Programmable Controller CP1L

Replace Guide
From CP1L to CP2E

CP2E-E□□DR-A
CP2E-S□□D□-□
CP2E-N□□D□-□
CP1L-L□□D□-□
CP1L-M□□D□-□
CP1L-EL□□D□-D
CP1L-EM□□D□-D

P177-E1-01

■ Introduction

This replacement guide assumes replacement of the CP1L with the CP2E and no changes to the operation or functions.

The contents include references for selection, configuration of settings, and wiring. No precautions for correct use are included. Be sure to obtain the user's manuals for both the source and target replacement models and refer to these manuals for necessary usage information—including precautions for correct use—and for verifying operation is satisfactory.

■ Intended Audience

This guide is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of introducing FA devices.
- Personnel in charge of designing FA systems.
- Personnel in charge of managing FA facilities.

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■ Related Manuals

Man. No.	Model	Manual
W462	CP1L-L10D□-□ CP1L-L14D□-□ CP1L-L20D□-□ CP1L-M30D□-□ CP1L-M40D□-□ CP1L-M60D□-□	SYSMAC CP Series CP1L CPU Unit OPERATION MANUAL
W516	CP1L-EL20D□-□ CP1L-EM30D□-□ CP1L-EM40D□-□	SYSMAC CP Series CP1L-EL/EM CPU Unit OPERATION MANUAL
W451	CP1H-X40D□-□ CP1H-XA40D□-□ CP1H-Y20DT-D CP1L-L10D□-□ CP1L-L14D□-□ CP1L-L20D□-□ CP1L-M30D□-□ CP1L-M40D□-□ CP1L-L60D□-□	SYSMAC CP Series CP1H/CP1L CPU Unit PROGRAMMING MANUAL
W613	CP2E-E□□D□-□ CP2E-S□□D□-□ CP2E-N□□D□-□	CP2E CPU Unit Hardware User's Manual
W614	CP2E-E□□D□-□ CP2E-S□□D□-□ CP2E-N□□D□-□	CP2E CPU Unit Software User's Manual
W483	CP1E-E□□D□-□ CP1E-N□□D□-□ CP2E-E□□D□-□ CP2E-S□□D□-□ CP2E-N□□D□-□	CP1E/CP2E CPU Unit Instructions Reference Manual
W446	CXONE-AL□□D-V4	CX-ProgrammerVer.9.□ Operation Manual

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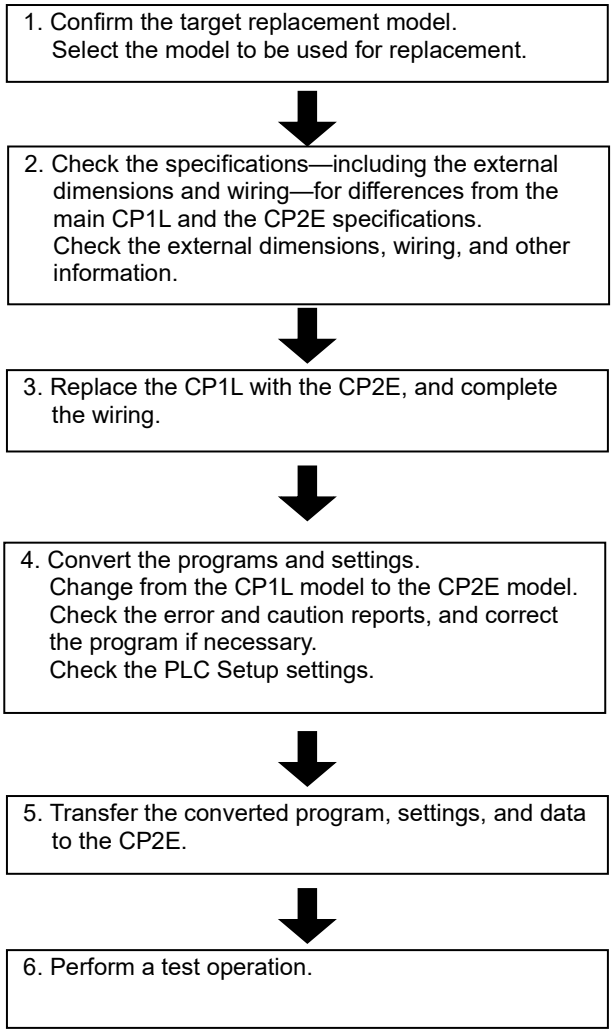
Replacement flow

The procedure to replace the CP1L with the CP2E is as follows. (Each number shows the number of the section)



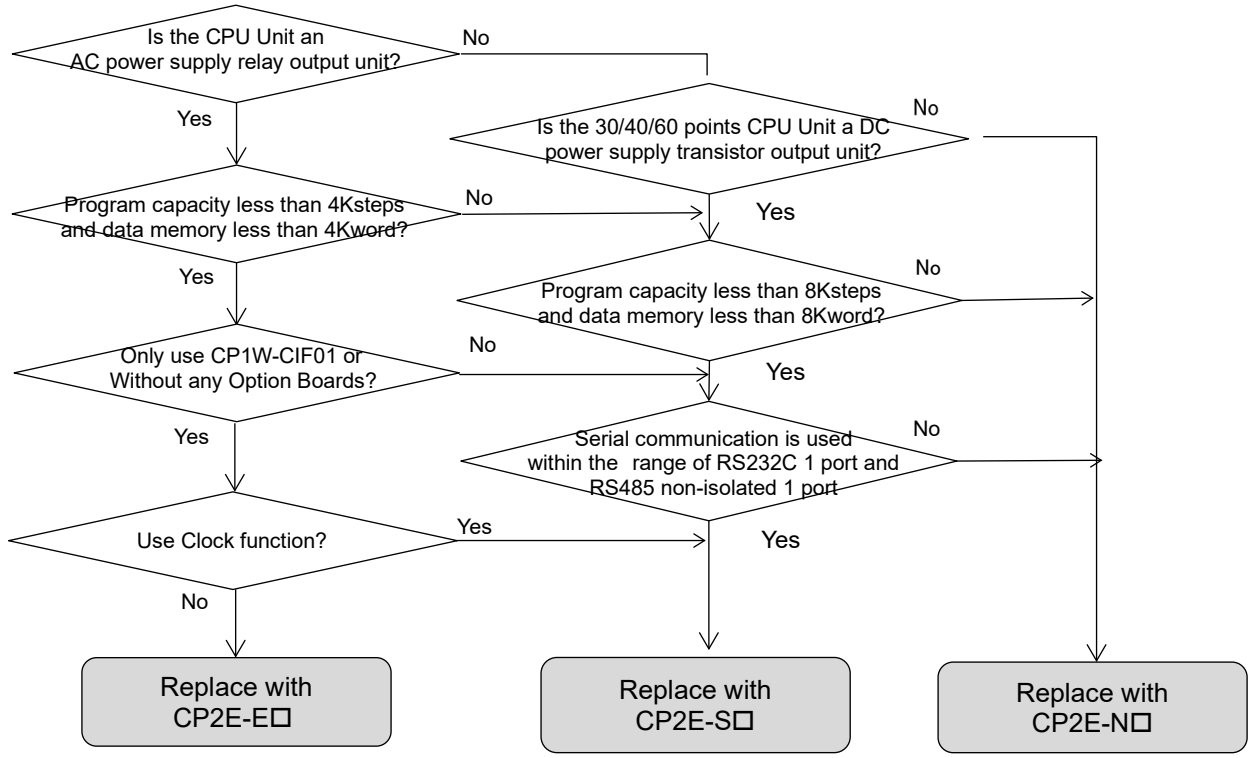
Precautions for Correct Use

- **This guide provides the procedure to replace the CP1L with the CP2E. However, there are differences in functions and performance between these two models, and not all CP1L can be replaced with the CP2E. Please refer to this guide and the manuals to examine replacement carefully.**
- **After replacement, please perform trial operation before starting actual operation and check that the system operates correctly. This guide does not include sufficient specifications for replacement. Please refer to the manuals listed on the *Related Manuals* page and check the specifications before continuing.**

1. Replacement Model Confirmation

< Precaution for replacement >
Note that the dimensions, specifications, programs, settings, terminal arrangements, and other aspects may be changed by replacing the CP1L with the CP2E. Please refer to this replacement guide and the user's manuals of the CP1L and CP2E for details.

● Using CP1L-L□□D□-□ or CP1L-M□□D□-□



Model being replaced: CP1L-L□/M□	Model used for replacement:		
	CP2E-E□	CP2E-S□	CP2E-N□
CP1L-L10D□-□	CP2E-E14DR-A	-	CP2E-N14D□-□
CP1L-L14D□-□	CP2E-E14DR-A	-	CP2E-N14D□-□
CP1L-L20D□-□	CP2E-E20DR-A	-	CP2E-N20D□-□
CP1L-M30D□-□	CP2E-E30DR-A	CP2E-S30D□-□	CP2E-N30D□-□
CP1L-M40D□-□	CP2E-E40DR-A	CP2E-S40D□-□	CP2E-N40D□-□
CP1L-M60D□-□	CP2E-E60DR-A	CP2E-S60D□-□	CP2E-N60D□-□

*: Replacing the communication port with the Option Board
If using the CP1W-CIF41 Ethernet Option Board, replace the CP1W-CIF41 with the CP2E-N Built-In Ethernet Port. The CP1W-CIF41 cannot be mounted on the CP2E-N□□.

● Using CP1L-EL□□D□-D or CP1L-EM□□D□-D
Replace with CP2E-N□□ D□-D.

Model being replaced: CP1L-EL□/EM□	Model used for replacement: CP2E-N□
CP1L-EL20D□-D	CP2E-N20D□-D
CP1L-EM30D□-D	CP2E-N30D□-D
CP1L-EM40D□-D	CP2E-N40D□-D

* Refer for replacing from CP1L to CP2E.
Appendix 1 Specification and Performance Comparison Between CP1L and CP2E
Appendix 2. Expansion Units, Option Boards, Cables, Batteries
Appendix 3. Instraction Comparison Between CP1L and CP2E

2. Main Specifications and Differences Between CP1L and CP2E

2.1. Dimensions

Although the dimensions of the CP1L and the CP2E are different, the two models are almost identical.
*: No 10-point CPU Unit is available for the CP2E. Replace with a CPU Unit with 14 points or more.

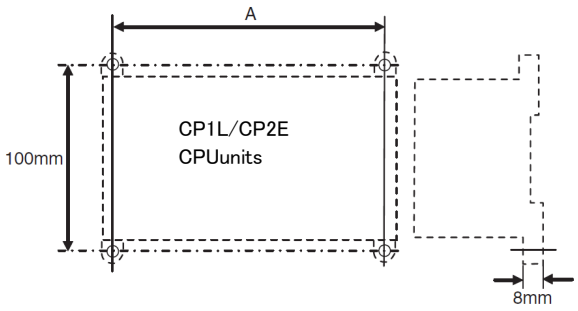
Dimension comparison table

I/O points	Dimensions (W x H x D) (mm)		
	CP1L-L□/M□	CP1L-EL□/EM□	CP2E
10 points	66×90×85	-	-
14 points	86×90×85	-	86×90×80
20 points	86×90×85	130×90×85	86×90×80
30 points	130×90×85	130×90×85	130×90×80
40 points	150×90×85	150×90×85	150×90×80
60 points	195×90×85	-	195×90×80

2.2. Mounting

The DIN track and screw hole dimensions are the same as for the CP2E except CP1L-EL20□.

