OMRON

Programmable Controller CJ1

Replacement Guide From CJ1M/CJ1G to CJ2M

CJ1M-CPU□□

CJ1G-CPU4□(H)

CJ2M-CPU□□

SYSMAC always in control

P068-E1-03

About this document

This document provides the reference information for replacing CJ1M/CJ1G PLC systems with CJ2M series PLC.
This document does not include precautions and reminders; please read and understand the important precautions and reminders described on the manuals of PLCs (both of PLC used in the existing system and PLC you will use to replace the existing PLC) before attempting to start operation.

Related Manuals

Man.No.	Manual
W472	CJ2 CPU Unit Hardware USER'S MANUAL
W473	CJ2 CPU Unit Software USER'S MANUAL
W486	CJ2M Pulse I/O Module USER'S MANUAL
W393	CJ Series OPERATION MANUAL
W441	CJ series CJ1M CPU Units with Ethernet Functions OPERATION MANUAL
W395	CJ series Built-in I/O CJ1M CPU Units OPERATION MANUAL
W394	CS/CJ/NSJ PROGRAMMING MANUAL
W474	CS/CJ/NSJ Series INSTRUCTIONS REFERENCE MANUAL
W342	CS/CJ/CP/NSJ Series Communications Commands REFERENCE MANUAL
W345	CS/CJ Series Analog I/O Units AD/DA/MAD42 OPERATION MANUAL
W368	CS/CJ Series Analog I/0 Units OPERATION MANUAL
W466	CJ Series Universal Input Units OPERATION MANUAL
W396	CJ Series Temperature Control Units OPERATION MANUAL
W401	High-speed Counter Units OPERATION MANUAL
W465	EtherNet/IP Units OPERATION MANUAL
W420	CS and CJ Series Ethernet Units OPERATION MANUAL Construction of Networks
W343	CS/CJ Series Ethernet Units OPERATION MANUAL
W421	CS/CJ Series Ethernet Units OPERATION MANUAL Construction of Applications
Z174	CS/CJ Series ID SENSOR UNITS OPERATION MANUAL
W397	CJ Series Position Control Units CJ1W-NC□□3 OPERATION MANUAL
W477	CJ Series Position Control Units CJ1W-NC□□4 OPERATION MANUAL
W336	CS/CJ Series Serial Communications Boards Serial Communications Units OPERATION MANUAL
W426	CS/CJ Series Position Control Units CS1W-NC□□1/CJ1WNC□□1-MA OPERATION MANUAL
W435	CS/CJ series Motion Control Unit CS1W/CJ1W-MCH71OPERATION MANUAL
W467	Controller Link Support Boards for PCI Bus INSTALLATION GUIDE
W309	Controller Link Units OPERATION MANUAL
V237	SPU-Console Ver.2.1 OPERATION MANUAL
W406	CS/CJ Series Loop Control Boards/Process-control CPU Units /Loop-control CPU Units OPERATION MANUAL
W407	CS/CJ Series Loop Control Boards/Process-control CPU Units /Loop-control CPU Units FUNCTION BLOCK REFERENCE MANUAL
W463	CX-One FA Integrated Tool Package SETUP MANUAL
W446	CX-Programmer OPERATION MANUAL
W447	CX-Programmer OPERATION MANUAL：Function Blocks/Structured Text
W469	CX-Programmer OPERATION MANUAL SFC Programming
W366	CX-Simulator OPERATION MANUAL
W464	CX-Integrator OPERATION MANUAL
W433	CX-Position OPERATION MANUAL
W436	CX-Motion-NCF OPERATION MANUAL
W448	CX-Motion-MCH OPERATION MANUAL

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MEMO

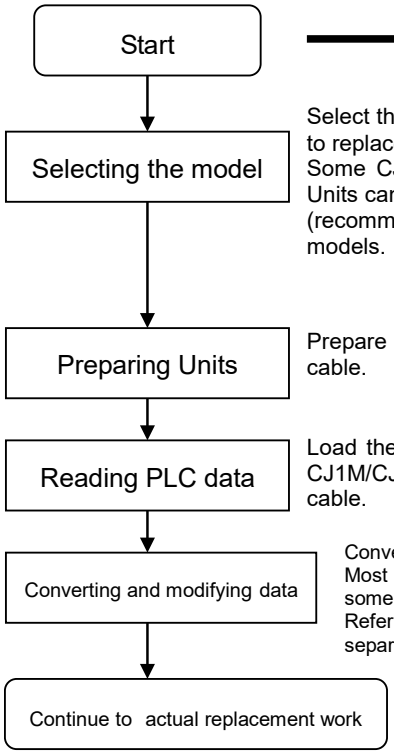
Replacement guide from CJ1M/CJ1G to CJ2

Table of Contents

This replacement guide describes the procedure to rebuild the system which uses the CJ1-series PLC by introducing the CJ2M-series PLC instead. The CJ2M-series has functions which can replace the functions and operation of CJ1-series PLC. Take the below work flow to replace your system. Also, refer to the reference pages for details.

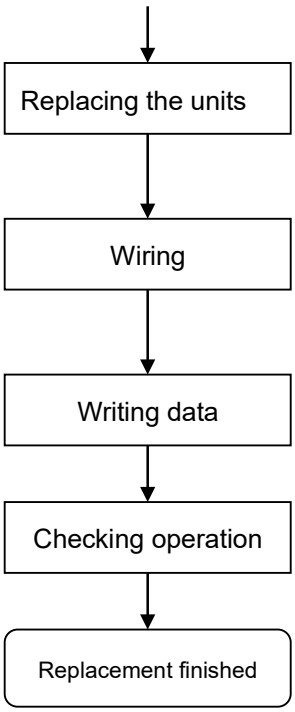
Work flow

1) Preparation: Before starting replacement, prepare according to the following steps.



