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Cat. No. W339-E1-17

SYSMAC CS Series
CS1G/H-CPU□□H

Programmable Controllers

OPERATION MANUAL

OMRON

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SYSMAC CS Series
CS1G/H-CPU□□H
Programmable Controllers

Operation Manual

Revised March 2012

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Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

⚠ DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Additionally, there may be severe property damage.

⚠ 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.

OMRON Product References

All OMRON products are capitalized in this manual. The word “Unit” is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation “Ch,” which appears in some displays and on some OMRON products, often means “word” and is abbreviated “Wd” in documentation in this sense.

The abbreviation “PLC” means Programmable Controller. “PC” is used, however, in some Programming Device displays to mean Programmable Controller.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

1,2,3... 1. Indicates lists of one sort or another, such as procedures, checklists, etc.

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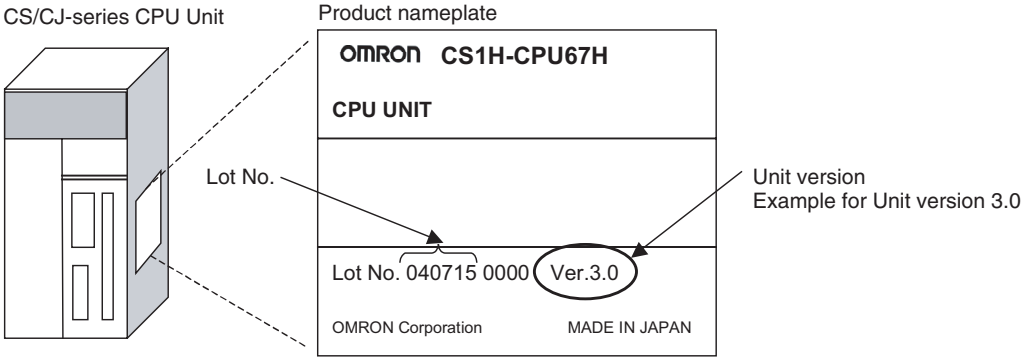
Unit Versions of CS/CJ-series CPU Units

Unit Versions

A “unit version” has been introduced to manage CPU Units in the CS/CJ Series according to differences in functionality accompanying Unit upgrades. This applies to the CS1-H, CJ1-H, CJ1M, and CS1D CPU Units.

Notation of Unit Versions on Products

The unit version is given to the right of the lot number on the nameplate of the products for which unit versions are being managed, as shown below.



- CS1-H, CJ1-H, and CJ1M CPU Units manufactured on or before November 4, 2003 do not have a unit version given on the CPU Unit (i.e., the location for the unit version shown above is blank).
- The unit version of the CS1-H, CJ1-H, and CJ1M CPU Units, as well as the CS1D CPU Units for Single-CPU Systems, begins at version 2.0.
- The unit version of the CS1D CPU Units for Duplex-CPU Systems, begins at version 1.1.
- CPU Units for which a unit version is not given are called *Pre-Ver. □.□ CPU Units, such as Pre-Ver. 2.0 CPU Units and Pre-Ver. 1.1 CPU Units*.

Confirming Unit Versions with Support Software

CX-Programmer version 4.0 can be used to confirm the unit version using one of the following two methods.

- Using the ***PLC Information***
- Using the ***Unit Manufacturing Information*** (This method can be used for Special I/O Units and CPU Bus Units as well.)

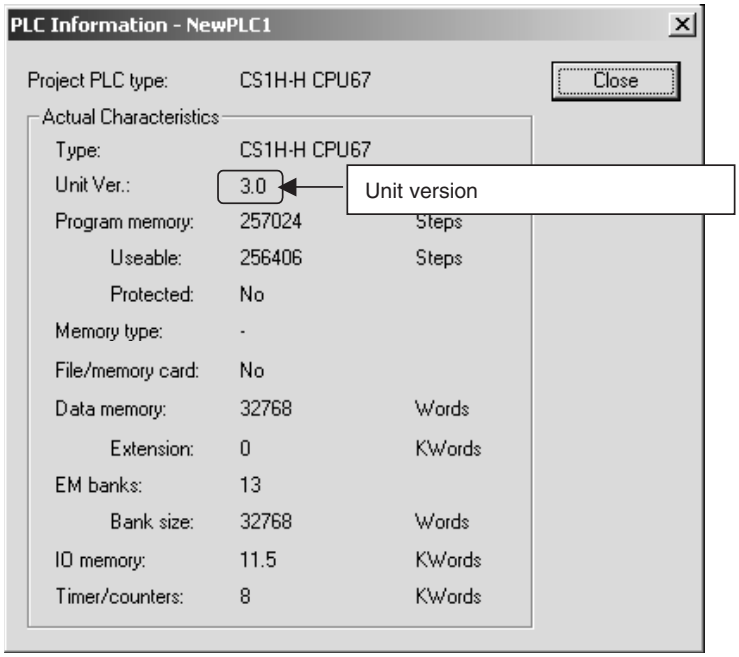
Note CX-Programmer version 3.3 or lower cannot be used to confirm unit versions.

PLC Information

- If you know the device type and CPU type, select them in the *Change PLC* Dialog Box, go online, and select ***PLC - Edit - Information*** from the menus.
- If you don't know the device type and CPU type, but are connected directly to the CPU Unit on a serial line, select ***PLC - Auto Online*** to go online, and then select ***PLC - Edit - Information*** from the menus.

In either case, the following *PLC Information* Dialog Box will be displayed.

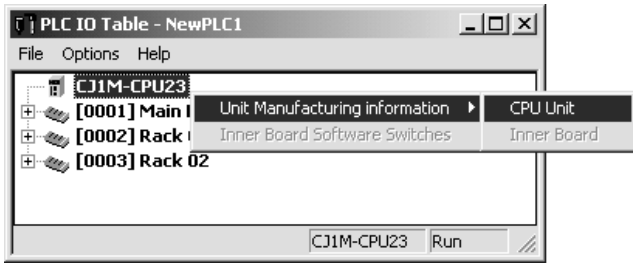
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Use the above display to confirm the unit version of the CPU Unit.

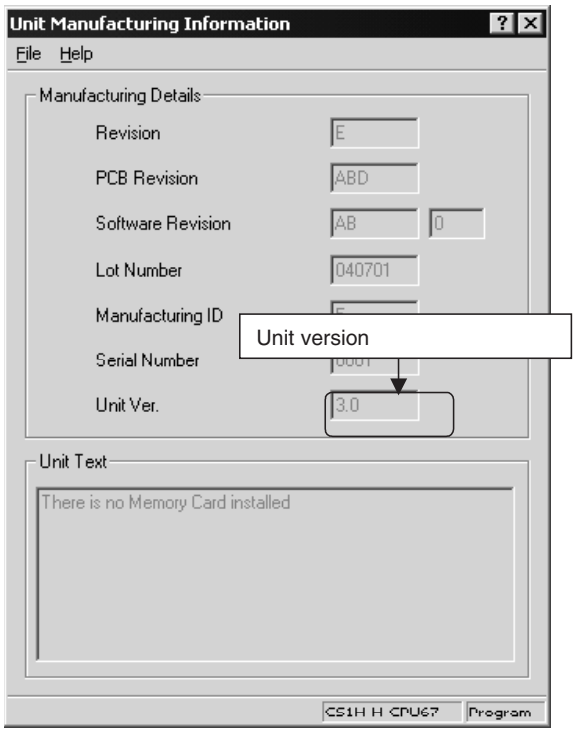
Unit Manufacturing Information

In the IO Table Window, right-click and select ***Unit Manufacturing information - CPU Unit.***



The following *Unit Manufacturing information* Dialog Box will be displayed.

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Use the above display to confirm the unit version of the CPU Unit connected online.

Using the Unit Version Labels

The following unit version labels are provided with the CPU Unit.

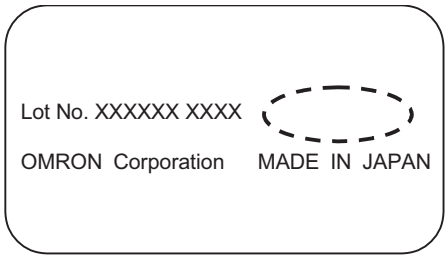
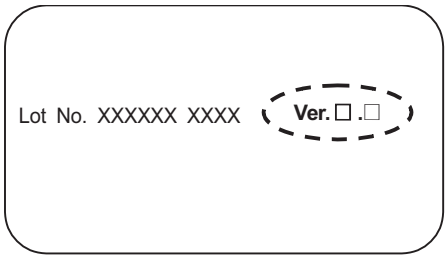


These labels can be attached to the front of previous CPU Units to differentiate between CPU Units of different unit versions.

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Unit Version Notation

In this manual, the unit version of a CPU Unit is given as shown in the following table.

Product nameplate Meaning	CPU Units on which no unit version is given 	Units on which a version is given (Ver. □.□) 
Designating individual CPU Units (e.g., the CS1H-CPU67H)	Pre-Ver. 2.0 CS1-H CPU Units	CS1H-CPU67H CPU Unit Ver. □.□
Designating groups of CPU Units (e.g., the CS1-H CPU Units)	Pre-Ver. 2.0 CS1-H CPU Units	CS1-H CPU Units Ver. □.□
Designating an entire series of CPU Units (e.g., the CS-series CPU Units)	Pre-Ver. 2.0 CS-series CPU Units	CS-series CPU Units Ver. □.□

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Unit Versions

CS Series

Units	Models	Unit version
CS1-H CPU Units	CS1□-CPU□□H	Unit version 4.0
		Unit version 3.0
		Unit version 2.0
		Pre-Ver. 2.0
CS1D CPU Units	Duplex-CPU Systems CS1D-CPU□□H	Unit version 1.2
		Unit version 1.1
		Pre-Ver. 1.1
	Single-CPU Systems CS1D-CPU□□S	Unit version 2.0
CS1 CPU Units	CS1□-CPU□□	No unit version.
CS1 Version-1 CPU Units	CS1□-CPU□□-V1	No unit version.

Function Support by Unit Version

• Functions Supported for Unit Version 4.0 or Later

CX-Programmer 7.0 or higher must be used to enable using the functions added for unit version 4.0.
CX-Programmer version 7.2 can be used to enable using additional functions.

CS1-H CPU Units

Function		CS1□-CPU□□H	
		Unit version 4.0 or later	Other unit versions
Online editing of function blocks **Note** This function cannot be used for simulations on the CX-Simulator.		OK	---
Input-output variables in function blocks		OK	---
Text strings in function blocks		OK	---
New application instructions	Number-Text String Conversion Instructions: NUM4, NUM8, NUM16, STR4, STR8, and STR16	OK	---
	TEXT FILE WRITE (TWRIT)	OK	---
The ST language can be used in task programs.		OK with CX-Programmer version 7.2 or higher	---
The SFC language can be used in task programs.		OK with CX-Programmer version 7.2 or higher	---

User programs that contain functions supported only by CPU Units with unit version 4.0 or later cannot be used on CS/CJ-series CPU Units with unit version 3.0 or earlier. An error message will be displayed if an attempt is made to download programs containing unit version 4.0 functions to a CPU Unit with a unit version of 3.0 or earlier, and the download will not be possible.

If an object program file (.OBJ) using these functions is transferred to a CPU Unit with a unit version of 3.0 or earlier, a program error will occur when operation is started or when the unit version 4.0 function is executed, and CPU Unit operation will stop.

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• **Functions Supported for Unit Version 3.0 or Later**

CX-Programmer 5.0 or higher must be used to enable using the functions added for unit version 3.0.

CS1-H CPU Units

Function		CS1□-CPU□□H	
		Unit version 3.0 or later	Other unit versions
Function blocks		OK	---
Serial Gateway (converting FINS commands to CompoWay/F commands at the built-in serial port)		OK	---
Comment memory (in internal flash memory)		OK	---
Expanded simple backup data		OK	---
New application instructions	TXDU(256), RXDU(255) (support no-protocol communications with Serial Communications Units with unit version 1.2 or later)	OK	---
	Model conversion instructions: XFERC(565), DISTC(566), COLLC(567), MOVBC(568), BCNTC(621)	OK	---
	Special function block instructions: GETID(286)	OK	---
Additional instruction functions	TXD(235) and RXD(236) instructions (support no-protocol communications with Serial Communications Boards with unit version 1.2 or later)	OK	---

User programs that contain functions supported only by CPU Units with unit version 3.0 or later cannot be used on CS/CJ-series CPU Units with unit version 2.0 or earlier. An error message will be displayed if an attempt is made to download programs containing unit version 3.0 functions to a CPU Unit with a unit version of 2.0 or earlier, and the download will not be possible.

If an object program file (.OBJ) using these functions is transferred to a CPU Unit with a unit version of 2.0 or earlier, a program error will occur when operation is started or when the unit version 3.0 function is executed, and CPU Unit operation will stop.

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• **Functions Supported for Unit Version 2.0 or Later**

CX-Programmer 4.0 or higher must be used to enable using the functions added for unit version 2.0.

CS1-H CPU Units

Function		CS1-H CPU Units (CS1□-CPU□□H)	
		Unit version 2.0 or later	Other unit versions
Downloading and Uploading Individual Tasks		OK	---
Improved Read Protection Using Passwords		OK	---
Write Protection from FINS Commands Sent to CPU Units via Networks		OK	---
Online Network Connections without I/O Tables		OK	---
Communications through a Maximum of 8 Network Levels		OK	---
Connecting Online to PLCs via NS-series PTs		OK	OK from lot number 030201
Setting First Slot Words		OK for up to 64 groups	OK for up to 8 groups
Automatic Transfers at Power ON without a Parameter File		OK	---
Automatic Detection of I/O Allocation Method for Automatic Transfer at Power ON		---	---
Operation Start/End Times		OK	---
New Application Instructions	MILH, MILR, MILC	OK	---
	=DT, <>DT, <DT, <=DT, >DT, >=DT	OK	---
	BCMP2	OK	---
	GRY	OK	OK from lot number 030201
	TPO	OK	---
	DSW, TKY, HKY, MTR, 7SEG	OK	---
	EXPLT, EGATR, ESATR, ECHRD, ECHWR	OK	---
	Reading/Writing CPU Bus Units with IORD/IOWR	OK	OK from lot number 030418
	PRV2	---	---

User programs that contain functions supported only by CPU Units with unit version 2.0 or later cannot be used on CS/CJ-series Pre-Ver. 2.0 CPU Units. An error message will be displayed if an attempt is made to download programs containing unit version s.0 functions to a Pre-Ver. 2.0 CPU Unit, and the download will not be possible.

If an object program file (.OBJ) using these functions is transferred to a Pre-Ver. 2.0 CPU Unit, a program error will occur when operation is started or when the unit version 2.0 function is executed, and CPU Unit operation will stop.

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Unit Versions and Programming Devices

The following tables show the relationship between unit versions and CX-Programmer versions.

Unit Versions and Programming Devices

CPU Unit	Functions		CX-Programmer					Programming Console
			Ver. 3.3 or lower	Ver. 4.0	Ver. 5.0 Ver. 6.0	Ver. 7.0 or higher	Ver. 7.2 or higher	
CS/CJ-series unit Ver. 4.0	Functions added for unit version 4.0	Using new functions	---	---	---	OK (See note 2.)	OK (See note 2.)	No restrictions
		Not using new functions	OK	OK	OK	OK	OK	
CS/CJ-series unit Ver. 3.0	Functions added for unit version 3.0	Using new functions	---	---	OK	OK	OK	
		Not using new functions	OK	OK	OK	OK	OK	
CS/CJ-series unit Ver. 2.0	Functions added for unit version 2.0	Using new functions	---	OK	OK	OK	OK	
		Not using new functions	OK	OK	OK	OK	OK	
CS1D CPU Units for Single-CPU Systems, unit Ver. 2.0	Functions added for unit version 2.0	Using new functions	---	OK	OK	OK	OK	
		Not using new functions						
CS1D CPU Units for Duplex-CPU Systems, unit Ver.1.	Functions added for unit version 1.1	Using function blocks	---	OK	OK	OK	OK	
		Not using function blocks	OK	OK	OK	OK	OK	

Note

1. As shown above, there is no need to upgrade to CX-Programmer version as long as the functions added for unit versions are not used.
2. CX-Programmer version 7.0 or higher is required to use the upgraded functions for CS/CJ-series CPU Units with unit version 4.0. CX-Programmer version 7.2 can be used to enable using additional functions.

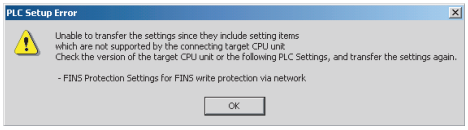
Device Type Setting

The unit version does not affect the setting made for the device type on the CX-Programmer. Select the device type as shown in the following table regardless of the unit version of the CPU Unit.

Series	CPU Unit group	CPU Unit model	Device type setting on CX-Programmer Ver. 4.0 or higher
CS Series	CS1-H CPU Units	CS1G-CPU□□H	CS1G-H
		CS1H-CPU□□H	CS1H-H
	CS1D CPU Units for Duplex-CPU Systems	CS1D-CPU□□H	CS1D-H (or CS1H-H)
	CS1D CPU Units for Single-CPU Systems	CS1D-CPU□□S	CS1D-S

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Troubleshooting Problems with Unit Versions on the CX-Programmer

Problem	Cause	Solution
 After the above message is displayed, a compiling error will be displayed on the *Compile* Tab Page in the Output Window.	An attempt was made to download a program containing instructions supported only by later unit versions or a CPU Unit to a previous unit version.	Check the program or change to a CPU Unit with a later unit version.
	An attempt was to download a PLC Setup containing settings supported only by later unit versions or a CPU Unit to a previous unit version.	Check the settings in the PLC Setup or change to a CPU Unit with a later unit version.
“????” is displayed in a program transferred from the PLC to the CX-Programmer.	An attempt was made to upload a program containing instructions supported only by higher versions of CX-Programmer to a lower version.	New instructions cannot be uploaded to lower versions of CX-Programmer. Use a higher version of CX-Programmer.

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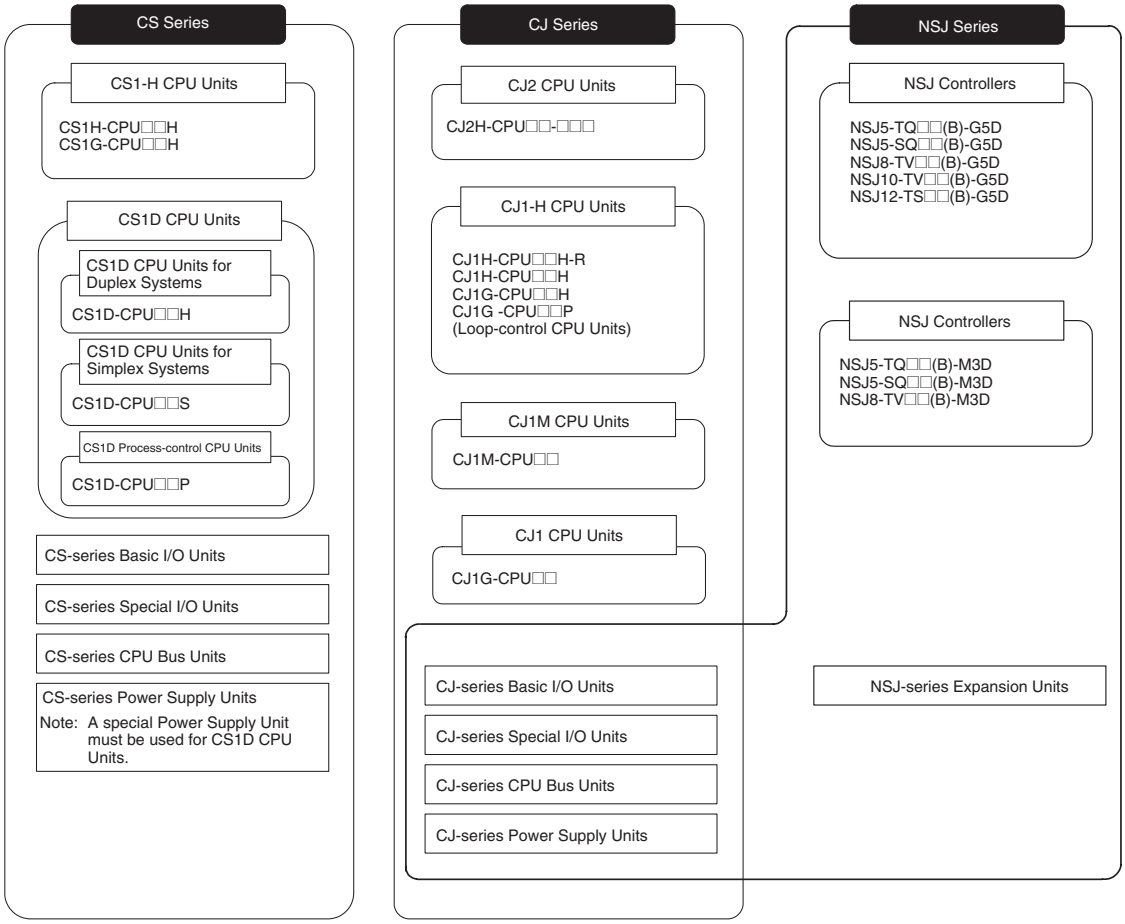
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About this Manual:

This manual describes the installation and operation of the CS-series Programmable Controllers (PLCs) and includes the sections described on the following page. The CS Series and CJ Series are subdivided as shown in the following figure.



Please read this manual and all related manuals listed in the following table and be sure you understand information provided before attempting to install or use CS1G/H-CPU□□H CPU Units in a PLC System.

Name	Cat. No.	Contents
SYSMAC CS Series CS1G/H-CPU□□H, CS1G/H-CPU□□-EV1 Programmable Controllers Operation Manual	W339	Provides an outlines of and describes the design, installation, maintenance, and other basic operations for the CS-series PLCs. (This manual)
SYSMAC CS/CJ/NSJ Series CS1G/H-CPU□□-EV1, CS1G/H-CPU□□H, CS1D-CPU□□H, CS1D-CPU□□S, CJ1H-CPU□□H-R, CJ1G-CPU□□, CJ1M-CPU□□, CJ1G-CPU□□P, CJ1G/H-CPU□□H Programmable Controllers Programming Manual	W394	This manual describes programming and other methods to use the functions of the CS/CJ-series PLCs.

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Name	Cat. No.	Contents
SYSMAC CS/CJ/NSJ Series CJ2H-CPU6□-EIP, CJ2H-CPU6□, CJ2M-CPU□□, CS1G/H-CPU□□H, CS1G/H-CPU□□-EV1, CS1D-CPU□□H, CS1D-CPU□□S, CJ1H-CPU□□H-R, CJ1G/H-CPU□□H, CJ1G-CPU□□P, CJ1M-CPU□□, CJ1G-CPU□□, NSJ□-□□□□(B)-G5D, NSJ□-□□□□(B)-M3D Programmable Controllers Instructions Reference Manual	W474	Provides detailed descriptions of the instructions. When programming, use this manual together with the manuals for your CPU Unit.
SYSMAC CS/CJ/NSJ Series CQM1H-PRO01-E, C200H-PRO27-E, CQM1-PRO01-E Programming Consoles Operation Manual	W341	Provides information on how to program and operate CS/CJ-series PLCs using a Programming Console.
SYSMAC CS/CJ/NSJ Series CS1G/H-CPU□□-EV1, CS1G/H-CPU□□H, CS1D-CPU□□H, CS1D-CPU□□S, CJ1H-CPU□□H-R, CJ1G-CPU□□, CJ1M-CPU□□, CJ1G-CPU□□P, CJ1G/H-CPU□□H, CJ2H-CPU6□-EIP, CJ2H-CPU6□, CJ2M-CPU□□, CS1W-SCU□□-V1, CS1W-SCB□□-V1, CJ1W-SCU□□-V1, CP1H-X□□□□-□, CP1H-XA□□□□-□, CP1H-Y□□□□-□, CP1L-M/L□□□-□, CP1E-E□□D□-□, CP1E-N□□D□-□, NSJ□-□□□□(B)-G5D, NSJ□-□□□□(B)-M3D Communications Commands Reference Manual	W342	Describes the C-series (Host Link) and FINS communications commands used with CS/CJ-series PLCs.
SYSMAC CS Series CS1D-CPU□□H CPU Units CS1D-CPU□□S CPU Units CS1D-DPL01/02D Duplex Unit CS1D-PA/PD□□□ Power Supply Unit Duplex System Operation Manual	W405	Provides an outline of and describes the design, installation, maintenance, and other basic operations for a Duplex System based on CS1D CPU Units.
CXONE-AL□□C-V4/AL□□D-V4 CX-Programmer Operation Manual	W446	Provides information on how to use the CX-Programmer for all functionality except for function blocks.
CXONE-AL□□C-V4/CXONE-AL□□D-V4 CX-Programmer Operation Manual Function Blocks/Structured Text	W447	Explains how to use the CX-Programmer software's function block and structured text functions. For explanations of other shared CX-Programmer functions, refer to the *CX-Programmer Operation Manual* (W446).
SYSMAC CS/CJ Series CS1W-SCB□□-V1, CS1W-SCU□□-V1, CJ1W-SCU□□-V1, CJ1W-SCU□2 Serial Communications Boards/Units Operation Manual	W336	Describes the use of Serial Communications Unit and Boards to perform serial communications with external devices, including the usage of standard system protocols for OMRON products.
CXONE-AL□□C-V4/AL□□D-V4 CX-Protocol Operation Manual	W344	Describes the use of the CX-Protocol to create protocol macros as communications sequences to communicate with external devices.
CXONE-AL□□C-V4/AL□□D-V4 CX-Integrator Operation Manual	W464	Describes operating procedures for the CX-Integrator Network Configuration Tool for CS-, CJ-, CP-, and NSJ-series Controllers.
CXONE-AL□□C-V4/AL□□D-V4, CXONE-LT□□C-V4 CX-One Setup Manual	W463	Installation and overview of CX-One FA Integrated Tool Package.

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This manual contains the following sections.

Section 1 introduces the special features and functions of the CS-series PLCs and describes the differences between these PLCs and other PLCs.

Section 2 provides tables of standard models, Unit specifications, system configurations, and a comparison between different Units.

Section 3 provides the names of components and their functions for various Units. The Unit dimensions are also provided.

Section 4 outlines the steps required to assemble and operate a CS-series PLC system.

Section 5 describes how to install a PLC System, including mounting the various Units and wiring the System. Be sure to follow the instructions carefully. Improper installation can cause the PLC to malfunction, resulting in very dangerous situations.

Section 6 describes the settings of the DIP switch and how they affect operation.

Section 7 describes the settings in the PLC Setup and how they are used to control CPU Unit operation.

Section 8 describes I/O allocations to Basic I/O Units, Special I/O Units, and CPU Bus Units, and data exchange with Units.

Section 9 describes the structure and functions of the I/O Memory Areas and Parameter Areas.

Section 10 describes the internal operation of the CPU Unit and the cycle used to perform internal processing.

Section 11 provides information on hardware and software errors that occur during PLC operation.

Section 12 provides inspection and maintenance information.

The ***Appendices*** provide Unit specifications, current/power consumptions, Auxiliary Area words and bits, a comparison of CS-series and previous PLCs, internal I/O addresses, and PLC Setup settings.

⚠ WARNING Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

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Read and Understand this Manual

Please read and understand this manual before using the product. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

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Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this manual.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

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Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

PERFORMANCE DATA

Performance data given in this manual is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

ERRORS AND OMISSIONS

The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

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PRECAUTIONS

This section provides general precautions for using the CS-series Programmable Controllers (PLCs) and related devices.

The information contained in this section is important for the safe and reliable application of Programmable Controllers. You must read this section and understand the information contained before attempting to set up or operate a PLC system.

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

2 General Precautions

The user must operate the product according to the performance specifications described in the operation manuals.

Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

This manual provides information for programming and operating the Unit. Be sure to read this manual before attempting to use the Unit and keep this manual close at hand for reference during operation.

⚠WARNING It is extremely important that a PLC and all PLC Units be used for the specified purpose and under the specified conditions, especially in applications that can directly or indirectly affect human life. You must consult with your OMRON representative before applying a PLC System to the above-mentioned applications.

3 Safety Precautions

⚠WARNING The CPU Unit refreshes I/O even when the program is stopped (i.e., even in PROGRAM mode). Confirm safety thoroughly in advance before changing the status of any part of memory allocated to I/O Units, Special I/O Units, or CPU Bus Units. Any changes to the data allocated to any Unit may result in unexpected operation of the loads connected to the Unit. Any of the following operation may result in changes to memory status.

- Transferring I/O memory data to the CPU Unit from a Programming Device.
- Changing present values in memory from a Programming Device.
- Force-setting/-resetting bits from a Programming Device.
- Transferring I/O memory files from a Memory Card or EM file memory to the CPU Unit.
- Transferring I/O memory from a host computer or from another PLC on a network.

⚠WARNING Do not attempt to take any Unit apart while the power is being supplied. Doing so may result in electric shock.

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

⚠**WARNING** Do not attempt to disassemble, repair, or modify any Units. Any attempt to do so may result in malfunction, fire, or electric shock.

⚠**WARNING** Do not touch the Power Supply Unit while power is being supplied or immediately after power has been turned OFF. Doing so may result in electric shock.

⚠**WARNING** Provide safety measures in external circuits (i.e., not in the Programmable Controller), including the following items, to ensure safety in the system if an abnormality occurs due to malfunction of the PLC or another external factor affecting the PLC operation. Not doing so may result in serious accidents.

- Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits.
- The PLC will turn OFF all outputs when its self-diagnosis function detects any error or when a severe failure alarm (FALS) instruction is executed. Unexpected operation, however, may still occur for errors in the I/O control section, errors in I/O memory, and other errors that cannot be detected by the self-diagnosis function. As a countermeasure for all such errors, external safety measures must be provided to ensure safety in the system.
- The PLC 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 safety in the system.
- When the 24-V DC output (service power supply to the PLC) is overloaded or short-circuited, the voltage may drop and result in the outputs being turned OFF. As a countermeasure for such problems, external safety measures must be provided to ensure safety in the system.

⚠**Caution** Confirm safety before transferring data files stored in the file memory (Memory Card or EM file memory) to the I/O area (CIO) of the CPU Unit using a peripheral tool. Otherwise, the devices connected to the output unit may malfunction regardless of the operation mode of the CPU Unit.

⚠**Caution** Fail-safe measures must be taken by the customer to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes. Serious accidents may result from abnormal operation if proper measures are not provided.

⚠**Caution** Execute online edit only after confirming that no adverse effects will be caused by extending the cycle time. Otherwise, the input signals may not be readable.

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⚠**Caution** A CS1-H/CJ1-H/CJ1M/CS1D CPU Unit automatically back up the user program and parameter data to flash memory when these are written to the CPU Unit. I/O memory (including the DM, EM, and HR Areas), however, is not written to flash memory. The DM, EM, and HR Areas can be held during power interruptions with a battery. If there is a battery error, the contents of these areas may not be accurate after a power interruption. If the contents of the DM, EM, and HR Areas are used to control external outputs, prevent inappropriate outputs from being made whenever the Battery Error Flag (A40204) is ON. Areas such as the DM, EM, and HR Areas, the contents of which can be held during power interrupts, is backed up by a battery. If a battery error occurs, the contents of the areas that are set to be held may not be accurate even though a memory error will not occur to stop operation. If necessary for the safety of the system, take appropriate measures in the ladder program whenever the Battery Error Flag (A40204) turns ON, such as resetting the data in these areas.

⚠**Caution** Confirm safety at the destination node before transferring a program to another node or changing contents of the I/O memory area. Doing either of these without confirming safety may result in injury.

⚠**Caution** Tighten the screws on the terminal block of the AC Power Supply Unit to the torque specified in the operation manual. The loose screws may result in burning or malfunction.

⚠**Caution** Be careful when connecting personal computers or other peripheral devices to a PLC to which is mounted a non-insulated Unit (CS1W-CLK1□(-V1), CS1W-CLK5□(-V1), or CS1W-ETN01) connected to an external power supply. A short-circuit will be created if the 24 V side of the external power supply is grounded and the 0 V side of the peripheral device is grounded. When connecting a peripheral device to this type of PLC, either ground the 0 V side of the external power supply or do not ground the external power supply at all.

4 Operating Environment Precautions

⚠**Caution** Do not operate the control system in the following locations:

- 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.

⚠**Caution** Take appropriate and sufficient countermeasures when installing systems in the following locations:

- Locations subject to static electricity or other forms of noise.
- Locations subject to strong electromagnetic fields.
- Locations subject to possible exposure to radioactivity.

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- Locations close to power supplies.

⚠ **Caution** The operating environment of the PLC System can have a large effect on the longevity and reliability of the system. Improper operating environments can lead to malfunction, failure, and other unforeseeable problems with the PLC System. Be sure that the operating environment is within the specified conditions at installation and remains within the specified conditions during the life of the system.

5 Application Precautions

Observe the following precautions when using the PLC System.

- You must use the CX-Programmer (programming software that runs on Windows) if you need to program more than one task. A Programming Console can be used to program only one cyclic task plus interrupt tasks. A Programming Console can, however, be used to edit multitask programs originally created with the CX-Programmer.
- There are restrictions in the areas and addresses that can be accessed in I/O memory of the CS-series CPU Units when using the C200H Special I/O Units in combination with the following functions. (Refer to *Appendix F Restrictions in Using C200H Special I/O Units* for details.)
  - There are restrictions in data transfer with the CPU Unit when programming transfers inside an ASCII Unit using the PLC READ, PLC WRITE, and similar commands.
  - There are restrictions in data transfer with the CPU Unit for allocated bits and DM area specifications (areas and addresses for source and destination specifications).
  - The DeviceNet output area for a C200HW-DRM21-V1 DeviceNet Master Unit (CIO 0050 to CIO 0099) overlaps with the I/O bit area (CIO 0000 to CIO 0319). Do not use automatic allocations for I/O in any system where allocations to the DeviceNet system will overlap with allocations to I/O Units. Instead, use a Programming Device or the CX-Programmer to manually allocate I/O for the DeviceNet devices, being sure that the same words and bits are not allocated more than once, and transfer the resulting I/O table to the CPU Unit. If DeviceNet communications are attempted when the same bits are allocated to both DeviceNet devices and I/O Units (which can occur even if automatic allocation is used), the DeviceNet devices and I/O Units may both exhibit faulty operation.
  - Special bits and flags for PLC Link Units (CIO 0247 to CIO 0250) overlap with the I/O bit area (CIO 0000 to CIO 0319). Do not use automatic allocations for I/O in any system where allocations to the I/O Units will overlap with allocations to I/O Units. Instead, use a Programming Device or the CX-Programmer to manually allocate I/O to I/O Units, being sure that the special bits and flags for PLC Link Units are not used, and transfer the resulting I/O table to the CPU Unit. If operation is attempted when the special bits and flags for PLC Link Units are also allocated to I/O Units (which can occur even if automatic allocation is used), the PLC Link Units and I/O Units may both exhibit faulty operation.

⚠ **WARNING** Always heed these precautions. Failure to abide by the following precautions could lead to serious or possibly fatal injury.

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- Always connect to a ground of 100 Ω or less when installing the Units. Not connecting to a ground of 100 Ω or less may result in electric shock.
- A ground of 100 Ω or less must be installed when shorting the GR and LG terminals on the Power Supply Unit.
- Always turn OFF the power supply to the PLC before attempting any of the following. Not turning OFF the power supply may result in malfunction or electric shock.
  - Mounting or dismounting Power Supply Units, I/O Units, CPU Units, Inner Boards, or any other Units.
  - Assembling the Units.
  - Setting DIP switches or rotary switches.
  - Connecting cables or wiring the system.
  - Connecting or disconnecting the connectors.

⚠ **Caution** Failure to abide by the following precautions could lead to faulty operation of the PLC or the system, or could damage the PLC or PLC Units. Always heed these precautions.

- The user program and parameter area data in CS1-H CPU Units is backed up in the built-in flash memory. The BKUP indicator will light on the front of the CPU Unit when the backup operation is in progress. Do not turn OFF the power supply to the CPU Unit when the BKUP indicator is lit. The data will not be backed up if power is turned OFF.
- If, when using a CS1-H CPU Unit, the PLC Setup is set to specify using the mode set on the Programming Console and a Programming Console is not connected, the CPU Unit will start in RUN mode. This is the default setting in the PLC Setup.
- When creating an AUTOEXEC.IOM file from a Programming Device (a Programming Console or the CX-Programmer) to automatically transfer data at startup, set the first write address to D20000 and be sure that the size of data written does not exceed the size of the DM Area. When the data file is read from the Memory Card at startup, data will be written in the CPU Unit starting at D20000 even if another address was set when the AUTOEXEC.IOM file was created. Also, if the DM Area is exceeded (which is possible when the CX-Programmer is used), the remaining data will be written to the EM Area. Refer to information on file operations in the *CS/CJ Series Programming Manual* for details.
- Always turn ON power to the PLC before turning ON power to the control system. If the PLC power supply is turned ON after the control power supply, temporary errors may result in control system signals because the output terminals on DC Output Units and other Units will momentarily turn ON when power is turned ON to the PLC.
- Fail-safe measures must be taken by the customer to ensure safety in the event that outputs from Output Units remain ON as a result of internal circuit failures, which can occur in relays, transistors, and other elements.
- Fail-safe measures must be taken by the customer to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes.
- Interlock circuits, limit circuits, and similar safety measures in external circuits (i.e., not in the Programmable Controller) must be provided by the customer.

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- Do not turn OFF the power supply to the PLC when data is being transferred. In particular, do not turn OFF the power supply when reading or writing a Memory Card. Also, do not remove the Memory Card when the BUSY indicator is lit. To remove a Memory Card, first press the memory card power supply switch and then wait for the BUSY indicator to go out before removing the Memory Card.
- If the I/O Hold Bit is turned ON, the outputs from the PLC will not be turned OFF and will maintain their previous status when the PLC is switched from RUN or MONITOR mode to PROGRAM mode. Make sure that the external loads will not produce dangerous conditions when this occurs. (When operation stops for a fatal error, including those produced with the FALS(007) instruction, all outputs from Output Unit will be turned OFF and only the internal output status will be maintained.)
- The contents of the DM, EM, and HR Areas in the CPU Unit are backed up by a Battery. If the Battery voltage drops, this data may be lost. Provide countermeasures in the program using the Battery Error Flag (A40204) to re-initialize data or take other actions if the Battery voltage drops.
- When supplying power at 200 to 240 V AC, always remove the metal jumper from the voltage selector terminals on the Power Supply Unit (except for Power Supply Units with wide-range specifications). The product will be destroyed and must be replaced if 200 to 240 V AC is supplied while the metal jumper is attached. Refer to *5-3 Wiring* for details.
- Always use the power supply voltages specified in the operation manuals. An incorrect voltage may result in malfunction or burning.
- Do not apply a force greater than 100 N on the terminal block when tightening the terminals.
- Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied. Be particularly careful in places where the power supply is unstable. An incorrect power supply may result in malfunction.
- Install external breakers and take other safety measures against short-circuiting in external wiring. Insufficient safety measures against short-circuiting may result in burning.
- Install Units as far as possible away from devices that generate strong, high-frequency noise.
- Do not apply voltages to the Input Units in excess of the rated input voltage. Excess voltages may result in burning.
- Do not apply voltages or connect loads to the Output Units in excess of the maximum switching capacity. Excess voltage or loads may result in burning.
- Separate the line ground terminal (LG) from the functional ground terminal (GR) on the Power Supply Unit before performing withstand voltage tests or insulation resistance tests. Not doing so may result in burning.
- Change the applied voltage gradually using the adjuster on the Tester. If 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.
- Install the Units properly as specified in the operation manuals. Improper installation of the Units may result in malfunction.
- Be sure that all the Backplane mounting screws, terminal block screws, and cable connector screws are tightened to the torque specified in the relevant manuals. Incorrect tightening torque may result in malfunction.

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- Leave the label attached to the Unit when wiring. Removing the label may result in malfunction if foreign matter enters the Unit.
- Remove the label after the completion of wiring to ensure proper heat dissipation. Leaving the label attached may result in malfunction.
- Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals. Connection of bare stranded wires may result in burning.
- Wire all connections correctly.
- Do not drop the product or subject it to excessive vibration or shock.
- Double-check all wiring and switch settings before turning ON the power supply. Incorrect wiring may result in burning.
- Mount Units only after checking terminal blocks and connectors completely.
- Be sure that the terminal blocks, Memory Units, expansion cables, and other items with locking devices are properly locked into place. Improper locking may result in malfunction.
- Check switch settings, the contents of the DM Area, and other preparations before starting operation. Starting operation without the proper settings or data may result in an unexpected operation.
- Check the user program for proper execution before actually running it on the Unit. Not checking the program may result in an unexpected operation.
- Confirm that no adverse effect will occur in the system before attempting any of the following. Not doing so may result in an unexpected operation.
  - Changing the operating mode of the PLC (including the setting of the startup operating mode).
  - Force-setting/force-resetting any bit in memory.
  - Changing the present value of any word or any set value in memory.
- Resume operation only after transferring to the new CPU Unit the contents of the DM Area, HR Area, and other data required for resuming operation. Not doing so may result in an unexpected operation.
- Do not pull on the cables or bend the cables beyond their natural limit. Doing either of these may break the cables.
- Do not place objects on top of the cables or other wiring lines. Doing so may break the cables.
- Do not use commercially available RS-232C personal computer cables. Always use the special cables listed in this manual or make cables according to manual specifications. Using commercially available cables may damage the external devices or CPU Unit.
- Never connect pin 6 (5-V power supply) on the RS-232C port on the CPU Unit to any device other than an NT-AL001, CJ1W-CIF11 Link Adapter, or NV3W-M□20L Programmable Terminal. The external device or the CPU Unit may be damaged.
- When replacing parts, be sure to confirm that the rating of a new part is correct. Not doing so may result in malfunction or burning.
- Before touching a Unit, be sure to first touch a grounded metallic object in order to discharge any static build-up. Not doing so may result in malfunction or damage.
- When transporting or storing circuit boards, cover them in antistatic material to protect them from static electricity and maintain the proper storage temperature.

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- Do not touch circuit boards or the components mounted to them with your bare hands. There are sharp leads and other parts on the boards that may cause injury if handled improperly.
- Do not short the battery terminals or charge, disassemble, heat, or incinerate the battery. Do not subject the battery to strong shocks. Doing any of these may result in leakage, rupture, heat generation, or ignition of the battery. 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 required that batteries be replaced only by experienced technicians. Do not allow unqualified persons to replace batteries.
- Dispose of the product and batteries according to local ordinances as they apply.
  Have qualified specialists properly dispose of used batteries as industrial waste.



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- Unexpected operation may result if inappropriate data link tables or parameters are set. Even if appropriate data link tables and parameters have been set, confirm that the controlled system will not be adversely affected before starting or stopping data links.
- CPU Bus Units will be restarted when routing tables are transferred from a Programming Device to the CPU Unit. Restarting these Units is required to read and enable the new routing tables. Confirm that the system will not be adversely affected before allowing the CPU Bus Units to be reset.
- When wiring crossovers between terminals, the total current for both terminals will flow in the line. Check the current capacities of all wires before wiring crossovers.
- The following precautions apply to Power Supply Units with Replacement Notification.
  - When the LED display on the front of the Power Supply Unit starts to alternately display “0.0” and “A02” or the alarm output automatically turns OFF, replace the Power Supply Unit within 6 months.
  - Separate the alarm output cables from power lines and high-voltage lines.
  - Do not apply a voltage or connect a load to the alarm output that exceeds the rated voltage or load.
  - Maintain an ambient storage temperature of –20 to 30°C and humidity of 25% to 70% when storing the product for longer than 3 months to keep the replacement notification function in optimum working condition.
  - Always use the standard installation method. A nonstandard installation will decrease heat dissipation, delay the replacement notification signal, and may degrade or damage the internal elements.
- Design the system so that the power supply capacity of the Power Supply Unit is not exceeded.
- Do not touch the terminals on the Power Supply Unit immediately after turning OFF the power supply. Electric shock may occur due to the residual voltage.

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6 Conformance to EC Directives

6-1 Applicable Directives

- EMC Directives
- Low Voltage Directive

6-2 Concepts

EMC Directives

OMRON devices that comply with EC Directives also conform to the related EMC standards so that they can be more easily built into other devices or the overall machine. The actual products have been checked for conformity to EMC standards (see the following note). Whether the products conform to the standards in the system used by the customer, however, must be checked by the customer.

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

Note Applicable EMC (Electromagnetic Compatibility) standards are as follows:

EMS (Electromagnetic Susceptibility): EN61131-2 or EN61000-6-2
EMI (Electromagnetic Interference): EN61000-6-4
(Radiated emission: 10-m regulations)

Low Voltage Directive

Always ensure that devices operating at voltages of 50 to 1,000 V AC and 75 to 1,500 V DC meet the required safety standards for the PLC (EN61131-2).

6-3 Conformance to EC Directives

The CS-series PLCs comply with EC Directives. To ensure that the machine or device in which the CS-series PLC is used complies with EC Directives, the PLC must be installed as follows:

1,2,3...

1. The CS-series PLC must be installed within a control panel.
2. You must use reinforced insulation or double insulation for the DC power supplies used for the communications power supply and I/O power supplies.
3. CS-series PLCs complying with EC Directives also conform to the Common Emission Standard (EN61000-6-4). 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 EC Directives.

6-4 Relay Output Noise Reduction Methods

The CS-series PLCs conforms to the Common Emission Standards (EN61000-6-4) of the EMC Directives. However, noise generated by relay output switching may not satisfy these Standards. In such a case, a noise filter must be connected to the load side or other appropriate countermeasures must be provided external to the PLC.

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.

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Countermeasures

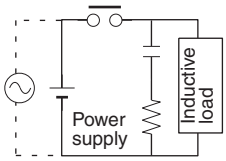
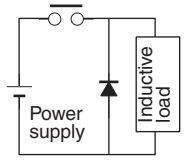
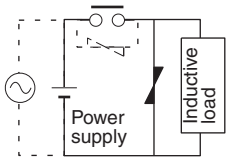
(Refer to EN61000-6-4 for more details.)

Countermeasures are not required if the frequency of load switching for the whole system with the PLC included is less than 5 times per minute.

Countermeasures are required if the frequency of load switching for the whole system with the PLC included is more than 5 times per minute.

Countermeasure Examples

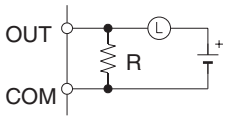
When switching an inductive load, connect an surge protector, diodes, etc., in parallel with the load or contact as shown below.

Circuit	Current		Characteristic	Required element
	AC	DC		
CR method 	Yes	Yes	If the load is a relay or solenoid, there is a time lag between the moment the circuit is opened and the moment the load is reset. 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.	The capacitance of the capacitor must be 1 to 0.5 μF per contact current of 1 A and resistance of the resistor must be 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.
Diode method 	No	Yes	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 time lag, between the moment the circuit is opened and the moment the load is reset, caused by this method is longer than that caused by the CR method.	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.
Varistor method 	Yes	Yes	The varistor method prevents the imposition of high voltage between the contacts by using the constant voltage characteristic of the varistor. There is time lag between the moment the circuit is opened and the moment the load is reset. 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.	---

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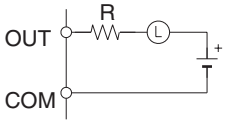
When switching a load with a high inrush current such as an incandescent lamp, suppress the inrush current as shown below.

Countermeasure 1



Providing a dark current of approx. one-third of the rated value through an incandescent lamp

Countermeasure 2



Providing a limiting resistor

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SECTION 1
Introduction

This section introduces the special features and functions of the CS-series PLCs and describes the differences between these PLCs and other PLCs.

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1-1 Overview

The CS-series PLCs are medium-sized Programmable Controllers that provide improved programming efficiency by dividing the program into tasks. The CS-series PLCs also feature faster processing, higher capacities, multiple ports supporting protocol macros, improved seamless communications across three network levels, and much more, enabling them to flexibly handle advanced information capabilities as core FA controllers.

Improvements in Basic Performance

Faster instruction execution and peripheral servicing

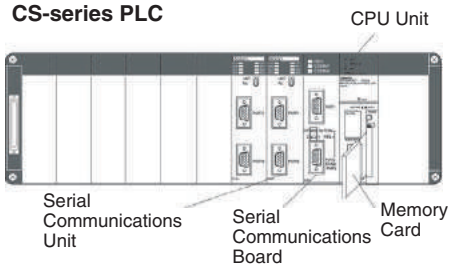
Larger memory capacity

Faster data exchange between Units and I/O memory access

Instruction operands can be specified binary or BCD

Programs from earlier PLCs are compatible

CS-series PLC



Structured Programming

The program is divided into tasks. Symbols can be used in programming.

The overall performance of the system is improved by executing only the required tasks.

Modification and debugging are simplified.

The program arrangement can be changed.

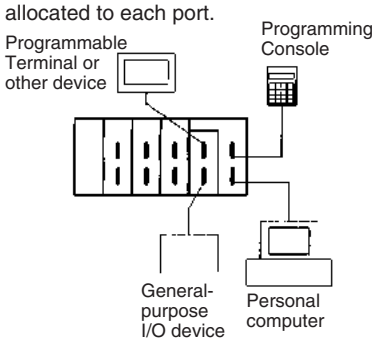
Step control and block programming instructions can be used.

Comments can be added to make the program easier to understand.

Protocol Macro Function Serves Multiple Ports

Up to 34 ports can be connected (Serial Communications Boards + Serial Communications Units).

Different Protocol Macros can be allocated to each port.



Remote Programming, Monitoring and Seamless Links between Networks

FINS commands allow communications between nodes in different networks.

Remote programming and monitoring can be performed.

Full Complement of Versatile Functions

Memory Card and file processing functions

Simplify programs with specialized instructions such as the table data and text string processing instructions

Troubleshooting functions

Data tracing function

Minimum (fixed) cycle time function

I/O refreshing method selection

PLC Setup functions

Use Windows tools to create multiple environments in a single personal computer.

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1-2 CS-series Features

1-2-1 Features

Improvements in Basic Performance

The CS-series PLCs provide higher speed, greater capacity, and more functions in a package as compact as the C200H PLCs.

Faster Cycle Times

For the CS1-H CPU Units, instruction processing times have been reduced to 0.02 μs min. for basic instructions, to 0.06 μs min. for special instructions, and to 0.8 μs min. for floating-point calculations. The time required for overseeing (overhead), I/O refreshing, and peripheral servicing has also been reduced dramatically.

Extra Capacity for High Value-added Programs

With capacity for 250,000 program steps, up to 448,000 words of Data Memory, and up to 5,120 I/O points, there is plenty of memory for complex programs, intricate interfaces, communications, and data processing.

Binary Operand Settings Increase Setting Ranges

In earlier PLCs, most instruction operands had to be specified in BCD (0 to 9,999), but in the CS-series PLCs they can be specified in binary (0 to FFFF hexadecimal or 0 to 65,535 decimal). As an example, the BLOCK TRANSFER instruction can now transfer data from up to 65,535 words rather than 9,999 words. Also the maximum DM address that can be indirectly addressed is now D32767 rather than the maximum DM address of D09999 in C200HX/HG/HE PLCs.

Program Compatibility

Programs from earlier OMRON PLCs (such as the C200H, C200HS, C200HX/HG/HE, and CV Series) can be imported into the CS-series PLCs.

CS-series and C200H Units Supported

High-density CS-series Units, such as the 96-point I/O Units and 8-point Analog I/O Units (4 inputs and 4 outputs) can be used together with the wide variety of C200H Units (about 90 models) can be used in a CS-series PLC.

CS-series Long-distance Expansion Racks

I/O Control Units and I/O Interface Units can be used to create systems containing CS-series Long-distance Expansion Racks. Up to two series of Long-distance Expansion Racks can be connected, each measuring up to 50 m, for a total coverage of 100 m. CS-series Long-distance Expansion Racks can be used to create high-speed, low-cost distribution systems without using Communications Units.

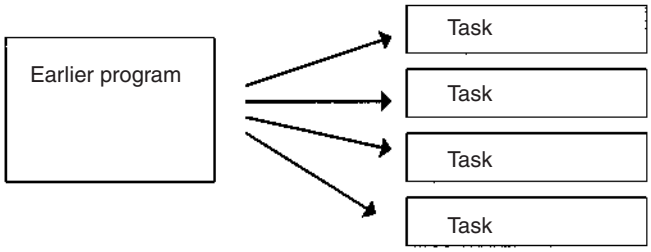
Structured Programming

Division of the Program into Tasks

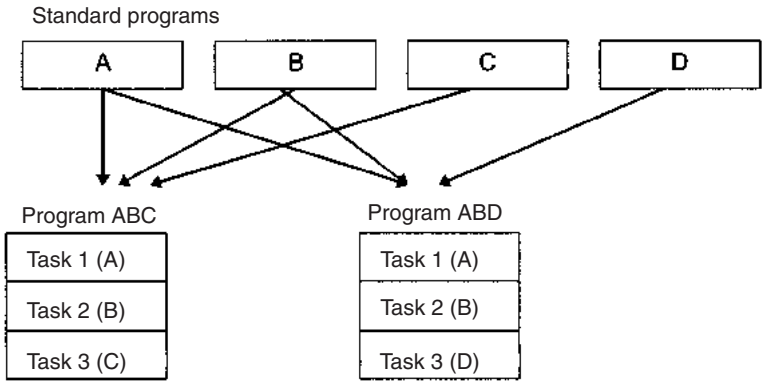
When the program is divided into tasks that handle separate functions, control systems, or processes, several programmers can develop these separate tasks simultaneously.

There can be up to 32 normal (cyclic) tasks and 256 interrupt tasks. There are four types of interrupts: the Power OFF Interrupt, Scheduled Interrupts, I/O Interrupts, and External Interrupts (interrupts from Special I/O Units or CPU Bus Units).

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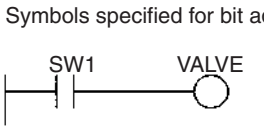


When a new program is being created, standard programs can be combined as tasks to create an entire program.



Using Symbols

Arbitrary symbols (names up to 32 characters) that are independent of I/O terminal allocations can be used in programming. Standard programs created with symbols are more general and easier to reuse as tasks in different programs.



Global and Local Symbols Supported

I/O names are handled as symbols which can be defined as global symbols, which apply to all of the programs in all tasks, or as local symbols, which apply to just the local task.

When the symbols are defined, you can choose to have the local symbols allocated to addresses automatically.

Improve Overall System Response Performance

The response performance of the system can be improved by dividing the program into a system-management task and tasks used for control and executing only those control tasks that need to be executed.

Simplify Program Modification

- Debugging is more efficient when the job of modifying and debugging the tasks can be divided among several individuals.
- Program maintenance is easier because only the tasks affected by changes have to be modified when there are changes (such as changes in specifications).
- Several consecutive program lines can be modified with online editing.
- The amount the cycle time is extended during online editing has been reduced.

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Change Program Arrangement Easily

When separate tasks have been programmed for different production models, the task control instructions can be used to switch the program quickly from production of one model to another.

Step Control and Block Programming

The step control and block programming instructions can be used to control repetitive processes that are difficult to program with ladder programming alone.

Comments

Several types of comments can be added to the program to make it easier to understand, including Rung comments, and I/O comments.

Section Function

The section function can be used to make the program easier to visualize (CX-Programmer version 2.0 or higher).

Port-specific Protocol Macro Function

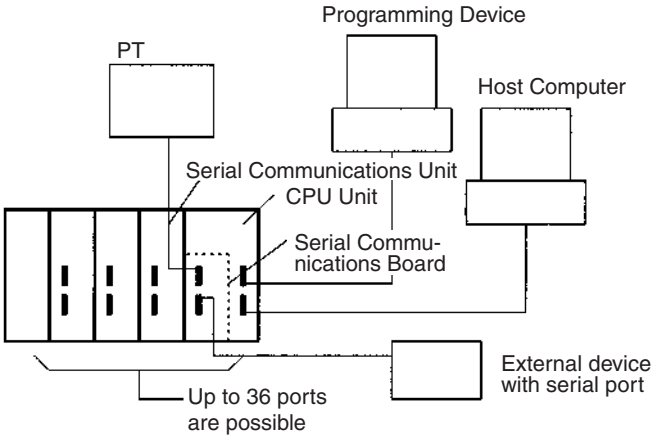
Create Protocol Functions for All Ports

The protocol macro function can be used to create versatile communications functions for any of the PLC's communications ports. The communications functions can have host link, NT Link, or protocol macro configurations and can be directed to RS-232C and RS-422/485 ports on any of the Units.

1,2,3...

1. One Serial Communications Board can be mounted in the CPU Unit. (A Serial Communications Board has two serial communications ports.)
2. Up to 16 Serial Communications Units can be connected to a CPU Unit. (Each Serial Communications Unit has two serial communications ports.)

   In total, up to 36 ports can be used.



Standard Serial Communications with External Devices

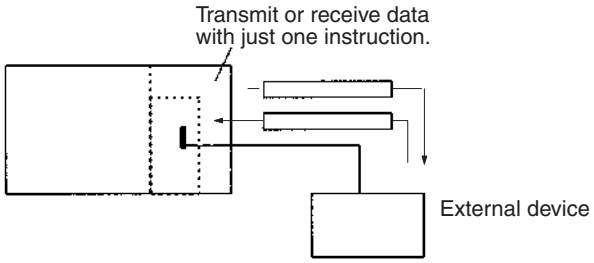
Messages can be transferred to and from standard serial devices with the protocol macro function (according to preset parameter settings). The protocol macro function supports processing options such as retries, timeout monitoring, and error checks.

Symbols that read and write data to the CPU Unit can be included in the communications frames, so data can be exchanged with the CPU Unit very easily.

OMRON components (such as Temperature Controllers, ID System Devices, Bar Code Readers, and Modems) can be connected to a Serial Communications Board or Serial Communications Unit with the standard system protocol. It is also possible to change the settings if necessary.

Note The Serial Communications Board or Serial Communications Unit must be purchased separately to take advantage of this function.

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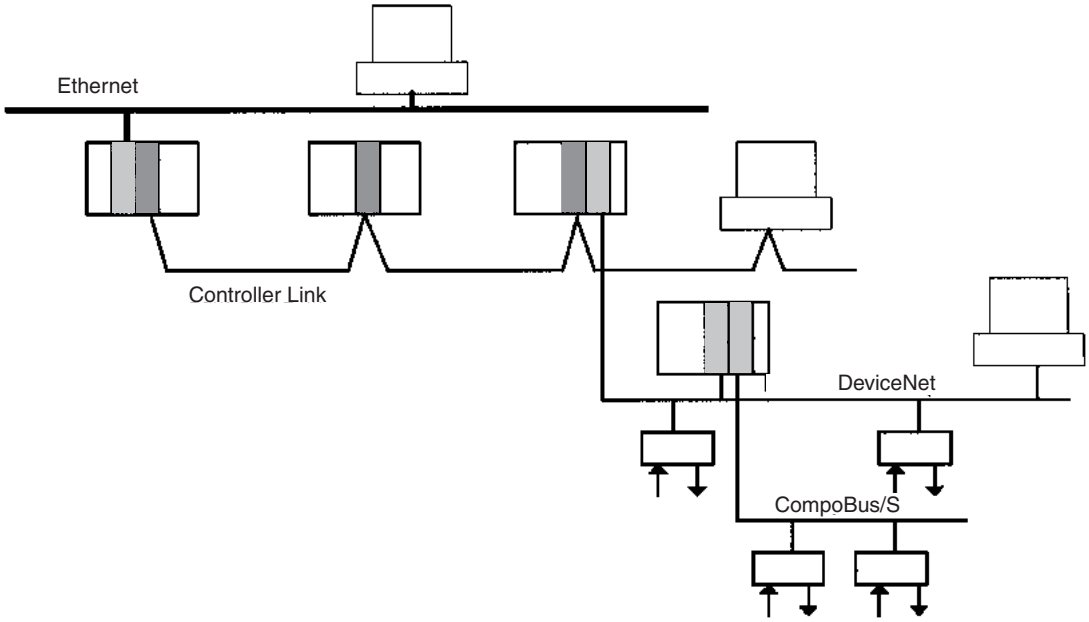


Multilevel Network Configurations

Different network levels can be connected as shown in the following diagram. The multilevel configuration provides more flexibility in networking from the manufacturing site to production management. In particular, the DeviceNet network makes it very easy to connect devices from other manufacturers.

OA Network:	Ethernet
FA Network:	Controller Link
DeviceNet*:	DeviceNet
High-speed ON/OFF bus:	CompoBus/S

Note *Units that conform to JEMANET standards are also available.

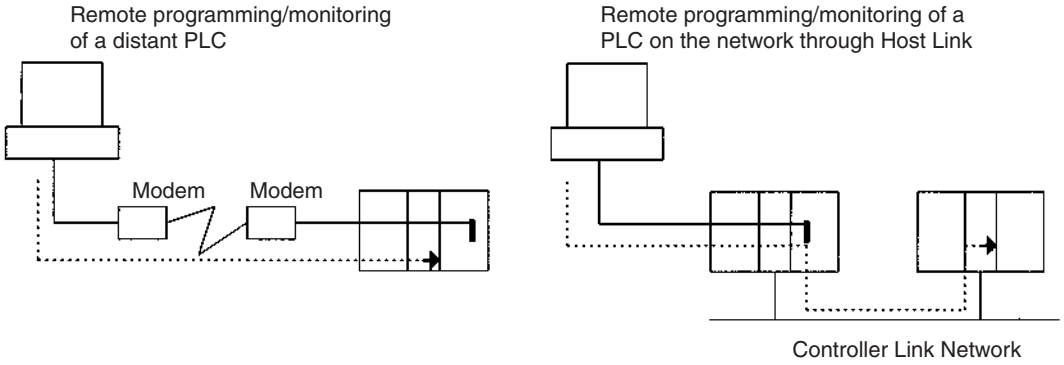


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Remote Monitoring and Programming

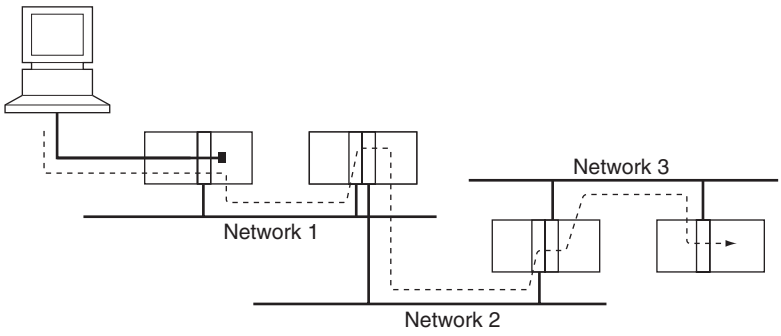
1,2,3...

1. The host link function can operate through a modem, which allows monitoring of a distant PLC's operation, data transfers, or even online editing of a distant PLC's program by phone.
2. PLCs in a network can be programmed and monitored through the Host Link.
3. It is possible to communicate through 3 network levels even with different types of networks.



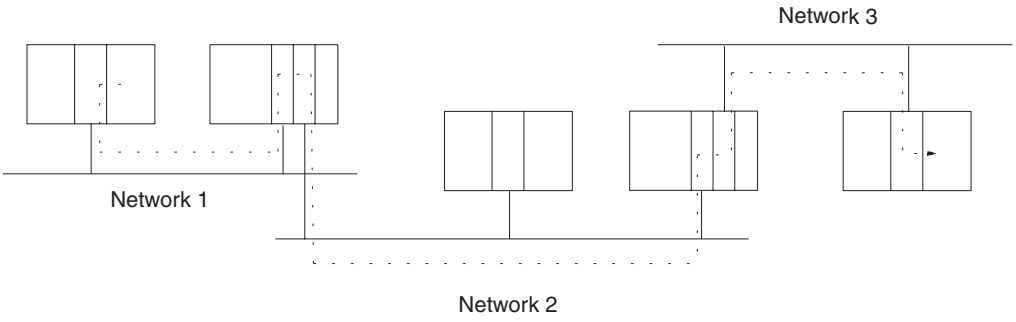
Communications Across 3 Network Levels

Remote programming/monitoring of a PLC on a network up to 3 levels away (including the local network) for the same or different types of networks is possible through Host Link.



Note With CS/CJ-series CPU Units Ver. 2.0 or later, remote programming/monitoring is possible up to 8 levels away. Refer to *1-6-2 Improved Read Protection Using Passwords* for details.

Message transfer between PLCs on a network 3 levels away (including the local network) for the same or different types of networks.



High-speed Communications with PTs

NT Link communications between an NS-series or NT31/NT631-V2 PT and a CS-series PLC are possible at high speed.

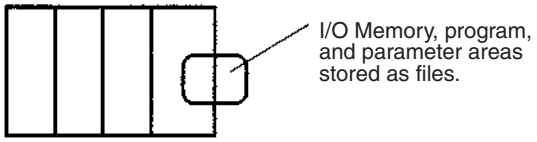
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1-2-2 Versatile Functions

Memory Card and File Management Functions

Transfer Data to and from Memory Cards

Data area data, program data, and PLC Setup data can be saved as files on a Memory Card (compact flash memory). Data can be read and written from Programming Devices, instructions in the user program, or host computers. (From the program, only I/O memory can be read and written and it must be read or written as a file.)



Convert EM Area Banks to File Memory

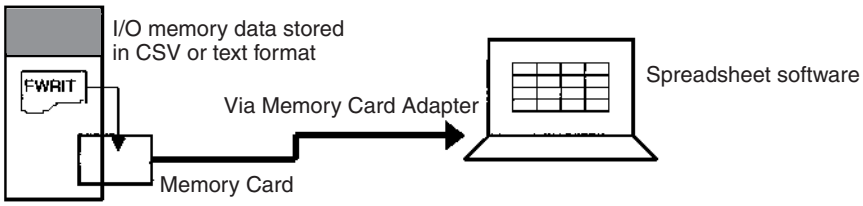
Part of the EM Area can be converted to file memory to provide file management capabilities without a Memory Card and with much faster access time than a Memory Card. (I/O comments can also be stored.)

Automatic File Transfer at Start-up

The PLC can be set up to transfer the program and/or PLC Setup files from the Memory Card when the PLC is turned ON. With this function, the Memory Card provides a flash-ROM transfer. This function can also be used to store and change PLC configurations quickly and easily.

I/O Memory Files in CSV and Text Format

It is now possible to save production results and other data (hexadecimal) from the CPU Unit I/O memory in a Memory Card in CSV or text format. The data can then be read and edited using personal computer spreadsheet software by means of a Memory Card Adapter.

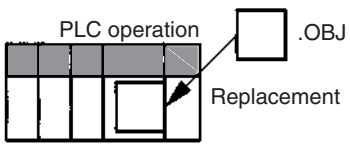


File Operations (Deleting, Creating Directories, etc.) from Ladder Programs

It is possible to format files, delete, copy, change file names, create new directories, and perform similar operations on a Memory Card from the ladder program during PLC operation.

Program Replacement During Operation

It is now possible to replace the entire user program in the CPU Unit from the Memory Card during operation. In this way, it is possible to switch PLC operation without stopping the PLC.



Easy Backups

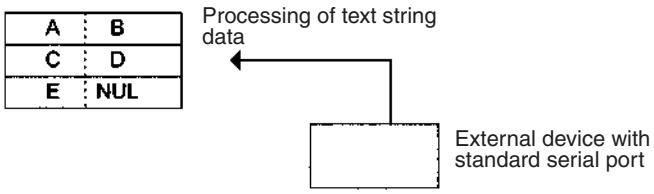
It is now possible to back up all data (user programs, parameters, and I/O memory) to the Memory Card by pressing the Memory Card power supply switch. In this way, if a malfunction arises, it is possible to back up all data in the CPU Unit at the time without using a Programming Device.

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Specialized Instructions Simplify Programming

Text String Instructions

The text string instructions allow text processing to be performed easily from the ladder program. These instructions simplify the processing required when creating messages for transmission or processing messages received from external devices with the protocol macro function.



Loop Instructions

The FOR(512), NEXT(513), and BREAK(514) instructions provide a very powerful programming tool that takes up little program capacity.

Index Registers

Sixteen Index Registers are provided for use as pointers in instructions. An Index Register can be used to indirectly address any word in I/O memory. The CS-series PLCs also support the auto-increment, auto-decrement, and offset functions.

The Index Registers can be a powerful tool for repetitive processing (loops) when combined with the auto-increment, auto-decrement, and offset functions. Index Registers can also be useful for table processing operations such as changing the order of characters in text strings.

Table Data Processing Instructions

Stack Instructions

A region of I/O memory can be defined as a stack region. Words in the stack are specified by a stack pointer for easy FIFO (first-in first-out) or LIFO (last-in first-out) data processing.

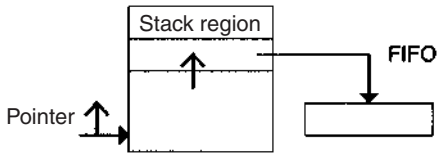
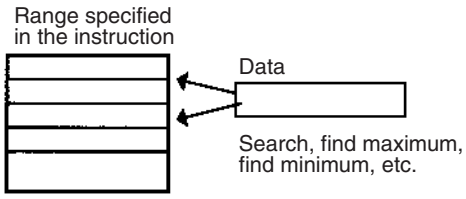


Table Processing

Range Instructions

These instructions operate on a specified range of words to find the maximum value or minimum value, search for a particular value, calculate the sum or FCS, or swap the contents of the leftmost and rightmost bytes in the words.



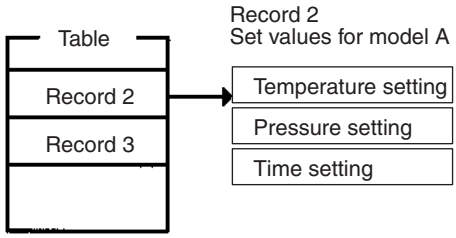
Record-table Instructions

Record-table instructions operate on specially defined data tables. The record table must be defined in advance with DIM(631), which declares the number of words in a record and the number of records in the table. Up to 16 record tables can be defined.

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Record tables are useful when data is organized in records. As an example, if temperatures, pressures, or other set values for various models have been combined into a table, the record-table format makes it easy to store and read the set values for each model.

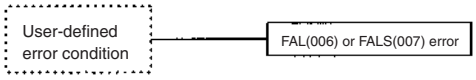
The SETR(635) can be used to store the first address of the desired record in an Index Register. Index Registers can then be used to simplify complicated processes such as changing the order of records in the record table, searching for data, or comparing data.



Troubleshooting Functions

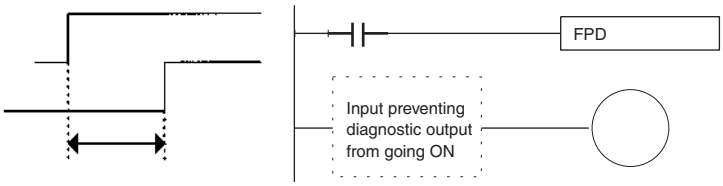
Failure Diagnosis: FAL(006) and FALS(007)

The FAL(006) and FALS(007) can be used to generate a non-fatal or fatal error when the user-defined conditions are met. Records of these errors are stored in the error log just like system-generated errors.



Failure Point Detection: FPD(269)

Diagnoses a failure in an instruction block by monitoring the time between execution of FPD(269) and execution of a diagnostic output and finding which input is preventing an output from being turned ON.



Error Log Functions

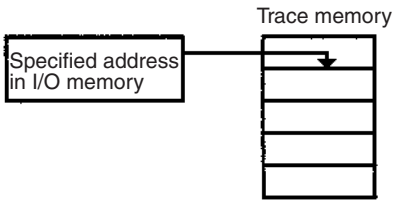
The error log contains the error code and time of occurrence for the most recent 20 errors (user-defined or system-generated errors).

Maintenance Functions

The CS-series PLCs record information useful for maintenance, such as the number of power interruptions and the total PLC ON time.

Data Trace Function

The content of the specified word or bit in I/O memory can be stored in trace memory by one of the following methods: scheduled sampling, cyclic sampling, or sampling at execution of TRSM(045).



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Fixed Cycle Time Function

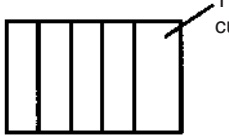
A fixed (minimum) cycle time can be set to minimize variations in I/O response times.

I/O Refreshing Methods

I/O refreshing can be performed cyclically and immediately by programming the immediate-refreshing variation of the instruction.

PLC Setup Functions

PLC operation can be customized with PLC Setup settings, such as the maximum cycle time setting (watch cycle time) and the instruction error operation setting, which determines whether instruction processing errors and access errors are treated as non-fatal or fatal errors.



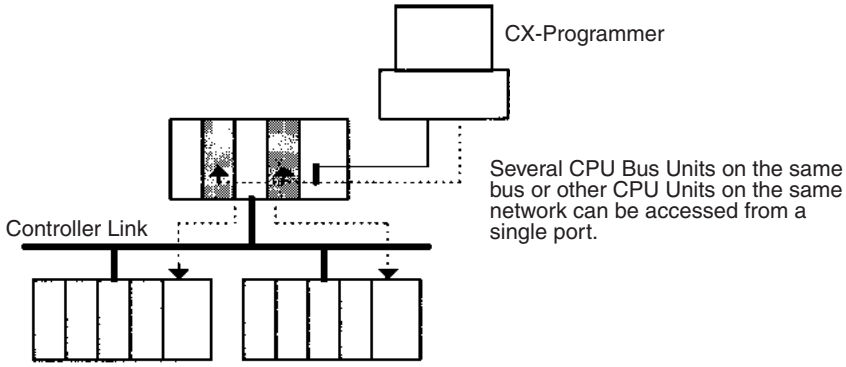
Binary Refreshing of Timer/Counter Instruction PVs

Present values of timer/counter instructions can now be refreshed in binary, in addition to the existing BCD capability. (Binary refreshing, however, can be specified with only CX-Programmer Ver. 3.0 and higher.) This allows the timer/counter setting time to be expanded to a range of 0 to 65535 (from the existing 0 to 9,999). Also, results calculated by other instructions can be used as is for timer/counter set values.

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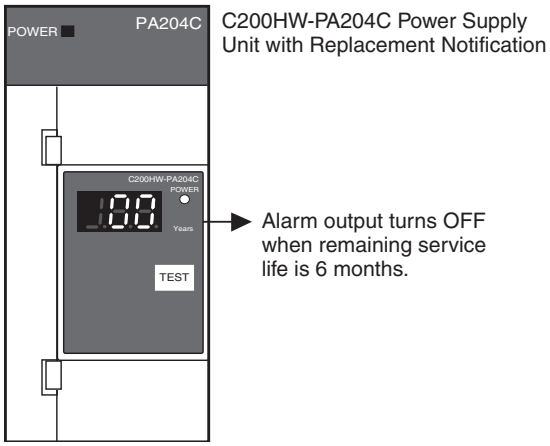
Windows Tools

The single-port multiple-access (SPMA) function can be used to program and monitor other CPU Bus Units on the same bus (CPU Rack or Expansion racks) or other CPU Units on the same network from a serial port on the CPU Unit or a Serial Communications Board.



Power Supply Units with Replacement Notification

The C200HW-PA204C Power Supply Units with Replacement Notification provide six display levels using a 7-segment display on the front panel of the Unit to indicate the remaining service life of the Power Supply Unit. An alarm output also notifies when the estimated remaining service life drops to 6 months or shorter. This function enables Power Supply Unit replacement before the power supply reaches the end of its service life resulting in a system failure.



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1-3 CS1-H CPU Unit Features

1-3-1 High-speed Performance

Ultra High-speed Cycle Time

The CS1-H CPU Units provide a cycle time that is three to four times faster than that of the previous CPU Units.

For example, a program consisting of 38 Ksteps of only basic instructions with 128 inputs and 128 outputs executes in 1 ms; a program consisting of 20 Ksteps of basic and special instructions in a 1:1 ratio with 128 inputs and 128 outputs executes in 1 ms; and a program consisting of 8 Ksteps of basic and special instructions in a 1:2 ratio with 64 inputs and 64 outputs executes in 0.5 ms.

The following factors give the CS1-H CPU Units their high speed.

1,2,3...

1. Instruction execution times: Only about 1/2 the time required for basic instructions, and only about 1/3 the time required for special instructions.
2. Better bus performance: Data transfers between the CPU Unit and Special I/O or Communications Units is about twice as fast, providing greater overall system performance.
3. Instruction execution is performed in parallel with peripheral servicing.
4. Other factors, including background execution of text string processing and table data processing instructions.

Faster Execution of Common Instructions

Extensive research on PLC applications was used to identify the 20 most commonly used instructions of the more than 400 supported instructions (see below), and execution speed for these instructions was increased by 10 to 20 times previous performance.

CPS (SIGNED BINARY COMPARE)
JMP (JUMP)
CPSL (DOUBLE SIGNED BINARY COMPARE)
CJP (CONDITIONAL JUMP)
XFER (BLOCK TRANSFER)
BCNT (BIT COUNTER)
MOVB (MOVE BIT)
MLPX (DATA DECODER)
MOVD (MOVE DIGITS)
BCD (BINARY-TO-BCD)
BSET (BLOCK SET)
SBS/RET (SUBROUTINE CALL/RETURN)

Transfer Speed between CPU Unit and CPU Bus Units Doubled

The speed of transferring data between the CPU Unit and CPU Bus Units has been doubled to increase overall system performance.

Parallel Processing of Instructions and Peripheral Servicing

A special mode is supported that enables parallel processing of instruction execution and peripheral device servicing to support the following types of application.

- Extensive data exchange with a host not restricted by the program capacity in the CS1-H CPU Unit
- Consistently timed data exchange with SCADA software
- Eliminating the effects on cycle time of future system expansion or increases in communications

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Less Cycle Time Fluctuation for Data Processing

Table data processing and text string processing, which often require time, can be separated over several cycles to minimize fluctuations in the cycle time and achieve stable I/O response.

Better Data Link and Remote I/O Refreshing

CPU Bus Unit refresh response has been increased both by reductions in the cycle time itself and by the addition of an immediate I/O refresh instruction for CPU Bus Units (DLNK(226)). This instruction will refresh data links, DeviceNet remote I/O, protocol macros, and other special data for CPU Bus Units.

The response of a CS1-H CPU Unit is approximately 2.4 times that of a CS1 CPU Unit. And, for a cycle time of approximately 100 ms or higher, the increase in the data link response is comparable to that for the cycle time.

Immediate Refreshing for CPU Bus Units

Although previously, I/O refreshing for CPU Bus Units was possible only after program executions, a CPU BUS I/O REFRESH instruction (DLNK(226)) has been added to enable immediate I/O refreshing for CPU Bus Units. Data links, DeviceNet remote I/O, an other unique CPU Bus Unit refreshing can be refreshed along with words allocated to the CPU Bus Unit in the CIO and DM Areas whenever DLNK(226) is executed. This is particularly effective for longer cycle times (e.g., 100 ms or longer). (Data exchange for data links, DeviceNet remote I/O, and other network communications are also affected by the communications cycle time, i.e., DLNK(226) refreshes data only between the CPU Bus Units and the CPU Unit, not the data on the individual networks.)

1-3-2 High-speed Structured Programming

To further aid standardized programming, program structuring functions have been improved, as has program execution speed.

More Cyclic Tasks

Tasks provide better efficiency by enabling programs to be separated by function or for development by different engineers. The CS1-H CPU Units support up to 288 cyclic tasks, an incredible increase over the previous maximum of 32 tasks.

Common Processing from Multiple Tasks

Global subroutines that can be called by any task are now supported. These can be used for common processing from more than one task, for greater standardization.

Faster Subroutine Instructions

Subroutine instruction are executed approximately 70 times faster to enable greater program modularization without having to be concerned about increasing the cycle time.

Shared Index and Data Registers between Tasks

Although separate index and data registers can still be used in each task, they have been joined by shared index and data registers that can be used between tasks to reduce the time required to switch between tasks.

1-3-3 Function Block (FB)

When using a CPU Unit with unit version 3.0 or later, standard processes can be encapsulated as easily reusable function blocks as long as those processes only exchange I/O data externally. The function blocks can be written in ladder language or ST (structured text) language. Mathematical processing that is difficult to write in ladder language can be written easily in the ST language.

OMRON function blocks can be written in ladder language or ST (structured text) language, and conform to IEC 61131-3 standards (JIS B3503). The function blocks provide functions for more efficient design and debugging of the user equipment, as well as easier maintenance.

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Smart FB Library

The Smart FB Library is a set of function blocks that improve interoperability between OMRON PLC Units and FA components. Since it isn't necessary to create a ladder program to use basic Unit and FA component functions, the user can concentrate on more important work, such as determining how to make the most of device functions.

Online Editing of FB Definitions

FB definitions can be changed during operation, so FB definitions can be edited quickly during debugging. In addition, FBs can be used with confidence even in equipment that must operate 24 hours/day. (Requires CPU Unit unit version 4.0 or later and CX-Programmer version 7.0 or higher.)

Nesting

Not only can programs be created with nested OMRON FBs, it is possible to make easy-to-understand, stress-free operations by switching displays under preset conditions and displaying structures in a directory-tree format. (Requires CX-Programmer version 6.0 or higher.)

Protecting FB Definitions

It is possible to prevent unauthorized manipulation, editing, or misappropriation of the program by setting passwords for the function block definitions allocated in the project file and protecting the definitions based on their purpose. (Requires CX-Programmer version 6.1 or higher.)

Offline Debugging with the Simulator

The Simulator enables checking the PLC program's operation on the desktop, so program quality can be improved and verified early on. Both the ladder and ST programming can be executed in the computer application.

Variable Support for String Operations (CPU Units with Unit Version 4.0 or Later)

The functions that perform string data operations in ST language not only support string variables, they also strengthen the functions used to communicate with string data I/O. This feature simplifies the creation of programs that send and receive communications commands. (Requires CPU Unit unit version 4.0 or later and CX-Programmer version 7.0 or higher.)

FB Generation Function

Existing PLC programming can be reused by easily converting it to FBs. (Requires CX-Programmer version 7.0 or higher.)

1-3-4 More Instructions for Specific Applications

Very specific control can be easily programmed for a much wider range of applications with the many new special instructions added to the CS1-H CPU Units.

High-speed Positioning for XY Tables

Double-precision floating-point calculations are supported for the CS1-H CPU Units to provide even better precision for position control operations.

Convert between Floating Point and Text String Data

To display floating-point data on PTs, the CS1-H CPU Units provide conversion instructions from floating-point data to text strings (ASCII). Conversion between ASCII and floating-point data is also possible so that ASCII data from serial communications with measurement devices can be used in calculations.

Accurate Line Approximations

Unsigned 16-bit binary/BCD data, signed 16/32-bit binary data, or single-precision floating-point data can be used for line data, enabling precise (high data resolution) conversions, such as from a level meter (mm) to tank capacity (l) based on the shape of the tank.

Realtime Workpiece Data Management

When loading and unloading workpieces from conveyor lines, stack instructions can be used to manage workpiece information in realtime in table format.

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PID Autotuning

Autotuning is now supported for PID constants with the PID CONTROL instruction. The limit cycle method is used to ensure rapid autotuning. Very effective for multiloop PID control.

System Debugging through Error Simulation

A specified error status can be created with the FAL/FALS instructions. This can be used effectively when depending systems. For example, errors can be simulated to produce corresponding displays on a PT to confirm that the correct messages are being displayed.

Program Simplification with More Specific Basic Instructions

Programs that use a high quantity of basic instructions can be simplified though the use of differentiated forms of the LD NOT, AND NOT and OR NOT instructions, and through the use of OUT, SET, and RSET instructions that can manipulate individual bits in the DM or EM Area.

Delayed Power OFF Processing for Specified Program Areas

The DI and EI instructions can be used to disable interrupts during specific portions of the program, for example, to prevent the power OFF interrupt from being executed until a specific instruction has been executed.

1-3-5 Battery-free Operation with Flash Memory

Any user program or parameter area data transferred to the CPU Unit is automatically backed up in flash memory in the CPU Unit to enable battery-free operation without using a Memory Card.

Note Refer to information on flash memory in the *CS/CJ Series Programming Manual* (W394) for precautions on this function.

1-3-6 Better Compatibility with Other SYSMAC PLCs

C200HE/HG/HX PLCs

The AREA RANGE COMPARE (ZCP) and DOUBLE AREA RANGE COMPARE (ZCPI) instructions from the C200HE/HG/HX PLCs are supported. This makes it easier to use C200HE/HG/HX programs in CS-series CPU Units.

CVM1/CV-series PLCs

The CONVERT ADDRESS FROM CV instruction allows real I/O memory addresses for the CVM1/CV-series PLCs to be converted to addresses for the CS-series PLCs, enabling programs with CVM1/CV-series addresses to be quickly converted for use with a CS-series CPU Unit.

1-3-7 Refreshing Timer/Counter PVs in Binary

In addition to BCD, binary can also be set as the PV refresh method for timer/counter instructions. (This setting is possible, however, only with version 3.0 or higher versions of the CX-Programmer.) This means that the settable time range for timer/counter instructions is increased from 0 to 9999 to 0 to 65,535. It also means that the results of calculations made with other instructions can be used without conversion.

1-3-8 Features of CS1-H CPU Units Ver. 3.0

Encapsulate Programming into Function Blocks Using Ladder Programming or Structured Text

When using CX-Programmer Ver. 5.0 or higher, function blocks can be used to encapsulate standard processing that is often reused and for which only I/O data is output externally as the user interface. Function blocks can be written using ladder programming or structured text. Structured text is particularly effective for easily including arithmetic processing that is difficult to write in ladder programming.

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Incorporate CompoWay/F-compatible OMRON Components into FINS Network Via Serial Gateway

Using the Serial Gateway mode for the CPU Unit's serial port enables flexible access to CompoWay/F-compatible OMRON components from devices on the network (e.g., PTs, PLC CPU Units, personal computers)

Store Comment/Section Data in CPU Unit's Flash Memory

The CX-Programmer can be used to save I/O comments and other comment/section data in the comment memory contained in the CPU Unit's flash memory.

Back Up Comment and Section Data

Comment/section data in comment memory can be backed up using the simple backup function.

Use No-protocol Communications at Multiple Ports

No-protocol communications can be performed via the serial ports of Serial Communications Boards/Units with unit version 1.2 or later. This enables no-protocol communications at multiple ports.

Free Running Timer Calculates Intervals without Requiring Timer Instructions

The system timers used after the power is turned ON are contained in Auxiliary Area words A000 and A001.

A000 is set to 0000 hex when the power is turned ON and this value is automatically incremented by 1 every 10 ms. The value returns to 0000 hex after reaching FFFF hex (655,350 ms), and then continues to be incremented in a ring operation.

A001 is set to 0000 hex when the power is turned ON and automatically incremented by 1 every 100 ms. The value returns to 0000 hex after reaching FFFF hex (655,350 ms), and then continues to be incremented in a ring operation.

Example:The interval can be counted between processing A and processing B without requiring timer instructions. This is achieved by calculating the difference between the value in A000 for processing A and the value in A000 for processing B. The interval is counted in 10 ms units. With unit version 4.0 or later, the free running time is stored in A002 in 1-s increments.

Reuse Ladder Programs Created Using C-series CPU Units

C-series ladder programs can be easily reused through the newly supported model conversion instructions (XFERC(565), DISTC(566), COLLC(567), MOVBC(568), and BCNTC(621)).

1-3-9 Changes to CS-series Operating Specifications

Increased Points for SYSMAC BUS Remote I/O Communications

The maximum number of points for SYSMAC BUS remote I/O communications in the operating specifications has been expanded from 800 points (50 words) to 1,280 points (80 words). This change applies to all CS-series CPU Units and Units using SYSMAC BUS remote I/O communications, including previously manufactured Units. For details, refer to *1-5-7 Increased Points for SYSMAC BUS Remote I/O Communications*.

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1-3-10 Features of CS1-H CPU Units Ver. 2.0

Easier System Development by Teams

Download/Upload Tasks Individually with CX-Programmer Version 4.0 or Higher

The CX-Programmer (version 4.0 or higher) can be used to upload or download only the required tasks. This enables the member of a development team to work separately and then upload/download tasks after debugging them, helping to eliminate the need for unification work by a manager as well as mistakes that can easily occur in such work.

Many Protection Functions

Improved Read Protection Using Passwords with CX-Programmer Version 4.0 or Higher

■ **Read Protection for Specific Tasks**

Passwords can be set to read-protect individual groups of tasks. This enables creating black boxes in the program.

■ **Enabling/Disabling Creating File Memory Program Files**

When read protection is set, an optional setting allows you to enable or disable creating program backup files (.OBJ). This setting can be used to prevent programs from being disclosed.

■ **Program Write Protection**

The user program can be protected without using the DIP switch setting. This helps prohibit unauthorized or accidental program changes.

Protection for CPU Units from FINS Write Commands Sent via Networks

Write operations to a CPU Unit using FINS commands across networks can be enabled for specific nodes and disabled for all other nodes. This can be used to enable monitoring data via networks while eliminating the possibility of accidental mistakes caused by careless writing operations.

Easier Network Connections and More-advanced Seamless Network Communications

Online Connections via Networks without I/O Tables

By using the CS1W-ETN21 Ethernet Unit, online connection is possible to any PLC in the local network from a Programming Device, such as the CX-Programmer, as soon as the network is connected by using automatic I/O allocation at startup. It's not necessary to create the I/O tables to enable connection. This eliminates the need to use a serial connection to create I/O tables before the CX-Programmer can be connected via Ethernet. Only an Ethernet connection is required to go online and create I/O tables.

Work Across Up to Eight Networks with CX-Net in CX-Programmer Version 4.0 or Higher

FINS commands can be sent across up to 8 network levels (including the local network). This enables a wider range of communications between devices on Ethernet and Controller Link Networks.

FINS commands can only be sent across up to 8 network levels when the destination is a CPU Unit. FINS commands can be sent to other destinations up to 3 network levels away.

Online Connections to PLCs via NS-series PTs

Downloading, uploading, and monitoring of ladder programs or other data is possible to a PLC connected serially to an NS-series PT from the CX-Programmer connected to the NS-series PT by Ethernet.

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Easier Implementation of Explicit Messages with Explicit Message Instructions

Special Explicit Message Instructions are now supported to simplify using explicit messages. (Previously, CMND(490) had to be used to send a FINS command of 2801 hex to enable sending explicit messages.) The new instructions include the following: EXPLICIT MESSAGE SEND (EXPLT(720)), EXPLICIT GET ATTRIBUTE (EGATR(721)), EXPLICIT SET ATTRIBUTE (ESATR(722)), EXPLICIT WORD READ (ECHRD(723)), and EXPLICIT WORD WRITE (ECHWR(724)). Of these, EXPLICIT WORD READ (ECHRD(723)) and EXPLICIT WORD WRITE (ECHWR(724)) enable easily reading and writing data in CPU Units on networks with the same type of notation as used for SEND(290) and RECV(298). (Not supported by the C200HX(-Z)/HG(-Z)/HE(-Z) and CV-series PLCs.)

Greater Flexibility in I/O Allocations

First Word Address Settings for Slots (Using CX-Programmer Version 3.1 or Higher)

When editing I/O tables for CS1-H CPU Units, the first word address can be set for up to 64 slots. This can be used, for example, to create fixed starting addresses for Input Units and Output Unit to separate I/O allocations from the program and increase the efficiency of program maintenance.

Automatic Power-ON Transfers without a Parameter File (.STD)

The user program can be automatically transferred to the CPU Unit at power ON without a parameter file (.STD) if the name of the program file (.OBJ) is changed to REPLACE on the CX-Programmer and the file is stored on a Memory Card. This can be used, for example, to enable transferring a program to a CPU Unit by creating the program offline and sending it as an email attachment, without a local Programming Device.

More Application Instruction with CX-Programmer Version 4.0 or Higher

Multiple Interlock Instructions (MILH(517), MILR(518), and MILC(519)) for Nested Interlocks

These instruction enable easy creation of nested interlocks. For example, create one interlock to control the entire program (e.g., for an emergency stop) and then nest other interlocks for separate portions of the program (e.g., conveyor operation, alarms, etc.).

TIME-PROPORTIONAL OUTPUT (TPO(685)) Instruction for Time-proportional Operation with Temperature Controllers or Variable-duty Lighting/Power Control

This instruction is used in combination with PID instructions to create a time-proportional output based on the manipulated variable output by the PID instruction. This enables easily connecting an SSR to a Transistor Output Unit to achieve time-proportional operation of a Temperature Controller. Variable-duty pulse outputs can also be created for lighting or power control.

Symbol Time Comparison Instructions for Easy Calendar Timers

Two times/dates can be compared to continue operation to the next instruction in the ladder program rung when the results of comparison is true. Opposed to normal comparison instructions, comparisons are by byte and the bytes that are compared in the time/date data can be controlled. This enables comparing built-in clock data with set times/dates to easily create a calendar timer, for example, on the hour (when the minutes is 0) or on a specific date each year).

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GRAY CODE CONVERSION (GRY(474)) for Easy Conversion of Parallel Inputs from Absolute Encoders to Binary, BCD, or Angle Data

This instruction converts Gray binary codes to binary, BCD, or angle data. This enables easily handling position or angle data input as parallel signals (2^n) from an Absolute Encoder with a Gray code output using a DC Input Unit.

EXPANDED BLOCK COMPARE (BCMP2(502)) for Comparison Judgements for Up to 256 Ranges (Upper/Lower Limits) with One Instruction

This instruction determines if a value is within any of up to 256 ranges defined by upper and lower limits. When used with the GRAY CODE CONVERSION (GRY(474)) instruction, the same operation as a cam switch can be achieved by determining if an angle input from an Absolute Encoder is in a comparison table.

Easier Processing of I/O Devices with Special I/O Instructions

Previously many instructions were required to read or write data for external input devices such as digital switches and 7-segment displays connected to Basic I/O Units. Now, I/O processing for these devices can be achieved with a single instruction. These are sometimes call Combination Instructions.

These instructions are the same as those supported by the C200HX/HG/HE and CQM1H PLCs, with the exception that more than one of each of these instructions can be executed in a single user program.

TEN KEY INPUT (TKY(211))

Sequentially reads numbers input from a ten-key connected to an Input Unit.

HEXADECIMAL KEY INPUT (HKY(212))

Sequentially reads numbers input from a hexadecimal keypad connected to an Input Unit and an Output Unit for a maximum of 8 digits.

DIGITAL SWITCH INPUT (DSW(213))

Reads numbers input from a digital switch or thumbwheel switch connected to an Input Unit and an Output Unit. Either 4 or 8 digits are read.

MATRIX INPUT (MTR(210))

Sequentially reads 64 input points input from a 8 × 8 matrix connected to an Input Unit and an Output Unit.

7-SEGMENT DISPLAY OUTPUT (7SEG(214))

Converts 4-digit or 8-digit values to data for a 7-segment display and outputs the result.

Read/Write CPU Bus Unit Memory Areas with IORD(222)/IOWR(223)

Although INTELLIGENT I/O READ (IORD(222)) and INTELLIGENT I/O WRITE (IOWR(223)) could previously be used only for Special I/O Units, these instructions can now be used to read and write data for CPU Bus Units.

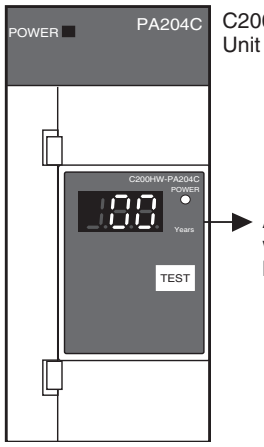
Operation Start/End Times

The times that operation is started and ended are automatically stored in memory in the Auxiliary Area (A515 to A517). This enables easier management of the operating times of the PLC System.

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Power Supply Units with Replacement Notification

The C200HW-PA204C Power Supply Units with Replacement Notification provide six display levels using a 7-segment display on the front panel of the Unit to indicate the remaining service life of the Power Supply Unit. An alarm output also notifies when the estimated remaining service life drops to 6 months or shorter. This function enables Power Supply Unit replacement before the power supply reaches the end of its service life resulting in a system failure.



C200HW-PA204C Power Supply Unit with Replacement Notification

Alarm output turns OFF when remaining service life is 6 months.

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1-4 CS1-H CPU Unit Ver. 4.0 Upgrades

This section summarizes the upgrades made for CS1-H CPU Units with unit version 4.0. CX-Programmer version 7.0 or higher must be used to enable using the following functions.

Functional Upgrades for Unit Version 4.0

Function	Section
Online Editing of Function Blocks	*1-4-1 Online Editing of Function Blocks*
Input-Output Variables in Function Blocks	*1-4-2 Input-Output Variables in Function Blocks*
Text String Support in Function Blocks	*1-4-3 Text String Support in Function Blocks*

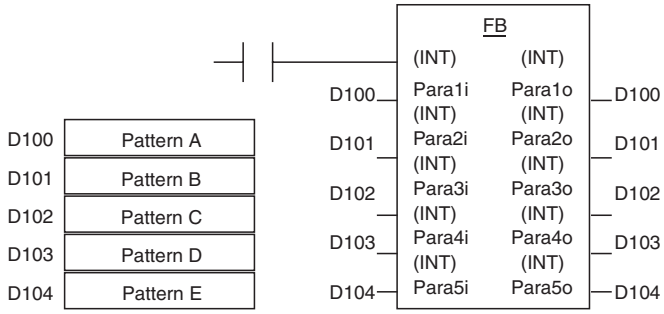
1-4-1 Online Editing of Function Blocks

Unit Version 3.0 or Earlier Function block definitions could not be changed during operation.

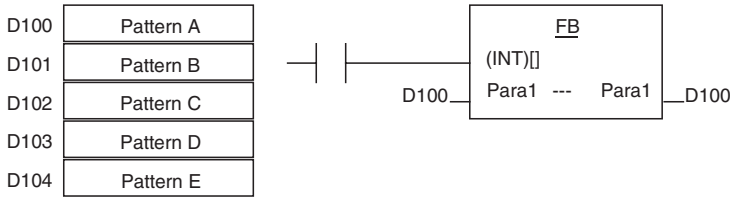
Unit Version 4.0 or Later Function block definitions can be changed during operation. This allows function block definitions to be quickly corrected during debugging. It also allows function blocks to be used more easily in systems that operate 24 hours a day.

1-4-2 Input-Output Variables in Function Blocks

Unit Version 3.0 or Earlier The data size of parameters that could be passed to and from function blocks was limited to four words maximum. It was thus necessary to separate elements with large data sizes, such as data tables.



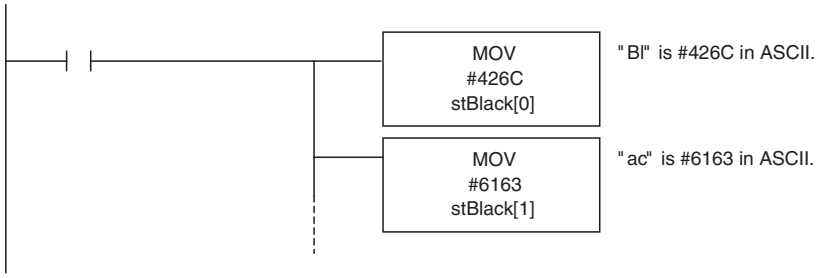
Unit Version 4.0 or Later Input-output variables can be used to passed large quantities of data, such as table data.



1-4-3 Text String Support in Function Blocks

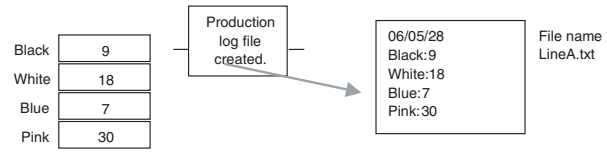
Unit Version 3.0 or Earlier To program text string processing for communications commands and display data in ladder diagrams, it was necessary to know the ladder string instructions and ASCII codes. Also, several instructions had to be combined to converted from numbers to text strings or text strings to numbers.

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Unit Version 4.0 or Later

Text strings can be used in ST programming to easily create text string processing programs.



FB to Create Production Log File

```
stBlack := INT_TO_STRING(Data[0]);      (* Convert black quantity to string *)
stWhite := INT_TO_STRING(Data[1]);      (* Convert white quantity to string *)
stBlue := INT_TO_STRING(Data[2]);       (* Convert blue quantity to string *)
stPink := INT_TO_STRING(Data[3]);       (* Convert pink quantity to string *)

GetDate(stDay)                          (* Get date text *)

stMessage := stDay  + '$N' + 'Black : '+ stBlack + '$N' + 'White : '+ stWhite + '$N' + 'Blue : '+ stBlue + '$N' + 'Pink : '+ stPink + '$N';

WRITE_TEXT(stMessage, '¥LineA', '', 0);     (* Create production log LineA.txt *)
```

FB to Create Date Text

```
(* ===================================================================
     Name: Generate Date Text
     Function: To create text data for yy/mm/dd

     (C)Copyright OMRON Corporation 2006 All Rights Reserved.
=================================================================== *)


stYYMM := WORD_TO_STRING(YYMM);    (* Create yymm text *)
stDDHH := WORD_TO_STRING(DDHH);    (* Create ddhh text *)

stDay := insert(stYYMM,'/',2) + '/' + left(stDDHH,2);
                    (* Insert / between yy and mm; extract only dd and combine *)
```

1-5 CS1-H CPU Unit Ver. 3.0 Upgrades

The following table shows the functional upgrades for CS1-H CPU Unit Ver. 3.0.

Functional Upgrades for CS1-H CPU Unit Ver. 3.0

Function	Section
Function blocks (when using CX-Programmer Ver. 5.0 or higher)	1-5-1
Serial Gateway (converting FINS commands to CompoWay/F commands at the built-in serial port)	1-5-2
Comment memory (in internal flash memory)	1-5-3
Expanded simple backup data	1-5-4
Free running timer (system timer after power is turned ON)	1-5-5

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Function		Section
New instructions added	TXDU(256) and RXDU(255) instructions (support no-protocol communications with Serial Communications Units with unit version 1.2 or later)	1-5-6
	Model conversion instructions: XFERC(565), DISTC(566), COLLC(567), MOVBC(568), and BCNTC(621)	
	Special function block instruction: GETID(286)	
Additional instruction functions	TXD(236) and RXD(235) instructions (support no-protocol communications with Serial Communications Boards with unit version 1.2 or later)	

Changes to Operating Specifications

Function	Section
Maximum number of points expanded for SYSMAC BUS remote I/O communications	1-5-7

1-5-1 Function Blocks (FB)

Pre-Ver. 2.0

Earlier Units did not support function blocks (FB).

Unit Ver. 3.0 or Later

Function blocks (FB) conforming to IEC 61131-3 are supported. Use of function blocks is determined by the user.

Note IEC 61131-3 is an international standard for programmable logic controllers (PLC) established by the International Electro-technical Commission (IEC). This standard is divided into seven parts, of which Part 3 *Programming Languages* (IEC 61131-3) provides regulations for programming PLCs.

Function blocks can be created with CX-Programmer Ver. 5.0 or higher by the user and pasted into normal programs. The standard function blocks provided by OMRON in the OMRON FB Library can also be pasted into normal programs. Function blocks enable standard processing to be simply inserted into a program as a single unit. Function blocks provide the following features.

- Function block algorithms can be written using ladder programming or structured text (see note).

  Note Structured text is a high level textual language designed for industrial control (primarily PLCs) stipulated in IEC 61131-3. The structured text supported by CX-Programmer Ver. 5.0 conforms to IEC 61131-1.

- A single function block that has been created can be stored in a library for easy reuse of standard processing.
- Programs that contain function blocks (ladder programming or structured text), can also be uploaded or downloaded in the same way as normal programs that do not contain function blocks. Tasks that include function blocks, however, cannot be downloaded in task units (although they can be uploaded).
- Array (one-dimensional) variables are supported, making it easier to handle data specific to an application.

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1-5-2 Serial Gateway (Converting FINS to CompoWay/F Via Serial Port)

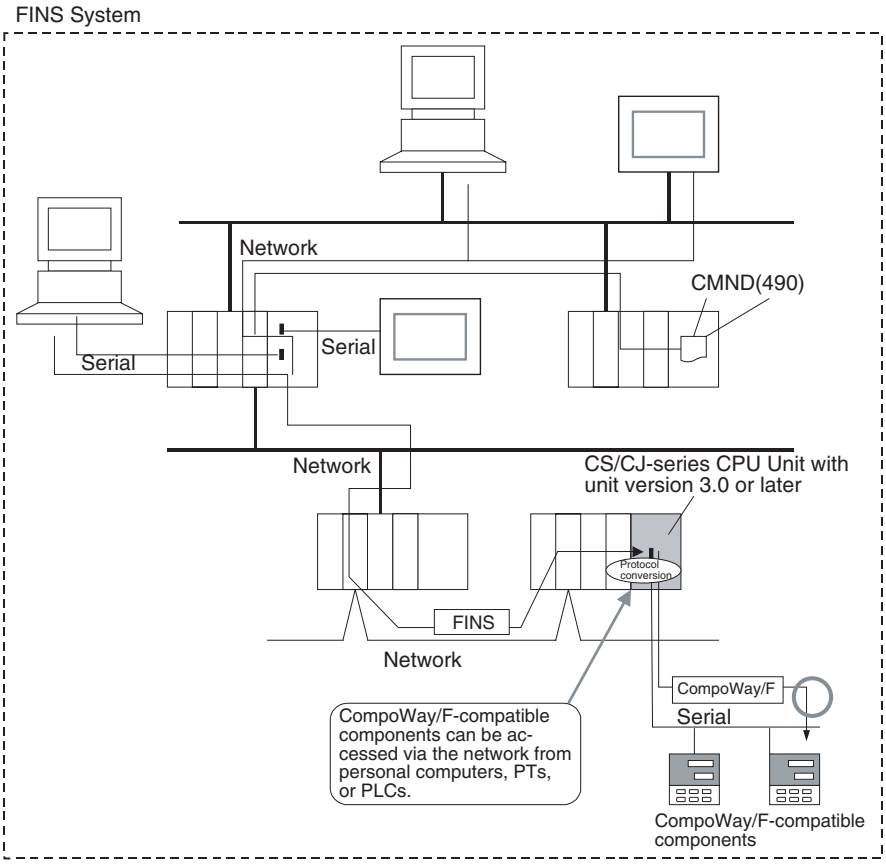
Pre-Ver. 2.0

Temperature Controllers, Digital Panel Meters, and other CompoWay/F-compatible OMRON Components previously could be accessed by sending user-specified CompoWay/F commands from the PLC. This required, however, the use of a Serial Communications Board/Unit protocol macro, execution of the PMCR(260) instruction in the ladder program of the CPU Unit on the same PLC, and implementation of the standard system protocol (CompoWay/F Master). The use of protocol macros prevented access across networks.

Note Specific data could be shared without communications instructions if user-specified CompoWay/F commands were not required, however, by using the CJ1W-CIF21 Basic Communications Unit.

Unit Ver. 3.0 or Later

FINS commands (CompoWay/F commands encapsulated in FINS frames) received by the CPU Unit at the built-in serial port (RS-232C port or peripheral port) are converted automatically into CompoWay/F command frames and transmitted on the serial line. This enables access to CompoWay/F-compatible OMRON components that are connected to the CPU Unit's built-in serial port via either an NS-series Programmable Terminal (PT) or by using the CMND(490) instruction.



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1-5-3 Comment Memory (in Internal Flash Memory)

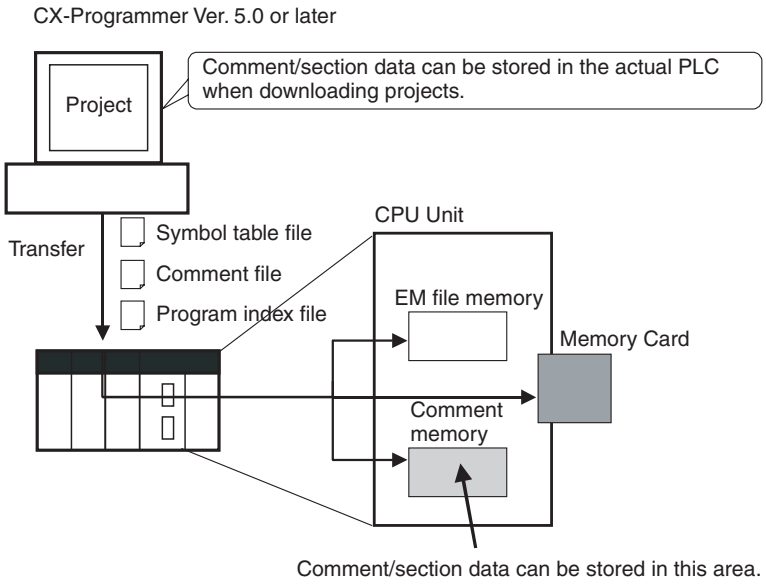
Pre-Ver. 2.0

Comment data and section data could not be stored in the actual PLC when a project was downloaded from the CX-Programmer to the CPU Unit unless both a Memory Card and EM file memory were available.

Unit Ver. 3.0 or Later

A comment memory is provided within the CPU Unit's internal flash memory. Therefore, the following comment/section data can be stored in and read from comment memory even if neither Memory Card nor EM file memory are available.

- Symbol table files (including CX-Programmer symbol names and I/O comments)
- Comment files (CX-Programmer rung comments and other comments)
- Program index files (CX-Programmer section names, section comments, and program comments)



When downloading projects using the CX-Programmer Ver. 5.0, either of the following storage locations can be selected as the transfer destination for comment data and section data.

- Memory Card
- EM file memory
- Comment memory (in CPU Unit's internal flash memory)

Note When using CX-Programmer Ver. 4.0 or earlier, this data is stored in either the Memory Card or EM file memory, whichever is available. If neither the Memory Card nor EM file memory is available, the comment/section data cannot be stored in comment memory.

1-5-4 Simple Backup Data Expanded

Pre-Ver. 2.0

The simple backup function could not be used to back up comment data or section data.

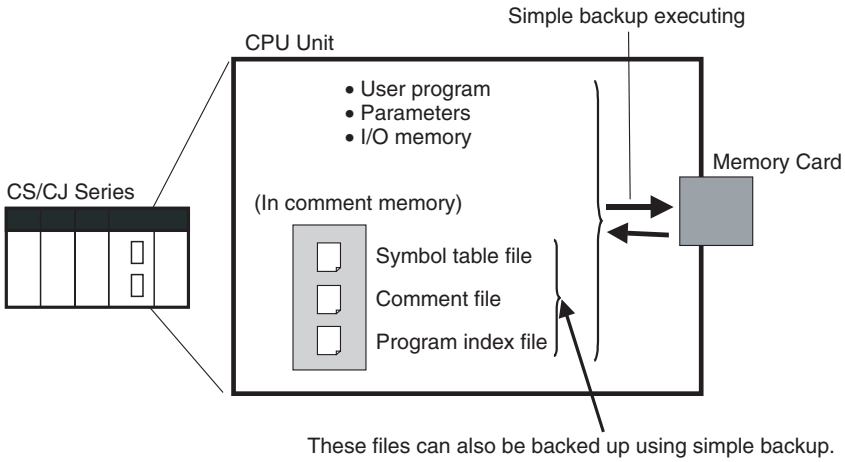
Unit Ver. 3.0 or Later

The following files stored in comment memory can be backed up to a Memory Card when a simple backup operation is executed, or the files can be restored to comment memory from the Memory Card.

- Symbol table files (including CX-Programmer symbol names and I/O comments)

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- Comment files (CX-Programmer rung comments and other comments)
- Program index files (CX-Programmer section names, section comments, and program comments)



This enables backup/restoration of all data in the CPU Unit including I/O comments if an error occurs or when adding a CPU Unit with the same specifications without requiring a Programming Device.

1-5-5 Free Running Timer

he system timers used after the power is turned ON are contained in the following Auxiliary Area words.

Name	Address	Function	Access
10-ms Incrementing Free Running Timer	A000	This word contains the system timer used after the power is turned ON. 0000 hex is set when the power is turned ON and this value is automatically incremented by 1 every 10 ms. The value returns to 0000 hex after reaching FFFF hex (655,350 ms), and then continues to be automatically incremented by 1 every 10 ms. (Unit version 3.0 or later)	Read-only
100-ms Incrementing Free Running Timer	A001	This word contains the system timer used after the power is turned ON. 0000 hex is set when the power is turned ON and this value is automatically incremented by 1 every 100 ms. The value returns to 0000 hex after reaching FFFF hex (6,553,500 ms), and then continues to be automatically incremented by 1 every 100 ms.(Unit version 3.0 or later)	Read-only
1-s Incrementing Free Running Timer	A002	This word contains the system timer used after the power is turned ON. 0000 hex is set when the power is turned ON and this value is automatically incremented by 1 every second. The value returns to 0000 hex after reaching FFFF hex (65,535 s), and then continues to be automatically incremented by 1 every second. (Unit version 4.0 or later)	Read-only

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Note The timer will continue to be incremented when the operating mode is switched to RUN mode.

Example: The interval can be counted between processing A and processing B without requiring timer instructions. This is achieved by calculating the difference between the value in A000 for processing A and the value in A000 for processing B. The interval is counted in 10 ms units.
CPU Units with unit version 4.0 and later also have a 1-s timer in A002, which is incremented by 1 every 1 s.

1-5-6 New Special Instructions and Functions

The following new instructions and instruction functions have been added. For details, refer to the *CS/CJ Series Instructions Reference Manual* (W474). These new instructions are supported by the CX-Programmer Ver. 5.0 or higher only.

- Serial Communications Instructions:
  Supporting no-protocol communications with Serial Communications Units with unit version 1.2 or later:
  TXDU(256): TRANSMIT VIA SERIAL COMMUNICATIONS UNIT
  RXDU(255): RECEIVE VIA SERIAL COMMUNICATIONS UNIT
  Supporting no-protocol communications with Serial Communications Boards with unit version 1.2 or later:
  TXD(236): TRANSMIT
  RXD(235): RECEIVE
- Model Conversion Instructions:
  When using CX-Programmer Ver. 5.0 or higher to convert a C-series ladder program for use in a CS/CJ-series CPU Unit, the C-series XFER(070), DIST(080), COLL(081), MOVB(082), and BCNT(067) instructions will be automatically converted to the following instructions. The operands do not require editing.
  XFERC(565) BLOCK TRANSFER
  DISTC(566) SINGLE WORD DISTRIBUTE
  COLLC(567) DATA COLLECT
  MOVBC(568) MOVE BIT
  BCNTC(621) BIT COUNTER

1-5-7 Increased Points for SYSMAC BUS Remote I/O Communications

Earlier Specifications

The maximum number of SYSMAC BUS remote I/O points per CPU Unit was 800 points (50 words), which were allocated in the SYSMAC BUS Area (CIO 3000 to CIO 3049).

Updated Specifications

The maximum number of SYSMAC BUS remote I/O points per CPU Unit has been increased to 1,280 points (80 words), which are allocated in the SYSMAC BUS Area (CIO 3000 to CIO 3079).

This expansion in the number of points is not related to any upgrade of the Units (CPU Units or SYSMAC BUS Remote I/O Communications Units). Therefore, the increase in maximum number of points applies to all CS-series CPU Units, including those that have already been shipped.

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Refer to the following table for details.

<table>
<tr><th colspan="2">Item</th><th>Before</th><th>Now</th></tr>
<tr><td rowspan="6">Maximum number of points per CPU Unit (total optical/wired points)</td><td>SYSMAC Bus remote I/O relay area</td><td>800 points
(50 words)</td><td>1,280 points
(80 words)</td></tr>
<tr><td>Number of Remote I/O Master Units (RM)</td><td colspan="2">2 Units</td></tr>
<tr><td rowspan="5">Number of C500 Remote I/O Slave Units (RT) (i.e., Slave Racks))</td><td>2 Units</td><td>4 Units</td></tr>
<tr><td colspan="2">C500 Remote I/O Slave Unit (RT) allocated words for 2 unit numbers
Up to 20 words in total per Slave Rack.</td></tr>
<tr><td>5 Units</td><td>8 Units</td></tr>
<tr><td colspan="2">Slave Rack: Any location, fixed word allocations
C200H Special I/O Unit can be connected.
Up to 10 words in total per Slave Rack.</td></tr>
<tr><td rowspan="6">Maximum points per Remote I/O Master Unit (RM) (Total optical/wired points)</td><td>SYSMAC BUS Remote I/O Relay Points</td><td colspan="2">512 points (32 words)</td></tr>
<tr><td rowspan="2">Maximum number of C500 Remote I/O Slave Units (i.e., Slave Racks)</td><td>2 Units</td><td>4 Units</td></tr>
<tr><td colspan="2">C500 Remote I/O Slave Unit (RT) allocated words for 2 unit numbers
Up to 20 words in total per Slave Rack.
Remote I/O Slave Unit's (RT) unit number cannot be used more than once.</td></tr>
<tr><td rowspan="2">Maximum number of C200H Remote I/O Slave Units (RT) (i.e., Slave Racks)</td><td>5 Units</td><td>8 Units</td></tr>
<tr><td colspan="2">Slave Rack: Any location, fixed word allocations
C200H Special I/O Unit can be connected.
Up to 10 words in total per Slave Rack.</td></tr>
<tr><td rowspan="2">Maximum number of Remote I/O Slaves (Slave Units, I/O Link Units, Remote I/O Units)</td><td colspan="2">Optical: 64 Units (Repeater required if number exceeds 32).</td></tr>
<tr><td colspan="2">Wired: Remote Interfaces, Remote Terminals: 32 Units total
Remote Units: 16 Units.</td></tr>
</table>

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1-6 CS1-H CPU Unit Ver. 2.0 Upgrades

The following table shows the functional upgrades for CS1-H CPU Unit Ver. 2.0.

Functional Upgrades for CS1-H CPU Unit Ver. 2.0

Function	Reference
Downloading and Uploading Individual Tasks	1-6-1
Improved Read Protection Using Passwords	1-6-2
Write Protection from FINS Commands Sent to CPU Units via Networks	1-6-3
Online Network Connections without I/O Tables	1-6-4
Communications through a Maximum of 8 Network Levels	1-6-5
Connecting Online to PLCs via NS-series PTs	1-6-6
Setting First Slot Words	1-6-7
Automatic Transfers at Power ON without a Parameter File	1-6-8
Operation Start/End Times	1-6-9
New Application Instructions	1-6-10

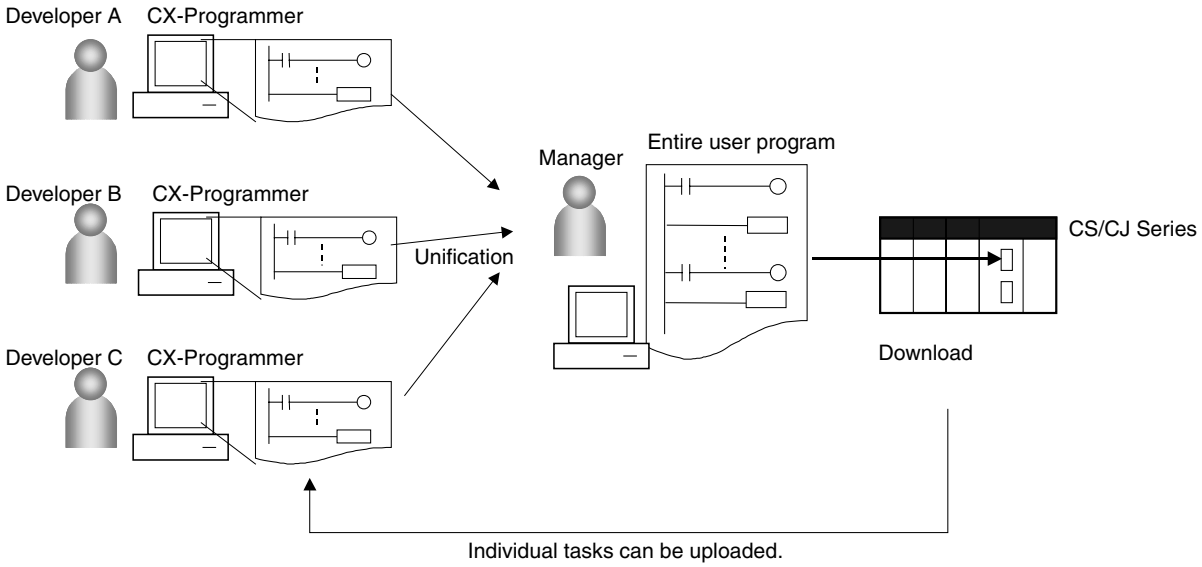
1-6-1 Downloading and Uploading Individual Tasks

Previous CPU Units (Pre-Ver. 2.0 CPU Units)

With the pre-Ver. 2.0 CPU Units, individual program tasks could not be downloaded from the CX-Programmer. It was only possible to download the entire user program.

For example, if several programmers were developing the program, the project manager had to unify each program after debugging and then download the entire user program. Furthermore, the entire user program had to be downloaded even if just a few changes were made.

Note It was possible to upload individual program tasks with CS/CJ-series PLCs.

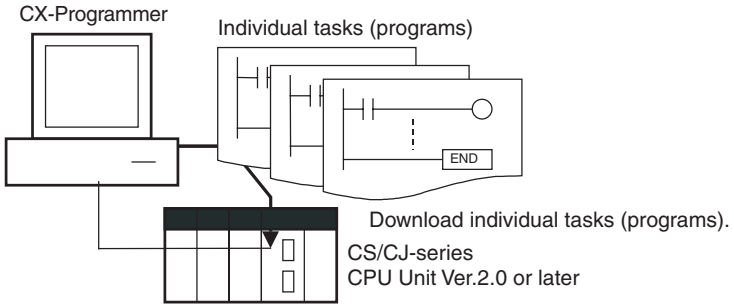


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CPU Unit Ver. 2.0

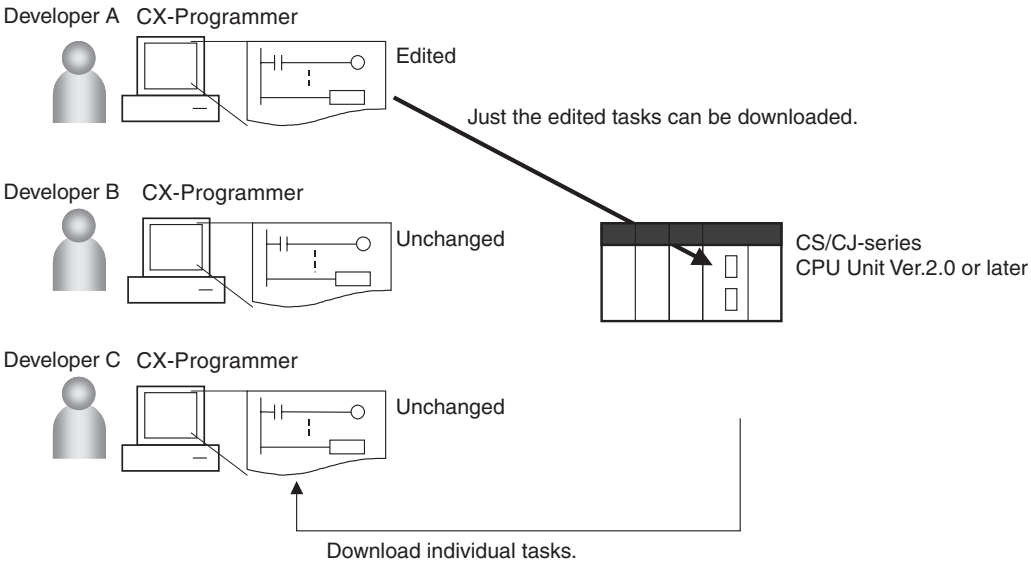
Overview

With CPU Unit Ver. 2.0 or later CPU Units, individual program tasks can be uploaded and downloaded from the CX-Programmer.



Usage

When several programmers are developing a program, it isn't necessary for a project manager to unify the data because just the debugged tasks can be downloaded/uploaded. Also, transferring individual tasks can help avoid mistakes.



Restrictions to Function Block Use

Individual tasks cannot be downloaded for programs containing function blocks (unit version 3.0 or later only) (uploading is possible).

1-6-2 Improved Read Protection Using Passwords

Read Protection for Individual Tasks Using Passwords

Previous CPU Units (Pre-Ver. 2.0 CPU Units)

With the pre-Ver. 2.0 CS/CJ-series CPU Units, it was possible to read-protect the entire PLC with a password (referred to as “UM read protection” below), but it was not possible to protect individual tasks.

UM read protection prevented anyone from displaying, editing, or uploading the entire user program from CX-Programmer without inputting the correct password.

CPU Unit Ver. 2.0 or Later and CX-Programmer Ver. 4.0 or Higher

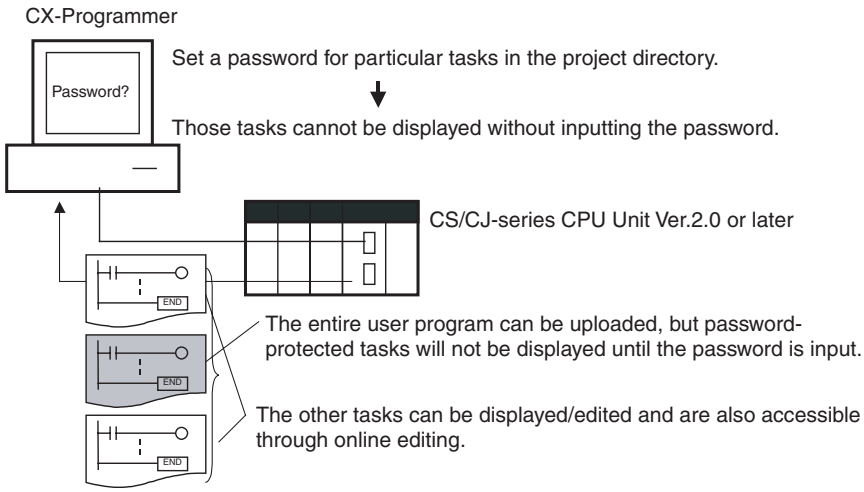
Overview

With the CPU Unit Ver. 2.0 or later CPU Units, it is possible to read-protect individual program tasks (referred to as “task read protection” below) or the entire PLC. same password controls access to all of the read-protected tasks.

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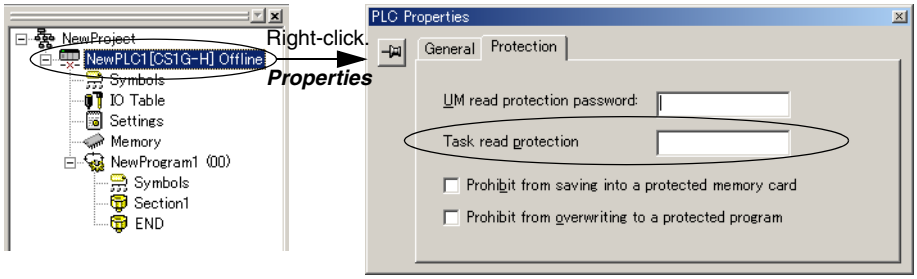
Task read protection prevents anyone from displaying, editing, or uploading the read-protected set of tasks from CX-Programmer without inputting the correct password. In this case, the entire program can be uploaded, but the read-protected tasks cannot be displayed or edited without inputting the correct password. Tasks that are not read-protected can be displayed, edited, or modified with online editing.

Note Task read protection cannot be set if UM read protection is already set. However, it is possible to set UM read protection after task read protection has been set.

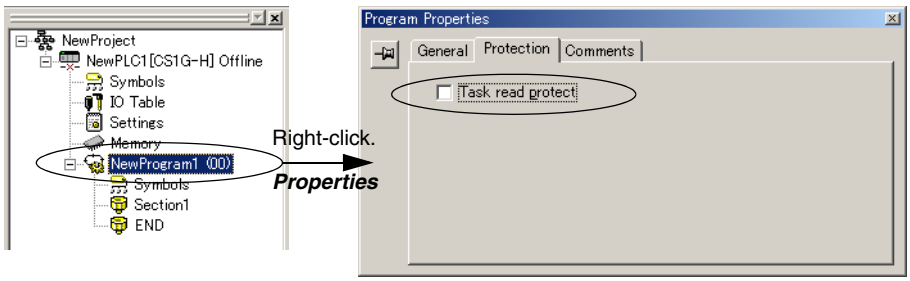


Operating Procedure

1,2,3... 1. Display the *Protection* Tab of the PLC Properties Window and register a password in the *Task read protection* Box.



2. Select the tasks that will be password-protected and select the *Task read protect* Option in the *Program Properties* Tab.



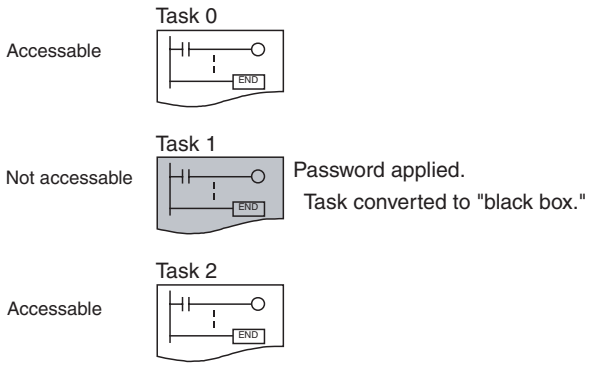
3. Connect online and execute either step a or b below.
   a) Transferring the Program and Setting Password Protection:
   Select ***PLC - Transfer - To PLC*** to transfer the program. The tasks registered in step 2 will be password-protected.

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b) Setting Password Protection without Transferring the Program:
Select ***PLC - Protection - Set Password*** and click the **OK** button. The tasks registered in step 2 will be password-protected.

Usage

Apply read protection to tasks when you want to convert those tasks (programs) to “black box” programs.



Note

1. If CX-Programmer Ver. 3.2 or an earlier version is used to read a task with task read protection applied, an error will occur and the task will not be read. Likewise, if a Programming Console or the PT Ladder Monitor function is used to read a password protected task, an error will occur and the task will not be read.
2. The entire program can be transferred to another CPU Unit even if individual tasks in the program are read-protected. It is also possible to connect online and create a program file (.OBJ file) with file memory operations. In both cases, the task read protection remains effective for the password-protected tasks.
3. When the CX-Programmer is used to compare a user program in the computer's memory with a user program in the CPU Unit, password-protected tasks will be compared too.

Restrictions on Function Block Use

For programs containing function blocks (unit version 3.0 or later only), function block definitions can be read even if the entire program or tasks are read-protected.

Enabling/Disabling Creating File Memory Program Files

Previous CPU Units (Pre-Ver. 2.0 CPU Units)

With the pre-Ver. 2.0 CS/CJ-series CPU Units, it was possible use file memory operations to transfer a program file (.OBJ file) to a Memory Card even if the program was protected with UM read protection. (Consequently, illegal copies could be made.)

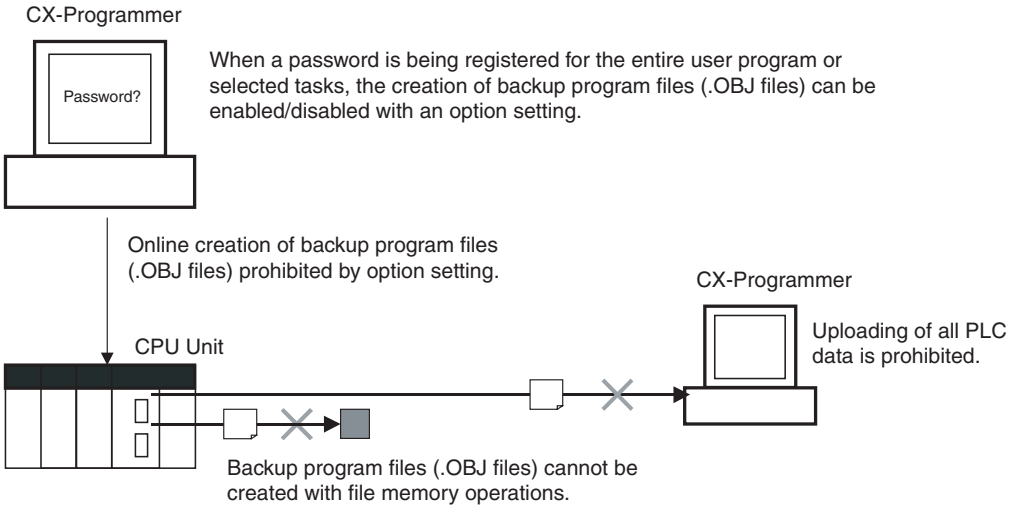
CPU Unit Ver. 2.0 or Later and CX-Programmer Ver. 4.0 or Higher

Overview

When the entire program or individual tasks in a CPU Unit Ver. 2.0 or later are read-protected from the CX-Programmer, an option can be set to enable or disable the creation/backup of.OBJ program files. It will not be possible to create program files (.OBJ files) with file memory operations if the creation/backup of program files is prohibited with this setting. (This setting prohibits both online transfers to a Memory Card/EM file memory as well as offline storage of PLC data that was uploaded to the CX-Programmer.)

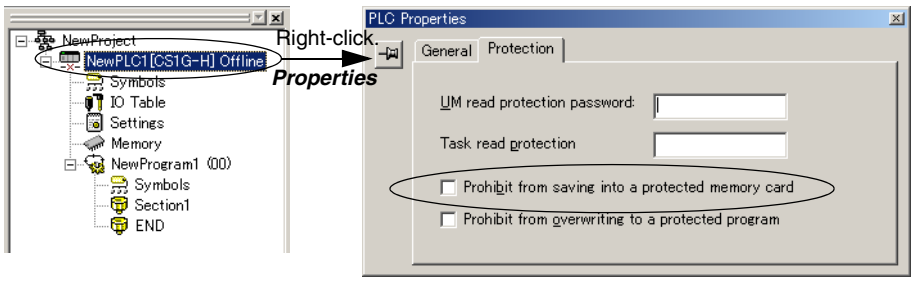
Disabling the creation of file memory program files can help prevent illegal copying of the user program.

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Operating Procedure

1,2,3... 1. When registering a password in the *UM read protection password* Box or *Task read protection* Box, select the *Prohibit from saving into a protected memory card* Option.



2. Either select ***PLC - Transfer - To PLC*** to transfer the program or select ***PLC - Protection - Set Password*** and click the **OK** button.

Usage

This option can be used to prevent the program from being transferred out of the PLC using the password.

Note

1. The simple backup operation can still be performed when the creation of program files is prohibited, but the backup program file (BACKUP.OBJ) will not be created.
2. The program can be copied when program read protection is not enabled.
3. The setting to enable/disable creating file memory program files will not take effect unless the program is transferred to the CPU Unit. Always transfer the program after changing this setting.

Enabling/Disabling Write Protection for Individual Tasks Using Passwords

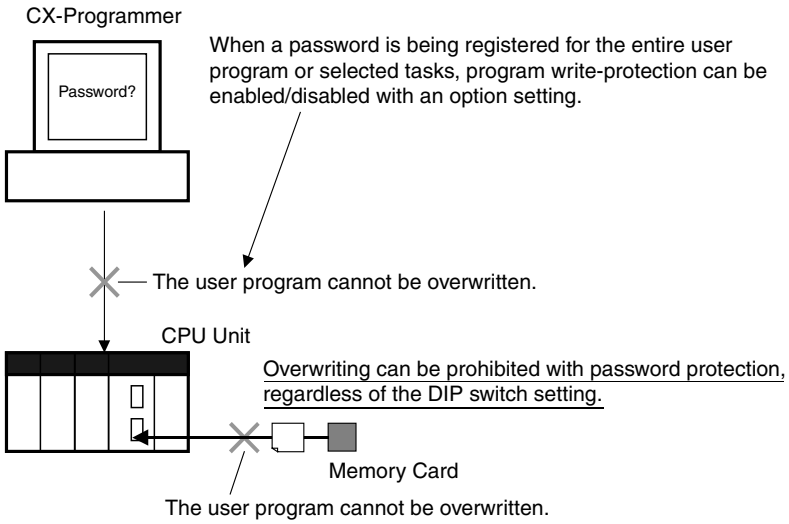
Previous CPU Units (Pre-Ver. 2.0 CPU Units)

With the pre-Ver. 2.0 CS/CJ-series CPU Units, the CPU Unit's user program memory (UM) can be write-protected by turning ON pin 1 of the CPU Unit's DIP switch. In this case, it is possible to overwrite the user program memory by turning OFF pin 1.

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CPU Unit Ver. 2.0 or Later and CX-Programmer Ver. 4.0 or Higher

With the CPU Unit Ver. 2.0 and later CPU Units, the CPU Unit's UM area can be write protected by turning ON pin 1 of the CPU Unit's DIP switch. The program (or selected tasks) can also be write-protected if the write protection option is selected from the CX-Programmer when a password is being registered for the entire program or those selected tasks. The write protection setting can prevent unauthorized or accidental overwriting of the program.



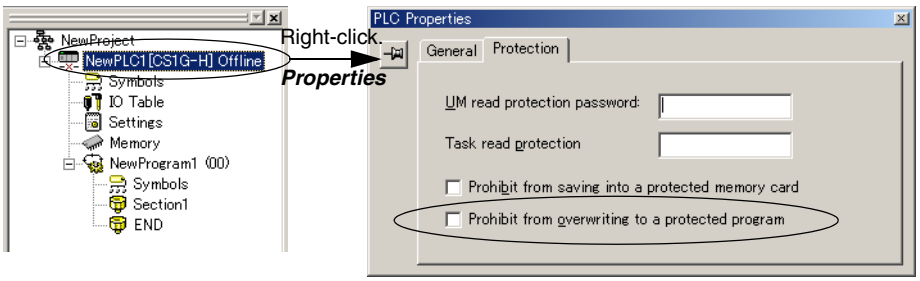
Note

1. If the selected tasks or program are write-protected by selecting this option when registering a password, only the tasks (program) that are password-protected will be protected from overwriting. It will still be possible to overwrite other tasks or programs with operations such as online editing and task downloading.
2. All tasks (programs) can be overwritten when program read protection is not enabled.
3. The setting to enable/disable creating file memory program files will not take effect unless the program is transferred to the CPU Unit. Always transfer the program after changing this setting.

Operating Procedure

1,2,3...

1. When registering a password in the *UM read protection password* Box or *Task read protection* Box, select the *Prohibit from overwriting to a protected program* Option.



2. Either select ***PLC - Transfer - To PLC*** to transfer the program or select ***PLC - Protection - Set Password*** and click the **OK** button.

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Auxiliary Area Flags and Bits related to Password Protection

Name	Bit address	Description
UM Read Protection Flag	A09900	Indicates whether or not the PLC (the entire user program) is read-protected. 0: UM read protection is not set. 1: UM read protection is set.
Task Read Protection Flag	A09901	Indicates whether or not selected program tasks are read-protected. 0: Task read protection is not set. 1: Task read protection is set.
Program Write Protection for Read Protection	A09902	Indicates whether or not the write protection option has been selected to prevent overwriting of password-protected tasks or programs. 0: Overwriting allowed 1: Overwriting prohibited (write-protected)
Enable/Disable Bit for Program Backup	A09903	Indicates whether or not a backup program file (.OBJ file) can be created when UM read protection or task read protection is set. 0: Creation of backup program file allowed 1: Creation of backup program file prohibited

1-6-3 Write Protection from FINS Commands Sent to CPU Units via Networks

Previous CPU Units (Pre-Ver. 2.0 CPU Units)

With the pre-Ver. 2.0 CS/CJ-series CPU Units, there was no way to prohibit write operations and other editing operations sent to the PLC's CPU Unit as FINS commands through a network such as Ethernet, i.e., connections other than direct serial connections.

CPU Unit Ver. 2.0 or Later

Summary

With the CPU Unit Ver. 2.0 and later CS/CJ-series CPU Units, it is possible to prohibit write operations and other editing operations sent to the PLC's CPU Unit as FINS commands through a network (including write operations from CX-Programmer, CX-Protocol, CX-Process, and other applications using FinsGateway). Read processes are not prohibited.

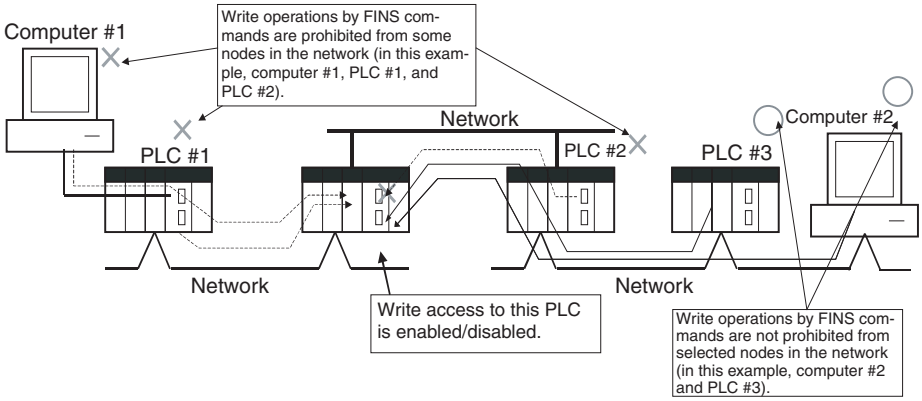
FINS write protection can disable write processes such as downloading the user program, PLC Setup, or I/O memory, changing the operating mode, and performing online editing.

It is possible to exclude selected nodes from write protection so that data can be written from those nodes.

An event log in the CPU Unit automatically records all write processes sent through the network and that log can be read with a FINS command.

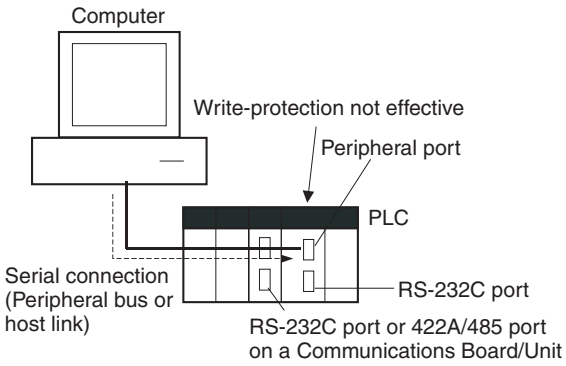
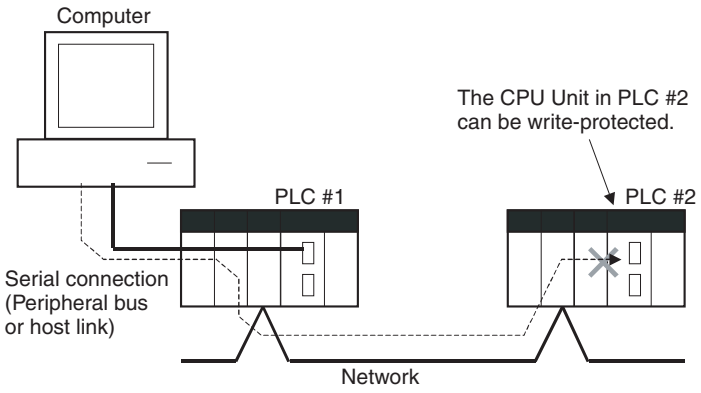
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Example:

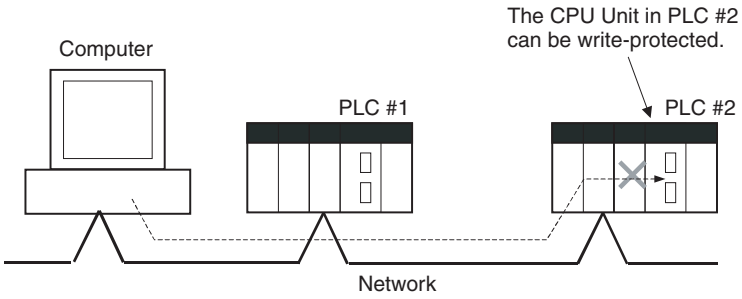
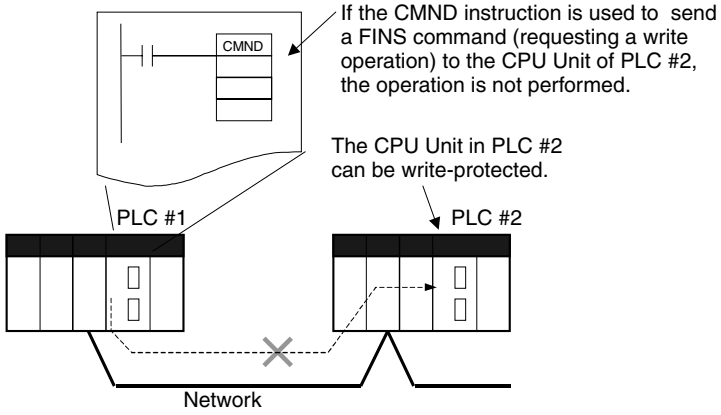


Note This function prohibits writing by FINS commands only, so it has no effect on write operations by functions other than FINS commands, such as data links.

Example Write Protection Patterns

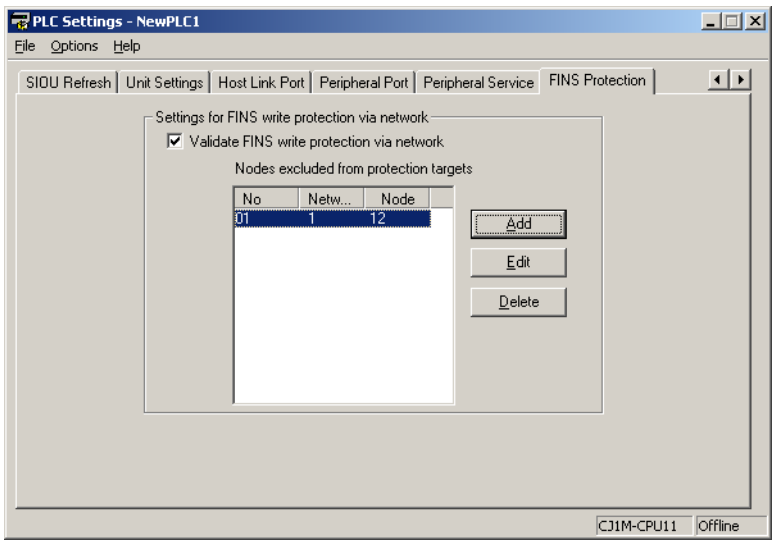
Connection pattern		Diagram (example)	Write protection
From a computer through a direct serial connection	Direct connection to PLC		Cannot be applied.
	Gateway connection (Serial-to-network) to PLC		Can be applied.

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Connection pattern	Diagram (example)	Write protection
From a computer through a direct network connection		Can be applied.
From another PLC in the network		Can be applied.

Operation

With the CX-Programmer, open the PLC Setup's *FINS Protection* Tab and select the *Use FINS Write Protection* Option. When this option is selected, it will not be possible to execute write operations for that CPU Unit with FINS commands sent through a network. To permit write operations from particular nodes, enter network addresses and node addresses for the node under *Protection Releasing Addresses*. (Up to 32 nodes can be excluded from FINS Write Protection).



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PLC Setup

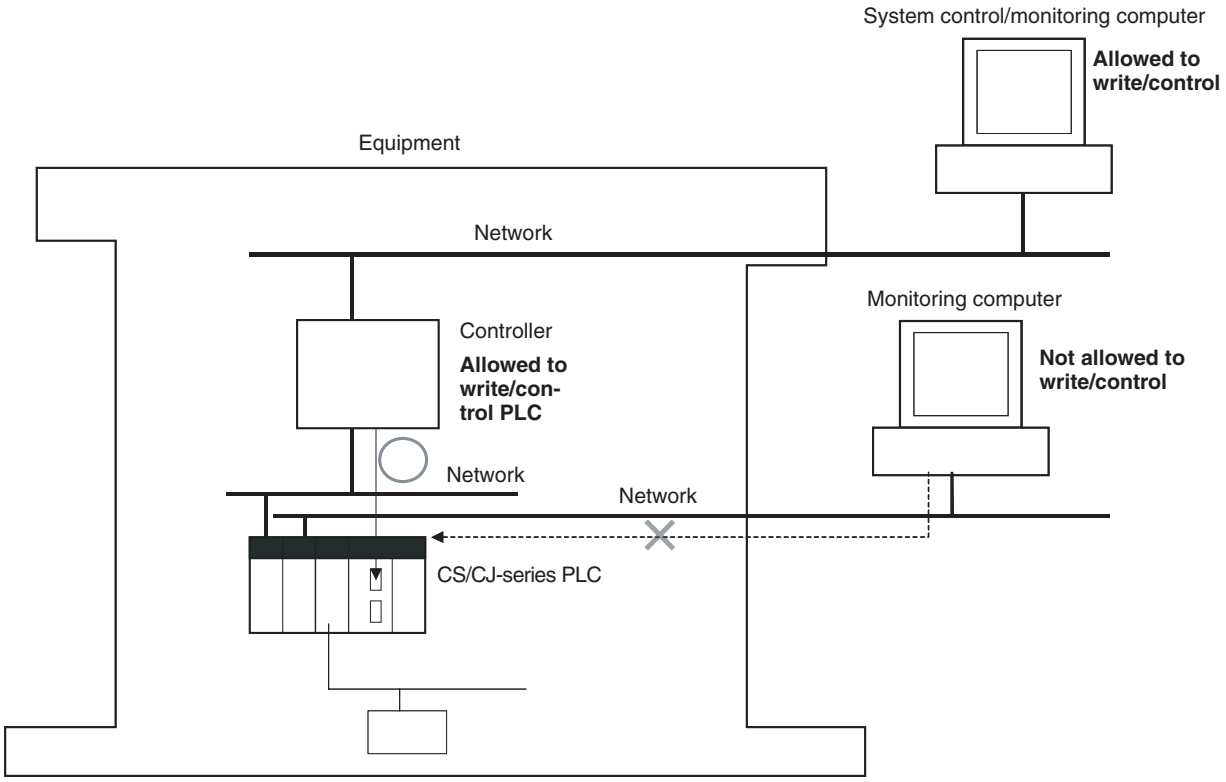
Item	Address in Programming Console	Description	Settings	Default setting
Use FINS Write Protection	Word 448, bit 15	Sets whether the CPU Unit is write-protected from FINS commands sent through the network. (Does not prohibit FINS commands sent through a direct serial connection).	0: Write protection disabled 1: Write protection enabled	0: Write protection disabled
Nodes Excluded from Write Protection (Protection Releasing Addresses)	Words 449 to 480	This area lists the nodes in the network that are not restricted by FINS write protection. Up to 32 nodes can be specified. **Note** These settings are effective only when FINS write protection is enabled.		
	Bits 08 to 15	Network address: Network address of the FINS command source	00 to 7F hex	
	Bits 00 to 07	Node address: Node address of the FINS command source	01 to FE hex, or FF hex (FF hex: node address unspecified)	
Number of Nodes Excluded from FINS Write Protection (Do not set this value. It is automatically calculated by the CX-Programmer.)	Word 448, bits 00 to 07	Contains the number of nodes that are not subject to the FINS write protection. If 0 is specified (no nodes excluded from write protection), FINS write commands are prohibited from all nodes other than the local node. **Note** This setting is effective only when FINS write protection is enabled.	0 to 32 (00 to 20 hex) (A value of 0 indicates that all nodes are subject to write protection.)	0 (All nodes subject to write protection.)

Usage

The system can be configured so that a PLC can be written only from authorized nodes in the network. (For example, use this function when the system's control/monitoring computer is the only node allowed to write to a Controller within a piece of equipment.)

By limiting the number of nodes that can write to the PLC, it is possible to prevent system problems caused by unintentional overwrites during data monitoring.

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Operations Restricted by Network FINS Write Protection

FINS Write Commands

The following FINS commands are restricted by FINS write protection when sent to the CPU Unit through the network.

Code	Command name
0102 hex	MEMORY AREA WRITE
0103 hex	MEMORY AREA FILL
0105 hex	MEMORY AREA TRANSFER
0202 hex	PARAMETER AREA WRITE
0203 hex	PARAMETER AREA FILL (CLEAR)
0307 hex	PROGRAM AREA WRITE
0308 hex	PROGRAM AREA CLEAR
0401 hex	RUN
0402 hex	STOP
0702 hex	CLOCK WRITE
0C01 hex	ACCESS RIGHT ACQUIRE

Code	Command name
2101 hex	ERROR CLEAR
2103 hex	ERROR LOG POINTER CLEAR
2203 hex	SINGLE FILE WRITE
2204 hex	FILE MEMORY FORMAT
2205 hex	FILE DELETE
2207 hex	FILE COPY
2208 hex	FILE NAME CHANGE
220A hex	MEMORY AREA-FILE TRANSFER
220B hex	PARAMETER AREA-FILE TRANSFER
220C hex	PROGRAM AREA-FILE TRANSFER
2215 hex	CREATE/DELETE DIRECTORY
2301 hex	FORCED SET/RESET
2302 hex	FORCED SET/RESET CANCEL

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Operations from CX-Programmer (including CX-Net) through the Network

The following CX-Programmer (including CX-Net) operations are restricted by FINS write protection when performed on the CPU Unit through the network.

Operations not allowed through the network when FINS write protection is enabled.	• Changing the Operating Mode • Transferring the ladder program to the CPU Unit • Transferring parameter area data (PLC Setup, I/O table, and CPU Bus Unit Setup) to the CPU Unit • Transferring memory area data (I/O memory data) to the CPU Unit • Transferring the variable table, comments, or program index to the CPU Unit • Forced Set/Reset • Changing timer/counter set values • Online editing • Writing file memory • Clearing the error log • Setting the clock • Releasing the access right • Transferring the routing table • Transferring the data link table

Note

1. FINS write protection does not prevent CX-Programmer operations from a computer connected through a direct serial connection.
2. FINS write protection does not prevent the following file memory write operations.
   - Automatic transfer from the Memory Card at startup
   - Simple backup function (including backup operations to selected Units/Boards)
   - Writing files with the FWRIT (WRITE DATA FILE) instruction

Operations from Other Support Software

FINS write protection also prevents the following operations performed through the network by the CX-Protocol and CX-Process.

- Changing the CPU Unit's operating mode, writing memory areas, transferring PLC Setup settings, transferring the I/O table, forced set/reset, and clearing the CPU Unit's error log

Operations from Applications That Use FinsGateway

FINS write protection prevents all write operations addressed to the CPU Unit from applications that use FinsGateway, such as PLC Reporter and Compolet.

1-6-4 Online Network Connections without I/O Tables

Previous CPU Units (Pre-Ver. 2.0 CPU Units)

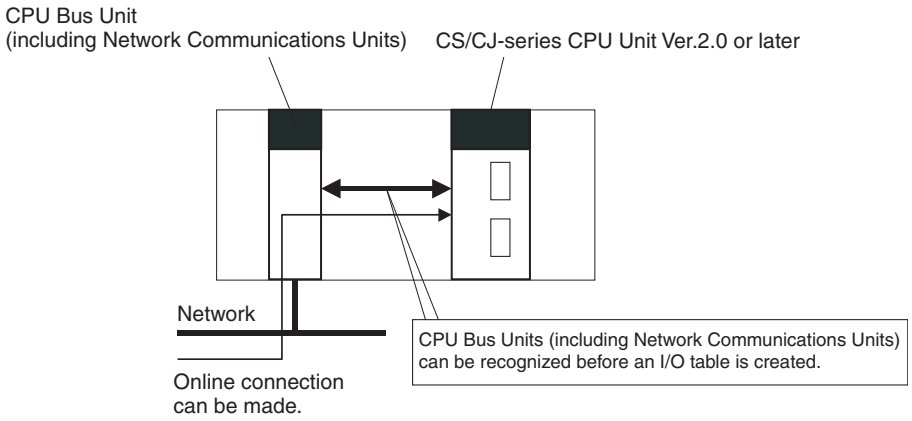
With the pre-Ver. 2.0 CPU Units, it was not possible to make an online connection to other PLCs in the network from CX-Programmer unless the I/O tables had been created (even if the network connections were completed) because the Network Communications Unit itself was not recognized from the CPU Unit. Consequently, it was necessary to connect a Programming Device (CX-Programmer or a Programming Console) to each PLC through a serial connection and create and I/O tables in each PLC in order to make online connections through the network.

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CPU Unit Ver. 2.0 or Later

Summary

With the CPU Unit Ver. 2.0 and later CS/CJ-series CPU Units, the CPU Unit can recognize a CPU Bus Unit (such as a Network Communications Unit, see note) even if the I/O tables have not been created and there is no registered I/O tables.



Note Network Communications Units include Ethernet Units, Controller Link Units, SYSMAC Link Units, and DeviceNet Units.

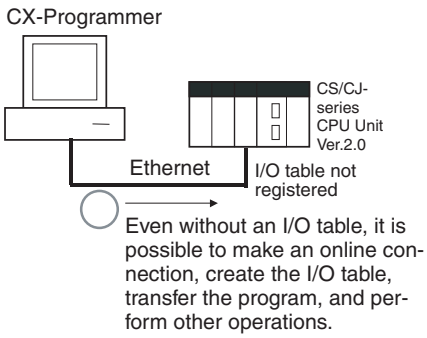
Usage

If the nodes are connected to the network, this function allows a computer-based Programming Device (such as the CX-Programmer) to connect online to PLCs in the network even if the I/O tables have not been created. Since a network connection is established with the PLCs, setup operations can be performed such as creating the I/O tables (or editing and transferring I/O tables), transferring the user program, transferring the PLC Setup, and transferring the CPU Bus Unit Setup.

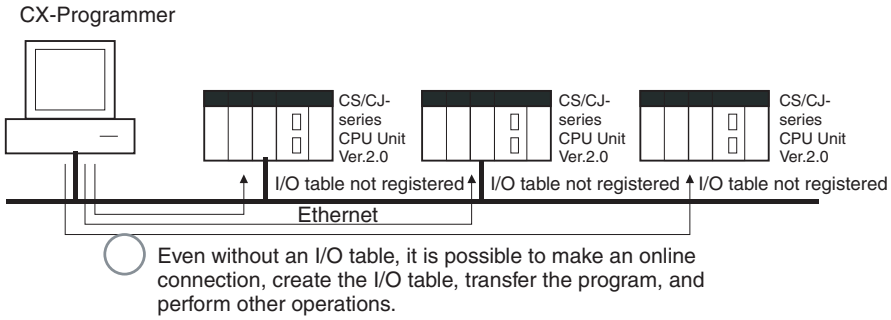
This function is particularly useful when connecting the CX-Programmer via Ethernet (using a CS1W-ETN21), because the I/O tables can be created through Ethernet so a serial cable isn't required and it isn't necessary to spend extra time establishing a serial connection.

Details

1:1 Computer-to-PLC connection



1:N Computer-to-PLC connection



- Applicable Units: All CS/CJ-series CPU Bus Units
- Applicable computer-based Programming Devices: CX-Programmer and CX-Protocol only
- Applicable functions: Online connections from CX-Programmer and CX-Protocol, and online functions of the applicable CPU Units and CPU Bus Units

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Note

1. A non-fatal I/O verification error will occur if a CPU Bus Unit (including a Network Communications Unit) is used without creating I/O tables.
2. With a CPU Unit Ver. 2.0 or later CS1-H CPU Unit, CPU Bus Units can be used even if the I/O tables have not been created, but the purpose of this function is making an online connection through the network with a computer-based Programming Device (such as the CX-Programmer).
   The I/O tables are used to identify the mounted Units and allocate I/O, so always create the I/O tables before operating the PLC.
3. Data can be exchanged between the CPU Unit and CPU Bus Units even if the I/O tables have not been created, but do not perform any online functions other than establishing an online connection with a computer-based Programming Device (such as the CX-Programmer).
4. When a CS1W-ETN21 or CJ1W-ETN21 Ethernet Unit is being used, the Ethernet Unit's IP address is automatically set to the default value of 192.168.250.xx, where xx is the FINS node address. After connecting the ethernet cable between the CX-Programmer and PLC (without making a direct serial connection and creating the I/O tables), manually set the computer's IP address (Example: 192.168.250.55) in the Windows Local Area Connection Properties. An online connection can be established just by setting the Ethernet Unit's IP address (192.168.250.xx) and node in the CX-Programmer.

   Note When connecting the computer directly to the Ethernet Unit, use an Ethernet crossover cable.

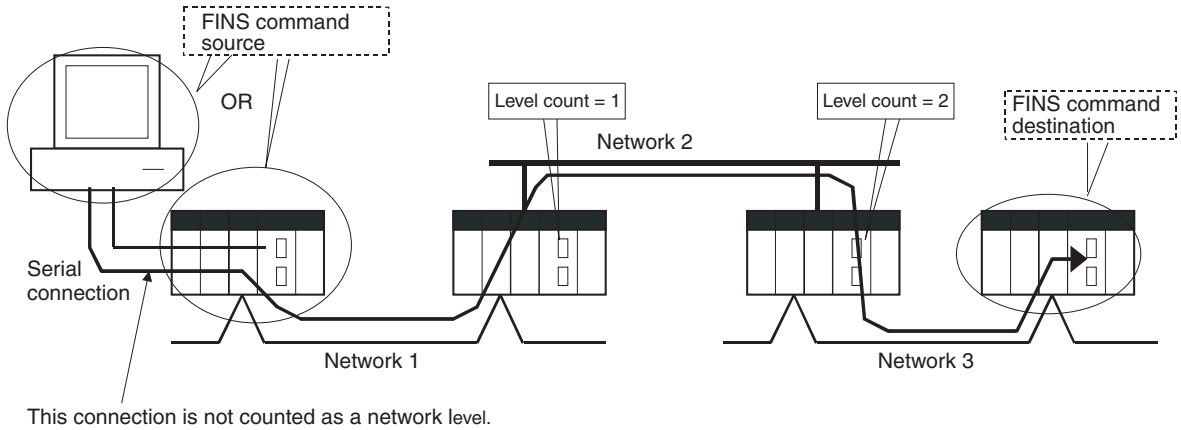
1-6-5 Communications through a Maximum of 8 Network Levels

Previous CPU Units (Pre-Ver. 2.0 CPU Units)

With the pre-Ver. 2.0 CPU Units, it was possible to communicate through 3 network levels max. (see note), including the local network. It was not possible to communicate through 4 or more levels.

Note

1. This functionality is enabled only after setting routing tables with the CX-Net in CX-Programmer version 4.0 or higher.
2. A Gateway to the network via serial communications was not counted as a level.



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CPU Unit Ver. 2.0 or Later

Summary

With the CPU Unit Ver. 2.0 or later CS/CJ-series CPU Units, it is possible to communicate through 8 network levels max. (see note), including the local network.

Note

1. FINS commands can only be sent across up to 8 network levels, however, when the destination is a CPU Unit. FINS commands can be sent to other destinations up to 3 network levels away.
2. CX-Net in CX-Programmer version 4.0 or higher must be used to set routing tables to enable communicating through 8 network levels.
3. A Gateway to the network via serial communications was not counted as a level.

Compatible Networks

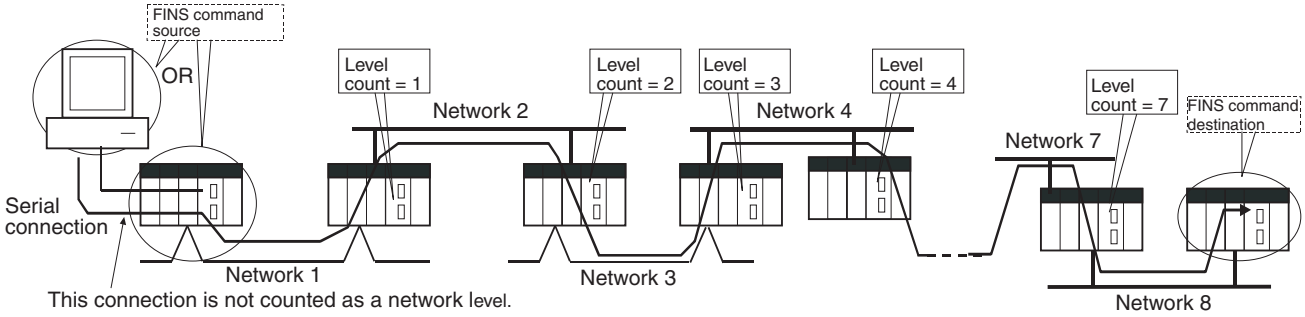
Only the following 2 kinds of networks can be used when communicating through a maximum of 8 networks. The network levels can be combined in any order.

- Controller Link
- Ethernet

Note Communications are restricted to a maximum of 8 networks through DeviceNet and SYSMAC Link networks.

Configuration of Compatible Models

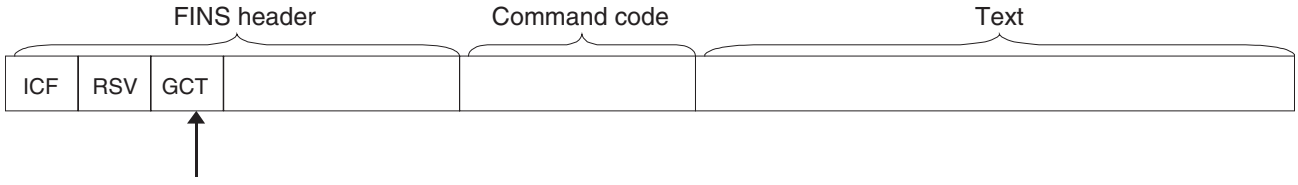
All of the CPU Units must be CPU Unit Ver. 2.0 or later CS/CJ-series CPU Units. Also, the Gateway Counter Setting must be made with the CX-Net.



Internal Structure

The Gateway Counter (GCT) is in the FINS header of the FINS command/response frame. This counter value is decremented (–1) each time a network level is crossed.

FINS Command Frame

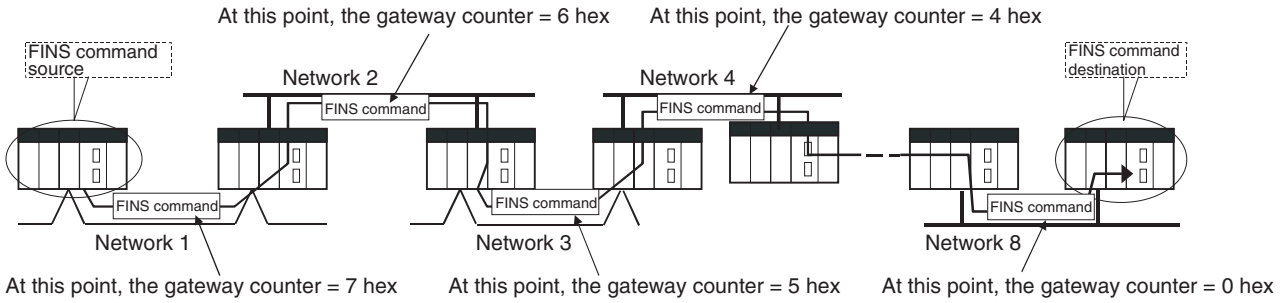


GCT (Gateway counter: Number of allowed bridge passages)

The standard setting is 02 hex when sending, but this value can be user-set up to 07 hex.
The count is decremented by one each time a network level is passed.

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Example:



Operating Procedure

Set the maximum number of network levels that can be crossed by setting the *Gateway Counter Setting* to 2 or 7. The gateway counter setting can be changed in the routing table settings of the CX-Net in the CX-Programmer Ver.4.0 or higher.

Note

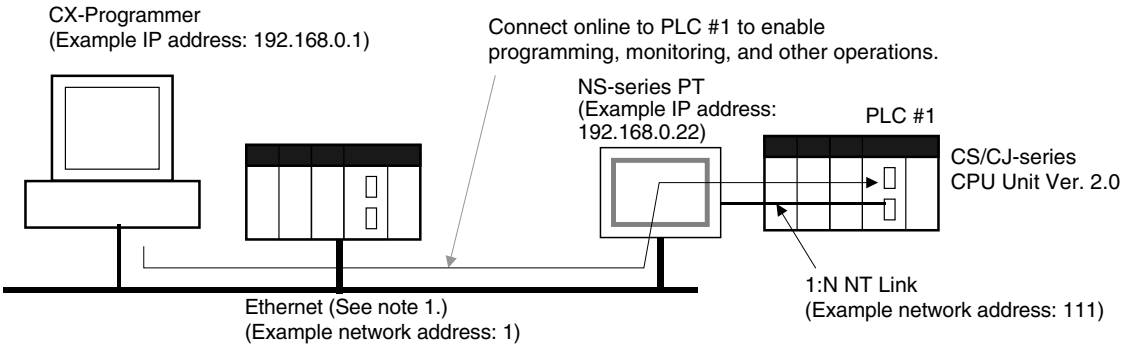
1. The gateway counter is the maximum number of levels that can be crossed, i.e., the maximum number of junctions.
   With earlier CPU Units (Pre-Ver. 2.0 CPU Units), up to 3 network levels were allowed, so the gateway counter was set to 2.
   With the CPU Unit Ver. 2.0 and later CS/CJ-series CPU Units, up to 8 network levels are allowed, so the maximum gateway counter setting is 7.
2. With CS/CJ-series CPU Units Ver. 2.0 or later, communications are possible for up to 8 network levels simply by setting the normal routing tables. No other operations are required.
3. When using communications only for up to 3 network levels, the CS/CJ-series CPU Units Ver. 2.0 or later can be used together with other CPU Units. When using communications only for up to 4 to 8 network levels, use only CS/CJ-series CPU Units Ver. 2.0 or later. Other CPU Units cannot be used. (Routing error (error codes 0501 to 0504 hex) may occurs in one of the relaying PLCs, preventing a FINS response from being returned.
4. With CS/CJ-series CPU Units with unit version 2.0 or later, the Gateway Counter (GCT: Number of allowed bridges passed) for FINS command/response frames is the value decremented from 07 hex (variable). (In earlier versions, the value was decremented from 02 hex.)
   With unit version 3.0 or later, the default GCT for FINS command/response frames is the value decremented from 02 hex. CX-Net can be select to used 07 hex as the value from which to decrement.
5. Do not use the Gateway Counter (GCT: Number of allowed bridge passages) enclosed in the FINS header of the FINS command/response frame in verification checks performed by user applications in host computers. The GCT in the FINS header is used by the system, and a verification error may occur if it is used to perform verification checks in user applications, particularly when using CS/CJ-series CPU Units with unit version 2.0 or later.

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1-6-6 Connecting Online to PLCs via NS-series PTs

Summary

The CX-Programmer can be connected online to a PLC connected via a serial line to an NS-series PT that is connected to the CX-Programmer via Ethernet (see note 2). This enables uploading, downloading, and monitoring the ladder program and other data.



Note

1. The NS-series PT must be version 3.0 or higher and the CX-Programmer must be version 3.1 or higher.
2. Connection is not possible through an NS-series PT connected serially to the CX-Programmer.

Connection Method

In CX-Programmer, open the *Change PLC* Window and set the *Network Type* to *Ethernet*. Click the **Settings** Button and set the IP address of the NS-series PT on the *Driver* Tab Page. Also make the following settings on the Network Tab Page.

- FINS Source Address
  Set the local network address of the NS-series PT for the *Network* (example network address: 1).
- FINS Destination Address
  Network: Set the address to 111 if the PLC is connected to serial port A on the NS-series PT and to 112 if it is connected to serial port B.
  Node: Always set to 1
- Frame Length: 1,000 (See note.)
- Response Timeout: 2

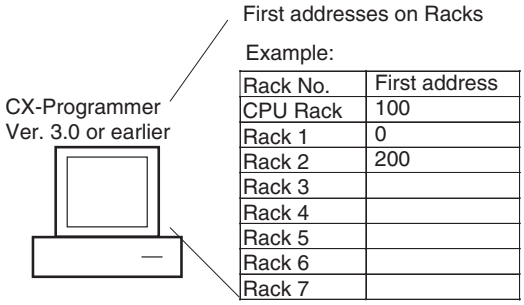
Note Do not set the frame length higher than 1,000. If any higher value is used, the program transfer will fail and a memory error will occur.

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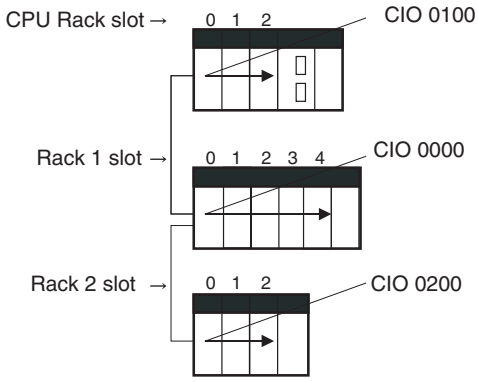
1-6-7 Setting First Slot Words

Previous CPU Units (Pre-Ver. 2.0 CPU Units)

With CX-Programmer Ver. 3.0 or earlier, only the first addresses on Racks could be set. The first address for a slot could not be set.



Rack No.	First address
CPU Rack	100
Rack 1	0
Rack 2	200
Rack 3	
Rack 4	
Rack 5	
Rack 6	
Rack 7	



CX-Programmer Ver. 3.1 or Higher

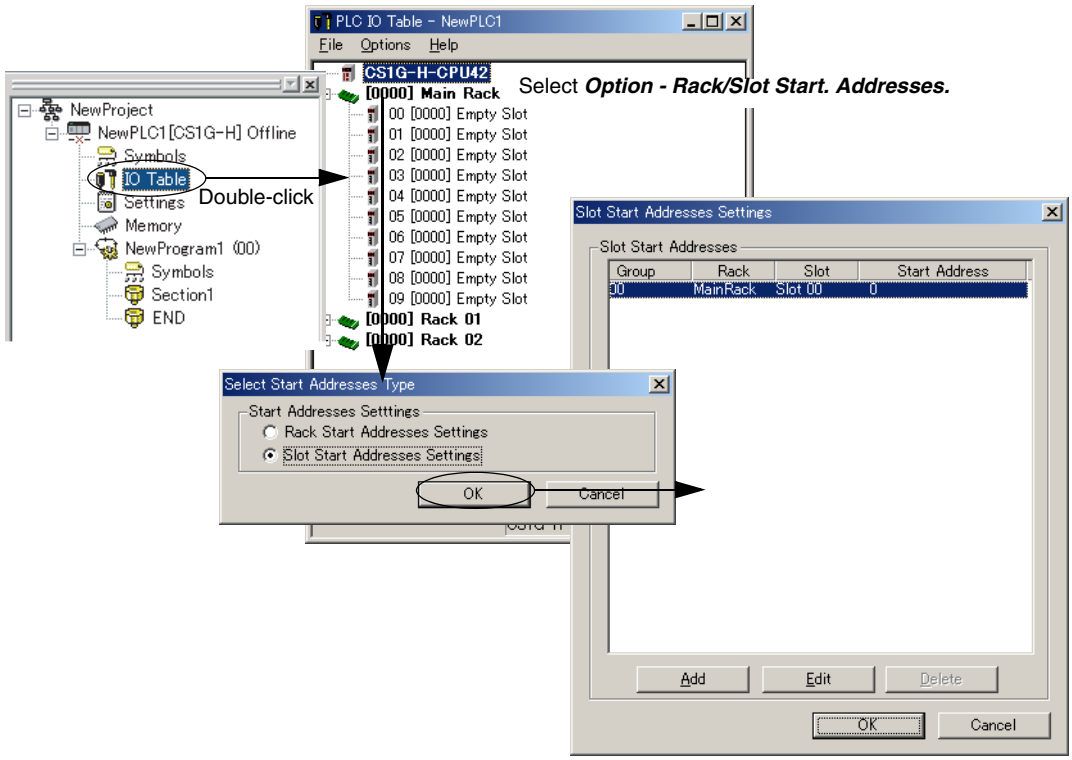
Summary Starting with CX-Programmer Ver. 3.1, the first addresses for slots can be set when editing the I/O tables for CS/CJ-series CPU Units (CS1-H, CJ1-H, and CJ1M). The first address can be set for up to eight slots. (See note.)

Note This function is supported only for CS1-H/CJ1-H CPU Units manufactured on June 1, 2002 or later (lot number 020601□□□□ or later). It is supported for all CJ1M CPU Units regardless of lot number. It is not supported for CS1D CPU Units.

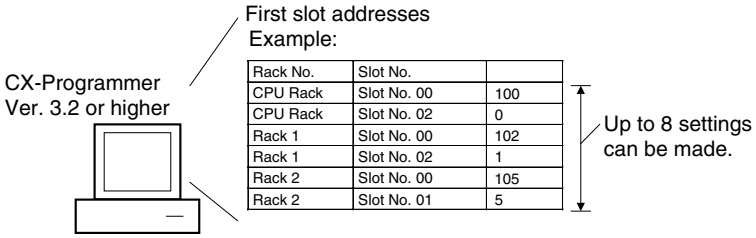
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Operating Procedure

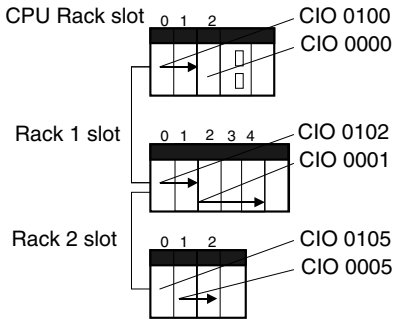
Select ***Option - Rack/Slot Start Addresses*** in the *PLC IO Table - Traffic Controller* Window. This command will enable setting both the first Rack addresses and the first slot addresses.



This function can be used, for example to allocate fixed addresses to Input Units and Output Units. (With CQM1H PLCs, input bits are from IR 000 to IR 015 and output bits are from IR 100 to IR 115. First slot addresses can be set when replacing CQM1H PLCs with CS/CJ-series PLCs to reduce conversion work.)



Rack No.	Slot No.	
CPU Rack	Slot No. 00	100
CPU Rack	Slot No. 02	0
Rack 1	Slot No. 00	102
Rack 1	Slot No. 02	1
Rack 2	Slot No. 00	105
Rack 2	Slot No. 01	5



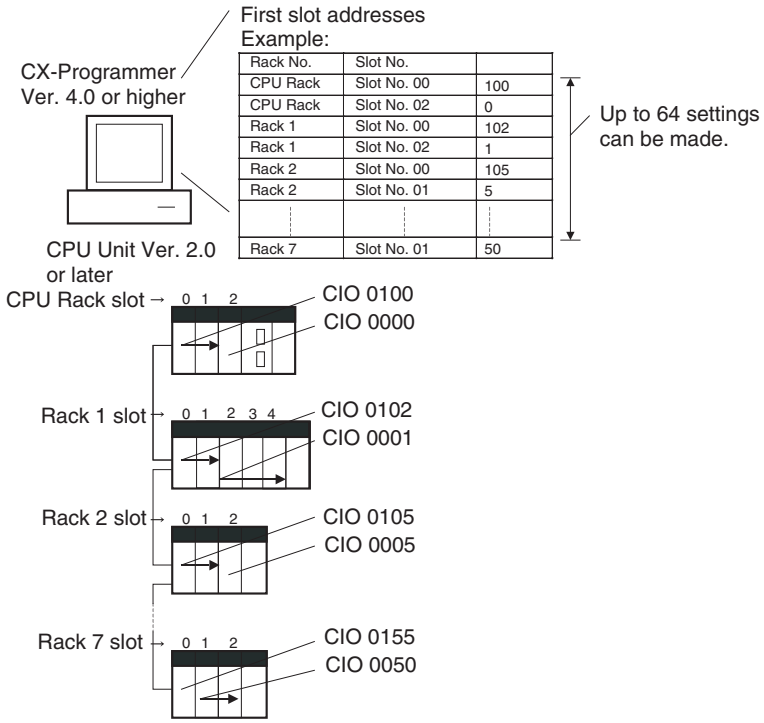
Note The first address settings for Racks and slots can be uploaded/downloaded from/to the CPU Unit.

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CPU Unit Ver. 2.0 or Later and CX-Programmer Ver. 4.0 or Higher

Summary When using CX-Programmer Ver.4.0 or higher with CPU Unit Ver. 2.0 or later, the first address can be set for up to 64 slots.

Note This function is supported only for CS1-H, CJ1-H, and CJ1M CPU Units Ver. 2.0 or later. It is not supported for CS1D CPU Units.



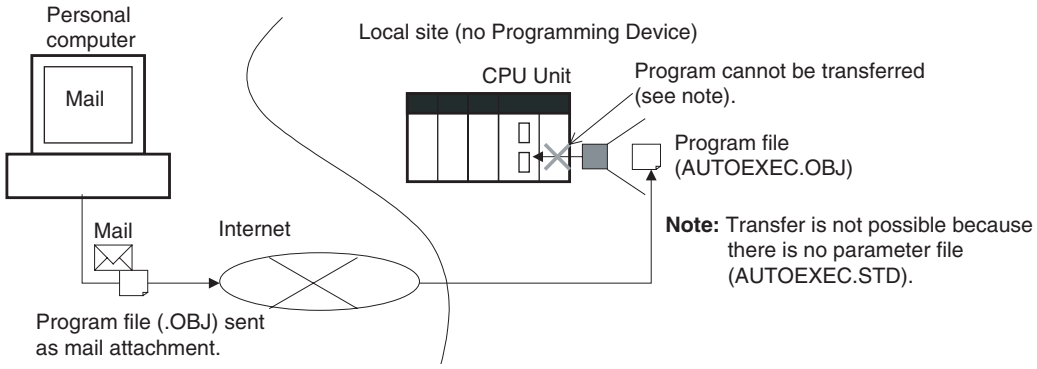
1-6-8 Automatic Transfers at Power ON without a Parameter File

Previous CPU Units (Pre-Ver. 2.0 CPU Units)

Previously with the CS/CJ-series CPU Units, both the program file for automatic transfer at power ON (AUTOEXEC.OBJ) and the parameter file for automatic transfer at power ON (AUTOEXEC.STD) had to be stored on the Memory Card to enable automatic transfers to the CPU Unit at power ON. Also, the parameter file for automatic transfer at power ON (AUTOEXEC.STD) could not be created without the actual PLC (regardless of whether it was made in online operations from the CX-Programmer or a Programming Console or by using the easy backup operation).

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Even if a program file (.OBJ) was created offline without the actual PLC and then sent to a remote PLC as an email attachment, the program file could not be transferred to the CPU Unit without a Programming Device.



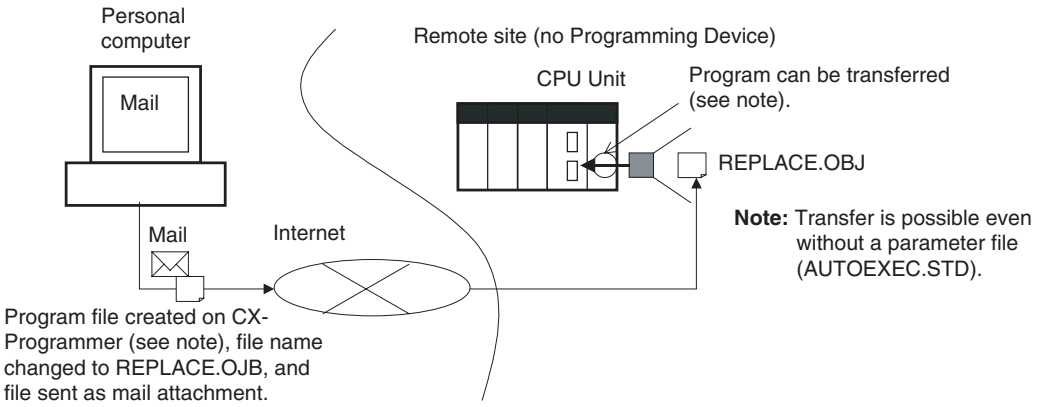
CPU Unit Ver. 2.0 or Later

Summary

With CS/CJ-series CPU Unit Ver. 2.0, the user program can be automatically transferred to the CPU Unit at power ON without a parameter file (.STD) if the name of the program file (.OBJ) is changed to REPLACE.OBJ on the CX-Programmer and the file is stored on a Memory Card. If data files are included with the program file using this function, the following data file names are used: REPLACE.IOM, REPLCDM.IOM, REPLCE□.IOM.

Note

1. If the Memory Card contains a REPLACE.OBJ file, any parameter file on the Memory Card will not be transferred.
2. If the Memory Card contains both a REPLACE.OBJ file and a AUTOEXEC.OBJ file, neither will be transferred.



Note With CX-Programmer Ver. 3.0 or higher, a program file (.OBJ) can be created offline and saved on a computer storage media. Select ***Transfer - To File*** from the *PLC* Menu. This enable creating a program file offline without a PLC so that the name can be changed to enable sending the program file.

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1-6-9 Operation Start/End Times

Previous CPU Units (Pre-Ver. 2.0 CPU Units)

The time that operation started and the time operation ended were not stored in the CPU Unit.

CPU Unit Ver. 2.0 or Later

The times that operation started and ended are automatically stored in the Auxiliary Area.

- The time that operation started as a result of changing the operating mode to RUN or MONITOR mode is stored in A515 to A517 of the Auxiliary Area. The year, month, day, hour, minutes, and seconds are stored.
- The time that operation stopped as a result of changing the operating mode to PROGRAM mode or due to a fatal error is stored in A518 to A520 of the Auxiliary Area. The year, month, day, hour, minutes, and seconds are stored.

This information simplifies managing PLC System operating times.

1-6-10 New Application Instructions

The following instructions have been added. Refer to the *Instructions Reference Manual* (W474) for details.

- Multiple Interlock Instructions:
  MULTI-INTERLOCK DIFFERENTIATION HOLD (MILH(517)), MULTI-INTERLOCK DIFFERENTIATION RELEASE (MILR(518)), and MULTI-INTERLOCK CLEAR (MILC(519))
- TIME-PROPORTIONAL OUTPUT (TPO(685))
- GRAY CODE CONVERSION (GRY(474))
- Combination Instructions:
  TEN KEY INPUT (TKY(211)), HEXADECIMAL KEY INPUT (HKY(212)), DIGITAL SWITCH INPUT (DSW(213)), MATRIX INPUT (MTR(210)), and 7-SEGMENT DISPLAY OUTPUT (7SEG(214))
- Time Comparison Instructions: =DT, <>DT, <DT, <=DT, >DT, >=DT
- Explicit Message Instructions:
  EXPLICIT MESSAGE SEND (EXPLT(720)), EXPLICIT GET ATTRIBUTE (EGATR(721)), EXPLICIT SET ATTRIBUTE (ESATR(722)), EXPLICIT WORD READ (ECHRD(723)), and EXPLICIT WORD WRITE (ECHWR(724))
- EXPANDED BLOCK COMPARE (BCMP2(502)) (This instruction, previously supported by only the CJ1M PLCs, is now supported by the CS1-H and CJ1-H.)
- INTELLIGENT I/O READ (IORD(222)) and INTELLIGENT I/O WRITE (IOWR(223)) (These instructions could previously be used only for Special I/O Units, but they can now be used to read and write data for CPU Bus Units.)

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1-7 CS-series Function Tables

The following tables list functions for the CS-series CPU Units.

1-7-1 Functions Arranged by Purpose

Purpose		Function	Reference
Studying Basic Operations and the System	Studying the system configuration		*SECTION 2 Specifications and System Configuration*
	Studying I/O allocations		*SECTION 8 I/O Allocations*
	Finding the installation dimensions		*5-2-4 Mounting Dimensions*
	Finding the installation method		*5-2 Installation*
	Setting the DIP switch		*3-1-2 Components*
	Setting the PLC Setup		*7-1 PLC Setup*
	Using special flags in the Auxiliary Area		*Appendix B Auxiliary Area*
	Studying the cycle time		*10-4-2 Cycle Time Overview*
	Troubleshooting		*11-2-4 Error Processing Flowchart*
Improving Program Structure	Standardizing programs as modules. Developing a program with several programmers working in parallel. Making the program easier to understand.	Program with tasks to divide the program, use function blocks (FBs), specify symbols, and define local and global symbols. Use ST (Structured Text) language.	Programming Manual (W394)
	Creating step programs.	Use the step instructions.	Instructions Reference Manual (W474)
	Using BASIC-like mnemonic instructions to program processes that are difficult to enter in the ladder diagram format (such as conditional branches and loops).	Use the block programming instructions. Use ST (Structured Text) language.	
Simplifying the Program	Creating looped program sections.	Use FOR(512) and NEXT(513) or JMP(004) and JME(005).	Instructions Reference Manual (W474)
	Indirectly addressing DM words.	All words in the DM and EM Areas can be indirectly addressed.	Programming Manual (W394)
	Simplifying the program by switching to PLC memory address specification.	Use Index Registers as pointers to indirectly address data area addresses. The Index Registers are very useful in combination with loops, increment instructions, and table data processing instructions. The auto-increment, auto-decrement, and offset functions are also supported.	
	Consolidating instruction blocks with the same pattern but different addresses into a single instruction block.	Use function blocks (FBs).	CX-Programmer Operation Manual Function Blocks (W438)
		Use MCRO(099).	Instructions Reference Manual (W474)

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	Purpose		Function	Reference
Managing the Cycle Time	Reducing the cycle time.	→	• Use tasks to put parts of the program that don't need to be executed into "standby" status. • Use JMP(004) and JME(005) to jump parts of the task that don't need to be executed. • Convert parts of the task to subroutines if they are executed only under particular conditions. • Disable a Unit's Special I/O Unit refreshing in the PLC Setup if it isn't necessary to exchange data with that Special I/O Unit every cycle. • Set sharing index and data registers by all tasks if index and data registers are not being used.	Programming Manual (W394)
	Setting a fixed (minimum) cycle time. • Variations in I/O response times can be eliminated by suppressing processing variations.	→	Set a minimum cycle time in the PLC Setup.	
	Setting a maximum cycle time. (Generating an error for a cycle time exceeding the maximum.)	→	Set a maximum cycle time (watch cycle time) in the PLC Setup. If the cycle time exceeds this value, the Cycle Time Too Long Flag (A40108) will be turned ON and PLC operation will be stopped.	*7-1 PLC Setup*
	Reducing the I/O response time for particular I/O points.	→	Use an I/O interrupt task, immediate refreshing, or IORF(097).	Programming Manual (W394)
	Receiving input pulses shorter than the cycle time.	→	Use a quick-response input on a Unit with High-speed Inputs or a High-density I/O Unit (a Special I/O Unit).	*3-6-3 Units with High-speed Inputs* and *3-7 C200H High-density I/O Units (Special I/O Units)*
	Finding the I/O refresh times for Units	→		*10-4-2 Cycle Time Overview*
	Studying the I/O response times	→		*10-4-6 I/O Response Time*
	Finding the increase in cycle time caused by online editing	→		*10-4-5 Online Editing Cycle Time Extension*

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Purpose			Function	Reference
Using Interrupt Tasks	Monitoring operating status at regular intervals • Monitoring operating status at regular intervals.	→	Use a scheduled interrupt task.	Programming Manual (W394)
	Performing interrupt processing when an input goes ON. • Executing processing immediately with an input.	→	Use an I/O interrupt task.	
	Issuing an interrupt to the CPU when data is received through serial communications.	→	Use a Serial Communications Board and external interrupt task or an ASCII Unit.	
	Executing an emergency interrupt program when the power supply fails.	→	Use a power OFF interrupt task. Enable the power OFF interrupt task in the PLC Setup.	
	Studying the interrupt response time	→		*10-4-7 Interrupt Response Times*
	Finding the priority of interrupt tasks	→		Programming Manual (W394)
Data Processing	Operating a FIFO or LIFO stack.	→	Use the stack instructions (FIFO(633) and LIFO(634)).	Instructions Reference Manual (W474)
	Performing basic operations on tables made up of 1-word records.	→	Use range instructions such as MAX(182), MIN(183), and SRCH(181).	
	Performing complex operations on tables made up of 1-word records.	→	Use Index Registers as pointers in special instructions.	
	Performing operations on tables made up of records longer than 1 word. (For example, the temperature, pressure, and other manufacturing settings for different models of a product could be stored in separate records.)	→	Use Index Registers and the record-table instructions (DIM, GETR, etc.)	Programming Manual (W394)
System Configuration	Monitoring several different kinds of devices through the RS-232C port.	→	Multiple serial ports can be installed with Serial Communications Units (protocol macro) and ASCII Units.	*2-3 Basic System Configuration*
	Changing protocol during operation (from a modem connection to host link, for example).	→	Use STUP(237), the CHANGE SERIAL PORT SETUP instruction.	Instructions Reference Manual (W474)

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Purpose			Function	Reference
Connecting Programming Devices	Connecting a Programming Console.	→	Connect to the peripheral port with pin 4 of the CPU Unit's DIP switch OFF.	*3-3-2 Programming Consoles*
	Connecting a Programming Device (e.g., the CX-Programmer).	→	Connect to the peripheral port with pin 4 of the CPU Unit's DIP switch OFF or with pin 4 ON and the network type of the CX-Programmer set to the peripheral bus. Connect to the RS-232C port with pin 5 of the CPU Unit's DIP switch ON or with pin 5 OFF and the network type of the CX-Programmer set to the peripheral bus.	*3-3-3 CX-Programmer*
	Connecting a host computer.	→	Connect to the RS-232C port or peripheral port. (Set the communications mode to "host link" in the PLC Setup.)	*2-5 Expanded System Configuration*
	Connecting a PT.	→	Connect to the RS-232C port or peripheral port. (Set the communications mode to "NT Link" in the PLC Setup.) Set the PT communications settings for a 1:N NT Link.	
	Connecting a standard serial device to the CPU Unit (no-protocol mode).	→	Connect to the RS-232C port. (Set the communications mode to "no-protocol" in the PLC Setup.)	
Controlling Outputs	Turning OFF all outputs on basic Output Units and High-density Output Units (a type of Special I/O Unit).	→	Turn ON the Output OFF Bit (A50015).	Programming Manual (W394)
	Maintaining the status of all outputs on Output Units when PLC operation stops (hot start).	→	Turn ON the IOM Hold BIt (A50012).	
Controlling I/O Memory	Maintaining the previous contents of all I/O Memory at the start of PLC operation (hot start).	→	Turn ON the IOM Hold BIt (A50012).	Programming Manual (W394)
	Maintaining the previous contents of all I/O Memory when the PLC is turned on.	→	Turn ON the IOM Hold BIt (A50012) and set the PLC Setup to maintain the status of the IOM Hold Bit at start-up. (IOM Hold Bit Status at Startup)	

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	Purpose		Function	Reference
File Memory	Automatically transferring the program, I/O Memory, and PLC Setup from the Memory Card when the PLC is turned on. • Easily replacing the program onsite. • Operating without a battery.	→	Enable the "automatic transfer at start-up" function by turning ON pin 2 of the CPU Unit's DIP switch and create an AUTOEXEC file.	Programming Manual (W394)
	Creating a library of programs for different program arrangements.	→	Memory Card functions (Program Files)	
	Creating a library of parameter settings for various PLC Racks and models.	→	Memory Card functions (Parameter Files)	
	Creating a library of data files with settings for various PLC Racks, and CPU Bus Units.	→	Memory Card functions (Data Files)	
	Storing I/O Comment data within the Memory Card.	→	Memory Card functions (Symbol Table Files)	
	Storing operating data (trend and quality data) within the CPU Unit during program execution.	→	EM File Memory Functions and the FREAD(700)/FWRIT(701) instructions	
	Replacing the program without stopping operation.	→	Memory Card functions (Program Replacement during PLC Operation)	
	Reading and writing I/O memory data with a spreadsheet.	→	Read/write data files using instructions in CSV or text format.	
	Creating data that can be read with a text editor.	→	Use the WRITE TEXT FILE instruction (TWRIT(704)).	
Text string processing	Performing string processing at the PLC which was performed at the host computer previously and reducing the program load at the host computer (operations such as read, insert, search, replace, and exchange).	→	• Easily replacing the program onsite • Operating without a battery Combine the Host Link function with the text string processing instructions.	Instructions Reference Manual (W474)
	Performing string processing operations such as rearranging text strings.	→	Replacing the program without stopping operation. Use the string comparison instructions and index registers.	
	Receiving data from external devices (such as bar code readers) through serial communications, storing the data in DM, and reading just the required string when it is needed.	→	Use the WRITE TEXT FILE instruction (TWRIT(704)). Combine the protocol macro function with the text string processing instructions.	

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	Purpose		Function	Reference
Maintenance and Debugging	Changing the program while it is being executed.		Use the online editing function from a Programming Device. (Several instruction blocks can be changed with CX-Programmer.)	Programming Manual (W394)
	Sampling I/O Memory data. • Periodic sampling • Sampling once each cycle • Sampling at specified times	 → → →	 Data trace at regular intervals Data trace at the end of each cycle Data trace each time that TRSM(045) is executed	
	Confirming there are no errors in instruction execution.	→	Set the PLC Setup to specify the desired operating mode at start-up. (Startup Mode)	
	Recording the time that power was turned on, the last time that power was interrupted, the number of power interruptions, and the total PLC on time.	→	Read the Auxiliary Area words containing power supply information. Startup Time: A510 and A511 Power Interruption Time: A512 and A513 Number of Power Interruptions: A514	
	Replacing the program without stopping operation. Reading the time/date when the user program was changed. Reading the time/date when the parameter area was changed.	→	Set the PLC Setup so that instruction errors are treated as fatal errors. (Instruction Error Operation)	
	Programming/monitoring the PLC remotely. • Programming or monitoring a PLC on the network through Host Link. • Programming or monitoring a PLC through modems.	 → →	 Host Link → Network Gateway function Host Link through modems	*2-5 Expanded System Configuration*
	Programming/monitoring PLCs in other networks	→	Communicate with PLCs up to 2 network levels away through Controller Link or Ethernet.	
Error Processing and Troubleshooting	Generating a non-fatal or fatal error for user-defined conditions. • Non-fatal errors (Operation continues.) • Fatal errors (PLC operation stops.) • Not recording user-defined alarms and errors in the error log.	 → → →	 FAILURE ALARM: FAL(006) SEVERE FAILURE ALARM: FALS(007) Set the PLC Setup so that user-defined FAL errors are not recorded in the error log.	Programming Manual (W394)
	Analyzing time and logic in execution of an instruction block.	→	FAILURE POINT DETECTION: FPD(269)	
	Recording the time/date of errors and error details. Reading recorded error details.	→	Use the error log function. Up to 20 error records can be stored.	
Other Functions	Allocating words in the I/O Area by specifying the first word allocated to Rack.	→	Set the first word allocated to Rack by registering the I/O table from the CX-Programmer. (Words must be allocated to Racks in the order that the Racks are connected.)	Programming Manual (W394)

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Purpose		Function	Reference
	Reducing input chattering and the effects of noise. →	Specify the input response times for Basic I/O Units in the PLC Setup. (Basic I/O Unit Input Response Time)	
	Allocating words in the I/O Area freely by specifying the word allocated to a slot. →	Set the first word allocated to a slot by registering the I/O tables from the CX-Programmer.	*8-4 Allocating First Words to Slots*

1-7-2 Communications Functions (Serial/Network)

Purpose			Protocol: Required Equipment	Reference
Monitoring from the Host Computer	RS-232C or RS-422/485	→	Host Link: Port in the CPU Unit, Serial Communications Board, or Serial Communications Unit	*2-5-2 Systems*
	Host Link communications from the PLC	→	Enclose a FINS command with a Host Link header and terminator and issue it from the PLC as a network communications instruction.	
	Network communications through RS-232C or RS-422/485	→	Controller Link and Ethernet communications are possible through the Host Link. (Enclose a FINS command with a Host Link header and terminator and issue it from the PLC as a network communications instruction.)	
	Network: Control system	→	Controller Link: Controller Link Unit or Controller Link Board	*2-5-3 Communications Network System*
	Network: Information system	→	Ethernet: Ethernet Unit	
Connecting to a Standard Serial Device	Creating a custom, user-defined protocol	→	Protocol written in BASIC: ASCII Unit	*2-5-2 Systems*
	Creating a simple protocol	→	Protocol Macro: Serial Communications Board or Serial Communications Unit	
	High-speed data exchange	→		
	No protocol	→	No protocol: CPU Unit's RS-232C port, ASCII Unit, or Protocol Macro	
Communicating with a PT	Direct access	→	NT Link: Port in the CPU Unit, Serial Communications Board, or Serial Communications Unit	
Data Link between PLCs	High capacity or free word allocation	→	Controller Link: Controller Link Unit	*2-5-3 Communications Network System*
	Low capacity and fixed word allocation	→	PLC Link: PLC Link Unit	
Data Link between PLC and computer		→	Controller Link: Controller Link Unit or Controller Link Board	
Message communications between PLCs	Normal or high capacity	→	Controller Link: Controller Link Unit	
	Information system	→	Ethernet: Ethernet Unit	

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Purpose			Protocol: Required Equipment	Reference
Message communications between PLC and computer	Control system	→	Controller Link: Controller Link Unit or Controller Link Board	*2-5-3 Communications Network System*
	Information system	→	Ethernet: Ethernet Unit	
Remote I/O between PLC and Slaves	High-density I/O	→	DeviceNet: DeviceNet Master Unit and required Slave Units	
	Free word allocation	→		
	Multi-vendor capability	→		
	Analog I/O capability	→		
	Multi-level architecture	→		
	High-speed Remote I/O	→	CompoBus/S: CompoBus/S Master Unit and required Slave Units	
	Remote I/O Slave Rack connection	→	SYSMAC BUS Wired Remote I/O: SYSMAC BUS Master Unit and required Slave Units	*2-3 Basic System Configuration*

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1-8 CS1-H Functions Arranged by Purpose

Purpose		Function
Increasing speed	Reducing the cycle time and improving communications responsiveness. • Fast large-scale data exchange with the host is needed even though the PLC program is very large. • Consistently timed data exchange with SCADA software is needed. • Fast message communications and control are required between distributed PLCs. • It is necessary to minimize the effects on the cycle time of future system expansion or increases in communications.	Use the Parallel Processing Mode with Synchronous Memory Access or Parallel Processing Mode with Asynchronous Memory Access. Using parallel processing enables the following savings. For example, if the program consists of basic instructions with a cycle time of approximately 10 ms and one Ethernet Unit is being used, the cycle time will be reduced to approximately 90% of the time for the normal mode. and the peripheral servicing time will be reduced to approximately 40% of the time for the normal mode.
	When using parallel processing mode, it is necessary to maintain concurrency between I/O memory data accessed for instruction execution and from communications (for data larger than one word).	Use the Parallel Processing Mode with Synchronous Memory Access.
	When using parallel processing mode, it is not necessary to maintain concurrency between I/O memory data accessed for instruction execution and from communications (for data larger than one word).	Use the Parallel Processing Mode with Asynchronous Memory Access.
	Giving higher priority to communications response than the cycle time. (For example, to give priority to the read/write response of CPU Unit data from SCADA software for process control).	The response of peripheral servicing can be adjusted by using the following modes (listed in order from highest response): Parallel Processing Mode with Asynchronous Memory Access, Peripheral Servicing Priority Mode (with a long instruction execution cycle), Parallel Processing Mode with Synchronous Memory Access, Normal Mode
	Minimizing cycle time fluctuations and maintaining consistent I/O response even when extensive table data and text string data is being processed	Table data processing and text string processing, which often require time, can be set in the PLC Setup so that they are processed in the background. The default is for no background execution. (For background execution, time slicing is used to separate processing over several cycles.) If background execution is used, the effect on the cycle time can be limited to 4% or less (PLC Setup default setting).
	Improving data link response with a long cycle time (Controller Link or SYSMAC LINK)	The CPU BUS UNIT I/O REFRESH instruction (DLNK(226)) can be used at one or more locations in the ladder program. This enables refreshing data links for specified Controller Link or SYSMAC LINK Units, whenever necessary, as well as during the I/O refresh period. (The actual data that is refreshed depends on the communications cycle time.)
	Improving DeviceNet remote I/O response	The CPU BUS UNIT I/O REFRESH instruction (DLNK(226)) can be used in the ladder program. This enables refreshing remote I/O for DeviceNet Units, whenever necessary, as well as during the I/O refresh period. (The actual data that is refreshed depends on the communications cycle time.)
	Improving the response of protocol macro data transfers for Serial Communications Units	The CPU BUS UNIT I/O REFRESH instruction (DLNK(226)) can be used at one or more locations in the ladder program. This enables refreshing data transferred for protocol macros executed by Serial Communications Units, whenever necessary, as well as during the I/O refresh period. (The actual data that is refreshed depends on the communications cycle time.)
	Immediately refreshing status data and other words allocated to CPU Bus Units in the CIO Area whenever necessary (including Ethernet Units, Serial Communications Units, Controller Link Units, etc.)	The CPU BUS UNIT I/O REFRESH instruction (DLNK(226)) can be used at one or more locations in the ladder program. This enables refreshing words allocated to CPU Bus Units in the CIO Area (25 words) whenever necessary, in the same way that the IORF instruction is used for other Units.

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Purpose		Function
Increasing structure	Using more tasks	Define interrupt tasks as cyclic tasks (called “extra cyclic tasks”).
	Reducing the cycle time even with structured programs using many tasks	Use shared index and data registers.
	Using the same index or data registers in different tasks without saving and loading register contents	
	Initializing processing when a task is started	Use the Task Start Flags.
	Using standard processing shared by more than one task	Use a global subroutine (GSBN to GRET) in interrupt task number 0. User function blocks (FBs).
	Standardization and program structure based on subroutines	Increase speed using subroutine instructions (SBS, SBN, and RET) and global subroutine instructions (GSBS, GSBN, and GRET)
	Protecting programs so that other people cannot read them	Read protection for entire program Task read protection
		Function block protection
Special applications	Displaying floating-point decimal data on a PT	Use the FLOATING- POINT TO ASCII instruction (FSTR(448)). Use function blocks (FBs).
	Using text string data from measurement devices in calculations	Use the ASCII TO FLOATING-POINT instruction (FVAL(449)). Use function blocks (FBs).
	Performing high-precision positioning, e.g., for XY tables	Use the Double-precision Floating-point instructions.
	Managing information on workpieces flowing on a conveyer in realtime in table form, e.g., when workpieces are added or removed from the conveyor during processing	Use the stack instructions. STACK DATA READ, STACK DATA OVERWRITE, STACK DATA INSERT, and STACK DATA DELETE (Operate on a specified element in the stack.) STACK SIZE READ (Counts the number of elements in the stack.)
	Performing high-precision linear approximations, e.g., converting a level meter reading in mm to a capacity value in liters according to the shape of a tank	Use the ARITHMETIC PROCESS instruction (unsigned 16-bit binary/BCD data, signed 16/32-bit binary data, or single-precision floating-point data can be used for line data).
	Autotuning PID constants (particularly to automatically tune PID constants and start the system faster when using multiloop PID)	Use the PID CONTROL WITH AUTO TUNING instruction.
	Saving and loading execution results (e.g., from comparison instructions) at different locations in a task or in different tasks	Use the SAVE CONDITION FLAGS (CCS) and LOAD CONDITION FLAGS (CCL) instructions to save the current status of the Condition Flags or load the previous status.
	Using a CVM1/CV-series program containing real I/O memory addresses in a CS-series CPU Unit	Use the CONVERT ADDRESS FROM CV (FRMCV) instruction.
	Using I/O memory tables containing CVM1/CV-series real I/O memory addresses (e.g., to return the data to a CVM1/CV-series CPU Unit after processing by the CS-series CPU Unit).	Use the CONVERT ADDRESS TO CV (TOCV) instruction.
	Disabling power interruptions during specific regions of the program	Create program sections for which power interrupts have been disabled with the DI and EI instructions (set A530 to A5A5 hex).

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Purpose		Function
Debugging and maintenance	Simulating errors in the CPU Unit when debugging the system, e.g., to check error messages displayed on a PT	Use FAL/FALS to simulate fatal and nonfatal system errors.
	Backing up CPU Unit data and internal from other Units, such as DeviceNet Units and Serial Communications Units/Boards.	Use the simple backup operation, which includes data from specific Units/Boards.
	Finding errors occurring when creating I/O tables	Reference the I/O Table Error Flags in A261.
	Using battery-free operation (ROM operation) without a Memory Card	Use the automatic program/parameter area backup function to flash memory in the CPU Unit.
	Starting CPU Unit operation without waiting for Units/Boards with comparatively long power-ON startup times to complete startup processing.	Use the startup condition settings (allowing the CPU Unit to startup immediately in RUN or MONITOR mode even when startup processing has not been completed for other Units/Boards).

1-9 Comparison of CS-series PLCs and C200HX/HG/HE Operation

Operation of the CS-series PLCs differs from that of the C200HX/HG/HE PLCs in several basic points, which are outlined in the following table. Refer to *Appendix A PLC Comparison* in the CS/CJ Series Programming Manual (W394) for differences between the CJ-series, CS-series, C200HX/HG/HE, CQM1H, and CV-series PLCs.

Item		C200HX/HG/HE PLCs	CS-series PLCs
Program Structure	Single program vs. multiple tasks	The program is executed as a single unit each cycle. Interrupt programs are executed as subroutines with subroutine numbers 00 to 15 (I/O interrupts) and 99 (scheduled interrupt). Both I/O interrupt (up to 16) and scheduled interrupt (just 1) programs are supported.	In CS-series PLCs, the program is divided into tasks (cyclic tasks) that are executed in order when they are enabled. Interrupt programs are also entered as tasks (interrupt tasks). The operation of a CS-series PLC is the same as a C200HX/HG/HE PLC when just one cyclic task (or extra cyclic task) is enabled. CS-series PLCs support up to 32 cyclic tasks, 32 I/O interrupt tasks, 2 scheduled interrupt tasks, 1 power OFF interrupt task, and 256 external interrupt tasks. With the CS1-H CPU Units, up to 255 interrupt tasks can be defined as cyclic tasks (called “extra cyclic tasks’). Thus, up to 288 extra cyclic tasks can be created (including normal cyclic tasks and extra cyclic tasks).
I/O allocation	I/O Table Registration is supported in CS-series PLCs.	I/O allocation is determined solely by the slot location of Basic I/O Units and the unit number settings on Special I/O Units. IR Area words are automatically allocated to I/O Units and Special I/O Units without performing the I/O Table Registration operation. (The I/O Table Registration operation is used to prevent Units from being installed in the wrong slots.)	In CS-series PLCs, word allocation doesn’t depend only on slot position, and it isn’t necessary to allocate words to an empty slot. If a Unit requires several words, those words can be allocated. When a CS-series PLC is being used, the I/O Table Registration operation must be executed. If it isn’t executed, the CPU Unit won’t recognize each Basic I/O Unit, Special I/O Unit, and CS-series CPU Bus Unit that has been installed.

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Item			C200HX/HG/HE PLCs	CS-series PLCs
Data Areas	CIO Area	I/O Area	IR 000 to IR 029, IR 300 to IR 309 (Unlike the CS Series, word allocation is fixed.)	CIO 0000 to CIO 0319 (CIO 0000 to CIO 0999 can be set if the first word on the Rack is set.) (Unlike the C200HX/HG/HE PLCs, word allocation is flexible.)
		C200H Group-2 High-density I/O Unit and B7A Interface Unit Area	IR 030 to IR 049, IR 330 to IR 341 (These words are allocated to C200H Group-2 High-density I/O Units.)	None (These words are allocated in the I/O Area.)
		Special I/O Unit Area	IR 100 to IR 199, IR 400 to IR 459	CIO 2000 to CIO 2959
		DeviceNet Area and SYSMAC BUS Area	IR 050 to IR 099 IR 350 to IR 399 (Can be used as the DeviceNet Area or SYSMAC BUS Area, but not both.)	DeviceNet Area: CIO 0050 to CIO 0099, CIO 0350 to CIO 0399 SYSMAC BUS Area: CIO 3000 to CIO 3079
		PLC Link Words	SR 247 to SR 250 (in SR Area)	CIO 0247 to CIO 0250 and A442
		Optical I/O Unit and I/O Terminal Area	Optical I/O Unit and I/O Terminal Area: IR 200 to IR 231	I/O Terminal Area: CIO 3100 to CIO 3131
		Work/Internal I/O Area	Work Areas: IR 310 to IR 329, IR 342 to IR 349, and IR 460 to IR 511	Internal I/O Area: CIO 1200 to CIO 1499 CIO 3800 to CIO 6143
	Work Area (WR)		None	Work Area: W000 to W511 (No new functions will be assigned to this area in future CPU versions; this area has been set aside for use as work words and bits.)
	Temporary Relay Area (TR)		TR 00 to TR 07	TR 00 to TR 15
	Holding Relay Area (HR)		HR 00 to HR 99	H 000 to H 511
	Special Relay Area (SR)		Special Relay Area: SR 236 to SR 255, SR 256 to SR 299	Auxiliary Area: A 000 to A 959
	Auxiliary Relay Area (AR)		Auxiliary Relay Area: AR 00 to AR 27	
	Link Relay Area (LR)		Link Relay Area: LR 00 to LR 63	Link Area: CIO 1000 to CIO 1199
	DM Area		DM 0000 to DM 6143 (Normal DM): Words in this range can be read and written by instructions and Programming Devices, although DM 6000 to DM 6030 are used for the Error Log and DM 1000 to DM 2599 are used by Special I/O Units. DM 6144 to DM 6655 (Fixed DM): Words in this range are read-only for instructions and can be read or written by Programming Devices. DM 6550 to DM 6559 and DM 6600 to DM 6655 are used for the PLC Setup. The Programming Console can be used to convert up to 3,000 words from the user program area (UM) to Fixed DM words (DM 7000 to DM 9999).	D00000 to D32767 D20000 to D29599 are used by Special I/O Units, D30000 to D31599 are used by CS-series CPU Bus Units, and D32000 to D32099 are used by Inner Boards. The Error Log is stored in A100 to A199 and the PLC Setup is stored in the Parameter Area (not a part of I/O Memory).

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Item		C200HX/HG/HE PLCs	CS-series PLCs
Data Areas, continued	EM Area	EM 0000 to EM 6143 (3 banks max., 16 banks max. for ZE-version PLCs) Basically, those EM Area instructions access the current bank, which can be changed.	E00000 to E32767 (13 banks max.) Regular instructions can access data in the current bank or any other bank. Part of the EM Area can be converted for use as file memory.
	Timer Area	Timer/Counter Area: T/C 000 to T/C 511 (Timers and counters share the same numbers.)	T0000 to T4095
	Counter Area		C0000 to C4095 (Timer and counter numbers are independent.)
	Task Flag Area	None	TK00 to TK31
	Index Registers	None	IR0 to IR15
	Data Registers	None	DR0 to DR15
Flags and Clock Pulses	Arithmetic Flags (such as ER, EQ, and CY)	Part of the SR Area	Condition Flags: In the CS Series, these Flags are in a separate area and are specified by labels rather than addresses. With the CX-Programmer, these are specified using global symbols, such as “P_ER” and “P_EQ.” With a Programming Console, they are specified using “ER,” “=,” etc.
	Clock pulses	Part of the SR Area	Clock Pulses: In the CS-series PLCs these pulses are in a separate area and are specified by labels such as “P_1s” and “P_0_1s” rather than addresses.
PLC Setup	C200HX/HG/HE: DM Area CS: Special Area	The PLC Setup is stored in the DM Area (DM 6550 to DM 6559 and DM 6600 to DM 6655), so PLC Setup settings are made directly by specifying DM addresses.	In the CS Series, the PLC Setup isn’t stored in the DM Area, but a separate area (the Parameter Area) which isn’t a part of I/O memory. The PLC Setup is edited with CX-Programmer in a table format and user-friendly dialogue. Individual PLC Setup addresses can also be edited with a Programming Console.
Instruction variations	Up-differentiation	Supported	Supported Including LD NOT, AND NOT, and OR NOT for CS1-H CPU Units.
	Down-differentiation	Supported	Supported for LD, AND, OR, RSET, and SET Including LD NOT, AND NOT, and OR NOT for CS1-H CPU Units.
	Immediate refreshing	Not supported	Supported for LD, LD NOT, AND, AND NOT, OR, OR NOT, OUT, OUT NOT, RSET, SET, KEEP, DIFU, DIFD, CMP, CPS, and MOV
	Up-differentiation and immediate refreshing	Not supported	Supported for LD, LD NOT, AND, AND NOT, OR, OR NOT, RSET, SET, and MOV
	Down-differentiation and immediate refreshing	Not supported	Supported for LD, LD NOT, AND, AND NOT, OR, OR NOT, RSET, and SET
Instruction operand data format		Basically operands are specified in BCD. In XFER(070), for example, the number of words is specified in BCD (0001 to 9999).	Basically operands are specified in binary. In XFER(070), for example, the number of words is specified in binary (0001 to FFFF or 1 to 65,535 decimal).
Specifying operands requiring multiple words		If an operand requiring multiple words is specified at the end of an area so that there are not enough words left in the area for the operand, the instruction will not be executed and the Error Flag will turn ON.	If an operand requiring multiple words is specified at the end of an area so that there are not enough words left in the area for the operand, the instruction can be executed and the Error Flag will not turn ON. The program, however, is checked when transferred from the CX-Programmer to the CPU Unit and cannot be transferred with incorrect operand specifications. Such programs also cannot be read from the CPU Unit.

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Item		C200HX/HG/HE PLCs	CS-series PLCs
Instructions	Sequence Input	Up and down-differentiated versions of LD, AND, and OR are not supported. TST and TSTN not supported.	Up and down-differentiated versions of LD, AND, and OR are supported. TST and TSTN supported.
	Sequence Output	SETA and RSTA not supported.	SETA and RSTA supported. With the CS1-H CPU Units, bit addresses can be specified in the DM and EM areas using OUT, SET, and RSET.
	Sequence Control	CJP and CJPN not supported.	CJP and CJPN supported.
	Timer/Counter	TIML, MTIM, TMHH, and CNR not supported.	TIML, MTIM, TMHH, and CNTR supported.
	Comparison	Input Comparison Instructions not supported.	Supported (AREA RANGE COMPARE (ZCP) and DOUBLE RANGE COMPARE (ZCPL)).
	Data Movement	MOVL, MVNL, and XCGL not supported.	MOVL, MVNL, and XCGL supported.
	Data Shift	NSFL/NSFR, NASL/NASR, NSLL/NSRL, ASLL/ASRL, ROLL/RORL, RLNC/RRNC, and RLNL/RRNL not supported.	NSFL/NSFR, NASL/NASR, NSLL/NSRL, ASLL/ASRL, ROLL/RORL, RLNC/RRNC, and RLNL/RRNL supported. ASFT can be executed in the background for CS1-H CPU Units.
	Increment/Decrement	++, ++L, – –, – –L, ++BL, and – –BL not supported.	++, ++L, – –, – –L, ++BL, and – –BL supported.
	Symbol Math	The same in both series.	
	Conversion	SIGN, BINS, BCDS, BISL, and BDSL not supported.	SIGN, BINS, BCDS, BISL, and BDSL supported.
	Logic	ANDL, ORWL, XORL, XNRL, and COML not supported.	ANDL, ORWL, XORL, XNRL, and COML supported.
	Special Math	ROTB not supported.	ROTB supported. SAVE CONDITION FLAGS (CCS) and LOAD CONDITION FLAGS (CCL) supported by CS1-H CPU Units.
	Floating-point Math	Not supported.	Supported. Floating-point math, floating-point to/from ASCII conversions, and double-precision floating-point math supported by CS1-H CPU Units.
	Table Data Processing	SSET, PUSH, LIFO, and FIFO not supported.	SSET, PUSH, LIFO, and FIFO supported. Stack insertions/deletions/replacements and stack counts supported by CS1-H CPU Units. Background execution of SRCH, SWAP, MAX, MIN, SUM, and FCS supported by CS1-H CPU Units.
	Data Control	SCL2 and SCL3 not supported.	SCL2 and SCL3 supported. PID with autotuning supported by CS1-H CPU Units.
	Subroutines	The same in both series.	Global subroutines (GSBS, GSBN, and GRET) supported by CS1-H CPU Units.
	Interrupt Control	Interrupts controlled using one instruction (INT).	Interrupts controlled using CLI, MSKS, and MSKR.

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Item		C200HX/HG/HE PLCs	CS-series PLCs
Instructions, continued	Step	The same in both series, although the specified control bit must be in the WR Area in CS-series PLCs.	
	I/O Units	TKY, HKY, DSW, and CMCR supported.	TKY, HKY, DSW, and CMCR not supported. CPU BUS UNIT I/O REFRESH (DLNK(226)) supported by CS1-H CPU Units.
	Network	CMND not supported.	CMND supported.
	File Memory	Not supported.	Supported.
	Display	LMSG (32-character message display) supported.	MSG (32-character message display) available, but only 16 characters displayed on a Programming Console.
	Clock	CADD, CSUB, and DATE not supported.	CADD, CSUB, and DATE supported.
	Debugging	The same in both series.	
	Failure Diagnosis	The same in both series.	Not storing user-defined FAL errors in the error log supported by CS1-H CPU Units. FAL/FALS error simulation supported by CS1-H CPU Units.
	Special	XDMR and IEMS supported.	SCAN not available
	Block Programming	Not supported.	Supported.
	Text String Processing	Not supported.	Supported. Background execution supported by CS1-H CPU Units.
	Task Control	Not supported.	Supported.
I/O Comment storage		A Programming Device can be used to divide the UM Area (user program memory area) into a program area, I/O comment area, and Expansion DM area. I/O comments can be stored in that I/O comment area.	In the CS-series PLCs, I/O comments can be stored in Memory Cards or EM file memory as variable files.
Battery installation		A battery is installed in the CPU Unit when it is shipped from the factory.	A battery is installed in a CS1-H CPU Unit when it is shipped from the factory, the same as it is for a C200HX/HG/HE CPU Unit.
Clock function		The internal clock is set when the PLC is shipped from the factory.	The internal clock is set when a CS1-H CPU Unit is shipped from the factory, the same as it is for a C200HX/HG/HE CPU Unit.
Memory Cards and Memory Cassettes	I/O Memory	All of I/O Memory can be saved to an EEPROM Memory Cassette by turning ON a control bit in the SR Area. A Programming Device (other than a Programming Console) can be used to read the data back from the Memory Cassette.	Any range of I/O Memory can be saved as a file in a Memory Card (flash ROM) or EM file memory with a Programming Device (including Programming Consoles) or the instruction provided for this operation. (With all CS1-H CPU Units, these files can also be saved in CSV or text format.) A Programming Device or instruction can be used to read the data from file memory. These operations can also be performed with FINS commands.

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Item			C200HX/HG/HE PLCs	CS-series PLCs
Memory Cards and Memory Cassettes	User program		The entire program can be saved to an EEPROM Memory Cassette by turning ON a control bit in the SR Area. A Programming Device (other than a Programming Console) can be used to read the data back from the Memory Cassette. A standard EPROM Writer can be used to save the entire program to an EPROM Memory Cassette. A Programming Device can be used to read the data back from the Memory Cassette. The PLC can be set to automatically read the entire program from the Memory Cassette (EEPROM or EPROM) when the PLC is turned on.	The entire program can be saved as a file in a Memory Card (flash ROM) or EM file memory with a Programming Device (including Programming Consoles) or the instruction provided for this operation. A Programming Device or instruction can be used to read the program back from file memory. These operations can also be performed with FINS commands. The PLC can be set to automatically read the entire program from the Memory Card when the PLC is turned on. With the -EV1 or higher, it is also possible to read (i.e., replace) the entire user program from the Memory Card during PLC operation.
Serial communications (peripheral port or RS-232C ports)	Mode	Peripheral port	Host link, customer (Programming Console and peripheral bus are automatically recognized.)	Host Link, peripheral bus, NT Link (1:N), (Programming Console is automatically recognized.) Custom protocols are not possible for the peripheral port.
		RS-232C port	Host Link, NT Link (1:1), NT Link (1:N), custom, 1:1 link master, 1:1 link slave	Host Link, peripheral bus, NT Link (1:N), custom 1:1 links and Programming Console are not supported for the RS-232C port.
	Baud rate	Peripheral port	2,400/4,800/9,600/19,200 bps	300/600/1,200/2,400/4,800/9,600/ 19,200/38,400/57,600/115,200 bps Baud rates of 38,400/57,600/ 115,200 bps are not standard for RS-232C. Your computer may not support these speeds. Use slower baud rates if necessary.
		RS-232C port		
Interrupt control modes			There are two interrupt modes in C200HX/HG/HE PLCs: normal interrupt mode and high-speed interrupt mode. Normal Interrupt Mode: In this mode, the interrupt is not executed until the current process (Host Link servicing, Remote I/O servicing, Special I/O Unit servicing, or execution of an instruction) is completed. High-speed Interrupt Mode: In this mode, the interrupt stops the current process (Host Link servicing, Remote I/O servicing, Special I/O Unit servicing, or execution of an instruction) and executes the interrupt immediately.	CS-series PLCs operate in high-speed interrupt mode only. If an interrupt occurs during peripheral servicing, I/O refreshing, or execution of an instruction, that process will be stopped immediately and the task will be executed instead. With CS1-H CPU Units, interrupt processing will also wait for completion of the BLOCK TRANSFER (XFER), BLOCK SET (BSET), and BIT COUNTER (BCNT) instructions.

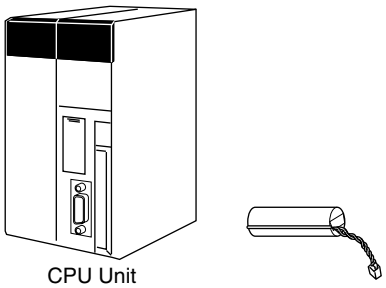
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Item	C200HX/HG/HE PLCs	CS-series PLCs
CPU processing mode	Normal Mode only (including instruction execution followed by I/O refreshing and peripheral servicing) Peripheral servicing include servicing the RS-232C port, Host Link, peripheral bus, and Communications Units (e.g., Controller Link Units).	CS1-H CPU Units: Normal Mode, Parallel Processing Mode with Asynchronous Memory Access, Parallel Processing Mode with Synchronous Memory Access, or Peripheral Servicing Priority Mode (Parallel processing executes peripheral servicing in parallel with instruction execution and I/O refreshing.)
Startup mode	RUN mode was entered if the Startup Mode was set in the PLC Setup to 00: Switch Setting on Programming Console and the CPU Unit was started without a Programming Console connected.	A CS1-H CPU Unit will start in RUN mode if the Startup Mode is set in the PLC Setup to PRCH: Switch Setting on Programming Console (default setting) and the CPU Unit is started without a Programming Console connected.

1-10 Checking the Package

Check to be sure that the CPU Unit and Battery Unit are in good shape without any damage.

CS1-H CPU Units



Note The CS1W-BAT01 will already be installed in the CPU Unit.

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SECTION 2
Specifications and System Configuration

This section provides tables of standard models, Unit specifications, system configurations, and a comparison between different Units.

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2-1 Specifications

2-1-1 CPU Unit Specifications

CPU Unit Comparison

CS1-H CPU Units

CPU		CS1H-CPU67H	CS1H-CPU66H	CS1H-CPU65H	CS1H-CPU64H	CS1H-CPU63H	CS1G-CPU45H	CS1G-CPU44H	CS1G-CPU43H	CS1G-CPU42H
I/O bits		5120						1280	960	
User program memory (steps)		250K	120K	60K	30K	20K	60K	30K	20K	10K
Data memory		32K words								
Extended data memory		32K words x 13 banks E0_00000 to EC_32767	32K words x 7 banks E0_00000 to E6_32767	32K words x 3 banks E0_00000 to E2_32767	32K words x 1 bank E0_00000 to E0_32767		32K words x 3 banks E0_00000 to E2_32767	32K words x 1 bank E0_00000 to E0_32767		
Function blocks	Maximum No. of definitions	1024	1024	1024	1024	128	1024	1024	128	128
	Maximum No. of instances	2048	2048	2048	2048	256	2048	2048	256	256
Flash memory (Unit version 4.0 or later (See note.))	Total (Kbytes) for FB program memory, comment files, program index files, and symbol tables	2048	2048	1280	1280	1280	1280	704	704	704
Current consumption		0.82 A at 5 V DC					0.78 A at 5 V DC			
Connector (provided)		One RS-232C Connector (Plug: XM2A-0901, Hood: XM2S-0911-E) provided with CPU Unit as standard								

Note The values displayed in the table are valid when a CPU Unit with unit version 4 or later is combined with CX-Programmer 7.0 or higher.

The following table shows the flash memory capacities for CPU Units with unit version 3.

CPU		CS1H-CPU67H	CS1H-CPU66H	CS1H-CPU65H	CS1H-CPU64H	CS1H-CPU63H	CS1G-CPU45H	CS1G-CPU44H	CS1G-CPU43H	CS1G-CPU42H
Flash memory (unit version 3)	FB program memory (Kbytes)	1664	1664	1024	512	512	1024	512	512	512
	Comment files (Kbytes)	128	128	64	64	64	64	64	64	64
	Program index files (Kbytes)	128	128	64	64	64	64	64	64	64
	Symbol tables (Kbytes)	128	128	128	64	64	128	64	64	64

Earlier CPU Units (unit version 2 or earlier) are not equipped with the function that stores data such as comment files in flash memory.

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Common Specifications

Item	Specification	Reference
Control method	Stored program	---
I/O control method	Cyclic scan and immediate processing are both possible.	---
Programming	• Ladder diagrams • SFC (sequential function charts) • ST (structured text) • Mnemonics	---
CPU processing mode	CS1-H CPU Units: Normal Mode, Parallel Processing Mode with Asynchronous Memory Access, Parallel Processing Mode with Synchronous Memory Access, or Peripheral Servicing Priority Mode	---
Instruction length	1 to 7 steps per instruction	Steps and number of steps per instruction: *10-5 Instruction Execution Times and Number of Steps*
Ladder instructions	Approx. 400 (3-digit function codes)	---
Execution time	CS1-H CPU Units: Basic instructions: 0.02 μs min. Special instructions: 0.06 μs min.	Instruction execution times: *10-5 Instruction Execution Times and Number of Steps*
Overhead processing time	CS1-H CPU Units: Normal mode: 0.3 ms min. Parallel processing: 0.2 ms min.	---
Number of Expansion Racks	7 max. (C200H Expansion I/O Racks: 3 max.)	Expansion Racks: *2-3-3 Expansion Racks*
Number of tasks	288 (cyclic tasks: 32, interrupt tasks: 256) **Note** Cyclic tasks are executed each cycle and are controlled with TKON(820) and TKOF(821) instructions. **Note** The following 4 types of interrupt tasks are supported. Power OFF interrupt tasks: 1 max. Scheduled interrupt tasks: 2 max. I/O interrupt tasks: 32 max. External interrupt tasks: 256 max.	Tasks: *Programming Manual* (W394): *1-4 Programs and Tasks* *Programming Manual* (W394): *Section 4: Tasks*
Interrupt types	Scheduled Interrupts: Interrupts generated at a time scheduled by the CPU Unit's built-in timer. I/O Interrupts: Interrupts from Interrupt Input Units. Power OFF Interrupts: Interrupts executed when the CPU Unit's power is turned OFF. External I/O Interrupts: Interrupts from the Special I/O Units, CS-series CPU Bus Units, or the Inner Board.	
Calling subroutines from more than one task	CS1-H CPU Units: Supported.	
Function blocks (CPU Units with unit version 3.0 or later only)	Languages in function block definitions: ladder programming, structured text	*CX-Programmer Ver. 7.□ CS/CJ Series Operation Manual Function Blocks* (W447)

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Item		Specification	Reference	
CIO (Core I/O) Area	**I/O Area**	5,120: CIO 000000 to CIO 031915 (320 words from CIO 0000 to CIO 0319) The setting of the first word can be changed from the default (CIO 0000) so that CIO 0000 to CIO 0999 can be used. I/O bits are allocated to Basic I/O Units, such as CS-series Basic I/O Units, C200H Basic I/O Units, and C200H Group-2 High-density I/O Units.	Input and output bits:*9-4 CIO Area*	The CIO Area can be used as work bits if the bits are not used as shown here.
	C200H DeviceNet Area	1,600 (100 words): Outputs: CIO 005000 to CIO 009915 (words CIO 0050 to CIO 0099) Inputs: CIO 035000 to CIO 039915 (words CIO 0350 to CIO 0399) C200H DeviceNet Area bits are allocated to Slaves according to C200HW-CRW21-V1 DeviceNet Unit remote I/O communications.	*9-5 C200H DeviceNet Area*	
	PLC Link Area	80 bits (5 words): CIO 024700 to CIO 025015 (words CIO 0247 to CIO 0250 and CIO A442) When a PLC Link Unit is used in a PLC Link, use these bits to monitor PLC Link errors and the operating status of other CPU Units in the PLC Link.	*9-7 PLC Link Area*	
	Link Area	3,200 (200 words): CIO 10000 to CIO 119915 (words CIO 1000 to CIO 1199) Link bits are used for data links and are allocated to Units in Controller Link Systems and PLC Link Systems.	*9-8 Data Link Area*	
	CPU Bus Unit Area	6,400 (400 words): CIO 150000 to CIO 189915 (words CIO 1500 to CIO 1899) CS-series CPU Bus Unit bits store the operating status of CS-series CPU Bus Units. (25 words per Unit, 16 Units max.)	*9-9 CPU Bus Unit Area*	
	Special I/O Unit Area	15,360 (960 words): CIO 200000 to CIO 295915 (words CIO 2000 to CIO 2959) Special I/O Unit bits are allocated to CS-series Special I/O Units and C200H Special I/O Units. (See Note.) (10 words per Unit, 96 Units max.) **Note** Special I/O Units are I/O Units that belong to a special group called “Special I/O Units.” Examples: C200H-ID215/0D215/MD215	*9-11 Special I/O Unit Area*	
	Inner Board Area	1,600 (100 words): CIO 190000 to CIO 199915 (words CIO 1900 to CIO 1999) Inner Board bits are allocated to Inner Boards. (100 I/O words max.)	*9-10 Inner Board Area*	
	SYSMAC BUS Area	1,280 (80 words): CIO 300000 to CIO 307915 (words CIO 3000 to CIO 3079) SYSMAC BUS bits are allocated to Slave Racks connected to SYSMAC BUS Remote I/O Master Units. (10 words per Rack, 8 Racks max.)	*9-12 SYSMAC BUS Area*	
	I/O Terminal Area	512 (32 words): CIO 310000 to CIO 313115 (words CIO 3100 to CIO 3131) I/O Terminal bits are allocated to I/O Terminal Units (but not to Slave Racks) connected to SYSMAC BUS Remote I/O Master Units. (1 word per Terminal, 32 Terminals max.)	*9-13 I/O Terminal Area*	

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<table>
<tr><th colspan="2">Item</th><th>Specification</th><th>Reference</th></tr>
<tr><td rowspan="2">CIO (Core I/O) Area, continued</td><td>CS-series DeviceNet Area</td><td>9,600 (600 words): CIO 320000 to CIO 379915 (words CIO 3200 to CIO 3799)
CS-series DeviceNet Area bits are allocated to Slaves according to C200HW-CRW21-V1 DeviceNet Unit remote I/O communications.<table><tr><td>Fixed allocation 1</td><td>Outputs: CIO 3200 to CIO 3263
Inputs: CIO 3300 to CIO 3363</td></tr><tr><td>Fixed allocation 2</td><td>Outputs: CIO 3400 to CIO 3463
Inputs: CIO 3500 to CIO 3563</td></tr><tr><td>Fixed allocation 3</td><td>Outputs: CIO 3600 to CIO 3663
Inputs: CIO 3700 to CIO 3763</td></tr></table>The following words are allocated to the CS-Series DeviceNet Unit functioning as a master when fixed allocations are used for the CS1W-DRM21 DeviceNet Unit.<table><tr><th>Setting</th><th>Master to slave</th><th>Slave to master</th></tr><tr><td>Fixed allocation 1</td><td>Outputs: CIO 3370</td><td>Inputs: CIO 3270</td></tr><tr><td>Fixed allocation 2</td><td>Outputs: CIO 3570</td><td>Inputs: CIO 3470</td></tr><tr><td>Fixed allocation 3</td><td>Outputs: CIO 3770</td><td>Inputs: CIO 3670</td></tr></table></td><td>9-6 CS-series DeviceNet Area</td></tr>
<tr><td colspan="2">Internal I/O Area</td><td>4,800 (300 words): CIO 120000 to CIO 149915 (words CIO 1200 to CIO 1499)
37,504 (2,344 words): CIO 380000 to CIO 614315 (words CIO 3800 to CIO 6143)
These bits in the CIO Area are used as work bits in programming to control program execution. They cannot be used for external I/O.</td><td>---</td></tr>
<tr><td colspan="2">Work Area</td><td>8,192 bits (512 words): W00000 to W51115 (W000 to W511)
Controls the programs only. (I/O from external I/O terminals is not possible.)
Note When using work bits in programming, use the bits in the Work Area first before using bits from other areas.</td><td>9-14 Work Area</td></tr>
<tr><td colspan="2">Holding Area</td><td>8,192 bits (512 words): H00000 to H51115 (H000 to H511)
Holding bits are used to control the execution of the program, and maintain their ON/OFF status when the PLC is turned OFF or the operating mode is changed.
Note The Function Block Holding Area words are allocated from H512 to H1535. These words can be used only for the function block instance area (internally allocated variable area).</td><td>9-15 Holding Area</td></tr>
<tr><td colspan="2">Auxiliary Area</td><td>Read only: 7,168 bits (448 words): A00000 to A44715 (words A000 to A447)
Read/write: 8,192 bits (512 words): A44800 to A95915 (words A448 to A959)
Auxiliary bits are allocated specific functions.</td><td>9-16 Auxiliary Area</td></tr>
<tr><td colspan="2">Temporary Area</td><td>16 bits (TR0 to TR15)
Temporary bits are used to temporarily store the ON/OFF execution conditions at program branches.</td><td>9-17 TR (Temporary Relay) Area</td></tr>
<tr><td colspan="2">Timer Area</td><td>4,096: T0000 to T4095 (used for timers only)</td><td>9-18 Timer Area</td></tr>
<tr><td colspan="2">Counter Area</td><td>4,096: C0000 to C4095 (used for counters only)</td><td>9-19 Counter Area</td></tr>
</table>

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Item	Specification	Reference
DM Area	32K words: D00000 to D32767 Used as a general-purpose data area for reading and writing data in word units (16 bits). Words in the DM Area maintain their status when the PLC is turned OFF or the operating mode is changed. Internal Special I/O Unit DM Area: D20000 to D29599 (100 words × 96 Units) Used to set parameters for Special I/O Units. CPU Bus Unit DM Area: D30000 to D31599 (100 words × 16 Units) Used to set parameters for CPU Bus Units. Inner Board DM Area: D32000 to D32099 Used to set parameters for Inner Boards.	*9-20 Data Memory (DM) Area*
EM Area	32K words per bank, 13 banks max.: E0_00000 to EC_32767 max. (Not available on some CPU Units.) Used as a general-purpose data area for reading and writing data in word units (16 bits). Words in the EM Area maintain their status when the PLC is turned OFF or the operating mode is changed. The EM Area is divided into banks, and the addresses can be set by either of the following methods. Changing the current bank using the EMBC(281) instruction and setting addresses for the current bank. Setting bank numbers and addresses directly. EM data can be stored in files by specifying the number of the first bank.	*9-21 Extended Data Memory (EM) Area*
Data Registers	DR0 to DR15 Store offset values for indirect addressing. One register is 16 bits (1 word). CS1-H CPU Units: Setting to use data registers either independently in each task or to share them between tasks.	*9-23 Data Registers*
Index Registers	IR0 to IR15 Store PLC memory addresses for indirect addressing. One register is 32 bits (2 words). CS1-H CPU Units: Setting to use index registers either independently in each task or to share them between tasks.	*9-22 Index Registers*
Task Flag Area	32 (TK0000 to TK0031) Task Flags are read-only flags that are ON when the corresponding cyclic task is executable and OFF when the corresponding task is not executable or in standby status.	*9-24 Task Flags*
Trace Memory	40,000 words (trace data: 31 bits, 6 words)	*Programming Manual* (W394)
File Memory	Memory Cards: Compact flash memory cards can be used (MS-DOS format). EM file memory: Part of the EM Area can be converted to file memory (MS-DOS format).	*Programming Manual* (W394)

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Function Specifications

Item	Specification	Reference
Constant cycle time	1 to 32,000 ms (Unit: 1 ms) When a parallel processing mode is used for a CS1-H CPU Unit, the cycle time for executing instructions is constant.	Cycle time: *10-4 Computing the Cycle Time* Constant cycle time: *Programming Manual* (W394)
Cycle time monitoring	Possible (Unit stops operating if the cycle is too long): 1 to 40,000 ms (Unit: 10 ms) When a parallel processing mode is used for a CS1-H CPU Unit, the instruction execution cycle is monitored. CPU Unit operation will stop if the peripheral servicing cycle time exceeds 2 s (fixed).	Cycle time: *10-4 Computing the Cycle Time* Cycle time monitoring: *Programming Manual* (W394)
I/O refreshing	Cyclic refreshing, immediate refreshing, refreshing by IORF(097). IORF(097) refreshes I/O bits allocated to Basic I/O Units and Special I/O Units. With the CS1-H CPU Units, the CPU BUS UNIT I/O REFRESH (DLNK(226)) instruction can be used to refresh bits allocated to CPU Bus Units in the CIO and DM Areas.	I/O refreshing: *10-4 Computing the Cycle Time* I/O refresh methods: *Programming Manual* (W394)
Timing of special refreshing for CPU Bus Units	Data links for Controller Link Units and SYSMAC LINK Units, remote I/O for DeviceNet Units, and other special refreshing for CPU Bus Units is performed at the following times: CS1-H CPU Units: I/O refresh period and when the CPU BUS UNIT I/O REFRESH (DLNK(226)) instruction is executed	---
I/O memory holding when changing operating modes	Depends on the ON/OFF status of the IOM Hold Bit in the Auxiliary Area.	I/O memory: *SECTION 9 Memory Areas* *Programming Manual* (W394): *6-6-1 Hot Start/Cold Start Function* Holding I/O memory: *9-2-3 Data Area Properties*
Load OFF	All outputs on Output Units can be turned OFF when the CPU Unit is operating in RUN, MONITOR, or PROGRAM mode.	Load OFF: *Programming Manual* (W394): *6-7-2 Load OFF Function and 7-2-3 Online Editing*
Input response time setting	Time constants can be set for inputs from Basic I/O Units. The time constant can be increased to reduce the influence of noise and chattering or it can be decreased to detect shorter pulses on the inputs.	Input response time: *10-4-6 I/O Response Time* Input response settings: *Programming Manual* (W394): *6-11-1 I/O Response Time Settings*
Startup mode setting	Supported The startup mode will be as follows if the PLC Setup is set to use the Programming Console mode (default) and a Programming Console is not connected: CS1-H CPU Units: RUN mode	Startup mode: *Programming Manual* (W394)
Flash memory (CS1-H CPU Units only)	• The user program and parameter area data (e.g., PLC Setup) are always backed up automatically in flash memory. • CPU Units with unit version 3.0 or later only: When downloading projects from CX-Programmer Ver. 5.0 or higher, symbol table files (including CX-Programmer symbol names, I/O comments), comment files (CX-Programmer rung comments, other comments), and program index files (CX-Programmer section names, section comments, or program comments) are stored in comment memory within the flash memory.	---

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Item	Specification		Reference
Memory Card functions	Automatically reading programs (autoboot) from the Memory Card when the power is turned ON.	Supported	Memory Cards and file memory: *3-2 File Memory* and *Programming Manual* (W394) *Section 5 File Memory Functions* Automatic file transfer at startup and file operations using CMND: *Programming Manual* (W394) *5-2-3 Using Instruction in User Program*
	Program replacement during PLC operation	Supported	Replacing the program with CMND: *Programming Manual* (W394)
	Format in which data is stored in Memory Card	User program: Program file format PLC Setup and other parameters: Data file format I/O memory: Data file format (binary format), text format, or CSV format	Data stored in the Memory Card: *Programming Manual* (W394) *5-2-3 Using Instruction in User Program*
	Functions for which Memory Card read/write is supported	User program instructions, Programming Devices (including Programming Consoles), Host Link computers, AR Area control bits, easy backup operation	Memory Card read/write operations: *Programming Manual* (W394)
Filing	Memory Card data and the EM (Extended Data Memory) Area can be handled as files.		File memory: *Programming Manual* (W394)
Debugging	Control set/reset, differential monitoring, data tracing (scheduled, each cycle, or when instruction is executed), storing location generating error when a program error occurs		Debugging, set/reset, differential monitoring, data tracing: *Programming Manual* (W394)
Online editing	When the CPU Unit is in MONITOR or PROGRAM mode, multiple program sections (“circuits”) of the user program can be edited together. This function is not supported for block programming areas. (With the CX-Programmer is used, multiple program sections of the user program can be edited together. When a Programming Console is used, the program can be edited in mnemonics only.).		Operating modes: *Programming Manual* (W394)
Program protection	Overwrite protection: Set using DIP switch. Copy protection: Password set using Programming Device.		Program protection: *Programming Manual* (W394)
Error check	User-defined errors (i.e., user can define fatal errors and non-fatal errors) The FPD(269) instruction can be used to check the execution time and logic of each programming block. FAL and FALS instructions can be used with the CS1-H CPU Units to simulate errors.		Failure diagnosis: *Programming Manual* (W394) Fatal and nonfatal errors: *11-2-4 Error Processing Flowchart* User-defined errors: *Programming Manual* (W394)
Error log	Up to 20 errors are stored in the error log. Information includes the error code, error details, and the time the error occurred. A CS1-H CPU Unit can be set so that user-defined FAL errors are not stored in the error log.		Error log: *Programming Manual* (W394)
Serial communications	Built-in peripheral port: Programming Device (including Programming Console) connections, Host Links, NT Links Built-in RS-232C port: Programming Device (excluding Programming Console) connections, Host Links, no-protocol communications, NT Links		Serial communications systems: *2-5-1 Serial Communications System* Serial communications: *Programming Manual* (W394)
	Serial Communications Board (sold separately): Protocol macros, Host Links, NT Links		

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Item	Specification	Reference
Clock	Provided on all models. Accuracy: ± 30 s/mo. at 25°C (accuracy varies with the temperature) **Note** Used to store the time when power is turned ON and when errors occur.	Clock: *Programming Manual* (W394)
Power OFF detection time	10 to 25 ms (not fixed)	Power OFF operation and power OFF detection time: *10-3 Power OFF Operation*
Power OFF detection delay time	0 to 10 ms (user-defined, default: 0 ms)	Power OFF detection delay time: *Programming Manual* (W394)
Memory protection	Held Areas: Holding bits, contents of Data Memory and Extended Data Memory, and status of the counter Completion Flags and present values. **Note** If the IOM Hold Bit in the Auxiliary Area is turned ON, and the PLC Setup is set to maintain the IOM Hold Bit status when power to the PLC is turned ON, the contents of the CIO Area, the Work Area, part of the Auxiliary Area, timer Completion Flag and PVs, Index Registers, and the Data Registers will be saved for up to 20 days.	Memory protection: *9-2-3 Data Area Properties*
Sending commands to a Host Link computer	FINS commands can be sent to a computer connected via the Host Link System by executing Network Communications Instructions from the PLC.	Host Links and non-solicited communications: *2-5-2 Systems*
Remote programming and monitoring	Host Link communications can be used for remote programming and remote monitoring through a Controller Link System or Ethernet network.	Remote programming and monitoring: *Programming Manual* (W394) Controller Link *2-5-3 Communications Network System*
Communicating across network layers	Remote programming and monitoring using the Support Software, as well as FINS message communications, can be conducted across network layers, including other types of network. Pre-Ver. 2.0: Three layers Version 2.0 or later: Eight layers for Controller Link and Ethernet (see note). Three layers for DeviceNet and SYSMAC LINK. **Note** To construct a network of eight layers, it is necessary to use the CX-Integrator or CX-Programmer (version 4.0 or higher) to set routing tables.	Host Links and FINS message service: *2-5-2 Systems*
Storing comments in CPU Unit	I/O comments can be stored as symbol table files in the Memory Card, EM file memory, or comment memory (see note). **Note** Comment memory is supported for CS/CJ-series CPU Units with unit version 3.0 or later only.	I/O comments: *CX-Programmer Operation Manual* (W446) Storing comments in CPU Unit: *Programming Manual* (W394)
Program check	Program checks are performed at the beginning of operation for items such as no END instruction and instruction errors. CX-Programmer can also be used to check programs.	Program check: *Programming Manual* (W394)
Control output signals	RUN output: The internal contacts will turn ON (close) while the CPU Unit is operating. These terminals are provided only on the C200HW-PA204R and C200HW-PA209R Power Supply Units.	RUN output: *Programming Manual* (W394)
Battery life	Battery Set: CS1W-BAT01	Battery life and replacement period: *12-2-1 Battery Replacement*

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Item	Specification	Reference
Self-diagnostics	CPU errors (watchdog timer), I/O verification errors, I/O bus errors, memory errors, and battery errors.	CPU, I/O bus, memory, and battery errors: *11-2-4 Error Processing Flowchart*
Other functions	Storage of number of times power has been interrupted. (Stored in A514.)	Number of power interruptions: *10-3 Power OFF Operation*

2-1-2 General Specifications

Item	Specifications						
Power Supply Unit	C200HW-PA204	C200HW-PA204C	C200HW-PA204R	C200HW-PA204S	C200HW-PA209R	C200HW-PD024	C200HW-PD025
Supply voltage	100 to 240 V AC (wide range), 50/60 Hz (See note 7.)			100 to 120 V AC or 200 to 240 V AC, 50/60 Hz		24 V DC	24 V DC
Operating voltage range	85 to 264 V AC			85 to 132 V AC or 170 to 264 V AC		19.2 to 28.8 V DC	19.2 to 28.8 V DC
Power consumption	120 VA max.	100 VA max.	120 VA max.	120 VA max.	180 VA max.	40 W max.	60 W max.
Inrush current	100 to 120 V AC input: 15 A max. (cold start at room temperature) for 8 ms max. 200 to 240 V AC input: 30 A max. (cold start at room temperature) for 8 ms max.			100 to 120 V AC input: 20 A max. (cold start at room temperature) for 8 ms max. 200 to 240 V AC input: 30 A max. (cold start at room temperature) for 8 ms max.	30 A max. 100 to 120 V 40 A max. 200 to 240 V	30 A max.	30 A max.
Output capacity (See note 6.)	4.6 A, 5 V DC (including the CPU Unit power supply)				9 A, 5 V DC (including the CPU Unit power supply)	4.6 A, 5 V DC (including the CPU Unit power supply)	5.3 A, 5 V DC (including the CPU Unit power supply)
	0.625 A, 26 V DC Total: 30 W max.	0.625 A, 26 V DC Total: 30 W max.	0.625 A, 26 V DC Total: 30 W max.	0.625 A, 26 V DC 0.8 A, 24 V DC Total: 30 W max.	1.3 A, 26 V DC Total: 45 W max.	0.625 A, 26 V DC Total: 30 W max.	1.3 A, 26 V DC Total: 40 W max.
Output terminal (service supply)	Not provided	Not provided	Not provided	Provided. At consumption of less than 0.3 A, 24-V DC supply will be +17%/–11%; at 0.3 A or greater, +10%/–11% (lot 0197 or later)	Not provided	Not provided	Not provided

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Item	Specifications						
Power Supply Unit	C200HW-PA204	C200HW-PA204C	C200HW-PA204R	C200HW-PA204S	C200HW-PA209R	C200HW-PD024	C200HW-PD025
RUN output (See note 2.)	Not provided	Not provided	Contact configuration: SPST-NO Switch capacity: 250 V AC, 2 A (resistive load) 250 V AC, 0.5 A (induction load), 24 V DC, 2 A	Not provided	Contact configuration: SPST-NO Switch capacity: 240 V AC, 2A (resistive load) 120 V AC, 0.5 A (induction load) 24 V DC, 2 A (resistive load) 24 V DC, 2 A (induction load)	Not provided	Not provided
Replacement notification function	Not provided	With Alarm output (open-collector output) 30 V DC max., 50 mA max.	Not provided	Not provided	Not provided	Not provided	Not provided
Insulation resistance	20 MΩ min. (at 500 V DC) between AC external and GR terminals (See note 1.)	20 MΩ min. (at 500 V DC) between all external terminals and GR terminal, and between all alarm output terminals. 20 MΩ min. (at 250 V DC) between all alarm output terminals and GR terminal.	20 MΩ min. (at 500 V DC) between AC external and GR terminals (See note 1.)	20 MΩ min. (at 500 V DC) between AC external and GR terminals (See note 1.)	20 MΩ min. (at 500 V DC) between AC external and GR terminals (See note 1.)	20 MΩ min. (at 500 V DC) between DC external and GR terminals (See note 1.)	
Dielectric strength (See note 5.)	2,300 V AC 50/60 Hz for 1 min between AC external and GR terminals (See note 1.) Leakage current: 10 mA max.	2,300 V AC, 50/60 Hz for 1 minute between all external terminals and GR terminal and between all alarm output terminals with a leakage current of 10 mA max.	2,300 V AC 50/60 Hz for 1 min between AC external and GR terminals (See note 1.) Leakage current: 10 mA max.	2,300 V AC 50/60 Hz for 1 min between AC external and GR terminals (See note 1.) Leakage current: 10 mA max.	2,300 V AC 50/60 Hz for 1 min between AC external and GR terminals (See note 1.) Leakage current: 10 mA max.	1,000 V AC 50/60 Hz for 1 min between DC external and GR terminals (See note 1.). Leakage current: 10 mA max.	
	1,000 V AC, 50/60 Hz for 1 minute between all alarm output terminals and GR terminal with a leakage current of 10 mA max.						
Noise immunity	2 kV on power supply line (conforming to IEC61000-4-4)						
Vibration resistance	10 to 57 Hz, 0.075-mm amplitude, 57 to 150 Hz, acceleration: 9.8 m/s^2 in X, Y, and Z directions for 80 minutes (Time coefficient: 8 minutes ×coefficient factor 10 = total time 80 min.) CPU Unit mounted to a DIN track: 2 to 55 Hz, 2.94 m/s^2 in X, Y, and Z directions for 20 minutes						
Shock resistance	147 m/s^2 3 times each in X, Y, and Z directions (according to JIS 0041)						
Ambient operating temperature	0 to 55°C						

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Item	Specifications						
Power Supply Unit	C200HW-PA204	C200HW-PA204C	C200HW-PA204R	C200HW-PA204S	C200HW-PA209R	C200HW-PD024	C200HW-PD025
Ambient operating humidity	10% to 90% (with no condensation)	10% to 90% (without condensation) (See note 4.)	10% to 90% (with no condensation)	10% to 90% (with no condensation)	10% to 90% (with no condensation)		
Atmosphere	Must be free from corrosive gases.						
Ambient storage temperature	–20 to 75°C (excluding battery)	–20 to 75°C (See note 4.)	–20 to 75°C (excluding battery)	–20 to 75°C (excluding battery)	–20 to 75°C (excluding battery)		
Grounding	Less than 100 Ω						
Enclosure	Mounted in a panel.						
Weight	All models are each 6 kg max.						
CPU Rack dimensions (mm) (See note 3.)	2 slots:198.5 × 157 × 123 (W x H x D) 3 slots: 260 × 130 × 123 (W x H x D) 5 slots: 330 × 130 × 123 (W x H x D) 8 slots: 435 × 130 × 123 (W x H x D) 10 slots:505 × 130 × 123 (W x H x D)						
Safety measures	Conforms to UL, CSA, cULus, cUL, NK, Lloyds, and EC directives.						

