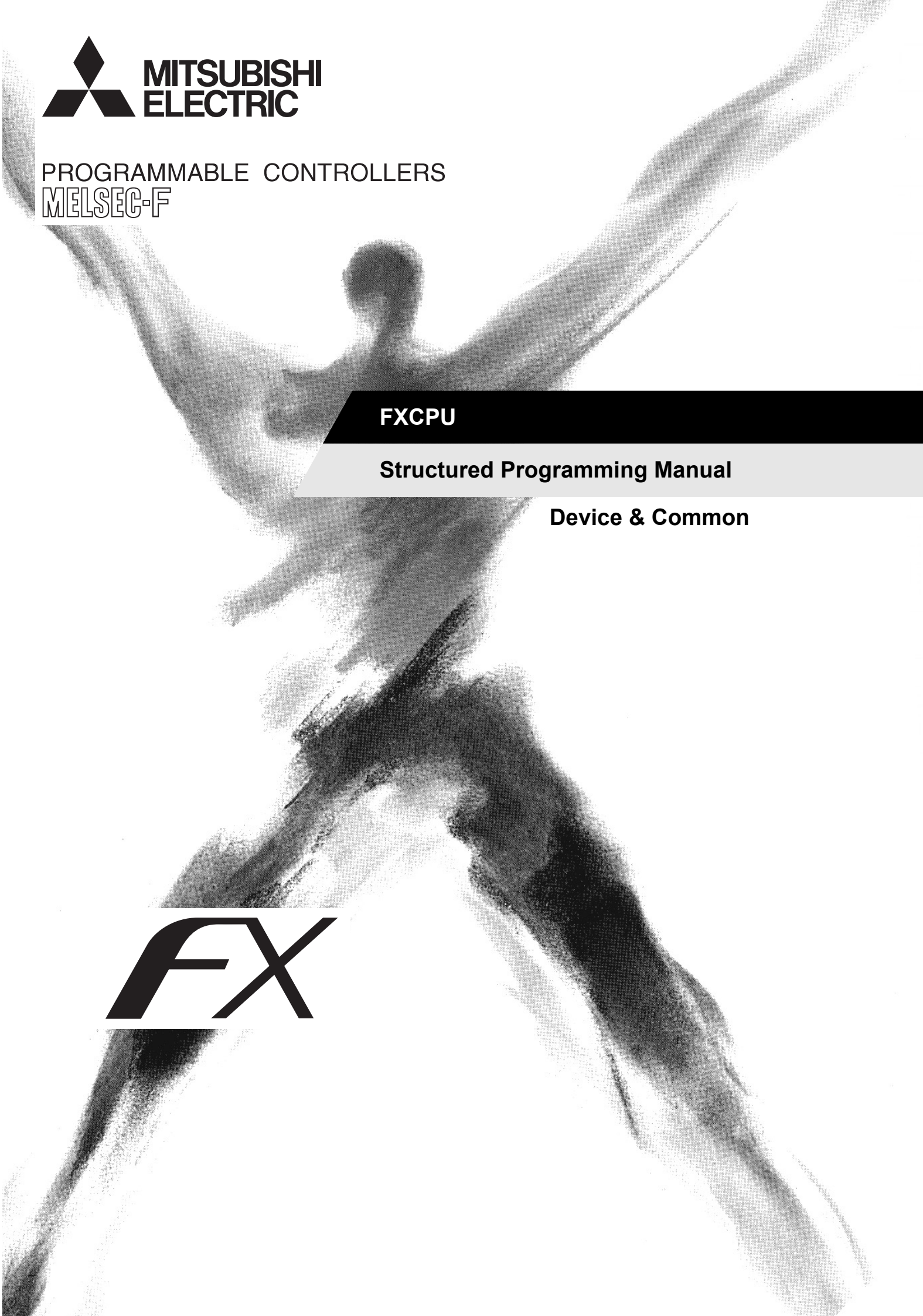
MITSUBISHI ELECTRIC

PROGRAMMABLE CONTROLLERS
MELSEC-F



FXCPU

Structured Programming Manual

Device & Common

FX

FXCPU Structured Programming Manual

[Device & Common]

Manual No.	JY997D26001
Revision	L
Date	4/2015

Foreword

This manual describes devices and parameters for structured programs used in the MELSEC-F FX Series.
Please read this manual and manuals of relevant products before use, sufficiently understand the specifications, and use the unit correctly and safely.
See to it that this manual is supplied to the end user.

Outline Precautions

- This manual provides information for the use of the FX Series Programmable Controllers. The manual has been written to be used by trained and competent personnel. The definition of such a person or persons is as follows;
  a) Any engineer who is responsible for the planning, design and construction of automatic equipment using the product associated with this manual should be of a competent nature, trained and qualified to the local and national standards required to fulfill that role. These engineers should be fully aware of all aspects of safety with regards to automated equipment.
  b) Any commissioning or service engineer must be of a competent nature, trained and qualified to the local and national standards required to fulfill that job. These engineers should also be trained in the use and maintenance of the completed product. This includes being completely familiar with all associated documentation for the said product. All maintenance should be carried out in accordance with established safety practices.
  c) All operators of the completed equipment should be trained to use that product in a safe and coordinated manner in compliance to established safety practices. The operators should also be familiar with documentation which is connected with the actual operation of the completed equipment.

  Note: the term 'completed equipment' refers to a third party constructed device which contains or uses the product associated with this manual
- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi Electric.
- This product has been manufactured under strict quality control. However when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.
- When combining this product with other products, please confirm the standard and the code, or regulations with which the user should follow. Moreover, please confirm the compatibility of this product to the system, machine, and apparatus with which a user is using.
- If in doubt at any stage during the installation of the product, always consult a professional electrical engineer who is qualified and trained to the local and national standards. If in doubt about the operation or use, please consult the nearest Mitsubishi Electric representative
- Since the examples indicated by this manual, technical bulletin, catalog, etc. are used as a reference, please use it after confirming the function and safety of the equipment and system. Mitsubishi Electric will accept no responsibility for actual use of the product based on these illustrative examples.
- This manual content, specification etc. may be changed without a notice for improvement.
- The information in this manual has been carefully checked and is believed to be accurate; however, you have noticed a doubtful point, a doubtful error, etc., please contact the nearest Mitsubishi Electric representative.

Registration

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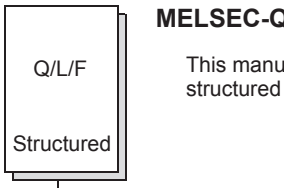
- Ethernet is a trademark of Xerox Corporation.
- MODBUS® is a registered trademark of Schneider Electric SA.
- The company name and the product name to be described in this manual are the registered trademarks or trademarks of each company.

Table of Contents

Positioning of This Manual

This manual explains devices and parameters for structured programs provided by GX Works2. Refer to other manuals for sequence instructions and application functions.
Refer to each corresponding manual for analog, communication, positioning control and special units and blocks.

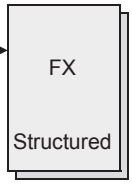
1. When using FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs



MELSEC-Q/L/F Structured Programming Manual (Fundamentals) (Additional Manual)

This manual explains programming methods, specifications, functions, etc. required to create structured programs.

(This manual)



FXCPU Structured Programming Manual [Device & Common] (Additional Manual)

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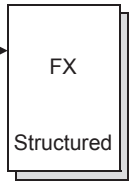
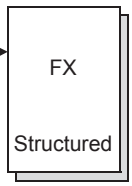


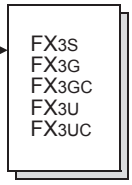
FXCPU Structured Programming Manual [Basic & Applied Instruction] (Additional Manual)

This manual explains sequence instructions for structured programs provided by GX Works2.



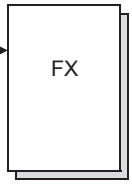
FXCPU Structured Programming Manual [Application Functions] (Additional Manual)

This manual explains application functions for structured programs provided by GX Works2.



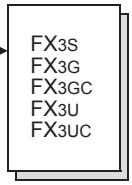
FX3S/FX3G/FX3GC/FX3U/FX3UC User's Manual- Analog Control Edition (Additional Manual)

This manual explains details of analog special function blocks and analog special adapters for FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs and PID instruction.
Explanation of instructions and instructions used in program examples are expressed for GX Developer.



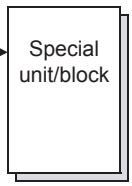
FX Series User's Manual -Data Communication Edition (Additional Manual)

This manual explains details of simple N:N link, parallel link, computer link, no-protocol communication (RS and RS2 instructions), programming communication and inverter communication for FX PLCs.
Explanation of instructions and instructions used in program examples are expressed for GX Developer.



FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual -Positioning Edition (Additional Manual)

This manual explains details of wiring, instructions and operations of the positioning function built in FX3S/FX3G/FX3GC/FX3U/FX3UC PLC main units.
Explanation of instructions and instructions used in program examples are expressed for GX Developer.



Individual manuals (Manual supplied with product or additional Manual*1)

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Explanation of instructions and instructions used in program examples are expressed for GX Developer.

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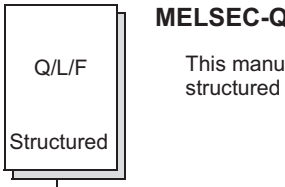
2. When using FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs



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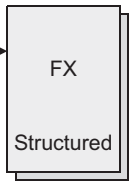
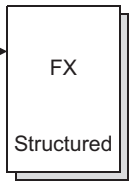


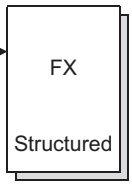
FXCPU Structured Programming Manual [Device & Common] (Additional Manual)

This manual explains devices and parameters for structured programs provided by GX Works2.



FXCPU Structured Programming Manual [Basic & Applied Instruction] (Additional Manual)

This manual explains sequence instructions for structured programs provided by GX Works2.



FXCPU Structured Programming Manual [Application Functions] (Additional Manual)

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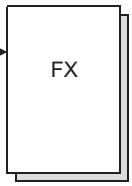

FX Series User's Manual -Data Communication Edition (Additional Manual)

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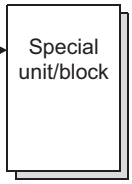
Explanation of instructions and instructions used in program examples are expressed for GX Developer and FX-PCS/WIN.



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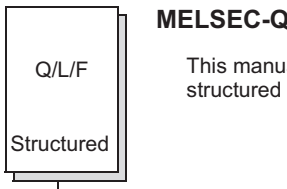
3. When using FX0S/X0/FX0N/FXU/FX2C PLCs



MELSEC-Q/L/F Structured Programming Manual (Fundamentals) (Additional Manual)

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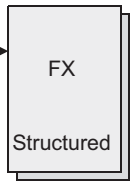

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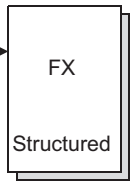

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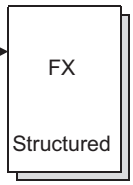

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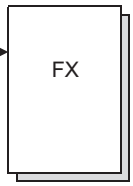

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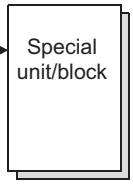

Individual manuals (Manual supplied with product or additional Manual *1)

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Explanation of instructions and instructions used in program examples are expressed for GX Developer and FX-PCS/WIN.

*1. Detailed explanation may be provided by a separate manual in some products.

Related Manuals

This manual explains devices and parameters for structured programs provided by GX Works2.
Refer to other manuals for sequence instructions and applied functions.
This chapter introduces only reference manuals for this manual and manuals which describe the hardware information of PLC main units.
Manuals not introduced here may be required in some applications.
Refer to the manual of the used PLC main unit and manuals supplied together with used products.
Contact the representative for acquiring required manuals.

Common among FX PLCs [structured]

Manual name	Manual number	Supplied with product or Additional Manual	Contents	Model name code
MELSEC-Q/L/F Structured Programming Manual (Fundamentals)	SH-080782	Additional Manual	Programming methods, specifications, functions, etc. required to create structured programs	13JW06
FXCPU Structured Programming Manual [Device & Common]	JY997D26001	Additional Manual	Devices, parameters, etc. provided in structured projects of GX Works2	09R925
FXCPU Structured Programming Manual [Basic & Applied Instruction]	JY997D34701	Additional Manual	Sequence instructions provided in structured projects of GX Works2	09R926
FXCPU Structured Programming Manual [Application Functions]	JY997D34801	Additional Manual	Application functions provided in structured projects of GX Works2	09R927

FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs

Manual name	Manual number	Supplied with product or Additional Manual	Contents	Model name code
PLC main unit				
FX3U Series Hardware Manual	JY997D18801	Supplied with product	I/O specifications, wiring and installation of the PLC main unit FX3U extracted from the FX3U Series User's Manual - Hardware Edition. For detailed explanation, refer to the FX3U Series User's Manual - Hardware Edition.	-
FX3U Series User's Manual- Hardware Edition	JY997D16501	Additional Manual	Details about the hardware including I/O specifications, wiring, installation and maintenance of the FX3U PLC main unit.	09R516
FX3UC (D, DS, DSS) Series Hardware Manual	JY997D28601	Supplied with product	I/O specifications, wiring and installation of the PLC main unit FX3UC (D, DS, DSS) extracted from the FX3UC Series User's Manual - Hardware Edition. For detailed explanation, refer to the FX3UC Series User's Manual - Hardware Edition.	-
FX3UC-32MT-LT-2 Hardware Manual	JY997D31601	Supplied with product	I/O specifications, wiring and installation of the PLC main unit FX3UC-32MT-LT-2 extracted from the FX3UC Series User's Manual - Hardware Edition. For detailed explanation, refer to the FX3UC Series User's Manual - Hardware Edition.	-
FX3UC Series User's Manual - Hardware Edition	JY997D28701	Additional Manual	Details about the hardware including I/O specifications, wiring, installation and maintenance of the FX3UC PLC main unit.	09R519
FX3G Series Hardware Manual	JY997D46001	Supplied with product	I/O specifications, wiring and installation of the PLC main unit FX3G extracted from the FX3G Series User's Manual - Hardware Edition. For detailed explanation, refer to the FX3G Series User's Manual - Hardware Edition.	-
FX3G Series User's Manual- Hardware Edition	JY997D31301	Additional Manual	Details about the hardware including I/O specifications, wiring, installation and maintenance of the FX3G PLC main unit.	09R521
FX3GC Series Hardware Manual	JY997D45201	Supplied with product	I/O specifications, wiring and installation of the PLC main unit FX3GC extracted from the FX3GC Series User's Manual - Hardware Edition. For detailed explanation, refer to the FX3GC Series User's Manual - Hardware Edition.	-
FX3GC Series User's Manual- Hardware Edition	JY997D45401	Additional Manual	Details about the hardware including I/O specifications, wiring, installation and maintenance of the FX3GC PLC main unit.	09R533

Manual name	Manual number	Supplied with product or Additional Manual	Contents	Model name code
PLC main unit				
FX3S Series Hardware Manual	JY997D48301	Supplied with product	I/O specifications, wiring and installation of the PLC main unit FX3S extracted from the FX3S Series User's Manual - Hardware Edition. For detailed explanation, refer to the FX3S Series User's Manual - Hardware Edition.	-
FX3S Series User's Manual - Hardware Edition	JY997D48601	Additional Manual	Details about the hardware including I/O specifications, wiring, installation and maintenance of the FX3S PLC main unit.	09R535
Programming				
FX3S/FX3G/FX3GC/FX3U/FX3UC User's Manual- Analog Control Edition	JY997D16701	Additional Manual	Details about the analog special function block (FX3U-4AD, FX3U-4DA, FX3UC-4AD) and analog special adapter (FX3U-****-ADP).	09R619
FX Series User's Manual -Data Communication Edition	JY997D16901	Additional Manual	Details about simple N : N link, parallel link, computer link and no-protocol communication (RS instruction and FX2N-232IF).	09R715
FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual - MODBUS Serial Communication Edition	JY997D26201	Additional Manual	Explains the MODBUS serial communication network in FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs.	09R626
FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual -Positioning Edition	JY997D16801	Additional Manual	Details about the positioning function built in the FX3S/FX3G/FX3GC/FX3U/FX3UC Series.	09R620
FX3U-CF-ADP User's Manual	JY997D35401	Additional Manual	Describes details of the FX3U-CF-ADP CF card special adapter.	09R720

FX1S/FX1N/FX1NC PLCs
FX2N/FX2NC PLCs [whose production is finished]

Manual name	Manual number	Supplied with product or Additional Manual	Contents	Model name code
PLC main unit				
FX1S HARDWARE MANUAL	JY992D83901	Additional Manual	Details about the hardware including I/O specifications, wiring, installation and maintenance of the FX1S PLC main unit.	-
FX1N HARDWARE MANUAL	JY992D89301	Additional Manual	Details about the hardware including I/O specifications, wiring, installation and maintenance of the FX1N PLC main unit.	-
FX2N HARDWARE MANUAL	JY992D66301	Additional Manual	Details about the hardware including I/O specifications, wiring, installation and maintenance of the FX2N PLC main unit.	09R508
FX1NC HARDWARE MANUAL	JY992D92101	Additional Manual	Details about the hardware including I/O specifications, wiring, installation and maintenance of the FX1NC PLC main unit. (Japanese only)	09R505
FX2NC HARDWARE MANUAL	JY992D76401	Additional Manual	Details about the hardware including I/O specifications, wiring, installation and maintenance of the FX2NC PLC main unit.	09R509
Programming				
FX Series User's Manual -Data Communication Edition	JY997D16901	Additional Manual	Details about simple N : N link, parallel link, computer link and no-protocol communication (RS instruction and FX2N-232IF).	09R715

FX0S/FX0/FX0N/FXU/FX2C PLCs [whose production is finished]

Manual name	Manual number	Supplied with product or Additional Manual	Contents	Model name code
PLC main unit				
FX0/FX0N HARDWARE MANUAL	JY992D47501	Supplied with product	Details about the hardware including I/O specifications, wiring, installation and maintenance of the FX0/FX0N PLC main unit.	-
FX0S HARDWARE MANUAL	JY992D55301	Supplied with product	Details about the hardware including I/O specifications, wiring, installation and maintenance of the FX0S PLC main unit.	-
FX/FX2C HARDWARE MANUAL	JY992D47401	Supplied with product	Details about the hardware including I/O specifications, wiring, installation and maintenance of the FXU/FX2C PLC main unit.	-
Programming				
FX Series User's Manual -Data Communication Edition	JY997D16901	Additional Manual	Details about simple N : N link, parallel link, computer link and no-protocol communication (RS instruction and FX2N-232IF).	09R715

Manuals of models whose production is finished

Production is finished for FX0S/FX0/FX0N/FXU/FX2C/FX2N/FX2NC PLCs.

Generic Names and Abbreviations Used in Manuals

Abbreviation/generic name	Name
PLCs	
FX3U Series or FX3U PLC	Generic name of FX3U Series PLCs
FX3UC Series or FX3UC PLC	Generic name of FX3UC Series PLCs
FX3G Series or FX3G PLC	Generic name of FX3G Series PLCs
FX3GC Series or FX3GC PLC	Generic name of FX3GC Series PLCs
FX3S Series or FX3S PLC	Generic name of FX3S Series PLCs
FX2N Series or FX2N PLC	Generic name of FX2N Series PLCs
FX2NC Series or FX2NC PLC	Generic name of FX2NC Series PLCs
FX1N Series or FX1N PLC	Generic name of FX1N Series PLCs
FX1NC Series or FX1NC PLC	Generic name of FX1NC Series PLCs These products can only used in Japan.
FX1S Series or FX1S PLC	Generic name of FX1S Series PLCs
FXU Series or FXU PLC	Generic name of FXU(FX,FX2) Series PLCs
FX2C Series or FX2C PLC	Generic name of FX2C Series PLCs
FX0N Series or FX0N PLC	Generic name of FX0N Series PLCs
FX0S Series or FX0S PLC	Generic name of FX0S Series PLCs
FX0 Series or FX0 PLC	Generic name of FX0 Series PLCs
Special adapters	
CF card special adapter	Generic name of CF card special adapters
CF-ADP	FX3U-CF-ADP
Ethernet adapter	Abbreviated name for FX3U-ENET-ADP
Programming language	
ST	Abbreviation of structured text language
Structured ladder	Abbreviation of ladder diagram language
FBD	Abbreviation of function block diagram language
Manuals	
Q/L/F Structured Programming Manual (Fundamentals)	Abbreviation of MELSEC-Q/L/F Structured Programming Manual (Fundamentals)
FX Structured Programming Manual [Device & Common]	Abbreviation of FXCPU Structured Programming Manual [Device & Common]
FX Structured Programming Manual [Basic & Applied Instruction]	Abbreviation of FXCPU Structured Programming Manual [Basic & Applied Instruction]
FX Structured Programming Manual [Application Functions]	Abbreviation of FXCPU Structured Programming Manual [Application Functions]
COMMUNICATION CONTROL EDITION	Abbreviation of FX Series User's Manual-DATA COMMUNICATION CONTROL EDITION
ANALOG CONTROL EDITION	Abbreviation of FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual-ANALOG CONTROL EDITION
POSITIONING CONTROL EDITION	Abbreviation of FX3S/FX3G/FX3GC/FX3U/FX3UC Series User's Manual-POSITIONING CONTROL EDITION

1. Device Outline

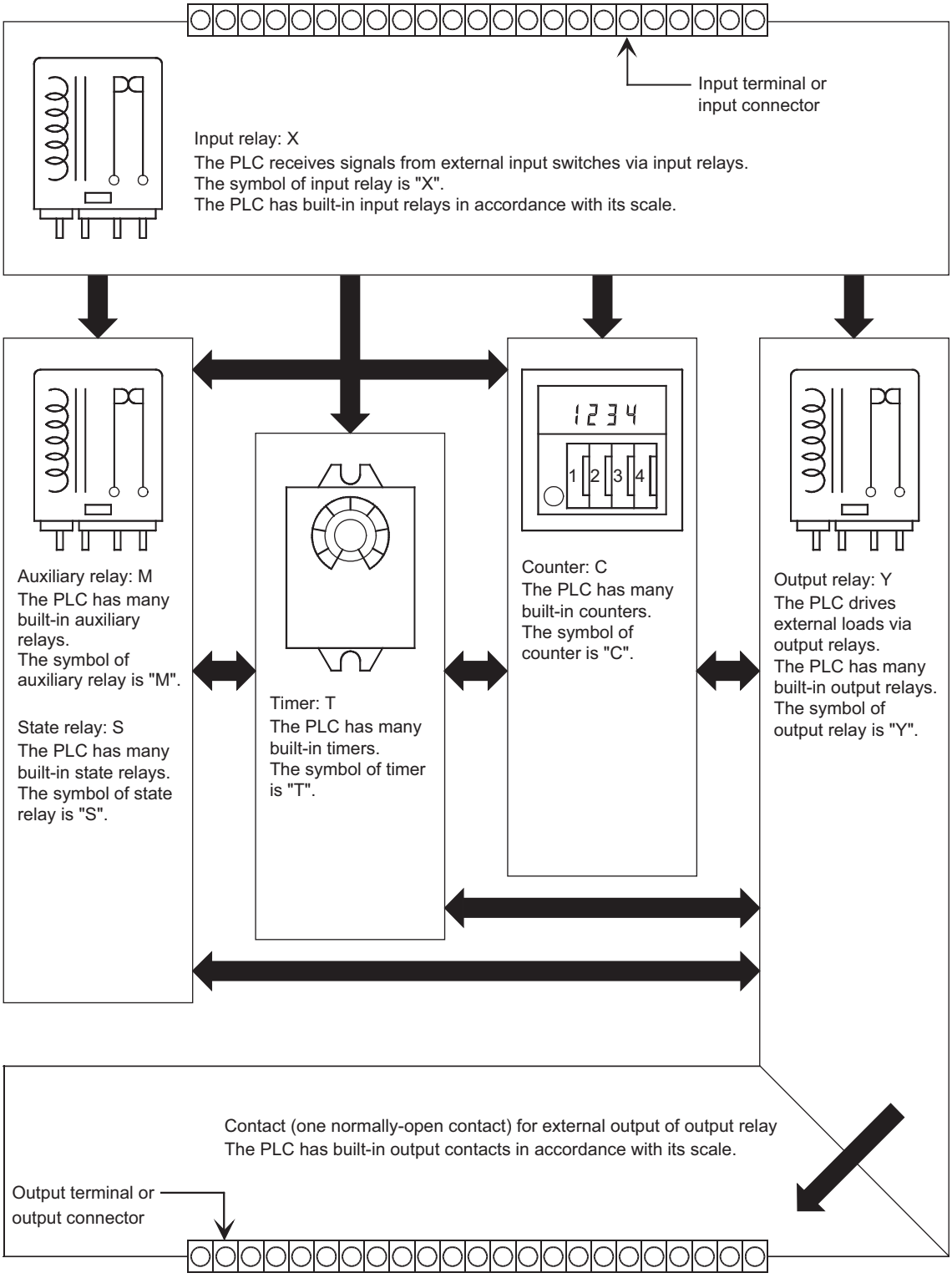
This chapter explains basic contents of devices.

1.1 Devices Constructing PLC

Each PLC has many built-in relays, timers, counters, etc.
Each of which has many normally-open contacts and normally-closed contacts.
Connect these contacts and coils to construct a program.
Each PLC also has built-in memory devices including data registers (D) and extension registers (R) to store numeric data.

1.1.1 Relation among devices

Arrow indicates signal transfer.



1.1.2 Device function list

1. Input relay (X) and output relay (Y)

→ **Refer to Section 2.2.**

- In the PLC main unit, input relays and output relays are assigned with serial octal numbers such as "X000 to X007", "X010 to X017", "Y000 to Y007" and "Y010 to Y017".
  In extension units and extension blocks, input relays and output relays are also assigned with serial octal numbers in the connection order from the PLC main unit.
- Digital filters are used in specified input relays, and the filter value can be changed in programs.
  Accordingly, assign input relay numbers having input filter for applications requiring high-speed receiving.
  (Refer to explanation of filter adjustment, input interrupt, high speed counter and various instructions.)

2. Auxiliary relay (M)

→ **Refer to Section 2.3.**

- Auxiliary relays are built in the PLC. Different from input relays and output relays, auxiliary relays cannot receive external inputs or cannot drive external loads directly.
  Auxiliary relays are available only in programs.
- In some auxiliary relays, the ON/OFF status is backed up against interruption of the PLC power.

3. State relay (S)

→ **Refer to Section 2.4.**

- State relays are used as process numbers in the step ladder.
- If state relays are not used as process numbers, they can be programmed as general contacts/coils in the same way as auxiliary relays.
- State relays can be used as annunciators for external failure diagnosis.

4. Timer (T)

→ **Refer to Section 2.5.**

- Timers count clock pulses (1 ms, 10 ms, 100 ms, etc.) inside the PLC.
  When the count value reaches the set value, output contacts are activated.
  Timers can measure 0.001 to 3276.7 seconds in accordance with the base clock pulse.

5. Counter (C)

Counters are classified into the following types, and can be used for suitable purposes and applications.

1) Counter (latched type)

→ **Refer to Section 2.6.**

Counters are used for signals inside the PLC. The response speed is several tens of Hz or less usually.

- 16-bit counter: For up-counting, counting range: 1 to 32767
- 32-bit counter: For up/down-counting, counting range: -2,147,483,648 to +2,147,483,647

2) High speed counter (latched type backed up against power interruption)

→ **Refer to Section 2.7.**

High speed counters can count several kHz without regard to operations in the PLC.

- 32-bit counter: For up/down-counting, counting range: -2,147,483,648 to +2,147,483,647
  (1-phase 1-counting, 1-phase 2 counting or 2-phase 2 counting) assigned to specific input relays

6. Data register (D)

→ **Refer to Section 2.8.**

Data registers store numeric data.
FX PLCs have only 16-bit data registers (whose most significant bit indicates the positive or negative sign), but two combined data registers can handle 32-bit numeric value (whose most significant bit indicates the positive or negative sign). (Refer to "5. Counter" for the available numeric range.)
Data registers are classified into the general type and the latched type (backed up against power interruption) in the same way as other devices.

7. Extension register (R) and extension file register (ER)

→ **Refer to Section 2.9.**

Only FX3G/FX3GC/FX3U/FX3UC PLCs support extension registers (R) and extension file registers (ER).
Extension registers(R) are extended type of data registers (D), and backed up against power interruption by battery in FX3U/FX3UC PLCs.
In FX3G/FX3GC PLCs, general type devices can be backed up against power interruption if an optional battery is connected.
FX3G/FX3GC/FX3U/FX3UC PLCs can store the contents of extension registers (R) in extension file registers (ER). However, FX3U/FX3UC PLCs can use extension file registers (ER) only while a memory cassette is attached.

8. Index register (V and Z)

→ **Refer to Section 2.10.**

Registers (V) (Z) are available for indexing.
Add index registers (V) (Z) to other devices as follows:
[In the case of "V0 = 5, Z0 = 5]

D100V0 = D105, C20Z0 = C25 ← Device number + Value of V□ or Z□

Data registers and index registers are used to indirectly specify set values of timers and counters, or used in instructions.

9. Pointer (P and I)

→ **Refer to Section 2.11.**

Pointers are classified into the branch type and the interrupt type.

- Branch pointers (P) specify the jump destination of the CJ (FNC 00: Conditional jump) and CALL (subroutine call) instructions.
- Interrupt pointers (I) specify the interrupt routine for input interrupt, timer interrupt or counter interrupt.

10. Constant (K, H and E)

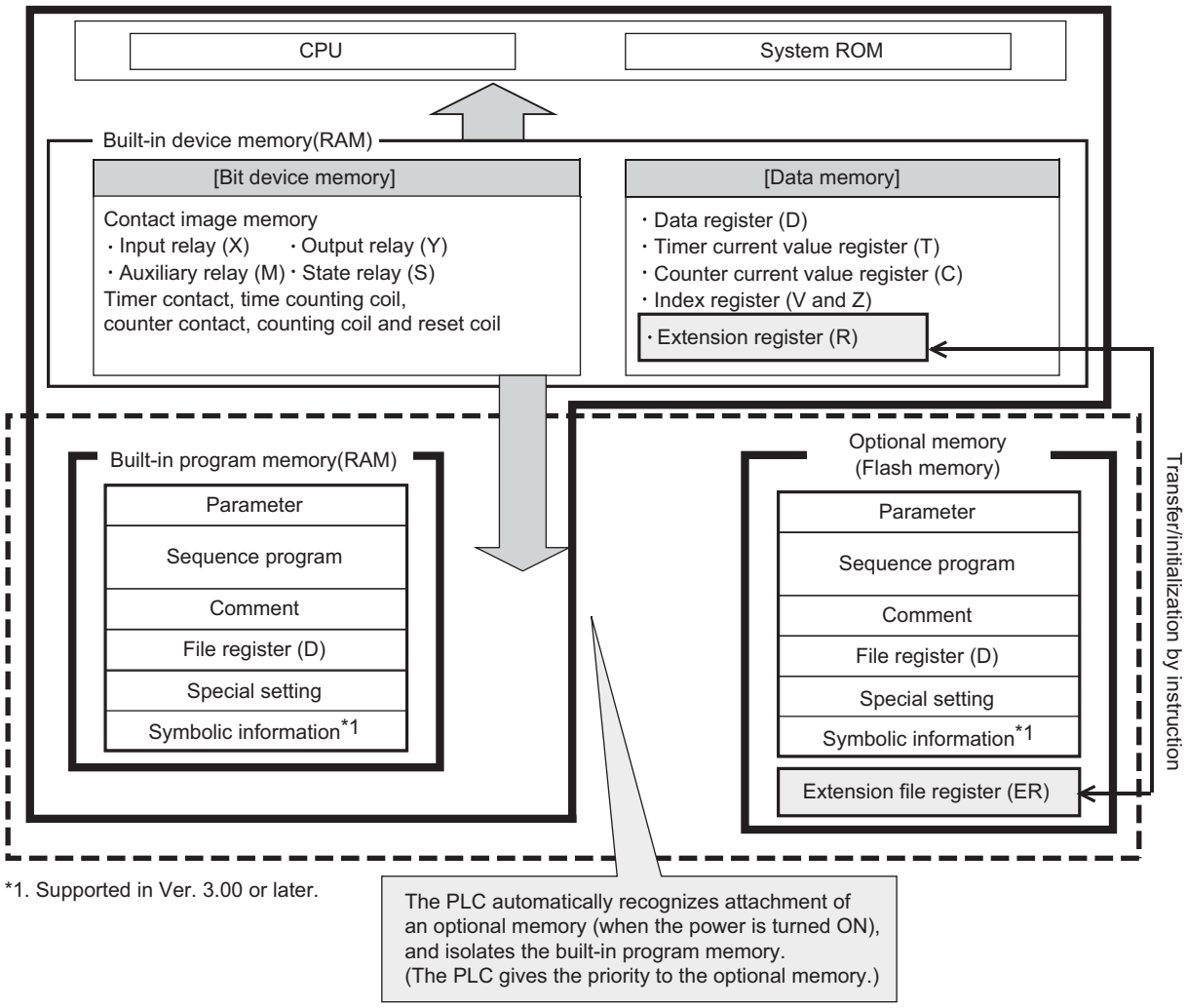
→ **Refer to Chapter 3.**

Among various numeric values used in PLCs, "K" indicates "decimal integer", "H" indicates "hexadecimal value", and "E" indicates "real number (floating point data)".
Constants are used for set values and current values of timers and counters as well as input variables of instructions.

1.2 Program Memory and Devices

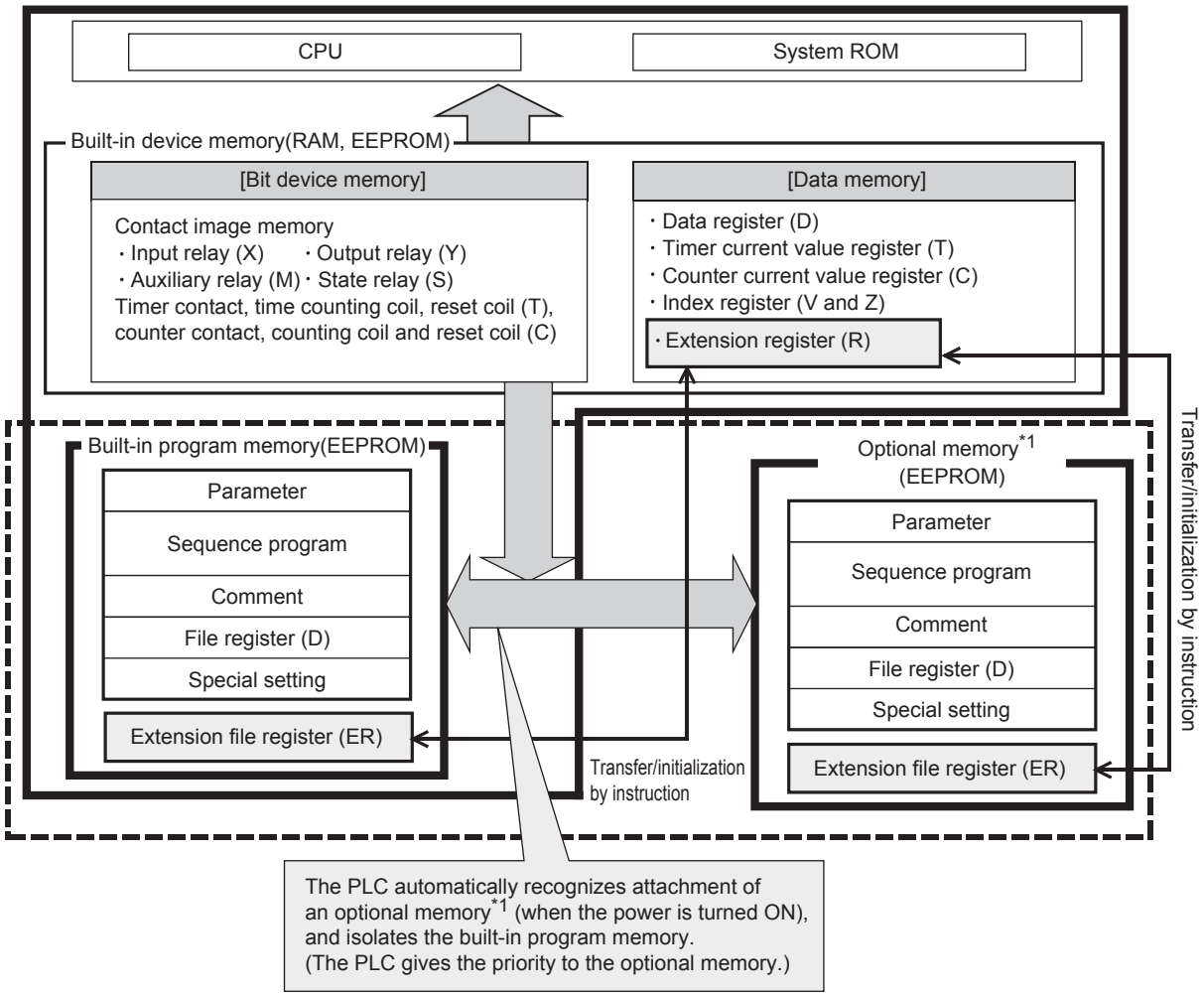
1.2.1 Memory structure

1. FX3U and FX3UC PLCs



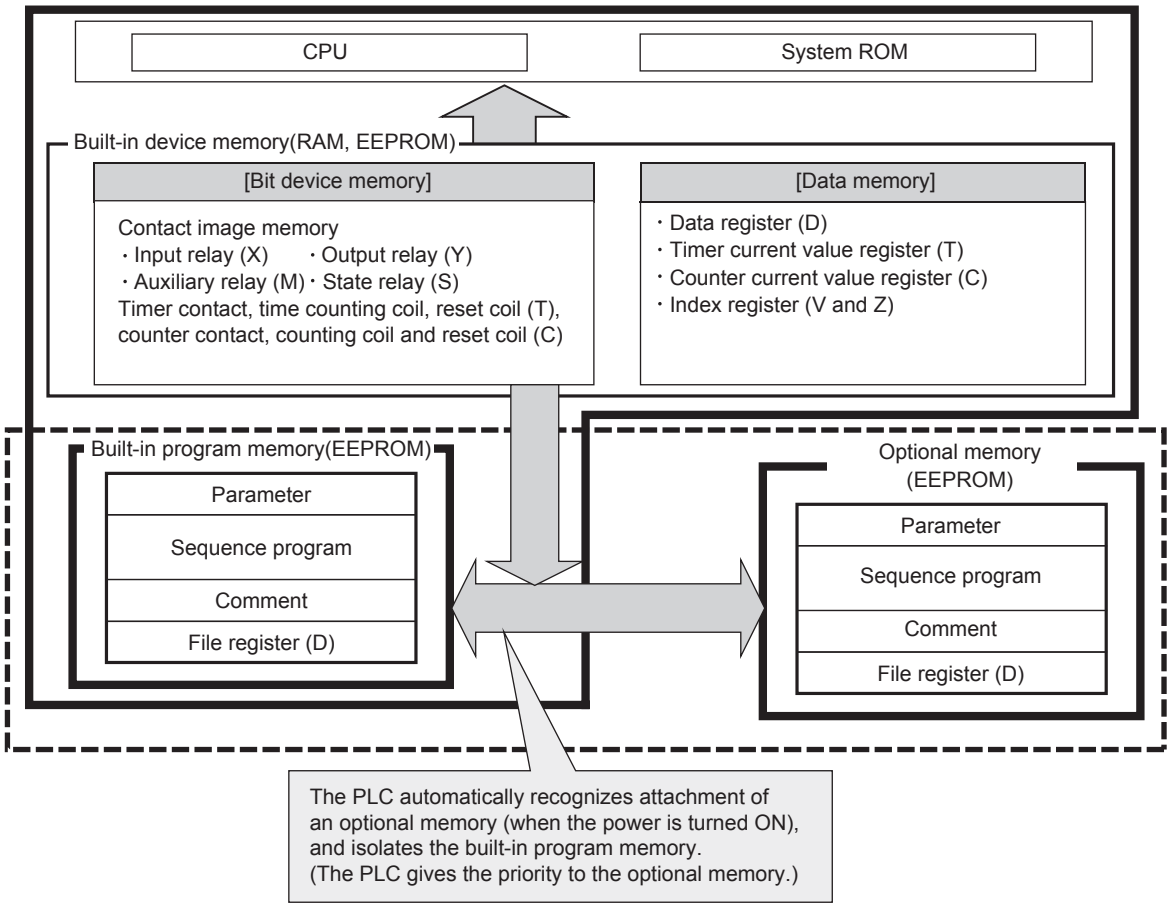
*1. Supported in Ver. 3.00 or later.

2. FX3G and FX3GC PLCs

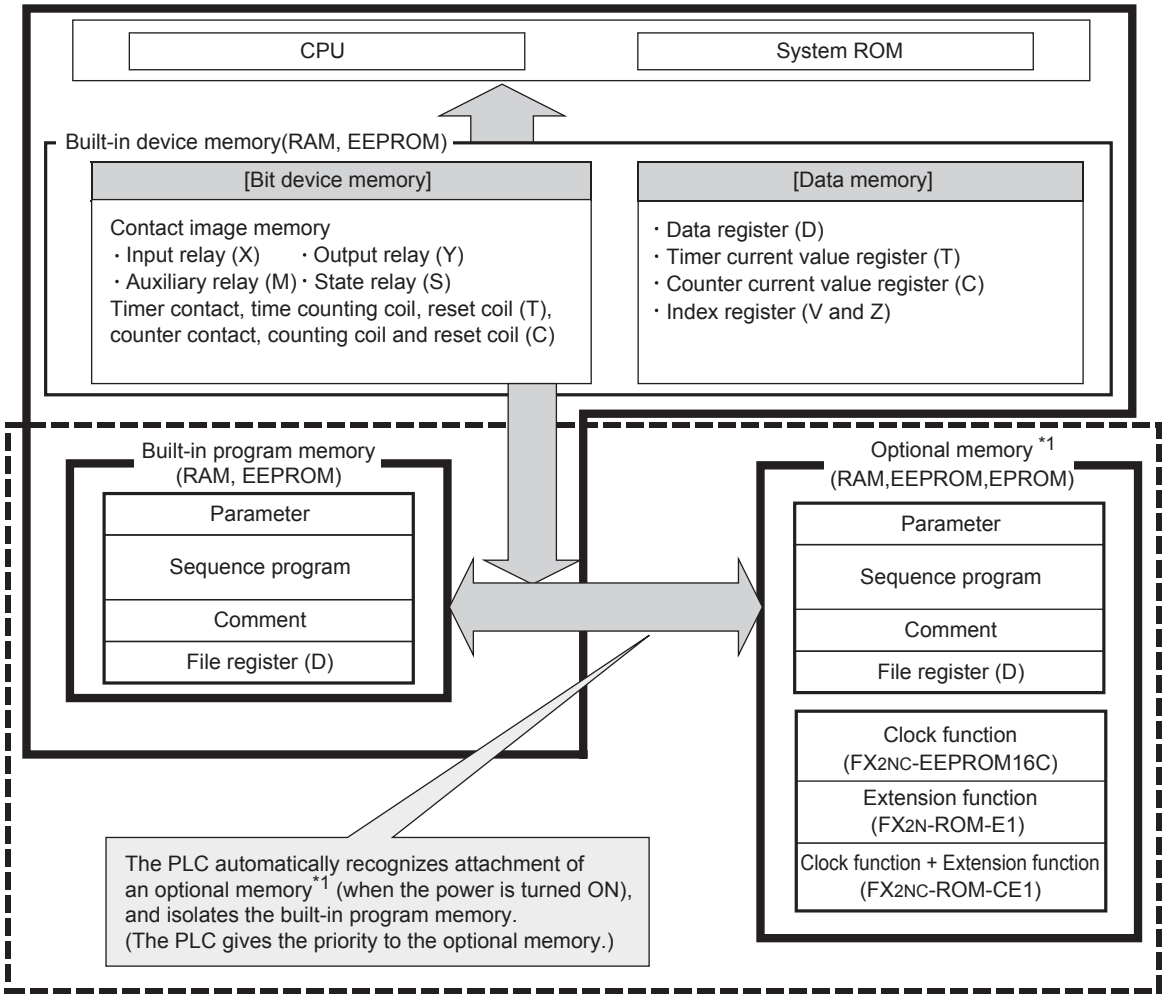


*1. Optional memory cannot be connected to FX3GC PLCs.

3. FX3S PLCs

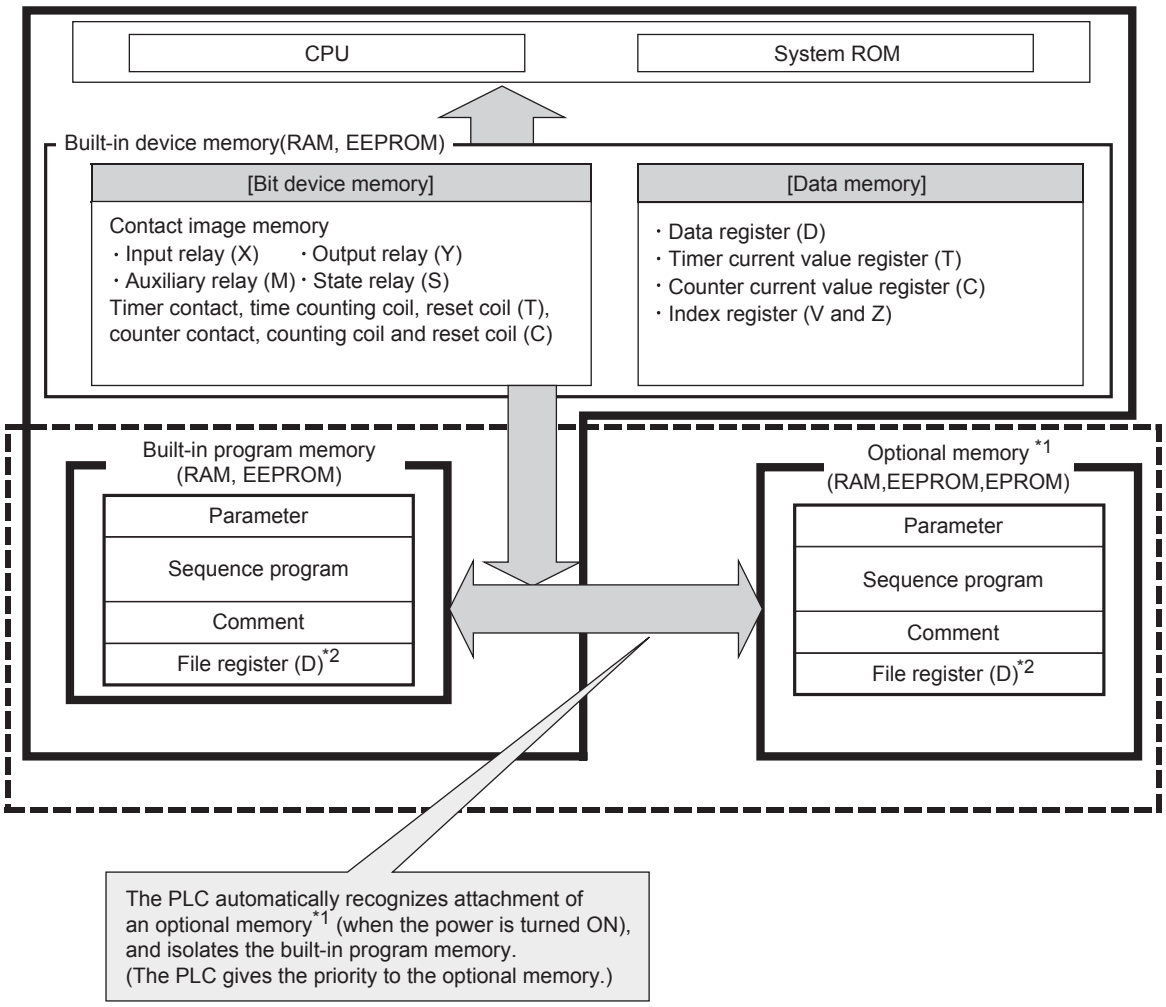

CPU
System ROM
Built-in device memory(RAM, EEPROM)
[Bit device memory]
Contact image memory
・Input relay (X)　・Output relay (Y)
・Auxiliary relay (M)・State relay (S)
Timer contact, time counting coil, reset coil (T),
counter contact, counting coil and reset coil (C)
[Data memory]
・Data register (D)
・Timer current value register (T)
・Counter current value register (C)
・Index register (V and Z)
Built-in program memory(EEPROM)
Parameter
Sequence program
Comment
File register (D)
Optional memory
(EEPROM)
Parameter
Sequence program
Comment
File register (D)
The PLC automatically recognizes attachment of
an optional memory (when the power is turned ON),
and isolates the built-in program memory.
(The PLC gives the priority to the optional memory.)

4. FX1S/FX1N/FX2N/FX1NC/FX2NC PLCs



*1. Optional memory cannot be connected to FX1NC PLCs.

5. FX0S/FX0/FX0N/FXU/FX2C PLCs



*1. Optional memory cannot be connected to FX0S/FX0 PLCs.

*2. FX0S/FX0 PLCs do not support file registers.

1.2.2 Memory operations and backup against power interruption (power ON/OFF and RUN/STOP)

1. FX3U/FX3UC PLCs

1) Types of program memory

Item		Power OFF	Power OFF→ON	STOP→RUN	RUN→STOP
Parameter		Does not change.*2			
Sequence program		Does not change.*2			
Comment	Can be secured by parameter setting.	Does not change.*2			
File register		Does not change.*2			
Special setting		Does not change.*2			
Symbolic information*1		Does not change.*2			

2) Types of word device memory

Item		Power OFF	Power OFF→ON	STOP→RUN	RUN→STOP
Data register (D)	General type	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type	Does not change.*3			
	File type	Does not change.*2			
	Special type	Cleared.	Set to initial value.*4	Does not change.*4	
Extension register (R)	Latched (backed-up) type	Does not change.*3			
Extension file register (ER)*5	File type	Does not change.			
Index register (V and Z)	V, Z	Cleared.		Does not change.	
Timer current value register (T)	For 100 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	For 10 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Retentive type for 100 ms	Does not change.*3			
	Retentive type for 1 ms	Does not change.*3			
Counter current value register (C)	General type	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type	Does not change.*3			
	High speed type	Does not change.*3			
Clock data	Current value	Does not change.*3			

*1. Available in Ver. 3.00 or later.

*2. The program memory contents or device status is not held correctly when the battery voltage becomes lower than the holding voltage if a memory cassette is not attached.

*3. The device status is not held correctly when the battery voltage becomes lower than the holding voltage.

*4. Some devices are cleared when the PLC mode switches from STOP to RUN.
→ **For special data registers, refer to Chapter 4.**

*5. An optional memory cassette is required.

- Caution
  When the battery voltage becomes low due to expiration of the battery life or another reason, programs (not stored in a memory cassette), latched (backed-up) type devices and clock data are not held correctly. Clear latched type devices, and transfer programs (not stored in a memory cassette) again. In addition, set the initial values and clock data if necessary.
  → **For rough guide to the life and replacement timing of the battery, refer to the User's Manual [Hardware Edition] of each PLC.**
  → **For the latched type device clear method, refer to Subsection 1.2.5.**

3) Types of bit device memory

Item		Power OFF	Power OFF→ON	STOP→RUN	RUN→STOP
Contact image memory (X, Y, M, S)	Input relay (X)	Cleared.		Does not change.	
				Does not change while M8033 is ON.	
	Output relay (Y)	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	General type auxiliary relay (M)	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type auxiliary relay (M)	Does not change.			
	Special auxiliary relay (M)	Cleared.	Set to initial value.*1	Does not change.*1	
	General type state relay (S)	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type state relay (S)	Does not change.			
	Annunciator (S)	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
Timer contact Time counting coil Reset coil (T)	For 100 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	For 10 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Retentive type for 100 ms	Does not change.			
	Retentive type for 1 ms	Does not change.			
Counter contact Counting coil Reset coil (C)	General type	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type	Does not change.			
	High speed type	Does not change.			

*1. Some devices are cleared when the PLC mode switches from STOP to RUN.

*2. When the battery voltage becomes lower than the holding voltage, the device status is not held correctly.

→ **For special auxiliary relays, refer to Chapter 4.**

2. FX3G/FX3GC PLCs

1) Types of program memory

Item		Power OFF	Power OFF→ON	STOP→RUN	RUN→STOP
Parameter		Does not change.			
Sequence program		Does not change.			
Comment	Can be secured by parameter setting.	Does not change.			
File register		Does not change.			

2) Types of word device memory

Item		Power OFF	Power OFF→ON	STOP→RUN	RUN→STOP
Data register (D)	General type	Cleared.*1		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type	Does not change.			
	File type	Does not change.			
	Special type	Cleared.	Set to initial value.*2	Does not change.*2	
Extension register (R)	General type	Cleared.*1		Does not change.	
Extension file register (ER)	File type	Does not change.			
Index register (V and Z)	V, Z	Cleared.		Does not change.	
Timer current value register (T)	For 100 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	For 10 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	For 1 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Retentive type for 100 ms	Does not change.			
	Retentive type for 1 ms	Does not change.			
Counter current value register (C)	General type	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type	Does not change.			
	High speed type	Does not change.			
Clock data	Current value	Does not change.*3			

*1. General type devices can be changed to the latched type by parameter setting if an optional battery is attached.

*2. Some devices are cleared when the PLC mode switches from STOP to RUN.
→ **For special data registers, refer to Chapter 4.**

*3. The clock data is held by the power accumulated in the large-capacity capacitor built in the PLC.
The clock data is not held correctly if the voltage of the built-in large-capacity capacitor becomes low.
The large-capacity capacitor can hold the clock data for 10 days (when the ambient temperature is 25°C) if it is charged fully (by turning ON the PLC for 30 minutes or more).
The clock data is backed up by the battery when an optional battery is attached and the battery mode is selected by parameter setting.

3) Types of bit device memory

Item		Power OFF	Power OFF→ON	STOP→RUN	RUN→STOP
Contact image memory (X, Y, M, S)	Input relay (X)	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Output relay (Y)	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	General type auxiliary relay (M)	Cleared.*1		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type auxiliary relay (M)	Does not change.			
	Special auxiliary relay (M)	Cleared.	Set to initial value.*2	Does not change.*2	
	General type state relay (S)	Cleared.*1		Does not change.	
	Latched (backed-up) type state relay (S)	Does not change.			
	Annunciator (S)	Does not change.			
Timer contact Time counting coil Reset coil (T)	For 100 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	For 10 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	For 1 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Retentive type for 100 ms	Does not change.			
	Retentive type for 1 ms	Does not change.			
Counter contact Counting coil Reset coil (C)	General type	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type	Does not change.			
	High speed type	Does not change.			

*1. General type devices can be changed to the latched type by parameter setting if an optional battery is attached.

*2. Some devices are cleared when the PLC mode switches from STOP to RUN.
→ **For special auxiliary relays, refer to Chapter 4.**

3. FX3S PLC

1) Types of program memory

Item		Power OFF	Power OFF→ON	STOP→RUN	RUN→STOP
Parameter		Does not change.			
Sequence program		Does not change.			
Comment	Can be secured by parameter setting.	Does not change.			
File register		Does not change.			

2) Types of word device memory

Item		Power OFF	Power OFF→ON	STOP→RUN	RUN→STOP
Data register (D)	General type	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type	Does not change.			
	File type	Does not change.			
	Special type	Cleared.	Set to initial value.*1	Does not change.*1	
Index register (V and Z)	V, Z	Cleared.		Does not change.	
Timer current value register (T)	For 100 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	For 10 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	For 1 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Retentive type for 100 ms	Does not change.			
	Retentive type for 1 ms	Does not change.			
Counter current value register (C)	General type	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type	Does not change.			
	High speed type	Does not change.			
Clock data	Current value	Does not change.*2			

*1. Some devices are cleared when the PLC mode switches from STOP to RUN.
→ **For special data registers, refer to Chapter 4.**

*2. The clock data is held by the power accumulated in the large-capacity capacitor built in the PLC. The clock data is not held correctly if the voltage of the built-in large-capacity capacitor becomes low. The large-capacity capacitor can hold the clock data for 10 days (when the ambient temperature is 25°C) if it is charged fully (by turning ON the PLC for 30 minutes or more).

3) Types of bit device memory

Item		Power OFF	Power OFF→ON	STOP→RUN	RUN→STOP
Contact image memory (X, Y, M, S)	Input relay (X)	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Output relay (Y)	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	General type auxiliary relay (M)	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type auxiliary relay (M)	Does not change.			
	Special auxiliary relay (M)	Cleared.	Set to initial value.*1	Does not change. *1	
	General type state relay (S)	Cleared.		Does not change.	
	Latched (backed-up) type state relay (S)	Does not change.			
Timer contact Time counting coil Reset coil (T)	For 100 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	For 10 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	For 1 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Retentive type for 100 ms	Does not change.			
	Retentive type for 1 ms	Does not change.			
Counter contact Counting coil Reset coil (C)	General type	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type	Does not change.			

*1. Some devices are cleared when the PLC mode switches from STOP to RUN.

→ **For special data registers, refer to Chapter 4.**

4. FX1S/FX1N/FX2N/FX1NC/FX2NC PLCs

The memory type varies depending on the PLC, and is classified as follows by the device initialization timing.

Classification		Power OFF	Power OFF→ON	STOP→RUN	RUN→STOP
A: Latched type memory	A1: Backed up by battery	Does not change. (The device status is not held correctly when the battery voltage becomes lower than the holding voltage.)			
	A2: Backed up by EEPROM	Does not change.			
	A3: Backed up by capacitor	Does not change. (The device status is held correctly for 10 days (when the ambient temperature is 25°C) after the capacitor is fully charged, but the device status is not held correctly after the capacitor is discharged.)			
B: Special device and index memory		Cleared.	Set to initial value.*1	Does not change.*1	
C: Non-latched type memory		Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	

*1. Some devices are cleared when the PLC mode switches from STOP to RUN.

1) Types of program memory

Item		FX1S	FX1N	FX2N	FX1NC	FX2NC
Parameter		A2	A2	A1*1	A2	A1*1
Sequence program		A2	A2	A1*1	A2	A1*1
Comment	Can be secured by parameter setting.	A2	A2	A1*1	A2	A1*1
File register		A2	A2	A1*1	A2	A1*1

*1. The battery is not used when an optional EEPROM or EPROM memory is attached.

2) Types of word device memory

Item		FX1S	FX1N	FX2N	FX1NC	FX2NC
Data register (D)	General type	C	C	C	C	C
	Latched (backed-up) type	A2	A2/A3	A1	A2/A3	A1
	File type*1	A2	A2	A1	A2	A1
	Special type	B	B	B	B	B
Index register (V and Z)	V, Z	B	B	B	B	B
Timer current value register (T)	For 100 ms	C	C	C	C	C
	For 10 ms	C	C	C	C	C
	Retentive type for 100 ms	-	A3	A1	A3	A1
	Retentive type for 1 ms	-	A3	A1	A3	A1
Counter current value register (C)	General type	C	C	C	C	C
	Latched (backed-up) type	A2	A2/A3	A1	A2/A3	A1
	High speed type	A2	A2	A1	A2	A1
Clock data	Current value	A3	A3	A1	A3	A1*1

*1. Attach a memory board having the clock function when the clock function is required in the FX2NC Series.

3) Types of bit device memory

Item		FX1S	FX1N	FX2N	FX1NC	FX2NC
Contact image memory (X, Y, M, S)	Input relay (X)	C	C	C	C	C
	Output relay (Y)	C	C	C	C	C
	General type auxiliary relay (M)	C	C	C	C	C
	Latched (backed-up) type auxiliary relay (M)	A2	A2/A3	A1	A2/A3	A1
	Special auxiliary relay (M)	B	B	B	B	B
	General type state relay (S)	A2	A2/A3	C	A2/A3	C
	Latched (backed-up) type state relay (S)	A2	A2/A3	A1	A2/A3	A1
	Annunciator (S)	-	-	A1	-	A1
Timer contact Time counting coil Reset coil (T)	For 100 ms	C	C	C	C	C
	For 10 ms	C	C	C	C	C
	Retentive type for 100 ms	-	A3	A1	A3	A1
	Retentive type for 1 ms	-	A3	A1	A3	A1
Counter contact Counting coil Reset coil (C)	General type	C	C	C	C	C
	Latched (backed-up) type	A2	A2/A3	A1	A2/A3	A1
	High speed type	A2	A2	A1	A2	A1

5. FX0S/FX0/FX0N/FXU/FX2C PLCs

1) Types of program memory

Item		Power OFF	Power OFF→ON	STOP→RUN	RUN→STOP
Parameter		Does not change.*2			
Sequence program		Does not change.*2			
Comment	Can be secured by parameter setting.	Does not change.*2			
File register		Does not change.*2			

2) Types of word device memory

Item		Power OFF	Power OFF→ON	STOP→RUN	RUN→STOP
Data register (D)	General type	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type	Does not change.*2			
	File type	Does not change*2.			
	Special type	Cleared.	Set to initial value.*1	Does not change.*1	
Index register (V and Z)	V, Z	Cleared.	Set to initial value.*1	Does not change.*1	
Timer current value register (T)	For 100 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	For 10 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Retentive type for 100 ms	Does not change.*2			
	Retentive type for 1 ms	Does not change.*2			
Counter current value register (C)	General type	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type	Does not change.*2			
	High speed type	Does not change.*2			
Clock data	Current value	Does not change.*2			

*1. Some devices are cleared when the PLC mode switches from STOP to RUN.
M8074 is backed up against power interruption.

*2. The device status is not held correctly when the battery voltage becomes lower than the holding voltage.
(FXU/FX2C PLCs)

3) Types of bit device memory

Item		Power OFF	Power OFF→ON	STOP→RUN	RUN→STOP
Contact image memory (X, Y, M, S)	Input relay (X)	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Output relay (Y)	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	General type auxiliary relay (M)	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type auxiliary relay (M)	Does not change.*2			
	Special auxiliary relay (M)	Cleared.	Set to initial value.*1	Does not change.*1	
	General type state relay (S)	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type state relay (S)	Does not change.*2			
	Annunciator (S)	Does not change.*2			
Timer contact Time counting coil Reset coil (T)	For 100 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	For 10 ms	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Retentive type for 100 ms	Does not change.*2			
	Retentive type for 1 ms	Does not change.*2			
Counter contact Counting coil Reset coil (C)	General type	Cleared.		Does not change.	Cleared.
				Does not change while M8033 is ON.	
	Latched (backed-up) type	Does not change.*2			
	High speed type	Does not change.*2			

*1. Some devices are cleared when the PLC mode switches from STOP to RUN.
M8074 is backed up against power interruption.

*2. The device status is not held correctly when the battery voltage becomes lower than the holding voltage.
(FXU/FX2C PLCs)

1.2.3 Types of backup methods against power interruption

There are following types of latch (backup) of the program memory and built-in devices in PLCs.

1. Battery backup method
FXU/FX2C/FX2N/FX2NC/FX3G/FX3GC/FX3U/FX3UC PLCs

Item	Description
Latched (backed-up) contents	A battery backs up the built-in RAM memory, latched type devices and clock data.
Maintenance	Periodical replacement is required. For rough guide to the replacement frequency, refer to the User's Manual [Hardware Edition] of each PLC.
Cautions	1) When the battery voltage becomes low, sequence programs and other latched (backed-up) contents are lost. 2) When an optional memory cassette (flash memory) is attached, it is not necessary to back up sequence programs using the battery (in FX3U/FX3UC PLCs).

2. Flash memory backup method
FX3U/FX3UC PLCs

Item	Description
Latched (backed-up) contents	1) The flash memory built in a memory cassette holds sequence programs. 2) A battery is used also to hold latched (backed-up) type devices and clock data.
Maintenance	Maintenance is not required.
Cautions	The upper limit is set for the number of times of overwriting. (Refer to the User's Manual [Hardware Edition] of each PLC.)

3. EEPROM backup method
FX0S/FX0N/FX1S/FX1N/FX1NC/FX3S/FX3G/FX3GC PLCs

Item	Description
Latched (backed-up) contents	1) The EEPROM built in the PLC holds sequence programs and latched (backed-up) type devices. 2) A capacitor is used also to hold the clock data.
Maintenance	Maintenance is not required.
Cautions	1) The upper limit is set for the number of times of overwriting. (Refer to the User's Manual [Hardware Edition] of each PLC.) 2) For secure backup, it is necessary to keep the PLC power ON for 5 minutes or more, and then turn OFF the power.

4. Capacitor backup method
FX1N/FX1NC PLCs

Item	Description
Latched (backed-up) contents	1) The large-capacity capacitor built in the PLC holds latched (backed-up) type devices and clock data. 2) The capacitor holds data for 10 days (when the ambient temperature is 25°C) if it is fully charged as described below.
Maintenance	Maintenance is not required.
Cautions	1) The large-capacity capacitor is charged while the PLC is ON, and fully charged after the PLC is ON for 30 minutes or more. 2) When the voltage of the large-capacity capacitor becomes low, latched (backed-up) type devices are not held correctly. When using the PLC for the first time after purchase, or when using the PLC after power OFF for a long time (10 days [when the ambient temperature is 25°C] in the fully charged status), clear latched (backed-up) type devices.

1.2.4 Change of devices between general type and latched (backed-up) type

FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FX3S/FX3G*1/FX3GC*1 PLCs do not support the type change of latched (backed-up) type devices.

1. When using latched (backed-up) type devices as non-latched type devices

Some latched (backed-up) type devices can be changed into the non-latched type by parameter setting.
Devices dedicated to the latched type cannot be changed into the non-latched type.
Such devices can be handled as non-latched type devices by clearing all latched type devices using the initial pulse (M8002) in a program.

2. When using non-latched type devices as latched (backed-up) type devices

Non-latched type devices can be changed into the latched (backed-up) type by parameter setting.

*1. In FX3G/FX3GC PLCs, non-latched type devices can be changed into the latched (backed-up) type by selecting the battery mode using a parameter if an optional battery is attached.

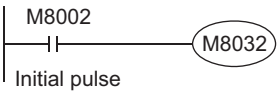
1.2.5 How to initialize latched (backed-up) type devices

Latched (backed-up) type devices can be initialized by clearing the whole PLC memory using peripheral equipment, clearing all latched type memories using the special auxiliary relay M8032, or executing the ZRST instruction.
This subsection describes two major methods.

1. M8032 (latched type memory all clear)

When M8032 is set to ON, all latched (backed-up) devices*1 (including reset coils of timers and counters) are cleared.
M8032 can be set to ON and OFF using the forced ON/OFF operation from peripheral equipment or in a sequence program. Note that latched type devices cannot be set to ON while M8032 is ON.
When M8032 is set to ON in a program, note that latched type devices are cleared during execution of the END instruction after M8032 turns ON.

Program example:
This program clears all latched type devices.



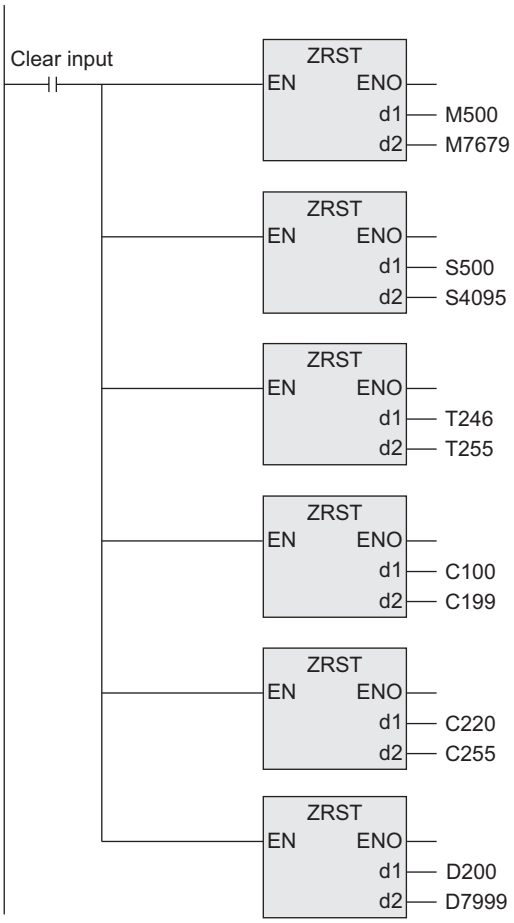
→ **For details, refer to Subsection 4.2.11.**

*1. General type devices which have been changed into the latched type in the FX3G/FX3GC PLCs using an optional battery attached are also cleared.

2. ZRST instruction (zone reset)

The ZRST instruction can clear multiple devices all at once.
(Because only a limited device range can be specified for the ZRST instruction, only a part of latched type devices can be cleared at a time.)

Program example:
This program clears latched (battery backed-up) type devices in the ranges shown in the table below in the FX3U and FX3UC PLCs.



	Latched (backed-up) device range
Auxiliary relay	M500 to M7679
State relay	S500 to S4095
Timer	T246 to T255
Counter	C100 to C199, C220 to C255
Data register	D200 to D7999

→ **For details on latched (backed-up) type devices, refer to Subsection 1.2.2**

2. Devices in Detail

This chapter explains how numeric values are handled in the PLC as well as the roles and functions of various built-in devices including I/O relays, auxiliary relays, state relays, counters and data registers. The following contents provide a basis for handling the PLC.

2.1 Device Number List

Device numbers are assigned in the FX3U and FX3UC PLCs as shown below.
The assignment varies depending on each PLC. For details, refer to the reference section.
For input relay numbers and output relay numbers when I/O extension equipment and special extension equipment are connected to the PLC main unit, refer to the User's Manual [Hardware Edition] of each PLC.

Device name	Description			Reference
I/O relay				
Input relay	X000 to X367	248 points	Device numbers are octal. The total number of inputs and outputs is 256.	Section 2.2
Output relay	Y000 to Y367	248 points		
Auxiliary relay				
General type [changeable]	M0 to M499	500 points	Devices can be changed between the latched (backed-up) type and the non-latched type using parameters.	Section 2.3
Latched (backed-up) type [changeable]	M500 to M1023	524 points		
Latched (backed-up) type [fixed]	M1024 to M7679	6656 points		
Special type*2	M8000 to M8511	512 points		Chapter 4
State relay				
Initial state (General type [changeable])	S0 to S9	10 points	Devices can be changed between the latched (backed-up) type and the non-latched type using parameters.	Section 2.4
General type [changeable]	S10 to S499	490 points		
Latched (backed-up) type [changeable]	S500 to S899	400 points		
Annunciator (Latched (backed-up) type [changeable])	S900 to S999	100 points		
Latched (backed-up) type [fixed]	S1000 to S4095	3096 points		
Timer (on-delay timer)				
100 ms	T0 to T191	192 points	0.1 to 3276.7 sec	Section 2.5
100 ms [for subroutine or interrupt routine]	T192 to T199	8 points	0.1 to 3276.7 sec	
10 ms	T200 to T245	46 points	0.01 to 327.67 sec	
Retentive type for 1 ms	T246 to T249	4 points	0.001 to 32.767 sec	
Retentive type for 100 ms	T250 to T255	6 points	0.1 to 3276.7 sec	
1 ms	T256 to T511	256 points	0.001 to 32.767 sec	
Counter				
General type up-counter (16 bits) [changeable]	C0 to C99	100 points	0 to 32767 counts Devices can be changed between the latched (backed-up) type and the non-latched type using parameters.	Section 2.6
Latched (backed-up) type up-counter (16 bits) [changeable]	C100 to C199	100 points		
General type bidirectional counter (32 bits) [changeable]	C200 to C219	20 points	-2147483648 to +2147483647 counts Devices can be changed between the latched (backed-up) type and the non-latched type using parameters.	
Latched (backed-up) type bidirectional counter (32 bits) [changeable]	C220 to C234	15 points		

Device name	Description			Reference
High speed counter				
1-phase 1-counting input Bidirectional (32 bits)	C235 to C245	Up to 8 points can be used among C235 to C255 [latched (backed-up) type] The setting can be changed between the latched (backed-up) type and the non-latched type using parameters. -2,147,483,648 to +2,147,483,647 counts Hardware counter*1 1 phase : 100 kHz × 6 points, 10 kHz × 2 points 2 phases : 50 kHz (1-edge counting), 50 kHz (4-edge counting) Software counter 1 phase : 40 kHz 2 phases : 40 kHz (1-edge counting), 10 kHz (4-edge counting)		Section 2.7
1-phase 2-counting input Bidirectional (32 bits)	C246 to C250			
2-phase 2-counting input Bidirectional (32 bits)	C251 to C255			
Data register (32 bits when used in pair form)				
General type (16 bits) [changeable]	D0 to D199	200 points	The setting can be changed between the latched (backed-up) type and the non-latched type using parameters.	Section 2.8
Latched (backed-up) type (16 bits) [changeable]	D200 to D511	312 points		
Latched (backed-up) type (16 bits) [fixed] <file register>	D512 to D7999 <D1000 to D7999>	7488 points <7000 points>	Among 7488 fixed latched (backed-up) type data registers, D1000 and later can be set as file registers in units of 500 points using parameters.	
Special type (16 bits)*2	D8000 to D8511	512 points		Chapter 4
Index type (16 bits)	V0 to V7, Z0 to Z7	16 points		Section 2.10
Extension register/Extension file register				
Extension register (16 bits)	R0 to R32767	32768 points	Backed up by a battery against power interruption.	Section 2.9
Extension file register (16 bits)	ER0 to ER32767	32768 points	Available only while a memory cassette is attached.	
Pointer				
For JUMP or CALL branch	P0 to P4095	4096 points	For CJ and CALL instructions	Section 2.11
Input interrupt Input delay interrupt	I0□□ to I5□□	6 points		
Timer interrupt	I6□□ to I8□□	3 points		
Counter interrupt	I010 to I060	6 points	For HSCS instruction	
Nesting				
For master control	N0 to N7	8 points	For MC instruction	
Constant				
Decimal (K)	16 bits	-32,768 to +32,767		Chapter 3
	32 bits	-2,147,483,648 to +2,147,483,647		
Hexadecimal (H)	16 bits	0 to FFFF		
	32 bits	0 to FFFFFFFF		
Real number (E)	32 bits	-1.0×2^{128} to -1.0×2^{-126}, 0, 1.0×2^{-126} to 1.0×2^{128} Both the decimal point expression and the exponent expression are available.		
Character string ("")	Character string	Specify characters with quotation marks. In a constant of an instruction, up to 32 half-width characters are available.		

*1. When the FX3U-4HSX-ADP is connected to an FX3U PLC, the maximum input frequency is set as follows:
1 phase : 200 kHz
2 phases : 100 kHz (1-edge counting), 100 kHz (4-edge counting)

*2. For supported functions, refer to Chapter 4.
For handling of the latched (backed-up) area, refer to Section 1.2.

2.2 Input/Output Relays [X and Y]

Some input relay and output relay numbers are secured in the main unit, and others are assigned to extension equipment according to the connection order.
Because input/output relays are numbered in octal, numeric values such as "8" and "9" do not exist.

2.2.1 Numbers of input/output relays

The tables below show input relay (X) and output relay (Y) numbers. (Numbers are assigned in octal.)

1. FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs

FX3U PLC	Model name	FX3U-16M	FX3U-32M	FX3U-48M	FX3U-64M	FX3U-80M	FX3U-128M	When extended	256 points in total
	Input	X000 to X007 8 points	X000 to X017 16 points	X000 to X027 24 points	X000 to X037 32 points	X000 to X047 40 points	X000 to X077 64 points	X000 to X367 248 points	
	Output	Y000 to Y007 8 points	Y000 to Y017 16 points	Y000 to Y027 24 points	Y000 to Y037 32 points	Y000 to Y047 40 points	Y000 to Y077 64 points	Y000 to Y367 248 points	

FX3UC (D, DS, DSS) PLC	Model name	FX3UC-16M	FX3UC-32M	FX3UC-64M	FX3UC-96M	When extended	256 points in total
	Input	X000 to X007 8 points	X000 to X017 16 points	X000 to X037 32 points	X000 to X057 48 points	X000 to X367 248 points	
	Output	Y000 to Y007 8 points	Y000 to Y017 16 points	Y000 to Y037 32 points	Y000 to Y057 48 points	Y000 to Y367 248 points	

FX3UC-32MT-LT(-2) PLC	Model name	FX3UC-32MT-LT(-2)	When extended	256 points in total
	Input	X000 to X017 16 points	X000 to X357 240 points	
	Output	Y000 to Y017 16 points	Y000 to Y357 240 points	

FX3G PLC	Model name	FX3G-14M	FX3G-24M	FX3G-40M	FX3G-60M	When extended	128 points in total
	Input	X000 to X007 8 points	X000 to X015 14 points (16)*1	X000 to X027 24 points	X000 to X043 36 points (40)*1	X000 to X177 128 points	
	Output	Y000 to Y005 6 points (8)*1	Y000 to Y011 10 points (16)*1	Y000 to Y017 16 points	Y000 to Y027 24 points	Y000 to Y177 128 points	

FX3GC PLC	Model name	FX3GC-32MT/D(DSS)	When extended	128 points in total
	Input	X000 to X017 16 points	X000 to X177 128 points	
	Output	Y000 to Y017 16 points	Y000 to Y177 128 points	

FX3S PLC	Model name	FX3S-10M	FX3S-14M	FX3S-20M	FX3S-30M	No extension
	Input	X000 to X005 6 points	X000 to X007 8 points	X000 to X013 12 points	X000 to X017 16 points	
	Output	Y000 to Y003 4 points	Y000 to Y005 6 points	Y000 to Y007 8 points	Y000 to Y015 14 points	

*1. A number inside ( ) indicates the number of occupied points.
The difference from the number of effective points indicates unused numbers.

2. FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs

FX1S PLC	Model name	FX1S-10M	FX1S-14M	FX1S-20M	FX1S-30M	No extension
	Input	X00 to X05 6 points	X00 to X07 8 points	X00 to X013 12 points	X00 to X17 16 points	
	Output	Y00 to Y03 4 points	Y00 to Y05 6 points	Y00 to Y07 8 points	Y00 to Y15 14 points	

FX1N PLC	Model name	FX1N-24M	FX1N-40M	FX1N-60M	When extended	128 points in total
	Input	X000 to X015 14 points	X000 to X027 24 points	X000 to X043 36 points	X000 to X177 128 points	
	Output	Y000 to Y011 10 points	Y000 to Y017 16 points	Y000 to Y027 24 points	Y000 to Y177 128 points	

FX2N PLC	Model name	FX2N-16M	FX2N-32M	FX2N-48M	FX2N-64M	FX2N-80M	FX2N-128M	When extended	256 points in total
	Input	X000 to X007 8 points	X000 to X017 16 points	X000 to X027 24 points	X000 to X037 32 points	X000 to X047 40 points	X000 to X077 64 points	X000 to X267 184 points	
	Output	Y000 to Y007 8 points	Y000 to Y017 16 points	Y000 to Y027 24 points	Y000 to Y037 32 points	Y000 to Y077 40 points	Y000 to Y077 64 points	Y000 to Y267 184 points	

FX1NC PLC	Model name	FX1NC-16M	FX1NC-32M	When extended	128 points in total
	Input	X000 to X007 8 points	X000 to X017 16 points	X000 to X177 128 points	
	Output	Y000 to Y007 8 points	Y000 to Y017 16 points	Y000 to Y177 128 points	

FX2NC PLC	Model name	FX2NC-16M	FX2NC-32M	FX2NC-64M	FX2NC-96M	When extended	256 points in total
	Input	X000 to X007 8 points	X000 to X017 16 points	X000 to X037 32 points	X000 to X057 48 points	X000 to X267 184 points	
	Output	Y000 to Y007 8 points	Y000 to Y017 16 points	Y000 to Y037 32 points	Y000 to Y057 48 points	Y000 to Y267 184 points	

3. FX0S/FX0/FX0N/FXU/FX2C PLCs

FX0S/FX0 PLC	Model name	FX0S-10M	FX0/FX0S-14M	FX0/FX0S-20M	FX0/FX0S-30M	No extension
	Input	X000 to X005 6 points	X000 to X007 8 points	X000 to X013 12 points	X000 to X017 16 points	
	Output	Y000 toY003 4 points	Y000 to Y005 6 points	Y000 to Y007 8 points	Y000 to Y015 14 points	

FX0N PLC	Model name	FX0N-24M	FX0N-40M	FX0N-60M	When extended	128 points in total
	Input	X000 to X015 14 points	X000 to X027 24 points	X000 to X043 36 points	X000 to X127 84 points	
	Output	Y000 to Y011 10 points	Y000 to Y017 16 points	Y000 to Y027 24 points	Y000 to Y77 64 points	

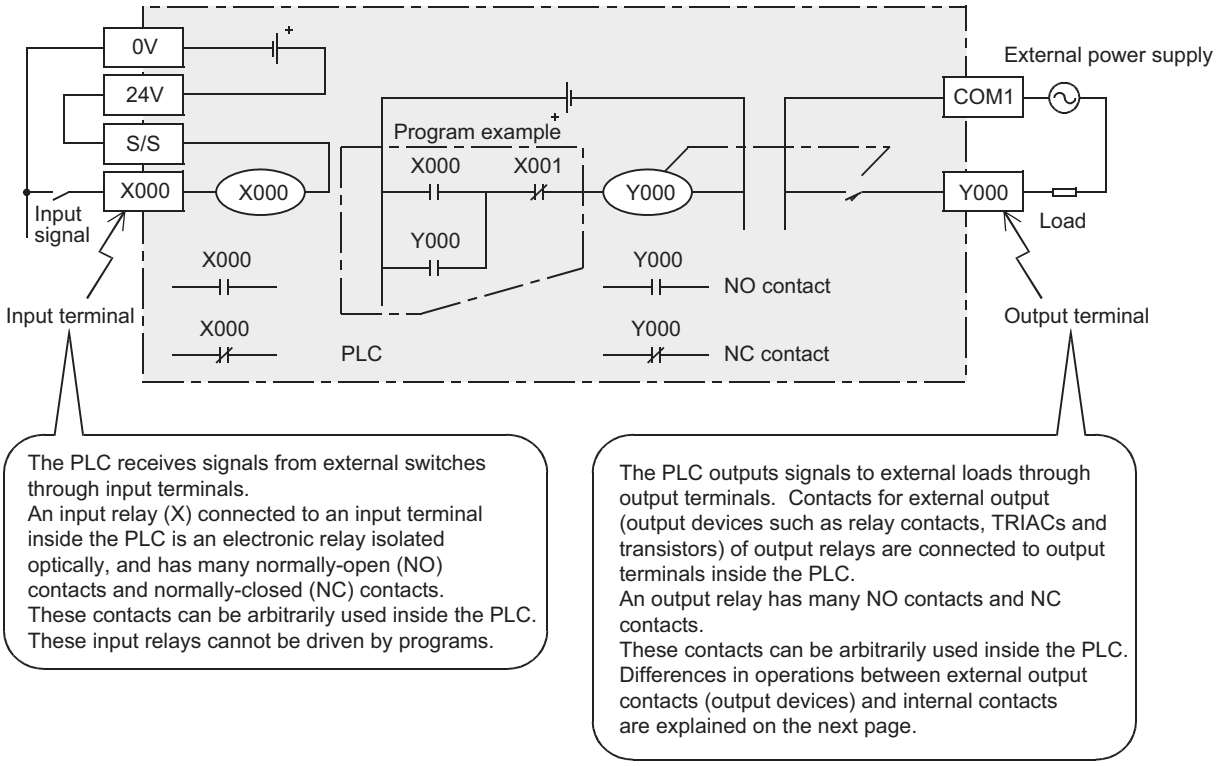
FXU PLC	Model name	FXU-16M	FXU-24M	FXU-32M	FXU-48M	FXU-64M	FXU-80M	FXU-128M
	Input	X000 to X007 8 points	X000 to X013 12 points	X000 to X017 16 points	X000 to X027 24 points	X000 to X037 32 points	X000 to X047 40 points	X000 to X077 64 points
	Output	Y000 to Y007 8 points	Y000 to Y013 12 points	Y000 to Y017 16 points	Y000 to Y027 24 points	Y000 to Y037 32 points	Y000 to Y047 40 points	Y000 to Y077 64 points

FXU PLC	Model name	When extended	256 points in total
	Input	X000 to X267 184 points	
	Output	Y000 to Y267 184 points	

FX2C PLC	Model name	FX2C-64M	FX2C-96M	FX2C-128M	FX2C-160M	When extended	256 points in total
	Input	X000 to X037 32 points	X000 to X057 48 points	X000 to X077 64 points	X000 to X117 80 points	X000 to X267 184 points	
	Output	Y000 to Y037 32 points	Y000 to Y057 48 points	Y000 to Y077 64 points	Y000 to Y117 80 points	Y000 to Y267 184 points	

2.2.2 Functions and roles

Examples of terminal names and wiring (sink input) are for the FX3U Series PLC.

