocated CIO word</th>
<th>Signal name</th>
<th>Allocated CIO word</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+V</td>
<td>Jxx_Ch1_Out01</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>+V</td>
<td>Jxx_Ch1_Out02</td>
<td>39</td>
</tr>
<tr>
<td>3</td>
<td>+V</td>
<td>Jxx_Ch1_Out03</td>
<td>38</td>
</tr>
<tr>
<td>4</td>
<td>+V</td>
<td>Jxx_Ch1_Out04</td>
<td>37</td>
</tr>
<tr>
<td>5</td>
<td>+V</td>
<td>Jxx_Ch1_Out05</td>
<td>36</td>
</tr>
<tr>
<td>6</td>
<td>+V</td>
<td>Jxx_Ch1_Out06</td>
<td>35</td>
</tr>
<tr>
<td>7</td>
<td>+V</td>
<td>Jxx_Ch1_Out07</td>
<td>34</td>
</tr>
<tr>
<td>8</td>
<td>+V</td>
<td>Jxx_Ch1_Out08</td>
<td>33</td>
</tr>
<tr>
<td>9</td>
<td>+V</td>
<td>Jxx_Ch1_Out09</td>
<td>32</td>
</tr>
<tr>
<td>10</td>
<td>COM0</td>
<td>Jxx_Ch1_Out10</td>
<td>31</td>
</tr>
<tr>
<td>11</td>
<td>COM0</td>
<td>Jxx_Ch1_Out11</td>
<td>30</td>
</tr>
<tr>
<td>12</td>
<td>COM0</td>
<td>Jxx_Ch1_Out12</td>
<td>29</td>
</tr>
<tr>
<td>13</td>
<td>COM0</td>
<td>Jxx_Ch1_Out13</td>
<td>28</td>
</tr>
<tr>
<td>14</td>
<td>COM0</td>
<td>Jxx_Ch1_Out14</td>
<td>27</td>
</tr>
<tr>
<td>15</td>
<td>COM0</td>
<td>Jxx_Ch1_Out15</td>
<td>26</td>
</tr>
<tr>
<td>16</td>
<td>COM0</td>
<td>Jxx_Ch1_Out16</td>
<td>25</td>
</tr>
<tr>
<td>17</td>
<td>COM0</td>
<td>Jxx_Ch1_Out17</td>
<td>24</td>
</tr>
<tr>
<td>18</td>
<td>COM0</td>
<td>Jxx_Ch1_Out18</td>
<td>23</td>
</tr>
<tr>
<td>19</td>
<td>COM0</td>
<td>Jxx_Ch1_Out19</td>
<td>22</td>
</tr>
<tr>
<td>20</td>
<td>COM0</td>
<td>Jxx_Ch1_Out20</td>
<td>21</td>
</tr>
<tr>
<td>21</td>
<td>COM1</td>
<td>Jxx_Ch1_Out21</td>
<td>20</td>
</tr>
<tr>
<td>22</td>
<td>COM1</td>
<td>Jxx_Ch1_Out22</td>
<td>19</td>
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</table>

### CN2

<table>
<thead>
<tr>
<th>Connector pin</th>
<th>Allocated CIO word</th>
<th>Signal name</th>
<th>Allocated CIO word</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+V</td>
<td>Jxx_Ch2_Out01</td>
<td>36</td>
</tr>
<tr>
<td>2</td>
<td>+V</td>
<td>Jxx_Ch2_Out02</td>
<td>35</td>
</tr>
<tr>
<td>3</td>
<td>+V</td>
<td>Jxx_Ch2_Out03</td>
<td>34</td>
</tr>
<tr>
<td>4</td>
<td>+V</td>
<td>Jxx_Ch2_Out04</td>
<td>33</td>
</tr>
<tr>
<td>5</td>
<td>+V</td>
<td>Jxx_Ch2_Out05</td>
<td>32</td>
</tr>
<tr>
<td>6</td>
<td>+V</td>
<td>Jxx_Ch2_Out06</td>
<td>31</td>
</tr>
<tr>
<td>7</td>
<td>+V</td>
<td>Jxx_Ch2_Out07</td>
<td>30</td>
</tr>
<tr>
<td>8</td>
<td>COM1</td>
<td>Jxx_Ch2_Out08</td>
<td>29</td>
</tr>
<tr>
<td>9</td>
<td>COM1</td>
<td>Jxx_Ch2_Out09</td>
<td>28</td>
</tr>
<tr>
<td>10</td>
<td>COM1</td>
<td>Jxx_Ch2_Out10</td>
<td>27</td>
</tr>
<tr>
<td>11</td>
<td>COM1</td>
<td>Jxx_Ch2_Out11</td>
<td>26</td>
</tr>
<tr>
<td>12</td>
<td>COM1</td>
<td>Jxx_Ch2_Out12</td>
<td>25</td>
</tr>
<tr>
<td>13</td>
<td>COM1</td>
<td>Jxx_Ch2_Out13</td>
<td>24</td>
</tr>
<tr>
<td>14</td>
<td>COM1</td>
<td>Jxx_Ch2_Out14</td>
<td>23</td>
</tr>
<tr>
<td>15</td>
<td>COM1</td>
<td>Jxx_Ch2_Out15</td>
<td>22</td>
</tr>
<tr>
<td>16</td>
<td>COM1</td>
<td>Jxx_Ch2_Out16</td>
<td>21</td>
</tr>
<tr>
<td>17</td>
<td>COM1</td>
<td>Jxx_Ch2_Out17</td>
<td>20</td>
</tr>
</tbody>
</table>

[Diagram of External connection and terminal-device variable diagram]
### CJ1W-OD202 Transistor Output Unit (8 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>8-point Transistor Output Unit with Terminal Block (Sourcing Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OD202</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Operating Load Voltage Range</td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>2 A/point, 8 A/Unit</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td>Residual Voltage</td>
<td>1.5 V max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>0.5 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>1.0 ms max.</td>
</tr>
<tr>
<td>Load Short-circuit Protection</td>
<td>Detection current: 6 A min. Automatic restart after error clearance. (Refer to page A-95.)</td>
</tr>
<tr>
<td>Line Disconnection Detection</td>
<td>Detection current: 200 mA (Refer to page A-95.)</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between the external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>8 (4 points/common, 2 circuits)</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>110 mA max.</td>
</tr>
<tr>
<td>Fuse</td>
<td>None</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>24 VDC, 50 mA min.</td>
</tr>
<tr>
<td>Weight</td>
<td>120 g max.</td>
</tr>
</tbody>
</table>

#### Circuit Configuration

- When an overcurrent or line disconnection is detected, the ERR indicator will light. At the same time, the corresponding bit (two points per bit) in the Basic I/O Unit Information Area system-defined variable will change to TRUE.
A-2 Specifications of Basic I/O Units

External connection and terminal-device variable diagram

* Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.

When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if the polarity is reversed.
CJ1W-OD204 Transistor Output Unit (8 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>8-point Transistor Output Unit with Terminal Block (Sourcing Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OD204</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Operating Load Voltage Range</td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>0.5 A/point, 4.0 A/Unit</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td>Residual Voltage</td>
<td>1.5 V max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>0.5 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>1.0 ms max.</td>
</tr>
</tbody>
</table>

Load Short-circuit Protection
Detection current: 0.7 to 2.5 A
Automatic restart after error clearance. (Refer to page A-98.)

Insulation Resistance
20 MΩ between the external terminals and the GR terminal (100 VDC)

Dielectric Strength
1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.

Number of Circuits
8 (8 points/common, 1 circuit)

Internal Current Consumption
100 mA max.

Fuse
None

External Power Supply
20.4 to 26.4 VDC, 40 mA min.

Weight
120 g max.

---

Circuit Configuration

External connection and terminal-device variable diagram

- When an overcurrent is detected, the ERR indicator will light. At the same time, the corresponding bit in the Basic I/O Unit Information Area system-defined variable will change to TRUE.

* Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.
### CJ1W-OD212 Transistor Output Unit (16 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>16-point Transistor Output Unit with Terminal Block (Sourcing Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OD212</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Operating Load Voltage Range</td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>0.5 A/point, 5.0 A/Unit</td>
</tr>
<tr>
<td>Maximum Inrush Current</td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>1.5 V max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>0.5 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>1.0 ms max.</td>
</tr>
</tbody>
</table>
| Load Short-circuit Protection | Detection current: 0.7 to 2.5 A  
Automatic restart after error clearance. (Refer to page A-98.) |
| Insulation Resistance | 20 MΩ between the external terminals and the GR terminal (100 VDC) |
| Dielectric Strength | 1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max. |
| Number of Circuits | 16 (16 points/common, 1 circuit)                                     |
| Internal Current Consumption | 5 VDC, 100 mA max.                                                  |
| External Power Supply | 20.4 to 26.4 VDC, 40 mA min.                                        |
| Weight | 120 g max.                                                            |

**Circuit Configuration**

- When an overcurrent is detected, the ERR indicator will light. At the same time, the corresponding bit in the Basic I/O Unit Information Area system-defined variable will change to TRUE.

**External connection and terminal-device variable diagram**

- When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if the polarity is reversed.

* Terminal numbers A0 to A8 and B0 to B8 are used in the external connection and terminal-device variable diagrams. They are not printed on the Units.
CJ1W-OD232 Transistor Output Unit (32 Points)

<table>
<thead>
<tr>
<th>Name</th>
<th>32-point Transistor Output Unit with MIL Connector (Sourcing Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OD232</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Operating Load Voltage Range</td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>0.5 A/point, 2.0 A/common, 4.0 A/Unit</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td>Residual Voltage</td>
<td>1.5 V max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>0.5 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>1.0 ms max.</td>
</tr>
<tr>
<td>Load Short-circuit Protection</td>
<td>Detection current: 0.7 to 2.5 A</td>
</tr>
<tr>
<td></td>
<td>Automatic restart after error clearance. (Refer to page A-98.)</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between the external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>32 (16 points/common, 2 circuits)</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>5 VDC 150 mA max.</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>20.4 to 26.4 VDC, 70 mA min.</td>
</tr>
<tr>
<td>Weight</td>
<td>80 g max.</td>
</tr>
<tr>
<td>Accessories</td>
<td>None</td>
</tr>
</tbody>
</table>

Circuit Configuration

- When an overcurrent is detected, the ERR indicator will light. At the same time, the corresponding bit (one bit for each common) in the Basic I/O Unit Information Area system-defined variable will change to TRUE.
• When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if the polarity is reversed.
• Be sure to wire both terminals 21 and 22 (COM0 (+V)).
• Be sure to wire both terminals 1 and 2 (COM1 (+V)).
• Be sure to wire both terminals 3 and 4 (0 V).
• Be sure to wire both terminals 23 and 24 (0 V).