Note

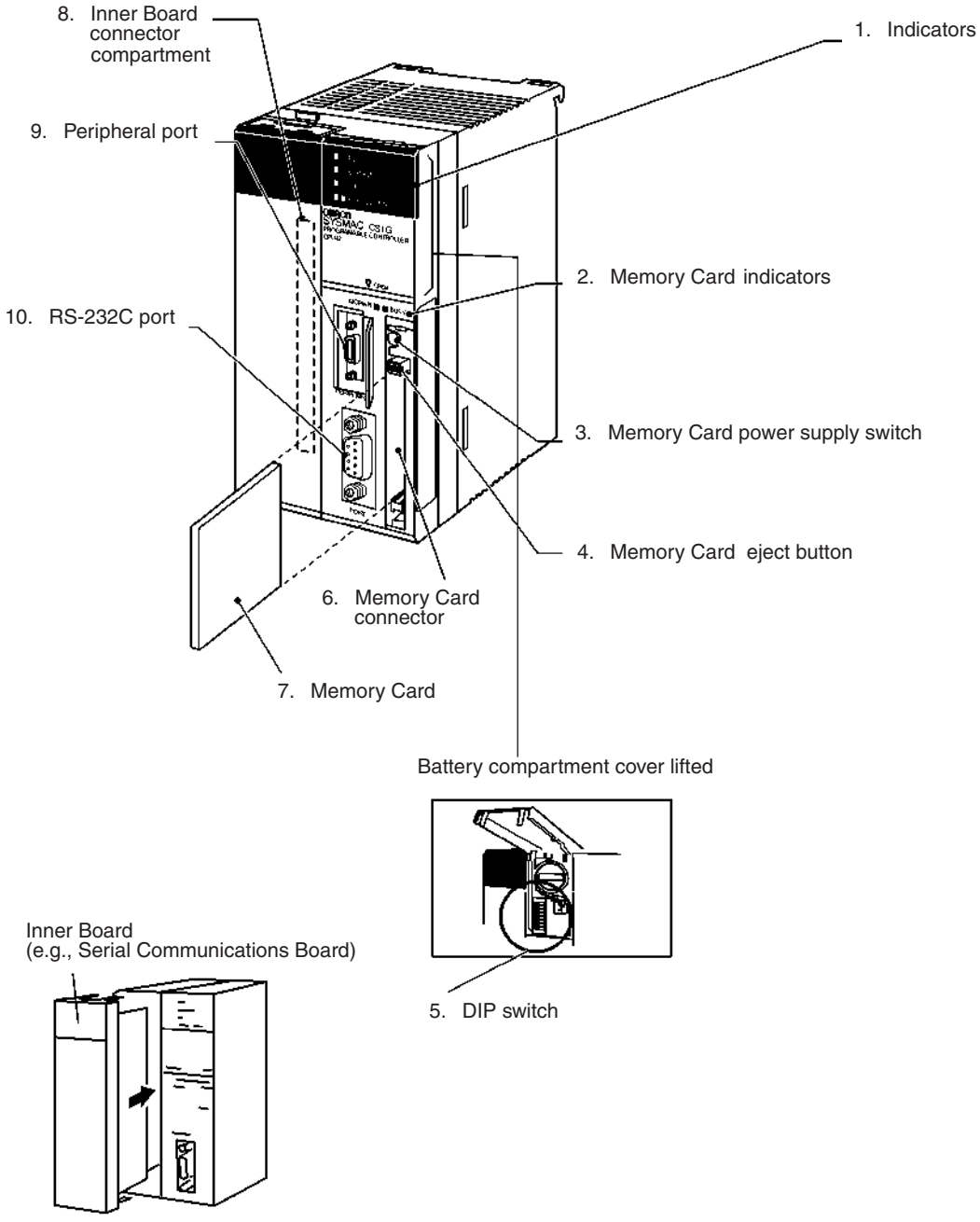
1. Disconnect the Power Supply Unit's LG terminal from the GR terminal when testing insulation and dielectric strength.

   Testing the insulation and dielectric strength with the LG terminal and the GR terminals connected will damage internal circuits in the CPU Unit.
2. Supported only when mounted to CPU Backplane.
3. The depth is 153 mm for the C200HW-PA209R/PD025 Power Supply Unit, 111 mm for the C200HW-PA204C Power Supply Unit.
4. Maintain an ambient storage temperature of –25 to 30°C and relative humidity of 25% to 70% when storing the C200HW-PA204C for longer than 3 months to keep the replacement notification function in optimum working condition.
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 Unit.
6. The Power Supply Unit's internal parts may deteriorate and be damaged if the power supply output capacity is exceeded for a long time or the outputs are short-circuited.
7. The power supply voltage for C200HW-PA204 Power Supply Units manufactured before March 2010 and C200HW-PA204R Power Supply Units manufactured before May 2010 is 100 to 120 V AC/200 to 240 V AC (switched using short bar). For details on the differences between these Units, refer to *Unit Differences by Manufacturing Date (Reference Information) on page 189*

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2-2 CPU Unit Components

2-2-1 Components



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1,2,3...

1. **Indicators**
The following table describes the LED indicators on the front panel of the CPU Unit.

Indicator	Meaning
RUN (green)	Lights when the PLC is operating normally in MONITOR or RUN mode.
ERR/ALM (red)	Flashes if a non-fatal error occurs that does not stop the CPU Unit. If a non-fatal error occurs, the CPU Unit will continue operating. Lights if a fatal error occurs that stops the CPU Unit or if a hardware error occurs. If a fatal or hardware error occurs, the CPU Unit will stop operating, and the outputs from all Output Units will turn OFF.
INH (orange)	Lights when the Output OFF Bit (A50015) turns ON. If the Output OFF Bit is turned ON, the outputs from all Output Units will turn OFF.
BKUP (orange)	Lights when data is being backed up from RAM to the flash memory. Do not turn OFF the CPU Unit when this indicator is lit.
PRPHL (orange)	Flashes when the CPU Unit is communicating via the peripheral port.
COMM (orange)	Flashes when the CPU Unit is communicating via the RS-232C port.
MCPWR (green)	Flashes when power is being supplied to the Memory Card.
BUSY (orange)	Flashes when the Memory Card is being accessed.

2. **Memory Card Indicators**
The MCPWR indicator flashes green when power is being supplied to the Memory Card and the BUSY indicator flashes orange when the Memory Card is being accessed.

3. **Memory Card Power Supply Switch**
Press the Memory Card power supply switch to disconnect power before removing the Memory Card. Also, press the Memory Card Power Supply Switch to perform an easy backup operation (i.e., to write to or verify the Memory Card), or to stop the MCPWR indicator flashing due to a write or verify malfunction when performing an easy backup to the Memory Card.

4. **Memory Card Eject Button**
Press the Memory Card eject button to remove the Memory Card from the CPU Unit before turning the power OFF or to perform an easy backup operation.

5. **DIP Switch**
A CS-series CPU Unit has an 8-pin DIP switch that is used to set basic operational parameters for the CPU Unit. The DIP switch is located under the cover of the battery compartment. The DIP switch pin settings are described in the following table.



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Pin No.	Setting	Function
1	ON	Writing disabled for user program memory.
	OFF	Writing enabled for user program memory.
2	ON	The user program is automatically transferred and executed when power is turned ON.
	OFF	The user program is automatically transferred but not executed when power is turned ON.
3	OFF	Always OFF.
4	ON	Use peripheral port communications parameters set in the PLC Setup.
	OFF	Auto-detect Programming Console or CX-Programmer communications parameters at the peripheral port.
5	ON	Auto-detect Programming Console or CX-Programmer communications parameters at the RS-232C port.
	OFF	Use RS-232C port communications parameters set in the PLC Setup.
6	ON	User-defined pin. Turns OFF the User DIP Switch Pin Flag (A39512).
	OFF	User-defined pin. Turns ON the User DIP Switch Pin Flag (A39512).
7	ON	Easy backup by reading/writing to Memory Card.
	OFF	Easy backup by verifying contents of Memory Card.
8	OFF	Always OFF.

6. **Memory Card Connector**
   The Memory Card connector connects the Memory Card to the CPU Unit.
7. **Memory Card**
   Memory Cards fit into the slot located on the lower right side of the CPU Unit. Memory Cards are not provided with the PLC and must be ordered separately and installed in the CPU Unit.
8. **Inner Board Connector Compartment**
   The Inner Board connector compartment is used to connect Inner Boards such as the Serial Communications Board.
9. **Peripheral Port**
   The peripheral port is connected to Programming Devices, such as a Programming Console or Host Computers. Refer to *3-3 Programming Devices* for details.
10. **RS-232C Port**
    The RS-232C port is connected to Programming Devices (excluding Programming Console), Host Computers, general-purpose external devices, Programmable Terminals, and other devices. Refer to *3-3 Programming Devices* for details.

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2-2-2 CS-series CPU Unit Capabilities

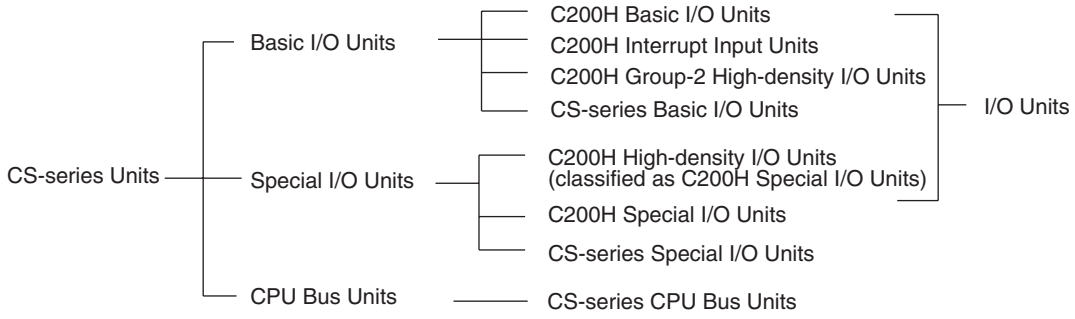
CS1-H CPU Units

Model	I/O bits	Program capacity	Data memory capacity (See note.)	Ladder instruction processing speed	Internal communications ports	Optional products
CS1H-CPU67H	5120 bits (Up to 7 Expansion Racks)	250K steps	448K words	0.02 µs	Peripheral port and RS-232C port.	Memory Cards Inner Boards such as Serial Communications Boards
CS1H-CPU66H		120K steps	256K words			
CS1H-CPU65H		60K steps	128K words			
CS1H-CPU64H		30K steps	64K words			
CS1H-CPU63H		20K steps	64K words			
CS1G-CPU45H	5120 bits (Up to 7 Expansion Racks)	60K steps	128K words	0.04 µs		
CS1G-CPU44H	1280 bits (Up to 3 Expansion Racks)	30K steps	64K words			
CS1G-CPU43H	960 bits (Up to 2 Expansion Racks)	20K steps	64K words			
CS1G-CPU42H		10K steps	64K words			

Note The available Data Memory capacity is the sum of the Data Memory (DM) and the Extended Data Memory (EM).

2-2-3 Unit Classifications

CS-series CPU Units can exchange data with Basic I/O Units, Special I/O Units, and CS-series CPU Bus Units as shown in the following diagram.



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2-2-4 Data Communications

CPU Unit Data Communications

Unit	Data Exchange during cyclic servicing (allocations)		Event service data communications (IORD/IOWR instruction)	I/O refreshing using IORF instruction
CS-series Basic I/O Units	According to I/O allocations (Words are allocated in order according to the position the Unit is mounted.)	I/O refreshing	Not provided.	Yes
C200H Basic I/O Units				Yes
C200H Group-2 High-density I/O Units (classified as Basic I/O Units)				Yes
CS-series Special I/O Units	Unit No. allocations	Special I/O Unit Area (CIO): 10 words/Unit Special I/O Unit Area (DM): 100 words/Unit	Yes (Not available for some Units.)	Yes (Not available for some Units.)
C200H Special I/O Units			Yes (Not available for some Units.)	Yes (Not available for some Units.)
CPU Bus Units		CS-series CPU Bus Unit Area (CIO): 5 words/ Unit CS-series CPU Bus Unit Area (DM): 100 words/Unit	Not provided.	No

CPU Unit Connections

Unit	Maximum Number of Units on CPU Racks and Expansion Racks	Racks to which Unit can be mounted			
		CPU Rack (See note 5.)	C200H Expansion I/O Racks	CS-series Expansion Racks (See note 5.)	SYSMAC BUS Slave Racks
CS-series Basic I/O Units	80 (See note 1.)	Yes	No	Yes	No
C200H Basic I/O Units	80 (See note 1.)	Yes	Yes	Yes	Yes
C200H Group-2 High-density I/O Units (classified as Basic I/O Units)	80 (See note 1.)	Yes	Yes	Yes	No
CS-series Special I/O Units	80 (See notes 2 and 4.)	Yes	No	Yes	No
C200H Special I/O Units	16	Yes	Yes	Yes	Yes (See notes 3 and 4.)
CPU Bus Units	16	Yes	No	Yes (See note 3.)	No

Note

1. The maximum number of Units on CPU Racks and Expansion Racks is 80 because there is a maximum of 80 slots.
2. There is a maximum of 80 slots.
3. Some CS-series CPU Bus Units cannot be mounted to a CS-series Expansion Rack.
4. Up to 89 Special I/O Units can be mounted as follows: Up to 79 CS-series Special I/O Units can be mounted to the CPU Rack and CS-series Expansion Racks and up to 10 C200H Special I/O Units can be mounted to the

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SYSMAC BUS Slave Racks. The C200H Special I/O Units must be assigned unit numbers 0 to 9, and each Remote I/O Master Unit must be counted as a CS-series Special I/O Unit.

5. C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

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2-3 Basic System Configuration

2-3-1 Basic System Configuration

CPU Rack

A CPU Rack consists of a CPU Unit, a Power Supply Unit, a CPU Backplane, Basic I/O Units, Special I/O Units, and CPU Bus Units. A Serial Communications Board and Memory Card are optional.

Note

1. The Backplanes required depend on which CPU Racks, Expansion I/O Racks, and Slave Racks are used.
2. Expansion Racks cannot be connected to a 2-slot CPU Rack.
3. A maximum of four C200HS-INT01 Interrupt Input Units can be connected to one CPU Unit.

Expansion Racks

The Expansion Racks required for the C200H CPU Units and CS-series CPU Units are different.

- C200H Expansion I/O Racks can be connected to CPU Racks, CS-series Expansion Racks, or other C200H Expansion I/O Racks.
- CS-series Expansion Racks can be connected to CPU Racks or other CS-series Expansion Racks. A CS-series Expansion Rack consists of a Power Supply Unit, a CS-series Expansion Backplane or C200H Expansion I/O Backplane, a Basic I/O Unit, a Special I/O Unit, and a CS-series CPU Bus Unit.

Note a) CS-series Expansion Racks cannot be connected after C200H Expansion I/O Racks.

b) CS-series Basic I/O Units, CS-series Special I/O Units and CS-series CPU Bus Units cannot be mounted to C200H Expansion I/O Racks.

c) Interrupt Input Units cannot be mounted to CS-series Expansion Racks or C200H Expansion I/O Racks.

CS-series Long-distance Expansion Racks

I/O Control Units and I/O Interface Units can be used to create systems containing CS-series Long-distance Expansion Racks. Up to two series of Long-distance Expansion Racks can be connected, each measuring up to 50 m, for a total coverage of 100 m.

SYSMAC BUS Slave Racks

Up to 5 SYSMAC BUS Slave Racks can be connected to one SYSMAC BUS Remote I/O Master Unit. A maximum of 5 Units, however, can be connected to one CPU Unit.

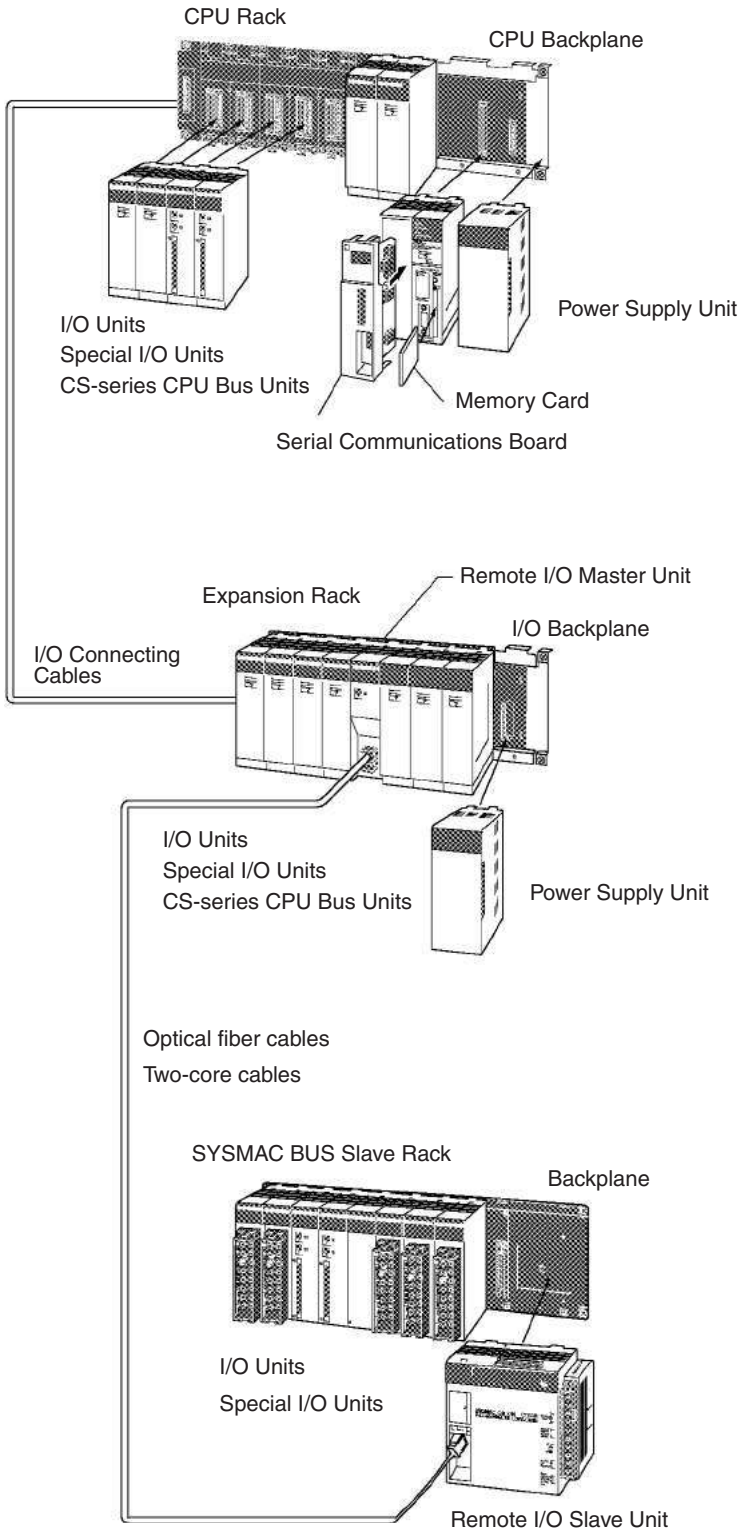
A SYSMAC BUS Slave Rack consists of a Remote I/O Slave Unit, a Remote I/O Slave Rack Backplane, a Basic I/O Unit, and a Special I/O Unit.

Note

1. C200H Group-2 High-density I/O Units, Interrupt Input Units, CS-series Basic I/O Units, CS-series Special I/O Units and CS-series CPU Bus Units cannot be mounted to SYSMAC BUS Slave Racks.

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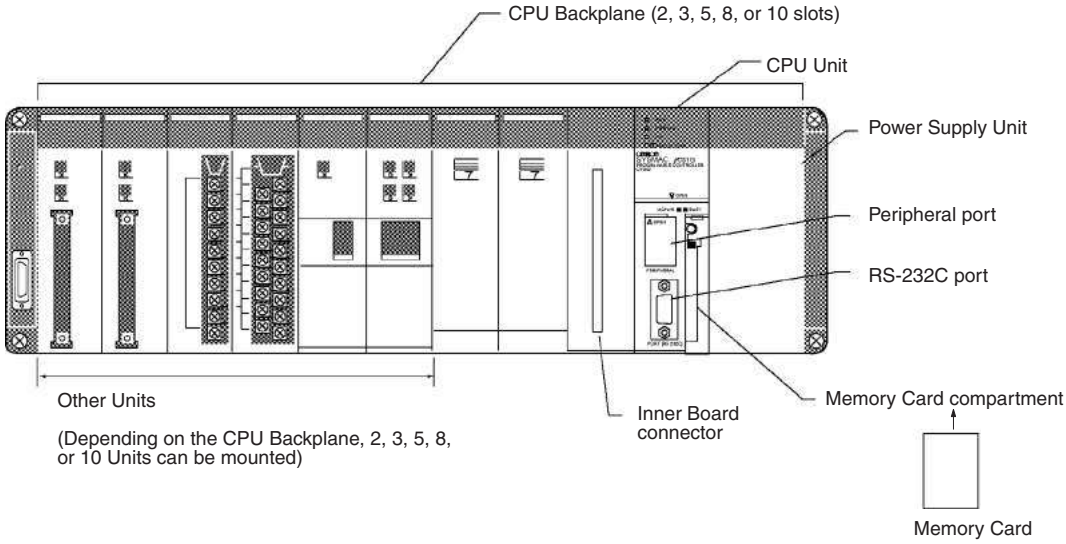
2. SYSMAC BUS Slave Racks can be connected to C200H Expansion I/O Racks using C200H I/O Connecting Cables.



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2-3-2 CPU Rack

A CS-series CPU Rack consists of a CPU Backplane, a Power Supply Unit, and various other Units.



Name	Configuration	Remarks
CPU Rack	CPU Backplane	One of each Unit required for every CPU Rack. Refer to the following table for details on applicable models.
	CPU Unit	
	Power Supply Unit	
	Memory Card	Install as required. Refer to the following table for details on applicable models.
	Serial Communications Board	

Units

CS1-H CPU Units

Name	Model	Specifications
CS-series CS1-H CPU Units	CS1H-CPU67H	I/O bits: 5,120, Program capacity: 250K steps Data Memory: 448K words (DM: 32K words, EM: 32K words × 13 banks)
	CS1H-CPU66H	I/O bits: 5,120, Program capacity: 120K steps Data Memory: 256K words (DM: 32K words, EM: 32K words × 7 banks)
	CS1H-CPU65H	I/O bits: 5,120, Program capacity: 60K steps Data Memory: 128K words (DM: 32K words, EM: 32K words × 3 banks)
	CS1H-CPU64H	I/O bits: 5,120, Program capacity: 30K steps Data Memory: 64K words (DM: 32K words, EM: 32K words × 1 banks)
	CS1H-CPU63H	I/O bits: 5,120, Program capacity: 20K steps Data Memory: 32K words (DM: 32K words, EM: 32K words × 1 banks)
	CS1H-CPU45H	I/O bits: 5,120, Program capacity: 60K steps Data Memory: 128K words (DM: 32K words, EM: 32K words × 3 banks)
	CS1H-CPU44H	I/O bits: 1,280, Program capacity: 30K steps Data Memory: 64K words (DM: 32K words, EM: 32K words × 1 banks)
	CS1H-CPU43H	I/O bits: 960, Program capacity: 20K steps Data Memory: 64K words (DM: 32K words, EM: 32K words × 1 banks)
	CS1H-CPU42H	I/O bits: 960, Program capacity: 10K steps Data Memory: 64K words (DM: 32K words, EM: 32K words × 1 banks)

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Name	Model	Specifications
Standard CPU Backplanes	CS1W-BC023	2 slots (Expansion Racks cannot be connected)
	CS1W-BC033	3 slots
	CS1W-BC053	5 slots
	CS1W-BC083	8 slots
	CS1W-BC103	10 slots
CS-series-only CPU Backplanes	CS1W-BC022	2 slots (See note 1.)
	CS1W-BC032	3 slots (See note 1.)
	CS1W-BC052	5 slots (See note 1.)
	CS1W-BC082	8 slots (See note 1.)
	CS1W-BC102	10 slots (See note 1.)

Name	Model	Specifications
Power Supply Units	C200HW-PA204	100 to 240 V AC Output capacity: 4.6 A at 5 V DC
	C200HW-PA204C	100 to 240 V AC (with replacement notification) Output capacity: 4.6 A at 5 V DC
	C200HW-PA204R	100 to 240 V AC (with RUN output) Output capacity: 4.6 A at 5 V DC
	C200HW-PA204S	100 to 120 V AC or 200 to 240 V AC (with 0.8 A 24 V DC service power supply) Output capacity: 4.6 A at 5 V DC
	C200HW-PA209R	100 to 120 V AC or 200 to 240 V AC (with RUN output) Output capacity: 9 A at 5 V DC
	C200HW-PD024	24 V DC
	C200HW-PD025	24 V DC
Memory Cards	HMC-EF372	Flash memory, 30 MB
	HMC-EF672	Flash memory, 64 MB
	HMC-EF183	Flash memory, 128 MB (See note 3.)
	HMC-AP001	Memory Card Adapter
Serial Communications Boards	CS1W-SCB21	2 × RS-232C ports, protocol macro function
	CS1W-SCB41	1 × RS-232C port + 1 × RS-422/485 port, protocol macro function
Programming Consoles	CQM1H-PRO01-E	An English Keyboard Sheet (CS1W-KS001-E) is required.
	CQM1-PRO01-E	
	C200H-PRO27-E	
Programming Console Key Sheet	CS1W-KS001-E	For CQM1-PRO01 or C200H-PRO27
Programming Console Connecting Cables	CS1W-CN114	Connects the CQM1-PRO01-E Programming Console. (Length: 0.05 m)
	CS1W-CN224	Connects the CQM1-PRO27-E Programming Console. (Length: 2.0 m)
	CS1W-CN624	Connects the CQM1-PRO27-E Programming Console. (Length: 6.0 m)
Programming Device Connecting Cables (for peripheral port)	CS1W-CN118	Connects DOS computers, D-Sub 9-pin receptacle (For converting between RS-232C cable and peripherals) (Length: 0.1 m)
	CS1W-CN226	Connects DOS computers, D-Sub 9-pin (Length: 2.0 m)
	CS1W-CN626	Connects DOS computers, D-Sub 9-pin (Length: 6.0 m)

Note: 1. C200H Units (C200H Basic I/O Units, C200H Group-2 High-density I/O Units, and C200H Special I/O Units) cannot be used with CS-series-only CPU Backplanes.

2. When using the CX-Programmer with the computer connected via a Programming Device Connecting Cable for the peripheral port, a Host Link (SYSWAY) software connection is not possible. Use a toolbus (peripheral bus) connection.

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3. The HMC-EF183 cannot be used with all CPU Units. Before ordering, refer to *Precaution on Applicable Units on page 164*.

Other Units

Name	Model	Specifications
Programming Device Connecting Cables (for RS-232C port)	XW2Z-200S-CV	Connects DOS computers D-Sub 9-pin (Length: 2.0 m), Static-resistant connector used.
	XW2Z-500S-CV	Connects DOS computers D-Sub 9-pin (Length: 5.0 m), Static-resistant connector used.
	XW2Z-200S-V	Connects DOS computers D-Sub 9-pin (Length: 2.0 m) (See note.)
	XW2Z-500S-V	Connects DOS computers D-Sub 9-pin (Length: 5.0 m) (See note.)
USB–Serial Conversion Cable	CS1W-CIF31	Converts between a USB connector and a D-Sub 9-pin connector. Cable length: 0.5 m
Battery Set	CS1W-BAT01	For CS Series only.

Note A peripheral bus connection is not possible when connecting the CX-Programmer via an RS-232C Connecting Cable. Use the Host Link (SYSWAY) connection.

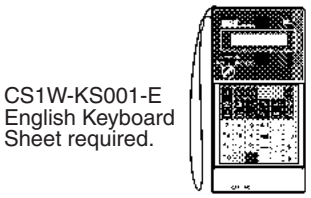
Connecting Programming Devices

Programming Console

When using a Programming Console, connect the Programming Console to the peripheral port of the CPU Unit and set pin 4 of the DIP switch on the front panel of the Unit to OFF (automatically uses default communications parameters for the peripheral port).

CQM1H-PRO01-E/CQM1-PRO01-E

The Programming Console can be connected only to the peripheral port.



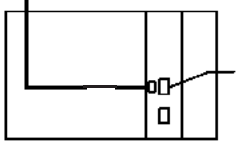
CS1W-KS001-E
English Keyboard
Sheet required.

CQM1H-PRO01-E,
CQM1-PRO01-E
Programming
Console

The following cable is included with the CQM1-PRO01-E Programming Console

Programming Console	Cable	Length
CQM1H-PRO01-E	Not required (pre-wired).	2 m
CQM1-PRO01-E	CS1W-CN114	0.05 m

Note Set pin 4 of the DIP switch on the front panel of the CPU Unit to OFF.



Peripheral port

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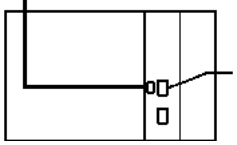
C200H-PRO27-E

The Programming Console can be connected only to the peripheral port.



Programming Console	Cable	Length
CQM1-PRO27-E	CS1W-CN224	2.0 m
	CS1W-CN624	6.0 m

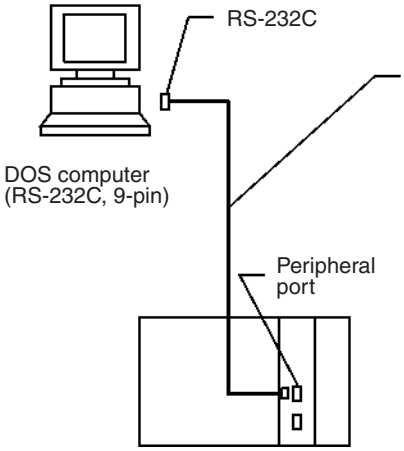
Note Set pin 4 of the DIP switch on the front panel of the CPU Unit to OFF.



Note When an OMRON Programmable Terminal (PT) is connected to the RS-232C port and Programming Console functions are being used, do not connect the Programming Console at the same time.

Connecting Personal Computers Running Support Software

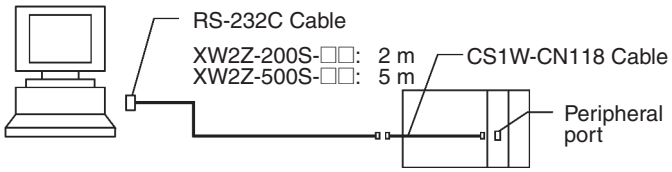
Connecting to Peripheral Port



Connecting Cables for Peripheral Port

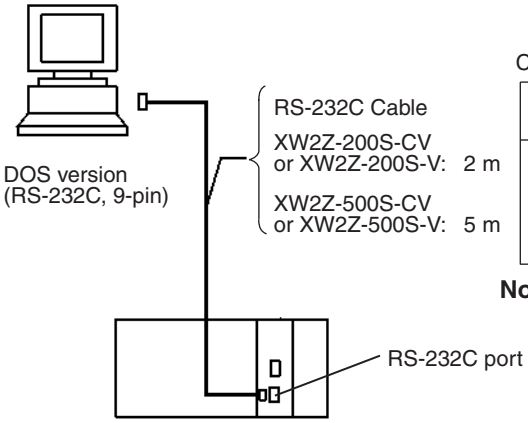
Computer	Cable	Length	Computer connector
DOS	CS1W-CN118	0.1 m	D-Sub, 9-pin
	CS1W-CN226	2.0 m	
	CS1W-CN626	6.0 m	

Note The CS1W-CN118 Cable is used with an RS-232C cable to connect to the peripheral port on the CPU Unit as shown below. The CS1W-CN118 Cable can not be used with an RS-232C cable whose model number ends in -V for a peripheral bus connection and must be used for a Host Link (SYSMAC WAY) connection.



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Connecting to RS-232C Port



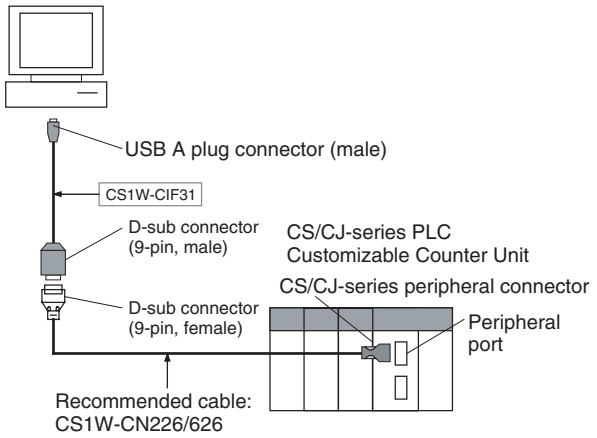
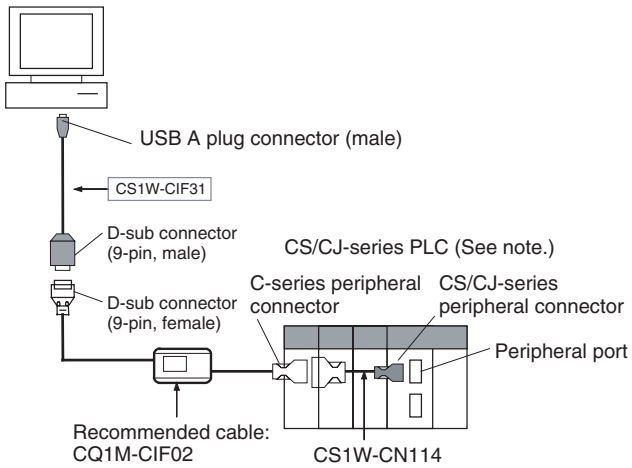
Connecting Cables for RS-232C Port

Computer	Cable	Length	Computer connector
DOS	XW2Z-200S-CV or XW2Z-200S-V	2.0 m	D-Sub, 9-pin
	XW2Z-500S-CV or XW2Z-500S-V	5.0 m	

Note The XW2Z-200S-CV and XW2Z-500S-CV use static-resistant connectors and can be connected to the peripheral bus or the Host Link. The XW2Z-200S-V and XW2Z-500S-V, however, can only be connected to the Host Link, not the peripheral bus.

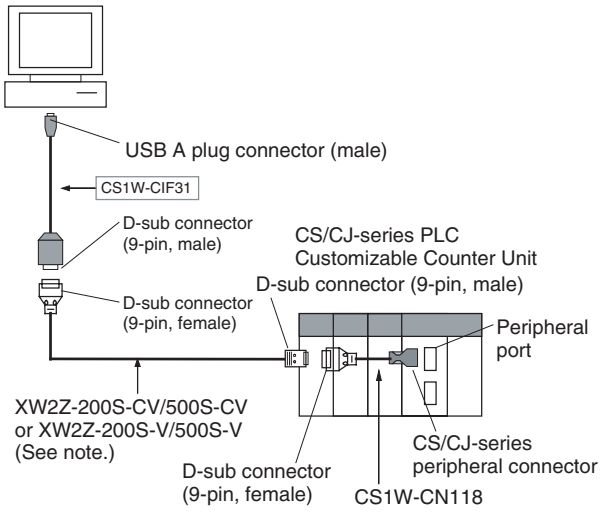
Using Personal Computer's USB Port (USB-Serial Conversion Cable)

Connecting to Peripheral Port

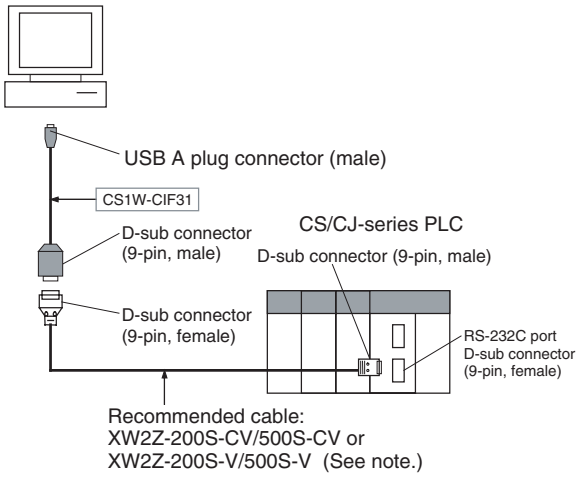
Cable	Connection diagram
CS1W-CN226/626	
CQM1-CIF02	

Note Connection supported for Host Link only when using CS/CJ-series PLCs.

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Cable	Connection diagram
XW2Z-200S-CV/ 500S-CV or XW2Z-200S-V/ 500S-V for RS-232C	 **Note** Connection supported for Host Link only when using CS/CJ-series PLCs.

Connecting to RS-232C Port

Cable	Connection diagram
XW2Z-200S-CV/500S-CV or XW2Z-200S-V/500S-V for RS-232C	 **Note** Connection supported for Host Link only when using CS/CJ-series PLCs.

2-3-3 Expansion Racks

To expand the number of Units in the system, other Expansion Racks can be connected to CPU Racks. The other Expansion Racks that can be connected to the CPU Racks are Standard CS-series Expansion Racks, CS-series Long-distance Expansion Racks, CS-series-only Expansion Racks, and C200H Expansion I/O Racks.

C200H Expansion I/O Racks can be connected after CS-series Expansion Racks, however, the CS-series Expansion Racks cannot be connected after C200H Expansion I/O Racks.

C200H Expansion I/O Racks cannot be connected in the same series as CS-series Long-distance Expansion Racks.

Note 1. Expansion Racks cannot be connected to a 2-slot CPU Rack (Backplane: CS1W-BC02□).

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2. C200H Units (C200H Basic I/O Units, C200H Group-2 High-density I/O Units, and C200H Special I/O Units) cannot be used on CS-series-only CS-series Expansion Backplanes (CS1W-BI□□2).
3. C200H Units cannot be used on the CPU Rack or Expansion Racks if a CS-series-only CPU Backplane (CS1W-BC□□2) is used. The C200H Units will not be recognized by the CPU Unit.
4. When using a CS-series-only Expansion Rack (CS1W-BI□□2) with a CPU Unit with a lot number of 000427 (27 April 2000) or earlier, CS-series Units and C200H Units cannot be used on any Expansion Racks past the CS-series-only CPU Expansion Rack. When using a CS-series-only CPU Backplane (CS1W-BC□□2), CS-series Units and C200H Units cannot be used on any Expansion Racks.

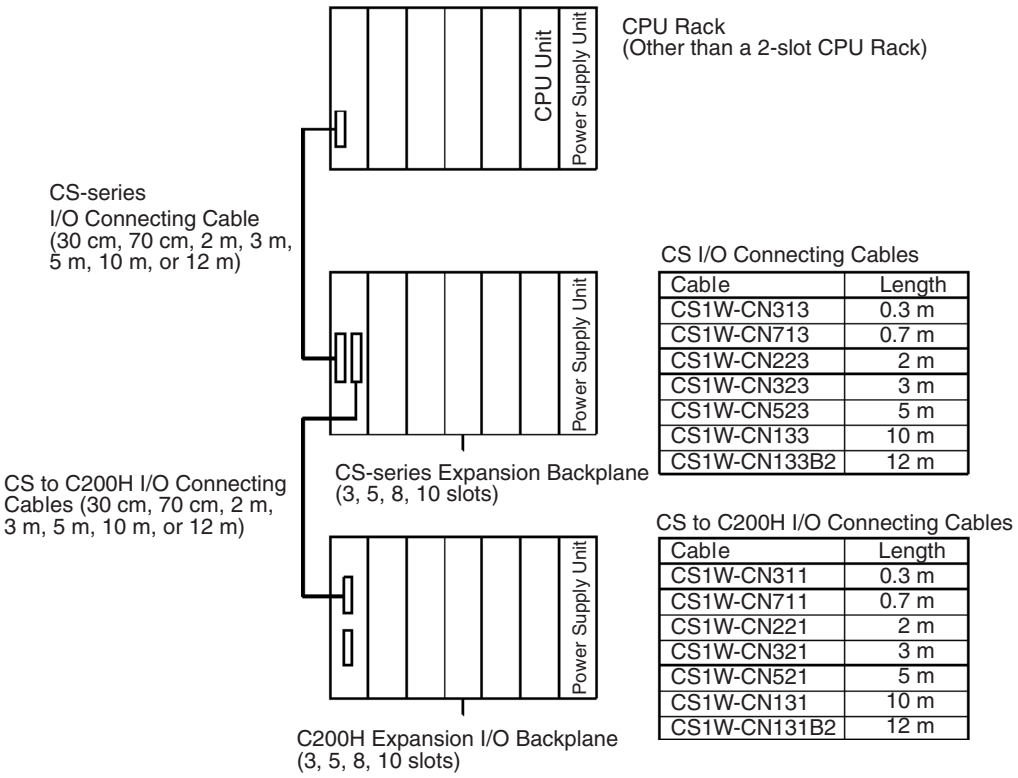
   When using C200H Units and both CS1W-BC□□2 and CS1W-BI□□2 Backplanes are used, use a CPU Unit with a lot number of 000428 (28 April 2000) or later. (When using a CS-series-only CPU Backplane (CS1W-BC□□2), the restriction described in note 3 above applies, and so C200H Units cannot be mounted on Expansion Racks even if a CPU Unit with a lot number of 000428 or later is used.)

Examples of Mixing Backplanes (❍: Mountable, ×: Not mountable)

	Rack	Backplane name	Backplane model	CS-series Units	C200H Units
Example 1	CPU Rack	CPU Backplane	CS1W-BC□□3	❍	❍
	Expansion Racks	CS-series Expansion Backplane	CS1W-BI□□3	❍	❍
	Expansion Racks	C200H Expansion I/O Backplane	C200HW-BI□□1-V1	×	❍
Example 2	CPU Rack	CPU Backplane	CS1W-BC□□3	❍	❍
	Expansion Racks	CS-series-only Expansion Backplane	CS1W-BI□□2	❍ (See note 4.)	× (See note 2.)
	Expansion Racks	CS-series Expansion Backplane	CS1W-BI□□3	❍ (See note 4.)	❍ (See note 4.)
Example 3	CPU Rack	CPU Backplane	CS1W-BC□□3	❍	❍
	Expansion Racks	CS-series-only Expansion Backplane	CS1W-BI□□2	❍ (See note 4.)	× (See note 2.)
	Expansion Racks	C200H Expansion I/O Backplane	C200HW-BI□□1-V1	×	❍ (See note 4.)
Example 4	CPU Rack	CS-series-only CPU Backplane	CS1W-BC□□2	❍	× (See note 3.)
	Expansion Racks	CS-series-only Expansion Backplane	CS1W-BI□□2	❍ (See note 4.)	× (See notes 2 and 3.)
	Expansion Racks	CS-series Expansion Backplane	CS1W-BI□□3	❍ (See note 4.)	× (See note 3.)

Refer to *Configuration Device List* and *2-4 Units* on CS-series Units and C200H Units.

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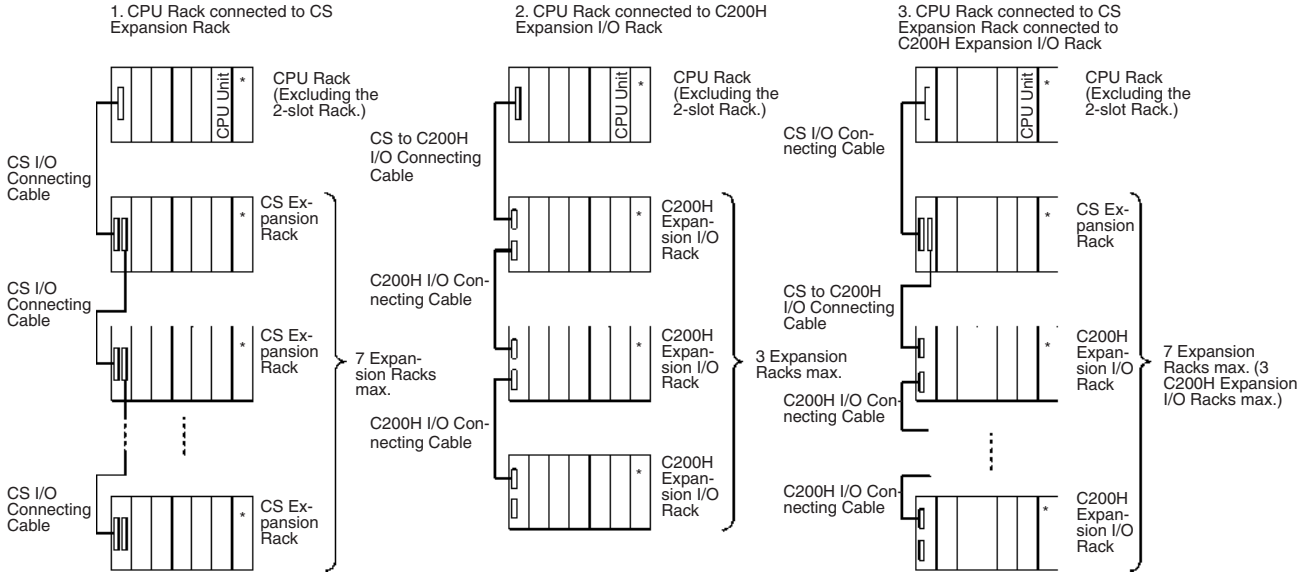


Cable	Length
CS1W-CN313	0.3 m
CS1W-CN713	0.7 m
CS1W-CN223	2 m
CS1W-CN323	3 m
CS1W-CN523	5 m
CS1W-CN133	10 m
CS1W-CN133B2	12 m

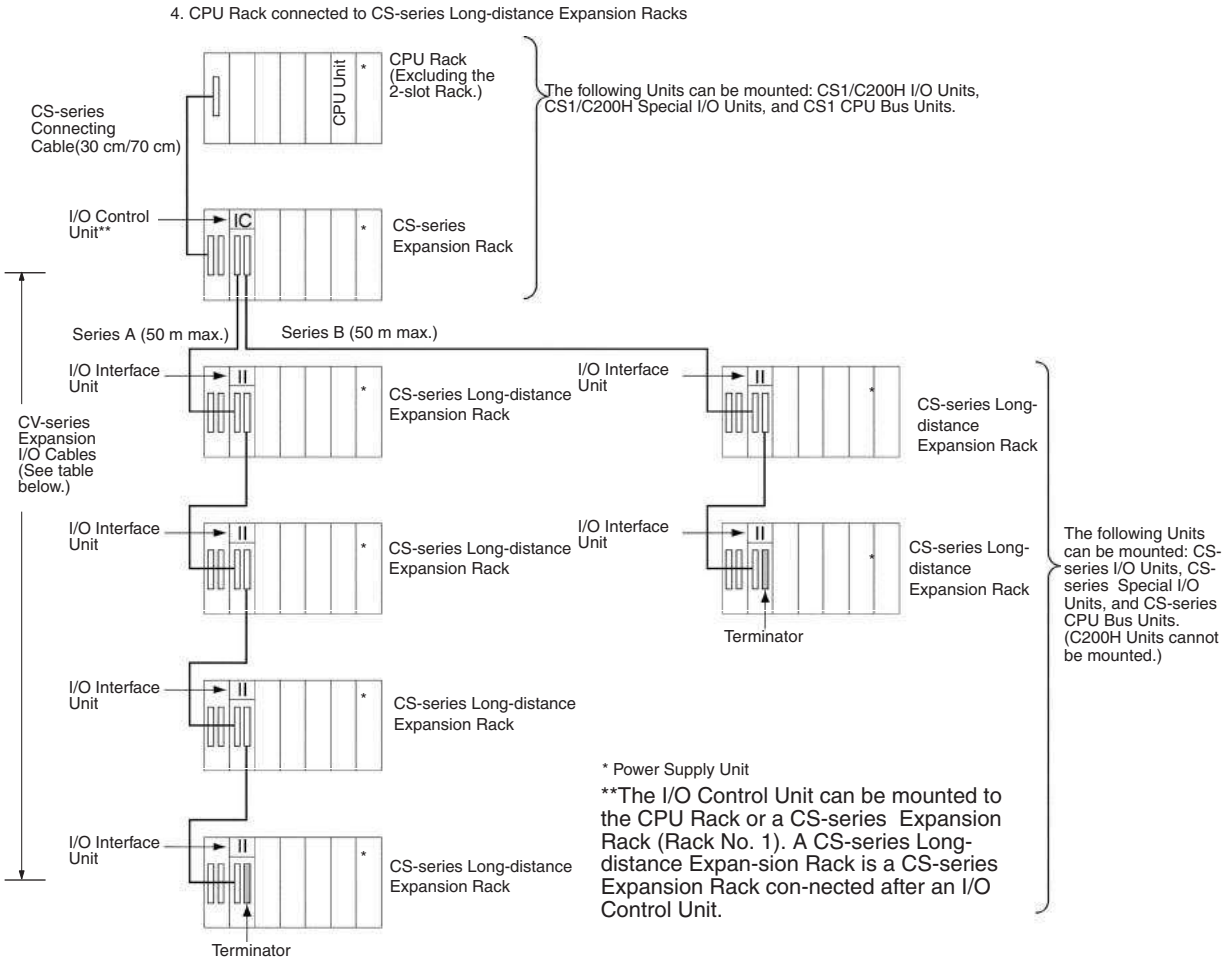
Cable	Length
CS1W-CN311	0.3 m
CS1W-CN711	0.7 m
CS1W-CN221	2 m
CS1W-CN321	3 m
CS1W-CN521	5 m
CS1W-CN131	10 m
CS1W-CN131B2	12 m

Expansion Patterns

The following diagrams show the 4 possible expansion patterns.



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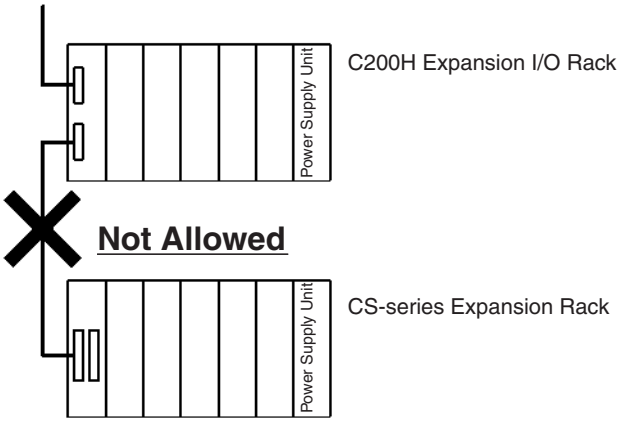


Note The following CV-series Expansion I/O Cables are used to connect to the CS-series Long-distance Expansion Racks (i.e., between the I/O Control Unit and the first I/O Interface Unit and between I/O Interface Units).

Model number	Length
CV500-CN312	0.3 m
CV500-CN612	0.6 m
CV500-CN122	1 m
CV500-CN222	2 m
CV500-CN322	3 m
CV500-CN522	5 m
CV500-CN132	10 m
CV500-CN232	20 m
CV500-CN332	30 m
CV500-CN432	40 m
CV500-CN532	50 m

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Note CS-series Expansion Racks must be connected before C200H Expansion I/O Racks. The following configuration is not allowed.



Maximum Expansion Racks

Expansion pattern	Rack	Maximum No. of Racks	Remarks
CPU Rack with CS-series Expansion Racks	CS-series Expansion Racks	7 Racks	The total cable length must be 12 m or less.
CPU Rack with CS-series Expansion Racks and C200H Expansion I/O Racks	CS-series Expansion Racks and C200H Expansion I/O Racks	7 Racks (with 3 C200H Expansion I/O Racks max.)	
CPU Rack with C200H Expansion I/O Racks	C200H Expansion I/O Racks	3 Racks	
CPU Rack with CS-series Expansion Racks and CS-series Long-distance Expansion Racks	CS-series Expansion Racks and CS-series Long-distance Expansion Racks	7 Racks (with 1 CS-series Expansion Rack max.)	The total cable length must be 0.7 m or less to the last CS-series Expansion Rack. The total cable length must be 50 m or less each for up to two series of CS-series Long-distance Expansion Racks (100 m max. total).

Note C200H Units (C200H Basic I/O Units, C200H Group-2 High-density I/O Units, and C200H Special I/O Units) cannot be used with CS-series-only CPU Racks.

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Rack Configurations

Rack	Configuration		Remarks
Standard CS-series Expansion Racks	CS-series Expansion Backplane		One of each Unit is required. **Note** CS-series Expansion Racks can be connected to C200H Expansion I/O Racks, however, C200H Expansion I/O Racks must be connected after CS-series Expansion Racks.
	Power Supply Unit		
	CPU Backplane or CS-series Expansion Backplane	CS I/O Connecting Cables	
	C200H Expansion I/O Backplane	CS to C200H I/O Connecting Cables	
CS-series-only Expansion Racks	CS-series-only Backplane		One of each Unit is required. **Note** C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.
	Power Supply Unit		
	CPU Backplane or CS-series Expansion Backplane	CS I/O Connecting Cables	
C200H Expansion I/O Racks	C200H Expansion I/O Backplane		One of each Unit is required.
	Power Supply Unit		
	CS-series Expansion Backplane	CS to C200H I/O Connecting Cables	
	C200H Expansion I/O Backplane	C200H I/O Connecting Cables	
CS-series Long-distance Expansion Racks	Mount an I/O Control Unit (CS1W-IC102) to the leftmost slot on the CPU Rack or the last CS-series Expansion Rack. Mount an I/O Interface Unit (CS1W-II102) to the leftmost slot on each Long-distance Expansion Rack. Attach a Terminator (CV500-TER01) to the last Long-distance Expansion Rack in each series. Two Terminators are provided with the I/O Control Unit.		Each I/O Control Unit and I/O Interface Unit requires one slot. These Units are not allocated I/O words. Use CV-series I/O Connecting Cables. A CS-series Expansion Rack cannot be connected to a CS-series Long-distance Expansion Rack using a CS I/O Connecting Cable.

Configuration Device List

Name	Model	Specifications	Cable Length
Standard CS-series Expansion Backplanes	CS1W-BI033	3 slots	Can be used for Long-distance Expansion Racks.
	CS1W-BI053	5 slots	
	CS1W-BI083	8 slots	
	CS1W-BI103	10 slots	
CS-series-only CS-series Expansion Backplanes	CS1W-BI032	3 slots	Can be used for Long-distance Expansion Racks.
	CS1W-BI052	5 slots	
	CS1W-BI082	8 slots	
	CS1W-BI102	10 slots	
C200H Expansion I/O Backplanes	C200HW-BI031	3 slots	Cannot be used for Long-distance Expansion Racks.
	C200HW-BI051	5 slots	
	C200HW-BI081-V1 (See note.)	8 slots	
	C200HW-BI101-V1 (See note.)	10 slots	

Note Using the C200HW-BI081/BI101
The C200HW-BI081 or C200HW-BI101 can be used, but always use the C200HW-BI081-V1 or C200HW-BI101-V1 if you are using the C200HW-PA209R Power Supply.

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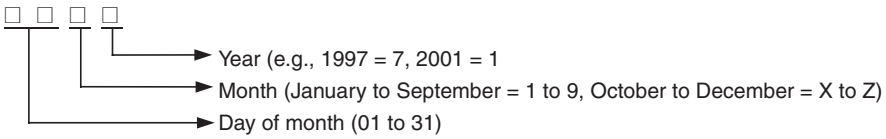
Name	Model	Specifications	Cable Length
Power Supply Units	C200HW-PA204	100 to 240 V AC Output capacity: 4.6 A at 5 V DC	---
	C200HW-PA204C	100 to 240 V AC (with replacement notification) Output capacity: 4.6 A at 5 V DC	
	C200HW-PA204R	100 to 240 V AC (with RUN output) Output capacity: 4.6 A, 5 V DC	
	C200HW-PA204S	100 to 120 V AC or 200 to 240 V AC (with 0.8 A 24 V DC service power supply) Output capacity: 4.6 A at 5 V DC	
	C200HW-PA209R	100 to 120 V AC or 200 to 240 V AC (with RUN output) Output capacity: 9 A at 5 V DC	
	C200HW-PD024	24 V DC	
	C200HW-PD025	24 V DC	
CS I/O Connecting Cables	CS1W-CN313 (See note.)	Connects CS-series Expansion Backplanes to CPU Backplanes or other CS-series Expansion Backplanes.	0.3 m
	CS1W-CN713 (See note.)		0.7 m
	CS1W-CN223		2 m
	CS1W-CN323		3 m
	CS1W-CN523		5 m
	CS1W-CN133		10 m
	CS1W-CN133B2		12 m
CS to C200H I/O Connecting Cables	CS1W-CN311	Connects C200H Expansion I/O Backplanes to CPU Backplanes or CS-series Expansion Backplanes.	0.3 m
	CS1W-CN711		0.7 m
	CS1W-CN221		2 m
	CS1W-CN321		3 m
	CS1W-CN521		5 m
	CS1W-CN131		10 m
	CS1W-CN131B2		12 m
C200H I/O Connecting Cables	C200H-CN311	Connects C200H Expansion I/O Backplanes to other C200H Expansion I/O Backplanes.	0.3 m
	C200H-CN711		0.7 m
	C200H-CN221		2 m
	C200H-CN521		5 m
	C200H-CN131		10 m
I/O Control Unit	CS1W-IC102	Mounts to the leftmost slot on the CPU Rack or a CS-series Expansion Rack to enable connecting CS-series Long-distance Expansion Racks.	---
I/O Interface Unit	CS1W-II102	Mounts to the leftmost slot on an CS-series Long-distance Expansion Rack.	

Note Restrictions in Using CS-series I/O Connecting Cables
When using a CS1W-CN313 or CS1W-CN713 CS-series I/O Connecting Cable with a CS1-H CPU Unit, always use a Cable manufactured on September 20, 2001 or later. Do not use Cables that do not have manufacturing numbers or Cables manufacture earlier than September 20, 2001.

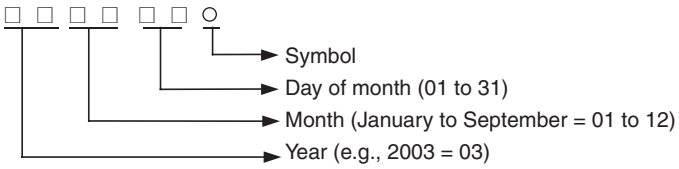
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Manufacturing Number Legend

Four-digit Numbers



Six-digit Numbers



Name	Model	Specifications	Cable Length
CV-series I/O Connecting Cables	CV500-CN312	Connects CS-series Long-distance Expansion Racks.	0.3 m
	CV500-CN612		0.6 m
	CV500-CN122		1 m
	CV500-CN222		2 m
	CV500-CN322		3 m
	CV500-CN522		5 m
	CV500-CN132		10 m
	CV500-CN232		20 m
	CV500-CN332		30 m
	CV500-CN432		40 m
	CV500-CN532		50 m

Connectable Units

The following table shows the Units that can be connected to CPU Racks, CS-series Expansion Racks, and C200H Expansion I/O Racks.
Refer to *2-4 Units* for details on the limitations on each particular Unit.

Unit	CS-series Basic I/O Units	C200H Basic I/O Units	C200H Group-2 High-density I/O Units (Basic I/O Units)	CS-series Special I/O Units	C200H Special I/O Units (See note 2.)	CPU Bus Units (See note 3.)
Standard CPU Rack	Yes	Yes	Yes	Yes	Yes	Yes
CS-series-only CPU Rack	Yes	No	No	Yes	No	Yes
Standard CS-series Expansion Racks	Yes	Yes	Yes	Yes	Yes	Yes
C200H Expansion I/O Racks	No	Yes	Yes	No	Yes	No
CS-series-only Expansion Racks	Yes	No	No	Yes	No	Yes
CS-series Long-distance Expansion Racks	Yes	No	No	Yes	No	Yes (See note 2.)

Note 1. The CS1W-INT01 and C200HS-INT01 Interrupt Input Units are Basic I/O Units, but they can be mounted only to the CPU Rack.

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2. Although CS-series CPU Bus Units can be mounted to CS-series Long-distance Expansion Racks, it is not recommended because doing so will increase the cycle time.

Maximum Number of Units The maximum number of expansion slots is 80, so the maximum number of Units that can be connected is 80. The total number of each type of Unit is not limited in the mounting location.

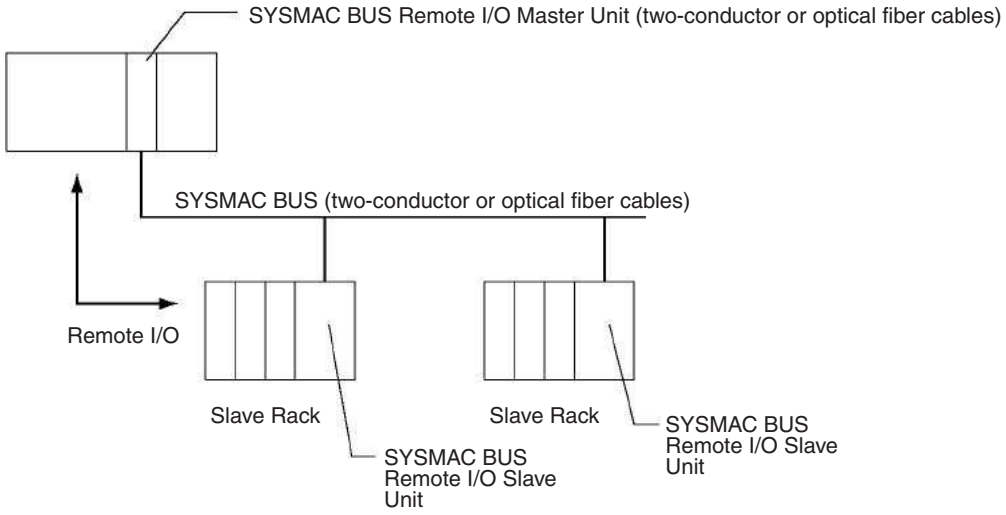
Note
1. CS1W-INT01 and C200HS-INT01 Interrupt Input Units are Basic I/O Units but can be connected to CPU Racks only (four C200HS-INT01 and two CS1W-INT01 Units max. per CPU Rack).
2. Up to 16 C200H Special I/O Units can be mounted.
3. Up to 16 CPU Bus Units can be mounted.

2-3-4 SYSMAC BUS Slave Racks

SYSMAC BUS Slave Racks are used to perform basic CS-series remote I/O communications. The SYSMAC BUS Slave Rack allows comparatively small-scale (512 bits max.) remote I/O communications using Basic I/O Units and Special I/O Units. The Slave Racks are connected using two-core cable or optical fiber cables. Units such as Basic I/O Units and Special I/O Units can be mounted to some Slave Racks. I/O Terminals can also be connected.

Configuration

Rack	Configuration	Remarks
SYSMAC BUS Slave Racks	Backplane	One of each required per Rack.
	Remote I/O Slave Unit	



Maximum No. of Units and Racks

Per CPU Rack		Per Master Unit	Per Slave Rack
Master Units	Slave Racks	Slave Racks	Maximum Units
2 Units max.	8 Racks max.	8 Racks max.	10 Units max. (depending on the Backplane used)

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Configuration Devices

Master Units

Unit	Model	Maximum Units per CPU Unit	Maximum Slave Racks and I/O bits per CPU Unit and Master Unit		Slave Rack communications cables	Transmission distance (total extension)
			Slave Racks	I/O bits		
SYSMAC BUS Wired Remote I/O Master Units	C200H-RM201	2 Units	8	1,280 (80 words)	Two-core cable	200 m
SYSMAC BUS Optical Remote I/O Master Units	C200H-RM001-PV1	2 Units	8	1,280 (80 words)	Optical fiber cable (PCF or APF) (See note.)	PCF: 200 m APF: 20 m

Note PCF: Plastic Clad Optical Fiber Cable
APF: All Plastic Optical Fiber Cable.

Slave Racks

Name	Model	Specifications	Remarks
SYSMAC BUS Slave Rack Backplanes	C200H-BC101-V2	10 Units	---
	C200H-BC081-V2	8 Units	
	C200H-BC051-V2	5 Units	
	C200H-BC031-V2	3 Units	
SYSMAC BUS Wired Remote I/O Master Units	C200H-RT201	Power supply voltage: 100 to 120 V AC or 200 to 240 V AC	Power Supply Unit is not required.
	C200H-RT202	Power supply voltage: 24 V DC	
SYSMAC BUS Optical Remote I/O Master Units	C200H-RT001-P	Power supply voltage: 100 to 120 V AC or 200 to 240 V AC	
	C200H-RT002-P	Power supply voltage: 24 V DC	

Note Words are allocated to Units on SYSMAC BUS Slave Racks from the SYSMAC BUS Area and not from the I/O Bit Area.

Connectable Units

Unit	CS-series Basic I/O Units	C200H Basic I/O Units	C200H Group-2 High-density I/O Units (Basic I/O Units)	CS-series Special I/O Units	C200H Special I/O Units	CPU Bus Units
SYSMAC BUS Wired Slave Racks	No	Yes	No	No	Yes (See note.)	No
SYSMAC BUS Optical Slave Racks	No	Yes	No	No	Yes (See note.)	No

Note

1. C200H DeviceNet Master Units (C200HW-DRM21-V1), CompoBus/S Master Units, PLC Link Units, and SYSMAC BUS Remote I/O Master Units cannot be connected to Wired Slave Racks.
2. Special I/O Unit words (CIO 2000 to CIO 2959) are allocated to C200H Special I/O Units according to unit numbers.
3. Up to a total of 10 C200H Special I/O Units can be mounted to all Slave Racks in a SYSMAC BUS Remote I/O System. Only unit numbers 0 to 9 can be used. The number of C200H Special I/O Units that can be mounted to any one Slave Rack depends on the specific Units that are used, as shown in the following table. For the purpose of calculating the maximum number of Units, Units are classified into four groups, A to D.

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Group	A	B	C	D
Units	High-speed Counter Units, NC111/NC112/NC113/NC213 Position Control Units, ASCII Units, Analog I/O Units, ID Sensor Units, Fuzzy Logic Units	High-density I/O Units, Temperature Controller Units, Heating/Cooling Control Units, PID Control Units, Cam Positioner Units	Temperature Sensor Units, Voice Units	NC211/NC413 Position Control Units, Motion Control Units
Maximum Units in each group for each Slave Rack	4 Units max.	8 Units max.	6 Units max.	2 Units max.
Maximum Units for all groups for each Slave Rack	$3A + B + 2C + 6D \leq 12$ and $A + B + C + D \leq 8$			

Note I/O READ/WRITE instructions (IORD/IOWR) cannot be used with C200H Special I/O Units that are mounted to a Slave Rack.

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2-4 Units

2-4-1 Basic I/O Units

Input Units

CS-series Basic Input Units

Name	Specifications	Model	Number of bits allocated (CIO 0000 to CIO 0319)	Mountable Racks					Reference
				CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks	
AC Input Units	100 to 120 V DC, 100 to 120 V AC 16 inputs	CS1W-IA111	16	Yes	No	Yes	Yes	No	
	200 to 240 V AC, 16 inputs	CS1W-IA211	16	Yes	No	Yes	Yes	No	
DC Input Units	24 V DC, 16 inputs	CS1W-ID211	16	Yes	No	Yes	Yes	No	
Interrupt Input Units	24 V DC, 16 inputs	CS1W-INT01	16	Yes	No	Yes (See note 1.)	Yes (See note 1.)	No	
High-speed Input Units	24 V DC, 16 inputs	CS1W-IDP01	16	Yes	No	Yes	Yes	No	
DC Input Units	24 V DC, 32 inputs	CS1W-ID231	32	Yes	No	Yes	Yes	No	
	24 V DC, 64 inputs	CS1W-ID261	64	Yes	No	Yes	Yes	No	
	24 V DC, 96 inputs	CS1W-ID291	96	Yes	No	Yes	Yes	No	

Note

1. The interrupt function can be used only when the Unit is mounted to the CPU Rack. (The Interrupt Input Unit can be used as a regular I/O Unit on Expansion Racks.)
2. The C200H-ID001 (8 no-voltage contact inputs, NPN) cannot be used with CS-series PLCs.

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C200H Basic Input Units

Name	Specifications	Model	Number of bits allocated (CIO 0000 to CIO 0319)	Mountable Racks					Reference
				CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks	
AC Input Units	100 to 120 V AC, 8 inputs	C200H-IA121	16	Yes	Yes	Yes	No	Yes	*3-6 Basic I/O Units* and *Appendix A Specifications of Basic I/O Units and High-density I/O Units*
	100 to 120 V AC, 16 inputs	C200H-IA122	16	Yes	Yes	Yes	No	Yes	
	100 to 120 V AC, 16 inputs	C200H-IA122V	16	Yes	Yes	Yes	No	Yes	
	200 to 240 V AC, 8 inputs	C200H-IA221	16	Yes	Yes	Yes	No	Yes	
	200 to 240 V AC, 16 inputs	C200H-IA222	16	Yes	Yes	Yes	No	Yes	
	200 to 240 V AC, 16 inputs	C200H-IA222V	16	Yes	Yes	Yes	No	Yes	
AC/DC Input Units	12 to 24 V AC/V DC, 8 inputs	C200H-IM211	16	Yes	Yes	Yes	No	Yes	
	24 V AC/V DC, 16 inputs	C200H-IM212	16	Yes	Yes	Yes	No	Yes	
DC Input Units	12 to 24 V DC, 8 inputs	C200H-ID211	16	Yes	Yes	Yes	No	Yes	
	24 V DC, 16 inputs	C200H-ID212	16	Yes	Yes	Yes	No	Yes	
Interrupt Input Units	12 to 24 V DC, 8 inputs	C200HS-INT01	16	Yes	Yes	Yes (See note 1.)	No	No	

Note

1. The interrupt function can be used only when the Unit is mounted to the CPU Rack. (The Interrupt Input Unit can be used as a regular I/O Unit on Expansion Racks.)
2. The C200H-ID001 (8 no-voltage contact inputs, NPN) cannot be used with CS-series PLCs.
3. C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

C200H High-density Input Units (Group 2)

Name	Specifications	Model	Number of bits allocated (CIO 0000 to CIO 0319)	Mountable Racks					Reference
				CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks	
DC Input Units	24 V DC, 32 inputs	C200H-ID216	32	Yes	Yes	Yes	No	No	
	24 V DC, 32 inputs	C200H-ID218	32	Yes	Yes	Yes	No	No	
	12 V DC, 64 inputs	C200H-ID111	64	Yes	Yes	Yes	No	No	
	24 V DC, 64 inputs	C200H-ID217	64	Yes	Yes	Yes	No	No	
	24 V DC, 64 inputs	C200H-ID219	64	Yes	Yes	Yes	No	No	

Note C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

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Basic Output Units

CS-series Basic Output Units

Name	Specifications	Model	Number of bits allocated (CIO 0000 to CIO 0319)	Mountable Racks					Reference
				CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks	
Relay Output Units	250 V AC/ 24 V DC, 2 A; 120 V DC, 0.1A; 8 points, independent contacts	CS1W-OC201	16	Yes	No	Yes	Yes	No	*3-6 Basic I/O Units* and *Appendix A Specifications of Basic I/O Units and High-density I/O Units*
	250 V AC/24 V DC, 2 A; 120 V DC, 0.1 A; 16 points	CS1W-OC211	16	Yes	No	Yes	Yes	No	
Triac Output Units	250 V AC, 1.2 A, 8 outputs, with fuse burnout detection circuit	CS1W-OA201	16	Yes	No	Yes	Yes	No	
	250 V AC, 0.5 A, 16 outputs	CS1W-OA211	16	Yes	No	Yes	Yes	No	
Transistor Output Units	12 to 24 V DC, 0.5 A, 16 sinking outputs	CS1W-OD211	16	Yes	No	Yes	Yes	No	
	12 to 24 V DC, 0.5 A, 32 sinking outputs	CS1W-OD231	32	Yes	No	Yes	Yes	No	
	12 to 24 V DC, 0.3 A, 64 sinking outputs	CS1W-OD261	64	Yes	No	Yes	Yes	No	
	12 to 24 V DC, 0.1 A, 96 sinking outputs, with fuse burnout detection circuit	CS1W-OD291	96	Yes	No	Yes	Yes	No	
	24 V DC, 0.5 A, 16 sourcing outputs, load short-circuit protection	CS1W-OD212	16	Yes	No	Yes	Yes	No	
	24 V DC, 0.3 A, 32 sourcing outputs, load short-circuit protection	CS1W-OD232	32	Yes	No	Yes	Yes	No	
	24 V DC, 0.3 A, 64 sourcing outputs, load short-circuit protection	CS1W-OD262	64	Yes	No	Yes	Yes	No	
	24 V DC, 0.1 A, 96 sourcing outputs, with fuse burnout detection circuit	CS1W-OD292	96	Yes	No	Yes	Yes	No	

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C200H Basic Output Units

Name	Specifications	Model	Number of bits allocated (CIO 0000 to CIO 0319)	Mountable Racks					Reference
				CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks	
Relay Output Units	250 V AC/24 V DC, 2 A, independent contacts, 5 outputs max.	C200H-OC223	16	Yes	Yes	Yes	No	Yes	
	250 V AC/24 V DC, 2 A, independent contacts, 8 outputs max.	C200H-OC224	16	Yes	Yes	Yes	No	Yes	
	250 V AC/24 V DC, 2 A, independent contacts, 8 outputs max.	C200H-OC224V (no longer manufactured)	16	Yes	Yes	Yes	No	Yes	
	250 V AC/24 V DC, 2 A, independent contacts, 8 outputs max.	C200H-OC224N	16	Yes	Yes	Yes	No	Yes	
	250 V AC/24 V DC, 2 A, 8 outputs max.	C200H-OC221	16	Yes	Yes	Yes	No	Yes	
	250 V AC/24 V DC, 2 A, 12 outputs max.	C200H-OC222	16	Yes	Yes	Yes	No	Yes	
	250 V AC/24 V DC, 2 A, 12 outputs max.	C200H-OC222V (no longer manufactured)	16	Yes	Yes	Yes	No	Yes	
	250 V AC/24 V DC, 2 A, 12 outputs max.	C200H-OC222N	16	Yes	Yes	Yes	No	Yes	
	250 V AC/24 V DC, 2 A, 16 outputs max.	C200H-OC226 (no longer manufactured)	16	Yes	Yes	Yes	No	Yes	
	250 V AC/24 V DC, 2 A, 16 outputs max.	C200H-OC226N	16	Yes	Yes	Yes	No	Yes	
	250 V AC/24 V DC, 2 A, 16 outputs max.	C200H-OC225	16	Yes	Yes	Yes	No	Yes	
Triac Output Units	250 V AC, 1 A, 8 outputs, with fuse burnout detection circuit	C200H-OA221 (no longer manufactured)	16	Yes	Yes	Yes	No	Yes	
	250 V AC, 1.2 A, 8 outputs, with fuse burnout detection circuit	C200H-OA223	16	Yes	Yes	Yes	No	Yes	
	250 V AC, 0.3 A, 12 outputs	C200H-OA222V	16	Yes	Yes	Yes	No	Yes	
	250 V AC, 0.5 A, 12 outputs	C200H-OA224	16	Yes	Yes	Yes	No	Yes	
Transistor Output Units, Sinking	24 V DC, 2.1 A, 8 outputs	C200H-OD213	16	Yes	Yes	Yes	No	Yes	
	12 to 48 V DC, 1 A, 8 outputs	C200H-OD411	16	Yes	Yes	Yes	No	Yes	
	24 V DC, 0.3 A, 12 outputs	C200H-OD211	16	Yes	Yes	Yes	No	Yes	
	24 V DC, 0.3 A, 16 outputs	C200H-OD212	16	Yes	Yes	Yes	No	Yes	

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Name	Specifications	Model	Number of bits allocated (CIO 0000 to CIO 0319)	Mountable Racks					Reference
				CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks	
Transistor Output Units, Sourcing	24 V DC, 0.8 A, 8 outputs, load short-circuit protection.	C200H-OD214	16	Yes	Yes	Yes	No	Yes	
	5 to 24 V DC, 0.3 A, 8 outputs	C200H-OD216	16	Yes	Yes	Yes	No	Yes	
	5 to 24 V DC, 0.3 A, 12 outputs	C200H-OD217	16	Yes	Yes	Yes	No	Yes	
	24 V DC, 1 A, 16 outputs, load short-circuit protection.	C200H-OD21A	16	Yes	Yes	Yes	No	Yes	

Note C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

C200H High-density Group-two Output Units

Name	Specifications	Model	Number of bits allocated (CIO 0000 to CIO 0319)	Mountable Racks					Reference
				CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks	
Transistor Output Units	4.5 V DC/16 mA to 26.4 V/100 mA, 32 sinking outputs	C200H-OD218	32	Yes	Yes	Yes	No	No	
	4.5 V DC/16 mA to 26.4 V/100 mA, 64 sinking outputs	C200H-OD219	64	Yes	Yes	Yes	No	No	
	24 V DC, 0.5 A, 32 outputs, sourcing outputs, load short-circuit protection	C200H-OD21B	32	Yes	Yes	Yes	No	No	

Note C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

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Mixed I/O Units

CS-series Basic I/O Units

Name	Specifications	Model	Number of bits allocated (CIO 0000 to CIO 0319)	Mountable Racks					Reference
				CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks	
DC Input/ Transistor Output Units	24 V DC, 32 inputs 12 to 24 V DC, 0.3 A, 32 sinking outputs	CS1W-MD261	64-point I/O	Yes	No	Yes	Yes	No	*3-6 Basic I/O Units* and *Appendix A Specifications of Basic I/O Units and High-density I/O Units*
	24 V DC, 48 inputs 12 to 24 V DC, 0.1 A, 48 sinking outputs, with fuse burnout detection circuit	CS1W-MD291	96-point I/O	Yes	No	Yes	Yes	No	
	24 V DC, 32 inputs 24 V DC, 0.3 A, 32 sourcing outputs, load short-circuit protection.	CS1W-MD262	64-point I/O	Yes	No	Yes	Yes	No	
	24 V DC, 48 inputs 12 to 24 V DC, 0.1 A, 48 sourcing outputs, with fuse burnout detection circuit	CS1W-MD292	96-point I/O	Yes	No	Yes	Yes	No	
TTL I/O Units	5 V DC, 3.5 mA, 32 inputs 5 V DC, 35 mA, 32 outputs	CS1W-MD561	64-point I/O	Yes	No	Yes	Yes	No	

B7A Interface Units

CS-series Basic I/O Units

Name	Specifications	Model	Number of bits allocated (CIO 0000 to CIO 0319)	Mountable Racks					Reference
				CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks	
B7A Input Units	32 inputs	CS1W-B7A12	32	Yes	No	Yes	Yes	No	*3-8 B7A Interface Units*
B7A Output Units	32 outputs	CS1W-B7A02	32	Yes	No	Yes	Yes	No	
B7A Input/ Output Units	16 inputs/ 16 outputs	CS1W-B7A21	32-point I/O	Yes	No	Yes	Yes	No	
	32 inputs/ 32 outputs	CS1W-B7A22	64-point I/O	Yes	No	Yes	Yes	No	

C200H Basic I/O Units

Name	Specifications	Model	Number of bits allocated (CIO 0000 to CIO 0319)	Mountable Racks					Reference
				CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks	
B7A Input Units	16 inputs	C200H-B7AI1	16	Yes	Yes	Yes	No	Yes	*3-8 B7A Interface Units*
B7A Output Units	16 outputs	C200H-B7AO1	16	Yes	Yes	Yes	No	Yes	

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Note C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

C200H High-density I/O Units (Group 2)

Name	Specifications	Model	Number of bits allocated (CIO 0000 to CIO 0319)	Mountable Racks					Reference
				CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks	
B7A Input Units	32 inputs	C200H-B7A12	32	Yes	Yes	Yes	No	No	*3-8 B7A Interface Units*
B7A Output Units	32 outputs	C200H-B7A02	32	Yes	Yes	Yes	No	No	
B7A I/O Units	16 inputs, 16outputs	C200H-B7A21	32-point I/O	Yes	Yes	Yes	No	No	
	32 inputs, 32outputs	C200H-B7A22	64-point I/O	Yes	Yes	Yes	No	No	

Note C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

Analog Timer Unit

C200H Basic Unit

Name	Specifications	Model	Number of bits allocated (CIO 0000 to CIO 0319)	Mountable Racks					Reference
				CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks	
Analog Timer Units	4-point timer	C200H-TM001	16 points	Yes	Yes	Yes	No	Yes	*3-9 Analog Timer Units*

Note C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

2-4-2 Special I/O Units

CS-series Special I/O Units

Name	Specifications	Model	Number of words allocated (CIO 2000 to CIO 2959)	Number of words allocated (D20000 to D29599)	Mountable Racks					Unit No.	Reference
					CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks		
Analog I/O Unit	4 inputs (4 to 20 mA, 1 to 5 V, etc.) 4 outputs (1 to 5 V, 0 to 10 V, etc.)	CS1W-MAD44	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	W345
Analog Input Unit	4 inputs (4 to 20 mA, 1 to 5 V, etc.)	CS1W-AD041-V1	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
	8 inputs (4 to 20 mA, 1 to 5 V, etc.)	CS1W-AD081-V1	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
	16 inputs (4 to 20 mA, 1 to 5 V, etc.)	CS1W-AD161	20 words	200 words	Yes	No	Yes	Yes	No	0 to 95 (See note.)	
Analog Output Unit	4 outputs (1 to 5 V, 4 to 20 mA, etc.)	CS1W-DA041	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
	8 outputs (1 to 5 V, etc.)	CS1W-DA08V	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
	8 outputs (4 to 20 mA)	CS1W-DA08C	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	

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Name	Specifications	Model	Number of words allocated (CIO 2000 to CIO 2959)	Number of words allocated (D20000 to D29599)	Mountable Racks					Unit No.	Reference
					CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks		
Isolated Thermocouple Input Unit	4 inputs (D, E, J, K, N, R, S, T, or ±80 mV DC)	CS1W-PTS01-V1	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	W368
High-resolution Isolated Thermocouple Input Unit	4 inputs (B, E, J, K, L, N, R, S, T, U, WRe5-26, PL II, or mV)	CS1W-PTS11	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
Isolated Resistance Thermometer Input Unit	4 inputs (Pt100, JPt100)	CS1W-PTS02	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
Isolated Ni508.4Ω Resistance Thermometer Input Unit	4 inputs (Ni508.4Ω)	CS1W-PTS03	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
High-resolution Isolated Resistance Thermometer Input Unit	4 inputs (Pt100, JPt100, Pt50, or Ni508.4 Ω)	CS1W-PTS12	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
Isolated 2-wire Transmission Device Input Unit	4 inputs (1 to 5 V, 4 to 20 mA) 2-wire transmission device power supply built in	CS1W-PTW01	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
Isolated DC Input Unit	4 inputs (1 to 5 V, 4 to 20 mA, etc.)	CS1W-PDC01	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
High-resolution Isolated DC Input Unit	4 inputs (1 to 5 V, 4 to 20 mA, etc.)	CS1W-PDC11	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
Isolated Control Output Unit (Analog Output Unit)	4 outputs (1 to 5 V, 4 to 20 mA)	CS1W-PMV01	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
Isolated Control Output Unit (Analog Output Unit, advanced type)	4 outputs (–10 to 10 V, –1 to 1 V: 1/16,000 resolution; 0 to 10 V, 0 to 5 V, 0 to 1 V: 1/8,000 resolution; 0 to 5 V: 1/4,000 resolution)	CS1W-PMV02	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
Power Transducer Input Unit	8 inputs (–1 to 1 mA, 0 to 1 mA)	CS1W-PTR01	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
DC Input Unit (100 mA)	8 inputs (–100 to 100 mV, 0 to 100 mV)	CS1W-PTR02	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
Isolated Pulse Input Unit	4 pulse inputs (0 to 20 kpulses/s, 0 to 20 pulses/s)	CS1W-PPS01	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	

Note Allocated two unit numbers.

Name	Specifications	Model	Number of words allocated (CIO 2000 to CIO 2959)	Number of words allocated (D20000 to D29599)	Mountable Racks					Unit No.	Reference
					CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks		
Position Control Units	Pulse output, 1 axis, 1 to 500 kpulses/s, open-collector output	CS1W-NC113	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	W376
	Pulse output, 1 axis, 1 to 500 kpulses/s, line-driver output	CS1W-NC133	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
	Pulse outputs, 2 axes, 1 to 500 kpulses/s, open-collector outputs	CS1W-NC213	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
	Pulse outputs, 2 axes, 1 to 500 kpulses/s, line-driver outputs	CS1W-NC233	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	
	Pulse outputs, 4 axes, 1 to 500 kpulses/s, open-collector outputs	CS1W-NC413	20 words	200 words	Yes	No	Yes	Yes	No	0 to 95 (See note 1.)	
	Pulse output, 4 axes, 1 to 500 kpulses/s, line-driver outputs	CS1W-NC433	20 words	200 words	Yes	No	Yes	Yes	No	0 to 95 (See note 1.)	
Motion Control Units	Two axes, analog output for each axis, supports G-language	CS1W-MC221-V1	30 words	None	Yes	No	Yes	Yes	No	0 to 95 (See note 2.)	W359
	Four axes, analog output for each axis, supports G-language	CS1W-MC421-V1	50 words	None	Yes	No	Yes	Yes	No	0 to 95 (See note 3.)	

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Name	Specifications	Model	Number of words allocated (CIO 2000 to CIO 2959)	Number of words allocated (D20000 to D29599)	Mountable Racks					Unit No.	Reference
					CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks		
Customizable Counter Unit	4 Kwords, 12 contact inputs, 8 contact outputs	CS1W-HIO01	10 words	100 words (90 for general data exchange)	Yes	No	Yes	Yes	No	0 to 95	W384
	4 Kwords, 12 contact inputs, 8 contact outputs, 2 pulse inputs, 2 pulse outputs	CS1W-HCP22	10 words		Yes	No	Yes	Yes	No	0 to 95	
	4 Kwords, 12 contact inputs, 8 contact outputs, 1 pulse input, 1 analog input, 2 analog outputs	CS1W-HCA12-V1	10 words		Yes	No	Yes	Yes	No	0 to 95	
	4 Kwords, 12 contact inputs, 8 contact outputs, 2 pulse inputs, 2 analog outputs	CS1W-HCA22	10 words		Yes	No	Yes	Yes	No	0 to 95	
High-speed Counter Unit	Pulse inputs for two axes, counting rate: 500 kcps max., line driver compatible	CS1W-CT021	40 words	400 words	Yes	No	Yes	Yes	No	0 to 95 (Allocated words for 4 unit numbers.)	W902
	Pulse inputs for four axes, counting rate: 500 kcps max., line driver compatible	CS1W-CT041	40 words	400 words	Yes	No	Yes	Yes	No	0 to 95 (Allocated words for 4 unit numbers.)	
GP-IB Interface Unit	Conforms to IEEE-488-1978.	CS1W-GPI01	10 words	100 words	Yes	No	Yes	Yes	No	0 to 95	W410
CompoNet Master Unit	CompoNet remote I/O	CS1W-CRM21			Yes	No	Yes	Yes	No		W456
	Communications mode No. 0: 128 inputs/128 outputs for Word Slaves		20 words	None						0 to 95 (Allocated words for 2 unit numbers.)	
	Communications mode No. 1: 256 inputs/256 outputs for Word Slaves		40 words	None						0 to 95 (Allocated words for 4 unit numbers.)	
	Communications mode No. 2: 512 inputs/512 outputs for Word Slaves		80 words	None						0 to 95 (Allocated words for 8 unit numbers.)	
	Communications mode No. 3: 256 inputs/256 outputs for Word Slaves and 128 inputs/128 outputs for Bit Slaves		80 words	None						0 to 95 (Allocated words for 8 unit numbers.)	
	Communications mode No. 8: 1,024 inputs/1,024 outputs for Word Slaves and 256 inputs/256 outputs for Bit Slaves maximum		10 words	Depends on setting						0 to 95 (Allocated words for 1 unit numbers.)	

Note
1. Allocated two unit numbers.
2. Allocated three unit numbers.
3. Allocated five unit numbers.

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C200H Special I/O Units

C200H High-density I/O Units

Note
1. Functionally, these Units are I/O Units, but are categorized as Special I/O Units.
2. C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

Name	Specifications	Model	Number of words allocated (CIO 2000 to CIO 2959)	Number of words allocated (D20000 to D29599)	Mountable Racks					Unit No.	Reference
					CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks		
DC Input Units	24 V DC, 32 inputs	C200H-ID215	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	*3-7 C200H High-density I/O Units (Special I/O Units)* and *Appendix A Specifications of Basic I/O Units and High-density I/O Units*
TTL Input Units	5 V DC, 32 inputs	C200H-ID501	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
Transistor Output Units	24 V DC, 32 sinking outputs	C200H-OD215	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
TTL Output Units	5 V DC, 32 sinking outputs	C200H-OD501	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
TTL I/O Units	5 V DC, 16 inputs, 16 sinking outputs	C200H-MD501	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
DC Input/Transistor Output Units	24 V DC, 16 inputs, 16 sinking outputs	C200H-MD215	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
	12 V DC, 16 inputs, 16 sinking outputs	C200H-MD115	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	

C200H Special I/O Units

Note C200H Units and Racks cannot be used with CS-series-only CPU Racks or Expansion Racks.

Name	Specifications	Model	Number of words allocated (CIO 2000 to CIO 2959)	Number of words allocated (D20000 to D29599)	Mountable Racks					Unit No.	Reference
					CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks		
Temperature Control Units	Thermocouple input, time-proportioning PID, or ON/OFF transistor output	C200H-TC001	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	W225
	Thermocouple input, time-proportioning PID, or ON/OFF voltage output	C200H-TC002	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
	Thermocouple input, PID current output	C200H-TC003	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
	Temperature-resistance thermometer input, time-proportioning PID, or ON/OFF transistor output	C200H-TC101	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
	Temperature-resistance thermometer input, time-proportioning PID, or ON/OFF voltage output	C200H-TC102	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
	Temperature-resistance thermometer input, PID current output	C200H-TC103	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	

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Name	Specifications	Model	Number of words allocated (CIO 2000 to CIO 2959)	Number of words allocated (D20000 to D29599)	Mountable Racks					Unit No.	Reference
					CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks		
Heat/Cool Temperature Control Units	Thermocouple input, time-proportioning PID, or ON/OFF transistor output	C200H-TV001	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	W240
	Thermocouple input, time-proportioning PID, or ON/OFF voltage output	C200H-TV002	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
	Thermocouple input, PID current output	C200H-TV003	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
	Temperature-resistance thermometer input, time-proportioning PID, or ON/OFF transistor output	C200H-TV101	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
	Temperature-resistance thermometer input, time-proportioning PID, or ON/OFF voltage output	C200H-TV102	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
	Temperature-resistance thermometer input, PID current output	C200H-TV103	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
Temperature Sensor Units	Thermocouple input, K(CA) or J(IC), selectable	C200H-TS001	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	W124
		C200H-TS002	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
	Temperature-resistance thermometer, JPt 100 Ω	C200H-TS101	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
	Temperature-resistance thermometer, Pt 100 Ω	C200H-TS102	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
PID Control Units	Voltage output/current input, time-proportioning PID, or ON/OFF transistor output	C200H-PID01	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	W241
	Voltage output/current input, time-proportioning PID, or ON/OFF voltage output	C200H-PID02	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
	Voltage output/current input, PID current output	C200H-PID03	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
Cam Positioner Units	48 cam outputs (16 external outputs and 32 internal outputs) Resolver speed: 20 μs (5 kHz)	C200H-CP114	10 words	11 words	Yes	Yes	Yes	No	Yes	0 to 9	W224
ASCII Units	24-Kbyte RAM	C200H-ASC02	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	W165
	200-Kbyte RAM, 2 RS-232C ports	C200H-ASC11	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to F	W306
	200-Kbyte RAM, RS-232C port, RS-422/485 port	C200H-ASC21	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to F	
	200-Kbyte RAM, 3 RS-232C ports	C200H-ASC31	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to F	
Analog Input Units	4 to 20 mA, 1 to 5/0 to 10 V (selectable), 4 inputs, 1/4,000 resolution	C200H-AD001	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to 9	W229
	4 to 20 mA, 1 to 5/0 to 10 V/–10 to +10 V (selectable); 8 inputs; 1/4,000 resolution	C200H-AD002	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to F	
	4 to 20 mA, 1 to 5/0 to 10 V/–10 to +10 V (selectable); 8 inputs; 1/4,000 resolution	C200H-AD003	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to F	W345
Analog Output Units	4 to 20 mA, 1 to 5/0 to 10 V (selectable); 2 outputs; 1/4,000 resolution	C200H-DA001	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to 9	W229
	4 to 20 mA, –10 to +10 V (selectable), 4 outputs	C200H-DA002	10 words	None	Yes	Yes	Yes	No	Yes	0 to F	
	1 to 5 V, 0 to 10 V, –10 to +10 V (selectable), 8 outputs; 1/4,000 resolution	C200H-DA003	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to F	W325
	4 to 20 mA, 8 outputs; 1/4,000 resolution	C200H-DA004	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to F	
Analog I/O Units	2 inputs (4 to 20 mA, 1 to 5 V, etc.) 2 outputs (4 to 20 mA, 1 to 5 V, etc.)	C200H-MAD01	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to F	

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Name	Specifications	Model	Number of words allocated (CIO 2000 to CIO 2959)	Number of words allocated (D20000 to D29599)	Mountable Racks					Unit No.	Reference
					CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks		
High-speed Counter Units	One-axis pulse input, counting rate: 50 kcps max.	C200H-CT001-V1	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to 9	W141
	One-axis pulse input, counting rate: 75 kcps max., line driver compatible	C200H-CT002	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to 9	
	Two-axis pulse input, counting rate: 75 kcps max., line driver compatible	C200H-CT021	20 words	100 words	Yes	Yes	Yes	No	Yes	0 to F	W311
Motion Control Units	G-language programmable, two-axis analog outputs	C200H-MC221	20 words	100 words (Uses first 2 words.)	Yes	Yes	Yes	No	Yes	0 to F	W315 W314
Position Control Units	Two axes, pulse output for each axis, speeds: 1 to 250,000 pps, directly connects to servomotor driver	C200H-NC211	20 words	200 words	Yes	Yes	Yes	No	Yes	0 to 9	W166
	One axis, pulse output, speed: 1 to 99,990 pps	C200H-NC111	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to 9	W137
	One axis, pulse output, speeds 1 to 250,000 pps, directly connects to servomotor driver, line driver compatible (Z level)	C200H-NC112	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to 9	W128
	One axis, pulse output, speeds 1 to 500,000 pps, directly connects to servomotor driver	C200HW-NC113	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to F	W334
	Two axes, pulse output for each axis, speeds 1 to 500,000 pps, directly connects to servomotor driver	C200HW-NC213	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to F	
	Four axes, pulse output for each axis, speeds 1 to 500,000 pps, directly connects to servomotor driver	C200HW-NC413	20 words	200 words	Yes	Yes	Yes	No	Yes	0 to F	
ID Sensor Units	Electromagnetic coupling	C200H-IDS01-V1	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	W153
	Microwave type	C200H-IDS21	10 words	None	Yes	Yes	Yes	No	Yes	0 to 9	
Voice Unit (See note 6.)	Adaptive differential pulse-code modulation	C200H-OV001	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to 9	W172
Fuzzy Logic Unit	8 inputs, 4 outputs	C200H-FZ001	10 words	100 words	Yes	Yes	Yes	No	Yes	0 to 9	W208
JPCN-1 Unit	Settable as master or slave	C200H-JRM21	10 words	100 words	Yes	Yes	Yes	No	No	0 to F	---
DeviceNet Master Units	DeviceNet Remote I/O, 1,600 bits max.	C200HW-DRM21-V1	(See note 1.)	None	Yes	Yes	Yes	No	No	0 to F	W347
C200H I/O Link Units	DeviceNet Slave, 512 inputs/512 outputs max.	C200HW-DRT21	10 words	None	Yes	Yes	Yes	No	No	0 to F	W347
CompoBus/S Master Units	CompoBus/S Remote I/O, 256 bits max.	C200HW-SRM21-V1	10 words or 20 words	None	Yes	Yes	Yes	No	No	0 to F	W266
PLC Link Units	PLC Link, single level: 32 units, multilevel: 16 Units	C200H-LK401	(See note 2.)	None	Yes	Yes	Yes	No	No	0 to 9	W135
SYSMAC BUS Remote I/O Master Units	Wired	C200H-RM201	(See note 3.)	---	Yes	Yes	Yes	No	No	0 to 3	W120
	Optical	C200H-RM001-PV1		---	Yes	Yes	Yes	No	No	0 to 3	W136

Note

1. The DeviceNet Slaves are allocated up to 1,600 I/O bits (100 words) in the DeviceNet Area.
2. PLC Link Units are allocated up to 1,024 bits (64 words) in the Link Area.
3. Each Slave Rack connected to a Remote I/O Master Unit is allocated 10 words in the SYSMAC BUS Area.
   Each I/O Terminal is allocated 1 word in the I/O Terminal Area.
4. The C200HW-CLK21 Controller Link Unit (C200HX/HG/HE) cannot be used. Use the CS1W-CLK21(-V1) or CS1W-CLK23 Controller Link Unit (CS-series CPU Bus Unit). Data links and message services are supported between C200HX/HG/HE and CS-series PLCs.

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5. The C200H-LK□□□-□□ Host Link Unit (C200H, C200HS, C200HX/HG/HE) cannot be used. Use the CS1W-SCU21 Serial Communications Unit (CS-series CPU Bus Unit).
6. Observe the following precautions when using the C200H-OV001 Voice Unit.
   - The Voice Unit cannot be used if an OMRON Programmable Terminal (PT) set for NT Link Mode is connected to the peripheral port or RS-232C port on the CPU Unit.
   - When using both a Voice Unit and an OMRON PT, connect the PT to a CS1W-SCB□□□ Serial Communications Board or to a CS1W-SCU□□□ Serial Communications Unit.
   - When a Voice Unit is mounted, set to baud rate for the peripheral port or RS-232C port on the CPU Unit to 9,600 bps or less when communicating with a computer or other external device.

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2-4-3 CS-series CPU Bus Units

Name	Specifications		Model	Number of words allocated CIO 1500 to CIO 1899	Number of words allocated D30000 to D31599	CPU Bus Unit System Settings	Mountable Racks					Unit No.	Reference
							CPU Rack	C200H Expansion I/O Racks	CS-series Expansion Racks	CS-series Long-distance Expansion Racks	SYSMAC BUS Slave Racks		
Controller Link Units	Wired		CS1W-CLK21-V1, CS1W-CLK23	25 words	100 words	Used (data link tables)	Yes	No	Yes	Yes	No	0 to F (See note 1.)	W309
	Optical ring, H-PCF cable		CS1W-CLK12-V1, CS1W-CLK13	25 words	100 words	Used (data link tables)	Yes	No	Yes	Yes	No		---
	Optical ring, GI cable		CS1W-CLK52-V1, CS1W-CLK53	25 words	100 words	Used (data link tables)	Yes	No	Yes	Yes	No		
SYSMAC LINK Units	Coaxial		CS1W-SLK21	25 words	100 words	Used (data link tables)	Yes	No	Yes	Yes	No	0 to F (See note 2.)	W367
	Optical		CS1W-SLK11	25 words	100 words	Used (data link tables)	Yes	No	Yes	Yes	No		
Serial Communications Unit	Two RS-232C Ports		CS1W-SCU21-V1	25 words	20 words	Not used	Yes	No	Yes	Yes	No	0 to F	W336
	Two RS-422A/ 485 Ports		CS1W-SCU31-V1	25 words	20 words	Not used	Yes	No	Yes	Yes	No		
Ethernet Unit	10Base-5		CS1W-ETN01	25 words	100 words	Used	Yes	No	Yes	Yes	No	0 to F (See note 2.)	W343
	100Base-TX (Can be used as 10Base-T.)		CS1W-ETN21	25 words	100 words	Used	Yes	No	Yes	Yes	No	0 to F (See note 2.)	W420 W421
EtherNet/IP Unit	Tag data links, FINS communications, CIP message communications, FTP server, etc.		CS1W-EIP21	25 words	100 words	Not used	Yes	No	Yes	Yes	No	0 to F (8 Units max.)	W465
FL-net Unit	100Base-TX cyclic transmissions and message transmissions		CS1W-FLN22	25 words	100 words	Used	Yes	No	Yes	Yes	No	0 to F (See note 2.)	W440
DeviceNet Unit	DeviceNet remote I/O 2,048 pt, user settings without Configurator		CS1W-DRM21-V1	25 words	100 words	Not used	Yes	No	Yes	Yes	No	0 to F	W380
PROFIBUS-DP Master Unit	PROFIBUS-DP remote I/O 7,168 words		CS1W-PRM21	25 words	100 words	Not used	Yes	No	Yes	Yes	No	0 to F	W409
Loop Control Unit	PID operations: 32 max. Loop, process operations: 250 max.		CS1W-LC001	25 words	None	Not used	Yes	No	No	No	No	0 to F (See note 3.)	W374 W375
Position Control Units supporting MECHATROLINK-II communications	MECHATROLINK-II, 16 axes max.		CS1W-NCF71	25 words	None	Not used	Yes	No	Yes	Yes	No	0 to F	W426
High-resolution Motion Control Unit	MECHATROLINK II, Real axes: 30, Virtual axes: 2, Special motion control language		CS1W-MCH71	25 words	100 words	Not used	Yes	No	Yes	Yes	No	0 to F	---
SYSMAC SPU Unit (High-speed Storage and Processing Unit)	One CF card type I/II slot (used with OMRON HMC-EF□□□ Memory Card)	One Ethernet port	CS1W-SPU01	Not used	Not used	Not used	Yes	No	Yes	Yes	No	0 to F	W229
		Two Ethernet ports	CS1W-SPU02	Not used	Not used	Not used							

Note

1. A maximum of eight Units can be mounted.
2. A maximum of four Units can be mounted.
3. A maximum of three Units can be mounted.
4. Some CPU Bus Units are allocated words in the CPU Bus Unit Setting Area. The system must be designed so that the number of words allocated in the CPU Bus Unit Setting Area does not exceed its capacity. Refer to *2-7 CPU Bus Unit Setting Area Capacity* for details.

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2-5 Expanded System Configuration

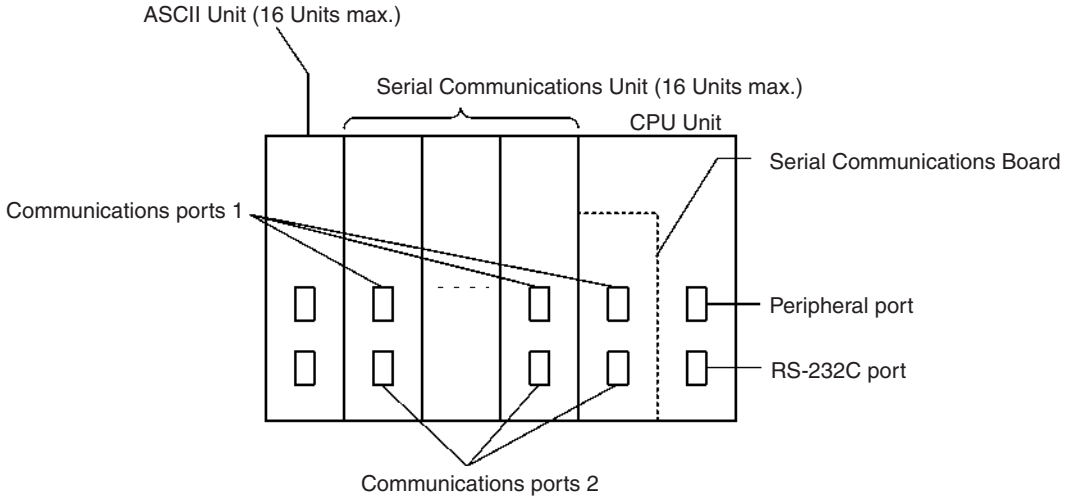
2-5-1 Serial Communications System

The CS-series system configuration can be expanded by using the following serial communications ports.

- CPU Unit built-in ports × 2 (peripheral port and RS-232C port)
- Serial Communications Board ports × 2 (RS-232C or RS-422/485)
- Serial Communications Unit ports × 2 (RS-232C)
- ASCII Unit ports × 2 (RS-232C or RS-422/485)

1,2,3...

1. If the CPU Unit built-in ports, the Serial Communications Board ports, or Serial Communications Unit ports are used, words can be allocated to various protocols, such as Host Link and protocol macro.
2. Up to 16 Serial Communications Units and 16 ASCII Units can be connected to one CPU Unit. The system configuration can then be expanded by connecting devices with RS-232C or RS-422/485 ports, such as Temperature Sensor Units, Bar Code Readers, ID Systems, personal computers, Board Computers, Racks, and other companies' PLCs.

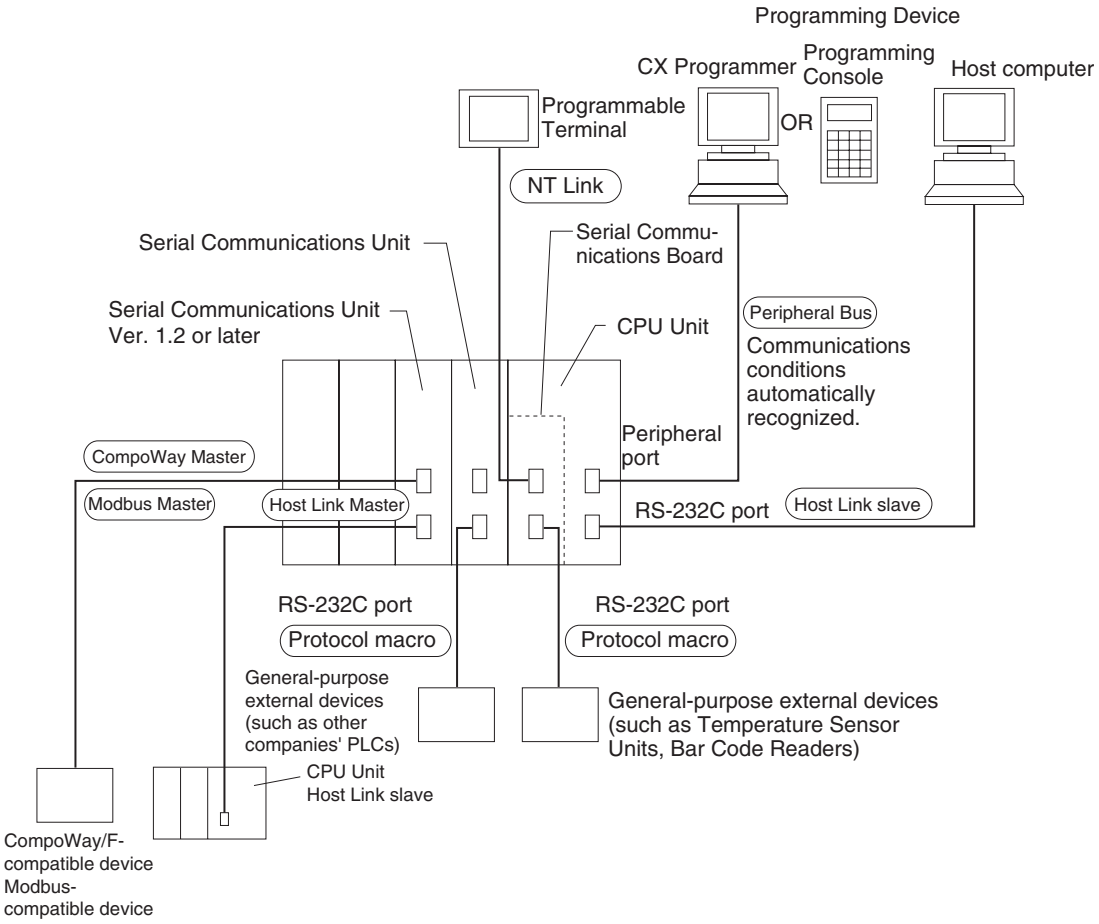


Expanding the system configuration as shown above allows a greater number of serial communications ports, and greater flexible and simpler support for different protocols.

3. The Serial Gateway is supported for CPU Units with unit version 3.0 or later and Serial Communications Boards/Units with unit version 1.2 or later.
   - CPU Units with unit version 3.0 or later: Gateway from FINS network to serial communications (CompoWay/F only) is possible through the peripheral port and RS-232C port.
   - Serial Communications Boards/Units with unit version 1.2 or later: Gateway from FINS network to serial network (CompoWay/F, Modbus, or Host Link) is possible. Using a Gateway to Host Link enables Host Links with the PLC as master.

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System Configuration Example



Refer to page 127 for a table showing which communications protocols are supported by each Unit.

2-5-2 Systems

The serial communications port mode (protocol) can be switched in the CPU Unit's PLC Setup. Depending on the protocol selected, the following systems can be configured.

Protocols

The following protocols support serial communications.

Protocol	Main connection	Use	Applicable commands, communications instructions
Host Link (SYSMAC WAY) slave	Personal computer OMRON Programmable Terminals	Communications between the Host computer and the PLC. Commands can be sent to a computer from the PLC.	Host Link commands/ FINS commands. Commands can be sent to a computer from the PLC.
No-protocol (customer) communications	General-purpose external devices	No-protocol communications with general-purpose devices.	TXD(236), RXD(235), TXDU(256), RXDU(255)
NT Links (1: N)	OMRON Programmable Terminals	High-speed communications with Programmable Terminals via direct access.	None

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Protocol	Main connection	Use	Applicable commands, communications instructions
Peripheral bus (See note 1.)	Programming Devices CX-Programmer	Communications between Programming Devices and the PLC from the computer.	None
Protocol macro (See note 2.)	General-purpose external devices	Sending and receiving messages (communications frames) according to the communications specifications of external devices. (SYSMAC-PST is used to create protocols by setting various parameters.)	PMCR(260) instruction
General-purpose (BASIC languages) (See note 3.)	General-purpose external devices	Free communications with general-purpose external devices using BASIC commands.	BASIC program
Serial Gateway	OMRON Component PLC	Converts FINS commands that are received into CompoWay/F, Modbus, or Host Link protocols, and then transmits the converted command to the serial line.	
CompoWay/F Master (See note 4.)	CompoWay/F slave	Converts FINS commands (encapsulated CompoWay/F commands) received at the serial port into CompoWay/F commands.	FINS command 2803 hex received (including sending FINS command using CMND(490))
Modbus Master (See note 5.)	Modbus slave	Converts FINS commands (encapsulated Modbus commands) received at the serial port into Modbus commands.	FINS command 2804 hex or 2805 hex received (including sending FINS command using CMND(490))
Host Link FINS (SYSWAY) Master (See note 5.)	Host Link FINS (SYSWAY) slave (PLC)	Converts FINS commands into FINS commands encapsulated in Host Link	Any FINS command received except those sent to serial port (including sending FINS command using CMND(490))

Note

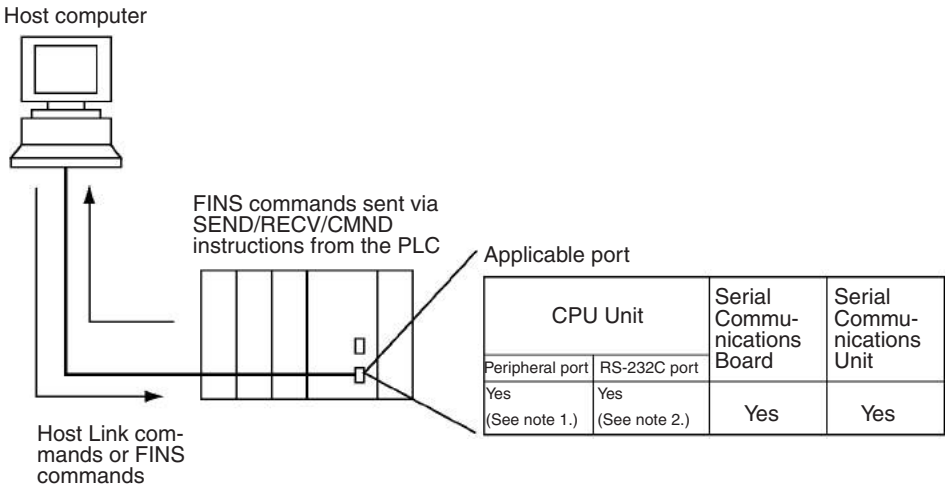
1. The peripheral bus mode is used for Programming Devices excluding Programming Console. If Programming Console is to be used, set pin 4 of the DIP switch on the front panel of the Unit to OFF so that the default peripheral port communications parameters are used instead of those specified in the PLC Setup.
2. Serial Communications Unit or Serial Communications Board required.
3. ASCII Unit required.
4. CPU Unit with version 3.0 or later (peripheral port and RS-232C port) and Serial Communications Board/Unit with unit version 1.2 or later only.
5. Serial Communications Board/Unit with unit version 1.2 or later only.

Host Link System (SYSWAY 1:N Mode) (Slave)

The Host Link System allows the I/O memory of the PLC to be read/written, and the operating mode to be changed from a Host computer (personal computer or Programmable Terminal) by executing Host Link commands or FINS commands that are preceded by a header and followed by a terminator. Alternatively, FINS commands (preceded by a header and followed by a termina-

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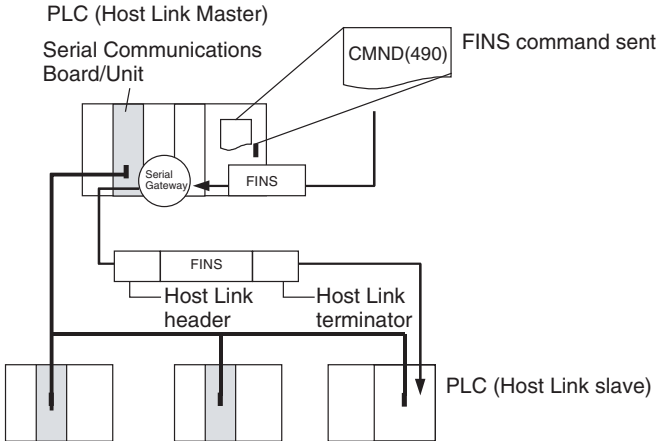
tor) can be sent to a computer connected via the Host Link System by executing Network Communications Instructions (SEND(090), RECV(098), and CMND(490)) from the CPU Unit.



CPU Unit		Serial Communications Board	Serial Communications Unit
Peripheral port	RS-232C port		
Yes (See note 1.)	Yes (See note 2.)	Yes	Yes

Note

1. Set pin 4 of the DIP switch on the front panel of the CPU Unit to ON, and set the serial communications mode in the PLC Setup to Host Link.
2. Set pin 5 of the DIP switch on the front panel of the CPU Unit to OFF, and set the serial communications mode in the PLC Setup to Host Link.
3. Host Link master functions can be performed by sending the CMND(490) instruction via the Serial Gateway when using Serial Communications Boards/Units with unit version 1.2 or later.



No-protocol (Custom) Communications System

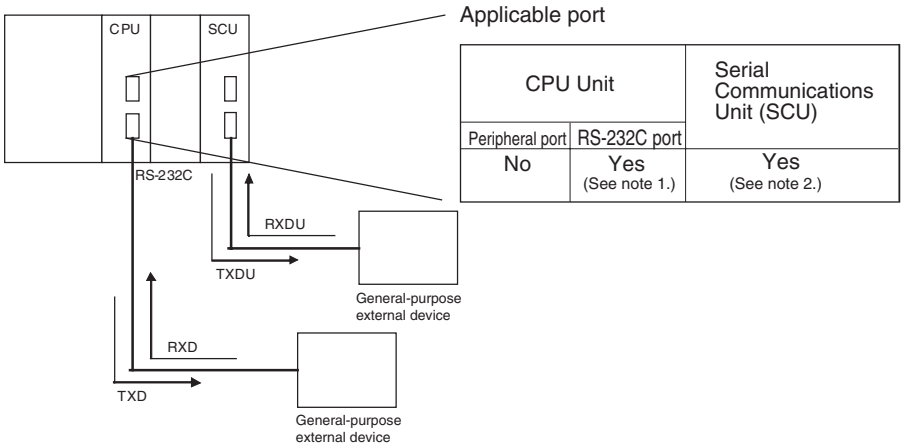
No-protocol communications allow simple data transmissions, such as inputting bar code data and outputting printer data using communications port I/O instructions. The start and completion codes can be set, and RS and CS signal control is also possible with no-protocol communications.

The following table shows the usage of each communications port I/O instruction, based on the communications port being used and the direction of the data transfer (sending or receiving).

Communications port	CPU Unit's built-in RS-232C port	Serial port on a Serial Communications Unit (unit version 1.2 or later)	Serial port on a Serial Communications Board (unit version 1.2 or later)

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Send	TXD(236)	TXDU(256)	TXD(236)
Receive	RXD(235)	RXDU(255)	RXD(235)



Applicable port

CPU Unit		Serial Communications Unit (SCU)
Peripheral port	RS-232C port	
No	Yes (See note 1.)	Yes (See note 2.)

Note
1. Set pin 5 of the DIP switch on the front panel of the CPU Unit to OFF, and set the serial communications mode in the PLC Setup to no-protocol communications.
2. No-protocol communications are supported for Serial Communications Units with unit version 1.2 or later only.

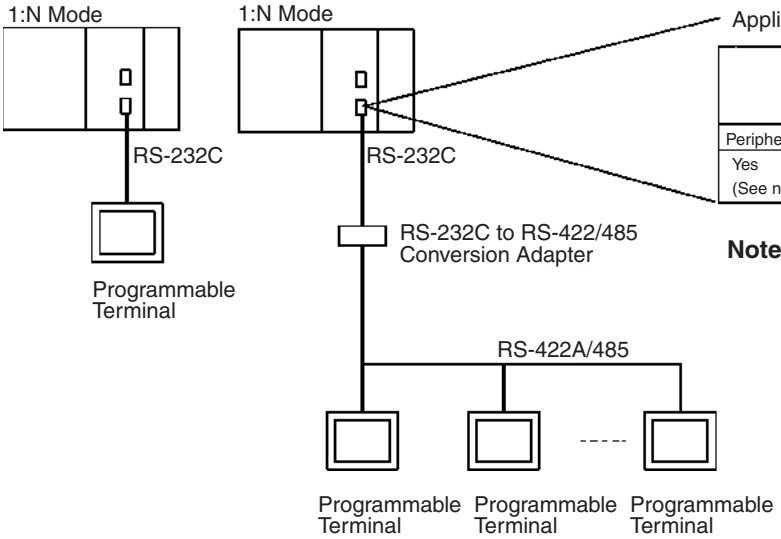
NT Link System (1:N Mode)

If the PLC and Programmable Terminal (PT) are connected together using RS-232C ports, the allocations for the PT's status control area, status notify area, objects such as touch switches, indicators, and memory maps can be allocated in the I/O memory of the PLC. The NT Link System allows the PT to be controlled by the PLC, and the PT can periodically read data from the status control area of the PLC, and perform necessary operations if there are any changes in the area. The PT can communicate with the PLC by writing data to the status notify area of the PLC from the PT. The NT Link system allows the PT status to be controlled and monitored without using PLC ladder programs. The ratio of PLCs to PTs is 1: n ($8 \geq n \geq 1$).

Set the PT communications settings for a 1:N NT Link. Either one or up to eight PTs can be connected to each PLC.

Version-1 CPU Units support high-speed NT Links (1:N mode). In this way, equipment monitoring and settings can be made faster from the PT. The applicable PTs are the NS-series PTs, the NT31(C)-V2 and the NT631(C)-V2.

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Applicable port

CPU Unit		Serial Communications Board	Serial Communications Unit
Peripheral port	RS-232C port		
Yes (See note 1.)	Yes (See note 2.)	Yes	Yes

Note
1. Turn ON pin 4 on the DIP switch on the front of the CPU Unit and set the serial communications mode in the PLC Setup for an NT Link.
2. Turn OFF pin 5 on the DIP switch on the front of the CPU Unit and set the serial communications mode in the PLC Setup for an NT Link.

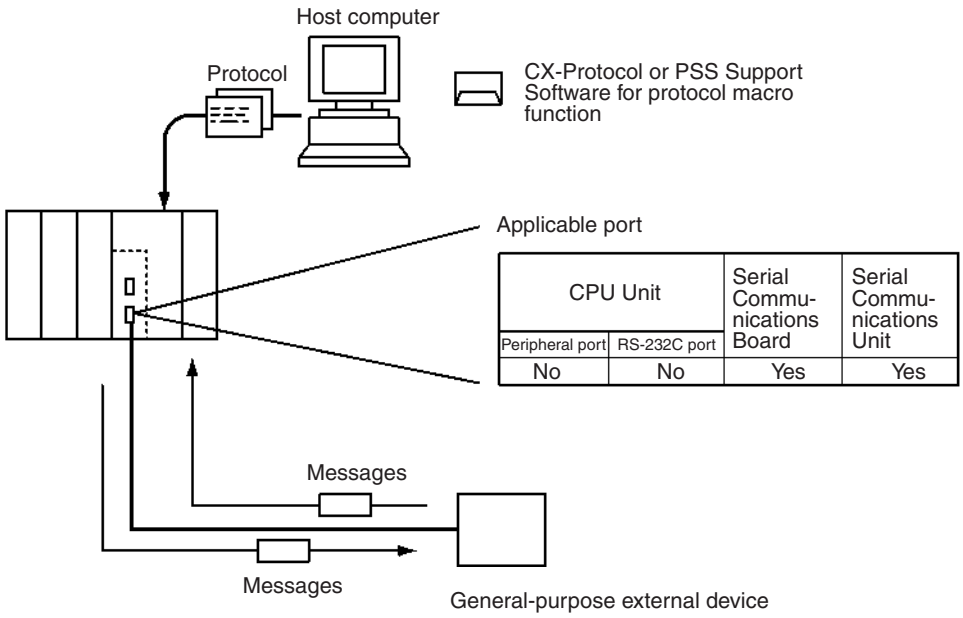
Note
1. The PLC can be connected to any PT port that supports 1:N NT Links. It cannot be connected to the RS-232C ports on the NT30 or NT30C, because these ports support only 1:1 NT Links.
2. The NT20S, NT600S, NT30, NT30C, NT620S, NT620C, and NT625C cannot be used if the CPU Unit's cycle time is 800 ms or longer (even if only one of these PTs is connected).
3. The Programming Console functionality of a PT (Expansion Function) can be used only when the PT is connected to the RS-232C or peripheral port on the CPU Unit. It cannot be used when connected to an RS-232C or RS-422A/485 port on a Serial Communications Board or Serial Communications Unit.
4. When more than one PT is connected to the same PLC, be sure that each PT is assigned a unique unit number. Malfunctions will occur if the same unit number is set on more than one PT.
5. The 1:1 and 1:N NT Link protocols are not compatible with each other, i.e., they are separate serial communications protocols.

Protocol Macros

The CX-Protocol is used to create data transmission procedures (protocols) for general-purpose external devices according to the communications specifications (half-duplex or full-duplex, asynchronous) of the general-purpose external devices. The protocols that have been created are then recorded in a Serial Communications Board, enabling data to be sent to and received from the external devices by simply executing the PMCR(260) instruction in the CPU Unit. Protocols for data communications with OMRON devices, such as Temperature Controller, Intelligent Signal Processors, Bar Code Readers, and Modems, are supported as standard protocols. (See note.)

Note The standard protocols are provided with the CX-Protocol, Serial Communications Boards, and Serial Communications Units.

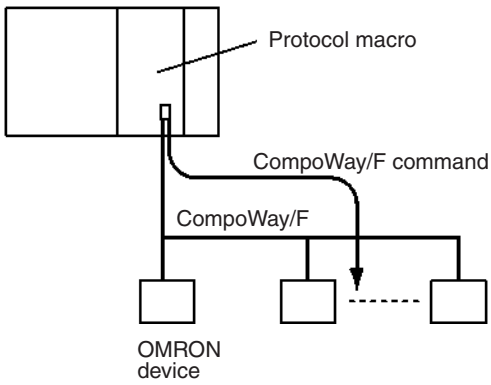
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CPU Unit		Serial Communications Board	Serial Communications Unit
Peripheral port	RS-232C port		
No	No	Yes	Yes

CompoWay/F (Host Function)

The CS-series CPU Unit can operate as a host to send CompoWay/F commands to OMRON components connected in the system. CompoWay/F commands are executed by using the CompoWay/F send/receive sequences in the standard protocols of the protocol macro function.



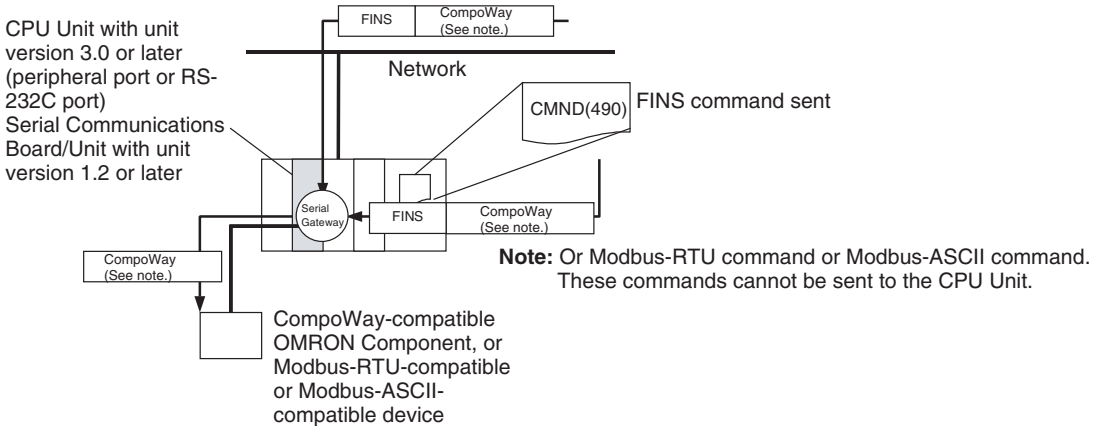
Serial Gateway Mode

When using CPU Units with unit version 3.0 or later (peripheral port and RS-232C port), the received FINS message is automatically converted into CompoWay/F according to the message (see note). When Serial Communications Boards/Units with unit version 1.2 or later are used, the received FINS message is automatically converted into either CompoWay/F, Modbus-RTU, Modbus-ASCII, or Host Link FINS according to the message.

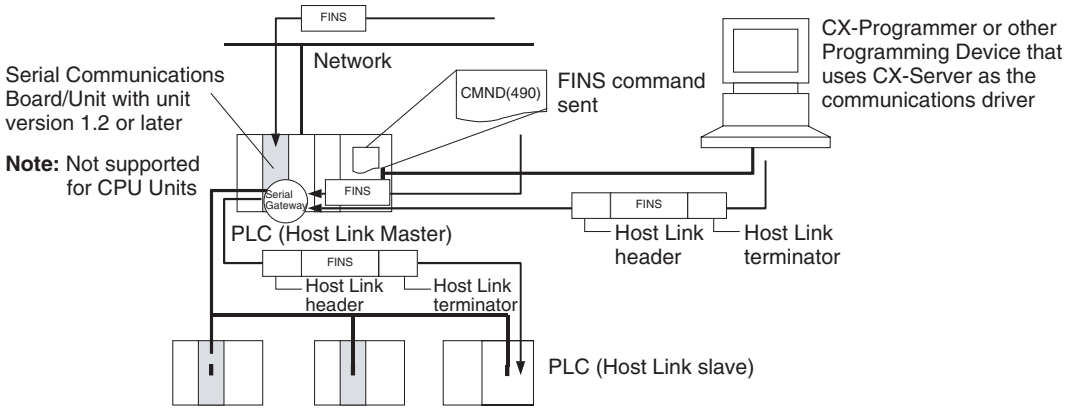
Note CPU Units with unit version 3.0 or later (peripheral port and RS-232C port) support automatic conversion into CompoWay/F only (automatic conversion into Modbus-RTU, Modbus-ASCII, and Host Link FINS is not possible).

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CompoWay/F, Modbus-RTU, Modbus-ASCII



Host Link FINS



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Unit/Protocol Compatibility

Unit	Model	Port	Peripheral bus (See note 1.)	Host Link (slave)	No-protocol (customer) communications	Protocol macro	NT Link (1:N Mode)	General-purpose (using BASIC)	Serial Gateway (See note 2.)
CPU Units	CS1G/H-CPU□□-E	Peripheral	Yes	Yes	---	---	Yes	---	Yes
		RS-232C	Yes	Yes	Yes	---	Yes	---	Yes
Serial Communications Boards	CS1W-SCB21-V1	RS-232C	---	Yes	Yes (See note 2.)	Yes	Yes	---	Yes
		RS-232C	---	Yes	Yes (See note 2.)	Yes	Yes	---	Yes
	CS1W-SCB41-V1	RS-232C	---	Yes	Yes (See note 2.)	Yes	Yes	---	Yes
		RS-422/485	---	Yes	Yes (See note 2.)	Yes	Yes	---	Yes
Serial Communications Units	CS1W-SCU21-V1	RS-232C	---	Yes	Yes (See note 2.)	Yes	Yes	---	Yes
		RS-232C	---	Yes	Yes (See note 2.)	Yes	Yes	---	Yes
	CS1W-SCU31-V1	RS422A/485	---	Yes	Yes (See note 2.)	Yes	Yes	---	Yes
		RS422A/485	---	Yes	Yes (See note 2.)	Yes	Yes	---	Yes
ASCII Units	C200H-ASC11	RS-232C	---	---	---	---	---	Yes	---
		RS-232C	---	---	---	---	---	Yes	---
	C200H-ASC21	RS-232C	---	---	---	---	---	Yes	---
		RS-422/485	---	---	---	---	---	Yes	---
	C200H-ASC31	RS-232C	---	---	---	---	---	Yes	---
		RS-232C	---	---	---	---	---	Yes	---
		RS-232C (Terminal port)	---	---	---	---	---	Yes	---

Note

1. The peripheral bus mode is used for Programming Devices excluding Programming Console. If Programming Console is to be used, set pin 4 of the DIP switch on the front panel of the Unit to OFF so that the default peripheral port communications parameters are used instead of those specified in the PLC Setup.
2. Supported for CPU Units with unit version 3.0 or later and Serial Communications Boards/Units with unit version 1.2 or later only. For CPU Units, however, only automatic CompoWay/F connection is possible.

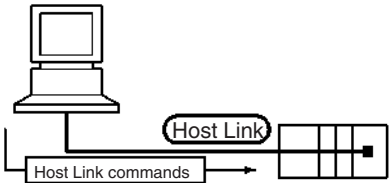
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Host Link System

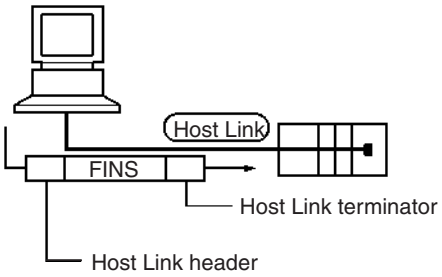
The following system configurations are possible for a Host Link System.

Host Link Slave

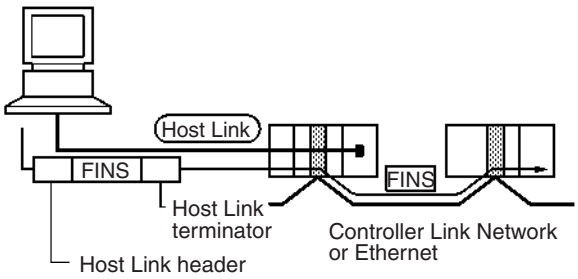
C-mode Commands

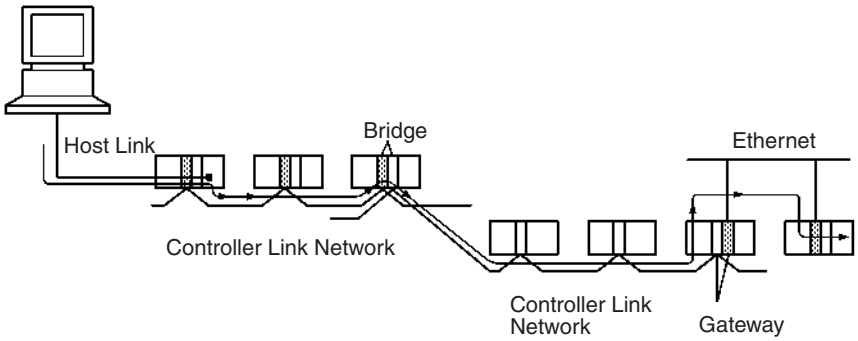


FINS Commands



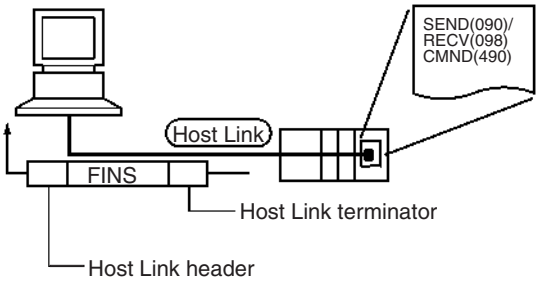
In Host Link mode, FINS commands contained between a header and terminator can be sent from the host computer to any PLC on the Network. Communications are possible with PLCs on the same or different types of interconnected Networks up to two levels away (three levels including the local level but not including the Host Link connection).





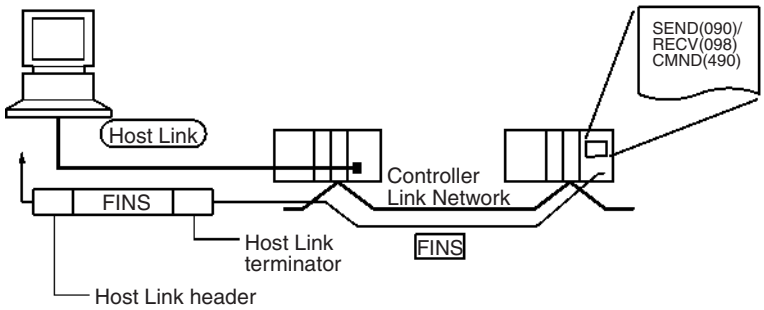
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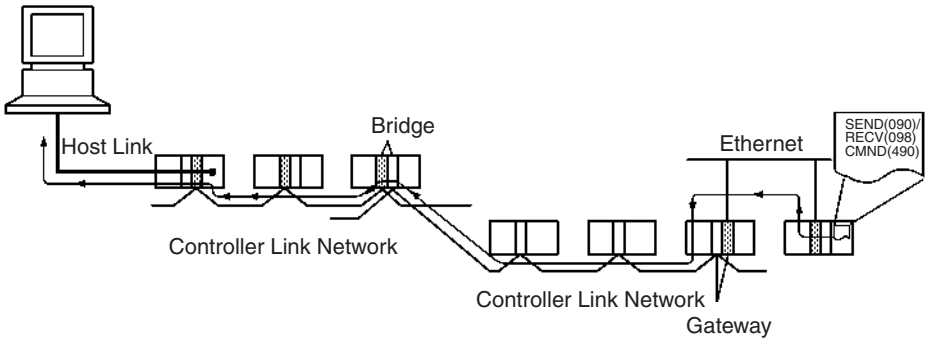
Communications from Host Computer



SEND(090): Sends data to the Host computer.
RECV(098): Receives data from the Host computer.
CMND(490): Executes a specified FINS command.

In Host Link mode, FINS commands contained between a header and terminator can be sent from the host computer to any PLC on the Network. Communications are possible with PLCs on the same or different types of interconnected Networks up to two levels away (three levels including the local level but not including the Host Link connection).

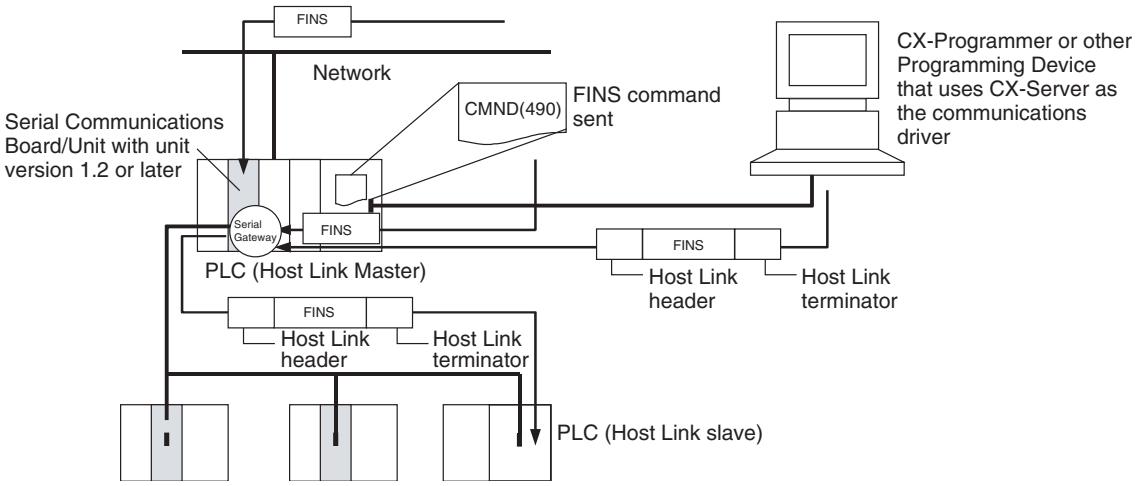




Host Link Master

Using a Serial Communications Board/Unit with unit version 1.2 or later and Serial Gateway mode enables received FINS commands to be enclosed in a Host Link header and terminator and transmitted to the PLC on the serial line (Host Link slave).

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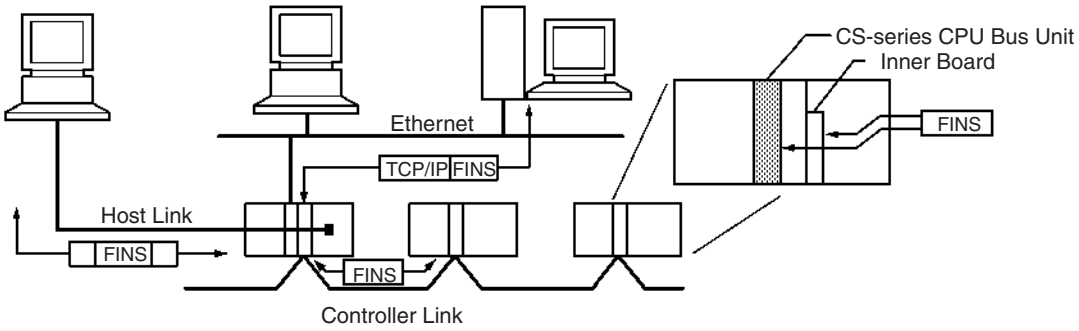


FINS Messages

FINS (Factory Interface Network Service) messages are commands and responses that are used as a message service in an OMRON Network. FINS messages enable the user to control operations such as sending and receiving data and changing operating modes when necessary. The features of FINS messages are as follows:

Flexible Communications

FINS messages are defined in the application layer and do not rely on the physical layer, data link layer, or other lower-level layers. This enables flexible communications on the CPU bus and different types of networks. Basically, communications with Ethernet, SYSMAC NET, SYSMAC LINK, Controller Link, DeviceNet, or Host Link Networks, and between the CPU Unit and CPU Bus Units or Inner Boards is possible via the CPU bus.

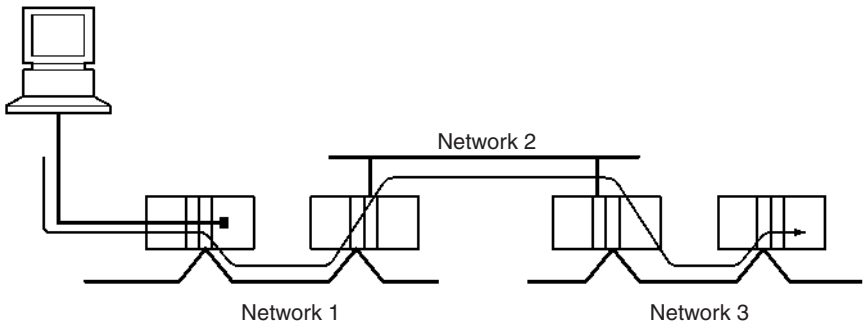


Note A TCP/IP header must be attached to the FINS command for an Ethernet Network, and a Host Link header must be attached to the FINS command for a Host Link Network

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Supports Network Relay

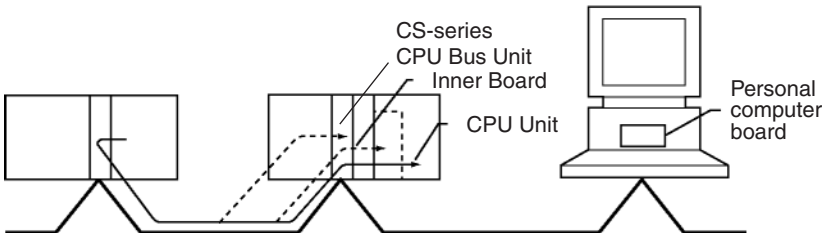
Up to three network levels (eight levels for unit version 2.0 or later), including the local network, can be bypassed to access other Racks.



Note With CS/CJ-series CPU Units Ver. 2.0 or later, remote programming/monitoring is possible up to 8 levels away. Refer to *1-6-5 Communications through a Maximum of 8 Network Levels* for details.

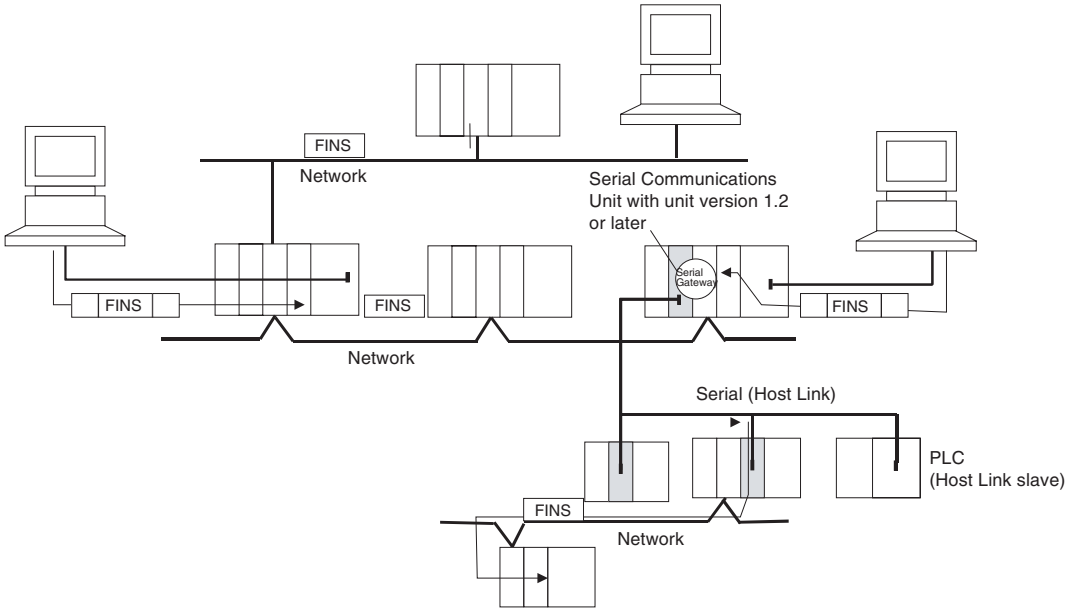
Access to CPU Unit Plus Other Devices on Racks

The CPU Unit, CS-series CPU Bus Units, personal computers (boards), Inner Boards, and other devices can be identified and specified using unit addresses.



Network-to-Serial Conversion or Network-to-Serial-to-Network Conversion

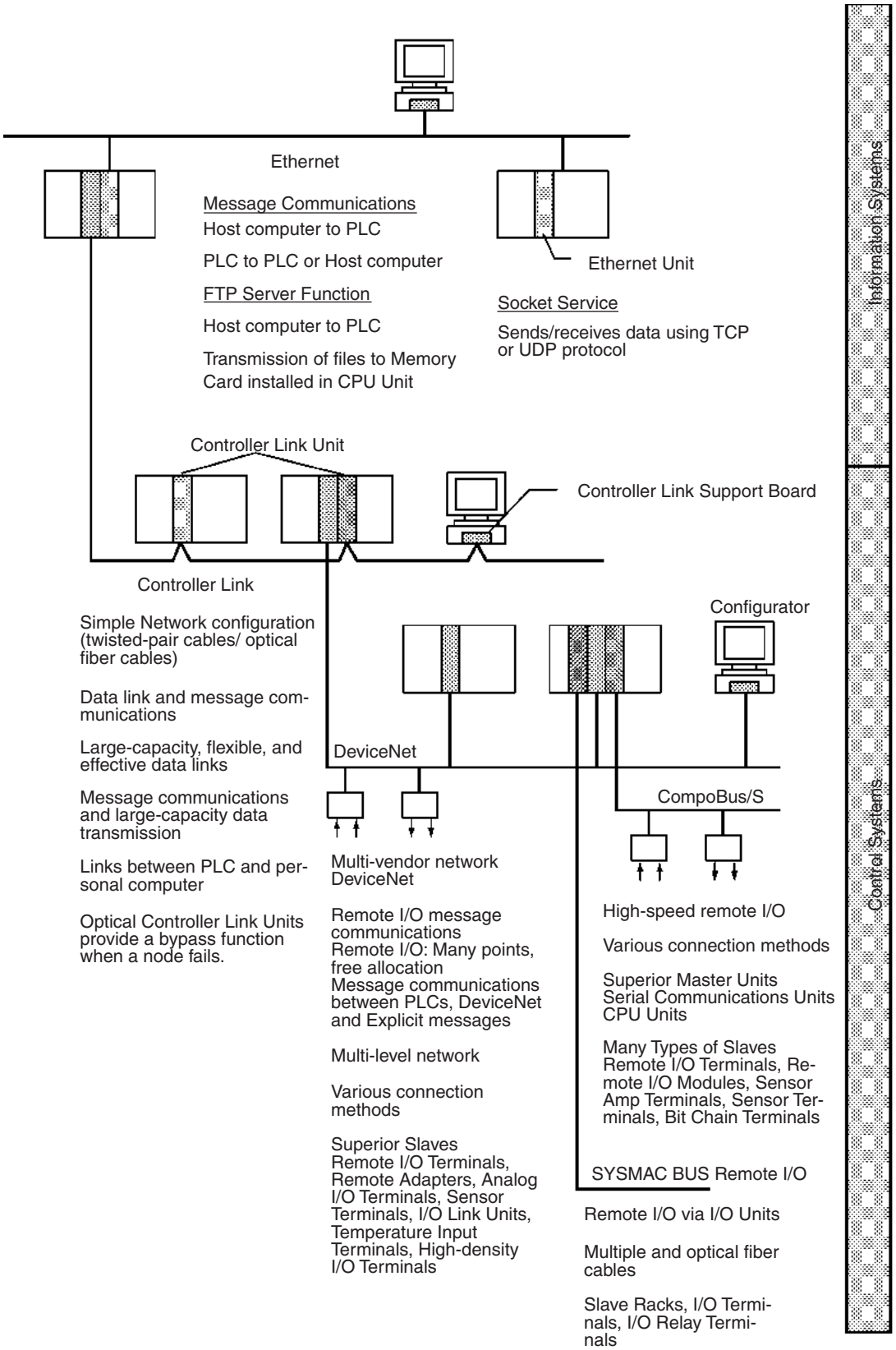
Using a Serial Communications Board/Unit with unit version 1.2 or later and Serial Gateway mode enables received FINS commands to be automatically converted into CompoWay/F, Modbus-RTU, Modbus-ASCII, or Host Link FINS commands according to the FINS message. FINS commands that have been converted into Host Link FINS commands can also be converted back into Host Link FINS commands.



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2-5-3 Communications Network System

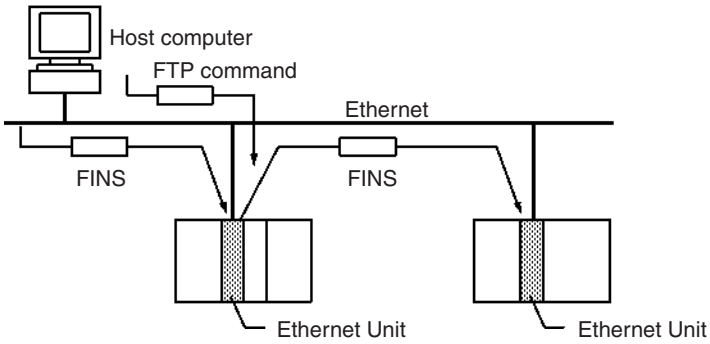
The following network systems can be configured when using CS-series Units.



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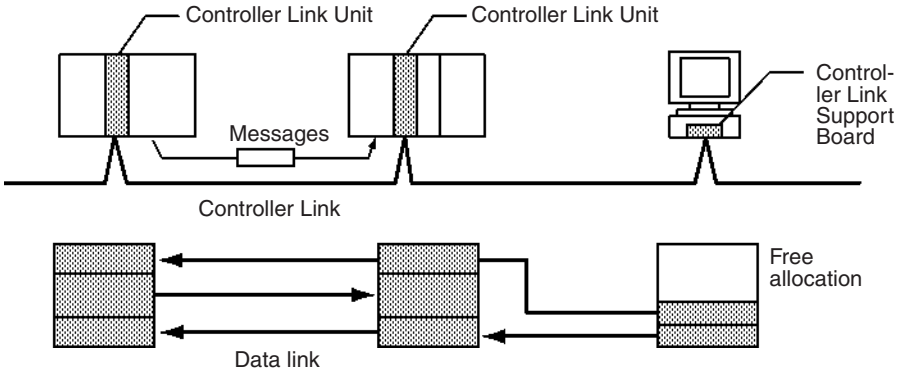
Ethernet

If an Ethernet Unit is connected to the system, FINS messages can be used to communicate between the Host computer connected to the Ethernet and the PLC, or between PLCs. By executing FTP commands for the PLC from the Host computer connected to the Ethernet, the contents of the files on the Memory Card installed in the CPU Unit can be read or written (transferred). Data can be sent and received using UDP and TCP protocols. These functions enable a greater compatibility with information networks.



Controller Link

The Controller Link Network is the basic framework of the OMRON PLC FA Network. Connecting a Controller Link Unit to the network enables data links between PLCs, so that data can be shared without programming, and FINS message communications between PLCs, which enable separate control and data transfer when required. The Controller Link Network connections use either twisted-pair cables or optical fiber cables. Data links and message communications are also possible between the PLC and personal computer. Data links enable large-capacity and free allocations. FINS message communications also allow large-capacity data transfer.



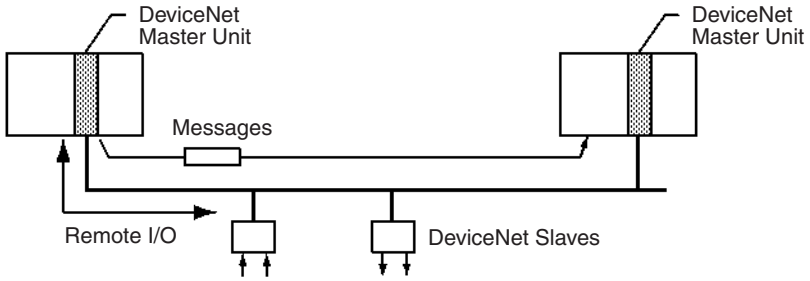
DeviceNet

DeviceNet is a multi-vendor network consisting of multi-bit control and information systems and conforms to the Open Field DeviceNet specification. Connecting a DeviceNet Master Unit to the network enables remote I/O communications between the PLC and the Slaves on the network. Remote I/O communications enable large-capacity I/O and user-set allocations. Analog I/O Terminals are used for the Slaves. Message communications are possible between PLCs and between the PLC and DeviceNet devices manufactured by other companies.

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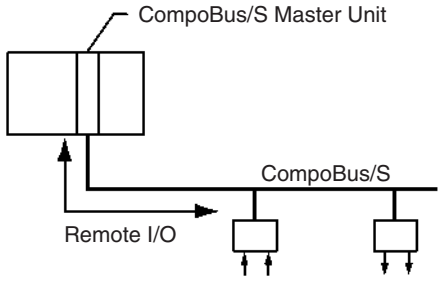
The following Units can be used to connect to a DeviceNet network from a CS-series PLC. There are differences in functionality, including in the words that are allocated for fixed allocations.

Name	Model	Classification	Master/slave	Fixed allocations for remote I/O master	
CS-series DeviceNet Unit	CS1W-DRM21	CS-series CPU Bus Unit	Master and slave	In CS-series DeviceNet Area	One of following three groups Outputs: CIO 3200 to CIO 3263 Inputs: CIO 3300 to CIO 3363 Outputs: CIO 3400 to CIO 3463 Inputs: CIO 3500 to CIO 3563 Outputs: CIO 3600 to CIO 3663 Inputs: CIO 3700 to CIO 3763
C200H DeviceNet Master Unit	C200HW-DRM21-V2	C200H Special I/O Unit	Master only	In C200H DeviceNet Area	Outputs: CIO 0050 to CIO 0099 Inputs: CIO 0350 to CIO 0399



CompoBus/S

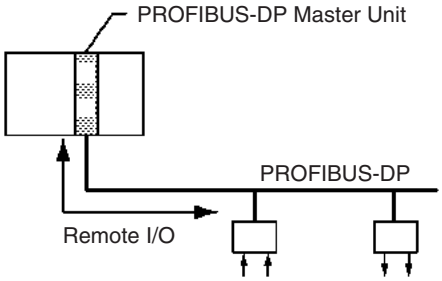
CompoBus/S is a high-speed ON/OFF bus for remote I/O communications. Connecting a CompoBus/S Master Unit to the network allows remote I/O communications between the PLC and Slaves. High-speed communications are performed with 256 points in a cycle time of 1 ms max.



PROFIBUS-DP

PROFIBUS (PROcess FIeldBUS) is an open fieldbus standard for a wide range of applications in manufacturing, processing, and building automation. The Standard, EN 50170 (the Euronorm for field communications), to which PROFIBUS adheres, ensures vendor independence and transparency of operation. It enables devices from various manufacturers to intercommunicate without having to make any special interface adaptations.

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Communications Network Overview

System	Network	Function	Communications	Communications Device
Information networks	Ethernet	Between Host computer and PLC.	FINS message communications	Ethernet Unit
		Between PLCs.		
		Between Host computer and Memory Card installed in CPU Unit.	FTP server	
		Between PLC and nodes with socket service, such as UNIX computers.	Socket service	
	Controller Link	Between PLC and personal computer directly connected to the Network.	FINS message communications	Controller Link Support Board and Controller Link Unit
			Data link (offset, simple settings)	
	RS-232C → Controller Link	Between Host Link computer and PLC on the Network.	Host Link commands and gateway.	RS-232C cables and Controller Link Unit
Control networks	Controller Link	Between PLCs.	FINS message communications	Controller Link Unit
			Data link (offset, simple settings)	
	PLC Link		Simple data link	PLC Link Unit
	DeviceNet		FINS message communications in an open network.	C200H DeviceNet Master Unit (C200HW-DRM21-V1) and Configurator
		PLC and Network devices (Slaves).	Large-capacity remote I/O (fixed or free allocation) in an open network	
	CompoBus/S		High-speed remote I/O in a network with OMRON devices only.	CompoBus/S Master Unit
	PROFIBUS-DP		Large-capacity remote I/O (user-set allocation) in an open network	PROFIBUS-DP Master Unit and Configurator

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Communications Specifications

Network	Communications			Max. baud rate	Communications distance	Max. No. of Units	Communications medium	Data link capacity (per network)	Max. remote I/O points	Connectable devices
	Messages	Data link	Remote I/O							
Ethernet	Yes	---	---	10 Mbps	2.5 km/ 100 m	---	Coaxial or twisted-pair	---	---	Host computer-to-PLC, PLC-to-PLC
				100 Mbps	100 m	---	Twisted-pair	---	---	
Controller Link	Yes	Yes	---	2 Mbps	Twisted-pair cables: 500 m (1.5 km with two Repeater Units) Optical cables: 20 km/ 30km	62 (62 for Wired Units only with Repeater Units, 32 without Repeater Units)	Special (twisted-pair) cables or optical fiber cables	32,000 words	---	PLC-to-PLC, personal computer-to-PLC
PLC Link	---	Yes	---	128 Kbps	500 m	32	RS-232C, RS-422, optical fiber cables	64 words	---	
DeviceNet	Yes	---	Yes	500 Kbps Communications cycle: Approx. 5 ms (128 inputs, 128 outputs)	100 m	63	Special cables	---	2,048	PLC-to-Slave (Slaves: Remote I/O Terminals, Remote Adapters. Sensor Terminals, CQM1 I/O Link Units, Analog Output Terminals, Analog Input Terminals)

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Network	Communications			Max. baud rate	Communications distance	Max. No. of Units	Communications medium	Data link capacity (per network)	Max. remote I/O points	Connectable devices
	Messages	Data link	Remote I/O							
CompoBus/S	---	---	Yes	750 Kbps Communications cycle: Approx. 1 ms max. (128 inputs, 128 outputs)	100 m	32	Two-core wires, special flat cables	---	256	PLC-to-Slave (Slaves: Remote I/O Terminals, Remote I/O Modules. Sensor Terminals, Sensor Amp Terminals, Bit Chain Terminals)
PROFIBUS-DP	---	---	Yes	12 Mbps Communications cycle: Approx. 3.5 ms max. (128 inputs, 128 outputs)	100 m	125	Special cables	---	7,168 words	PLC-to-Slave (Slaves: All PROFIBUS-DP slaves)

2-6 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 for the Power Supply Unit.

2-6-1 CPU Racks and Expansion Racks

The following table shows the maximum currents and power that can be supplied by Power Supply Units in CPU Racks and Expansion Racks (both CS-series Expansion Racks and C200H Expansion I/O Racks).

When calculating current/power consumption in a CPU Rack, be sure to include the power required by the CPU Rack and CPU Unit themselves. Likewise, be sure to include the power required by the Expansion Rack itself When calculating current/power consumption in an Expansion Rack.

Power Supply Unit	Max. Current Consumption			Max. Total Power Consumption
	5-V group (Internal logic)	26-V group (Relays)	24-V group (Service)	
C200HW-PA204	4.6 A	0.625 A	None	30 W
C200HW-PA204S	4.6 A	0.625 A	0.8 A	30 W
C200HW-PA204R	4.6 A	0.625 A	None	30 W
C200HW-PA204C	4.6 A	0.625 A	None	30 W
C200HW-PD204	4.6 A	0.625 A	None	30 W
C200HW-PA209R	9 A	1.3 A	None	45 W
C200HW-PD025	5.3 A	1.3 A	None	40 W

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2-6-2 SYSMAC BUS Remote I/O Slave Racks

The following table shows the maximum currents and power that can be supplied by Power Supply Units in SYSMAC BUS Remote I/O Slave Racks. Be sure to include the power required by the Rack itself When calculating current/power consumption.

Slave Unit	Max. Current Consumption			Max. Total Power Consumption
	5-V group (Internal logic)	26-V group (Relays)	24-V group (Service)	
C200H-RT201 (Wired)	2.7 A	0.625 A	0.8 A	28 W
C200H-RT202 (Wired)	2.7 A	0.625 A	None	23 W
C200H-RT001-P (Optical)	2.7 A	0.625 A	0.8 A	28 W
C200H-RT002-P (Optical)	2.7 A	0.625 A	None	23 W

The current consumed by each voltage group must not exceed the maximum current shown in the table above.

1,2,3...

1. Current required at 5 V DC by all Units (A) ≤ Max. Current shown in table
2. Current required at 26 V DC by all Units (B) ≤ Max. Current shown in table
3. Current required at 24 V DC by all Units (C) ≤ Max. Current shown in table

Also, the power consumed by all Units must not exceed the maximum shown in the table above.

$A \times 5$ V DC + $B \times 26$ V DC + $C \times 24$ V DC ≤ Max. Power shown in table

2-6-3 Example Calculations

Example 1

In this example, the following Units are mounted to a CPU Rack with a C200HW-PA204S Power Supply Unit.

Unit	Model	Quantity	Voltage group		
			5 V DC	26 V DC	24 V DC
CPU Backplane (8 slots)	CS1W-BC083	1	0.11 A	---	---
CPU Unit	CS1H-CPU66H	1	0.82 A	---	---
Input Units	C200H-ID216	2	0.10 A	---	---
	CS1W-ID291	2	0.20 A	---	---
Output Units	C200H-OC221	2	0.01 A	0.075 A	---
Special I/O Unit	C200HW-NC213	1	0.30 A	---	---
CS-series CPU Bus Unit	CS1W-CLK21	1	0.33 A	---	---
Service power supply (24 V DC)		0.3 A used	---	---	0.3 A

Current Consumption

Group	Current consumption
5 V DC	0.11 A + 0.82 A + 0.10 A × 2 + 0.20 A × 2 + 0.01 A × 2 + 0.30 A + 0.33 A = 2.18 A (≤4.6 A)
26 V DC	0.075 A × 2 = 0.15 A (≤0.625 A)
24 V DC	0.3 A = 0.3 A (≤0.8 A)

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Power Consumption

2.18 A × 5 V + 0.15 A × 26 V + 0.3 A × 24 V
= 10.9 W + 3.9 W + 7.2 W
= 22.0 W (≤30 W)

Example 2

In this example, the following Units are mounted to a CS-series Expansion Rack with a C200HW-PA209R Power Supply Unit.

Unit	Model	Quantity	Voltage group		
			5 V DC	26 V DC	24 V DC
CS-series Expansion Backplane (10 slots)	CS1W-BI103	1	0.23 A	---	---
Input Units	CS1W-ID291	2	0.20 A	---	---
Output Units	CS1W-OD291	8	0.48 A	---	---

Current Consumption

Group	Current consumption
5 V DC	0.23 A + 0.20 A × 2 + 0.48 A × 8 = 4.47 A (≤9 A)
26 V DC	---
24 V DC	---

Power Consumption

4.47 A × 5 V = 22.35 W (≤45 W)

Example 3

In this example, the following Units are mounted to a SYSMAC BUS Remote I/O Slave Rack with a C200H-RT201 Slave Unit.

Unit	Model	Quantity	Voltage group		
			5 V DC	26 V DC	24 V DC
Input Units	C200H-ID211	2	0.11 A	---	---
Output Units	C200H-OD411	3	0.14 A	---	---

Current Consumption

Group	Current consumption
5 V DC	0.11 A × 2 + 0.14 A × 3 = 0.64 A (≤2.7A)
26 V DC	---
24 V DC	---

Power Consumption

0.64 A × 5 V = 3.2 W (≤28 W)

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2-6-4 Current Consumption Tables

5-V DC Voltage Group

Name	Model	Current consumption (A)
CS1-H CPU Units (These values include current consumption by a Programming Console or CX-Programmer connection.)	CS1H-CPU6□H	0.82 (See note.)
	CS1G-CPU4□H	0.78 (See note.)
Serial Communications Boards	CS1W-SCB21	0.28 (See note.)
	CS1W-SCB41	0.37 (See note.)
Standard CPU Backplanes	CS1W-BC□□3	0.11
CS-series-only CPU Backplanes	CS1W-BC□□2	0.11
Standard CS-series Expansion Backplanes	CS1W-BI□□3	0.23
CS-series-only Expansion Backplanes	CS1W-BI□□2	0.23
C200H Expansion I/O Backplanes	C200HW-BI031	0.15
	C200HW-BI051	0.15
	C200HW-BI081-V1	0.15
	C200HW-BI101-V1	0.15
I/O Control Units	CS1W-IC102	0.92
I/O Interface Units	CS1W-II102	0.23

Note NT-AL001 Link Adapters consume 0.15/Unit when used.
Add 0.04 A for each CJ1W-CIF11 RS-422A Adapter that is used.
Add 0.20 A for each NV3W-M□20L Programmable Terminal that is used.

Basic I/O Unit

Category	Name	Model	Current consumption (A)
C200H Input Units	DC Input Units	C200H-ID211	0.01
		C200H-ID212	0.01
	AC Input Units	C200H-IA121	0.01
		C200H-IA122	0.01
		C200H-IA122V	0.01
		C200H-IA221	0.01
		C200H-IA222	0.01
		C200H-IA222V	0.01
	AC/DC Input Units	C200H-IM211	0.01
		C200H-IM212	0.01
	Interrupt Input Unit	C200HS-INT01	0.02
C200H Group-2 High-density Input Units	DC Input Units	C200H-ID216	0.10
		C200H-ID217	0.12
		C200H-ID218	0.10
		C200H-ID219	0.12
		C200H-ID111	0.12

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Category	Name	Model	Current consumption (A)
CS-series Basic Input Units	DC Input Units	CS1W-ID211	0.10
		CS1W-ID231	0.15
		CS1W-ID261	0.15
		CS1W-ID291	0.20
	AC Input Units	CS1W-IA111	0.11
		CS1W-IA211	0.11
	B7A Input Unit	CS1W-B7A12	0.09
	Interrupt Input Unit	CS1W-INT01	0.10
	High-speed Input Unit	CS1W-IDP01	0.10
C200H Output Units	Relay Output Units	C200H-OC221	0.01
		C200H-OC222	0.01
		C200H-OC222V	0.01
		C200H-OC222N	0.01
		C200H-OC225	0.05
		C200H-OC226	0.03
		C200H-OC226N	0.03
		C200H-OC223	0.01
		C200H-OC224	0.01
		C200H-OC224V	0.01
		C200H-OC224N	0.01
	Transistor Output Units	C200H-OD411	0.14
		C200H-OD213	0.14
		C200H-OD214	0.14
		C200H-OD216	0.01
		C200H-OD211	0.16
		C200H-OD217	0.01
		C200H-OD212	0.18
		C200H-OD21A	0.10
	B7A Interface Units	C200H-B7AO1	0.10
		C200H-B7A02	0.18
	Triac Output Units	C200H-OA221	0.14
		C200H-OA223	0.27
		C200H-OA222V	0.18
		C200H-OA224	0.27
C200H Group-2 High-density Output Units	Transistor Output Units	C200H-OD218	0.18
		C200H-OD21B	0.18
		C200H-OD219	0.27

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Category	Name	Model	Current consumption (A)
CS-series Basic Output Units	Relay Output Units	CS1W-OC201	0.10
		CS1W-OC211	0.13
	Transistor Output Units	CS1W-OD211	0.17
		CS1W-OD212	0.17
		CS1W-OD231	0.27
		CS1W-OD232	0.27
		CS1W-OD261	0.39
		CS1W-OD262	0.39
		CS1W-OD291	0.48
		CS1W-OD292	0.48
	Triac Output Units	CS1W-OA201	0.23
		CS1W-OA211	0.41
	B7A Output Unit	CS1W-B7A02	0.09
CS-series Basic I/O Units	DC Input/ Transistor Output Units	CS1W-MD261	0.27
		CS1W-MD262	0.27
		CS1W-MD291	0.35
		CS1W-MD292	0.35
	TTL I/O Unit	CS1W-MD561	0.27
	B7A I/O Units	CS1W-B7A21	0.09
		CS1W-B7A22	0.09
C200H Basic Output Unit	B7A Output Unit	C200H-B7AO1	0.10
C200H High-density Output Unit		C200H-B7A02	0.10
C200H High-density I/O Units	B7A I/O Units	C200H-B7A21	0.10
		C200H-B7A22	0.10
C200H Basic Unit	Analog Timer Unit	C200H-TM001	0.06

Special I/O Units

Category	Name	Model	Current consumption (A)
C200H High-density I/O Units (Special I/O Units)	DC Input Unit	C200H-ID215	0.13
	TTL Input Unit	C200H-ID501	0.13
	Transistor Output Unit	C200H-OD215	0.22
	TTL Output Unit	C200H-OD501	0.22
	TTL I/O Unit	C200H-MD501	0.18
	DC Input/ Transistor Output Units	C200H-MD215	0.18
		C200H-MD115	0.18

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Category	Name	Model	Current consumption (A)
C200H Special I/O Units	Temperature Control Units	C200H-TC001	0.33
		C200H-TC002	0.33
		C200H-TC003	0.33
		C200H-TC101	0.33
		C200H-TC102	0.33
		C200H-TC103	0.33
	Heat/Cool Temperature Control Units	C200H-TV001	0.33
		C200H-TV002	0.33
		C200H-TV003	0.33
		C200H-TV101	0.33
		C200H-TV102	0.33
		C200H-TV103	0.33
	Temperature Sensor Units	C200H-TS001	0.45
		C200H-TS002	0.45
		C200H-TS101	0.45
		C200H-TS102	0.45
	PID Control Units	C200H-PID01	0.33
		C200H-PID02	0.33
		C200H-PID03	0.33
	Cam Positioner Unit	C200H-CP114	0.30
	ASCII Units	C200H-ASC02	0.20
		C200H-ASC11	0.25
		C200H-ASC31	0.30
	Analog Input Units	C200H-AD001	0.55
		C200H-AD002	0.45
		C200H-AD003	0.10
	Analog Output Units	C200H-DA001	0.65
		C200H-DA002	0.60
		C200H-DA003	0.10
		C200H-DA004	0.10

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Category	Name	Model	Current consumption (A)
C200H Special I/O Units	Analog I/O Unit	C200H-MAD01	0.10
	High-speed Counter Units	C200H-CT001-V1	0.30
		C200H-CT002	0.30
		C200H-CT021	0.45
	Motion Control Unit	C200H-MC221	0.65 (0.85 with Teaching Box)
	Position Control Units	C200H-NC211	0.50
		C200H-NC111	0.15
		C200H-NC112	0.15
		C200HW-NC113	0.30
		C200HW-NC213	0.30
		C200HW-NC413	0.50
	ID Sensor Units	C200H-IDS01-V1	0.25
		C200H-IDS21	0.25
	Voice Unit	C200H-OV001	0.30
	DeviceNet Master Unit	C200HW-DRM21-V1	0.25
	CompoBus/S Master Unit	C200HW-SRM21-V1	0.15
	PLC Link Unit	C200H-LK401	0.35
	SYSMAC BUS Remote I/O Slave Units	C200H-RM201	0.20
		C200H-RM001-PV1	0.20
CS-series Special I/O Units	Analog I/O Unit	CS1W-MAD44	0.20
	Analog Input Units	CS1W-AD041-V1/081-V1	0.13
		CS1W-AD161	0.15
	Analog Output Units	CS1W-DA041/08V/08C	0.13
	Isolated Thermocouple Input Unit	CS1W-PTS01-V1	0.15
	High-resolution Isolated Thermocouple Input Unit	CS1W-PTS11	0.12
	Isolated Resistance Thermometer Input Unit	CS1W-PTS02	0.15
	Isolated Ni508.4Ω Resistance Thermometer Input Unit	CS1W-PTS03	0.15
	High-resolution Isolated Resistance Thermometer Input Unit	CS1W-PTS12	0.12
	Isolated 2-wire Transmission Device Input Unit	CS1W-PTW01	0.15
	Isolated DC Input Unit	CS1W-PDC01	0.15
	High-resolution Isolated DC Input Unit	CS1W-PDC11	0.12
	Isolated Control Output Unit (Analog Output Unit)	CS1W-PMV01	0.15

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Category	Name	Model	Current consumption (A)
CS-series Special I/O Units	Power Transducer Input Unit	CS1W-PTR01	0.15
	DC Input Unit (100 mA)	CS1W-PTR02	0.15
	Isolated Pulse Input Unit	CS1W-PPS01	0.20
	Motion Control Units	CS1W-MC221	0.6 (0.80 when connected to a Teaching Box)
		CS1W-MC421	0.7 (1.00 when connected to a Teaching Box)
	Position Control Units	CS1W-NC113	0.25
		CS1W-NC133	0.25
		CS1W-NC213	0.25
		CS1W-NC233	0.25
		CS1W-NC413	0.36
		CS1W-NC433	0.36
	Customizable Counter Units	CS1W-HIO01-V1	0.60
		CS1W-HCP22-V1	0.80
		CS1W-HCA12-V1	0.75
		CS1W-HCA22-V1	0.75
	High-speed Counter Unit	CS1W-CT021	0.36
		CS1W-CT041	0.45
	GP-IB Interface Unit	CS1W-GPI01	0.33
	CompoNet Master Unit	CS1W-CRM21	0.40

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CS-series CPU Bus Units

Category	Name	Model	Current consumption (A)
CS-series CPU Bus Units	Controller Link Unit	CS1W-CLK21-V1, CS1W-CLK23	0.33
		CS1W-CLK12-V1, CS1W-CLK13	0.58
		CS1W-CLK52-V1, CS1W-CLK53	0.65
	Serial Communications Units	CS1W-SCU21-V1	0.30 (See note.)
		CS1W-SCU31-V1	0.40
	SYSMAC LINK Unit	CS1W-SLK21	0.48
		CS1W-SLK11	0.47
	Ethernet Unit	CS1W-ETN01	0.40
		CS1W-ETN21	0.38
	EtherNet/IP Unit	CS1W-EIP21	0.41
	FL-net Unit	CS1W-FLN22	0.38
	DeviceNet Unit	CS1W-DRM21-V1	0.29
	PROFIBUS-DP Master Unit	CS1W-PRM21	0.40
	Position Control Unit supporting MECHATROLINK-II communications	CS1W-NCF71	0.36
	Loop Control Unit	CS1W-LC001	0.36
	High-resolution Motion Control Unit	CS1W-MCH71	0.80
	SYSMAC SPU Units (High-speed Storage and Processing Unit)	CS1W-SPU01	0.56
		CS1W-SPU02	0.70

Note NT-AL001 Link Adapters consume 0.15/Unit when used.
Add 0.04 A for each CJ1W-CIF11 RS-422A Adapter that is used.
Add 0.20 A for each NV3W-M□20L Programmable Terminal that is used.

Current Consumptions for 26-V Supply

Category	Name	Model	Current consumption (A)
C200H Output Units	Relay Contact Output Unit	C200H-OC221	0.075 for 8 points when ON simultaneously
		C200H-OC222	
		C200H-OC223	
		C200H-OC224	
		C200H-OC225	
		C200H-OC222V/N	0.09 for 8 points when ON simultaneously
		C200H-OC226(N)	
		C200H-OC224V/N	
	Transistor Output Units	C200H-OD216	0.075 for 8 points when ON simultaneously
		C200H-OD217	

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Category	Name	Model	Current consumption (A)
C200H Special I/O Units	Analog Input Units	C200H-AD003	0.10
	Analog Output Units	C200H-DA003	0.20
		C200H-DA004	0.25
	Analog I/O Units	C200H-MAD01	0.2
	ID Sensor Units	C200H-IDS01-V1	0.12
		C200H-IDS21	0.12
CS-series Basic Output Units	Relay Output Units	CS1W-OC201	0.006 per ON output point
		CS1W-OC211	0.006 per ON output point
CS-series Special I/O Units	Analog I/O Unit	CS1W-MAD44	0.20
	Analog Input Unit	CS1W-AD041/081	0.09
		CS1W-AD161	0.06
	Analog Output Unit	CS1W-DA041/08V	0.18
		CS1W-DA08C	0.25
	Isolated Thermocouple Input Unit	CS1W-PTS01-V1	0.15
	High-resolution Isolated Thermocouple Input Unit	CS1W-PTS11	0.08
	Isolated Resistance Thermometer Input Unit	CS1W-PTS02	0.15
	Isolated Ni508Ω Resistance Thermometer Input Unit	CS1W-PTS03	0.15
	High-resolution Isolated Resistance Thermometer Input Unit	CS1W-PTS12	0.07
	Isolated 2-wire Transmission Device Input Unit	CS1W-PTW01	0.16
	Isolated DC Input Unit	CS1W-PDC01	0.15
	High-resolution Isolated DC Input Unit	CS1W-PDC11	0.12
	Isolated Control Output Unit (Analog Output Unit)	CS1W-PMV01	0.16
	Power Transducer Input Unit	CS1W-PTR01	0.08
	DC Input Unit (100 mA)	CS1W-PTR02	0.08
	Isolated Pulse Input Unit	CS1W-PPS01	0.16
	Customizable Counter Unit	CS1W-HCA12-V1	0.15
		CS1W-HCA22-V1	0.15

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2-7 CPU Bus Unit Setting Area Capacity

Settings for most CPU Bus Units and Inner Boards are stored in the CPU Bus Unit Setting Area in the CPU Unit. Refer to *9-27 Parameter Areas* for details. The CPU Bus Units are allocated the required number of works for settings from this area.

There is a limit to the capacity of the CPU Bus Unit Setting Area of 10,752 bytes (10 Kbytes). The system must be designed so that the number of words used in the CPU Bus Unit Setting Area by all of the CPU Bus Units and the Inner Board does not exceed this capacity. If the wrong combination of Units is used, the capacity will be exceeded and either Units will operate from default settings only or will not operate at all.

2-7-1 System Setting Allocations to CPU Bus Units

Classification	Name	Model number	Allocation (bytes)
CS-series CPU Bus Units	Controller Link Unit	CS1W-CLK11/12/21/52(-V1), CS1W-CLK13/23/53	512
	Serial Communications Unit	CS1W-SCU21/31-V1	0
	Ethernet Unit	CS1W-ETN01	412
		CS1W-ETN21	99.4
	FL-net Unit	CS1W-FLN22	988
	SYSMAC LINK Unit	CS1W-SLK21/11	512
	DeviceNet Unit	CS1W-DRM21-V1	0
	Position Control Unit	CS1W-NCF71	0
	Motion Control Unit	CS1W-MCH71	0
	Loop Control Unit	CS1W-LC001	0
	High-resolution Motion Control Unit	CS1W-MCH71	0
	Storage and Processing Unit	CS1W-SPU01/02	0
Inner Boards	Serial Communications Board	CS1W-SCB21/41	0

Note Any Unit with a usage of “0” does not use the CPU Bus Unit Setting Area at all.

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2-8 I/O Table Settings

The following settings are used in the I/O tables on the CX-Programmer.

2-8-1 CS-series Basic I/O Units

Name	Model	Unit type setting	Addresses per Unit	Input Words	Output Words
AC Input Units	CS1W-IA111	16pt Unit – 16pt Input	---	1	0
	CS1W-IA211	16pt Unit – 16pt Input	---	1	0
	CS1W-IA121/221	CS/CJ 8pt Unit – 8pt Input	---	1	0
	CS1W-IA122/122V/222/222V	16pt Unit – 16pt Input	---	1	0
AC/DC Input Units	C200H-IM211	CS/CJ 8pt Unit – 8pt Input	---	1	0
	C200H-IM212	16pt Unit – 16pt Input	---	1	0
DC Input Units	CS1W-ID211	16pt Unit – 16pt Input	---	1	0
	CS1W-ID231	32pt Unit – 32pt Input	---	2	0
	CS1W-ID261	64pt Unit – 64pt Input	---	4	0
	CS1W-ID291	96pt Unit – 96pt Input	---	6	0
	C200H-ID211	CS/CJ 8pt Unit – 8pt Input	---	1	0
	C200H-ID212	16pt Unit – 16pt Input	---	1	0
DC Input Units classified as C200H Group-2 Units	C200H-ID216/218	32pt Unit – 32pt Input	---	2	0
	C200H-ID111/217/219	64pt Unit – 64pt Input	---	4	0
Interrupt Input Units	CS1W-INT01	Interrupt Unit (8 Bit)	---	1	0
	C200HS-INT01	Interrupt Unit (8 Bit)	---	1	0
High-speed Input Unit	CS1W-IDP01	16pt Unit – 16pt Input	---	1	0
Contact Output Units	CS1W-OC201	8pt Unit – 8pt Output	---	0	1
	CS1W-OC211	16pt Unit – 16pt Output	---	0	1
	C200H-OC223	5pt Unit - 5pt Output	---	0	1
	C200H-OC221/224/224V/224N	8pt Unit – 8pt Output	---	0	1
	C200H-OC222/222V/222N	12pt Unit - 12pt Output	---	0	1
	C200H-OC225/226/226N	16pt Unit – 16pt Output	---	0	1
Triac Output Units	CS1W-OA201	8pt Unit – 8pt Output	---	0	1
	CS1W-OA211	16pt Unit – 16pt Output	---	0	1
	CS1W-OA221/223	8pt Unit – 8pt Mixed	---	0	1
	CS1W-OA222V/224	12pt Unit – 12pt Output	---	0	1
Transistor Output Units	CS1W-OD211/212	16pt Unit – 16pt Output	---	0	1
	CS1W-OD231/232	32pt Unit – 32pt Output	---	0	2
	CS1W-OD261/262	64pt Unit – 64pt Output	---	0	4
	CS1W-OD291/292	96pt Unit – 96pt Mixed	---	0	6
	C200H-OD213/214/216/411	8pt Unit – 8pt Mixed	---	0	1
	C200H-OD211/217	12pt Unit – 12pt Output	---	0	1
	C200H-OD212/21A	16pt Unit – 16pt Output	---	0	1
Transistor Output Units classified as C200H Group-2 Units	C200H-OD218/21B	32pt Unit – 32pt Output	---	0	2
	C200H-OD219	64pt Unit – 64pt Output	---	0	4
DC Input/Transistor Output Units	CS1W-MD261/262	64pt Unit – 64pt Mixed	---	2	2
	CS1W-MD291/292	96pt Unit – 96pt Mixed	---	3	3
TTL I/O Units	CS1W-MD561	64pt Unit - 64pt Mixed	---	2	2

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Name	Model	Unit type setting	Addresses per Unit	Input Words	Output Words
B7A Interface Units classified as CS-series Basic I/O Units	CS1W-B7A12	32pt Unit – 32pt Input	---	2	0
	CS1W-B7A02	32pt Unit – 32pt Output	---	0	2
	CS1W-B7A21	32pt Unit – 32pt Mixed	---	1	1
	CS1W-B7A22	64pt Unit – 64pt Mixed	---	2	2
B7A Interface Units	C200H-B7AI1	16pt Unit – 16pt Input	---	1	0
	C200H-B7AO1	16pt Unit – 16pt Output	---	0	1
B7A Interface Units classified as C200H Group-2 Units	C200H-B7A12	32pt Unit – 32pt Input	---	2	0
	C200H-B7A02	32pt Unit – 32pt Output	---	0	2
	C200H-B7A21	32pt Unit – 32pt Mixed	---	1	1
	C200H-B7A22	64pt Unit – 64pt Mixed	---	2	2
Analog Timer Unit	C200H-TM001	4 times Internal bits: 8 inputs and 4 outputs	---	1	

Note
1. An I/O setting error will occur if Units are not set correctly.
2. An I/O verification error will occur if the number of input or output words is set incorrectly.

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2-8-2 CS-series Special I/O Units

Name	Model	Unit type setting		Addresses per Unit	Input Words	Output Words
Analog I/O Unit	CS1W-MAD44	CS/CJ SIO Unit – Analog Input/Output Unit		1	5	5
Analog Input Units	CS1W-AD041/081-V1	CS/CJ SIO Unit – Analog Input Unit		1	9	1
	CS1W-AD161	CS/CJ SIO Unit – Analog Input Unit		2	17	1
Analog Output Units	CS1W-DA041/08V/08C	CS/CJ SIO Unit – Analog Output Unit		1	1	9
Isolated Thermocouple Input Unit	CS1W-PTS01-V1	CS/CJ SIO Unit – Process Input/Output Unit		1	10	0
High-resolution Isolated Thermocouple Input Unit	CS1W-PTS11	CS/CJ SIO Unit – Process Input/Output Unit		1	10	0
Isolated Resistance Thermometer Input Unit	CS1W-PTS02	CS/CJ SIO Unit – Process Input/Output Unit		1	10	0
Isolated Ni508.4Ω Resistance Thermometer Input Unit	CS1W-PTS03	CS/CJ SIO Unit – Process Input/Output Unit		1	10	0
High-resolution Isolated Resistance Thermometer Input Unit	CS1W-PTS12	CS/CJ SIO Unit – Process Input/Output Unit		1	10	0
Isolated 2-wire Transmission Device Input Unit	CS1W-PTW01	CS/CJ SIO Unit – Process Input/Output Unit		1	10	0
Isolated DC Input Unit	CS1W-PDC01	CS/CJ SIO Unit – Process Input/Output Unit		1	10	0
High-resolution Isolated DC Input Unit	CS1W-PDC11	CS/CJ SIO Unit – Process Input/Output Unit		1	10	0
Isolated Control Output Unit (Analog Output Unit)	CS1W-PTR01	CS/CJ SIO Unit – Process Input/Output Unit		1	10	0
Power Transducer Input Unit	CS1W-PTR02	CS/CJ SIO Unit – Process Input/Output Unit		1	10	0
DC Input Unit (100 mA)	CS1W-PMV01	CS/CJ SIO Unit – Process Input/Output Unit		1	5	5
Isolated Pulse Input Unit	CS1W-PPS01	CS/CJ SIO Unit – Process Input/Output Unit		1	10	0
Motion Control Units	CS1W-MC221	CS/CJ SIO Unit – Motion Control Unit		3	20	10
	CS1W-MC421			5	32	18
Position Control Units	CS1W-NC113/133	CS/CJ SIO Unit – Numerical Control Unit		1	3	2
	CS1W-NC213/233			1	6	4
	CS1W-NC413/433			2	12	8
Customizable Counter Units	CS1W-HIO01/HCP22/HCA22	CS/CJ SIO Unit – Customizable Unit		1	5	5
High-speed Counter Units	CS1W-CT021/041	CS/CJ SIO Unit – High Speed Counter Unit		4	26	14
GP-IB Interface Unit	CS1W-GPI01	CS/CJ SIO Unit – Other SIO Unit		1	5	5
CompoNet Master Unit	CS1W-CRM21	CS/CJ SIO Unit – CompoNet Master Unit	Communications mode No. 0	2	11	9
			No. 1	4	21	17
			No. 2	8	41	33
			No. 3	8	45	25
			No. 8	1	Variable	Variable

Note A Special I/O setting error will occur if Units, the number of input, or the number of output words is set incorrectly.

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2-8-3 C200H Special I/O Units

Name	Model	Unit type setting	Addresses per Unit	Input Words	Output Words
High-density I/O Units	C200H-ID501/215	C200H SIOU/C200H ASCII Unit	1	2	0
	C200H-OD501/215 (standard mode)		1	0	2
	C200H-OD501/215 (dynamic mode)		1	0	8
	C200H-MD501/215/115 (standard mode)		1	1	1
	C200H-MD501/215/115 (dynamic mode)		1	8	0
Temperature Control Units	C200H-TC001/002/003/101/102/103	C200H SIOU/C200H ASCII Unit	1	7	3
Heating/Cooling Control Units	C200H-TV001/002/003/101/102/103	C200H SIOU/C200H ASCII Unit	1	7	3
Temperature Sensor Units	C200H-TS001/002/101/102	C200H SIOU/C200H ASCII Unit	1	5	1
PID Control Units	C200H-PID01/02/03	C200H SIOU/C200H ASCII Unit	1	7	3
Cam Positioner Unit	C200H-CP114	C200H SIOU/C200H ASCII Unit	1	8	2
ASCII Units	C200H-ASC02	C200H SIOU/C200H ASCII Unit	1	1	3
	C200H-ASC11/21/31		1	5	5
Analog Input Units	C200H-AD001	C200H SIOU/C200H ASCII Unit	1	5	1
	C200H-AD002		1	9	1
	C200H-AD003 (normal mode)		1	9	1
	C200H-AD003 (adjustment mode)		1	2	8
Analog Output Units	C200H-DA001	C200H SIOU/C200H ASCII Unit	1	1	3
	C200H-DA002		1	0	4
	C200H-DA003/004 (normal mode)		1	1	9
	C200H-DA003/004 (adjustment mode)		1	2	8
Analog I/O Units	C200H-MAD01 (normal mode)	C200H SIOU/C200H ASCII Unit	1	5	5
	C200H-MAD01 (adjustment mode)		1	2	8
High-speed Counter Units	C200H-CT001-V1/CT002 (mode 1 or 2)	C200H High Speed Counter Unit	1	6	4
	C200H-CT001-V1/CT002 (mode 3)		1	5	4
	C200H-CT001-V1/CT002 (mode 4, 5, or 6)		1	4	4
	C200H-CT021		1	8	2
Motion Control Units	C200H-MC221	C200H Numerical Control Unit	2	12	8
Position Control Units	C200H-NC111/112	C200H Numerical Control Unit	1	5	5
	C200H-NC211		2	10	10
	C200H-NC114		1	3	2
	C200HW-NC213		1	6	4
	C200HW-NC413		2	12	8
ID Sensor Units	C200H-IDS01-V1/IDS21	C200H SIOU/C200H ASCII Unit	1	1	4
Voice Unit	C200H-OV001	C200H SIOU/C200H ASCII Unit	1	1	5
Fuzzy Logic Control Unit	C200H-FZ001	C200H SIOU/C200H ASCII Unit	1	1	4

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Name	Model	Unit type setting	Addresses per Unit	Input Words	Output Words
JPCN-1 Unit	C200H-JRM21	C200H SIOU/C200H ASCII Unit	1	2	8
C200H DeviceNet Master Unit	C200HW-DRM21-V1	C200H SIOU/C200H ASCII Unit	1	9	1
DeviceNet Slave Unit (C200H I/O Link Unit)	C200HW-DRT21	C200H SIOU/C200H ASCII Unit	1	5	5
CompoBus/S Master Unit	C200HW-SRM21-V1 (unit number 1)	C200H SIOU/C200H ASCII Unit	1	6	4
	C200HW-SRM21-V1 (unit number 2)		2	12	8
PLC Link Unit	C200H-LK401	PC Link Unit LK401	---	---	---
SYSMAC BUS Remote I/O Master Unit	C200H-RM001-PV1/RM201	SYSMAC BUS Master	---	---	---

Note A Special I/O setting error will occur if Units, the number of input, or the number of output words is set incorrectly.

2-8-4 CS-series CPU Bus Units

Unit type setting	Name	Model
Communications	Controller Link Unit	CS1W-CLK13/23/53 CS1W-CLK12/21/52(-V1)
	Serial Communications Unit	CS1W-SCU21-V1 CS1W-SCU31-V1
	Ethernet Unit	CS1W-ETN01/11/21 CS1D-ETN21D
	FL-net Unit	CS1W-FLN01/02/12/22
	SYSMAC LINK Unit	CS1W-SLK11/21
	DeviceNet Unit	CS1W-DRM21-V1
Position Control Unit	Position Control Unit	CS1W-NCF71
Motion Controllers	Motion Control Unit	CS1W-MCH71
Loop Controllers	Loop Control Unit	CS1W-LC001
General-purpose Devices	Storage and Processing Unit	CS1W-SPU01/02
	Open Network Controller	CS1W-EIS/EIX-CTS
		ITBC-CTS01

Note The DeviceNet Unit is not support by CX-Programmer version 2.0 or earlier, and I/O tables containing the DeviceNet Unit cannot be created with these versions. Create the tables online.

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SECTION 3
Nomenclature, Functions, and Dimensions

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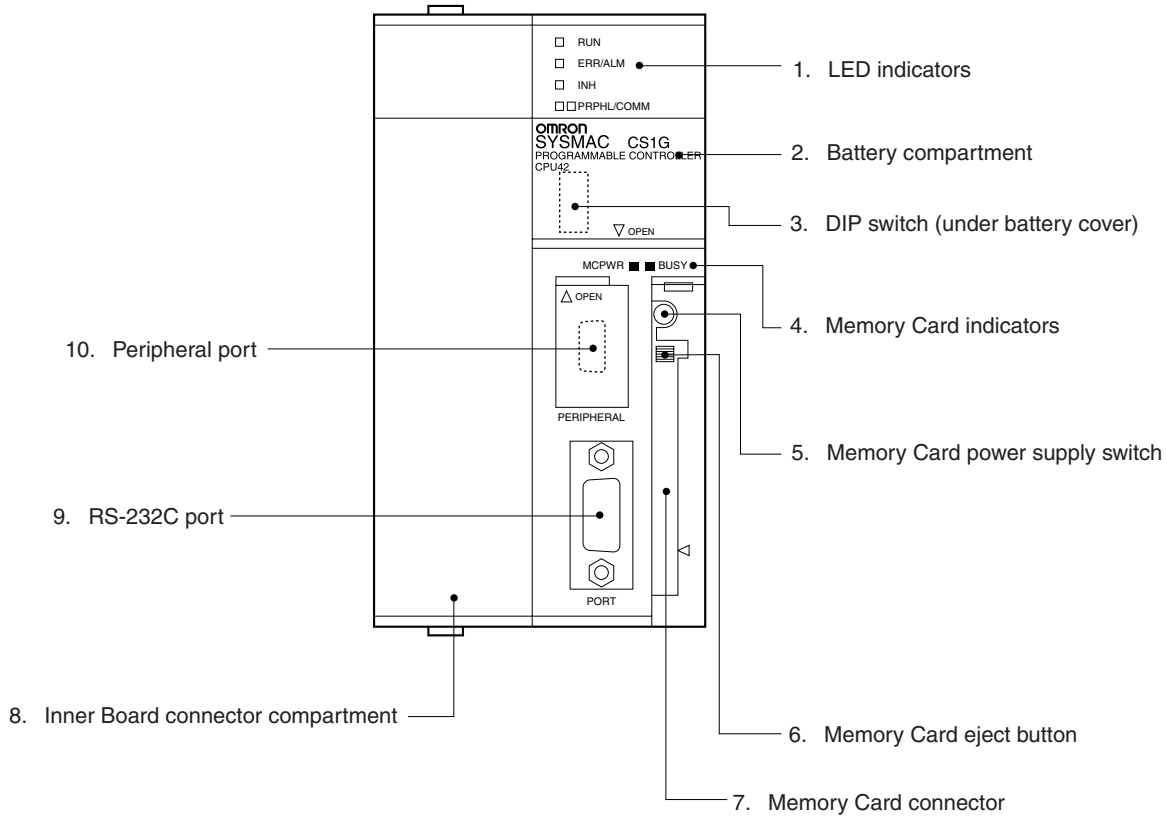
3-1 CPU Units

3-1-1 Models

CS1-H CPU Units

I/O points	Expansion Racks	Programming	Data Memory (DM + EM)	LD instruction processing time	Model	Weight
5,120	7 max.	250K steps	448K words	0.02 µs	CS1H-CPU67H	350 g max.
		120K steps	256K words		CS1H-CPU66H	
		60K steps	128K words		CS1H-CPU65H	
		30K steps	64K words		CS1H-CPU64H	
		20K steps	64K words		CS1G-CPU63H	
		60K steps	128K words	0.04 µs	CS1G-CPU45H	
1,280	3 max.	30K steps	64K words		CS1G-CPU44H	
960	2 max.	20K steps	64K words		CS1G-CPU43H	
		10K steps	64K words		CS1G-CPU42H	

3-1-2 Components



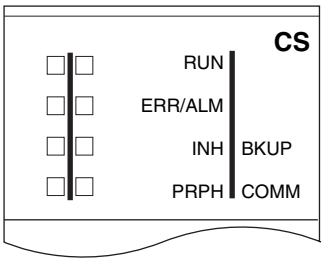
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Indicators

The following table describes the LED indicators located on the front panel of the CPU Units.

Indicator	Color	Status	Meaning
RUN	Green	ON	PLC is operating normally in MONITOR or RUN mode.
		Flashing	System download mode error or DIP switch settings error.
		OFF	PLC has stopped operating while in PROGRAM mode, or has stopped operating due to a fatal error, or is downloading data from the system.
ERR/ALM	Red	ON	A fatal error has occurred (including FALS instruction execution), or a hardware error (watchdog timer error) has occurred. The CPU Unit will stop operating, and the outputs from all Output Units will turn OFF.
		Flashing	A non-fatal error has occurred (including FAL instruction execution) The CPU Unit will continue operating.
		OFF	CPU Unit is operating normally.
INH	Orange	ON	Output OFF Bit (A50015) has been turned ON. The outputs from all Output Units will turn OFF.
		OFF	Output OFF Bit (A50015) has been turned OFF.
BKUP	Orange	ON	User program and parameter area data is being backed up to flash memory in the CPU Unit or being restored from flash memory. **Note** Do not turn OFF the power supply to the PLC while this indicator is lit.
		OFF	Data is not being written to flash memory.
PRPHL	Orange	Flashing	CPU Unit is communicating (sending or receiving) via the peripheral port.
		OFF	CPU Unit is not communicating via the peripheral port.
COMM	Orange	Flashing	CPU Unit is communicating (sending or receiving) via the RS-232C port.
		OFF	CPU Unit is not communicating via the RS-232C port.
MCPWR	Green	ON	Power is being supplied to the Memory Card.
		Flashing	Flashes once: Easy backup read, write, or verify normal Flashes five times: Easy backup write malfunction Flashes three times: Easy backup write warning Flashes continuously: Easy backup read or verify malfunction
		OFF	Power is not being supplied to the Memory Card.
BUSY	Orange	Flashing	Memory Card is being accessed.
		OFF	Memory Card is not being accessed.

CS1-H CPU Unit



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DIP Switch Settings

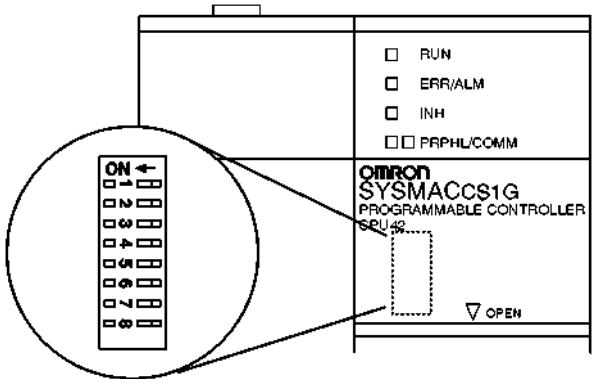
Pin no.	Setting	Function	Usage	Default
1	ON	Writing disabled for user program memory. (See note.)	Used to prevent programs from being accidently overwritten from Programming Devices (including Programming Console).	OFF
	OFF	Writing enabled for user program memory.		
2	ON	The user program is automatically transferred from the Memory Card when power is turned ON.	Used to store the programs in the Memory Card to switch operations, or to automatically transfer programs at power-up (Memory Card ROM operation). **Note** When pin 7 is ON, easy backup reading from the Memory Card is given priority, so even if pin 2 is ON, the user program is not automatically transferred from the Memory Card when power is turned ON.	OFF
	OFF	The user program is not automatically transferred from the Memory Card when power is turned ON.		
3	OFF	Always OFF. (See note.)		OFF
4	ON	Peripheral port communications parameters set in the PLC Setup are used.	Turn ON to use the peripheral port for a device other than Programming Console or CX-Programmer (Peripheral bus only).	OFF
	OFF	Peripheral port communications parameters set using Programming Console or CX-Programmer (Peripheral bus only) are used.		
5	ON	RS-232C port communications parameters set using a CX-Programmer (Peripheral bus only) are used.	Turn ON to use the RS-232C port for a Programming Device.	OFF
	OFF	RS-232C port communications parameters set in the PLC Setup are used.		
6	ON	User-defined pin. Turns OFF the User DIP Switch Pin Flag (A39512).	Set pin 6 to ON or OFF and use A39512 in the program to create a user-defined condition without using an I/O Unit.	OFF
	OFF	User-defined pin. Turns ON the User DIP Switch Pin Flag (A39512).		
7	ON	Writing from the CPU Unit to the Memory Card.	Press and hold the Memory Card Power Supply Switch for three seconds. **Note** Normally, this pin should be left turned OFF.	OFF
		Restoring from the Memory Card to the CPU Unit.	To read from the Memory Card to the CPU Unit, turn ON the PLC power. This operation is given priority over automatic transfer (pin 2 is ON) when power is ON.	
	OFF	Verifying contents of Memory Card.	Press and hold the Memory Card Power Supply Switch for three seconds.	
8	OFF	Always OFF.		OFF

Note

1. The following data cannot be overwritten when pin 1 is ON:
   - All parts of the user program (programs in all tasks)
   - All data in the parameter area (such as the PLC Setup and I/O table)

   When pin 1 is ON, the user program and parameter area will not be cleared when the memory clear operation is performed from a Programming Device.
2. The DIP switch is not used to set the display language with CS1-H CPU Units. The language is selected on the startup display on the Programming Console.
3. The CPU Unit will not enter any mode except PROGRAM mode after backing up data to a Memory Card using DIP switch pin 7. To enter RUN or MONITOR mode, turn OFF the power supply, turn OFF pin 7, and then restart the PLC. This will enable changing the operating mode as normal.

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3-1-3 CPU Unit Memory Block Map

The memory of CS-series CPU Units is configured in the following blocks.

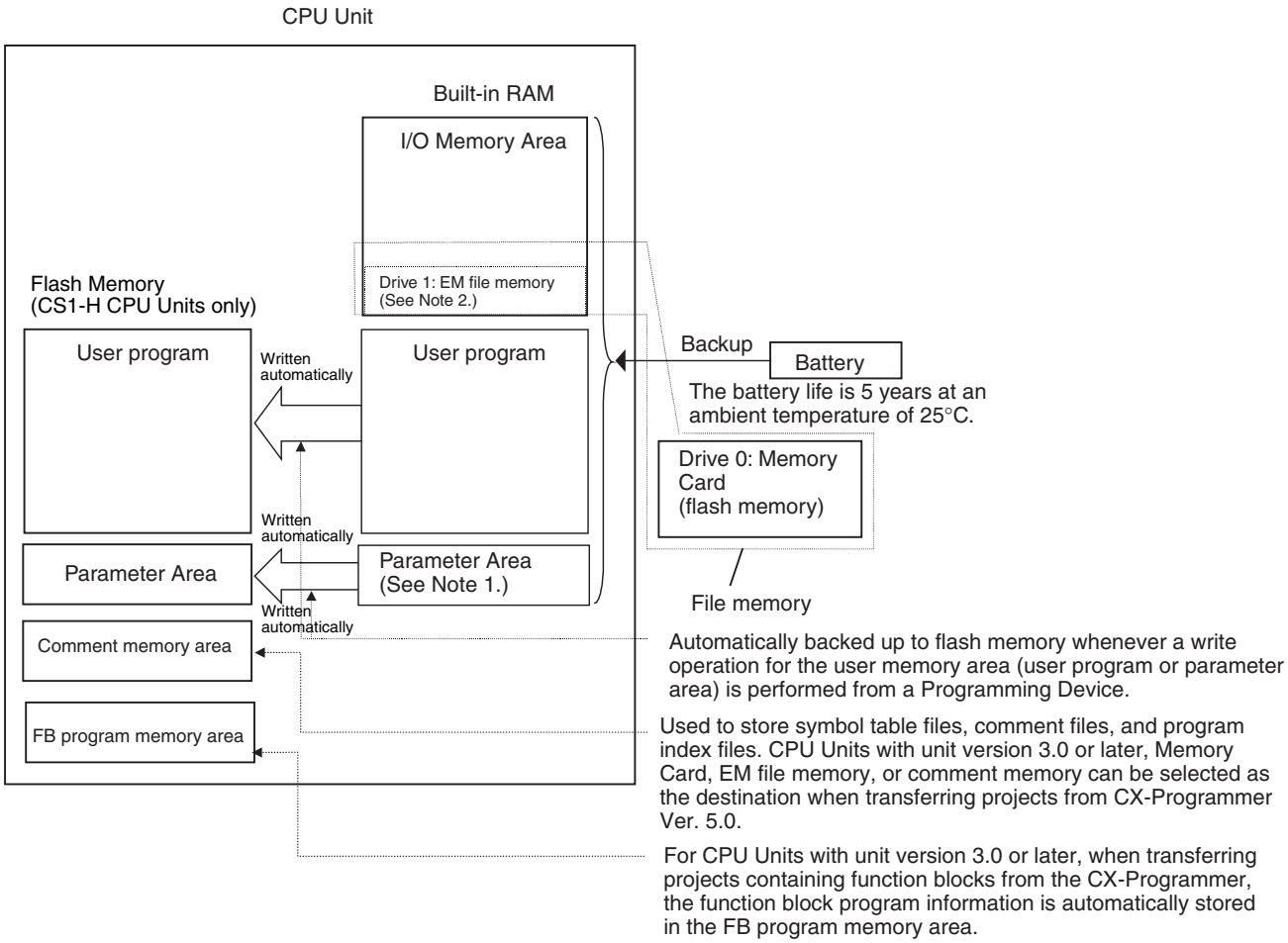
- I/O Memory: The data areas accessible from the user program
- User Memory: The user program and parameter areas (See Note 1.)

The above memory is backed up using a CS1W-BAT01 Battery. If the battery voltage is low, the data in these areas will not be stable.

With the CS1-H CPU Units, however, the CPU Unit has a built-in flash memory to which the user program and parameter area data is backed up whenever the user memory is written to, including data transfers and online editing from a Programming Device (CX-Programmer or Programming Console, data transfers from a Memory Card, etc. The user program and the parameter area data will be held when using a CS1-H CPU Unit.

The internal flash memory of CS1-H CPU Units with unit version 3.0 also contains a comment memory and FB program memory area. The comment memory is used to store symbol table files, comment files, and program index files (if comment memory is selected as the transfer destination when transferring projects from a CX-Programmer Ver. 5.0). The FB source memory area is used to store function block program data.

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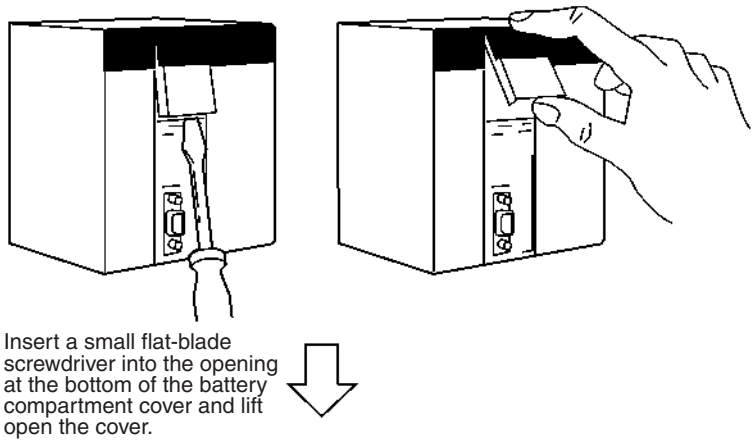
Note

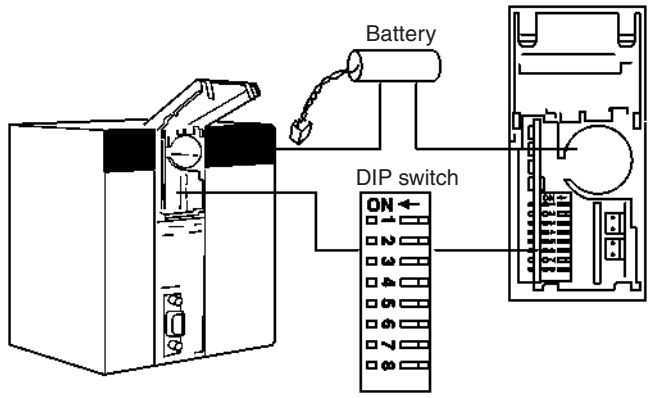
1. The Parameter Area stores system information for the CPU Unit, such as the PLC Setup.
2. Part of the EM (Extended Data Memory) Area can be converted to file memory to handle data files and program files in RAM memory format, which has the same format as Memory Cards. File memory in the EM Area is backed up by a battery.

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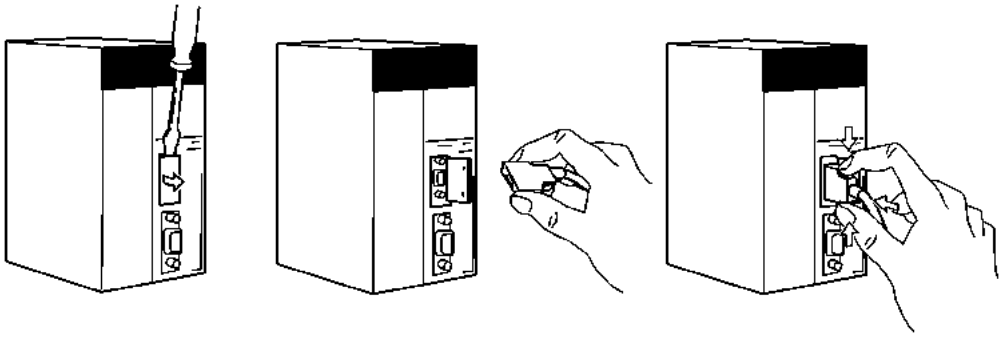
Opening the Battery Compartment Cover

Insert a small flat-blade screwdriver into the opening at the bottom of the battery compartment cover and lift open the cover.





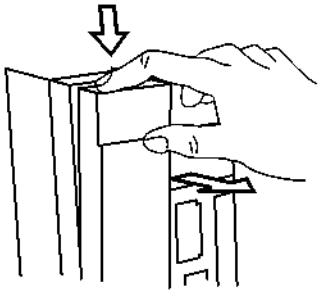
Opening the Peripheral Port Cover and Connecting Cables



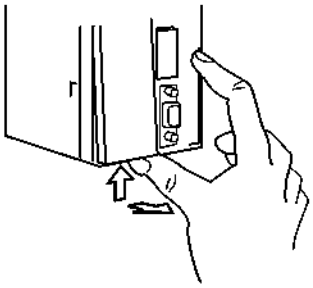
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Installing Inner Boards

1,2,3... 1. Press in the lever at the top of the Inner Board connector compartment and pull out.

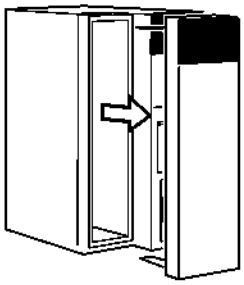


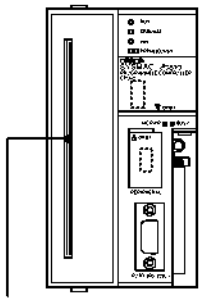
Press in the lever on the top of the cover and pull out.



Press in the lever on the bottom of the cover and pull out.

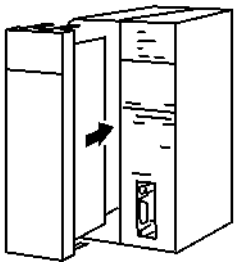
2. Remove the cover of the Inner Board connector compartment.





Inner Board connector

3. Insert the Inner Board into the compartment.



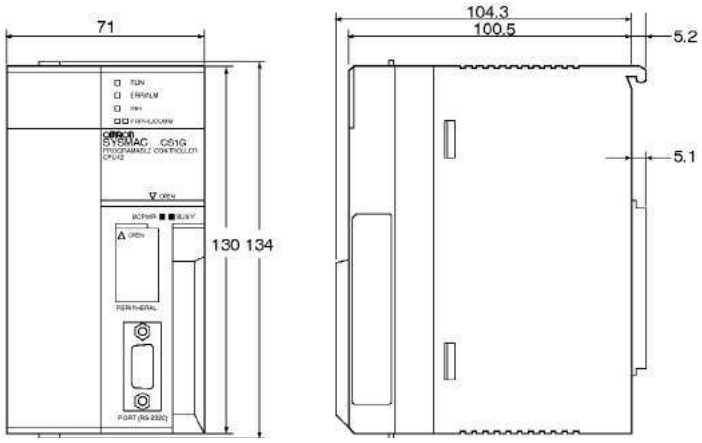
Note

1. Always make sure the power is OFF before installing the Inner Board. Installing the Inner Board when the power is ON may cause CPU Unit malfunction, damage to internal components, and improper communications.
2. Before installing the Inner Board, be sure to touch a grounded metal object to discharge static electricity from your body.

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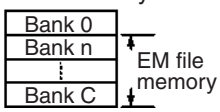
3-1-4 Dimensions

CS1H-CPU□□H, CS1G-CPU□□H



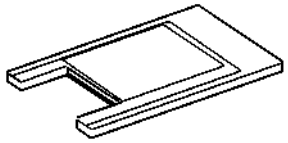
3-2 File Memory

For CS-series CPU Units, the Memory Card and a specified part of the EM Area can be used to store files. All user programs, the I/O Memory Area, and the Parameter Area can be stored as files.

File memory	Memory type	Memory capacity	Model/Contents
Memory Card 	Flash memory	30 Mbytes	HMC-EF372
		64 Mbytes	HMC-EF672
		128 Mbytes	HMC-EF183 (See note 3.)
EM file memory 	RAM	The maximum capacity of the CPU Unit's EM Area (e.g., the maximum capacity for a CPU67 is 832 Kbytes)	The specified bank (set in the PLC Setup) to the last bank of the EM Area in the I/O Memory.
Comment memory (CS/CJ-series CPU Units with unit version 3.0 or later only)	CPU Unit's internal flash memory	Comment files CPU66H/67H: 128 Kbytes Other CPU Units: 64 Kbytes	CX-Programmer rung comments and other comments
		Program index files CPU66H/67H: 128 Kbytes Other CPU Units: 64 Kbytes	CX-Programmer section names, section comments, and program comments
		Symbol table files CPU45H/65H66H/67H: 128 Kbytes Other CPU Units: 64 Kbytes	CX-Programmer global symbol tables, local symbol tables, and settings for automatically allocated areas.

Note

1. A Memory Card can be written up to approximately 100,000 times. (Each write operation to the Memory Card must be counted regardless of the size of the write.) Be particularly careful not to exceed the life of the Memory Card when writing to it from the ladder program.
2. The HMC-AP001 Memory Card Adapter is shown below.



3. The HMC-EF183 cannot be used with all CPU Units. Before ordering, refer to *Precaution on Applicable Units on page 164*.

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3-2-1 Specifications of Memory Card

Specifications

Model number		HMC-EF183	HMC-EF672	HMC-EF372
Memory Card capacity		128 Mbytes	64 Mbytes	30 Mbytes
Common specifications	Dimensions	42.8 × 36.4 × 3.3 mm (W × H × T)		
	Weight	15 g max.		
	Current consumption	Approx. 30 mA (when used with PLC)		
	Environmental specifications	Same as general specifications of PLC		
	No. of writes	100,000 (guaranteed value)		
Factory specifications	No. of files writable to root directory	511		
	File system	FAT16		

Precaution on Applicable Units

The HMC-EF183 Memory Card cannot be used with the following CPU Units and PTs. Confirm applicability when ordering.

1) CS-series CPU Units

- All CS1G-CPU□□H and CS1H-CPU□□H CPU Units manufactured before January 9, 2002 (lot number 020108 and earlier)

2) CJ-series CPU Units

- All CJ1G-CPU□□H and CJ1H-CPU□□H CPU Units manufactured before January 9, 2002 (lot number 020108 and earlier)
- All CJ1G-CPU□□ CPU Units (i.e., those without an H in the model number suffix: CPU□□H)

3) NS7-series PTs

All NS7-SV0□ PTs manufactured before May 9, 2002 (lot number 0852 and earlier)

Memory Card Recognition Time

Several seconds is normally required for the CPU Unit to recognize the Memory Card after it is inserted. The required time depends on the PLC's cycle time, the Memory Card Capacity, the number of files stored on the Memory Card, and other factors.

The recognition times given in the following table are guidelines for a CS1H-CPU□□H CPU Unit with a PLC cycle time of 0.4 ms and all PLC Setup parameters set to the default values.

Model	HMC-EF183	HMC-EF672	HMC-EF372
Recognition time	8 s	5 s	3 s

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3-2-2 Files Handled by CPU Unit

Files are ordered and stored in the Memory Card or EM file memory according to the file name and the extension attached to it.

General-use Files

File type	Contents		File name	Extension
Data files	Specified range in I/O memory	Binary	******** (See note 1.)	.IOM
		Text		.TXT
		CSV		.CSV
Program file	All user programs			.OBJ
Parameter file	PLC Setup, registered I/O tables, routing tables, CS-series CPU Bus Unit settings, SYSMAC LINK data link tables, and Controller Link data link tables			.STD

Files Transferred Automatically at Startup

Including Parameter File

File type	Contents	File name	Extension
Data files	DM area data (stores data for specified number of words starting from D20000)	AUTOEXEC	.IOM
	DM area data (stores data for specified number of words starting from D00000)	ATEXECDM	.IOM
	EM area for bank No. □ (stores data for specified number of words starting from E□_00000)	ATEXECE□	.IOM
Program file	All user programs	AUTOEXEC	.OBJ
Parameter file	PLC Setup, registered I/O tables, routing tables, CS-series CPU Bus Unit settings, SYSMAC LINK data link tables, and Controller Link data link tables	AUTOEXEC	.STD

Excluding Parameter File (CPU Unit Ver. 2.0 or Later)

File type	Contents	File name	Extension
Data files	DM area data (stores data for specified number of words starting from D20000)	REPLACE (CPU Unit Ver. 2.0 or later only)	.IOM
	DM area data (stores data for specified number of words starting from D00000)	REPLCDM (CPU Unit Ver. 2.0 or later only)	.IOM
	EM area for bank No. □ (stores data for specified number of words starting from E□_00000)	REPLCE□ (CPU Unit Ver. 2.0 or later only)	.IOM
Program file	All user programs	REPLACE (CPU Unit Ver. 2.0 or later only)	.OBJ
Parameter file	---	Not needed	---

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Easy Backup Files

File type	Contents	File name	Extension
Data files	Words allocated to Special I/O Units, CPU Bus Units, and Inner Boards in the DM area	BACKUP	.IOM
	CIO area	BACKUPIO	.IOR
	DM area	BACKUPDM	.IOM
	EM area	BACKUPE□	.IOM
Program files	All user programs	BACKUP	.OBJ
Parameter files	PLC Setup, registered I/O tables, routing tables, CS-series CPU Bus Unit settings, SYSMAC LINK data link tables, and Controller Link data link tables		.STD
Unit/Board backup files (CS1-H CPU Units only)	Data from specific Units or Boards	BACKUP□□	.PRM
Symbol table files (See note 4.)	CX-Programmer global symbol tables, local symbol tables, settings for automatically allocated areas	BKUPSYM	.SYM
Comment files (See note 4.)	CX-Programmer rung comments and comments	BKUPCMT	.CMT
Program index files (See note 4.)	CX-Programmer section names, section comments, and program comments	BCKUPPRG	.IDX

Note

1. Specify 8 ASCII characters. For a file name with less than 8 characters, add spaces (20 hex).
2. Always specify the name of files to be transferred automatically at power-up as AUTOEXEC or ATEXEC□□.
3. The BACKUP□□.PRM files are as follows:

Unit/Board	□□	Unit number
CPU Bus Units	10 to 1F	0 to F
Special I/O Units	20 to 6F	0 to 79
Inner Board	E1	---

4. Supported for CS/CJ-series CPU Units with unit version 3.0 or later only.

3-2-3 Initializing File Memory

File memory	Initializing procedure	Data capacity after initialization
Memory Card	1. Install Memory Card into CPU Unit. 2. Initialize the Memory Card using a Programming Device (including Programming Console).	Essentially the specific capacity of the Memory Card
EM file memory	1. Convert the part of the EM Area from the specified bank No. to the last bank No. to file memory in the PLC Setup. 2. Initialize the EM file memory using a Programming Device (excluding Programming Console).	1 bank: Approx. 61 KB 13 banks: Approx. 825 KB

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3-2-4 Using File Memory

Note For details on using file memory, refer to *SECTION 5 File Memory* of the *CS/CJ Series PLC Programming Manual*.

Memory Cards

Reading/Writing Files Using Programming Device

File	File name and extension	Data transfer direction
Program files	********.OBJ	Between CPU Unit and Memory Card,
I/O memory files	********.IOM	
Parameter files	********.STD	

1,2,3...

1. Install the Memory Card into the CPU Unit.
2. Initialize the Memory Card if necessary.
3. Name the file containing the data in the CPU Unit and save the contents in the Memory Card.
4. Read the file that is saved in the Memory Card to the CPU Unit.

Automatically Transferring Memory Card Files to the CPU Unit at Power-up

Including Parameter File

File	File name and extension	Data transfer direction
Program file	AUTOEXEC.OBJ	From Memory Card to CPU Unit
I/O memory files	AUTOEXEC.IOM ATEXECDM.IOM ATEXECE□.IOM	
Parameter file	AUTOEXEC.STD	

1,2,3...

1. Install the Memory Card into the CPU Unit.
2. Set pin 2 of the DIP switch to ON.
3. The files are read automatically when the power is turned ON.

Excluding Parameter File

File	File name and extension	Data transfer direction
Program file	REPLACE.OBJ	From Memory Card to CPU Unit
I/O memory files	REPLACE.IOM REPLCDM.IOM REPLCE□.IOM	
Parameter file	Not needed	

1,2,3...

1. Install the Memory Card into the CPU Unit.
2. Set pin 2 of the DIP switch to ON.
3. Turn ON the power to the PLC. The files will be read automatically when the power is turned ON.

Reading/Writing I/O Memory Files Using FREAD(700)and FWRIT(701)

File	File name and extension	Data transfer direction
I/O memory files	********.IOM ********.TXT ********.CSV	Between CPU Unit and Memory Card

1,2,3...

1. Install the Memory Card into the CPU Unit.
2. Initialize the Memory Card using a Programming Device.

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3. Using the FWRIT(701) instruction, name the file of the specified I/O memory area, and save to the Memory Card.
4. Using the FREAD(700) instruction, read the I/O memory files from the Memory Card to the I/O memory in the CPU Unit.

Note When using spreadsheet software to read data that has been written to the Memory Card in CSV or text format, it is now possible to read the data using Windows applications by mounting a Memory Card in the personal computer card slot using a HMC-AP001 Memory Card Adapter.

Reading and Replacing Program Files during Operation

File	File name and extension	Data transfer direction
Program files	********.OBJ	Memory Card to CPU Unit

1,2,3...

1. Install a Memory Card into the CPU Unit.
2. Set the following information: Program File Name (A654 to A657) and Program Password (A651).
3. Next, from the program, turn ON the Replacement Start Bit (A65015).

Backing Up or Restoring CPU Unit Data or Data for Specific Units and Boards

File	File name and extension	Data transfer direction
Program files	BACKUP.OBJ	CPU Unit to Memory Card (when backing up) Memory Card to CPU Unit (when restoring)
Data files	BACKUP.IOM	
	BACKUPIO.IOR	
	BACKUPDM.IOM	
	BACKUPE□.IOM	
Parameter files	BACKUP.STD	
Unit/Board backup files (CS1-H CPU Units only)	BACKUP□□.PRM	
Symbol table files	BKUPSYM.SYM	
Comment files	BKUPCMT.CMT	
Program index files	BKUPPRG.IDX	

1,2,3...

1. Install a Memory Card into the CPU Unit.
2. Turn ON pin 7 on the DIP switch.
3. To back up data, press and hold the Memory Card Power Supply Switch for three seconds. To restore data, turn ON the PLC power.

Transferring Files between Memory Cards and the CX-Programmer

The following files can be transferred between a Memory Card and the CX-Programmer.

File	File name and extension	Data transfer direction
Symbols file	SYMBOLS.SYM	Between CX-Programmer and Memory Card
Comment file	COMMENTS.CNT	
Program index file	PROGRAM.IDX	

1,2,3...

1. Insert a formatted Memory Card into the CPU Unit.
2. Place the CX-Programmer online and use the file transfer operations to transfer the above files from the personal computer to the PLC or from the PLC to the personal computer.

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EM File Memory

Reading/Writing EM File Memory Files Using Programming Device

File	File name and extension	Data transfer direction
Program files	********.OBJ	Between CPU Unit and EM file memory
I/O memory files	********.IOM	
Parameter files	********.STD	

1,2,3...

1. Convert the part of the EM Area specified by the first bank number into file memory in the PLC Setup.
2. Initialize the EM file memory using a Programming Device.
3. Name the data in the CPU Unit and save in the EM file memory using the Programming Device.
4. Read the EM file memory files to the CPU Unit using the Programming Device.

Reading/Writing I/O Memory Files in EM File Memory Using FREAD(700)and FWRIT(701)

File	File name and extension	Data transfer direction
I/O memory files	********.IOM	Between CPU Unit and EM file memory

1,2,3...

1. Convert the part of the EM Area specified by the first bank number into file memory in the PLC Setup.
2. Initialize the EM file memory using a Programming Device.
3. Using the FWRIT(701) instruction, name the specified area in I/O memory with a file name and save in the EM file memory.
4. Using the FREAD(700) instruction, read the I/O memory files from the EM file memory to the I/O memory in the CPU Unit.

Note The following files can be transferred between EM file memory and the CX-Programmer.

File	File name and extension	Data transfer direction
Symbols file	SYMBOLS.SYM	Between CX-Programmer and EM file memory
Comment file	COMMENTS.CNT	
Program index file	PROGRAM.IDX	

1,2,3...

1. Format the EM Area in the CPU Units as file memory.
2. Place the CX-Programmer online and use the file transfer operations to transfer the above files from the personal computer to the PLC or from the PLC to the personal computer.

Comment Memory (Unit Version 3.0 or Later Only)

The internal flash memory in CS/CJ-series CPU Units with unit version 3.0 or later contains a comment memory area. The following comment data and section data (symbol table files, comment files, and program index files) can be stored in or read from the comment memory when both the Memory Card and EM file memory are not available.

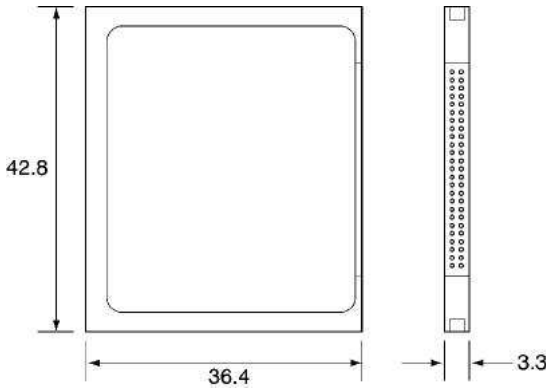
Note When using CX-Programmer Ver. 5.0 to download projects, either of the following locations can be selected as the transfer destination for comment data and section data.

- Memory Card
- EM file memory

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• Comment memory (in CPU Unit's internal flash memory)

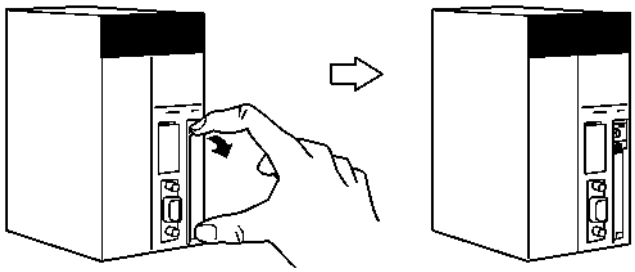
3-2-5 Memory Card Dimensions



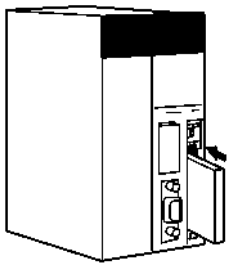
3-2-6 Installing and Removing the Memory Card

Installing the Memory Card

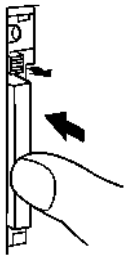
1,2,3... 1. Pull the top end of the Memory Card cover forward and remove from the Unit.



2. Insert the Memory Card with the label facing to the right. (Insert with the Δ on the Memory Card label and the ◁ on the CPU Unit facing each other.)



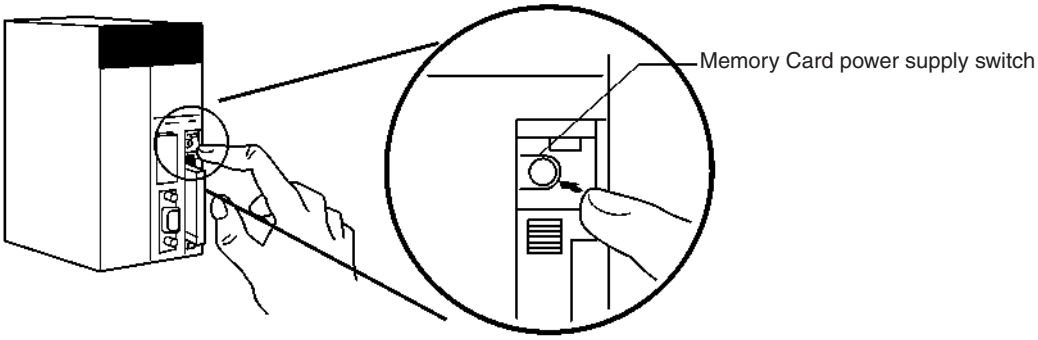
3. Push the Memory Card securely into the compartment. If the Memory Card is inserted correctly, the Memory Card eject button will be pushed out.



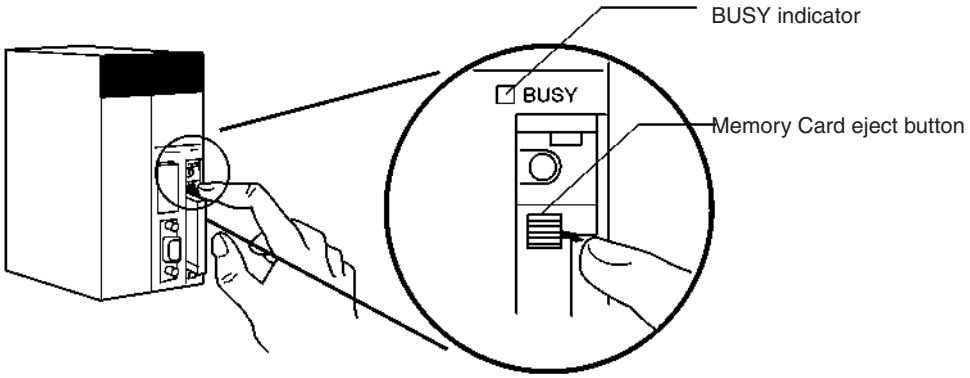
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Removing the Memory Card

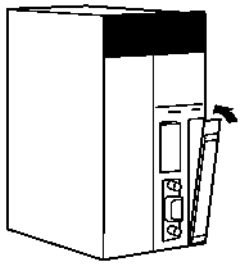
1,2,3... 1. Press the Memory Card power supply switch.



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



3. The Memory Card will eject from the compartment.
4. Remove the Memory Card cover when a Memory Card is not being used.

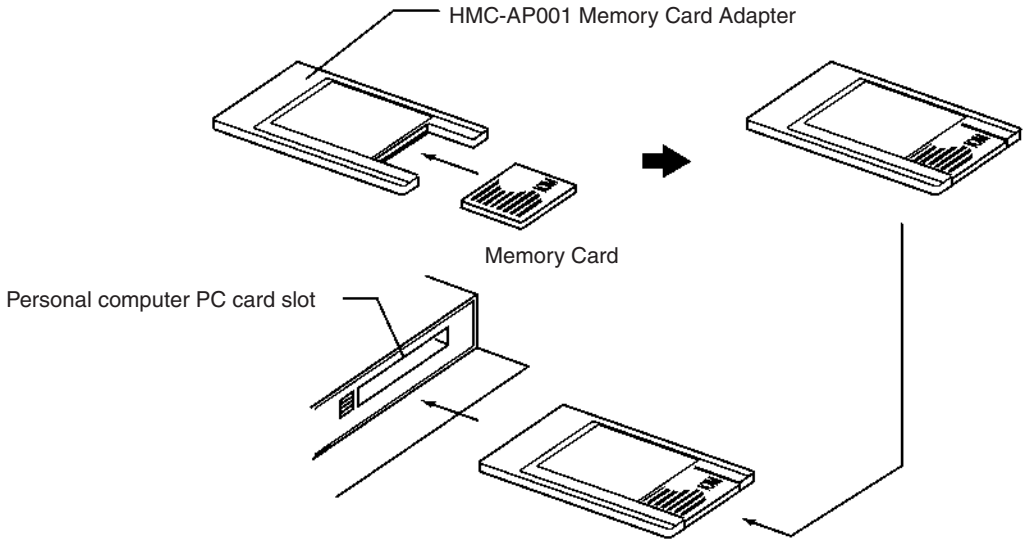


Note

1. Never turn OFF the PLC while the CPU is accessing the Memory Card.
2. Never remove the Memory Card while the CPU is accessing the Memory Card. Press the Memory Card power supply switch and wait for the BUSY indicator to go OFF before removing the Memory Card. In the worst case, the Memory Card may become unusable if the PLC is turned OFF or the Memory Card is removed while the Card is being accessed by the CPU.
3. Never insert the Memory Card facing the wrong way. If the Memory Card is inserted forcibly, it may become unusable.

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Installing the Memory Card into a Personal Computer



Note

1. When a Memory Card is inserted into a computer using a Memory Card Adapter, it can be used as a standard storage device, like a floppy disk or hard disk.
2. When deleting all of the data in a Memory Card or formatting it in any way, always place it in the CPU Unit and perform the operation from the CX-Programmer or a Programming Console.

3-3 Programming Devices

3-3-1 Overview

There are 2 types of Programming Devices that can be used: Any of three models of Hand-held Programming Consoles or the CX-Programmer, which is operated on a Windows computer. The CX-Programmer is usually used to write the programs, and a Programming Console is then used to change the operating modes, edit the programs, and monitor a limited number of points.

The following table provides a comparison between the CX-Programmer functions and the Programming Console functions.

Function		Programming Console	CX-Programmer
Editing and referencing I/O tables		Yes	Yes
Selecting tasks		Yes	Yes
Writing programs	Inputting instructions	Writes instructions one at a time using mnemonics	Writes multiple blocks using mnemonics or ladder programs
	Inputting addresses	Addresses only	Addresses or symbols
	I/O comment, rung comment	No	Yes
	Setting global/local symbols	No	Yes (Automatic allocation of local symbols)
Editing programs		Inserts instructions and searches for program addresses	Yes (Cutting, pasting, inserting within programs; searching/exchanging instructions, addresses, and symbols; displaying cross-references)
Checking programs		No	Yes
Monitoring programs		Monitors in program address units	Monitors multiple blocks

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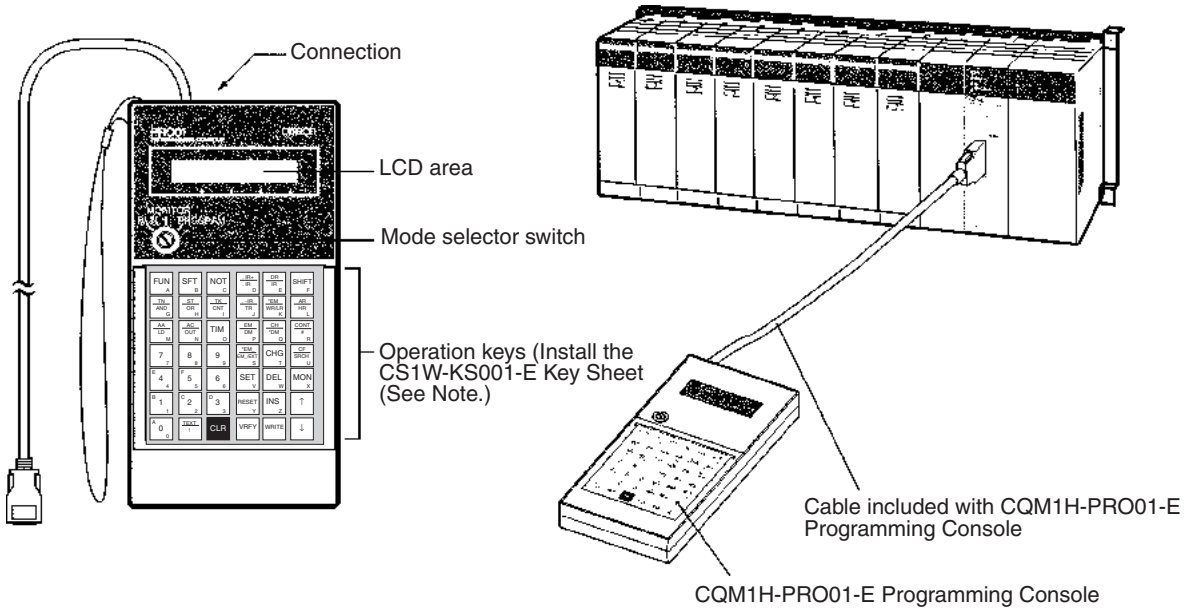
Function		Programming Console	CX-Programmer
Monitoring I/O memory		Simultaneous, 2 points max.	Monitors multiple points
Changing I/O memory present values		Changes 1 point at a time	Yes
Online editing		Edits in instruction units	Edits multiple adjacent blocks
Debugging	Changing timer and counter settings	Yes	Yes
	Control set/ reset	Executes 1 point at a time (or resets all at once)	Yes
	Differentiation monitoring	Yes	Yes
	Reading cycle time	Yes	Yes
	Data tracing	No	Yes
	Time chart monitoring	No	Yes
Reading error information		Yes (error message display)	Yes
Reading error log		No	Yes
Reading/setting timer information		Yes	Yes
Reading/setting PLC parameters		Yes	Yes
Setting CPU Bus Unit parameters		No	Yes
File memory operations	Initializing Memory Card	Yes	Yes
	Initializing EM file memory	Yes	Yes
	Transferring files between CPU Unit and file memory	Yes	Yes
Remote programming and monitoring	Between Host Link and Network PLC	No	Yes
	Via modem	No	Yes
Setting password protection		No	Yes
Managing files		No	Manages files by project.
Printing		No	Yes

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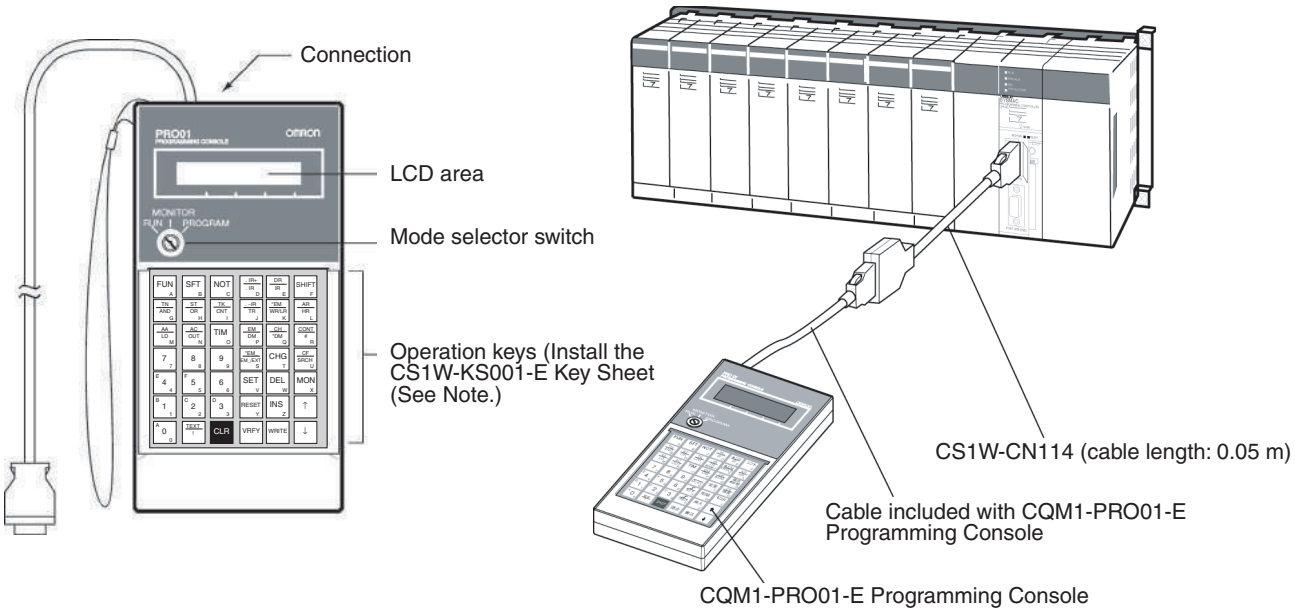
3-3-2 Programming Consoles

There are three Programming Consoles that can be used with the CS-series CPU Units: The CQM1H-PRO01-E, CQM1-PRO01-E, and C200H-PRO27-E. These Programming Consoles are shown here.