I/O points	Mounting hole pitch, A (mm)		
	CP1L-L□/M□	CP1L-EL□/EM□	CP2E
10 points	56±0.5	-	-
14 points	76±0.5	-	76±0.5
20 points	76±0.5	120±0.5	76±0.5
30 points	120±0.5	120±0.5	120±0.5
40 points	140±0.5	140±0.5	140±0.5
60 points	185±0.5	-	185±0.5



2.3. Expansion (I/O) Units

All CP1W Expansion (I/O) Units connectable to the CP1L can be used with the CP2E.
The 14-point/20-point CP1L can connect one expansion I/O, but the 14-point/20-point CP2E cannot connect expansion I/O. When using an expansion unit, please use the 30-point type.

2.4. Option Boards

CP2E cannot use the LCD option board: CP1W-DAM01.
For monitoring and configuring items such as the data memory of the CP2E, please use a Programmable Terminal or equivalent device.
The CP1W-CIF41 cannot be used with the CP2E. If using the CP1W-CIF41 with the CP1L, use the built-in Ethernet port of CP2E-N□.

2.5. Memory cassette

CP2E cannot use memory cassette: CP1W-ME05M.
Please use CX-Programmer for uploading and downloading programs.

2.6. Supply Voltage

Although the power supply voltage and operating voltage range of the CP1L and CP2E are the same, the power consumption increases depending on the model.
Change to an appropriate power supply if power supply capacity is insufficient.

2.7. External Power Supply

CP2E has an external power supply function in the 30/40/60 point AC power type, but not in the 14/20 point type. When using an external power supply, please use a switching power supply.

2.8. I/O Function Assignment

The CP2E has been changed from the CP1L, so please consider it carefully when replacing it.

(1) Input interrupt, quick-response input function

The function assignment has been changed. The CP2E-N☐ includes an increased number of interrupt inputs and quick-response inputs.

Contact function assignments

Input contact	CP1L		
	CP1L-L10☐	CP1L-L14☐	CP1L-L20/M30/M40/M60☐ CP1L-EL20/EM30/EM40☐
0.04	Interrupt input 0/ Quick-response input 0	Interrupt input 0/ Quick-response input 0	Interrupt input 0/Quick-response input 0
0.05	Interrupt input 1/ Quick-response input 1	Interrupt input 1/ Quick-response input 1	Interrupt input 1/Quick-response input 1
0.06	—	Interrupt input 2/ Quick-response input 2	Interrupt input 2/Quick-response input 2
0.07	—	Interrupt input 3/ Quick-response input 3	Interrupt input 3/Quick-response input 3
0.08	—	—	Interrupt input 4/Quick-response input 4
0.09	—	—	Interrupt input 5/Quick-response input 5

Input contact	CP2E	
	CP2E-S/E☐、CP2E-N14☐	CP2E-N20/30/40/60☐
0.02	Interrupt input 2/Quick-response input 2	Interrupt input 2/Quick-response input 2
0.03	Interrupt input 3/Quick-response input 3	Interrupt input 3/Quick-response input 3
0.04	Interrupt input 4/Quick-response input 4	Interrupt input 4/Quick-response input 4
0.05	Interrupt input 5/Quick-response input 5	Interrupt input 5/Quick-response input 5
0.06	Interrupt input 6/Quick-response input 6	Interrupt input 6/Quick-response input 6
0.07	Interrupt input 7/Quick-response input 7	Interrupt input 7/Quick-response input 7
0.08	—	Interrupt input 8/Quick-response input 8
0.09	—	Interrupt input 9/Quick-response input 9

(2) High-speed counter input function changes

The function assignment has been changed. CP2E's summing pulse input does not support a Z-phase reset input. Counter 0/1 of CP2E cannot be used with a mixture of the quadruple quadruple/addition and subtraction method and the pulse + direction method.CP1L target match comparison compares CP2E to all target values in the table, regardless of the order of the comparison table.compares according to the order in which the comparison table is set.

Contact function assignments

Input contact	CP1L-L14/L20☐, CP1L-M☐, CP1L-EL/EM☐	
	Increment pulse	Differential phase or up/down or Pulse + direction
0.00	High-speed counter 0	High-speed counter 0 (phase A/increment/pulset)
0.01	High-speed counter 1	High-speed counter 0 (phase B/decrement/direction)
0.02	High-speed counter 2	High-speed counter 1 (phase A/increment/pulset)
0.03	High-speed counter 3	High-speed counter 1 (phase B/decrement/direction)
0.04	High-speed counter 0 (phase Z/reset)	High-speed counter 0 (phase Z/reset)
0.05	High-speed counter 1 (phase Z/reset)	High-speed counter 1 (phase Z/reset)
0.06	High-speed counter 2 (phase Z/reset) *	-
0.07	High-speed counter 3 (phase Z/reset) *	-

*CP1L-L10 do not have input contact 0.06 and 0.07

Input contact	CP2E		
	Increment pulse	Differential phase or up/down	Pulse + direction
0.00	High-speed counter 0	High-speed counter 0 (phase A/increment)	High-speed counter 0 (pulse)
0.01	High-speed counter 1	High-speed counter 0 (phase B/decrement)	High-speed counter 1 (pulse)
0.02	High-speed counter 2	High-speed counter 1 (phase A/increment)	High-speed counter 0 (direction)
0.03	—	High-speed counter 1 (phase B/decrement)	High-speed counter 1 (direction)
0.04	High-speed counter 3	High-speed counter 0 (phase Z/reset)	High-speed counter 0 (reset)
0.05	High-speed counter 4	High-speed counter 1 (phase Z/reset)	High-speed counter 1 (reset)
0.06	High-speed counter 5	—	—

Max. input frequency

High-speed counter	CP1L	CP2E-S/E□, CP2E-N14/N20□	CP2E-N30/N40/N60□
High-speed counter 0	Increment pulse: 100 kHz Increment/decrement pulse: 100 kHz Pulse + direction: 100 kHz Phase difference: 50 kHz	Increment pulse: 100 kHz Increment/decrement pulse: 100 kHz Pulse + direction: 100 kHz Phase difference: 50 kHz	Increment pulse: 100 kHz Increment/decrement pulse: 100 kHz Pulse + direction: 100 kHz Phase difference: 50 kHz
High-speed counter 1	Increment pulse: 100 kHz Increment/decrement pulse: 100 kHz Pulse + direction: 100 kHz Phase difference: 50 kHz	Increment pulse: 100 kHz Increment/decrement pulse: 10 kHz Pulse + direction: 100 kHz Phase difference: 5 kHz	Increment pulse: 100 kHz Increment/decrement pulse: 100 kHz Pulse + direction: 100 kHz Phase difference: 50 kHz
High-speed counter 2	Increment pulse: 100 kHz	Increment pulse: 10 kHz	Increment pulse: 100 kHz
High-speed counter 3	Increment pulse: 100 kHz	Increment pulse: 10 kHz	Increment pulse: 10 kHz
High-speed counter 4	-	Increment pulse: 10 kHz	Increment pulse: 10 kHz
High-speed counter 5	-	Increment pulse: 10 kHz	Increment pulse: 10 kHz

(3) Using pulse outputs

The CP2E has been enhanced to a maximum of 4 axes.

The CP2E pulse output method does not support CW/CCW. Also, you cannot specify an S-shaped acceleration/deceleration curve.

Contact function assignments

Output

Output contact	CP1L	
	CP1L-L10□	CP1L-L14/L20□,CP1L-M□,CP1L-EL/EM□
100.00	Pulse output 0 (CW/pulse)	Pulse output 0 (CW/pulse)
100.01	Pulse output 0 (CCW/direction)	Pulse output 0 (CCW/direction)
100.02	Pulse output 1 (CW/pulse)	Pulse output 1 (CW/pulse)
100.03	Pulse output 1 (CCW/direction)/ Pulse output 0 Error counter reset output	Pulse output 1 (CCW/direction)
100.04		Pulse output 0 Error counter reset output
100.05		Pulse output 1 Error counter reset output

Output contact	CP2E	
	CP2E-S□,CP2E-N14/N20□	CP2E-N30/N40/N60□
100.00	Pulse output 0 (pulse)	Pulse output 0 (pulse)
100.01	Pulse output 1 (pulse)	Pulse output 1 (pulse)
100.02	Pulse output 0 (direction)	Pulse output 0 (direction)
100.03	Pulse output 1 (direction)	Pulse output 1 (direction)
100.04	Pulse output 0 Error counter reset output	Pulse output 0 Error counter reset output
100.05	Pulse output 1 Error counter reset output	Pulse output 1 Error counter reset output
100.06	-	Pulse output 2 Error counter reset output
100.07	-	Pulse output 3 Error counter reset output
101.00	-	Pulse output 2 (pulse)
101.01	-	Pulse output 3 (pulse)
101.02	-	Pulse output 2 (direction)
101.03	-	Pulse output 3 (direction)

Input (With origin searching)

Input contact	CP1L		
	CP1L-L10□	CP1L-L14□,	CP1L-L20□,CP1L-M□, CP1L-EL/EM□
0.02		Pulse output 0 origin proximity input	
0.03	Pulse output 0 origin proximity input	Pulse output 1 origin proximity input	
0.04			
0.05	Pulse output 0 origin input		
0.06		Pulse output 0 origin input	Pulse output 0 origin input
0.07		Pulse output 1 origin input	Pulse output 1 origin input
0.08			
0.09			
0.10			Pulse output 0 origin proximity input
0.11			Pulse output 1 origin proximity input

Input contact	CP2E		
	CP2E-S□, CP2E-N20□	CP2E-N14□,	CP2E-N30/N40□/N60□
0.03		Pulse output 0 origin proximity input	
0.04		-	
0.05		Pulse output 1 origin proximity input	
0.06	Pulse output 0 origin input	Pulse output 0 origin input	Pulse output 0 origin input
0.07	Pulse output 1 origin input	Pulse output 1 origin input	Pulse output 1 origin input
0.08	-		Pulse output 2 origin input
0.09	-		Pulse output 3 origin input
0.10	Pulse output 0 origin proximity input		Pulse output 0 origin proximity input
0.11	Pulse output 1 origin proximity input		Pulse output 1 origin proximity input
1.00	-		Pulse output 2 origin proximity input
1.01	-		Pulse output 3 origin proximity input

*1: The pulse output function cannot be used with relay output models.
*2: Pulse outputs 2 and 3 can be used with N30/40/60 CPU Units.

(4) Using the PWM output function

The CP2E can be used with one S-type/N type.

Output contact	CP1L	CP2E-S□, CP2E-N□
100.01	PWM output 0	PWM output 0
100.02		
100.03	PWM output 1	

*: The PWM output function cannot be used with relay output models.

2.9. Battery

CP1L and CP2E use different batteries.

For CP1L: CJ1W-BAT01 (built-in) CP2E: CP2W-BAT02 (sold separately)

The CP1L and CP2E have different areas to be held by the battery/capacitor. If the CP1L uses a battery to hold I/O memory, the CP2E does not require battery installation. If you are using the clock function with the CP1L, insert the battery into the CP2E.