	Description	Reference Pages
Selecting the model	Select the unit, programming software, and connecting cable to replace CJ1 with CJ2M. Some CJ1 Units can be used with CJ2M. However, some Units can not be used with CJ2M. Read the reference pages (recommended models and precautions) and select the models.	1. Performance specifications 2. System Configurations
Preparing Units	Prepare the units, programming software, and connecting cable.	
Reading PLC data	Load the program, I/O Memory and other settings from the CJ1M/CJ1G using the programming software and connecting cable.	4.Example of converting ladder program by CX-Programmer
Converting and modifying data	Convert the data read from CJ1 for CJ2M. Most of the data can be automatically converted; however, some instructions and some Unit data can not be converted. Refer to the reference pages and modify the data and program separately.	4.Example of converting ladder program by CX-Programmer

2) Actual replacement work: Take the steps below to replace the CJ1M/CJ1G to CJ2M.



	Description	Reference pages
Replacing the units	Replace the units. *Refer to CJ-series CJ2 CPU Unit Hardware User's Manual (Cat. No. W472) and user's manuals of each Special Units for installation of the unit.	Refer to the related manuals.
Wiring	Perform wiring for the replacement unit. *Refer to CJ-series CJ2 CPU Unit Hardware User's Manual (Cat. No. W472) and user's manuals of each Special Units for information of wiring.	
Writing data	Write the data acquired and converted from CJ1M/CJ1G (programs, IO memory, setting data) to CJ2M. Check the wirings by operating In/Out signals	
Checking operation	Turn ON the power to the controller and check the operation.	
Replacement finished	Notes: In some systems, cycle time needs to be adjusted because the cycle times in CJ1M/CJ1G and CJ2M are different and it may affect the operation.	

1. Performance specifications

1.1 CJ1M/CJ2M specifications comparison

The table below lists the major difference in specifications of the CJ1M series and CJ2M series.

Item		CJ1M-CPU**	CJ2M-CPU**
Number of I/O points		CPU*1: 160 points CPU*2: 320 points CPU*3: 640 points	2,560 points
Program capacity		CPU*1: 5k step CPU*2: 10k step CPU*3: 20k step	CPU*1: 5k step CPU*2: 10k step CPU*3: 20k step CPU*4: 30k step CPU*5: 60k step
Data memory		32k words	32k words
			EM CPU*1 to *3: 1 bank (32k) CPU*4 to *5: 4 banks (32k x 4)
Built-in I/O		CJ2*: In:10 points/Out:6 points	CPU Unit funcitons will be available by mounting CJ2M-MD211/CJ2M-MD212. Up to two units can be mounted. In:10 points/Out:6 points (when one unit is used) In:20 points/Out:12 points (when two units are used) Attention: It is possible to use the unit with the CPU Unit of unit version 2.0 or later.
Length of instructions		1-7 steps/one instruction	1-30 steps/one instruction
Execution time of instruction	LD instruction	0.10us	0.04us
	MOV instruction	0.30us	0.12us
Overhead processing time		CPU*1: 0.7ms CPU*2/*3: 0.5ms	CPU3*: 270us CPU1*: 160us
Maximum Number of Connectable Units		CPU*1/CPU*2: 10 units CPU*3: 20 units	40 units
Maximum Number of Expansion Racks		CPU*1/CPU*2: No expansion CPU*3: 1	3
Clock function		Equipped as a standard function	Equipped as a standard function
Dimensions (CPU Unit)		CPU*1: 90(H)x31(W)x65(D) CPU*2: 90(H)x49(W)x65(D)	CPU*1: 90(H) x 31(W) x 75(D) CPU*3: 90(H) x 62(W) x 75(D)
Programming software		CX-Programmer	CX-Programmer
Programming device connection	Programming device for personal computer	< Peripheral port connection > Connection with PC requires cables: CS1W-CN*** or CS1W-CN118 + XW2Z-***S-** < RS232C port connection > Connection with PC requires cables: XW2Z-***S-CV or XW2Z-***S (-V) .	< Peripheral (USB) port > A direct connection can be made between the USB port of the personal computer and the PLC using the commercially-available USB cable < Serial (RS232C) port connection > Use the serial cable (XW2Z-200S-CV/500S-CV) to connect the PC and serial port on the CPU Unit. (The CPU3* does not have the RS232C port on it. Mount the RS232C option board (CP1W-CIF01) and connect the cable with the unit)
	Programming console	Available C200H-PRO27 CQM1-PRO01	Not supported

1.2 CJ1G/CJ2M specifications comparison

The table below lists the major difference in specifications of the CJ1G and CJ2M series.

Item		CJ1G-CPU4*H/CPU4*	CJ2M-CPU**
Number of I/O points		CPU42H/43H: 960 points CPU44/45/44H/45H: 1280 points	2,560 points
Program capacity		CPU42H: 10k step CPU43H: 20k step CPU44/44H: 30k step CPU45/45H: 60k step	CPU*1: 5k step CPU*2: 10k step CPU*3: 20k step CPU*4: 30k step CPU*5: 60k step
Data memory		32k words	32k words
			EM CPU*1 to *3: 1 bank (32k) CPU*4 to *5: 4 banks (32k x 4)
Built-in I/O		-	Built-in CPU funciton will be available by adding the CJ2M-MD211/CJ2M-MD212. Up to two units can be mounted. In:10 points/Out:6 points (when one unit is used) In:20 points/Out:12 points (when two units are used) Attention: It is possible to use the unit with the CPU Unit of unit version 2.0 or later.
Length of instructions		1-7 steps/one instruction	1-30 steps/one instruction
Execution time of instruction	LD instruction	CPU4*H: 0.04us CPU4*: 0.08us	0.04us
	MOV instruction	CPU4*H: 0.20us CPU4*: 0.29us	0.12us
Overhead processing time		CPU4*H : 0.3ms CPU4*: 0.5ms	CPU3*: 270us CPU1*: 160us
Maximum number of connectable units		40 units	40 units
Maximum number of Expansion Racks		3	3
Clock function		Equipped as a standard function	Equipped as a standard function
Dimensions (CPU Unit)		90(H) x 62(W) x 65(D)	CPU1*: 90(H) x 31(W) x 75(D) CPU3*: 90(H) x 62(W) x 75(D)
Programming software		CX-Programmer	CX-Programmer
Programming device connection	Programming device for personal computer	< Peripheral port connection > Connection with PC requires cables: CS1W-CN*** or CS1W-CN118 + XW2Z-***S-** < RS232C port connection > Connection with PC requires cables: XW2Z-***S-CV or XW2Z-***S(-V)	< Peripheral (USB) port > A direct connection can be made between the USB port of the personal computerand the PLC using the commercially-available USB cable < Serial (RS232C) port connection > Use the serial cable (XW2Z-200S-CV/500S-CV) to connect the PC and serial port on the CPU Unit. (The CPU3* does not have the RS232C port on it. Mount the RS232C option board (CP1W-CIF01) and connect the cable with the unit)
	Programming console	Available C200H-PRO27 CQM1-PRO01	Not supported.