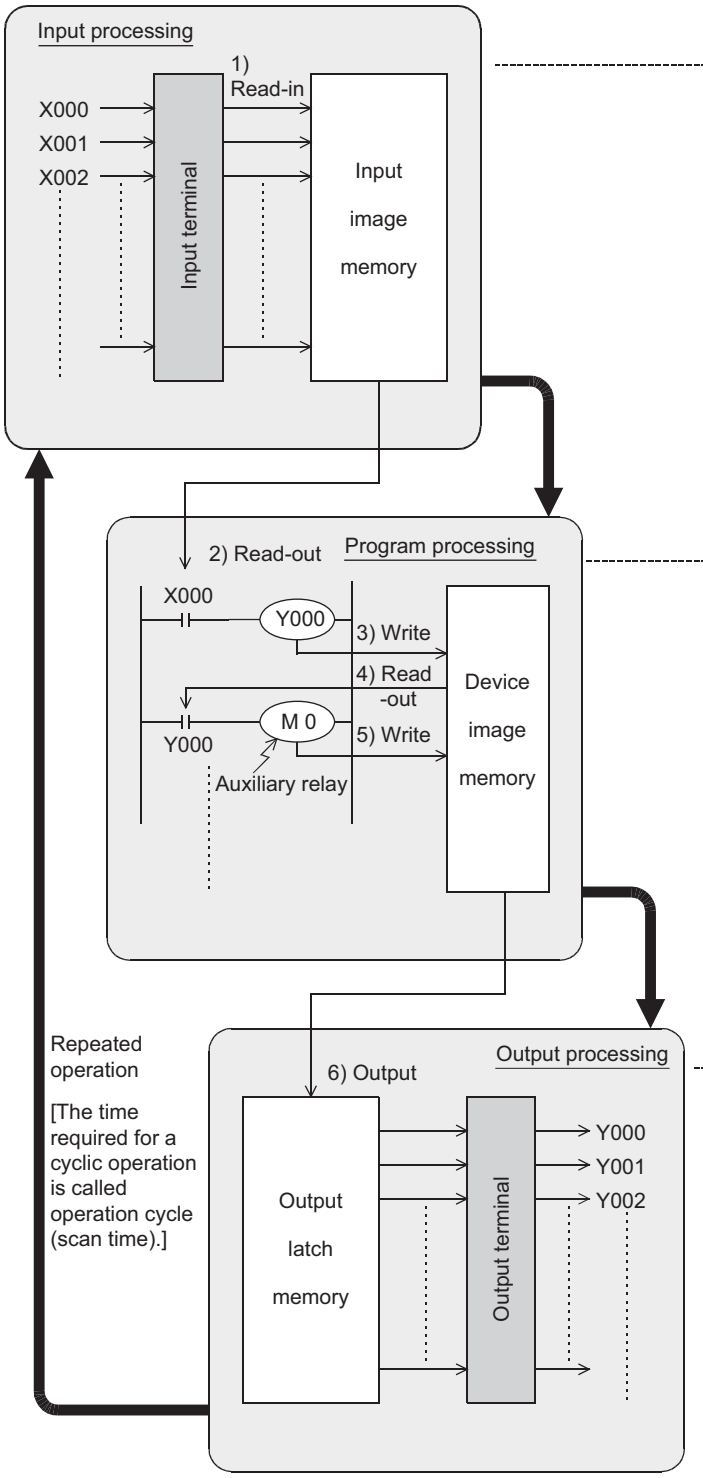


The PLC receives signals from external switches through input terminals.
An input relay (X) connected to an input terminal inside the PLC is an electronic relay isolated optically, and has many normally-open (NO) contacts and normally-closed (NC) contacts.
These contacts can be arbitrarily used inside the PLC.
These input relays cannot be driven by programs.

The PLC outputs signals to external loads through output terminals. Contacts for external output (output devices such as relay contacts, TRIACs and transistors) of output relays are connected to output terminals inside the PLC.
An output relay has many NO contacts and NC contacts.
These contacts can be arbitrarily used inside the PLC.
Differences in operations between external output contacts (output devices) and internal contacts are explained on the next page.

2.2.3 Operation timing of I/O relays

The PLC executes sequence control by repeatedly executing the following processing procedure.
In this batch I/O method, not only are there driving times of input filters and output devices but also response delays caused by operation cycles.



1) 2) 3)...6) indicate the processing order.

Input processing

Before executing a program, the PLC reads the ON/OFF status of all input terminals inside the PLC into the input image memory.
Even if inputs change while the PLC is executing the program, the contents of the input image memory remain unchanged, but the changes in inputs are read during the input processing in the next cycle.
Even if an input contact changes from ON to OFF or from OFF to ON, its ON/OFF status is judged after the response delay (approximately 10 ms) caused by the input filter.
(When the input filter is the digital type, its value can be overwritten by a sequence program.)

Program processing

The PLC reads the ON/OFF status of each device from the input image memory and other device image memories according to the contents of instructions in the program memory, executes operations in sequence from the step 0, and then writes the operation result to the image memory at each time.
Accordingly, the contents of the image memory of each device change as the program is executed.
The operation of a contact inside an output relay is determined by the contents of the output image memory.

Output processing

When execution of all instructions is finished, the ON/OFF status of the image memory of outputs (Y) is transferred to the latch memory. This is the actual output of the PLC.
External output contacts inside the PLC operate after the response delay time of the output devices.

The above method is called the batch I/O method (or refresh method).

2.3 Auxiliary relay [M]

There are many auxiliary relays inside the PLC. Coils of auxiliary relays are driven by contacts of various devices inside the PLC in the same way as output relays.
Auxiliary relays have many electronically normally-open contacts and normally-closed contacts which can be used arbitrarily inside the PLC.
However, external loads cannot be driven directly by these contacts. External loads should be driven by output relays.

2.3.1 Numbers of auxiliary relays

The table below shows auxiliary relay (M) numbers. (Numbers are assigned in decimal.)

1. FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs

	General type	Latched (battery backed-up) type	Fixed latched (battery backed-up) type	Special type
FX3U/FX3UC PLC	M0 to M499 500 points*1	M500 to M1023 524 points*2	M1024 to M7679 6656 points*3	M8000 to M8511 512 points

	General type	Fixed latched (EEPROM backed-up) type	General type	Special type
FX3G/FX3GC PLC	M0 to M383 384 points	M384 to M1535 1152 points	M1536 to M7679 6144 points*4	M8000 to M8511 512 points

	General type	Fixed latched (EEPROM backed-up) type	General type	Special type
FX3S PLC	M0 to M383 384 points	M384 to M511 128 points	M512 to M1535 1024 points	M8000 to M8511 512 points

*1. This area is not latched (backed up). It can be changed to the latched (backed-up) area by parameter setting.

*2. This area is latched (backed up). It can be changed to the non-latched (non-backed-up) area by parameter setting.

*3. The characteristics of latch (backup) cannot be changed using parameters.

*4. They can be changed to the latched (battery backed-up) type using parameters while an optional battery is attached. However, the latched area cannot be set.

When simple N:N link or parallel link is used, some auxiliary relays are occupied for the link.
→ **Refer to the data communication manual.**

2. FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs

	General type	Latched (battery backed-up) type	Fixed latched (backed-up) type			Special type
			Battery backed-up	EEPROM backed-up	Capacitor backed-up	
FX1S PLC	M0 to M383 384 points*3	-	-	M384 to M511 128 points*3	-	M8000 to M8255 256 points
FX1N/FX1NC PLC	M0 to M383 384 points*3	-	-	M384 to M511 128 points*3	M512 to M1535 1024 points*3	M8000 to M8255 256 points
FX2N/FX2NC PLC	M0 to M499 500 points*1	M500 to M1023 524 points*2	M1024 to M3071 2048 points*3	-	-	M8000 to M8255 256 points

*1. This area is not latched (backed up). It can be changed to the latched (backed-up) area by parameter setting.

*2. This area is latched (backed up). It can be changed to the non-latched (non-backed-up) area by parameter setting.

*3. The characteristics of latch (backup) cannot be changed using parameters.

3. FX0S/FX0/FX0N/FXU/FX2C PLCs

	General type	Latched (backed-up) type	Fixed latched (backed-up) type	Special type
FX0S/FX0 PLC	M0 to M495 496 points*4	-	M496 to M511 16 points*3	M8000 to M8254 57 points
FX0N PLC	M0 to M383 384 points*4	-	M384 to M511 128 points*3	M8000 to M8254 67 points
FXU/FX2C PLC	M0 to M499 500 points*1	M500 to M1023 524 points*2	M1024 to M1535 512 points*3	M8000 to M8255 173 points
FXU PLC (Ver. 2.30 or earlier) (Reference)		For link Parent → Child:M800 to M899 Child → Parent:M900 to M999	-	M8000 to M8255 169 point

*1. This area is not latched (backed up). It can be changed to the latched (backed-up) area by parameter setting.

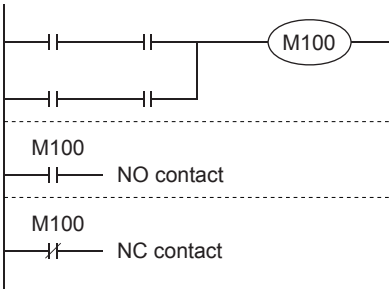
*2. This area is latched (backed up). It can be changed to the non-latched (non-backed-up) area by parameter setting.

*3. This area is fixed to the latched (backed-up) type. (The contents can be cleared by the RST and ZRST instructions.)

*4. This area is fixed to the non-latched (non-backed-up) type. The characteristics of latch (backup) cannot be changed.

2.3.2 Functions and operation examples

1. General type



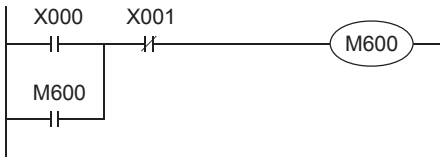
Auxiliary relay circuit

All of general type auxiliary relays turn OFF when the PLC is turned OFF.
When the ON/OFF status of auxiliary relays just before power interruption is required for control, use latched (backed-up) type auxiliary relays.

2. Latched (backed-up) type

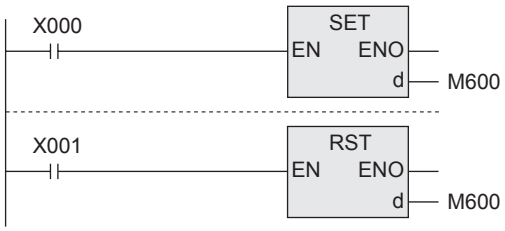
When the power is turned OFF while the PLC is operating, all of output relays and general type auxiliary relays turn OFF.
Even when the power is restored after that, all of output relays and general type auxiliary relays remain OFF except those whose input condition is ON. In some output relays and auxiliary relays, however, the ON/OFF status just before power interruption should be stored and then replicated when the power is restored, depending on control targets. In such a case, use latched (backed-up) type auxiliary relays.
Latched (backed-up) type devices are backed up by a battery, EEPROM, etc. built in the PLC.

→ **For details on the backup method against power interruption, refer to Section 1.2.**



PLC
Backup against power interruption
(self-holding circuit)

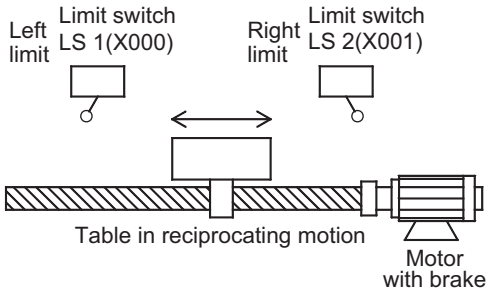
The left figure shows an operation example of M600 (latched type device) in a self-holding circuit.
When X000 turns ON and M600 turns ON in this circuit, M600 holds its operation by itself even if X000 turns OFF. Because M600 is a latched (backed-up) type device, it remains activated even when the operation is restarted after X000 has turned OFF due to power interruption. If a normally-closed contact of X001 is opened when the operation is restarted, however, M600 is deactivated.



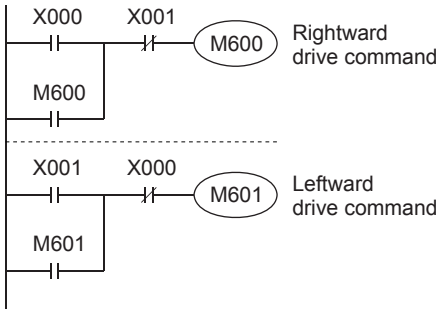
PLC
Backup against power interruption
(set/reset circuit)

The left figure shows a circuit using the SET and RST instructions.

1) Application example of latched (backed-up) type auxiliary relays

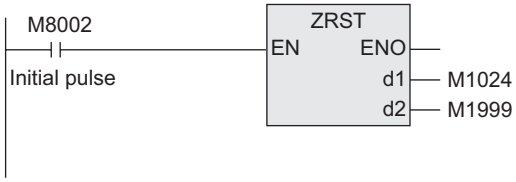


In some cases, the table should be restarted in the same direction as the direction selected just before power interruption.



X000 = ON (at the left limit) → M600 = ON → The table is driven rightward. → The power is turned OFF. → The table stops in an intermediate position. → The table is restarted (M600 = ON). → X001 = ON (at the right limit) → M600 = OFF, M601 = ON → The table is driven leftward.

2) Method to use a fixed latched (backed-up) type auxiliary relay as a general type auxiliary relay
When using a fixed latched (backed-up) type auxiliary relay as a general type auxiliary relay, provide a reset circuit shown in the figure below around the head step in the program.



2.4 State Relay [S]

State relays (S) are important devices to simply program stepping type process control, and are combined with the step ladder instruction STL.

2.4.1 Numbers of state relays

The table below shows state relay (S) numbers. (Numbers are assigned in decimal.)

1. FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs

	Initial state type	General type	Latched (battery backed-up) type	Fixed latched (battery backed-up) type	Annunciator type
FX3U/FX3UC PLC	S0 to S9 10 points*1	S0 to S499 500 points (S0 to S9 are provided for the initial state.)*1	S500 to S899 400 points*2	S1000 to S4095 3096 points*3	S900 to S999 100 points*2

	Initial state (EEPROM backed-up) type	Latched (EEPROM backed-up) type	Annunciator (EEPROM backed-up) type	General type
FX3G/FX3GC PLC	S0 to S9 10 points	S10 to S899 890 points	S900 to S999 100 points	S1000 to S4095 3096 points*4

	Initial state (EEPROM backed-up) type	Fixed latched (EEPROM backed-up) type	General type
FX3S PLC	S0 to S9 10 points	S10 to S127 118 points	S128 to S255 128 points

*1. This area is not latched (backed up). It can be changed to the latched (backed-up) area by parameter setting.

*2. This area is latched (backed up). It can be changed to the non-latched (non-backed-up) area by parameter setting.

*3. The characteristics of latch (backup) cannot be changed using parameters.

*4. They can be changed to the latched (battery backed-up) type using parameters while an optional battery is attached. However, the latched area cannot be set.

2. FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs

	General type	Latched (battery backed-up) type	Fixed latched (backed-up) type		Annunciator type
			EEPROM backed-up	Capacitor backed-up	
FX1S PLC	-	-	S0 to S127 128 points*3 (S0 to S9 are provided for the initial state.)	-	-
FX1N/FX1NC PLC	-	-	S0 to S127 128 points*3 (S0 to S9 are provided for the initial state.)	S128 to S999 872 points*3	-
FX2N/FX2NC PLC	S0 to S499 500 points*1 (S0 to S9 are provided for the initial state.)	S500 to S899 400 points*2	-	-	S900 to S999 100 points*2

*1. This area is not latched (backed up). It can be changed to the latched (backed-up) area by parameter setting.

*2. This area is latched (backed up). It can be changed to the non-latched (non-backed-up) area by parameter setting.

*3. The characteristics of latch (backup) cannot be changed using parameters.

3. FX0S/FX0/FX0N/FXU/FX2C PLCs

	General type	Latched (backed-up) type	Fixed latched (backed-up) type	Annunciator type
FX0S/FX0 PLC	S0 to S63 64 points*4 (S0 to S9 are provided for the initial state.)	-	-	-
FX0N PLC	-	-	S0 to S127 128 points*3 (S0 to S9 are provided for the initial state.)	-
FXU/FX2C PLC	S0 to S499 500 points*1 (S0 to S9 are provided for the initial state.) (S10 to S19 are provided for zero return.)	S500 to S899 400 points*2	-	S900 to S999 100 points*2

*1. This area is not latched (backed up). It can be changed to the latched (backed-up) area by parameter setting.

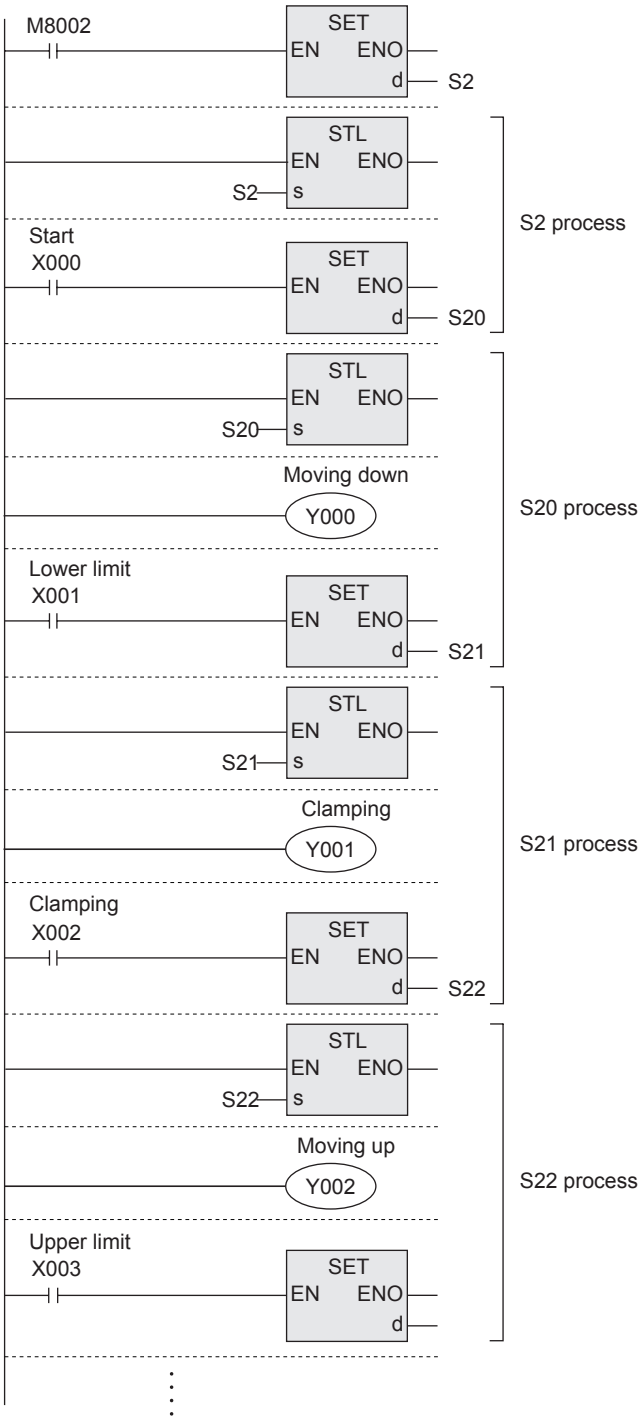
*2. This area is latched (backed up). It can be changed to the non-latched (non-backed-up) area by parameter setting.

*3. This area is fixed to the latched (backed-up) type. (The contents can be cleared by the RST and ZRST instructions.)

*4. This area is fixed to the non-latched (non-backed-up) type. The characteristics of latch (backup) cannot be changed.

2.4.2 Functions and operation examples

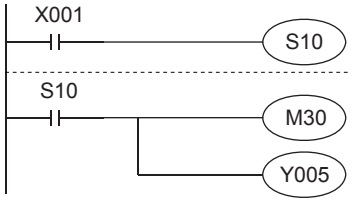
1. General type



In the stepping type process control shown in the left figure, when the start signal X000 turns ON, the state relay S20 is set (turned ON) and the solenoid valve Y000 for moving down is activated.
When the lower limit switch X001 turns ON, the state relay S21 is set (turned ON) and the solenoid valve Y001 for clamping is activated.
When the clamp confirmation limit switch X002 turns ON, the state relay S22 is set (turned ON).
When the operation proceeds to the next step, the state relay in the preceding step is automatically reset (turned OFF).

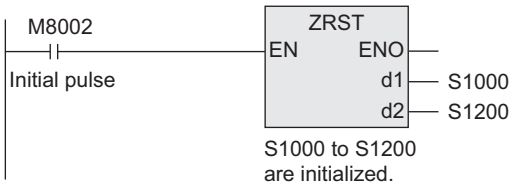
When the PLC is turned OFF, all of general type state relays are turned OFF.
When the ON/OFF status just before power interruption is required for restart, use latched (backed-up) type state relays.

State relays have many normally-open contacts and normally-closed contacts in the same way as auxiliary relays, and these contacts can be used arbitrarily in sequence programs.
When state relays (S) are not used for step ladder instructions, they can be used in general sequences in the same way as auxiliary relays (M) (as shown in the right figure).



2. Latched (backed-up) type

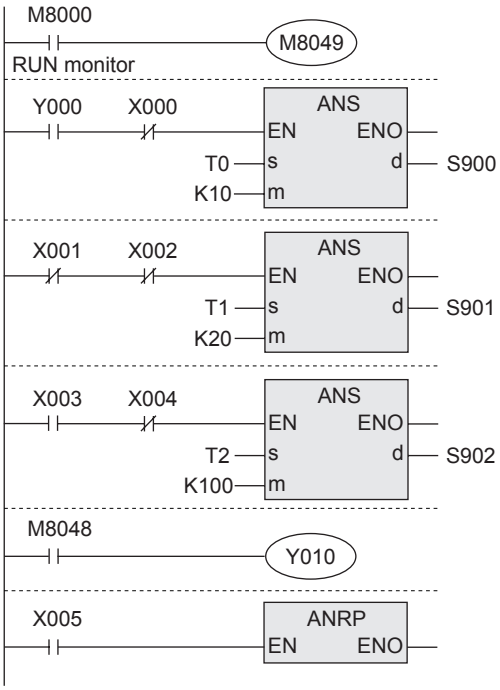
- Latched (backed-up) type state relays store their ON/OFF status even if the power is shut down while the PLC is operating, so the operation can be restarted after shutdown from the previous last point in the process.
  Latched (backed-up) type state relays are backed up by a battery, EEPROM, etc. built in the PLC.
  → **For details on each backup method, refer to Section 1.2.**
- When using latched (backed-up) type state relays as general type state relays, provide a reset circuit shown in the right figure around the head step in the program.



3. Annunciator type

Annunciator type state relays can be also used as outputs for external fault diagnosis.

For example, when an external fault diagnosis circuit shown in the figure below is created and the contents of the special data register D8049 are monitored, the smallest number out of the active state relays S900 to S999 is displayed.
If two or more faults have occurred, the smallest state relay number having a fault is displayed at first. When the displayed fault is cleared, the next smallest state relay number having a fault is stored in D8049 and displayed.



- When the special auxiliary relay M8049 is driven, monitoring becomes valid.
- If the forward end detection input X000 is not activated within 1 second after the forward output Y000 is driven, S900 is activated.
- If both the upper limit detection input X001 and the lower limit detection input X002 are deactivated at the same time for 2 seconds or more, S901 is activated.
- In a machine whose takt time is less than 10 seconds,if the switch X004 which is designed to be activated during one-cycle operation of the machine is not activated while the continuous operation mode input X003 is ON, S902 is activated.
- When any of annunciator type state relays S900 to S999 turns ON, the special auxiliary relay M8048 is activated and the fault display output Y010 is activated.
- The state relays activated by the external fault diagnosis program can be turned OFF by the reset button X005.
  Every time X005 is set to ON, the active annunciator type state relay having the smallest number is reset in turn.

While the special auxiliary relay M8049 is not driven, annunciator type state relays can be used as latched (backed-up) type state relays in sequence programs in the same way as general type state relays.

2.5 Timer [T]

Timers add and count clock pulses of 1 ms, 10 ms, 100 ms, etc. inside the PLC. When the count value reaches a specified set value, the output contact of the timer turns ON.
A set value can be directly specified by a constant (K) in the program memory, or indirectly specified by the contents of a data register (D).
In timers, "TS" indicates a contact, "TC" indicates a coil, and "TN" indicates the current value.

→ **Refer to the Q/L/F Structured Programming Manual (Fundamentals).**

2.5.1 Numbers of timers

The table below shows timer (T) numbers. (Numbers are assigned in decimal.)

1. FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs

	For 100 ms pulses 0.1 to 3276.7 sec	**For 10 ms pulses 0.01 to 327.67 sec**	**Retentive type for 1 ms pulses*1 0.001 to 32.767 sec**	**Retentive type for 100 ms pulses*1 0.1 to 3276.7 sec**	**For 1 ms pulses 0.001 to 32.767 sec**
FX3U/ FX3UC PLC	T0 to T199 200 points ---------- Routine program type T192 to T199	T200 to T245 46 points	T246 to T249 4 points Interrupt execution latched (backed-up) type*1	T250 to T255 6 points Latched (backed-up) type*1	T256 to T511 256 points

	For 100 ms pulses 0.1 to 3276.7 sec	**For 10 ms pulses 0.01 to 327.67 sec**	**Retentive type for 1 ms pulses 0.001 to 32.767 sec**	**Retentive type for 100 ms pulses 0.1 to 3276.7 sec**	**For 1 ms pulses 0.001 to 32.767 sec**	**Variable potentiometer type Numeric value from 0 to 255**
FX3G/ FX3GC PLC	T0 to T199 200 points ---------- Routine program type T192 to T199	T200 to T245 46 points	T246 to T249 4 points*2 Interrupt execution latched (backed-up) type	T250 to T255 6 points*2 Latched (backed-up) type	T256 to T319 64 points	2 built-in points (Only in FX3G PLC)

	For 100 ms pulses 0.1 to 3276.7 sec	**For 100/10 ms pulses 0.1 to 3276.7 sec 0.01 to 327.67 sec**	**For 1 ms pulses 0.001 to 32.767 sec**	**Retentive type for 1 ms pulses 0.001 to 32.767 sec**	**Retentive type for 100 ms pulses 0.1 to 3276.7 sec**	**Variable potentiometer type Numeric value from 0 to 255**
FX3S PLC	T0 to T62 63 points	T32 to T62 31 points*3	T63 to T127 65 points	T128 to T131 4 points Interrupt execution latched (backed-up) type*2	T132 to T137 6 points Latched (backed-up) type*2	2 built-in points*4

Timer numbers not used for timers can be used as data registers for storing numeric values.

*1. Retentive type timers are backed up by the battery in FX3U/FX3UC PLCs.

*2. Retentive type timers are backed up by the EEPROM memory (built in PLC) in FX3S/FX3G/FX3GC PLCs.

*3. 100 ms timers are changed to 10 ms timers when the special auxiliary relay M8028 is driven.

*4. This function is not supported in the FX3S-30M□/E□-2AD PLC.

2. FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs

	For 100 ms pulses 0.1 to 3276.7 sec	For 100/10 ms pulses 0.1 to 3276.7 sec 0.01 to 327.67 sec	For 10 ms pulses 0.01 to 327.67 sec	For 1 ms pulses 0.001 to 32.767 sec	Retentive type for 100 ms pulses 0.1 to 3276.7 sec	Variable potentiometer type Numeric value from 0 to 255
FX1S PLC	T0 to T31 32 points	T32 to T62 31 points*1	-	T63 1 point	-	2 built-in points 8 points for function board (Only in FX1S/ FX1N PLCs)
FX1N/ FX1NC PLC	T0 to T199 200 points	-	T200 to T245 46 points	T246 to T249 4 points Capacitor latched (backed-up) type (Retentive type)	T250 to T255 6 points Capacitor latched (backed-up) type	
FX2N/ FX2NC PLC	T0 to T199 200 points ---------- Routine program type T192 to T199	-	T200 to T245 46 points	T246 to T249 4 points Interrupt execution latched (backed-up) type (Retentive type)	T250 to T255 6 points Capacitor latched (backed-up) type	8 points for function board (Only in FX2N PLC)

Timer numbers not used for timers can be used as data registers for storing numeric values.

*1. 100 ms timers are changed to 10 ms timers when the special auxiliary relay M8028 is driven.

3. FX0S/FX0/FX0N/FXU/FX2C PLCs

	For 100 ms pulses 0.1 to 3276.7 sec	For 10 ms pulses 0.01 to 327.67 sec	For 1 ms pulses 0.001 to 32.767 sec	Retentive type for 100 ms pulses 0.1 to 3276.7 sec	Variable potentiometer type Numeric value from 0 to 255
FX0S/FX0 PLC	T0 to T55 56 points	(T32 to T55) (24 points)*1	-	-	1 built-in point
FX0N PLC	T0 to T62 63 points	(T32 to T62) (31 points)*1	T63	-	2 built-in points
FXU/FX2C PLC	Routine program type T192 to T199	T200 to T245 46 points	T246 to T249*2 4 points Retentive type Interrupt execution	T250 to T255*2 6 points	8 points for function board

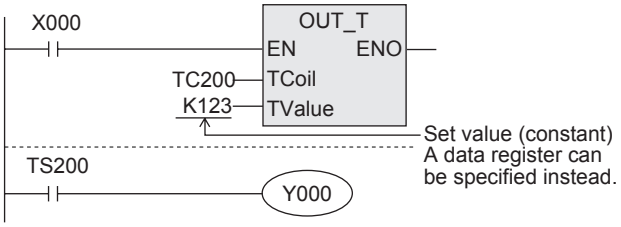
Timer numbers not used for timers can be used as data registers for storing numeric values.

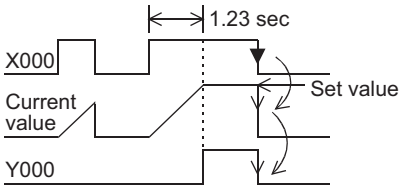
*1. 100 ms timers are changed to 10 ms timers when the special auxiliary relay M8028 is driven.
In FX0 PLCs, this function is available in Ver. 1.01 and later.

*2. They are backed up against power interruption.

2.5.2 Functions and operation examples

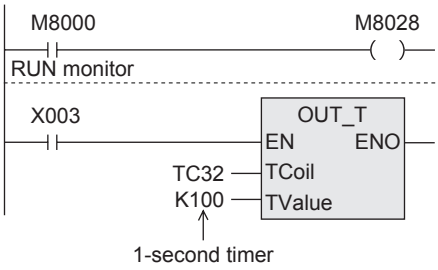
1. General type



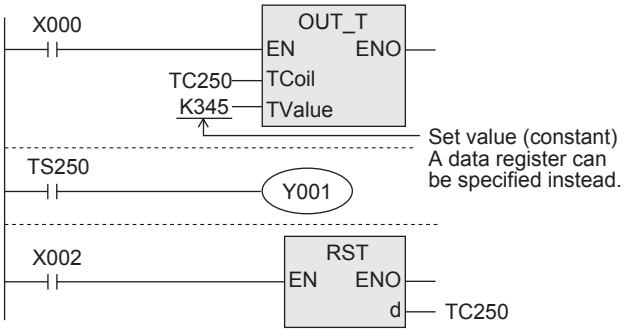


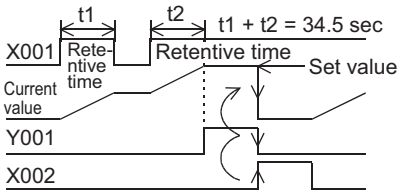
When the drive input X000 of the timer T200 turns ON, the current value counter for T200 adds and counts clock pulses of 10 ms. When the count value becomes equivalent to the set value K123, the output contact of the timer turns ON.
In other words, the output contact turns ON 1.23 seconds after the coil is driven.
When the drive input X000 turns OFF or when the power is turned OFF, the timer is reset and the output contact turns OFF.

- The program of 100 ms/10 ms type timer of the FX0S, FX0, FX0N, FX1S and FX3S PLCs.
  100 ms timers are changed to timers which operate based on the 10 ms base clock when the special auxiliary relay M8028 is driven in the program.



2. Retentive type





When the drive input X001 of the timer T250 turns ON, the current value counter for T250 adds and counts clock pulses of 100 ms. When the count value becomes equivalent to the set value K345, the output contact of the timer turns ON.
Even if the drive input X001 turns OFF or if the power is turned OFF during counting, the timer continues counting when the operation restarts. The retentive operating time is 34.5 seconds.
When the reset input X002 turns ON, the timer is reset and the output contact turns OFF.

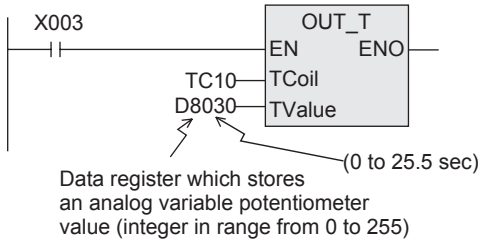
3. Variable potentiometer type

- Program for built-in analog variable potentiometers
  Program values for built-in analog variable potentiometers are stored in the following special data registers as numeric data within the range from 0 to 255 in accordance with the scale position.
  Values received as numeric values can be specified as the indirectly specified value for a timer to provide variable potentiometer type analog timers.

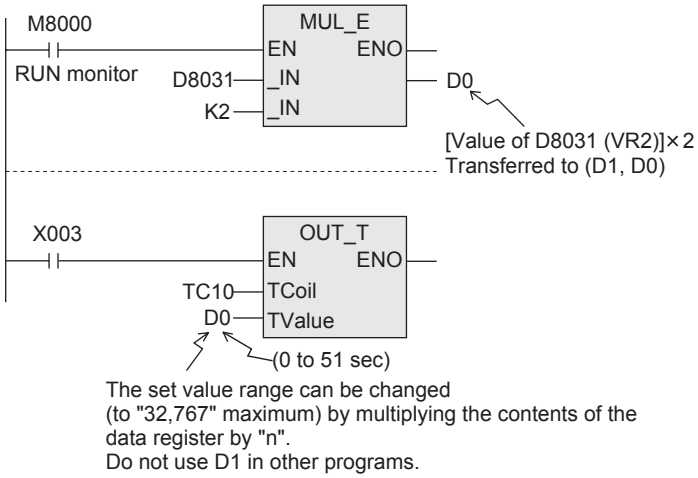
[Special data registers]

- FX1S, FX1N, FX3S*1, FX3G PLC
  VR1→D8030
  VR2→D8031
- FX0S, FX0 PLC
  D8013
- FX0N PLC
  VR1→D8013(D8030)
  VR2→D8031

[Example of basic circuit]

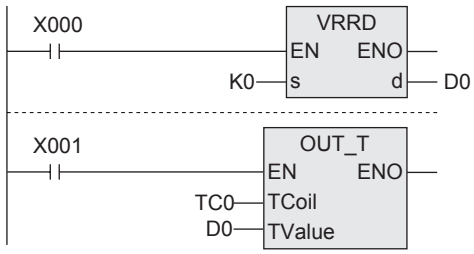


[Example of applied circuit]



*1. FX3S-30M□/E□-2AD are not applicable to built-in analog variable potentiometers.

- Program for analog variable potentiometers on function board
  Values of analog variable potentiometers which can be built in the PLC as a function board can be received as numeric data in the range from 0 to 255 in accordance with the scale position.
  Values received as numeric values can be specified as timer function values to provide variable potentiometer type analog timers.
  Use the VRRD function to put analog variable potentiometer values into the PLC.

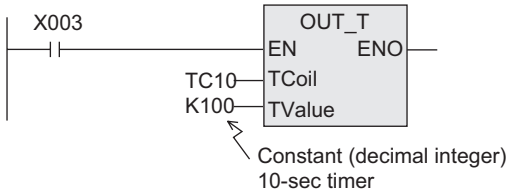


The analog value of the variable potentiometer No. 0 is converted into 8-bit binary value, and the value in the range from 0 to 255 is transferred to D0.
In this example, D0 is used as the timer set value.

Use the VRSC instruction to put the value of an analog variable potentiometer as a numeric value in the range from 0 to 10 in accordance with the scale position.

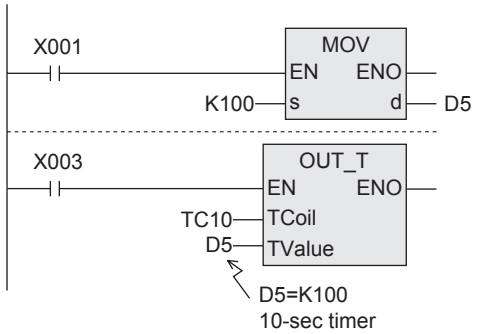
2.5.3 Set value specification method

1. Specification using a constant (K)



T10 is a timer for 100 ms (0.1 s) pulses.
When the constant "100" is specified, T10 works as a 10-second timer (0.1 sec × 100 = 10 sec).

2. Indirect specification using a data register



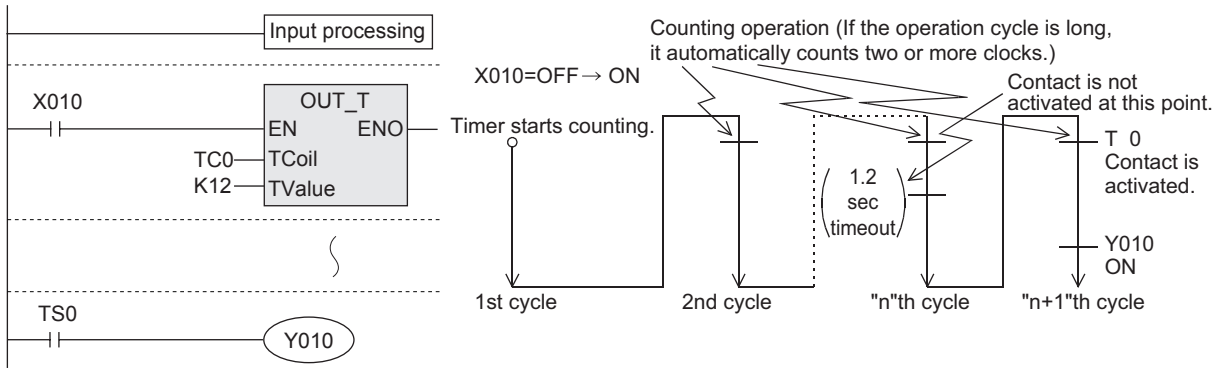
Write in advance a value to the data register used for indirect specification in a program, or set such a value in advance using a digital switch.
Note that the set value of a latched (backed-up) type register can be indefinite when the battery voltage becomes low.

2.5.4 Cautions on use

1) Use timers T192 to T199 in subroutines and interrupt routines. These timers execute counting when a coil instruction or END instruction is executed.
Once the count value of such a timer has reached the set value, the timer output contact turns ON when a coil instruction or END instruction is executed.
Because general type timers execute counting only when a coil instruction is executed (refer to "2.5.5 Details of timer operations and timer accuracy" below), they do not operate normally if they are used in subroutines or interrupt routines in which a coil instruction is executed only in a certain condition.
2) If a retentive type timer for 1 ms pulses is used in a subroutine or interrupt routine, its output contact turns ON when the first coil instruction is executed after its count value has reached the set value.
3) For writing the symbolic information and changing the set values of timers and counters using a peripheral equipment, it is recommended to create programs with the set values specified indirectly.
If the set values are specified directly, programs cannot be restored from the symbolic information after the set values are changed.

2.5.5 Details of timer operations and timer accuracy

A timer (except interrupt execution type) starts counting when the coil is driven, and its output contact turns ON when the first coil instruction is executed after the timer has reached timeout.



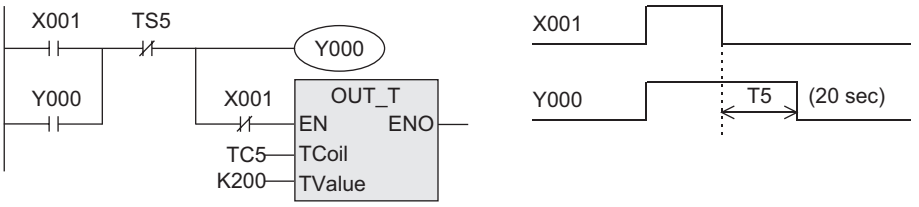
As shown in the above operation diagram, the accuracy of operation of the timer contact after the coil is driven until the contact turns ON is shown in the following outline expression:

$T^{+T_0}_{-\alpha}$ α :0.001 sec (timer for 1 ms), 0.01 sec (timer for 10 ms) or 0.1 sec (timer for 100 ms)
T :Timer set value (sec)
T_0:Operation cycle (sec)

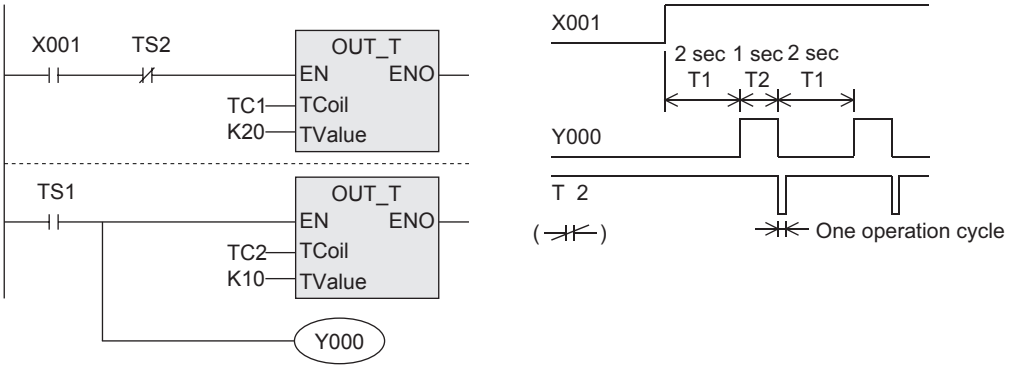
If the contact is programmed before the timer coil, "+2T0" results in the worst case.
When the timer set value is "0", the output contact turns ON when a coil instruction is executed in the next cycle.
An interrupt execution type timer for 1 ms pulses counts clock pulses of 1 ms as an interrupt processing after a coil instruction has been executed.

2.5.6 Program examples [Off-delay timer and flicker timer]

Off-delay timer



Flicker timer

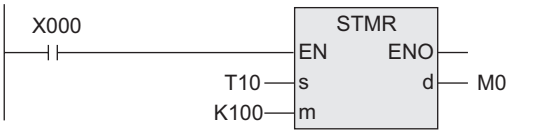


In addition, the flicker operation can be performed by the ALT instruction.

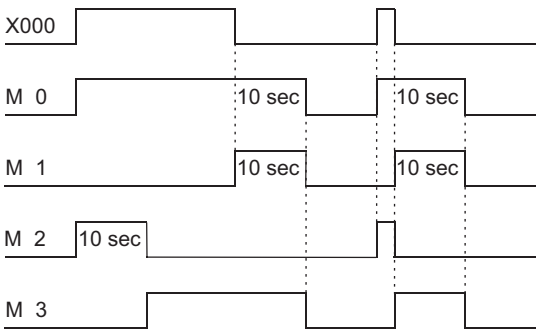
Multi-timer using the STMR instruction

Off-delay timers, one-shot timers and flicker timers can be easily created using this instruction.

Off-delay timer and one-shot timer

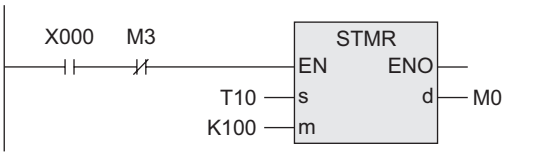


- The value specified in "m" is handled as the set value of a timer specified in input variable (s). The set value is "10 sec." in this example.

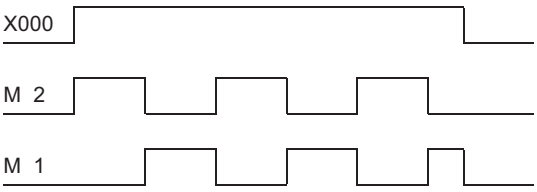


- M0 is an off-delay timer.
- M1 is a one-shot timer which operates after the input turns OFF from ON.
- M2 and M3 are flicker timers, and connected as shown in the program example below for flicker.

Flicker timer



- When M3 is connected as shown in the left figure, M2 and M1 become flicker outputs.



- When X000 is set to OFF, M0, M1 and M3 turn OFF and T10 is reset after the set time.
- Do not use the timers used here in other general circuits again.

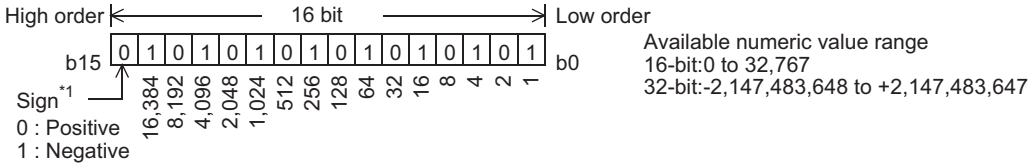
In addition, the timer time can be set according to the switch input time using the teaching timer instruction TTMR.

2.5.7 Handling timers as numeric devices

In timers, the output contact operating in accordance with the set value is used in some cases, and the current value is used as numeric data for control in other cases.
The figures below show the structure of timer current value registers. When a timer number is specified in an input variable of an instruction, the timer is handled as a device which stores 16-bit or 32-bit data in the same way as data registers.

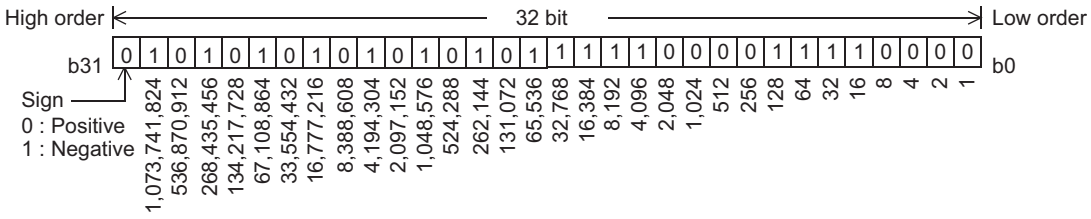
1. Structure of timer current value registers

1) 16-bit



*1.The sign is valid only when a timer is handled as a substitute for a data register.

2) 32-bit



2. Use examples

For the full use of timers as numeric devices, refer to the instruction explanation manual offered separately.

→ **FX Structured Programming Manual [Basic & Applied Instruction]**

2.6 Counter [C]

In counters, "CS" indicates a contact, "CC" indicates a coil, and "CN" indicates the current value.
→ **Refer to the Q/L/F Structured Programming Manual (Fundamentals).**

2.6.1 Numbers of counters

The tables below show counter (C) numbers. (Numbers are assigned in decimal.)
→ **For high speed counters, refer to Section 2.7.**

1. In FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs

	16-bit up-counter Counting range: 0 to 32767		32-bit bi-directional counter -2,147,483,648 to +2,147,483,647	
	General type	Latched (battery backed-up) type	General type	Latched (battery backed-up) type
FX3U/FX3UC PLC	C0 to C99 100 points*1	C100 to C199 100 points*2	C200 to C219 20 points*1	C220 to C234 15 points*2

	16-bit up-counter Counting range: 0 to 32767		32-bit bi-directional counter -2,147,483,648 to +2,147,483,647	
	General type	Fixed latched (EEPROM keep) type	General type	Fixed latched (EEPROM keep) type
FX3G/FX3GC PLC	C0 to C15 16 points	C16 to C199 184 points	C200 to C219 20 points	C220 to C234 15 points

	16-bit up-counter Counting range: 0 to 32767		32-bit bi-directional counter -2,147,483,648 to +2,147,483,64732
	General type	Fixed latched (EEPROM keep) type	General type
FX3S PLC	C0 to C15 16 points	C16 to C31 16 points	C200 to C234 35 points

*1. This area is not latched (backed up). It can be changed to the latched (backed-up) area by parameter setting.

*2. This area is latched (backed up). It can be changed to the non-latched (non-backed-up) area by parameter setting.

2. In FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs

	16-bit up-counter Counting range: 0 to 32767				32-bit bi-directional counter -2,147,483,648 to +2,147,483,647		
	General type	Latched (backed-up) type	Fixed latched (backed-up) type		General type	Latched (backed-up) type	Fixed latched (backed-up) type
		Battery backed-up	EEPROM backed-up	Capacitor backed-up		Battery backed-up	Capacitor backed-up
FX1S PLC	C0 to 15 16 points*3	-	C16 to C31 16 points*3	-	-	-	-
FX1N/FX1NC PLC	C0 to C15 16 points*3	-	C16 to C31 16 points*3	C32 to C199 168 points*3	C200 to C219 20 points*3	-	C220 to C234 15 points*3
FX2N/FX2NC PLC	C0 to C99 100 points*1	C100 to C199 100 points*2	-	-	C200 to C219 20 points*1	C220 to C234 15 points*2	-

*1. This area is not latched (backed up). It can be changed to the latched (backed-up) area by parameter setting.

*2. This area is latched (backed up). It can be changed to the non-latched (non-backed-up) area by parameter setting.

*3. The characteristics of latch (backup) cannot be changed using parameters.

Counter numbers not used as counters can be used as data registers to store numeric values.

3. In FX0S/FX0/FX0N/FXU/FX2C PLCs

	16-bit up-counter Counting range: 0 to 32767			32-bit bi-directional counter -2,147,483,648 to +2,147,483,647	
	General type	Latched (backed-up) type	Fixed latched (backed-up) type	General type	Latched (backed-up) type
FX0S/FX0 PLC	C0 to 13 14 points*4	-	C14 to C15 2 points*3	-	-
FX0N PLC	C0 to C15 16 points*4	-	C16 to C31 16 points*3	-	-
FXU/FX2C PLC	C0 to C99 100 points*1	C100 to C199 100 points*2	-	C200 to C219 20 points*1	C220 to C234 15 points*2

*1. This area is not latched (backed up). It can be changed to the latched (backed-up) area by parameter setting.

*2. This area is latched (backed up). It can be changed to the non-latched (non-backed-up) area by parameter setting.

*3. This area is fixed to the latched (backed-up) type. (The contents can be cleared by the RST and ZRST instructions.)

*4. This area is fixed to the non-latched (non-backed-up) type. The characteristics of latch (backup) cannot be changed.

Counter numbers not used as counters can be used as data registers to store numeric values.

2.6.2 Features of counters

The table below shows the features of 16-bit counters and 32-bit counters.
These counters can be used in accordance with the operating condition such as counting direction switching and counting range.

Item	16-bit counter	32-bit counter
Counting direction	Up-counting	Up-counting and down-counting can be switched (refer to Subsection 2.6.3).
Set value	1 to 32767	-2,147,483,648 to +2,147,483,647
Set value specification	Constant (K) or data register	Constant (K) or a pair of data registers
Current value change	Does not change after counting up.	Changes even after counting up (ring counter).
Output contact	Latches the operation status after counting up.	Latches the operation status (in up-counting), or is reset (in down-counting).
Reset operation	When the RST instruction is executed, the current value of counter is reset to "0" and the output contact turns OFF.	
Current value register	16-bit	32-bit

2.6.3 Related devices (to specify counting direction) [32-bit counter]

FX0S/FX0/FX0N PLCs do not support 32-bit counters.

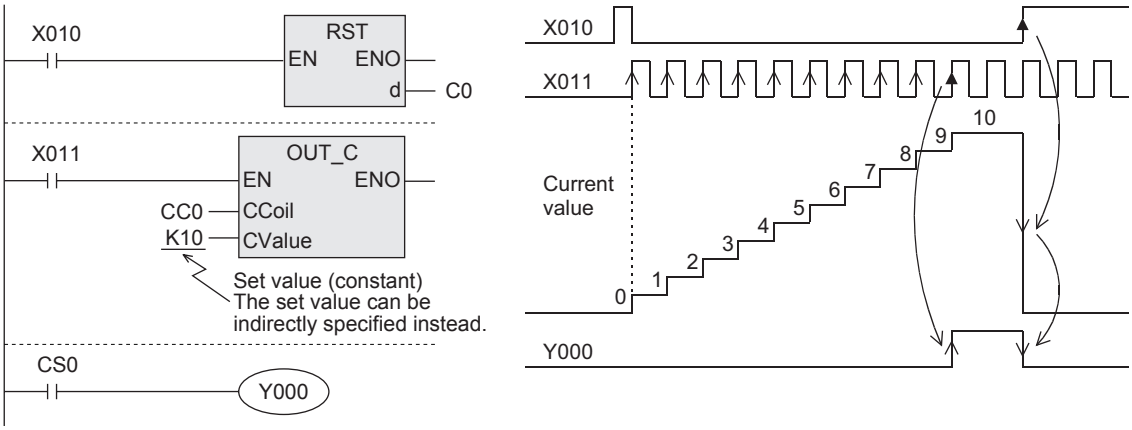
When an auxiliary relay for switching the counting direction is set to ON, the counter executes down-counting. When the auxiliary relay is set to OFF, the counter executes up-counting.

Counter No.	Counting direction switching relay	Counter No.	Counting direction switching relay	Counter No.	Counting direction switching relay	Counter No.	Counting direction switching relay
C200	M8200	C210	M8210	C220	M8220	C230	M8230
C201	M8201	C211	M8211	C221	M8221	C231	M8231
C202	M8202	C212	M8212	C222	M8222	C232	M8232
C203	M8203	C213	M8213	C223	M8223	C233	M8233
C204	M8204	C214	M8214	C224	M8224	C234	M8234
C205	M8205	C215	M8215	C225	M8225		
C206	M8206	C216	M8216	C226	M8226		
C207	M8207	C217	M8217	C227	M8227		
C208	M8208	C218	M8218	C228	M8228		
C209	M8209	C219	M8219	C229	M8229		

2.6.4 Functions and operation examples

1. General type and latched (backed-up) type 16-bit counters

- The valid setting rage of 16-bit binary up-counter is from K1 to K32767 (decimal constant).
  K0 causes the same operation as K1, and the output contact turns ON at the first counting.
- In general type counters, the count value is cleared when the PLC is turned OFF.
  In latched (backed-up) type counters, the count value just before power interruption is stored. The count value in the subsequent operation can be added to the previous last count value.
- Every time the coil C0 is driven by the counting input X011, the current value of the counter increases. When a coil instruction is executed 10 times, the output contact turns ON. After that, the current value of the counter does not change even if the counting input X011 turns ON.
  When the reset input X010 turns ON and then the RST instruction is executed, the current value of the counter is reset to "0" and the output contact turns OFF.



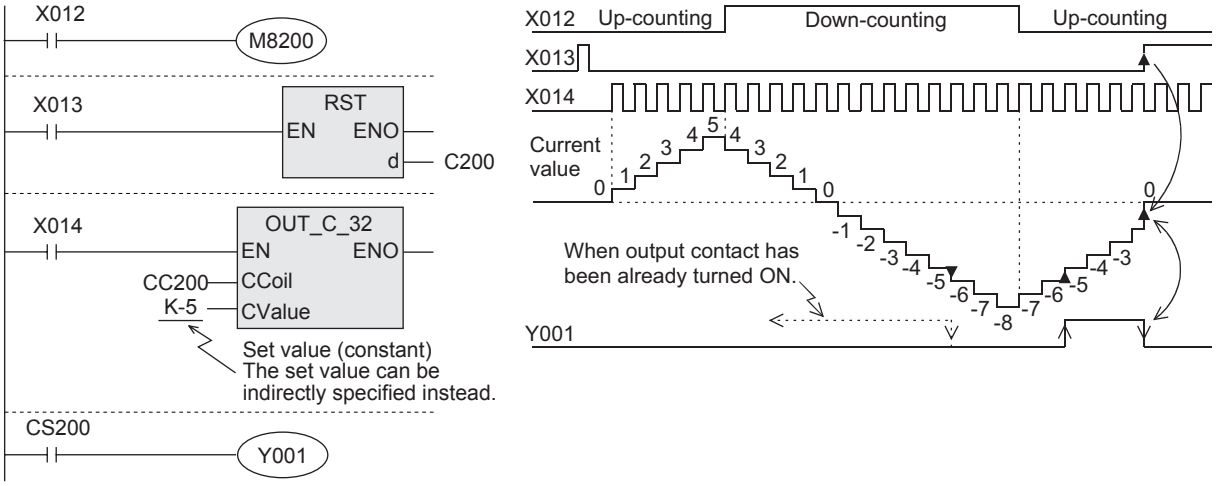
- The counter set value can be set directly by a constant (K) as shown above, or specified indirectly by a data register number.
  For example, when D10 is specified and the contents of D10 are "123", it is equivalent to "K123".
- If data beyond the set value is written to the current value register by the MOV instruction, etc., the OUT coil turns ON and the current value register becomes the set value when the next counting input is received.
- In a latched (backed-up) type counter, the current value, output contact operation status and reset status of the counter are latched (backed up) by a battery, EEPROM, etc. built in the PLC.
  → **For details on backup methods against power interruption, refer to Section 2.6.**

2. General type and latched (backed-up) type 32-bit bidirectional counters

The valid setting range of 32-bit binary bidirectional counters is from -2,147,483,648 to +2,147,483,647 (decimal constant).
The counting direction (up or down) is specified by special auxiliary relays M8200 to M8234.

- When M8△△△ is driven for the counter C△△△, the counter executes down-counting.
  When M8△△△ is not driven for the counter C△△△, the counter executes up-counting. (Refer to the previous page.)
- The (positive or negative) set value can be specified by a constant (K) or the contents of data registers (D). When data registers are used, 32-bit data composed of a pair of serial data registers is handled as the set value.
  However, when handling 32-bit data in structured programs, it is not allowed to specify 16-bit data registers directly, different from simple projects. (Because 32-bit counters have 32-bit length, it is allowed to specify 32-bit data directly.) Use a label when handling 32-bit data.
  For example, when specifying 32-bit data using two data registers D1 and D0, define D0 using a global label.

- When the coil C200 is driven by the counting input X014, the counter starts up-counting or down-counting. When the current value of the counter increases from "-6" to "-5", the output contact turns ON. When the current value decreases from "-5" to "-6", the output contact turns OFF.

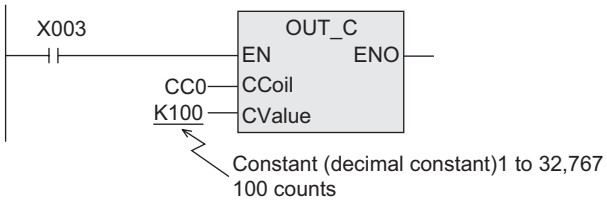


- The current value increases or decreases without regard to the operation of the output contact. When the counter executes up-counting from "2,147,483,647", the count value becomes "-2,147,483,648". In the same way, when the counter executes down-counting from "-2,147,483,648", the count value becomes "2,147,483,647". (This type of counter is called ring counter.)
- When the reset input X013 turns ON and then the RST instruction is executed, the current value of the counter is reset to "0" and the output contact turns OFF.
- In a latched type counter, the current value, output contact operation status and reset status of the counter are latched (backed up) by a battery, etc. in the PLC.
  → **For details on backup methods against power interruption, refer to Section 1.2.**
- A 32-bit counter can be used as a 32-bit data register. 32-bit counters cannot be handled as target devices in 16-bit applied instructions.
- If data beyond the set value is written to the current value register by the DMOV instruction, etc., the counter continues counting and the contact does not change when the next counting input is received.

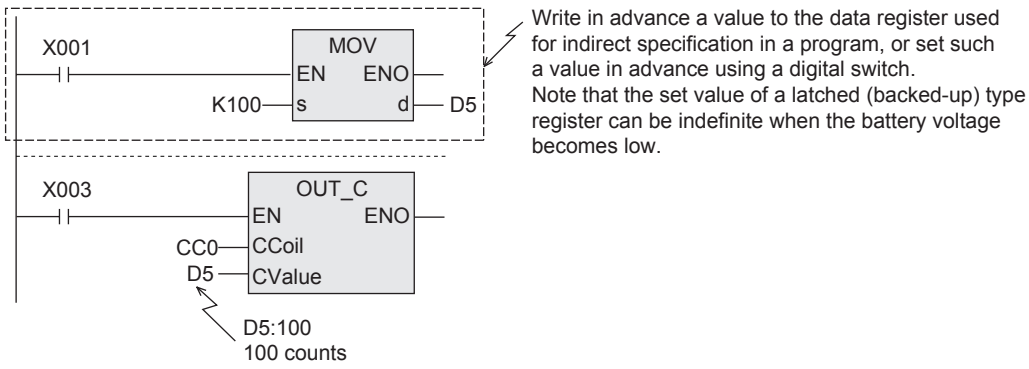
2.6.5 Set value specification method

1. 16-bit counter

1) Direct specification using a constant (K)

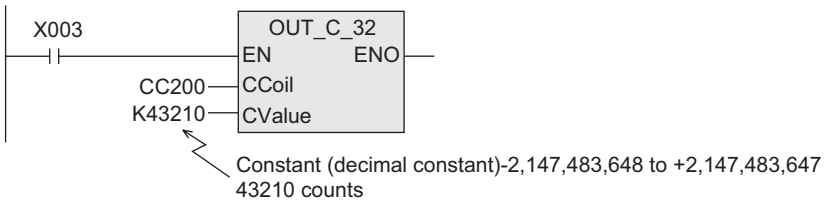


2) Indirect specification using a data register (D)

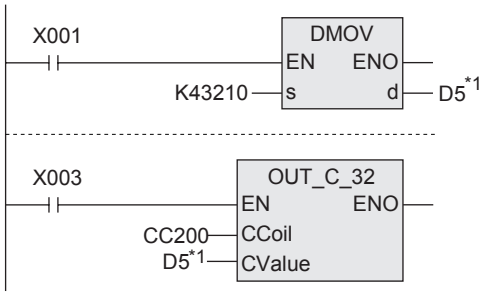


2. 32-bit counter

1) Direct specification using a constant (K)



2) Indirect specification using a data register (D)



*1 Make sure data registers used for indirect specification are not used in other programs.

2.6.6 Cautions on use

For writing the symbolic information and changing the set values of timers and counters using a peripheral equipment, it is recommended to create programs with the set values specified indirectly.
If the set values are specified directly, programs cannot be restored from the symbolic information after the set values are changed.

2.6.7 Response speed of counters

Counters execute counting by cyclic operation for contact operations of signals X, Y, M, S, C, etc. inside the PLC.
For example, when X011 is used for counting input, its ON duration and OFF duration should be longer than the scan time of the PLC (which is several tens Hz or less usually).
On the other hand, high speed counters described later execute counting as an interrupt processing for specific input, and can execute counting at several kHz without regard to the scan time.

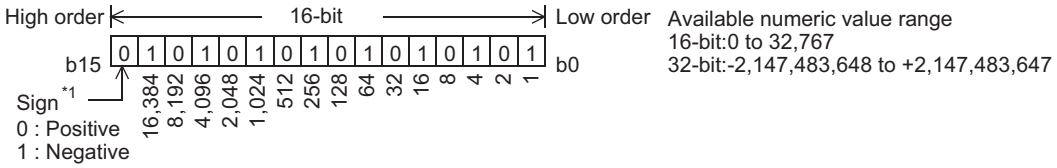
→ **For high speed counters, refer to Section 2.7.**

2.6.8 Counters handled as numeric devices

Counters use output contacts which operate in accordance with the set value, or use the count value (current value) as numeric data for control.
The figures below show the structure of current value registers of counters.
When a counter number is specified in an input variable of an instruction, the counter is handled as a device which stores 16-bit or 32-bit data in the same way as data registers.
A 32-bit counter is handled as 32-bit data.

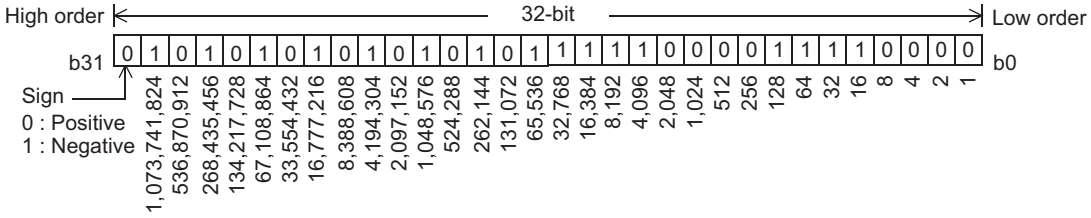
1. Structure of the current value register of a counter

1) 16-bit



*1.The sign is valid only when a timer is handled as a substitute for a data register.

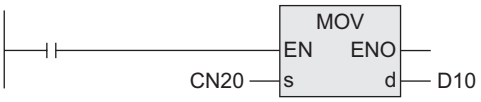
2) 32-bit



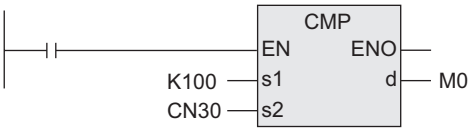
2. Use examples in applied instructions

For the full use of counters as numeric devices, refer to the instruction explanation manual offered separately.

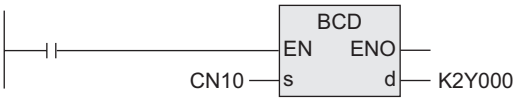
→ **FX Structured Programming Manual [Basic & Applied Instruction]**



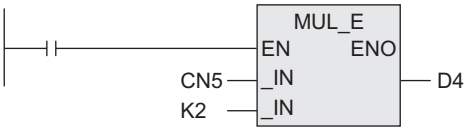
CN20 (current value) is transferred to D10.



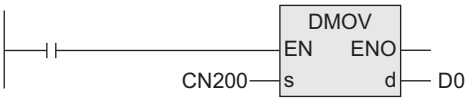
A decimal integer "100" is compared with CN30 (current value), and the comparison result is output to M0 to M2.



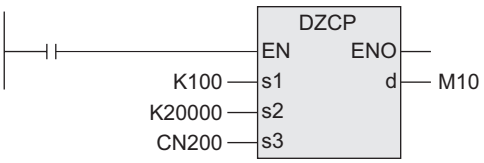
The contents of CN10 (current value) are converted into BCD, and output to Y000 to Y007 (to control the 7-segment display unit).



CN5 (current value) is multiplied by "2", and the obtained value is transferred to (D5, D4).



CN200 (current value) is transferred to (D1, D0).

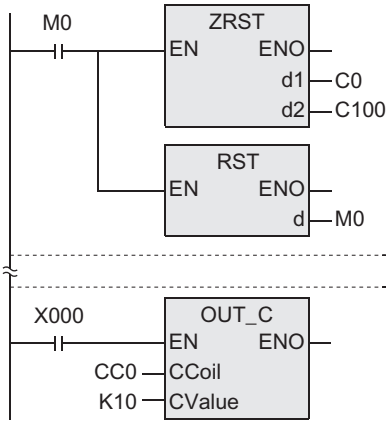


CN200 (current value) is compared with a decimal integer zone "100 to 20000", and the comparison result is output to M10 to M12.

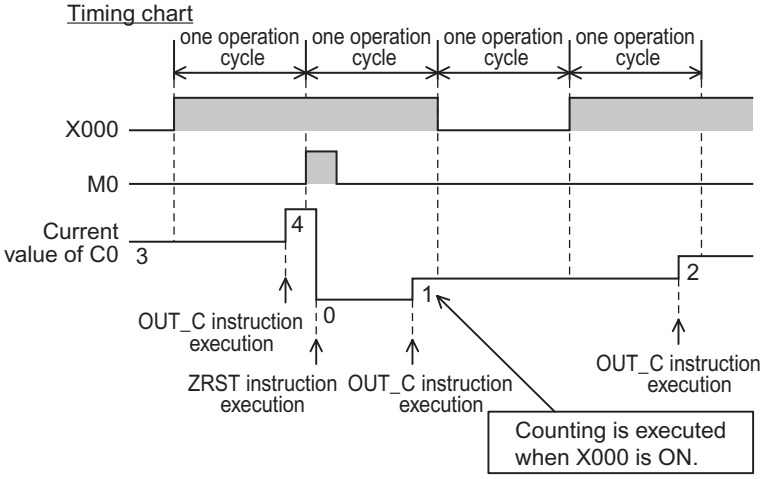
3. Caution on simultaneous instances of the ZRST instruction and a counter

The ZRST instruction resets also the last stage and reset state of T and C coils.
Accordingly, if the drive contact of X000 is ON in the following program, the counter executes counting after the ZRST instruction is executed.

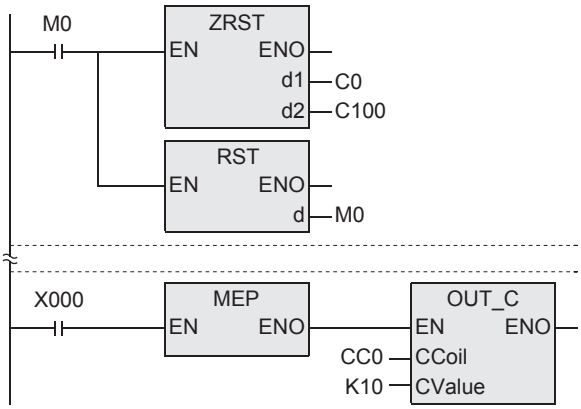
Structured ladder/FBD



Timing chart



Program in the following way to disable counting after execution of the ZRST instruction.



2.7 High Speed Counter [C]

2.7.1 Types and device numbers of high speed counters

1. Types of high speed counters

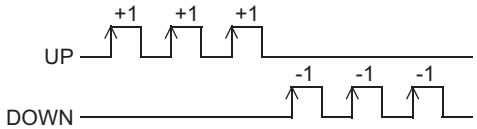
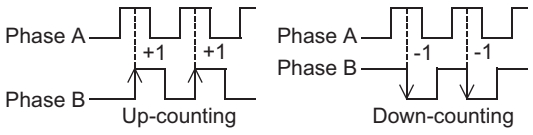
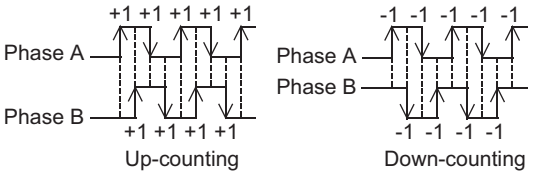
The PLC main unit has built-in 32-bit high speed bidirectional counters (1-phase 1-counting, 1-phase 2-counting and 2-phase 2-counting). These high speed counters are classified into the hardware type and the software type according to the counting method.
Some high speed counters can be used together with an external reset input terminal and external start input terminal (for counting start).

2. Classification of high speed counters according to the counting method

- Hardware counters :These types of counters execute counting using hardware, but are switched to software counters depending on the operation condition.
  → **For the condition handled as software counters, refer to Subsection 2.7.9.**
- Software counters : These types of counters execute counting through CPU interrupt processing. It is necessary to use each software counter within restrictions of both the maximum response frequency and the total frequency.
  → **For restriction of the response frequency depending on the total frequency, refer to Subsection 2.7.10.**

3. Types of high speed counters and input signal forms

The table below shows the types (1-phase 1-counting, 1-phase 2-counting and 2-phase 2-counting) and input signals (waveforms) of high speed counters.

		Input signal form	Counting direction
1-phase 1-counting input			The ON/OFF status of M8235 to M8245 specifies down-counting or up-counting. ON: Down-counting OFF: Up-counting
1-phase 2-counting input			A counter executes up-counting or down-counting as shown on the left. The counting direction can be checked in M8246 to M8250. ON: Down-counting OFF: Up-counting
2-phase 2-counting input	1-edge counting		A counter automatically executes up-counting or down-counting according to changes in the input status of the phase A or B as shown on the left. The counting direction can be checked in M8251 to M8255. ON: Down-counting OFF: Up-counting
	4-edge counting		

4. Cautions on counterpart equipment connected to high speed counter inputs

General-purpose inputs X000 to X007 (X003) are used for high speed counter inputs. An encoder*1 adopting the output type shown in the table below can be connected depending on the connected terminal.
Encoders adopting the voltage output type and absolute encoders cannot be connected to high speed counter inputs.

→ **For the wiring, refer to the manual (Hardware Edition) of the PLC main unit.**

Output type which can be directly connected to input terminal of main unit	Open collector transistor output type compatible with 24 VDC
Output type which can be directly connected to input terminal of FX3U-4HSX-ADP*2	Differential line driver output type (Output voltage: 5 VDC or less)

*1. A rotary encoder adopting the output type shown above may not operate correctly depending on the electrical compatibility. Check the specifications before connecting an encoder.

*2. This product is the adaptor for high speed input dedicated to FX3U PLCs.

5. High speed counter list

1) In FX3U/FX3UC PLCs

	Classification	Counter No.	1-edge counting/ 4-edge counting	Data length	External reset input terminal	External start input terminal
1-phase 1-counting input	Hardware counters*1	C235*2 C236*2 C237*2 C238*2 C239*2 C240*2	-	32-bit bidirectional counter	Not provided	Not provided
		C244(OP)*3 C245(OP)*3	-			
	Software counters	C241 C242 C243	-		Provided*5	Not provided
		C244*3 C245*3	-		Provided*5	Provided
1-phase 2-counting input	Hardware counters*1	C246*2 C248(OP)*2*3	-	32-bit bidirectional counter	Not provided	Not provided
	Software counters	C247 C248*3	-		Provided*5	Not provided
		C249 C250	-		Provided*5	Provided
2-phase 2-counting input	Hardware counters*1	C251*2	1-edge counting*4	32-bit bidirectional counter	Not provided	Not provided
			4-edge counting*4			
		C253*2	1-edge counting*4		Provided*5	
			4-edge counting*4			
	Software counters	C252	1-edge counting*4		Provided*5	Not provided
			4-edge counting*4			
		C253(OP)*6	1-edge counting*4		Not provided	
			4-edge counting*4			
		C254 C255	1-edge counting*4		Provided*5	Provided
			4-edge counting*4			

*1. They are handled as software counters depending on the operating condition. When they are handled as software counters, they get restrictions of both the maximum response frequency and the total frequency.

→ For the condition handled as software counters, refer to Subsection 2.7.9.
→ For the total frequency, refer to Subsection 2.7.10.

*2. Cautions on wiring should be considered for these high speed counters.

→ For the wiring, refer to the manual (Hardware Edition) of the PLC main unit.

*3. C244, C245 and C248 are usually used as software counters, but can be used as hardware counters C244 (OP), C245 (OP) and C248 (OP) by combining special auxiliary relays (M8388 and one among M8390 to M8392).

→ For the method to switch the counter function, refer to Subsection 2.7.7.

*4. 2-phase 2-input counters usually execute 1-edge counting, but can be used for 4-edge counting by combining special auxiliary relays (M8388 and one between M8198 and M8199).

→ For the method to use a 2-phase 2-input counter for 4-edge counting, refer to Subsection 2.7.8.

*5. The external reset input usually causes reset at turning ON, but can cause reset at turning OFF by combining special auxiliary relays (M8388 and M8389).

→ For the method to change the logic for external reset input, refer to Subsection 2.7.6.

*6. C253 is usually used as a hardware counter, but can be used as a counter C253 (OP) not having reset input by combining special auxiliary relays (M8388 and M8392).
In this case, C253 (OP) is handled as a software counter.

Notation of high speed counters

For some high speed counters in FX3U/FX3UC PLCs, the assignment of input terminals switches when special auxiliary relays are combined.
(For input terminal numbers, refer to Subsection 2.7.2.)
Such high speed counters are described as follows in this section. Note that "(OP)" is not available in programming.

Standard device number	Switched device number
C244	C244(OP)
C245	C245(OP)

Standard device number	Switched device number
C248	C248(OP)
C253	C253(OP)

2) In FX3G/FX3GC PLCs

	Classification	Counter No.	1-edge counting/ 4-edge counting	Data length	External reset input terminal	External start input terminal
1-phase 1-counting input	Software counters	C235 C236 C237 C238 C239 C240	-	32-bit bidirectional counter	Not provided	Not provided
		C241 C242 C243	-		Provided	Not provided
		C244 C245	-		Provided	Provided
1-phase 2-counting input	Software counters	C246 C248(OP)*1	-	32-bit bidirectional counter	Not provided	Not provided
		C247 C248	-		Provided	Not provided
		C249 C250	-		Provided	Provided
2-phase 2-counting input	Software counters	C251 C253(OP)*1 C254(OP)*2	1-edge counting	32-bit bidirectional counter	Not provided	Not provided
		C252 C253	1-edge counting		Provided	Not provided
		C254 C255	1-edge counting		Provided	Provided

*1. C248 and C253 are usually used as counters having reset input, but can be used as counters C248 (OP) and C253 (OP) not having reset input when used together with special auxiliary relays M8388 and M8392.

*2. C254 is usually used as a counter having reset input and start input, but can be used as a counter C254 (OP) not having reset input or start input when used together with special auxiliary relays M8388 and M8395.

Notation of high speed counters

For some high speed counters in FX3G/FX3GC PLCs, the assignment of input terminals switches when special auxiliary relays are combined.
Such high speed counters are described as follows in this section. Note that "(OP)" is not available in programming.

Standard device number	Switched device number
C248	C248(OP)
C253	C253(OP)
C254	C254(OP)

3) In FX3S PLC

	Classification	Counter No.	1-edge counting/ 4-edge counting	Data length	External reset input terminal	External start input terminal
1-phase 1-counting input	Software counters	C235 C236 C237 C238 C239 C240	-	32-bit bidirectional counter	Not provided	Not provided
		C241 C242 C243	-		Provided	Not provided
		C244 C245	-		Provided	Provided
1-phase 2-counting input	Software counters	C246 C248(OP)*1	-	32-bit bidirectional counter	Not provided	Not provided
		C247 C248	-		Provided	Not provided
		C249 C250	-		Provided	Provided
2-phase 2-counting input	Software counters	C251 C253(OP)*1	1-edge counting	32-bit bidirectional counter	Not provided	Not provided
		C252 C253	1-edge counting		Provided	Not provided
		C254 C255	1-edge counting		Provided	Provided

*1. C248 and C253 are usually used as counters having reset input, but can be used as counters C248 (OP) and C253 (OP) not having reset input when used together with special auxiliary relays M8388 and M8392.

Notation of high speed counters

For some high speed counters in FX3S PLC, the assignment of input terminals switches when special auxiliary relays are combined.
Such high speed counters are described as follows in this section. Note that "(OP)" is not available in programming.

Standard device number	Switched device number
C248	C248(OP)
C253	C253(OP)

4) In FX1S/FX1N/FX1NC PLCs

	Classification	Counter No.	1-edge counting/ 4-edge counting	Data length	External reset input terminal	External start input terminal
1-phase 1-counting input	Software counters	C235 C236	-	32-bit bidirectional counter	Not provided	Not provided
		C237 C238 C239 C240 C241 C242 C243 C244 C245	-		Provided	
						Provided
1-phase 2-counting input	Software counters	C246	-	32-bit bidirectional counter	Not provided	Not provided
		C247 C248 C249 C250	-		Provided	
						Provided
2-phase 2-counting input	Software counters	C251	1-edge counting	32-bit bidirectional counter	Not provided	Not provided
		C252 C253 C254 C255			Provided	
						Provided

5) In FX2N/FX2NC PLCs

	Classification	Counter No.	1-edge counting/ 4-edge counting	Data length	External reset input terminal	External start input terminal
1-phase 1-counting input	Hardware counters*1	C235 C236	-	32-bit bidirectional counter	Not provided	Not provided
	Software counters	C237 C238 C239 C240 C241 C242 C243 C244 C245	-		Provided	
						Provided
1-phase 2-counting input	Hardware counters*1	C246	-	32-bit bidirectional counter	Not provided	Not provided
	Software counters	C247 C248 C249 C250	-		Provided	
						Provided
2-phase 2-counting input	Hardware counters*1	C251	1-edge counting	32-bit bidirectional counter	Not provided	Not provided
	Software counters	C252 C253 C254 C255			Provided	
						Provided

*1. They are handled as software counters depending on the operating condition. When they are handled as software counters, they get restrictions of both the maximum response frequency and the total frequency.

6) In FX0S/FX0/FX0N PLCs

	Classification	Counter No.	1-edge counting/ 4-edge counting	Data length	External reset input terminal	External start input terminal
1-phase 1-counting input	Software counters	C235 C236 C237 C238 C241 C242 C244	-	32-bit bidirectional counter	Not provided	Not provided
					Provided	Provided
1-phase 2-counting input	Software counters	C246 C247 C249	-	32-bit bidirectional counter	Not provided	Not provided
					Provided	Provided
2-phase 2-counting input	Software counters	C251 C252 C254	1-edge counting	32-bit bidirectional counter	Not provided	Not provided
					Provided	Provided

7) In FXU/FX2C PLCs

	Classification	Counter No.	1-edge counting/ 4-edge counting	Data length	External reset input terminal	External start input terminal
1-phase 1-counting input	Software counters	C235 C236 C237 C238 C239 C240 C241 C242 C243 C244 C245	-	32-bit bidirectional counter	Not provided	Not provided
					Provided	Provided
1-phase 2-counting input	Software counters	C246 C247 C248 C249 C250	-	32-bit bidirectional counter	Not provided	Not provided
					Provided	Provided
2-phase 2-counting input	Software counters	C251 C252 C253 C254 C255	1-edge counting	32-bit bidirectional counter	Not provided	Not provided
					Provided	Provided

2.7.2 Input assignment for high speed counters

Inputs X000 to X007 (X003) are assigned as shown in the tables below according to each high speed counter number.
When a high speed counter is used, the filer constant of a corresponding input number in the PLC main unit automatically changes.
Input terminals not used for high speed counters, however, can be used as general inputs.

→ **For the input specifications of the PLC main unit, refer to the hardware manual of the PLC main unit.**

FX3U/FX3UC PLCs : (X000 to X005:5μS, X006, X007:50μS)
FX3G/FX3GC PLCs : (X000, X001, X003, X004:10μS, X002, X005 to X007:50μS)
FX3S PLC : (X000, X001:10μS, X002 to X007:50μS)
FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs : (X000, X001:20μS, X002 to X005:50μS)
FX0S/FX0/FX0N/FXU/FX2C PLCs : (X000 to X003/X005:50μS)

- Prohibition on redundant use of input terminals
  Inputs X000 to X007(X003) are used for high speed counters, input interrupt, pulse catch, SPD/DSZR/DVIT/ZRN instructions and general-purpose inputs.
  Make sure to use each input terminal only once.

1. In FX3U/FX3UC PLCs

When FX3U-4HSX-ADP units are connected to an FX3U PLC, input terminals inside heavy-line frames in the table below are assigned to the first FX3U-4HSX-ADP unit, and other input terminals are assigned to the second FX3U-4HSX-ADP unit.
Same input numbers are assigned to input terminals of the FX3U-4HSX-ADP and input terminals of the FX3U PLC main unit. Use only either input terminal.
If both input terminals are used, intended operations are not achieved because inputs of the FX3U-4HSXADP and inputs of the FX3U PLC operate under the "OR" relationship.