Battery/capacitor backup area

	CP1L	CP2E
I/O memory • DM Area (D) • Holding Area (H) • Current counter value/counter flag (C) • Auxiliary Area	Battery/capacitor backup	- (Battery-less backup is performed even when the power is OFF, so no battery is required.)
Clock	Battery/capacitor backup	Battery/capacitor backup (For CP2E-S□□/CP2E-N□□)

2.10. Analog Adjusters/External analog setting input

The CP2E does not have an analog volume function or an external analog setting input function.

To implement the analog volume function, please change the method—for example, by adding an analog timer such as the H3DT.

For external analog setting input, please change the implementation method by using an analog option board (CP1W-ADB21 or CP1W-MAB221).

2.11. Communication protocol for serial communication function

Some of the communication protocols supported by CP1L are no longer available in CP2E.

Serial communi-cation protocols	CP1L	CP2E	remarks
Host Link	✓	✓	PLC → does not have the function of issuing a specified frame to the host computer. Please change the method of implementation, such as using Ethernet.
Tool Bus	✓	-	CP2E is not supported
No-protocol mode	✓	✓	
1:N NT Link	✓	✓	Only one programmable terminal can be connected
1:1 NT Link	✓	-	Use 1:N NT Link
Serial Gateway	✓	-	CP2E is not supported
Serial PLC Links	✓	✓	Programmable terminals cannot be connected in a mix
1:1 Link	✓	-	Use a serial PLC link
Modbus-RTU easy master	✓	✓	
Modbus-RTU easy slave	-	✓	

・2.12 Other different features

The following functions are supported by the CP1L but not available on the CP2E.

・PT Procon

・Data tracing

・Inverter positioning

・DIP switch status flag (A395.12)

* Refer for replacing from CP1L to CP2E.

Appendix 1 Specification and Performance Comparison Between CP1L and CP2E

3. Wiring

3.1. Terminal Arrangement

The terminal blocks of the CP1L 30/40/60points CPU units are removable, but the terminal blocks of the CP2E are fixed.

● Input wiring

CP1L and CP2E have the same arrangement of input terminals.

However, if you are using a high-speed counter, you will need to change the wiring due to the different function assignment of the contacts.

● Output wiring

If you are using a pulse output or high-speed counter, you need to change the wiring because the function assignment of the contacts is different.

Relay Output Type

For the 14-point / 20-point type, wiring change is required because the arrangement of output terminals is different between CP1L and CP2E.

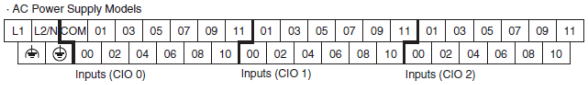
For the 30-point, 40-point, and 60-point types, the output terminal arrangement of CP1L and CP2E is the same.

Input wiring

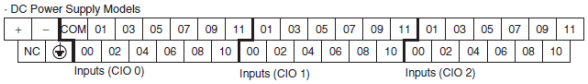
CP1L

CP1L 60-point type

· AC Power Supply Models

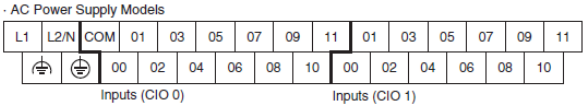


· DC Power Supply Models

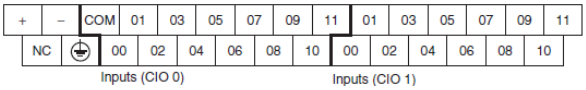


CP1L 40-point type

· AC Power Supply Models

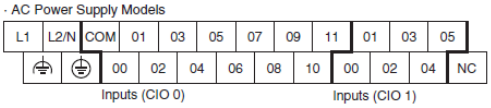


· DC Power Supply Models

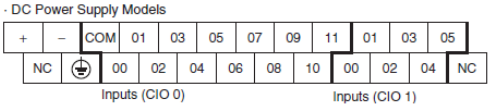


CP1L 30-point type

· AC Power Supply Models

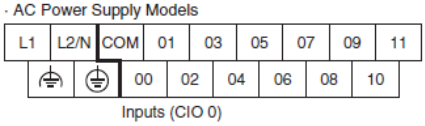


· DC Power Supply Models

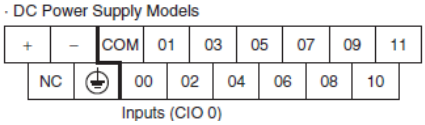


CP1L 20-point type

· AC Power Supply Models

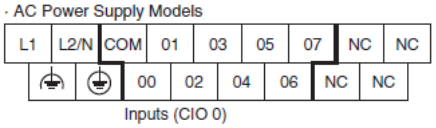


· DC Power Supply Models

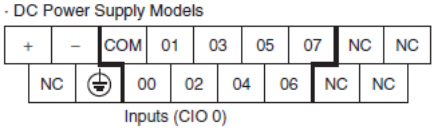


CP1L 14-point type

· AC Power Supply Models

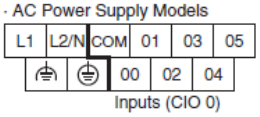


· DC Power Supply Models

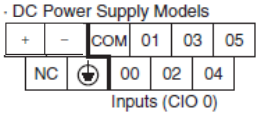


CP1L 10-point type

· AC Power Supply Models



· DC Power Supply Models

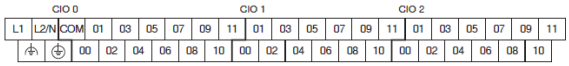


CP2E

CP2E 60-point type

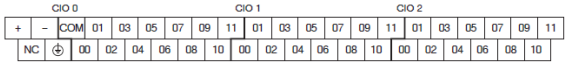
AC power supply

CP2E-□60D□-A



DC power supply

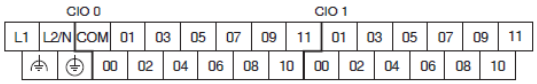
CP2E-□60D□-D



CP2E 40-point type

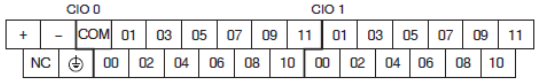
AC power supply

CP2E-□40D□-A



DC power supply

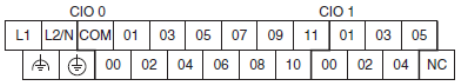
CP2E-□40D□-D



CP2E 30-point type

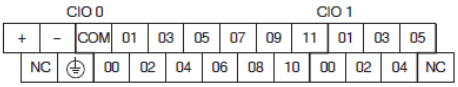
AC power supply

CP2E-□30D□-A



DC power supply

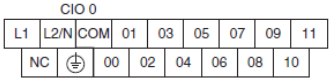
CP2E-□30D□-D



CP2E 20-point type

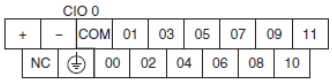
AC power supply

CP2E-□20D□-A



DC power supply

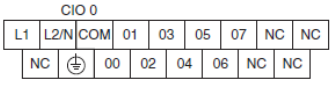
CP2E-N20D□-D



CP2E 14-point type

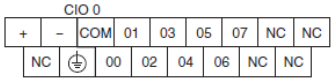
AC power supply

CP2E-□14D□-A



DC power supply

CP2E-N14D□-D

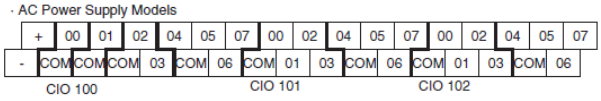


Output wiring

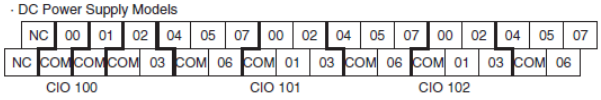
CP1L

CP1L 60-point type

· AC Power Supply Models

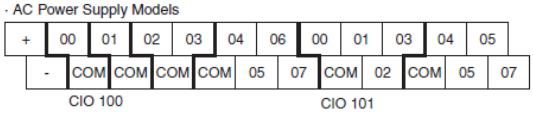


· DC Power Supply Models



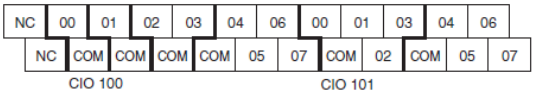
CP1L 40-point type

· AC Power Supply Models

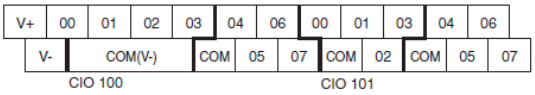


· DC Power Supply Models

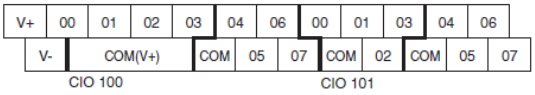
CP1L-EM40DR-D/CP1L-M40D□-D



CP1L-EM40DT-D



CP1L-EM40DT1-D

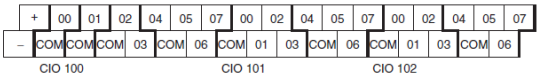


CP2E

CP2E 60-point type

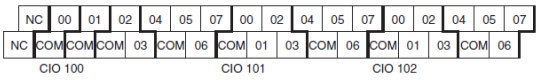
AC power supply

CP2E-□60D□-A

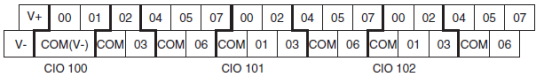


DC power supply

CP2E-N60D□-D

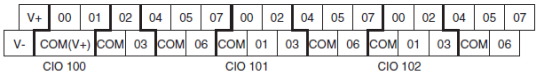


CP2E-S60DT-D



Note: COM(V-) has been connected with V- in an inner circuit.

CP2E-S60DT1-D

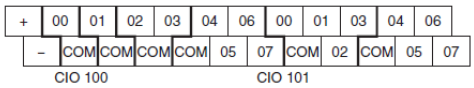


Note: COM(V+) has been connected with V+ in an inner circuit.

CP2E 40-point type

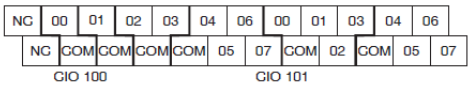
AC power supply

CP2E-□40D□-A

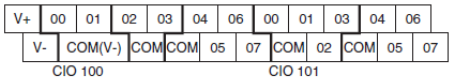


DC power supply

CP2E-N40D□-D

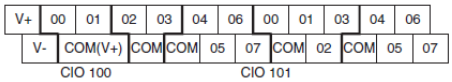


CP2E-S40DT-D



Note: COM(V-) has been connected with V- in an inner circuit.

CP2E-S40DT1-D

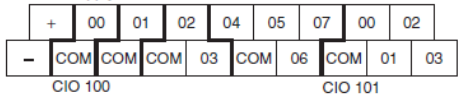


Note: COM(V+) has been connected with V+ in an inner circuit.