2. System Configurations

2.1 CJ1M/CJ1G/CJ2M system comfiguration comparison

Same Power Supply Unit, Special I/O Units, and Basic I/O Unit can be used for CJ1M/CJ1G Series and CJ2M Series.

♦Built-in I/O

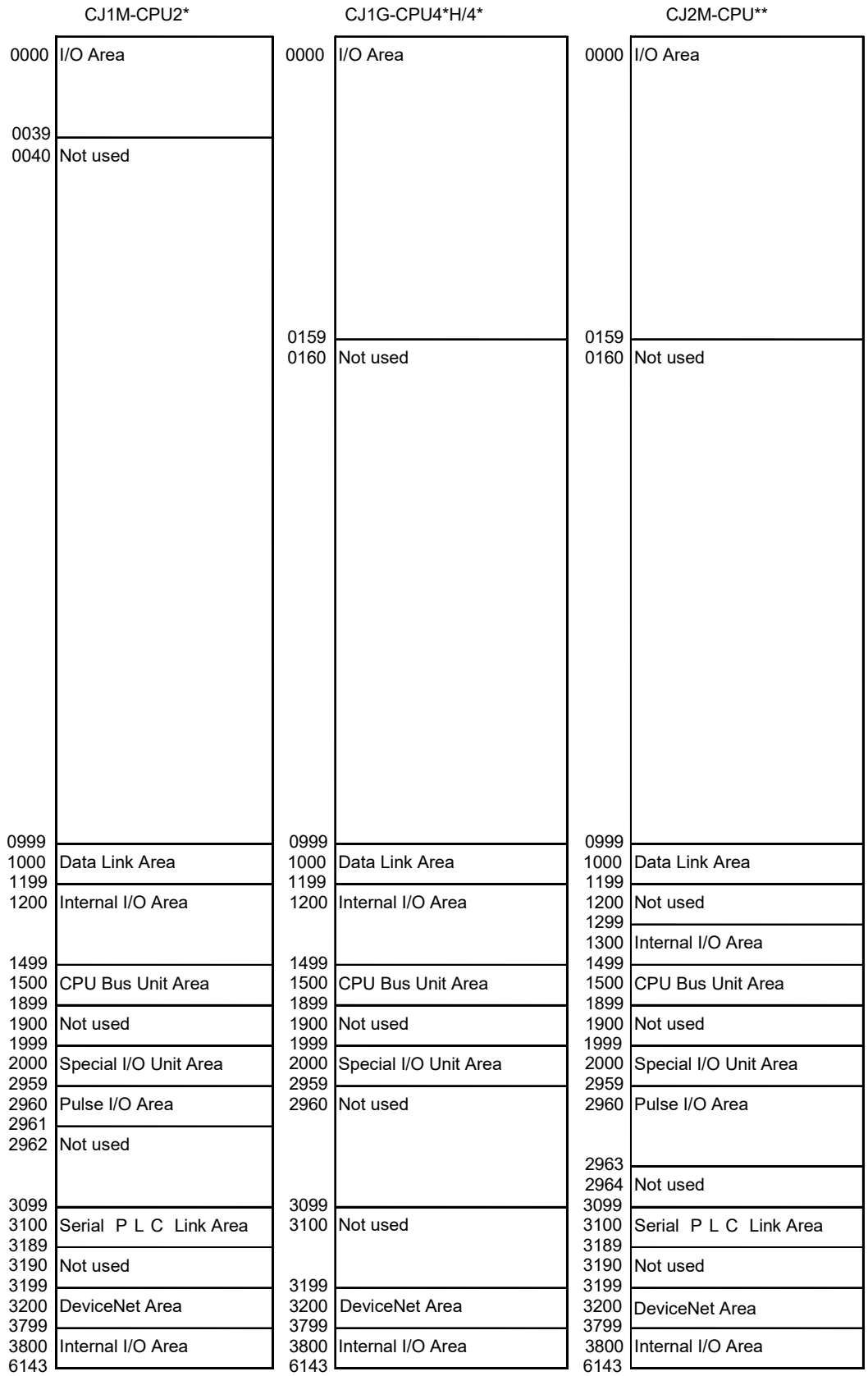
CJ1M	CJ1G	CJ2M
Built-in I/O function	Built-in I/O function not supported	CPU funcitons will be available by adding the CJ2M-MD211/CJ2M-MD212 Up to two units can be mounted. *It is possible to use the unit with the CPU Unit of unit version 2.0 or later
In:10 points/Out:6 points Supported by CPU2* only	-	In:10 points/Out:6 points (when one unit is used) In:20 points/Out:12 points (when two units are used)