→ **For the input specifications of the FX3U-4HSX-ADP, refer to the FX3U hardware manual.**

	Counter No.	Classification	Input terminal assignment							
			X000	X001	X002	X003	X004	X005	X006	X007
1-phase 1-counting input	C235*1	H/W*2	U/D							
	C236*1	H/W*2		U/D						
	C237*1	H/W*2			U/D					
	C238*1	H/W*2				U/D				
	C239*1	H/W*2					U/D			
	C240*1	H/W*2						U/D		
	C241	S/W	U/D	R						
	C242	S/W			U/D	R				
	C243	S/W					U/D	R		
	C244	S/W	U/D	R					S	
	C244(OP)*3	H/W*2							U/D	
	C245	S/W			U/D	R				S
	C245(OP)*3	H/W*2								U/D
1-phase 2-counting input	C246*1	H/W*2	U	D						
	C247	S/W	U	D	R					
	C248	S/W				U	D	R		
	C248(OP)*1*3	H/W*2				U	D			
	C249	S/W	U	D	R				S	
	C250	S/W				U	D	R		S
2-phase 2-counting input	C251*1	H/W*2	A	B						
	C252	S/W	A	B	R					
	C253*1	H/W*2				A	B	R		
	C253(OP)*3	S/W				A	B			
	C254	S/W	A	B	R				S	
	C255	S/W				A	B	R		S

H/W : Hardware counters S/W : Software counters U : Up-counting input D : Down-counting input
A : Phase A input B : Phase B input R : External reset input S : External start input

*1. Cautions on wiring should be considered for these high speed counters.
→ **For the wiring, refer to the hardware manual of the PLC main unit.**

*2. Hardware counters are switched to software counters when a comparison set/reset instruction for high speed counter (DHSCS, DHSCR, DHSZ or DHSCT) is used.
C253 is switched to a software counter when the logic for external reset input is reversed.
→ **For the condition under which hardware counters are handled as software counters, refer to Subsection 2.7.9.**

*3. When a special auxiliary relay is driven in a program, used input terminals and their functions are switched.
→ **For the method to use software counters as hardware counters, refer to Subsection 2.7.7.**

*4. 2-phase 2-input counters usually execute 1-edge counting, but can be used for 4-edge counting by combining special auxiliary relays.
→ **For the method to use a 2-phase 2-input counter for 4-edge counting, refer to Subsection 2.7.8.**

2. In FX3G/FX3GC PLCs

	Counter No.	Classification	Input terminal assignment							
			X000	X001	X002	X003	X004	X005	X006	X007
1-phase 1-counting input	C235	S/W	U/D							
	C236	S/W		U/D						
	C237	S/W			U/D					
	C238	S/W				U/D				
	C239	S/W					U/D			
	C240	S/W						U/D		
	C241	S/W	U/D	R						
	C242	S/W			U/D	R				
	C243	S/W					U/D	R		
	C244	S/W	U/D	R					S	
	C245	S/W			U/D	R				S
1-phase 2-counting input	C246	S/W	U	D						
	C247	S/W	U	D	R					
	C248	S/W				U	D	R		
	C248(OP)	S/W				U	D			
	C249	S/W	U	D	R				S	
	C250	S/W				U	D	R		S
2-phase 2-counting input	C251	S/W	A	B						
	C252	S/W	A	B	R					
	C253	S/W				A	B	R		
	C253(OP)	S/W				A	B			
	C254	S/W	A	B	R				S	
	C254(OP)	S/W							A	B
	C255	S/W				A	B	R		S

H/W : Hardware counters S/W : Software counters U : Up-counting input D : Down-counting input
A : Phase A input B : Phase B input R : External reset input S : External start input

3. In FX3S PLC

	Counter No.	Classification	Input terminal assignment							
			X000	X001	X002	X003	X004	X005	X006	X007
1-phase 1-counting input	C235	S/W	U/D							
	C236	S/W		U/D						
	C237	S/W			U/D					
	C238	S/W				U/D				
	C239	S/W					U/D			
	C240	S/W						U/D		
	C241	S/W	U/D	R						
	C242	S/W			U/D	R				
	C243	S/W					U/D	R		
	C244	S/W	U/D	R					S	
	C245	S/W			U/D	R				S
1-phase 2-counting input	C246	S/W	U	D						
	C247	S/W	U	D	R					
	C248	S/W				U	D	R		
	C248(OP)	S/W				U	D			
	C249	S/W	U	D	R				S	
	C250	S/W				U	D	R		S
2-phase 2-counting input	C251	S/W	A	B						
	C252	S/W	A	B	R					
	C253	S/W				A	B	R		
	C253(OP)	S/W				A	B			
	C254	S/W	A	B	R				S	
	C255	S/W				A	B	R		S

H/W : Hardware counters S/W : Software counters U : Up-counting input D : Down-counting input
A : Phase A input B : Phase B input R : External reset input S : External start input

4. In FX1S/FX1N/FX1NC PLCs

	Counter No.	Classification	Input terminal assignment							
			X000	X001	X002	X003	X004	X005	X006	X007
1-phase 1-counting input	C235	S/W	U/D							
	C236	S/W		U/D						
	C237	S/W			U/D					
	C238	S/W				U/D				
	C239	S/W					U/D			
	C240	S/W						U/D		
	C241	S/W	U/D	R						
	C242	S/W			U/D	R				
	C243	S/W					U/D	R		
	C244	S/W	U/D	R					S	
	C245	S/W			U/D	R				S
1-phase 2-counting input	C246	S/W	U	D						
	C247	S/W	U	D	R					
	C248	S/W				U	D	R		
	C249	S/W	U	D	R				S	
	C250	S/W				U	D	R		S
2-phase 2-counting input	C251	S/W	A	B						
	C252	S/W	A	B	R					
	C253	S/W				A	B	R		
	C254	S/W	A	B	R				S	
	C255	S/W				A	B	R		S

H/W : Hardware counters S/W : Software counters U : Up-counting input D : Down-counting input
A : Phase A input B : Phase B input R : External reset input S : External start input

5. In FX2N/FX2NC PLCs

	Counter No.	Classification	Input terminal assignment							
			X000	X001	X002	X003	X004	X005	X006	X007
1-phase 1-counting input	C235	H/W*1	U/D							
	C236	H/W*1		U/D						
	C237	S/W			U/D					
	C238	S/W				U/D				
	C239	S/W					U/D			
	C240	S/W						U/D		
	C241	S/W	U/D	R						
	C242	S/W			U/D	R				
	C243	S/W					U/D	R		
	C244	S/W	U/D	R					S	
	C245	S/W			U/D	R				S
1-phase 2-counting input	C246	H/W*1	U	D						
	C247	S/W	U	D	R					
	C248	S/W				U	D	R		
	C249	S/W	U	D	R				S	
	C250	S/W				U	D	R		S
2-phase 2-counting input	C251	H/W*1	A	B						
	C252	S/W	A	B	R					
	C253	S/W				A	B	R		
	C254	S/W	A	B	R				S	
	C255	S/W				A	B	R		S

H/W : Hardware counters S/W : Software counters U : Up-counting input D : Down-counting input
A : Phase A input B : Phase B input R : External reset input S : External start input

*1. Hardware counters are switched to software counters when a comparison set/reset instruction for high speed counter (DHSCS, DHSCR or DHSZ) is used.
→ **For the condition under which hardware counters are handled as software counters, refer to Subsection 2.7.9.**

6. In FXU/FX2C PLCs

	Counter No.	Classification	Input terminal assignment							
			X000	X001	X002	X003	X004	X005	X006	X007
1-phase 1-counting input	C235	S/W	U/D							
	C236	S/W		U/D						
	C237	S/W			U/D					
	C238	S/W				U/D				
	C239	S/W					U/D			
	C240	S/W						U/D		
	C241	S/W	U/D	R						
	C242	S/W			U/D	R				
	C243	S/W					U/D	R		
	C244	S/W	U/D	R					S	
	C245	S/W			U/D	R				S
1-phase 2-counting input	C246	S/W	U	D						
	C247	S/W	U	D	R					
	C248	S/W				U	D	R		
	C249	S/W	U	D	R				S	
	C250	S/W				U	D	R		S
2-phase 2-counting input	C251	S/W	A	B						
	C252	S/W	A	B	R					
	C253	S/W				A	B	R		
	C254	S/W	A	B	R				S	
	C255	S/W				A	B	R		S

H/W : Hardware counters S/W : Software counters U : Up-counting input D : Down-counting input
A : Phase A input B : Phase B input R : External reset input S : External start input

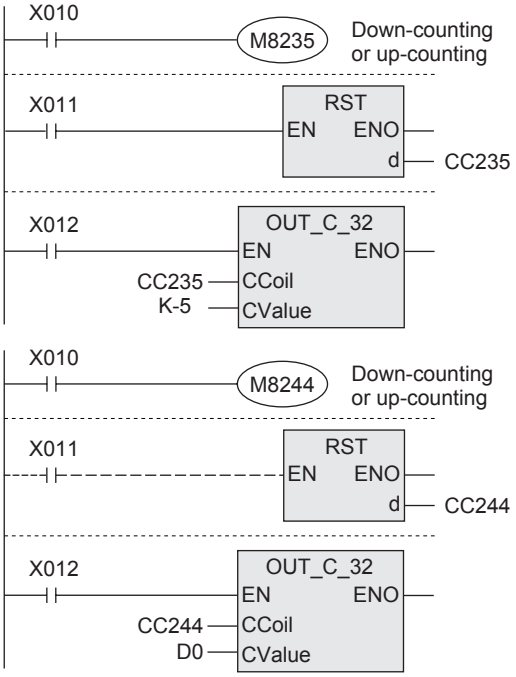
7. In FX0S/FX0/FX0N PLCs

	Counter No.	Classification	Input terminal assignment			
			X000	X001	X002	X003
1-phase 1-counting input	C235	S/W	U/D			
	C236	S/W		U/D		
	C237	S/W			U/D	
	C238	S/W				U/D
	C241	S/W	U/D	R		
	C242	S/W			U/D	R
	C244	S/W	U/D	R		S
1-phase 2-counting input	C246	S/W	U	D		
	C247	S/W	U	D	R	
	C249	S/W	U	D	R	S
2-phase 2-counting input	C251	S/W	A	B		
	C252	S/W	A	B	R	
	C254	S/W	A	B	R	S

H/W : Hardware counters S/W : Software counters U : Up-counting input D : Down-counting input
A : Phase A input B : Phase B input R : External reset input S : External start input

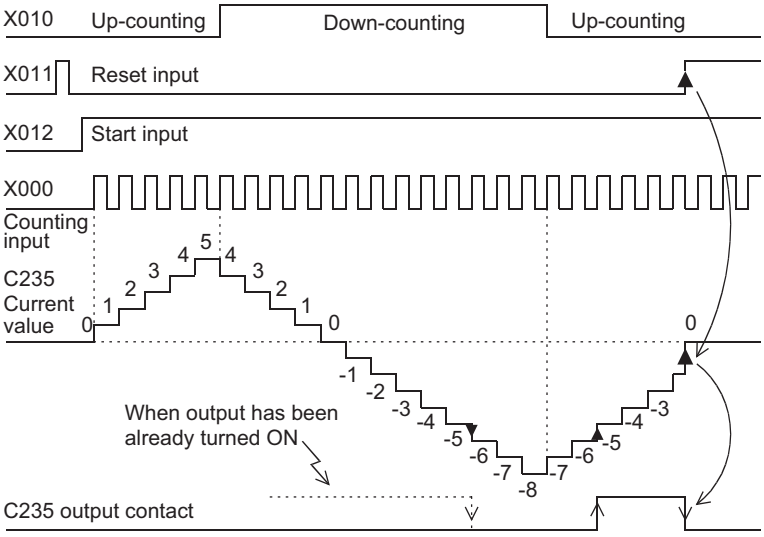
2.7.3 Handling of high speed counters

1. 1-phase 1-counting input



- While X012 is ON, C235 counts "OFF→ON" of the input X000.
- When X011 turns ON and then the RST instruction is executed, C235 is reset.
- The counting direction of counters C235 to C245 is switched to down-counting or up-counting when M8235 to M8245 turns ON or OFF.
- While X012 is ON, C244 immediately starts counting when the input X006 turns ON. The counting input is X000.
  In this example, the set value is indirectly specified as the contents of data registers (D1, D0).
- The high speed counter C244 can be reset using X011 in a sequence as shown in the figure, but it is immediately reset without any program when X001 is closed.In this case, any program including X011 is not necessary.
- The counting direction of counters C235 to C245 is switched to down-counting or up-counting when M8235 to M8245 turns ON or OFF.

Operation example
The counter C235 shown above operates as follows:

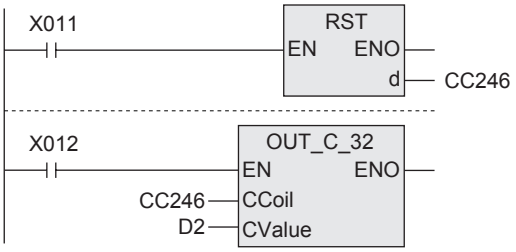


When the counting input X000 is given, C235 executes up-counting or down-counting as interrupt processing.

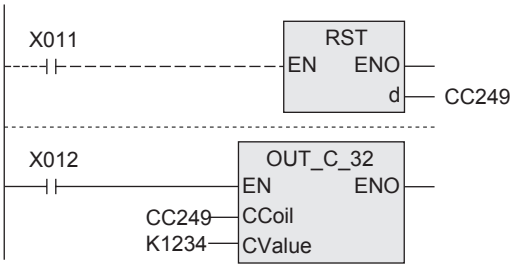
- When the current value of the counter increases from "-6" to "-5", the output contact is set (turned ON). When the current value decreases from "-5" to "-6", the output contact is reset (turned OFF).
- The current value increases or decreases without regard to the operation of the output contact. When the counter executes up-counting from "+2,147,483,647", the count value becomes "-2,147,483,648". In the same way, when the counter executes down-counting from "-2,147,483,648", the count value becomes "+2,147,483,647". (This type of operation is called ring counter.)
- When the reset input X011 turns ON and then the RST instruction is executed, the current value of the counter is reset to "0" and the output contact is turned OFF.
- In a latched type high speed counter, the current value, output contact operation status and reset status of the counter are latched (backed up) even if the power is interrupted.

2. 1-phase 2-counting input

These counters are 32-bit bidirectional counters. The operation of the output contact caused by the current value is equivalent to that in 1-phase 1-counting input type high speed counters described above.



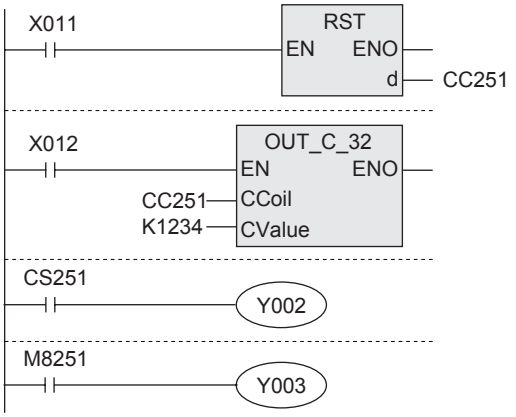
- While X012 is ON, C246 executes up-counting when the input X000 turns ON from OFF, and executes down-counting when the input X001 turns ON from OFF.
- The up/down-counting operation of C246 to C250 is indicated by the ON/OFF status of M8246 to M8250.
  ON: Down-counting
  OFF: Up-counting



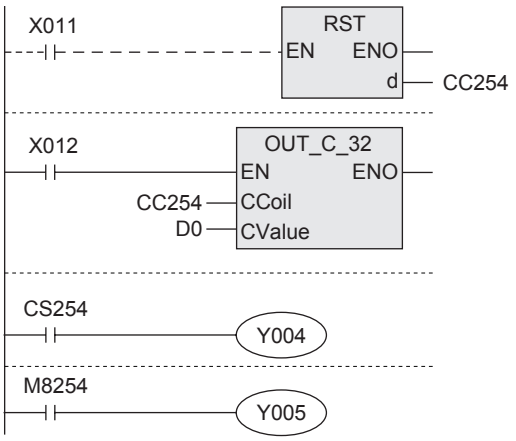
- While X012 is ON, C249 immediately starts counting when the input X006 (X003) turns ON.
  The up-counting input is X000, and the down-counting input is X001.
- The high speed counter C244 can be reset using X011 in a sequence as shown in the figure, but it is immediately reset without any program when X002 is closed. In this case, any program including X011 is not necessary.
- The up/down-counting operation of C246 to C250 is indicated by the ON/OFF status of M8246 to M8250.
  ON: Down-counting
  OFF: Up-counting

These counters are 32-bit bidirectional counters. The operation of the output contact caused by the current value is equivalent to that in 1-phase type high speed counters described above.

→ **Refer to "2.7.2 Input assignment for high speed counters".**

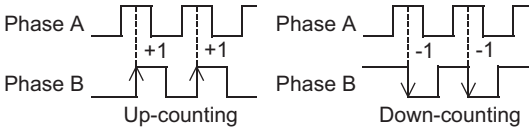


- While X012 is ON, C251 counts operations of inputs X000 (phase A) and X001 (phase B) as interrupt processing.
  When X011 turns ON and then the RST instruction is execute, C251 is reset.
- When the current value becomes equivalent to or larger than the set value, Y002 turns ON. When the current value becomes equivalent to or smaller than the set value, Y002 turns OFF.
- Y003 turns ON (for down-counting) or OFF (for up-counting) according to the counting direction.

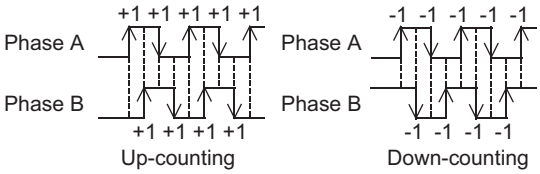


- While X012 is ON, C254 immediately starts counting when the input X006 turns ON. Its counting inputs are X000 (phase A) and X001 (phase B).
- In addition to reset by X011 in a sequence, C254 is immediately reset when X002 turns ON.
- When the current value becomes equivalent to or larger than the set value (D1, D0), Y004 turns ON. When the current value becomes equivalent to or smaller than the set value, Y004 turns OFF.
- Y005 turns ON (for down-counting) or OFF (for up-counting) according to the counting direction.

- 2-phase encoder generates outputs for the phase A and phase B with a phase difference of 90°. With these outputs, a high speed counter automatically executes up-counting and down-counting as shown in the figure below.
  - When a counter is executing 1-edge counting



  - When a counter is executing 4-edge counting



- The up/down-counting operation of C251 to C255 is indicated by the ON/OFF status of M8251 to M8255.
  ON: Down-counting
  OFF: Up-counting

2.7.4 Current value update timing and comparison of current value

1. Current value update timing

A high speed counter executes up-counting or down-counting when a pulse is input to its input terminal, but the current value of the high speed counter is updated at the timing shown in the table below.
When the current value of a high speed counter is used as it is in the MOV instruction, CMP instruction or applied instruction for data comparison, etc., the current value update timing is affected by scans as shown in the table.

	Current value update timing
Hardware counter	When OUT or HCMOV instruction is executed for counter
Software counter	When counting input is given

2. Comparison of the current value

The following two methods are available to compare and output the current value of a high speed counter.
Some instructions are not supported in some PLCs.

→ **Refer to the FX Structured Programming Manual [Basic & Applied Instruction].**

1) Using the comparison instruction (CMP), zone comparison instruction (ZCP) or data comparison instruction
When the comparison result is not necessary during counting operation, comparison may be smoothly executed in the main program[*1] if the DHCMOV instruction is used just before the comparison instruction (CMP or ZCP) or data comparison instruction.

*1. If it is necessary to execute comparison and update an output contact (Y) at the timing at which the current value of a high speed counter changes, use a comparison instruction for high speed counter (DHSCS, DHSCR, DHSZ or DHSCT).

2) Using a comparison instruction for high speed counter (DHSCS, DHSCR, DHSZ or DHSCT)
A comparison instruction for high speed counter (DHSCS, DHSCR, DHSZ or DHSCT) executes comparison and outputs the comparison result while the target high speed counter is counting.
The number of times of using these instructions is restricted as shown in the table below.
When an output relay (Y) is specified for the comparison result, the comparison result is directly reflected on the ON/OFF status of the output without regard to output refresh executed by the END instruction.
Mechanical operation delay (about 10 ms) cannot be avoided in a relay output type PLC.
Use a transistor output type PLC.

Instruction	Restriction of number of times of using instruction
DHSCS[*1]	FX3U/FX3UC PLCs: These instructions can be used up to 32 times including the DHSCT instruction. FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FXU/FX2C/FX2N/FX2NC/FX3S/FX3G/FX3GC PLCs: These instructions can be used up to 6 times. (FX0S/FX0/FX0N/FX1S/FX1N/FX1NC PLCs do not support the DHSZ instruction.)
DHSCR[*1]	
DHSZ[*1]	
DHSCT[*1]	This instruction can be used only once. (FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FXU/FX2C/FX2N/FX2NC/FX3S/FX3G/FX3GC PLCs do not support the DHSCT instruction.)

*1. When a comparison instruction for high speed counter is used, the maximum response frequency and total frequency of software counters may be restricted.

→ **For the maximum response frequency and total frequency of software counters, refer to Subsection 2.7.10.**

2.7.5 Related devices

1. Devices used to switch the counting direction of 1-phase 1-counting input counters

Type	Counter No.	Specifying device	Up-counting	Down-counting
1-phase 1-counting input	C235	M8235	OFF	ON
	C236	M8236		
	C237	M8237		
	C238	M8238		
	C239	M8239		
	C240	M8240		
	C241	M8241		
	C242	M8242		
	C243	M8243		
	C244	M8244		
	C245	M8245		

2. Devices used to monitor the counting direction of 1-phase 1-counting input counters and 2-phase 2-counting input counters

Type	Counter No.	Monitoring device	OFF	ON
1-phase 1-counting input	C246	M8246	Up-counting	Down-counting
	C247	M8247		
	C248	M8248		
	C249	M8249		
	C250	M8250		
2-phase 2-counting input	C251	M8251		
	C252	M8252		
	C253	M8253		
	C254	M8254		
	C255	M8255		

3. Devices used to switch the high speed counter function

FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FXU/FX2C/FX2N/FX2NC PLCs do not support this function.

Device number	Name	Description
M8388	Contact for switching function of high speed counter	Switches the function of high speed counter.
M8389	Function switching device	Switches the logic of the external reset input. (For details, refer to Subsection 2.7.6.) (FX3S/FX3G/FX3GC PLCs do not support this device.)
M8390		Switches the function of C244. (For details, refer to Subsection 2.7.7.) (FX3S/FX3G/FX3GC PLCs do not support this device.)
M8391		Switches the function of C245. (For details, refer to Subsection 2.7.7.) (FX3S/FX3G/FX3GC PLCs do not support this device.)
M8392		Switches the function of C248 and C253. (For details, refer to Subsection 2.7.7.)
M8395		Switches the function of C254. (For details, refer to Subsection 2.7.7.) (FX3S/FX3U/FX3UC PLCs do not support this device.)
M8198		Switches the edge counting type (between 1 and 4) of C251, C252 and C254. (For details, refer to Subsection 2.7.8.) (FX3S/FX3G/FX3GC PLCs do not support this device.)
M8199		Switches the edge counting type (between 1 and 4) of C253, C255 and C253 (OP). (For details, refer to Subsection 2.7.8.) (FX3S/FX3G/FX3GC PLCs do not support this device.)

4. Operation status of hardware counters and software counters

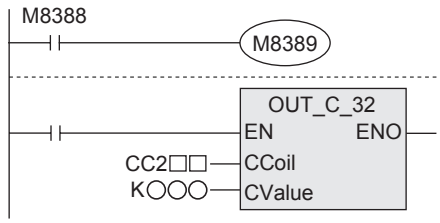
FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FXU/FX2C/FX2N/FX2NC/FX3S/FX3G/FX3GC PLCs do not support this function.

Device number	Name	Description	ON	OFF
M8380*1	Operation status	Indicates the operation status of C235, C241, C244, C246, C247, C249, C251, C252 and C254.	Software counter	Hardware counter
M8381*1		Indicates the operation status of C236.		
M8382*1		Indicates the operation status of C237, C242 and C245.		
M8383*1		Indicates the operation status of C238, C248, C248 (OP), C250, C253 and C255.		
M8384*1		Indicates the operation status of C239 and C243.		
M8385*1		Indicates the operation status of C240.		
M8386*1		Indicates the operation status of C244 (OP).		
M8387*1		Indicates the operation status of C245 (OP).		

*1. Cleared when the PLC mode switches from STOP to RUN.

2.7.6 Change of logic of external reset input signal

Counters C241 to C245, C247 to C250 and C252 to C255 are usually reset when the external reset input signal turns ON.
By using the program shown below, the logic can be reversed so that these counters are reset when the external reset input signal turns OFF.
FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FXU/FX2C/FX2N/FX2NC/FX3S/FX3G/FX3GC PLCs do not support this function.

Counter No.	Program to reverse logic of external reset input signal	Description
C241 to C245 C247 to C250 C252 to C255		The logic of the external reset input signal is reversed so that the counters are reset when the external reset input signal turns OFF. (The logic is reversed for all target counters.)

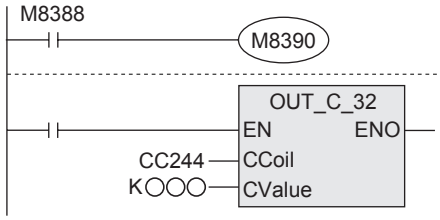
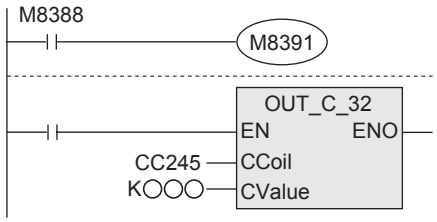
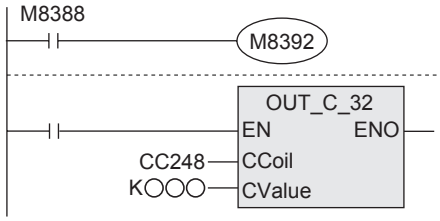
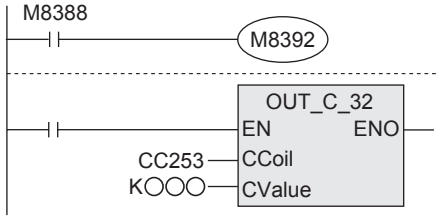
Caution

When the logic of the external reset input signal is reversed, C253 switches to a software counter.

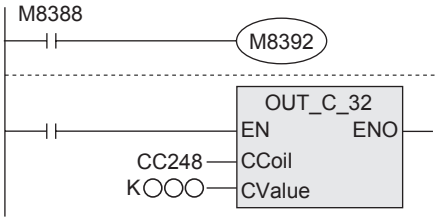
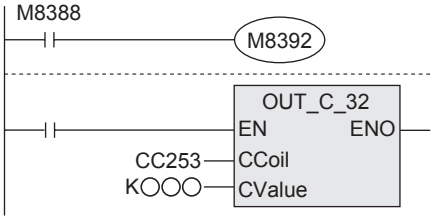
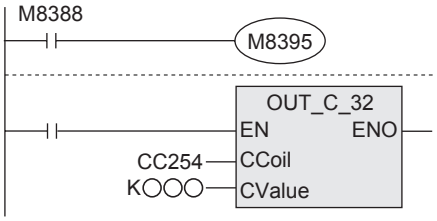
2.7.7 Assignment of counter input terminal and switching of function

The assignment of input terminal and the function of software counters change as shown below when the following special auxiliary relays are combined.
In a program, put a special auxiliary relay just before a target counter.
FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FXU/FX2C/FX2N/FX2NC PLCs do not support this function.

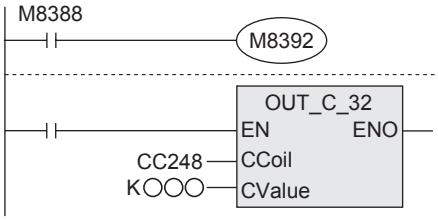
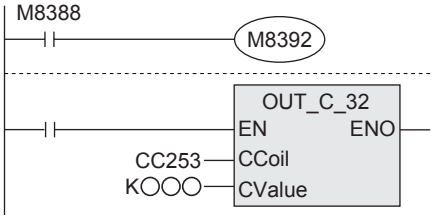
1. In FX3U/FX3UC PLCs

Counter No.	When using software counter as hardware counter	Description
C244(OP)		• The counting input changes from X000 to X006. • The reset input is not provided. • The start input is not provided. • It operates as a hardware counter.
C245(OP)		• The counting input changes from X002 to X007. • The reset input is not provided. • The start input is not provided. • It operates as a hardware counter.
C248(OP)		• The reset input is not provided. • It operates as a hardware counter.
C253(OP)		• The reset input is not provided. • It operates as a software counter.

2. In FX3G/FX3GC PLCs

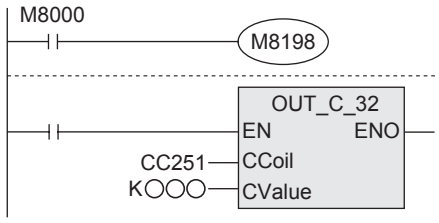
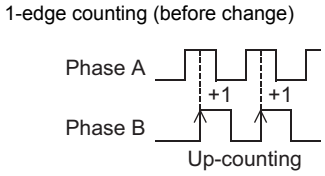
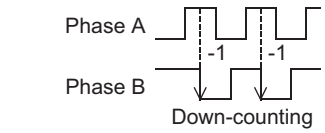
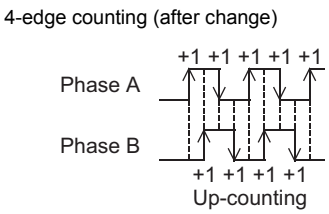
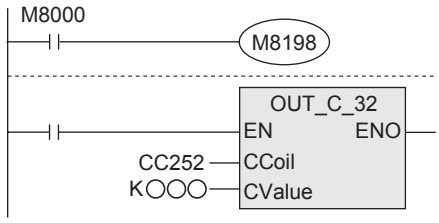
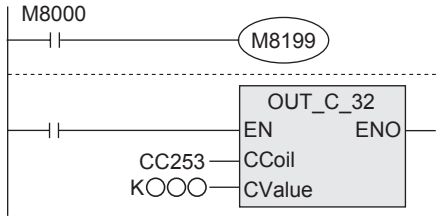
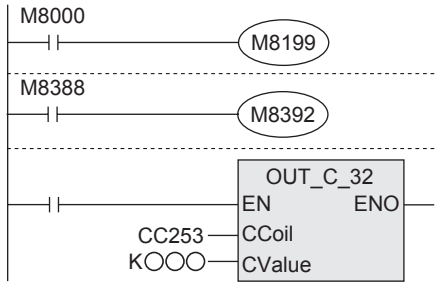
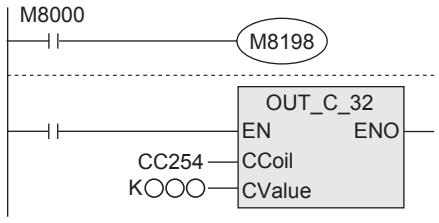
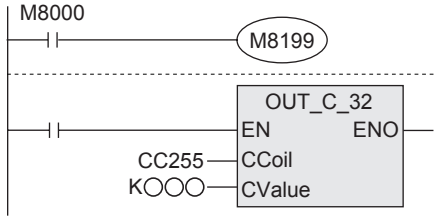
Counter No.	When using assignment of counter input terminal and switching of function	Description
C248(OP)		• The reset input is not provided.
C253(OP)		• The reset input is not provided.
C254(OP)		• The input counting (2-phase 2-counting) changes as follows: Phase A: Changes from X000 to X006. Phase B: Changes from X001 to X007. • The reset input is not provided. • The start input is not provided.

3. In FX3S PLCs

Counter No.	When using assignment of counter input terminal and switching of function	Description
C248(OP)		• The reset input is not provided.
C253(OP)		• The reset input is not provided.

2.7.8 How to use 2-phase 2-counting input counters C251 to C255 for 4-edge counting

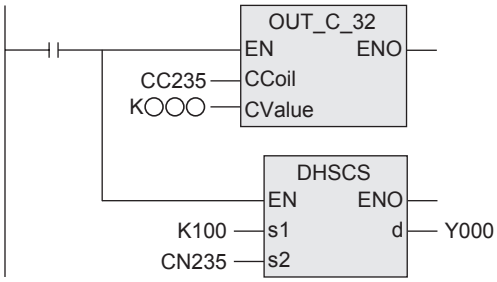
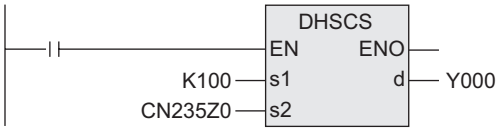
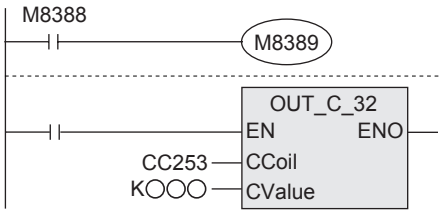
2-phase 2-counting input counters C251 to C255 usually executes 1-edge counting, but can be used for 4-edge counting by the programs shown in the table below.
FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FXU/FX2C/FX2N/FX2NC/FX3S/FX3G/FX3GC PLCs do not support this function.

Counter No.	When using 2-phase 2-counting input counter for 4-edge counting	Description
C251		  
C252		
C253		
C253(OP)		
C254		
C255		

2.7.9 Condition under which hardware counters are handled as software counters

High speed counters are classified into hardware counters and software counters. Under some conditions, however, hardware counters are handled as software counters.
In this case, use such counters within the range of maximum response frequency and total frequency determined for software counters.

Conditions under which hardware counters are handled as software counters

Counter No.	Conditions under which hardware counters are handled as software counters
FX3U/FX3UC PLCs C235 C236 C237 C238 C239 C240 C244(OP) C245(OP) C246 C248(OP) C251 C253 FX2N/FX2NC PLCs C235 C236 C246 C251	Because hardware counters execute counting at the hardware level of the PLC, they can execute counting without regard to the total frequency. However, they are handled as software counters in the following conditions.In this case, the maximum response frequency and total frequency are restricted in the same way as other software counters. Use M8380 to M8387 to know whether high speed counters are handled as hardware counters or software counters (only in FX3U/FX3UC PLCs). • When the DHSCS, DHSCR, DHSZ or DHSCT instruction is used for a hardware counter number, the corresponding hardware counter is handled as a software counter. (FX2N/FX2NC PLCs do not support the DHSCT instruction.) Example: C235  In this case, C235 is handled as a software counter. • When an index register is used for a counter number specified in the DHSCS, DHSCR, DHSZ or DHSCT instruction, all hardware counters are handled as software counters (only in FX3U/FX3UC PLCs). Example: C235Z0  • C253 (hardware counter) is handled as a software counter when the logic is reversed using the external reset input signal logic change function (only in FX3U/FX3UC PLCs). Example: When the logic of the external reset input signal is reversed for C253 → **For reverse of the logic of the external reset input signal, refer to Subsection 2.7.6.** 

2.7.10 Response frequency of high speed counters

1. Response frequency of hardware counters

The tables below show the maximum response frequency of hardware counters.
When hardware counters are handled as software counters in some operating conditions, their maximum response frequency becomes equivalent to that of software counters, and they are subject to restriction of the total frequency.

→ **For conditions under which hardware counters are handled as software counters, refer to the previous page.**

1) In FX3U/FX3UC PLCs

		Counter No.	Maximum response frequency	
			Main unit	FX3U-4HSX-ADP
1-phase 1-counting input		C235, C236, C237, C238, C239, C240	100kHz	200kHz
		C244(OP), C245(OP)	10kHz	
1-phase 2-counting input		C246, C248(OP)	100kHz	
2-phase 2-counting input	1-edge counting	C251, C253	50kHz	100kHz
	4-edge counting		50kHz	100kHz

2) In FX2N/FX2NC PLCs

	Counter No.	Maximum response frequency
		Main unit
1-phase 1-counting input	C235, C236	60kHz
1-phase 2-counting input	C246	60kHz
2-phase 2-counting input	C251	30kHz

2. Response frequency and total frequency of software counters

The tables below show the maximum response frequency and total frequency of software counters.
When the DHSZ or DHSCT instruction is used in a program, both the maximum response frequency and the total frequency are restricted for all software counters without regard to operands of the instruction.
While examining a system or creating a program, consider the restrictions, and use software counters within the allowable range of maximum response frequency and total frequency.

→ **For conditions under which hardware counters are handled as software counters, refer to the previous page.**

1) In FX3U/FX3UC PLCs

- When special analog adapters and FX3U/3UC Series special function blocks/units are not connected

Counter type				Magnification for calculating total frequency	Response frequency and total frequency according to instructions used							
					When DHSZ and DHSCT instructions are not used		When only DHSCT instruction is used		When only DHSZ instruction is used		When both DHSZ and DHSCT instructions are used	
		Software counter	Following software counter combined with DHSCS, DHSCR, DHSZ or DHSCT instruction[*1]		Maximum response frequency (kHz)	Total frequency (kHz)	Maximum response frequency (kHz)	Total frequency (kHz)	Maximum response frequency (kHz)	Total frequency (kHz)	Maximum response frequency (kHz)	Total frequency (kHz)
1-phase 1-counting input		C241, C242, C243, C244, C245	C235, C236, C237, C238, C239, C240	×1	40	80	30	60	40 - (Number of times of using instructions)[*2]	80 - 1.5 × (Number of times of using instructions)	30 - (Number of times of using instructions)[*2]	60 - 1.5 × (Number of times of using instructions)
		-	C244(OP), C245(OP)	×1	10		10					
1-phase 2-counting input		C247, C248, C249, C250	C246, C248(OP)	×1	40		30					
2-phase 2-counting input	1-edge counting	C252, C253(OP), C254, C255	C251, C253	×1	40		30					
	4-edge counting			×4	10		7.5		(40 - Number of times of using instructions) / 4		(30 - Number of times of using instructions) / 4	

*1. When index registers are added to a counter number specified by the DHSCS, DHSCR, DHSZ or DHSCT instruction, all hardware counters switch to software counters.

*2. High speed counters C244 (OP) and C245 (OP) can count at up to 10 kHz.

- When special analog adapters and FX3U/3UC Series special function blocks/units are connected

Counter type				Magnification for calculating total frequency	Response frequency and total frequency according to instructions used							
					When DHSZ and DHSCT instructions are not used		When only DHSCT instruction is used		When only DHSZ instruction is used		When both DHSZ and DHSCT instructions are used	
		Software counter	Following software counter combined with DHSCS, DHSCR, DHSZ or DHSCT instruction*1		Maximum response frequency (kHz)	Total frequency (kHz)	Maximum response frequency (kHz)	Total frequency (kHz)	Maximum response frequency (kHz)	Total frequency (kHz)	Maximum response frequency (kHz)	Total frequency (kHz)
1-phase 1-counting input		C241, C242, C243, C244, C245	C235, C236, C237, C238, C239, C240	×1	30	60	25	50	30 - (Number of times of using instructions)*2	50 - 1.5 × (Number of times of using instructions)	25 - (Number of times of using instructions)*2	50 - 1.5 × (Number of times of using instructions)
		-	C244(OP), C245(OP)	×1	10		10					
1-phase 2-counting input		C247, C248, C249, C250	C246, C248(OP)	×1	30		25					
2-phase 2-counting input	1-edge counting	C252, C253(OP), C254, C255	C251, C253	×1	30		25					
	4-edge counting			×4	7.5		6.2		(30 - Number of times of using instructions) / 4		(25 - Number of times of using instructions) / 4	

*1. When index registers are added to a counter number specified by the DHSCS, DHSCR, DHSZ or DHSCT instruction, all hardware counters switch to software counters.

*2. High speed counters C244 (OP) and C245 (OP) can count at up to 10 kHz.

- Calculation of the total frequency
  Total frequency ≥ Sum of "Response frequency of high speed counter × Magnification for calculating total frequency"
- Calculation example
  When only the DHSZ instruction is used 6 times in a program, the total frequency is calculated as follows in accordance with the columns for "When only DHSZ instruction is used" shown in the table above.
  This calculation example is provided for a system configuration not including special analog adapters and FX3U/FX3UC Series special function blocks/units.

Used high speed counter No.		Input frequency	Maximum response frequency calculation	Magnification for calculating total frequency	Used instruction
C237	Operates as software counter.	30kHz	40 - 6 (times) = 34 kHz	×1	DHSZ instruction × 6 times
C241	Software counter	20kHz	40 - 6 (times) = 34 kHz	×1	
C253(OP) [4-edge counting]		4kHz	{40 - 6 (times)} / 4 = 8.5 kHz	×4	

1) The total frequency is calculated as follows because the DHSZ instruction is used 6 times:
   Total frequency = 80 - 1.5 × 6 = 71 kHz
2) The sum of the response frequency of used high speed counters is calculated as follows:
   {30kHz×1[C237]} + {20kHz×1[C241]} + {4kHz×4[C253(OP)]} =66kHz ≤ 71kHz

2) In FX3G/FX3GC PLCs

Counter type		Response frequency	Overall frequency determined by condition of instructions used	
	Software counter		When DHSCS, DHSCR or DHSZ instruction is not used	When DHSCS, DHSCR or DHSZ instruction is used
1-phase 1-counting input	C235, C236, C238, C239, C241	60kHz	200 kHz - (Number of positioned axes*1 + Number of pulse width/period measurement inputs) × 40 kHz	60 kHz - (Number of positioned axes*1 × 5 kHz) (Number of pulse width/period measurement inputs × 20 kHz)
	C237, C240, C242, C243, C244, C245	10kHz		
1-phase 2-counting input	C246, C248(OP)	60kHz		
	C247, C248, C249, C250	10kHz		
2-phase 2-counting input	C251, C253(OP)	30kHz		
	C252, C253, C254, C254(OP), C255	5kHz		

*1. Number of axes used in the following positioning instructions:
PLSY, PLSR , DSZR , DTBL , ZRN , PLSV , DRVI , DRVA

- Calculation of the total frequency
The total frequency is calculated using the following expression:

Total frequency ≥ (Sum of frequency used by 1-phase counters) + (Sum of frequency used by 2-phase counters)

- Calculation example
Example1: When DHSCS, DHSCR or DHSZ instruction is not used, and instructions related to positioning (DRVI instruction [Y000] and DRVA instruction [Y001]) are used

Overall frequency: 200 kHz - (2 axes × 40 kHz) = 120 kHz

<Counter No.>	<Contents of use>
C235 (1-phase 1-counting) :	50 kHz is input.
C236 (1-phase 1-counting) :	50 kHz is input.
C237 (1-phase 1-counting) :	10 kHz is input.
C253 (2-phase 2-counting) :	5 kHz is input.
	Total115 kHz ≦ 120 kHz (Overall frequency)

Example2: When DHSCS, DHSCR or DHSZ instruction is not used, and instructions related to positioning (DRVI instruction [Y000] are used, Number of pulse width/pulse period measurement inputs(X003)

Overall frequency: 200 kHz - (1 axes + 1 input) × 40 kHz = 120 kHz

<Counter No.>	<Contents of use>
C235 (1-phase 1-counting) :	50 kHz is input.
C236 (1-phase 1-counting) :	50 kHz is input.
	Total100 kHz ≦ 120 kHz (Overall frequency)

3) In FX3S PLC

Counter type		Response frequency	Overall frequency determined by condition of instructions used	
	Software counter		When DHSCS, DHSCR or DHSZ instruction is not used	When DHSCS, DHSCR or DHSZ instruction is used
1-phase 1-counting input	C235, C236, C241	60kHz	200 kHz - (Number of positioned axes*1 × 40 kHz)	60 kHz - (Number of positioned axes*1 × 5 kHz)
	C237, C238, C239, C240, C242, C243, C244, C245	10kHz		
1-phase 2-counting input	C246	60kHz		
	C247, C248, C248(OP), C249, C250	10kHz		
2-phase 2-counting input	C251	30kHz		
	C252, C253, C253(OP), C254, C255	5kHz		

*1. Number of axes used in the following positioning instructions:
PLSY, PLSR, DSZR, ZRN, PLSV, DRVI, DRVA

- Calculation of the total frequency
  The total frequency is calculated using the following expression:

  Total frequency ≥ (Sum of frequency used by 1-phase counters) + (Sum of frequency used by 2-phase counters)

- Calculation example
  Example: When DHSCS, DHSCR or DHSZ instruction is not used, and instructions related to positioning (DRVI instruction [Y000] and DRVA instruction [Y001]) are used

  Overall frequency: 200 kHz - (2 axes × 40 kHz) = 120 kHz

  <Counter No.> <Contents of use>
  C235 (1-phase 1-counting) : 50 kHz is input.
  C236 (1-phase 1-counting) : 50 kHz is input.
  C237 (1-phase 1-counting) : 10 kHz is input.
  C253 (2-phase 2-counting) : 5 kHz is input.
  Total 115 kHz ≦ 120 kHz (Overall frequency)

4) In FX1S/FX1N/FX1NC PLCs

Counter type		Magnification for calculating total frequency	Response frequency and total frequency according to instructions used			
			When DHSCS and DHSCR instructions are not used		When DHSCS and DHSCR instructions are used	
	Software counter		Maximum response frequency (kHz)	Total frequency (kHz)	Maximum response frequency (kHz)	Total frequency (kHz)
1-phase 1-counting input	C235 to C245	×1	C235, C236, C246(1-phase)*1 C251(2-phase) :30 C237 to C245, C247 to C250(1-phase) :10 C252 to 255(2-phase) :5	60	C235, C236, C246(1-phase)*1 C251(2-phase) :30 C237 to C245, C247 to C250(1-phase) :10 C252 to 255(2-phase) :5	30
1-phase 2-counting input	C246 to C250	×1				
2-phase 2-counting input	C251 to C255	×2				

*1. The maximum response frequency is 60 kHz.

When using two or more high speed counters or when combining a high speed counter and the SPD, PLSY or PLSR instruction, make sure that the sum of the processing frequency does not exceed the total frequency shown above.

Calculation example (When the DHSCS and DHSCR instructions are not used)

Used high speed counter No.		Input/output frequency	Magnification for calculating total frequency	Calculated value
C235(1-phase)	Software counter	30kHz	×1	30kHz
C237(1-phase)	Software counter	10kHz	×1	10kHz
C253(2-phase)	Software counter	5kHz	×2	10kHz

Total frequency = 60 kHz
Sum of processing frequency = 30 kHz + 10 kHz + 10 kHz = 50 kHz
Sum of processing frequency (50 kHz) ≤ Total frequency (60 kHz)

5) In FX2N/FX2NC PLCs

Counter type			Magnification for calculating total frequency	Response frequency and total frequency according to instructions used					
				When DHSCS, DHSCR and DHSCZ instructions are not used		When only DHSCS and DHSCR instructions are used		When only DHSCZ instruction is used	
	Software counter	Following software counter combined with DHSCS, DHSCR or DHSCZ instruction		Maximum response frequency (kHz)	Total frequency (kHz)	Maximum response frequency (kHz)	Total frequency (kHz)	Maximum response frequency (kHz)	Total frequency (kHz)
1-phase 1-counting input	C237 to C245	C235, C236	×1	10	20	10	11	5.5	5.5
1-phase 2-counting input	C247 to C250	C246	×1	10		10		5.5	
2-phase 2-counting input	C252 to C255	C251	×2	5		C251:5 C252 to C255:4		4	

When using two or more high speed counters or when combining a high speed counter and the SPD, PLSY or PLSR instruction, make sure that the sum of the processing frequency does not exceed the total frequency shown above.

Calculation example (When the DHSCS, DHSCR and DHSZ instructions are not used)

Used high speed counter No.		Input/output frequency	Magnification for calculating total frequency	Calculated value
C235(1-phase)	Handled as hardware counter	60kHz	(Not required to be added because C235 is handled as hardware counter)	(Not required to be added because C235 is handled as hardware counter)
C237(1-phase)	Software counter	3kHz	×1	3kHz
C253(2-phase)	Software counter	2kHz	×2	4kHz
PLSY(Y0)	Pulse output instruction	7kHz	-	7kHz
PLSY(Y1)		4kHz	-	4kHz

Total frequency = 20 kHz
Sum of processing frequency = 3 kHz + 4 kHz + 7 kHz + 4 kHz = 18 kHz
Sum of processing frequency (18 kHz) ≤ Total frequency (20 kHz)

6) In FXU/FX2C PLCs

The maximum response frequency of high speed counters C235 to C255 is generally as follows (when the DHSCS and DHSCR instructions are not used or not driven):

Sum of frequency of 1-phase counters + (Sum of frequency of 2-phase counters) × 4 ≤ 20 kHz maximum

However, the actual maximum response frequency varies depending on used counters and DHSCS, DHSCR and DHSZ instructions.

The table below shows the maximum response frequency of each counter. Do not exceed the values shown below.

(Each value indicates the maximum response frequency of one high speed counter.)

Combination of high speed counters	Number of 1-phase counters driven simultaneously	Number of 2-phase counters driven simultaneously	When DHSCS, DHSCR and DHSZ instructions are not used or not driven		DHSCS, DHSCR		When one or two DHSZ instructions are driven	
			Maximum response frequency of 1-phase counters					
Counter No. when up to three 1-phase counters are driven simultaneously→			C235, C237, C238	C236, C239, C240	C235, C237, C238	C236, C239, C240	C235, C237, C238	C236, C239, C240
When only 1-phase counters are used	1	-	10	7.0	7.0	5.0	5.0	4.0
	2	-	10[A]	3.5	4.0[B]	2.5	2.5	1.5
	3	-	6.6	2.5	2.5	2.0	2.5	1.5
	4	-	2.5		1.5		1.5	
	5	-	2.5		1.5		1.5	
	6	-	2.5		1.5		1.0	
When one 2-phase counter (1 kHz or less) and one to four 1-phase counters are used	1	1	5.0		4.0		3.0	
	2	1	4.0		2.0		1.0	
	3	1	3.0		2.0		1.0	
	4	1	2.0		1.0		1.0	

			Maximum response frequency of 2-phase counters (kHz)		
When only 2-phase counters are used	-	1	2.0	2.0	2.0
	-	2	2.0	1.5	1.3

1) The maximum response frequency of counters changes when the DHSCS, DHSCR and DHSZ instructions are used.
   For example, the maximum response frequency of C235 and C237 driven at the same time is 10 kHz (part A), but decreases to 4 kHz (part B) respectively when the DHSCS and DHSCR instructions are driven at the same time.
2) When the DHSCS, DHSCR and DHSZ instructions are driven at the same time, the maximum response frequency is equivalent to the maximum response frequency when the DHSZ instruction is driven.

7) In FX0/FX0N PLCs

Counter type		Magnification for calculating total frequency	Maximum response frequency (kHz)	Total frequency (kHz)
	Software counter			
1-phase 1-counting input	C235 to C238, C241 to C242, C244	×1	5	5
1-phase 2-counting input	C246 to C247, C249	×1	5	
2-phase 2-counting input	C251 to C252, C254	×1	2	

It is not allowed to use 1-phase counters and 2-phase counters together.

Calculation example

Used high speed counter No.		Input/output frequency	Magnification for calculating total frequency	Calculated value
C235(1-phase)	Software counter	1kHz	×1	1kHz
C236(1-phase)	Software counter	3kHz	×1	3kHz

Total frequency = 5 kHz
Sum of processing frequency = 1 kHz + 3 kHz = 4 kHz
Sum of processing frequency (4 kHz) ≤ Total frequency (5 kHz)

8) In FX0S PLCs

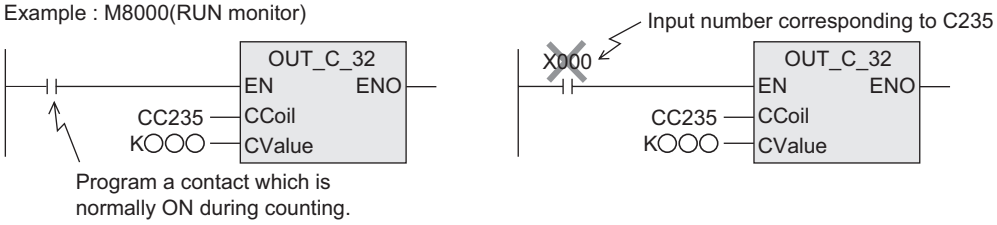
Counter type		Magnification for calculating total frequency	Maximum response frequency (kHz)	Total frequency (kHz)
	Software counter			
1-phase 1-counting input	C235 to C238, C241 to C242, C244	×1	7	14
1-phase 2-counting input	C246 to C247, C249	×1	7	
2-phase 2-counting input	C251 to C252, C254	×1	2	

Used high speed counter No.		Input/output frequency	Magnification for calculating total frequency	Calculated value
C237(1-phase)	Software counter	3kHz	×1	3kHz
C238(1-phase)	Software counter	3kHz	×1	3kHz
C251(2-phase)	Software counter	2kHz	×1	4kHz

Total frequency = 14 kHz
Sum of processing frequency = 3 kHz + 3 kHz + 4 kHz = 10 kHz
Sum of processing frequency (10 kHz) ≤ Total frequency (14 kHz)

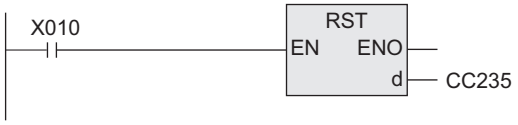
2.7.11 Cautions on use

- For a contact to drive the coil of a high speed counter, use a contact which is normally ON during high speed counting.

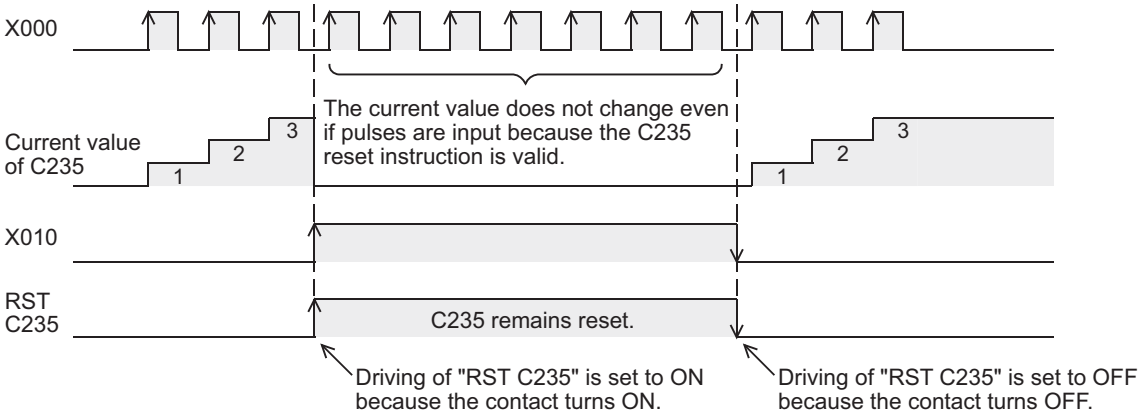


- If the operation of a high speed counter is triggered by a device equipped with a contact such as simulation switch, the counter may malfunction due to noise generated by chattering of the switch.
- The input filter of input terminals in the PLC main unit used for high speed counters are automatically set as follows:
  FX3U/FX3UC PLCs: 5 µs (X000 to X005) or 50 µs (X006 and X007)
  FX3G/FX3GC PLCs: 10 µs (X000, X001, X003 and X004) or 50 µs (X002 and X005 to X007)
  FX3S PLC: 10 µs (X000 and X001) or 50 µs (X002 to X007)
  FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs: 20 µs (X000 and X001) or 50 µs (X002 to X005)
  FX0S/FX0/FX0N/FXU/FX2C PLCs: 50 µs (X000 to X003 or X005)
  Accordingly, it is not necessary to use the REFF instruction or special data register D8020 (input filter adjustment).
  The input filter of input relays not used for high speed counters remain 10 ms (initial value).
- Inputs X000 to X007 (X003) are used for high speed counters, input interrupt, pulse catch, SPD/DSZR/DVIT/ZRN instructions and general-purpose inputs.
  Make sure to use each input terminal only once.
  For example, when C251 is used, X000 and X001 are occupied. As a result, "C235, C236, C241, C244, C246, C247, C249, C252 and C254", "input interrupt pointers I00* and I10*", "pulse catch contacts M8170 and M8171" and "SPD instruction using X000 and/or X001" cannot be used.
- When a counting input pulse is not provided, none of high speed counter output contacts does not turn ON even if the PLC executes an instruction in the status "Current value = Set value".
- Counting can be started or stopped in a high speed counter when the output coil (OUT C**) is set to ON or OFF. Program this output coil in the main routine.
  If the output coil is programmed in a step ladder circuit, subroutine or interrupt routine, counting cannot be started or stopped until the step ladder or routine is executed.
- Make sure that the signal input to a high speed counter does not exceed the response frequency described above.
  If an input signal exceeds the response frequency, a WDT error or parallel link (communication) malfunction may occur.
- The response frequency changes depending on number of used counters, but the input filter value is fixed. Note that noise above the response frequency may be counted depending on the filter value of the used input.
- When a high speed counter is reset by the RST instruction, it cannot execute counting until driving of the RST instruction is set to OFF.

1) Program example

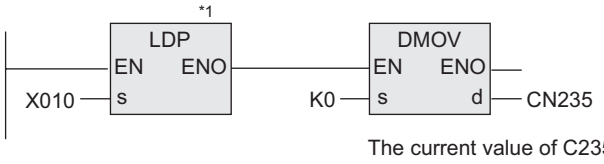


2) Timing chart



- Write the following program "to reset only the current value of a high speed counter (and not to turn OFF the contact)".

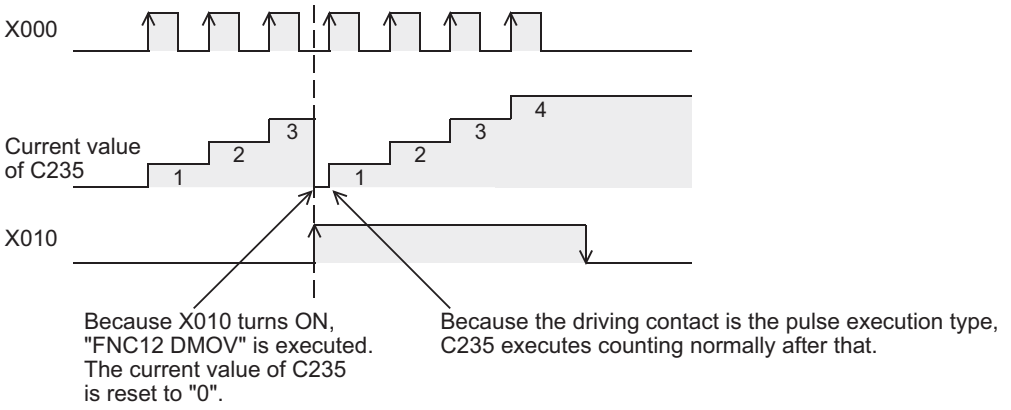
1) Program example



The current value of C235 is cleared (to "0").

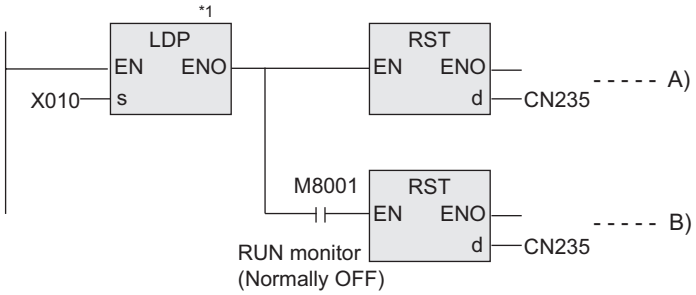
*1. When the driving contact is the continuous execution type, the current value of the counter is reset to "0" at each scan while X010 remains ON.

2) Timing chart



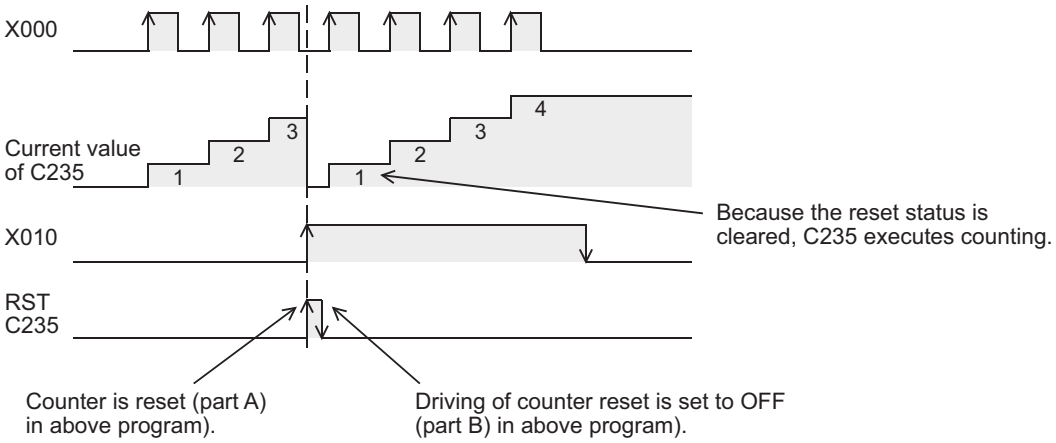
- Write the following program "to turn OFF the contact and reset the current value of a high speed counter".

1) Program example



*1. When the driving contact is the continuous execution type, the current value of the counter is reset to "0" and the counter reset status is cleared at each scan while X010 remains ON.

2) Timing chart



- For writing the symbolic information and changing the set values of timers and counters using a peripheral equipment, it is recommended to create programs with the set values specified indirectly.
  If the set values are specified directly, programs cannot be restored from the symbolic information after the set values are changed.

2.8 Data Register and File Register [D]

Data registers store numeric values. File registers are handled as initial values of data registers.
FX0S and FX0 are not applicable to file registers.
Each data register or file register stores 16-bit data (whose most significant bit specifies the positive or negative sign). Two data registers or file registers combined can store 32-bit data (whose most significant bit specifies the positive or negative sign).

→ **For the functions and operations of file registers, refer to Subsection 2.8.4.**

2.8.1 Numbers of data registers and file registers

The tables below show data register and file register [D] numbers. (Numbers are assigned in decimal.)

1. In FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs

	Data registers				File registers (latched (battery backed-up) type)
	General type	Latched (battery backed-up) type	Fixed latched (battery backed-up) type	Special type	
FX3U/FX3UC PLCs	D0 to D199 200 points*1	D200 to D511 312 points*2	D512 to D7999 7488 points*3*4	D8000 to D8511 512 points*3	D1000*4 and later 7000 points maximum

	Data registers				File registers (latched (EEPROM backed-up) type)
	General type	Fixed latched (EEPROM backed-up) type	General type	Special type	
FX3G/FX3GC PLCs	D0 to D127 128 points*3	D128 to D1099 972 points*3	D1100 to D7999 6900 points*5	D8000 to D8511 512 points*3	D1000*4 and later 7000 points maximum

	Data registers				File registers (latched (EEPROM backed-up) type)
	General type	Fixed latched (EEPROM backed-up) type)	General type	Special type	
FX3S PLC	D0 to D127 128 points	D128 to D255 128 points	D256 to D2999 2744 points	D8000 to D8511 512 points	D1000*4 and later 2000 points maximum

*1. This area is not latched, but can be changed to the latched (backed-up) area by parameter setting.

*2. This area is latched, but can be changed to the non-latched (non-backed-up) area by parameter setting.

*3. The characteristics about latch (battery backup) cannot be changed using parameters.

*4. Data registers D1000 and later can be used as file registers in units of 500 points by parameter setting.

*5. This area can be changed to the latched (battery backed-up) area by parameter setting while an optional battery is attached, but the latched (battery backed-up) range cannot be specified.

When simple N:N link or parallel link is used, some data registers are occupied for the link.

→ **Refer to the data communication manual.**

2. In FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs

	Data registers						File registers (latched (battery backed-up) type)
	General type	Latched (battery backed-up) type	Fixed latched (battery backed-up) type			Special type	
			Battery backed-up	EEPROM backed-up	Capacitor backed-up		
FX1S PLCs	D0 to D127 128 points*3	-	-	D128 to D255 128 points*3	-	D8000 to D8255 256 points	D1000*4 and later 1500 points maximum
FX1N/FX1NC PLCs	D0 to D127 128 points*3	-	-	D128 to D255 128 points*3	D256 to D7999 7744 points*3	D8000 to D8255 256 points	D1000*4 and later 7000 points maximum
FX2N/FX2NC PLCs	D0 to D199 200 points*1	D200 to D511 312 points*2	D512 to D7999 7488 points*3	-	-	D8000 to D8255 256 points	D1000*4 and later 7000 points maximum

*1. This area is not latched, but can be changed to the latched (backed-up) area by parameter setting.

*2. This area is latched, but can be changed to the non-latched (non-backed-up) area by parameter setting.

*3. The characteristics about latch (backup) cannot be changed using parameters.

*4. Data registers D1000 and later can be used as file registers in units of 500 points by parameter setting.

When simple N:N link or parallel link is used, some data registers are occupied for the link.
→ **Refer to the data communication manual.**

3. FX0S/FX0/FX0N/FXU/FX2C PLCs

	Data registers				File registers
	General type	Latched (backed-up) type	Fixed latched (backed-up) type	Special type	
FX0/FX0S PLCs	D0 to D29 30 points*4	-	D30, 31 2 points*3	D8000 to D8069 27 points	-
FX0N PLCs	D0 to D127 128 points*4	-	D128 to D255 128 points*3	D8000 to D8129 38 points	D1000*5 and later 1500 points maximum
FXU/FX2C PLCs	D0 to D199 200 points*1	D200 to D511 312 points*2 For link Master→Slave:D490 to D499 Slave→Master:D500 to D509	D512 to D999 488 points*3	D8000 to D8137 85 points	D1000*5 and later 2000 points maximum D6000 to D7999*6 2000 points(RAM file)
FXU PLCs (Ver. 2.30 or earlier) (Reference)			-	D8000 to D8135 69 points	-

*1. This area is not latched, but can be changed to the latched (backed-up) area by parameter setting.

*2. This area is latched, but can be changed to the non-latched (non-backed-up) area by parameter setting.

*3. This area is fixed to the latched (backed-up) type (, and the contents can be cleared by the RST and ZRST instructions).

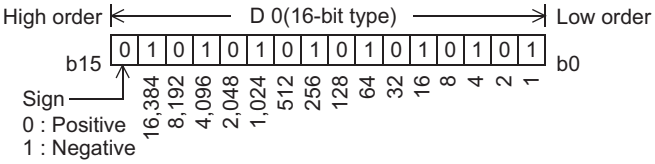
*4. This area is fixed to the non-latched (non-backed-up) type (, and the characteristics about latch (backup) cannot be changed).

*5. Data registers D1000 and later can be used as file registers in units of 500 points by parameter setting.

*6. Data registers D6000 to D7999 can be used as file registers by driving the special auxiliary relay M8074 and prohibiting sampling trace.
Different from file registers secured inside the program memory, D6000 to D7999 are secured inside the system memory of the PLC, and may be called "RAM file registers" (to notify that they are the latched type).

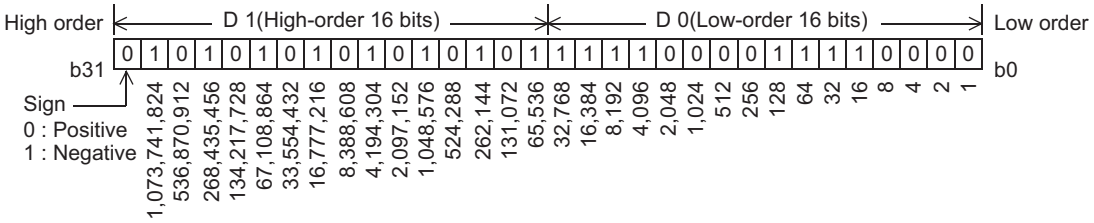
2.8.2 Structure of data registers and file registers

1) 16-bit type
One (16-bit) data register or file register can store a numeric value within the range from -32768 to +32767.



A numeric value can be read from or written to a data register by an instruction usually.
Or a numeric value can be directly read from or written to a data register from a display unit, display module or programming tool.

2) 32-bit type
Two serial data registers or file registers can express 32-bit data.
- A data register having a larger device number handles high-order 16 bits, and a data register having a smaller device number handles low-order 16 bits.
- In the index type, V handles high-order 16 bits, and Z handles low-order 16 bits.
- Two serial data registers or file registers can store a numeric value within the range from -2,147,483,648 to +2,147,483,647.



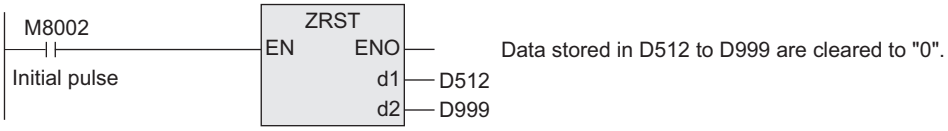
In the case of 32-bit type, when a data register or file register on the low-order side (Example: D0) is specified, the subsequent number on the high-order side (Example: D1) is automatically occupied.
Either an odd or even device number can be specified for the low-order side, but it is recommended to specify an even device number for the low-order side under consideration of the monitoring function of display units, display modules and programming tools.

2.8.3 Functions and operation examples of data registers

Data registers store numeric data.
Each data register stores 16-bit data (whose most significant bit specifies the positive or negative sign). Two data registers combined can store 32-bit data (whose most significant bit specifies the positive or negative sign).

1. General type and latched (backed-up) type data registers

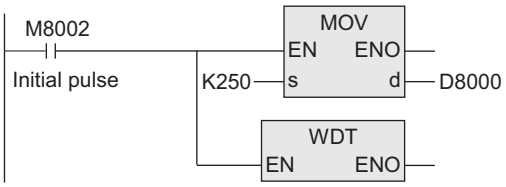
- Once data is written to a data register, it does not change unless other data overwrites it.
  When the PLC mode switches from "RUN" to "STOP" or when the power is interrupted, however, all data stored in general type data registers are cleared to "0".
  If the special auxiliary relay M8033 has been driven in advance, data are held even when the PLC mode switches from "RUN" to "STOP".
- Latched (backed-up) type data registers hold their contents even when the PLC mode switches from "RUN" to "STOP" or when the power is interrupted.
- The contents of data registers are latched (backed up) by a battery, EEPROM, etc. built in the PLC.
  → **For details on each backup method, refer to Section 2.6.**
- When using fixed latched (backed-up) type data registers as general type registers, provide the following reset circuit using the RST or ZRST instruction at the head step in a program.



→ **For file registers, refer to Subsection 2.8.4.**

2. Special type data registers

- Special type data registers store specific data in advance, or receive data for special purpose.
  The contents of special data registers are set to their initial values when the power is turned ON.
  (Generally, these data registers are cleared to "0" first, and then initial values (if there are any) are written by the system ROM.)
- For example, the watchdog timer time is set initially to D8000 by the system ROM. To change the contents, write desired time to D8000 using the transfer instruction MOV.



The watchdog timer is set to 250 ms.

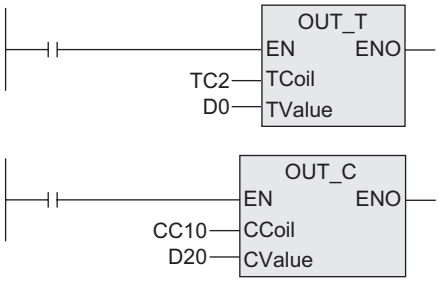
The watchdog timer is refreshed.

→ **For the backup characteristics of special data registers, refer to Section 1.2 and Chapter 4.**
→ **For types and functions of special data registers, refer to Chapter 4.**

3. Operation examples

Data registers can be used in various controls handling numeric data.
This paragraph explains representative operation examples among various applications.
For the full use of data registers, refer to the explanation on applied instructions provided later.

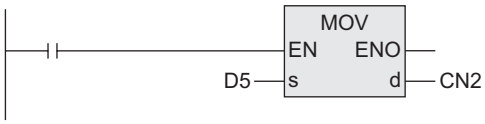
1) Specifying the set value of a timer or counter



A counter or timer operates while regarding the contents of a specified data register as its set value.

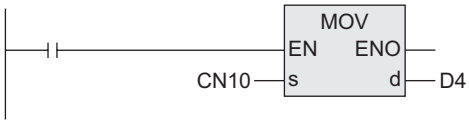
2) Operation examples using the MOV instruction

a) Changing the current value of a counter



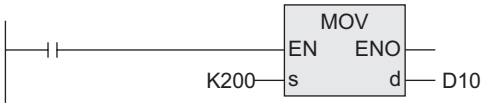
The current value of the counter C2 is changed to the contents of D5.

b) Reading the current value of a timer or counter



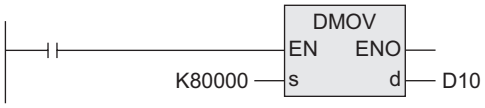
The current value of the counter C10 is transferred to D4.

c) Storing a numeric value in data registers
16-bit type



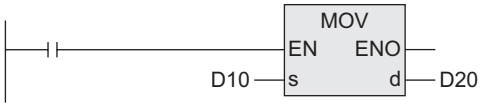
"200 (decimal value)" is transferred to D10.

32-bit type



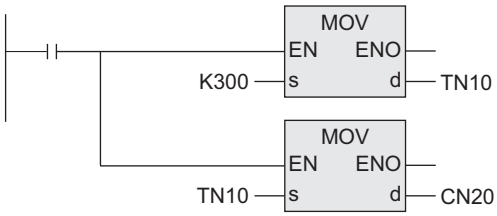
"80000 (decimal value)" is transferred to D10 and D11.
Because a numeric value larger than "32767" is 32-bit data, a 32-bit operation is required.
When a data register on the low-order side (D10) is specified, a data register on the high-order side (D11) is automatically occupied.

d) Transferring the contents of a data register to another data register



The contents of D10 are transferred to D20.

3) Using unoccupied timers and counters as data registers
Operation example using the MOV instruction
Timers and counters not used in a program can be used as devices for storing 16-bit or 32-bit numeric values (data registers).



"300 (decimal value)" is transferred to T10.

The contents of T10 are transferred to the current value register of C20.
In this case, T10 is not working as a timer, but is working as a data register.

With regard to 32-bit data, two 16-bit timers or counters (such as C1 and C0) can express 32-bit data in the same way as data registers.
Each 32-bit counter (such as C200) can handle 32-bit data individually.

2.8.4 Functions and operation examples of file registers

A file register sets the initial value of a data register having the same device number.
Each file register stores 16-bit data (whose most significant bit specifies the positive or negative sign). Two file registers combined can store 32-bit data (whose most significant bit specifies the positive or negative sign).
Data registers D1000 and later can be specified as file registers by parameter setting.

→ **For the maximum number of points to be specified as file registers, refer to Subsection 2.8.1.**

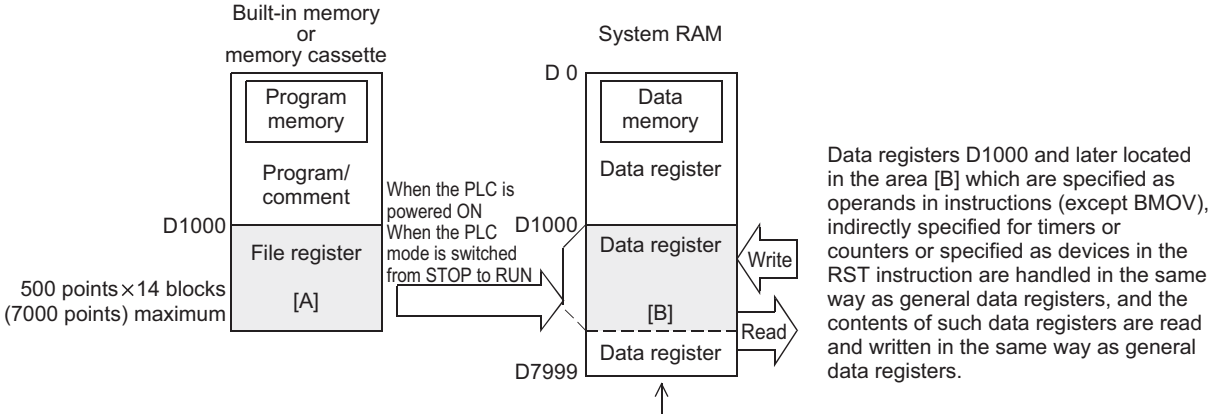
- In parameter setting, 1 to 14 blocks can be specified. One block secures 500 file registers, and uses the program memory area for 500 steps.

→ **For the number of blocks to be specified as parameter setting, refer to Subsection 6.3.**

- When some of data registers D1000 and later are specified as file registers, remaining unspecified data registers can be used as data registers.
The program Capacity and file register points differs from one PLC to another.
This explanation here uses the FX3U and FX3UC PLCs as examples.

1. Operation of file registers

- The contents of the file register area [A] in the program memory set inside the built-in memory or an optional memory are batch-transferred to the data register area [B] in the data memory inside the system RAM when the PLC is powered ON or when the PLC mode is switched from "STOP" to "RUN".
If data registers in the area [A] are specified as file registers by parameter setting, the contents of the area [A] in the program memory are batch-transferred to the area [B] in the data memory when the PLC is powered ON or when the PLC mode is switched from "STOP" to "RUN". This means that the contents of changes stored in the data memory are initialized.
If it is necessary to save the contents of changes caused by a sequence program and stored in the data memory, update the contents of the area [A] to changed values using the same-number register update function of the BMOV instruction described later.



- Difference between the BMOV instruction and other instructions
The table below shows difference between the BMOV instruction and other instructions for file registers (D1000 and later).

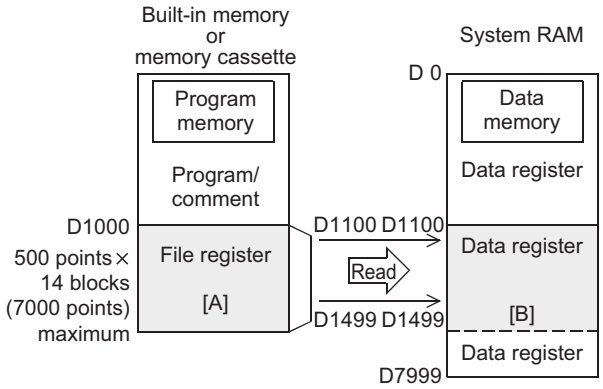
Instruction	Description	Remarks
BMOV instruction	Reads data from and writes data to the file register area [A] in the program memory.	Data writing to file registers using the BMOV instruction is not available in FX0N/FXU (Ver. 2.30 or earlier) PLCs. Use peripheral equipment for data writing.
Other instructions	Read data from and write data to the data register area [B] in the image memory in the same way as data reading from and data writing to general data registers.	Because the data register area [B] is provided in the system RAM inside the PLC, their contents can be arbitrarily changed without regard to restriction of the optional memory type.

The contents of data registers specified as file registers are automatically copied from the file register area [A] to the data register area [B] when the PLC is powered ON.

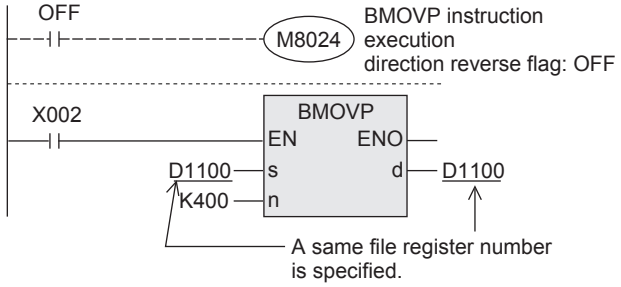
- When a file register is monitored from peripheral equipment, the contents of the data register area [B] in the data memory are read.
When "file register current value change", "file register forced reset" or "PC memory all clear" is executed from peripheral equipment, the contents of the file register area [A] in the program memory are changed, and then the changed contents are automatically transferred to the data register area [B].
Accordingly, when overwriting of file registers is required, the program memory should be located in the built-in memory or a memory cassette whose protect switch is set to OFF. (File registers stored in a memory cassette cannot be overwritten from peripheral equipment if its protect switch is ON.)

2. File register ↔ Data register <Same-number register update function of the BMOV instruction>

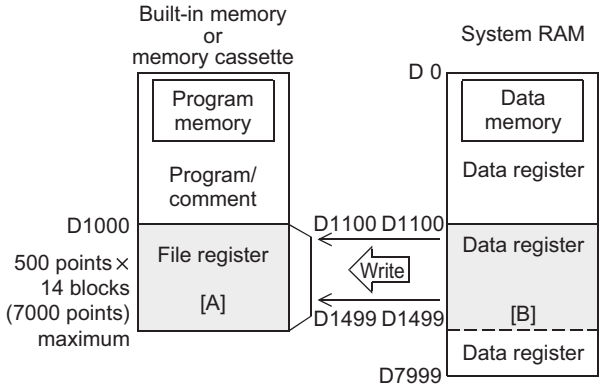
When a same file register is specified in both input variables (s) and (d) in the BMOV instruction, the same-number register update function of the BMOV instruction is activated as described below.
FX0N/FX1S/FXU/FX2C PLCs do not support the same-number register update function.
In FXU/FX2C PLCs, the special device M8198 reverses the BMOV instruction execution direction.



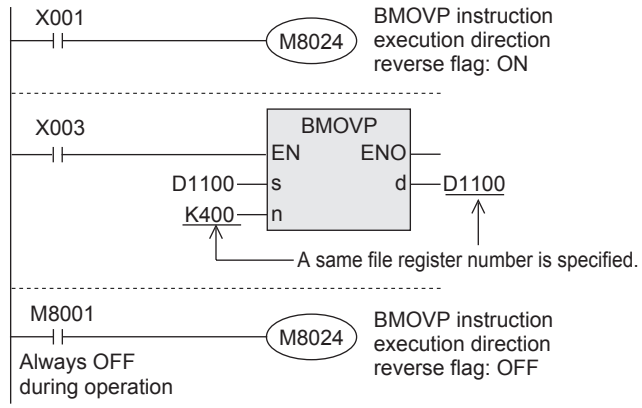
Read



- When X002 is set to ON while the BMOV instruction execution direction reverse flag M8024 is OFF, the contents of file registers in the area [A] in the program memory are transferred to the data register area [B] in the data memory as shown in the left figure.



Write

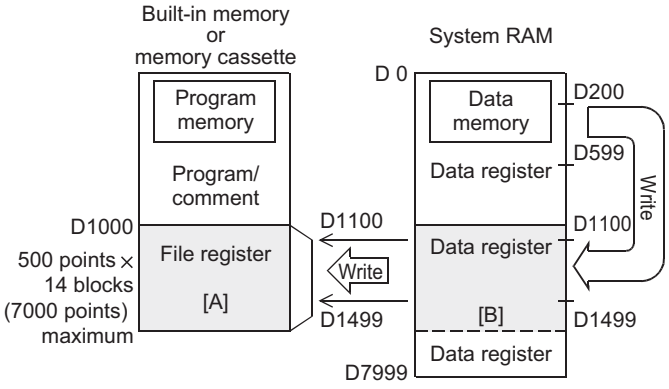


- When X003 is set to ON while the BMOV instruction execution direction reverse flag M8024 is ON, the contents of data registers in the area [B] in the data memory are transferred to the file register area [A] in the program memory as shown in the left figure.

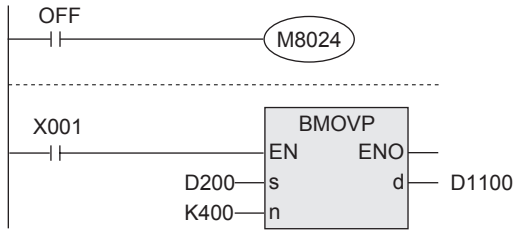
- When updating the contents of file registers using the same-number register update function, make sure that the file register number is equivalent between the input variable (s) and the input variable (d). Make sure also that the number of transfer points specified by "n" does not exceed the file register area. If the number of transfer points exceeds the file register area, an operation error occurs and the BMOV instruction is not executed.
- When input variables (s) and (d) are indexed, the instruction is executed if the actual device number is located within the file register area and if the number of transfer points does not exceed the file register area.

3. Data register → File register <Writing by the BMOV instruction>

When a file register (D1000 or later) is specified as the destination of the BMOV instruction, it is possible to directly write data to the file register area [A] in the program memory.
FX0N PLCs do not support this function.
In FXU/FX2C PLCs, the special device M8198 reverses the BMOV instruction execution direction.

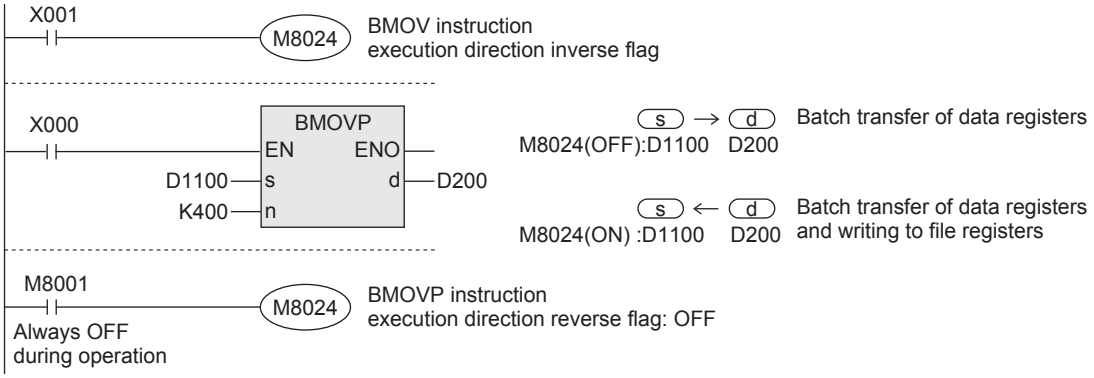


Write



- When X001 is set to ON, data is transferred to the data register area [B] and file register area [A] as shown in the left figure.
  If the protect switch of the memory cassette is set to ON and data cannot be written to the file register area [A], data is written to only the data register area [B].
  When a file register is specified in the output variable (d) in a general instruction, data is transferred only to the data register area [B].
- A file register can be specified in the input variable (s). However, if a same number is specified in both the input variable (s) and the output variable (d), the same-number register update function is activated.
  → **For the same-number register update function, refer to the previous page.**

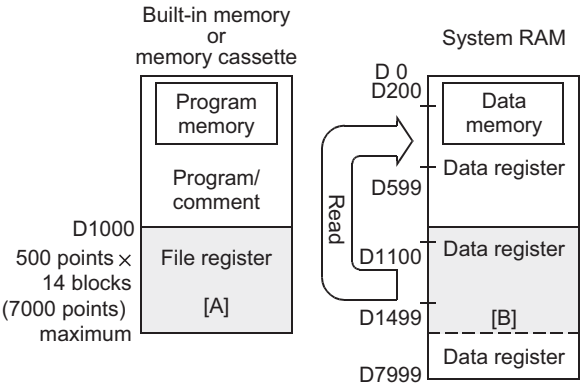
- By controlling the BMOV instruction execution direction reverse flag M8024 in the BMOV instruction, data can be transferred in both directions in one program (as shown in the figure below).



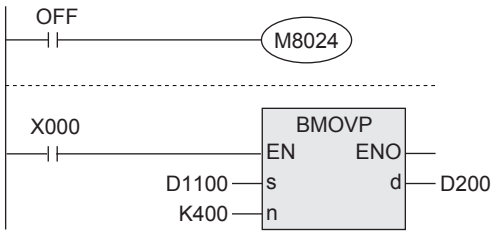
Cautions on reading

When a file register (D1000 or later) is specified as the source of the BMOV instruction and a file register having the same number is not specified as the destination (that is, when the same-number register update function is not activated), the contents of the file register area [A] in the program memory are not read.