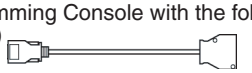
CQM1H-PRO01-E Programming Console



CQM1-PRO01-E Programming Console

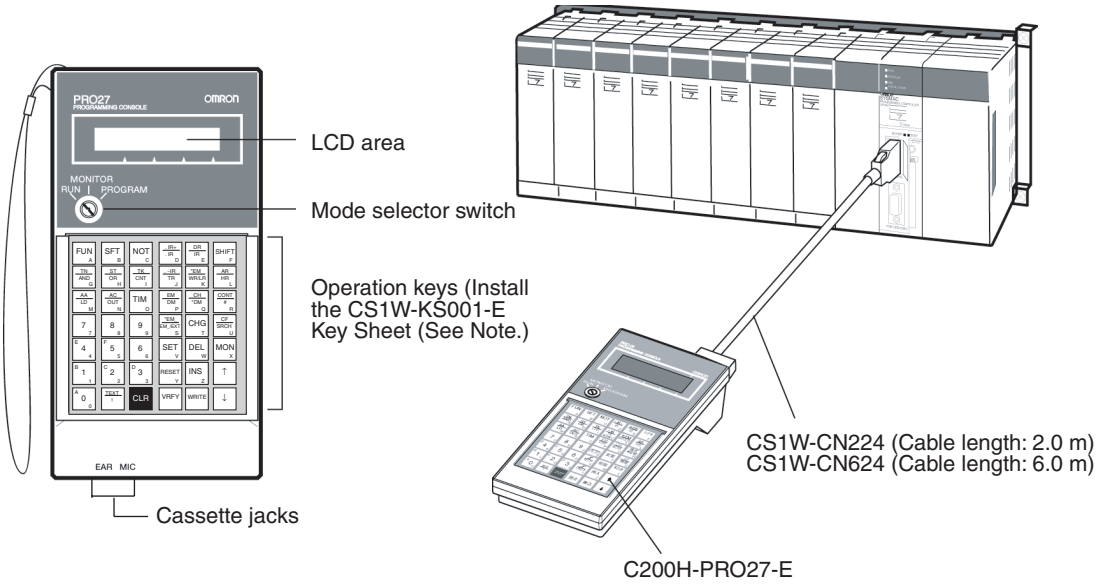


Connect the CPU Unit to the Programming Console with the following cables.
CS1W-CN114 (Cable length: 0.05 m)

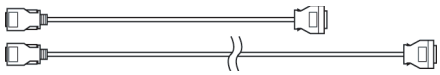


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C200H-PRO27-E Programming Console



Connect the CPU Unit to the Programming Console with the following cables.
CS1W-CN224 (Cable length: 2.0 m)
CS1W-CN624 (Cable length: 6.0 m)



Note The Key Sheet is not used with CS-series CPU Units.

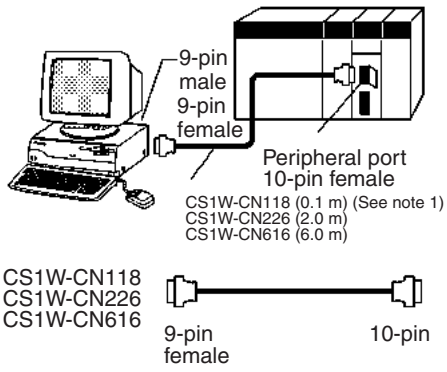
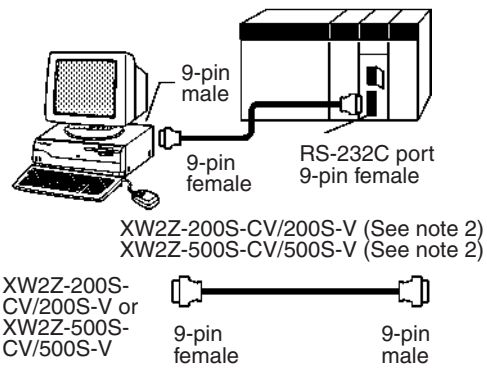
3-3-3 CX-Programmer

Item	Details
Applicable PLC	CS-series, CJ-series, CP-series, NSJ-series, CV-series, C200HX/HG/HE (-Z), C200HS, CQM1, CPM1, CPM1A, SRM1, C1000H/2000H
OS	Microsoft Windows 95 (See note.), 98, NT 4.0 (Service Pack 6), 2000, Me, XP
Personal computer	DOS version
Connection method	CPU Unit's peripheral port or built-in RS-232C port
Communications protocol with PLC	Peripheral bus or Host Link
Offline operation	Programming, I/O memory editing, creating I/O tables, setting PLC parameters, printing, program changing
Online operation	Transmitting, referencing, monitoring, creating I/O tables, setting PLC parameters
Basic functions	1. Programming: Creates and edits ladder programs and mnemonic programs for the applicable PLC. 2. Creating and referencing I/O tables. 3. Changing the CPU Unit operating mode. 4. Transferring: Transfers programs, I/O memory data, I/O tables, PLC Setup, and I/O comments between the personal computer and the CPU Unit. 5. Program execution monitoring: Monitors I/O status/present values on ladder displays, I/O status/present values on mnemonic displays, and present values on I/O memory displays

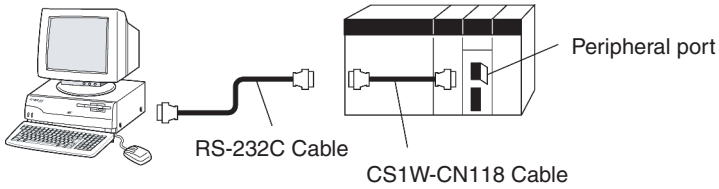
Note Windows 95 cannot be used when connecting via a Controller Link Support Board (PCI bus) or a SYSMAC LINK Support Board (PCI bus).

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Connections

Personal computer	Peripheral port connection	RS-232C port connection
DOS		

Note 1. The CS1W-CN118 Cable is used with one of the RS-232C Cables shown on the right (XW2Z-□□□S-□□) to connect to the peripheral port on the CPU Unit.



2. If cables with model numbers ending in -V instead of -CV are used to connect the computer running the CX-Programmer to the RS-232C port (including when using a CS1W-CN118 Cable), a peripheral bus connection cannot be used. Use a Host Link (SYSMAC WAY) connection. To connect to the port using a peripheral bus connection, prepare an RS-232C cable as described in *3-3-5 RS-232C Port Specifications.*

CX-Programmer Connecting Cables

Unit	Unit port	Computer	Computer port	Serial communications mode	Model	Length	Cable notes
CPU Units	Peripheral port	DOS	D-Sub, 9-pin, male	Peripheral Bus or Host Link	CS1W-CN226	2.0 m	---
					CS1W-CN626	6.0 m	
	Built-in RS-232C port D-Sub, 9-pin, female	DOS	D-Sub, 9-pin, male	Peripheral Bus or Host Link	XW2Z-200S-CV	2 m	Use a static-resistant connector.
					XW2Z-500S-CV	5 m	
Serial Communications Boards/Units	RS-232C Port D-Sub, 9-pin, female	DOS	D-Sub, 9-pin, male	Host Link	XW2Z-200S-CV	2 m	Use a static-resistant connector.
					XW2Z-500S-CV	5 m	

Note 1. Before connecting a connector from the above table to an RS-232C port, touch a grounded metal object to discharge static electricity from your body.
The XW2Z-□□□S-CV Cables have been strengthened against static because they use a static-resistant connector hood (XM2S-0911-E). Even so, always discharge static electricity before touching the connectors.

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2. Do not use commercially available RS-232C personal computer cables. Always use the special cables listed in this manual or make cables according to manual specifications. Using commercially available cables may damage the external devices or CPU Unit.

RS-232C Cables for a Peripheral Port

Unit	Unit port	Computer	Computer port	Serial communications mode	Model	Length	Cable notes
CPU Units	Built-in peripheral port	DOS	D-Sub, 9-pin, male	Peripheral Bus or Host Link	CS1W-CN118 + XW2Z-200S-CV/500S-CV	0.1 m+ (2 m or 5 m)	XW2Z-□□□S-CV models use a static-resistant connector

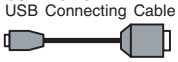
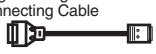
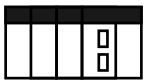
Using a CQM1-CIF01/02 Cable for a Peripheral Port

Unit	Unit port	Computer	Computer port	Serial communications mode	Model	Length	Cable notes
CPU Units	Built-in peripheral port	DOS	D-Sub, 9-pin, male	Host Link	CS1W-CN114 + CQM1-CIF02	0.05 m + 3.3 m	---

Using a RS-232C Cable for a IBM PC/AT or Compatible

Unit	Unit port	Computer	Computer port	Serial communications mode	Model	Length	Cable notes
CPU Units	Built-in RS-232C port D-Sub, 9-pin, female	DOS	D-Sub, 9-pin, male	Host Link	XW2Z-200S-V	2 m	---
					XW2Z-500S-V	5 m	
Serial Communications Boards/Units	RS-232C port D-Sub, 9-pin, female	DOS	D-Sub, 9-pin, male	Host Link	XW2Z-200S-V	2 m	
					XW2Z-500S-V	5 m	

Connection Method for USB-Serial Conversion Cable

Computer	CS1W-CIF31		Cable 1		Cable 2	PLC
	CS1W-CIF31 USB Connecting Cable 	+	CS1W-CN226/626 CS/CJ-series Peripheral Port Programming Device Connecting Cable  OR CQM1H-CIF02 C-series Peripheral Port Programming Device Connecting Cable  OR XW2Z-□□□ RS-232C Programming Device Connecting Cable 	+	CS1W-CN114 C-series Peripheral-CS/CJ-series Peripheral Conversion Cable  CS1W-CN118 RS-232C-CS/CJ-series Peripheral Conversion Cable 	

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CX-Programmer Connecting Cables

Cables Connecting to CPU Units

USB Connecting Cable Model	Cable 1			Cable 2			Unit port	Serial communications mode (network)
	Connector	Cable model	Connector	Connector	Cable model	Connector		
CS1W-CIF31	D-sub, 9-pin female	CS1W-CN226/626 (length: 2 m/6 m)	CS/CJ-series peripheral	Not required.			CS/CJ-series peripheral	Peripheral Bus (Toolbus) or Host Link (SYSWAY)
		CQM1-CIF02 (length: 3.3 m)	C-series peripheral	C-series peripheral	CS1W-CN114 (length: 5 cm)	CS/CJ-series peripheral		Host Link (SYSWAY)
		XW2Z-200S-V/ 500S-V (length: 2 m/ 5 m)	D-sub, 9-pin male	D-sub, 9-pin female	CS1W-CN118 (length: 0.1 m)	CS/CJ-series peripheral		Peripheral Bus (Toolbus) or Host Link (SYSWAY)
		XW2Z-200S-V/ 500S-V (length: 2 m/ 5 m)	D-sub, 9-pin male	D-sub, 9-pin female	CS1W-CN118 (length: 0.1 m)	CS/CJ-series peripheral		Host Link (SYSWAY)
		XW2Z-200S-CV/ 500S-CV (length: 2 m/5 m)	RS-232C D-sub, 9-pin male	Not required.			RS-232C D-sub, 9-pin female	Peripheral Bus (Toolbus) or Host Link (SYSWAY)
		XW2Z-200S-V/ 500S-V (length: 2 m/ 5 m)	RS-232C D-sub, 9-pin male	Not required.				Host Link (SYSWAY)

Cables Connecting to Serial Communications Boards/Units

USB Connecting Cable Model	Cable 1			Cable 2	Unit port	Serial communications mode (network)
	Connector	Cable model	Connector			
CS1W-CIF31	D-sub, 9-pin female	XW2Z-200S-CV/ 500S-CV (length: 2 m/5 m)	RS-232C D-sub, 9-pin male	Not required.	RS-232C D-sub, 9-pin female	Host Link (SYSWAY)
CS1W-CIF31	D-sub, 9-pin female	XW2Z-200S-V/ 500S-V (length: 2 m/5 m)	RS-232C D-sub, 9-pin male	Not required.		

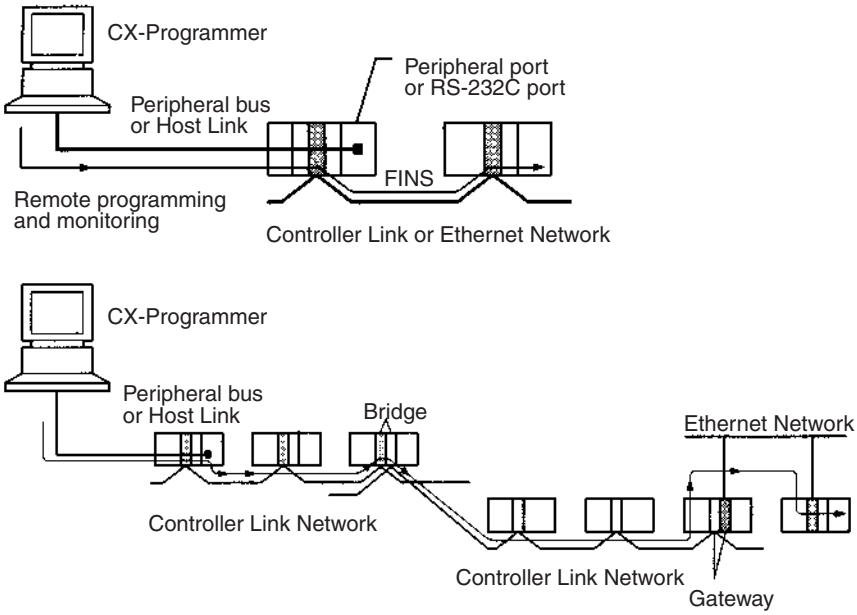
Communications Modes when Connecting a CX-Programmer to a CS-series CPU Unit

Serial communications mode	Characteristics
Peripheral Bus	High-speed communications are possible. Consequently, connecting via a peripheral bus is recommended when using a CX-Programmer. Only 1:1 connection is possible. When using a CS-series CPU Unit, the baud rate of the communications devices can be automatically recognized for connection.
Host Link	This is a communications protocol with a general-purpose host computer. Either 1:1 or 1:N connections are possible. Host Link communications are slow compared with the Peripheral Bus communications. The following connections are possible: Via a modem or optical fiber adapter, over long distance using a RS-422A/485, and 1:N.

Note The CX-Programmer can be used for remote programming and monitoring. It can be used to program and monitor not only the PLC to which it is directly connected, but also to program and monitor any PLC connected through a Controller Link or Ethernet network to which the PLC that the CX-Programmer

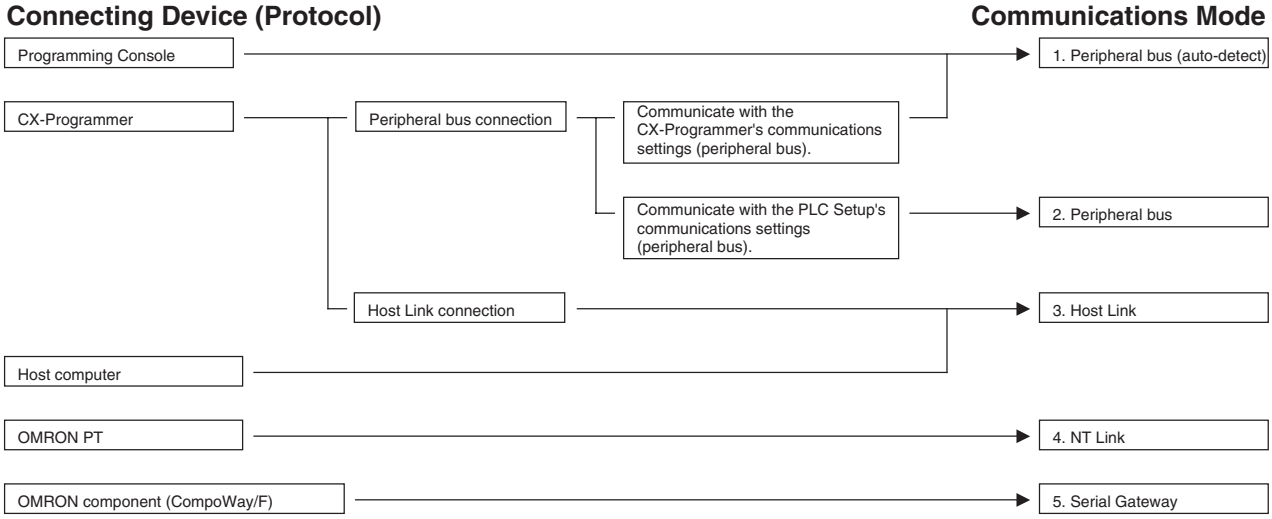
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is connected to is a part of. All programming and monitoring functionality for the directly connected PLC is supported for remote programming and monitoring, the PLC can be connected though either the peripheral or an RS-232C port, and either the peripheral bus or Host Link bus can be used. Remote programming is possible for up to three levels of networks (counting the local network but not counting the peripheral bus or Host Link connection between the CX-Programmer and the local PLC).



3-3-4 Peripheral Port Specifications

Communications Mode Selection Flowchart



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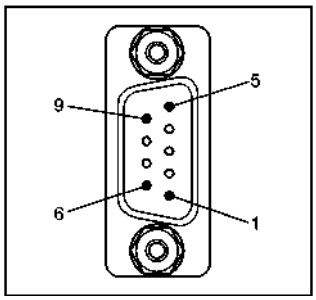
Peripheral Port Communications Settings

Connection	Communications Settings	
	Pin 4 of Front-panel DIP Switch	PLC Setup peripheral port setting (See note.)
1. Peripheral bus (auto-detect)	OFF (factory setting)	---
2. Peripheral bus	ON	Peripheral bus
3. Host Link	ON	Host Link (default setting)
4. NT Link	ON	NT Link
5. Serial Gateway	ON	Serial Gateway

Note Set from the CX-Programmer or Programming Console.

3-3-5 RS-232C Port Specifications

Connector Pin Arrangement

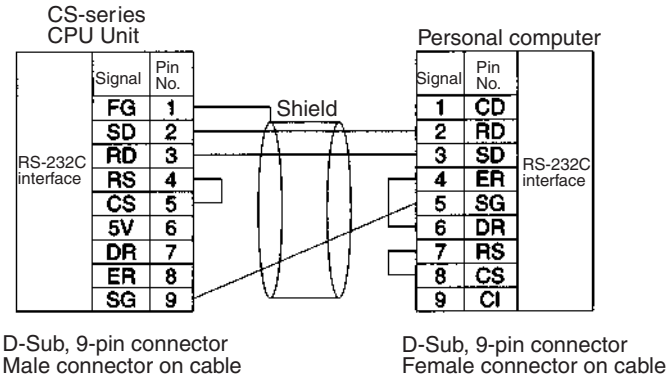


Pin No.	Signal	Name	Direction
1	FG	Protection earth	---
2	SD (TXD)	Send data	Output
3	RD (RXD)	Receive data	Input
4	RS (RTS)	Request to send	Output
5	CS (CTS)	Clear to send	Input
6	5 V	Power supply	---
7	DR (DSR)	Data set ready	Input
8	ER (DTR)	Data terminal ready	Output
9	SG (0 V)	Signal ground	---
Connector hood	FG	Protection earth	---

Note Do not use the 5-V power from pin 6 of the RS-232C port for anything other than an NT-AL001, CJ1W-CIF11 Link Adapter, or NV3W-M□20L Programmable Terminal. Using this power supply for any other external device may damage the CPU Unit or the external device.

Connection between CS-series CPU Unit and Personal Computer

The following connections are in Host Link serial communications mode.

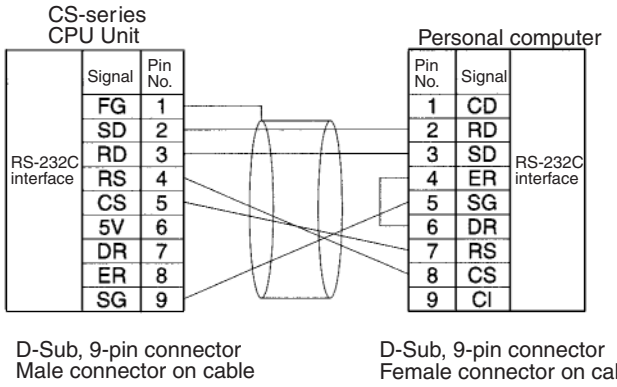


Note

1. Refer to *Appendix E Connecting to the RS-232C Port on the CPU Unit* when converting between RS-232C and RS-422A/485 for 1:N connections.
2. Refer to *Appendix E Connecting to the RS-232C Port on the CPU Unit* when making your own RS-232C cable.

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The following connections are in Peripheral Bus serial communications mode.



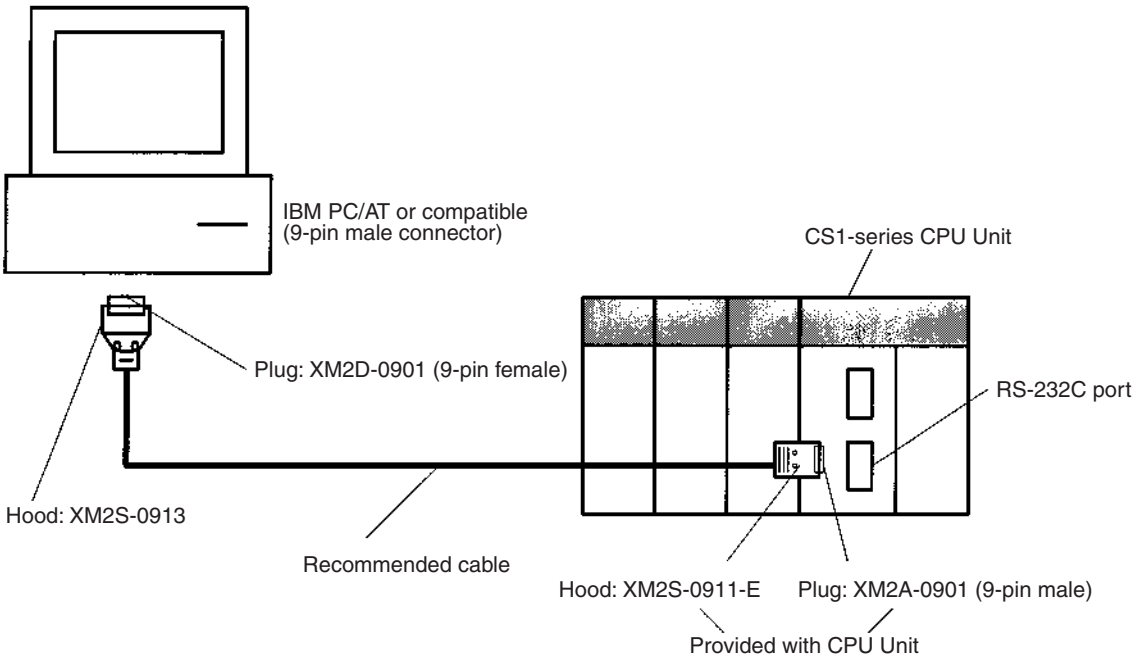
Applicable Connectors

CPU Unit Connector

Item	Model	Specifications	
Plug	XM2A-0901	9-pin male	Used together (One of each provided with CPU Unit.)
Hood	XM2S-0911-E	9-pin, millimeter screws	

Personal Computer Connector

Item	Model	Specifications	
Plug	XM2D-0901	9-pin female	Used together
Hood	XM2S-0913	9-pin, inch screws	



Note Use the special cables provided from OMRON for all connections whenever possible. If cables are produced in-house, be sure they are wired correctly. External devices and the CPU Unit may be damaged if general purpose (e.g., computer to modem) cables are used or if wiring is not correct.

Recommended Cables

Fujikura Ltd.: UL2464 AWG28 × 5P IFS-RVV-SB (UL product)
AWG 28 × 5P IFVV-SB (non-UL product)

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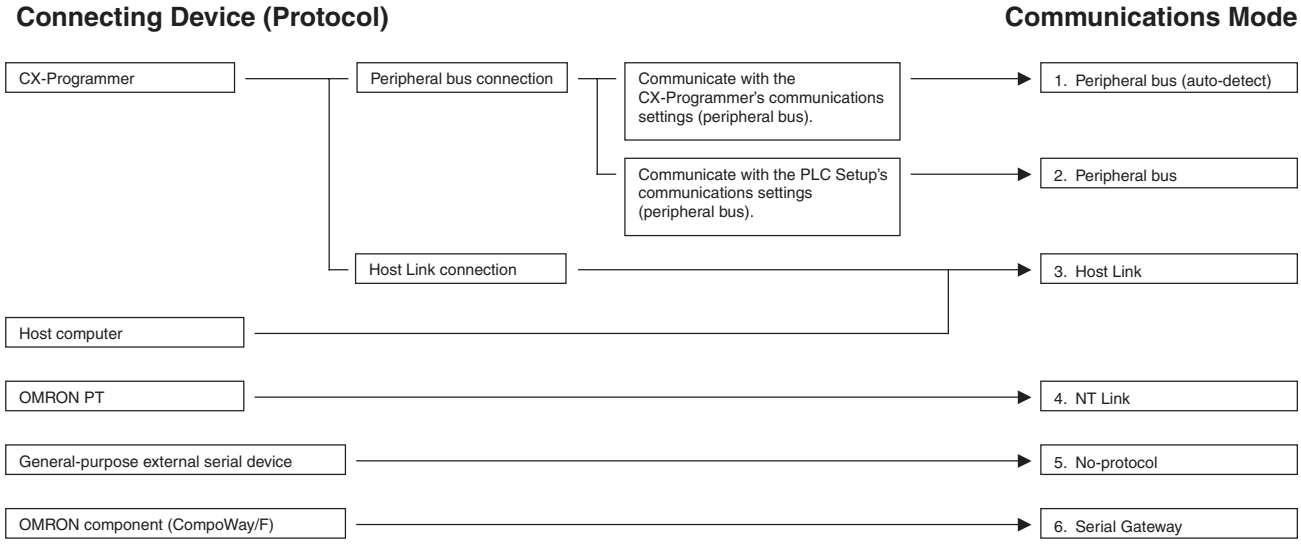
Hitachi Cable, Ltd.: UL2464-SB(MA) 5P × 28AWG (7/0.127) (UL product)
CO-MA-VV-SB 5P × 28AWG (7/0.127) (non-UL product)

RS-232C Port Specifications

Item	Specification
Communications method	Half duplex
Synchronization	Start-stop
Baud rate	0.3/0.6/1.2/2.4/4.8/9.6/19.2/38.4/57.6/115.2 kbps (See note.)
Transmission distance	15 m max.
Interface	EIA RS-232C
Protocol	Host Link, NT Link, 1:N, No-protocol, or Peripheral Bus

Note Baud rates for the RS-232C are specified only up to 19.2 kbps. The CS Series supports serial communications from 38.4 kbps to 115.2 kbps, but some computers cannot support these speeds. Lower the baud rate if necessary.

Communications Mode Selection Flowchart



RS-232C Port Communications Settings

Connection	Communications Settings	
	Pin 5 of Front-panel DIP Switch	PLC Setup RS-232C port setting (See note.)
1. Peripheral bus (auto-detect)	ON	---
2. Peripheral bus	OFF (factory setting)	Peripheral bus
3. Host Link	OFF (factory setting)	Host Link (default setting)
4. NT Link	OFF (factory setting)	NT Link
5. No-protocol	OFF (factory setting)	No-protocol
6. Serial Gateway	OFF (factory setting)	Serial Gateway

Note Set from the CX-Programmer or Programming Console.

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3-4 Power Supply Units

3-4-1 Power Supply Units

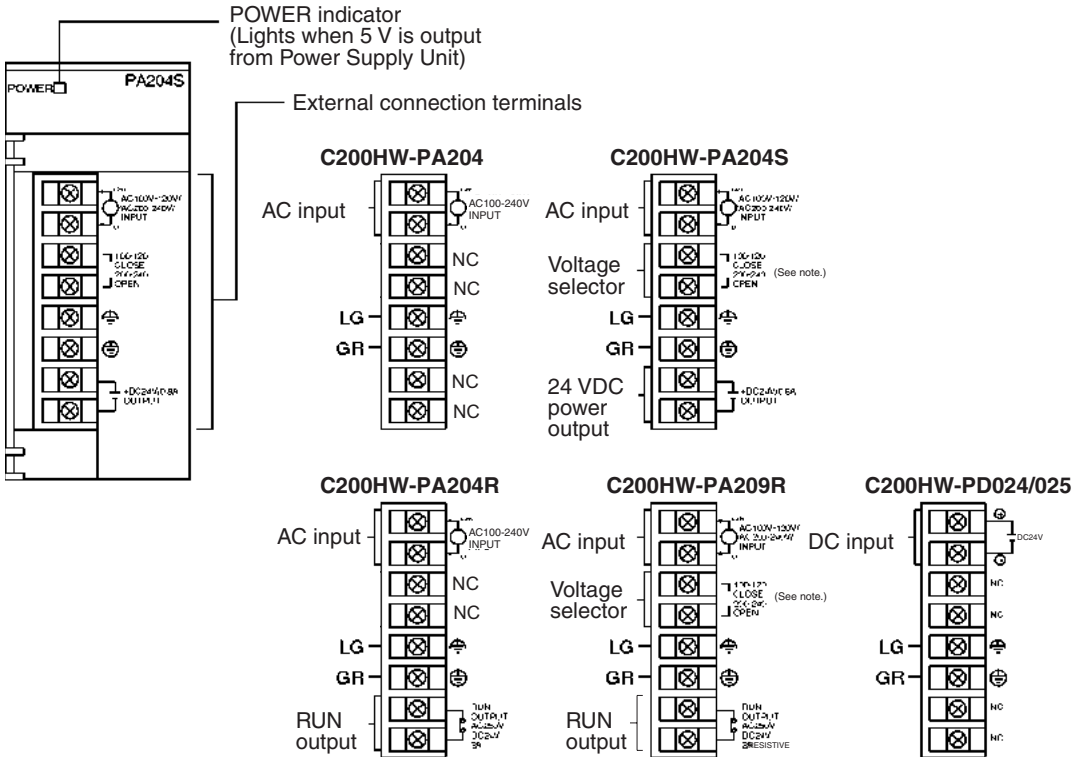
Model	Supply voltage	Output capacity	Power output terminals	RUN output	Replacement notification function	Weight
C200HW-PA204	100 to 240 V AC (Wide range) (See note 2.)	5 V DC, 4.6 A, 26 V DC, 0.625 A, total 30 W	No	No	Without	500 g max.
C200HW-PA204C			No	No	Display: Supported Output: Supported	500 g max.
C200HW-PA204R			No	Yes	Without	500 g max.
C200HW-PA204S	100 to 120 V AC or 200 to 240 V AC (Select the voltage using the metal short bar on the voltage selector terminals.)	5 V DC, 4.6 A, 26 V DC, 0.625 A, total 30 W (See note 1.)	Yes 24 V DC, 0.8 A	No	Without	500 g max.
C200HW-PA209R		5 VDC, 9 A, 26 V DC, 1.3A, total 45 W	No	Yes	Without	1,000 g max.
C200HW-PD024	24 V DC	5 V DC, 4.6 A, 26 V DC, 0.625 A, total 30 W	No	No	Without	550 g max.
C200HW-PD025	24 V DC	5 V DC, 5.3 A, 26 V DC, 1.3 A, total 40 W	No	No	Without	630 g max.

Note

1. For C200HW-PA204S, the total also includes the power consumption of the power supply output terminals.
2. The power supply voltage for C200HW-PA204 Power Supply Units manufactured before March 2010 and C200HW-PA204R Power Supply Units manufactured before May 2010 is 100 to 120 V AC/200 to 240 V AC (switched using short bar). For details on the differences between these Units, refer to *Unit Differences by Manufacturing Date (Reference Information) on page 189*.

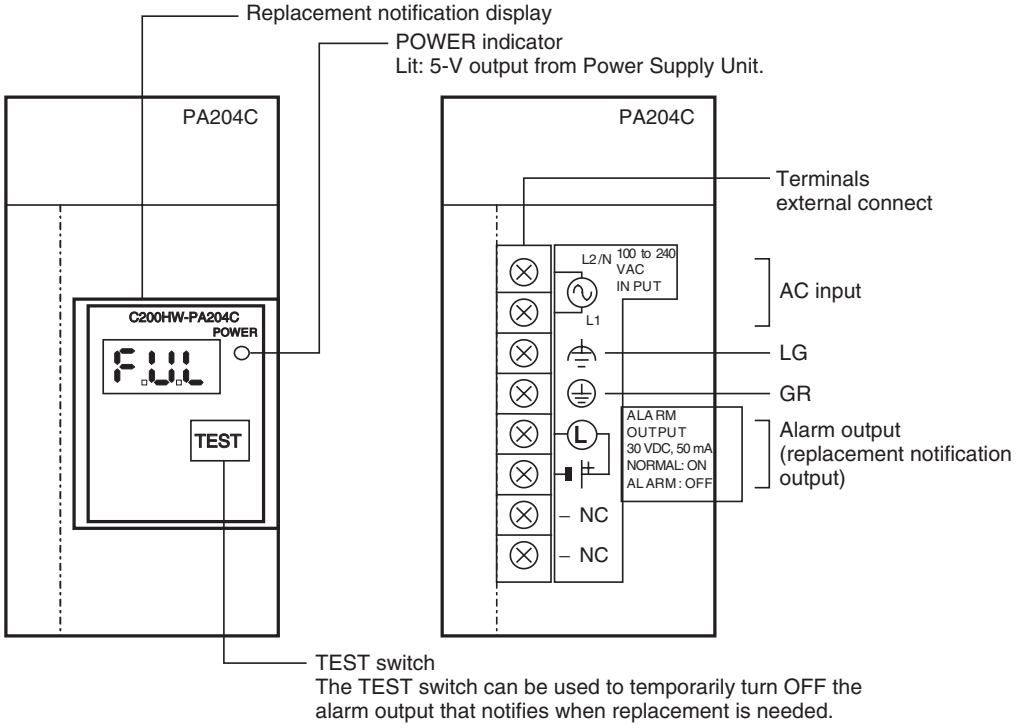
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3-4-2 Components and Switch Settings



Note 100 to 120 V AC: Closed circuit, 200 to 240 V AC: Open circuit
Always open the circuit (remove the metal jumper) before applying a voltage of 200 to 240 V AC.

(Example: C200HW-PA204C)



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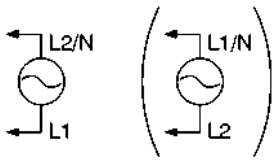
AC Input

Either a power supply of 100 to 120 V AC or 200 to 240 V AC can be selected.

The C200HW-PA204/PA204R/PA204C supplies 100 to 240 V AC (allowable voltage fluctuation range: 85 to 264 V AC).

The C200HW-PA204C has a wide-range supply voltage, so voltage selector terminals are not provided.

Note The L2/N and L1 display on the AC power supply terminal is L1/N and L2 on some products, however, the function and performance of the terminals are the same.



Voltage Selector

Before applying a voltage of 100 to 120 V AC, close the circuit using the metal jumper.

Note Always remove the metal jumper before applying a voltage of 200 to 240 V AC. Not doing so will damage the Unit.

LG

Ground to a resistance of 100 Ω or less to increase noise resistance and avoid electric shock.

GR

Ground to a resistance of 100 Ω or less to avoid electric shock.

24-V DC Power Output (PA204 Only)

This terminal outputs a service voltage of 24 V DC. Use this terminal to supply power to DC Input Units (C200HW-PA204S only). The total current consumption of the 5-V and 24-V outputs must be 30 W max.

DC Input

24-V DC power is supplied from this terminal.

RUN Output (PA204R/PA209R Only)

The internal contact turns ON when the CPU Unit is operating (RUN or MONITOR mode). (The RUN output does not turn ON on Expansion Racks.)

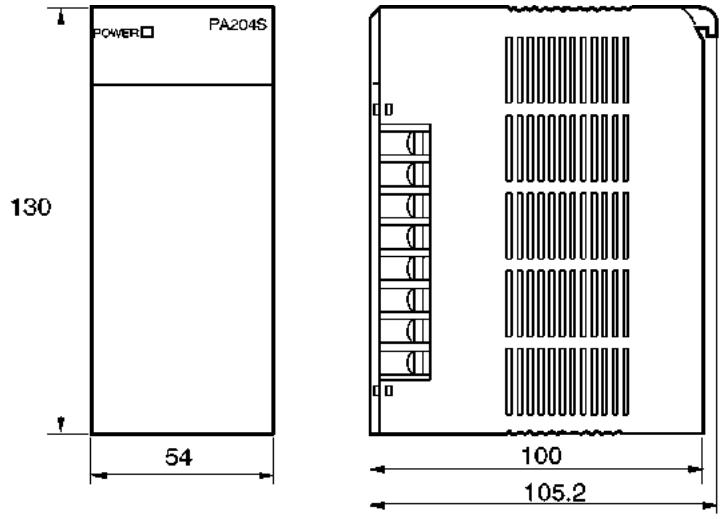
Alarm Output (PA204C Only)

The alarm output is used to notify when Power Supply Unit replacement is required. The output is normally ON. The output turns OFF when the time until replacement is 6 months or less.

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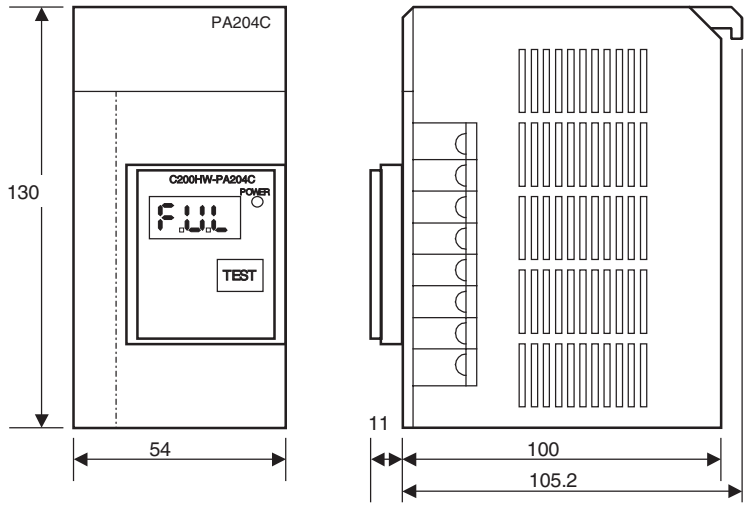
3-4-3 Dimensions

C200HW-PA204
C200HW-PA204S
C200HW-PA204R
C200HW-PD204

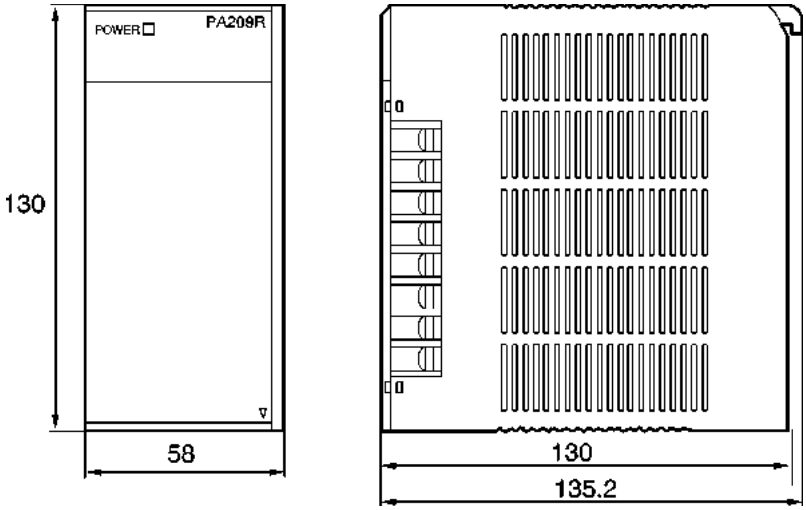


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C200HW-PA204C



C200HW-PA209R
C200HW-PD025



3-4-4 Selecting a Power Supply Unit

After determining what power supply voltage is required, whether power output terminals and a RUN output are required, and whether replacement notification is required, calculate the current and power requirements for each Rack.

Condition 1: Current Requirements

There are three voltage groups for internal power consumption: 5 V DC, 26 V DC, and 24 V DC.

Current Consumption at 5 V DC (Internal Logic Power Supply)

The following table shows the current that can be supplied to Units (including the CPU Unit) and Backplanes that use 5-V DC power.

Power Supply Unit	Maximum current at 5 V DC
C200HW-PA204/204S/204R/204C	4.6 A
C200HW-PD204	

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Power Supply Unit	Maximum current at 5 V DC
C200HW-PA209R	9 A
C200HW-PD025	5.3 A

Current Consumption at 26 V DC (Relay Driving Power Supply)

The following table shows the current that can be supplied to Units that use 26-V DC power.

Power Supply Unit	Maximum current at 26 V DC
C200HW-PA204/204S/204R/204C	0.625 A
C200HW-PD204	
C200HW-PA209R/PD025	1.3 A

Current Consumption at 24 V DC (Power Output Terminals)

The C200HW-PA204S Power Supply Unit can supply up to 0.8 A at 24 V DC through its power output terminals.

Condition 2: Power Requirements

The following table shows the maximum total power that can be supplied at 5 V DC, 26 V DC, and 24 V DC.

Power Supply Unit	Maximum total power output
C200HW-PA204/204S/204R/204C	30 W
C200HW-PD204	
C200HW-PA209R	45 W
C200HW-PD025	40 W

Refer to *2-6 Unit Current Consumption* for tables showing the current consumed by each particular Unit as well as example calculations.

Precautions when Replacing the C200HW-PA204/PA204R

The following precautions apply when replacing a C200HW-PA204/PA204R.

■ Startup Time

The time from when the power is turned ON until the PLC operation starts is approximately 1 second faster. Make sure that the system will not be adversely affected by the change in timing.

■ Power Failure Detection Voltage

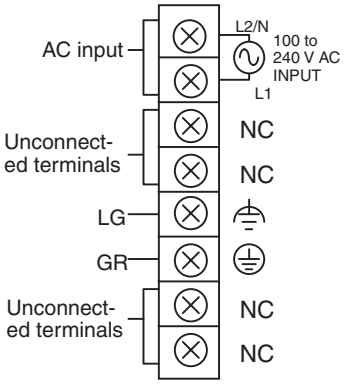
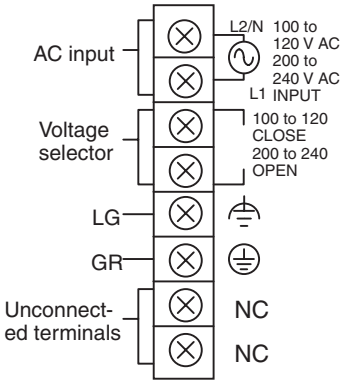
The power failure detection voltage is 85 V max. The PLC will stop operating if the voltage drops below this voltage level.

Note If the previously used Power Supply Unit was switchable between 100 to 120 V AC and 200 to 240 V AC and 200 to 240 V AC was used, power failures were detected when the voltage dropped to 170 V or lower and the PLC operation stopped. With C200HW-PA204 Units manufactured from March 2010 and C200HW-PA204R Units manufactured from May 2010, however, operation will not stop between 85 V and 170 V. Therefore, make sure that the system will not be adversely affected by the change in detection voltage.

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Unit Differences by Manufacturing Date (Reference Information)

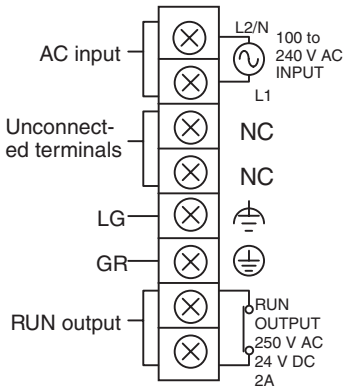
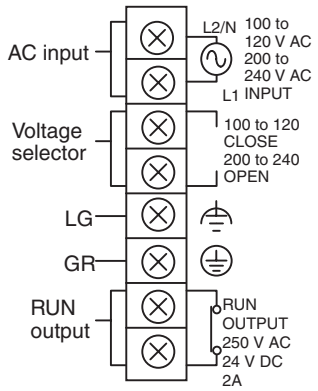
■ Differences in C200HW-PA204 Models

Model	C200HW-PA204	
Manufacturing date	March 2010 or later	Before March 2010
Identification on nameplate	C200HW-PA204/Wide AC OMRON C200HW-PA204 /Wide AC	C200HW-PA204 OMRON C200HW-PA204
Input specifications	100 to 240 V AC (wide range)	100 to 120 V AC/200 to 240 V AC (Switched with short bar.)
Power failure detection voltage	85 V max.	100 to 120 V AC: 85 V max. 200 to 240 V AC: 170 V max.
Power supply startup time (See note.)	200 ms max.	1,500 ms max.
Service power supply	Not supported.	Not supported.
RUN output	Not supported.	Not supported.
Terminal block wiring	C200HW-PA204 	C200HW-PA204 

Note The time from when the external input (AC power supply) is input until 5 V or 26 V is output.

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■ **Differences in C200HW-PA204R Models**

Model	**C200HW-PA204R**	
Manufacturing date	May 2010 or later	Before May 2010
Identification on nameplate	C200HW-PA204R/Wide AC OMRON C200HW-PA204R /Wide AC	C200HW-PA204R OMRON C200HW-PA204R
Input specifications	100 to 240 V AC (wide range)	100 to 120 V AC/200 to 240 V AC (Switched with short bar.)
Power failure detection voltage	85 V max.	100 to 120 V AC: 85 V max. 200 to 240 V AC: 170 V max.
Power supply startup time (See note.)	200 ms max.	1,500 ms max.
Service power supply	Not supported.	Not supported.
RUN output	Supported	Supported
Terminal block wiring	C200HW-PA204R 	C200HW-PA204R 

Note The time from when the external input (AC power supply) is input until 5 V or 26 V is output.

3-4-5 Replacement Notification

Principle of Replacement Notification

The Power Supply Unit has a built-in electrolytic capacitor. The electrolytic capacitor is impregnated with electrolytic solution that starts to penetrate the sealing rubber from the time of manufacture. As time elapses, the internal electrolytic solution continues to evaporate, resulting in decreased electrostatic capacity and deterioration in other characteristics. Over time, the characteristic deterioration of the electrolytic capacitor prevents the Power Supply Unit from being utilized to its full capacity. In particular, the speed at which the electrolytic capacitor deteriorates fluctuates greatly with the ambient temperature (generally, a temperature rise of 10°C will double the rate of a reaction, as stated by Arrhenius' law).

The C200HW-PA204C Power Supply Unit with Replacement Notification monitors the internal temperature of the Power Supply Unit while the power is turned ON, and calculates the level of deterioration of the electrolytic capacitor from the operating time and internal temperature. The replacement notification function displays the approximate time until the Power Supply Unit will stop functioning at its full capacity due to the characteristic deterioration of the electrolytic capacitor, based on the calculated level of deterioration. When 6 months are remaining until replacement is required, the alarm output will turn OFF.

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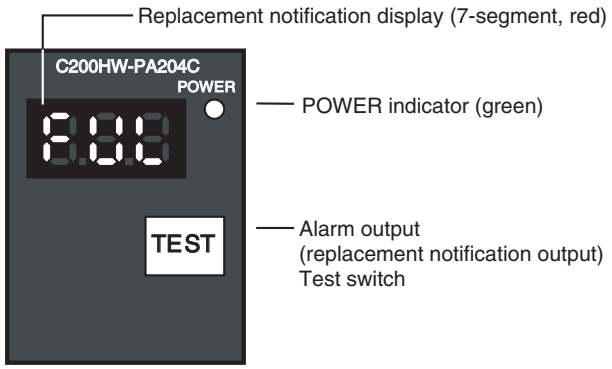
Note The replacement notification function provides an indication of when the deterioration of the electrolytic capacitor will prevent the power supply functioning at its full capacity. It does not provide information on failures occurring due to other causes.

Power Supply Unit with Replacement Notification

Model	Specifications
C200HW-PA204C	Output capacity: 4.6 A at 5 V DC, 0.625 A at 26 V DC, total of 30 W With replacement notification

Power Supply Unit Replacement Notification Module

C200HW-PA204C



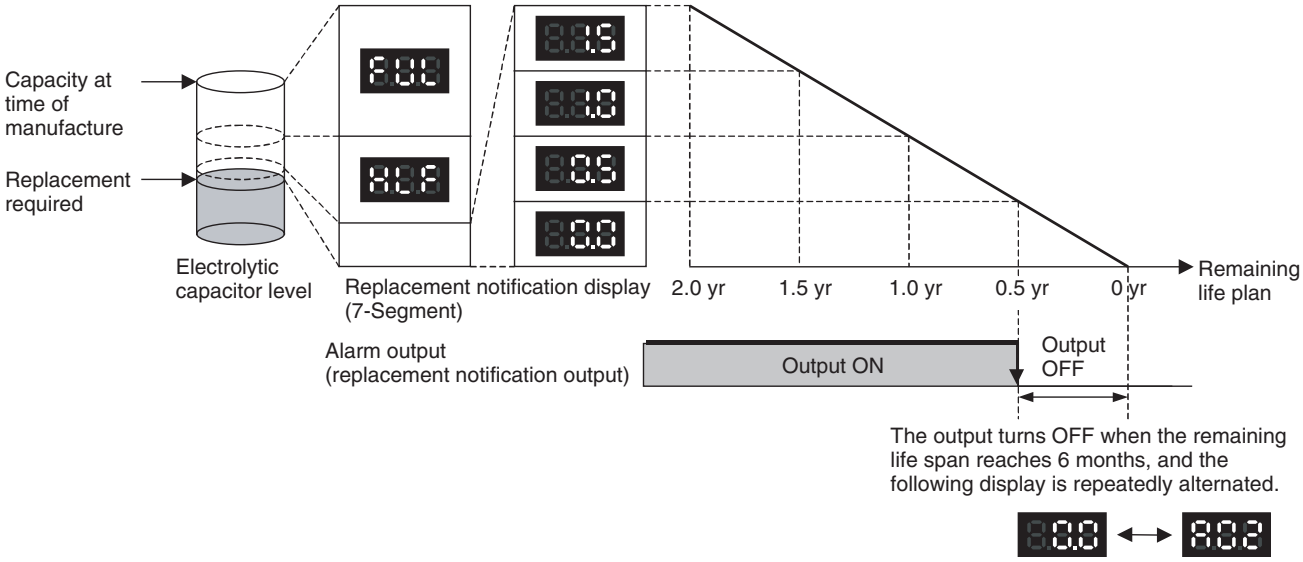
Function

Replacement Notification Function Displays

The replacement notification for the Power Supply Unit is shown using three 7-segment LED displays.

- At time of purchase “FUL” is displayed. The display changes to “HLF” as the electrolytic capacitor deteriorates (“HLF” may not be displayed, depending on the operating environment).
- When the time until replacement is required drops below 2 years, the display will change corresponding to the operating time from “1.5” to “1.0” to “0.5” to “0.0”/”A02.” When the remaining service life reaches 6 months or less, the display will alternate between “0.0” and “A02” in 2-second intervals.

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Note

1. The time remaining until replacement does not include periods when the power is turned OFF.
2. Until approximately one month of operating time has accumulated, the display will always be “FUL” and the alarm output will remain ON (conducting) due to the estimated deterioration speed.
3. The time remaining until replacement will vary the operating and storage conditions, so periodically check the display.
4. Fluctuation in the time remaining until replacement may result in the alarm output repeatedly turning ON and OFF.
5. The precision of the replacement notification function will be adversely affected by applications in which the power is frequently turned ON and OFF.
6. Due to the service life of the electronic components, replace the Power Supply Unit approximately 15 years after purchase, even if the replacement notification display or output has not indicated that replacement is required.

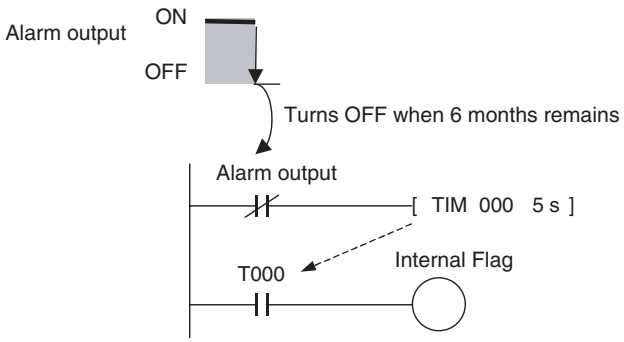
Alarm Output (Replacement Notification Output)

The output remains ON until the remaining service life drops below 6 months and then turns OFF.

Note

1. The alarm output will also turn OFF under the following conditions.
   - The AC input to the Power Supply Unit is turned OFF.
   - An error is detected by the self-diagnostic function.
   - The TEST switch is pressed for at least 3 seconds.
2. Example of Using the Alarm Output:
   Monitoring Power Supply Replacement Notification in the System (6 Months or Less Until Replacement Is Required)

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The Flag is programmed to allow for the delay in the alarm output at system startup. The Flag does not turn ON when the alarm output is ON (normal operation). When the alarm output turns OFF (replacement required), the Flag turns ON, and the replacement notification can be monitored from the system.

Maintenance Function Using the TEST Switch

- Press the TEST switch for at least 3 seconds to display "A02" and force the alarm output OFF. Release the switch to return to normal operating status.
  The TEST switch is used initially or periodically to check the connection status between the alarm output and external devices.
- Press the TEST switch for less than 3 seconds to display the unit version information for the Power Supply Unit.

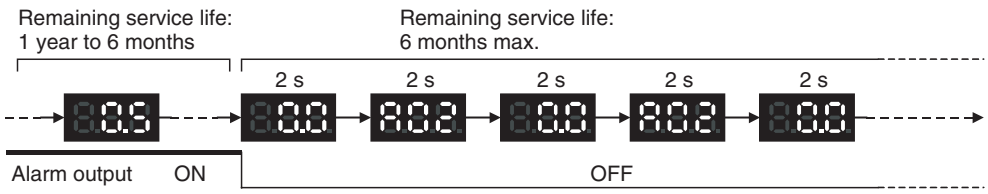
Note

1. Replace the Power Supply Unit within 6 months when the display on the front panel of the Power Supply Unit alternates between 0.0 and A02 or the alarm output automatically turns OFF.
2. Maintain an ambient storage temperature of –20 to 30°C and humidity of 25% to 70% when storing the product (with the power turned OFF) for longer than 3 months to keep the replacement notification function in optimum working condition. The replacement time is calculated from when the power is turned ON only. The precision of the replacement period will decline if the electrolytic capacitor deteriorates during storage.

Display and Alarm Output Operation

Normal Display: Replacement Notification Display

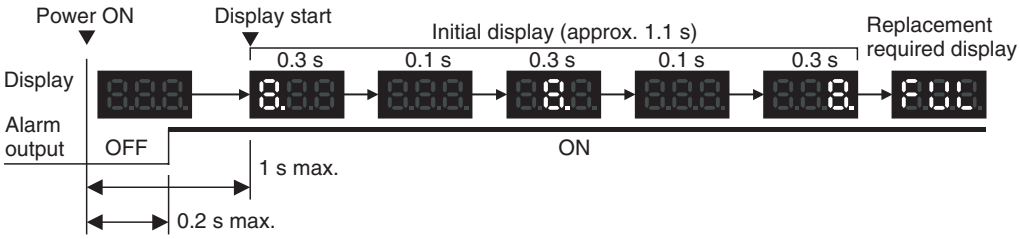
When 6 months or less are remaining until replacement is required, the display will alternate between "0.0" and "A02" (in 2 second intervals), and the alarm output will turn OFF.



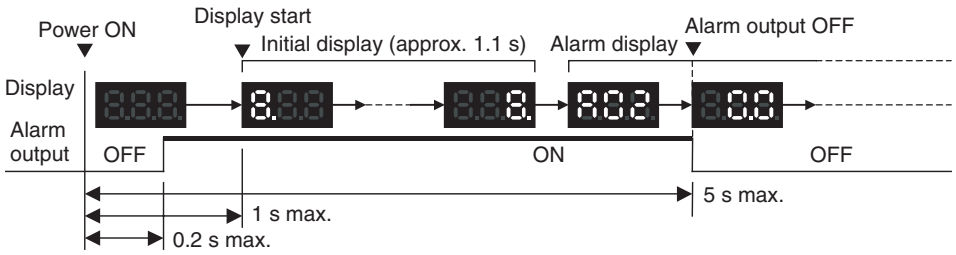
Operation at Powerup

The following initial display is shown when the power is turned ON, after which the replacement notification is displayed. The alarm output turns ON approximately 0.2 seconds after the power is turned ON.

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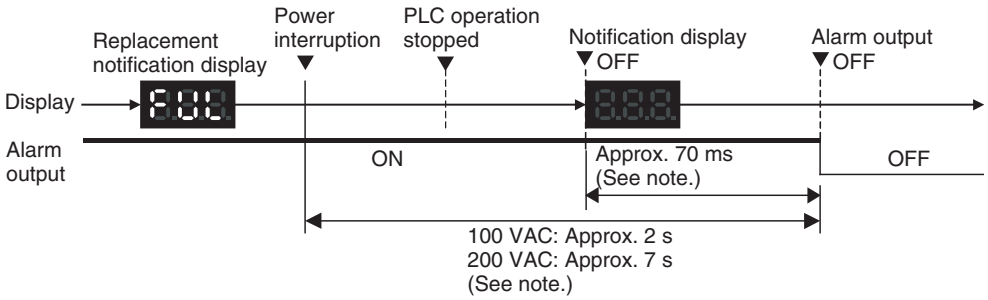


When replacement is already required, the alarm display will follow the initial display. The alarm output will turn ON approximately 0.2 seconds after the power is turned ON, and then turn OFF after approximately 5 seconds.

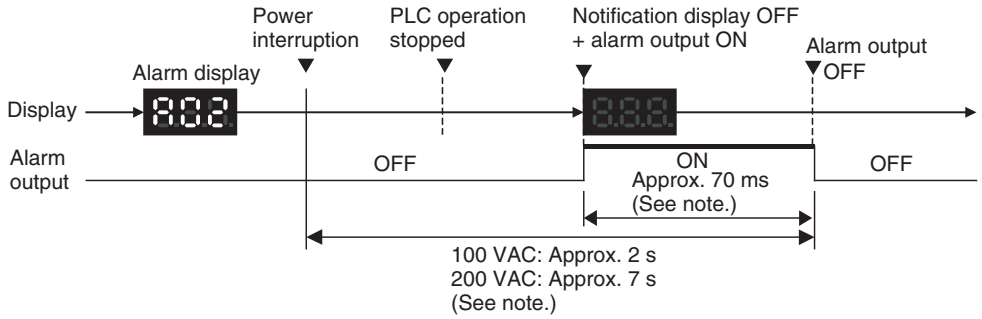


Operation at Power OFF

When the power is turned OFF, the display will turn OFF after the PLC operation stops. The alarm output will turn OFF after the display turns OFF.



If replacement is already required, the display will turn OFF after the PLC operation stops. When the display turns OFF, the alarm output will turn ON momentarily and then turn OFF again.



Note The values shown are reference values (calculated for a no-load status on the Power Supply Unit's output).

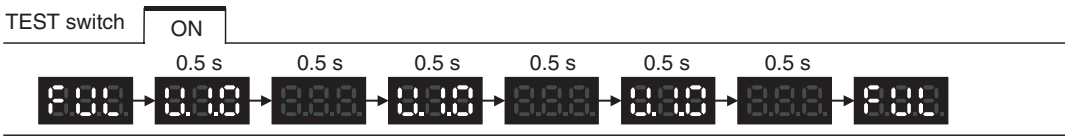
Operation when TEST Switch Is Pressed

The following operation will be performed when the TEST switch on the replacement notification function module is pressed. When the switch is pressed for less than 3 seconds, the unit version will be displayed 3 times at 0.5-second intervals. When the switch is pressed for at least 3 seconds, the alarm output will momentarily turn OFF, and the alarm display A02 will be shown. The operation will return to the normal display and output when the

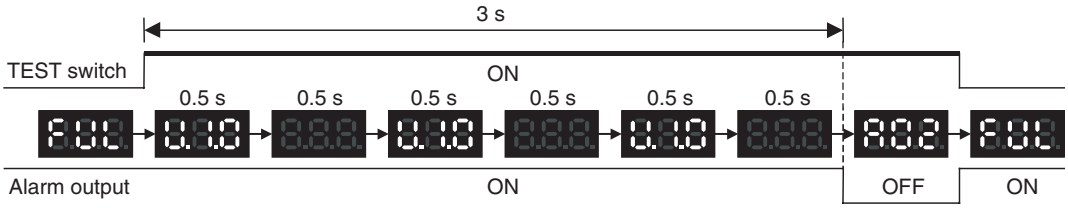
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switch is released. Use the TEST switch to check the connection between the replacement notification output and devices.

1. Operation when TEST switch is pressed for less than 3 seconds.



2. Operation when TEST switch is pressed for 3 seconds or longer.



Note In standard operating conditions, the Power Supply Unit replacement notification function will be activated after between several years to beyond a decade. For long-term use, be sure to periodically check TEST switch operations, and make sure that the alarm output is operating normally.

Self-diagnostic Function

Error name	Display	Alarm output status	Error details (cause)	Recovery method
Unit overheated error		OFF	Internal overheating has occurred in the Power Supply Unit as a result of usage under conditions that exceed the specified values, insufficient ventilation, or incorrect installation. (See note.)	Remove the cause of the overheating error.
Unit error		OFF	System error from external noise or hardware malfunction.	Turn ON the input's power supply again.If the Unit does not recover, the error may be caused by a Unit malfunction. Consult with your OMRON representative.

Note If the error continues for 3 hours or longer, the replacement notification function will be disabled. Even if the cause of the overheating is removed, the display will continue as “Hot,” and the notification output will remain OFF. In this state, the internal parts may deteriorate even if the PLC operation is normal, so replace the Power Supply Unit.

Precautions when Replacing Earlier Units

The following precautions apply when replacing a C200HW-PA204/PA204S/PA204R with a C200HW-PA204C.

Terminal Wiring

- Be sure to wire the ground terminals correctly. Incorrect ground terminal wiring will adversely affect the Unit's resistance to noise. (For details on terminal arrangements for each Power Supply Unit, refer to *3-4-2 Components and Switch Settings*.)
- The C200HW-PA204C is not provided with a service power supply and RUN output (RUN).

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Startup Time

The startup time of the C200HW-PA204 and C200HW-PA204R depends on the manufacturing date. Refer to the tables of differences for details.

The time from when the power is turned ON until the PLC operation starts is approximately 1 second faster. Make sure that the system will not be adversely affected by the change in timing.

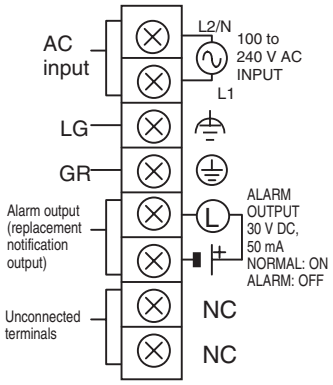
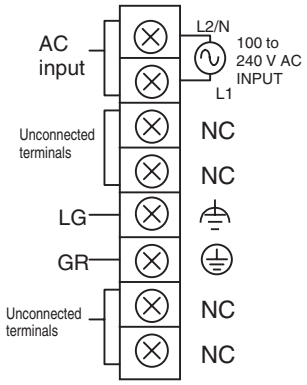
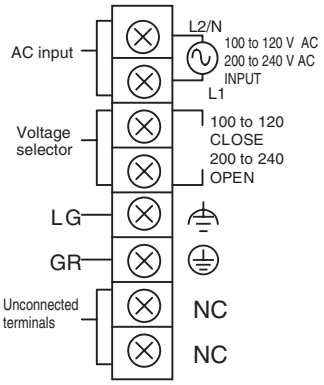
Power Failure Detection Voltage

The power failure detection voltage of the C200HW-PA204 and C200HW-PA204R depends on the manufacturing date. Refer to the tables of differences for details.

The power failure detection voltage is 85 V. The PLC will stop operating if the voltage drops below this voltage level.

Note If the previously used Power Supply Unit was switchable between 100 to 120 V AC and 200 to 240 V AC and 200 to 240 V AC was used, power failures were detected when the voltage dropped to 170 V or lower and the PLC operation stopped. With C200HW-PA204C, however, operation will not stop between 85 V and 170 V. Therefore, make sure that the system will not be adversely affected by the change in detection voltage.

Comparison between the C200HW-PA204C and the C200HW-PA204

Item	C200HW-PA204C	C200HW-PA204 (Manufactured March 2010 or later)	C200HW-PA204 (Manufactured before March 2010)
Identification on nameplate	C200HW-PA204C	C200HW-PA204/Wide AC	C200HW-PA204
Input specifications	100 to 240 V AC (wide range)	100 to 240 V AC (wide range)	100 to 120 V AC/200 to 240 V AC (Switched with short bar.)
Power failure detection voltage	85 V max.	85 V max.	100 to 120 V AC: 85 V max. 200 to 240 V AC: 170 V max.
Power supply startup time (See note.)	200 ms max.	200 ms max.	1,500 ms max.
RUN output	Not supported	Not supported (Supported by the PA204R)	Not supported (Supported by the PA204R)
Terminal block wiring	C200HW-PA204C 	C200HW-PA204 	C200HW-PA204 
POWER indicator	On replacement notification module	On hood of Power Supply Unit	On hood of Power Supply Unit
Replacement notification	Supported (7-segment display + transistor outputs)	Not supported	Not supported

Note The time from when the external input (AC power supply) is input until 5 V or 26 V is output.

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3-5 Backplanes

3-5-1 CPU Backplanes

CPU Backplane Models

Standard CS-series CPU Backplanes

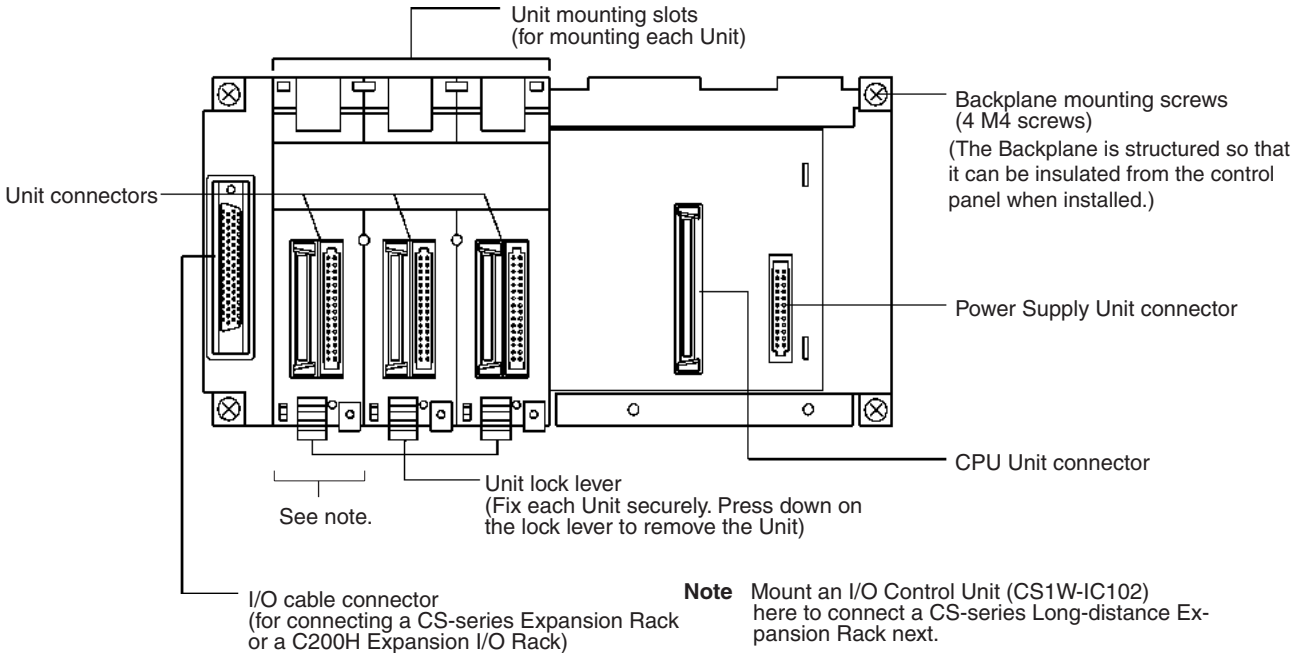
Number of slots	Model
2 slots	CS1W-BC023
3 slots	CS1W-BC033
5 slots	CS1W-BC053
8 slots	CS1W-BC083
10 slots	CS1W-BC103

CS-series-only CPU Backplanes

Number of slots	Model
2 slots	CS1W-BC022
3 slots	CS1W-BC032
5 slots	CS1W-BC052
8 slots	CS1W-BC082
10 slots	CS1W-BC102

Note C200H Units (C200H Basic I/O Units, C200H Group-2 High-density I/O Units, and C200H Special I/O Units) cannot be used with CS-series-only CPU Backplanes.

Components and Switch Settings

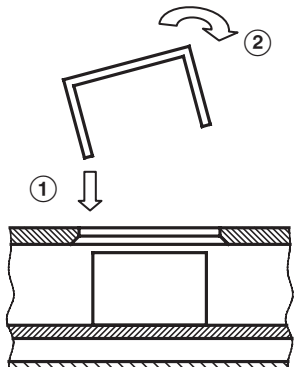


Note Always cover the connectors that are not being used with Connector Covers (sold separately) as a measure against dust.

When you attach the CV500-COV01 to a CS-series Backplane (for CS-series Units only), it will go on easier if you insert the CV500-COV01 on the side with

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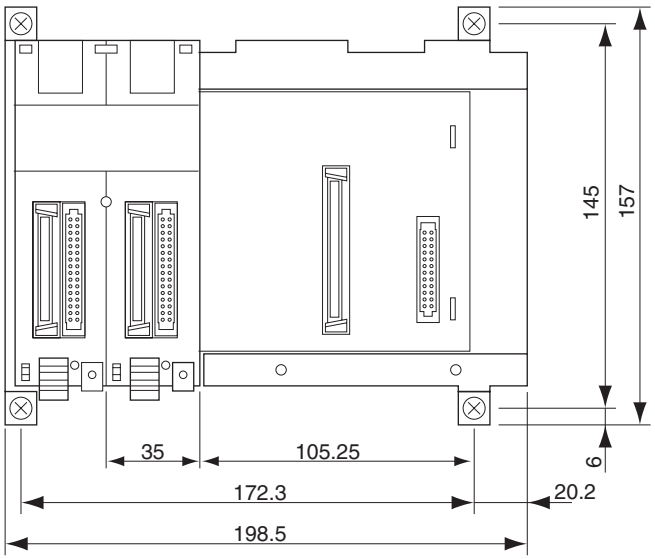
the larger gap next to the connector first and then rotate the CV500-COV01 and insert it on the side with the narrower gap.



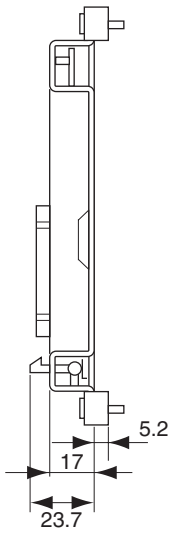
Name	Model
C200H Unit Connector Cover	C500-COV01
CS-series Special I/O Unit Connector Cover	CV500-COV01

Dimensions and Weights

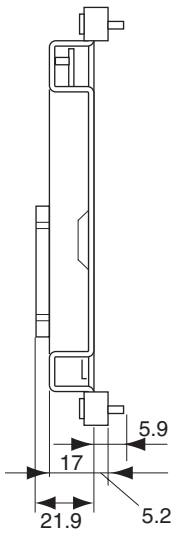
CS1W-BC023/022 (2 Slots)



Weight: 600 g max.



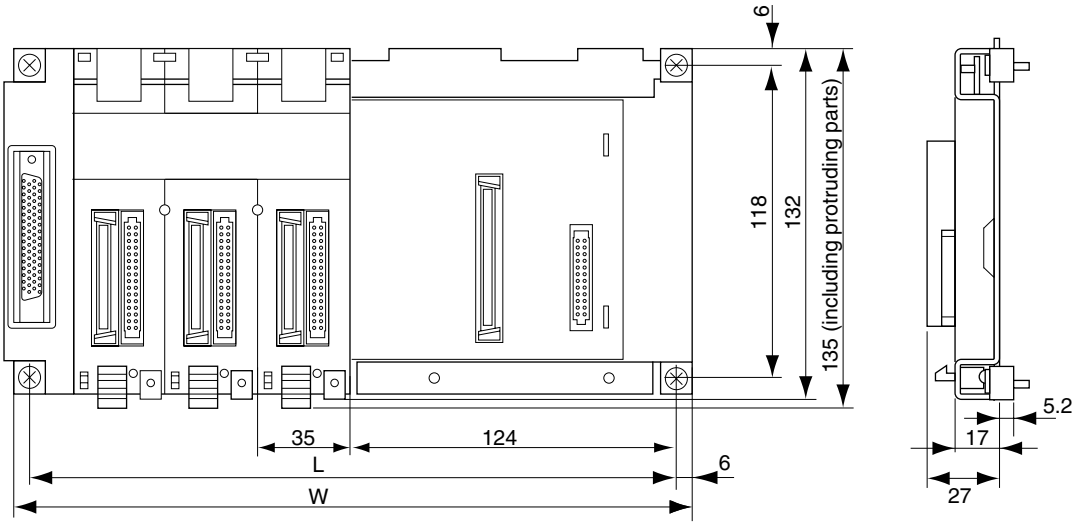
CS1W-BC023



CS1W-BC022

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CS1W-BC□□□ (3, 5, 8, or 10 Slots)



Model	Number of slots	L (mm)	W (mm)	Weight (max.)
CS1W-BC033	3	246	260	750 g
CS1W-BC053	5	316	330	900 g
CS1W-BC083	8	421	435	1,200 g
CS1W-BC103	10	491	505	1,400 g
CS1W-BC032	3	246	260	750 g
CS1W-BC052	5	316	330	900 g
CS1W-BC082	8	421	435	1,200 g
CS1W-BC102	10	491	505	1,400 g

3-5-2 CS-series Expansion Backplanes

CS-series Expansion Backplanes are used for both CS-series Expansion Racks and CS-series Long-distance Expansion Racks.

CS-series Expansion Backplane Models

Standard CS-series Expansion Backplane

Number of slots	Model
3 slots	CS1W-BI033
5 slots	CS1W-BI053
8 slots	CS1W-BI083
10 slots	CS1W-BI103

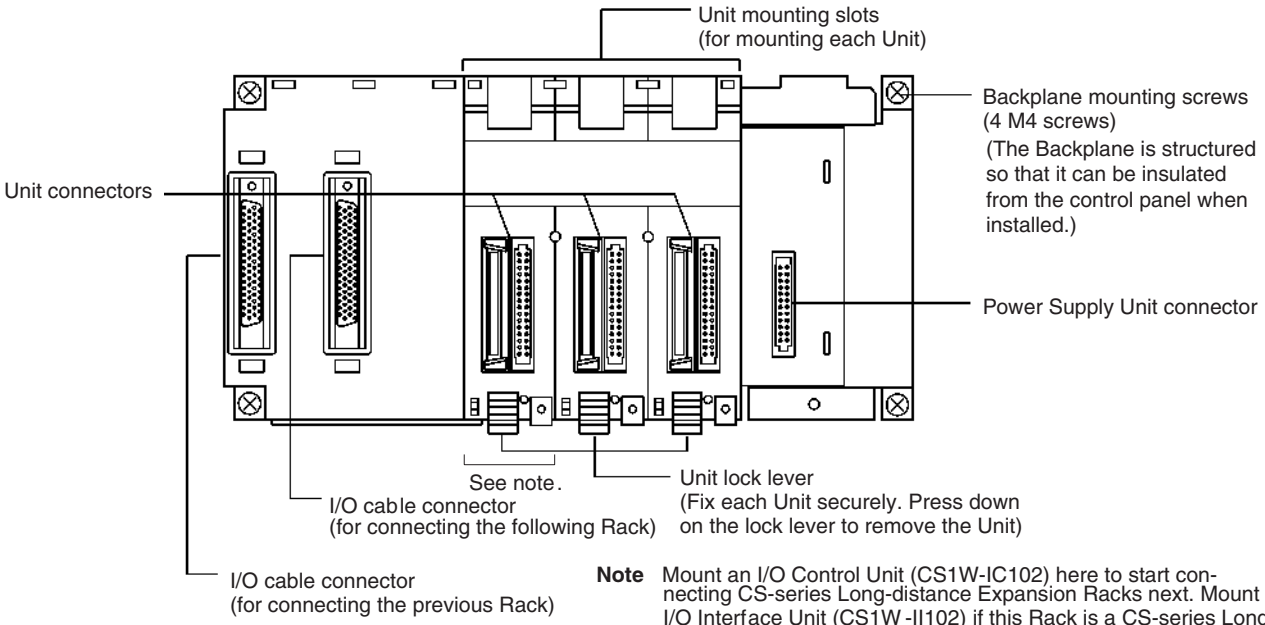
CS-series-only Expansion Backplane

Number of slots	Model
3 slots	CS1W-BI032
5 slots	CS1W-BI052
8 slots	CS1W-BI082
10 slots	CS1W-BI102

Note C200H Units (C200H Basic I/O Units, C200H Group-2 High-density I/O Units, and C200H Special I/O Units) cannot be used with CS-series-only Expansion Backplanes.

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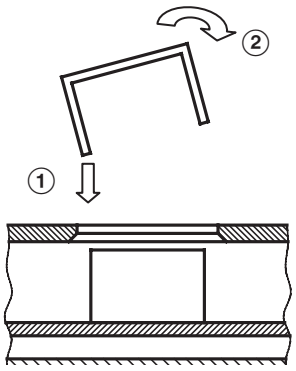
Components and Switch Settings



Note Mount an I/O Control Unit (CS1W-IC102) here to start connecting CS-series Long-distance Expansion Racks next. Mount an I/O Interface Unit (CS1W-II102) if this Rack is a CS-series Long-distance Expansion Rack (i.e., the previous Rack is connected via an I/O Control Unit or an I/O Interface Unit).

Note Always cover the connectors that are not being used with Connector Covers (sold separately) as a measure against dust.

When you attach the CV500-COV01 to a CS-series Backplane (for CS-series Units only), it will go on easier if you insert the CV500-COV01 on the side with the larger gap next to the connector first and then rotate the CV500-COV01 and insert it on the side with the narrower gap.

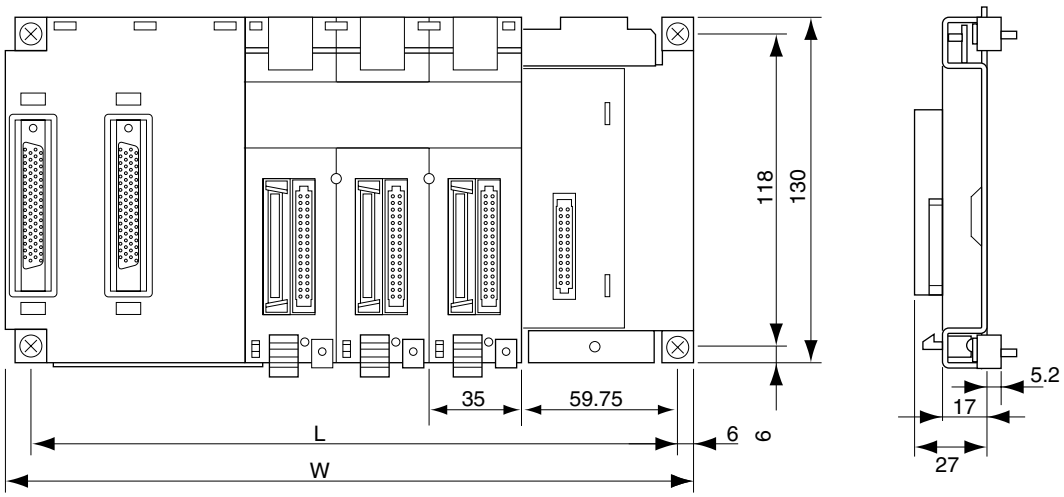


Name	Model
C200H Unit Connector Cover	C500-COV01
CS-series CPU Bus Unit Connector Cover	CV500-COV01

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Dimensions

CS1W-BI□□□



Model	Number of slots	L (mm)	W (mm)	Weight (max.)
CS1W-BI033	3	246	260	750 g
CS1W-BI053	5	316	330	900 g
CS1W-BI083	8	421	435	1,200 g
CS1W-BI103	10	491	505	1,400 g
CS1W-BI032	3	246	260	750 g
CS1W-BI052	5	316	330	900 g
CS1W-BI082	8	421	435	1,200 g
CS1W-BI102	10	491	505	1,400 g

3-5-3 C200H Expansion I/O Backplanes

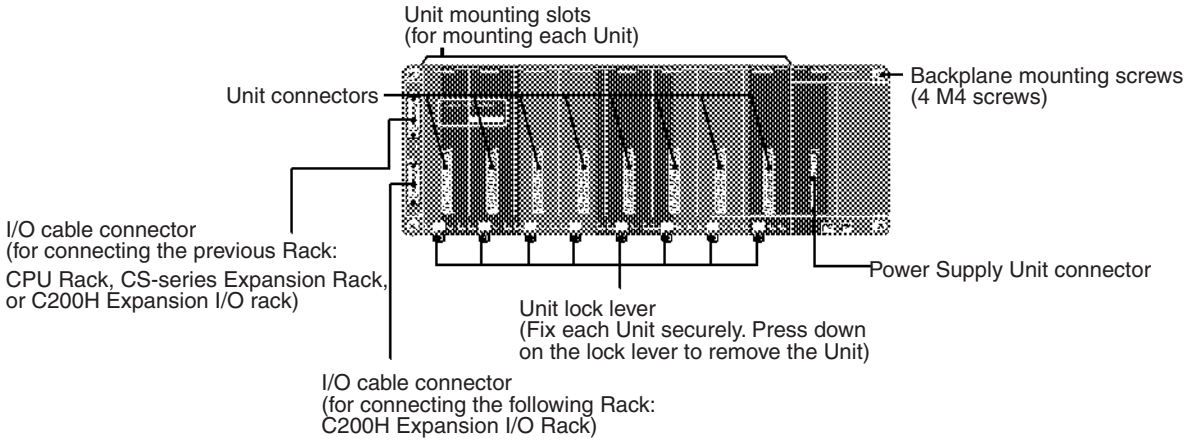
C200H Expansion I/O Racks cannot be connected together with CS-series Long-distance Expansion Racks.

C200H Expansion I/O Backplane Models

Number of slots	Model
3 slots	C200HW-BI031
5 slots	C200HW-BI051
8 slots	C200HW-BI081-V1
10 slots	C200HW-BI101-V1

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Components and Switch Settings



Note Always cover the connectors that are not being used with Connector Covers (sold separately) as a measure against dust.

Name	Model
C200H Unit Connector Cover	C500-COV01
CS-series CPU Bus Unit Connector Cover	CV500-COV01

Dimensions

C200HW-BI□□□



Model	Number of slots	W (mm)	Weight (max.)
C200HW-BI031	3	189	500 g
C200HW-BI051	5	259	650 g
C200HW-BI081-V1	8	364	950 g
C200HW-BI101-V1	10	434	1,100 g

Optional Products

Product	Specifications	Number of slots	Model
Backplane Insulation Plate (for C200H Expansion I/O Backplane) 	Used to electrically insulate the C200H Expansion I/O Rack from the mounting surface in the control panel to improve noise resistance.	3 slots	C200HW-ATT32
		5 slots	C200HW-ATT52
		8 slots	C200HW-ATT82
		10 slots	C200HW-ATTA2

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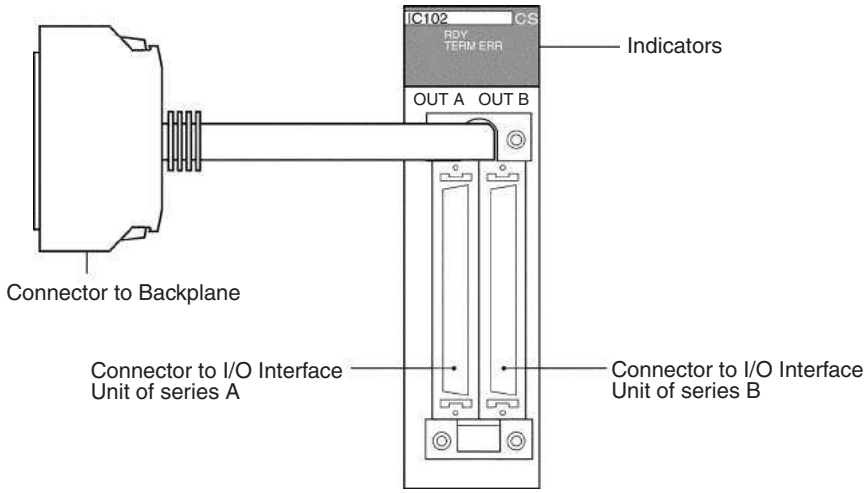
3-5-4 I/O Control Units, I/O Interface Units, and Terminators

I/O Control Units and I/O Interface Units are used to create CS-series Long-distance Expansion Racks. Terminators are connected to the last CS-series Long-distance Expansion Rack in each series. (Up to two series of CS-series Long-distance Expansion Racks can be connected.)

CS1W-IC102 I/O Control Unit

An I/O Control Unit is connected to the leftmost slot on the CPU Rack or the last CS-series Expansion Rack to start connecting CS-series Long-distance Expansion Racks.

Part Names and Functions

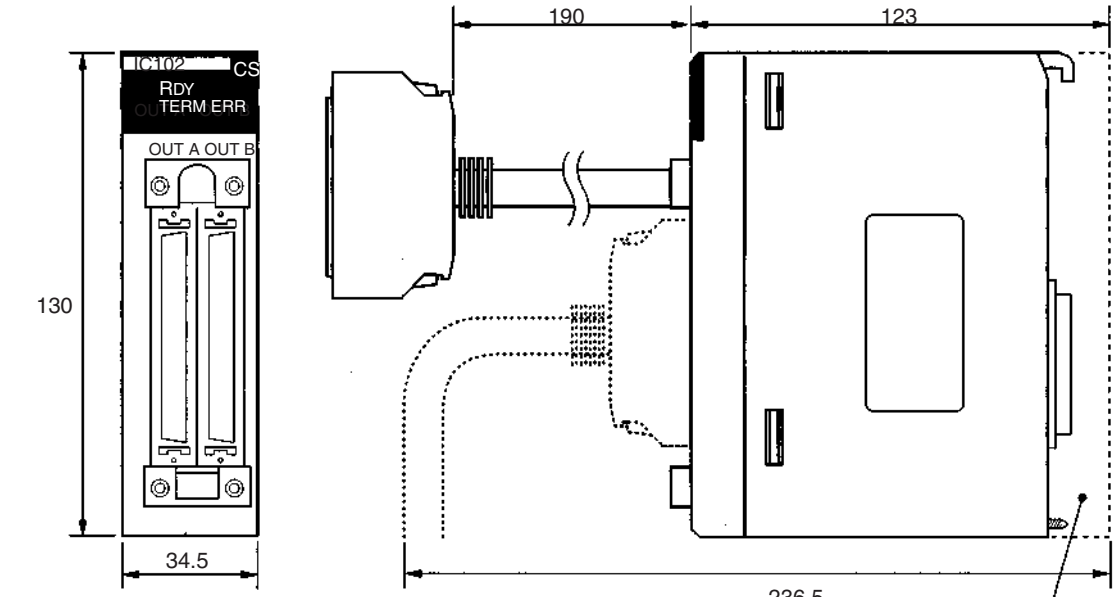


Indicators

Indicator	Status	Meaning
RDY (green)	Lit	Operating normally.
	Not lit	Bus error.
TERM ERR (red)	Lit	Terminator missing.
	Not lit	Terminator connected.

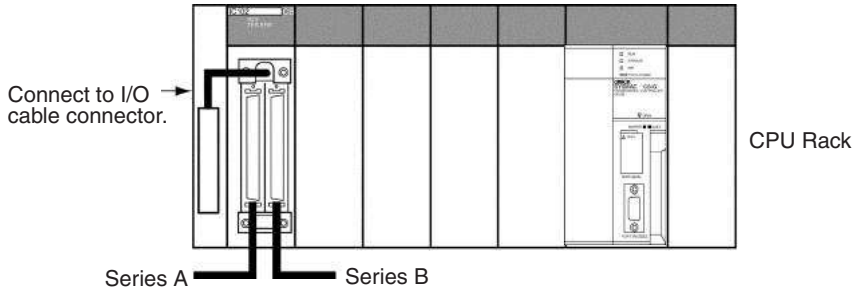
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Dimensions and Weight



Weight: 300 g max. (including cable to Backplane)

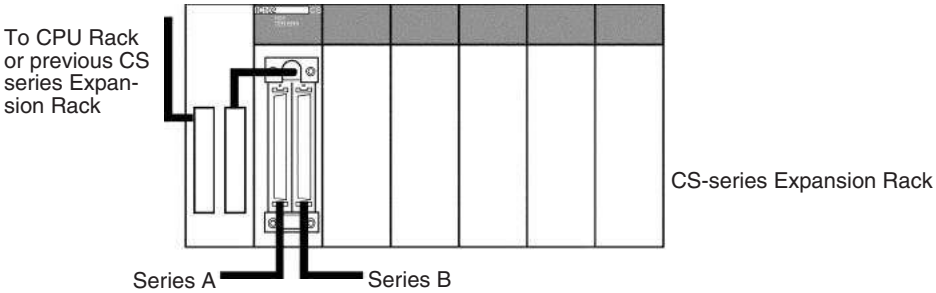
Connection Method on CPU Rack



Note Connect a Terminator (CV500-TER01) to the unused connector when connecting only series A or series B.

Connection Method on CS-series Expansion Rack

Connect the I/O Control Unit to the output I/O cable connector (right side).



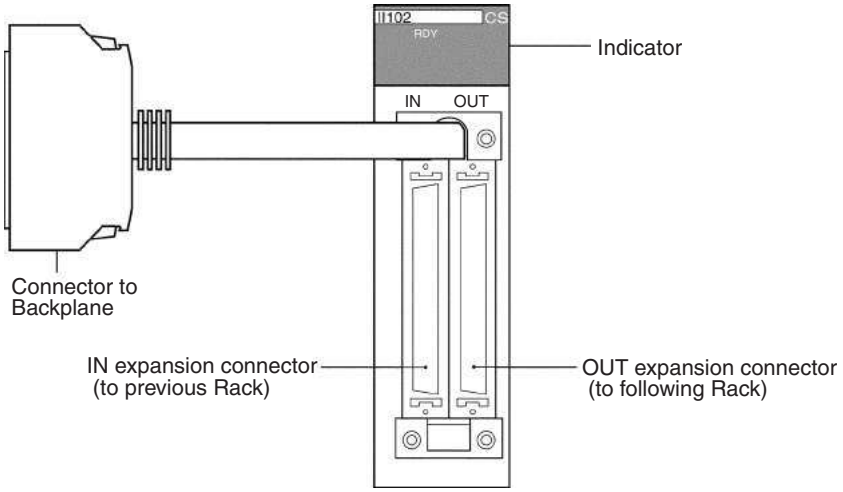
Note Connect a Terminator (CV500-TER01) to the unused connector when connecting only series A or series B.

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CS1W-II102 I/O Interface Unit

Mount an I/O Interface Unit to the leftmost slot on each CS-series Long-distance Expansion Rack.

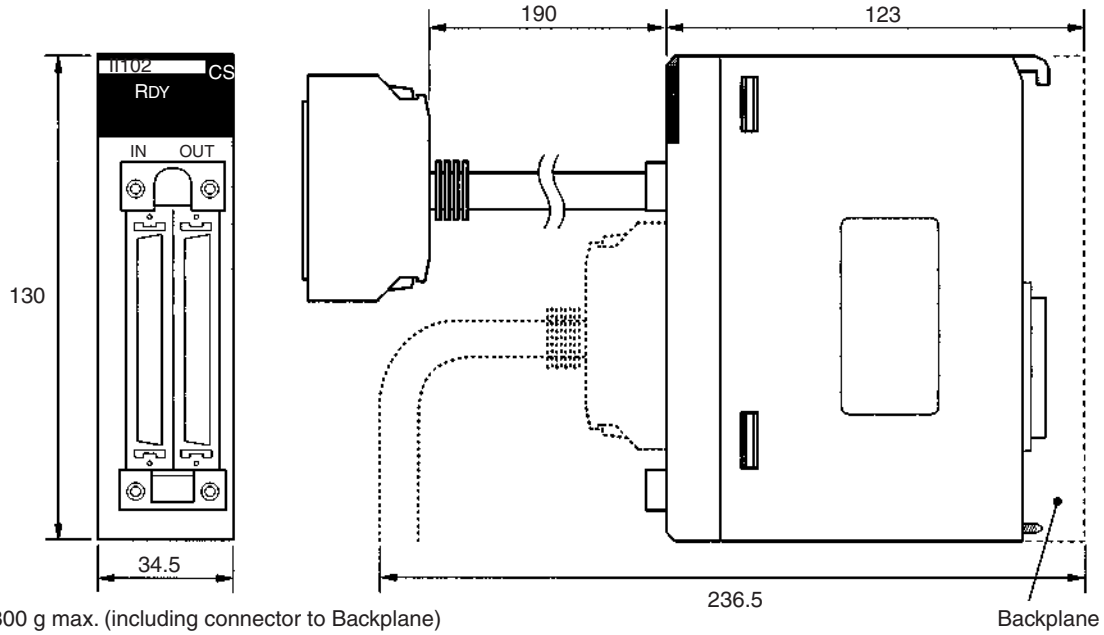
Part Names and Functions



Indicator

Indicator	Status	Meaning
RDY (green)	Lit	Operating normally.
	Not lit	Bus error (bus reset) or system error.

Dimensions and Weight

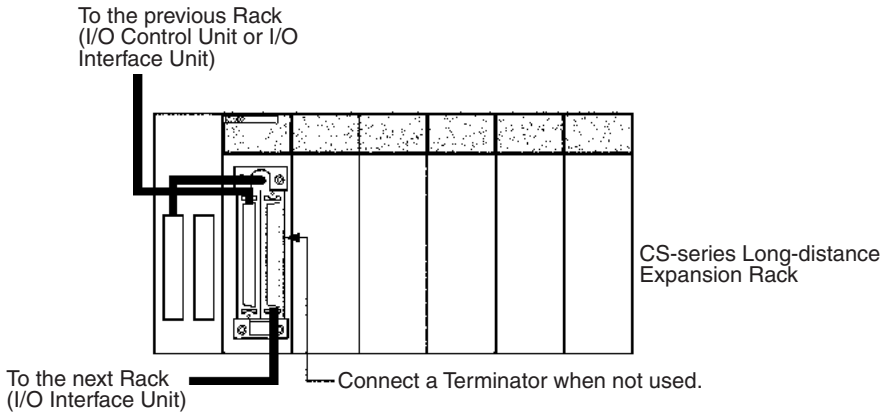


Weight: 300 g max. (including connector to Backplane)

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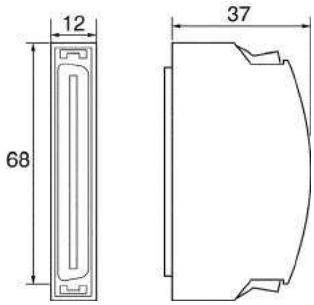
Connection Method

Connect the I/O Interface Unit to the input I/O cable connector on the Backplane (left side). Always connect a Terminator (CV500-TER01) to the connector for the next Rack when it is not used (i.e., on the last CS-series Long-distance Expansion Rack in the series).



CV500-TER01 Terminator

Two Terminators are provided with an I/O Control Unit



Weight: 50 g max.

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3-6 Basic I/O Units

3-6-1 C200H and CS-series Basic I/O Units with Terminal Blocks

Name		Specifications	Model	External view/dimensions reference No.
Basic Input Units (with terminal blocks)	AC Input Units	100 to 120 V AC, 100 to 120 V DC, 16 inputs	CS1W-IA111	5
		100 to 120 V AC, 8 inputs	C200H-IA121	1
		100 to 120 V AC, 16 inputs	C200H-IA122	3
			C200H-IA122V	3
		200 to 240 V AC, 8 inputs	C200H-IA221	1
		200 to 240 V AC, 16 inputs	C200H-IA222	3
			C200H-IA222V	3
		200 to 240 V AC, 16 inputs	CS1W-IA211	5
	AC/DC Input Units	12 to 24 V AC/V DC, 8 inputs	C200H-IM211	1
		24 V AC/V DC, 16 inputs	C200H-IM212	3
	DC Input Units	12 to 24 V DC, 8 inputs	C200H-ID211	1
		12 to 24 V DC, 16 inputs	C200H-ID212	3
		24 V DC, 16 inputs	CS1W-ID211	5
	Interrupt Input Units	24 V DC, 16 inputs	CS1W-INT01	5
		12 to 24 V DC, 8 inputs	C200HS-INT01	1
	High-speed Input Unit	24 V DC, 16 inputs	CS1W-IDP01	5
C200H Output Units (with terminal blocks)	Relay Output Units	2 A at 250 V AC/24 V DC max., 0.1 A at 120 V DC, independent contacts, 8 outputs	CS1W-OC201	5
		2 A at 250 V AC/24 V DC max., 0.1 A at 120 V DC, 16 outputs	CS1W-OC211	5
		2 A at 250 V AC/24 V DC max., independent contacts, 5 outputs	C200H-OC223	1
		2 A at 250 V AC/24 V DC max., independent contacts, 8 outputs	C200H-OC224	3
			C200H-OC224N	3
			C200H-OC224V (no longer manufactured)	3
			C200H-OC124N	
		2 A at 250 V AC/24 V DC max., 8 outputs	C200H-OC221	1
		2 A at 250 V AC/24 V DC max., 12 outputs	C200H-OC222	3
			C200H-OC222V (no longer manufactured)	3
			C200H-OC222N	3
		2 A at 250 V AC/24 V DC max., 16 outputs	C200H-OC225	3
			C200H-OC226 (no longer manufactured)	4
			C200H-OC226N	4

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Name		Specifications	Model	External view/dimensions reference No.
C200H Output Units (with terminal blocks)	Triac Output Units	1.2 A at 250 V AC max., 8 outputs, with fuse burnout detection circuit	CS1W-OA201	5
		1 A at 250 V AC max., 8 outputs, with fuse burnout detection circuit	C200H-OA221 (no longer manufactured)	1
		1.2 A at 250 V AC max., 8 outputs, with fuse burnout detection circuit	C200H-OA223	2
		0.3 A at 250 V AC max., 12 outputs	C200H-OA222V	3
		0.5 A at 250 V AC max., 12 outputs	C200H-OA224	3
		0.5 A at 250 V AC max., 16 outputs	CS1W-OA211	5
	Transistor Output Units, Sinking	2.1 A at 24 V DC, 8 outputs	C200H-OD213	1
		1 A at 12 to 48 V DC, 8 outputs	C200H-OD411	1
		0.3 A at 24 V DC, 12 outputs	C200H-OD211	3
		0.3 A at 24 V DC, 16 outputs	C200H-OD212	3
		0.5 A at 12 to 24 V DC, 16 outputs	CS1W-OD211	5
	Transistor Output Units, Sourcing	0.8 A at 24 V DC, load short-circuit protection, 8 outputs	C200H-OD214	1
		0.3 A at 5 to 24 V DC common, 8 outputs	C200H-OD216	1
		0.3 A at 5 to 24 V DC common, 12 outputs	C200H-OD217	3
		0.5 A at 24 V DC, load short-circuit protection, 16 outputs	CS1W-OD212	5
		1 A at 24 V DC, load short-circuit protection, 16 outputs	C200H-OD21A	3

Note Immediate refreshing (!) or refreshing using IORF(097) is possible for all C200H Basic I/O Units.

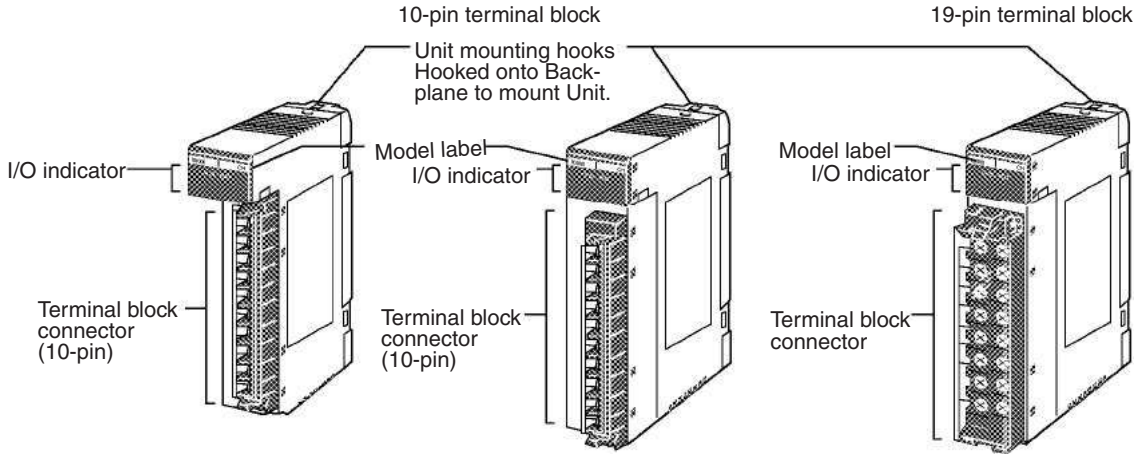
Optional Products

Name	Specifications	Model
I/O Unit Cover 	Cover for 10-pin terminal block; 8-point Input/5-point Output Unit	C200H-COV11
Terminal Block Covers 	Short protection for 10-pin terminal block (package of 10 covers); 8 inputs, 8 outputs	C200H-COV02
	Short protection for 19-pin terminal block (package of 10 covers); 12 inputs, 12 outputs	C200H-COV03
CS-series Special I/O Unit Connector Cover	Protective cover for unused connectors on Backplane	CV500-COV01
C200H Unit Connector Cover 	Protective cover for unused connectors on Backplane	C200H-COV01
Relay 	24 V DC, C200H-OC221/OC222/OC223/OC224/OC225	G6B-1174P-FD-US-M

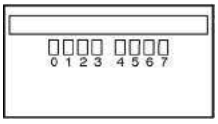
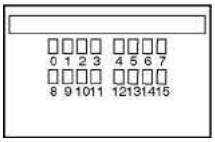
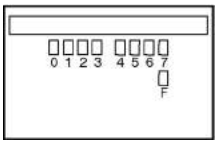
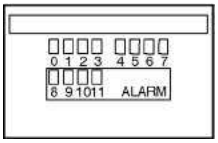
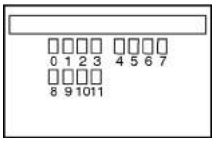
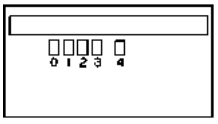
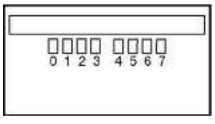
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Components and Switch Settings

C200H 10-pin/19-pin Terminal Block

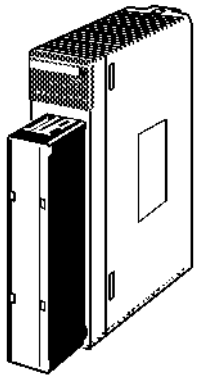


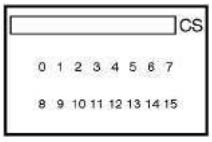
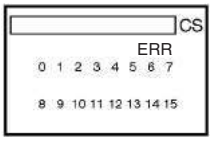
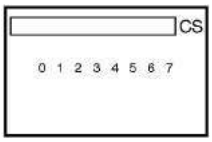
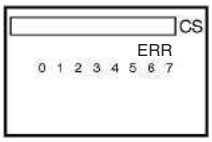
10-pin Terminal Block **10-pin Terminal Block (C200H-OA223)** **19-pin Terminal Block (C200H-OC226 19-pin Terminal Block)**

10-pin terminal block			19-pin terminal block		
	8-point Unit	C200H-ID211, C200H-IM211, C200H-IA121, C200H-IA221, C200H-OC221, C200H-OD216		16-point Unit	C200H-ID212, C200H-IA122, C200H-IA222, C200H-IM212, C200H-IA122V, C200H-IA222V, C200H-OD21A, C200H-OD212, C200H-OC225, C200H-OC226N, C200H-OC226 (illustrated above)
	8-point Unit F indicator (fuse burnout)	C200H-OD213, C200H-OD411, C200H-OA221, C200H-OA223 (illustrated above)			
	8-point Unit ALARM indicator	C200H-OD214		12-point Unit	C200H-OC222, C200H-OC222V, C200H-OD211, C200H-OD217, C200H-OA224, C200H-OA222V C200H-OC222N
	5-point Unit	C200H-OC223		8-point Unit	C200H-OC224, C200H-224V, C200H-224N

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CS-series Basic Input Units (20-pin Terminal Block)



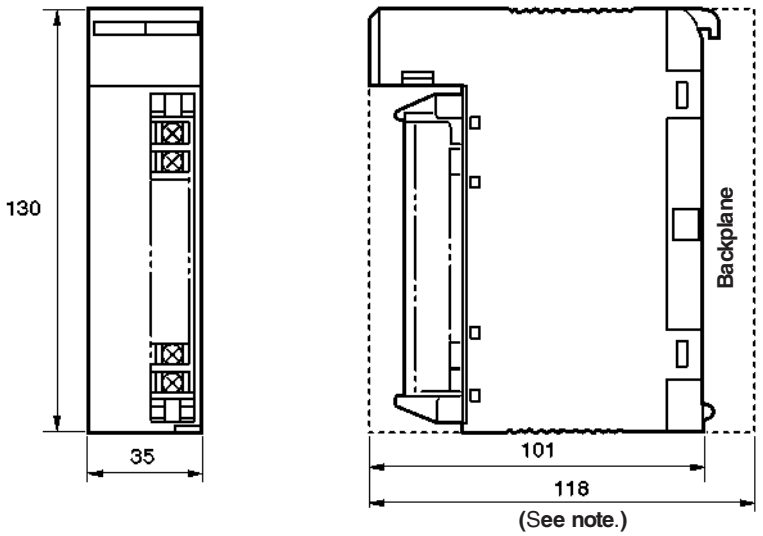
20-pin terminal block					
	16-point Unit	CS1W-ID211 INT01 IDP01 OD211 IA111 IA211 OC211 OA211		16-point Units with ERR indicator (load short-circuit)	CS1W-OD212
	8-point Unit	CS1W-OC201		8-point Units with ERR indicator (fuse burnout)	CS1W-OA201

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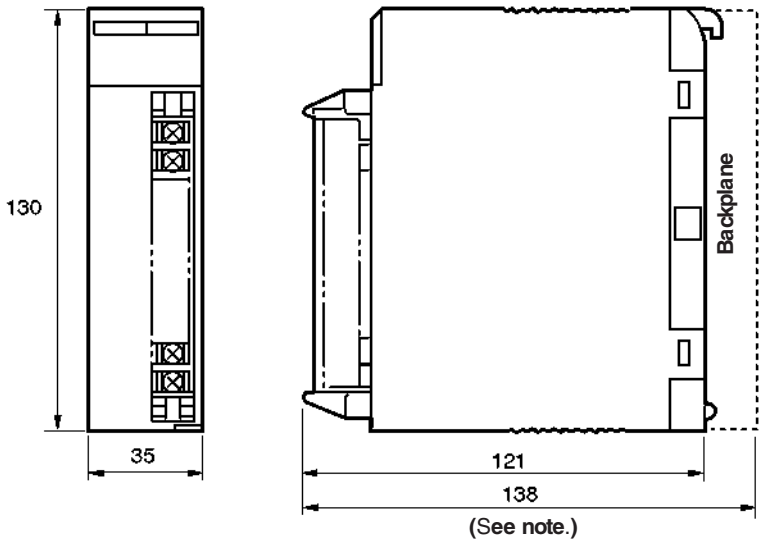
Dimensions

C200H Units with 10-pin Terminal Blocks

C200H-IA121
C200H-IA221
C200H-ID211
C200H-IM211
C200H-OA221
C200H-OC221
C200H-OC223
C200H-OD216
C200H-OD213
C200H-OD411
C200H-OD214



C200H-OA223

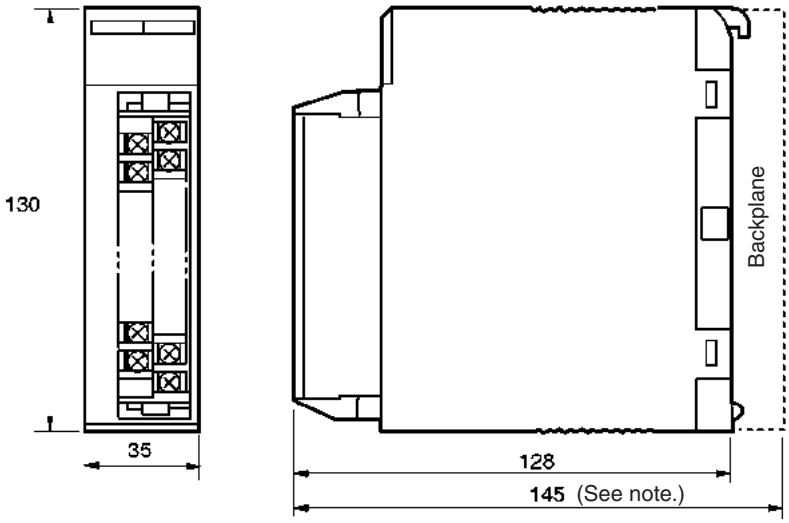


Note The heights of the Units including the Backplane are 5 mm greater on the CPU Backplane and CS-series Expansion Backplane (123 and 143 mm).

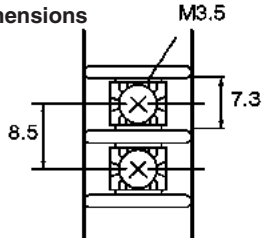
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Units with 19-pin Terminal Blocks

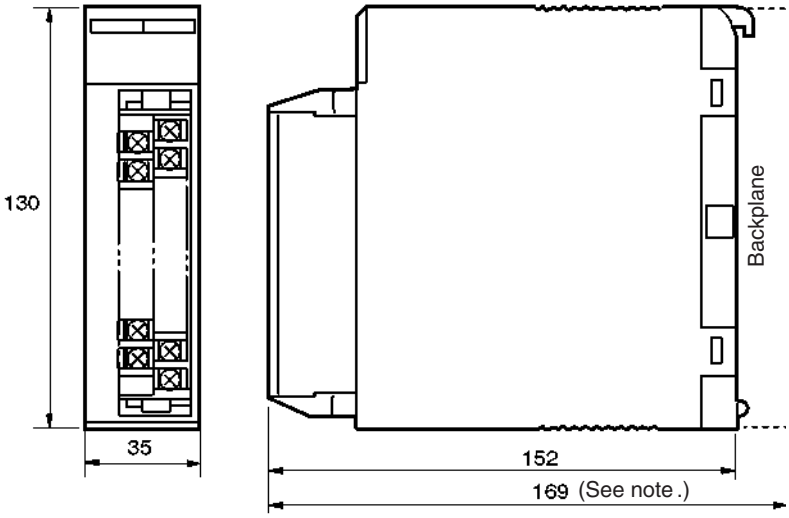
C200H-IA122
C200H-IA122V
C200H-IA222
C200H-IA222V
C200H-ID212
C200H-IM212
C200H-OA222V
C200H-OA224
C200H-OC222
C200H-OC222V
C200H-OC224
C200H-OC224V
C200H-OC225
C200H-OD211
C200H-OD212
C200H-OD217
C200H-OD21A
C200H-OC222N
C200H-OC224N



Terminal Dimensions



C200H-OC226
C200H-OC226N

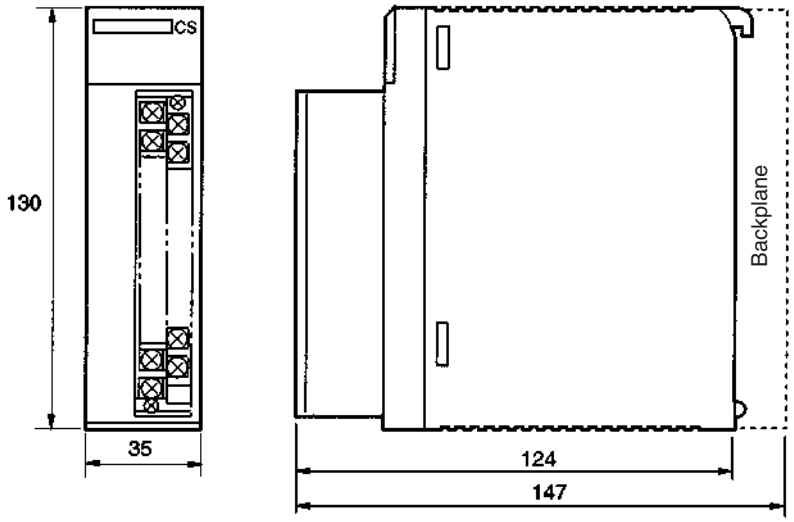


Note The heights of the Units including the Backplane are 5 mm greater on the CPU Backplane and CS-series Expansion Backplane (150 and 174 mm).

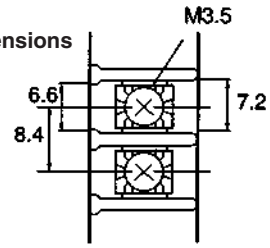
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CS-series Basic I/O Units (20-pin Terminal Blocks)

CS1W-IA111
CS1W-IA211
CS1W-ID211
CS1W-INT01
CS1W-IDP01
CS1W-OD211
CS1W-OD212
CS1W-OA201
CS1W-OA211
CS1W-OC201
CS1W-OC211



Terminal Dimensions

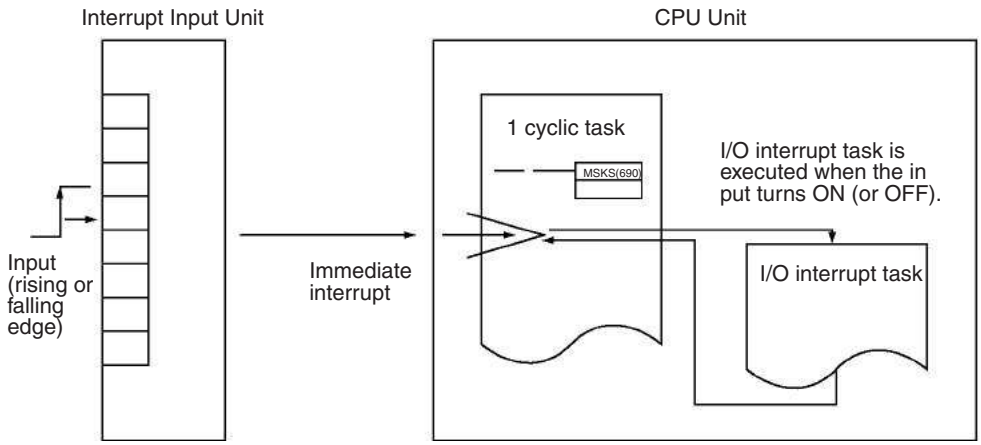


3-6-2 Interrupt Input Units

Functions

Interrupt Input Units are used to execute interrupt programs on the rising or falling edge of an input signal (See note.). When the specified interrupt input turns ON (or OFF), execution of the cyclic program in the CPU Unit is interrupted and an I/O interrupt task (task number 100 to 131) is executed. When execution of the I/O interrupt task has been completed, the cyclic program is again executed starting from the instruction after which it was interrupted.

Note Only the CS1W-INT01 can detect falling edges. The interrupt control instructions, however, can be used to switch between upward and downward differentiation.



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Applicable Units

Either of the following Interrupt Input Units can be used.

Model	Specifications	No. of Units mountable to CPU Rack
CS1W-INT01	24 V DC 16 inputs	2 max.
C200HS-INT01	24 V DC 8 inputs	4 max.

Application Precautions

All Interrupt Input Units must be mounted to the CPU Rack. The interrupt input function will not be supported if an Interrupt Input Unit is mounted to an Expansion Rack. If mounted to an Expansion Rack, the Unit can be used as a normal I/O Unit.

There are limits to the number of Interrupt Input Units that can be mounted. (See table, above.)

Use only CS-series or only C200H Interrupt Input Units on the same CPU Rack. The CS-series and C200H Interrupt Input Units cannot be used together.

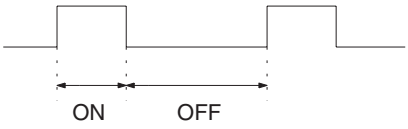
Can be used only with CPU Units with model numbers ending in "-V1," i.e., CS1W-CPU4□-V1 or CS1W-CPU6□-V1.

The input response time cannot be changed for the CS1W-INT01, and the related portions of the Basic I/O Unit input time constants in the PLC Setup, and the setting status in A220 to A259 will not be valid.

Use CX-Programmer Version 2.0 or higher when using the CS1W-INT01 Interrupt Input Unit. Earlier versions of CX-Programmer do not support this Unit. (The Programming Consoles, however, can be used for this Unit.)

Input Signal Width

Input signals must meet the following conditions.

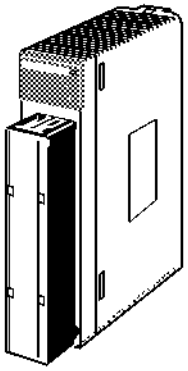


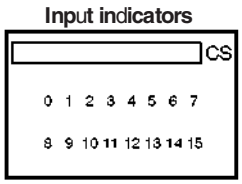
Unit	ON time	OFF time
CS1W-INT01	0.1 ms min.	0.5 ms min.
C200HS-INT01	0.2 ms min.	0.5 ms min.

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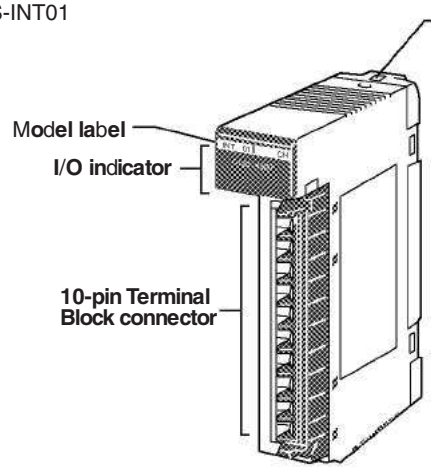
Components

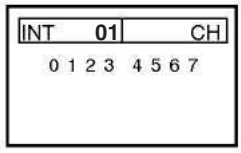
CS1W-INT01





C200HS-INT01





Using I/O Interrupts

1,2,3...

1. Mount the Input Interrupt Unit to the CPU Rack and create the I/O tables.
2. Create the I/O task (see note 1).
3. Use the SET INTERRUPT MASK Instruction (MSKS(690)) in the cyclic program to enable the required interrupt input numbers (see note 1).
4. Turn ON or OFF the inputs on the Interrupt Input Unit for the interrupt input numbers that have been enabled.

Note

1. The relationship between Interrupt Input Unit numbers, interrupt input numbers, and I/O interrupt tasks is shown in the following table.

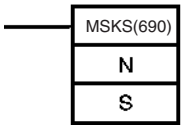
Model	Interrupt Input Unit number	Interrupt input number	I/O interrupt task number
CS1W-INT01	0	0 to 15	100 to 115
	1		116 to 131
C200HS-INT01	0	0 to 7	100 to 107
	1		108 to 115
	2		116 to 123
	3		124 to 131

2. The CS1W-INT01 can set to detect either rising or falling edges.

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MSKS(690) Instruction

Specifying Rising/Falling Edge for CS1W-INT01



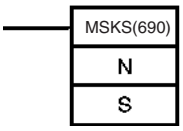
N: Control data 1 (Interrupt Input Unit No.)
S: Control data 2 (interrupt mask data)

The MSKS(690) instruction is used to set rising edge or falling edge detection for each interrupt input number.

- The value of N will determine which Interrupt Input Unit will perform the I/O interrupt processing.
- The value of S will determine rising or falling edge detection for each interrupt input number.

Operand	Value		Details
	CS1W-INT01	C200HS-INT01	
N	2, 3	---	Interrupt Input Unit Number Numbers 2 and 3 are assigned to the Units in order from left to right. 2: Interrupt Input Unit 0 (interrupt task numbers 100 to 115) 3: Interrupt Input Unit 1 (interrupt task numbers 116 to 131)
S	0000 to FFFF hex	---	Rising/Falling Edge Designation Bits 00 to 15 correspond to the interrupt input numbers (interrupt tasks 100 to 115 or 116 to 131). 0: Rising edge 1: Falling edge

Specifying I/O Interrupt Processing



N: Control data 1 (Interrupt Input Unit No.)
S: Control data 2 (interrupt mask data)

The MSKS(690) instruction is used to set I/O interrupt processing or scheduled interrupt processing.

- The value of N will determine which Interrupt Input Unit will perform the I/O interrupt processing.
- The value of S will determine which interrupt number will be enabled.

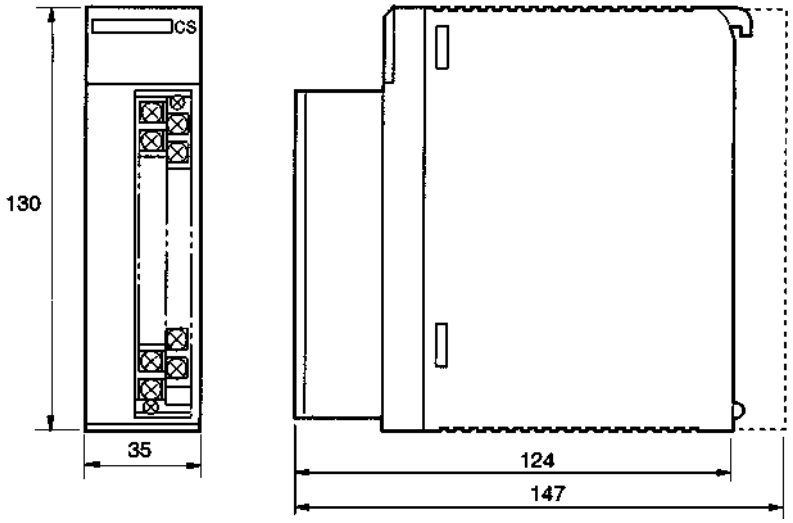
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Operand	Value		Details
	CS1W-INT01	C200HS-INT01	
N	0, 1	0 to 3	Interrupt Input Unit Number Numbers are assigned to the Units in order from left to right. CS1W-INT01 (unit numbers 0 and 1) 0: Interrupt Input Unit 0 (interrupt task numbers 100 to 115) 1: Interrupt Input Unit 1 (interrupt task numbers 116 to 131) CS1W-INT01 (unit numbers 0 to 3) 0: Interrupt Input Unit 0 (interrupt task numbers 100 to 107) 1: Interrupt Input Unit 1 (interrupt task numbers 108 to 115) 2: Interrupt Input Unit 2 (interrupt task numbers 116 to 123) 3: Interrupt Input Unit 3 (interrupt task numbers 123 to 131)
S	0000 to FFFF hex	0000 to 00FF hex	Interrupt Mask Data Bits 00 to 15 for the CS1W-INT01 and the rightmost 8 bits for the C200H-INT01are used for the Interrupt Input Unit's interrupt input number. 1: Interrupt masked (interrupt input disabled) 0: Interrupt valid (interrupt input enabled)

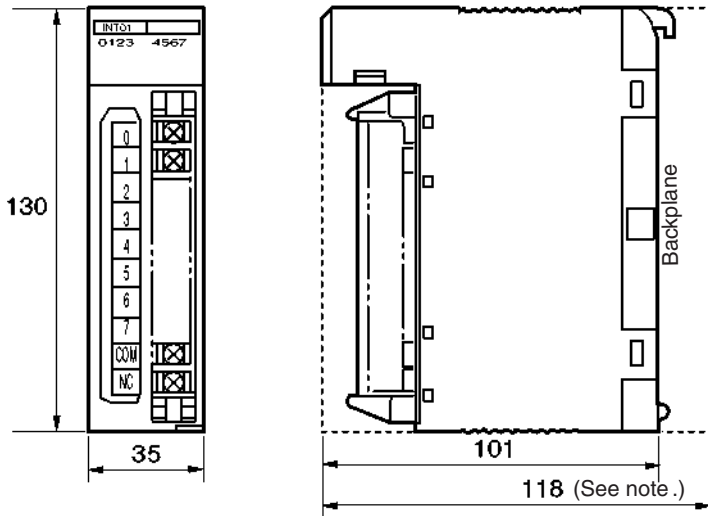
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Dimensions

CS1W-INT01



C200HS-INT01



Note The height of the Unit including the Backplane is 5 mm greater on the CPU Backplane and CS-series Expansion Backplane (123 mm).

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3-6-3 Units with High-speed Inputs

Functions

The CS1W-IDP01 enables inputting pulse signals that are shorted than the cycle time of the CPU Unit. C200H High-density I/O Units (Special I/O Units) also supported high-speed inputs.

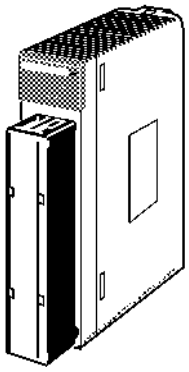
I/O Units with High-speed Inputs

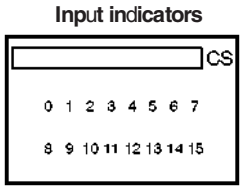
Model	Name	Specifications
CS1W-IDP01	High-speed Input Unit	24 V DC, 16 inputs
C200H-ID501	TTL Input Unit	5 V DC, 32 inputs
C200H-ID215	DC Input Unit	24 V DC, 32 inputs
C200H-MD501	TTL I/O Unit	5 V DC,16 inputs/16 outputs
C200H-MD115	DC Input/Transistor Output Unit	12 V DC,16 inputs/16 outputs
C200H-MD215		24 V DC,16 inputs/16 outputs,

Note Refer to *3-7 C200H High-density I/O Units (Special I/O Units)* for details on C200H High-density I/O Units

Components

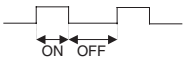
CS1W-IDP01





Input Signal Width

High-speed input signals must meet the following conditions for the ON time.



Model	ON time
CS1W-IDP01	0.1 ms min.
C200H-ID501/215 C200H-MD501/215/115	1.0/4.0 ms min. (switchable)

Dimensions

The High-speed Input Unit has the same dimensions as the Interrupt Input Unit. Refer to page 218.

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3-6-4 CS-series Basic I/O Units with Connectors (32-, 64-, and 96-pt Units)

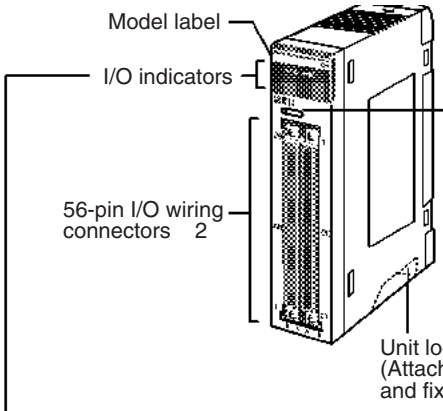
CS-series Basic I/O Units are classified as Basic I/O Units.

Models

Name	Specifications	Model
DC Input Unit	24 V DC, 32 inputs	CS1W-ID231
	24 V DC, 64 inputs	CS1W-ID261
	24 V DC, 96 inputs	CS1W-ID291
Transistor Output Unit, Sinking	0.5 A at 12 to 24 V DC, 32 outputs	CS1W-OD231
	0.3 A at 12 to 24 V DC, 64 outputs	CS1W-OD261
	0.1 A at 12 to 24 V DC, with fuse burnout detection circuit, 96 outputs	CS1W-OD291
Transistor Output Unit, Sourcing	0.5 A at 24 V DC, load short-circuit protection, 16 outputs	CS1W-OD212
	0.5 A at 24 V DC, load short-circuit protection, 32 outputs	CS1W-OD232
	0.3 A at 24 V DC, load short-circuit protection, 64 outputs	CS1W-OD262
	0.1 A at 24 V DC, with fuse burnout detection circuit, 96 outputs	CS1W-OD292
DC Input/Transistor Output Unit, Sinking	24 V DC input, 0.3 A output at 12 to 24 V DC, 32 inputs/32 outputs	CS1W-MD261
	24 V DC input, 0.1 A output at 12 to 24 V DC, with fuse burnout detection circuit, 48 inputs/48 outputs	CS1W-MD291
DC Input/Transistor Output Unit, Sourcing	24 V DC input, 0.3 A output at 24 V DC, load short-circuit protection, 32 inputs/32 outputs	CS1W-MD262
	24 V DC input, 0.1 A output at 24 V DC, with fuse burnout detection circuit, 48 inputs/48 outputs	CS1W-MD292
TTL I/O Unit	3.5 mA at 5 V DC, 32 inputs 35 mA at 5 V DC, 32 outputs	CS1W-MD561

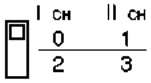
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Note Immediate refreshing (!) or refreshing using IORF(097) is possible for CS-series High-density I/O Units.



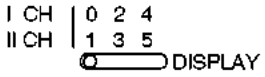
Unit mounting hooks
Hooked onto Backplane to mount Unit.

Display Switch for 64-point I/O Units



	Display switch	
	0, 1	2, 3
Area 1	m	m + 2
Area 2	m + 1	m + 3

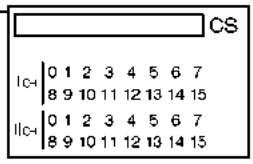
Display Switch for 96-point I/O Units



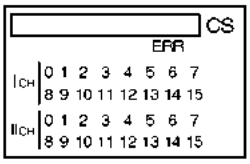
Display switch (3-level selection)

	Display switch		
	0, 1	2, 3	4, 5
Area 1	m	m + 2	m + 4
Area 2	m + 1	m + 3	m + 5

32-point Units
CS1W-ID231
CS1W-OD231



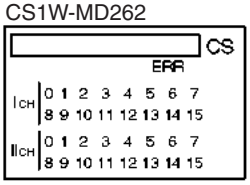
32-point Units with ERR indicator (load short-circuit indicator)
CS1W-OD232



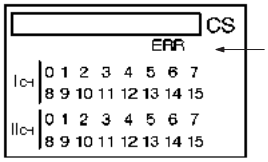
64-point Units
CS1W-ID261
CS1W-OD261
CS1W-MD261
CS1W-MD561



64-point Units with ERR indicator (load short-circuit indicator)
CS1W-OD262
CS1W-MD262



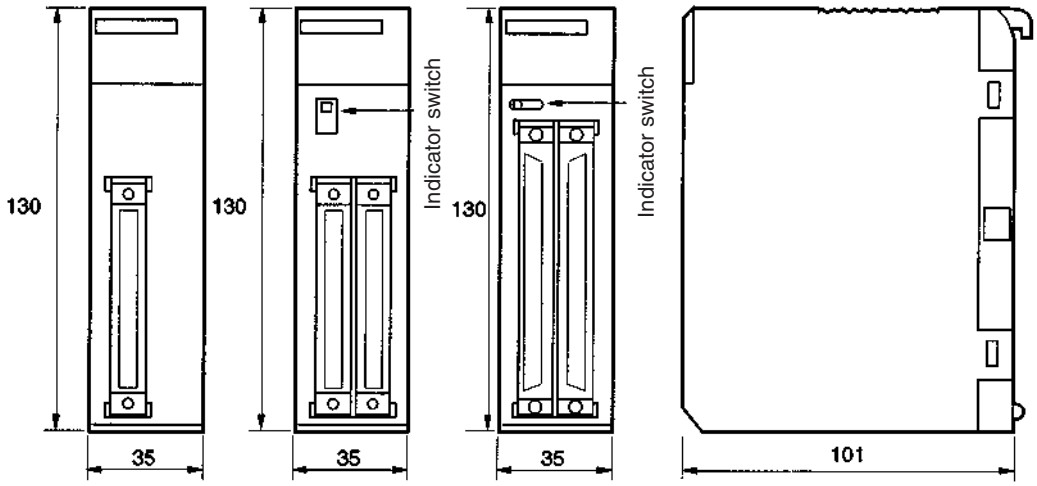
96-point Units
CS1W-ID291/OD291/OD292/MD291/MD292



F (fuse burnt out) indicator
Available on Output Units.
Lights when one or more fuses in the Unit blows.
Lights when external power is OFF.

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Dimensions

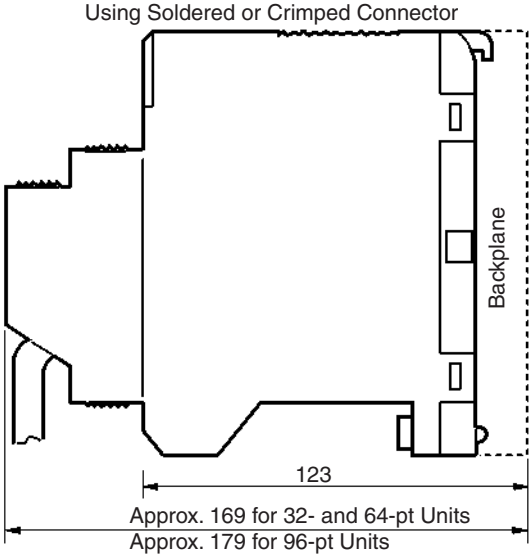


Units with One 40-pin connector
CS1W-ID231
CS1W-0D231
CS1W-0D232

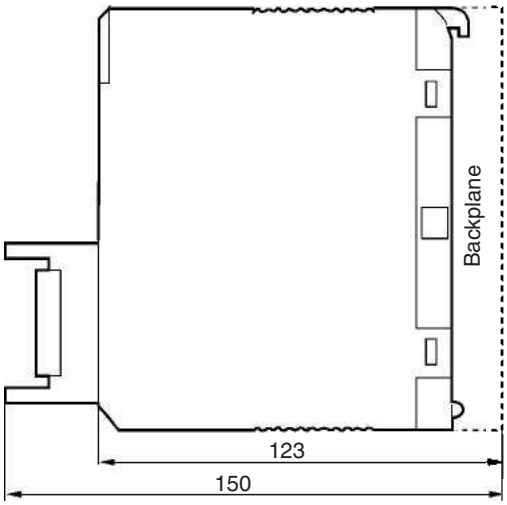
Units with Two 40-pin connectors
CS1W-ID261
CS1W-0D261
CS1W-OD262
CS1W-MD261
CS1W-MD262
CS1W-MD561

Units with 56-pin connectors
CS1W-ID291
CS1W-OD291
CS1W-OD292
CS1W-MD291
CS1W-MD292

Using Soldered or Crimped Connector



Using Pressure-welded Connector Connecting Cables:
G79-□□□C-□□□-□□□
XW2Z-□□□



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3-6-5 C200H Group-2 High-density I/O Units

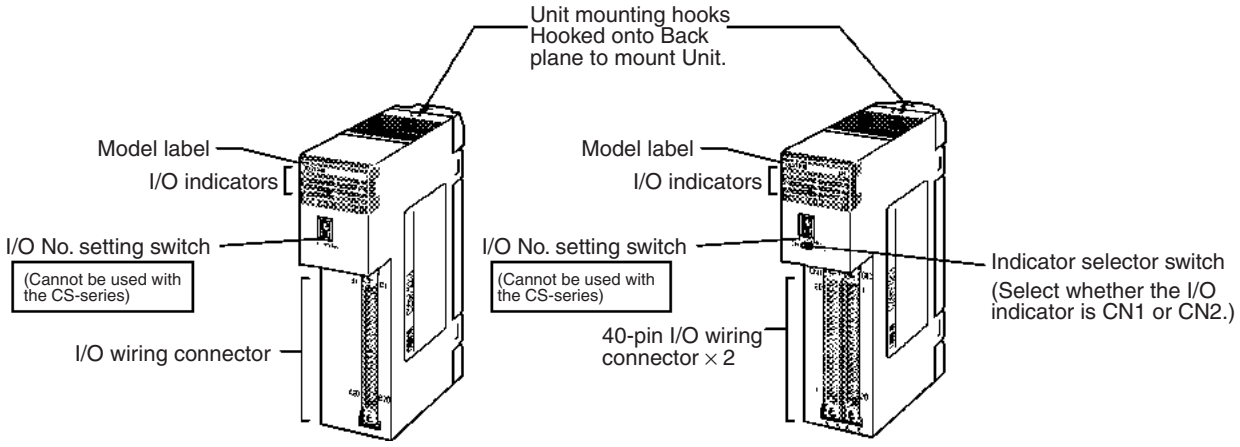
C200H Group-2 High-density I/O Units are classified as Basic I/O Units.

Models

Name	Specifications	Model	Appearance/ dimensions reference No.
DC Input Unit	24 V DC, input current: 4.1 mA typical, 32 inputs	C200H-ID216	1
	24 V DC, input current: 6 mA typical, 32 inputs	C200H-ID218	1
	12 V DC, 64 inputs	C200H-ID111	2
	24 V DC, input current: 4.1 mA typical, 64 inputs	C200H-ID217	2
	24 V DC, input current: 6 mA typical, 64 inputs	C200H-ID219	2
Transistor Output Unit	16 mA at 4.5 V to 100 mA at 26.4 V, 32 outputs	C200H-OD218	1
	16 mA at 4.5 V to 100 mA at 26.4 V, 64 outputs	C200H-OD219	2
	24 V DC, 0.5 A, sourcing, 32 inputs	C200H-OD21B	1

Note
1. C200H Group-2 High-density I/O Units cannot be mounted to SYSMAC BUS Slave Racks.
2. Immediate refreshing (!) is not possible for C200H Group-2 High-density I/O Units, but refreshing using IORF (097) is possible for these Units.

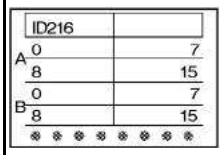
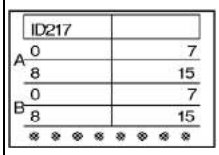
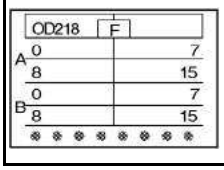
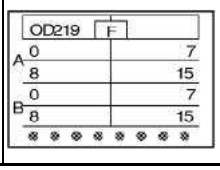
Components and Switch Settings



1. Units with One 40-pin Connector
2. Units with Two 40-pin Connectors

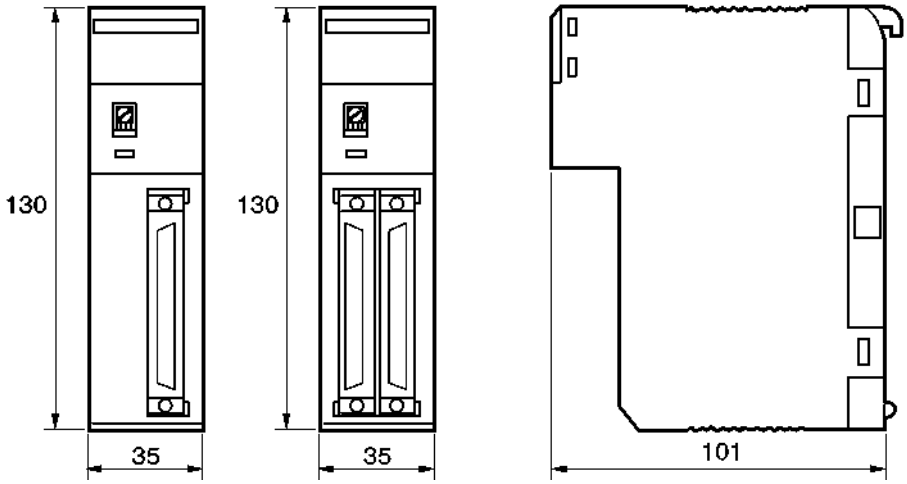
Note The I/O number setting switch on the front panel of C200H Group-2 High-density I/O Units is not used for the CS Series, i.e., the I/O number setting will not affect allocations. Words are allocated to the Units according to their position on the Rack in the same way as for Basic I/O Units.

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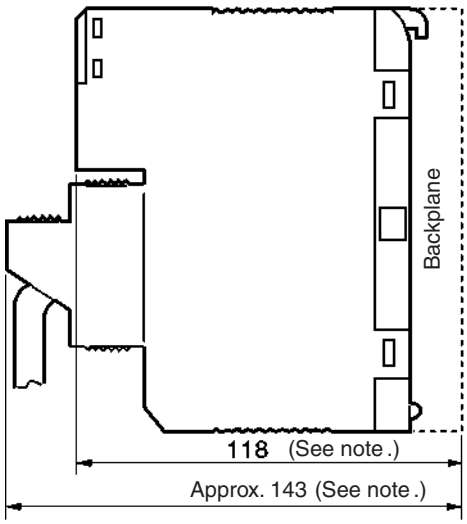
Units with One 40-pin Connector			Units with Two 40-pin Connectors		
	32-point Unit	C200H-ID216 C200H-ID218		64-point Unit	C200H-ID111 C200H-ID217 C200H-ID219
	32-point Unit F (fuse burnt out) indicator	C200H-OD218		64-point Unit F (fuse burnt out) indicator	C200H-OD219

Dimensions

1. Units with 40-pin Connector
2. Units with Two 40-pin Connectors



Unit Dimensions with Backplane and Connector



Note The height of the Unit including the Backplane is 5 mm greater on the CPU Backplane and CS-series Expansion Backplane (123 and 148 mm).

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3-7 C200H High-density I/O Units (Special I/O Units)

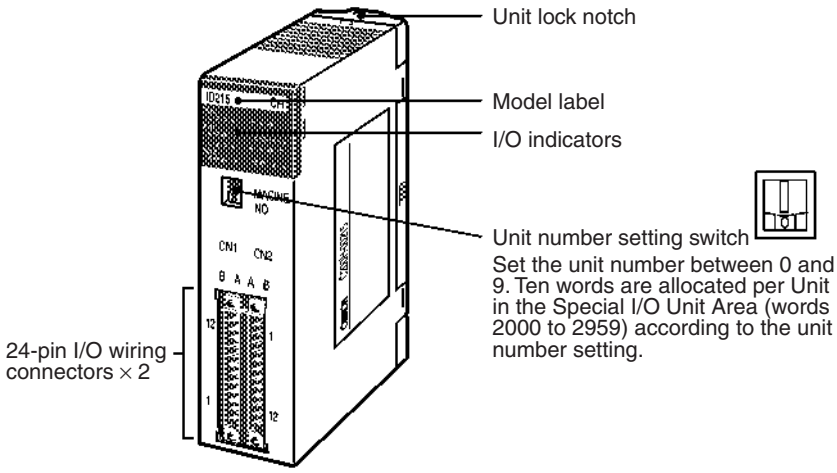
C200H High-density I/O Units are classified as C200H Special I/O Units.

Models

Name	Specifications	Model	Dynamic I/O mode	Static I/O mode
TTL Input Unit	5 V DC, 32 inputs	C200H-ID501	---	High-speed inputs
DC Input Unit	24 V DC, 32 inputs	C200H-ID215	---	High-speed inputs
TTL Output Unit	5 V DC, 32 outputs	C200H-OD501	128 outputs	---
Transistor Output Unit	24 V DC, 32 outputs	C200H-OD215	128 outputs	---
TTL I/O Unit	5 V DC, 16 inputs/16 outputs	C200H-MD501	128 inputs	High-speed inputs
DC Input/Transistor Output Unit	12 V DC, 16 inputs/16 outputs	C200H-MD115	128 inputs	High-speed inputs
	24 V DC, 16 inputs/16 outputs	C200H-MD215	128 inputs	High-speed inputs

Note Immediate refreshing (!) is not possible for C200H High-density I/O Units, but refreshing using IORF (097) is possible.

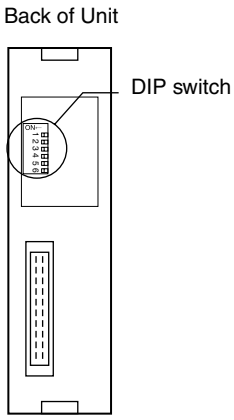
Components and Switch Settings



Note

1. Be sure to turn OFF the power supply to the PLC before setting the unit number.
2. Set the unit number using a flat-blade screwdriver.
3. Do not stop in the middle of setting the value (between 0 and 9) or the setting will not be complete.
4. Make sure that the groove in the unit number setting switch does not become damaged.

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Model	RUN mode		High-speed inputs		High-speed input minimum response pulse		Normal input response time		Dynamic data output logic	
	SW1		SW2		SW3		SW4		SW5	
	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
C200H-ID501	---	---	High-speed input function enabled	Normal input	4 ms	1 ms	---	---	15 ms max.	2.5 ms max.
C200H-ID215	---	---	High-speed input function enabled	Normal input	4 ms	1 ms	---	---	15 ms max.	2.5 ms max.
C200H-OD501	128 dynamic outputs	32 static outputs	---	---	---	---	---	---	Positive logic output (See note.)	Negative logic output (See note.)
C200H-OD215	128 dynamic outputs	32 static outputs	---	---	---	---	---	---	Positive logic output (See note.)	Negative logic output (See note.)
C200H-MD501	128 dynamic inputs	16 static inputs, 16 static outputs	High-speed input function enabled	Normal input	4 ms	1 ms	15 ms max.	2.5 ms max.	---	---
C200H-MD115	128 dynamic inputs	16 static inputs, 16 static outputs	High-speed input function enabled	Normal input	4 ms	1 ms	15 ms max.	2.5 ms max.	---	---
C200H-MD215	128 dynamic inputs	16 static inputs, 16 static outputs	High-speed input function enabled	Normal input	4 ms	1 ms	15 ms max.	2.5 ms max.	---	---

Note Negative and positive logic output are only available with 128-point dynamic output mode.

C200H High-density I/O Units are classified as C200H Special I/O Units and have the following functions.

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Dynamic I/O Mode

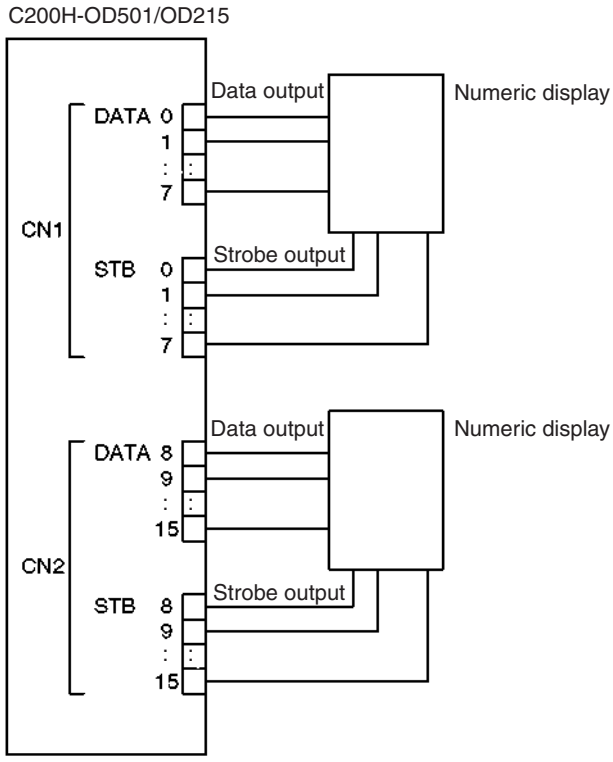
The High-density I/O Units (other than the C200H-ID501 and C200H-ID215) can provide high-density I/O rather than the normal output (static output mode) and I/O (static I/O mode). High-density I/O (dynamic output and dynamic input modes: 128 points) is achieved by combining the I/O signals with a strobe signal output. The High-density I/O Units require less wiring, use a numeric display device in dynamic output mode with large number capacity, and use keyboard switches in dynamic input mode.

High-speed Inputs

The High-density I/O Units (other than the C200H-OD501 and C200H-OD502) also provide high-speed inputs. High-speed inputs are possible with 8 input points. This function enables accurate reading of short pulse inputs from photomicroswitches and other devices.

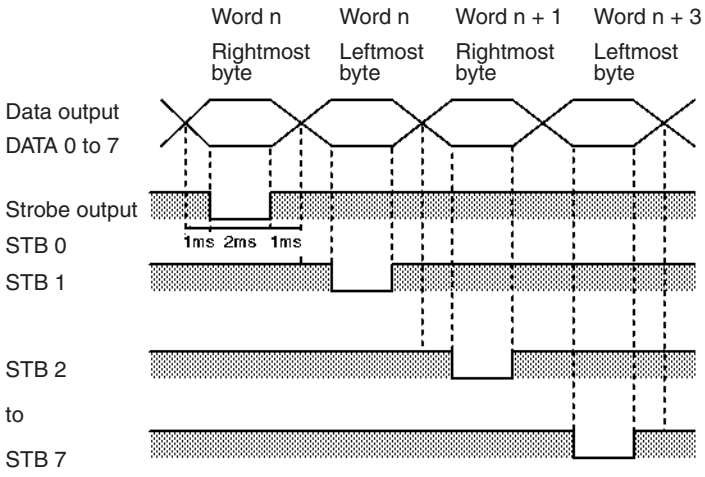
Dynamic I/O Mode

Dynamic Output Mode



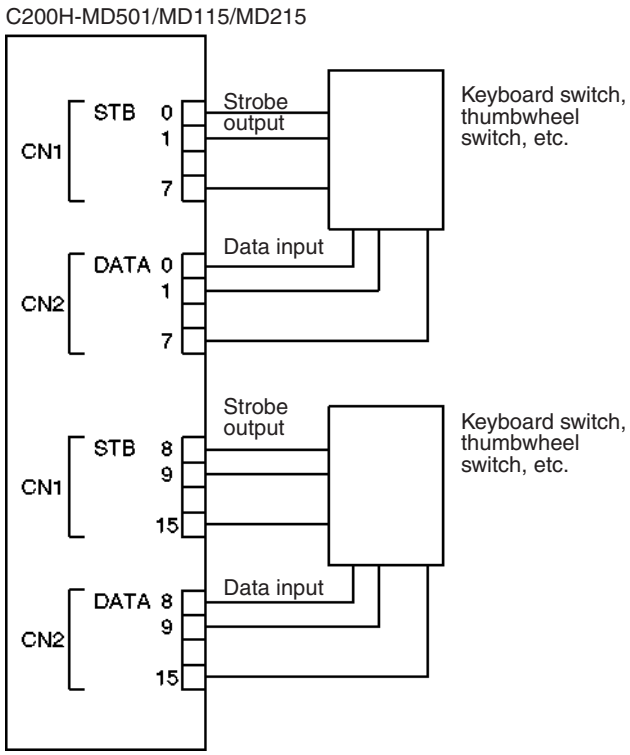
By combining data signals (DATA 0 to 7 and DATA 8 to 15) with strobe signals (STB 0 to 7/ STB 8 to 15, 128 bits (8 words) can be output to a numerical display device as shown in the following diagram.

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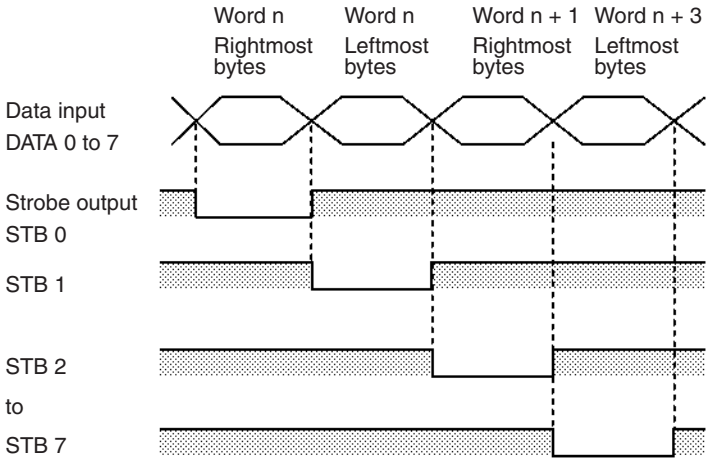
DATA 8 to 15 can also be output as STB 8 to 15 at the same time.

Dynamic Input Mode



Using strobe signals STB 0 to 7 as outputs, data signals DATA 0 to 7 as inputs, strobe signals STB 8 to 15 as outputs, and data signals DATA 8 to 15 as inputs, 128 bits (8 words) can be input from strobe input keyboard switches or thumbwheel switches as shown in the following diagram.

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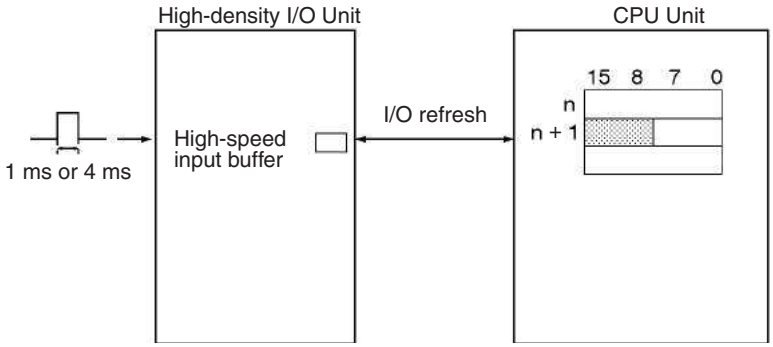


DATA 8 to 15 can also be output as STB 8 to 15 at the same time.

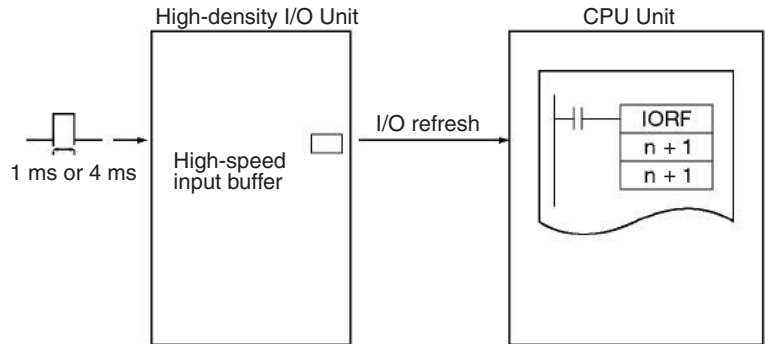
High-speed Inputs

The inputs 8 to 15 from the CN2 connector can be used for pulse input. The minimum pulse width is 1 ms or 4 ms (selectable).

A High-density I/O Unit will recognize a pulse input when the pulse input occurs (i.e., the inputs turns ON and then OFF again), and the pulse width is greater than 1 ms or 4 ms (according to the selected minimum pulse width). The data is refreshed in the Special I/O Unit Area (word n + 1, bits 8 to 15) of I/O memory during the CPU Unit's I/O refresh period.

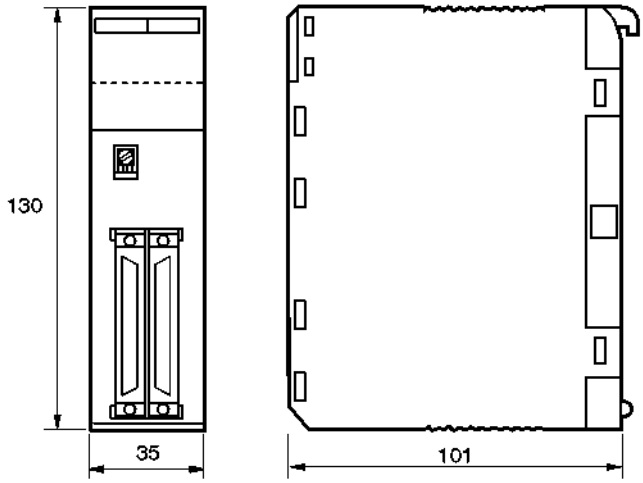


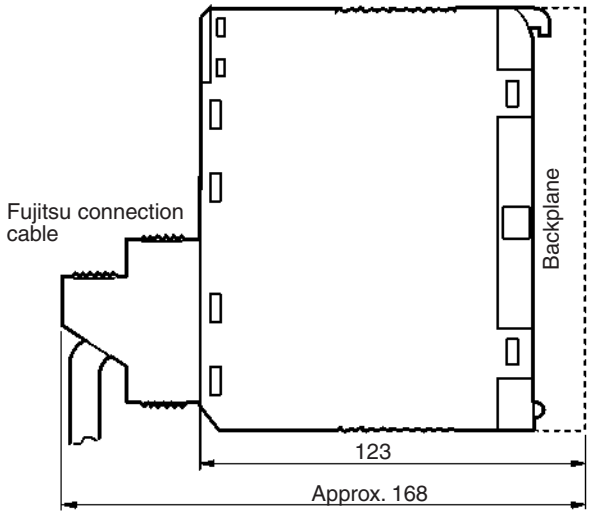
The High-density I/O Unit data in the high-speed input buffer can also be refreshed during program execution by executing the IORF(097) instruction for the desired Special I/O Unit.

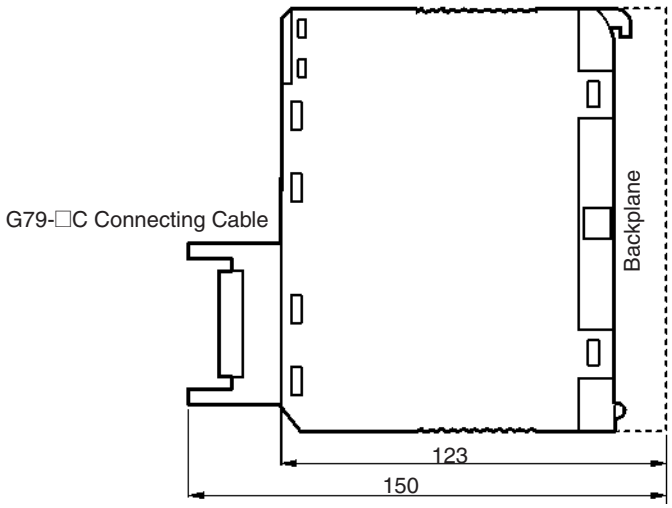


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Dimensions







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3-8 B7A Interface Units

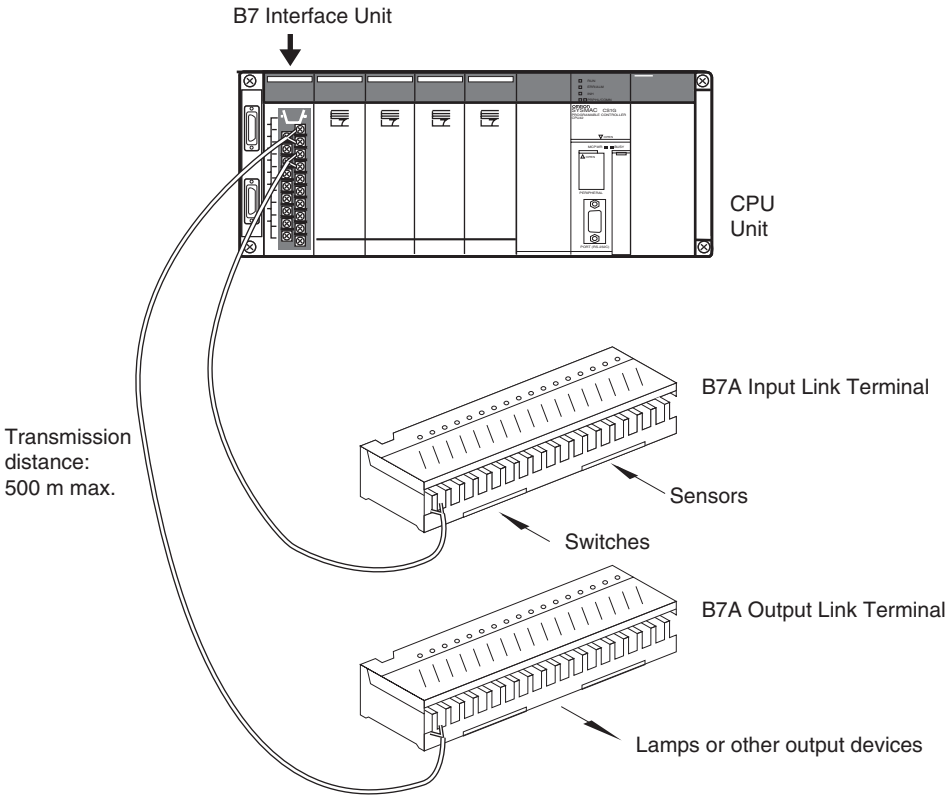
3-8-1 CS-series B7A Interface Units (CS-series Basic I/O Units)

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 CS1W-B7A□□ B7A Interface Unit is a CS-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.

System Configuration



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Models

B7A Interface Unit	Specifications	I/O words allocated to Unit	Connectable B7A Link Terminals (See note 1.)
CS1W-B7A12	32 inputs (two B7A ports)	2 input words	Inputs: Two 16-point Input Terminals, one 32-point Input Terminal, or one 16-point Input Terminal
CS1W-B7A02	32 outputs (two B7A ports)	2 output words	Outputs: Two 16-point Output Terminals or one 32-point Output Terminal or one 16-point Output Terminal
CS1W-B7A21	16 inputs, 16 outputs (two B7A ports)	1 input word and 1 output word	Inputs: One 16-point Input Terminal Outputs: One 16-point Output Terminal or One Mixed I/O Terminal (16 inputs/16 outputs)
CS1W-B7A22	32 inputs, 32 outputs (four B7A ports)	2 input words and 2 output words	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)

Note
1. A 10-point B7A Link Terminal cannot be connected to a B7A Interface Unit. B7A Interface Units can be connected together.
2. 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.

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B7A Communications Specifications

Item	Specifications		
Transmission method	One-way time-sharing multiplex transmissions		
Transmission delay (communications delay on transmission path)	High-speed	3 ms typical, 5 ms max.	
	Standard	19.2 ms typical, 31 ms max.	
Transmission points	CS1W-B7A12	32 inputs (2 ports)	
	CS1W-B7A02	32 outputs (2 ports)	
	CS1W-B7A21	16 inputs (1 port), 16 outputs (1 port)	
	CS1W-B7A22	32 inputs (2 ports), 32 outputs (2 ports)	
External power supply voltage (See note 3.)	12 to 24 V DC (allowable voltage range: 10.8 to 26.4 V)		
External supply current (See note 4.)	CS1W-B7A12	20 mA min.	
	CS1W-B7A02	60 mA min.	
	CS1W-B7A21	30 mA min.	
	CS1W-B7A22	60 mA min.	
Minimum input time (See note 5.)	High-speed	16 ms	
	Standard	2.4 ms	
Transmission distance	High-speed	Power supply on one side (common power supply)	10 m max.
			50 m max. (with shielded cable)
		Power supply on both sides (separate power supplies)	10 m max.
			100 m max. (with shielded cable)
	Standard	Power supply on one side (common power supply)	100 m max.
		Power supply on both sides (separate power supplies)	500 m max.
Cables	VCTF, 0.75 mm^2, 3 conductors (power supply on one side (common power supply))		
	VCTF, 0.75 mm^2, 2 conductors (power supply on both sides (separate power supplies))		
	Shielded cable, 0.75 mm^2, 3 conductors (power supply on one side (common power supply))		
	Shielded cable, 0.75 mm^2, 2 conductors (power supply on both sides (separate power supplies))		

Note

1. When separate power supplies are used, the B7A Interface Unit and B7A Link Terminal are supplied by separate external power supplies.
2. When a common power supply is used, the B7A Interface Unit and B7A Link Terminal are supplied by the same external power supply.
3. Use a SELV power supply with overcurrent protection. A SELV power supply refers to a power supply with double or reinforced insulation between input and output and with an output voltage of 30 V rms with a 42.4-V peak or an output voltage of 60 VDC max. We recommend OMRON S8□□-series Power Supply Units for the external power supplies.
4. The capacity of the external supply current does not include the capacity required by the B7A Link Terminal.
5. The minimum input time is the minimum time required by the B7A Interface Unit to read the input signals from the CPU Unit.

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Common Specifications

Item	Specifications
Applicable PLCs	CS Series
Unit classification	CS-series Basic I/O Unit
Transmission delay	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) **Note** A transmission error will occur if B7A Link Terminals with different transmission delay times are connected to each other.
Transmission error input status processing	Hold status or reset inputs (loads off) (switch settable)
Front panel connection	Terminal block
Current consumption	5 V DC: 90 mA max. (supplied from Power Supply Unit)
Weight	CS1W-B7A12: 230 g max. CS1W-B7A02: 230 g max. CS1W-B7A21: 240 g max. CS1W-B7A22: 240 g max.

I/O Memory Allocations

The B7A Interface Unit is a Basic I/O Unit. Each Unit is allocated two or four words in the I/O Area (which starts at CIO 0000). The words are allocated according to the mounting position of the Unit as shown in the following table.

Port	Input/output				Allocated word
	CS1W-B7A12	CS1W-B7A02	CS1W-B7A21	CS1W-B7A22	(n: First word allocated to Unit)
1	Input	Output	Output	Output	Word n
2	Input	Output	Input	Output	Word n+1
3	---	---	---	Input	Word n+2
4	---	---	---	Input	Word n+3

Transmission Error Processing

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 a transmission occurs at an input port, indicators ERR1 to ERR2 on the front panel will turn ON according to the port where the error occurred.

Port where error occurred	LED error indicators			
	CS1W-B7A12	CS1W-B7A02	CS1W-B7A21	CS1W-B7A22
Port 1	ERR1	---	---	---
Port 2	ERR2	---	ERR1	---
Port 3	---	---	---	ERR1
Port 4	---	---	---	ERR2

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■ Transmission Error Flag

The corresponding Transmission Error Flag in the first word allocated to the Unit in the CPU Unit's Auxiliary Area will turn ON for each input port, as shown in the following table. Words A050 to A080 are allocated to Basic I/O Unit as information words.

Example: Rack 0, Slot 0

Port where error occurred	Transmission Error Flag			
	CS1W-B7A12	CS1W-B7A02	CS1W-B7A21	CS1W-B7A22
Port 1	A05000	---	---	---
Port 2	A05001	---	A05000	---
Port 3	---	---	---	A05000
Port 4	---	---	---	A05001

Example: Rack 0, Slot 1

Port where error occurred	Transmission Error Flag			
	CS1W-B7A12	CS1W-B7A02	CS1W-B7A21	CS1W-B7A22
Port 1	A05008	---	---	---
Port 2	A05009	---	A05008	---
Port 3	---	---	---	A05008
Port 4	---	---	---	A05009

■ Transmission Error Input Status Processing

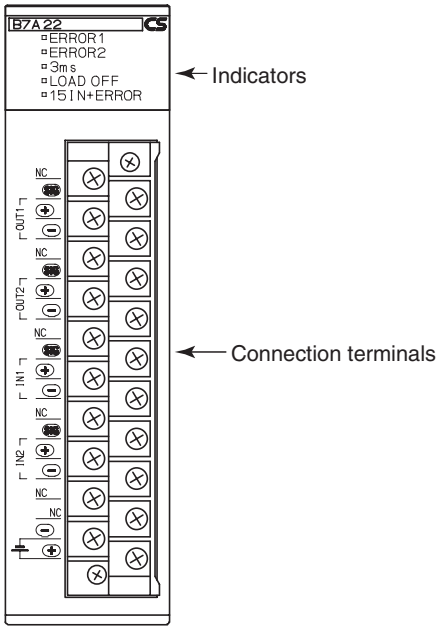
If an error occurs at an input port, the Unit will hold the status of the input bit in the CPU Unit's I/O memory from immediately before the transmission error occurred. When transmission returns to normal, the signals that have been normally received will be input to the input bit.

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.

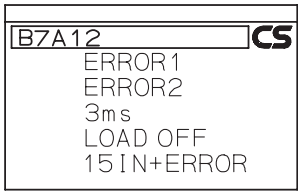
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Parts and Names



Indicators

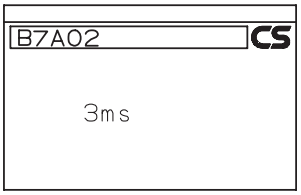
■ **CS1W-B7A12**



Display	Name	Color	Status	Condition
ERROR1	Port 1 transmission error	Red	ON	A transmission error has occurred at port 1 of the B7A Unit.
			OFF	The Unit is operating normally.
ERROR2	Port 2 transmission error	Red	ON	A transmission error has occurred at port 2 of the B7A Unit.
			OFF	The Unit is operating normally.
3 ms	Transmission delay setting	Orange	ON	The high-speed transmission delay (3 ms) is set.
			OFF	The standard transmission delay (19.2 ms) is set.
LOAD OFF	Transmission error input status processing setting	Orange	ON	Transmission error input status processing is set to reset status (loads OFF).
			OFF	Transmission error input status processing is set to hold status.
15IN + ERR	Input mode setting	Orange	ON	The input mode is set to 15 inputs + error input.
			OFF	The input mode is set to 16 inputs.

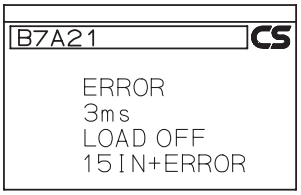
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■ CS1W-B7A02



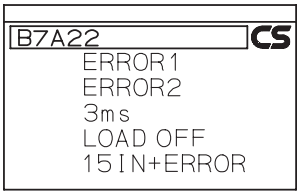
Display	Name	Color	Status	Condition
3 ms	Transmission delay setting	Orange	ON	The high-speed transmission delay (3 ms) is set.
			OFF	The standard transmission delay (19.2 ms) is set.

■ CS1W-B7A21



Display	Name	Color	Status	Condition
ERROR	Port 1 transmission error	Red	ON	A transmission error has occurred at port 1 of the B7A Unit.
			OFF	The Unit is operating normally.
3 ms	Transmission delay setting	Orange	ON	The high-speed transmission delay (3 ms) is set.
			OFF	The standard transmission delay (19.2 ms) is set.
LOAD OFF	Transmission error input status processing setting	Orange	ON	Transmission error input status processing is set to reset status (loads OFF).
			OFF	Transmission error input status processing is set to hold status.
15IN + ERR	Input mode setting	Orange	ON	The input mode is set to 15 inputs + error input.
			OFF	The input mode is set to 16 inputs.

■ CS1W-B7A22

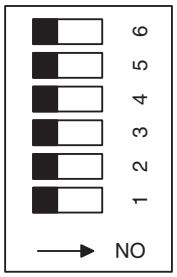


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Display	Name	Color	Status	Condition
ERROR1	Port 1 transmission error	Red	ON	A transmission error has occurred at port 1 of the B7A Unit.
			OFF	The Unit is operating normally.
ERROR2	Port 2 transmission error	Red	ON	A transmission error has occurred at port 2 of the B7A Unit.
			OFF	The Unit is operating normally.
3 ms	Transmission delay setting	Orange	ON	The high-speed transmission delay (3 ms) is set.
			OFF	The standard transmission delay (19.2 ms) is set.
LOAD OFF	Transmission error input status processing setting	Orange	ON	Transmission error input status processing is set to reset status (loads OFF).
			OFF	Transmission error input status processing is set to hold status.
15IN + ERR	Input mode setting	Orange	ON	The input mode is set to 15 inputs + error input.
			OFF	The input mode is set to 16 inputs.

Function Setting Switch

Set functionality using the DIP switch on the back of the Unit.



OFF ⟷ ON

■ **CS1W-B7A12**

Pin	Name	OFF	ON
1	Transmission delay	Standard (19.2 ms)	High-speed (3 ms)
2	Transmission error process	Hold status	Reset Inputs
3	Input mode	16 inputs	15 inputs + error input
4	ERROR 1 indicator enable	Disabled	Enabled
5	ERROR 2 indicator enable	Disabled	Enabled
6	Not used. (Leave OFF.)	NA	NA

Defaults: Pins 4 and 5 are turned ON and all other pins are turned OFF.

■ **CS1W-B7A02**

Pin	Name	OFF	ON
1	Transmission delay	Standard (19.2 ms)	High-speed (3 ms)
2 to 6	Not used. (Leave OFF.)	NA	NA

Defaults: All pins are turned OFF

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■ **CS1W-B7A21**

Pin	Name	OFF	ON
1	Transmission delay	Standard (19.2 ms)	High-speed (3 ms)
2	Transmission error process	Hold status	Reset Inputs
3	Input mode	16 inputs	15 inputs + error input
5	ERROR indicator enable	Disabled	Enabled
4, 6	Not used. (Leave OFF.)	NA	NA

Defaults: Pin 5 is turned ON and all other pins are turned OFF

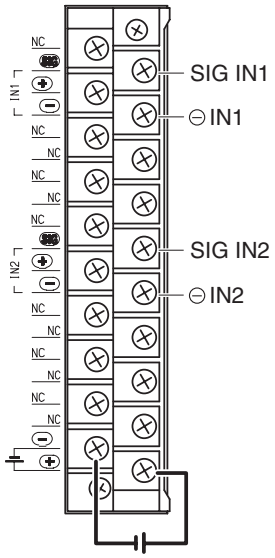
■ **CS1W-B7A22**

Pin	Name	OFF	ON
1	Transmission delay	Standard (19.2 ms)	High-speed (3 ms)
2	Transmission error process	Hold status	Reset Inputs
3	Input mode	16 inputs	15 inputs + error input
4	ERROR 1 indicator enable	Disabled	Enabled
5	ERROR 2 indicator enable	Disabled	Enabled
6	Not used. (Leave OFF.)	NA	NA

Defaults: Pins 4 and 5 are turned ON and all other pins are turned OFF

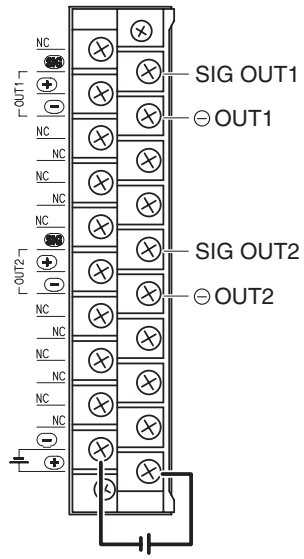
Terminal Names and Allocations

■ **CS1W-B7A12**

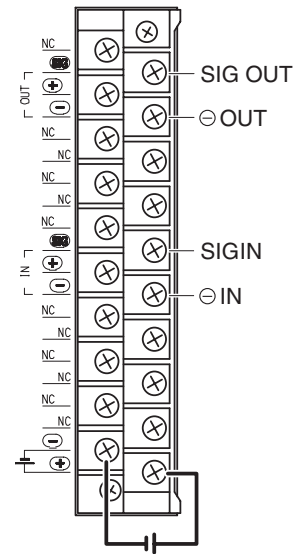
Terminal	Name	Function	Word	Appearance
B0	SIG IN1	Connect to SIG terminal on Input B7A Link Terminal.	n	
A1	+V	Connect to + terminal on external power supply.		
B1	⊖IN1	Connect to – power supply terminal on Input B7A Link Terminal.		
B4	SIG IN2	Connect to SIG terminal on Input B7A Link Terminal.	n+1	
A5	+V	Connect to + terminal on external power supply.		
B5	⊖IN2	Connect to – power supply terminal on Input B7A Link Terminal.		
A0, A2 to A4, A6 to A8, B2, B3, B6 to B8	NC	Not used.	---	
A9	–V	Connect to – terminal on external power supply.		
B9	+V	Connect to + terminal on external power supply.		

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■ CS1W-B7A02

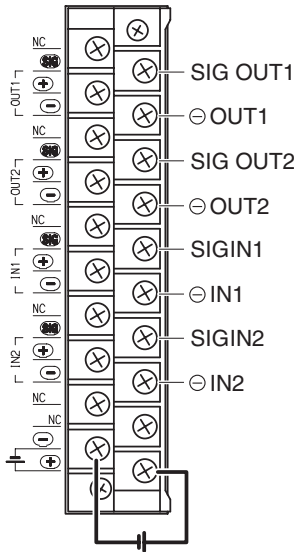
Terminal	Name	Function	Word	Appearance
B0	SIG OUT1	Connect to SIG terminal on Output B7A Link Terminal.	n	
A1	+V	Connect to + terminal on external power supply.		
B1	⊖OUT1	Connect to – power supply terminal on Output B7A Link Terminal.		
B4	SIG OUT2	Connect to SIG terminal on Output B7A Link Terminal.	n+1	
A5	+V	Connect to + terminal on external power supply.		
B5	⊖OUT2	Connect to – power supply terminal on Output B7A Link Terminal.		
A0, A2 to A4, A6 to A8, B2, B3, B6 to B8	NC	Not used.	---	
A9	–V	Connect to – terminal on external power supply.		
B9	+V	Connect to + terminal on external power supply.		

■ CS1W-B7A21

Terminal	Name	Function	Word	Appearance
B0	SIG OUT1	Connect to SIG terminal on Output B7A Link Terminal.	n	
A1	+V	Connect to + terminal on external power supply.		
B1	⊖OUT1	Connect to – power supply terminal on Output B7A Link Terminal.		
B4	SIG IN1	Connect to SIG terminal on Input B7A Link Terminal.	n+1	
A5	+V	Connect to + terminal on external power supply.		
B5	⊖IN1	Connect to – power supply terminal on Input B7A Link Terminal.		
A0, A2 to A4, A6 to A8, B2, B3, B6 to B8	NC	Not used.	---	
A9	–V	Connect to – terminal on external power supply.		
B9	+V	Connect to + terminal on external power supply.		

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■ **CS1W-B7A22**

Terminal	Name	Function	Word	Appearance
B0	SIG OUT1	Connect to SIG terminal on Output B7A Link Terminal.	n	
A1	+V	Connect to + terminal on external power supply.		
B1	⊖OUT1	Connect to – power supply terminal on Output B7A Link Terminal.		
B2	SIG OUT2	Connect to SIG terminal on Output B7A Link Terminal.	n+1	
A3	+V	Connect to + terminal on external power supply.		
B3	⊖OUT2	Connect to – power supply terminal on Output B7A Link Terminal.		
B4	SIG IN1	Connect to SIG terminal on Input B7A Link Terminal.	n+2	
A5	+V	Connect to + terminal on external power supply.		
B5	⊖IN1	Connect to – power supply terminal on Input B7A Link Terminal.		
B6	SIG IN2	Connect to SIG terminal on Input B7A Link Terminal.	n+3	
A7	+V	Connect to + terminal on external power supply.		
B7	⊖IN2	Connect to – power supply terminal on Input B7A Link Terminal.		
A0, A2, A4, A6, A8, B8	NC	Not used.	---	
A9	–V	Connect to – terminal on external power supply.		
B9	+V	Connect to + terminal on external power supply.		

Preparing and Connecting Cables

Cables

Terminal connector	Recommended wire size
20-pin	AWG22 (0.32 mm^2)

- The current capacity of a wire depends on the ambient temperature and insulation thickness.

Terminal Screws and Crimp Terminals

M3.5 self-rising screws are used for all power supply wiring terminals.

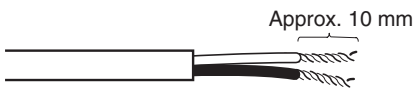
Note Always turn OFF the Unit's power supply and communications power supply before attaching or removing connectors.

Use the following procedure to prepare and connect the cables.

1) Preparing the Covering

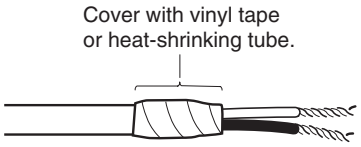
First, use the following procedure to prepare the cable.

1,2,3... 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.



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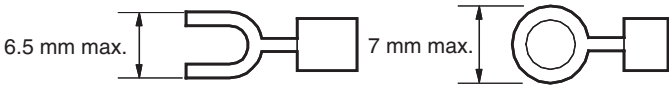
2. Use vinyl tape or a heat-shrink tube to cover the end of the VCTF cable sheath, as shown in the following diagram.



2) Preparing Cable Signal Lines

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

1,2,3... 1. Attaching Crimp Terminals
Insert the end of the cable into the terminal and crimp.

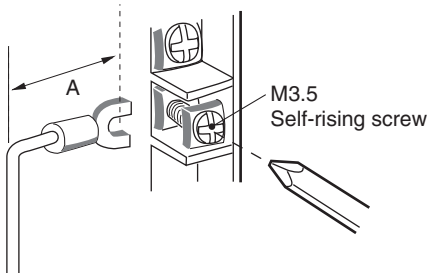


Note Always use the specified crimp tool to attach the crimp terminals. If a crimp tool is not used, the cable will not be crimped properly, which may cause the cable to become detached from the terminal.

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

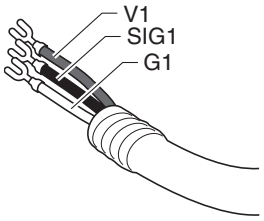
Wiring

- Wire the Units so 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 or damage.
- Tighten the terminal screws to the torque of 0.8 N.m.

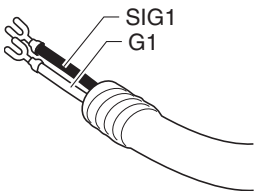


	A
20-pin	18 mm

- Power Supply on One Side (Common Power Supply)



- Power Supply on Both Sides (Separate Power Supplies)



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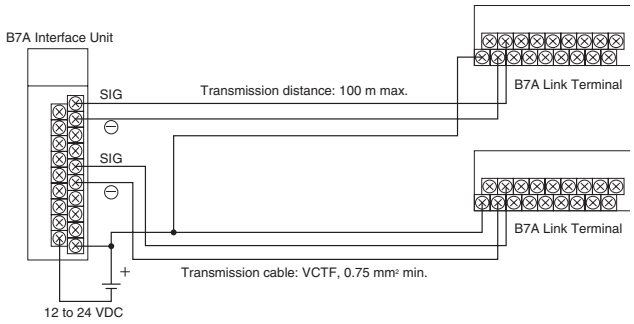
Wiring Methods

Note

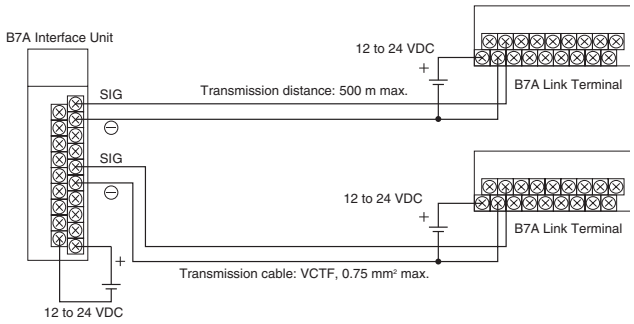
1. Confirm that terminals are connected correctly. If connections are incorrect, the internal components of the B7A Interface Unit and B7A Link Terminal may be damaged.
2. Route the signal lines in separate ducts both inside and outside the control panel to isolate them from power lines.
3. Connect cables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

Standard Mode

■ Common Power Supply



■ Separate Power Supplies

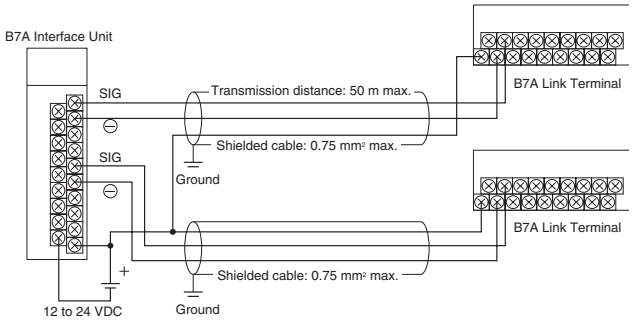


High-speed Mode

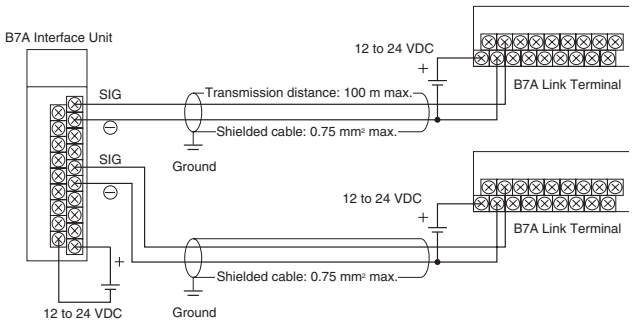
Note If shielded cable is not used, the maximum transmission distance is 10 m regardless of whether a common or separate power supplies are used. (Use VCTF cable of 0.75 mm^2 or higher.)

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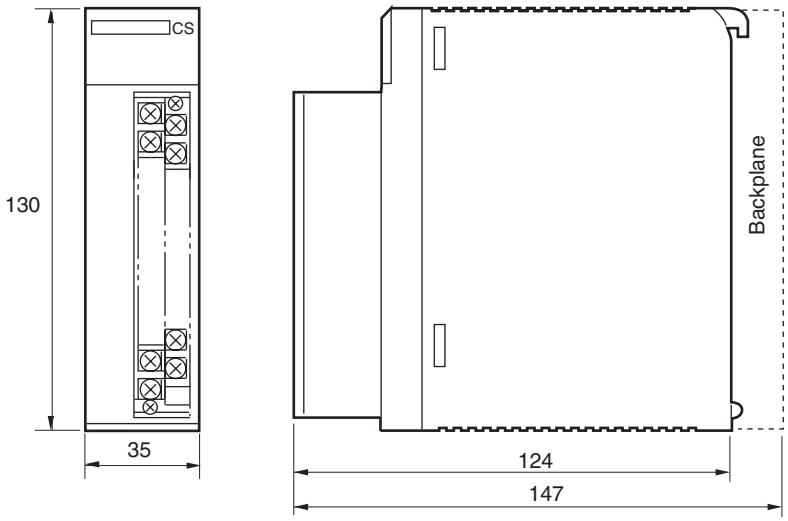
■ Common Power Supply



■ Separate Power Supplies



Dimensions (Unit: mm)



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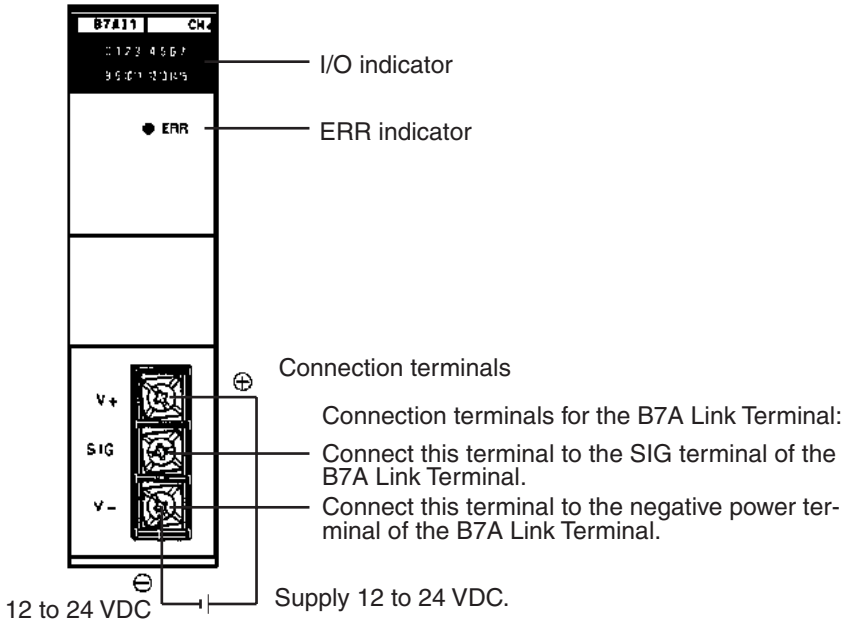
3-8-2 C200H Basic B7A Interface Units (C200H Basic I/O Units)

The Basic B7A Interface Unit used with the B7A Link Terminal allows the transmission and reception of 16-point I/O data over two wires.

The following Basic B7A Interface Unit and B7A Link Terminal models are available.

B7A Interface Unit (C200H Basic I/O Unit)	B7A Link Terminals
16-point input: C200H-B7AI1	B7A-T6□1 (Screw terminal models) B7A-T6D2 (Modular models)
16-point output: C200H-B7AO1	B7A-R6□□1 (Screw terminal models) B7A-R6A52 (Modular models)

Note If the B7A Interface Unit is mounted to a Rack with a C200HW-PD024 24-V DC Power Supply Unit, supply 24 V DC from an independent power supply to the B7A Interface Unit or use a transformer to separate the power supply line to the B7A Interface Unit from the power supply lines to the CPU Unit and I/O Power Supply Unit.



I/O Indicator Indicates the ON or OFF status of input from the B7A Link Terminal or the ON and OFF status of output to the B7A Link Terminal.

ERR Indicator Incorporated by the B7AI1 and lit when the B7AI1's data transmission or reception is abnormal.

Connection Terminals

SIG: Connects to the SIG terminal of the B7A Link Terminal.
V–: Connects to the negative power terminal of the B7A Link Terminal.

⚠ **Caution** If the terminals are not connected correctly, the internal circuitry of the B7A Link Terminal will be damaged.

Note

1. The transmission cable must be a VCTF cable with a thickness of 0.75 mm^2 minimum.
2. Do not wire power lines or high-tension lines along with the transmission cable in the same conduit.

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Input Mode Selector

The B7AI1 incorporates an input mode selector on the back panel of the Unit, with which the following modes can be set.

Input mode		15 points + 1 error	16 points
Function		Fifteen-point input from the B7A Link Terminal is effective. Bit 15 is used as transmission error bit.	Sixteen-point input from the B7A Link Terminal is effective.
Switch setting		Upper side	Lower side
Bit no. allocation	00 to 14	Input 00 to input 14	Input 00 to input 14
	15	Transmission error bit	Input 15
Status of input indicator lamp 15		Not used	Lit when input 15 is ON. Not lit when input 15 is OFF.
Status of the ERR indicator		Lit when there is a transmission error and OFF during normal transmission	

The ERR indicator is lit when an error occurs. If the error is corrected, the ERR indicator is OFF at the next transmission cycle.

When there is a transmission error, the B7A Link Terminal will hold the data just before the occurrence of the transmission error. If there is a transmission error because the B7A Link Terminal is turned off, however, data 0 is transmitted in the first transmission cycle when the B7A Link Terminal is turned on again.

Transmission errors between the C200H-B7AO1 and B7A Link Terminal are detected by the B7A Link Terminal only. Check the ERR indicator and error bit for any error.

Performance Specifications

Item	C200H-B7AI1	C200H-B7AO1
I/O points	16 points or 15 points and 1 error input	16 output points
Transmission distance	500 m max. if power is supplied to the Interface Unit and B7A Link Terminal separately. 100 m max. if power is supplied to the Interface Unit and B7A Link Terminal from a single power supply. (24 V DC±10%)	
Transmission delay	Typ. 19.2 ms, 31 ms max.	
Minimum input time (See note 1.)	—	16 ms
Internal current consumption	5 V DC, 100 mA max.	
External power supply (See note 2.)	12 to 24 V DC ±10%, 10 mA min.	12 to 24 V DC ±10%, 30 mA min.
Weight	200 g max.	

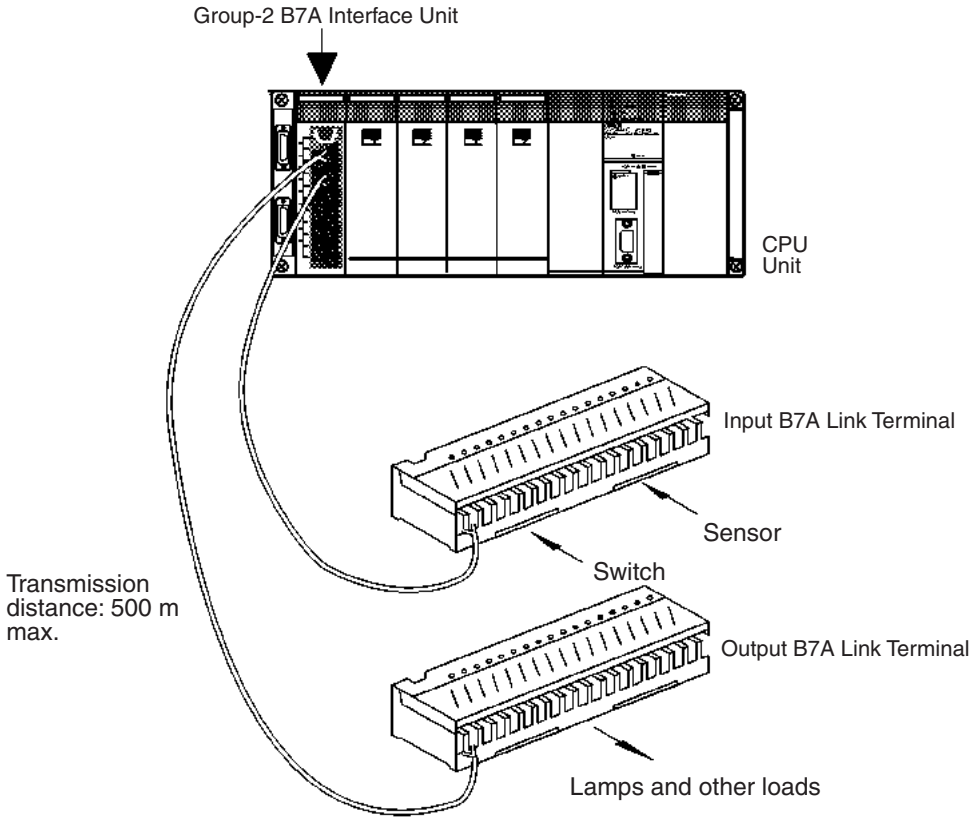
Note

1. The minimum input time refers to the minimum time required for reading the input signals from the CPU Unit. The ON/OFF width of the signal transmitted from the CPU Unit to the Output Relay of the B7A Interface Unit should be set to a value larger than the minimum input time.
2. The value of the external power supply does not include the value required by the B7A Link Terminal.

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3-8-3 B7A Interface Units (C200H Group-2 High-density I/O Units)

Features and System Configuration



A B7A Interface Unit (C200H Group-2 High-density I/O Unit) used with two or four B7A Link Terminals allows the transmission and reception of 32-point or 64-point I/O data over two-conductor cables.

A B7A Interface Unit (C200H Group-2 High-density I/O Unit) can be mounted to a CPU Rack or an Expansion I/O Rack. They cannot be mounted to Slave Racks.

I/O words are allocated in the same way as for C200H Basic I/O Units, i.e., according to the position on the Rack. Units with 32 I/O points are allocated two words; Units with 64 I/O points are allocated four words.

Refer to the *B7A Link Terminals Datasheet* for more information on B7A Link Terminals.

Models

The following B7A Interface Units (C200H Group-2 High-density I/O Units) are available.

B7A Interface Unit	Inputs	Outputs
C200H-B7A12	32 points	None
C200H-B7A02	None	32 points
C200H-B7A21	16 points	16 points
C200H-B7A22	32 points	32points

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Comparison between B7A Interface Units Classified as Basic I/O Units and C200H Group-2 High-density I/O Units

Type	Models	Word allocations	Connectable B7A Link Terminals		
			Transmission delay	Transmission errors	Points
C200H Basic I/O Units	C200H-B7AI1	Same as I/O Units (in order mounted).	Standard types only (19.2 ms)	Input status held automatically	16-point Terminals only (10-point, 32-point, and mixed I/O Terminals cannot be connected.
	C200H-B7AO1				
C200H Group 2 High-density I/O Units	C200H-B7A12	Same as I/O Units (in order mounted).	Standard (19.2 ms) and high-speed (3 ms) types (set via switch)	Switch setting to hold or reset Input status.	
	C200H-B7A02				
	C200H-B7A21				
	C200H-B7A22				

Note 1. With CS-series PLCs, I/O is allocated to B7A Interface Units (C200H Group-2 High-density I/O Units) just like other Basic I/O Units (allocating outputs first and then inputs for I/O Units). The unit number setting on the front panel of the B7A Interface Unit does not affect I/O allocations.

Name	Model	Words per Unit	Order of allocation
32-point Input Unit	C200H-B7A12	2	2 input words
32-point Output Unit	C200H-B7A02		2 output words
16-point Input/ 16-point Output Unit	C200H-B7A21		1 output word then 1 input word
32-point Input/32-point Output Unit	C200H-B7A22	4	2 output words then 2 input words

2. B7A Link Terminals with 10 points or those with 8 input and 8 output points cannot be connected to the B7A Interface Units. B7A Link Terminals with 16 points, two circuits of 16 points each (32 points total) or 16 points of mixed I/O can be connected.

Connectable B7A Link Terminals

Only 16-point B7A Link Terminals can be connected to a B7A Interface Unit. These are listed in the following tables.

Input Terminals

Type	Model	Transmission delay
Screw terminals	B7A-T6□1	Standard (19.2 ms)
	B7AS-T6□1	
	B7A-T6□6	High-speed (3 ms)
	B7AS-T6□6	
Modular	B7A-T6D2	Standard (19.2 ms)
	B7A-T6D7	High-speed (3 ms)
PLC connectors	B7A-T□E3	Standard (19.2 ms)
	B7A-T□E8	High-speed (3 ms)

Output Terminals

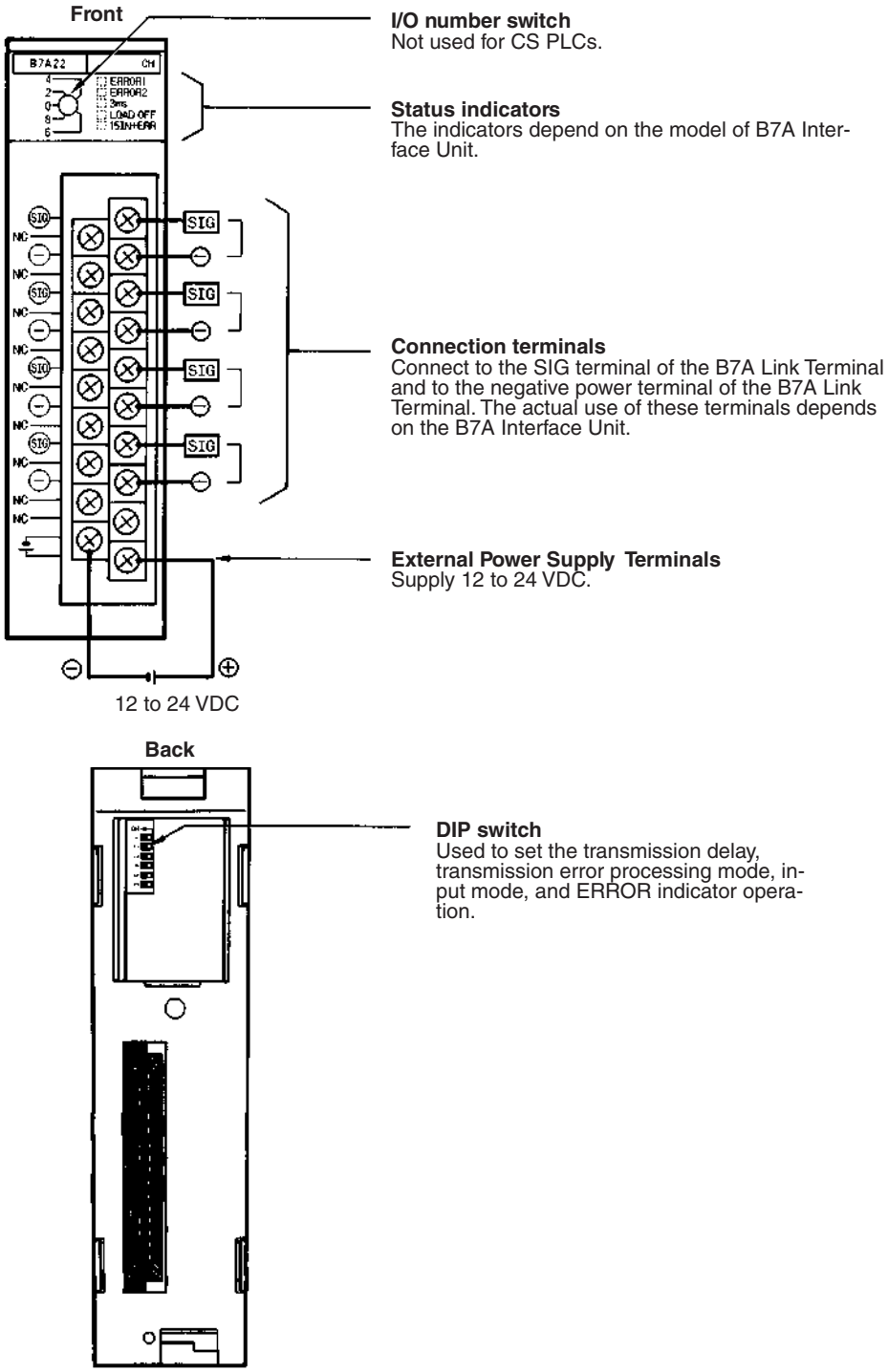
Type	Model	Transmission delay
Screw terminals	B7A-R6□□1	Standard (19.2 ms)
	B7AS-R6□□1	
	B7A-R6□□6	High-speed (3 ms)
	B7AS-R6□□6	
Modular	B7A-R6A52	Standard (19.2 ms)
	B7A-R6A57	High-speed (3 ms)
PLC connectors	B7A-R□A□3	Standard (19.2 ms)
	B7A-R□A□8	High-speed (3 ms)

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Note

1. Do not connect Terminals with different transmission delays to the same Interface Unit. Doing so will cause a transmission error.
2. Only 16-point or 32-point B7A Link Terminals can be connected to B7A Interface Units. Mixed I/O B7A Link Terminals and 10-point B7A Link Terminals cannot be connected.

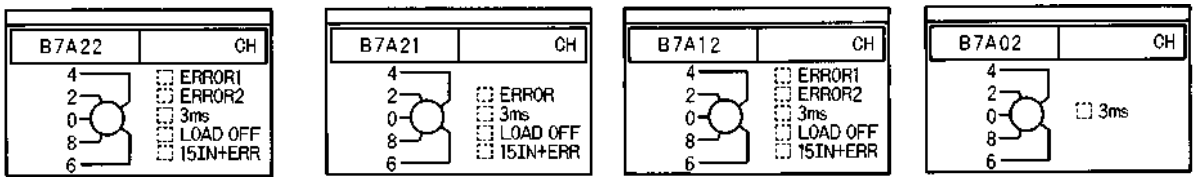
Parts and Names (C200H-B7A22 shown below)



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Indicator Operation

The indicators depend on the model of B7A Interface Unit, as shown below.



Name		Color	Function
ERROR 1 ERROR 2 ERROR	Input transmission error	Red	Lights when an error occurs in transmissions from an Input B7A Link Terminal. For the B7A12/22, ERROR 1 is for the first word allocated to the B7A Interface Unit; ERROR 2 is for the second word.
3ms	Transmission delay setting	Orange	Lit when the transmission delay is set to the high-speed setting (3 ms). Not lit when the transmission delay is set to the standard setting (19.2 ms).
LOAD OFF	Transmission error process	Orange	Lit when the processing for transmission errors is set to reset input status. Not lit when the processing for transmission errors is set to hold input status.
15IN+ERR	Input mode setting	Orange	Lit when the input mode is set to use 15 inputs and 1 error input. Not lit when the input mode is set to use 16 inputs.

Note With CS-series PLCs, I/O is allocated to Group-2 B7A Interface Units just like other Basic I/O Units. The unit number setting on the front panel of the Group-2 B7A Interface Unit is not used and does not affect I/O allocations.

DIP Switch Settings

Set the DIP switch as described before for the various models of B7A Interface Units.

C200H-B7A22/12

Pin	Function	OFF	ON
1	Transmission delay	Standard (19.2 ms)	High-speed (3 ms)
2	Transmission error process	Hold status	Reset Inputs
3	Input mode	16 inputs	15 inputs + error input
4	ERROR 1 indicator enable	Disabled	Enabled
5	ERROR 2 indicator enable	Disabled	Enabled
6	Not used.	NA	NA

Factory settings: Pins 4 and 5 ON, others OFF.

C200H-B7A21

Pin	Function	OFF	ON
1	Transmission delay	Standard (19.2 ms)	High-speed (3 ms)
2	Transmission error process	Hold status	Reset Inputs
3	Input mode	16 inputs	15 inputs + error input
4	ERROR indicator enable	Disabled	Enabled
5	Not used.	NA	NA
6	Not used.	NA	NA

Factory settings: Pin 5 ON, others OFF.

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C200H-B7A02

Pin	Function	OFF	ON
1	Transmission delay	Standard (19.2 ms)	High-speed (3 ms)
2	Not used.	NA	NA
3	Not used.	NA	NA
4	Not used.	NA	NA
5	Not used.	NA	NA
6	Not used.	NA	NA

Factory settings: All pins OFF.

Transmission Delay

Pin 1 is used to set the transmission delay. The same delay is used for all words allocated to the Unit.

Set the transmission delay to match that of the B7A Link Terminal. A transmission error will occur if the same transmission delay is not set.

The "3ms" indicator will be lit whenever the high-speed (3 ms) transmission delay is set.

Transmission Error Process

Pin 2 is used to turned ON to specify resetting input status when transmission errors occur. If pin 2 is turned OFF, input status will be held when transmission errors occur.

The LOAD OFF indicator will be lit whenever pin 2 is turned ON.

Input Mode

Pin 3 is turned ON to specify use of only 15 inputs and the use of bit 15 as a Transmission Error Flag. If pin 3 is OFF, 16 normal inputs can be used.

The "15IN+ERR" indicator will be lit whenever pin 3 is turned ON.

ERROR Indicators

Pin 4 or pins 4 and 5 are turned ON to enable the ERROR, ERROR 1, and/or ERROR 2 indicators. These indicators will not light even if a transmission error occurs if the corresponding pin is turned OFF.

Transmission Error Precautions

Startup

The Transmission Error Flag for the B7A Interface Unit will be OFF when power is turned on to the CS-series PLCs. If normal transmissions with the B7A Link Terminal are not possible within about 10 ms, the Transmission Error Flag (bit 15) will turn ON (i.e., if its operation is enabled by the input mode setting).

All input bits will remain OFF until normal transmissions are achieved.

Inputs

When a transmission error occurs, input status will be either held or all inputs will be reset according to the setting for the transmission error process, and the Transmission Error Flag (bit 15) will turn ON (i.e., if its operation is enabled by the input mode setting). The Transmission Error Flag will go OFF and the input status will return to normal when normal transmissions are achieved again.

Outputs

Transmission errors for Output B7A Link Terminals are not detected at the B7A Interface Unit and must be confirmed using the error indicators or error outputs on the Link Terminal.

Wiring

Terminal Names and Allocations

The use of the terminals depends on the model of the B7A Interface Unit. "m" indicates the first word allocated to the Unit.

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C200H-B7A22

Terminal	Name	Function	Word
B0	SIG OUT1	Connect to SIG terminal on Output B7A Link Terminal.	m
B1	– OUT1	Connect to – power supply terminal on Output B7A Link Terminal.	
B2	SIG OUT2	Connect to SIG terminal on Output B7A Link Terminal.	m + 1
B3	– OUT2	Connect to – power supply terminal on Output B7A Link Terminal.	
B4	SIG IN1	Connect to SIG terminal on Input B7A Link Terminal.	m + 2
B5	– IN1	Connect to – power supply terminal on Input B7A Link Terminal.	
B6	SIG IN2	Connect to SIG terminal on Input B7A Link Terminal.	m + 3
B7	– IN2	Connect to – power supply terminal on Input B7A Link Terminal.	
B8	NC	Not used.	---
A0 to A7			
B9	+V	Connect to + terminal on external power supply.	
A8	–V	Connect to – terminal on external power supply.	

C200H-B7A21

Terminal	Name	Function	Word
B0	SIG OUT1	Connect to SIG terminal on Output B7A Link Terminal.	m
B1	– OUT1	Connect to – power supply terminal on Output B7A Link Terminal.	
B2, B3	NC	Not used.	---
B4	SIG IN1	Connect to SIG terminal on Input B7A Link Terminal.	m + 1
B5	– IN1	Connect to – power supply terminal on Input B7A Link Terminal.	
B6 to B8	NC	Not used.	----
A0 to A7			
B9	+V	Connect to + terminal on external power supply.	
A8	–V	Connect to – terminal on external power supply.	

C200H-B7A12

Terminal	Name	Function	Word
B0	SIG IN1	Connect to SIG terminal on Input B7A Link Terminal.	m
B1	– IN1	Connect to – power supply terminal on Input B7A Link Terminal.	
B2, B3	NC	Not used.	---
B4	SIG IN2	Connect to SIG terminal on Input B7A Link Terminal.	m + 1
B5	– IN2	Connect to – power supply terminal on Input B7A Link Terminal.	
B6 to B8	NC	Not used.	---
A0 to A7			
B9	+V	Connect to + terminal on external power supply.	
A8	–V	Connect to – terminal on external power supply.	

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C200H-B7A02

Terminal	Name	Function	Word
B0	SIG OUT1	Connect to SIG terminal on Output B7A Link Terminal.	m
B1	– OUT1	Connect to – power supply terminal on Output B7A Link Terminal.	
B2, B3	NC	Not used.	---
B4	SIG OUT2	Connect to SIG terminal on Output B7A Link Terminal.	m + 1
B5	– OUT2	Connect to – power supply terminal on Output B7A Link Terminal.	
B6 to B8	NC	Not used.	---
A0 to A7			
B9	+V	Connect to + terminal on external power supply.	
A8	–V	Connect to – terminal on external power supply.	

Recommended Cables and Transmission Distance

The following cables are recommended to connect the B7A Interface Unit to B7A Link Terminals. The wiring method and transmission distance depend on the transmission delay and on whether or not a common power supply is being used for the B7A Link Terminal and the Interface Unit.

Standard Transmission Delays (19.2 ms): Cap-tire Cable

Power supply	Cable	Transmission distance
Common	VCTF, 0.75 mm^2 x 3 conductors	100 m max.
Separate	VCTF,0.75 mm^2 x 2 conductors	500 m max.

High-speed Transmission Delays (3 ms): Shielded Cable

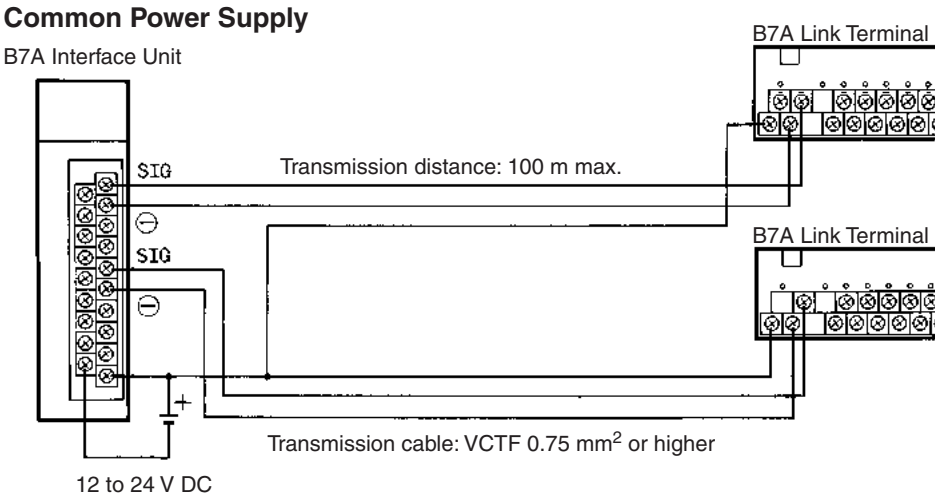
Power supply	Cable	Transmission distance
Common	Shielded cable, 0.75 mm^2 x 3 conductors	50 m max.
Separate	Shielded cable, 0.75 mm^2 x 2 conductors	100 m max.

Terminal Construction

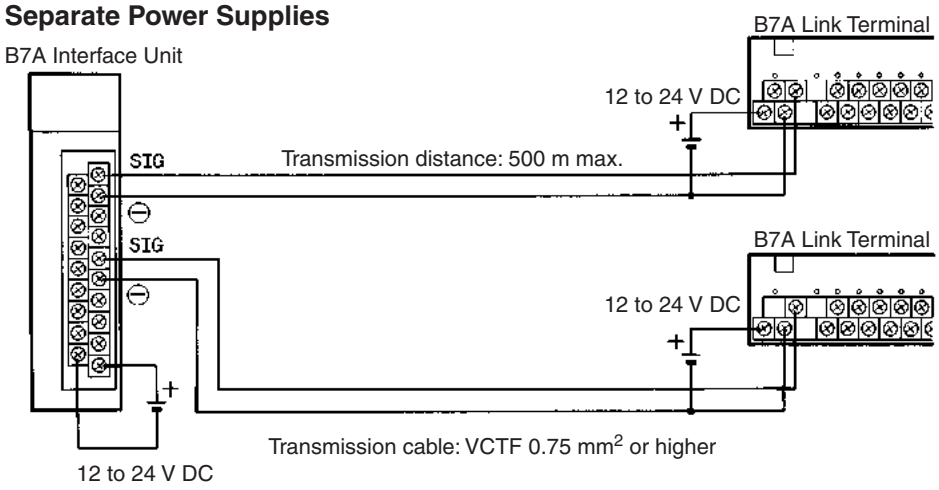
Use hook-type crimp connectors with a line thickness of 0.25 to 1.65 mm^2. The construction of the terminals is shown in the illustration.

Wiring Method

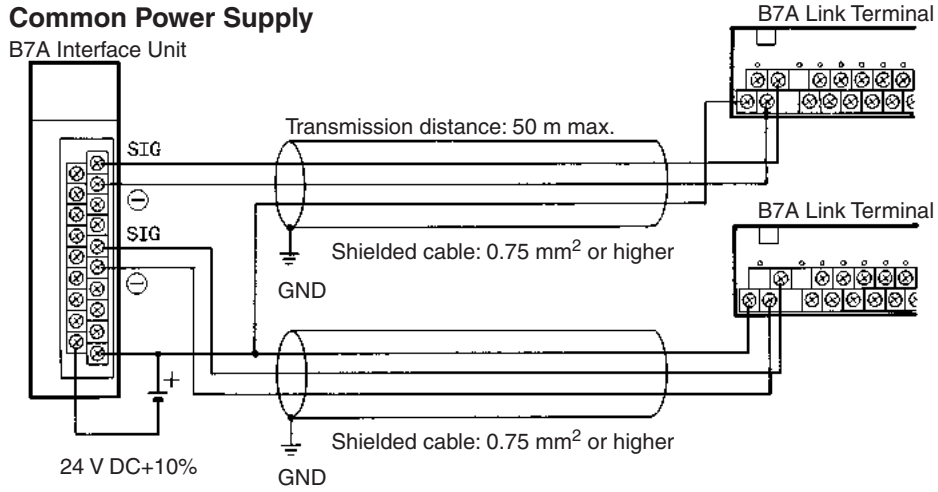
Standard Transmission Delays (19.2 ms)

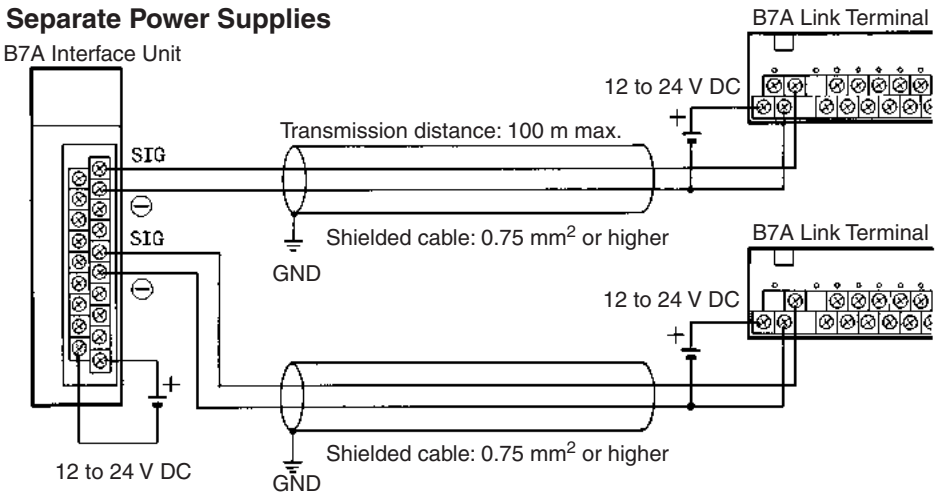


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High-speed Transmission Delays (3 ms): Shielded Cable





Note

1. We recommend grounding the shielded cable.
2. 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 0.75 mm^2 or higher VCTF cable.)
3. To prevent noise on the transmission cable, do not lay it near power cables or high-voltage lines.

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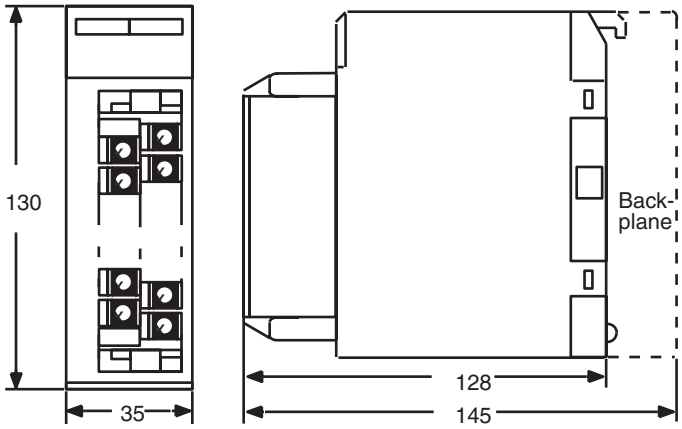
Specifications

Item	C200H-B7A12	C200H-B7A02	C200H-B7A21	C200H-B7A22
I/O points	32 input points or 30 input points and 2 error inputs	32 output points	16 output points and 16 input points or 15 input points + 1 error input	32 output points and 32 input points or 30 input points + 2 error inputs
Transmission method	One-way distributed multiplex transmission			
Transmission distance (see note 1)	Standard: 500 m max. High-speed: 100 m max.			
Transmission delay	Standard: Typ. 19.2 ms, 31 ms max. High-speed: Typ. 3 ms, 5 ms max.			
Minimum input time (see note 2, 3)	Standard: 16 ms High-speed: 2.4 ms			
Internal current consumption	5 V DC, 100 mA max.			
External power supply (see note 4)	12 to 24 V DC ±10%			
	0.05 A min.	0.06 A min.	0.05 A min.	0.08 A min.
Weight	300 g max.			
Dimensions	35 x 130 x 128 mm (W x H x D)			

Note

1. The transmission distance also depends on whether a common or separate power supplies are used.
2. The minimum input time refers to the minimum time required for reading the input signals from the CPU Unit.
3. The ON/OFF width of the signal transmitted from the CPU Unit to the Output Relay of the B7A Interface Unit should be set to a value larger than the minimum input time.
4. The capacity of the external power supply does not include the capacity required by the B7A Link Terminal.

Dimensions



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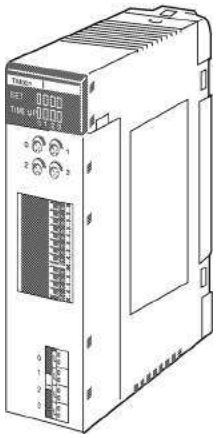
3-9 Analog Timer Units

Analog Timer Units are classified as Basic I/O Units.

Analog Timer Units have 4 built-in timers (numbers 0 to 3). The timer settings can be adjusted using the internal and external variable resistors without requiring a Programming Device. The timer can also be used as a accumulative register to temporarily pause the timer operation using a timer pause input.

Models

Name	Specifications	Model
Analog Timer Unit	4-point timer Timer settings: 0.1 to 1.0 s, 1.0 to 10 s, 10 to 60 s, 1 to 10 min.	C200H-TM001



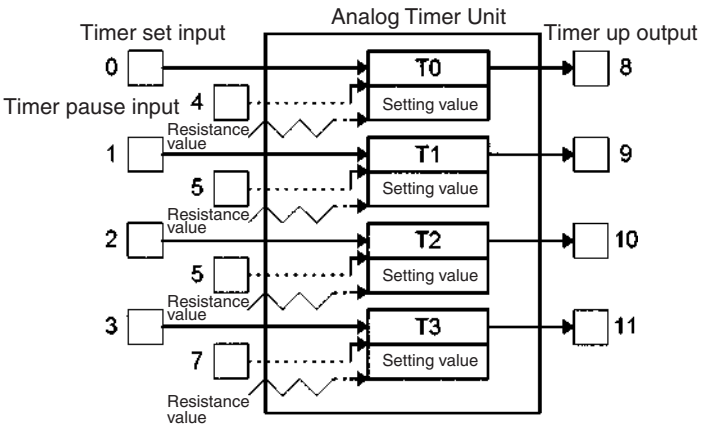
The Analog Timer Unit is classified as a Basic I/O Unit and is allocated one word in the I/O Area. The word (16 bits) allocated to the Unit is used for the 4 timers' start input, pause input, time-up output, and data transfer with the CPU Unit.

Allocated words	Bits	Details	Direction
1 word (16 bits)	4 (bits 0 to 3)	Set Bit	CPU Unit to Analog Timer Unit
	4 (bits 4 to 7)	Pause Inputs	CPU Unit to Analog Timer Unit
	4 (bits 8 to 11)	Time-up Outputs	Analog Timer Unit to CPU Unit

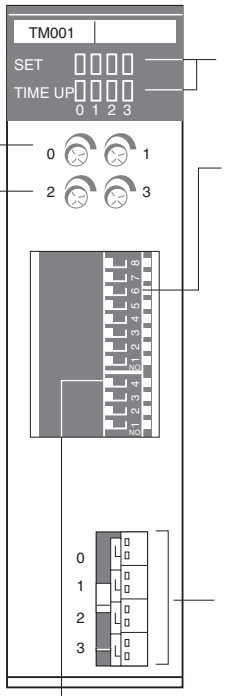
The timer settings are adjusted using the internal and external variable resistors. The timer settings can be selected using the DIP switch for each timer number from one of the following four settings.

0.1 to 1 s, 1 to 10 s, 10 to 60 s, 1 to 10 min

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Components and Switch Settings



Timer status indicators

The SET indicators in the top row light when the corresponding timer is operating and the TIME UP indicators in the bottom row light when the corresponding time is up.

Internal variable resistor

- Sets variable resistance of specified timer setting.
- The settings of these resistors are only effective when the selector switch on the Unit is ON (set to the right).
- Numbers 0 to 3 correspond to timers T0 to T3, respectively.
- Set or adjust times using the flat-blade screwdriver supplied with the Unit. turning the variable resistor clockwise to increase the time value.

Time range setting

Each timer uses 2 pins. The upper 8 pins 8 to 1 are used for timers T0 to T3 as follows:

(0: OFF, 1: ON)

Timer	Pin	0.1 to 1 s	1 to 10 s	10 to 60 s	1 to 10 m
T0	8	0	1	0	1
	7	0	0	1	1
T1	6	0	1	0	1
	5	0	0	1	1
T2	4	0	1	0	1
	3	0	0	1	1
T3	2	0	1	0	1
	1	0	0	1	1



External variable resistor connectors

- Cable connector for when timer is set with external volume instead of internal volume.
- Turn OFF (set to left) the Internal/external volume selector switch.
- Numbers 0 to 3 correspond to timers T0 to T3.
- The external volume resistance is 20 kΩ.
- Use the following connectors. The C4K-CN223 (2 m) connector with cable can also be used.

INT/EXT selector switch

ON	Internal variable resistor
OFF	External variable resistor

T0	T1	T2	T3
SW4	SW3	SW2	SW1

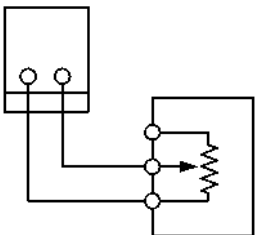
Name	Model	Manufacturer
Connector	IL-2S-S3L-(N)	Japan Aviation Electronics Industry, Ltd.
Contact	IL-C2-1-10000	

Note

1. When the internal variable resistor is used, make sure that the external variable resistor connector for the same timer number is open. Otherwise the internal variable resistor settings will not function properly.
2. Use AWG 28 to AWG 22 lead wires for the external variable resistor connectors.
3. Soldering is not required to wire the external variable resistor connectors. Wire the connector as shown in the following diagram.

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Analog Timer Unit connector



External variable resistor: 20 kΩ
Diameter: 16
Shaft length: 15 mm
Check manufacturer's specifications

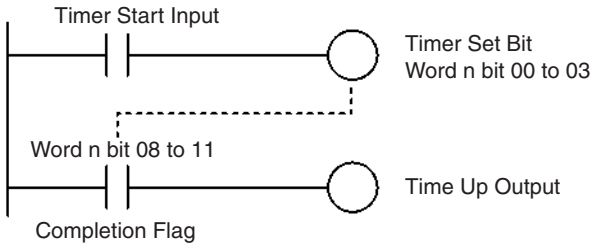
Analog Timer Unit Specifications

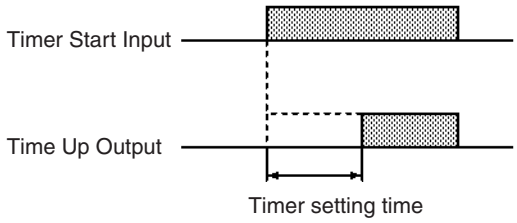
Item	Specifications
Oscillation method	CR oscillation
Number of timer points	4
Time setting range	Use the DIP switch to set any of the following four ranges. 0.1 to 1 s (typical) 1 to 10 s (typical) 10 to 60 s (typical) 1 to 10 min (typical)
Timer pause function	The timing operation can be paused by the user program, so the timers can be used as cumulative registers.
Operation indicators	SET and TIME UP
External variable resistor	Either the external variable resistor or the internal variable resistor can be selected using the INT/EXT selector switch on the front panel of the Unit. External variable resistors are connected by wiring the connector. Use 20 kΩ variable resistors
Relay number allocations	One word (16 bits) is allocated in the I/O Area. Bit I/O Word n 00 Output T0 Set Bit 01 Output T1 Set Bit 02 Output T2 Set Bit 03 Output T3 Set Bit — "1" when time is running 04 Output T0 Pause Input Bit 05 Output T1 Pause Input Bit 06 Output T2 Pause Input Bit 07 Output T3 Pause Input Bit — 0: Operates, 1: Stops 08 Input T0 Completion Flag 09 Input T1 Completion Flag 10 Input T2 Completion Flag 11 Input T3 Completion Flag — "1" when time is up 12 --- Not Used 13 --- Not Used 14 --- Not Used 15 --- Not Used
Internal current consumption	60 mA 5 V DC max.
Weight	200 g max.

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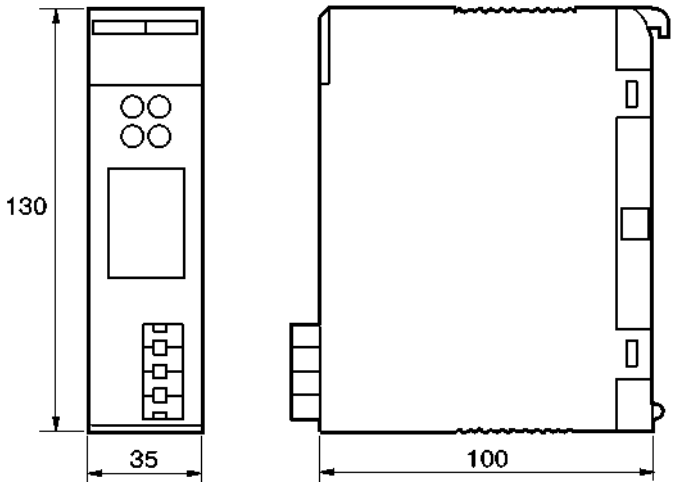
Timer Operation

- When the Timer Start Input turns ON, the Timer Set Bits allocated to the Analog Timer Unit (word n bits 00 to 03) turn ON, and the Analog Timer will operate. The timer set indicator (SET) on the Analog Timer Unit will light.
- After the time specified by the internal variable resistor or external variable resistor has elapsed, the Unit's Completion Output (word n bits 08 to 11) will turn ON, and the Time Up Output will turn ON. The TIME UP indicator on the Analog Timer Unit will turn light.





Dimensions



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SECTION 4
Operating Procedures

This section outlines the steps required to assemble and operate a CS-series PLC system.

4-1 Introduction 262
4-2 Examples 264

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4-1 Introduction

The following procedure outlines the recommended steps to follow when preparing CS-series PLCs for operation.

1,2,3...

1. Installation

   Set the DIP switches on the front of each Unit as required.
   Mount the CPU Unit, Power Supply Unit, and other Units to the Backplane.
   Install the Inner Board and Memory Card if required.

   See *5-2 Installation* for details.

2. Wiring

   Connect the power supply wiring, I/O wiring, and Programming Device (CX-Programmer or Programming Console). Connect communications wiring as required.

   See *5-3 Wiring* for details on power supply and I/O wiring.

3. Initial Settings (Hardware)

   Set the DIP switches an Rotary switches on the front of the CPU Unit and other Units.

   See *6-1 DIP Switch Settings* for details.

4. Confirming Programming Device Connection

   a) Connect a Programming Device (i.e., the CX-Programmer or a Programming Console).

   b) Check the power supply wiring and voltage, turn ON the power supply, and check to be sure the Programming Device will connect to the CPU Unit.

   See *3-3 Programming Devices* for details.

5. Registering the I/O Table

   Check the Units to verify that they are installed in the right slots. With the PLC in PROGRAM mode, register the I/O table from the Programming Device (CX-Programmer or Programming Console). (Another method is to create the I/O table in CX-Programmer and transfer it to the CPU Unit.)

   See *8-1 I/O Allocations* for details.

6. PLC Setup Settings

   With the PLC in PROGRAM mode, change the settings in the PLC Setup as necessary from the Programming Device (CX-Programmer or Programming Console). (Another method is to change the PLC Setup in CX-Programmer and transfer it to the CPU Unit.)

   See *7-1 PLC Setup* for details.

7. DM Area Settings

   a) Use a Programming Device (CX-Programmer or Programming Console) to make any necessary settings in the parts of the DM Area that are allocated to Special I/O Units, CS-series CPU Bus Units, and Inner Boards.

   b) Reset the power (ON → OFF → ON) or toggle the Restart Bit for each Unit or Board. See the Unit's or Board's Operation Manual for details.

8. Writing the Program

   Write the program with a Programming Device (CX-Programmer or Programming Console.)

9. Transferring the Program (CX-Programmer Only)

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With the PLC in PROGRAM mode, transfer the program from CX-Programmer to the CPU Unit. See *7-1 Program Transfer* in the *CS/CJ Series Programmable Controllers Programming Manual* (W394) for details.

10. Testing Operation

    a) Checking I/O Wiring

Output wiring	With the PLC in PROGRAM mode, force-set output bits and check the status of the corresponding outputs.
Input wiring	Activate sensors and switches and either check the status of the indicators on the Input Unit or check the status of the corresponding input bits with the Programming Device's Bit/Word Monitor operation.

    b) Auxiliary Area Settings (As Required)
    Check operation of special Auxiliary Area Settings such as the following:

Output OFF Bit	When necessary, turn ON the Output OFF Bit (A50015) from the program and test operation with the outputs forced OFF.
Hot Start Settings	When you want to start operation (switch to RUN mode) without changing the contents of I/O memory, turn ON the IOM Hold Bit (A50012).

    c) Trial Operation
    Test PLC operation by switching the PLC to MONITOR mode.

    d) Monitoring and Debugging
    Monitor operation from the Programming Device. Use functions such as force-setting/force-resetting bits, tracing, and online editing to debug the program.
    See *SECTION 7 Program Transfer, Trial Operation, and Debugging* in the *CS/CJ Series Programmable Controllers Programming Manual* (W394) for details.

11. Saving and Printing the Program
12. Running the Program

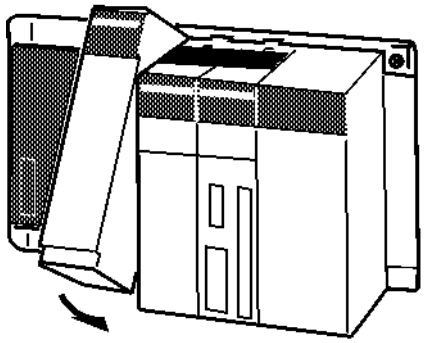
    Switch the PLC to RUN mode to run the program.

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4-2 Examples

1. Installation

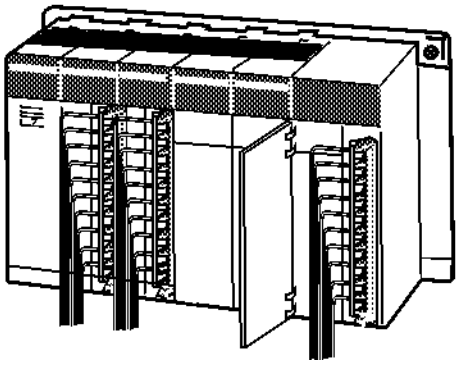
Mount the Backplane and install each Unit. When necessary, install the Inner Board or Memory Card.



Make sure that the total power consumption of the Units is less than the maximum capacity of the Power Supply Unit.

2. Wiring

Connect the power supply and I/O wiring.



Note When 220-V AC power (200 to 240 V AC) is being supplied, be sure to remove the jumper bar that shorts the voltage selector terminals. The Power Supply Unit will be damaged if 220 V AC is supplied with the jumper bar connected.

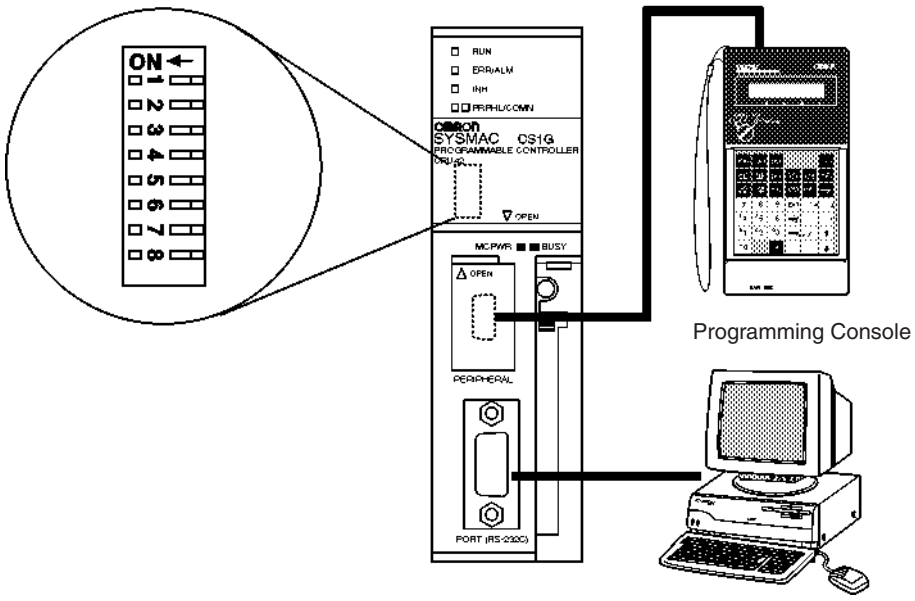
3. Initial Settings (Hardware)

Make necessary hardware settings such as the DIP switch settings on the CPU Unit. Be sure that the communications settings for the peripheral port and RS-232C port are correct, especially when connecting a Programming Device (CX-Programmer or Programming Console).

In the following example, a Programming Console is connected to the peripheral port so pin 4 is turned OFF. CX-Programmer is connected to the RS-232C port, so pin 5 is turned ON.

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Note When devices other than a Programming Device are connected to the peripheral port and RS-232C port, turn ON pin 4 and turn OFF pin 5.



Programming Console

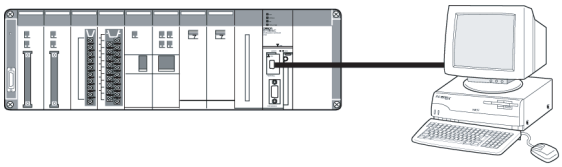
Programming Device

4. Verifying the Programming Device Connection

Connecting to the CX-Programmer

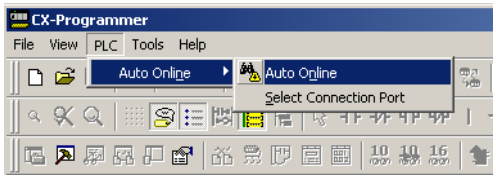
1,2,3... 1. Connect the CX-Programmer's connecting cable to the peripheral port or RS-232C port.

Note When connecting to the RS-232C port, pin 5 of the CPU Unit's DIP switch must be ON.



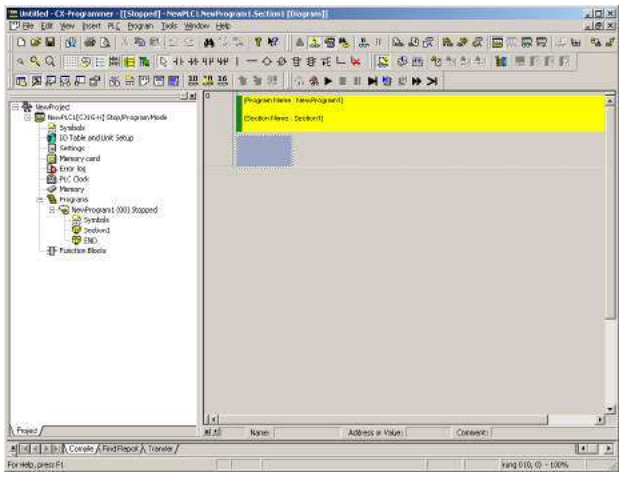
CX-Programmer
Support Software

2. When connecting to the RS-232C port, pin 5 of the CPU Unit's DIP switch must be ON.After checking the power supply wiring and voltage, turn ON the power and verify the Power Supply Unit's POWER Indicator is lit.
3. Start the CX-Programmer and automatically connect online to the PLC.

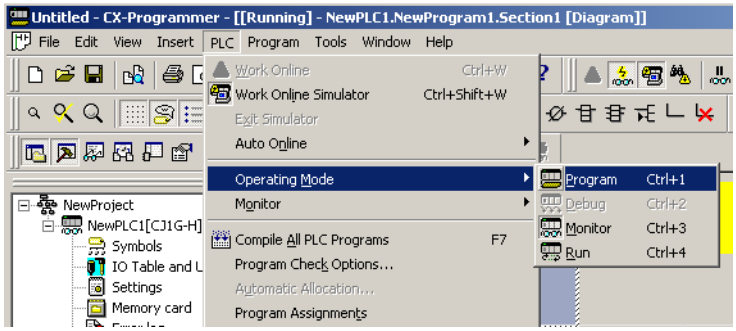


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4. When connecting online automatically, the CPU Unit is connected in RUN mode.Verify that the CX-Programmer has connected online with the PLC.

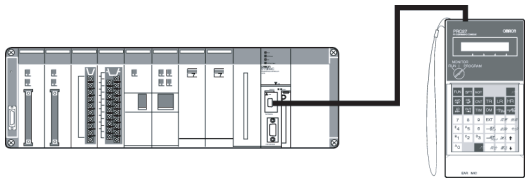


5. Change the operating mode from RUN mode to PROGRAM mode.



Connecting to the Programming Console

1. Connect the Programming Console to the CPU Unit's peripheral port (the upper port).



Programming Console

2. Verify that the Programming Console's mode is PROGRAM mode.
3. After checking the power supply wiring and voltage, turn ON the power and verify the Power Supply Unit's POWER Indicator is lit.
4. Verify that the Programming Console has the following display.



5. Input the password (the Clear and Monitor Keys) and verify that the Programming Console has the following display.



Note If the PLC Setup's Startup Mode Setting is set to PRCN (Startup Mode determined by the Programming Console's mode switch, the default setting), but a Programming Console isn't connected when the power is turned ON, the CPU Unit will enter RUN Mode and start operating.

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5. Registering the I/O Table

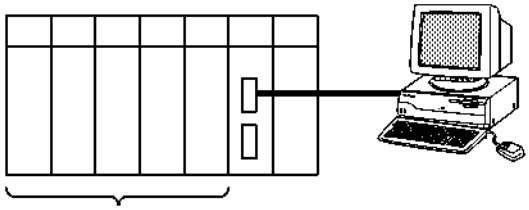
Registering the I/O table allocates I/O memory to the Units actually installed in the PLC. This operation is required in CS-series PLCs.

Note The user program and parameter area data in CS1-H CPU Units is backed up in the built-in flash memory. The BKUP indicator will light on the front of the CPU Unit when the backup operation is in progress. Do not turn OFF the power supply to the CPU Unit when the BKUP indicator is lit. The data will not be backed up if power is turned OFF.

■ Using the CX-Programmer Online

Mounting All Units and Then Creating I/O Tables

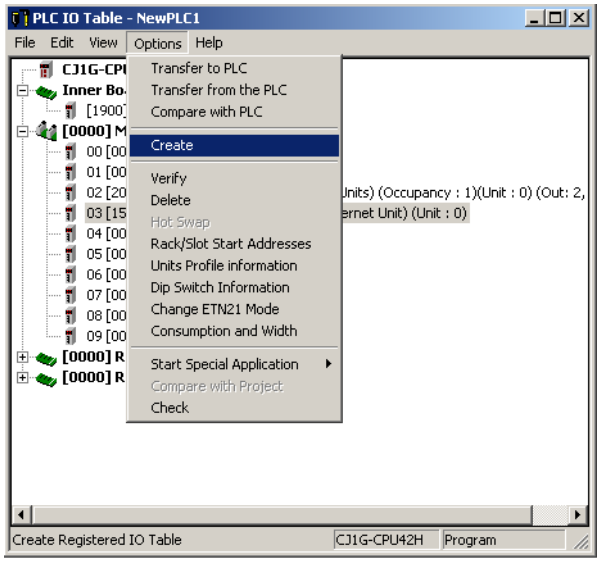
Use the following procedure to register the I/O table with the CX-Programmer that is connected to the PLC.



1,2,3...

1. Install all of the Units in the PLC.
2. Connect CX-Programmer Connecting Cable to the peripheral port or RS-232C port. (The power must be OFF.)

   Note If the host computer is being connected to the RS-232C port, pin 5 of the CPU Unit's DIP switch must be set to ON.
3. Start the CX-Programmer and connect online to the PLC.
4. Double-click ***I/O Table*** on the project tree in the main window. The I/O Table Window will be displayed.
5. Select ***Options*** and then ***Create***. The models and positions of Units mounted to the Racks will be written to the Registered I/O Table in the CPU Unit.



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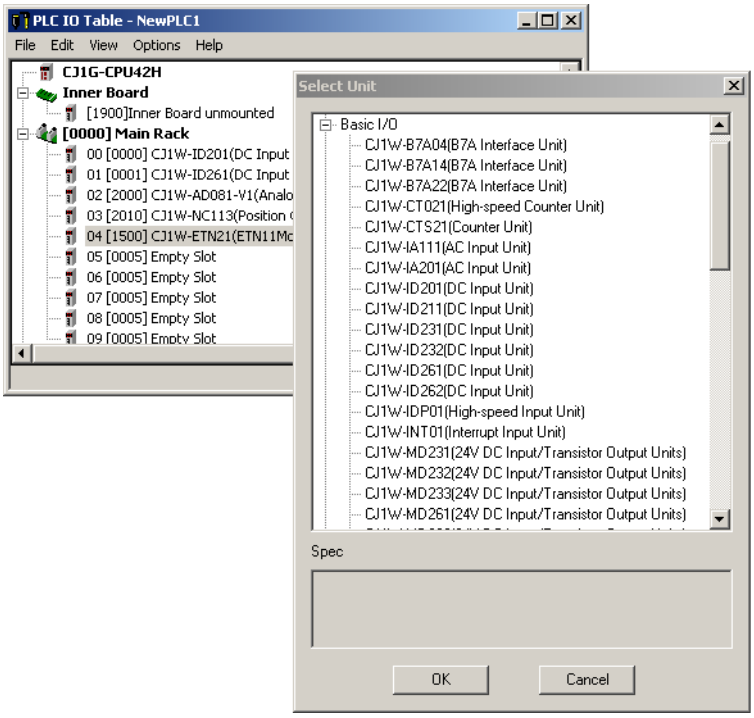
Using the CX-Programmer Offline

Use the following procedure to create the I/O table offline with the CX-Programmer and later transfer the I/O table from to the CPU Unit.



1,2,3...

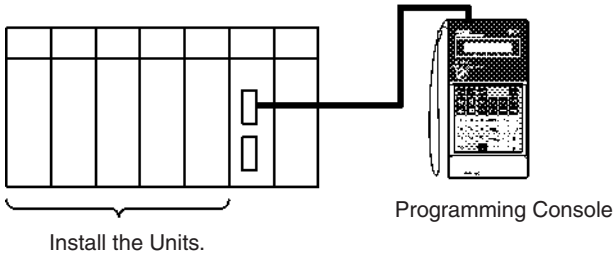
1. Double-click ***I/O Table*** on the project tree in the main window. The I/O Table Window will be displayed.
2. Double-click the Rack to be edited. The slots for that Rack will be displayed.
3. Right-click the slots to be edited and select the desired Units from the pull-down menu.
4. Select ***Options*** and then ***Transfer to PLC*** to transfer the I/O table to the CPU Unit.



Note The first word allocated to each Rack can be set by selecting ***Rack/Slot Start Addresses*** from the Option Menu of the PLC IO Table Window of the CX-Programmer.

