TECHNICAL BULLETIN

[Issue No.] FA-A-0001-F **[Page]** 1/58
[Title] Method of replacing High Performance model QCPU with Universal model QCPU
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[Relevant Models] Q02UCPU, Q03UDCPU, Q04UDHCPU, Q06UDHCPU, Q10UDHCPU, Q13UDHCPU, Q20UDHCPU, Q26UDHCPU, Q03UDECPU, Q04UDEHCPU, Q06UDEHCPU, Q10UDEHCPU, Q13UDEHCPU, Q20UDEHCPU, Q26UDEHCPU

Thank you for your continued support of Mitsubishi programmable controllers, MELSEC-Q series.
This bulletin provides detailed information on how to replace the High Performance model QCPU with the Universal model QCPU.
For the method of replacing the Basic model QCPU with the Universal model QCPU, refer to the latest version of the technical bulletin “FA-A-0054”.
Note that the reference manuals or the references described in this bulletin are information as of July 2011.

Contents

GENERIC TERMS

Generic term	Description
Universal model QCPU	Generic term for Q02UCPU, Q03UDCPU, Q04UDHCPU, Q06UDHCPU, Q10UDHCPU, Q13UDHCPU, Q20UDHCPU, Q26UDHCPU, Q03UDECPU, Q04UDEHCPU, Q06UDEHCPU, Q10UDEHCPU, Q13UDEHCPU, Q20UDEHCPU, and Q26UDEHCPU
Built-in Ethernet port QCPU	Generic term for Q03UDECPU, Q04UDEHCPU, Q06UDEHCPU, Q10UDEHCPU, Q13UDEHCPU, Q20UDEHCPU, and Q26UDEHCPU
QnUD(H)CPU	Generic term for Q03UDCPU, Q04UDHCPU, Q06UDHCPU, Q10UDHCPU, Q13UDHCPU, Q20UDHCPU, and Q26UDHCPU

1. PRECAUTIONS FOR REPLACEMENT

This chapter describes the precautions for replacing the High Performance model QCPU with the Universal model QCPU and the replacement methods.

(1) System configuration

Table 1.1 Precautions and replacement methods

Item	Precaution	Replacement method	Reference
Use of AnS/A series module	AnS/A series modules are not supported.	Use Q series modules.	-
GOT	GOT900 series cannot be connected.	Use GOT1000 series.	-
Programming tool connection	Applicable USB cables are different. • High Performance model QCPU … A-B type • Universal model QCPU … A-miniB type	Use USB cables of A-miniB type. Or, use USB conversion adapters of B-miniB type.	-
Applicable products and software	Products and software compatible with the Universal model QCPU must be used.	Products need to be replaced for the compatibility with the Universal model QCPU and software need to be upgraded for the communication with the Universal model QCPU are described in Chapter 2.	Chapter 2
Multiple CPU system	To configure a multiple CPU system, CPU modules compatible with the Universal model QCPU must be used.	CPU modules compatible with the Universal model QCPU are described in Chapter 2.	Chapter 2
	In a multiple CPU system using the Motion CPU, an existing auto refresh area and user setting area cannot be used for data communication with the Motion CPU.	For data communication with the Motion CPU, use an auto refresh area and user setting area in the multiple CPU high-speed transmission area.	Chapter 4 in the QCPU User's Manual (Multiple CPU System)
Redundant power supply system [*1]	In a redundant power supply system using the Q38RB redundant power supply main base unit and the Q68RB redundant power supply extension base unit, the status of the power supply module cannot be stored in the special relays and special registers (SM1780 to SM1783/SD1780 to SD1783). The status cannot be displayed on the system monitor.	Check the status of the power supply module by the LED on the front of the module.	Section 7.1 in the QCPU User's Manual (Hardware Design, Maintenance and Inspection)
MELSECNET/H	The simple dual-structured network function is not supported.	-	Section 7.7 in the Q Corresponding MELSECNET/H Network System Reference Manual (PLC to PLC network)

*1: The serial number (first five digits) of the Universal model QCPU must be “10041” or earlier.

(2) Program

Table 1.2 Precautions and replacement methods

Item	Precaution	Replacement method	Reference
Language and instruction	Some instructions are not supported.	Replace the instructions not supported in the Universal model QCPU are described in Chapter 3.	Chapter 3
Floating-point operation	The Universal model QCPU performs program operations of floating-point data in single precision.	Instructions for floating-point double-precision operation are added for the Universal model QCPU. Replace the instructions if floating-point double-precision operations are required, as described in Section 4.1.	• Appendix 4.4 in the QnUCPU User's Manual (Function Explanation, Program Fundamentals) • Section 4.1, 4.2
	When using the floating-point data comparison instructions, LDE□, ANDE□, ORE□, LDED□, ANDED□, and ORED□, if the comparison source data are -0, nonnumeric, unnormalized number, or ±∞, “OPERATION ERROR” (error code: 4101) is detected. (□ indicates one of the followings: =, <>, <=, >=, <, >)	When the floating-point data comparison instructions are used, modify the program as described in Section 4.2.	
Device range check at index modification	When a device number exceeds a setting range due to index modification, “OPERATION ERROR” (error code: 4101) is detected.	Deselect the "Check device range at indexing" checkbox in the PLC RAS tab of the PLC parameter dialog box so that checking is not performed.	Section 3.17 in the QnUCPU User's Manual (Function Explanation, Program Fundamentals) • Section 4.3
Program execution type	Low-speed execution type programs are not supported.	Use scan execution type programs or fixed scan execution type programs.	Section 2.10 in theQnUCPU User's Manual (Function Explanation, Program Fundamentals)
	A program execution type cannot be changed by remote operation.	Use instructions for switching program execution types, such as PSTOP, POFF, and PSCAN.	Section 2.10.5 in the QnUCPU User's Manual (Function Explanation, Program Fundamentals)
Latch setting	If latch ranges of internal user devices are specified, the processing time is added in proportion to the device points set to be latched. (For example, if 8K points are latched for the latch relay (L), the processing time is 28.6μs.)	The latch function of the Universal model QCPU is enhanced. (1) Large-capacity file register (R, ZR) (2) Writing/reading device data to the standard ROM (SP.DEVST and S(P).DEVLD instructions) (3) Latch range specification of internal devices Change the latch method to the method described in (1) to (3) above according to the application.	• Section 3.3 in the QnUCPU User's Manual (Function Explanation, Program Fundamentals) • Section 4.4

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Table 1.2 Precautions and replacement methods (continued)

Item	Precaution	Replacement method	Reference
Interrupt program	The interrupt pointer (I49) for the high-speed interrupt function is not supported.	Consider the use of interrupt pointers for fixed scan interrupt (I28 to I31).	Section 3.13.2 and 4.2.11 in the QnUCPU User's Manual (Function Explanation, Program Fundamentals)
	Interrupt counter is not supported.	Check the numbers of executions for interrupt programs on the Interrupt program monitor list screen of GX Developer.	
	The interrupt pointer (I32 to I40) for an error is not supported.	-	-
SCJ instruction	When the SCJ instruction is used in the Universal model QCPU, the AND SM400 (or NOP instruction) needs to be inserted immediately before the SCJ instruction.	Insert the AND SM400 (or NOP instruction) immediately before the SCJ instruction when the SCJ instruction is used.	Section 6.5.1 in the MELSEC-Q/L Programming Manual (Common Instruction)
ZPUSH instruction	The number of index registers is increased to 20 for the Universal model QCPU. The area for saving the data in the index register with the ZPUSH instruction is increased as well.	Increase the save areas used for the ZPUSH instruction as needed.	Section 7.18.8 in the MELSEC-Q/L Programming Manual (Common Instruction)
File usability setting for each program	The following file usability setting for each program is not available. *1 • File register • Initial device value • Comment	When file usability is set, modify the program as described in Section 4.5.	• Section 2.10 in the QnUCPU User's Manual (Function Explanation, Program Fundamentals) • Section 4.5
I/O refresh setting for each program	I/O refresh setting for each program is not available.	Use the RFS instruction if I/O refresh setting for each program is required.	MELSEC-Q/L Programming Manual (Common Instruction)
SM/SD	Usage of a part of the special relay and special register is different.	Replace the corresponding special relay and special register as described in Chapter 5.	Chapter 5
	A sereis-compatible special relay and special register are not supported. (SM1000 to SM1255/SD1000 to SD1255)	Using GX Developer, A series-compatible special relay and special register can be replaced with the Universal model QCPU-compatible special relay and special register. Note, however, that the ones which are not compatible with the Universal model QCPU are replaced with SM1255 and SD1255. Modify programs as needed.	Appendix 2 and Appendix 3 in the QCPU User's Manual (Hardware Design, Maintenance and Inspection)
Processing time	Scan time and other processing times are different.	Modify programs as needed, checking the processing timing.	-

*1: The local device file usability setting is also not available for the Q02UCPU, Q03UDCPU, Q04UDHCPU, and Q06UDHCPU if the serial number (first five digits) is "10011" or earlier.

(3) Drive and file

Table 1.3 Precautions and replacement methods

Item	Precaution	Replacement method	Reference
Boot file setting	Files in the standard ROM cannot be booted to the program memory.	Since the Universal model QCPU holds the data in the program memory even when the battery voltage drops, the boot file setting is not necessary. Move files with the boot setting (from the standard ROM to the program memory) to the program memory.	• Section 2.1.2 in the QnUCPU User's Manual (Function Explanation, Program Fundamentals) • Section 4.6
	Booting operation is different.	Replacement method when the parameter-valid drive and the boot file setting are set in the High Performance model QCPU is described in Section 4.6.	
Automatic all data write from memory card to standard ROM	The setting method of this function is different.	In the Boot file tab of the PLC parameter dialog box, select "standard ROM" for the transfer destination. Note, however, that the transfer destination of "program" is fixed to "program memory". (Setting by DIP switches is not necessary.)	Section 2.11 in the QnUCPU User's Manual (Function Explanation, Program Fundamentals)

(4) External communication

Table 1.4 Precautions and replacement methods

Item	Precaution	Replacement method	Reference
Module service interval time read	The module service interval time cannot be read.	-	-
MC protocol	The following frame types cannot be used when accessing the Universal model QCPU. *1 • A-compatible 1C frame • A-compatible 1E frame	Use the frame types below. • QnA-compatible 2C/3C/4C frame • QnA-compatible 3E frame • 4E frame	MELSEC-Q/L MELSEC Communication Protocol Reference Manual
	The following commands cannot specify monitoring conditions. • Randomly reading data in units of word (Command: 0403) • Device memory monitoring (Command: 0801) The applicable frame types are as follows: • QnA-compatible 3C/4C frame • QnA-compatible 3E frame • 4E frame	-	

*1: Applicable to the Q02UCPU, Q03UDCPU, Q04UDHCPU, Q06UDHCPU, Q13UDHCPU, and Q26UDHCPU if the serial number (first five digits) is "10101" or earlier.

(5) Diagnostic function

Table 1.5 Precautions and replacement methods

Item	Precaution	Replacement method	Reference
Error history	Error history data cannot be stored in the memory card.	The Universal model QCPU stores all storable data (up to 100) in the built-in memory.	Section 3.18 in the QnUCPU User's Manual (Function Explanation, Program Fundamentals)
LED indication priority setting	LED indication priority cannot be set. Only LED indication setting at error occurrence is supported.	-	Section 3.20.2 in the QnUCPU User's Manual (Function Explanation, Program Fundamentals)

(6) Debugging

Table 1.6 Precautions and replacement methods

Item	Precaution	Replacement method	Reference
Monitor *3	The monitoring condition cannot be set.	Use the sampling trace function for checking device data under the specified monitoring condition. With this function, changes of the specified device data can be recorded at the following timings: • at the execution of the specified step • at the rising/falling edge of bit devices • when the value of word devices coincide with the setting value • at every specified time (settable range: 1ms to 5000ms)	Section 3.11.1 and 3.14 in the QnU CPU User's Manual (Function Explanation, Program Fundamentals)
Scan time measurement by GX Developer *3	Time required for executing a part of the program cannot be measured using the scan time measurement function.*1	Calculate the time using instruction processing time described in the manual.	• Section 3.13.3 in the QnUCPU User's Manual (Function Explanation, Program Fundamentals) • Appendix 1.4 in the MELSEC-Q/L Programming Manual (Common Instruction)
External input/output forced on/off *3	The external input/output forced on/off function is not supported. *2	The function can be replaced with the programs described in Section 4.7. Note, however, that replacement method described does not apply in the following cases: • Input and output targeted for forced on/off are referred to or changed using the direct input device (DX) and direct output device (DY). • Input and output targeted for forced on/off are referred to or changed within an interrupt program.	• Section 3.11.3 in the QnUCPU User's Manual (Function Explanation, Program Fundamentals) • Section 4.7

*1: Scan time of each program can be checked on the Program monitor list screen.
*2: Device test by GX Developer can be performed.
*3: Applicable to the Q02UCPU, Q03UDCPU, Q04UDHCPU, Q06UDHCPU, Q13UDHCPU, and Q26UDHCPU if the serial number (first five digits) if "10041" or earlier.

(7) Switch on the front of the CPU module

Table 1.7 Precautions and replacement methods

Item	Precaution	Replacement method	Reference
Switch on the front of the CPU module	The operation method with the RESET/RUN/STOP switch is modified.	The RESET/STOP/RUN switch of the Universal model QCPU can be used for the reset operation of the CPU module and switching between STOP and RUN status.	Section 6.1.3 in the QCPU User's Manual (Hardware Design, Maintenance and Inspection)
	Latch data cannot be cleared by the switch.	To clear latch data, use the remote latch clear operation of GX Developer.	Section 6.1.3 in the QCPU User's Manual (Hardware Design, Maintenance and Inspection)
	The system protect cannot be set by the switch.	Data in the files can be protected by setting a password for each file. Password for each file can be registered with GX Developer.	Section 3.19 in the QnUCPU User's Manual (Function Explanation, Program Fundamentals)
	The parameter-valid drive setting is not necessary.	The Universal model QCPU automatically determines the parameter-valid drive. Change the setting as described in Section 4.6 when the parameter-valid drive is set to other than the program memory in the High Performance model QCPU.	• Section 6.1.3 in the QCPU User's Manual (Hardware Design, Maintenance and Inspection) • Section 4.6

(8) SFC

Table 1.8 Precautions and replacement methods

Item	Precaution	Replacement method	Reference
Step transition monitoring timer	The step transition monitoring timer is not supported.	Change the program as described in Appendix 3.1 in the MELSEC-Q/L/QnA Programming Manual (SFC)	Section 4.6 and Appendix 3.1 in the MELSEC-Q/L/QnA Programming Manual (SFC)
SFC operation mode setting	The periodic execution block setting is not supported.	Change the program as described in Appendix 3.2 in the MELSEC-Q/L/QnA Programming Manual (SFC)	Section 4.7.4 and Appendix 3.2 in the MELSEC-Q/L/QnA Programming Manual (SFC)
	An operation mode at double block START cannot be selected. (Fixed to “WAIT”.)*1	-	Section 4.7.5 in the MELSEC-Q/L/QnA Programming Manual (SFC)
	An operation mode at transition to active step cannot be selected. (Fixed to “TRANSFER".)	-	Section 4.7.6 in the MELSEC-Q/L/QnA Programming Manual (SFC)
SFC program for program execution management	SFC programs for program execution management are not supported.	-	Section 5.2.3 in the MELSEC-Q/L/QnA Programming Manual (SFC)
SFC control instruction	Some SFC control instructions are not supported.	SFC control instructions not supported in the Universal model QCPU and replacing methods are described in Section 3.1.	• Section 4.4 in the MELSEC-Q/L/QnA Programming Manual (SFC) • Section 3.1
SFC comment readout instruction*1	The following SFC comment readout instructions are not supported. • S(P).SFCSCOMR (SFC step comment readout instruction) • S(P).SFCTCOMR (SFC transition condition comment readout instruction)	-	Section 4.8 in the MELSEC-Q/L/QnA Programming Manual (SFC)
Method of SFC program change	SFC program files cannot be written to the running CPU module. (Programs in SFC Figure can be changed online.)	• Write program data to the CPU module after changing the Universal model QCPU status to STOP. • An inactive block in an SFC program can be changed by online change of inactive block.*2	Section 6.6 in the MELSEC-Q/L/QnA Programming Manual (SFC)

*1: This applies to the Universal model QCPU whose serial number (first five digits) is "12051" or earlier.
*2: This operation is available for the Universal model QCPU other than the Q02UCPU and whose serial number (first five digits) is "12052" or later.

2. APPLICABLE PRODUCTS AND SOFTWARE

(1) Products need to be replaced for the compatibility with the Universal model QCPU

The following tables show products need to be replaced for the compatibility with the Universal model QCPU. (As for devices not listed in the tables below, replacement is not required.)

Table 2.1 Product need to be replaced (Communication modules)

Product	Model	Serial number (first five digits) of the product compatible with the Universal model QCPU *2	
		Used with Q02U/Q03UD/Q04UDH/Q06UDHCPU	Used with Q10UDH/Q13UDH/Q20UDH/Q26UDHCPU or Built-in Ethernet port QCPU
Web server module *1	• QJ71WS96	"09042" or later.	"10012" or later.
MES interface module	• QJ71MES96		

*1: The Universal model QCPU does not operate normally when the Web server module on which GX RemoteService-I is installed is used.
*2: The Universal model QCPU does not operate normally when an incompatible module version is used.

Table 2.2 Product need to be replaced (Personal computer boards)

Product		Model	Dedicated software package version compatible with the Universal model QCPU *1		
			Used with Q02U/Q03UD/Q04UDH/Q06UDHCPU	Used with Q13UDH/Q26UDHCPU	Used with Q10UDH/Q20UDHCPU, or Built-in Ethernet port QCPU
CC-Link IE controller network interface board		• Q80BD-J71GP21-SX • Q80BD-J71GP21S-SX	No restrictions	Version 1.03D or later	Version 1.06G or later
MELSECNET/H interface board	SI/QSI/H-PCF optical cable	• Q80BD-J71LP21-25 • Q80BD-J71LP21S-25	Version 15R or later	Version 18U or later	Version 20W or later
		• Q81BD-J71LP21-25	Version 19V or later	Version 19V or later	
	GI optical cable	• Q80BD-J71LP21G	Version 15R or later	Version 18U or later	
	Coaxial cable	• Q80BD-J71BR11			
CC-Link system master/local interface board		• Q80BD-J61BT11N	Version 1.02C or later	Version 1.05F or later	Version 1.07H or later
		• Q81BD-J61BT11	Version 1.06G or later	Version 1.06G or later	

*1: No restrictions on the board itself.