1) When a file register is specified as the source and a data register is specified as the destination

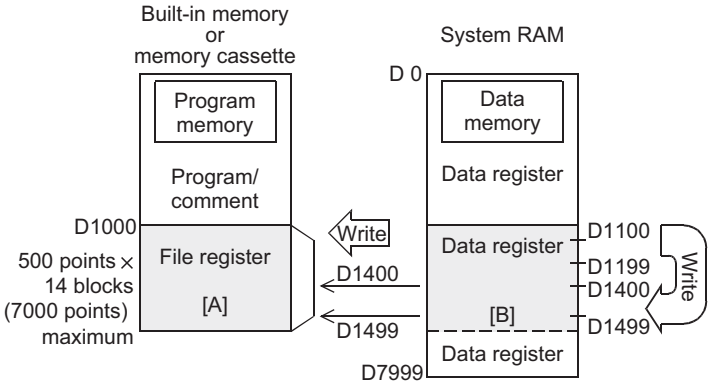


Batch transfer of data registers

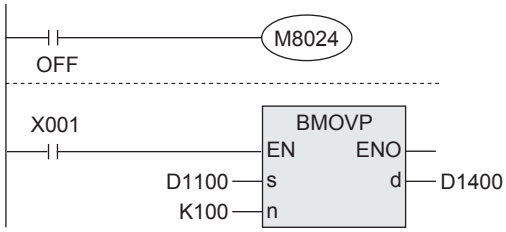


- When X000 is set to ON, the contents of the data register area [B] are read as shown in the left figure.
- A file register can be specified in the output variable (d).
  However, if a same number is specified in both the input variable (s) and the output variable (d), the same-number register update function is activated.
  → **For the same-number register update function, refer to the previous page.**

2) When file registers of different numbers are specified in the source and destination



Write



- When X001 is set to ON, the contents of the data register area [B] are transferred to the data register area [B] and file register area [A] as shown in the left figure.
  If the protect switch of the memory cassette is set to ON and data cannot be written to the file register area [A], data is written to only the data register area [B].

2.8.5 Cautions on using file registers

1. Cautions on using a memory cassette

When changing the contents of file registers secured in a memory cassette, satisfy the following conditions:

- Set to OFF the protect switch of the memory cassette.
- Allowable number of times of writing data to the program memory
  → **For the allowable number of times of writing data, refer to Section 6.4.**
  When data is written by a continuous operation type instruction in a program, data is written to the program memory in each operation cycle of the PLC.
  For preventing this, make sure to use a pulse execution type instruction (BMOVP).
- Writing data to the flash memory
  <In the case of FX3U/FX3UC PLCs>
  - It takes 66 to 132 ms to write data to one serial block (500 points).
    Execution of the program is paused during this period. Because the watchdog timer is not refreshed during this period, it is necessary to take proper countermeasures such as inserting the WDT instruction into the sequence program.
  - Do not turn OFF the power while the contents of file registers are changed.
    If the power is turned OFF during the change, the data stored in file registers may be filled with unexpected values, or a parameter error may occur.
- Writing data to the EEPROM memory
  <In the case of FX3S/FX3G/FX3GC PLCs>
  It takes 80 ms to write data to one serial block (500 points).
  Execution of the program is paused during this period but the watchdog timer is refreshed automatically, cautions are required.
  <In the case of FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs>
  It takes 10ms to write data to 1 point.
  Execution of the program is paused during this period, and the watchdog timer is automatically refreshed.
  <In the case of FX0N PLCs>
  Write data from peripheral equipment.

2. Cautions on handling file registers using the same-number register update function of the BMOV instruction

- When updating the contents of file registers having the same number, make sure that the file register number is same between the input variable (s) and the output variable (d).
- Make sure that the number of transfer points specified by "n" does not exceed the file register area.
- If the number of transfer points exceeds the file register area, an operation error (M8067) occurs and the BMOV instruction is not executed.
- Indexing
  When the input variable (s) and output variable (d) are indexed, the BMOV instruction is executed if the actual device number is located within the file register area and if the number of transfer points does not exceed the file register area.

2.9 Extension Register [R] and Extension File Register [ER]

FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FXU/FX2C/FX2N/FX2NC/FX3S PLCs do not support extension registers and extension file registers.
Extension registers (R) are extended data registers (D).
The contents of extension registers (R) can be stored in extension file registers (ER). In FX3U/FX3UC PLCs, however, extension file registers (ER) are available only while a memory cassette is attached.

2.9.1 Numbers of extension registers and extension file registers

The tables below show the extension register (R) and extension file register (ER) numbers. (Numbers are assigned in decimal.)

	Extension register (R) (Latched (battery backed-up) type)	Extension file register (ER) (File type)
FX3U/FX3UC PLCs	R0 to R32767 32768 points	ER0 to ER32767 32768 points*1

	Extension register (R) (General type)	Extension file register (ER) (File type)
FX3G/FX3GC PLCs	R0 to R23999 24000 points*2	ER0 to ER23999 24000 points*3

*1. Available only while a memory cassette is attached (because they are stored in the flash memory inside a memory cassette).

*2. Can be changed to the latched (battery backed-up) type by parameter setting while an optional battery is attached (, but the latched (battery backed-up) area cannot be set).

*3. Stored in the EEPROM built in the PLC, or stored in the EEPROM in a memory cassette while a memory cassette is attached.

2.9.2 Data storage destination and access method

Because the memory for data storage is different between extension registers and extension file registers, the access method is different as shown in the tables below:

Data storage destination

Device	PLC	Data storage destination
Extension registers (R)	FX3U/FX3UC	Built-in RAM (backed up by battery)
	FX3G/FX3GC	Built-in RAM
Extension file registers (ER)	FX3U/FX3UC	Memory cassette (flash memory)
	FX3G	Built-in EEPROM or memory cassette (EEPROM)
	FX3GC	Built-in EEPROM

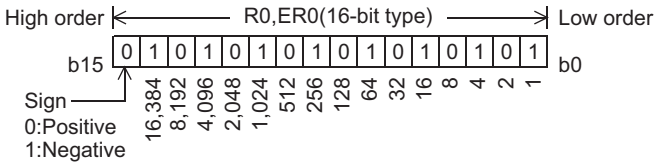
Access method

Access method		Extension registers	Extension file registers
Reading in program		○	△ Only dedicated instructions can access.
Writing in program		○	△ Only dedicated instructions can access.
Display module		○	○
Data change method	Test operation in online mode of GX Works2	○	×
	Batch writing by GX Works2	○	○
	Computer link function	○	×

2.9.3 Structure of extension registers and extension file registers

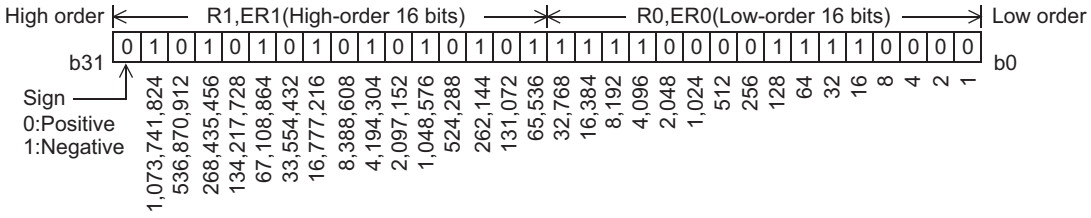
One extension register consists of 16 bits. Extension registers can be used in 16-bit and 32-bit operation instructions in the same way as data registers.

1) 16-bit type
One extension register (consisting of 16 bits) can handle a numeric value within the range from -32768 to +32767.



A numeric value is usually read from and written to an extension register by an instruction.
Or a numeric value can be read and written directly from a display unit, display module or programming tool.

2) 32-bit type
Two serial extension registers can express a 32-bit numeric value within the range from -2,147,483,648 to +2,147,483,647. (An extension register having a larger number handles high-order 16 bits, and an extension register having a smaller number handles low-order 16 bits.)



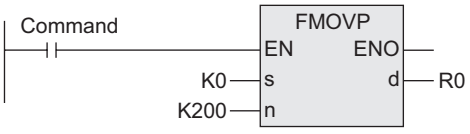
- In the case of 32-bit data, when an extension register on the low-order side (Example: R0) is specified, the subsequent number on the high-order side (Example: R1) is automatically occupied.
  Either an odd or even device number can be specified for the low-order side, but it is recommended to specify an even device number for the low-order side under consideration of the monitoring function of display units, display modules and programming tools.

2.9.4 Initialization of extension registers and extension file registers

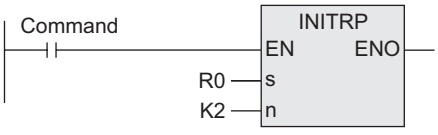
The contents of extension registers are backed up by the battery even when the power is turned OFF or when the PLC mode switches from "STOP" to "RUN" if the PLC is the FX3U/FX3UC Series or the FX3G/FX3GC Series if extension registers are changed to the latched (backed-up) type and an optional battery is attached.
For initializing extension registers, execute the data clear operation using a PLC program or GX Works2.

1. Initialization using a program

- When initializing some extension registers (R)
  Example: When initializing (clearing) R0 to R199



- When initializing extension registers and extension file registers in units of sector
  (Sectors are not provided for extension registers and extension file registers in FX3G/FX3GC PLCs.)
  Example: When initializing R0 to R4095 and ER0 to ER4095 (initializing two sectors starting from R0 and ER0 respectively)



2. Initialization using GX Works2

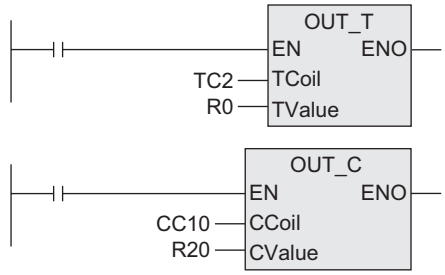
Select [Online] → [Clear PLC memory ...] in GX Works2, and clear [Data device].
Note that this operation initializes the contents of timers, counters, data registers, file registers and extension registers.

2.9.5 Functions and operation examples of extension registers

Extension registers can be used in various controls handling numeric data in the same way as data registers. This subsection explains representative operation examples among various applications.
For the full use of extension registers, refer to the explanation on sequence instruction offered separately.
→ **FX Structured Programming Manual [Basic & Applied Instruction]**

1. Extension registers in sequence instructions (basic instructions)

- Specifying the set value of a timer or counter

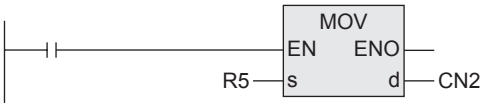


A counter or timer operates while regarding the contents of a specified extension register as its set value.

2. Extension registers in sequence instructions (applied instructions)

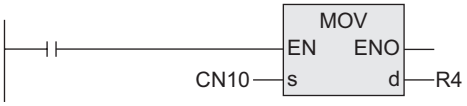
Operation examples using the MOV instruction

- Changing the current value of a counter



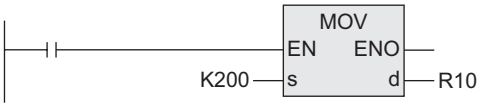
The current value of the counter C2 is changed to the contents of R5.

- Reading the current value of a counter



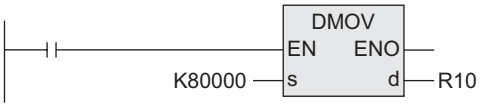
The current value of the counter C10 is transferred to R4.

- Storing a numeric value to extension registers
  16-bit type



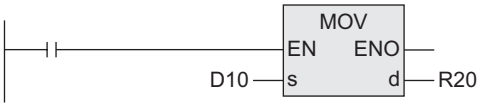
"200 (decimal value)" is transferred to R10.

  32-bit type



"80000 (decimal value)" is transferred to R10 and R11. Because a numeric value larger than "32767" is 32-bit data, a 32-bit operation (double-D instruction) is required.
When an extension register on the low-order side (R10) is specified, an extension register on the high-order side (R11) is automatically occupied.

- Transferring the contents of a data register to an extension register



The contents of D10 are transferred to R20.

2.9.6 Functions and operation examples of extension file registers

Extension file registers (ER) are usually used as log data storage destinations and set data storage destinations.
Extension file registers can be handled only in dedicated instructions shown in the table below. When using the contents of extension file registers in other instructions, transfer them to extension registers having the same device numbers, and then use corresponding extension registers.
In FX3U/FX3UC PLCs, extension file registers are available only while a memory cassette is attached.

- FX3U/FX3UC PLCs

Instruction	Description
LOADR	This (transfer) instruction reads the contents of extension file registers (ER)*1 to extension registers (R).
SAVER	This (transfer) instruction writes the contents of extension registers (R) to extension file registers (ER)*1 in units of 2048 points (1 sector). Use this instruction to store the contents of newly created 1 sector (2048 points) to extension file registers (ER)*1.
INITR	This instruction initializes extension registers (R) and extension file registers (ER)*1 in units of 2048 points (1 sector). Use this instruction to initializes extension registers (R) and extension file registers (ER)*1 before starting to log data using the LOGR instruction.
LOGR	This instruction logs specified data, and writes it to extension registers (R) and extension file registers (ER)*1.
RWER	This (transfer) instruction writes the content of specified extension registers (R) to extension file registers (ER)*1, and is supported in FX3UC PLCs Ver. 1.30 or later. Use this instruction to store the contents of arbitrary extension registers (R) to extension file registers (ER)*1.
INITER	This instruction initializes extension file registers (ER)*1 in units of 2048 points (1 sector), and is supported in FX3UC PLCs Ver. 1.30 or later. Use this instruction to initialize extension file registers (ER)*1 before executing the SAVER instruction.

*1. Extension file registers are accessible only while a memory cassette is attached.

- FX3G/FX3GC PLCs

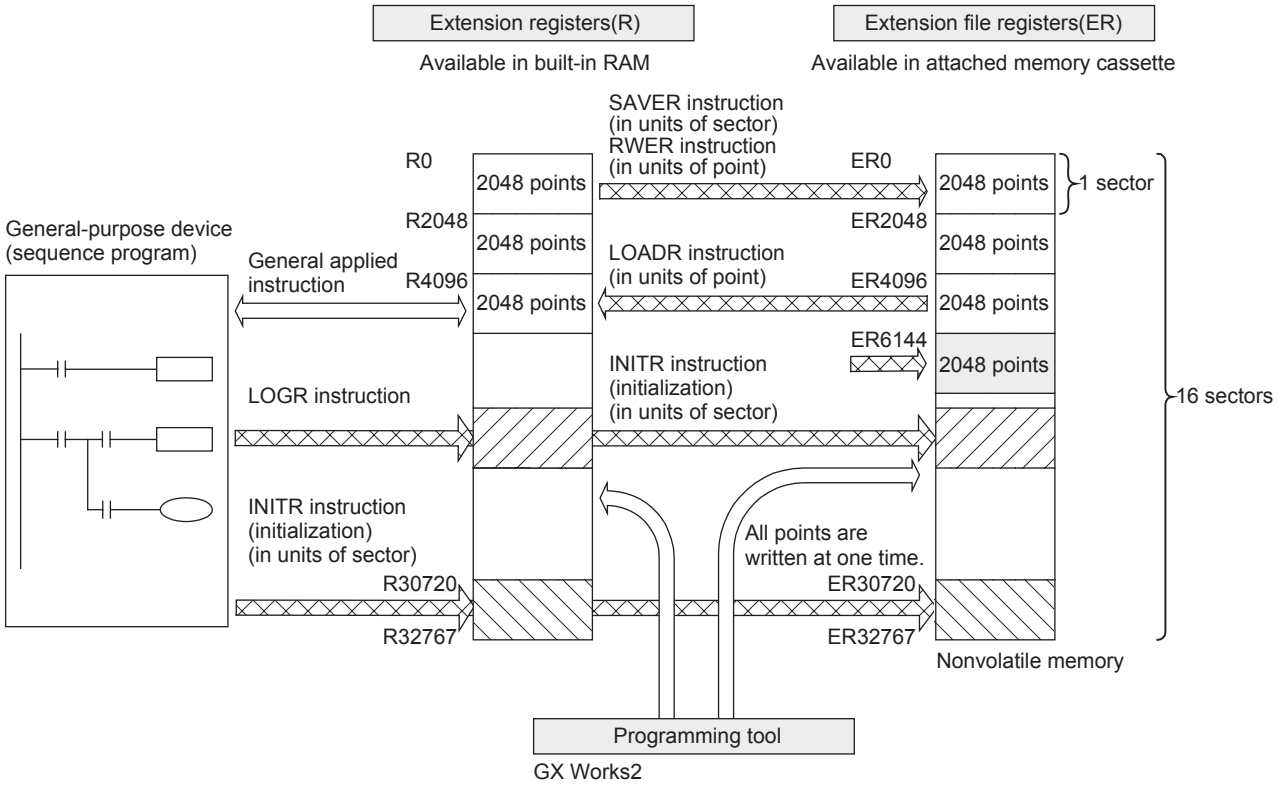
Instruction	Description
LOADR	This (transfer) instruction reads the contents of extension file registers (ER) to extension registers (R).
RWER	This (transfer) instruction writes the contents of specified extension registers (R) to extension file registers (ER). Use this instruction to store the contents of arbitrary extension registers (R) to extension file registers (ER)*2.

*2. While a memory cassette is attached, extension file registers in the memory cassette are accessed. While a memory cassette is not attached, extension file registers in the EEPROM built in the PLC are accessed.

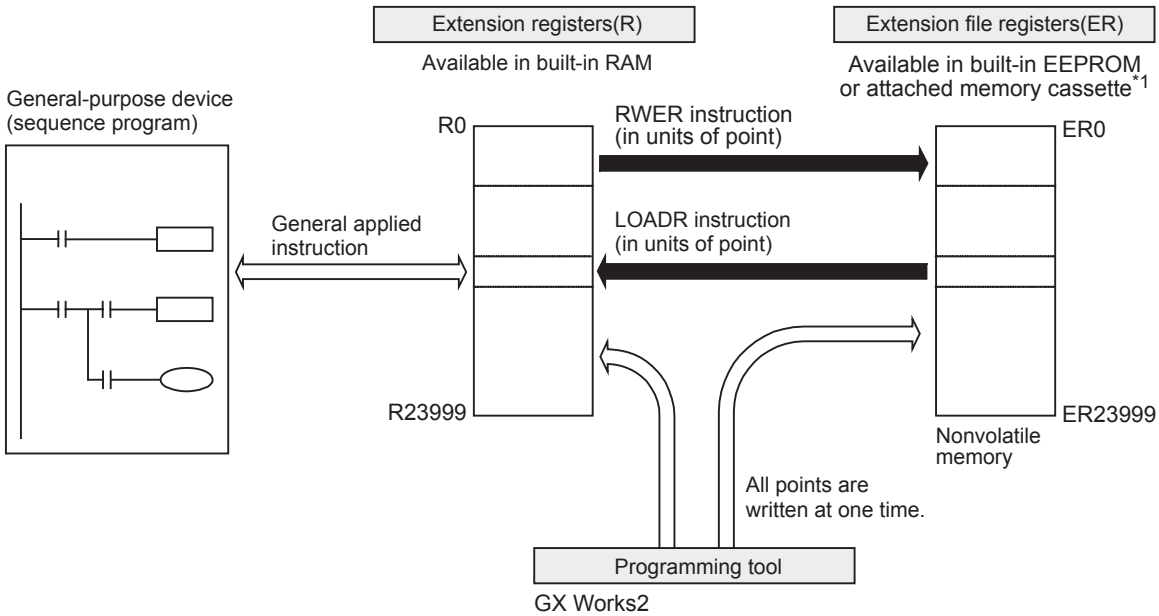
1. Relationship between extension file registers and extension registers

Extension file registers and extension registers have the following positional relationship inside the PLC.

a) FX3U/FX3UC PLCs



b) FX3G/FX3GC PLCs



*1. Memory cassette cannot be connected to FX3GC PLCs.

2. Sectors of extension registers and extension file registers

According to the data structure, extension registers and extension file registers are divided into sectors in FX3U/FX3UC PLCs. One sector consists of 2048 devices. The table below shows the head device in each sector.
Sectors are not provided for extension registers and extension file registers in FX3G/FX3GC PLCs.

Sector No.	Head device No.	Device range
Sector 0	R0	ER0 to ER2047, R0 to R2047
Sector 1	R2048	ER2048 to ER4095, R2048 to R4095
Sector 2	R4096	ER4096 to ER6143, R4096 to R6143
Sector 3	R6144	ER6144 to ER8191, R6144 to R8191
Sector 4	R8192	ER8192 to ER10239, R8192 to R10239
Sector 5	R10240	ER10240 to ER12287, R10240 to R12287
Sector 6	R12288	ER12288 to ER14335, R12288 to R14335
Sector 7	R14336	ER14336 to ER16383, R14336 to R16383

Sector No.	Head device No.	Device range
Sector 8	R16384	ER16384 to ER18431, R16384 to R18431
Sector 9	R18432	ER18432 to ER20479, R18432 to R20479
Sector 10	R20480	ER20480 to ER22527, R20480 to R22527
Sector 11	R22528	ER22528 to ER24575, R22528 to R24575
Sector 12	R24576	ER24576 to ER26623, R24576 to R26623
Sector 13	R26624	ER26624 to ER28671, R26624 to R28671
Sector 14	R28672	ER28672 to ER30719, R28672 to R30719
Sector 15	R30720	ER30720 to ER32767, R30720 to R32767

2.9.7 Cautions on using extension file registers

1. Cautions on writing data to extension file registers (in FX3U/FX3UC PLCs)

Because extension file registers are stored in the flash memory inside a memory cassette, pay attention to the following points:

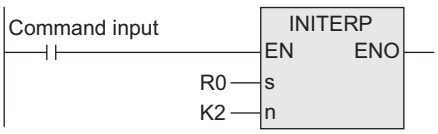
- When writing data to extension file registers using the SAVER instruction
  Initialize sectors to be written in advance before executing this instruction. After initialization, write data to extension file registers.
  In FX3UC PLCs Ver. 1.30 or later, it is not necessary to initialize sectors to be written when using the RWER instruction.
- When writing data to extension file registers using the LOGR instruction
  Initialize sectors to be written in advance before starting to log data.
- When using the INITR instruction
  This instruction initializes the contents of extension registers and extension file registers in specified sectors. When initializing only extension file registers using this instruction, make sure to temporarily move the contents of extension registers in target sectors to unused extension registers or unused data registers before executing this instruction.
  When initializing only extension file registers in FX3UC PLCs Ver. 1.30 or later, use the INITER instruction.

2. Initialization of extension file registers

Because the contents of extension file registers are stored in the attached memory cassette or built-in EEPROM, execute the data clear operation using a sequence program or GX Works2.
When writing data to extension file registers in FX3U/FX3UC PLCs, it is necessary to initialize areas to be written in advance.
When writing data to extension file registers in FX3G/FX3GC PLCs, it is not necessary to initialize areas to be written.

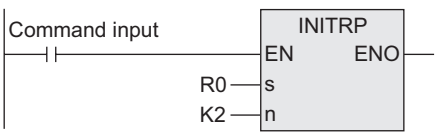
1) Initialization using a program (only in FX3U/FX3UC PLCs)

a) Initialize only extension file registers in units of sector [in Ver. 1.30 or later]
Example: When initializing ER0 to ER4095 (initializing two sectors starting from ER0)



The current value is initialized to "FFFFH" in each of ER0 to ER4095.

b) When initializing extension registers and extension file registers in units of sector
Example: When initializing R0 to R4095 and ER0 to ER4095 (initializing two sectors starting from R0 and ER0 respectively)



The current value is initialized to "FFFFH" in each of R0 to R4095 and ER0 to ER4095.

2) Initialization using GX Works2
Select [Online] → [Clear PLC memory ...] in GX Works2, and clear [Data device].
Note that this operation initializes the contents of timers, counters, data registers, file registers and extension registers.

3. Allowable number of times of writing data to the program memory

Pay attention to the following points when accessing extension file registers

- In the case of FX3U/FX3UC PLCs
The allowable number of times of writing is 10,000 or less in a memory cassette (flash memory).
Every time the INITR, RWER or INITER instruction is executed, each execution is counted as one time of writing. Make sure that the allowable number of times of writing is not exceeded.
When a continuous execution type instruction is used, data is written to the memory in each operation cycle of the PLC. For preventing this, make sure to use a pulse execution type instruction.

  Even if the LOADR, SAVER or LOGR instruction is executed, each execution is not counted as one time of writing.
However, it is necessary to initialize sectors to be written in advance before executing the SAVER or LOGR instruction.
When initializing registers using the INITR or INITER instruction, note that each execution of the INITR or INITER instruction is counted as one time of writing. Make sure that the allowable number of times of writing is not exceeded.

- In the case of FX3G/FX3GC PLCs
The allowable number of times of writing is 10,000 or less in a memory cassette (EEPROM), and 20,000 or less in the built-in memory (EEPROM).
Every time the RWER instruction is executed, each execution is counted as one time of writing. Make sure that the allowable number of times of writing is not exceeded.
When a continuous execution type instruction is used, data is written to the memory in each operation cycle of the PLC. For preventing this, make sure to use a pulse execution type instruction.
Even if the LOADR instruction is executed, each execution is not counted as one time of writing.

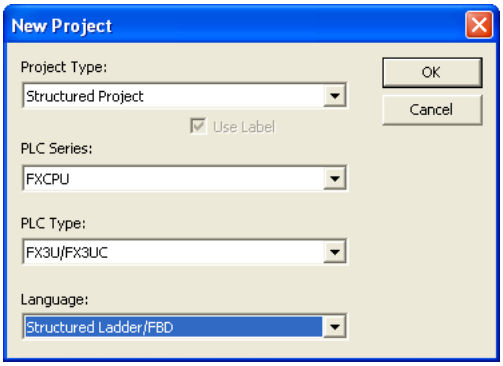
2.9.8 Registration of data stored in extension registers and extension file registers

This subsection explains the operation procedures in GX Works2.

→ **For details on operation procedures in GX Works2, refer to the GX Works2 manual.**

1 Setting the project type, PLC type and programming language

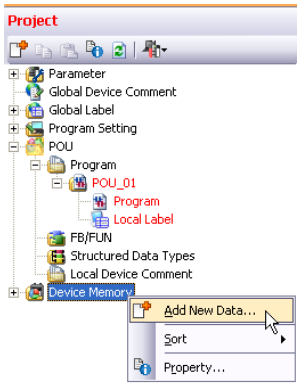
Select [Project] → [NEW].

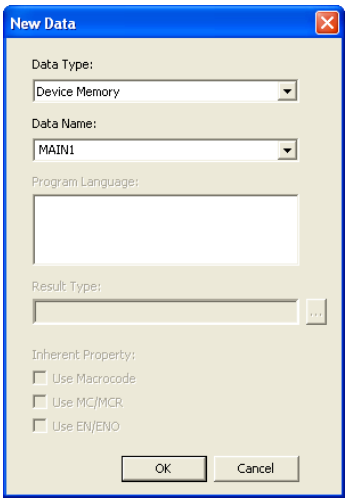


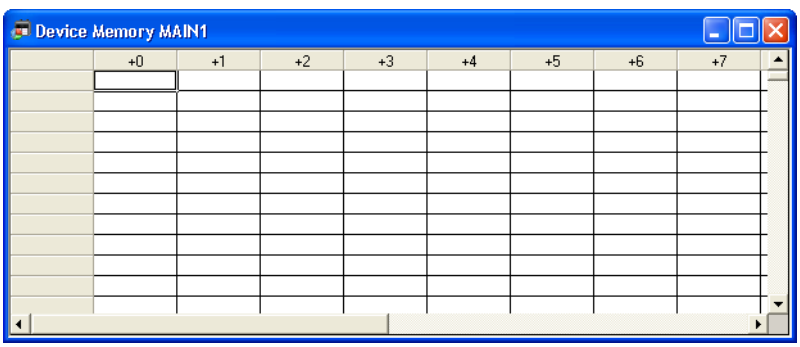
2 Creating the device memory

This operation is not required when using the device memory offered as the default.

1. **Right-click [Device Memory] in the project data list to open the submenu.**
2. **Click [Add NEW Data] to open the "New Data" dialog box.**
   Set the Data Name
3. **Input the data name, and click the [OK] button to open the created "Device Memory" dialog box.**

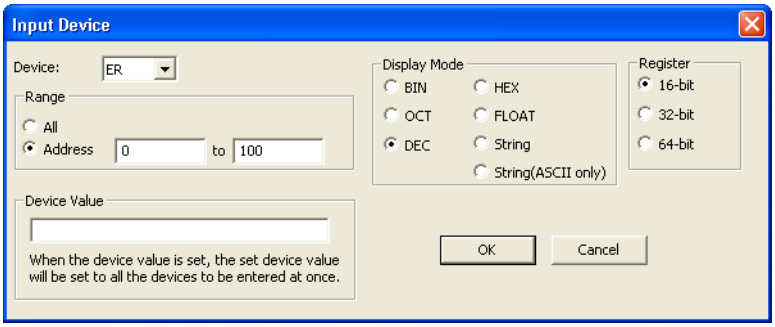




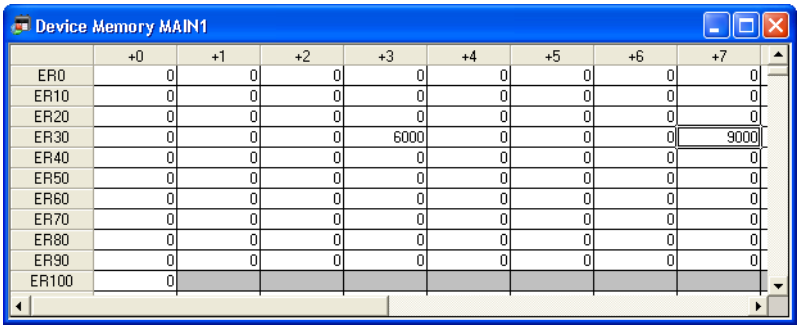


3 Setting the data

1. **Select [Edit] → [Input Device] to open the "Input Device" dialog box.**
2. **Set the "Device", "Range", "Display Mode" and "Register".**



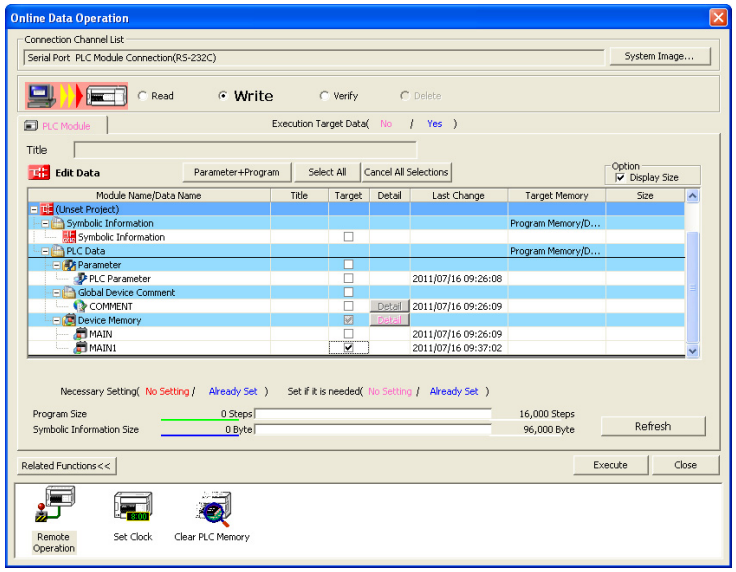
3. **Set the data.**



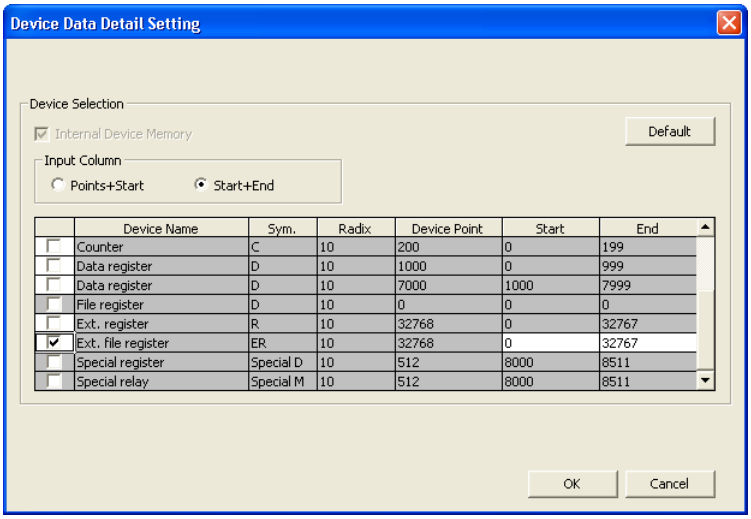
	+0	+1	+2	+3	+4	+5	+6	+7
ER0	0	0	0	0	0	0	0	0
ER10	0	0	0	0	0	0	0	0
ER20	0	0	0	0	0	0	0	0
ER30	0	0	0	6000	0	0	0	9000
ER40	0	0	0	0	0	0	0	0
ER50	0	0	0	0	0	0	0	0
ER60	0	0	0	0	0	0	0	0
ER70	0	0	0	0	0	0	0	0
ER80	0	0	0	0	0	0	0	0
ER90	0	0	0	0	0	0	0	0
ER100	0							

4 Writing (transferring) the data to the PLC

1. **Select [Online] → [Write to PLC] to open the "Online Data Operation" dialog box.**
2. **Check the Device Memory to write (transfer) the data.**



3. **Click the [Detail] button in the "Online Data Operation" dialog box to open the "Device Data Detail Setting" dialog box.**
   Check the [Ext. file register(ER)].



4. **Click the [Execute] button to write (transfer) to the PLC.**

2.10 Index Register [V and Z]

Index registers can be used in the same way as data registers.
But they are special registers because they can change device numbers and numeric values in a program when combined with another device number or numeric value used as operands in applied instructions.

2.10.1 Numbers of index registers

The table below shows index register (V and Z) numbers. (Numbers are assigned in decimal.)
When only "V" or "Z" is specified, it is handled as "V0" or "Z0" respectively.

1. FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs

	Index type
FX3U/FX3UC/ FX3G/FX3GC/ FX3S PLCs	V0(V) to V7, Z0(Z) to Z7 16 points*1

*1. The characteristics about latch (backup) against power interruption cannot be changed by parameters.

2. FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs

	Index type
FX1S PLCs	V0(V) to V7, Z0(Z) to Z7 16 points*1
FX1N/FX1NC PLCs	V0(V) to V7, Z0(Z) to Z7 16 points*1
FX2N/FX2NC PLCs	V0(V) to V7, Z0(Z) to Z7 16 points*1

*1. The characteristics about latch (backup) against power interruption cannot be changed by parameters.

3. FX0S/FX0/FX0N/FXU/FX2C PLCs

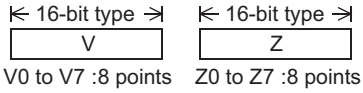
	Index type
FX0S/FX0 PLCs	V, Z 2 points*1
FX0N PLCs	
FXU/FX2C PLCs	

*1. The characteristics about latch (backup) against power interruption cannot be changed by parameters.

2.10.2 Functions and structures

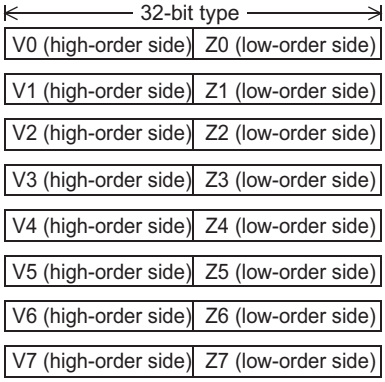
1. 16-bit type

Index registers have the same structure as data registers.



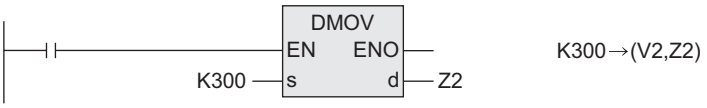
2. 32-bit type

Make sure to use Z0 to Z7 when indexing a device used in a 32-bit applied instruction or handling a numeric value beyond the 16-bit range.



This is because FX PLCs handle Z as the low-order side of a 32-bit register as shown in combinations of V and Z in the left figure. Even if V0 to V7 (on the high-order side) is specified, indexing is not executed. When index registers are specified as a 32-bit device, both V (high-order side) and Z (low-order side) are referred to at the same time. If a numeric value used for another purpose remains in V (high-order side), consequently the numeric value here becomes extremely large, and an operation error occurs.

Example of writing data to 32-bit index registers



Even if an index value used in a 32-bit instruction does not exceed the 16-bit numeric range, use a 32-bit operation instruction such as DMOV for writing a numeric value to Z as shown above so that both V (high-order side) and Z (low-order side) are overwritten at the same time.

2.10.3 Indexing of devices

Available devices and contents of indexing are as described below.

→ **For indexing method and cautions, refer to Section 3.7.**

Decimal devices and numeric values: M, S, T, C, D, R, KnM, KnS, P and K

For example, when "V0 = K5" is specified and "D20V0" is executed, an instruction is executed for the device number D25 (D20 + 5).

Constants can be indexed also. When "K30V0" is specified, an instruction is executed for the decimal value K35 (30 + 5).

Octal devices: X, Y, KnX and KnY

For example, when "Z1 = K8" is specified and "X0Z1" is executed, an instruction is executed for the device X10 (X0 + 8: Octal addition).

When indexing a device whose device number is handled in octal, a numeric value converted into octal is added for the contents of V and Z.

Accordingly, note that X0Z1 indicates X12, and does not indicate X10 when "Z1 = K10" is specified.

Hexadecimal values: H

For example, when "V5 = K30" is specified, a constant H30V5 is handled as "H4E (30H + K30)". When "V5 = H30" is specified, a constant H30V5 is handled as "H60 (30H + 30H)".

2.11 Pointer [P and I]

2.11.1 Numbers of pointers

The table below shows pointer (P and I) numbers. (Numbers are assigned in decimal.)
When an input interrupt type pointer is used, the input number assigned to the pointer cannot be used together with a "high speed counter" or "speed detection" which uses the same input range.

1. FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs

Series	Branch type	END jump type	Input interrupt/input delay interrupt type	Timer interrupt type	Counter interrupt type
FX3U/FX3UC PLCs	P0 to P62 P64 to P4095 4095 points	P63 1 point	I00□(X000) I30□(X003) I10□(X001) I40□(X004) I20□(X002) I50□(X005) 6 points	I6□□ I7□□ I8□□ 3 points	I010 I040 I020 I050 I030 I060 6 points

Series	Branch type	END jump type	Input interrupt type	Timer interrupt type
FX3G/FX3GC PLCs	P0 to P62 P64 to P2047 2047 points	P63 1 point	I00□(X000) I30□(X003) I10□(X001) I40□(X004) I20□(X002) I50□(X005) 6 points	I6□□ I7□□ I8□□ 3 points

Series	Branch type	END jump type	Input interrupt type	Timer interrupt type
FX3S PLC	P0 to P62 P64 to P255 255 points	P63 1 point	I00□(X000) I30□(X003) I10□(X001) I40□(X004) I20□(X002) I50□(X005) 6 points	I6□□ I7□□ I8□□ 3 points

2. FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs

Series	Branch type	END jump type	Input interrupt type	Timer interrupt type	Counter interrupt type
FX1S PLCs	P0 to P62 63 points	P63 1 point	I00□(X000) I30□(X003) I10□(X001) I40□(X004) I20□(X002) I50□(X005) 6 points	-	-
FX1N/FX1NC PLCs	P0 to P62 P64 to P127 127 points	P63 1 point	I00□(X000) I30□(X003) I10□(X001) I40□(X004) I20□(X002) I50□(X005) 6 points	-	-
FX2N/FX2NC PLCs	P0 to P62 P64 to P127 127 points	P63 1 point	I00□(X000) I30□(X003) I10□(X001) I40□(X004) I20□(X002) I50□(X005) 6 points	I6□□ I7□□ I8□□ 3 points	I010 I040 I020 I050 I030 I060 6 points

3. FX0S/FX0/FX0N/FXU/FX2C PLCs

Series	Branch type	END jump type	Input interrupt type	Timer interrupt type	Counter interrupt type
FX0S/FX0 PLCs	P0 to P63 64 points	-	I00□(X000) I10□(X001) I20□(X002) I30□(X003) 4 points	-	-
FX0N PLCs		-		-	-
FXU/FX2C PLCs	P0 to P62 P64 to P127 127 points	P63	I00□(X000) I10□(X001) I20□(X002) I30□(X003) I40□(X004) I50□(X005) 6 points	I6□□ I7□□ I8□□ 3 points	I010 I040 I020 I050 I030 I060 6 points
FXU PLCs (Ver. 2.30 or earlier) Reference	P0 to P62 63 points	P63			-

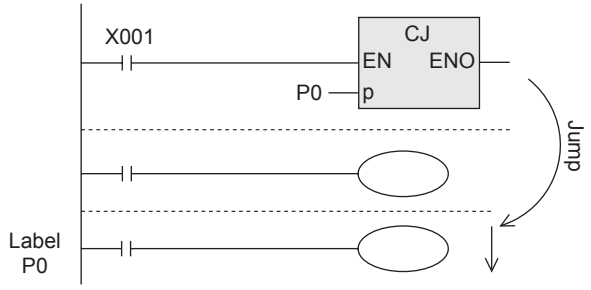
2.11.2 Functions and operation examples of branch pointers

The roles and operations of branch pointers are as described below.
Because all of these pointers are combined with instructions, refer to the explanation of each instruction for detailed use methods.

→ **FX Structured Programming Manual [Basic & Applied Instruction]**
→ **FX Structured Programming Manual [Application Functions]**

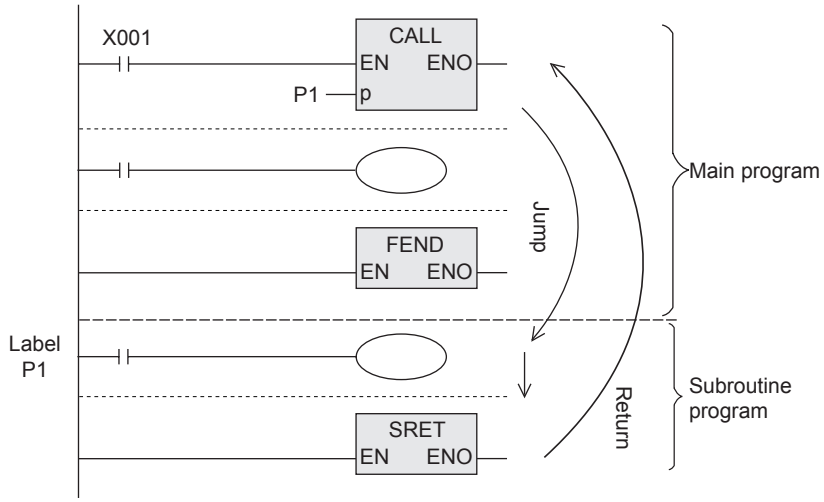
1. Applied instructions using branch pointers (P)

- CJ (conditional jump) instruction



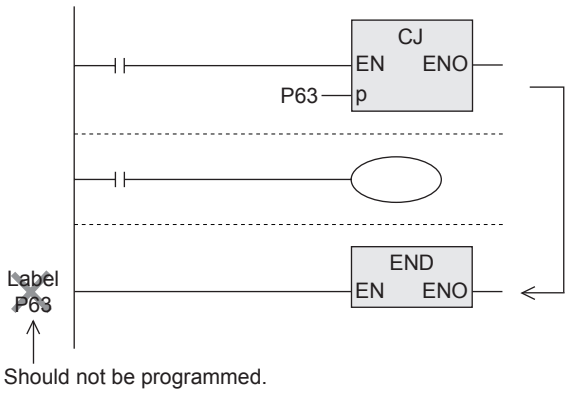
When X001 turns ON, the PLC jumps to the label position specified by the CJ instruction, and executes the subsequent program.

- CALL (call subroutine) instruction



When X001 turns ON, the PLC executes a subroutine in the label position specified by the CALL instruction, and then returns to the original position by the SRET instruction.

- Role of the pointer P63 for jump to the END step



P63 is a special pointer for jumping to the END step when the CJ instruction is executed. Note that a program error will occur if P63 is programmed as a label.

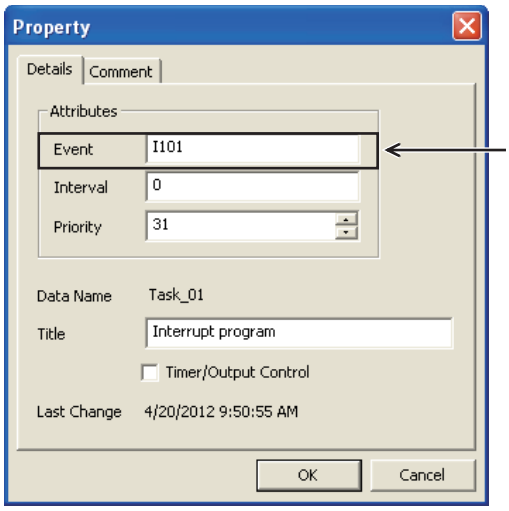
2.11.3 Functions and operation examples of interrupt pointers

Interrupt pointes are classified into three subtypes, input interrupt type, timer interrupt type and counter interrupt type.

1. Creating an interrupt program

Create an interrupt program as follows:

1) Create a task for interrupt program and a task for main program.
2) In the interrupt program task, set an interrupt pointer in the "Event" column.

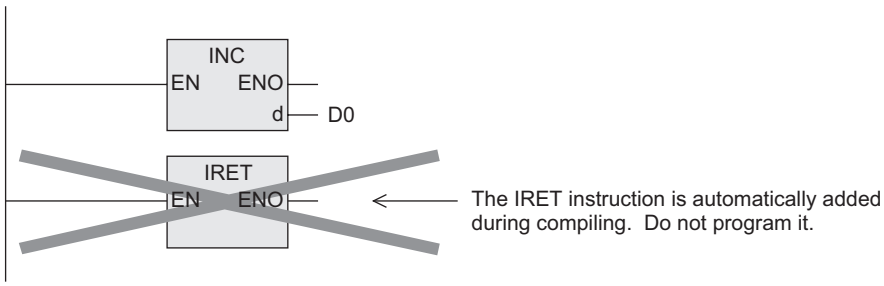


Set an interrupt pointer

For interrupt pointes which can be set in the "Event" column, refer to "2. Interrupt pointers" described below.

3) During compiling, the IRET instruction is automatically added at the end of the program block registered in the interrupt program task. It is not necessary to program the IRET instruction.

Interrupt program



The IRET instruction is automatically added during compiling. Do not program it.

2. Interrupt pointers

1) Input interrupt pointers

The PLC can receive input signals from specific input numbers without affected by its operation cycle. By using these input signals as triggers, the PLC executes interrupt routine programs.
Because input interrupt pointers can handle signals shorter than the operation cycle, use them for high-priority processing during sequence control or for control handling short pulses.

a) FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs

Input	Input interrupt pointer		Interrupt disabling flag	ON duration or OFF duration of input signal		
	Interrupt at rising edge	Interrupt at falling edge		FX3U/ FX3UC	FX3G/ FX3GC	FX3S
X000	I001	I000	M8050*1	5 μs or more	10 μs or more	10 μs or more
X001	I101	I100	M8051*1			
X002	I201	I200	M8052*1		50 μs or more	50 μs or more
X003	I301	I300	M8053*1		10 μs or more	
X004	I401	I400	M8054*1			
X005	I501	I500	M8055*1		50 μs or more	

*1. Cleared when the PLC mode switches from "RUN" to "STOP".

b) FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs

Input	Input interrupt pointer		Interrupt disabling flag	ON duration or OFF duration of input signal
	Interrupt at rising edge	Interrupt at falling edge		
X000	I001	I000	M8050	FX1S, FX1N, FX1NC : 10 μs(X000, X001) or more 50 μs(X002 to X005) or more FX2N, FX2NC : 20 μs(X000, X001) or more 50 μs(X002 to X005) or more
X001	I101	I100	M8051	
X002	I201	I200	M8052	
X003	I301	I300	M8053	
X004	I401	I400	M8054	
X005	I501	I500	M8055	

c) FX0S/FX0/FX0N PLCs

Input	Input interrupt pointer		Interrupt disabling flag	ON duration or OFF duration of input signal
	Interrupt at rising edge	Interrupt at falling edge		
X000	I001	I000	M8050	100 μs or more
X001	I101	I100	M8051	
X002	I201	I200	M8052	
X003	I301	I300	M8053	

d) FXU/FX2C PLCs

Input	Input interrupt pointer		Interrupt disabling flag	ON duration or OFF duration of input signal
	Interrupt at rising edge	Interrupt at falling edge		
X000	I001	I000	M8050	200 μs or more
X001	I101	I100	M8051	
X002	I201	I200	M8052	
X003	I301	I300	M8053	
X004	I401	I400	M8054	
X005	I501	I500	M8055	

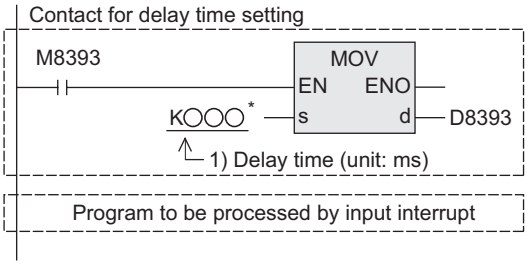
Prohibition on redundant use of input terminals

Inputs X000 to X007 are used for high speed counters, input interrupt, pulse catch, SPD/DSZR/DVIT/ZRN instructions and general-purpose inputs.
Make sure to use each input terminal only once.

Delay function of input interrupt pointers

Input interrupt pointers have the function to delay the execution of interrupt routine in units of 1 ms. FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FXU/FX2C/FX2N/FX2NC/FX3S/FX3G/FX3GC PLCs do not support the delay function of input interrupt pointers.
Specify the delay time using the following pattern program.
This delay function can electrically adjust the mounting position of sensors used for input interrupts without shifting the actual position.

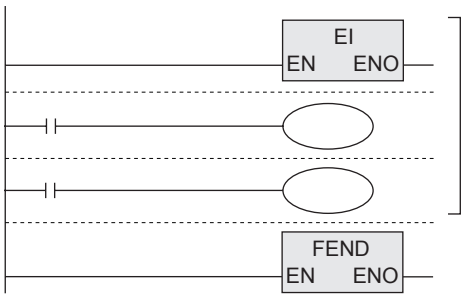
[Interrupt program]
(Event: I□□□)



- Delay time specifying program
  Make sure to describe the delay time specifying program shown on the left at the head of an interrupt routing program.
  Because this is a pattern program, change only the delay time [1)].
  Only a constant (K) or data register (D) can be used to specify the delay time*.

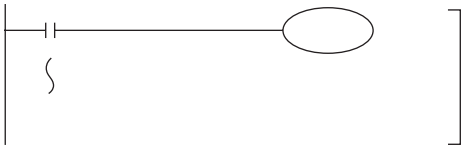
Operation

[Main program]

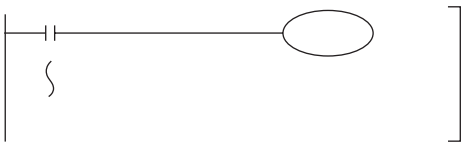


- Interrupts are usually disabled in the PLC.
  If interrupts are enabled by the EI instruction, when X000 or X001 turns ON while the program is scanned, the PLC executes the interrupt routine 1) or 2), and then returns to the main program by the IRET instruction.
  (The IRET instruction is automatically added during compiling.)

[Interrupt program]
(Event: I001) ← Rising edge of X000 is detected.



[Interrupt program]
(Event: I101) ← Rising edge of X001 is detected.



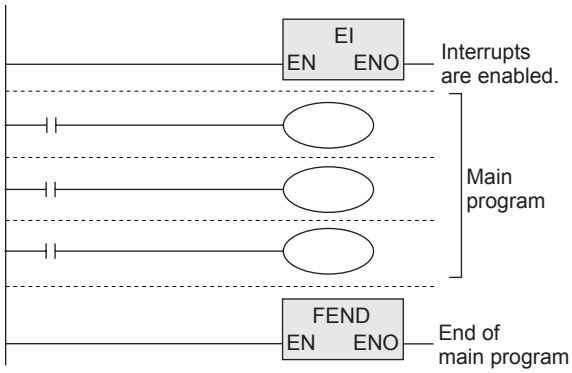
2) Timer interrupt pointers: 3 points
The PLC executes an interrupt routine program at every specified interrupt cycle time (10 to 99 ms). Use these pointers for control which requires cyclic interrupt processing without regard to the operation cycle of the PLC.
FX0S/FX0/FX0N/FX1S/FX1N/FX1NC PLCs do not support timer interrupt pointers.

Input No.	Interrupt cycle (ms)	Interrupt disabling flag
I6□□	An integer from 10 to 99 is put in the "□□" portion of the pointer name. Example: I610 = Timer interrupt at every 10 ms	M8056*1
I7□□		M8057*1
I8□□		M8058*1

*1. Cleared in FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs when the PLC mode switches from "RUN" to "STOP".

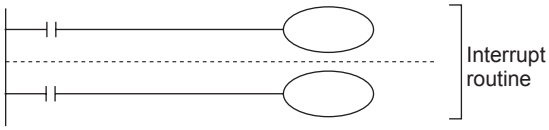
Operation

[Main program]



- Timer interrupts are enabled after the EI instruction.
  It is not necessary to program the DI (disable interrupt) instruction when the timer interrupt disabled zone is not required.
- "FEND" indicates the end of the main program.

[Interrupt program]
(Event: I620) ← Interrupt at every 20 ms



- The PLC executes an interrupt routine at every 20 ms.

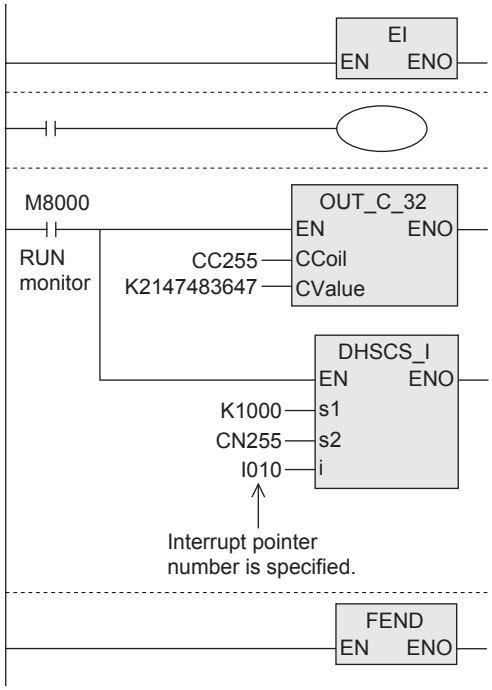
3) Counter interrupt pointers: 6 points
The PLC executes an interrupt routine based on the comparison result obtained by the comparison set instruction for high speed counter (DHSCS_I).
Use these pointers for control which gives high priority to the counting result of high speed counters.
FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FX3S/FX3G/FX3GC PLCs do not support counter interrupt pointers.

Pointer No.	Interrupt disabling flag	Pointer No.	Interrupt disabling flag
I010	M8059*1	I040	M8059*1
I020		I050	
I030		I060	

*1. Cleared in FX3U/FX3UC PLCs when the PLC mode switches from "RUN" to "STOP".

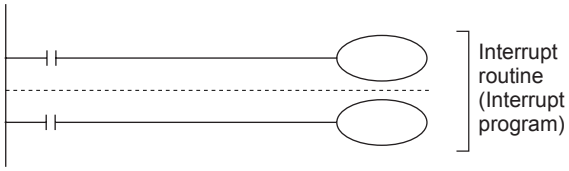
Operation

[Main program]



- Enable interrupts after the EI instruction, and then describe the main program.
- Drive the coil of a high speed counter, and specify an interrupt pointer in the DHSCS_I instruction.
- When the current value of C255 changes from "999" to "1000" or from "1001" to "1000", the PLC executes the interrupt routine.
For use examples of interrupt program, refer to the above description of input interrupt pointers.

[Interrupt program]
(Event: I010) ← When counter interrupt is specified



3. How to Specify Devices and Constants in Instructions

This chapter explains how to specify sources and destinations in instructions, which is the basis for handling PLC instructions.

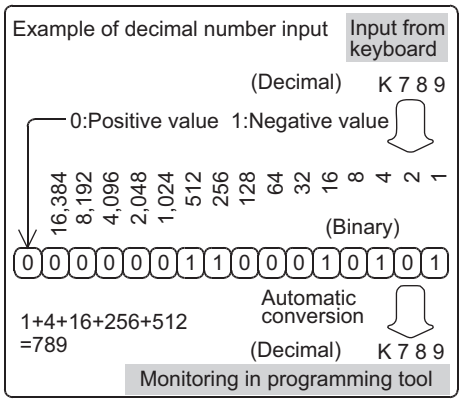
- Specifying constants (decimal, hexadecimal and real numbers)
- Specifying digits of bit devices
- Specifying bit positions in data registers
- Directly specifying BFM (buffer memory) in special function blocks/units
- Indexing by adding index registers

3.1 Numeric Values Handled in PLCs (Octal, Decimal, Hexadecimal and Real Numbers)

FX PLCs handle five types of numeric values according to the application and purpose.
This section explains the roles and functions of these numeric values.

3.1.1 Types of numeric values

1. **Decimal number (DEC)**
   - Set value (constant "K") of timers and counters
   - Device numbers of auxiliary relays (M), timers (T), counters (C), state relays (S), etc.
   - Numeric values used as operands and instruction operations in instructions (constant "K")
2. **Hexadecimal number (HEX)**
   - Numeric values used as operands and instruction operations in instructions (constant "H")
3. **Binary number (BIN)**
   For a timer, counter or data register, a numeric value is specified in the decimal or hexadecimal notation as described above. But all of these numeric values are handled in the binary notation inside PLCs.
   When these devices are monitored in peripheral equipment, they are automatically converted into the decimal notation as shown in the right figure (, and can be converted into the hexadecimal notation).



   - Handling of negative value
     A negative value is expressed in two's complement inside PLCs.
     For details, refer to the explanation of NEG instruction in the following manual.
     → **FX Structured Programming Manual [Basic & Applied Instruction]**
4. **Octal number (OCT)**
   In FX PLCs, device numbers of input relays and output relays are assigned in octal.
   Because "8" and "9" do not exist in the octal notation, device numbers are carried in the way "0 to 7, 10 to 17 ... 70 to 77, 100 to 107".
5. **Binary-coded decimal (BCD)**
   The BCD notation expresses each numeric value from 0 to 9 constructing each digit of a decimal number as a 4-bit binary number.
   Because each digit can be handled easily, this notation is adopted for controlling digital switches of BCD output type and seven-segment display units.
6. **Real number (floating point data)**
   PLCs have the floating point operation function to perform high-accuracy operation.
   In floating point operations, binary floating point values (real numbers) are used, and decimal floating point values (real numbers) (scientific notation) are also used for monitoring binary floating point values.
   FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FXU/FX2C PLCs do not support floating point operations.

3.1.2 Conversion of numeric values

Numeric values handled in FX PLCs can be converted as shown in the table below.

Decimal number	Octal number	Hexadecimal number	Binary number		BCD	
0	0	00	0000	0000	0000	0000
1	1	01	0000	0001	0000	0001
2	2	02	0000	0010	0000	0010
3	3	03	0000	0011	0000	0011
4	4	04	0000	0100	0000	0100
5	5	05	0000	0101	0000	0101
6	6	06	0000	0110	0000	0110
7	7	07	0000	0111	0000	0111
8	10	08	0000	1000	0000	1000
9	11	09	0000	1001	0000	1001
10	12	0A	0000	1010	0001	0000
11	13	0B	0000	1011	0001	0001
12	14	0C	0000	1100	0001	0010
13	15	0D	0000	1101	0001	0011
14	16	0E	0000	1110	0001	0100
15	17	0F	0000	1111	0001	0101
16	20	10	0001	0000	0001	0110
⋮	⋮	⋮	⋮	⋮	⋮	⋮
99	143	63	0110	0011	1001	1001
⋮	⋮	⋮	⋮	⋮	⋮	⋮

Major applications

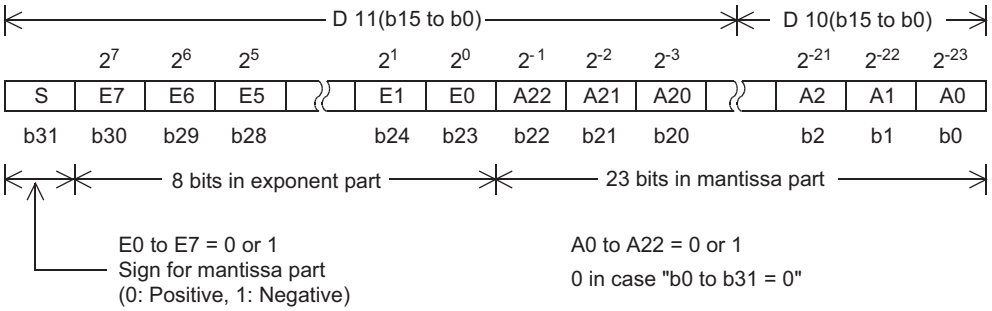
Decimal number	Octal number	Hexadecimal number	Binary number	BCD
Constants (K) and numbers of internal devices except input relays and output relays	Numbers of internal input relays and output relays	Constants (H)	Processing inside PLC	BCD digital switches and seven-segment display units

3.1.3 Handling of numeric values in floating point operations

Handling of numeric values in floating point operations
Binary integers are handled inside PLCs.
In division of integers, the answer "40 / 3 = 13 ... 1" is obtained, for example.
In squire root extractions of integers, the portion after the decimal point is truncated.
In PLCs, floating point operations are available to achieve higher accuracy in such operations.
FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FXU/FX2C PLCs do not support floating point operations.

Binary floating point (real number)

When handling a binary floating point (real number) in data registers, use a pair of data registers having consecutive device numbers.
When D11 and D10 are used, for example, a binary floating point is handled as shown below:



Binary floating point (real number)= $\pm(2^0+A22\times2^{-1}+A21\times2^{-2}+\bullet\bullet\bullet+A0\times2^{-23})$
$\times2^{(E7\times2^7+E6\times2^6+\bullet\bullet\bullet+E0\times2^0)}/2^{127}$

Example: A22=1, A21=0, A20=1, A19 to A0=0, E7=1, E6 to E1=0, E0=1

Binary floating point (real number)= $\pm(2^0+1\times2^{-1}+0\times2^{-2}+1\times2^{-3}+\bullet\bullet\bullet+0\times2^{-23})$
$\times2^{(1\times2^7+0\times2^6+\bullet\bullet\bullet+1\times2^0)}/2^{127}$
$=\pm1.625\times2^{129}/2^{127}=\pm1.625\times2^2$

The sign bit b31 indicates whether data is positive or negative, but is not handled as a complement.

Number of significant figures
The number of significant figures of binary floating point is approximately "7" when expressed in the decimal notation.
Binary floating point handles the following range:

- Minimum absolute value 1175494 $\times$ 10^{-44}
- Maximum absolute value 3402823 $\times$ 10^{32}

Handling of zero (M8020), borrow (M8021) and carry (M8022) flags
These flags operate as follows in floating point operations:

- Zero flag : "1" when the result is truly "0"
- Borrow flag : "1" when the result does not reach the minimum unit but is not "0"
- Carry flag : "1" when the absolute value of the result exceeds the available value

Monitoring of binary floating point (real number)
Programming software such as GX Works2 which supports the display of floating point can directly monitor binary floating point (real number).

Decimal floating point (real number) (scientific notation)

Because binary floating point (real number) is difficult to understand for users, it can be converted into decimal floating point (real number). But the PLC executes internal operations using binary floating point (real number) in any case.
Decimal floating point (real number) is handled by a pair of data registers having consecutive device numbers. Different from binary floating point (real number), a data register having a smaller device number handles the mantissa part, and the other data register having a larger device number handles the exponent part.
For example, when data registers D1 and D0 are used, they handle decimal floating point as shown below. Data can be written to D0 and D1 by the MOV instruction.

Decimal floating point (real number)= [Mantissa D0] × 10[Exponent D1]
Mantissa D0=± (1,000 to 9,999) or 0
Exponent D1=-41 to +35

The most significant bit of D0 and D1 specifies the positive or negative sign respectively, and is handled as two's complement respectively.
The mantissa D0 does not allow "100", for example. In the case of "100", it is handled as "1000×10^{-1}".
The decimal floating point (real number) handles the following range:

- Minimum absolute value 1175×10^{-41}
- Maximum absolute value 3402×10^{35}

Number of significant figures
The number of significant figures of decimal floating point is approximately "4" when expressed in the decimal notation.
Decimal floating point handles the above range.

Decimal floating point (real number) is valid in the following instructions:

- Conversion from binary floating point (real number) into decimal floating point (real number): DEBCD
- Conversion from decimal floating point (real number) into binary floating point (real number): DEBIN

3.2 Specification of Constants K, H and E (Decimal, Hexadecimal and Real Numbers)

When handling constants in a sequence program, use constants "K (decimal)", "H (hexadecimal)" and E (floating point)".
In peripheral equipment for programming, add "K" to a decimal number, "H" to a hexadecimal number and "E" to a floating point (real number) for operations associated with numeric values in instructions.
(Examples: K100 (decimal number), H64 (hexadecimal number) and E1.23 or E1.23+10 (real number))
The roles and functions of constants are described below.

3.2.1 Constant "K" (decimal number)

"K" indicates a decimal integer, and is mainly used to specify the set value of timers and counters and numeric values used as operands in instructions (Example: K1234).
The decimal constant specification range is as follows:

- When word data (16 bits) is used •••• K-32768 to K32767
- When double word data (32 bits) is used •••• K-2,147,483,648 to K2,147,483,647

3.2.2 Constant "H" (hexadecimal number)

"H" indicates a hexadecimal number, and is mainly used to specify numeric values used as operands in instructions (Example: H1234).
When a number in the range from 0 to 9 is used in every digit, BCD data can be specified because the status of each bit (1 or 0) is equivalent to the BCD code.
(Example: When specifying BCD data for "H1234", specify each digit of the hexadecimal number using 0 to 9.)
The hexadecimal constant specification range is as follows:

- When word data (16 bits) is used•••H0 to HFFFF (H0 to H9999 in the case of BCD data)
- When double word data (32 bits) is used •••H0 to HFFFFFFFF (H0 to H99999999 in the case of BCD data)

3.2.3 Constant "E" (real number)

"E" indicates a real number (floating point data), and is mainly used to specify numeric values used as operands in instructions (Example: E1.234 or E1.234+3).
The real number setting range is from -1.0×2^{128} to -1.0×2^{-126}, 0, 1.0×2^{-126} to 1.0×2^{128}
In sequence programs, a real number can be specified in two methods, "normal expression" and "exponent expression".

- Normal expression •••••Specify a numeric value as it is.
  For example, specify "10.2345" in the format "E10.2345".
- Exponent expression••••Specify a numeric value in the format "(Numeric value) $\times 10^{n}$".
  For example, specify "1234" in the format "E1.234+3".
  "+3" in "E1.234+3" indicates "10^{3}".

FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FXU/FX2C/FX2N/FX2NC PLCs do not support real numbers (E).
In FX3G PLCs, this function is support in Ver. 1.10 and later.

3.3 Character Strings

Character strings are classified into character string constants which directly specify character strings as operands in instructions and character string data.
FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FXU/FX2C/FX2N/FX2NC/FX3S/FX3G/FX3GC PLCs do not support character strings.

3.3.1 Character string constant ("ABC")

A device "character string" directly specifies a character string in a sequence program.
Put half-width characters inside quotation marks (Example: "ABCD1234") in specification.
JIS8 codes are available.
Up to 32 characters can be specified as a character string.

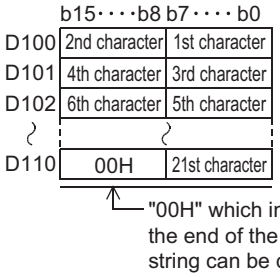
3.3.2 Character string data

With regard to character string data, the range from a specified device to the NUL code (00H) is handled as one character string in units of byte.
When expressing (recognizing) character string data using bit devices with digit specification, however, 16 bits are required also for data including NUL code (00H) which specifies the end of the character string because the instruction length is 16 bits. (Refer to "Example 2" in the step 2 below.)
In the following cases, an operation error occurs in the instruction (Error cord: K6706):

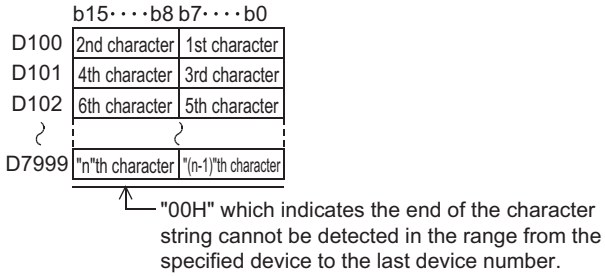
- When "00H" is not set in the corresponding device range after the device number specified as the source in an instruction
- When there are insufficient devices for storing character string data (including "00H" or "0000H" which indicates the end of the character string data) in devices specified as the destination in an instruction

1) Character string data stored in word devices

- Example of data which can be recognized as character string data

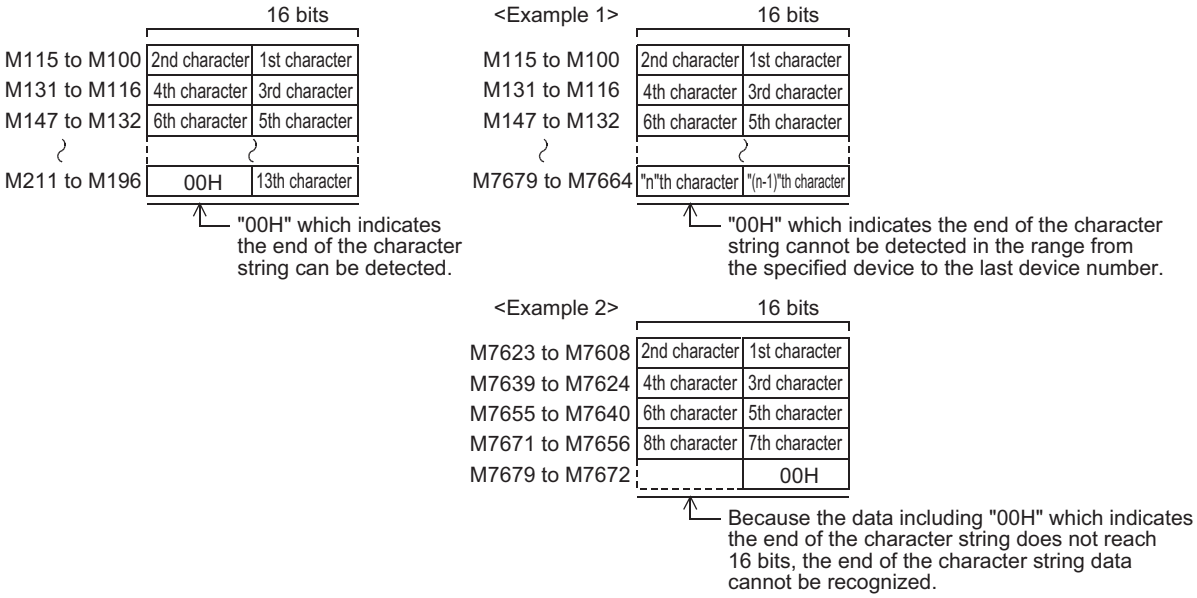


- Example of data which cannot be recognized as character string data



2) Character string data stored in bit devices with digit specification

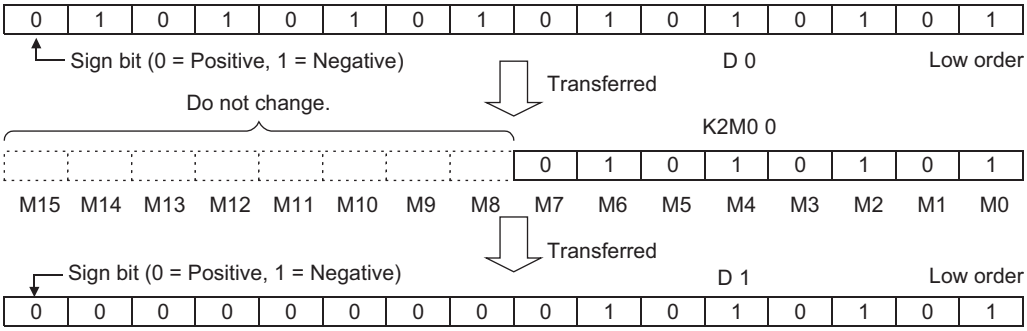
- Example of data which can be recognized as character string data
- Example of data which cannot be recognized as character string data


16 bits
M115 to M100
M131 to M116
M147 to M132
M211 to M196
2nd character
1st character
4th character
3rd character
6th character
5th character
00H
13th character
"00H" which indicates the end of the character string can be detected.
<Example 1>
16 bits
M115 to M100
M131 to M116
M147 to M132
M7679 to M7664
2nd character
1st character
4th character
3rd character
6th character
5th character
"n"th character
"(n-1)"th character
"00H" which indicates the end of the character string cannot be detected in the range from the specified device to the last device number.
<Example 2>
16 bits
M7623 to M7608
M7639 to M7624
M7655 to M7640
M7671 to M7656
M7679 to M7672
2nd character
1st character
4th character
3rd character
6th character
5th character
8th character
7th character
00H
Because the data including "00H" which indicates the end of the character string does not reach 16 bits, the end of the character string data cannot be recognized.

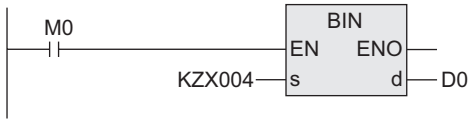
3.4 Specification of Digits for Bit Devices (Kn□***)

Handling of bit devices

Devices which handle only the ON/OFF information such as X, Y, M and S are called bit devices.
On the other hand, devices which handle numeric values such as T, C, D and R are called word devices.
Even bit devices can handle numeric values when they are combined. In this case, the number of digits "Kn" and the head device number should be combined.
The number of digits is expressed in units of 4 bits. "K1" to "K4" are used for 16-bit data, and "K1" to "K8" are used for 32-bit data.
For example, "K2M0" indicates 2-digit data handled by M0 to M7.



When 16-bit data is transferred to K1M0 to K3M0, data is not transferred to high-order bits because the data length is insufficient.
32-bit data is transferred in the same way.
When the number of digits specified for bit devices is "K1" to "K3" in a 16-bit (or "K1" to "K7" in a 32-bit) operation, insufficient high order bits are always regarded as "0". It means that such data is always positive.



2-digit BCD data handled by X004 to X013 is converted into binary data, and then transferred to D0.

A bit device number can be specified arbitrarily usually, but it is recommended to set the least significant digit to "0" for X and Y. (In other words, it is recommended to specify "X000, X010, X020 ... Y000, Y010, Y020 ... ")
For M and S, multiples of "8" are ideal, but it is recommended to specify "M0, M10, M20 ..." to prevent confusion.

Specification of consecutive words

A series of data registers starting from D1 means "D1, D2, D3, D4 ..."
In the case of words with digit specification, they are specified as shown below when they are handled as a series.

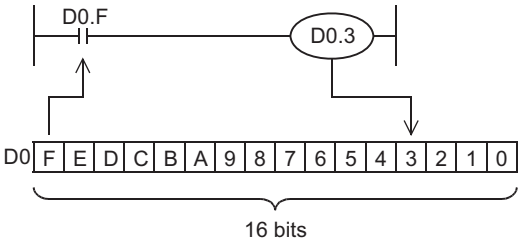
- K1X000, K1X004, K1X010, K1X014••••••
- K2Y010, K2Y020, K2Y030••••••
- K3M0, K3M12, K3M24, K3M36••••••
- K4S16, K4S32, K4S48••••••

Use the above devices in units of digit so that devices are not skipped.
When "K4Y000" is used in a 32-bit operation, high-order 16 bits are regarded as "0".
It is necessary to use "K8Y000" when 32-bit data is required.

3.5 Specification of Bit for Word Device [D□.b]

By specifying a bit of a word device, the specified bit can be used as bit data.
Only FX3U/FX3UC PLCs support this function.
When specifying a bit of a word device, use a word device number and bit number (hexadecimal).
(Example: "D0.0" indicates the bit No. 0 of data register (d).)
Indexing is not available for both the device number and the bit number.

Target word device : Data register or special data register
Bit number : 0 to F(hexadecimal)

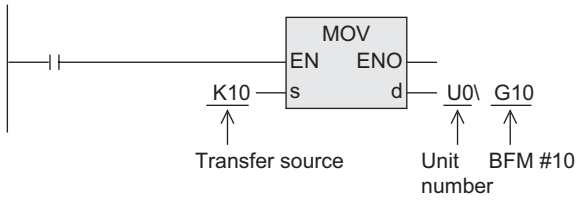


3.6 Direct Specification of Buffer Memory (U□\G□)

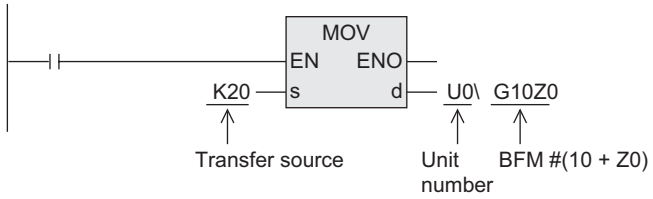
A buffer memory (BFM) of a special function block or special function unit can be specified directly.
Only FX3U/FX3UC PLCs support this function.
BFM is 16-bit or 32-bit word data, and mainly used for operands in instructions.
For specifying BMF, specify the unit number (U) of a special function block or special function unit and the BFM number (\G) consecutively.
(Example: "U0\G0" indicates BFM #0 in the special function block or special function unit whose unit number is "0".)
Indexing is available for BFM numbers.
The specification range is as follows:

Unit number(U) . . . . 0 to 7
BFM number(\G) . . . 0 to 32766

Example of MOV instruction



Example of indexing BFM number



3.7 Indexing

The functions and structures of index registers are explained in detail in "2.10 Index Register [V and Z]". Refer to this section in advance.

3.7.1 Indexing in basic instructions

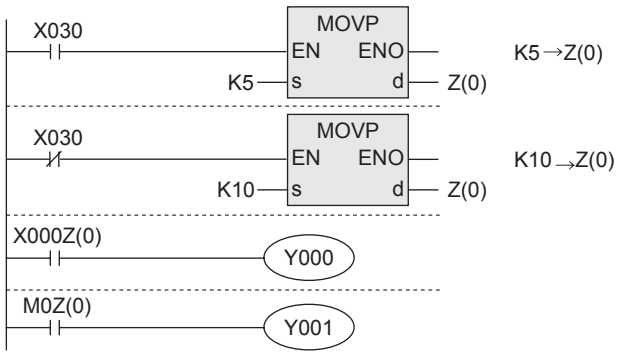
Only FX3U/FX3UC PLCs support this function.

In the case of bit devices

Bit devices [X, Y, M (except special auxiliary relays), T and C (C0 to C199)] used in the LD, LDI, AND, ANI, OR, ORI, OUT, SET, RST, PLS and PLF instructions can be indexed with index registers.
The right figure shows an example of the indexing operation using the index register Z(0) for X000 and M0 in the LD instruction.
Transfer "K5" or "K10" in advance to the index register Z(0).
If Z(0) is "5", "X(0+5) = X005" and "M(0+5) = M5". When X005 turns ON, Y000 turns ON. When M5 turns ON, Y001 turns ON.
If Z(0) is "10", "X(0+10) = X012*1" and "M(0+10) = M10". When X012*1 turns ON, Y000 turns ON. When M10 turns ON, Y001 turns ON.

*1. Refer to the caution 3) below.

- Index registers Z0 to Z7 and V0 to V7 can be used for indexing.
- In the OUT instruction for a timer or counter, the timer number (or counter number) and the device specified for the set value can be indexed.



Z(0)=5 : X005 = ON → Y000 = ON
M5 = ON → Y001 = ON
Z(0)=10 : X012*2 = ON → Y000 = ON
M10 = ON → Y001 = ON

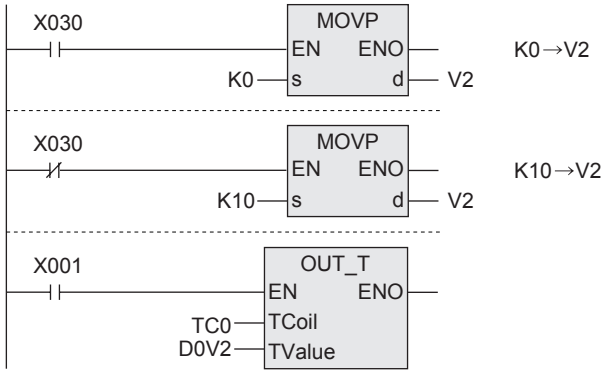
*2 Refer to the caution 3) below.

Cautions

1) 32-bit counters and special auxiliary relays cannot be indexed with index registers.
2) It is not allowed to use 16-bit counters as 32-bit counters by indexing.
3) When the octal device number of X or Y is indexed with an index register, the contents of the index register are converted into octal, and then added to the device number.
For example, when the value of an index register added to the input X000 is changed to K0, K8 and K16, the input X000 gets addition of the device number converted into octal in the way "X000 + 0 = X000", "X000 + 8 = X010" and "X000 + 16 = X020", and the input number is changed accordingly.

In the case of word devices and constants

The set value of word devices (T and C (00 to 199)) used in the OUT instruction can be indexed with index registers.
The right figure shows an example of the indexing operation in which the set value D0 of T0 used in the OUT instruction is indexed with an index register V2.
Transfer K0 or K10 to the index register V2 in advance.
When X001 is set to ON and if V2 is "0", T0 operates with the set value D0 (D (0+0) = D0).
When X001 is set to ON and if V2 is "10", T0 operates with the set value D10 (D (0+10) = D10).



V2=0 : The set value of T0 is the current value of D0.
V2=10 : The set value of T0 is the current value of D10.

Cautions

1) When a 32-bit counter is used in the OUT instruction, the set value cannot be indexed with index registers.

3.7.2 Indexing in instructions

Indication of instructions allowing indexing

In the explanation of instructions, operands allowing indexing are indicated as shown in the table below.

→ **FX Structured Programming Manual [Basic & Applied Instruction]**

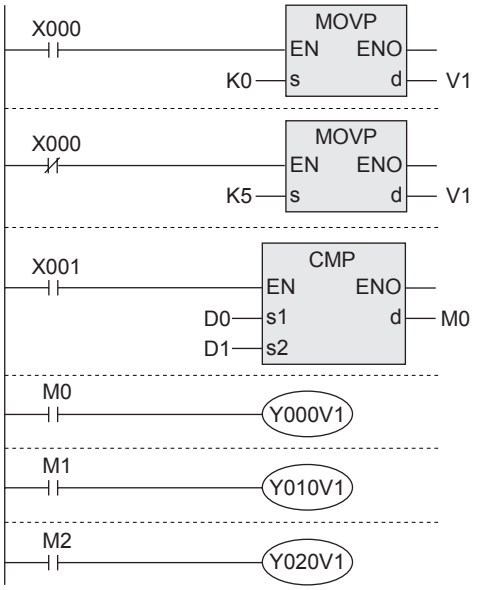
Operand type	Bit Device							Word Device												Others				
	System User							Digit Specification				System User				Special Unit	Index			Constant		Real Number	Character String	Pointer
	X	Y	M	T	C	S	D□.b	KnX	KnY	KnM	KnS	T	C	D	R	U□\G□	V	Z	Modifier	K	H	E	"□"	P
(s)								●	●	●	●	●	●	●	●	●	●	●	●	●	●			
(d)									●	●	●	●	●	●	●	●	●	●	●					

Indicated by "●"

In the case of bit devices

The right figure shows an example of the indexing operation in which the comparison result M0 in the CMP instruction is indexed with the index register V1.
Transfer K0 or K5 to the index register V1 in advance.
When X001 is set to ON, the comparison result is output to M0 to M2.
When M0 is ON and if V1 is "0", Y000 (= Y000+0) is activated.
When M0 is ON and if V1 is "5", Y005 (= Y000+5) is activated.
When M1 is ON and if V1 is "0", Y010 (= Y010+0) is activated.
When M2 is ON and if V1 is "0", Y020 (= Y020+0) is activated.
When M2 is ON and if V1 is "5", Y025 (= Y020+5) is activated.

- For available index registers, refer to Section 2.10.