Output wiring	
CP1L	CP2E

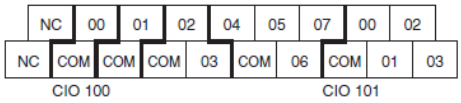
CP1L 30-point type

· AC Power Supply Models

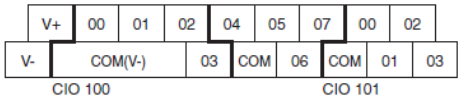


· DC Power Supply Models

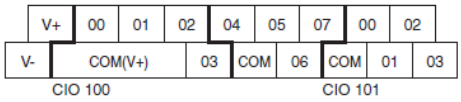
CP1L-EM30DR-D/CP1L-M30D□-D



CP1L-EM30DT-D

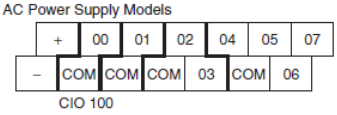


CP1L-EM30DT1-D



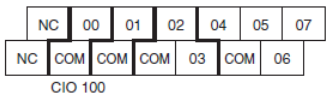
CP1L 20-point type

· AC Power Supply Models

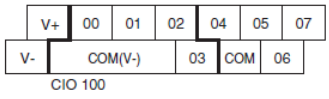


· DC Power Supply Models

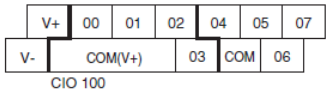
CP1L-EL20DR-D/CP1L-L20D□-D



CP1L-EL20DT-D

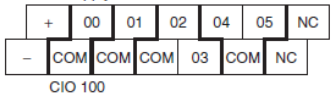


CP1L-EL20DT1-D

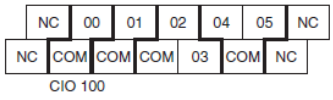


CP1L 14-point type

· AC Power Supply Models

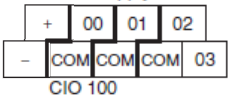


· DC Power Supply Models

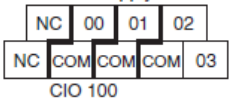


CP1L 10-point type

· AC Power Supply Models



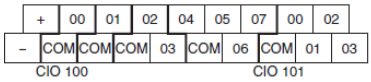
· DC Power Supply Models



CP2E 30-point type

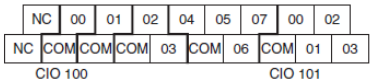
AC power supply

CP2E-□30D□-A

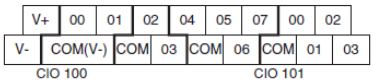


DC power supply

CP2E-N30D□-D

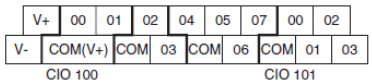


CP2E-S30DT-D



Note: COM(V-) has been connected with V- in an inner circuit.

CP2E-S30DT1-D

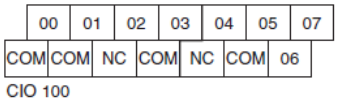


Note: COM(V+) has been connected with V+ in an inner circuit.

CP2E 20-point type

AC/DC power supply

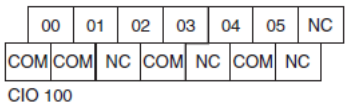
CP2E-□20D□-□



CP2E 14-point type

AC/DC power supply

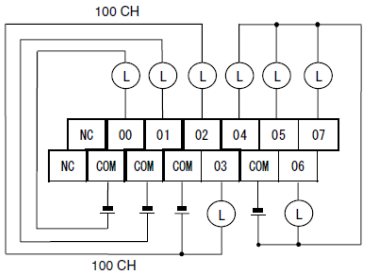
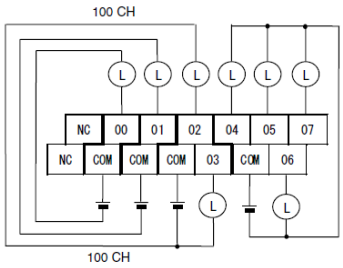
CP2E-□14D□-□



Differences in the Transistor Output Terminal Arrangement

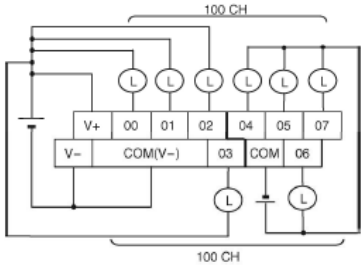
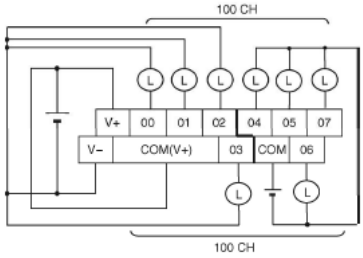
It is necessary to change the wiring depending on the replacement model.

CP1L-L/M☐

Sink type	Source Type
	

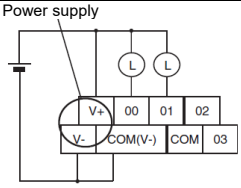
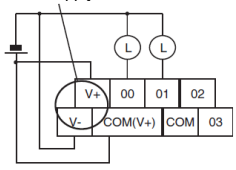
CP1L-EL/EM☐

When using 100CH00bit/01bit, DC24V must be supplied externally.

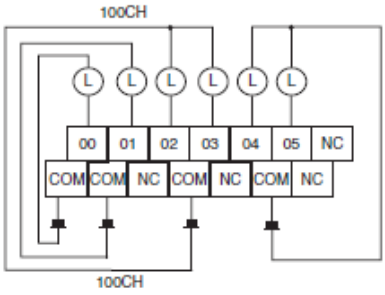
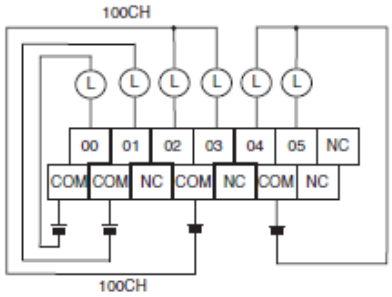
Sink type	Source Type
 COM (V-) and V- are connected internally.	 COM(V+) and V+ are connected internally.

CP2E-S☐

When using 100CH00bit/01bit, DC24V must be supplied externally.

Sink type	Source Type
Power supply  COM (V-) and V- are connected internally.	Power supply  COM(V+) and V+ are connected internally.

CP2E-N☐

Sink type	Source Type
	

3.2. Communication Port Wiring

Number of ports

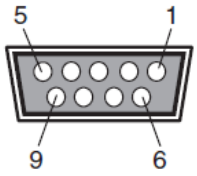
	CP1L-L□	CP1L-M□	CP1L-EL□	CP1L-EM□	CP2E-E□	CP2E-S□	CP2E-N14/20□	CP2E-N30/40/60□
Built-in USB	1	1	-	-	1	1	-	-
Built-in Ethernet			1	1			1	2
Built-in RS232C	-	-	-	-	1	1	-	-
Built-in RS485	-	-	-	-	-	1	-	-
Option Board	1	2	1	2	-	-	1	2

● Built-in RS-232C port

The CP1L's RS-232C port (option board CP1W-CIF01) and CP2E-S/E□□ type built-in RS-232C port have different interfaces. Change the wiring.

Model being replaced: CP1L+ option board CP1W-CIF01

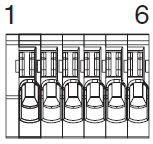
D-sub connector



pin number	Signal Name
1	FG
2	SD(TXD)
3	RD(RXD)
4	RS(RTS)
5	CS(CTS)
6	5V
7	DR(DSR)
8	ER(DTR)
9	SG(0V)
shell	FG

Model used for replacement: CP2E-S/E□ built-in RS232C port

terminal block



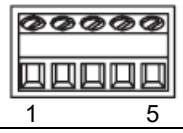
pin number	Signal Name
1	SD(TXD)
2	RD(RXD)
3	RS(RTS)
4	CS(CTS)
5	SG(0V)
6	FG

● Built-in RS-485 port

RS-422A/485 port on CP1 L (option board CP1W-CIF11/CIF12-V1) and CP2E-S□ type built-in RS-485 port have different interfaces. Change the wiring.

Model being replaced: CP1L+ option board CP1W-CIF11/CIF12-V1

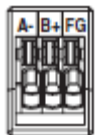
terminal block



pin number	Signal Name
1	RDA-
2	RDB+
3	SDA-
4	SDB+
5	FG

Model used for replacement: CP2E-S□ built-in RS485 port

terminal block



pin number	Signal Name
1	A-
2	B+
3	FG

3.3.Expansion Unit and Option Board Wiring

Expansion Units and Option Boards can be replaced as they are.

4. Changing Programs and Settings Using CX-Programmer

Use CX-Programmer to change programs and settings from the CP1L to the CP2E.
Use CX-Programmer version 9.72 or later.

4.1. Restrictions

There are the following program differences between CP1L and CP2E.

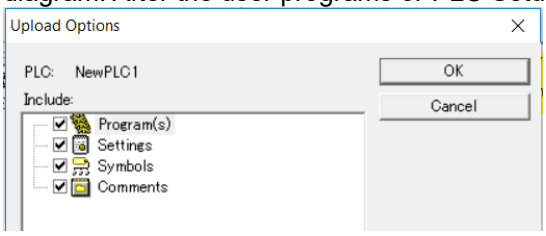
- CP2E data memory capacity and I/O memory are less than CP1L.
- There are 32 cycle execution tasks for CP1L, but only 1 for CP2E.
- There are 256 interrupt tasks for the CP1L, but 16 for the CP2E.
- There are about 500 instruction types for the CP1L, but about 200 types for the CP2E.
- The number of function block definitions for the CP1L is 128, but for the CP2E it is 64.
- The CP1L has 256 function block instances, but the CP2E has 128.
- The maximum number of subroutine numbers for CP1L is 256, but for CP2E, it is 128.
- The maximum JMP number for CP1L is 256, but for CP2E, it is 128.
- The presence or absence of imperative words is described in Appendix 3. Instraction Comparison Between CP1L and CP2E

4.2. Saving CP1L Programs and Settings

If programs must be transferred from the CP1L being replaced, use CX-Programmer to save the necessary CP1L programs.

● Saving User Programs

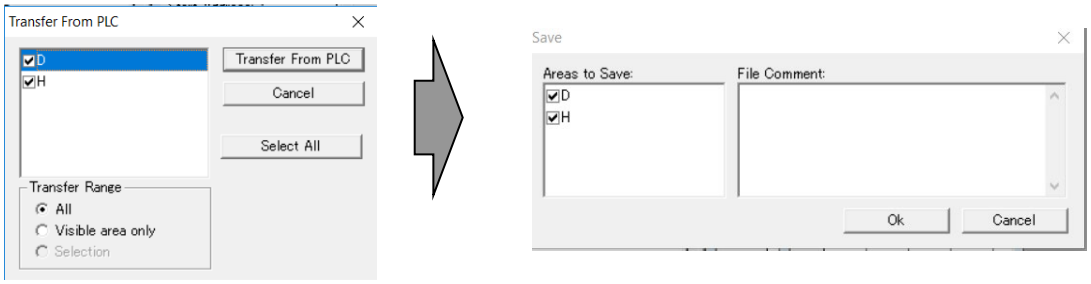
From the menu, click ***PLC*** → ***Transfer*** → ***Transfer From PLC***, and check all of the boxes as in the following diagram. After the user programs or PLC Setup settings are transferred to the project, save the project.



● Saving I/O Memory

When the data for the ladder program is set in the I/O memory (DM Area and Holding Area) of the CP1L, it is necessary to copy it to the I/O memory area of the CP1L. Follow the procedure below to save a .mem file.