Table 2.3 Product need to be replaced (GOT)

Product	Model	GT Designer2 OS version compatible with the Universal model QCPU *1				
		Used with Q02U/Q03UD/Q04UDH/Q06UDHCPU	Used with Q13UDH/Q26UDHCPU	Used with Q10UDH/Q20UDHCPU	Used with Q03UDE/Q04UDEH/Q06UDEH/Q13UDEH/Q26UDEHCPU	Used with Q10UDEH/Q20UDEHCPU
GOT1000	• GT15□-□ • GT11□-□	Version 2.60N or later	Version 2.76E or later	Version 2.91V or later	Version 2.81K or later	Version 2.91V or later
	• GT10□-□	Version 2.76E or later	Version 2.76E or later	Version 2.91V or later	-	-

*1: No restrictions on GOT itself.

Table 2.4 Product need to be replaced (Network module and serial communication module)

Product	**Model**	**Module version compatible with the Universal model QCPU**	
		Used with Q02U/Q03UD/ 04UDH/Q06UDH/ Q10UDH/Q13UDH/Q20UDH/Q26UDHCPU	**Used with Built-in Ethernet port QCPU**
MELSECNET/H module	• QJ71LP21-25 • QJ71LP21S-25 • QJ71LP21G • QJ71BR11	No restrictions	Some restrictions depending on use conditions [*1]
Serial communication module	• QJ71C24N • QJ71C24N-R2 • QJ71C24N-R4		The serial number (first five digits) "10042" or later.
Modem interface module	• QJ71CMON		

*1: The serial number (first five digits) of the MELSECNET/H module must be "10042" or later if all conditions 1) to 4) described below are satisfied.
1) A multiple CPU system including Built-in Ethernet port QCPU is configured.
2) GX Developer or GOT is connected to an Ethernet port of Built-in Ethernet port QCPU.
3) GX Developer or GOT accesses the CPU module on another station via the MELSECNET/H module controlled by another CPU.
4) The access target on another station is A/QnA series CPU module.

(2) CPU modules that can configure a multiple CPU system with the Universal model QCPU

CPU modules that can configure a multiple CPU system with the Universal model QCPU are shown below.

(a) For the QnUD(H)CPU or Built-in Ethernet port QCPU

Table 2.5 CPU module that can configure a multiple CPU system with the QnUD(H)CPU or Built-in Ethernet port QCPU

CPU module	**Model**	**Applicable version**			**Restrictions**
		Configured with 03UD/Q04UDH/ Q06UDHCPU	**Configured with Q13UDH/ Q26UDH/Q03UDE/ Q04UDEH/Q06UDEH/ Q13UDEH/Q26UDEHCPU**	**Configured with Q10UDH/ Q20UDH/ Q10UDEH/ Q20UDEHCPU**	
Motion CPU	• Q172DCPU • Q173DCPU	No restrictions			Use the multiple CPU high-speed main base unit (Q3□DB) for a main base unit.
PC CPU module	• PPC-CPU852(MS)	Driver S/W (PPC-DRV-02) version 1.01 or later	Driver S/W (PPC-DRV-02) version 1.02 or later	Driver S/W (PPC-DRV-02) version 1.03 or later	-
C Controller module	• Q06CCPU-V • Q06CCPU-V-B	No restrictions	Serial number (first five digits) "10102" or later.		-
	• Q12DCCPU-V	No restrictions			-
High Performance model QCPU	• Q02CPU • Q02HCPU • Q06HCPU • Q12HCPU • Q25HCPU	Function version B or later			-
Process CPU	• Q02PHCPU • Q06PHCPU • Q12PHCPU • Q25PHCPU	No restrictions			-

(b) For the Q02UCPU

Table 2.6 CPU module that can configure a multiple CPU system with Q02UCPU

CPU module	**Model**	**Applicable version**	**Restrictions**
Motion CPU	• Q172CPUN(-T) • Q173CPUN(-T) • Q172HCPU(-T) • Q173HCPU(-T)	No restrictions	The multiple CPU high-speed main base unit (Q3□DB) cannot be used for a main base unit.
PC CPU module	• PPC-CPU852(MS)	Driver S/W (PPC-DRV-02) version 1.01 or later.	-
C Controller module	• Q06CCPU-V • Q06CCPU-V-B	Serial number (first five digits) "10102" or later.	-

(3) Software need to be upgraded for the compatibility with the Universal model QCPU

The following table shows software need to be upgraded for the communication with the Universal model QCPU. (As for software not listed in the table below, version upgrade is not required.)
The latest version can be downloaded from the MELFANSweb.

Table 2.7 Software need to be upgraded for the compatibility with the Universal model QCPU

Software	Model	Version compatible with the Universal model QCPU			
		Used with Q02U/ Q03UD/Q04UDH/ Q06UDHCPU	Used with Q13UDH/ Q26UDHCPU	Used with Q03UDE/ Q04UDEH/Q06UDEH, Q13UDEH/Q26UDEHCPU	Used with Q10UDH/ Q20UDH/Q10UDEH/ Q20UDEHCPU
GX Developer	SW8D5C-GPPW-E	Version 8.48A or later	Version 8.62Q or later	Version 8.68W or later	Version 8.78G or later
GX Configulator-AD	SW2D5C-QADU-E	Version 2.05F or later *1	Version 2.05F or later *2	Version 2.05F or later *3	Version 2.05F or later *4
GX Configulator-DA	SW2D5C-QDAU-E	Version 2.06G or later *1	Version 2.06G or later *2	Version 2.06G or later *3	Version 2.06G or later *4
GX Configulator-SC	SW2D5C-QSCU-E	Version 2.12N or later *1	Version 2.12N or later *2	Version 2.17T or later *3	Version 2.17T or later *4
GX Configulator-CT	SW0D5C-QCTU-E	Version 1.25AB or later *1	Version 1.25AB or later *2	Version 1.25AB or later *3	Version 1.25AB or later *4
GX Configulator-TI	SW1D5C-QTIU-E	Version 1.24AA or later *1	Version 1.24AA or later *2	Version 1.24AA or later *3	Version 1.24AA or later *4
GX Configulator-TC	SW0D5C-QTCU-E	Version 1.23Z or later *1	Version 1.23Z or later *2	Version 1.23Z or later *3	Version 1.23Z or later *4
GX Configulator-FL	SW0D5C-QFLU-E	Version 1.23Z or later *1	Version 1.23Z or later *2	Version 1.23Z or later *3	Version 1.23Z or later *4
GX Configulator-QP	SW2D5C-QD75P-E	Version 2.25B or later	Version 2.29F or later	Version 2.30G or later *5	Version 2.32J or later
GX Configulator-PT	SW1D5C-QPTU-E	Version 1.23Z or later *1	Version 1.23Z or later *2	Version 1.23Z or later *3	Version 1.23Z or later *4
GX Configulator-AS	SW1D5C-QASU-E	Version 1.21X or later *1	Version 1.21X or later *2	Version 1.21X or later *3	Version 1.21X or later *4
GX Configulator-MB	SW1D5C-QMBU-E	Version 1.08J or later *1	Version 1.08J or later *2	Version 1.08J or later *3	Version 1.08J or later *4
GX Configulator-DN	SW1D5C-QDNU-E	Version 1.23Z or later *1	Version 1.23Z or later *2	Version 1.24AA or later *3	Version 1.24AA or later *4
MX Component	SW3D5C-ACT-E	Version 3.09K or later	Version 3.10L or later	Version 3.11M or later	Version 3.12N or later
GX Simulator	SW7D5C-LLT-E	Version 7.23Z or later *4	Version 7.23Z or later *4	Version 7.23Z or later *4	Version 7.23Z or later *4

*1: The software can be used by installing GX Developer Version 8.48A or later.
*2: The software can be used by installing GX Developer Version 8.62Q or later.
*3: The software can be used by installing GX Developer Version 8.68W or later.
*4: The software can be used by installing GX Developer Version 8.78G or later.
*5: GX Configurator-QP Version 2.29F can be used when connected via USB.

(4) Software not supported by the Universal model QCPU

The following table shows software not supported by the Universal model QCPU.

Table 2.8 Software not supported by the Universal model QCPU

Product	Model
GX Explorer	SW□D5C-EXP-E
GX Converter	SW□D5C-CNVW-E

3. INSTRUCTIONS

3.1 Instructions not Supported in the Universal Model QCPU and Replacing Methods

The Universal model QCPU does not support instructions listed in Table 3.1 and 3.2. Use alternative methods described in the tables. (For other instructions, replacement is not required.)

Table 3.1 Instructions not supported in the Universal model QCPU and alternative methods

Symbol	Instruction	Replacing method	Reference
IX	Index modification of entire ladder	Use alternative programs.	Section 3.3 (1)
IXEND			
IXDEV	Modification value specification in index modification of entire ladder	Change the program so that the device offset values specified by the IXSET instruction are directly set to the index modification table using the MOV instruction.	Section 3.3 (2)
IXSET			
PR	Print ASCII code instruction	• It is recommended to use GOT as an ASCII code display device. ASCII codes stored in devices are directly displayed as characters on GOT. • Instructions can be replaced using a replacement program.	Section 3.3 (3)
PRC	Print comment instruction	• It is recommended to use GOT as an ASCII code display device. Device comments can be displayed on GOT. • Comment data can be output to a display device in the replacement program of the PR instruction after reading data using the reading device comment data instruction (COMRD(P)).	
CHKST	Specific format failure check instruction	Instructions can be replaced using a replacement program.	Section 3.3 (4)
CHK			
CHKCIR	Format change instruction for CHK instruction	Failure detection ladder patterns can be changed in a replacement program.	
CHKEND			
PLOW	Program low-speed execution registration instruction	• Use the PSCAN instruction instead of this instruction when low-speed execution type programs are replaced with scan execution type programs. • No instruction can be used if low-speed execution type programs are replaced with fixed scan execution type programs.	-
PCHK	Program execution status check instruction	Check a program execution status on the Program monitor list screen of GX Developer. For details, refer to Section 3.13.1 in the QnUCPU User's Manual (Function Explanation, Program Fundamentals).	-
KEY	Numerical key input instruction	• It is recommended to use GOT as a numeral input device. • Instructions can be replaced using a replacement program.	Section 3.3 (5)
PLOADP	Load program from memory card	Store all programs to be executed in the program memory. The Universal model QCPU can neither add programs to the program memory nor change them with other programs during RUN. If the capacity of the program memory is not enough, store parameters, device comments, and device initial values in the program memory into the standard ROM or memory card instead.	-
PUNLOADP	Unload program from memory card		
PSWAPP	Load + Unload		

Table 3.2 SFC control instructions not supported in the Universal model QCPU and alternative methods

Symbol	Instruction	Alternative method
LD TRn	Forced transition check instruction	When the programmable controller type is changed, these instructions are converted into SM1255. Modify programs as needed.
AND TRn		
OR TRn		
LDI TRn		
ANDI TRn		
ORI TRn		
LD BLm\TRn		
AND BLm\TRn		
OR BLm\TRn		
LDI BLm\TRn		
ANDI BLm\TRn		
ORI BLm\TRn		
SCHG(D)	Active step change instruction	Refer to Appendix 3 "Restrictions on Basic Model QCPU, Universal Model QCPU, and LCPU and Alternative Methods" in the MELSEC-Q/L/QnA Programming Manual (SFC).
SET TRn	Transition control instruction	Refer to Appendix 3 " Restrictions on Basic Model QCPU, Universal Model QCPU, and LCPU and Alternative Methods" in the MELSEC-Q/L/QnA Programming Manual (SFC).
SET BLm\TRn		
RST TRn		
RST BLm\TRn		
BRSET(S)	Block switching instruction	When the programmable controller type is changed, these instructions are converted into SM1255. Modify programs as needed.

3.2 Replacing Programs Using Multiple CPU Transmission Dedicated Instructions

(1) Replacing the module with the QnUD(H)CPU or Built-in Ethernet port QCPU

Table 3.3 shows instructions need to be replaced and corresponding alternative instructions. For the specifications of each instruction, refer to the manuals for the Motion CPU.

Table 3.3 Instructions need to be replaced

Symbol	Instruction description	Symbol of alternative instruction
S(P).DDWR	Write other CPU device data into host CPU	D(P).DDWR
S(P).DDRD	Read other CPU device data into host CPU	D(P).DDRD
S(P).SFCS	Request of motion SFC program startup	D(P).SFCS
S(P).SVST	Request of servo program startup	D(P).SVST
S(P).CHGA	Current value change of halted axis/synchronized encoder/cam axis	D(P).CHGA
S(P).CHGV	Axis speed change during positioning and JOG operation	D(P).CHGV
S(P).CHGT	Torque control value change during operation and suspension in real mode	D(P).CHGT
S(P).GINT	Request of other CPU interrupt program startup	D(P).GINT

(2) Replacing the module with the Q02UCPU

The Q02UCPU supports the same multiple CPU transmission dedicated instructions used in the Basic model QCPU. The alternative instructions in Table 3.3 are not available for the Q02UCPU.

3.3 Program Replacement Examples

This section shows program replacement examples for the instructions listed in Section 3.1. (Skip this section if instructions listed in Section 3.1 are not used.)

(1) Replacement example of the IX and IXEND instructions

A replacement example of program using the IX and IXEND instructions is shown below.
To save index register data using the ZPUSH instruction, a 23-word index register save area is required.

(a) Example of device assignment

(Before replacement)

Application	Device
Index modification table	D100 to D115

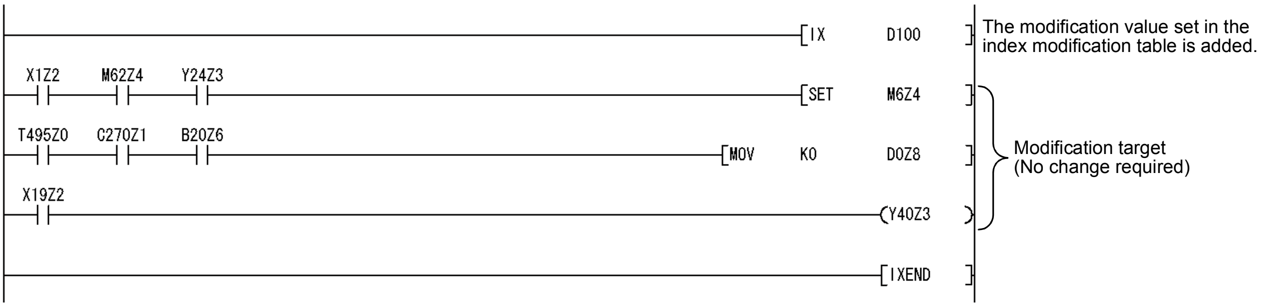
⇒

(After replacement)

Application	Device
Index modification table	D100 to D115
Index register save area	D200 to D222

If the device numbers in the example above are used for other applications, assign unused device numbers instead.

(b) Program before replacement

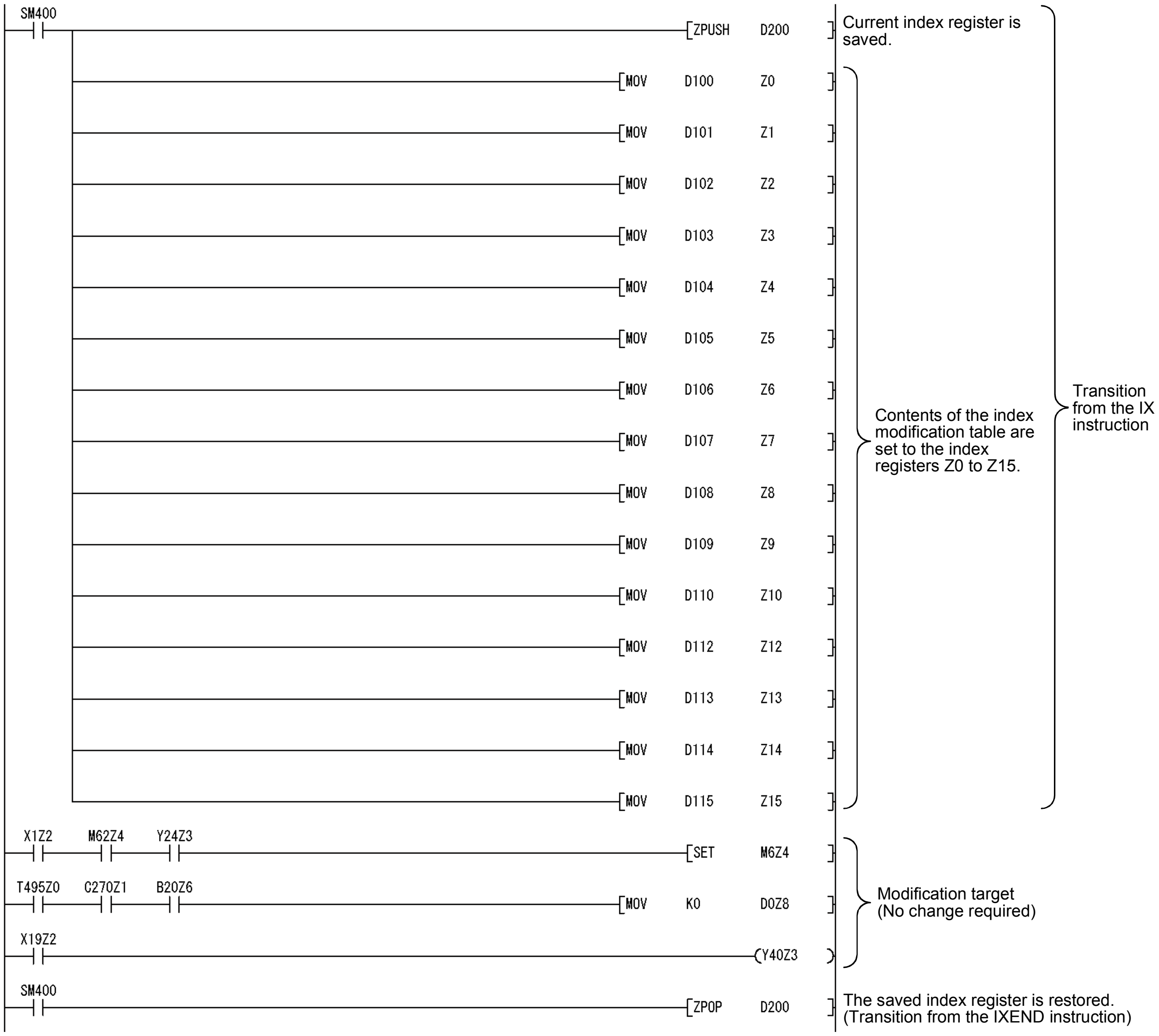


The modification value set in the index modification table is added.

Modification target (No change required)

(c) Program after replacement

- Replace the IX instruction with the ZPUSH instruction and set the contents of index modification table in the to index register.
- Replace the IXEND instruction with the ZPOP instruction.



Current index register is saved.

Contents of the index modification table are set to the index registers Z0 to Z15.