■ **Using a Programming Console**

Mounting All Units and Then Creating I/O Tables

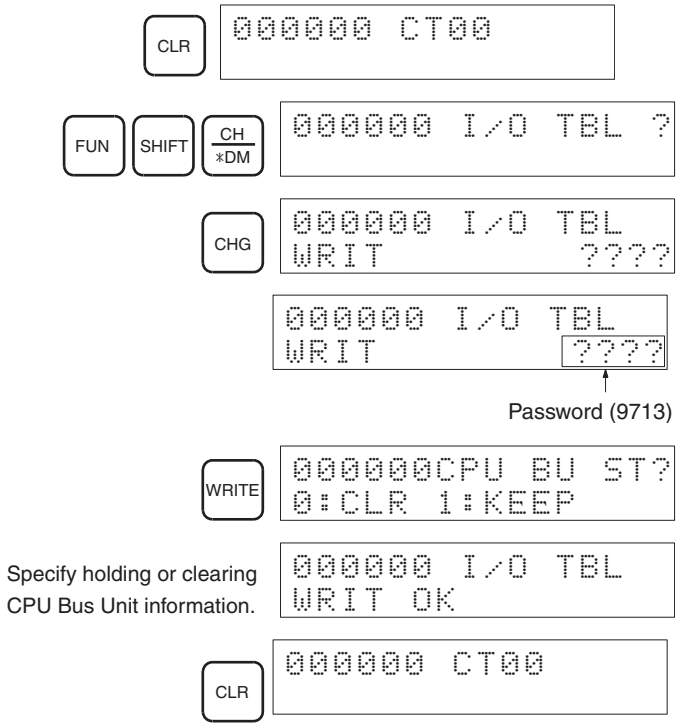


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1,2,3... 1. Install all of the Units in the PLC.

2. Connect the Programming Console to the peripheral port. (It can be connected with the power on.)

3. Perform the following Programming Console operation.



Note With the CS1-H CPU Units, detailed I/O table error information is stored in A261 whenever the I/O tables cannot be created for any reason. This information can be used to facilitate troubleshooting if an error occurs.

6. PLC Setup Settings

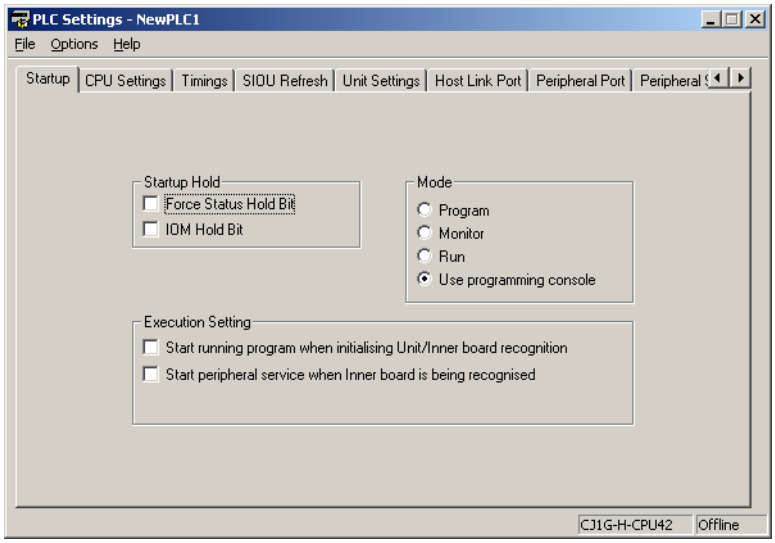
These settings are the CPU Unit's software configuration. See *7-1 PLC Setup* for details on the settings.

Note When a Programming Console is used to set the PLC Setup, the PLC Setup settings are arranged by word addresses. Refer to the provided Programming Console settings sheet for details.

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Making the Settings with the CX-Programmer

1. Double-click the Settings Icon in the main window's project directory tree. The PLC Settings Dialog Box will be displayed.



2. Make the required settings.
3. After completing the settings, transfer the PLC Setup to the PLC.

Making the Settings with the Programming Console

When a Programming Console is used to set the PLC Setup, the PLC Setup settings are arranged by word addresses. Refer to the provided Programming Console settings sheet for details.

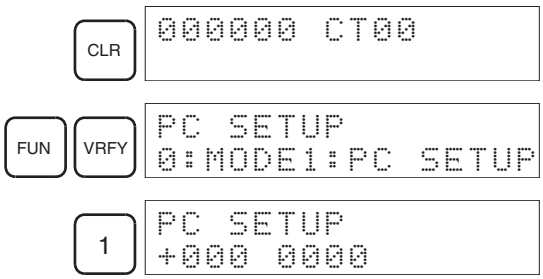
Setting with a Programming Console



In this example, the Programming Console is used to set the Watch Cycle Time (maximum cycle time) in 10-ms units.

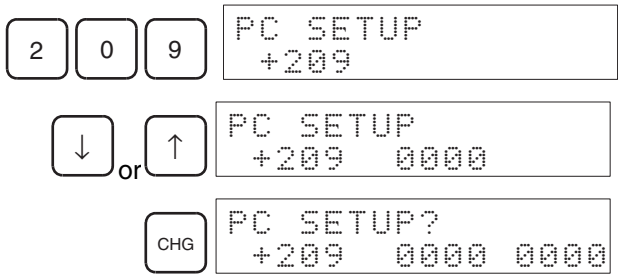
The following diagram shows the required Programming Console operations.

Address	Bits	Setting	Setting range
209	15	Enable for Watch Cycle Time setting	0: Use default 1: Use setting in bits 0 to 14.
	0 to 14	Watch Cycle Time setting	0001 to 0FA0

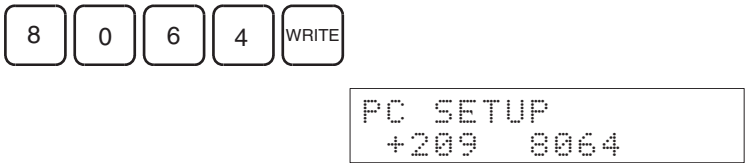


Specifying a word address in the PLC Setup.
(Example: 209)

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Example: Input 8064.

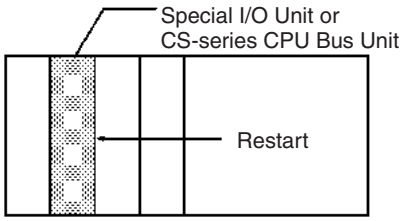


7. DM Area Settings

The following table shows the parts of the DM Area are allocated to Special I/O Units, CS-series CPU Bus Units, and Inner Boards for initial settings. The actual settings depend on the model of Unit or Inner Board being used.

Unit/Board	Allocated words
Special I/O Units	D20000 to D29599 (100 words × 96 Units)
CPU Bus Units	D30000 to D31599 (100 words × 16 Units)
Inner Board	D32000 to D32099 (100 words × 1 Board)

After writing the initial settings to the DM Area, be sure to restart the Units by turning the PLC off and then on again or toggling the Restart Bits for the affected Units.



8. Writing the Program

Write the program with the CX-Programmer or a Programming Console.

Unlike earlier OMRON PLCs, the CS-series PLC's program can be divided into independently executable tasks. A single cyclic task can be written for program execution like earlier PLCs or several cyclic tasks can be written for a

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more flexible and efficient program. The following table shows the differences when programming with CX-Programmer or a Programming Console.

Programming Device	Relationship between Tasks and Program	Writing a new program		Editing an existing program	
		Cyclic tasks	Interrupt tasks	Cyclic tasks	Interrupt tasks
CX-Programmer	Specify the type of task and task number for each program.	All can be written. (Cyclic tasks 0 to 31)	All can be written. (Interrupt tasks 0 to 255)	All can be edited.	All can be edited.
Programming Console	Task = program (Cyclic task 0 is the main program)	Only one can be written. (Cyclic task 0)	Several can be written. (Interrupt tasks 1 to 3, 100 to 131)	All can be edited.	All can be edited.

Note When writing the program with a Programming Console, specify whether there are interrupt tasks during the memory clear operation.

9. Transferring the Program

When the program has been created in a Programming Device other than a Programming Console, it must be transferred to the PLC's CPU Unit.

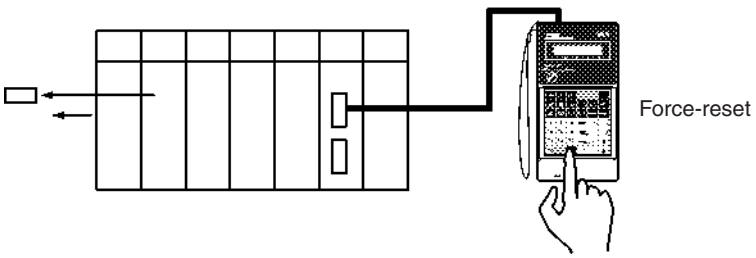
10. Testing Operation

10-a) I/O Wiring Checks

Before performing a Trial Operation in MONITOR mode, check the I/O wiring.

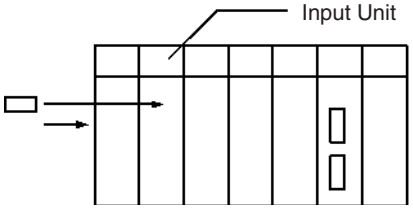
Check Output Wiring

With the PLC in PROGRAM mode, force-set and force-reset output bits and verify that the corresponding outputs operate properly.



Check Input Wiring

Activate input devices such as sensors and switches and verify that the corresponding indicators on the Input Units light. Also, use the Bit/Word Monitor operation in the Programming Device to verify the operation of the corresponding input bits.



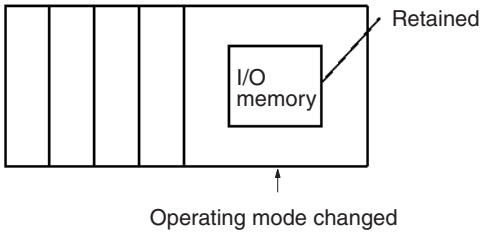
10-b) Auxiliary Area Settings

Make any required Auxiliary Area settings, such as the ones shown below. These settings can be made from a Programming Device (including a Programming Console) or instructions in the program.

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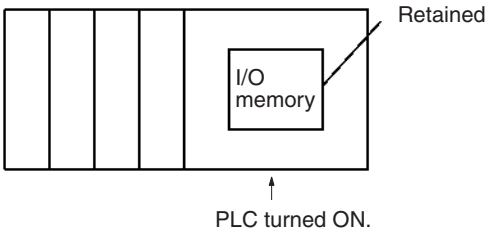
IOM Hold Bit (A50012)

Turning ON the IOM Hold Bit protects the contents of I/O memory (the CIO Area, Work Area, Timer Completion Flags and PVs, Index Registers, and Data Registers) that would otherwise be cleared when the operating mode is switched from PROGRAM mode to RUN/MONITOR mode or vice-versa.



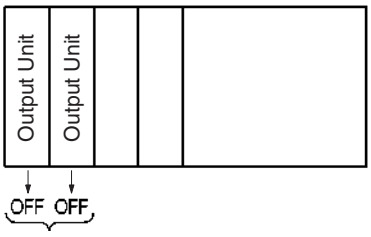
IOM Hold Bit Status at Startup

When the IOM Hold Bit has been turned ON and the PLC Setup is set to protect the status of the IOM Hold Bit at startup (PLC Setup address 80 bit 15 turned ON), the contents of I/O memory that would otherwise be cleared will be retained when the PLC is turned ON.



Output OFF Bit (A50015)

Turning ON the Output OFF Bit causes all outputs on Basic I/O Units and Special I/O Units to be turned OFF. The outputs will be turned OFF regardless of the PLC's operating mode.

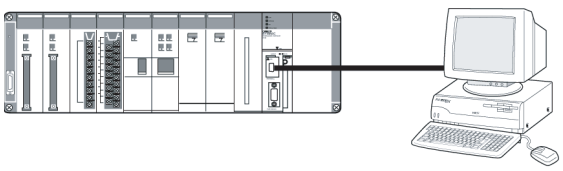


10-c) Trial Operation

Use the Programming Console or Programming Device (CX-Programmer) to switch the CPU Unit to MONITOR mode.

Using CX-Programmer

The PLC can be put into MONITOR mode with a host computer running CX-Programmer.



CX-Programmer

Trial Operation

Select ***PLC, Mode, RUN.***

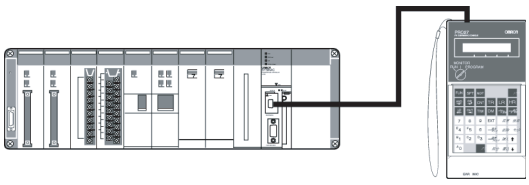
Actual operation

Select ***PLC, Mode, RUN.***

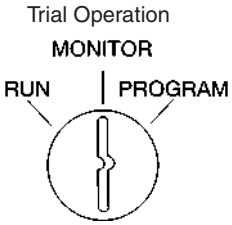
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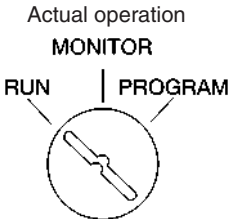
Using a Programming Console

Turn the Mode Switch to MONITOR for the Trial Operation. (Turn the switch to RUN for full-scale PLC operation.)



Programming Console





10-d) Monitoring and Debugging

There are several ways to monitor and debug PLC operation, including the force-set and force-reset operations, differentiation monitoring, time chart monitoring, data tracing, and online editing.

Force-Set and Force-Reset

When necessary, the force-set and force-reset operations can be used to force the status of bits and check program execution.

When a Programming Console is being used, monitor the bits with Bit/Word Monitor or 3-word Monitor. Press the SHIFT+SET Keys to force-set a bit or press the SHIFT+RESET Keys to force-reset a bit. The forced status can be cleared by pressing the NOT Key.

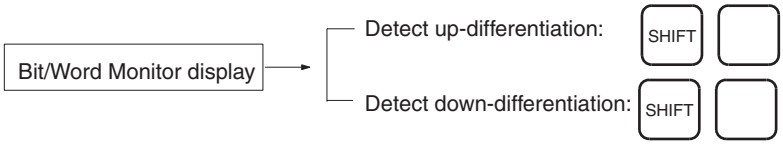
CX-Programmer	Programming Console
1. Click the bit to be force-set or force-reset. 2. Select ***Force On*** or ***Off*** from the PLC menu.	Bit/Word Monitor display 3-word Monitor display Force-set: SHIFT SET Force-reset: SHIFT SET Clear: NOT

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Differentiation Monitor

The differentiation monitor operation can be used to monitor the up or down differentiation of particular bits.

When a Programming Console is being used, monitor the bit with Bit/Word Monitor. Press the SHIFT+Up Arrow Keys to specify up differentiation or press the SHIFT+Down Arrow Keys to specify down differentiation.

CX-Programmer	Programming Console
1. Click the bit for differential monitoring. 2. Click ***Differential Monitor*** from the PLC Menu. The Differential Monitor Dialog Box will be displayed. 3. Click ***Rising*** or ***Falling.*** 4. Click the **Start** Button. The buzzer will sound when the specified change is detected and the count will be incremented. 5. Click the **Stop** Button. Differential monitoring will stop.	

Time Chart Monitoring

The CX-Programmer's time chart monitor operation can be used to check and debug program execution.

Data Tracing

The CX-Programmer's data trace operation can be used to check and debug program execution.

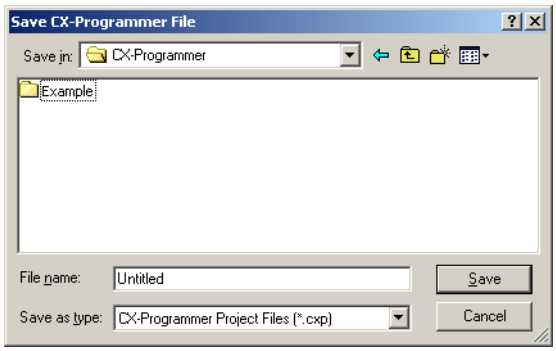
Online Editing

When a few lines of the program in the CPU Unit have to be modified, they can be edited online with the PLC in MONITOR mode or PROGRAM mode. When more extensive modifications are needed, upload the program from the CPU Unit to the host computer, make the necessary changes, and transfer the edited program back to the CPU Unit.

11. Save and Print the Program

Save

To save a created program, select ***File*** - ***Save or File*** - ***Save As*** from the CX-Programmer menus.

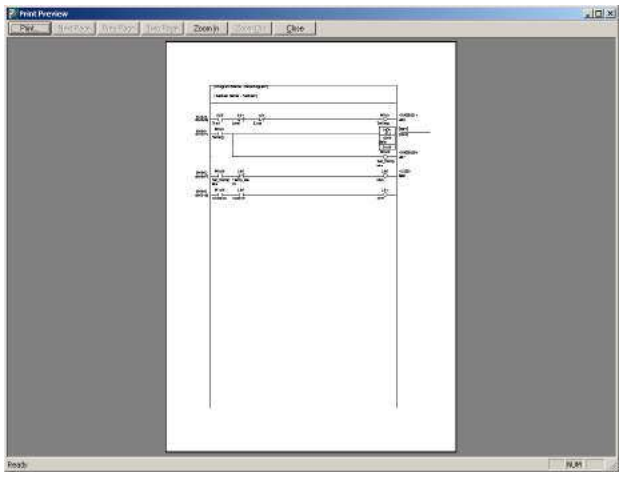


Print

To print a created program, first preview the print output by selecting the desired section in the CX-Programmer's project workspace and selecting ***File***

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- Print Preview from the CX-Programmer menu. If the preview is acceptable, select ***File - Print*** to print.



12. Run the Program

Switch the PLC to RUN mode to run the program.

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SECTION 5
Installation and Wiring

This section describes how to install a PLC System, including mounting the various Units and wiring the System. Be sure to follow the instructions carefully. Improper installation can cause the PLC to malfunction, resulting in very dangerous situations.

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5-2 Installation 280
5-2-1 Installation and Wiring Precautions 280
5-2-2 Installation in a Control Panel 282
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5-2-4 Mounting Dimensions 285
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5-2-6 DIN Track Mounting 288
5-2-7 I/O Connecting Cables 290
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5-1 Fail-safe Circuits

Be sure to set up safety circuits outside of the PLC to prevent dangerous conditions in the event of errors in the PLC or external power supply.

Supply Power to the PLC before Outputs

If the PLC's power supply is turned on after the controlled system's power supply, outputs in Units such as DC Output Units may malfunction momentarily. To prevent any malfunction, add an external circuit that prevents the power supply to the controlled system from going on before the power supply to the PLC itself.

Managing PLC Errors

When any of the following errors occurs, PLC operation will stop and all outputs from Output Units will be turned OFF.

- Operation of the Power Supply Unit's overcurrent protection circuit
- A CPU error (watchdog timer error) or CPU on standby
- A fatal error* (memory error, I/O bus error, duplicate number error, Inner Board stopped error, too many I/O points error, program error, cycle time too long error, or FALS(007) error)

Be sure to add any circuits necessary outside of the PLC to ensure the safety of the system in the event of an error that stops PLC operation.

Note *When a fatal error occurs, all outputs from Output Units will be turned OFF even if the IOM Hold Bit has been turned ON to protect the contents of I/O memory. (When the IOM Hold Bit is ON, the outputs will retain their previous status after the PLC has been switched from RUN/MONITOR mode to PROGRAM mode.)

Managing Output Malfunctions

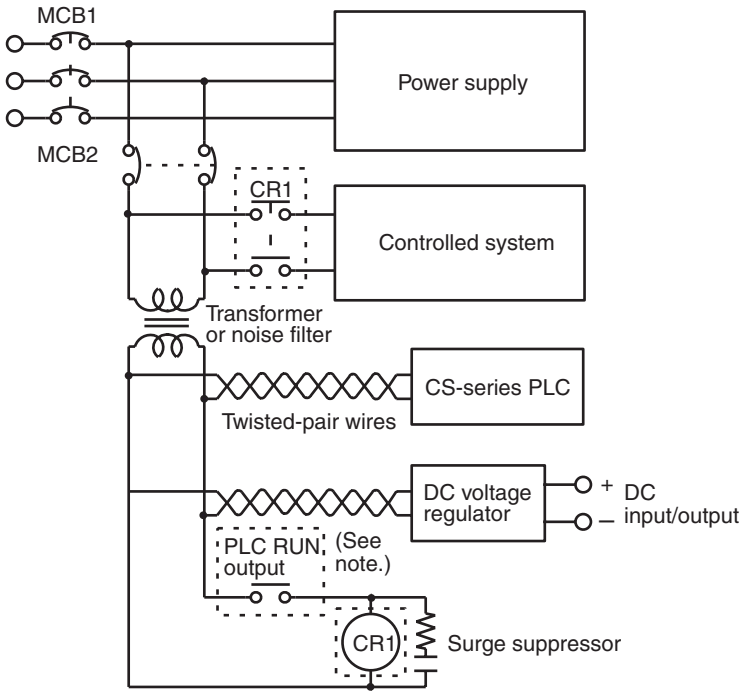
It is possible for an output to remain ON due to a malfunction in the internal circuitry of the Output Unit, such as a relay or transistor malfunction. Be sure to add any circuits necessary outside of the PLC to ensure the safety of the system in the event that an output fails to go OFF.

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 PLC 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.

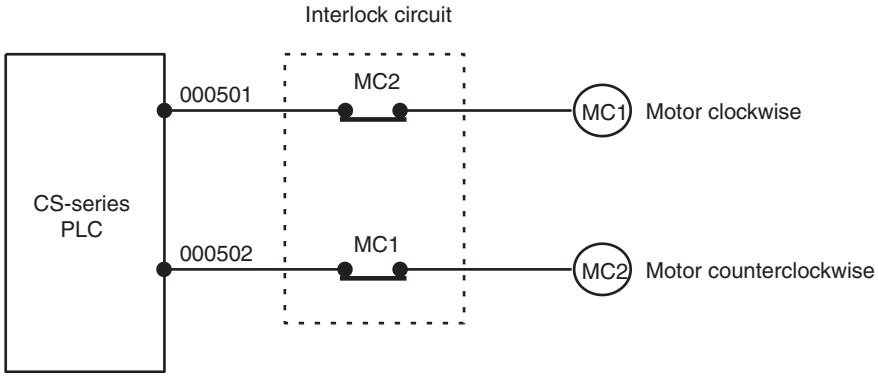
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Note This configuration is possible with the C200HW-PA204R and C200HW-PA204R Power Supply Units only. When a Power Supply Unit without a RUN output is used, program the Always ON Flag (A1) as the execution condition for an output point from an Output Unit. Do not include a circuit that stops the controlled system by latching the RUN output during operation. Relay contacts are used, and so chattering may cause incorrect operation.

Interlock Circuits

When the PLC controls an operation such as the clockwise and counterclockwise operation of a motor, provide an external interlock such as the one shown below to prevent both the forward and reverse outputs from turning ON at the same time.



This circuit prevents outputs MC1 and MC2 from both being ON at the same time even if both CIO 000500 and CIO 000501 are both ON, so the motor is protected even if the PLC is programmed improperly or malfunctions.

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5-2 Installation

5-2-1 Installation and Wiring Precautions

Be sure to consider the following factors when installing and wiring the PLC to improve the reliability of the system and make the most of the PLC's functions.

Ambient Conditions

Do not install the PLC in any of the following locations.

- Locations subject to ambient temperatures lower than 0°C or higher than 55°C.
- Locations subject to drastic temperature changes or condensation.
- Locations subject to ambient humidity lower than 10% or higher than 90%.
- Locations subject to corrosive or flammable gases.
- Locations subject to excessive dust, salt, or metal filings.
- Locations that would subject the PLC to direct shock or vibration.
- Locations exposed to direct sunlight.
- Locations that would subject the PLC to water, oil, or chemical reagents.

Be sure to enclose or protect the PLC sufficiently in the following locations.

- 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.

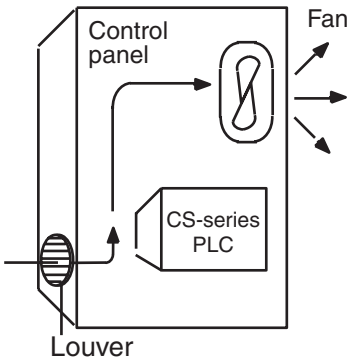
Installation in Cabinets or Control Panels

When the PLC 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°C 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 PLC 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.



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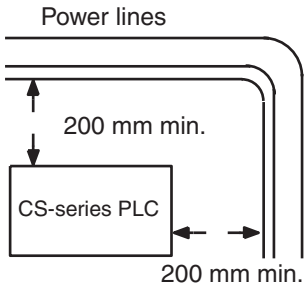
- If a Programming Console will be left on the PLC, the ambient temperature must be within the Programming Console's operating range of 0°C to 45°C.

Accessibility for Operation and Maintenance

- To ensure safe access for operation and maintenance, separate the PLC as much as possible from high-voltage equipment and moving machinery.
- The PLC will be easiest to install and operate if it is mounted at a height of about 1.3 m (4 feet).

Improving Noise Resistance

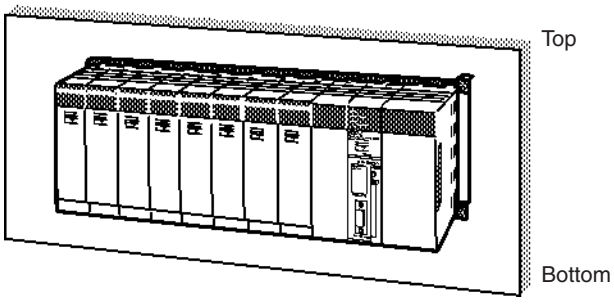
- Do not mount the PLC in a control panel containing high-voltage equipment.
- Install the PLC at least 200 mm (6.5 feet) from power lines.



- Ground the mounting plate between the PLC 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 mm^2 in cross-sectional area).

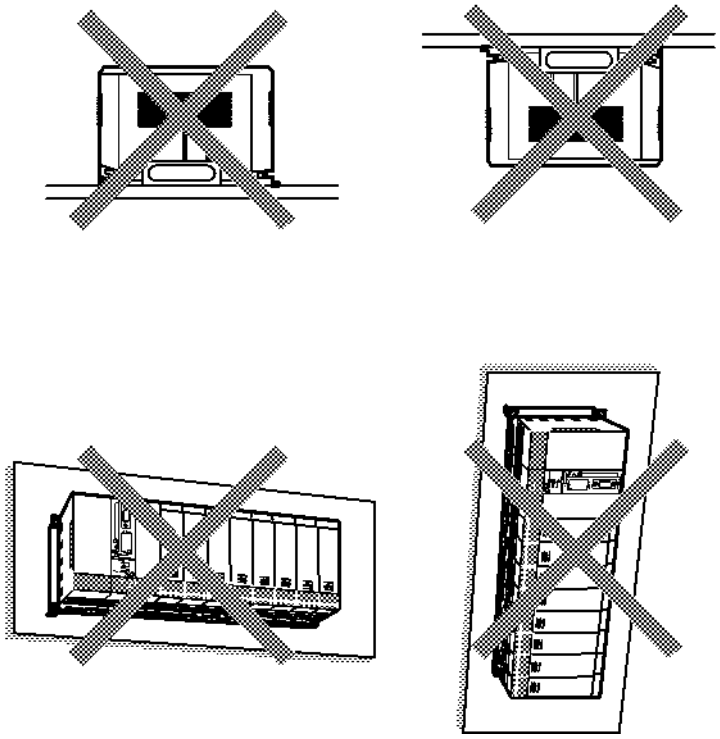
PLC Orientation

- Each Rack must be mounted in an upright position to provide proper cooling.



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- Do not install a Rack in any of the following positions.

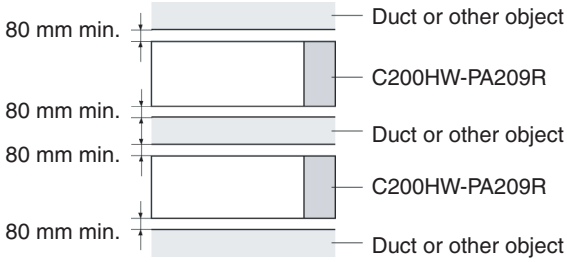


Note Always use the standard installation method. A nonstandard installation will decrease heat dissipation, and may delay the replacement notification signal (in particular for C200H-PA204C Power Supply Units with Replacement Notification), or degrade or damage the internal elements.

5-2-2 Installation in a Control Panel

- A typical installation is a CPU Rack mounted above an Expansion Rack on a mounting plate in the control panel.
- The spacing between the CPU Rack and Expansion Rack (or between two Expansion Racks) should be sufficient to allow space for a wiring duct, wiring, air circulation, and replacement of Units in the Racks.

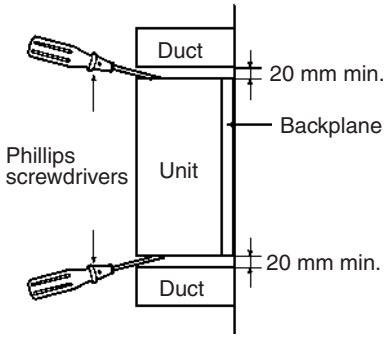
Note If the C200HW-PA209R Power Supply Unit is to be used at an ambient temperature of 50 °C or higher, provide a minimum space of 80 mm between the top of the Unit and any other objects, e.g., ceiling, wiring ducts, structural supports, devices, etc.



- Up to 7 Expansion Racks can be connected.
  Each I/O Connecting Cable can be up to 12 m long, but the sum total of all cables between the CPU Rack and Expansion Racks must be 12 m or less.

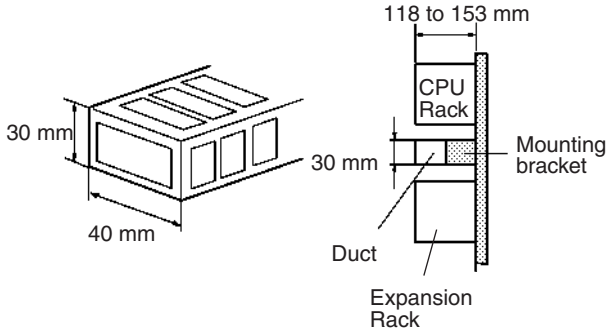
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- The mounting plate should be grounded completely and we recommend using a mounting plate that has been plated with a good conductor to improve noise resistance.
- If all of the Racks cannot be mounted to the same mounting plate, the individual plates should be securely connected together using 3 wires of at least 2 mm^2 in cross-sectional area.
- The Backplanes are mounted to the plate(s) with four M4 screws each.
- Whenever possible, route I/O wiring through wiring ducts or raceways. Install the duct 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 Ducts

The following example shows the proper installation of wiring duct.



Note Tighten the Unit mounting screws, PLC Rack mounting screws, terminal block screws, and cable screws to the following torques.

Unit Mounting Screws

CPU Unit:	0.9 N·m
Power Supply Unit:	0.9 N·m
I/O Units:	0.4 N·m

Backplane Mounting Screws: 0.9 N·m

Terminal Screws

M3.5:	0.8 N·m
M3:	0.5 N·m

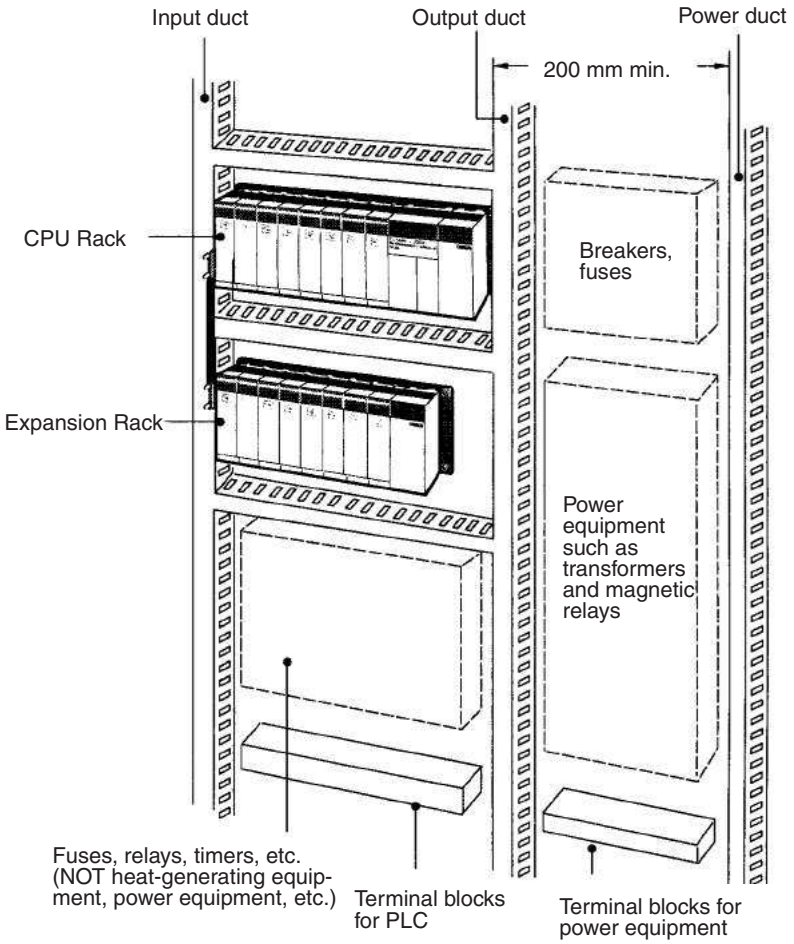
Cable Connector Screws

M2.6:	0.2 N·m

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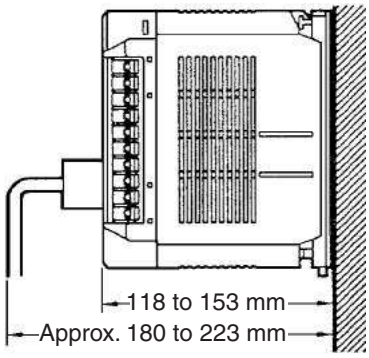
Routing Wiring Ducts

Install the wiring ducts at least 20 mm between 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. If the C200HW-PA209R Power Supply Unit is to be used at an ambient temperature of 50 °C or higher, provide a minimum space of 80 mm.



5-2-3 Mounting Height

The mounting height of CPU Racks, Expansion Racks, or Slave Racks is 118 to 153 mm for a CS-series Backplane, depending on I/O Units mounted. If Programming Devices or connecting cables are attached, the additional dimensions must be taken into account. Allow sufficient clearance in the control panel in which the PLC is mounted.

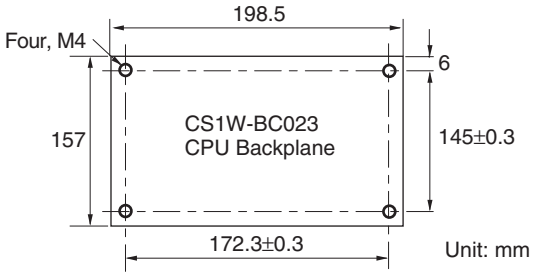


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5-2-4 Mounting Dimensions

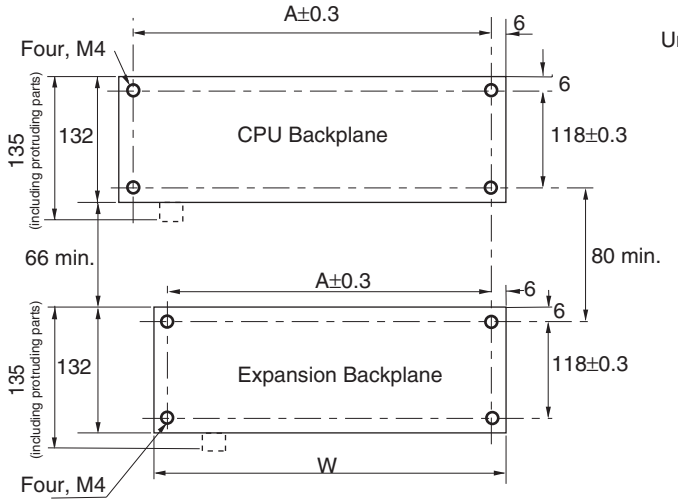
Backplanes

CPU Backplane with 2 Slots



Note Expansion Backplanes cannot be connected to 2-slot CPU Backplanes.

CPU Backplane with 3, 5, 8, or 10 Slots



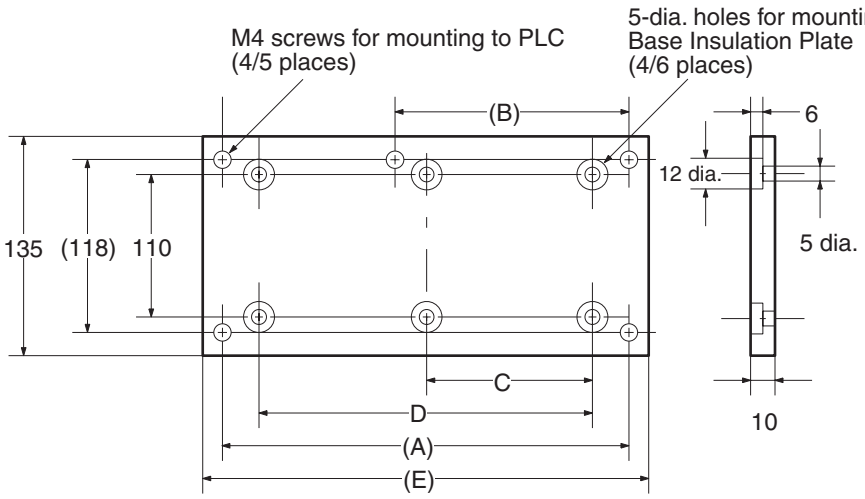
Backplane		Model	A	W
Standard CPU Backplanes		CS1W-BC033	246 mm	260 mm
		CS1W-BC053	316 mm	330 mm
		CS1W-BC083	421 mm	435 mm
		CS1W-BC103	491 mm	505 mm
CS-series-only CPU Backplanes		CS1W-BC032	246 mm	260 mm
		CS1W-BC052	316 mm	330 mm
		CS1W-BC082	421 mm	435 mm
		CS1W-BC102	491 mm	505 mm
Expansion Backplanes	CS-series Expansion Backplanes	CS1W-BI033	246 mm	260 mm
		CS1W-BI053	316 mm	330 mm
		CS1W-BI083	421 mm	435 mm
		CS1W-BI103	491 mm	505 mm
	C200H Expansion I/O Backplanes	C200HW-BI031	245 mm	259 mm
		C200HW-BI051	316 mm	330 mm
		C200HW-BI081-V1	350 mm	364 mm
		C200HW-BI101-V1	420 mm	434 mm

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Backplane Insulation Plates

Backplane Insulation Plates can be installed on C200H I/O Backplanes only. There are four models available, corresponding to the number of slots on the Backplane. The dimensions at locations A, B, C, D, and E are shown below in millimeters for each Backplane Insulation Plate.

Unit: mm



Insulation Plates for I/O Backplanes

Specifications	Model	Dimensions (mm)				
		E	D	C	B	A
For 3 slots	C200HW-ATT32	190	140	---	---	175
For 5 slots	C200HW-ATT52	260	210	---	---	245
For 8 slots	C200HW-ATT82	365	315	---	---	350
For 10 slots	C200HW-ATTA2	435	385	---	---	420

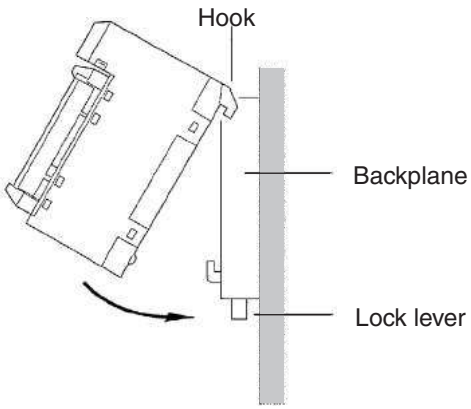
5-2-5 Mounting Units to the Backplane

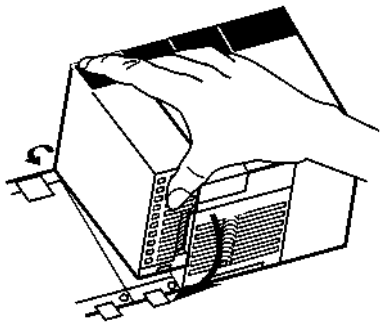
There are two methods for mounting or removing Units in the Backplane. The following table shows which method to use for each type of Unit.

Group	Unit type	Installation method	Removal method
A	CS-series CPU Units, Power Supply Units, CS-series Basic I/O Units, CS-series Special I/O Units, CS-series CPU Bus Units, and SYSMAC BUS Remote I/O Slave Units	Hook the top of the Unit into the slot on the Backplane and tighten the screw on the bottom of Unit.	Loosen the screw on the bottom of the Unit and rotate the Unit upward.
B	C200H Basic I/O Units, C200H Special I/O Units	Hook the top of the Unit into the slot on the Backplane and secure the bottom of the Unit with the Backplane's lock lever.	Press and hold the lock lever at the bottom of the Unit and rotate the Unit upward.

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1,2,3... 1. Mount the Unit to the Backplane by hooking the top of the Unit into the slot on the Backplane and rotating the I/O Unit downwards. (Groups A and B)

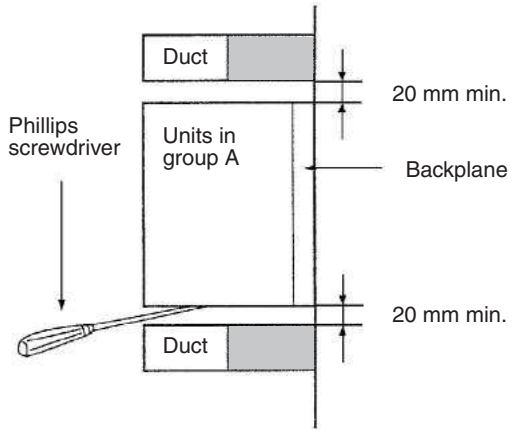


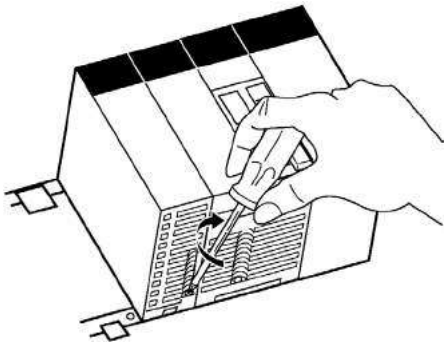


2. Make sure that the connector on the back of the Unit is properly inserted into the connector in the Backplane. (Groups A and B)
3. With the Group-A Units, use a Phillips-head screwdriver to tighten the screw on the bottom of Unit. The screwdriver must be held at a slight angle, so be sure to leave enough space below each Rack.

Note The screws at the bottoms of the Units must be tightened to the following torques.

CPU Unit:	0.9 N·m
Power Supply Unit:	0.9 N·m
I/O Units:	0.4 N·m

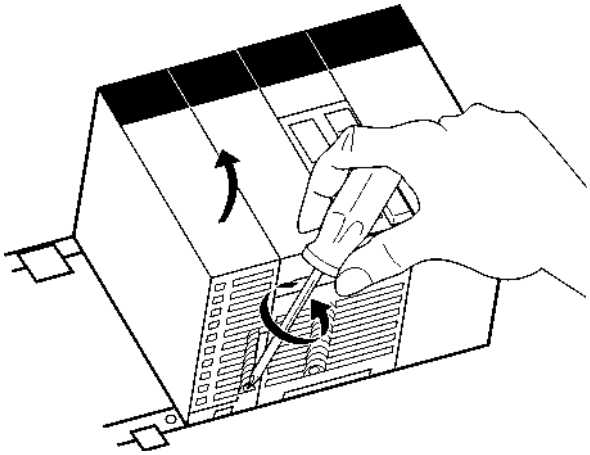




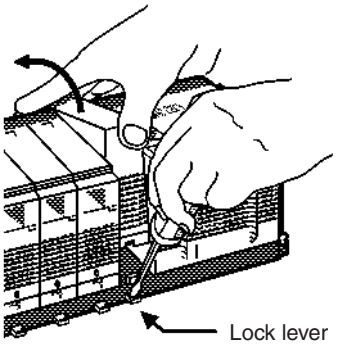
With Group-B Units, the lock lever will snap into place when the Unit is properly inserted. Check that the lock lever is engaged and the Unit is secure.

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4. To remove a Group-A Unit, use a phillips-head screwdriver to loosen the screw at the bottom of the Unit, rotate the Unit upward, and remove it.



To remove a Group-B Unit, hold down the lock lever with a tool such as a screwdriver, rotate the Unit upward, and remove it.



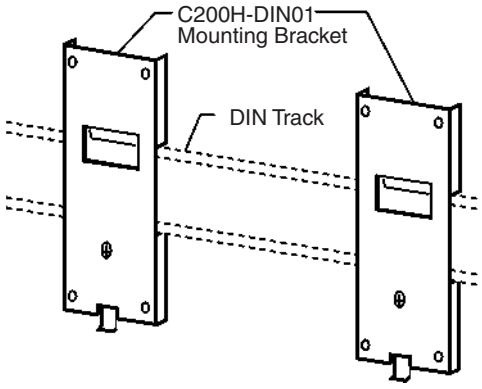
5-2-6 DIN Track Mounting

Do not use DIN Track to mount Backplane in locations subject to vibration; use locking screws to attach the Backplane directly.

Mount the DIN Track in the control panel with M4 screws in at least three places. Tighten the mounting screws to a torque of 1.2 N·m.

DIN Track Mounting Bracket

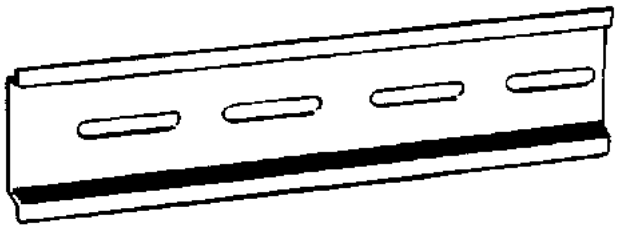
Use DIN Track Mounting Brackets to mount Racks to the DIN Track.



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DIN Track

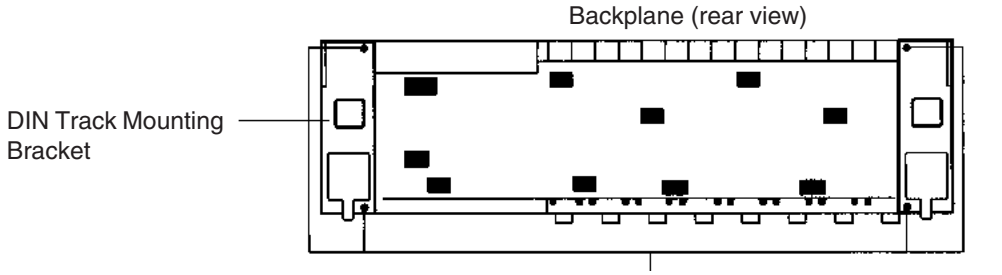
The following DIN Tracks are available.



Model	Specification
PFP-50N	50 cm long, 7.3 mm high
PFP-100N	1 m long, 7.3 mm high
PFP-100N2	1 m long, 16 mm high

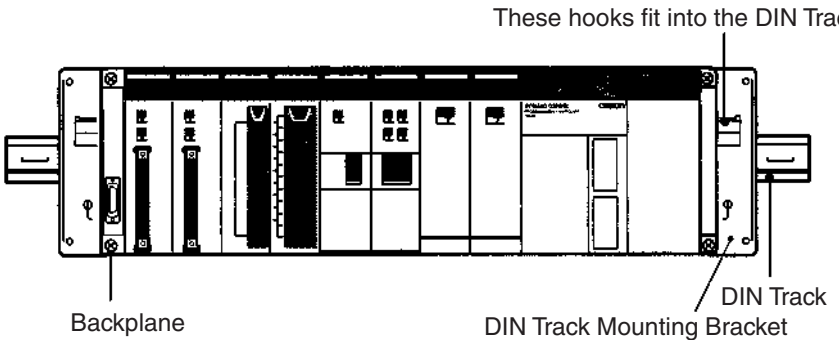
DIN Track Installation

1,2,3... 1. Attach Mounting Brackets to each side (left and right) of the Backplane as shown below.



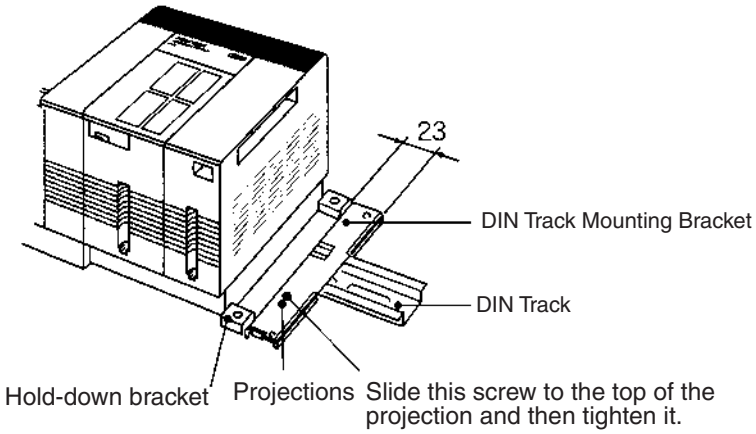
There are two Backplane mounting screws each on the left and right sides of the Backplane. Use these screws to attach the DIN Track Mounting Brackets to the Backplane. (Tighten to a torque of 0.9 N·m.)

2. Mount the Backplane to the DIN Track so that the hooks on the Mounting Brackets fit into the upper portion of the DIN Track as shown below.



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3. Loosen the hold-down bracket's screws and slide the Backplane upward so that the Mounting Bracket and Backplane clamp securely onto the DIN Track. Tighten the screws to a torque of 0.5 N·m.



5-2-7 I/O Connecting Cables

I/O Connecting Cables are used to connect the CPU Rack and Expansion Racks. There are four types of I/O Connecting Cables.

Type	Model number	Connectors		Usage
		CPU Rack end	Expansion Rack end	
CS → CS I/O Connecting Cables	CS1W-CN□□3	Simple lock connector	Simple lock connector	CPU Rack → CS-series Expansion Rack
				CS-series Expansion Rack → CS-series Expansion Rack
CS → C200H I/O Connecting Cables	CS1W-CN□□1	Simple lock connector	Two-screw connector	CPU Rack → C200H Expansion I/O Rack
				CS-series Expansion Rack → C200H Expansion I/O Rack
C200H → C200H I/O Connecting Cables	C200H-CN□□1	Two-screw connector	Two-screw connector	C200H Expansion I/O Rack → C200H Expansion I/O Rack
Cables for CS-series Long-distance Expansion Racks (CV-series I/O Connecting Cables)	CV500-CN□□2	Simple lock connector	Simple lock connector	CPU Rack or CS-series Long-distance Expansion Rack → CS-series Long-distance Expansion Rack

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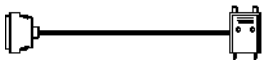
Available Models

CS →CS I/O Connecting Cables



Model number	Cable length
CS1W-CN313	0.3 m (See note.)
CS1W-CN713	0.7 m (See note.)
CS1W-CN223	2 m
CS1W-CN323	3 m
CS1W-CN523	5 m
CS1W-CN133	10 m
CS1W-CN133B2	12 m

CS →C200H I/O Connecting Cables



Model number	Cable length
CS1W-CN311	0.3 m
CS1W-CN711	0.7 m
CS1W-CN221	2 m
CS1W-CN321	3 m
CS1W-CN521	5 m
CS1W-CN131	10 m
CS1W-CN131B2	12 m

C200H → C200H I/O Connecting Cables



Model number	Cable length
C200H-CN311	0.3 m
C200H-CN711	0.7 m
C200H-CN221	2 m
C200H-CN521	5 m
C200H-CN131	10 m

Cables for CS-series Long-distance Expansion Racks (CV-series I/O Connecting Cables)

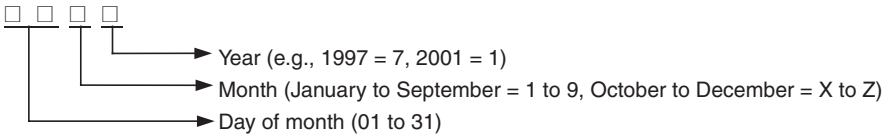


Model number	Cable length
CV500-CN312	0.3 m
CV500-CN612	0.6 m
CV500-CN122	1 m
CV500-CN222	2 m
CV500-CN322	3 m
CV500-CN522	5 m
CV500-CN132	10 m
CV500-CN232	20 m
CV500-CN332	30 m
CV500-CN432	40 m
CV500-CN532	50 m

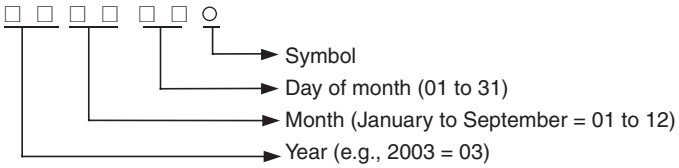
Note Restrictions in Using CS-series I/O Connecting Cables
When using a CS1W-CN313 or CS1W-CN713 CS-series I/O Connecting Cable with a CS1-H CPU Unit, always use a Cable manufactured on September 20, 2001 or later. Do not use Cables that do not have manufacturing numbers or Cables manufacture earlier than September 20, 2001.

Manufacturing Number Legend

Four-digit Numbers

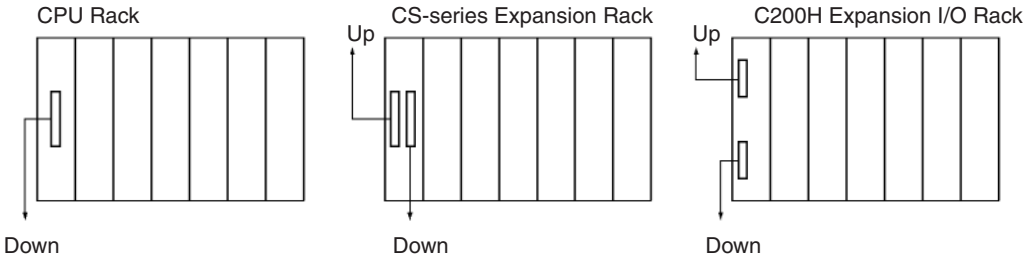


Six-digit Numbers

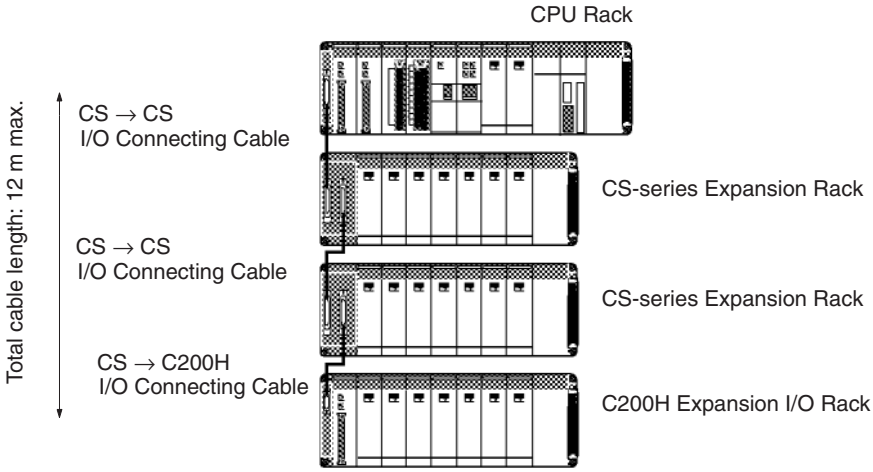


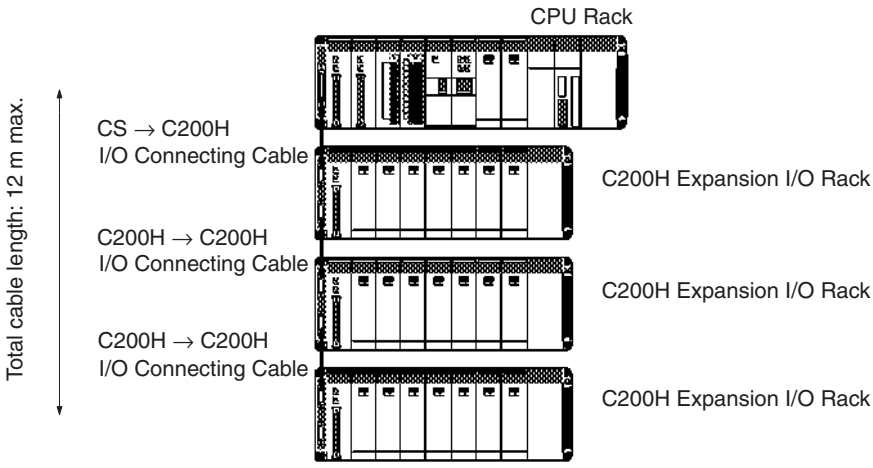
- Install the Racks and select I/O Connecting Cables so that the total length of all I/O Connecting Cables does not exceed 12 m.
- The following diagram shows where each I/O Connecting Cable must be connected on each Rack. The Rack will not operate if the cables aren't connected properly. (The "up" direction is towards the CPU Unit and "down" is away from the CPU Unit.)

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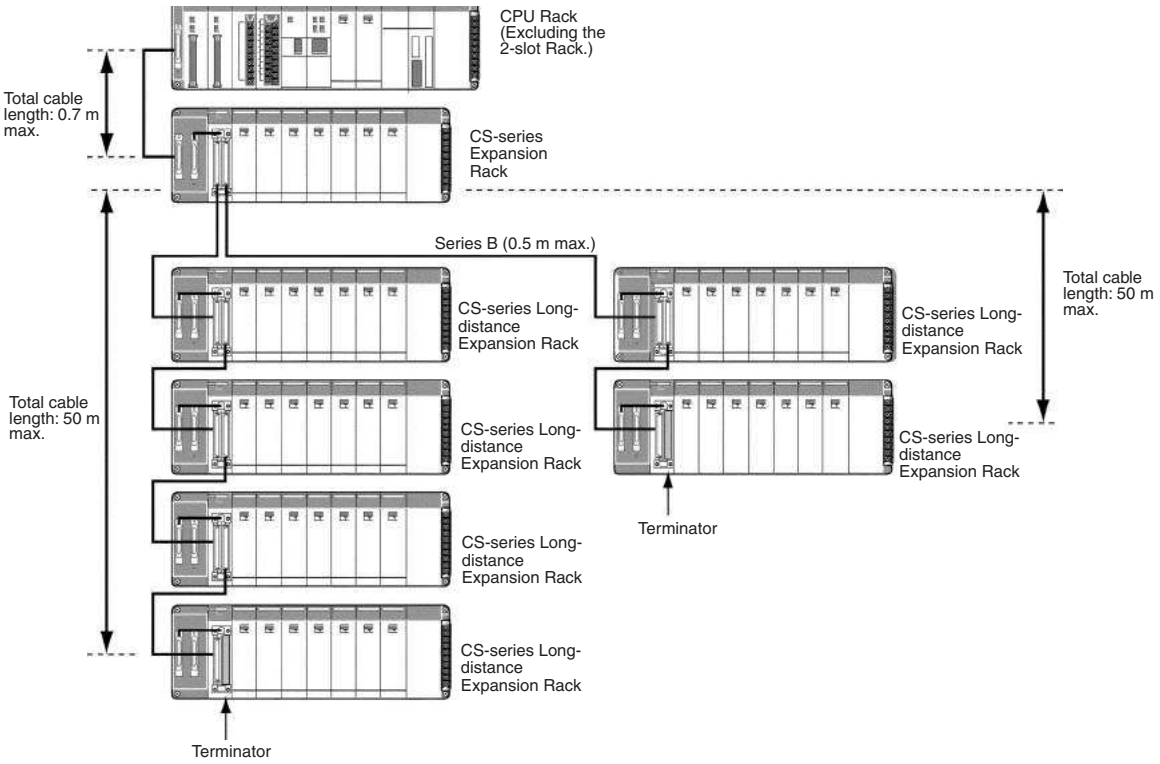
- The following diagram shows two examples of proper Rack connections.





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Example



- I/O Control Unit can also be mounted on the CPU Rack.
- Only one CS-series Expansion Rack can be connected.
- The cable length between the CPU Rack and CS-series Expansion Rack must be 0.7 m max.
- Up to two series of CS-series Long-distance Expansion Racks can be connected.
- A maximum of seven CS-series and CS-series Long-distance Expansion Racks can be connected (including all Racks in both series).
- Each series of CS-series Long-distance Expansion Racks must be 50 m max. with a total of 100 m max. for both series.
- C200H Expansion I/O Racks cannot be connected together with CS-series Long-distance Expansion Racks.
- A CS-series Expansion Rack cannot be connected to a CS-series Long-distance Expansion Rack using a CS I/O Connecting Cable.

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Cable Connections

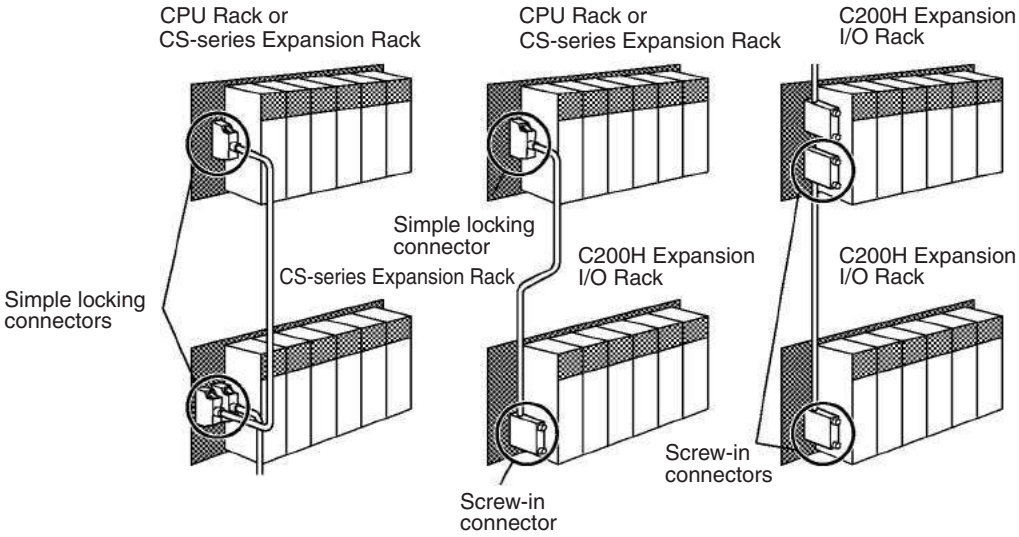
There are two types of connectors used in the I/O Connecting Cables: Simple locking connectors for CS-series Racks and screw-in connectors for C200H Racks.

The connectors can be inserted only one way; they cannot be inserted upside down. Be sure that the connectors fit properly as they are inserted.

CS → CS
I/O Connecting Cable
This cable has simple locking connectors on both ends.

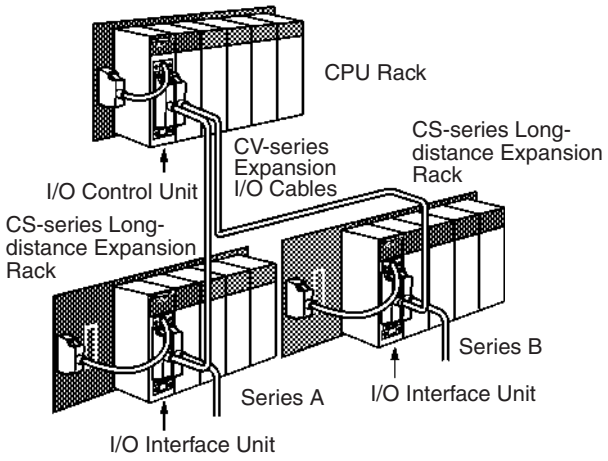
CS → C200H
I/O Connecting Cable
This cable has a simple locking connector on one end and a screw-in connector on the other.

C200H → C200H
I/O Connecting Cable
This cable has screw-in connectors on both ends.



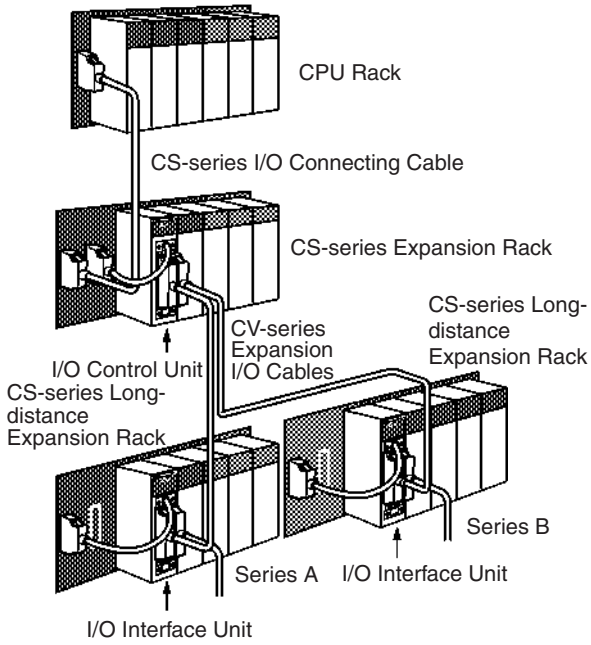
Cables to CS-series Long-distance Expansion Racks

Mounting the I/O Control Unit to the CPU Rack



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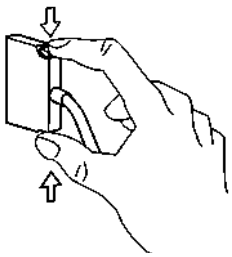
Mounting the I/O Control Unit to a CS-series Expansion Rack



Connecting the Simple Locking Connectors

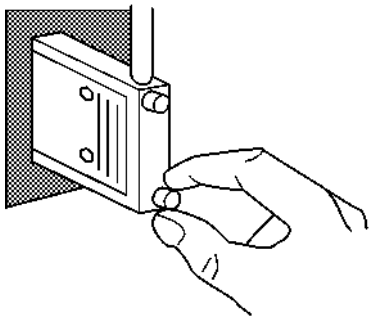
Insert the connector until it locks in place. The PLC will not operate properly if the connector isn't inserted completely.

Note When using an I/O Connecting Cable with a locking connector, be sure that the connector is firmly locked in place before using it.



Connecting the Screw-in Connectors

Insert the connector and secure it by tightening the two screws to a torque of 0.2 N·m. The PLC will not operate properly if the connector isn't inserted completely. To remove the connector, simply loosen the screws and pull it out.

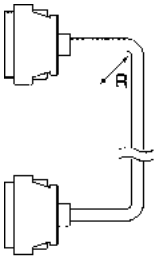


Do not route the I/O Connecting Cables through ducts that contain the I/O or power wiring.

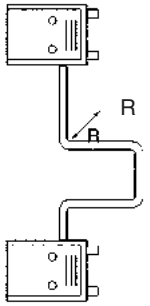
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- An I/O bus error will occur and the PLC will stop if an I/O Connecting Cable's connector separates from the Rack. Be sure that the connectors are secure.
- A 75-mm hole will be required if the I/O Connecting Cable must pass through a hole when connecting a CS-series Long-distance Expansion Rack and a 63-mm hole will be required for Cables connecting other Racks. The cables can withstand a pulling force up to 49 N (11 lbs), so be sure that they aren't pulled too forcefully.
- Do not cut or reconnect I/O Connecting Cables. Handle them with caution when mounting the PLC or when using wiring ducts.
- Do not bend the I/O Connecting Cables too severely. The minimum bending radii are shown in the following diagram.
- Always turn OFF the power supply to the PLC before connecting Cables.

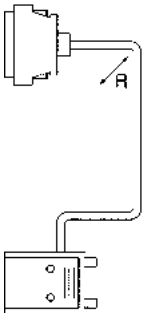
CS → CS I/O Connecting Cable
(Cable diameter: 8.6 mm)



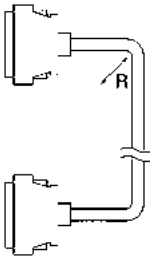
C200H → C200H I/O Connecting Cable
(Cable diameter: 5.1 mm)



CS → C200H I/O Connecting Cable
(Cable diameter: 5.1 mm)



Cables for CS-series Long-distance Expansion Racks
(Cable diameter: 10 mm)



Mounting the Brackets for Securing the Expansion Cable

Expansion Cable Brackets can be used to prevent Expansion Cables from accidentally coming loose.

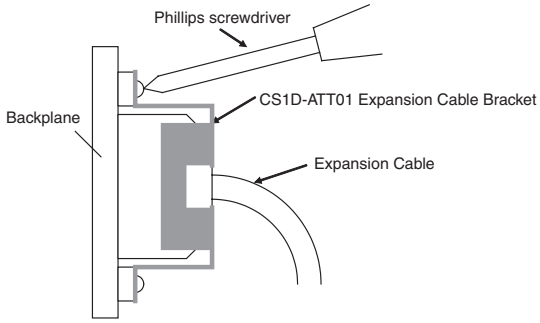
Note Expansion Cable Brackets must be ordered separately from Expansion Cables and Backplanes.

Screw holes are required in the Backplane. Use a Backplane manufactured in August 2007 or later. Earlier Backplanes do not have screw holes, so the Brackets cannot be mounted. (Refer to *Manufacturing Number Legend* on page 291.)

1,2,3... 1. Connect the Cables according to the description in *5-2-7 I/O Connecting Cables*.

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2. Mount the Expansion Cable Bracket from the top, and tighten the screws (included) on the top and bottom using a Phillips screwdriver.



Tighten the screws to a torque of 0.5 N·m.

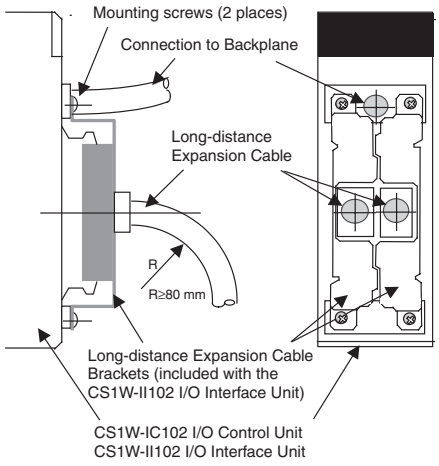
Mounting Long-distance Expansion Cable Brackets

Long-distance Expansion Cable Brackets can be used to prevent Expansion Cables from accidentally coming loose.

Note Two Long-distance Expansion Cable Brackets are included with the CS1W-II102 I/O Interface Unit.

1,2,3... 1. Connect the Cables according to the description in *5-2-7 I/O Connecting Cables*.

2. Mount the Long-distance Expansion Cable Bracket from the top, and use a Phillips screwdriver to tighten the screws (included) on the top and bottom.



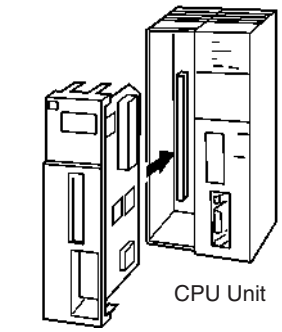
- Tighten the screws to a torque of 0.5 N·m.
- When connecting two Long-distance Expansion Cables to a single Long-distance Expansion Unit, turn one of the Mounting Brackets upside down and attached them from the sides as shown in the figure to the left.

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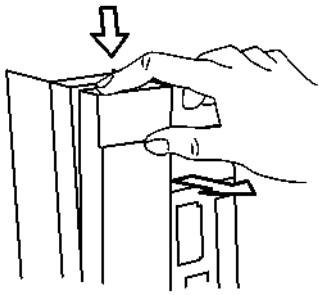
5-2-8 Inner Board Installation

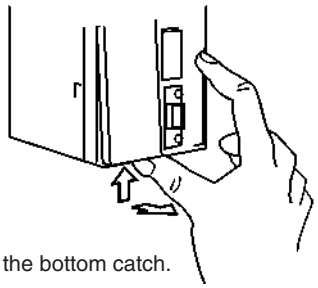
Always turn the power off before installing or removing the Inner Board. Installing or removing the Inner Board with the power on can cause the CPU Unit to malfunction, damage internal components, or cause communications errors.

Before installing the Inner Board, be sure to first touch a grounded metallic object, such as a metal water pipe, in order to discharge any static build-up.

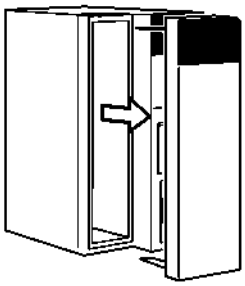


1,2,3... 1. Press the catches at the top and bottom of the Inner Board compartment cover and pull the cover forward.


Press the top catch.

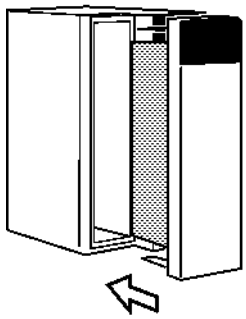

Press the bottom catch.

2. Remove the Inner Board compartment cover.



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3. Align the Inner Board with the groove and slide it into the compartment.

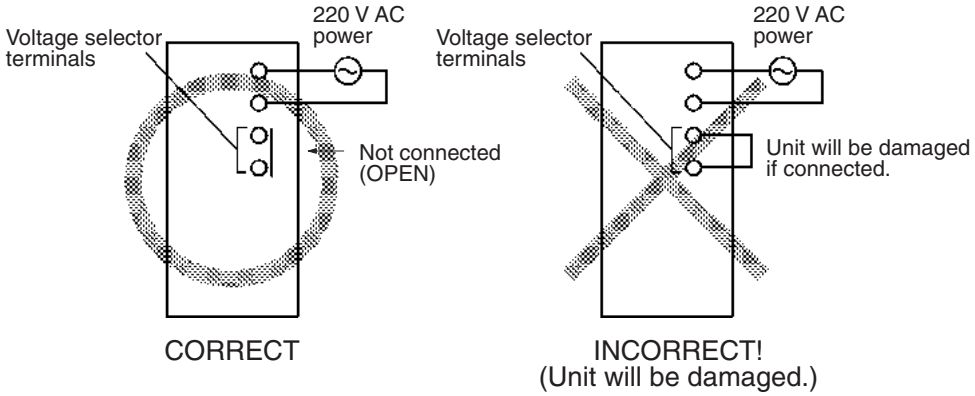


5-3 Wiring

5-3-1 Power Supply Wiring

AC Power Supply Units

When 200 to 240 V AC power is being supplied, be sure to remove the jumper bar that shorts the voltage selector terminals. The Unit will be damaged if 220 V AC is supplied with the jumper bar connected.

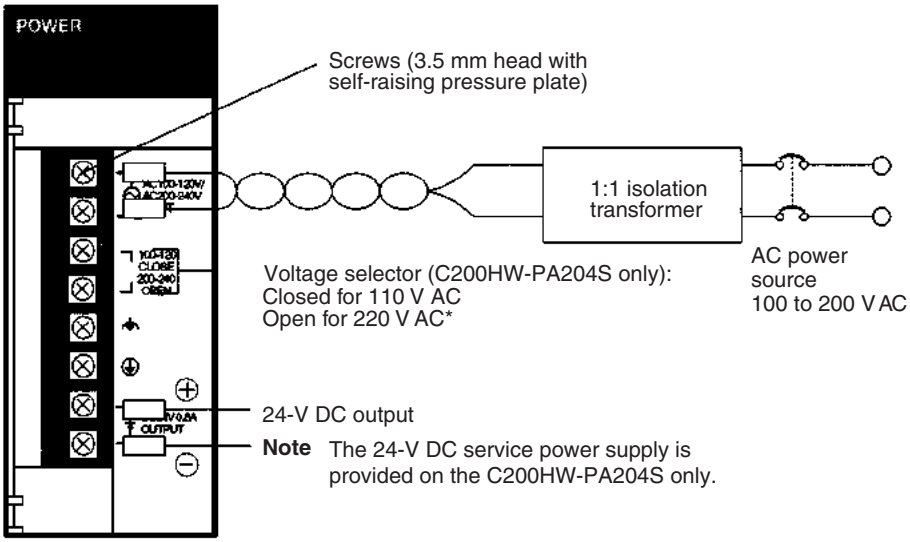


Note If 110 V AC power is supplied but the jumper bar has been removed to select 220 V AC, the Unit will not operate because the power supply voltage will be below the 85% minimum level.

- Do not remove the protective label from the top of the Unit until wiring has been completed. This label prevents wire strands and other foreign matter from entering the Unit during wiring procedures.

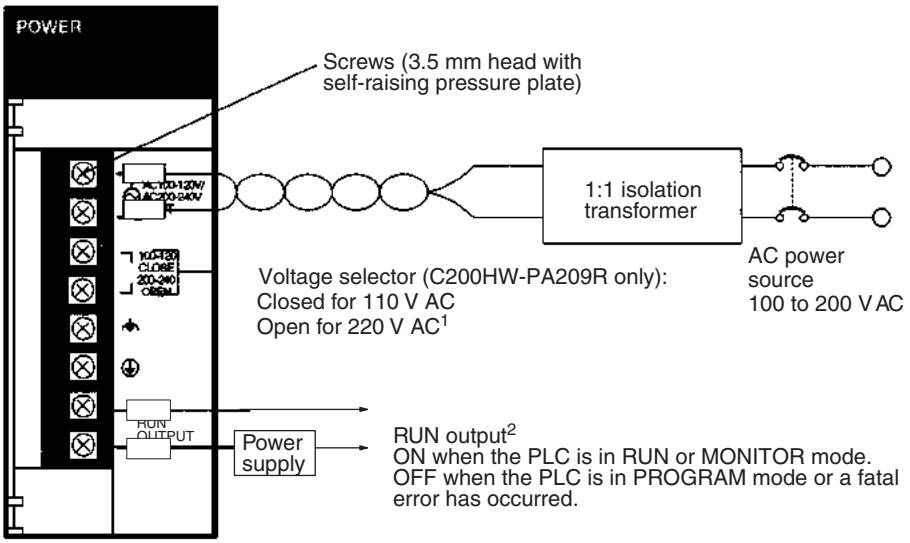
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C200HW-PA204 or C200HW-PA204S Power Supply Unit



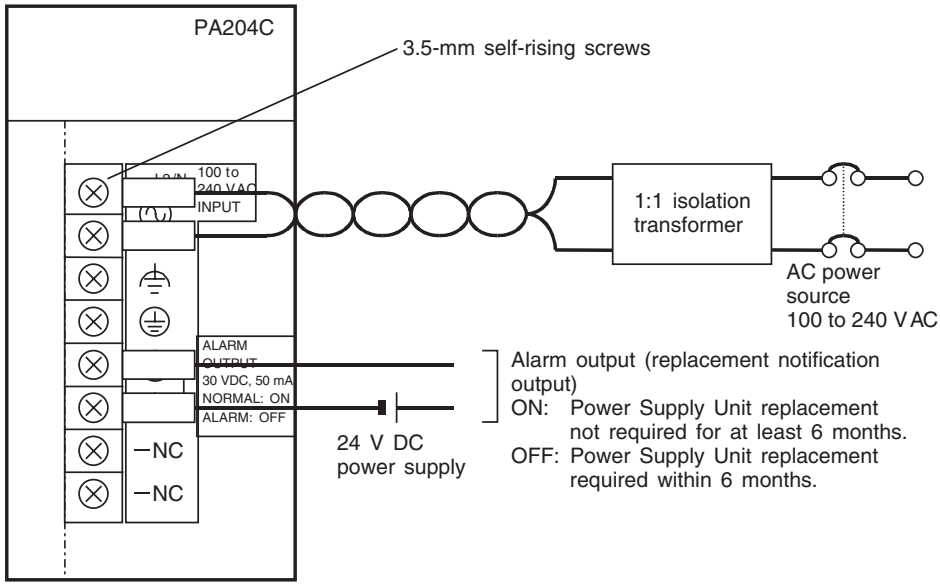
Note To prevent damage, be sure that the jumper bar on the voltage selector terminals has been removed before applying 220 V AC power.

C200HW-PA204R or C200HW-PA209R Power Supply Unit

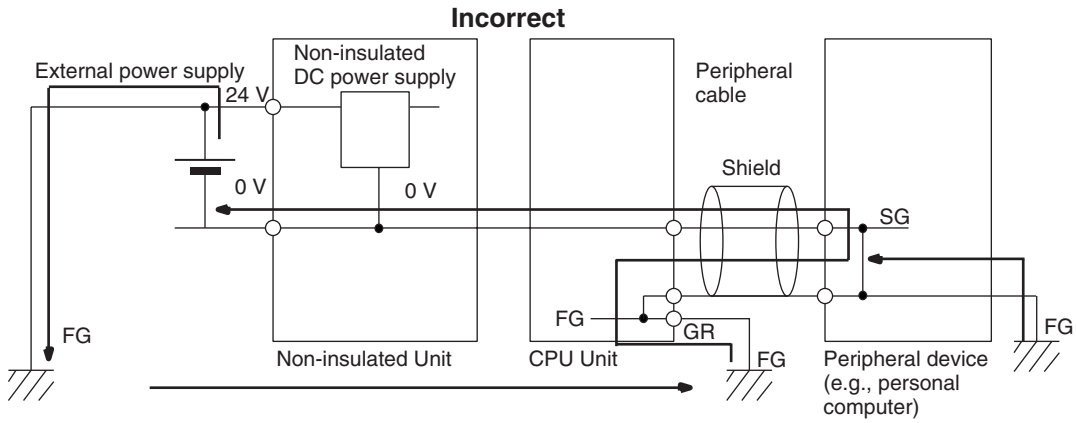


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C200HW-PA204C Power Supply Unit



⚠ Caution Be careful when connecting personal computers or other peripheral devices to a PLC to which is mounted a non-insulated Unit (CS1W-CLK12/15(-V1), CS1W-CLK13/53, or CS1W-ETN01) connected to an external power supply. A short-circuit will be created if the 24 V side of the external power supply is grounded and the 0 V side of the peripheral device is grounded. When connecting a peripheral device to this type of PLC, either ground the 0 V side of the external power supply or do not ground the external power supply at all.



Note

1. To prevent damage, be sure that the jumper bar on the voltage selector terminals has been removed before applying 220 V AC power.
2. If a Power Supply Unit without a RUN output is being used, an output that acts as a RUN output can be created by programming the Always ON Flag (A1) as the execution condition for an output from an Output Unit.

AC Power Source

- Supply 100 to 120 V AC or 200 to 240 V AC.
- The C200HW-PA204/PA204R/PA204C supplies 100 to 240 V AC (allowable voltage fluctuation range: 85 to 264 V AC). The C200HW-PA204/PA204R/PA204C has a wide-range supply voltage (100 to 240 V AC), so voltage selector terminals are not provided.

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- Keep voltage fluctuations within the specified range:

Power Supply Unit model	Supply voltage	Allowable voltage fluctuations
C200HW-204S/PA209R	100 to 120 V AC	85 to 132 V AC
	200 to 240 V AC	170 to 264 V AC
C200HW-PA204/ PA204R/PA204C	100 to 240 V AC	85 to 264 V AC

- The terminal block indicator L2/N-L1 may appear as L1/N-L2 in some Units, but the function of the terminals is the same.
- If one power supply phase of the equipment is grounded, connect the grounded phase side to the L2/N (or L1/N if so indicated) terminal.

Voltage Selector

Shorted: 100 to 120 V AC
Open: 200 to 240 V AC

Short-circuit the voltage selector terminals with the jumper bar to select 100 to 120 V AC supply voltage. For 200 to 240 V AC leave them open.

Note The Power Supply Unit will be damaged if 200 to 240 V AC power is supplied and the voltage selector terminals are connected with the jumper bar.

Isolation Transformer

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

Power Consumption

The power consumption will be 120 VA max. per Rack, but there will be a surge current of at least 5 times the max. current when power is turned ON.

24-V DC Output (C200HW-PA204S Only)

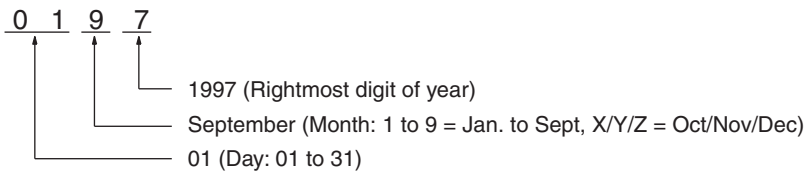
Use these terminals as the power supply for 24-V DC Input Units. Never externally short these terminals; PLC operation will stop if these terminals are shorted.

Although the 24-V DC output can supply up to 0.8 A, the combined power consumption for both 5 V DC and 24 V DC must be 30 W or less, i.e., the capacity of the 24-V DC output will be reduced if the Units mounted to the Rack consume a lot of current. Refer to *Appendix C Unit Current and Power Consumption* for the power consumption of each Unit.

The output voltage of the 24-V DC output will vary with the current consumption of the load as shown in the following table. Be sure to check the current consumption and allowable voltage ranges of the devices connected before using these terminals.

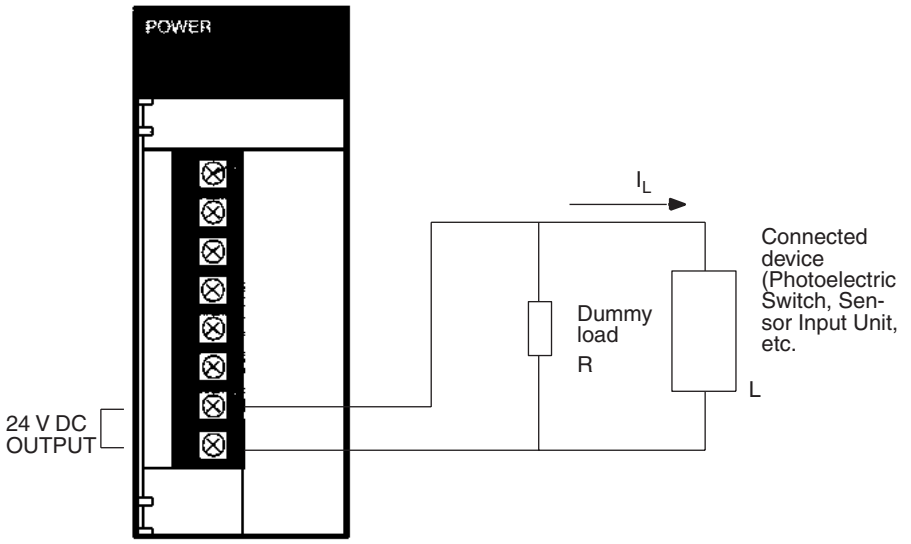
Load current on 24-V DC output	Less than 0.3 A	0.3 A or higher
Accuracy of 24-V DC output for lot No. 0197 or later	+17% –11%	+10% –11%
Accuracy of 24-V DC output for lot No. 3187 or earlier	+10% –20%	

Note Lot numbers are as shown in the following diagram.



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We recommend connecting a dummy load as shown in the following diagram if the maximum operating voltage of the connected device is 26.4 V (24 V +10%).



Resistance of the dummy load:

$$R = \frac{24}{0.3 - I_L}$$

120 Ω when I_L = 0.1 A
240 Ω when I_L = 0.2 A
Not necessary when I_L = 0.3 A
(I_L: Total current of connected devices)

Power rating of the dummy load (with a safety factor of 5):

$$W = (0.3 - I_L) \times 26.4 \times 5$$

30 W (120 Ω) when I_L = 0.1 A
15 W (240 Ω) when I_L = 0.2 A

Note Since the dummy load will generate heat, be careful not to allow any combustible materials to come in contact with the resistor.

Alarm Output (C200HW-PA204C Only)

Connect the alarm output to a PLC's Input Unit or external LED indicator to enable notification when Power Supply Unit replacement is required.

ON: Power Supply Unit replacement not required for at least 6 months.
OFF: Power Supply Unit replacement required within 6 months.

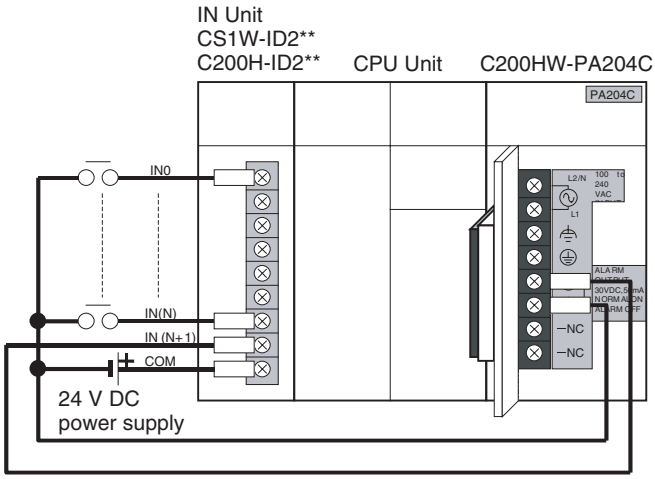
Output Specifications:

Transistor open-collector output
30 VDC max., 50 mA max.
ON: Residual voltage of 2 V max., OFF: Leakage current of 0.1 mA max.

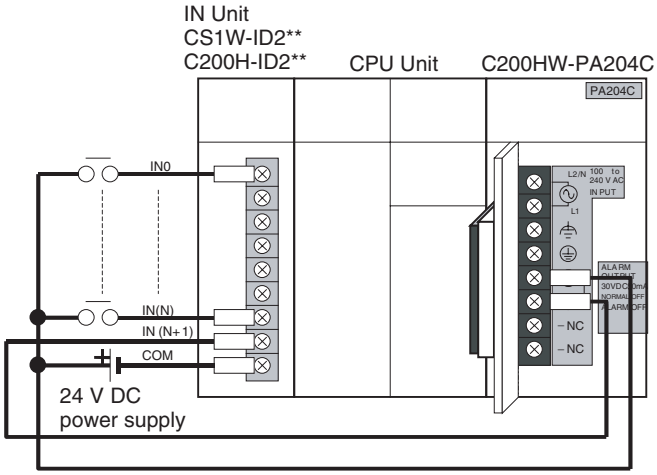
PLC Input Unit Wiring Example

Connect the positive terminals of the 24-V DC power supply to the Input Unit common (COM) terminals.

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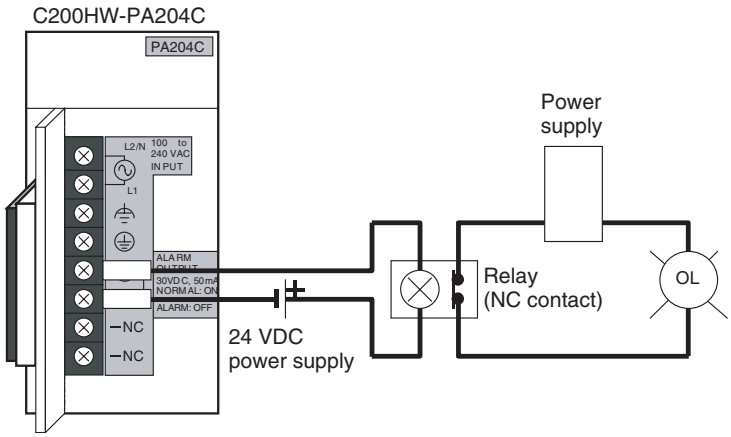


Connect the negative terminal of the 24-V DC power supply to the Input Unit common (COM) terminal.



External Display Device Connection Example

The alarm output (replacement notification output) is an NC contact. Therefore, wire the alarm output using an NC contact or other means to turn ON an error indicator or LED display as shown in the following diagram.



Note

1. The OL display will also light if the PLC's power supply fails.
2. Separate the alarm output cables from power lines and high-voltage lines.

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3. Do not apply a voltage or connect a load to the alarm output that exceeds the rated voltage or load.

RUN Output (C200HW-PA204R/209R)

This output is ON whenever the CPU Unit is operating in RUN or MONITOR mode; it is OFF when the CPU Unit is in PROGRAM mode or a fatal error has occurred.

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 PLC is not operating. (See *5-1 Fail-safe Circuits* for more details on the emergency stop circuit.)

	C200HW-PA204R	C200HW-PA209R
Contact form	SPST-NO	SPST-NO
Maximum switching capacity	250 V AC: 2 A for resistive loads 0.5 A for inductive loads 24 V DC: 2 A	240 V AC:2 A for resistive loads 120 V AC:0.5 A for inductive loads 24 V DC: 2 A for resistive loads 2 A for inductive loads

Wiring

Terminal screws	M3.5 self-rising screws
Recommended wire size	AWG 20 to 14 (0.517 to 2.08 mm^2)
Recommended tightening torque	0.8 N·m

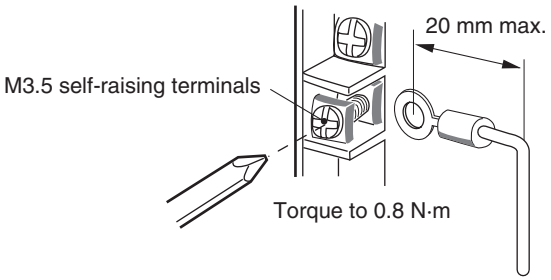
Recommended crimp terminals



Manufacturer	Models	Shape	Applicable wire range (stranded wire)
JST Mfg.	V1.25-YS3A	Y-shaped terminal with sleeve	0.25 to 1.65 mm^2 (AWG 22 to 16)
	V1.25-M3(RAV1.25-3.5)	Round terminal with sleeve	
	V2-YS3A	Y-shaped terminal with sleeve	1.04 to 2.63 mm^2 (AWG 16 to 14)
	V2-M3(RAV2-3.5)	Round terminal with sleeve	

Note

1. Use crimp terminals for wiring.
2. Do not connect bare stranded wires directly to the terminals.



⚠ **Caution** Tighten the AC power supply terminal block screws to the torque of 0.8 N·m. Loose screws may result in short-circuit, malfunction, or fire.

Note

1. Supply power to all of the Power Supply Units from the same source.

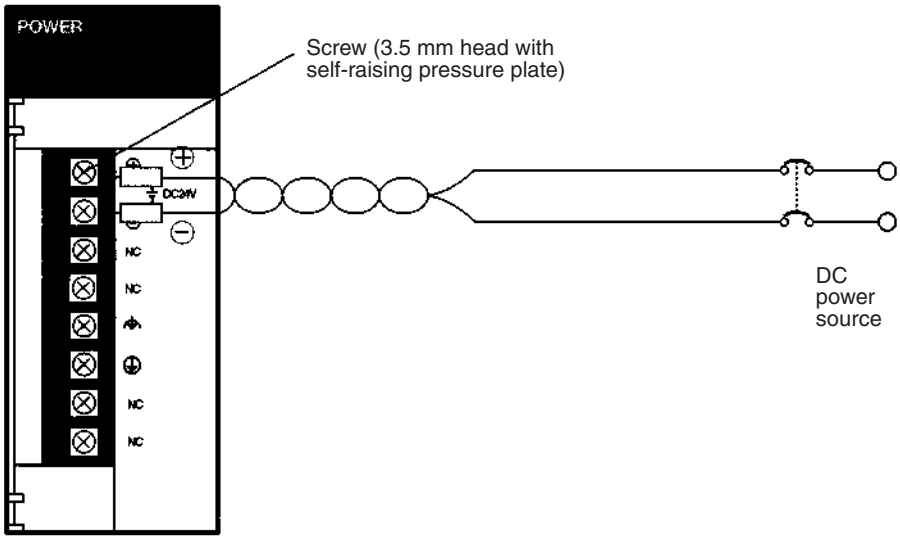
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2. Be sure to check the setting of the voltage selector before supplying power.
3. Do not forget to remove the label from the top of the Power Supply Unit after wiring the Unit. The label will block air circulation needed for cooling.

DC Power Supplies

Do not remove the protective label from the top of the Unit until wiring has been completed. This label prevents wire strands and other foreign matter from entering the Unit during wiring procedures. (Remove the label after wiring has been completed to allow air circulation needed for cooling.)

C200HW-PD024/025 Power Supply Unit



DC Power Source

Supply 24 V DC. Keep voltage fluctuations within the specified range (19.2 to 28.8 V DC).

Power Supply Capacity

The maximum power consumption is 40 W per Rack for C200HW-PD024 and 60 W per Rack for C200HW-PD025, but there will be a surge current of about 5 times that level when the power is turned on.

Wiring

Terminal screws	M3.5 self-rising screws
Recommended wire size	AWG 20 to 14 (0.517 to 2.08 mm^2)
Recommended tightening torque	0.8 N·m

Recommended crimp terminals



Manufacturer	Models	Shape	Applicable wire range (stranded wire)
JST Mfg.	V1.25-YS3A	Y-shaped terminal with sleeve	0.25 to 1.65 mm^2 (AWG 22 to 16)
	V1.25-M3(RAV1.25-3.5)	Round terminal with sleeve	
	V2-YS3A	Y-shaped terminal with sleeve	1.04 to 2.63 mm^2 (AWG 16 to 14)
	V2-M3(RAV2-3.5)	Round terminal with sleeve	

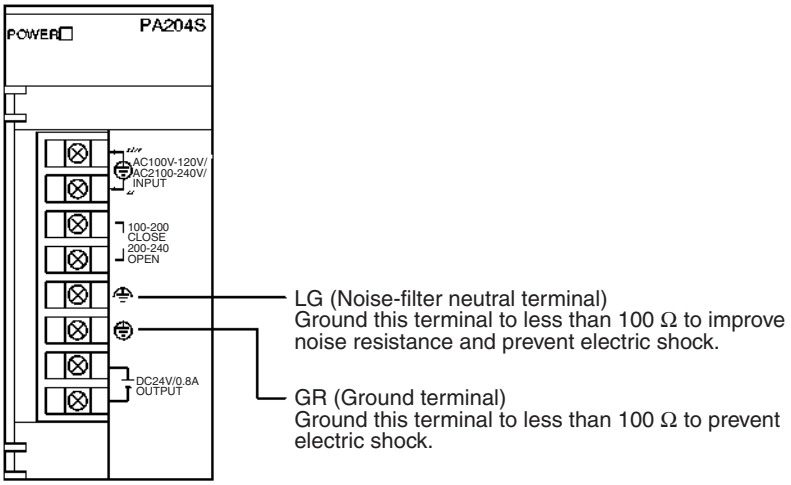
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Note

1. Use crimp terminals for wiring.
2. Do not connect bare stranded wires directly to the terminals.
3. Wire the power supply with the correct polarity. Supply power to all of the Power Supply Units from the same source.
4. Remove the label after the completion of wiring to ensure proper heat dissipation. Leaving the label attached may result in malfunction.

Grounding

The diagram below shows the location of the ground and line ground terminals.

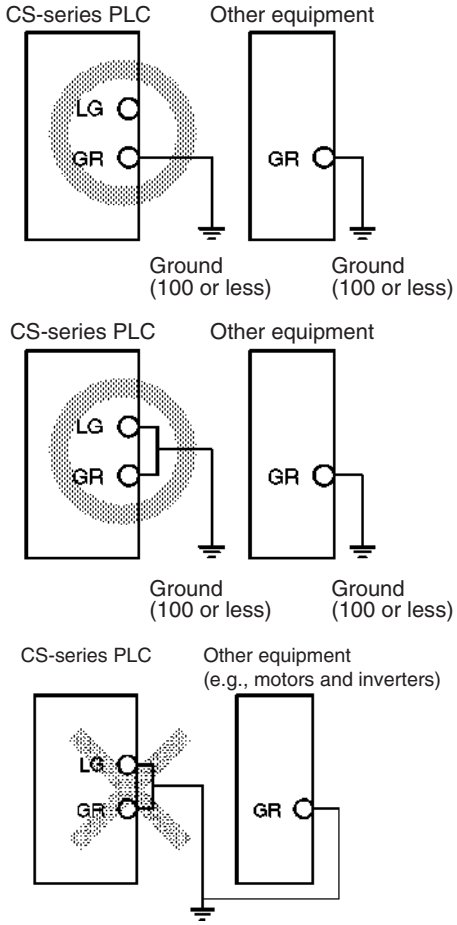


- To help prevent electrical shock, ground the ground terminal (GR: ⏚) with a ground resistance of less than 100 Ω using a 14-gauge wire (minimum cross-sectional area of 2 mm^2).
- The line ground terminal (LG:⏚) is a noise-filtered neutral terminal. If noise is a significant source of errors or electrical shocks are a problem, connect the line ground terminal to the ground terminal and ground both with a ground resistance of less than 100 Ω.
- The ground wire should not be more than 20 m long.
- The following grounding configurations are acceptable.
- The CS-series Backplanes 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). (C200HX/HG/HE and C200H Backplanes are mounted directly to the mounting surface. If Expansion I/O is being affected by control panel or other environmental noise, use the C200HW-ATT□□ or C200H-ATT□□ Backplane Insulation Plates to isolate the Backplanes.

Note Make sure that the C200HW-PA204C is wired correctly. The C200HW-PA204C terminals are wired differently from other Power Supply Units.

- Do not share the PLC's ground with other equipment, such as motors and inverters, or ground the PLC to the metal structure of a building. The configuration shown in the following diagram may worsen operation.

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⚠ **Caution** Tighten the AC power supply terminal block screws to the torque of 0.8 N·m. Loose screws may result in short-circuit, malfunction, or fire.

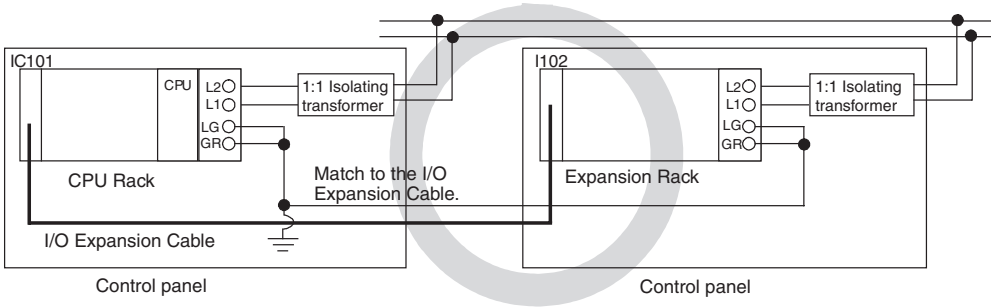
Grounding Long-distance Expansion Racks

A difference in potential will occur between remote ground points if more than one point is grounded on the CPU Rack and Long-distance Expansion Racks in a CS-series Long-distance Expansion System. This is caused by high-frequency noise from power lines, potential and phase differences between power lines, and other factors. To prevent noise from entering on the GR (ground) terminal as a result of a difference in potential, wire the system as shown below.

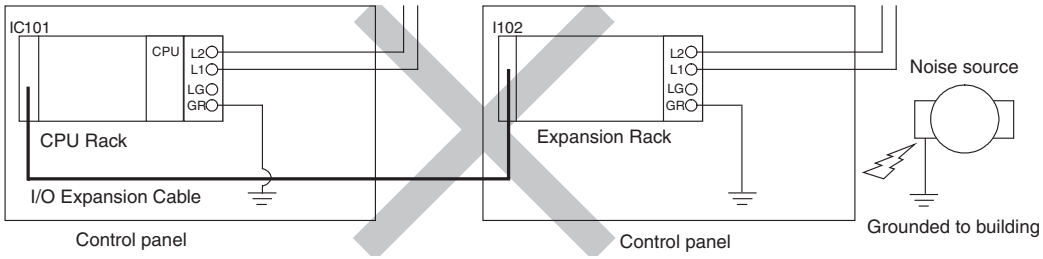
- Connect all of the GR terminals on the Racks and ground them at one point only to 100 Ω or less.
- Short the LR terminals to the GR terminals.
- Use a ground wire of 2 mm^2 min.
- Insert 1:1 isolating transformers into the power supply lines and do not ground the secondary sides of the transformers.

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Recommended Wiring



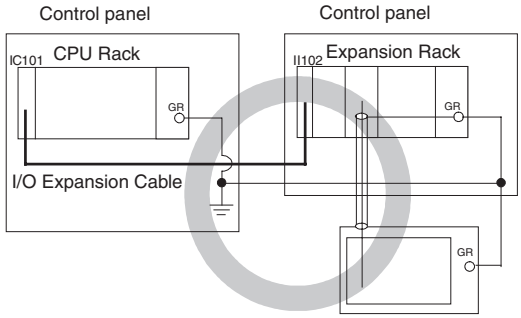
Wiring Susceptible to Noise



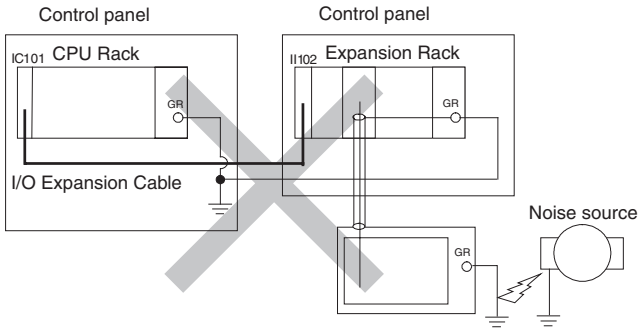
Wiring Communications Lines

When using communications from one or more Rack in the system, ground the entire system so that only one point is grounded. (Refer to user documentation for the devices connected.) For detailed connection methods, refer to the *Operation Manual* for the Communications Unit.

Recommended Wiring



Wiring Susceptible to Noise



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Wiring

Terminal screws	M3.5 self-rising screws
Recommended wire size	AWG 14 min. (2 mm^2 min.)
Recommended tightening torque	0.8 N·m

Recommended crimp terminals



Manufacturer	Models	Shape	Applicable wire range (stranded wire)
JST Mfg.	V2-YS3A	Y-shaped terminal with sleeve	1.04 to 2.63 mm^2 (AWG 16 to 14)
	V2-M3(RAV2-3.5)	Round terminal with sleeve	

Note
1. Use crimp terminals for wiring.
2. Do not connect bare stranded wires directly to the terminals.

5-3-2 Wiring CS-series and C200H Basic I/O Units

I/O Unit Specifications

Double-check the specifications for the I/O Units. In particular, do not apply a voltage that exceeds the input voltage for Input Units or the maximum switching capacity for Output Units. Doing so may result in breakdown, damage, or fire.

When the power supply has positive and negative terminals, be sure to wire them correctly.

Electric Wires

The following wire gauges are recommended.

Terminal Block Connector	Wire Size
10-terminal	AWG 22 to 18 (0.32 to 0.82 mm^2)
19-terminal/20-terminal	AWG 22 (0.32 mm^2)

Note 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.

Wiring

Terminal screws	M3.5 self-rising screws
Recommended wire size	AWG 22 to 18 (0.326 to 0.823 mm^2)
Recommended tightening torque	0.8 N·m

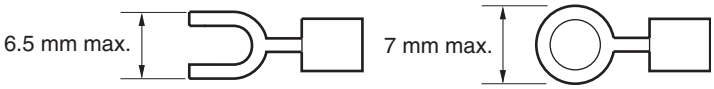
Recommended crimp terminals

1. C200H Basic I/O Units with 10-terminal or 19-terminal Terminal Blocks



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2. CS-series Basic I/O Units with 20-terminal Terminal Blocks

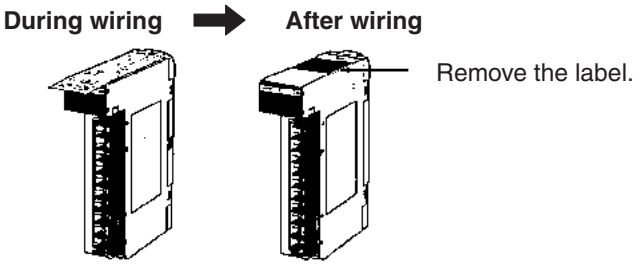


Manufacturer	Models	Shape	Applicable wire range (stranded wire)
JST Mfg.	V1.25-YS3A	Y-shaped terminal with sleeve	0.25 to 1.65 mm^2 (AWG 22 to 16)
	V1.25-M3(RAV1.25-3.5)	Round terminal with sleeve	

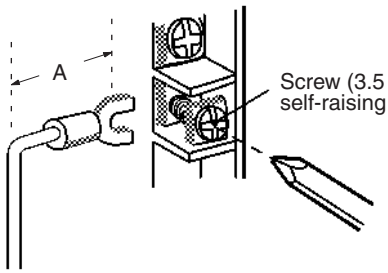
Note

1. Use crimp terminals for wiring.
2. Do not connect bare stranded wires directly to the terminals.

Do not remove the protective label from the top of the Unit until wiring has been completed. This label prevents wire strands and other foreign matter from entering the Unit during wiring procedures. (Remove the label after wiring has been completed to allow air circulation needed for cooling.)



- Wire the Units so that they can be easily replaced. In addition, 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 0.8 N·m.
- The terminals have screws with 3.5-mm diameter heads and self-raising pressure plates. Connect the lead wires to the terminals as shown below.

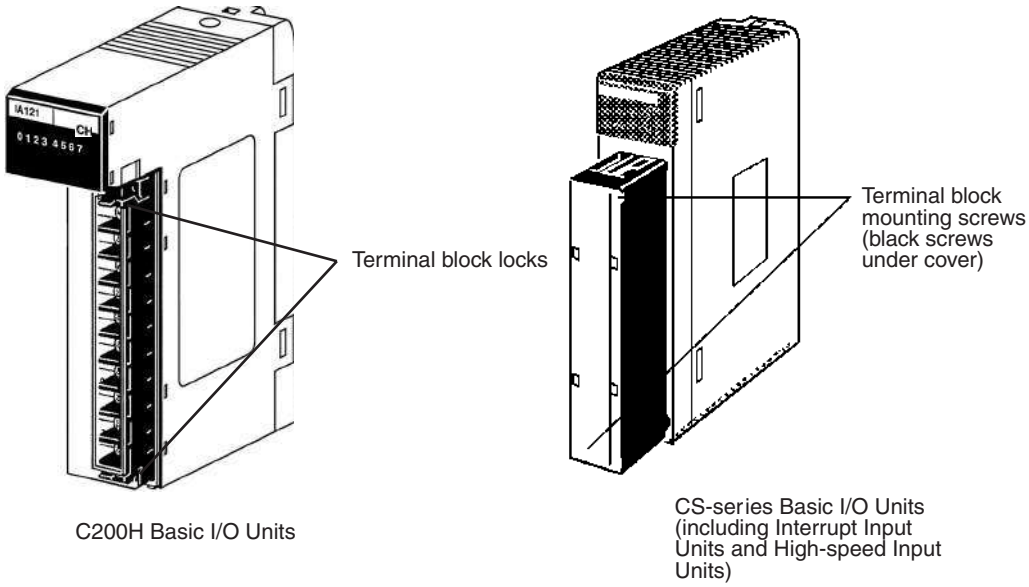


Terminal block	A
10P	23 mm
19P	14 mm
20P	18 mm

Terminal Blocks

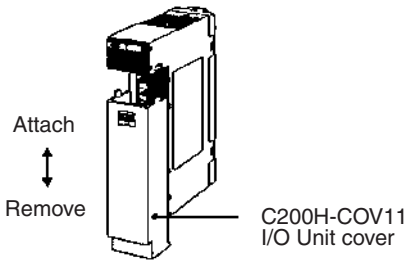
The I/O Units are equipped with removable terminal blocks. The lead wires do not have to be removed from the terminal block to remove it from an I/O Unit. The terminal block on a C200H Basic I/O Units can be removed by pressing the terminal block locks. The terminal block on a CS-series Basic I/O Units can be removed by taking out the terminal block mounting screws.

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I/O Unit Covers

The C200H-COV11 Cover is available to cover the terminal block on Units with 10-terminal terminal block connectors. These Covers can be purchased separately if extra protection is required.



5-3-3 Wiring CS-series and C200H I/O Units with Connectors

This section describes wiring for the following Units:

- C200H Group-2 High-density I/O Units
- CS-series Basic I/O Units with Connectors (32-, 64-, and 96-point Units)
- C200H High-density I/O Units (Special I/O Units)

C200H High-density I/O Units and CS-series Basic I/O Units with connectors use special connectors to connector to external I/O devices. The user can combine a special connector with cable or use a preassembled OMRON cable to connect a High-density I/O Unit to a terminal block or Relay Terminal. The available OMRON cables are described later in this section.

CS-series Basic I/O Units with connectors have the same connector pin allocations as the C200H High-density I/O Units to make them compatible.

- Be sure not to apply a voltage that exceeds the input voltage for Input Units or the maximum switching capacity for Output Units.
- When the power supply has positive and negative terminals, be sure to wire them correctly. Loads connected to Output Units may malfunction if the polarity is reversed.
- Use reinforced insulation or double insulation on the DC power supply connected to DC I/O Units when required by EC Directives (low voltage).
- When connecting the connector to the I/O Unit, tighten the connector screws to a torque of 0.2 N·m.

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- 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.

Available Connectors

Use the following connectors when assembling a connector and cable.

C200H Group-2 High-density I/O Units and CS-series Basic 32- and 64-point I/O Units

The following connectors are recommended for attachment to C200H Group-2 High-density I/O Units and CS-series 32- and 64-point I/O Units.

Connection	Pins	OMRON set	Fujitsu parts
Solder-type (included with Unit)	40	C500-CE404	Socket: FCN-361J040-AU Connector bar: FCN-360C040-J2
Crimp-type	40	C500-CE405	Socket: FCN-363J040 Connector bar: FCN-360C040-J2 Contacts: FCN-363J-AU
Crimp-type	40	C500-CE403	FCN-367J040-AU/F

Note Solder-type connectors are included with each Unit.

CS-series 96-point Basic I/O Units

The following connectors are recommended for attachment to CS-series 96-point I/O Units.

Connection	Pins	OMRON set	Fujitsu parts
Solder-type (included with Unit)	56	CS1W-CE561	Socket: FCN-361J056-AU Connector bar: FCN-360C056-J2
Crimp-type	56	CS1W-CE562	Socket: FCN-363J056 Connector bar: FCN-360C056-J2 Contacts: FCN-363J-AU
Crimp-type	56	CS1W-CE563	FCN-367J056-AU/F

Note Solder-type connectors are included with each Unit.

C200H High-density I/O Units

The following connectors are recommended for attachment to C200H High-density I/O Units.

Connection	Pins	OMRON set	Fujitsu parts
Solder-type (included with Unit)	24	C500-CE241	Socket: FCN-361J024-AU Connector bar: FCN-360C024-J2
Crimp-type	24	C500-CE242	Socket: FCN-363J024 Connector bar: FCN-360C024-J2 Contacts: FCN-363J-AU
Crimp-type	24	C500-CE243	FCN-367J024-AU/F

Note Solder-type connectors are included with each Unit.

Wire

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

Wiring Procedure

The wiring procedure is the same for the C200H Group-2 High-density I/O Units, CS-series High-density I/O Units, and C200H High-density I/O Units (C200H Special I/O Units).

1,2,3...

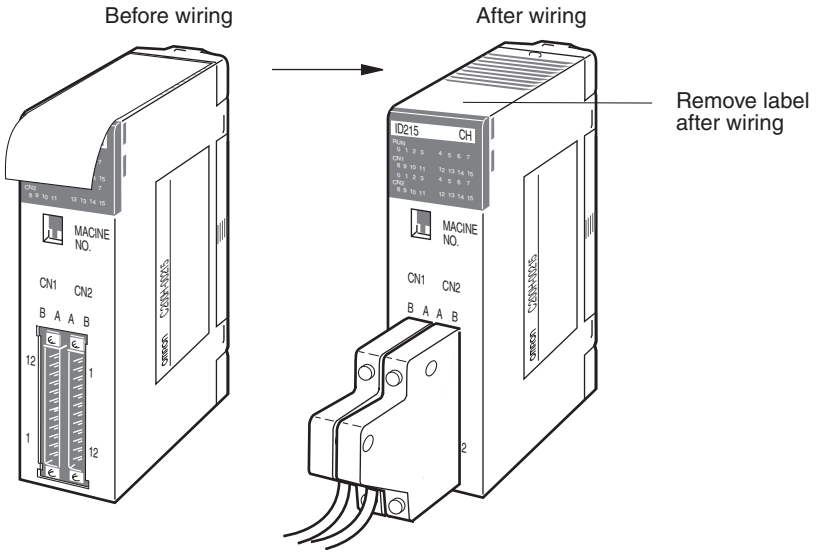
1. Check that each Unit is installed securely.

   Note Do not force the cables.

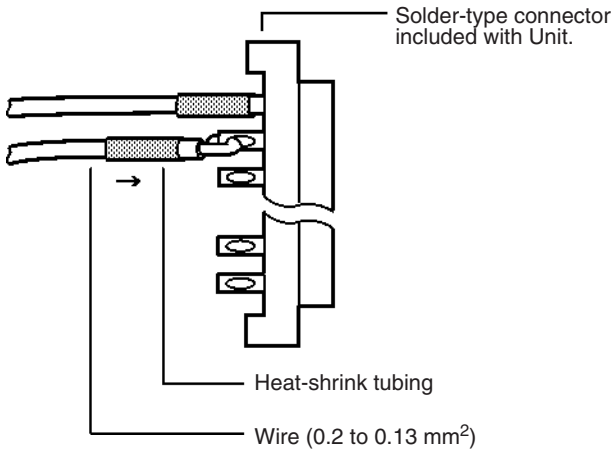
2. Do not remove the protective label from the top of the Unit until wiring has been completed. This label prevents wire strands and other foreign matter

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from entering the Unit during wiring. (Remove the label after wiring has been completed to allow air circulation needed for cooling.)



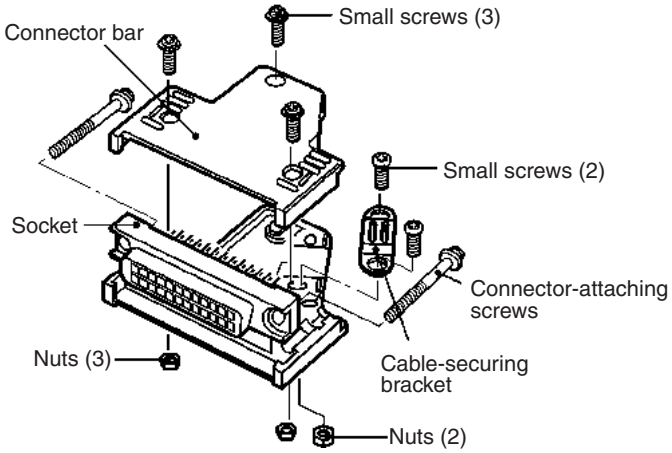
3. When solder-type connectors are being used, be sure not to accidentally short adjacent terminals. Cover the solder joint with heat-shrink tubing.



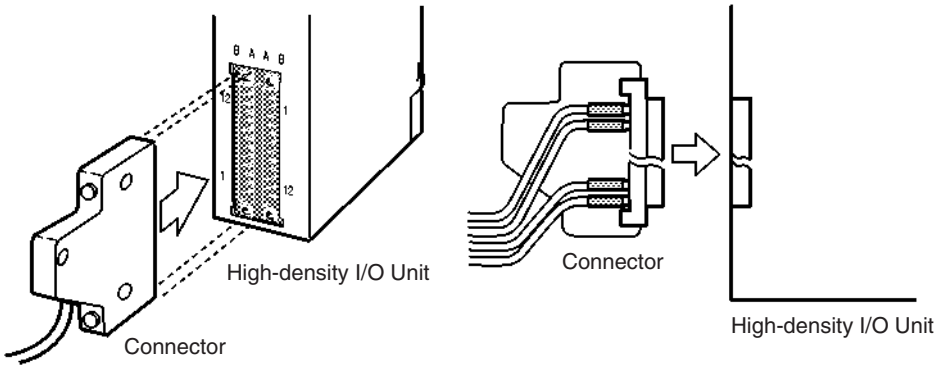
Note Double-check to make sure that the Output Unit's power supply leads haven't been reversed. If the leads are reversed, the Unit's internal fuse will blow and the Unit will not operate.

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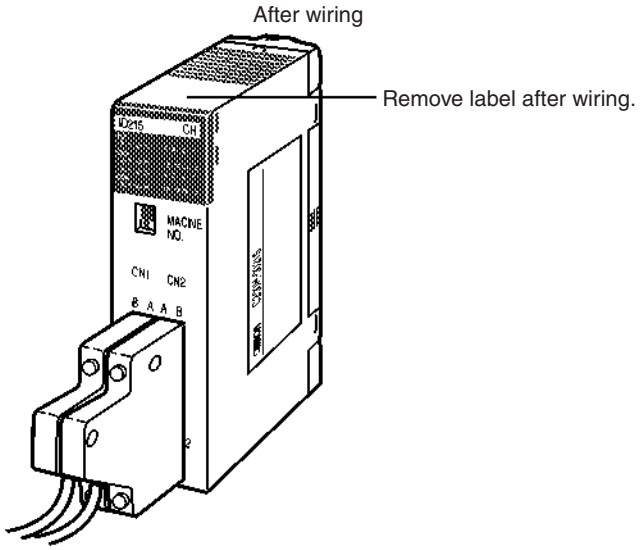
4. Assemble the connector (included or purchased separately) as shown in the following diagram.



5. Insert the wired connector.



6. Remove the protective label after wiring has been completed to allow air circulation needed for cooling.



Tighten the connector-attaching screws to a torque of 0.2 N·m.

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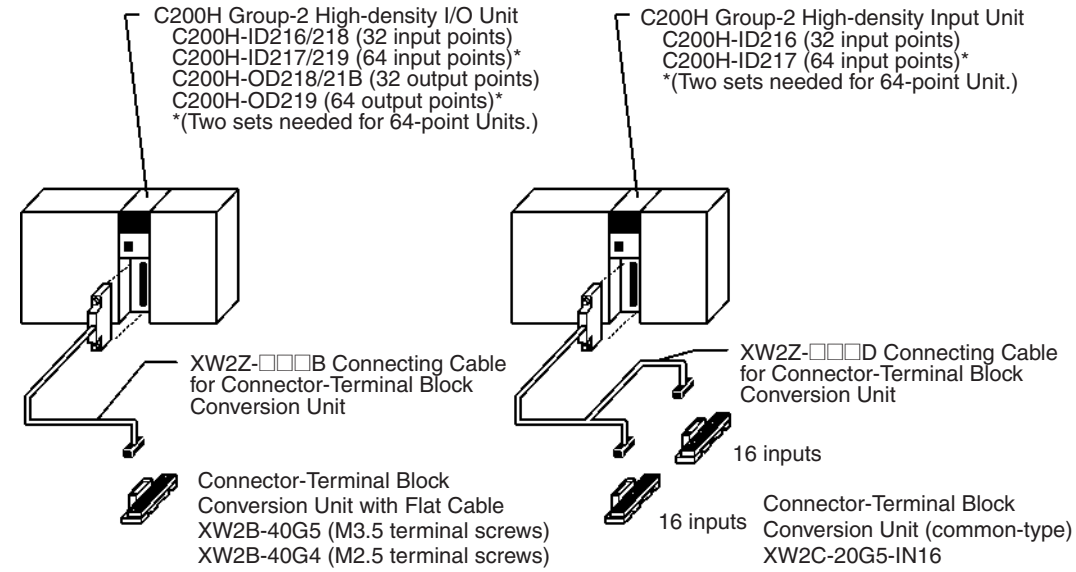
Preassembled Cables

The following examples show applications for preassembled OMRON Cables. Contact your OMRON dealer for more details.

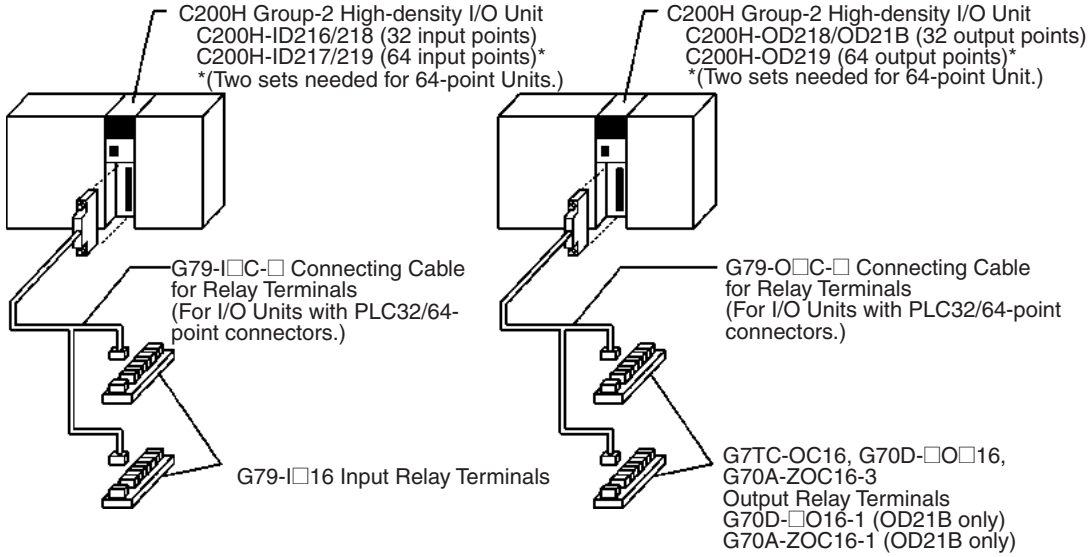
C200H Group-2 High-density I/O Units

The following cables are compatible with C200H Group-2 High-density I/O Units.

1,2,3... 1. Connecting to a terminal block.



2. Connecting to a Relay Terminal.

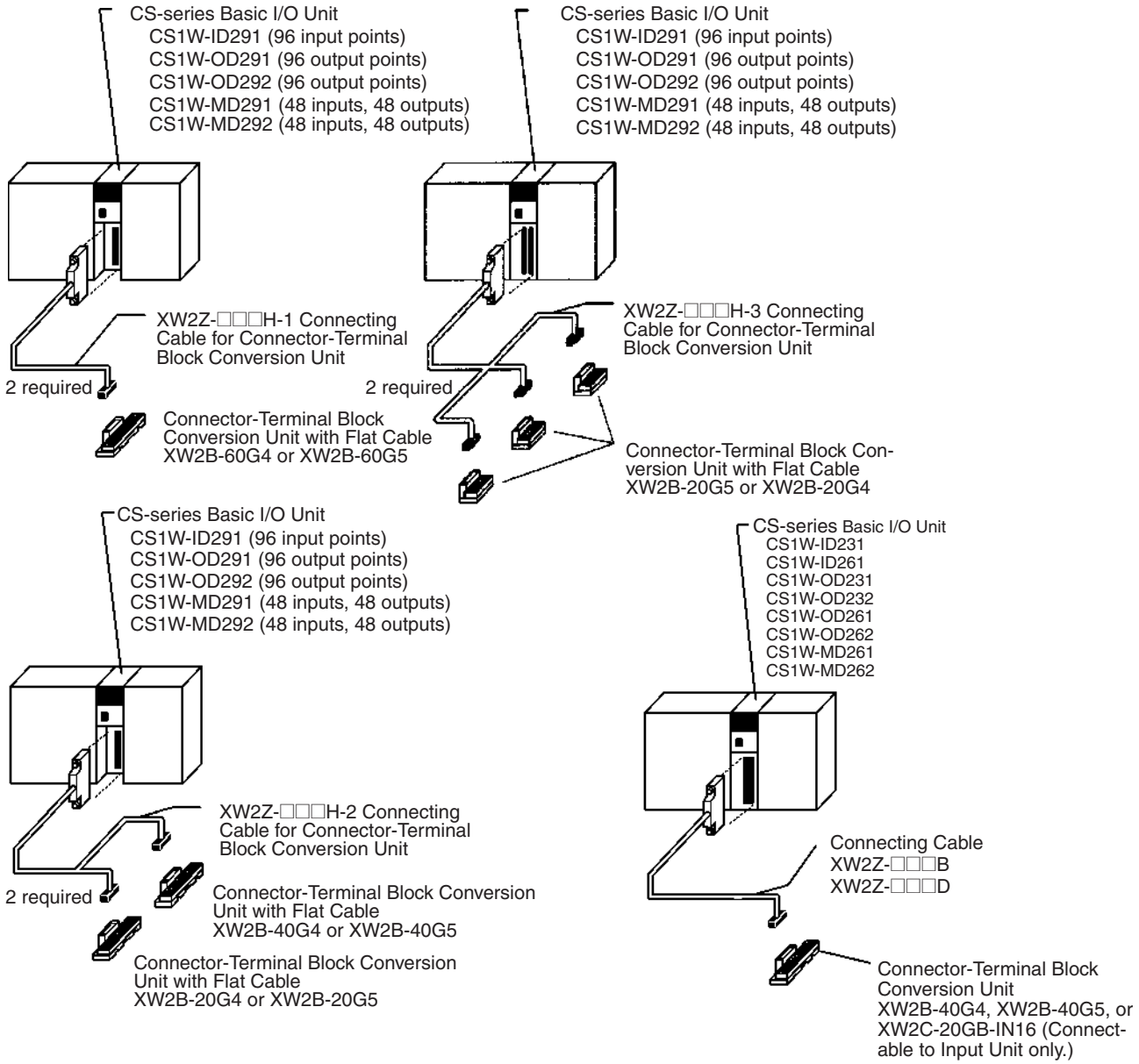


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CS-series Basic I/O Units with Connectors

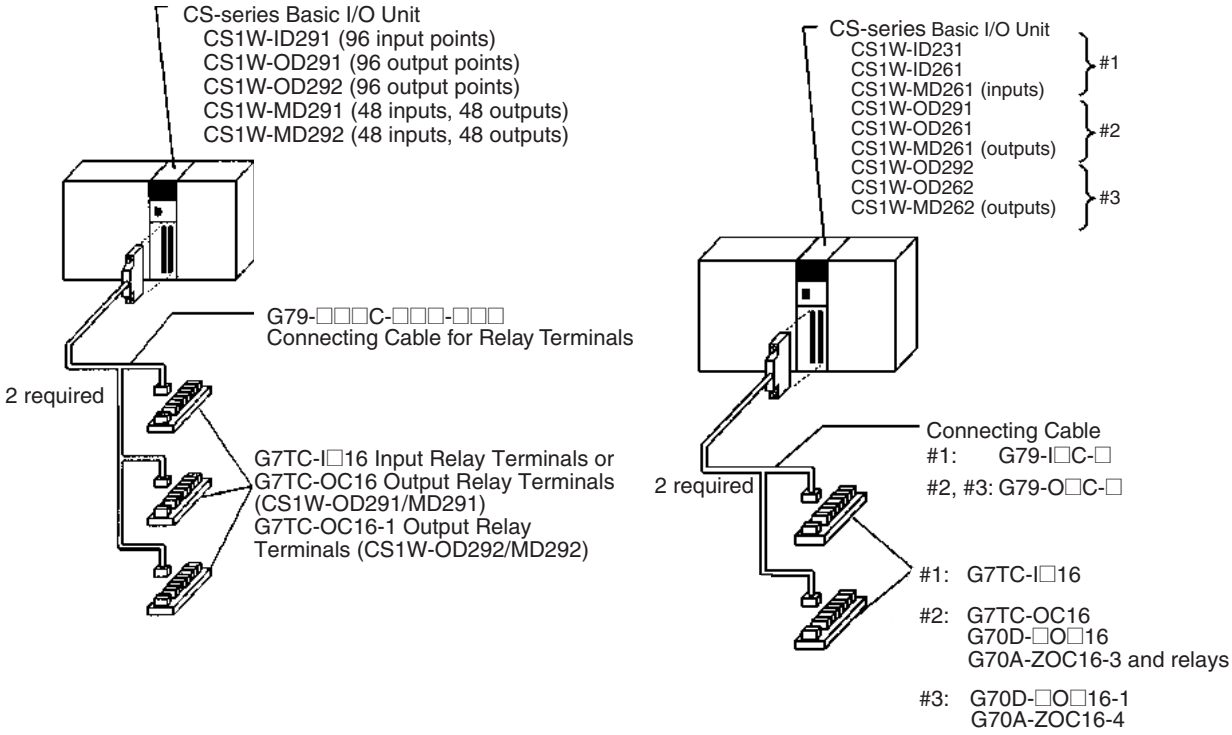
The following cables are compatible with CS-series High-density I/O Units.

1,2,3... 1. Connecting to a terminal block. (Two of the following Cables and Conversion Units are required.)



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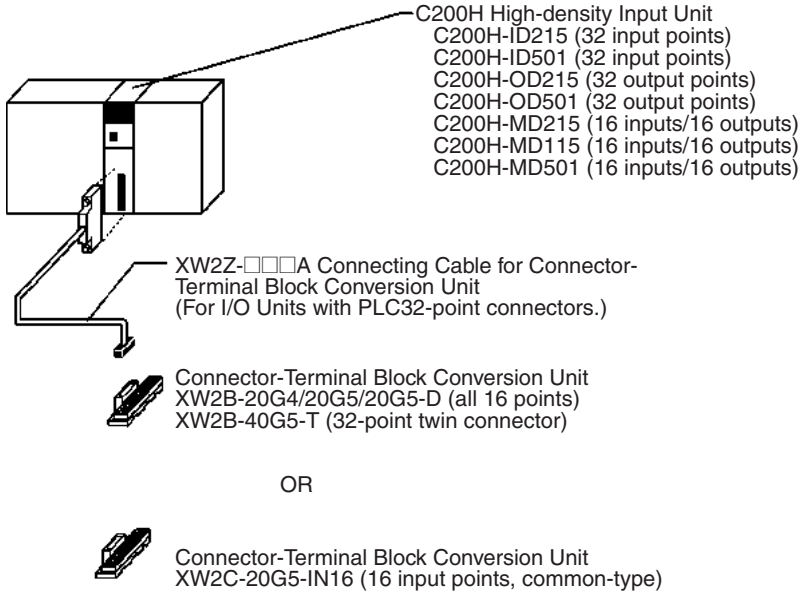
2. Connecting to a Relay Terminal. (Two of the following Cables and Relay Terminals are required.)



C200H High-density I/O Units

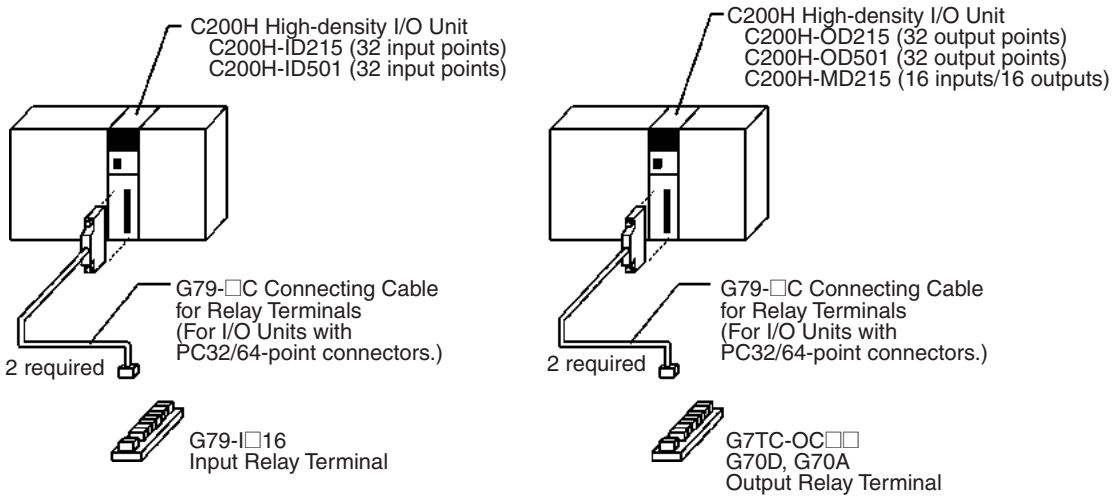
The following cables are compatible with C200H High-density I/O Units (a kind of C200H Special I/O Unit).

1,2,3... 1. Connecting to a terminal block.



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2. Connecting to a Relay Terminal.



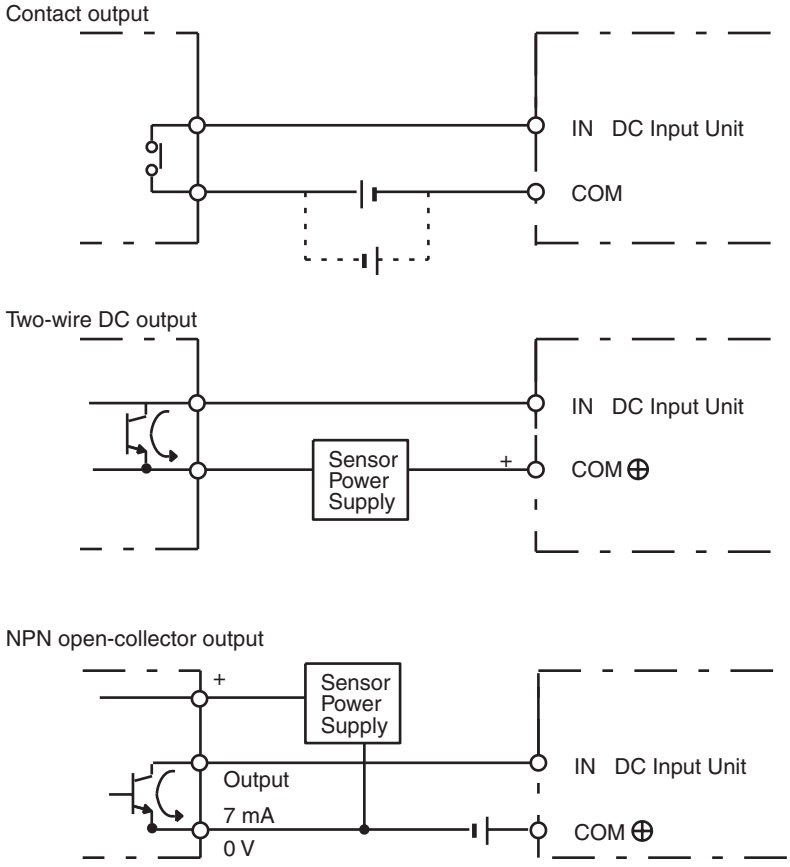
5-3-4 Connecting I/O Devices

Input Devices

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

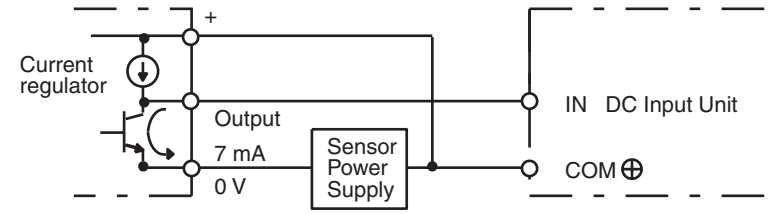
DC Input Units

The following types of DC input devices can be connected.

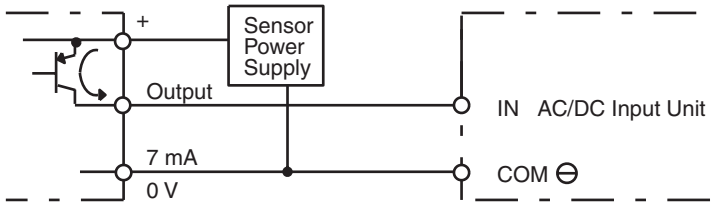


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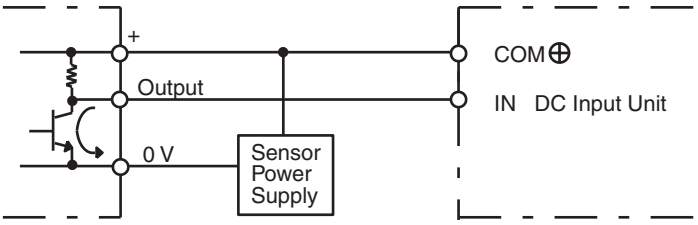
NPN current output



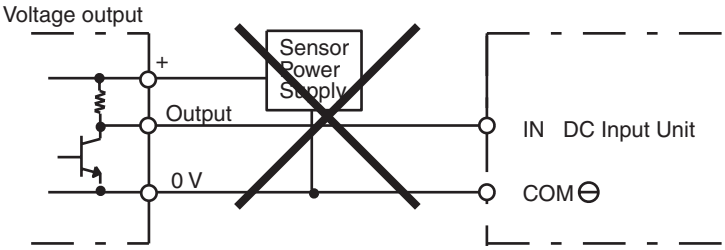
PNP current output



Voltage current output



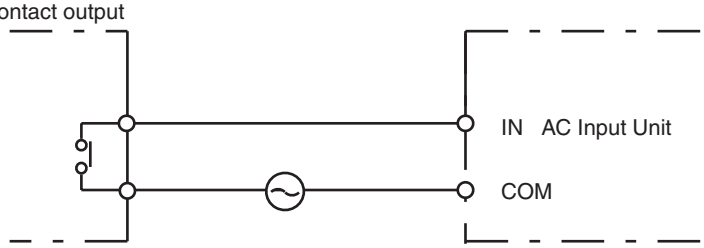
The circuit below should **NOT** be used for I/O devices having a voltage output.



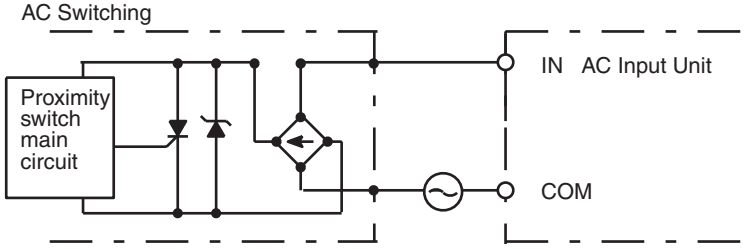
AC Input Units

The following types of AC input devices can be connected.

Contact output



AC Switching



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Note 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 12-V DC or 24-V DC input device, check that the following conditions have been met. Failure to meet these conditions may result in operating errors.

1,2,3...

1. Relation between voltage when the PLC is ON and the sensor residual voltage:

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

2. Relation between voltage when the PLC is ON and sensor control output (load current):

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

   $I_{ON} = (V_{CC} - V_R - 1.5$ [PLC 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:

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

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

Note The residual voltage in the PLC is 4.0 V for the following Units:
C200H-ID211/ID212/IM211/IM212/INT01
The residual voltage is 1.5 V for all other Units.

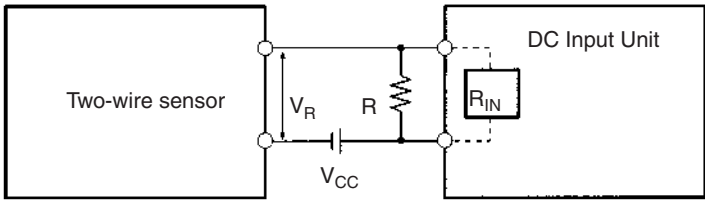
3. Relation between current when the PLC is OFF and sensor leakage current:

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

   If I_{leak} is larger than I_{OFF}, connect a breeder resistor. The breeder resistor constant can be calculated as follows:

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

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



V_{CC}: Power voltage
V_{ON}: PLC ON voltage
I_{ON}: PLC ON current
I_{OFF}: PLC OFF current
R_{IN}: PLC input impedance

V_R: Sensor output residual current
I_{OUT}: Sensor control current (load current)
I_{leak}: Sensor leakage current
R: Bleeder resistance

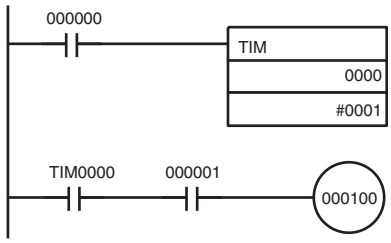
4. Precautions on Sensor Surge Current

   An incorrect input may occur if a sensor is turned ON after the PLC 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 into the program a timer delay after turning ON the sensor.

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Example

In this example, the sensor's power supply voltage is used as the input to CIO 000000 and a 100-ms timer delay (the time required for an OMRON Proximity Sensor to stabilize) is created in the program. After the Completion Flag for the timer turns ON, the sensor input on CIO 000001 will cause output bit CIO 000100 to turn ON.



Output Wiring Precautions

Output Short-circuit Protection

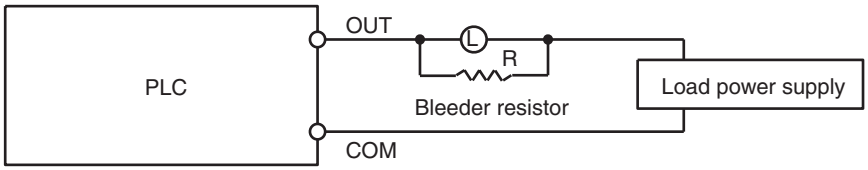
If a load connected to the output terminals is short-circuited, output components and the and printed circuit boards may be damaged. To guard against this, incorporate a fuse in the external circuit. Use a fuse with a capacity of about twice the rated output.

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 Leakage Current

If a Triac Output Unit is used to drive a low-current load, the leakage current may prevent the output device from turning OFF. To prevent this, connect a bleeder resistor in parallel with the load as shown in the following diagram.



Use the following formula to determine the resistance and rating for the bleeder resistor.

$$R < \frac{V_{ON}}{I}$$

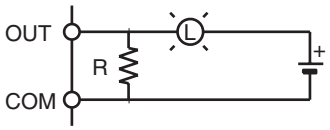
V_{ON}: ON voltage of the load (V)
I: Leakage current (mA)
R: Bleeder resistance (KΩ)

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.

Method 1

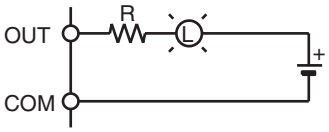
Add a resistor that draws about 1/3 of the current consumed by the bulb.



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Method 2

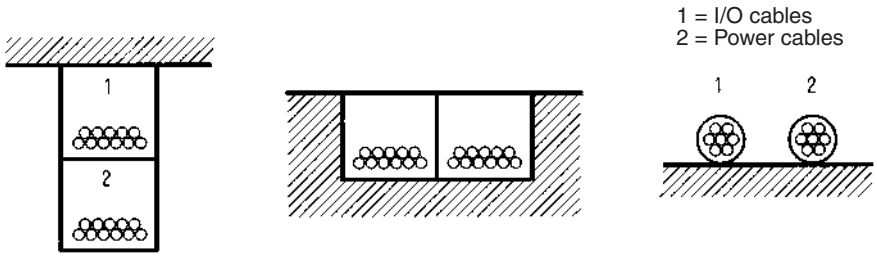
Add a control resistor as shown in the following diagram.



5-3-5 Reducing Electrical Noise

I/O Signal Wiring

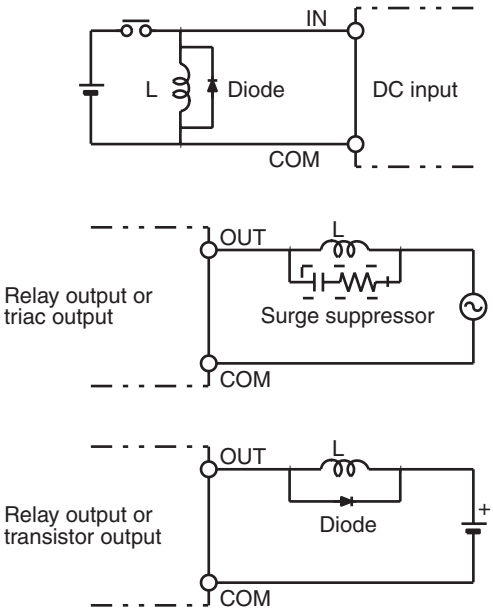
Whenever possible, place I/O signal lines and power lines in separate ducts or raceways both inside and outside of the control panel.



If the I/O wiring and power wiring must be routed in the same duct, use shielded cable and connect the shield to the GR terminal to reduce noise.

Inductive Loads

When an inductive load is connected to an I/O Unit, connect a surge suppressor or diode in parallel with the load as shown below.



Note Use surge suppressors and diodes with the following specifications.

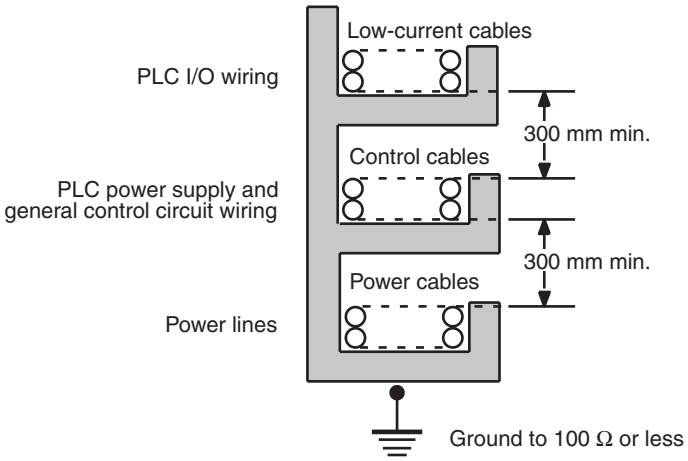
Surge suppressor specifications	Diode specifications
Resistor: 50 Ω Capacitor: 0.47 μF Voltage: 200 V	Breakdown voltage: 3 times load voltage min. Mean rectification current: 1 A

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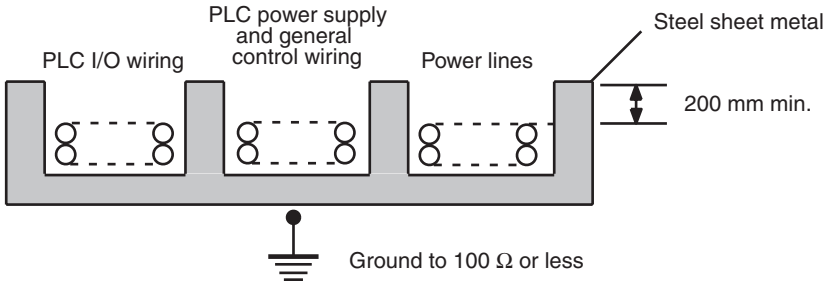
External Wiring

Observe the following precautions for external wiring.

- When multi-conductor signal cable is being used, avoid combining I/O wires and other control wires in the same cable.
- If wiring racks are parallel, allow at least 300 mm (12 inches) between the racks.



If the I/O wiring and power cables must be placed in the same duct, they must be shielded from each other using grounded steel sheet metal.



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SECTION 6
DIP Switch Settings

This section describes the settings of the DIP switch and how they affect operation.

6-1 DIP Switch Settings 326

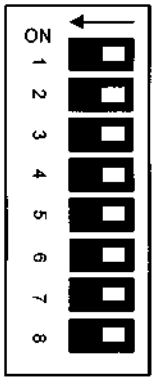
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6-1 DIP Switch Settings

There are two kinds of initial settings for a CS-series PLC: hardware settings and software settings. Hardware settings are made with the CPU Unit's DIP switch and software settings are made in the PLC Setup (using a Programming Device).

The DIP switch can be reached by opening the battery compartment cover on the front of the CPU Unit.

Note Always touch a grounded piece of metal to discharge any static electricity from your body before touching the DIP switch. Otherwise, the PLC may malfunction due to static discharge.



Pin	Function	Setting		Description
1	Write-protection for user program memory (UM) (See note 1.)	ON	Write-protected	User program memory is write-protected when this pin is ON. Turn ON to prevent the program from being changed accidentally.
		OFF	Read/write	
2	Automatic transfer of the program at start-up	ON	Yes	The program (AUTOEXEC.OBJ) and PLC Setup (AUTOEXEC.STD) will be transferred from the Memory Card to the CPU Unit automatically at start-up when this pin is ON. (See note 4.) A PLC's software (program and PLC Setup) can be completely initialized just by inserting a new Memory Card and turning on the power. This can be used to switch the system to a new arrangement very quickly. **Note** When pin 7 is ON, reading from the Memory Card for easy backup is given priority; even if pin 2 is ON, the program will not be automatically transferred.
		OFF	No	
3	CS1-H CPU Unit Always OFF.	Not used.		
4	Peripheral port communications parameters	ON	Use parameters set in the PLC Setup.	• Leave this pin OFF when using a Programming Console or CX-Programmer (peripheral bus setting) connected to the peripheral port. • Turn this pin ON when the peripheral port is being used for a device other than a Programming Console or CX-Programmer (peripheral bus setting).
		OFF (default)	Auto-detect Programming Device (See note 2.)	
5	RS-232C port communications parameters	ON	Auto-detect Programming Device (See note 3.)	• Leave this pin OFF when the RS-232C port is being used for a device other CX-Programmer (peripheral bus setting) such as a Programmable Terminal or host computer. • Turn this pin ON when using CX-Programmer (peripheral bus setting) connected to the RS-232C port.
		OFF (default)	Use parameters set in the PLC Setup.	
6	User-defined pin	ON	A39512 ON	The ON/OFF status of this pin is reflected in A39512. Use this function when you want to create an Always-ON or Always-OFF condition in the program without using an Input Unit.
		OFF (default)	A39512 OFF	

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Pin	Function	Setting		Description
7	Easy backup setting	ON	Writing from the CPU Unit to the Memory Card	Press and hold the Memory Card Power Supply Switch for three seconds.
			Restoring from the Memory Card to the CPU Unit.	To read from the Memory Card to the CPU Unit, turn ON the PLC power. This operation is given priority over automatic transfer (pin 2 is ON) when power is ON. (See note 5.)
		OFF (default)	Verifying contents of Memory Card.	Press and hold the Memory Card Power Supply Switch for three seconds.
8	Not used	OFF (default)	Always OFF.	

Note

1. The following data is write-protected when pin 1 is ON: the user program and all data in the parameter area such as the PLC Setup and registered I/O table. Furthermore when pin 1 is ON, the user program and parameter area won't be cleared even when the memory clear operation is performed from a Programming Device.
2. The auto-detect goes through baud rates in the following order: Programming Console → Peripheral bus at 9,600 bps, 19,200 bps, 38,400 bps, and 115,200 bps. Programming Devices that aren't in peripheral bus mode and devices in peripheral bus mode operating at 51,200 bps will not be detected.
3. The auto-detect operation goes through baud rates in the following order: Peripheral bus at 9,600 bps, 19,200 bps, 38,400 bps, and 115,200 bps. Programming Devices that aren't in peripheral bus mode and devices in peripheral bus mode operating at any other speeds will not be detected.
4. When pin 2 is ON and the power is turned ON, any I/O Memory file (AUTOEXEC.IOM, ATEXEC□□.IOM) (prefer to the *CS/CJ Series Programming Manual*) will also be transferred automatically. Both the program (AUTOEXEC.OBJ) and the parameter area (AUTOEXEC.STD) must exist in the Memory Card. I/O Memory files (AUTOEXEC.IOM, ATEXEC□□.IOM) are optional.
5. After reading data from the Memory Card to the CPU Unit with the simple backup operation, the CPU Unit will remain in PROGRAM mode and cannot be changed to MONITOR or RUN mode until the power supply has been cycled. After completing the backup operation, turn OFF the power supply to the CPU Unit, change the settings of pin 7, and then turn the power supply back ON.

DIP switch settings		PLC Setup settings				
		Peripheral port settings				
		Default	NT Link	Peripheral bus	Host Link	Serial Gateway
Pin 4	OFF	Programming Console or CX-Programmer in Peripheral Bus Mode (Auto-detect connected device's baud rate)				
	ON	Host computer or CX-Programmer in host link mode	OMRON PT (NT Link)	CX-Programmer in Peripheral Bus Mode	Host computer or CX-Programmer in host link mode	OMRON component (CompoWay/F)

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DIP switch settings		PLC Setup settings					
		Peripheral port settings					
		Default	**NT Link**	**No-protocol**	**Peripheral bus**	**Host Link**	**Serial Gateway**
Pin 5	OFF	Host computer or CX-Programmer in host link mode	OMRON PT (NT Link)	Standard external device	CX-Programmer in Peripheral Bus Mode	Host computer or CX-Programmer in host link mode	OMRON component (Compo-Way/F)
	ON	CX-Programmer in Peripheral Bus Mode (Auto-detect connected device's baud rate)					

Note Use the following settings for the network on the CX-Programmer and pin 4 on the DIP switch when connecting the CX-Programmer via the peripheral or RS-232C port.

CX-Programmer network setting	Peripheral port connections	RS-232C port connection	PLC Setup
Toolbus (peripheral bus)	Turn OFF pin 4.	Turn ON pin 5.	None
SYSMAC WAY (Host Link)	Turn ON bit 4.	Turn OFF pin 5.	Set to Host Link.

When CX-Programmer is set to host link mode, it won't be possible to communicate (go online) in the following cases:

- The computer is connected to the CPU Unit's peripheral port and pin 4 is OFF.
- The computer is connected to the CPU Unit's RS-232C port and pin 5 is ON.

To go online, set CX-Programmer to peripheral bus mode, turn pin 4 ON (turn pin 5 OFF for the RS-232C port), and set the communications mode to host link mode in the PLC Setup.

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SECTION 7
PLC Setup

This section describes the settings in the PLC Setup and how they are used to control CPU Unit operation.

7-1 PLC Setup 330
7-1-1 Overview of the PLC Setup 330
7-1-2 PLC Setup Settings 332
7-2 Explanations of PLC Setup Settings 357

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7-1 PLC Setup

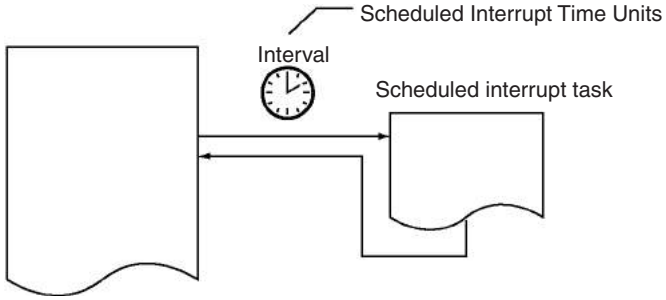
7-1-1 Overview of the PLC Setup

The PLC Setup contains basic CPU Unit software settings that the user can change to customize PLC operation. These settings can be changed from a Programming Console or other Programming Device. The various settings for the CPU Unit are made in the PLC Setup.

The following table lists cases in which the PLC Setup must be changed. In other cases, the PLC can be operated with the default settings.

Note To read or set parameters in the PLC Setup, use the version of CX-Programmer that corresponds to the parameters.

For example, with CX-Programmer Ver.3.□,when the PLC Setup is uploaded from a PLC that was used to set the PLC Setup for CPU Unit Ver. 2.0 or higher only, the PLC Setup that was set cannot be downloaded again. (The following screen will be displayed.) Use the CX-Programmer Ver. 4.0 in this case.



Cases when settings must be changed	Setting(s) to be changed
The input response time settings for Basic I/O Units must be changed in the following cases: • Chattering or noise occur in CS-series Basic I/O Units. • Short pulse inputs are being received for intervals longer than the cycle time.	Basic I/O Unit Input Response Time
Data in all regions of I/O Memory (including the CIO Area, Work Areas, Timer Flags and PVs, Task Flags, Index Registers, and Data Registers) must be retained when the PLC's power is turned on.	IOM Hold Bit Status at Startup
The status of bits force-set or force-reset from a Programming Device (including Programming Consoles) must be retained when the PLC's power is turned on.	Forced Status Hold Bit Status at Startup
• You do not want the operating mode to be determined by the Programming Console's mode switch setting at startup. • You want the PLC to go into RUN mode or MONITOR mode and start operating immediately after startup. • You want the operating mode to be other than PROGRAM mode when the power is turned ON.	Startup Mode
Disabling detection of low-battery errors when it is not required.	Detect Low Battery
Detecting interrupt-task errors is not required.	Detect Interrupt Task Error
Data files are required but a Memory Card cannot be used or the files are written frequently. (Part of the EM Area will be used as file memory.)	EM File Memory
The peripheral port will not be used with the Programming Console or CX-Programmer (peripheral bus) communications speed auto-detection and will not used the default host link communications settings such as 9,600 bps. **Note** Pin 4 of the DIP switch on the front of the CPU Unit must be OFF to change the PLC Setup settings.	Peripheral Port Settings

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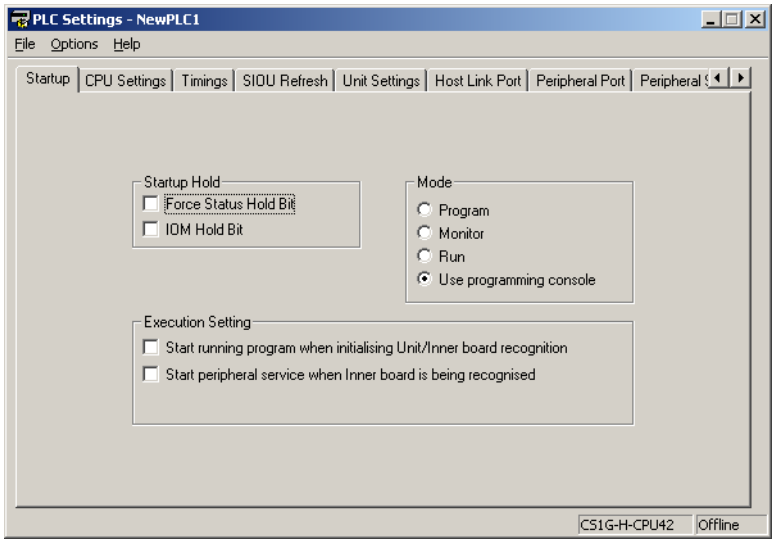
Cases when settings must be changed	Setting(s) to be changed
The RS-232C port will not be used with the Programming Console or CX-Programmer (peripheral bus) communications speed auto-detection and will not use the default host link communications settings such as 9,600 bps. **Note** Pin 5 of the DIP switch on the front of the CPU Unit must be OFF to change the PLC Setup settings.	RS-232C Port Settings
You want to speed up communications with a PT via an NT Link.	Set the peripheral port or the RS-232C port communications port baud rate to "high-speed NT Link."
You want the intervals for scheduled interrupts to be set in units of 1 ms rather than 10 ms.	Scheduled Interrupt Time Units
You want CPU Unit operation to be stopped for instruction errors, i.e., when the ER Flag or AER Flag is turned ON. (You want instruction errors to be fatal errors.) You want to find the instructions where instruction errors are occurring (where the ER Flag is turning ON.	Instruction Error Operation
You want a minimum cycle time setting to create a consistent I/O refresh cycle.	Minimum Cycle Time
You want to set a maximum cycle time other than 1 second (10 ms to 40,000 ms).	Watch Cycle Time
You want to delay peripheral servicing so that it is executed over several cycles.	Fixed Peripheral Servicing Time
You want to give priority to servicing peripherals over program execution. Here, "peripherals" include CPU Bus Units, Special I/O Units, Inner Boards, the built-in RS-232C port, and the peripheral port.	Peripheral Servicing Priority Mode
A power OFF interrupt task will be used.	Power OFF Interrupt Task
You want to extend the detection of a power interruption to 10 to 20 ms.	Power OFF Detection Delay Time
You want to shorten the average cycle time when a lot of Special I/O Units are being used. You want to extend the I/O refreshing interval for Special I/O Units.	Special I/O Unit Cyclic Refreshing
You want to improve both program execution and peripheral servicing response.	CPU Processing Mode
You do not want to record user-defined errors for FAL(006) and FPD(269) in the error log.	FAL Error Log Registration
You want to reduce fluctuation in the cycle time caused by text string processing	Background Execution for Table Data, Text String, and Data Shift Instructions
You do not want to wait for Units and Boards to complete startup processing to start CPU Unit operation.	Startup Condition

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7-1-2 PLC Setup Settings

The Programming Console addresses given in this section are used to access and change settings in the PLC Setup when using a Programming Console or the Programming Console function of an NS-series Programming Terminal. The PLC Setup is stored in the Parameter Area, which can be accessed only from a Programming Device. Addresses in the Parameter Area cannot be used as instruction operands in the same way as addresses in the I/O Memory Area.

Startup Operation Settings (CX-Programmer's Startup Tab Page)



7-1-2-1 Startup Tab Page

Startup Hold Settings

Forced Status Hold Bit

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+80	14	0: Cleared 1: Retained Default: 0	This setting determines whether or not the status of the Forced Status Hold Bit (A50013) is retained at startup. When you want all of the bits that have been force-set or force-reset to retain their forced status when the power is turned on, turn ON the Forced Status Hold Bit and set this setting to 1 (ON).	A50013 (Forced Status Hold Bit)	Takes effect at startup

IOM Hold Bit

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+80	15	0: Cleared 1: Retained Default: 0	This setting determines whether or not the status of the IOM Hold Bit (A50012) is retained at startup. When you want all of the data in I/O Memory to be retained when the power is turned on, turn ON the IOM Hold Bit and set this setting to 1 (ON).	A50012 (IOM Hold Bit)	Takes effect at startup

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Mode Setting

Programming Console address		Settings	Function	Related flags and words	New setting's effective-ness
Word	Bit(s)				
+81	---	Use programming console (PRCN): Programming Console's mode switch Program: PROGRAM mode Monitor: MONITOR mode Run: RUN mode Default: Program	This setting determines whether the Startup Mode will be the mode set on the Programming Console's mode switch or the mode set here in the PLC Setup. If this setting is PRCN and a Programming Console isn't connected, startup mode will depend on the CPU Unit being used. CS1 CPU Unit: PROGRAM mode CS1-H CPU Unit: RUN mode	---	Takes effect at startup

Execution Settings

Startup Condition

Programming Console address		Settings	Function	Related flags and words	New setting's effective-ness
Word	Bit(s)				
+83	15	0: Wait for Units and Boards. 1: Don't wait. Default: 0	To start the CPU Unit in MONITOR or PROGRAM mode even if there is one or more Boards or Units that has not completed startup processing, set this setting to 1 (Don't wait for Units and Boards). (The operation for Inner Boards, however, also depends on the next setting.) To wait for all Units and Boards to finish startup processing, set this setting to 0 (Wait for Units and Boards).	---	Takes effect at startup

Note This setting applies only to specific Units and Boards.

Specific Units

This setting applies to the ITNC-EIS01-CST and ITNC-EIX01-CST Open Network Controller-CS1 Bus Interface Units.

Specific Boards

There are currently no Inner Boards that are applicable as of July 2006.

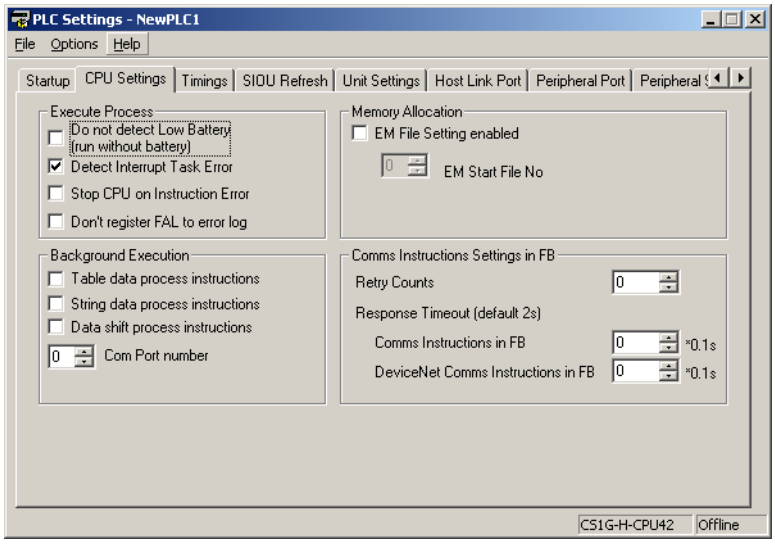
Inner Board Setting

Programming Console address		Settings	Function	Related flags and words	New setting's effective-ness
Word	Bit(s)				
+84	15	0: Wait for Boards. 1: Don't wait. Default: 0	To start the CPU Unit in MONITOR or PROGRAM mode even if there is one or more of Boards that has not completed startup processing, set this setting to 1 (Don't wait for Boards). To wait for all Boards to finish startup processing, set this setting to 0 (Wait for Boards). This setting is valid only if the Startup Condition is set to 1 (Don't wait for Units and Boards).	---	Takes effect at startup

Note There are currently no Inner Boards that are applicable as "Specific Boards" as of July 2006.

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7-1-2-2 CPU Unit Settings (CPU Settings Tab Page on the CX-Programmer)



Execute Process

Detect Low Battery

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+128	15	0: Detect 1: Do not detect Default: 0	This setting determines whether CPU Unit battery errors are detected. If this setting is set to 0 and a battery error is detected, the ERR/ALM indicator on the CPU Unit will flash and the Battery Error Flag (A40204) will be turned ON, but CPU Unit operation will continue.	A40204 (Battery Error Flag)	Takes effect the next cycle

Detect Interrupt Task Error

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+128	14	0: Detect 1: Do not detect Default: 0	This setting determines whether interrupt task errors are detected. If this setting is set to 0 and an interrupt task error is detected, the ERR/ALM indicator on the CPU Unit will flash and the Interrupt Task Error Flag (A40213) will be turned ON, but CPU Unit operation will continue.	A40213 (Interrupt Task Error Flag)	Takes effect the next cycle

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Stop CPU on Instruction Error (Instruction Error Operation)

Programming Console address		Settings	Function	Related flags and words	New setting's effective-ness
Word	Bit(s)				
+197	15	0: Continue 1: Stop Default: 0	This setting determines whether instruction errors (instruction processing errors (ER) and illegal access errors (AER)) are treated as non-fatal or fatal errors. When this setting is set to 1, CPU Unit operation will be stopped if the ER or AER Flags is turned ON (even when the AER Flag is turned ON for an indirect DM/EM BCD error). Related Flags: A29508 (Instruction Processing Error Flag) A29509 (Indirect DM/EM BCD Error Flag) A29510 (Illegal Access Error Flag)	A29508, A29509, A29510 (If this setting is set to 0, these flags won't be turned ON even if an instruction error occurs.)	At start of operation.

Don't Register FAL to Error Log

Programming Console address		Settings	Function	Related flags and words	New setting's effective-ness
Word	Bit(s)				
+129	15	0: Record user-defined FAL errors in error log. 1: Don't record user-defined FAL errors in error log. Default: 0	This setting determines if user-defined FAL errors created with FAL(006) and time monitoring for FPD(269) will be recorded in the error log (A100 to A199). Set it to 1 so prevent these errors from being recorded.	---	Whenever FAL(006) is executed (every cycle)

Memory Allocation Settings

EM File Setting Enabled

Programming Console address		Settings	Function	Related flags and words	New setting's effective-ness
Word	Bit(s)				
+136	7	0: None 1: EM File Memory Enabled Default: 0	This setting determines whether part of the EM Area will be used for file memory.	---	After initialization from Programming Device or via FINS command.

EM Start File No. (Starting Memory Starting Bank)

Programming Console address		Settings	Function	Related flags and words	New setting's effective-ness
Word	Bit(s)				
+136	0 to 3	0 to 6 Default: 0	If bit 7 (above) is set to 1, the setting here specifies the EM bank where file memory begins. The specified EM bank and all subsequent banks will be used as file memory. This setting will be disabled if bit 7 is set to 0.	A344 (EM File Memory Starting Bank)	After initialization from Programming Device or via FINS command.

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Background Execution Settings

Table Data Process Instructions

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+198	15	0: Not executed in background 1: Executed in background Default: 0	This setting determines if Table Data Instructions will be processed over multiple cycle times (i.e., processed in the background).	---	Start of operation

String Data Process Instructions

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+198	14	0: Not executed in background 1: Executed in background Default: 0	This setting determines if Text String Data Instructions will be processed over multiple cycle times (i.e., processed in the background).	---	Start of operation

Data Shift Process Instructions

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+198	13	0: Not executed in background 1: Executed in background Default: 0	This setting determines if Data Shift Instructions will be processed over multiple cycle times (i.e., processed in the background).	---	Start of operation

Communications Port Number for Background Execution

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+198	0 to 3	0 to 7: Communications ports 0 to 7 (internal logical ports)	The communications port number (internal logical port) that will be used for background execution.	---	Start of operation

7-1-2-3 FB Communications Instruction Settings (Settings for OMRON FB Library)

The following PLC Setup settings are used only when using the OMRON FB Library.

Number of Resends

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+200	0 to 3	0 to F: 0 to 15 Default: 0	Set the number of retries for sending commands when executing DeviceNet explicit messages or FINS messages within function blocks.	A58000 to A58003	Start of operation

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FB Communications Instruction Response Monitoring Time

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+201	0 to 15	0001 to FFFF (Unit: 0.1 s, 0.1 to 6553.5) 0000: 2 s	A response timeout occurs when no response is returned within the time set here for FINS commands executed within a function block.	A581	Start of operation

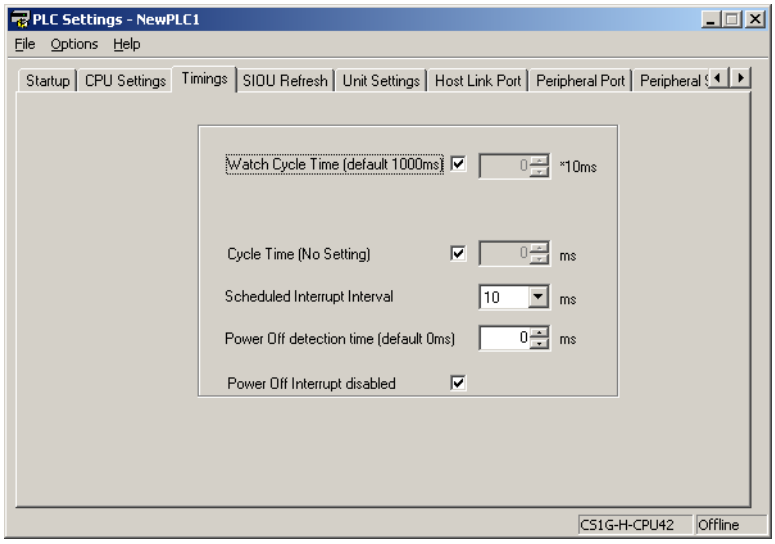
DeviceNet Communications Instruction Response Monitoring Time

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+202	0 to 15	0001 to FFFF (Unit: 0.1 s, 0.1 to 6553.5) 0000: 2 s	A response timeout occurs when no response is returned within the time set here for explicit messages commands executed within a function block.	A582	Start of operation

Note The number of resends and response monitoring time must be set by the user in the FB communications instructions settings in the PLC Setup, particularly when using function blocks from the OMRON FB Library to execute FINS messages or DeviceNet explicit messages communications. The values set in this PLC Setup for OMRON FB Library will be automatically stored in the related Auxiliary Area words A580 to A582 and used by the function blocks from the OMRON FB Library.

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7-1-2-4 Time and Interrupt Settings (CX-Programmer Timings Tab Page)



Enable Watch Cycle Time Setting

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+209	15	0: Default 1: Bits 0 to 14 Default: 0	Set to 1 to enable the Watch Cycle Time Setting in bits 0 to 14. Leave this setting at 0 for a maximum cycle time of 1 s.	A40108 (Cycle Time Too Long Flag)	Takes effect at the start of operation (Can't be changed during operation.)

Watch Cycle Time

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+209	0 to 14	001 to FA0: 10 to 40,000 ms (10-ms units) Default: 001 (1 s)	This setting is valid only when bit 15 of 209 is set to 1. The Cycle Time Too Long Flag (A40108) will be turned ON if the cycle time exceeds this setting.	A264 and A265 (Present Cycle Time)	Takes effect at the start of operation (Can't be changed during operation.)

Cycle Time (Minimum Cycle Time)

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+208	0 to 15	0001 to 7D00: 1 to 32,000 ms (1-ms units) Default: 0000 (No minimum)	Set to 0001 to 7D00 to specify a minimum cycle time. If the cycle time is less than this setting, it will be extended until this time passes. Leave this setting at 0000 for a variable cycle time. (Can't be changed during operation.) This cycle time will apply to the program execution cycle when a parallel processing mode is used.	---	Takes effect at the start of operation

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Schedule Interrupt Interval

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+195	0 to 3	0 hex: 10 ms 1 hex: 1.0 ms Default: 0 hex	Sets the time interval for the scheduled interrupt task.	---	Takes effect at the start of operation. (Can't be changed during operation.)

Power OFF Detection Time (Power OFF Detection Delay Time)

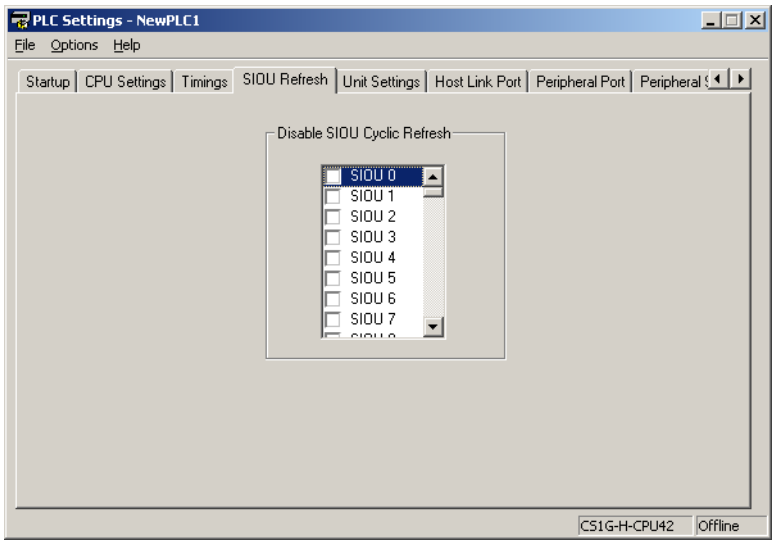
Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+225	0 to 7	00 to 0A: 0 to 10 ms (1-ms units) Default: 00	This setting determines how much of a delay there will be from the detection of a power interruption (approximately 10 to 25 ms after the AC power supply voltage drops below 85% of the rated value or DC power supply voltage drops below 80% of the rated value) to the confirmation of a power interruption. The default setting is 0 ms. When the power OFF interrupt task is enabled, it will be executed when the power interruption is confirmed. If the power OFF interrupt task is disabled, the CPU will be reset and operation will be stopped.	---	Takes effect at startup or at the start of operation. (Can't be changed during operation.)

Power OFF Interrupt Disable

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+225	15	0: Disabled 1: Enabled Default: 0	When this setting is set to 1, the power OFF interrupt task will be executed when power is interrupted.	---	Takes effect at startup or at the start of operation. (Can't be changed during operation.)

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7-1-2-5 Special I/O Unit Cyclic Refreshing (CX-Programmer SIOU Refresh Tab Page)

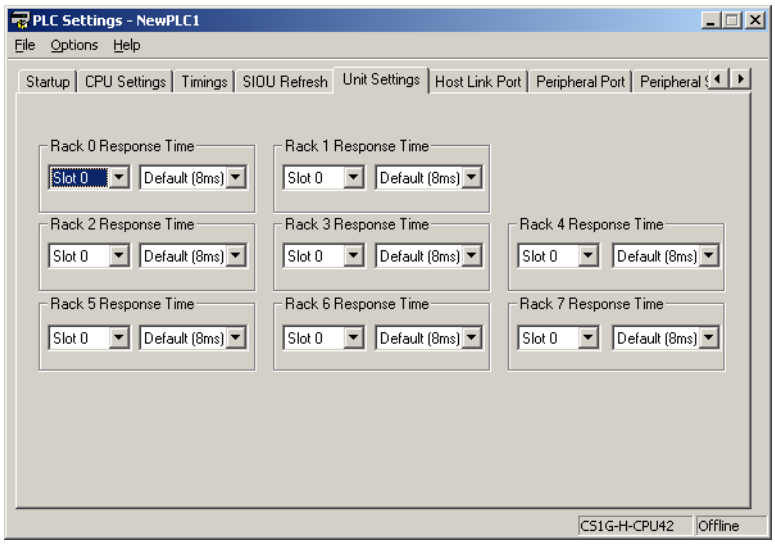


Item	Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
	Word	Bit(s)				
Cyclic Refreshing of Units 0 to 15	+226	0 to 15	0: Enabled 1: Disabled Default: 0	These settings determine whether data will be exchanged between the specified Unit and the Special I/O Unit's allocated words (10 words/Unit) during cyclic refreshing for Special I/O Units. Turn ON the corresponding bit to disable cyclic refreshing when the Unit will be refreshed in an interrupt task by IORF(097), several Special I/O Units are being used and you don't want to extend the cycle time, or the cycle time is so short that the Special I/O Unit's internal processing can't keep up. (Special I/O Units can be refreshed from the program with IORF(097).)	---	Takes effect at the start of operation
Cyclic Refreshing of Units 16 to 31	+227	0 to 15	0: Enabled 1: Disabled Default: 0			
Cyclic Refreshing of Units 32 to 47	+228	0 to 15	0: Enabled 1: Disabled Default: 0			
Cyclic Refreshing of Units 48 to 63	+229	0 to 15	0: Enabled 1: Disabled Default: 0			
Cyclic Refreshing of Units 64 to 79	+230	0 to 15	0: Enabled 1: Disabled Default: 0			
Cyclic Refreshing of Units 80 to 95	+231	0 to 15	0: Enabled 1: Disabled Default: 0			

Note If a Special I/O Unit is not refreshed periodically from the CPU Unit (at least every 11 seconds), a CPU Unit monitoring error will occur. (The ERH indicator and RUN indicator will be lit on the Special I/O Unit.) If cyclic I/O refreshing of a Special I/O Unit is disabled, use the IORF(097) instruction to refresh the Unit from the user program.

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7-1-2-6 Basic I/O Unit Input Response Times (Unit Settings Tab Page on the CX-Programmer)

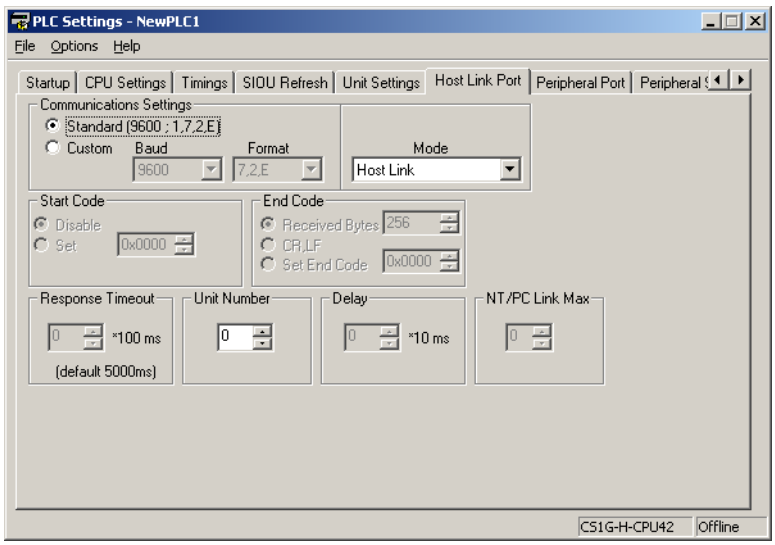


Item	Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
	Word	Bit(s)				
Rack 0, Slot 0	+10	0 to 7	00: 8 ms 10: 0 ms 11: 0.5 ms 12: 1 ms 13: 2 ms 14: 4 ms 15: 8 ms 16: 16 ms 17: 32 ms Default: 00 (8 ms)	Sets the input response time (ON response time = OFF response time) for CS-series Basic I/O Units. The default setting is 8 ms and the setting range is 0.5 ms to 32 ms. This value can be increased to reduce the effects of chattering and noise, or it can be reduced to allow reception of shorter input pulses.	A220 to A259: Actual input response times for Basic I/O Units	Takes effect at startup
Rack 0, Slot 1		8 to 15				
Rack 0, Slot 2	+11	0 to 7				
Rack 0, Slot 3		8 to 15				
Rack 0, Slot 4	+12	0 to 7				
Rack 0, Slot 5		8 to 15				
Rack 0, Slot6	+13	0 to 7				
Rack 0, Slot 7		8 to 15				
Rack 0, Slot 8	+14	0 to 7				
Rack 0, Slot 9		8 to 15				
Rack 1, Slots 0 to 9	+15 to 19	See Rack 0.				
Rack 2, Slots 0 to 9	+20 to 24					
Rack 3, Slots 0 to 9	+25 to 29					
Rack 4, Slots 0 to 9	+30 to 34					
Rack 5, Slots 0 to 9	+35 to 39					
Rack 6, Slots 0 to 9	+40 to 44					
Rack 7, Slots 0 to 9	+45 to 49					

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7-1-2-7 Host Link (RS-232C) Port Tab Page

The following settings are valid when pin 5 on the DIP switch on the CPU Unit is ON.



Host Link Settings

Communications Settings

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+160	15	0: Standard 1: PLC Setup (custom) Default: 0	*The default settings are for 1 start bit, 7 data bits, even parity, 2 stop bits, and a baud rate of 9,600 bps.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle.

Mode: Communications Mode

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+160	8 to 11	00: Host link 05: Host link Default: 0	This setting determines whether the RS-232C port will operate in host link mode or another serial communications mode. (Host link can be specified with 00 or 05.) The Peripheral bus mode is for communications with Programming Devices other than the Programming Console.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle.

Format: Data Bits

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+160	3	0: 7 bits 1: 8 bits Default: 0	These settings are valid only when the communications mode is set to host link or no-protocol. These settings are also valid only when the RS-232C Port Settings Selection is set to 1: PLC Setup.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle.

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Format: Stop Bits

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+160	2	0: 2 bits 1: 1 bit Default: 0	These settings are valid only when the communications mode is set to host link or no-protocol. These settings are also valid only when the RS-232C Port Settings Selection is set to 1: PLC Setup.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle.

Format: Parity

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+160	0 to 1	00: Even 01: Odd 10: None Default: 00	These settings are valid only when the communications mode is set to host link or no-protocol. These settings are also valid only when the RS-232C Port Settings Selection is set to 1: PLC Setup.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle.

Baud Rate (bps)

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+161	0 to 7	00: 9,600 bps 01: 300 bps 02: 600 bps 03: 1,200 bps 04: 2,400 bps 05: 4,800 bps 06: 9,600 bps 07: 19,200 bps 08: 38,400 bps 09: 57,600 bps 0A: 115,200 bps Default: 00	These settings are valid only when the communications mode is set to host link or no-protocol. These settings are also valid only when the RS-232C Port Settings Selection is set to 1: PLC Setup.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle.

Unit Number (for CPU Unit in Host Link Mode)

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+163	0 to 7	00 to 1F: (0 to 31) Default: 00	This setting determines the CPU Unit's unit number when it is connected in a 1-to-N (N=2 to 32) Host Link.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle.

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NT Link Settings

Mode: Communications Mode

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+160	8 to 11	02: 1:N NT Link Default: 0	This setting determines whether the RS-232C port will operate in host link mode or another serial communications mode. **Note** Communications will not be possible with PTs set for 1:1 NT Links.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle.

Baud Rate (bps)

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+161	0 to 7	00: Standard 0A: High-speed NT Link* Default: 00	* Set to 115,200 bps when setting this value from the CX-Programmer. To return to the standard setting, leave the setting set to "PLC Setup" and set the baud rate to 9,600 bps.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle.

NT Link Max. (Maximum Unit Number in NT Link Mode)

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+166	0 to 3	0 to 7 Default: 0	This setting determines the highest unit number of PT that can be connected to the PLC.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle.

Peripheral Bus Settings

Communications Settings

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+160	15	0: Standard* 1: PLC Setup (custom) Default: 0	*The default settings are for a baud rate of 9,600 bps.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle.

Mode: Communications Mode

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+160	8 to 11	04: Peripheral bus Default: 0	This setting determines whether the RS-232C port will operate in host link mode or another serial communications mode. (Host link can be specified with 00 or 05.) The Peripheral Bus mode is for communications with Programming Devices other than the Programming Console.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle.

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Baud Rate (bps)

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+161	0 to 7	00: 9,600 bps 06: 9,600 bps 07: 19,200 bps 08: 38,400 bps 09: 57,600 bps 0A: 115,200 bps Default: 00	Settings 00 and 06 through 0A are valid when the communications mode is set to peripheral bus.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle.

No-protocol Settings

Standard/Custom Settings

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+160	15	0: Standard 1: Custom Default: 0	The standard settings are as follows: 1 stop bit, 7-bit data, even parity, 2 stop bits, 9,600 bps	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

Serial Communications Mode

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+160	08 to 11	03 Hex: No-protocol Default: 00 Hex	This setting determines whether the RS-232C port will operate in no-protocol mode or another serial communications mode.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

Data Length

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+160	3	0: 7-bit 1: 8-bit Default: 0	This setting is valid only in no-protocol communications mode. Set the Standard/Custom setting (word 160, bit 15) to 1 to enable this setting.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

Stop Bits

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+160	2	0: 2 bits 1: 1 bit Default: 0	This setting is valid only in no-protocol communications mode. Set the Standard/Custom setting (word 160, bit 15) to 1 to enable this setting.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

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Parity

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+160	00 to 01	00 Hex: Even 01 Hex: Odd 10 Hex: None Default: 00	This setting is valid only in no-protocol communications mode. Set the Standard/Custom setting (word 160, bit 15) to 1 to enable this setting.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

Baud Rate

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+161	00 to 07	00 Hex: 9,600 bps 01 Hex: 300 bps 02 Hex: 600 bps 03 Hex: 1,200 bps 04 Hex: 2,400 bps 05 Hex: 4,800 bps 06 Hex: 9,600 bps 07 Hex: 19,200 bps 08 Hex: 38,400 bps 09 Hex: 57,600 bps 0A Hex: 115,200 bps Default: 00 Hex	This setting is valid only in no-protocol communications mode. Set the Standard/Custom setting (word 160, bit 15) to 1 to enable this setting.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

Send Delay

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+162	00 to 15	0000 to 270F Hex (0 to 99,990 ms) Unit: 10 ms Default: 0000	When the TXD(236) instruction is executed, data will be sent from the RS-232C after the send delay set here has expired.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

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Start Code/End Code

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	**Bit(s)**				
+164	8 to 15	00 to FF Default: 00	Start code: Set this start code only when the start code is enabled (1) in bits 12 to 15 of 165.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)
	0 to 7	00 to FF Default: 00	End code: Set this end code only when the end code is enabled (1) in bits 8 to 11 of 165.		
+165	12	0: None 1: Code in 164 Default: 0	Start code setting: A setting of 1 enables the start code in 164 bits 8 to 15.		
	8 to 9	0: None 1: Code in 164 2: CR+LF Default: 0	End code setting: With a setting of 0, the amount of data being received must be specified. A setting of 1 enables the end code in bits 0 to 7 of 164. A setting of 2 enables an end code of CR+LF.		
	0 to 7	00: 256 bytes 01 to FF: 1 to 255 bytes Default: 00	Set the data length to be sent and received with no-protocol communications. The end code and start code are not included in the data length. Set this value only when the end code setting in bits 8 to 11 of 165 is “0: None.” This setting can be used to change the amount of data that can be transferred at one time by TXD(236) or RXD(235). The default setting is the maximum value of 256 bytes.		

Serial Gateway Settings

Communications Settings

Programming Console address		Settings	Function	Related flags and words	New setting’s effectiveness
Word	**Bit(s)**				
+160	15	0: Default (standard)* 1: PLC Setup (custom) Default: 0	*The default settings are for a baud rate of 9,600 bps.	A61901 (RS-232C Port Settings Changing Flag)	Takes effect the next cycle. (Also can be changed with STUP (237).)

Mode: Communications Mode

Programming Console address		Settings	Function	Related flags and words	New setting’s effectiveness
Word	**Bit(s)**				
+160	8 to 11	9: Serial Gateway Default: 0	This setting determines whether the communications mode for the RS-232C port port. The peripheral bus mode is used for all Programming Devices except for Programming Consoles.	A61901 (RS-232C Port Settings Changing Flag)	Takes effect the next cycle. (Also can be changed with STUP (237).)
+160	8 to 11	0: Host Link 5: Host Link Default: 0	This setting determines whether the communications mode for the RS-232C port. (Host Link can be used when specified to either 0 or 5 hex.)	A61901 (RS-232C Port Settings Changing Flag)	Takes effect the next cycle. (Also can be changed with STUP (237).)

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Data Bits

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+160	3	0: 7 bits 1: 8 bits Default: 0	These settings are valid when the RS-232C Port Settings Selection is set to 1: PLC Setup.	A61901 (RS-232C Port Settings Changing Flag)	Takes effect the next cycle. (Also can be changed with STUP (237).)

Stop Bits

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+160	2	0: 2 bits 1: 1 bit Default: 0	These settings are valid when the RS-232C Port Settings Selection is set to 1: PLC Setup.	A61901 (RS-232C Port Settings Changing Flag)	Takes effect the next cycle. (Also can be changed with STUP (237).)

Parity

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+160	0 to 1	00: Even 01: Odd 10: None Default: 00	These setting is valid only when the communications mode is set to Host Link. These settings are also valid only when the RS-232C Port Settings Selection is set to 1: PLC Setup.	A61902 (RS-232C Port Settings Changing Flag)	Takes effect the next cycle. (Also can be changed with STUP (237).)

Baud Rate (bps)

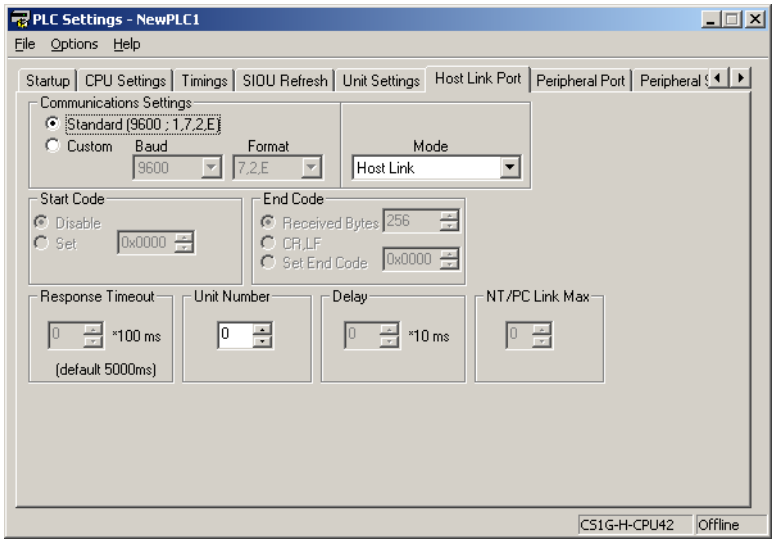
Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+161	0 to 7	00: 9,600 01: 300 02: 600 03: 1,200 04 2,400 05: 4,800 06: 9,600 07: 19,200 08: 38,400 09: 57,600 0A: 115,200 Default: 00	These setting is valid only when the communications mode is set to Host Link. These settings are also valid only when the RS-232C Port Settings Selection is set to 1: PLC Setup.	A61902 (RS-232C Port Settings Changing Flag)	Takes effect the next cycle. (Also can be changed with STUP (237).)

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Response Monitoring Time

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+167	8 to 15	00: 5 s 01 to FF: 100 to 25,500 ms (Unit: 100 ms) Default: 00	Monitors the time from when the FINS command that has been converted into the specified protocol using Serial Gateway is sent until the response is received. Default: 5 s; PLC Setup: 0.1 to 25.5 s Note: If a timeout occurs, the FINS end code 0205 hex (response timeout) will be returned to the FINS source.	A61902 (RS-232C Port Settings Changing Flag)	Takes effect the next cycle. (Also can be changed with STUP (237).)

7-1-2-8 Peripheral Port Tab Page



The following settings are valid when pin 4 on the DIP switch on the CPU Unit is ON.

Host Link Settings

Communications Settings

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+144	15	0: Standard* 1: PLC Setup (Custom) Default: 0	*The default settings are for 1 start bit, 7 data bits, even parity, 2 stop bits, and a baud rate of 9,600 bps.	A61901 (Peripheral Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

Mode: Communications Mode

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+144	8 to 11	00: Host Link 05: Host link Default: 0	This setting determines whether the peripheral port will operate in host link mode or another serial communications mode. (Host link can be specified with 00 or 05.) The Peripheral Bus Mode is for communications with Programming Devices other than the Programming Console.	A61901 (Peripheral Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

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Format: Data Bits

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+144	3	0: 7 bits 1: 8 bits Default: 0	These settings are valid only when the communications mode is set to Host link. These settings are also valid only when the Peripheral Port Settings Selection is set to 1: PLC Setup.	A61901 (Peripheral Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

Format: Stop Bits

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+144	2	0: 2 bits 1: 1 bit Default: 0	These settings are valid only when the communications mode is set to Host link. These settings are also valid only when the Peripheral Port Settings Selection is set to 1: PLC Setup.	A61901 (Peripheral Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

Format: Parity

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+144	0 and 1	00: Even 01: Odd 10: None Default: 00	These setting is valid only when the communications mode is set to Host link. These settings are also valid only when the Peripheral Port Settings Selection is set to 1: PLC Setup.	A61901 (Peripheral Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

Baud Rate (bps)

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+145	0 to 7	00: 9,600 bps 01: 300 bps 02: 600 bps 03: 1,200 bps 04: 2,400 bps 05: 4,800 bps 06: 9,600 bps 07: 19,200 bps 08: 38,400 bps 09: 57,600 bps 0A: 115,200 bps Default: 00	This setting is valid only when the communications mode is set to the Host Link mode. These settings are also valid only when the Peripheral Port Settings Selection is set to 1: PLC Setup.	A61901 (Peripheral Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

Unit Number (for CPU Unit in Host Link Mode)

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+147	0 to 7	00 to 1F (0 to 31) Default: 00	This setting determines the CPU Unit's unit number when it is connected in a 1-to-N (N=2 to 32) Host Link.	A61901 (Peripheral Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

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NT Link Settings

Mode: Communications Mode

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+144	8 to 11	02: 1:N NT Link Default: 0	This setting determines whether the RS-232C port will operate in host link mode or another serial communications mode. **Note** Communications will not be possible with PTs set for 1:1 NT Links.	A61902 (RS-232C Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

Baud Rate (bps)

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+145	0 to 7	00: Standard 0A: High-speed NT Link* Default: 00	* Set to 115,200 bps when setting this value from the CX-Programmer.	A61901 (Peripheral Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

NT Link Max. (Maximum Unit Number in NT Link Mode)

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+150	0 to 3	0 to 7 Default: 0	This setting determines the highest unit number of PT that can be connected to the PLC in NT Link mode.	A61901 (Peripheral Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

Peripheral Bus Settings

Communications Setting

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+144	15	0: Default (standard)* 1: PLC Setup (custom) Default: 0	*The default settings are for a baud rate of 9,600 bps.	A61901 (Peripheral Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

Mode: Communications Mode

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+144	8 to 11	4: Peripheral bus Default: 0	This setting determines whether the communications mode for the peripheral port. The Peripheral Bus Mode is used for all Programming Devices except for Programming Consoles.	A61901 (Peripheral Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

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Baud Rate (bps)

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+145	0 to 7	00: 9,600 bps 06: 9,600 bps 07: 19,200 bps 08: 38,400 bps 09: 57,600 bps 0A: 115,200 bps Default: 00	The following settings are valid for the Peripheral Bus Mode: 00 and 06 to 0A hex.	A61901 (Peripheral Port Settings Changing Flag)	At the next cycle. (Also can be changed with STUP (237).)

Serial Gateway Settings

Communications Setting

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+144	15	0: Default (standard)* 1: PLC Setup (custom)	*The default settings are for a baud rate of 9,600 bps.	A61901 (Peripheral Port Settings Changing Flag)	Takes effect the next cycle. (Also can be changed with STUP (237).)

Mode: Communications Mode

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+144	8 to 11	9: Serial Gateway Default: 0	This setting determines whether the communications mode for the peripheral port. The peripheral bus mode is used for all Programming Devices except for Programming Consoles.	A61901 (Peripheral Port Settings Changing Flag)	Takes effect the next cycle. (Also can be changed with STUP (237).)

Format: Data Bits

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+144	3	0: 7 bits 1: 8 bits Default: 0	These settings are valid when the Peripheral Port Settings Selection is set to 1: PLC Setup.	A61901 (Peripheral Port Settings Changing Flag)	Takes effect the next cycle. (Also can be changed with STUP (237).)

Format: Stop Bits

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+144	2	0: 2 bits 1: 1 bit Default: 0	These settings are valid when the Peripheral Port Settings Selection is set to 1: PLC Setup.	A61901 (Peripheral Port Settings Changing Flag)	Takes effect the next cycle. (Also can be changed with STUP (237).)

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Format: Parity

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+144	0 to 1	00: Even 01: Odd 10: None Default: 00	These setting is valid only when the communications mode is set to Host Link. These settings are also valid only when the Peripheral Port Settings Selection is set to 1: PLC Setup.	A61901 (Peripheral Port Settings Changing Flag)	Takes effect the next cycle. (Also can be changed with STUP (237).)

Baud Rate (bps)

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+145	0 to 7	00: 9,600 01: 300 02: 600 03: 1,200 04 2,400 05: 4,800 06: 9,600 07: 19,200 08: 38,400 09: 57,600 0A: 115,200 Default: 00	These setting is valid only when the communications mode is set to Host Link. These settings are also valid only when the Peripheral Port Settings Selection is set to 1: PLC Setup.	A61901 (Peripheral Port Settings Changing Flag)	Takes effect the next cycle. (Also can be changed with STUP (237).)

Response Monitoring Time

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+151	8 to 15	00: 5 s 01 to FF: 100 to 25,500 ms (Unit: 100 ms) Default: 00	Monitors the time from when the FINS command is converted into CompoWay/F using Serial Gateway and sent until the response is received. Default: 5 s; PLC Setup: 0.1 to 25.5 s Note: If a timeout occurs, the FINS end code 0205 hex (response timeout) will be returned to the FINS source.	A61901 (Peripheral Port Settings Changing Flag)	Takes effect the next cycle. (Also can be changed with STUP (237).)

7-1-2-9 Peripheral Service Tab Page (CPU Processing Mode Settings)

Peripheral Service Mode (Peripheral Servicing Priority Mode)

Instruction Execution Time

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+219	08 to 15	00 05 to FF (hex) Default: 00 (hex)	The Peripheral Servicing Priority Mode will be used if a time slice is set for instruction execution (5 to 255 ms in 1-ms increments). Instructions will be executed at the set time slice. 00: Disable priority servicing 05 to FF: Time slice for instruction execution (5 to 255 ms in 1-ms increments)	A266 and A267	At start of operation (Can't be changed during operation.)

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Peripheral Service Execution Time

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+219	00 to 07	00 to FF (hex) Default: 00 (hex)	This parameter sets the time slice for peripheral servicing (0.1 to 25.5 ms in 0.1-ms increments). The specified amount of time will be used to service peripherals for each time slice. 00: Disable priority servicing 01 to FF: Time slice for peripheral servicing (0.1 to 25.5 ms in 0.1-ms increments)	A266 and A267	At start of operation (Can't be changed during operation.)

Target Units (Units for Priority Servicing)

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+220	08 to 15	00 10 to 1F 20 to 2F E1 FC FD Default: 00	Up to five Units can be specified for priority servicing. 00: Disable priority servicing 10 to 1F: CPU Bus Unit unit number (0 to 15) + 10 (hex) 20 to 7F: CS-series Special I/O Unit unit number (0 to 96) + 20 (hex) FC: RS-232C port FD: Peripheral port	---	At start of operation (Can't be changed during operation.)
	00 to 07				
+221	08 to 15				
	00 to 07				
+222	08 to 15				

Sync/Async Comms (Parallel Processing Modes)

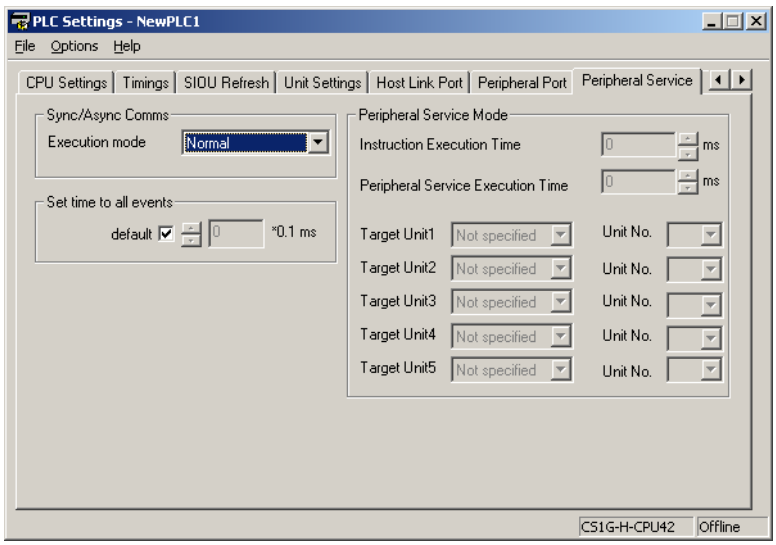
The following setting is supported only by the CS1-H CPU Units

Execution Mode (Parallel Processing Mode)

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+219	08 to 15	00 01 02 Default: 00	This parameter specifies if I/O memory access is to be included in the peripheral service processing executed in parallel with instruction execution. 00: Not specified (disable parallel processing) 01: Synchronous (Synchronous Memory Access 02: Asynchronous (Asynchronous Memory Access)	---	At start of operation (Can't be changed during operation.)

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Set Time to All Events (Fixed Peripheral Servicing Time)



Enable Fixed Servicing Time

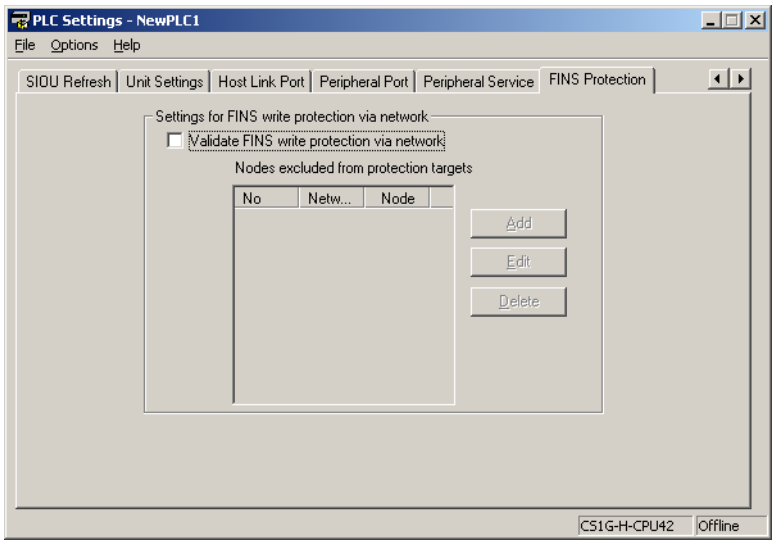
Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+218	15	0: Default* 1: Bits 0 to 7 Default: 0	Set to 1 to enable the fixed peripheral servicing time in bits 0 to 7. *Default: 4% of the cycle time	---	At start of operation (Can't be changed during operation.)

Fixed Servicing Time

Programming Console address		Settings	Function	Related flags and words	When setting is read by CPU Unit
Word	Bit(s)				
+218	0 to 7	00 to FF: 0.0 to 25.5 ms (0.1-ms units) Default: 00	Set the peripheral servicing time. This setting is valid only when bit 15 of 218 is set to 1.	---	At start of operation (Can't be changed during operation.)

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7-1-2-10 FINS Protection Tab Page (Protection Against FINS Writes Across Networks) (CS-series CPU Unit Ver. 2.0 Only)



Enabling FINS Write Protection (Use FINS Write Protection)

Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
+448	15	0: Disable FINS write protection 1: Enable FINS write protection Default: 0	Enables or disables write protection for the CPU Unit from FINS command sent over a network (i.e., all connections except for serial connections).	---	At any time

Nodes Excluded from Write Protection (Protection Releasing Addresses)

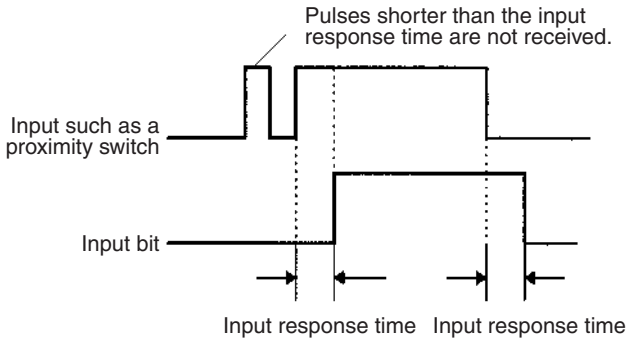
Programming Console address		Settings	Function	Related flags and words	New setting's effectiveness
Word	Bit(s)				
Set the nodes and networks from which FINS write operations will be enabled. The total number of nodes set to be excluded from write protection will be automatically set. A maximum of 32 nodes can be set. If these settings are not made (i.e., if the total number of nodes is 0), write operations will be disabled for all nodes but the local node. Note: This setting is valid only when FINS write protection has been enabled.					
+449 to 480	8 to 15	0 to 127 (00 to 7F hex)	FINS command source network address	---	At any time
	0 to 7	1 to 255 (01 to FE hex) Note: 255 (FF hex) can be set to include all nodes in the specified network.	FINS command source node address	---	
+448	0 to 7	0 to 32 (00 to 20 hex)	Number of nodes excluded from protection (Automatically calculated by the CX-Programmer; do not set.)	---	

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7-2 Explanations of PLC Setup Settings

Basic I/O Unit Input Response Time

The input response time can be set for CS-series Basic I/O Units by Rack and Slot number. Increasing this value reduces the effects of chattering and noise. Decreasing this value allows reception of shorter input pulses, (but do not set the ON response time or OFF response time to less than the cycle time).



The default setting for the input response time is 8 ms and the setting range is 0 to 32 ms. When the input response time is set to 0 ms, the only delay will be the delays in the Unit's internal elements. For information on the Unit's internal elements, refer to *Appendix A Specifications of Basic I/O Units and High-density I/O Units* and check the input response time for the Unit that you are using.

The input response time settings are transferred to the CS-series Basic I/O Units when the PLC is turned on.

When the Unit's settings are changed, they are stored in A220 to A259 (Actual Input Response Times for Basic I/O Units). When the settings in the PLC Setup have been changed with the PLC in PROGRAM mode, the PLC Setup settings will differ from the actual settings in the Units. In this case, the values in A220 to A259 can be checked to see the input response times actually set in the Units.

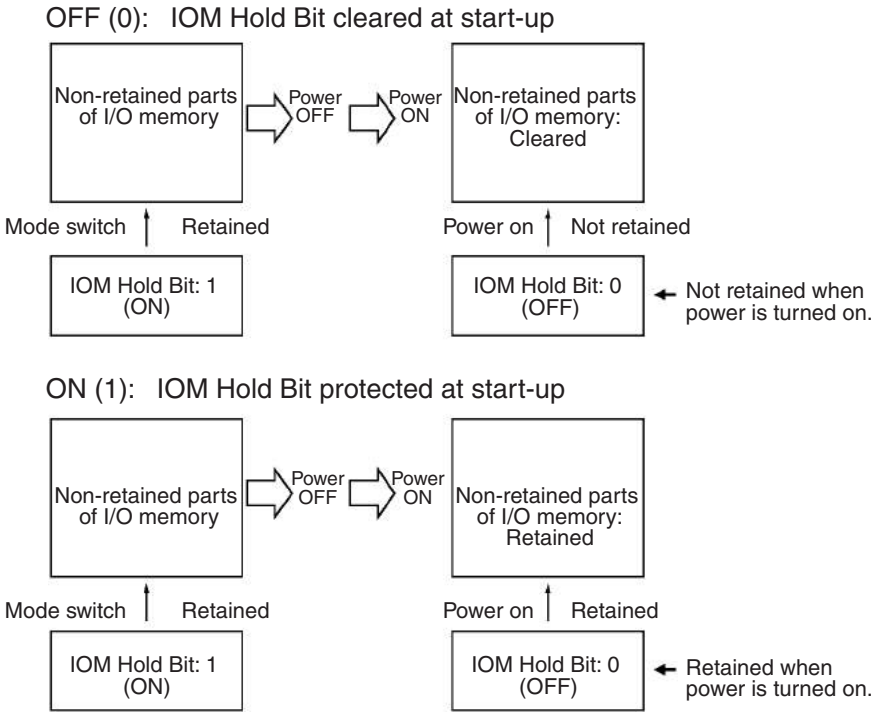
IOM Hold Bit Status at Startup

The IOM Hold Bit (A50012) can be turned ON to retain all of the data in I/O Memory when the CPU Unit's operating mode is switched between PROGRAM mode and RUN/MONITOR mode. When the PLC is turned on, the IOM Hold Bit itself will be cleared (OFF) unless it is protected with this PLC Setup setting.

If the IOM Hold Bit Status at Startup setting is ON, the status of the IOM Hold Bit will be protected when the PLC is turned on. If this setting is ON and the IOM Hold BIt itself is ON, all data in I/O memory will be retained when the PLC is turned on.

Note If the backup battery fails or is disconnected, the IOM Hold Bit will be cleared whether this setting is ON or OFF.

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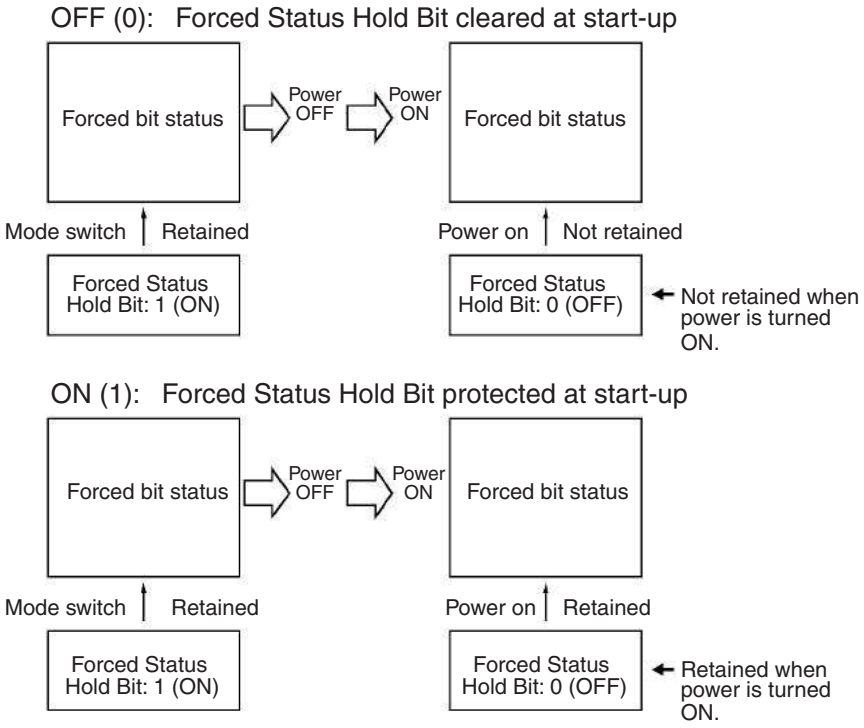
Forced Status Hold Bit at Startup

The Forced Status Hold Bit (A50013) can be turned ON to retain the forced status of all bits that have been force-set or force-reset when the CPU Unit's operating mode is switched between PROGRAM mode and RUN/MONITOR mode. When the PLC is turned on, the Forced Status Hold Bit itself will be cleared (OFF) unless it is protected with this PLC Setup setting.

If the Forced Status Hold Bit at Startup setting is ON, the status of the Forced Status Hold Bit will be protected when the PLC is turned on. If this setting is ON and the Forced Status Hold BIt itself is ON, all force-set and force-reset bits will retain their forced status when the PLC is turned on.

Note If the backup battery fails or is disconnected, the Forced Status Hold Bit will be cleared whether this setting is ON or OFF.

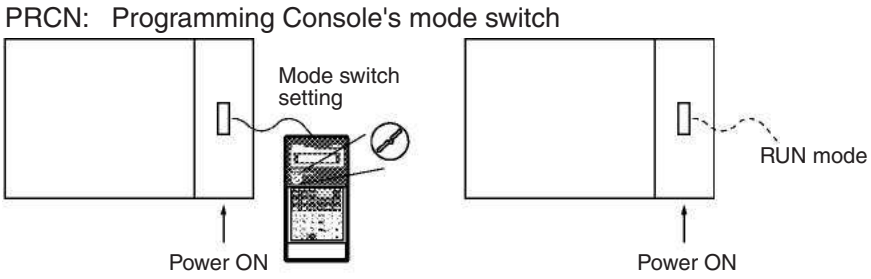
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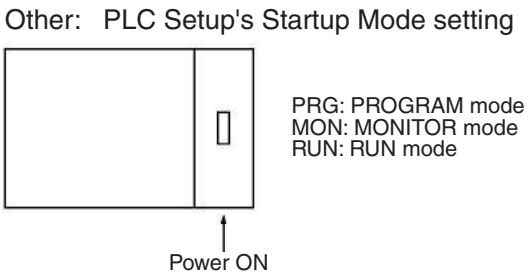


Startup Mode Setting

This setting determines whether the startup mode will be the mode set on the Programming Console's mode switch or the mode set here in the PLC Setup.

⚠ **Caution** The CS1-H CPU Unit will start in RUN mode if it is set to use the mode that is specified on the Programming Console but a Programming Console is not connected.





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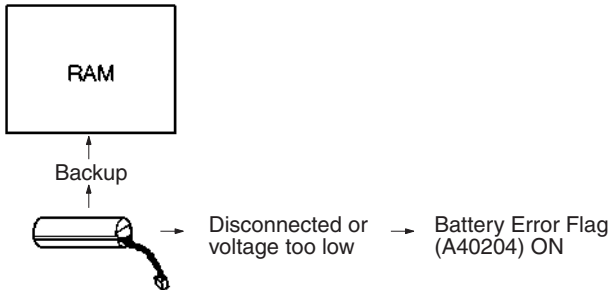
Detect Low Battery

This setting determines whether CPU Unit battery errors are detected. Set the PLC Setup so that battery errors are not detected when using battery-free operation. Refer to information on battery-free operation in the *CS/CJ Series Programming Manual* for details.

If this setting is set to detect errors (0) and a battery error is detected, the Battery Error Flag (A40204) will be turned ON.

Note

1. The contents of the DM, EM, and HR Areas in the CPU Unit are not backed up to flash memory; they are backed up only by a Battery. If the Battery voltage drops, this data may be lost. Provide countermeasures in the program using the Battery Error Flag (A40204) to re-initialize data or take other actions if the Battery voltage drops.
2. A battery error will be detected when the battery is disconnected or its voltage drops below the minimum allowed.



Detect Interrupt Task Error

If this setting is set to detect errors (0), an interrupt task error will be detected in the following cases:

- An interrupt task is executed for more than 10 ms during I/O refreshing of a C200H Special I/O Unit or SYSMAC BUS Remote I/O.
- IORF(097) is executed in an interrupt task to refresh a Special I/O Unit's I/O while that Unit's I/O is being refreshed during cyclic refreshing.

EM File Memory Settings

These settings are used to specify converting not converting part of the EM Area to file memory.

CX-Programmer

With the CX-Programmer, file memory will be formatted when file memory conversion and the number of banks to be converted is specified when transferring the PLC Setup. (EM banks cannot be formatted as file memory unless they have been specified as file memory in the PLC Setup.)

Once part of the EM Area has been formatted for use as file memory, it can be converted back to normal EM Area usage by changing these PLC Setup settings back to their previous value and "un-formatting" the EM banks with a Programming Device.

Programming Console

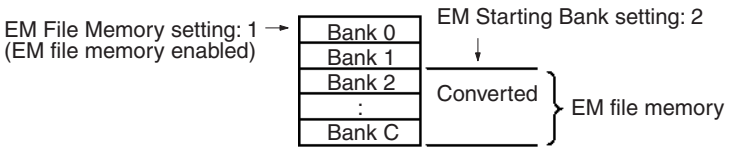
The specified EM bank and all subsequent banks will be set aside as file memory. Changing these settings using the Programming Console does not format the specified EM banks; the EM banks must be formatted with a Programming Device after changing these PLC Setup settings. When formatting the EM banks with a Programming Console, refer to *7-2 Memory Card Format* in the *Programming Console Operation Manual* (W341).

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Note

1. The actual starting file memory bank is stored in A344 (EM File Memory Starting Bank). When the settings in the PLC Setup have been changed but the EM Area hasn't been formatted, the PLC Setup setting will differ from the actual file memory setting in the EM Area. In this case, the values in A344 can be checked to see the actual file memory setting.
2. The EM Area cannot be formatted if the current EM bank is one of the banks that is being converted to file memory.

The following example shows EM banks 2 to C (12) converted to file memory.

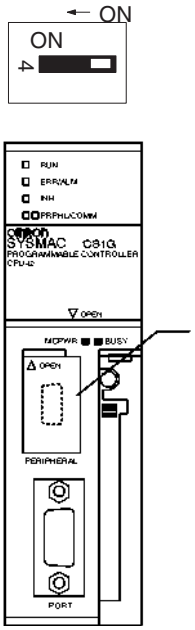


Peripheral Port Settings

These settings are effective only when pin 4 of the DIP switch on the front of the CPU Unit is ON.

The default settings for the peripheral port are: host link mode, 1 start bit, 7 data bits, even parity, 2 stop bits, and a baud rate of 9,600 bps. Set the peripheral port settings in the PLC Setup when you need to change these settings.

Note When pin 4 of the DIP switch on the front of the CPU Unit is OFF, the CPU Unit automatically detects the communications parameters of a connected Programming Device (including Programming Consoles). Those automatically detected parameters are not stored in the PLC Setup.



Peripheral port communications settings when DIP switch pin 4 is ON:

Default settings:
Host link mode, 1 start bit, 7 data bits, even parity, 2 stop bits, and a baud rate of 9,600 bps

User-defined settings:
Set the communications mode (host link, NT Link, or peripheral bus) and other settings such as the baud rate.

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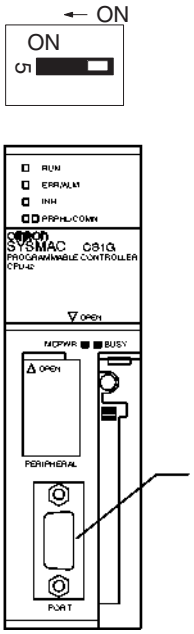
RS-232C Port Settings

These settings are effective only when pin 5 of the DIP switch on the front of the CPU Unit is OFF.

The default settings for the RS-232C port are: host link mode, 1 start bit, 7 data bits, even parity, 2 stop bits, and a baud rate of 9,600 bps. Set the RS-232C port settings in the PLC Setup when you need to change these settings. Specify the frame format when no-protocol mode is selected.

The RS-232C port settings can also be changed with STUP(237). The RS-232C Port Settings Changing Flag (A61902) is turned ON when STUP(237) is executed and it is turned OFF when the RS-232C port settings have been changed.

Note When pin 5 of the DIP switch on the front of the CPU Unit is ON, the CPU Unit automatically detects the communications parameters of a Programming Device (including Programming Consoles) connected to the RS-232C port. Those automatically detected parameters are not stored in the PLC Setup.



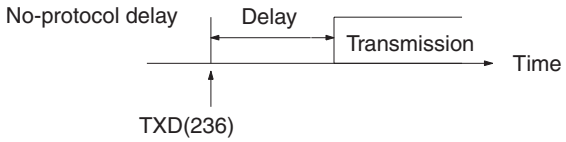
RS-232C port communications settings when DIP switch pin 5 is OFF:

Default settings:
Host link mode, 1 start bit, 7 data bits, even parity, 2 stop bits, and a baud rate of 9,600 bps

User-defined settings:
Set the communications mode (host link, NT Link, no-protocol*, or peripheral bus) and other settings such as the baud rate.

*See notes 1 and 2 for details on no-protocol mode.

Note 1. A no-protocol transmission delay (address 162) can be set in no-protocol mode. The operation of this delay is shown in the following diagram.



2. The following table shows the message formats that can be set for transmissions and receptions in no-protocol mode. The format is determined by the start code (ST) and end code (ED) settings. (From 1 to 256 bytes can be received in no-protocol mode.)

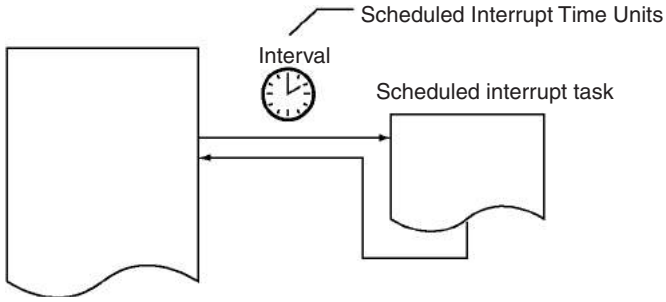
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Start code setting	End code setting		
	None	Yes	CR+LF
None	DATA	DATA+ED	DATA+CR+LF
Yes	ST+DATA	ST+DATA+ED	ST+DATA+CR+LF

Scheduled Interrupt Time Units

This setting determines the time units for the scheduled interrupt interval settings. Set the scheduled interrupt interval from the program with MSKS(690).

Note This setting cannot be changed while the CPU Unit is in RUN or MONITOR mode.



Instruction Error Operation

This setting determines whether instruction execution errors are treated as non-fatal (0) or fatal errors (1). A program error will be generated as an instruction error if any of the following flags is turned ON.

Instruction error flag	Address	Cause
Instruction Processing Error Flag	A29508	The ER Flag was turned ON.
Indirect DM/EM BCD Error Flag	A29509	The contents of a DM/EM word wasn't BCD when BCD was required for indirect addressing.
Illegal Access Error Flag	A29510	Attempted to access part of memory that is off-limits from the program.

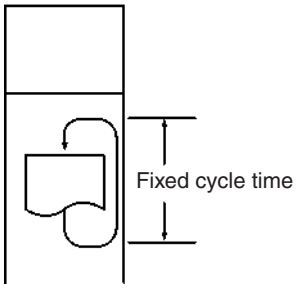
If this setting is OFF (0), PLC operation will continue after one of these errors.
If this setting is ON (1), PLC operation will stop after one of these errors.

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Minimum Cycle Time

Set the minimum cycle time to a non-zero value to eliminate inconsistencies in I/O responses. This setting is effective only when the actual cycle time is shorter than the minimum cycle time setting. If the actual cycle time is longer than the minimum cycle time setting, the actual cycle time will remain unchanged.

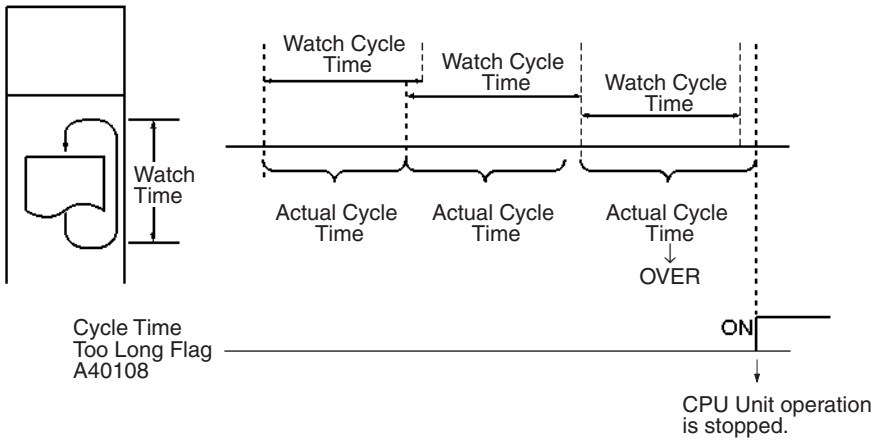
Note The minimum cycle time setting cannot be changed while the CPU Unit is in RUN or MONITOR mode. As the length of the cycle time increases, the interval for servicing Programming Devices will also increase. The may slow down the response to online operations from a Programming Device or make it difficult to establish an online connection.



Watch Cycle Time

If the cycle time exceeds the watch (maximum) cycle time setting, the Cycle Time Too Long Flag (A40108) will be turned ON and PLC operation will be stopped. This setting must be changed if the normal cycle time exceeds the default watch cycle time setting of 1 s.

Note The watch cycle time setting cannot be changed while the CPU Unit is in RUN or MONITOR mode.



Note The default value for the watch cycle time is 1 s (1,000 ms).

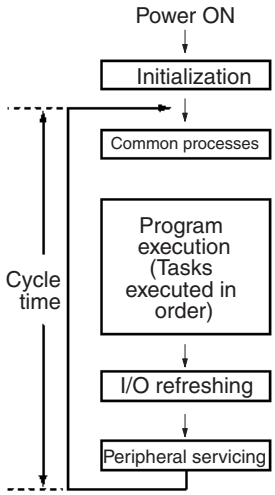
Fixed Peripheral Servicing Time

This setting determines whether the peripheral servicing for the following processes is performed with the default settings (4% of the cycle time) or all together in a fixed servicing time.

Exchange data with CS-series Special I/O Units when necessary
Exchange data with CS-series CPU Bus Units when necessary
Exchange data with peripheral port
Exchange data with serial communications ports
Exchange data with Inner Board
Service file access operations (Memory Card)

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Peripheral servicing is performed at the end of the cycle, just after I/O refreshing.



The following table shows a breakdown of the peripheral servicing time.

Peripheral servicing time	Default value	Setting range
Event service time for CS-series Special I/O Units	4% of the previous cycle's cycle time	Uniform servicing time in ms: 0.0 to 25.5 ms in 0.1-ms units
Event service time for CS-series CPU Bus Units	Same as above.	
Event service time for peripheral port	Same as above.	
Event service time for RS-232C port	Same as above.	
Event service time for serial communication ports	Same as above.	
File access service time for Memory Card	Same as above.	

The default value for each servicing process is 4% of the last cycle's cycle time.

In general, we recommend using the default value. Set a uniform servicing time only when peripheral servicing is being delayed because each service process is being spread over several cycles.

Note

1. When the peripheral servicing time is set to a time longer than the default value, the cycle time will also be longer.
2. The fixed peripheral servicing time setting cannot be changed while the CPU Unit is in RUN mode or MONITOR mode.
3. Use the Peripheral Servicing Priority Mode to give priority to servicing peripheral over program execution. Refer to the *CS/CJ Series Programming Manual* for details.

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Power OFF Interrupt Task

This setting determines whether or not a power OFF interrupt task will be executed when a power interruption is detected. (When this setting is set to 0, the regular program will just stop when a power interruption is detected.)

The power OFF interrupt task will be stopped when the power hold time (processing time after power interrupt + power OFF detection delay time) has elapsed. The maximum power hold time is 10 ms.

When a power OFF detection delay time has to be set, be sure that the power OFF interrupt task can be executed in the available time (10 ms – power OFF detection delay time).

Note The power OFF interrupt task setting cannot be changed while the CPU Unit is in RUN mode or MONITOR mode.

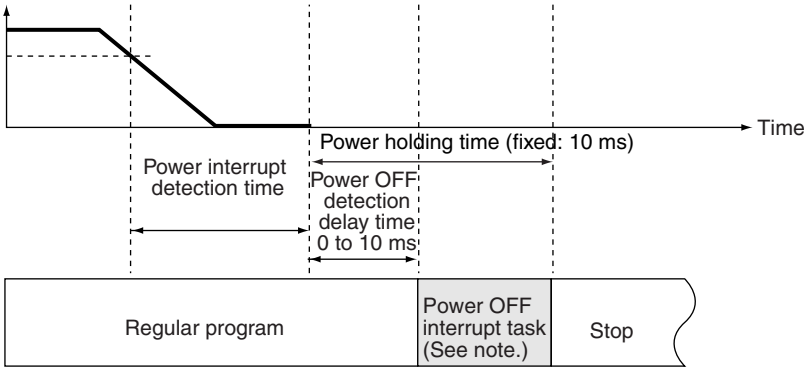
Power OFF Detection Delay Time

This setting determines how much of a delay there will be from the detection of a power interruption (approximately after the power supply voltage drops below 85% of the rated value) until a power interruption is established and the regular program is stopped. The setting can be between 0 and 10 ms.

It takes a maximum of 10 ms for the internal 5 V DC power supply to drop to 0 V DC after the initial power interrupt detection time. Extend the time until detection of a power interruption when momentary interruptions in a bad power supply are causing PLC operation to stop.

Note The power OFF detection delay time setting cannot be changed while the CPU Unit is in RUN mode or MONITOR mode.

Power Interrupt Detection Time
AC power supply: 10 to 25 ms (not consistent)
DC power supply: 2 to 5 ms (not consistent)

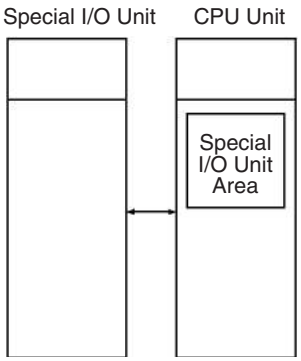


Note The execution time for the power OFF interrupt task must be less than the maximum time available, namely: 10 ms – power OFF detection delay time. Refer to *CS/CJ Series Programming Manual* for details on the power interrupt task and on CPU Unit operation when power is turned OFF.

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Special I/O Unit Cyclic Refreshing

When a Special I/O Unit will be refreshed in an interrupt task by IORF(097), always disable cyclic refreshing for that Unit with this setting. The expected results will not be achieved and the Interrupt Task Error Flag (A40213) will be turned ON if IORF(097) is executed in an interrupt task during normal I/O refreshing.



These settings determine whether or not data will be exchanged with the 10 words allocated to each Special I/O Unit in the Special I/O Unit Area during cyclic I/O refreshing.

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SECTION 8
I/O Allocations

This section describes I/O allocations to Basic I/O Units, Special I/O Units, and CPU Bus Units, and data exchange with CPU Bus Units.

8-1 I/O Allocations 370
8-1-1 Unit Types 370
8-1-2 Creating I/O Tables 372
8-2 I/O Allocation Methods 375
8-2-1 I/O Allocations to Basic I/O Units 375
8-2-2 I/O Allocations to Special I/O Units 380
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8-6-2 Disabling Special I/O Unit Cyclic Refreshing 390
8-6-3 CPU Bus Units 391

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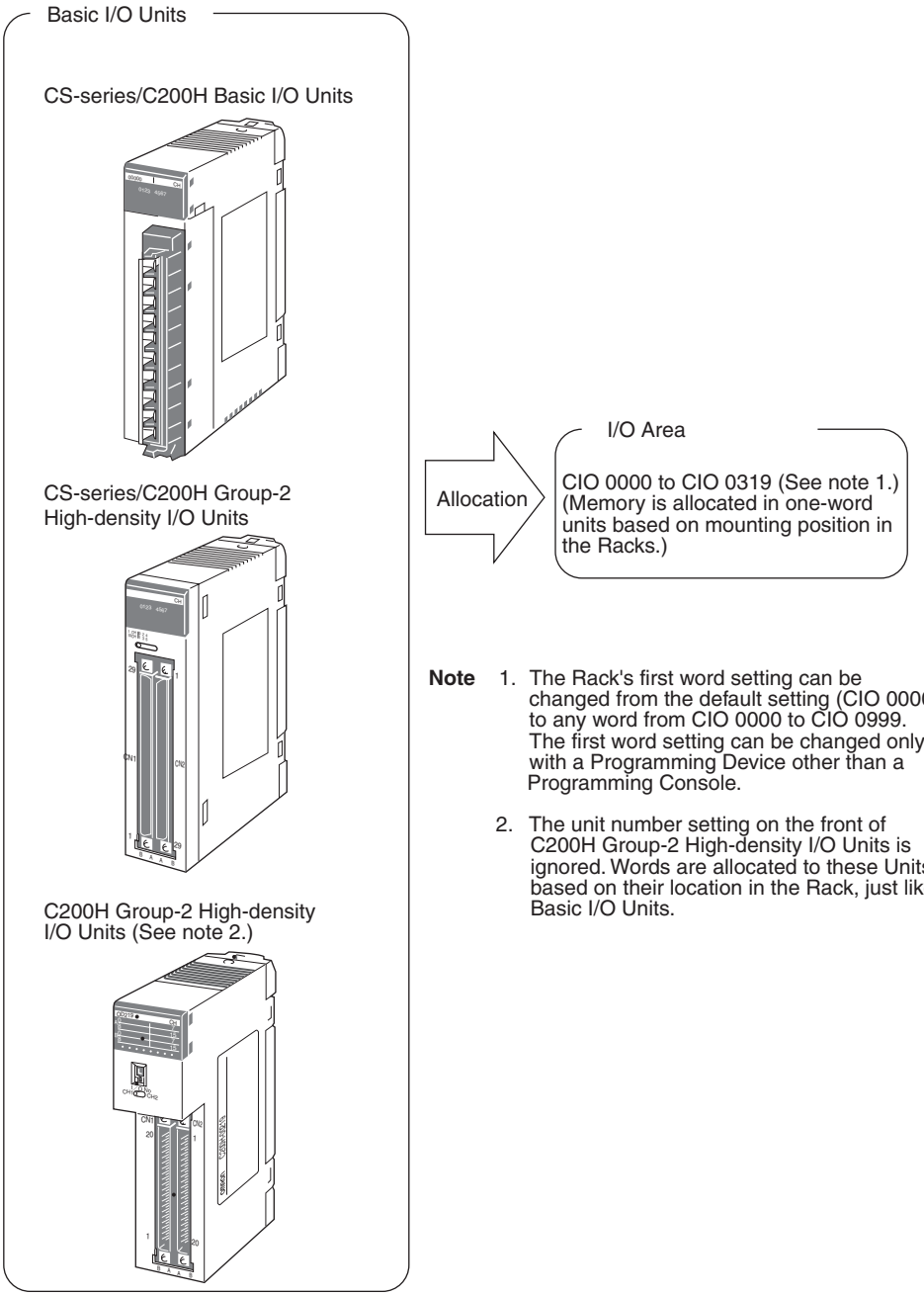
8-1 I/O Allocations

In CS-series PLCs, memory must be allocated to the Units mounted in the PLC. I/O tables containing the models and locations of all Units and the allocations made to each must be created and these I/O tables must be registered in the CPU Unit. When the power supply is turned ON to the CPU Unit, the I/O tables are compared against the mounted Units to verify their accuracy.

8-1-1 Unit Types

Memory is allocated differently to Basic I/O Units, Special I/O Units, and CS-series CPU Bus Units.

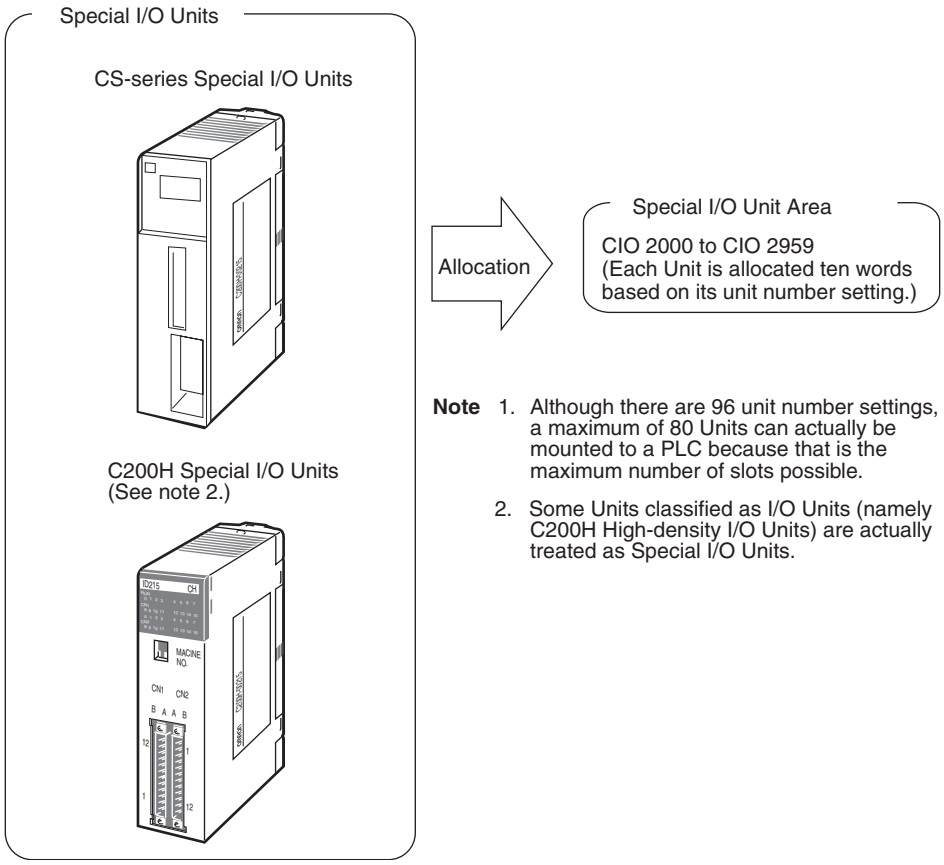
Basic I/O Units



Note
1. The Rack's first word setting can be changed from the default setting (CIO 0000) to any word from CIO 0000 to CIO 0999. The first word setting can be changed only with a Programming Device other than a Programming Console.
2. The unit number setting on the front of C200H Group-2 High-density I/O Units is ignored. Words are allocated to these Units based on their location in the Rack, just like Basic I/O Units.

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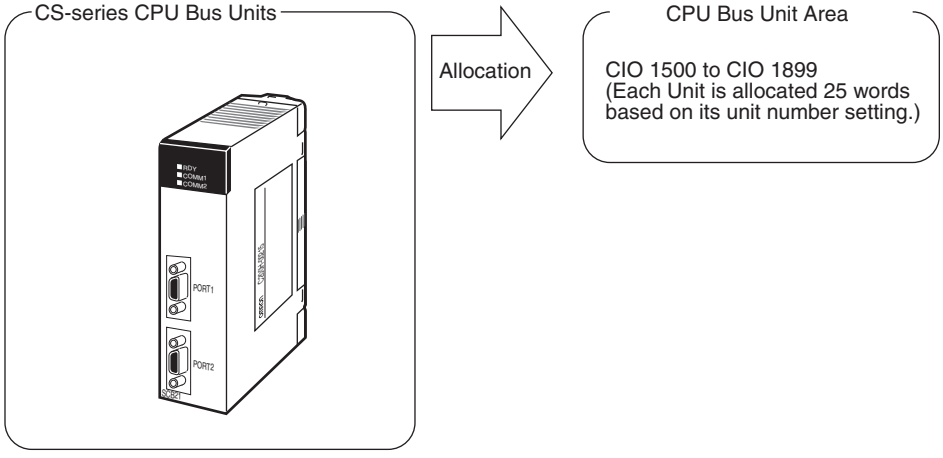
Special I/O Units



Note 1. Although there are 96 unit number settings, a maximum of 80 Units can actually be mounted to a PLC because that is the maximum number of slots possible.

2. Some Units classified as I/O Units (namely C200H High-density I/O Units) are actually treated as Special I/O Units.

CS-series CPU Bus Units



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8-1-2 Creating I/O Tables

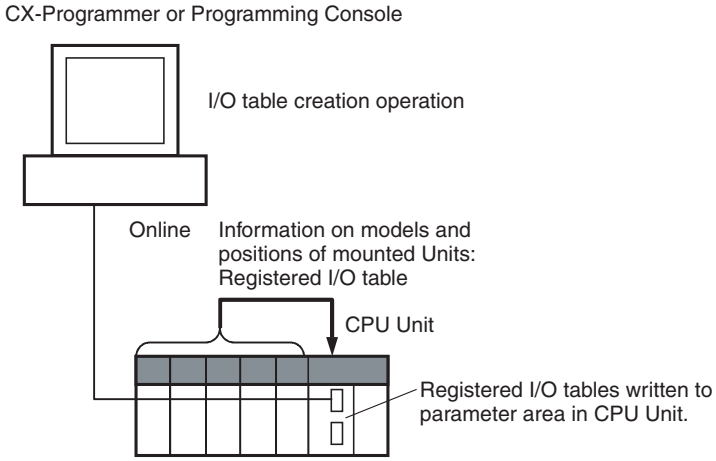
There are two ways to allocate I/O memory to CS-series Units.

- Create the I/O tables online based on the Units actually mounted to the PLC. This can be done from either the CX-Programmer or a Programming Console. The Programming Device is connected online and then the I/O tables are created based on the Units that are mounted.
- Create the I/O tables offline without basing them directly on the mounted Units and then transfer the I/O tables to the PLC. This is done offline on the CX-Programmer.

The word addresses, number of words, and mounting slot for each Unit are registered in the CPU Unit as I/O tables. Data is exchanged between the Units and the CPU Unit, e.g., to help prevent mistakes in mounting when replacing Units.

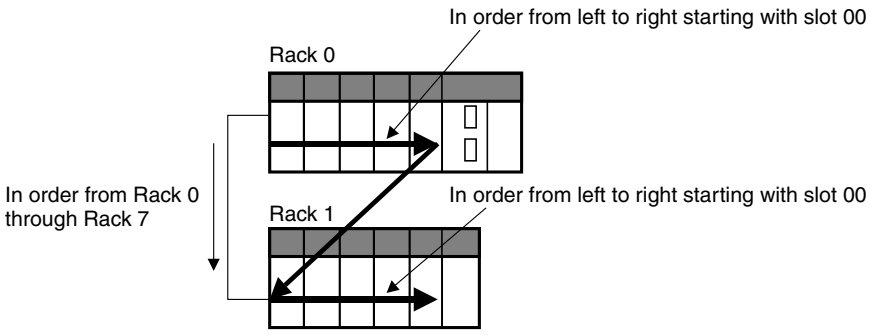
Creating I/O Tables Based on Mounted Units

Connect a Programming Console or the CX-Programmer to a CPU Unit in a PLC with all the Units mounted and create the I/O tables. In the I/O table creation operation, information on the Unit models and mounting locations are registered in the parameter area of the CPU Unit as the registered I/O tables for all Units mounted to the basic PLC system and SYSMAC BUS Remote I/O Racks.



I/O Memory Allocations

When I/O memory is allocated automatically, words are automatically allocated to Units in the order they are mounted to the Racks. Words are allocated to Units from left to right starting on Rack 0 and then left to right on each Rack through Rack 7.



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I/O Table Creation with CX-Programmer

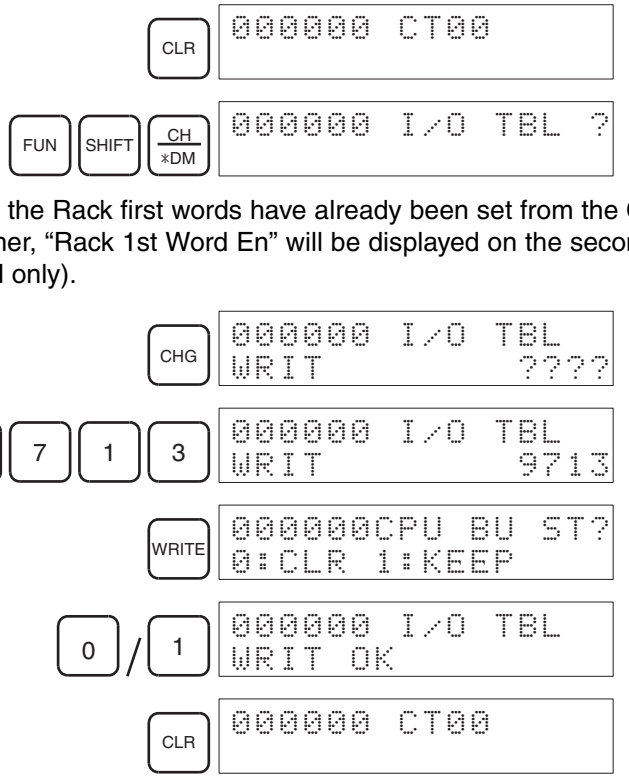
Use the following procedure to create the I/O tables online with the CX-Programmer.