(1) ***Memory***
(2) Open ***D/H***
(3) ***Online*** → ***Transfer From PLC***
(4) ***File*** → ***Save to File***

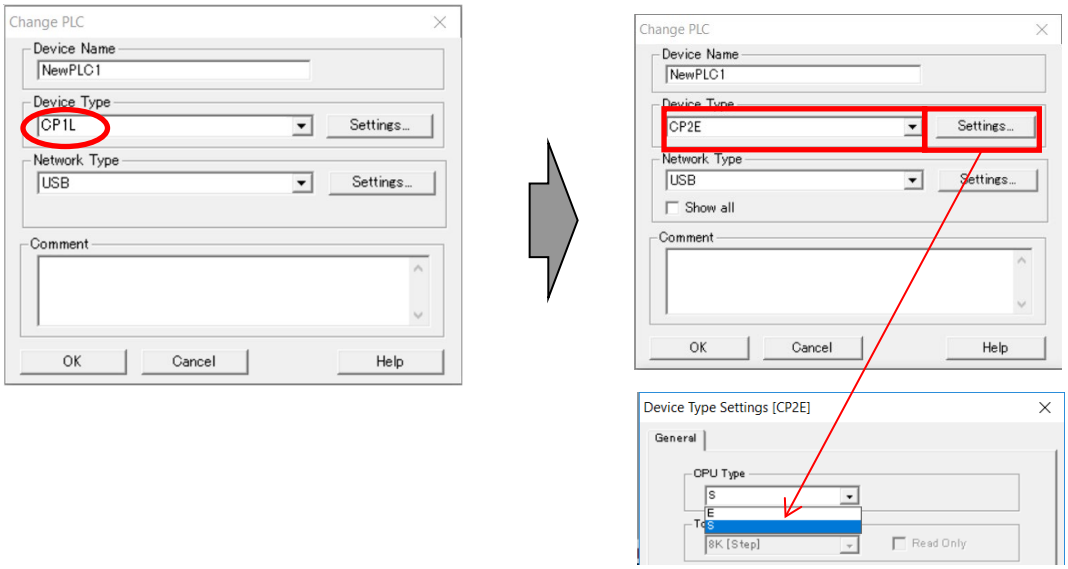


4.3.Converting program

hanging the PLC

Change the PLC model in the CP1L user program from “CP1L” to “CP2E” or “CP2E-N” with the CX-Programmer.

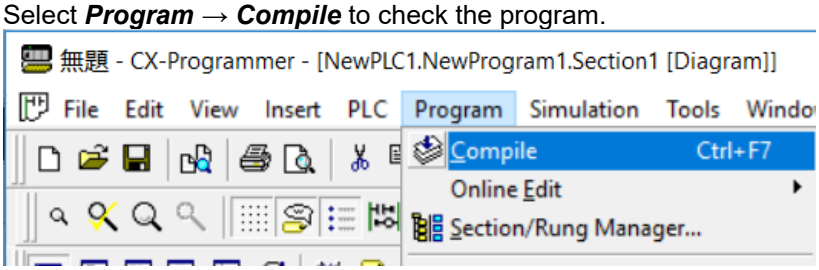
Also set the CPU model.



4.4.Checking error and warning report

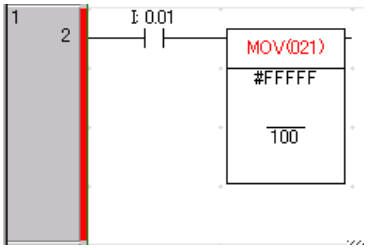
Check for errors after converting to the CP2E.

Select ***Program*** → ***Compile*** to check the program.



If the Output window shows errors or warnings, check the details for each.

If a ladder rung contains an error, a red line appears down the left-hand side of the rung.



The contents to be checked in "Compile" are as follows.

- Data unconfirmed check -whether it is established as a normal circuit-
- Instruction existence check -whether it is an instruction / operand existing in the PLC-
- Operand check -whether operands are within the operable range-
- Program capacity check -whether it is within the UM capacity of the target PLC model-
- Syntax check -ladder syntax is correct-
- Circuit shape check -whether the circuit shape is appropriate-
- Dual use check -coil double use check-
- Task checks -checks related to tasks-

4.5.Modifying Program

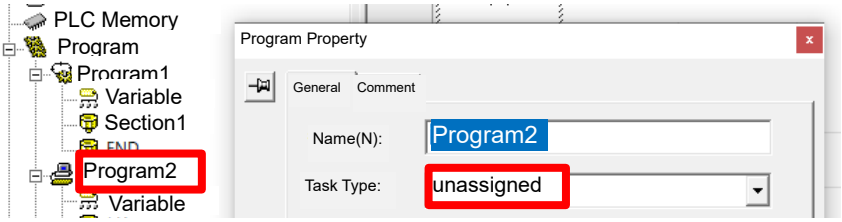
If an error occurs, correct the error while referring to the *CP2E CPU Unit User's Manual*, the *CP1L CPU Unit Operation Manual*, the *CP1L-EL/EM CPU Unit Operation Manual*, the *CP1E/CP2E Instructions Reference Manual, CP1H/CP1L CPUunits PROGRAMMING MANUAL*.

Precautions for Correct Use

Some errors may not be detected by the above-mentioned check with *Compile*.
Check the entire program to ensure there are no problems with the system, and modify as necessary.

4.6.Converting Cycle Execution Tasks

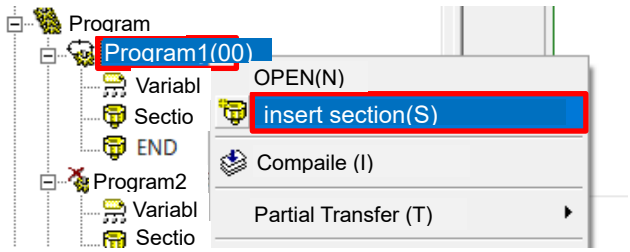
When model conversion is performed from CP1L to CP2E that uses multiple cycle execution tasks, CP2E has only one cycle execution task, so all but one program will be unassigned. Correct the program assignment.



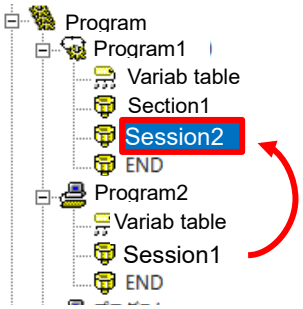
■reference

You can move the section of an unassigned task program to a cycle execution task in the following ways:

Right-click on the cycle execution task name → insert section to add a section to the cycle execution task program.



You can move the program section you want to move by dragging and dropping it to the added section.



4.7. Modifying Program

Depending on the CP2E model being used for replacement, the CP1L PLC Setup settings may not be transferred. Open the PLC Setup settings for the CP2E and configure the settings manually. Make sure that the PLC Setup settings have been changed correctly.

The timing of some PLC system settings has been changed from CP1L to CP2E.
In the CPU unit setting, "Whether or not FAL abnormality is registered in the abnormality history", and the serial communication setting CP1L reflects "every cycle".
However, in CP2E, it is reflected "when the power is turned on".

5. Transferring Data

Transfer the programs, settings, and data that have been converted or modified to the CP2E CPU Unit via USB port or Ethernet port.
Set the clock if the timer function will be used.

6. Test Operation

Turn on the power and confirm operation is correct before starting actual operation.

Precautions for Correct Use

After replacement, please perform trial operation before starting actual operation and check that the system operates correctly. If the wiring or settings are not configured correctly, the system may malfunction.

Appendix 1. Specification and Performance Comparison Between CP1L and CP2E

● Functional Specifications

Item		CP1LM/L□-type CPU Units	CP1LEM/EL□-type CPU Units	CP2E E/S□-type CPU Units	CP2E N□-type CPU Units
Power supply		100 to 240 VAC 24 VDC	24 VDC	100 to 240 VAC 24 VDC	100 to 240 VAC 24 VDC
Operation temperature		0°C~55°C	0°C~55°C	-20°C~60°C	-20°C~60°C
Power supply to external devices (service power)		Only AC power supply M30/40/60□: 300 mA L10/14/20□ : 200mA	None	Only AC power supply S30/40/60□:300 mA E30/40/60□:300 mA E14/20□ : None	Only AC power supply N30/40/60□:300 mA N14/20□: None
Removable terminal		M30/40/60: Suported L10/14/20: Not supported	EM30/40□: Suported EL20□: Not supported	Not supported	Not supported
Dip SW		Suported	Suported	Not supported	Not supported
High-speed counter inputs		Up/down inputs: 100 kHz × 2 counter Or Pulse plus direction inputs: 100 kHz × 2 counters Or Differential phase inputs (4x) 50 kHz × 2 counter Or Incremental pulse inputs 100 kHz × 4 counters	Up/down inputs: 100 kHz × 2 counter Or Pulse plus direction inputs: 100 kHz × 2 counters Or Differential phase inputs (4x) 50 kHz × 2 counter Or Incremental pulse inputs 100 kHz × 4 counters	Up/down inputs: 100 kHz × 1 counter 10 kHz × 1 counter Or Pulse plus direction inputs: 100 kHz × 2 counters Or Differential phase inputs (4x) 50 kHz × 1 counter 5 kHz × 1 counter Or Incremental pulse inputs 100 kHz × 2 counters 10 kHz × 4 counters	N14/20: Up/down inputs: 100 kHz × 1 counter 10 kHz × 1 counter Or Pulse plus direction inputs: 100 kHz × 2 counters Or Differential phase inputs(4×) 50 kHz × 1 counter 5 kHz × 1 counter Or Incremental pulse inputs 100 kHz × 2 counters 10 kHz × 4 counters N30/40/60□: Up/down or pulse plus direction inputs: 100 kHz × 2 counters, Or Differential phase inputs(4×) 50 kHz × 2 counters Or Incremental pulse inputs 100 kHz × 3 counters 10 kHz × 3 counters
Quick-response / Interrupt inputs		6 inputs (2 points only for L10□ 4 points only for L14□)	6 inputs	6 inputs	8 inputs (6 inputs only for N14□)
Pulse outputs (Models with transistor outputs only)	Pulse output method	2 outputs, 1 Hz to 100 kHz (CCW/CW or pulse plus direction)	2 outputs, 1 Hz to 100 kHz (CCW/CW or pulse plus direction)	2 outputs, 1 Hz to 100 kHz (pulse plus direction)	N14/20□ CPU Unit: 2 outputs N30/40/60□ CPU Unit: 4 outputs 1 Hz to 100 kHz (pulse plus direction)
	Speed control	Supported	Supported	Supported	Supported
	Positioning	Supported	Supported	Supported	Supported
	Origin searches	Supported	Supported	Supported	Supported
PWM outputs (Models with transistor outputs only)		2 outputs	2 outputs	E□-type: Not supported S□-type: 1 output	1 output
Inverter Positioning		Supported	Supported	Not supported	Not supported
Analog I/O		1 input (Resolution: 1/256, Input range: 0 to 10 V)	2 inputs (10 bits Input, range: 0 to 10 V)	Not supported	Not supported
Analog volume		1	Not supported	Not supported	Not supported
USB port		Provided. USB2.0 Full-speed (12M)	Not provided	Provided. USB2.0 Full-speed (12M)	Not provided
Ethernet port		Not provided	Provided	Not provided	Provided With switch function* * N14/20□ is not supported.
Built-in serial communication port		Not provided Provided by installing Option Board.	Not provided Provided by installing Option Board.	Provided. E□: RS-232C S□:RS-232C and RS-485	Not provided Provided by installing Option Board.
Serial option board		L10□: Not provided L14/20 □: 1 slot M30/40/60□: 2 slots	EL14/20□: 1 slot EM30/40/60□: 2 slots	Not provided	N14/20□: 1 slot N30/40/60□: 2 slots
Serial communi-cation protocols	Baud rate	300/600/1200/2400/4800/9600/19.2k/38.4k/57.6k/115.2k	300/600/1200/2400/4800/9600/19.2k/38.4k/57.6k/115.2k	1200/2400/4800/9600/19.2k/38.4k/57.6k/115.2k	1200/2400/4800/9600/19.2k/38.4k/57.6k/115.2k
	Supported protocol	• Host Link • 1:N NT Link • No-protocol mode • Serial PLC Links (master, slave) • Modbus-RTU easy master	• Host Link • 1:N NT Link • No-protocol mode • Serial PLC Links (master, slave) • Modbus-RTU easy master	• Host Link • 1:N NT Link • No-protocol mode • Serial PLC Links (master, slave) • Modbus-RTU easy master • Modbus-RTU Slave	• Host Link* • 1:N NT Link* • No-protocol mode • Serial PLC Links (master, slave) • Modbus-RTU Easy Master • Modbus-RTU Slave * PORT1 (EX) is not supported.