Transition from the IX instruction

Modification target (No change required)

The saved index register is restored. (Transition from the IXEND instruction)

(2) Replacement example of the IXDEV and IXSET instructions

Change the program so that the device offset values specified for the contacts between the IXDEV and IXSET instructions are directly set to the index modification table using the MOV instruction.

For a device offset value not specified by the IXDEV and IXSET instructions, it value to 0 in the program after replacement.

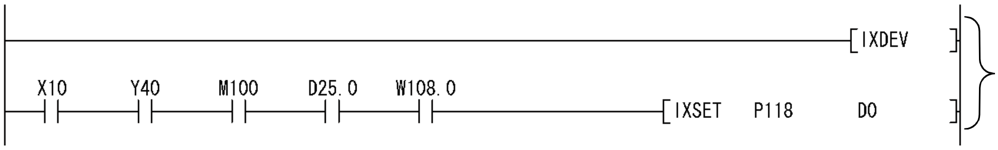
Device offset specification by the INDEV and IXSET instructions			Index modification table
Timer	T□ ⊣ ⊢	→	(D)+0
Counter	C□ ⊣ ⊢	→	(D)+1
Input [*1]	X□ ⊣ ⊢	→	(D)+2
Output [*1]	Y□ ⊣ ⊢	→	(D)+3
Internal relay	M□ ⊣ ⊢	→	(D)+4
Latch relay	L□ ⊣ ⊢	→	(D)+5
Edge relay	V□ ↑	→	(D)+6
Link relay [*1]	B□ ⊣ ⊢	→	(D)+7
Data register	D□.XX ⊣ ⊢	→	(D)+8
Link register [*1]	W□.XX ⊣ ⊢	→	(D)+9
File register	R□.XX ⊣ ⊢	→	(D)+10
Intelligent function module device [*2]	U□\G□.XX ⊣ ⊢	Start I/O number →	(D)+11
		Buffer memory →	(D)+12
Link direct device [*3]	J□\B□ ⊣ ⊢	→	(D)+13
File register (through number)	ZR□.XX ⊣ ⊢	→	(D)+14
Pointer	⊣[IXSET | P□]	→	(D)+15

*1: Device numbers are represented in hexadecimal. Use hexadecimal constants (H□) when setting values in the index modification table.

*2: Start I/O numbers (U□) are represented in hexadecimal. Use hexadecimal constants (H□) when setting values in the index modification table.

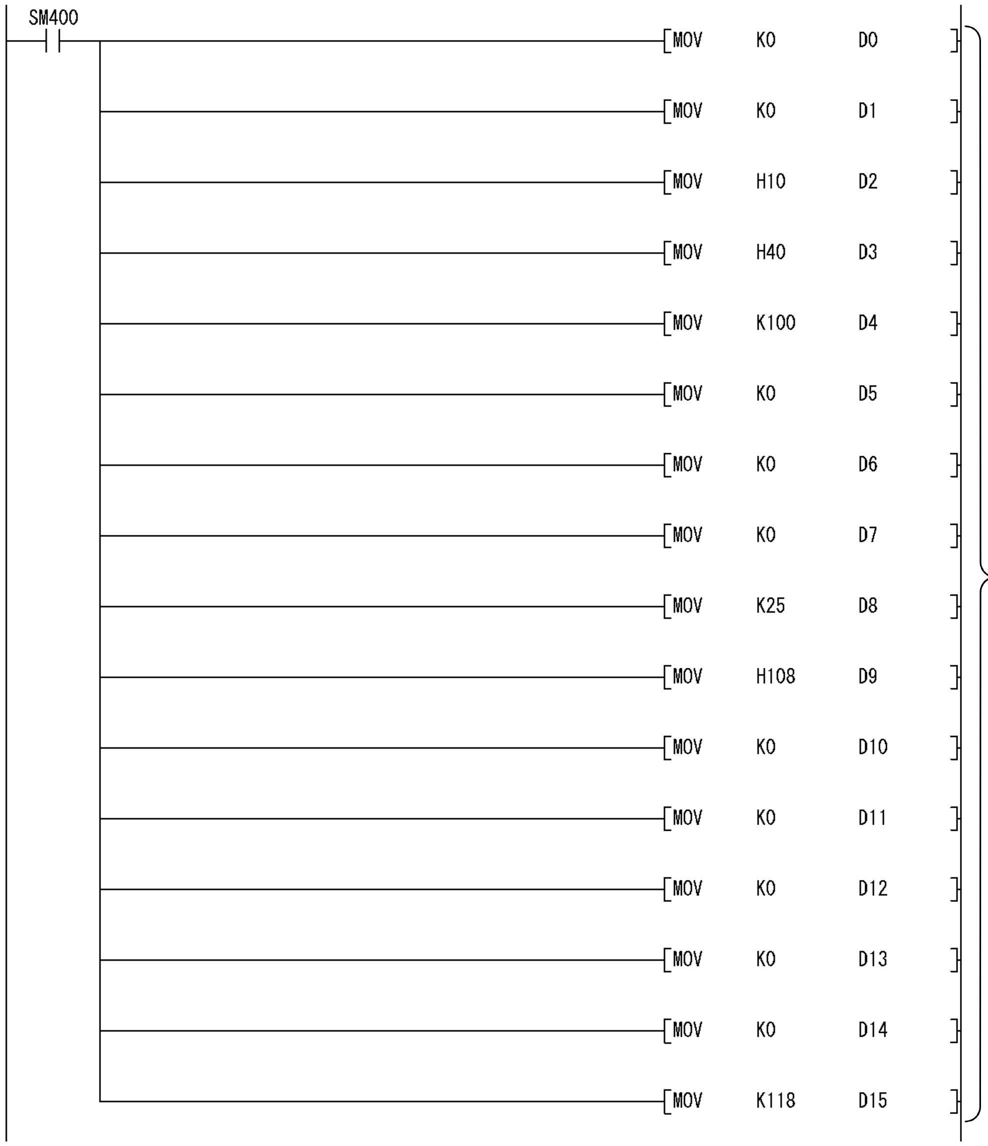
*3: Devices B, W, X, or Y can be specified following J□\. Set device numbers for B, W, X, and Y as device offset values of each device in the index modification table.
For example, if 'J10\Y220' is specified by the IXDEV or IXSET instruction, set 'K10' in (D)+13 and 'H220' in (D)+3 in the replacement program. ((D) indicates the start device in the index modification table.)

(a) Program before replacement



The device offset values for input (X), output (Y), internal relay (M), data register (D), link register (W), and pointer (P) are set to the index modification table starting from D0.

(b) Program after replacement



The device offset values specified by the IXDEV and IXSET instructions are set to the index modification table starting from D0.

(3) Replacement example of the PR instruction

The number of output characters can be switched by the on/off status of SM701.

(a) Example of device assignment

(Before replacement)

Application	Device
Output string	D0 to D3
ASCII code output signal	Y100 to Y107
Strobe signal	Y108
In-execution flag	Y109

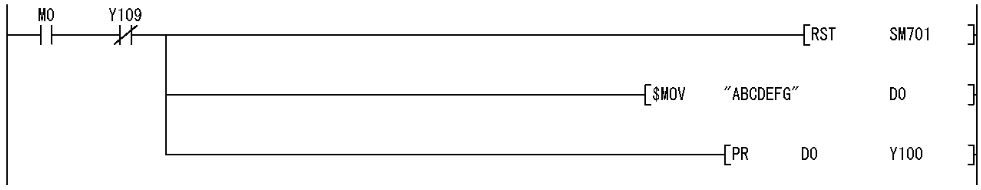
⇒

(After replacement)

Application	Device
Output string	D0 to D3
ASCII code output signal	Y100 to Y107
Strobe signal	Y108
In-execution flag	Y109
Output string storage address (BIN32)	D20 to D21
Output string storage address (BIN32) (Used for sub-routine programs and interrupt programs)	D200 to D201
Number of output characters	D202
Output module start Y number	D203
Character extraction position	D204
Number of extracted characters	D205
String output status value	D206
Result of string extraction by the MIDR instruction	D207
String output in-execution flag	M200
For index modification	Z0

If the device numbers in the example above are used for other applications, assign unused device numbers instead.

(b) Program before replacement

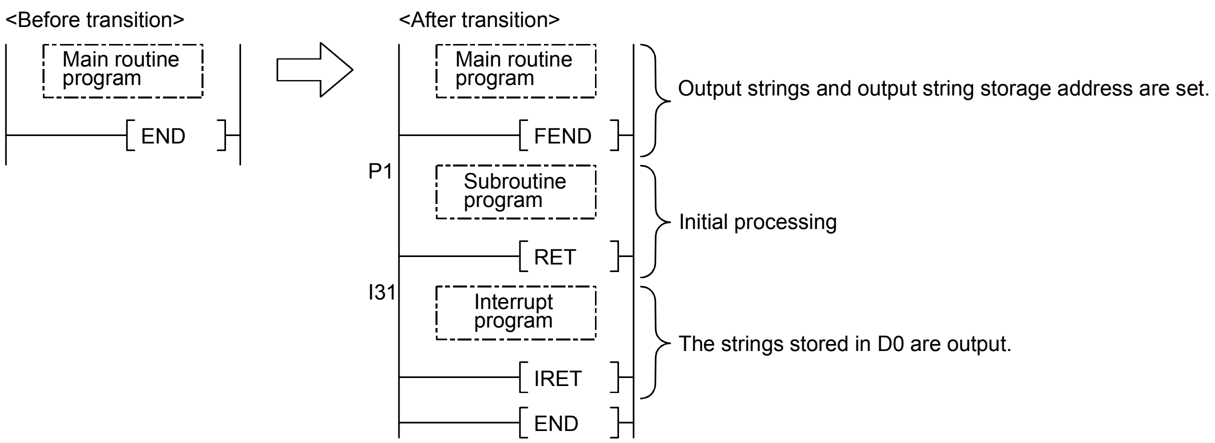


The number of output strings is set to variable. (Output untill ASCII code 00H appears.)

The strings stored in D0 or later are output to Y100 to Y108.

(c) Program after replacement

In the sequence program after replacement, three programs are required as shown below.



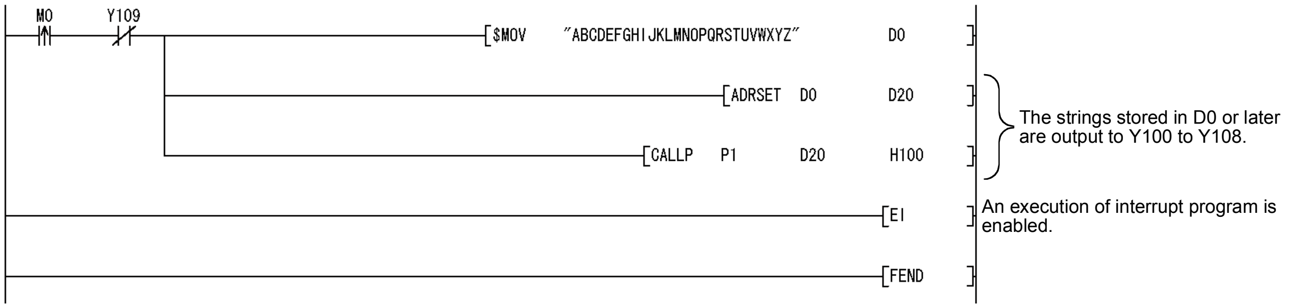
Output strings and output string storage address are set.

Initial processing

The strings stored in D0 are output.

1) Main routine program

- Replace the PR instruction with the CALL instruction so that a subroutine program is called.
- Output string storage device (‘D0’ in the program below) cannot be specified directly with the CALL instruction.
  Use the ADRSET instruction to acquire the indirect address for the CALL instruction.
- Y device (‘Y100’ in the program before replacement shown in (b)) cannot be specified directly as output Y number with the CALL instruction. Specify the output Y number in integer.
- An interrupt program is used to output character codes via the output module. Enable the execution of interrupt program using the EI instruction.



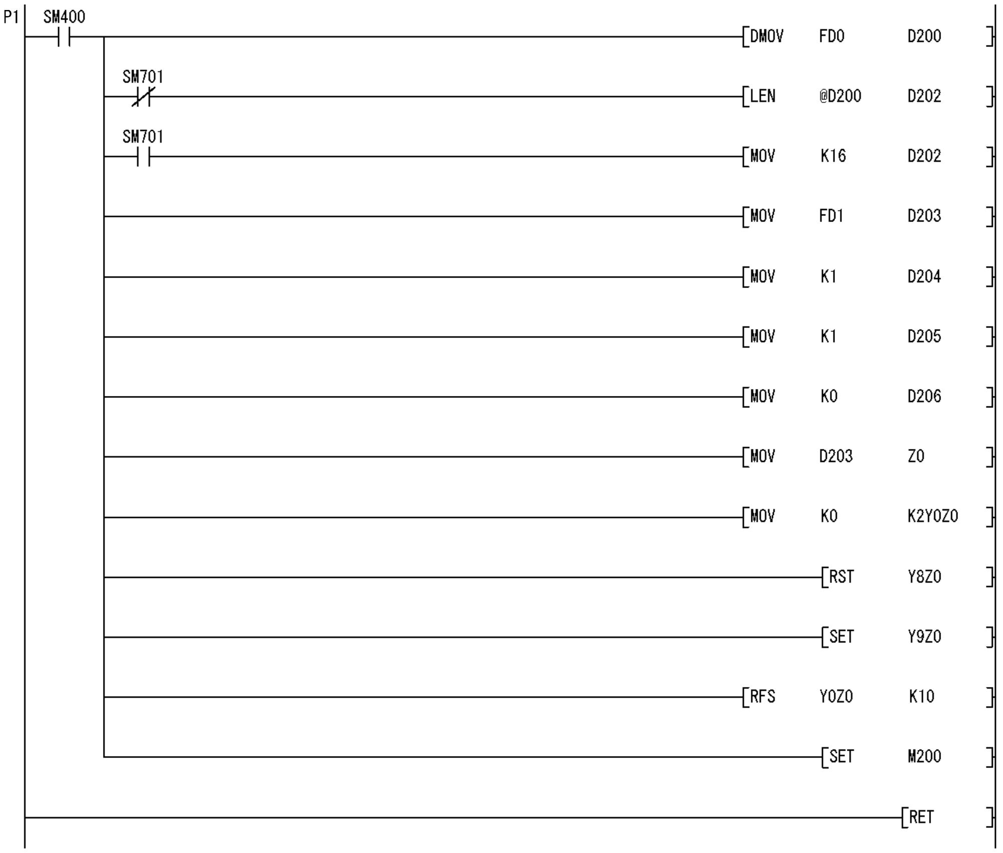
The strings stored in D0 or later are output to Y100 to Y108.

An execution of interrupt program is enabled.

2) Subroutine program

- In the subroutine program, the data for outputting ASCII codes using a fixed scan interrupt program (10ms) are set to work devices. Also, the flag for activating the processing in the fixed scan interrupt program is turned on.
- Specify the following arguments for the subroutine program.

First argument	Output string storage address	(Input)
Second argument	Output module start Y number	(Input)



Data specified by the CALL(P) arguments are saved.
・Output string storage address
・Number of output strings
・Output module start number

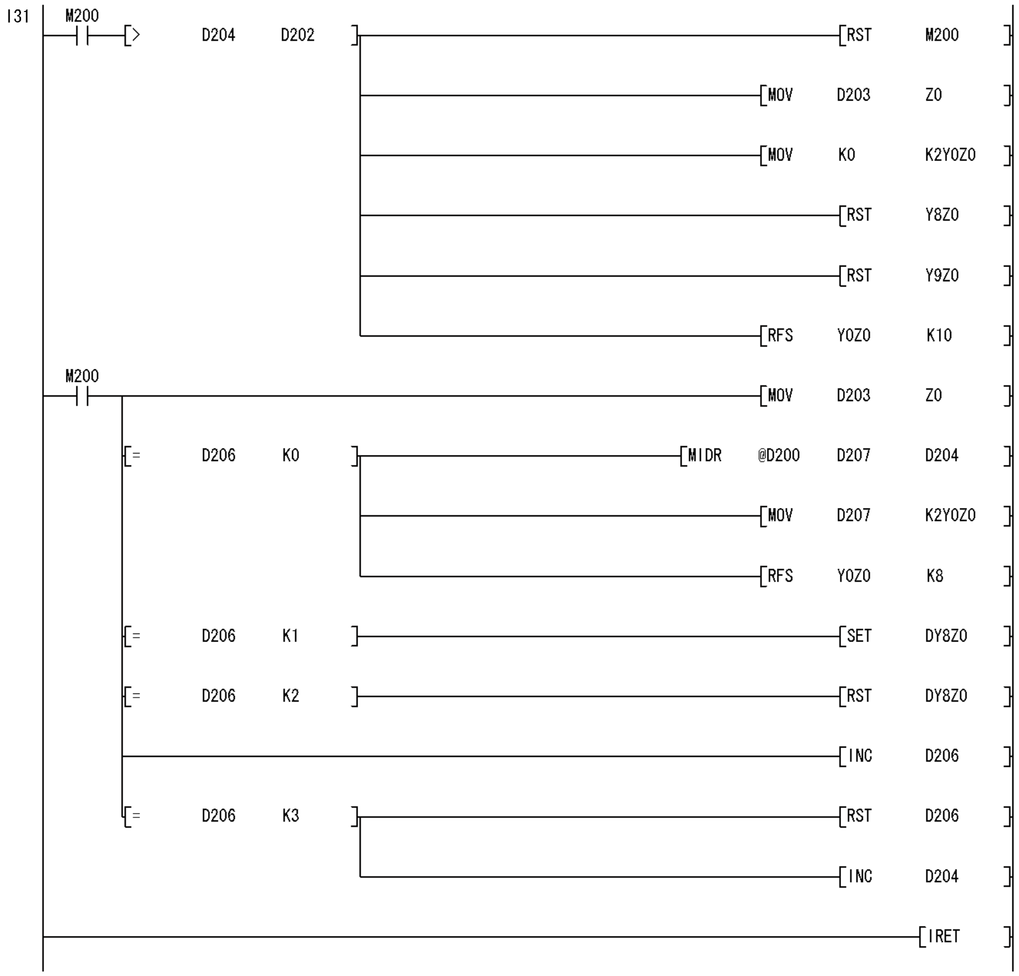
Devices used for the string output processing of the interrupt program I31 are initialized.

Yn0 to Yn7 (ASCII code), Yn8 (strobe signal), and Yn9 (in-execution flag) are all turned OFF.

The flag to activate the string output processing of the interrupt program is turned ON.

3) Interrupt program

The following processing is added to a fixed scan interrupt program (10ms).
The fixed scan interrupt program outputs ASCII codes from the output module and controls the strobe signal.



The following signals are all turned OFF when all strings are output.
・Yn0 to Yn7 (ASCII code)
・Yn8 (strobe signal)
・Yn9 (in-execution flag)

Status 0:
One character is extracted from the output string using the MIDR instruction and output to the Y module.
The strobe signal is turned OFF for 10ms.