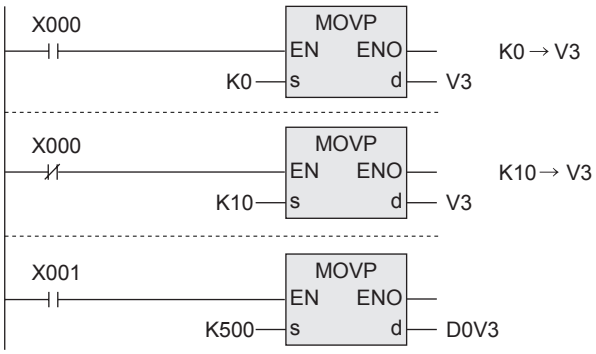


V1=0 V1=5
D0>D1 → M0=ON → Y000=ON Y005=ON
D0=D1 → M1=ON → Y010=ON Y015=ON
D0<D1 → M2=ON → Y020=ON Y025=ON

In the case of word devices

1. Indexing of operands in a 16-bit instruction

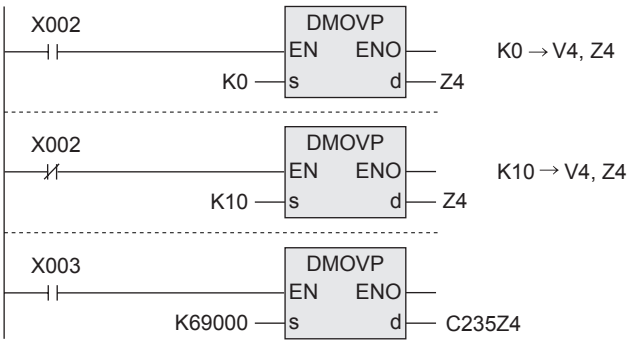
The right figure shows an example of the indexing operation in which the transfer destination D0 in the MOV instruction is indexed with the index register V3.
Transfer K0 or K10 to the index register V3 in advance.
When X001 is set to ON and if V3 is "0", K500 is transferred to D0 (D (0+0) = D0).
When X001 is set to ON and if V3 is "10", K500 is transferred to D10 (D (0+10) = D10).



V3=0 : K500 → D0 (D0+0)
V3=10 : K500 → D10 (D0+10)

2. Indexing of operands in a 32-bit operation

In a 32-bit instruction, it is also necessary to specify a 32-bit index register in the instruction. When handling 32-bit data in a structured program, however, direct specification of 16-bit devices is not available, different from a simple project. Use a label when handling 32-bit data. (32-bit counters can be specified directly because they have 32-bit data length.)
When an index register Z (Z0 or later) is specified in a 32-bit instruction, the specified Z and its counterpart V (V0 or later) work together as a 32-bit register.

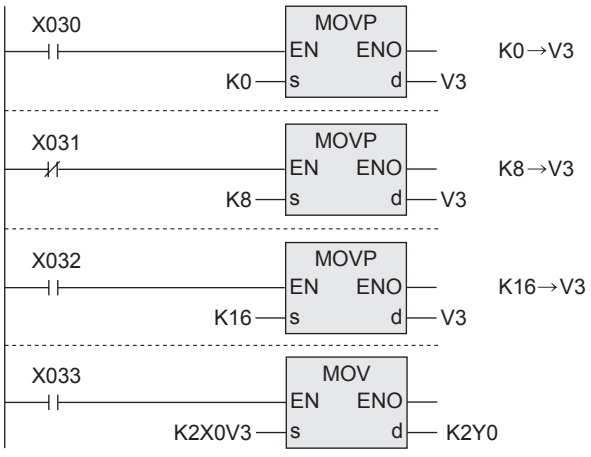


V4,Z4=0 : K69000 → C235 (C235+0)
V4,Z4=10 : K69000 → C245 (C235+10)

The right figure shows an example of the indexing operation in which the transfer destination C235 (32-bit counter) in the DMOV instruction is indexed with the index registers V4 and Z4.
Transfer K0 or k10 to the index registers V4 and Z4 in advance.
When X003 is set to ON and if V4 and Z4 are "0", K69000 is transferred to C235 (C (235+0) = C235).
When X003 is set to ON and if V4 and Z4 are "10", K69000 is transferred to C245 (C (235+10) = C245).

Cautions

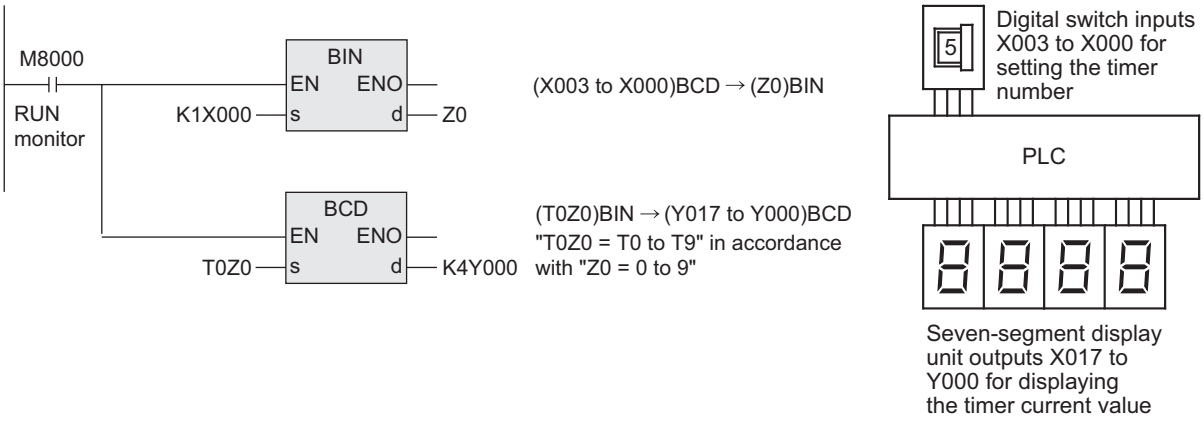
1) Even if a numeric value written to index registers does not exceed the 16-bit numeric range (0 to 32767), make sure to overwrite both V and Z using a 32-bit instruction. If only Z is overwritten and another numeric value remains in V, the resulting numeric value will be extremely large and an operation error will occur.
2) It is not allowed to index 16-bit counters and use them as 32-bit counters.
When 32-bit counters are required as the result of indexing, add Z0 to Z7 to counters C200 and later.
3) It is not allowed to index V and Z themselves.
4) Direct specification of buffer memory in special function blocks/units
In the direct specification of buffer memory "U□\G□", the buffer memory number can be indexed with index registers.
The unit number cannot be indexed with index registers.
("U0\G0Z0" is valid, but "U0Z0\G0" is invalid.)
5) Indexing in bit digit specification
It is not allowed to index "n" in "Kn" used for digit specification.
("K4M0Z0" is valid, but "K0Z0M0" is invalid.)
6) Indexing in I/O relays (octal device numbers)
When the octal device number of X, Y, KnX or KnY is indexed with an index register, the contents of the index register are converted into octal, and then added to the device number.
The right figure shows an example of the indexing operation in which Y000 to Y007 are output by the MOV instruction and inputs are switched by indexing to "X007 to X000", "X017 to X010" or "X027 to X020".
When the index value is overwritten by "K0", "K8" and "K16", the device number converted into octal is added in the way "X000 + 0 = X000", "X000 + 8 = X010" and "X000 + 16 = X020", and the input terminal working as the source is changed accordingly.



V3=0 : X7 to X0 → Y7 to Y0
V3=8 : X17 to X10 → Y7 to Y0
V3=16 : X27 to X20 → Y7 to Y0

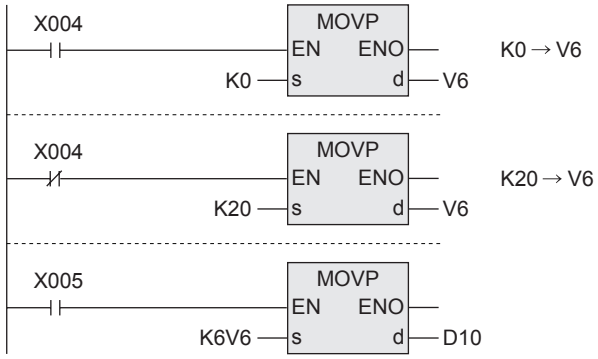
Display example of the timer current value

A sequence to display the current value of timers T0 to T9 can be programmed using index registers.



In the case of constants

The right figure shows an example of the indexing operation in which the transfer source in the MOV instruction is indexed with the index register V6. Transfer K0 or K20 to the index register V6 in advance.
When X005 is set to ON and if V6 is "0", K6 (= K(6+0))is transferred to D10.
When X005 is set to ON and if V6 is "20", K26 (= K(6+20))is transferred to D10.

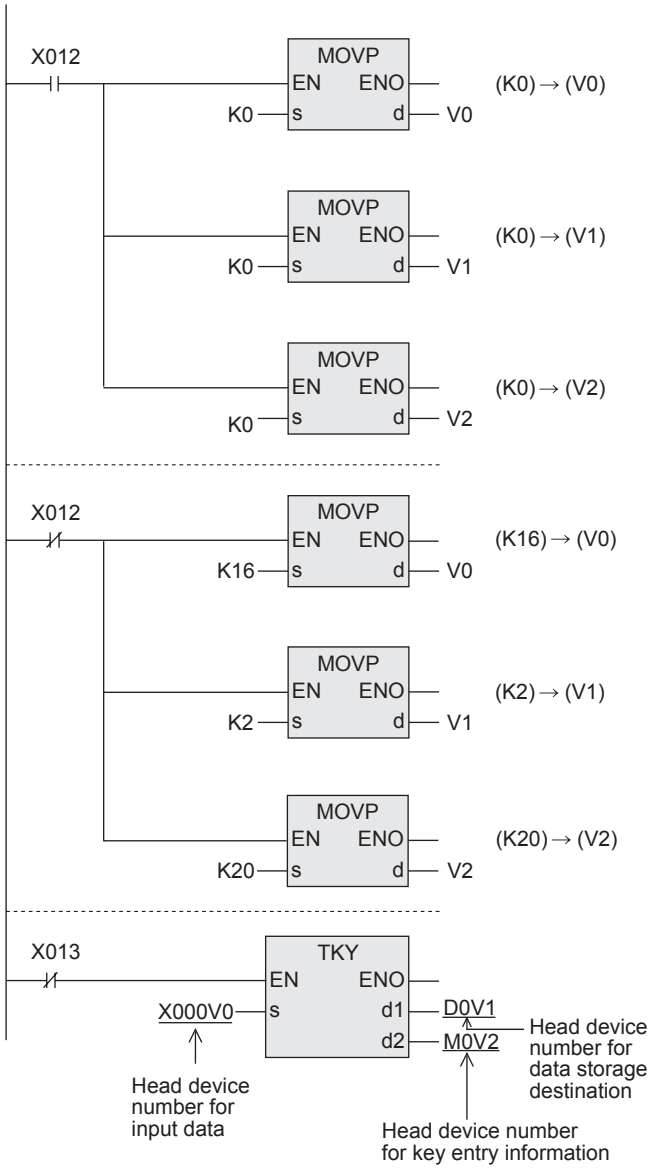


3.7.3 Indexing example for instructions whose number of times of use is restricted

By indexing the target device number with index registers V and Z, it is possible to change the target device number for each program. When this method is applied to an instruction whose number of times of use is restricted, it is regarded as if a same instruction is used multiple times in the program.

Example of indexing operation using the TKY instruction

Two sets of key entries (of 0 to 9 given from the ten-key pad) store the input data to D0 and D2. The TKY instruction can be programmed only once, but two sets of key entries of 0 to 9 are available by indexing the head device number for input data, the head device number for input data storage destination and the head device number for turning ON the key entry information.
Even if V is changed while the TKY instruction is executed, such a change is invalid. To make the change valid, turn OFF the execution of the TKY instruction.



4. Operations of Special Devices (M8000 and later, D8000 and later)

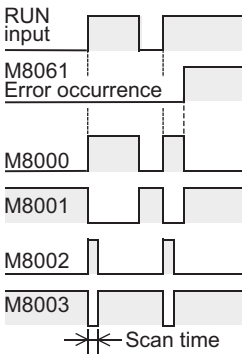
4.1 Special Device List (M8000 and later, D8000 and later)

This section explains types and functions of special auxiliary relays (indicated as "special M" in tables) and special data registers (indicated as "special D" in tables).
Note that functions of certain devices vary depending on the PLC series even if the device number is same.
Do not use undefined and blank special auxiliary relays and special data registers in sequence programs because they are occupied by the CPU.
Do not activate or write data to devices with brackets on the first character such as "[M]8000" and "[D]8001" in programs.

→ **For supplementary information on special devices, refer to Section 4.2.**

4.1.1 Special auxiliary relays (M8000 and later)

1. FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
PLC status							
[M]8000 RUN monitor NO contact	 → **Refer to Subsection 4.2.1.**	✓	✓	✓	✓	✓	-
[M]8001 RUN monitor NC contact		✓	✓	✓	✓	✓	-
[M]8002 Initial pulse NO contact		✓	✓	✓	✓	✓	-
[M]8003 Initial pulse NC contact		✓	✓	✓	✓	✓	-
[M]8004 Error occurrence	Remains ON while either one among M8060, M8061, M8064, M8065, M8066 or M8067 is ON.	✓	✓	✓	✓	✓	D8004
[M]8005 Battery voltage low	Remains ON while the battery voltage is abnormally low. → **Refer to Subsection 4.2.3.**	✓	✓	✓	✓	-	D8005
[M]8006 Battery voltage low latch	Turns ON when abnormally low battery voltage is detected. → **Refer to Subsection 4.2.3.**	✓	✓	✓	✓	-	D8006
[M]8007 Instantaneous power interruption	Remains ON during 1 scan when instantaneous power interruption is detected. Even if M8007 turns ON, the PLC continues operation as far as the duration of low supply voltage is within the time period specified by D8008. → **Refer to Subsection 4.2.4.**	✓	✓	-	-	-	D8007 D8008
[M]8008 Power interruption	It is set when momentary power failure is detected. When the duration of low supply voltage exceeds the time period specified by D8008, M8008 turns OFF and the PLC switches to the STOP mode (M8000 = OFF). → **Refer to Subsection 4.2.4.**	✓	✓	-	-	-	D8008
[M]8009 24V DC failure	ON when 24 V DC power fails in any I/O extension units or special function unit/block.	✓	✓	✓	✓	-	D8009

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Clock							
[M]8010	Unavailable	-	-	-	-	-	-
[M]8011 10 ms clock	Turns ON and OFF in 10 ms cycle (ON duration: 5 ms, OFF duration: 5 ms). → **Refer to Subsection 4.2.6.**	✓	✓	✓	✓	✓	-
[M]8012 100ms clock	Turns ON and OFF in 100 ms cycle (ON duration: 50 ms, OFF duration: 50 ms). → **Refer to Subsection 4.2.6.**	✓	✓	✓	✓	✓	-
[M]8013 1 sec clock	Turns ON and OFF in 1 sec cycle (ON duration: 500 ms, OFF duration: 500 ms). → **Refer to Subsection 4.2.6.**	✓	✓	✓	✓	✓	-
[M]8014 1 min clock	Turns ON and OFF in 1 min cycle (ON duration: 30 s, OFF duration: 30 s). → **Refer to Subsection 4.2.6.**	✓	✓	✓	✓	✓	-
M 8015	Stops and presets time counting. For real-time clock → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓	-
M 8016	Stops the time display. For real-time clock → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓	-
M 8017	Corrects by ±30 seconds. For real-time clock → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓	-
[M]8018	Detects installation (Always remains ON). For real-time clock → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓	-
M 8019	Notifies a real-time clock (RTC) error. For real-time clock → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓	-
Flag							
[M]8020 Zero	Turns ON when the addition or subtraction result is "0".	✓	✓	✓	✓	✓	-
[M]8021 Borrow	Turns ON when the subtraction result is less than the maximum negative value.	✓	✓	✓	✓	✓	-
M 8022 Carry	Turns ON when "carry" occurs in the addition result, or when overflow occurs in the shift operation result.	✓	✓	✓	✓	✓	-
[M]8023	Unavailable	-	-	-	-	-	-
M 8024*1	Specifies the BMOV instruction execution direction.	✓	✓	✓	✓	✓	-
M 8025*1	Indicates the HSC mode.	✓	✓	-	-	-	-
M 8026*1	Indicates the RAMP mode.	✓	✓	-	-	-	-
M 8027*1	Indicates the PR mode.	✓	✓	-	-	-	-
M 8028	Changes over the 100 ms timer and 10 ms timer.	-	-	-	-	✓	-
	Enables interrupts while the FROM/TO instruction is executed.	✓	✓	✓	✓	-	-
[M]8029 Instruction execution complete	Turns ON when the operation of DSW, etc. is completed.	✓	✓	✓	✓	✓	-

*1. Cleared when the PLC mode switches from RUN to STOP.

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
PLC mode							
M 8030*1 Battery LED OFF command	Does not turn ON the battery LED on the PLC panel even if the battery voltage becomes low. → **Refer to Subsection 4.2.10.**	✓	✓	✓	✓	-	-
M 8031*1 Non-latched memory all clear	Clears the ON/OFF image memory of Y, M, S, T and C, and clears the current value of T, C, D, special D and R. Does not clear file registers (D) in the program memory and extension file registers (ER) in the memory cassette. → **Refer to Subsection 4.2.11.**	✓	✓	✓	✓	✓	-
M 8032*1 Latched memory all clear		✓	✓	✓	✓	✓	-
M 8033 Memory holding against STOP mode	Holds the contents of the image memory and data memory when the PLC mode switches from RUN to STOP. → **Refer to Subsection 4.2.12.**	✓	✓	✓	✓	✓	-
M 8034*1 All output disable	Set to OFF all external output contacts of the PLC. → **Refer to Subsection 4.2.13.**	✓	✓	✓	✓	✓	-
M 8035 Forced RUN mode	→ **Refer to Subsection 4.2.14 for details.**	✓	✓	✓	✓	✓	-
M 8036 Forced RUN command		✓	✓	✓	✓	✓	-
M 8037 Forced STOP command		✓	✓	✓	✓	✓	-
[M]8038 Parameter setting	Communication parameter setting flag (to set simple N:N link). → **Refer to the data communication manual.**	✓	✓	✓	✓	✓	D8176 to D8180
M 8039 Constant scan mode	Makes the PLC execute cyclic operations while keeping the scan time specified in D8039. → **Refer to Subsection 4.2.15.**	✓	✓	✓	✓	✓	D8039

*1. Activated when the END instruction is executed.

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Step ladder and annunciator							
M 8040 Transfer disable	Disables transfer between states.	✓	✓	✓	✓	✓	-
[M]8041*1 Transfer start	Enables transfer from the initial state during automatic operation.	✓	✓	✓	✓	✓	-
[M]8042 Start pulse	Gives pulse output in response to start input.	✓	✓	✓	✓	✓	-
M 8043*1 Zero point return complete	Should be set to ON in the zero return mode end state.	✓	✓	✓	✓	✓	-
M 8044*1 Zero point condition	Should be set to ON when the machine zero point is detected.	✓	✓	✓	✓	✓	-
M 8045 All output reset disable	Disables reset of all outputs when the operation mode switches.	✓	✓	✓	✓	✓	-
[M]8046*2 STL state ON	Remains ON while M8047 is ON and either one among S0 to S899 and S1000 to S4095*3 is ON.	✓	✓	✓	✓	✓	M8047
M 8047*2 STL monitoring enable	Enables M8040 to D8047.	✓	✓	✓	✓	✓	D8040 to D8047
[M]8048*2 Annunciator ON	Remains ON while M8049 is ON and either one among S900 to S999 is ON.	✓	✓	✓	✓	-	-
M 8049*1 Annunciator enable	Enables D8049.	✓	✓	✓	✓	-	D8049 M8048

*1. Cleared when the PLC mode switches from RUN to STOP.

*2. Activated when the END instruction is executed.

*3. S1000 to S4095 are available only in the FX3S, FX3G, FX3GC, FX3U, or FX3UC PLCs.

Interrupt disable							
M 8050 (Input interrupt) I00□ disable*4	• When a special M for disabling input interrupt or timer interrupt is ON Even if an input interrupt or timer interrupt occurs while acceptance of the corresponding interrupt is disabled, the interrupt program is not executed. For example, when the interrupt I00□ is given while M8050 is ON (to disable the interrupt I00□), the interrupt program is not executed even within the interrupt enabled program area. • When a special M for disabling input interrupt or timer interrupt is OFF a) When an input interrupt or timer interrupt occurs, it is accepted. b) The interrupt program is executed immediately if interrupts are enabled by the EI instruction. If the DI instruction disables interrupts, execution of the interrupt program is paused until the EI instruction enables interrupts.	✓	✓	✓	✓	✓	-
M 8051 (Input interrupt) I10□ disable*4		✓	✓	✓	✓	✓	-
M 8052 (Input interrupt) I20□ disable*4		✓	✓	✓	✓	✓	-
M 8053 (Input interrupt) I30□ disable*4		✓	✓	✓	✓	✓	-
M 8054 (Input interrupt) I40□ disable*4		✓	✓	✓	✓	✓	-
M 8055 (Input interrupt) I50□ disable*4		✓	✓	✓	✓	✓	-
M 8056 (Timer interrupt) I6□□ disable*4		✓	✓	✓	✓	✓	-
M 8057 (Timer interrupt) I7□□ disable*4		✓	✓	✓	✓	✓	-
M 8058 (Timer interrupt) I8□□ disable*4		✓	✓	✓	✓	✓	-
M 8059 Counter interrupt disable*4	Disables interrupts I010 to I060.	✓	✓	-	-	-	-

*4. Cleared when the PLC mode switches from RUN to STOP.

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Error detection (Refer to Chapter 5 for details.)							
[M]8060	I/O configuration error	✓	✓	✓	✓	-	D8060
[M]8061	PLC hardware error	✓	✓	✓	✓	✓	D8061
[M]8062	PLC/PP communication error	✓*1	✓*1	-	-	✓*1	D8062
	Serial communication error 0 [ch0]*2	-	-	✓	✓	-	D8062
[M]8063*2*3	Serial communication error 1 [ch1]	✓	✓	✓	✓	✓	D8063
[M]8064	Parameter error	✓	✓	✓	✓	✓	D8064
[M]8065	Syntax error	✓	✓	✓	✓	✓	D8065 D8069 D8314 D8315
[M]8066	Circuit error	✓	✓	✓	✓	✓	D8066 D8069 D8314 D8315
[M]8067*4	Operation error	✓	✓	✓	✓	✓	D8067 D8069 D8314 D8315
M 8068	Operation error latch	✓	✓	✓	✓	✓	D8068 D8312 D8313
M 8069*5	I/O bus check	✓	✓	✓	✓	-	-

*1. It truns on, only when a memory access error (6230) occurs in FX3S, FX3U, and FX3UC PLCs.

*2. Cleared when the PLC power supply from OFF to ON.

*3. M8438 notifies a serial communication error 2 [ch2].

*4. Cleared when the PLC mode switches from STOP to RUN.

*5. The PLC executes the I/O bus check when M8069 is set to ON. (For details, refer to Chapter 5.)

Parallel link							
M 8070*6	Parallel link (Should be set to ON for the master station.)	✓	✓	✓	✓	✓	-
M 8071*6	Parallel link (Should be set to ON for the slave station.)	✓	✓	✓	✓	✓	-
[M]8072	Parallel link (Remains ON during operation.)	✓	✓	✓	✓	✓	-
[M]8073	Parallel link (Turns ON when M8070 or M8071 is set incorrectly.)	✓	✓	✓	✓	✓	-

*6. Cleared when the PLC mode switches from STOP to RUN.

Sampling Trace [FX3U and FX3UC PLCs]							
[M]8074	Unavailable	-	-	-	-	-	-
[M]8075	Ready request for sampling trace	✓	✓	-	-	-	D8075 to D8098
[M]8076	Start request for sampling trace	✓	✓	-	-	-	
[M]8077	Remains ON while sampling trace is executed.	✓	✓	-	-	-	
[M]8078	Turns ON when sampling trace is completed.	✓	✓	-	-	-	
[M]8079	Sampling trace system area	✓	✓	-	-	-	
[M]8080	Unavailable	-	-	-	-	-	-
[M]8081		-	-	-	-	-	-
[M]8082		-	-	-	-	-	-
[M]8083		-	-	-	-	-	-
[M]8084		-	-	-	-	-	-
[M]8085		-	-	-	-	-	-
[M]8086		-	-	-	-	-	-
[M]8087		-	-	-	-	-	-
[M]8088		-	-	-	-	-	-
[M]8089		-	-	-	-	-	-

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Pulse width/Pulse period measurement [FX3G/FX3GC PLCs] (Refer to the FX Structured Programming Manual [Basic & Applied Instruction] for details.)							
[M]8074	Unavailable	-	-	-	-	-	-
[M]8075	Pulse width/Pulse period measurement setting flag	-	-	✓*1	✓	-	
[M]8076	[X000] Pulse width/Pulse period measurement flag	-	-	✓*1	✓	-	D8074 to D8079
[M]8077	[X001] Pulse width/Pulse period measurement flag	-	-	✓*1	✓	-	D8080 to D8085
[M]8078	[X003] Pulse width/Pulse period measurement flag	-	-	✓*1	✓	-	D8086 to D8091
[M]8079	[X004] Pulse width/Pulse period measurement flag	-	-	✓*1	✓	-	D8092 to D8097
M 8080	[X000] Pulse period measurement mode	-	-	✓*1	✓	-	D8074 to D8079
M 8081	[X001] Pulse period measurement mode	-	-	✓*1	✓	-	D8080 to D8085
M 8082	[X003] Pulse period measurement mode	-	-	✓*1	✓	-	D8086 to D8091
M 8083	[X004] Pulse period measurement mode	-	-	✓*1	✓	-	D8092 to D8097
[M]8084 to [M]8089	Unavailable	-	-	-	-	-	-

*1. Available in Ver. 1.10 or later.

Flag							
[M]8090	BKCMP instruction: Block comparison signal	✓	✓*2	-	-	-	-
M 8091	COMRD and BINDA instructions: Output character quantity selector signal	✓	✓*2	-	-	-	-
[M]8092	Unavailable	-	-	-	-	-	-
[M]8093		-	-	-	-	-	-
[M]8094		-	-	-	-	-	-
[M]8095		-	-	-	-	-	-
[M]8096		-	-	-	-	-	-
[M]8097		-	-	-	-	-	-
[M]8098		-	-	-	-	-	-
High speed ring counter							
M 8099*3	High speed ring counter operation (in units of 0.1 ms, 16 bits)	✓	✓	-	-	-	D8099
[M]8100	Unavailable	-	-	-	-	-	-

*2. Available in Ver. 2.20 or later.
*3. The 0.1 ms high speed ring counter (D8099) operates after M8099 is set to ON.

Memory information							
[M]8101	Unavailable	-	-	-	-	-	-
[M]8102		-	-	-	-	-	-
[M]8103		-	-	-	-	-	-
[M]8104	Remains ON while the function extension memory is installed.	-	-	-	-	-	D8104 D8105
[M]8105	ON during writing in RUN mode*4	✓	✓	✓	✓	✓	-
[M]8106	Unavailable	-	-	-	-	-	-
[M]8107	Checks registration of device comment.	✓	✓	-	-	-	D8107
[M]8108	Unavailable	-	-	-	-	-	-
Output refresh error (Refer to Chapter 5 for details.)							
[M]8109	Output refresh error	✓	✓	✓	✓	-	D8109
[M]8110	Unavailable	-	-	-	-	-	-
[M]8111		-	-	-	-	-	-
Expansion Board [For FX3S/FX3G]							
[M]8112	FX3G-4EX-BD: BX0 input	-	-	✓*5	-	✓*6	-
[M]8113	FX3G-4EX-BD: BX1 input	-	-	✓*5	-	✓*6	-
[M]8114	FX3G-4EX-BD: BX2 input	-	-	✓*5	-	✓*6	-
[M]8115	FX3G-4EX-BD: BX3 input	-	-	✓*5	-	✓*6	-
M 8116	FX3G-2EYT-BD: BY0 output	-	-	✓*5	-	✓*6	-
M 8117	FX3G-2EYT-BD: BY1 output	-	-	✓*5	-	✓*6	-
[M]8118	Unavailable	-	-	-	-	-	-
[M]8119		-	-	-	-	-	-

*4. In FX3U/FX3UC PLCs, available only when a optional memory is connected.
*5. Available in Ver. 2.20 or later.
*6. Available in Ver. 1.10 or later.

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
RS instruction and computer link [ch1] (Refer to the data communication manual for details.)							
[M]8120	Unavailable	-	-	-	-	-	-
[M]8121*1	RS instruction: Send wait flag	✓	✓	✓	✓	✓	-
M 8122*1	RS instruction: Send request	✓	✓	✓	✓	✓	D8122
M 8123*1	RS instruction: Receive complete flag	✓	✓	✓	✓	✓	D8123
[M]8124	RS instruction: Carrier detection flag	✓	✓	✓	✓	✓	-
[M]8125	Unavailable	-	-	-	-	-	-
[M]8126	Computer link [ch1]: Global signal ON	✓	✓	✓	✓	✓	D8127 D8128 D8129
[M]8127	Computer link [ch1]: On-demand send being executed	✓	✓	✓	✓	✓	
M 8128	Computer link [ch1]: On-demand error flag	✓	✓	✓	✓	✓	
M 8129	Computer link [ch1]: On-demand word/byte changeover RS (FNC 80) instruction: Timeout check flag	✓	✓	✓	✓	✓	

*1. Cleared when the PLC mode switches from RUN to STOP or when the RS instruction is set to OFF.

High speed counter comparison and high speed table							
M 8130	DHSZ instruction: Table comparison mode	✓	✓	-	-	-	D8130
[M]8131	DHSZ instruction: Table comparison complete flag	✓	✓	-	-	-	
M 8132	DHSZ and PLSY instructions: Speed pattern mode	✓	✓	-	-	-	D8131 to D8134
[M]8133	HSZ instruction: Table comparison complete flag	✓	✓	-	-	-	
[M]8134	Unavailable	-	-	-	-	-	-
[M]8135		-	-	-	-	-	-
[M]8136		-	-	-	-	-	-
[M]8137		-	-	-	-	-	-
[M]8138	DHSCT instruction: Instruction execution complete flag	✓	✓	-	-	-	D8138
[M]8139	DHSCS, DHSCR, DHSZ and DHSCT instructions: High speed counter comparison instruction being executed	✓	✓	-	-	-	D8139
M 8140	ZRN instruction: CLR signal output function enable	-	-	-	-	-	-
[M]8141	Unavailable	-	-	-	-	-	-
[M]8142		-	-	-	-	-	-
[M]8143		-	-	-	-	-	-
[M]8144		-	-	-	-	-	-
M 8145	[Y000] Pulse output stop command	-	-	✓	✓	✓	-
M 8146	[Y001] Pulse output stop command	-	-	✓	✓	✓	-
[M]8147	[Y000] Pulse output monitor (BUSY or READY)	-	-	✓	✓	✓	-
[M]8148	[Y001] Pulse output monitor (BUSY or READY)	-	-	✓	✓	✓	-
[M]8149	Unavailable	-	-	-	-	-	-

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Inverter communication function (Refer to the data communication manual for details.)							
[M]8150	Unavailable	-	-	-	-	-	-
[M]8151	Inverter communication being executed [ch1]	✓	✓	✓*2	✓	✓	D8151
[M]8152*1	Inverter communication error [ch1]	✓	✓	✓*2	✓	✓	D8152
[M]8153*1	Inverter communication error latch [ch1]	✓	✓	✓*2	✓	✓	D8153
[M]8154*1	IVBWR instruction error [ch1]	✓	✓	-	-	-	D8154
[M]8156	Inverter communication being executed [ch2]	✓	✓	✓*2	✓	-	D8156
[M]8157*1	Inverter communication error [ch2]	✓	✓	✓*2	✓	-	D8157
	Communication error latch for EXTR instruction	-	-	-	-	-	D8157
[M]8158*1	Inverter communication error latch [ch2]	✓	✓	✓*2	✓	-	D8158
[M]8159*1	IVBWR instruction error [ch2]	✓	✓	-	-	-	D8159

*1. Cleared when the PLC mode switches from STOP to RUN.

*2. Available in Ver. 1.10 or later.

Advanced function							
M 8160*3	XCH instruction: SWAP function	✓	✓	-	-	-	-
M 8161*3*4	8-bit processing mode	✓	✓	✓	✓	✓	-
M 8162	High speed parallel link mode	✓	✓	✓	✓	✓	-
[M]8163	Unavailable	-	-	-	-	-	-
M 8164*3	FROM and TO instructions: Transfer points variable mode	-	-	-	-	-	D8164
M 8165*3	SORT2 instruction: Sorting in descending order	✓	✓*5	-	-	-	-
[M]8166	Unavailable	-	-	-	-	-	-
M 8167*3	HKY instruction: Hexadecimal data handling function	✓	✓	-	-	-	-
M 8168*3	SMOV instruction: Hexadecimal data handling function	✓	✓	✓	✓	✓	-
[M]8169	Unavailable	-	-	-	-	-	-

*3. Cleared when the PLC mode switches from RUN to STOP.

*4. Available in the ASC, RS, ASCI, HEX, CCD and CRC instructions*6.

*5. Available in Ver. 2.20 or later.

*6. The CRC instruction is available only in FX3U/FX3UC PLCs.

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Pulse catch							
M 8170*1	Input X000 pulse catch	✓	✓	✓	✓	✓	-
M 8171*1	Input X001 pulse catch	✓	✓	✓	✓	✓	-
M 8172*1	Input X002 pulse catch	✓	✓	✓	✓	✓	-
M 8173*1	Input X003 pulse catch	✓	✓	✓	✓	✓	-
M 8174*1	Input X004 pulse catch	✓	✓	✓	✓	✓	-
M 8175*1	Input X005 pulse catch	✓	✓	✓	✓	✓	-
M 8176*1	Input X006 pulse catch	✓	✓	-	-	-	-
M 8177*1	Input X007 pulse catch	✓	✓	-	-	-	-

*1. Cleared when the PLC mode switches from STOP to RUN.
FX3U/FX3UC PLCs: The EI instruction is necessary.
FX3S/FX3G/FX3GC PLCs: The EI instruction is not necessary.

Communication port channel setting (Refer to the data communication manual for details.)							
M 8178	Parallel link: Channel changeover (OFF: ch1, ON: ch2)	✓	✓	✓	✓	-	-
M 8179	Simple N:N link: Channel changeover*2	✓	✓	✓	✓	-	-

*2. The channel is specified by the setting whether or not M8179 is used in the setting program.
→ **For the setting program, refer to the data communication manual.**

- ch1: Specified when M8179 is not used in the program.
- ch2: Specified when M8179 is used in the program.

Simple N:N link (Refer to the data communication manual for details.)							
[M]8180	Unavailable	-	-	-	-	-	-
[M]8181		-	-	-	-	-	-
[M]8182		-	-	-	-	-	-
[M]8183	Data transmission sequence error (master station)	✓	✓	✓	✓	✓	D8201 to D8218
[M]8184	Data transmission sequence error (slave station No. 1)	✓	✓	✓	✓	✓	
[M]8185	Data transmission sequence error (slave station No. 2)	✓	✓	✓	✓	✓	
[M]8186	Data transmission sequence error (slave station No. 3)	✓	✓	✓	✓	✓	
[M]8187	Data transmission sequence error (slave station No. 4)	✓	✓	✓	✓	✓	
[M]8188	Data transmission sequence error (slave station No. 5)	✓	✓	✓	✓	✓	
[M]8189	Data transmission sequence error (slave station No. 6)	✓	✓	✓	✓	✓	
[M]8190	Data transmission sequence error (slave station No. 7)	✓	✓	✓	✓	✓	
[M]8191	Data transmission sequence being executed	✓	✓	✓	✓	✓	
[M]8192	Unavailable	-	-	-	-	-	-
[M]8193		-	-	-	-	-	-
[M]8194		-	-	-	-	-	-
[M]8195		-	-	-	-	-	-
[M]8196		-	-	-	-	-	-
[M]8197		-	-	-	-	-	-

High speed counter edge counting specification (Refer to Subsection 2.7.8 for details.)							
[M]8198*3*4	1-edge/4-edge counting selector for C251, C252 and C254	✓	✓	-	-	-	-
[M]8199*3*4	1-edge/4-edge counting selector for C253, C255 and C253 (OP)	✓	✓	-	-	-	-

*3. OFF: 1-edge counting
ON: 4-edge counting

*4. Cleared when the PLC mode switches from RUN to STOP.

Number and name		Operation and function	Applicable model					
			FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Counter: Up/down-counter counting direction (Refer to Section 2.6 for details.)								
M 8200	C200	When M8□□□ turns ON, the corresponding counter C□□□ becomes the down-counting mode. • ON: Down-counting operation • OFF: Up-counting operation	✓	✓	✓	✓	✓	-
M 8201	C201		✓	✓	✓	✓	✓	-
M 8202	C202		✓	✓	✓	✓	✓	-
M 8203	C203		✓	✓	✓	✓	✓	-
M 8204	C204		✓	✓	✓	✓	✓	-
M 8205	C205		✓	✓	✓	✓	✓	-
M 8206	C206		✓	✓	✓	✓	✓	-
M 8207	C207		✓	✓	✓	✓	✓	-
M 8208	C208		✓	✓	✓	✓	✓	-
M 8209	C209		✓	✓	✓	✓	✓	-
M 8210	C210		✓	✓	✓	✓	✓	-
M 8211	C211		✓	✓	✓	✓	✓	-
M 8212	C212		✓	✓	✓	✓	✓	-
M 8213	C213		✓	✓	✓	✓	✓	-
M 8214	C214		✓	✓	✓	✓	✓	-
M 8215	C215		✓	✓	✓	✓	✓	-
M 8216	C216		✓	✓	✓	✓	✓	-
M 8217	C217		✓	✓	✓	✓	✓	-
M 8218	C218		✓	✓	✓	✓	✓	-
M 8219	C219		✓	✓	✓	✓	✓	-
M 8220	C220		✓	✓	✓	✓	✓	-
M 8221	C221		✓	✓	✓	✓	✓	-
M 8222	C222		✓	✓	✓	✓	✓	-
M 8223	C223		✓	✓	✓	✓	✓	-
M 8224	C224		✓	✓	✓	✓	✓	-
M 8225	C225		✓	✓	✓	✓	✓	-
M 8226	C226		✓	✓	✓	✓	✓	-
M 8227	C227		✓	✓	✓	✓	✓	-
M 8228	C228		✓	✓	✓	✓	✓	-
M 8229	C229		✓	✓	✓	✓	✓	-
M 8230	C230		✓	✓	✓	✓	✓	-
M 8231	C231		✓	✓	✓	✓	✓	-
M 8232	C232		✓	✓	✓	✓	✓	-
M 8233	C233		✓	✓	✓	✓	✓	-
M 8234	C234		✓	✓	✓	✓	✓	-
High speed counter: Up/down-counter counting direction (Refer to Section 2.7 for details.)								
M 8235	C235	When M8□□□ turns ON, the corresponding counter C□□□ becomes the down-counting mode. • ON: Down-counting operation • OFF: Up-counting operation	✓	✓	✓	✓	✓	-
M 8236	C236		✓	✓	✓	✓	✓	-
M 8237	C237		✓	✓	✓	✓	✓	-
M 8238	C238		✓	✓	✓	✓	✓	-
M 8239	C239		✓	✓	✓	✓	✓	-
M 8240	C240		✓	✓	✓	✓	✓	-
M 8241	C241		✓	✓	✓	✓	✓	-
M 8242	C242		✓	✓	✓	✓	✓	-
M 8243	C243		✓	✓	✓	✓	✓	-
M 8244	C244		✓	✓	✓	✓	✓	-
M 8245	C245		✓	✓	✓	✓	✓	-

Number and name		Operation and function	Applicable model					
			FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
High speed counter: Up/down-counter monitor (Refer to Section 2.7 for details.)								
[M]8246	C246	When the 1-phase 2-input or 2-phase 2-input counter C□□□ is in the down-counting mode, the corresponding M8□□□ is ON. • ON: Down-counting operation • OFF: Up-counting operation	✓	✓	✓	✓	✓	-
[M]8247	C247		✓	✓	✓	✓	✓	-
[M]8248	C248		✓	✓	✓	✓	✓	-
[M]8249	C249		✓	✓	✓	✓	✓	-
[M]8250	C250		✓	✓	✓	✓	✓	-
[M]8251	C251		✓	✓	✓	✓	✓	-
[M]8252	C252		✓	✓	✓	✓	✓	-
[M]8253	C253		✓	✓	✓	✓	✓	-
[M]8254	C254		✓	✓	✓	✓	✓	-
[M]8255	C255		✓	✓	✓	✓	✓	-
[M]8256 to [M]8259	Unavailable		-	-	-	-	-	-
Analog Special Adapter [FX3U, FX3UC](Refer to Subsection 4.2.18 for applicability of each analog special adapter.)								
M 8260 to M 8269	1st special adapter*1		✓	✓*2	-	-	-	-
M 8270 to M 8279	2nd special adapter*1		✓	✓*2	-	-	-	-
M 8280 to M 8289	3rd special adapter*1		✓	✓*2	-	-	-	-
M 8290 to M 8299	4th special adapter*1		✓	✓*2	-	-	-	-
Analog Special Adapter [FX3G, FX3GC, FX3S], Analog Expansion Board [FX3G, FX3S] (Refer to Subsection 4.2.17 for applicability of each analog special adapter and analog expansion board)								
M 8260 to M 8269	1st expansion board*3		-	-	✓*6	-	✓	-
M 8270 to M 8279	2nd expansion board*4*5		-	-	✓*6	-	-	-
M 8280 to M 8289	1st special adapter*1		-	-	✓	✓	✓	-
M 8290 to M 8299	2nd special adapter*1*5		-	-	✓	✓	-	-
Flag								
[M]8300 to [M]8303	Unavailable		-	-	-	-	-	-
[M]8304 Zero	Turns ON when the multiplication or division result is "0".		✓*7	✓*7	✓	✓	✓	-
[M]8305	Unavailable		-	-	-	-	-	-
[M]8306 Carry	Turns ON when overflow occurs in the division result.		✓*7	✓*7	✓	✓	✓	-
[M]8307 to [M]8311	Unavailable		-	-	-	-	-	-

*1. Count the number of connected analog special adapter from the main unit.

*2. Available in Ver. 1.20 or later.

*3. Expansion board connected to the BD1 connector of a FX3G PLC (40-point and 60-point type) or the BD connector of a FX3G PLC (14-point and 24-point type) and FX3S PLCs.

*4. Expansion board connected to the BD2 connector of a FX3G PLC (40-point and 60-point type).

*5. Only a FX3G PLC (40-point and 60-point type) can be connected.

*6. Available in Ver. 1.10 or later.

*7. Available in Ver. 2.30 or later.

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Unconnected I/O specification error (Refer to Chapter 5 for details.) and flag							
M8312*1	Real-time clock data loss error	-	-	✓	✓	✓	-
[M]8313 to [M]8315	Unavailable	-	-	-	-	-	-
[M]8316*2	Unconnected I/O specification error	✓	✓	-	-	-	D8316 D8317
[M]8317	Unavailable	-	-	-	-	-	-
[M]8318	BFM initialization failure Turns ON when a FROM/TO error occurs in a special function block/unit specified in the BMF initialization function after the PLC mode switched from STOP to RUN. When M8318 turns ON, D8318 stores the unit number where the error has occurred, and D8319 stores the BMF number.	✓	✓*3	-	-	-	D8318 D8319
[M]8319 to [M]8321	Unavailable	-	-	-	-	-	-
[M]8322	Indicates the model (FX3UC-32MT-LT or FX3UC-32MT-LT-2). 1: FX3UC-32MT-LT-2 0: FX3UC-32MT-LT	-	✓*4	-	-	-	-
[M]8323	Built-in CC-Link/LT configuration request	-	✓*4	-	-	-	-
[M]8324	Built-in CC-Link/LT configuration complete	-	✓*4	-	-	-	-
[M]8325 to [M]8327	Unavailable	-	-	-	-	-	-
[M]8328	Instruction non-execution	✓	✓*3	-	-	-	-
[M]8329	Instruction execution abnormal end	✓	✓	✓	✓	✓	-

*1. Backed up against power interruption, and cleared by the clear operation or automatically cleared when the clock data is set again.

*2. Turns ON if a specified I/O device number is not connected when the I/O device number is directly specified or indirectly specified by an index register in the LD, AND, OR or OUT instruction.

*3. Available in Ver. 2.20 or later.

*4. Only the FX3UC-32MT-LT-2 is available.

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Timing clock and positioning (Refer to the position control manual for details.)							
[M]8330	DUTY instruction: Timing clock output 1	✓	✓*1	-	-	-	D8330
[M]8331	DUTY instruction: Timing clock output 2	✓	✓*1	-	-	-	D8331
[M]8332	DUTY instruction: Timing clock output 3	✓	✓*1	-	-	-	D8332
[M]8333	DUTY instruction: Timing clock output 4	✓	✓*1	-	-	-	D8333
[M]8334	DUTY instruction: Timing clock output 5	✓	✓*1	-	-	-	D8334
[M]8335	Unavailable	-	-	-	-	-	-
M 8336*2	DVIT instruction: Interrupt input specification function enable	✓	✓*3	-	-	-	D8336
[M]8337	Unavailable	-	-	-	-	-	-
[M]8338	PLSV instruction: Acceleration/deceleration operation	✓	✓*1	✓	✓	✓	-
[M]8339	Unavailable	-	-	-	-	-	-
[M]8340	[Y000] Pulse output monitor (ON:BUSY/OFF:READY)	✓	✓	✓	✓	✓	-
M 8341*2	[Y000] Clear signal output function enable	✓	✓	✓	✓	✓	-
M 8342*2	[Y000] Zero point return direction specification	✓	✓	✓	✓	✓	-
M 8343	[Y000] Normal rotation limit	✓	✓	✓	✓	✓	-
M 8344	[Y000] Reverse rotation limit	✓	✓	✓	✓	✓	-
M 8345*2	[Y000] Near-point watchdog signal logic reverse	✓	✓	✓	✓	✓	-
M 8346*2	[Y000] Zero point signal logic reverse	✓	✓	✓	✓	✓	-
M 8347*2	[Y000] Interrupt signal logic reverse	✓	✓	-	-	-	-
[M]8348	[Y000] Positioning instruction being driven	✓	✓	✓	✓	✓	-
M 8349*2	[Y000] Pulse output stop command	✓	✓	✓	✓	✓	-
[M]8350	[Y001] Pulse output monitor (ON:BUSY/OFF:READY)	✓	✓	✓	✓	✓	-
M 8351*2	[Y001] Clear signal output function enable	✓	✓	✓	✓	✓	-
M 8352*2	[Y001] Zero point return direction specification	✓	✓	✓	✓	✓	-
M 8353	[Y001] Normal rotation limit	✓	✓	✓	✓	✓	-
M 8354	[Y001] Reverse rotation limit	✓	✓	✓	✓	✓	-
M 8355*2	[Y001] Near-point watchdog signal logic reverse	✓	✓	✓	✓	✓	-
M 8356*2	[Y001] Zero point signal logic reverse	✓	✓	✓	✓	✓	-
M 8357*2	[Y001] Interrupt signal logic reverse	✓	✓	-	-	-	-
[M]8358	[Y001] Positioning instruction being driven	✓	✓	✓	✓	✓	-
M 8359*2	[Y001] Pulse output stop command	✓	✓	✓	✓	✓	-
[M]8360	[Y002] Pulse output monitor (ON:BUSY/OFF:READY)	✓	✓	✓	-	-	-
M 8361*2	[Y002] Clear signal output function enable	✓	✓	✓	-	-	-
M 8362*2	[Y002] Zero point return direction specification	✓	✓	✓	-	-	-
M 8363	[Y002] Normal rotation limit	✓	✓	✓	-	-	-
M 8364	[Y002] Reverse rotation limit	✓	✓	✓	-	-	-
M 8365*2	[Y002] Near-point watchdog signal logic reverse	✓	✓	✓	-	-	-
M 8366*2	[Y002] Zero point signal logic reverse	✓	✓	✓	-	-	-
M 8367*2	[Y002] Interrupt signal logic reverse	✓	✓	-	-	-	-
[M]8368	[Y002] Positioning instruction being driven	✓	✓	✓	-	-	-
M 8369*2	[Y002] Pulse output stop command	✓	✓	✓	-	-	-

*1. Available in Ver. 2.20 or later.

*2. Cleared when the PLC mode switches from RUN to STOP.

*3. Available in Ver. 1.30 or later.

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Positioning (FX3U PLCs) (Refer to the position control manual for details.)							
[M]8370	[Y003] Pulse output monitor (ON:BUSY/OFF:READY)	✓*2	-	-	-	-	-
M 8371*1	[Y003] Clear signal output function enable	✓*2	-	-	-	-	-
M 8372*1	[Y003] Zero point return direction specification	✓*2	-	-	-	-	-
M 8373	[Y003] Normal rotation limit	✓*2	-	-	-	-	-
M 8374	[Y003] Reverse rotation limit	✓*2	-	-	-	-	-
M 8375*1	[Y003] Near-point watchdog signal logic reverse	✓*2	-	-	-	-	-
M 8376*1	[Y003] Zero point signal logic reverse	✓*2	-	-	-	-	-
M 8377*1	[Y003] Interrupt signal logic reverse	✓*2	-	-	-	-	-
[M]8378	[Y003] Positioning instruction being driven	✓*2	-	-	-	-	-
M 8379*1	[Y003] Pulse output stop command	✓*2	-	-	-	-	-
RS2 instruction [ch0] (FX3G/FX3GC PLCs) (Refer to the data communication manual for details.)							
[M]8370	Unavailable	-	-	-	-	-	-
[M]8371*1	RS2(FNC 87)[ch0] Send wait flag	-	-	✓	✓	-	-
M 8372*1	RS2(FNC 87)[ch0] Send request	-	-	✓	✓	-	-
M 8373*1	RS2(FNC 87)[ch0] Receive complete flag	-	-	✓	✓	-	-
[M]8374 to [M]8378	Unavailable	-	-	-	-	-	-
M 8379	RS2(FNC 87)[ch0] Timeout check flag	-	-	✓	✓	-	-

*1. Cleared when the PLC mode switches from RUN to STOP or when the RS2 instruction [ch0] turns OFF.

*2. Available only when two FX3U-2HSY-ADP units are connected to an FX3U PLC.

High speed counter function (Refer to Subsection 2.7.5 for details.)							
[M]8380*3	Operation status of C235, C241, C244, C246, C247, C249, C251, C252 and C254	✓	✓	-	-	-	-
[M]8381*3	Operation status of C236	✓	✓	-	-	-	-
[M]8382*3	Operation status of C237, C242 and C245	✓	✓	-	-	-	-
[M]8383*3	Operation status of C238, C248, C248 (OP), C250, C253 and C255	✓	✓	-	-	-	-
[M]8384*3	Operation status of C239 and C243	✓	✓	-	-	-	-
[M]8385*3	Operation status of C240	✓	✓	-	-	-	-
[M]8386*3	Operation status of C244 (OP)	✓	✓	-	-	-	-
[M]8387*3	Operation status of C245 (OP)	✓	✓	-	-	-	-
[M]8388	Contact for high speed counter function change	✓	✓	✓	✓	✓	-
M 8389	External reset input logic changeover	✓	✓	-	-	-	-
M 8390	Function changeover device for C244	✓	✓	-	-	-	-
M 8391	Function changeover device for C245	✓	✓	-	-	-	-
M 8392	Function changeover device for C248 and C253	✓	✓	✓	✓	✓	-

*3. Cleared when the PLC mode switches from STOP to RUN.

Interrupt program							
[M]8393	Contact for delay time setting	✓	✓	-	-	-	D8393
[M]8394	HCMOV (FNC189) instruction: Drive contact for interrupt program	✓	✓	-	-	-	-
[M]8395	Function changeover device for C254	-	-	✓	✓	-	-
[M]8396	Unavailable	-	-	-	-	-	-
[M]8397		-	-	-	-	-	-
Ring counter							
M 8398	1 ms ring counter activation (32 bits)*4	✓	✓	✓	✓	✓	D8398, D8399
[M]8399	Unavailable	-	-	-	-	-	-

*4. The 1 ms ring counters (D8399 and D8398) are activated when the END instruction is executed after M8398 turned ON.

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
RS2 instruction [ch1] (Refer to the data communication manual for details.)							
[M]8400	Unavailable	-	-	-	-	-	-
[M]8401*1	RS2[ch1] Send wait flag	✓	✓	✓	✓	✓	-
M 8402*1	RS2[ch1] Send request	✓	✓	✓	✓	✓	D8402
M 8403*1	RS2[ch1] Receive complete flag	✓	✓	✓	✓	✓	D8403
[M]8404	RS2[ch1] Carrier detection flag	✓	✓	✓	✓	✓	-
[M]8405	RS2[ch1] Data set ready (DSR) flag	✓*2	✓*2	✓	✓	✓	-
[M]8406	Unavailable	-	-	-	-	-	-
[M]8407		-	-	-	-	-	-
[M]8408		-	-	-	-	-	-
M 8409	RS2[ch1] Timeout check flag	✓	✓	✓	✓	✓	-

*1. They are cleared when the PLC mode switches from RUN to STOP or when the RS2 instruction [ch1] is set to OFF.
*2. Available in Ver. 2.30 or later.

RS2 instruction [ch2] and computer link [ch2] (Refer to the data communication manual for details.)							
[M]8410 to [M]8420	Unavailable	-	-	-	-	-	-
[M]8421*3	RS2[ch2] Send wait flag	✓	✓	✓	✓	-	-
M 8422*3	RS2[ch2] Send request	✓	✓	✓	✓	-	D8422
M 8423*3	RS2[ch2] Receive complete flag	✓	✓	✓	✓	-	D8423
[M]8424	RS2[ch2] Carrier detection flag	✓	✓	✓	✓	-	-
[M]8425	RS2[ch2] Data set ready (DSR) flag	✓*4	✓*4	✓	✓	-	-
[M]8426	Computer link [ch2]: Global signal ON	✓	✓	✓	✓	-	D8427 D8428 D8429
[M]8427	Computer link [ch2]: On-demand send being executed	✓	✓	✓	✓	-	
M 8428	Computer link [ch2]: On-demand error flag	✓	✓	✓	✓	-	
M 8429	Computer link [ch2]: On-demand word/byte changeover RS2 (FNC87) instruction [ch2]: Timeout check flag	✓	✓	✓	✓	-	

*3. They are cleared when the PLC mode switches from RUN to STOP or when the RS2 instruction [ch2] is set to OFF.
*4. Available in Ver. 2.30 or later.

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
MODBUS serial communication [ch1] (Refer to MODBUS serial communication Manual for details.)							
[M]8401	MODBUS Request in Process	✓*5	✓*5	✓*6	✓	✓	-
[M]8402	MODBUS Communication Error	✓*5	✓*5	✓*6	✓	✓	D8402
[M]8403	MODBUS Communication Error (latched)	✓*5	✓*5	✓*6	✓	✓	D8403
[M]8404	Listen Only Mode	✓*5	✓*5	-	-	-	-
[M]8405 to [M]8407	Unavailable	-	-	-	-	-	-
[M]8408	Retry	✓*5	✓*5	✓*6	✓	✓	-
[M]8409	Timeout	✓*5	✓*5	✓*6	✓	✓	-
[M]8410	Unavailable	-	-	-	-	-	-
MODBUS serial communication [ch2] (Refer to MODBUS serial communication Manual for details.)							
[M]8421	MODBUS Request in Process	✓*5	✓*5	✓*6	✓	-	-
[M]8422	MODBUS Communication Error	✓*5	✓*5	✓*6	✓	-	D8422
[M]8423	MODBUS Communication Error (latched)	✓*5	✓*5	✓*6	✓	-	D8423
[M]8424	Listen Only Mode	✓*5	✓*5	-	-	-	-
[M]8425 to [M]8427	Unavailable	-	-	-	-	-	-
[M]8428	Retry	✓*5	✓*5	✓*6	✓	-	-
[M]8429	Timeout	✓*5	✓*5	✓*6	✓	-	-
[M]8430	Unavailable	-	-	-	-	-	-
MODBUS serial communication [ch1, ch2] (Refer to MODBUS serial communication Manual for details.)							
M 8411	MODBUS Configuration Request Flag	✓*5	✓*5	✓*6	✓	✓	-

*5. Available in Ver. 2.40 or later.
*6. Available in Ver. 1.30 or later.

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
FX3U-CF-ADP [ch1] (Refer to FX3U-CF-ADP User's Manual for details)							
[M]8400 to [M]8401	Unavailable	-	-	-	-	-	-
[M]8402	CF-ADP instruction executing	✓*1	✓*1	-	-	-	-
[M]8403	Unavailable	-	-	-	-	-	-
[M]8404	CF-ADP unit ready	✓*1	✓*1	-	-	-	-
[M]8405	CF card mount status	✓*1	✓*1	-	-	-	-
[M]8406 to [M]8409	Unavailable	-	-	-	-	-	-
M 8410	CF-ADP status renewal stop	✓*1	✓*1	-	-	-	-
[M]8411 to [M]8417	Unavailable	-	-	-	-	-	-
M 8418	CF-ADP instruction error*2	✓*1	✓*1	-	-	-	-
[M]8419	Unavailable	-	-	-	-	-	-
FX3U-CF-ADP [ch2] (Refer to FX3U-CF-ADP User's Manual for details)							
[M]8420 to [M]8421	Unavailable	-	-	-	-	-	-
[M]8422	CF-ADP instruction executing	✓*1	✓*1	-	-	-	-
[M]8423	Unavailable	-	-	-	-	-	-
[M]8424	CF-ADP unit ready	✓*1	✓*1	-	-	-	-
[M]8425	CF card mount status	✓*1	✓*1	-	-	-	-
[M]8426 to [M]8429	Unavailable	-	-	-	-	-	-
M 8430	CF-ADP status renewal stop	✓*1	✓*1	-	-	-	-
[M]8431 to [M]8437	Unavailable	-	-	-	-	-	-
M 8438	CF-ADP instruction error*2	✓*1	✓*1	-	-	-	-
[M]8439	Unavailable	-	-	-	-	-	-

*1. Available in Ver. 2.61 or later.

*2. Cleared when the PLC mode switches from STOP to RUN.

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
FX3U-ENET-ADP [ch1] (Refer to ENET-ADP Manual for details.)							
[M]8400 to [M]8403	Unavailable	-	-	-	-	-	-
[M]8404	FX3U-ENET-ADP unit ready	✓*2	✓*2	✓*3	✓*3	✓	-
[M]8405	Unavailable	-	-	-	-	-	-
[M]8406*1	Time setting execution	✓*2	✓*2	✓*3	✓*3	✓	-
[M]8407 to [M]8410	Unavailable	-	-	-	-	-	-
[M]8411*1	Execute time setting	✓*2	✓*2	✓*3	✓*3	✓	-
[M]8412 to [M]8415	Unavailable	-	-	-	-	-	-
FX3U-ENET-ADP [ch2] (Refer to ENET-ADP Manual for details.)							
[M]8420 to [M]8423	Unavailable	-	-	-	-	-	-
[M]8424	FX3U-ENET-ADP unit ready	✓*2	✓*2	✓*3	✓*3	-	-
[M]8425	Unavailable	-	-	-	-	-	-
[M]8426*1	Time setting execution	✓*2	✓*2	✓*3	✓*3	-	-
[M]8427 to [M]8430	Unavailable	-	-	-	-	-	-
[M]8431*1	Execute time setting	✓*2	✓*2	✓*3	✓*3	-	-
[M]8432 to [M]8435	Unavailable	-	-	-	-	-	-
FX3U-ENET-ADP [ch1, ch2] (Refer to ENET-ADP Manual for details.)							
[M]8490 to [M]8491	Unavailable	-	-	-	-	-	-
M 8492	IP address storage area write request	-	-	✓*4	✓*4	✓	-
[M]8493	IP address storage area write completion	-	-	✓*4	✓*4	✓	-
[M]8494	IP address storage area write error	-	-	✓*4	✓*4	✓	-
M 8495	IP address storage area clear request	-	-	✓*4	✓*4	✓	-
[M]8496	IP address storage area clear completion	-	-	✓*4	✓*4	✓	-
[M]8497	IP address storage area clear error	-	-	✓*4	✓*4	✓	-
[M]8498	IP address change function enable	-	-	✓*4	✓*4	✓	-

*1. Used when the SNTP function setting is set to "Use" in the time setting parameters.

*2. Available in Ver. 3.10 or later.

*3. Available in Ver. 2.00 or later.

*4. Available in Ver. 2.10 or later.

Number and name	Operation and function	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Error detection (Refer to Chapter 5 for details.)							
[M]8430 to [M]8437	Unavailable	-	-	-	-	-	-
M 8438	Serial communication error 2 [ch2]*1	✓	✓	✓	✓	-	D8438
[M]8439 to [M]8448	Unavailable	-	-	-	-	-	-
[M]8449	Special block error flag	✓	✓*2	✓	✓	-	D8449
[M]8450 to [M]8459	Unavailable	-	-	-	-	-	-

*1. Cleared when the PLC power supply from OFF to ON.

*2. Available in Ver. 2.20 or later.

Positioning (Refer to the positioning control manual for details.)							
M 8460	DVIT instruction [Y000]: User interrupt input command	✓	✓*3	-	-	-	D8336
M 8461	DVIT instruction [Y001]: User interrupt input command	✓	✓*3	-	-	-	D8336
M 8462	DVIT instruction [Y002]: User interrupt input command	✓	✓*3	-	-	-	D8336
M 8463	DVIT instruction [Y003]: User interrupt input command	✓*4	-	-	-	-	D8336
M 8464	DSZR and ZRN instructions [Y000]: Clear signal device specification function enable	✓	✓*3	✓	✓	✓	D8464
M 8465	DSZR and ZRN instructions [Y001]: Clear signal device specification function enable	✓	✓*3	✓	✓	✓	D8465
M 8466	DSZR and ZRN instructions [Y002]: Clear signal device specification function enable	✓	✓*3	✓	-	-	D8466
M 8467	DSZR and ZRN instructions [Y003]: Clear signal device specification function enable	✓*4	-	-	-	-	D8467

*3. Available in Ver. 2.20 or later.

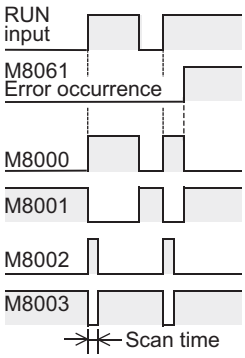
*4. Available only when two FX3U-2HSY-ADP units are connected to an FX3U PLC.

Error detection							
[M]8468 to [M]8486	Unavailable	-	-	-	-	-	-
[M]8487	USB error	-	-	-	-	✓	D8487
[M]8488	Unavailable	-	-	-	-	-	-
[M]8489	Special parameter error	✓*5	✓*5	✓*6	✓*6	✓	D8489
[M]8490 to [M]8511	Unavailable	-	-	-	-	-	-

*5. Available in Ver. 3.10 or later.

*6. Available in Ver. 2.00 or later.

2. FX1S/FX1N/FX2N/FX1NC/FX2NC PLCs

Number and name	Operation and function	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
PLC status							
[M]8000 RUN monitor NO contact	 → **Refer to Subsection 4.2.1.**	✓	✓	✓	✓	✓	-
[M]8001 RUN monitor NC contact		✓	✓	✓	✓	✓	-
[M]8002 Initial pulse NO contact		✓	✓	✓	✓	✓	-
[M]8003 Initial pulse NC contact		✓	✓	✓	✓	✓	-
[M]8004 Error occurrence	• Remains ON while either one among M8060, M8061, M8063, M8064, M8065, M8066 and M8067 is ON.	✓	✓	✓	✓	✓	D8004
[M]8005 Battery voltage low	Remains ON while the battery voltage is abnormally low. → **Refer to Subsection 4.2.3.**	-	-	✓	-	✓	D8005
[M]8006 Battery voltage low latch	Turns ON when abnormally low battery voltage is detected. → **Refer to Subsection 4.2.3.**	-	-	✓	-	✓	D8006
[M]8007 Instantaneous power interruption	Remains ON during 1 scan when instantaneous power interruption is detected. Even if M8007 turns ON, the PLC continues operation as far as the duration of low supply voltage is within the time period specified by D8008. → **Refer to Subsection 4.2.4.**	-	-	✓	-	✓	D8007
[M]8008 Power interruption	Turns ON when instantaneous power interruption is detected. When the duration of low supply voltage exceeds the time period specified by D8008, M8008 turns OFF and the PLC switches to the STOP mode (M8000 = OFF). → **Refer to Subsection 4.2.4.**	-	-	✓	-	✓	D8008
[M]8009 24V DC failure	Turns ON when 24V DC power fails in either function unit*1.	-	-	✓	-	✓	D8009

*1. Function units are available only in FX1N/FX2N PLCs.

Number and name	Operation and function	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
Clock							
[M]8010	Unavailable	-	-	-	-	-	-
[M]8011 10 ms clock	Turns ON and OFF in 10 ms cycle (ON duration: 5 ms, OFF duration: 5 ms). → **Refer to Subsection 4.2.6.**	✓	✓	✓	✓	✓	-
[M]8012 100ms clock	Turns ON and OFF in 100 ms cycle (ON duration: 50 ms, OFF duration: 50 ms). → **Refer to Subsection 4.2.6.**	✓	✓	✓	✓	✓	-
[M]8013 1 sec clock	Turns ON and OFF in 1 sec cycle (ON duration: 500 ms, OFF duration: 500 ms). → **Refer to Subsection 4.2.6.**	✓	✓	✓	✓	✓	-
[M]8014 1 min clock	Turns ON and OFF in 1 min cycle (ON duration: 30 s, OFF duration: 30 s). → **Refer to Subsection 4.2.6.**	✓	✓	✓	✓	✓	-
M 8015	Stops and presets time counting. For real-time clock → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓*3	-
M 8016	Stops the time display. For real-time clock → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓*3	-
M 8017	Corrects by ±30 seconds. For real-time clock → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓*3	-
[M]8018	Detects installation (Always remains ON). For real-time clock → **Refer to Subsection 4.2.7.**	✓ (Always ON)*3					-
M 8019	Notifies a real-time clock (RTC) error. For real-time clock → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓*3	-
Flag							
[M]8020 Zero	Turns ON when the addition or subtraction result is "0".	✓	✓	✓	✓	✓	-
[M]8021 Borrow	Turns ON when the subtraction result is less than the maximum negative value.	✓	✓	✓	✓	✓	-
M 8022 Carry	Turns ON when "carry" occurs in the addition result, or when overflow occurs in the shift operation result.	✓	✓	✓	✓	✓	-
[M]8023	Unavailable	-	-	-	-	-	-
M 8024*1	Specifies the BMOV instruction execution direction.	-	✓	✓	✓	✓	-
M 8025*2	Indicates the HSC mode.	-	-	✓	-	✓	-
M 8026*2	Indicates the RAMP mode.	-	-	✓	-	✓	-
M 8027*2	Indicates the PR mode.	-	-	✓	-	✓	-
M 8028	Changes over the 100 ms timer and 10 ms timer.	✓	-	-	-	-	-
	Enables interrupts while the FROM/TO instruction is executed.	-	-	✓	-	✓	-
[M]8029 Instruction execution complete	Turns ON when the operation of DSW, etc. is completed.	✓	✓	✓	✓	✓	-

*1. The operation varies depending on the PLC:
- Not cleared in FX1N/FX2N/FX2NC PLCs.

*2. The operation varies depending on the PLC:
- Not cleared in FX2N/FX2NC PLCs.

*3. FX2NC PLCs require an optional memory board (equipped with real-time clock).

Number and name	Operation and function	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
PLC mode							
M 8030*1 Battery LED OFF command	Does not turn ON the battery LED on the PLC panel even if the battery voltage becomes low. → **Refer to Subsection 4.2.10.**	-	-	✓	-	✓	-
M 8031*1 Non-latched memory all clear	Clears the ON/OFF image memory of Y, M, S, T and C, and clears the current value of T, C and D to "0". Does not clear file registers (D) in the program memory. → **Refer to Subsection 4.2.11.**	✓	✓	✓	✓	✓	-
M 8032*1 Latched memory all clear		✓	✓	✓	✓	✓	-
M 8033 Memory holding against STOP mode	Holds the contents of the image memory and data memory when the PLC mode switches from RUN to STOP. → **Refer to Subsection 4.2.12.**	✓	✓	✓	✓	✓	-
M 8034*1 All output disable	Set to OFF all external output contacts of the PLC. → **Refer to Subsection 4.2.13.**	✓	✓	✓	✓	✓	-
M 8035 Forced RUN mode	→ **Refer to Subsection 4.2.14 for details.**	✓	✓	✓	✓	✓	-
M 8036 Forced RUN command		✓	✓	✓	✓	✓	-
M 8037 Forced STOP command		✓	✓	✓	✓	✓	-
[M]8038 Parameter setting	Communication parameter setting flag (to set simple N:N link). → **Refer to the data communication manual.**	✓	✓	✓*2	✓	✓	-
M 8039 Constant scan mode	Makes the PLC execute cyclic operations while keeping the scan time specified in D8039. → **Refer to Subsection 4.2.15.**	✓	✓	✓	✓	✓	D8039

*1. Activated when the END instruction is executed.

*2. Available in Ver. 2.00 or later.

Number and name	Operation and function	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
Step ladder and annunciator							
M 8040 Transfer disable	Disables transfer between states.	✓	✓	✓	✓	✓	-
[M]8041*1 Transfer start	Enables transfer from the initial state during automatic operation.	✓	✓	✓	✓	✓	-
[M]8042 Start pulse	Gives pulse output in response to start input.	✓	✓	✓	✓	✓	-
M 8043*1 Zero point return complete	Should be set to ON in the zero return mode end state.	✓	✓	✓	✓	✓	-
M 8044*1 Zero point condition	Should be set to ON when the machine zero point is detected.	✓	✓	✓	✓	✓	-
M 8045 All output reset disable	Disables reset of all outputs when the operation mode switches.	✓	✓	✓	✓	✓	-
[M]8046*2*3 STL state ON	Remains ON while M8047 is ON and either state relay shown in the right is ON.	✓ S0 to S127	✓ S0 to S999	✓ S0 to S899	✓ S0 to S999	✓ S0 to S899	M8047
M 8047*2 STL monitoring enable	Enables M8040 to D8047.	✓	✓	✓	✓	✓	D8040 to D8047
[M]8048*2 Annunciator ON	Remains ON while M8049 is ON and either one among S900 to S999 is ON.	-	-	✓	-	✓	-
M 8049*1 Annunciator enable	Enables D8049.	-	-	✓	-	✓	D8049 M8048

*1. Cleared when the PLC mode switches from RUN to STOP.
*2. Activated when the END instruction is executed.
*3. State relays S128 to S999 are backed up by the capacitor in FX1N/FX1NC PLCs. If the backup period expires, the status of these state relays is not held correctly. In this case, M8046 may turn ON.

Interrupt disable							
M 8050*4 (Input interrupt) I00□ disable	• When a special M for disabling input interrupt or timer interrupt is ON Even if an input interrupt or timer interrupt occurs while acceptance of the corresponding interrupt is disabled, the interrupt program is not executed. For example, when the interrupt I00□ is given while M8050 is ON (to disable the interrupt I00□), the interrupt program is not executed even within the interrupt enabled program area. • When a special M for disabling input interrupt or timer interrupt is OFF a) When an input interrupt or timer interrupt occurs, it is accepted. b) The interrupt program is executed immediately if interrupts are enabled by the EI instruction. If the DI instruction disables interrupts, execution of the interrupt program is paused until the EI instruction enables interrupts.	✓	✓	✓	✓	✓	-
M 8051*4 (Input interrupt) I10□ disable		✓	✓	✓	✓	✓	-
M 8052*4 (Input interrupt) I20□ disable		✓	✓	✓	✓	✓	-
M 8053*4 (Input interrupt) I30□ disable		✓	✓	✓	✓	✓	-
M 8054*4 (Input interrupt) I40□ disable		✓	✓	✓	✓	✓	-
M 8055*4 (Input interrupt) I50□ disable		✓	✓	✓	✓	✓	-
M 8056*4 (Timer interrupt) I6□□ disable		-	-	✓	-	✓	-
M 8057*4 (Timer interrupt) I7□□ disable		-	-	✓	-	✓	-
M 8058*4 (Timer interrupt) I8□□ disable		-	-	✓	-	✓	-
M 8059*4 Counter interrupt disable	Disables interrupts I010 to I060.	-	-	✓	-	✓	-

*4. Cleared when the PLC mode switches from RUN to STOP.

Number and name	Operation and function	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
Error detection (Refer to Chapter 5 for details.)							
[M]8060	I/O configuration error	-	-	✓	-	✓	D8060
[M]8061	PLC hardware error	-	-	✓	-	✓	D8061
[M]8062	PLC/PP communication error	✓	✓	✓	✓	✓	D8062
[M]8063*1	Communication error	✓	✓	✓	✓	✓	D8063
[M]8064	Parameter error	✓	✓	✓	✓	✓	D8064
[M]8065	Syntax error	✓	✓	✓	✓	✓	D8065 D8069
[M]8066	Circuit error	✓	✓	✓	✓	✓	D8066 D8069
[M]8067*1	Operation error	✓	✓	✓	✓	✓	D8067 D8069
M 8068	Operation error latch	✓	✓	✓	✓	✓	D8068
M 8069*2	I/O bus check	-	-	✓	-	✓	-
Parallel link							
M 8070*3	Parallel link (Should be set to ON for the master station.)	✓	✓	✓	✓	✓	-
M 8071*3	Parallel link (Should be set to ON for the slave station.)	✓	✓	✓	✓	✓	-
[M]8072	Parallel link (Remains ON during operation.)	✓	✓	✓	✓	✓	-
[M]8073	Parallel link (Turns ON when M8070 or M8071 is set incorrectly.)	✓	✓	✓	✓	✓	-
Sampling trace							
[M]8074	Unavailable	-	-	-	-	-	-
[M]8075	System area during sampling trace	-	-	✓	-	✓	-
[M]8076	System area during sampling trace	-	-	✓	-	✓	-
[M]8077	Remains ON while sampling trace is executed.	-	-	✓	-	✓	-
[M]8078	Turns ON when sampling trace is completed.	-	-	✓	-	✓	-
[M]8079	Sampling trace system area	-	-	✓	-	✓	-
[M]8080	Unavailable	-	-	-	-	-	-
[M]8081		-	-	-	-	-	-
[M]8082		-	-	-	-	-	-
[M]8083		-	-	-	-	-	-
[M]8084		-	-	-	-	-	-
[M]8085		-	-	-	-	-	-
[M]8086		-	-	-	-	-	-
[M]8087		-	-	-	-	-	-
[M]8088		-	-	-	-	-	-
[M]8089		-	-	-	-	-	-

*1. Cleared when the PLC mode switches from STOP to RUN.

*2. The PLC executes the I/O bus check when M8069 is set to ON. (For details, refer to Chapter 5.)

*3. Cleared when the PLC mode switches from STOP to RUN.

Number and name	Operation and function	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
Undefined							
[M]8090	Unavailable	-	-	-	-	-	-
[M]8091		-	-	-	-	-	-
[M]8092		-	-	-	-	-	-
[M]8093		-	-	-	-	-	-
[M]8094		-	-	-	-	-	-
[M]8095		-	-	-	-	-	-
[M]8096		-	-	-	-	-	-
[M]8097		-	-	-	-	-	-
[M]8098		-	-	-	-	-	-
High speed ring counter							
M 8099*1	High speed ring counter operation (in units of 0.1 ms, 16 bits)	-	-	✓	-	✓	-
[M]8100	Unavailable	-	-	-	-	-	-

*1. In FX2N/FX2NC PLCs, the 0.1 ms high speed ring counter (D8099) is activated when the END instruction is executed after M8099 turned ON.

Memory information							
[M]8101	Unavailable	-	-	-	-	-	-
[M]8102		-	-	-	-	-	-
[M]8103		-	-	-	-	-	-
[M]8104	Remains ON while the function extension memory is installed.	-	-	✓*2	-	✓*2	-
[M]8105	Unavailable	-	-	-	-	-	-
[M]8106		-	-	-	-	-	-
[M]8107		-	-	-	-	-	-
[M]8108		-	-	-	-	-	-

*2. Available in Ver. 3.00 or later.

Output refresh error (Refer to Chapter 5 for details.)							
[M]8109	Output refresh error	-	-	✓	-	✓	D8109
[M]8110	Unavailable	-	-	-	-	-	-
[M]8111		-	-	-	-	-	-
Function board [For FX1S/FX1N PLCs]							
M 8112	FX1N-4EX-BD: BX0 input	✓	✓	-	-	-	-
	FX1N-2AD-BD: Input mode changeover in ch1	✓	✓	-	-	-	D8112
M 8113	FX1N-4EX-BD: BX1 input	✓	✓	-	-	-	-
	FX1N-2AD-BD: Input mode changeover in ch2	✓	✓	-	-	-	D8113
M 8114	FX1N-4EX-BD: BX2 input	✓	✓	-	-	-	-
	FX1N-1DA-BD: Output mode changeover	✓	✓	-	-	-	D8114
M 8115	FX1N-4EX-BD: BX3 input	✓	✓	-	-	-	-
M 8116	FX1N-2EYT-BD: BY0 output	✓	✓	-	-	-	-
M 8117	FX1N-2EYT-BD: BY1 output	✓	✓	-	-	-	-
[M]8118	Unavailable	-	-	-	-	-	-
[M]8119		-	-	-	-	-	-

Number and name	Operation and function	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
Communication link (Refer to the data communication manual for details.)							
[M]8120	Unavailable	-	-	-	-	-	-
[M]8121*1	Send wait flag (no procedure)	✓	✓	✓	✓	✓	-
M 8122*1	Send flag (no procedure)	✓	✓	✓	✓	✓	D8122
M 8123*1	Receive complete flag (no procedure)	✓	✓	✓	✓	✓	D8123
[M]8124	Carrier detection flag (no procedure)	✓	✓	✓	✓	✓	-
[M]8125	Unavailable	-	-	-	-	-	-
[M]8126	Global signal (dedicated protocol)	✓	✓	✓	✓	✓	-
[M]8127	On-demand handshake signal (dedicated protocol)	-	-	✓	-	✓	D8127 D8128 D8129
M 8128	On-demand error flag (dedicated protocol)	✓	✓	✓	-	✓	
M 8129	On-demand word/byte changeover (dedicated protocol)	✓	✓	✓	✓	✓	
	Timeout check flag (no procedure)	✓	✓	✓	✓	✓	

*1. Cleared when the PLC mode switches from RUN to STOP or when the RS instruction is set to OFF.

High speed counter comparison, high speed table and positioning [Positioning is offered for FX1S/FX1N/FX1NC PLCs.]							
M 8130	HSZ instruction: Table comparison mode	-	-	✓	-	✓	D8130
[M]8131	HSZ instruction: Table comparison complete flag	-	-	✓	-	✓	
M 8132	HSZ and PLSY instructions: Speed pattern mode	-	-	✓	-	✓	D8131 D8132 D8134
[M]8133	HSZ instruction: Table comparison complete flag	-	-	✓	-	✓	
[M]8134	Unavailable	-	-	-	-	-	-
[M]8135		-	-	-	-	-	-
[M]8136		-	-	-	-	-	-
[M]8137		-	-	-	-	-	-
[M]8138		-	-	-	-	-	-
[M]8139		-	-	-	-	-	-
M 8140	ZRN instruction: CLR signal output function enable	✓	✓	-	✓	-	-
[M]8141	Unavailable	-	-	-	-	-	-
[M]8142		-	-	-	-	-	-
[M]8143		-	-	-	-	-	-
[M]8144		-	-	-	-	-	-
M 8145	[Y000] Pulse output stop command	✓	✓	-	✓	-	-
M 8146	[Y001] Pulse output stop command	✓	✓	-	✓	-	-
[M]8147	[Y000] Pulse output monitor (BUSY or READY)	✓	✓	-	✓	-	-
[M]8148	[Y001] Pulse output monitor (BUSY or READY)	✓	✓	-	✓	-	-
[M]8149	Unavailable	-	-	-	-	-	-

Number and name	Operation and function	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
Inverter communication function (Refer to the data communication manual for details.)							
[M]8154	Defined in each EXTR instruction	-	-	✓*2	-	✓*2	D8154
[M]8155	Indicates that a communication port is used in the EXTR instruction.	-	-	✓*2	-	✓*2	D8155
[M]8156	Indicates that a communication error or parameter error has occurred in the EXTR instruction.	-	-	✓*2	-	✓*2	D8156
[M]8157*1	Communication error latch for EXTR instruction	-	-	✓*2	-	✓*2	D8157

*1. Cleared when the PLC mode switches from STOP to RUN.

*2. Available in Ver. 3.00 or later.

Advanced function							
M 8160*3	XCH instruction: SWAP function	-	-	✓	-	✓	-
M 8161*3*4	8-bit processing mode	✓	✓	✓	✓	✓	-
M 8162	High speed parallel link mode	✓	✓	✓	✓	✓	-
[M]8163	Unavailable	-	-	-	-	-	-
M 8164*3	FROM and TO instructions: Transfer points variable mode	-	-	✓*5	-	✓	D8164
M 8165	Unavailable	-	-	-	-	-	-
[M]8166		-	-	-	-	-	-
M 8167*3	HKY instruction: Hexadecimal data handling function	-	-	✓	-	✓	-
M 8168*3	SMOV instruction: Hexadecimal data handling function	-		✓	-	✓	-
[M]8169	Unavailable	-	-	-	-	-	-

*3. Cleared when the PLC mode switches from RUN to STOP.

*4. Available in the ASC, RS, ASC, HEX and CCD instructions.

*5. Available in Ver. 2.00 or later.

Number and name	Operation and function	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
Pulse catch							
M 8170*1	Input X000 pulse catch	✓	✓	✓	✓	✓	-
M 8171*1	Input X001 pulse catch	✓	✓	✓	✓	✓	-
M 8172*1	Input X002 pulse catch	✓	✓	✓	✓	✓	-
M 8173*1	Input X003 pulse catch	✓	✓	✓	✓	✓	-
M 8174*1	Input X004 pulse catch	✓	✓	✓	✓	✓	-
M 8175*1	Input X005 pulse catch	✓	✓	✓	✓	✓	-
[M]8176	Unavailable	-	-	-	-	-	-
[M]8177		-	-	-	-	-	-

*1. Cleared when the PLC mode switches from STOP to RUN.
FX2N/FX2NC PLCs ··· The EI instruction is necessary.
FX1S/FX1N/FX1NC PLCs ··· The EI instruction is not unnecessary.

Simple N:N link (Refer to the data communication manual for details.)							
[M]8180	Unavailable	-	-	-	-	-	-
[M]8181		-	-	-	-	-	-
[M]8182		-	-	-	-	-	-
[M]8183*2	Data transmission sequence error (master station)	(M504)	✓	✓*3	✓	✓	-
[M]8184*2	Data transmission sequence error (slave station No. 1)	(M505)	✓	✓*3	✓	✓	-
[M]8185*2	Data transmission sequence error (slave station No. 2)	(M506)	✓	✓*3	✓	✓	-
[M]8186*2	Data transmission sequence error (slave station No. 3)	(M507)	✓	✓*3	✓	✓	-
[M]8187*2	Data transmission sequence error (slave station No. 4)	(M508)	✓	✓*3	✓	✓	-
[M]8188*2	Data transmission sequence error (slave station No. 5)	(M509)	✓	✓*3	✓	✓	-
[M]8189*2	Data transmission sequence error (slave station No. 6)	(M510)	✓	✓*3	✓	✓	-
[M]8190*2	Data transmission sequence error (slave station No. 7)	(M511)	✓	✓*3	✓	✓	-
[M]8191*2	Data transmission sequence being executed	(M503)	✓	✓*3	✓	✓	-
[M]8192	Unavailable	-	-	-	-	-	-
[M]8193		-	-	-	-	-	-
[M]8194		-	-	-	-	-	-
[M]8195		-	-	-	-	-	-
[M]8196		-	-	-	-	-	-
[M]8197		-	-	-	-	-	-
[M]8198		-	-	-	-	-	-
[M]8199		-	-	-	-	-	-

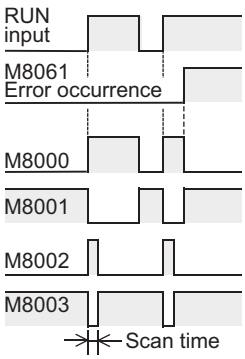
*2. Numbers inside ( ) are used in FX1S PLCs.

*3. Available in Ver. 2.00 or later.