3. Memory area

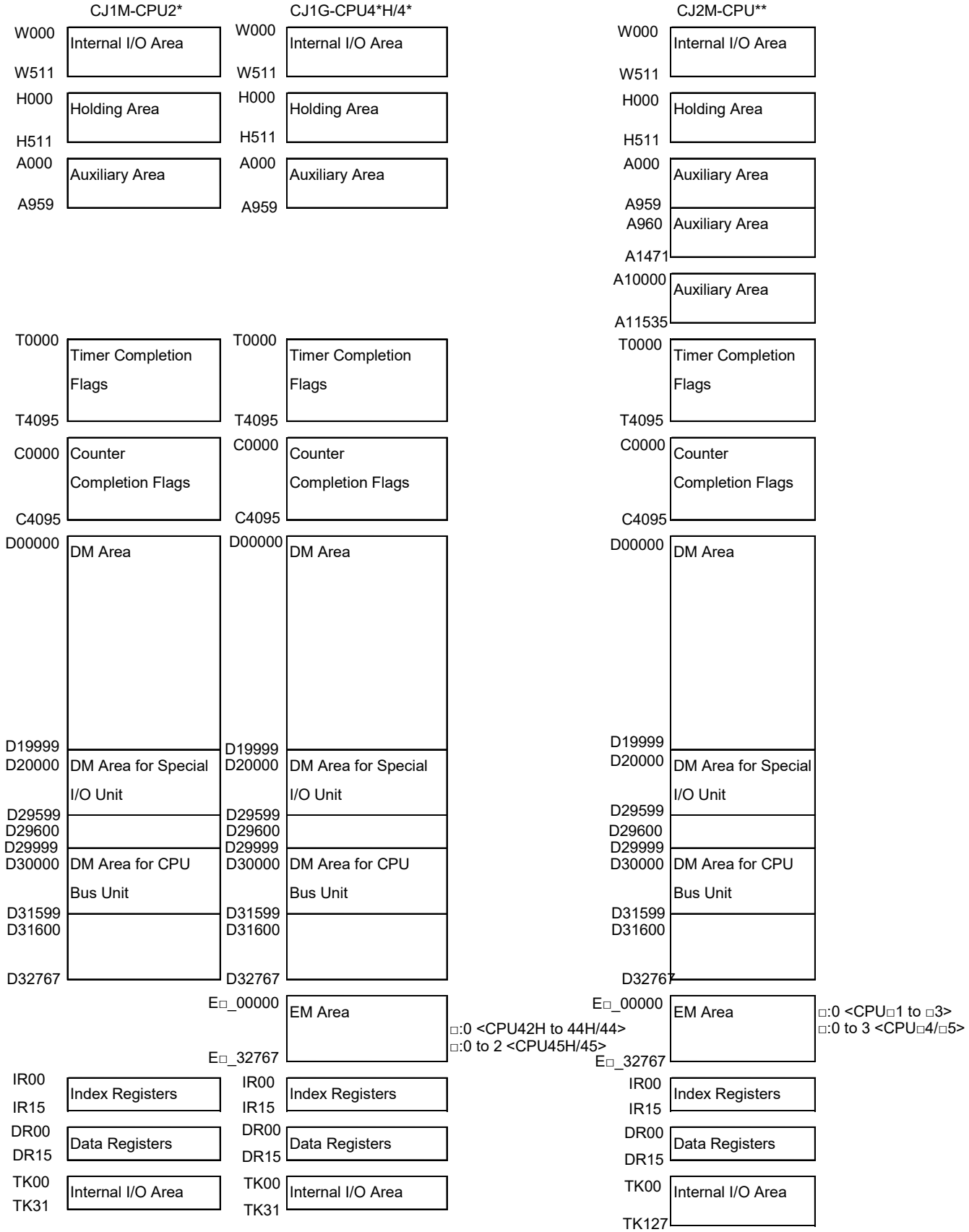
3.1 CJ1M/CJ1G/CJ2M memory area comparison

This section explains the difference of the memory area of the CJ1M series, CJ1G series and CJ2M series, using an example of CJ1M-CPU2*, CJ1G-CPU4*H/4* and CJ2M-CPU**.

♦ CI/O area



♦ Area other than CIO Area



4. Example of converting ladder program by CX-Programmer

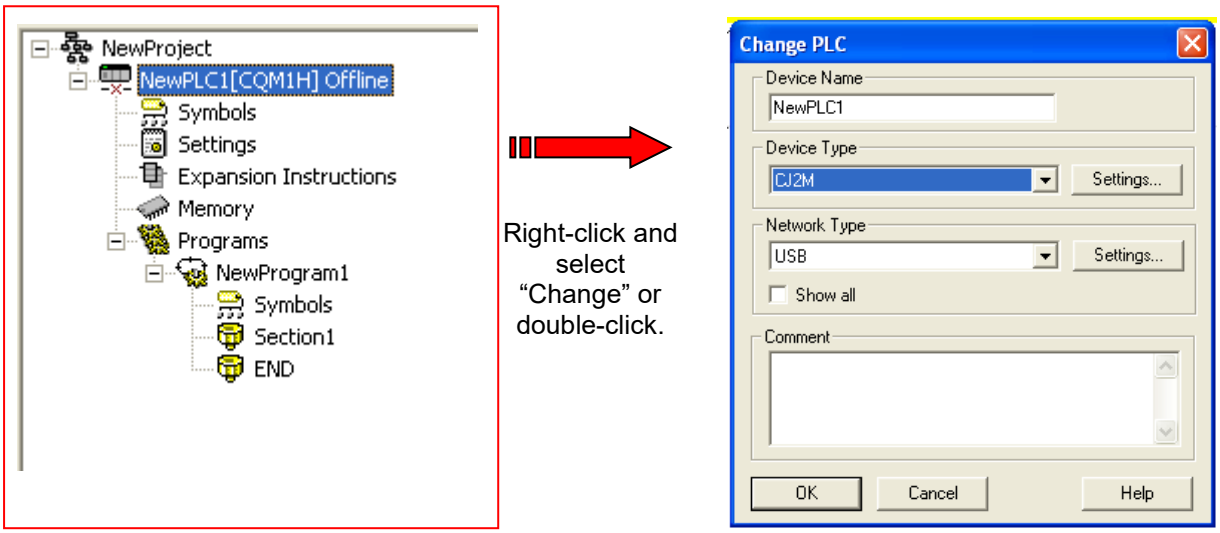
This section explains the method of converting the ladder program using CX-Programmer Ver.9.1. Here, convert the ladder program of CJ1M/CJ1G for CJ2M-CPU** as an example.