1,2,3...

1. Double-click ***IO Table*** in the project tree in the main window. The I/O Table Window will be displayed.
2. Select ***Options - Create.*** The models and positions of the Units mounted to the Racks will be written to the CPU Unit as the registered I/O tables.

I/O Table Creation with a Programming Console

Use the following procedure to register the I/O table with a Programming Console.



Note If the Rack first words have already been set from the CX-Programmer, “Rack 1st Word En” will be displayed on the second line (CS1-H only).

Creating I/O Tables without Mounted Units

With the CX-Programmer, I/O tables can be created offline without mounted Units and then transferred to the CPU Unit. The information on Unit models and mounting locations are written to the parameter area of the CPU Unit as the registered I/O tables.

I/O Table Creation with CX-Programmer

Use the following procedure to create the I/O tables offline with the CX-Programmer and then transfer them to the CPU Unit. Once the Units that are to be mounted are set for each Rack, the CX-Programmer will automatically allocate words according to Rack and slot positions starting from CIO 0000.

1,2,3...

1. Double-click ***IO Table*** in the project tree in the main window. The I/O Table Window will be displayed.
2. Double-click the Rack to be edited. The slots will be displayed for the Rack.
3. Right-click the slot to which to assign a Unit and select the Unit from the pop-up menu.

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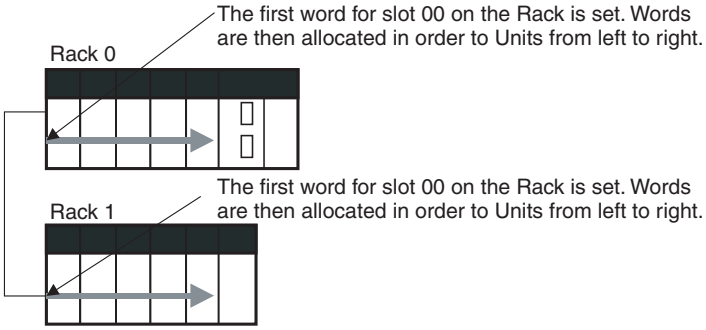
4. When all the desired Units have been assigned to slots, select ***Options - Transfer to PLC***. The I/O tables will be transferred.

With the CX-Programmer, you can also assign any desired word to an I/O Unit regardless of it's position on the Racks.

Setting the First Word on a Rack

The first word allocated on a Rack can be set to allocate specific words to the Units on the Rack regardless of the order in which the Rack is connected. Words will be allocated consecutively to the Units on the Rack in the order that Units are mounted to the Rack. Refer to *8-3 Allocating First Words to Racks* for details.

Setting the First Word on Each Rack

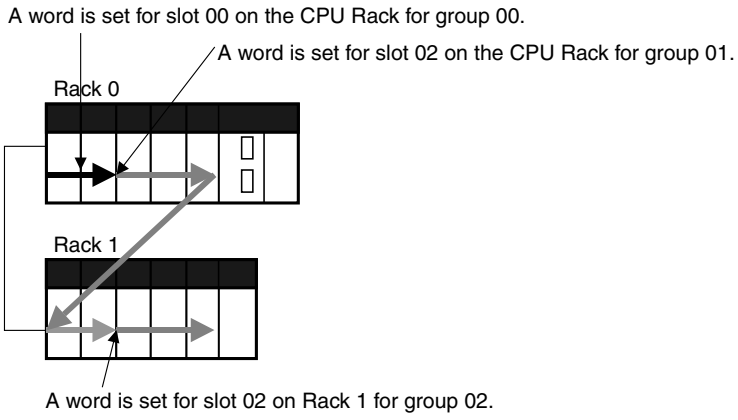


Note The first words for Racks cannot be set at the same time as the first words for slots.

Setting the First Word for a Slot

The first word allocated to the Unit in any slot on any Rack can be set regardless of the order of the Rack or the position of the slot. Words are then allocated in sequence to the following Units in the order they are mounted. Refer to *8-4 Allocating First Words to Slots* for details.

Setting the First Words for Specific Slots



Note The first words for Racks cannot be set at the same time as the first words for slots.

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Overview

Method	Operation	Allocations		Rack allocation order	Slot allocation order within Rack
Using actual mounted Units	Perform I/O table creation online.	Automatic allocations according to mounting position		In order from Rack 0 to Rack 7	Left to right from slot 00
Not using actual mounted Units	Edit the I/O tables offline and transfer them to CPU Unit.	Automatic allocations according to mounting position		In order from Rack 0 to Rack 7	Left to right from slot 00
		Partial manual allocation without restrictions by mounting position	Allocating Rack first words	User-set	Left to right from slot 00
			Allocation slot first words		Left to right from any slot allocated a first word

Note

1. Always create I/O tables either online or by editing them offline and transferring them to the CPU Unit. The CPU Unit will not be able to recognize Basic I/O Units, Special I/O Units, CPU Bus Units, or Units on SYSMAC BUS I/O Rack unless I/O tables are registered in the CPU Unit.
2. For CS1-H CPU Unit Ver. 2.0 or later, CPU Bus Units can be used even if they are not registered in the I/O tables, this function is provided to enable online connections from Programming Devices running on personal computers (e.g., the CX-Programmer) and is not intended for normal system operation. Always register I/O tables in the CPU Unit before starting operation.
3. The C200HX/HG/HE, C200H, and C200HS PLCs use fixed word allocations for slots, enabling operation without I/O tables. I/O tables were created only to prevent Units from being mounted to the wrong slot. With the CS-series PLCs, the words allocated to any particular slots are not fixed. Words are merely allocated to the Units actually mounted. If no Unit is mounted, no words are allocated. If the mounted Unit requires more than one word, the required number of words is allocated. Operation for CS-series PLCs is thus not possible unless I/O tables are registered.

8-2 I/O Allocation Methods

8-2-1 I/O Allocations to Basic I/O Units

Basic I/O Units include the following Units:

- CS-series Basic I/O Units
- C200H Basic I/O Units
- C200H Group-2 High-density I/O Units

These Units are allocated words in the I/O Area (CIO 0000 to CIO 0319) and can be mounted to the CPU Rack, CS-series Expansion Racks, and C200H Expansion I/O Racks (See note 2).

Note

1. Refer to *2-4 Units* for list of specific Basic I/O Units.
2. CS-series Basic I/O Units cannot be mounted to C200H Expansion I/O Racks.

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Allocation Methods

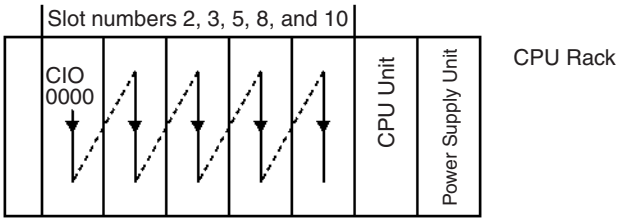
When I/O tables are created in the order of the Racks and the order that Units are mounted, I/O words will be allocated as described below. If a Programming Console or the CX-Programmer is connected online and the I/O tables are created automatically according to the Units that are actually mounted, the CPU Unit will automatically create and register the I/O tables. If the I/O tables are created offline using the CX-Programmer, the CX-Programmer will automatically allocate words according to the Unit settings that have been made.

Basic I/O Units on the CPU Rack

Basic I/O Units on the CPU Rack are allocated words from left to right starting from CIO 0000 and each Unit is allocated as many words as it requires.

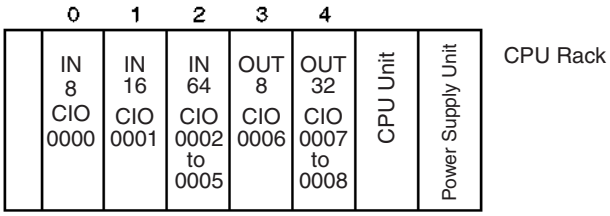
Note

1. Units that have 1 to 16 I/O points are allocated 16 bits (1 word) and Units that have 17 to 32 I/O points are allocated 32 bits (2 words).
2. I/O words are not allocated to empty slots. To allocate words to an empty slot, change the I/O table with a Programming Device.
3. The unit number setting on the front of C200H Group-2 High-density I/O Units is ignored. Words are allocated to these Units based on their location on the Rack, just like Basic I/O Units.



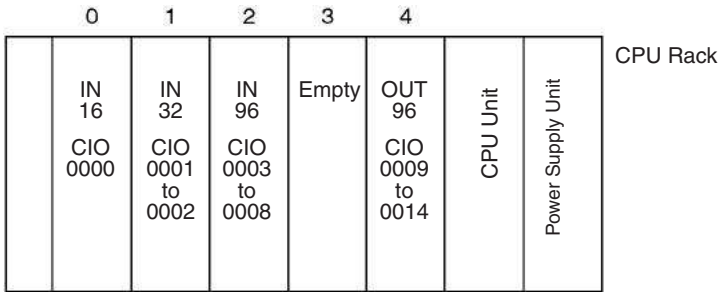
Example 1

The following example shows the I/O allocations to 5 Basic I/O Units on the CPU Rack.



Example 2

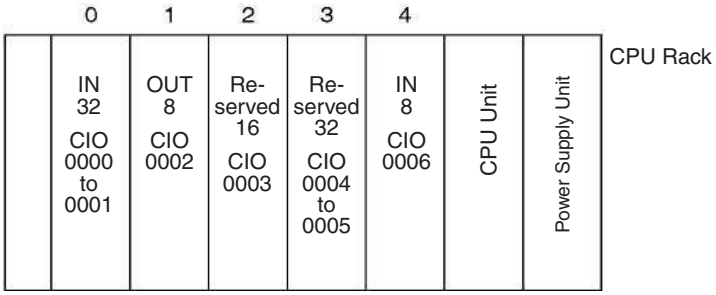
The following example shows the I/O allocations to 4 Basic I/O Units on the CPU Rack with one empty slot.



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Example 3

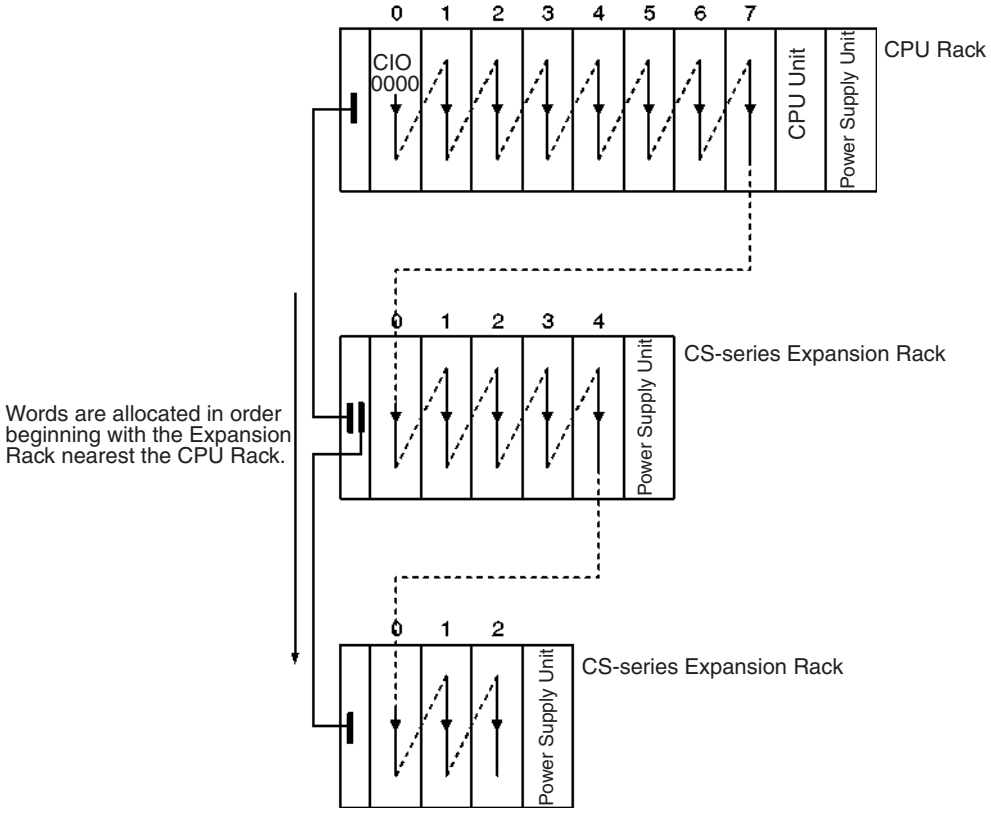
The following example shows the I/O allocations to 5 Basic I/O Units in the CPU Rack. Two slots are filled with Dummy Units to reserve I/O words for those slots.



Note Use the CX-Programmer's I/O table change operation to reserve words for the empty slots.

Basic I/O Units on CS-series and C200H Expansion Racks

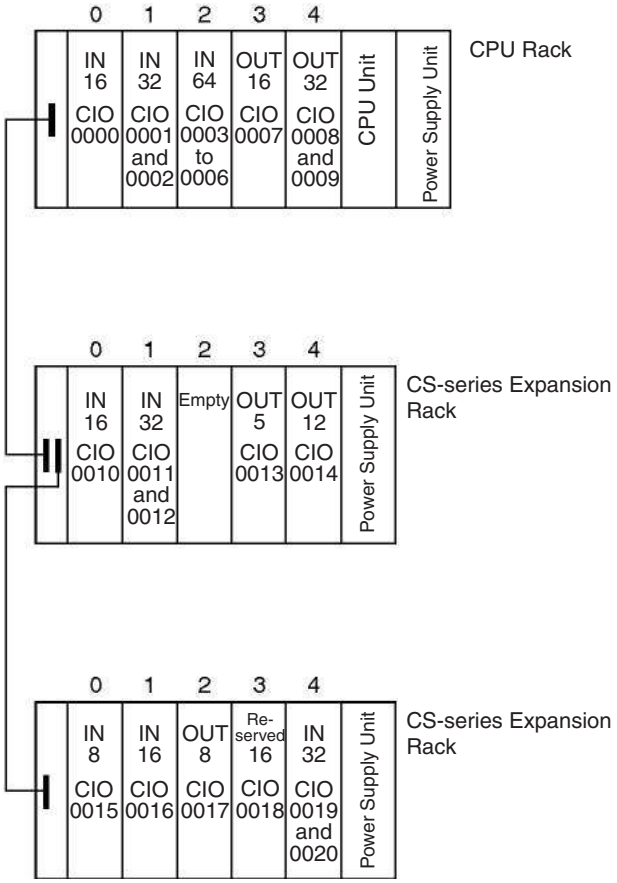
I/O allocation to Basic I/O Units continues from the CPU Rack to the Expansion Rack (CS-series Expansion Rack or C200H Expansion I/O Rack) connected to the CPU Rack. Words are allocated from left to right and each Unit is allocated as many words as it requires, just like Units in the CPU Rack.



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Example

The following example shows the I/O allocation to Basic I/O Units in the CPU Rack and two CS-series Expansion Racks.



Note Use the CX-Programmer's I/O table change operation to reserve a word for the empty slot.

Allocations to CS-series Long-distance Expansion Racks

In configurations containing CS-series Long-distance Expansion Racks, up to two series of CS-series Long-distance Expansion Racks can be included. Words are automatically allocated to the Units mounted to the Racks in order of rack number and slot in the same way as for other configurations. The CPU Rack is rack 0, the CS-series Expansion Rack (if there is one) is Rack 1. Rack numbers are then assigned in order to the Racks in series A of CS-series Long-distance Expansion Racks and finally to the Racks in series B of CS-series Long-distance Expansion Racks, to a maximum rack number of 7. Although words are automatically allocated, the first word on each Rack can be set.

Note

1. I/O words are not allocated to the I/O Control Units or I/O Interface Units.
2. No C200H Units of any kind can be mounted to CS-series Long-distance Expansion Racks.
3. CS-series CPU Bus Units should always be placed on the CPU Rack or CS-series Expansion Rack. Although they can be placed on CS-series Long-distance Expansion Racks, doing so is not recommended because it will increase the cycle time.

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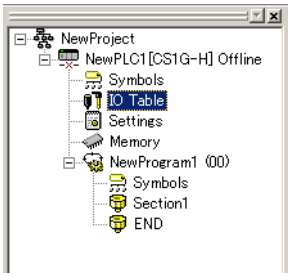
Reserving I/O Words for Expected Changes

If the system configuration will be changed at a later date, changes to the program can be minimized by reserving I/O words in advance for future Unit changes or additions. To reserve I/O words, edit the I/O table with the CX-Programmer.

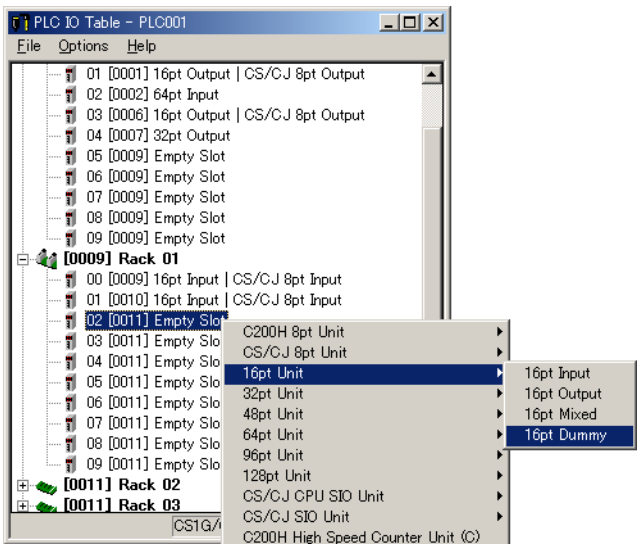
I/O Table Editing Operation

1,2,3...

1. Double-click ***IO Table*** in the project tree in the main window. The I/O Table Window will be displayed.



2. Right-click the slot for which a word is to be reserved and select the *Dummy* item from under the Basic I/O Unit with the correct number of I/O points.



Note

1. Do not execute the I/O table creation operation after completing the above editing operation. The reserved word settings will be lost.
2. The following High-density I/O Units are not Basic I/O Units, but Special I/O Units. These Units are allocated 10 words/Unit in the Special I/O Unit Area (CIO 2000 to CIO 2959) based on their unit number settings. Refer to *8-2-2 I/O Allocations to Special I/O Units* for more details.

Name	Specifications	Model
High-density I/O Units	32-point DC Input Unit	C200H-ID215
	32-point TTL Input Unit	C200H-ID501
	32-point Transistor Output Unit	C200H-OD215
	32-point TTL Output Unit	C200H-OD501
	16-point TTL Input/16-point TTL Output Unit	C200H-MD501
	16-point DC Input/16-point Transistor Output Unit	C200H-MD215
	16-point DC Input/16-point Transistor Output Unit	C200H-MD115

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8-2-2 I/O Allocations to Special I/O Units

Special I/O Units include the following Units:

- CS-series Special I/O Units
- C200H Special I/O Units

Each of these Units is allocated ten words in the Special I/O Unit Area (CIO 2000 to CIO 2959) according the unit number set on the Unit.

Special I/O Units can be mounted to the CPU Rack, CS-series Expansion Racks, and C200H Expansion I/O Racks (see note 2).

Note

1. Refer to *2-4 Units* for more details on the available Special I/O Units.
2. CS-series Special I/O Units cannot be mounted to C200H Expansion I/O Racks.

Word Allocation

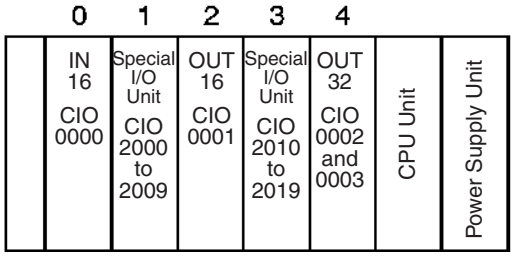
The following table shows which words in the Special I/O Unit Area are allocated to each Unit according to unit number.

Unit number	Words allocated
0	CIO 2000 to CIO 2009
1	CIO 2010 to CIO 2019
2	CIO 2020 to CIO 2029
:	:
15	CIO 2150 to CIO 2159
:	:
95	CIO 2950 to CIO 2959

Special I/O Units are ignored during I/O allocation to Basic I/O Units. Slots containing Special I/O Units are treated as empty slots and aren't allocated any words in the I/O Area.

Example

The following example shows the I/O word allocation to Basic I/O Units and Special I/O Units in the CPU Rack.



Slot	Unit	Words required	Words allocated	Unit number	Group
0	C200H-ID212 16-point DC Input Unit	1	CIO 0000	---	Basic I/O Unit
1	C200H-AD002 Analog Input Unit	10	CIO 2000 to CIO 2009	0	Special I/O Unit
2	C200H-OD21A 16-point Transistor Output Unit	1	CIO 0001	---	Basic I/O Unit
3	C200H-NC211 Position Control Unit	20	CIO 2010 to CIO 2029	1	Special I/O Unit
4	C200H-OD218 32-point Transistor Output Unit	2	CIO 0002 and CIO 0003	---	Basic I/O Unit

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8-2-3 I/O Allocations to CPU Bus Units

Each CPU Bus Unit is allocated 25 words in the CPU Bus Unit Area (CIO 1500 to CIO 1899) according the unit number set on the Unit. CPU Bus Units can be mounted to the CPU Rack or CS-series Expansion Racks.

Word Allocations

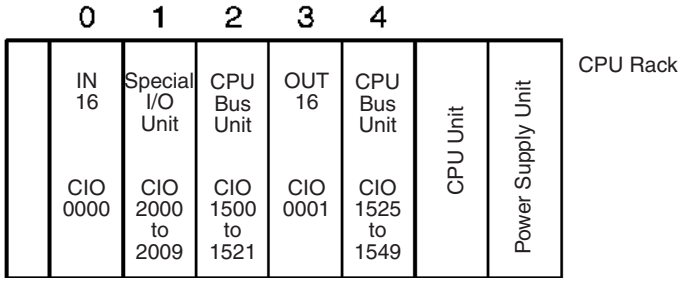
The following table shows which words in the CS-series CPU Bus Unit Area are allocated to each Unit.

Unit number	Words allocated
0	CIO 1500 to CIO 1524
1	CIO 1525 to CIO 1549
2	CIO 1550 to CIO 1574
:	:
15	CIO 1875 to CIO 1899

CS-series CPU Bus Units are ignored during I/O allocation to Basic I/O Units. Slots containing CS-series CPU Bus Units are treated as empty slots and aren't allocated any words in the I/O Area.

Example

The following example shows the I/O word allocation to Basic I/O Units, Special I/O Units, and CS-series CPU Bus Units in the CPU Rack.



Slot	Unit	Words required	Words allocated	Unit number	Group
0	C200H-ID212 16-point DC Input Unit	1	CIO 0000	---	Basic I/O Unit
1	C200H-ASC02/11/21/31 ASCII Unit	10	CIO 2000 to CIO 2009	0	Special I/O Unit
2	C200H-SCU21-V1 Serial Communications Unit	25	CIO 1500 to CIO 1524	0	CS-series CPU Bus Unit
3	C200H-OD21A 16-point Transistor Output Unit	1	CIO 0001	---	Basic I/O Unit
4	C200H-SCU21-V1 Serial Communications Unit	25	CIO 1525 to CIO 1549	1	CS-series CPU Bus Unit

8-2-4 I/O Allocations to SYSMAC BUS Slave Racks

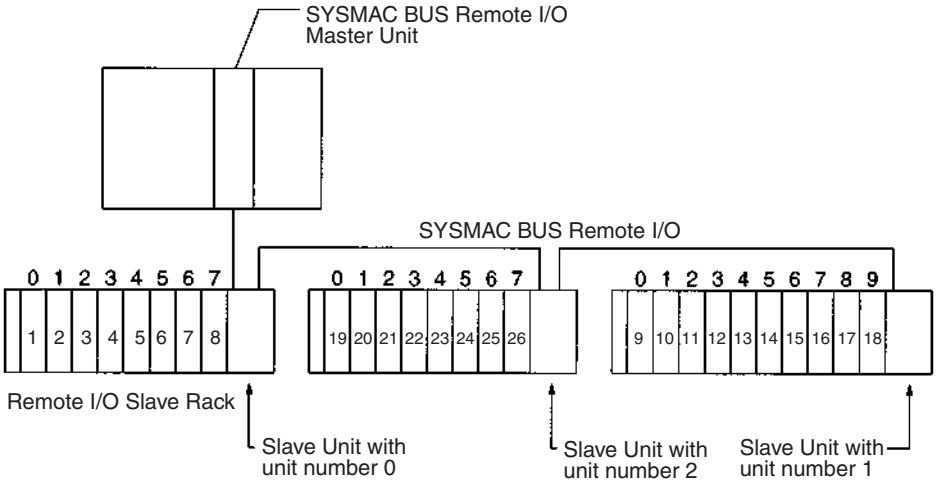
Each SYSMAC BUS Remote I/O Slave Rack is allocated 10 words in the SYSMAC BUS Area (CIO 3000 to CIO 3079) according the unit number (0 to 7) set on the Slave Unit. No words in the I/O Area are allocated to Units in Slave Racks.

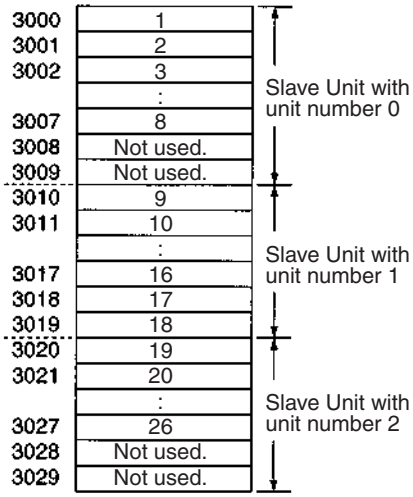
Each slot in the Slave Rack is allocated one of the Rack's 10 words. The words are allocated from left to right. One word is allocated to every slot even if the slot is empty and the last two words allocated to each Rack are not used because the Slave Racks have only 8 slots.

The Master and Slave Units themselves do not require any words.

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Example The following example shows the word allocation to 3 Slave Racks.





CIO 3000 to CIO 3079 can be used as work words/bits when a SYSMAC BUS System is not being used. Also, even if a SYSMAC BUS System is used, words that are not allocated in the SYSMAC BUS System, such as CIO 3030 to CIO 3079 in the above example, can be used as work bits/words.

8-3 Allocating First Words to Racks

In the CS-series PLCs, the first word allocated to each Rack can be set with the CX-Programmer's I/O table edit operation. For example, the CPU Rack can be set to be allocated words starting with CIO 0000; the next Rack, words starting with CIO 0100; the next Rack, words starting with CIO 0200; etc. This can make it easier to check word allocations to Units without calculating all the way from the CPU Rack.

Note The first words for Racks cannot be set at the same time as the first words for slots.

Word Allocations

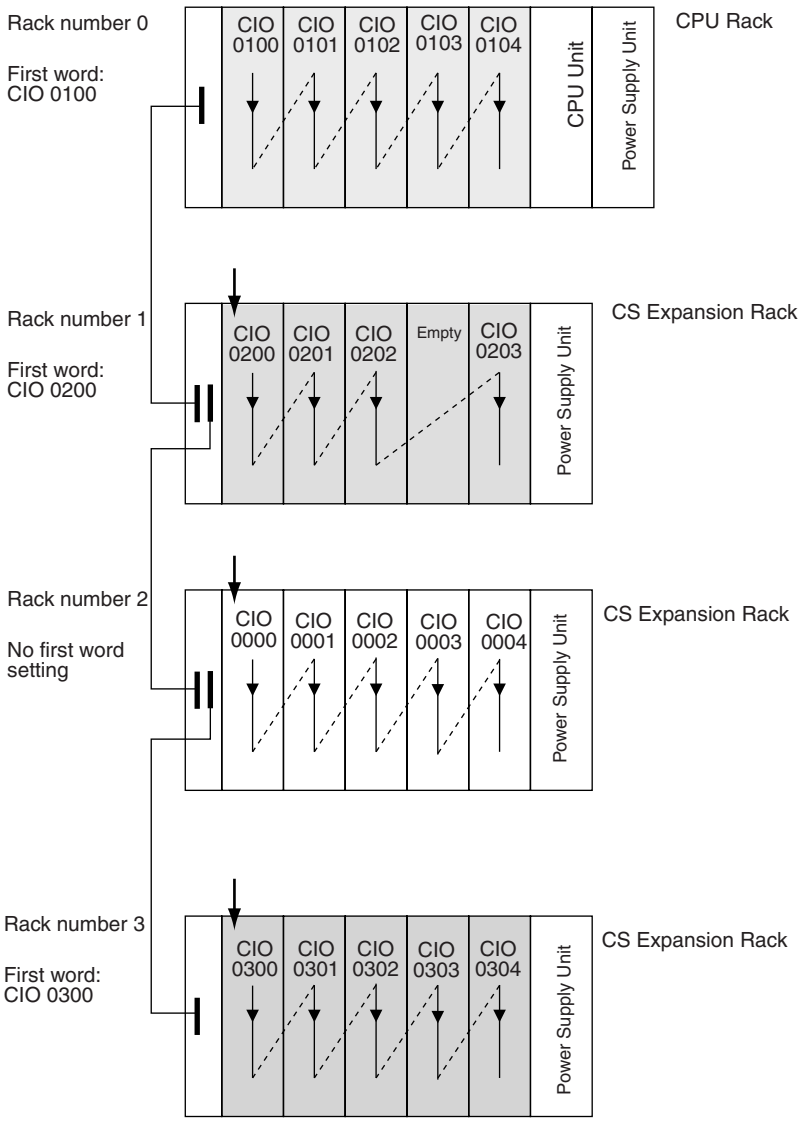
For Racks in which the first word address has been set, words are allocated to Units in the order that the Units are mounted (from left to right) beginning with the specified first word. Words are not allocated to empty slots.

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For Racks in which the first word address has not been set, words are allocated in rack-number order (lowest to highest) continuing from the last word allocated to the previous rack and starting with CIO 0000 on the first Rack for which the first word is not set.

Example: Setting the First Words for Racks

In this example, the first words have been set for Racks 0 (the CPU Rack), 2, and 3. For simplicity, only 16-bit Units have been used.



Rack First Word Settings

Rack	First word
CPU Rack	CIO 0100
Rack 1	CIO 0200
Rack 2	Not set
Rack 3	CIO 0300

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Note Rack numbers (0 to 7) are fixed according to the order that the Racks are physically connected with cable. The CPU Rack is always Rack 0 and the other Racks are, in order, Racks 1 to 7. These numbers cannot be changed. In the above example, the shaded Racks are allocated words starting from the specified first words. The non-shaded Racks are allocated in order from left to right and in order of Rack starting from CIO 0000.

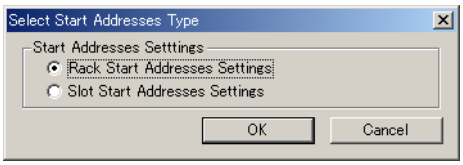
Setting First Rack Words from the CX-Programmer

The first word allocated on each Rack can be set from the CX-Programmer. These settings are not possible from a Programming Console.

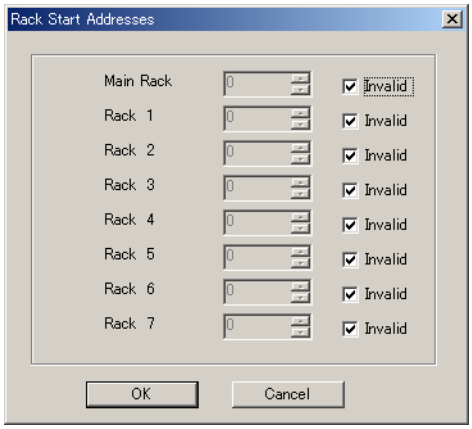
Note For CS1-H CPU Units, an indication of whether or not the first rack words have been set will be displayed on a Programming Console.

Use the following procedure to set the first rack words.

1,2,3... 1. Select the ***Rack/Slot Start Addresses*** from the Option Menu on the I/O Table Window. The following dialog box will be displayed.



2. Select the *Rack Start Addresses Settings* Option and click the **OK** Button.
3. In the dialog box that will appear, remove the checkmarks from the settings disabling the first rack word settings and set the address of the first words for the CPU Rack and Expansion Racks (1 to 7).



Setting	Setting range	Default	Remarks
Rack Start Address	0 to 9000	0	Same for all Racks
Invalid	Selected or cleared	Selected (invalid)	

4. Click the **OK** Button.

Note Up to 8 Racks can be set for any CPU Unit model.

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Confirming First Rack Word Settings on a Programming Console

With a CS1-H CPU Unit, the Programming Console can be used to check whether or not the first word has been set on a Rack. Use the following procedure.

1,2,3...

1. Press the **FUN**, **SHIFT**, and **CH** Keys to start the I/O table creation operation. If the first work for a Rack has been set, a message saying so will appear on the second line of the display.



   If nothing is displayed, then a first word has not been set.

2. Press the **CHG** Key, enter the password (9713), and then press the **WRITE** Key to continue creating the I/O tables, or press the **CLR** Key to cancel the operation and return to the initial display.

Precautions in Setting Rack First Words

- Be sure to make first word settings so that allocated words do not overlap. The first word setting for a rack can be any address from CIO 0000 to CIO 0900. If the same word is allocated to two Racks, the I/O tables cannot be created and the Duplication Error Flag (A26103) in the I/O Table Error Information will turn ON.
- Always register the I/O table after installing an I/O Unit, after setting a rack number, or after setting the first word allocation for a Rack. The I/O Table Registration operation registers the I/O words allocated to the Racks.
- I/O words will not be allocated to empty slots. If an I/O Unit will be installed later, reserve words for the empty slot by changing the I/O table with a Programming Device's I/O Table Change Operation.
- If the actual system configuration is changed after registering the I/O table so that the number of words or I/O type does not match the I/O table, an I/O verification error (A40209) or I/O setting error (A40110) will occur. A CS-series CPU Bus Unit Setting Error (A40203) or Special I/O Unit Setting Error (A40202) may occur as well.
- When a Unit is removed, words can be reserved for the missing Unit using the I/O Table Change Operation. If a Unit is changed or added, all of the words in the program following that Unit's allocated words will be changed and the I/O Table Registration Operation will have to be performed again.

8-4 Allocating First Words to Slots

In the CS-series PLCs, the first word allocated to a slot on any Rack can be set with the CX-Programmer's I/O table edit operation regardless of the position of the slot. This feature can be used whenever it's necessary to control allocations to specific Units, e.g., to group allocated I/O words by device or circuit.

The first word can be set for up to 64 slots.

Note The first words for slots cannot be set at the same time as the first words for Racks.

Word Allocations

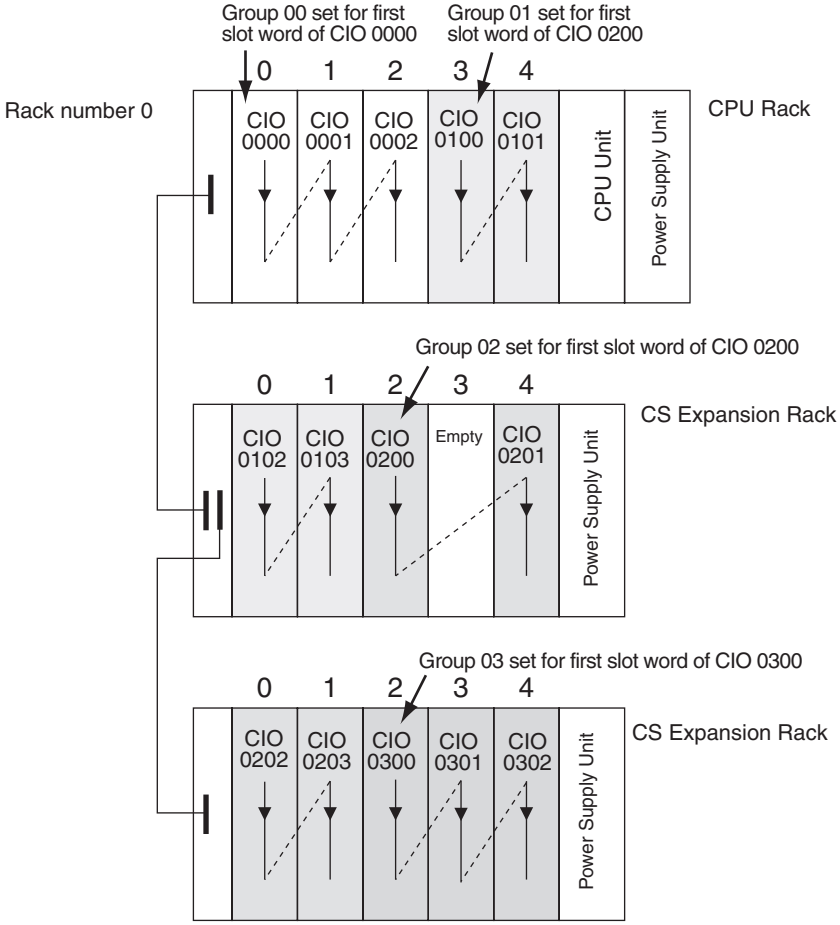
When setting first words for slots, the first word must be set for slot 00 on the CPU Rack. The first word can then be set for any slot on any Rack for up to 63 other slots.

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Each first word set for a slot creates a group starting with that slot. Words are allocated starting from the specified word to the first slot in the group and continuing left to right allocating consecutive words to each Unit until the next group (i.e., until the next Unit for which a first slot word is set). The next group can start on the same Rack or on a following Rack.

Example: Setting the First Words for Racks

In this example, a first slot word has been set in the middle of each Rack. For simplicity, only 16-bit Units have been used.



First Slot Word Settings

Group	Rack	Slot	Word
00	CPU Rack	00	CIO 0000
01	CPU Rack	03	CIO 0100
02	Rack 1	02	CIO 0200
03	Rack 2	02	CIO 0300

Note Group 00 must start at slot 00 on the CPU Rack. Any word can be set. Any slot can be set on any Rack for groups 01 to 63.

Setting First Slot Words from the CX-Programmer

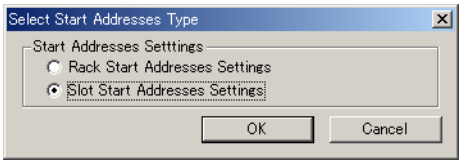
First slot words can be set from the CX-Programmer. These settings are not possible from a Programming Console.

Note For CS1-H CPU Units, an indication of whether or not the first rack words have been set will be displayed on a Programming Console.

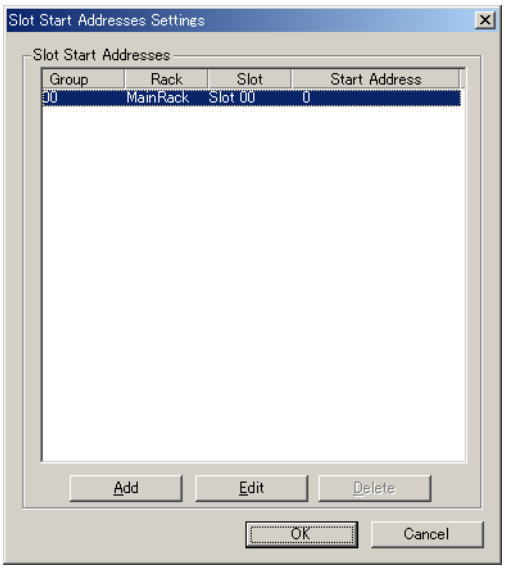
Use the following procedure to set the first rack words.

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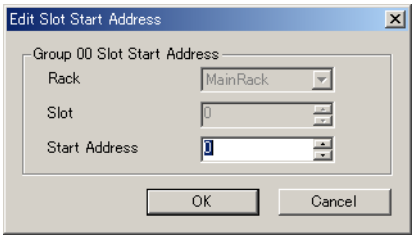
1,2,3... 1. Select the ***Rack/Slot Start Addresses*** from the Option Menu on the I/O Table Window. The following dialog box will be displayed.



2. Select the *Slot Start Addresses Settings* Option and click the **OK** Button.
3. In the dialog box that will appear, set the first word for slot 00 on the CPU Rack.



4. To change the setting from CIO 0000, click the **Edit** Button. The follow dialog box will appear.



5. Set the desired word and click the **OK** Button.
6. To set slot first words for other groups, click the **Add** Button and make the appropriate settings for the Rack, slot, and word.

Up to 64 groups can be set for the CS/CJ-series CPU Unit Ver. 2.0. Only 8 groups can be set for the CS/CJ-series CPU Unit Ver. 1.0

Setting	Setting range	Default	Remarks
Group	00 to 63	00	Groups numbers are allocated automatically in the order the groups are displayed and set.
Rack	CPU Rack (“MainRack”) Racks 1 to 7	CPU Rack	Group 00 always starts at slot 00 on the CPU Rack.
Slot	00 to 99	0	
First word	0 to 999	0	---

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Precautions in Setting First Slot Words

When the I/O tables are edited, the CX-Programmer checks for any duplications in word allocations caused by first word settings. It is conceivable, however, that duplications in word allocations could occur after the I/O tables have been registered, e.g., as the result of replacing a 1-word Unit with a 2-word Unit. In this case the extra word needed by the new Unit would still also be allocated to the next Unit.

When the PLC is turned ON, the CPU Unit checks the registered I/O tables against the actual Units mounted to the PLC. If there are any duplications, and error will occur and it will be no longer possible to edit the I/O tables. If this happens, the I/O tables will have to be deleted and recreated or retransferred from a Programming Devices.

8-5 Detailed Information on I/O Table Creation Errors

With a CS1-H CPU Unit, the contents of A261 provides information on the Unit causing the error whenever one occurs when creating the I/O tables from the Programming Console or CX-Programmer. This information will make it easier to find the Unit causing the problem with troubleshooting I/O tables. Refer to *SECTION 11 Troubleshooting* for actual procedures.

Name	Address		Contents	When changing to RUN mode	At startup	Setting timing
	Word	Bit				
CPU Bus Unit Setup Area Initialization Error Flag	A261	00	ON: Error in CPU Bus Unit Setup Turns OFF when I/O tables are generated normally.	Held	Cleared	When I/O tables are created
I/O Overflow Flag		02	ON: Overflow in maximum number of I/O points. Turns OFF when I/O tables are generated normally.			
Duplication Error Flag		03	ON: The same unit number was used more than once. Turns OFF when I/O tables are generated normally.			
I/O Bus Error Flag		04	ON: I/O bus error Turns OFF when I/O tables are generated normally.			
SYSMAC BUS Recognition Error Flag		06	ON: SYSMAC BUS detection ended in an error. Turns OFF when I/O tables are generated normally.			
Special I/O Unit Error Flag		07	ON: Error in a Special I/O Unit Turns OFF when I/O tables are generated normally.			
I/O Unconfirmed Error Flag		09	ON: I/O detection has not been completed. Turns OFF when I/O tables are generated normally.			

8-6 Data Exchange with CPU Bus Units

This section describes how data can be exchanged between Special I/O Units or CS-series CPU Bus Units, and the CPU Unit.

8-6-1 Special I/O Units

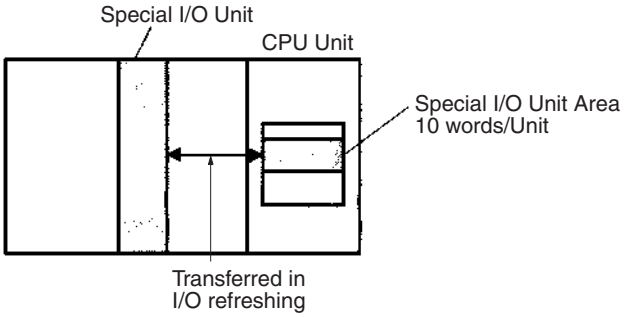
Special I/O Units include C200H Special I/O Units and CS-series Special I/O Units. Data can be exchanged between Special I/O Units and the CPU Unit through the Special I/O Unit Area, the DM Area, or FINS commands.

Special I/O Unit Area (I/O Refreshing)

Data is exchanged each cycle during I/O refreshing of the Special I/O Unit Area. Basically, 10 words are allocated to each Special I/O Unit based on its unit number setting. The number of words actually used by the Special I/O Unit varies; there are models that require 2 words, 4 words, and 20 words.

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The Special I/O Unit Area ranges from CIO 2000 to CIO 2959 (10 words × 96 Units).



Transfer of Words Allocated in DM Area

C200H Special I/O Units

The 100 words allocated to each Unit are transferred from the DM Area to the Unit when the PLC is turned on or the Unit is restarted. Some C200H Special I/O Units do not use any of the allocated DM words and others use only a part of the allocated words.

CS-series Special I/O Units

There are three times that data may be transferred through the words allocated to each Unit. The timing of data transfers depends on the model being used.

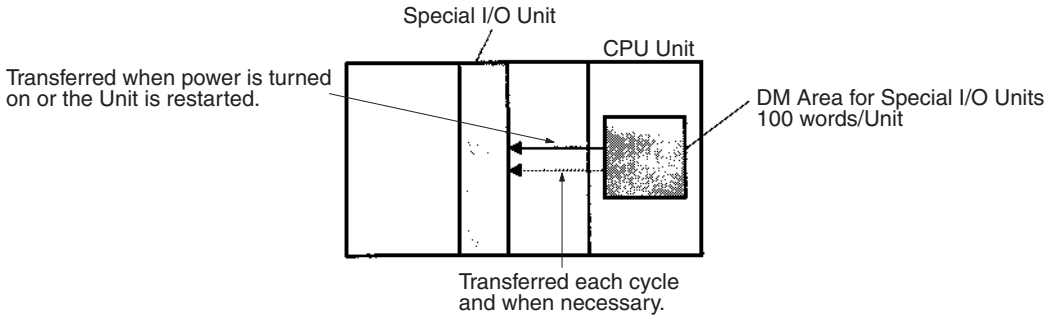
1,2,3...

1. Data transferred when the PLC is turned on.
2. Data transferred when the Unit is restarted.
3. Data transferred when necessary.

Some models transfer data in both directions, from the DM Area to the Unit and from the Unit to the DM Area. See the Unit's *Operation Manual* for details on data transfers.

Special I/O Unit Words in the DM Area: D20000 to D29599 (100 Words x 96 Units)

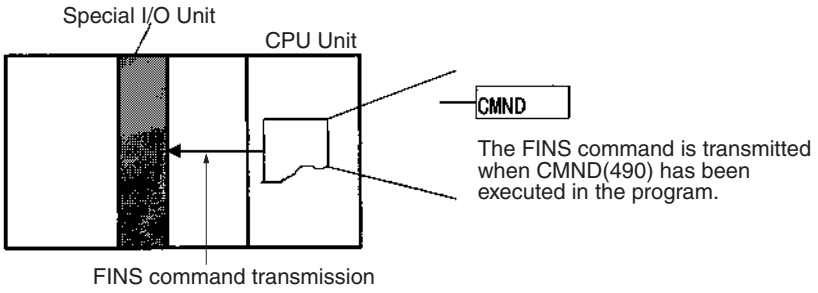
Each Special I/O Unit is allocated 100 words in the DM Area in the range of D20000 to D29599 (100 words × 96 Units). These 100 words are generally used to hold initial settings for the Special I/O Unit. When the contents of this area are changed from the program to reflect a change in the system, the Restart Bits for affected Units must be turned ON to restart the Units.



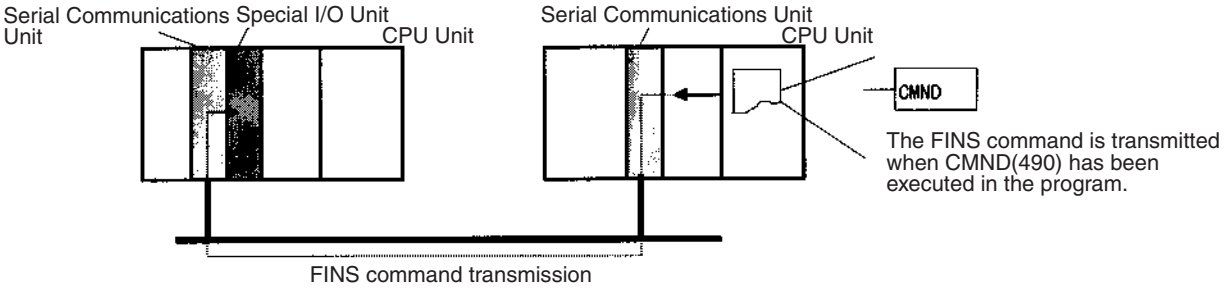
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FINS Commands

The CMND(490) instruction can be added to the ladder program to issue a FINS command to the Special I/O Unit.



FINS commands can be transmitted to Special I/O Units in other PLCs in the network, not just the local PLC.



Special I/O Unit Initialization

Special I/O Units are initialized when the PLC's power is turned on or the Unit's Restart Bit is turned ON. The Unit's Special I/O Unit Initialization Flag (A33000 to A33515) will be ON while the Unit is initializing.
I/O refreshing (cyclic I/O refreshing or refreshing by IORF(097)) will not be performed for a Special I/O Unit while its Initialization Flag is ON.

8-6-2 Disabling Special I/O Unit Cyclic Refreshing

Ten words are allocated to each Special I/O Unit in the Special I/O Unit Area (CIO 2000 to CIO 2959) based on the unit number set on the front of each Unit. The data in the Special I/O Unit Area is refreshed in the CPU Unit every cycle during I/O refreshing (just after execution of the END(001) instruction).

I/O refreshing may take too long if too many Special I/O Units are installed. If I/O refreshing is taking too much time, the PLC Setup can be set to disable cyclic refreshing for particular Special I/O Units. (The Special I/O Unit Cyclic Refreshing Disable Bits are in PLC Setup addresses 226 to 231.)

If the I/O refreshing time is too short, the Unit's internal processing will not be able to keep pace, the Special I/O Unit Error Flag (A40206) will be turned ON, and the Special I/O Unit may not operate properly. In this case, the cycle time can be extended by setting a minimum cycle time in the PLC Setup or cyclic I/O refreshing with the Special I/O Unit can be disabled. When cyclic refreshing has been disabled, the Special I/O Unit's data can be refreshed during program execution with IORF(097).

Note

1. Always disable a Special I/O Unit's cyclic refreshing if the Unit's I/O will be refreshed in an interrupt task with IORF(097). An interrupt task error (A40213) will occur if cyclic refreshing and IORF(097) refreshing are performed simultaneously.
2. Whenever disabling a Special I/O Unit's cyclic refreshing, be sure that the I/O for that Unit is refreshed with IORF(097) in the program at least every

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11 seconds during operation. A CPU Unit service monitoring error will occur in the Special I/O Unit if it is not refreshed every 11 seconds.

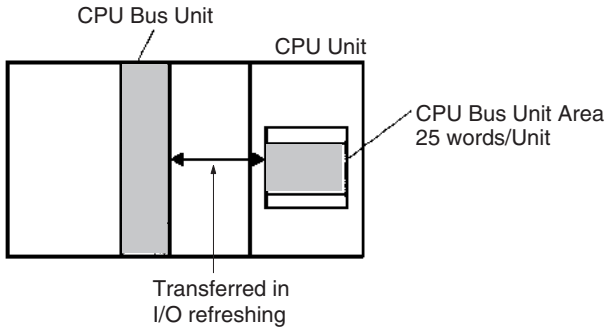
8-6-3 CPU Bus Units

Data can be exchanged between CPU Bus Units and the CPU Unit through the CPU Bus Unit Area, the DM Area, or FINS commands.

CPU Bus Unit Area (I/O Refreshing)

Data is exchanged each cycle during I/O refreshing of the CPU Bus Unit Area. Basically, 25 words are allocated to each CPU Bus Unit based on its unit number setting. The number of words actually used by the CPU Bus Unit varies.

The Special I/O Unit Area ranges from CIO 1500 to CIO 1899 (25 words × 16 Units).



Note With CS1-H CPU Units, the CPU BUS I/O REFRESH instruction (DLNK(226)) can be executed in the ladder program to refresh the CIO Area words allocated to the CPU Bus Unit of a specified unit number.

Transfer of Words Allocated in the DM Area

Each CPU Bus Unit is allocated 100 words in the DM Area in the range of D30000 to D31599 (100 words × 16 Units). There are three times that data may be transferred through the words allocated to each Unit. The timing of data transfers depends on the model being used.

1,2,3...

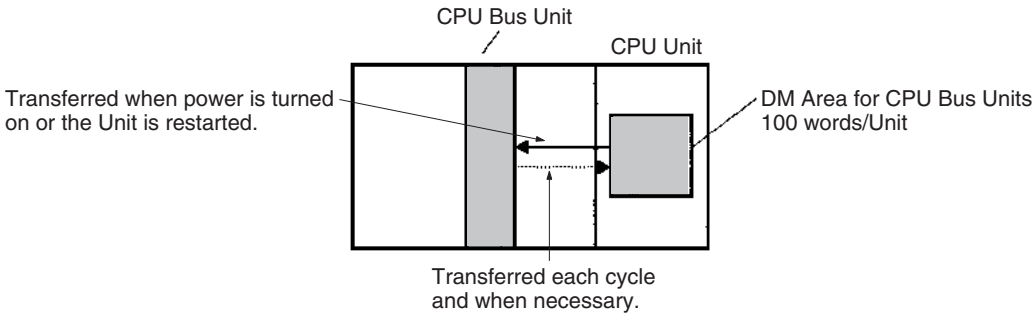
1. Data transferred when the PLC is turned ON.
2. Data transferred each cycle.
3. Data transferred when necessary.

Note With CS1-H CPU Units, the CPU BUS I/O REFRESH instruction (DLNK(226)) can be executed in the ladder program to refresh the DM Area words allocated to the CPU Bus Unit of a specified unit number.

Some models transfer data in both directions, from the DM Area to the Unit and from the Unit to the DM Area. See the Unit's Operation Manual for details on data transfers.

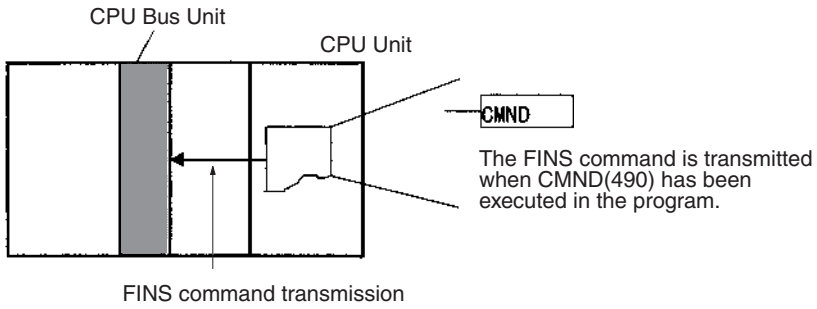
These 100 words are generally used to hold initial settings for the CPU Bus Unit. When the contents of this area are changed from the program to reflect a change in the system, the Restart Bits (A50100 to A50115) for affected Units must be turned ON to restart the Units.

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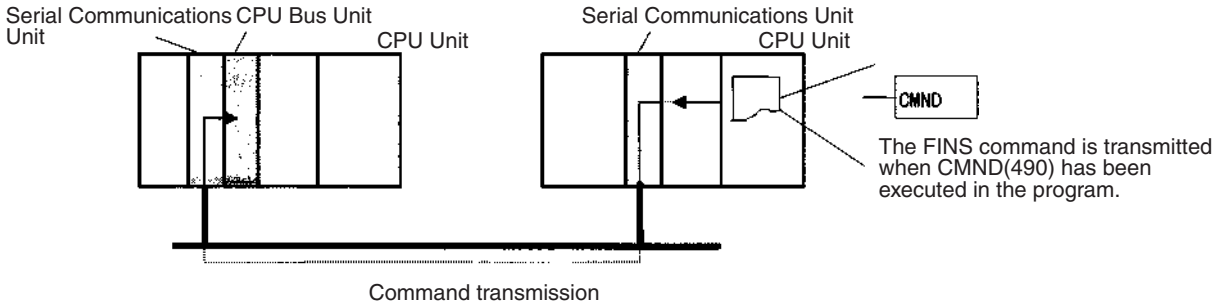


FINS Commands

The CMND(490) instruction can be added to the ladder program to issue a FINS command to the CPU Bus Unit.



FINS commands can be transmitted to CPU Bus Units in other PLCs in the network, not just the local PLC.



CPU Bus Unit Initialization

CPU Bus Units are initialized when the PLC's power is turned on or the Unit's Restart Bit is turned ON. The Unit's CPU Bus Unit Initialization Flag (A30200 to A30215) will be ON while the Unit is initializing.

Cyclic I/O refreshing will not be performed for a CPU Bus Unit while its Initialization Flag is ON.

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SECTION 9
Memory Areas

This section describes the structure and functions of the I/O Memory Areas and Parameter Areas.

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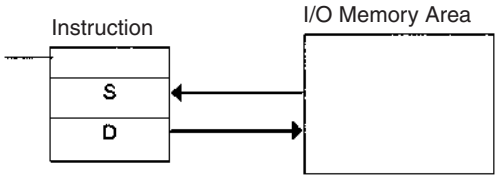
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9-1 Introduction

The CPU Unit's memory (RAM with battery back-up) can be divided into three parts: the User Program Memory, I/O Memory Area, and Parameter Area. This section describes the I/O Memory Area and Parameter Area.

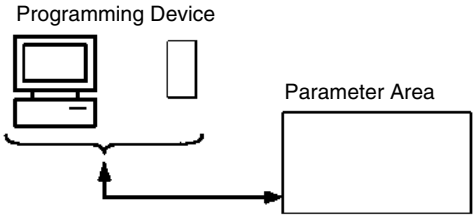
I/O Memory Area

This region of memory contains the data areas which can be accessed by instruction operands. The data areas include the CIO Area, Work Area, Holding Area, Auxiliary Area, DM Area, EM Area, Timer Area, Counter Area, Task Flag Area, Data Registers, Index Registers, Condition Flag Area, and Clock Pulse Area.



Parameter Area

This region of memory contains various settings that cannot be specified by instruction operands; they can be specified from a Programming Device only. The settings include the PLC Setup, I/O Table, Routing Table, and CPU Bus Unit settings.



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9-2 I/O Memory Areas

9-2-1 I/O Memory Area Structure

The following table shows the basic structure of the I/O Memory Area.

Area		Size	Range	External I/O allocation	Bit access	Word access	Access		Change from Programming Device	Status at startup or mode change	Forcing bit status
							Read	Write			
CIO Area	I/O Area	5,120 bits (320 words)	CIO 0000 to CIO 0319 (See note 1.)	Basic I/O Units	OK	OK	OK	OK	OK	Cleared (See note 5.)	OK
	C200H DeviceNet Words	1,600 bits (100 words)	Outputs: CIO 0050 to CIO 0099 Inputs: CIO 0350 to CIO 0399 (See note 2.)	DeviceNet Slaves	OK	OK	OK	OK	OK		OK
	PLC Link Words	32 bits (4 words)	CIO 0247 to CIO 0250 A442	---	OK	OK	OK	OK	OK		OK
	Data Link Area	3,200 bits (200 words)	CIO 1000 to CIO 1199	Data link or PLC Link	OK	OK	OK	OK	OK		OK
	CPU Bus Unit Area	6,400 bits (400 words)	CIO 1500 to CIO 1899	CPU Bus Units	OK	OK	OK	OK	OK		OK
	Special I/O Unit Area	15,360 bits (960 words)	CIO 2000 to CIO 2959	Special I/O Units	OK	OK	OK	OK	OK		OK
	Inner Board Area	1,600 bits (100 words)	CIO 1900 to CIO 1999	Inner Boards	OK	OK	OK	OK	OK		OK
	SYSMAC BUS Area	1,280 bits (80 words)	CIO 3000 to CIO 3079 (See note 8.)	Slave Racks	OK	OK	OK	OK	OK		OK
	I/O Terminal Area	512 bits (32 words)	CIO 3100 to CIO 3131 (See note 9.)	Slaves other than Racks	OK	OK	OK	OK	OK		OK
	CS-series DeviceNet Area	9,600 bits (600 words)	CIO 3200 to CIO 3799	DeviceNet Slaves	OK	OK	OK	OK	OK		OK
	Internal I/O Areas	37,504 bits (2,344 words) 4,800 bits (300 words)	CIO 1200 to CIO 1499 CIO 3800 to CIO 6143	---	OK	OK	OK	OK	OK		OK
Work Area		8,192 bits (512 words)	W000 to W511	---	OK	OK	OK	OK	OK		OK
Holding Area (See note 10.)		8,192 bits (512 words)	H000 to H511	---	OK	OK	OK	OK	OK	Maintained	OK

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Area	Size	Range	External I/O allocation	Bit access	Word access	Access		Change from Programming Device	Status at startup or mode change	Forcing bit status
						Read	Write			
Auxiliary Area	15,360 bits (960 words)	A000 to A447	---	OK	OK	OK	No	No	Varies from address to address.	No
		A448 to A959					OK	OK		
TR Area	16 bits	TR0 to TR15	---	OK	---	OK	OK	No	Cleared	No
DM Area	32,768 words	D00000 to D32767	---	No (See note 3.)	OK	OK	OK	OK	Maintained	No
EM Area	32,768 words per bank (0 to C, 13 max.)	E0_00000 to EC_32767	---	No (See note 3.)	OK	OK	OK	OK	Maintained	No
Timer Completion Flags	4,096 bits	T0000 to T4095	---	OK	---	OK	OK	OK	Cleared (See note 5.)	OK
Counter Completion Flags	4,096 bits	C0000 to C4095	---	OK	---	OK	OK	OK	Maintained	OK
Timer PVs	4,096 words	T0000 to T4095	---	---	OK	OK	OK	OK	Cleared (See note 5.)	No (See note 6.)
Counter PVs	4,096 words	C0000 to C4095	---	---	OK	OK	OK	OK	Maintained	No (See note 7.)
Task Flag Area	32 bits	TK00 to TK31	---	OK	---	OK	No	No	Cleared	No
Index Registers (See note 4.)	16 registers	IR0 to IR15	---	OK	OK	Indirect addressing only	Specific instructions only	No	Cleared (See note 5.)	No
Data Registers (See note 4.)	16 registers	DR0 to DR15	---	No	OK	OK	OK	No	Cleared (See note 5.)	No

Note

1. The I/O Area can be expanded to CIO 0000 to CIO 0999 by changing the first words allocated to Racks.
2. C200H DeviceNet Words are used for fixed allocations by the C200H DeviceNet Master Unit (C200HW-DRM21-V1). The CS-series DeviceNet Unit (CS1W-DRM21) does not use this same area for fixed allocations, but rather uses the CS-series DeviceNet Area (CIO 3200 to CIO 3799).
3. Bits can be manipulated using TST(350), TSTN(351), SETB(532), RSTB(533), OUTB(534).
4. Index registers and data registers can be used either individually by task or they can be shared by all the tasks (CS1-H CPU Units only).
5. If the I/O Memory Hold Bit (A50012) is turned ON, the contents of these areas will be maintained when the operating mode is changed. If in addition the IOM Hold Bit is selected under *Startup Hold* in the PLC Setup, the contents of these areas will be maintained when the power supply is turned ON.
6. Timer PVs can be refreshed indirectly by forced setting/resetting the Timer Completion Flag.
7. Counter PVs can be refreshed indirectly by forced setting/resetting Counter Completion Flags.
8. These words can be used as work words/bits when SYSMAC BUS Slaves are not used.
9. These words can be used as work words/bits when I/O Terminals are not used.

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10. The Function Block Holding Area words are allocated from H512 to H1535. These words can be used only for the function block instance area (internally allocated variable area).

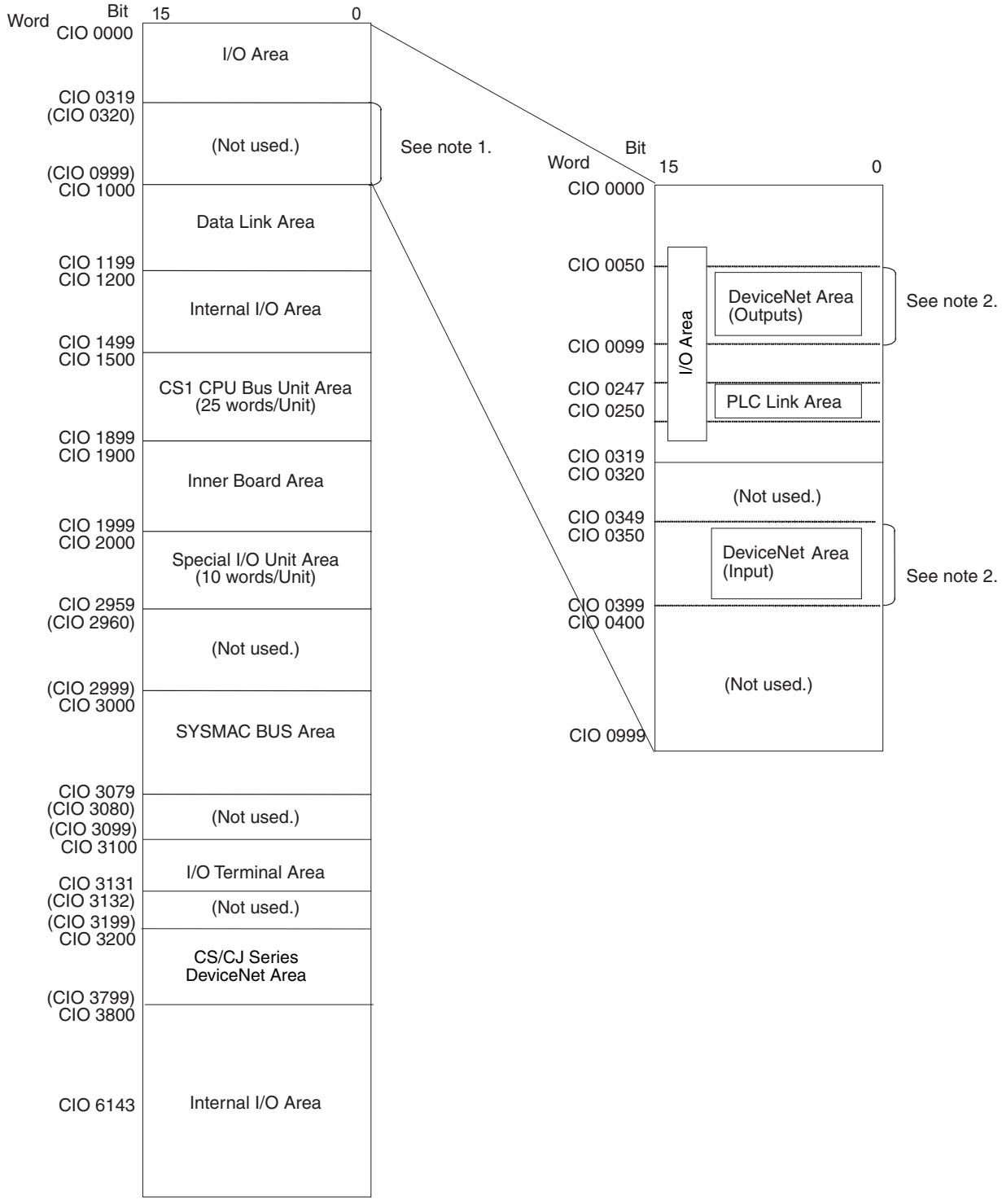
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9-2-2 Overview of the Data Areas

The data areas in the CS-series I/O Memory Area are described in detail below.

CIO Area

It isn't necessary to input the "CIO" acronym when specifying an address in the CIO Area. The CIO Area is generally used for data exchanges such as I/O refreshing with various Units. Words that aren't allocated to Units may be used as work words and work bits in the program only.



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Note

1. It is possible to use CIO 0320 to CIO 0999 for I/O words by making the appropriate settings for the first words on the Racks. Settings for the first words on the Racks can be made using the CX-Programmer to set the first Rack addresses in the I/O table. The settings range for the first Rack addresses is from CIO 0000 to CIO 0900.
2. When using a C200H DeviceNet Master Unit (C200HW-DRM21-V1), be sure the same words are not allocated to both Basic I/O Units and DeviceNet I/O.
3. The parts of the CIO Area that are labelled “Not used” may be used in programming as work bits. In the future, however, unused CIO Area bits may be used when expanding functions. Always use Work Area bits first.

I/O Area

These words are allocated to external I/O terminals on Basic I/O Units. Words that aren’t allocated to external I/O terminals may be used only in the program.

C200H DeviceNet Area

These words are allocated to Slaves for DeviceNet Remote I/O Communications for C200H DeviceNet Master Units (C200HW-DRM21-V1). Allocations are fixed and cannot be changed. Be sure that allocates to not overlap with those used for other I/O points.

The CS-series DeviceNet Unit (CS1W-DRM21) does not use this same area for fixed allocations.

PLC Link Area

When PLC Link Units are used to create a PLC Link system, the PLC Link Area contains flags that indicate PLC Link errors and the operating status of CPU Units in the PLC Link. CIO 247 to CIO 250 are equivalent to SR 247 to SR 250 in the C200HX/HG/HE PLCs. (The PLC Link Operating Level Flags, A44211 and A44212, are equivalent to AR 2411 and AR 2412 in the C200HX/HG/HE PLCs.)

Link Area

These words are used for data links in Controller Link Networks. Words that aren’t used in data links may be used only in the program.

CPU Bus Unit Area

These words are allocated to CPU Bus Units to transfer status information. Each Unit is allocated 25 words and up to 16 Units (with unit numbers 0 to 15) can be used. Words that aren’t used by CPU Bus Units may be used only in the program.

Special I/O Unit Area

These words are allocated to CS-series Special I/O Units and C200H Special I/O Units. Each Unit is allocated 10 words and up to 96 Units (unit numbers 0 to 95) can be used. (C200H Special I/O Units are limited to unit numbers 0 to F (15).)
Words that aren’t used by Special I/O Units may be used only in the program.

Inner Board Area

These words are allocated to Inner Boards such as Communications Boards. Up to 100 words can be allocated for input and output.

SYSMAC BUS Area

These words are allocated to Slave Racks connected to SYSMAC BUS Remote I/O Master Units. Each Rack is allocated 10 words and up to 8 Racks (rack numbers 0 to 7) can be used. These words can be used as work words/bits when SYSMAC BUS Slaves are not used.

I/O Terminal Area

These words are allocated to Units other than Slave Racks (such as I/O Interfaces and I/O Terminals) that are connected to SYSMAC BUS Remote I/O Master Units. Each Unit is allocated 1 word except for Optical I/O Units which take 2 words; up to 32 Units (unit numbers 0 to 31) can be used. These words can be used as work words/bits when I/O Terminals are not used.

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CS-series DeviceNet Area

These words are allocated to Slaves for DeviceNet Remote I/O Communications for CS-series DeviceNet Units (CS1W-DRM21). Allocations are fixed and cannot be changed. Be sure that allocates to not overlap with those used for other I/O points.

The C200H DeviceNet Master Unit (C200HW-DRM21-V1) does not use this same area for fixed allocations

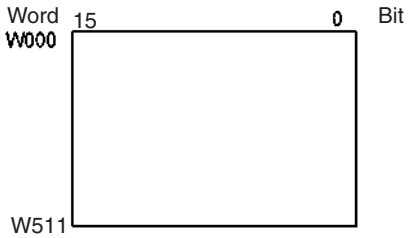
Internal I/O Area

These words can be used only in the program; they cannot be used for I/O exchange with external I/O terminals. Be sure to use the work words provided in the Work Area (WR) before allocating words in the Internal I/O Area or other unused words in the CIO Area. It is possible that these words will be assigned to new functions in future versions of CS-series CPU Units, so the program may have to be changed before being used in a new CS-series PLC if CIO Area words are used as work words in the program.

Note CIO 25207 and CIO 25213 will be used for the Module (M-Net) Interface Network Restart Bits when a M-Net Interface Unit is connected to the CS-series PLC. Do not use these bits are work bits in programming. The M-Net Interface Unit is restarted by turning ON these bits.

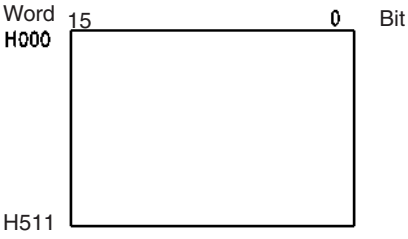
Work Area (WR)

Words in the Work Area can be used only in the program; they cannot be used for I/O exchange with external I/O terminals. No new functions will be assigned to this area in future versions of CS-series PLCs, so use this area for work words and bits before any words in the CIO Area.



Holding Area (HR)

Words in the Holding Area can be used only in the program. These words retain their content when the PLC is turned on or the operating mode is switched between PROGRAM mode and RUN or MONITOR mode.



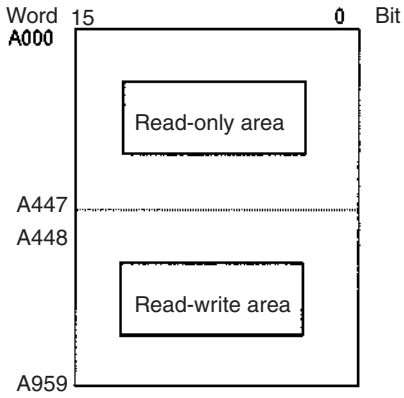
Note The Function Block Holding Area words are allocated from H512 to H1535. These words can be used only for the function block instance area (internally allocated variable area). These words cannot be specified as instruction operands in the user program.

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Auxiliary Area (AR)

The Auxiliary Area contains flags and control bits used to monitor and control PLC operation. This area is divided into two parts: A000 to A447 are read-only and A448 to A959 can be read or written. Refer to *9-16 Auxiliary Area* for details on the Auxiliary Area.

Note The undefined addresses of the Auxiliary Area may be allocated to functions in future version upgrades of the CPU Unit. Do not use these words as CIO Area words in the user program.

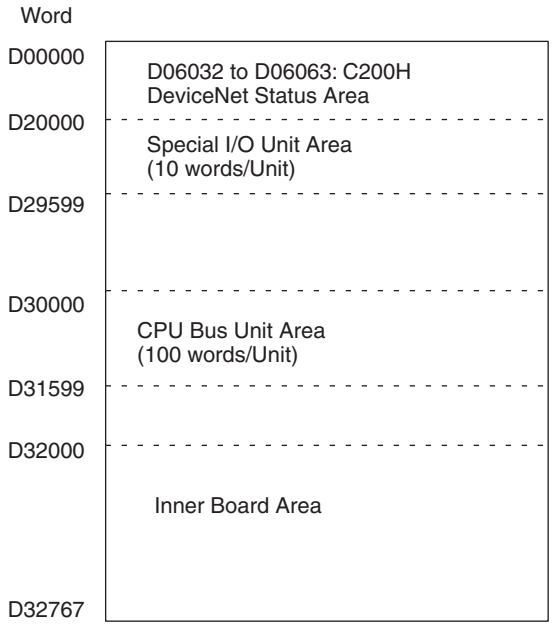


Temporary Relay Area (TR)

The TR Area contains bits that record the ON/OFF status of program branches. The TR bits are used with mnemonics only.

Data Memory Area (DM)

The DM Area is a multi-purpose data area that can be accessed in word-units only. These words retain their content when the PLC is turned on or the operating mode is switched between PROGRAM mode and RUN or MONITOR mode.

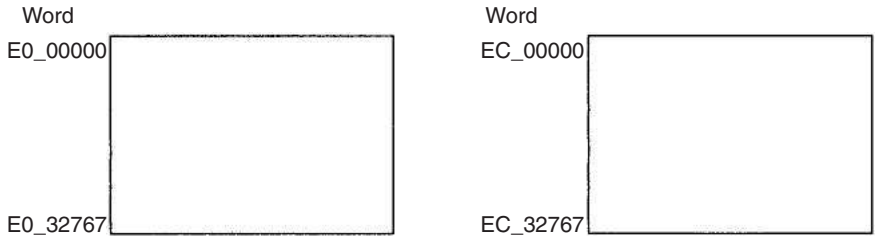


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Extended Data Memory Area (EM)

The EM Area is a multi-purpose data area that can be accessed in word-units only. These words retain their content when the PLC is turned on or the operating mode is switched between PROGRAM mode and RUN or MONITOR mode.

The EM Area is divided into 32,767-word regions called banks. The number of EM banks depends upon the model of CPU Unit, with a maximum of 13 banks (0 to C). Refer to *2-1 Specifications* for details on the number of EM banks provided in each model of CPU Unit.



Timer Area

There are two timer data areas, the Timer Completion Flags and the Timer Present Values (PVs). Up to 4,096 timers with timer numbers T0000 to T4095 can be used. The same number is used to access a timer's Completion Flag and PV.

Timer Completion Flags

These flags are read as bits. A Completion Flag is turned ON by the system when the corresponding timer times out (the set time elapses).

Timer PVs

The PVs are read and written as words (16 bits). The PVs count up or down as the timer operates.

Counter Area

There are two counter data areas, the Counter Completion Flags and the Counter Present Values (PVs). Up to 4,096 counters with counter numbers C0000 to C4095 can be used. The same number is used to access a counter's Completion Flag and PV.

Counter Completion Flags

These flags are read as bits. A Completion Flag is turned ON by the system when the corresponding counter counts out (the set value is reached).

Counter PVs

The PVs are read and written as words (16 bits). The PVs count up or down as the counter operates.

Condition Flags

These flags include the Arithmetic Flags such as the Error Flag and Equals Flag which indicate the results of instruction execution as well as the Always ON and Always OFF Flags. The Condition Flags are specified with labels (symbols) rather than addresses.

Clock Pulses

The Clock Pulses are turned ON and OFF by the CPU Unit's internal timer. These bits are specified with labels (symbols) rather than addresses.

Task Flag Area (TK)

Task Flags range from TK00 to TK31 and correspond to cyclic tasks 0 to 31. A Task Flag will be ON when the corresponding cyclic task is in executable

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(RUN) status and OFF when the cyclic task hasn't been executed (INI) or is in standby (WAIT) status.

Index Registers (IR)

These registers (IR0 to IR15) are used to store PLC memory addresses (absolute memory addresses in RAM) to indirectly address words in I/O memory. The Index Registers can be used separately in each task or, for CS1-H CPU Units, they can be shared by all tasks.

Data Registers (DR)

These registers (DR0 to DR15) are used together with the Index Registers. When a Data Register is input just before an Index Register, the content of the Data Register is added to the PLC memory address in the Index Register to offset that address. The Data Registers are used separately in each task or, for CS1-H CPU Units, they can be shared by all tasks.

9-2-3 Data Area Properties

Content After Fatal Errors, Forced Set/Reset Usage

Area		External allocation	Fatal Error Generated				Forced Set/ Forced Reset Functions Usable?
			Execution of FALS(007)		Other Fatal Error		
			IOM Hold Bit OFF	IOM Hold Bit ON	IOM Hold Bit OFF	IOM Hold Bit ON	
CIO Area	I/O Area	Basic I/O Units	Retained	Retained	Cleared	Retained	Yes
	C200H DeviceNet Words	DeviceNet Slaves					
	PLC Link Words	None					
	Data Link Area	Controller Link or PLC Link data links					
	CPU Bus Units	CPU Bus Units					
	Special I/O Unit Area	Special I/O Units					
	Inner Board Area	Inner Boards					
	SYSMAC BUS Area	SYSMAC BUS Remote I/O Slaves					
	I/O Terminal Area	SYSMAC BUS Remote I/O Terminals					
	CS-series DeviceNet Area	DeviceNet Slaves or Master					
	Internal I/O Area	None					
Work Area (W)		None	Retained	Retained	Cleared	Retained	Yes
Holding Area (H)			Retained	Retained	Retained	Retained	Yes
Auxiliary Area (A)			Status varies from address to address.				No
Data Memory Area (D)			Retained	Retained	Retained	Retained	No
Extended Data Memory Area (E)			Retained	Retained	Retained	Retained	No
Timer Completion Flags (T)			Retained	Retained	Cleared	Retained	Yes
Timer PVs (T)			Retained	Retained	Cleared	Retained	No
Counter Completion Flags (C)			Retained	Retained	Retained	Retained	Yes
Counter PVs (C)			Retained	Retained	Retained	Retained	No
Task Flags (TK)			Retained	Retained	Cleared	Cleared	No
Index Registers (IR)			Retained	Retained	Cleared	Retained	No
Data Registers (DR)			Retained	Retained	Cleared	Retained	No

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Content After Mode Change or Power Interruption

Area		Mode Changed[1]		PLC Power OFF to ON			
				IOM Hold Bit Cleared[2]		IOM Hold Bit Held[2]	
		IOM Hold Bit OFF	IOM Hold Bit ON	IOM Hold Bit OFF	IOM Hold Bit ON	IOM Hold Bit OFF	IOM Hold Bit ON
CIO Area	I/O Area	Cleared	Retained	Cleared	Cleared	Cleared	Retained
	C200H DeviceNet Words						
	PLC Link Words						
	Data Link Area						
	CPU Bus Units						
	Special I/O Unit Area						
	Inner Board Area						
	SYSMAC BUS Area						
	I/O Terminal Area						
	CS-series DeviceNet Area						
	Internal I/O Area						
Work Area (W)		Cleared	Retained	Cleared	Cleared	Cleared	Retained
Holding Area (H)		Retained	Retained	Retained	Retained	Retained	Retained
Auxiliary Area (A)		Status varies from address to address.					
Data Memory Area (D)		Retained	Retained	Retained	Retained	Retained	Retained
Extended Data Memory Area (E)		Retained	Retained	Retained	Retained	Retained	Retained
Timer Completion Flags (T)		Cleared	Retained	Cleared	Cleared	Cleared	Retained
Timer PVs (T)		Cleared	Retained	Cleared	Cleared	Cleared	Retained
Counter Completion Flags (C)		Retained	Retained	Retained	Retained	Retained	Retained
Counter PVs (C)		Retained	Retained	Retained	Retained	Retained	Retained
Task Flags (TK)		Cleared	Cleared	Cleared	Cleared	Cleared	Cleared
Index Registers (IR)		Cleared	Retained	Cleared	Cleared	Cleared	Cleared
Data Registers (DR)		Cleared	Retained	Cleared	Cleared	Cleared	Cleared

Note
1. Mode changed from PROGRAM to RUN/MONITOR or vice-versa.
2. The PLC Setup's "IOM Hold Bit Status at Startup" setting determines whether the IOM Hold Bit's status is held or cleared when the PLC is turned on.

9-3 Precautions in Using C200H Special I/O Units

Observe the following precautions when using C200H Special I/O Units.

Memory Areas

There are differences between the words allocated to Special I/O Units in the PLC memory areas, as shown in the following table.

PLC	C200H/C200HS	C200HX/HG/HE	CS Series
IR/CIO Area allocations	IR 100 to IR 199	IR 100 to IR 199 IR 400 to IR 459	CIO 2000 to CIO 2959 (allocated CIO 2000 to CIO 2159 for unit numbers 0 up to 15)
DM Area allocations	DM 1000 to DM 1999	DM 1000 to DM 1999 DM 2000 to DM 2599	D20000 to D29599 (allocated D20000 to D21599 for unit numbers 0 up to 15)

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Restrictions

There are special restrictions in programming, allocations, and data communications with the CPU Unit for the following C200H Special I/O Units. Refer to *Appendix F Restrictions in Using C200H Special I/O Units* for details.

Unit	Model number
ASCII Units	C200H-ASC02/ASC11/ASC21/ASC31
High-speed Counter Units	C200H-CT001-V1/CT002
ID Sensor Units	C200H-IDS01-V1/IDS21
Position Control Units	C200H-NC111/NC112/NC211
Fuzzy Logic Units	C200H-FZ001
High-speed Counter Units	C200H-CT021
Motion Control Units	C200H-MC221
C200H I/O LInk Units	C200H-DRT21

There are no special restrictions for other C200H Special I/O Units.

9-4 CIO Area

I/O Area addresses range from CIO 0000 to CIO 0319 (CIO bits 000000 to 031915), but the area can be expanded to CIO 0000 to CIO 0999 by changing the first Rack word with any Programming Device other than a Programming Console. The maximum number of bits that can be allocated for external I/O will still be 5,120 (320 words) even if the I/O Area is expanded.

Note The maximum number of external I/O points depends upon the CPU Unit being used.

Words in the I/O Area can be allocated to I/O terminals on Basic I/O Units (CS-series Basic I/O Units, C200H Basic I/O Units, and C200H Group-2 High-density I/O Units).

Words are allocated to Basic I/O Units based on the slot position (left to right) and number of words required. The words are allocated consecutively and empty slots are skipped. Words in the I/O Area that aren't allocated to Basic I/O Units can be used only in the program.

CIO 0000 to CIO 0319 include the C200H DeviceNet Output Area (CIO 0050 to CIO 0099) and the PLC Link Words CIO 0247 to CIO 0250. Be sure that word allocations do not overlap allocations for other I/O points when using a C200H DeviceNet Master Unit (C200HS-DRM1-V1) or when using a PLC Link Unit.

I/O Area Initialization

The contents of the I/O Area will be cleared in the following cases:

1,2,3...

1. The operating mode is changed from PROGRAM to RUN or MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
   (See the following explanation of IOM Hold Bit Operation.)
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
   (See the following explanation of IOM Hold Bit Operation.)
3. The I/O Area is cleared from a Programming Device.
4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the I/O Area will be retained if FALS(007) is executed.)

IOM Hold Bit Operation

If the IOM Hold Bit (A50012) is ON, the contents of the I/O Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN or MONITOR mode or vice-versa.

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If the IOM Hold BIt (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the I/O Area won't be cleared when the PLC's power supply is cycled. All I/O bits, including outputs, will retain the status that they had before the PLC was turned off.

Note If the I/O Hold Bit is turned ON, the outputs from the PLC will not be turned OFF and will maintain their previous status when the PLC is switched from RUN or MONITOR mode to PROGRAM mode. Make sure that the external loads will not produce dangerous conditions when this occurs. (When operation stops for a fatal error, including those produced with the FALS(007) instruction, all outputs from Output Unit will be turned OFF and only the internal output status will be maintained.)

Forcing bit Status

Bits in the I/O Area can be force-set and force-reset.

Note When designating addresses in programming or allocations inside C200H Special I/O Units, "000" to "255" will specify CIO 0000 to CIO 0255 in the CPU Unit and "000" to "511" will specify CIO 0000 to CIO 0511 in the CPU Unit. Other addresses in this area cannot be specified inside the C200H Special I/O Units.

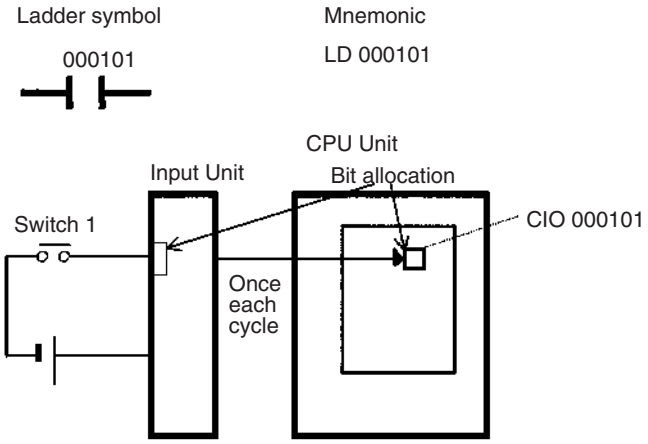
Input Bits

A bit in the I/O Area is called an input bit when it is allocated to an Input Unit. Input bits reflect the ON/OFF status of devices such as push-button switches, limit switches, and photoelectric switches. There are three ways for the status of input points to be refreshed in the PLC: normal I/O refreshing, immediate refreshing, and IORF(097) refreshing.

Normal I/O Refreshing

The status of I/O points on external devices is read once each cycle after program execution.

In the following example, CIO 000101 is allocated to switch 1, an external switch connected to the input terminal of an Input Unit. The ON/OFF status of switch 1 is reflected in CIO 000101 once each cycle.



Immediate Refreshing

When the immediate refreshing variation of an instruction is specified by inputting an exclamation point just before the instruction, and the instruction's operand is an input bit or word, the word containing the bit or the word itself will be refreshed just before the instruction is executed. This immediate refreshing is performed in addition to the normal I/O refreshing performed once each cycle.

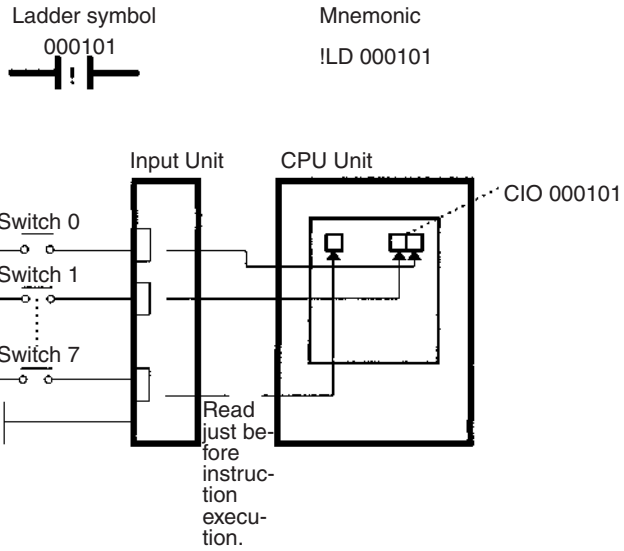
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Note Immediate refreshing will be performed for input bits allocated to Basic I/O Units only (excluding C200H Group-2 High-density I/O Units and Basic I/O Units mounted in Remote I/O Slave Racks), not High-density I/O Units which are Special I/O Units.

1,2,3... 1. Bit Operand
Just before the instruction is executed, the ON/OFF status of the 16 I/O points allocated to the word containing the specified bit will be read to the PLC.

2. Word Operand
Just before the instruction is executed, the ON/OFF status of the 16 I/O points allocated to the specified word will be read to the PLC.

In the following example, CIO 000101 is allocated to switch 1, an external switch connected to the input terminal of an Input Unit. The ON/OFF status of switch 1 is read and reflected in CIO 000101 just before !LD 000101 is executed.

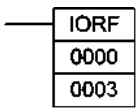


IORF(097) Refreshing

When IORF(097) (I/O REFRESH) is executed, the input bits in the specified range of words are refreshed. This I/O refreshing is performed in addition to the normal I/O refreshing performed once each cycle.

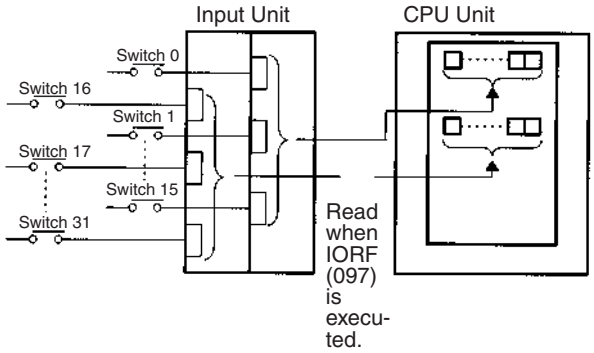
Note IORF(097) refreshes input bits allocated to Basic I/O Units (excluding Basic I/O Units mounted in Remote I/O Slave Racks), C200H Group-2 High-density I/O Units, and other High-density I/O Units which are Special I/O Units.

The following IORF(097) instruction refreshes the status of all I/O points in I/O Area words CIO 0000 to CIO 0003. The status of input points is read from the Input Units and the status of output bits is written to the Output Units.



In the following example, the status of input points allocated to CIO 0000 and CIO 0001 are read from the Input Unit. (CIO 0002 and CIO 0003 are allocated to Output Units.)

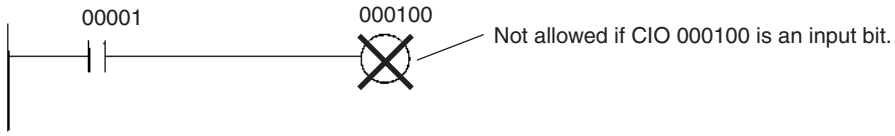
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Limitations on Input bits

There is no limit on the number of times that input bits can be used as normally open and normally closed conditions in the program and the addresses can be programmed in any order.

An input bit cannot be used as an operand in an Output instruction.

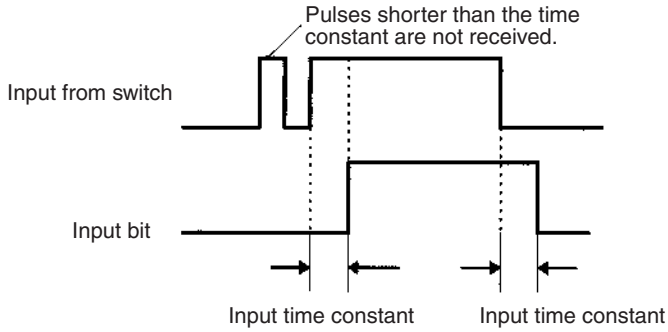


Input Response Time Settings

The input response times for each CS-series Input Unit can be set in the PLC Setup. Increasing the input response time will reduce chattering and the effects of noise and decreasing the input response time allows higher speed input pulses to be received.

The default value for input response times is 8 ms and the setting range is 0 to 32 ms.

Note If the time is set to 0 ms, there will still be an ON delay time of 20 μs max. and an OFF delay time of 300 μs due to delays caused by internal elements.



Output Bits

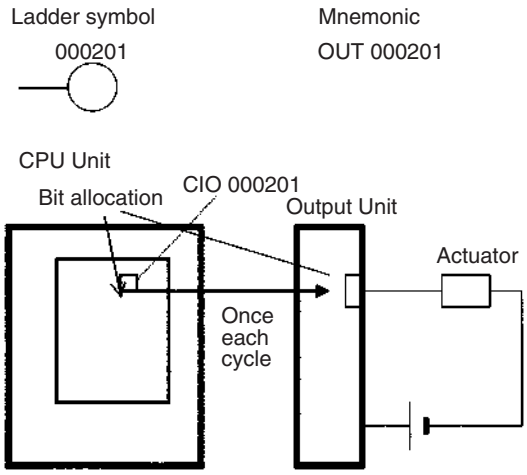
A bit in the I/O Area is called an output bit when it is allocated to an Output Unit. The ON/OFF status of an output bits are output to devices such as actuators. There are three ways for the status of output bits to be refreshed to an Output Unit: normal I/O refreshing, immediate refreshing, and IORF(097) refreshing.

Normal I/O Refreshing

The status of output bits are output to external devices once each cycle after program execution.

In the following example, CIO 000201 is allocated to an actuator, an external device connected to an output terminal of an Output Unit. The ON/OFF status of CIO 000201 is output to that actuator once each cycle.

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Immediate Refreshing

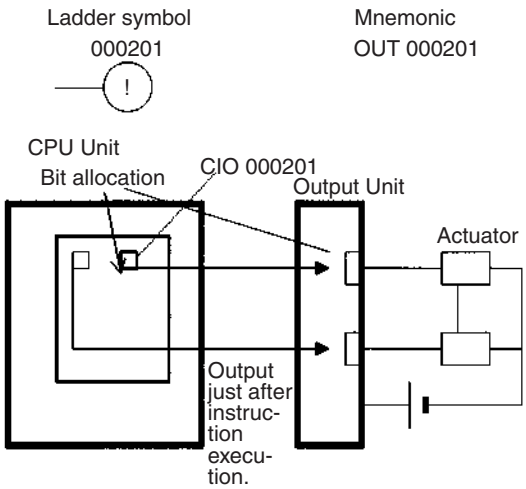
When the immediate refreshing variation of an instruction is specified by inputting an exclamation point just before the instruction, and the instruction's operand is an output bit or word, the content of the word containing the bit or the word itself will be output just after the instruction is executed. This immediate refreshing is performed in addition to the normal I/O refreshing performed once each cycle.

Note Immediate refreshing will be performed for output bits allocated to Basic I/O Units only (excluding C200H Group-2 High-density I/O Units and Basic I/O Units mounted in Remote I/O Slave Racks), not High-density I/O Units which are Special I/O Units.

1,2,3...

1. Bit Operand
   Just after the instruction is executed, the ON/OFF status of the 16 I/O points allocated to the word containing the specified bit will be output to the output device(s).
2. Word Operand
   Just after the instruction is executed, the ON/OFF status of the 16 I/O points allocated to the specified word will be output to the output device(s).

In the following example, CIO 000201 is allocated to an actuator, an external device connected to the output terminal of an Output Unit. The ON/OFF status of CIO 000201 is output to the actuator just after !OUT 000201 is executed.



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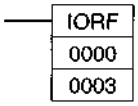
IORF(097) Refreshing

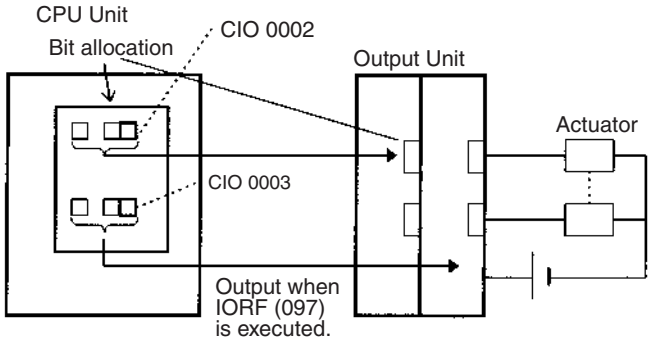
When IORF(097) (I/O REFRESH) is executed, the ON/OFF status of output bits in the specified range of words is output to their external devices. This I/O refreshing is performed in addition to the normal I/O refreshing performed once each cycle.

Note IORF(097) refreshes output bits allocated to Basic I/O Units (excluding Basic I/O Units mounted in Remote I/O Slave Racks), C200H Group-2 High-density I/O Units, and other High-density I/O Units which are Special I/O Units.

The following IORF(097) instruction refreshes the status of all I/O points in I/O Area words CIO 0000 to CIO 0003. The status of input points is read from the Input Units and the status of output bits is written to the Output Units.

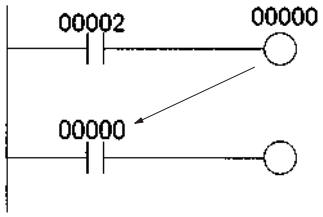
In this example, the status of input points allocated to CIO 0002 and CIO 0003 are output to the Output Unit. (CIO 0000 and CIO 0001 are allocated to Input Units.)



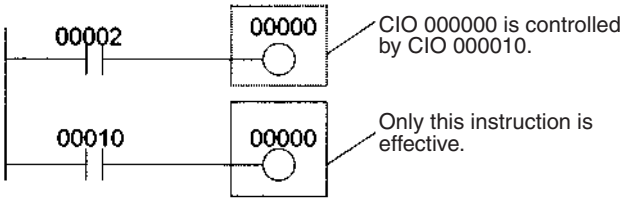


Limitations on Output Bits

Output bits can be programmed in any order. Output bits can be used as operands in Input instructions and there is no limit on the number of times that an output bit is used as a normally open and normally closed condition.



An output bit can be used in only one Output instruction that controls its status. If an output bit is used in two or more Output instructions, only the last instruction will be effective.



Note All outputs on Basic I/O Units and Special I/O Units can be turned OFF by turning ON the Output OFF Bit (A50015). The status of the output bits won't be affected even though the actual outputs are turned OFF.

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9-5 C200H DeviceNet Area

The C200H DeviceNet Area is divided into two parts:

1,2,3...

1. The DeviceNet Output Area contains 50 words with addresses ranging from CIO 0050 to CIO 0099.
2. The DeviceNet Input Area contains 50 words with addresses ranging from CIO 0350 to CIO 0399.

Words in the C200H DeviceNet Area are used for fixed allocations to Slaves for DeviceNet remote I/O communications for the C200H DeviceNet Master Unit (C200HW-DRM21-V1).

Note The CS-series DeviceNet Unit (CS1W-DRM21) does not use this same area for fixed allocations, but rather uses the CS-series DeviceNet Area (CIO 3200 to CIO 3799).

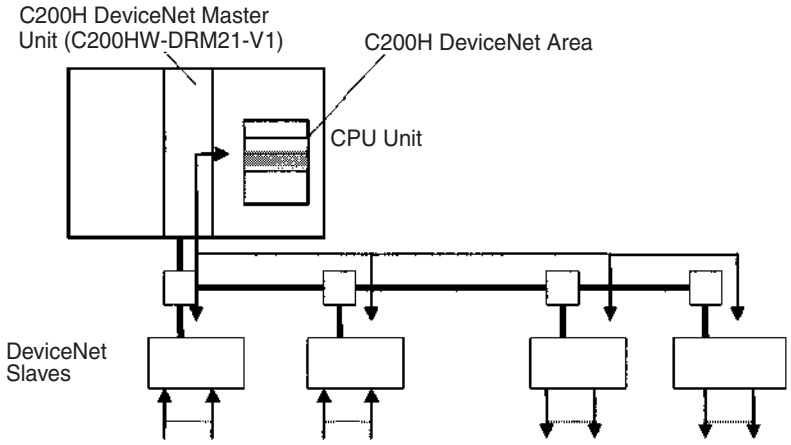
Data is exchanged regularly to Slaves in the network (independent of the program) through the C200H DeviceNet Master Unit (C200HW-DRM21-V1) mounted in the CPU Rack.

Words can be allocated to Slaves in two ways: fixed allocation (words allocated by node number) or free allocation (user-set word allocation).

- With fixed allocations, words in the C200H DeviceNet Area are allocated automatically in node-number order.
- With user-set allocations, the user can allocate words to Slaves from the following words.
  CIO 0000 to CIO 0235, CIO 0300 to CIO 0511, CIO 1000 to CIO 1063
  H000 to H099
  D00000 to D05999

The same ranges can be allocated for both CS-series and C200HX/G/E PLCs except that LR 00 to LR 63 in the C200HX/G/E PLCs correspond to CIO 1000 to CIO 1063 in the CS-series PLCs. (The entire Master Status Area is from D06032 to D06063.)

For details on word allocations, refer to the C200H*DeviceNet Operation Manual* (W267).



With fixed allocation, words are assigned according to node numbers. (If a Slave requires two or more words, it will occupy as many node numbers as words required.)

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DeviceNet Area Initialization

The contents of the DeviceNet Area will be cleared in the following cases:

1,2,3...

1. The operating mode is changed between PROGRAM and RUN or MONITOR mode and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
3. The DeviceNet Area is cleared from a Programming Device.
4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the DeviceNet Area will be retained when FALS(007) is executed.)

IOM Hold Bit Operation

If the IOM Hold BIt (A50012) is ON, the contents of the DeviceNet Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN or MONITOR mode or vice-versa.

If the IOM Hold BIt (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the DeviceNet Area won't be cleared when the PLC's power supply is cycled.

Forcing Bit Status

Bits in the DeviceNet Area can be force-set and force-reset.

Note

1. The C200H DeviceNet Output Area overlaps the I/O Area. When using DeviceNet communications with the default allocations, be sure that words are not also allocated to other I/O points.
2. With the CS-series CPU Units, words beginning at D06032 are allocated as follows for the C200H DeviceNet Master Status and the Communications Cycle Present Value:

   DeviceNet Master Status: D06032 + unit number × 2

   Communications Cycle Present Value: D06033 + unit number × 2

9-6 CS-series DeviceNet Area

The CS-series DeviceNet Area addresses run from CIO 3200 to CIO 3799 (600 words).

Words in the CS-series DeviceNet Area are used for fixed allocations to Slaves for DeviceNet remote I/O communications for the CS-series DeviceNet Unit (CS1W-DRM21).

Note The C200H DeviceNet Master Unit (C200HW-DRM21-V1) does not use this same area for fixed allocations, but rather uses the C200H DeviceNet Area (CIO 0050 to CIO0099 and CIO 0350 to CIO 0399).

The Fixed Allocation Setting Switches 1 to 3 (Software Switches) in the CIO Area words allocated to the DeviceNet Unit determine which fixed allocation words are used.

Area	Master to Slave (Output Words)	Slave to Master (Input Words)
Fixed Allocation Area 1	CIO 3200 to CIO 3263	CIO 3300 to CIO 3363
Fixed Allocation Area 2	CIO 3400 to CIO 3463	CIO 3500 to CIO 3563
Fixed Allocation Area 3	CIO 3600 to CIO 3663	CIO 3700 to CIO 3763

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Note If the DeviceNet Unit is set to use the I/O slave function, the following words are also allocated.

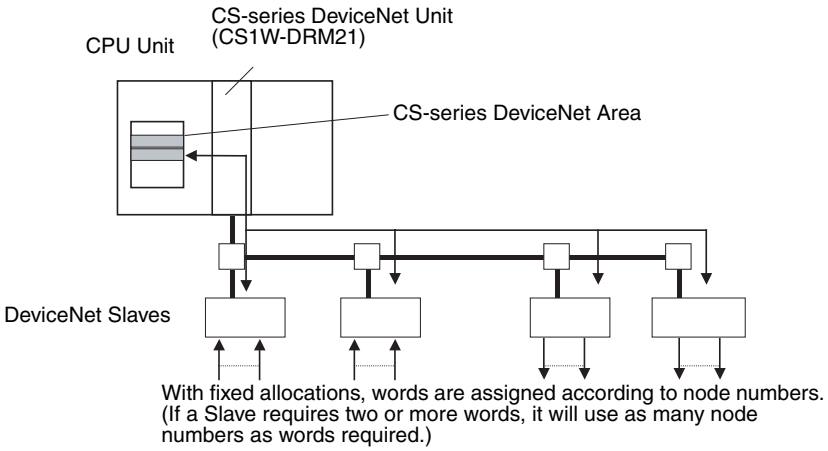
Area	Master to Slave (Output Word)	Slave to Master (Input Word)
Fixed Allocation Area 1	CIO 3370	CIO 3270
Fixed Allocation Area 2	CIO 3570	CIO 3470
Fixed Allocation Area 3	CIO 3770	CIO 3670

Data is exchanged regularly to Slaves in the network (independent of the program) through the CS-series DeviceNet Unit (CS1W-DRM21) mounted in the CPU Rack.

Words can be allocated to Slaves in two ways: fixed allocation (words allocated by node number) or free allocation (user-set word allocation).

- With fixed allocations, words in the CS-series DeviceNet Area are allocated automatically in node-number order in one of the fixed allocation areas (1 to 3).
- With user-set allocations, the user can allocate words to Slaves from the following words.
  CIO 0000 to CIO 6143
  W000 to W511
  H000 to H511
  D00000 to D32767
  E00000 to E32767 (banks 0 to C)

For details on word allocations, refer to the CS/CJ Series *DeviceNet Unit Operation Manual* (W380).



Forcing Bit Status

Bits in the CS-series DeviceNet Area can be force-set and force-reset.

DeviceNet Area Initialization

The contents of the DeviceNet Area will be cleared in the following cases:

1,2,3...

1. The operating mode is changed between PROGRAM and RUN or MONITOR mode and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
3. The DeviceNet Area is cleared from a Programming Device.
4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the DeviceNet Area will be retained when FALS(007) is executed.)

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IOM Hold Bit Operation

If the IOM Hold BIt (A50012) is ON, the contents of the DeviceNet Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN or MONITOR mode or vice-versa.

If the IOM Hold BIt (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the DeviceNet Area won't be cleared when the PLC's power supply is cycled.

9-7 PLC Link Area

The PLC Link Area contains 5 words with addresses ranging from CIO 0247 to CIO 0250. A442 is also used for PLC Links. Use these words to monitor PLC Link errors, monitor CPU Unit operating status, and detect PLC Link operating levels.

Note The Link Area (CIO 1000 to CIO 1063) is used to exchange data between PLCs in a PLC Link system, just as the LR Area is used in other OMRON PLCs. The flags in the PLC Link Area indicate the status of PLC Link operations.

PLC Link Error Flags

When a transmission error occurs or there is a power interruption at another Unit after the PLC link is established, the flag corresponding to the other Unit's unit number will be turned ON. These flags are read-only, although the PLC Link Error Flag will be turned ON if the CPU Unit is stopped by a FALS(007) error.

CPU Unit RUN Flags

The flag corresponding to the a CPU Unit's unit number will be ON when the CPU Unit is operating in RUN or MONITOR mode. The corresponding flag will be OFF when the CPU Unit is in PROGRAM mode. These flags can be used to determine another Unit's operating status. These flags are read-only.

Operating Level Detection Flags

The flags in A442 can be used to determine whether a PLC Link Unit is mounted to the PLC as well as the Unit's operating level. A44211 will be ON if the PLC Link Unit is in operating level 1 and A44212 will be ON if the PLC Link Unit is in operating level 0.

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CIO Area Flags

The following table shows the allocation of the CIO Area flags related to PLC Link operation. (The numbers in parentheses show the allocation for multilevel systems; operating level 0 is #0 and operating level 1 is #1.)

Flag type	Bit	CIO 0247	CIO 0248	CIO 0249	CIO 0250
CPU Unit RUN Flags	00	Unit 24 (#1, Unit 8)	Unit 16 (#1, Unit 0)	Unit 8 (#0, Unit 8)	Unit 0 (#0, Unit 0)
	01	Unit 25 (#1, Unit 9)	Unit 17 (#1, Unit 1)	Unit 9 (#0, Unit 9)	Unit 1 (#0, Unit 1)
	02	Unit 26 (#1, Unit 10)	Unit 18 (#1, Unit 2)	Unit 10 (#0, Unit 10)	Unit 2 (#0, Unit 2)
	03	Unit 27 (#1, Unit 11)	Unit 19 (#1, Unit 3)	Unit 11 (#0, Unit 11)	Unit 3 (#0, Unit 3)
	04	Unit 28 (#1, Unit 12)	Unit 20 (#1, Unit 4)	Unit 12 (#0, Unit 12)	Unit 4 (#0, Unit 4)
	05	Unit 29 (#1, Unit 13)	Unit 21 (#1, Unit 5)	Unit 13 (#0, Unit 13)	Unit 5 (#0, Unit 5)
	06	Unit 30 (#1, Unit 14)	Unit 22 (#1, Unit 6)	Unit 14 (#0, Unit 14)	Unit 6 (#0, Unit 6)
	07	Unit 31 (#1, Unit 15)	Unit 23 (#1, Unit 7)	Unit 15 (#0, Unit 15)	Unit 7 (#0, Unit 7)
PLC Link Error Flags	08	Unit 24 (#1, Unit 8)	Unit 16 (#1, Unit 0)	Unit 8 (#0, Unit 8)	Unit 0 (#0, Unit 0)
	09	Unit 25 (#1, Unit 9)	Unit 17 (#1, Unit 1)	Unit 9 (#0, Unit 9)	Unit 1 (#0, Unit 1)
	10	Unit 26 (#1, Unit 10)	Unit 18 (#1, Unit 2)	Unit 10 (#0, Unit 10)	Unit 2 (#0, Unit 2)
	11	Unit 27 (#1, Unit 11)	Unit 19 (#1, Unit 3)	Unit 11 (#0, Unit 11)	Unit 3 (#0, Unit 3)
	12	Unit 28 (#1, Unit 12)	Unit 20 (#1, Unit 4)	Unit 12 (#0, Unit 12)	Unit 4 (#0, Unit 4)
	13	Unit 29 (#1, Unit 13)	Unit 21 (#1, Unit 5)	Unit 13 (#0, Unit 13)	Unit 5 (#0, Unit 5)
	14	Unit 30 (#1, Unit 14)	Unit 22 (#1, Unit 6)	Unit 14 (#0, Unit 14)	Unit 6 (#0, Unit 6)
	15	Unit 31 (#1, Unit 15)	Unit 23 (#1, Unit 7)	Unit 15 (#0, Unit 15)	Unit 7 (#0, Unit 7)

PLC Link Area Initialization

The contents of the PLC Link Area will be cleared in the following cases:

1,2,3...

1. The operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
3. The PLC Link Area is cleared from a Programming Device.
4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the PLC Link Area will be retained when FALS(007) is executed.)

IOM Hold Bit Operation

If the IOM Hold BIt (A50012) is ON, the contents of the PLC Link Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold BIt (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the PLC Link Area won't be cleared when the PLC's power supply is cycled.

Forcing Bit Status

Bits in the PLC Link Area can be force-set and force-reset.

Auxiliary Area Flags

A44211 will be ON when the PLC Link Unit is in operating level #1. A44212 will be ON when the Unit is in operating level #0 or a PLC Link Unit isn't mounted in the PLC. (The other bits in A442 are not used.)

Refer to *9-16 Auxiliary Area* and to *Appendix B Auxiliary Area* for more details on A422.

Note

1. The PLC Link Area (CIO 0247 to CIO 0250) overlaps the I/O Area. When using PLC Link Units, be sure that words are not also allocated to other I/O points.
2. When designating addresses in programming or allocations inside C200H Special I/O Units, "247" to "250" will actually specify CIO 0247 to CIO 0250 in the CPU Unit. A422 cannot be specified inside a C200H Special I/O Unit.

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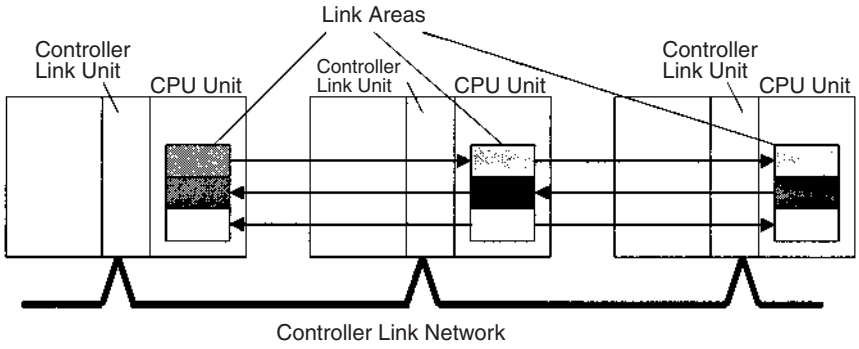
9-8 Data Link Area

Data Link Area addresses range from CIO 1000 to CIO 1199 (CIO bits 100000 to 119915). Words in the Link Area are used for data links when *LR* is set as the data link area for Controller Link Networks. It is also used for PLC Links.

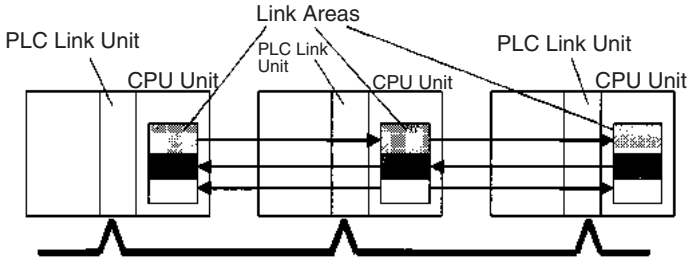
A data link automatically (independently of the program) shares data with Link Areas in other CS-series CPU Units in the network through a Controller Link Unit mounted to the PLC's CPU Rack.

Data links can be generated automatically (using the same number of words for each node) or manually. When a user defines the data link manually, he can assign any number of words to each node and make nodes receive-only or transmit-only. Refer to the *Controller Link Units Operation Manual* (W309) for more details.

Words in the Link Area can be used in the program when *LR* is not set as the data link area for Controller Link Networks and PLC Links are not used.



Link Area words are also allocated to PLC Link Systems when a PLC Link is created by connecting PLC Link Units.



Links to C200HX/HG/HE, C200HS, and C200H PLCs

Link Area words CIO 1000 to CIO 1063 in CS-series PLCs correspond to Link Relay Area words LR 00 to LR 63 for data links created in C200HX/HG/HE PLCs and PLC Links created in C200HX/HG/HE, C200HS, or C200H PLCs. When converting C200HX/HG/HE, C200HS, or C200H programs for use in CS-series PLCs, change addresses LR 00 through LR 63 to their equivalent Link Area addresses CIO 1000 through CIO 1063.

Link Area Initialization

The contents of the Link Area will be cleared in the following cases:

1,2,3...

1. The operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
3. The Link Area is cleared from a Programming Device.

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4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the Link Area will be retained if FALS(007) is executed.)

IOM Hold Bit Operation

If the IOM Hold BIt (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the Link Area won't be cleared when the PLC's power supply is cycled.

If the IOM Hold BIt (A50012) is ON, the contents of the Link Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

Forcing Bit Status

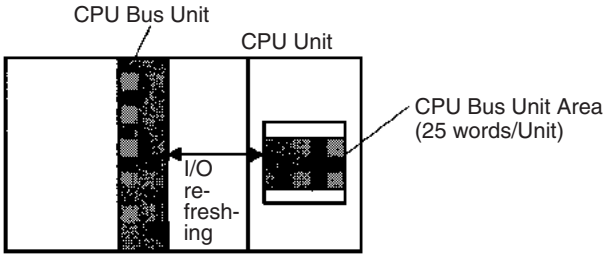
Bits in the Link Area can be force-set and force-reset.

Note When designating addresses in programming or allocations inside C200H Special I/O Units, "LR 00" to "LR63" will actually specify CIO 1000 to CIO1063 in the CPU Unit. CIO 1064 to CIO 1199 in the CPU Unit cannot be specified in the C200H Special I/O Unit.

9-9 CPU Bus Unit Area

The CPU Bus Unit Area contains 400 words with addresses ranging from CIO 1500 to CIO 1899. Words in the CPU Bus Unit Area can be allocated to CPU Bus Units to transfer data such as the operating status of the Unit. Each Unit is allocated 25 words based on the Unit's unit number setting.

Data is exchanged with CPU Bus Units once each cycle during I/O refreshing, which occurs after program execution. (Words in this data area cannot be refreshed with immediate-refreshing or IORF(097).)



Each CPU Bus Unit is allocated 25 words based on its unit number, as shown in the following table.

Unit number	Allocated words
0	CIO 1500 to CIO 1524
1	CIO 1525 to CIO 1549
2	CIO 1550 to CIO 1574
3	CIO 1575 to CIO 1599
4	CIO 1600 to CIO 1624
5	CIO 1625 to CIO 1649
6	CIO 1650 to CIO 1674
7	CIO 1675 to CIO 1699
8	CIO 1700 to CIO 1724
9	CIO 1725 to CIO 1749
A	CIO 1750 to CIO 1774
B	CIO 1775 to CIO 1799
C	CIO 1800 to CIO 1824
D	CIO 1825 to CIO 1849

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Unit number	Allocated words
E	CIO 1850 to CIO 1874
F	CIO 1875 to CIO 1899

The function of the 25 words depends upon the CPU Bus Unit being used. For details, refer to the Unit's operation manual.

Words in the CPU Bus Unit Area that aren't allocated to CPU Bus Units can be used only in the program.

Note The addresses in the CS-series CPU Bus Unit Area cannot be designated directly in programming or allocations inside C200H Special I/O Units.

CPU Bus Unit Area Initialization

The contents of the CPU Bus Unit Area will be cleared in the following cases:

1,2,3...

1. The operating mode is changed from PROGRAM to RUN or MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
3. The CPU Bus Unit Area is cleared from a Programming Device.
4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the CPU Bus Unit Area will be retained when FALS(007) is executed.)

IOM Hold Bit Operation

If the IOM Hold BIt (A50012) is ON, the contents of the CS-series CPU Bus Unit Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold BIt (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the CS-series CPU Bus Unit Area won't be cleared when the PLC's power supply is cycled.

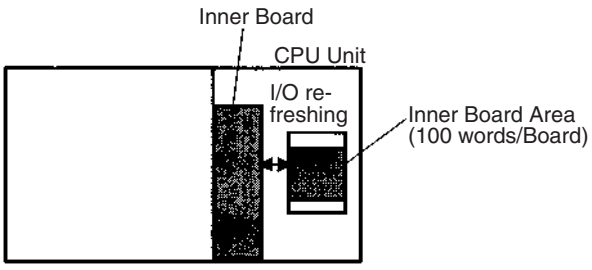
Forcing Bit Status

Bits in the CPU Bus Unit Area can be force-set and force-reset.

9-10 Inner Board Area

The Inner Board Area contains 100 words with addresses ranging from CIO 1900 to CIO 1999. Words in the Inner Board Area can be allocated to an Inner Board to transfer data such as the operating status of the Unit. All 100 words must be allocated to just one Inner Board.

Data is exchanged with the Inner Board once each cycle during normal I/O refreshing, which occurs after program execution. Depending on the type of Inner Board that is mounted, data can also be refreshed directly.



The function of the 100 words in the Inner Board Area depends upon the Inner Board being used. For details, refer to the Board's Operation Manual.

When the words in the Inner Board Area aren't allocated to an Inner Board, they can be used only in the program.

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Inner Board Area Initialization

The contents of the Inner Board Area will be cleared in the following cases:

1,2,3...

1. The operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
3. The Inner Board Area is cleared from a Programming Device.
4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the Inner Board Area will be retained when FALS(007) is executed.)

IOM Hold Bit Operation

If the IOM Hold BIt (A50012) is ON, the contents of the Inner Board Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold BIt (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the Inner Board Area won't be cleared when the PLC's power supply is cycled.

Forcing Bit Status

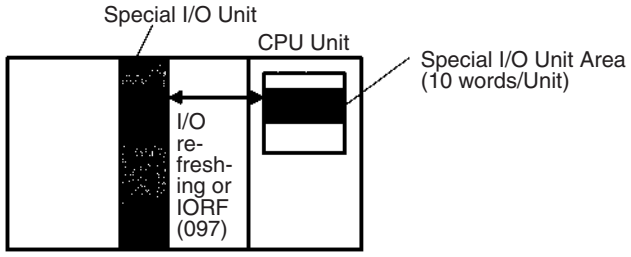
Bits in the Inner Board Area can be force-set and force-reset.

Note The addresses in the Inner Board Area cannot be designated directly in programming or allocations inside C200H Special I/O Units.

9-11 Special I/O Unit Area

The Special I/O Unit Area contains 960 words with addresses ranging from CIO 2000 to CIO 2959. Words in the Special I/O Unit Area are allocated to CS-series and C200H Special I/O Units to transfer data such as the operating status of the Unit. Each Unit is allocated 10 words based on its unit number setting.

Data is exchanged with Special I/O Units once each cycle during I/O refreshing, which occurs after program execution. The words can also be refreshed with IORF(097).



Note The addresses in the Special I/O Unit Area cannot be designated directly in programming or allocations inside C200H Special I/O Units.

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Each Special I/O Unit is allocated 25 words based on its unit number, as shown in the following table.

Unit number	Allocated words	C200H Special I/O Units	CS-series Special I/O Units
0	CIO 2000 to CIO 2009	Valid unit numbers	Valid unit numbers
1	CIO 2010 to CIO 2019		
2	CIO 2020 to CIO 2029		
3	CIO 2030 to CIO 2039		
4	CIO 2040 to CIO 2049		
5	CIO 2050 to CIO 2059		
6	CIO 2060 to CIO 2069		
7	CIO 2070 to CIO 2079		
8	CIO 2080 to CIO 2089		
9	CIO 2090 to CIO 2099		
10 (A)	CIO 2100 to CIO 2109		
11 (B)	CIO 2110 to CIO 2119		
12 (C)	CIO 2120 to CIO 2129		
13 (D)	CIO 2130 to CIO 2139		
14 (E)	CIO 2140 to CIO 2149		
15 (F)	CIO 2150 to CIO 2159		
16	CIO 2160 to CIO 2169	Not available on C200H Units	
17	CIO 2170 to CIO 2179		
95	CIO 2950 to CIO 2959		

The function of the 10 words allocated to a Unit depends upon the Special I/O Unit being used. For details, refer to the Unit's Operation Manual.

Words in the Special I/O Unit Area that aren't allocated to Special I/O Units can be used only in the program.

Special I/O Unit Area Initialization

The contents of the Special I/O Unit Area will be cleared in the following cases:

1,2,3...

1. The operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
3. The Special I/O Unit Area is cleared from a Programming Device.
4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the Special I/O Unit Area will be retained when FALS(007) is executed.)

IOM Hold Bit Operation

If the IOM Hold BIt (A50012) is ON, the contents of the Special I/O Unit Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold BIt (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the Special I/O Unit Area won't be cleared when the PLC's power supply is cycled.

Forcing Bit Status

Bits in the Special I/O Unit Area can be force-set and force-reset.

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9-12 SYSMAC BUS Area

The SYSMAC BUS Area contains 80 words with addresses ranging from CIO 3000 to CIO 3079. Words in the SYSMAC BUS Area are allocated to Slave Racks connected to Wired or Optical SYSMAC BUS Remote I/O Master Units (C200H-RM201 or C200H-RM001-PV1). Up to two Masters can be mounted to the CPU Rack or a C200H Expansion I/O Rack. A maximum of 8 Slave Racks can be managed by one CPU Unit, whether one or two Masters are mounted.

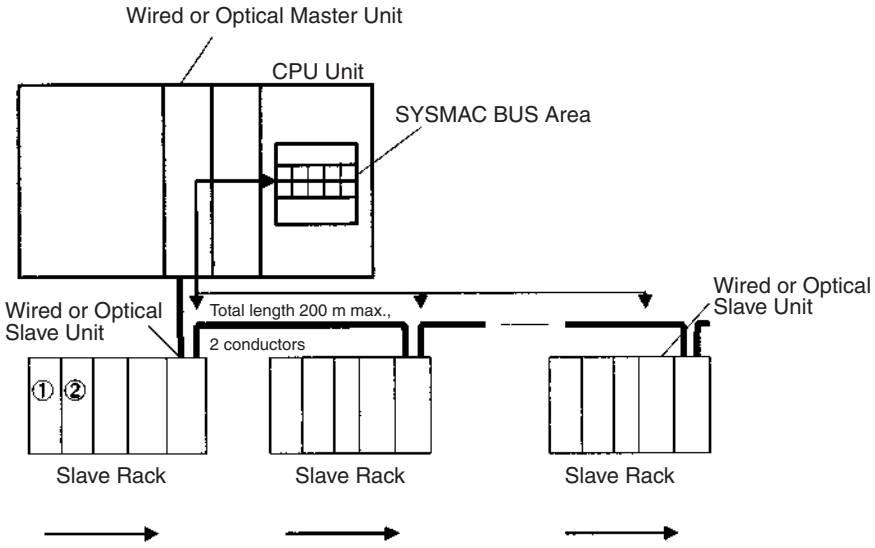
Each Slave Rack is allocated 10 words based on the Rack's rack number setting (0 to 7).

Rack number	Allocated words
0	CIO 3000 to CIO 3009
1	CIO 3010 to CIO 3019
2	CIO 3020 to CIO 3029
3	CIO 3030 to CIO 3039
4	CIO 3040 to CIO 3049
5	CIO 3050 to CIO 3059
6	CIO 3060 to CIO 3069
7	CIO 3070 to CIO 3079

Up to 10 C200H Basic I/O Units can be mounted in a Slave Rack. One word (16 bits) is allocated to each slot in the Slave Rack from left to right. Allocations are fixed by slot, e.g., if there is no Unit in a slot, the word normally allocated to that slot will not be used.

Note

1. Up to two Masters can be mounted for any one CPU Unit A maximum of 8 Slave Racks can be managed by one CPU Unit, regardless of whether one or two Masters are mounted.
2. C200H Special I/O Units can also be mounted to Slave Racks, but they will be allocated words according to their unit number and will not be allocated SYSMAC BUS Area words.
3. SYSMAC BUS Units other than Slave Racks (such as I/O Terminals) can also be connected. These other Units are allocated words in the I/O Terminal Area. Refer to *9-13 I/O Terminal Area* for details.



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1,2,3...

1. Ten words are allocated to each Rack based on the rack number set on the Slave Unit.
2. The ten words in each Rack are allocated to the slots in the Rack from left to right (one word/slot).

SYSMAC BUS Area Initialization

The contents of the SYSMAC BUS Area will be cleared in the following cases:

1,2,3...

1. The operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
3. The SYSMAC BUS Area is cleared from a Programming Device.
4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the SYSMAC BUS Area will be retained when FALS(007) is executed.)

IOM Hold Bit Operation

If the IOM Hold BIt (A50012) is ON, the contents of the SYSMAC BUS Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold BIt (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the SYSMAC BUS Area won't be cleared when the PLC's power supply is cycled.

Forcing Bit Status

Bits in the SYSMAC BUS Area can be force-set and force-reset.

Note

1. A C200H Expansion I/O Rack can also be connected to a Remote I/O Slave Rack. If that is done, then the C200H Expansion I/O Rack is counted as a Remote I/O Slave Rack and allocated the next unit number. The total number of Remote I/O Slave Racks is eight, of which only two can be C200H Expansion I/O Racks.
2. The addresses in the SYSMAC BUS Area cannot be designated directly in programming or allocations inside C200H Special I/O Units.

9-13 I/O Terminal Area

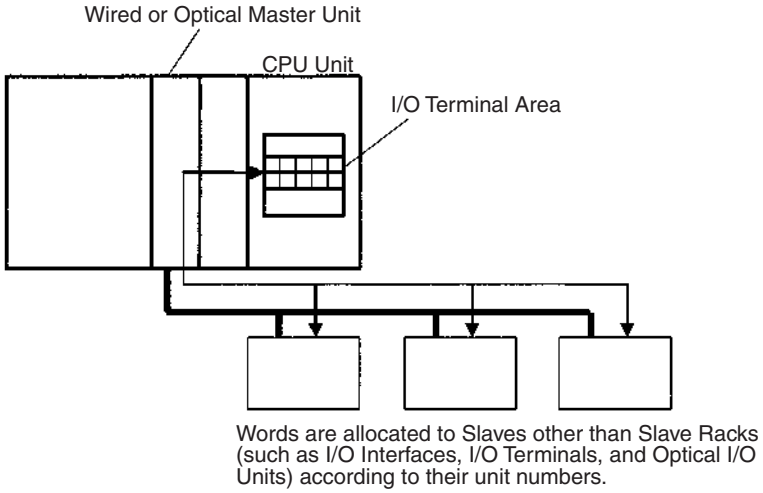
The I/O Terminal Area contains 32 words with addresses ranging from CIO 3100 to CIO 3131. Words in the I/O Terminal Area can be allocated to Slaves other than Slave Racks (such as I/O Interfaces, I/O Terminals, and Optical I/O Units) connected to a Wired or Optical SYSMAC BUS Remote I/O Master Units (C200H-RM201 or C200H-RM001-PV1). Up to two Masters can be mounted to the CPU Rack or a C200H Expansion I/O Rack. Up to 32 Slaves are allowed for each CPU Unit.

Each Slave is allocated 1 word based on its unit number setting (0 to 31) except for Optical I/O Units, which are allocated 2 words each. The words are allocated according to unit numbers even when two Master Units are being used.

Unit number	Allocated word
0	CIO 3100
1	CIO 3101
31	CIO 3131

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Both Slave Racks and SYSMAC BUS Slaves other than Slave Racks (such as I/O Terminals) can be connected. Slave Racks are allocated words in the SYSMAC BUS Area. Refer to *9-12 SYSMAC BUS Area* for details.



Note The addresses in the I/O Terminal Area cannot be designated directly in programming or allocations inside C200H Special I/O Units.

I/O Terminal Area Initialization

The contents of the I/O Terminal Area will be cleared in the following cases:

1,2,3...

1. The operating mode is changed from PROGRAM to RUN or MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
3. The I/O Terminal Area is cleared from a Programming Device.
4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the I/O Terminal Area will be retained when FALS(007) is executed.)

IOM Hold Bit Operation

If the IOM Hold BIt (A50012) is ON, the contents of the I/O Terminal Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold BIt (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the I/O Terminal Area won't be cleared when the PLC's power supply is cycled.

Forcing Bit Status

Bits in the I/O Terminal Area can be force-set and force-reset.

9-14 Work Area

The Work Area contains 512 words with addresses ranging from W000 to W511. These words can be used only in the program as work words.

There are unused words in the CIO Area (CIO 1200 to CIO 1499 and CIO 3800 to CIO 6143) that can also be used in the program, but use any available words in the Work Area first because the unused words in the CIO Area may be allocated to new functions in future versions of CS-series CPU Units.

Work Area Initialization

The contents of the Work Area will be cleared in the following cases:

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1,2,3...

1. The operating mode is changed from PROGRAM to RUN or MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.
3. The Work Area is cleared from a Programming Device.
4. PLC operation is stopped when a fatal error other than an FALS(007) error occurs. (The contents of the Work Area will be retained when FALS(007) is executed.)

IOM Hold Bit Operation

If the IOM Hold BIt (A50012) is ON, the contents of the Work Area won't be cleared when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold BIt (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the contents of the Work Area won't be cleared when the PLC's power supply is cycled.

Forcing Bit Status

Bits in the Work Area can be force-set and force-reset.

Note The addresses in the Work Area cannot be designated directly in programming or allocations inside C200H Special I/O Units.

9-15 Holding Area

The Holding Area contains 512 words with addresses ranging from H000 to H511 (bits H00000 to H51115). These words can be used only in the program.

Holding Area bits can be used in any order in the program and can be used as normally open or normally closed conditions as often as necessary.

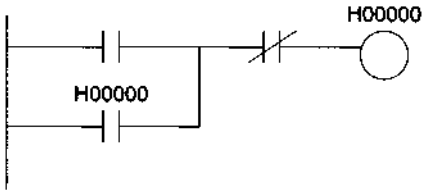
Holding Area Initialization

Data in the Holding Area is not cleared when the PLC's power supply is cycled or the PLC's operating mode is changed from PROGRAM mode to RUN or MONITOR mode or vice-versa.

A Holding Area bit will be cleared if it is programmed between IL(002) and ILC(003) and the execution condition for IL(002) is OFF. To keep a bit ON even when the execution condition for IL(002) is OFF, turn ON the bit with the SET instruction just before IL(002).

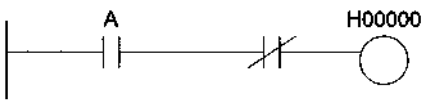
Self-maintaining Bits

When a self-maintaining bit is programmed with a Holding Area bit, the self-maintaining bit won't be cleared even when the power is reset.



Note

1. If a Holding Area bit is not used for the self-maintaining bit, the bit will be turned OFF and the self-maintaining bit will be cleared when the power is reset.
2. If a Holding Area bit is used but not programmed as a self-maintaining bit as in the following diagram, the bit will be turned OFF by execution condition A when the power is reset.

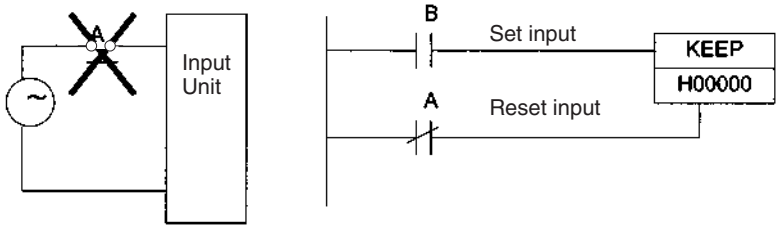


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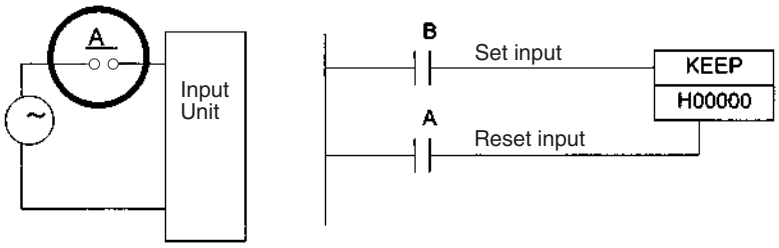
3. The Function Block Holding Area words are allocated from H512 to H1535. These words can be used only for the function block instance area (internally allocated variable area). These words cannot be specified as instruction operands in the user program.

Precautions

When a Holding Area bit is used in a KEEP(011) instruction, never use a normally closed condition for the reset input if the input device uses an AC power supply. When the power supply goes OFF or is temporarily interrupted, the input will go OFF before the PLC's internal power supply and the Holding Area bit will be reset.



Instead, use a configuration like the one shown below.



There are no restrictions in the order of using bit address or in the number of N.C. or N.O. conditions that can be programmed.

Note When designating addresses in programming or allocations inside C200H Special I/O Units, "HR 00" to "HR 99" will actually specify H000 to H099 in the CPU Unit and "AR 00" to "AR 27" will actually specify H100 to H127 in the CPU Unit. Other addresses in this area cannot be specified inside the C200H Special I/O Units.

9-16 Auxiliary Area

The Auxiliary Area contains 960 words with addresses ranging from A000 to A959). These words are preassigned as flags and control bits to monitor and control operation.

A000 through A447 are read-only, but A448 through A959 can be read or written from the program or a Programming Device.

Note

1. The addresses in the Auxiliary Area cannot be designated directly in programming or allocations inside C200H Special I/O Units.
2. The undefined addresses of the Auxiliary Area may be allocated to functions in future version upgrades of the CPU Unit. Do not use these words as CIO Area words in the user program.

Forcing Bit Status

Bits in the Auxiliary Area cannot be force-set and force-reset continuously.

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Writing Auxiliary Area Data

The following operations can be performed from a Programming Device to write data in the Auxiliary Area.

- Using the CX-Programmer: Online set/reset (not force-set/force-reset) (only for version 1.2 or higher), changing present values when monitoring programming addresses (set values dialog box), or transferring data to the PLC after editing the PLC data tables. Refer to the *CX-Programmer User Manual* (W446).
- Using a Programming Console: Temporarily force-setting/force-resetting bits from the Bit/Word Monitor or the 3-word Monitor operation (see Programming Consoles Operation Manual).

Functions

The following table lists the functions of Auxiliary Area flags and control bits. The table is organized according to the functions of the flags and bits. Some of these functions are not supported by some CPU Unit models and unit versions. For more details or to look up a bit by its address, refer to *Appendix B Auxiliary Area*.

Initial Settings

Name	Address	Description	Access
I/O Response Times in Basic I/O Units	A22000 to A25915	Contains the current I/O response times for CS-series Basic I/O Units.	Read-only
IOM Hold Bit	A50012	Determines whether the contents of I/O memory are retained when the PLC's power is reset or the PLC's operating mode is changed (from PROGRAM to RUN/MONITOR or vice-versa). Turn ON this bit to maintain I/O memory when changing between PROGRAM and RUN or MONITOR mode. Turn OFF this bit to clear I/O memory when changing the changing between PROGRAM and RUN or MONITOR mode.	Read/write
Forced Status Hold Bit	A50013	Determines whether the status of force-set and force-reset bits is maintained when the PLC's power is reset or the PLC's operating mode is changed (between PROGRAM and RUN or MONITOR mode).	Read/write
Power Interruption Disable Setting (CS1-H CPU Units only)	A530	Set to A5A5 hex to disable power interrupts (except the Power OFF Interrupt task) between DI(693) and EI(694) instructions.	Read/write

CPU Unit Settings

Name	Address	Description	Access
Status of DIP Switch Pin 6	A39512	Contains the status set on pin 6 of the CPU Unit's DIP switch. (Refreshed every cycle.)	Read-only

Basic I/O Unit Settings

Name	Address	Description	Access
Basic I/O Unit Status Area	A05000 to A08915	Indicates whether fuses in Basic I/O Units are intact or blown. The flags correspond to rack 0, slot 0 through rack 7, slot 9.	Read-only

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CPU Bus Unit Flags/Bits

Name	Address	Description	Access
CPU Bus Unit Initialization Flags	A30200 to A30215	These flags correspond to CPU Bus Units 0 to 15. A flag will be ON while the corresponding Unit is initializing after the power is turned ON or the Unit's Restart Bit (in A501) is turned ON.	Read-only
CPU Bus Unit Restart Bits	A50100 to A50115	These bits correspond to CPU Bus Units 0 to 15. Turn a bit from OFF to ON to restart the corresponding Unit.	Read/write

Special I/O Unit Flags/Bits

Name	Address	Description	Access
Special I/O Unit Initialization Flags	A33000 to A33515	These flags correspond to Special I/O Units 0 to 95. A flag will be ON while the corresponding Unit is initializing after the power is turned ON or the Unit's Restart Bit is turned ON. (Restart Bits A50200 to A50715 correspond to Units 0 to 95.)	Read-only
Special I/O Unit Restart Bits	A50200 to A50715	These bits correspond to Special I/O Units 0 to 95. Turn a bit from OFF to ON to restart the corresponding Unit.	Read/write

Inner Board Flags/Bits

Name	Address	Description	Access
Inner Board Monitoring Area	A35500 to A35915	The function of these words is defined in the Inner Board.	Read-only
Inner Board Restart Bit	A60800	Turn the bit from OFF to ON to restart the corresponding Inner Board.	Read/write

Flags for Programming

Name	Address	Description	Access
First Cycle Flag	A20011	This flag is turned ON for one cycle when program execution starts (the operating mode is switched from PROGRAM to RUN/MONITOR).	Read-only
Initial Task Execution Flag	A20015	When a task switches from INI to RUN status for the first time, this flag will be turned ON within the task for one cycle only.	Read-only
Task Started Flag	A20014	When a task switches from WAIT or INI to RUN status, this flag will be turned ON within the task for one cycle only. The only difference between this flag and A20015 is that this flag also turns ON when the task switches from WAIT to RUN status.	Read-only
10-ms Incrementing Free Running Timer	A000	This word contains the system timer used after the power is turned ON. 0000 hex is set when the power is turned ON and this value is automatically incremented by 1 every 10 ms. The value returns to 0000 hex after reaching FFFF hex (655,350 ms), and then continues to be automatically incremented by 1 every 10 ms. **Note:** The timer will continue to be incremented when the operating mode is switched to RUN mode. Example: The interval can be counted between processing A and processing B without requiring timer instructions. This is achieved by calculating the difference between the value in A000 for processing A and the value in A000 for processing B. The interval is counted in 10 ms units.	Read-only

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Name	Address	Description	Access
100-ms Incrementing Free Running Timer	A001	This word contains the system timer used after the power is turned ON. 0000 hex is set when the power is turned ON and this value is automatically incremented by 1 every 100 ms. The value returns to 0000 hex after reaching FFFF hex (655,350 ms), and then continues to be automatically incremented by 1 every 10 ms. **Note:** The timer will continue to be incremented when the operating mode is switched to RUN mode.	Read-only
1-s Incrementing Free Running Timer (Unit version 4.0 or later)	A002	This word contains the system timer used after the power is turned ON. 0000 hex is set when the power is turned ON and this value is automatically incremented by 1 every 1 s. The value returns to 0000 hex after reaching FFFF hex (65,535 s), and then continues to be automatically incremented by 1 every 1 s. **Note:** The timer will continue to be incremented when the operating mode is switched to RUN mode.	Read-only

Cycle Time Information

Name	Address	Description	Access
Maximum Cycle Time	A262 to A263	These words contain the maximum cycle time in units of 0.1 ms. In a Parallel Processing Mode, the maximum cycle time of the program execution cycle will be given. The time is updated every cycle and is recorded in 32-bit binary (0 to FFFF FFFF, or 0 to 429,496,729.5 ms). (A263 is the leftmost word.)	Read-only
Present Cycle Time	A264 to A265	These words contain the present cycle time in units of 0.1 ms. In a Parallel Processing Mode, the maximum cycle time of the program execution cycle will be given. The time is updated every cycle and is recorded in 32-bit binary (0 to FFFF FFFF, or 0 to 429,496,729.5 ms). (A265 is the leftmost word.)	Read-only
Peripheral Servicing Cycle Time	A268	In Parallel Processing with Synchronous or Asynchronous Memory Access, this word contains the peripheral servicing cycle time in units of 0.1 ms. The time is updated every cycle and is recorded in 16-bit binary (0 to 4E20 hex, or 0.0 to 2,000.0 ms).	Read-only

Task Information

Name	Address	Description	Access
Task Number when Program Stopped	A294	This word contains the task number of the task that was being executed when program execution was stopped because of a program error.	Read-only
Maximum Interrupt Task Processing Time	A440	Contains the Maximum Interrupt Task Processing Time in units of 0.1 ms.	Read-only
Interrupt Task with Max. Processing Time	A441	Contains the task number of the interrupt task with the maximum processing time. Hexadecimal values 8000 to 80FF correspond to task numbers 00 to FF. Bit 15 is turned ON when an interrupt has occurred.	Read-only
IR/DR Operation between Tasks	A09914	Turn ON this bit to share index and data registers between all tasks. Turn OFF this bit to use separate index and data registers between in each task.	Read-only

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Debugging Information

■ Online Editing

Name	Address	Description	Access
Online Editing Wait Flag	A20110	ON when an online editing process is waiting. (An online editing request was received while online editing was disabled.)	Read-only
Online Editing Processing Flag	A20111	ON when an online editing process is being executed.	Read-only
Online Editing Disable Bit Validator	A52700 to A52707	The Online Editing Disable Bit (A52709) is valid only when this byte contains 5A.	Read/write
Online Editing Disable Bit	A52709	Turn this bit ON to disable online editing. (A52700 to A52707 must be set to 5A.)	Read/write

■ Output Control

Name	Address	Description	Access
Output OFF Bit	A50015	Turn this bit ON to turn OFF all outputs from Basic I/O Units, Output Units, and Special I/O Units.	Read/write

■ Differentiate Monitor

Name	Address	Description	Access
Differentiate Monitor Completed Flag	A50809	ON when the differentiate monitor condition has been established during execution of differentiation monitoring.	Read/write

■ Data Tracing

Name	Address	Description	Access
Sampling Start Bit	A50815	When a data trace is started by turning this bit from OFF to ON from a Programming Device, the PLC will begin storing data in Trace Memory by one of the three following methods: 1) Periodic sampling (10 to 2,550 ms) 2) Sampling at execution of TRSM(045) 3) Sampling at the end of every cycle.	Read/write
Trace Start Bit	A50814	Turn this bit from OFF to ON to establish the trigger condition. The offset indicated by the delay value (positive or negative) determines which data samples are valid.	Read/write
Trace Busy Flag	A50813	ON when the Sampling Start Bit (A50815) is turned from OFF to ON. OFF when the trace is completed.	Read/write
Trace Completed Flag	A50812	ON when sampling of a region of trace memory has been completed during execution of a Trace. OFF when the next time the Sampling Start Bit (A50815) is turned from OFF to ON.	Read/write
Trace Trigger Monitor Flag	A50811	ON when a trigger condition is established by the Trace Start Bit (A50814). OFF when the next Data Trace is started by the Sampling Start bit (A50815).	Read/write

File Memory Information

Name	Address	Description	Access
Memory Card Type	A34300 to A34302	Indicates the type of Memory Card, if any, installed.	Read-only
Memory Card Format Error Flag	A34307	ON when the Memory Card is not formatted or a formatting error has occurred.	Read-only
File Transfer Error Flag	A34308	ON when an error occurred while writing data to file memory.	Read-only
File Write Error Flag	A34309	ON when data cannot be written to file memory because it is write-protected or the data exceeds the capacity of the file memory.	Read-only
File Read Error	A34310	ON when a file could not be read because of a malfunction (file is damaged or data is corrupted).	Read-only

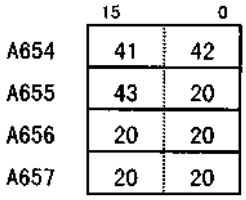
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Name	Address	Description	Access
File Missing Flag	A34311	ON when an attempt is made to read a file that doesn't exist, or an attempt is made to write to a file in a directory that doesn't exist.	Read-only
File Memory Operation Flag	A34313	ON while any of the following operations is being executed. OFF when none of them are being executed. Memory Card detection started. CMND instruction sending a FINS command to the local CPU Unit. FREAD/FWRIT instructions. Program replacement using the control bit in the Auxiliary Area. Easy backup operation. If this flag is ON, write and comparison operations to the Memory Card cannot be executed.	Read-only
Memory Card Detected Flag	A34315	ON when a Memory Card has been detected. OFF when a Memory Card has not been detected.	Read-only
Number of Items to Transfer	A346 to A347	These words contain the number of words or fields remaining to be transferred (8-digit hexadecimal). For binary files (.IOM), the value is decremented for each word that is read. For text (.TXT) or CSV (.CSV) data, the value is decremented for each field that is read.	Read-only
Accessing File Data Flag	A34314	ON while file data is being accessed.	Read-only
EM File Memory Format Error Flag	A34306	Turns ON when a format error occurs in the first EM bank allocated for file memory. Turns OFF when formatting is completed normally.	Read-only
EM File Memory Starting Bank	A344	Contains the starting bank number of EM file memory (bank number of the first formatted bank). This number is read when starting to write data from a Memory Card. If the largest bank number for which there is an EM file for simple backup (BACKUPE□.IOM, where represents consecutive bank numbers) is the same as the largest bank number supported by the CPU Unit, the EM Area will be formatted as file memory using the value in A344. If the maximum bank numbers are different, the EM Area will be returned to it's unformatted (not file memory) status.	Read-only
Program Index File Flag	A34501	Turns ON when the comment memory contains a program index file. 0: No file 1: File present	Read-only
Comment File Flag	A34502	Turns ON when the comment memory contains a comment file. 0: No file 1: File present	
Symbol Table File Flag	A34503	Turns ON when the comment memory contains a symbol table file. 0: No file 1: File present	
File Deletion Flags	A39506	The system automatically deleted the remainder of an EM file memory file that was being updated when a power interruption occurred.	Read-only
	A39507	The system automatically deleted the remainder of a Memory Card file that was being updated when a power interruption occurred.	Read-only

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Name	Address	Description	Access
Simple Backup Write Capacity	A397	If a write for a simple backup operation fails, A397 will contain the Memory Card capacity that would have been required to complete the write operation. The value is in Kbytes. (This indicates that the Memory Card did not have the specified capacity when the write operation was started.) 0001 to FFFF hex: Write error (value indicates required capacity from 1 to 65,535 Kbytes). A397 will be cleared to 0000 hex when the write is completed successfully for a simple backup operation.	Read-only
Program Replacement End Code	A65000 to A65007	Normal End (i.e., when A65014 is OFF) 01 hex: Program file (.OBJ) replaced. Error End (i.e., when A65014 is ON) 00 hex: Fatal error 01 hex: Memory error 11 hex: Write-protected 12 hex: Program replacement password error 21 hex: No Memory Card 22 hex: No such file 23 hex: Specified file exceeds capacity (memory error). 31 hex: One of the following in progress: File memory operation User program write Operating mode change	Read-only
Replacement Error Flag	A65014	ON when the Replacement Start Bit (A65015) has been turned ON to replace the program, but there is an error. If the Replacement Start Bit is turned ON again, the Replacement Error Flag will be turned OFF.	Read/write
Replacement Start Bit	A65015	Program replacement starts when the Replacement Start Bit is turned ON if the Program Password (A651) is valid (A5A5 hex). Do not turn OFF the Replacement Start Bit during program replacement. When the power is turned ON or program replacement is completed, the Replacement Start Bit will be turned OFF, regardless of whether replacement was completed normally or in error. It is possible to confirm if program replacement is being executed by reading the Replacement Start Bit using a Programming Device, PT, or host computer.	Read/write

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Name	Address	Description	Access
Program Password	A651	Store the password to replace a program. A5A5 hex: Replacement Start Bit (A65015) is enabled. Any other value: Replacement Start Bit (A65015) is disabled. When the power is turned ON or program replacement is completed, the Replacement Start Bit will be turned OFF, regardless of whether replacement was completed normally or in error.	Read/write
Program File Name	A654 to A657	When program replacement starts, the program file name will be stored in ASCII. File names can be specified up to eight characters in length excluding the extension. File names are stored in the following order: A654 to A657 (i.e., from the lowest word to the highest), and from the highest byte to the lowest. If a file name is less than eight characters, the lowest remaining bytes and the highest remaining word will be filled with spaces (20 hex). Null characters and space characters cannot be used within file names. Example: File name is ABC.OBJ 	Read/write

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Program Error Information

Name	Address	Description	Access
Program Error Flag (Fatal error)	A40109	ON when program contents are incorrect. CPU Unit operation will stop.	Read-only
Program Error Task	A294	Provides the type and number of the tack that was being executed when program execution stops as a result of a program error.	Read-only
Instruction Processing Error Flag	A29508	This flag and the Error Flag (ER) will be turned ON when an instruction processing error has occurred and the PLC Setup has been set to stop operation for an instruction error.	Read-only
Indirect DM/EM BCD Error Flag	A29509	This flag and the Access Error Flag (AER) will be turned ON when an indirect DM/EM BCD error has occurred and the PLC Setup has been set to stop operation an indirect DM/EM BCD error.	Read-only
Illegal Access Error Flag	A29510	This flag and the Access Error Flag (AER) will be turned ON when an illegal access error has occurred and the PLC Setup has been set to stop operation an illegal access error.	Read-only
No END Error Flag	A29511	ON when there isn't an END(001) instruction in each program within a task.	Read-only
Task Error Flag	A29512	ON when a task error has occurred. The following conditions will generate a task error. 1) There isn't an executable cyclic task. 2) There isn't a program allocated to the task.	Read-only
Differentiation Overflow Error Flag	A29513	ON when the specified Differentiation Flag Number exceeds the allowed value.	Read-only
Illegal Instruction Error Flag	A29514	ON when a program that cannot be executed has been stored.	Read-only
UM Overflow Error Flag	A29515	ON when the last address in UM (user program memory) has been exceeded.	Read-only
Program Address Where Program Stopped	A298 and A299	These words contain the 8-digit hexadecimal program address of the instruction where program execution was stopped due to a program error. (A299 contains the leftmost digits.)	Read-only

Error Information

■ Error Log, Error Code

Name	Address	Description	Access
Error Log Area	A100 to A199	When an error has occurred, the error code, error contents, and error's time and date are stored in the Error Log Area.	Read-only
Error Log Pointer	A300	When an error occurs, the Error Log Pointer is incremented by 1 to indicate the location where the next error record will be recorded as an offset from the beginning of the Error Log Area (A100).	Read-only
Error Log Pointer Reset Bit	A50014	Turn this bit ON to reset the Error Log Pointer (A300) to 00.	Read/write
Error Code	A400	When a non-fatal error (user-defined FALS(006) or system error) or a fatal error (user-defined FALS(007) or system error) occurs, the 4-digit hexadecimal error code is written to this word.	Read-only

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■ **FAL/FALS Error Information**

Name	Address	Description	Access
FAL Error Flag (Non-fatal error)	A40215	ON when a non-fatal error is generated by executing FAL(006).	Read-only
Executed FAL Number Flags	A360 to A391	The flag corresponding to the specified FAL number will be turned ON when FAL(006) is executed. Bits A36001 to A39115 correspond to FAL numbers 001 to 511.	Read-only
FALS Error Flag (Fatal error)	A40106	ON when a fatal error is generated by the FALS(007) instruction.	Read-only
FAL/FALS Number for System Error Simulation	A053	Set a dummy FAL/FALS number to use to simulate the system error using FAL(006) or FALS(007). 0001 to 01FF hex: FAL/FALS numbers 1 to 511 0000 or 0200 to FFFF hex: No FAL/FALS number for system error simulation. (No error will be generated.)	Read/write

■ **Memory Error Information**

Name	Address	Description	Access
Memory Error Flag (Fatal error)	A40115	ON when an error occurred in memory or there was an error in automatic transfer from the Memory Card when the power was turned ON. The ERR/ALM indicator on the front of the CPU Unit will light and CPU Unit operation will stop when this flag turns ON. If the automatic data transfer at startup fails, A40309 will be turned ON. If an error occurs in automatic transfer at startup, this error cannot be cleared.	Read-only
Memory Error Location	A40300 to A40308	When a memory error occurs, the Memory Error Flag (A40115) is turned ON and one of the following flags is turned ON to indicate the memory area where the error occurred. A40300: User program A40304: PLC Setup A40305: Registered I/O Table A40307: Routing Table A40308: CS-series CPU Bus Unit Settings	Read-only
Startup Memory Card Transfer Error Flag	A40309	ON when an error occurs in automatically transferring a file from the Memory Card to the CPU Unit at startup, including when a file is missing or a Memory Card is not mounted. The error can be cleared by turning OFF the power. (This error cannot be cleared while the power is ON.)	Read-only
Flash Memory Error	A40310	Turns ON when the flash memory fails.	Read-only

■ **PLC Setup Error Information**

Name	Address	Description	Access
PLC Setup Error Flag (Non-fatal error)	A40210	ON when there is a setting error in the PLC Setup.	Read-only
PLC Setup Error Location	A406	When there is a setting error in the PLC Setup, the location of that error is written to A406 in 4-digit hexadecimal. The location is given as the address set on the Programming Console.	Read-only

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■ Interrupt Task Error Information

Name	Address	Description	Access
Interrupt Task Error Flag (Non-fatal error)	A40213	ON when the Detect Interrupt Task Errors setting in the PLC Setup is set to “Detect” and one of the following occurs. IORD(222) or IOWR(223) in a cyclic task are competing with IORD(222) or IOWR(223) in an interrupt task. An interrupt task is executed for more than 10 ms during I/O refreshing of a C200H Special I/O Unit or a SYSMAC BUS I/O Unit. IORD(222) or IOWR(223) was executed in an interrupt task when I/O was being refreshed.	Read-only
Interrupt Task Error Cause Flag	A42615	Indicates the cause of an Interrupt Task Error.	Read-only
Interrupt Task Error, Task Number	A42600 to A42611	The function of these bits depends upon the status of A42615 (the Interrupt Task Error Cause Flag). A42615 OFF: Contains the interrupt task number when an interrupt task was executed for more than 10 ms during I/O refreshing of a C200H Special I/O Unit or a SYSMAC BUS Remote I/O Unit. A42615 ON: Contains the Special I/O Unit’s unit number when an attempt was made to refresh a Special I/O Unit’s I/O from an interrupt task with IORF(097) while the Unit’s I/O was being refreshed by cyclic I/O refreshing (duplicate refreshing).	Read-only

■ I/O Information

Name	Address	Description	Access
Basic I/O Unit Error Flag (Non-fatal error)	A40212	ON when an error has occurred in a Basic I/O Unit (including C200H Group-2 High-density I/O Units and C200H Interrupt Input Units).	Read-only
Basic I/O Unit Error, Slot Number	A40800 to A40807	Contains the binary slot number where the error occurred when an error has occurred in a Basic I/O Unit (including C200H Group-2 High-density I/O Units and C200H Interrupt Input Units).	Read-only
Basic I/O Unit Error, Rack Number	A40808 to A40815	Contains the binary rack number where the error occurred when an error has occurred in a Basic I/O Unit (including C200H Group-2 High-density I/O Units and C200H Interrupt Input Units).	Read-only
I/O Setting Error Flag (Fatal error)	A40110	ON when an Input Unit has been installed in an Output Unit’s slot or vice-versa, so the Input and Output Units clash in the registered I/O table.	Read-only
I/O Verification Error Flag (Non-fatal error)	A40209	ON when a Basic I/O Unit registered in the I/O Table does not match the Basic I/O Unit actually installed in the PLC because a Unit was added or removed.	Read-only
Expansion I/O Rack Number Duplication Flags	A40900 to A40907	The corresponding flag will be turned ON when an Expansion I/O Rack’s starting word address was set from a Programming Device and two Racks have overlapping word allocations or a Rack’s starting address exceeds CIO 0901. Bits 00 to 07 correspond to Racks 0 to 7.	Read-only
Too Many I/O Points Flag (Fatal error)	A40111	ON when the number of I/O points being used in Basic I/O Units exceeds the maximum allowed for the PLC.	Read-only

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Name	Address	Description	Access
Too Many I/O Points, Details	A40700 to A40712	The 6 possible causes of the Too Many I/O Points Error are listed below. The 3-digit binary value in A40713 to A40715 indicates the cause of the error. (The causes corresponding to values 0 to 5 are listed below.) The 13-bit binary value in A40700 to A40712 indicates the details: the excessive value or the duplicated unit number. The number of I/O points will be written here when the total number of I/O points set in the I/O Table (excluding Slave Racks) exceed the maximum allowed for the CPU Unit. The number of interrupt inputs will be written here when there are more than 32 interrupt inputs. The unit number of the Slave Unit will be written here when a unit number is duplicated or the number of I/O points on a C500 Slave Unit exceeds 320. The unit number of the I/O Terminal (excluding Slave Racks) will be written here when a unit number is duplicated The unit number of the Master Unit will be written here when a unit number is duplicated or the unit number is outside of the allowed setting range. The number of Racks will be written here when the number of Expansion I/O Racks exceeds the maximum.	Read-only
Too Many I/O Points, Cause	A40713 to A40715	These three bits indicate the cause of the Too Many I/O Points Error. (See A40700 to A40712.) 000 (0): Too many I/O points. 001 (1): Too many Interrupt Input points. 010 (2): Slave Unit's unit number duplicated or the number of I/O points on a C500 Slave Unit exceeds 320. 011 (3): I/O Terminal's unit number duplicated. 100 (4): Master Unit's unit number duplicated or unit number is out-of-range (not 0 or 1). 101 (5): Too many Expansion Racks connected. 110 (6): The unit number of the Remote I/O Master Unit is 4, 6, or 7, or an Special I/O Unit's unit number cannot be detected.	Read-only
I/O Bus Error Flag (Fatal error)	A40114	ON when an error occurs in a data transfer between the CPU Unit and a Unit mounted to a slot.	Read-only
I/O Bus Error Slot Number	A40400 to A40407	Contains the 8-bit binary slot number (00 to 09) where an I/O Bus Error occurred.	Read-only
I/O Table Errors	A26100	ON: Error in CPU Bus Unit Setup Turns OFF when I/O tables are generated normally.	Read-only
	A26102	ON: Overflow in maximum number of I/O points. Turns OFF when I/O tables are generated normally.	Read-only
	A26103	ON: The same unit number was used more than once. Turns OFF when I/O tables are generated normally.	Read-only
	A26104	ON: I/O bus error Turns OFF when I/O tables are generated normally.	Read-only
	A26106	ON: SYSMAC BUS detection ended in an error. Turns OFF when I/O tables are generated normally.	Read-only
	A26107	ON: Error in a Special I/O Unit Turns OFF when I/O tables are generated normally.	Read-only
	A26109	ON: I/O detection has not been completed. Turns OFF when I/O tables are generated normally.	Read-only

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Name	Address	Description	Access
I/O Bus Error Rack Number	A40408 to A40415	Contains the 8-bit binary rack number (00 to 07) where an I/O Bus Error occurred.	Read-only
Duplication Error Flag (Fatal error)	A40113	ON in the following cases: Two CPU Bus Units have been assigned the same unit number. Two Special I/O Units have been assigned the same unit number. Two Basic I/O Units have been allocated the same data area words. The same rack number is set for more than one Expansion Rack.	Read-only

■ **CPU Bus Unit Information**

Name	Address	Description	Access
CPU Bus Unit Number Duplication Flags	A410	The Duplication Error Flag (A40113) and the corresponding flag in A410 will be turned ON when a CPU Bus Unit's unit number has been duplicated. Bits 00 to 15 correspond to unit numbers 0 to F.	Read-only
CPU Bus Unit Error, Unit Number Flags	A417	When an error occurs in a data exchange between the CPU Unit and a CPU Bus Unit, the CPU Bus Unit Error Flag (A40207) and the corresponding flag in A417 are turned ON. Bits 00 to 15 correspond to unit numbers 0 to F.	Read-only
CPU Bus Unit Setting Error, Unit Number Flags	A427	When a CPU Bus Unit Setting Error occurs, A40203 and the corresponding flag in A27 are turned ON. Bits 00 to 15 correspond to unit numbers 0 to F.	Read-only
CPU Bus Unit Setting Error Flag (Non-fatal error)	A40203	ON when an installed CPU Bus Unit does not match the CPU Bus Unit registered in the I/O table.	Read-only
CPU Bus Unit Error Flag (Non-fatal error)	A40207	ON when an error occurs in a data exchange between the CPU Unit and a CPU Bus Unit (including an error in the CPU Bus Unit itself).	Read-only

■ **Special I/O Unit Information**

Name	Address	Description	Access
Special I/O Unit Number Duplication Flags	A41100 to A41615	The Duplication Error Flag (A40113) and the corresponding flag in A411 through A416 will be turned ON when a Special I/O Unit's unit number has been duplicated. (Bits A41100 to A41615 correspond to unit numbers 0 to 95.)	Read-only
Special I/O Unit Setting Error Flag (Non-fatal error)	A40202	ON when an installed Special I/O Unit does not match the Special I/O Unit registered in the I/O table.	Read-only
Special I/O Unit Setting Error, Unit Number Flags	A42800 to A43315	When a Special I/O Unit Setting Error occurs, A40202 and the corresponding flag in these words are turned ON. (Bits A42800 to A43315 correspond to unit numbers 0 to 95.)	Read-only
Special I/O Unit Error Flag (Non-fatal error)	A40206	ON when an error occurs in a data exchange between the CPU Unit and a Special I/O Unit (including an error in the Special I/O Unit itself).	Read-only
Special I/O Unit Error, Unit Number Flags	A41800 to A42315	When an error occurs in a data exchange between the CPU Unit and a Special I/O Unit, the Special I/O Unit Error Flag (A40206) and the corresponding flag in these words are turned ON. (Bits A42800 to A43315 correspond to unit numbers 0 to 95.)	Read-only

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■ **Inner Board Information**

Name	Address	Description	Access
Inner Board Error Flag (Non-fatal error)	A40208	ON when an error occurs in a data exchange between the CPU Unit and the Inner Board (including an error in the Inner Board itself).	Read-only
Inner Board Error Information	A424	When an error occurs in a data exchange between the CPU Unit and the Inner Board, the Inner Board Error Flag (A40208) and the appropriate error code will be written to A424.	Read-only
Inner Board Stopped Error Flag (Fatal error)	A40112	ON when there is an Inner Board Error (watchdog timer error).	Read-only

■ **SYSMAC BUS Remote I/O Information**

Name	Address	Description	Access
SYSMAC BUS Error Flag (Non-fatal error)	A40205	ON when an error occurs in a data transfer in the SYSMAC BUS system. The number of the Master involved is indicated with bits A40500 and A40501.	Read-only
SYSMAC BUS Master Error Flags	A40500 to A40501	When a transmission error occurs in the SYSMAC BUS system, the flag for the affected Master Unit will be turned ON. A40500: Flag for Master Unit #0 A40501: Flag for Master Unit #1	Read-only
Slave Number of SYSMAC BUS Error After Start-up	A42504 to A42506	When there is an error in a Slave Rack, these bits contain the Slave's unit number.	Read-only
	A42504 only	When there is an error in an Optical I/O Unit (excluding Slave Racks), the status of A42504 (0 or 1) indicates whether the Unit is low or high.	Read-only
	A42508 to A42515	When there is an error in a Slave Rack, this byte contains the 2-digit hexadecimal unit number of the Master to which the Slave is connected. (0xB0 for Master Unit 0, 0xB1 for Master Unit 1)	Read-only
		When there is an error in an Optical I/O Unit, this byte contains its 2-digit hexadecimal unit number (00 to 1F, or 0 to 31 decimal).	Read-only
SYSMAC BUS Slave Number Refresh Bit	A50900	Turn this bit ON to refresh the error information in A425 (unit number of Slave where error occurred after startup).	Read/write

■ **PLC Link Information**

Name	Address	Description	Access
PLC Link Operating Level Flags	A44211	These flags indicate whether a PLC Link Unit is mounted to the PLC and the PLC Link Unit's operating level. ON when the Unit is in operating level #1.	Read-only
	A44212	These flags indicate whether a PLC Link Unit is mounted to the PLC and the PLC Link Unit's operating level. ON when the Unit is in operating level #0.	Read-only

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■ **Other PLC Operating Information**

Name	Address	Description	Access
Battery Error Flag (Non-fatal error)	A40204	ON if the CPU Unit's battery is disconnected or its voltage is low and the PLC Setup has been set to detect this error. (Detect Low Battery)	Read-only
Cycle Time Too Long Flag (Fatal error)	A40108	ON if the cycle time exceeds the maximum cycle time set in the PLC Setup. In the Parallel Processing Modes, the program execution cycle time will be used. (Watch Cycle Time)	Read-only
Peripheral Servicing Too Long Flag	A40515	Turns ON when the peripheral servicing time in a Parallel Processing Mode exceeds 2 s. This will also cause a cycle time error and operation will stop.	Read-only
FPD Teaching Bit	A59800	Turn this bit ON to set the monitoring time in FPD(269) automatically with the teaching function.	Read/write
Memory Backup Battery Failure Flag	A39511	Data from the I/O memory areas that are maintained when power is turned OFF (HR, DM, etc.) are backed up with a Battery. A39511 turns ON if the Battery voltage drops and the data can no longer be maintained. The data in the I/O memory will not be dependable when this happens.	Read-only

Clock

■ **Clock Information**

Name	Address	Description	Access
Clock Data	The clock data from the clock built into the CPU Unit is stored here in BCD.		Read-only
	A35100 to A35107	Seconds: 00 to 59 (BCD)	Read-only
	A35108 to A35115	Minutes: 00 to 59 (BCD)	Read-only
	A35200 to A35207	Hour: 00 to 23 (BCD)	Read-only
	A35208 to A35215	Day of the month: 01 to 31 (BCD)	Read-only
	A35300 to A35307	Month: 01 to 12 (BCD)	Read-only
	A35308 to A35315	Year: 00 to 99 (BCD)	Read-only
	A35400 to A35407	Day of the week: 00: Sunday, 01: Monday, 02: Tuesday, 03: Wednesday, 04: Thursday, 05: Friday, 06: Saturday	Read-only

The internal clock time is saved in the above words in the Auxiliary Area once every few cycles. For details on internal clock accuracy, refer to *2-1-1 CPU Unit Specifications*.

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■ **Operation Start and End Times**

Name	Address	Description	Access
Operation Start Time	A515 to A517	The time that operation started as a result of changing the operating mode to RUN or MONITOR mode is stored here in BCD. A51500 to A51507: Seconds (00 to 59) A51508 to A51515: Minutes (00 to 59) A51600 to A51607: Hour (00 to 23) A51608 to A51615: Day of month (01 to 31) A51700 to A51707: Month (01 to 12) A51708 to A51715: Year (00 to 99) Note: The previous start time is stored after turning ON the power supply until operation is started.	Read/write
Operation End Time	A518 to A520	The time that operation stopped as a result of changing the operating mode to PROGRAM mode is stored here in BCD. A51800 to A51807: Seconds (00 to 59) A51808 to A51815: Minutes (00 to 59) A51900 to A51907: Hour (00 to 23) A51908 to A51915: Day of month (01 to 31) A52000 to A52007: Month (01 to 12) A52008 to A52015: Year (00 to 99) Note: If an error occurs in operation, the time of the error will be stored. If the operating mode is then changed to PROGRAM mode, the time that PROGRAM mode was entered will be stored.	Read/write

■ **Power Supply ON/OFF Time Information**

Name	Address	Description	Access
Startup Time	A510 and A511	These words contain the time (in BCD) at which the power was turned ON. The contents are updated every time that the power is turned ON. A51000 to A51007: Seconds (00 to 59) A51008 to A51015: Minutes (00 to 59) A51100 to A51107: Hour (00 to 23) A51108 to A51115: Day of the month (01 to 31)	Read/write
Power Interruption Time	A512 and A513	These words contain the time (in BCD) at which the power was interrupted. The contents are updated every time that the power is interrupted. A51200 to A51207: Seconds (00 to 59) A51208 to A51215: Minutes (00 to 59) A51300 to A51307: Hour (00 to 23) A51308 to A51315: Day of month (01 to 31)	Read/write
Number of Power Interruptions	A514	Contains the number of times (in binary) that power has been interrupted since the power was first turned on. To reset this value, overwrite the current value with 0000.	Read/write
Total Power ON Time	A523	Contains the total time (in binary) that the PLC has been on in 10-hour units. The data is stored is updated every 10 hours. To reset this value, overwrite the current value with 0000.	Read/write
Power ON Clock Data 1 (See note.)	A720 to A722	These words contain the startup date/time (the same time as the startup time stored in words A510 to A511 as well as the month and year information) for the last time that power was turned ON. The data is BCD. A72000 to A72007: Seconds (00 to 59) A72008 to A72015: Minutes (00 to 59) A72100 to A72107: Hour (00 to 23) A72108 to A72115: Day of month (01 to 31) A72200 to A72207: Month (01 to 12) A72208 to A72215: Year (00 to 99)	Read/write

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Name	Address	Description	Access
Power ON Clock Data 2 (See note.)	A723 to A725	These words contain the startup time/date for the second-to-last time that power was turned ON. The data is BCD and the storage format is the same as words A720 to A722.	Read/write
Power ON Clock Data 3 (See note.)	A726 to A728	These words contain the startup time/date for the third-to-last time that power was turned ON. The data is BCD and the storage format is the same as words A720 to A722.	Read/write
Power ON Clock Data 4 (See note.)	A729 to A731	These words contain the startup time/date for the fourth-to-last time that power was turned ON. The data is BCD and the storage format is the same as words A720 to A722.	Read/write
Power ON Clock Data 5 (See note.)	A732 to A734	These words contain the startup time/date for the fifth-to-last time that power was turned ON. The data is BCD and the storage format is the same as words A720 to A722.	Read/write
Power ON Clock Data 6 (See note.)	A735 to A737	These words contain the startup time/date for the sixth-to-last time that power was turned ON. The data is BCD and the storage format is the same as words A720 to A722.	Read/write
Power ON Clock Data 7 (See note.)	A738 to A740	These words contain the startup time/date for the seventh-to-last time that power was turned ON. The data is BCD and the storage format is the same as words A720 to A722.	Read/write
Power ON Clock Data 8 (See note.)	A741 to A743	These words contain the startup time/date for the eighth-to-last time that power was turned ON. The data is BCD and the storage format is the same as words A720 to A722.	Read/write
Power ON Clock Data 9 (See note.)	A744 to A746	These words contain the startup time/date for the ninth-to-last time that power was turned ON. The data is BCD and the storage format is the same as words A720 to A722.	Read/write
Power ON Clock Data 10 (See note.)	A747 to A749	These words contain the startup time/date for the tenth-to-last time that power was turned ON. The data is BCD and the storage format is the same as words A720 to A722.	Read/write

Note Supported only by unit version 3.0 or later.

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■ User Data Revision Times

Name	Address	Description	Access
User Program Date	A090 to A093	These words contain in BCD the date and time that the user program was last overwritten. A09000 to A09007: Seconds (00 to 59) A09008 to A09015: Minutes (00 to 59) A09100 to A09107: Hour (00 to 23) A09108 to A09115: Day of month (01 to 31) A09200 to A09207: Month (01 to 12) A09208 to A09215: Year (00 to 99) A09308 to A09307: Day of the week (00: Sunday, 01: Monday, 02: Tuesday, 03: Wednesday, 04: Thursday, 05: Friday, 06: Saturday)	Read-only
Parameter Date	A094 to A097	These words contain in BCD the date and time that the parameters were last overwritten. A09400 to A09407: Seconds (00 to 59) A09408 to A09415: Minutes (00 to 59) A09500 to A09507: Hour (00 to 23) A09508 to A09515: Day of month (01 to 31) A09600 to A09607: Month (01 to 12) A09608 to A09615: Year (00 to 99) A09708 to A09707: Day of the week (00: Sunday, 01: Monday, 02: Tuesday, 03: Wednesday, 04: Thursday, 05: Friday, 06: Saturday)	Read-only

Information on Read Protection Using a Password

Name	Address	Description	Access
UM Read Protection Flag	A09900	Indicates whether the entire user program in the PLC is read-protected. 0: UM not read-protected. 1: UM read-protected.	Read-only
Task Read Protection Flag	A09901	Indicates whether read protection is set for individual tasks. 0: Tasks not read-protected. 1: Tasks read-protected.	Read-only
Program Write Protection for Read Protection	A09902	Indicates whether the program is write-protected. 0: Write-enabled. 1: Write-protected.	Read-only
Enable/Disable Bit for Program Backup	A09903	Indicates whether creating a backup program file (.OBJ) is enabled or disabled. 0: Enabled. 1: Disabled.	Read-only

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Communications

■ Network

Network Communications Information

Name	Address	Description	Access
Communications Port Enabled Flags	A20200 to A20207	ON when a network instruction (SEND(090), RECV(098), CMND(490), or PMCR(260)) can be executed with the corresponding port number or background execution can be executed with the corresponding port number (CS1-H CPU Units only). Bits 00 to 07 correspond to communications ports 0 to 7. When the simple backup operation is used to performed a write or compare operation for a Memory Card on a CS1-H CPU Unit, a communications port will be automatically allocated, and the corresponding flag will be turned ON during the operation and turned OFF when the operation has been completed.	Read-only
Communications Port Completion Codes	A203 to A210	These words contain the completion codes for the corresponding port numbers when network instructions (SEND(090), RECV(098), CMND(490), or PMCR(260)) have been executed. The contents will be cleared when background execution has been completed (for CS1-H CPU Unit only). Words A203 to A210 correspond to communications ports 0 to 7. When the simple backup operation is used to performed a write or compare operation for a Memory Card on a CS1-H CPU Unit, a communications port will be automatically allocated, and a completion code will be stored in the corresponding word.	Read-only
Communications Port Error Flags	A21900 to A21907	ON when an error occurred during execution of a network instruction (SEND(090), RECV(098), CMND(490), or PMCR(260)). Turns OFF then execution has been finished normally. Bits 00 to 07 correspond to communications ports 0 to 7. When the simple backup operation is used to performed a write or compare operation for a Memory Card on a CS1-H CPU Unit, a communications port will be automatically allocated. The corresponding flag will be turned ON if an error occurs and will be turned OFF if the simple backup operation ends normally.	Read-only

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Auxiliary Area Bits and Words Used when Automatically Allocating Communications Ports

Name	Address	Description	Access
Network Communications Port Allocation Enabled Flag	A20215	ON when there is a communications port available for automatic allocation. **Note:** Use this flag to confirm whether a communications port is available for automatic allocation before executing communications instructions when using 9 or more communications instructions simultaneously.	Read-only
First Cycle Flags after Network Communications Finished	A21400 to A21407	Each flag will turn ON for just one cycle after communications have been completed. Bits 00 to 07 correspond to ports 0 to 7. Use the Used Communications Port Number stored in A218 to determine which flag to access. **Note:** These flags are not effective until the next cycle after the communications instruction is executed. Delay accessing them for at least one cycle.	Read-only
First Cycle Flags after Network Communications Error	A21500 to A21507	Each flag will turn ON for just one cycle after a communications error occurs. Bits 00 to 07 correspond to ports 0 to 7. Use the Used Communications Port Number stored in A218 to determine which flag to access. Determine the cause of the error according to the Communications Port Completion Codes stored in A203 to A210. **Note:** These flags are not effective until the next cycle after the communications instruction is executed. Delay accessing them for at least one cycle.	Read-only
Network Communications Completion Code Storage Address	A216 to A217	The completion code for a communications instruction is automatically stored at the address with the I/O memory address given in these words. Place this address into an index register and use indirect addressing through the index register to read the communications completion code.	Read-only
Used Communications Port Numbers	A218	Stores the communications port numbers used when a communications instruction is executed using automatic communication port allocations. 0000 to 0007 hex: Communications port 0 to 7	Read-only

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Information on Explicit Message Instructions

Name	Address	Description	Access
Explicit Communications Error Flag	A21300 to A21307	Turn ON when an error occurs in executing an Explicit Message Instruction (EXPLT(720), EGATR(721), ESATR(722), ECHRD(723), or ECHWR(724)). Bits 00 to 07 correspond to communications ports 0 to 7. The corresponding bit will turn ON both when the explicit message cannot be sent and when an error response is returned for the explicit message. The status will be maintained until the next explicit message communication is executed. The bit will always turn OFF when the next Explicit Message Instruction is executed.	Read-only
Network Communications Error Flag	A21900 to A21907	Turn ON if the explicit message cannot be sent when executing an Explicit Message Instruction (EXPLT(720), EGATR(721), ESATR(722), ECHRD(723), or ECHWR(724)). Bits 00 to 07 correspond to communications ports 0 to 7. The corresponding bit will turn ON when the explicit message cannot be sent. The status will be maintained until the next explicit message communication is executed. The bit will always turn OFF when the next Explicit Message Instruction is executed.	Read-only
Network Communications Response Code	A203 to A210	The following codes will be stored when an Explicit Message Instruction (EXPLT(720), EGATR(721), ESATR(722), ECHRD(723), or ECHWR(724)) has been executed. A203 to A210 correspond to communications ports 0 to 7. If the Explicit Communications Error Flag turns OFF, 0000 hex is stored. If the Explicit Communications Error Flag is ON and the Network Communications Error Flag is ON, the FINS end code is stored. If the Explicit Communications Error Flag is ON and the Network Communications Error Flag is OFF, the explicit message end code is stored. During communications, 0000 hex will be stored and the suitable code will be stored when execution has been completed. The code will be cleared when operation is started.	Read-only

SYSMAC BUS Communications Information

Name	Address	Description	Access
SYSMAC BUS Master 1 Restart Bit	A52614	Turn this bit ON to restart SYSMAC BUS Remote I/O Master Unit 1. (Turned OFF automatically when restart processing is completed.)	Read/write
SYSMAC BUS Master 0 Restart Bit	A52615	Turn this bit ON to restart SYSMAC BUS Remote I/O Master Unit 0. (Turned OFF automatically when restart processing is completed.)	Read/write

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■ **Peripheral Port Communications Information**

Name	Address	Description	Access
Peripheral Port Communications Error Flag	A39212	ON when a communications error has occurred at the peripheral port. **Note:** This flag is disabled in NT Link (1:N) mode.	Read-only
Peripheral Port Restart Bit	A52601	Turn this bit ON to restart the peripheral port.	Read/write
Peripheral Port Settings Change Bit	A61901	ON while the peripheral port's communications settings are being changed.	Read/write
Peripheral Port Error Flags	A52808 to A52815	These flags indicate what kind of error has occurred at the peripheral port.	Read/write
Peripheral Port PT Communications Flags	A39400 to A39407	The corresponding bit will be ON when the peripheral port is communicating with a PT in NT link mode. Bits 0 to 7 correspond to units 0 to 7.	Read-only
Peripheral Port PT Priority Registered Flags	A39408 to A39415	The corresponding bit will be ON for the PT that has priority when the peripheral port is communicating in NT link mode. Bits 0 to 7 correspond to units 0 to 7.	Read-only

■ **RS-232C Port Communications Information**

Name	Address	Description	Access
RS-232C Port Communications Error Flag	A39204	ON when a communications error has occurred at the RS-232C port. **Note:** Do not access this flag in peripheral bus mode, 1:N NT Link mode, or Serial PLC Link Master/Slave mode.	Read-only
RS-232C Port Restart Bit	A52600	Turn this bit ON to restart the RS-232C port.	Read/write
RS-232C Port Settings Change Bit	A61902	ON while the RS-232C port's communications settings are being changed.	Read/write
RS-232C Port Error Flags	A52800 to A52807	These flags indicate what kind of error has occurred at the RS-232C port.	Read/write
RS-232C Port Send Ready Flag (No-protocol mode)	A39205	ON when the RS-232C port is able to send data in no-protocol mode.	Read-only
RS-232C Port Reception Completed Flag (No-protocol mode)	A39206	ON when the RS-232C port has completed the reception in no-protocol mode.	Read-only
RS-232C Port Reception Overflow Flag (No-protocol mode)	A39207	ON when a data overflow occurred during reception through the RS-232C port in no-protocol mode.	Read-only
RS-232C Port PT Communications Flags	A39300 to A39307	The corresponding bit will be ON when the RS-232C port is communicating with a PT in NT link mode. Bits 0 to 7 correspond to units 0 to 7.	Read-only
RS-232C Port PT Priority Registered Flags	A39308 to A39315	The corresponding bit will be ON for the PT that has priority when the RS-232C port is communicating in NT link mode. Bits 0 to 7 correspond to units 0 to 7.	Read-only
RS-232C Port Reception Counter (No-protocol mode)	A39300 to A39315	Indicates (in binary) the number of bytes of data received when the RS-232C port is in no-protocol mode.	Read-only

■ **Serial Device Communications Information**

Name	Address	Description	Access
Communications Units 0 to 15, Ports 1 to 4 Settings Change Bits	A62001 to A63504	The corresponding flag will be ON when the settings for that port are being changed. (Bits 1 to 4 in A620 to A635 correspond to ports 1 to 4 in Communications Units 0 to 15.)	Read/write
Communications Board Ports 1 to 4 Settings Change Bits	A63601 to A63604	The corresponding flag will be ON when the settings for that port are being changed. (Bits 1 to 4 correspond to ports 1 to 4.)	Read/write

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Instruction-related Information

Name	Address	Description	Access
Step Flag	A20012	ON for one cycle when step execution is started with STEP(008).	Read-only
Current EM Bank	A301	This word contains the current EM bank number in 4-digit hexadecimal.	Read-only
Macro Area Input Words	A600 to A603	When MCRO(099) is executed, it copies the input data from the specified source words (input parameter words) to A600 through A603.	Read/write
Macro Area Output Words	A604 to A607	After the subroutine specified in MCRO(099) has been executed, the results of the subroutine are transferred from A604 through A607 to the specified destination words (output parameter words).	Read/write

Background Execution Information

Name	Address	Description	Access
DR00 Output for Background Execution	A597	When a data register is specified as the output for an instruction processed in the background, A597 receives the output instead of DR00. 0000 to FFFF hex	Read-only
IR00 Output for Background Execution	A595 and A596	When an index register is specified as the output for an instruction processed in the background, A595 and A596 receive the output instead of IR00. 0000 0000 to FFFF FFFF hex (A596 contains the leftmost digits.)	Read-only
Equals Flag for Background Execution	A59801	Turns ON if matching data is found for an SRCH(181) instruction executed in the background.	Read-only
ER/AER Flag for Background Execution	A39510	Turns ON if an error or illegal access occurs during background execution. Turns OFF when power is turned ON or operation is started.	Read-only

Function Block Information

■ Function Block Memory Information

Name	Address	Description	Access
FB Program Data Flag	A34500	Turns ON if the FB program memory contains FB program data. 0: No data 1: Data present	Read-only

■ OMRON FB Library Information

Name	Address	Description	Access
FB Communications Instruction Response Required	A58015	0: Not required 1: Required	Read-only
FB Communications Instruction Port No.	A58008 to A58011	0 to 7 hex: Communications port No. 0 to 7 F hex: Automatic allocation	Read-only
FB Communications Instruction Retries	A58000 to A58003	Automatically stores the number of retries in the FB communications instruction settings specified in the PLC Setup.	Read-only
FB Communications Instruction Response Monitoring Time	A581	Automatically stores the FB communications instruction response monitoring time set in the PLC Setup. 0001 to FFFF hex (Unit: 0.1 s; Range: 0.1 to 6553.5) 0000 hex: 2 s	Read-only
FB DeviceNet Communications Instruction Response Monitoring Time	A582	Automatically stores the FB DeviceNet communications instruction response monitoring time set in the PLC Setup. 0001 to FFFF hex (Unit: 0.1 s; Range: 0.1 to 6553.5) 0000 hex: 2 s	Read-only

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Note These Auxiliary Area bits/words are not to be written by the user. The number of resends and response monitoring time must be set by the user in the FB communications instructions settings in the PLC Setup, particularly when using function blocks from the OMRON FB Library to execute FINS messages or DeviceNet explicit messages communications. The values set in the Settings for OMRON FB Library in the PLC Setup will be automatically stored in the related Auxiliary Area words A580 to A582 and used by the function blocks from the OMRON FB Library.

9-17 TR (Temporary Relay) Area

The TR Area contains 16 bits with addresses ranging from TR0 to TR15. These temporarily store the ON/OFF status of an instruction block for branching. TR bits are useful when there are several output branches and interlocks cannot be used.

It is not necessary to consider TR bits when displaying ladder diagrams on the CX-Programmer.

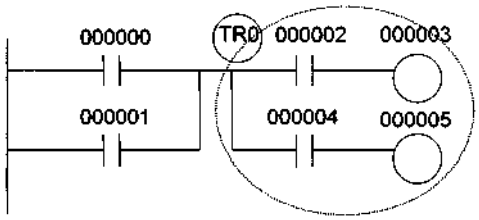
The TR bits can be used as many times as required and in any order required as long as the same TR bit is not used twice in the same instruction block.

TR bits can be used only with the OUT and LD instructions. OUT instructions (OUT TR0 to OUT TR15) store the ON OFF status of a branch point and LD instructions recall the stored ON OFF status of the branch point.

TR bits cannot be changed from a Programming Device.

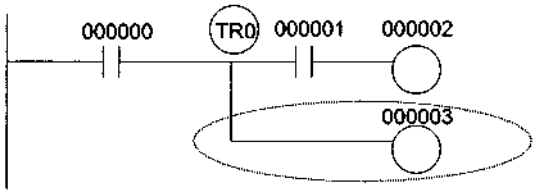
Examples

In this example, a TR bit is used when two outputs have been directly connected to a branch point.



Instruction	Operand
LD	000000
OR	000001
OUT	TR 0
AND	000002
OUT	000003
LD	TR 0
AND	000004
OUT	000005

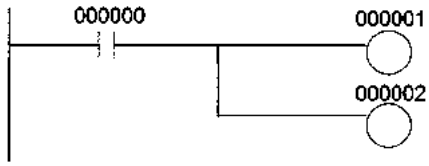
In this example, a TR bit is used when an output is connected to a branch point without a separate execution condition.



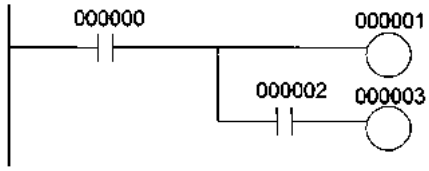
Instruction	Operand
LD	000000
OUT	TR 0
AND	000001
OUT	000002
LD	TR 0
OUT	000003

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Note A TR bit is not required when there are no execution conditions after the branch point or there is an execution condition only in the last line of the instruction block.



Instruction	Operand
LD	000000
OUT	000001
OUT	000002



Instruction	Operand
LD	000000
OUT	000001
AND	000002
OUT	000003

9-18 Timer Area

The 4,096 timer numbers (T0000 to T4095) are shared by the TIM, TIMX, TIMH(015), TIMHX(551), TMHH(540), TMHHX(552), TTIM(087), TTIMX(555), TIMW(813), TIMWX(816), TMHW(815), and TMHWX(817) instructions. Timer Completion Flags and present values (PVs) for these instructions are accessed with the timer numbers. (The TIML(542), TIMLX(553), MTIM(543), and MTIMX(554) instructions do not use timer numbers.)

When a timer number is used in an operand that requires bit data, the timer number accesses the Completion Flag of the timer. When a timer number is used in an operand that requires word data, the timer number accesses the PV of the timer. Timer Completion Flags can be used as often as necessary as normally open and normally closed conditions and the values of timer PVs can be read as normal word data.

With CS1-H CPU Units, the refresh method for timer PVs can be set from the CX-Programmer to either BCD or binary.

Note It is not recommended to use the same timer number in two timer instructions because the timers will not operate correctly if they are timing simultaneously. (If two or more timer instructions use the same timer number, an error will be generated during the program check, but the timers will operate as long as the instructions are not executed in the same cycle.)

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The following table shows when timer PVs and Completion Flags will be reset.

Instruction name	Effect on PV and Completion Flag			Operation in Jumps and Interlocks	
	Mode change[1]	PLC start-up[1]	CNR(545) or CNRX(547)	Jumps (JMP-JME) or Tasks on standby	Interlocks (IL-ILC)
TIMER: TIM or TIMX	PV → 0 Flag → OFF	PV → 0 Flag → OFF	PV → 9999 Flag → OFF	PVs refreshed in operating timers	PV → SV (Reset to SV.) Flag → OFF
HIGH-SPEED TIMER: TIMH(015) or TIMHX(551)					
ONE-MS TIMER: TMHH(540) or TMHHX(552)					
ACCUMULATIVE TIMER: TTIM(087) or TTIMX(555)				PV Maintained	PV Maintained
TIMER WAIT: TIMW(813) or TIMWX(816)				PVs refreshed in operating timers	---
HIGH-SPEED TIMER WAIT: TMHW(815) or TMHWX(817)					---

Note

1. If the IOM Hold BIt (A50012) is ON, the PV and Completion Flag will be retained when a fatal error occurs or the operating mode is changed from PROGRAM mode to RUN or MONITOR mode or vice-versa. The PV and Completion Flag will be cleared when power is cycled.
2. If the IOM Hold BIt (A50012) is ON and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, the PV and Completion Flag will be retained when the PLC's power is cycled.
3. Since the TIML(542), TIMLX(553), MTIM(543), and MTIMX(554) instructions do not use timer numbers, they are reset under different conditions. Refer to the descriptions of these instructions for details.
4. The present value of TIM, TIMX, TIMH(015), TIMHX(551), TMHH(540), TMHHX(552), TIMW(813), TIMWX(816), TMHW(815), and TMHWX(817) timers programmed with timer numbers 0000 to 2047 will be updated even when jumped between JMP and JME instructions or when in a task that is on standby. The present value of timers programmed with timer numbers 2048 to 4095 will be held when jumped or when in a task that is on standby.

Forcing Bit Status

Timer Completion Flags can be force-set and force-reset.

Timer PVs cannot be force-set or force-reset, although the PVs can be refreshed indirectly by force-setting/resetting the Completion Flag.

Note When designating addresses in programming or allocations inside C200H Special I/O Units, "T000" to "T511" will actually specify T0000 to T0511 in the CPU Unit. T0512 to T4095 cannot be specified inside the C200H Special I/O Units.

9-19 Counter Area

The 4,096 counter numbers (C0000 to C4095) are shared by the CNT, CNTX, CNTR(012), CNTRX(548), CNTW(814), and CNTWX(818) instructions. Counter Completion Flags and present values (PVs) for these instructions are accessed with the counter numbers.

When a counter number is used in an operand that requires bit data, the counter number accesses the Completion Flag of the counter. When a counter number is used in an operand that requires word data, the counter number accesses the PV of the counter.

With CS1-H CPU Units, the refresh method for counter PVs can be set from the CX-Programmer to either BCD or binary.

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It is not recommended to use the same counter number in two counter instructions because the counters will not operate correctly if they are counting simultaneously. If two or more counter instructions use the same counter number, an error will be generated during the program check, but the counters will operate as long as the instructions are not executed in the same cycle.

The following table shows when counter PVs and Completion Flags will be reset.

Instruction name	Effect on PV and Completion Flag					
	Reset	Mode change	PLC startup	Reset Input	CNR(545) or CNRX(548)	Interlocks (IL-ILC)
COUNTER: CNT or CNTX	PV → 0000 Flag → OFF	Maintained	Maintained	Reset	Reset	Maintained
REVERSIBLE COUNTER: CNTR(012) or CNTRX(548)						
COUNTER WAIT: CNTW(814) or CNTWX(818)						

Note When designating addresses in programming or allocations inside C200H Special I/O Units, “C000” to “C511” will actually specify T0000 to T0511 in the CPU Unit. C0512 to C4095 cannot be specified inside the C200H Special I/O Units.

9-20 Data Memory (DM) Area

The DM Area contains 32,768 words with addresses ranging from D00000 to D32767. This data area is used for general data storage and manipulation and is accessible only by word.

Data in the DM Area is retained when the PLC’s power is cycled or the PLC’s operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

Although bits in the DM Area cannot be accessed directly, the status of these bits can be accessed with the BIT TEST instructions, TST(350) and TSTN(351).

Bits in the DM Area cannot be force-set or force-reset.

Note

1. If using a C200H DeviceNet Master Unit (C200HW-DRM21-V1), use the following words as the status area. Data in this area is updated when the C200H DeviceNet Master Unit is used, so the area cannot be used for other applications.
   - Master Status: D06032 + (2 x unit number)
   - Current Communications Cycle Time: D06033 + (2 x unit number)

   The CS-series DeviceNet Unit (CS1W-DRM21) does not use the above words.
2. When designating addresses in programming or allocations inside Group-I and Group-II C200H Special I/O Units, DM 0000 to DM 0999 will actually specify D00000 to D00999 in the CPU Unit and DM 1000 to DM1999 will actually specify D20000 to D20999 (part of the Special I/O Unit Area) in the CPU Unit. Other addresses in this area cannot be specified. When designating addresses in programming or allocations inside Group-III and Group-IV C200H Special I/O Units, DM 0000 to DM 6655 will actually specify D00000 to D06655 in the CPU Unit. Other addresses in this area cannot be specified.

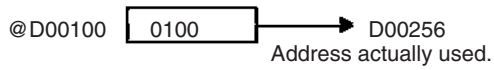
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Indirect Addressing

Words in the DM Area can be indirectly addressed in two ways: binary-mode and BCD-mode.

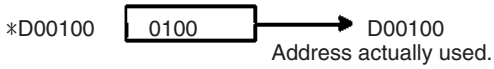
Binary-mode Addressing (@D)

When a "@" character is input before a DM address, the content of that DM word is treated as binary and the instruction will operate on the DM word at that binary address. The entire DM Area (D00000 to D32767) can be indirectly addressed with hexadecimal values 0000 to 7FFF.



BCD-mode Addressing (*D)

When a "*" character is input before a DM address, the content of that DM word is treated as BCD and the instruction will operate on the DM word at that BCD address. Only part of the DM Area (D00000 to D09999) can be indirectly addressed with BCD values 0000 to 9999.



DM Area Allocation to Special Units Inner Board

Parts of the DM Area are allocated to Special I/O Units, CS-series CPU Bus Units, and Inner Boards for functions such as initial Unit settings. The timing for data transfers is different for these Units, but may occur at any of the three following times.

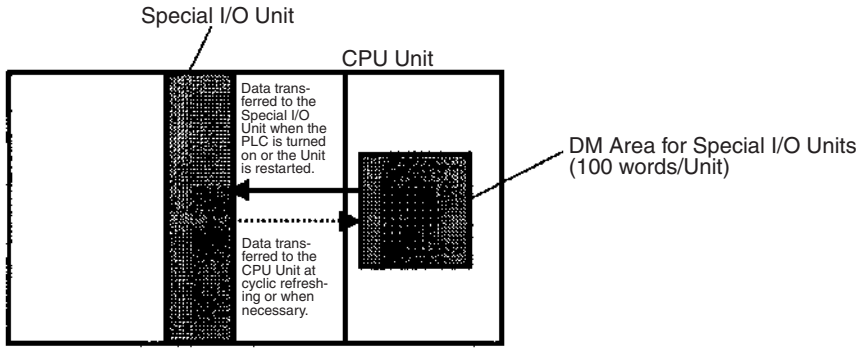
1,2,3...

1. Transfer data when the PLC's power is turned on or the Unit is restarted.
2. Transfer data once each cycle.
3. Transfer data when required.

Refer to the Unit's Operation Manual for details on data transfer timing.

Special I/O Units (D20000 to D29599)

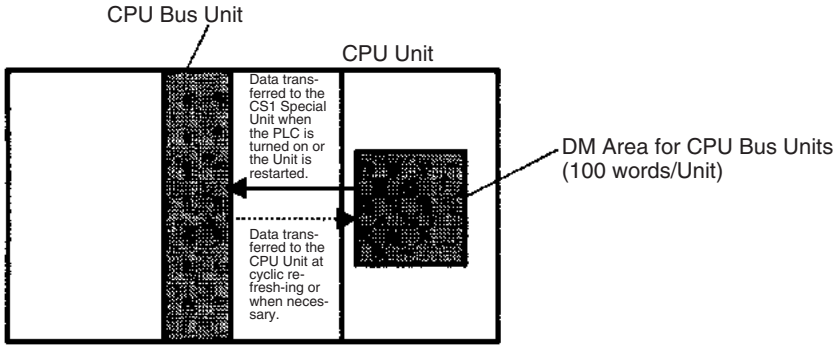
Each Special I/O Unit is allocated 100 words (based on unit numbers 0 to 95). Refer to the Unit's Operation Manual for details on the function of these words.



CPU Bus Units (D30000 to D31599)

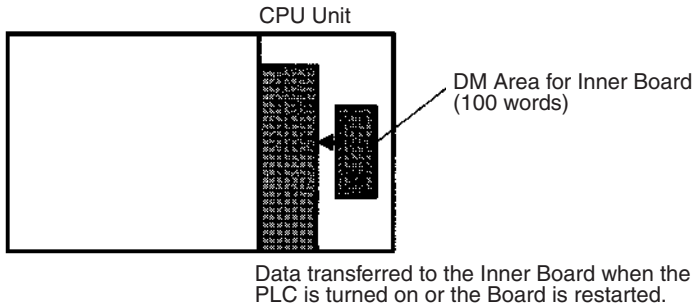
Each CPU Bus Unit is allocated 100 words (based on unit numbers 0 to F). Refer to the Unit's Operation Manual for details on the function of these words. With some CPU Bus Units such as Ethernet Units, initial settings must be registered in the CPU Unit's Parameter Area; this data can be registered with a Programming Device other than a Programming Console.

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Inner Board (D32000 to D32099)

The Inner Board is allocated 100 words. Refer to the Board's Operation Manual for details on the function of these words.



9-21 Extended Data Memory (EM) Area

The EM Area is divided into 13 banks (0 to C) that each contain 32,768 words. EM Area addresses range from E0_00000 to EC_32767. This data area is used for general data storage and manipulation and is accessible only by word.

Data in the EM Area is retained when the PLC's power is cycled or the PLC's operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

Although bits in the EM Area cannot be accessed directly, the status of these bits can be accessed with the BIT TEST instructions, TST(350) and TSTN(351).

Bits in the EM Area cannot be force-set or force-reset.

Specifying EM Addresses

There are two ways to specify an EM address: the bank and address can be specified at the same time or an address in the current bank can be specified (after changing the current bank, if necessary). In general, we recommend specifying the bank and address simultaneously.

1,2,3...

1. Bank and Address Specification
   With this method, the bank number is specified just before the EM address. For example, E2_00010 specifies EM address 00010 in bank 2.
2. Current Bank Address Specification
   With this method, just the EM address is specified. For example, E00010 specifies EM address 00010 in the current bank. (The current bank must be changed with EMBC(281) to access data in another bank. A301 contains the current EM bank number.)

   The current bank will be reset to 0 when the operating mode is changed from PROGRAM mode to RUN/MONITOR mode, unless the IOM Hold Bit

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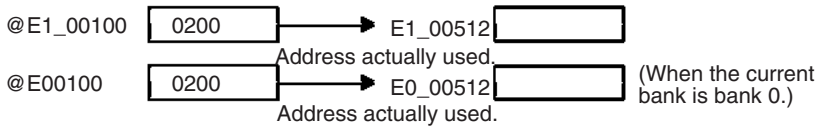
(A50012) is ON. The current bank is not changed as the program proceeds through cyclic tasks and the current bank will be returned to its original value (in the source cyclic task) if it has been changed in an interrupt task.

Indirect Addressing

Words in the EM Area can be indirectly addressed in two ways: binary-mode and BCD-mode.

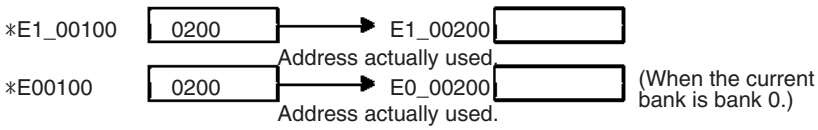
Binary-mode Addressing (@E)

When a "@" character is input before a EM address, the content of that EM word is treated as binary and the instruction will operate on the EM word in the same bank at that binary address. All of the words in the same EM bank (E00000 to E32767) can be indirectly addressed with hexadecimal values 0000 to 7FFF and words in the next EM bank (E00000 to E32767) can be addressed with hexadecimal values 8000 to FFFF.



BCD-mode Addressing (*E)

When a "*" character is input before a EM address, the content of that EM word is treated as BCD and the instruction will operate on the EM word in the same bank at that BCD address. Only part of the EM bank (E00000 to E09999) can be indirectly addressed with BCD values 0000 to 9999.

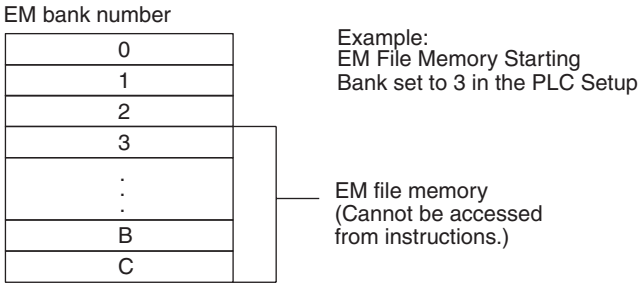


File Memory Conversion

Part of the EM Area can be converted for use as file memory with settings in the PLC Setup. All EM banks from the specified bank (EM File Memory Starting Bank) to the last EM bank will be converted to file memory.

Once EM banks have been converted to file memory, they cannot be accessed (read or written) by instructions. An Illegal Access Error will occur if a file-memory bank is specified as an operand in an instruction.

The following example shows EM file memory when the EM File Memory Starting Bank has been set to 3 in the PLC Setup.



Note When designating addresses in programming or allocations inside C200H Special I/O Units, "EM 0000" to "EM 6143" will actually specify E0_00000 to E0_06143 in the CPU Unit. Other addresses in this area cannot be specified.

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9-22 Index Registers

The sixteen Index Registers (IR0 to IR15) are used for indirect addressing. Each Index Register can hold a single PLC memory address, which is the absolute memory address of a word in I/O memory. Use MOVR(560) to convert a regular data area address to its equivalent PLC memory address and write that value to the specified Index Register. (Use MOVRW(561) to set the PLC memory address of a timer/counter PV in an Index Register.)

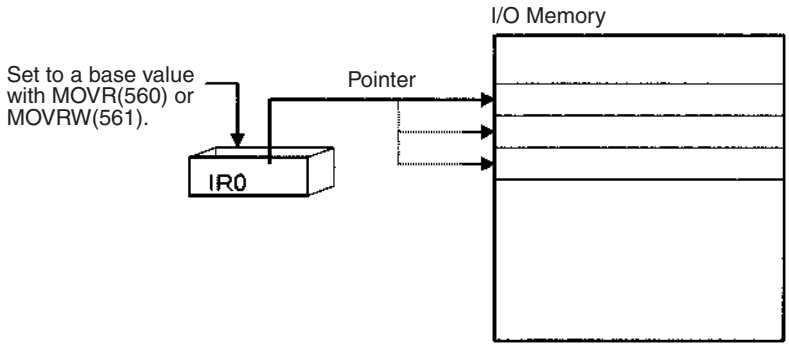
Note Refer to *Appendix C Memory Map* for more details on PLC memory addresses.

Indirect Addressing

When an Index Register is used as an operand with a "," prefix, the instruction will operate on the word indicated by the PLC memory address in the Index Register, not the Index Register itself. Basically, the Index Registers are I/O memory pointers.

- All addresses in I/O memory (except Index Registers, Data Registers, and Condition Flags) can be specified seamlessly with PLC memory addresses. It isn't necessary to specify the data area.
- In addition to basic indirect addressing, the PLC memory address in an Index Register can be offset with a constant or Data Register, auto-incremented, or auto-decremented. These functions can be used in loops to read or write data while incrementing or decrementing the address by one each time that the instruction is executed.

With the offset and increment/decrement variations, the Index Registers can be set to base values with MOVR(560) or MOVRW(561) and then modified as pointers in each instruction.



Note It is possible to specify regions outside of I/O memory and generate an Illegal Access Error when indirectly addressing memory with Index Registers. Refer to *Appendix C Memory Map* for details on the limits of PLC memory addresses.

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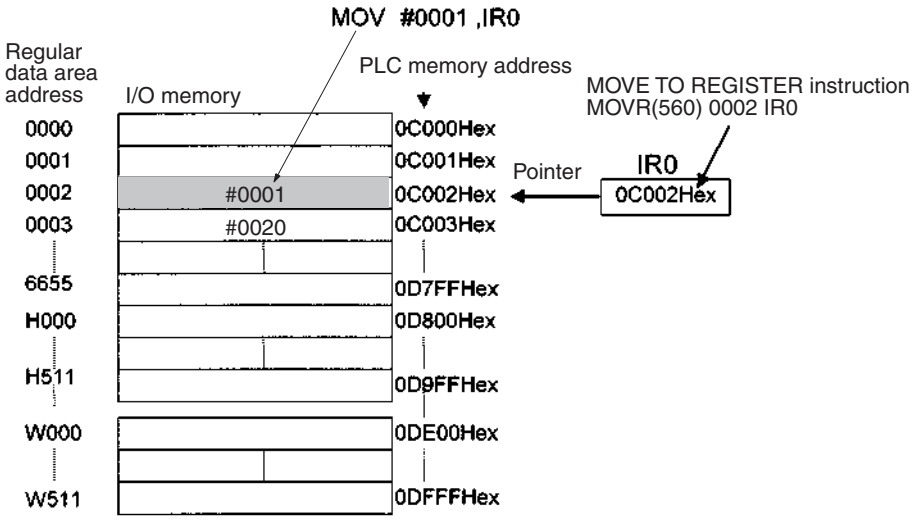
The following table shows the variations available when indirectly addressing I/O memory with Index Registers. (IR□ represents an Index Register from IR0 to IR15.)

Variation	Function	Syntax	Example	
Indirect addressing	The content of IR□ is treated as the PLC memory address of a bit or word.	,IR□	LD ,IR0	Loads the bit at the PLC memory address contained in IR0.
Indirect addressing with constant offset	The constant prefix is added to the content of IR□ and the result is treated as the PLC memory address of a bit or word. The constant may be any integer from –2,048 to 2,047.	Constant ,IR□ (Include a + or – in the constant.)	LD +5,IR0	Adds 5 to the contents of IR0 and loads the bit at that PLC memory address.
Indirect addressing with DR offset	The content of the Data Register is added to the content of IR□ and the result is treated as the PLC memory address of a bit or word.	DR□,IR□	LD DR0,IR0	Adds the contents of DR0 to the contents of IR0 and loads the bit at that PLC memory address.
Indirect addressing with auto-increment	After referencing the content of IR□ as the PLC memory address of a bit or word, the content is incremented by 1 or 2.	Increment by 1: ,IR□+ Increment by 2: ,IR□++	LD , IR0++	Loads the bit at the PLC memory address contained in IR0 and then increments the content of IR0 by 2.
Indirect addressing with auto-decrement	The content of IR□ is decremented by 1 or 2 and the result is treated as the PLC memory address of a bit or word.	Decrement by 1: ,–IR□ Decrement by 2: ,– –IR□	LD , – –IR0	Decrements the content of IR0 by 2 and then loads the bit at that PLC memory address.

Example

This example shows how to store the PLC memory address of a word (CIO 0002) in an Index Register (IR0), use the Index Register in an instruction, and use the auto-increment variation.

MOVR(560)	0002	IR0	Stores the PLC memory address of CIO 0002 in IR0.
MOV(021)	#0001	,IR0	Writes #0001 to the PLC memory address contained in IR0.
MOV(021)	#0020	+1,IR0	Reads the content of IR0, adds 1, and writes #0020 to that PLC memory address.



Note

1. Auto-incrementing and auto-decrementing for index registers are performed whenever an instruction using them is executed. Care is required in application, particularly with instructions like OUT, which are executed

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every cycle. Refer to *1-1-5 Inputting Data in Operands* in the *Instructions Reference* for details.

Example

```
MOVR  000013 IR0
LD    P_Off
OUT   ,IR0+
```

With the above programming, OUT will turn OFF CIO 000013 and IR0 will be incremented to point to CIO 000014.

```
MOVR  000013 IR0
LD    P_Off
SET   ,IR0+
```

SET is executed only when the input condition is ON. With the above programming, SET will not be executed and IR0 will not be incremented.

2. The PLC memory addresses are listed in the diagram above, but it isn't necessary to know the PLC memory addresses when using Index Registers.

Since some operands are treated as word data and others are treated as bit data, the meaning of the data in an Index Register will differ depending on the operand in which it is used.

1,2,3...

1. Word Operand:

```
MOVR(560)    0000      IR2
MOV(021)     D00000    , IR2
```

When the operand is treated as a word, the contents of the Index Register are used "as is" as the PLC memory address of a word.
In this example MOVR(560) sets the PLC memory address of CIO 0002 in IR2 and the MOV(021) instruction copies the contents of D00000 to CIO 0002.

2. Bit Operand:

```
MOVR(560)    000013    ,IR2
SET          +5 , IR2
```

When the operand is treated as a bit, the leftmost 7 digits of the Index Register specify the word address and the rightmost digit specifies the bit number. In this example, MOVR(560) sets the PLC memory address of CIO 000013 (0C000D hex) in IR2. The SET instruction adds +5 from bit 13 to this PLC memory address, so it turns ON bit CIO 000102.

Index Register Initialization

The Index Registers will be cleared in the following cases:

1,2,3...

1. The operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.

IOM Hold Bit Operation

If the IOM Hold Bit (A50012) is ON, the Index Registers won't be cleared when a FALS error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold Bit (A50012) is ON, and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, and if the Index Registers are not set to be shared between tasks (default setting), Index Registers will be held in the following way when power is interrupted. For tasks that were completed before power was interrupted, the values for the cycle during which power was interrupted will be held. For tasks that were not completed before power was interrupted, the values for the cycle before the cycle during which

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power was interrupted will be held. For example, in a program with three tasks, tasks 0, 1, and 2, if power is interrupted in the nth cycle during execution of task 1, then the execution result for the nth cycle of task 0 and the execution results for the (n–1)th cycle of tasks 1 and 2 will be held.

If the IOM Hold Bit (A50012) is ON, the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, and the Index Registers are set to be shared between tasks, Index Registers will not be held when the PLC's power supply is reset (ON →OFF →ON). The Index Registers may take undefined values. Be sure to set the values before continuing.

Forcing Bit Status

Bits in Index Registers cannot be force-set and force-reset.

Direct Addressing

When an Index Register is used as an operand without a "," prefix, the instruction will operate on the contents of the Index Register itself (a two-word or "double" value). Index Registers can be directly addressed only in the instructions shown in the following table. Use these instructions to operate on the Index Registers as pointers.

The Index Registers cannot be directly addressed in any other instructions, although they can usually be used for indirect addressing.

Instruction group	Instruction name	Mnemonic
Data Movement Instructions	MOVE TO REGISTER	MOVR(560)
	MOVE TIMER/COUNTER PV TO REGISTER	MOVRW(561)
	DOUBLE MOVE	MOVL(498)
	DOUBLE DATA EXCHANGE	XCGL(562)
Table Data Processing Instructions	SET RECORD LOCATION	SETR(635)
	GET RECORD NUMBER	GETR(636)
Increment/Decrement Instructions	DOUBLE INCREMENT BINARY	++L(591)
	DOUBLE DECREMENT BINARY	– –L(593)
Comparison Instructions	DOUBLE EQUAL	=L(301)
	DOUBLE NOT EQUAL	< >L(306)
	DOUBLE LESS THAN	< L(311)
	DOUBLE LESS THAN OR EQUAL	< =L(316)
	DOUBLE GREATER THAN	> L(321)
	DOUBLE GREATER THAN OR EQUAL	> =L(326)
	DOUBLE COMPARE	CMPL(060)
Symbol Math Instructions	DOUBLE SIGNED BINARY ADD WITHOUT CARRY	+L(401)
	DOUBLE SIGNED BINARY SUBTRACT WITHOUT CARRY	–L(411)

The SRCH(181), MAX(182), and MIN(183) instructions can output the PLC memory address of the word with the desired value (search value, maximum, or minimum) to IR0. In this case, IR0 can be used in later instructions to access the contents of that word.

Precautions

Do not use Index Registers until a PLC memory address has been set in the register. The pointer operation will be unreliable if the registers are used without setting their values.

The values in Index Registers are unpredictable at the start of an interrupt task. When an Index Register will be used in an interrupt task, always set a PLC memory address in the Index Register with MOVR(560) or MOVRW(561) before using the register in that task.

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Each Index Register task is processed independently, so they do not affect each other. For example, IR0 used in Task 1 and IR0 used in Task 2 are different. Consequently, each Index Register task has 16 Index Registers.

Limitations when Using Index Registers

1,2,3...

1. It is only possible to read the Index Register for the last task executed within the cycle from the Programming Devices. If using Index Registers with the same number to perform multiple tasks, it is only possible with the Programming Devices to read the Index Register value for the last task performed within the cycle from the multiple tasks. Nor is it possible to write the Index Register value from the Programming Devices.
2. It is not possible to either read or write to the Index Registers using Host Link commands or FINS commands.
3. The Index Registers cannot share tasks between them for CS1 CPU Units. (With CS1-H CPU Units, a PLC Setup setting can be made from the CX-Programmer to share Index Registers between tasks.)

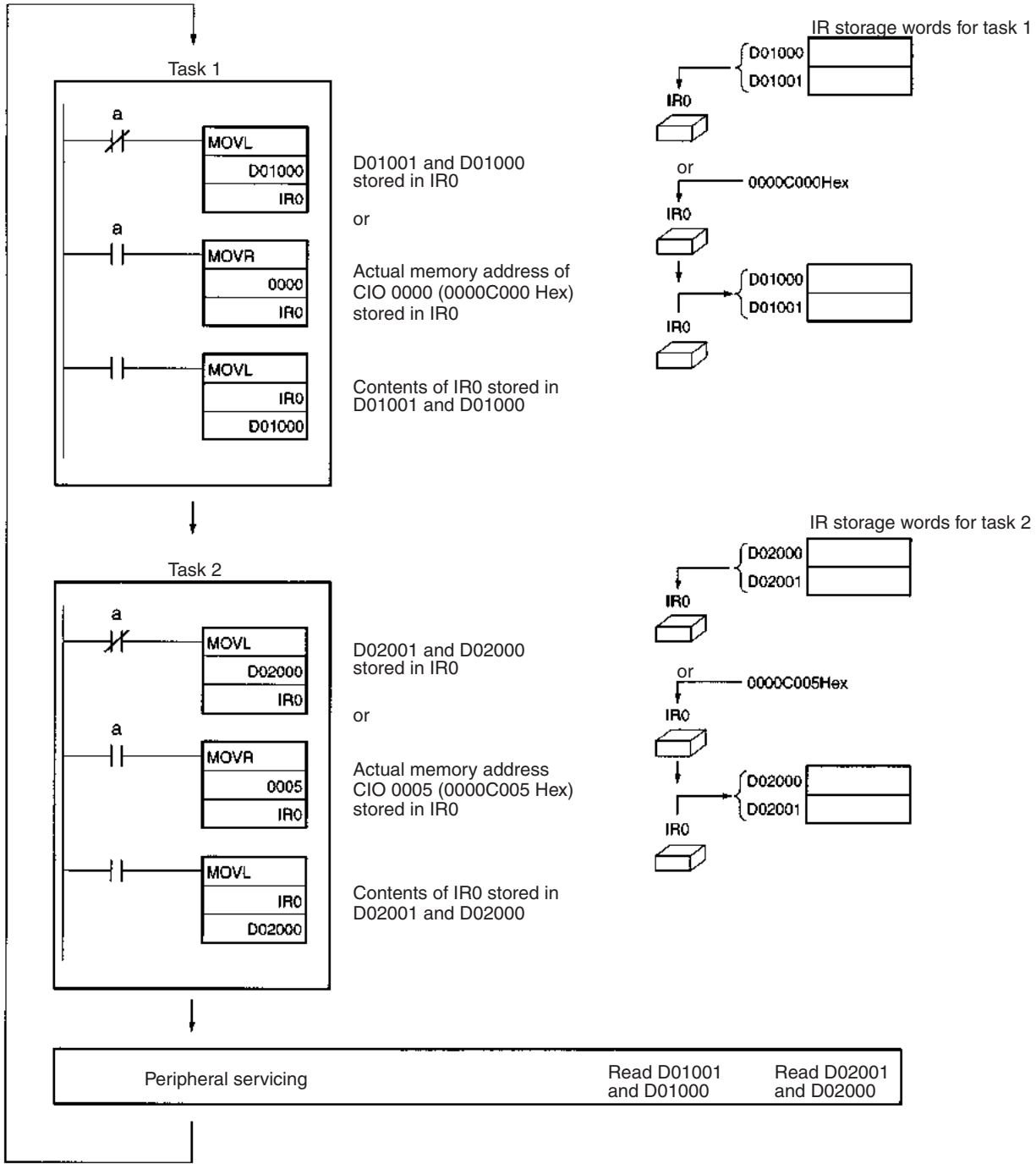
Monitoring and Sharing Index Registers

It is possible to monitor or share Index Registers as follows:

To use the Programming Devices to monitor the final Index Register values for each task, or to monitor the Index Register values using Host Link commands or FINS commands, write a program to store Index Register values from each task to another area (e.g., DM area) at the end of each task, and to read Index Register values from the storage words (e.g., DM area) at the beginning of each task. The values stored for each task in other areas (e.g., DM area) can then be edited using the Programming Devices, Host Link commands, or FINS commands.

Note Be sure to use PLC memory addresses in Index Registers.

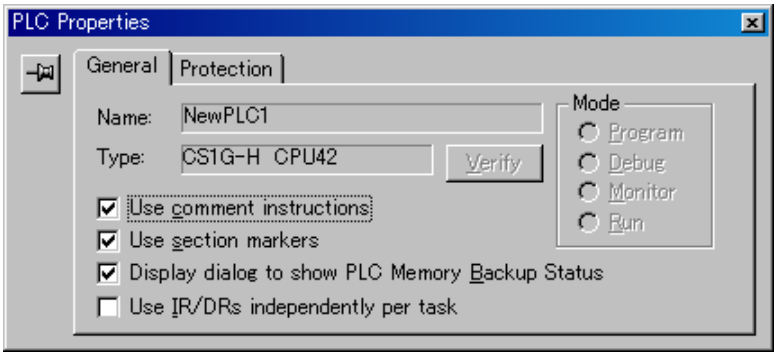
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Sharing Index Registers

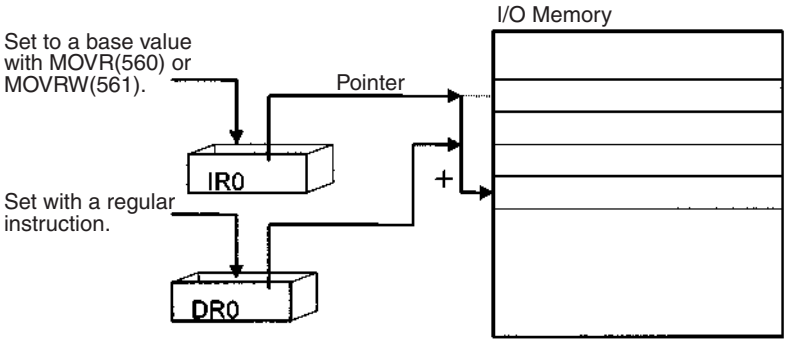
The following setting can be made from the PLC properties dialog box on the CX-Programmer to control sharing index and data registers between tasks.



9-23 Data Registers

The sixteen Data Registers (DR0 to DR15) are used to offset the PLC memory addresses in Index Registers when addressing words indirectly.

The value in a Data Register can be added to the PLC memory address in an Index Register to specify the absolute memory address of a bit or word in I/O memory. Data Registers contain signed binary data, so the content of an Index Register can be offset to a lower or higher address.



Examples

The following examples show how Data Registers are used to offset the PLC memory addresses in Index Registers.

LD DR0 ,IR0	Adds the contents of DR0 to the contents of IR0 and loads the bit at that PLC memory address.
MOV(021) #0001 DR0 ,IR1	Adds the contents of DR0 to the contents of IR1 and writes #0001 to that PLC memory address.

Range of Values

The contents of data registers are treated as signed binary data and thus have a range of –32,768 to 32,767.

Hexadecimal content	Decimal equivalent
8000 to FFFF	–32,768 to –1
0000 to 7FFF	0 to 32,767

Data Register Initialization

The Data Registers will be cleared in the following cases:

1,2,3...

1. The operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa and the IOM Hold Bit is OFF.
2. The PLC's power supply is cycled and the IOM Hold Bit is OFF or not protected in the PLC Setup.

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IOM Hold Bit Operation

If the IOM Hold Bit (A50012) is ON, the Data Registers won't be cleared when a FALS error occurs or the operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.

If the IOM Hold Bit (A50012) is ON, and the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, and if the Data Registers are not set to be shared between tasks (default setting), Data Registers will be held in the following way when power is interrupted. For tasks that were completed before power was interrupted, the values for the cycle during which power was interrupted will be held. For tasks that were not completed before power was interrupted, the values for the cycle before the cycle during which power was interrupted will be held. For example, in a program with three tasks, tasks 0, 1, and 2, if power is interrupted in the nth cycle during execution of task 1, then the execution result for the nth cycle of task 0 and the execution results for the (n−1)th cycle of tasks 1 and 2 will be held.

If the IOM Hold Bit (A50012) is ON, the PLC Setup's "IOM Hold Bit Status at Startup" setting is set to protect the IOM Hold Bit, and the Data Registers are set to be shared between tasks, Data Registers will not be held when the PLC's power supply is reset (ON →OFF →ON). The Data Registers may take undefined values. Be sure to set the values before continuing.

Forcing Bit Status

Bits in Data Registers **cannot** be force-set and force-reset.

Precautions

Data Registers are normally local to each task. For example, DR0 used in task 1 is different from DR0 used in task 2. (With CS1-H CPU Units, a PLC Setup setting can be made from the CX-Programmer to share Data Registers between tasks.)

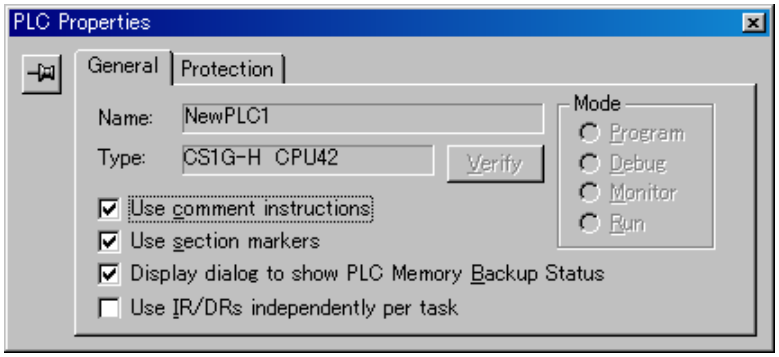
The content of Data Registers cannot be accessed (read or written) from a Programming Device.

Do not use Data Registers until a value has been set in the register. The register's operation will be unreliable if they are used without setting their values.

The values in Data Registers are unpredictable at the start of an interrupt task. When a Data Register will be used in an interrupt task, always set a value in the Data Register before using the register in that task.

Sharing Data Registers

The following setting can be made from the PLC properties dialog box on the CX-Programmer to control sharing index and data registers between tasks.



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9-24 Task Flags

Task Flags range from TK00 to TK31 and correspond to cyclic tasks 0 to 31. A Task Flag will be ON when the corresponding cyclic task is in executable (RUN) status and OFF when the cyclic task hasn't been executed (INI) or is in standby (WAIT) status.

Note These flags indicate the status of cyclic tasks only (including extra cyclic tasks), they do not reflect the status of interrupt tasks.

Task Flag Initialization

The Task Flags will be cleared in the following cases, regardless of the status of the IOM Hold Bit.

1,2,3...

1. The operating mode is changed from PROGRAM mode to RUN/MONITOR mode or vice-versa.
2. The PLC's power supply is cycled.

Forcing Bit Status

The Task Flags **cannot** be force-set and force-reset.

9-25 Condition Flags

These flags include the Arithmetic Flags such as the Error Flag and Equals Flag which indicate the results of instruction execution. In earlier PLCs, these flags were in the SR Area.

The Condition Flags are specified with labels, such as CY and ER, or with symbols, such as P_Carry and P_Instr_Error, rather than addresses. The status of these flags reflects the results of instruction execution, but the flags are read-only; they cannot be written directly from instructions or Programming Devices.

Note The CX-Programmer treats condition flags as global symbols beginning with P_.

All Condition Flags are cleared when the program switches tasks, so the status of the ER and AER flags are maintained only in the task in which the error occurred.

The Condition Flags **cannot** be force-set and force-reset.

Summary of the Condition Flags

The following table summarizes the functions of the Condition Flags, although the functions of these flags will vary slightly from instruction to instruction.

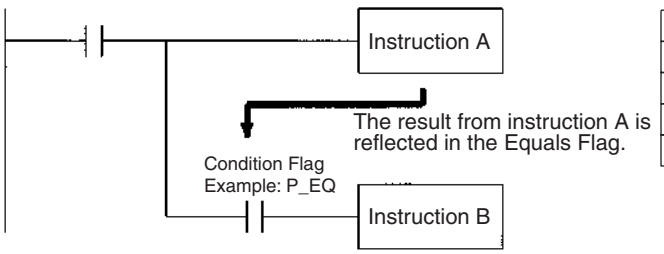
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Refer to the description of the instruction for complete details on the operation of the Condition Flags for a particular instruction.

Name	Symbol	Label	Function
Error Flag	P_ER	ER	Turned ON when the operand data in an instruction is incorrect (an instruction processing error) to indicate that an instruction ended because of an error. **Note:** When the PLC Setup is set to stop operation for an instruction error (Instruction Error Operation), program execution will be stopped and the Instruction Processing Error Flag (A29508) will be turned ON when the Error Flag is turned ON.
Access Error Flag	P_AER	AER	Turned ON when an Illegal Access Error occurs. The Illegal Access Error indicates that an instruction attempted to access an area of memory that should not be accessed. **Note:** When the PLC Setup is set to stop operation for an instruction error (Instruction Error Operation), program execution will be stopped and the Instruction Processing Error Flag (A429510) will be turned ON when the Access Error Flag is turned ON.
Carry Flag	P_CY	CY	Turned ON when there is a carry in the result of an arithmetic operation or a "1" is shifted to the Carry Flag by a Data Shift instruction. The Carry Flag is part of the result of some Data Shift and Symbol Math instructions.
Greater Than Flag	P_GT	>	Turned ON when the first operand of a Comparison Instruction is greater than the second or a value exceeds a specified range.
Equals Flag	P_EQ	=	Turned ON when the two operands of a Comparison Instruction are equal the result of a calculation is 0.
Less Than Flag	P_LT	<	Turned ON when the first operand of a Comparison Instruction is less than the second or a value is below a specified range.
Negative Flag	P_N	N	Turned ON when the most significant bit (sign bit) of a result is ON.
Overflow Flag	P_OF	OF	Turned ON when the result of calculation overflows the capacity of the result word(s).
Underflow Flag	P_UF	UF	Turned ON when the result of calculation underflows the capacity of the result word(s).
Greater Than or Equals Flag	P_GE	>=	Turned ON when the first operand of a Comparison Instruction is greater than or equal to the second.
Not Equal Flag	P_NE	< >	Turned ON when the two operands of a Comparison Instruction are not equal.
Less Than or Equals Flag	P_LE	< =	Turned ON when the first operand of a Comparison Instruction is less than or equal to the second.
Always ON Flag	P_On	ON	Always ON. (Always 1.)
Always OFF Flag	P_Off	OFF	Always OFF. (Always 0.)

Using the Condition Flags

The Condition Flags are shared by all of the instructions, so their status may change often in a single cycle. Be sure to read the Condition Flags immediately after the execution of instruction, preferably in a branch from the same execution condition.



Instruction	Operand
LD	
Instruction A	
AND	=
Instruction B	

Since the Condition Flags are shared by all of the instructions, program operation can be changed from its expected course by interruption of a single task. Be sure to consider the effects of interrupts when writing the program. Refer

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to *SECTION 2 Programming* of *CS/CJ Series Programmable Controllers* (W394) for more details.

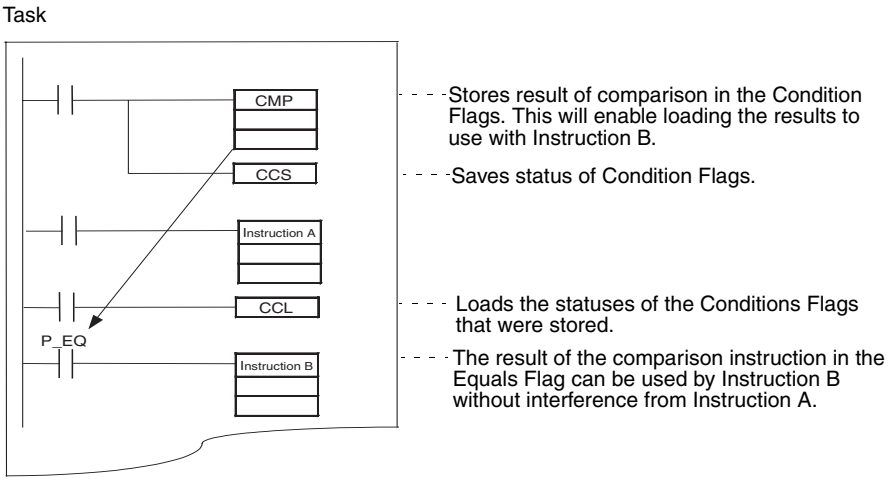
The Condition Flags are cleared when the program switches tasks, so the status of a Condition Flag cannot be passed to another task. For example the status of a flag in task 1 cannot be read in task 2. (The flag's status must be transferred to a bit.)

Note The condition flags cannot be designated directly in programming or allocations inside C200H Special I/O Units.

Saving and Loading Condition Flag Status

The CCS(282) and CCL(283) instructions can be used to save and load the Condition Flag status. These can be used to access the status of the Condition Flags at other locations in a task or in a different task.

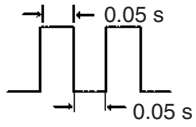
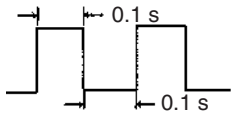
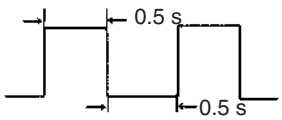
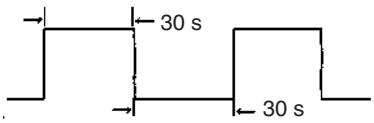
The following example shows how the Equals Flag is used at a different location in the same task.



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9-26 Clock Pulses

The Clock Pulses are flags that are turned ON and OFF at regular intervals by the system.

Name	Label	Symbol	Programming Console name	Operation	
0.02 s Clock Pulse	0.02s	P_0_02_s	0.02 s		ON for 0.01 s OFF for 0.01 s
0.1 s Clock Pulse	0.1s	P_0_1s	0.1 s		ON for 0.05 s OFF for 0.05 s
0.2 s Clock Pulse	0.2s	P_0_2s	0.2 s		ON for 0.1 s OFF for 0.1 s
1 s Clock Pulse	1s	P_1s	1 s		ON for 0.5 s OFF for 0.5 s
1 min Clock Pulse	1min	P_1min	1 min		ON for 30 s OFF for 30 s

The Clock Pulses are specified with labels (or symbols) rather than addresses.

Specify the flags as shown above using the CX-Programmer or Programming Console.

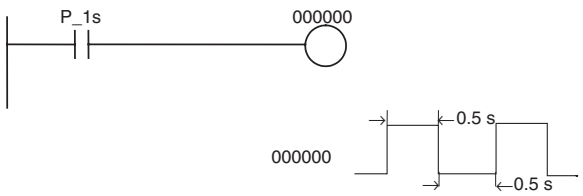
Note The CX-Programmer treats condition flags as global symbols beginning with P_.

The Clock Pulses are read-only; they cannot be overwritten from instructions or Programming Devices.

The Clock Pulses are cleared at the start of operation.

Using the Clock Pulses

The following example turns CIO 000000 ON and OFF at 0.5 s intervals.



Instruction	Operand
LD	P_1s
OUT	000000

Note The clock pulses cannot be designated directly in programming or allocations inside C200H Special I/O Units.

Clock Pulses Update Timing

Clock pulses are updated during program execution, so the ON and OFF status may differ at the beginning and end of the program.

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Error

The clock pulses have a maximum error of 0.01% at 25°C. For long-term time control, it is recommended that control be based on the internal clock rather than the clock pulses. The internal clock itself also has an error factor.

9-27 Parameter Areas

Unlike the data areas in I/O memory which can be used in instruction operands, the Parameter Area can be accessed only from a Programming Device. The Parameter Area is made up of the following parts.

- The PLC Setup
- The Registered I/O Table
- The Routing Table
- The CPU Bus Unit Settings

9-27-1 PLC Setup

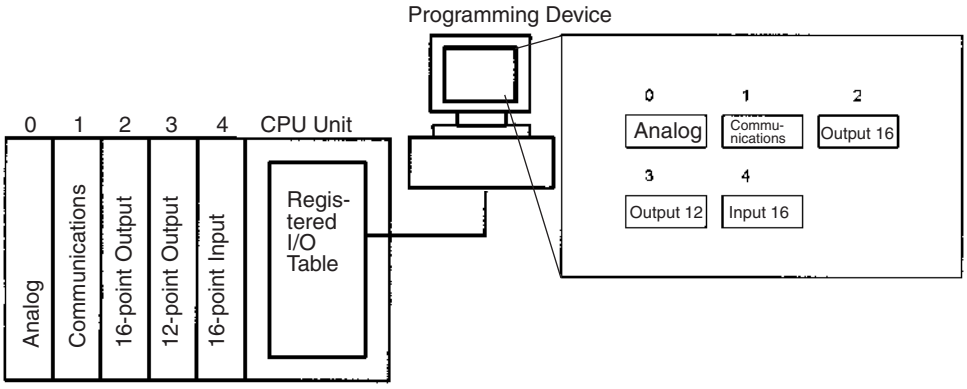
The user can customize the basic specifications of the CPU Unit with the settings in the PLC Setup. The PLC Setup contains settings such as the serial port communications settings and minimum cycle time setting.

Refer to *7-1 PLC Setup* for details on the PLC Setup settings and refer to the Programming Device's Operation Manual for details on changing these settings.

9-27-2 Registered I/O Table

The Registered I/O Table is a table in the CPU Unit that contains the information on the model and slot location of all of the Units mounted to the CPU Rack, Expansion I/O Racks, and Slave Racks. The I/O Table is written to the CPU Unit with a Programming Device operation.

The CPU Unit allocates I/O memory to actual I/O points (on Basic I/O Units or Remote I/O Units) and CPU Bus Units based on the information in the Registered I/O Table. Refer to the Programming Device's Operation Manual for details on registering the I/O Table.



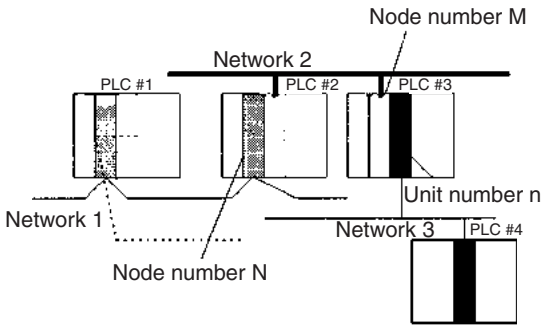
The I/O Verification Error Flag (A40209) will be turned ON if the models and locations of the Units actually mounted to the PLC (CPU Rack, Expansion I/O Racks, and Slave Racks) do not match the information in the Registered I/O Table.

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9-27-3 Routing Table

When transferring data between networks, it is necessary to create a table in each CPU Unit that shows the communications route from the local PLC's Communications Unit to the other networks. These tables of communications routes are called "Routing Tables."

Create the Routing Tables with a Programming Device or the Controller Link Support Software and transfer the tables to each CPU Unit. The following diagram shows the Routing Tables used for a data transfer from PLC #1 to PLC #4.



1,2,3... 1. Relay Network Table of PLC #1:

Destination network	Relay network	Relay node
3	1	N

2. Relay Network Table of PLC #2:

Destination network	Relay network	Relay node
3	2	M

3. Local Network Table of PLC #3:

Local network	Unit number
3	n

Relay Network Table

This table lists the network address and node number of the first relay node to contact in order to reach the destination network. The destination network is reached through these relay nodes.

Local Network Table

This table lists the network address and unit number of the Communications Unit connected to the local PLC.

These are settings for the CS-series CPU Bus Units which are controlled by the CPU Unit. The actual settings depend on the model of CS-series CPU Bus Unit being used; refer to the Unit's Operation Manual for details.

9-27-4 CPU Bus Unit Settings

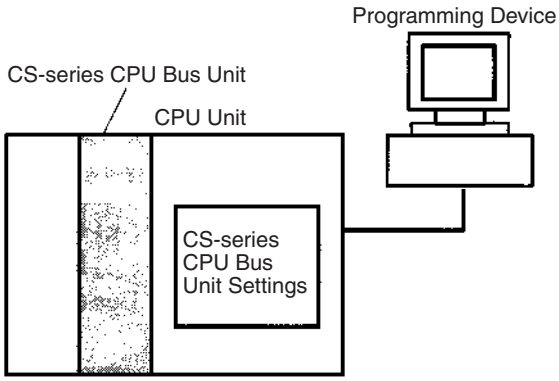
These settings are not managed directly like the I/O memory's data areas, but are set from a Programming Device like the Registered I/O Tables.

Example 1: For Controller Link Units, user-set data link parameters and network parameters are managed as CPU Bus Unit settings.

Example 2: For Ethernet Units, the settings required to operate as an Ethernet node, such as the IP address table, are managed as CPU Bus Unit settings.

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Refer to the Programming Device's Operation Manual for details on changing these settings.



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SECTION 10
CPU Unit Operation and the Cycle Time

This section describes the internal operation of the CPU Unit and the cycle used to perform internal processing.

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10-1 CPU Unit Operation

10-1-1 General Flow

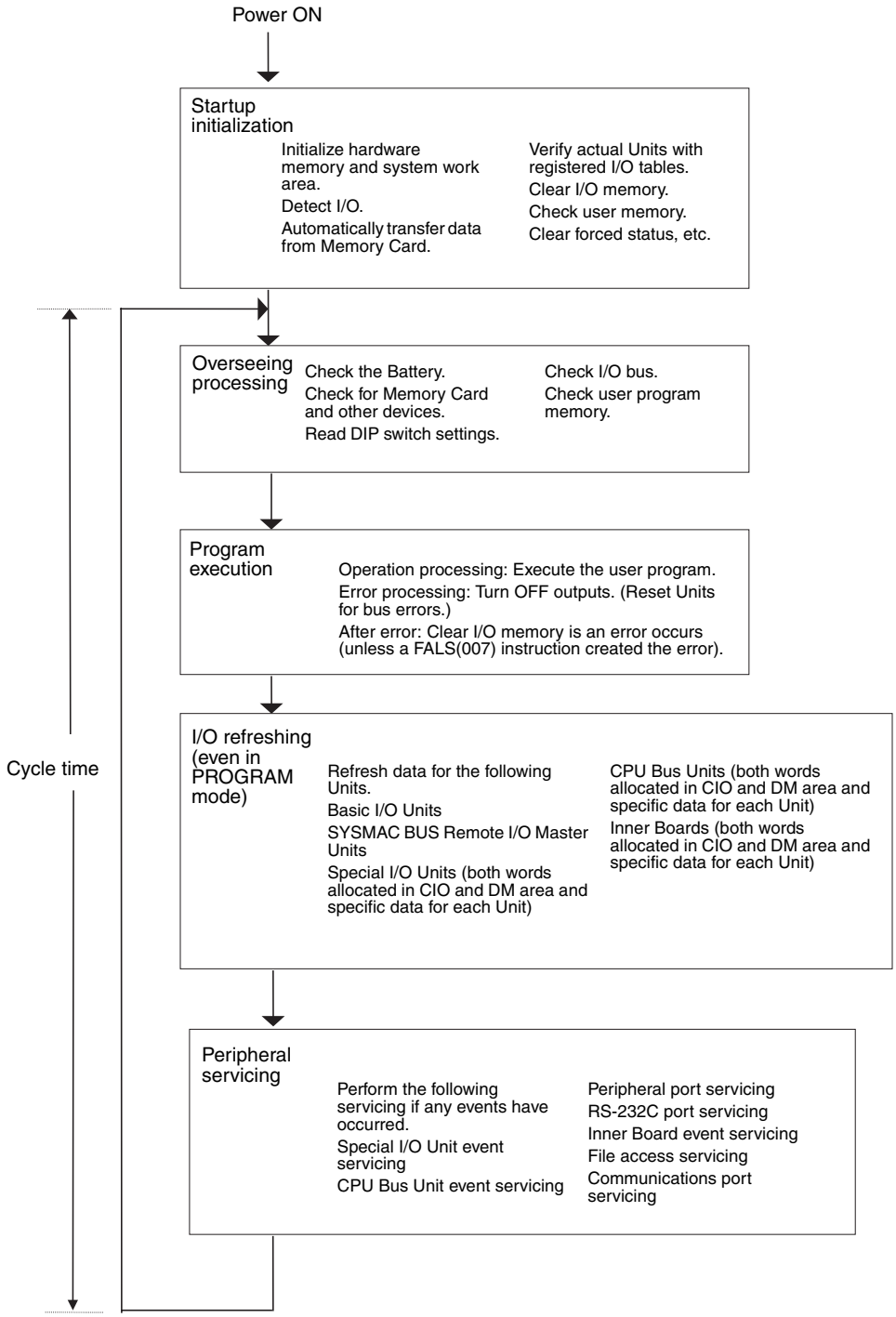
The following flowchart shows the overall operation of the CPU Unit.

Note The CPU Unit's processing mode is set to Normal Mode, Parallel Processing with Synchronous Memory Access, or Parallel Processing with Asynchronous Memory Access in the PLC Setup (Programming Console address 219, bits 08 to 15). This setting is also possible from the CX-Programmer.

Normal Mode

In the normal mode, the program is executed before I/O is refreshed and peripherals are serviced. This cycle is executed repeatedly.

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Parallel Processing

The following two types of processing are performed in parallel in either of the Parallel Processing Modes.