Item	CP1LM/L□-type CPU Units	CP1LEM/EL□-type CPU Units	CP2E E/S□-type CPU Units	CP2E N□-type CPU Units
Option Boards that can be mounted	• RS232C Option Board CP1W-CIF01 • RS-422A/485 Option Board CP1W-CIF11/CIF12-V1 • Ethernet Option Board CP1W-CIF41 • LCD Option Board CP1W-DAM01	• RS232C Option Board CP1W-CIF01 • RS-422A/485 Option Board CP1W-CIF11/CIF12-V1 • LCD Option Board CP1W-DAM01 • Analog Option Board CP1W-MAB221/ ADB21/ DAB21V	Cannot be mounted.	• RS232C Option Board CP1W-CIF01 • RS-422A/485 Option Board CP1W-CIF11/CIF12-V1 Serial Communication Option Board with two ports*1 • RS232C Option Board CP2W-CIFD1 • RS232C & RS-485 Option Board CP2W-CIFD2 • RS-485 Option Board CP2W-CIFD3 • Analog Option Board*2 CP1W-MAB221/ ADB21/ DAB21V *1 CP2W-CIFD□ can only be mounted on option slot 1. *2 Maximum one Analog Option Board can be mounted on an N□-type CPU Unit.
Memory casset	CP1W-ME05M	CP1W-ME05M	Cannot be mounted.	Cannot be mounted.
Memory backup	Built-in EEPROM: Contains the user programs, parameters, DM Area initial values and comment files Built-in SRAM (Battery backup): DM/HR/CNT/AR Data memory area	Built-in EEPROM: Contains the user programs, parameters, DM Area initial values and comment files Built-in SRAM (Battery backup): DM/HR/CNT/AR Data memory area	Built-in Flash Memory: Contains the user programs, parameters, DM Area initial values and comment files Built-in non-volatile memory (Batteryless backup): DM/HR/CNT/AR Data memory area	Built-in Flash Memory: Contains the user programs, parameters, DM Area initial values and comment files Built-in non-volatile memory (Batteryless backup): DM/HR/CNT/AR Data memory area
Clock	Supported	Supported	E□: Not supported S□: Supported	Supported

Item	CP1L CPU Units	CP2E CPU Units
Program capacity	L□:5Ksteps M□:10K steps EL□:5Ksteps EM□:10K steps	E□: 4K steps S□: 8K steps N□: 10K steps
FB capacity	L□: Not provided M□: Not provided EL□:5Ksteps EM□: 10K steps	E□: 4K steps S□: 8K steps N□: 10K steps
Program language	Ladder diagram	Ladder diagram
Function blocks	Maximum number of function block definitions: 128 Maximum number of instances: 256	Maximum number of function block definitions: 64 Maximum number of instances: 128 Languages usable in function block definitions: Ladder diagrams, structured text (ST)
Instructions	Approximately 500	Approximately 220
Instruction execution times	LD: 0.55μs MOV: 41μs	LD: 0.23 μs MOV: 1.76 μs
Number of tasks	288 • 32 cyclic task • 256 interrupt tasks	17 • 1 cyclic task • 16 interrupt tasks
Maximum subroutine number	256	128
Maximum jump number	256	128
Scheduled interrupt tasks	1	1
CIO Area	98304 bits (6144 words) CIO 0.00 to CIO 6143.15 (CIO 0 to CIO 6143)	4,640 bits (290 words) CIO 0.00 to CIO 289.15 (CIO 0 to CIO 289)
Work Area (W)	8192 bits (512words) W0.00 to W511.15 (W0 to W511)	2,048 bits (128 words) W0.00 to W127.15 (W0 to W127)
Holding Area (H)	8192 bits (512words) H0.00 to H511.15 (H0 to H511)	2048 bits (128 words) H0.00 to H127.15 (H0 to H127)
Auxiliary Area (A)	Read-only: 7168 bits (448 words) A0.00 to A447.15 (A0 to A447) Read/write: 8192 bits (512 words) A448.00 to A959.15 (A448 to A959)	Read-only: 7,168 bits (448 words) A0.00 to A447.15 (A0 to A447) Read/write: 8,192 bits (512 words) A448.00 to A959.15 (A448 to A959)
Temporary Area (TR)	16 bits: TR0 to TR15	16 bits: TR0 to TR15
Timer Area (T)	4096 timer numbers: T0 to T4095	256 timer numbers: T0 to T255
Counter Area (C)	4096 counter numbers: C0 to C4095	256 counter numbers: C0 to C255
Data Memory Area (D)	L/EL□: 10K words D0 to D9999, D32000 to D32767 M/EM□: 32K words D0 to D32767	E□: 4K words D0 to D4095 S□: 8K words D0 to D8191 N□: 16K words D0 to D16383
Data Registers (DR)	16 registers: DR0 to DR15	16 registers: DR0 to DR15
Index Registers (IR)	16 registers: IR0 to IR15	16 registers: IR0 to IR15
Task flag (TK)	32 registers: TK0000 to TK0031	Not provided

Socket Services

Item	CP1LEM/EL□-type CPU Units	CP2E N□-type CPU Units
Data Memory Area Allocations	D32400 to D32447	D16000 to D16047

Analog Option Board

Item	CP1LEM/EL□-type CPU Units	CP2E N□-type CPU Units
Data Memory Area Allocations	EM□ Port 1: CIO2980 to CIO 2989 EM□ Port 2, EL□type Port 1::CIO2990 to CIO2999	CIO80 to CIO89

Serial PLC Links

Item	CP1L CPU Units	CP2E CPU Units
Allocated data area	CIO 3100.00 to CIO3189.15	CIO200.00 to CIO289.15

Modbus-RTU Easy Master Function

・CP1L Serial ports

CP1L CPU Unit serial port	Data Memory Area Allocations	Auxiliary Area Allocation
Serial port 2 on M/EM-type CPU Unit Serial port 1 on L/EL-type CPU Unit	D32300 to D32399	A640.00 to A640.02
Serial port 1 on M/EM-type CPU Unit	D32200 to D32299	A641.00 to A641.02

・CP2E Serial ports

CP2E CPU Unit serial port		**Data Memory Area Allocations**	**Auxiliary Area Allocation**
E□ CPU units	Built-in RS-232C port	D1200 to D1299	A640.00 to A640.02
S□ CPU units	Built-in RS-232C port	D1200 to D1299	A640.00 to A640.02
	Built-in RS-485 port	D1300 to D1399	A641.00 to A641.02
N14/20□ CPU units	Serial Port 1	D1200 to D1299	A640.00 to A640.02
	Serial Port 1 (EX)	D1400 to D1499	A648.00 to A648.02
N30/40/60□ CPU units	Serial Port 1	D1200 to D1299	A640.00 to A640.02
	Serial Port 2	D1300 to D1399	A641.00 to A641.02
	Serial Port 1 (EX)	D1400 to D1499	A648.00 to A648.02

Appendix 2. CP2E Expansion Units, Option Boards, Cables, Batteries

● CP1W Expansion Unit

The CP1W Expansion Unit can be used with the CP2E.

Product	CP1W Expansion Unit	Remarks
I/O Unit with 40 I/O points	CP1W-40EDR1	
	CP1W-40EDT	
	CP1W-40EDT1	
I/O Unit with 20 I/O points	CP1W-20EDR1	
	CP1W-20EDT	
	CP1W-20EDT1	
Input Unit with 8 inputs	CP1W-8ED	
Output Unit with 8 outputs	CP1W-8ER	
	CP1W-8ET	
	CP1W-8ET1	
Output Unit with 16 outputs	CP1W-16ER	
	CP1W-16ET	
	CP1W-16ET1	
Output Unit with 32 outputs	CP1W-32ER	
	CP1W-32ET	
	CP1W-32ET1	
Analog Input Unit	CP1W-AD041	
	CP1W-AD042	
	CP1W-DA021	
Analog Output Unit	CP1W-DA041	
	CP1W-DA042	
Analog I/O Unit	CP1W-MAD11	
	CP1W-MAD42	
	CP1W-MAD44	
Temperature Sensor Unit	CP1W-TS001	
	CP1W-TS002	
	CP1W-TS003	
	CP1W-TS004	
	CP1W-TS101	
	CP1W-TS102	

● Option Boards

All CP1W Option Boards except the CP1W-CIF41/DAM01/ME05M can be used with the CP2E.

Product	CP1W Expansion Unit	Remarks
Option Boards	CP1W-CIF01	
	CP1W-CIF11	
	CP1W-CIF12-V1	
	CP2W-CIFD1	For CP2E
	CP2W-CIFD2	For CP2E
	CP2W-CIFD3	For CP2E
	CP1W-ADB221	
	CP1W-DAB21V	
	CP1W-MAD221	
	CP1W-CIF41	Cannot be used
LCD option Board	CP1W-DAM01	Cannot be used
Memory casset	CP1W-ME05M	Cannot be used

● Others

Compatible batteries have changed from the CP1E.