**CJ1W-OD262 Transistor Output Unit (64 Points)**

<table>
<thead>
<tr>
<th>Name</th>
<th>64-point Transistor Output Unit with MIL Connectors (Sourcing Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-OD262</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>12 to 24 VDC</td>
</tr>
<tr>
<td>Operating Load Voltage Range</td>
<td>10.2 to 26.4 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>0.3 A/point, 1.6 A/common, 6.4 A/Unit</td>
</tr>
<tr>
<td>Maximum Inrush Current</td>
<td>3.0 A/point, 10 ms max.</td>
</tr>
<tr>
<td>Residual Voltage</td>
<td>1.5 V max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>0.5 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>1.0 ms max.</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between the external terminals and the GR terminal (100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Number of Circuits</td>
<td>64 (16 points/common, 4 circuits)</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>170 mA max. (5 VDC)</td>
</tr>
<tr>
<td>Fuse</td>
<td>None</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>10.2 to 26.4 VDC, 50 mA min.</td>
</tr>
<tr>
<td>Weight</td>
<td>110 g max.</td>
</tr>
<tr>
<td>Accessories</td>
<td>None</td>
</tr>
</tbody>
</table>
When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if the polarity is reversed.

- Be sure to wire both terminals 21 and 22 (COM0 (+V)) of CN1.
- Be sure to wire both terminals 1 and 2 (COM1 (+V)) of CN1.
- Be sure to wire both terminals 23 and 24 (0 V) of CN1.
- Be sure to wire both terminals 3 and 4 (0 V) of CN1.

When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if the polarity is reversed.

- Be sure to wire both terminals 21 and 22 (COM2 (+V)) of CN2.
- Be sure to wire both terminals 1 and 2 (COM3 (+V)) of CN2.
- Be sure to wire both terminals 23 and 24 (0 V) of CN2.
- Be sure to wire both terminals 3 and 4 (0 V) of CN2.
### Mixed I/O Units

#### CJ1W-MD231 DC Input/Transistor Output Unit (24 VDC, 16 Inputs/16 Outputs)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong></td>
<td>16-point DC Input/16-point Transistor Output Unit with Fujitsu Connectors (Sinking Outputs)</td>
</tr>
<tr>
<td><strong>Model</strong></td>
<td>CJ1W-MD231</td>
</tr>
<tr>
<td><strong>Output section (CN1)</strong></td>
<td><strong>Input section (CN2)</strong></td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>12 to 24 VDC</td>
</tr>
<tr>
<td>Operating Voltage Range</td>
<td>10.2 to 26.4 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>0.5 A/point, 2.0 A/Unit</td>
</tr>
<tr>
<td>Maximum Inrush Current</td>
<td>4.0 A/point, 10 ms max.</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td>Residual Voltage</td>
<td>1.5 V max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>0.1 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>0.8 ms max.</td>
</tr>
<tr>
<td>No. of Circuits</td>
<td>16 (16 points/common, 1 circuit)</td>
</tr>
<tr>
<td>Fuse</td>
<td>None</td>
</tr>
<tr>
<td><strong>Rated Input Voltage</strong></td>
<td>24 VDC</td>
</tr>
<tr>
<td><strong>Operating Input Voltage</strong></td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td><strong>Input Impedance</strong></td>
<td>3.3 kΩ</td>
</tr>
<tr>
<td><strong>Input Current</strong></td>
<td>7 mA typical (at 24 VDC)</td>
</tr>
<tr>
<td>OFF Voltage/ON Current</td>
<td>14.4 VDC min. / 3 mA min.</td>
</tr>
<tr>
<td>ON Voltage/ON Current</td>
<td>5 VDC max. / 1 mA max.</td>
</tr>
<tr>
<td><strong>ON Response Time</strong></td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)</td>
</tr>
<tr>
<td><strong>OFF Response Time</strong></td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)</td>
</tr>
<tr>
<td><strong>No. of Circuits</strong></td>
<td>16 (16 points/common, 1 circuit)</td>
</tr>
<tr>
<td><strong>Fuse</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>External Power Supply</strong></td>
<td>12 to 24 VDC, 20 mA min.</td>
</tr>
<tr>
<td><strong>Number of Simultaneously ON Points</strong></td>
<td>75% (at 24 VDC)</td>
</tr>
<tr>
<td><strong>Insulation Resistance</strong></td>
<td>20 MΩ between the external terminals and the GR terminal (at 100 VDC)</td>
</tr>
<tr>
<td><strong>Dielectric Strength</strong></td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td><strong>Internal Current Consumption</strong></td>
<td>5 VDC 130 mA max.</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>90 g max.</td>
</tr>
<tr>
<td><strong>Accessories</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

**Circuit Configuration**

<table>
<thead>
<tr>
<th>Internal circuits</th>
<th>Signal name</th>
<th>Allocated CIO word</th>
<th>Connect or row A</th>
<th>Connect or row B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output indicator</td>
<td>+V</td>
<td>Jxx_Ch1_Out00 to Jxx_Ch1_Out07</td>
<td>Wd m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>COM0</td>
<td>Jxx_Ch1_Out15</td>
<td>Wd m</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internal circuits</th>
<th>Signal name</th>
<th>Allocated CIO word</th>
<th>Connect or row A</th>
<th>Connect or row B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input indicator</td>
<td>+V</td>
<td>Jxx_Ch1_In00 to Jxx_Ch1_In07</td>
<td>Wd m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>COM1</td>
<td>Jxx_Ch1_In15</td>
<td>Wd m</td>
<td></td>
</tr>
</tbody>
</table>

**Number of Simultaneously ON Points vs. Ambient Temperature Characteristic**

- 16 points at 33°C
- 12 points at 55°C
- 9 points at 55°C
* The ON response time will be 20 μs maximum and OFF response time will be 400 μs maximum even if the response times are set to 0 ms due to internal element delays.

When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if polarity is reversed.

Be sure to wire both pins A9 and B9 (COM0 (0 V)) of CN1.

Be sure to wire both pins A10 and B10 (+V) of CN1.
CJ1W-MD233 DC Input/Transistor Output Unit (24 VDC, 16 Inputs/16 Outputs)

<table>
<thead>
<tr>
<th>Name</th>
<th>16-point DC Input/16-point Transistor Output Unit with MIL Connectors (Sinking Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-MD233</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output section (CN1)</th>
<th>Input section (CN2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated Voltage</strong></td>
<td>12 to 24 VDC</td>
</tr>
<tr>
<td><strong>Operating Load Voltage Range</strong></td>
<td>10.2 to 26.4 VDC</td>
</tr>
<tr>
<td><strong>Maximum Load Current</strong></td>
<td>0.5 A/point, 2.0 A/Unit</td>
</tr>
<tr>
<td><strong>Leakage Current</strong></td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td><strong>Residual Voltage</strong></td>
<td>1.5 V max.</td>
</tr>
<tr>
<td><strong>ON Response Time</strong></td>
<td>0.1 ms max.</td>
</tr>
<tr>
<td><strong>OFF Response Time</strong></td>
<td>0.8 ms max.</td>
</tr>
<tr>
<td><strong>No. of Circuits</strong></td>
<td>16 (16 points/common, 1 circuit)</td>
</tr>
<tr>
<td><strong>Fuse</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>External Power Supply</strong></td>
<td>12 to 24 VDC, 20 mA min.</td>
</tr>
<tr>
<td><strong>Insulation Resistance</strong></td>
<td>20 MΩ between the external terminals and the GR terminal (at 100 VDC)</td>
</tr>
<tr>
<td><strong>Dielectric Strength</strong></td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td><strong>Internal Current Consumption</strong></td>
<td>5 VDC 130 mA max.</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>90 g max.</td>
</tr>
<tr>
<td><strong>Accessories</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

**Circuit Configuration**

![Circuit Diagram]

**Specifications**

- **ON Voltage/ON Current**
  - 14.4 VDC min./3 mA min.
- **OFF Voltage/OFF Current**
  - 5 VDC max./1 mA max.
- **Operating Load Voltage**
  - 20.4 to 26.4 VDC
- **Input Impedance**
  - 3.3 kΩ
- **Maximum Inrush Current**
  - 4.0 A/point, 10 ms max.
- **Input Current**
  - 7 mA typical (at 24 VDC)
- **Rated Input Voltage**
  - 24 VDC
- **Operating Input Voltage**
  - 24 VDC
- **Input Voltage**
  - 20.4 to 26.4 VDC
- **Output Voltage**
  - 10.2 to 26.4 VDC
- **Rated Voltage**
  - 12 to 24 VDC

**Graph:**

Number of Simultaneously ON Points vs. Ambient Temperature Characteristic

- Input voltage: 24 VDC
  - 12 points at 55°C
  - 9 points at 55°C

- Input voltage: 26.4 VDC
  - 16 points at 35°C
  - 16 points at 45°C

**Signal Names and Allocations**

- **CN1 (OUT)**
  - Jxx_Ch1_Out00 to Jxx_Ch1_Out07
  - Jxx_Ch1_Out08 to Jxx_Ch1_Out15
  - COM0
  - +V

- **CN2 (IN)**
  - Jxx_Ch1_In00 to Jxx_Ch1_In07
  - Jxx_Ch1_In08 to Jxx_Ch1_In15
  - COM1
  - +V

**Algorithms**

- Jxx_Ch1_Out00 to Jxx_Ch1_Out07
  - Wd m
- Jxx_Ch1_Out08 to Jxx_Ch1_Out15
  - Wd m+1
- Jxx_Ch1_In00 to Jxx_Ch1_In07
  - Wd m
- Jxx_Ch1_In08 to Jxx_Ch1_In15
  - Wd m+1

**Table:**

<table>
<thead>
<tr>
<th>Internal circuits</th>
<th>Output indicator</th>
<th>Internal circuits</th>
<th>Input indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>+V</td>
<td>Wd m</td>
<td>+V</td>
<td>Wd m+1</td>
</tr>
<tr>
<td>COM0</td>
<td></td>
<td>COM1</td>
<td></td>
</tr>
<tr>
<td>Jxx_Ch1_Out00</td>
<td></td>
<td>Jxx_Ch1_In00</td>
<td></td>
</tr>
<tr>
<td>Jxx_Ch1_Out07</td>
<td></td>
<td>Jxx_Ch1_In07</td>
<td></td>
</tr>
<tr>
<td>Jxx_Ch1_Out08</td>
<td></td>
<td>Jxx_Ch1_In08</td>
<td></td>
</tr>
<tr>
<td>Jxx_Ch1_Out15</td>
<td></td>
<td>Jxx_Ch1_In15</td>
<td></td>
</tr>
</tbody>
</table>

**Number of Simultaneously ON Points**

- 75% (at 24 VDC)

**Graph:**

Number of simultaneously ON points vs. Ambient Temperature Characteristic

- 75% at 24 VDC
- 60% at 26.4 VDC
- 33% at 33°C
- 50% at 45°C
* The ON response time will be 20 μs maximum and OFF response time will be 400 μs maximum even if the response times are set to 0 ms due to internal element delays.