♦Changing model from CJ1M/CJ1G to CJ2M.

As shown on the below figure, select NewPLC1[CJ1M] and right-click or double click it to change the PLC model. Please set the CPU model to the Device Type.

The error report might be displayed if there are instructions which cannot be converted.

Please correct and modify the program using support software function or manually, and execute program check. If errors are detected by the program check, please correct them referring to the error report.



♦Checking program

Check whether there is problem in the ladder program which was converted from the CJ1M/CJ1G series for CJ2M series.

■Program check

There are 2 types of program check; automatic check on the CX-Programmer and check conducted by users. CX-Programmer checks the program when "Change model" is executed and the ledder program is converted.

• Automatic program checks on the CX-Programmer

Timing of program check	Description
When PLC model is changed.	Program check for each PLC model Check for all instructions and all operands.

You can see the check result on the "Compile (Program check)" tab of the Output Window.

The left bus-bar on the ladder section window turns red if there is an error in the rung.

• Program check conducted by users

This section describes the procedure of program check, an example of checking result, and explanation of error levels.

<Program check for one program (task)>

1. Select the ladder section window or nimonic window to check.
2. Select ***Program – Compile (Program check)***.

   The results of program check will be displayed on the Output Window. Refer to *Results of program check* on the next page for details.

- Checking the entire program

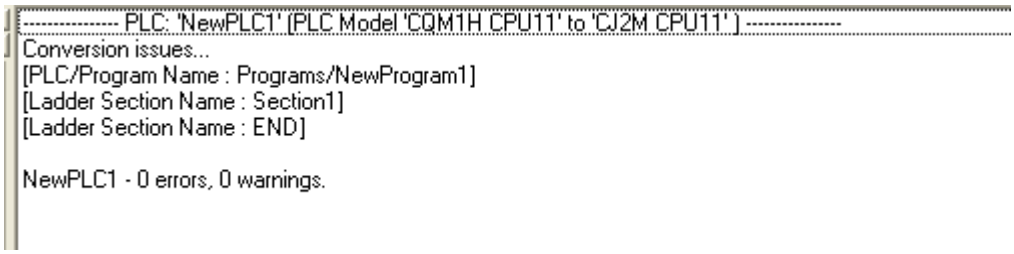
  Select ***PLC – Compile All PLC Programs***.

You can see the program check results on the Output Window.
Refer to *Results of program check* for details.

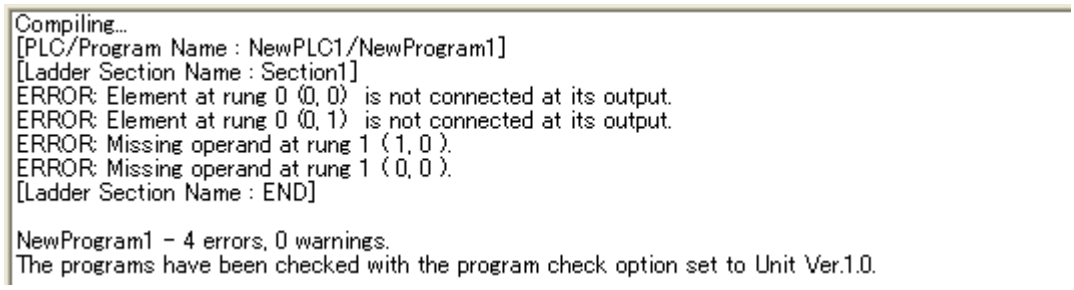
<Results of program check>

You can see the check result on the "Compile (Program check)" tab of the Output Window.
There are three error levels; errors are divided and shown for each level.

When there is no error.