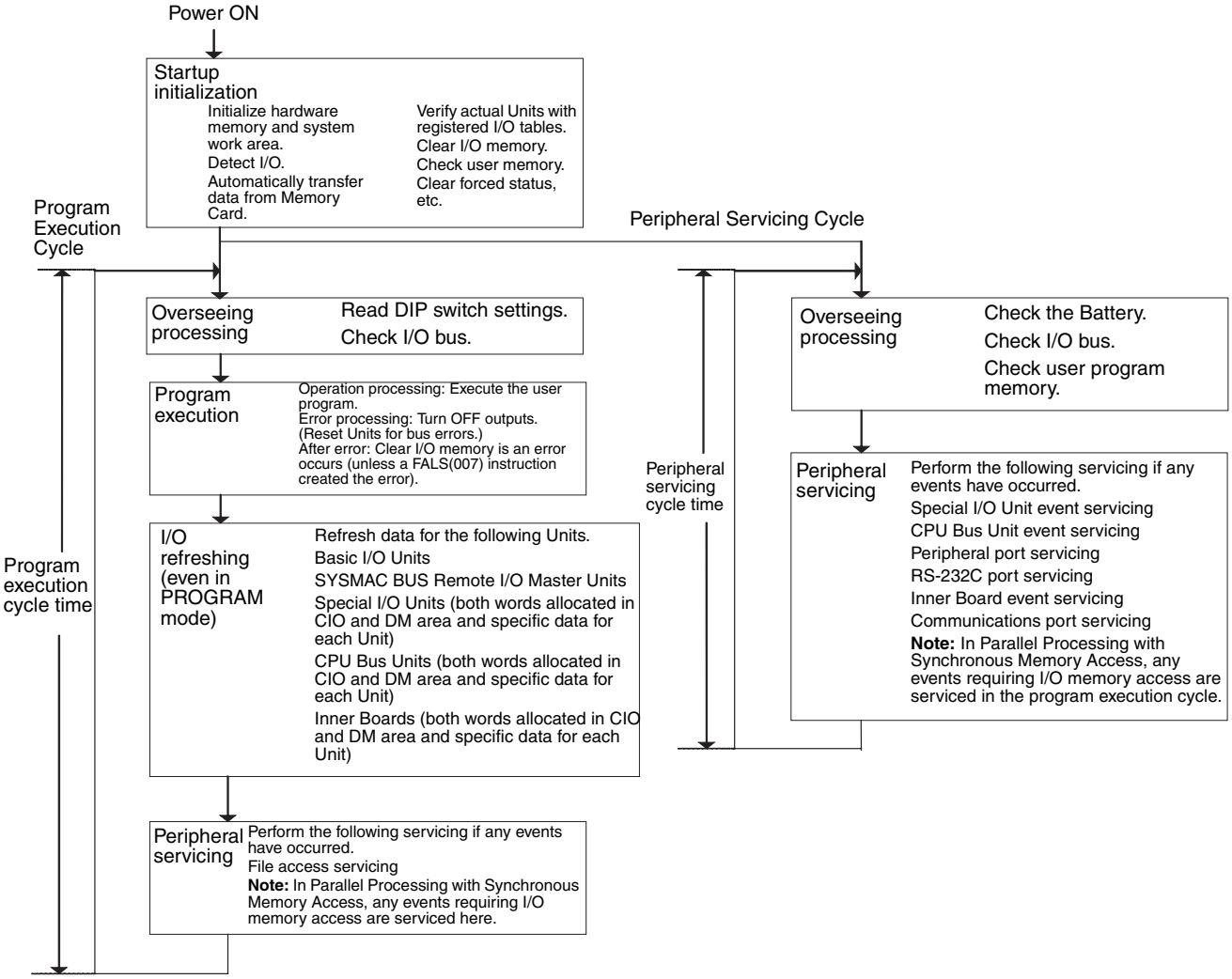
1,2,3...

1. Program execution: Includes user program execution and I/O refreshing. It is this cycle time that is monitored from a Programming Device.
2. Peripheral servicing: Programming Devices and events from Special I/O Units and CPU Bus Units are serviced when they occur.

There are two different Parallel Processing Modes. Parallel Processing with Synchronous Memory Access refreshes I/O memory in the program execution

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cycle and Parallel Processing with Asynchronous Memory Access refreshes I/O memory in the peripheral servicing cycle.



Note Always disconnect the Programming Console from the peripheral port during actual system operation in a Parallel Processing Mode. If the Programming Console is left attached, excess time will be allocated to increase key response for the Programming Console, adversely affecting performance.

10-1-2 I/O Refreshing and Peripheral Servicing

I/O Refreshing

I/O refreshing involves cyclically transferring data with external devices using preset words in memory. I/O refreshing includes the following:

- Refreshing between Basic I/O Units and I/O words in the CIO Area and refreshing between SYSMAC BUS Remote I/O Master Units and SYSMAC BUS and I/O Terminal words in the CIO Area
- Refreshing between Special I/O Units, CPU Bus Units, and Inner Boards, and the words allocated to these in the CIO Area (and for CPU Bus Units, words allocated in the DM Area)
- Refreshing Unit-specific data for Special I/O Units, CPU Bus Units, and Inner Boards.

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All I/O refreshing is performed in the same cycle (i.e., time slicing is not used). I/O refreshing is always performed after program execution (even in a Parallel Processing Mode for CS1-H CPU Units).

Units			Max. data exchange	Data exchange area
Basic I/O Units (including C200H Group-2 I/O Units)			Depends on the Unit.	I/O Bit Area
SYSMAC BUS Remote I/O Master Unit			Depends on the Unit.	SYSMAC BUS Area and I/O Terminal Area
Special I/O Units (CS-series and C200H)	Words allocated in CIO Area		10 words/Unit (Depends on the Unit.)	Special I/O Unit Area
	Unit-specific data	C200H DeviceNet Master Unit	Depends on the Unit.	Words set for remote I/O communications (for either fixed or user-set allocations)
		CompoBus/S Master Unit	Depends on the Unit.	Special I/O Units Area
CS-series CPU Bus Units	Words allocated in CIO Area		25 words/Unit	CS-series CPU Bus Unit Area
	Words allocated in DM Area		100 words/Unit	CS-series CPU Bus Unit Area
	Unit-specific data	Controller Link Unit and SYSMAC LINK Unit	Depends on the Unit.	Words set for data links (for either fixed or user-set allocations)
		CS-series DeviceNet Unit	Depends on the Unit.	Words set for remote I/O communications (for either fixed or user-set allocations)
		Serial Communications Unit	Depends on the protocol macros.	Communications data set for protocol macros
		Ethernet Unit	Depends on the Unit.	Communications data for socket services initiated by specific control bit operations.
Inner Boards	Words allocated in CIO Area		100 words/Unit	Inner Board Area
	Unit-specific data	Serial Communications Board	Depends on the protocol macros.	Communications data set for protocol macros

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Peripheral Servicing

Peripheral servicing involves servicing non-scheduled events for external devices. This includes both events from external devices and service requests to external devices.

Most peripheral servicing for CS-series PLCs involved FINS commands. The specific amount of time set in the system is allocated to each type of servicing and executed every cycle. If all servicing cannot be completed within the allocated time, the remaining servicing is performed the next cycle.

Units	Servicing
Event servicing for CS-series Special I/O Units	Non-scheduled servicing for FINS commands from CS-series Special I/O Units, CS-series CPU Bus Units, and Inner Boards (e.g., requests to start external interrupt tasks)
Event servicing for CS-series CPU Bus Units	Non-scheduled servicing for FINS commands from the CPU Unit to the above Units.
Event servicing for Inner Boards	
Peripheral port servicing	Non-scheduled servicing for FINS or Host Link commands received via the peripheral or RS-232C ports from Programming Devices, PTs, or host computers (e.g., requests to transfer programming, monitoring, forced-set/reset operations, or online editing Non-scheduled servicing from the CPU Unit transmitted from the peripheral or RS-232C port (non-solicited communications)
RS-232C port servicing	
Communications port servicing	Servicing to execute network communications, serial communications, or file memory access for the SEND, RECV, CMND or PMCR instructions using communications ports 0 to 7 (internal logical ports) Servicing to execute background execution using communications ports 0 to 7 (internal logical ports) (CS1-H CPU Unit only)
File access servicing	File read/write operations for Memory Cards or EM file memory.

Note

1. CS-series Special I/O Units, CS-series CPU Bus Units, RS-232C communications ports, Inner Boards, and file servicing is allocated 4% of the cycle time by default (the default can be changed). If servicing is separated over many cycles, delaying completion of the servicing, set the same allocated time (same time for all services) rather than a percentage under execute time settings in the PLC Setup.
2. In either of the Parallel Processing Modes for the CS1-H CPU Unit, all peripheral servicing except for file access is performed in the peripheral servicing cycle.

10-1-3 Initialization at Startup

The following initializing processes will be performed once each time the power is turned ON.

- Detect mounted Units.
- Compare the registered I/O tables and the actual Units.
- Clear the non-holding areas of I/O memory according to the status of the IOM Hold Bit. (See note 1.)
- Clear forced status according to the status of the Forced Status Hold Bit. (See note 2.)
- Autoboot using the autotransfer files in the Memory Card if one is inserted.
- Perform self-diagnosis (user memory check).

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Note

1. The I/O memory is held or cleared according to the status of the IOM Host Bit and the setting for IOM Hold Bit Status at Startup in the PLC Setup (read only when power is turned ON).

Auxiliary bit / PLC Setup setting		IOM Hold Bit (A50012)	
		Clear (OFF)	Hold (ON)
IOM Hold Bit Status at Startup (Programming Console address: Word 80, bit 15)	Clear (OFF)	At power ON: Clear At mode change: Clear	At power ON: Clear At mode change: Hold
	Hold (ON)		At power ON: Hold At mode change: Hold

   Mode Change: Between PROGRAMMING mode and RUN or MONITOR mode

2. The forced status held or cleared according to the status of the Force Status Hold Bit and the setting for Forced Status Hold Bit Status at Startup in the PLC Setup.

Auxiliary bit / PLC Setup setting		Forced Status Hold Bit (A50013)	
		Clear (OFF)	Hold (ON)
Forced Status Hold Bit Status at Startup (Programming Console address: Word 80, bit 14)	Clear (OFF)	At power ON: Clear At mode change: Clear	At power ON: Clear At mode change: Hold
	Hold (ON)		At power ON: Hold At mode change: Hold

   Mode Change: Between PROGRAMMING mode and RUN or MONITOR mode

3. If the CPU Unit is turned OFF after online editing before the backup process has been competed, an attempt will be made to recover the program when power is turned ON again. The BKUP indicator will light during this process. Refer to the *CS/CJ Series Programming Manual* (W394) for details.

10-2 CPU Unit Operating Modes

10-2-1 Operating Modes

The CPU Unit has three operating modes that control the entire user program and are common to all tasks.

PROGRAM: Programs are not executed and preparations, such as creating I/O tables, initializing the PLC Setup and other settings, transferring programs, checking programs, force-setting and force-resetting can be executed prior to program execution.

MONITOR: Programs are executed, but some operations, such as online editing, forced-set/reset, and changes to present values in I/O memory, are enabled for trial operation and other adjustments.

RUN: Programs are executed and some operations are disabled.

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10-2-2 Status and Operations in Each Operating Mode

PROGRAM, RUN, and MONITOR are the three operating modes available in the CPU Unit. The following lists status and operations for each mode.

Overall Operation

Mode	Program (See note)	I/O refresh	External outputs	I/O Memory	
				Non-holding areas	Holding areas
PROGRAM	Stopped	Executed	OFF	Clear	Hold
RUN	Executed	Executed	Controlled by program	Controlled by program	
MONITOR	Executed	Executed	Controlled by program	Controlled by program	

Programming Console Operations

Mode	Monitor I/O Memory	Monitor Program	Transfer Program		Check Program	Create I/O Table
			PLC to Programming Device	Programming Device to PLC		
PROGRAM	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**
MONITOR	**OK**	**OK**	**OK**	X	X	X
RUN	**OK**	**OK**	**OK**	X	X	X

Mode	PLC Setup	Modify Program	Force-set/reset	Changing Timer/Counter SV	Changing Timer/Counter PV	Changing I/O Memory PV
PROGRAM	**OK**	**OK**	**OK**	**OK**	**OK**	**OK**
RUN	X	X	X	X	X	X
MONITOR	X	**OK**	**OK**	**OK**	**OK**	**OK**

Note The following table shows the relationship of operating modes to tasks.

Mode	Cyclic task status	Interrupt task status
PROGRAM	Disabled status (INI)	Stopped
RUN MONITOR	• Any task that has not yet been executed, will be in disabled status (INI). • A task will go to READY status if the task is set to go to READY status at startup or the TASK ON (TKON) instruction has been executed for it. • A task in READY status will be executed (RUN status) when it obtains the right to execute. • A status will go to Standby status if a READY task is put into Standby status by a TASK OFF (TKOF) instruction.	Executed if interrupt condition is met.

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Operating Mode Changes and I/O Memory

Mode Changes	Non-holding areas	Holding Areas
	• I/O bits • Data Link bits • CPU Bus Unit bits • Special I/O Unit bits • Inner Board bits • SYSMAC BUS bits • I/O Terminal bits • C200H Special I/O Unit bits • DeviceNet bits • Work bits • Timer PV/Completion Flags • Index Registers • Data Registers • Task Flags (Auxiliary Area bits/words are holding or non-holding depending on the address.)	• HR Area • DM Area • EM Area • Counter PV and Completion Flags (Auxiliary Area bits/words are holding or non-holding depending on the address.)
RUN or MONITOR to PROGRAM	Cleared (See note 1.)	Held
PROGRAM to RUN or MONITOR	Cleared (See note 1.)	Held
RUN to MONITOR or MONITOR to RUN	Held (See note 2.)	Held

Note

1. The following processing is performed depending on the status of the I/O Memory Hold Bit. Output from Output Units will be turned OFF when operation stops even if I/O bit status is held in the CPU Unit.
2. The cycle time will increase by approximately 10 ms when the operating mode is changed from MONITOR to RUN mode. This will not, however, cause an error for exceeding the maximum cycle time limit.

I/O Memory Hold Bit status (A50012)	I/O Memory			Output bits allocated to Output Units		
	Mode changed between PROGRAM and RUN/ MONITOR	Operation stopped		Mode changed between PROGRAM and RUN/ MONITOR	Operation stopped	
		Fatal error other than FALS	FALS executed		Fatal error other than FALS	FALS executed
OFF	Cleared	Cleared	Held	OFF	OFF	OFF
ON	Held	Held	Held	Held	OFF	OFF

Note Refer to *9-2 I/O Memory Areas* for more details on I/O Memory.

10-3 Power OFF Operation

10-3-1 Overview

The following processing is performed if CPU Unit power is turned OFF. Power OFF processing will be performed if the power supply falls below 85% of the rated voltage while the CPU Unit is in RUN or MONITOR mode.

1,2,3...

1. The CPU Unit will stop.
2. Outputs from all Output Units will be turned OFF.

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Note All output will turn OFF despite an I/O Memory Hold Bit or I/O Memory Hold Bit at power ON settings in the PLC Setup.

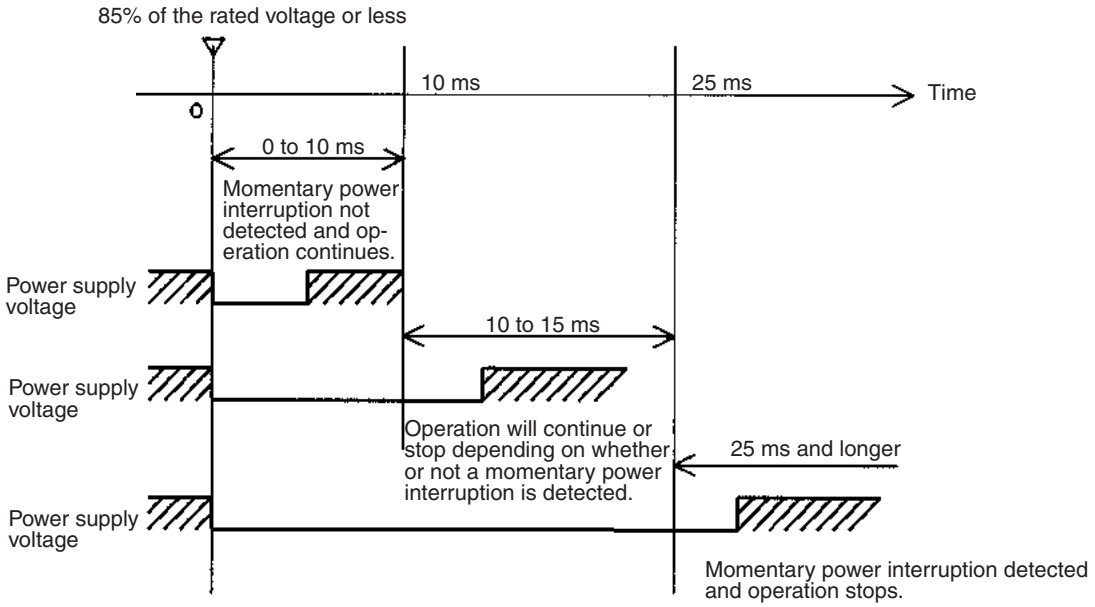
85% of the rated voltage:
AC power: 85 V for a 100 V AC system and 170 V for a 200 V AC system
DC power: 19.2 V DC

The following processing will be performed if power drops only momentarily (momentary power interruption).

1,2,3...

1. The system will continue to run unconditionally if the momentary power interruption lasts less than 10 ms, i.e., the time it takes the rated voltage at 85% or less to return to 85% or higher is less than 10 ms.
2. A momentary power interruption that lasts more than 10 ms but less than 25 ms is difficult to determine and a power interruption may or may not be detected.
3. The system will stop unconditionally if the momentary power interruption lasts more than 25 ms.

If operation stops under the conditions given in items 2 and 3 above, the timing used to stop operation (or the timing used to start execution of the Power OFF Interrupt Task) can be delayed by setting the Power OFF Detection Delay Time (0 to 10 ms) in the PLC Setup. Operation, however, will always be stopped 10 ms after detecting a momentary power interruption regardless of the setting in the PLC Setup.

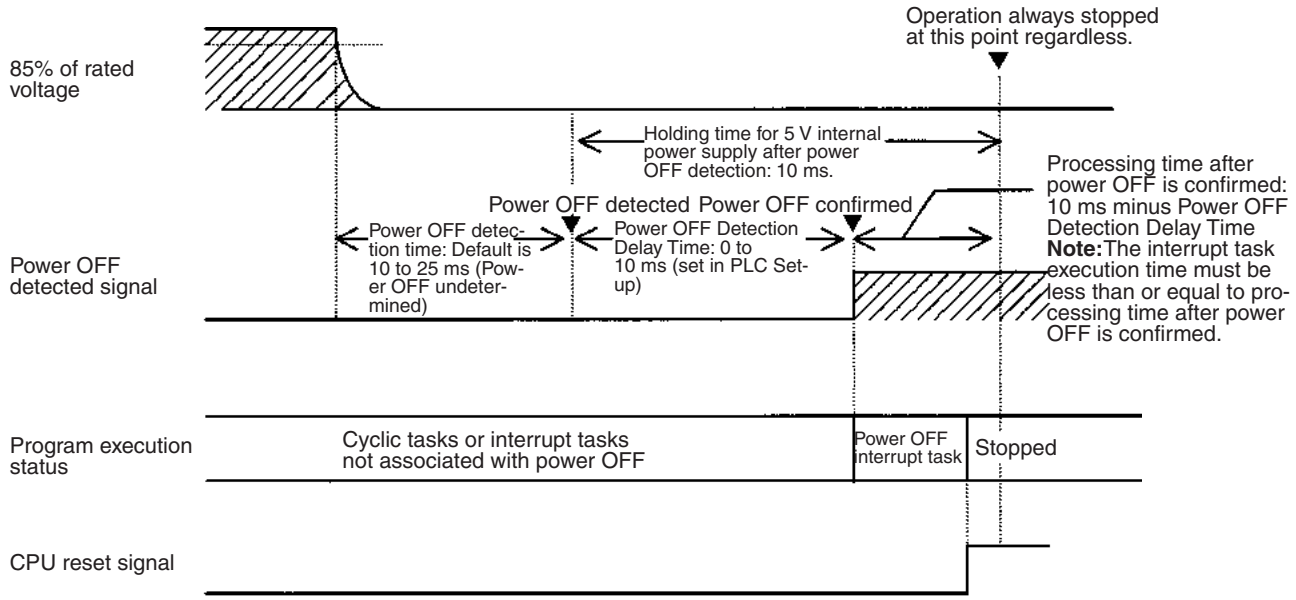


Note The above timing chart shows an example when the power OFF detection time is set to 0 ms (the default value).

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The following timing chart shows the CPU Unit power OFF operation in more detail.

Power OFF Timing Chart



Power OFF Detection Time
The time it takes to detect power OFF after the power supply falls below 85% of the rated voltage.

Power OFF Detection Delay Time
The delay time after power OFF is detected until it is confirmed. This can be set in the PLC Setup within a range from 0 to 10 ms. (The default is 0 ms.)

Power Holding Time
The amount of time (fixed at 10 ms) that 5 V will be held internally after power shuts OFF. The time that it takes for the power OFF interrupt task to execute must not exceed 10 ms minus the Power OFF Detection Delay Time (processing time after power OFF is confirmed). The power OFF interrupt task will be ended even if it has not been completely executed the moment this time expires.

Description of Operation

1,2,3...

1. Power OFF will be detected if the 100 to 120 V AC, 200 to 240 V AC or 24 V DC power supply falls below 85% of the rated voltage for the power OFF detection time (somewhere between 10 to 25 ms).
2. If the Power OFF Detection Delay Time is set (0 to 10 ms) in the PLC Setup, then the following operations will be performed when the set time expires.
   a) If the power OFF interrupt task is disabled (default PLC Setup setting) The CPU reset signal will turn ON and the CPU will be reset immediately.
   b) If the power OFF interrupt task is enabled (in the PLC Setup), the CPU reset signal will turn ON and the CPU will be reset after the power OFF interrupt task has been executed. Make sure that the power OFF interrupt task will finish executing within 10 ms minus the Power OFF Detection Delay Time = processing time after power OFF. The 5-V internal power supply will be maintained only for 10 ms after power OFF is detected.

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10-3-2 Instruction Execution for Power Interruptions

If power is interrupted and the interruption is confirmed when the CPU Unit is operating in RUN or MONITOR mode, the instruction currently being executed will be completed (see note) and the following power interruption processing will be performed.

- If the power OFF interrupt task has not been enabled, the CPU Unit will be reset immediately.
- If the power OFF interrupt task has been enabled, the task will be executed and then the CPU Unit will be reset immediately.

The power OFF interrupt task is enable and disabled in the PLC Setup.

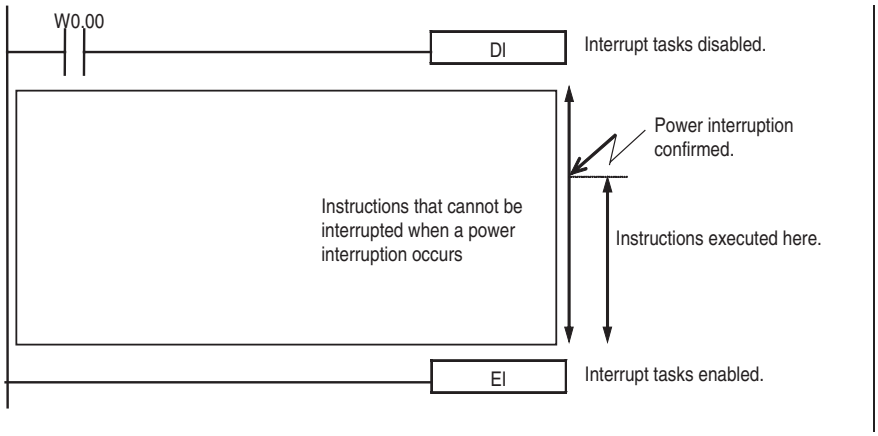
Note The current instruction can be completed only when the time required to complete execution is less than or equal to the processing time after power interruption detection (10 ms – power interruption detection delay time). If the instruction is not completed within this time, it will be interrupted and the above processing will be performed.

Disabling Power Interruption Processing in the Program

With CS1-H CPU Units, if the power OFF interrupt task is disabled, areas of the program can be protected from power interruptions so that the instructions will be executed before the CPU Unit performs power OFF processing even if the power supply is interrupted. This is achieved by using the DISABLE INTERRUPTS (DI(693)) and ENABLE INTERRUPTS (EI(694)) instructions.

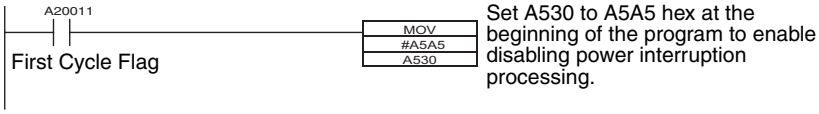
The following procedure is used.

1,2,3... 1. Insert DI(693) before the program section to be protected to disable interrupts and then place EI(694) after the section to enable interrupts.



2. Set the Disable Setting for Power OFF Interrupts in A530 to A5A5 hex to enable disabling power interruption processing.

   Note A530 is normally cleared when power is turned OFF. To prevent this, the IOM Hold Bit (A50012) must be turned ON and the PLC Setup must be set to maintain the setting of the IOM Hold Bit at Startup, or the following type of instruction must be included at the beginning of the program to set A530 to A5A5 hex.



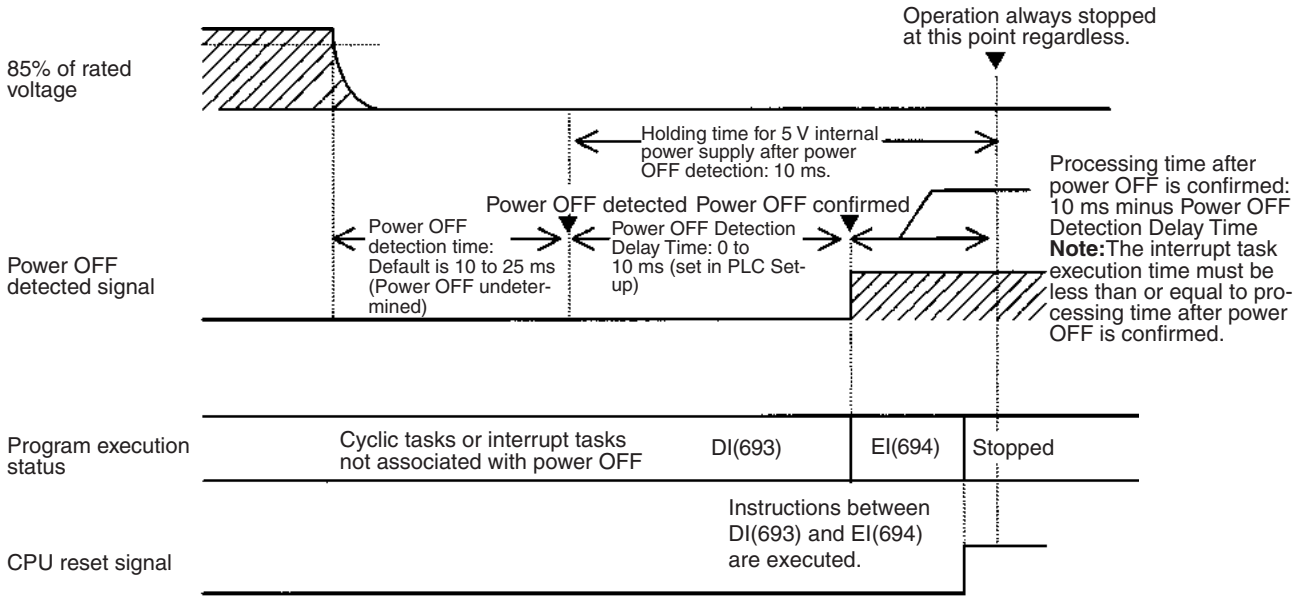
3. Disable the Power OFF Interrupt Task in the PLC Setup.

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With the above procedure, all instructions between DI(693) and EI(694) (or END) will be completed (see note 1) before the Power OFF Interrupt is executed even if the power interruption occurs while executing the instructions between DI(693) and EI(694).

Note

1. The protected instructions can be completed only when the time required to complete execution is less than or equal to the processing time after power interruption detection (10 ms − power interruption detection delay time). If the instructions is not completed within this time, they will be interrupted and the above processing will be performed.
2. If the Power OFF Interrupt Task is not disabled in the PLC Setup, the Power OFF Interrupt Task will be executed, and the CPU Unit will be reset without executing the protected instructions as soon as the power interruption is detected.
3. If a power interrupt is detected while DI(693) is being executed, the CPU Unit will be reset without executing the protected instructions.



Interrupt processing is performed according to the contents of A530 and the PLC Setup as shown below.

A530		**A5A5 hex (disabling power interrupt processing)**	**Other**
Power OFF Interrupt Task (PLC Setup)	Disabled	All instructions between DI(693) and EI(694) are executed and the CPU Unit is reset.	Execution of the current instruction is completed and the CPU Unit is reset.
	Enabled	Execution of the current instruction is completed, the Power OFF Interrupt Task is executed, and the CPU Unit is reset.	

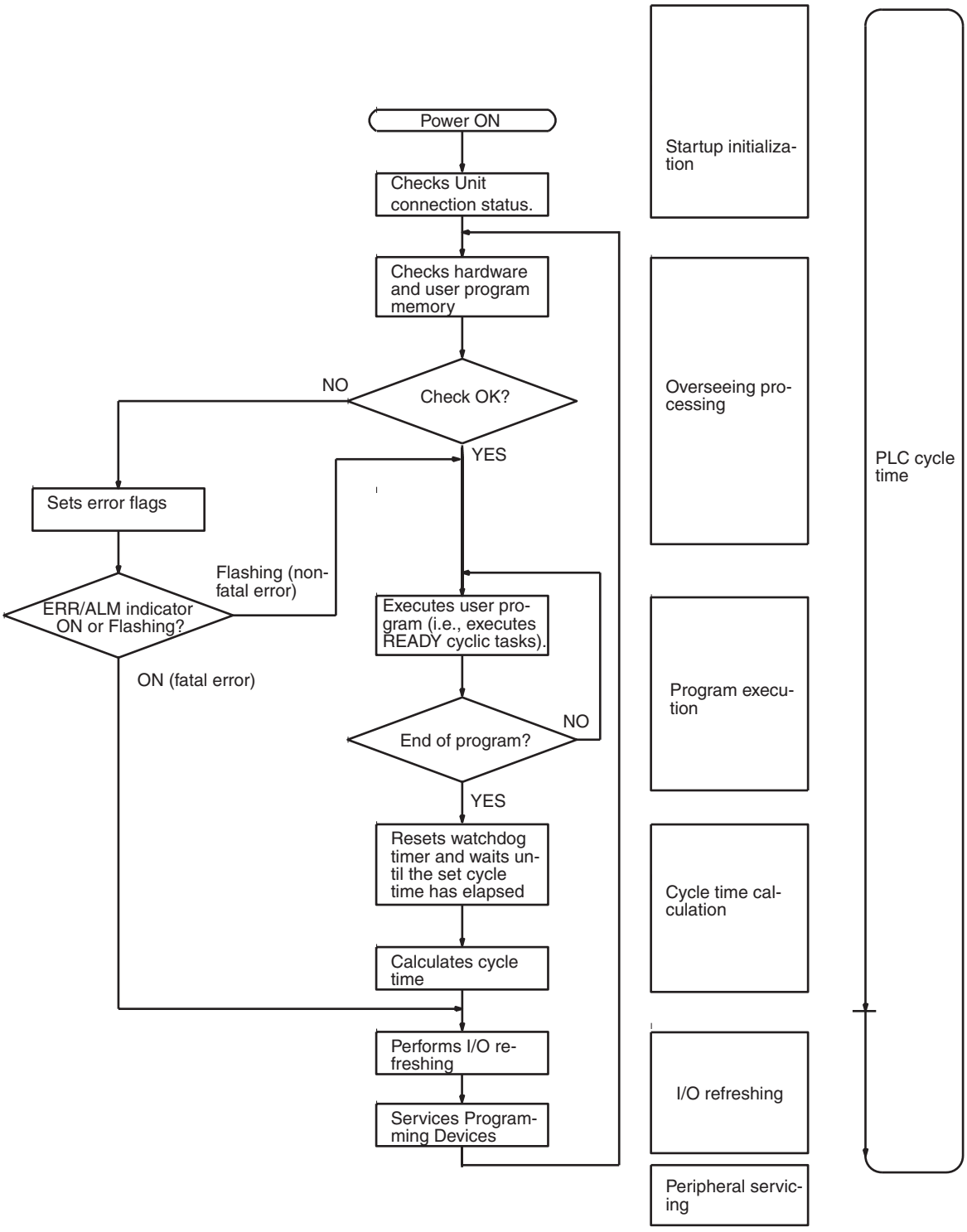
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10-4 Computing the Cycle Time

10-4-1 CPU Unit Operation Flowchart

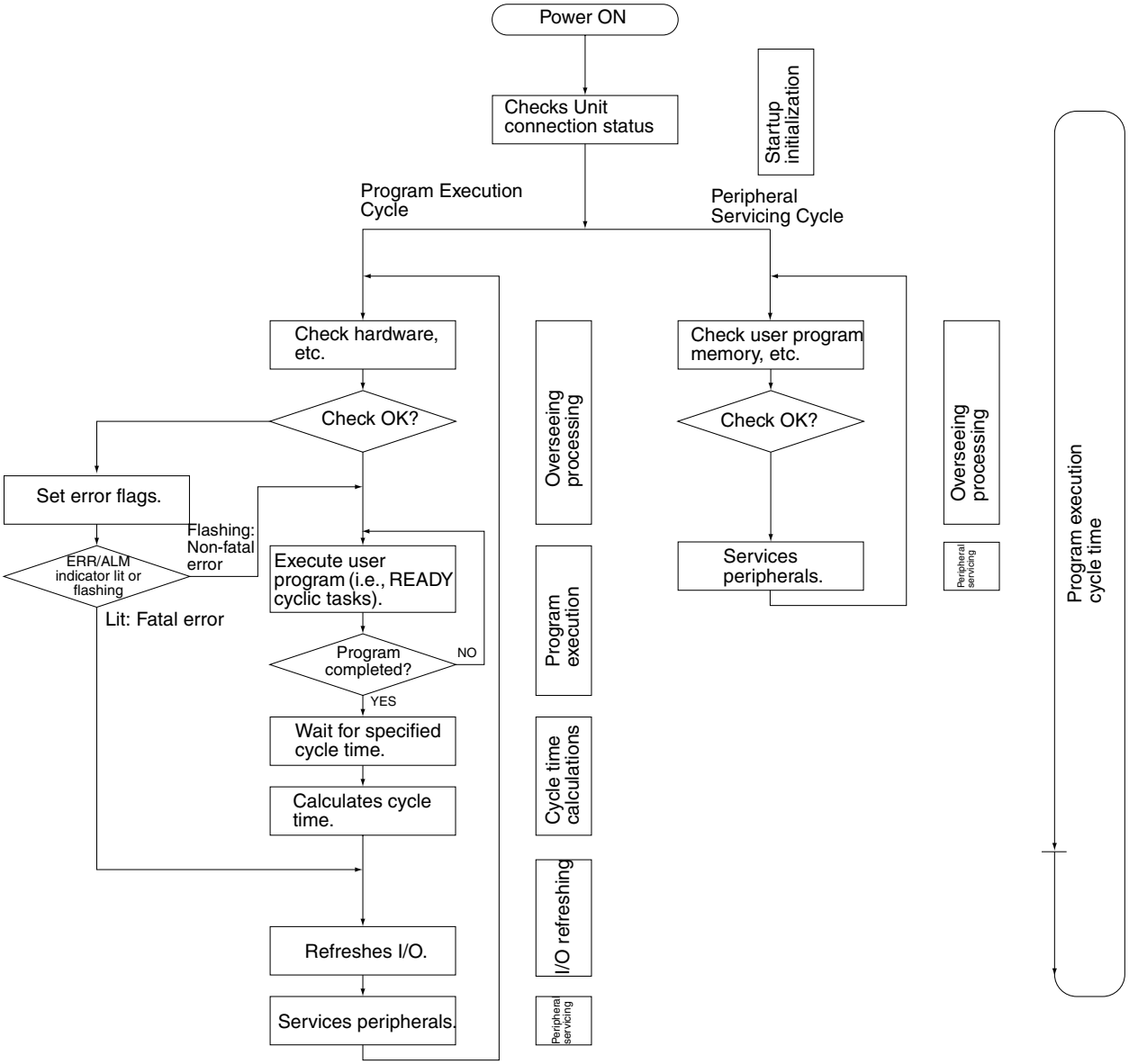
The CS-series CPU Units process data in repeating cycles from the overseeing processing up to peripheral servicing as shown in the following diagram.

Normal Processing Mode



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Parallel Processing Mode



10-4-2 Cycle Time Overview

Normal Processing Mode

The cycle time depends on the following conditions.

- Type and number of instructions in the user program (in all cyclic tasks that are executed during a cycle, and within interrupt tasks for which the execution conditions have been satisfied).
- Type and number of Basic I/O Units
- Number of SYSMAC BUS Remote I/O Master Units and number of I/O points on the Slaves
- Type and number of Special I/O Units, CS-series CPU Bus Units, Inner Boards, and type of services being executed.
- Specific servicing for the following Units/Boards
  - Data link refreshing and the number of data link words for Controller Link and SYSMAC LINK Units

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- Remote I/O for DeviceNet (Master) Units and the number of remote I/O words
- Use of protocol macros and the largest communications message
- Socket services for specific control bits for Ethernet Units and the number of send/receive words

- Fixed cycle time setting in the PLC Setup
- File access in file memory, and the amount of data transferred to/from file memory
- Event servicing for Special I/O Units, CPU Bus Units, Inner Boards, and communications ports
- Use of peripheral and RS-232C ports
- Fixed peripheral servicing time in the PLC Setup

Note

1. The cycle time is not affected by the number of tasks that are used in the user program. The tasks that affect the cycle time are those cyclic tasks that are READY in the cycle.
2. When the mode is switched from MONITOR mode to RUN mode, the cycle time will be extended by 10 ms (this will not, however, take the cycle time over its limit).

The cycle time is the total time required for the PLC to perform the 5 operations shown in the following tables.

Cycle time = (1) + (2) + (3) + (4) + (5)

1: Overseeing

Details	Processing time and fluctuation cause
Checks the I/O bus and user program memory, checks for battery errors and refreshes the clock.	CS1-H CPU Unit: 0.3 ms

2: Program Execution

Details	Processing time and fluctuation cause
Executes the user program, and calculates the total time time taken for the instructions to execute the program.	Total instruction execution time

3: Cycle Time Calculation

Details	Processing time and fluctuation cause
Waits for the specified cycle time to elapse when a minimum (fixed) cycle time has been set in the PLC Setup. Calculates the cycle time.	When the cycle time is not fixed, the time for step 3 is approximately 0. When the cycle time is fixed, the time for step 3 is the preset fixed cycle time minus the actual cycle time ((1) + (2) + (4) + (5)).

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4: I/O Refreshing

Details			Processing time and fluctuation cause
Basic I/O Units (including C200H Group-2 I/O Units)	Basic I/O Units are refreshed. Outputs from the CPU Unit to the I/O Unit are refreshed first for each Unit, and then inputs.		I/O refresh time for each Unit multiplied by the number of Units used.
SYSMAC BUS Remote I/O Master Unit	SYSMAC BUS remote I/O is refreshed. Outputs from the CPU Unit to remote I/O are refreshed first for each Unit, and then inputs.		I/O refresh time for SYSMAC BUS remote I/O system.
Special I/O Units	Words allocated in CIO Area		I/O refresh time for each Unit multiplied by the number of Units used.
	Unit- specific data	DeviceNet remote I/O for C200H DeviceNet Master Units and CompoBus/S remote I/O	
CPU Bus Units	Words allocated in CIO and DM Areas		I/O refresh time for each Unit multiplied by the number of Units used.
	Unit- specific data	Data links for Controller Link and SYSMAC LINK Units, DeviceNet remote I/O for CS-series DeviceNet Units, send/receive data for protocol macros, and socket services for specific control bits for Ethernet Units	I/O refresh time for each Unit multiplied by the number of Units used.
Inner Boards	Words allocated in Inner Board Area		I/O refresh time for each Unit multiplied by the number of Units used.
	Unit- specific data	Example: Send/receive data for protocol macros,	

5: Peripheral Servicing

Details	Processing time and fluctuation cause
Services events for CS-series Special I/O Units. **Note** Peripheral servicing does not include I/O refreshing,	If a uniform peripheral servicing time hasn't been set in the PLC Setup for this servicing, 4% of the previous cycle's cycle time (calculated in step (3)) will be allowed for peripheral servicing. If a uniform peripheral servicing time has been set in the PLC Setup, servicing will be performed for the set time. At least 0.1 ms, however, will be serviced whether the peripheral servicing time is set or not. If no Units are mounted, the servicing time is 0 ms.
Services events for CS-series CPU Bus Units. **Note** Peripheral servicing does not include I/O refreshing.	Same as above.
Services events for peripheral ports.	If a uniform peripheral servicing time hasn't been set in the PLC Setup for this servicing, 4% of the previous cycle's cycle time (calculated in step (3)) will be allowed for peripheral servicing. If a uniform peripheral servicing time has been set in the PLC Setup, servicing will be performed for the set time. At least 0.1 ms, however, will be serviced whether the peripheral servicing time is set or not. If the ports are not connected, the servicing time is 0 ms.
Services RS-232C ports.	Same as above.

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Details	Processing time and fluctuation cause
Services Inner Board events.	If a uniform peripheral servicing time hasn't been set in the PLC Setup for this servicing, 4% of the previous cycle's cycle time (calculated in step (3)) will be allowed for peripheral servicing. If a uniform peripheral servicing time has been set in the PLC Setup, servicing will be performed for the set time. At least 0.1 ms, however, will be serviced whether the peripheral servicing time is set or not. If no Inner Boards are mounted, the servicing time is 0 ms.
Services file access (Memory Card or EM file memory).	If a uniform peripheral servicing time hasn't been set in the PLC Setup for this servicing, 4% of the previous cycle's cycle time (calculated in step (3)) will be allowed for peripheral servicing. If a uniform peripheral servicing time has been set in the PLC Setup, servicing will be performed for the set time. At least 0.1 ms, however, will be serviced whether the peripheral servicing time is set or not. If there is no file access, the servicing time is 0 ms.
Services communications ports.	If a uniform peripheral servicing time hasn't been set in the PLC Setup for this servicing, 4% of the previous cycle's cycle time (calculated in step (3)) will be allowed for peripheral servicing. If a uniform peripheral servicing time has been set in the PLC Setup, servicing will be performed for the set time. At least 0.1 ms, however, will be serviced whether the peripheral servicing time is set or not. If no communications ports are used, the servicing time is 0 ms.

Parallel Processing with Asynchronous Memory Access

Program Execution Cycle

The program execution cycle time depends on the following conditions.

- Type and number of instructions in the user program (in all cyclic tasks that are executed during a cycle, and within interrupt tasks for which the execution conditions have been satisfied).
- Type and number of Basic I/O Units
- Number of SYSMAC BUS Remote I/O Master Units and number of I/O points on the Slaves
- Type and number of Special I/O Units, CS-series CPU Bus Units, Inner Boards, and type of services being executed.
- Specific servicing for the following Units/Boards
  - Data link refreshing and the number of data link words for Controller Link and SYSMAC LINK Units
  - Remote I/O for DeviceNet (Master) Units and the number of remote I/O words
  - Use of protocol macros and the largest communications message
  - Socket services for specific control bits for Ethernet Units and the number of send/receive words
- Fixed cycle time setting in the PLC Setup
- File access in file memory, and the amount of data transferred to/from file memory
- Fixed peripheral servicing time in the PLC Setup

The program execution cycle time is the total time required for the PLC to perform the 5 operations shown in the following tables.

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Cycle time = (1) + (2) + (3) + (4) + (5)

Details			Processing time and fluctuation cause
(1)	Overseeing	I/O bus check, etc.	0.3 ms
(2)	Program execution	Same as for Normal Mode.	Same as for Normal Mode.
(3)	Cycle time calculation	Waits for the specified cycle time.	Same as for Normal Mode.
(4)	I/O refreshing	Same as for Normal Processing Mode.	Same as for Normal Processing Mode.
(5)	Partial peripheral servicing	Servicing file access	Same as for Normal Processing Mode.

Peripheral Servicing Cycle Time

The peripheral servicing execution cycle time depends on the following conditions.

- Type and number of Special I/O Units, CS-series CPU Bus Units, Inner Boards, and type of services being executed.
- Type and frequency of event servicing requiring communications ports.
- Use of peripheral and RS-232C ports

The peripheral servicing cycle time is the total time required for the PLC to perform the 5 operations shown in the following tables.

Cycle time = (1) + (2)

Name		Processing		Processing time and fluctuation cause
(1)	Overseeing processing	Checks user program memory, checks for battery errors, etc.		0.2 ms
(2)	Peripheral servicing	Performs services for the events give at the right, including I/O memory access.	Events with CS-series Special I/O Units (does not include I/O refreshing)	1.0 ms for each type of service If servicing ends before 1 ms has expired, the next type of servicing will be started immediately without waiting.
			Events with CS-series CPU Bus Units (does not include I/O refreshing)	
			Peripheral port events	
			RS-232C port events	
			Events with Inner Boards	
			Events using communications ports	

Note

1. The cycle time display on a Programming Device is the Program Execution Cycle Time.
2. The peripheral service cycle time varies with the event load and number of Units that are mounted. In a Parallel Processing Mode, however, this variation will not affect the program execution cycle time.

Parallel Processing with Synchronous Memory Access

Program Execution Cycle

The program execution cycle time depends on the same conditions as the Normal Mode. Partial peripheral servicing ((5) below), however, is restricted to servicing for file and I/O memory access.

The program execution cycle time is the total time required for the PLC to perform the 5 operations shown in the following tables.

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Cycle time = (1) + (2) + (3) + (4) + (5)

Details				Processing time and fluctuation cause
(1)	Overseeing	I/O bus check, etc.		0.3 ms
(2)	Program execution	Same as for Normal Mode.		Same as for Normal Mode.
(3)	Cycle time calculation	Waits for the specified cycle time.		Same as for Normal Mode.
(4)	I/O refreshing	Same as for Normal Processing Mode.		Same as for Normal Mode.
(5)	Partial peripheral servicing	Servicing file access (Memory Card or EM file memory)		Same as for Normal Mode.
		Performs services for the events give at the right that requires I/O memory access	Events with CS-series Special I/O Units (does not include I/O refreshing)	
			Events with CS-series CPU Bus Units (does not include I/O refreshing)	
			Peripheral port events	
			RS-232C port events	
			Events with Inner Boards	
			Events using communications ports	

Peripheral Servicing Cycle Time

The peripheral servicing execution cycle time depends on the same conditions as the Parallel Processing with Asynchronous Memory Access. Peripheral servicing ((2) below), however, is restricted to servicing that does not access I/O memory.

The peripheral servicing cycle time is the total time required for the PLC to perform the 2 operations shown in the following tables.

Cycle time = (1) + (2)

Name		Processing		Processing time and fluctuation cause
(1)	Overseeing processing	Checks user program memory, checks for battery errors, etc.		0.2 ms
(2)	Peripheral servicing	Performs services for the events give at the right, excluding those that require I/O memory access.	Events with CS-series Special I/O Units (does not include I/O refreshing)	1.0 ms for each type of service If servicing ends before 1 ms has expired, the next type of servicing will be started immediately without waiting.
			Events with CS-series CPU Bus Units (does not include I/O refreshing)	
			Peripheral port events	
			RS-232C port events	
			Events with Inner Boards	
			Events using communications ports	

Note

1. The cycle time display on a Programming Device is the Program Execution Cycle Time.
2. The peripheral service cycle time varies with the event load and number of Units that are mounted. In a Parallel Processing Mode, however, this variation will not affect the program execution cycle time.

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10-4-3 I/O Unit Refresh Times for Individual Units and Boards

Basic I/O Unit Refresh

Unit	Name	Model	I/O refresh time per Unit
C200H Basic I/O Units	8-point Input Unit	C200H-ID211	0.03 ms
	8-point Output Unit	C200H-OC221	0.03 ms
	12-point Output Unit	C200H-OA224	0.03 ms
	16-point Input Unit	C200H-ID212	0.02 ms
	16-point Output Unit	C200H-OD212	0.03 ms
	Interrupt Input Unit	C200HS-INT01	0.10 ms
C200H Group-2 High-density I/O Unit (classified as Basic I/O Units)	32-point Input Unit	C200H-ID216	0.10 ms
	32-point Output Unit	C200H-OD218	0.10 ms
	64-point Input Unit	C200H-ID217	0.20 ms
	64-point Output Unit	C200H-OD219	0.13 ms
	32-point B7A Input Units	C200H-B7A12	0.1 ms
	32-point B7A Output Units	C200H-B7A02	0.1 ms
	16/16-point B7A I/O Units	C200H-B7A21	0.1 ms
	32/32-point B7A I/O Units	C200H-B7A22	0.2 ms

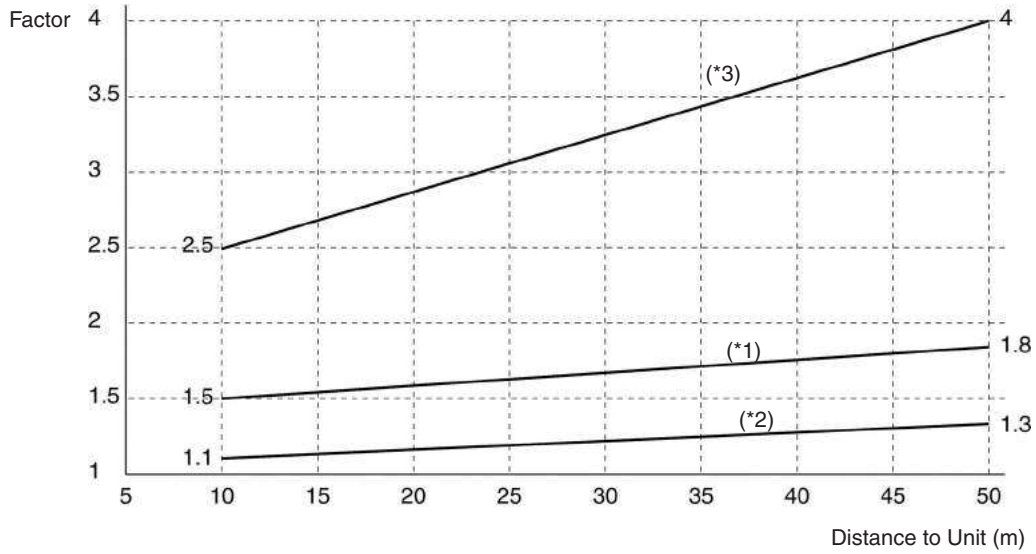
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Unit	Name	Model	I/O refresh time per Unit
CS-series Basic I/O Units	16-point DC Input Unit	CS1W-ID211	0.004 ms (See note.)
	16-point AC Input Unit	CS1W-IA111/211	0.004 ms (See note.)
	8/16-point Relay Output Unit	CS1W-OC201/211	0.004 ms (See note.)
	8/16-point Triac Output Unit	CS1W-OA201/211	0.004 ms (See note.)
	16-point Transistor Output Unit, sinking outputs	CS1W-OD211	0.004 ms (See note.)
	16-point Transistor Output Unit, sourcing outputs	CS1W-OD212	0.004 ms (See note.)
	16-point Interrupt Input Unit	CS1W-INT01	0.004 ms (See note.)
	16-point High-speed Input Unit	CS1W-IDP01	0.004 ms (See note.)
	32-point DC Input Unit	CS1W-ID231	0.007 ms (See note.)
	64-point DC Input Unit	CS1W-ID261	0.014 ms (See note.)
	96-point DC Input Unit	CS1W-ID291	0.02 ms (See note.)
	32-point Transistor Output Unit, sinking outputs	CS1W-OD231	0.008 ms (See note.)
	32-point Transistor Output Unit, sourcing outputs	CS1W-OD232	0.008 ms (See note.)
	64-point Transistor Output Unit, sinking outputs	CS1W-OD261	0.016 ms (See note.)
	64-point Transistor Output Unit, sourcing outputs	CS1W-OD262	0.016 ms (See note.)
	96-point Transistor Output Unit, sinking outputs	CS1W-OD291	0.02 ms (See note.)
	96-point Transistor Output Unit, sourcing outputs	CS1W-OD292	0.02 ms (See note.)
	32-point DC Input/32-point Transistor Output Unit, sourcing outputs	CS1W-MD261	0.015 ms (See note.)
	32-point DC Input/32-point Transistor Output Unit, sinking outputs	CS1W-MD262	0.015 ms (See note.)
	48-point DC Input/48-point Transistor Output Unit, sinking outputs	CS1W-MD291	0.02 ms (See note.)
	48-point DC Input/48-point Transistor Output Unit, sourcing outputs	CS1W-MD292	0.02 ms (See note.)
	32-point B7A Input Unit	CS1W-B7A12	0.1 ms (See note.)
	64-point B7A Output Unit	CS1W-B7A02	0.1 ms (See note.)
	16-point Input/16-point Output B7A I/O Unit	CS1W-B7A21	0.1 ms (See note.)
	32-point Input/32-point Output B7A I/O Unit	CS1W-B7A22	0.2 ms (See note.)

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Note Longer I/O refresh times will be required according to the distance from the CPU Rack to the Unit when these Units are mounted to CS-series Long-distance Expansion Racks. Multiply the values given in the table by the factors on line *1 in the following graph.

I/O Unit Refresh Time Coefficients for Units on CS-series Long-distance Expansion Racks



Special I/O Unit Refresh

Unit	Name	Model	I/O refresh time per Unit
C200H Special I/O Units	High-density I/O Units	C200H-MD215	0.5 ms
		C200H-MD501	1.5 ms
	Temperature Control Unit	C200H-TC□□□	2.6 ms
	Heat/Cool Temperature Control Unit	C200H-TV□□□	2.6 ms
	Temperature Sensor Unit	C200H-TS□□□	1.0 ms
	PID Control Unit	C200H-PID□□	2.6 ms
	ASCII Unit	C200H-ASC02	1.8 ms
		C200H-ASC11/21/31	0.4 ms
	Analog Input Unit	C200H-AD001	1.0 ms
		C200H-AD002	1.4 ms
		C200H-AD003	0.7 ms
	Analog Output Unit	C200H-DA001/002	0.9 ms
		C200H-DA003/004	0.6 ms
	Analog I/O Unit	C200H-MAD01	0.6 ms
	High-speed Counter Unit	C200H-CT001-V1/CT002	2.4 ms
		C200H-CT021	0.5 ms
	Position Control Unit	C200H-NC111/112	2.2 ms (4.0 ms for read)

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Unit	Name	Model	I/O refresh time per Unit
C200H Special I/O Units, continued	Position Control Unit, continued	C200H-NC211	5.1 ms (6.7 ms for read)
		C200HW-NC113	2.0 ms (2.9 ms for read or write)
		C200HW-NC213	2.3 ms (3.2 ms for read or write)
		C200HW-NC413	4.3 ms (5.5 ms for read or write)
	Motion Control Unit	C200H-MC221	1.2 ms (2.1 ms for read)
	ID Sensor Unit	C200H-IDS01-V1/21	1.8 ms
	Cam Positioner Unit	C200H-CP114	2.0 ms
	Voice Unit	C200H-OV001	3.4 ms
	Fuzzy Logic Unit	C200H-FZ001	1.8 ms
	PC Link Unit	C200H-LK401	0.3 ms (connected without data links operating)
			4.1 ms (for 256 data link points)
			7.4 ms (for 512 data link points)
	SYSMAC BUS Remote I/O Master Unit	C200H-RM201	1.1 ms x No. of Units + 0.17 x N, where N is the No. of words allocated to slaves
		C200H-RM001-V1	
	C200H DeviceNet Master Unit	C200HW-DRM21-V1	1.72 ms + 0.0022 × number of allocated words
	C200H DeviceNet I/O Link Unit	C200HW-DRT21-V1	1.72 ms + 0.0022 × number of allocated words
	CompoBus/S Master Unit	C200HW-SRM21-V1	0.4 ms (for the maximum of 16 slaves)
			0.9 ms (for the maximum of 32 slaves)

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Unit	Name	Model		I/O refresh time per Unit	When a Long-distance Expansion Rack is used (See note.)
				CS1-H	
CS-series Special I/O Units	Analog I/O Unit	CS1W-MAD44		0.12 ms	0.2 ms × *2
	Analog Input Unit	CS1W-AD041/081-V1		0.12 ms	0.2 ms × *2
		CS1W-AD161		0.11 ms	0.3 ms × *2
	Analog Output Unit	CS1W-DA041/08V/08C		0.12 ms	0.2 ms × *2
	Isolated Thermocouple Input Unit	CS1W-PTS01-V1		0.16 ms	0.3 ms × *2
	Isolated Resistance Thermometer Input Unit	CS1W-PTS02-V1		0.16 ms	0.3 ms × *2
	Isolated Ni508.4Ω Resistance Thermometer Input Unit	CS1W-PTS03		0.16 ms	0.3 ms × *2
	Isolated 2-wire Transmission Device Input Unit	CS1W-PTW01		0.16 ms	0.3 ms × *2
	Isolated DC Input Unit	CS1W-PDC01		0.16 ms	0.3 ms × *2
	Isolated Control Output Unit (Analog Output Unit)	CS1W-PMV01		0.16 ms	0.3 ms × *2
	Power Transducer Input Unit	CS1W-PTR01		0.16 ms	0.3 ms × *2
	DC Input Unit (100 mA)	CS1W-PTR02		0.16 ms	0.3 ms × *2
	Isolated Pulse Input Unit	CS1W-PPS01		0.16 ms	0.3 ms × *2
	Position Control Unit	CS1W-NC113/133		0.29 ms (+ 0.7 ms for each instruction (IOWR/IORD) used to transfer data)	Multiply times at left by factor *2 (See note.)
		CS1W-NC213/233		0.32 ms (+ 0.7 ms for each instruction (IOWR/IORD) used to transfer data)	
		CS1W-NC413/433		0.41 ms (+ 0.6 ms for each instruction (IOWR/IORD) used to transfer data)	
	High-speed Counter Unit	CS1W-CT021/041		0.14 ms	0.2 ms × *2
	Motion Control Unit	CS1W-MC221		0.32 ms	0.8 ms × *2
		CS1W-MC421		0.42 ms	0.8 ms × *2
	Customizable Counter Unit	CS1W-HIO01		0.2 ms (+ 0.3 ms if DM Area or LR Area is used for data exchange with CPU Unit)	Multiply times at left by factor *2 (See note.)
		CS1W-HCP22			
		CS1W-HCA22			
	CompoNet Master Unit	CS1W-CRM21	Communications mode No. 0	0.189 ms	Multiply times at left by factor *2 (See note.)
			Communications mode No. 1	0.211 ms	
			Communications mode No. 2	0.233 ms	
			Communications mode No. 3	0.289 ms	
			Communications mode No. 8	0.109 + (0.0014 × No. of allocated words) ms	

Note Longer increases in the cycle time will occur according to the distance from the CPU Rack to the Unit when these Units are mounted to CS-series Long-distance Expansion Racks. Multiply the values given in the table by the factors on line *2 in the graph on page 494 for the increases for data link words and send/receive words.

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Increase in Cycle Time Caused by CPU Bus Units

Name	Model	Increase	Remarks
Controller Link Unit	CS1W-CLK11/21 (-V1) or CS1W-CLK23	CS1-H: 0.1 ms (See note 1.) With Long-distance Expansion Rack: 0.2 ms × factor *2	There will be an increase of 0.1 ms + 0.7 μs x number of data link words for CS1-H CPU Units. (See note 2.) With Long-distance Expansion Rack: (1.5 ms + (number of send words × 1 μs)) × factor *3 There will be an additional increase of the event execution times when message services are used.
	CS1W-CLK12/52 (-V1) or CS1W-CLK13/53	CS1-H: 0.1 ms (See note 1.) With Long-distance Expansion Rack: 0.2 ms × factor *2	
SYSMAC LINK	CS1W-SLK11/21	CS1-H: 0.1 ms (See note 1.) With Long-distance Expansion Rack: 0.2 ms × factor *2	
Serial Communications Unit	CS1W-SCU21-V1	CS1-H: 0.22 ms (See note 1.) With Long-distance Expansion Rack: 0.2 ms × factor *2	There will be an increase of up to the following time when a protocol macro is executed: CS1-H CPU Units: 0.1 ms + 0.7 μs × maximum number of data words sent or received (0 to 500 words) With Long-distance Expansion Rack: (1.3 ms + (max. number of send/receive words × 1 μs)) × factor *3 Max. number of send/receive words = 0 to 500 words There will be an increase of the event execution times when Host Links or 1:N NT Links are used.
DeviceNet Unit	CS1W-DRM21-V1	CS1-H: 0.4 ms + 0.7 μs for each allocated word (See note 1.) With Long-distance Expansion Rack: (0.7 ms + (number of allocated words × 1 μs)) × factor *3	---
Ethernet Unit	CS1W-ETN01/11/21	CS1-H: 0.1 ms (See note 1.) With Long-distance Expansion Rack: 0.2 ms × factor *2	If socket services are executed with software switches, there will be an increase of 1.4 μs × the number of bytes sent/received for CS1-H CPU Units. (See note 2.) With Long-distance Expansion Rack: (number of send or receive bytes × 2 μs) × factor *3 There will be an increase of the event execution times when FINS communications services, socket services for CMND instructions, or FTP services are performed.
PROFIBUS-DP Master Unit	CS1W-PRM21	CS1-H: 0.4 ms + 0.7 μs for each allocated word	Include all words allocated to the slaves, including unused ones. For FINS communications with the Unit, add the number of communications words to the calculations on the left.
Loop Control Unit	CS1W-LC001	CS1-H: 0.1 ms (See note 1.) With Long-distance Expansion Rack: 0.2 × factor *2	---

Note 1. The times given show the performance of the CPU6□H.

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2. Longer increases in the cycle time will occur according to the distance from the CPU Rack to the Unit when these Units are mounted to CS-series Long-distance Expansion Racks. Multiply the values given in the table by the factors on line *2 in the graph on page 494 for the increases and by the factors on line *3 for the additional increases for data link words and send/receive words

Increase in Cycle Time Caused by Inner Board

Name	Model	Increase	Remarks
Serial Communications Board	CS1W-SCB21/41-V1	CS1-H: 0.22 ms	There will be an increase of up to the following time when a protocol macro is executed: CS1-H CPU Units: 0.7 μs × maximum number of data words sent or received (0 to 500 words) + 0.1 ms There will be an increase of the event execution times when Host Links or 1:N NT Links are used.

10-4-4 Cycle Time Calculation Example

The following example shows the method used to calculate the cycle time when Basic I/O Units only are mounted to the PLC with a CS1G-CPU4□H.

Conditions

Item	Details	
CPU Rack (8 slots)	CS1W-ID291 96-point Input Units	4 Units
	CS1W-OD291 96-point Output Units	4 Units
CS-series Expansion Rack (8 slots) × 1 Unit	CS1W-ID291 96-point Input Units	4 Units
	CS1W-OD291 96-point Output Units	4 Units
User program	5 K steps	LD instruction 2.5 K steps, OUT instruction 2.5 K steps
Peripheral port connection	Yes and no	
Fixed cycle time processing	No	
RS-232C port connection	No	
Peripheral servicing with other devices (Special I/O Units, CS-series CPU Bus Units, Inner Boards, and file access)	No	

Calculation Example

Process name	Calculation	Processing time	
		With Programming Device	Without Programming Device
(1) Overseeing	---	0.3 ms	0.3 ms
(2) Program execution	0.04 μs × 2,500 + 0.04 μs × 2,500	0.2 ms	0.2 ms
(3) Cycle time calculation	(Fixed cycle time not set)	0 ms	0 ms
(4) I/O refreshing	0.02 ms × 8 + 0.02 ms × 8	0.32 ms	0.32 ms
(5) Peripheral servicing	(Peripheral port connected only)	0.1 ms	0 ms

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Process name	Calculation	Processing time	
		With Programming Device	Without Programming Device
Cycle time	(1) + (2) + (3) + (4) + (5)	0.92 ms	0.82 ms

10-4-5 Online Editing Cycle Time Extension

When online editing is executed from a Programming Device (such as Programming Console or CX-Programmer) while the CPU Unit is operating in MONITOR mode to change the program, the CPU Unit will momentarily suspend operation while the program is being changed. The period of time that the cycle time is extended is determined by the following conditions.

- Number of steps changed
- Editing operations (insert/delete/overwrite)
- Types of instructions used

If the maximum program size for each task is 64 Ksteps, the following table provides guidelines for the maximum online editing cycle time extensions.

CPU Unit	Guidelines for increase in cycle time for online editing
CPU6□H CS1-H CPU Units	Approx. 8 ms
CPU4□H CS1-H CPU Units	Approx. 11 ms

When editing online, the cycle time will be extended by the time that operation is stopped.

Note When there is one task, online editing is processed all in the cycle time following the cycle in which online editing is executed (written). When there are multiple tasks (cyclic tasks and interrupt tasks), online editing is separated, so that for n tasks, processing is executed over n to n ×2 cycles max.

10-4-6 I/O Response Time

The I/O response time is the time it takes from when an Input Unit's input turns ON, the data is recognized by the CS-series CPU Unit, and the user program is executed, up to the time for the result to be output to an Output Unit's output terminals.

The length of the I/O response time depends on the following conditions.

- Timing of Input Bit turning ON.
- Cycle time.
- Type of Rack to which Input and Output Units are mounted (CPU Rack, CPU Expansion Rack, Expansion Rack).

Basic I/O Units

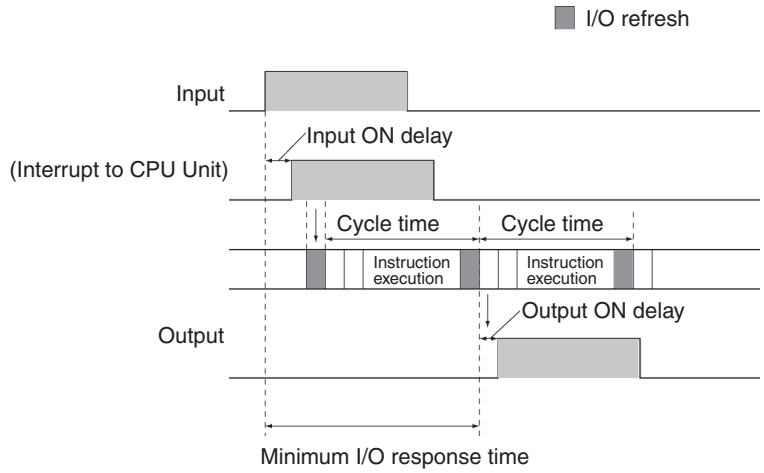
Minimum I/O Response Time

The I/O response time is shortest when data is retrieved immediately before I/O refresh of the CPU Unit.

The minimum I/O response time is the total of the Input ON delay, the cycle time, and the Output ON delay.

Note The Input and Output ON delay differs according to the Unit used.

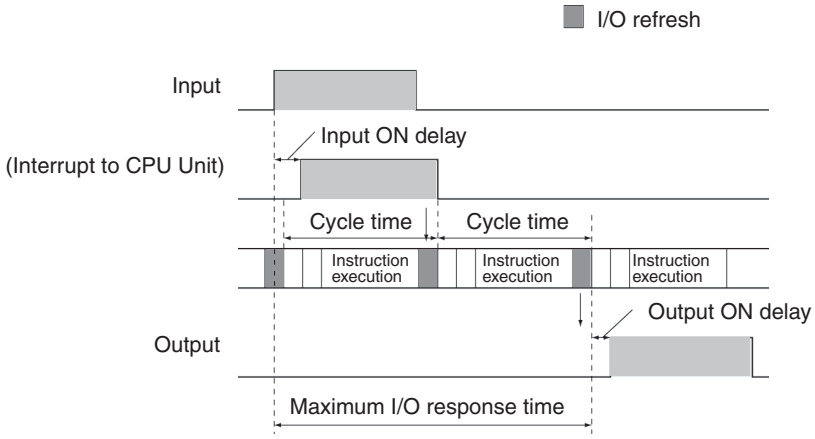
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Maximum I/O Response Time

The I/O response time is longest when data is retrieved immediately after I/O refresh of the Input Unit.

The maximum I/O response time is the total of the Input ON delay, (the cycle time × 2), and the Output ON delay.



Calculation Example

Conditions:		
	Input ON delay	1.5 ms
	Output ON delay	0.2 ms
	Cycle time	20.0 ms

Minimum I/O response time = 1.5 ms + 20 ms + 0.2 ms = 21.7 ms

Maximum I/O response time = 1.5 ms + (20 ms ×2) + 0.2 ms = 41.7 ms

SYSMAC BUS Remote I/O

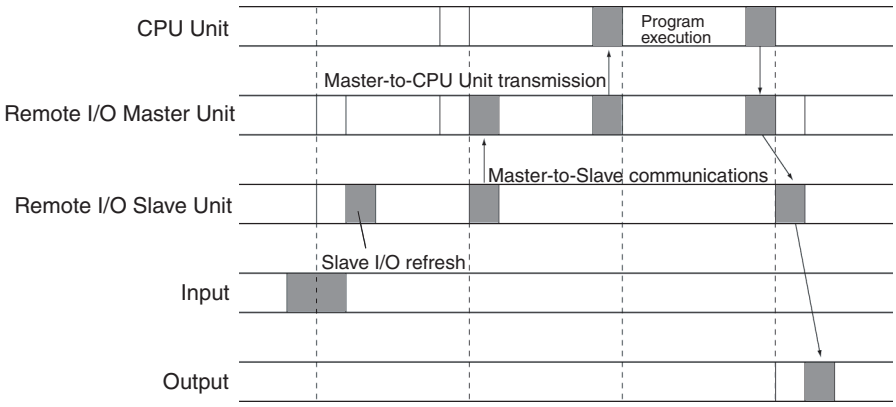
The response times for both inputs and outputs are shown here for when Slave Racks are used.

Minimum Remote I/O Response Time

The minimum I/O response time is the sum of the Input ON delay, (the cycle time × 3), and the Output ON delay.

Note The cycle time is longer than the remote I/O transmission time.

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Remote I/O transmission time = (Remote I/O Slave transmission time per Slave + I/O Terminal transmission time) × 2

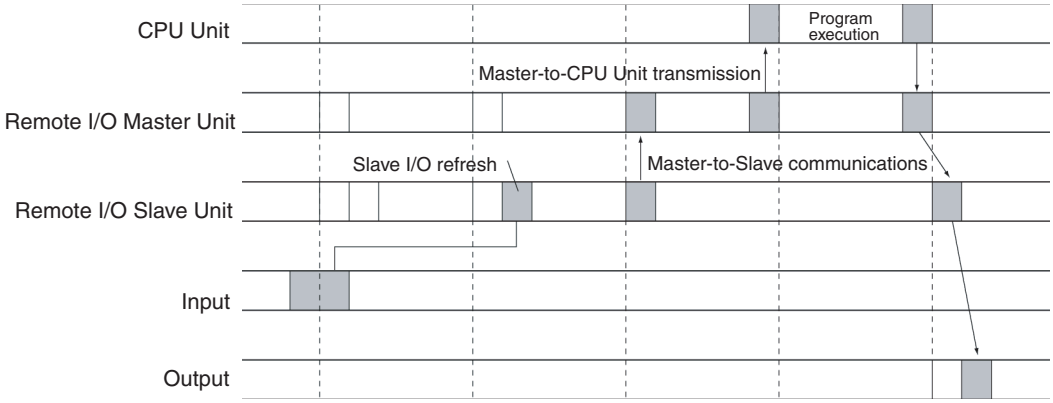
Remote I/O Slave transmission time per Slave = 1.4 ms + 0.2 ms × (total number of I/O words on Slave Rack)

I/O Terminal transmission time = 2.0 ms × (number of I/O Terminals)

Maximum Remote I/O Response Time

The maximum I/O response time is the sum of the Input ON delay, (the cycle time × 4), and the Output ON delay.

Note The cycle time is longer than the remote I/O transmission time.



Calculation Example

Conditions:		
	Input ON delay	1.5 ms
	Output ON delay	0.2 ms
	Cycle time	20.0 ms

Minimum I/O response time = 1.5 ms + (20 ms ×3) + 0.2 ms = 61.7 ms

Maximum I/O response time = 1.5 ms + (20 ms ×4) + 0.2 ms = 81.7 ms

- When Special I/O Units are mounted to Slave Racks, the cycle time may be less than or equal to the remote I/O transmission time. In this case, I/O refresh may not occur between the CPU Unit and the Remote I/O Master Unit in some cycles.
- Refreshing will be performed for Remote I/O Masters only once in each cycle, and then only after confirming completion of the remote cycle.
- The short duration of ON/OFF status produced by differentiated instructions can cause inaccurate signals.

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10-4-7 Interrupt Response Times

I/O Interrupt Tasks

The interrupt response time for I/O interrupt tasks is the time taken from when an input from a CS1W-INT01 or C200HS-INT01 Interrupt Input Unit has turned ON (or OFF) until the I/O interrupt task has actually been executed.

The length of the interrupt response time for I/O interrupt tasks depends on the following conditions.

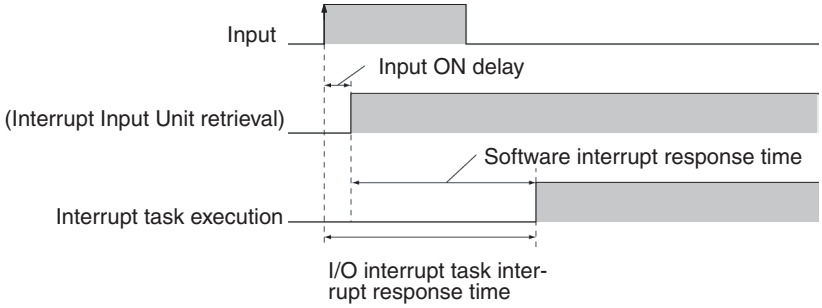
Item	Time
Hardware response	Upward differentiation: 0.1 ms, Downward differentiation: 0.5 ms
Software interrupt response	124 μs

Note

1. The software interrupt response time will be 1 ms if there is a C200H Special I/O Unit in the PLC.
   - The C200HS-INT01 Interrupt Input Unit's input ON delay is 0.2 ms maximum.
   - The C200HS-INT01 Interrupt Input Unit's software interrupt response time is 1 ms maximum.
2. I/O interrupt tasks can be executed (while an instruction is being executed, or by stopping the execution of an instruction) during execution of the user program, I/O refresh, peripheral servicing, or overseeing. The interrupt response time is not affected by the Input of the Interrupt Input Unit turning ON during any of the above processing operations.

   Some I/O interrupts, however, are not executed during interrupt tasks even if the I/O interrupt conditions are satisfied. Instead, the I/O interrupts are executed in order of priority after the other interrupt task has completed execution and the software interrupt response time (1 ms max.) has elapsed.

The interrupt response time of I/O interrupt tasks is the sum of the Input ON delay (0.2 ms max.) and the software interrupt response time (1 ms max.).



Scheduled Interrupt Tasks

The interrupt response time of scheduled interrupt tasks is the time taken from after the scheduled time specified by the MSKS(690) instruction has elapsed until the interrupt task has actually been executed.

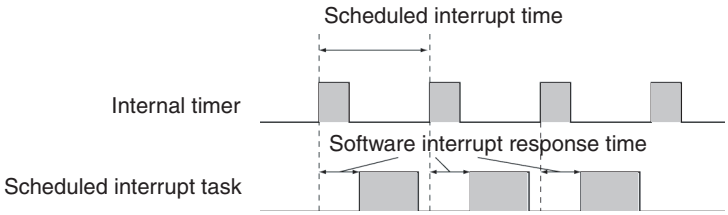
The length of the interrupt response time for scheduled interrupt tasks is 1 ms max.

Note Scheduled interrupt tasks can be executed (while an instruction is being executed, or by stopping the execution of an instruction) during execution of the user program, I/O refresh, peripheral servicing, or overseeing. The interrupt response time is not affected by the scheduled time elapsing during any of the above processing operations.

Some scheduled interrupts, however, are not executed during other interrupt tasks even if the scheduled interrupt conditions are satisfied. Instead, the scheduled interrupts are executed in order of priority after the other interrupt

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task has completed execution and the software interrupt response time (1 ms max.) has elapsed.



External Interrupt Tasks The interrupt response time for external interrupt tasks differs depending on the Unit or Board (Special I/O Unit, CS-series CPU Bus Unit, or Inner Board) that is requesting the external interrupt task of the CPU Unit and the type of service requested by the interrupt. For details, refer to the appropriate operation manual for the Unit or Board being used.

Power OFF Interrupt Tasks Power OFF interrupt tasks are executed within 0.1 ms of the power being confirmed as OFF.

10-5 Instruction Execution Times and Number of Steps

The following table lists the execution times for all instructions that are available for CS-series PLCs.

The total execution time of instructions within one whole user program is the process time for program execution when calculating the cycle time (See note.).

Note User programs are allocated tasks that can be executed within cyclic tasks and interrupt tasks that satisfy interrupt conditions.

Execution times for most instructions differ depending on the CPU Unit used (CS1□-CPU6□H, CS1□-CPU4□H) and the conditions when the instruction is executed. The top line for each instruction in the following table shows the minimum time required to process the instruction and the necessary execution conditions, and the bottom line shows the maximum time and execution conditions required to process the instruction.

The execution time can also vary when the execution condition is OFF.

The following table also lists the length of each instruction in the *Length (steps)* column. The number of steps required in the user program area for each of the CS-series instructions varies from 1 to 7 steps, depending upon the instruction and the operands used with it. The number of steps in a program is not the same as the number of instructions.

Note

1. Program capacity for CS-series PLCs is measured in steps, whereas program capacity for previous OMRON PLCs, such as the C-series and CV-series PLCs, was measured in words. Basically speaking, 1 step is equivalent to 1 word. The amount of memory required for each instruction, however, is different for some of the CS-series instructions, and inaccuracies will occur if the capacity of a user program for another PLC is converted for a CS-series PLC based on the assumption that 1 word is 1 step. Refer to the information at the end of *10-5 Instruction Execution Times and Number of Steps* for guidelines on converting program capacities from previous OMRON PLCs.

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Most instructions are supported in differentiated form (indicated with ↑, ↓, @, and %). Specifying differentiation will increase the execution times by the following amounts.

Symbol	CS1-H CPU Units	
	CPU6□H	CPU4□H
↑ or ↓	+0.24	+0.32
@ or %	+0.24	+0.32

2. Use the following times as guidelines when instructions are not executed.

CS1-H CPU Units	
CPU6□H	CPU4□H
Approx. 0.1	Approx. 0.2

10-5-1 Sequence Input Instructions

Instruction	Mnemonic	Code	Length (steps)	ON execution time (μs)		Conditions
				CPU6□H	CPU4□H	
LOAD	LD	---	1	0.02	0.04	---
	!LD	---	2	+21.14	+21.16	Increase for CS Series
				+45.1	+45.1	Increase for C200H
LOAD NOT	LD NOT	---	1	0.02	0.04	---
	!LD NOT	---	2	+21.14	+21.16	Increase for CS Series
				+45.1	+45.1	Increase for C200H
AND	AND	---	1	0.02	0.04	---
	!AND	---	2	+21.14	+21.16	Increase for CS Series
				+45.1	+45.1	Increase for C200H
AND NOT	AND NOT	---	1	0.02	0.04	---
	!AND NOT	---	2	+21.14	+21.16	Increase for CS Series
				+45.1	+45.1	Increase for C200H
OR	OR	---	1	0.02	0.04	---
	!OR	---	2	+21.14	+21.16	Increase for CS Series
				+45.1	+45.1	Increase for C200H
OR NOT	OR NOT	---	1	0.02	0.04	---
	!OR NOT	---	2	+21.14	+21.16	Increase for CS Series
				+45.1	+45.1	Increase for C200H
AND LOAD	AND LD	---	1	0.02	0.04	---
OR LOAD	OR LD	---	1	0.02	0.04	---
NOT	NOT	520	1	0.02	0.04	---
CONDITION ON	UP	521	3	0.3	0.42	---
CONDITION OFF	DOWN	522	4	0.3	0.42	---
LOAD BIT TEST	LD TST	350	4	0.14	0.24	---
LOAD BIT TEST NOT	LD TSTN	351	4	0.14	0.24	---
AND BIT TEST NOT	AND TSTN	351	4	0.14	0.24	---
OR BIT TEST	OR TST	350	4	0.14	0.24	---
OR BIT TEST NOT	OR TSTN	351	4	0.14	0.24	---

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

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10-5-2 Sequence Output Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
OUTPUT	OUT	---	1	0.02	0.04	---
	!OUT	---	2	+21.37	+21.37	Increase for CS Series
				+49.3	+49.3	Increase for C200H
OUTPUT NOT	OUT NOT	---	1	0.02	0.04	---
	!OUT NOT	---	2	+21.37	+21.37	Increase for CS Series
				+49.3	+49.3	Increase for C200H
KEEP	KEEP	011	1	0.06	0.08	---
DIFFERENTIATE UP	DIFU	013	2	0.24	0.40	---
DIFFERENTIATE DOWN	DIFD	014	2	0.24	0.40	---
SET	SET	---	1	0.02	0.06	---
	!SET	---	2	+21.37	+21.37	Increase for CS Series
				+49.3	+49.3	Increase for C200H
RESET	RSET	---	1	0.02	0.06	Word specified
	!RSET	---	2	+21.37	+21.37	Increase for CS Series
				+49.3	+49.3	Increase for C200H
MULTIPLE BIT SET	SETA	530	4	5.8	6.1	With 1-bit set
				25.7	27.2	With 1,000-bit set
MULTIPLE BIT RESET	RSTA	531	4	5.7	6.1	With 1-bit reset
				25.8	27.1	With 1,000-bit reset
SINGLE BIT SET	SETB	532	2	0.24	0.34	---
	!SETB		3	+21.44	+21.54	---
SINGLE BIT RESET	RSTB	534	2	0.24	0.34	---
	!RSTB		3	+21.44	+21.54	---
SINGLE BIT OUTPUT	OUTB	534	2	0.22	0.32	---
	!OUTB		3	+21.42	+21.52	---

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-3 Sequence Control Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
END	END	001	1	5.5	6.0	---
NO OPERATION	NOP	000	1	0.02	0.04	---
INTERLOCK	IL	002	1	0.06	0.06	---
INTERLOCK CLEAR	ILC	003	1	0.06	0.06	---
MULTI-INTERLOCK DIFFERENTIATION HOLD (See note 2.)	MILH	517	3	6.1	6.5	During interlock
				7.5	7.9	Not during interlock and interlock not set
				8.9	9.7	Not during interlock and interlock set
MULTI-INTERLOCK DIFFERENTIATION RELEASE (See note 2.)	MILR	518	3	6.1	6.5	During interlock
				7.5	7.9	Not during interlock and interlock not set
				8.9	9.7	Not during interlock and interlock set

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Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
MULTI-INTERLOCK CLEAR (See note 2.)	MILC	519	2	5.0	5.6	Interlock not cleared
				5.7	6.2	Interlock cleared
JUMP	JMP	004	2	0.38	0.48	---
JUMP END	JME	005	2	---	---	---
CONDITIONAL JUMP	CJP	510	2	0.38	0.48	When JMP condition is satisfied
CONDITIONAL JUMP NOT	CJPN	511	2	0.38	0.48	When JMP condition is satisfied
MULTIPLE JUMP	JMP0	515	1	0.06	0.06	---
MULTIPLE JUMP END	JME0	516	1	0.06	0.06	---
FOR LOOP	FOR	512	2	0.52	0.54	Designating a constant
BREAK LOOP	BREAK	514	1	0.06	0.06	---
NEXT LOOP	NEXT	513	1	0.18	0.16	When loop is continued
				0.22	0.40	When loop is ended

Note
1. When a double-length operand is used, add 1 to the value shown in the length column in the following table.
2. Supported only by CPU Units Ver. 2.0 or later.

10-5-4 Timer and Counter Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
TIMER	TIM	---	3	0.56	0.88	---
	TIMX	550	3	0.56	0.88	---
COUNTER	CNT	---	3	0.56	0.88	---
	CNTX	546	3	0.56	0.88	---
HIGH-SPEED TIMER	TIMH	015	3	0.88	1.14	---
	TIMHX	551	3	0.88	1.14	---
ONE-MS TIMER	TMHH	540	3	0.86	1.12	---
	TMHHX	552	3	0.86	1.12	---
ACCUMULATIVE TIMER	TTIM	087	3	16.1	17.0	---
				10.9	11.4	When resetting
				8.5	8.7	When interlocking
	TTIMX	555	3	16.1	17.0	---
				10.9	11.4	When resetting
				8.5	8.7	When interlocking
LONG TIMER	TIML	542	4	7.6	10.0	---
				6.2	6.5	When interlocking
	TIMLX	553	4	7.6	10.0	---
				6.2	6.5	When interlocking
MULTI-OUTPUT TIMER	MTIM	543	4	20.9	23.3	---
				5.6	5.8	When resetting
	MTIMX	554	4	20.9	23.3	---
				5.6	5.8	When resetting
REVERSIBLE COUNTER	CNTR	012	3	16.9	19.0	---
	CNTRX	548	3	16.9	19.0	---

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Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
RESET TIMER/ COUNTER	CNR	545	3	9.9	10.6	When resetting 1 word
				4.16 ms	4.16 ms	When resetting 1,000 words
	CNRX	547	3	9.9	10.6	When resetting 1 word
				4.16 ms	4.16 ms	When resetting 1,000 words

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-5 Comparison Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
Input Comparison Instructions (unsigned)	LD, AND, OR +=	300	4	0.10	0.16	---
	LD, AND, OR + <>	305				
	LD, AND, OR + <	310				
	LD, AND, OR +<=	315				
	LD, AND, OR +>	320				
	LD, AND, OR +>=	325				
Input Comparison Instructions (double, unsigned)	LD, AND, OR +=+L	301	4	0.10	0.16	---
	LD, AND, OR +<>+L	306				
	LD, AND, OR +<+L	311				
	LD, AND, OR +<=+L	316				
	LD, AND, OR +>+L	321				
	LD, AND, OR +>=+L	326				
Input Comparison Instructions (signed)	LD, AND, OR +=+S	302	4	0.10	0.16	---
	LD, AND, OR +<>+S	307				
	LD, AND, OR +<+S	312				
	LD, AND, OR +<=	317				
	LD, AND, OR +>+S	322				
	LD, AND, OR +>=+S	327				

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Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
Input Comparison Instructions (double, signed)	LD, AND, OR +=+SL	303	4	0.10	0.16	---
	LD, AND, OR +<>+SL	308				
	LD, AND, OR +<+SL	313				
	LD, AND, OR +<=+SL	318				
	LD, AND, OR +>+SL	323				
	LD, AND, OR +>=+SL	328				
Time Comparison Instructions (See note 2.)	LD, AND, OR +DT	341	4	25.1	36.4	ON and OFF execution times are the same as given at the left.
	LD, AND, OR +<>DT	342	4	25.2	36.4	
	LD, AND, OR +<DT	343	4	25.2	36.4	
	LD, AND, OR +<=DT	344	4	25.2	36.4	
	LD, AND, OR +>DT	345	4	25.1	36.4	
	LD, AND, OR +>=DT	346	4	25.2	36.4	
COMPARE	CMP	020	3	0.04	0.04	---
	!CMP	020	7	+42.1	+42.1	Increase for CS Series
				+90.4	+90.4	Increase for C200H
DOUBLE COMPARE	CMPL	060	3	0.08	0.08	---
SIGNED BINARY COMPARE	CPS	114	3	0.08	0.08	---
	!CPS	114	7	+35.9	+35.9	Increase for CS Series
				+84.1	+84.1	Increase for C200H
DOUBLE SIGNED BINARY COMPARE	CPSL	115	3	0.08	0.08	---
TABLE COMPARE	TCMP	085	4	14.0	15.2	---
MULTIPLE COMPARE	MCMP	019	4	20.5	22.8	---
UNSIGNED BLOCK COMPARE	BCMP	068	4	21.5	23.7	---
AREA RANGE COMPARE	ZCP	088	3	5.3	5.4	---
DOUBLE AREA RANGE COMPARE	ZCPL	116	3	5.5	6.7	---

Note
1. When a double-length operand is used, add 1 to the value shown in the length column in the following table.
2. Supported only by CPU Units Ver. 2.0 or later.

10-5-6 Data Movement Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
MOVE	MOV	021	3	0.18	0.20	---
	!MOV	021	7	+21.38	+21.40	Increase for CS Series
				+90.52	+90.52	Increase for C200H

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Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
DOUBLE MOVE	MOVL	498	3	0.32	0.34	---
MOVE NOT	MVN	022	3	0.18	0.20	---
DOUBLE MOVE NOT	MVNL	499	3	0.32	0.34	---
MOVE BIT	MOVB	082	4	0.24	0.34	---
MOVE DIGIT	MOVD	083	4	0.24	0.34	---
MULTIPLE BIT TRANSFER	XFRB	062	4	10.1	10.8	Transferring 1 bit
				186.4	189.8	Transferring 255 bits
BLOCK TRANSFER	XFER	070	4	0.36	0.44	Transferring 1 word
				300.1	380.1	Transferring 1,000 words
BLOCK SET	BSET	071	4	0.26	0.28	Setting 1 word
				200.1	220.1	Setting 1,000 words
DATA EXCHANGE	XCHG	073	3	0.40	0.56	---
DOUBLE DATA EXCHANGE	XCGL	562	3	0.76	1.04	---
SINGLE WORD DISTRIBUTE	DIST	080	4	5.1	5.4	---
DATA COLLECT	COLL	081	4	5.1	5.3	---
MOVE TO REGISTER	MOVR	560	3	0.08	0.08	---
MOVE TIMER/ COUNTER PV TO REGISTER	MOVRW	561	3	0.42	0.50	---

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-7 Data Shift Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
SHIFT REGISTER	SFT	010	3	7.4	10.4	Shifting 1 word
				433.2	488.0	Shifting 1,000 words
REVERSIBLE SHIFT REGISTER	SFTR	084	4	6.9	7.2	Shifting 1 word
				615.3	680.2	Shifting 1,000 words
ASYNCHRONOUS SHIFT REGISTER	ASFT	017	4	6.2	6.4	Shifting 1 word
				1.22 ms	1.22 ms	Shifting 1,000 words
WORD SHIFT	WSFT	016	4	4.5	4.7	Shifting 1 word
				171.5	171.7	Shifting 1,000 words
ARITHMETIC SHIFT LEFT	ASL	025	2	0.22	0.32	---
DOUBLE SHIFT LEFT	ASLL	570	2	0.40	0.56	---
ARITHMETIC SHIFT RIGHT	ASR	026	2	0.22	0.32	---
DOUBLE SHIFT RIGHT	ASRL	571	2	0.40	0.56	---
ROTATE LEFT	ROL	027	2	0.22	0.32	---
DOUBLE ROTATE LEFT	ROLL	572	2	0.40	0.56	---
ROTATE LEFT WITHOUT CARRY	RLNC	574	2	0.22	0.32	---
DOUBLE ROTATE LEFT WITHOUT CARRY	RLNL	576	2	0.40	0.56	---
ROTATE RIGHT	ROR	028	2	0.22	0.32	---
DOUBLE ROTATE RIGHT	RORL	573	2	0.40	0.56	---
ROTATE RIGHT WITHOUT CARRY	RRNC	575	2	0.22	0.32	---

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Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
DOUBLE ROTATE RIGHT WITHOUT CARRY	RRNL	577	2	0.40	0.56	---
ONE DIGIT SHIFT LEFT	SLD	074	3	5.9	6.1	Shifting 1 word
				561.1	626.3	Shifting 1,000 words
ONE DIGIT SHIFT RIGHT	SRD	075	3	6.9	7.1	Shifting 1 word
				760.5	895.5	Shifting 1,000 words
SHIFT N-BIT DATA LEFT	NSFL	578	4	7.5	8.3	Shifting 1 bit
				40.3	45.4	Shifting 1,000 bits
SHIFT N-BIT DATA RIGHT	NSFR	579	4	7.5	8.3	Shifting 1 bit
				50.5	55.3	Shifting 1,000 bits
SHIFT N-BITS LEFT	NASL	580	3	0.22	0.32	---
DOUBLE SHIFT N-BITS LEFT	NSLL	582	3	0.40	0.56	---
SHIFT N-BITS RIGHT	NASR	581	3	0.22	0.32	---
DOUBLE SHIFT N-BITS RIGHT	NSRL	583	3	0.40	0.56	---

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-8 Increment/Decrement Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
INCREMENT BINARY	++	590	2	0.22	0.32	---
DOUBLE INCREMENT BINARY	++L	591	2	0.40	0.56	---
DECREMENT BINARY	– –	592	2	0.22	0.32	---
DOUBLE DECREMENT BINARY	– –L	593	2	0.40	0.56	---
INCREMENT BCD	++B	594	2	6.4	4.5	---
DOUBLE INCREMENT BCD	++BL	595	2	5.6	4.9	---
DECREMENT BCD	– –B	596	2	6.3	4.6	---
DOUBLE DECREMENT BCD	– –BL	597	2	5.3	4.7	---

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-9 Symbol Math Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
SIGNED BINARY ADD WITHOUT CARRY	+	400	4	0.18	0.20	---
DOUBLE SIGNED BINARY ADD WITHOUT CARRY	+L	401	4	0.32	0.34	---
SIGNED BINARY ADD WITH CARRY	+C	402	4	0.18	0.20	---
DOUBLE SIGNED BINARY ADD WITH CARRY	+CL	403	4	0.32	0.34	---
BCD ADD WITHOUT CARRY	+B	404	4	8.2	8.4	---
DOUBLE BCD ADD WITHOUT CARRY	+BL	405	4	13.3	14.5	---

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Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
BCD ADD WITH CARRY	+BC	406	4	8.9	9.1	---
DOUBLE BCD ADD WITH CARRY	+BCL	407	4	13.8	15.0	---
SIGNED BINARY SUBTRACT WITHOUT CARRY	–	410	4	0.18	0.20	---
DOUBLE SIGNED BINARY SUBTRACT WITHOUT CARRY	–L	411	4	0.32	0.34	---
SIGNED BINARY SUBTRACT WITH CARRY	–C	412	4	0.18	0.20	---
DOUBLE SIGNED BINARY SUBTRACT WITH CARRY	–CL	413	4	0.32	0.34	---
BCD SUBTRACT WITHOUT CARRY	–B	414	4	8.0	8.2	---
DOUBLE BCD SUBTRACT WITHOUT CARRY	–BL	415	4	12.8	14.0	---
BCD SUBTRACT WITH CARRY	–BC	416	4	8.5	8.6	---
DOUBLE BCD SUBTRACT WITH CARRY	–BCL	417	4	13.4	14.7	---
SIGNED BINARY MULTIPLY	*	420	4	0.38	0.40	---
DOUBLE SIGNED BINARY MULTIPLY	*L	421	4	7.23	8.45	---
UNSIGNED BINARY MULTIPLY	*U	422	4	0.38	0.40	---
DOUBLE UNSIGNED BINARY MULTIPLY	*UL	423	4	7.1	8.3	---
BCD MULTIPLY	*B	424	4	9.0	9.2	---
DOUBLE BCD MULTIPLY	*BL	425	4	23.0	24.2	---
SIGNED BINARY DIVIDE	/	430	4	0.40	0.42	---
DOUBLE SIGNED BINARY DIVIDE	/L	431	4	7.2	8.4	---
UNSIGNED BINARY DIVIDE	/U	432	4	0.40	0.42	---
DOUBLE UNSIGNED BINARY DIVIDE	/UL	433	4	6.9	8.1	---
BCD DIVIDE	/B	434	4	8.6	8.8	---
DOUBLE BCD DIVIDE	/BL	435	4	17.7	18.9	---

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-10 Conversion Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
BCD-TO-BINARY	BIN	023	3	0.22	0.24	---
DOUBLE BCD-TO-DOUBLE BINARY	BINL	058	3	6.5	6.8	---
BINARY-TO-BCD	BCD	024	3	0.24	0.26	---
DOUBLE BINARY-TO-DOUBLE BCD	BCDL	059	3	6.7	7.0	---

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Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
2'S COMPLEMENT	NEG	160	3	0.18	0.20	---
DOUBLE 2'S COMPLEMENT	NEGL	161	3	0.32	0.34	---
16-BIT TO 32-BIT SIGNED BINARY	SIGN	600	3	0.32	0.34	---
DATA DECODER	MLPX	076	4	0.32	0.42	Decoding 1 digit (4 to 16)
				0.98	1.20	Decoding 4 digits (4 to 16)
				3.30	4.00	Decoding 1 digit 8 to 256
				6.50	7.90	Decoding 2 digits (8 to 256)
DATA ENCODER	DMPX	077	4	7.5	7.9	Encoding 1 digit (16 to 4)
				49.6	50.2	Encoding 4 digits (16 to 4)
				18.2	18.6	Encoding 1 digit (256 to 8)
				55.1	57.4	Encoding 2 digits (256 to 8)
ASCII CONVERT	ASC	086	4	6.8	7.1	Converting 1 digit into ASCII
				11.2	11.7	Converting 4 digits into ASCII
ASCII TO HEX	HEX	162	4	7.1	7.4	Converting 1 digit
COLUMN TO LINE	LINE	063	4	19.0	23.1	---
LINE TO COLUMN	COLM	064	4	23.2	27.5	---
SIGNED BCD-TO-BINARY	BINS	470	4	8.0	8.3	Data format setting No. 0
				8.0	8.3	Data format setting No. 1
				8.3	8.6	Data format setting No. 2
				8.5	8.8	Data format setting No. 3
DOUBLE SIGNED BCD-TO-BINARY	BISL	472	4	9.2	9.6	Data format setting No. 0
				9.2	9.6	Data format setting No. 1
				9.5	9.9	Data format setting No. 2
				9.6	10.0	Data format setting No. 3
SIGNED BINARY-TO-BCD	BCDS	471	4	6.6	6.9	Data format setting No. 0
				6.7	7.0	Data format setting No. 1
				6.8	7.1	Data format setting No. 2
				7.2	7.5	Data format setting No. 3

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Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
DOUBLE SIGNED BINARY-TO-BCD	BDSL	473	4	8.1	8.4	Data format setting No. 0
				8.2	8.6	Data format setting No. 1
				8.3	8.7	Data format setting No. 2
				8.8	9.2	Data format setting No. 3
GRAY CODE CONVERSION (See note 2.)	GRY	474	4	46.9	72.1	8-bit binary
				49.6	75.2	8-bit BCD
				57.7	87.7	8-bit angle
				61.8	96.7	15-bit binary
				64.5	99.6	15-bit BCD
				72.8	112.4	15-bit angle
				52.3	87.2	360° binary
				55.1	90.4	360° BCD
				64.8	98.5	360° angle
FOUR-DIGIT NUMBER TO ASCII (See note 3.)	STR4	601	3	13.79	20.24	---
EIGHT-DIGIT NUMBER TO ASCII (See note 3.)	STR8	602	3	18.82	27.44	---
SIXTEEN-DIGIT NUMBER TO ASCII (See note 3.)	STR16	603	3	30.54	44.41	---
ASCII TO FOUR-DIGIT NUMBER (See note 3.)	NUM4	604	3	18.46	27.27	---
ASCII TO EIGHT-DIGIT NUMBER (See note 3.)	NUM8	605	3	27.27	40.29	---
ASCII TO SIXTEEN-DIGIT NUMBER (See note 3.)	NUM16	606	3	52.31	78.25	---

Note
1. When a double-length operand is used, add 1 to the value shown in the length column in the following table.
2. Supported only by CPU Units Ver. 2.0 or later.
3. Supported only by CPU Units Ver. 4.0 or later.

10-5-11 Logic Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
LOGICAL AND	ANDW	034	4	0.18	0.20	---
DOUBLE LOGICAL AND	ANDL	610	4	0.32	0.34	---
LOGICAL OR	ORW	035	4	0.22	0.32	---
DOUBLE LOGICAL OR	ORWL	611	4	0.32	0.34	---
EXCLUSIVE OR	XORW	036	4	0.22	0.32	---
DOUBLE EXCLUSIVE OR	XORL	612	4	0.32	0.34	---
EXCLUSIVE NOR	XNRW	037	4	0.22	0.32	---

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Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
DOUBLE EXCLUSIVE NOR	XNRL	613	4	0.32	0.34	---
COMPLEMENT	COM	029	2	0.22	0.32	---
DOUBLE COMPLEMENT	COML	614	2	0.40	0.56	---

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-12 Special Math Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
BINARY ROOT	ROTB	620	3	49.6	50.0	---
BCD SQUARE ROOT	ROOT	072	3	13.7	13.9	---
ARITHMETIC PROCESS	APR	069	4	6.7	6.9	Designating SIN and COS
				17.2	18.4	Designating line-segment approximation
FLOATING POINT DIVIDE	FDIV	079	4	116.6	176.6	---
BIT COUNTER	BCNT	067	4	0.3	0.38	Counting 1 word

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-13 Floating-point Math Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
FLOATING TO 16-BIT	FIX	450	3	10.6	10.8	---
FLOATING TO 32-BIT	FIXL	451	3	10.8	11.0	---
16-BIT TO FLOATING	FLT	452	3	8.3	8.5	---
32-BIT TO FLOATING	FLTL	453	3	8.3	8.5	---
FLOATING-POINT ADD	+F	454	4	8.0	9.2	---
FLOATING-POINT SUBTRACT	–F	455	4	8.0	9.2	---
FLOATING-POINT DIVIDE	/F	457	4	8.7	9.9	---
FLOATING-POINT MULTIPLY	*F	456	4	8.0	9.2	---
DEGREES TO RADIANS	RAD	458	3	10.1	10.2	---
RADIANS TO DEGREES	DEG	459	3	9.9	10.1	---
SINE	SIN	460	3	42.0	42.2	---
COSINE	COS	461	3	31.5	31.8	---
TANGENT	TAN	462	3	16.3	16.6	---
ARC SINE	ASIN	463	3	17.6	17.9	---
ARC COSINE	ACOS	464	3	20.4	20.7	---
ARC TANGENT	ATAN	465	3	16.1	16.4	---
SQUARE ROOT	SQRT	466	3	19.0	19.3	---
EXPONENT	EXP	467	3	65.9	66.2	---
LOGARITHM	LOG	468	3	12.8	13.1	---
EXPONENTIAL POWER	PWR	840	4	125.4	126.0	---

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Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
Floating Symbol Comparison	LD, AND, OR +=F	329	3	6.6	8.3	---
	LD, AND, OR +<>F	330				
	LD, AND, OR +<F	331				
	LD, AND, OR +<=F	332				
	LD, AND, OR +>F	333				
	LD, AND, OR +>=F	334				
FLOATING- POINT TO ASCII	FSTR	448	4	48.5	48.9	---
ASCII TO FLOATING-POINT	FVAL	449	3	21.1	21.3	---

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-14 Double-precision Floating-point Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
DOUBLE SYMBOL COMPARISON	LD, AND, OR +=D	335	3	8.5	10.3	---
	LD, AND, OR +<>D	336				
	LD, AND, OR +<D	337				
	LD, AND, OR +<=D	338				
	LD, AND, OR +>D	339				
	LD, AND, OR +>=D	340				
DOUBLE FLOATING TO 16-BIT BINARY	FIXD	841	3	11.7	12.1	---
DOUBLE FLOATING TO 32-BIT BINARY	FIXLD	842	3	11.6	12.1	---
16-BIT BINARY TO DOUBLE FLOATING	DBL	843	3	9.9	10.0	---
32-BIT BINARY TO DOUBLE FLOATING	DBLL	844	3	9.8	10.0	---
DOUBLE FLOATING-POINT ADD	+D	845	4	11.2	11.9	---
DOUBLE FLOATING-POINT SUBTRACT	–D	846	4	11.2	11.9	---
DOUBLE FLOATING-POINT MULTIPLY	*D	847	4	12.0	12.7	---
DOUBLE FLOATING-POINT DIVIDE	/D	848	4	23.5	24.2	---
DOUBLE DEGREES TO RADIANS	RADD	849	3	27.4	27.8	---

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Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
DOUBLE RADIANS TO DEGREES	DEGD	850	3	11.2	11.9	---
DOUBLE SINE	SIND	851	3	45.4	45.8	---
DOUBLE COSINE	COSD	852	3	43.0	43.4	---
DOUBLE TANGENT	TAND	853	3	20.1	20.5	---
DOUBLE ARC SINE	ASIND	854	3	21.5	21.9	---
DOUBLE ARC COSINE	ACOSD	855	3	24.7	25.1	---
DOUBLE ARC TANGENT	ATAND	856	3	19.3	19.7	---
DOUBLE SQUARE ROOT	SQRTD	857	3	47.4	47.9	---
DOUBLE EXPONENT	EXPD	858	3	121.0	121.4	---
DOUBLE LOGARITHM	LOGD	859	3	16.0	16.4	---
DOUBLE EXPONENTIAL POWER	PWRD	860	4	223.9	224.2	---

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-15 Table Data Processing Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
SET STACK	SSET	630	3	8.0	8.3	Designating 5 words in stack area
				231.6	251.8	Designating 1,000 words in stack area
PUSH ONTO STACK	PUSH	632	3	6.5	8.6	---
FIRST IN FIRST OUT	FIFO	633	3	6.9	8.9	Designating 5 words in stack area
				352.6	434.3	Designating 1,000 words in stack area
LAST IN FIRST OUT	LIFO	634	3	7.0	9.0	---
DIMENSION RECORD TABLE	DIM	631	5	15.2	21.6	---
SET RECORD LOCATION	SETR	635	4	5.4	5.9	---
GET RECORD NUMBER	GETR	636	4	7.8	8.4	---
DATA SEARCH	SRCH	181	4	15.5	19.5	Searching for 1 word
				2.42 ms	3.34 ms	Searching for 1,000 words
SWAP BYTES	SWAP	637	3	12.2	13.6	Swapping 1 word
				1.94 ms	2.82 ms	Swapping 1,000 words
FIND MAXIMUM	MAX	182	4	19.2	24.9	Searching for 1 word
				2.39 ms	3.36 ms	Searching for 1,000 words
FIND MINIMUM	MIN	183	4	19.2	25.3	Searching for 1 word
				2.39 ms	3.33 ms	Searching for 1,000 words
SUM	SUM	184	4	28.2	38.5	Adding 1 word
				1.42 ms	1.95 ms	Adding 1,000 words
FRAME CHECKSUM	FCS	180	4	20.0	28.3	For 1-word table length
				1.65 ms	2.48 ms	For 1,000-word table length
STACK SIZE READ	SNUM	638	3	6.0	6.3	---

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Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
STACK DATA READ	SREAD	639	4	8.0	8.4	---
STACK DATA OVERWRITE	SWRIT	640	4	7.2	7.6	---
STACK DATA INSERT	SINS	641	4	7.8	9.9	---
				354.0	434.8	For 1,000-word table
STACK DATA DELETE	SDEL	642	4	8.6	10.6	---
				354.0	436.0	For 1,000-word table

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-16 Data Control Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
PID CONTROL	PID	190	4	436.2	678.2	Initial execution
				332.3	474.9	Sampling
				97.3	141.3	Not sampling
LIMIT CONTROL	LMT	680	4	16.1	22.1	---
DEAD BAND CONTROL	BAND	681	4	17.0	22.5	---
DEAD ZONE CONTROL	ZONE	682	4	15.4	20.5	---
TIME-PROPORTIONAL OUTPUT (See note 2.)	TPO	685	4	10.4	14.8	OFF execution time
				54.5	82.0	ON execution time with duty designation or displayed output limit
				61.0	91.9	ON execution time with manipulated variable designation and output limit enabled
SCALING	SCL	194	4	37.1	53.0	---
SCALING 2	SCL2	486	4	28.5	40.2	---
SCALING 3	SCL3	487	4	33.4	47.0	---
AVERAGE	AVG	195	4	36.3	52.6	Average of an operation
				291.0	419.9	Average of 64 operations
PID CONTROL WITH AUTOTUNING	PIDAT	191	4	446.3	712.5	Initial execution
				339.4	533.9	Sampling
				100.7	147.1	Not sampling
				189.2	281.6	Initial execution of autotuning
				535.2	709.8	Autotuning when sampling

Note
1. When a double-length operand is used, add 1 to the value shown in the length column in the following table.
2. Supported only by CPU Units Ver. 2.0 or later.

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10-5-17 Subroutine Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
SUBROUTINE CALL	SBS	091	2	1.26	1.96	---
SUBROUTINE ENTRY	SBN	092	2	---	---	---
SUBROUTINE RETURN	RET	093	1	0.86	1.60	---
MACRO	MCRO	099	4	23.3	23.3	---
GLOBAL SUBROUTINE CALL	GSBN	751	2	---	---	---
GLOBAL SUBROUTINE ENTRY	GRET	752	1	1.26	1.96	---
GLOBAL SUBROUTINE RETURN	GSBS	750	2	0.86	1.60	---

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-18 Interrupt Control Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
SET INTERRUPT MASK	MSKS	690	3	25.6	38.4	---
READ INTERRUPT MASK	MSKR	692	3	11.9	11.9	---
CLEAR INTERRUPT	CLI	691	3	27.4	41.3	---
DISABLE INTERRUPTS	DI	693	1	15.0	16.8	---
ENABLE INTERRUPTS	EI	694	1	19.5	21.8	---

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-19 Step Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
STEP DEFINE	STEP	008	2	17.4	20.7	Step control bit ON
				11.8	13.7	Step control bit OFF
STEP START	SNXT	009	2	6.6	7.3	---

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

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10-5-20 Basic I/O Unit Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
I/O REFRESH	IORF	097	3	58.5	63.2	1-word refresh (IN) for C200H Basic I/O Units
				62.6	67.0	1-word refresh (OUT) for C200H Basic I/O Units
				15.5	16.4	1-word refresh (IN) for CS-series Basic I/O Units
				17.20	18.40	1-word refresh (OUT) for CS-series Basic I/O Units
				303.3	343.9	10-word refresh (IN) for C200H Basic I/O Units
				348.2	376.6	10-word refresh (OUT) for C200H Basic I/O Units
				319.9	320.7	60-word refresh (IN) for CS-series Basic I/O Units
				358.00	354.40	60-word refresh (OUT) for CS-series Basic I/O Units
7-SEGMENT DECODER	SDEC	078	4	6.5	6.9	---
DIGITAL SWITCH INPUT (See note 2.)	DSW	210	6	50.7	73.5	4 digits, data input value: 0
				51.5	73.4	4 digits, data input value: F
				51.3	73.5	8 digits, data input value: 0
				50.7	73.4	8 digits, data input value: F
TEN KEY INPUT (See note 2.)	TKY	211	4	9.7	13.2	Data input value: 0
				10.7	14.8	Data input value: F
HEXADECIMAL KEY INPUT (See note 2.)	HKY	212	5	50.3	70.9	Data input value: 0
				50.1	71.2	Data input value: F
MATRIX INPUT (See note 2.)	MTR	213	5	47.8	68.1	Data input value: 0
				48.0	68.0	Data input value: F
7-SEGMENT DISPLAY OUTPUT (See note 2.)	7SEG	214	5	58.1	83.3	4 digits
				63.3	90.3	8 digits
INTELLIGENT I/O READ	IORD	222	4	Read/write times depend on the Special I/O Unit for which the instruction is being executed.		---
INTELLIGENT I/O WRITE	IOWR	223	4			---
CPU BUS I/O REFRESH	DLNK	226	4	287.8	315.5	Allocated 1 word

Note
1. When a double-length operand is used, add 1 to the value shown in the length column in the following table.
2. Supported only by CPU Units Ver. 2.0 or later.

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10-5-21 Serial Communications Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
PROTOCOL MACRO	PMCR	260	5	100.1	142.1	Sending 0 words, receiving 0 words
				134.2	189.6	Sending 249 words, receiving 249 words
TRANSMIT	TXD	236	4	68.5	98.8	Sending 1 byte
				734.3	1.10 ms	Sending 256 bytes
RECEIVE	RXD	235	4	89.6	131.1	Storing 1 byte
				724.2	1.11 ms	Storing 256 bytes
TRANSMIT VIA SERIAL COMMUNICATIONS UNIT	TXDU	256	4	131.5	202.4	Sending 1 byte
RECEIVE VIA SERIAL COMMUNICATIONS UNIT	RXDU	255	4	131	200.8	Storing 1 byte
CHANGE SERIAL PORT SETUP	STUP	237	3	341.2	400.0	---

Note
1. When a double-length operand is used, add 1 to the value shown in the length column in the following table.
2. TXDU(256) and RXDU(255) are supported for unit version 3.0 or later only.

10-5-22 Network Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
NETWORK SEND	SEND	090	4	84.4	123.9	---
NETWORK RECEIVE	RECV	098	4	85.4	124.7	---
DELIVER COMMAND	CMND	490	4	106.8	136.8	---
EXPLICIT MESSAGE SEND (See note 2.)	EXPLT	720	4	127.6	190.0	---
EXPLICIT GET ATTRIBUTE (See note 2.)	EGATR	721	4	123.9	185.0	---
EXPLICIT SET ATTRIBUTE (See note 2.)	ESATR	722	3	110.0	164.4	---
EXPLICIT WORD READ (See note 2.)	ECHRD	723	4	106.8	158.9	---
EXPLICIT WORD WRITE (See note 2.)	ECHWR	724	4	106.0	158.3	---

Note
1. When a double-length operand is used, add 1 to the value shown in the length column in the following table.
2. Supported only by CPU Units Ver. 2.0 or later.

10-5-23 File Memory Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
READ DATA FILE	FREAD	700	5	391.4	632.4	2-character directory + file name in binary
				836.1	1.33 ms	73-character directory + file name in binary

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Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
WRITE DATA FILE	FWRIT	701	5	387.8	627.0	2-character directory + file name in binary
				833.3	1.32 ms	73-character directory + file name in binary
WRITE TEXT FILE (See note 2.)	TWRIT	704	5	390.1	619.1	---

Note
1. When a double-length operand is used, add 1 to the value shown in the length column in the following table.
2. Supported only by CPU Units Ver. 4.0 or later.

10-5-24 Display Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
DISPLAY MESSAGE	MSG	046	3	10.1	14.2	Displaying message
				8.4	11.3	Deleting displayed message

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-25 Clock Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
CALENDAR ADD	CADD	730	4	38.3	201.9	---
CALENDAR SUBTRACT	CSUB	731	4	38.6	170.4	---
HOURS TO SECONDS	SEC	065	3	21.4	29.3	---
SECONDS TO HOURS	HMS	066	3	22.2	30.9	---
CLOCK ADJUSTMENT	DATE	735	2	60.5	87.4	---

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-26 Debugging Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
Trace Memory Sampling	TRSM	045	1	80.4	120.0	Sampling 1 bit and 0 words
				848.1	1.06 ms	Sampling 31 bits and 6 words

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

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10-5-27 Failure Diagnosis Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
FAILURE ALARM	FAL	006	3	15.4	16.7	Recording errors
				179.8	244.8	Deleting errors (in order of priority)
				432.4	657.1	Deleting errors (all errors)
				161.5	219.4	Deleting errors (individually)
SEVERE FAILURE ALARM	FALS	007	3	---	---	---
FAILURE POINT DETECTION	FPD	269	4	140.9	202.3	When executed
				163.4	217.6	First time
				185.2	268.9	When executed
				207.5	283.6	First time

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-28 Other Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
SET CARRY	STC	040	1	0.06	0.06	---
CLEAR CARRY	CLC	041	1	0.06	0.06	---
SELECT EM BANK	EMBC	281	2	14.0	15.1	---
EXTEND MAXIMUM CYCLE TIME	WDT	094	2	15.0	19.7	---
SAVE CONDITION FLAGS	CCS	282	1	8.6	12.5	---
LOAD CONDITION FLAGS	CCL	283	1	9.8	13.9	---
CONVERT ADDRESS FROM CV	FRMCV	284	3	13.6	19.9	---
CONVERT ADDRESS TO CV	TOCV	285	3	11.9	17.2	---
DISABLE PERIPHERAL SERVICING	IOSP	287	---	13.9	19.8	---
ENABLE PERIPHERAL SERVICING	IORS	288	---	63.6	92.3	---

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-29 Block Programming Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
BLOCK PROGRAM BEGIN	BPRG	096	2	12.1	13.0	---
BLOCK PROGRAM END	BEND	801	1	9.6	12.3	---
BLOCK PROGRAM PAUSE	BPPS	811	2	10.6	12.3	---
BLOCK PROGRAM RESTART	BPRS	812	2	5.1	5.6	---
CONDITIONAL BLOCK EXIT	(Execution condition) EXIT	806	1	10.0	11.3	EXIT condition satisfied
				4.0	4.9	EXIT condition not satisfied

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Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
CONDITIONAL BLOCK EXIT	EXIT (bit address)	806	2	6.8	13.5	EXIT condition satisfied
				4.7	7.2	EXIT condition not satisfied
CONDITIONAL BLOCK EXIT (NOT)	EXIT NOT (bit address)	806	2	12.4	14.0	EXIT condition satisfied
				7.1	7.6	EXIT condition not satisfied
Branching	IF (execution condition)	802	1	4.6	4.8	IF true
				6.7	7.3	IF false
Branching	IF (relay number)	802	2	6.8	7.2	IF true
				9.0	9.6	IF false
Branching (NOT)	IF NOT (relay number)	802	2	7.1	7.6	IF true
				9.2	10.1	IF false
Branching	ELSE	803	1	6.2	6.7	IF true
				6.8	7.7	IF false
Branching	IEND	804	1	6.9	7.7	IF true
				4.4	4.6	IF false
ONE CYCLE AND WAIT	WAIT (execution condition)	805	1	12.6	13.7	WAIT condition satisfied
				3.9	4.1	WAIT condition not satisfied
ONE CYCLE AND WAIT	WAIT (relay number)	805	2	12.0	13.4	WAIT condition satisfied
				6.1	6.5	WAIT condition not satisfied
ONE CYCLE AND WAIT (NOT)	WAIT NOT (relay number)	805	2	12.2	13.8	WAIT condition satisfied
				6.4	6.9	WAIT condition not satisfied
COUNTER WAIT	CNTW	814	4	17.9	22.6	Default setting
				19.1	23.9	Normal execution
	CNTWX	818	4	17.9	22.6	Default setting
				19.1	23.9	Normal execution
HIGH-SPEED TIMER WAIT	TMHW	815	3	25.8	27.9	Default setting
				20.6	22.7	Normal execution
	TMHWX	817	3	25.8	27.9	Default setting
				20.6	22.7	Normal execution
				9.3	10.8	LEND condition not satisfied
Loop Control	LOOP	809	1	7.9	9.1	---
Loop Control	LEND (execution condition)	810	1	7.7	8.4	LEND condition satisfied
				6.8	8.0	LEND condition not satisfied
Loop Control	LEND (relay number)	810	2	9.9	10.7	LEND condition satisfied
				8.9	10.3	LEND condition not satisfied
Loop Control	LEND NOT (relay number)	810	2	10.2	11.2	LEND condition satisfied
				9.3	10.8	LEND condition not satisfied

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Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
TIMER WAIT	TIMW	813	3	22.3	25.2	Default setting
				24.9	27.8	Normal execution
	TIMWX	816	3	22.3	25.2	Default setting
				24.9	27.8	Normal execution

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

10-5-30 Text String Processing Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
MOV STRING	MOV$	664	3	45.6	66.0	Transferring 1 character
CONCATENATE STRING	+$	656	4	86.5	126.0	1 character + 1 character
GET STRING LEFT	LEFT$	652	4	53.0	77.4	Retrieving 1 character from 2 characters
GET STRING RIGHT	RGHT$	653	4	52.2	76.3	Retrieving 1 character from 2 characters
GET STRING MIDDLE	MID$	654	5	56.5	84.6	Retrieving 1 character from 3 characters
FIND IN STRING	FIND$	660	4	51.4	77.5	Searching for 1 character from 2 characters
STRING LENGTH	LEN$	650	3	19.8	28.9	Detecting 1 character
REPLACE IN STRING	RPLC$	661	6	175.1	258.7	Replacing the first of 2 characters with 1 character
DELETE STRING	DEL$	658	5	63.4	94.2	Deleting the leading character of 2 characters
EXCHANGE STRING	XCHG$	665	3	60.6	87.2	Exchanging 1 character with 1 character
CLEAR STRING	CLR$	666	2	23.8	36.0	Clearing 1 character
INSERT INTO STRING	INS$	657	5	136.5	200.6	Inserting 1 character after the first of 2 characters
String Comparison Instructions	LD, AND, OR +=$	670	4	48.5	69.8	Comparing 1 character with 1 character
	LD, AND, OR +<>$	671				
	LD, AND, OR +<$	672				
	LD, AND, OR +>$	674				
	LD, AND, OR +>=$	675				

Note When a double-length operand is used, add 1 to the value shown in the length column in the following table.

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10-5-31 Task Control Instructions

Instruction	Mnemonic	Code	Length (steps) (See note.)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
TASK ON	TKON	820	2	19.5	26.3	---
TASK OFF	TKOF	821	2	13.3	19.0	---

10-5-32 Model Conversion Instructions (Unit Ver. 3.0 or Later Only)

Instruction	Mnemonic	Code	Length (steps)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
BLOCK TRANSFER	XFERC	565	4	6.4	6.5	Transferring 1 word
				481.6	791.6	Transferring 1,000 words
SINGLE WORD DISTRIBUTE	DISTC	566	4	3.4	3.5	Data distribute
				5.9	7.3	Stack operation
DATA COLLECT	COLLC	567	4	3.5	3.85	Data collection
				8	9.1	Stack operation
				8.3	9.6	Stack operation 1 word FIFO Read
				2052.3	2097.5	Stack operation 1,000 words FIFO Read
MOVE BIT	MOVBC	568	4	4.5	4.88	---
BIT COUNTER	BCNTC	621	4	4.9	5	Counting 1 word
				1252.4	1284.4	Counting 1,000 words

10-5-33 Special Function Block Instructions (Unit Ver. 3.0 or Later Only)

Instruction	Mnemonic	Code	Length (steps)	ON execution time (μs)		Conditions
				CPU-6□H	CPU-4□H	
GET VARIABLE ID	GETID	286	4	14	22.2	---

Guidelines on Converting Program Capacities from Previous OMRON PLCs

Guidelines are provided in the following table for converting the program capacity (unit: words) of previous OMRON PLCs (SYSMAC C200HX/HG/HE, CVM1, or CV-series PLCs) to the program capacity (unit: steps) of the CS-series PLCs.

Add the following value (n) to the program capacity (unit: words) of the previous PLCs for each instruction to obtain the program capacity (unit: steps) of the CS-series PLCs.

CS-series steps = "a" (words) of previous PLC + n			
Instructions	**Variations**	**Value of n when converting from C200HX/HG/HE to CS Series**	**Value of n when converting from CV-series PLC or CVM1 to CS Series**
Basic instructions	None	OUT, SET, RSET, or KEEP(011): –1 Other instructions: 0	0
	Upward Differentiation	None	+1
	Immediate Refreshing	None	0
	Upward Differentiation and Immediate Refreshing	None	+2

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CS-series steps = "a" (words) of previous PLC + n			
Instructions	**Variations**	**Value of n when converting from C200HX/HG/HE to CS Series**	**Value of n when converting from CV-series PLC or CVM1 to CS Series**
Special instructions	None	0	–1
	Upward Differentiation	+1	0
	Immediate Refreshing	None	+3
	Upward Differentiation and Immediate Refreshing	None	+4

For example, if OUT is used with an address of CIO 000000 to CIO 25515, the program capacity of a C200HX/HG/HE PLC would be 2 words per instruction and that of the CS-series PLC would be 1 (2 – 1) step per instruction.

For example, if !MOV is used (MOVE instruction with immediate refreshing), the program capacity of a CV-series PLC would be 4 words per instruction and that of the CS-series PLC would be 7 (4 + 3) steps.

10-5-34 Function Block Instance Execution Time (CPU Units with Unit Version 3.0 or Later)

Use the following equation to calculate the effect of instance execution on the cycle time when function block definitions have been created and the instances copied into the user program using CS/CJ-series CPU Units with unit version 3.0 or later.

Effect of Instance Execution on Cycle Time
= Startup time (A)
+ I/O parameter transfer processing time (B)
+ Execution time of instructions in function block definition (C)

The following table shows the length of time for A, B, and C.

Operation			CPU Unit model		
			CS1H-CPU6□H CJ1H-CPU6□H	**CS1G-CPU4□H CJ1G-CPU4□H**	**CJ1M-CPU□□**
A	Startup time	Startup time not including I/O parameter transfer	6.8 μs	8.8 μs	15.0 μs
B	I/O parameter transfer processing time The data type is indicated in parentheses.	1-bit I/O variable (BOOL)	0.4 μs	0.7 μs	1.0 μs
		1-word I/O variable (INT, UINT, WORD)	0.3 μs	0.6 μs	0.8 μs
		2-word I/O variable (DINT, UDINT, DWORD, REAL)	0.5 μs	0.8 μs	1.1 μs
		4-word I/O variable (LINT, ULINT, LWORD, LREAL)	1.0 μs	1.6 μs	2.2 μs
C	Function block definition instruction execution time	Total instruction processing time (same as standard user program)			

Example: CS1H-CPU63H
Input variables with a 1-word data type (INT): 3
Output variables with a 1-word data type (INT): 2
Total instruction processing time in function block definition section: 10 μs
Execution time for 1 instance = 6.8 μs + (3 + 2) × 0.3 μs + 10 μs = 18.3 μs

Note The execution time is increased according to the number of multiple instances when the same function block definition has been copied to multiple locations.

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Number of Function Block Program Steps (CPU Units with Unit Version 3.0 or Later)

Use the following equation to calculate the number of program steps when function block definitions have been created and the instances copied into the user program using CS/CJ-series CPU Units with unit version 3.0 or later.

Number of steps

= Number of instances × (Call part size m + I/O parameter transfer part size n × Number of parameters) + Number of instruction steps in the function block definition p (See note.)

Note The number of instruction steps in the function block definition (p) will not be diminished in subsequence instances when the same function block definition is copied to multiple locations (i.e., for multiple instances). Therefore, in the above equation, the number of instances is not multiplied by the number of instruction steps in the function block definition (p).

Contents			CS/CJ-series CPU Units with unit version 3.0 or later
m	Call part		57 steps
n	I/O parameter transfer part The data type is shown in parentheses.	1-bit I/O variable (BOOL)	6 steps
		1-word I/O variable (INT, UINT, WORD)	6 steps
		2-word I/O variable (DINT, UDINT, DWORD, REAL)	6 steps
		4-word I/O variable (LINT, ULINT, LWORD, LREAL)	12 steps
p	Number of instruction steps in function block definition	The total number of instruction steps (same as standard user program) + 27 steps.	

Example:
Input variables with a 1-word data type (INT): 5
Output variables with a 1-word data type (INT): 5
Function block definition section: 100 steps
Number of steps for 1 instance = 57 + (5 + 5) × 6 steps + 100 steps + 27 steps = 244 steps

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SECTION 11
Troubleshooting

This section provides information on hardware and software errors that occur during PLC operation.

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11-1 Error Log

Each time that an error occurs, the CPU Unit stores error information in the Error Log Area. The error information includes the error code (stored in A400), error contents, and time that the error occurred. Up to 20 records can be stored in the Error Log.

Errors Generated by FAL(006)/FALS(007)

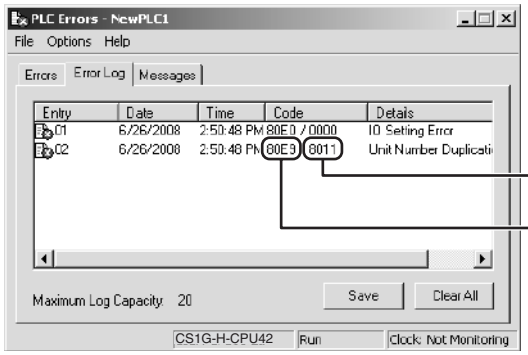
In addition to system-generated errors, the PLC records user-defined FAL(006) and FALS(007) errors, making it easier to track the operating status of the system.

A user-defined error is generated when FAL(006) or FALS(007) is executed in the program. The execution conditions of these instructions constitute the user-defined error conditions. FAL(006) generates a non-fatal error and FALS(007) generates a fatal error that stops program execution.

The following table shows the error codes for FAL(006) and FALS(007).

Instruction	FAL numbers	Error codes
FAL(006)	#0001 to #01FF (1 to 511 decimal)	4101 to 42FF
FALS(007)	#0001 to #01FF (1 to 511 decimal)	C101 to C2FF

Check the error log by clicking the **Error Log** Tab in the PLC Errors Window of the CX-Programmer.



The above example shows that unit number 17 has been duplicated for Special I/O Units.

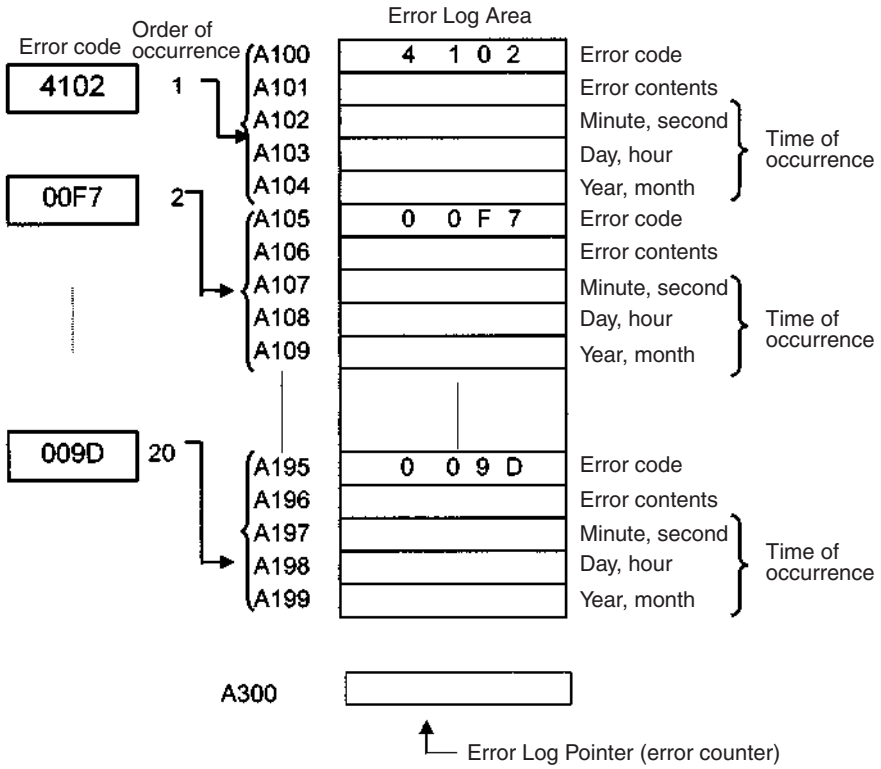
- Error code 80E9: Unit number duplication error
- Error information: 80 “11”: 11 hex = 17 decimal

For details on error codes and error information, refer to *11-2-5 Error Messages*.

Error Log Structure

When more than 20 errors occur, the oldest error data (in A100 to A104) is deleted, the newest record is stored in A195 to A199, and the other errors are shifted by one.

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The number of records is stored in binary in the Error Log Pointer (A300). The data in the Error Log can be cleared from a Programming Device.

Note The Error Log Pointer can be reset by turning ON the Error Log Pointer Reset Bit (A50014), but this operation does not clear the data in the Error Log A100 to A199) itself.

11-2 Error Processing

11-2-1 Error Categories

Errors in CS-series PLCs can be broadly divided into the following three categories.

Category	Result	Indicators		Comments
		RUN	ERR/ALM	
CPU Standby	The CPU Unit will not start operation in RUN or MONITOR mode.	OFF	OFF	---
Non-fatal Errors (including FAL(006))	The CPU Unit will continue operating in RUN or MONITOR mode.	ON (Green)	Flashing (Red)	Other indicators will also operate when a communications error has occurred or the Output OFF Bit is ON.
Fatal Errors (including FALS(007))	The CPU Unit will stop operating in RUN or MONITOR mode.	OFF	ON (Red)	The indicators will all be OFF when there is a power interruption.

11-2-2 Error Information

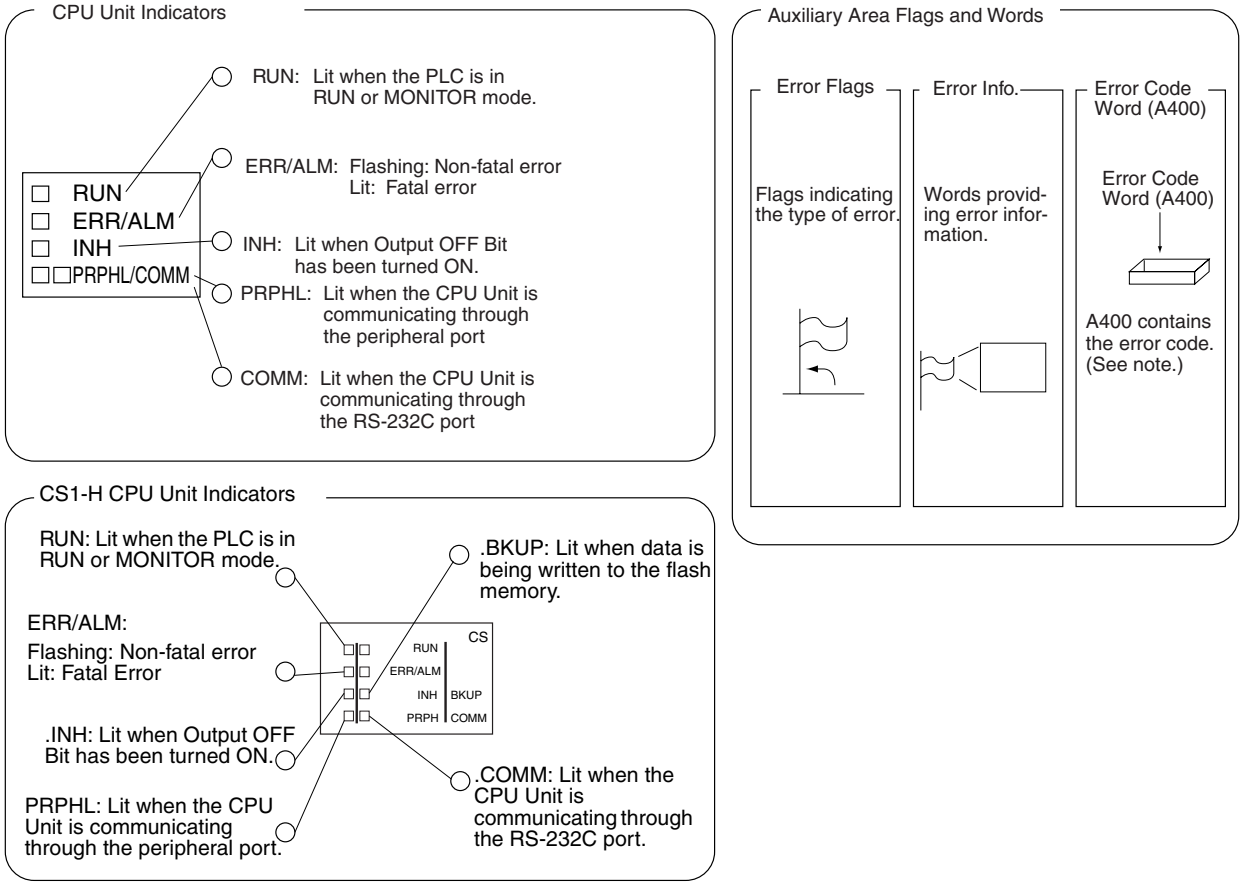
There are basically four sources of information on errors that have occurred:

1,2,3...

1. The CPU Unit's indicators
2. The Auxiliary Area Error Flags
3. The Auxiliary Area Error Information Words

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4. The Auxiliary Area Error Code Word



Note When two or more errors occur at the same time, the highest (most serious) error code will be stored in A400.

Indicator Status and Error Conditions

The following table shows the status of the CPU Unit's indicators for errors that have occurred in RUN or MONITOR mode.

Indicator*	CPU error	CPU reset	CPU standby	Fatal error	Non-fatal error	Communications error		Output OFF Bit ON
						Peripheral	RS-232C	
RUN	OFF	OFF	OFF	OFF	ON	ON	ON	---
ERR/ALM	ON	OFF	OFF	ON	Flashing	---	---	---
INH	OFF	OFF	---	---	---	---	---	ON
PRPHL	---	---	---	---	---	OFF	---	---
COMM	---	---	---	---	---	---	OFF	---

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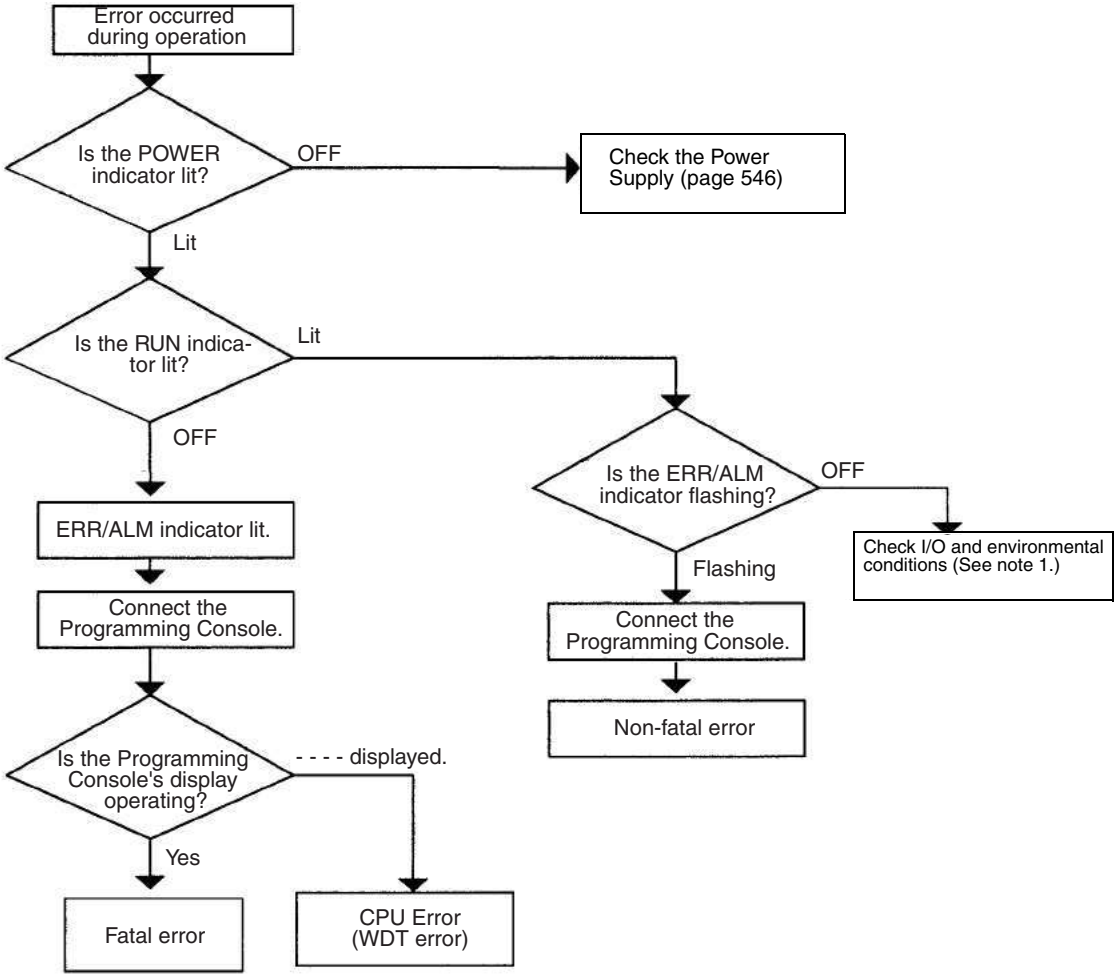
11-2-3 Error Codes and Error Flags

Classification	Error code	Error name	Page
Fatal system errors	80F1	Memory error	538
	80C0 to 80C7, 80CF	I/O bus error	539
	80CB	I/O bus error B	539
	80E9	Duplicated number error	539
	80E1	Too many I/O points	540
	80E0	I/O setting error	540
	80F0	Program error	541
	809F	Cycle time too long	542
	80EA	Expansion Rack number duplicated	539
	82F0	Fatal Inner Board error	539
Non-fatal system errors	008B	Interrupt task error	543
	009A	Basic I/O error	543
	009B	PLC Setup setting error	544
	00E7	I/O verification error	544
	02F0	Inner Board error	544
	0200 to 020F	CS1-series CPU Bus Unit error	544
	0300 to 035F	Special I/O Unit error	544
	00A0 to 00A1	SYSMAC BUS error	544
	00F7	Battery error	544
	0400 to 040F	CS1-series CPU Bus Unit setting error	545
	0500 to 055F	Special I/O Unit setting error	545
User-defined fatal errors	4101 to 42FF	FALS(007) error (C101 to C2FF are stored for FALS numbers 001 to 511)	543
User-defined non-fatal errors	C101 to C2FF	FAL(006) error (4101 to 42FF are stored for FAL numbers 001 to 511)	542

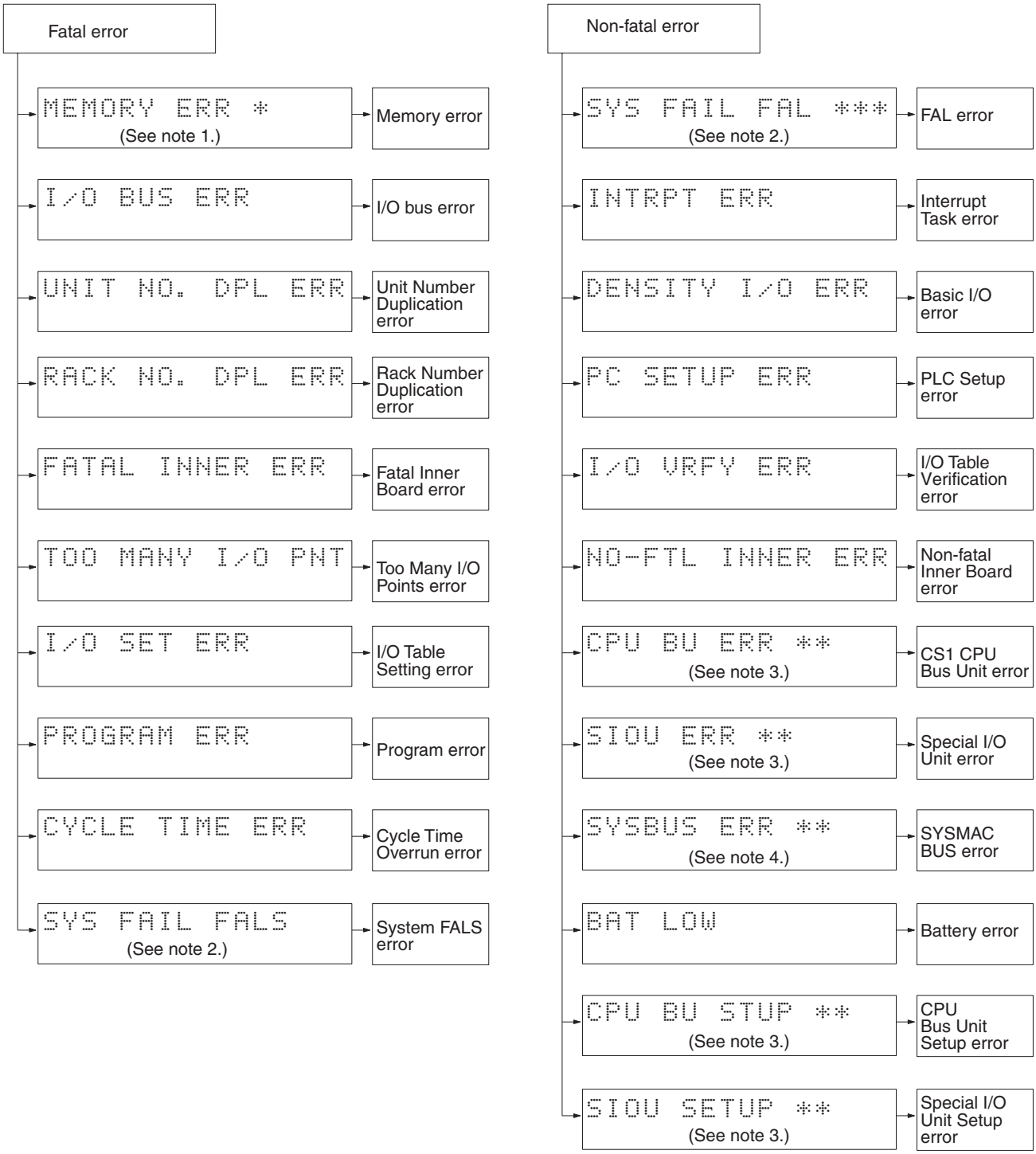
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11-2-4 Error Processing Flowchart

Use the following flowchart as a guide for error processing with a Programming Console.



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Note
1. The rack number will be given at *.
2. The FAL./FALS number will be given at ***.
3. The unit number will be given at **.
4. The master number will be given at *.

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11-2-5 Error Messages

The following tables show error messages for errors which can occur in CS-series PLCs and indicate the likely cause of the errors.

⚠ **Caution** Always check the safety of the controlled system before turning the power supply OFF or ON.

CPU Errors

A CPU error has occurred if the indicators have the following conditions in RUN or MONITOR mode. A Programming Device, such as a Programming Console, cannot be connected when the CPU Unit is in this state.

Power Supply Unit Indicator	CPU Unit Indicators				
POWER	RUN	ERR/ALM	INH	PRPHL	COMM
ON	---	ON	---	---	---

Status	Error	Programming Console display	Error flags in Auxiliary Area	Error code (in A400)	Flags and word data	Probable cause	Possible remedy
Stopped	CPU error	– – – –	None	None	None	Watchdog timer has exceeded maximum setting.	Turn the power OFF and restart. The Unit may be faulty. Contact your OMRON representative if the problem persists.

CPU Reset

The following indicators status indicates an Expansion Rack power interruption, not a CPU error. A Programming Device, such as a Programming Console, cannot be connected when the CPU Unit is in this state.

Power Supply Unit Indicator	CPU Unit Indicators				
POWER	RUN	ERR/ALM	INH	PRPHL	COMM
ON	OFF	OFF	OFF	---	---

Status	Error	Programming Console display	Error flags in Auxiliary Area	Error code (in A400)	Flags	Probable cause	Possible remedy
Stopped	CPU reset	– – – –	None	None	None	Power is not being supplied to an Expansion Rack.	Supply power to the Expansion Rack.
						An I/O Connecting Cable is not connected properly. For example, the IN and OUT connections between the CPU Rack and an Expansion Rack are reversed.	Turn OFF the power supply, check the connections all I/O Connecting Cables, and turn the power supply back ON.

Note When power supply is interrupted to an Expansion Rack, the CPU Unit will stop program execution and the same operations as are performed when the power supply to the CPU Unit is interrupted will be performed. For example, if the power OFF interrupt task is enabled, it will be executed. If power is then

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restored to the Expansion Rack, the CPU Unit will perform startup processing, i.e., the same operational status as existed before the power interrupt will not necessarily be continued.

CPU Standby Errors

A CPU standby error has occurred if the indicators have the following conditions in RUN or MONITOR mode.

Power Supply Unit Indicator	CPU Unit Indicators				
POWER	RUN	ERR/ALM	INH	PRPHL	COMM
ON	OFF	OFF	---	---	---

Status	Error	Programming Console display	Error flags in Auxiliary Area	Error code (in A400)	Flags	Probable cause	Possible remedy
Stopped	CPU standby error	CPU WAIT'G	None	None	None	Recognition of one or more of the following Unit has not been completed: CPU Bus Units, Special I/O Units, High-density I/O Units, Interrupt Input Units, or an Inner Board.	Turn OFF the power supply, check the mounting and settings of all the Unit and the Inner Board, and turn the power supply back ON.
						Power is not being supplied to a Slave Rack or the terminator is not recognized in a Remote I/O System.	Check the power supply to the Slave Racks and terminating resistance settings for Remote I/O Systems. Also check cable connections in the Remote I/O Systems.

Startup Condition

The CS1-H CPU Units support a Startup Condition setting.

To start the CPU Unit in MONITOR or PROGRAM mode even if there is one or more Boards or Units that has not completed startup processing, set the Startup Condition to 1.

PLC Setup

Programming Console address		Name	Settings	Default
Word	Bit			
+83	15	Startup Condition	0: Wait for Units and Boards. 1: Don't wait.	0: Wait for Units and Boards.

Note The operation for Inner Boards, however, also depends on the next setting of the Inner Board Setting in word +84, but 15. This bit must also be turned ON to not wait for Inner Boards.

Fatal Errors

A fatal error has occurred if the indicators have the following conditions in RUN or MONITOR mode.

Power Supply Unit Indicator	CPU Unit Indicators				
POWER	RUN	ERR/ALM	INH	PRPHL	COMM
ON	OFF	ON	---	---	---

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Connect the CX-Programmer or a Programming Console to display the error message (in the PLC Error Window on the CX-Programmer). The cause of the error can be determined from the error message and related Auxiliary Area flags and words.

Errors are listed in order of importance. When two or more errors occur at the same time, the more serious error's error code will be recorded in A400.

If the IOM Hold Bit hasn't been turned ON to protect I/O memory, all non-retained areas of I/O memory will be cleared when a fatal error other than FALS(007) occurs. If the IOM Hold Bit is ON, the contents of I/O memory will be retained but all outputs will be turned OFF.

If the IOM Hold Bit hasn't been turned ON to protect I/O memory, all non-retained areas of I/O memory will be cleared when a fatal error other than FALS(007) occurs. When the IOM Hold Bit is ON, the contents of I/O memory will be retained but all outputs will be turned OFF.

Error	Programming Console display	Error code (in A400)	Flag and word data	Probable cause	Possible remedy
Memory error	MEMORY ERR	80F1	A40115: Memory Error Flag A403: Memory Error Location	An error has occurred in memory. A bit in A403 will turn ON to show the location of the error as listed below.	See below.
				A40300 ON: A checksum error has occurred in the user program memory. The power was turned OFF while storing data to the flash memory (backup memory).	Check the program and correct the error.
				A40304 ON: A checksum error has occurred in the PLC Setup.	Clear the entire PLC Setup to 0000 and reenter the settings.
				A40305 ON: A checksum error has occurred in the registered I/O table.	Initialize the registered I/O table and generate a new I/O table.
				A40307 ON: A checksum error has occurred in the routing tables.	Initialize the routing tables and reenter the tables.
				A40308 ON: A checksum error has occurred in the CS-series CPU Bus Unit setup.	Initialize the CS-series CPU Bus Unit setup and reenter the settings.
				A40309 ON: An error occurred during automatic transfer from the Memory Card at startup.	Make sure that the Memory Card is installed properly and that the correct file is on the Card.
				A40310 ON: Flash memory has failed.	Retransfer the user program and parameter data.

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Error	Programming Console display	Error code (in A400)	Flag and word data	Probable cause	Possible remedy
I/O Bus error	I/O BUS ERR	80C0 to 80C7 or 80CF	A40114: I/O Bus Error Flag A404: I/O Bus Error Slot and Rack Numbers	Error has occurred in the bus line between the CPU and I/O Units. A40400 to A40407 contain the error slot number (00 to 09) in binary. 0F indicates that the slot cannot be determined. A40408 to A40415 contain the error rack number (00 to 07) in binary. 0F indicates that the rack cannot be determined.	Try turning the power OFF and ON again. If the error isn't corrected, turn the power OFF and check cable connections between the I/O Units and Racks. Check for damage to the cable or Units. Correct the cause of the error and then turn the Rack's power supply OFF and then ON again
	I/O BUS ERR B	80CB	A404: I/O Bus Error Slot and Rack Numbers	I/O bus error B: CPU Unit is mounted to a Duplex Backplane. Note: A40400 to A40407 = 0F hex A40408 to A40415 = 0B hex	Turn OFF the power, replace the Backplane with a CS1W-BC□□□ Backplane, and turn the power back ON.
Unit/Rack Number Duplication error	UNIT No. DPL ERR	80E9	A40113: Duplication Error Flag A410: CPU Bus Unit Duplicate Number Flags	The same number has been allocated to more than one CS-series CPU Bus Unit. Bits A41000 to A41015 correspond to unit numbers 0 to F.	Check the unit numbers, eliminate the duplications, and turn the Rack's power supply OFF and then ON again.
			A40113: Duplication Error Flag A411 to A416: Special I/O Unit Duplicate Number Flags	The same number has been allocated to more than one Special I/O Unit. Bits A41100 to A41615 correspond to unit numbers 0 to 95.	Check the unit numbers, eliminate the duplications, and turn the Rack's power supply OFF and then ON again.
	RACK No. DPL ERR	80EA	A409: Expansion Rack Duplicate Rack Number	The same I/O word has been allocated to more than one Basic I/O Unit.	Check allocations to Units on the rack number whose bit in ON in A40900 to A40907. Correct the allocations so that no words are allocated more than once, including to Units on other Racks, and turn the Rack's power supply OFF and then ON again.
				An Expansion I/O Rack's starting word address exceeds CIO 0901. The corresponding bit in A40900 to A40907 (Racks 0 to 7) will be turned ON.	Check the first word setting for the Rack indicated in A40900 to A40907 and change the setting to a valid word address below CIO 0901 with a Programming Device.
Fatal Inner Board error	FATAL INNER ERR	82F0	A40112: Inner Board Stopped Error Flag A424: Inner Board Error Information	The Inner Board is faulty. An error occurred on the Inner bus.	Check the indicators on the Inner Board and refer to the operation manual for the Inner Board.

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Error	Programming Console display	Error code (in A400)	Flag and word data	Probable cause	Possible remedy
Too Many I/O Points error	TOO MANY I/O PNT	80E1	A40111: Too Many I/O Points Flag A407: Too Many I/O Points, Details	The probable causes are listed below. The 3-digit binary value (000 to 101) in A40713 to A40715 indicates the cause of the error. The value of these 3 bits is also output to A40700 to A40712. 1) The total number of I/O points set in the I/O Table (excluding Slave Racks) exceeds the maximum allowed for the CPU Unit (bits: 000). 2) There are more than 32 interrupt inputs (bits: 001). 3) The unit number of a Slave Unit is duplicated or the number of I/O points on a C500 Slave Unit exceeds 320 (bits: 010). 4) The unit number of an I/O Interface (excluding Slave Racks) is duplicated (bits: 011). 5) The unit number of a Master Unit is duplicated or the unit number is outside of the allowed setting range (bits: 100). 6) The number of Expansion Racks exceeds the maximum (bits: 101). 7) C200H Special I/O Unit not detected or Remote I/O not detected (bits: 110)	Correct the problem indicated by the content of A407 and turn the power OFF and ON again.
I/O Table Setting error	I/O SET ERR	80E0	A40110: I/O Setting Error Flag	Input and output word allocations do no agree with input/output words required by Units actually mounted.	Check the I/O table with I/O Table Verification operation. When the system has been corrected, register the I/O table again.

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Error	Programming Console display	Error code (in A400)	Flag and word data	Probable cause	Possible remedy
Program error	PROGRAM ERR	80F0	A40109: Program Error Flag A294 to A299: Program error information	The program is incorrect. See the following rows of this table for details. The address at which the program stopped will be output to A298 and A299.	Check A295 to determine the type of error that occurred and check A298/A299 to find the program address where the error occurred. Correct the program and then clear the error.
				A29511: No END error	Be sure that there is an END(001) instruction at the end of the task specified in A294 (program stop task number).
				A29512: Task error A task error has occurred. The following conditions will generate a task error. 1) There isn't an executable cyclic task. 2) There isn't a program allocated to the task. Check A294 for the number of the task missing a program. 3) The task specified in a TKON(820), TKOF(821), or MSKS(690) instruction doesn't exist.	• Check the startup cyclic task attributes. • Check the execution status of each task as controlled by TKON(820) and TKOF(821). • Make sure that all of the task numbers specified in TKON(820), TKOF(821), and MSKS(690) instructions have corresponding tasks. Use MSKS(690) to mask any I/O or scheduled interrupt tasks that are not being used and that do not have programs set for them. • If the power OFF interrupt task is enables in the PLC Setup, make sure that the power OFF interrupt task has been created.
				A29510: Illegal access error An illegal access error has occurred and the PLC Setup has been set to stop operation for an instruction error. The following are illegal access errors: 1. Reading/writing a parameter area. 2. Writing memory that is not installed. 3. Writing an EM bank that is EM file memory. 4. Writing to a read-only area. 5. Indirect DM/EM address that is not in BCD when BCD mode is specified.	Find the program address where the error occurred (A298/A299) and correct the instruction.
				A29509: Indirect DM/EM BCD error An indirect DM/EM BCD error has occurred and the PLC Setup has been set to stop operation for an instruction error.	Find the program address where the error occurred (A298/A299) and correct the indirect addressing or change to binary mode.

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Error	Programming Console display	Error code (in A400)	Flag and word data	Probable cause	Possible remedy
Program error (contd.)	PROGRAM ERR	80F0	A40109: Program Error Flag A294 to A299: Program error information	A29508: Instruction error An instruction processing error has occurred and the PLC Setup has been set to stop operation for an instruction error.	Find the program address where the error occurred (A298/A299) and correct the instruction. Alternatively, set the PLC Setup to continue operation for an instruction error.
				A29513: Differentiation overflow error Too many differentiated instructions have been inserted or deleted during online editing.	After writing any changes to the program, switch to PROGRAM mode and then return to MONITOR mode to continue editing the program.
				A29514: Illegal instruction error The program contains an instruction that cannot be executed.	Retransfer the program to the CPU Unit.
				A29515: UM overflow error The last address in UM (user program memory) has been exceeded.	Use a Programming Device to transfer the program again.
Cycle Time Overrun error	CYCLE TIME ERR	809F	A40108: Cycle Time Too Long Flag	The cycle time has exceeded the maximum cycle time (watch cycle time) set in the PLC Setup.	Change the program to reduce the cycle time or change the maximum cycle time setting. Check the Maximum Interrupt Task Processing Time in A440 and see if the Cycle Time Watch Time can be changed. The cycle time can be reduced by dividing unused parts of the program into tasks, jumping unused instructions in tasks, and disabling cyclic refreshing of Special I/O Units that don't require frequent refreshing.
			A40515: Peripheral Servicing Cycle Time Too Long	Turns ON when the peripheral servicing time in a Parallel Processing Mode exceeds 2 s.	Change the CPU Processing Mode in the PLC Setup to Normal Mode or Peripheral Servicing Priority Mode, or review the system to reduce the event load. Parallel processing may not be possible if the program execution time (given in A66) is too short (e.g., less than 0.2 ms).
System FALS error	SYS FAIL FALS	C101 to C2FF	A40106: FALS Error Flag	FALS(007) has been executed in the program. The error code in A400 will indicate the FAL number. The leftmost digit of the code will be C and the rightmost 3 digits of the code will be from 100 to 2FF hex and will correspond to FAL numbers 001 to 511.	Correct according to cause indicated by the FAL number (set by user).

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Non-fatal Errors

A non-fatal error has occurred if the indicators have the following conditions in RUN or MONITOR mode.

Power Supply Unit Indicator	CPU Unit Indicators				
POWER	RUN	ERR/ALM	INH	PRPHL	COMM
ON	ON	Flashing	---	---	---

Connect the CX-Programmer or a Programming Console to display the error message (in the PLC Error Window on the CX-Programmer). The cause of the error can be determined from the error message and related Auxiliary Area flags and words.

Errors are listed in order of importance. When two or more errors occur at the same time, the more serious error's error code will be recorded in A400.

Error	Programming Console display	Error code (in A400)	Flag and word data	Probable cause	Possible remedy
System FAL error	SYS FAIL FAL	4101 to 42FF	A40215: FAL Error Flag A360 to A391: Executed FAL Number Flags	FAL(006) has been executed in program. Executed FAL Number Flags A36001 to A39115 correspond to FAL numbers 001 to 511. The error code in A400 will indicate the FAL number. The leftmost digit of the code will be 4 and the rightmost 3 digits of the code will be from 100 to 2FF hex and will correspond to FAL numbers 001 to 511.	Correct according to cause indicated by FAL number (set by user).
Interrupt Task error	INTRPT ERR	008B	A40213: Interrupt Task Error Flag A426: Interrupt Task Error, Task Number	PLC Setup Set to Detect Interrupt Task Errors: An interrupt task was executed for more than 10 ms during I/O refreshing of a C200H Special I/O Unit or a SYSMAC BUS Remote I/O Unit.	Check the program. Either disable detection of interrupt task errors in the PLC Setup (address 128, bit 14) or correct the problem in the program.
				PLC Setup Set to Detect Interrupt Task Errors: Attempted to refresh a Special I/O Unit's I/O from an interrupt task with IORF(097) while the Unit's I/O was being refreshed by cyclic I/O refreshing (duplicate refreshing).	
Basic I/O error	DENSITY I/O ERR	009A	A40212: Basic I/O Unit Error Flag A408: Basic I/O Unit Error, Slot Number	An error has occurred in a Basic I/O Unit (including C200H High-density I/O Units and C200H Interrupt Input Units). A408 contains the errant rack/slot number.	Check the errant Unit for blown fuse, etc.

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Error	Programming Console display	Error code (in A400)	Flag and word data	Probable cause	Possible remedy
PLC Setup error	PLC Setup ERR	009B	A40210: PLC Setup Error Flag A406: PLC Setup Error Location	There is a setting error in the PLC Setup. The location (binary offset) of the error is written to A406.	Change the indicated setting to a valid setting.
I/O Table Verification error	I/O VRFY ERR	00E7	A40209: I/O Verification Error Flag	A Unit has been added or removed, so the registered I/O tables don't agree with the actual Units in the PLC. The I/O Verification Error Flag goes OFF when the situation is corrected.	Execute the I/O Table Verify operation to find the problem location. Create new I/O tables or replace the Unit to match the registered I/O tables.
Non-fatal Inner Board error	NO-FTL INNER ERR	02F0	A40208: Inner Board Error Flag A424: Inner Board Error Information	An error occurred in the Inner Board	Check the Inner Board indicators. Refer to the Inner Board's operation manual for details.
CS-series CPU Bus Unit error	CPU BU ERR	0200 to 020F	A40207: CS-series CPU Bus Unit Error Flag A417: CS-series CPU Bus Unit Error, Unit Number Flags	An error occurred in a data exchange between the CPU Unit and a CS-series CPU Bus Unit. The corresponding flag in A417 is turned ON to indicate the problem Unit. Bits A41700 to A41715 correspond to unit numbers 0 to F.	Check the Unit indicated in A417. Refer to the Unit's operation manual to find and correct the cause of the error. Restart the Unit by toggling its Restart Bit or turn the power OFF and ON again. Replace the Unit if it won't restart.
Special I/O Unit error	SIOU ERR	0300 to 035F, or 03FF	A40206: Special I/O Unit Error Flag A418 to A423: Special I/O Unit Error, Unit Number Flags	An error occurred in a data exchange between the CPU Unit and a Special I/O Unit. The corresponding flag in A418 to A423 is turned ON to indicate the problem Unit. Bits A41800 to A42315 correspond to unit numbers 0 to 95.	Check the Unit indicated in A418 to A423. Refer to the Unit's operation manual to find and correct the cause of the error. Restart the Unit by toggling its Restart Bit or turn the power OFF and ON again. Replace the Unit if it won't restart.
SYSMAC BUS error	SYSBUS ERR	00A0 or 00A1	A40205: SYSMAC BUS Error Flag A405: SYSMAC BUS Master Error Flags	An error has occurred between a Master and Slave Rack. A Unit has been removed from or added to a Slave Rack. The flag for the affected Master Unit will be turned ON. A40500: Flag for Master Unit #0 A40501: Flag for Master Unit #1	Check the condition of the Slave Unit and the transmission line between the Master Unit and Slave Unit.
Battery error	BATT LOW	00F7	A40204: Battery Error Flag	This error occurs when the PLC Setup has been set to detect battery errors and the CPU Unit's backup battery is missing or its voltage has dropped.	Check battery and replace if necessary. Change the PLC Setup setting if battery-free operation is being used.

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Error	Programming Console display	Error code (in A400)	Flag and word data	Probable cause	Possible remedy
CS-series CPU Bus Unit Setup error	CPU BU ST ERR	0400 to 040F	A40203: CS-series CPU Bus Unit Setting Error Flag A427: CS-series CPU Bus Unit Setting Error, Unit Number Flags	An installed CS-series CPU Bus Unit does not match the CS-series CPU Bus Unit registered in the I/O table. The corresponding flag in A427 will be ON. Bits 00 to 15 correspond to unit numbers 0 to F.	Change the registered I/O tables.
Special I/O Unit Setup error	SIOU SETUP ERR	0500 to 055F	A40202: Special I/O Unit Setting Error Flag A428 to A433: Special I/O Unit Setting Error, Unit Number Flags	An installed Special I/O Unit does not match the Special I/O Unit registered in the I/O table. The corresponding flag in A428 to A433 will be ON. Bits A42800 to A43315 correspond to unit numbers 0 to 95.	

Other Errors

Peripheral Port Communications Error

A communications error has occurred in communications with the device connected to the peripheral port if the indicators have the following conditions.

Power Supply Unit Indicator	CPU Unit Indicators				
POWER	RUN	ERR/ALM	INH	PRPHL	COMM
ON	ON	---	---	OFF	---

Check the setting of pin 4 on the DIP switch and the peripheral port settings in the PLC Setup. Also check the cable connections.

RS-232C Port Communications Error

A communications error has occurred in communications with the device connected to the RS-232C port if the indicators have the following conditions.

Power Supply Unit Indicator	CPU Unit Indicators				
POWER	RUN	ERR/ALM	INH	PRPHL	COMM
ON	ON	---	---	---	OFF

Check the setting of pin 5 on the DIP switch and the RS-232C port settings in the PLC Setup. Also check the cable connections. If a host computer is connected, check the communications settings of the serial port on the host computer and the communications program in the host computer.

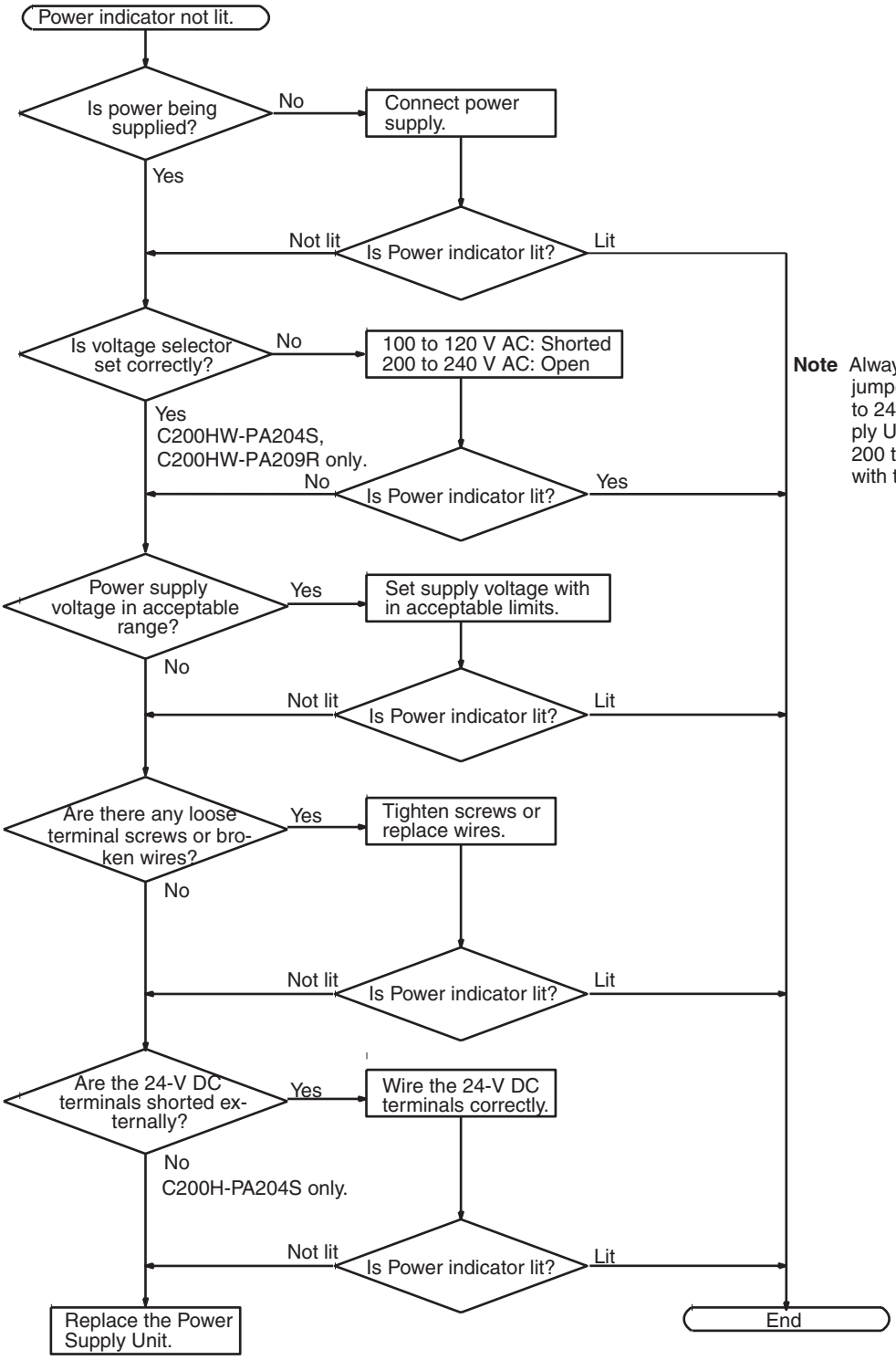
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11-2-6 Power Supply Check

The allowable voltage ranges are shown in the following table.

Power Supply Unit	Power supply voltage	Allowable voltage range
C200HW-PA204S or C200HW-P209R	100 to 120 V AC	85 to 132 V AC
	200 to 240 V AC	170 to 264 V AC
C200HW-PA204, C200HW-PA204R, or C200HW-PA204C	100 to 240 V AC	85 to 264 V AC
C200HW-PD024	24 V DC	20.4 to 28.8 V DC
C200HW-PD025	24 V DC	19.2 to 28.8 V DC

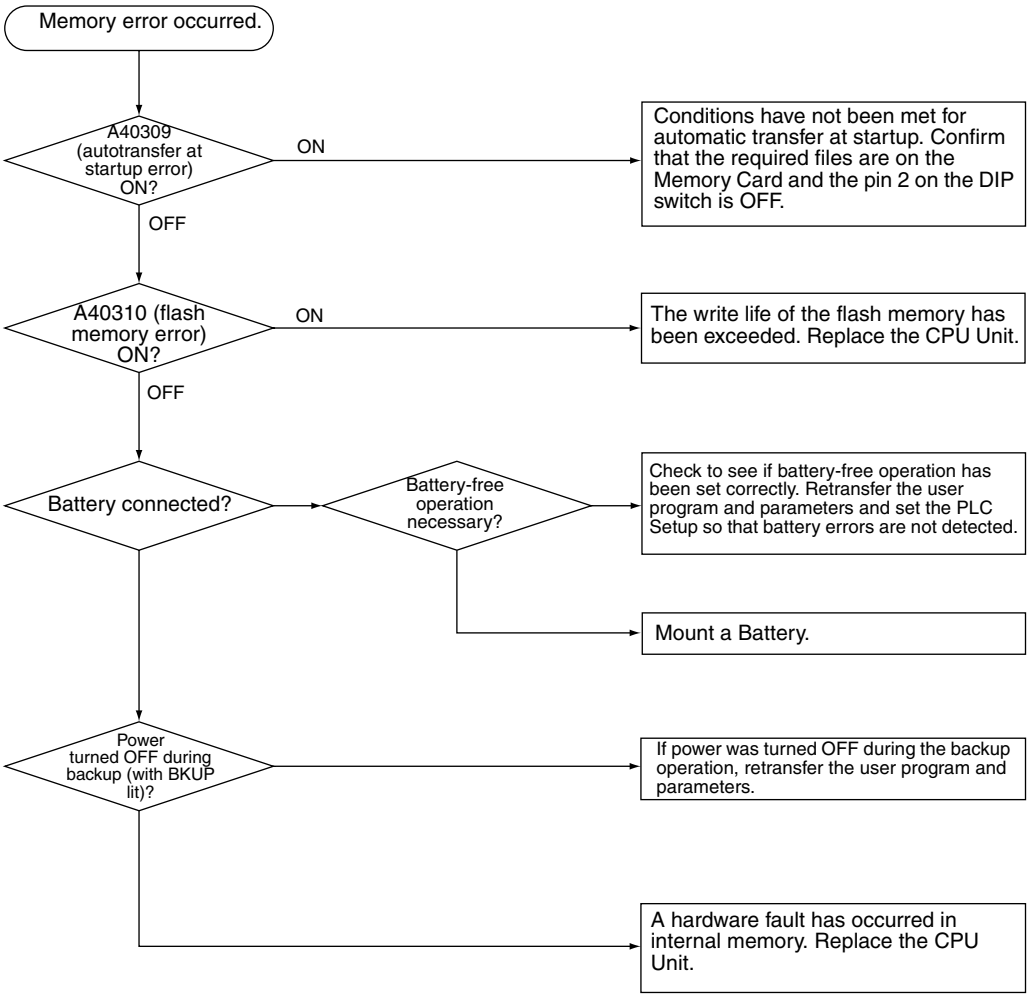
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Note Always remove the short jumper before supplying 200 to 240 V AC. The Power Supply Unit will be destroyed if 200 to 240 V AC is supply with the jumper connected.

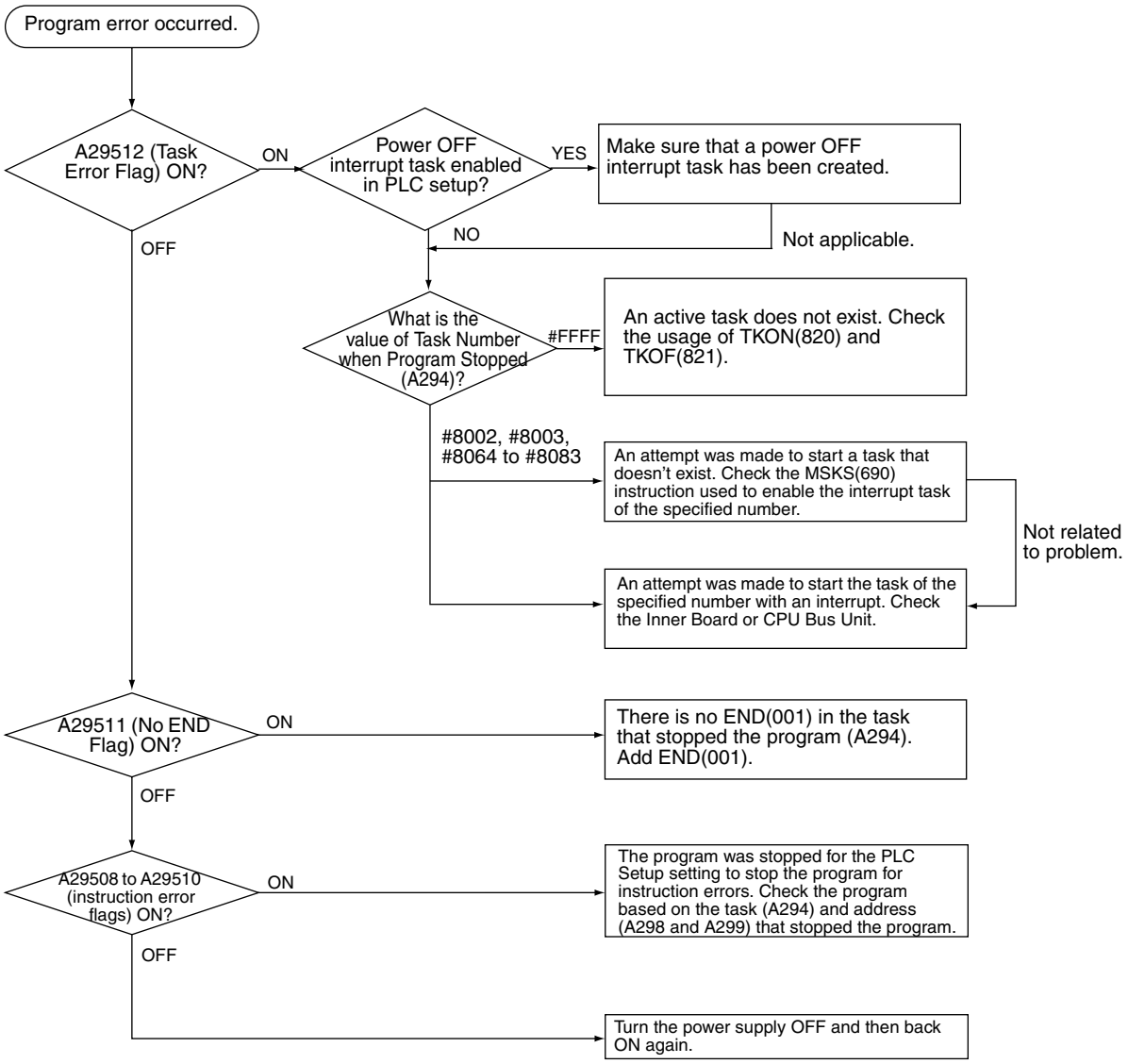
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11-2-7 Memory Error Check



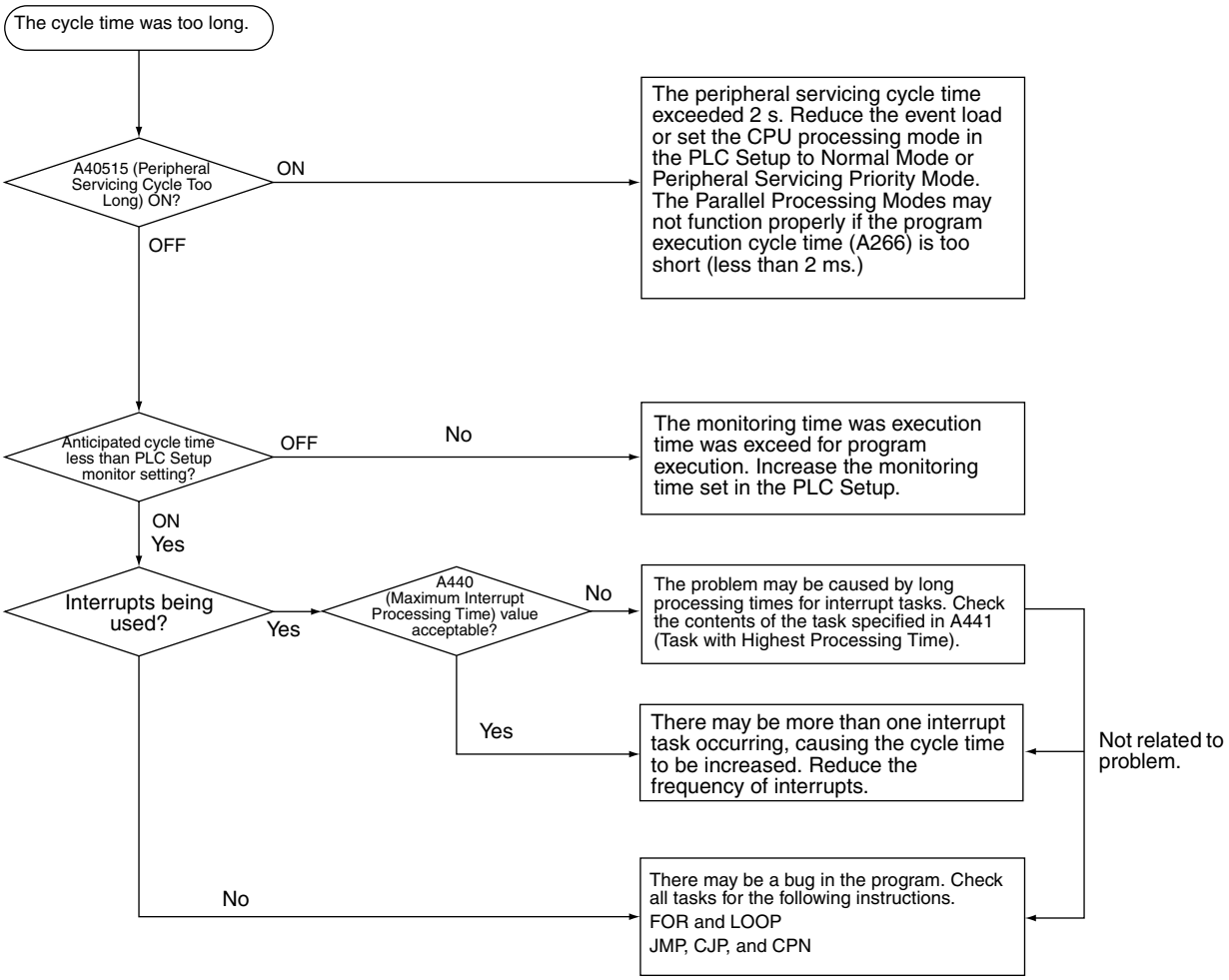
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11-2-8 Program Error Check

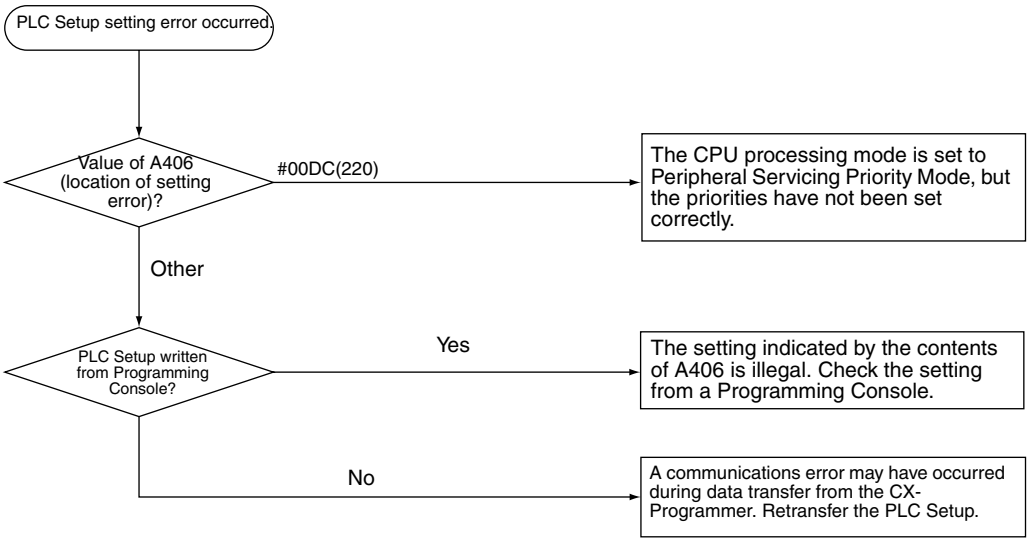


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11-2-9 Cycle Time Too Long Error Check

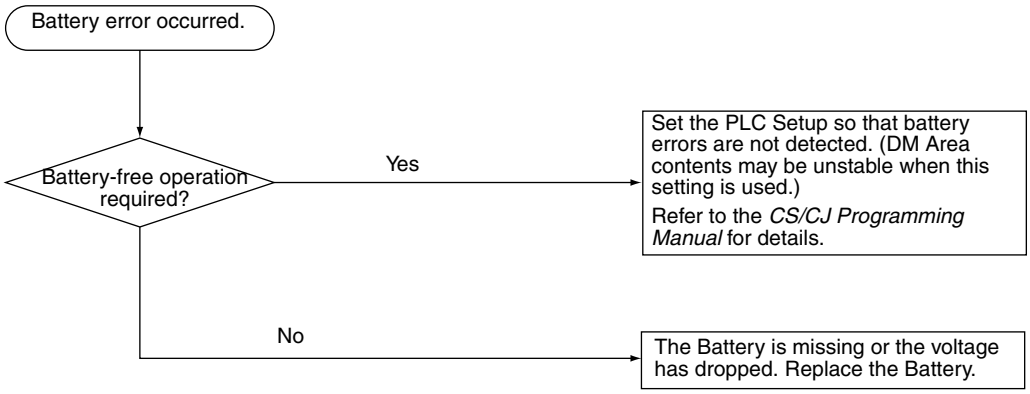


11-2-10 PLC Setup Setting Error Check

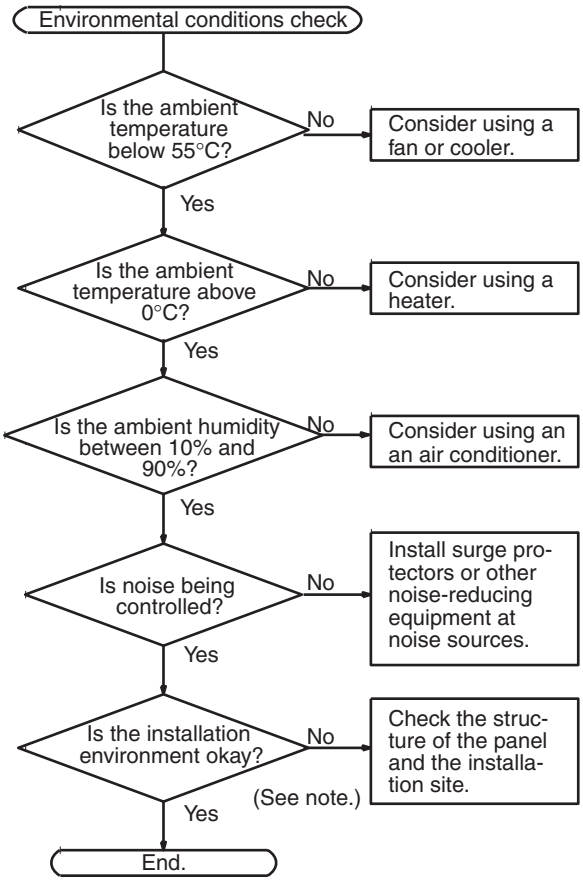


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11-2-11 Battery Error Check



11-2-12 Environmental Conditions Check

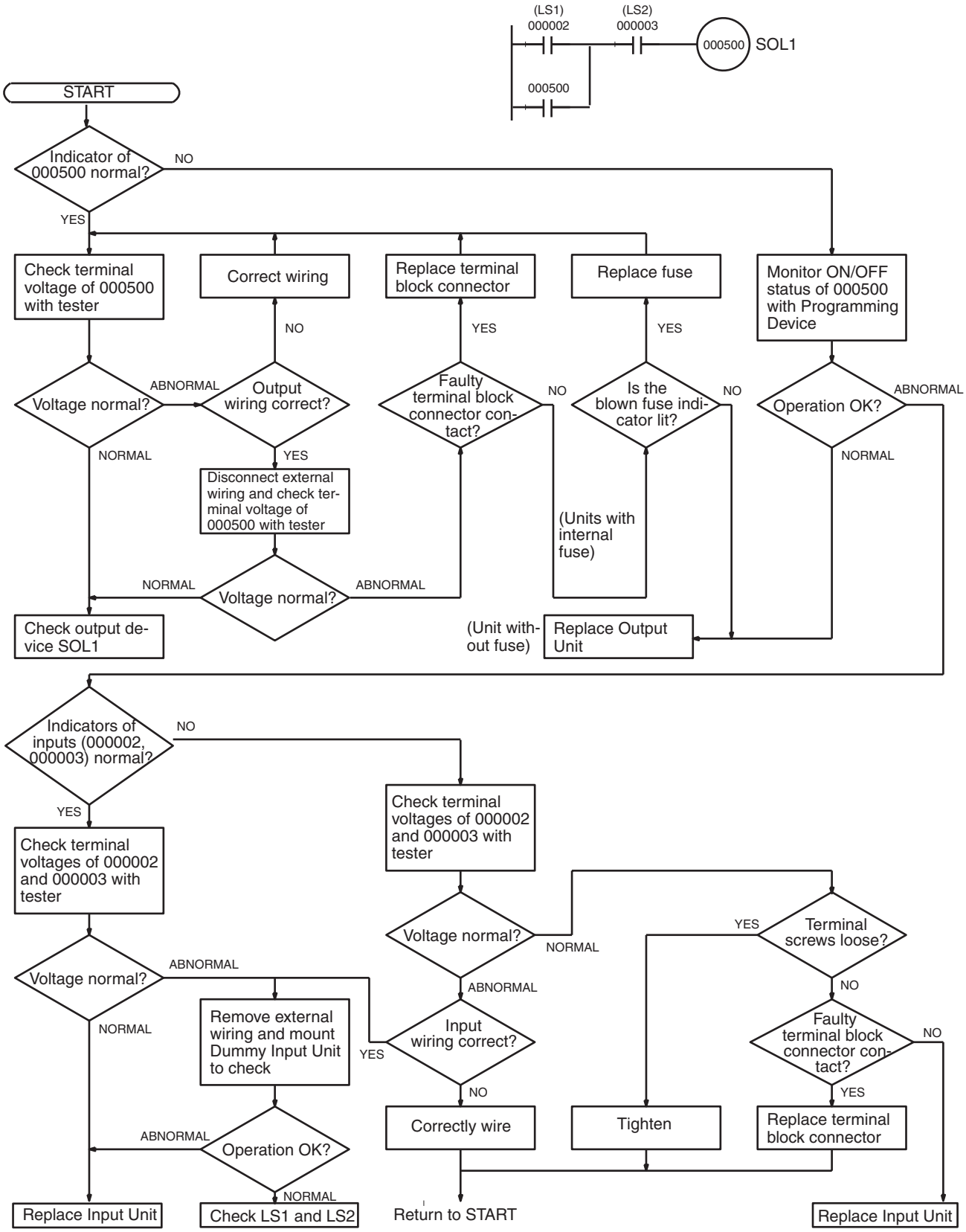


Note Check for corrosive gases, flammable gases, dust, dirt, salts, metal dust, direct light, water, oils, and chemicals.

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11-2-13 I/O Check

The I/O check flowchart is based on the following ladder diagram section assuming that SOL1 does not turn ON.



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11-3 Troubleshooting Racks and Units

CPU Racks and Standard Expansion Racks

Symptom	Cause	Remedy
POWER indicator is not lit.	PCB short-circuited or damaged.	Replace Power Supply Unit or Backplane.
	(1) Error in program.	Correct program.
	(2) Power line is faulty.	Replace Power Supply Unit.
RUN output* does not turn ON. RUN indicator lit. (*C200HW-PS204R/209R)	Internal circuitry of Power Supply Unit is faulty.	Replace Power Supply Unit.
Serial Communications Unit or CS-series CPU Bus Unit does not operate or malfunctions.	(1) The I/O Connecting Cable is faulty. (2) The I/O bus is faulty.	Replace the I/O Connecting Cable Replace the Backplane.
Bits do not operate past a certain point.		
Error occurs in units of 8 points.		
I/O bit turns ON.		
All bits in one Unit do not turn ON.		

Special I/O Units

Refer to the *Operation Manual* for the Special I/O Unit to troubleshoot any other errors.

Symptom	Cause	Remedy
The ERH and RUN indicators on the Special I/O Unit are lit.	I/O refreshing is not being performed for the Unit from the CPU Unit (CPU Unit monitoring error). It's possible that cyclic refreshing has been disabled for the Special I/O Unit in the Cyclic Refresh Disable Setting in the PLC Setup (i.e., the bit corresponding to the unit number has been set to 1).	Change the bit corresponding to the unit number to 0 to enable cyclic refreshing, or make sure that the Unit is refreshed from the program using IORF at least once every 11 s.

CS-series Long-distance Expansion Racks

Symptom	Cause	Remedy
CPU Unit won't operate. (No response to Programming Devices and no CPU Unit indicators are lit.)	(1) Power is not turned ON to an Expansion Rack.	Turn ON power to all Expansion Racks.
	(2) An Expansion Rack is not connected correctly.	Recheck the connections and configuration using information in *2-3-3 Expansion Racks, 3-5-4 I/O Control Units, I/O Interface Units, and Terminators,* and *5-2-7 I/O Connecting Cables.*
	(3) An I/O Connecting Cable is not wired correctly.	Reconnect the I/O Connecting Cables in the correct order for output and input connectors.
	(4) A Unit is faulty.	Gradually remove/replace Units to determine the Unit that is faulty, including the Backplane, Power Supply Unit, I/O Units, I/O Control/Interface Unit, and I/O Connecting Cable.

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Symptom	Cause	Remedy
Expansion Rack not detected.	(1) A Terminator is not connected.	If the TERM indicator is lit, connect a Terminator.
	(2) An Expansion Rack is not connected correctly.	Recheck the connections and configuration using information in *2-3-3 Expansion Racks, 3-5-4 I/O Control Units, I/O Interface Units, and Terminators,* and *5-2-7 I/O Connecting Cables.*
	(3) A Unit is faulty.	Gradually remove/replace Units to determine the Unit that is faulty, including the Backplane, Power Supply Unit, I/O Units, I/O Control/Interface Unit, and I/O Connecting Cable.
I/O bus error or I/O verification error occurs.	(1) An I/O Connecting Cable or Terminator connection is faulty.	Check that I/O Connecting Cables and Terminators are connected correctly.
	(2) Expansion cable is not wired correctly	Rewire the terminals using the correct OUT-IN sequence.
	(3) Noise or other external factor.	Separate all cables from possible sources of noise or place them in metal ducts.
	(4) A Unit is faulty.	Gradually remove/replace Units to determine the Unit that is faulty, including the Backplane, Power Supply Unit, I/O Units, I/O Control/Interface Unit, and I/O Connecting Cable.
Cycle time is too long.	(1) A CPU Bus Unit that is allocated many words (e.g., Controller Link Unit) is mounted to a CS-series Long-distance Expansion Rack.	Move the CPU Bus Unit to the CPU Rack.
	(2) A Unit is faulty.	Gradually remove/replace Units to determine the Unit that is faulty, including the Backplane, Power Supply Unit, I/O Units, I/O Control/Interface Unit, and I/O Connecting Cable.
I/O Control Unit and I/O Interface Units do not appear on CX-Programmer I/O table.	This is not an error. These Units are not allocated I/O words and thus are not registered in the I/O tables.	---

Input Units

Symptom	Cause	Remedy
Not all inputs turn ON or indicators are not lit.	(1) Power is not supplied to Input Unit.	Supply power
	(2) Supply voltage is low.	Adjust supply voltage to within rated range.
	(3) Terminal block mounting screws are loose.	Tighten screws.
	(4) Faulty contact of terminal block connector.	Replace terminal block connector.
Not all inputs turn ON (indicator lit).	Input circuit is faulty. (There is a short at the load or something else that caused an overcurrent to flow.)	Replace Unit.
Not all inputs turn OFF.	Input circuit is faulty.	Replace Unit.
Specific bit does not turn ON.	(1) Input device is faulty.	Replace input devices.
	(2) Input wiring disconnected.	Check input wiring.
	(3) Terminal block screws are loose.	Tighten screws.
	(4) Faulty terminal block connector contact.	Replace terminal block connector.
	(5) Too short ON time of external input.	Adjust input device.
	(6) Faulty input circuit	Replace Unit.
	(7) Input bit number is used for output instruction.	Correct program.

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Symptom	Cause	Remedy
Specific bit does not turn OFF.	(1) Input circuit is faulty.	Replace Unit.
	(2) Input bit number is used for output instruction.	Correct program.
Input irregularly turns ON/OFF.	(1) External input voltage is low or unstable.	Adjust external input voltage to within rated range.
	(2) Malfunction due to noise.	Take protective measures against noise, such as: (1) Increase input response time (PLC Setup) (2) Install surge suppressor. (3) Install insulation transformer. (4) Install shielded cables between the Input Unit and the loads.
	(3) Terminal block screws are loose.	Tighten screws.
	(4) Faulty terminal block connector contact.	Replace terminal block connector.
Error occurs in units of 8 points or 16 points, i.e., for the same common.	(1) Common terminal screws are loose.	Tighten screws.
	(2) Faulty terminal block connector contact.	Replace terminal block connector.
	(3) Faulty data bus	Replace Unit.
	(4) Faulty CPU	Replace CPU.
Input indicator is not lit in normal operation.	Faulty indicator or indicator circuit.	Replace Unit.

Output Units

Symptom	Cause	Remedy
Not all outputs turn ON	(1) Load is not supplied with power.	Supply power
	(2) Load voltage is low.	Adjust voltage to within rated range.
	(3) Terminal block screws are loose.	Tighten screws.
	(4) Faulty terminal block connector contact.	Replace terminal block connector.
	(5) An overcurrent (possibly caused by a short at the load) resulted in a blown fuse in the Output Unit. (Some Output Units provide an indicator for blown fuses.)	Replace fuse or Unit.
	(6) Faulty I/O bus connector contact.	Replace Unit.
	(7) Output circuit is faulty.	Replace Unit.
	(8) If the INH indicator is lit, the Output OFF Bit (A50015) is ON.	Turn A50015 OFF.
Not all outputs turn OFF	Output circuit is faulty.	Replace Unit.
Output of a specific bit number does not turn ON or indicator is not lit.	(1) Output ON time too short because of a mistake in programming.	Correct program to increase the time that the output is ON.
	(2) Bit status controlled by multiple instructions.	Correct program so that each output bit is controlled by only one instruction.
	(3) Faulty output circuit.	Replace Unit.
Output of a specific bit number does not turn ON (indicator lit).	(1) Faulty output device.	Replace output device.
	(2) Break in output wiring.	Check output wiring.
	(3) Loose terminal block screws.	Tighten screws.
	(4) Faulty terminal block connector faulty.	Replace terminal block connector.
	(5) Faulty output bit.	Replace relay or Unit.
	(6) Faulty output circuit.	Replace Unit.
Output of a specific bit number does not turn OFF (indicator is not lit).	(1) Faulty output bit.	Replace relay or Unit.
	(2) Bit does not turn OFF due to leakage current or residual voltage.	Replace external load or add dummy resistor.

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Symptom	Cause	Remedy
Output of a specific bit number does not turn OFF (indicator lit).	(1) Bit status controlled by multiple instructions.	Correct program.
	(2) Faulty output circuit.	Replace Unit.
Output irregularly turns ON/OFF.	(1) Low or unstable load voltage.	Adjust load voltage to within rated range
	(2) Bit status controlled by multiple instructions.	Correct program so that each output bit is controlled by only one instruction.
	(3) Malfunction due to noise.	Protective measures against noise: (1) Install surge suppressor. (2) Install insulation transformer. (3) Use shielded cables between the Output Unit and the loads.
	(4) Terminal block screws are loose.	Tighten screws.
	(5) Faulty terminal block connector contact.	Replace terminal block connector.
Error occurs in units of 8 points or 16 points, i.e., for the same common.	(1) Loose common terminal screw.	Tighten screws.
	(2) Faulty terminal block connector contact.	Replace terminal block connector.
	(3) An overcurrent (possibly caused by a short at the load) resulted in a blown fuse in the Output Unit.	Replace fuse or Unit.
	(4) Faulty data bus.	Replace Unit.
	(5) Faulty CPU.	Replace CPU.
Output indicator is not lit (operation is normal).	Faulty indicator.	Replace Unit.

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SECTION 12
Inspection and Maintenance

This section provides inspection and maintenance information.

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12-1-2 Unit Replacement Precautions 559
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12-1 Inspections

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

12-1-1 Inspection Points

Although the major electronic components in CS-series PLCs 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.

Inspection Points

No.	Item	Inspection	Criteria	Action
1	Source Power Supply	Check for voltage fluctuations at the power supply terminals.	The voltage must be within the allowable voltage fluctuation range. (See note.)	Use a voltage tester to check the power supply at the terminals. Take necessary steps to bring voltage fluctuations within limits.
2	I/O Power Supply	Check for voltage fluctuations at the I/O terminals.	Voltages must be within specifications for each Unit.	Use a voltage tester to check the power supply at the terminals. Take necessary steps to bring voltage fluctuations within limits.
3	Ambient environment	Check the ambient temperature. (Inside the control panel if the PLC is in a control panel.)	0 to 55°C	Use a thermometer to check the temperature and ensure that the ambient temperature remains within the allowed range of 0 to 55°C.
		Check the ambient humidity. (Inside the control panel if the PLC is in a control panel.)	Relative humidity must be 10% to 90% with no condensation.	Use a hygrometer to check the humidity and ensure that the ambient humidity remains within the allowed range.
		Check that the PLC is not in direct sunlight.	Not in direct sunlight	Protect the PLC if necessary.
		Check for accumulation of dirt, dust, salt, metal filings, etc.	No accumulation	Clean and protect the PLC if necessary.
		Check for water, oil, or chemical sprays hitting the PLC.	No spray on the PLC	Clean and protect the PLC if necessary.
		Check for corrosive or flammable gases in the area of the PLC.	No corrosive or flammable gases	Check by smell or use a sensor.
		Check the level of vibration or shock.	Vibration and shock must be within specifications.	Install cushioning or shock absorbing equipment if necessary.
		Check for noise sources near the PLC.	No significant noise sources	Either separate the PLC and noise source or protect the PLC.
4	Installation and wiring	Check that each Unit is installed securely.	No looseness	Tighten loose screws with a Phillips-head screwdriver.
		Check that cable connectors are fully inserted and locked.	No looseness	Correct any improperly installed connectors.
		Check for loose screws in external wiring.	No looseness	Tighten loose screws with a Phillips-head screwdriver.
		Check crimp connectors in external wiring.	Adequate spacing between connectors	Check visually and adjust if necessary.
		Check for damaged external wiring cables.	No damage	Check visually and replace cables if necessary.

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No.	Item	Inspection	Criteria	Action
5	User-service-able parts	Check whether internal relays in Relay Output Units have reached their service life.	No open relay contacts, improper operation, or faulty contacts Refer to *Appendix A Specifications of Basic I/O Units and High-density I/O Units* for information on relay service life.	Replace the relay or Unit.
		Check whether the CS1W-BAT01 Battery has reached its service life.	Life expectancy is 5 years at 25°C, less at higher temperatures. (From 0.4 to 5 years depending on model, power supply rate, and ambient temperature.)	Replace the battery when its service life has passed even if a battery error has not occurred. (Battery life depends upon the model, the percentage of time in service, and ambient conditions.)
		Check for blown fuses.	Preventative maintenance	Even if the fuses are not blown, they should be replace periodically because they are weakened by inrush currents.

Note The following table shows the allowable voltage fluctuation ranges for source power supplies.

Supply voltage	Allowable voltage range
100 to 120 V AC	85 to 132 V AC
200 to 240 V AC	170 to 264 V AC
24 V DC	19.2 to 28.8 V DC

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

- Synchroscope
- Oscilloscope with pen plotter
- Thermometer and hygrometer (humidity meter)

12-1-2 Unit Replacement Precautions

Check the following after replacing any faulty Unit.

- Do not replace a Unit until the power is turned OFF.
- Check the new Unit to make sure that there are no errors.
- If a faulty Unit is being returned for repair, describe the problem in as much detail as possible, enclose this description with the Unit, and return the Unit to your OMRON representative.
- For poor contact, take a clean cotton cloth, soak the cloth in industrial alcohol, and carefully wipe the contacts clean. Be sure to remove any lint prior to remounting the Unit.

Note

1. When replacing a CPU Unit, be sure that not only the user program but also all other data required for operation is transferred to or set in the new CPU Unit before starting operation, including DM Area and HR Area settings. If data area and other data are not correct for the user program, un-

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expected accidents may occur. Be sure to include the routing tables, Controller Link Unit data link tables, network parameters, and other CPU Bus Unit data, which are stored as parameters in the CPU Unit. Refer to the CPU Bus Unit and Special I/O Unit operation manuals for details on the data required by each Unit.

2. The simple backup operation can be used to store the user program and all parameters for the CS1-H CPU Unit, DeviceNet Units, Serial Communications Units, and other specific Units in a Memory Card as backup files. A Memory Card and the simple backup operation can be used to easily restore data after replacing any of these Units. Refer to the *CS/CJ Series Programming Manual* (W394) for details.

12-2 Replacing User-serviceable Parts

The following parts should be replaced periodically as preventative maintenance. The procedures for replacing these parts are described later in this section.

- Battery (the CPU Unit's RAM-backup battery)
- Output Unit fuses (in Transistor Output and Triac Output Units)
- Output Unit relays (in Relay Output Units)

12-2-1 Battery Replacement

Battery Functions

The battery retains the following data of the CPU Unit's RAM when the main power supply is OFF.

- Retained regions of I/O memory (such as the Holding Area and DM Area)

If the battery is not installed or battery voltage drops too low, the clock will stop and the data in RAM will not be stable when the main power supply turns OFF.

Battery Service Life and Replacement Period

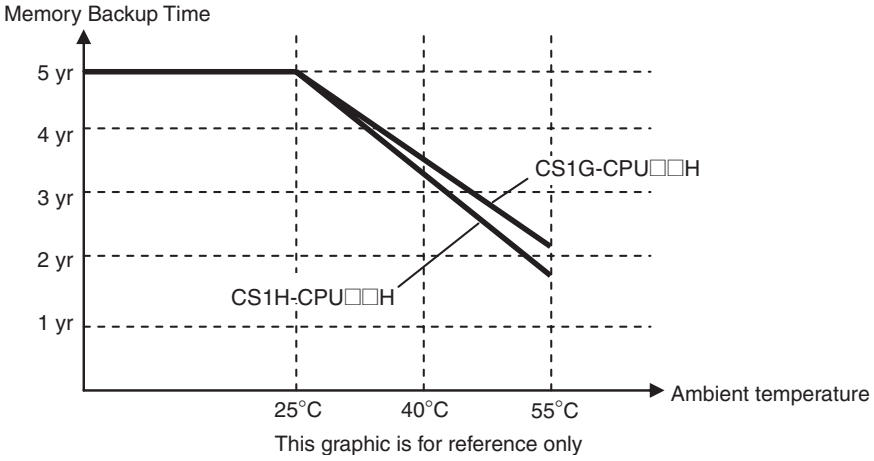
At 25°C, the maximum service life for batteries is 5 years whether or not power is supplied to the CPU Unit while the battery is installed. The battery's lifetime will be shorter when it is used at higher temperatures and when power is not supplied to the CPU Unit for long periods.

The following table shows minimum lifetimes and typical lifetimes for the backup batterys.

Model	Approx. maximum lifetime	Approx. minimum lifetime (See note.)	Typical lifetime (See note.)
CS1H-CPU□□H	5 years	15,000 hours (1.7 years)	43,000 hours (5 years)
CS1G-CPU□□H	5 years	18,000 hours (2.1 years)	43,000 hours (5 years)

Note 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.

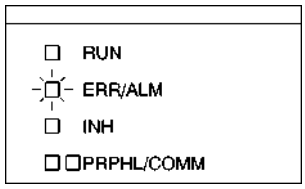
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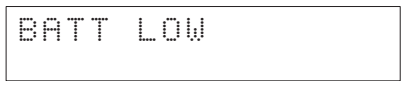
This graphic is for reference only

Low Battery Indicators

If the PLC Setup has been set to detect a low-battery error, the ERR/ALM indicator on the front of the CPU Unit will flash when the CPU Unit detects that the battery is nearly discharged.



When the ERR/ALM indicator flashes, connect the CX-Programmer to the peripheral port and read the error message. If the message “BATT LOW” appears on the Programming Console* and the Battery Error Flag (A40204) is ON*, first check whether the battery is properly connected to the CPU Unit. If the battery is properly connected, replace the battery as soon as possible.



Once a low-battery error has been detected, the battery will fail in 5 days. Battery failure can be delayed by ensuring that the CPU Unit power is not turned OFF until the battery has been replaced.

Note *The PLC Setup must be set to detect a low-battery error (Detect Low Battery). If this setting has not been made, the BATT LOW error message will not appear on the Programming Console and the Battery Error Flag (A40204) will not go ON when the battery fails.

Replacement Battery

The battery replacement method depends the CPU Unit’s unit version.

⚠ **Caution** 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 with the power ON, but be sure to touch a grounded metal object to discharge any static electricity before replacing the battery. After replacing the battery, connect a Programming Device and clear the battery error.

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Unit Versions and Corresponding Battery Replacement Methods

Type	Unit version	Number of battery connectors	Replacement time (see note)	Replacement method
CS1-H CPU Units	Pre-Ver. 2.0 Unit Ver. 2.0	1	3 min.	Refer to *Replacement Procedure for CS1-H CPU Units (Pre-Ver. 2.0 and Ver. 2.0) with One Battery Connector*.
	Unit Ver. 3.0	2	3 min.	Refer to *Replacement Procedure for CS1-H (Ver. 3.0) CPU Units with Two Battery Connectors*.

Note The replacement time indicates the time required to install a new battery after turning OFF the power (25°C). If the CPU Unit is without a battery for a longer period of time, data will not be stable.

Replacement Procedure for CS1-H CPU Units (Pre-Ver. 2.0 and Ver. 2.0) with One Battery Connector

Use the following procedure to replace a battery that has been completely discharged.

1,2,3...

1. Turn OFF the power to the CPU Unit. (If the power was already OFF, turn the power ON for at least one minute before turning the power OFF again.)

Note There is a capacitor in the CPU Unit that will back up memory while the battery is being replaced. If this capacitor is not completely charged by turning ON the power supply for one minute, data will not be stable during battery replacement.

2. Insert a small flat-blade screwdriver into the notch at the bottom of the battery compartment cover and lift open the cover.
3. Disconnect the connector under the cover of the CPU Unit, remove the old battery from the compartment, and replace the battery with a new one.

Note Complete the battery replacement procedure (at an ambient temperature of 25°C) within three minutes of turning OFF the power supply. If more than three minutes elapse without a battery installed in the CPU Unit, data will not be stable during battery replacement.

Replacement Procedure for CS1-H (Ver. 3.0) CPU Units with Two Battery Connectors

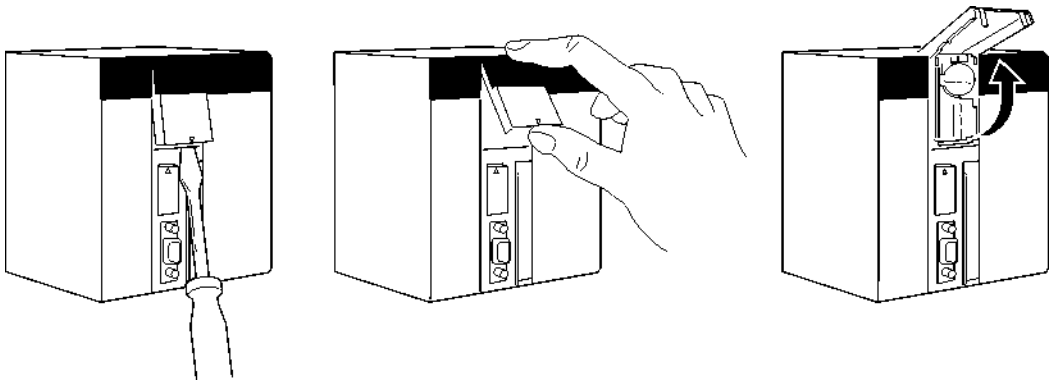
Use the following procedure to replace a battery that has been completely discharged.

When replacing a battery with the power OFF, connect the new battery while the old battery is in place. Remove the old battery after connecting the new battery. (There are two pairs of identical connectors for the battery. The old battery will not be charged even if the new battery is connected at the same time.)

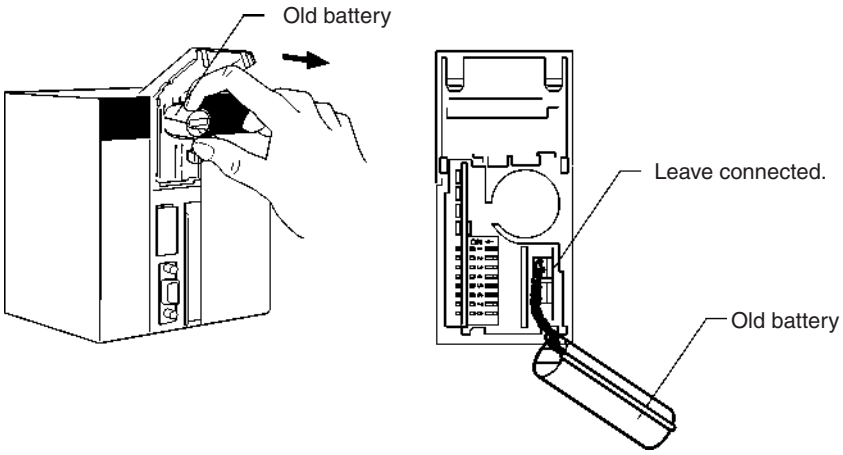
1,2,3...

1. Turn OFF the power to the CPU Unit. (If the power was already OFF, turn the power ON for at least ten seconds before turning the power OFF again.)
2. Insert a small flat-blade screwdriver into the notch at the bottom of the battery compartment cover and lift open the cover.

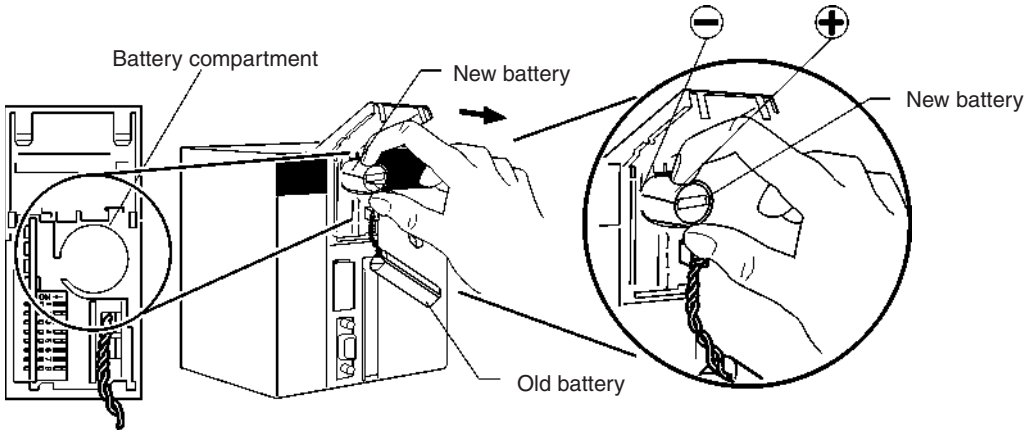
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3. Remove the old battery from the compartment, but leave its connector connected.

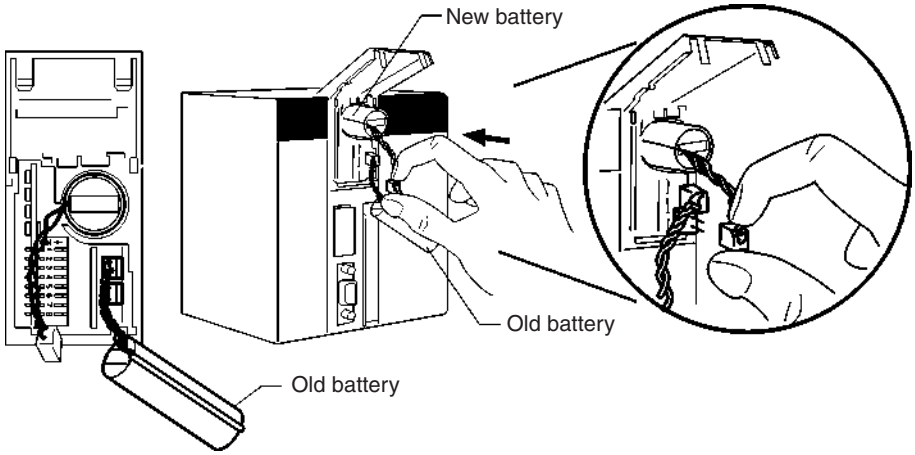


4. Insert the new battery into the battery compartment with the cable and connector facing outward.

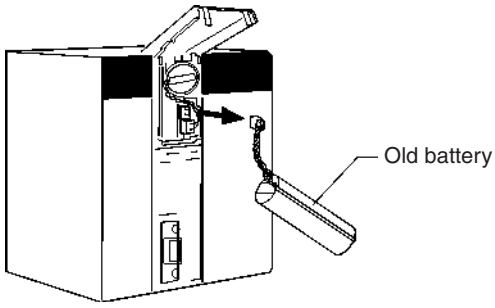


5. With the old battery connected, insert the new battery's connector in the open connector in the CPU Unit. Be sure that the connector is inserted so that its red wire is at the top and the white wire is at the bottom.

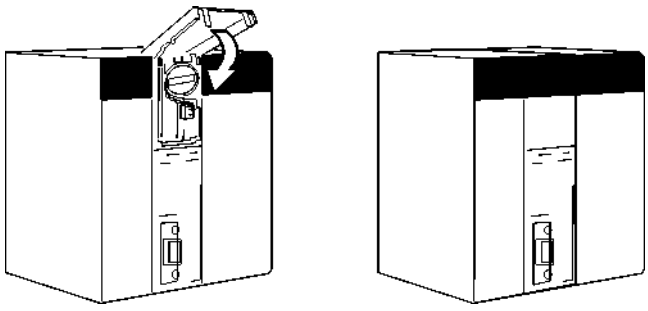
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6. Remove the old battery's connector.



7. Push the new battery's wire into the battery compartment and close the cover.



8. Connect a Programming Device and verify that the Battery Error has been cleared.

Note

1. If the above procedure is not used and the old battery is disconnected with the power ON (power ON and no battery connected), memory will still be backed up. However, be sure to touch a grounded metal object to discharge any static electricity before replacing the battery.
2. With CPU Units that have two battery connectors, leave the old battery attached while connecting the new battery. This prevents a battery error occurring during battery replacement. Remove the old battery after the new battery is connected.

⚠ **Caution** With a CS1-H CPU Unit, do not short the battery terminals or charge, disassemble, heat, or incinerate the battery. Do not subject the battery to strong shocks. Doing any of these may result in leakage, rupture, heat generation, or ignition of the battery.

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⚠ **Caution** 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.

⚠ **Caution** Do not allow unqualified persons to replace batteries. UL standards required that batteries be replaced only by experienced technicians.

⚠ **Caution** 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.

12-2-2 Output Unit Fuse Replacement

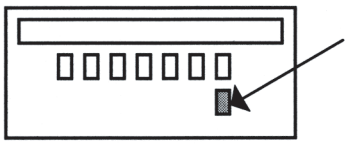
The following Transistor and Triac Output Units contain one fuse for each common. For the C200H-OD411/OD213/OD221/OA223 Units which have a blown-fuse (F) indicator, replace the fuse if the fuse indicator lights. For the C200H-OD211/OD212/OA222V/OA224 Units which do not have blown-fuse indicators, check the fuses if outputs are not produced.

Replacement Fuses

The Output Units are supplied with one spare fuse in the back of each Unit; if two or more fuses need to be replaced, use replacement fuses which meet the specifications shown in the following table.

Unit type	Model	Unit specifications	Blown-fuse indicators*	Fuse specifications
Transistor Output	C200H-OD411	8 outputs, 1 A, 12 to 48 V DC	Yes	125 V, 5 A (5.2 mm × 20 mm)
	C200H-OD211	12 outputs, 0.3 A, 24 V DC	No	
	C200H-OD212	16 outputs, 0.3 A, 24 V DC	No	125 V, 8 A (5.2 mm × 20 mm)
	C200H-OD213	8 outputs, 2.1 A, 24 V DC	Yes	
Triac Output	C200H-OA221	8 outputs, 1 A, 250 V AC max.	Yes	250 V, 5 A (5.2 mm × 20 mm)
	C200H-OA222V	12 outputs, 0.3 A, 250 V AC max.	No	250 V, 3 A (5.2 mm × 20 mm)
	C200H-OA223	8 outputs, 1.2 A, 250 V AC max.	Yes	250 V, 5 A (5.2 mm × 20 mm)
	C200H-OA224	12 outputs, 0.5 A, 250 V AC max.	No	250 V, 3.15 A (5.2 mm × 20 mm)

Note The C200H-OD411/OD213/OD221/OA223 Output Units have a blown-fuse (F) indicator at the location shown in the following diagram. When a fuse blows in one of these Units, the blown-fuse indicator will light and bit 8 of the word allocated to the Unit will be turned ON.



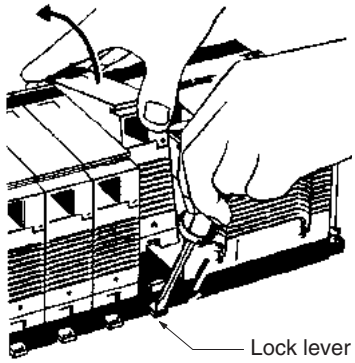
Replacement Procedure

1,2,3...

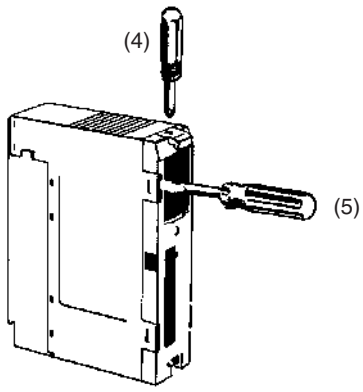
1. Turn OFF the power to the PLC.
2. Remove the terminal block by unlocking the lock levers at the top and bottom of the terminal block. The terminal block can be removed without disconnecting the wiring.

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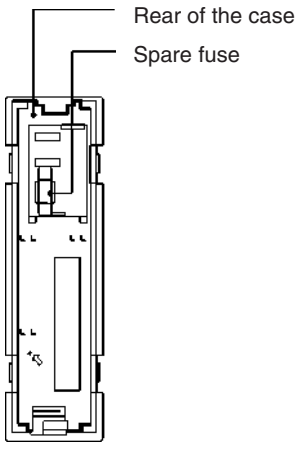
3. Remove the Output Unit. Push down the lock lever on the Backplane with a screwdriver and lift the Unit out as shown below.



4. Use a Phillips-head screwdriver to remove the screws from the top and bottom of the Unit.
5. Use a slotted screwdriver to detach the case from the Unit.



6. Pull out the printed circuit board.
7. Insert a new fuse. A spare fuse is provided inside the rear of the case when the Unit is delivered.



8. Reverse the steps above to reassemble the Unit.

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12-2-3 Relay Replacement

A Relay Output Unit's relay is probably faulty if one of the Unit's outputs remains ON or OFF regardless of the execution of output instructions in the program. Replace a relay if it remains ON or OFF or if the Unit's contact is otherwise faulty.

Replacement Relays

The following Output Units are equipped with relay sockets that allow the Relays to be replaced if they should go bad. Use the Relay listed in the following table.

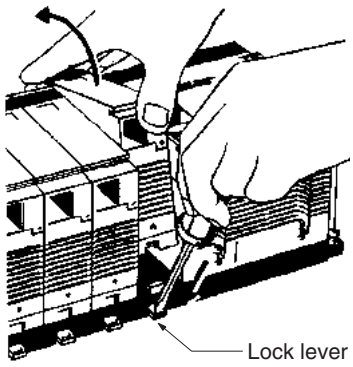
Model	Unit specifications	Replacement Relay
C200H-OC221	8 outputs, 2 A, 250 V AC/24 V DC max.	G6B-1174P-FD-US-M 24 V DC
C200H-OC222	12 outputs, 2 A, 250 V AC/24 V DC max.	
C200H-OC225	16 outputs, 2 A, 250 V AC/24 V DC max.	
C200H-OC223	5 outputs, 2 A, 250 V AC/24 V DC max. (independent commons)	
C200H-OC224	8 outputs, 2 A, 250 V AC/24 V DC max. (independent commons)	
C200H-OC222V	12 outputs, 2 A, 250 V AC/24 V DC max.	G6R-1, 24 V DC
C200H-OC226	16 outputs, 2 A, 250 V AC/24 V DC max.	
C200H-OC224V	8 outputs, 2 A, 250 V AC/24 V DC max.	

Note Relays cannot be replaced for the C200H-OC222N/OC226N/OC224N or the CS1W-OC201/OC211.

Replacement Procedure

1,2,3...

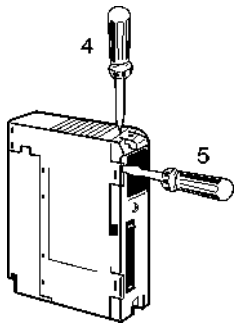
1. Turn OFF the power to the PLC.
2. Remove the terminal block by unlocking the lock levers at the top and bottom of the terminal block. The terminal block can be removed without disconnecting the wiring.
3. Remove the Output Unit. Push down the lock lever on the Backplane with a screwdriver and lift the Unit out as shown below.



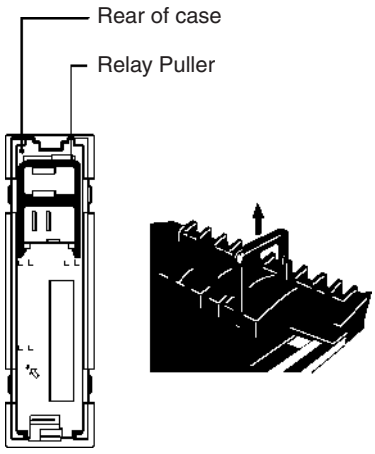
4. Use a Phillips-head screwdriver to remove the screws from the top and bottom of the Unit.

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5. Use a slotted screwdriver to detach the case from the Unit.



6. Pull out the printed circuit board.
7. Replace the faulty Relay with a new one. Use the Relay puller provided inside the rear of the case when the Unit is delivered. Relays for the C200H-OC222V/OC224V/OC226 can be replaced with the P6B-Y1 Relay Puller.

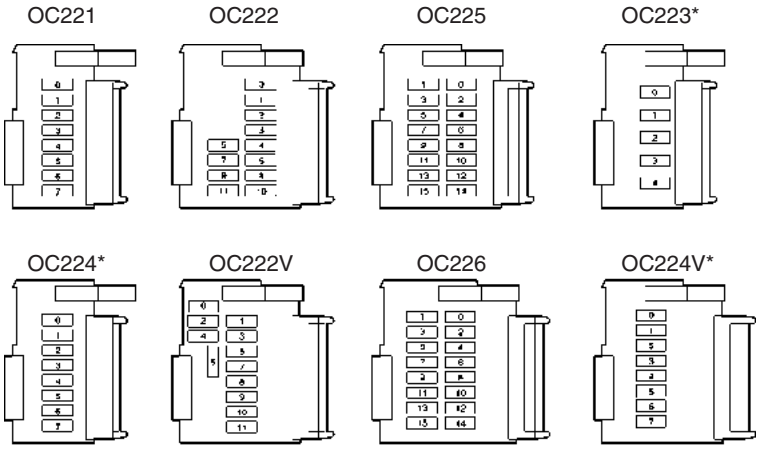


Grasp the faulty Relay with the Relay Puller and pull it out.

8. Reassemble the Unit by reversing the above procedure and mount it to the Backplane.

Note

1. Use the P6B-Y1 Relay Puller (sold separately) to remove Relays.
2. Check the pin arrangement before inserting a new Relay into the socket. Pins can only be inserted one way, so do not try to force them if they do not go in easily. Applying too much force can bend the pins and render the Relay unusable.



*The Relay Output Units marked with an asterisk have independent commons.

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Appendix A
Specifications of Basic I/O Units and High-density I/O Units

Input Units

Category	Name	Specifications	Model	Page
C200H/CS-series Basic Input Units with Terminal Blocks	AC Input Units	100 to 120V AC/V DC, 16 inputs, 50/60 Hz	CS1W-IA111	572
		100 to 120V AC, 8 inputs, 50/60 Hz	C200H-IA121	574
		100 to 120V AC, 16 inputs, 50/60 Hz	C200H-IA122	575
			C200H-IA122V	
		200 to 240V AC, 8 inputs	C200H-IA221	576
		200 to 240V AC, 16 inputs	C200H-IA222	578
			C200H-IA222V	
			CS1W-IA211	577
	AC/DC Input Units	12 to 24 V AC/V DC, 8 inputs	C200H-IM211	579
		24 V AC/V DC, 16 inputs	C200H-IM212	580
	DC Input Units	12 to 24 V DC, 8 inputs	C200H-ID211	581
		12 to 24 V DC, 16 inputs	C200H-ID212	582
		24 V DC, 16 inputs	CS1W-ID211	583
	Interrupt Input Units	24 V DC, 16 inputs	CS1W-INT01	584
		12 to 24 V DC, 8 inputs	C200HS-INT01	585
	High-speed Input Unit	24 V DC, 16 inputs	CS1W-IDP01	586
CS-series Basic Input Units with Connectors C200H Group-2 High-density Input Units	DC Input Units	24 V DC, 32 inputs	CS1W-ID231	587
			C200H-ID216	589
			C200H-ID218	590
		12 V DC, 64 inputs	C200H-ID111	591
		24 V DC, 64 inputs	CS1W-ID261	593
			C200H-ID217	595
			C200H-ID219	596
		24 V DC, 96 inputs	CS1W-ID291	598
		Simultaneously ON 24-V DC inputs for CS1W-ID291/MD291/MD292		600

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Output Units

Category	Name	Specifications	Model	Page
C200H/CS-series Basic Outputs Units with Terminal Blocks	Relay Output Units	250V AC/24V DC, 2 A; 120 V DC, 0.1 A; independent contacts, 8 outputs	CS1W-OC201 (See note.)	602
		250V AC/24V DC, 2 A; 120 V DC, 0.1 A; 16 outputs	CS1W-OC211	601
		250V AC/24V DC, 2 A, independent contacts, 5 outputs	C200H-OC223	603
		250 V AC/24 V DC, 2 A, independent contacts, 8 outputs	C200H-OC224	604
			C200H-OC224V/224N	605
		250V AC/24V DC, 2 A, 8 outputs	C200H-OC221	606
		250V AC/24V DC, 2 A, 12 outputs	C200H-OC222	607
			C200H-OC222V/222N	608
		250V AC/24V DC, 2 A, 16 outputs	C200H-OC225	609
			C200H-OC226/226N	610
		Relay contact outputs		612
	Triac Output Units	250 V AC, 1.2 A, with fuse burnout detection circuit, 8 outputs	CS1W-OA201 (See note.)	619
		250 V AC, 1 A, with fuse burnout detection circuit, 8 outputs	C200H-OA221	615
		250 V AC, 1.2 A, with fuse burnout detection circuit, 8 outputs	C200H-OA223	616
		250 V AC, 0.3 A, 12 outputs	C200H-OA222V	617
		250 V AC, 0.5 A, 12 outputs	C200H-OA224	618
		250 V AC, 0.5 A, 16 outputs	CS1W-OA211	614
	Transistor Output Units, sinking outputs	24 V DC, 2.1 A, 8 outputs	C200H-OD213	620
		12 to 48 V DC, 1A, 8 outputs	C200H-OD411	621
		24 V DC, 0.3 A, 12 outputs	C200H-OD211	622
		24 V DC, 0.3 A, 16 outputs	C200H-OD212	623
		12 to 24 V DC, 0.5 A, 16 outputs	CS1W-OD211	624
	Transistor Output Units, sinking	12 to 24 V DC, 0.5 A, 32 outputs	CS1W-OD231	625
		4.5 V DC/16 mA to 26.4 V/100mA, with fuse burnout detection circuit, 32 outputs	C200H-OD218	626
		12 to 24 V DC, 0.3 A, 64 outputs	CS1W-OD261	629
		4.5 V DC/16 mA to 26.4 V/100mA, 64 outputs	C200H-OD219	630
		12 to 24 V DC, 0.1 A, with fuse burnout detection circuit, 96 outputs	CS1W-OD291	634
	Transistor Output Units, sourcing outputs	24 V DC, 0.8 A, load short-circuit protection, 8 outputs.	C200H-OD214	635
		5 to 24 V DC, 0.3 A, 8 outputs	C200H-OD216	638
		5 to 24 V DC, 0.3 A, 12 outputs	C200H-OD217	639
		24 V DC, 0.5 A, load short-circuit protection, 16 outputs	CS1W-OD212	640
		Load short-circuit protection for CS1W-OD212/OD232/OD262/MD262 and C200H-OD21B		641
		24 V DC, 1 A, load short-circuit protection, 16 outputs.	C200H-OD21A	643
		24 V DC, 0.5 A, load short-circuit protection, 32 outputs	CS1W-OD232	645
		24 V DC, 0.5 A, 32 outputs, sourcing outputs, load short-circuit protection	C200H-OD21B	646
		24 V DC, 0.3 A, load short-circuit protection, 64 outputs	CS1W-OD262	648
		24 V DC, with fuse burnout detection circuit, 0.1 A, 96 outputs	CS1W-OD292	649

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Note This Unit uses only 8 bits for external I/O even though 16 bits (1 word) are allocated. This Unit is also treated as a 16-point Unit in the I/O tables.

Mixed I/O Units

Category	Name	Specifications	Model	Page
CS-series Basic I/O Units with Connectors	DC Input/Transistor Output Units	24 V DC inputs; 12 to 24 V DC, 0.3-A, sinking outputs; 32 inputs, 32 outputs	CS1W-MD261	652
		24 V DC inputs; 12 to 24 V DC, 0.1 A, sinking outputs with fuse burnout detection circuit; 48 inputs, 48 outputs	CS1W-MD291	654
		24 V DC inputs 24 V DC, 0.3 A, sourcing outputs with load short-circuit protection; 32 inputs, 32 outputs	CS1W-MD262	657
		24 V DC inputs 24 V DC, 0.1 A, sourcing outputs with fuse burnout detection circuit; 48 inputs, 48 outputs	CS1W-MD292	659
	TTL I/O Unit	5 V DC, 3.5 mA inputs; 5 V DC, 35 mA, outputs; 32 inputs, 32 outputs	CS1W-MD561	662

Note For details on the connectors included with the Unit, refer to the information provided under *Accessories* in the tables for Basic I/O Units in the following pages.

Special I/O Units

High-density Input Units

Category	Name	Specifications	Model	Page
TTL Input Units	TTL Input Unit	5 V DC, static input mode, 32 inputs	C200H-ID501	664
DC Input Units	DC Input Unit	24 V DC, static input mode, 32 inputs	C200H-ID215	665

High-density Output Units

Category	Name	Specifications		Model	Page
TTL Output Units	TTL Output Units	5 V DC, 35 mA	Static output mode, 32 outputs	C200H-OD501	666
			Dynamic output mode, 128 outputs		668
Transistor Output Units	Transistor Output Units	4.5 V DC, 16 mA to 26.4 V, 100 mA	Static output mode, 32 outputs	C200H-OD215	670
			Dynamic output mode, 128 outputs		672

Mixed I/O Units

Category	Name	Specifications	Model	Page
TTL I/O Units	TTL I/O Units	Static input mode: 5 V DC inputs; 5 V DC, 35 mA outputs; 16 inputs, 16 outputs	C200H-MD501	675
		Dynamic output mode: 5 V DC, 35 mA outputs; 128 outputs		677

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Category	Name	Specifications	Model	Page
DC Input/Transistor Output Units	DC Input/Transistor Output Units	Static input mode: 12 V DC inputs; 4.5 V DC, 16 mA to 26.4 V 100 mA outputs, 16 inputs, 16 outputs	C200H-MD115	679
		Dynamic output mode: 12 V DC, 50 mA outputs; 128 outputs		682
		Static input mode: 24 V DC inputs, 24 V DC 16 mA to 26.4 V 100 mA outputs; 16 inputs, 16 outputs	C200H-MD215	684
		Dynamic output mode: 24 V DC, 100 mA outputs; 128 outputs		686
		Maximum switching capacity of C200H-MD115/MD215		688

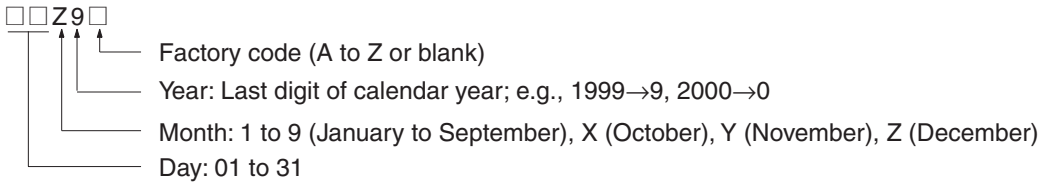
Specifications Changes for Transistor Output Units

Some of the specifications of the following Units with transistor outputs have been improved.

Output elements have been changed from NPN to field-effect transistors (FET). Part of the circuit configuration has been changed. There are no changes in performance characteristics as a result of these improvements, but care is required in connecting the polarity of the load power supply. Outputs will not operate dependably if the polarity is reversed. check the manufacturing number on your Unit before wiring.

Name	Model	Date of change	Manufacturing number (See below.)
Transistor Output Unit	C200H-OD215	Manufactured on or after November 30, 1999	30Y9 or later
DC Input/Transistor Output Unit	C200H-MD215		
Transistor Output Units	C200H-OD218	Manufactured on or after January 31, 2000	3110 or later
	C200H-OD219		

Manufacturing Numbers



The following figures and tables provide specifications for Basic I/O Units and High-density I/O Units. Refer to *Section SECTION 3 Nomenclature, Functions, and Dimensions* for dimensions.

Reading Terminal Connection Diagrams

- I/O terminals in terminal connection 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.

Basic I/O Units

CS1W-IA111 100-V AC Input Unit (16 Points)

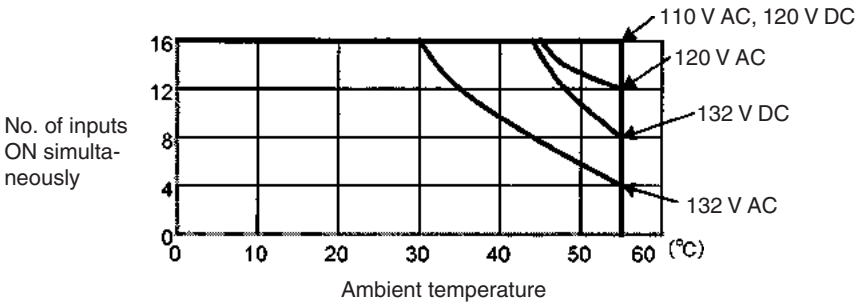
Rated Input Voltage	100 to 120 V AC (50/60 Hz), 100 to 120 V DC
Operating Input Voltage	85 to 132 V AC (50/60 Hz), 85 to 132 V DC
Input Impedance	10 kΩ (50 Hz), 8 kΩ (60 Hz), 69 kΩ (DC)
Input Current	10 mA typical (at 100 V AC), 1.5 mA typical (at 100 V DC)
ON Voltage	65 V AC min., 75 V DC min.
OFF Voltage	20 V AC max., 25 V DC max.
ON Response Time	18 ms max. when PLC Setup on default setting (8 ms) (See note.)

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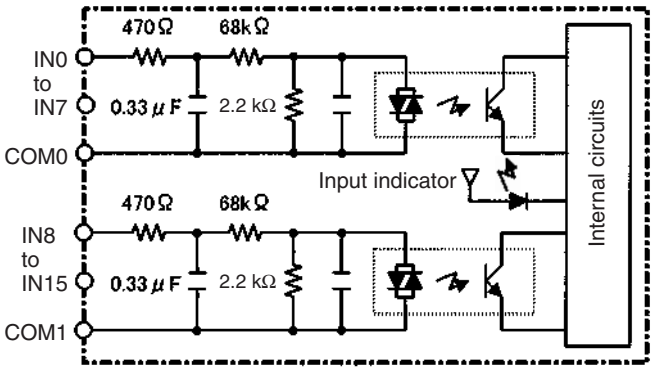
OFF Response Time	63 ms max. when PLC Setup on default setting (8 ms) (See note.)
Insulation Resistance	20 MΩ between external terminals and the GR terminal (500 V DC)
Dielectric Strength	2,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
No. of Circuits	2 (each 8 points/common)
Number of Inputs ON Simultaneously	100% simultaneously ON (for 110 V AC, 120 V DC) Refer to the diagram below.
Internal Current Consumption	110 mA 5 V DC max.
Weight	260 g max.

Note The Input ON and OFF response times for Basic I/O Units can be set to 0 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, or 32 ms in the PLC Setup. 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.

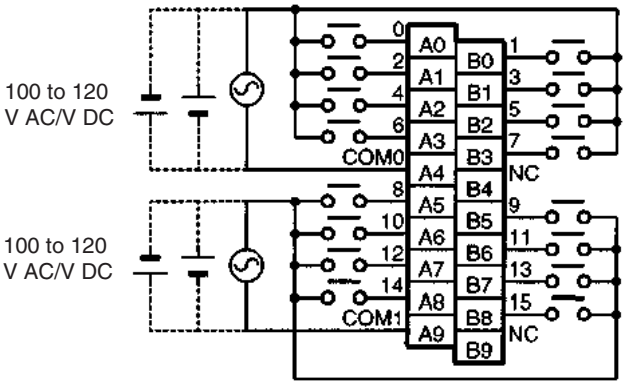
Number of Inputs ON Simultaneously



Circuit Layout



Terminal Connections



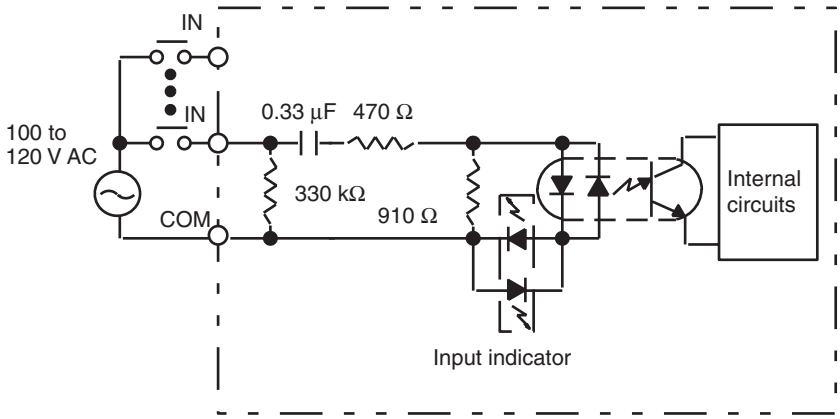
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Note Terminal numbers A0 to A9 and B0 to B9 are used in this manual, but they are not printed on the Unit.

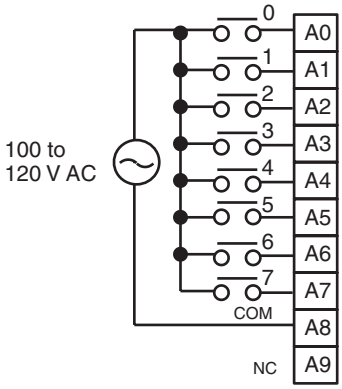
C200H-IA121 AC Input Unit (8 Points)

Rated Input Voltage	100 to 120 V AC (50/60 Hz)
Operating Input Voltage	85 to 132 V AC (50/60 Hz)
Input Impedance	9.7 kΩ (50 Hz), 8 kΩ (60 Hz)
Input Current	10 mA typical (at 100 V AC)
ON Voltage	60 V AC min.
OFF Voltage	20 V AC max.
ON Response Time	35 ms max. (at 100 V AC, 25°C)
OFF Response Time	55 ms max. (at 100 V AC, 25°C)
No. of Circuits	1 (8 points/common)
Internal Current Consumption	10 mA 5 V DC max.
Weight	250 g max.

Circuit Configuration



Terminal Connections

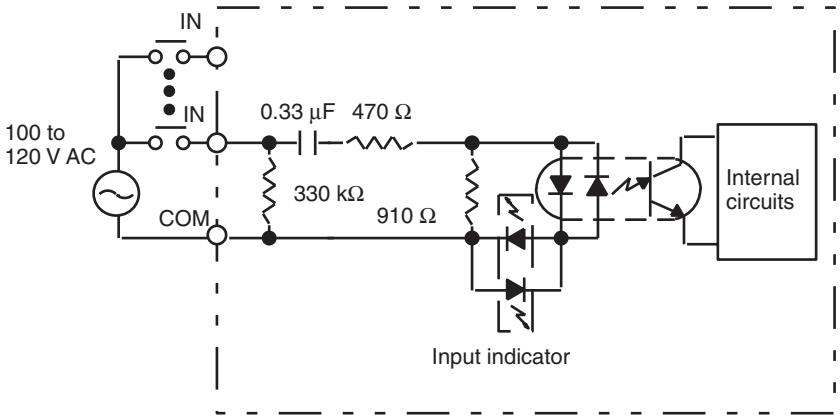


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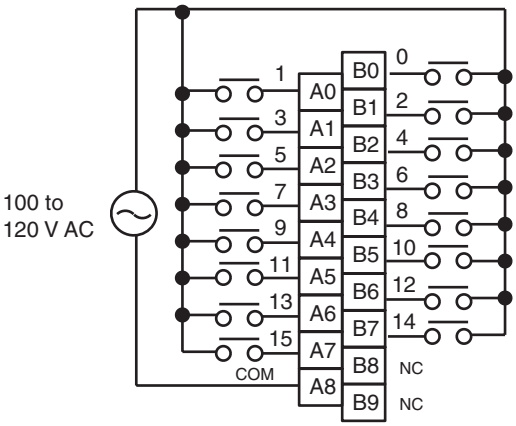
C200H-IA122/IA122V AC Input Unit (16 Points)

Rated Input Voltage	100 to 120 V AC (50/60 Hz)
Operating Input Voltage	85 to 132 V AC (50/60 Hz)
Input Impedance	9.7 kΩ (50 Hz), 8 kΩ (60 Hz)
Input Current	10 mA typical (at 100 V AC)
ON Voltage	60 V AC min.
OFF Voltage	20 V AC max.
ON Response Time	35 ms max. (at 100 V AC, 25°C)
OFF Response Time	55 ms max. (at 100 V AC, 25°C)
No. of Circuits	1 (16 points/common)
Internal Current Consumption	10 mA 5 V DC max.
Weight	300 g max./400 g max. (IA122V)

Circuit Configuration



Terminal Connections

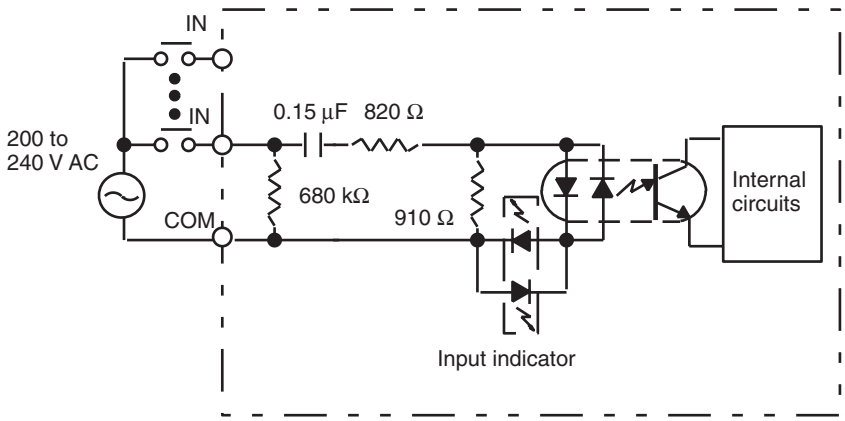


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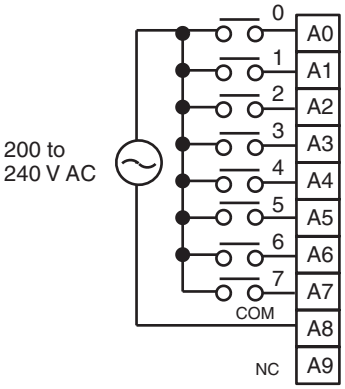
C200H-IA221 AC Input Unit (8 Points)

Rated Input Voltage	200 to 240 V AC (50/60 Hz)
Operating Input Voltage	170 to 264 V AC (50/60 Hz)
Input Impedance	21 kΩ (50 Hz), 18 kΩ (60 Hz)
Input Current	10 mA typical (at 200 V AC)
ON Voltage	120 V AC min.
OFF Voltage	40 V AC max.
ON Response Time	35 ms max. (at 200 V AC, 25°C)
OFF Response Time	55 ms max. (at 200 V AC, 25°C)
No. of Circuits	1 (8 points/common)
Internal Current Consumption	10 mA 5 V DC max.
Weight	250 g max.