### CJ1W-MD261 DC Input/Transistor Output Unit (24 VDC 32 Inputs/32 Outputs)

<table>
<thead>
<tr>
<th><strong>Name</strong></th>
<th>32-point DC Input/32-point Transistor Output Unit with Fujitsu Connectors (Sinking Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
<td>CJ1W-MD261</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Output section (CN1)</strong></th>
<th><strong>Input section (CN2)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated Voltage</strong></td>
<td>12 to 24 VDC</td>
</tr>
<tr>
<td><strong>Rated Input Voltage</strong></td>
<td>24 VDC</td>
</tr>
<tr>
<td><strong>Operating Load Voltage Range</strong></td>
<td>10.2 to 26.4 VDC</td>
</tr>
<tr>
<td><strong>Operating Input Voltage</strong></td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td><strong>Maximum Load Current</strong></td>
<td>0.3 A/point, 1.6 A/common, 3.2 A/Unit</td>
</tr>
<tr>
<td><strong>Input Impedance</strong></td>
<td>5.6 kΩ</td>
</tr>
<tr>
<td><strong>Maximum Inrush Current</strong></td>
<td>3.0 A/point, 10 ms max.</td>
</tr>
<tr>
<td><strong>Input Current</strong></td>
<td>4.1 mA typical (at 24 VDC)</td>
</tr>
<tr>
<td><strong>Leakage Current</strong></td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td><strong>ON Voltage/ON Current</strong></td>
<td>19.0 VDC min./3 mA min.</td>
</tr>
<tr>
<td><strong>OFF Voltage/OFF Current</strong></td>
<td>5 VDC max./1 mA max.</td>
</tr>
<tr>
<td><strong>ON Response Time</strong></td>
<td>0.5 ms max.</td>
</tr>
<tr>
<td><strong>ON Response Time</strong></td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)</td>
</tr>
<tr>
<td><strong>OFF Response Time</strong></td>
<td>1.0 ms max.</td>
</tr>
<tr>
<td><strong>OFF Response Time</strong></td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)</td>
</tr>
<tr>
<td><strong>No. of Circuits</strong></td>
<td>32 (16 points/common, 2 circuits)</td>
</tr>
<tr>
<td><strong>Number of Simultaneously ON Points</strong></td>
<td>75% (24 points) (at 24 VDC)</td>
</tr>
<tr>
<td><strong>Fuse</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>External Power Supply</strong></td>
<td>12 to 24 VDC, 30 mA min.</td>
</tr>
<tr>
<td><strong>Internal Current Consumption</strong></td>
<td>5 VDC 140 mA max.</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>110 g max.</td>
</tr>
<tr>
<td><strong>Accessories</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

### External connection and terminal-device variable diagram

![Diagram](image-url)

- When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if polarity is reversed.
- Be sure to wire both terminals 3 and 4 (COM0 (0 V)) of CN1.
- Be sure to wire both terminals 1 and 2 (+V) of CN1.

- When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if polarity is reversed.
- Be sure to wire both pins 3 and 4 (COM1) of CN2, and set the same polarity for both pins.
*1 Observe the following restrictions when connecting to a 2-wire sensor.

- Make sure the input power supply voltage is larger than the ON voltage (19 V) plus the residual voltage of the sensor (approx. 3 V).
- Use a sensor with a minimum load current of 3 mA min.
- Connect bleeder resistance if you connect a sensor with a minimum load current of 5 mA or higher.

*2 The ON response time will be 120 μs maximum and OFF response time will be 400 μs maximum even if the response times are set to 0 ms due to internal element delays.
## CJ1W-MD263 DC Input/Transistor Output Unit (24 VDC 32 Inputs/32 Outputs)

<table>
<thead>
<tr>
<th>Name</th>
<th>32-point DC Input/32-point Transistor Output Unit with MIL Connectors (Sinking Outputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-MD263</td>
</tr>
</tbody>
</table>

### Output section (CN1)  
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage</td>
<td>12 to 24 VDC</td>
</tr>
<tr>
<td>Operating Load Voltage Range</td>
<td>10.2 to 26.4 VDC</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>0.3 A/point, 1.6 A/common, 3.2 A/Unit</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td>Residual Voltage</td>
<td>1.5 V max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>0.5 ms max.</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>1.0 ms max.</td>
</tr>
<tr>
<td>No. of Circuits</td>
<td>32 (16 points/common, 2 circuits)</td>
</tr>
<tr>
<td>Fuse</td>
<td>None</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>12 to 24 VDC, 30 mA min.</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>20 MΩ between the external terminals and the GR terminal (at 100 VDC)</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td>Internal Current Consumption</td>
<td>5 VDC 140 mA max.</td>
</tr>
<tr>
<td>Weight</td>
<td>110 g max.</td>
</tr>
</tbody>
</table>

### Input section (CN2)  
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Input Voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Operating Input Voltage</td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>5.6 kΩ</td>
</tr>
<tr>
<td>Input Current</td>
<td>4.1 mA typical (at 24 VDC)</td>
</tr>
<tr>
<td>ON Voltage/ON Current</td>
<td>19.0 VDC min./3 mA min.*1</td>
</tr>
<tr>
<td>OFF Voltage/OFF Current</td>
<td>5 VDC max./1 mA max.</td>
</tr>
<tr>
<td>ON Response Time</td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)*2</td>
</tr>
<tr>
<td>OFF Response Time</td>
<td>8.0 ms max. (Can be set to between 0 and 32 ms in the Unit Information settings.)*2</td>
</tr>
<tr>
<td>No. of Circuits</td>
<td>32 (16 points/common, 2 circuits)</td>
</tr>
<tr>
<td>Number of Simultaneously ON Points</td>
<td>75% (24 points) (at 24 VDC)</td>
</tr>
</tbody>
</table>

### Circuit Configuration

**CN1 (OUT)**

<table>
<thead>
<tr>
<th>Signal name</th>
<th>Allocated CIO word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jxx_Ch1_Out00</td>
<td>Wd m</td>
</tr>
<tr>
<td>Jxx_Ch1_Out15</td>
<td>Wd m+1</td>
</tr>
<tr>
<td>Jxx_Ch2_Out00</td>
<td>Wd m+2</td>
</tr>
<tr>
<td>Jxx_Ch2_Out15</td>
<td>Wd m+3</td>
</tr>
</tbody>
</table>

**CN2 (IN)**

<table>
<thead>
<tr>
<th>Signal name</th>
<th>Allocated CIO word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jxx_Ch1_In00</td>
<td>COM2</td>
</tr>
<tr>
<td>Jxx_Ch1_In15</td>
<td>COM3</td>
</tr>
</tbody>
</table>

[Diagram showing the circuit configuration and allocation of CIO words]
*1 Observe the following restrictions when connecting to a 2-wire sensor.

- Make sure the input power supply voltage is larger than the ON voltage (19 V) plus the residual voltage of the sensor (approx. 3 V).
- Use a sensor with a minimum load current of 3 mA min.
- Connect bleeder resistance if you connect a sensor with a minimum load current of 5 mA or higher.

*2 The ON response time will be 120 μs maximum and OFF response time will be 400 μs maximum even if the response times are set to 0 ms due to internal element delays.
## CJ1W-MD232 DC Input/Transistor Output Unit (24 VDC, 16 inputs/16 Outputs)

### Name
16-point DC Input/16-point Transistor Output Unit with MIL Connectors (Sourcing Outputs)

### Model
CJ1W-MD232

<table>
<thead>
<tr>
<th>Output section (CN1)</th>
<th>Input section (CN2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated Voltage</strong></td>
<td>24 VDC</td>
</tr>
<tr>
<td><strong>Operating Load Voltage Range</strong></td>
<td>20.4 to 26.4 VDC</td>
</tr>
<tr>
<td><strong>Maximum Load Current</strong></td>
<td>0.5 A/point, 2.0 A/Unit</td>
</tr>
<tr>
<td><strong>Leakage Current</strong></td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td><strong>Residual Voltage</strong></td>
<td>1.5 V max.</td>
</tr>
<tr>
<td><strong>ON Response Time</strong></td>
<td>0.5 ms max.</td>
</tr>
<tr>
<td><strong>OFF Response Time</strong></td>
<td>1.0 ms max.</td>
</tr>
<tr>
<td><strong>Load Short-circuit Protection</strong></td>
<td>Detection current: 0.7 to 2.5 A min. Automatic restart after error clearance. (Refer to page A-98.)</td>
</tr>
<tr>
<td><strong>No. of Circuits</strong></td>
<td>16 (16 points/common, 1 circuit)</td>
</tr>
<tr>
<td><strong>External Power Supply</strong></td>
<td>20.4 to 26.4 VDC, 40 mA min.</td>
</tr>
<tr>
<td><strong>Insulation Resistance</strong></td>
<td>20 MΩ between the external terminals and the GR terminal (at 100 VDC)</td>
</tr>
<tr>
<td><strong>Dielectric Strength</strong></td>
<td>1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.</td>
</tr>
<tr>
<td><strong>Internal Current Consumption</strong></td>
<td>5 VDC 130 mA max.</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>100 g max.</td>
</tr>
<tr>
<td><strong>Accessories</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

### Circuit Configuration

![Circuit Diagram](image)

#### CN1 (OUT)
- **Signal name**: COM0 (+V), Jxx_Ch1_Out00, Jxx_Ch1_Out07, Jxx_Ch1_Out08, Jxx_Ch1_Out15
- **Allocated CIO word**: Wd m
- **Internal circuits**
- **ERR indicator**

#### CN2 (IN)
- **Signal name**: Jxx_Ch1_In00, Jxx_Ch1_In07, Jxx_Ch1_In08, Jxx_Ch1_In15
- **Allocated CIO word**: Wd m+1
- **3.3 kΩ
to Jxx_Ch1_In07
to Jxx_Ch1_In15
COM1
- **1000 pF**
- **472 Ω**
- **Input indicator**

### Number of Simultaneously ON Points vs. Ambient Temperature Characteristic

- 16 points at 33°C
- 16 points at 45°C
- 12 points at 55°C
- 9 points at 59°C

---

Appendices
The ON response time will be 20 μs maximum and OFF response time will be 400 μs maximum even if the response times are set to 0 ms due to internal element delays.

When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if polarity is reversed.

Be sure to wire both terminals 3 and 4 ((COM0 (+V)) of CN1.

Be sure to wire both terminals 1 and 2 (0 V) of CN1.

• When wiring, pay careful attention to the polarity of the external power supply. The load may operate incorrectly if polarity is reversed.