Number and name		Operation and function	Applicable model					
			FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
Counter: Up/down-counter counting direction (Refer to Section 2.6 for details.)								
M 8200	C200	When M8□□□ turns ON, the corresponding counter C□□□ becomes the down-counting mode. • ON: Down-counting operation • OFF: Up-counting operation	-	✓	✓	✓	✓	-
M 8201	C201		-	✓	✓	✓	✓	-
M 8202	C202		-	✓	✓	✓	✓	-
M 8203	C203		-	✓	✓	✓	✓	-
M 8204	C204		-	✓	✓	✓	✓	-
M 8205	C205		-	✓	✓	✓	✓	-
M 8206	C206		-	✓	✓	✓	✓	-
M 8207	C207		-	✓	✓	✓	✓	-
M 8208	C208		-	✓	✓	✓	✓	-
M 8209	C209		-	✓	✓	✓	✓	-
M 8210	C210		-	✓	✓	✓	✓	-
M 8211	C211		-	✓	✓	✓	✓	-
M 8212	C212		-	✓	✓	✓	✓	-
M 8213	C213		-	✓	✓	✓	✓	-
M 8214	C214		-	✓	✓	✓	✓	-
M 8215	C215		-	✓	✓	✓	✓	-
M 8216	C216		-	✓	✓	✓	✓	-
M 8217	C217		-	✓	✓	✓	✓	-
M 8218	C218		-	✓	✓	✓	✓	-
M 8219	C219		-	✓	✓	✓	✓	-
M 8220	C220		-	✓	✓	✓	✓	-
M 8221	C221		-	✓	✓	✓	✓	-
M 8222	C222		-	✓	✓	✓	✓	-
M 8223	C223		-	✓	✓	✓	✓	-
M 8224	C224		-	✓	✓	✓	✓	-
M 8225	C225		-	✓	✓	✓	✓	-
M 8226	C226		-	✓	✓	✓	✓	-
M 8227	C227		-	✓	✓	✓	✓	-
M 8228	C228		-	✓	✓	✓	✓	-
M 8229	C229		-	✓	✓	✓	✓	-
M 8230	C230		-	✓	✓	✓	✓	-
M 8231	C231		-	✓	✓	✓	✓	-
M 8232	C232		-	✓	✓	✓	✓	-
M 8233	C233		-	✓	✓	✓	✓	-
M 8234	C234		-	✓	✓	✓	✓	-
High speed counter: Up/down-counter counting direction (Refer to Section 2.7 for details.)								
M 8235	C235	When M8□□□ turns ON, the corresponding counter C□□□ becomes the down-counting mode. • ON: Down-counting operation • OFF: Up-counting operation	✓	✓	✓	✓	✓	-
M 8236	C236		✓	✓	✓	✓	✓	-
M 8237	C237		✓	✓	✓	✓	✓	-
M 8238	C238		✓	✓	✓	✓	✓	-
M 8239	C239		✓	✓	✓	✓	✓	-
M 8240	C240		✓	✓	✓	✓	✓	-
M 8241	C241		✓	✓	✓	✓	✓	-
M 8242	C242		✓	✓	✓	✓	✓	-
M 8243	C243		✓	✓	✓	✓	✓	-
M 8244	C244		✓	✓	✓	✓	✓	-
M 8245	C245		✓	✓	✓	✓	✓	-

Number and name		Operation and function	Applicable model					
			FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
High speed counter: Up/down-counter monitor (Refer to Section 2.7 for details.)								
[M]8246	C246	When the 1-phase 2-input or 2-phase 2-input counter C□□□ is in the down-counting mode, the corresponding M8□□□ is ON. • ON: Down-counting operation • OFF: Up-counting operation	✓	✓	✓	✓	✓	-
[M]8247	C247		✓	✓	✓	✓	✓	-
[M]8248	C248		✓	✓	✓	✓	✓	-
[M]8249	C249		✓	✓	✓	✓	✓	-
[M]8250	C250		✓	✓	✓	✓	✓	-
[M]8251	C251		✓	✓	✓	✓	✓	-
[M]8252	C252		✓	✓	✓	✓	✓	-
[M]8253	C253		✓	✓	✓	✓	✓	-
[M]8254	C254		✓	✓	✓	✓	✓	-
[M]8255	C255		✓	✓	✓	✓	✓	-

3. FX0S/FX0/FX0N/FXU/FX2C PLCs

Number and name	Operation and function	Applicable model				
		FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
PLC status						
[M]8000 RUN monitor NO contact	 → **Refer to Subsection 4.2.1.**	✓	✓	✓	✓	-
[M]8001 RUN monitor NC contact		✓	✓	✓	✓	-
[M]8002 Initial pulse NO contact		✓	✓	✓	✓	-
[M]8003 Initial pulse NC contact		✓	✓	✓	✓	-
[M]8004 Error occurrence	• Remains ON while either one among M8060, M8061, M8062, M8063, M8064, M8065, M8066 and M8067 is ON.	✓	✓	✓	✓	D8004
[M]8005 Battery voltage low	Remains ON while the battery voltage is abnormally low. → **Refer to Subsection 4.2.3.**	-	-	✓	✓	D8005
[M]8006 Battery voltage low latch	Turns ON when abnormally low battery voltage is detected. → **Refer to Subsection 4.2.3.**	-	-	✓	✓	D8006
[M]8007 Instantaneous power interruption	Remains ON during 1 scan when instantaneous power interruption is detected. Even if M8007 turns ON, the PLC continues operation as far as the duration of low supply voltage is within the time period specified by D8008. → **Refer to Subsection 4.2.4.**	-	-	✓	✓	D8007
[M]8008 Power interruption	Turns ON when instantaneous power interruption is detected. When the duration of low supply voltage exceeds the time period specified by D8008, M8008 turns OFF and the PLC switches to the STOP mode (M8000 = OFF). → **Refer to Subsection 4.2.4.**	-	-	✓	✓	D8008
[M]8009 24V DC failure	Turns ON when 24V DC fails in either function unit or function block.	-	-	✓	✓	D8009

Number and name	Operation and function	Applicable model				
		FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
Clock						
[M]8010	Unavailable	-	-	-	-	-
[M]8011 10 ms clock	Turns ON and OFF in 10 ms cycle (ON duration: 5 ms, OFF duration: 5 ms). → **Refer to Subsection 4.2.6.**	✓	✓	✓	✓	-
[M]8012 100ms clock	Turns ON and OFF in 100 ms cycle (ON duration: 50 ms, OFF duration: 50 ms). → **Refer to Subsection 4.2.6.**	✓	✓	✓	✓	-
[M]8013 1 sec clock	Turns ON and OFF in 1 sec cycle (ON duration: 500 ms, OFF duration: 500 ms). → **Refer to Subsection 4.2.6.**	✓	✓	✓	✓	-
[M]8014 1 min clock	Turns ON and OFF in 1 min cycle (ON duration: 30 s, OFF duration: 30 s). → **Refer to Subsection 4.2.6.**	✓	✓	✓	✓	-
M 8015	Stops and presets time counting. For real-time clock → **Refer to Subsection 4.2.7.**	-	-	✓*1	✓	-
M 8016	Stops the time display. For real-time clock → **Refer to Subsection 4.2.7.**	-	-	✓*1	✓	-
M 8017	Corrects by ±30 seconds. For real-time clock → **Refer to Subsection 4.2.7.**	-	-	✓*1	✓	-
[M]8018	Detects installation (Always remains ON). For real-time clock → **Refer to Subsection 4.2.7.**	-	-	✓*1	✓	-
M 8019	Notifies a real-time clock (RTC) error. For real-time clock → **Refer to Subsection 4.2.7.**	-	-	✓*1	✓	-
Flag						
[M]8020 Zero	Turns ON when the addition or subtraction result is "0".	✓	✓	✓	✓	-
[M]8021 Borrow	Turns ON when the subtraction result is less than the maximum negative value.	✓	✓	✓	✓	-
M 8022 Carry	Turns ON when "carry" occurs in the addition result, or when overflow occurs in the shift operation result.	✓	✓	✓	✓	-
M 8023	Floating-point operation flag	-	-	✓*1	✓	-
M 8024	Unavailable	-	-	-	-	-
M 8025	Indicates the HSC mode.	-	-	✓*2	✓	-
M 8026	Indicates the RAMP mode.	-	-	✓*2	✓	-
M 8027	Indicates the PR mode.	-	-	✓*2	✓	-
M 8028	Changes over the 100 ms timer and 10 ms timer.	✓	✓	-	-	-
	Enables interrupts while the FROM/TO instruction is executed.	-	-	✓*2	✓	-
[M]8029 Instruction execution complete	Turns ON when the operation of DSW, etc. is completed.	✓	✓	✓	✓	-

*1. Available in Ver. 3.07 or later.

*2. Available in Ver. 2.1 or later.

Number and name	Operation and function	Applicable model				
		FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
PLC mode						
M 8030*1 Battery LED OFF command	Does not turn ON the battery LED on the PLC panel even if the battery voltage becomes low. → **Refer to Subsection 4.2.10.**	-	-	✓	✓	-
M 8031*1 Non-latched memory all clear	Clears the ON/OFF image memory of Y, M, S, T and C, and clears the current value of T, C and D to "0". Does not clear special D and file registers in the program memory. → **Refer to Subsection 4.2.11.**	✓	✓	✓	✓	-
M 8032*1 Latched memory all clear		✓	✓	✓	✓	-
M 8033 Memory holding against STOP mode	Holds the contents of the image memory and data memory when the PLC mode switches from RUN to STOP. → **Refer to Subsection 4.2.12.**	✓	✓	✓	✓	-
M 8034*1 All output disable	Set to OFF all external output contacts of the PLC. → **Refer to Subsection 4.2.13.**	✓	✓	✓	✓	-
M 8035*3 Forced RUN mode	When M8035 and M8036 are set to ON by M8000 and M8037 is set to ON by XOO via a pushbutton, the PLC mode can be switched between RUN and STOP by two inputs, RUN input button and stop button XOO.	Only forced RUN and forced STOP can be executed using programming equipment.		✓	✓	-
M 8036*3 Forced RUN command				✓	✓	-
M 8037*3 Forced STOP command				✓	✓	-
[M]8038*1 RAM file register all clear	Clears D6000 to D79999 when set to ON while M8074 is ON.	-	-	✓*2	✓	-
M 8039 Constant scan mode	Makes the PLC execute cyclic operations while keeping the scan time specified in D8039. → **Refer to Subsection 4.2.15.**	✓	✓	✓	✓	D8039

*1. Activated when the END instruction is executed.

*2. Available in Ver. 3.07 or later.

*3. Cleared when the PLC mode switches from RUN to STOP.

Number and name	Operation and function	Applicable model				
		FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
Step ladder and annunciator						
M 8040 Transfer disable	Disables transfer between states.	✓	✓	✓	✓	-
[M]8041*1 Transfer start	Enables transfer from the initial state during automatic operation.	✓	✓	✓	✓	-
[M]8042 Start pulse	Gives pulse output in response to start input.	✓	✓	✓	✓	-
M 8043*1 Zero point return complete	Should be set to ON in the zero return mode end state.	✓	✓	✓	✓	-
M 8044*1 Zero point condition	Should be set to ON when the machine zero point is detected.	✓	✓	✓	✓	-
M 8045 All output reset disable	Disables reset of all outputs when the operation mode switches.	✓	✓	✓	✓	-
[M]8046*2 STL state ON	Remains ON while M8047 is ON and either one among S0 to S899 is ON.	✓	✓	✓	✓	M8047
M 8047*2 STL monitoring enable	Enables D8040 to D8047.	✓	✓	✓	✓	D8040 to D8047
[M]8048*2 Annunciator ON	Remains ON while M8049 is ON and either one among S900 to S999 is ON.	-	-	✓	✓	-
M 8049*1 Annunciator enable	Enables D8049.	-	-	✓	✓	D8049 M8048

*1. Cleared when the PLC mode switches from RUN to STOP.

*2. Activated when the END instruction is executed.

Number and name	Operation and function	Applicable model				
		FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
Interrupt disable and pulse catch						
M 8050 (Input interrupt) I00□ disable	• When a special M for disabling input interrupt or timer interrupt is ON Even if an input interrupt or timer interrupt occurs while acceptance of the corresponding interrupt is disabled, the interrupt program is not executed. For example, when the interrupt I00□ is given while M8050 is ON (to disable the interrupt I00□), the interrupt program is not executed even within the interrupt enabled program area. • When a special M for disabling input interrupt or timer interrupt is OFF a) When an input interrupt or timer interrupt occurs, it is accepted. b) The interrupt program is executed immediately if interrupts are enabled by the EI instruction. If the DI instruction disables interrupts, execution of the interrupt program is paused until the EI instruction enables interrupts.	✓	✓	✓	✓	-
M 8051 (Input interrupt) I10□ disable		✓	✓	✓	✓	-
M 8052 (Input interrupt) I20□ disable		✓	✓	✓	✓	-
M 8053 (Input interrupt) I30□ disable		✓	✓	✓	✓	-
M 8054 (Input interrupt) I40□ disable		-	-	✓	✓	-
M 8055 (Input interrupt) I50□ disable		-	-	✓	✓	-
M 8056 (Timer interrupt) I6□□ disable		They are provided for the pulse catch function as described below.		✓	✓	-
M 8057 (Timer interrupt) I7□□ disable				✓	✓	-
M 8058 (Timer interrupt) I8□□ disable				✓	✓	-
M 8059 Counter interrupt disable	Disables interrupts I010 to I060.			✓*1	✓	-
M 8056 Pulse catch X00	Set to ON at the rising edge of the corresponding input signal. Set to OFF by the RST instruction.	✓	✓	They disable the interrupt processing as described above.		-
M 8057 Pulse catch X01		✓	✓			-
M 8058 Pulse catch X02		✓	✓			-
M 8059 Pulse catch X03		✓	✓			-

Number and name	Operation and function	Applicable model				
		FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
Error detection (Refer to Chapter 5 for details.)						
[M]8060	I/O configuration error	-	-	✓	✓	D8060
[M]8061	PLC hardware error	✓	✓	✓	✓	D8061
[M]8062	PLC/PP communication error	-	-	✓	✓	D8062
[M]8063	Parallel link error*1 RS-232C communication error	-	✓*2	✓	✓	D8063
[M]8064	Parameter error	✓	✓	✓	✓	D8064
[M]8065	Syntax error	✓	✓	✓	✓	D8065 D8069
[M]8066	Circuit error	✓	✓	✓	✓	D8066 D8069
[M]8067*1	Operation error	✓	✓	✓	✓	D8067 D8069
M 8068	Operation error latch	✓	✓	✓	✓	D8068
M 8069*3	I/O bus check	-	-	✓	✓	-

*1. Cleared when the PLC mode switches from STOP to RUN.
(Note that M8068 and D8068 are not cleared.)

*2. Available in Ver. 1.20 or later.

*3. When M8069 is set to ON, the PLC executes the I/O bus check.
When an error occurs, D8061 stores the error code "6103" and M8061 turns ON.

Parallel link						
M 8070*4	Parallel link (Should be set to ON for the master station.)	-	-	✓	✓	-
M 8071*4	Parallel link (Should be set to ON for the slave station.)	-	-	✓	✓	-
[M]8072	Parallel link (Remains ON during operation.)	-	-	✓	✓	-
[M]8073	Parallel link (Turns ON when M8070 or M8071 is set incorrectly.)	-	-	✓	✓	-

*4. Cleared when the PLC mode switches from STOP to RUN.

Sampling trace						
M8074	RAM file register use mode (backed up against power interruption)	-	-	✓*5	✓	-
M8075	Ready request for sampling trace	-	-	✓	✓	-
M8076	Sampling trace preparation complete (execution start command)	-	-	✓	✓	-
[M]8077	Remains ON while sampling trace is executed.	-	-	✓	✓	-
[M]8078	Turns ON when sampling trace is completed.	-	-	✓	✓	-
[M]8079	Turns ON when the number of times of trace reaches 512.	-	-	✓	✓	-
[M]8080 to [M]8098	Unavailable	-	-	-	-	-

*5. Available in Ver. 3.01 or later.

High speed ring counter						
M 8099*6	High speed ring counter operation	-	-	✓	✓	-

*6. The high speed ring counter D8099 is activated when the END instruction is executed after M8099 turned ON.

Undefined						
[M]8100 to [M]8119	Unavailable	-	-	-	-	-

Number and name	Operation and function	Applicable model				
		FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
Special adapter						
M 8120*1	Communication setting latch	-	✓*2	-	-	-
[M]8121*5*7	RS-232C send wait	-	✓*2	✓*3	✓	-
M 8122*5*7	RS-232 send flag	-	✓*2	✓*3	✓	D8122
M 8123*5*7	RS-232C receive complete flag	-	✓*2	✓*3	✓	D8123
[M]8124	RS-232C carrier being received	-	-	✓*3	✓	-
[M]8125	Unavailable	-	-	-	-	-
[M]8126*6	Global signal	-	✓*2	✓*4	✓*4	-
[M]8127*6	On-demand handshake signal	-	✓*2	✓*4	✓*4	-
M 8128*6	On-demand error flag	-	✓*2	✓*4	✓*4	-
M 8129*6	On-demand word/byte changeover	-	✓*2	✓*4	✓*4	-

*1. When M8120 is set to ON, latched type data registers D254 and D255 are changed to the non-latched type.
These data registers can be used as general registers in programs.

*2. Available in Ver. 1.20 or later.

*3. Available in Ver. 3.07 or later.

*4. Available in Ver. 3.30 or later.

*5. Provided for the communication adapter FX(0N)-232ADP

*6. Provided for the communication adapter FX(0N)-485ADP

*7. Cleared when the PLC mode switches from STOP to RUN.

High speed table						
M 8130	HSZ instruction: Table comparison mode	-	-	✓*8	✓	D8130
[M]8131	HSZ instruction: Table comparison complete flag	-	-	✓*8	✓	
M 8132	HSZ and PLSY instructions: Speed pattern mode	-	-	✓*8	✓	D8131 D8132 D8134
[M]8133	HSZ instruction: Table comparison complete flag	-	-	✓*8	✓	
[M]8134 to [M]8159	Unavailable	-	-	-	-	-

*8. Available in Ver. 3.07 or later.

Advanced function						
M 8160	XCH instruction: SWAP function	-	-	✓*10	✓	-
M 8161*9	8-bit processing mode	-	✓*11	✓*10	✓	-
M 8162	High speed parallel link mode command	-	✓	✓*10	✓	-
[M]8163	Unavailable	-	-	-	-	-
[M]8164		-	-	-	-	-
[M]8165		-	-	-	-	-
[M]8166		-	-	-	-	-
M 8167	HKY instruction: Hexadecimal data handling function	-	-	✓*10	✓	-
M 8168	SMOV instruction: Hexadecimal data handling function	-	-	✓*10	✓	-
[M]8169	Unavailable	-	-	-	-	-

*9. Available in the ASC, RS, ASCI, HEX and CCD instructions.

*10. Available in Ver. 3.07 or later.

*11. Available in Ver. 1.20 or later.

Number and name	Operation and function	Applicable model				
		FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
Pulse catch						
M 8170*1	Input X000 pulse catch	Refer to M8056 to M8059 for the pulse catch function.		✓*2	✓	-
M 8171*1	Input X001 pulse catch			✓*2	✓	-
M 8172*1	Input X002 pulse catch			✓*2	✓	-
M 8173*1	Input X003 pulse catch			✓*2	✓	-
M 8174*1	Input X004 pulse catch			✓*2	✓	-
M 8175*1	Input X005 pulse catch			✓*2	✓	-
[M]8176	Unavailable	-	-	-	-	-
[M]8177		-	-	-	-	-
[M]8178		-	-	-	-	-
[M]8179		-	-	-	-	-

*1. Cleared when the PLC mode switches from STOP to RUN.

*2. Available in Ver. 3.07 or later.

Substitute function (high speed counter interrupt function and substitute instruction function)								
[M]8180	Unavailable		-	-	-	-	-
M 8181	Substitute of I010	Write these special M instead of a pointer as the destination of the HSCS instruction.	-	-	✓*3	✓	-
M 8182	Substitute of I020		-	-	✓*3	✓	-
M 8183	Substitute of I030		-	-	✓*3	✓	-
M 8184	Substitute of I040		-	-	✓*3	✓	-
M 8185	Substitute of I050		-	-	✓*3	✓	-
M 8186	Substitute of I060		-	-	✓*3	✓	-
[M]8187	Unavailable		-	-	-	-	-
[M]8188			-	-	-	-	-
[M]8189			-	-	-	-	-
M 8190	Substitute of SQR	:M8190+MOV	-	-	✓*3	✓	-
M 8191	Substitute of FLT	:M8191+MOV	-	-	✓*3	✓	-
M 8192	Substitute of SQRT	:M8192+SMOV	-	-	✓*3	✓	-
M 8193	Substitute of SER	:M8193+RAMP	-	-	✓*3	✓	-
M 8194	Substitute of RS	:M8194+RAMP	-	-	✓*3	✓	-
M 8195	Substitute of CCD	:M8195+FMOV	-	-	✓*3	✓	-
M 8196	Substitute of ASCI	:M8196+FMOV	-	-	✓*3	✓	-
M 8197	Substitute of HEX	:M8197+FMOV	-	-	✓*3	✓	-
M 8198	S/d direction reverse in the BMOV instruction		-	-	✓*3	✓	-
[M]8199	Unavailable		-	-	-	-	-

*3. Available in Ver. 3.07 or later.

Number and name		Operation and function	Applicable model				
			FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
Counter: Up/down-counter counting direction (Refer to Section 2.6 for details.)							
M 8200	C200	When M8□□□ turns ON, the corresponding counter C□□□ becomes the down-counting mode. • ON: Down-counting operation • OFF: Up-counting operation	-	-	✓	✓	-
M 8201	C201		-	-	✓	✓	-
M 8202	C202		-	-	✓	✓	-
M 8203	C203		-	-	✓	✓	-
M 8204	C204		-	-	✓	✓	-
M 8205	C205		-	-	✓	✓	-
M 8206	C206		-	-	✓	✓	-
M 8207	C207		-	-	✓	✓	-
M 8208	C208		-	-	✓	✓	-
M 8209	C209		-	-	✓	✓	-
M 8210	C210		-	-	✓	✓	-
M 8211	C211		-	-	✓	✓	-
M 8212	C212		-	-	✓	✓	-
M 8213	C213		-	-	✓	✓	-
M 8214	C214		-	-	✓	✓	-
M 8215	C215		-	-	✓	✓	-
M 8216	C216		-	-	✓	✓	-
M 8217	C217		-	-	✓	✓	-
M 8218	C218		-	-	✓	✓	-
M 8219	C219		-	-	✓	✓	-
M 8220	C220		-	-	✓	✓	-
M 8221	C221		-	-	✓	✓	-
M 8222	C222		-	-	✓	✓	-
M 8223	C223		-	-	✓	✓	-
M 8224	C224		-	-	✓	✓	-
M 8225	C225		-	-	✓	✓	-
M 8226	C226		-	-	✓	✓	-
M 8227	C227		-	-	✓	✓	-
M 8228	C228		-	-	✓	✓	-
M 8229	C229		-	-	✓	✓	-
M 8230	C230		-	-	✓	✓	-
M 8231	C231		-	-	✓	✓	-
M 8232	C232		-	-	✓	✓	-
M 8233	C233		-	-	✓	✓	-
M 8234	C234		-	-	✓	✓	-
High speed counter: Up/down-counter counting direction (Refer to Section 2.7 for details.)							
M 8235	C235	When M8□□□ turns ON, the corresponding counter C□□□ becomes the down-counting mode. • ON: Down-counting operation • OFF: Up-counting operation	✓	✓	✓	✓	-
M 8236	C236		✓	✓	✓	✓	-
M 8237	C237		✓	✓	✓	✓	-
M 8238	C238		✓	✓	✓	✓	-
M 8239	C239		-	-	✓	✓	-
M 8240	C240		-	-	✓	✓	-
M 8241	C241		✓	✓	✓	✓	-
M 8242	C242		✓	✓	✓	✓	-
M 8243	C243		-	-	✓	✓	-
M 8244	C244		✓	✓	✓	✓	-
M 8245	C245		-	-	✓	✓	-

Number and name	Operation and function		Applicable model				
			FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
High speed counter: Up/down-counter monitor (Refer to Section 2.7 for details.)							
[M]8246	C246	When the 1-phase 2-input or 2-phase 2-input counter C□□□ is in the down-counting mode, the corresponding M8□□□ is ON. • ON: Down-counting operation • OFF: Up-counting operation	✓	✓	✓	✓	-
[M]8247	C247		✓	✓	✓	✓	-
[M]8248	C248		-	-	✓	✓	-
[M]8249	C249		✓	✓	✓	✓	-
[M]8250	C250		-	-	✓	✓	-
[M]8251	C251		✓	✓	✓	✓	-
[M]8252	C252		✓	✓	✓	✓	-
[M]8253	C253		-	-	✓	✓	-
[M]8254	C254		✓	✓	✓	✓	-
[M]8255	C255		-	-	✓	✓	-
[M]8256 to [M]8259	Unavailable		-	-	-	-	-

4.1.2 Special data registers (D8000 and later)

1. FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs

Number and name	Content of register	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
PLC status							
D 8000 Watchdog timer	The initial value is shown on the right (Unit: 1 ms) (Transferred from the system ROM when the PLC power is turned ON). The value overwritten by a program is valid after the END or WDT instruction was executed. → **Refer to Subsection 4.2.2.**	200	200	200	200	200	-
[D]8001 PLC type and system version	2 4 1 0 0 Shown on the right: Version 1.00	24	24	26	26	28	D8101
[D]8002 Memory capacity	• 2 ... 2K steps • 4 ... 4K steps • 8 ... 8K steps • In the case of 16K steps or more "8" is written to D8002, and "16", "32" or 64" is written to D8102.	✓8	✓8	✓8	✓8	✓4*1	D8102
[D]8003 Memory type	Type of the built-in memory, type of the RAM, EEPROM and EPROM memory cassettes and ON/OFF status of the write protect switch Value / Memory type / Protect switch: 00H: RAM memory cassette: - 01H: EPROM cassette: - 02H: EEPROM memory cassette or flash memory cassette: OFF 0AH: EEPROM memory cassette or flash memory cassette: ON 10H: Memory built in PLC: -	✓	✓	✓	✓	✓	-
[D]8004 Error M number	8 0 6 0 8060 to 8068(when M8004 is ON)	✓	✓	✓	✓	✓	M8004
[D]8005 Battery voltage	3 0 (Unit: 0.1 V) Current value of battery voltage (Example:3.0V)	✓	✓	✓	✓	-	M8005
[D]8006 Low battery voltage detection level	Initial value • 2.7V (Unit: 0.1 V) (Transferred from the system ROM when the PLC power is turned ON)	✓	✓	✓	✓	-	M8006

*1. "4" is displayed even when the memory capacity is set to 16K steps in the parameter setting.

Number and name	Content of register	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
PLC status							
[D]8007 Instantaneous power interruption	Stores the number of times M8007 is set to ON. Cleared when the power is turned OFF.	✓	✓	-	-	-	M8007
D 8008 Instantaneous power interruption detection time	Initial value • FX3U PLCs (AC power supply type): 10 ms • FX3U/FX3UC PLCs (DC power supply type): 5 ms → **Refer to Subsection 4.2.4.**	✓	✓	-	-	-	M8008
[D]8009 Unit number where 24V DC has failed	Lowest input device number of function unit or extension power supply unit where 24V DC has failed	✓	-	✓	-	-	M8009
Clock							
[D]8010 Current scan time	Accumulated instruction execution time from the step 0 (Unit: 0.1 ms) → **Refer to Subsection 4.2.5.**	✓ The displayed value includes the waiting time for the constant scan operation triggered by M8039.					-
[D]8011 Minimum scan time	Minimum value of scan time (Unit: 0.1 ms) → **Refer to Subsection 4.2.5.**						-
[D]8012 Maximum scan time	Maximum value of scan time (Unit: 0.1 ms) → **Refer to Subsection 4.2.5.**						-
D 8013 Second data	0 to 59 seconds (For real-time clock) → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓	-
D 8014 Minute data	0 to 59 minutes (For real-time clock) → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓	-
D 8015 Hour data	0 to 23 hours (For real-time clock) → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓	-
D 8016 Day data	1st to 31st day (For real-time clock) → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓	-
D 8017 Month data	January to December (For real-time clock) → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓	-
D 8018 Year data	Last 2 digits of year(0 to 99) (For real-time clock) → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓	-
D 8019 Day-of-the-week data	0 (Sunday) to 6 (Saturday) (For real-time clock) → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓	-

Number and name	Content of register	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Input filter							
D 8020 Input filter adjustment	Input filter value of X000 to X017 (X000 to X007 in FX3G/FX3GC PLC main units) (Initial value :10 ms) → **Refer to Subsection 4.2.9.**	✓	✓	✓	✓	✓	-
[D]8021	Unavailable	-	-	-	-	-	-
[D]8022		-	-	-	-	-	-
[D]8023		-	-	-	-	-	-
[D]8024		-	-	-	-	-	-
[D]8025		-	-	-	-	-	-
[D]8026		-	-	-	-	-	-
[D]8027		-	-	-	-	-	-
Index register Z0, V0							
[D]8028	Value of the register Z0 (Z)*1	✓	✓	✓	✓	✓	-
[D]8029	Value of the register V0 (V)*1	✓	✓	✓	✓	✓	-
Variable analog potentiometer [FX3G, FX3S]							
[D]8030	Value (Integer from 0 to 255) of the variable analog potentiometer VR1	-	-	✓	-	✓*2	-
[D]8031	Value (Integer from 0 to 255) of the variable analog potentiometer VR2	-	-	✓	-	✓*2	-

*1. D8182 to D8015 store values of Z1 to Z7 and V1 to V7.

*2. This function is not supported in the FX3S-30M□/E□-2AD PLC.

Constant scan							
[D]8032	Unavailable	-	-	-	-	-	-
[D]8033		-	-	-	-	-	-
[D]8034		-	-	-	-	-	-
[D]8035		-	-	-	-	-	-
[D]8036		-	-	-	-	-	-
[D]8037		-	-	-	-	-	-
[D]8038		-	-	-	-	-	-
D 8039 Constant scan time	Initial value : 0 ms(Unit: 1 ms) (Transferred from the system ROM when the PLC power is turned ON) Can be overwritten by a program. → **Refer to Subsection 4.2.15.**	✓	✓	✓	✓	✓	M8039

Number and name	Content of register	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Step ladder and annunciator							
[D]8040*1 ON state relay number 1	D8040 stores the smallest number of active state relays among S0 to S899 and S1000 to S4095*2, and D8041 stores the second-smallest number of active state relays. In this way, D8040 to D8047 sequentially store up to 8 active state relays.	✓	✓	✓	✓	✓	M8047
[D]8041*1 ON state relay number 2		✓	✓	✓	✓	✓	
[D]8042*1 ON state relay number 3		✓	✓	✓	✓	✓	
[D]8043*1 ON state relay number 4		✓	✓	✓	✓	✓	
[D]8044*1 ON state relay number 5		✓	✓	✓	✓	✓	
[D]8045*1 ON state relay number 6		✓	✓	✓	✓	✓	
[D]8046*1 ON state relay number 7		✓	✓	✓	✓	✓	
[D]8047*1 ON state relay number 8		✓	✓	✓	✓	✓	
[D]8048	Unavailable	-	-	-	-	-	-
[D]8049*1 Smallest active state relay number	Stores the smallest number of active annunciator relays among S900 to S999 when M8049 is ON.	✓	✓	✓	✓	-	M8049
[D]8050 to [D]8059	Unavailable	-	-	-	-	-	-

*1. Activated when the END instruction is executed.

*2. S1000 to S4095 are available only in the FX3G, FX3GC, FX3U, or FX3UC PLCs.

Error detection (Refer to Chapter 5 for details.)							
[D]8060	Unconnected head I/O number in I/O configuration error When programmed input/output numbers are unconnected, D8060 stores the head unconnected device number. Example: When X020 is unconnected 1 0 2 0 Value converted into BCD Device number*3 1:Input X 0:Output Y	✓	✓	✓	✓	-	M8060
[D]8061	Error code for PLC hardware code	✓	✓	✓	✓	✓	M8061
[D]8062	Error code for PLC/PP communication error	✓	✓	✓	✓	✓	M8062
	Error code for serial communication error 0 [ch0]*4	-	-	✓	✓	-	M8062
[D]8063*4	Error code for serial communication error 1 [ch1]	✓	✓	✓	✓	✓	M8063
[D]8064	Error code for parameter error	✓	✓	✓	✓	✓	M8064
[D]8065	Error code for syntax error	✓	✓	✓	✓	✓	M8065
[D]8066	Error code for circuit error	✓	✓	✓	✓	✓	M8066
[D]8067*5	Error code for operation error	✓	✓	✓	✓	✓	M8067
D 8068	Latched step number where operation error has occurred	✓*6	✓*6	✓	✓	✓	M8068
[D]8069*5	Step number where M8065 to M8067 error has occurred	✓*7	✓*7	✓	✓	✓	M8065 to M8067

*3. 10 to 337 in FX3U/FX3UC PLCs
10 to 177 in FX3G/FX3GC PLCs

*4. Cleared when the PLC power supply from OFF to ON.

*5. Cleared when the PLC mode switches from STOP to RUN.

*6. D8313 and D8312 store the step number when there are 32K steps or more.

*7. D8315 and D8314 store the step number when there are 32K steps or more.

Number and name	Content of register	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Parallel link (Refer to the data communication manual for details.)							
[D]8070	Parallel link error check time: 500 ms	✓	✓	✓	✓	✓	-
[D]8071	Unavailable	-	-	-	-	-	-
[D]8072		-	-	-	-	-	-
[D]8073		-	-	-	-	-	-
Sampling trace*1							
[D]8074	The PLC system occupies these devices when the sampling trace function is used in the connected A6GPP, A6PHP, A7PHP or personal computer*1.	✓	✓	-	-	-	M8075 to M8079
[D]8075		✓	✓	-	-	-	
[D]8076		✓	✓	-	-	-	
[D]8077		✓	✓	-	-	-	
[D]8078		✓	✓	-	-	-	
[D]8079		✓	✓	-	-	-	
[D]8080		✓	✓	-	-	-	
[D]8081		✓	✓	-	-	-	
[D]8082		✓	✓	-	-	-	
[D]8083		✓	✓	-	-	-	
[D]8084		✓	✓	-	-	-	
[D]8085		✓	✓	-	-	-	
[D]8086		✓	✓	-	-	-	
[D]8087		✓	✓	-	-	-	
[D]8088		✓	✓	-	-	-	
[D]8089		✓	✓	-	-	-	
[D]8090		✓	✓	-	-	-	
[D]8091		✓	✓	-	-	-	
[D]8092		✓	✓	-	-	-	
[D]8093		✓	✓	-	-	-	
[D]8094		✓	✓	-	-	-	
[D]8095		✓	✓	-	-	-	
[D]8096		✓	✓	-	-	-	
[D]8097		✓	✓	-	-	-	
[D]8098		✓	✓	-	-	-	

*1. Sampling trace devices are used by peripheral equipment.

Number and name		Content of register	Applicable model					
			FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Pulse width/Pulse period measurement [FX3G/FX3GC PLCs] (Refer to the FX Structured Programming Manual [Basic & Applied Instruction] for details.)								
D 8074*1	Lower	[X000] Ring counter value for rising edge (1/6 μs unit)	-	-	✓*2	✓	-	M8076 M8080
D 8075*1	Upper		-	-			-	
D 8076*1	Lower	[X000] Ring counter value for falling edge (1/6 μs unit)	-	-	✓*2	✓	-	
D 8077*1	Upper		-	-			-	
D 8078*1	Lower	[X000] Pulse width/Pulse period (10 μs unit)	-	-	✓*2	✓	-	
D 8079*1	Upper		-	-			-	
D 8080*1	Lower	[X001] Ring counter value for rising edge (1/6 μs unit)	-	-	✓*2	✓	-	M8077 M8081
D 8081*1	Upper		-	-			-	
D 8082*1	Lower	[X001] Ring counter value for falling edge (1/6 μs unit)	-	-	✓*2	✓	-	
D 8083*1	Upper		-	-			-	
D 8084*1	Lower	[X001] Pulse width/Pulse period (10 μs unit)	-	-	✓*2	✓	-	
D 8085*1	Upper		-	-			-	
D 8086*1	Lower	X003] Ring counter value for rising edge (1/6 μs unit)	-	-	✓*2	✓	-	M8078 M8082
D 8087*1	Upper		-	-			-	
D 8088*1	Lower	[X003] Ring counter value for falling edge (1/6 μs unit)	-	-	✓*2	✓	-	
D 8089*1	Upper		-	-			-	
D 8090*1	Lower	[X003] Pulse width/Pulse period (10 μs unit)	-	-	✓*2	✓	-	
D 8091*1	Upper		-	-			-	
D 8092*1	Lower	[X004] Ring counter value for rising edge (1/6 μs unit)	-	-	✓*2	✓	-	M8079 M8083
D 8093*1	Upper		-	-			-	
D 8094*1	Lower	[X004] Ring counter value for falling edge (1/6 μs unit)	-	-	✓*2	✓	-	
D 8095*1	Upper		-	-			-	
D 8096*1	Lower	[X004] Pulse width/Pulse period (10 μs unit)	-	-	✓*2	✓	-	
D 8097*1	Upper		-	-			-	
D 8098	Unavailable		-	-	-	-	-	-

*1. Cleared when PLC switches from STOP to RUN.

*2. Available in Ver. 1.10 or later.

High speed ring counter								
D 8099	Up-counting ring counter of 0 to 32767 (Unit: 0.1 ms, 16 bits)*3	✓	✓	-	-	-	M8099
[D]8100	Unavailable	-	-	-	-	-	-

*3. The 0.1 ms high speed ring counter D8099 is activated when the END instruction is executed after M8099 turned ON.

Number and name	Content of register	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Memory information							
[D]8101 PLC type and system version	1 6 1 0 0 Value converted into BCD Shown on the right Version 1.00	16	16	26	26	28	-
[D]8102	16 ... 16K steps 32 ... 32K steps 64 ... 64K steps	✓ 16*1 64	✓ 16*1 64	✓ 32	✓ 32	✓ 4*2	-
[D]8103	Unavailable	-	-	-	-	-	-
[D]8104		-	-	-	-	-	-
[D]8105		-	-	-	-	-	-
[D]8106		-	-	-	-	-	-
[D]8107	Number of registered device comments	✓	✓	-	-	-	M8107
[D]8108	Number of connected special units	✓	✓	✓	✓	-	-
Output refresh error (Refer to Chapter 5 for details.)							
[D]8109	Y number where output refresh error has occurred	✓	✓	✓	✓	-	M8109
[D]8110	Unavailable	-	-	-	-	-	-
[D]8111		-	-	-	-	-	-
[D]8112		-	-	-	-	-	-
[D]8113		-	-	-	-	-	-
[D]8114		-	-	-	-	-	-
[D]8115 to [D]8119		-	-	-	-	-	-
RS instruction and computer link [ch1] (Refer to the data communication manual for details.)							
D 8120*3	RS instruction and computer link [ch1]: Communication format setting	✓	✓	✓	✓	✓	-
D 8121*3	Computer link [ch1]: Station number setting	✓	✓	✓	✓	✓	-
[D]8122*4	RS instruction: Number of remaining send data points	✓	✓	✓	✓	✓	M8122
[D]8123*4	RS instruction: Monitoring of number of received data points	✓	✓	✓	✓	✓	M8123
D 8124	RS instruction: Header (Initial value: STX)	✓	✓	✓	✓	✓	-
D 8125	RS instruction: Terminator (Initial value: ETX)	✓	✓	✓	✓	✓	-
[D]8126	Unavailable	-	-	-	-	-	-
D 8127	Computer link [ch1]: On-demand head number specification	✓	✓	✓	✓	✓	M8126 to M8129
D 8128	Computer link [ch1]: On-demand data quantity specification	✓	✓	✓	✓	✓	
D 8129*3	RS instruction and computer link [ch1]: Timeout time setting	✓	✓	✓	✓	✓	

*1. When the FX3U-FLROM-16 is attached

*2. "4" is displayed even when the memory capacity is set to 16K steps in the parameter setting.

*3. Backed up against power interruption

*4. Cleared when the PLC mode switches from RUN to STOP.

Number and name	Content of register		Applicable model					
			FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
High speed counter comparison and high speed table								
[D]8130	HSZ instruction: High speed comparison table counter		✓	✓	-	-	-	M8130
[D]8131	HSZ and PLSY instructions: Speed pattern table counter		✓	✓	-	-	-	M8132
[D]8132	Low order	HSZ and PLSY instructions: Speed pattern frequency	✓	✓	-	-	-	M8132
[D]8133	High order		✓	✓	-	-	-	
[D]8134	Low order	HSZ and PLSY instructions: Number of target pulses for speed pattern	✓	✓	-	-	-	M8132
[D]8135	High order		✓	✓	-	-	-	
D 8136	Low order	PLSY and PLSR instructions: Accumulated total number of pulses output to Y000 and Y001	✓	✓	✓	✓	✓	-
D 8137	High order		✓	✓	✓	✓	✓	
[D]8138	HSCT instruction: Table counter		✓	✓	-	-	-	M8138
[D]8139	HSCS, HSCR, HSZ and HSCT instructions: Number of instructions being executed		✓	✓	-	-	-	M8139
D 8140	Low order	PLSY and PLSR instructions: Accumulated number of pulses output to Y000	✓	✓	✓	✓	✓	-
D 8141	High order							
D 8142	Low order	PLSY and PLSR instructions: Accumulated number of pulses output to Y001	✓	✓	✓	✓	✓	-
D 8143	High order							
[D]8144	Unavailable		-	-	-	-	-	-
[D]8145			-	-	-	-	-	-
[D]8146			-	-	-	-	-	-
[D]8147			-	-	-	-	-	-
[D]8148			-	-	-	-	-	-
[D]8149			-	-	-	-	-	-

Number and name	Content of register	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Inverter communication function (Refer to the data communication manual for details.)							
D 8150*1	Response waiting time in inverter communication [ch1]	✓	✓	✓*3	✓	✓	-
[D]8151	Step number being processed in inverter communication [ch1] Initial value: -1	✓	✓	✓*3	✓	✓	M8151
[D]8152*2	Error code in inverter communication [ch1]	✓	✓	✓*3	✓	✓	M8152
[D]8153*2	Latched step where error has occurred in inverter communication [ch1] Initial value: -1	✓	✓	✓*3	✓	✓	M8153
[D]8154*2	Parameter number in which error has occurred in the IVBWR instruction [ch1] Initial value: -1	✓	✓	-	-	-	M8154
D 8155*1	Response waiting time in inverter communication [ch2]	✓	✓	✓*3	✓	-	-
[D]8156	Step number being processed in inverter communication [ch2] Initial value: -1	✓	✓	✓*3	✓	-	M8156
[D]8157*2	Error code in inverter communication [ch2]	✓	✓	✓*3	✓	-	M8157
[D]8158*2	Latched step where error has occurred in inverter communication [ch2] Initial value: -1	✓	✓	✓*3	✓	-	M8158
[D]8159*2	Parameter number in which error has occurred in the IVBWR instruction [ch2] Initial value: -1	✓	✓	-	-	-	M8159

*1. Cleared when the PLC power supply from OFF to ON.

*2. Cleared when the PLC mode switches from STOP to RUN.

*3. Available in Ver. 1.10 or later.

<table>
<tr><th rowspan="2">Number and name</th><th rowspan="2">Content of register</th><th colspan="6">Applicable model</th></tr>
<tr><th>FX3U</th><th>FX3UC</th><th>FX3G</th><th>FX3GC</th><th>FX3S</th><th>Corresponding special device</th></tr>
<tr><td colspan="8">Advanced function</td></tr>
<tr><td>[D]8160</td><td rowspan="6">Unavailable</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>[D]8161</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>[D]8162</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>[D]8163</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>[D]8164</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>[D]8165</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>[D]8166</td><td>Special block error condition</td><td>✓*4</td><td>✓*4</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>[D]8167</td><td rowspan="2">Unavailable</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>[D]8168</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>[D]8169</td><td>Access restriction status
<table>
<tr><th rowspan="2">Present value</th><th rowspan="2">Access restriction status</th><th colspan="2">Program</th><th rowspan="2">Monitoring</th><th rowspan="2">Present value change</th></tr>
<tr><th>Read</th><th>Write</th></tr>
<tr><td>H**00*1</td><td>Protect by (16-digit) keyword is not set.</td><td>✓*2</td><td>✓*2</td><td>✓*2</td><td>✓*2</td></tr>
<tr><td>H**10*1</td><td>Write protection</td><td>✓</td><td>-</td><td>✓</td><td>✓</td></tr>
<tr><td>H**11*1</td><td>Read/write protection</td><td>-</td><td>-</td><td>✓</td><td>✓</td></tr>
<tr><td>H**12*1</td><td>All online operation protection</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>H**20*1</td><td>Keyword cancel</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
</table></td><td>✓</td><td>✓*3</td><td>✓</td><td>✓</td><td>✓</td><td>-</td></tr>
</table>

*1. "**" indicates areas used by the system.

*2. The accessibility is restricted depending on the keyword setting status.

*3. Available in Ver. 2.20 or later.

*4. Available in Ver. 3.00 or later.
For details refer to Chapter 5.

Simple N:N link (setting) (Refer to the data communication manual for details.)							
[D]8170	Unavailable	-	-	-	-	-	-
[D]8171		-	-	-	-	-	-
[D]8172		-	-	-	-	-	-
[D]8173	Station number setting status	✓	✓	✓	✓	✓	-
[D]8174	Slave station setting status	✓	✓	✓	✓	✓	-
[D]8175	Refresh range setting status	✓	✓	✓	✓	✓	-
D 8176	Station number setting	✓	✓	✓	✓	✓	M8038
D 8177	Slave station quantity setting	✓	✓	✓	✓	✓	
D 8178	Refresh range setting	✓	✓	✓	✓	✓	
D 8179	Number of times of retry	✓	✓	✓	✓	✓	
D 8180	Monitoring time	✓	✓	✓	✓	✓	
[D]8181	Unavailable	-	-	-	-	-	-

Number and name	Content of register	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Index register (Z1 to Z7 and V1 to V7)							
[D]8182	Value of register Z1	✓	✓	✓	✓	✓	-
[D]8183	Value of register V1	✓	✓	✓	✓	✓	-
[D]8184	Value of register Z2	✓	✓	✓	✓	✓	-
[D]8185	Value of register V2	✓	✓	✓	✓	✓	-
[D]8186	Value of register Z3	✓	✓	✓	✓	✓	-
[D]8187	Value of register V3	✓	✓	✓	✓	✓	-
[D]8188	Value of register Z4	✓	✓	✓	✓	✓	-
[D]8189	Value of register V4	✓	✓	✓	✓	✓	-
[D]8190	Value of register Z5	✓	✓	✓	✓	✓	-
[D]8191	Value of register V5	✓	✓	✓	✓	✓	-
[D]8192	Value of register Z6	✓	✓	✓	✓	✓	-
[D]8193	Value of register V6	✓	✓	✓	✓	✓	-
[D]8194	Value of register Z7	✓	✓	✓	✓	✓	-
[D]8195	Value of register V7	✓	✓	✓	✓	✓	-
[D]8196	Unavailable	-	-	-	-	-	-
[D]8197		-	-	-	-	-	-
[D]8198		-	-	-	-	-	-
[D]8199		-	-	-	-	-	-
Simple N:N link (Refer to the data communication manual for details.)							
[D]8200	Unavailable	-	-	-	-	-	-
[D]8201	Current link scan time	✓	✓	✓	✓	✓	-
[D]8202	Maximum link scan time	✓	✓	✓	✓	✓	-
[D]8203	Number of data transmission sequence errors in master station	✓	✓	✓	✓	✓	M8183 to M8191
[D]8204	Number of data transmission sequence errors in slave station No. 1	✓	✓	✓	✓	✓	
[D]8205	Number of data transmission sequence errors in slave station No. 2	✓	✓	✓	✓	✓	
[D]8206	Number of data transmission sequence errors in slave station No. 3	✓	✓	✓	✓	✓	
[D]8207	Number of data transmission sequence errors in slave station No. 4	✓	✓	✓	✓	✓	
[D]8208	Number of data transmission sequence errors in slave station No. 5	✓	✓	✓	✓	✓	
[D]8209	Number of data transmission sequence errors in slave station No. 6	✓	✓	✓	✓	✓	
[D]8210	Number of data transmission sequence errors in slave station No. 7	✓	✓	✓	✓	✓	
[D]8211	Code for data transmission error in master station	✓	✓	✓	✓	✓	
[D]8212	Code for data transmission error in slave station No. 1	✓	✓	✓	✓	✓	
[D]8213	Code for data transmission error in slave station No. 2	✓	✓	✓	✓	✓	
[D]8214	Code for data transmission error in slave station No. 3	✓	✓	✓	✓	✓	
[D]8215	Code for data transmission error in slave station No. 4	✓	✓	✓	✓	✓	
[D]8216	Code for data transmission error in slave station No. 5	✓	✓	✓	✓	✓	
[D]8217	Code for data transmission error in slave station No. 6	✓	✓	✓	✓	✓	
[D]8218	Code for data transmission error in slave station No. 7	✓	✓	✓	✓	✓	
[D]8219 to [D]8259	Unavailable	-	-	-	-	-	-

Number and name	Content of register	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Analog special adapter [FX3U/FX3UC] (Refer to Subsection 4.2.18 for the applicability of each analog special adapter.)							
D 8260 to D 8269	1st special adapter*1	✓	✓*2	-	-	-	-
D 8270 to D 8279	2nd special adapter*1	✓	✓*2	-	-	-	-
D 8280 to D 8289	3rd special adapter*1	✓	✓*2	-	-	-	-
D 8290 to D 8299	4th special adapter*1	✓	✓*2	-	-	-	-
Analog Special Adapter [FX3G/FX3GC/FX3S], Analog Expansion Board [FX3G/FX3S] (Refer to Subsection 4.2.17 for applicability of each analog special adapter and analog expansion board)							
D 8260 to D 8269	1st expansion board*3	-	-	✓*6	-	✓	-
D 8270 to D 8279	2nd expansion board*4*5	-	-	✓*6	-	-	-
D 8280 to D 8289	1st special adapter*1	-	-	✓	✓	✓	-
D 8290 to D 8299	2nd special adapter*1*5	-	-	✓	✓	-	-
Built-in analog function [FX3S-30M□/E□-2AD] (Refer to FX3S Hardware Edition for details.)							
[D]8270	Ch1 analog input data (0 to 1020)	-	-	-	-	✓*7	-
[D]8271	Ch2 analog input data (0 to 1020)	-	-	-	-	✓*7	-
[D]8272	Unavailable	-	-	-	-	-	-
[D]8273		-	-	-	-	-	-
D 8274	Averaging time for ch1 (1 to 4095)	-	-	-	-	✓*7	-
D 8275	Averaging time for ch2 (1 to 4095)	-	-	-	-	✓*7	-
[D]8276	Unavailable	-	-	-	-	-	-
[D]8277		-	-	-	-	-	-
[D]8278	Error status b0: Ch1 upper over-scale detection b1: Ch2 upper over-scale detection b2: Not used b3: Not used b4: EEPROM error b5: Averaging time setting error (common ch1 and ch2) b6 to b15: Not used	-	-	-	-	✓*7	-
[D]8279	Model code: K5	-	-	-	-	✓*7	-

*1. Count the number of connected analog special adapter from the main unit.

*2. Available in Ver. 1.20 or later.

*3. Expansion board connected to the BD1 connector of a FX3G PLC (40-point and 60-point type) or the BD connector of a FX3G PLC (14-point and 24-point type) and FX3S PLCs.

*4. Expansion board connected to the BD2 connector of a FX3G PLC (40-point and 60-point type).

*5. Only a 40-point or 60-point type FX3G PLC can be connected.

*6. Available in Ver. 1.10 or later.

*7. This function is supported only in the FX3S-30M□/E□-2AD PLC.

Number and name	Content of register	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Display module (FX3G-5DM, FX3U-7DM) function (Refer to the hardware manual of the PLC for details.)							
D 8300	Control device (D) for display module Default: K-1	✓	✓	✓*2	-	-	-
D 8301	Control device (M) for display module Default: K-1	✓	✓	✓*2	-	-	-
D 8302*1	Language display setting Japanese: K0 English: Other than K0	✓	✓	✓*2	-	-	-
D 8303	LCD contrast setting value Default: K0	✓	✓	✓*2	-	-	-
[D]8304	Unavailable	-	-	-	-	-	-
[D]8305		-	-	-	-	-	-
[D]8306		-	-	-	-	-	-
[D]8307		-	-	-	-	-	-
[D]8308		-	-	-	-	-	-
[D]8309		-	-	-	-	-	-

*1. Latch (battery or EEPROM backed) device.

*2. Available in Ver. 1.10 or later.

RND									
[D]8310	Low order	RND instruction: Data for generating random number Default: K1	✓	✓	-	-	-	-
[D]8311	High order								
Syntax/circuit/operation/unconnected I/O specification error step number (Refer to Chapter 5 for details.)									
D 8312	Low order	Latched step number where operation error has occurred (32 bits)	✓	✓	-	-	-	M8068
D 8313	High order								
[D]8314*3	Low order	Step number where M8065 to M8067 error has occurred (32 bits)	✓	✓	-	-	-	M8065 to M8067
[D]8315*3	High order								
[D]8316	Low order	Step number of instruction specifying an unconnected I/O number (directly or indirectly using index register)	✓	✓	-	-	-	M8316
[D]8317	High order								
[D]8318	BMF initialization function: Unit number where error has occurred		✓	✓*4	-	-	-	M8318
[D]8319	BMF initialization function: BFM number where error has occurred		✓	✓*4	-	-	-	M8318
[D]8320 to [D]8328	Unavailable		-	-	-	-	-	-

*3. Cleared when the PLC mode switches from STOP to RUN.

*4. Available in Ver. 2.20 or later.

Number and name	Content of register		Applicable model					
			FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Timing clock and positioning (Refer to the position control manual for details.)								
[D]8329	Unavailable		-	-	-	-	-	-
[D]8330	DUTY instruction: Scan count for timing clock output 1		✓	✓*1	-	-	-	M8330
[D]8331	DUTY instruction: Scan count for timing clock output 2		✓	✓*1	-	-	-	M8331
[D]8332	DUTY instruction: Scan count for timing clock output 3		✓	✓*1	-	-	-	M8332
[D]8333	DUTY instruction: Scan count for timing clock output 4		✓	✓*1	-	-	-	M8333
[D]8334	DUTY instruction: Scan count for timing clock output 5		✓	✓*1	-	-	-	M8334
D 8336	DVIT instruction: Interrupt input specification Default: -		✓	✓*2	-	-	-	M8336
[D]8337 to [D]8339	Unavailable		-	-	-	-	-	-
D 8340	Low order	[Y000] Current value register Default: 0	✓	✓	✓	✓	✓	-
D 8341	High order							
D 8342	[Y000] Bias speed Initial value: 0		✓	✓	✓	✓	✓	-
D 8343	Low order	[Y000] Maximum speed Default: 100000	✓	✓	✓	✓	✓	-
D 8344	High order							
D 8345	[Y000] Creep speed Initial value: 1000		✓	✓	✓	✓	✓	-
D 8346	Low order	[Y000] Zero return speed Default: 50000	✓	✓	✓	✓	✓	-
D 8347	High order							
D 8348	[Y000] Acceleration time Default: 100		✓	✓	✓	✓	✓	-
D 8349	[Y000] Deceleration time Default: 100		✓	✓	✓	✓	✓	-
D 8350	Low order	[Y001] Current value register Default: 0	✓	✓	✓	✓	✓	-
D 8351	High order							
D 8352	[Y001] Bias speed Initial value: 0		✓	✓	✓	✓	✓	-
D 8353	Low order	[Y001] Maximum speed Default: 100000	✓	✓	✓	✓	✓	-
D 8354	High order							
D 8355	[Y001] Creep speed Initial value: 1000		✓	✓	✓	✓	✓	-
D 8356	Low order	[Y001] Zero return speed Default: 50000	✓	✓	✓	✓	✓	-
D 8357	High order							
D 8358	[Y001] Acceleration time Default: 100		✓	✓	✓	✓	✓	-
D 8359	[Y001] Deceleration time Default: 100		✓	✓	✓	✓	✓	-

*1. Available in Ver. 2.20 or later.

*2. Available in Ver. 1.30 or later.

Number and name	Content of register		Applicable model					
			FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Timing clock and positioning (Refer to the position control manual for details.)								
D 8360	Low order	[Y002] Current value register Default: 0	✓	✓	✓	-	-	-
D 8361	High order							
D 8362	[Y002] Bias speed Default: 0		✓	✓	✓	-	-	-
D 8363	Low order	[Y002] Maximum speed Default: 100000	✓	✓	✓	-	-	-
D 8364	High order							
D 8365	[Y002] Creep speed Default: 1000		✓	✓	✓	-	-	-
D 8366	Low order	[Y002] Zero return speed Default: 50000	✓	✓	✓	-	-	-
D 8367	High order							
D 8368	[Y002] Acceleration time Default: 100		✓	✓	✓	-	-	-
D 8369	[Y002] Deceleration time Default: 100		✓	✓	✓	-	-	-
Positioning (FX3U PLCs) (Refer to the positioning control manual for details.)								
D 8370	Low order	[Y003] Current value register Default: 0	✓*2	-	-	-	-	-
D 8371	High order							
D 8372	[Y003] Bias speed Default: 0		✓*2	-	-	-	-	-
D 8373	Low order	[Y003] Maximum speed Default: 100000	✓*2	-	-	-	-	-
D 8374	High order							
D 8375	[Y003] Creep speed Default: 1000		✓*2	-	-	-	-	-
D 8376	Low order	[Y003] Zero return speed Default: 50000	✓*2	-	-	-	-	-
D 8377	High order							
D 8378	[Y003] Acceleration time Default: 100		✓*2	-	-	-	-	-
D 8379	[Y003] Deceleration time Default: 100		✓*2	-	-	-	-	-
[D]8380 to [D]8392	Unavailable		-	-	-	-	-	-
RS2 instruction [ch0] (FX3G/FX3GC PLCs) (Refer to the data communication manual for details.)								
D 8370	RS2[ch0] Communication format setting		-	-	✓	✓	-	-
D 8371	Unavailable		-	-	-	-	-	-
[D]8372*1	RS2[ch0] Number of remaining send data points		-	-	✓	✓	-	-
[D]8373*1	RS2[ch0] Monitoring of number of received data points		-	-	✓	✓	-	-
D 8374	Unavailable		-	-	-	-	-	-
[D]8375 to [D]8378	Unavailable		-	-	-	-	-	-
D 8379	RS2[ch0] Timeout time setting		-	-	✓	✓	-	-
D 8380	RS2[ch0] Headers 1 and 2 <Initial value: STX>		-	-	✓	✓	-	-
D 8381	RS2[ch0] Headers 3 and 4		-	-	✓	✓	-	-
D 8382	RS2[ch0] Terminators 1 and 2 <Initial value: ETX>		-	-	✓	✓	-	-
D 8383	RS2[ch0] Terminators 3 and 4		-	-	✓	✓	-	-
[D]8384	RS2[ch0] Receive sum (received data)		-	-	✓	✓	-	-
[D]8385	RS2[ch0] Receive sum (calculation result)		-	-	✓	✓	-	-
[D]8386	RS2[ch0] Send sum		-	-	✓	✓	-	-
[D]8387 to [D]8388	Unavailable		-	-	-	-	-	-
[D]8389	Operation mode display [ch0]		-	-	✓	✓	-	-
[D]8390 to [D]8392	Unavailable		-	-	-	-	-	-

*1. Cleared when the PLC mode switches from RUN to STOP.

*2. Available only when two FX3U-2HSY-ADP units are connected to an FX3U PLC.

<table>
<tr><th rowspan="2">Number and name</th><th rowspan="2">Content of register</th><th colspan="6">Applicable model</th></tr>
<tr><th>FX3U</th><th>FX3UC</th><th>FX3G</th><th>FX3GC</th><th>FX3S</th><th>Corresponding special device</th></tr>
<tr><td colspan="8">Interrupt program</td></tr>
<tr><td>D 8393</td><td colspan="2">Delay time</td><td>✓</td><td>✓</td><td>-</td><td>-</td><td>-</td><td>M8393</td></tr>
<tr><td>[D]8394</td><td colspan="2">Unavailable</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>[D]8395
Symbolic Information, Block password status</td><td colspan="2">Symbolic information storage status and execution program protection status using the block password.
<table><tr><th>Value</th><th>Symbolic information storage</th><th>Protection of execution program</th></tr><tr><td>H**00*1</td><td>None</td><td>None</td></tr><tr><td>H**01*1</td><td>None</td><td>Provided</td></tr><tr><td>H**10*1</td><td>Provided</td><td>None</td></tr><tr><td>H**11*1</td><td>Provided</td><td>Provided</td></tr></table></td><td>✓*2</td><td>✓*2</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>[D]8396</td><td colspan="2">CC-Link/LT setting information</td><td>-</td><td>✓*3</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>[D]8397</td><td colspan="2">Unavailable</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td colspan="8">Ring counter</td></tr>
<tr><td>D 8398</td><td>Low order</td><td rowspan="2">Up-counting ring counters*4 of 0 to 2,147,483,647 (Unit: 1 ms)</td><td rowspan="2">✓</td><td rowspan="2">✓</td><td rowspan="2">✓</td><td rowspan="2">✓</td><td rowspan="2">✓</td><td rowspan="2">M8398</td></tr>
<tr><td>D 8399</td><td>High order</td></tr>
</table>

*1. "**" indicates areas used by the system.

*2. Available in Ver. 3.00 or later.

*3. Only the FX3UC-32MT-LT-2 is available.

*4. 1 ms ring counters (D8399 and D8398) are activated when the END instruction is executed after M8398 turned ON.

Number and name	Content of register	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
RS2 instruction [ch1] (Refer to the data communication manual for details.)							
D 8400	RS2[ch1] Communication format setting	✓	✓	✓	✓	✓	-
[D]8401	Unavailable	-	-	-	-	-	-
[D]8402*1	RS2[ch1] Number of remaining send data points	✓	✓	✓	✓	✓	M8402
[D]8403*1	RS2[ch1] Monitoring of number of received data points	✓	✓	✓	✓	✓	M8403
[D]8404	Unavailable	-	-	-	-	-	-
[D]8405	Communication parameter display [ch1]	✓	✓	✓	✓	✓	-
[D]8406	Unavailable	-	-	-	-	-	-
[D]8407		-	-	-	-	-	-
[D]8408		-	-	-	-	-	-
D 8409	RS2[ch1] Timeout time setting	✓	✓	✓	✓	✓	-
D 8410	RS2[ch1] Headers 1 and 2 <Initial value: STX>	✓	✓	✓	✓	✓	-
D 8411	RS2[ch1] Headers 3 and 4	✓	✓	✓	✓	✓	-
D 8412	RS2[ch1] Terminators 1 and 2 <Initial value: ETX>	✓	✓	✓	✓	✓	-
D 8413	RS2[ch1] Terminators 3 and 4	✓	✓	✓	✓	✓	-
[D]8414	RS2[ch1] Receive sum (received data)	✓	✓	✓	✓	✓	-
[D]8415	RS2[ch1] Receive sum (calculation result)	✓	✓	✓	✓	✓	-
[D]8416	RS2[ch1] Send sum	✓	✓	✓	✓	✓	-
[D]8417	Unavailable	-	-	-	-	-	-
[D]8418		-	-	-	-	-	-
[D]8419	Operation mode display [ch1]	✓	✓	✓	✓	✓	-
RS2 instruction [ch2] and computer link [ch2] (Refer to the data communication manual for details.)							
D 8420	RS2[ch2] Communication format setting	✓	✓	✓	✓	-	-
D 8421	Computer link [ch2]: Station number setting	✓	✓	✓	✓	-	-
[D]8422*1	RS2[ch2] Number of remaining send data points	✓	✓	✓	✓	-	M8422
[D]8423*1	RS2[ch2] Monitoring of number of received data points	✓	✓	✓	✓	-	M8423
[D]8424	Unavailable	-	-	-	-	-	-
[D]8425	Communication parameter display [ch2]	✓	✓	✓	✓	-	-
[D]8426	Unavailable	-	-	-	-	-	-
D 8427	Computer link [ch2]: On-demand head number specification	✓	✓	✓	✓	-	M8426 to M8429
D 8428	Computer link [ch2]: On-demand data quantity specification	✓	✓	✓	✓	-	
D 8429	RS2 instruction [ch2] and computer link [ch2]: Timeout time setting	✓	✓	✓	✓	-	
D 8430	RS2[ch2] Headers 1 and 2 <Initial value: STX>	✓	✓	✓	✓	-	-
D 8431	RS2[ch2] Headers 3 and 4	✓	✓	✓	✓	-	-
D 8432	RS2[ch2] Terminators 1 and 2 <Initial value: ETX>	✓	✓	✓	✓	-	-
D 8433	RS2[ch2] Terminators 3 and 4	✓	✓	✓	✓	-	-
[D]8434	RS2[ch2] Receive sum (received data)	✓	✓	✓	✓	-	-
[D]8435	RS2[ch2] Receive sum (calculation result)	✓	✓	✓	✓	-	-
[D]8436	RS2[ch2] Send sum	✓	✓	✓	✓	-	-
[D]8437	Unavailable	-	-	-	-	-	-

*1. Cleared when the PLC mode switches from RUN to STOP.

Number and name	Content of register	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
MODBUS serial communication [ch1] (Refer to MODBUS serial communication Manual for details.)							
D 8400	Communication format	✓*1	✓*1	✓*2	✓	✓	-
D 8401	Protocol	✓*1	✓*1	✓*2	✓	✓	-
D 8402	Error code of communication error	✓*1	✓*1	✓*2	✓	✓	M8402
D 8403	Error details	✓*1	✓*1	✓*2	✓	✓	M8403
D 8404	Step in which communication error occurred	✓*1	✓*1	✓*2	✓	✓	-
[D]8405	Communication parameter display	✓*1	✓*1	✓*2	✓	✓	-
D 8406	ASCII Input Delimiter	✓*1	✓*1	-	-	-	-
[D]8407	Step Number Being Executed	✓*1	✓*1	✓*2	✓	✓	-
[D]8408	Current Retry Value	✓*1	✓*1	✓*2	✓	✓	-
D 8409	Slave Response Timeout	✓*1	✓*1	✓*2	✓	✓	-
D 8410	Turn Around Delay	✓*1	✓*1	✓*2	✓	✓	-
D 8411	Message to Message Delay	✓*1	✓*1	✓*2	✓	✓	-
D 8412	Number of Retries	✓*1	✓*1	✓*2	✓	✓	-
D 8414	Slave Node Address	✓*1	✓*1	✓*2	✓	✓	-
D 8415	Communication Status Information Setup	✓*1	✓*1	-	-	-	-
D 8416	Communication Status Device Range Setup	✓*1	✓*1	-	-	-	-
[D]8419	Operation mode display	✓*1	✓*1	✓*2	✓	✓	-
MODBUS serial communication [ch2] (Refer to MODBUS serial communication Manual for details.)							
D 8420	Communication format	✓*1	✓*1	✓*2	✓	-	-
D 8421	Protocol	✓*1	✓*1	✓*2	✓	-	-
D 8422	Error code of communication error	✓*1	✓*1	✓*2	✓	-	M8422
D 8423	Error details	✓*1	✓*1	✓*2	✓	-	M8423
D 8424	Step in which communication error occurred	✓*1	✓*1	✓*2	✓	-	-
[D]8425	Communication parameter display	✓*1	✓*1	✓*2	✓	-	-
D 8426	ASCII Input Delimiter	✓*1	✓*1	✓*2	✓	-	-
[D]8427	Step Number Being Executed	✓*1	✓*1	✓*2	✓	-	-
[D]8428	Current Retry Value	✓*1	✓*1	✓*2	✓	-	-
D 8429	Slave Response Timeout	✓*1	✓*1	✓*2	✓	-	-
D 8430	Turn Around Delay	✓*1	✓*1	✓*2	✓	-	-
D 8431	Message to Message Delay	✓*1	✓*1	✓*2	✓	-	-
D 8432	Number of Retries	✓*1	✓*1	✓*2	✓	-	-
D 8434	Slave Node Address	✓*1	✓*1	✓*2	✓	-	-
D 8435	Communication Status Information Setup	✓*1	✓*1	-	-	-	-
D 8436	Communication Status Device Range Setup	✓*1	✓*1	-	-	-	-
[D]8439	Operation mode display	✓*1	✓*1	✓*2	✓	-	-

*1. Available in Ver. 2.40 or later.

*2. Available in Ver. 1.30 or later.

Number and name		Content of register	Applicable model					
			FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
MODBUS serial communication [ch1, ch2] (Refer to MODBUS serial communication Manual for details.)								
D 8470	Lower	MODBUS Device Mapping 1	✓*1	✓*1	-	-	-	-
D 8471	Upper							
D 8472	Lower	MODBUS Device Mapping 2	✓*1	✓*1	-	-	-	-
D 8473	Upper							
D 8474	Lower	MODBUS Device Mapping 3	✓*1	✓*1	-	-	-	-
D 8475	Upper							
D 8476	Lower	MODBUS Device Mapping 4	✓*1	✓*1	-	-	-	-
D 8477	Upper							
D 8478	Lower	MODBUS Device Mapping 5	✓*1	✓*1	-	-	-	-
D 8479	Upper							
D 8480	Lower	MODBUS Device Mapping 6	✓*1	✓*1	-	-	-	-
D 8481	Upper							
D 8482	Lower	MODBUS Device Mapping 7	✓*1	✓*1	-	-	-	-
D 8483	Upper							
D 8484	Lower	MODBUS Device Mapping 8	✓*1	✓*1	-	-	-	-
D 8485	Upper							

*1. Available in Ver. 2.40 or later.

Number and name	Content of register	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
FX3U-CF-ADP [ch1] (Refer to FX3U-CF-ADP User's Manual for details)							
[D]8400 to [D]8401	Unavailable	-	-	-	-	-	-
[D]8402	Step number of executing CF-ADP instruction*2	✓*1	✓*1	-	-	-	-
[D]8403		✓*1	✓*1	-	-	-	-
[D]8404 to [D]8405	Unavailable	-	-	-	-	-	-
[D]8406	CF-ADP status	✓*1	✓*1	-	-	-	-
[D]8407	Unavailable	-	-	-	-	-	-
[D]8408	CF-ADP version	✓*1	✓*1	-	-	-	-
[D]8409 to [D]8413	Unavailable	-	-	-	-	-	-
[D]8414	Error step number of M8418, Error step number of M8438*2	✓*1	✓*1	-	-	-	-
[D]8415		✓*1	✓*1	-	-	-	-
[D]8416	Unavailable	-	-	-	-	-	-
[D]8417	Error code in detail for CF-ADP instructions*2	✓*1	✓*1	-	-	-	-
[D]8418	Error code for CF-ADP instructions*2	✓*1	✓*1	-	-	-	-
[D]8419	Operation mode display	✓*1	✓*1	-	-	-	-
FX3U-CF-ADP [ch2] (Refer to FX3U-CF-ADP User's Manual for details)							
[D]8420 to [D]8421	Unavailable	-	-	-	-	-	-
[D]8422	Step number of executing CF-ADP instruction*2	✓*1	✓*1	-	-	-	-
[D]8423		✓*1	✓*1	-	-	-	-
[D]8424 to [D]8425	Unavailable	-	-	-	-	-	-
[D]8426	CF-ADP status	✓*1	✓*1	-	-	-	-
[D]8427	Unavailable	-	-	-	-	-	-
[D]8428	CF-ADP version	✓*1	✓*1	-	-	-	-
[D]8429 to [D]8433	Unavailable	-	-	-	-	-	-
[D]8434	Error step number of M8418, Error step number of M8438*2	✓*1	✓*1	-	-	-	-
[D]8435		✓*1	✓*1	-	-	-	-
[D]8436	Unavailable	-	-	-	-	-	-
[D]8437	Error code in detail for CF-ADP instructions*2	✓*1	✓*1	-	-	-	-
[D]8438	Error code for CF-ADP instructions*2	✓*1	✓*1	-	-	-	-
[D]8439	Operation mode display	✓*1	✓*1	-	-	-	-

*1. Available in Ver. 2.61 or later.

*2. Cleared when the PLC mode switches from STOP to RUN.

Number and name	Content of register	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
FX3U-ENET-ADP [ch1] (Refer to ENET-ADP Manual for details.)							
[D]8400	IP Address (Low-order)	✓*1	✓*1	✓*2	✓*2	✓	-
[D]8401	IP Address (High-order)	✓*1	✓*1	✓*2	✓*2	✓	-
[D]8402	Subnet mask (Low-order)	✓*1	✓*1	✓*2	✓*2	✓	-
[D]8403	Subnet mask (High-order)	✓*1	✓*1	✓*2	✓*2	✓	-
[D]8404	Default Router IP Address (Low-order)	✓*1	✓*1	✓*2	✓*2	✓	-
[D]8405	Default Router IP Address (High-order)	✓*1	✓*1	✓*2	✓*2	✓	-
[D]8406	Status information	✓*1	✓*1	✓*2	✓*2	✓	-
[D]8407	Connection condition of the Ethernet port	✓*1	✓*1	✓*2	✓*2	✓	-
[D]8408	FX3U-ENET-ADP version	✓*1	✓*1	✓*2	✓*2	✓	-
D 8409	Communication timeout time	✓*1	✓*1	✓*2	✓*2	✓	-
D 8410	Connection forcible nullification	✓*1	✓*1	✓*2	✓*2	✓	-
[D]8411	Time setting functional operation result	✓*1	✓*1	✓*2	✓*2	✓	-
[D]8412 to [D]8414	Host MAC address	✓*1	✓*1	✓*2	✓*2	✓	-
[D]8415	Unavailable	-	-	-	-	-	-
[D]8416	Model code	✓*1	✓*1	✓*2	✓*2	✓	-
[D]8417	Error code of the Ethernet adapter	✓*1	✓*1	✓*2	✓*2	✓	-
[D]8418	Unavailable	-	-	-	-	-	-
[D]8419	Operation mode display	✓*1	✓*1	✓*2	✓*2	✓	-
FX3U-ENET-ADP [ch2] (Refer to ENET-ADP Manual for details.)							
[D]8420	IP Address (Low-order)	✓*1	✓*1	✓*2	✓*2	-	-
[D]8421	IP Address (High-order)	✓*1	✓*1	✓*2	✓*2	-	-
[D]8422	Subnet mask (Low-order)	✓*1	✓*1	✓*2	✓*2	-	-
[D]8423	Subnet mask (High-order)	✓*1	✓*1	✓*2	✓*2	-	-
[D]8424	Default Router IP Address (Low-order)	✓*1	✓*1	✓*2	✓*2	-	-
[D]8425	Default Router IP Address (High-order)	✓*1	✓*1	✓*2	✓*2	-	-
[D]8426	Status information	✓*1	✓*1	✓*2	✓*2	-	-
[D]8427	Connection condition of the Ethernet port	✓*1	✓*1	✓*2	✓*2	-	-
[D]8428	FX3U-ENET-ADP version	✓*1	✓*1	✓*2	✓*2	-	-
D 8429	Communication timeout time	✓*1	✓*1	✓*2	✓*2	-	-
D 8430	Connection forcible nullification	✓*1	✓*1	✓*2	✓*2	-	-
[D]8431	Time setting functional operation result	✓*1	✓*1	✓*2	✓*2	-	-
[D]8432 to [D]8434	Host MAC address	✓*1	✓*1	✓*2	✓*2	-	-
[D]8435	Unavailable	-	-	-	-	-	-
[D]8436	Model code	✓*1	✓*1	✓*2	✓*2	-	-
[D]8437	Error code of the Ethernet adapter	✓*1	✓*1	✓*2	✓*2	-	-
[D]8438	Unavailable	-	-	-	-	-	-
[D]8439	Operation mode display	✓*1	✓*1	✓*2	✓*2	-	-
FX3U-ENET-ADP [ch1, ch2] (Refer to ENET-ADP Manual for details.)							
[D]8490 to [D]8491		-	-	-	-	-	-
D 8492	IP Address (Low-order)	-	-	✓*3	✓*3	✓	-
D 8493	IP Address (High-order)	-	-	✓*3	✓*3	✓	-
D 8494	Subnet mask setting (Low-order)	-	-	✓*3	✓*3	✓	-
D 8495	Subnet mask setting (High-order)	-	-	✓*3	✓*3	✓	-
D 8496	Default router IP address setting (Low-order)	-	-	✓*3	✓*3	✓	-
D 8497	Default router IP address setting (High-order)	-	-	✓*3	✓*3	✓	-
[D]8498	Error code for IP address storage area write	-	-	✓*3	✓*3	✓	-
[D]8499	Error Code for IP address storage area clear	-	-	✓*3	✓*3	✓	-

*1. Available in Ver. 3.10 or later.
*2. Available in Ver. 2.00 or later.
*3. Available in Ver. 2.10 or later.

Number and name	Content of register	Applicable model					
		FX3U	FX3UC	FX3G	FX3GC	FX3S	Corresponding special device
Error detection (Refer to Chapter 5 for details.)							
[D]8438*1	Error code for serial communication error 2 [ch2]	✓	✓	✓	✓	-	✓

*1. Cleared when the PLC power supply from OFF to ON.

RS2 instruction [ch2] and computer link [ch2] (Refer to the data communication manual for details.)							
[D]8439	Operation mode display [ch2]	✓	✓	✓	✓	-	-
Error detection (Refer to Chapter 5 for details.)							
[D]8440 to [D]8448	Unavailable	-	-	-	-	-	-
[D]8449	Special block error code	✓	✓*2	✓	✓	-	M8449
[D]8450 to [D]8459	Unavailable	-	-	-	-	-	-

*2. Available in Ver. 2.20 or later.

Positioning (Refer to the positioning control manual for details.)							
[D]8460 to [D]8463	Unavailable	✓	✓	-	-	-	-
D 8464	DSZR and ZRN instructions [Y000]: Clear signal device specification	✓	✓*3	✓	✓	✓	M8464
D 8465	DSZR and ZRN instructions [Y001]: Clear signal device specification	✓	✓*3	✓	✓	✓	M8465
D 8466	DSZR and ZRN instructions [Y002]: Clear signal device specification	✓	✓*3	✓	-	-	M8466
D 8467	DSZR and ZRN instructions [Y003]: Clear signal device specification	✓*4	-	-	-	-	M8467

*3. Available in Ver. 2.20 or later.

*4. Available only when two FX3U-2HSY-ADP units are connected to an FX3U PLC.

Error detection							
[D]8468 to [D]8486	Unavailable	-	-	-	-	-	-
[D]8487	USB error	-	-	-	-	✓	M8487
[D]8488	Unavailable	-	-	-	-	-	-
[D]8489	Error code for special parameter error	✓*5	✓*5	✓*6	✓*6	✓	M8489
[D]8490 to [D]8511	Unavailable	-	-	-	-	-	-

*5. Available in Ver. 3.10 or later.

*6. Available in Ver. 2.00 or later.

2. FX1S/FX1N/FX2N/FX1NC/FX2NC PLCs

Number and name	Content of register	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
PLC status							
D 8000 Watchdog timer	The initial value is shown on the right (Unit: 1 ms) (Transferred from the system ROM when the PLC power is turned ON). The value overwritten by a program is valid after the END or WDT instruction was executed. → **Refer to Subsection 4.2.2.**	200	200	200	200	200	-
[D]8001 PLC type and system version	2 4 1 0 0 Value converted into BCD Shown on the right Version 1.00	22	26	24	26	24	-
[D]8002 Memory capacity	• 2 ... 2K steps • 4 ... 4K steps • 8 ... 8K steps • In the case of 16K steps or more "8" is written to D8002, and "16" is written to D8102.	✓ 2	✓ 8	✓ 4 8	✓ 8	✓ 4 8	D8102
[D]8003 Memory type	Type of the built-in memory, type of the RAM, EEPROM and EPROM memory cassettes and ON/OFF status of the write protect switch **Value** / **Memory type** / **Protect switch** 00H / RAM memory cassette / - 01H / EPROM cassette / - 02H / EEPROM memory cassette or flash memory cassette / OFF 0AH / EEPROM memory cassette or flash memory cassette / ON 10H / Memory built in PLC / -	✓	✓	✓	✓	✓	-
[D]8004 Error M number	8 0 6 0 8060 to 8068(when M8004 is ON)	✓	✓	✓	✓	✓	M8004
[D]8005 Battery voltage	3 0 (Unit: 0.1 V) Current value of battery voltage (Example: 3.0V)	-	-	✓	-	✓	M8005
[D]8006 Low battery voltage detection level	Initial value; • FX2N/FX2NC PLCs : 3.0V (Unit: 0.1 V) (Transferred from the system ROM when the PLC power is turned ON)	-	-	✓	-	✓	M8006

Number and name	Content of register	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
PLC status							
[D]8007 Instantaneous power interruption	Stores the number of times M8007 is set to ON. Cleared when the power is turned OFF.	-	-	✓	-	✓	M8007
D 8008 Instantaneous power interruption detection time	Initial value • FX2N PLCs (AC power supply type): 10 ms • FX2N/FX2NC PLCs (DC power supply type): 5ms → **Refer to Subsection 4.2.4.**	-	-	✓	-	✓	M8008
[D]8009 24V DC failure Unit number where 24V DC has failed	Minimum input device number of function unit or extension power supply unit where 24V DC has failed	-	-	✓	-	✓	M8009
Clock							
[D]8010 Current scan time	Accumulated instruction execution time from the step 0 (Unit: 0.1 ms) → **Refer to Subsection 4.2.5.**	✓ The displayed value includes the waiting time for the constant scan operation triggered by M8039.					-
[D]8011 Minimum scan time	Minimum value of scan time (Unit: 0.1 ms) → **Refer to Subsection 4.2.5.**						-
[D]8012 Maximum scan time	Maximum value of scan time (Unit: 0.1 ms) → **Refer to Subsection 4.2.5.**						-
D 8013 Second data	0 to 59 seconds (For real-time clock) → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓*1	-
D 8014 Minute data	0 to 59 minutes (For real-time clock) → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓*1	-
D 8015 Hour data	0 to 23 hours (For real-time clock) → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓*1	-
D 8016 Day data	1st to 31st day (For real-time clock) → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓*1	-
D 8017 Month data	January to December (For real-time clock) → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓*1	-
D 8018 Year data	Last 2 digits of year (0 to 99) (For real-time clock) → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓*1	-
D 8019 Day-of-the-week data	0 (Sunday) to 6 (Saturday) (For real-time clock) → **Refer to Subsection 4.2.7.**	✓	✓	✓	✓	✓*1	-

*1. FX2NC PLCs require a memory board equipped with the real-time clock function.

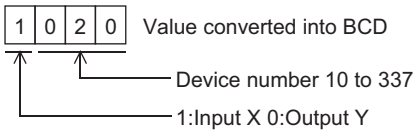
Number and name	Content of register	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
Input filter							
D 8020 Input filter adjustment	Input filter value of X000 to X017 (X000 to X007 in FX1N/FX1NC PLCs) (Default: 10ms) → **Refer to Subsection 4.2.9.**	✓	✓	✓	✓	✓	-
[D]8021	Unavailable	-	-	-	-	-	-
[D]8022		-	-	-	-	-	-
[D]8023		-	-	-	-	-	-
[D]8024		-	-	-	-	-	-
[D]8025		-	-	-	-	-	-
[D]8026		-	-	-	-	-	-
[D]8027		-	-	-	-	-	-
Index register Z0, V0							
[D]8028	Value of the register Z0 (Z)*1	✓	✓	✓	✓	✓	-
[D]8029	Value of the register V0 (V)*1	✓	✓	✓	✓	✓	-

*1. D8182 to D8015 store values of Z1 to Z7 and V1 to V7.

Variable analog potentiometer [FX1S/FX1N]							
[D]8030	Value (Integer from 0 to 255) of the variable analog potentiometer VR1	✓	✓	-	-	-	-
[D]8031	Value (Integer from 0 to 255) of the variable analog potentiometer VR2	✓	✓	-	-	-	-
Constant scan							
[D]8032	Unavailable	-	-	-	-	-	-
[D]8033		-	-	-	-	-	-
[D]8034		-	-	-	-	-	-
[D]8035		-	-	-	-	-	-
[D]8036		-	-	-	-	-	-
[D]8037		-	-	-	-	-	-
[D]8038		-	-	-	-	-	-
D 8039 Constant scan time	Default: 0ms(Unit: 0.1 ms) (Transferred from the system ROM when the PLC power is turned ON) Can be overwritten by a program. → **Refer to Subsection 4.2.15.**	✓	✓	✓	✓	✓	M8039

Number and name	Content of register	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
Step ladder and annunciator							
[D]8040*1 ON state relay number 1	D8040 stores the smallest number of active state relays, and D8041 stores the second-smallest number of active state relays. In this way, D8040 to D8047 sequentially store up to 8 active state relays. Target state relay numbers are as follows: • FX1S: S0 to S127 • FX1N, FX1NC: S0 to S999 • FX2N, FX2NC: S0 to S899	✓	✓	✓	✓	✓	M8047
[D]8041*1 ON state relay number 2		✓	✓	✓	✓	✓	
[D]8042*1 ON state relay number 3		✓	✓	✓	✓	✓	
[D]8043*1 ON state relay number 4		✓	✓	✓	✓	✓	
[D]8044*1 ON state relay number 5		✓	✓	✓	✓	✓	
[D]8045*1 ON state relay number 6		✓	✓	✓	✓	✓	
[D]8046*1 ON state relay number 7		✓	✓	✓	✓	✓	
[D]8047*1 ON state relay number 8		✓	✓	✓	✓	✓	
[D]8048	Unavailable	-	-	-	-	-	-
[D]8049*1 Smallest active state relay number	Stores the smallest number of active annunciator relays among S900 to S999 when M8049 is ON.	-	-	✓	-	✓	M8049
[D]8050 to [D]8059	Unavailable	-	-	-	-	-	-

*1. Activated when the END instruction is executed.