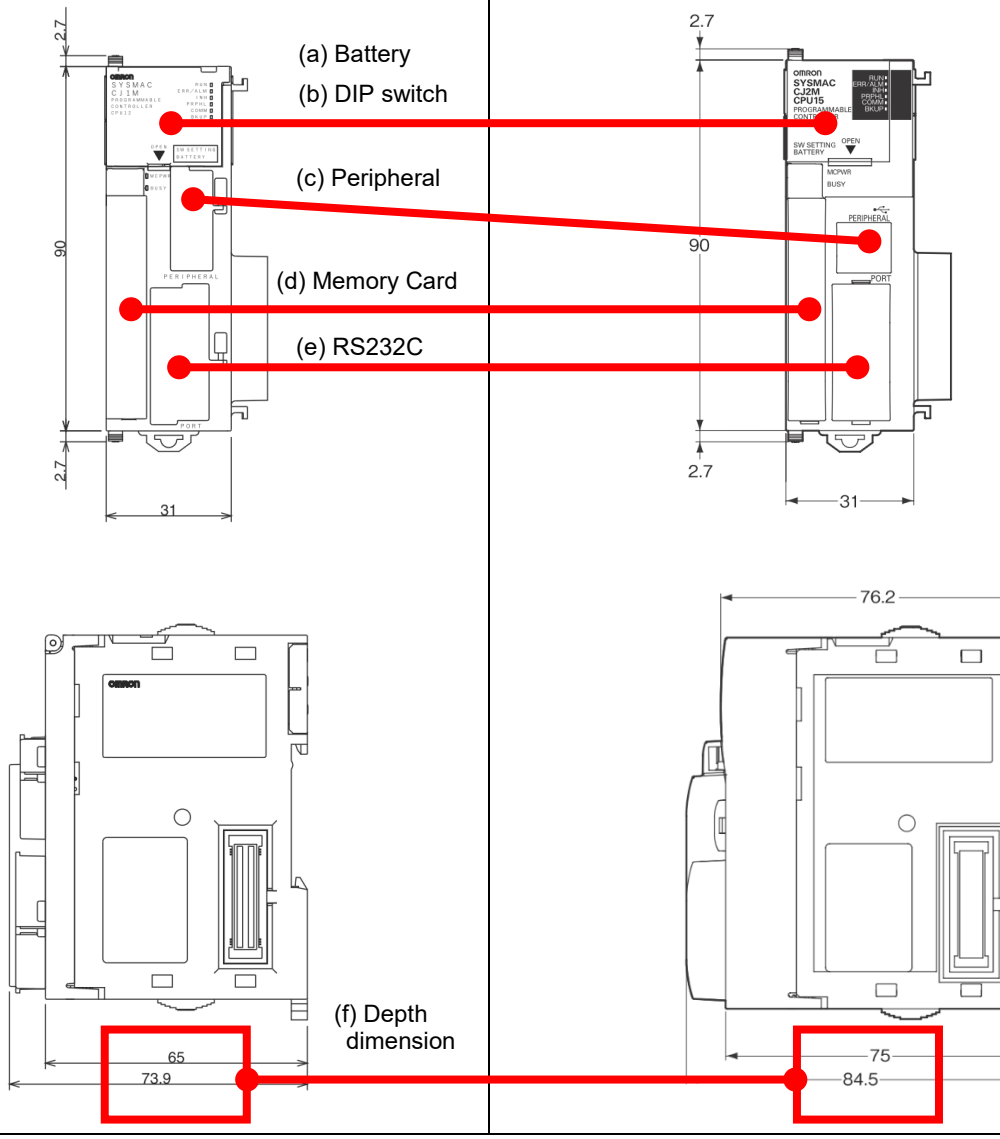
When there are errors.



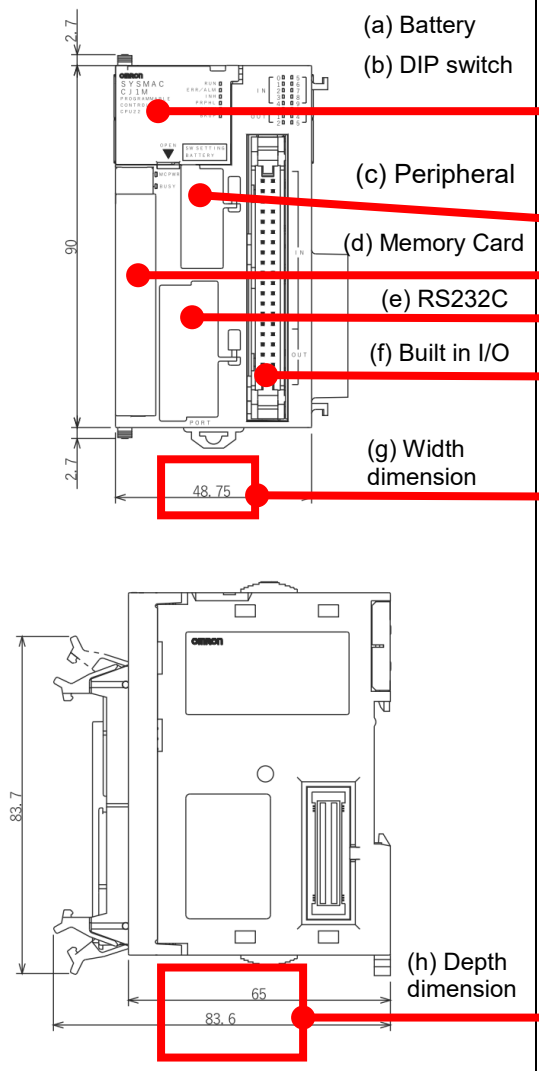
Double-click an error on the Output Window to jump to the correposnding cell.
Numeric data in (,) shows the position of a cell with an error.
If you right-click on the Output Window, below menus are shown.

Menu	Functions
[Clear]	Clears the content of Output Window. Same as selecting “Edit” – “Clear Compile Window”.
[Next Reference]	Jump to the error cell next to the error now selected. Same as selecting “Edit” – “Next Reference”.
[Allow Docking]	Output Window is shown on the main window of the CX-Programmer. If unckeck the check box, Output Window will be shown on the separate window.
[Hide]	Close the output window. Same as selecting “View” – “Window” – “Output”.
[Float In Main Window]	Output window will be changed to other window (ex. Ladder section window).