Product	CP1W Expansion Unit	Remarks
Battery	CP2W-BAT02	The CP1W-BAT01 cannot be used.
Extension cable	CP1W-CN811	

Appendix 3. Instraction Comparison Between CP1L and CP2E

●Sequence Input Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
LD	LOAD ˚		✓	✓
LD NOT	LOAD NOT		✓	✓
AND	AND		✓	✓
AND NOT	AND NOT		✓	✓
OR	OR		✓	✓
OR NOT	OR NOT		✓	✓
AND LD	AND NOT		✓	✓
OR LD	OR NOT		✓	✓
NOT	NOT	520	✓	✓
UP	CONDITION ON	521	✓	✓
DOWN	CONDITION OFF	522	✓	✓
LD TST	LOAD BIT TEST	350	✓	✓
LD TSTN	LOAD BIT TEST NOT	351	✓	✓
AND TST	AND BIT TEST	350	✓	✓
AND TSTN	AND BIT TEST NOT	351	✓	✓
OR TST	OR BIT TEST	350	✓	✓
OR TSTN	OR BIT TEST NOT	351	✓	✓

●Sequence Output Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
OUT	OUTPUT		✓	✓
OUT NOT	OUTPUT NOT		✓	✓
KEEP	KEEP	011	✓	✓
DIFU	DIFFERENTIATE UP	013	✓	✓
DIFD	DIFFERENTIATE DOWN	014	✓	✓
SET	SET		✓	✓
RSET	RESET		✓	✓
SETA	MULTIPLE BIT SET	530	✓	✓
RSTA	MULTIPLE BIT RESET	531	✓	✓
SETB	SINGLE BIT SET	532	✓	✓
RSTB	SINGLE BIT RESET	533	✓	✓
OUTB	SINGLE BIT OUTPUT	534	✓	

●Sequence Control Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
END	END	001	✓	✓
NOP	NO OPERATION	000	✓	✓
IL	INTERLOCK	002	✓	✓
ILC	INTERLOCK CLEAR	003	✓	✓
MILH	MULTI-INTERLOCK DIFFERENTIATION HOLD	517	✓	✓
MILR	MULTI-INTERLOCK DIFFERENTIATION RELEASE	518	✓	✓
MILC	MULTI-INTERLOCK CLEAR	519	✓	✓
JMP	JUMP	004	✓	✓
JME	JUMP END	005	✓	✓
CJP	CONDITIONAL JUMP	510	✓	✓
CJPN	CONDITIONAL JUMP NOT	511	✓	
JMP0	MULTIPLE JUMP	515	✓	
JME0	MULTIPLE JUMP END	516	✓	
FOR	FOR LOOP	512	✓	✓
BREAK	BREAK LOOP	514	✓	✓
NEXT	NEXT LOOP	513	✓	✓

●Timer and Counter Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
TIM	TIMER		✓	✓
TIMX		550	✓	✓
CNT	COUNTER		✓	✓
CNTX		546	✓	✓
TIMH	HIGH-SPEED TIMER	015	✓	✓
TIMHX		551	✓	✓
TMHH	ONE-MS TIMER	540	✓	✓
TMHHX		552	✓	✓
TTIM	ACCUMULATIVE TIMER	087	✓	✓
TTIMX		555	✓	✓
TIML	LONG TIMER	542	✓	✓
TIMLX		553	✓	✓
MTIM	MULTI-OUTPUT TIMER	543	✓	
MTIMX		554	✓	
CNTR	REVERSIBLE COUNTER	012	✓	✓
CNTRX		548	✓	✓
CNR	RESET TIMER/COUNTER	545	✓	✓
CNRX		547	✓	✓

●Comparison Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
LD,AND,OR+ ＝	Input Comparison Instructions (unsigned)	300	✓	✓
LD,AND,OR+ ＜＞		305	✓	✓
LD,AND,OR+ ＜		310	✓	✓
LD,AND,OR+ ＜ ＝		315	✓	✓
LD,AND,OR+ ＞		320	✓	✓
LD,AND,OR+ ＞ ＝		325	✓	✓
LD,AND,OR+ =L	Input Comparison Instructions (double, unsigned)	301	✓	✓
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	✓	✓
LD,AND,OR+ =S	Input Comparison Instructions (signed)	302	✓	✓
LD,AND,OR+ <>S		307	✓	✓
LD,AND,OR+ <S		312	✓	✓
LD,AND,OR+ <=S		317	✓	✓
LD,AND,OR+ >S		322	✓	✓
LD,AND,OR+ >=S		327	✓	✓
LD,AND,OR+ =SL	Input Comparison Instructions (double, signed)	303	✓	✓
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	✓	✓
LD,AND,OR+ =DT	Time Comparison Instructions	341	✓	✓
LD,AND,OR+ <>DT		342	✓	✓
LD,AND,OR+ <DT		343	✓	✓
LD,AND,OR+ <=DT		344	✓	✓
LD,AND,OR+ >DT		345	✓	✓
LD,AND,OR+ >=DT		346	✓	✓
CMP	COMPARE	020	✓	✓
CMPL	DOUBLE COMPARE	060	✓	✓
CPS	SIGNED BINARY COMPARE	114	✓	✓
CPSL	DOUBLE SIGNED BINARY COMPARE	115	✓	✓
TCMP	TABLE COMPARE	085	✓	✓
MCMP	MULTIPLE COMPARE	019	✓	
BCMP	UNSIGNED BLOCK COMPARE	068	✓	✓
BCMP2	EXPANDED BLOCK COMPARE	502	✓	
ZCP	AREA RANGE COMPARE	088	✓	✓
ZCPL	DOUBLE AREA RANGE COMPARE	116	✓	✓

●Data Movement Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
MOV	MOVE	021	✓	✓
MOVL	DOUBLE MOVE	498	✓	✓
MVN	MOVE NOT	022	✓	✓
MVNL	DOUBLE MOVE NOT	499	✓	
MOVB	MOVE BIT	082	✓	✓
MOVD	MOVE DIGIT	083	✓	✓
XFRB	MULTIPLE BIT TRANSFER	062	✓	✓
XFER	BLOCK TRANSFER	070	✓	✓
BSET	BLOCK SET	071	✓	✓
XCHG	DATA EXCHANGE	073	✓	✓
XCGL	DOUBLE DATA EXCHANGE	562	✓	
DIST	SINGLE WORD DISTRIBUTE	080	✓	✓
COLL	DATA COLLECT	081	✓	✓
MOVR	MOVE TO REGISTER	560	✓	✓
MOVRW	MOVE TIMER/COUNTER PV TO REGISTER	561	✓	✓

●Data Shift Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
SFT	SHIFT REGISTER	010	✓	✓
SFTR	REVERSIBLE SHIFT REGISTER	084	✓	✓
ASFT	ASYNCHRONOUS SHIFT REGISTER	017	✓	
WSFT	WORD SHIFT	016	✓	✓
ASL	ARITHMETIC SHIFT LEFT	025	✓	✓
ASLL	DOUBLE SHIFT LEFT	570	✓	✓
ASR	ARITHMETIC SHIFT RIGHT	026	✓	✓
ASRL	DOUBLE SHIFT RIGHT	571	✓	✓
ROL	ROTATE LEFT	027	✓	✓
ROLL	DOUBLE ROTATE LEFT	572	✓	✓
RLNC	ROTATE LEFT WITHOUT CARRY	574	✓	
RLNL	DOUBLE ROTATE LEFT WITHOUT CARRY	576	✓	
ROR	ROTATE RIGHT	028	✓	✓
RORL	DOUBLE ROTATE RIGHT	573	✓	✓
RRNC	ROTATE RIGHT WITHOUT CARRY	575	✓	
RRNL	DOUBLE ROTATE RIGHT WITHOUT CARRY	577	✓	
SLD	ONE DIGIT SHIFT LEFT	074	✓	✓
SRD	ONE DIGIT SHIFT RIGHT	075	✓	✓
NSFL	SHIFT N-BIT DATA LEFT	578	✓	
NSFR	SHIFT N-BIT DATA RIGHT	579	✓	
NASL	SHIFT N-BITS LEFT	580	✓	✓
NSLL	DOUBLE SHIFT N-BITS LEFT	582	✓	✓
NASR	SHIFT N-BITS RIGHT	581	✓	✓
NSRL	OUBLE SHIFT N-BITS RIGHT	583	✓	✓

●Increment/Decrement Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
++	INCREMENT BINARY	590	✓	✓
++L	DOUBLE INCREMENT BINARY	591	✓	✓
--	DECREMENT BINARY	592	✓	✓
--L	DOUBLE DECREMENT BINARY	593	✓	✓
++B	INCREMENT BCD	594	✓	✓
++BL	DOUBLE INCREMENT BCD	595	✓	✓
--B	DECREMENT BCD	596	✓	✓
--BL	DOUBLE DECREMENT BCD	597	✓	✓

●Symbol Math Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
+	SIGNED BINARY ADD WITHOUT CARRY	400	✓	✓
+L	DOUBLE SIGNED BINARY ADD WITHOUT CARRY	401	✓	✓
+C	SIGNED BINARY ADD WITH CARRY	402	✓	✓
+CL	DOUBLE SIGNED BINARY ADD WITH CARRY	403	✓	✓
+B	BCD ADD WITHOUT CARRY	404	✓	✓
+BL	DOUBLE BCD ADD WITHOUT CARRY	405	✓	✓
+BC	BCD ADD WITH CARRY	406	✓	✓
+BCL	DOUBLE BCD ADD WITH CARRY	407	✓	✓
-	SIGNED BINARY SUBTRACT WITHOUT CARRY	410	✓	✓
-L	DOUBLE SIGNED BINARY SUBTRACT WITHOUT CARRY	411	✓	✓
-C	SIGNED BINARY SUBTRACT WITH CARRY	412	✓	✓
-CL	DOUBLE SIGNED BINARY SUBTRACT WITH CARRY	413	✓	✓
-B	BCD SUBTRACT WITHOUT CARRY	414	✓	✓
-BL	DOUBLE BCD SUBTRACT WITHOUT CARRY	415	✓	✓
-BC	BCD SUBTRACT WITH CARRY	416	✓	✓
-BCL	DOUBLE BCD SUBTRACT WITH CARRY	417	✓	✓
*	SIGNED BINARY MULTIPLY	420	✓	✓
*L	DOUBLE SIGNED BINARY MULTIPLY	421	✓	✓
*U	UNSIGNED BINARY MULTIPLY	422	✓	✓
*UL	DOUBLE UNSIGNED BINARY MULTIPLY	423	✓	✓
*B	BCD MULTIPLY	424	✓	✓
*BL	DOUBLE BCD MULTIPLY	425	✓	✓
/	SIGNED BINARY DIVIDE	430	✓	✓
/L	DOUBLE SIGNED BINARY DIVIDE	431	✓	✓
/U	UNSIGNED BINARY DIVIDE	432	✓	✓
/UL	DOUBLE UNSIGNED BINARY DIVIDE	433	✓	✓
/B	BCD DIVIDE	434	✓	✓

/BL	DOUBLE BCD DIVIDE	435	✓	✓

●Conversion Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
BIN	BCD-TO-BINARY	023	✓	✓
BINL	DOUBLE BCD-TO-DOUBLE BINARY	058	✓	✓
BCD	BINARY-TO-BCD	024	✓	✓
BCDL	BLE BINARY-TO-DOUBLE BCD	059	✓	✓
NEG	2'S COMPLEMENT	160	✓	✓
NEGL	DOUBLE 2'S COMPLEMENT	161	✓	
SIGN	16-BIT TO 32-BIT SIGNED BINARY	600	✓	
MLPX	DATA DECODER	076	✓	✓
DMPX	DATA ENCODER	077	✓	✓
ASC	ASCII CONVERT	086	✓	✓
HEX	ASCII TO HEX	162	✓	✓
LINE	COLUMN TO LINE	063	✓	
COLM	LINE TO COLUMN	064	✓	
BINS	SIGNED BCD-TO-BINARY	470	✓	
BISL	DOUBLE SIGNED BCD-TO-BINARY	472	✓	
BCDS	SIGNED BINARY-TO-BCD	471	✓	
BDSL	DOUBLE SIGNED BINARY-TO-BCD	473	✓	
GRY	GRAY CODE CONVERSION	474	✓	

●Logic Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
ANDW	LOGICAL AND	34	✓	✓
ANDL	DOUBLE LOGICAL AND	610	✓	✓
ORW	LOGICAL OR	35	✓	✓
ORWL	DOUBLE LOGICAL OR	611	✓	✓
XORW	EXCLUSIVE OR	36	✓	✓
XORL	DOUBLE EXCLUSIVE OR	612	✓	✓
XNRW	EXCLUSIVE NOR	37	✓	
XNRL	DOUBLE EXCLUSIVE NOR	613	✓	
COM	COMPLEMENT	29	✓	✓
COML	DOUBLE COMPLEMENT	614	✓	✓