Error detection (Refer to Chapter 5 for details.)							
[D]8060	Unconnected head I/O number in I/O configuration error When programmed input/output numbers are unconnected, D8060 stores the head unconnected device number. Example: When X020 is unconnected  	-	-	✓	-	✓	M8060
[D]8061	Error code for PLC hardware code	-	-	✓	-	✓	M8061
[D]8062	Error code for PLC/PP communication error	✓	✓	✓	✓	✓	M8062
[D]8063*2	Error code for serial communication error 1 [ch1]	✓	✓	✓	✓	✓	M8063
[D]8064	Error code for parameter error	✓	✓	✓	✓	✓	M8064
[D]8065	Error code for syntax error	✓	✓	✓	✓	✓	M8065
[D]8066	Error code for circuit error	✓	✓	✓	✓	✓	M8066
[D]8067*2	Error code for operation error	✓	✓	✓	✓	✓	M8067
D 8068	Latched step number where operation error has occurred	✓	✓	✓	✓	✓	M8068
[D]8069*2	Step number where M8065 to M8067 error has occurred	✓	✓	✓	✓	✓	M8065 to M8067

*2. Cleared when the PLC mode switches from STOP to RUN.

Number and name	Content of register	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
Parallel link (Refer to the data communication manual for details.)							
[D]8070	Parallel link error check time: 500 ms	✓	✓	✓	✓	✓	-
[D]8071	Unavailable	-	-	-	-	-	-
[D]8072		-	-	-	-	-	-
[D]8073		-	-	-	-	-	-
Sampling trace*1							
[D]8074	The PLC system occupies these devices when the sampling trace function is used in the connected A6GPP, A6PHP, A7PHP or personal computer.*1	-	-	✓	-	✓	M8075 to M8079
[D]8075		-	-	✓	-	✓	
[D]8076		-	-	✓	-	✓	
[D]8077		-	-	✓	-	✓	
[D]8078		-	-	✓	-	✓	
[D]8079		-	-	✓	-	✓	
[D]8080		-	-	✓	-	✓	
[D]8081		-	-	✓	-	✓	
[D]8082		-	-	✓	-	✓	
[D]8083		-	-	✓	-	✓	
[D]8084		-	-	✓	-	✓	
[D]8085		-	-	✓	-	✓	
[D]8086		-	-	✓	-	✓	
[D]8087		-	-	✓	-	✓	
[D]8088		-	-	✓	-	✓	
[D]8089		-	-	✓	-	✓	
[D]8090		-	-	✓	-	✓	
[D]8091		-	-	✓	-	✓	
[D]8092		-	-	✓	-	✓	
[D]8093		-	-	✓	-	✓	
[D]8094		-	-	✓	-	✓	
[D]8095		-	-	✓	-	✓	
[D]8096		-	-	✓	-	✓	
[D]8097		-	-	✓	-	✓	
[D]8098		-	-	✓	-	✓	

*1. Sampling trace devices are used by peripheral equipment.

High speed ring counter							
D 8099	Up-counting ring counter of 0 to 32767 (Unit: 0.1 ms, 16 bits)*2	-	-	✓	-	✓	-
[D]8100	Unavailable	-	-	-	-	-	-

*2. The 0.1 ms high speed ring counter D8099 is activated when the END instruction is executed after M8099 turned ON.

Number and name	Content of register	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
Memory information							
[D]8101	Unavailable	-	-	-	-	-	-
[D]8102	2 ... 2K steps 4 ... 4K steps 8 ... 8K steps 16 ... 16K steps	✓ 2	✓ 8	✓ 4 8 16	✓ 8	✓ 4 8 16	-
[D]8103	Unavailable	-	-	-	-	-	-
[D]8104	Type code specific to the function extension memory	-	-	✓*1	-	✓*1	M8104
[D]8105	Version of the function extension memory (Ver.1.00=100)	-	-	✓*1	-	✓*1	M8104
[D]8106	Unavailable	-	-	-	-	-	-
[D]8107		-	-	-	-	-	-
[D]8108		-	-	-	-	-	-

*1. Available in Ver. 3.00 or later.

Output refresh error (Refer to Chapter 5 for details.)							
[D]8109	Y number where output refresh error has occurred	-	-	✓	-	✓	M8109
[D]8110	Unavailable	-	-	-	-	-	-
[D]8111		-	-	-	-	-	-
Function board (dedicated to FX1S/FX1N PLCs)							
[D]8112	FX1N-2AD-BD: Digital value of ch1	✓	✓	-	-	-	M8112
[D]8113	FX1N-2AD-BD: Digital value of ch2	✓	✓	-	-	-	M8113
D 8114	FX1N-1DA-BD: Digital value to be output	✓	✓	-	-	-	M8114
[D]8115 to [D]8119	Unavailable	-	-	-	-	-	-
RS instruction and computer link [ch1] (Refer to the data communication manual for details.)							
D 8120*2	RS instruction and computer link [ch1]: Communication format setting	✓	✓	✓	✓	✓	-
D 8121*2	Computer link [ch1]: Station number setting	✓	✓	✓	✓	✓	-
[D]8122*3	RS instruction: Number of remaining send data points	✓	✓	✓	✓	✓	M8122
[D]8123*3	RS instruction: Monitoring of number of received data points	✓	✓	✓	✓	✓	M8123
D 8124	RS instruction: Header (Initial value: STX)	✓	✓	✓	✓	✓	-
D 8125	RS instruction: Terminator (Initial value: ETX)	✓	✓	✓	✓	✓	-
[D]8126	Unavailable	-	-	-	-	-	-
D 8127	Computer link [ch1]: On-demand head number specification	✓	✓	✓	✓	✓	M8127 M8128 M8129
D 8128	Computer link [ch1]: On-demand data quantity specification	✓	✓	✓	✓	✓	
D 8129*2	RS instruction and computer link [ch1]: Timeout time setting	✓	✓	✓	✓	✓	

*2. Backed up against power interruption

*3. Cleared when the PLC mode switches from RUN to STOP.

Number and name	Content of register		Applicable model					
			FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
High speed counter comparison, high speed table and positioning								
[D]8130	HSZ instruction: High speed comparison table counter		-	-	✓	-	✓	M8130
[D]8131	HSZ and PLSY instructions: Speed pattern table counter		-	-	✓	-	✓	M8132
[D]8132	Low order	HSZ and PLSY instructions: Speed pattern frequency	-	-	✓	-	✓	M8132
[D]8133	Unused							
[D]8134	Low order	HSZ and PLSY instructions: Number of target pulses for speed pattern	-	-	✓	-	✓	M8132
[D]8135	High order							
D 8136	Low order	PLSY and PLSR instructions: Accumulated total number of pulses output to Y000 and Y001	✓	✓	✓	✓	✓	-
D 8137	High order							
[D]8138	Unavailable		-	-	-	-	-	-
[D]8139			-	-	-	-	-	-
D 8140	Low order	PLSY and PLSR instructions: Accumulated number of pulses output to Y000 or current address of Y000 when a positioning instruction is used	✓	✓	✓	✓	✓	-
D 8141	High order							
D 8142	Low order	PLSY and PLSR instructions: Accumulated number of pulses output to Y001 or current address of Y001 when a positioning instruction is used	✓	✓	✓	✓	✓	-
D 8143	High order							
[D]8144	Unavailable		-	-	-	-	-	-
D 8145	ZRN, DRVI and DRVA instructions: Bias speed initial value (0)		✓	✓	-	✓	-	-
D 8146	Low order	ZRN, DRVI and DRVA instructions: Maximum speed • FX1S/FX1N PLCs: 100000 (initial value) • FX1NC PLCs: 100000*1 (initial value)	✓	✓	-	✓*1	-	-
D 8147	High order							
D 8148	ZRN, DRVI and DRVA instructions: Acceleration/ deceleration time (Initial value:100)		✓	✓	-	✓	-	-
[D]8149	Unavailable		-	-	-	-	-	-

*1. Change the maximum speed to a value not more than "100000" using a sequence program.

Number and name	Content of register	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
Inverter communication function (Refer to the data communication manual for details.)							
[D]8150	Unavailable	-	-	-	-	-	-
[D]8151		-	-	-	-	-	-
[D]8152		-	-	-	-	-	-
[D]8153		-	-	-	-	-	-
D 8154*1	EXTR instruction: Response waiting time	-	-	✓*2	-	✓*2	-
[D]8155	EXTR instruction: Step number being processed in communication	-	-	✓*2	-	✓*2	-
[D]8156	EXTR instruction: Error code	-	-	✓*2	-	✓*2	-
[D]8157	EXTR instruction: Latched step number where error has occurred Initial value:-1	-	-	✓*2	-	✓*2	-
[D]8158	Unavailable	-	-	-	-	-	-
[D]8159		-	-	-	-	-	-

*1. Cleared when the PLC power supply from OFF to ON.

*2. Available in Ver. 3.00 or later.

Display module function [FX1S/FX1N PLCs]							
D 8158	Control device (D) for FX1N-5DM Initial value:-1	✓	✓	-	-	-	-
D 8159	Control device (M) for FX1N-5DM Initial value:-1	✓	✓	-	-	-	-

Number and name	Content of register	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
Advanced function							
D 8159	Specification of low battery voltage detection flag for the FX1N-BAT Default: -1	-	✓	-	-	-	-
[D]8160	Unavailable	-	-	-	-	-	-
[D]8161		-	-	-	-	-	-
[D]8162		-	-	-	-	-	-
[D]8163		-	-	-	-	-	-
D 8164	FROM and TO instructions: Transfer point quantity specification	-	-	✓*1	-	✓	-
[D]8165	Unavailable	-	-	-	-	-	-
[D]8166		-	-	-	-	-	-
[D]8167		-	-	-	-	-	-
[D]8168		-	-	-	-	-	-
[D]8169		-	-	-	-	-	-

*1. Available in Ver. 2.00 or later.

Simple N:N link (setting) (Refer to the data communication manual for details.)							
[D]8170	Unavailable	-	-	-	-	-	-
[D]8171		-	-	-	-	-	-
[D]8172		-	-	-	-	-	-
[D]8173	Station number setting status	✓	✓	✓*2	✓	✓	-
[D]8174	Slave station setting status	✓	✓	✓*2	✓	✓	-
[D]8175	Refresh range setting status	✓	✓	✓*2	✓	✓	-
D 8176	Station number setting	✓	✓	✓*2	✓	✓	M8038
D 8177	Slave station quantity setting	✓	✓	✓*2	✓	✓	
D 8178	Refresh range setting	✓	✓	✓*2	✓	✓	
D 8179	Number of times of retry	✓	✓	✓*2	✓	✓	
D 8180	Monitoring time	✓	✓	✓*2	✓	✓	
[D]8181	Unavailable	-	-	-	-	-	-

*2. Available in Ver. 2.00 or later.

Number and name	Content of register	Applicable model					
		FX1S	FX1N	FX2N	FX1NC	FX2NC	Corresponding special device
Index register (Z1 to Z7 and V1 to V7)							
[D]8182	Value of register Z1	✓	✓	✓	✓	✓	-
[D]8183	Value of register V1	✓	✓	✓	✓	✓	-
[D]8184	Value of register Z2	✓	✓	✓	✓	✓	-
[D]8185	Value of register V2	✓	✓	✓	✓	✓	-
[D]8186	Value of register Z3	✓	✓	✓	✓	✓	-
[D]8187	Value of register V3	✓	✓	✓	✓	✓	-
[D]8188	Value of register Z4	✓	✓	✓	✓	✓	-
[D]8189	Value of register V4	✓	✓	✓	✓	✓	-
[D]8190	Value of register Z5	✓	✓	✓	✓	✓	-
[D]8191	Value of register V5	✓	✓	✓	✓	✓	-
[D]8192	Value of register Z6	✓	✓	✓	✓	✓	-
[D]8193	Value of register V6	✓	✓	✓	✓	✓	-
[D]8194	Value of register Z7	✓	✓	✓	✓	✓	-
[D]8195	Value of register V7	✓	✓	✓	✓	✓	-
[D]8196	Unavailable	-	-	-	-	-	-
[D]8197		-	-	-	-	-	-
[D]8198		-	-	-	-	-	-
[D]8199		-	-	-	-	-	-
Simple N:N link (Refer to the data communication manual for details.)							
[D]8200	Unavailable	-	-	-	-	-	-
[D]8201*1	Current link scan time	(D201)	✓	✓*2	✓	✓	-
[D]8202*1	Maximum link scan time	(D202)	✓	✓*2	✓	✓	-
[D]8203*1	Number of data transmission sequence errors in master station	(D203)	✓	✓*2	✓	✓	-
[D]8204*1	Number of data transmission sequence errors in slave station No. 1	(D204)	✓	✓*2	✓	✓	-
[D]8205*1	Number of data transmission sequence errors in slave station No. 2	(D205)	✓	✓*2	✓	✓	-
[D]8206*1	Number of data transmission sequence errors in slave station No. 3	(D206)	✓	✓*2	✓	✓	-
[D]8207*1	Number of data transmission sequence errors in slave station No. 4	(D207)	✓	✓*2	✓	✓	-
[D]8208*1	Number of data transmission sequence errors in slave station No. 5	(D208)	✓	✓*2	✓	✓	-
[D]8209*1	Number of data transmission sequence errors in slave station No. 6	(D209)	✓	✓*2	✓	✓	-
[D]8210*1	Number of data transmission sequence errors in slave station No. 7	(D210)	✓	✓*2	✓	✓	-
[D]8211*1	Code for data transmission error in master station	(D211)	✓	✓*2	✓	✓	-
[D]8212*1	Code for data transmission error in slave station No. 1	(D212)	✓	✓*2	✓	✓	-
[D]8213*1	Code for data transmission error in slave station No. 2	(D213)	✓	✓*2	✓	✓	-
[D]8214*1	Code for data transmission error in slave station No. 3	(D214)	✓	✓*2	✓	✓	-
[D]8215*1	Code for data transmission error in slave station No. 4	(D215)	✓	✓*2	✓	✓	-
[D]8216*1	Code for data transmission error in slave station No. 5	(D216)	✓	✓*2	✓	✓	-
[D]8217*1	Code for data transmission error in slave station No. 6	(D217)	✓	✓*2	✓	✓	-
[D]8218*1	Code for data transmission error in slave station No. 7	(D218)	✓	✓*2	✓	✓	-
[D]8219 to [D]8259	Unavailable	-	-	-	-	-	-

*1. FX1S PLCs use device numbers inside ( ) in the "Applicable model" column.

*2. Available in Ver. 2.00 or later.

3. FX0S/FX0/FX0N/FXU/FX2C PLCs

Number and name	Content of register	Applicable model				
		FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
PLC status						
D 8000 Watchdog timer	The initial value is shown on the right (Unit: 1 ms) (Transferred from the system ROM when the PLC power is turned ON). The value overwritten by a program is valid after the END or WDT instruction was executed. → **Refer to Subsection 4.2.2.**	200	200	100	100	-
[D]8001 PLC type and system version	2 1 0 0 Value converted into BCD Shown on the right Version 1.00	2	2	2	2	-
[D]8002 Memory capacity	• 2 ... 2K steps • 4 ... 4K steps • 8 ... 8K steps	-	-	✓	✓	-
[D]8003 Memory type	Type of the built-in memory, type of the RAM, EEPROM and EPROM memory cassettes and ON/OFF status of the write protect switch **Value** / **Memory type** / **Protect switch** 00H / Optional RAM memory / - 01H / Optional EPROM memory / - 02H / Optional EEPROM memory / OFF 0AH / Memory built in PLC / ON 10H / RAM built in PLC / -	-	-	✓	✓	-
[D]8004 Error M number	8 0 6 0 8060 to 8068(when M8004 is ON)	✓	✓	✓	✓	M8004
[D]8005 Battery voltage	3 0 (Unit: 0.1 V) Current value of battery voltage (Example: 3.0V)	-	-	✓	✓	M8005
[D]8006 Low battery voltage detection level	Initial value; 3.0V (Unit: 0.1 V) (Transferred from the system ROM when the PLC power is turned ON)	-	-	✓	✓	M8006

Number and name	Content of register	Applicable model				
		FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
PLC status						
[D]8007 Instantaneous power interruption	Stores the number of times M8007 is set to ON. Cleared when the power is turned OFF.	-	-	✓	✓	M8007
D 8008 Instantaneous power interruption detection time	Initial value • FXU/FX2C PLCs (AC power supply type): 10 ms • FXU PLCs (DC power supply type): 10 ms → **Refer to Subsection 4.2.4.**	-	-	✓	✓	M8008
[D]8009 Unit number where 24V DC has failed	Minimum input device number of function unit or extension power supply unit where 24V DC has failed	-	-	✓	✓	M8009
Clock						
[D]8010 Current scan time	Accumulated instruction execution time from the step 0 (Unit: 0.1 ms) → **Refer to Subsection 4.2.5.**	✓ The displayed value does not include the waiting time for the constant scan operation triggered by M8039.				-
[D]8011 Minimum scan time	Minimum value of scan time (Unit: 0.1 ms) → **Refer to Subsection 4.2.5.**					-
[D]8012 Maximum scan time	Maximum value of scan time (Unit: 0.1 ms) → **Refer to Subsection 4.2.5.**					-
D 8013 Second data	0 to 59 seconds (For real-time clock) → **Refer to Subsection 4.2.7.**	Stores the analog value (0 to 255) of the variable analog potentiometer No. 1.		✓*1	✓	-
D 8014 Minute data	0 to 59 minutes (For real-time clock) → **Refer to Subsection 4.2.7.**	-	-	✓*1	✓	--
D 8015 Hour data	0 to 23 hours (For real-time clock) → **Refer to Subsection 4.2.7.**	-	-	✓*1	✓	-
D 8016 Day data	1st to 31st day (For real-time clock) → **Refer to Subsection 4.2.7.**	-	-	✓*1	✓	-
D 8017 Month data	January to December (For real-time clock) → **Refer to Subsection 4.2.7.**	-	-	✓*1	✓	-
D 8018 Year data	Last 2 digits of year(0 to 99) (For real-time clock) → **Refer to Subsection 4.2.7.**	-	-	✓*1	✓	-
D 8019 Day-of-the-week data	0 (Sunday) to 6 (Saturday) (For real-time clock) → **Refer to Subsection 4.2.7.**	-	-	✓*1	✓	-

*1. Available in Ver. 2.1 or later.

Number and name	Content of register	Applicable model				
		FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
Input filter						
D 8020 Input filter adjustment	Input filter value (0 to 15) of X000 to X007 (Initial value: 10ms) → **Refer to Subsection 4.2.9.**	✓	✓	-	-	-
D 8021 Input filter adjustment	Input filter value (0 to 15) of X10 to X17 (Initial value: 10ms) → **Refer to Subsection 4.2.9.**	✓	-	-	-	-
[D]8022	Unavailable	-	-	-	-	-
[D]8023		-	-	-	-	-
[D]8024		-	-	-	-	-
[D]8025		-	-	-	-	-
[D]8026		-	-	-	-	-
[D]8027		-	-	-	-	-
Index register Z0, V0						
[D]8028	Value of register Z	✓	✓	✓	✓	-
[D]8029	Value of register V	✓	✓	✓	✓	-
Variable analog potentiometer [FX1S/FX1N]						
[D]8030	Value (Integer from 0 to 255) of the variable analog potentiometer VR1 (Same value as D8013)	-	✓	-	-	-
[D]8031	Value (Integer from 0 to 255) of the variable analog potentiometer VR2	-	✓	-	-	-
Constant scan						
[D]8032	Unavailable	-	-	-	-	-
[D]8033		-	-	-	-	-
[D]8034		-	-	-	-	-
[D]8035		-	-	-	-	-
[D]8036		-	-	-	-	-
[D]8037		-	-	-	-	-
[D]8038		-	-	-	-	-
D 8039 Constant scan time	Initial value : 0 ms(Unit: 1 ms) (Transferred from the system ROM when the PLC power is turned ON) Can be overwritten by a program. → **Refer to Subsection 4.2.15.**	✓	✓	✓	✓	M8039

Number and name	Content of register	Applicable model				
		FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
Step ladder and annunciator						
[D]8040*1 ON state relay number 1	D8040 stores the smallest number of active state relays, and D8041 stores the second-smallest number of active state relays. In this way, D8040 to D8047 sequentially store up to 8 active state relays. Target state relay numbers are as follows: • FX0, FX0S : S0 to S63 • FX0N : S0 to S127 • FXU, FX2C : S0 to S899	✓	✓	✓	✓	M8047
[D]8041*1 ON state relay number 2		✓	✓	✓	✓	
[D]8042*1 ON state relay number 3		✓	✓	✓	✓	
[D]8043*1 ON state relay number 4		✓	✓	✓	✓	
[D]8044*1 ON state relay number 5		✓	✓	✓	✓	
[D]8045*1 ON state relay number 6		✓	✓	✓	✓	
[D]8046*1 ON state relay number 7		✓	✓	✓	✓	
[D]8047*1 ON state relay number 8		✓	✓	✓	✓	
[D]8048	Unavailable	-	-	-	-	-
[D]8049*1 Smallest active state relay number	Stores the smallest number of active annunciator relays among S900 to S999 when M8049 is ON.	-	-	✓	✓	M8049
[D]8050 to [D]8059	Unavailable	-	-	-	-	-

*1. Activated when the END instruction is executed.

Error detection (Refer to Chapter 5 for details.)						
[D]8060	Unconnected head I/O number in I/O configuration error When programmed input/output numbers are unconnected, D8060 stores the head unconnected device number. Example: When X020 is unconnected 1 0 2 0 Value converted into BCD Device number 10 to 337 1:Input X 0:Output Y	-	-	✓	✓	M8060
[D]8061	Error code for PLC hardware code	✓	✓	✓	✓	M8061
[D]8062	Error code for PLC/PP communication error	-	-	✓	✓	M8062
[D]8063	Error code for parallel link error Error code for RS-232C communication error	-	✓*3	✓	✓	M8063
[D]8064	Error code for parameter error	✓	✓	✓	✓	M8064
[D]8065	Error code for syntax error	✓	✓	✓	✓	M8065
[D]8066	Error code for circuit error	✓	✓	✓	✓	M8066
[D]8067	Error code for operation error*2	✓	✓	✓	✓	M8067
D 8068*2	Latched step number where operation error has occurred	✓	✓	✓	✓	M8068
[D]8069*2	Step number where M8065 to M8067 error has occurred*2	✓	✓	✓	✓	M8065 to M8067

*2. Cleared when the PLC mode switches from STOP to RUN.

*3. Available in Ver. 1.20 or later.

Number and name	Content of register	Applicable model				
		FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
Parallel link (Refer to the data communication manual for details.)						
[D]8070	Parallel link error check time: 500 ms	-	-	✓	✓	-
[D]8071	Unavailable	-	-	-	-	-
[D]8072		-	-	-	-	-
[D]8073		-	-	-	-	-
Sampling trace*1						
[D]8074	The PLC system occupies these devices when the sampling trace function is used in the connected A6GPP, A6PHP, A7PHP or personal computer*1.	-	-	✓	✓	-
[D]8075		-	-	✓	✓	-
[D]8076		-	-	✓	✓	-
[D]8077		-	-	✓	✓	-
[D]8078		-	-	✓	✓	-
[D]8079		-	-	✓	✓	-
[D]8080		-	-	✓	✓	-
[D]8081		-	-	✓	✓	-
[D]8082		-	-	✓	✓	-
[D]8083		-	-	✓	✓	-
[D]8084		-	-	✓	✓	-
[D]8085		-	-	✓	✓	-
[D]8086		-	-	✓	✓	-
[D]8087		-	-	✓	✓	-
[D]8088		-	-	✓	✓	-
[D]8089		-	-	✓	✓	-
[D]8090		-	-	✓	✓	-
[D]8091		-	-	✓	✓	-
[D]8092		-	-	✓	✓	-
[D]8093		-	-	✓	✓	-
[D]8094		-	-	✓	✓	-
[D]8095		-	-	✓	✓	-
[D]8096		-	-	✓	✓	-
[D]8097		-	-	✓	✓	-
[D]8098		-	-	✓	✓	-

*1. Sampling trace devices are used by peripheral equipment.

High speed ring counter						
D 8099	Up-counting ring counter of 0 to 32767 (Unit: 0.1 ms, 16 bits)*2	-	-	✓	✓	-
[D]8100	Unavailable	-	-	-	-	-

*2. The 0.1 ms high speed ring counter D8099 is activated when the END instruction is executed after M8099 turned ON.

Number and name	Content of register	Applicable model				
		FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
Special adapter						
D 8120*1	Communication format setting	-	✓*3	✓*4	✓	-
D 8121*1	Station number setting	-	✓*3	✓*5	✓*5	-
[D]8122*2	Number of remaining send data points in RS-232C communication	-	✓*3	✓*4	✓	M8122
[D]8123*2	Number of received data points in RS-232C communication	-	✓*3	✓*4	✓	M8123
D 8124	Header (8 bits) <Initial value: STX>	-	✓*3	✓*4	✓	-
D 8125	Terminator (8 bits) <Initial value: FTX>	-	✓*3	✓*4	✓	-
[D]8126	Unavailable	-	-	-	-	-
D 8127	On-demand head number specification	-	✓*3	✓*5	✓*5	-
D 8128	On-demand data quantity specification	-	✓*3	✓*5	✓*5	-
D 8129*1	Timeout time setting	-	✓*3	✓*5	✓*5	-

*1. Backed up against power interruption

*2. Cleared when the PLC mode switches from STOP to RUN.

*3. Available in Ver. 1.20 or later.

*4. Available in Ver. 3.07 or later.

*5. Available in Ver. 3.30 or later.

Number and name	Content of register		Applicable model				
			FX0S, FX0	FX0N	FXU	FX2C	Corresponding special device
High speed table							
[D]8130	HSZ instruction: High speed comparison table counter		-	-	✓*1	✓	M8130
[D]8131	HSZ and PLSY instructions: Speed pattern table counter		-	-	✓*1	✓	M8132
[D]8132	Low order	HSZ and PLSY instructions: Speed pattern frequency	-	-	✓*1	✓	M8132
[D]8133	Unused						
[D]8134	Low order	HSZ and PLSY instructions: Number of target pulses for speed pattern	-	-	✓*1	✓	M8132
[D]8135	High order						
[D]8136	Low order	PLSY instruction Output pulse	-	-	✓*1	✓	-
[D]8137	High order						
[D]8138	Unavailable		-	-	-	-	-
[D]8139			-	-	-	-	-
[D]8140			-	-	-	-	-
[D]8141			-	-	-	-	-
[D]8142			-	-	-	-	-
[D]8143			-	-	-	-	-
[D]8144			-	-	-	-	-
[D]8145			-	-	-	-	-
[D]8146			-	-	-	-	-
[D]8147			-	-	-	-	-
[D]8148			-	-	-	-	-
[D]8149			-	-	-	-	-
[D]8150			-	-	-	-	-
[D]8151			-	-	-	-	-
[D]8152			-	-	-	-	-
[D]8153			-	-	-	-	-
[D]8154			-	-	-	-	-
[D]8155			-	-	-	-	-
[D]8156			-	-	-	-	-
[D]8157			-	-	-	-	-
[D]8158			-	-	-	-	-
[D]8159			-	-	-	-	-

*1. Available in Ver. 3.07 or later.

4.2 Supplement of Special Devices (M8000 and later and D8000 and later)

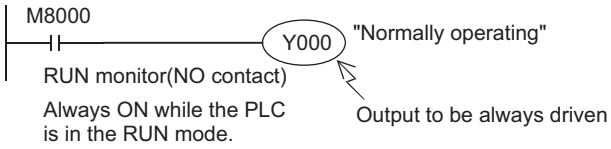
This section explains how to use special devices provided to activate functions built in the PLC.

4.2.1 RUN monitor and initial pulse [M8000 to M8003]

1. RUN monitor (M8000 and M8001)

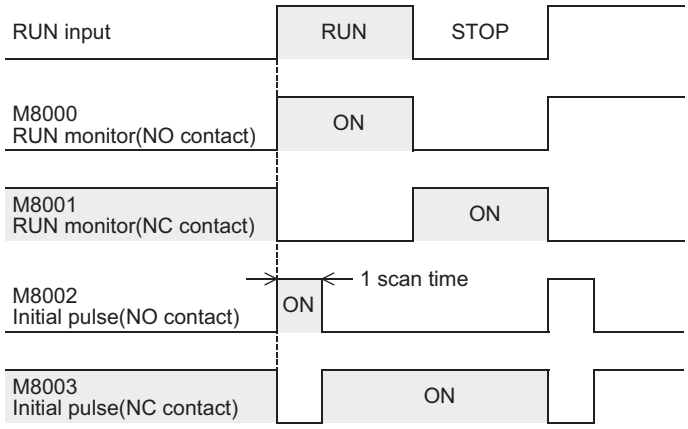
Use the RUN monitor (M8000 and M8001) which indicates the PLC operation status to drive instructions and give external display "normally operating".

1) Program example



M8001 is always OFF while the PLC is in the RUN mode.

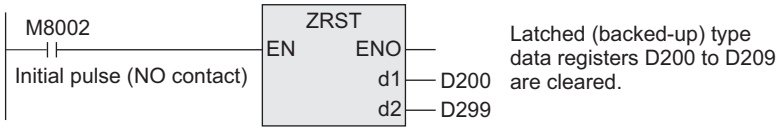
2) Flag operation timing



2. Initial pulse (M8002 and M8003)

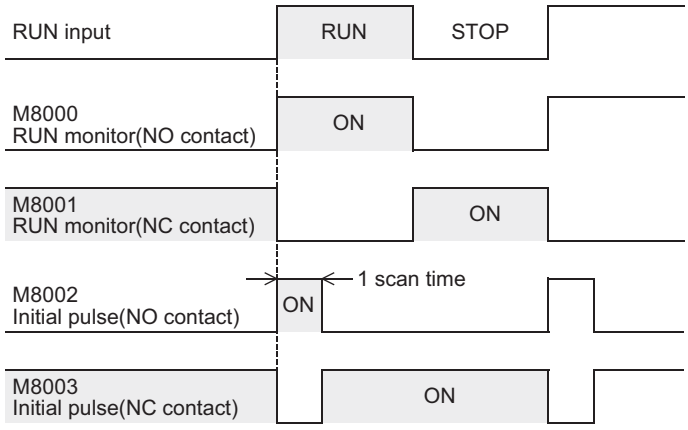
The initial pulse (M8002 and M8003) remains ON or OFF instantaneously (only for 1 scan time) when the PLC starts operation.
Use the initial pulse as the initial setting signal in a program for initializing the program or writing specified values.

1) Program example



M8003 remains OFF instantaneously (only for 1 scan time) after the PLC becomes the RUN mode.

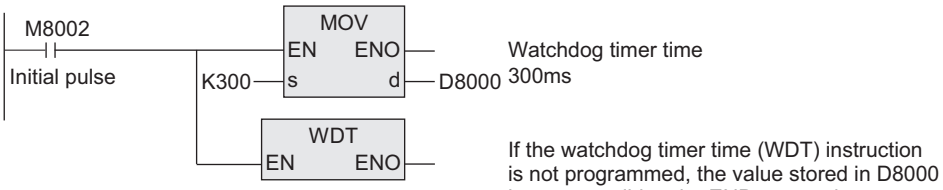
2) Flag operation timing



4.2.2 Watchdog timer time [D8000]

The watchdog timer monitors the operation time of the PLC. If the PLC does not finish operation within the specified time, it turns ON the following LED and turns OFF all outputs.
FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs: ERROR (ERR) LED
FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs: CPU • E (ERROR) LED
FX0S/FX0/FX0N/FXU/FX2C PLCs: CPU • E LED
The system transfers "200 ms (or 100 ms)" as the initial value when the power is turned ON. When it is necessary to execute a program which requires the scan time longer than 200 ms (or 100 ms), the watchdog timer time can be changed using a program.

1. Program example



2. When a watchdog timer error occurs

A watchdog timer error may occur in the following cases. Add the above program near the first step and extend the watchdog timer time, or shift the FROM/TO instruction execution timing.

1) When many special function units/blocks are connected
If many special function units/blocks (for positioning, cam switch, link, analog, etc.) are connected, it takes more time to initialize buffer memories when the PLC becomes the RUN mode. As a result, the operation time becomes longer, and a watchdog timer error may occur.

2) When many FROM/TO instructions are driven at the same time
If many FROM/TO instructions are executed or many buffer memories are transferred, the operation time becomes longer. As a result, a watchdog timer error may occur.

3) When many high speed counters (software counters) are used
If many high speed counters are programmed and they count high frequency at the same time, the operation time becomes longer. As a result, a watchdog timer error may occur.

3. How to reset the watchdog timer

The watchdog timer can be reset in the middle of a sequence program using the WDT instruction.
This reset method is recommended when the operation time of a specific sequence program is long or when many special function units/blocks are connected.

→ **For the WDT instruction, refer to the FX Structured Programming Manual [Basic & Applied Instruction].**

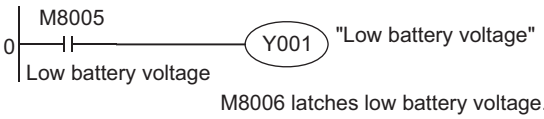
4. Caution on changing the watchdog timer time

The watchdog timer time can be set to 32767 ms maximum. However, the operation error detection timing is delayed if the watchdog timer time is long.
It is recommended to use the initial value (200 ms or 100 ms) when no problems are expected in operations.
The watchdog timer time becomes "0" when a value less than "0" is set to D8000.

4.2.3 Low battery voltage detection [M8005 and M8006]

These special devices detect low voltage in the lithium battery used for memory backup.
When the PLC detects low battery voltage, the BATT (BAT) LED turns ON. In FX3G/FX3GC PLCs, the ALM LED turns ON when the PLC detects low battery voltage if an optional battery is used and the battery mode is selected by the parameter setting.
Use the following program to notify low battery voltage to the outside.

Program example



4.2.4 Power interruption detection time [D8008, M8008 and M8007]

1. FX3U PLCs (AC power supply type)

The table below shows the allowable instantaneous power interruption time in FX3U PLCs (AC power supply type).

Supply voltage	Allowable instantaneous power interruption time
100V AC system	10ms
200V AC system	Setting range: 10 to 100 ms Set a value to D8008. Initial value: 10 ms

2. FX3U/FX3UC PLCs (DC power supply type)

The allowable instantaneous power interruption time in FX3U/FX3UC PLCs (DC power supply type) is 5 ms. Do not overwrite the power interruption detection time stored in D8008.

3. FX2N PLCs (AC power supply type)

The table below shows the allowable instantaneous power interruption time in FX2N PLCs (AC power supply type).

Supply voltage	Allowable instantaneous power interruption time
200V AC system	Setting range: 10 to 100 ms Set a value to D8008. Initial value: 10 ms

4. FX2N PLCs (24V DC power supply type)

The allowable instantaneous power interruption time in FX2N PLCs (24V DC power supply type) is set to "5 ms" when "K-1" is written to D8008.

5. FX2NC PLCs

The allowable instantaneous power interruption time in FX2NC PLCs is 5 ms.
The PLC system writes "K-1" to D8008. Do not overwrite D8008 in a sequence program.

6. FXU/FX2C PLCs (AC power supply type)

The table below shows the allowable instantaneous power interruption time in FXU/FX2C PLCs (AC power supply type).

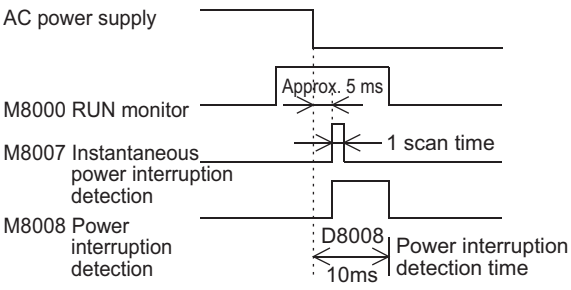
Supply voltage	Allowable instantaneous power interruption time
200V AC system	Setting range: 10 to 100 ms Set a value to D8008. Initial value: 10 ms

7. FXU PLCs (24V DC power supply type)

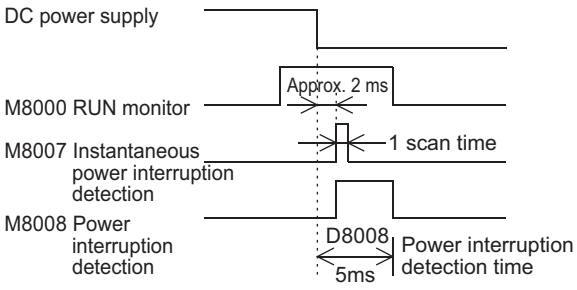
The allowable instantaneous power interruption time in FXU PLCs (24 VDC power supply type) is set to "5 ms" when "K-4" is written to D8008.

8. Time chart

AC power supply type (FX3U/FX2N/FXU/FX2C PLCs)



DC power supply type (FX3U/FX3UC PLCs)



4.2.5 Operation cycle (scan time) monitor [D8010 to D8012]

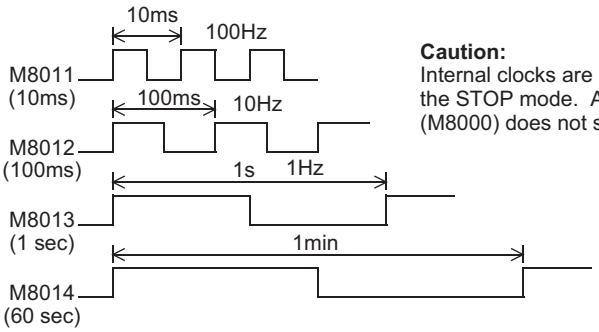
D8010 to D8012 store the current value, minimum value and maximum value of the PLC scan time respectively (in units of 0.1 ms).
When the constant scan function is used, the scan time is as follows:
FX1S/FX1N/FX1NC/FX2N/FX2NC/FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs: The scan time includes the waiting time for constant scan.
FX0S/FX0/FX0N/FXU/FX2C PLCs: The scan time does not include the waiting time for constant scan.

D8010 : Current value
D8011 : Minimum value
D8012 : Maximum value

These values can be monitored from peripheral equipment.

4.2.6 Internal clock [M8011 to M8014]

The PLC has the following four types of internal clocks which are always oscillating while the PLC power is ON.



Caution:
Internal clocks are always oscillating even while the PLC is in the STOP mode. Accordingly, the rising edge of the RUN monitor (M8000) does not synchronize with the clock start timing.

4.2.7 Real-time clock [M8015 to M8019 and D8013 to D8019]

1. Assignment of special auxiliary relays (M8015 to M8019) and special data registers (D8013 to D8019)

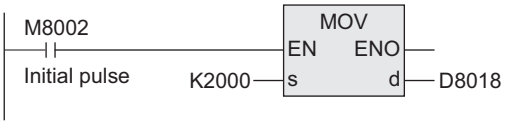
Number	Name	Operation and function
M8015	Clock stop and preset	Stops the clock when set to ON. The time is written and the clock is activated again at the edge from ON to OFF.
M8016	Time display stop	Stops the time display when set to ON (, but continues time counting).
M8017	±30-second correction	Corrects the second's digit at the edge from OFF to ON. (Sets the second's digit to "0" when the value in the second's digit is "0" to "29", and carries over the minute's digit and sets the second's digit to "0" when the value in the second's digit is "30" to "59".
M8018	Installation detection	Always remains ON.
M8019	Real-time clock (RTC) error	Turns ON when the values of special data registers exceed the setting range at time setting.

Number	Name	Setting range	Operation and function
D8013	Second data	0 to 59	Use these devices to write the initial value at time setting or read the current time. • D8018 (year data) can be changed over to the four-digit year mode. In the four-digit year mode, 1980 to 2079 can be displayed. FXU/FX2C PLCs do not support the four-digit year mode. FX0/FX0S/FX0N PLCs do not support the real-time clock. • Clock accuracy: ±45 sec/month (at 25°C) • Leap year correction: Provided
D8014	Minute data	0 to 59	
D8015	Hour data	0 to 23	
D8016	Day data	1 to 31	
D8017	Month data	1 to 12	
D8018	Year data	00 to 99 (last two digits of year)	
D8019	Day-of-the-week data	0 to 6 (which corresponds to Sunday to Saturday)	

→ **For the real-time clock setting method, refer to Subsection 4.2.8.**

2. Changing over the year display (from the two-digit year mode to the four-digit year mode)

When displaying year in four digits, add the following program.
D8018 is set to the four-digit year mode in the second scan in the PLC RUN mode.
FXU/FX2C PLCs do not support the four-digit year mode.



1) The PLC is usually operating in the two-digit year mode.
When the above instruction is executed in the RUN mode and "K2000 (fixed value)" is transferred to D8018 (year data) for only 1 scan time, D8018 switches to the four-digit year mode.

2) Execute this program every time the PLC becomes the RUN mode.
Only the year data is displayed in four digits when "K2000" is transferred. The current date and time are not affected at all.

3) In the four-digit year mode, the set values "80" to "99" correspond to "1980" to "1999", and "00" to "79" correspond to "2000" to "2079".
Examples: 80 = 1980 99 = 1999 00 = 2000 79 = 2079

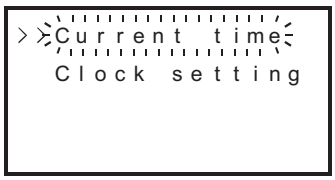
4) When connecting the data access unit FX-10DU, FX-20DU or FX-25DU
Select the two-digit year mode.
Year is not displayed correctly in the four-digit year mode in the current version of these units.
Note that the clock of the PLC switches to the two-digit year mode when the PLC clock operating in the four-digit year mode is set from the FX-10DU, FX-20DU or FX-25DU.

4.2.8 How to set real-time clock

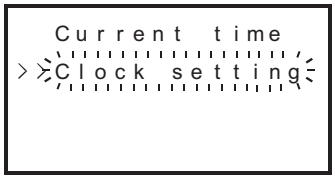
The following two methods are available to set the real-time clock.

1. Method using the built-in display module FX3UC-32MT-LT/FX3UC-32MT-LT-2 or FX3U-7DM

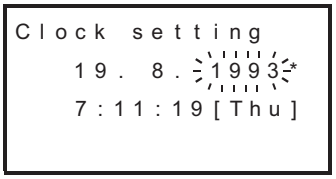
1) Set the cursor to "ClockMenu" by pressing the [+] or [-] key on the "Menu" screen, and press the [OK] key to display the "Selection screen" shown on the right.
Press the [ESC] key to cancel the operation and return to the "Top" screen.



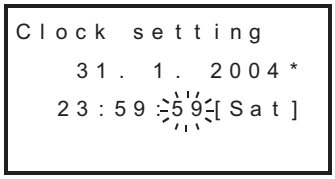
2) Set the cursor to "Clock setting" by pressing the [+] or [-] key.
Press the [ESC] key to cancel the operation and return to the "Menu" screen.



3) Press the [OK] key to display the "Clock setting" screen.
Press the [ESC] key to cancel the operation and return to the "Selection" screen.



4) Change the flickering data by pressing the [+] or [-] key, and then press the [OK] key to determine the displayed value. The set items change in the order "Year → month → day → hour → minute → second".
When the last data "second" is determined by the [OK] key, the message "Current time is set." appears, and setting of the current time is completed.

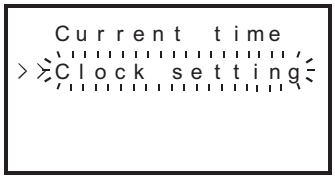


* The last two digits of year are displayed in the initial setting.

Operation key	Contents of operation
ESC	Returns to the previous set item. Returns to the "Selection" screen when the year data is flickering.
-	Decreases a numeric value. Decreases a numeric value at high speed when pressed and held for 1 second or more.
+	Increases a numeric value. Increases a numeric value at high speed when pressed and held for 1 second or more.
OK	Moves to the next set item. Displays the message "Current time is set." when pressed while the second data is flickering.

5) Press the [OK] or [ESC] key to return to the "Selection" screen.

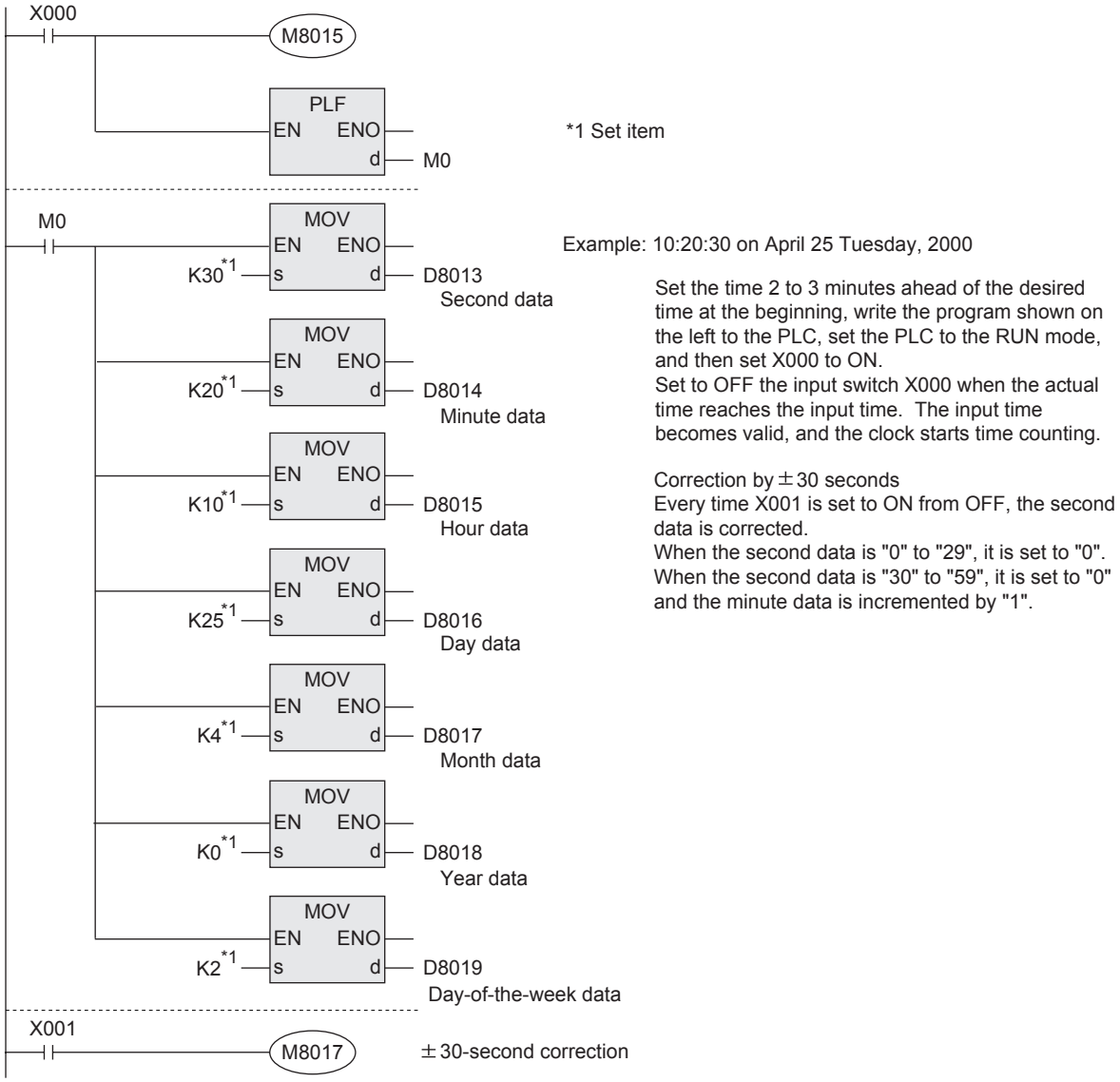
6) Press the [ESC] key to return to the "Menu" screen.



2. Method using a program

1) Method using the TWR instruction dedicated to time setting
→ **FX Structured Programming Manual [Basic & Applied Instruction]**

2) Method not using the TWR instruction dedicated to time setting
Use the following program when not using the TWR instruction dedicated to time setting.



3. Method using a programming tool

1) Starting the time change
Forcibly set M8015 to ON.

2) Set the time several minutes ahead of the desired time to each data register using the data register current value change function (device monitor function) of a programming tool.

3) Finishing the time change
Forcibly set M8015 to OFF from ON when the actual time reaches the input set time.

Points on time setting

a) The values stored in date/time registers cannot be changed while M8015 is OFF.
Make sure to set M8015 to ON at the beginning, and then input desired date and time.

b) Input the time several minutes ahead of the desired time.
Forcibly set M8015 to OFF from ON when the actual time reaches the input time. The input time becomes valid, and the clock starts time counting.

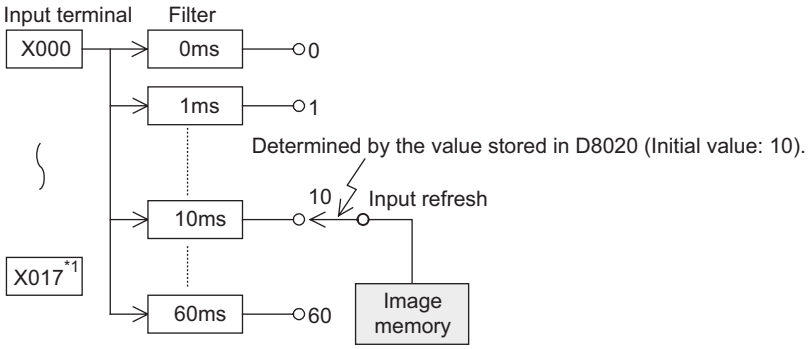
c) If values indicating impossible date and time (Example: February 30, 2006) are input, the input date and time are ignored. Input possible date and time.

d) The day of the week (D8019) is automatically corrected in accordance with the date without regard to the written numeric value.

4.2.9 Input filter adjustment [D8020]([D8021])

1. In FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs

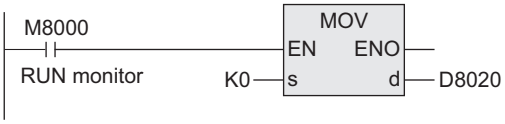
Inputs X000 to X017*1 have a digital filter circuit of 0 to 60 ms respectively. The digital filter constant is determined by the value in the range from 0 to 60*2 stored in the special data register D8020.
D8020 is automatically set to "10 (ms)" when the PLC is powered ON from OFF.



*1. X000 to X007 in FX3G PLC

*2. 0 to 15 in FX3S, FX3G and FX3GC PLCs

1) Program example for adjusting the input filter
When the program shown below is executed, the filter constant is changed to "0 ms".
Because the C-R filter is provided in the hardware, however, the filter constant actually becomes the value shown in the table below when "0" is specified.



FX3U/FX3UC PLCs

Input number	Input filter value when "0" is set
X000 to X005	5μs*1
X006, X007	50μs
X010 to X017*2	200μs

FX3G/FX3GC PLCs

Input number	Input filter value when "0" is set
X000, X001, X003, X004	10μs
X002, X005, X006, X007	50μs

FX3S PLC

Input number	Input filter value when "0" is set
X000, X001	10μs
X002 to X007	50μs
X010 to X017	200μs

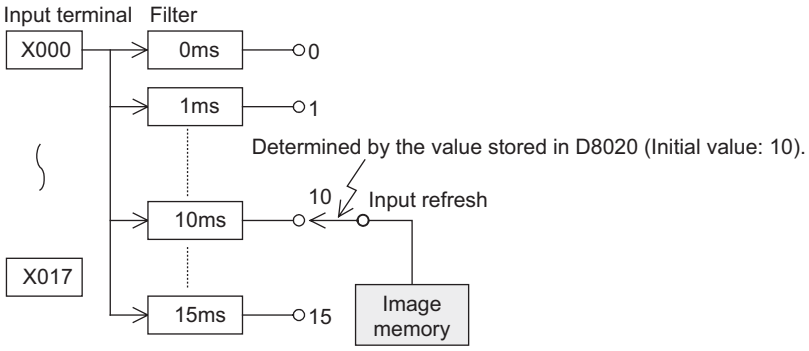
*1. When setting the input filter to "5 μs" or when receiving pulses whose response frequency is 50 to 100 kHz using a high speed counter, perform the following:
- Set the wiring length to 5 m or less.
- Connect a bleeder resistor (1.5 kΩ, 1/2 W) to the input terminal. Make sure that the load current of the open collector transistor output in the counterpart equipment added by the input current of the PLC is 20 mA or more.

*2. In the FX3U/FX3UC PLCs (16-point type), only X000 to X007 support the input filter adjustment function.

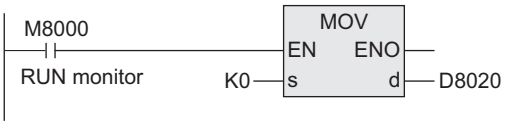
- The input filter value can be changed as many times as needed in the middle of a program.
- The input filter adjustment described here is not necessary when high speed counters, input interrupts or pulse catch relays (M8170 to M8177) are used.

2. FX1S PLCs

Inputs X000 to X017 have a digital filter circuit of 0 to 15 ms respectively. The digital filter constant is determined by the value in the range from 0 to 15 stored in the special data register D8020.
D8020 is automatically set to "10 (ms)" when the PLC is powered ON from OFF.



1) Program example for adjusting the input filter
When the program shown below is executed, the filter constant is changed to "0 ms".
Because the C-R filter is provided in the hardware, however, the filter constant actually becomes the value shown in the table below when "0" is specified.

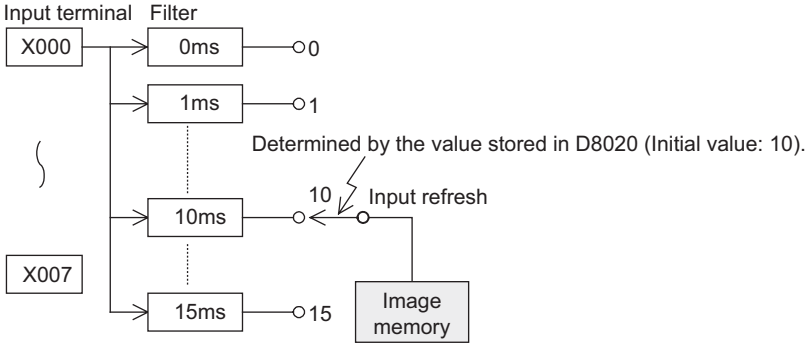


Input number	Input filter value when "0" is set
X000 to X001	10μs
X002 to X017	50μs

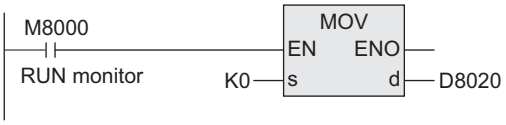
- The input filter value can be changed as many times as needed in the middle of a program.
- The input filter adjustment described here is not necessary when high speed counters, input interrupts or pulse catch relays (M8170 to M8175) are used.

3. FX1N PLCs

Inputs X000 to X007 have a digital filter circuit of 0 to 15 ms respectively. The digital filter constant is determined by the value in the range from 0 to 15 stored in the special data register D8020.
D8020 is automatically set to "10 (ms)" when the PLC is powered ON from OFF.



1) Program example for adjusting the input filter
When the program shown below is executed, the filter constant is changed to "0 ms".
Because the C-R filter is provided in the hardware, however, the filter constant actually becomes the value shown in the table below when "0" is specified.

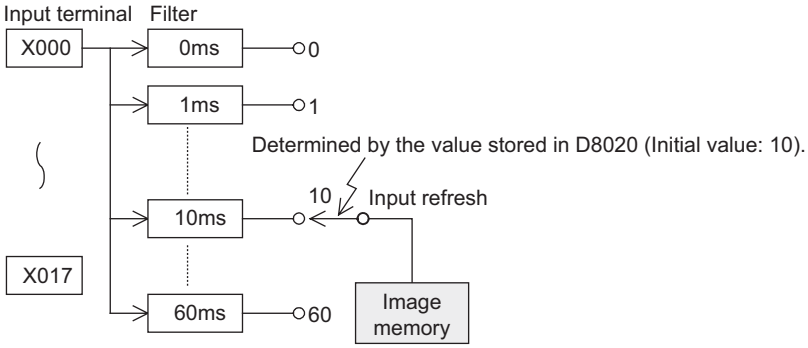


Input number	Input filter value when "0" is set
X000 to X001	10μs
X002 to X017	50μs

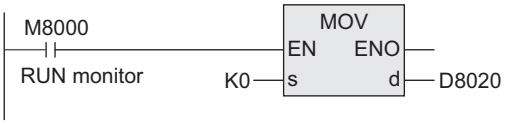
- The input filter value can be changed as many times as needed in the middle of a program.
- The input filter adjustment described here is not necessary when high speed counters, input interrupts or pulse catch relays (M8170 to M8175) are used.

4. FX2N/FX2NC PLCs

Inputs X000 to X017 have a digital filter circuit of 0 to 60 ms respectively. The digital filter constant is determined by the value in the range from 0 to 60 stored in the special data register D8020.
D8020 is automatically set to "10 (ms)" when the PLC is powered ON from OFF.



1) Program example for adjusting the input filter
When the program shown below is executed, the filter constant is changed to "0 ms".
Because the C-R filter is provided in the hardware, however, the filter constant actually becomes the value shown in the table below when "0" is specified.

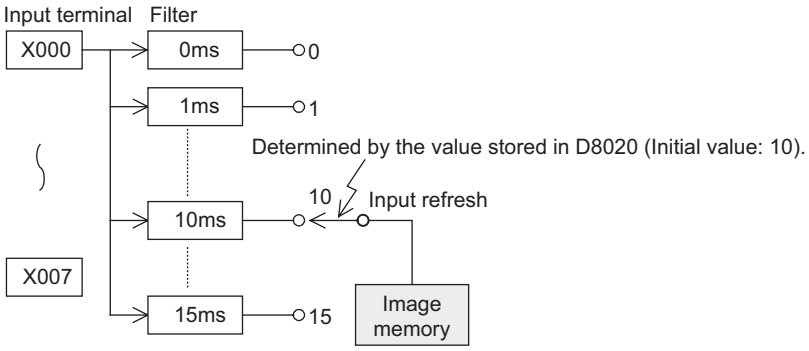


Input number	Input filter value when "0" is set
X000 to X001	20μs
X002 to X017	50μs

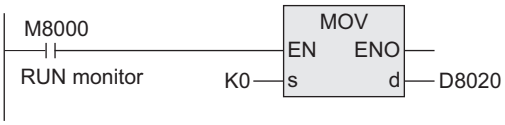
- The input filter value can be changed as many times as needed in the middle of a program.
- The input filter adjustment described here is not necessary when high speed counters, input interrupts or pulse catch relays (M8170 to M8175) are used.

5. FX0N PLCs

Inputs X000 to X007 have a digital filter circuit of 0 to 15 ms respectively. The digital filter constant is determined by the value in the range from 0 to 15 stored in the special data register D8020.
D8020 is automatically set to "10 (ms)" when the PLC is powered ON from OFF.



1) Program example for adjusting the input filter
When the program shown below is executed, the filter constant is changed to "0 ms".
Because the C-R filter is provided in the hardware, however, the filter constant actually becomes the value shown in the table below when "0" is specified.

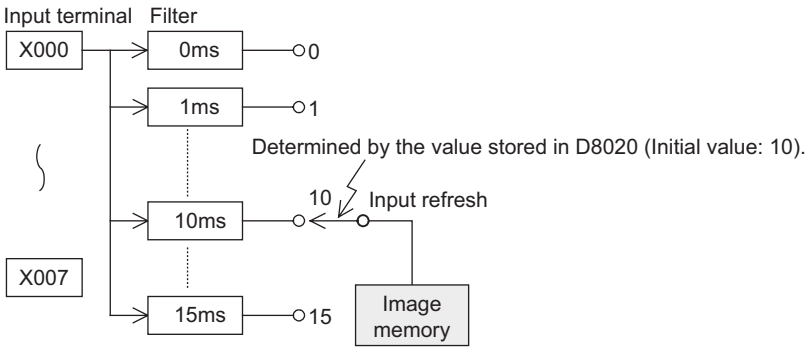


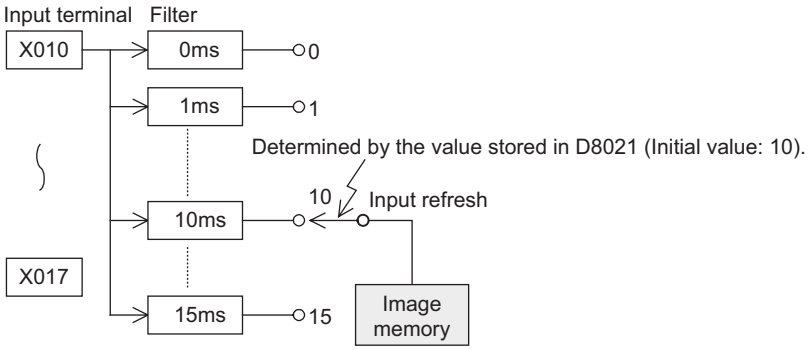
Input number	Input filter value when "0" is set
X000 to X003	50μs
X004 to X017	200μs

- The input filter value can be changed as many times as needed in the middle of a program.
- The input filter adjustment described here is not necessary when high speed counters, input interrupts or pulse catch relays (M8056 to M8059) are used.

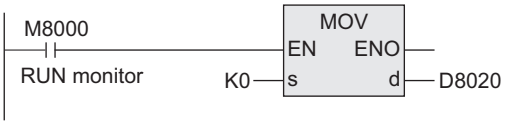
6. FX0S/FX0 PLCs

Inputs X000 to X007 have a digital filter circuit of 0 to 15 ms respectively. The digital filter constant is determined by the value in the range from 0 to 15 stored in the special data register D8020.
D8020 is automatically set to "10 (ms)" when the PLC is powered ON from OFF.
X010 to X017 function in the same way as X00 to X07, but their digital filter constant is determined by the value stored in the special data register D8021.





1) Program example for adjusting the input filter
When the program shown below is executed, the filter constant is changed to "0 ms".
Because the C-R filter is provided in the hardware, however, the filter constant actually becomes the value shown in the table below when "0" is specified.



Input number	Input filter value when "0" is set
X000 to X005	50μs
X006 to X017	200μs

- The input filter value can be changed as many times as needed in the middle of a program.
- The input filter adjustment described here is not necessary when high speed counters, input interrupts or pulse catch relays (M8056 to M8059) are used.

4.2.10 Battery [BATT (BAT)] LED OFF command [M8030]

1. Batteryless operation

While M8030 remains ON, the battery LED does not turn ON even if the voltage of the battery used for memory backup becomes low.
FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FX3S PLCs do not support M8030.
Set M8030 to ON when indication of the low battery voltage error is not required or when the battery is removed.
When the batteryless operation is required, however, do not use M8030 but refer to "2. Parameter setting in peripheral equipment" below.

2. Parameter setting in peripheral equipment

Specify the "batteryless operation" mode in the parameter setting.
FX0S/FX0/FX0N/FX1S/FX1N/FX1NC/FXU/FX2C/FX3S/FX3G/FX3GC PLCs do not support the batteryless operation mode.

1) When the batteryless operation mode is specified
The PLC system automatically controls turning OFF of the battery LED and initializes devices in the latched area shown below.
   - Auxiliary relay (M)
   - Counter (C)
   - State relay (S)
   - Data register (D)
   - Timer (T)
   - Extension register (R)

2) When the parameter setting for the batteryless operation mode is not available, input a sequence program for the batteryless operation mode described below.

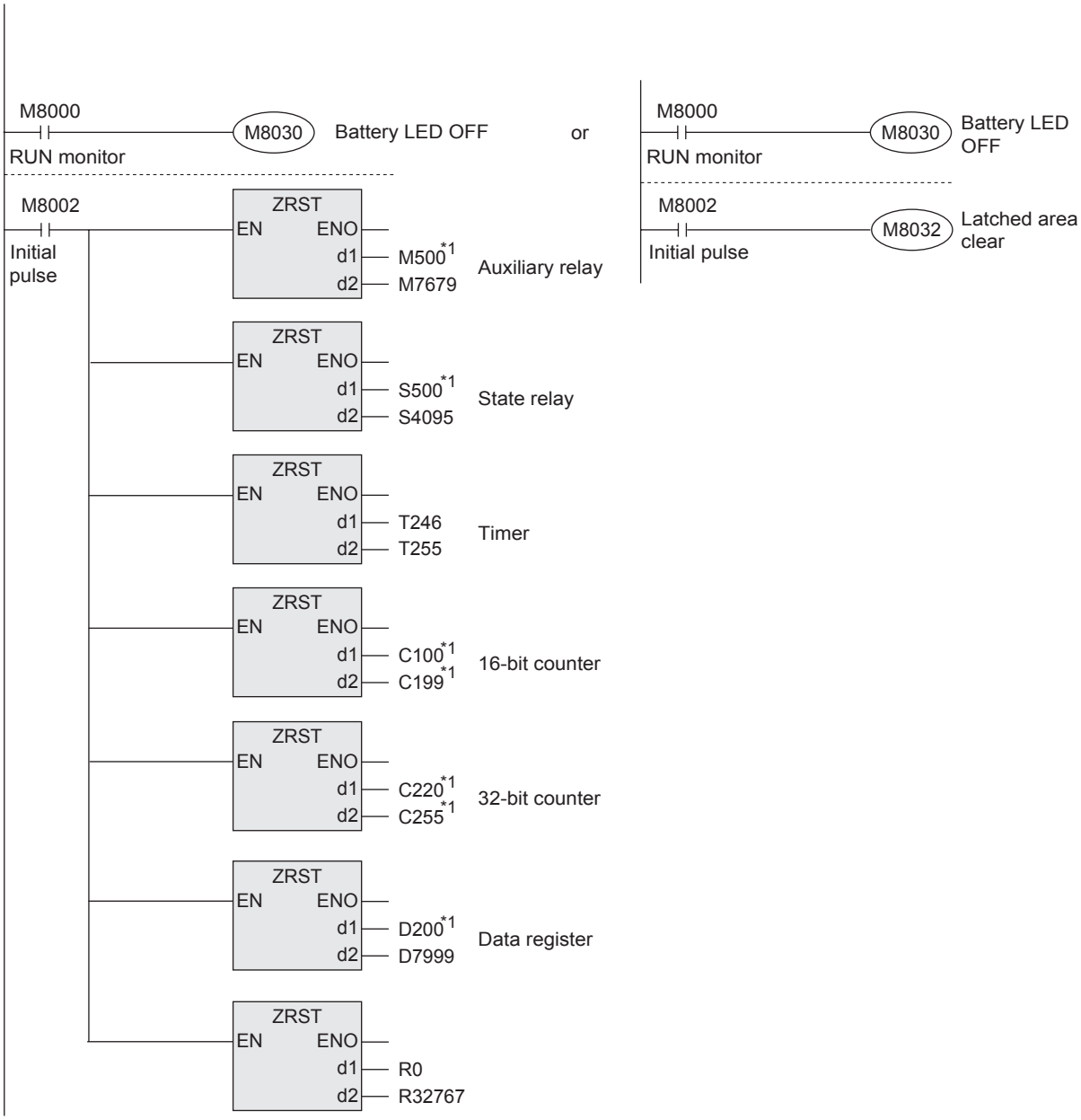
3. Conditions to enable the batteryless operation mode

1) An FLROM, EEPROM or EPROM for program memory is attached so that programs will not be lost.
2) Lathed (backed-up) type devices such as auxiliary relays and data registers are not used for control.
3) The sampling trace function is not used.
4) The real-time clock function is not used.

4. Sequence program example for batteryless operation

When the parameter setting for the batteryless operation mode is not available, create the sequence program shown below.

- Program example for clearing the latched area (when the initial latched areas are set)
  This example shows a program for FX3U/FX3UC PLCs.



*1. The device number shows a value when the initial latched area is set.
If the latched area is changed, change the device number accordingly.

5. Caution on using communication setting devices (D8120, D8121 and D8129)

Special data registers D8120 (communication format), D8121 (station number setting) and D8129 (timeout check time) are backed up against power interruption.
When using the batteryless operation function, reset these devices once in the same way as the above example, and then transfer set values using a program.
The communication conditions can be set in the parameter setting.
When the communication conditions are set in the parameter setting, the PLC transfers the parameter values to the above special data registers before starting operation. Accordingly, it is recommended to set the communication conditions in the parameter setting.

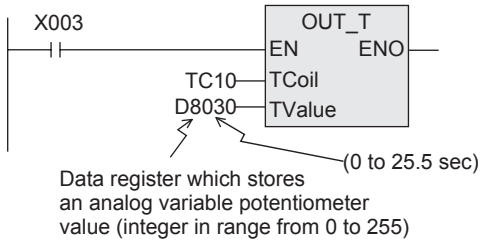
4.2.11 Built-in analog variable potentiometers [D8030, D8031, D8013]

- Program for built-in analog variable potentiometers
  Program values for built-in analog variable potentiometers are stored in the following special data registers as numeric data within the range from 0 to 255 in accordance with the scale position.
  Values received as numeric values can be specified as the indirectly specified value for a timer to provide variable potentiometer type analog timers.

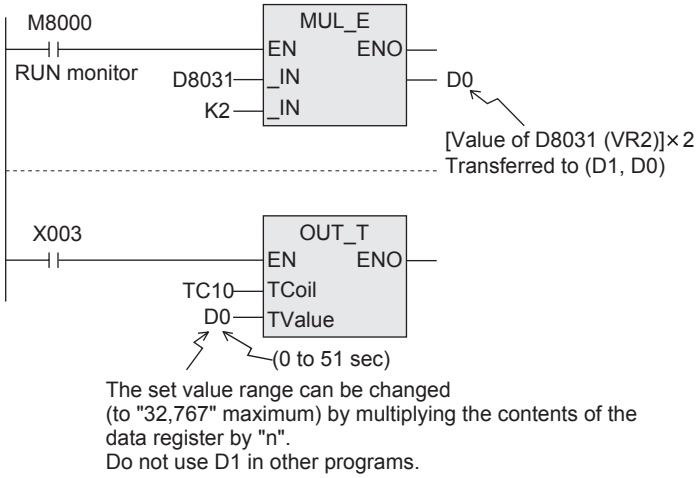
[Special data registers]

- FX1S, FX1N, FX3S*1, FX3G PLC
  VR1→D8030
  VR2→D8031
- FX0S, FX0 PLC
  D8013
- FX0N PLC
  VR1→D8013(D8030)
  VR2→D8031

[Example of basic circuit]



[Example of applied circuit]



*1. FX3S-30M□/E□-2AD are not applicable to built-in analog variable potentiometers.

4.2.12 Clear command [M8031 and M8032]

For all devices (image memory) in the PLC, the non-latched area or latched area can be cleared.
M8031 (Non-latched memory all clear)
M8032 (Latched memory all clear)

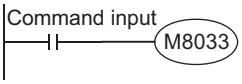
Device number	Cleared devices
M8031*1 (Non-latched memory all clear)	• Contact image of output relay (Y), general type auxiliary relay (M) and general type state relay (S) • Contact and time counting coil of timer (T) • Contact, number counting coil and reset coil of general type counter (C) • Current value of general type data register (D) (Except data registers used as file registers) • Current value register of timer (T) • Current value register of general type counter (C)
M8032 (Latched memory all clear)	• Contact image of latched type auxiliary relay (M) and latched type state relay (S) • Contact and time counting coil of retentive type timer (T) • Contact, number counting coil and reset coil of latched type counter and high speed counter • Current value register of latched type data register (D) • Current value of general type data register (D) (Data registers used as file registers) • Current value register of retentive type timer (T) and 1ms timer (T) • Current value register of latched type counter and high speed counter • Latched type extension register (R)

*1. In FX3G/FX3GC PLCs equipped with an optional battery, general-type devices which have been changed to the latched type are handled as devices in the latched area.

4.2.13 Memory hold stop [M8033] (Output holding in STOP mode)

When the special auxiliary relay M8033 is set to ON, the output status in the RUN mode is held even if the PLC mode switches from RUN to STOP.

1. Program example

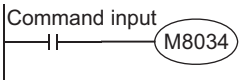


For example, when a heater is driven by the PLC, it is possible to stop the PLC while the heater and other equipment are kept driven, change the program, an then restart the PLC again.

4.2.14 All output disable command [M8034]

When M8034 is set to ON, the output memory is cleared. As a result, contacts of all output relays are turned OFF, and the PLC runs on the image memory.

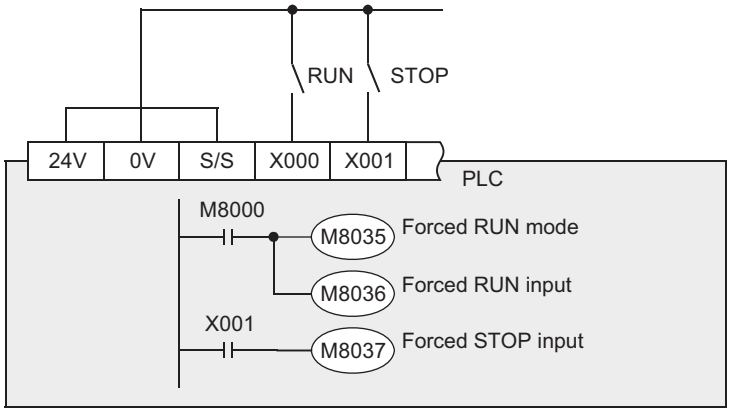
1. Program example



4.2.15 Independent operation for RUN/STOP input [M8035 to M8037]

When using external pushbutton switches to control the PLC's RUN/STOP mode, set the switches as shown below.
The PLC enters the RUN mode by one-shot input of the RUN switch, and enters the STOP mode by one-shot input of the STOP switch.
In FX0/FX0S/FX0N PLCs, only a programming tool is available for switch between the RUN mode and the STOP mode.

1. Program example



The left figure shows an example of FX3U PLC (sink input).

Write the above program in the PLC in advance.

2. Setting method

1) Fix the built-in RUN/STOP switch on the "STOP" side.
2) Specify the RUN switch input (X). (X000 is specified in the above circuit diagram example.)
   Enable the external RUN/STOP input, and specify one input among X000 to X017 for the RUN input signal.
   a) Open the parameter setting dialog box in the programming tool.
      In GX Works2, double-click [Parameter]-[PC parameter] in the project view to display the parameter setting dialog box.
      Click the "PC system (1)" tab, and set "RUN terminal input".
   b) Specify the input number (X) to switch the PLC from the STOP mode to the RUN mode.
3) Specify the STOP switch input (X).
   Specify an arbitrary input terminal (actual I/O in the PLC) in a sequence program.
   Refer to the above program.
4) Transfer the program and parameters to the PLC.
5) Power OFF the PLC once, and then power it ON again to enable the parameter setting.

3. Cautions

1) When both the RUN switch and the STOP switch are pressed at the same time, the priority is given to the STOP switch.
2) When the built-in RUN/STOP switch is set to "RUN" in the STOP mode, the PLC enters the RUN mode. However, note that the STOP command has the priority over the built-in switch. For giving the STOP command, use the STOP switch assigned to an arbitrary input. (Even if the built-in switch is set to "RUN", the PLC enters the STOP mode when the STOP command is given because the STOP command has the priority over the built-in switch.)

4. RUN/STOP command from a programming tool

1) When using the programming software for personal computer
The programming software has the remote RUN/STOP function for the PLC.
Use the programming software to set the PLC to the RUN or STOP mode using a command sent from the personal computer.

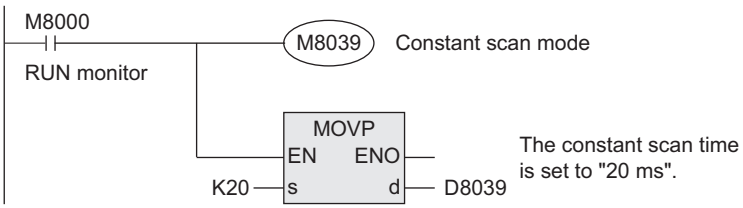
2) When using any other programming tool
The PLC enters the RUN mode when M8035 (forced RUN mode) and M8036 (forced RUN input) are set to ON by the forced ON/OFF operation.
Set M8037 (forced STOP input) to ON in this status to let the PLC enter the STOP mode.

3) When the RUN/STOP switch built in the PLC is set to "RUN"
The remote STOP input from a programming tool and M8037 (forced STOP input) are enabled.

4.2.16 Constant scan mode [M8039 and D8039] (Fixed scan time)

When the special auxiliary relay M8039 is set to ON and desired scan time (in units of ms) is written to the special data register D8039, the scan time in the PLC does not become shorter than the value stored in D8039.
If the operation is finished earlier, the PLC pauses for the remaining time, and then returns to the step No. 0.

1. Program example



2. Cautions

1) When using an instruction which is executed in synchronization with a scan
   a) When using the RAMP, HKY, SEGL, ARWS or PR instruction
   It is recommended to use the constant scan mode or turn ON the scan with a constant time interval using timer interrupts.
   b) When using the HKY instruction
   It is necessary to set the scan time to 20 ms or more because of the response relay caused by the key input filter.

2) Scan time display (D8010 to D8012)
In FX1S/FX1N/FX1NC/FX2N/FX2NC/FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs, the constant scan time is included in the scan time display stored in D8010 to D8012.
In FX0S/FX0/FX0N/FXU/FX2C PLCs, the constant scan time is not included in the scan time display stored in D8010 to D8012.

4.2.17 State control in program by STL instruction [M8040]

When M8040 is set to ON, the state relay ON status is not transferred even if the transfer condition is satisfied.
Outputs in the stopped state relay continue operation.

→ **For resetting outputs in state relays, refer to the FX Structured Programming Manual [Basic & Applied Instruction].**

4.2.18 Analog expansion boards [M8260 to M8279 and D8260 to D8279]

When the analog expansion board is connected, operations and functions are assigned to devices shown in the table below in accordance with the connection position.
Operations and functions in the table below are shaded for write-prohibited devices.

→ **For details, refer to the Analog Control Edition.**

1. Special auxiliary relay (M8260 to M8279)

- FX3S/FX3G PLC

Number	Operation and function	
	FX3G-2AD-BD[*1]	**FX3G-1DA-BD**[*1]
1st analog expansion board		
M 8260	Input mode switching Ch1	Output mode switching
M 8261	Input mode switching Ch2	Not used
M 8262	Not used	Not used
M 8263	Not used	Not used
M 8264	Not used	Output hold mode cancel
M 8265	Not used	Not used
M 8266	Not used	Not used
M 8267	Not used	Not used
M 8268	Not used	Not used
M 8269	Not used	Not used
2nd analog expansion board[*2]		
M 8270	Input mode switching Ch1	Output mode switching
M 8271	Input mode switching Ch2	Not used
M 8272	Not used	Not used
M 8273	Not used	Not used
M 8274	Not used	Output hold mode cancel
M 8275	Not used	Not used
M 8276	Not used	Not used
M 8277	Not used	Not used
M 8278	Not used	Not used
M 8279	Not used	Not used

*1. In the case of FX3G PLC, versions 1.10 or later are applicable.

*2. Only a 40-point or 60-point type FX3G PLC can be connected.

2. Special data register (D8260 to D8279)

- FX3S/FX3G PLC

Number	Operation and function	
	FX3G-2AD-BD*1	FX3G-1DA-BD*1
1st analog expansion board		
D 8260	Input data Ch1	Output data
D 8261	Input data Ch2	Not used
D 8262	Not used	Not used
D 8263	Not used	Not used
D 8264	Number of averaging times for Ch1 (1 to 4095)	Not used
D 8265	Number of averaging times for Ch2 (1 to 4095)	Not used
D 8266	Not used	Not used
D 8267	Not used	Not used
D 8268	Error status	Error status
D 8269	Model code: K3	Model code: K4
2nd analog expansion board*2		
D 8270	Input data Ch1	Output data
D 8271	Input data Ch2	Not used
D 8272	Not used	Not used
D 8273	Not used	Not used
D 8274	Number of averaging times for Ch1 (1 to 4095)	Not used
D 8275	Number of averaging times for Ch2 (1 to 4095)	Not used
D 8276	Not used	Not used
D 8277	Not used	Not used
D 8278	Error status	Error status
D 8279	Model code: K3	Model code: K4

*1. In the case of FX3G PLC, versions 1.10 or later are applicable.

*2. Only a 40-point or 60-point type FX3G PLC can be connected.

4.2.19 Analog special adapters [M8260 to M8299 and D8260 to D8299] (FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs)

When analog special adapters are connected, operations and functions are assigned to the devices shown in the table below in accordance with the number of connected analog special adapters.
Devices which cannot be written are shaded in the "Operation and function" column in the table below.

→ **For details, refer to the Analog Control Edition.**

1. Special auxiliary relays (M8260 to M8299)

- FX3U/FX3UC PLCs

Number	Operation and function		
	FX3U-4AD-ADP*1	FX3U-4DA-ADP*1	FX3U-3A-ADP*2
1st analog special adapter			
M 8260	Ch1: Input mode switching	Ch1: Output mode switching	Input mode switching Ch1
M 8261	Ch2: Input mode switching	Ch2: Output mode switching	Input mode switching Ch2
M 8262	Ch3: Input mode switching	Ch3: Output mode switching	Output mode switching
M 8263	Ch4: Input mode switching	Ch4: Output mode switching	Not used
M 8264	Not used (disabled)	Ch1: Output hold mode reset	Not used
M 8265	Not used (disabled)	Ch2: Output hold mode reset	Not used
M 8266	Not used (disabled)	Ch3: Output hold mode reset	Output hold mode cancel
M 8267	Not used (disabled)	Ch4: Output hold mode reset	Sets whether or not input channel 1 is used.
M 8268	Not used (disabled)	Not used (disabled)	Sets whether or not input channel 2 is used.
M 8269	Not used (disabled)	Not used (disabled)	Sets whether or not output channel is used.
2nd analog special adapter			
M 8270	Ch1: Input mode switching	Ch1: Output mode switching	Input mode switching Ch1
M 8271	Ch2: Input mode switching	Ch2: Output mode switching	Input mode switching Ch2
M 8272	Ch3: Input mode switching	Ch3: Output mode switching	Output mode switching
M 8273	Ch4: Input mode switching	Ch4: Output mode switching	Not used
M 8274	Not used (disabled)	Ch1: Output hold mode reset	Not used
M 8275	Not used (disabled)	Ch2: Output hold mode reset	Not used
M 8276	Not used (disabled)	Ch3: Output hold mode reset	Output hold mode cancel
M 8277	Not used (disabled)	Ch4: Output hold mode reset	Sets whether or not input channel 1 is used.
M 8278	Not used (disabled)	Not used (disabled)	Sets whether or not input channel 2 is used.
M 8279	Not used (disabled)	Not used (disabled)	Sets whether or not output channel is used.
3rd analog special adapter			
M 8280	Ch1: Input mode switching	Ch1: Output mode switching	Input mode switching Ch1
M 8281	Ch2: Input mode switching	Ch2: Output mode switching	Input mode switching Ch2
M 8282	Ch3: Input mode switching	Ch3: Output mode switching	Output mode switching
M 8283	Ch4: Input mode switching	Ch4: Output mode switching	Not used
M 8284	Not used (disabled)	Ch1: Output hold mode reset	Not used
M 8285	Not used (disabled)	Ch2: Output hold mode reset	Not used
M 8286	Not used (disabled)	Ch3: Output hold mode reset	Output hold mode cancel
M 8287	Not used (disabled)	Ch4: Output hold mode reset	Sets whether or not input channel 1 is used.
M 8288	Not used (disabled)	Not used (disabled)	Sets whether or not input channel 2 is used.
M 8289	Not used (disabled)	Not used (disabled)	Sets whether or not output channel is used.
4th analog special adapter			
M 8290	Ch1: Input mode switching	Ch1: Output mode switching	Input mode switching Ch1
M 8291	Ch2: Input mode switching	Ch2: Output mode switching	Input mode switching Ch2
M 8292	Ch3: Input mode switching	Ch3: Output mode switching	Output mode switching
M 8293	Ch4: Input mode switching	Ch4: Output mode switching	Not used
M 8294	Not used (disabled)	Ch1: Output hold mode reset	Not used
M 8295	Not used (disabled)	Ch2: Output hold mode reset	Not used
M 8296	Not used (disabled)	Ch3: Output hold mode reset	Output hold mode cancel
M 8297	Not used (disabled)	Ch4: Output hold mode reset	Sets whether or not input channel 1 is used.
M 8298	Not used (disabled)	Not used (disabled)	Sets whether or not input channel 2 is used.
M 8299	Not used (disabled)	Not used (disabled)	Sets whether or not output channel is used.

*1. In the case of FX3UC PLC, versions 1.20 or later are applicable.

*2. In the case of FX3U and FX3UC PLCs, versions 2.61 or later are applicable.