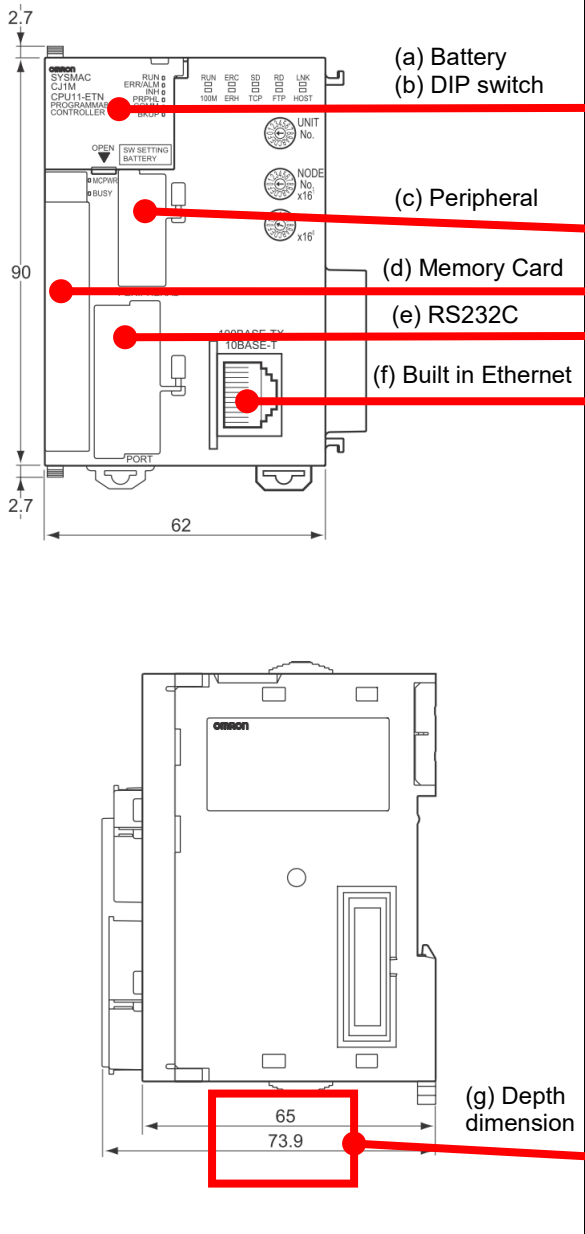
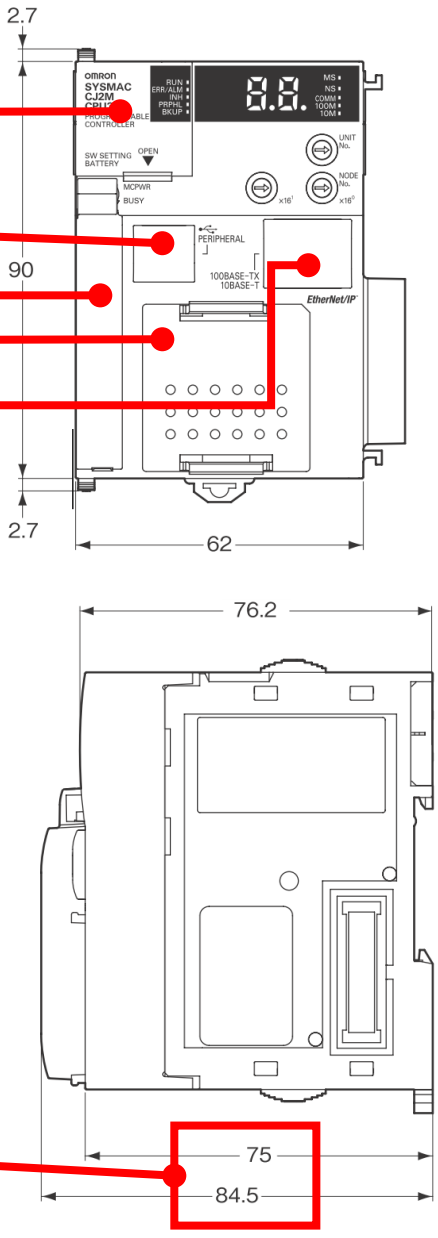
Appendix 1. CJ1M/CJ2M Appearance comparison

CJ1M-CPU11/12/13	CJ2M-CPU11/12/13/14/15
	

(a) Battery : Common to all models (use CJ1W-BAT01)
(b) DIP switch : CJ2M does not use SW4 (Setting Peripheral port) (Other switches are common to all models)
(c) Peripheral : CJ2M uses USB communication (See Appendix 2 for functional difference)
(d) Memory Card : Common to all models (use HMC-EFxxx)
(e) RS232C : Pin assignment and functions are common to all models.
(f) Depth dimension : CJ2M is about 10mm larger than CJ1M.

CJ1M-CPU21/22/23	CJ2M-CPU11/12/13/14/15, CJ2M-MD211
	

(a) Battery : Common to all models (use CJ1W-BAT01)
(b) DIP switch : CJ2M does not use SW4 (Setting Peripheral port) (Other switches are common to all models)
(c) Peripheral : CJ2M uses USB communication (See Appendix 2 for functional difference)
(d) Memory Card : Common to all models (use HMC-EFxxx)
(e) RS232C : Pin assignment and functions are common to all models.
(f) Built in I/O :
[Position] CJ1M is located on the right side and CJ2M is located on the left side.
[Wiring] Same. However, do not connect any signal other than “Power supply input (+V) for output” to pin 38. (See Appendix 3 for pin assignment)
[Operation] There are some differences in the operation of the interrupt input. (See Appendix 3 for functional differences)
(g) Width dimension : CJ2M is about 2mm larger than CJ1M.
(h) Depth dimension : CJ2M is about 10mm larger than CJ1M.

CJ1M-CPU11/12/13-ETN	CJ2M-CPU31/32/33/34/35
	

(a) Battery : Common to all models (use CJ1W-BAT01)
(b) DIP switch : CJ2M does not use SW4 (Setting Peripheral port) (Other switches are common to all models)
(c) Peripheral : CJ2M uses USB communication (See Appendix 2 for functional difference)
(d) Memory Card : Common to all models (use HMC-EFxxx)
(e) RS232C : CJ2M requires an optional board (CP1W-CIF01) to be installed.
(f) Built in Ethernet : Some functions cannot be used with the built-in EtherNet/IP of CJ2M (See Appendix 4)
(g) Depth dimension : CJ2M is about 10mm larger than CJ1M.