• Be sure to wire both pins 3 and 4 (COM1) of CN2, and set the same polarity for both pins.
CJ1W-MD563 TTL I/O Unit (32 Inputs/32 Outputs)

<table>
<thead>
<tr>
<th>Name</th>
<th>32-point Input / 32-point Output TTL I/O Unit with MIL Connectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>CJ1W-MD563</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output section (CN1)</th>
<th>Input section (CN2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated Voltage</strong></td>
<td>5 VDC ± 10%</td>
</tr>
<tr>
<td><strong>Operating Load Voltage Range</strong></td>
<td>4.5 to 5.5 VDC</td>
</tr>
<tr>
<td><strong>Maximum Load Current</strong></td>
<td>36 mA/point, 560 mA/common, 1.12 A/Unit</td>
</tr>
<tr>
<td><strong>Leakage Current</strong></td>
<td>0.1 mA max.</td>
</tr>
<tr>
<td><strong>Residual Voltage</strong></td>
<td>0.4 V max.</td>
</tr>
<tr>
<td><strong>ON Response Time</strong></td>
<td>0.2 ms max.</td>
</tr>
<tr>
<td><strong>OFF Response Time</strong></td>
<td>0.3 ms max.</td>
</tr>
<tr>
<td><strong>Fuse</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

| **Rated Input Voltage** | 5 VDC ± 10% |
| **Operating Load Voltage Range** | 4.5 to 5.5 VDC |
| **Maximum Load Current** | 36 mA/point, 560 mA/common, 1.12 A/Unit |
| **Leakage Current** | 0.1 mA max. |
| **Residual Voltage** | 0.4 V max. |
| **ON Response Time** | 0.2 ms max. |
| **OFF Response Time** | 0.3 ms max. |
| **Fuse** | None |

**Insulation Resistance:** 20 MΩ between the external terminals and the GR terminal (at 100 VDC)

**Dielectric Strength:** 1,000 VAC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.

**Internal Current Consumption:** 5 VDC 190 mA max.

**Weight:** 110 g max.

**Accessories:** None

**Circuit Configuration**

![Circuit Configuration Diagram](image-url)
* The ON response time will be 120 μs maximum and OFF response time will be 400 μs maximum even if the response times are set to 0 ms due to internal element delays.
Appendices

A-2-3  Precautions on Contact Output Units

Service Life Expectancy

The service life expectancy of the relays (NY-24W-K-IE) in the CJ1W-OC201/211 Contact Output Units depends on the type of load, the contact current, and the ambient temperature. Use the following diagrams to calculate the relay service life based on the operating conditions, and replace the relay before the end of its service life.

Contact Current vs. Service Life Characteristic

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

Inductive Load

The life of the Relay varies with the load inductance. If any inductive load is connected to the Contact Output Unit, use an arc killer with the Contact Output Unit. (See next page.)

Be sure to connect a diode in parallel with every DC inductive load that is connected to the Contact Output Unit. The usage of an arc killer has a significant effect on the service life of the contacts.

Contact Protection Circuit

Arc killers are used with the Contact Output Unit in order to prolong the life of each Relay mounted to the Contact Output Unit, prevent noise, and reduce the generation of carbide and nitrate deposits. However, if arc killers are used incorrectly, they can reduce relay life. Using an arc killer can also cause a delay in the resetting time (shut-off time). Arc killer circuit examples are listed in the following table.
Precautions for Correct Use

Do not connect a capacitor as an arc killer in parallel with an inductive load as shown in the diagram on the right. This arc killer is very effective for preventing spark discharge at the moment when the circuit is opened. However, at the moment the contacts are closed, the contacts may be welded due to the current charged in the capacitor.

DC inductive loads can be more difficult to switch than resistive loads. If appropriate arc killers are used, however, DC inductive loads will be as easy to switch as resistive loads.

---

### Specifications of Basic I/O Units

<table>
<thead>
<tr>
<th>Circuit Method</th>
<th>Applicable for AC</th>
<th>Applicable for DC</th>
<th>Characteristic</th>
<th>Required Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR method</td>
<td>Yes</td>
<td>Yes</td>
<td>If the load is a relay or solenoid, there is a delay in the resetting time. If the supply voltage is 24 or 48 V, insert the arc killer in parallel with the load. If the supply voltage is 100 to 200 V, insert the arc killer between the contacts.</td>
<td>The capacitance of the capacitor should be approx. 1 to 0.5 μF per contact current of 1 A and resistance of the resistor should be approx. 0.5 to 1 Ω per contact voltage of 1 V. These values, however, vary with the load and the characteristics of the relay. Decide these values from experiments, and take into consideration that the capacitance suppresses spark discharge when the contacts are separated and the resistance limits the current that flows into the load when the circuit is closed again. The dielectric strength of the capacitor must be 200 to 300 V. If the circuit is an AC circuit, use a capacitor with no polarity.</td>
</tr>
<tr>
<td>Diode method</td>
<td>No</td>
<td>Yes</td>
<td>The diode connected in parallel with the load changes energy accumulated by the coil into current, which then flows into the coil so that the current will be converted into Joule heat by the resistance of the inductive load. This delay in the resetting time caused by this method is longer than that caused by the CR method.</td>
<td>The reversed dielectric strength value of the diode must be at least 10 times as large as the circuit voltage value. The forward current of the diode must be the same as or larger than the load current. The reversed dielectric strength value of the diode may be two to three times larger than the supply voltage if the arc killer is applied to electronic circuits with low circuit voltages.</td>
</tr>
<tr>
<td>Varistor method</td>
<td>Yes</td>
<td>Yes</td>
<td>The varistor method prevents the imposition of high voltage between the contacts by using the constant voltage characteristic of the varistor. There is delay in the resetting time. If the supply voltage is 24 or 48 V, insert the varistor in parallel with the load. If the supply voltage is 100 to 200 V, insert the varistor between the contacts.</td>
<td>---</td>
</tr>
</tbody>
</table>
### Patterns for Combining Connector-Terminal Block Conversion Units and I/O Relay Terminals

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

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

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Configuration</th>
<th>Number of Connectors</th>
<th>Branching</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Connecting Cable 40 or 60 terminals</td>
<td>1</td>
<td>None</td>
</tr>
<tr>
<td>B</td>
<td>Connecting Cable with two branches 20 terminals 20 terminals</td>
<td>2 branches</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Connecting Cable 40 or 60 terminals 20 terminals</td>
<td>2</td>
<td>None</td>
</tr>
<tr>
<td>D</td>
<td>Connecting Cable 40 or 60 terminals 20 terminals 20 terminals</td>
<td>2 branches</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Connecting Cable with two branches 40 or 60 terminals 20 terminals 20 terminals</td>
<td>2 branches</td>
<td></td>
</tr>
</tbody>
</table>
### Connection Patterns for I/O Relay Terminals

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
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# Combinations of Connections

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

## Connections to Connector-Terminal Block Conversion Units

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<tr>
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<th>I/O capacity</th>
<th>Number of connectors</th>
<th>Polarity</th>
<th>Connection pattern</th>
<th>Number of branches</th>
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*¹ The inputs are NPN. For PNP inputs, reverse the polarity of the external power supply connections to the power supply terminals on the Connector-Terminal Block Conversion Unit.

*² Bleeder resistance (5.6 kΩ) is built in.
### A-2-4 Connecting Connector-Terminal Block Conversion Units and I/O Relay Terminals

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<th>Number of connectors</th>
<th>Polarity</th>
<th>Connection pattern</th>
<th>Number of branches</th>
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*1 The inputs are NPN. For PNP inputs, reverse the polarity of the external power supply connections to the power supply terminals on the Connector-Terminal Block Conversion Unit.

*2 Bleeder resistance (5.6 kΩ) is built in.
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## A-2-4 Connecting Connector-Terminal Block Conversion Units and I/O Relay Terminals

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

**2** Bleeder resistance (5.6 kΩ) is built in.
### Appendices

**NJ-series CPU Unit Hardware User's Manual (W500)**

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

*2 Bleeder resistance (5.6 kΩ) is built in.

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<td>1 MIL connector</td>
<td>NPN</td>
<td>B</td>
<td>2</td>
<td>XW2Z-R0C00-01</td>
<td>G7TC-ID16</td>
<td>A-84</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>B</td>
<td>2</td>
<td>XW2Z-R0C00-01</td>
<td>G7TC-OC08</td>
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</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>B</td>
<td>2</td>
<td>XW2Z-R0C00-01</td>
<td>G70D-SOC16</td>
<td>A-86</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>B</td>
<td>2</td>
<td>XW2Z-R0C00-01</td>
<td>G70D-FOM16</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>B</td>
<td>2</td>
<td>XW2Z-R0C00-01</td>
<td>G70D-VSOC16</td>
<td>A-85</td>
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<tr>
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<td>B</td>
<td>2</td>
<td>XW2Z-R0C00-01</td>
<td>G70D-VFOM16</td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td>B</td>
<td>2</td>
<td>XW2Z-R0C00-01</td>
<td>G70A-ZOC16-3 and Relay</td>
<td>A-88</td>
</tr>
<tr>
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<td></td>
<td></td>
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<td>B</td>
<td>2</td>
<td>XW2Z-R0C00-01</td>
<td>G70R-SOC08</td>
<td>A-87</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>B</td>
<td>2</td>
<td>XW2Z-R0C00-01</td>
<td>G70D-SOC08</td>
<td></td>
</tr>
</tbody>
</table>
Connect to the Terminal Block Conversion Unit and external connection diagrams are provided below for Basic I/O Unit connections to Connector-Terminal Block Conversion Units.

### Inputs

<table>
<thead>
<tr>
<th>Programmable Controller I/O Unit</th>
<th>Connector-Terminal Block Conversion Unit</th>
<th>Connecting Cables</th>
</tr>
</thead>
<tbody>
<tr>
<td>CJ1W-ID231</td>
<td>XW2D-40G6</td>
<td>XW2Z-□□□□B</td>
</tr>
<tr>
<td></td>
<td>XW2D-40G6-RF</td>
<td></td>
</tr>
</tbody>
</table>

**Note 1**  
The polarity for input power supply connections indicated with dotted lines (-----) can be connected in either direction provided that the same polarity is used for the commons for rows A and B.

**2** Both COM0 and COM1 have two pins each. They are internally connected inside the Controller, but they must all be wired.

---

**Programmable Controller I/O Unit**  
CJ1W-ID231

**Connector-Terminal Block Conversion Unit**  
XW2D-40G6-IO16 (two Units)

**Connecting Cables**  
XW2Z-□□□□D

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

<table>
<thead>
<tr>
<th>Programma-</th>
<th>Connector-</th>
<th>Connecting</th>
</tr>
</thead>
<tbody>
<tr>
<td>ble Control-</td>
<td>Terminal</td>
<td>Cables</td>
</tr>
<tr>
<td>ler I/O Unit</td>
<td>Block Conversion Unit</td>
<td>XW2Z-□□□K</td>
</tr>
<tr>
<td>CJ1W-ID232</td>
<td>XW2D-40G6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>XW2D-40G6-RM</td>
<td></td>
</tr>
</tbody>
</table>

**Note 1** The polarity for input power supply connections indicated with dotted lines (-----) can be connected in either direction provided that the same polarity is used for the commons.

2 Both COM0 and COM1 have two pins each. They are internally connected inside the Controller, but they must all be wired.

<table>
<thead>
<tr>
<th></th>
<th>Programma-</th>
<th>Connector-</th>
</tr>
</thead>
<tbody>
<tr>
<td>ble Control-</td>
<td>Terminal</td>
<td>Block Conversion Unit</td>
</tr>
<tr>
<td>ler I/O Unit</td>
<td>XW2C-20G6-IO16 (2 Units)</td>
<td></td>
</tr>
</tbody>
</table>

**Note 1** Connect the A9/B9 terminal and the ⊗ terminal for NPN. Connect the A9/B9 terminal and the ⊗ terminal for PNP. (Use the enclosed short bar.)