Status 1:
The strobe signal is turned ON for 10ms.

Status 2:
The strobe signal is turned OFF for 10ms.

The status value is incremented by one.

Status 3:
The status value is returned to 0 since the output processing of one character is completed. The next character is extracted.

(4) Replacement example of the CHKST and CHK instructions

In the example below, if the replacement program for the CHKST and CHK instructions detects a failure, a failure number (contact number + coil number) is stored in D200 and the annunciator F200 is turned on.

(a) Example of device assignment

(Before replacement)

Application	Device
Advance end detection sensor input 1	X100
Retract end detection sensor input 1	X101
Advance end detection sensor input 2	X102
Retract end detection sensor input 2	X103
Advance end detection sensor input 3	X104
Retract end detection sensor input 3	X105
Advance end detection sensor input 4	X106
Retract end detection sensor input 4	X107
Failure detection output 1	Y100
Failure detection output 2	Y102
Failure detection output 3	Y104
Failure detection output 4	Y106

⇒

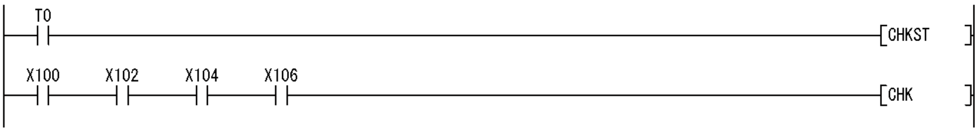
(After replacement)

Application	Device
Advance end detection sensor input 1	X100
Retract end detection sensor input 1	X101
Advance end detection sensor input 2	X102
Retract end detection sensor input 2	X103
Advance end detection sensor input 3	X104
Retract end detection sensor input 3	X105
Advance end detection sensor input 4	X106
Retract end detection sensor input 4	X107
Failure detection output 1	Y100
Failure detection output 2	Y102
Failure detection output 3	Y104
Failure detection output 4	Y106
Coil number (failure type detected)	D100
Contact number	D101
Failure number	D200
Failure detection display	F200
For index modification	Z0

If the device numbers in the example above are used for other applications, assign unused device numbers instead. When the advance end detection sensor input performs a failure detection of Xn, assign device numbers for the retract end detection sensor input and the failure detection output as described below.

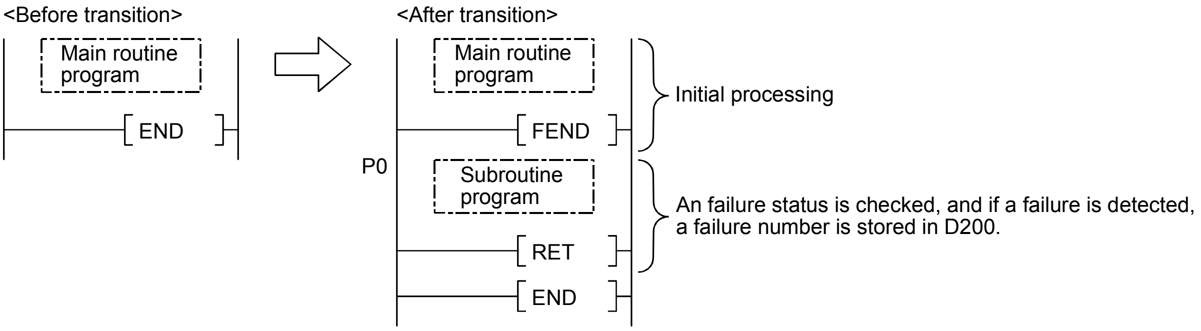
Advance end detection sensor input	Xn
Retract end detection sensor input	Xn+1
Failure detection output	Yn

(b) Program before replacement



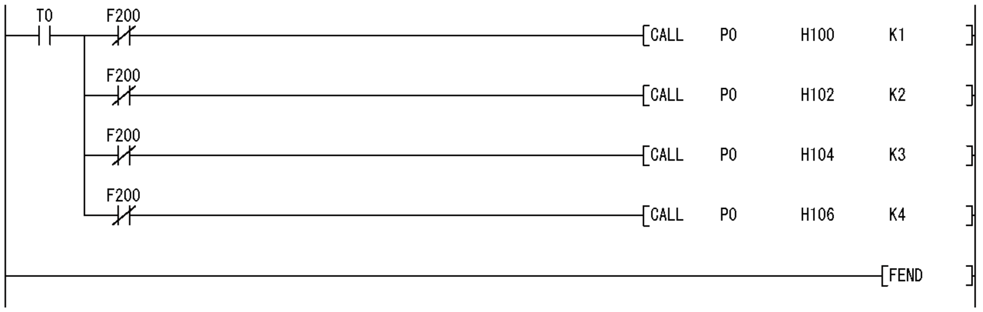
(c) Program after replacement

In the sequence program after replacement, two programs are required as shown below.



1) Main routine program

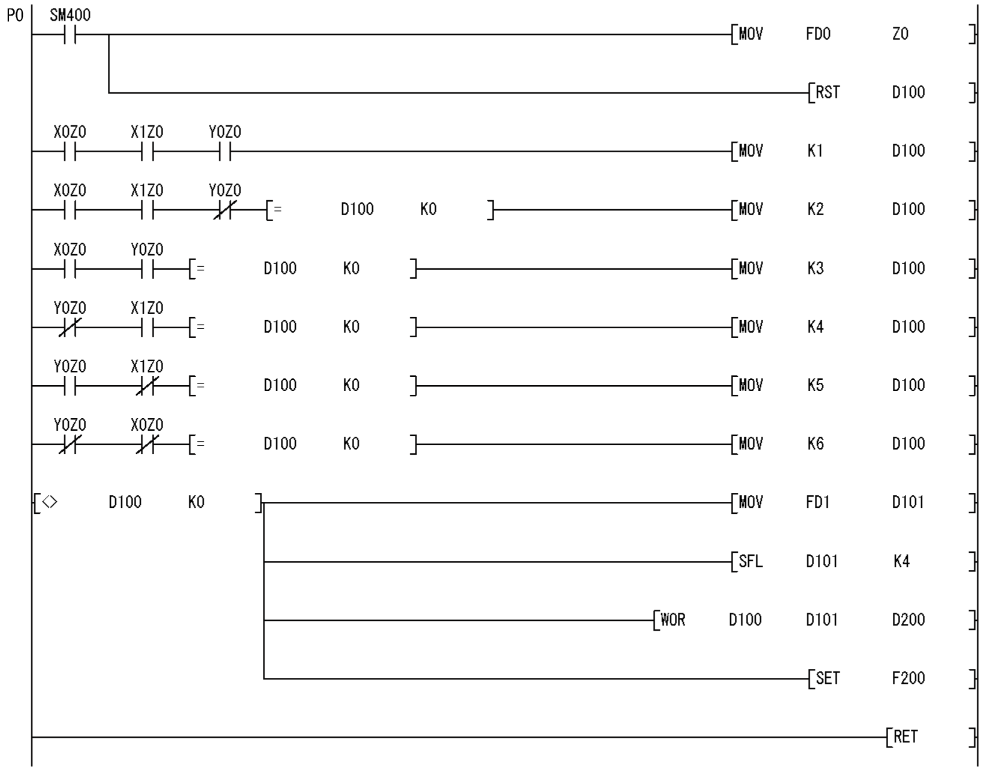
- Replace the CHKST and CHK instructions with the CALL instructions so that a subroutine program is called.
- One CALL instruction is required for each device specified as check condition before the CHK instruction. (In the program before replacement shown in (b), four CALL instructions need to be added since there are four check conditions before the CHK instruction.)
- Device number and contact number of X devices (check condition) are specified in each CALL instruction.
- Contact number is used to display failure number when a failure is detected.



2) Subroutine program

- In the subroutine program, a failure status is checked using a failure detection ladder pattern.
- If a failure is detected, a failure number is stored in D200 and the annunciator F200 is turned on.
- Specify the following arguments for the subroutine program.

First argument	Device number of X device targeted for failure check	(Input)
Second argument	Contact number of X device targeted for failure check	(Input)



<Failure detection target>
If a failure is detected, the coil number corresponding to the failure type is set to D100.

If a failure is detected,
a failure number is created by combining the coil number corresponding to the failure type and the contact number.
The annunciator is turned ON.

(d) Replacement method when failure detection ladder patterns are changed by the CHKCIR and CHKEND instructions
Failure detection ladder patterns can be changed in the subroutine program described in (C).

(5) Replacement example of the KEY instruction

(a) Example of device assignment

(Before replacement)

Application	Device
Numeric input execution instruction	M0
Input complete flag	M1
Input data area	D200 to D203
ASCII code input signal	X100 to X107
Strobe signal	X108

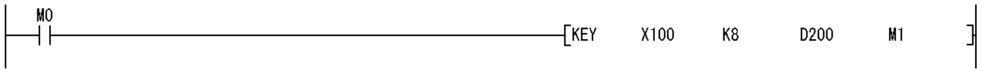
⇒

(After replacement)

Application	Device
Numeric input execution instruction	M0
Input complete flag	M1
Input data area	D200 to D202
ASCII code input signal	X100 to X107
Strobe signal	X108
Input data area address (BIN32)	D210 to D211
(Input data area + 0) address (BIN32)	D212 to D213
(Input data area + 1) address (BIN32)	D214 to D215
(Input data area + 2) address (BIN32)	D216 to D217
For shifting input data	D218
For converting input data	D219 to D220

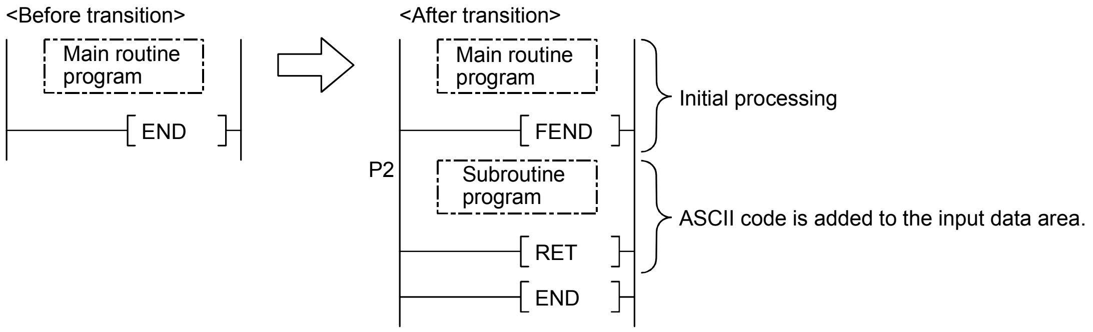
If the device numbers in the example above are used for other applications, assign unused device numbers instead.

(b) Program before replacement



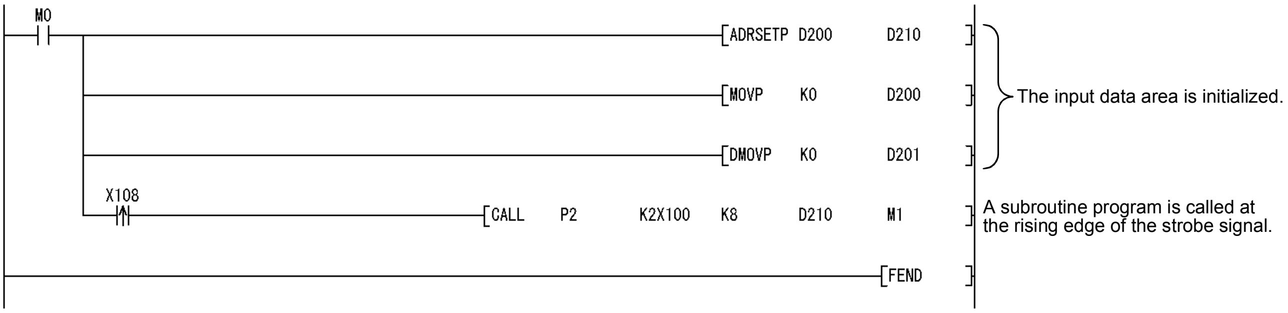
(c) Program after replacement

In the sequence program after replacement, two programs are required as shown below.



1) Main routing program

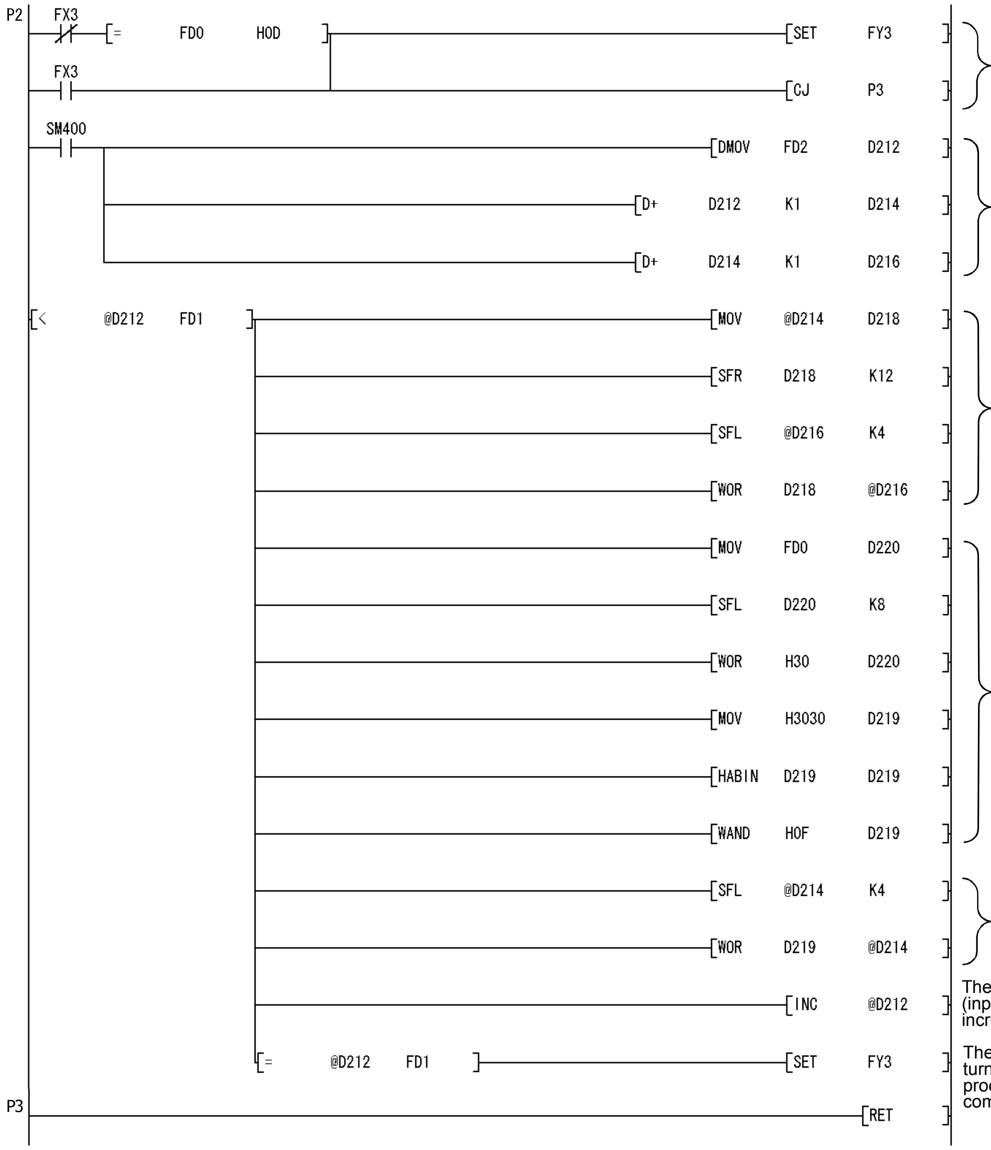
- Set ‘0’ in the input data area on the rising edge of the execution instruction (‘M0’ in the program below) and initialize the program.
- Execute the CALL instruction on every rising edge of the strobe signal (‘X108’ in the program below) so that a subroutine program is called.
- In the subroutine program, input codes are added to the input data area and the completion status is checked.
- Pass the following data to the subroutine program at the execution of the CALL instruction.
    - ASCII code input value from the input module (Xn0 to Xn7)
    - Number of digits to be input.
    - Indirect address of the input data area (Use the ADRSET instruction to acquire the indirect address for the input data area.)
    - Bit devices to be turned on when input is completed.


M0
ADRSETP D200 D210
MOVP K0 D200
DMOVP K0 D201
The input data area is initialized.
X108
CALL P2 K2X100 K8 D210 M1
A subroutine program is called at the rising edge of the strobe signal.
FEND

2) Subroutine program

- In the subroutine program, ASCII codes specified by an argument are added to the input data area and the completion status is checked.
- Specify the following arguments for the subroutine program.

First argument	ASCII code input from the input module (K2Xn)	(Input)
Second argument	Number of digits to be input	(Input)
Third argument	Indirect address of the input data area	(Input)
Fourth argument	Bit device turned on when input is completed	(Output)



Numeric entry is ended when the at-completion ON signal is ON or 0DH is input.

Addresses of the input data area are saved in the work devices.

The 1st to 4th digit numerals in (input data area +2) areshifted for one digit to the left.

Numeral entered in ASCII code is converted into one numeral in BIN data using the HABIN instruction.

The 5th to 8th digit numerals in (input data area +1) are shifted for one digit to the left and the converted numeral is set to the 8th digit.

The number of digits to be input in (input data area +0) is incremented by one.

The at-completion ON signal is turned ON when the input processing for specified digits is completed.

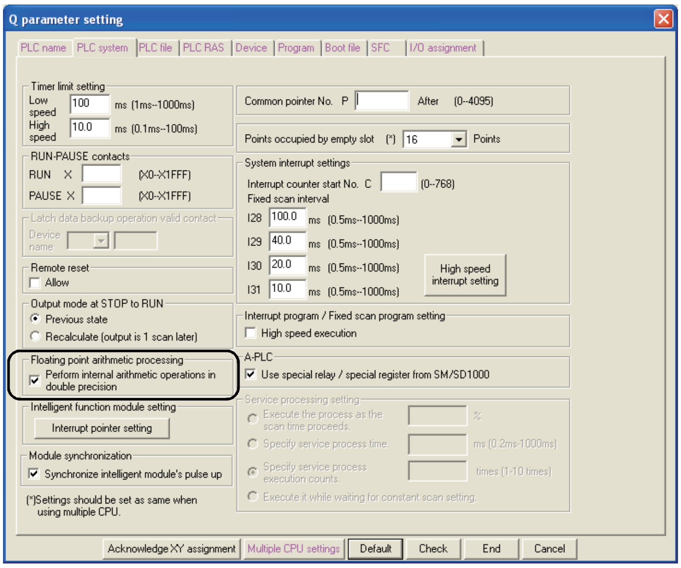
4. FUNCTIONS

4.1 Floating-point Operation Instructions

(1) Differences between the High Performance model QCPU and Universal model QCPU

(a) High Performance model QCPU

The High Performance model QCPU can perform only the single-precision floating-point operation instructions. Note, however, that internal operation processing can be performed in double precision by selecting the item shown below (default: selected).