●Special Math Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
ROTB	BINARY ROOT	620	✓	
ROOT	BCD SQUARE ROOT	72	✓	
APR	ARITHMETIC PROCESS	69	✓	✓
FDIV	FLOATING POINT DIVIDE	79	✓	
BCNT	BIT COUNTER	67	✓	✓

●Floating-point Math Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
FIX	FLOATING TO 16-BIT	450	✓	✓
FIXL	FLOATING TO 32-BIT	451	✓	✓
FLT	16-BIT TO FLOATING	452	✓	✓
FLTL	32-BIT TO FLOATING	453	✓	✓
+F	FLOATING-POINT ADD	454	✓	✓
-F	FLOATING-POINT SUBTRACT	455	✓	✓
/F	FLOATING-POINT DIVIDE	457	✓	✓
＊F	FLOATING-POINT MULTIPLY	456	✓	✓
RAD	DEGREES TO RADIANS	458	✓	
DEG	RADIANS TO DEGREES	459	✓	
SIN	SINE	460	✓	
COS	COSINE	461	✓	
TAN	TANGENT	462	✓	
ASIN	ARC SINE	463	✓	
ACOS	ARC COSINE	464	✓	
ATAN	ARC TANGENT	465	✓	
SQRT	SQUARE ROOT	466	✓	
EXP	EXPONENT	467	✓	
LOG	LOGARITHM	468	✓	
PWR	EXPONENTIAL POWER	840	✓	
LD,AND,OR+ =F	Floating Symbol Comparison	329	✓	✓
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	✓	✓
FSTR	FLOATING- POINT TO ASCII	448	✓	✓
FVAL	ASCII TO FLOATING-POINT	449	✓	✓

●Double-precision Floating-point Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
LD,AND,OR+ =D		335	✓	
LD,AND,OR+ <>D		336	✓	
LD,AND,OR+ <D		337	✓	
LD,AND,OR+ <=D		338	✓	
LD,AND,OR+ >D		339	✓	
LD,AND,OR+ >=D	DOUBLE SYMBOL COMPARISON	340	✓	
FIXD	DOUBLE FLOATING TO 16-BIT BINARY	841	✓	
FIXLD	DOUBLE FLOATING TO 32-BIT BINARY	842	✓	
DBL	16-BIT BINARY TO DOUBLE FLOATING	843	✓	
DBLL	32-BIT BINARY TO DOUBLE FLOATING	844	✓	
+D	DOUBLE FLOATING-POINT ADD	845	✓	
-D	DOUBLE FLOATING-POINT SUBTRACT	846	✓	
＊D	DOUBLE FLOATING-POINT MULTIPLY	847	✓	
/D	DOUBLE FLOATING-POINT DIVIDE	848	✓	
RADD	DOUBLE DEGREES TO RADIANS	849	✓	
DEGD	DOUBLE RADIANS TO DEGREES	850	✓	
SIND	DOUBLE SINE	851	✓	
COSD	DOUBLE COSINE	852	✓	
TAND	DOUBLE TANGENT	853	✓	
ASIND	DOUBLE ARC SINE	854	✓	
ACOSD	DOUBLE ARC COSINE	855	✓	
ATAND	DOUBLE ARC TANGENT	856	✓	
SQRTD	DOUBLE SQUARE ROOT	857	✓	
EXPD	DOUBLE EXPONENT	858	✓	
LOGD	DOUBLE LOGARITHM	859	✓	
PWRD	DOUBLE EXPONENTIAL POWER	860	✓	

●Table Data Processing Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
SSET	SET STACK	630	✓	
PUSH	PUSH ONTO STACK	632	✓	
FIFO	FIRST IN FIRST OUT	633	✓	
LIFO	LAST IN FIRST OUT	634	✓	
DIM	DIMENSION RECORD TABLE	631	✓	
SETR	SET RECORD LOCATION	635	✓	
GETR	GET RECORD NUMBER	636	✓	
SRCH	DATA SEARCH	181	✓	
SWAP	SWAP BYTES	637	✓	✓
MAX	FIND MAXIMUM	182	✓	✓
MIN	FIND MINIMUM	183	✓	✓
SUM	SUM	184	✓	
FCS	FRAME CHECKSUM	180	✓	✓
SNUM	STACK SIZE READ	638	✓	
SREAD	STACK DATA READ	639	✓	
SWRIT	STACK DATA OVERWRITE	640	✓	
SINS	STACK DATA INSERT	641	✓	
SDEL	STACK DATA DELETE	642	✓	

●Data Control Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
PID	PID CONTROL	190	✓	
PIDAT	PID CONTROL WITH AUTOTUNING	191	✓	✓
LMT	LIMIT CONTROL	680	✓	
BAND	DEAD BAND CONTROL	681	✓	
ZONE	DEAD ZONE CONTROL	682	✓	
TPO	TIMEPROPORTIONAL OUTPUT	685	✓	✓
SCL	SCALING	194	✓	✓
SCL2	SCALING2	486	✓	✓
SCL3	SCALING3	487	✓	✓
AVG	AVERAGE	195	✓	✓

●Subroutine Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
SBS	SUBROUTINE CALL	91	✓	✓
SBN	SUBROUTINE ENTRY	92	✓	✓
RET	SUBROUTINE RETURN	93	✓	✓
MCRO	MACRO	99	✓	
GSBS	GLOBAL SUBROUTINE CALL	750	✓	
GSBN	GLOBAL SUBROUTINE ENTRY	751	✓	
GRET	GLOBAL SUBROUTINE RETURN	752	✓	

●Interrupt Control Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
MSKS	SET INTERRUPT MASK	690	✓	✓
MSKR	READ INTERRUPT MASK	692	✓	
CLI	CLEAR INTERRUPT	691	✓	✓
DI	DISABLE INTERRUPTS	693	✓	✓
EI	ENABLE INTERRUPTS	694	✓	✓

●High-speed Counter and Pulse Output Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
INI	MODE CONTROL	880	✓	✓
PRV	HIGH-SPEED COUNTER PV READ	881	✓	✓
PRV2	COUNTER FREQUENCY CONVERT	883	✓	
CTBL	COMPARISON TABLE LOAD	882	✓	✓
SPED	SPEED OUTPUT	885	✓	✓
PULS	SET PULSES	886	✓	✓
PLS2	PULSE OUTPUT	887	✓	✓
ACC	ACCELERATION CONTROL	888	✓	✓
ORG	ORIGIN SEARCH	889	✓	✓
PWM	PULSE WITH VARIABLE DUTY FACTOR	891	✓	✓
IFEED	STEP DEFINE	892		✓
ITPL	STEP START	893		✓

●I/O Unit Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
STEP	STEP DEFINE	8	✓	✓
SNXT	STEP START	9	✓	✓

●I/O Unit Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
IORF	I/O REFRESH	97	✓	✓
SDEC	7-SEGMENT DECODER	78	✓	✓
DSW	DIGITAL SWITCH INPUT	210	✓	
TKY	TEN KEY INPUT	211	✓	
HKY	HEXADECIMAL KEY INPUT	212	✓	
MTR	MATRIX INPUT	213	✓	✓
7SEG	7-SEGMENT DISPLAY OUTPUT	214	✓	✓

●Serial Communications Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
TXD	TRANSMIT	236	✓	✓
RXD	RECEIVE	235	✓	✓
STUP	CHANGE SERIAL PORT SETUP	237	✓	

●Network Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
SEND	NETWORK SEND	90	✓	✓
RECV	NETWORK RECEIVE	98	✓	✓
CMND	DELIVER COMMAND	490	✓	✓

●Display Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
MSG	DISPLAY MESSAGE	46	✓	

●Clock Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
CADD	CALENDAR ADD	730	✓	✓
CSUB	CALENDAR SUBTRACT	731	✓	✓
SEC	HOURS TO SECONDS	65	✓	
HMS	SECONDS TO HOURS	66	✓	
DATE	CLOCK ADJUSTMENT	735	✓	✓

●Debugging Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
TRSM	TRACE MEMORY SAMPLING	45	✓	

●Failure Diagnosis Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
FAL	FAILURE ALARM	6	✓	✓
FALS	SEVERE FAILURE ALARM	7	✓	✓
FPD	FAILURE POINT DETECTION	269	✓	

●Failure Diagnosis Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
STC	SET CARRY	40	✓	✓
CLC	CLEAR CARRY	41	✓	✓
WDT	EXTEND MAXIMUM CYCLE TIME	94	✓	✓
CCS	SAVE CONDITION FLAGS	282	✓	
CCL	LOAD CONDITION FLAGS	283	✓	
FRMCV	CONVERT ADDRESS FROM CV	284	✓	
TOCV	CONVERT ADDRESS TO CV	285	✓	

●Block Programming Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
BPRG	BLOCK PROGRAM BEGIN	96	✓	
BEND	BLOCK PROGRAM END	801	✓	
BPPS	BLOCK PROGRAM PAUSE	811	✓	
BPRS	BLOCK PROGRAM RESTART	812	✓	
EXIT	CONDITIONAL BLOCK EXIT	806	✓	
EXIT NOT	CONDITIONAL BLOCK EXIT (NOT)	806	✓	
IF	Branching	802	✓	
IF NOT	Branching (NOT)	802	✓	
ELSE	Branching	803	✓	
IEND	Branching	804	✓	
WAIT	ONE CYCLE AND WAIT	805	✓	
WAIT NOT	ONE CYCLE AND WAIT (NOT)	805	✓	
TIMW	TIMER WAIT	813	✓	
TIMWX		816	✓	
CNTW	COUNTER WAIT	814	✓	
CNTWX		818	✓	
TMHW	HIGH-SPEED TIMER WAIT	815	✓	
TMHWX		817	✓	
LOOP	LOOP CONTROL	809	✓	
LEND	LOOP CONTROL	810	✓	
LEND NOT	LOOP CONTROL	810	✓	

●Text String Processing Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
MOV$	MOV STRING	664	✓	
+$	CONCATENATE STRING	656	✓	
LEFT$	GET STRING LEFT	652	✓	
RGHT$	GET STRING RIGHT	653	✓	
MID$	GET STRING MIDDLE	654	✓	
FIND$	FIND IN STRING	660	✓	
LEN$	STRING LENGTH	650	✓	
RPLC$	REPLACE IN STRING	661	✓	
DEL$	DELETE STRING	658	✓	
XCHG$	EXCHANGE STRING	665	✓	
CLR$	CLEAR STRING	666	✓	
INS$	INSERT INTO STRING	657	✓	
LD,AND,OR+ =$	String Comparison Instructions	670	✓	
LD,AND,OR+ <>$		671	✓	
LD,AND,OR+ <$		672	✓	
LD,AND,OR+ <=$		673	✓	
LD,AND,OR+ >$		674	✓	
LD,AND,OR+ >=$		675	✓	

●Task Control Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
TKON	TASK ON	820	✓	
TKOF	TASK OFF	821	✓	

●Model Conversion Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
XFERC	BLOCK TRANSFER	565	✓	
DISTC	SINGLE WORD DISTRIBUTE	566	✓	
COLLC	DATA COLLECT	567	✓	
MOVBC	MOVE BIT	568	✓	
BCNTC	BIT COUNTER	621	✓	

●Special Function Block Instructions

Mnemonic	Instruction	FUN No	CP1L	CP2E
GETID	GET VARIABLE ID	286	✓	

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

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