2 The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.
Note 1  The polarity for input power supply connections indicated with dotted lines (-----) can be connected in either direction provided that the same polarity is used for the commons.

2 Both COM0 and COM1 have two pins each. They are internally connected inside the Controller, but they must all be wired.

---

Note 1  Connect the A9/B9 terminal and the \( \oplus \) terminal for NPN.
Connect the A9/B9 terminal and the \( \ominus \) terminal for PNP.
(Use the enclosed short bar.)

2 The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.
**Appendices**

**A-2 Specifications of Basic I/O Units**

**A-2.4 Connecting Connector-Terminal Block Conversion Units and I/O Relay Terminals**

**Note 1**

The polarity for input power supply connections indicated with dotted lines (-----) can be connected in either direction provided that the same polarity is used for the commons for rows A and B.

**2**

COM0, COM1, COM2, and COM3 have two pins each. They are internally connected inside the Controller, but they must all be wired.

---

**Programmable Controller I/O Unit**

<table>
<thead>
<tr>
<th></th>
<th>CJ1W-ID261</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector-Terminal Block Conversion Unit</td>
<td>XW2D-40G6</td>
</tr>
<tr>
<td>Connecting Cables</td>
<td>XW2Z-□□□□B</td>
</tr>
</tbody>
</table>

**Connection diagram**

- Wd m (Wd (m+2))
- Wd (m+1) (Wd (m+3))
- CN1
- CN2
- NC
- COM0 (COM3)
- COM1 (COM2)
- A0-A9
- B0-B9

**Programmable Controller I/O Unit**

<table>
<thead>
<tr>
<th></th>
<th>CJ1W-ID261</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector-Terminal Block Conversion Unit</td>
<td>XW2C-20G6-IO16 (2 Units)</td>
</tr>
<tr>
<td>Connecting Cables</td>
<td>XW2Z-□□□□D</td>
</tr>
</tbody>
</table>

**Connection diagram**

- Wd m and m+1 (Wd m+2 and m+3)
- CN1
- CN2
- A9/B9
- +
- -
- 24 VDC

**Note 1**

Connect the A9/B9 terminal and the + terminal for NPN.
Connect the A9/B9 terminal and the - terminal for PNP.
(Use the enclosed short bar.)

**2**

The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.
| Programma-
bler Control-
er I/O Unit       | CJ1W-ID262 |
|------------------|-----------|
| Connector-
Terminal Block Conversion Unit | XW2D-40G6, XW2D-40G6-RM |
| Connecting Cables | XW2Z-□□□K |

### Note 1
The polarity for input power supply connections indicated with dotted lines (-----) can be connected in either direction provided that the same polarity is used for the commons.

2 COM0, COM1, COM2, and COM3 have two pins each. They are internally connected inside the Controller, but they must all be wired.

---

| Programma-
bler Control-
er I/O Unit       | CJ1W-ID262 |
|------------------|-----------|
| Connector-
Terminal Block Conversion Unit | XW2C-20G6-I016 (2 Units) |
| Connecting Cables | XW2Z-□□□N |

### Note 1
Connect the A9/B9 terminal and the \( \oplus \) terminal for NPN.
Connect the A9/B9 terminal and the \( \ominus \) terminal for PNP.
(Use the enclosed short bar.)

2 The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.
 Outputs

<table>
<thead>
<tr>
<th>Connectable Basic I/O Units</th>
<th>RJ Series</th>
<th>RJ Series</th>
<th>RJ Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programmable Controller I/O Units</td>
<td>Programmed Controller I/O Units</td>
<td>Programmed Controller I/O Units</td>
<td>Programmed Controller I/O Units</td>
</tr>
<tr>
<td>W500</td>
<td>W500</td>
<td>W500</td>
<td>W500</td>
</tr>
</tbody>
</table>

### Notes

1. Connect the A9/B9 terminal and the +V terminal.
2. Connect the A10/B10 terminal and the +V terminal.

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

**Note 1** Connect the A9/B9 terminal and the +V terminal. Connect the A10/B10 terminal and the +V terminal. (Use the enclosed short bar.)

**Note 2** The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.
Note The COM (+V) terminals and 0V terminals are internally connected inside the Controller, but they must all be wired.

Note 1 Connect the A9/B9 terminal and the \( \oplus \) terminal. Connect the A10/B10 terminal and the \( \ominus \) terminal. (Use the enclosed short bar.)

2 The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.
Note The +V terminals and COM terminals are internally connected inside the Controller, but they must all be wired.

Connection diagram

Note 1 Connect the A9/B9 terminal and the terminal.
Connect the A10/B10 terminal and the terminal.
(Use the enclosed short bar.)

2 The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.
Note The +V terminals and COM terminals are internally connected inside the Controller, but they must all be wired.

Note 1 Connect the A9/B9 terminal and the \( \oplus \) terminal. Connect the A10/B10 terminal and the \( \ominus \) terminal. (Use the enclosed short bar.)

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

2 The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.
Note The COM (+V) terminals and 0V terminals are internally connected inside the Controller, but they must all be wired.

Note 1 Connect the A9/B9 terminal and the terminal. Connect the A10/B10 terminal and the terminal. (Use the enclosed short bar.)

2 The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.
Note The +V terminals and COM terminals are internally connected inside the Controller, but they must all be wired.

Note 1 Connect the A9/B9 terminal and the \( + \) terminal. Connect the A10/B10 terminal and the \( - \) terminal. (Use the enclosed short bar.)
2 The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.
Note 1 The polarity for input power supply connections indicated with dotted lines (-----) can be connected in either direction.

2 The COM terminals are internally connected inside the Controller, but they must all be wired.
<table>
<thead>
<tr>
<th>Programmable Controller I/O Unit</th>
<th>CJ1W-MD231</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector-Terminal Block Conversion Unit</td>
<td>XW2C-20G6-1O16</td>
</tr>
<tr>
<td>Connecting Cables</td>
<td>XW2Z-□□□A</td>
</tr>
</tbody>
</table>

**Connection diagram**

**Note 1**
Connect the A9/B9 terminal and the terminal.
Connect the A10/B10 terminal and the terminal.
(Use the enclosed short bar.)

**Note 2**
The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.

**Note 1**
Connect the A9/B9 terminal and the terminal for NPN.
Connect the A9/B9 terminal and the terminal for PNP.
(Use the enclosed short bar.)

**Note 2**
The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.
Note 1 The polarity for input power supply connections indicated with dotted lines (-----) can be connected in either direction.

2 The COM terminals and 0V terminals are internally connected inside the Controller, but they must all be wired.
Programmable Controller I/O Unit | CJ1W-MD261
---|---
Connector-Terminal Block Conversion Units | XW2D-40G6
| XW2D-40G6RF
Connecting Cables | XWZZ-□□□□B

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

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

Programmable Controller I/O Unit  
CJ1W-MD261

Connector-Terminal Block Conversion Unit  
XW2C-20G6-IO16 (2 Units)  
XW2C-20G6-IO16 (2 Units)

Connecting Cables  
XW2Z-□□□L  
XW2Z-□□□D

Connection diagram

Note 1  
Connect the A9/B9 terminal and the ` terminal.  
Connect the A10/B10 terminal and the ` terminal.  
(Use the enclosed short bar.)

2  
The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.

Note 1  
Connect the A9/B9 terminal and the ` terminal for NPN.  
Connect the A9/B9 terminal and the ` terminal for PNP.  
(Use the enclosed short bar.)

2  
The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.
<table>
<thead>
<tr>
<th>Programmable Controller I/O Unit</th>
<th>CJ1W-MD263</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector-Terminal Block Conversion Unit</td>
<td>XW2D-40G6</td>
</tr>
<tr>
<td>Connecting Cables</td>
<td>XW2Z-□□□□K</td>
</tr>
</tbody>
</table>

**Connection diagram**

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

**Note 1** The polarity for input power supply connections indicated with dotted lines (-----) can be connected in either direction.

2 Both COM0 and COM1 have two pins each. They are internally connected inside the Controller, but they must all be wired.
**Note 1** Connect the A9/B9 terminal and the • terminal.
Connect the A10/B10 terminal and the • terminal.
(Use the enclosed short bar.)

2 The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.

---

**Note 1** Connect the A9/B9 terminal and the • terminal for NPN.
Connect the A9/B9 terminal and the • terminal for PNP.
(Use the enclosed short bar.)

2 The COM terminals are wired inside the Connector-Terminal Block Conversion Unit.
<table>
<thead>
<tr>
<th>Programmable Controller I/O Unit</th>
<th>CJ1W-MD563</th>
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</thead>
<tbody>
<tr>
<td>Connector-Terminal Block Conversion Unit</td>
<td>XW2D-40G6</td>
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<tr>
<td></td>
<td>XW2D-40G6-RM</td>
</tr>
<tr>
<td>Connecting Cables</td>
<td>XW2Z-□□□□K</td>
</tr>
</tbody>
</table>

### Notes

1. The +V terminals and COM terminals are internally connected inside the Controller, but they must all be wired.
2. The power supply voltage for the CJ1W-MD563 is 5 V.

#### Connection diagram

- **Note 1**: The +V terminals and COM terminals are internally connected inside the Controller, but they must all be wired.
- **Note 2**: The power supply voltage for the CJ1W-MD563 is 5 V.
Connection Diagrams for I/O Relay Terminals

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

- Inputs

G7TC I/O Relay Terminals

**Note 1**
Inputs to the Input Units and I/O Relay Terminals use isolated contacts. “00” to “15” are the input bit numbers for the Input Unit and the I/O Relay Terminal.

**Note 2**
Use the G78-04 short bar to short to the common terminal.
### Outputs

**G70D-V Relay Terminals**

<table>
<thead>
<tr>
<th>G70D-VSOC16</th>
<th>G70D-VSOC16+G70D-ET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>Power supply</td>
</tr>
<tr>
<td>L 15</td>
<td>L 15</td>
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<tr>
<td>L 14</td>
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<tr>
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<td>C14</td>
<td>C14</td>
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<tr>
<td>C15</td>
<td>C15</td>
</tr>
</tbody>
</table>

**Note 1** They are also isolated from the Output Unit and I/O Relay Terminal. "00" to "15" are the output numbers for the Output Unit and the I/O Relay Terminal.

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

---

**G70D-VSOC16+G70D-ET**

<table>
<thead>
<tr>
<th>G70D-VSOC16</th>
<th>G70D-VSOC16+G70D-ET</th>
</tr>
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<tbody>
<tr>
<td>Power supply</td>
<td>Power supply</td>
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<tr>
<td>L 15</td>
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<td>C14</td>
</tr>
<tr>
<td>C15</td>
<td>C15</td>
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</tbody>
</table>

**Note 1** They are also isolated from the Output Unit and I/O Relay Terminal. "00" to "15" are the output numbers for the Output Unit and the I/O Relay Terminal.

**Note 2** Use the G6D-4-SB short bar to short to the common terminal.
**Note** Every two outputs share a common. The current supplied is 3 A per common. They are also isolated from the Output Unit and I/O Relay Terminal. "00" to "15" are the output numbers for the Output Unit and the I/O Relay Terminal.