Timer limit setting
Low speed 100 ms (1ms--1000ms)
High speed 10.0 ms (0.1ms--100ms)

RUN-PAUSE contacts
RUN X (X0--X1FFF)
PAUSE X (X0--X1FFF)

Latch data backup operation valid contact
Device name

Remote reset
□ Allow

Output mode at STOP to RUN
● Previous state
○ Recalculate (output is 1 scan later)

Floating point arithmetic processing
☑ Perform internal arithmetic operations in double precision

Intelligent function module setting

Module synchronization
☑ Synchronize intelligent module's pulse up

(*)Settings should be set as same when using multiple CPU.

Common pointer No. P After (0--4095)

Points occupied by empty slot (*) 16 Points

System interrupt settings
Interrupt counter start No. C (0--768)
Fixed scan interval
I28 100.0 ms (0.5ms--1000ms)
I29 40.0 ms (0.5ms--1000ms)
I30 20.0 ms (0.5ms--1000ms)
I31 10.0 ms (0.5ms--1000ms)

Interrupt program / Fixed scan program setting
□ High speed execution

A-PLC
☑ Use special relay / special register from SM/SD1000

Service processing setting
○ Execute the process as the scan time proceeds. %
○ Specify service process time. ms (0.2ms-1000ms)
● Specify service process execution counts. times (1-10 times)
○ Execute it while waiting for constant scan setting.

Figure 4.1 PLC system tab

(b) Universal model QCPU

The Universal model QCPU supports the double-precision floating-point operation instructions.

The operation can be performed either in single precision or double precision depending on the data. Therefore, “Perform internal arithmetic operations in double precision” item in the PLC system tab of the PLC parameter dialog box cannot be selected.

Because of this new function, operation results (both in single precision and double precision) slightly differ between the High Performance model QCPU and the Universal model QCPU if “Perform internal arithmetic operations in double precision” is selected in the High Performance model QCPU.

If higher accuracy is required in floating-point operations, replace the floating-point operation instructions as described in (4). However, if six or less digits are used as significant digits for the floating-point operation instructions, replacement is not necessary. The single-precision floating-point operation results in the Universal model QCPU can be used as they are in the system. When not replacing instructions, make sure that it does not cause any problems in the system.

(2) Floating-point operation instructions for the Universal model QCPU

Table 4.1 lists floating-point operation instructions for the Universal model QCPU.
Specifications of the single-precision floating-point operation instructions are compatible with those for the High Performance model QCPU.

Table 4.1 List of floating-point operation instructions supported in the Universal model QCPU

Instruction name		**Instruction symbol**		**Remarks**
		Single-precision floating-point data	Double-precision floating-point data	
Comparison	Floating-point data comparison	LDE□	LDED□	□ indicates one of the followings; <>, =, <, >, <=, >=
		ANDE□	ANDED□	
		ORE□	ORED□	
Data transfer	Floating-point data transfer	EMOV(P)	EDMOV(P)	-
Four arithmetic operation	Floating-point data addition	E+(P)	ED+(P)	-
	Floating-point data subtraction	E-(P)	ED-(P)	
	Floating-point data multiplication	E*(P)	ED*(P)	
	Floating-point data division	E/(P)	ED/(P)	
Data conversion	Conversion from BIN 16-bit data to floating-point data	FLT(P)	FLTD(P)	-
	Conversion from BIN 32-bit data to floating-point data	DFLT(P)	DFLTD(P)	
	Conversion from floating-point data to BIN 16-bit data	INT(P)	INTD(P)	
	Conversion from floating-point data to BIN 32-bit data	DINT(P)	DINTD(P)	
	Floating-point sign inversion	ENEG(P)	EDNEG(P)	
Special function	SIN operation	SIN(P)	SIND(P)	-
	COS operation	COS(P)	COSD(P)	
	TAN operation	TAN(P)	TAND(P)	
	SIN^{-1} operation	ASIN(P)	ASIND(P)	
	COS^{-1} operation	ACOS(P)	ACOSD(P)	
	TAN^{-1}operation	ATAN(P)	ATAND(P)	
	Conversion from angle to radian	RAD(P)	RADD(P)	
	Conversion from radian to angle	DEG(P)	DEGD(P)	
	Square root	SQR(P)	SQRD(P)	
	Exponential operation	EXP(P)	EXPD(P)	
	Natural logarithm operation	LOG(P)	LOGD(P)	

Floating-point data can be converted mutually between single precision and double precision using instructions in Table 4.2.

Table 4.2 Floating-point data conversion instructions (single precision ⇔ double precision)

Instruction name	**Instruction symbol**
Single precision to double precision conversion	ECON(P)
Double precision to single precision conversion	EDCON(P)

(3) Advantages and disadvantages when using the double-precision floating-point data of the Universal model QCPU

Table 4.3 shows the advantages and disadvantages when executing the double-precision floating-point operation instructions in the Universal model QCPU.
If higher accuracy is required in floating-point operations, it is recommended to replace the instructions with the double-precision floating-point operation instructions.

Table 4.3 Advantages and disadvantages when using the double-precision floating-point operation instructions

Advantage	Disadvantage
The results are more accurate than those of the single-precision floating-point operation instructions.	The instruction processing speed is slower than that of the single-precision floating-point operation instructions. *1 Double-precision floating-operation data use twice as many word device points as single-precision floating-operation data.

*1: The processing speed of the double-precision floating-point operation instructions in the Universal model QCPU is higher than that of floating-point operation instructions using internal double-precision operations in the High Performance model QCPU.

Table 4.4 shows the comparison between single-precision and double-precision floating-point data.

Table 4.4 Comparison between single-precision and double-precision floating-point data

Item		Single-precision floating-point data	Double-precision floating-point data
Word point required for data retention		2 words	4 words
Setting range		$-2^{128}<N\leqq-2^{-126},0,2^{-126}\leqq N<2^{128}$	$-2^{1024}<N\leqq-2^{-1022},0,2^{-1022}\leqq N<2^{1024}$
Precision (number of bits)	Mantissa part	23 bits	52 bits
	Exponent part	8 bits	11 bits
	Sign part	1 bit	1 bit
Instruction processing speed (Q04UDHCPU/Q06UDHCPU) (Maximum)	Data comparison (Conductive status) (LDE>= / LDED>=)	5.5μs	9.0μs
	Data transfer (EMOV/EDMOV)	0.019μs	5.0μs
	Addition (3 devices) (E+ / ED+)	0.0665μs	9.2μs
	SIN operation (SIN/SIND)	5.7μs	13.8μs

(4) Method of replacing the High Performance model QCPU with Universal model QCPU

(a) Replacing all single-precision floating-point operation instructions with double-precision floating-point operation instructions

Single-precision floating-point data occupy two points of word device per data. On the other hand, four points are required per double-precision floating-point data. Therefore, all device numbers for storing floating-point data need to be reassigned.

Example) Replacing the floating-point operation ‘A×B+C’ (Changing all floating-point data into double precision.)

1) Device assignment

(Before replacement)

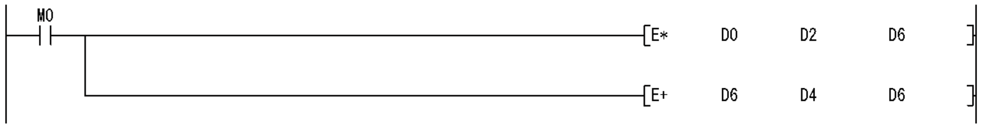
Application	Device	Data type
Data A	D0 to D1	Floating-point data (single precision)
Data B	D2 to D3	
Data C	D4 to D5	
Operation result	D6 to D7	

⇒

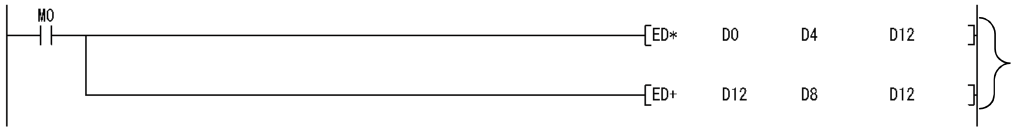
(After replacement)

Application	Device	Data type
Data A(D)	D0 to D3	Floating-point data (double precision)
Data B(D)	D4 to D7	
Data C(D)	D8 to D11	
Operation result(D)	D12 to D15	

2) Program before replacement



3) Program after replacement



Operation is performed using double-precision floating-point data.

(b) Replacing a part of floating-point operation instructions with double-precision floating-point operation instructions
Only operations that require high accuracy are replaced with double-precision floating-point operation instructions. Using the ECON and EDCON instructions, convert floating-point data mutually between single precision and double precision. The flow of a replacement program is as follows:

- Data required for operations are converted from single precision to double precision using the ECON instruction.
- Operations are performed in double precision using the double-precision floating-point operation instructions.
- Operation results are converted from double precision to single precision using the EDCON instruction.

A program example that floating-point data are converted mutually between single precision and double precision before and after operations is shown below.

Example) Replacing the floating-point operation ‘A×B+C’ (Using the ECON and EDCON instructions)

1) Device assignment

(Before replacement)

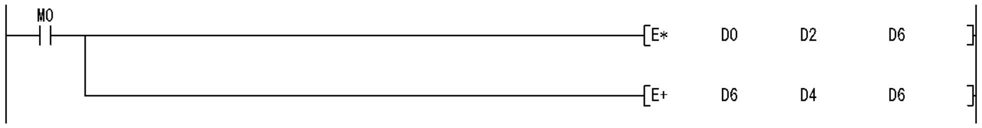
Application	Device	Data type
Data A	D0 to D1	Floating-point data (single precision)
Data B	D2 to D3	
Data C	D4 to D5	
Operation result	D6 to D7	

⇒

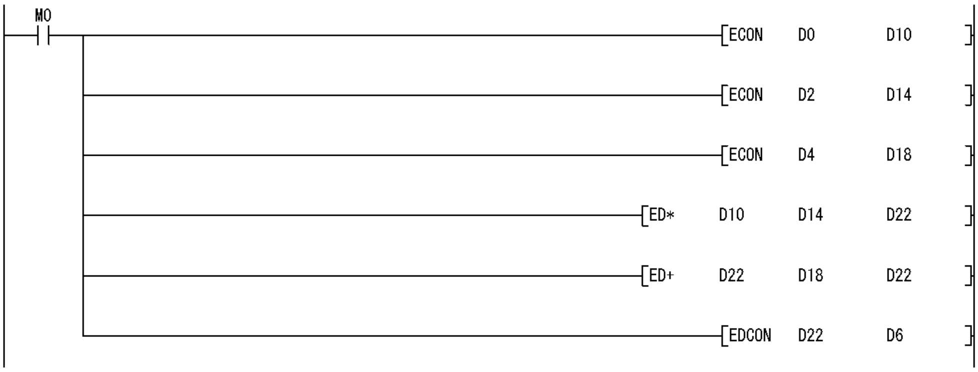
(After replacement)

Application	Device	Data type
Data A	D0 to D1	Floating-point data (single precision)
Data B	D2 to D3	
Data C	D4 to D5	
Operation result	D6 to D7	
Data A(D)	D10 to D13	Floating-point data (double precision)
Data B(D)	D14 to D17	
Data C(D)	D18 to D21	
Operation result(D)	D22 to D25	

2) Program before replacement



3) Program after replacement



Floating-point data are converted from single precision to double precision.

Operation is performed using double-precision floating-point data.

The floating-point operation result data are converted from double precision to singe precision.

(c) Replacing a part of floating-point operation instructions with double-precision floating-point operation instructions using subroutine programs

The flow of a replacement program described in (b) can be regarded as one subroutine program. Create subroutine programs for each floating-point operation instruction and then replace the original floating-point operation instructions with the CALL(P) instructions so that the corresponding subroutine program is called.

With this method, changes in the program are minimized, but the processing for calling subroutine programs increases the scan time. In addition, since conversions from double precision to single precision are performed for each instruction, rounding-off errors generated during operations are larger than those in the replacement program described in (b).

Example) Replacing the floating-point operation ‘A×B+C’ (Using a subroutine program)

1) Device assignment

(Before replacement)

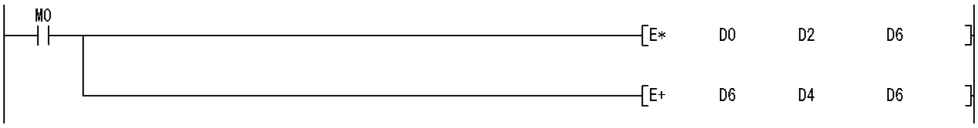
Application	Device	Data type
Data A	D0 to D1	Floating-point data (single precision)
Data B	D2 to D3	
Data C	D4 to D5	
Operation result	D6 to D7	

⇒

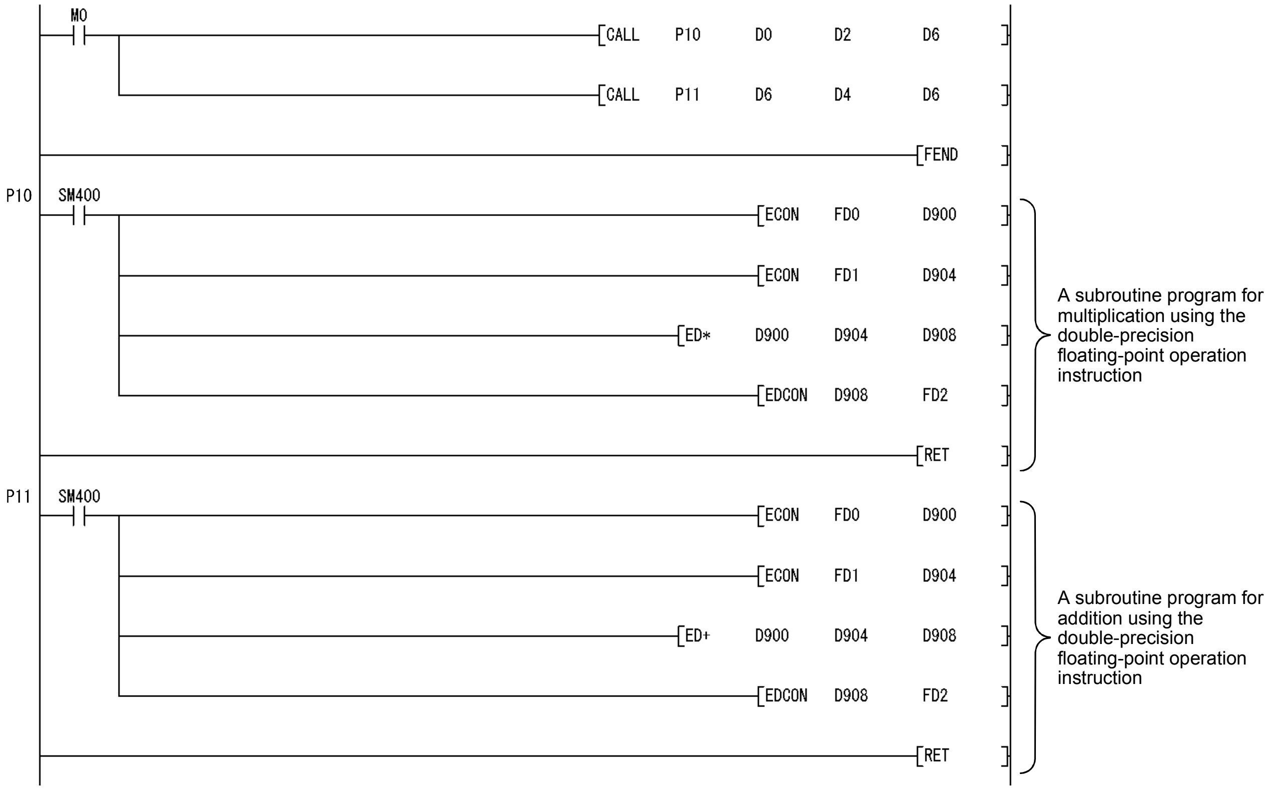
(After replacement)

Application	Device	Data type
Data A	D0 to D1	Floating-point data (single precision)
Data B	D2 to D3	
Data C	D4 to D5	
Operation result	D6 to D7	
Subroutine input data 1	D900 to D903	Floating-point data (double precision)
Subroutine input data 2	D904 to D907	
Subroutine operation result	D908 to D911	

2) Program before replacement



3) Program after replacement



4.2 Error Check Processing for Floating-point Data Comparison Instructions

(1) Input data check

Error check processing for floating-point data comparison instructions has been enhanced for the Universal model QCPU. Input of a "special value" (-0, nonnumeric, unnormalized number, or ±∞) is checked, and if any special value are input, the CPU module detects “OPERATION ERROR” (error code: 4140).

When the LDE□, ANDE□, ORE□, LDED□, ANDED□, and/or ORED□ instructions (□ indicates one of the followings: =, <>, <, >, <=, >=) are used in the program, “OPERATION ERROR” (error code: 4140) can be detected if invalid floating-point data exist. This occurs even when interlocks are provided using the valid data flag (the signal which shows the floating-point validity).

Invalid floating-point data are not stored as the result of operations performed in the Universal model QCPU.

Reasons for those invalid data are considered as follows:

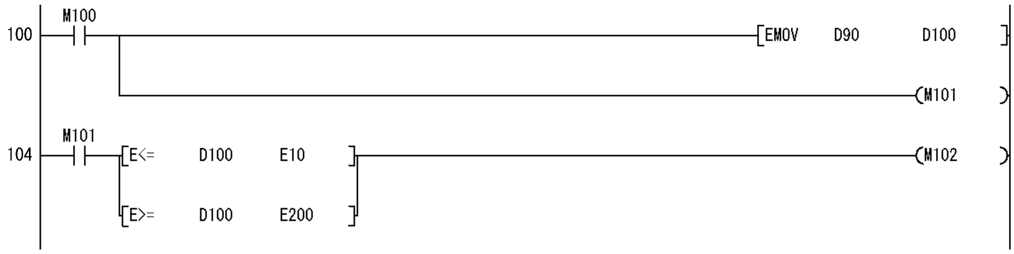
- The same device is used for storing floating-point data and other data, such as binary values, BCD values, and strings.
  ⇒ Use different devices for storing floating-point data and data other than floating-point data.

- Floating-point data externally written are invalid.
  ⇒ Take measures on the external-source side so that valid data are written.

If an error occurs in the floating-point data comparison instructions, take the above measures.