Circuit Configuration



Terminal Connections



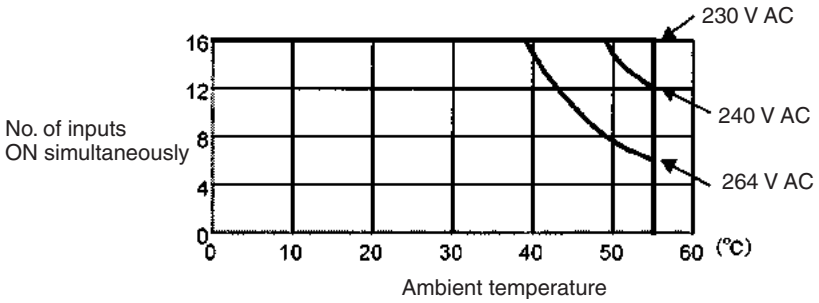
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CS1W-IA211 200-V AC Input Unit (16 Points)

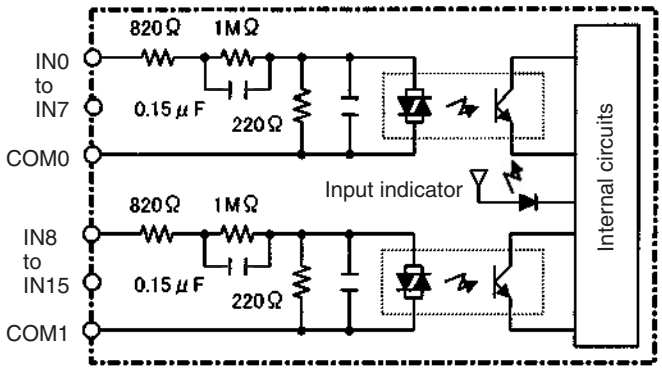
Rated Input Voltage	200 to 240 V AC (50/60 Hz)
Operating Input Voltage	170 to 264 V AC (50/60 Hz)
Input Impedance	21 kΩ (50 Hz), 18 kΩ (60 Hz)
Input Current	10 mA typical (at 200 V AC)
ON Voltage/ON current	120 V AC min.
OFF Voltage/OFF current	40 V AC max.
ON Response Time	18 ms max. when PLC Setup on default setting (8 ms) (See note.)
OFF Response Time	48 ms max. when PLC Setup on default setting (8 ms) (See note.)
No. of Circuits	2 (each 8 points/common)
Number of Inputs ON Simultaneously	100% simultaneously ON (for 230 V AC). Refer to the diagram below.
Insulation Resistance	20 MΩ between external terminals and the GR terminal (500 V DC)
Dielectric Strength	1,000 V AC 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 V DC max.
Weight	260 g max.

Note The Input ON and OFF response times for Basic I/O Units can be set to 0 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, or 32 ms in the PLC Setup. 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.

Number of Inputs ON Simultaneously

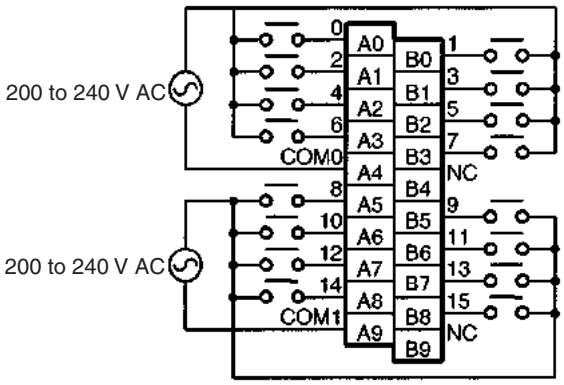


Circuit Configuration



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Terminal Connections

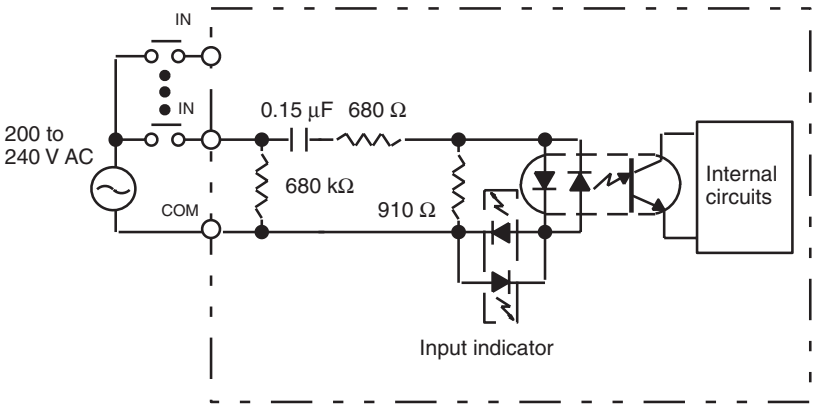


Note Terminal numbers A0 to A9 and B0 to B9 are used in this manual, but they are not printed on the Unit.

C200H-IA222/IA222V AC Input Unit (16 Points)

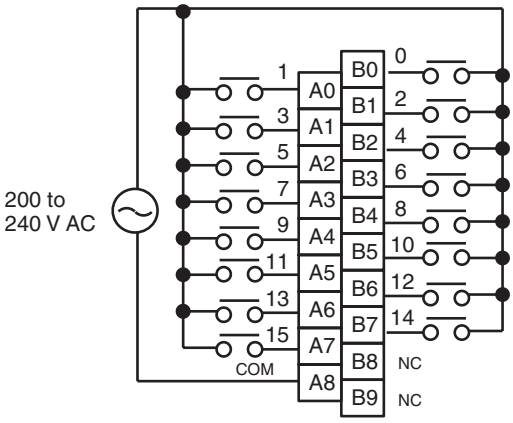
Rated Input Voltage	200 to 240 V AC (50/60 Hz)
Input Impedance	21 kΩ (50 Hz), 18 kΩ (60 Hz)
Operating Input Voltage	170 to 264 V DC (50/60 Hz)
Input Current	10 mA typical (at 200 V AC)
ON Voltage	120 V AC min.
OFF Voltage	40 V AC max.
ON Response Time	35 ms max. (at 200 V AC, 25°C)
OFF Response Time	55 ms max. (at 200 V AC, 25°C)
No. of Circuits	1 (16 points/common)
Internal Current Consumption	10 mA 5 V DC max.
Weight	300 g max./400 g max. (IA222V)

Circuit Configuration



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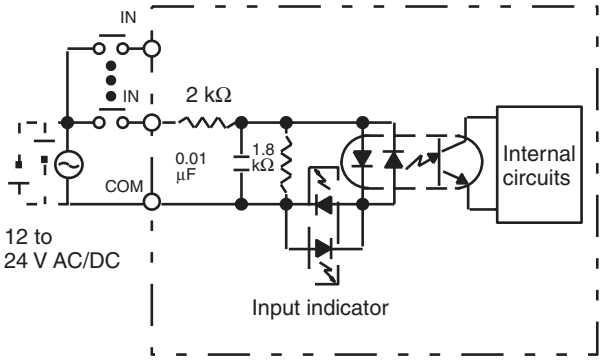
Terminal Connections



C200H-IM211 AC/DC Input Unit (8 Points)

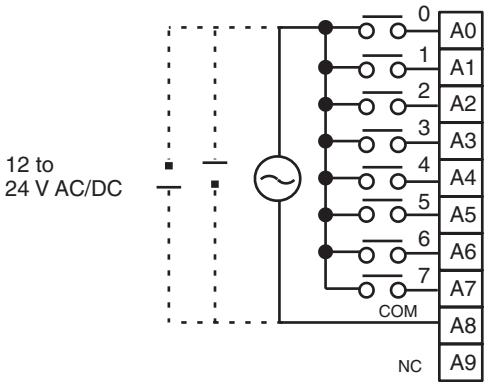
Rated Input Voltage	12 to 24 V DC/V AC (50/60 Hz)
Operating Input Voltage	10.2 to 26.4 V AC/V DC (50/60 Hz)
Input Impedance	2 kΩ
Input Current	10 mA typical (at 24 V DC)
ON Voltage	10.2 V DC min.
OFF Voltage	3.0 V DC max.
ON Response Time	15 ms max. (at 12 to 24 V DC, 25°C)
OFF Response Time	15 ms max. (at 12 to 24 V DC, 25°C)
No. of Circuits	1 (8 points/common)
Internal Current Consumption	10 mA 5 V DC max.
Weight	200 g max.

Circuit Configuration



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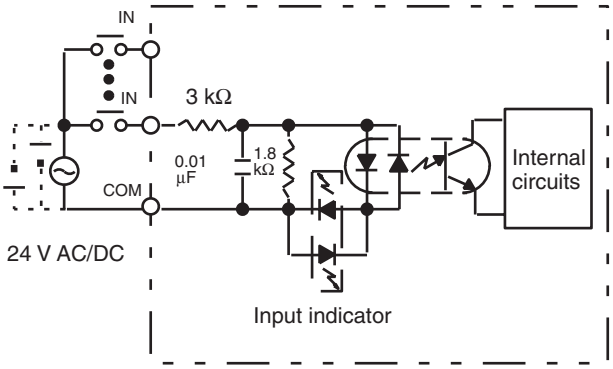
Terminal Connections



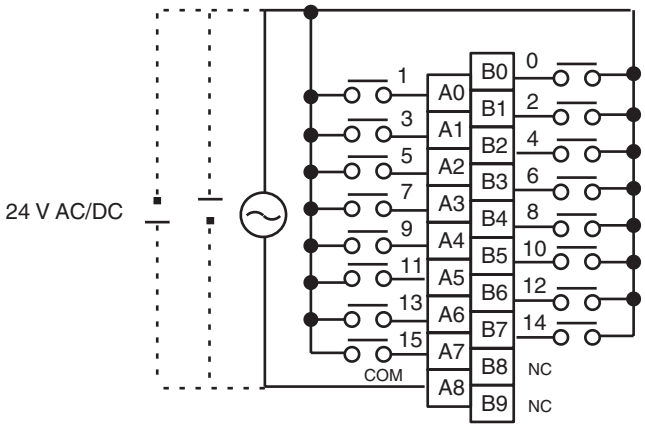
C200H-IM212 AC/DC Input Unit (16 Points)

Rated Input Voltage	24 V DC/V AC (50/60 Hz)
Operating Input Voltage	20.4 to 26.4 V AC/V DC (50/60 Hz)
Input Impedance	3 kΩ
Input Current	7 mA typical (at 24 V DC)
ON Voltage	14.4 V DC min.
OFF Voltage	5.0 V DC max.
ON Response Time	15 ms max. (at 24 V DC, 25°C)
OFF Response Time	15 ms max. (at 24 V DC, 25°C)
No. of Circuits	1 (16 points/common)
Internal Current Consumption	10 mA 5 V DC max.
Weight	250 g max.

Circuit Configuration



Terminal Connections

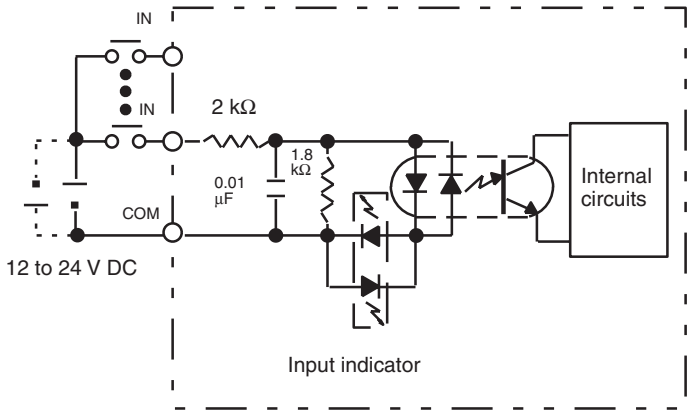


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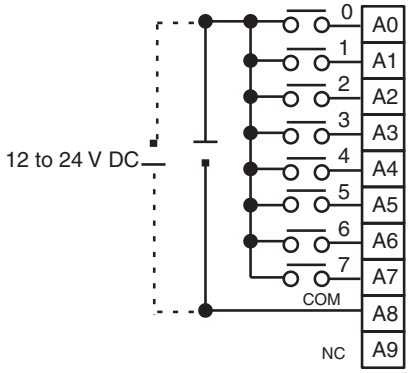
C200H-ID211 DC Input Unit (8 Points)

Rated Input Voltage	12 to 24 V DC
Operating Input Voltage	10.2 to 26.4 V DC
Input Impedance	2 kΩ
Input Current	10 mA typical (at 24 V DC)
ON Voltage	10.2 V DC min.
OFF Voltage	3.0 V DC max.
ON Response Time	1.5 ms max. (at 12 to 24 V DC, 25°C)
OFF Response Time	1.5 ms max. (at 12 to 24 V DC, 25°C)
No. of Circuits	1 (8 point/common)
Internal Current Consumption	10 mA 5 V DC max.
Weight	200 g max.

Circuit Configuration



Terminal Connections



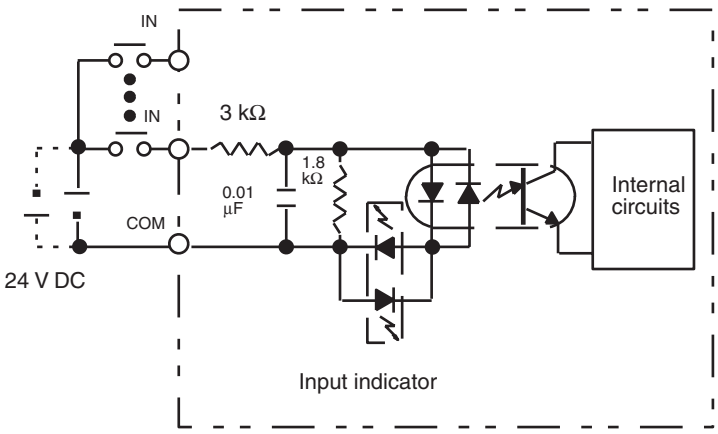
Note Terminal numbers A0 to A9 and B0 to B9 are used in this manual, but they are not printed on the Unit.

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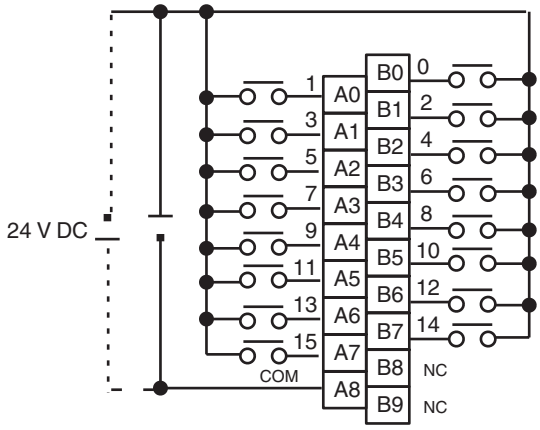
C200H-ID212 DC Input Unit (16 Points)

Rated Input Voltage	24 V DC
Operating Input Voltage	20.4 to 26.4 V DC
Input Impedance	3 kΩ
Input Current	7 mA typical (at 24 V DC)
ON Voltage	14.4 V DC min.
OFF Voltage	5.0 V DC max.
ON Response Time	1.5 ms max. (at 24 V DC, 25°C)
OFF Response Time	1.5 ms max. (at 24 V DC, 25°C)
No. of Circuits	1 (16 points/common)
Internal Current Consumption	10 mA 5 V DC max.
Weight	300 g max.

Circuit Configuration



Terminal Connections

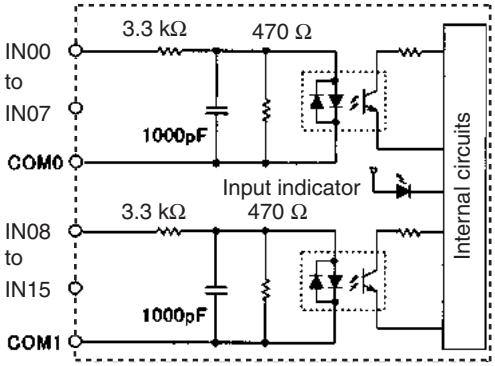


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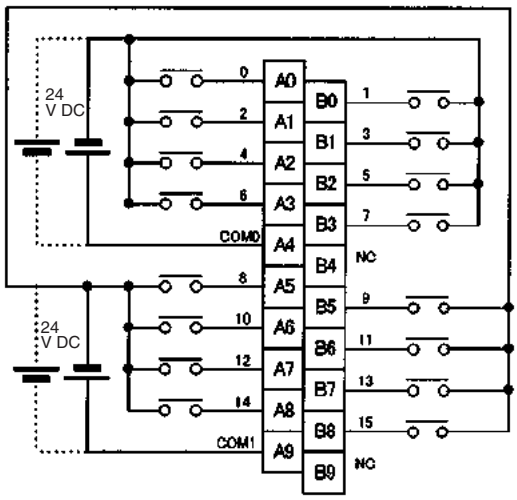
CS1W-ID211 DC Input Unit (16 Points)

Rated Input Voltage	24 V DC
Operating Input Voltage	20.4 to 26.4 V DC
Input Impedance	3.3 kΩ
Input Current	7 mA typical (at 24 V DC)
ON Voltage/ON Current	14.4 V DC min./3 mA min.
OFF Voltage/OFF Current	5 V DC max./1 mA max.
ON Response Time	8.0 ms max. (Possible to set to between 0 and 32 ms in the PLC Setup.)
OFF Response Time	8.0 ms max. (Possible to set to between 0 and 32 ms using PLC)
No. of Circuits	16 (8 points/common, 2 circuits)
Number of Simultaneously ON Points	100% simultaneously ON
Insulation Resistance	20 MΩ between external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
Internal Current Consumption	100 mA 5 V DC max.
Weight	270 g max.

Circuit Configuration



Terminal Connections



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

Note 1. The ON response time will be 20 μs maximum and OFF response time will be 300 μs maximum even if the response times are set to 0 ms due to internal element delays.

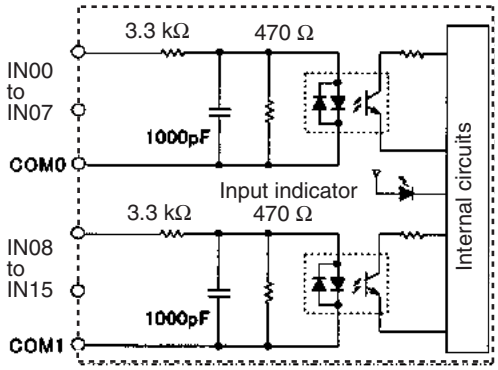
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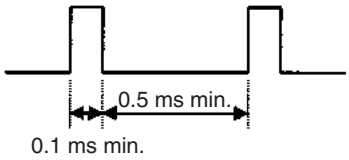
2. Terminal numbers A0 to A9 and B0 to B9 are used in this manual, but they are not printed on the Unit.

CS1W-INT01 Interrupt Input Unit (16 Points)

Rated Input Voltage	24 V DC
Operating Input Voltage	20.4 to 26.4 V DC
Input Impedance	3.3 kΩ
Input Current	7 mA typical (at 24 V DC)
ON Voltage/ON Current	14.4 V DC min./3 mA min.
OFF Voltage/OFF Current	5 V DC max./1 mA max.
ON Response Time	0.1 ms max.
OFF Response Time	0.5 ms max.
No. of Circuits	16 (8 points/common, 2 circuits)
Number of Simultaneously ON Points	100% simultaneously ON
Insulation Resistance	20 MΩ between external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
Internal Current Consumption	100 mA 5 V DC max.
Weight	270 g max.

Circuit Configuration

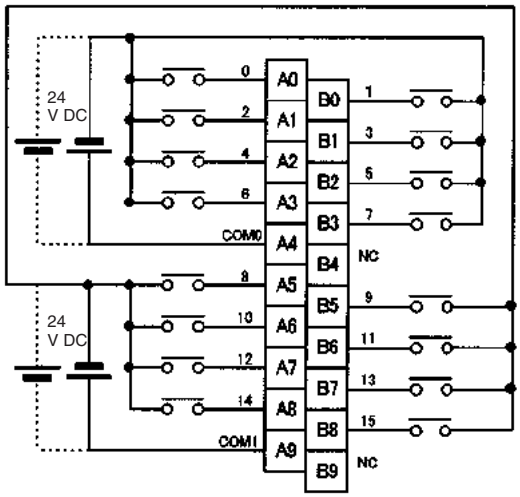




- Up to two Interrupt Input Units can be mounted to the CPU Rack.
- Interrupts cannot be used when an Interrupt Input Unit is mounted to an Expansion I/O Rack, i.e., it will be treated as a 16-point Input Unit.
- Set the pulse width of signals input to the Interrupt Input Unit so they satisfy the above conditions.

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Terminal Connections



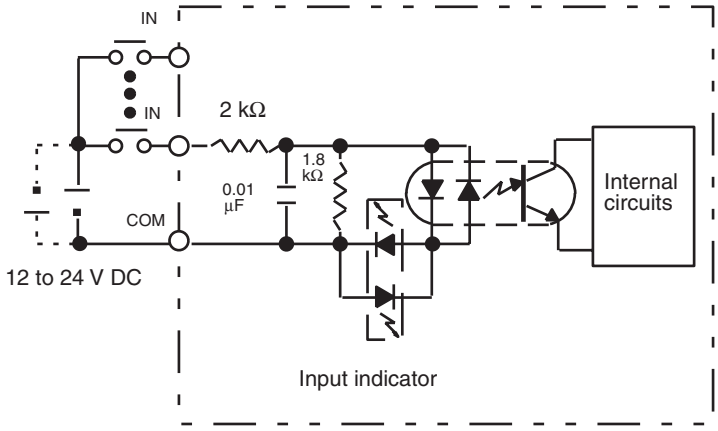
Polarity of the input power supply can connected in either direction.

Note Terminal numbers A0 to A9 and B0 to B9 are used in this manual, but they are not printed on the Unit.

C200HS-INT01 Interrupt Input Unit (8 Points)

Rated Input Voltage	12 to 24 V DC
Operating Input Voltage	10.2 to 26.4 V DC
Input Impedance	2 KΩ
Input Current	10 mA typical (24 V DC)
ON Voltage	10.2 V DC min.
OFF Voltage	3.0 V DC max.
ON Response Time	0.2 ms max.
OFF Response Time	0.5 ms max.
No. of Circuits	1 (8 points/common)
Internal Current Consumption	20 mA 5 V DC max.
Weight	200 g max.

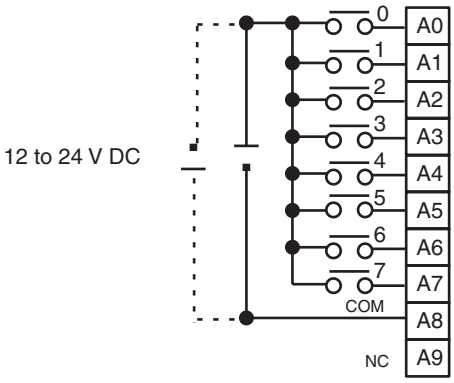
Circuit Configuration



Either plus or minus can be used for the input power supply.

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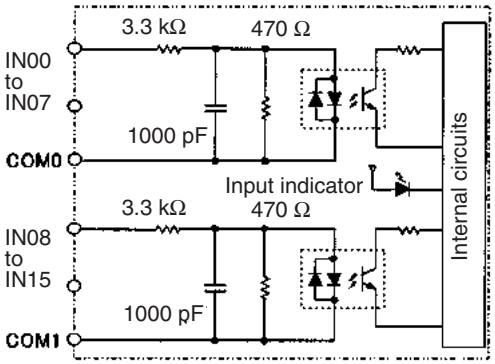
Terminal Connections



CS1W-IDP01 High-speed Input Unit (16 Points)

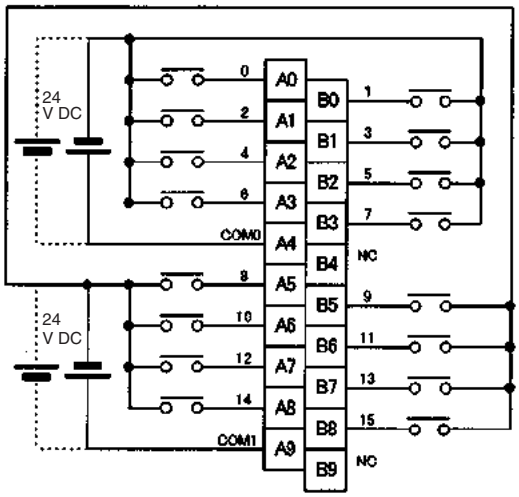
Rated Input Voltage	24 V DC
Operating Input Voltage	20.4 to 26.4 V DC
Input Impedance	3.3 kΩ
Input Current	7 mA typical (at 24 V DC)
ON Voltage/ON Current	14.4 V DC min./3 mA min.
OFF Voltage/OFF Current	5 V DC max./1 mA max.
ON Response Time	0.1 ms max.
OFF Response Time	0.5 ms max.
No. of Circuits	16 (8 points/common, 2 circuits)
Number of Simultaneously ON Points	100% simultaneously ON
Insulation Resistance	20 MΩ between external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
Internal Current Consumption	100 mA 5 V DC max.
Weight	270 g max.

Circuit Configuration



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Terminal Connections



*1 Polarity of the input power supply can be connected in either direction.
*2 Terminal numbers A0 to A9 and B0 to B9 are used in this manual, but they are not printed the Unit.

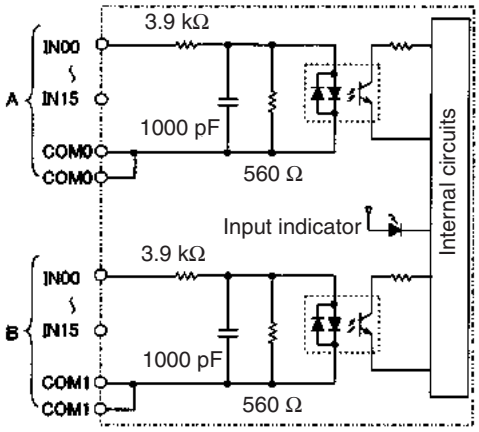
- With a High-speed Input Unit, pulse inputs shorter than the cycle time of the CPU Unit can be read.
- The minimum pulse width (ON time) that can be read by the High-speed Input Unit is 0.1 ms.
- Input data in the internal circuits is cleared during the input refresh period.

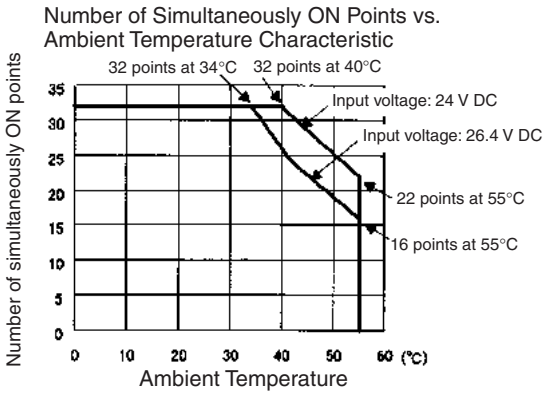
CS1W-ID231 DC Input Unit (32 Points)

Rated Input Voltage	24 V DC
Operating Input Voltage	20.4 to 26.4 V DC
Input Impedance	3.9 kΩ
Input Current	6 mA typical (at 24 V DC)
ON Voltage/ON Current	15.4 V DC min./3 mA min.
OFF Voltage/OFF Current	5 V DC max./1 mA max.
ON Response Time	8.0 ms max. (Can be set to between 0 and 32 in the PLC Setup.)
OFF Response Time	8.0 ms max. (Can be set to between 0 and 32 in the PLC Setup)
No. of Circuits	32 (16 points/common, 2 circuits)
Number of Simultaneously ON Points	70% (11 points/common) (at 24 V DC) (Refer to the following illustrations.)
Insulation Resistance	20 MΩ between external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
Internal Current Consumption	150 mA 5 V DC max.
Weight	200 g max.
Accessories	One connector for external wiring (soldered)

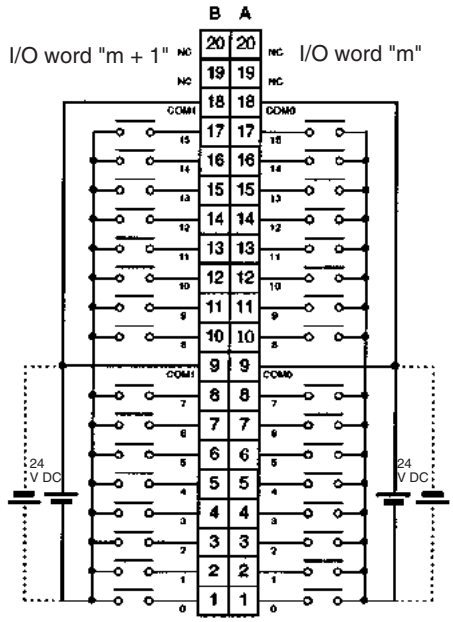
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Circuit Configuration





Terminal Connections



- The input power polarity can be connected in either direction provided that the same polarity is set for rows A and B.
- Both COM0 and COM1 have two pins each. Although they are internally connected, wire all points completely.

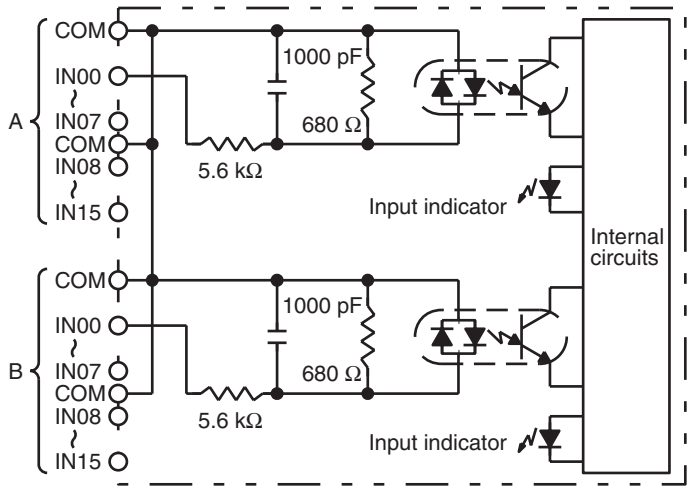
Note The ON response time will be 120 μs maximum and OFF response time will be 300 μs maximum even if the response times are set to 0 ms due to internal element delays.

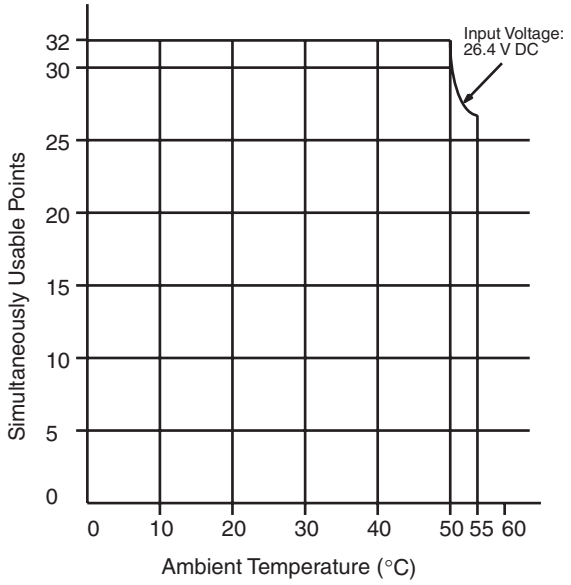
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C200H-ID216 DC Input Unit (32 Points)

Rated Input Voltage	24 V DC
Operating Input Voltage	20.4 to 26.4 V DC
Input Impedance	5.6 kΩ
Input Current	4.1 mA (at 24 V DC)
ON Voltage	14.4 V DC min.
OFF Voltage	5.0 V DC max.
ON Response Time	1.0 ms max.
OFF Response Time	1.0 ms max.
No. of Circuits	32 (32 points/common)
Internal Current Consumption	100 mA 5 V DC max.
Weight	180 g max.

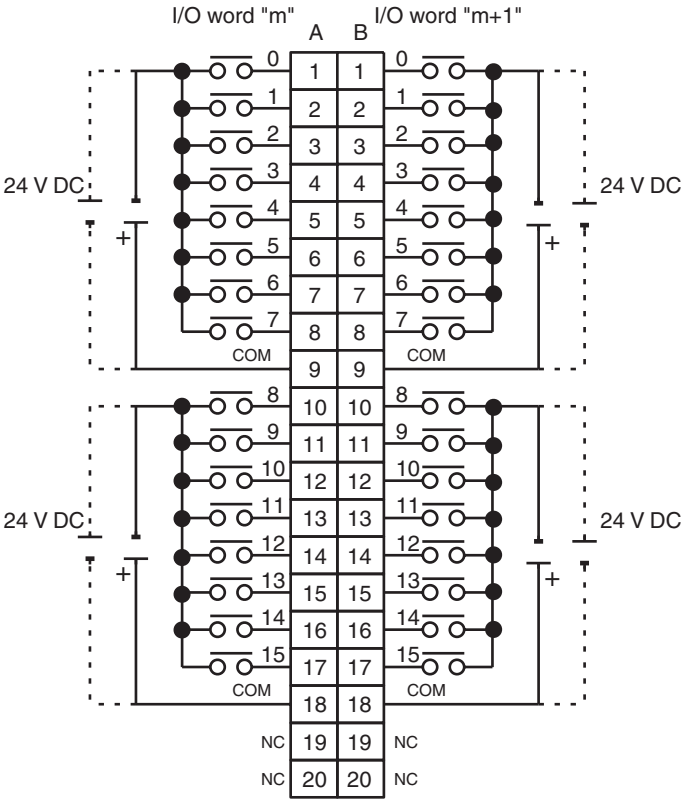
Circuit Configuration and Simultaneously Usable Points





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Terminal Connections



Note 1. I/O word “m” is determined by the I/O number setting.

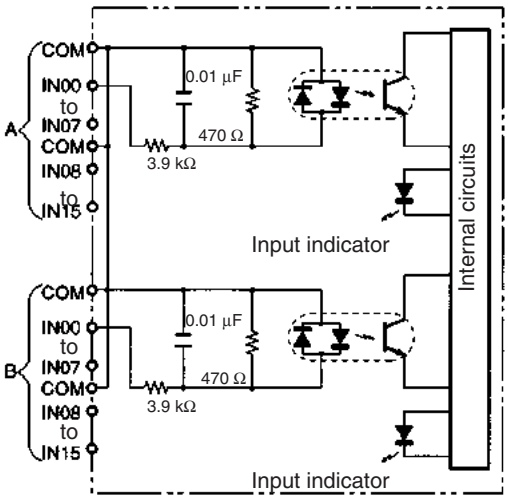
2. The power can be supplied in either polarity, but the same polarity must be used for all COM terminals. Connect power supply wiring to every COM terminal, even though the COM terminals are connected internally.

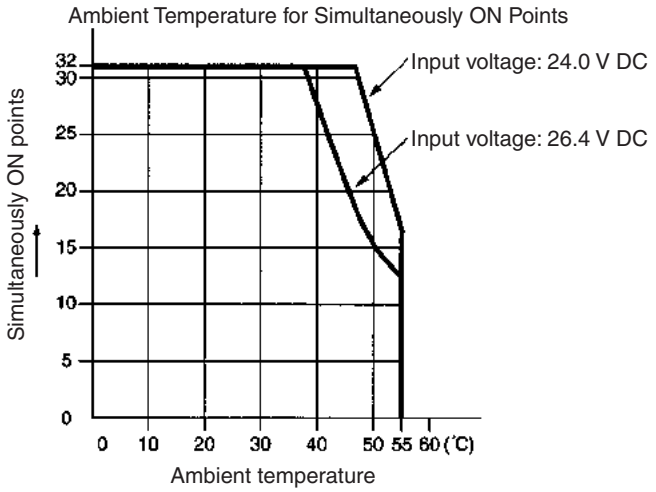
C200H-ID218 DC Input Unit (32 Points)

Rated Input Voltage	24 V DC
Operating Input Voltage	20.4 to 26.4 V DC
Input Impedance	3.9 kΩ
Input Current	6 mA (at 24 V DC)
ON Voltage/ON Current	15.4 V DC min./3.5 mA min.
OFF Voltage/OFF Current	5.0 V DC max./1 mA max.
ON Response Time	1.0 ms max.
OFF Response Time	1.0 ms max.
No. of Circuits	32 (32 points/common)
Internal Current Consumption	100 mA 5 V DC max.
Weight	180 g max.

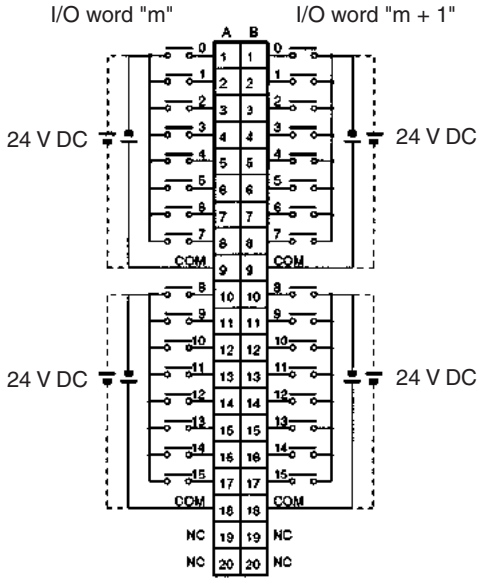
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Circuit Configuration





Terminal Connections



Note 1. The polarity of the input power supply can be either positive or negative. The polarity of all commons, however, must be the same.

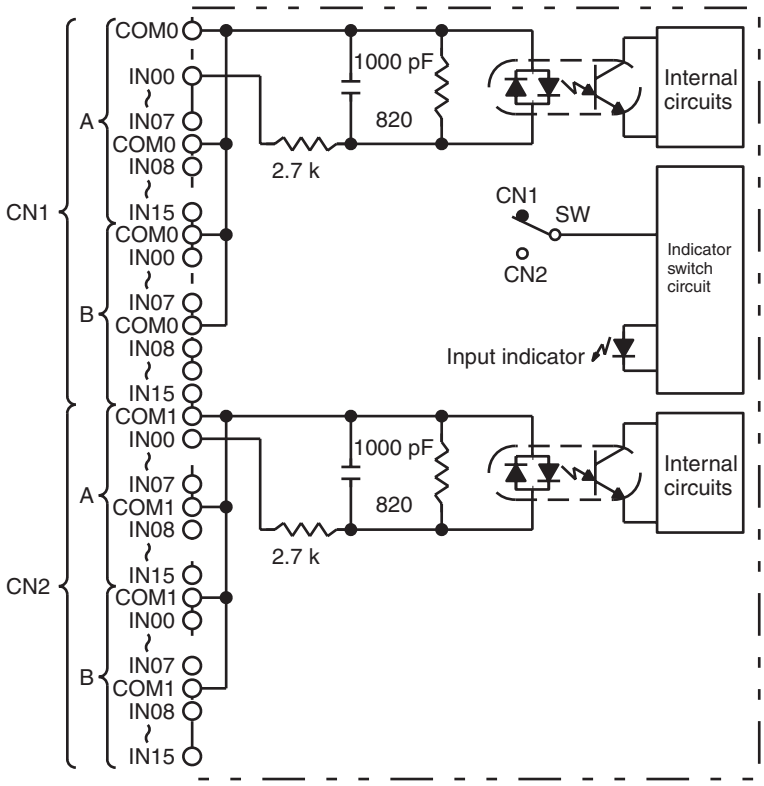
2. COM terminals must all be wired even though they are connected internally.

C200H-ID111 DC Input Unit (64 Points)

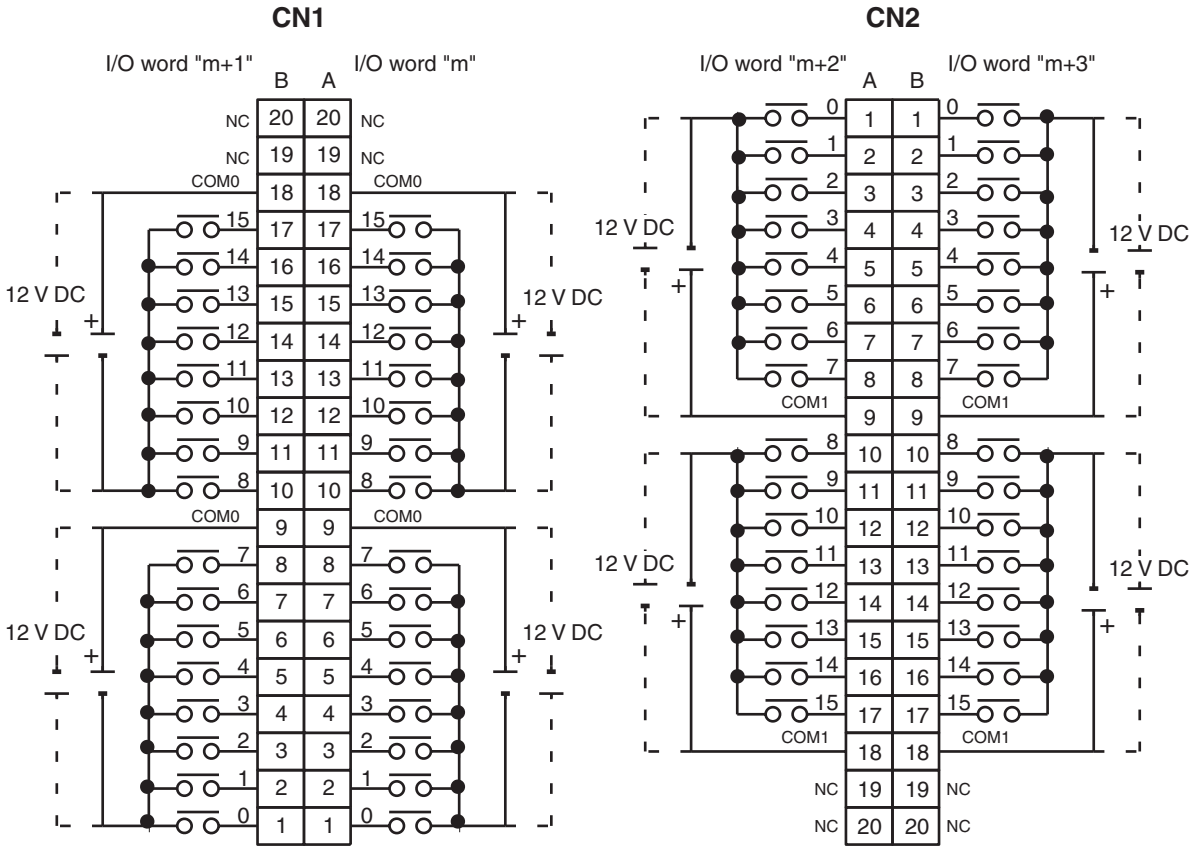
Rated Input Voltage	12 V DC
Operating Input Voltage	10.2 to 13.2 V DC
Input Impedance	2.7 kΩ
Input Current	4.1 mA typical (at 12 V DC)
ON Voltage	8.0 V DC min.
OFF Voltage	3.0 V DC max.
ON Response Time	1.0 ms max.
OFF Response Time	1.0 ms max.
No. of Circuits	2 (32 points/common)
Internal Current Consumption	120 mA 5 V DC max.
Weight	250 g max.

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Circuit Configuration



Terminal Connections



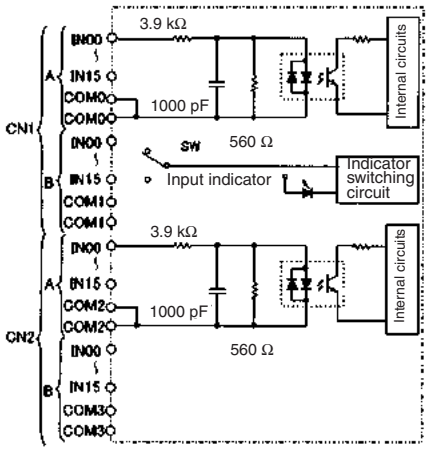
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Note The power can be supplied in either polarity, but the same polarity must be used for all COM terminals in each connector. Connect power supply wiring to every COM terminal, even though the COM terminals in each connector are connected internally.

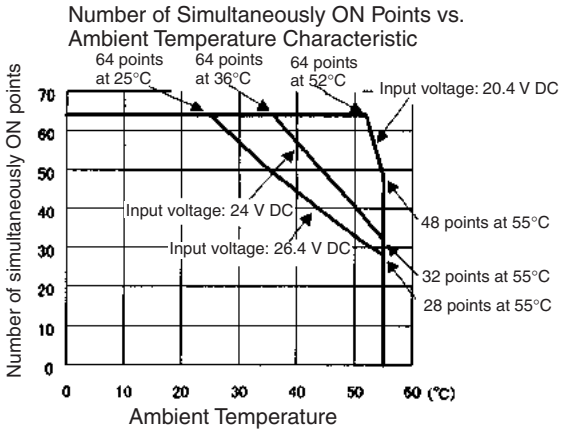
CS1W-ID261 DC Input Unit (64 Points)

Rated Input Voltage	24 V DC
Operating Input Voltage	20.4 to 26.4 V DC
Input Impedance	3.9 kΩ
Input Current	6 mA typical (at 24 V DC)
ON Voltage/ON Current	15.4 V DC min./3 mA min.
OFF Voltage/OFF Current	5 V DC max./1 mA max.
ON Response Time	8.0 ms max. (Can be set to between 0 and 32 in the PLC Setup.)
OFF Response Time	8.0 ms max. (Can be set to between 0 and 32 in the PLC Setup.)
No. of Circuits	64 (16 points/common, 4 circuits)
Number of Simultaneously ON Points	50% (8 points/common) (at 24 V DC) (Refer to the following illustrations.)
Insulation Resistance	20 MΩ between external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
Internal Current Consumption	150 mA 5 V DC max.
Weight	260 g max.
Accessories	Two connectors for external wiring (soldered)

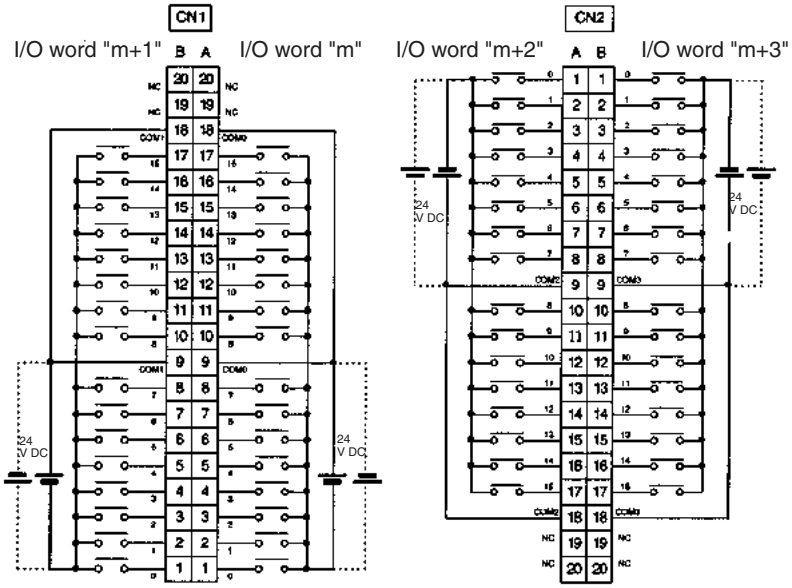
Circuit Configuration



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Terminal Connections



- The input power polarity can be connected in either direction provided that the same polarity be set for rows A and B.
- COM0, COM1, COM2, and COM3 have two pins each. Although they are internally connected, wire all points completely.

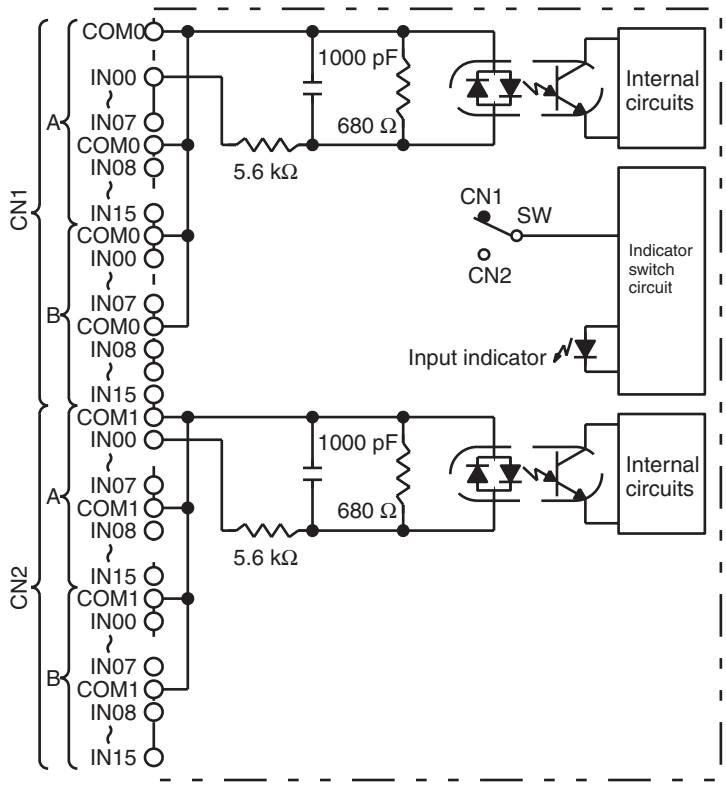
Note The ON response time will be 120 μs maximum and OFF response time will be 300 μs maximum even if the response times are set to 0 ms due to internal element delays.

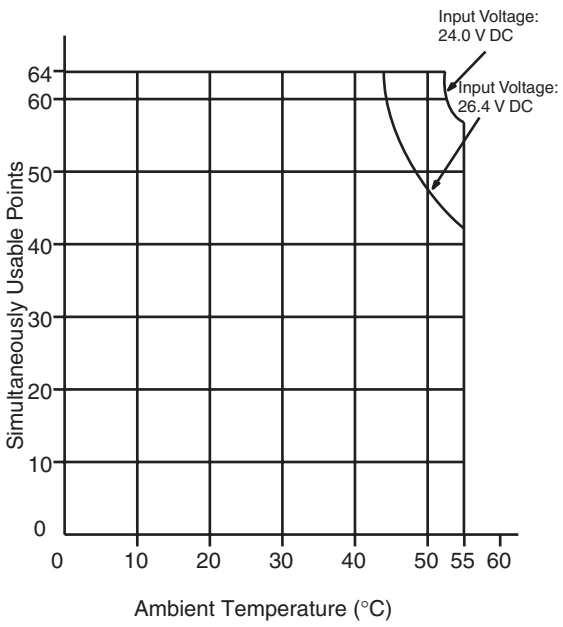
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C200H-ID217 DC Input Unit (64 Points)

Rated Input Voltage	24 V DC
Operating Input Voltage	20.4 to 26.4 V DC
Input Impedance	5.6 kΩ
Input Current	4.1 mA typical (at 24 V DC)
ON Voltage	14.4 V DC min.
OFF Voltage	5.0 V DC max.
ON Response Time	1.0 ms max.
OFF Response Time	1.0 ms max.
No. of Circuits	2 (32 points/common) All 64 points cannot be turned ON simultaneously at high temperatures. Refer to the following graph.
Internal Current Consumption	120 mA 5 V DC max.
Weight	250 g max.

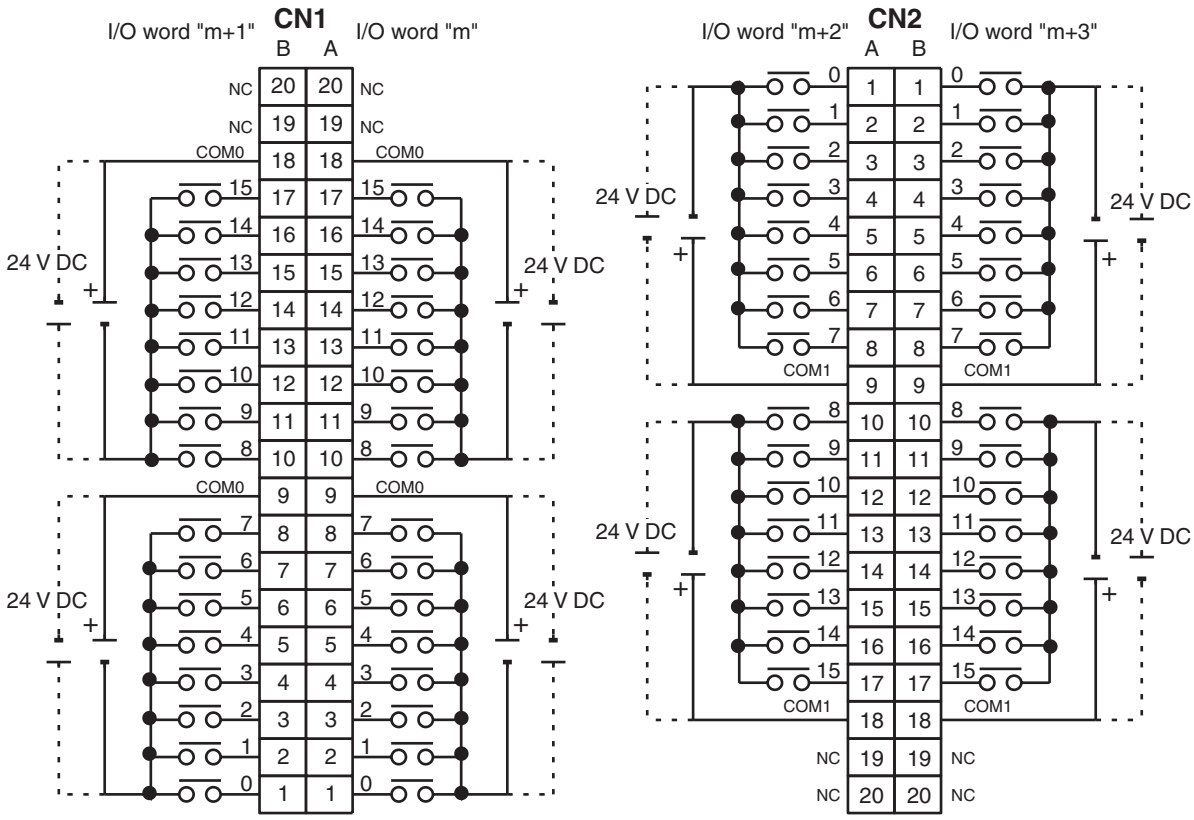
Circuit Configuration and Simultaneously Usable Points





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Terminal Connections



Note 1. I/O word “m” is determined by the I/O number setting.

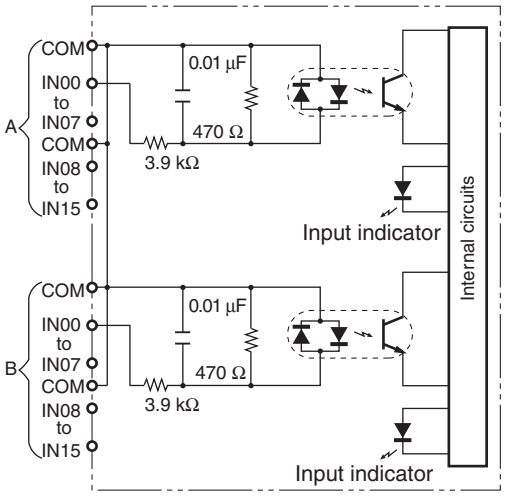
2. The power can be supplied in either polarity, but the same polarity must be used for all COM terminals in each connector. Connect power supply wiring to every COM terminal, even though the COM terminals in each connector are connected internally.

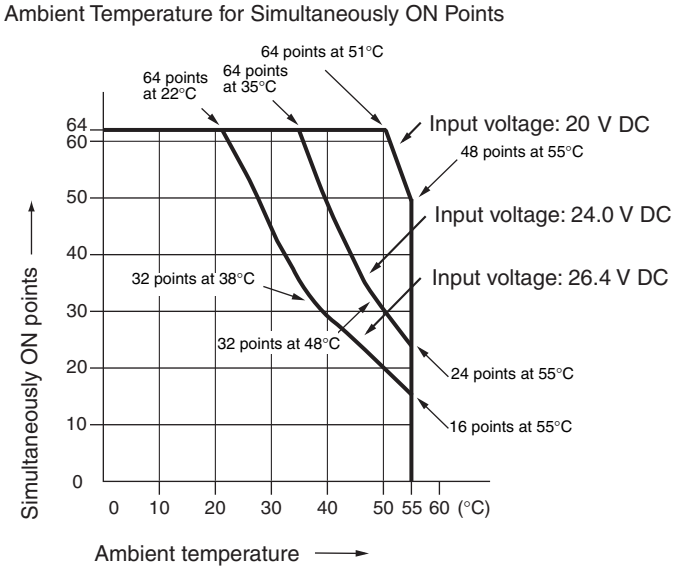
C200H-ID219 DC Input Unit (64 Points)

Rated Input Voltage	24 V DC
Operating Input Voltage	20.4 to 26.4 V DC
Input Impedance	3.9 kΩ
Input Current	6 mA (at 24 V DC)
ON Voltage/ON Current	15.4 V DC min./3.5 mA min.
OFF Voltage/OFF Current	5.0 V DC max./1 mA max.
ON Response Time	1.0 ms max.
OFF Response Time	1.0 ms max.
No. of Circuits	64 (32 points/common) **Note** The number of points that can be ON simultaneously is limited according to the ambient temperature. Refer to the following diagram for details.
Internal Current Consumption	120 mA 5 V DC max.
Weight	250 g max.

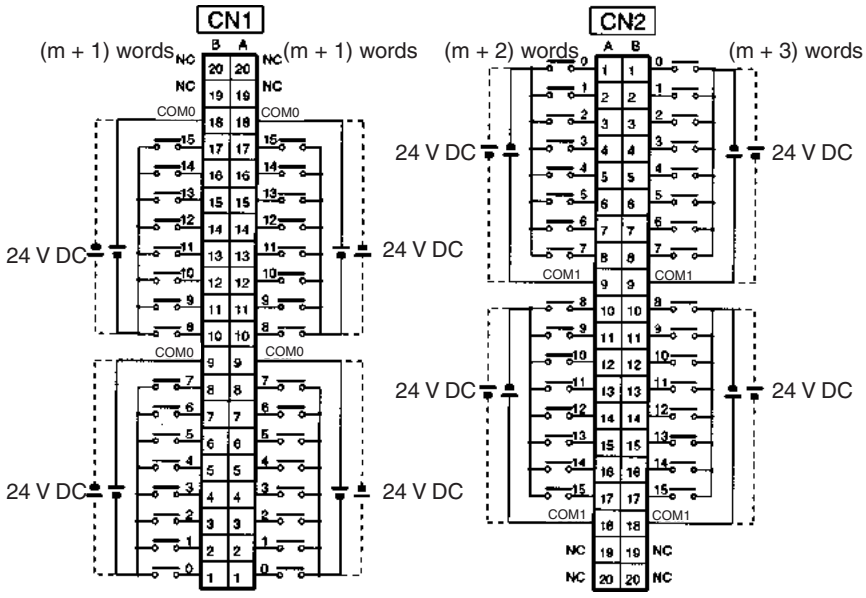
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Circuit Configuration





Terminal Connections



Note 1. The polarity of the input power supply can be either positive or negative. The polarity of all commons for CN1 and CN2, however, must be the same.

2. COM terminals for CN1 and CN2 must all be wired even though they are connected internally.

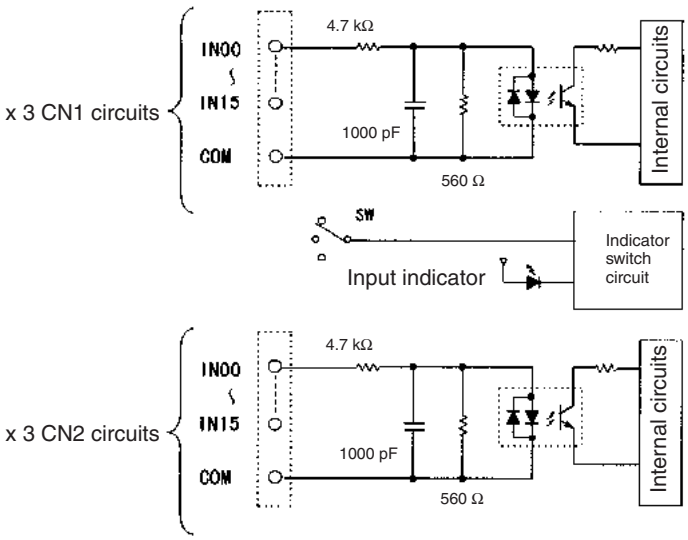
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CS-series High-density I/O Units

CS1W-ID291 DC Input Unit (96 Points)

Rated Input Voltage	24 V DC
Operating Input Voltage	20.4 to 26.4 V DC
Input Impedance	4.7 kΩ
Input Current	Approx. 5 mA (at 24 V DC)
ON Voltage/ON Current	17 V DC min./3 mA min.
OFF Voltage/OFF Current	5 V DC max./1 mA max.
ON Response Time	8.0 ms max.(Possible to select one out of eight times from 0 to 32 ms in the PLC Setup.) (See note.)
OFF Response Time	8.0 ms max. (Possible to select one out of eight times from 0 to 32 ms in the PLC Setup.) (See note.)
No. of Circuits	6 (16 points/common)
Number of Inputs ON Simultaneously	50% (8 points/common) (at 24 V DC) (Depends on ambient temperature)
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
Internal Current Consumption	200 mA 5 V DC max.
Weight	320 g max.
Accessories	Two connectors for external wiring (soldered)

Circuit Configuration

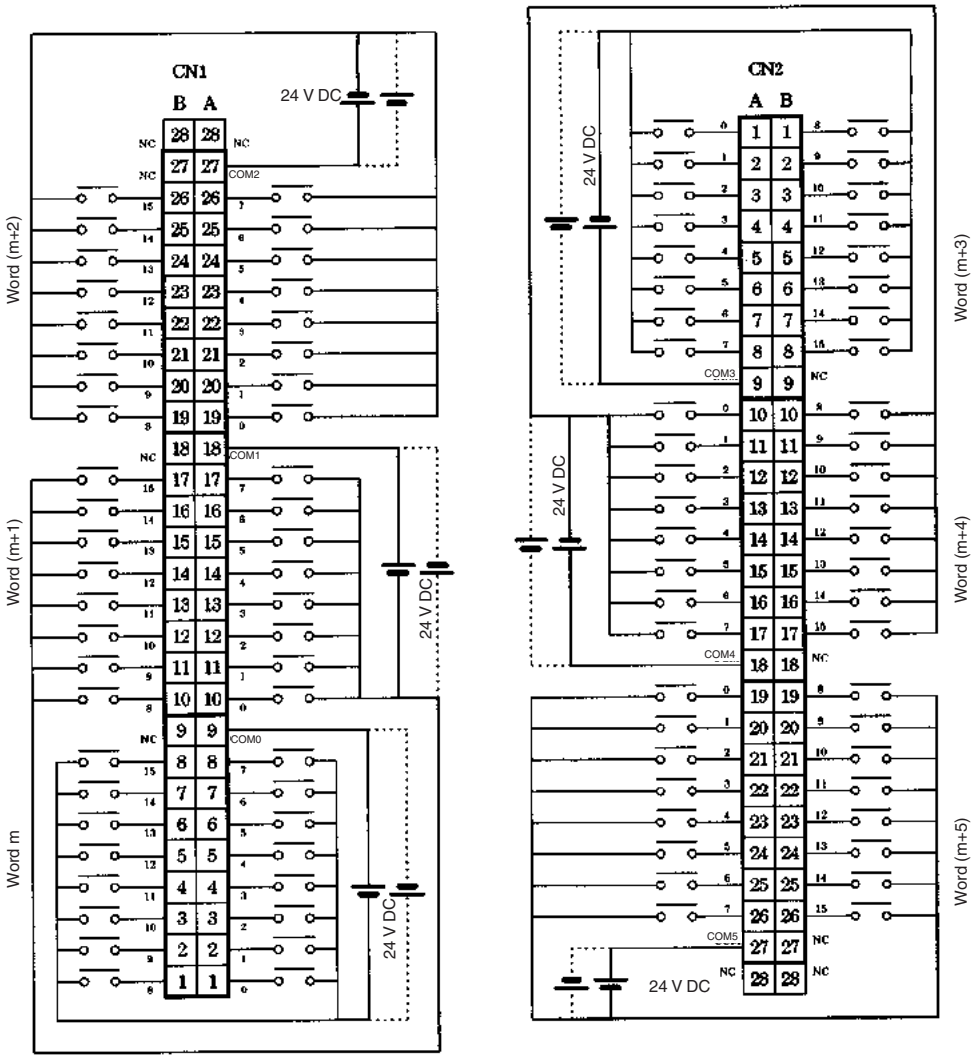


Note 1. The Input ON and OFF response times for Basic I/O Units can be set to 0 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, or 32 ms in the PLC Setup.

2. The ON response time will be 120 μs maximum and OFF response time will be 300 μs maximum even if the response times are set to 0 ms due to internal element delays.

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Terminal Connections: CS1W-ID291 24-V DC 96-point Input Unit



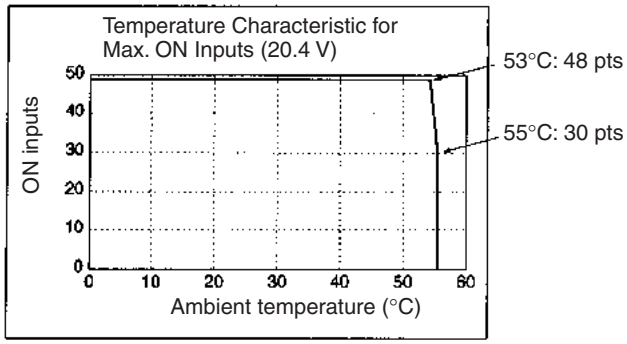
- The polarity of the input power supply can be in either direction, as indicated by the dotted lines.

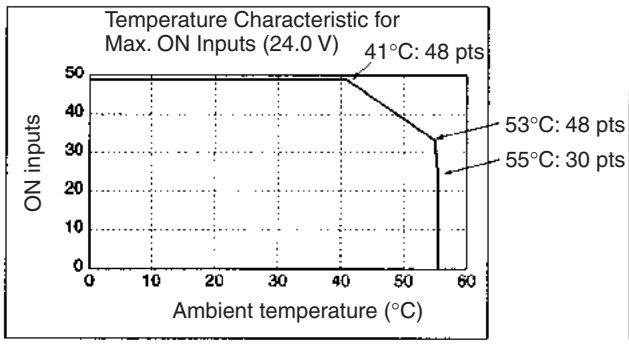
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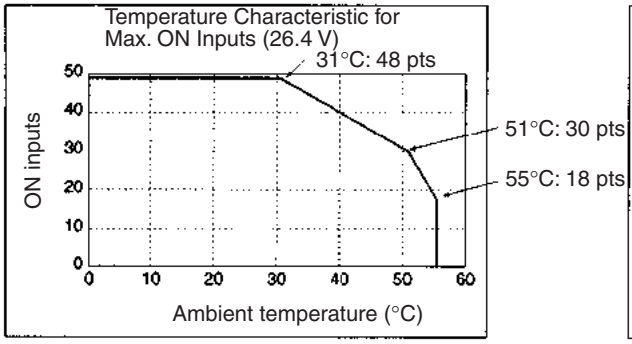
Maximum Number of ON Inputs

The maximum number of 24-V DC inputs that can be ON simultaneously for the CS1W-ID291/MD291/MD292 depends on the ambient temperature, as shown in the following diagrams.

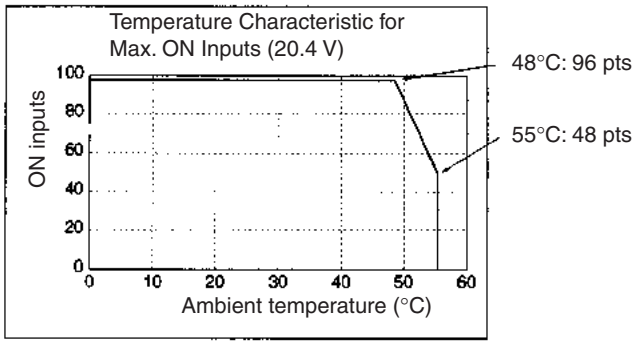
CS1W-MD291/MD292 Inputs

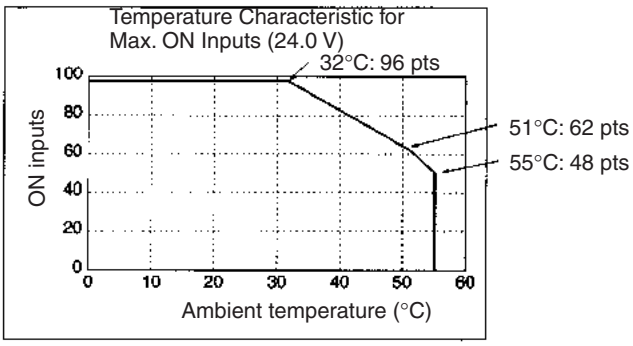


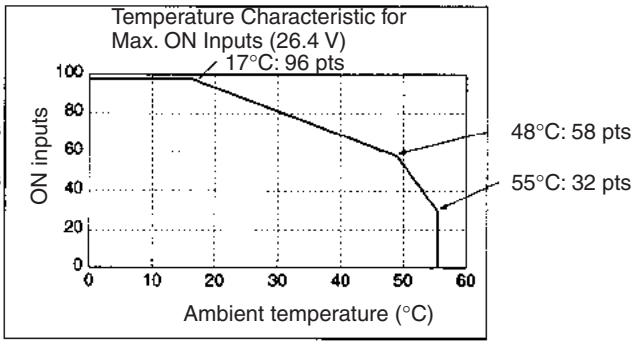




CS1W-ID291 Inputs







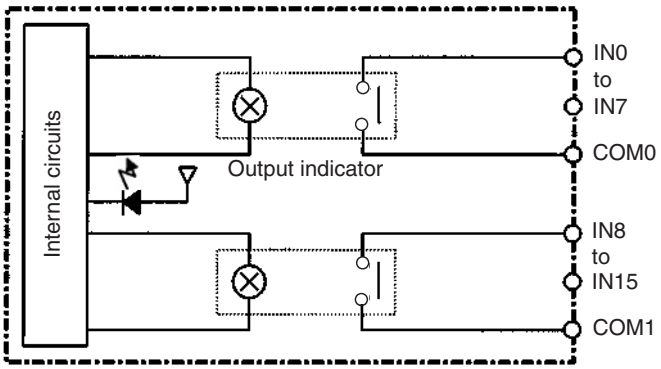
If the maximum number of ON points is exceeded for the CS1W-ID291/MD291/MD292, heat generated by electronic elements will increase the temperature of the electronic elements and the interior of the Unit. This will reduce the reliability and life of the electronic elements and cause Unit malfunctions. There will be a delay in the temperature increase, however, and there will be no problems if all inputs are ON for 10 minutes or less at the start of operations or any other time that all inputs have been off for at least 2 hours.

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CS1W-OC211 Contact Output Unit (16 points)

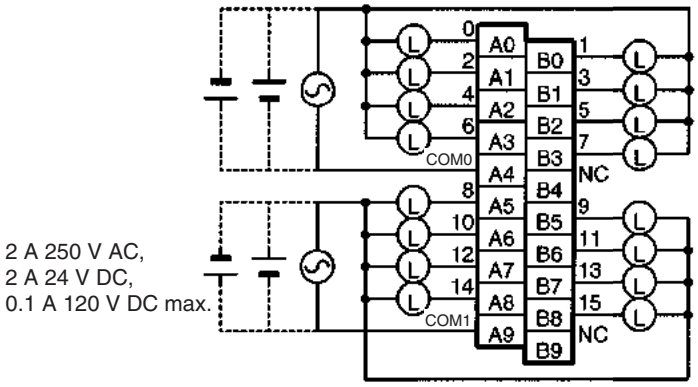
Max. Switching Capacity	2 A 250 V AC (cosϕ = 1), 2 A 24 V DC (8 A/common, 16 A/Unit), 0.1 A 120 V DC
Min. Switching Capacity	1 mA 5 V DC
Service Life of Relay	Electrical: 150,000 operations (resistive load)/ 100,000 operations (inductive load) Mechanical: 20,000,000 operations Service life will vary depending on the connected load. Refer to page 612 for information on service life according to the load.
Relay replacement	NY-24W-K-IE (Fujitsu Takamizawa Component Ltd.) Relays cannot be replaced by users.
ON Response Time	15 ms max.
OFF Response Time	15 ms max.
No. of Circuits	2 (each 8 points/common)
Number of Inputs ON Simultaneously	16
Surge Protector	None
Fuses	None
Insulation Resistance	20 MΩ between external terminals and the GR terminal (500 V DC)
Dielectric Strength	2,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
Internal Current Consumption	130 mA 5 V DC max. 96 mA 26 V DC (6 mA × No. points ON)
Weight	290 g max.

Circuit Configuration



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Terminal Connections

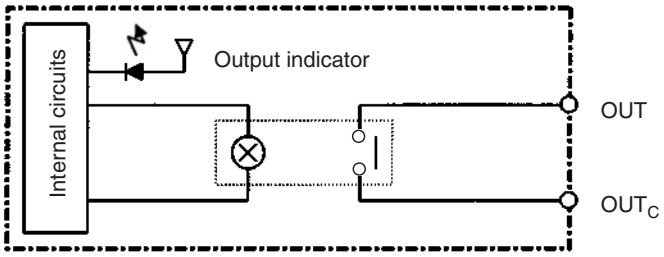


Note Terminal numbers A0 to A9 and B0 to B9 are used in this manual, but they are not printed on the Unit.

CS1W-OC201 Contact Output Unit (8 points) (See note 1.)

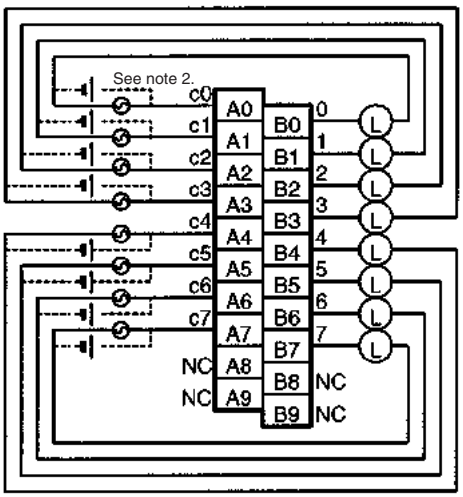
Max. Switching Capacity	2 A 250 V AC (cosϕ = 1), 2 A 24 V DC (16 A/Unit), 0.1 A 120 V DC
Min. Switching Capacity	1 mA 5 V DC
Service Life of Relay	Electrical: 150,000 operations (resistive load)/ 100,000 operations (inductive load) Mechanical: 20,000,000 operations Service life will vary depending on the connected load. Refer to page 612 for information on service life according to the load.
Relay replacement	NY-24W-K-IE (Fujitsu Takamizawa Component Ltd.) Relays cannot be replaced by users.
ON Response Time	15 ms max.
OFF Response Time	15 ms max.
No. of Circuits	8 independent contacts
Number of Inputs ON Simultaneously	8
Surge Protector	None
Fuses	None
Insulation Resistance	20 MΩ between external terminals and the GR terminal (500 V DC)
Dielectric Strength	2,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
Internal Current Consumption	100 mA 5 V DC max. 48 mA 26 V DC (6 mA × No. points ON)
Weight	270 g max.

Circuit Configuration



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Terminal Connections



2 A 250 V AC,
2 A 24 V DC,
0.1 A 120 V DC max.

Note: There are no restrictions in the polarity when connecting a DC power supply.

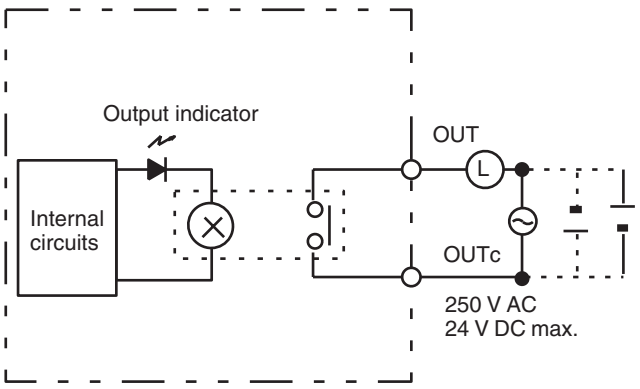
Note 1. This Unit uses only 8 bits for external I/O even though 16 bits (1 word) are allocated. This Unit is also treated as a 16-point Unit in the I/O tables.

2. Terminal numbers A0 to A9 and B0 to B9 are used in this manual, but they are not printed on the Unit.

C200H-OC223 Contact Output Unit (5 Points)

Max. Switching Capacity	2 A 250 V AC (cosϕ = 1), 2 A 250 V AC (cosϕ = 0.4), 2 A 24 V DC (10 A/Unit)
Min. Switching Capacity	10 mA 5 V DC
Relay	G6B-1174-P-FD-US-M (24 V DC) with socket
Service Life of Relay	Electrical: 500,000 operations (resistive load)/ 100,000 operations (inductive load) Mechanical: 50,000,000 operations Service life will vary depending on the current and ambient temperature.
ON Response Time	10 ms max.
OFF Response Time	10 ms max.
No. of Circuits	5 independent contacts
Internal Current Consumption	10 mA 5 V DC max. 75 mA 26 V DC (8 points ON simultaneously.)
Weight	250 g max.

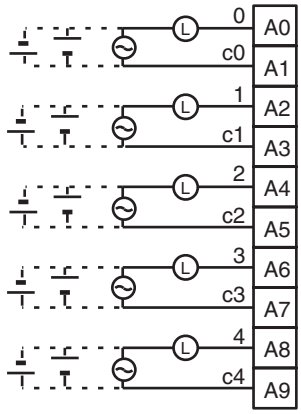
Circuit Configuration



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Terminal Connections

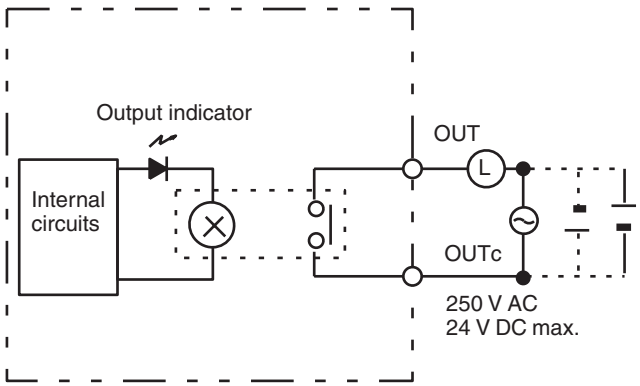
250 V AC 24 V DC max.
(inductive load: 2 A
resistive load: 2 A)
(10 A/Unit)



C200H-OC224 Contact Output Unit (8 Points)

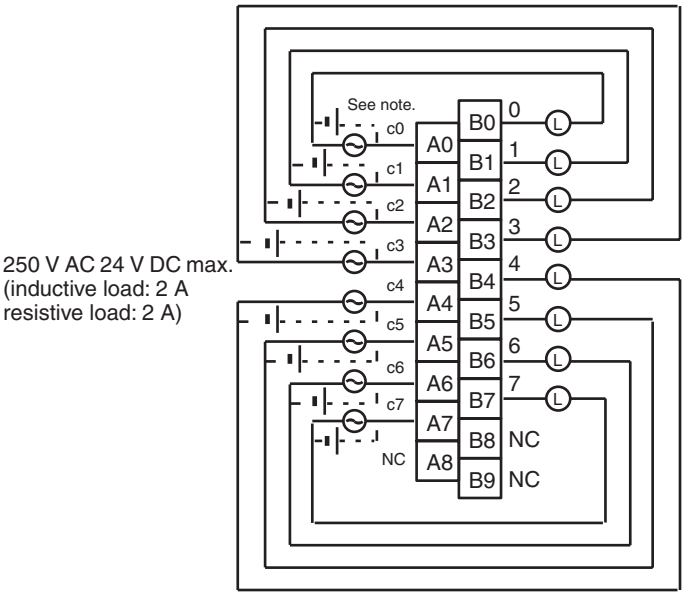
Max. Switching Capacity	2 A 250 V AC (cosϕ = 1), 2 A 250 V AC (cosϕ = 0.4), 2 A 24 V DC (16 A/Unit)
Min. Switching Capacity	10 mA 5 V DC
Relay	G6B-1174-P-FD-US-M (24 V DC) with socket
Service Life of Relay	Electrical: 500,000 operations (resistive load)/ 100,000 operations (inductive load) Mechanical: 50,000,000 operations Service life will vary depending on the current and ambient temperature.
ON Response Time	10 ms max.
OFF Response Time	10 ms max.
No. of Circuits	8 independent contacts
Internal Current Consumption	10 mA 5 V DC max. 75 mA 26 V DC (8 points ON simultaneously.)
Weight	300 g max.

Circuit Configuration



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Terminal Connections

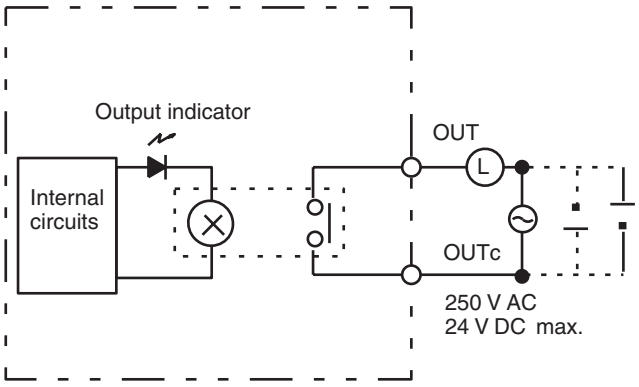


Note: There are no restrictions in the polarity when connecting a DC power supply.

C200H-OC224V/OC224N Contact Output Unit (8 Points)

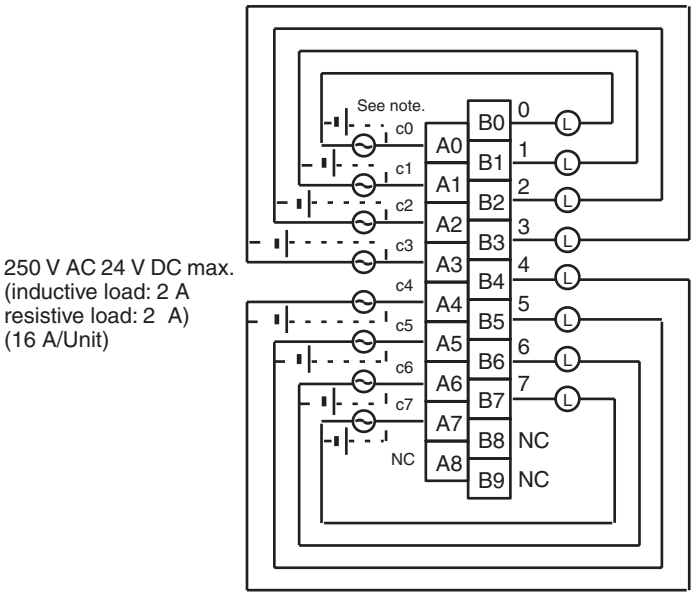
Item	OC224V	OC224N
Max. Switching Capacity	2 A 250 V AC (cosϕ = 1), 2 A 250 V AC (cosϕ = 0.4), 2 A 24 V DC (16 A/Unit)	
Min. Switching Capacity	10 mA 5 V DC	
Relay	G6R-1 (24 V DC) with socket	G6RN-1-ACD (24 V DC) PCB soldering
Service Life of Relay	Electrical: 300,000 operations Mechanical: 10,000,000 operations Service life will vary depending on the current and ambient temperature.	
ON Response Time	15 ms max.	
OFF Response Time	15 ms max.	
No. of Circuits	8 independent contacts	
Internal Current Consumption	10 mA 5 V DC max. 90 mA 26 V DC (8 points ON simultaneously.)	
Weight	350 g max.	

Circuit Configuration



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Terminal Connections

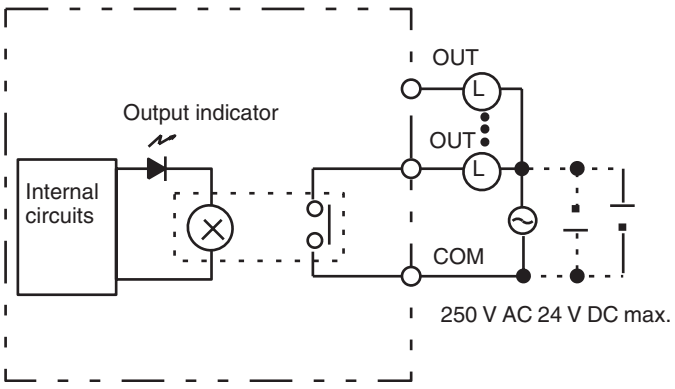


Note: There are no restrictions in the polarity when connecting a DC power supply.

C200H-OC221 Contact Output Unit (8 Points)

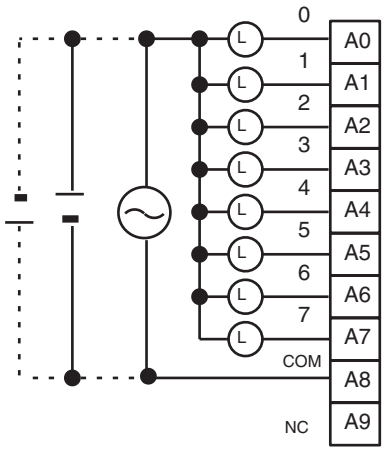
Max. Switching Capacity	2 A 250 V AC (cosϕ = 1), 2 A 250 V AC (cosϕ = 0.4), 2 A 24 V DC (8 A/Unit)
Min. Switching Capacity	10 mA 5 V DC
Relay	G6B-1174P-FD-US-M (24 V DC) with socket
Service Life of Relay	Electrical: 500,000 operations (resistive load)/ 100,000 operations (inductive load) Mechanical: 50,000,000 operations Service life will vary depending on the current and ambient temperature.
ON Response Time	10 ms max.
OFF Response Time	10 ms max.
No. of Circuits	1 (8 points/common)
Internal Current Consumption	10 mA 5 V DC max. 75 mA 26 V DC (8 points ON simultaneously.)
Weight	250 g max.

Circuit Configuration



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Terminal Connections

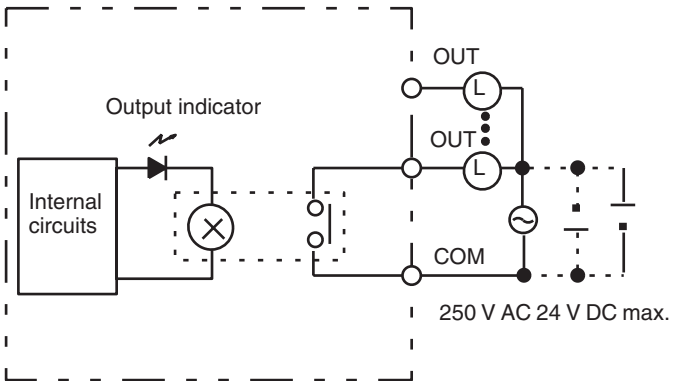


250 V AC 24 V DC max.
(inductive load: 2 A, resistive load: 2 A) (8 A/Unit)

C200H-OC222 Contact Output Unit (12 Points)

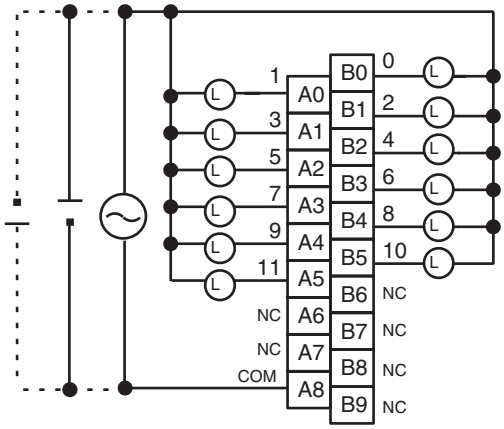
Max. Switching Capacity	2 A 250 V AC (cosϕ = 1), 2 A 250 V AC (cosϕ = 0.4), 2 A 24 V DC (8 A/Unit)
Min. Switching Capacity	10 mA 5 V DC
Relay	G6B-1174P-FD-US-M (24 V DC) with socket
Service Life of Relay	Electrical: 500,000 operations (resistive load)/ 100,000 operations (inductive load) Mechanical: 50,000,000 operations Service life will vary depending on the current and ambient temperature.
ON Response Time	10 ms max.
OFF Response Time	10 ms max.
No. of Circuits	1 (12 points/common) 8 points max. can be ON simultaneously.
Internal Current Consumption	10 mA 5 V DC max. 75 mA 26 V DC (8 points ON simultaneously.)
Weight	300 g max.

Circuit Configuration



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Terminal Connections

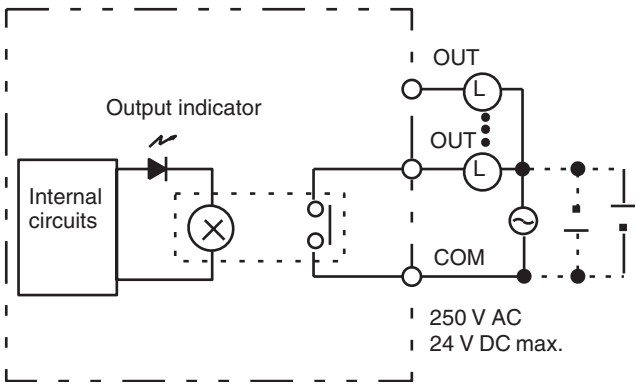


250 V AC 24 V DC max.
(inductive load: 2 A, resistive load: 2 A) (8 A/Unit)

C200H-OC222V/OC222N Contact Output Unit (12 Points)

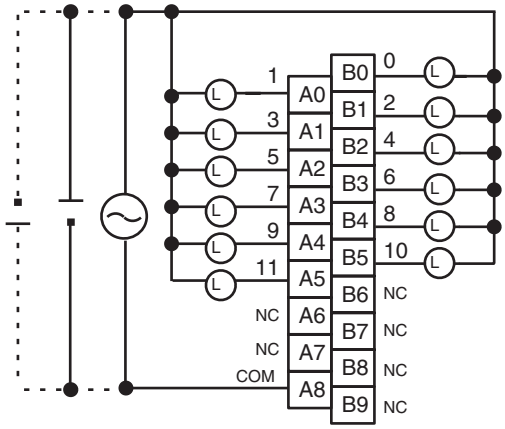
Item	OC222V	OC222N
Max. Switching Capacity	2 A 250 V AC (cosϕ = 1), 2 A 250 V AC (cosϕ = 0.4), 2 A 24 V DC (8 A/Unit)	
Min. Switching Capacity	10 mA 5 V DC	
Relay	G6R-1 (24 V DC) with socket	G6RN-1-ACD (24 V DC) PCB soldering
Service Life of Relay	Electrical: 300,000 operations Mechanical: 10,000,000 operations Service life will vary depending on the current and ambient temperature.	
ON Response Time	15 ms max.	
OFF Response Time	15 ms max.	
No. of Circuits	1 (12 points/common) 8 points max. can be ON simultaneously.	
Internal Current Consumption	8 mA 5 V DC max. 90 mA 26 V DC (8 points ON simultaneously.)	
Weight	400 g max.	

Circuit Configuration



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Terminal Connections

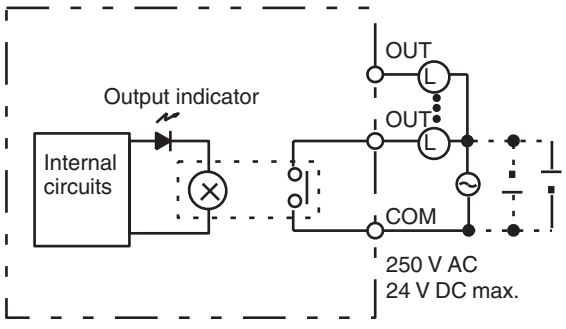


250 V AC 24 V DC max.
(inductive load: 2 A, resistive load: 2 A) (8 A/Unit)

C200H-OC225 Contact Output Unit (16 Points)

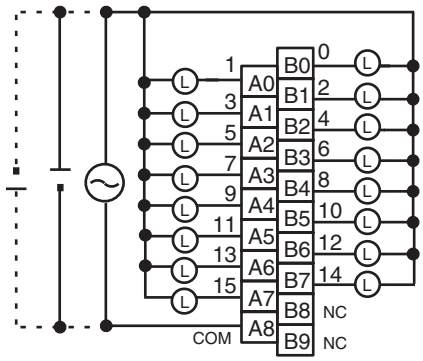
Max. Switching Capacity	2 A 250 V AC (cosϕ = 1), 2 A 250 V AC (cosϕ = 0.4), 2 A 24 V DC (8 A/Unit)
Min. Switching Capacity	10 mA 5 V DC
Relay	G6B-1174P-FD-US-M (24 V DC) with socket
Service Life of Relay	Electrical: 500,000 operations (resistive load)/ 100,000 operations (inductive load) Mechanical: 50,000,000 operations Service life will vary depending on the current and ambient temperature.
ON Response Time	10 ms max.
OFF Response Time	10 ms max.
No. of Circuits	1 (16 points/common) 8 points max. can be ON simultaneously.
Internal Current Consumption	50 mA 5 V DC max. 75 mA 26 V DC (8 points ON simultaneously.)
Weight	400 g max.

Circuit Configuration



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Terminal Connections



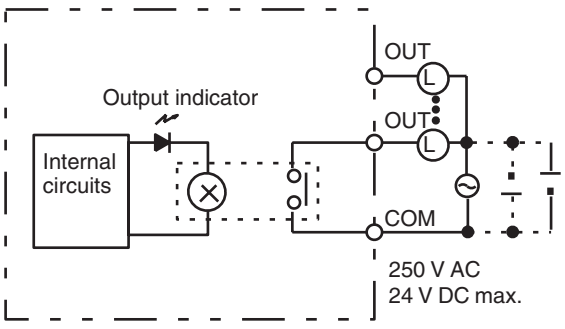
250 V AC 24 V DC max.
(inductive load: 2 A, resistive load: 2 A) (8 A/Unit)

Note This Unit can overheat if more than 8 output points are turned ON simultaneously.

C200H-OC226/OC226N Contact Output Unit (16 Points)

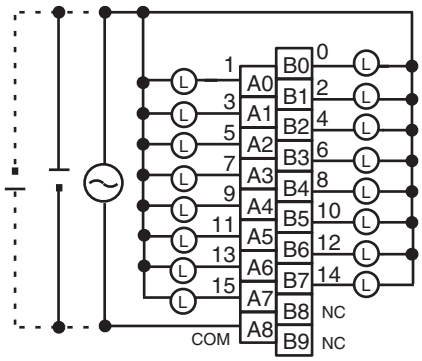
Item	OC226	OC226N
Max. Switching Capacity	2 A 250 V AC (cosϕ = 1), 2 A 250 V AC (cosϕ = 0.4), 2 A 24 V DC (8 A/Unit)	
Min. Switching Capacity	10 mA 5 V DC	
Relay	G6R-1 (24 V DC) with socket	G6RN-1-ACD (24 V DC) PCB soldering
Service Life of Relay	Electrical: 300,000 operations Mechanical: 10,000,000 operations Service life will vary depending on the current and ambient temperature.	
ON Response Time	15 ms max.	
OFF Response Time	15 ms max.	
No. of Circuits	1 (16 points/common) 8 points max. can be ON simultaneously.	
Internal Current Consumption	30 mA 5 V DC max. 90 mA 26 V DC (8 points ON simultaneously.)	
Weight	500 g max.	

Circuit Configuration



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Terminal Connections



250 V AC 24 V DC max.
(inductive load: 2 A, resistive load: 2 A) (8 A/Unit)

Note 1. Mount to the C200H-BC□□1-V1/V2 Backplane.

2. The number of simultaneously ON contact points must be eight or less to ensure proper heat resistance.

About Contact Output Units

There are some differences in the relays used by the C200H and CS-series Contact Output Units. For this reason, when used in the ways shown below, there may be differences in the respective life expectancies of the relays.

- When using in excess of rated values
- When appropriate surge countermeasures are not taken
- When connected to a load (e.g., relay, solenoid, or motor) that generates a high counterelectromotive force when power is interrupted
- When connected to a load (e.g., capacitor or lamp) that generates a high inrush current when power is turned ON

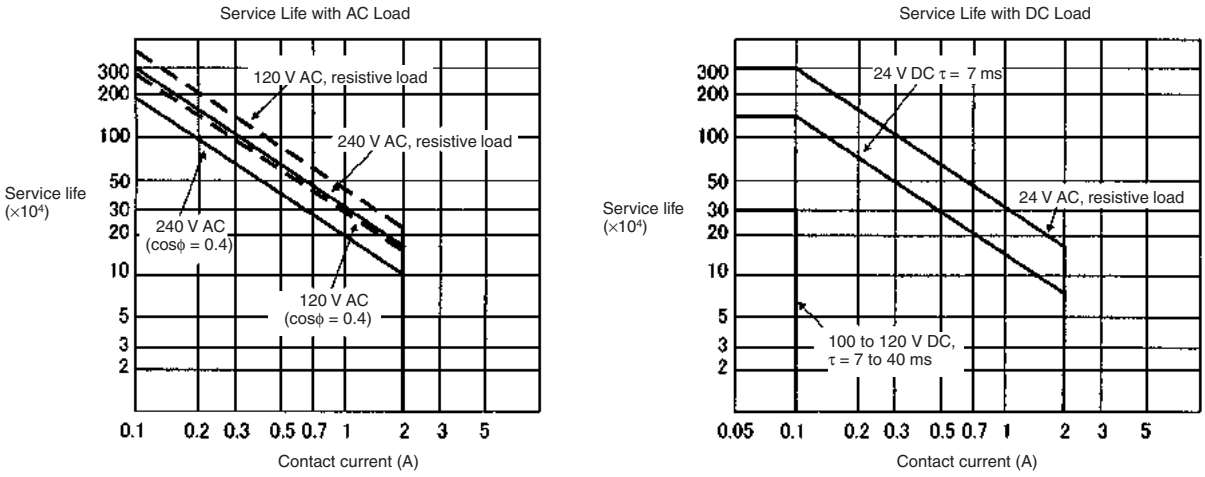
In the above cases, ensure the rated life expectancies of the relays by, for example, taking the appropriate surge countermeasures as explained in the manual, or using a switching device (as a relay) with ratings appropriate for the load.

Life Expectancy of CS1W-OC201/211 Relays

The life expectancy of the CS1W-OC201/211 Contact Output Unit is shown in the following diagrams. Use the diagrams to calculate the relay service life based on the operating conditions, and replace the relay before the end of its service life.

Note The diagrams show the life expectancy of the relay itself. Do not use a contact current, therefore, that exceeds the maximum switching capacity specified in the specifications for each Contact Output Unit. 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.

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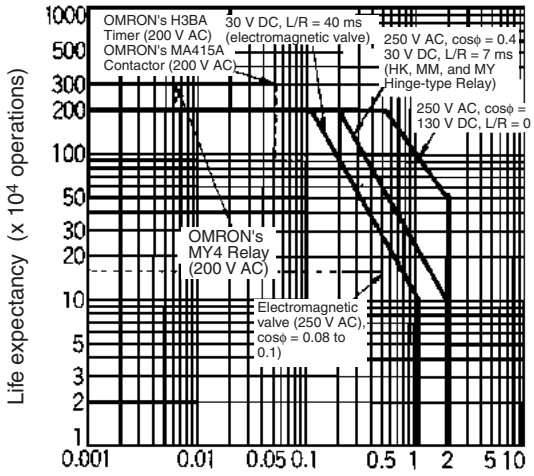
Max. switching frequency: 1,800 times/h

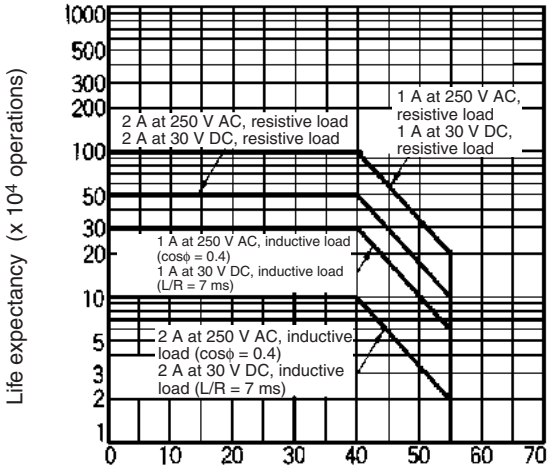
Life Expectancy of C200H-OC221/222/223/224/225 Contact Output Unit

The C200H-OC221/222/223/224/225 Contact Output Unit uses OMRON's G6B-1174P-FD-US-M Relay. The life of the G6B-1174P-FD-US-M Relay varies with the contact current and ambient temperature. Refer to the following graphs to calculate this value, and be sure to replace the Relays before their service life expires.

Contact Current vs. Life Expectancy
Conditions
Switching frequency: 1,800 times/hour max.
Ambient temperature: 23°C

Ambient Temperature vs. Life Expectancy
Conditions
Switching frequency: 1,800 times/hour max.





Note 1. If the Contact Output Unit is panel-mounted, the temperature inside the panel represents the ambient temperature.

2. The life of the Relay at an ambient temperature of 55°C is one-fifth the life of the Relay at room temperature (0° to 40°C).

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 using an inductive load.

Be sure to connect a diode in parallel with every DC inductive load that is connected to the Contact Output Unit.

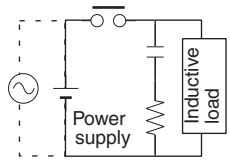
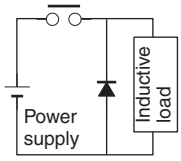
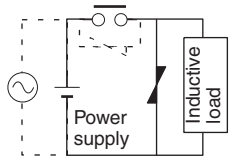
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Contact Protection Circuit

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. Arc killers can, however, reduce relay life if not use correctly.

Note Arc killers used with the Contact Output Unit can delay the resetting time required by each Relay mounted to the Contact Output Unit.

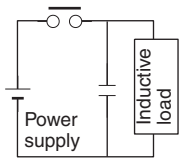
Arc killer circuit examples are listed in the following table.

Circuit	Current		Characteristic	Required element
	AC	DC		
CR method 	Yes	Yes	If the load is a relay or solenoid, there is a time lag between the moment the circuit is opened and the moment the load is reset. 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.	The capacitance of the capacitor must be 1 to 0.5 μF per contact current of 1 A and resistance of the resistor must be 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.
Diode method 	No	Yes	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 time lag, between the moment the circuit is opened and the moment the load is reset, caused by this method is longer than that caused by the CR method.	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.
Varistor method 	Yes	Yes	The varistor method prevents the imposition of high voltage between the contacts by using the constant voltage characteristic of the varistor. There is time lag between the moment the circuit is opened and the moment the load is reset. 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.	---

Note Do not connect a capacitor as an arc killer in parallel with an inductive load as shown in the following diagram. This arc killer is very effective for preventing spark discharge at the moment when the circuit is opened. However when the contacts are closed, the contacts may be welded due to the current charged in the capacitor.

DC inductive loads can be more difficult to switch than resistive loads. If appropriate arc killers are used, however, DC inductive loads will be as easy to switch as resistive loads.

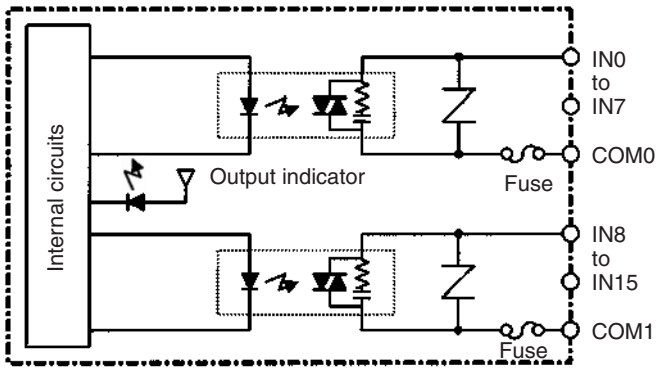
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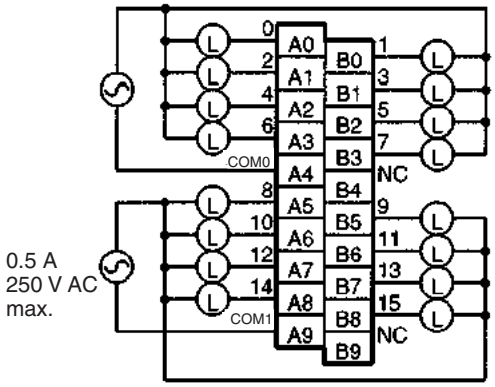
CS1W-OA211 Triac Output Unit (16 Points)

Max. Switching Capacity	0.5 A 250 V AC, 50/60 Hz (2 A/common, 4 A/Unit)
Max. Inrush Current	15 A (pulse width: 10 ms)
Min. Switching Capacity	50 mA 75 V AC
Leakage Current	1.5 mA (200 V AC) max.
Residual Voltage	1.6 V AC max.
ON Response Time	1 ms max.
OFF Response Time	1/2 of load frequency+1 ms or less.
No. of Circuits	2 (8 points/common)
Surge Protector	C.R Absorber + Surge Absorber
Fuses	2 × 4 A (1 per common) The fuse cannot be replaced by the user.
Blown Fuse Detection Circuit	None
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (500 V DC)
Dielectric Strength	2,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
Internal Current Consumption	406 mA 5 V DC max. (70 mA + 21 mA × No. of ON points)
Weight	300 g max.

Circuit Configuration



Terminal Connections



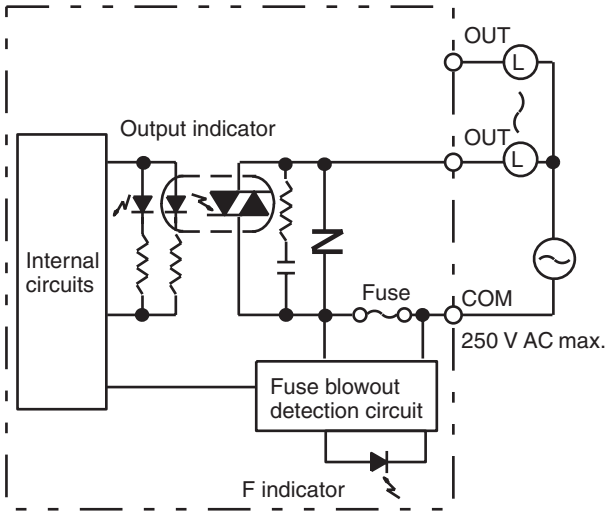
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Note Terminal numbers A0 to A9 and B0 to B9 are used in this manual, but they are not printed on the Unit.

C200H-OA221 Triac Output Unit (8 Points)

Max. Switching Capacity	1 A 250 V AC, 50/60 Hz (4 A/Unit)
Min. Switching Capacity	10 mA (resistive load)/40 mA (inductive load) 10 V AC
Leakage Current	3 mA (100 V AC) max./6 mA (200 V AC) max.
Residual Voltage	1.2 V max.
ON Response Time	1 ms max.
OFF Response Time	1/2 of load frequency or less.
No. of Circuits	1 (8 points/common)
Internal Current Consumption	140 mA 5 V DC max.
Fuse Rating	5 A 250 V (5.2-dia. × 20)
Weight	250 g max.

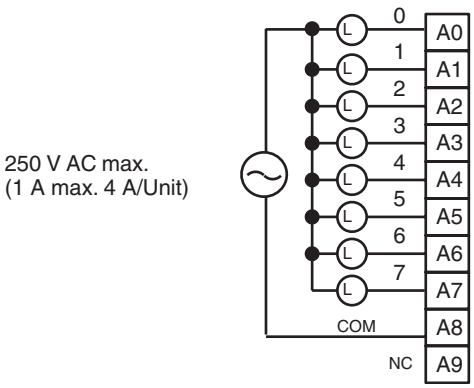
Circuit Configuration



Fuse: 5 A 250 V (5.2-dia. x 20) MF51SH (JIS)

Note When the fuse blows, the F indicator lights and bit 08 turns ON. Bits 08 through 15 cannot be used as work bits.

Terminal Connections

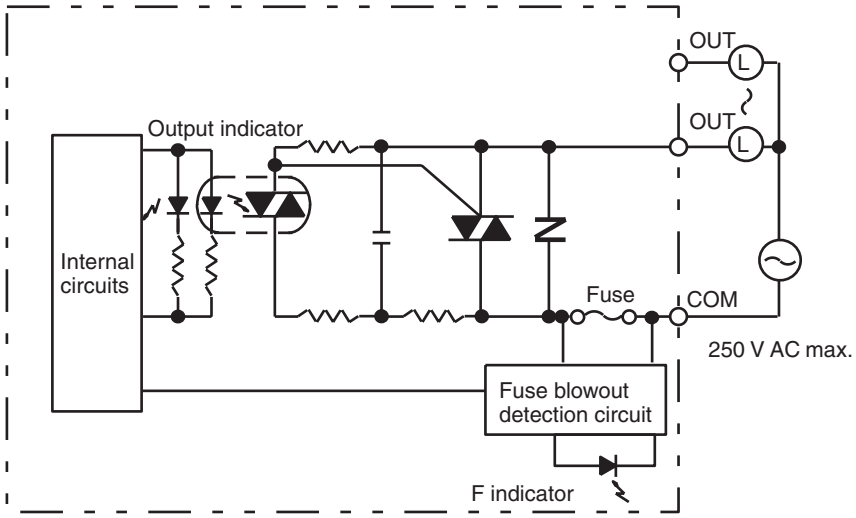


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C200H-OA223 Triac Output Unit (8 Points)

Max. Switching Capacity	1.2 A 250 V AC, 50/60 Hz (4 A/Unit)
Max. Inrush Current	15 A (pulse width: 100 ms) 30 A (pulse width: 10 ms)
Min. Switching Capacity	100 mA 10 V AC/50 mA 24 V AC/10 mA 100 V AC min.
Leakage Current	1.5 mA (120 V AC) max./3 mA (240 V AC) max.
Residual Voltage	1.5 V AC max. (50 to 1,200 mA)/ 5 V AC max. (10 to 50 mA)
ON Response Time	1 ms max.
OFF Response Time	1/2 of load frequency+1 ms or less.
No. of Circuits	1 (8 points/common)
Internal Current Consumption	180 mA 5 V DC max.
Fuse Rating	5 A 250 V (5.2-dia. × 20)
Power for External Supply	N/A
Weight	300 g max.

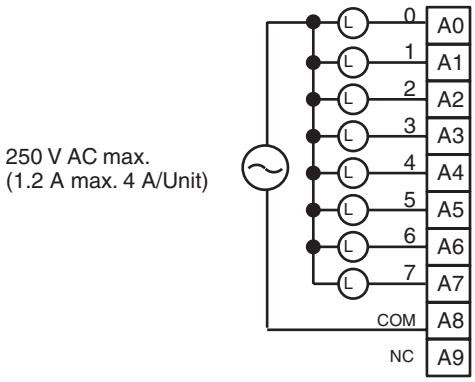
Circuit Configuration



Fuse: 5 A 250 V (5.2-dia. x 20) HT (SOC)

Note When the fuse blows, the F indicator lights and bit 08 turns ON. Bits 08 through 15 cannot be used as work bits.

Terminal Connections

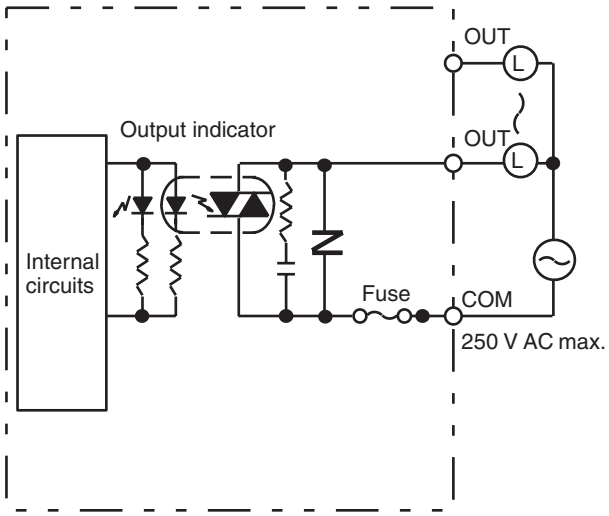


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C200H-OA222V Triac Output Unit (12 Points)

Max. Switching Capacity	0.3 A 250 V AC, 50/60 Hz (2 A/Unit)
Min. Switching Capacity	10 mA (resistive load)/40 mA (inductive load) 10 V AC
Leakage Current	3 mA (100 V AC) max./6 mA (200 V AC) max.
Residual Voltage	1.2 V max.
ON Response Time	1/2 of load frequency or less
OFF Response Time	1/2 of load frequency or less.
No. of Circuits	1 (12 points/common)
Internal Current Consumption	200 mA 5 V DC max.
Fuse Rating	3 A 250 V (5.2-dia. × 20)
Weight	400 g max.

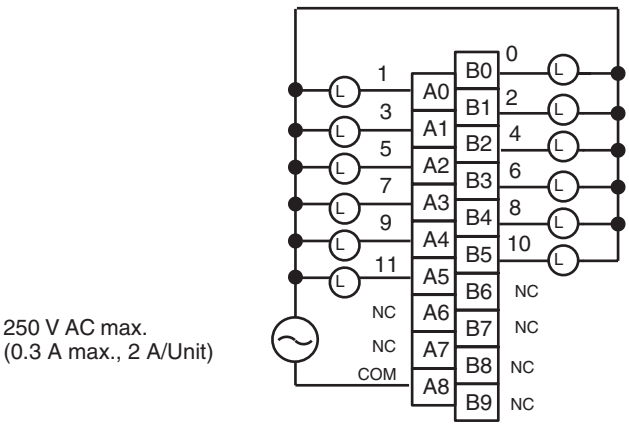
Circuit Configuration



Fuse: 3 A 250 V (5.2-dia. x 20) MQ4 (SOC)

Note 1. No blown fuse detector circuit is provided.
2. Check the fuse when there is no output.

Terminal Connections

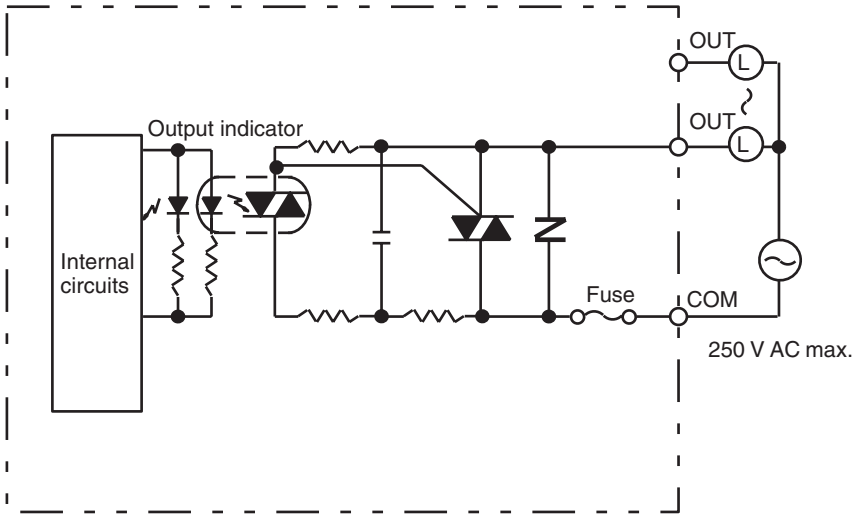


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C200H-OA224 Triac Output Unit (12 Points)

Max. Switching Capacity	0.5 A 250 V AC, 50/60 Hz (2 A/Unit)
Max. inrush current	10 A (pulse width: 100 ms) 20 A (pulse width: 10 ms)
Min. Switching Capacity	100 mA 10 V AC/50 mA 24 V AC/10 mA 100 V AC min.
Leakage Current	1.5 mA (120 V AC) max./3 mA (240 V AC) max.
Residual Voltage	1.5 V AC max. (50 to 500 mA)/5 V AC max. (10 to 50 mA)
ON Response Time	1 ms max.
OFF Response Time	1/2 of load frequency + 1 ms or less.
No. of Circuits	1 (12 points/common)
Internal Current Consumption	270 mA 5 V DC max.
Fuse Rating	3.15 A 250 V (5.2-dia. × 20)
Weight	300 g max.

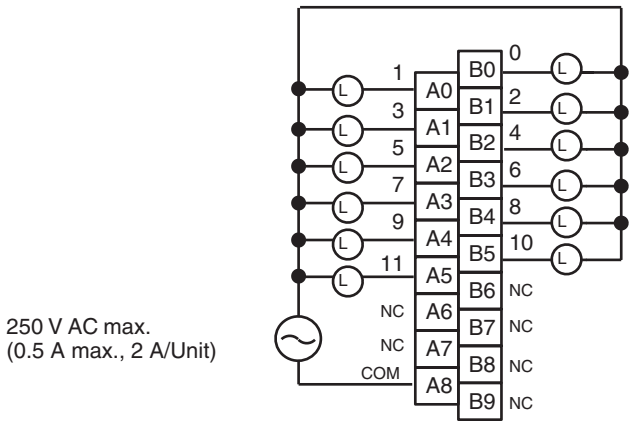
Circuit Configuration



Fuse: 3.15 A 250 V (5.2-dia. x 20) MT4 (SOC)

Note 1. No blown fuse detector circuit is provided.
2. Check the fuse when there is no output.

Terminal Connections

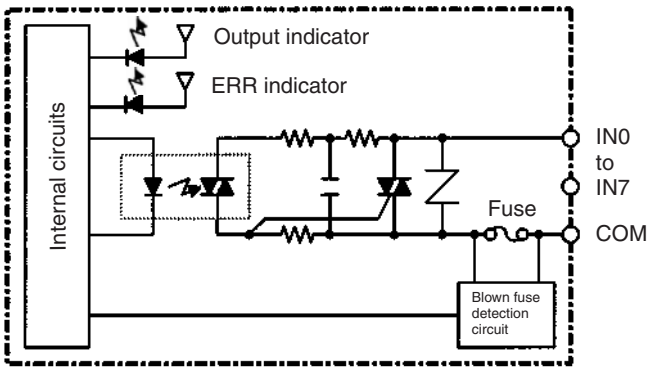


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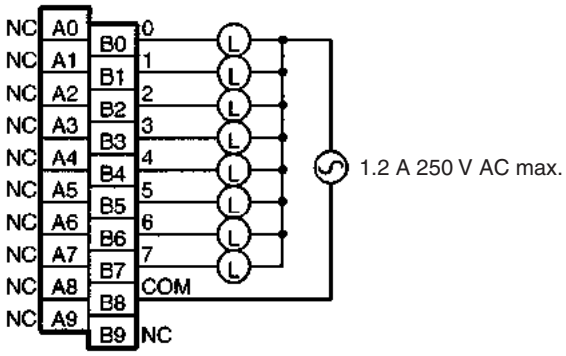
CS1W-OA201 Triac Output Unit (8 Points) (See note 1.)

Max. Switching Capacity	1.2 A 250 V AC, 50/60 Hz (4.8 A/Unit)
Max. Inrush Current	10 A (pulse width: 100 ms), 20 A (pulse width: 10 ms)
Min. Switching Capacity	100 mA 10 V AC, 50 mA 24 V AC, 10 mA 100 V AC min.
Leakage Current	1.5 mA (120 V AC) max., 3.0 mA (240 V AC) max.
Residual Voltage	1.5 V AC max. (50 to 500 mA), 5.0 V AC max. (10 to 50 mA)
ON Response Time	1 ms max.
OFF Response Time	1/2 of load frequency+1 ms or less.
No. of Circuits	1 (8 points/common)
Surge Protector	C.R Absorber + Surge Absorber
Fuses	8A The fuse cannot be replaced by the user.
Blown Fuse Detection Circuit	ERR indicator lit when fuse blown. Also, the corresponding Flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON.
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (500 V DC)
Dielectric Strength	2,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
Internal Current Consumption	230 mA 5 V DC max. (70 mA + 20 mA × No. of ON points)
Weight	300 g max.

Circuit Configuration



Terminal Connections



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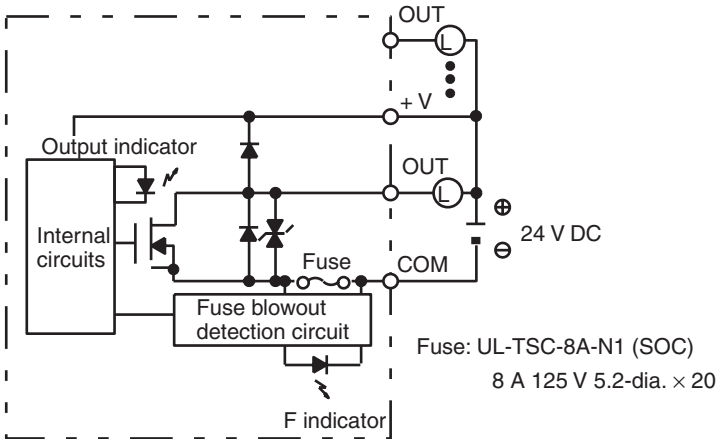
Note 1. This Unit uses only 8 bits for external I/O even though 16 bits (1 word) are allocated. This Unit is also treated as a 16-point Unit in the I/O tables.

2. Terminal numbers A0 to A9 and B0 to B9 are used in this manual, but they are not printed on the Unit.

C200H-OD213 Transistor Output Unit (8 Points)

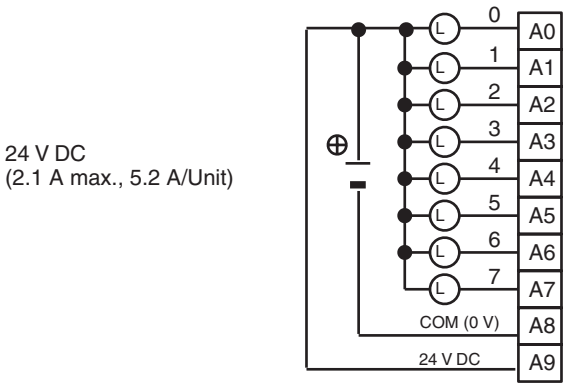
Max. Switching Capacity	2.1 A 24 V DC (20.4 to 26.4 V DC) (5.2 A/Unit) NPN output
Leakage Current	0.1 mA max.
Residual Voltage	1.4 V max.
ON Response Time	0.2 ms max.
OFF Response Time	0.3 ms max.
No. of Circuits	1 (8 points/common)
Internal Current Consumption	140 mA 5 V DC max.
Fuse Rating	8 A 125 V (5.2-dia. × 20)
Power for External Supply	30 mA 20.4 to 26.4 V DC min.
Weight	250 g max.

Circuit Configuration



Note When the fuse blows, the F indicator lights and bit 08 turns ON. Bits 08 through 15 cannot be used as work bits.

Terminal Connections



Note 1. Be sure to supply power to A9; otherwise current will leak through the load while the output is OFF.

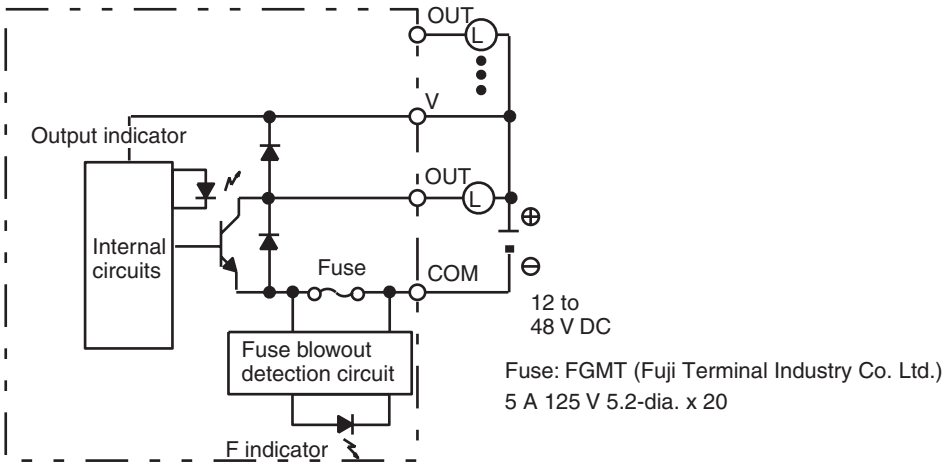
2. Incorrect load operation may result if polarity is not connected correctly.

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C200H-OD411 Transistor Output Unit (8 Points)

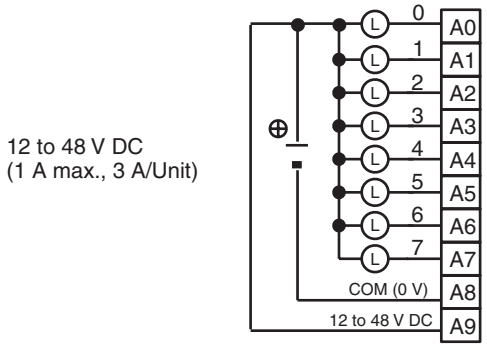
Max. Switching Capacity	10.2 to 52.8 V DC 1 A (3 A/Unit)
Leakage Current	0.1 mA max.
Residual Voltage	1.4 V max.
ON Response Time	0.2 ms max.
OFF Response Time	0.3 ms max.
No. of Circuits	1 (8 points/common)
Internal Current Consumption	140 mA 5 V DC max.
Fuse Rating	5 A 125 V (5.2-dia. × 20)
Power for External Supply	30 mA 10.2 to 52.8 V DC min.
Weight	250 g max.

Circuit Configuration



Note When the fuse blows, the F indicator lights and bit 08 turns ON. Bits 08 through 15 cannot be used as work bits.

Terminal Connections



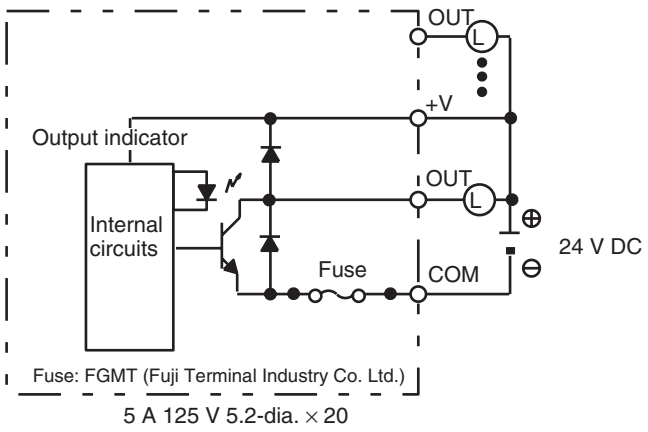
Note Be sure to supply power to A9; otherwise current will leak through the load while the output is OFF.

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C200H-OD211 Transistor Output Unit (12 Points)

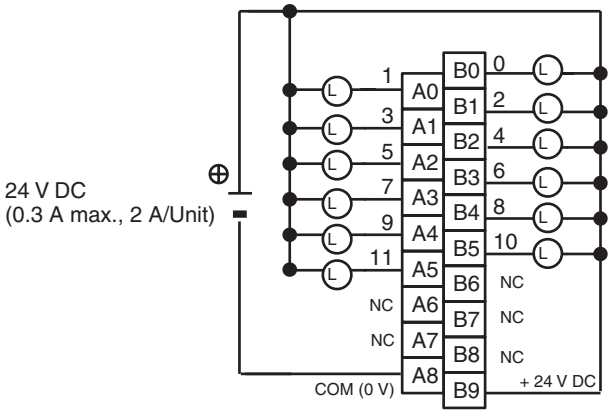
Max. Switching Capacity	0.3 A 24 V DC (20.4 to 26.4 V DC) (2 A/Unit)
Leakage Current	0.1 mA max.
Residual Voltage	1.4 V max.
ON Response Time	0.2 ms max.
OFF Response Time	0.3 ms max.
No. of Circuits	1 (12 points/common)
Internal Current Consumption	160 mA 5 V DC max.
Fuse Rating	5 A 125 V (5.2-dia. × 20)
Power for External Supply	25 mA 20.4 to 26.4 V DC min.
Weight	300 g max.

Circuit Configuration



Note 1. No blown fuse detector circuit is provided.
2. Check the fuse when there is no output.

Terminal Connections



Note 1. Be sure to supply power to B9; otherwise current will leak through the load while the output is OFF.
2. Terminal numbers A0 to A9 and B0 to B9 are used in this manual, but they are not printed on the Unit.

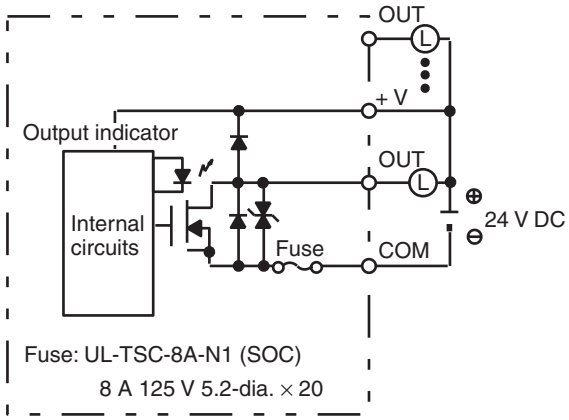
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C200H-OD212 Transistor Output Unit (16 Points)

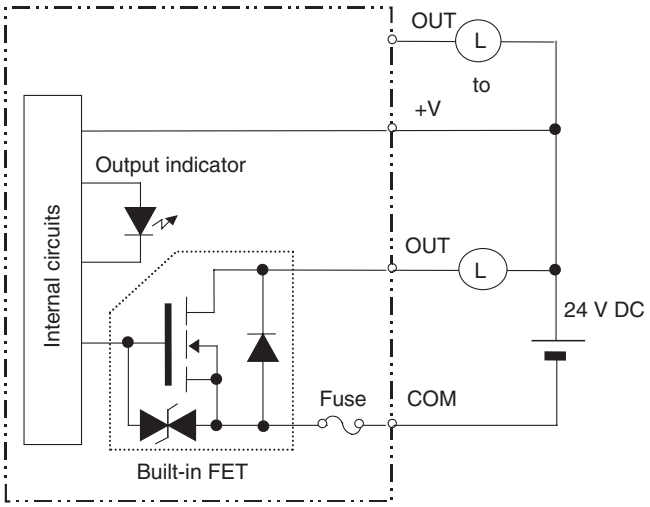
Max. Switching Capacity	0.3 A 24 V DC (20.4 to 26.4 V DC) (4.8 A/Unit)
Leakage Current	0.1 mA max.
Residual Voltage	1.4 V max.
ON Response Time	0.2 ms max.
OFF Response Time	0.3 ms max.
No. of Circuits	1 (16 points/common)
Internal Current Consumption	180 mA 5 V DC max.
Fuse Rating	8 A 125 V (5.2-dia. × 20)
Power for External Supply	35 mA 24 V DC (20.4 to 26.4 V DC) min.
Weight	350 g max.

Circuit Configuration

Units manufactured on or before October 9, 2002
(manufacturing numbers 09X2 or earlier)



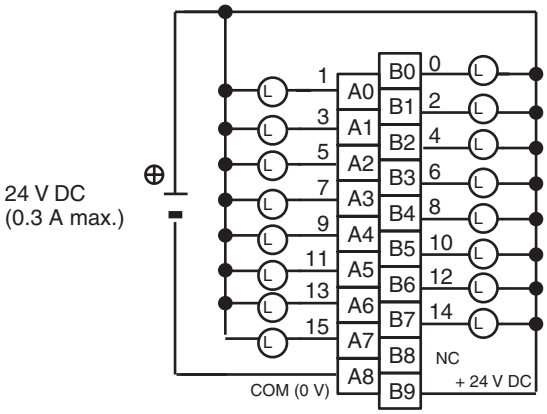
Units manufactured on or after October 10, 2002
(manufacturing numbers 10X2H or later)



Note 1. No blown fuse detector circuit is provided.
2. Check the fuse when there is no output.

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Terminal Connections

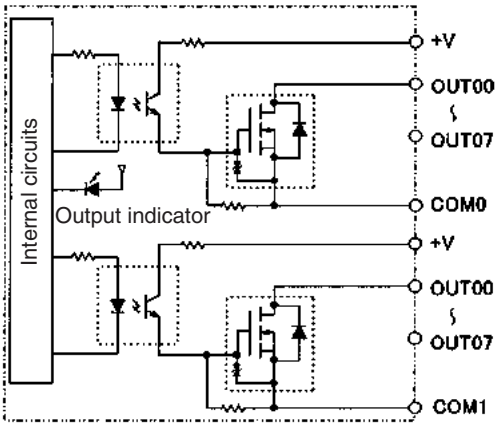


Note 1. Be sure to supply power to B9; otherwise current will leak through the load while the output is OFF.
2. Terminal numbers A0 to A9 and B0 to B9 are used in this manual, but they are not printed on the Unit.

CS1W-OD211 Transistor Output Unit (16 Points, Sinking)

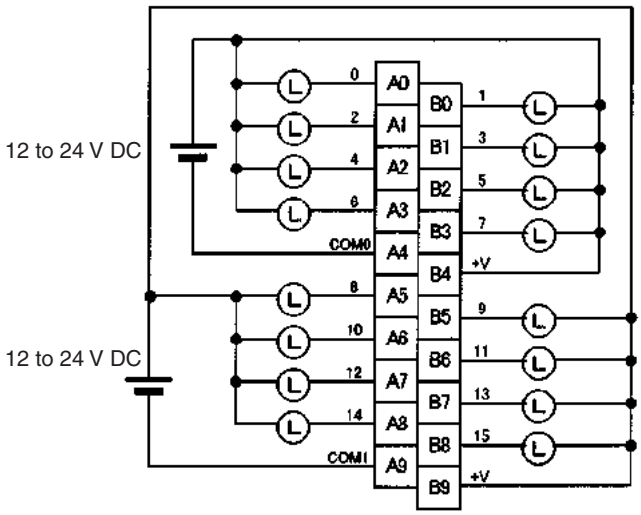
Rated Voltage	12 to 24 V DC
Operating Load Voltage Range	10.2 to 26.4 V DC
Maximum Load Current	0.5 A/point, 4.0 A/common, 8.0 A/Unit
Maximum Inrush Current	4.0 A/point, 10 ms max.
Leakage Current	0.1 mA max.
Residual Voltage	1.5 V max.
ON Response Time	0.5 ms max.
OFF Response Time	1.0 ms max.
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
No. of Circuits	16 (8 points/common, 2 circuits)
Internal Current Consumption	5 V DC 170 mA max.
Fuse	None
External Power Supply	10.2 to 26.4 V DC, 20 mA min.
Weight	270 g max.

Circuit Configuration



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Terminal Connections



Note Terminal numbers A0 to A9 and B0 to B9 are used in this manual, but they are not printed on the Unit. When wiring, pay careful attention to the polarity. The load may operate incorrectly if the polarity is reversed.

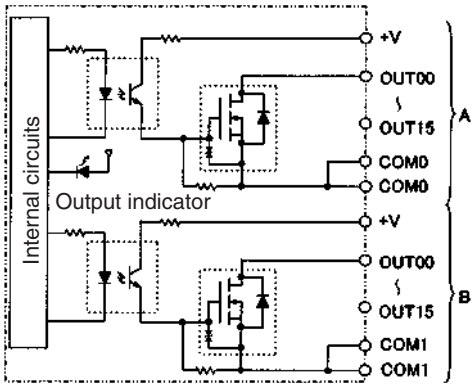
CS1W-OD231 Transistor Output Unit (32 Points, Sinking)

Rated Voltage	12 to 24 V DC
Operating Load Voltage Range	10.2 to 26.4 V DC
Maximum Load Current	0.5 A/point, 2.5 A/common, 5.0 A/Unit (See note.)
Maximum Inrush Current	4.0 A/point, 10 ms max.
Leakage Current	0.1 mA max.
Residual Voltage	1.5 V max.
ON Response Time	0.5 ms max.
OFF Response Time	1.0 ms max.
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
No. of Circuits	32 (16 points/common, 2 circuits)
Internal Current Consumption	5 V DC 270 mA max.
Fuse	None
External Power Supply	10.2 to 26.4 V DC, 30 mA min.
Weight	200 g max.
Accessories	One connector for external wiring (soldered)

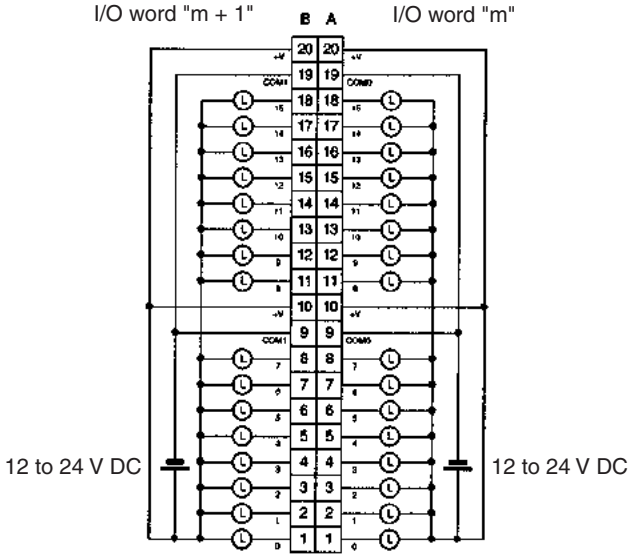
Note The maximum load currents will be 2.0 A/common and 4.0 A/Unit if a pressure-welded connector is used.

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Circuit Configuration



Terminal Connections



- When wiring, pay careful attention to the polarity. The load may operate if the polarity is reversed.
- Although the +V and COM terminals of rows A and B are internally connected, wire all points completely.

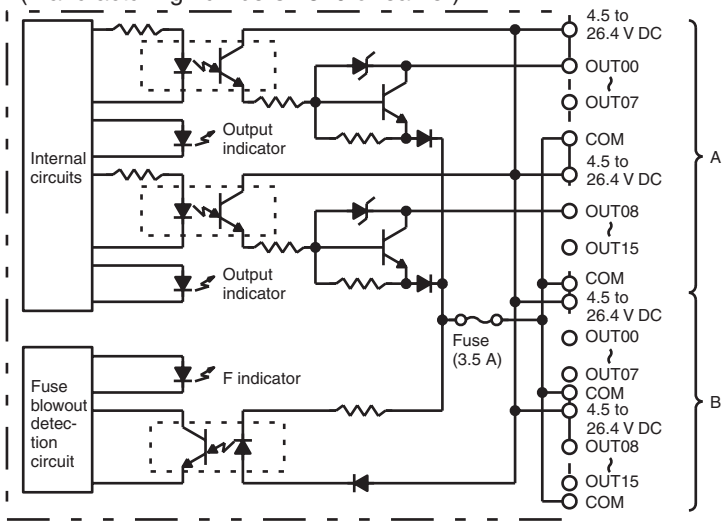
C200H-OD218 Transistor Output Unit (32 Points)

Max. Switching Capacity	16 mA 4.5 V DC to 100 mA 26.4 V DC (see below)
Leakage Current	0.1 mA max.
Residual Voltage	0.8 V max.
ON Response Time	0.1 ms max.
OFF Response Time	0.4 ms max.
No. of Circuits	1 (32 points/common)
Internal Current Consumption	180 mA 5 V DC max.
Fuse Rating	3.5 A (The fuse is not user-replaceable.)
Power for External Supply	110 mA 5 to 24 V DC±10% min. (3.4 mA × number of ON pts)
Weight	180 g max.

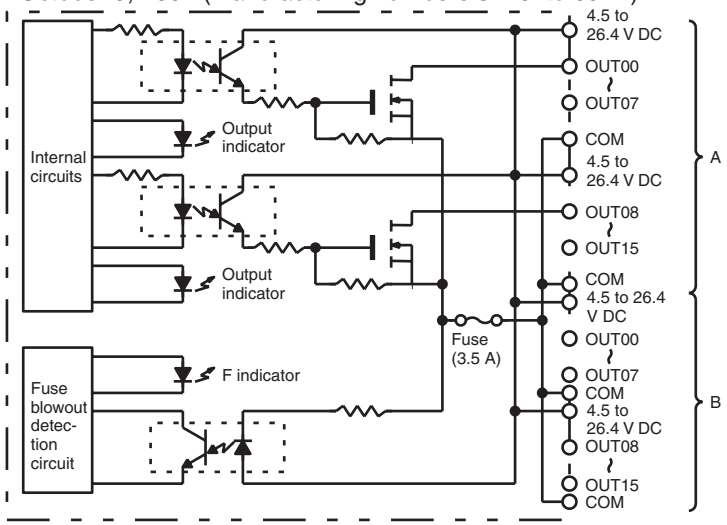
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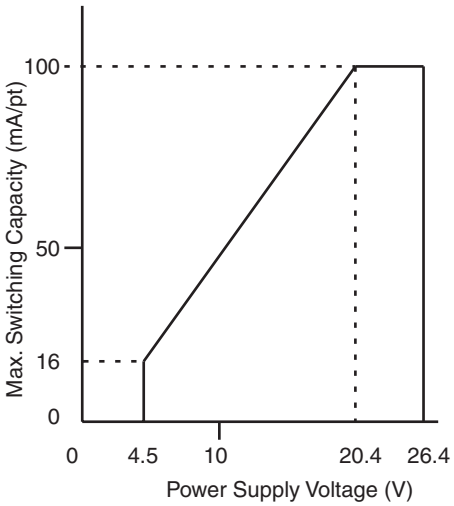
Circuit Configuration and Maximum Switching Capacity

Units manufactured on or before January 28, 2000
(manufacturing numbers 2810 or earlier)



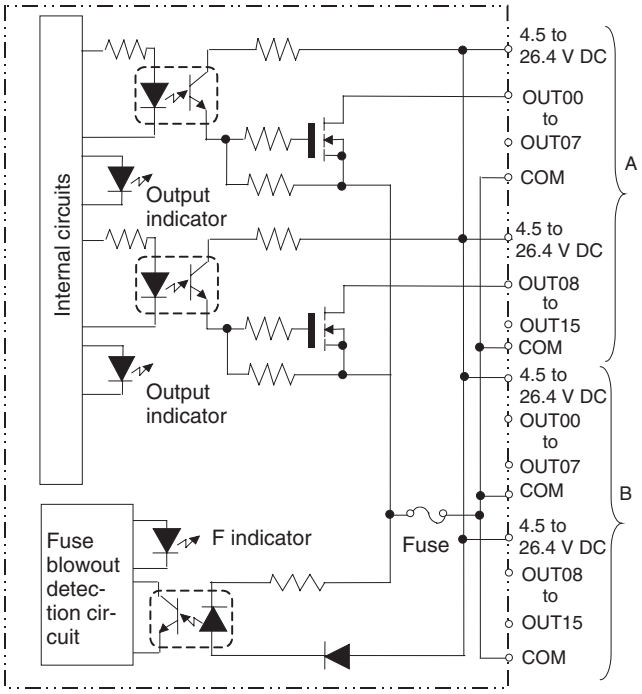
Units manufactured between January 31, 2000 and
October 9, 2002 (manufacturing numbers 3110 to 09X2)



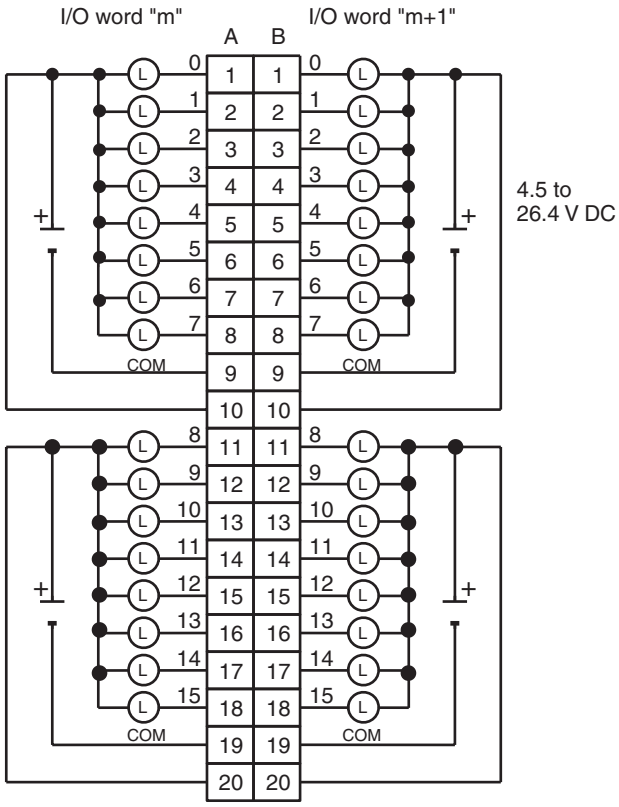


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Units manufactured on or after October 10, 2002
(manufacturing numbers 10X2H or later)



Terminal Connections



Note 1. When the fuse blows, the F indicator will light and the corresponding flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON.

2. The interruption of power from the external power supply is treated the same as a fuse blowout.

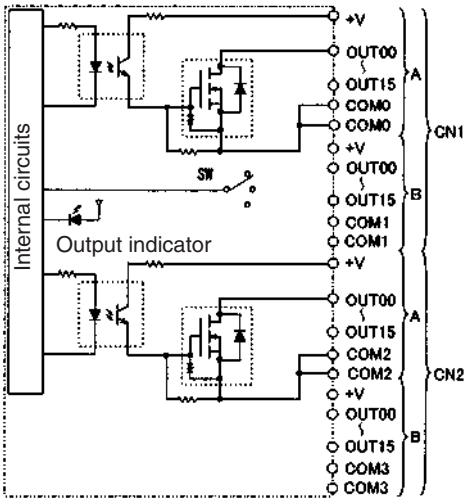
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3. Connect power supply wiring to every COM terminal, even though the COM terminals are connected internally.

CS1W-OD261 Transistor Output Unit (64 Points, Sinking)

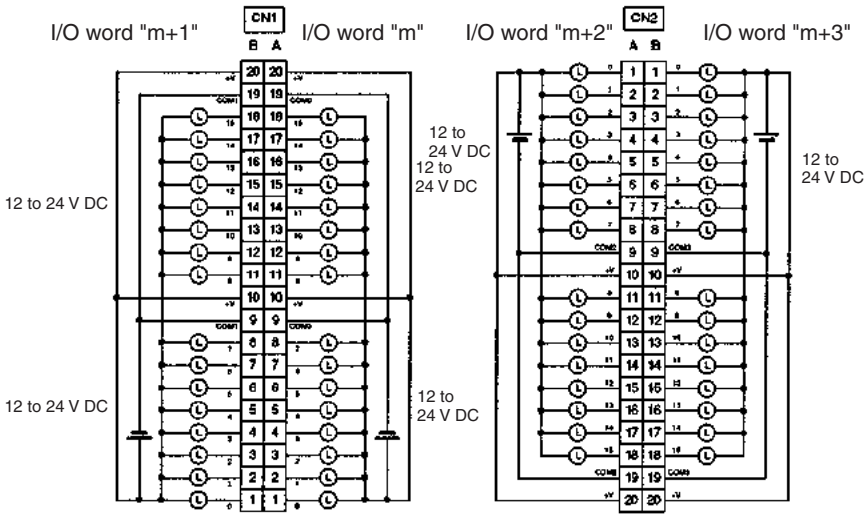
Rated Voltage	12 to 24 V DC
Operating Load Voltage Range	10.2 to 26.4 V DC
Maximum Load Current	0.3 A/point, 1.6 A/common, 6.4 A/Unit
Maximum Inrush Current	3.0 A/point, 10 ms max.
Leakage Current	0.1 mA max.
Residual Voltage	1.5 V max.
ON Response Time	0.5 ms max.
OFF Response Time	1.0 ms max.
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
No. of Circuits	64 (16 points/common, 4 circuits)
Internal Current Consumption	5 V DC 390 mA max.
Fuse	None
External Power Supply	10.2 to 26.4 V DC, 50 mA min.
Weight	260 g max.
Accessories	Two connectors for external wiring (soldered)

Circuit Configuration



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Terminal Connections



- When wiring, pay careful attention to the polarity. The load may operate if the polarity is reversed.
- Although the +V and COM terminals of rows A and B of CN1 and CN2 are internally connected, wire all points completely.

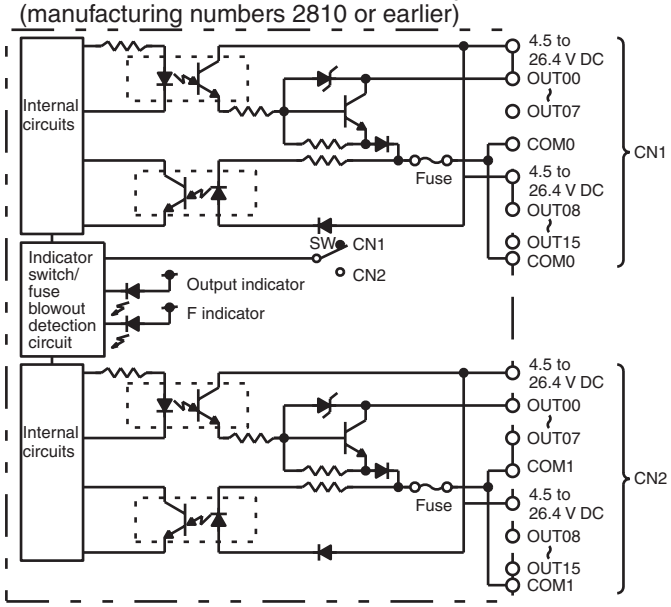
C200H-OD219 Transistor Output Unit (64 Points)

Max. Switching Capacity	16 mA 4.5 V DC to 100 mA 26.4 V DC (see below)
Leakage Current	0.1 mA max.
Residual Voltage	0.8 V max.
ON Response Time	0.1 ms max.
OFF Response Time	0.4 ms max.
No. of Circuits	2 (32 points/common)
Internal Current Consumption	270 mA 5 V DC max.
Fuses	Two 3.5 A fuses (1 fuse/common) The fuses are not user-replaceable.
Power for External Supply	220 mA 5 to 24 V DC±10% min. (3.4 mA × number of ON pts)
Weight	250 g max.

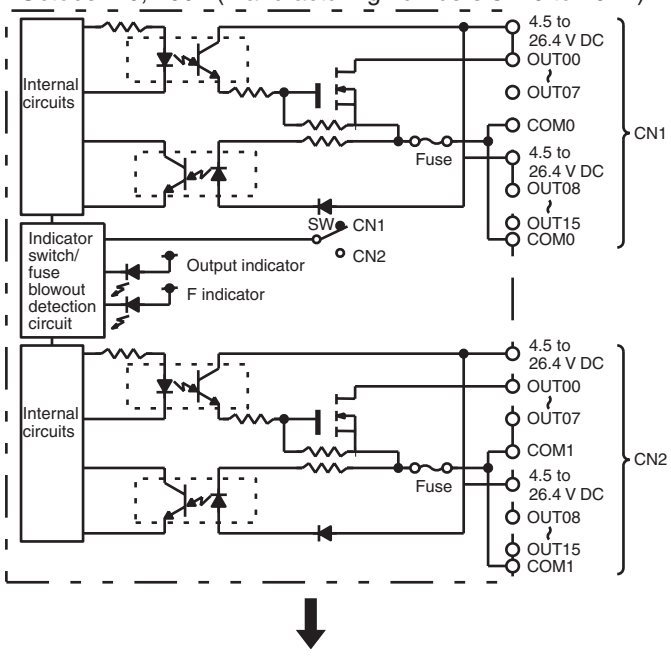
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Circuit Configuration

Units manufactured on or before January 28, 2000
(manufacturing numbers 2810 or earlier)

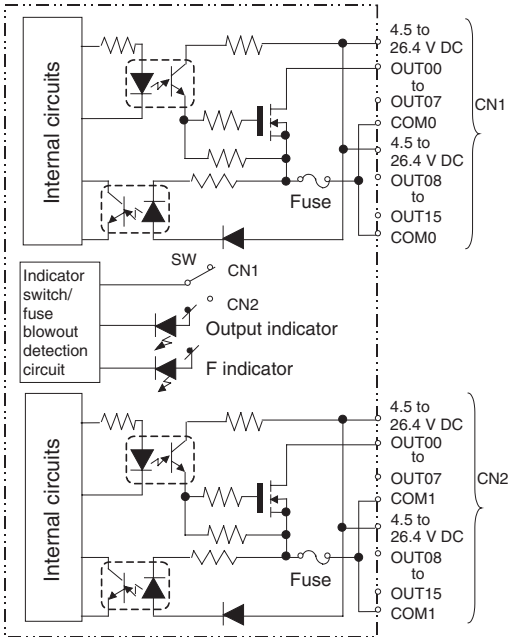


Units manufactured between January 29, 2000 and
October 10, 2002 (manufacturing numbers 3110 to 10X2)

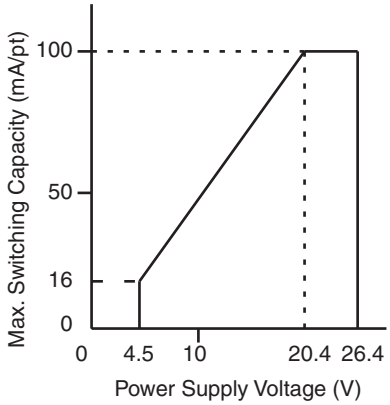


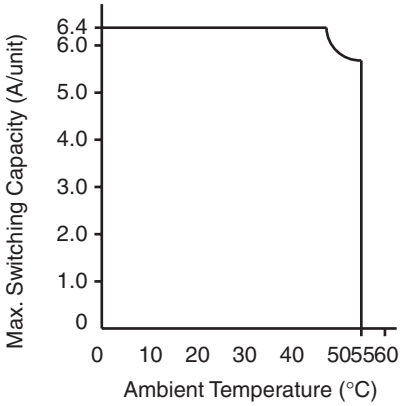
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Units manufactured on or after October 11, 2002
(manufacturing numbers 11X2H or later)



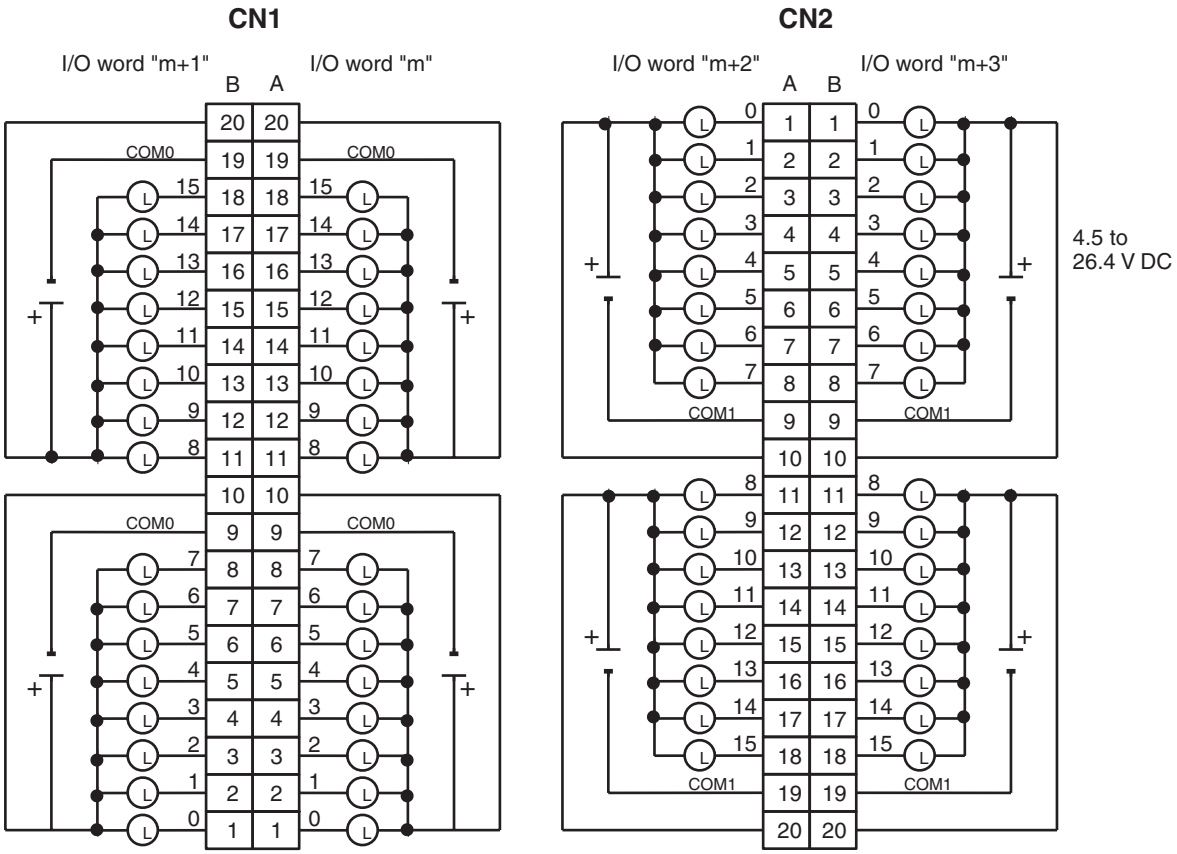
Maximum Switching Capacity





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Terminal Connections



Note 1. When either fuse blows, the F indicator will light and the corresponding Flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON.

2. The interruption of power from the external power supply is treated the same as a fuse blowout.

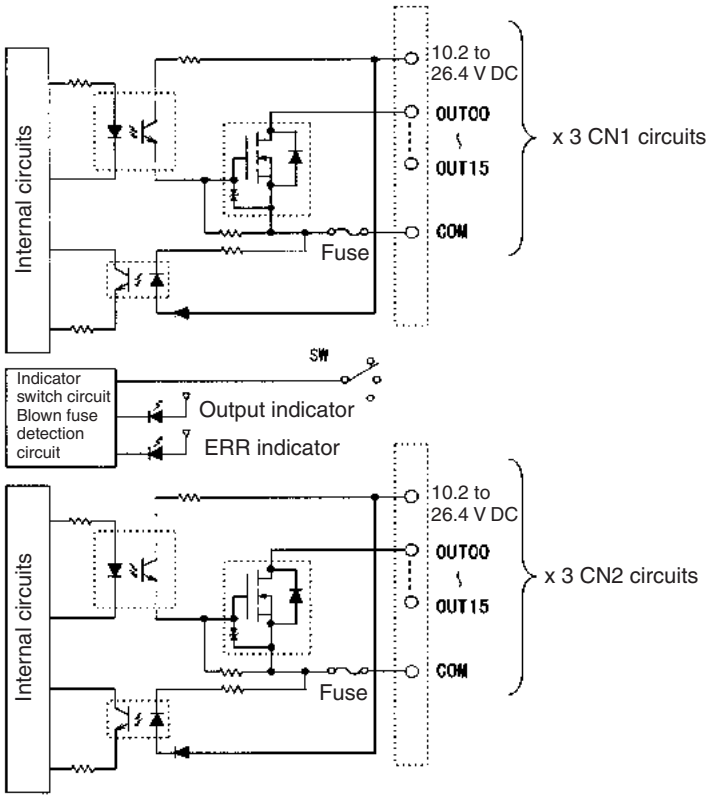
3. Connect power supply wiring to every COM terminal, even though the COM terminals in each connector are connected internally.

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CS1W-OD291 Transistor Output Unit (96 Points, Sinking)

Rated Voltage	12 to 24 V DC
Operating Load Voltage	10.2 to 26.4 V DC
Maximum Load Current	0.1 A/point, 1.2 A/common, 7.2 A/Unit (See note 2.)
Maximum Inrush Current	1.0 A/point, 10 ms max. 8.0 A/common, 10 ms max.
Leakage Current	0.1 mA max.
Residual Voltage	1.5 V max.
ON Response Time	0.5 ms max.
OFF Response Time	1.0 ms max.
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
No. of Circuits	6 (16 points/common)
Internal Current Consumption	480 mA max. at 5 V DC
Fuse	3 A (1 per common) The fuse cannot be replaced by the user.
External Power Supply	10.2 to 26.4 V DC, 100 mA min.
Weight	320 g max.
Accessories	Two connectors for external wiring (soldered)

Circuit Configuration

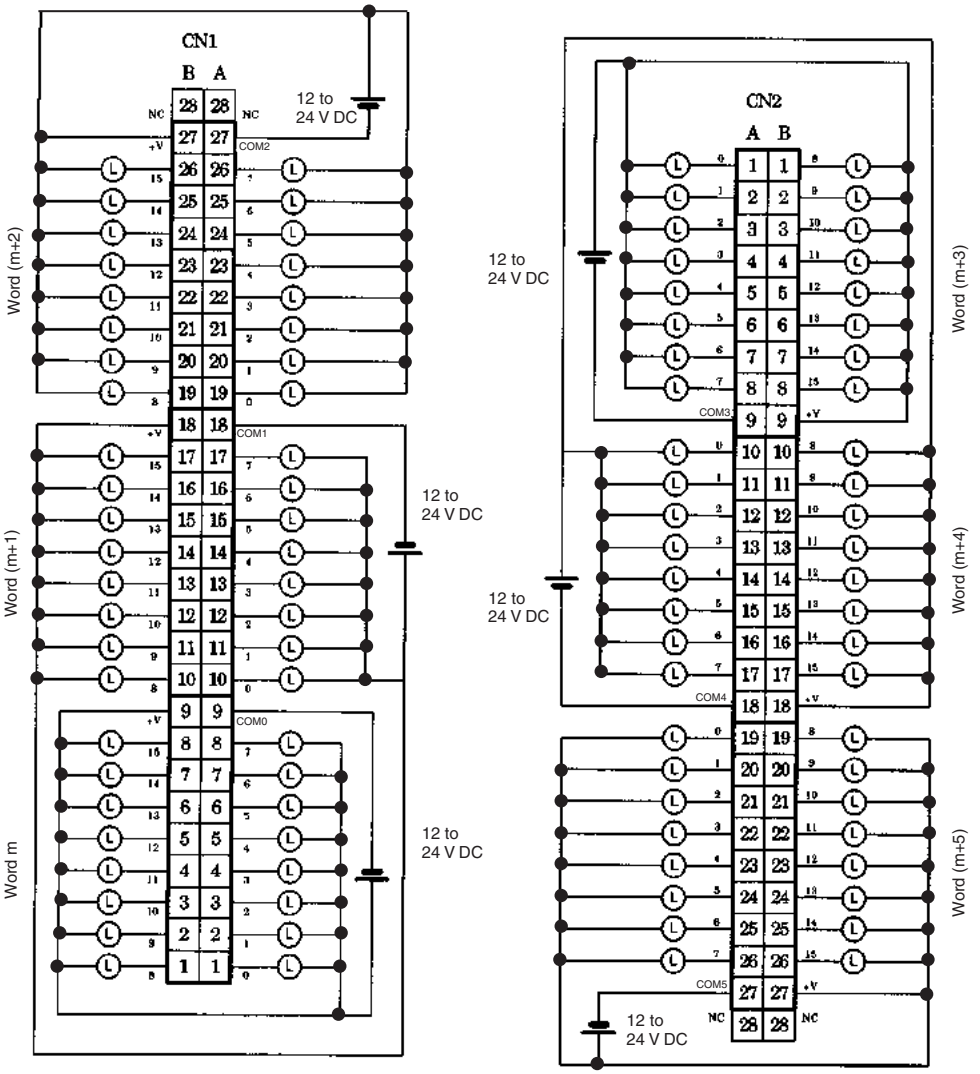


Note 1. The ERR indicator will light if a fuse blows or if the external power supply is turned OFF, and the corresponding Flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON.

2. The maximum load currents will be 1.0 A/common and 6.0 A/Unit if a pressure-welded connector is used.

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Terminal Connections: CS1W-OD291 24-V DC 96-point Transistor Output Unit (Sinking Outputs)

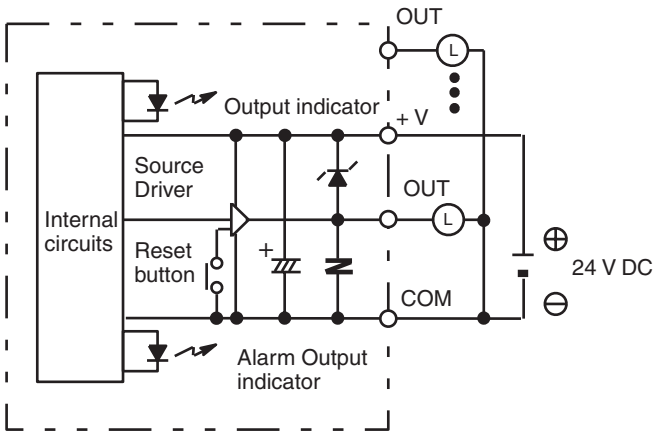


C200H-OD214 Transistor Output Unit (8 Points, Sourcing)

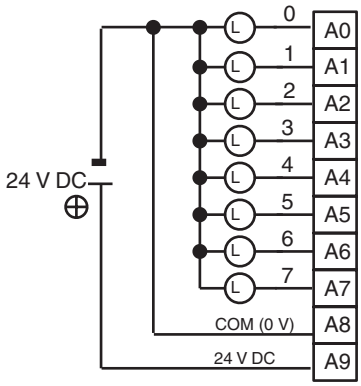
Max. Switching Capacity	24 V DC (20.4 to 26.4 V DC) 0.8 A (2.4 A/Unit)
Leakage Current	1 mA max.
Residual Voltage	1.5 V max.
ON Response Time	1 ms max.
OFF Response Time	1 ms max.
No. of Circuits	1 (8 points/common)
Internal Current Consumption	140 mA 5 V DC max.
Short-circuit protection	Overcurrent protection Thermal protection
Power for External Supply	150 mA 20.4 to 26.4 V DC min.
Weight	250 g max.

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Circuit Configuration



Terminal Connections



Note Be sure to supply power to A9; otherwise current will leak through the load while the output is OFF.

C200H-OD214 Short-circuit Protection

The C200H-OD214 Output Unit is equipped with two types of short-circuit protection: overcurrent protection and thermal protection. Any short-circuit must be eliminated immediately to protect the Unit.

Overcurrent Protection

When the output current reaches 2 A, the alarm output turns ON, and the alarm indicator lights. Make sure the surge current of the load does not exceed 2 A, or the alarm may be activated.

Thermal Protection

When the junction temperature of the output transistor reaches its upper limit, the output will turn OFF, the alarm output will turn ON, and the alarm indicator will flash protect to the transistor.

As shown in the alarm output table given below, there is one alarm indicator and alarm output bit for every two outputs. The alarm indicator and alarm output bit will function the same regardless of which output an alarm is detected for.

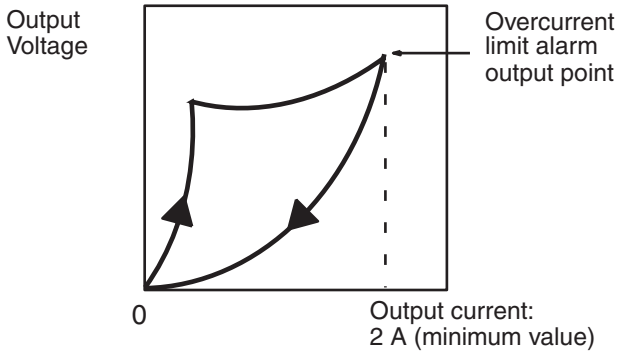
Thermal protection also works for two outputs at a time. If the thermal protection level is detected for one of the outputs, the other output will be turned OFF as well.

The output transistor is provided with a cooling plate. If only one of the outputs is short-circuited, heat generation will be balanced with heat radiation, and the transistor junction temperature may increase high enough to activate thermal protection. The alarm indicator and alarm output bit, however, will operate so that the alarm can be detected.

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How It Works

When the short-circuit protection activates, the output displays the characteristic shown below.



Clearing the Alarm

When the short-circuit has been eliminated, reset the Unit by pressing the reset button. The alarm indicator will go out, the alarm output bit will turn OFF, and the output will be reset.

Operating Restrictions

Although the C200H-OD214 is provided with short-circuit protection, these are for protecting internal circuits against momentary short-circuiting in the load. 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.

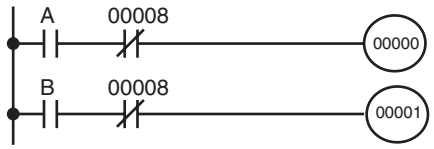
If a short-circuit occurs in an external load, immediately turn OFF the corresponding output. The C200H-OD214 turns ON an alarm output bit that corresponds with the external load output number. Each pair of outputs share one alarm indicator and one alarm output bit as shown below (bits 12 through 15 are not used and cannot be used as work bits)

Output No.	0	1	2	3	4	5	6	7
Alarm indicator No.	0		2		4		6	
Alarm Output Point No.	08		09		10		11	

Both the alarm indicator and alarm output bit for the short-circuited output turn ON even if only one of the outputs is short-circuited. Both outputs should be disconnected until the short-circuit can be traced.

Programming Example

If there is a short-circuit in an output, we want the program to turn that output OFF. Assume that the Unit is mounted at CIO 000. A program to turn OFF output bits 00 and 01 is shown below.



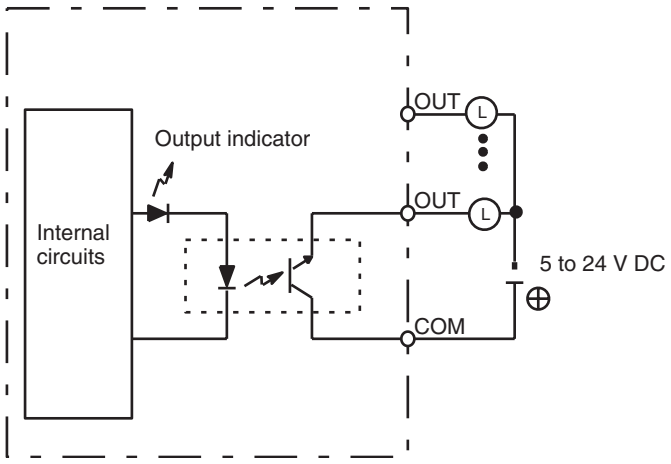
Since alarm output bit 08 covers both output bits 00 and 01, both these outputs are forced OFF as soon as output bit 08 turns ON (bits A and B can be any other bits required in the program).

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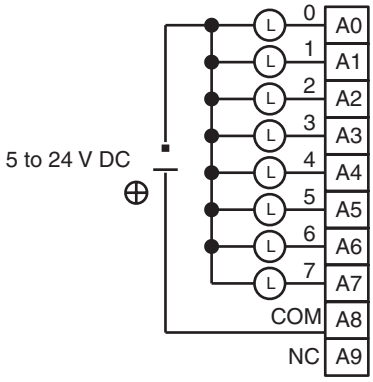
C200H-OD216 Transistor Output Unit (8 Points, Sourcing)

Max. Switching Capacity	0.3 A 5 to 24 V DC
Min. Switching Capacity	10 mA 5 V DC
Leakage Current	0.1 mA max.
Residual Voltage	1.5 V max.
ON Response Time	1.5 ms max.
OFF Response Time	2 ms max.
No. of Circuits	1 (8 points/common) positive common (source type)
Internal Current Consumption	10 mA 5 V DC max. 75 mA 26 V DC (8 points ON simultaneously.)
Fuse Rating	None
Weight	250 g max.

Circuit Configuration



Terminal Connections

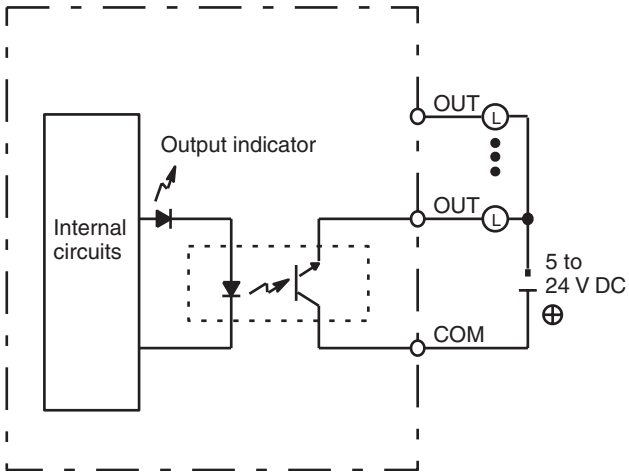


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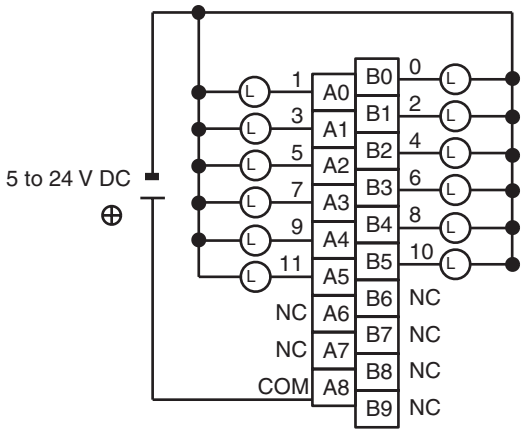
C200H-OD217 Transistor Output Unit (12 Points, Sourcing)

Max. Switching Capacity	0.3 A 5 to 24 V DC
Min. Switching Capacity	10 mA 5 V DC
Leakage Current	0.1 mA max.
Residual Voltage	1.5 V max.
ON Response Time	1.5 ms max.
OFF Response Time	2 ms max.
No. of Circuits	1 (12 points/common) positive common (source type)
Internal Current Consumption	10 mA 5 V DC max. 75 mA 26 V DC (8 points ON simultaneously.)
Fuse Rating	None
Weight	300 g max.

Circuit Configuration



Terminal Connections

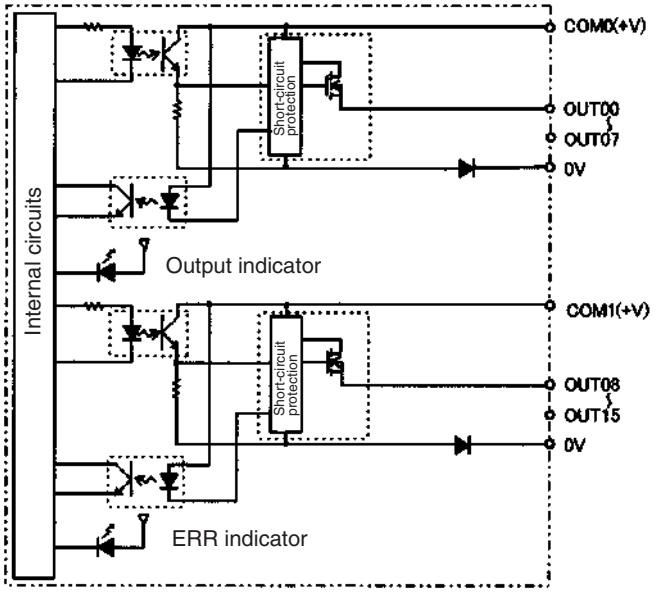


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CS1W-OD212 Transistor Output Unit (16 Points, Sourcing)

Rated Voltage	24 V DC
Operating Load Voltage Range	20.4 to 26.4 V DC
Maximum Load Current	0.5 A/point, 2.5 A/common, 5.0 A/Unit
Maximum Inrush Current	0.1 mA max.
Leakage Current	1.5 V max.
ON Response Time	0.5 ms max.
OFF Response Time	1.0 ms max.
Load Short-circuit Prevention	Detection current: 0.7 to 2.5 A Automatic restart after error clearance. (Refer to the following pages.)
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
No. of Circuits	16 (8 points/common, 2 circuits)
Internal Current Consumption	5 V DC 170 mA max.
External Power Supply	20.4 to 26.4 V DC, 40 mA min.
Weight	270 g max.

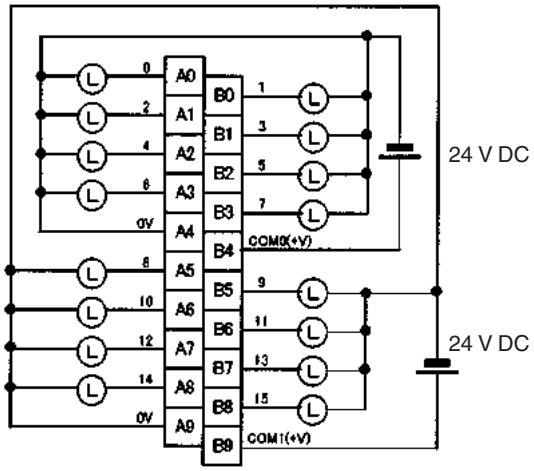
Circuit Configuration



When overcurrent is detected, the ERR indicator will light, and the corresponding flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON.

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Terminal Connections



Note Terminal numbers A0 to A9 and B0 to B9 are used in this manual, but they are not printed on the Unit.

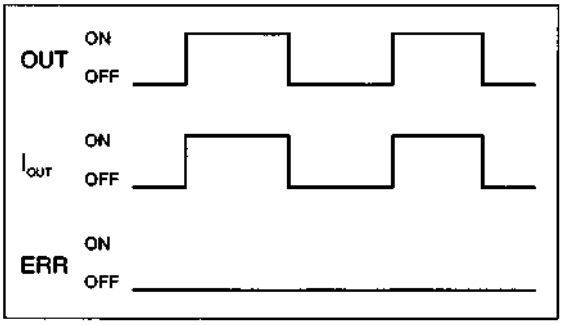
When wiring, pay careful attention to the polarity of the external power supply. The load may operate if the polarity is reversed.

Load Short-circuit Protection

This section describes the load short-circuit protection of the CS1W-OD212/OD232/OD262/MD262, C200H-OD21B Output Units.

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 (Iout) is overloaded or short-circuited exceeding the detection current (Ilim), the output current (Iout) will be limited as shown in *Figure 2* below. 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.

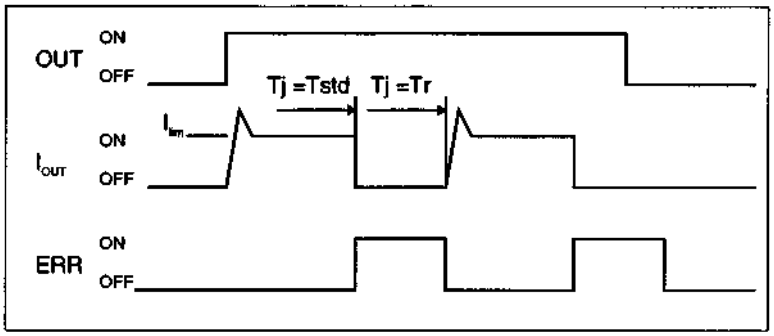
Figure 1: Normal Condition



OUT: OUTPUT instruction
I_{OUT}: Output current
ERR: Alarm output, ERR indicator
I_{lim}: Detection current
Tj: Junction temperature of transistor
Tstd: Thermal shutdown temperature
Tr: Reset temperature

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Figure 2: Overload or Short-circuit



Operating Restrictions

Although the CS1W-OD212/OD232/OD262/MD262 and C200H-OD21B are provided with short-circuit protection, these are for protecting internal circuits against momentary short-circuiting in the load. As shown in *Figure 2* below, the 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 CS1W-OD212/OD232/OD262/MD262 and C200H-OD21B turn ON an alarm output bit that corresponds to the external load output number. 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 bit is allocated in the Basic I/O Unit Information Area (A050 to A089) for every Unit mounting slot.

The following table shows the correspondence between output bits and bits in the Basic I/O Unit Information Area.

Output bit		m		m+1	m+2	m+3
		0 to 7	8 to 15	0 to 15	0 to 15	0 to 15
CS1W-OD212	Mounted in even slot	0	1	---	---	---
	Mounted in odd slot	8	9	---	---	---
CS1W-OD232	Mounted in even slot	0		1	---	---
	Mounted in odd slot	8		9	---	---
CS1W-OD262	Mounted in even slot	0		1	2	3
	Mounted in odd slot	8		9	10	11
CS1W-MD262	Mounted in even slot	0		1	---	---
	Mounted in odd slot	8		9	---	---
C200H-OD21B	Mounted in even slot	0		---	---	---
	Mounted in odd slot	8		---	---	---

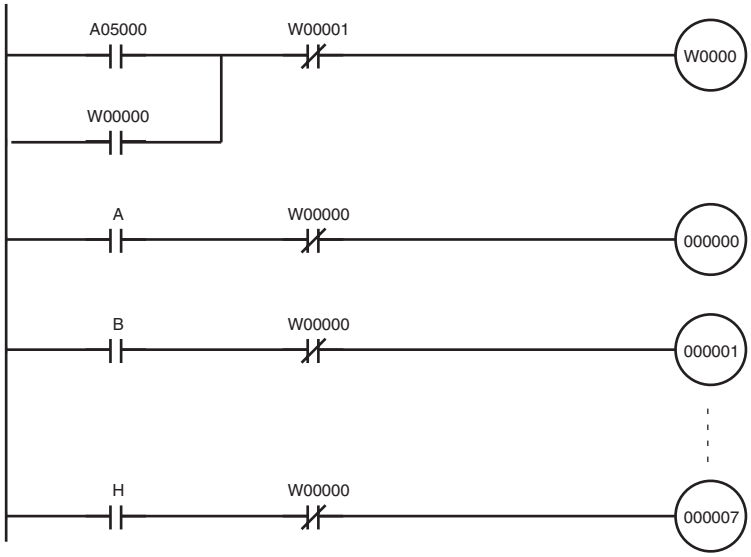
For example, when the CS1W-OD212 is mounted in slot 0 on Rack 0, A05001 will turn ON if the output 8 is short-circuited. When the CS1W-OD262 is mounted in slot 1 of Rack 0, A05011 will turn ON if the output m+3 is short-circuited.

Programming Example

In this example, CS1W-OD212 is mounted in slot 0 of the Rack 0.

This example shows how to turn OFF output bits CIO 000000 to CIO 000007 immediately if the alarm output bit A05000 turns ON and how to keep the output bits OFF until the cause is removed and the bit is reset using work bit W000001.

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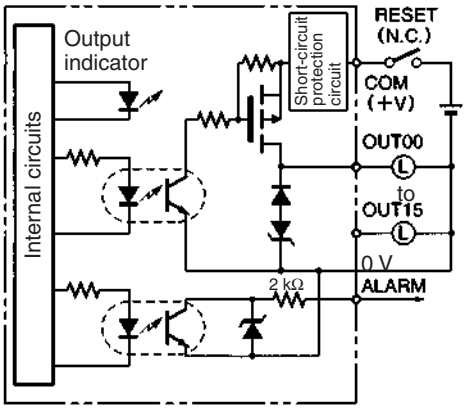


C200H-OD21A Transistor Output Unit (16 Points, Sourcing) (Load Circuit Protection Provided)

Max. Switching Capacity	24 V DC (20.4 to 26.4 V DC), 1.0 A (4 A/Unit)
Leakage Current	0.1 mA max.
Residual Voltage	0.8 V max.
ON Response Time	0.1 ms max.
OFF Response Time	0.3 ms max.
No. of Circuits	1 (16 points/common)
Internal Current Consumption	160 mA 5 V DC max.
Load Short-circuit Protection	Detection current: 1.2 A min (1.6 A typical)
Power for External Supply	35 mA 20.4 to 26.4 V DC min.
Weight	400 g max.
Alarm Output (See note 1.)	No. of outputs: 1 (2 kΩ internal resistor), Output current: 10 mA max., Connectable Units: Only the following DC Input Units can be connected: C200H-ID001, ID211, ID212, IM211 (DC), IM212 (DC), ID215, ID501, MD115, MD215, MD501
Reset Input	Used when alarm output turns ON. Value will depend on the external power supply. (See note 2.)
Load Short-circuit Protection	Detection current: 1.2 A min. (1.6 A typical)
Dimensions	B-shape

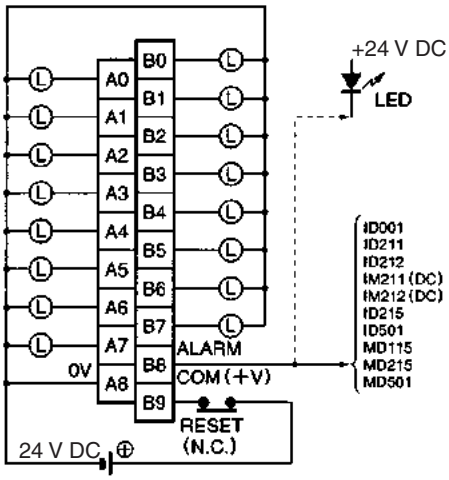
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Circuit Configuration



Note When short-circuit/overload protection is activated, all 16 outputs will be switched OFF and the ALARM output becomes active (low level). The problem can be detected externally by connecting a DC Input Unit to the ALARM output or by connecting an alarm output indicator. It's not possible to connect both the Input Unit and the indicator at the same time.

Terminal Connections



Note When the ALARM output turns ON, remove the cause of the high current and then shut off the external power supply for approx. 1 second. After confirming that the cause has been removed, turn ON the power supply again to reset the output. As shown in the diagram, it is recommended that a relay or switch that turns ON or OFF only the external power supply be connected right before the B9 (+V). Check that this relay or switch has a contact capacity higher than the external power supply current consumption (35 mA + load current minimum).

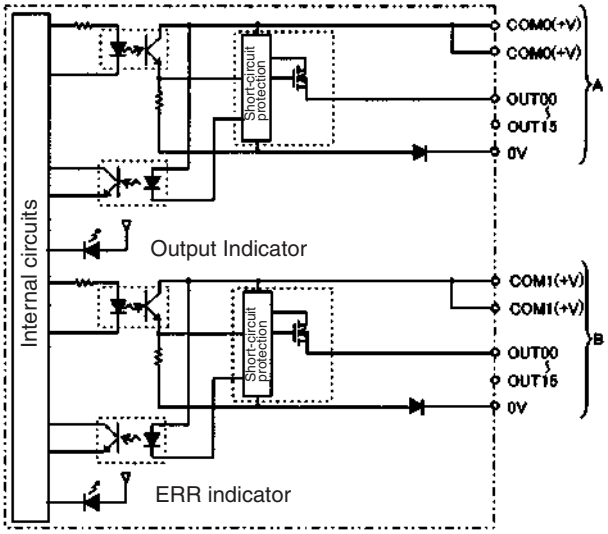
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CS1W-OD232 (32 Points, Sourcing)

Rated Voltage	24 V DC
Operating Load Voltage Range	20.4 to 26.4 V DC
Maximum Load Current	0.5 A/point, 2.5 A/common, 5.0 A/Unit (See note.)
Leakage Current	0.1 mA max.
Residual Voltage	1.5 V max.
ON Response Time	0.5 ms max.
OFF Response Time	1.0 ms max.
Load Short-circuit Prevention	Detection current: 0.7 to 2.5 A Automatic restart after error clearance. (Refer to the above Load Short-circuit Protection.)
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
No. of Circuits	32 (16 points/common, 2 circuits)
Internal Current Consumption	5 V DC 270 mA max.
External Power Supply	20.4 to 26.4 V DC, 70 mA min.
Weight	210 g max.
Accessories	One connector for external wiring (soldered)

Note The maximum load currents will be 2.0 A/common and 4.0 A/Unit if a pressure-welded connector is used.

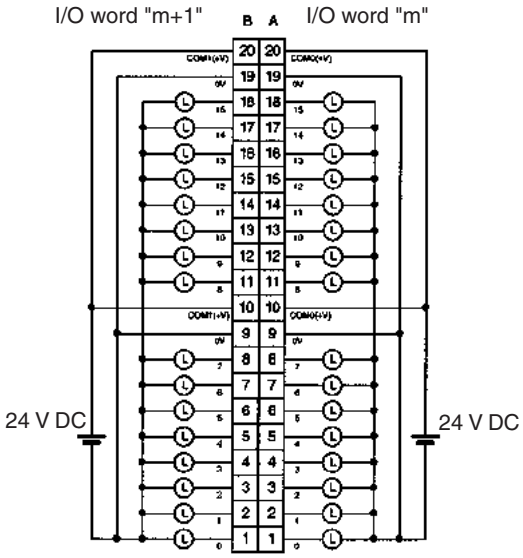
Circuit Configuration



When the output current of any output exceeds the detection current, the output for that point will turn OFF. At the same time, the ERR indicator will light and the corresponding flag (one for each common) in the Basic I/O Unit Information Area (A050 to A089) will turn ON.

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Terminal Connections



- When wiring, pay careful attention to the polarity of the external power supply. The load may operate if the polarity is reversed.
- Although the COM(+V) and 0V of rows A and B are internally connected, wire all points completely.

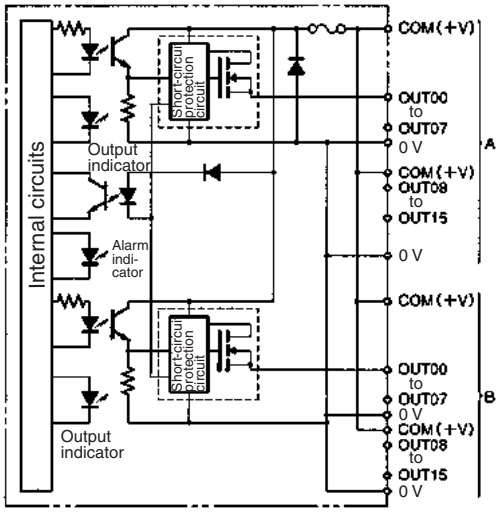
Transistor Output Unit C200H-OD21B (32 Points) (Load Short-circuit Protection Provided)

Max. Switching Current	0.5 A 24 V DC (20.4 to 26.4 V DC) (5 A/Unit) (See note.)
Min. Switching Current	None
Leakage Current	0.1 mA max.
Residual Voltage	0.8 V max.
ON Response Time	0.1 ms max.
OFF Response Time	0.3 ms max.
No. of Circuits	32 (32 points/common)
Internal Current Consumption	180 mA 5 V DC max.
Fuses	One 7 A fuse (1 fuse/common) The fuses are not user-replaceable.
Power for External Supply	160 mA 20.4 to 26.4 V DC min. (5 mA × number of ON pts)
Weight	180 g max.
Alarm Indicator	Lamp F lights (unless fuse is broken).
Load Short-circuit Prevention (See note 1.)	Detection current: 0.7 to 2.5 A Automatic restart after error clearance.
Dimensions	C-shape

Note The maximum load currents will be 4.0 A/Unit if a pressure-welded connector is used.

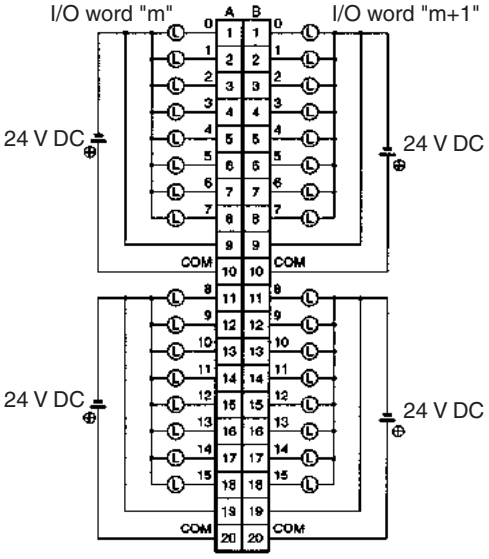
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Circuit Configuration



Note When the short-circuit/overload protection is activated for a contact point, the output for that point is turned OFF. At the same time, lamp “F” lights, and the corresponding Flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON. After the cause of the error has been removed, the alarm will be cleared automatically when the internal temperature of the element drops.

Terminal Connections

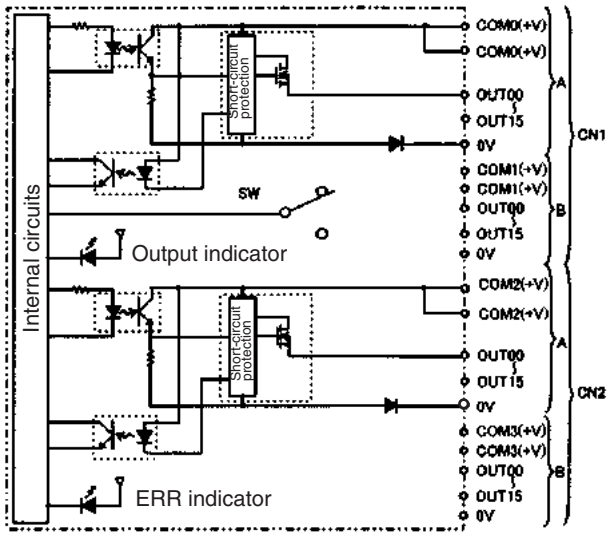


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CS1W-OD262 (64 Points, Sourcing)

Rated Voltage	24 V DC
Operating Load Voltage Range	20.4 to 26.4 V DC
Maximum Load Current	0.3 A/point, 1.6 A/common, 6.4 A/Unit
Leakage Current	0.1 mA max.
Residual Voltage	1.5 V max.
ON Response Time	0.5 ms max.
OFF Response Time	1.0 ms max.
Load Short-circuit Prevention	Detection current: 0.7 to 2.5 A Automatic restart after error clearance. (Refer to the above Load Short-circuit Protection.)
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
No. of Circuits	64 (16 points/common, 4 circuits)
Internal Current Consumption	5 V DC 390 mA max.
External Power Supply	20.4 to 26.4 V DC, 130 mA min.
Weight	270 g max.
Accessories	Two connectors for external wiring (soldered)

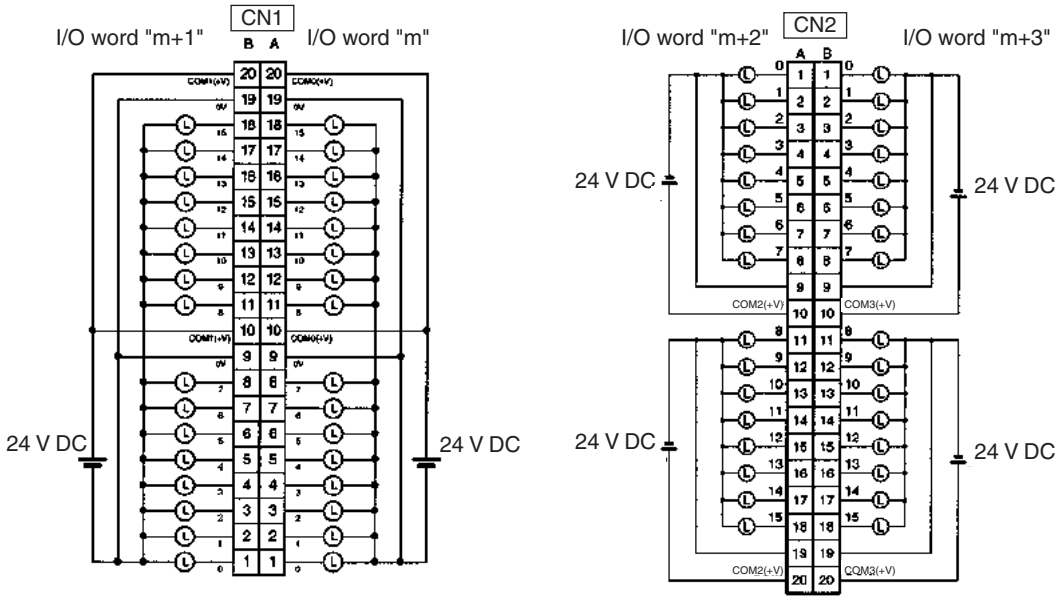
Circuit Configuration



When overcurrent is detected, the ERR indicator will light. At the same time, the corresponding flag (one for each common) in the Basic I/O Unit Information Area (A050 to A089) will turn ON.

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Terminal Connections



- When wiring, pay careful attention to the polarity of the external power supply. The load may operate if the polarity is reversed.
- Although the COM(+V) and 0V of rows A and B of CN1 and CN2 are internally connected, wire all points completely.

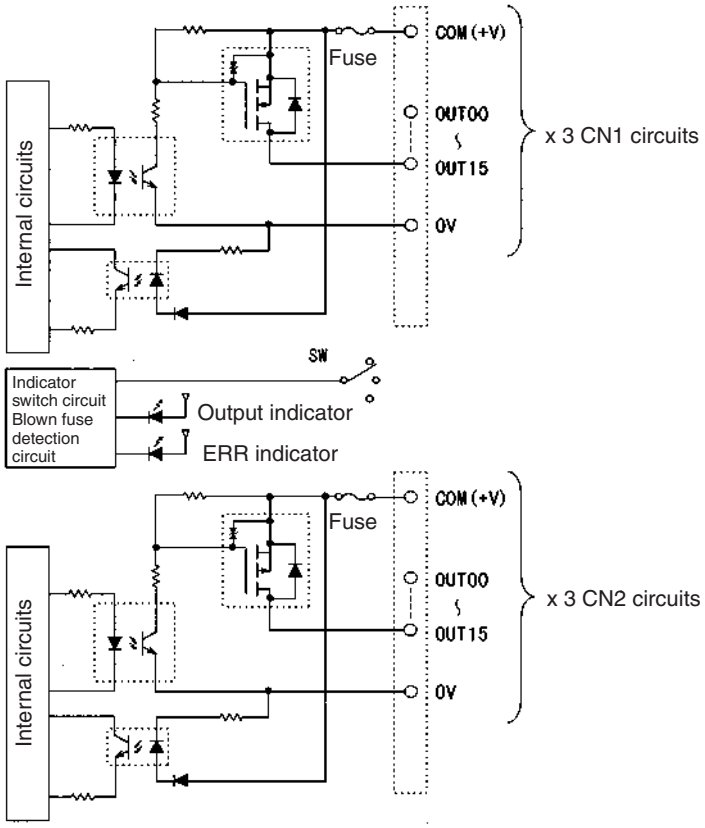
CS1W-OD292 Transistor Output Unit (96 Points, Sourcing)

Rated Voltage	12 to 24 V DC
Operating Load Voltage Range	10.2 to 26.4 V DC
Maximum Load Current	0.1 A/point, 1.2 A/common, 7.2 A/Unit (See note.)
Maximum Inrush Current	1.0 A/point, 10 ms max. 8.0 A/common, 10 ms max.
Leakage Current	0.1 mA max.
Residual Voltage	1.5 V max.
ON Response Time	0.5 ms max.
OFF Response Time	1.0 ms max.
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
No. of Circuits	6 (16 points/common)
Internal Current Consumption	480 mA max. at 5 V DC
Fuse	3 A (1 per common) The fuse cannot be replaced by the user.
External Power Supply	10.2 to 26.4 V DC, 100 mA min.
Weight	320 g max.
Accessories	Two connectors for external wiring (soldered)

Note The maximum load currents will be 1.0 A/command and 6.0 A/Unit if a pressure-welded connector is used.

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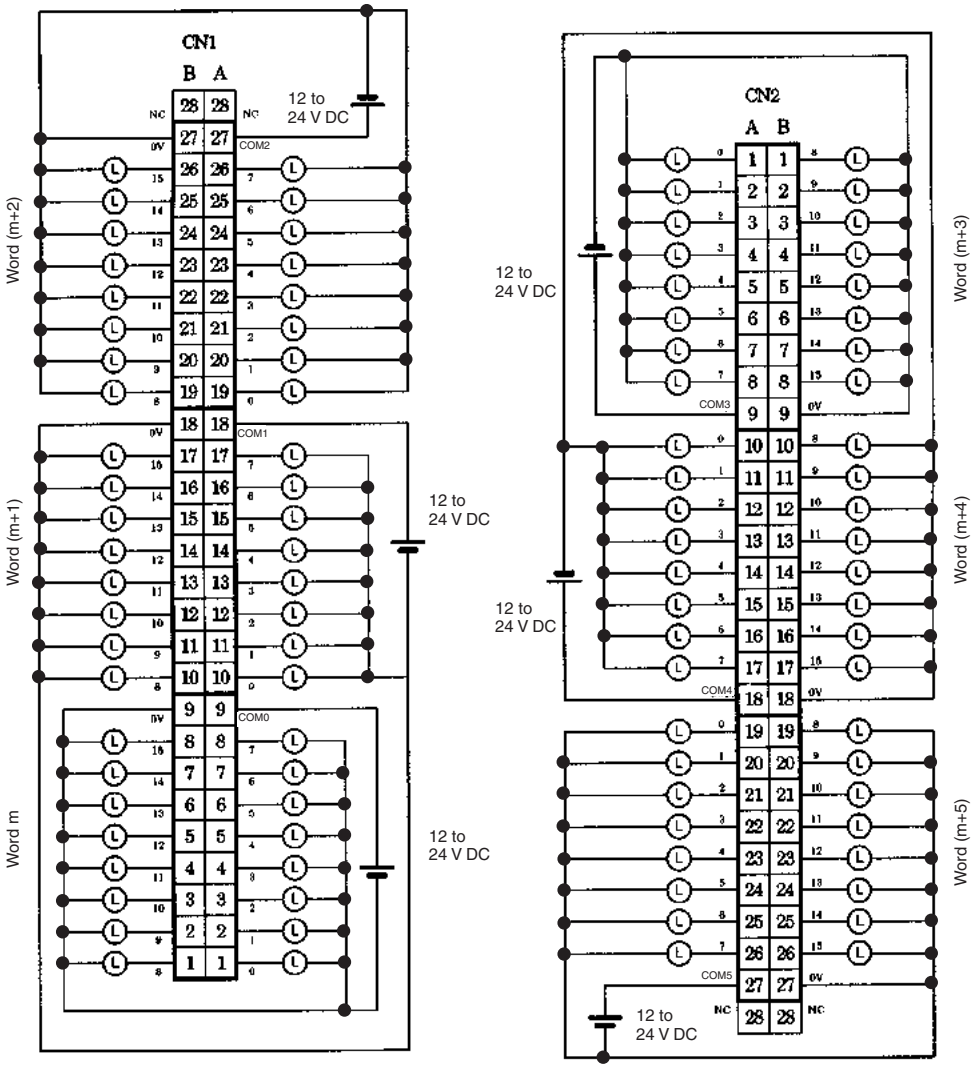
Circuit Configuration



Note The ERR indicator will light if a fuse blows or if the external power supply is turned OFF, and the corresponding Flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON.

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Terminal Connections: CS1W-OD292 24-V DC 96-point Transistor Output Unit (Sourcing Outputs)

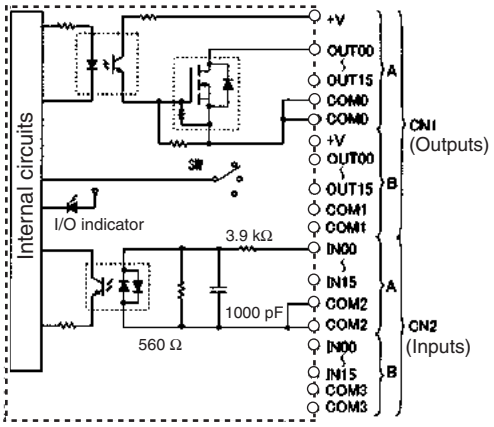


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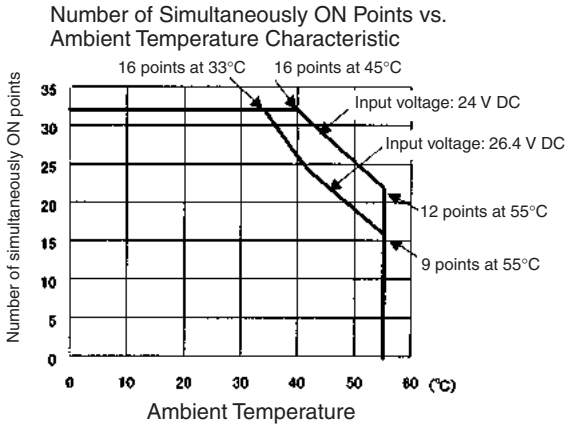
CS1W-MD261 DC Input/Transistor Output Unit (32/32 Points, Sinking)

Output section (CN1)		Input section (CN2)	
Rated Voltage	12 to 24 V DC	Rated Input Voltage	24 V DC
		Operating Input Voltage	20.4 to 26.4 V DC
Operating Load Voltage Range	10.2 to 26.4 V DC	Input Impedance	3.9 kΩ
Maximum Load Current	0.3 A/point, 1.6 A/common, 3.2 A/Unit	Input Current	6 mA typical (at 24 V DC)
Maximum Inrush Current	3.0/point, 10 ms max.	ON Voltage/ON Current	15.4 V DC min./3 mA min.
Leakage Current	0.1 mA max.	OFF Voltage/OFF Current	5 V DC min./1 mA min.
Residual Voltage	1.5 V max.	ON Response Time	8.0 ms max. (Can be set to between 0 and 32 in the PLC Setup.) (See notes 1 and 2.)
ON Response Time	0.5 ms max.		
OFF Response Time	1.0 ms max.	OFF Response Time	8.0 ms max. (Can be set to between 0 and 32 in the PLC Setup.) (See notes 1 and 2.)
No. of Circuits	32 (16 points/common, 2 circuits)		
Fuse	None	No. of Circuits	32 (16 points/common, 2 circuits)
External Power Supply	10.2 to 26.4 V DC, 30 mA min.	Number of Simultaneously ON Points	70% (11 points/common) (at 24 V DC)
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)		
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.		
Internal Current Consumption	5 V DC 270 mA max.		
Weight	260 g max.		
Accessories	Two connectors for external wiring (soldered)		

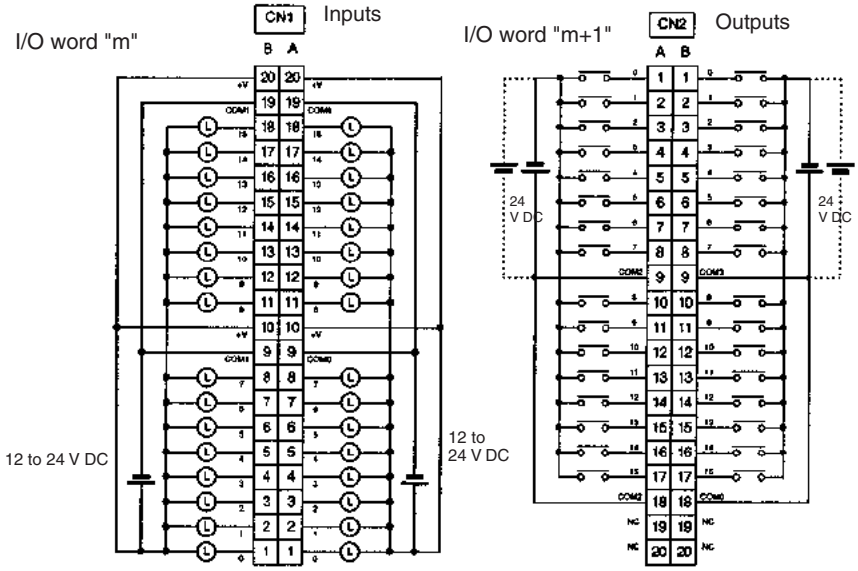
Circuit Configuration



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Terminal Connections



- When wiring, pay careful attention to the polarity. The load may operate is polarity is reversed.
- Although the +V and COM terminals of rows A and B of CN1 and CN2 are internally connected, wire all points completely.

Note 1. The ON response time will be 120 μs maximum and OFF response time will be 300 μs maximum even if the response times are set to 0 ms due to internal element delays.

2. The input ON and OFF response times for Basic I/O Units can be set to 0, 0.5, 1, 2, 4, 8, 16, or 32 ms in the PLC Setup.

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CS1W-MD291 DC Input/Transistor Output Unit (48/48 Points, Sinking)

Outputs (CN1)

Rated Voltage	12 to 24 V DC
Operating Load Voltage Range	10.2 to 26.4 V DC
Maximum Load Current	0.1 A/point, 1.2 A/common, 3.6 A/Unit (See note.)
Maximum Inrush Current	1.0 A/point, 10 ms max. 8.0 A/common, 10 ms max.
Leakage Current	0.1 mA max.
Residual Voltage	1.5 V max.
ON Response Time	0.5 ms max.
OFF Response Time	1.0 ms max.
No. of Circuits	48 points (16 points/common, 3 commons)
Fuse	3-A fuses (1 per common). Three fuses are used. The fuse cannot be replaced by the user.
External Power Supply	10.2 to 26.4 V DC, 50 mA min.
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
Internal Current Consumption	350 mA max. at 5 V DC
Weight	320 g max.
Accessories	Two connectors for external wiring (soldered)

Note The maximum load currents will be 1.0 A/common and 3.0 A/Unit if a pressure-welded connector is used.

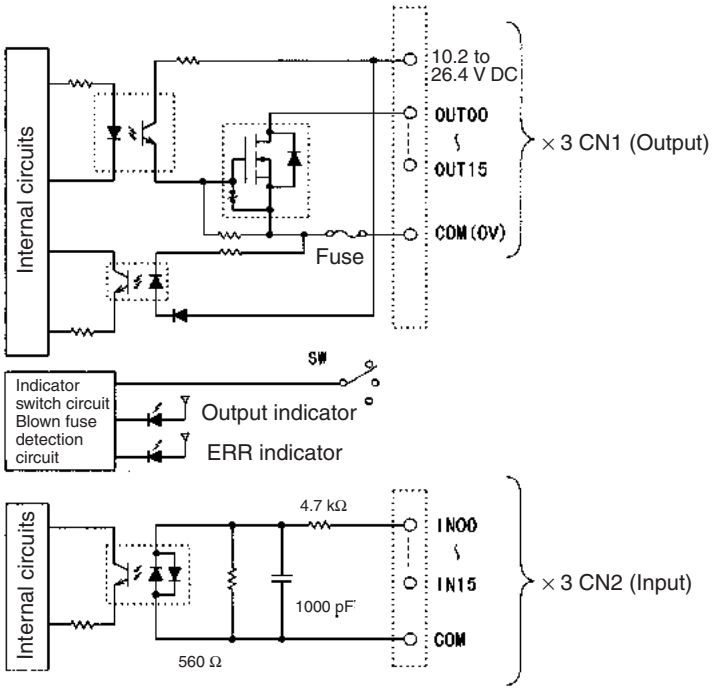
Inputs (CN2)

Rated Input Voltage	24 V DC
Operating Input Voltage	20.4 to 26.4 V DC
Input Impedance	4.7 kΩ
Input Current	Approx. 5 mA (at 24 V DC)
ON Voltage/ON Current	17 V DC min./3 mA min.
OFF Voltage/OFF Current	5.0 V DC max./1 mA max.
ON Response Time	8.0 ms max.(Possible to select one out of eight times from 0 to 32 ms in the PLC Setup.) (See note below.)
OFF Response Time	8.0 ms max. (Possible to select one out of eight times from 0 to 32 ms in the PLC Setup.) (See note below.)
No. of Circuits	48 points (16 points/common, 3 commons)
Number of Inputs Simultaneous ON	50% (8 points/common) (at 24 V DC) (Depends on ambient temperature.)
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
Internal Current Consumption	350 mA max. at 5 V DC
Weight	320 g max.
Accessories	Two connectors for external wiring (soldered)

Note The input ON and OFF response times for Basic I/O Units can be set to 0 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, or 32 ms in the PLC Setup.

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Circuit Configuration

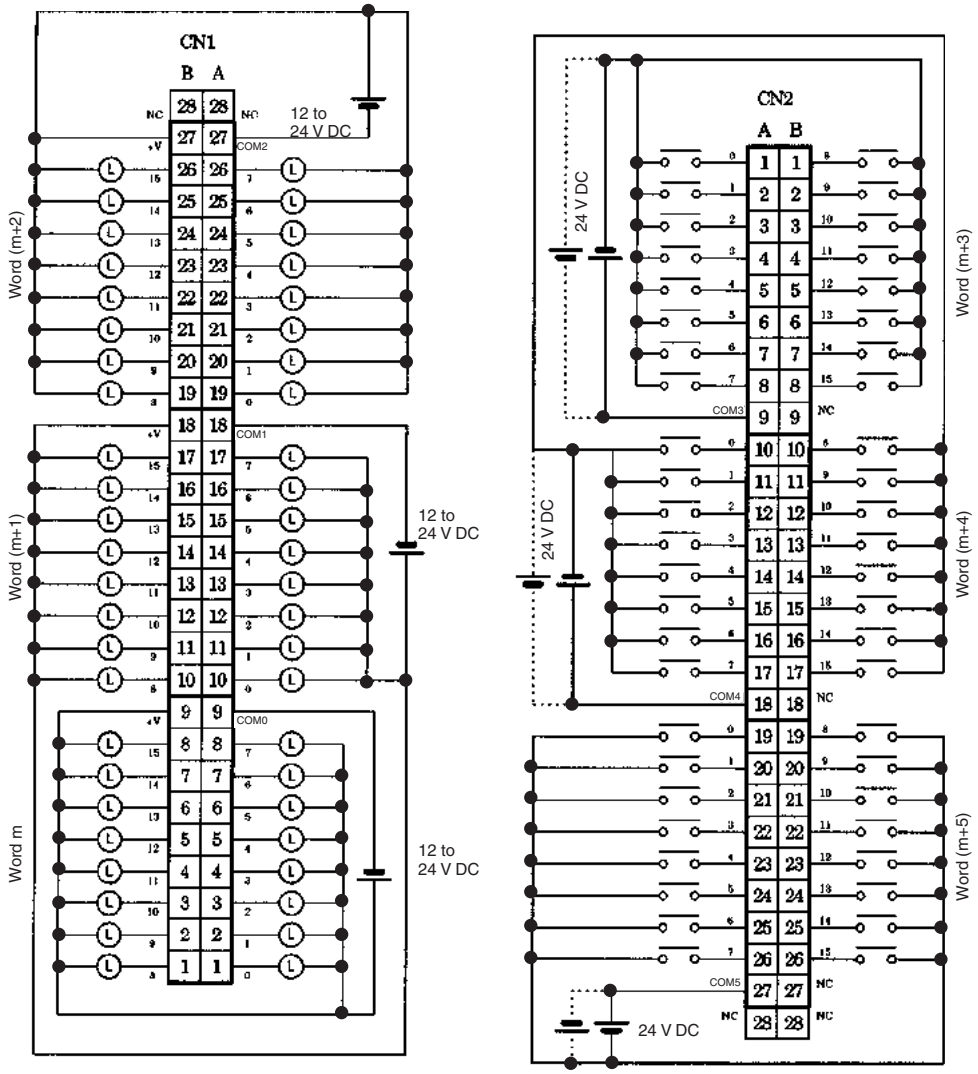


Note 1. The ERR indicator will light if a fuse blows or if the external power supply is turned OFF, and the corresponding Flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON.

2. The ON response time will be 120 μs maximum and OFF response time will be 300 μs maximum even if the response times are set to 0 ms due to internal element delays.

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Terminal Connections: CS1W-MD291 24-V DC 48-point Input/48-point Output Unit (Sinking Outputs)

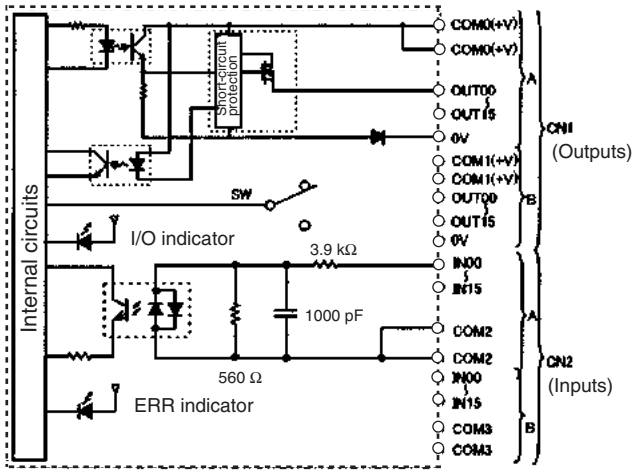


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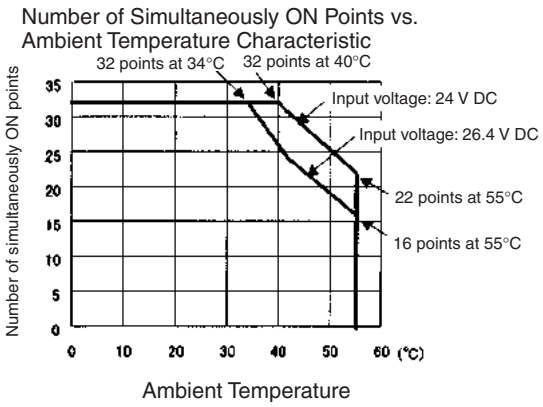
CS1W-MD262 DC Input/Transistor Output Unit (32/32 Points, Sourcing)

Output section (CN1)		Input section (CN2)	
Rated Voltage	24 V DC	Rated Input Voltage	24 V DC
		Operating Input Voltage	20.4 to 26.4 V DC
Operating Load Voltage Range	20.4 to 26.4 V DC	Input Impedance	3.9 kΩ
Maximum Load Current	0.3 A/point, 1.6 A/common, 3.2 A/Unit	Input Current	6 mA typical (at 24 V DC)
Leakage Current	0.1 mA max.	ON Voltage/ON Current	15.4 V DC min./3 mA min.
Residual Voltage	1.5 V max.	OFF Voltage/OFF Current	5 V DC min./1 mA min.
ON Response Time	0.5 ms max.	ON Response Time	8.0 ms max. (Can be set to between 0 and 32 in the PLC Setup.) (Refer to the above Load Short-circuit Protection.)
OFF Response Time	1.0 ms max.		
Load Short-circuit Prevention	Detection current: 0.7 to 2.5 A Automatic restart after error clearance. (Refer to the above *Load Short-circuit Protection*.)	OFF Response Time	8.0 ms max. (Can be set to between 0 and 32 in the PLC Setup.) (Refer to the above *Load Short-circuit Protection*.)
No. of Circuits	32 (16 points/common, 2 circuits)		
External Power Supply	20.4 to 26.4 V DC, 70 mA min.	Number of Simultaneously ON Points	70% (11 points/common) (at 24 V DC)
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)		
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.		
Internal Current Consumption	5 V DC 270 mA max.		
Weight	270 g max.		
Accessories	Two connectors for external wiring (soldered)		

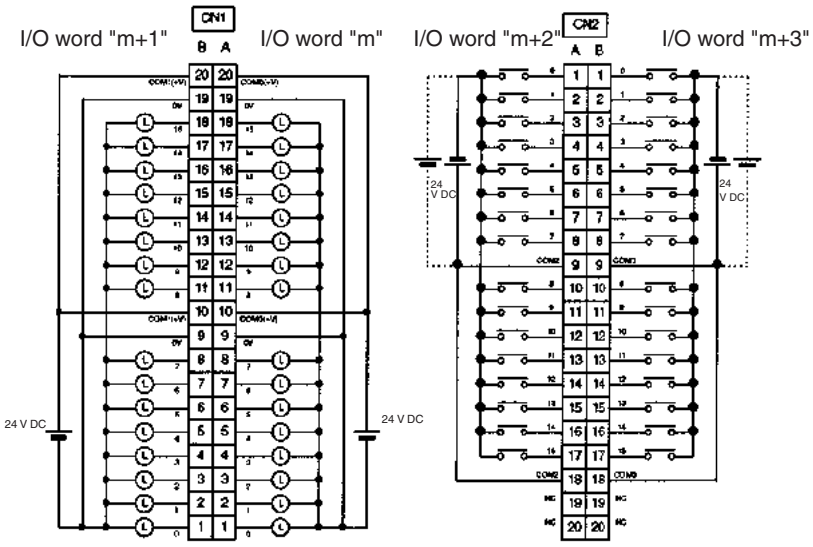
Circuit Configuration



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Terminal Connections



- When wiring, pay careful attention to the polarity. The load may operate if the polarity is reversed.
- Although the +V and COM terminals of rows A and B of CN1 and CN2 are internally connected, wire all points completely.

Note The ON response time will be 120 μs maximum and OFF response time will be 300 μs maximum even if the response times are set to 0 ms due to internal element delays.

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CS1W-MD292 DC Input/Transistor Output Unit (48/48 Points, Sourcing)

Outputs (CN1)

Rated Voltage	12 to 24 V DC
Operating Load Voltage Range	10.2 to 26.4 V DC
Maximum Load Current	0.1 A/point, 1.2 A/common, 3.6 A/Unit (See note.)
Maximum Inrush Current	1.0 A/point, 10 ms max. 8.0 A/common, 10 ms max.
Leakage Current	0.1 mA max.
Residual Voltage	1.5 V max.
ON Response Time	0.5 ms max.
OFF Response Time	1.0 ms max.
No. of Circuits	48 points (16 points/common, 3 commons)
Fuse	3 A (1 per common) The fuse cannot be replaced by the user.
External Power Supply	10.2 to 26.4 V DC, 50 mA min.
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
Internal Current Consumption	350 mA max. at 5 V DC
Weight	320 g max.
Accessories	Two connectors for external wiring (soldered)

Note The maximum load currents will be 1.0 A/common and 3.0 A/Unit if a pressure-welded connector is used.

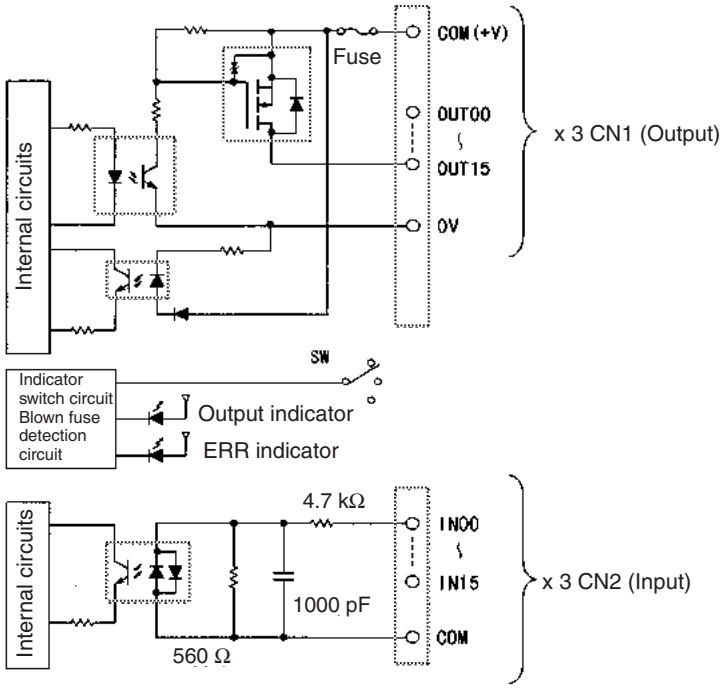
Inputs (CN2)

Rated Input Voltage	24 V DC
Operating Input Voltage	20.4 to 26.4 V DC
Input Impedance	4.7 kΩ
Input Current	Approx. 5 mA (at 24 V DC)
ON Voltage/ON Current	17 V DC min./3 mA min.
OFF Voltage/OFF Current	5.0 V DC max./1 mA max.
ON Response Time	8.0 ms max. (Possible to select one out of eight times from 0 to 32 ms in the PLC Setup.) (See note below.)
OFF Response Time	8.0 ms max. (Possible to select one out of eight times from 0 to 32 ms in the PLC Setup.) (See note below.)
No. of Circuits	48 points (16 points/common, 3 commons)
Number of Simultaneously ON Points	50% (8 points/common) (at 24 V DC) (Depends on ambient temperature.)
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
Internal Current Consumption	350 mA max. at 5 V DC
Weight	320 g max.
Accessories	Two connectors for external wiring (soldered)

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Note The input ON and OFF response times for Basic I/O Units can be set to 0 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, or 32 ms in the PLC Setup.

Circuit Configuration

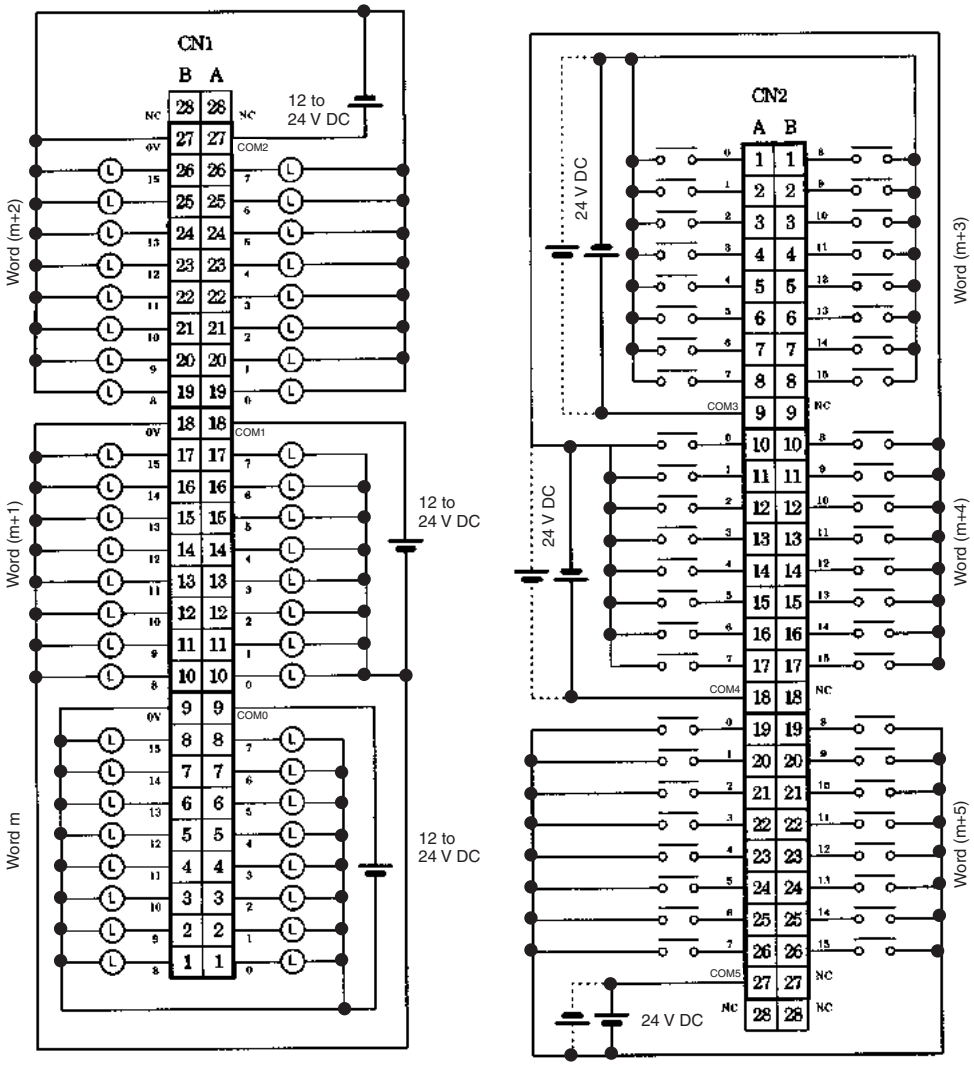


Note 1. The ERR indicator will light if a fuse blows or if the external power supply is turned OFF, and the corresponding Flag in the Basic I/O Unit Information Area (A050 to A089) will turn ON.

2. The ON response time will be 120 μs maximum and OFF response time will be 300 μs maximum even if the response times are set to 0 ms due to internal element delays.

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Terminal Connections: CS1W-MD292 24-V DC 48-point Input/48-point Transistor Output Unit (Sourcing Outputs)



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CS1W-MD561 TTL I/O Unit (32/32 Points)

Outputs (CN1)

Rated Voltage	5 V DC±10%
Operating Load Voltage Range	4.5 to 5.5 V DC
Maximum Load Current	35 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.
No. of Circuits	32 points (16 points/common, 2 commons)
Fuse	None
External Power Supply	5 V DC±10%, 40 mA min. (1.2 mA × No. of ON points)
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
Internal Current Consumption	270 mA max. at 5 V DC
Weight	260 g max.
Accessories	Two connectors for external wiring (soldered)

Inputs (CN2)

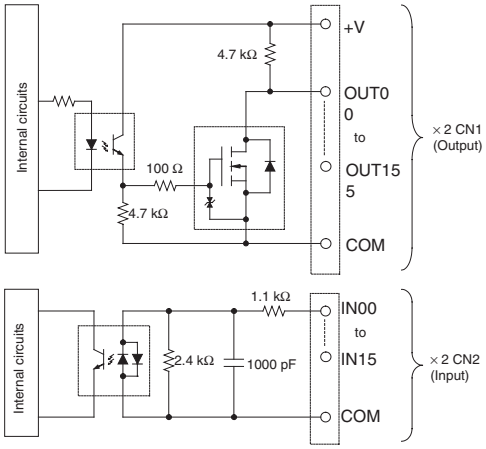
Rated Input Voltage	5 V DC±10%
Input Impedance	1.1 kΩ
Input Current	Approx. 3.5 mA (at 5 V DC)
ON Voltage	3.0 V DC min.
OFF Voltage	1.0 V DC max.
ON Response Time	8.0 ms max. (Possible to select one out of eight times from 0 to 32 ms in the PLC Setup.) (See notes 1 and 2.)
OFF Response Time	8.0 ms max. (Possible to select one out of eight times from 0 to 32 ms in the PLC Setup.) (See notes 1 and 2.)
No. of Circuits	32 points (16 points/common, 2 commons)
Number of Simultaneously ON Points	No restrictions
Insulation Resistance	20 MΩ between the external terminals and the GR terminal (100 V DC)
Dielectric Strength	1,000 V AC between the external terminals and the GR terminal for 1 minute at a leakage current of 10 mA max.
Internal Current Consumption	270 mA max. at 5 V DC
Weight	260 g max.
Accessories	Two connectors for external wiring (soldered)

Note 1. The ON response time will be 120 μs maximum and OFF response time will be 300 μs maximum even if the response times are set to 0 ms due to internal element delays.

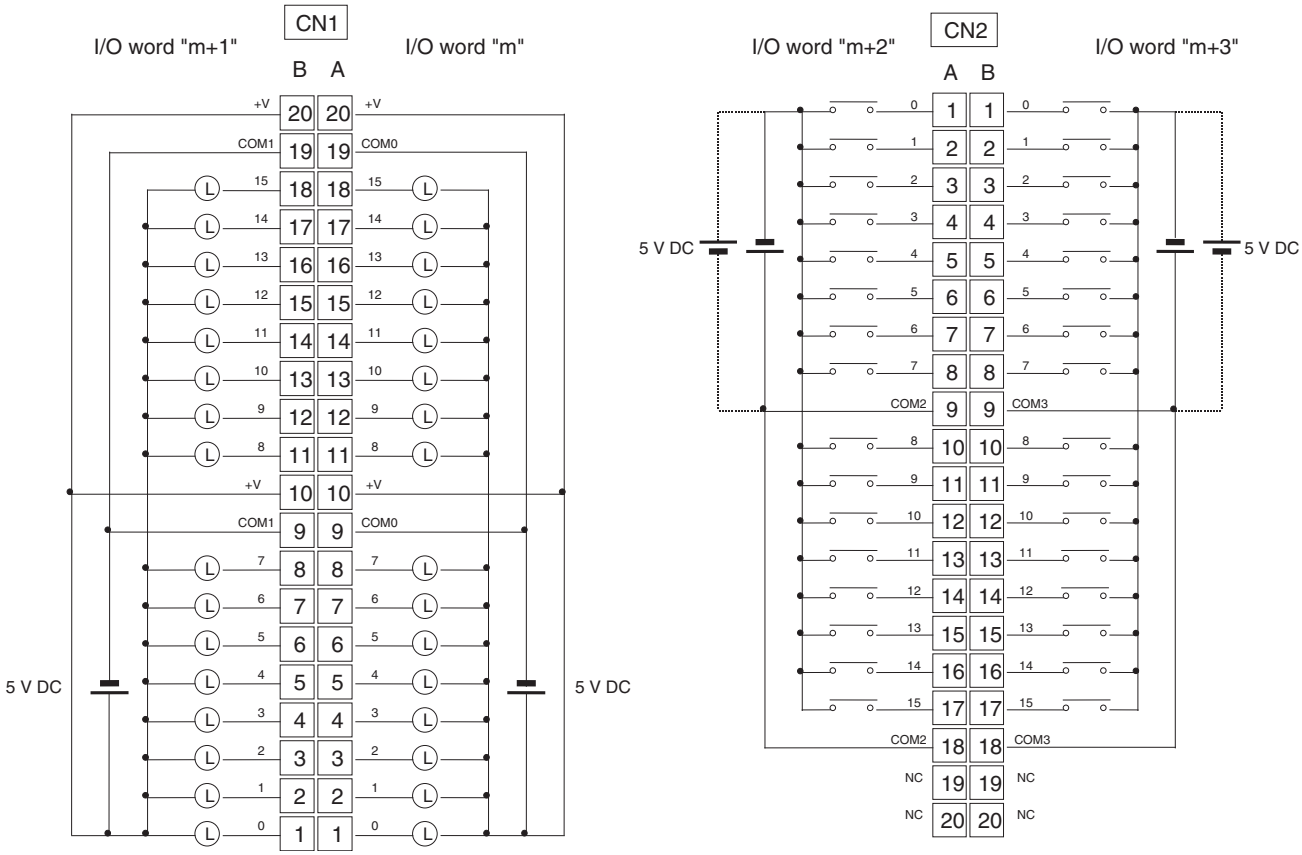
2. The input ON and OFF response times for Basic I/O Units can be set to 0 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, or 32 ms in the PLC Setup.

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Circuit Configuration



Terminal Connections: CS1W-MD561 TTL 32-point Input/32-point Output Unit



- When wiring, pay careful attention to the polarity. The load may operate if the polarity is reversed.
- Although the +V and COM terminals of rows A and B of CN1 and CN2 are internally connected, wire all points completely.

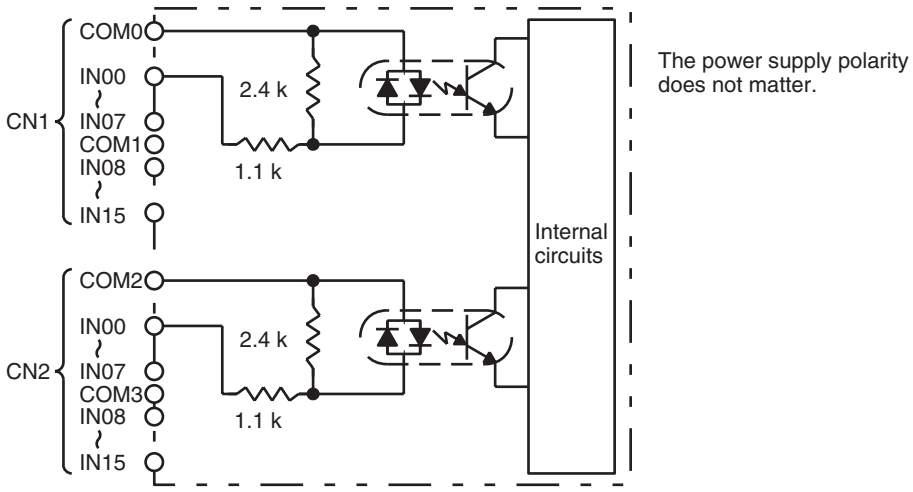
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High-density I/O Units (Special I/O Units)

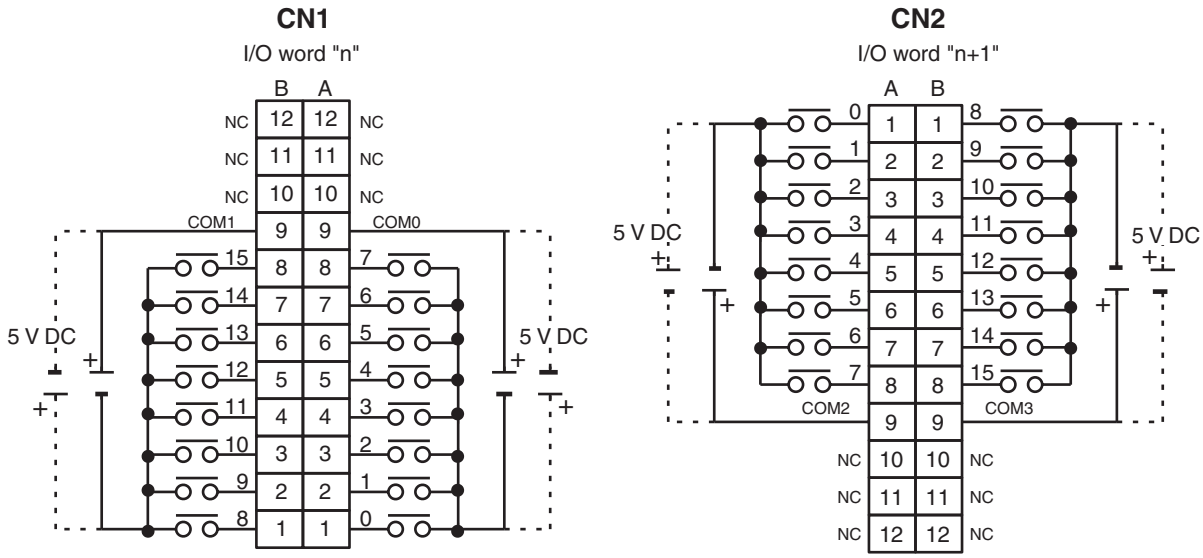
C200H-ID501 TTL Input Unit Used for 32 Static Inputs

Rated Input Voltage	5 V DC ±10%
Input Impedance	1.1 kΩ
Input Current	3.5 mA typical (at 5 V DC)
ON Voltage	3.0 V DC min.
OFF Voltage	1.0 V DC max.
ON Response Time	2.5 ms/15 ms max.
OFF Response Time	2.5 ms/15 ms max.
No. of Circuits	4 (8 points/common)
High-speed Inputs	8 points (connector 2 terminals 8 to 15, when set) Pulse width: 1 ms/4 ms min. (switchable)
Internal Current Consumption	130 mA 5 V DC max.
Weight	300 g max.

Circuit Configuration



Terminal Connections



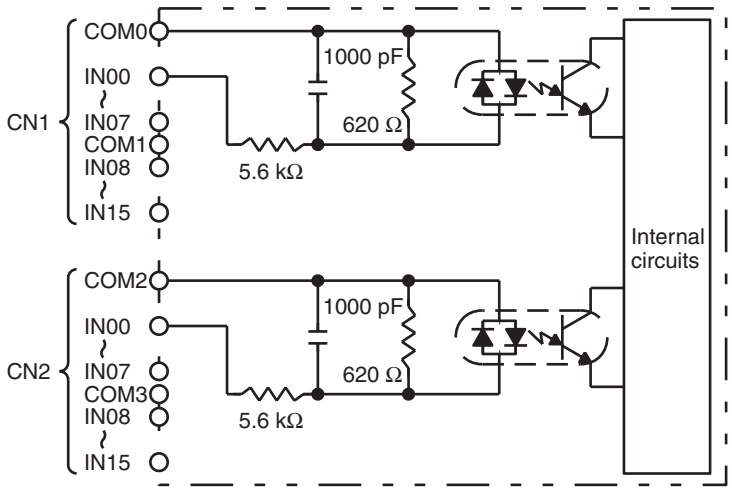
Note When pin 2 of the Unit's DIP switch is ON, input points 08 to 15 in connector 2 are high-speed inputs.

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C200H-ID215 DC Input Unit Used for 32 Static Inputs

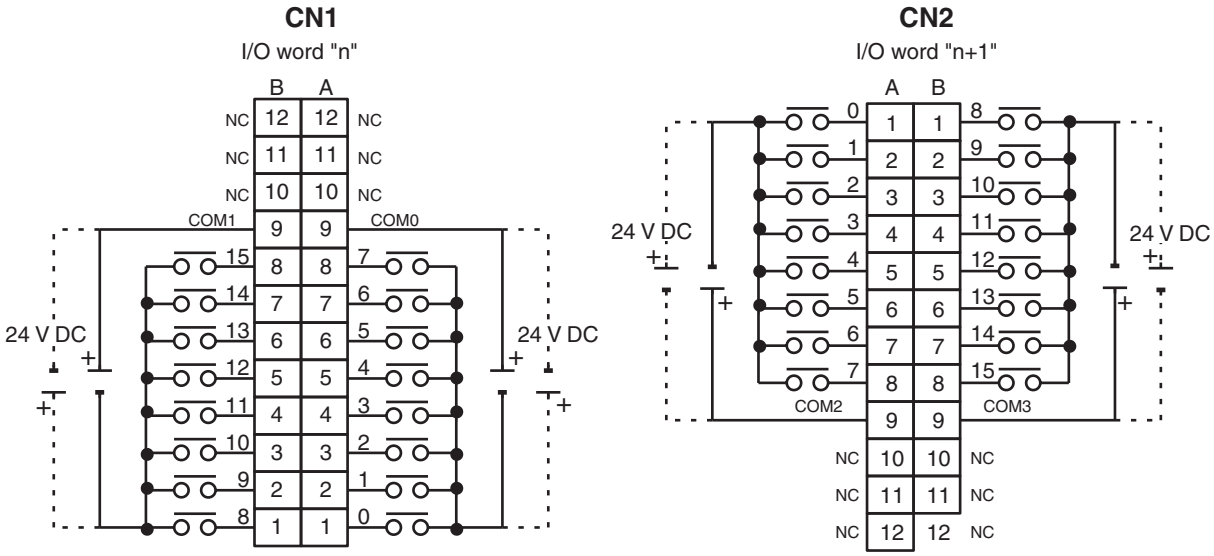
Rated Input Voltage	24 V DC
Operating Input Voltage	20.4 to 26.4 V DC
Input Impedance	5.6 kΩ
Input Current	4.1 mA (at 24 V DC)
ON Voltage	14.4 V DC min.
OFF Voltage	5.0 V DC max.
ON Response Time	2.5 ms/15 ms max.
OFF Response Time	2.5 ms/15 ms max.
No. of Circuits	4 (8 points/common) (See note 2.)
High-speed Inputs	8 points (connector 2 terminals 8 to 15, when set) Pulse width: 1 ms/4 ms min. (switchable)
Internal Current Consumption	130 mA 5 V DC max.
Weight	300 g max.

Circuit Configuration



The power supply polarity does not matter.

Terminal Connections



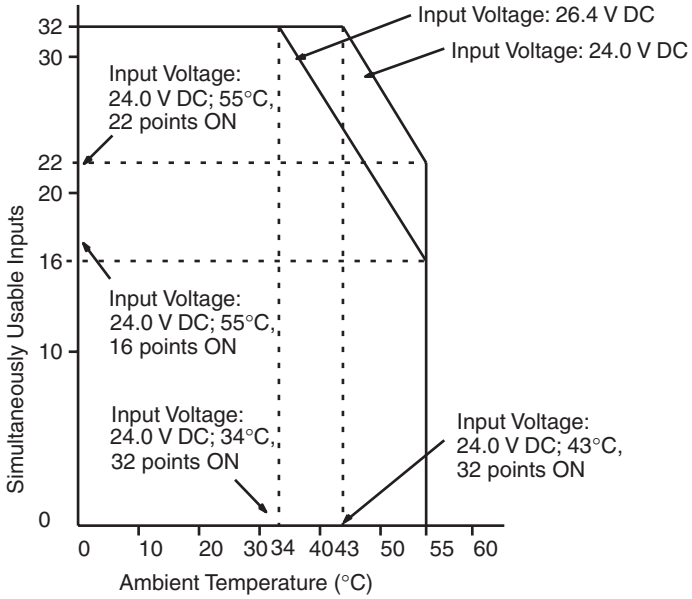
Note 1. When pin 2 of the Unit's DIP switch is ON, input points 08 to 15 in connector 2 are high-speed inputs.

2. At high temperatures, the number of inputs that can be turned ON simultaneously is limited. Refer to the graphs on the following page for details.

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Number of Simultaneous Inputs

The number C200H-ID215 24-V DC inputs that can be ON simultaneously will vary with ambient temperature as shown in the figure below.



If the number of inputs that are ON exceeds the number that can be ON at the same time, then heat generated by electronic components will increase the temperature of the components and the case. Higher temperatures will lower the reliability and service life of the elements and will damage the Unit. Higher temperatures in electronic components and the case will also cause time delays. There is no particular problem if all input points are turned ON for less than 10 minutes (if all input points have been OFF for at least 2 hours) under special conditions, such as during startup work inspections.

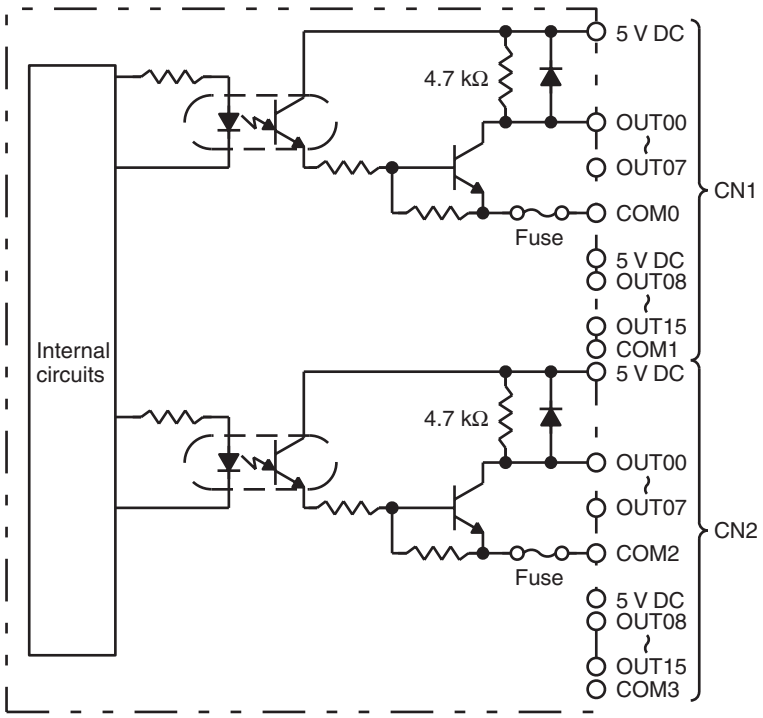
C200H-OD501 TTL Output Unit Used for 32 Static Outputs

Max. Switching Capacity	5 V DC±10% 35 mA (280 mA/common, 1.12 A/Unit; output resistance 4.7 kΩ)
Min. Switching Capacity	None
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.
No. of Circuits	4 (8 points/common)
Internal Current Consumption	220 mA 5 V DC max.
Fuses	4 (1 fuse/common; fuses are not user-replaceable.)
Power for External Supply	39 mA 5 V DC±10% min. (1.2 mA × no. of outputs ON)
Weight	300 g max.