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

2 Use the G6D-4-SB short bar to short to the common terminal.
G70R Relay Terminals

<table>
<thead>
<tr>
<th>A7</th>
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<tbody>
<tr>
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<td>A4</td>
<td>B4</td>
</tr>
<tr>
<td>A3</td>
<td>B3</td>
</tr>
<tr>
<td>A2</td>
<td>B2</td>
</tr>
<tr>
<td>A1</td>
<td>B1</td>
</tr>
<tr>
<td>A0</td>
<td>B0</td>
</tr>
</tbody>
</table>

**Power supply**

**Output Unit**

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

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

G7TC I/O Relay Terminals

**G7TC-OC16/OC08**

**Power supply**

**Output Unit**

**Note 1**
All outputs are independent. They are also isolated from the Output Unit and I/O Relay Terminal. “00” to “15” are the output numbers for the Output Unit and the I/O Relay Terminal.

**2**
The G7TC-OC08 has only 8 outputs and therefore does not have 8 to 15 and C8 to C15.

**3**
Use the G78-04 short bar to short to the common terminal.
Note 1  All outputs are independent. They are also isolated from the Output Unit and I/O Relay Terminal. “00” to “15” are the output numbers for the Output Unit and the I/O Relay Terminal.

2 Use the G78-04 short bar to short to the common terminal.

Note 1  The above diagram is an example with the G2R-1-S(N) mounted to the G70A-ZOC16-3.

2 All outputs are independent. They are also isolated from the Output Unit and I/O Relay Terminal. “00” to “15” are the output numbers for the Output Unit and the I/O Relay Terminal.
A-3 Dimensions

A-3-1 NJ-series CPU Units

NJ501-□□□□, NJ301-□□□□ and NJ101-□□□□

Unit: mm
A-3-2  NJ-series Power Supply Units

**NJ-PA3001**

**NJ-PD3001**
A-3-3  CJ-series Basic I/O Units

8/16-point Units with 18-terminal Terminal Blocks

32-point Units (Input Units and Output Units)

Units with Fujitsu-compatible Connector (40-pin × 1)

Units with MIL Connector (40-pin × 1)
32-point Units (24-VDC Input/Transistor Output Units)

Units with Fujitsu-compatible Connector (24-pin × 2)

Units with MIL Connector (20-pin × 2)
64-point Units (Input Units, Output Units, 24-VDC Input/Transistor Output Units, TTL I/O Units)

Units with Fujitsu-compatible Connector (40-pin × 2)  Unit: mm

Units with MIL Connector (40-pin × 2)
A-3-4  B7A Interface Unit

CJ1W-B7A

A-3-5  CJ-series I/O Control Unit and I/O Interface Unit

CJ1W-IC101  I/O Control Unit
CJ1W-II101  I/O Interface Unit

A-3-6  SD Memory Card

Unit: mm
A-4 Load Short-circuit Protection and Line Disconnection Detection for CJ-series Basic I/O Units

A-4-1 Load Short-circuit Protection and Line Disconnection Detection for CJ1W-OD202

This section describes the load short-circuit protection and line disconnection detection of the CJ1W-OD202 Output Units.

As shown below, normally when the output bit (OUT) turns ON, the transistor will turn ON and then output current (I_{out}) will flow.

**Figure 1 Normal Operation**

If the output current (I_{out}) exceeds the detection current (I_{lim}) when an overload or short-circuit occurs, the output current (I_{out}) will be limited as shown in figure below. When the junction temperature (T_j) of the output transistor reaches the thermal shutdown temperature (T_{std}), the output will turn OFF to protect the transistor from being damaged, and the alarm output bit will turn ON to light the ERR indicator. When the junction temperature (T_j) of the transistor drops down to the reset temperature (T_r), the ERR indicator will be automatically reset and the output current will start flowing.

**Figure 2 Operation for Overload or Short Circuit**

If the line is disconnected and the output current (I_{out}) drops below the line disconnection detection current (I_{OL}), the ERR indicator will light as shown in the following figure.
Figure 3 Operation for Disconnected Line with Output Current below the Line Disconnection Detection Current

A: Load not connected or load line broken.

B: Current to load at or below line disconnection detection current.

C: Rise of current to load too slow and error detected before the disconnection detection current was reached.

When load L is connected, the ERR indicator may light and the Alarm Output Bit may turn ON for approximately 100 ms. The programming example given in the next section can be used so that an error is not detected in this case.

- Operating Restrictions of CJ1W-OD202

Although the CJ1W-OD202 is provided with load short-circuit protection, these are for protecting internal circuits against momentary short-circuiting in the load. As shown in Figure 2, the load short-circuit protection is automatically released when the Tj equals to Tr. Therefore, unless the cause of short-circuit is removed, ON/OFF operations will be repeated in the output. Leaving short-circuits for any length of time will cause internal temperature rise, deterioration of elements, discoloration of the case or PCBs, etc. Therefore, observe the following restrictions.

- Restrictions

If a short-circuit occurs in an external load, immediately turn OFF the corresponding output and remove the cause. The CJ1W-OD202 turns ON an alarm output bit that corresponds to the external load output number. There is an alarm output bit for every two outputs.

When an alarm output bit turns ON, use a self-holding bit for the alarm in the user program and turn OFF the corresponding output.

The Alarm Output Bits are allocated in the Basic I/O Unit Information Area system-defined variable. Two output bits are assigned for each slot and rack in which a Unit is mounted.

```
_CJB_IOUnitInfo[rack_number,slot_number,serial_number_in_Unit]
```

For example, when the CJ1W-OD202 is mounted in slot 0 of rack 0, `CJB_IOUnitInfo[0,0,0]` changes to TRUE if output Ch1Out0 changes to TRUE. When the CJ1W-OD202 is mounted in slot 1 of rack 0, `CJB_IOUnitInfo[0,1,3]` changes to TRUE if output Ch1Out7 changed to TRUE.
● Programming Example

In this example, CJ1W-OD202 is mounted in slot 0 of rack 0.

This example shows how to change output \textit{Jxx\_Ch0\_Out00} to FALSE immediately if the Alarm Output Bit \textit{\_CJB\_I0UnitInfo[0,0,0]} changes to TRUE and how to keep the output FALSE until the cause is removed and the bit is reset with \textit{RstOD202}.

To prevent the Alarm Output Bit from changing to TRUE momentarily when the inductive load turns ON, the alarm output is not changed to TRUE for 200 ms after input \textit{En\_OD202} changes to TRUE.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Data type</th>
<th>Initial value</th>
<th>Address</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>OutData</td>
<td>BOOL</td>
<td>FALSE</td>
<td></td>
<td>Output data</td>
</tr>
<tr>
<td>NG</td>
<td>BOOL</td>
<td>FALSE</td>
<td></td>
<td>TON_OC202 timer output</td>
</tr>
<tr>
<td>ResetOD202</td>
<td>BOOL</td>
<td>FALSE</td>
<td></td>
<td>Reset switch</td>
</tr>
<tr>
<td>AlarmOut</td>
<td>BOOL</td>
<td>FALSE</td>
<td></td>
<td>Error flag</td>
</tr>
<tr>
<td>\texttt{J01_Ch1_Out00}</td>
<td>BOOL</td>
<td>FALSE</td>
<td>IOBus://rack#0/slot#0/Ch1_Out/Ch1_Out00</td>
<td>OC202 output</td>
</tr>
<tr>
<td>_CJB_I0UnitInfo</td>
<td>ARRAY[0..3,0..9, 0..7] OF BOOL</td>
<td></td>
<td>Basic I/O Unit information array</td>
<td></td>
</tr>
</tbody>
</table>

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Variable} & \text{Data type} & \text{Initial value} & \text{Address} & \text{Comment} \\
\hline
\_CJB\_I0UnitInfo[0.0.0] & & & & \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Variable} & \text{Data type} & \text{Initial value} & \text{Address} & \text{Comment} \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Variable} & \text{Data type} & \text{Initial value} & \text{Address} & \text{Comment} \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Variable} & \text{Data type} & \text{Initial value} & \text{Address} & \text{Comment} \\
\hline
\end{array}
\]

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\begin{array}{|c|c|c|c|}
\hline
\text{Variable} & \text{Data type} & \text{Initial value} & \text{Address} & \text{Comment} \\
\hline
\end{array}
\]

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\begin{array}{|c|c|c|c|}
\hline
\text{Variable} & \text{Data type} & \text{Initial value} & \text{Address} & \text{Comment} \\
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\end{array}
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\begin{array}{|c|c|c|c|}
\hline
\text{Variable} & \text{Data type} & \text{Initial value} & \text{Address} & \text{Comment} \\
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\end{array}
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\begin{array}{|c|c|c|c|}
\hline
\text{Variable} & \text{Data type} & \text{Initial value} & \text{Address} & \text{Comment} \\
\hline
\end{array}
\]

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\begin{array}{|c|c|c|c|}
\hline
\text{Variable} & \text{Data type} & \text{Initial value} & \text{Address} & \text{Comment} \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Variable} & \text{Data type} & \text{Initial value} & \text{Address} & \text{Comment} \\
\hline
\end{array}
\]
As shown below, normally when the output bit turns ON (OUT), the transistor will turn ON and then output current (Iout) will flow. If the output current (Iout) exceeds the detection current (Ilim) when an overload or short-circuit occurs, the output current (Iout) will be limited as shown in Figure 2. When the junction temperature (Tj) of the output transistor reaches the thermal shutdown temperature (Tstd), the output will turn OFF to protect the transistor from being damaged, and the alarm output bit will turn ON to light the ERR indicator. When the junction temperature (Tj) of the transistor drops down to the reset temperature (Tr), the ERR indicator will be automatically reset and the output current will start flowing.

Operating Restrictions for the CJ1W-OD204/OD212/OD232/MD232

Although these Units are provided with load short-circuit protection, these are for protecting internal circuits against momentary short-circuiting in the load. As shown in Figure 2, the load short-circuit protection is automatically released when the Tj equals to Tr. Therefore, unless the cause of short-circuit is removed, ON/OFF operations will be repeated in the output. Leaving short-circuits for any length of time will cause internal temperature rise, deterioration of elements, discoloration of the case or PCBs, etc. Therefore, observe the following restrictions.
● Restrictions

If a short-circuit occurs in an external load, immediately turn OFF the corresponding output and remove the cause. An alarm output bit that corresponds to the external load output number is turned ON. There is an alarm output bit for every common.

When an alarm output bit turns ON, use a self-holding bit for the alarm in the user program and turn OFF the corresponding output.

The Alarm Output Bits are allocated in the Basic I/O Unit Information Area system-defined variable. Sixteen output bits are assigned for each slot and rack in which a Unit is mounted.

_CJB_IOUnitInfo[rack_number, slot_number, serial_number_in_Unit]

For example, when the CJ1W-OD212 is mounted in slot 0 of rack 0, _CJB_IOUnitInfo[0,0,0] changes to TRUE if output Ch1Out2 changes to TRUE.