Example 1) Detecting “OPERATION ERROR” (error code: 4140) with the LDE□ instruction

[Ladder mode] [List mode]



```
100 LD     M100
101 EMOV   D90    D100
103 OUT    M101
104 LD     M101
105 LDE<=  D100   E10
109 ORE>=  D100   E200
113 ANB
114 OUT    M102
```

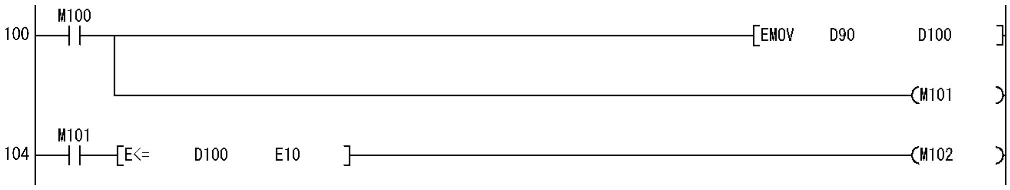
In the ladder block starting from step 104, the floating-point data comparison instructions of steps 105 and 109 are not executed when M101 (valid data flag) is off.

However, the LDE<= instruction of step 105 and the ORE>= instruction of step 109 are executed regardless of the execution result of the LD instruction of step 104 in the program above. Therefore, even when M101 is off, “OPERATION ERROR (error code: 4140) will be detected in the LDE<= instruction of step 105 if a ‘special value’ is stored in D100.

For the method of avoiding “OPERATION ERROR”, refer to (2) in this section.

Example 2) Not detecting "OPERATION ERROR" (error code: 4140) with the ANDE□ instruction

[Ladder mode] [List mode]

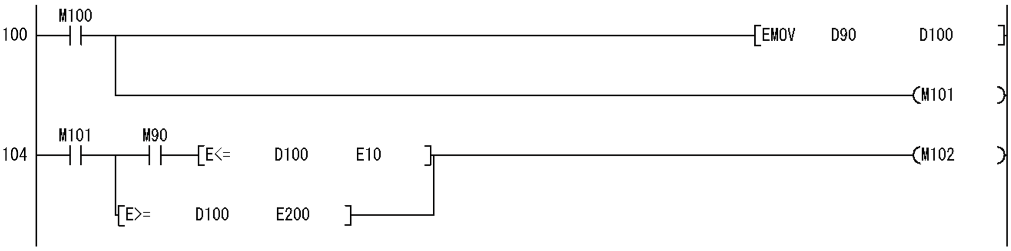


```
100  LD       M100
101  EMOV     D90      D100
103  OUT      M101
104  LD       M101
105  ANDE<=   D100     E10
109  OUT      M102
```

In the ladder block starting from step 104, the ANDE<= instruction of step 105 is not executed when M101 (valid data flag) is off.
The ANDE<= instruction of step 105 is not executed when M101 is off in the LD instruction of step 104 in the program above. Therefore, when M101 is off, "OPERATION ERROR" (error code: 4140) will not be detected even if a 'special value' is stored in D100.

Example 3) Detecting "OPERATION ERROR" (error code: 4140) in the ANDE□ instruction

[Ladder mode] [List mode]



```
100  LD       M100
101  EMOV     D90      D100
103  OUT      M101
104  LD       M101
105  LD       M90
106  ANDE<=   D100     E10
110  ORE>=    D100     E200
114  ANB
115  OUT      M102
```

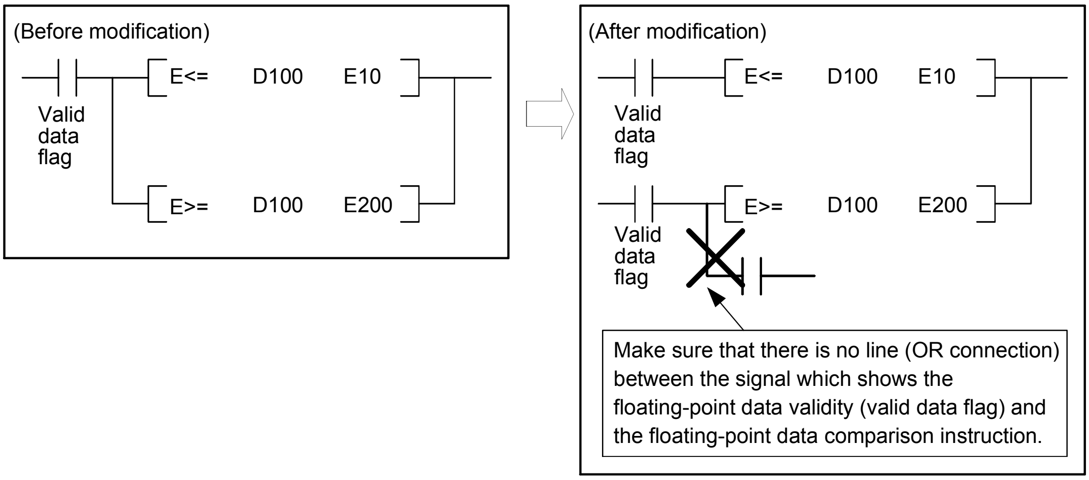
In the ladder block starting from step 104, the ANDE<= instruction of step 106 and the OR>= instruction of step 110 are not executed when M101 (valid data flag) is off.
However, if M90 is on in the LD instruction of step 105, the ANDE<= instruction of step 106 is executed. Therefore, even when M101 is off, "OPERATION ERROR" (error code: 4140) will be detected in the ANDE<= instruction of step 106 if M90 is on and a 'special value' is stored in D100.
For the method of avoiding "OPERATION ERROR", refer to (2) in this section.

(2) Method of avoiding "OPERATION ERROR" (error code: 4140) in the floating-point data comparison instructions

As shown in the modification examples below, connect a valid data flag contact to a floating-point data comparison instruction is series. (Use the AND connection for connecting the contact of the valid data flag and floating-point data comparison instruction.)

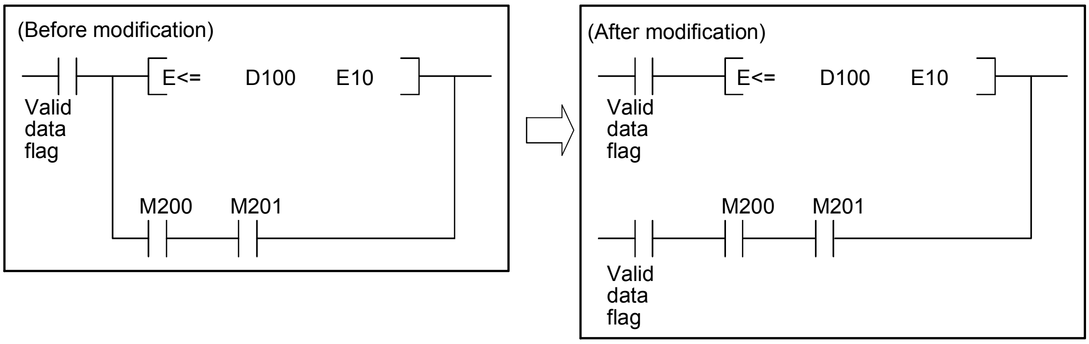
Make sure that there is no vertical line (the OR connection) between the valid data flag and floating-point data comparison instruction.

<Modification example 1>



Make sure that there is no line (OR connection) between the signal which shows the floating-point data validity (valid data flag) and the floating-point data comparison instruction.

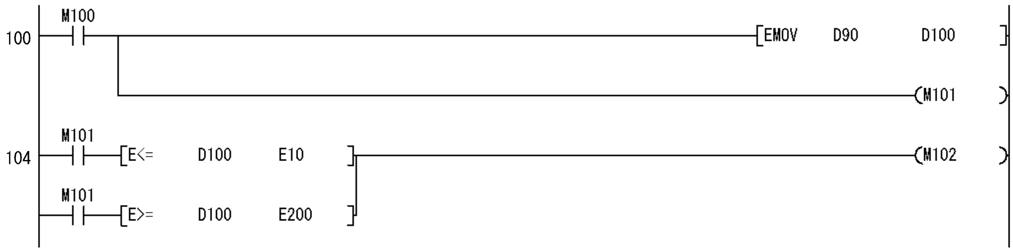
<Modification example 2>



Program examples corresponding to for Examples 1) and 3) in (1) are shown below.

Example 4) Modified program (Example 1) (“OPERATION ERROR” (error code: 4140) is no longer detected.)

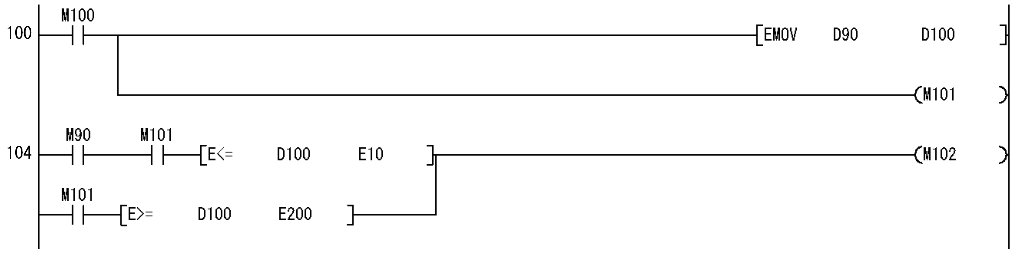
[Ladder mode] [List mode]



```
100 LD      M100
101 EMOV    D90    D100
103 OUT     M101
104 LD      M101
105 ANDE<=  D100   E10
109 LD      M101
110 ANDE>=  D100   E200
114 ORB
115 OUT     M102
```

Example 5) Modified program (Example 3) (“OPERATION ERROR” (error code: 4140) is no longer detected.)

[Ladder mode] [List mode]



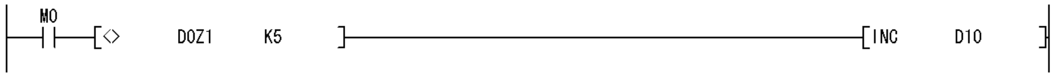
```
100 LD      M100
101 EMOV    D90    D100
103 OUT     M101
104 LD      M90
105 AND     M101
106 ANDE<=  D100   E10
110 LD      M101
111 ANDE>=  D100   E200
115 ORB
116 OUT     M102
```

4.3 Range Check Processing for Index-modified Devices

(1) Device range check

Error check processing at index modification of devices has been enhanced for the Universal model QCPU.
Each index-modified device range is checked, and if the check target device is outside the device range before index modification, the CPU module detects "OPERATION ERROR" (error code: 4101).

Example 1) Detecting "OPERATION ERROR" (error code: 4101) by error check processing at index modification of devices



In Example 1), when the contact (M0) is on and the value, -1 or less, is specified in Z1, the device D0Z1 is included in the C device range, exceeding the D device range, as shown in Figure 4.2.
As a result, "OPERATION ERROR" (error code: 4101) will be detected.

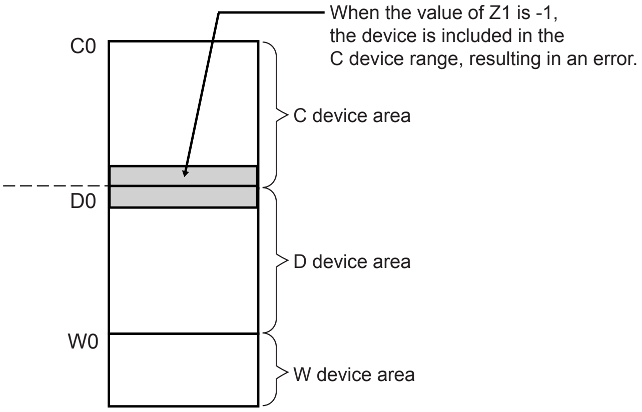
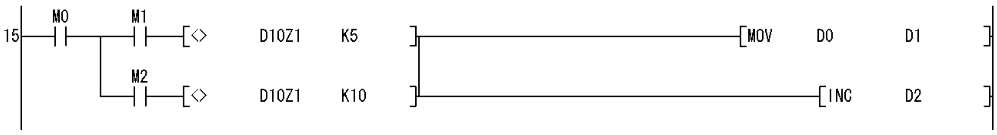

When the value of Z1 is -1,
the device is included in the
C device range, resulting in an error.
C0
C device area
D0
D device area
W0
W device area

Figure 4.2 Device D0Z1 when the value of Z1 is -1

When an error is detected, check the index modification value (value of Z1 in the above example) and remove the error cause.
Examples of the cases where an error is detected and not detected are shown below.

Example 2) Detecting "OPERATION ERROR" (error code: 4101)

[Ladder mode] [List mode]



```
15  LD      M0
16  LD      M1
17  AND<>   D10Z1   K5
20  LD      M2
21  AND<>   D10Z1   K10
24  ORB
25  ANB
26  MOV     D0      D1
28  INC     D2
```

In Example 2, in the ladder block starting from the step 15, the AND < > instruction of the step 17 or 21 is supposed to be not executed when M0 (valid data flag) is off.

However, since the LD instruction which is always executed is used in the step 16 and 20, the AND < > instruction of the step 17 or 21 is executed regardless of the execution status of the LD instruction in the step 15 when M1 or M2 is on.

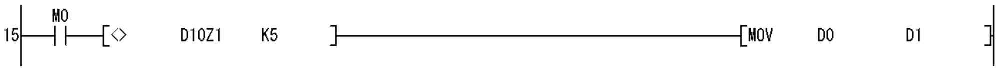
For this reason, even when M0 is off, if the D10Z1 value is outside the D device range, "OPERATION ERROR" (error code: 4101) will be detected in the AND < > instruction of the step 17.

Note that the step 26 (MOV D0 D1) and the step 28 (INC D2) are not executed.

For the method of avoiding "OPERATION ERROR" (error code: 4101), refer to (2) in this section.

Example 3) Not detecting "OPERATION ERROR" (error code: 4101)

[Ladder mode] [List mode]



```
15  LD      M0
16  AND<>   D10Z1   K5
19  MOV     D0      D1
```

In Example 3, the AND < > instruction of the step 16 is not executed when M0 (valid data flag) of the step 15 is off.

For this reason, "OPERATION ERROR" (error code: 4101) will not be detected no matter what the D10Z1 value is.

(2) Method of avoiding "OPERATION ERROR" (error code: 4101)

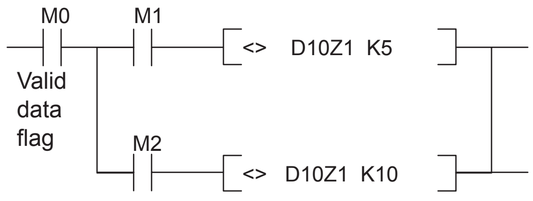
When the index-modified device range does not need to be checked, use the method 1).
When the index-modified device range needs to be checked, use the method 2).

1) Deselect the "Check device range at indexing." item in the PLC RAS tab of the PLC parameter dialog box so that the index-modified device range will not be checked.
2) As shown in the modification examples below, connect the contacts of valid data flag in series for each instruction that checks the index-modified device range.

<Modification example>

(Before modification)

[Ladder mode]

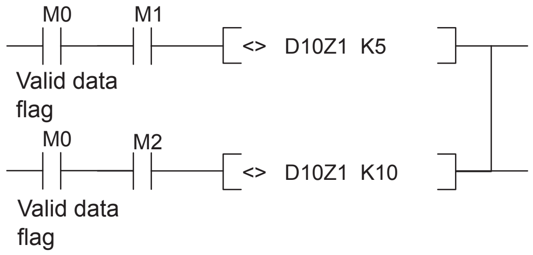


[List mode]

```
LD          M0
LD          M1
AND  <>     D10Z1   K5
LD          M2
AND  <>     D10Z1   K10
ORB
ANB
```

(After modification)

[Ladder mode]



[List mode]

```
LD          M0
AND         M1
AND  <>     D10Z1     K5
LD          M0
AND         M2
AND  <>     D10Z1     K10
ORB
```

In the program before modification (on the left), the instruction immediately before the AND < > instruction is regarded as the LD instruction. However, in the program after modification (on the right), the same instruction will be regarded as the AND instruction.
In the program after modification, only when both contacts of M0 and M1 (or M2) turn on, the AND < > instruction is executed. As a result, no error will be detected during index-modified device range check processing.

4.4 Device Latch Function

(1) Overview

The device latch function[*1] for the Universal model QCPU is more enhanced compared to that for the High performance model QCPU.
This section describes the enhanced device latch function in the Universal model QCPU.

*1: The latch function is used to hold device data even when the CPU module is powered off or reset.

(2) Device data latch methods

Device data of the Universal model QCPU can be latched by:

- using a large-capacity file register (R, ZR),
- writing/reading device data to/from the standard ROM (with the SP.DEVST and S(P).DEVLD instructions), or
- specifying a latch range of internal user devices.

(3) Details of each latch method

(a) Large-capacity file registers (R, ZR)

File register size is larger and processing speed is higher in the Universal model QCPU, compared to the High Performance model QCPU.
To latch a lot of data (many device points), use of a file register is effective.

Table 4.5 shows capacities of file registers for each CPU module.

Table 4.5 File register size available for each CPU module

Model	File register (R, ZR) size in the standard RAM *1
Q02UCPU	64K points
Q03UDCPU and Q03UDECPU	96K points
Q04UDHCPU and 04UDEHCPU	128K points
Q06UDHCPU and 06UDEHCPU	384K points
Q13UDHCPU and 13UDEHCPU	512K points
Q26UDHCPU and 26UDEHCPU	640K points

*1: Use of a memory card can increase the number of points.

(b) Writing/reading device data to/from the standard ROM (SP.DEVST/S(P).DEVLD instructions)

Device data of the Universal model QCPU can be latched using the SP.DEVST and S (P).DEVLD instructions (instructions for writing/reading data to/from the standard ROM).
Utilizing the standard ROM allows data backup without batteries. This method is effective for latching data that will be updated less frequently.

(c) Specifying the latch range of internal user devices

Device data of the Universal model QCPU can be latched by specifying a latch range of internal user devices in the same way as for the High Performance model QCPU.
The ranges can be set in the Device tab of the PLC parameter dialog box.
Internal user devices that can be latched are as follows:

- Latch relay (L)
- Link relay (B)
- Annunciator (F)
- Edge relay (V)
- Timer (T)
- Retentive timer (ST)
- Counter (C)
- Data register (D)
- Link register (W)

POINT

- If latch ranges of internal user devices are specified in the Universal model QCPU, the processing time will increase in proportion to the points of the device to be latched. (For example, if 8K points are latched for the latch relay (L), the scan time will be 28.6μs.) To shorten the scan time, remove unnecessary latch device points to minimize the latch range.
- The scan time will not increase when a latch range of the file register (R, ZR) is specified.

(4) How to shorten the scan time

When data to be latched are stored in a file register (R or ZR), the processing time is shorter than that for latching internal user device.

Example) Reducing the latch points of the data register (D) from 8K points to 2K points, and using the file register (ZR) instead (when the Q06UDHCPU is used).