Appendix 2. CJ1M/CJ2M Peripheral function comparison

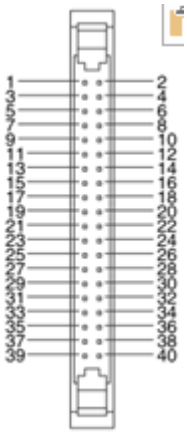
Function	CJ1M	CJ2M	Description
Programming console	Supported	Not Supported	CJ2M cannot use the programming console.
Tool Bus	Supported	Supported	
Host Link	Supported	Not Supported	Use CJ1W-SCUxx, if you use this function
NT Link (1: N)	Supported	Not Supported	Use CJ1W-SCUxx, if you use this function
Serial Gateway	Supported	Not Supported	Use CJ1W-SCUxx, if you use this function

Appendix 3. CJ1M/CJ2M Built in I/O function comparison

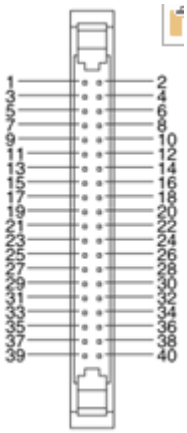
(1) Pin assignment

Note. CJ1M does not use Pin No.38, but CJ2M use as “Power supply input +V for output”. CJ2M does not affect operation if it is not connected. But remove the wiring if it is connecting to another signal.

[CJ1M-CPU21/22/23]

Pin layout	Terminal symbol	Input signal type	Pin No.	Terminal symbol	Input signal type	Pin No.
	IN0	24 VDC	1	IN1	24 VDC	2
		LD+	3		LD+	4
		0 V/LD-	5		0 V/LD-	6
	IN2	24 VDC	7	IN3	24 VDC	8
		LD+	9		LD+	10
		0 V/LD-	11		0 V/LD-	12
	IN4	24 VDC	13	IN5	24 VDC	14
		LD+	15		LD+	16
		0 V/LD-	17		0 V/LD-	18
	IN6	24 VDC	19	IN7	24 VDC	20
		LD+	21		LD+	22
		0 V/LD-	23		0 V/LD-	24
	IN8	24 VDC	25	IN9	24 VDC	26
		LD+	27		LD+	28
		0 V/LD-	29		0 V/LD-	30
	OUT0	---	31	OUT1	---	32
	OUT2	---	33	OUT3	---	34
	OUT4	---	35	OUT5	---	36
	Power supply input (+V) for output	---	37	Not used	---	38
	Output COM	---	39	Output COM	---	40

[CJ2M-MD211]

Pin layout	Terminal symbol	Input signal type	Pin No.	Terminal symbol	Input signal type	Pin No.
	IN0/IN10	24 VDC	1	IN1/IN11	24 VDC	2
		LD+	3		LD+	4
		0 V/LD-	5		0 V/LD-	6
	IN2/IN12	24 VDC	7	IN3/IN13	24 VDC	8
		LD+	9		LD+	10
		0 V/LD-	11		0 V/LD-	12
	IN4/IN14	24 VDC	13	IN5/IN15	24 VDC	14
		LD+	15		LD+	16
		0 V/LD-	17		0 V/LD-	18
	IN6/IN16	24 VDC	19	IN7/IN17	24 VDC	20
		LD+	21		LD+	22
		0 V/LD-	23		0 V/LD-	24
	IN8/IN18	24 VDC	25	IN9/IN19	24 VDC	26
		LD+	27		LD+	28
		0 V/LD-	29		0 V/LD-	30
	OUT0/OUT10	---	31	OUT1/OUT11	---	32
	OUT2/OUT12	---	33	OUT3/OUT13	---	34
	OUT4/OUT14	---	35	OUT5/OUT15	---	36
	Power supply input (+V) for output	---	37	Power supply input (+V) for output	---	38
	Output COM	---	39	Output COM	---	40

(2) Functional differences for Interrupt inputs

The following operation differences exist between CJ1M / CJ2M in the interrupt input function. If used, check that the operation is not affected.

Interrupt Inputs	CJ1M	CJ2M	Description
Update method for interrupt counter SV (Counter Mode)	Updating interrupt counter SV in Auxiliary Area	Updating interrupt counter SV in Auxiliary Area and then executing MSKS again to enable interrupts	Add MSKS instruction, if you use this operation.
Update method for interrupt counter PV (Counter Mode)	· Updating with INI instruction · Updating interrupt counter PV in Auxiliary Area	Updating with INI instruction	Change to INI instruction, if you use Auxiliary for updating.
Updating timing for interrupt counter PV (Counter Mode)	·Once per count ·When PRV instruction is executed	·Every cycle ·When count completion interrupt occurs ·When PRV instruction is executed	Make sure that it does not affect operation. If it is affected, it is necessary to change the program etc.
Operation of interrupt counter when interrupts are disabled with DI instruction	Counter operation not countinued	Counter operation continued, but interrupt will not occur at count completion	Make sure that it does not affect operation. If it is affected, it is necessary to change the program etc.

Appendix 4. CJ1M/CJ2M Built in Ethernet function comparison

Function	CJ1M Built in Ethernet	CJ2M Built in EtherNet/IP	Description
Tag data link communications service	Not supported	Supported	
CIP message communications service	Not supported	Supported	
FINS/UDP service	Supported	Supported	
FINS/TCP service	Supported	Supported	
File transfer (FTP)	Supported	Supported	
Web functions	Supported	Not supported	Use CJ1W-ETN21, if you use this function
Automatic adjustment of PLC's internal clock	Supported	Supported	
Simple backup function	Supported	Supported	
Error log	Supported	Supported	
Response to PING command	Supported	Supported	
SNMP/SNMP trap	Not supported	Supported	
CIDR function for IP addresses	Not supported	Supported	
Online connection by EtherNet/IP using CX-One	Not supported	Supported	
Online connection by Ethernet (FINS) using CX-One	Supported	Supported	
Online connection by EtherNet/IP using Network Configurator	Not supported	Supported	

MEMO

Note: Do not use this document to operate the Unit.

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Cat. No. P068-E1-03 0320(1210)