When the CJ1W-OD232 is mounted in slot 1 of rack 2, _CJB_IOUnitInfo[2,1,1] changes to TRUE if output Ch2Out8 changes to TRUE.
A-5  EMC Directive Measures for Relay Outputs

The NJ-series Controllers conform to the Common Emission Standards (EN 61131-2) of the EMC Directives. However, noise generated by relay output switching may not satisfy these Standards when the Controller is incorporated into a system. In such a case, a noise filter must be connected to the load side or other appropriate countermeasures must be provided external to the Controller.

Countermeasures taken to satisfy the standards vary depending on the devices on the load side, wiring, configuration of machines, etc. Following are examples of countermeasures for reducing the generated noise.

- **Countermeasures**

  (Refer to EN61131-2 for more details.)

  Countermeasures are not required if the frequency of load switching for the whole system with the Controller included is less than 5 times per minute.

  Countermeasures are required if the frequency of load switching for the whole system with the Controller included is 5 times or more per minute.

- **Countermeasure Examples**

  When switching an inductive load, connect an surge protector, diodes, etc., in parallel with the load or contact as shown below.

<table>
<thead>
<tr>
<th>Circuit</th>
<th>Current</th>
<th>Characteristic</th>
<th>Required element</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR method</td>
<td></td>
<td>If the load is a relay or solenoid, there is a delay in the resetting time. If the supply voltage is 24 or 48 V, insert the surge protector in parallel with the load. If the supply voltage is 100 to 200 V, insert the surge protector between the contacts.</td>
<td>The capacitance of the capacitor should be approx. 1 to 0.5 μF per contact current of 1 A and resistance of the resistor should be approx. 0.5 to 1 Ω per contact voltage of 1 V. These values, however, vary with the load and the characteristics of the relay. Decide these values from experiments, and take into consideration that the capacitance suppresses spark discharge when the contacts are separated and the resistance limits the current that flows into the load when the circuit is closed again. The dielectric strength of the capacitor must be 200 to 300 V. If the circuit is an AC circuit, use a capacitor with no polarity.</td>
</tr>
<tr>
<td>Diode method</td>
<td>No</td>
<td>The diode connected in parallel with the load changes energy accumulated by the coil into a current, which then flows into the coil so that the current will be converted into Joule heat by the resistance of the inductive load. This delay in the resetting time, caused by this method is longer than that caused by the CR method.</td>
<td>The reversed dielectric strength value of the diode must be at least 10 times as large as the circuit voltage value. The forward current of the diode must be the same as or larger than the load current. The reversed dielectric strength value of the diode may be two to three times larger than the supply voltage if the surge protector is applied to electronic circuits with low circuit voltages.</td>
</tr>
</tbody>
</table>
When switching a load with a high inrush current such as an incandescent lamp, suppress the inrush current as shown below.

<table>
<thead>
<tr>
<th>Circuit</th>
<th>Current (AC)</th>
<th>Current (DC)</th>
<th>Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varistor method</td>
<td>Yes</td>
<td>Yes</td>
<td>The varistor method prevents the imposition of high voltage between the contacts by using the constant voltage characteristic of the varistor. There is a delay in the resetting time. If the supply voltage is 24 or 48 V, insert the varistor in parallel with the load. If the supply voltage is 100 to 200 V, insert the varistor between the contacts.</td>
</tr>
</tbody>
</table>

**Countermeasure 1**

Providing a dark current of approx. one-third of the rated value through an incandescent lamp

**Countermeasure 2**

Providing a limiting resistor
A-6 System-defined Variables Related to Hardware

System-defined variables are assigned specific functions by the system. They are registered in the global variable table, or the local variable table for each POU, in advance.

The variable names cannot be changed. Some of the variables start with an underbar and some start with "P_".

Some of the system-defined variables are read-only and some are read/write.

You read and write the variables with the user program, with communications from external devices, with the Sysmac Studio, or with an NS/NA-series PT.

The system-defined variables that are related to hardware are classified by functions as follows.

- System-defined Variables for the Overall NJ-series Controller (No Category)
  - Clock
  - Errors
  - SD Memory Card
  - Backup
  - Power supply
  - Version
- PLC Function Module, Category Name: _PLC
  - Errors
- PLC Function Module, Category Name: _CJB
  - I/O bus status
  - I/O bus errors
  - Auxiliary area bits for CJ-series Units

Refer to the NJ/NX-series CPU Unit Software User’s Manual (Cat. No. W501) for details.
A-7  Version Information

This section describes the relationship between the unit versions of CPU Units and the Sysmac Studio versions, and the functions that are supported for each unit version.

A-7-1  Relationship between Unit Versions of CPU Units and Sysmac Studio Versions

This section describes how the unit versions of CPU Units correspond to Sysmac Studio versions. Normally use the corresponding versions.

### Unit Versions and Corresponding Sysmac Studio Versions

The following table gives the relationship between unit versions of CPU Units and the corresponding Sysmac Studio versions.

<table>
<thead>
<tr>
<th>Unit version of CPU Unit</th>
<th>Corresponding version of Sysmac Studio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ver.1.40*1</td>
<td>Ver.1.29</td>
</tr>
<tr>
<td>Ver.1.21*2</td>
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<tr>
<td>Ver.1.21*3</td>
<td>Ver.1.28</td>
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<tr>
<td>Ver.1.20</td>
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</tr>
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<tr>
<td>Ver.1.00</td>
<td>Ver.1.00</td>
</tr>
</tbody>
</table>

*1  This is the Unit version of NJ501-1□□00, NJ301-□□□□□□, and NJ101-□□□□□0 CPU Units.

*2  This is the Unit version of NJ501-4□□00, NJ501-4□□10, NJ501-1340, and NJ501-5300 CPU Units.

*3  This is the Unit version of NJ501-1□□00, NJ301-1□□□□□□, and NJ101-□□□□□0 CPU Units.

*4  There is no NJ101-□□□□□□ CPU Unit with unit version 1.09 or earlier.

*5  Use an NJ101-□□□□□□ CPU Unit with Sysmac Studio version 1.13 or higher. You cannot use an NJ101-□□□□□□ CPU Unit with Sysmac Studio version 1.12 or lower.

*6  There is no NJ301-□□□□□□ CPU Unit with unit version 1.00. Therefore, you cannot use an NJ301-□□□□□□ CPU Unit with Sysmac Studio version 1.01 or lower.
### Specifications When Not Using the Sysmac Studio Version That Corresponds to the Unit Version of the CPU Unit

The specifications when you do not use the Sysmac Studio version that corresponds to the unit version of the CPU Unit are given in this section.

**Using an Lower Sysmac Studio Version**

If you use a lower version of the Sysmac Studio, you can use only the functions of the unit version of the CPU Unit that corresponds to the Sysmac Studio version.

**Example:**

<table>
<thead>
<tr>
<th>Unit version of CPU Unit: 1.04</th>
<th>Sysmac Studio version: 1.04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit version 1.03 of the CPU Unit corresponds to Sysmac Studio version 1.04. Therefore, you can use only the functions that are supported by unit version 1.03 of the CPU Unit. You cannot use functionality that was added for unit version 1.04 or later of the CPU Unit.</td>
<td></td>
</tr>
</tbody>
</table>

**Using a CPU Unit with an Earlier Unit Version**

If you use a CPU Unit with an earlier version, select the unit version of the used CPU Unit or an earlier unit version in the Select Device Area of the Project Properties Dialog Box on the Sysmac Studio. The unit version that you selected is the project unit version of the project. You can use only the functions that are supported by the project unit version.

**Example:**

<table>
<thead>
<tr>
<th>Unit version of CPU Unit: 1.03</th>
<th>Sysmac Studio version: 1.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit version 1.04 of the CPU Unit corresponds to Sysmac Studio version 1.05. However, the used CPU Unit is unit version 1.03, so select version 1.03 or earlier as the version in the Select Device Area of the Project Properties Dialog Box. If you select version 1.03 as the version in the Select Device Area of the Project Properties Dialog Box, you can use only the functions that are supported by project unit version 1.03. You cannot use functionality that was added for unit version 1.04 or later of the CPU Unit.</td>
<td></td>
</tr>
</tbody>
</table>

---

### Precautions for Correct Use

An error will occur if you perform the following type of operation.

- Create a project on Sysmac Studio version 1.02 or higher with unit version 1.01 or later selected as the version in the Select Device Area of the Project Properties Dialog Box.
- Upload the project to Sysmac Studio version 1.01.
Additional Information

Project Unit Version for Projects

- With Sysmac Studio version 1.02 or higher, you can select the unit version in the Select Device Area of the relevant dialog boxes.
- You can select any unit version that is the same as or earlier than the unit version of the CPU Unit. For example, if the unit version of the CPU Unit is 1.01, select either 1.00 or 1.01.
- The Sysmac Studio will treat the project unit version as the unit version of the CPU Unit. For example, if the project unit version is 1.00, you can use the functionality for unit version 1.00 on the Sysmac Studio.
- You can transfer a project to the Sysmac Studio if the project unit version is the same as or earlier than the unit version of the destination CPU Unit.
- Refer to the Sysmac Studio Version 1 Operation Manual (Cat. No. W504) for details on the Select Device Area of the relevant dialog boxes.

A-7-2 Relationship between Hardware Revisions of CPU Units and Sysmac Studio Versions

The following table shows how the hardware revisions of the NJ-series CPU Units correspond to Sysmac Studio versions. Use the corresponding version of Sysmac Studio or higher if you execute the Simulator in Execution Time Estimation Mode. You cannot select the relevant hardware revision if you use a lower version of the Sysmac Studio.

<table>
<thead>
<tr>
<th>Model number</th>
<th>Hardware revision of CPU Unit</th>
<th>Corresponding version of Sysmac Studio</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJ501-######</td>
<td>A</td>
<td>Ver.1.14</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>Ver.1.24</td>
</tr>
<tr>
<td>NJ301-######</td>
<td>A</td>
<td>Ver.1.24</td>
</tr>
<tr>
<td>NJ101-######</td>
<td>A</td>
<td>Ver.1.24</td>
</tr>
</tbody>
</table>
### Functions That Were Added or Changed for Each Unit Version

This section gives the functions that were added or changed for each unit version of the CPU Unit.

#### Additions and Changes to Functional Specifications

The following table gives the unit version of the CPU Units and the Sysmac Studio version for each addition or change to the functional specifications.