Table 4.6 Differences between before and after moving latch points of the data register (D) to the file register (ZR)

Item		Before	After
Latch points for data register (D)		8192 (8K) points	2048 (2K) points (6k points are moved to file register.)
Number of devices in the program	Data register (D) (Latch range)	400	100
	File register (ZR) (Standard RAM)	0	300
Additional scan time		0.41ms	0.13ms [*1]
Number of steps increased		-	300 steps

*1: Indicates the time required additionally when file register data are stored in the standard RAM.

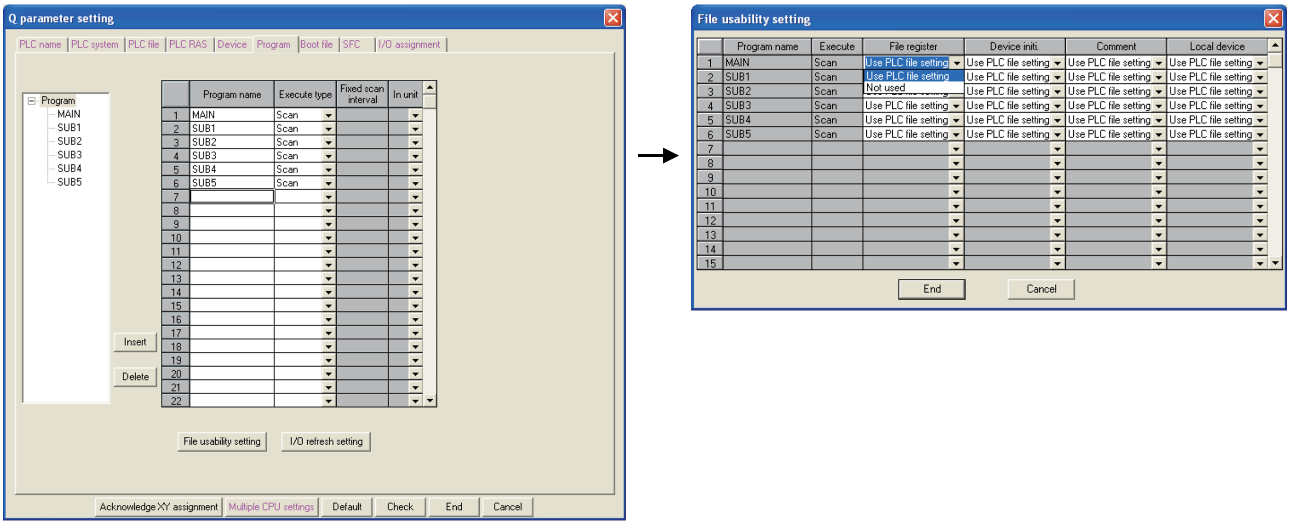
4.5 File Usability Setting

(1) Differences between the High Performance model QCPU and Universal model QCPU

(a) High Performance model QCPU

In the High Performance model QCPU, file usability ("Use PLC file setting" or "Not used") of the following files can be set for each program on the screen opened by clicking the "File usability setting" button on the Program tab of the PLC parameter dialog box.

- File register
- Device initial value
- Comment
- Local device



	Program name	Execute type	Fixed scan interval	In unit
1	MAIN	Scan		
2	SUB1	Scan		
3	SUB2	Scan		
4	SUB3	Scan		
5	SUB4	Scan		
6	SUB5	Scan		
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				

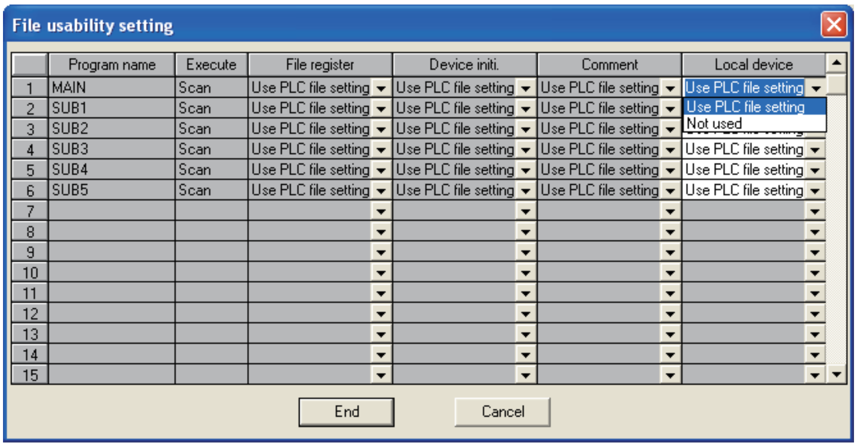
	Program name	Execute	File register	Device initi.	Comment	Local device
1	MAIN	Scan	Use PLC file setting	Use PLC file setting	Use PLC file setting	Use PLC file setting
2	SUB1	Scan	Use PLC file setting	Use PLC file setting	Use PLC file setting	Use PLC file setting
3	SUB2	Scan	Not used	Use PLC file setting	Use PLC file setting	Use PLC file setting
4	SUB3	Scan	Use PLC file setting	Use PLC file setting	Use PLC file setting	Use PLC file setting
5	SUB4	Scan	Use PLC file setting	Use PLC file setting	Use PLC file setting	Use PLC file setting
6	SUB5	Scan	Use PLC file setting	Use PLC file setting	Use PLC file setting	Use PLC file setting
7						
8						
9						
10						
11						
12						
13						
14						
15						

Figure 4.2 Program tab

(b) Universal model QCPU

In the Universal model QCPU, file usability of the following files[*1] cannot be set for each program on the screen opened by clicking the "File usability setting" button on the Program tab of the PLC parameter dialog box.

- File register
- Device initial value
- Comment



	Program name	Execute	File register	Device initi.	Comment	Local device
1	MAIN	Scan	Use PLC file setting	Use PLC file setting	Use PLC file setting	Use PLC file setting
2	SUB1	Scan	Use PLC file setting	Use PLC file setting	Use PLC file setting	
3	SUB2	Scan	Use PLC file setting	Use PLC file setting	Use PLC file setting	
4	SUB3	Scan	Use PLC file setting	Use PLC file setting	Use PLC file setting	Use PLC file setting
5	SUB4	Scan	Use PLC file setting	Use PLC file setting	Use PLC file setting	Use PLC file setting
6	SUB5	Scan	Use PLC file setting	Use PLC file setting	Use PLC file setting	Use PLC file setting
7						
8						
9						
10						
11						
12						
13						
14						
15						

Figure 4.3 File usability setting

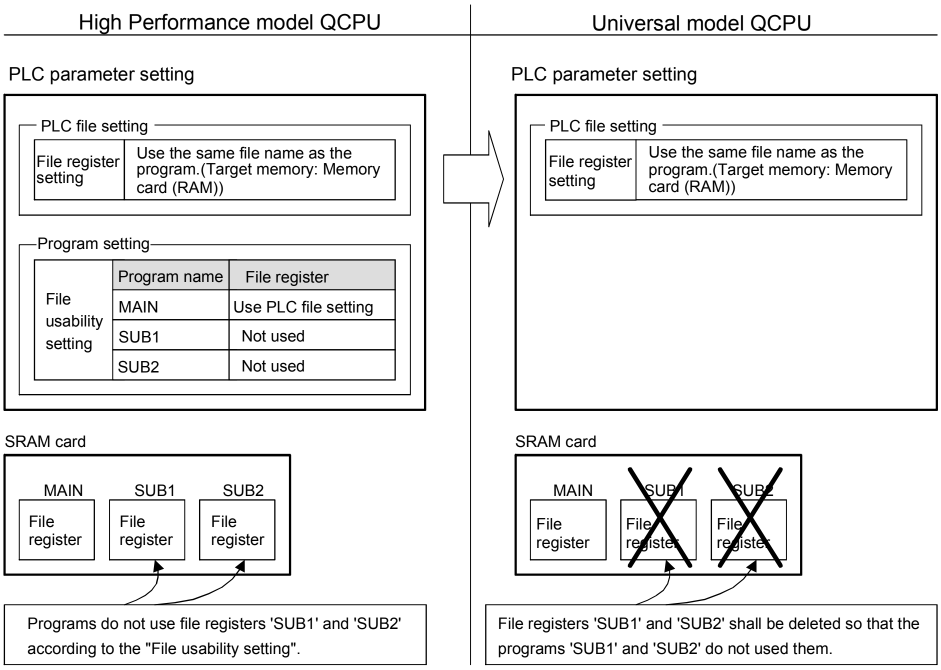
[*1] The local device file usability setting is also not available for the Universal model QCPU if the serial number (first five digits) is "10011" or earlier. If the local device is set to be used in the PLC file tab of the PLC parameter dialog box in the High Performance model QCPU, all the programs use the local device in the Universal model QCPU after replacement.

When the file usability setting is set in the High Performance model QCPU, change the setting in the following pages.

(2) Method of replacing High Performance model QCPU with Universal model QCPU

Replacement method varies depending on the settings in the PLC file tab of the PLC parameter dialog box.

Table 4.7 Replacement method

Setting in the PLC file tab	Setting in Universal model QCPU
“Not used.” is selected.	No change in parameter setting is required. Operation of the Universal model QCPU is the same regardless of the file usability setting in the High Performance model QCPU.
“Use the same file name as the program.” is selected.	When file usability is set to “Not used.” in the High Performance model QCPU, delete the corresponding program file (file register, device initial value or comment), which uses the same name as the program, from the target memory. The Universal model QCPU executes a program without using a program file if no program file that uses the same name as the program exists in the target memory.  High Performance model QCPU Universal model QCPU PLC parameter setting PLC file setting File register setting Use the same file name as the program.(Target memory: Memory card (RAM)) Program setting File usability setting Program name File register MAIN Use PLC file setting SUB1 Not used SUB2 Not used PLC parameter setting PLC file setting File register setting Use the same file name as the program.(Target memory: Memory card (RAM)) SRAM card MAIN SUB1 SUB2 File register File register File register SRAM card MAIN SUB1 SUB2 File register File register File register Programs do not use file registers 'SUB1' and 'SUB2' according to the "File usability setting". File registers 'SUB1' and 'SUB2' shall be deleted so that the programs 'SUB1' and 'SUB2' do not used them.
“Use the following file.” is selected.	No change in parameter setting is required. Operation of the Universal model QCPU is the same regardless of the file usability setting in the High Performance model QCPU.

4.6 Parameter-valid Drive and Boot File Setting

(1) Differences between the High Performance model QCPU and Universal model QCPU

(a) High Performance model QCPU
The parameter-valid drive is specified at the switches on the front panel of the High Performance model QCPU.

(b) Universal model QCPU
The Universal model QCPU automatically determines the parameter-valid drive, depending on the existence of parameters in the drive (program memory, memory card or standard ROM). Therefore, when replacing the High Performance model QCPU with the Universal model QCPU, changing the boot file setting for parameter and/or moving files to another drive may be required.
When replacing the module, change the setting in the following pages.

(2) Method of replacing the High Performance model QCPU with Universal model QCPU

(a) When the parameter-valid drive is set to the standard ROM in the High Performance model QCPU

Table 4.8 When the parameter-valid drive is set to the standard ROM

<table>
<tr><th>Setting in High Performance model QCPU</th><th rowspan="2">Setting in Universal model QCPU</th></tr>
<tr><th>Setting in the Boot file tab of the PLC parameter dialog box</th></tr>
<tr><td>No boot file setting</td><td>Change the setting so that the Universal model QCPU can refer to the parameters in the standard ROM.
• Changes in parameter setting are not required.
• Delete parameters that exist in the program memory and memory card. [*2]</td></tr>
<tr><td>Settings in the Boot file tab<table><tr><td>Type</td><td>Transfer from</td><td>Transfer to</td></tr><tr><td>Program</td><td>Standard ROM</td><td>Program memory</td></tr></table>(No boot file setting for parameters)</td><td>Change the setting so that programs are stored in the program memory in the first place, instead of booting from the standard ROM.
• Delete all settings for parameter in the Boot file tab of the PLC parameter dialog box.
• Delete parameters that exist in the program memory and memory card. [*2]
• Move the programs with boot setting into the program memory from the standard ROM. [*1]</td></tr>
<tr><td>Settings in the Boot file tab<table><tr><td>Type</td><td>Transfer from</td><td>Transfer to</td></tr><tr><td>Program</td><td>Standard ROM</td><td>Program memory</td></tr><tr><td>Parameter</td><td>Standard ROM</td><td>Program memory</td></tr></table></td><td>Change the setting so that programs and parameters are stored in the program memory in the first place, instead of booting from the standard ROM.
• Move the programs and parameters with boot setting into the program memory from the standard ROM. [*1]
• Delete all settings for parameter in the Boot file tab of the PLC parameter dialog box.</td></tr>
<tr><td>Settings in the Boot file tab<table><tr><td>Type</td><td>Transfer from</td><td>Transfer to</td></tr><tr><td>Program</td><td>Memory card</td><td>Program memory</td></tr></table>(No boot file setting for parameters)</td><td>Change the setting so that the Universal model QCPU can refer to the parameters in the memory card and programs are booted from the memory card to the program memory.
• Move the parameters in the standard ROM into the memory card.
• Make setting so that programs are booted from the memory card to the program memory in the Boot file tab of the PLC parameter dialog box. [*3]</td></tr>
<tr><td>Settings in the Boot file tab<table><tr><td>Type</td><td>Transfer from</td><td>Transfer to</td></tr><tr><td>Program</td><td>Memory card</td><td>Program memory</td></tr><tr><td>Parameter</td><td>Memory card</td><td>Program memory</td></tr></table></td><td>Change the setting so that the Universal model QCPU can refer to the parameters in the memory card and programs and parameters are booted from the memory card to the program memory.
• Move the parameters in the standard ROM into the memory card.
• Make setting so that programs and parameters are booted from the memory card to the program memory in the Boot file tab of the PLC parameter dialog box. [*3]</td></tr>
<tr><td>Settings in the Boot file tab<table><tr><td>Type</td><td>Transfer from</td><td>Transfer to</td></tr><tr><td>(Data other than program and parameter)</td><td>Memory card</td><td>Program memory</td></tr></table>Or<table><tr><td>Type</td><td>Transfer from</td><td>Transfer to</td></tr><tr><td>(Data other than program and parameter)</td><td>Standard ROM</td><td>Program memory</td></tr></table>(Data other than program and parameter indicate initial device value, device comment, and label program.)</td><td>Delete all settings for data other than program and parameter in the boot file setting. Since these data can be used even not stored in the program memory, it is not necessary to transfer them to the program memory. Or, change the setting so that they are stored in the program memory in the first place.
• Delete all settings for data other than program and parameter in the Boot file tab of the PLC parameter dialog box.
• Move the data other than programs and parameters into the program memory as needed.</td></tr>
</table>

*1: Since the Universal model QCPU holds the data in the program memory even when the battery voltage drops, the boot file setting is not necessary.

*2: The Universal model QCPU searches for parameters in order of in the program memory, in the memory card, and in the standard ROM. Then, the module uses the parameters found first. If parameters exist in the program memory or the memory card, the Universal model QCPU cannot use the parameters in the standard ROM.

*3: The Universal model QCPU ignores the boot file setting for parameters in the standard ROM.

(b) When the parameter-valid drive is set to the memory card (RAM) or memory card (ROM) in the High Performance model QCPU

Table 4.9 When the parameter-valid drive is set to the memory card (RAM) or memory card (ROM)

<table>
<tr><th>Setting in High Performance model QCPU
Setting in the Boot file tab of the PLC parameter dialog box</th><th>Setting in Universal model QCPU</th></tr>
<tr><td>No boot file setting</td><td>Change the setting so that the Universal model QCPU can refer to the parameters in the memory card.
• Changes in parameter setting are not required.
• Delete parameters that exist in the program memory. *2</td></tr>
<tr><td>Settings in the Boot file tab
<table><tr><th>Type</th><th>Transfer from</th><th>Transfer to</th></tr><tr><td>Program</td><td>Memory card</td><td>Program memory</td></tr></table>
(No boot file setting for parameters)</td><td>Change the setting so that the Universal model QCPU can refer to the parameters in the memory card.
• Changes in parameter setting are not required.
• Delete parameters that exist in the program memory. *2</td></tr>
<tr><td>Settings in the Boot file tab
<table><tr><th>Type</th><th>Transfer from</th><th>Transfer to</th></tr><tr><td>Program</td><td>Memory card</td><td>Program memory</td></tr><tr><td>Parameter</td><td>Memory card</td><td>Program memory</td></tr></table></td><td>No changes are required.</td></tr>
<tr><td>Settings in the Boot file tab
<table><tr><th>Type</th><th>Transfer from</th><th>Transfer to</th></tr><tr><td>Program</td><td>Standard ROM</td><td>Program memory</td></tr></table>
(No boot file setting for parameters)</td><td>Change the setting so that programs are stored in the program memory in the first place, instead of booting from the standard ROM.
• Move the programs targeted for booting from the standard ROM into the program memory. *1
• Delete all settings for program in the Boot file tab of the PLC parameter dialog box.
• Delete parameters that exist in the program memory. *2</td></tr>
<tr><td>Settings in the Boot file tab
<table><tr><th>Type</th><th>Transfer from</th><th>Transfer to</th></tr><tr><td>Program</td><td>Standard ROM</td><td>Program memory</td></tr><tr><td>Parameter</td><td>Memory card</td><td>Program memory</td></tr></table></td><td>Change the setting so that programs are stored in the program memory in the first place, instead of booting from the standard ROM.
• Move the programs targeted for booting from the standard ROM into the program memory. *1
• Delete all settings for program in the Boot file tab of the PLC parameter dialog box.</td></tr>
<tr><td>Settings in the Boot file tab
<table><tr><th>Type</th><th>Transfer from</th><th>Transfer to</th></tr><tr><td>(Data other than program and parameter)</td><td>Memory card</td><td>Program memory</td></tr></table>
Or
<table><tr><th>Type</th><th>Transfer from</th><th>Transfer to</th></tr><tr><td>(Data other than program and parameter)</td><td>Standard ROM</td><td>Program memory</td></tr></table>
(Data other than program and parameter indicate initial device value, device comment, and label program.)</td><td>Delete all settings for data other than program and parameter in the boot file setting. Since these data can be used even not stored in the program memory, it is not necessary to transfer them to the program memory. Or, change the setting so that they are stored in the program memory in the first place.
• Delete all settings for data other than program and parameter in the Boot file tab of the PLC parameter dialog box.
• Move the data other than program and parameter into the program memory as needed.</td></tr>
</table>

*1: Since the Universal model QCPU holds the data in the program memory even when the battery voltage drops, the boot file setting is not necessary.

*2: The Universal model QCPU searches for parameters in order of in the program memory, in the memory card, and in the standard ROM. Then, the module uses the parameters found first. If parameters exist in the program memory or the memory card, the Universal model QCPU cannot use the parameters in the standard ROM.