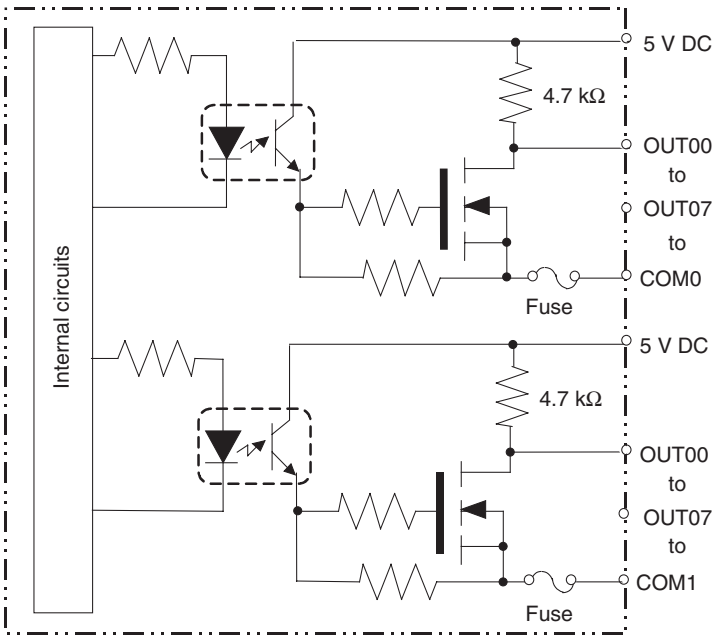
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Circuit Configuration

Units manufactured on or before November 13, 2002
(manufacturing numbers 13Y2 or earlier)

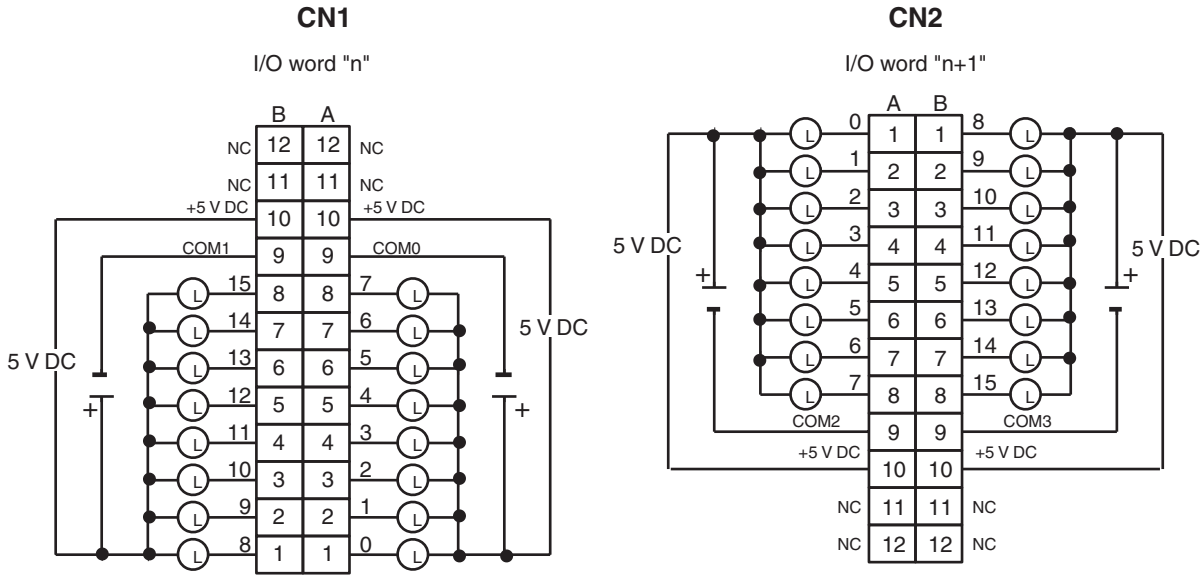


Units manufactured on or after November 14, 2002
(manufacturing numbers 14Y2H or later)



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Terminal Connections



Note 1. I/O word “n” is determined by the unit number setting (n = CIO 2000 + 10 × unit number).

2. The Unit will have 32 static output points when pin 1 of it’s DIP switch is OFF.

3. The outputs are negative logic outputs; when there is an output, the terminal has an “L” voltage level. Each output terminal has an output resistance of 4.7 kΩ.

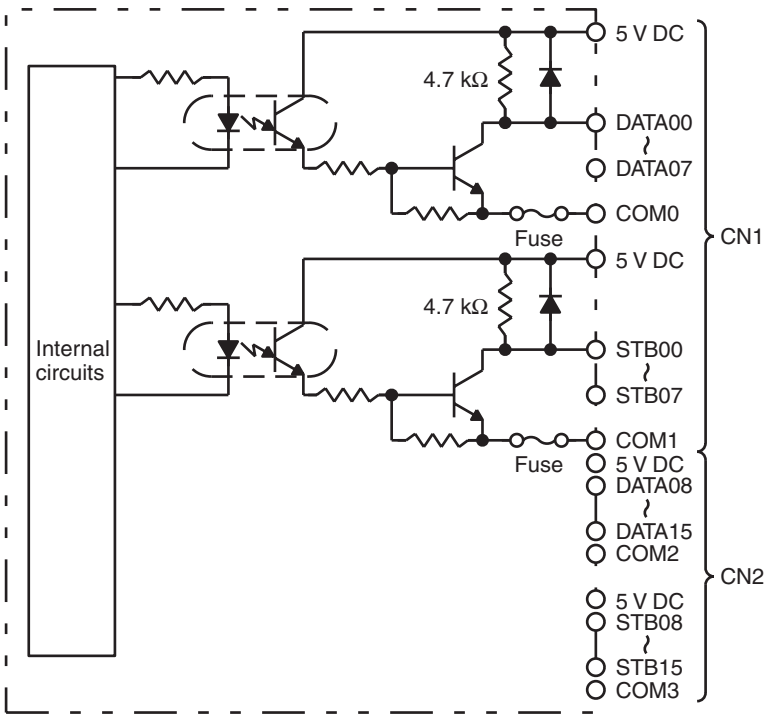
C200H-OD501 TTL Output Unit Used for 128 Dynamic Inputs

Max. Switching Capacity	5 V DC±10% 35 mA (280 mA/common, 1.12 A/Unit; output resistance 4.7 kΩ)
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.
No. of Circuits	2 (dynamic, 64 points/circuit)
Internal Current Consumption	220 mA 5 V DC max.
Fuses	4 (1 fuse/common; fuses are not user-replaceable.)
Power for External Supply	39 mA 5 V DC min. (1.2 mA × no. of outputs ON)
Weight	300 g max.

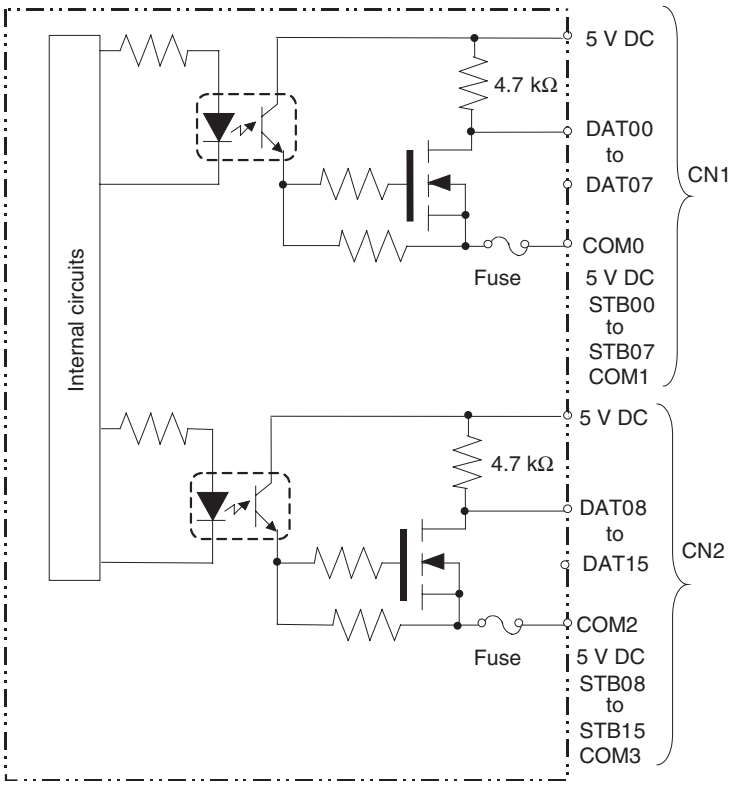
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Circuit Configuration

Units manufactured on or before November 13, 2002
(manufacturing numbers 13Y2 or earlier)

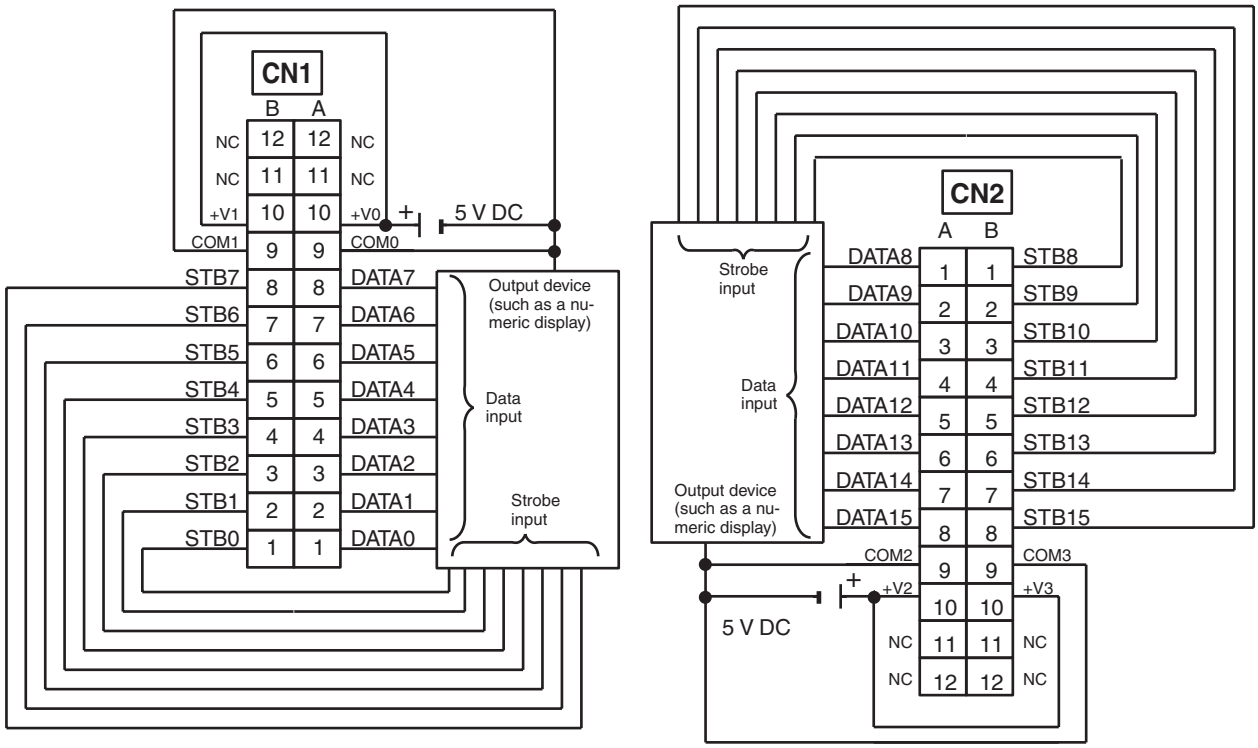


Units manufactured on or after November 14, 2002
(manufacturing numbers 14Y2H or later)



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Terminal Connections



Note 1. Refer to the Unit's operation manual for details on I/O bit allocation.

2. The Unit will have 128 dynamic output points when pin 1 of it's DIP switch is ON.
3. Set pin 5 of the Unit's DIP switch ON for positive logic outputs, or OFF for negative logic outputs. When set for negative logic outputs, the terminal has an "L" voltage level when there is an output. When set for positive logic outputs, the terminal has an "H" voltage level when there is an output.
4. The strobe signal has negative logic regardless of the setting of pin 5.
5. Each output terminal has an output resistance of 4.7 kΩ.

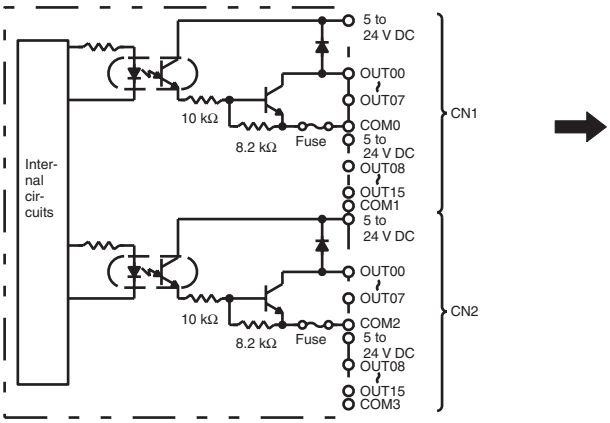
C200H-OD215 Transistor Output Unit Used for 32 Static Outputs

Max. Switching Capacity	16 mA, 4.5 V DC to 100 mA, 26.4 V DC 800 mA/common, 3.2 A/Unit
Leakage Current	0.1 mA max.
Residual Voltage	0.7 V max.
ON Response Time	0.2 ms max.
OFF Response Time	0.6 ms max.
No. of Circuits	4 (8 points/common)
Internal Current Consumption	220 mA 5 V DC max.
Fuses	4 (1 fuse/common; fuses are not user-replaceable.)
Power for External Supply	90 mA 5 to 24 V DC±10% min. (2.8 mA × number of ON outputs)
Weight	300 g max.

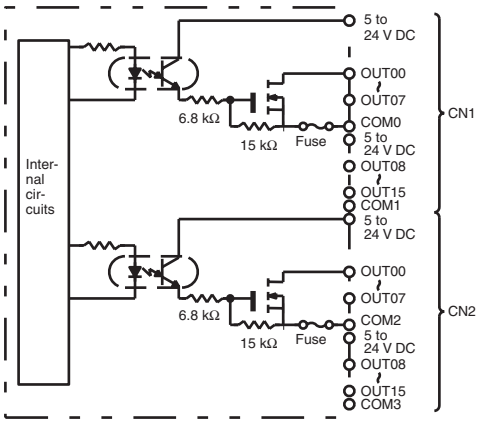
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Circuit Configuration

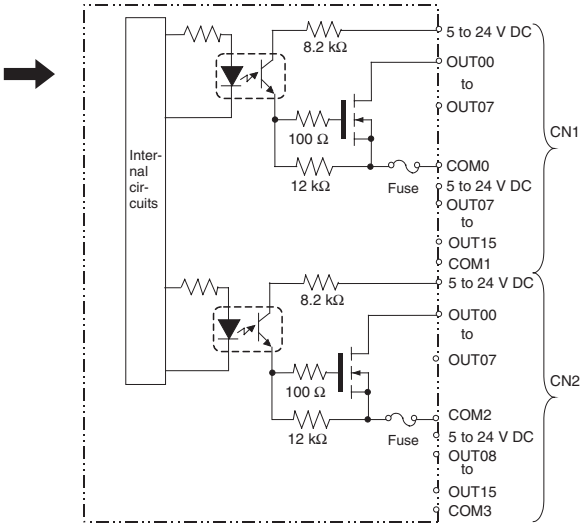
Units manufactured on or before November 29, 1999 (manufacturing numbers 29Y9 or earlier)



Units manufactured between November 30, 1999 and October 9, 2002 (manufacturing numbers 30Y9 to 09X2)

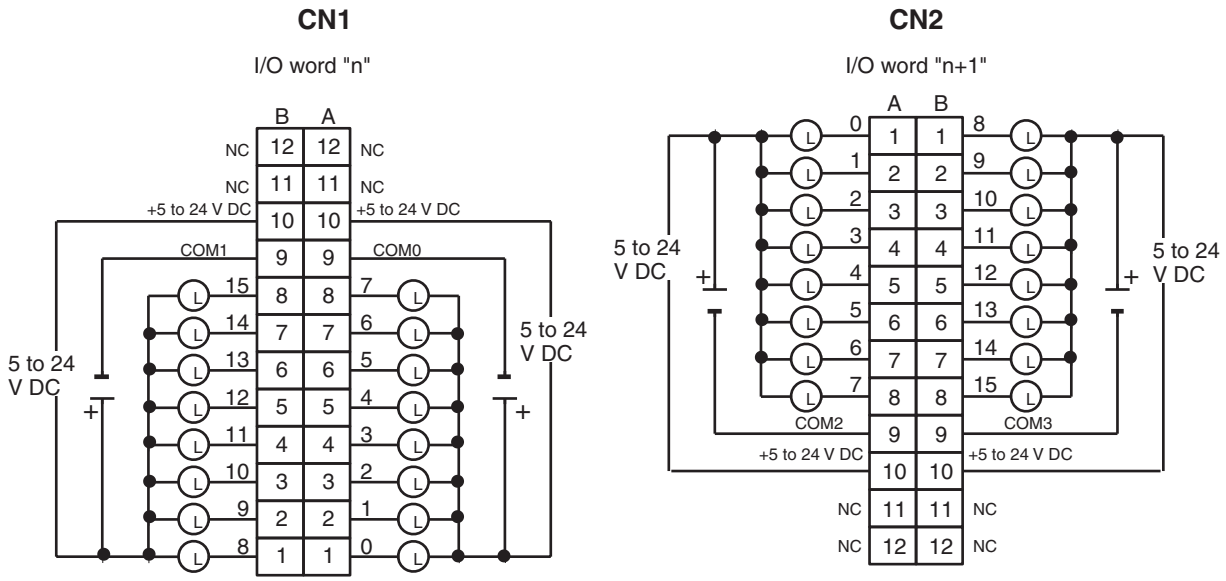


Units manufactured on or after October 10, 2002 (manufacturing numbers 10X2H or later)



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Terminal Connections



Note 1. I/O word “n” is determined by the unit number setting (n = CIO 2000 + 10 × unit number).

2. The Unit will have 32 static output points when pin 1 of it’s DIP switch is OFF.

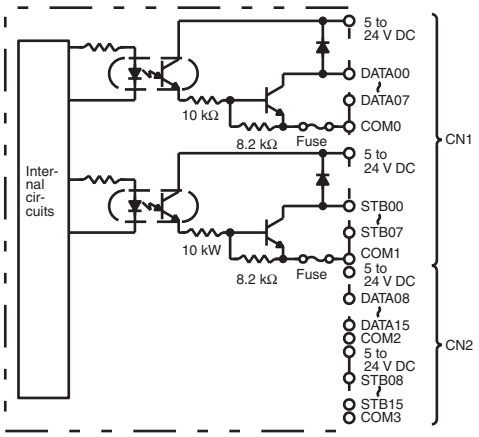
C200H-OD215 Transistor Output Unit Used for 128 Dynamic Outputs

Max. Switching Capacity	16 mA, 4.5 V DC to 100 mA, 26.4 V DC 800 mA/common, 3.2 A/Unit
Leakage Current	0.1 mA max.
Residual Voltage	0.7 V max.
ON Response Time	0.2 ms max.
OFF Response Time	0.6 ms max.
No. of Circuits	2 (dynamic, 64 points/circuit)
Internal Current Consumption	220 mA 5 V DC max.
Fuses	4 (1 fuse/common; fuses are not user-replaceable.)
Power for External Supply	90 mA 5 to 24 V DC±10% min. (2.8 mA × number of ON outputs)
Weight	300 g max.

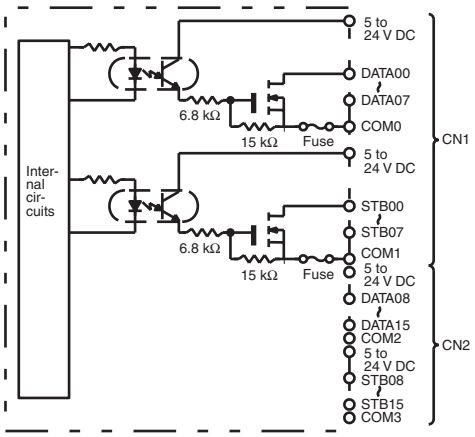
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Circuit Configuration

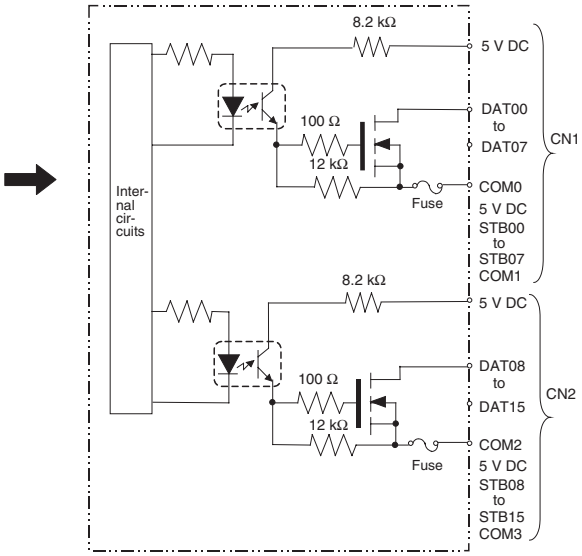
Units manufactured on or before November 29, 1999 (manufacturing numbers 29Y9 or earlier)



Units manufactured between November 30, 1999 and October 9, 2002 (manufacturing numbers 30Y9 to 09X2)

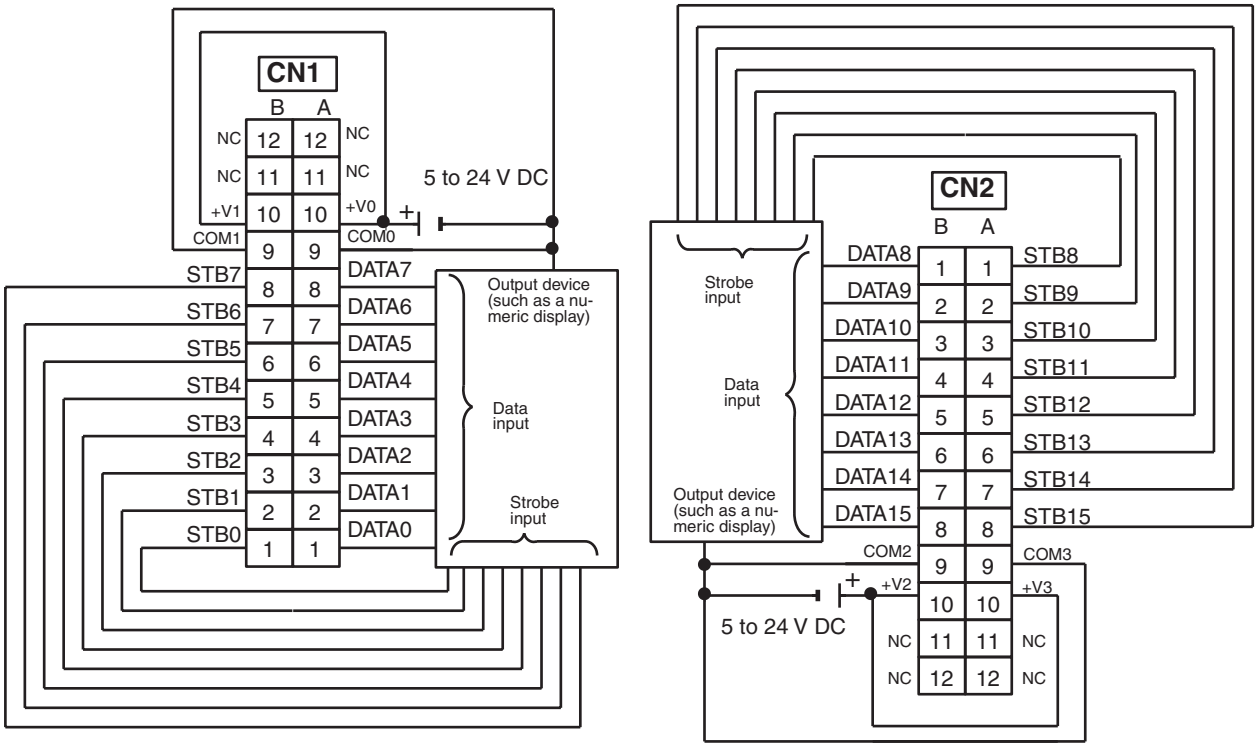


Units manufactured on or after October 10, 2002 (manufacturing numbers 10X2H or later)



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Terminal Connections



Note 1. Refer to the Unit's operation manual for details on I/O bit allocation.

2. The Unit will have 128 dynamic output points when pin 1 of it's DIP switch is ON.
3. Set pin 5 of the Unit's DIP switch ON for positive logic outputs, or OFF for negative logic outputs. When set for negative logic outputs, the terminal has an "L" voltage level when there is an output. When set for positive logic outputs, the terminal has an "H" voltage level when there is an output.
4. The strobe signal has negative logic regardless of the setting of pin 5.
5. When the output device (such as a numeric display) does not have a pull-up resistor, it is necessary to add a pull-up resistor between the + terminal of the power supply and each data (0 to 15) and strobe (0 to 15) terminal.

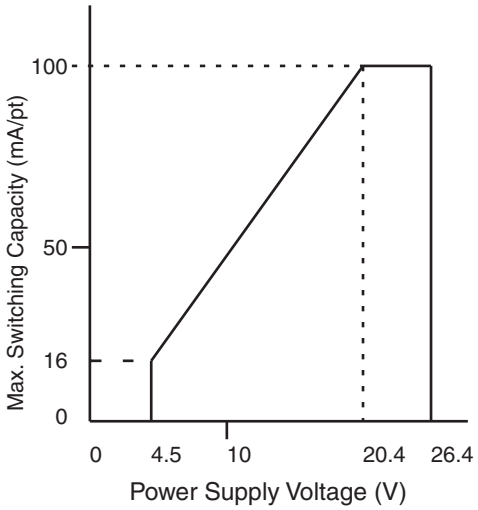
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High-density I/O Unit Limitations

Limitations on the switching capacity of C200H-OD215/MD115/MD215 Transistor Output Units and the usable number of I/O points in the C200H-ID215 and C200H-MD215 are shown below.

Switching Capacity

The switching capacity of C200H-OD215/MD115/MD215 Transistor Output Units depends on the power supply voltage, as shown below.



C200H-MD501 TTL I/O Unit Used for 16 Static Inputs and 16 Static Outputs

Output Specifications (Connector 1)

Max. Switching Capacity	5 V DC±10% 35 mA (280 mA/common, 560 mA/Unit; output resistance 4.7 kΩ)
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.
No. of Circuits	2 (8 points/common)
Fuses	2 (1 fuse/common; fuses are not user-replaceable.)
Power for External Supply	20 mA 5 V DC±10% min. (1.2 mA × no. of outputs ON)

Input Specifications (Connector 2)

Rated Input Voltage	5 V DC±10%
Input Impedance	1.1 kΩ
Input Current	3.5 mA typical (at 5 V DC)
ON Voltage	3.0 V DC min.
OFF Voltage	1.0 V DC max.
ON Response Time	2.5 ms/15 ms max. (switchable)
OFF Response Time	2.5 ms/15 ms max. (switchable)
No. of Circuits	2 (8 points/common)
High-speed Inputs	8 points (connector 2 terminals 8 to 15, when set) Pulse width: 1 ms/4 ms min. (switchable)

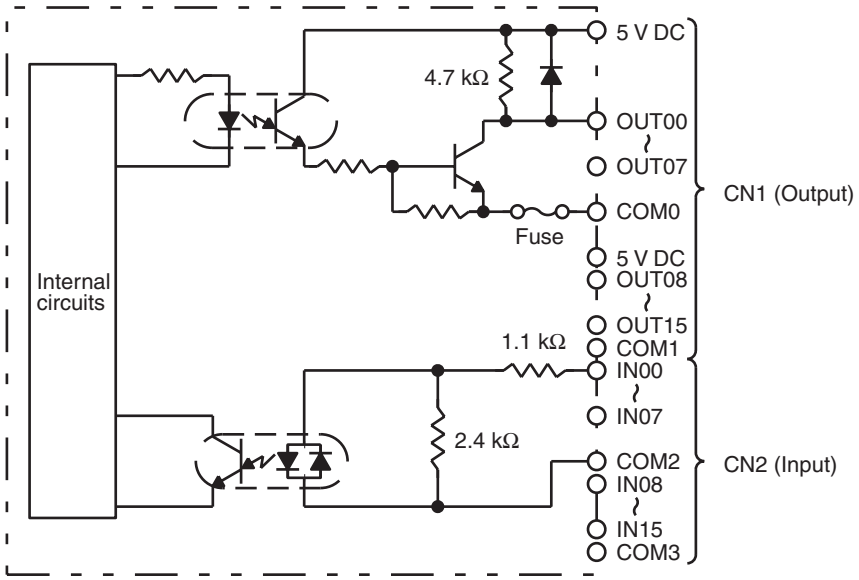
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General Specifications

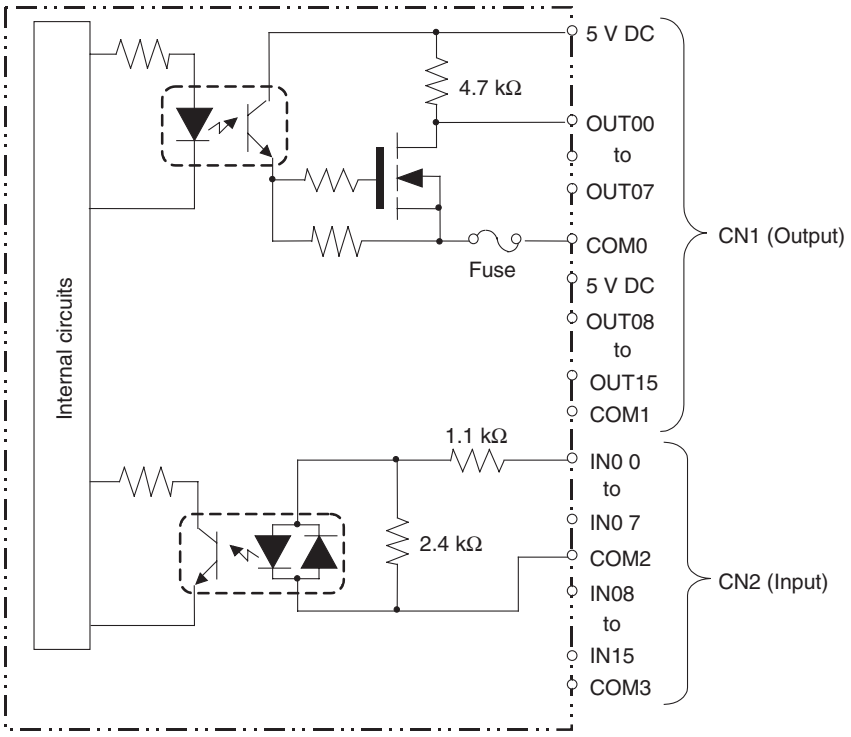
Internal Current Consumption	180 mA 5 V DC max.
Weight	300 g max.

Circuit Configuration

Units manufactured on or before November 21, 2002
(manufacturing numbers 21Y2 or earlier)

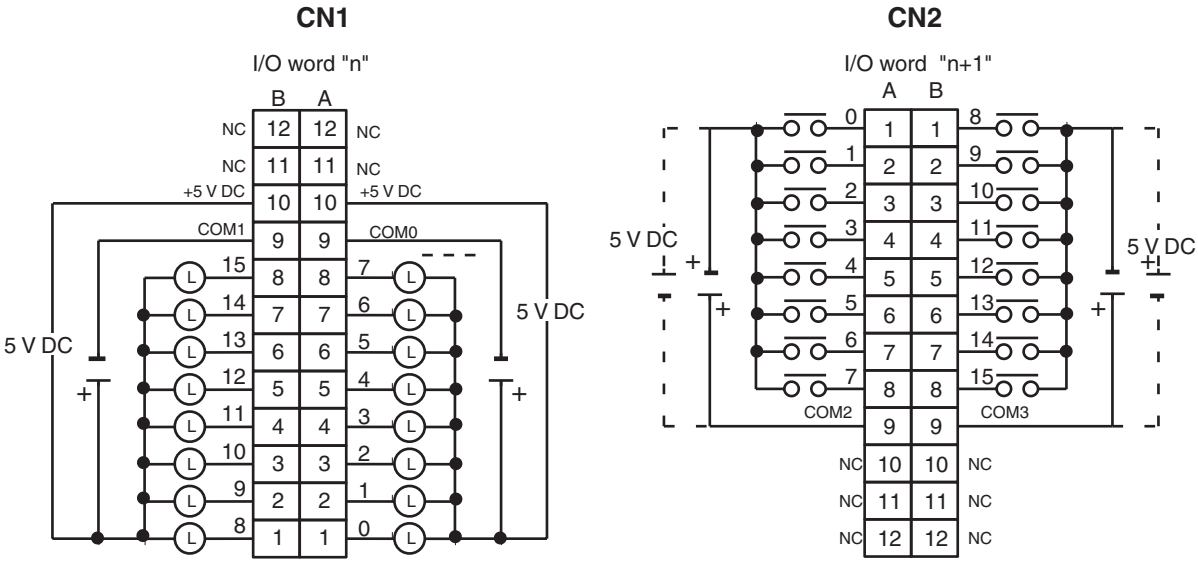


Units manufactured on or after November 22, 2002
(manufacturing numbers 22Y2H or later)



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Terminal Connections



Note 1. The Unit will have 16 static output and16 static input points when pin 1 of it's DIP switch is OFF.

2. When pin 2 of the Unit's DIP switch is ON, input points 08 to 15 in connector 2 are high-speed inputs.
3. The outputs are negative logic outputs; when there is an output, the terminal has an "L" voltage level. Each output terminal has an output resistance of 4.7 kΩ.
4. The user is not authorized to change the fuse.

C200H-MD501 TTL I/O Unit Used for 128 Dynamic Inputs

Output Specifications (Connector 1)

Max. Switching Capacity	5 V DC±10% 35 mA (280 mA/common, 560 mA/ Unit; output resistance 4.7 kΩ)
Min. Switching Capacity	None
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.
Fuses	2 (1 fuse/common; fuses are not user-replaceable.)
Power for External Supply	20 mA 5 V DC±10% min. (1.2 mA × no. of outputs ON)

Input Specifications (Connector 2)

Rated Input Voltage	5 V DC ±10%
Input Impedance	1.1 kΩ
Input Current	3.5 mA (at 5 V DC)
ON Voltage	3.0 V DC min.
OFF Voltage	1.0 V DC max.

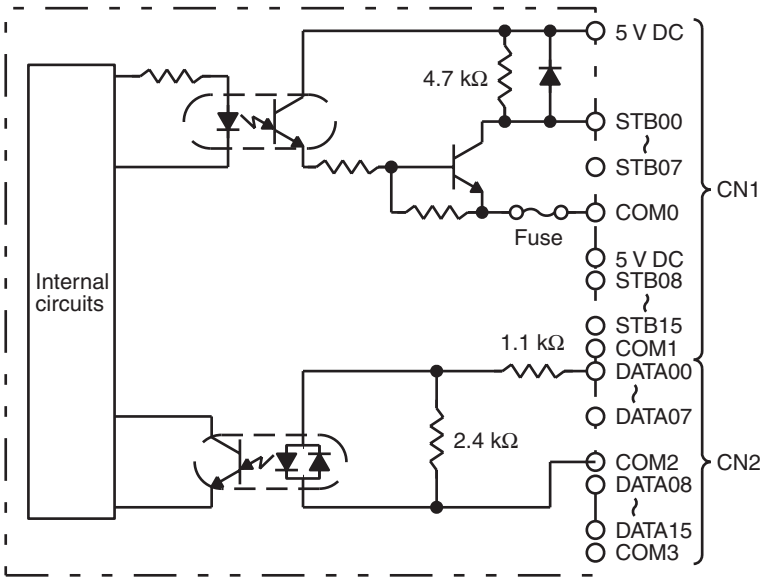
General Specifications

No. of Circuits	2 (dynamic, 64 points/circuit)
Internal Current Consumption	180 mA 5 V DC max.
Weight	300 g max.

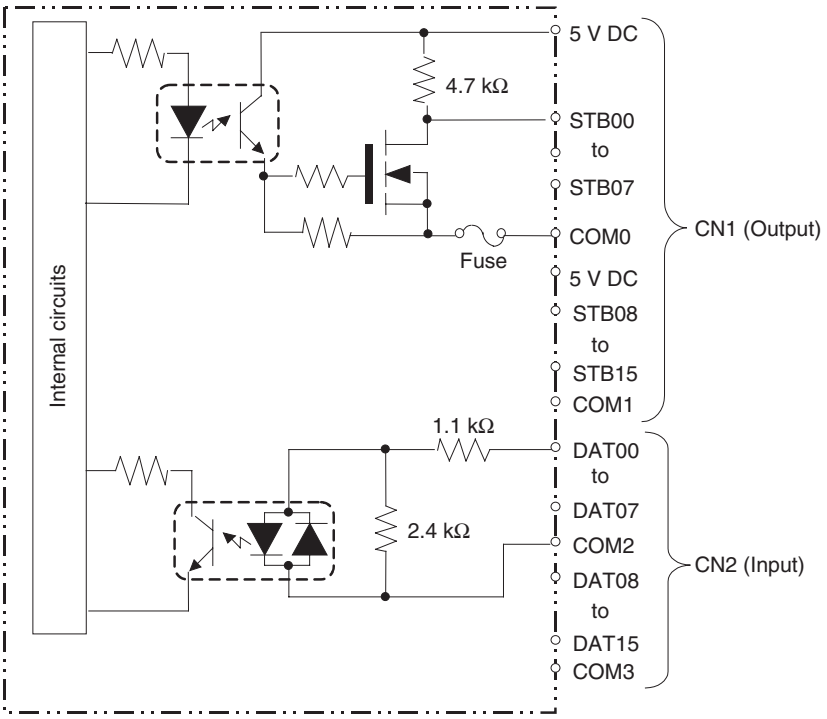
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Circuit Configuration

Units manufactured on or before November 21, 2002
(manufacturing numbers 21Y2 or earlier)

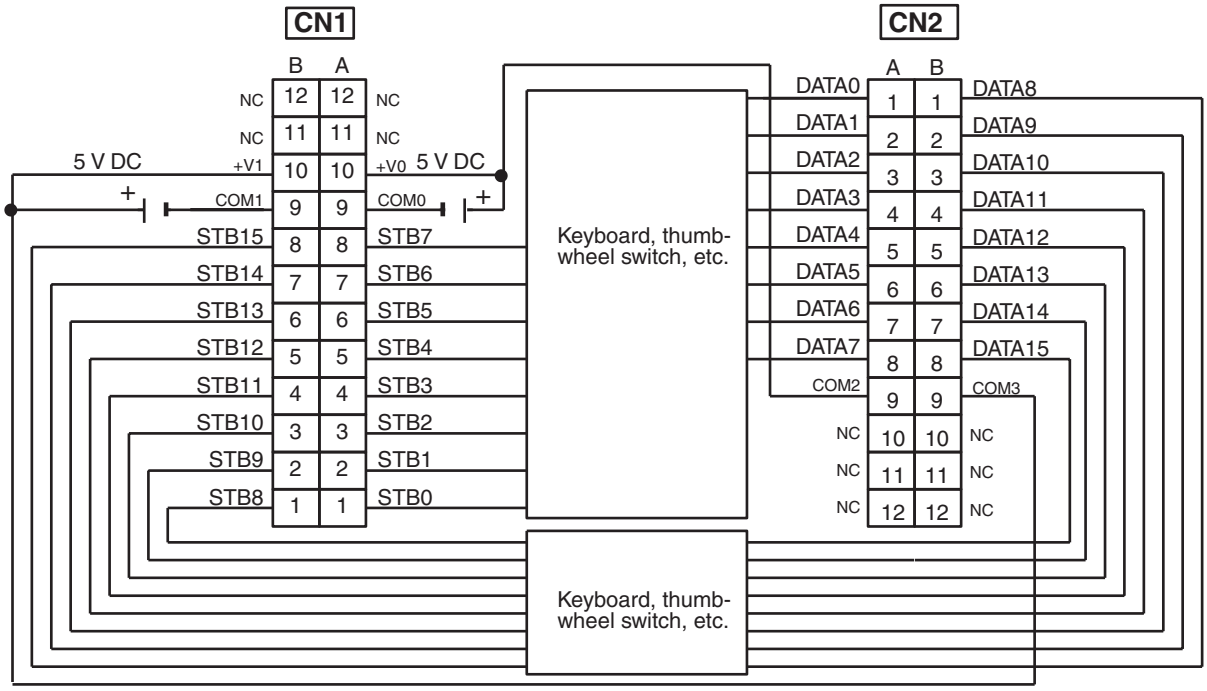


Units manufactured on or after November 22, 2002
(manufacturing numbers 22Y2H or later)



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Terminal Connections



Note 1. Refer to the Unit's operation manual for details on I/O bit allocation.

2. The Unit will have 128 dynamic output points when pin 1 of it's DIP switch is ON.

3. Each output terminal has an output resistance of 4.7 kΩ.

C200H-MD115 12-V DC Input/Transistor Output Unit Used for 16 Static Inputs and 16 Static Outputs

Output Specifications (Connector 1)

Max. Switching Capacity	16 mA, 4.5 V DC to 100 mA, 26.4 V DC 800 mA/common, 1.6 A/Unit
Leakage Current	0.1 mA max.
Residual Voltage	0.7 V max.
ON Response Time	0.2 ms max.
OFF Response Time	0.6 ms max.
No. of Circuits	2 (8 points/common)
Fuses	2 (1 fuse/common; fuses are not user-replaceable.)
Power for External Supply	45 mA 5 to 24 V DC±10% min. (2.8 mA × number of ON outputs)

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Input Specifications (Connector 2)

Rated Input Voltage	12 V DC
Operating Input Voltage	10.2 to 13.2 V DC
Input Impedance	2.7 kΩ
Input Current	4.1 mA typical (at 12 V DC)
ON Voltage	8.0 V DC min.
OFF Voltage	3.0 V DC max.
ON Response Time	2.5 ms/15 ms max. (switchable)
OFF Response Time	2.5 ms/15 ms max. (switchable)
No. of Circuits	2 (8 points/common)
High-speed Inputs	8 points (connector 2 terminals 8 to 15, when set) Pulse width: 1 ms/4 ms min. (switchable)

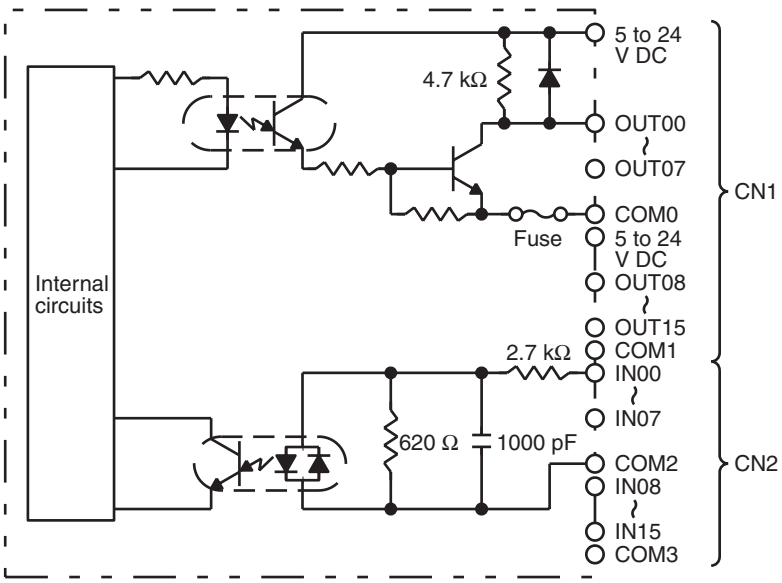
General Specifications

Internal Current Consumption	180 mA 5 V DC max.
Weight	300 g max.

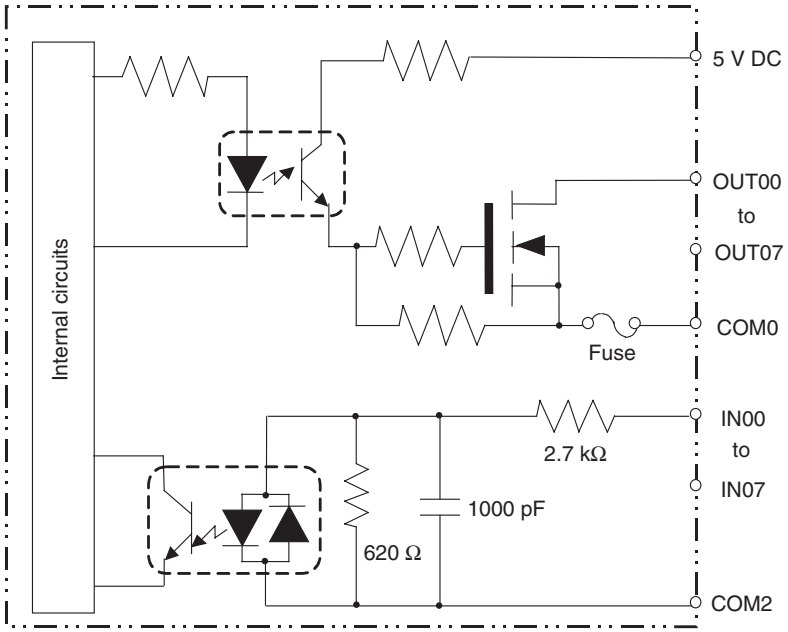
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Circuit Configuration

Units manufactured on or before November 17, 2002
(manufacturing numbers 17Y2 or earlier)

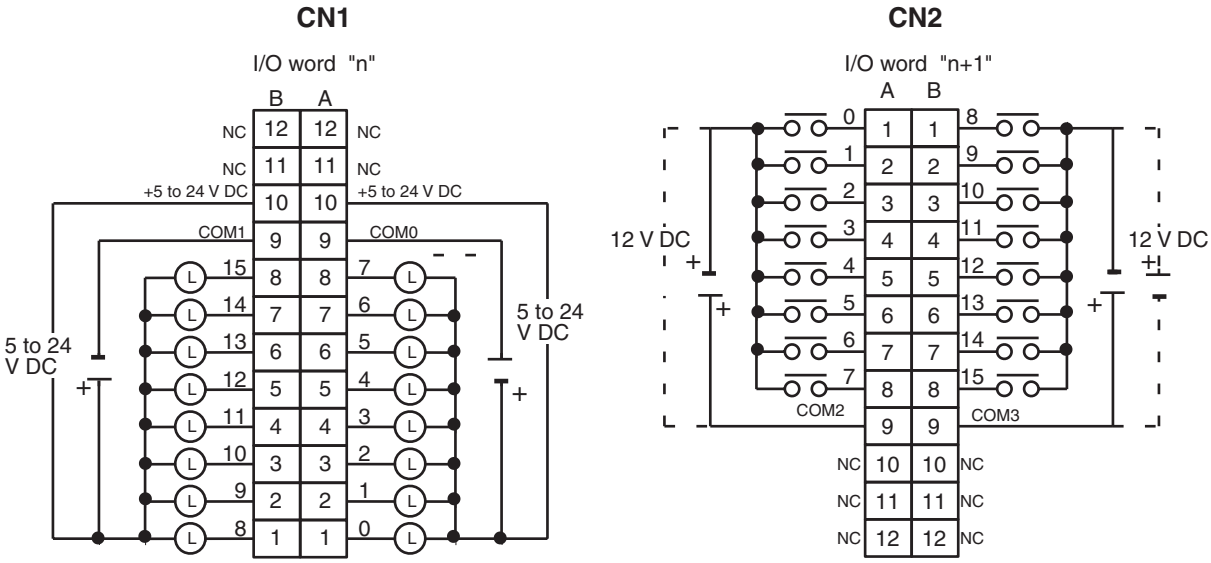


Units manufactured on or after November 18, 2002
(manufacturing numbers 18Y2H or later)



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Terminal Connections



Note 1. I/O word “n” is determined by the unit number setting (n = CIO 2000 + 10 × unit number).
2. The Unit will have 16 static output and16 static input points when pin 1 of it’s DIP switch is OFF.
3. When pin 2 of the Unit’s DIP switch is ON, input points 08 to 15 in connector 2 are high-speed inputs.
4. The user is not authorized to change the fuse.

C200H-MD115 12-V DC Input/Transistor Output Unit Used for 128 Dynamic Inputs

Output Specifications (Connector 1)

Max. Switching Capacity	50 mA, 12 V DC (10.2 to 13.2 V DC), 400 mA/common, 0.8 A/Unit
Leakage Current	0.1 mA max.
Residual Voltage	0.7 V max.
ON Response Time	0.2 ms max.
OFF Response Time	0.6 ms max.
Fuses	2 (1 fuse/common; fuses are not user-replaceable.)
Power for External Supply	45 mA 5 to 24 V DC±10% min. (2.8 mA × number of ON outputs)

Input Specifications (Connector 2)

Rated Input Voltage	12 V DC
Operating Input Voltage	10.2 to 13.2 V DC
Input Impedance	2.7 kΩ
Input Current	4.1 mA typical (at 12 V DC)
ON Voltage	8.0 V DC min.
OFF Voltage	3.0 V DC max.

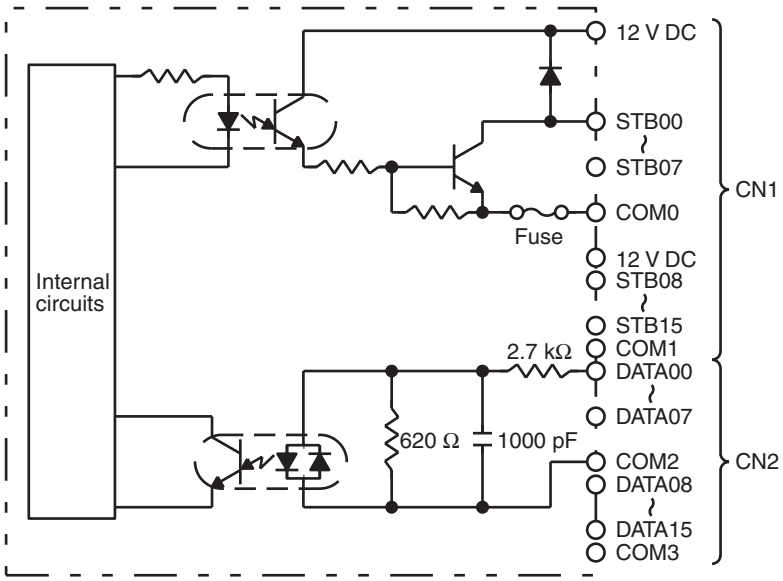
General Specifications

No. of Circuits	2 (dynamic, 64 points/circuit)
Internal Current Consumption	180 mA 5 V DC max.
Weight	300 g max.

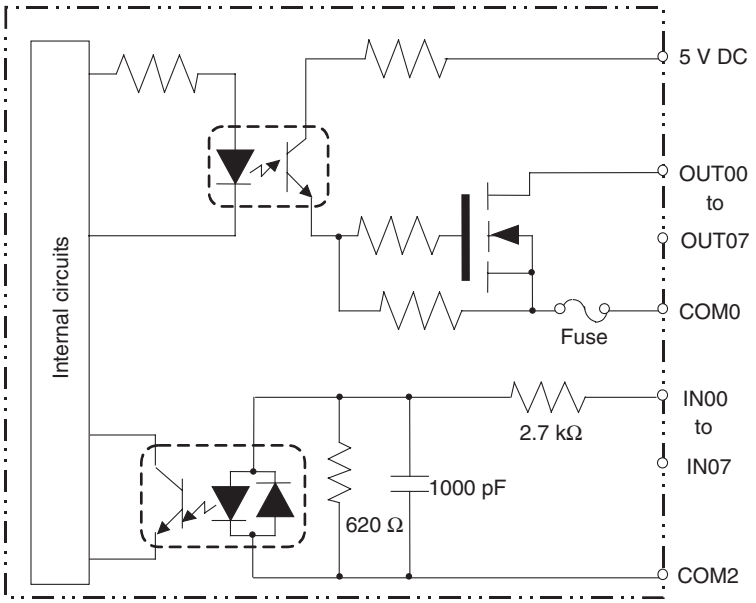
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Circuit Configuration

Units manufactured on or before November 17, 2002
(manufacturing numbers 17Y2 or earlier)

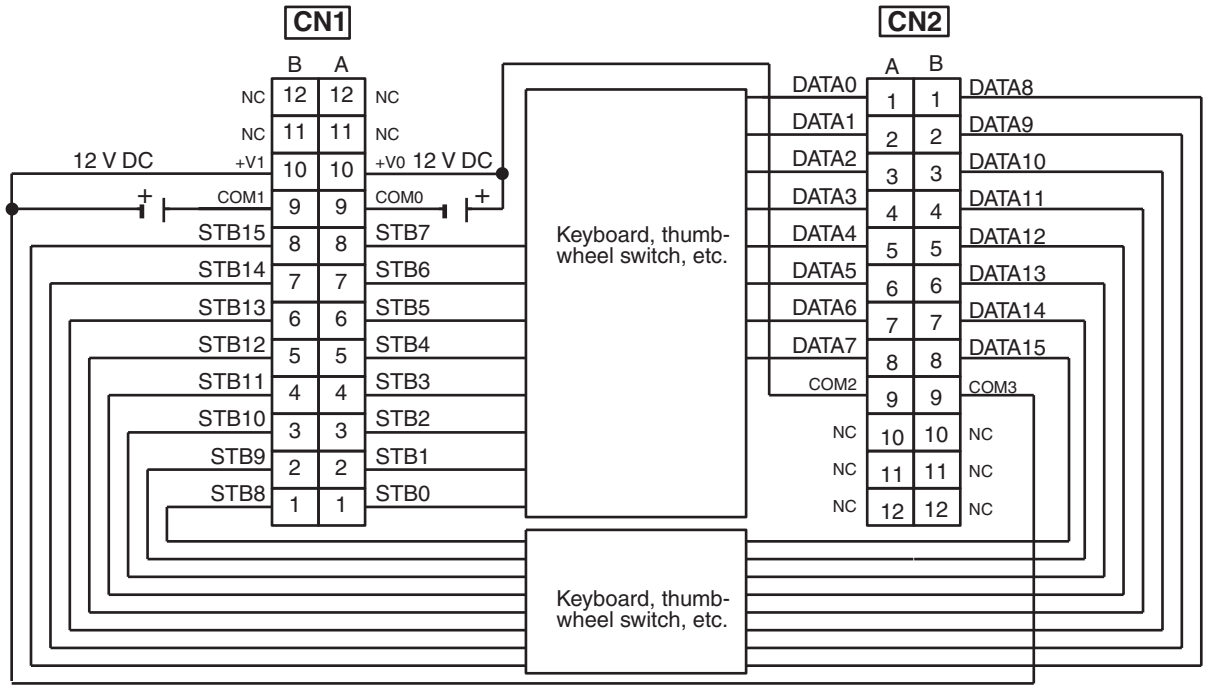


Units manufactured on or after November 18, 2002
(manufacturing numbers 18Y2H or later)



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Terminal Connections



Note 1. Refer to the Unit's operation manual for details on I/O bit allocation.
2. The Unit will have 128 dynamic output points when pin 1 of it's DIP switch is ON.
3. The user is not authorized to change the fuse.

C200H-MD215 24-V DC Input/Transistor Output Unit Used for 16 Static Inputs and 16 Static Outputs

Output Specifications (Connector 1)

Max. Switching Capacity	16 mA, 4.5 V DC to 100 mA, 26.4 V DC 800 mA/common, 1.6 A/Unit
Leakage Current	0.1 mA max.
Residual Voltage	0.7 V max.
ON Response Time	0.2 ms max.
OFF Response Time	0.6 ms max.
No. of Circuits	2 (8 points/common)
Fuses	2 (1 fuse/common; fuses are not user-replaceable.)
Power for External Supply	45 mA 5 to 24 V DC±10% min. (2.8 mA × number of ON outputs)

Input Specifications (Connector 2)

Rated Input Voltage	24 V DC
Operating Input Voltage	20.4 to 26.4 V DC
Input Impedance	5.6 kΩ
Input Current	4.1 mA (at 24 V DC)
ON Voltage	14.4 V DC min.
OFF Voltage	5.0 V DC max.
ON Response Time	2.5 ms/15 ms max. (switchable)
OFF Response Time	2.5 ms/15 ms max. (switchable)
No. of Circuits	2 (8 points/common)
High-speed Inputs	8 points (connector 2 terminals 8 to 15, when set) Pulse width: 1 ms/4 ms min. (switchable)

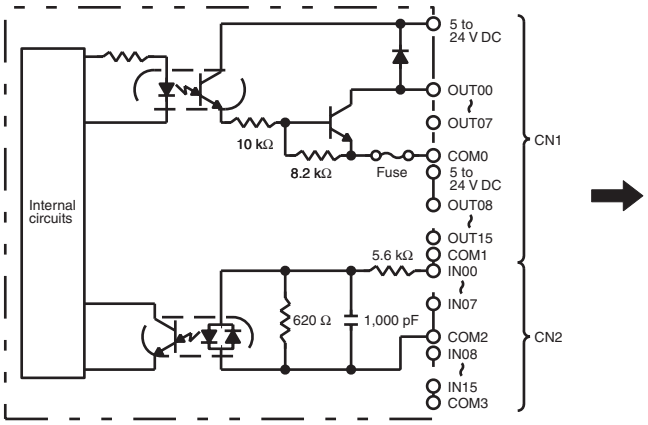
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General Specifications

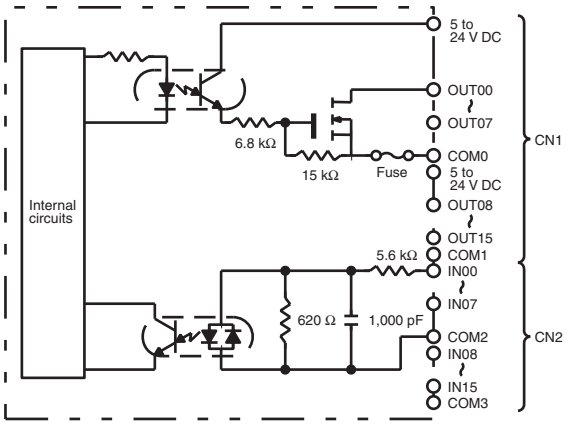
Internal Current Consumption	180 mA 5 V DC max.
Weight	300 g max.

Circuit Configuration

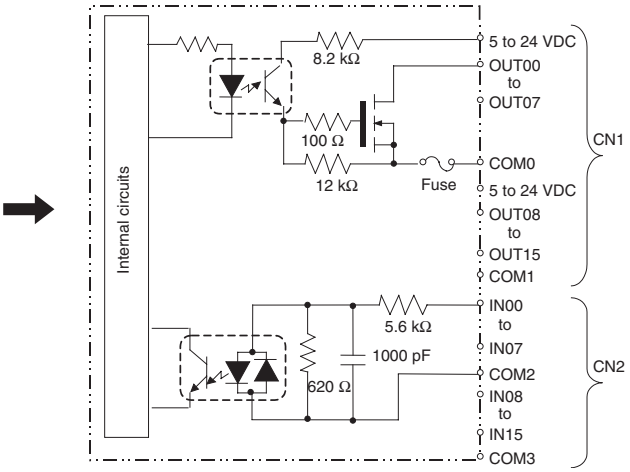
Units manufactured on or before November 29, 1999 (manufacturing numbers 29Y9 or earlier)



Units manufactured between November 30, 1999 and October 9, 2002 (manufacturing numbers 30Y9 to 09X2)

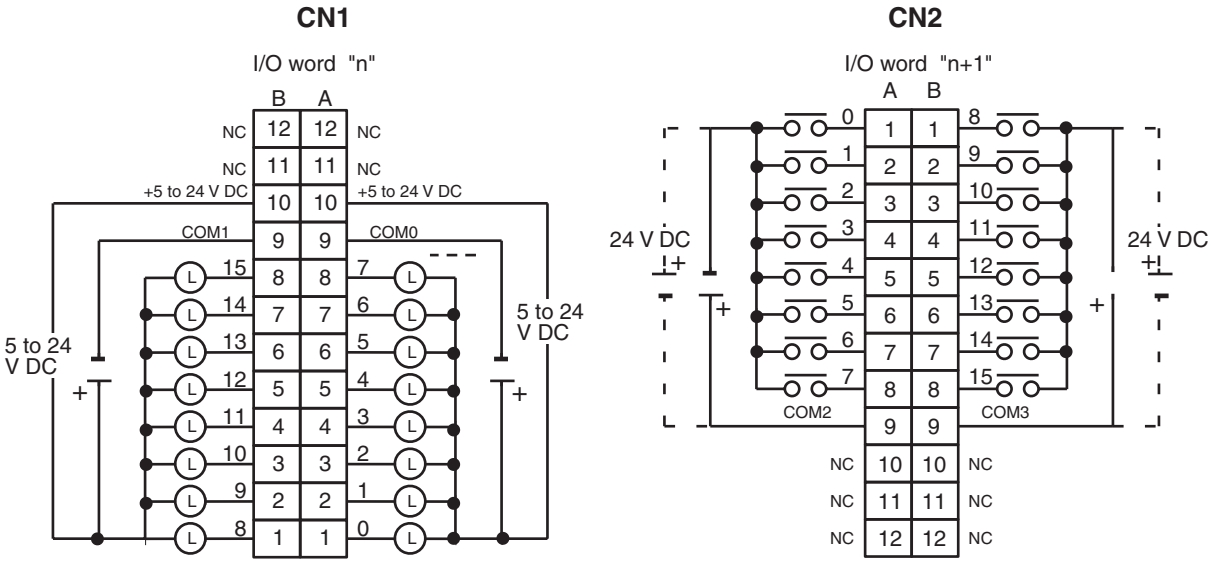


Units manufactured on or after October 10, 2002 (manufacturing numbers 10X2H or later)



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Terminal Connections



Note 1. I/O word “n” is determined by the unit number setting (n = CIO 2000 + 10 × unit number).

2. The Unit will have 16 static output and16 static input points when pin 1 of it’s DIP switch is OFF.
3. At high temperatures, the number of inputs that can be turned ON simultaneously is limited. Refer to the graph page 688 for details.
4. When pin 2 of the Unit’s DIP switch is ON, input points 08 to 15 in connector 2 are high-speed inputs.
5. The user is not authorized to change the fuse.

C200H-MD215 24-V DC Input/Transistor Output Unit Used for 128 Dynamic Inputs/Dynamic Outputs

Output Specifications (Connector 1)

Max. Switching Capacity	100 mA, 24 V DC (20.4 to 26.4 V DC), 800 mA/common, 1.6 A/Unit
Leakage Current	0.1 mA max.
Residual Voltage	0.7 V max.
ON Response Time	0.2 ms max.
OFF Response Time	0.6 ms max.
Fuses	2 (1 fuse/common; fuses are not user-replaceable.)
Power for External Supply	45 mA 5 to 24 V DC±10% min. (2.8 mA × number of ON outputs)

Input Specifications (Connector 2)

Rated Input Voltage	24 V DC
Operating Input Voltage	20.4 to 26.4 V DC
Input Impedance	5.6 kΩ
Input Current	4.1 mA (at 24 V DC)
ON Voltage	14.4 V DC min.
OFF Voltage	5.0 V DC max.

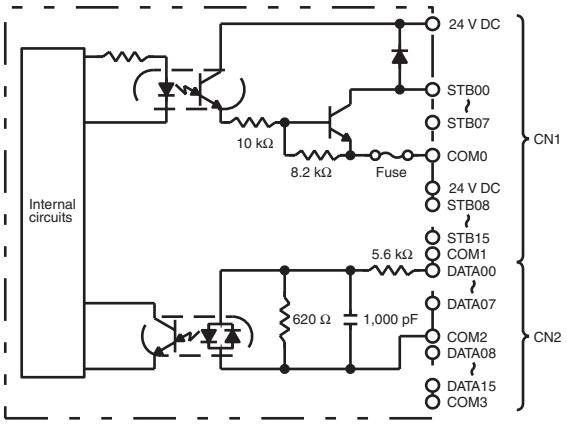
General Specifications

No. of Circuits	2 (dynamic, 64 points/circuit)
Internal Current Consumption	180 mA 5 V DC max.
Weight	300 g max.

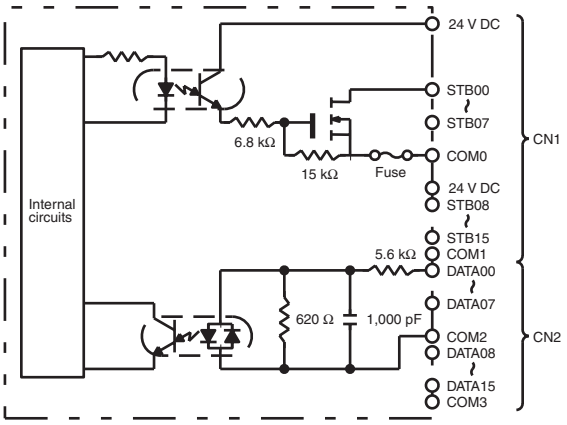
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Circuit Configuration

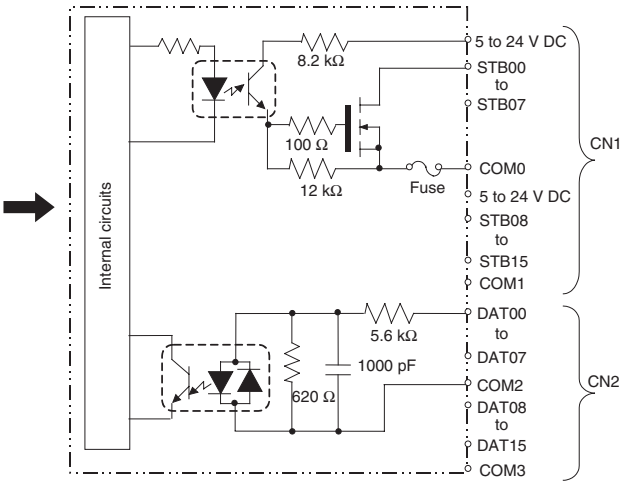
Units manufactured on or before November 29, 1999 (manufacturing numbers 29Y9 or earlier)



Units manufactured between November 30, 1999 and October 9, 2002 (manufacturing numbers 30Y9 to 09X2)

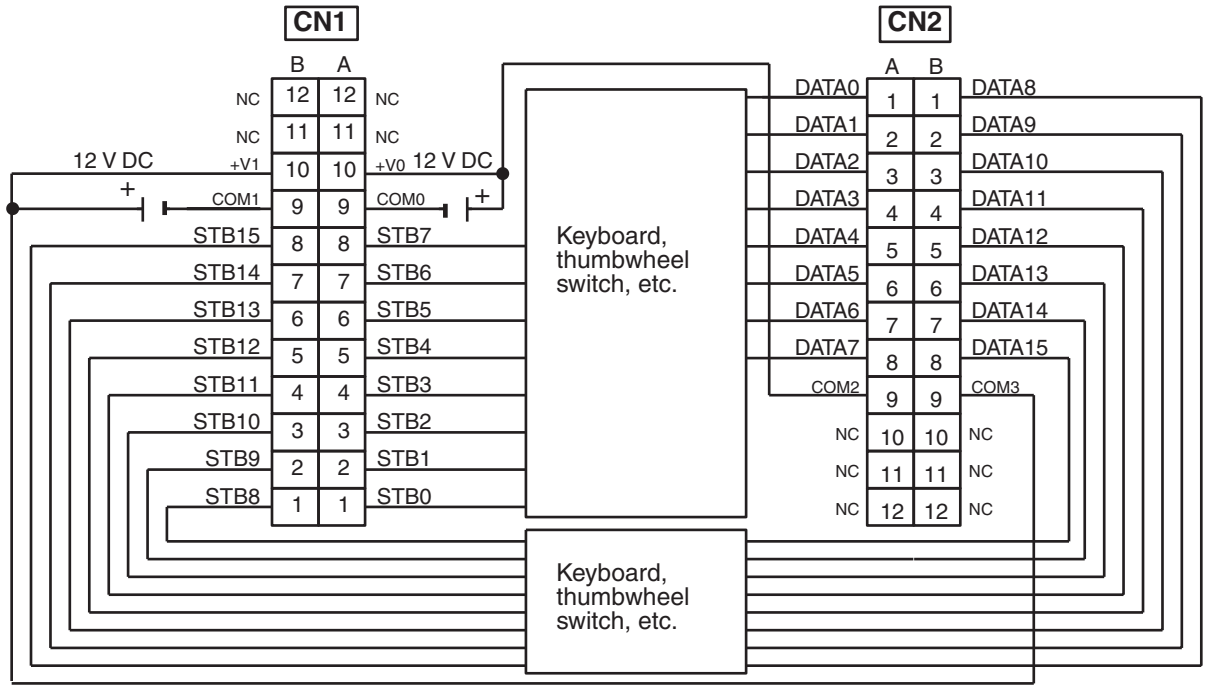


Units manufactured on or after October 10, 2002 (manufacturing numbers 10X2H or later)



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Terminal Connections



Note 1. Refer to the Unit's operation manual for details on I/O bit allocation.

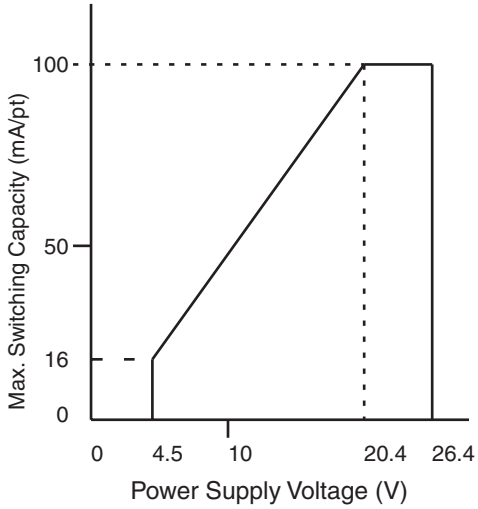
2. The Unit will have 128 dynamic output points when pin 1 of it's DIP switch is ON.
3. Each output terminal has an output resistance of 4.7 kΩ.
4. At high temperatures, the number of inputs that can be turned ON simultaneously is limited. Refer to the graph on the next page for details.
5. The user is not authorized to change the fuse.

High-density I/O Unit Limitations

Limitations on the switching capacity of C200H-OD215/MD115/MD215 Transistor Output Units and the usable number of I/O points in the C200H-ID215 and C200H-MD215 are shown below.

Switching Capacity

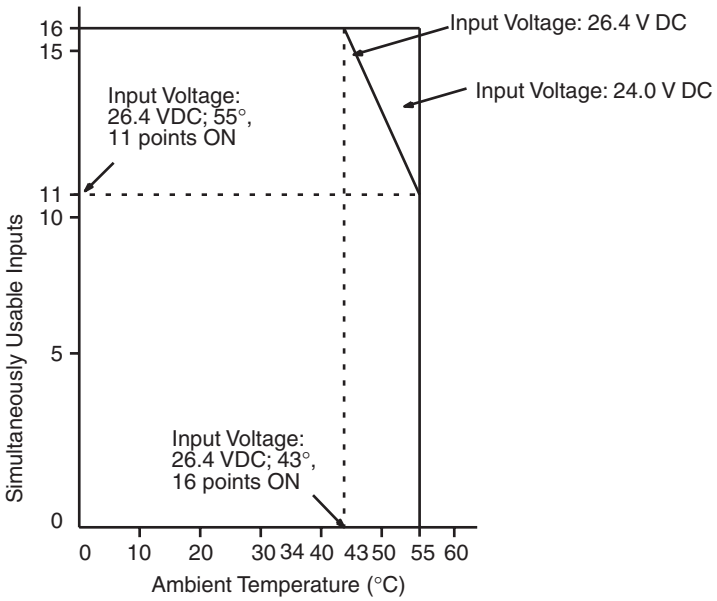
The switching capacity of C200H-OD215/MD115/MD215 Transistor Output Units depends on the power supply voltage, as shown below.



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Simultaneous Input and Outputs for the C200H-MD215

The number C200H-MD215 24-V DC inputs that can be ON simultaneously will depend on ambient temperature as shown in the figure below. There is no limit to the number of outputs that can be ON simultaneously.



Note If the number of C200H-MD215 inputs that are ON exceeds the number that can be ON at the same time, then heat generated by electronic components will raise the temperature of the components and the case. This will lower the reliability and service life of the components and will damage the Unit. Higher temperatures in electronic components and the case will also cause time delays. There is no problem if all input points are turned ON for less than 10 minutes (if all input points have been OFF for at least 2 hours) under special conditions, such as during startup work inspections.

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Appendix B
Auxiliary Area

Note The undefined addresses of the Auxiliary Area may be allocated to functions in future version upgrades of the CPU Unit. Do not use these words as CIO Area words in the user program.

A000 to A447: Read-only Area, A448 to A959: Read/Write Area

Read-only Area (Set by System)

Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	Bits					
A000	---	10-ms Incrementing Free Running Timer	This word contains the system timer used after the power is turned ON. 0000 hex is set when the power is turned ON and this value is automatically incremented by 1 every 10 ms. The value returns to 0000 hex after reaching FFFF hex (655,350 ms), and then continues to be automatically incremented by 1 every 10 ms. **Note:** The timer will continue to be incremented when the operating mode is switched to RUN mode. Example: The interval can be counted between processing A and processing B without requiring timer instructions. This is achieved by calculating the difference between the value in A000 for processing A and the value in A000 for processing B. The interval is counted in 10 ms units.	Retained	Cleared	Every 10 ms after power is turned ON CPU Unit with unit version 3.0 or later
A001	---	100-ms Incrementing Free Running Timer	This word contains the system timer used after the power is turned ON. 0000 hex is set when the power is turned ON and this value is automatically incremented by 1 every 100 ms. The value returns to 0000 hex after reaching FFFF hex (655,350 ms), and then continues to be automatically incremented by 1 every 10 ms. **Note:** The timer will continue to be incremented when the operating mode is switched to RUN mode.	Retained	Cleared	Every 100 ms after power is turned ON CPU Unit with unit version 3.0 or later
A002	---	1-s Incrementing Free Running Timer	This word contains a system timer used after the power is turned ON 0000 hex is set when the power is turned ON and this value is automatically incremented by 1 every 1 s. The value returns to 0000 hex after reaching FFFF hex (65,535 s), and then continues to be automatically incremented by 1 every 1 s. **Note:** The timer will continue to be incremented when the operating mode is switched to RUN mode.	Retained	Cleared	Every 1 s after power is turned ON CPU Unit with unit version. 4.0 or later
A050	A05000 to A05007	Basic I/O Unit Information, Rack 0 Slot 0	A bit will turn ON to indicate when a fuse has blows. The bit numbers correspond to the fuse number on the Unit. Only the right-most bit is used for C200H Basic I/O Units. 1: Fuse blown 0: Normal	---	---	Every cycle
	A05008 to A05015	Basic I/O Unit Information, Rack 0 Slot 1		---	---	
A051 to A069	A05100 to A06915	Basic I/O Unit Information, Racks 2 to 9		---	---	

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	**Bits**					
A090 to A093	---	User Program Date	These words contain in BCD the date and time that the user program was last overwritten. A09000 to A09007: Seconds (00 to 59) A09008 to A09015: Minutes (00 to 59) A09100 to A09107: Hour (00 to 23) A09108 to A09115: Day of month (01 to 31) A09200 to A09207: Month (01 to 12) A09208 to A09215: Year (00 to 99) A09308 to A09307: Day of the week (00: Sunday, 01: Monday, 02: Tuesday, 03: Wednesday, 04: Thursday, 05: Friday, 06: Saturday)	Retained	Retained	---
A094 to A097	---	Parameter Date	These words contain in BCD the date and time that the parameters were last overwritten. The format is the same as above	Retained	Retained	---
A099	A09900	UM Read Protection Status	Indicates whether the entire user program in the PLC is read-protected. 0: UM not read-protected. 1: UM read-protected.	Retained	Retained	When protection is set or cleared CPU Unit with unit version 2.0 or later
	A09901	Task Read Protection Status	Indicates whether read protection is set for individual tasks. 0: Tasks not read-protected. 1: Tasks read-protected.	Retained	Retained	When protection is set or cleared CPU Unit with unit version 2.0 or later
	A09902	Program Write Protection Status when Read Protection Is Set	Indicates whether the program is write-protected. 0: Write-enabled. 1: Write-protected.	Retained	Retained	When protection is set or cleared CPU Unit with unit version 2.0 or later
	A09903	Enable/Disable Status for Backing Up the Program to a Memory Card	Indicates whether creating a backup program file (.OBJ) is enabled or disabled. 0: Enabled. 1: Disabled.	Retained	Retained	When protection is set or cleared CPU Unit with unit version 2.0 or later
	A09914	IR/DR Operation between Tasks	Turn ON this bit to share index and data registers between all tasks. Turn OFF this bit to use separate index and data registers between in each task. 0: Independent 1: Shared (default)	Retained	Retained	---
	A09915	Timer/ Counter PV Refresh Mode Flag	Indicates whether the CPU Unit is storing timer/counter PV in BCD or binary. 0: BCD mode 1: Binary mode	Retained	Retained	---

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	Bits					
A100 to A199	All	Error Log Area	When an error has occurred, the error code, error contents, and error's time and date are stored in the Error Log Area. Information on the 20 most recent errors can be stored. Each error record uses 5 words; the function of these 5 words is as follows: 1) Error code (bits 0 to 15) 2) Error contents (bits 0 to 15) Error code Error contents: Address of Aux. Area word with details or 0000 3) Minutes (bits 8 to 15), Seconds (bits 0 to 7) Seconds: 00 to 59, BCD Minutes: 00 to 59, BCD 4) Day of month (bits 8 to 15), Hours (bits 0 to 7) Hours: 00 to 23, BCD Day of month: 01 to 31, BCD 5) Year (bits 8 to 15), Month (bits 0 to 7) Year: 00 to 99, BDC Month: 00 to 12, BCD Errors generated by FAL(006) and FALS(007) will also be stored in this Error Log. The Error Log Area can be reset from a Programming Device. If the Error Log Area is full (20 records) and another error occurs, the oldest record in A100 to A104 will be cleared, the other 19 records are shifted down, and the new record is stored in A195 to A199.	Retained	Retained	Written when error occurs A50014 A300 A400
A200	A20011	First Cycle Flag	ON for one cycle after PLC operation begins (after the mode is switched from PROGRAM to RUN or MONITOR, for example). ON for the first cycle	---	---	---
	A20012	Step Flag	ON for one cycle when step execution is started with STEP(008). This flag can be used for initialization processing at the beginning of a step. ON for the first cycle after execution of STEP(008).	Cleared	---	---
	A20014	Task Started Flag	When a task switches from WAIT or INI to RUN status, this flag will be turned ON within the task for one cycle only. ON for first cycle (including transitions from WAIT and IN) The only difference between this flag and A20015 is that this flag also turns ON when the task switches from WAIT to RUN status.	Cleared	Cleared	---
	A20015	First Task Startup Flag	ON when a task is executed for the first time. This flag can be used to check whether the current task is being executed for the first time so that initialization processing can be performed if necessary. 1: First execution 0: Not executable for the first time or not being executed.	Cleared	---	---
A201	A20110	Online Editing Wait Flag	ON when an online editing process is waiting. (If another online editing command is received while waiting, the other command won't be recorded and an error will occur.) 1: Waiting for online editing 0: Not waiting for online editing	Cleared	Cleared	A527
	A20111	Online Editing Flag	ON when an online editing process is being executed 1: Online editing in progress 0: Online editing not in progress	Cleared	Cleared	A527

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	**Bits**					
A202	A20200 to A20207	Communications Port Enabled Flags	ON when a network instruction (SEND, RECV, CMND, PMCR, TXDU or RXDU) or background execution can be executed with the corresponding port number. Bits 00 to 07 correspond to communications ports 0 to 7. 1: Network instruction is not being executed 0: Network instruction is being executed (port busy) When two or more network instructions are programmed with the same port number, use the corresponding flag as an execution condition to prevent the instructions from being executed simultaneously. (The flag for a given port is turned OFF while a network instruction with that port number is being executed.) (When the simple backup operation is used to performed a write or compare operation for a Memory Card, a communications port will be automatically allocated, and the corresponding Flag will be turned OFF.)	Cleared	---	---
	A20215	Network Communications Automatic Allocation Flag	This flag turns ON when a Network Communications Instruction (SEND(090), RECV(098), CMND(490), PMCR(260), TXDU(256), or RXDU(255)) can be executed using the automatic communications port allocation function. 1: Communications port available 0: Communications port not available **Note:** When using the automatic communications port allocation function to execute nine or more network communications instructions simultaneously, use this flag to perform exclusive control.	Cleared	---	---
A203 to A210	All	Communications Port Completion Codes	These words contain the completion codes for the corresponding port numbers when network instructions (SEND, RECV, CMND, or PMCR) or background execution has been executed. Words A203 to A210 correspond to communications ports 0 to 7. Non-zero: Error code 0000: Normal condition The following codes will be stored when an Explicit Message Instruction (EXPLT, EGATR, ESATR, ECHRD, or ECHWR) has been executed. If the Explicit Communications Error Flag turns OFF, 0000 hex is stored. If the Explicit Communications Error Flag is ON and the Network Communications Error Flag is ON, the FINS end code is stored. If the Explicit Communications Error Flag is ON and the Network Communications Error Flag is OFF, the explicit message end code is stored. During communications, 0000 hex will be stored and the suitable code will be stored when execution has been completed. The code will be cleared when operation is started. (The completion code for a given port is cleared to 0000 when a network instruction with that port number is executed.) (When the simple backup operation is used to performed a write or compare operation for a Memory Card, a communications port will be automatically allocated, and a completion code will be stored in the corresponding word.)	Cleared	---	---

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	**Bits**					
A213	A21300 to A21307	Explicit Communications Error Flag	Turn ON when an error occurs in executing an Explicit Message Instruction (EXPLT, EGATR, ESATR, ECHRD, or ECHWR). Bits 00 to 07 correspond to communications ports 0 to 7. 1: Error end 0: Normal end The corresponding bit will turn ON both when the explicit message cannot be sent and when an error response is returned for the explicit message. The status will be maintained until the next explicit message communication is executed. The bit will always turn OFF when the next Explicit Message Instruction is executed.	Cleared	---	A21900 to A21907 A203 to A210
A214	A21400 to A21407	First Cycle Flags after Network Communications Finished	Each flag will turn ON for just one cycle after communications have been completed. Bits 00 to 07 correspond to ports 0 to 7. Use the Used Communications Port Number stored in A218 to determine which flag to access. 1: First cycle after communications finish only 2: Other status **Note:** These flags are not effective until the next cycle after the communications instruction is executed. Delay accessing them for at least one cycle.	Retained	Cleared	---
A215	A21500 to A21507	First Cycle Flags after Network Communications Error	Each flag will turn ON for just one cycle after a communications error occurs. Bits 00 to 07 correspond to ports 0 to 7. Use the Used Communications Port Number stored in A218 to determine which flag to access. Determine the cause of the error according to the Communications Port Completion Codes stored in A203 to A210. 1: First cycle after communications error only 0: Other status **Note:** These flags are not effective until the next cycle after the communications instruction is executed. Delay accessing them for at least one cycle.	Retained	Cleared	---
A216 to A217	All	Network Communications Completion Code Storage Address	The completion code for a communications instruction is automatically stored at the address with the I/O memory address given in these words. Place this address into an index register and use indirect addressing through the index register to read the communications completion code.	Retained	Cleared	---
A218	All	Used Communications Port Numbers	Stores the communications port numbers used when a communications instruction is executed using automatic communication port allocations. 0000 to 0007 hex: Communications port 0 to 7	Retained	Cleared	---
A219	A21900 to A21907	Communications Port Error Flags	ON when an error occurred during execution of a network instruction (SEND, RECV, CMND, or PMCR). Bits 00 to 07 correspond to communications ports 0 to 7. 1: Error occurred 0: Normal condition (When the simple backup operation is used to performed a write or compare operation for a Memory Card, a communications port will be automatically allocated, and the corresponding Flag will be turned OF if an error occurs.)	Retained	---	---
A220 to A259	A22000 to A25915	Basic I/O Unit Input Response Times	These words contain the actual input response times. 0 to 17 hexadecimal When the Basic I/O Unit input response time setting is changed in the PLC Setup while the PLC is in PROGRAM mode, the setting in the PLC Setup will not match the actual value in the Basic I/O Unit unless the power is turned OFF and then ON again. In that case, the actual value can be monitored in these words.	Retained	See function column.	PLC Setup (Basic I/O Unit Input response time settings)

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	Bits					
A261	A26100	CPU Bus Unit Setup Area Initialization Error Flag	ON: Error in CPU Bus Unit Setup Turns OFF when I/O tables are generated normally. ON: Error in CPU Bus Unit Setup OFF: I/O tables generated normally	Retained	Cleared	When I/O tables are generated
	A26102	I/O Overflow Flag	ON: Overflow in maximum number of I/O points Turns OFF when I/O tables are generated normally. ON: Overflow in maximum number of I/O points OFF: I/O tables generated normally			A40111 (Too many I/O points)
	A26103	Duplication Error Flag	ON: The same unit number was used more than once. Turns OFF when I/O tables are generated normally. ON: The same unit number was used more than once. OFF: I/O tables generated normally			A40113 (duplicated number)
	A26104	I/O Bus Error Flag	ON: I/O bus error Turns OFF when I/O tables are generated normally. ON: I/O bus error OFF: I/O tables generated normally			A40114 (I/O but error)
	A26106	SYSMAC BUS Recognition Error Flag	ON: SYSMAC BUS detection ended in an error. Turns OFF when I/O tables are generated normally. ON: SYSMAC BUS detection ended in an error. OFF: I/O tables generated normally			
	A26107	Special I/O Unit Error Flag	ON: Error in a Special I/O Unit Turns OFF when I/O tables are generated normally. ON: Error in a Special I/O Unit OFF: I/O tables generated normally			
	A26109	I/O Unconfirmed Error Flag	ON: I/O detection has not been completed. Turns OFF when I/O tables are generated normally. ON: I/O detection has not been completed. OFF: I/O tables generated normally			
A262 and A263	All	Maximum Cycle Time	These words contain the maximum cycle time since the start of PLC operation (the program execution cycle time for a Parallel Processing Mode). The cycle time is recorded in 8-digit hexadecimal with the leftmost 4 digits in A263 and the rightmost 4 digits in A262. 0 to FFFFFFFF: 0 to 429,496,729.5 ms (0.1ms units)	Cleared	Cleared-	---
A264 and A265	All	Present Cycle Time	These words contain the present cycle time in 8-digit hexadecimal with the leftmost 4 digits in A265 and the rightmost 4 digits in A264 (the program execution cycle time for a Parallel Processing Mode). 0 to FFFFFFFF: 0 to 429,496,729.5 ms	Cleared	Cleared	---
A266 and A267	All	Program Execution Time + Priority Peripheral Servicing Time	Total of all slice times for program execution and all slice times for peripheral servicing. 00000000 to FFFFFFFF hex 0.0 to 429,496,729.5 ms (0.1-ms increments)	Cleared	Cleared	---
A268	All	Peripheral Servicing Cycle Time	In Parallel Processing with Synchronous or Asynchronous Memory Access, this word contains the peripheral servicing cycle time. The time is updated every cycle and is recorded in 16-bit binary. 0 to 4E20 hex, (0.0 to 2,000.0 ms in units of 0.1 ms)	Cleared	Cleared	Each cycle A40515
A294	All	Task Number when Program Stopped	This word contains the task number of the task that was being executed when program execution was stopped because of a program error. Normal tasks: 0000 to 001F (task 0 to 31) Interrupt tasks: 8000 to 80FF (task 0 to 255) (A298 and A299 contain the program address where program execution was stopped.)	Cleared	Cleared	A298/A299

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	Bits					
A295	A29508	Instruction Processing Error Flag	This flag and the Error Flag (ER) will be turned ON when an instruction processing error has occurred and the PLC Setup has been set to stop operation for an instruction error. CPU Unit operation will stop and the ERR/ALM indicator will light when this flag goes ON. 1: Error Flag ON 0: Error Flag OFF	Cleared	Cleared	PLC Setup (Operation when instruction error has occurred) The task number where the error occurred will be stored in A294 and the program address will be stored in A298 and A299.
	A29509	Indirect DM/EM BCD Error Flag	This flag and the Access Error Flag (AER) will be turned ON when an indirect DM/EM BCD error has occurred and the PLC Setup has been set to stop operation an indirect DM/EM BCD error. (This error occurs when the content of an indirectly addressed DM or EM word is not BCD although BCD mode has been selected.) CPU Unit operation will stop and the ERR/ALM indicator will light when this flag goes ON. 1: Not BCD 0: Normal	Cleared	Cleared	PLC Setup (Operation when instruction error has occurred) The task number where the error occurred will be stored in A294 and the program address will be stored in A298 and A299.
A295	A29510	Illegal Access Error Flag	This flag and the Access Error Flag (AER) will be turned ON when an illegal access error has occurred and the PLC Setup has been set to stop operation an illegal access error. (This error occurs when a region of memory is access illegally.) CPU Unit operation will stop and the ERR/ALM indicator will light when this flag goes ON. The following operations are considered illegal access: 1) Reading/writing the system area 2) Reading/writing EM File Memory 3) Writing to a write-protected area 4) Indirect DM/EM BCD error (in BCD mode) 1: Illegal access occurred 0: Normal condition	Cleared	Cleared	PLC Setup (Operation when instruction error has occurred) The task number where the error occurred will be stored in A294 and the program address will be stored in A298 and A299.
	A29511	No END Error Flag	ON when there isn't an END(001) instruction in each program within a task. CPU Unit operation will stop and the ERR/ALM indicator will light when this flag goes ON. 1: No END 0: Normal condition	Cleared	Cleared	The task number where the error occurred will be stored in A294 and the program address will be stored in A298 and A299.
	A29512	Task Error Flag	ON when a task error has occurred. The following conditions generate a task error. There isn't even one regular task that is executable (started). There isn't a program allocated to the task. 1: Error 0: Normal	Cleared	Cleared	The task number where the error occurred will be stored in A294 and the program address will be stored in A298 and A299.
	A29513	Differentiation Overflow Error Flag	The allowed value for Differentiation Flags which correspond to differentiation instructions has been exceeded. CPU Unit operation will stop and the ERR/ALM indicator will light when this flag goes ON. 1: Error 0: Normal	Cleared	Cleared	The task number where the error occurred will be stored in A294 and the program address will be stored in A298 and A299.
	A29514	Illegal Instruction Error Flag	ON when a program that cannot be executed has been stored. CPU Unit operation will stop and the ERR/ALM indicator will light when this flag goes ON. 1: Error 0: Normal	Cleared	Cleared	The task number where the error occurred will be stored in A294 and the program address will be stored in A298 and A299.
	A29515	UM Overflow Error Flag	ON when the last address in UM (User Memory) has been exceeded. CPU Unit operation will stop and the ERR/ALM indicator will light when this flag goes ON. 1: Error 0: Normal	Cleared	Cleared	---

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	**Bits**					
A298 to A299	All	Program Address Where Program Stopped	These words contain the 8-digit binary program address of the instruction where program execution was stopped due to a program error.	Cleared	Cleared	A294 contains the task number of the task where program execution was stopped.
A300	All	Error Log Pointer	When an error occurs, the Error Log Pointer is incremented by 1 to indicate the location where the next error record will be recorded as an offset from the beginning of the Error Log Area (A100 to A199). 00 to 14 hexadecimal The Error Log Pointer can be cleared to 00 by turning A50014 (the Error Log Reset Bit) from OFF to ON. When the Error Log Pointer has reached 14 (20 decimal), the next record is stored in A195 to A199 when the next error occurs.	Retained	Retained	Written when error occurs A50014
A301	All	Current EM Bank	This word contains the current EM bank number in 4-digit hexadecimal. The current bank number can be changed with the EMBC(281) instruction. 0000 to 000C hexadecimal	Cleared	Cleared	---
A302	A30200 to A30215	CPU Bus Unit Initializing Flags	These flags are ON while the corresponding CPU Bus Unit is initializing after its CPU Bus Unit Restart Bit (A50100 to A50115) is turned from OFF to ON or the power is turned ON. Bits 00 to 15 correspond to unit numbers 0 to 15. Use these flags in the program to prevent the CPU Bus Unit's refresh data from being used while the Unit is initializing. IORF(097) cannot be executed while an CPU Bus Unit is initializing. 0: Not initializing 1: Initializing (Reset to 0 automatically after initialization.) These bits are turned OFF automatically when initialization is completed.	Retained	Cleared	Written during initialization A50100
A330 to A335	A33000 to A33515	Special I/O Unit Initializing Flags	These flags are ON while the corresponding Special I/O Unit is initializing after its Special I/O Unit Restart Bit (A50200 to A50715) is turned from OFF to ON or the power is turned ON. The bits in these words correspond to unit numbers 0 to 95 as follows: A33000 to A33015: Units 0 to 15 A33100 to A33115: Units 16 to 31 ---- A33500 to A33515: Units 80 to 95 Use these flags in the program to prevent the Special I/O Unit's refresh data from being used while the Unit is initializing. Also, IORF(097) cannot be executed while a Special I/O Unit is initializing. 0: Not initializing 1: Initializing (Reset to 0 automatically after initialization.) These bits are turned OFF automatically when initialization is completed.	Retained	Cleared	A50200 to A50715
A339 and A340	All	Maximum Differentiation Flag Number	These words contain the maximum value of the differentiation flag numbers being used by differentiation instructions.	See Function column.	Cleared	Written at the start of operation A29513

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	Bits					
A343	A34300 to A34302	Memory Card Type	Indicates the type of Memory Card, if any, installed. This information is recorded when the PLC power is turned ON or the Memory Card power switch is turned ON. 0: None 4: Flash ROM	Retained	See Function column.	See Function column. ---
	A34306	EM File Memory Format Error Flag	ON when a format error occurs in the first EM bank allocated for file memory. 1: Format error 0: No format error (The flag is turned OFF when formatting is completed normally.)	Retained	Cleared	---
	A34307	Memory Card Format Error Flag	ON when the Memory Card is not formatted or a formatting error has occurred. (The flag is turned OFF when formatting is completed normally.) 1: Format error 0: No format error This flag is written when the PLC power is turned ON or the Memory Card power switch is turned ON.	Retained	See Function column.	See Function column.
	A34308	File Transfer Error Flag	ON when an error occurred while writing data to file memory. 1: Error 0: No error	Retained	Cleared	Written when file data is written
	A34309	File Write Error Flag	ON when data cannot be written to file memory because it is write-protected or the data exceeds the capacity of the file memory. 1: Write not possible 0: Normal condition	Retained	Cleared	Written when file data is written
	A34310	File Read Error	ON when a file could not be read because of a malfunction (file is damaged or data is corrupted). 1: Read not possible 0: Normal condition	Retained	Cleared	Written when file data is read
	A34311	File Missing Flag	ON when an attempt is made to read a file that doesn't exist, or an attempt is made to write to a file in a directory that doesn't exist. 1: Specified file or directory is missing 0: Normal condition	Retained	Cleared	Written when file data is read
	A34313	File Memory Operation Flag	ON while any of the following operations is being executed. OFF when none of them are being executed. CMND instruction sending a FINS command to the local CPU Unit. Execution of a File Memory instructions. Program replacement using the control bit in the Auxiliary Area. Easy backup operation. 1: Instruction being executed. 0: Instruction not being executed.	Retained	Cleared	Written when file memory instruction is executed
	A34314	Accessing File Data Flag	ON while file data is being accessed. Use this flag to prevent two file memory instructions from being executed at the same time. 1: File being accessed 0: File not being accessed	Retained	Cleared	---
	A34315	Memory Card Detected Flag	ON when a Memory Card has been detected. OFF when a Memory Card has not been detected. 1: Memory Card detected 0: Memory Card not detected	Retained	Cleared	Written when Memory Card is inserted, or the power is turned ON.

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	Bits					
A344	All	EM File Memory Starting Bank	Contains the starting bank number of EM file memory (bank number of the first formatted bank). All EM banks from this starting bank to the last bank in EM are formatted for use as file memory. To convert the EM Area for use as file memory, first set the PLC Setup's EM File Memory Function setting to 1, set the PLC Setup's EM File Memory Starting Bank setting, and then format the EM Area from a Programming Device The PLC Setup's EM file memory settings won't agree with the actual settings unless the EM Area is formatted after the PLC Setup's EM file memory settings have been changed. In that case, the actual settings can be determined with this word.	Retained	Retained	Written when EM file formatting is performed PLC Setup (EM File Memory Function setting and EM File Memory Starting Bank setting)
A345	A34500	FB Program Data Flag	Turns ON if the FB program memory contains FB program data.	Retained	Retained	When program is downloaded
	A34501	Program Index File Flag	Turns ON when the comment memory contains a program index file.			
	A34502	Comment File Flag	Turns ON when the comment memory contains a comment file.			
	A34503	Symbol Table File Flag	Turns ON when the comment memory contains a symbol table file.			
A346 and A347	All	Number of Remaining Words to Transfer	These words contain the 8-digit hexadecimal number of words remaining to be transferred by FREAD(700) or FWRIT(701). When one of these instructions is executed, the number of words to be transferred is written to A346 and A347. While the data is being transferred, the value in these words is decremented. A326 contains the rightmost 4-digits and A347 contains the leftmost 4-digits. Check the content of these words to determine whether or not the planned number of words have been transferred successfully.	Retained	Cleared	Written as FREAD or FWRIT is being executed. Decremented as data is actually transferred.
A351 to A354	All	Calendar/Clock Area	These words contain the CPU Unit's internal clock data in BCD. The clock can be set from a Programming Device such as a Programming Console, with the DATE(735) instruction, or with a FINS command (CLOCK WRITE, 0702).	Retained	Retained	Written every cycle
	A35100 to A35107		Seconds (00 to 59) (BCD)			
	A35108 to A35115		Minutes (00 to 59) (BCD)			
	A35200 to A35207		Hours (00 to 23) (BCD)			
	A35208 to A35215		Day of the month (01 to 31) (BCD)			
	A35300 to A35307		Month (01 to 12) (BCD)			
	A35308 to A35315		Year (00 to 99) (BCD)			
	A35400 to A35407		Day of the week (00 to 06) (BCD) 00: Sunday, 01: Monday, 02: Tuesday, 03: Wednesday, 04: Thursday, 05: Friday, 06: Saturday			
A355	A35500 to A35915	Inner Board Monitoring Area	The function of these words is defined by the Inner Board.	Determined by Inner Board	Determined by Inner Board	---

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	Bits					
A360 to A391	A36001 to A39115	Executed FAL Number Flags	The flag corresponding to the specified FAL number will be turned ON when FAL(006) is executed. Bits A36001 to A39115 correspond to FAL numbers 001 to 511. The flag will be turned OFF when the error is cleared. 1: That FAL was executed 0: That FAL wasn't executed	Retained	Cleared	Written when error occurs A40215
A392	A39204	RS-232C Port Error Flag	ON when an error has occurred at the RS-232C port. (Not valid in peripheral bus mode or NT Link mode.) 1: Error 0: No error	Retained	Cleared	Written when error occurs
	A39205	RS-232C Port Send Ready Flag (No-protocol mode)	ON when the RS-232C port is able to send data in no-protocol mode. 1: Able-to-send 0: Unable-to-send	Retained	Cleared	Written after transmission
	A39206	RS-232C Port Reception Completed Flag (No-protocol mode)	ON when the RS-232C port has completed the reception in no-protocol mode. • When the number of bytes was specified: ON when the specified number of bytes is received. • When the end code was specified: ON when the end code is received or 256 bytes are received.	Retained	Cleared	Written after reception
	A39207	RS-232C Port Reception Overflow Flag (No-protocol mode)	ON when a data overflow occurred during reception through the RS-232C port in no-protocol mode. • When the number of bytes was specified: ON when more data is received after the reception was completed but before RXD(235) was executed. • When the end code was specified: ON when more data is received after the end code was received but before RXD(235) was executed. ON when 257 bytes are received before the end code. 1: Overflow 0: No overflow	Retained	Cleared	---
	A39212	Peripheral Port Communications Error Flag	ON when a communications error has occurred at the peripheral port. (Not valid in peripheral bus mode or NT Link mode.) 1: Error 0: No error	Retained	Cleared	---
A393	A39300 to A39307	RS-232C Port PT Communications Flag	The corresponding bit will be ON when the RS-232C port is communicating with a PT in NT link mode. Bits 0 to 7 correspond to units 0 to 7. 1: Communicating 0: Not communicating	Retained	Cleared	Written when there is a normal response to the token
	A39308 to A39315	RS-232C Port PT Priority Registered Flags	The corresponding bit will be ON for the PT that has priority when the RS-232C port is communicating in NT link mode. Bits 0 to 7 correspond to units 0 to 7. These flags are written when the priority registration command is received. 1: Priority registered 0: Priority not registered	Retained	Cleared	See *Function* column.
	A39300 to A39315	RS-232C Port Reception Counter (No-protocol mode)	Indicates (in binary) the number of bytes of data received when the RS-232C port is in no-protocol mode.	Retained	Cleared	Written when data is received

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	Bits					
A394	A39400 to A39407	Peripheral Port PT Communications Flag	The corresponding bit will be ON when the peripheral port is communicating with a PT in NT link mode. Bits 0 to 7 correspond to units 0 to 7. 1: Communicating 0: Not communication	Retained	Cleared	Written when there is a normal response to the token
	A39408 to A39415	Peripheral Port PT Priority Registered Flags	The corresponding bit will be ON for the PT that has priority when the peripheral port is communicating in NT link mode. Bits 0 to 7 correspond to units 0 to 7. These flags are written when the priority registration command is received. 1: Priority registered 0: Priority not registered	Retained	Cleared	See *Function* column.
A395	A39506	File Deleted Flags	The system deleted the remainder of a Memory Card file that was being updated when a power interruption occurred. 1: File deleted 0: No files deleted	Cleared	Cleared	Written when the system deletes the file.
	A39507		The system deleted the remainder of an EM file memory file that was being updated when a power interruption occurred. 1: File deleted 0: No files deleted	Cleared	Cleared	Written when the system deletes the file.
	A39510	ER/AER Flag for Background Execution	Turns ON if an error or illegal access occurs during background execution. Turns OFF when power is turned ON or operation is started. 1: Error 0: No error (Cleared when background execution is started.)	Cleared	Cleared	---
	A39511	Memory Corruption Detected Flag	ON when memory corruption is detected when the power supply is turned ON. 1: Memory corruption 0: Normal operation	Retained	See Function column.	Written when power is turned ON.
	A39512	DIP Switch Pin 6 Status Flag	The status of pin 6 on the DIP switch on the front of the CPU Unit is written to this flag every cycle. 1: Pin 6 ON 0: Pin 6 OFF	Retained	See Function column.	Written every cycle
A397	---	Simple Backup Write Capacity	If a write for a simple backup operation fails, A397 will contain the Memory Card capacity that would have been required to complete the write operation. The value is in Kbytes. (This indicates that the Memory Card did not have the specified capacity when the write operation was started.) A397 will be cleared to 0000 hex when the write is completed successfully for a simple backup operation.	Retained	Retained	When write is executed
A400	All	Error code	When a non-fatal error (user-defined FALS(006) or system error) or a fatal error (user-defined FALS(007) or system error) occurs, the 4-digit hexadecimal error code is written to this word. (Refer to *Details on Auxiliary Area Operation on page 722*.) When two or more errors occur simultaneously, the highest error code will be recorded. Refer to page 722 for details on error codes.	Cleared	Cleared	Written when error occurs
A401	A40106	FALS Error Flag (Fatal error)	ON when a non-fatal error is generated by the FALS(006) instruction. The CPU Unit will continue operating and the ERR/ALM indicator will flash. The corresponding error code will be written to A400. Error codes C101 to C2FF correspond to FALS numbers 001 to 511. 1: FALS(006) executed 0: FALS(006) not executed This flag will be turned OFF when the FALS errors are cleared.	Cleared	Cleared	Written when error occurs A400

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	Bits					
A401	A40108	Cycle Time Too Long Flag (Fatal error)	ON if the cycle time exceeds the maximum cycle time set in the PLC Setup (the cycle time monitoring time). The program execution cycle time is used in a Parallel Processing Mode. CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light. 0: Cycle time under max. 1: Cycle time over max. This flag will be turned OFF when the error is cleared.	Cleared	Cleared	Written when the cycle time exceeds max. PLC Setup (Cycle time monitoring time)
	A40109	Program Error Flag (Fatal error)	ON when program contents are incorrect. CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light. The task number where the error occurred will be stored in A294 and the program address will be stored in A298 and A299. The type of program error that occurred will be stored in bits 8 to 15 of A295. Refer to the description of A295 or to *2-3 Checking Programs* of *CS/CJ Series Programmable Controllers* (W394) for more details on program errors. 1: Error 0: No error This flag will be turned OFF when the error is cleared.	Cleared	Cleared	A294,A295, A298 and A299
	A40110	I/O Setting Error Flag (Fatal error)	ON when a Unit in the registered I/O tables does not agree with the Unit in the real I/O tables (i.e., the Unit actually connected). CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light. 1: Error 0: No error This flag will be turned OFF when the error is cleared.	Cleared	Cleared	A40508
	A40111	Too Many I/O Points Flag (Fatal error)	ON when the number of I/O points being used in Basic I/O Units exceeds the maximum allowed for the PLC. CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light. 1: Error 0: No error This flag will be turned OFF when the error is cleared.	Cleared	Cleared	A407
	A40112	Inner Board Stopped Error Flag (Fatal error)	ON when there is an Inner Board Error (Watchdog timer error). CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light. 1: Error 0: No error This flag will be turned OFF when the error is cleared, but will be turned ON again unless the cause of the error is eliminated.	Cleared	Cleared	---
	A40113	Duplication Error Flag (Fatal error)	ON in the following cases: • Two CPU Bus Units have been assigned the same unit number. • Two Special I/O Units have been assigned the same unit number. • Two Basic I/O Units have been allocated the same data area words. CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light. The duplicated unit number is indicated in A409 to A416. 1: Duplication error 0: No duplication (This flag will be turned OFF when the error is cleared.)	Cleared	Cleared	A410 to A416

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	Bits					
A401	A40114	I/O Bus Error Flag (Fatal error)	ON when an error occurs in a data transfer between the CPU Unit and a Unit mounted to a slot. CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light. 1: Error 0: No error The slot number (00 to 09) where the I/O Bus Error occurred is written to A40400 to A40407 in binary and the rack number (00 to 07) is written to A40408 to A40415 in binary (This flag will be turned OFF when the error is cleared.)	Cleared	Cleared	A404
	A40115	Memory Error Flag (Fatal error)	ON when an error occurred in memory or there was an error in automatic transfer from the Memory Card when the power was turned ON. CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light. 1: Error 0: No error The location where the error occurred is indicated in A40300 to A40308, and A40309 will be turned ON if there was an error during automatic transfer at start-up. This flag will be turned OFF when the error is cleared. (The automatic transfer at start-up error cannot be cleared without turning off the PLC.)	Cleared	Cleared	A403
A402	A40202	Special I/O Unit Setting Error Flag (Non-fatal error)	ON when an installed Special I/O Unit does not match the Special I/O Unit registered in the I/O table. The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. 1: Error 0: No error The unit number of the Unit where the setting error occurred is indicated in A428 to A433. (This flag will be turned OFF when the error is cleared.)	Cleared	Cleared	A428 to A433
	A40203	CPU Bus Unit Setting Error Flag (Non-fatal error)	ON when an installed CPU Bus Unit does not match the CPU Bus Unit registered in the I/O table. The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. 1: Error 0: No error The unit number of the Unit where the setting error occurred is written to A427. (This flag will be turned OFF when the error is cleared.)	Cleared	Cleared	A427
	A40204	Battery Error Flag (Non-fatal error)	ON if the CPU Unit's battery is disconnected or its voltage is low and the Detect Battery Error setting has been set in the PLC Setup. The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. 1: Error 0: No error This flag can be used to control an external warning light or other indicator to indicate that the battery needs to be replaced. (This flag will be turned OFF when the error is cleared.)	Cleared	Cleared	PLC Setup (Detect Battery Error)
	A40205	SYSMAC BUS Error Flag (Non-fatal error)	ON when an error occurs in a data transfer in the SYSMAC BUS system. The number of the Master involved is indicated with bits A40500 and A40501. 1: Error 0: No error The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. (This flag will be turned OFF when the error is cleared.)	Cleared	Cleared	A40500, A40501

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	Bits					
A402	A40206	Special I/O Unit Error Flag (Non-fatal error)	ON when an error occurs in a data exchange between the CPU Unit and a Special I/O Unit (including an error in the Special I/O Unit itself). 1: Error 0: No error The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. The Special I/O Unit where the error occurred will stop operating and the unit number of the Unit where the data exchange error occurred is indicated in A418 through A423. (This flag will be turned OFF when the error is cleared.)	Cleared	Cleared	A418 to A423
	A40207	CPU Bus Unit Error Flag (Non-fatal error)	ON when an error occurs in a data exchange between the CPU Unit and an CPU Bus Unit (including an error in the CPU Bus Unit itself). 1: Error 0: No error The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. The CPU Bus Unit where the error occurred will stop operating and the unit number of the Unit where the data exchange error occurred is indicated in A417. (This flag will be turned OFF when the error is cleared.)	Cleared	Cleared	A417
	A40208	Inner Board Error Flag (Non-fatal error)	ON when an error occurs in a data exchange between the CPU Unit and the Inner Board (including an error in the Inner Board itself). 1: Error 0: No error The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. The Inner Board will stop operating and details on the error will be written to A424. (This flag will be turned OFF when the error is cleared.)	Cleared	Cleared	A424
	A40209	I/O Verification Error Flag (Non-fatal error)	ON when a Basic I/O Unit registered in the I/O Table does not match the Basic I/O Unit actually installed in the PLC because a Unit was added or removed. 1: Mismatch 0: No mismatch The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. (This flag will be turned OFF when the error is cleared.)	Cleared	Cleared	---
	A40210	PLC Setup Error Flag (Non-fatal error)	ON when there is a setting error in the PLC Setup. The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. The location of the error will be written to A406. 1: Error 0: No error (This flag will be turned OFF when the error is cleared.)	Cleared	Cleared	A406
	A40212	Basic I/O Unit Error Flag (Non-fatal error)	ON when an error has occurred in a Basic I/O Unit (including C200H Group-2 High-density I/O Units and C200H Interrupt Input Units). 1: Error 0: No error The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. The location of the error will be written to A408. (This flag will be turned OFF when the error is cleared.)	Cleared	Cleared	A408

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	Bits					
A402	A40213	Interrupt Task Error Flag (Non-fatal error)	ON when the Detect Interrupt Task Errors setting in the PLC Setup is set to “Detect” and an interrupt task is executed for more than 10 ms during I/O refreshing of a C200H Special I/O Unit or a SYSMAC BUS I/O Unit. This flag will also be turned ON if an attempt is made to refresh a Special I/O Unit’s I/O from an interrupt task with IORF(097) while the Unit’s I/O is being refreshed by cyclic I/O refreshing (duplicate refreshing). The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. 1: Error 0: No error (This flag will be turned OFF when the error is cleared.)	Cleared	Cleared	A426, PLC Setup (Detect Interrupt Task Errors setting)
	A40215	FAL Error Flag (Non-fatal error)	ON when a non-fatal error is generated by executing FAL(006). The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. The bit in A360 to A391 that corresponds to the FAL number specified in FALS(006) will be turned ON and the corresponding error code will be written to A400. Error codes 4101 to 42FF correspond to FAL numbers 001 to 2FF (0 to 511). 1: FALS(006) error occurred 0: FALS(006) not executed (This flag will be turned OFF when the error is cleared.)	Cleared	Cleared	A360 to A391, A400
A403	A40300 to A40308	Memory Error Location	When a memory error occurs, the Memory Error Flag (A40115) is turned ON and one of the following flags is turned ON to indicate the memory area where the error occurred. 1: Error 0: No error A40300: User program A40304: PLC Setup A40305: Registered I/O Table A40307: Routing Table A40308: CPU Bus Unit Settings When a memory error occurs, the CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. (The corresponding flag will be turned OFF when the error is cleared.)	Cleared	Cleared	A40115
	A40309	Memory Card Start-up Transfer Error Flag	ON when automatic transfer at start-up has been selected and an error occurs during automatic transfer. An error will occur if there is a transfer error, the specified file does not exist, or the Memory Card is not installed. 1: Error 0: No error (This flag will be turned OFF when the error is cleared by turning the power off. The error cannot be cleared without turning the power off.)	Cleared	Cleared	Written when power is turned ON
	A40310	Flash Memory Error Flag	ON when the flash memory is physically destroyed. 1: Error 0: No error	Cleared	Cleared	Refreshed when error is detected.

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	**Bits**					
A404	A40400 to A40407	I/O Bus Error Slot Number	Contains the 8-bit binary slot number (00 to 09) where an I/O Bus Error occurred. 00 to 09 hex (slot No. 0 to 9) CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light. The I/O Bus Error Flag (A40114) will be ON. (This flag will be turned OFF when the error is cleared.)	Cleared	Cleared	A40114
	A40408 to A40415	I/O Bus Error Rack Number	Contains the 8-bit binary rack number (00 to 07) where an I/O Bus Error occurred. CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light. The I/O Bus Error Flag (A40114) will be ON. 00 to 07 hex (Rack No. 0 to 7) (This flag will be turned OFF when the error is cleared.)	Cleared	Cleared	A40114
A405	A40500 and A40501	SYSMAC BUS Master Flags	When a transmission error occurs in the SYSMAC BUS system, the flag for the affected Master Unit will be turned ON. A40500: Flag for Master Unit #0 A40501: Flag for Master Unit #1 1: Error 0: No error (The flag will be turned OFF when the error is cleared.)	Cleared	Cleared	---
	A40515	Peripheral Servicing Too Long Flag	Turns ON when the peripheral servicing time in a Parallel Processing Mode exceeds 2 s. This will also cause a cycle time error and operation will stop. 1: Too long (Parallel processing cannot be used.) 0: Not too long (Parallel processing can be used.)	Cleared	Cleared	A268
A406	All	PLC Setup Error Location	When there is a setting error in the PLC Setup, the location of that error is written to A406 in 4-digit hexadecimal. The location is given as the address displayed on a Programming Console. The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. 0000 to 01FF hexadecimal (A406 will be cleared when the cause of the error is eliminated.)	Cleared	Cleared	A40210

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	Bits					
A407	A40700 to A40712	Too Many I/O Points, Details	The 6 possible causes of the Too Many I/O Points Error are listed below. The 3-digit binary value in A40713 to A40715 indicates the cause of the error (values 0 to 5 correspond to causes 1 to 6, below). The 13-bit binary value in A40700 to A40712 indicates the details: the excessive value or the duplicated unit number. CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light. 1) The number of I/O points will be written here when the total number of I/O points set in the I/O Table (excluding Slave Racks) exceed the maximum allowed for the CPU Unit. 2) The number of interrupt inputs will be written here when there are more than 32 interrupt inputs. 3) The unit number of the Slave Unit will be written here when a unit number is duplicated or the number of I/O points on a C500 Slave Unit exceeds 320. 4) The unit number of the I/O Terminal (excluding Slave Racks) will be written here when a unit number is duplicated. 5) The unit number of the Master Unit will be written here when a unit number is duplicated or the unit number is outside of the allowed setting range. 6) The number of Racks will be written here when the number of Expansion I/O Racks exceeds the maximum. (The relevant value will be written here (A40700 to A40712) when the error occurs. These bits will be cleared when the error is cleared.)	Cleared	Cleared	A40111, A40713 to A40715
	A40713 to A40715	Too Many I/O Points, Cause	The 3-digit binary value of these bits indicates the cause of the Too Many I/O Points Error and shows the meaning of the value written to bits A40700 to A40712. Values of 000 to 101 (0 to 5) correspond to causes 1 through 6 described in “Too Many I/O Points, Cause 1,” above. 000: Too many I/O total 001: Too many interrupt I/O 010: Duplicate Remote I/O Slave Unit unit numbers or too many I/O on C500 Remote I/O Slave Units (more than 320) 011: Duplicate I/O Terminal unit numbers 100: Duplicate Remote I/O Master Unit unit numbers or undefined unit numbers (not 0 or 1) 101: Too many Racks (These bits will be cleared when the error is cleared.)	Cleared	Cleared	---
A408	A40800 to A40807	Basic I/O Unit Error, Slot Number	When an error has occurred in a Basic I/O Unit (including C200H Group-2 High-density I/O Units and C200H Interrupt Input Units), A40212 will be turned ON and the slot number where the error occurred will be written here in binary. The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. 00 to 09 hexadecimal (Slots 0 to 9) (These bits will be cleared when the error is cleared.)	Cleared	Cleared	A40212
	A40808 to A40815	Basic I/O Unit Error, Rack Number	When an error has occurred in a Basic I/O Unit (including C200H Group-2 High-density I/O Units and C200H Interrupt Input Units), A40212 will be turned ON and the Rack number where the error occurred will be written here in binary. The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. 00 to 07 hexadecimal (Racks 0 to 7) (These bits will be cleared when the error is cleared.)	Cleared	Cleared	A40212

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	Bits					
A409	A40900 to A40907	Expansion I/O Rack Number Duplication Flags	The corresponding flag will be turned ON when an Expansion I/O Rack's starting word address was set from a Programming Device and two Racks have overlapping word allocations or a Rack's starting address exceeds CIO 0901. Bits 00 to 07 correspond to Racks 0 to 7. 1: The same word is allocated on more than one Rack or the starting word address on the Rack is too high (i.e., causes the area to be exceeded). 0: No error (The corresponding flag will be cleared when the error is cleared.)	Cleared	Cleared	---
A410	A41000 to A41015	CPU Bus Unit Number Duplication Flags	The Duplication Error Flag (A40113) and the corresponding flag in A410 will be turned ON when an CPU Bus Unit's unit number has been duplicated. Bits 00 to 15 correspond to unit numbers 0 to F. CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light. 1: Duplication detected 0: No duplication	Cleared	Cleared	A40113
A411 to A416	A41100 to A41615	Special I/O Unit Number Duplication Flags	The Duplication Error Flag (A40113) and the corresponding flag in A411 through A416 will be turned ON when a Special I/O Unit's unit number has been duplicated. Bits 00 to 15 correspond to unit numbers 0 to F. (Bits A41100 to A41615 correspond to unit numbers 000 to 05F (0 to 95).) CPU Unit operation will stop and the ERR/ALM indicator on the front of the CPU Unit will light. The corresponding bit will also be turned ON when the Special I/O Unit's words are also allocated to a Basic I/O Unit on an Expansion I/O Rack because of the Expansion I/O Rack's starting word setting. 1: Duplication detected 0: No duplication	Cleared	Cleared	A40113
A417	A41700 to A41715	CPU Bus Unit Error, Unit Number Flags	When an error occurs in a data exchange between the CPU Unit and an CPU Bus Unit, the CPU Bus Unit Error Flag (A40207) is turned ON and the bit in A417 corresponding to the unit number of the Unit where the error occurred is turned ON. Bits 00 to 15 correspond to unit numbers 0 to F. 1: Error 0: No error The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash.	Cleared	Cleared	A40207
A418 to A423	A41800 to A42315	Special I/O Unit Error, Unit Number Flags	When an error occurs in a data exchange between the CPU Unit and a Special I/O Unit, the Special I/O Unit Error Flag (A40206) will be turned ON. Each bit corresponds to a unit number. Bit 00 in A418 to bit 15 in A423 correspond to unit numbers 0 to 95. The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. 1: Error 0: No error (Bits A41800 to A42315 correspond to unit numbers 000 to 05F (0 to 95).) The unit number of the Unit where the error occurred is indicated in A417. If the unit number of the Unit is uncertain, none of the flags will be turned ON. (The flag will be turned OFF when the error is cleared.)	Cleared	Cleared	A40206

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	Bits					
A424	A42400 to A42415	Inner Board Error Information	When an error occurs in a data exchange between the CPU Unit and the Inner Board, the Inner Board Error Flag (A40208) and the appropriate bits in A424 will be turned ON. •The meaning of the bits in A424 depends upon the model of Inner Board that is being used. Refer to the Board's operation manual for details. A424 will be cleared when the error is cleared.	Cleared	Cleared	---
A425	A42504 to A42506	Slave Number of SYSMAC BUS Error After Start-up	When there is an error in a Slave Rack, these bits contain the Slave's unit number. 0 to 4 hex (Unit No. 0 to 4) These bits are reset when the system is restarted.	Cleared	Cleared	Written every cycle
	A42504		When there is an error in an Optical I/O Unit (excluding Slave Racks), the status of A42504 (ON or OFF) indicates whether the Unit is allocated high or low bytes. This flag is turned OFF when the system is restarted. 1: High 0: Low			
	A42508 to A42515		When there is an error in a Slave Rack, this byte contains the 2-digit hexadecimal unit number of the Master to which the Slave is connected. B0: Unit 0 B1: Unit 1	Cleared	Cleared	Written every cycle
			When there is an error in an Optical I/O Unit, this byte contains its 2-digit hexadecimal unit number (00 to 1F, or 0 to 31 decimal). 00 to 1F hex (0 to 31)			
A426	A42600 to A42611	Interrupt Task Error, Task Number	When A40213 is ON, the content of these bits depends upon the status of A42615 (the Interrupt Task Error Cause Flag). 1) A42615 OFF: An interrupt task was executed for more than 10 ms during I/O refreshing of a C200H Special I/O Unit or a SYSMAC BUS Remote I/O Unit. A42600 to A42611: contain the interrupt task number. 2) A42615 ON: An attempt was made to refresh a Special I/O Unit's I/O from an interrupt task with IORF(097) while the Unit's I/O is being refreshed by cyclic I/O refreshing (duplicate refreshing). A42600 to A42611: contain the Special I/O Unit's unit number. Task number: 000 to 0FF (0 to 255) Unit number: 000 to 05F (0 to 95) These bits will be cleared when the error is cleared.	Cleared	Cleared	A40213, A42615
	A42615	Interrupt Task Error Cause Flag	When A40213 (the Interrupt Task Error Flag) is ON, this flag indicates the cause of the error. The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. A42615 will be ON if a Special I/O Unit was refreshed from the interrupt task while it was already being refreshed. A42615 will be OFF if the interrupt task was executed for more than 10 ms during I/O refreshing of a C200H Special I/O Unit or a SYSMAC BUS Remote I/O Unit. 1: Duplicated refreshing 0: Interrupt task executed over 10 ms	Cleared	Cleared	A40213, A42600 to A42611
A427	A42700 to A42715	CPU Bus Unit Setting Error, Unit Number Flags	When an CPU Bus Unit Setting Error occurs, A40203 and the bit in this word corresponding to the Unit's unit number are turned ON. Bits 00 to 15 correspond to unit numbers 0 to F. The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. 1: Setting error 0: No setting error	Cleared	Cleared	Written when power is turned ON or I/O is recognized A40203

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Address		Name	Function	Status after mode change	Status at startup	Write timing/ Related flags, settings
Words	Bits					
A428 to A433	A42800 to A43315	Special I/O Unit Setting Error, Unit Number Flags	If a Special I/O Unit Setting Error occurs (i.e., when A40202 turns ON), the bit corresponding to the unit number will turn ON. The CPU Unit will continue operating and the ERR/ALM indicator on the front of the CPU Unit will flash. Bits A42800 to A43315 correspond to 00 to 5F (unit numbers 0 to 95).	Cleared	Cleared	Written when power is turned ON or I/O is recognized A40202
A440	All	Max. Interrupt Task Processing Time	Contains the Maximum Interrupt Task Processing Time in units of 0.1 ms. (This value is written after the interrupt task with the max. processing time is executed and cleared when PLC operation begins.)	Cleared	Cleared	See Function column.
A441	All	Interrupt Task With Max. Processing Time	Contains the task number of the interrupt task with the maximum processing time. Hexadecimal values 8000 to 80FF correspond to task numbers 00 to FF. Bit 15 is turned ON when an interrupt has occurred. (This value is written after the interrupt task with the max. processing time is executed and cleared when PLC operation begins.)	Cleared	Cleared	See Function column.
A442	A44211 to A44212	PLC Link Operating Level Detection Flags	Indicate whether PLC Link Units are mounted to the PLC as follows: A44211: PLC Link operating level 1 A44212: PLC Link operating level 0 1: Unit mounted 0: Unit not mounted	Retained	Cleared	Written when power is turned ON or when Unit is restarted. A247 to A250

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Read/Write Area (Set by User)

Addresses		Name	Function	Settings	Status after mode change	Status at startup	Write timing/ Related Flags, Settings
Word	Bit						
A500	A50012	IOM Hold Bit	Turn this bit ON to preserve the status of the I/O Memory when shifting from PROGRAM to RUN or MONITOR mode or vice versa. The I/O Memory includes the CIO Area, Transition Flags, Timer Flags and PVs, Index Registers, Data Registers, and the Current EM Bank Number. (If the status of the IOM Hold Bit itself is preserved in the PLC Setup (IOM Hold Bit Status), the status of the I/O Memory Area will be retained when the PLC is turned ON or power is interrupted.)	1: Retained 0: Not retained	Retained	See Function column.	See Function column. PLC Setup (IOM Hold Bit Status setting)
	A50013	Forced Status Hold Bit	Turn this bit ON to preserve the status of bits that have been force-set or force-reset when shifting from PROGRAM to MONITOR mode or vice versa. Bits that have been force-set or force-reset will always return to their default status when shifting to RUN mode. (If the status of the Forced Status Hold Bit itself is preserved in the PLC Setup (Forced Status Hold Bit Status), the status of force-set and force-reset bits will be retained when the PLC is turned ON or power is interrupted.)	1: Retained 0: Not retained	Retained	See Function column.	See Function column. PLC Setup (Forced Status Hold Bit Status setting)
	A50014	Error Log Reset Bit	Turn this bit ON to reset the Error Log Pointer (A300) to 00. The contents of the Error Log Area itself (A100 to A199) are not cleared. (This bit is automatically reset to 0 after the Error Log Pointer is reset.)	0→1: Clear	Retained	Cleared	A100 to A199, A300
	A50015	Output OFF Bit	Turn this bit ON to turn OFF all outputs from Basic I/O Units and Special I/O Units. The INH indicator on the front of the CPU Unit will light while this bit is ON. (The status of the Output OFF Bit is retained through power interruptions.)		Retained	Retained	---
A501	A50100 to A50115	CPU Bus Unit Restart Bits	Turn these bits ON to restart (initialize) the CPU Bus Unit with the corresponding unit number. Bits 00 to 15 correspond to unit numbers 0 to F. When a restart bit is turned ON, the corresponding CPU Bus Unit Initializing Flag (A30200 to A30215) will be turned ON. Both the restart bit and initializing flag will be turned OFF automatically when initialization is completed.	0 to 1: Restart 1 to 0: Restart completed Turned OFF by the system when the Unit has been restarted.	Retained	Cleared	A30200 to A30215
A502 to A507	A50200 to A50715	Special I/O Unit Restart Bits	Turn these bits ON to restart (initialize) the Special I/O Unit with the corresponding unit number. Bits A50200 to A50715 correspond to unit numbers 0 to 95. When a restart bit is turned ON, the corresponding Special I/O Unit Initializing Flag (A33000 to A33515) will be turned ON. Both the restart bit and initializing flag will be turned OFF automatically when initialization is completed.	0 to 1: Restart 1 to 0: Restart completed Turned OFF by the system when the Unit has been restarted.	Retained	Cleared	A33000 to A33515

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Addresses		Name	Function	Settings	Status after mode change	Status at startup	Write timing/ Related Flags, Settings
Word	Bit						
A508	A50809	Differentiate Monitor Completed Flag	ON when the differentiate monitor condition has been established during execution of differentiation monitoring. (This flag will be cleared to 0 when differentiation monitoring starts.)	1: Monitor condition established 0: Not yet established	Retained	Cleared	---
	A50811	Trace Trigger Monitor Flag	ON when a trigger condition is established by the Trace Start Bit (A50814). OFF when the next Data Trace is started by the Sampling Start bit (A50815).	1: Trigger condition established 0: Not yet established or not tracing	Retained	Cleared	---
	A50812	Trace Completed Flag	ON when sampling of a region of trace memory has been completed during execution of a Trace. OFF when the next time the Sampling Start Bit (A50815) is turned from OFF to ON.	1: Trace completed 0: Not tracing or trace in progress	Retained	Cleared	---
	A50813	Trace Busy Flag	ON when the Sampling Start Bit (A50815) is turned from OFF to ON. OFF when the trace is completed.	1: Trace in progress 0: Not tracing (not sampling)	Retained	Cleared	---
	A50814	Trace Start Bit	Turn this bit from OFF to ON to establish the trigger condition. The offset indicated by the delay value (positive or negative) determines which data samples are valid.	1: Trace trigger condition established 0: Not established	Retained	Cleared	---
	A50815	Sampling Start Bit	When a data trace is started by turning this bit from OFF to ON from a Programming Device, the PLC will begin storing data in Trace Memory by one of the three following methods: 1) Data is sampled at regular intervals (10 to 2,550 ms). 2) Data is sampled when TRSM(045) is executed in the program. 3) Data is sampled at the end of every cycle. The operation of A50815 can be controlled only from a Programming Device.	0 to 1: Starts data trace (sampling) Turned ON from Programming Device.	Retained	Cleared	---
A509	A50900	SYSMAC BUS Slave Number Refresh Bit	Turn this bit ON to refresh the error information in A425 (unit number of Slave where error occurred after startup).		Retained	Cleared	A425
A510 to A511		Start-up Time	These words contain the time at which the power was turned ON. The contents are updated every time that the power is turned ON. The data is stored in BCD. A51000 to A51007: Second (00 to 59) A51008 to A51015: Minute (00 to 59) A51100 to A51107: Hour (00 to 23) A51108 to A51115: Day of month (01 to 31)	See Function column.	Retained	See Function column.	Written when power is turned ON
A512 to A513		Power Interruption Time	These words contain the time at which the power was interrupted. The contents are updated every time that the power is interrupted. The data is stored in BCD. A51200 to A51207: Second (00 to 59) A51208 to A51215: Minute (00 to 59) A51300 to A51307: Hour (00 to 23) A51308 to A51315: Day of month (01 to 31) (These words are not cleared at startup.)	See Function column.	Retained	Retained	Written at power interruption

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Addresses		Name	Function	Settings	Status after mode change	Status at startup	Write timing/ Related Flags, Settings
Word	Bit						
A514		Number of Power Interruptions	Contains the number of times that power has been interrupted since the power was first turned ON. The data is stored in binary. To reset this value, overwrite the current value with 0000. (This word is not cleared at start-up, but it is cleared when the Memory Corruption Detected Flag (A39511) goes ON.)	0000 to FFFF hexadecimal	Retained	Retained	Written when power is turned ON A39511
A515 to A517		Operation Start Time	The time that operation started as a result of changing the operating mode to RUN or MONITOR mode is stored here in BCD. A51500 to A51507: Seconds (00 to 59) A51508 to A51515: Minutes (00 to 59) A51600 to A51607: Hour (00 to 23) A51608 to A51615: Day of month (00 to 31) A51700 to A51707: Month (01 to 12) A51708 to A51715: Year (00 to 99) Note: The previous start time is stored after turning ON the power supply until operation is started.	See at left.	Retained	Retained	See at left.
A518 to A520		Operation End Time	The time that operation stopped as a result of changing the operating mode to PROGRAM mode is stored here in BCD. A51800 to A51807: Seconds (00 to 59) A51808 to A51815: Minutes (00 to 59) A51900 to A51907: Hour (00 to 23) A51908 to A51915: Day of month (00 to 31) A52000 to A52007: Month (01 to 12) A52008 to A52015: Year (00 to 99) Note: If an error occurs in operation, the time of the error will be stored. If the operating mode is then changed to PROGRAM mode, the time that PROGRAM mode was entered will be stored.	See at left.	Retained	Retained	See at left.
A523		Total Power ON Time	Contains the total time that the PLC has been on in 10-hour units. The data is stored in binary and it is updated every 10 hours. To reset this value, overwrite the current value with 0000. (This word is not cleared at start-up, but it is cleared to 0000 when the Memory Corruption Detected Flag (A39511) goes ON.)	0000 to FFFF hexadecimal	Retained	Retained	---
A526	A52600	RS-232C Port Restart Bit	Turn this bit ON to restart the RS-232C port. (Do not use this bit when the port is operating in peripheral bus mode.) This bit is turned OFF automatically when the restart processing is completed.	0 to 1: Restart	Retained	Cleared	---
	A52601	Peripheral Port Restart Bit	Turn this bit ON to restart the peripheral port. This bit is turned OFF automatically when the restart processing is completed.	0 to1: Restart	Retained	Cleared	---
	A52614	SYSMAC BUS Master 1 Restart Bit	Turn this bit ON to restart SYSMAC BUS Remote I/O Master Unit 1. This bit is turned OFF automatically when the restart processing is completed.	0 to 1: Restart	Retained	Cleared	---
	A52615	SYSMAC BUS Master 0 Restart Bit	Turn this bit ON to restart SYSMAC BUS Remote I/O Master Unit 0. This bit is turned OFF automatically when the restart processing is completed.	0 to 1: Restart	Retained	Cleared	---

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Addresses		Name	Function	Settings	Status after mode change	Status at startup	Write timing/ Related Flags, Settings
Word	Bit						
A527	A52700 to A52707	Online Editing Disable Bit Validator	The Online Editing Disable Bit (A52709) is valid only when this byte contains 5A. To disable online editing from a Programming Device, set this byte to 5A and turn ON A52709. (Online editing refers to changing or adding to the program while the PLC is operating in MONITOR mode.)	5A: A52709 enabled Other value: A52709 disabled	Retained	Cleared	A52709
	A52709	Online Editing Disable Bit	Turn this bit ON to disable online editing. The setting of this bit is valid only when A52700 to A52707 have been set to 5A.	1: Disabled 0: Not disabled	Retained	Cleared	A52700 to A52707
A528	A52800 to A52807	RS-232C Port Error Flags	These flags indicate what kind of error has occurred at the RS-232C port; they are automatically turned OFF when the RS-232C port is restarted. (These flags are valid in Serial Gateway mode. They are not valid in peripheral bus mode and only bit 5 is valid in NT Link mode.) Bits 0 and 1: Not used. Bit 2: ON when there was a parity error. Bit 3: ON when there was a framing error. Bit 4: ON when there was an overrun error. Bit 5: ON when there was a timeout error. Bits 6 and 7: Not used.	See Function column.	Retained	Cleared	---
	A52808 to A52815	Peripheral Port Error Code	These flags indicate what kind of error has occurred at the peripheral port; they are automatically turned OFF when the peripheral port is restarted. (These flags are valid in Serial Gateway mode. They are not valid in peripheral bus mode and only bit 13 (timeout error) is valid in NT Link mode.) Bits 8 and 9: Not used. Bit 10: ON when there was a parity error. Bit 11: ON when there was a framing error. Bit 12: ON when there was an overrun error. Bit 13: ON when there was a timeout error. Bits 14 and 15: Not used.	See Function column.	Retained	Cleared	---
A529	---	FAL/FALS Number for System Error Simulation	Set a dummy FAL/FALS number to use to simulate the system error using FAL(006) or FALS(007). When FAL(006) or FALS(007) is executed and the number in A529 is the same as the one specified in the operand of the instruction, the system error given in the operand of the instruction will be generated instead of a user-defined error.	0001 to 01FF hex: FAL/FALS numbers 1 to 511 0000 or 0200 to FFFF hex: No FAL/FALS number for system error simulation. (No error will be generated.)	Retained	Cleared	---

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Addresses		Name	Function	Settings	Status after mode change	Status at startup	Write timing/ Related Flags, Settings
Word	Bit						
A530	---	Power Interruption Disable Setting	Set to A5A5 hex to disable power interrupts (except the Power OFF Interrupt task) between DI(693) and EI(694) instructions.	A5A5 hex: Masking power interruption processing enabled Other: Masking power interruption processing not enabled.	Cleared	Cleared	---
A580 (See note.)	A58000 to A58003	FB Communications Instruction Retries	Automatically stores the number of retries in the FB communications instruction settings specified in the PLC Setup.	0 to F hex	As set in PLC Setup	Cleared	Written at start of operation
A581 (See note.)		FB Communications Instruction Response Monitoring Time	Automatically stores the FB communications instruction response monitoring time set in the PLC Setup.	0001 to FFFF hex (Unit: 0.1 s; Range: 0.1 to 6553.5) 0000 hex: 2 s	As set in PLC Setup	Cleared	Written at start of operation
A582 (See note.)		FB DeviceNet Communications Instruction Response Monitoring Time	Automatically stores the FB DeviceNet communications instruction response monitoring time set in the PLC Setup.	0001 to FFFF hex (Unit: 0.1 s; Range: 0.1 to 6553.5) 0000 hex: 2 s	As set in PLC Setup	Cleared	Written at start of operation
A595 and A596	---	IR00 Output for Background Execution	When an index register is specified as the output for an instruction processed in the background, A595 and A596 receive the output instead of IR00.	0000 0000 to FFFF FFFF hex (A596 contains the leftmost digits.)	Cleared	Cleared	---
A597	---	DR00 Output for Background Execution	When a data register is specified as the output for an instruction processed in the background, A597 receives the output instead of DR00.	0000 to FFFF hex	Cleared	Cleared	---
A598	A59800	FPD Teaching Bit	Turn this bit ON to set the monitoring time automatically with the teaching function. While A59800 is ON, FPD(269) measures how long it takes for the diagnostic output to go ON after the execution condition goes ON. If the measured time exceeds the monitoring time, the measured time is multiplied by 1.5 and that value is stored as the new monitoring time. (The teaching function can be used only when a word address has been specified for the monitoring time operand.)	1: Teach monitoring time 0: Teaching function off	Cleared	Cleared	---
	A59801	Equals Flag for Background Execution	Turns ON if matching data is found for an SRCH(181) instruction executed in the background.	1: Search data found in table 0: Search data not found	Cleared	Cleared	---

Note These Auxiliary Area bits/words are not to be written by the user. The number of resends and response monitoring time must be set by the user in the FB communications instructions settings in the PLC Setup, particularly when using function blocks from the OMRON FB Library to execute FINS messages or DeviceNet explicit messages communications. The values set in the Settings for OMRON FB Library in the PLC Setup will be automatically stored in the related Auxiliary Area words A580 to A582 and used by the function blocks from the OMRON FB Library.

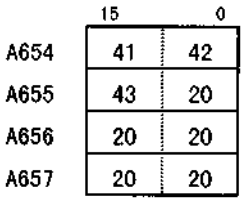
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Addresses		Name	Function	Settings	Status after mode change	Status at startup	Write timing/ Related Flags, Settings
Word	Bit						
A600 to A603		Macro Area Input Words	When MCRO(099) is executed, it copies the input data from the specified source words (input parameter words) to A600 through A603 and executes the specified subroutine with that input data.	Input data: 4 words	Cleared	Cleared	---
A604 to A607		Macro Area Output Words	After the subroutine specified in MCRO(099) has been executed, the results of the subroutine are transferred from A604 through A607 to the specified destination words. (output parameter words).	Output data: 4 words	Cleared	Cleared	---
A608	A60800	Inner Board Restart Bit	Turn the corresponding bit ON to restart (initialize) Inner Board 0 or 1. The bit is turned OFF automatically when the restart processing is completed.	---	Retained	Cleared	---
A619	A61901	Peripheral Port Settings Changing Flag	ON while the peripheral port's communications settings are being changed. This flag will be turned ON when STUP(237) is executed and it will be turned OFF after the settings have been changed.	1: Changing 0: Not changing	Retained	Cleared	---
	A61902	RS-232C Port Settings Changing Flag	ON while the RS-232C port's communications settings are being changed. This flag will be turned ON when STUP(237) is executed and it will be turned OFF after the settings have been changed.	1: Changing 0: Not changing	Retained	Cleared	---
A620	A62001	Communications Unit 0, Port 1 Settings Changing Flag	The corresponding flag will be ON when the settings for that port are being changed. The flag will be turned ON when STUP(237) is executed and it will be turned OFF by an event issued from the Serial Communications Unit after the settings have been changed. It is also possible for the user to indicate a change in serial port settings by turning these flags ON.	1: Changing 0: Not changing	Retained	Cleared	---
	A62002	Communications Unit 0, Port 2 Settings Changing Flag		1: Changing 0: Not changing	Retained	Cleared	---
	A62003	Communications Unit 0, Port 3 Settings Changing Flag		1: Changing 0: Not changing	Retained	Cleared	---
	A62004	Communications Unit 0, Port 4 Settings Changing Flag		1: Changing 0: Not changing	Retained	Cleared	---
A621 to A635	A62100 to A63504	Communications Units 0 to 15, Ports 1 to 4 Settings Changing Flag	Same as above.	1: Changing 0: Not changing	Retained	Cleared	---

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Addresses		Name	Function	Settings	Status after mode change	Status at startup	Write timing/ Related Flags, Settings
Word	Bit						
A636	A63601	Communications Board Port 1 Settings Changing Flag	The corresponding flag will be ON when the settings for that port are being changed. The flag will be turned ON when STUP(237) is executed and it will be turned OFF by an event issued from the Serial Communications Board after the settings have been changed. It is also possible for the user to indicate a change in serial port settings by turning these flags ON.	1: Changing 0: Not changing	Retained	Cleared	---
	A63602	Communications Board Port 2 Settings Changing Flag		1: Changing 0: Not changing	Retained	Cleared	---
	A63603	Communications Board Port 3 Settings Changing Flag		1: Changing 0: Not changing	Retained	Cleared	---
	A63604	Communications Board Port 4 Settings Changing Flag		1: Changing 0: Not changing	Retained	Cleared	---
A650	A65000 to A65007	Program Replacement End Code	• Normal End (i.e., when A65014 is OFF) 01 hex: Program file (.OBJ) replaced. • Error End (i.e., when A65014 is ON) 00 hex: Fatal error 01 hex: Memory error 11 hex: Write-protected 12 hex: Program replacement password error 21 hex: No Memory Card 22 hex: No such file 23 hex: Specified file exceeds capacity (memory error). 31 hex: One of the following in progress: • File memory operation • User program write • Operating mode change	---	Retained	Cleared	---
	A65014	Replacement Error Flag	ON when the Replacement Start Bit (A65015) is turned ON to replace the program, but there is an error. If the Replacement Start Bit is turned ON again, the Replacement Error Flag will be turned OFF.	1: Replacement error 0: No replacement error, or the Replacement Start Bit (A65015) is ON.	Retained	Cleared	---
	A65015	Replacement Start Bit	Program replacement starts when the Replacement Start Bit is turned ON if the Program Password (A651) is valid (A5A5 hex). Do not turn OFF the Replacement Start Bit during program replacement. When the power is turned ON or program replacement is completed, the Replacement Start Bit will be turned OFF, regardless of whether replacement was completed normally or in error. It is possible to confirm if program replacement is being executed by reading the Replacement Start Bit using a Programming Device, PT, or host computer.	1: Program replaced 0: Replacement completed, or after power is turned ON	Retained	Cleared	---

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Addresses		Name	Function	Settings	Status after mode change	Status at startup	Write timing/ Related Flags, Settings
Word	Bit						
A651	---	Program Password	Type in the password to replace a program. A5A5 hex: Replacement Start Bit (A65015) is enabled. Any other value: Replacement Start Bit (A65015) is disabled. When the power is turned ON or program replacement is completed, the Replacement Start Bit will be turned OFF, regardless of whether replacement was completed normally or in error.	---	Retained	Cleared	---
A654 to A657	---	Program File Name	When program replacement starts, the program file name will be stored in ASCII. File names can be specified up to eight characters in length excluding the extension. File names are stored in the following order: A654 to A657 (i.e., from the lowest word to the highest), and from the highest byte to the lowest. If a file name is less than eight characters, the lowest remaining bytes and the highest remaining word will be filled with spaces (20 hex). Null characters and space characters cannot be used within file names. Example: File name is ABC.OBJ  	---	Retained	Cleared	---
A720 to A722		Power ON Clock Data 1 (See note.)	These words contain the same time data as the startup time stored in words A510 to A511, as well as the month and year information. A72000 to A72007: Seconds (00 to 59) A72008 to A72015: Minutes (00 to 59) A72100 to A72107: Hour (00 to 23) A72108 to A72115: Day of month (00 to 31) A72200 to A72207: Month (01 to 12) A72208 to A72215: Year (00 to 99)	See at left.	Retained	Retained	Written when power is turned ON.
A723 to A725		Power ON Clock Data 2 (See note.)	These words contain the time at which the power was turned ON one time before the startup time stored in words A510 to A511. A72300 to A72307: Seconds (00 to 59) A72308 to A72315: Minutes (00 to 59) A72400 to A72407: Hour (00 to 23) A72408 to A72415: Day of month (00 to 31) A72500 to A72507: Month (01 to 12) A72508 to A72515: Year (00 to 99)	See at left.	Retained	Retained	Written when power is turned ON.
A726 to A728		Power ON Clock Data 3 (See note.)	These words contain the time at which the power was turned ON two times before the startup time stored in words A510 to A511. A72600 to A72607: Seconds (00 to 59) A72608 to A72615: Minutes (00 to 59) A72700 to A72707: Hour (00 to 23) A72708 to A72715: Day of month (00 to 31) A72800 to A72807: Month (01 to 12) A72808 to A72815: Year (00 to 99)	See at left.	Retained	Retained	Written when power is turned ON.

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Addresses		Name	Function	Settings	Status after mode change	Status at startup	Write timing/ Related Flags, Settings
Word	Bit						
A729 to A731		Power ON Clock Data 4 (See note.)	These words contain the time at which the power was turned ON three times before the startup time stored in words A510 to A511. A72900 to A72907: Seconds (00 to 59) A72908 to A72915: Minutes (00 to 59) A73000 to A73007: Hour (00 to 23) A73008 to A73015: Day of month (00 to 31) A73100 to A73107: Month (01 to 12) A73108 to A73115: Year (00 to 99)	See at left.	Retained	Retained	Written when power is turned ON.

Note Supported by unit version 3.0 or later.

A732 to A734		Power ON Clock Data 5 (See note.)	These words contain the time at which the power was turned ON four times before the startup time stored in words A510 to A511. A73200 to A73207: Seconds (00 to 59) A73208 to A73215: Minutes (00 to 59) A73300 to A73307: Hour (00 to 23) A73308 to A73315: Day of month (00 to 31) A73400 to A73407: Month (01 to 12) A73408 to A73415: Year (00 to 99)	See at left.	Retained	Retained	Written when power is turned ON.
A735 to A737		Power ON Clock Data 6 (See note.)	These words contain the time at which the power was turned ON five times before the startup time stored in words A510 to A511. A73500 to A73507: Seconds (00 to 59) A73508 to A73515: Minutes (00 to 59) A73600 to A73607: Hour (00 to 23) A73608 to A73615: Day of month (00 to 31) A73700 to A73707: Month (01 to 12) A73708 to A73715: Year (00 to 99)	See at left.	Retained	Retained	Written when power is turned ON.
A738 to A740		Power ON Clock Data 7 (See note.)	These words contain the time at which the power was turned ON six times before the startup time stored in words A510 to A511. A73800 to A73807: Seconds (00 to 59) A73808 to A73815: Minutes (00 to 59) A73900 to A73907: Hour (00 to 23) A73908 to A73915: Day of month (00 to 31) A74000 to A74007: Month (01 to 12) A74008 to A74015: Year (00 to 99)	See at left.	Retained	Retained	Written when power is turned ON.
A741 to A743		Power ON Clock Data 8 (See note.)	These words contain the time at which the power was turned ON seven times before the startup time stored in words A510 to A511. A74100 to A74107: Seconds (00 to 59) A74108 to A74115: Minutes (00 to 59) A74200 to A74207: Hour (00 to 23) A74208 to A74215: Day of month (00 to 31) A74300 to A74307: Month (01 to 12) A74308 to A74315: Year (00 to 99)	See at left.	Retained	Retained	Written when power is turned ON.
A744 to A746		Power ON Clock Data 9 (See note.)	These words contain the time at which the power was turned ON eight times before the startup time stored in words A510 to A511. A74400 to A74407: Seconds (00 to 59) A74408 to A74415: Minutes (00 to 59) A74500 to A74507: Hour (00 to 23) A74508 to A74515: Day of month (00 to 31) A74600 to A74607: Month (01 to 12) A74608 to A74615: Year (00 to 99)	See at left.	Retained	Retained	Written when power is turned ON.

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Addresses		Name	Function	Settings	Status after mode change	Status at startup	Write timing/ Related Flags, Settings
Word	Bit						
A747 to A749		Power ON Clock Data 10 (See note.)	These words contain the time at which the power was turned ON nine times before the startup time stored in words A510 to A511. A74700 to A74707: Seconds (00 to 59) A74708 to A74715: Minutes (00 to 59) A74800 to A74807: Hour (00 to 23) A74808 to A74815: Day of month (00 to 31) A74900 to A74907: Month (01 to 12) A74908 to A74915: Year (00 to 99)	See at left.	Retained	Retained	Written when power is turned ON.

Note Supported by unit version 3.0 or later.

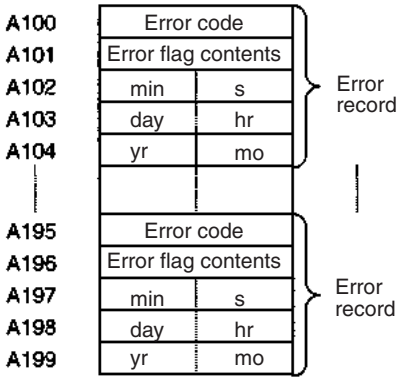
Note In CS-series PLCs, the following flags are provided in a special read-only area and can be specified with the labels given in the table. These flags are not contained in the Auxiliary Area. Always use the labels to specify these flags. Refer to *9-25 Condition Flags* and *9-26 Clock Pulses* for details.

Flag area	Name	Label	Meaning
Condition Code Area	Error Flag	**ER**	Turns ON when an error occurs in processing an instructions, indicating an error end to the instruction.
	Access Error Flag	**AER**	Turns ON when an attempt is made to access an illegal area. The status of this flag is maintain only during the current cycle and only in the task in which it occurred.
	Carry Flag	**CY**	Turns ON when there is a carry or borrow in a math operation, when a bit is shifted into the Carry Flag, etc.
	Greater Than Flag	**>**	Turns ON when the result of comparing two values is “greater than,” when a value exceeds a specified range, etc.
	Equals Flag	**=**	Turns ON when the result of comparing two values is “equals,” when the result of a math operation is 0, etc.
	Less Than Flag	**<**	Turns ON when the result of comparing two values is “less than,” when a value is below a specified range, etc.
	Negative Flag	**N**	Turns ON when the MSB in the result of a math operation is 1.
	Overflow Flag	**OF**	Turns ON when the result of a math operation overflows.
	Underflow Flag	**UF**	Turns ON when the result of a math operation underflows.
	Greater Than or Equals Flag	**>=**	Turns ON when the result of comparing two values is “greater than or equals.”
	Not Equal Flag	**<>**	Turns ON when the result of comparing two values is “not equal.”
	Less than or Equals Flag	**<=**	Turns ON when the result of comparing two values is “less than or equals.”
	Always ON Flag	**A1**	This flag is always ON.
	Always OFF Flag	**A0**	This flag is always OFF.
Clock Pulse Area	0.02-s clock pulse	**0.02s**	Repeatedly turns ON for 0.02 s and OFF for 0.02 s.
	0.1-s clock pulse	**0.1s**	Repeatedly turns ON for 0.1 s and OFF for 0.1 s.
	0.2-s clock pulse	**0.2s**	Repeatedly turns ON for 0.2 s and OFF for 0.2 s.
	1-s clock pulse	**1s**	Repeatedly turns ON for 1 s and OFF for 1 s.
	1-min clock pulse	**1min**	Repeatedly turns ON for 1 min and OFF for 1 min.

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Details on Auxiliary Area Operation

A100 to A199: Error Log Area



The following data would be generated in an error record if a memory error (error code 80F1) occurred on 1 April 1998 at 17:10:30 with the error located in the PLC Setup (04 hex).

80	F1
00	04
10	30
01	17
98	04

The following data would be generated in an error record if an FALS error with FALS number 001 occurred on 2 May 1997 at 8:30:15.

C1	01
00	00
30	15
02	08
97	05

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Error Codes and Error Flags

Classification	Error code	Meaning	Error flags
System-defined fatal errors	80F1	Memory error	A403
	80C0 to 80C7, 80CF	I/O bus error	A404
	80E9	Duplicate number error	A410, A411 to 416 (See note 3.)
	80E1	Too many I/O error	A407
	80E0	I/O setting error	---
	80F0	Program error	A295 to 299 (See note 4.)
	809F	Cycle time too long error	---
	80EA	Duplicate Expansion Rack number error	A40900 to 40907
User-defined fatal errors	C101 to C2FF	FALS instruction executed (See note 1.)	---
User-defined non-fatal errors	4101 to 42FF	FAL instruction executed (See note 2.)	---
System-defined non-fatal errors	008B	Interrupt task error	A426
	009A	Basic I/O error	A408
	009B	PLC Setup setting error	A406
	0200 to 020F	CS-series CPU Bus Unit error	A417
	0300 to 035F	Special I/O Unit error	A418 to 423 (See note 5.)
	00A0 to 00A1	SYSMAC BUS error	A405
	0400 to 040F	CS-series CPU Bus Unit setup error	A427
	0500 to 055F	Special I/O Unit setup error	A428 to 433 (See note 5.)

Note 1. C101 to C2FF will be stored for FALS numbers 001 to 511.

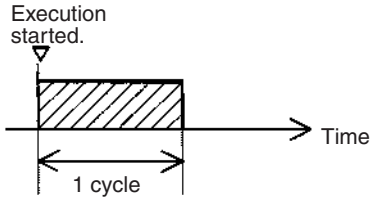
2. 4101 to 42FF will be stored for FAL numbers 001 to 511.

3. The contents of the error flags for a duplicate number error are as follows:
Bits 0 to 7: Unit number (binary), 00 to 5F hex for Special I/O Units, 00 to 0F hex for CS-series CPU Bus Units
Bits 8 to 14: All zeros.
Bit 15: Unit type, 0 for CS-series CPU Bus Units and 1 for Special I/O Units.

4. Only the contents of A295 is stored as the error flag contents for program errors.

5. 0000 hex will be stored as the error flag contents.

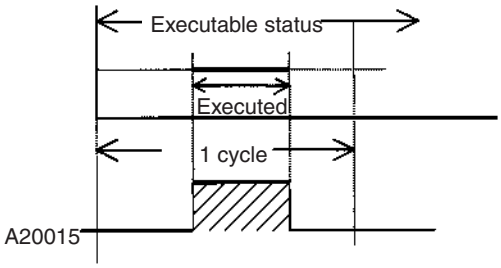
A20011: First Cycle Flag



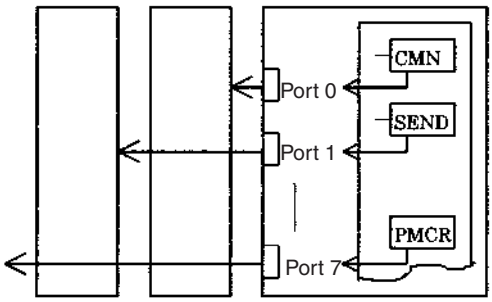
A20015: Initial Task Flag

A20015 will turn ON during the first time a task is executed after it has reached executable status. It will be ON only while the task is being executed and will not turn ON if following cycles.

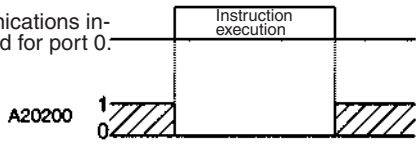
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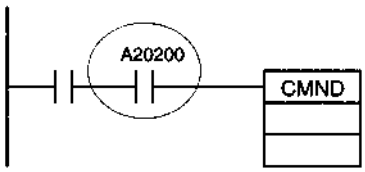


A20200 to A20207: Communications Port Enabled Flags



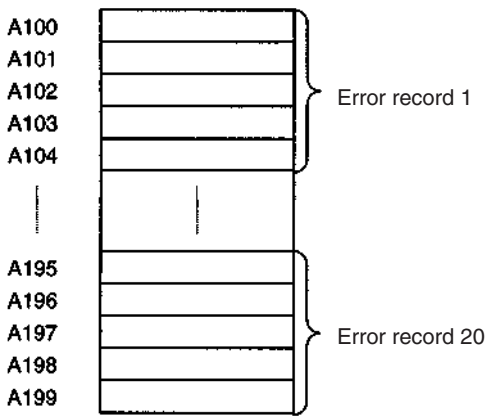
Network communications instruction executed for port 0.

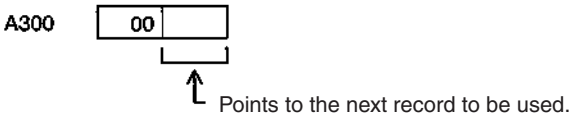




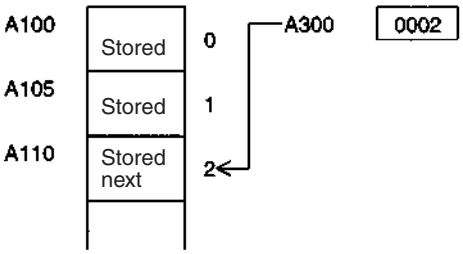
The program is designed so that CMND(490) will be executed only when A20200 is ON.

A300: Error Record Pointer



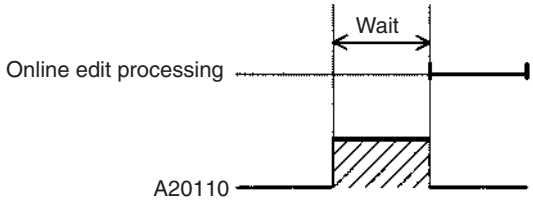


Example

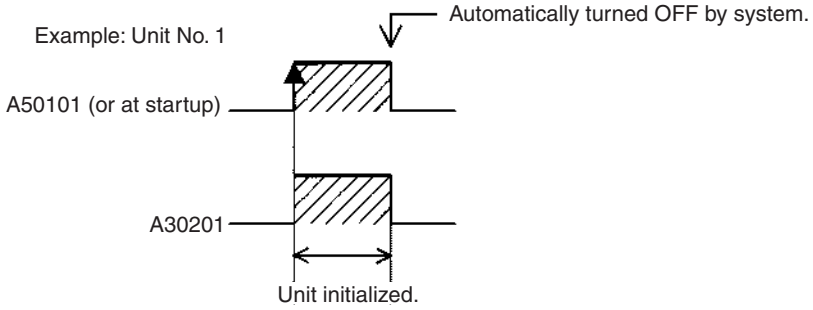


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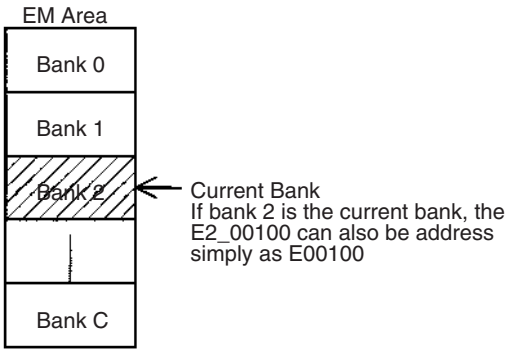
A20110: Online Editing Wait Flag



A50100 to A50115: CPU Bus Unit Restart Bits and A30200 to A30215: CPU Bus Unit Initialization Flags



A301: Current EM Bank

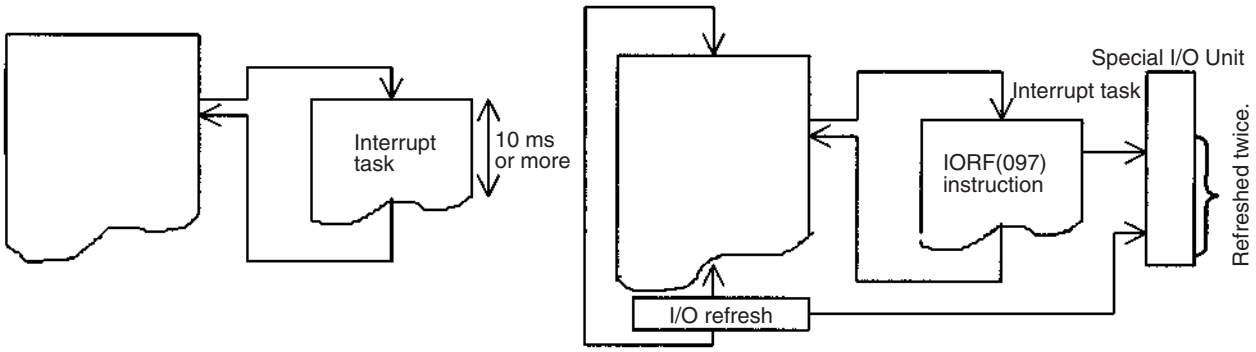


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A40109: Program Error

Error	Address
UM Overflow Error Flag	A29515
Illegal Instruction Flag	A29514
Distribution Overflow Error Flag	A29513
Task Error Flag	A25912
No END(001) Error Flag	A29511
Illegal Area Access Error Flag	A29510
Indirect DM/EM Addressing Error Flag	A29509

A42615: Interrupt Task Error Cause Flag



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Appendix C
Memory Map of PLC Memory Addresses

PLC Memory Addresses

PLC memory addresses are set in Index Registers (IR00 to IR15) to indirectly address I/O memory. Normally, use the MOVE TO REGISTER (MOVR(560)) and MOVE TIMER/COUNTER PV TO REGISTER (MOVRW(561)) instructions to set PLC memory addresses into the Index Registers.

Some instructions, such as DATA SEARCH (SRCH(181)), FIND MAXIMUM (MAX(182)), and FIND MINIMUM (MIN(183)), output the results of processing to an Index Register to indicate an PLC memory address.

There are also instructions for which Index Registers can be directly designated to use the PLC memory addresses stored in them by other instructions. These instructions include DOUBLE MOVE (MOVL(498)), some symbol comparison instructions (=L, <>L, <L, >L, <=L, and >=L), DOUBLE COMPARE (CMPL(060)), DOUBLE DATA EXCHANGE (XCGL(562)), DOUBLE INCREMENT BINARY (++L(591)), DOUBLE DECREMENT BINARY (—L(593)), DOUBLE SIGNED BINARY ADD WITHOUT CARRY (+L(401)), DOUBLE SIGNED BINARY SUBTRACT WITHOUT CARRY (–L(411)), SET RECORD LOCATION (SETR(635)), and GET RECORD LOCATION (GETR(636)).

The PLC memory addresses all are continuous and the user must be aware of the order and boundaries of the memory areas. As reference, the PLC memory addresses are provided in a table at the end of this appendix.

Note Directly setting PLC memory addresses in the program should be avoided whenever possible. If PLC memory addresses are set in the program, the program will be less compatible with new CPU Unit models or CPU Units for which changed have been made to the layout of the memory.

Memory Configuration

There are two classifications of the RAM memory (with battery backup) in a CS-series CPU Unit.

Parameter Areas: These areas contain CPU Unit system setting data, such as the PLC Setup, CS-series CPU Bus Unit Setups, etc. An illegal access error will occur if an attempt is made to access any of the parameter areas from an instruction in the user program.

I/O Memory Areas: These are the areas that can be specified as operands in the instructions in user programs.

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Memory Map

Do not access addresses reserved by the system.

Classification	PLC memory addresses (hex)	User addresses	Area
I/O memory areas	00000 to 0B1FF	---	Reserved for system.
	0B200 to 0B7FF	---	Reserved for system.
	0B800 to 0B801	TK00 to TK31	Task Flag Area
	0B802 to 0B83F	---	Reserved for system.
	0B840 to 0B9FF	A000 to A447	Read-only Auxiliary Area
	0BA00 to 0BBFF	A448 to A959	Read/Write Auxiliary Area
	0BC00 to 0BDFF	---	Reserved for system.
	0BE00 to 0BEFF	T0000 to T4095	Timer Completion Flags
	0BF00 to 0BFFF	C0000 to C4095	Counter Completion Flags
	0C000 to 0D7FF	CIO 0000 to CIO 6143	CIO Area
	0D800 to 0D9FF	H000 to H511	Holding Area
	0DA00 to 0DDFF	H512 to H1535	Holding Area These words are used for function blocks only.
	0DE00 to 0DFFF	W000 to W511	Work Area
	0E000 to 0EFFF	T0000 to T4095	Timer PVs
	0F000 to 0FFFF	C0000 to C4095	Counter PVs
	10000 to 17FFF	D00000 to D32767	DM Area
	18000 to 1FFFF	E0_00000 to E0_32767	EM Area bank 0
	20000 to 27FFF	E1_00000 to E1_32767	EM Area bank 1
	78000 to 7FFFF	EC_00000 to EC_32767	EM Area bank C
	F8000 to FFFFF	E_0000 to E_32767	EM Area, current bank (See note.)

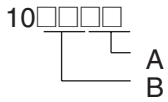
Note The data from the current EM Area bank specified in the program is stored in this area. For example, if the current bank is bank 1 (20000 to 27FFF), then the data in F8000 to FFFFF will be the same as the data in 20000 to 27FFF.

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Appendix D
PLC Setup Coding Sheets for Programming Console

Use the following coding sheets when setting the PLC Setup from a Programming Console.

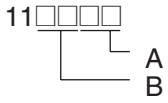
Address



	Value (hex)	Rack 0, Slot 0 I/O Response Time
A	00	8 ms
	10	No filter
	11	0.5 ms
	12	1 ms
	13	2 ms
	14	4 ms
	15	8 ms
	16	16 ms
	17	32 ms
B	00	8 ms
	10	No filter
	11	0.5 ms
	12	1 ms
	13	2 ms
	14	4 ms
	15	8 ms
	16	16 ms
	17	32 ms

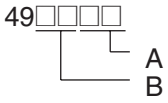
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Address



	Value (hex)	Rack 0, Slot 2 I/O Response Time
A	00	8 ms
	10	No filter
	11	0.5 ms
	12	1 ms
	13	2 ms
	14	4 ms
	15	8 ms
	16	16 ms
	17	32 ms
	Value (hex)	**Rack 0, Slot 3 I/O Response Time**
B	00	8 ms
	10	No filter
	11	0.5 ms
	12	1 ms
	13	2 ms
	14	4 ms
	15	8 ms
	16	16 ms
	17	32 ms

Address



	Value (hex)	Rack 7, Slot 8 I/O Response Time
A	00	8 ms
	10	No filter
	11	0.5 ms
	12	1 ms
	13	2 ms
	14	4 ms
	15	8 ms
	16	16 ms
	17	32 ms
	Value (hex)	**Rack 7, Slot 9 I/O Response Time**
B	00	8 ms
	10	No filter
	11	0.5 ms
	12	1 ms
	13	2 ms
	14	4 ms
	15	8 ms
	16	16 ms
	17	32 ms

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Address

80□□□□

A

	Value (hex)	IOM Hold Bit Status at Startup	Forced Status Hold Bit Status at Startup
A	C000	Retained	Retained
	8000	Retained	Cleared
	4000	Cleared	Retained
	0000	Cleared	Cleared

Address

81□□□□

A

	Value (hex)	Startup Mode
A	PRCN	Mode on Programming Console's mode switch
	PRG	PROGRAM mode
	MON	MONITOR mode
	RUN	RUN mode

Address

83□□□□

A

	Value (hex)	Startup Condition (CS1-H CPU Units only)
A	8000	Don't wait.
	0000	Wait for all Units and Boards.

Address

84□□□□

A

	Value (hex)	Inner Board Setting (CS1-H CPU Units only)
A	8000	Don't wait.
	0000	Wait for all Boards.

Address

128□□□□

A

	Value (hex)	Low Battery Voltage Detection	Interrupt Task Error Detection
A	C000	Do not detect	Do not detect
	8000	Do not detect	Detect
	4000	Detect	Do not detect
	0000	Detect	Detect

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Address

129□□□□

A

	Value (hex)	FAL Error Log Registration (CS1-H CPU Units only)
A	8000	Don't store user-defined FAL error in error log.
	0000	Store user-defined FAL error in error log.

Address

136□□□□

A

	Value (hex)	EM File Memory Conversion
A	0000	None
	0080	EM File Memory Enabled: Bank No. 0
	0081	EM File Memory Enabled: Bank No. 1
	to	to
	008C	EM File Memory Enabled: Bank No. C

Address

144□□□□

A

B

Peripheral Port

	Value (hex)	Data bits	Stop bits	Parity
A	00	7 bits	2 bits	Even
	01	7 bits	2 bits	Odd
	02	7 bits	2 bits	None
	04	7 bits	1 bit	Even
	05	7 bits	1 bit	Odd
	06	7 bits	1 bit	None
	08	8 bits	2 bits	Even
	09	8 bits	2 bits	Odd
	0A	8 bits	2 bits	None
	0C	8 bits	1 bit	Even
	0D	8 bits	1 bit	Odd
	0E	8 bits	1 bit	None

	Value (hex)	Communications mode
B	00	Default (Rightmost 2 digits ignored.)
	80	Host link
	82	NT link
	84	Peripheral bus
	85	Host link

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Address

145□□□□
└── A

Peripheral Port

	Value (hex)	Baud rate
A	0000	9,600 bps
	0001	300 bps
	0002	600 bps
	0003	1,200 bps
	0004	2,400 bps
	0005	4,800 bps
	0006	9,600 bps
	0007	19,200 bps
	0008	38,400 bps
	0009	57,600 bps
	000A	115,200 bps

Note Set 0000 to 0009 hex for standard NT Links and 000A hex for high-speed NT Links.

Address

147□□□□
└── A

Peripheral Port

	Value (hex)	Host link Unit No.
A	0000	No. 0
	0001	No. 1
	0002	No. 2
	to	to
	001F	No. 31

Address

150□□□□
└── A

Peripheral Port

	Value (hex)	NT Link Mode Maximum Unit No.
A	0000	No. 0
	0001	No. 1
	to	to
	0007	No. 7

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Address

160□□□□

A

B

RS-232C Port

	Value (hex)	Data bits	Stop bits	Parity
A	00	7 bits	2 bits	Even
	01	7 bits	2 bits	Odd
	02	7 bits	2 bits	None
	04	7 bits	1 bit	Even
	05	7 bits	1 bit	Odd
	06	7 bits	1 bit	None
	08	8 bits	2 bits	Even
	09	8 bits	2 bits	Odd
	0A	8 bits	2 bits	None
	0C	8 bits	1 bit	Even
	0D	8 bits	1 bit	Odd
	0E	8 bits	1 bit	None

	Value (hex)	Communications mode
B	00	Default (Rightmost 2 digits ignored.)
	80	Host link
	82	NT link
	83	No-protocol
	84	Peripheral bus
	85	Host link

Address

161□□□□

A

RS-232C Port

	Value (hex)	Baud rate
A	0000	9,600 bps
	0001	300 bps
	0002	600 bps
	0003	1,200 bps
	0004	2,400 bps
	0005	4,800 bps
	0006	9,600 bps
	0007	19,200 bps
	0008	38,400 bps
	0009	57,600 bps
	000A	115,200 bps

Note Set 0000 to 0009 hex for standard NT Links and 000A hex for high-speed NT Links.

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Address

162□□□□

A

RS-232C Port

	Value (hex)	No-protocol mode delay
A	0000	0 ms
	0001	10 ms
	to	to
	270F	99,990 ms

Address

163□□□□

A

RS-232C Port

	Value (hex)	Host link Unit No.
A	0000	No. 0
	0001	No. 1
	0002	No. 2
	to	to
	001F	No. 31

Address

164□□□□

A

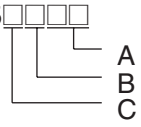
B

	Value (hex)	No-protocol Mode End Code
A	00	00
	to	to
	FF	FF
	Value (hex)	**No-protocol Mode Start Code**
B	00	00
	to	to
	FF	FF

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Address

165□□□□



RS-232C Port

	Value (hex)	No-protocol Mode reception data volume
A	00	256
	01	1
	to	to
	FF	256
	Value (hex)	**No-protocol Mode end code setting**
B	0	None (Specify the amount of data being received)
	1	Yes (Specify the end code)
	2	End code is set to CF+LF
	Value (hex)	**No-protocol Mode start code setting**
C	0	None
	1	Yes

Address

166□□□□



RS-232C Port

	Value (hex)	Maximum Unit No. in NT Link Mode
A	0000	No. 0
	0001	No. 1
	to	to
	0007	No. 7

Address

195□□□□



	Value (hex)	Scheduled interrupt time unit
A	0000	10 ms
	0001	1.0 ms

Address

197□□□□



	Value (hex)	Instruction Error Operation
A	0000	Continue operation
	8000	Stop operation

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Address

198□□□□

A

	Value (hex)	Background Communications Port Number (CS1-H CPU Units only)
A	0 to 7	Communications port number 0 to 7 (logical port number)

	Value (hex)	Background Processes (CS1-H CPU Units only)		
		Table data instructions	Text string instructions	Data shifting instructions
B	E00	Yes	Yes	Yes
	C00	Yes	Yes	No
	A00	Yes	No	Yes
	800	Yes	No	No
	600	No	Yes	Yes
	400	No	Yes	No
	100	No	No	Yes
	000	No	No	No

Address

208□□□□

A

	Value (hex)	Minimum Cycle Time
A	0000	Cycle time not fixed
	0001	Cycle time fixed: 1 ms
	to	to
	7D00	Cycle time fixed: 32,000 ms

Address

209□□□□

A

	Value (hex)	Watch Cycle Time
A	0000	Default: 1,000 ms (1 s)
	8001	10 ms
	to	to
	8FA0	40,000 ms

Address

218□□□□

A

	Value (hex)	Fixed Peripheral Servicing Time
A	0000	Default (4% of the cycle time)
	8000	00 ms
	8001	0.1 ms
	to	to
	80FF	25.5 ms

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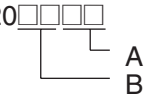
	Value (hex)	Slice Time for Peripheral Servicing in Peripheral Servicing Priority Mode
A	00	Disable Peripheral Servicing Priority Mode.
	01 to FF	0.1 to 25.5 ms (in 0.1-ms increments)

	Value (hex)	Slice Time for Program Execution in Peripheral Servicing Priority Mode
B	00	Disable Peripheral Servicing Priority Mode.
	05 to FF	5 to 255 (in 1-ms increments)

	Value (hex)	Slice Time for Program Execution in Parallel Processing Mode (CS1-H CPU Units only)
B	00	Don't use Parallel Processing Mode
	01	Parallel Processing with Synchronous Memory Access
	02	Parallel Processing with Asynchronous Memory Access

Address

220□□□□



	Value (hex)	Unit/Port for Priority Servicing
A	00	Disable Peripheral Servicing Priority Mode.
	10 to 1F	CPU Bus Unit unit number (0 to 15) + 10 hex
	20 to 7F	CPU Special I/O Unit unit number (0 to 96) + 20 hex
	FC	RS-232C port
	FD	Peripheral port
	Value (hex)	**Unit/Port for Priority Servicing**
B	00	Disable Peripheral Servicing Priority Mode.
	10 to 1F	CPU Bus Unit unit number (0 to 15) + 10 hex
	20 to 7F	CPU Special I/O Unit unit number (0 to 96) + 20 hex
	FC	RS-232C port
	FD	Peripheral port

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221□□□□

A

B

	Value (hex)	Unit/Port for Priority Servicing
A	00	Disable Peripheral Servicing Priority Mode.
	10 to 1F	CPU Bus Unit unit number (0 to 15) + 10 hex
	20 to 7F	CPU Special I/O Unit unit number (0 to 96) + 20 hex
	FC	RS-232C port
	FD	Peripheral port
	Value (hex)	**Unit/Port for Priority Servicing**
B	00	Disable Peripheral Servicing Priority Mode.
	10 to 1F	CPU Bus Unit unit number (0 to 15) + 10 hex
	20 to 7F	CPU Special I/O Unit unit number (0 to 96) + 20 hex
	FC	RS-232C port
	FD	Peripheral port

Address

222□□□□

Not used.

A

	Value (hex)	Unit/Port for Priority Servicing
A	00	Disable Peripheral Servicing Priority Mode.
	10 to 1F	CPU Bus Unit unit number (0 to 15) + 10 hex
	20 to 7F	CPU Special I/O Unit unit number (0 to 96) + 20 hex
	FC	RS-232C port
	FD	Peripheral port

Address

225□□□□

A

	Value (hex)	Power OFF Interrupt Task	Power OFF Detection Delay Time
A	0000	Disabled	0 ms
	0001		1 ms
	to		to
	000A		10 ms
	8000	Enabled	0 ms
	8001		1 ms
	to		to
	800A		10 ms

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226□□□□
└── A

	Value (hex)	Special I/O Unit Cyclic Refreshing 0: Yes 1: No															
		Unit number															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
A	0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	0002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	0003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	0004	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	0005	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
	to																
	FFFF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Addresses 227 through 231 are the same as 226.

Address

448□□□□
├── A
└── B

Use FINS Write Protection and Number of Node Excluded from Write Protection

	Value (hex)	Number of Nodes Excluded from Write Protection
A	00	Set the number of nodes excluded from write protection in Programming Console addresses 448 to 480. 00 to 20 hex (0 to 32 nodes)
	to	
	20	
	Value (hex)	**Use FINS Write Protection**
B	80	Write protection enabled
	00	Write protection disabled

Address

449□□□□
to
448□□□□
├── A
└── B

Nodes Excluded from Write Protection (Protection Releasing Addresses, 32 Nodes Maximum)

	Value (hex)	FINS Source Node Address
A	01	Node address of a node to be excluded from write protection.
	to	
	FE	
	FF	All nodes in specified network.
	Value (hex)	**FINS Source Network Address**
B	00	Network address of the node to be excluded from write protection.
	to	
	7F	

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Appendix E
Connecting to the RS-232C Port on the CPU Unit

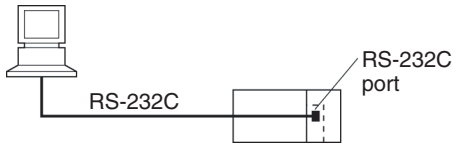
Connection Examples

The wiring diagrams for connecting to the RS-232C port are provided in this appendix. In actual wiring, we recommend the use of shielded twisted-pair cables and other methods to improve noise resistance. Refer to *Recommended Wiring Methods* later in this appendix for recommended wiring methods.

Connections to Host Computers

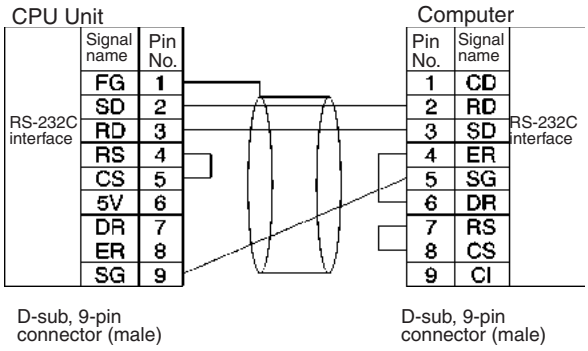
Note Connections to a computer running the CX-Programmer are the same as those shown here.

1:1 Connections via RS-232C Port



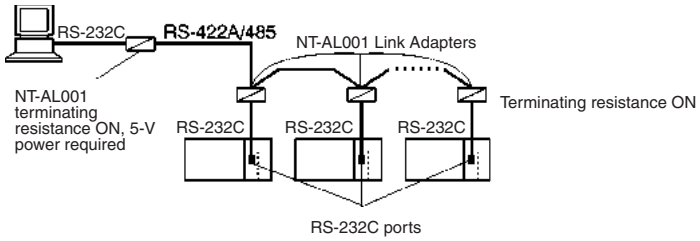
Note The maximum cable length for an RS-232C connection is 15 m. RS-232C communications specifications, however, do not cover transmissions at 19.2 Kbps. Refer to documentation of the device being connected when using this baud rate.

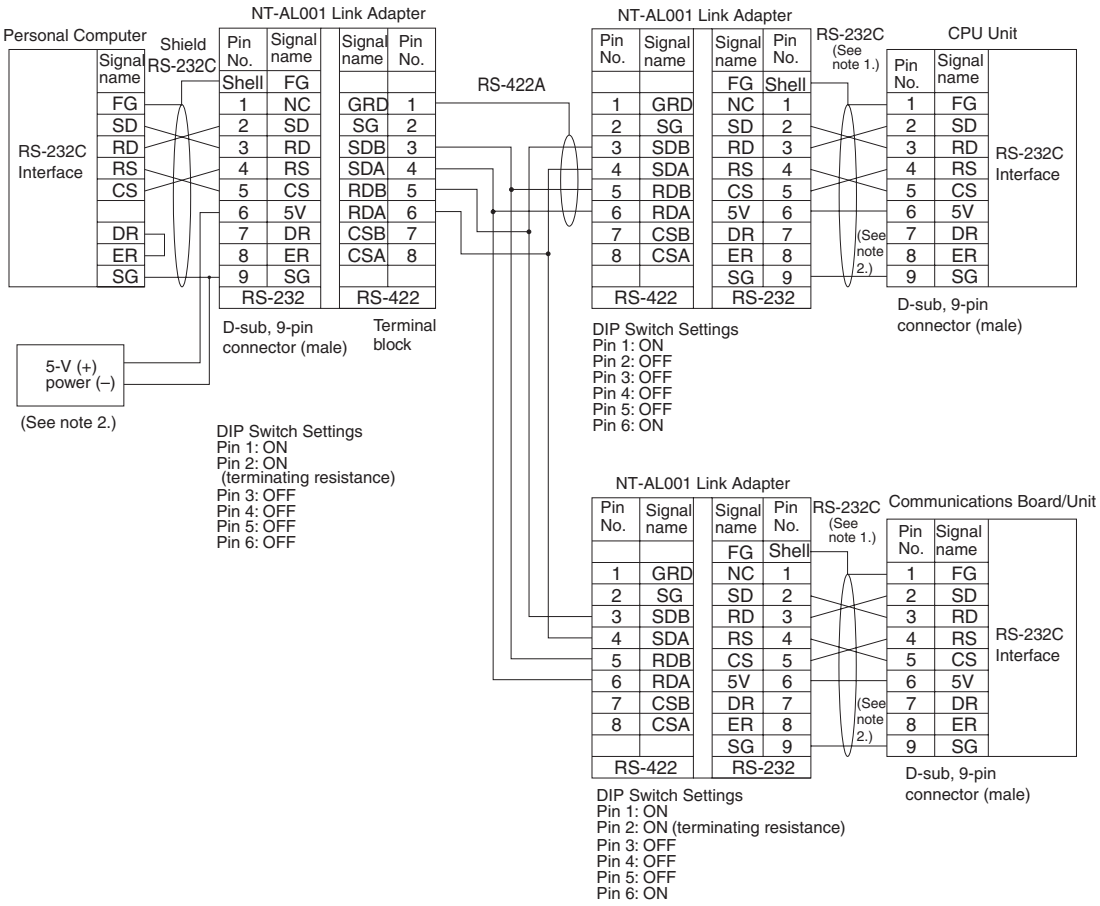
IBM PC/AT or Compatible Computer



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1:N Connections via RS-232C Port





Note 1. We recommend using the following NT-AL001 Link Adapter Connecting Cables to connect to NT-AL001 Link Adapters.

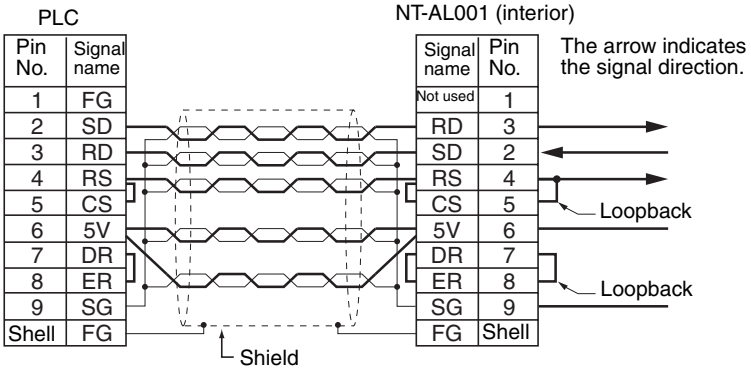
XW2Z-070T-1: 0.7 m
XW2Z-200T-1: 2 m

The recommended cables should be wired as shown below. Each signal wire should be twisted with the SG (signal ground) wire and placed in a shielded cable to prevent the effects of noise in noise-prone environments. The 5-V wires can also be twisted with the SG wire to increase noise immunity.

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Although this wiring is different from that shown in the example above, it can be used to increase noise immunity if required.

Wiring with XW2Z-□□0T-1 (10 Conductors)



2. When the NT-AL001 Link Adapter is connected to the RS-232C port on the CPU Unit, 5 V is supplied from pin 6, eliminating the need for a 5-V power supply.
3. Do not use the 5-V power from pin 6 of the RS-232C port for anything other than an NT-AL001, CJ1W-CIF11 Link Adapter, or NV3W-M□20L Programmable Terminal. Using this power supply for any other external device may damage the CPU Unit or the external device.
4. The XW1Z-□□0T-1 Cable is designed to connect the NT-AL001 and contains special wiring for the CS and RS signals. Do not use this cable for any other application. Connecting this cable to other devices can damage them.

DIP Switch Settings on the NT-AL001 Link Adapter

There is a DIP switch on the NT-AL001 Link Adapter that is used to set RS-422A/485 communications parameters. Set the DIP switch as required for the serial communications mode according to the following table.

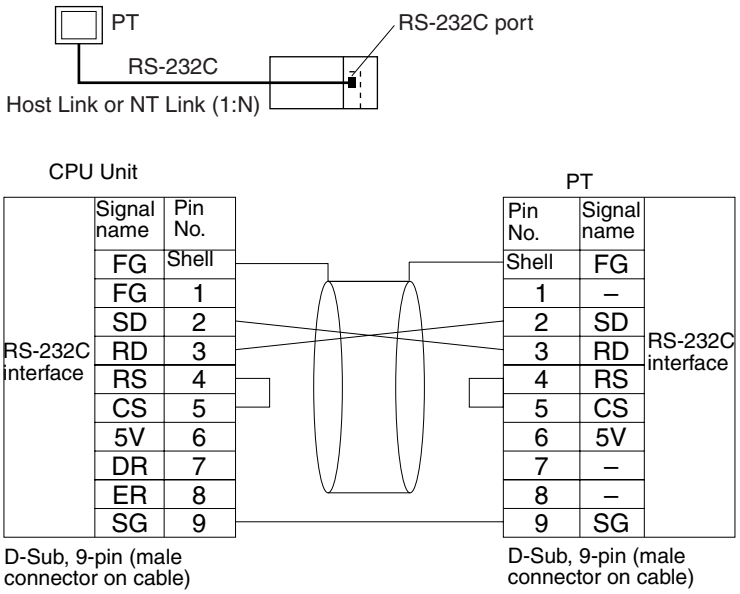
Pin	Function	Default setting
1	Not used. (Leave set to ON.)	ON
2	Internal terminating resistance setting. ON: Terminating resistance connected. OFF: Terminating resistance not connected.	ON
3	2-wire/4-wire setting Both pins ON: 2-wire communications Both pins OFF: 4-wire communications	OFF
4		OFF
5	Communications mode (See note.) Both pins OFF: Always send. 5 OFF/6 ON: Send when RS-232C's CS is high. 5 ON/6 OFF: Send when RS-232C's CS is low.	ON
6		OFF

Note Turn OFF pin 5 and turn ON pin 6 when connected to a CS-series CPU Unit.

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Connection Example to Programmable Terminal (PT)

Direct Connection from RS-232C to RS-232C



- Communications Mode: Host Link (unit number 0 only for Host Link)
  NT Link (1:N, N = 1 Unit only)
- OMRON Cables with Connectors:
  XW2Z-200T-1: 2 m
  XW2Z-500T-1: 5 m

Recommended Wiring Methods

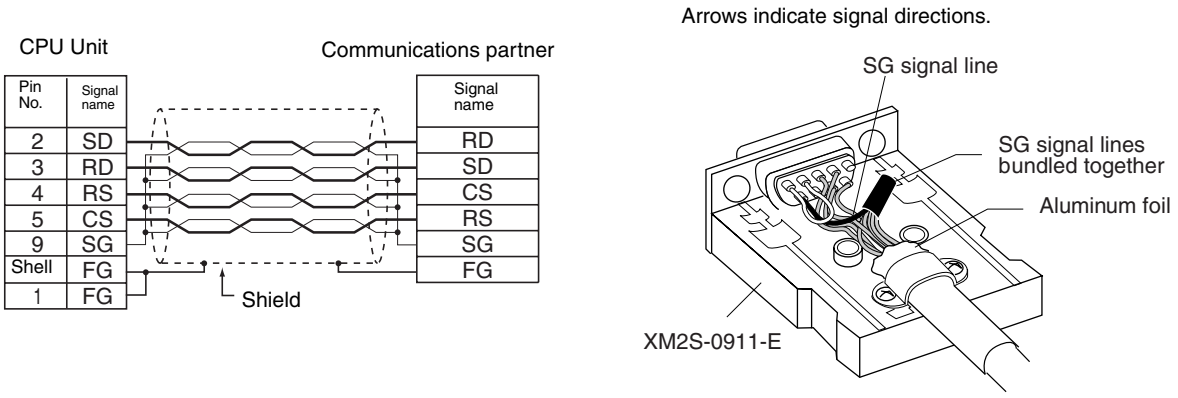
We recommend the following wiring methods for RS-232C, especially in environment prone to noise.

1. Use shielded twisted-pair cable for communications cables. The following RS-232C cables are recommended.

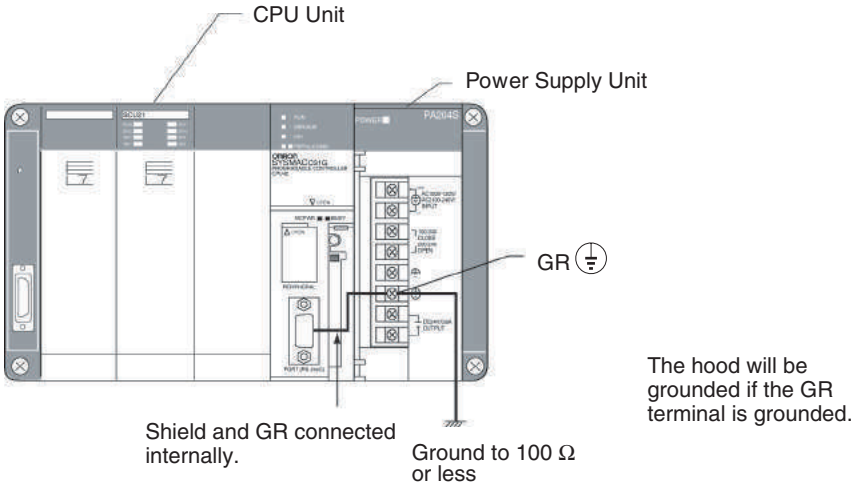
Model	Manufacturer
UL2464 AWG28×5P IFS-RVV-SB (UL approved) AWG28×5P IFVV-SB (not UL approved)	Fujikura Ltd.
UL2464-SB (MA) 5P×28AWG (7/0.127) (UL approved) CO-MA-VV-SB 5P×28AWG (7/0.127) (not UL approved)	Hitachi Cable, Ltd.

2. Use a twisted-pair cable for each signal line and SG (signal ground) to connect the CPU Unit to a communications partner. Also, bundle all the SG lines at the Board/Unit and at the other device and connect them together.
3. Connect the shield line of the communications cable to the hood (FG) of the RS-232C connector at the Board/Unit. Also, ground the protective earth (GR) terminal of the Power Supply Units on the CPU Rack and the CS-series Expansion Racks to a resistance of 100 Ω or less. The following example shows connecting SD-SG, RD-SG, RS-SG, and CS-SG for Serial Communications Mode using a twisted-pair cable using the peripheral bus.

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Note The hood (FG) is internally connected to the protective earth (GR) terminal on the Power Supply Unit through the CPU Rack or CS-series Expansion Rack. FG can thus be connected by connecting the protective earth (GR) terminal on the Power Supply Unit. The hood (FG) is also electrically connected to pin 1 (FG), but the connection resistance between the shield and the FG is smaller for the hood. To reduce contact resistance between the hood (FG) and the FG, connect the shield both to the hood (FG) and to pin 1 (FG).



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Wiring Connectors

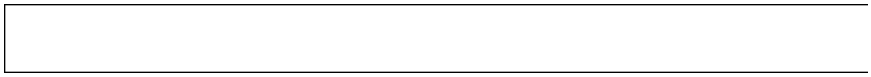
Use the following procedures to wire connectors.

1. Preparing the Cable

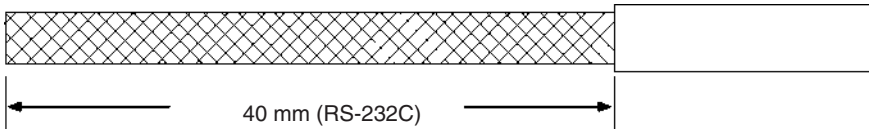
Lengths for steps in the procedure are provided in the diagrams.

Connecting the Shield Line to the Hood (FG)

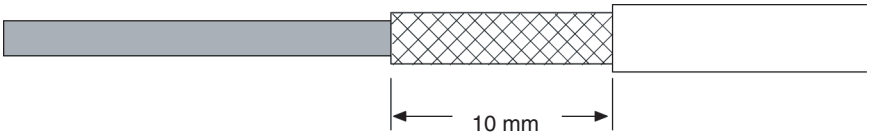
1. Cut the cable to the required length, leaving leeway for wiring and laying the cables.



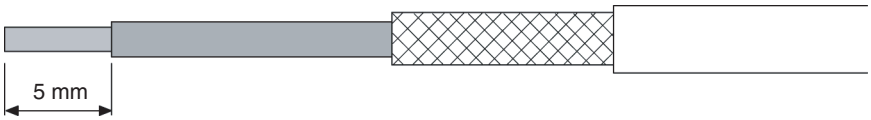
2. Use a razor blade to cut away the sheath, being careful not to damage the braiding.



3. Use scissors to cut away all but 10 mm of the exposed braiding.



4. Use wire strippers to remove the insulation from the end of each wire.



5. Fold the braiding back over the end of the sheath.



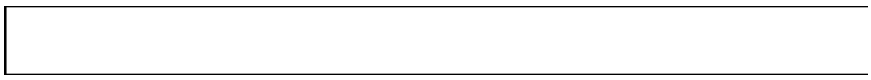
6. Wrap aluminum foil tape over the top of the braiding for one and a half turns.



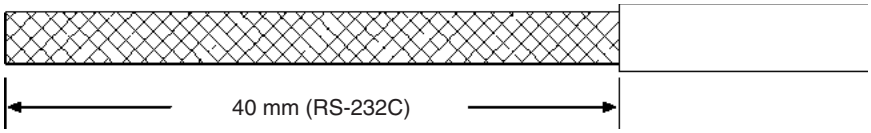
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Not Connecting the Shield to the Hood (FG)

1. Cut the cable to the required length, leaving leeway for wiring and laying the cables.



2. Use a razor blade to cut away the sheath, being careful not to damage the braiding.



3. Use scissors to cut away the exposed braiding.



4. Use wire strippers to remove the insulation from the end of each wire.

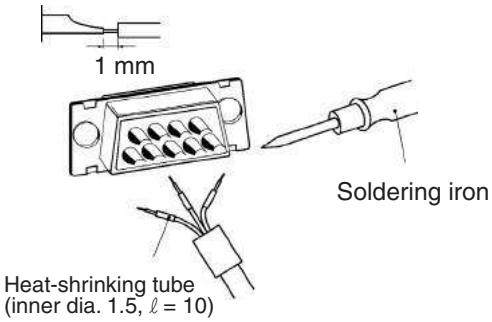


5. Wrap electrician's tape over the top and end of the cut sheath.

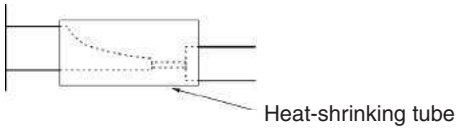


2. Soldering

1. Place heat-shrinking tubes over all wires.
2. Pre-solder all wires and connector terminals.
3. Solder the wires.



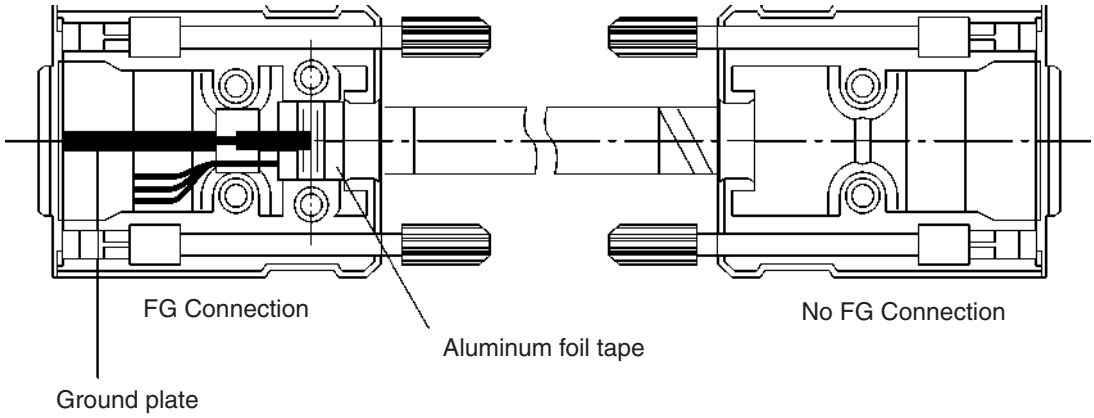
4. Move the heat-shrinking tubes onto the soldered area and shrink them into place.



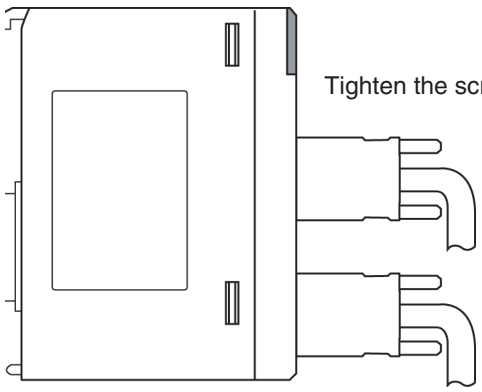
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3. Assembling the Hood

Assemble the connector hood as shown.



4. Connection to the CPU Unit



- Always turn OFF the power supply to the PLC before connecting or disconnecting communications cables.
- Tighten the communications connector attachment screws to 0.4 N·m.

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Appendix F
Restrictions in Using C200H Special I/O Units

Restrictions in Areas and Addresses

There are restrictions in transferring I/O memory data between C200H Special I/O Units and the CPU Unit. The restrictions on the Unit depend on the group in which the Unit belongs. The five groups are shown in the following tables.

Units that Transfer data for Programming Inside the Unit Itself

Group	Models
Group I	C200H-ASC02 ASCII Unit
Group II	C200H-ASC11/21/31 ASCII Units

Units that Transfer data for Allocated Words

Group	Models
Group III	C200H-CT001-V1/CT002 High-speed Counter Units, C200H-IDS01-V1/ IDS21 ID Sensor Units, C200H-NC111/NC112/NC211 Position Control Units, C200H-FZ001 Fuzzy Logic Unit
Group IV	C200H-CT021 High-speed Counter Unit, C200H-MC221 Motion Control Unit, C200H-DRT21 C200H I/O LInk Unit, C200HW-NC113/NC213/NC413 Position Control Units

Units that Do Not Transfer data for Programming or Allocated Words

Group	Models
Group V	C200H-TS001/TS002/TS101/TS102 Temperature Sensor Units, C200H-TC001/TC002/TC003/TC101/TC102/TC103 Temperature Controller Units, C200H-PID01/PID02/PID03 PID Control Units, C200H-TV001/TV002/TV003/TV101/TV102/TV103 Heating/Cooling Units, C200H-OV001 Voice Unit, C200H-ID501/ID215 High-density Input Units, C200H-OD501/OD215 High-density Output Units, C200H-MD501/MD215/MD115 High-density I/O Units, C200HW-SRM21 CompoBus/S Master Unit, C200H-AD001/AD002/AD003 Analog Input Units, C200H-DA001/DA002/DA003/DA004 Analog Output Units, C200H-MAD01 Analog I/O Unit, C200HW-DRM21-V1 DeviceNet Master Unit, C200H-CP114 Cam Positioner Unit, T200H-MIF01 M-Net Interface Unit

If any of the above Units in groups I to IV are used in combination with the following functionality, the restrictions described in the rest of this section apply for area and address specifications.

- Data transfers with the CPU Unit from instructions (PLC READ, PLC WRITE, etc.) in the program executed by the C200H Special I/O Unit. This applies to the ASCII Units only.
- Data transfers with the CPU Unit for allocated words or DM area specifications (i.e., source/destination areas and addresses).

Note There are no restriction in using the IORD(222) and IOWR(223) instruction in the CPU Unit to transfer data. These instruction can thus be used in the CPU Unit to transfer data for Units that support data transfer for IORD(222) and IOWR(223), i.e., C200H-CT021, C200H-MC221, and C200H-ASC11/ASC21/ASC31.

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Restrictions in Using Existing ASCII Unit Programs

The following replacements in areas and addresses will be made if existing ASCII Unit programs are used.

For most addresses, a zero (0) will simply be added as the most significant digit. The following four exceptions exist.

1,2,3...

1. AR 00, AR02 to AR 27 (C200H AR Area words) will specify H100, H102 to H127 in the CS-series CPU Unit.
2. TIM 000 to TIM 511 and CNT 000 to CNT 511 (C200H Timer/Counter Area words) will specify T0000 to T0511 in the CS-series CPU Unit.
3. LR 00 to LR 63 (C200H LR Area words) will specify CIO 1000 to CIO 1063 in the CS-series CPU Unit.
4. AR 01 and CIO 281 cannot be specified. Use other addresses.

Corresponding Addresses for C200H-ASC02 (Group I)

Area/Address specifications in a C200H CPU Unit			Areas/Addresses in a CS-series CPU Unit	
Code	**Area**	**Addresses**	**Area**	**Address**
@R	IR	000 to 255	CIO	000 to 0255
@L	LR	LR 00 to LR 63	CIO	1000 to 1063
@H	HR	HR 00 to HR 99	Holding	H000 to H099
@A	AR	AR 00	Holding	H100
		AR01	Cannot be accessed. Use another address.	
		AR02 to AR27	Holding	H102 to H127
@G	Timer/Counter	TIM/CNT 000 to TIM/CNT 511	Timer/Counter	T0000 to T0511
@D	DM	DM 0000 to DM 0999	DM	D00000 to D00999
		DM 0000 to DM 1999		D20000 to D20999

Corresponding Addresses for C200H-ASC11/ASC21/ASC31 (Group II)

Area/Address specifications in a C200H CPU Unit			Areas/Addresses in a CS-series CPU Unit	
Code	**Area**	**Addresses**	**Area**	**Address**
@R	IR	000 to 280	CIO	0000 to 0280
		281	Cannot be accessed. Use another address.	
		282 to 511	CIO	0282 to 0511
@L	LR	LR 00 to LR 63	CIO	1000 to 1063
@H	HR	HR 00 to HR 99	Holding	H000 to H099
@A	AR	AR 00	Holding	H100
		AR 01	Cannot be accessed. Use another address.	
		AR 02 to AR 27	Holding	H102 to H127
@G	Timer/Counter	TIM/CNT 000 to TIM/CNT 511	Timer	T0000 to T0511
@D	DM	DM 0000 to DM 6655	DM	D00000 to D6655
@E	EM	EM 0000 to EM 6143	EM	E0_00000 to E0_06143

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Restrictions in Programming C200H Special I/O Units for the CS Series (Groups I to IV)

There following restrictions in area and address specifications exist in programming inside C200H Special I/O Units (i.e., ASCII Unit) or in specifying C200H Special I/O Unit allocations for the CS-series CPU Unit.

1,2,3...

1. CIO 0256 to CIO 0999 cannot be specified for Units in Group I or III, CIO 0281, 0512 to CIO 0999 cannot be specified for Units in Group II or IV, and CIO 1064 to CIO 6143 cannot be specified.
2. Addresses in the Work Area (W000 to W511) cannot be specified.
3. H101 and H128 to H511 cannot be specified, and H100, H102 to H127 must be specified using AR 00, AR02 to AR 27.
4. Timers T0512 to T4095 cannot be specified.
5. Counters (C0000 to C4095) cannot be specified.
6. D01000 to D19999 and D21000 to D32767 in Group I or III D06656 to D32767 in Group II or IV cannot be specified.

   Note If D1000 to D1999 are specified in a C200H Special I/O Unit for data transfer, the CS Series will interpret them as D20000 to D20999. Do not use D1000 to D1999.
7. E0_06144 to E0_32767 (bank 0) and E□_00000 to E□_32767 in all banks except bank 0 cannot be specified.

Special I/O Units in Groups I and III

Area/Address specifications in CS-series CPU Unit		Areas/Addresses to use in C200H Special I/O Unit	
Area	**Addresses**	**Area**	**Address**
CIO	0000 to 0255	IR	000 to 255
	0256 to 0999		Not addressable.
CIO	1000 to 1063	LR	LR 00 to LR 63
CIO	1064 to 6143	IR	Not addressable.
Work	W000 to W511	None	---
Auxiliary	A000 to A959	None	---
Holding	H000 to H099	HR	HR 00 to HR 99
	H100	AR	AR 00
	H101	AR	Not addressable.
	H102 to H127	AR	AR 02 to AR 27
	H128 to H511	None	---
Timer	T0000 to T0511	Timer/Counter	TIM/CNT 000 to TIM/CNT 511
	T0512 to Y4095		Not addressable.
Counter	C0000 to C4095		Not addressable.
DM	D00000 to D00999	DM	DM0000 to DM 0999
	D06656 to D19999		Not addressable.
	D20000 to D20999		DM1000 to DM1999
	D21000 to D32767		Not addressable.
EM	E0_00000 to E0_32767	None	---
	E1_00000 to EC_32767		---

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Special I/O Units in Groups II and IV

Area/Address specifications in CS-series CPU Unit		Areas/Addresses to use in C200H Special I/O Unit	
Area	**Addresses**	**Area**	**Address**
CIO	0000 to 0280	IR	000 to 280
	0281		Not addressable.
	0282 to 0511		282 to 511
	0512to 0999		Not addressable.
CIO	1000 to 1063	LR	LR 00 to LR 63
CIO	1064 to 6143	IR	Not addressable.
Work	W000 to W511	None	---
Auxiliary	A000 to A959	None	---
Holding	H000 to H099	HR	HR 00 to HR 99
	H100	AR	AR 00
	H101		Not addressable.
	H102 to H127		AR 02 to AR 27
	H128 to H511	None	---
Timer	T0000 to Y0511	Timer/Counter	TIM/CNT 000 to TIM/CNT 511
	T0512 to Y4095		Not addressable.
Counter	C0000 to C4095		Not addressable.
DM	D00000 to D06655	DM	DM0000 to DM 6655
	D06656 to D32767		Not addressable.
EM	E0_00000 to E0_06143	EM	EM0000 to EM6143
	E0_06144 to E0_32767		Not addressable.
	E1_00000 to EC_32767		Not addressable.

Functions with Addressing Restrictions

Restrictions apply to the following functions.

ASCII Units

Group	Unit	Model	Function with restricted addressing	Alternative
I	ASCII Units	C200H-ASC02	Areas and addresses in read/write operands for PLC READ, PLC WRITE, PLC READ@ and PLC WRITE@.	Write to available addresses and then transfer to the desired locations. (See the note following the next table.)
II		C200H-ASC11/ ASC21/ASC31	Areas and addresses in read/write operands for PLC READ, PLC WRITE, PLC READ@, PLC WRITE@	Use IORD(222) and IOWR(223) (#00□□).

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Other C200H Special I/O Units

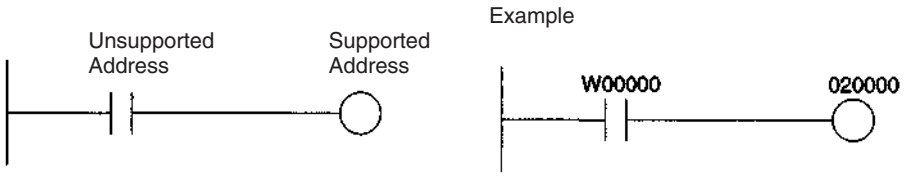
Group	Unit	Model	Function with restricted addressing	Alternative
III	High-speed Counter Units	C200H-CT001-V1/ CT002	Setting the source areas and addresses in allocated words n+2 and n+3 for transferring words m to m+99 (high-speed counter system data).	Write to available addresses and then transfer to the desired locations. (See note.)
	ID Sensor Units	C200H-IDS01-V1/ IDS21	Setting the source areas and addresses in allocated word n+2 for command data. Setting the destination areas and addresses in allocated word n+3 for storing data read from Data Carriers.	
	Position Control Units	C200H-NC111/ NC112/NC211	Setting the source areas and addresses in allocated word n+4 for position data and speeds.	
	Fuzzy Logic Unit	C200H-FZ001	Setting the source areas and addresses in allocated word n+1 for fuzzy input write data to be transferred to the Fuzzy Logic Unit. Setting the destination areas and addresses in allocated word n+3 for fuzzy logic results data to be read from the Fuzzy Logic Unit.	
IV	High-speed Counter Unit	C200H-CT021	Setting the source areas and addresses in allocated word m+4 for upper/lower limits, present values, and other data to be transferred to the High-speed Counter Unit.	Use IORD(222) and IOWR(223).
	Motion Control Unit	C200H-MC221	Setting the source/destination areas and addresses for expansion information.	
	C200H I/O Link Unit	C200HW-DRT21	Setting the areas and addresses in allocated words n+1 to n+4 in the CPU Unit for automatic transfer of I/O memory of the CPU Unit to which the C200H I/O Link Unit is mounted to the DeviceNet Master Unit.	Write to available addresses and then transfer to the desired locations. (See note.)

Note Examples of the alternative method are shown below.

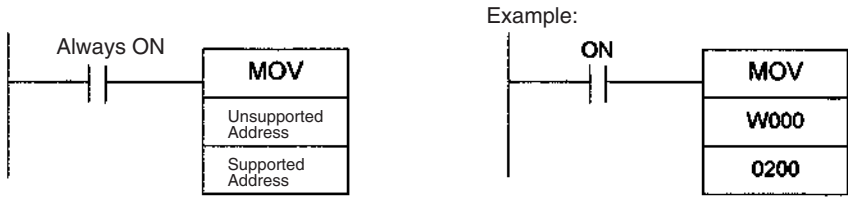
Reading CPU Unit Data from a Special I/O Unit

Write the data from the unsupported address to a supported address and then read the data from the supported address to the Special I/O Unit.

- **Bit Data**



- **Word Data**

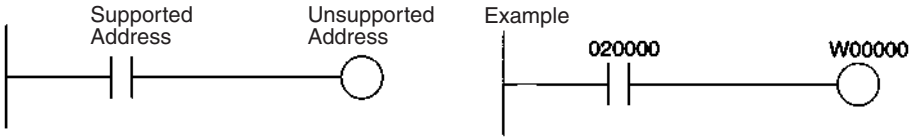


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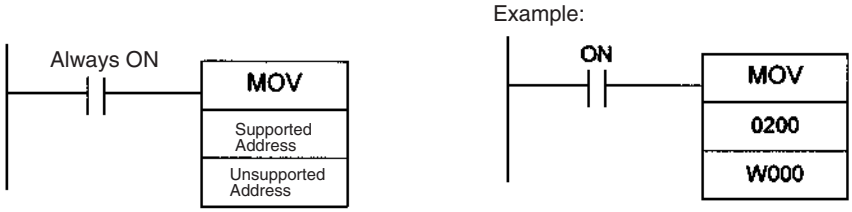
Reading Special I/O Unit Data form the CPU Unit

Read the data from the Special I/O Unit and then write the data from the supported address to an unsupported address.

- **Bit Data**



- **Word Data**



Precautions When Using C200HW-DRM21-V1 DeviceNet Master Unit

When using a DeviceNet Master Unit, limitations apply when using the following functions (except for data transfer).

Allocation Limitations

Only the following areas can be allocated when allocating remote I/O using a Configurator.

Area	Allocation words
CIO	0000 to 0235 0300 to 0511
HR	H000 to H099
LR	1000 to 1063
DM	D00000 to D05999

Note
1. When creating master parameters using a configurator, set the PLC model to C200HX/HG/HE(-Z) (except for the C200HE-CPU11).
2. When reading master parameters from a master using a configurator, set the PLC model to the C200HX-CPU85.

Limitations when using DM as the Status Area

When using the DeviceNet Master Unit, the following words will be allocated in addition to the DM Area words allocated to the Unit as a Special I/O Unit.

Master Status Area: D06032 + (2 × unit number)
Communications cycle time present value: D06033 + (2 × unit number)

Do not use these words for other applications, because data is updated when the DeviceNet Master Unit is being used.

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Appendix G
CJ1W-CIF11 RS-422A Converter

The CJ1W-CIF11 RS-422A Converter converts RS-232C to RS-422A/485.

Specifications

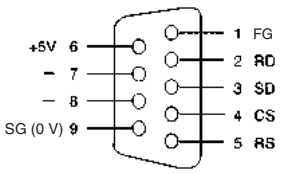
General Specifications

Item	Specification	
Dimensions	18.2 × 34.0 × 38.8 (W × H × D)	
Weight	20 g max.	
Ambient operating temperature	0 to 55°C	
Ambient storage temperature	–20 to 75°C	
Ambient operating humidity	10% to 90% (with no condensation)	
Rated power supply voltage	5 V	(Supplied from pin 6 of the RS-232C connector.)
Current consumption	40 mA max.	
Operating atmosphere	No corrosive gases	
Vibration resistance	Same as SYSMAC CS/CJ Series.	
Shock resistance	Same as SYSMAC CS/CJ Series.	
Isolation method	Not isolated	
Maximum communications distance	50 m	

Electrical Specifications

RS-232C Connector

Connector Pin Arrangement for RS-232C Port

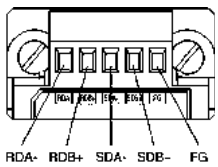


Pin number	Signal
1	FG
2	RD
3	SD
4	CS
5	RS
6	+5V
7, 8	NC
9	SG (0 V)
Hood	FG

Note The hood will have the same electrical potential as the connector on the other end of the cable.

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RS-422A/485 Terminal Block



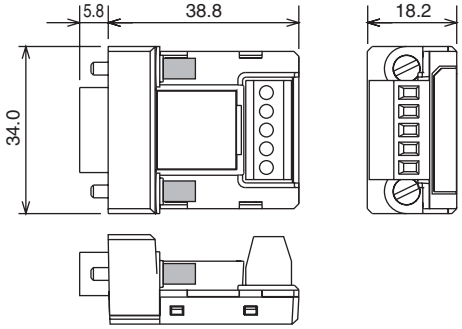
Signal
RDA–
RDB+
SDA–
SDB+
FG

DIP Switch Settings

Pin number	Function	ON	OFF
1	Terminating resistance	With (at both ends of the communications path)	Without
2	Two-wire/four-wire method selection (See note 1.)	Two-wire method	Four-wire method
3	Two-wire/four-wire method selection (See note 1.)	Two-wire method	Four-wire method
4	Not used.	---	---
5	Selection of RS control for RD (See note 2.)	With RS control	Without RS control (always ready to receive)
6	Selection of RS control for SD (See note 3.)	With RS control	Without RS control (always ready to send)

Note 1. Set pins 2 and 3 to the same setting. (ON for the two-wire method or OFF for the four-wire method.)
2. To prohibit echoback, set pin 5 to ON (with RS control).
3. When connecting to several devices using the four-wire method in a 1:N connection, set pin 6 to ON (with RS control). When connecting using the two-wire method, set pin 6 to ON (with RS control).

Dimensions



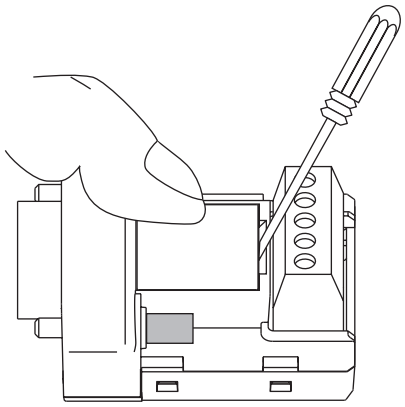
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DIP Switch Settings, Wiring, and Installation

Setting the DIP Switch

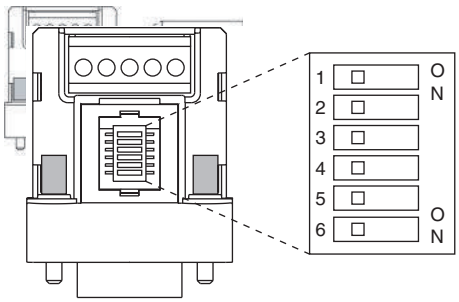
The DIP switch settings must be changed to perform communications according to settings other than the default settings.

1. Remove the DIP switch cover using a flat-bladed screwdriver in the way shown below.



Note Press the cover gently while removing it to prevent it from popping out suddenly.

2. Using a fine pair of tweezers or other tool with a fine point, change the settings of the DIP switch pins to match the desired communications conditions.
3. Be sure to remount the cover after finishing the DIP switch settings.

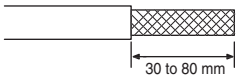


All the pins are factory-set to OFF.

Wiring the RS-422A/485 Terminal Block

- Use either two-wire or four-wire shielded cable.
  Recommended cable: CO-HC-ESV-3P×7/0.2 (Hirakawa Hewtech)
- Connect the shield wire at both ends of the cable carrying RS-422A/485 signals to ground, and ground the ground terminal on the Power Supply Unit of the CPU or Expansion Rack to 100 Ω max.

1. Taking care not to damage the shield, strip between 30 and 80 mm of sheath off the end of the cable.



2. Carefully twist the shield mesh together to form a single wire, and carefully cut off the material surrounding the signal wires and any unnecessary signal wires.

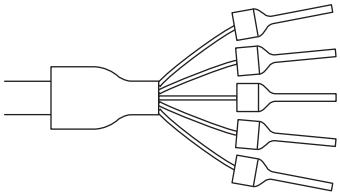


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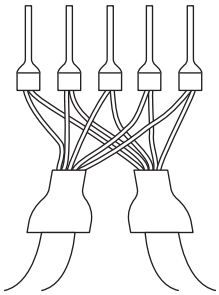
3. Strip the sheath off the signal wires to a length sufficient to attach crimp terminals. Apply vinyl tape or heat-shrinking tube to the sheathes and stripped parts of communications lines.



4. Attach sticktype crimp terminals to ends of the signal lines and crimp them using a crimp tool.
   - Recommend crimp terminals:
     Phoenix Contact
     AI Series
     AI-0.5-8WH-B (serial number: 3201369)
   - Recommended crimp tool:
     Phoenix Contact ZA3

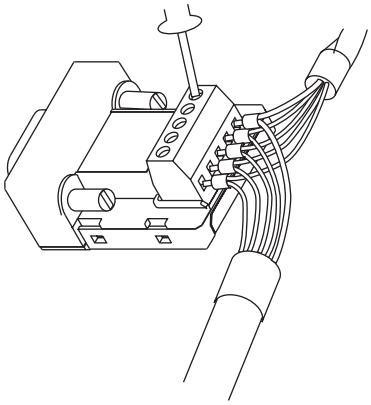


With four-wire cables, insert two signal lines into each crimp terminal together before crimping.



   - Recommend crimp terminals:
     Phoenix Contact
     AI Series
     AI-TWIN2×0.5-8WH (serial number: 3200933)
   - Recommended crimp tool:
     Phoenix Contact
     UD6 (serial number: 1204436)

5. Connect the signal lines and the shield line to the RS-422A/485 terminal block.



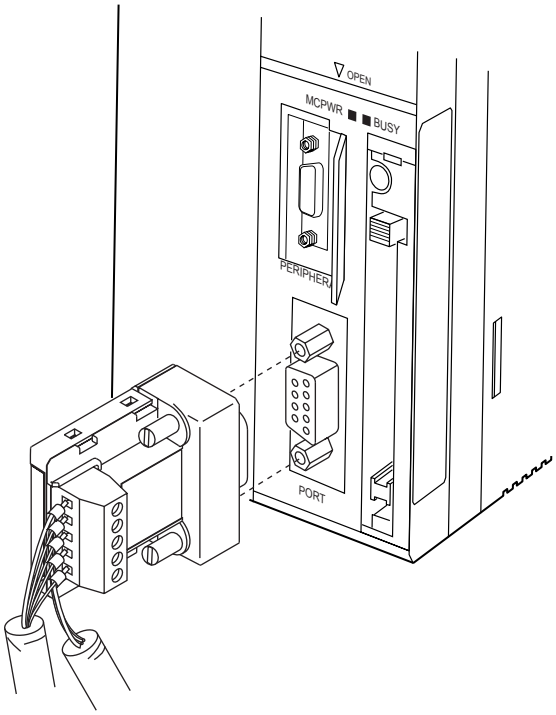
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Mounting to the Unit

Mount the Converter to the RS-232C port (D-Sub, 9-pin) of the Unit to be connected in the following way.

1. Align the Converter's connector with that of the Unit and push it into the Unit's connector as far as possible.
2. Tighten the mounting screws on either side of the Converter. (Tightening torque: 0.3 N·m.)

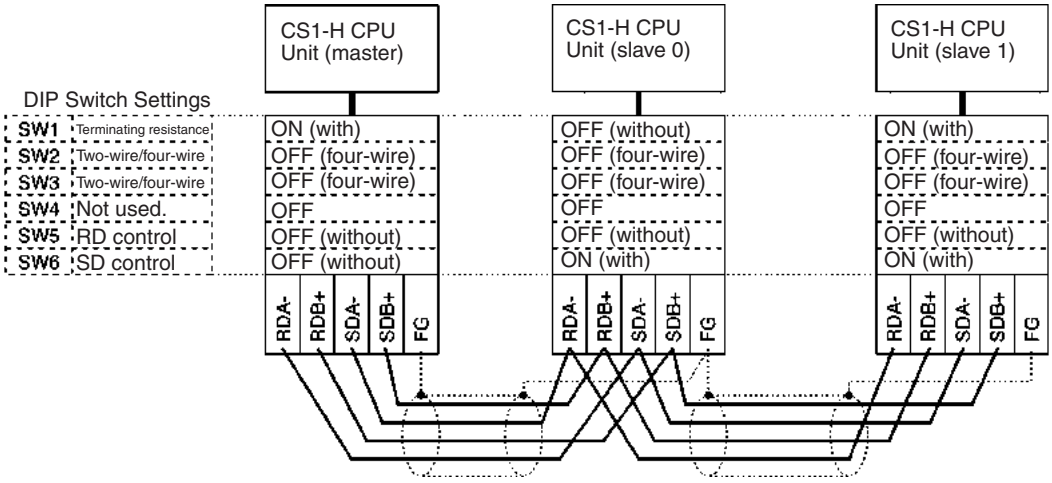
As an example, connection to a CS1-H CPU Unit is shown below.



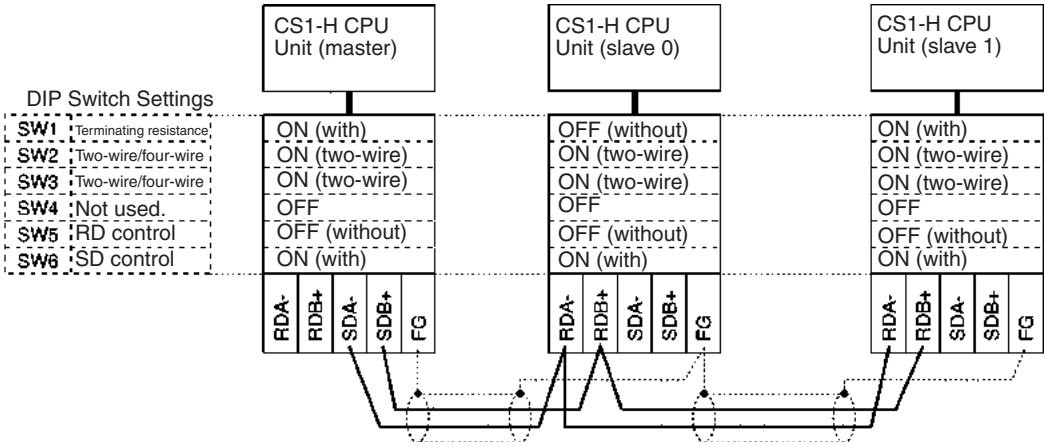
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Wiring Examples

Wiring for Four-wire Cable



Wiring for Two-wire Cable



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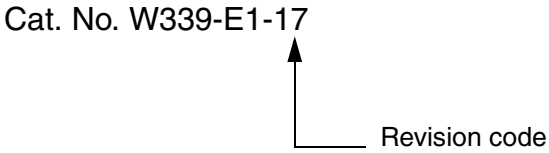
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Revision History

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



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
01	February 1999	Original production
02	October 1999	Revisions and additions for version-1 CPU Units. See page 118 of the *CS-series Programming Manual* for a list.
03	May 2000	Revisions and additions as follows: **All:** “CS1 High-density I/O Unit” changed to “CS1 Basic I/O Units with connectors.” **Page xi:** Information on CX-Programmer and CX-Server manuals added. **Page 38:** Noise immunity specification changed. **Pages 54 to 57, 84, 85, 120, and 542:** Tables reworked and expanded. **Page 63:** Note added on Voice Unit. **Page 67:** Note added. **Page 87:** Voice Unit added to top table. Model numbers added to bottom table. **Pages 122, 124, 181, and 493:** CS1 Unit information added. **Pages 124 and 125:** Interrupt Input Unit section reworked and section added on High-speed Input Unit. **Page 127:** Subsection moved to end of section. **Pages 132:** Section reworked and moved before previous section. **Page 134:** Section reworked and renamed. **Page 144:** Two sections added. **Page 180:** Information added for 20-terminal Units **Pages 182 and 183:** Section headings changed and information added. **Page 186 to 188:** Models added to diagrams and diagrams added. **Pages 188:** Last line of page changed. **Page 191:** Information on residual voltages added. **Page 192:** Information on sensor surge current and fuse capacity added. **Page 217:** Information for task flags changed. **Page 224:** Information on DM area allocations for DeviceNet added. **Page 225:** Note added. **Pages 292 and 293:** “Host link mode” removed from default settings. **Page 459:** Less than sign changed to equals sign. **Page 470:** Reference to other manual added. **Page 493:** Information added. **Page 545:** Section starting at bottom of page redone. **Page 548:** Information added to I/O interrupt task description. **Page 549:** Information added. **Page 551 to 574:** “Top: Min. Bottom: Max.” removed from table column heading. **Pages 550 to 554:** Small table added on differentiation; ! execution times added. **Page 583:** Fatal Inner Board error description rewritten. **Page 588 and 589:** Part of *Cause* removed from non-fatal Inner Board error and low battery error. **Page 609:** Tables added. **Page 611 to end of appendix:** CS1 Units added. **Page 620, 621, and 622:** OC222N, OC226N, and OC224N added. **Page 627 to 630:** Circuit configuration diagrams corrected. **Page 630, 651, 658, and 659:** Note added. **Pages 648, 651, 654 to 657, 671, 673, 680, and 682:** Diagrams revised. **Page 649:** Note changed. **Page 659:** Last two sentences removed. **Page 754:** Information added to notes. **Page 762:** Information added to restrictions at bottom of page.

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Revision code	Date	Revised content
04	August 2000	Revisions and additions to add CS1 Long-distance Expansion Racks and Peripheral Servicing Mode. Specific changes are as follows: **Page xvii:** "Power Supply Unit" added to mounting/dismounting warning. **Pages 4,16, 41, 48 to 51, 84, 118 to 121, 187 to 190, 292, and 613:** Changes and additions for CS1 Long-distance Expansion Racks. **Pages 4, 16, 307, 313, 322, 539, 729, and 792:** Changes and additions for Peripheral Servicing Priority Mode. **Pages 45, 46, 106, and 108:** Programming Console model added. **Page 51:** CS1W-INT01 added (two locations). **Page 52:** Headings corrected in middle of page. **Page 89:** Section added on CPU Unit Setting Area capacity. **Page 100:** "Etc." replaced with "SYSMAC LINK link tables and Controller Link link tables." **Pages 118 to 121:** Weights added. **Pages 147 to 151:** Information on I/O number switch removed/replaced (not used for CS1). **Section 7:** "CompoBus/D" changed to "DeviceNet" (with references left to CompoBus/D). **Page 234:** Status area added to top graphic. **Page 243:** Information added to note. **Page 323:** Information added to top graphic. **Page 532:** Table added to bottom of page. **Pages 560, 562, and 563:** Note added after table.
05	January 2001	New products added and other changes made as follows: **Pages 59, 62, 89, 90, 94, 129, 130, 133, 135, 574, 645, 646, 648, 650, 672, 680, 682, and 686:** Information added on new products. **Page 325:** Paragraph below diagram changed. **Page 631:** Remedy added for "Input irregularly turns ON/OFF." **Pages 631 and 632:** Replacing Unit added for 4 remedies. **Page 635:** First row for "User-serviceable parts" changed. **Page 642:** Model added to note following table. **Page 648:** Precautions added before *Basic I/O Units*.
06	October 2001	New products added to the manual, including the new High-speed CPU Units (CS1-H CPU Units). (Extensive changes too numerous to list.)

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Revision code	Date	Revised content
07	September 2002	"PC" was changed to "PLC" throughout the manual. "CS1" was changed to "CS Series" where appropriate (i.e., when not referring directly to a CPU Unit). In addition, the following changes were made: **Page v:** Change made to information on OMRON product references. **Page xi:** Model numbers changed or added in several places. **Page xv:** Precautionary information added. **Page 2:** Minor change made to callouts. **Page 5:** Line added before graphic. **Page 6:** "CompoBus/D" added in one place. **Page 12:** Wording changed in second heading. **Pages 14, 17, 348, 349, 349, 350, 402, 422:** Information related to new timer/counter instructions added. **Pages 57, 62, 64, 65, 66, 69, 72, 74, 75, 76, 77, 132:** Notes added. **Pages 57, 129, 184:** New section headings added. **Page 60:** 32 corrected to 64 in two places. **Page 61:** Information on new CPU Backplanes added. **Page 64:** Information added to middle section. **Pages 67, 69, 76, 102, 143, 145, 163, 211, 262, 391, 469, 573:** Information added to tables. **Page 132:** Minor changes made to information in table. **Pages 141, 144:** Tables added. **Page 143:** Numerical corrections made in two places. **Page 150, 162, 163, 166, 168:** Page references removed. **Pages 198, 200, 201:** Information reordered. **Page 233, 558, 626, 627, 628:** Minor changes made to headings. **Page 256:** Third table removed. **Pages 270, 277:** Changes made to graphic callouts. **Pages 280, 281:** Callout moved. **Page 300:** Second graphic replaced. **Pages 356, 360:** Changes made to explanation of I/O Hold Bit operation. **Page 377:** 25 changed to 15 in bottom graphic. **Page 378:** Minor change in wording. **Page 386:** Information added before bottom table. **Page 387:** Information added before second table. **Page 393:** Numerical changes made in two places in table. **Page 395:** First note removed. **Pages 400 to 425:** Zeroes added before instruction codes where appropriate (i.e., to make them three digits long.) **Page 406:** Numerical corrections made in six places. **Page 454:** Minor change made to wording of text before table. **Page 457:** Changes made to bottom table in several places. **Page 459:** Last heading removed. **Appendix A:** Minor changes made to graphics and notation used for input voltage, maximum switching capacity, and external power supply throughout the Appendix. **Page 553:** Information on TTL I/O Unit added. **Page 589:** Change made to setting range for A406. **Page 623**: Graphic replaced.

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Revision code	Date	Revised content
08	December 2003	Revisions and additions as follows: **Pages xv to xxv:** PLP information updated **Page 18:** Rows beginning “Operation after” corrected. **Page 34:** “Peripheral bus” removed from second cell in *CS-series PLCs* column. **Pages 63, 242, 535, and 561:** Graphic corrected. **Pages 64, 119, 126, 304, 463, 506, 551, 560, and 616:** Note added. **Pages 65, 119, 250, 251, 432, and 631:** Note changed. **Page 70:** Section on cable restrictions added. **Page 79:** “No” in *SYSMAC BUS Slave Racks* column corrected. **Page 124:** Memory Card models corrected. **Page 125:** “General-purpose” removed from bottom table. **Pages 133 and 34:** Keyboard corrected. **Page 142:** Information added to *RUN Output* section. **Pages 145, 147, 503, and 505:** Sentence added to graphic. **Page 165:** Model number corrected in bottom table. **Page 226:** Paragraph added at top of page. **Page 234:** Information added on grounding. **Page 256:** Dates changed. **Pages 291 and 294:** Paragraph added to bottom of page. **Page 307:** Sentence added to SYSMAC BUS Area and I/O Terminal Area descriptions. **Page 322:** Address corrected in note. **Page 357:** Information added before note. **Page 432:** Address corrected under table. **Page 434:** Column added to top table. **Page 437:** Multiple additions and changes made. **Page 438:** “Stopped” status information changed. **Page 473:** TTL I/O Unit model number corrected. **Page 474:** Manufacturing number description changed. **Pages 478, 501, 502, 515, and 520:** Insulation resistance test voltage changed to 500 V DC. **Pages 524, 528, 531, 565, 566, 568, 569, 571, 572, 574, 575, 577, and 578:** Alternate circuit configuration added. **Page 584:** Description of A266 and A267 changed. **Page 590:** “A528” added to top right of table. **Page 591:** Description of A39506 and A39507 reversed. **Page 602:** Description of A50014 changed. **Page 616:** Sentence added at top of page. **Page 643:** Appendix added.

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Revision code	Date	Revised content
09	July 2004	Revisions and additions were made throughout the manual for the functionality supported by the version upgrade to CPU Units with unit version 3.0, including the following changes. **Pages vi to xiv:** Reorganized, changed, and added information on unit versions. **Page xix:** Added manuals to table. **Page 15:** Added new sections *1-3-7* and *1-3-8* with information on new functionality. **Page 18:** Added version upgrade information to new section *1-4*. **Pages 19 and 21:** Added information on function blocks. **Pages 32 and 33:** Added notes. **Page 54:** Changed 3049 to 3079 for SYSMAC BUS Area. **Page 66:** Replaced table for CS1-H and expanded table for CS1. **Page 67:** Expanded specifications table. **Page 68:** Changed values for SYSMAC Bus Area. **Page 69:** Added note to Holding Area. **Page 71:** Added information to flash memory **Page 73:** Changed information on storing comment data. **Page 85:** Changed Memory Card models. **Page 88:** Added information on USB connections. **Page 93:** Removed note reference for CS-series Expansion Backplanes. **Page 96:** Changed 5 Racks to 8 Racks in table. **Page 100:** Removed note reference for CS1W-IDP01. **Page 108:** Added V1 suffix to Analog Input Units. **Page 109:** Added CS1W-PMV02. **Page 111:** Added information. **Page 112:** Updated diagram and added new information to table. **Page 113:** Added new information and diagram. **Page 116:** Added new information and diagrams for Serial Gateway. **Page 117:** Added note. **Page 119:** Added information on Host Link Master. **Page 120:** Added information on protocol conversion. **Page 130:** Changed current consumption from 0l11 to 0.01 for DC Input Unit. **Page 135:** Added V1 suffix to Analog Input Units. **Pages 148 and 149:** Changed information on memory block maps. **Pages 152, 154, 156, and 157:** Added information to tables and also added information on comment memory to 157. **Page 225:** Added reference information. **Page 259:** Changed diagram and added precaution. **Page 291:** Added information for function blocks. **Pages 297 and 298:** Added information for Serial Gateway. **Pages 327 and 328:** Changed 4 to 7 in unit number range, and 3049 to 3079 in SYSMAC BUS Area range. **Page 341:** Changed 800 to 1,280 and 3049 to 3079 in SYSMAC BUS Area. Also added note for Holding Area. **Pages 344, 345, and 367:** Changed information for SYSMAC BUS Area. **Pages 346 and 370:** Added note to Holding Area. **Pages 376 and 387:** Added information on new words and bits to table. **Page 389:** Added note for A39212 and A39204. **Page 390:** Added information on new words and bits for function blocks. **Pages 467 and 474:** Added information on new instructions. **Page 498:** Added error information to table. **Pages 507, 508, and 510:** Changes made to precautions and new precautions added. **Page 517:** Added note to table. **Pages 525 and 527:** Changed voltage for ON/OFF response time. **Page 534:** Changed “m” to “m+1” and vice versa in terminal connections diagram. **Page 640:** Added TXDU/RXDU instructions in information on A203 to A210. Also added information for A214 to A218 to table. **Page 646:** Added information on A345. **Pages 647 and 648:** Added note on Serial Gateway to A39204 and A39212. **Page 650:** Changed reference for A40109. **Page 663:** Added information to A528 **Page 664:** Added information for new words A580 to A582. **Page 667:** Added information for new words A720 to A749.
10	January 2005	Revisions and additions were made throughout the manual for functionality supported by the C200HW-PA204C Power Supply Units with Replacement Notification, including the following changes. **Page xx:** Changed table of reference manuals. **Pages xxix, xxx, and xxxi:** Added precautionary information. **Pages 11 and 18:** Added information on battery replacement notification. **Pages 83, 94, 10, 140, 185, and 515:** Added information to table. **Pages 84, 256:** Added notes. **Pages 185 and 186:** Added information on components and switch settings. **Page 187:** Added dimensions diagram and information on selecting Power Supply Units. **Pages 187 and 188:** Added models to tables. **Page 188:** Added new sub section on battery replacement notification. **Page 273:** Added wiring diagram. **Page 274:** Added information on AC power source and changed table. **Page 275:** Added information on alarm output. **Page 278:** Added note and moved diagram to following page. **Pages 590, 591, 592, and 593:** Changed fuse information in diagrams. **Pages 531 to 534:** Revised information on battery replacement.

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Revision code	Date	Revised content
11	November 2005	Revisions and additions were made throughout the manual to include information on the C200HW-PD025, including the following changes. **Page 83:** Column added to table and reference to note 7 added for output capacity. **Page 84:** Column added to table. **Page 85:** Notes 6 and 7 added, column added to table, reference to note 6 added for safety measures, and reference to the C200HW-PD025 added to note 3. **Pages 95, 107, 142, 187, 190, 191, 287, and 527:** Information on C200HW-PD025 added. **Pages 195, 377, 401, and 675:** Note added. **Page 685:** "VM" changed to "UM" in table.
12	October 2006	Revisions and additions were made throughout the manual to include information on unit version 4.0 of the CPU Units. Descriptions and contents were improved. The 15-Mbyte flash memory was deleted. Many other changes were made throughout the manual.
13	September 2007	**Pages x and xiii:** Added upgraded features for release of CX-Programmer 7.2. **Pages xix and xx:** Added the CJ1H-CPU□□H-R CPU Units. **Pages 52 to 55:** Added the CS1G-CPU4□H and CS1G-CPU4□-E CPU Units. **Pages 78 and 79:** Corrected "E2_" to "E0" in "Extended data memory" for CPU Units supporting only one bank. **Page 86:** Rewrote row for three-level communications. **Page 93:** Corrected data memory capacity for the CS1G-CPU43H, CS1G-CPU42H, and GS1H-CPU63-EV1. **Pages 99 and 172:** Added Memory Card model. **Page 114:** Corrected "DC" to "AC" for AC Input Unit. **Page 120 and 159:** Corrected model numbers of B7A Interface Units. **Pages 121, 154, 156, 160, and 502:** Added the CS1W-AD161. **Page 122:** Upgraded versions of Motion Control Units and changed notes. **Page 127:** Removed "High-resolution Isolated DC Input Unit" from left column and corrected model number of the High-resolution Motion Control Unit. **Page 151:** Corrected model number of B7A Output Unit. **Pages 157 and 162:** Removed line for CompoNet Unit in table. **Page 160:** Added CompoNet Master Unit. **Page 173:** Added section on Memory Card specifications. **Page 206:** Added "-V1" to two Backplane model numbers. **Pages 212, 583, 619, 620, 622, 623, 625, and 628:** Added "-M" to Relay model number. **Page 252:** Corrected model number of C200H Basic Output Unit. **Page 301:** Corrected beginning of first paragraph. **Page 302:** Added information on connector brackets. **Page 445:** Added paragraph at bottom of page and split table. **Page 452:** Changed note for A39204. **Page 472:** Added column to table, added sentence after table, changed "1 s" in diagram and accompanying table, and added information at bottom of page. **Page 503:** Added Ethernet Unit model number. **Page 574:** Removed first two bulleted items and changed the next paragraph. **Page 710:** Added TXDU and RXDU to function description in first row and added A21215. **Page 773:** Added "(0 V)."

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Revision code	Date	Revised content
14	December 2008	**Page xix:** Changed top figure. **Page xx:** Updated manual names and versions. **Page xxx:** Updated CLK model numbers. **Pages xxxv, 672, and 673:** Removed "-E" from "NT-AL001-E." **Page 55:** Changed instruction names in last row of table. **Pages 78 and 79:** Changed final Extended Data Memory address for CS1W-CPU67-EV1. **Page 79:** Changed programming specification. **Page 100:** Moved note. **Page 105:** Changed notes. **Page 111:** Corrected model numbers for C200H I/O Connecting Cables. **Page 117:** Removed note. **Pages 129, 157, and 159:** Removed Optical Controller Link Unit (CS1W-CLK11) and 10Base-T Ethernet Unit (CS1W-ETN11). **Page 129:** Changed first note and added new note 2. **Page 152:** Added Triac Output Unit. **Page 158:** Changed current consumption for first row for Analog Input Units. **Page :** Removed most of FL-net Unit models. **Pages 228, 229, and 231:** Added model numbers and names. **Page 287:** Added note. **Pages 313, 314, and 318:** Redid *Crimp Terminals* section. **Page 321:** Changed wire sizes in *Wire* section. **Page 326:** Added "#3" to right side of top figure. **Pages 601, 602, 604, 605, 611, and 616:** Added voltage to specification for internal current consumption. **Page 607:** Changed specification for number of circuits. **Page 608:** Removed note from table. **Page 616:** Moved paragraph to note. **Page 664:** Moved note to next page. **Page 672:** Changed specification for fuse. **Page 683:** Added reference in table to note 2. **Page 731:** Changed description of A428 to A433. **Page 739:** Added information above A650. **Page 787:** Added "PLC memory address" to index.
15	September 2009	**Pages xxxv, 192, and 763:** Added Programmable Terminal. **Pages 100, 110, 175, 449, 450, 673, 678, 740, and 471:** Added note. **Pages 110 and 293:** Updated model numbers. **Pages 124 and 156:** Added High-speed Counter Units and CompoNet Master Units. **Pages 127 and 148:** Corrected model numbers from "C200" to "C200HW." **Pages 150 and 157:** Added information to note. **Page 195:** Corrected *Output* column. **Pages 246 to 248:** Corrected terminal numbers and corrected "output" to "input." **Page 321:** Added "/F" in top two tables. **Page 340:** Added paragraph at top of page. **Pages 403 and 404:** Added and reorganized notes. **Page 504:** Added CompoNet Master Units. **Pages 612, 616, 671, 676, and 680:** Changed note. **Page 739:** Added information to top cell in *Name* column.
15A	December 2009	**Page xxix:** Changed precaution on safety measures in external circuits.
16	March 2010	**Page xx:** Versions updated in manual names. **Pages 87 to 89:** Columns reorganized. **Page 87:** First two rows of specifications changed. **Page 89:** Last row of table changed. **Page 90:** Note 6 removed and note added. **Pages 100 and 111:** Rows for Power Supply Units changed. **Page 195:** Table changed. **Page 199:** New section added before 3-4-5 Replacement Notification. **Page 204:** Information added to sections on startup time and power failure detection voltage. Note changed. **Page 205:** Top table changed. **Page 308:** Model restrictions added to labels in figures. **Page 309:** Models added in last paragraph.l **Page 310:** Models added in top table. **Page 326:** Models corrected at bottom left of top figure. **Page 411:** "Cleared" corrected to "Retained" in row for Task Flags. **Page 412:** "Retained" corrected to "Cleared" two times in bottom right corner of top table. **Page 430:** Note added. **Page 564:** Models added in table. **Page 565:** Model restrictions added and removed in flowchart.

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Revision code	Date	Revised content
17	March 2012	Revised entire manual to cover only CS1-H CPU Units (i.e., removed information on CS1 CPU Units. Made the following changes. **Pages xix and xx:** Updated table of related manuals. **Pages 28, 57, 59, and 60:** Changed catalog number from W340 to W474 for CS/CJ Series Instructions Reference Manual. **Page 51:** Changed manual reference from W340 to W474. **Page 87:** Changed specifications for inrush current. **Pages 127 and 154:** Added EtherNet/IP Unit. **Pages 146 and 147:** Changed values for CPU Unit in the example calculations (part of the changes to remove the CS1 CPU Units). **Page 155:** Corrected model number of the Customizable Counter Unit. **Page 187:** Corrected model number of cable in middle row of second table. **Page 195:** Added model numbers at top of page. **Pages 208 and 210:** Added information on using CV500-COV01. **Page 309:** Changed first sentence in AC Power Supply Units. **Page 326:** Added information in parentheses to the bottom part of figure. **Pages 328 and 329:** Added “2 required.” **Page 550:** Removed screen capture and added a different screen capture and descriptions. **Page 561:** Added item to right column of third row of table. **Page 569:** Changed upper-middle portion of flowchart.

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