<table>
<thead>
<tr>
<th>Function</th>
<th>Unit version</th>
<th>Sysmac Studio version</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tasks</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conditionally executed tasks</td>
<td>Addition</td>
<td>1.03</td>
<td>1.04 [NJ/NX-series CPU Unit Software User’s Manual (Cat. No. W501)]</td>
</tr>
<tr>
<td><strong>Namespaces</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structure data types</td>
<td>Addition</td>
<td>1.01</td>
<td>1.02 [NJ/NX-series CPU Unit Software User’s Manual (Cat. No. W501)]</td>
</tr>
<tr>
<td>Specifying member offsets</td>
<td>Change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable-length array</td>
<td>Addition</td>
<td>1.18</td>
<td>1.22 [NJ/NX-series CPU Unit Software User’s Manual (Cat. No. W501)]</td>
</tr>
<tr>
<td><strong>Libraries</strong></td>
<td></td>
<td>1.01</td>
<td>1.02 [NJ/NX-series CPU Unit Software User’s Manual (Cat. No. W501)]</td>
</tr>
<tr>
<td><strong>Motion control</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-axes position control</td>
<td>Addition</td>
<td>1.03</td>
<td>1.04 [NJ/NX-series CPU Unit Motion Control User’s Manual (Cat. No. W507)]</td>
</tr>
<tr>
<td>Cyclic synchronous absolute positioning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homing with specified parameters</td>
<td>Addition</td>
<td>1.06</td>
<td>1.07 [NJ/NX-series CPU Unit Motion Control User’s Manual (Cat. No. W507)]</td>
</tr>
<tr>
<td>Enabling digital cam switches</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Command position compensation</td>
<td>Addition</td>
<td>1.10</td>
<td>1.12 [NJ/NX-series CPU Unit Motion Control User’s Manual (Cat. No. W507)]</td>
</tr>
<tr>
<td>Cam monitor</td>
<td>Addition</td>
<td>1.21</td>
<td>1.28/1.29 [NJ/NX-series CPU Unit Motion Control User’s Manual (Cat. No. W507)]</td>
</tr>
<tr>
<td>Start velocity</td>
<td>Addition</td>
<td>1.05</td>
<td>1.06 [NJ/NX-series CPU Unit Motion Control User’s Manual (Cat. No. W507)]</td>
</tr>
<tr>
<td><strong>Axes groups</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Axes group synchronous absolute positioning</td>
<td>Addition</td>
<td>1.01</td>
<td>1.02 [NJ/NX-series CPU Unit Motion Control User’s Manual (Cat. No. W507)]</td>
</tr>
<tr>
<td>Reading axes group positions</td>
<td>Addition</td>
<td>1.01</td>
<td>1.02 [NJ/NX-series CPU Unit Motion Control User’s Manual (Cat. No. W507)]</td>
</tr>
<tr>
<td>Changing the axes in a group</td>
<td>Addition</td>
<td>1.01</td>
<td>1.02 [NJ/NX-series CPU Unit Motion Control User’s Manual (Cat. No. W507)]</td>
</tr>
<tr>
<td><strong>Common items</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generating cam tables</td>
<td>Addition</td>
<td>1.08</td>
<td>1.09 [NX-series EtherCAT Coupler Unit User’s Manual (Cat. No. W519)]</td>
</tr>
<tr>
<td>Changing axis parameters</td>
<td>Addition</td>
<td>1.08</td>
<td>1.09 [NX-series EtherCAT Coupler Unit User’s Manual (Cat. No. W519)]</td>
</tr>
<tr>
<td><strong>Auxiliary functions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input signal logic inversion</td>
<td>Addition</td>
<td>1.05</td>
<td>1.06 [NX-series EtherCAT Coupler Unit User’s Manual (Cat. No. W519)]</td>
</tr>
<tr>
<td>NX Units</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function</td>
<td>Description</td>
<td>Addition/ Change</td>
<td>Unit version</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------------------------------</td>
<td>------------------</td>
<td>--------------</td>
</tr>
<tr>
<td><strong>Communications</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Built-in Ether-Net/IP port</td>
<td>TCP/IP applications</td>
<td>Addition</td>
</tr>
<tr>
<td></td>
<td>OPC UA</td>
<td>Server Function</td>
<td>Addition</td>
</tr>
<tr>
<td></td>
<td>Packet monitoring*1 (NJ301-□□□□□□□)</td>
<td>Addition</td>
<td>1.10 1.40</td>
</tr>
<tr>
<td></td>
<td>Topology Ring</td>
<td>Addition</td>
<td>1.40 1.29</td>
</tr>
<tr>
<td></td>
<td>Communications instructions</td>
<td>Change</td>
<td>1.08 1.11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Debugging functions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Differential monitoring</td>
<td>Addition</td>
<td>1.03 1.04</td>
</tr>
<tr>
<td><strong>Reliability functions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Self diagnosis</td>
<td>Controller errors</td>
<td>Changing levels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Protection</td>
<td>Data protection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operation authority verification</td>
<td>Number of groups</td>
</tr>
<tr>
<td><strong>SD Memory Cards</strong></td>
<td>Application</td>
<td>Automatic transfer from SD Memory Card</td>
<td>Addition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Program transfer from SD Memory Card</td>
<td>Addition</td>
</tr>
<tr>
<td><strong>Backups data</strong></td>
<td>SD Memory Card backups</td>
<td>Operating methods</td>
<td>CPU Unit front-panel DIP switch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Specification with system-defined variables</td>
<td>Addition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD Memory Card Window in Sysmac Studio</td>
<td>Addition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Special instruction</td>
<td>Addition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Protection</td>
<td>Disabling backups to SD Memory Cards</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Backups to SD Memory Cards</td>
<td>Operation authority verification</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sysmac Studio Controller backups</td>
<td>Addition</td>
</tr>
</tbody>
</table>

*1 This addition applies only to an NJ301-□□□□□□□ CPU Unit. The NJ501-□□□□□□□ and NJ101-□□□□□□□ CPU Units support packet monitoring with all versions.

*2 Packet monitoring can be used with project unit version earlier than 1.40. It cannot be used with project unit version 1.40 or later.

**Note** Refer to the manuals for the function modules for additions and changes to function module functions for each unit version of the CPU Units.
Appendices

- **Addition of Mountable CJ-series Units**
  The CJ-series Units that can be mounted have increased for the new unit version of the CPU Unit. For details, refer to *CJ-series Configuration Units* on page 2-11.

- **Additions and Changes to Basic Instructions and Motion Control Instructions**
  The basic instructions and motion control instructions that you can use have increased or changed for the new unit version of the CPU Unit. For details, refer to the *NJ/NX-series Instructions Reference Manual* (Cat. No. W502) and *NJ/NX-series Motion Control Instructions Reference Manual* (Cat. No. W508).

- **Additions and Changes to Controller Events**
  The events that can occur have increased or changed for the new unit version of the CPU Unit. There are also changes in the recovery methods to use when some errors occur. For details, refer to the *NJ/NX-series Troubleshooting Manual* (Cat. No. W503).

- **Additions and Changes to System-defined Variables**
  The system-defined variables that you can use have increased or changed for the new unit version of the CPU Unit. For details, refer to the *NJ/NX-series CPU Unit Software User’s Manual* (Cat. No. W501).
This section introduces the functions for which performance was improved for each unit version of the CPU Unit and for each Sysmac Studio version.

<table>
<thead>
<tr>
<th>Function</th>
<th>Performance value</th>
<th>Unit version</th>
<th>Sysmac Studio version</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Programming</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program capacity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantities</td>
<td>Number of POU instances (NJ501-[])</td>
<td>9,000</td>
<td>1.06 or higher</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6,000</td>
<td>1.05 or lower</td>
</tr>
<tr>
<td></td>
<td>Number of POU instances (NJ301-[])</td>
<td>3,000</td>
<td>1.04 or later</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,500</td>
<td>1.05 or higher</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,400</td>
<td>1.04 or lower</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,500</td>
<td>1.06 or lower</td>
</tr>
<tr>
<td>Variables with a Retain attribute</td>
<td>Number of variables*1 (NJ301-[])</td>
<td>5,000</td>
<td>1.04 or later</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,500</td>
<td>1.04 or lower</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,500</td>
<td>1.03 or earlier</td>
</tr>
<tr>
<td>Variables without a Retain attribute</td>
<td>Number of variables (NJ501-[])</td>
<td>180,000</td>
<td>1.20 or later</td>
</tr>
<tr>
<td></td>
<td></td>
<td>90,000</td>
<td>1.26 or higher</td>
</tr>
<tr>
<td></td>
<td>Number of variables (NJ301-[])</td>
<td>90,000</td>
<td>Other than the above combination</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22,500</td>
<td>Other than the above combination</td>
</tr>
<tr>
<td><strong>Memory capacity for variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of POU instances (NJ501-[])</td>
<td>3,000</td>
<td>1.05 or higher</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,500</td>
<td>1.04 or lower</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,400</td>
<td>1.05 or higher</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,500</td>
<td>1.04 or lower</td>
</tr>
<tr>
<td></td>
<td>Number of variables (NJ501-[])</td>
<td>150,000</td>
<td>1.04 or later</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75,000</td>
<td>1.05 or higher</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25,000</td>
<td>1.04 or lower</td>
</tr>
<tr>
<td><strong>Motion Control</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of controlled axes<em>2</em>3*4 (NJ301-[])</td>
<td>15 axes</td>
<td>1.06 or later</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 axes (NJ301-1200)</td>
<td>1.07 or higher</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 axes (NJ301-1100)</td>
<td>Other than the above combination</td>
</tr>
<tr>
<td></td>
<td>Maximum number of axes for single-axis control*5 (NJ301-[])</td>
<td>15 axes</td>
<td>1.06 or later</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 axes (NJ301-1200)</td>
<td>1.07 or higher</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 axes (NJ301-1100)</td>
<td>Other than the above combination</td>
</tr>
<tr>
<td></td>
<td>Packet interval</td>
<td>Can be set for each connection. 1 to 10,000 ms in 1-ms increments</td>
<td>1.03 or higher</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Can be set for each connection. 10 to 10,000 ms in 1-ms increments</td>
<td>1.02 or lower</td>
</tr>
<tr>
<td></td>
<td>Permissible communications band</td>
<td>3,000 pps*6 (including heartbeat)</td>
<td>1.03 or higher</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,000 pps (including heartbeat)</td>
<td>1.02 or lower</td>
</tr>
<tr>
<td></td>
<td>Number of TCP sockets</td>
<td>30</td>
<td>1.03 or higher</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16</td>
<td>1.02 or lower</td>
</tr>
<tr>
<td><strong>Built-in EtherCAT port</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Communications cycle*7 (NJ301-[])</td>
<td>500, 1,000, 2,000, or 4,000 (\mu)s</td>
<td>1.03 or higher</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,000, 2,000, or 4,000 (\mu)s</td>
<td>1.02 or lower</td>
</tr>
</tbody>
</table>

*1 The performance improvement applies only to an NJ301-\[\] CPU Unit. The maximum number of variables with a Retain attribute for the NJ501-\[\] is 10,000.

*2 This is the total for all axis types.
*3 The performance improvement applies only to an NJ301-CPU Unit. The maximum numbers of controlled axes for the NJ501-CPU are as follows:

*4 There is no change in the maximum number of used real axes.

*5 The performance improvement applies only to an NJ301-CPU Unit. The maximum numbers of axes for single-axis control for the NJ501-CPU are as follows:

*6 Here, pps means “packets per second” and indicates the number of packets that can be processed in one second.

*7 The performance improvement applies only to an NJ301-CPU Unit. You can use 500, 1,000, 2,000 or 4,000 μs communications cycle with an NJ501-CPU Unit, and 1,000, 2,000 or 4,000 μs communications cycle with an NJ101-CPU Unit.
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