4.7 External Input/Output Forced On/Off Function

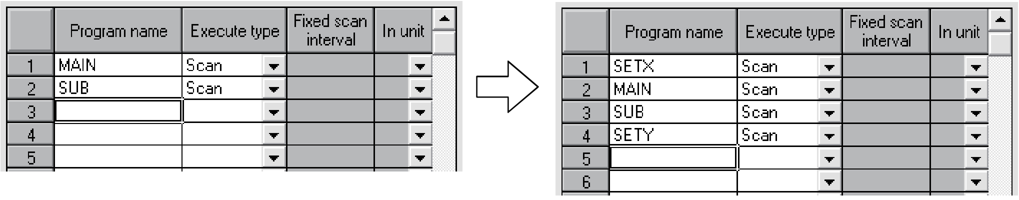
(1) Differences between the High Performance model QCPU and Universal model QCPU

(a) High Performance model QCPU
External input/output can be forcibly turned on/off on the screen opened by selecting [Online]→[Debug]→[Forced input output registration/cancellation] in GX Developer.

(b) Universal model QCPU
If the serial number (first five digits) is "10041" or earlier, the external input/output forced on/off function cannot be used.
External input/output can be forcibly turned on/off by using the replacement program described below.

(2) Method of replacing High Performance model QCPU with Universal model QCPU

As shown in Figure 4.4, add program names, “SETX” and “SETY”, in the Program tab of the PLC parameter dialog box.



<Before replacement>

	Program name	Execute type	Fixed scan interval	In unit
1	MAIN	Scan		
2	SUB	Scan		
3				
4				
5				

<After replacement>

	Program name	Execute type	Fixed scan interval	In unit
1	SETX	Scan		
2	MAIN	Scan		
3	SUB	Scan		
4	SETY	Scan		
5				
6				

Figure 4.4 Modification in the Program tab of the PLC parameter setting

The following table shows the program setting of the “SETX” and “SETY”.

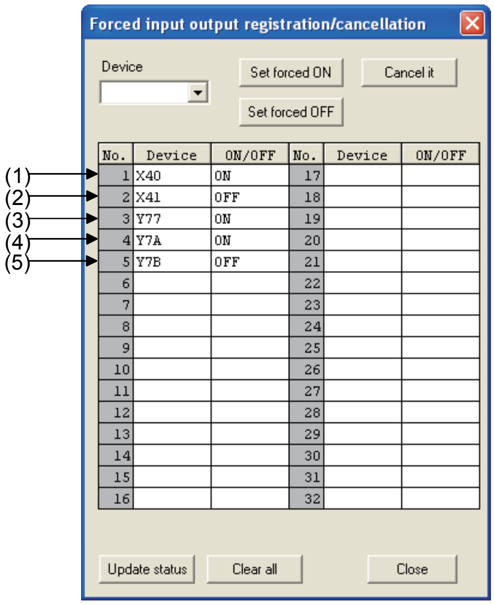
Table 4.10 Program setting of “SETX” and “SETY”

Program name	Execution type	Position where program is added
SETX	Scan	Start of Program setting (No.1)
SETY	Scan	End of Program setting

Example) Forcibly turning X40, X77, and X7A on, and X41 and Y7B off

The programs, "SETX" and "SETY", turns on or off the X and Y devices, which have been registered for forced on/off using the external input/output forced on/off function, at each scan using the SET and RST instructions.

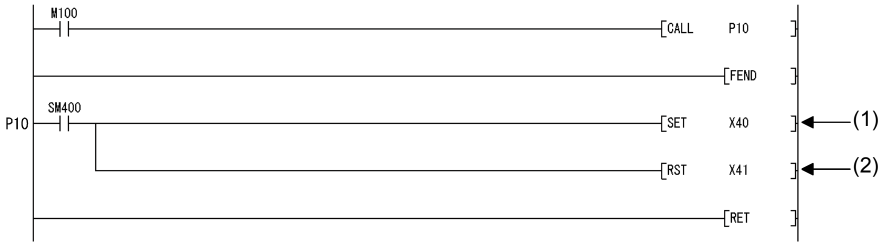
High Performance model QCPU



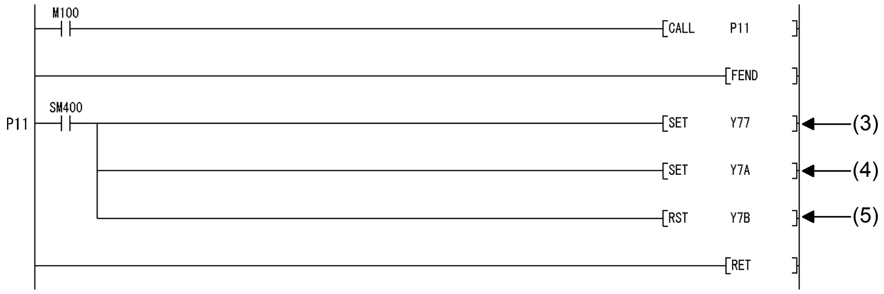
No.	Device	ON/OFF	No.	Device	ON/OFF
1	X40	ON	17		
2	X41	OFF	18		
3	Y77	ON	19		
4	Y7A	ON	20		
5	Y7B	OFF	21		
6			22		
7			23		
8			24		
9			25		
10			26		
11			27		
12			28		
13			29		
14			30		
15			31		
16			32		

Universal model QCPU

- Program example of "SETX"



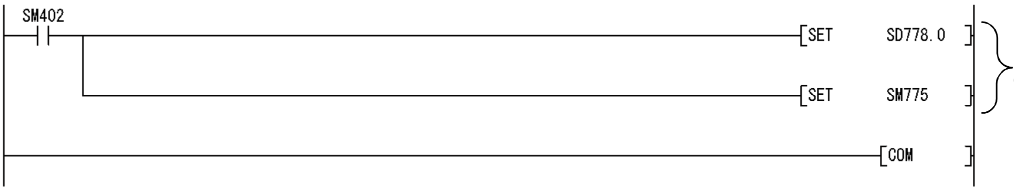
- Program example of "SETY"



(3) Replacing the COM instruction

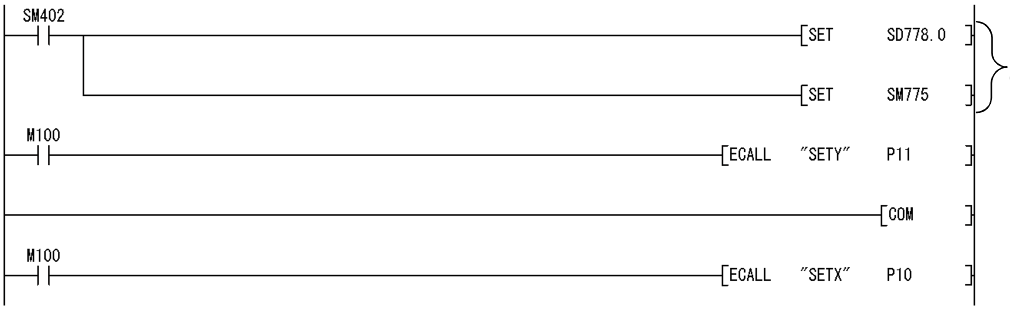
If the COM instruction is used, add subroutine calls for P10 and P11 before and after the COM instruction. (P10 and P11 are pointers shown in the program examples in (2).) When SM775 is on (Executes refresh set by SD778) and also the 0 bit of SD778 is off (Do not execute I/O refresh), replacement of the instruction is not necessary.

(a) Program before replacement



Selection of refresh processing during COM instruction execution

(b) Program after replacement

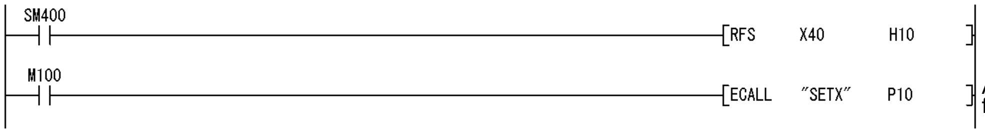


Selection of refresh processing during COM instruction execution

(4) Replacing the RFS instruction

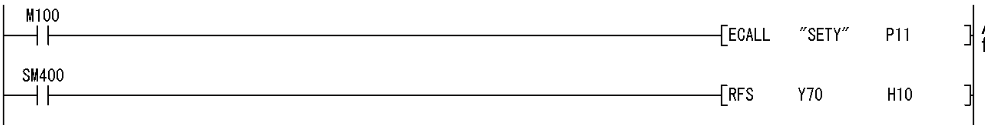
If any I/O numbers targeted for forced on/off are included in the partial refresh range specified by the RFS instruction, add subroutine calls for P10 and P11 before and after the RFS instruction. (P10 and P11 are pointers shown in the program examples in (2).)
If no I/O number targeted for forced on/off is included, addition of subroutine calls for P10 and P11 is not necessary.

(a) When partial refresh for input (X) is executed by the RFS instruction
Add a subroutine call that executes forced input after the RFS instruction.



A subroutine call that executes forced input is added.

(b) When partial refresh for output (Y) is executed by the RFS instruction
Add a subroutine call that executes forced output before the RFS instruction.



A subroutine call that executes forced output is added.

(5) Restrictions

Replacements described in (2) to (4) do not apply in the following cases:

- Input and output targeted for forced on/off are referred to or changed using the direct input device (DX)/direct output device (DY).
- Input and output targeted for forced on/off are referred to or changed within an interrupt program.

5. SPECIAL RELAY AND SPECIAL REGISTER

The Universal model QCPU does not support the special relay and special register described in Section 5.1 and 5.2. Replace them using the method described in the following table or delete the corresponding sections.

5.1 Special Relay List

Table 5.1 lists special relay not supported in the Universal model QCPU and measures.

Table 5.1 Special relay not supported in the Universal model QCPU and measures

Number	Name/Description		Measures
SM80	CHK detection		The Universal model QCPU does not support the CHK instruction. For the replacing method of the CHK instruction, refer to Section 3.3.
SM91	Step transition monitoring timer start		The Universal model QCPU does not support the step transition monitoring timer function. For the alternative method of this function, refer to Appendix 3 "Restrictions on Basic Model QCPU, Universal Model QCPU, and LCPU and Alternative Methods" in the MELSEC-Q/L/QnA Programming Manual (SFC).
SM92			
SM93			
SM94			
SM95			
SM96			
SM97			
SM98			
SM99			
SM250	Largest mounted I/O number read		Operation of SD250 is not necessary. The Universal model QCPU always stores the largest mounted I/O number in SD250. Delete the corresponding parts.
SM255	MELSECNET/H module 1 information	Indicates operative network or standby network	These are special relays for the simple dual-structured network function. Since the Universal model QCPU does not support this function, there is no application for these special relays. Delete the corresponding sections.
SM256		At refresh from link module to CPU, selects whether to read data from the link module.	
SM257		At refresh from CPU to link module, selects whether to write data to the link module.	
SM260	MELSECNET/H module 2 information	Indicates operative network or standby network	
SM261		At refresh from link module to CPU, selects whether to read data from the link module.	
SM262		At refresh from CPU to link module, selects whether to write data to the link module.	
SM265	MELSECNET/H module 3 information	Indicates operative network or standby network	
SM266		At refresh from link module to CPU, selects whether to read data from the link module.	
SM267		At refresh from CPU to link module, selects whether to write data to the link module.	
SM270	MELSECNET/H module 4 information	Indicates operative network or standby network	
SM271		At refresh from link module to CPU, selects whether to read data from the link module.	
SM272		At refresh from CPU to link module, selects whether to write data to the link module.	
SM280	CC-Link error		Replace the relay with the I/O signals (Xn0, Xn1, and XnF) of the mounted CC-Link module.

(To the next page)

Table 5.1 Special relay not supported on the Universal model QCPU and measures (continued)

Number	Name/Description	Measures
SM330	Operation mode for low-speed execution type program	The Universal model QCPU does not support low-speed execution type programs. Delete the corresponding parts.
SM331	Normal SFC program execution status	The Universal model QCPU supports only normal SFC programs. Delete SM331 and SM332 which are used as interlocks or replace them with SM321.
SM332	Program execution management SFC program execution status	
SM390	Access execution flag	Modify the program that the Module ready signal (Xn) is used as an interlock according to sample programs described in the manual for each module.
SM404	ON for only 1 scan after RUN of low-speed execution type programs	The Universal model QCPU does not support low-speed execution type programs. Delete the corresponding parts or replace them with the special relays for scan execution type programs (SM402 and SM403).
SM405	OFF for only 1 scan after RUN of low-speed execution type programs	
SM430	User timing clock No.5 (for low-speed execution type programs)	The Universal model QCPU does not support low-speed execution type programs. Delete the corresponding parts or replace them with the special relays for scan execution type programs (SM420 and SM424).
SM431	User timing clock No.6 (for low-speed execution type programs)	
SM432	User timing clock No.7 (for low-speed execution type programs)	
SM433	User timing clock No.8 (for low-speed execution type programs)	
SM434	User timing clock No.9 (for low-speed execution type programs)	
SM510	Low-speed execution type program executing flag	The Universal model QCPU does not support low-speed execution type programs. Delete the corresponding sections.
SM551	Module service interval time read	The Universal model QCPU does not support the service interval measurement function. Delete the corresponding sections.
SM672	Memory card file register access range flag	When outside the range of the file register in the memory card is accessed, the Universal model QCPU detects "OPERATION ERROR" (error code: 4101). Programming for detecting errors using this special realy is not necessary. Delete the corresponding sections.
SM710	CHK instruction priority flag	The Universal model QCPU does not support the CHK instruction. For the replacing method of the CHK instruction, refer to Section 3.3.
SM734	XCALL instruction execution condition specification	The Universal model QCPU executes the XCALL instruction on the rising edge of execution condition as well. There is no application for this special relay. Delete the corresponding sections.
SM735	SFC comment readout instruction in-execution flag	The Universal model QCPU does not support the following instructions: • SFC step comment readout instruction (S(P).SFCSCOMR) • SFC transition condition comment readout instruction (S(P).SFCTCOMR) Delete the corresponding sections.
SM1780 *1	Power supply ~~OFF~~ off detection flag	The Universal model QCPU does not store redundant power supply system information in SM1780 to SM1783. Delete the corresponding sections. (SM1780 to SM1783 are always off.)
SM1781 *1	Power supply failure detection flag	
SM1782 *1	Momentary power failure detection flag for power supply 1	
SM1783 *1	Momentary power failure detection flag for power supply 2	

*1: The special relay can be used if the serial number (first five digits) of the Universal model QCPU is "10042" or later.

5.2 Special Register List

Table 5.2 lists special register not supported in the Universal model QCPU and measures.

Table 5.2 Special registers not supported in the Universal model QCPU and measures

Number	Name/Description	Measures
SD80	CHK number	The Universal model QCPU does not support the CHK instruction. For the replacing method of the CHK instruction, refer to Section 3.3.
SD90	Step transition monitoring timer setting value	The Universal model QCPU does not support the step transition monitoring timer function. For the replacing method of this function, refer to Appendix 3 "Restrictions on Basic Model QCPU, Universal Model QCPU, and LCPU and Alternative Methods" in the MELSEC-Q/L/QnA Programming Manual (SFC).
SD91		
SD92		
SD93		
SD94		
SD95		
SD96		
SD97		
SD98		
SD99		
SD280	CC-Link error	Replace these registers with the I/O signals (Xn0, Xn1, and XnF) of the mounted CC-Link module.
SD281		
SD315	Time reserved for communication processing	Service processing setting is available for the Universal model QCPU on the PLC system setting tab of the PLC parameter dialog box. Select "Specify service process time." for the service processing setting parameter and set the service processing time. Other setting methods can be selected as well.
SD430	Low-speed scan counter	The Universal model QCPU does not support low-speed execution type programs. Delete the corresponding section or replace it with the special register for scan execution type programs (SD420).
SD510	Low-speed execution type program number	The Universal model QCPU does not support low-speed execution type programs. Delete the corresponding section or replace it with the special register for scan execution type programs (SD500).
SD528	Current scan time for low-speed execution type programs	The Universal model QCPU does not support low-speed execution type programs. Delete the corresponding sections or replace them with the special registers for scan execution type programs (SD520 and SD521).
SD529		
SD532	Minimum scan time for low-speed execution type programs	The Universal model QCPU does not support low-speed execution type programs. Delete the corresponding sections or replace them with the special registers for scan execution type programs (SD524 to SD527).
SD533		
SD534	Maximum scan time for low-speed execution type programs	
SD535		
SD544	Cumulative execution time for low-speed execution type programs	The Universal model QCPU does not support low-speed execution type programs. Delete the corresponding sections.
SD545		
SD546	Execution time for low-speed execution type programs	The Universal model QCPU does not support low-speed execution type programs. Delete the corresponding sections.
SD547		
SD550	Service interval measurement module	The Universal model QCPU does not support the service interval measurement function. Delete the corresponding sections.
SD551	Service interval time	
SD552		
SD720	Program No. specification for PLAODP instruction	The Universal model QCPU does not support the PLAODP instruction. Delete the corresponding section.
SD1780 *1	Power supply off detection status	The Universal model QCPU does not store redundant power supply system information in SD1780 to SD1783. Delete the corresponding sections. (SD1780 to SD1783 are always off.)
SD1781 *1	Power supply failure detection status	
SD1782 *1	Momentary power failure detection counter for power supply 1	
SD1783 *1	Momentary power failure detection counter for power supply 1	

*1: The special register can be used if the serial number (first five digits)of the Universal model QCPU is "10042" or later.

REVISIONS

Version	Print Date	Revision
-	January 2008	First edition
A	March 2008	• The following modules have been added. Q13UDHCPU, Q26UDHCPU • The following chapters and sections have been modified in accordance with the version upgrade of the Universal model QCPU. Chapter 1 (2), Chapter 2, Section 4.4
B	May 2008	• The following modules have been added. Q03UDECPU, Q04UDEHCPU, Q06UDEHCPU, Q13UDEHCPU, Q26UDEHCPU • The following chapters and sections have been modified in accordance with the version upgrade of the Universal model QCPU. Chapter 1 (1), (6), Chapter 2, Section 4.3, 4.6, 5.1, 5.2 • Software listed in Chapter 2 (3) “Software need to be upgraded for the compatibility with the Universal model QCPU” have been reviewed and modified. • “GX Converter” has been added to the list in Chapter 2 (4) “Software not supported in the Universal model QCPU”.
C	December 2008	• The following modules have been added. Q10UDHCPU, Q20UDHCPU, Q10UDEHCPU, Q20UDEHCPU. • The following chapters and sections have been modified in accordance with the version upgrade of the Universal model QCPU. Chapter 1 , Chapter 2, Chapter 3.
D	January 2009	Section 4.3 has been added.
E	September 2009	Chapter 1 (4); Two precaution items have been added to the following table. External communication.
F	July 2011	The descriptions of the reference manuals or the references have been changed in accordance with the composition changes of the manuals.

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