Number	Operation and function		
	FX3U-4AD-PT(W)-ADP*1	FX3U-4AD-TC-ADP*1	FX3U-4AD-PNK-ADP*1
1st analog special adapter			
M 8260	Temperature unit selection	Temperature unit selection	Temperature unit selection
M 8261	Not used	Type-K/-J switching	Input sensor selection
M 8262	Not used	Not used	Not used
M 8263	Not used	Not used	Not used
M 8264	Not used	Not used	Not used
M 8265	Not used	Not used	Not used
M 8266	Not used	Not used	Not used
M 8267	Not used	Not used	Not used
M 8268	Not used	Not used	Not used
M 8269	Not used	Not used	Not used
2nd analog special adapter			
M 8270	Temperature unit selection	Temperature unit selection	Temperature unit selection
M 8271	Not used	Type-K/-J switching	Input sensor selection
M 8272	Not used	Not used	Not used
M 8273	Not used	Not used	Not used
M 8274	Not used	Not used	Not used
M 8275	Not used	Not used	Not used
M 8276	Not used	Not used	Not used
M 8277	Not used	Not used	Not used
M 8278	Not used	Not used	Not used
M 8279	Not used	Not used	Not used
3rd analog special adapter			
M 8280	Temperature unit selection	Temperature unit selection	Temperature unit selection
M 8281	Not used	Type-K/-J switching	Input sensor selection
M 8282	Not used	Not used	Not used
M 8283	Not used	Not used	Not used
M 8284	Not used	Not used	Not used
M 8285	Not used	Not used	Not used
M 8286	Not used	Not used	Not used
M 8287	Not used	Not used	Not used
M 8288	Not used	Not used	Not used
M 8289	Not used	Not used	Not used
4th analog special adapter			
M 8290	Temperature unit selection	Temperature unit selection	Temperature unit selection
M 8291	Not used	Type-K/-J switching	Input sensor selection
M 8292	Not used	Not used	Not used
M 8293	Not used	Not used	Not used
M 8294	Not used	Not used	Not used
M 8295	Not used	Not used	Not used
M 8296	Not used	Not used	Not used
M 8297	Not used	Not used	Not used
M 8298	Not used	Not used	Not used
M 8299	Not used	Not used	Not used

*1. In the case of FX3UC PLC, versions 1.30 or later are applicable.

- FX3S/FX3G/FX3GC PLCs

Number	Operation and function		
	FX3U-4AD-ADP	**FX3U-4DA-ADP**	**FX3U-3A-ADP*1**
1st analog special adapter			
M 8280	Ch1: Input mode switching	Ch1: Output mode switching	Input mode switching Ch1
M 8281	Ch2: Input mode switching	Ch2: Output mode switching	Input mode switching Ch2
M 8282	Ch3: Input mode switching	Ch3: Output mode switching	Output mode switching
M 8283	Ch4: Input mode switching	Ch4: Output mode switching	Not used
M 8284	Not used (disabled)	Ch1: Output hold mode reset	Not used
M 8285	Not used (disabled)	Ch2: Output hold mode reset	Not used
M 8286	Not used (disabled)	Ch3: Output hold mode reset	Output hold mode cancel
M 8287	Not used (disabled)	Ch4: Output hold mode reset	Sets whether or not input channel 1 is used.
M 8288	Not used (disabled)	Not used (disabled)	Sets whether or not input channel 2 is used.
M 8289	Not used (disabled)	Not used (disabled)	Sets whether or not output channel is used.
2nd analog special adapter*2			
M 8290	Ch1: Input mode switching	Ch1: Output mode switching	Input mode switching Ch1
M 8291	Ch2: Input mode switching	Ch2: Output mode switching	Input mode switching Ch2
M 8292	Ch3: Input mode switching	Ch3: Output mode switching	Output mode switching
M 8293	Ch4: Input mode switching	Ch4: Output mode switching	Not used
M 8294	Not used (disabled)	Ch1: Output hold mode reset	Not used
M 8295	Not used (disabled)	Ch2: Output hold mode reset	Not used
M 8296	Not used (disabled)	Ch3: Output hold mode reset	Output hold mode cancel
M 8297	Not used (disabled)	Ch4: Output hold mode reset	Sets whether or not input channel 1 is used.
M 8298	Not used (disabled)	Not used (disabled)	Sets whether or not input channel 2 is used.
M 8299	Not used (disabled)	Not used (disabled)	Sets whether or not output channel is used.

Number	Operation and function		
	FX3U-4AD-PT(W)-ADP	**FX3U-4AD-TC-ADP**	**FX3U-4AD-PNK-ADP**
1st analog special adapter			
M 8280	Temperature unit selection	Temperature unit selection	Temperature unit selection
M 8281	Not used	Type-K/-J switching	Input sensor selection
M 8282	Not used	Not used	Not used
M 8283	Not used	Not used	Not used
M 8284	Not used	Not used	Not used
M 8285	Not used	Not used	Not used
M 8286	Not used	Not used	Not used
M 8287	Not used	Not used	Not used
M 8288	Not used	Not used	Not used
M 8289	Not used	Not used	Not used
2nd analog special adapter*2			
M 8290	Temperature unit selection	Temperature unit selection	Temperature unit selection
M 8291	Not used	Type-K/-J switching	Input sensor selection
M 8292	Not used	Not used	Not used
M 8293	Not used	Not used	Not used
M 8294	Not used	Not used	Not used
M 8295	Not used	Not used	Not used
M 8296	Not used	Not used	Not used
M 8297	Not used	Not used	Not used
M 8298	Not used	Not used	Not used
M 8299	Not used	Not used	Not used

*1. In the case of FX3G PLC, versions 1.20 or later are applicable.

*2. Can be connected only to 40-point or 60-point type FX3G and FX3GC PLCs.

2. Special data registers (D8260 to D8299)

- FX3U/FX3UC PLCs

Number	Operation and function		
	FX3U-4AD-ADP*1	FX3U-4DA-ADP*1	FX3U-3A-ADP*2
1st analog special adapter			
D 8260	Ch1: Input data	Ch1: Output setting data	Input data Ch1
D 8261	Ch2: Input data	Ch2: Output setting data	Input data Ch2
D 8262	Ch3: Input data	Ch3: Output setting data	Output data
D 8263	Ch4: Input data	Ch4: Output setting data	Not used
D 8264	Ch1: Number of times of averaging (1 to 4095)	Not used (disabled)	Number of averaging times for Ch1 (1 to 4095)
D 8265	Ch2: Number of times of averaging (1 to 4095)	Not used (disabled)	Number of averaging times for Ch2 (1 to 4095)
D 8266	Ch3: Number of times of averaging (1 to 4095)	Not used (disabled)	Not used
D 8267	Ch4: Number of times of averaging (1 to 4095)	Not used (disabled)	Not used
D 8268	Error status	Error status	Error status
D 8269	Model code = 1	Model code = 2	Model code: K50
2nd analog special adapter			
D 8270	Ch1: Input data	Ch1: Output setting data	Input data Ch1
D 8271	Ch2: Input data	Ch2: Output setting data	Input data Ch2
D 8272	Ch3: Input data	Ch3: Output setting data	Output data
D 8273	Ch4: Input data	Ch4: Output setting data	Not used
D 8274	Ch1: Number of times of averaging (1 to 4095)	Not used (disabled)	Number of averaging times for Ch1 (1 to 4095)
D 8275	Ch2: Number of times of averaging (1 to 4095)	Not used (disabled)	Number of averaging times for Ch2 (1 to 4095)
D 8276	Ch3: Number of times of averaging (1 to 4095)	Not used (disabled)	Not used
D 8277	Ch4: Number of times of averaging (1 to 4095)	Not used (disabled)	Not used
D 8278	Error status	Error status	Error status
D 8279	Model code = 1	Model code = 2	Model code: K50
3rd analog special adapter			
D 8280	Ch1: Input data	Ch1: Output setting data	Input data Ch1
D 8281	Ch2: Input data	Ch2: Output setting data	Input data Ch2
D 8282	Ch3: Input data	Ch3: Output setting data	Output data
D 8283	Ch4: Input data	Ch4: Output setting data	Not used
D 8284	Ch1: Number of times of averaging (1 to 4095)	Not used (disabled)	Number of averaging times for Ch1 (1 to 4095)
D 8285	Ch2: Number of times of averaging (1 to 4095)	Not used (disabled)	Number of averaging times for Ch2 (1 to 4095)
D 8286	Ch3: Number of times of averaging (1 to 4095)	Not used (disabled)	Not used
D 8287	Ch4: Number of times of averaging (1 to 4095)	Not used (disabled)	Not used
D 8288	Error status	Error status	Error status
D 8289	Model code = 1	Model code = 2	Model code: K50
4th analog special adapter			
D 8290	Ch1: Input data	Ch1: Output setting data	Input data Ch1
D 8291	Ch2: Input data	Ch2: Output setting data	Input data Ch2
D 8292	Ch3: Input data	Ch3: Output setting data	Output data
D 8293	Ch4: Input data	Ch4: Output setting data	Not used
D 8294	Ch1: Number of times of averaging (1 to 4095)	Not used (disabled)	Number of averaging times for Ch1 (1 to 4095)
D 8295	Ch2: Number of times of averaging (1 to 4095)	Not used (disabled)	Number of averaging times for Ch2 (1 to 4095)
D 8296	Ch3: Number of times of averaging (1 to 4095)	Not used (disabled)	Not used
D 8297	Ch4: Number of times of averaging (1 to 4095)	Not used (disabled)	Not used
D 8298	Error status	Error status	Error status
D 8299	Model code = 1	Model code = 2	Model code: K50

*1. In the case of FX3UC PLC, versions 1.20 or later are applicable.
*2. In the case of FX3U and FX3UC PLCs, versions 2.61 or later are applicable.

Number	Operation and function		
	FX3U-4AD-PT(W)-ADP*1	FX3U-4AD-TC-ADP*1	FX3U-4AD-PNK-ADP*1
1st analog special adapter			
D 8260	Measured temperature Ch1	Measured temperature Ch1	Measured temperature Ch1
D 8261	Measured temperature Ch2	Measured temperature Ch2	Measured temperature Ch2
D 8262	Measured temperature Ch3	Measured temperature Ch3	Measured temperature Ch3
D 8263	Measured temperature Ch4	Measured temperature Ch4	Measured temperature Ch4
D 8264	Number of averaging times for Ch1 (1 to 4095)	Number of averaging times for Ch1 (1 to 4095)	Number of averaging times for Ch1 (1 to 4095)
D 8265	Number of averaging times for Ch2 (1 to 4095)	Number of averaging times for Ch2 (1 to 4095)	Number of averaging times for Ch2 (1 to 4095)
D 8266	Number of averaging times for Ch3 (1 to 4095)	Number of averaging times for Ch3 (1 to 4095)	Number of averaging times for Ch3 (1 to 4095)
D 8267	Number of averaging times for Ch4 (1 to 4095)	Number of averaging times for Ch4 (1 to 4095)	Number of averaging times for Ch4 (1 to 4095)
D 8268	Error status	Error status	Error status
D 8269	Model code: K20, K21*2	Model code: K10	Model code: K11
2nd analog special adapter			
D 8270	Measured temperature Ch1	Measured temperature Ch1	Measured temperature Ch1
D 8271	Measured temperature Ch2	Measured temperature Ch2	Measured temperature Ch2
D 8272	Measured temperature Ch3	Measured temperature Ch3	Measured temperature Ch3
D 8273	Measured temperature Ch4	Measured temperature Ch4	Measured temperature Ch4
D 8274	Number of averaging times for Ch1 (1 to 4095)	Number of averaging times for Ch1 (1 to 4095)	Number of averaging times for Ch1 (1 to 4095)
D 8275	Number of averaging times for Ch2 (1 to 4095)	Number of averaging times for Ch2 (1 to 4095)	Number of averaging times for Ch2 (1 to 4095)
D 8276	Number of averaging times for Ch3 (1 to 4095)	Number of averaging times for Ch3 (1 to 4095)	Number of averaging times for Ch3 (1 to 4095)
D 8277	Number of averaging times for Ch4 (1 to 4095)	Number of averaging times for Ch4 (1 to 4095)	Number of averaging times for Ch4 (1 to 4095)
D 8278	Error status	Error status	Error status
D 8279	Model code: K20, K21*2	Model code: K10	Model code: K11
3rd analog special adapter			
D 8280	Measured temperature Ch1	Measured temperature Ch1	Measured temperature Ch1
D 8281	Measured temperature Ch2	Measured temperature Ch2	Measured temperature Ch2
D 8282	Measured temperature Ch3	Measured temperature Ch3	Measured temperature Ch3
D 8283	Measured temperature Ch4	Measured temperature Ch4	Measured temperature Ch4
D 8284	Number of averaging times for Ch1 (1 to 4095)	Number of averaging times for Ch1 (1 to 4095)	Number of averaging times for Ch1 (1 to 4095)
D 8285	Number of averaging times for Ch2 (1 to 4095)	Number of averaging times for Ch2 (1 to 4095)	Number of averaging times for Ch2 (1 to 4095)
D 8286	Number of averaging times for Ch3 (1 to 4095)	Number of averaging times for Ch3 (1 to 4095)	Number of averaging times for Ch3 (1 to 4095)
D 8287	Number of averaging times for Ch4 (1 to 4095)	Number of averaging times for Ch4 (1 to 4095)	Number of averaging times for Ch4 (1 to 4095)
D 8288	Error status	Error status	Error status
D 8289	Model code: K20, K21*2	Model code: K10	Model code: K11
4th analog special adapter			
D 8290	Measured temperature Ch1	Measured temperature Ch1	Measured temperature Ch1
D 8291	Measured temperature Ch2	Measured temperature Ch2	Measured temperature Ch2
D 8292	Measured temperature Ch3	Measured temperature Ch3	Measured temperature Ch3
D 8293	Measured temperature Ch4	Measured temperature Ch4	Measured temperature Ch4
D 8294	Number of averaging times for Ch1 (1 to 4095)	Number of averaging times for Ch1 (1 to 4095)	Number of averaging times for Ch1 (1 to 4095)
D 8295	Number of averaging times for Ch2 (1 to 4095)	Number of averaging times for Ch2 (1 to 4095)	Number of averaging times for Ch2 (1 to 4095)
D 8296	Number of averaging times for Ch3 (1 to 4095)	Number of averaging times for Ch3 (1 to 4095)	Number of averaging times for Ch3 (1 to 4095)
D 8297	Number of averaging times for Ch4 (1 to 4095)	Number of averaging times for Ch4 (1 to 4095)	Number of averaging times for Ch4 (1 to 4095)
D 8298	Error status	Error status	Error status
D 8299	Model code: K20, K21*2	Model code: K10	Model code: K11

*1. In the case of FX3UC PLC, versions 1.30 or later are applicable.

*2. The model code is "20" for the PT-ADP, and "21" for the PTW-ADP.

- FX3S/FX3G/FX3GC PLCs

Number	Operation and function		
	FX3U-4AD-ADP	**FX3U-4DA-ADP**	**FX3U-3A-ADP*1**
Applicable version	Ver. 1.00 or later	Ver. 1.00 or later	Ver.1.20 or later
1st analog special adapter			
D 8280	Ch1: Input data	Ch1: Output setting data	Input data Ch1
D 8281	Ch2: Input data	Ch2: Output setting data	Input data Ch2
D 8282	Ch3: Input data	Ch3: Output setting data	Output data
D 8283	Ch4: Input data	Ch4: Output setting data	Not used
D 8284	Ch1: Number of times of averaging (1 to 4095)	Not used (disabled)	Number of averaging times for Ch1 (1 to 4095)
D 8285	Ch2: Number of times of averaging (1 to 4095)	Not used (disabled)	Number of averaging times for Ch2 (1 to 4095)
D 8286	Ch3: Number of times of averaging (1 to 4095)	Not used (disabled)	Not used
D 8287	Ch4: Number of times of averaging (1 to 4095)	Not used (disabled)	Not used
D 8288	Error status	Error status	Error status
D 8289	Model code = 1	Model code = 2	Model code: K50
2nd analog special adapter*2			
D 8290	Ch1: Input data	Ch1: Output setting data	Input data Ch1
D 8291	Ch2: Input data	Ch2: Output setting data	Input data Ch2
D 8292	Ch3: Input data	Ch3: Output setting data	Output data
D 8293	Ch4: Input data	Ch4: Output setting data	Not used
D 8294	Ch1: Number of times of averaging (1 to 4095)	Not used (disabled)	Number of averaging times for Ch1 (1 to 4095)
D 8295	Ch2: Number of times of averaging (1 to 4095)	Not used (disabled)	Number of averaging times for Ch2 (1 to 4095)
D 8296	Ch3: Number of times of averaging (1 to 4095)	Not used (disabled)	Not used
D 8297	Ch4: Number of times of averaging (1 to 4095)	Not used (disabled)	Not used
D 8298	Error status	Error status	Error status
D 8299	Model code = 1	Model code = 2	Model code: K50

*1. In the case of FX3G PLC, versions 1.20 or later are applicable.
*2. Can be connected only to 40-point or 60-point type FX3G and FX3GC PLCs.

Number	Operation and function		
	FX3U-4AD-PT(W)-ADP	**FX3U-4AD-TC-ADP**	**FX3U-4AD-PNK-ADP**
1st analog special adapter			
D 8280	Measured temperature Ch1	Measured temperature Ch1	Measured temperature Ch1
D 8281	Measured temperature Ch2	Measured temperature Ch2	Measured temperature Ch2
D 8282	Measured temperature Ch3	Measured temperature Ch3	Measured temperature Ch3
D 8283	Measured temperature Ch4	Measured temperature Ch4	Measured temperature Ch4
D 8284	Number of averaging times for Ch1 (1 to 4095)	Number of averaging times for Ch1 (1 to 4095)	Number of averaging times for Ch1 (1 to 4095)
D 8285	Number of averaging times for Ch2 (1 to 4095)	Number of averaging times for Ch2 (1 to 4095)	Number of averaging times for Ch2 (1 to 4095)
D 8286	Number of averaging times for Ch3 (1 to 4095)	Number of averaging times for Ch3 (1 to 4095)	Number of averaging times for Ch3 (1 to 4095)
D 8287	Number of averaging times for Ch4 (1 to 4095)	Number of averaging times for Ch4 (1 to 4095)	Number of averaging times for Ch4 (1 to 4095)
D 8288	Error status	Error status	Error status
D 8289	Model code: K20, K21*2	Model code: K10	Model code: K11
2nd analog special adapter*1			
D 8290	Measured temperature Ch1	Measured temperature Ch1	Measured temperature Ch1
D 8291	Measured temperature Ch2	Measured temperature Ch2	Measured temperature Ch2
D 8292	Measured temperature Ch3	Measured temperature Ch3	Measured temperature Ch3
D 8293	Measured temperature Ch4	Measured temperature Ch4	Measured temperature Ch4
D 8294	Number of averaging times for Ch1 (1 to 4095)	Number of averaging times for Ch1 (1 to 4095)	Number of averaging times for Ch1 (1 to 4095)
D 8295	Number of averaging times for Ch2 (1 to 4095)	Number of averaging times for Ch2 (1 to 4095)	Number of averaging times for Ch2 (1 to 4095)
D 8296	Number of averaging times for Ch3 (1 to 4095)	Number of averaging times for Ch3 (1 to 4095)	Number of averaging times for Ch3 (1 to 4095)
D 8297	Number of averaging times for Ch4 (1 to 4095)	Number of averaging times for Ch4 (1 to 4095)	Number of averaging times for Ch4 (1 to 4095)
D 8298	Error status	Error status	Error status
D 8299	Model code: K20, K21*2	Model code: K10	Model code: K11

*1. Can be connected only to 40-point or 60-point type FX3G and FX3GC PLCs.

*2. The model code is "20" for the PT-ADP, and "21" for the PTW-ADP.

5. Errors

This chapter explains error codes stored in special data registers when program errors occur in the PLC, and actions to be taken against errors.
Support of error detection devices depends on the PLCs.

→ **For details, refer to Section 4.1.**

5.1 FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs

5.1.1 Error detection devices

1. Error detection (M8060 and later and D8060 and later)

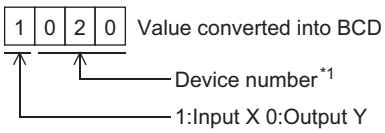
When some devices among M8060, M8061 and M8064 to M8067 turn ON, D8004 stores the smallest device number and M8004 turns ON.

1) M8060, M8061 and M8064 to M8067 are cleared when the PLC mode switches from STOP to RUN. Note that M8068 and D8068 are not cleared.

2) When M8069 is set to ON, the PLC will enter the STOP mode (M8061: PLC hardware error) if a failure occurs in an I/O extension unit, extension power supply unit or function block.
When M8069 is set to ON, the PLC executes the I/O bus check. If an error is detected, D8061 stores the error code ("6103" or "6104") and M8061 turns ON.
When D8061 stores "6104", M8009 turns ON and D8009 stores the I/O numbers connected after the extension power supply unit where 24V DC power failure has occurred.
This function is available only in FX3G, FX3GC, FX3U, and FX3UC PLCs.

3) When units and blocks having programmed I/O numbers are not actually connected, M8060 turns ON and D8060 stores the head device number of unconnected units/blocks.
This function is available only in FX3G, FX3GC, FX3U, and FX3UC PLCs.

Example: When X020 is unconnected

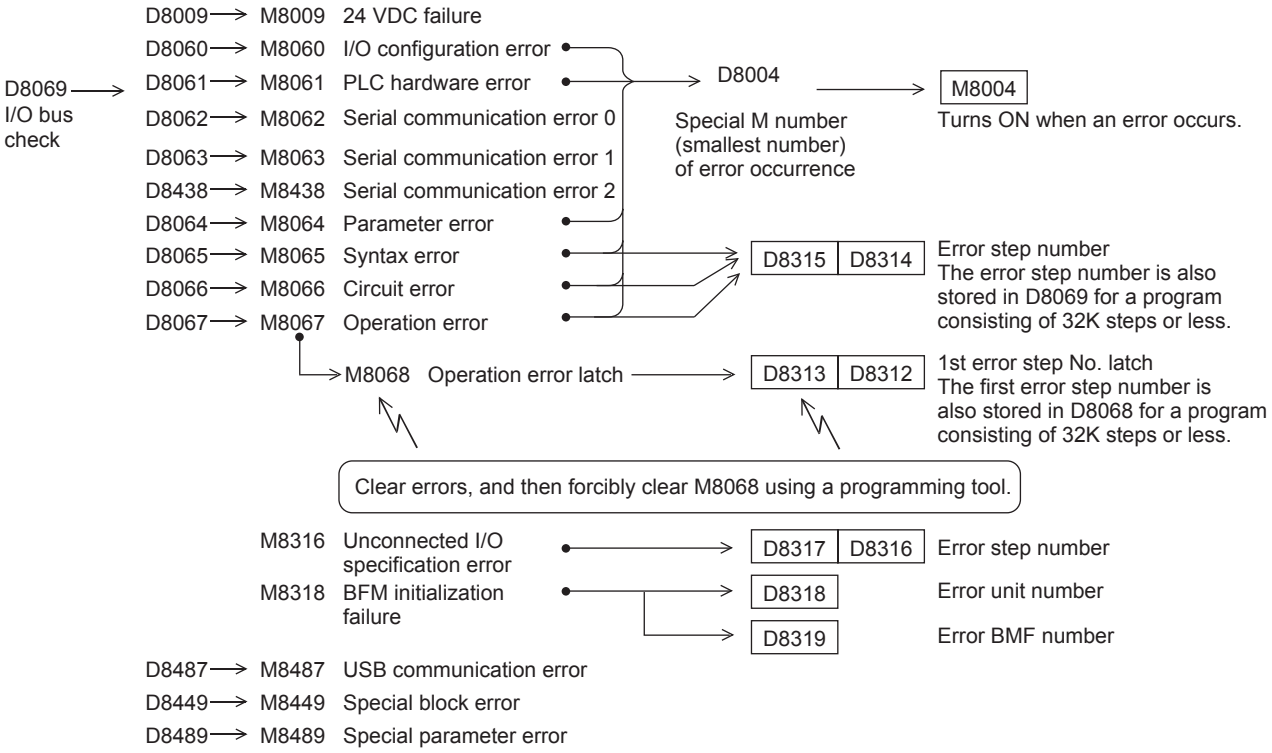


*1. 10 to 337 in FX3U/FX3UC PLCs, and 10 to 177 in FX3G/FX3GC PLCs

4) When an I/O device number is directly specified or indirectly specified using index registers for the LD, AND, OR or OUT instruction, and if the specified I/O device number is not actually connected, M8316 turns ON, and D8317 (high-order bits) and D8316 (low-order bits) store the error step number in the instruction.
This function is available only in FX3U and FX3UC PLCs.

2. Operations of special devices for error detection

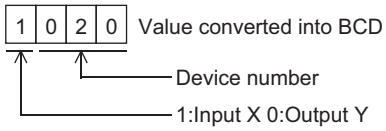
Special auxiliary relays for error detection and special data registers for error detection operate under the relationship shown below.
The error occurrence state can be checked by monitoring the contents of auxiliary relays and data registers from a programming tool or by using the PLC diagnosis function.



3. Error detection timing

Error item	Error detection timing		
	When power is turned ON from OFF	When PLC mode switches from STOP to RUN	Other timing
M8060 I/O configuration error	Checked	Checked	-
M8061 PLC hardware error	Checked	-	Always
M8062 Serial communication error 0 [CH0]	-	-	When PLC receives signal from counterpart station
M8063 Serial communication error 1 [CH1]	-	-	When PLC receives signal from counterpart station
M8438 Serial communication error 2 [CH2]	-	-	When PLC receives signal from counterpart station
M8064 Parameter error	Checked	Checked	When program is changed (STOP) When program is transferred (STOP)
M8065 Syntax error			
M8066 Circuit error			
M8067 Operation error	-	-	RUN mode
M8068 Operation error latch			
M8109 Output refresh error	-	-	Always
M8316 Unconnected I/O specification error	-	-	RUN mode
M8318 BFM initialization failure	-	Checked	-
M8449 Special block error	-	-	Always
M8487 USB communication error	-	-	When PLC receives signal from counterpart station
M8489 Special parameter error	Checked	-	When special parameter is changed (STOP)
D8166 Special block error condition	-	-	Always

5.1.2 Error Code List and Action

Error code	PLC operation at error occurrence	Contents of error	Action
I/O configuration error [M8060(D8060)]			
Example: 1020	Continues operation	Head unconnected I/O device number Example: When X020 is unconnected  • 1st to 3rd digits: Device number • 4th digit: I/O type (1:Input X 0:Output Y) Example: When D8060 stores "1020", inputs X020 and later are unconnected.	Unconnected I/O relay numbers are programmed. The PLC continues its operation. Modify the program if necessary.
Serial communication error [M8438(D8438)]			
0000	-	No error	
3801	Continues operation	Parity error, overrun error or framing error	• Ethernet communication, Inverter communication, computer link and programming: Confirm that parameters are set correctly in accordance with the application. • Simple N:N link, parallel link, MODBUS communication, etc.: Confirm that the program is set correctly in accordance with the application. • Remote maintenance: Confirm that the modem power is ON, and that AT commands are set properly. • Confirm the wiring of communication cables.
3802		Communication character error	
3803		Communication data sum check error	
3804		Data format error	
3805		Command error	
3806		Monitoring timeout error	
3807		Modem initialization error	
3808		Simple N:N link parameter error	
3809		N:N Network setting error	
3812		Parallel link character error	
3813		Parallel link sum check error	
3814		Parallel link format error	
3820		Inverter communication error	
3821		MODBUS communication error	
3830		Memory access error	When the memory cassette is used, check whether it is mounted correctly. If the problem persists or if the memory cassette is not used, something may be malfunctioning inside the PLC. Consult your local Mitsubishi Electric representative.
3840		Special adapter connection error	Check connection of the special adapter.
PLC hardware error [M8061(D8061)]			
0000	-	No error	
6101	Stops operation	Memory access error	When the memory cassette is used, check whether it is mounted correctly. If the problem persists or if the memory cassette is not used, something may be malfunctioning inside the PLC. Consult your local Mitsubishi Electric representative.
6102		Operation circuit error	Isolate the PLC and supply power to it using a different power supply. If the ERROR(ERR) LED turns OFF, noise may be affecting the PLC. Take the following measures. - Check the ground wiring, and reexamine the wiring route and installation location. - Fit a noise filter onto the power supply line. If the ERROR(ERR) LED does not turn OFF even after the above actions are taken, consult your local Mitsubishi Electric representative.
6103		I/O bus error (while M8069 is ON)	Verify that extension cables are correctly connected.
6104		24V failure in function unit (while M8069 is ON)	
6105		Watchdog timer error	The sampling (scan) time exceeds the value stored in D8000. Check the program.
6106		I/O table creation error (CPU error)	24V DC power failure has occurred in a function unit when the power is turned ON. (The 24V DC power is not supplied for 10 seconds or more after the power is turned ON.) I/O assignment to the CC-Link/LT (built in the FX3UC-32MT-LT/LT-2) is disabled when the power is turned ON.

Error code	PLC operation at error occurrence	Contents of error	Action
PLC hardware error [M8061(D8061)]			
6107	Stops operation	System configuration error	Check the number of connected special function units/ blocks. Some special function units/blocks have a connection number limit.
6112		Changed settings for the built-in CC-Link/LT special function block cannot be written to the attached flash memory cassette.	Verify that the memory cassette is installed correctly.
6113		Changed settings for the built-in CC-Link/LT special function block cannot be written to the attached write protected flash memory cassette.	Set the protect switch to OFF.
6114		CC-Link/LT settings cannot be written to the built-in CC-Link/LT special function block.	Set the configuration again. If the problem persists, something may be malfunctioning inside the PLC. Consult your local Mitsubishi Electric representative.
6115		A built-in CC-Link/LT special function block EEPROM writing time-out error occurred, or the built-in CC-Link/LT special function block configuration could not be completed normally in self CONFIG mode.	
PLC/PP communication error (D8062) Serial communication error 0 [M8062(D8062)]			
0000	-	No error	
6201	Continues operation	Parity error, overrun error or framing error	Confirm that the equipment connected to the programming panel (PP) or programming connector is connected securely to the PLC. This error may occur when a cable is disconnected and reconnected during monitoring of the PLC.
6202		Communication character error	
6203		Communication data sum check error	
6204		Data format error	
6205		Command error	
6230		Memory access error	When the memory cassette is used, check whether it is mounted correctly. If the problem persists or if the memory cassette is not used, something may be malfunctioning inside the PLC. Consult your local Mitsubishi Electric representative.
Serial communication error 1 [M8063(D8063)]			
0000	-	No error	
6301	Continues operation	Parity error, overrun error or framing error	• Ethernet communication, Inverter communication, computer link and programming: Confirm that parameters are set correctly in accordance with the application. • Simple N:N link, parallel link, MODBUS communication, etc.: Confirm that the program is set correctly in accordance with the application. • Remote maintenance: Confirm that the modem power is ON, and that AT commands are set properly. • Confirm the wiring of communication cables.
6302		Communication character error	
6303		Communication data sum check error	
6304		Data format error	
6305		Command error	
6306		Monitoring timeout error	
6307		Modem initialization error	
6308		Simple N:N link parameter error	
6309		N:N Network setting error	
6312		Parallel link character error	
6313		Parallel link sum check error	
6314		Parallel link format error	
6320		Inverter communication error	
6321		MODBUS communication error	
6330		Memory access error	When the memory cassette is used, check whether it is mounted correctly. If the problem persists or if the memory cassette is not used, something may be malfunctioning inside the PLC. Consult your local Mitsubishi Electric representative.
6340		Special adapter connection error	Check connection of the special adapter.

Error code	PLC operation at error occurrence	Contents of error	Action
Parameter error [M8064(D8064)]			
0000	-	No error	
6401	Stops operation	Program sum check error	• STOP the PLC, and correctly set the parameters. • Check that the following functions are not used with an unsupported PLC version when a memory cassette is attached: - Permanent PLC lock (supported in the FX3U/FX3UC PLCs of Ver. 2.61 or later) - Read-protect the execution program for block passwords (supported in the FX3U/FX3UC PLCs of Ver. 3.00 or later) - FX3U-FLROM-1M (supported in the FX3U/FX3UC PLCs of Ver. 3.00 or later)
6402		Memory capacity setting error	
6403		Latched area setting error	
6404		Comment area setting error	
6405		File register area setting error	
6406		BFM initial value sum check error	
6407		BFM initial value error	
6409		Other setting error	
6411		Built-in CC-Link/LT setting parameter (dedicated area) error	• STOP the PLC, and correctly set the parameters. • Set parameters correctly, turn OFF the power, and then turn ON the power.
6412		Built-in CC-Link/LT setting parameter (special setting area) sum check error	
6413		Built-in CC-Link/LT setting parameter (dedicated area) sum check error	
6420		Special parameter sum check error	• STOP the PLC, and correctly set the parameters. • Set special parameters correctly, turn OFF the power, and then turn ON the power.
6421		Special parameters setting error	• Check the contents of the special parameter error code (D8489), confirm troubleshooting for special adapters/special blocks, and set special parameters correctly. • Set special parameters correctly, turn OFF the power, and then turn ON the power
Syntax error [M8065(D8065)]			
0000	-	No error	
6501	Stops operation	Incorrect combination among instruction, device symbol and device number	Each instruction is checked during programming. If a syntax error occurs, correct the improper instruction in the program mode.
6502		"OUT T" or "OUT C" is not provided before the set value.	
6503		• The set value is not provided after "OUT T" or "OUT C". • Insufficient number of operands in an instruction	
6504		• A same label number is used more than once. • A same interrupt input or high speed counter input is used more than once.	
6505		The device number is beyond the allowable range.	
6506		An undefined instruction is used.	
6507		Label number (P) definition error	
6508		Interrupt input (I) definition error	
6509		Other error	
6510		MC nesting number error	

Error code	PLC operation at error occurrence	Contents of error	Action
Circuit error [M8066(D8066)]			
0000	-	No error	
6610	Stops operation	The LD or LDI instruction is used continuously 9 times or more.	This error occurs when a combination of instructions is incorrect in the entire circuit block or when the relationship between a pair of instructions is incorrect. Correct the instructions in the program mode so that their mutual relationship becomes correct.
6611		The number of ANB or ORB instructions is more than the number of LD or LDI instructions.	
6612		The number of ANB or ORB instructions is less than the number of LD or LDI instructions.	
6613		MPS is used continuously 12 times or more.	
6614		MPS is not provided.	
6615		MPP is not provided.	
6616		A coil is not used between MPS-MRD and MPP, or the relationship between them is improper.	
6617		The following instructions should be connected to bus line: STL, RET, MCR, P, I, DI, EI, FOR, NEXT, SRET, IRET, FEND and END	
6618		The following instructions which can be used only in the main program are used in any other place (such as interrupt and subroutine): STL, MC and MCR	
6619		The following instructions cannot be used between FOR and NEXT: STL, RET, MC, MCR, I and IRET	
6620		The nesting level between FOR and NEXT is too much.	
6621		The number of FOR instructions and the number of NEXT instructions do not agree.	
6622		The NEXT instruction is not provided.	
6623		The MC instruction is not provided.	
6624		The MCR instruction is not provided	
6625		The STL instruction is used continuously 9 times or more.	
6626		The following instructions cannot be used between STL and RET: MC, MCR, I, SRET and IRET	
6627		The STL instruction is not provided.	
6628		The following instructions cannot be used in the main program: I, SRET and IRET	
6629		P or I is not provided.	
6630		The SRET or IRET instruction is not provided. The STL-RET or MC-MCR instructions are provided in a subroutine.	
6631		The SRET instruction is provided in an invalid position.	
6632		The FEND instruction is provided in an invalid position.	

Error code	PLC operation at error occurrence	Contents of error	Action
Operation error [M8067(D8067)]			
0000		No error	
6701	Continues operation	• There is no jump destination for CJ or CALL instruction. • The label is undefined or outside the range from P0 to P4095 due to indexing. • The label P63 is executed in the CALL instruction. P63 cannot be used in the CALL instruction because it offers jump to the END instruction.	This error occurs while the PLC is executing an operation. Review the program and check the contents of operands used in instructions. Even if the syntax or circuit design is correct, an operation error may occur for the following reasons, for example. Example: "T500Z" itself is not an error. However, if Z is "100", "T500Z" means "T600" which causes a device number error.
6702		The nesting level of CALL instruction is 6 or more.	
6703		The nesting level of interrupt is 3 or more.	
6704		The nesting level of FOR-NEXT instructions is 6 or more.	
6705		An unavailable device is used as an operand in an instruction.	
6706		The device number or data value of an operand in an instruction is outside the allowable range.	
6707		A file register is accessed without its parameter setting.	
6708		FROM/TO instruction error	This error occurs while the PLC is executing an operation. • Review the program and check the contents of operands used in instructions. • Confirm that the specified buffer memory exists in the counterpart equipment. • Confirm that extension cables are connected correctly.
6709		Others (invalid branch, etc.)	This error occurs while the PLC is executing an operation. Review the program and check the contents of operands used in instructions. Even if the syntax or circuit design is correct, an operation error may occur for the following reason, for example. Example: "T500Z" itself is not an error. However, if Z is "100", "T500Z" means "T600" which causes a device number error.
6710		Mismatch among parameters	This error occurs when a same device is used in both the source and the destination in a shift instruction, etc.
6730		Improper sampling time ($T_S \leq 0$)	<The PLC stops PID operation.> This data error occurs in the control parameter set value or during PID instruction. Check the contents of parameters.
6732		Improper input filter constant ($\alpha < 0$ or $100 \leq \alpha$)	
6733		Improper proportional gain ($K_P < 0$)	
6734		Improper integral time ($T_I < 0$)	
6735		Improper derivative gain ($K_D < 0$ or $201 \leq K_D$)	
6736		Improper derivative time ($T_D < 0$)	
6740		Sampling time (T_S) ≤ Scan time	<The PLC continues auto tuning.> The PLC continues the operation in the condition "Sampling time (Ts) = Cyclic time (Scan time)".

Error code	PLC operation at error occurrence	Contents of error	Action
Operation error [M8067(D8067)]			
6742	Continues operation	The measured value variation exceeds the limit. (ΔPV < -32768 or 32767 < ΔPV)	<The PLC continues PID operation.> The PLC continues operation with each parameter set to the maximum or minimum value.
6743		The deviation exceeds the limit. (EV < -32768 or 32767 < EV)	
6744		The integral result exceeds the limit. (Outside the range from -32768 to 32767)	
6745		The derivative value exceeds the limit due to the derivative gain (K_D) beyond the limit.	
6746		The derivative result exceeds the limit. (Outside the range from -32768 to 32767)	
6747		The PID operation result exceeds the limit. (Outside the range from -32768 to 32767)	
6748		PID output upper limit set value < PID output lower limit set value	<The PLC transposes the output upper limit value and the output lower limit value each other, and continues PID operation.> Confirm that the target setting contents are correct.
6749		The PID input variation alarm set value or output variation alarm set value is abnormal (Set value < 0).	<The PLC does not output alarm, and continues PID operation.> Confirm that the target setting contents are correct.
6750		<Step response method> The auto tuning result is improper.	<The PLC finishes auto tuning, and starts PID operation.> • The deviation at the start of auto tuning was 150 or less. • When auto tuning was finished, the difference was 1/3 or more of the difference at the start of auto tuning. Check the measured value and target value, and then execute tuning again.
6751		<Step response method> Auto tuning operation direction mismatch	<The PLC forcibly finishes auto tuning, and does not start PID operation.> The operation direction estimated from the measured value at the start of auto tuning did not agree with the actual operation direction caused by the output for auto tuning. Correct the relationship among the target value, output value for auto tuning and measured value, and then execute auto tuning again.
6752		<Step response method> The auto tuning operation is improper.	<The PLC finishes auto tuning, and does not start PID operation.> The PLC did not execute auto tuning correctly because the set value fluctuated during auto tuning. Set the sampling time to a value sufficiently longer than the output change cycle, or set the input filter constant to a larger value. After changing the setting, execute auto tuning again.
6753		<Limit cycle method> The output set value for auto tuning is abnormal. [ULV (upper limit) ≤ LLV (lower limit)]	<The PLC forcibly finishes auto tuning, and does not start PID operation.> Confirm that the target setting contents are correct.
6754		<Limit cycle method> The PV threshold (hysteresis) set value for auto tuning is abnormal. (SHPV < 0)	
6755		<Limit cycle method> The auto tuning transfer status is abnormal. (Data of a device which controls the transfer status is overwritten abnormally.)	<The PLC forcibly finishes auto tuning, and does not start PID operation.> Confirm that devices occupied by the PID instruction are not overwritten in the program.
6756		<Limit cycle method> The result is abnormal due to excessive auto tuning measurement time. (τ on > τ, τ on < 0, τ < 0)	<The PLC forcibly finishes auto tuning, and does not start PID operation.> The auto tuning time is longer than necessary. Increase the difference (ULV - LLV) between the upper limit and the lower limit of the output value for auto tuning, set the input filter constant (α) to a smaller value, or set the PV threshold (SH_{PV}) for auto tuning to a smaller value, and then check whether the situation is improved.
6757		<Limit cycle method> The auto tuning result exceeds the proportional gain. (K_P = Outside the range from 0 to 32767)	<The PLC finishes auto tuning (K_P = 32767), and starts PID operation.> The variation of the measured value (PV) is small compared with the output value. Multiply the measured value (PV) by "10", for example, so that the variation of the measured value will increase during auto tuning.

Error code	PLC operation at error occurrence	Contents of error	Action
Operation error [M8067(D8067)]			
6758	Continues operation	<Limit cycle method> The auto tuning result exceeds the integral time. (T_I = Outside the range from 0 to 32767)	<The PLC finishes auto tuning (K_P = 32767), and starts PID operation.> The auto tuning time is longer than necessary. Increase the difference (ULV - LLV) between the upper limit and the lower limit of the output value for auto tuning, set the input filter constant (α) to a smaller value, or set the PV threshold (SH_{PV}) for auto tuning to a smaller value, and then check whether the situation is improved.
6759		<Limit cycle method> The auto tuning result exceeds the derivative time. (T_D = Outside the range from 0 to 32767)	
6760		Sum check error in the ABS data sent from the servo	Check the connection to the servo and parameter setting.
6762		The port specified by an inverter communication instruction is already used in another communication.	Confirm that the port is not specified by another instruction.
6763		1) The input (X) specified in the DSZR, DVIT or ZRN instruction is already used in another communication. 2) The interrupt signal device in the DVIT instruction is outside the allowable setting range.	1) Confirm that the input (X) specified in the DSZR, DVIT or ZRN instruction is not used for the following purposes: - Input interrupt (including the delay function) - High speed counter C235 to C255 - Pulse catch relay M8170 to M8177 - SPD instruction 2) Check the contents of D8336 (interrupt signal specification) for the DVIT instruction.
6764		The pulse output number is already used in a positioning instruction or pulse instruction (PLSY, PWM, etc.).	Confirm that the pulse output destination is not driven by another positioning instruction.
6765		Tue number of times of using applied instructions exceeds the limit.	Confirm that the number of times an applied instruction is used in the program does not exceed the limit.
6770		Memory access error	When the memory cassette is used, check whether it is mounted correctly. If the problem persists or if the memory cassette is not used, something may be malfunctioning inside the PLC. Consult your local Mitsubishi Electric representative.
6771		The memory cassette is not connected.	Confirm that the memory cassette is attached correctly.
6772		Data write error to the memory cassette	The write-protect switch of the memory cassette was set to ON when data was transferred to the flash memory. Set the protect switch to OFF.
6773		Access error to the memory cassette in the RUN mode	While data was written in the RUN mode, data was transferred to (read from or written to) the memory cassette.
USB communication error [M8487 (D8487)]			
8702	Continues operation	Communication character error	Confirm the cable connection between the programming device and the PLC. This error may occur when a cable is disconnected an reconnected during PLC monitoring.
8703		Communication data sum check error	
8704		Data format error	
8705		Command error	
8730		Memory access error	When the memory cassette is used, check whether it is mounted correctly. If the problem persists or if the memory cassette is not used, something may be malfunctioning inside the PLC. Consult your local Mitsubishi Electric representative.

Error code	PLC operation at error occurrence	Contents of error	Action
Special block error [M8449(D8449)]			
□020*1	Continues operation	General data sum error	Verify that extension cables are correctly connected.
□021*1		General data message error	
□022*1		System access error	
□025*1		Access sum error in other station via CC-Link	
□026*1		Message error in other station via CC-Link	
□030*1		Memory access error	When the memory cassette is used, check whether it is mounted correctly. If the problem persists or if the memory cassette is not used, something may be malfunctioning inside the PLC. Consult your local Mitsubishi Electric representative.
□080*1		FROM/TO error	This error occurs in the execution of operation. • Review the program and check the contents of the operands used in applied instructions. • Verify that specified buffer memories exist in the counterpart equipment. • Verify that extension cables are correctly connected.
□090*1		Peripheral equipment access error	• Check the cable connection between the programming panel (PP) / programming device and the PLC. • Verify that extension cables are correctly connected.
Special parameter error [M8489 (D8489)]			
□□01*2	Continues operation	Special parameter setting time-out error	Turn OFF the power, and check the power supply and connection of special adapters/special blocks.
□□02*2		Special parameter setting error	Special parameters are set improperly. • Confirm troubleshooting for special adapters/special blocks, and set special parameters correctly. • Set special parameters correctly, turn OFF the power, and then turn ON the power.
□□03*2		Special parameter transfer target unconnected error	Special parameters are set, but special adapters/special blocks are not connected. Check whether special adapters/special blocks are connected.
□□04*2		Special parameter unsupported function	Check that special parameters with unsupported settings are not set for connected special adapters/special blocks.

*1. The unit number 0 to 7 of the special function unit/block error is put in □.

*2. "□□" indicates the following values for each special adapter/special block where an error has occurred.
If an error has occurred in 2 or more special adapters/special blocks, "□□" indicates the lowest unit number among the special adapters/special blocks in which an error has occurred.

Value of □□ (decimal)	Special adapter/special block where an error has occurred
00	Special block (Unit number 0)
10	Special block (Unit number 1)
20	Special block (Unit number 2)
30	Special block (Unit number 3)
40	Special block (Unit number 4)
50	Special block (Unit number 5)
60	Special block (Unit number 6)
70	Special block (Unit number 7)
81	Special adapter (Communication channel 1)
82	Special adapter (Communication channel 2)

Error bit	PLC operation at error occurrence	Contents of error	Action
Special block error condition [D8166]			
b0	Continues operation	Unit 0 access error	This error occurs when an operation is executed or when the END instruction is executed. • Review the program and check the contents of the operands used in applied instructions. • Verify that the specified buffer memories exist in the counterpart equipment. • Verify that extension cables are correctly connected.
b1		Unit 1 access error	
b2		Unit 2 access error	
b3		Unit 3 access error	
b4		Unit 4 access error	
b5		Unit 5 access error	
b6		Unit 6 access error	
b7		Unit 7 access error	
b8 to b15	-	Not available	

5.2 FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs

5.2.1 Error detection devices

1. Error detection (M8060 and later and D8060 and later)

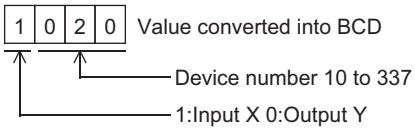
When some devices among M8060 to M8067 turn ON, D8004 stores the smallest device number and M8004 turns ON.

1) M8063 and M8067 are cleared when the PLC mode switches from STOP to RUN.
Note that M8068 and D8068 are not cleared.

2) When M8069 is set to ON, the PLC executes the I/O bus check. If an error is detected, D8061 stores the error code ("6103" or "6104") and M8061 turns ON.
When D8061 stores "6104", M8009 turns ON and D8009 stores the I/O numbers in the unit where 24V DC power failure has occurred.
Only FX2N/FX2NC PLCs support this function.

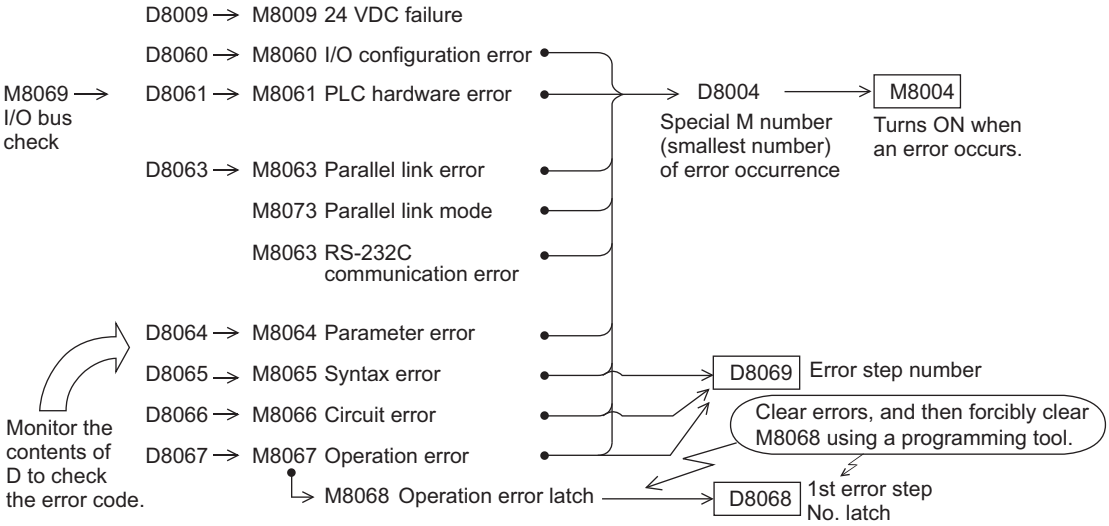
3) When units and blocks having programmed I/O numbers are not actually connected, M8060 turns ON and D8004 stores the head device number of unconnected units/blocks.
Only FXU/FX2NC PLCs support this function.

Example: When X020 is unconnected



2. Operations of special devices for error detection

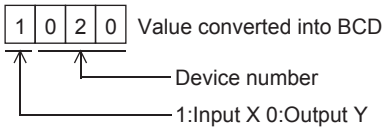
Special auxiliary relays for error detection and special data registers for error detection operate under the relationship shown below.
The error occurrence state can be checked by monitoring the contents of auxiliary relays and data registers from a programming tool or by using the PLC diagnosis function.



3. Error detection timing

Error item	Error detection timing		
	When power is turned ON from OFF	When PLC mode switches from STOP to RUN	Other timing
M8060 I/O configuration error	Checked	Checked	During operation
M8061 PLC hardware error	Checked	-	During operation
M8062 PLC/PP error	-	-	When PLC receives signal from PP
M8063 Link/communication error	-	-	When PLC receives signal from counterpart station
M8064 Parameter error	Checked	Checked	When program is changed (STOP) When program is transferred (STOP)
M8065 Syntax error			
M8066 Circuit error			
M8067 Operation error	-	-	During operation
M8068 Operation error latch			

5.2.2 Error Code List and Action

Error code	PLC operation at error occurrence	Contents of error	Action
I/O configuration error [M8060(D8060)]			
Example: 1020	Continues operation	Head unconnected I/O device number Example: When X020 is unconnected  • 1st to 3rd digits: Device number • 4th digit: I/O type (1:Input X 0:Output Y) Example: When D8060 stores "1020", inputs X020 and later are unconnected.	Unconnected I/O relay numbers are programmed. The PLC continues its operation. Modify the program if necessary.
PLC hardware error [M8061(D8061)]			
0000	-	No error	
6101	Stops operation	RAM error	Confirm that extension cables are connected correctly.
6102		Operation circuit error	
6103		I/O bus error (while M8069 is ON)	
6104		24V failure in function unit (while M8069 is ON)	
6105		Watchdog timer error	The sampling (scan) time exceeds the value stored in D8000. Check the program.
6110		Function extension memory failure (sum check error)	Confirm that the function extension memory is attached correctly.

Error code	PLC operation at error occurrence	Contents of error	Action
PLC/PP communication error [M8062(D8062)]			
0000	-	No error	
6201	Continues operation	Parity error, overrun error or framing error	Confirm that the equipment connected to the programming panel (PP) or programming connector is connected securely to the PLC. This error may occur when a cable is disconnected and reconnected while the PLC power is ON.
6202		Communication character error	
6203		Communication data sum check error	
6204		Data format error	
6205		Command error	
Parallel link communication error 1 [M8063(D8063)]			
0000	-	No error	
6301	Continues operation	Parity error, overrun error or framing error	• Inverter communication, computer link and programming: Confirm that communication parameters are set correctly in accordance with the application. • Simple N:N link, parallel link, etc.: Confirm that the program is set correctly in accordance with the application. • Confirm the wiring of communication cables.
6302		Communication character error	
6303		Communication data sum check error	
6304		Data format error	
6305		Command error	
6306		Monitoring timeout error	
6307 to 6311		No error	
6312		Parallel link character error	
6313		Parallel link sum check error	
6314		Parallel link format error	
Parameter error [M8064(D8064)]			
0000	-	No error	
6401	Stops operation	Program sum check error	Stop the PLC, and set the parameters correctly.
6402		Memory capacity setting error	
6403		Latched area setting error	
6404		Comment area setting error	
6405		File register area setting error	
6409		Other setting error	

Error code	PLC operation at error occurrence	Contents of error	Action
Syntax error [M8065(D8065)]			
0000	-	No error	
6501	Stops operation	Incorrect combination among instruction, device symbol and device number	Each instruction is checked during programming. If a syntax error occurs, correct the improper instruction in the program mode.
6502		"OUT T" or "OUT C" is not provided before the set value.	
6503		• The set value is not provided after "OUT T" or "OUT C". • Insufficient number of operands in an instruction	
6504		• A same label number is used more than once. • A same interrupt input or high speed counter input is used more than once.	
6505		The device number is beyond the allowable range.	
6506		An undefined instruction is used.	
6507		Label number (P) definition error	
6508		Interrupt input (I) definition error	
6509		Other error	
6510		MC nesting number error	
6511		A same interrupt input or high speed counter input is used more than once.	
6512		The EXTR instruction is executed though a function extension memory is not attached.	

Error code	PLC operation at error occurrence	Contents of error	Action
Circuit error [M8066(D8066)]			
0000	-	No error	
6601	Stops operation	The LD or LDI instruction is used continuously 9 times or more.	This error occurs when a combination of instructions is incorrect in the entire circuit block or when the relationship between a pair of instructions is incorrect. Correct the instructions in the program mode so that their mutual relationship becomes correct.
6602		• The LD or LDI instruction is not provided. A coil is not provided. The relationship between LD/LDI and ANB/ORB is improper. • The STL, RET, MCR, EI, DI, SRET, IRET, FOR, NEXT, FEND or END instruction, P (pointer) or I (interrupt) is not connected to the bus line. • The MPP instruction is not provided.	
6603		The MPS instruction is used continuously 12 times or more.	
6604		The relationship among MPS, MRD and MPP instructions is improper.	
6605		• The STL instruction is used continuously 9 times or more. • The MC, MCR, I (interrupt) or SRET instruction is provided inside the STL instruction. • The RET instruction is provided outside STL instruction. The RET instruction is not provided.	
6606		• P (pointer) or I (interrupt) are not provided. • SRET or IRET instruction is not provided. • I (interrupt), SRET or IRET instruction is provided in the main program. • The STL, RET, MC or MCR instruction is provided in a subroutine or interrupt routine.	
6607		• The relationship between the FOR instruction and the NEXT instruction is improper. The nesting level between the FOR instruction and the NEXT instruction is 6 or more. • The STL, RET, MC, MCR, IRET, SRET, FEND or END instruction is provided between the FOR instruction and the NEXT instruction.	
6608		• The relationship between the MC instruction and the MCR instruction is improper. • MCR NO is not provided. • The SRET or IRET instruction or I (interrupt) is provided between the MC instruction and the MCR instruction.	
6609		Other error	
6610		The LD or LDI instruction is used continuously 9 times or more.	
6611		The number of ANB or ORB instructions is more than the number of LD or LDI instructions.	
6612		The number of ANB or ORB instructions is less than the number of LD or LDI instructions.	
6613		MPS is used continuously 12 times or more.	
6614		MPS is not provided.	
6615		MPP is not provided.	
6616		A coil is not used between MPS-MRD and MPP, or the relationship between them is improper.	
6617		The following instructions should be connected to bus line: STL, RET, MCR, P, I, DI, EI, FOR, NEXT, SRET, IRET, FEND and END	
6618		The following instructions which can be used only in the main program are used in any other place (such as interrupt and subroutine): STL, MC and MCR	
6619		The following instructions cannot be used between FOR and NEXT: STL, RET, MC, MCR, I and IRET	
6620		The nesting level between FOR and NEXT is too much.	
6621		The number of FOR instructions and the number of NEXT instructions do not agree.	
6622		The NEXT instruction is not provided.	
6623		The MC instruction is not provided.	
6624		The MCR instruction is not provided	
6625		The STL instruction is used continuously 9 times or more.	

Error code	PLC operation at error occurrence	Contents of error	Action
6626	Stops operation	The following instructions cannot be used between STL and RET: MC, MCR, I, SRET and IRET	This error occurs when a combination of instructions is incorrect in the entire circuit block or when the relationship between a pair of instructions is incorrect. Correct the instructions in the program mode so that their mutual relationship becomes correct.
6627		The RET instruction is not provided.	
6628		The following instructions cannot be used in the main program: I, SRET and IRET	
6630		The SRET or IRET instruction is not provided. The STL-RET or MC-MCR instructions are provided in a subroutine.	
6631		The SRET instruction is provided in an invalid position.	
6632		The FEND instruction is provided in an invalid position.	

Error code	PLC operation at error occurrence	Contents of error	Action
Operation error [M8067(D8067)]			
0000		No error	
6701	Continues operation	• There is no jump destination for CJ or CALL instruction. • A label is provided after the END instruction. • An independent label is provided between the FOR instruction and the NEXT instruction or between routine programs.	This error occurs while the PLC is executing an operation. Review the program, or check the contents of operands used in instructions. Even if the syntax or circuit design is correct, an operation error may occur for the following reasons, for example. Example: "T200Z" itself is not an error. However, if Z is "100", "T200Z" means "T300" which causes a device number error.
6702		The nesting level of CALL instruction is 6 or more.	
6703		The nesting level of interrupt is 3 or more.	
6704		The nesting level of FOR-NEXT instructions is 6 or more.	
6705		An unavailable device is used as an operand in an instruction.	
6706		The device number or data value of an operand in an instruction is outside the allowable range.	
6707		A file register is accessed without its parameter setting.	
6708		FROM/TO instruction error	This error occurs while the PLC is executing an operation. • Review the program, or check the contents of operands used in instructions. • Confirm that the specified buffer memory exists in the counterpart equipment. • Confirm that extension cables are connected correctly.
6709		Other error (absence of the IRET instruction, absence of the SRET instruction, improper relationship between FOR and NEXT, etc.)	This error occurs while the PLC is executing an operation. Review the program, or check the contents of operands used in instructions. Even if the syntax or circuit design is correct, an operation error may occur for the following reason, for example. Example: "T200Z" itself is not an error. However, if Z is "100", "T200Z" means "T300" which causes a device number error.
6730		Improper sampling time ($T_S \leq 0$)	<The PLC stops PID operation.> This data error occurs in the control parameter set value or during PID instruction. Check the contents of parameters.
6732		Improper input filter constant ($\alpha < 0$ or $100 \leq \alpha$)	
6733		Improper proportional gain ($K_P < 0$)	
6734		Improper integral time ($T_I < 0$)	
6735		Improper derivative gain ($K_D < 0$ or $201 \leq K_D$)	
6736		Improper derivative time ($T_D < 0$)	
6740		Sampling time (T_S) ≤ Scan time	<The PLC continues operation while regarding the operation data as the maximum value.> A data error has occurred in the control parameter set value or PID operation. Check the contents of parameters.

Error code	PLC operation at error occurrence	Contents of error	Action
Operation error [M8067(D8067)]			
6742	Continues operation	The measured value variation exceeds the limit. (ΔPV < -32768 or 32767 < ΔPV)	<The PLC continues PID operation.> The PLC continues operation with each parameter set to the maximum or minimum value.
6743		The deviation exceeds the limit. (EV < -32768 or 32767 < EV)	
6744		The integral result exceeds the limit. (Outside the range from -32768 to 32767)	
6745		The derivative value exceeds the limit due to the derivative gain (K_D) beyond the limit.	
6746		The derivative result exceeds the limit. (Outside the range from -32768 to 32767)	
6747		The PID operation result exceeds the limit. (Outside the range from -32768 to 32767)	
6750		<Step response method> The auto tuning result is improper.	<The PLC finishes auto tuning, and starts PID operation.> • When auto tuning was finished, the difference between the measured value at the start of auto tuning and the target value was 150 or less. • When auto tuning was finished, the difference between the measured value at the start of auto tuning and the target value was 1/3 or more. Check the measured value and target value, and then execute tuning again.
6751		<Step response method> Auto tuning operation direction mismatch	<The PLC forcibly finishes auto tuning, and does not start PID operation.> The operation direction estimated from the measured value at the start of auto tuning did not agree with the actual operation direction caused by the output for auto tuning. Correct the relationship among the target value, output value for auto tuning and measured value, and then execute auto tuning again.
6752		<Step response method> The auto tuning operation is improper.	<The PLC finishes auto tuning, and does not start PID operation.> The PLC did not execute auto tuning correctly because the set value fluctuated during auto tuning. Set the sampling time to a value sufficiently longer than the output change cycle, or set the input filter constant to a larger value. After changing the setting, execute auto tuning again.
6760		Sum check error in the ABS data sent from the servo	Check the connection to the servo and parameter setting.

5.3 FX0S/FX0/FX0N/FXU/FX2C PLCs

5.3.1 Error detection devices

1. Error detection (M8060 and later and D8060 and later)

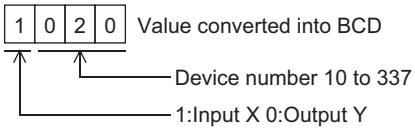
When some devices among M8060 to M8067 turn ON, D8004 stores the smallest device number and M8004 turns ON.

1) M8063 and M8067 are cleared when the PLC mode switches from STOP to RUN.
Note that M8068 and D8068 are not cleared.

2) When M8069 is set to ON, the PLC executes the I/O bus check. If an error is detected, D8061 stores the error code ("6103") and M8061 turns ON.
Only FXU/FX2C PLCs support this function.

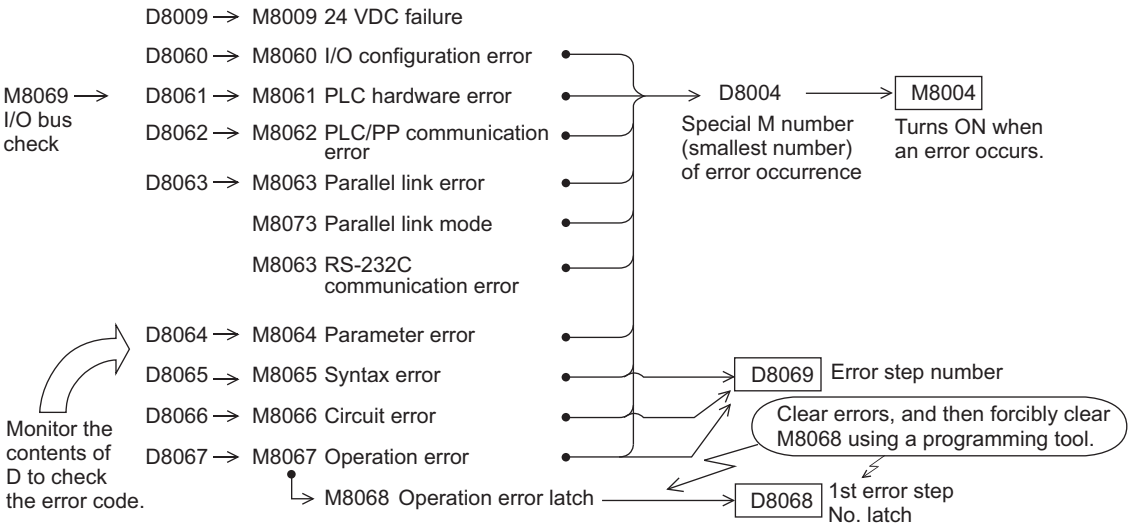
3) When units and blocks having programmed I/O numbers are not actually connected, M8060 turns ON and D8004 stores the head device number of unconnected units/blocks.
Only FXU/FX2C PLCs support this function.

Example: When X020 is unconnected



2. Operations of special devices for error detection

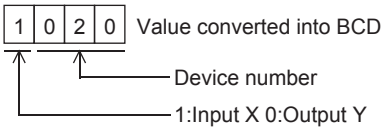
Special auxiliary relays for error detection and special data registers for error detection operate under the relationship shown below.
The error occurrence state can be checked by monitoring the contents of auxiliary relays and data registers from a programming tool or by using the PLC diagnosis function.



3. Error detection timing

Error item	Error detection timing		
	When power is turned ON from OFF	When PLC mode switches from STOP to RUN	Other timing
M8060 I/O configuration error	Checked	Checked	During operation
M8061 PLC hardware error	Checked	-	During operation
M8062 PLC/PP error	-	-	When PLC receives signal from PP
M8063 Link/communication error	-	-	When PLC receives signal from counterpart station
M8064 Parameter error	Checked	Checked	When program is changed (STOP) When program is transferred (STOP)
M8065 Syntax error			
M8066 Circuit error			
M8067 Operation error	-	-	During operation
M8068 Operation error latch			

5.3.2 Error Code List and Action

Error code	PLC operation at error occurrence	Contents of error	Action
I/O configuration error [M8060(D8060)]			
Example: 1020	Continues operation	Head unconnected I/O device number Example: When X020 is unconnected  • 1st to 3rd digits: Device number • 4th digit: I/O type (1:Input X 0:Output Y) Example: When D8060 stores "1020", inputs X20 and later are unconnected.	Unconnected I/O relay numbers are programmed. The PLC continues its operation. Modify the program if necessary.
PLC hardware error [M8061(D8061)]			
0000	-	No error	
6101	Stops operation	RAM error	Confirm that extension cables are connected correctly.
6102		Operation circuit error	
6103		I/O bus error (while M8069 is ON)	

Error code	PLC operation at error occurrence	Contents of error	Action
PLC/PP communication error [M8062(D8062)]			
0000	-	No error	
6201	Continues operation	Parity error, overrun error or framing error	Confirm that the equipment connected to the programming panel (PP) or programming connector is connected securely to the PLC.
6202		Communication character error	
6203		Communication data sum check error	
6204		Data format error	
6205		Command error	
Parallel link communication adapter error 1 [M8063(D8063)]			
0000	-	No error	
6301	Continues operation	Parity error, overrun error or framing error	• Confirm that the power is ON in both PLCs. • Confirm that the connection between the adapter and the PLC and the connection between ring adapters are performed correctly.
6302		Communication character error	
6303		Communication data sum check error	
6304		Data format error	
6305		Command error	
6306		Monitoring timeout error	
Parameter error [M8064(D8064)]			
0000	-	No error	
6401	Stops operation	Program sum check error	Stop the PLC, and set the parameters correctly.
6402		Memory capacity setting error	
6403		Latched area setting error	
6404		Comment area setting error	
6405		File register area setting error	
6409		Other setting error	

Error code	PLC operation at error occurrence	Contents of error	Action
Syntax error [M8065(D8065)]			
0000	-	No error	
6501	Stops operation	Incorrect combination among instruction, device symbol and device number	Each instruction is checked during programming. If a syntax error occurs, correct the improper instruction in the program mode.
6502		"OUT T" or "OUT C" is not provided before the set value.	
6503		• The set value is not provided after "OUT T" or "OUT C". • Insufficient number of operands in an instruction	
6504		• A same label number is used more than once. • A same interrupt input or high speed counter input is used more than once.	
6505		The device number is beyond the allowable range.	
6509		Other error	
Circuit error [M8066(D8066)]			
0000	-	No error	
6601	Stops operation	The LD or LDI instruction is used continuously 9 times or more.	This error occurs when a combination of instructions is incorrect in the entire circuit block or when the relationship between a pair of instructions is incorrect. Correct the instructions in the program mode so that their mutual relationship becomes correct.
6602		• The LD or LDI instruction is not provided. A coil is not provided. The relationship between LD/LDI and ANB/ORB is improper. • The STL, RET, MCR, EI, DI, SRET, IRET, FOR, NEXT, FEND or END instruction, P (pointer) or I (interrupt) is not connected to the bus line. • The MPP instruction is not provided.	
6603		The MPS instruction is used continuously 12 times or more.	
6604		The relationship among MPS, MRD and MPP instructions is improper.	
6605		• The STL instruction is used continuously 9 times or more. • The MC, MCR, I (interrupt) or SRET instruction is provided inside the STL instruction. • The RET instruction is provided outside STL instruction. The RET instruction is not provided.	
6606		• P (pointer) or I (interrupt) are not provided. • SRET or IRET instruction is not provided. • I (interrupt), SRET or IRET instruction is provided in the main program. • The STL, RET, MC or MCR instruction is provided in a subroutine or interrupt routine.	
6607		• The relationship between the FOR instruction and the NEXT instruction is improper. The nesting level between the FOR instruction and the NEXT instruction is 6 or more. • The STL, RET, MC, MCR, IRET, SRET, FEND or END instruction is provided between the FOR instruction and the NEXT instruction.	
6608		• The relationship between the MC instruction and the MCR instruction is improper. • MCR NO is not provided. • The SRET or IRET instruction or I (interrupt) is provided between the MC instruction and the MCR instruction.	
6609		Other error	

Error code	PLC operation at error occurrence	Contents of error	Action
Operation error [M8067(D8067)]			
0000		No error	
6701	Continues operation	• There is no jump destination for CJ or CALL instruction. • A label is provided after the END instruction. • An independent label is provided between the FOR instruction and the NEXT instruction or between routine programs.	This error occurs while the PLC is executing an operation. Review the program, or check the contents of operands used in instructions. Even if the syntax or circuit design is correct, an operation error may occur for the following reasons, for example. Example: "T200Z" itself is not an error. However, if Z is "100", "T200Z" means "T300" which causes a device number error.
6702		The nesting level of CALL instruction is 6 or more.	
6703		The nesting level of interrupt is 3 or more.	
6704		The nesting level of FOR-NEXT instructions is 6 or more.	
6705		An unavailable device is used as an operand in an instruction.	
6706		The device number or data value of an operand in an instruction is outside the allowable range.	
6707		A file register is accessed without its parameter setting.	
6708		FROM/TO instruction error	This error occurs while the PLC is executing an operation. • Review the program, or check the contents of operands used in instructions. • Confirm that the specified buffer memory exists in the counterpart equipment. • Confirm that extension cables are connected correctly.
6709		Other error (absence of the IRET instruction, absence of the SRET instruction, improper relationship between FOR and NEXT, etc.)	This error occurs while the PLC is executing an operation. Review the program, or check the contents of operands used in instructions. Even if the syntax or circuit design is correct, an operation error may occur for the following reason, for example. Example: "T200Z" itself is not an error. However, if Z is "100", "T200Z" means "T300" which causes a device number error.
6730		Improper sampling time ($T_S \leq 0$)	<The PLC stops PID operation.> This data error occurs in the control parameter set value or during PID instruction. Check the contents of parameters.
6732		Improper input filter constant ($\alpha < 0$ or $100 \leq \alpha$)	
6733		Improper proportional gain ($K_P < 0$)	
6734		Improper integral time ($T_I < 0$)	
6735		Improper derivative gain ($K_D < 0$ or $201 \leq K_D$)	
6736		Improper derivative time ($T_D < 0$)	
6740		Sampling time (T_S) ≤ Scan time	
6742		The measured value variation exceeds the limit. (ΔPV < -32768 or 32767 < ΔPV)	<The PLC continues operation while regarding the operation data as the maximum value.> A data error has occurred in the control parameter set value or PID operation. Check the contents of parameters.
6743		The deviation exceeds the limit. (EV < -32768 or 32767 < EV)	
6744		The integral result exceeds the limit. (Outside the range from -32768 to 32767)	
6745		The derivative value exceeds the limit due to the derivative gain (K_D) beyond the limit.	
6746		The derivative result exceeds the limit. (Outside the range from -32768 to 32767)	
6747		The PID operation result exceeds the limit. (Outside the range from -32768 to 32767)	

6. Types and Setting of Parameters

Setting of parameters means setting of the environment where the PLC operates.
Almost all PLCs can be used with factory default values. When it is necessary to add an optional memory, set the comment capacity, set the communication condition for serial ports, etc., however, change the parameter setting using a programming tool such as personal computer.

6.1 Parameter List

The following items can be set in the parameter setting.

1. FX3S/FX3G/FX3GC/FX3U/FX3UC PLCs

Classification	Item	Description
Memory Capacity	Memory Capacity	This parameter specifies the maximum value for the number of steps to which a sequence program can be input. 1) The upper limit is determined by the capacity of the built-in memory or attached optional memory. 2) The memory capacity includes the program memory, file registers, comment area and other special setting capacity.
	Comments Capacity	This parameter incorporates comments into the program memory. 1) Because comments remain in the PLC, the contents can be easily understood at the time of maintenance. 2) Up to 50 comments can be input when one block is specified, and one block requires 500 steps in the memory capacity.
	File Register Capacity	This parameter incorporates data registers into the program memory. 1) A sequence program and control data such as machining set values can be handled together, which is convenient. 2) Up to 500 file registers can be created when one block is specified, and one block requires 500 steps in the memory capacity.
	Special Function Memory Capacity	1) This parameter sets whether or not the special block/unit initial value setting function is used[*1]. When this function is used, this function requires 4000 steps (8 blocks) in the memory capacity. 2) This parameter sets whether or not the positioning setting (constants and setting table) in the TBL instruction is used. When this setting is used, this setting requires 9000 steps (18 blocks). 3) This parameter sets whether or not the built-in CC-Link/LT function is used[*2]. When this function is used, this function requires 500 steps (1 block) in the memory capacity.
Device	Latch range setting	This parameter enables to change the latched (backed-up) device range and non-latched (non-backed-up) device range inside the PLC.
Special Function Block	Special Function Block Settings	This parameter sets the initial values of the buffer memory (BFM) for each special block/unit number. It is necessary to set the memory capacity.
	Built-in CC-Link/LT Setting	This parameter sets the transmission speed, point mode and station information. It is necessary to set the memory capacity when setting the station information.
PLC System (1)	Battery Less Mode	This parameter sets the PLC operation mode without a battery. When the batteryless mode is selected, the PLC automatically stops detection of low battery voltage error, and initializes the contents of latched (backed-up) devices.
	Battery mode	This parameter sets the PLC operation mode with a battery. When the battery mode is selected, general-purpose devices can be changed to the latched (backed-up) type.
	MODEM Initialized	This parameter automatically sends a specified AT command as the initialization command to a modem connected to the serial port.
	RUN Terminal Input	This parameter specifies the input number of the RUN input described above in the range from X000 to X017. (X000 to X007 in the FX3U-16M□, FX3UC-16M□ and 14-point type FX3G PLCs) (X000 to X015 in 24-point type FX3G PLCs)
PLC System (2)	Serial port operation setting	This parameter corresponds to the following settings by specifying each contents on the personal computer screen: Setting of the communication format (D8120, D8400 and D8420) Setting of the station number (D8121 and D8421) Setting of the timeout check (D8129, D8409 and D8429)
Positioning	Constant setting	This parameter sets interrupt inputs for the maximum speed, bias speed, creep speed, zero return speed, acceleration time, deceleration time and DVIT instruction. It is necessary to set the memory capacity.
	Individual dual setting	This parameter sets the operation table. It is necessary to set the memory capacity.
Special parameter	Ethernet Port	Special parameters are used in special adapters, special blocks, etc. They are stored in the main unit.
	Network parameter	

Classification	Item	Description
Others	Keyword	This parameter sets protection to prevent erroneous reading and incorrect writing of a sequence program. The keyword protection (8digits), keyword protection (16digits) and customer keyword can be specified in alphanumeric characters A to F and 0 to 9. In addition, a permanent PLC lock can be specified.
	Program title	This parameter enables to set a character string to be used as the program title.
	Storage of the symbolic information / Block password	For details refer to Section 7.1.

2. FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs

Classification	Item	Description
Memory Capacity	Memory Capacity	This parameter specifies the maximum value for the number of steps to which a sequence program can be input. 1) The upper limit is determined by the capacity of the built-in memory or attached optional memory. 2) The memory capacity includes the program memory, file registers and comment area.
	Comments Capacity	This parameter incorporates comments into the program memory. 1) Because comments remain in the PLC, the contents can be easily understood at the time of maintenance. 2) Up to 50 comments can be input when one block is specified, and one block requires 500 steps in the memory capacity.
	File Register Capacity	This parameter incorporates data registers into the program memory. 1) A sequence program and control data such as machining set values can be handled together, which is convenient. 2) Up to 500 file registers can be created when one block is specified, and one block requires 500 steps in the memory capacity.
Device	Latch range setting	This parameter enables to change the latched (backed-up) device range and non-latched (non-backed-up) device range inside FX2N/FX2NC PLCs. (These device ranges cannot be changed in FX1S/FX1N/FX1NC PLCs.)
PLC System(1)	Battery Less Mode	This parameter sets the PLC operation mode without a battery in FX2N/FX2NC PLCs. When the batteryless mode is selected, the PLC automatically stops detection of battery voltage low error, and initializes the contents of latched (backed-up) devices.
	MODEM Initialized	This parameter automatically sends a specified AT command as the initialization command to a modem connected to the serial port.
	RUN Terminal Input	This parameter specifies the input number of the RUN input described above in the range from X000 to X017. In main units whose number of input points is 16 or less, the input number can be set for available number of input points.
PLC System(2)	Serial port operation setting	This parameter corresponds to the following settings by specifying each contents on the personal computer screen: Setting of the communication format (D8120) Setting of the station number (D8121) Setting of the timeout check (D8129)
Others	Keyword	This parameter sets protection to prevent erroneous reading and incorrect writing of a sequence program. The 8-digit keyword can be specified in alphanumeric characters A to F and 0 to 9.
	Program title	This parameter enables to set a character string to be used as the program title.

3. FX0S/FX0/FX0N/FXU/FX2C PLCs

Classification	Item	Description
Memory Capacity	Memory Capacity	This parameter specifies the maximum value for the number of steps to which a sequence program can be input. This item is not available in FX0S/FX0/FX0N PLCs. 1) The upper limit is determined by the capacity of the built-in memory or attached optional memory. 2) The memory capacity includes the program memory, file registers and comment area.
	Comments Capacity	This parameter incorporates comments into the program memory. This item is not available in FX0S/FX0 PLCs. 1) Because comments remain in the PLC, the contents can be easily understood at the time of maintenance. 2) Up to 50 comments can be input when one block is specified, and one block requires 500 steps in the memory capacity.
	File Register Capacity	This parameter incorporates data registers into the program memory. This item is not available in FX0S/FX0 PLCs. 1) A sequence program and control data such as machining set values can be handled together, which is convenient. 2) Up to 500 file registers can be created when one block is specified, and one block requires 500 steps in the memory capacity.
Device	Latch range setting	This parameter enables to change the latched (backed-up) device range and non-latched (non-backed-up) device range inside the PLC. This item is not available in FX0S/FX0/FX0N PLCs.
Others	Keyword	This parameter sets protection to prevent erroneous reading and incorrect writing of a sequence program. The 8-digit keyword can be specified in alphanumeric characters A to F and 0 to 9.
	Program title	This parameter enables to set a character string to be used as the program title. This item is not available in FX0S/FX0 PLCs.

6.2 Parameter Initial Values

1. FX3U/FX3UC PLCs

Item		Initial value	Setting range
Memory Capacity	Program Capacity (steps)	16000	Refer to Section 6.3.
	Comment Capacity (blocks)	0	
	File register Capacity (blocks)	0	
	Special Function Block Settings	Not used	
	Positioning Instruction Settings	Not used	
	Built-in CC-Link/LT Settings*1	Not used	
Latched (backed-up) range	Supplement relay [M]	500 to 1023	0 to 1023
	State [S]	500 to 999	0 to 999
	Counter [C] (16 bit)	100 to 199	0 to 199
	Counter [C] (32 bit)	220 to 255	200 to 255
	Data Register [D]	200 to 511	0 to 511
Program title		Not registered	Refer to Section 6.1.
Keyword		Not registered	
Battery Less Mode		Not used	
MODEM Initialized		Not provided	
RUN Terminal Input		Not provided	
Serial port operation setting		Not set	

*1. Available only in the FX3UC-32MT-LT-2.

2. FX3G/FX3GC PLCs

Item		Initial value	Setting range
Memory Capacity	Program Capacity (steps)	8000	Refer to Section 6.3.
	Comment Capacity (blocks)	0	
	File register Capacity (blocks)	0	
	Positioning	Not used	
Latched (backed-up) range	Supplement relay [M]	cannot be changed	cannot be changed
	State [S]	cannot be changed	cannot be changed
	Counter [C] (16 bit)	cannot be changed	cannot be changed
	Counter [C] (32 bit)	cannot be changed	cannot be changed
	Data Register [D]	cannot be changed	cannot be changed
Program title		Not registered	Refer to Section 6.1.
Keyword		Not registered	
Battery Mode		Not used	
MODEM Initialized		Not provided	
RUN Terminal Input		Not provided	
Serial port operation setting		Not set	

3. FX3S PLC

Item		Initial value	Setting range
Memory Capacity		16000	Refer to Section 6.3.
	Program Capacity (steps)	4000	
	Comment Capacity (blocks)	24	
	File register Capacity (blocks)	0	
Latched (backed-up) range	Supplement relay [M]	cannot be changed	cannot be changed
	State [S]	cannot be changed	cannot be changed
	Counter [C] (16 bit)	cannot be changed	cannot be changed
	Counter [C] (32 bit)	cannot be changed	cannot be changed
	Data Register [D]	cannot be changed	cannot be changed
Program title		Not registered	Refer to Section 6.1.
Keyword		Not registered	
MODEM Initialized		Not provided	
RUN Terminal Input		Not provided	
Serial port operation setting		Not set	

4. FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs

Item		Initial value			Setting range		
		FX1S	FX1N, FX1NC	FX2N, FX2NC	FX1S	FX1N, FX1NC	FX2N, FX2NC
Memory capacity	Program Capacity	2000	8000	8000	Refer to Section 6.3.	Refer to Section 6.3.	Refer to Section 6.3.
	Comment Capacity	0	0	0			
	File register Capacity	0	0	0			
Latched (backed-up) range	Supplement relay [M]	384 to 511	384 to 511	500 to 1023	Cannot be changed	Cannot be changed	0 to 1023
	State [S]	0 to 127	0 to 127	500 to 999			0 to 999
	Counter [C] (16 bit)	16 to 31	16 to 31	100 to 199			0 to 199
	Counter [C] (32 bit)	235 to 255	220 to 255	220 to 255			200 to 255
	Data Register [D]	128 to 255	220 to 255	200 to 511			0 to 511
Program title		Not registered	Not registered	Not registered	Refer to Section 6.1.	Refer to Section 6.1.	Refer to Section 6.1.
Keyword		Not registered	Not registered	Not registered			
Battery Less Mode		*1	*1	Not provided			
MODEM Initialized		Not provided	Not provided	Not set			
RUN Terminal Input		Not provided	Not provided	Not provided			
Serial port operation setting		Not set	Not set	Not set			

*1. The batteryless mode is not supported.

5. FX0S/FX0/FX0N/FXU/FX2C PLCs

Item		Initial value			Setting range		
		FX0S, FX0	FX0N	FXU, FX2C	FX0S, FX0	FX0N	FXU, FX2C
Memory Capacity	Program Capacity (steps)	800	2000	2000	Cannot be changed	Refer to Section 6.3.	Refer to Section 6.3.
	Comment Capacity (blocks)	*1	0	0	*1		
	File register Capacity (blocks)	*2	0	0	*2		
Latched (backed-up) range	Supplement relay [M]	496 to 511	384 to 511	500 to 1023	Cannot be changed	Cannot be changed	0 to 1023
	State [S]	*3	0 to 127	500 to 999	*3		0 to 999
	Counter [C] (16 bit)	14 to 15	16 to 31	100 to 199	Cannot be changed		0 to 199
	Counter [C] (32 bit)	235, 241, 244 to 254	235 to 254	220 to 255			220 to 255
	Data Register [D]	30, 31	128 to 255	200 to 511			0 to 511

*1. Comment Capacity are not supported.
*2. File registers are not supported.
*3. (Latched type) state relays are not supported.

6.3 Memory Capacity Setting Range

1. FX3U/FX3UC PLCs

⊙: Built-in memory capacity ✓: Can be set by change of parameter setting

Number of steps	Memory capacity setting	Comment capacity setting Unit: Block	File register capacity setting Unit: Block	Special unit initial value setting Unit: Block	Positioning setting Unit: Block	Built-in CC-Link/LT setting*2 Unit: Block
2000 steps	✓	0 to 3	0 to 3	-	-	1
4000 steps	✓	0 to 7	0 to 7	-	-	1
8000 steps	✓	0 to 15	0 to 14	8	-	1
16000 steps	✓	0 to 31	0 to 14	8	18	1
32000 steps	✓	0 to 63	0 to 14	8	18	1
64000 steps	⊙	0 to 127	0 to 14	8	18	1

2. FX3S/FX3G/FX3GC PLCs

⊙: Built-in memory capacity ✓: Can be set by change of parameter setting

Number of steps	Memory capacity setting		Comment capacity setting Unit: Block		File register capacity setting Unit: Block		Positioning setting Unit: Block	
	FX3G FX3GC	FX3S	FX3G FX3GC	FX3S	FX3G FX3GC	FX3S	FX3G FX3GC	FX3S
2000 steps	✓	✓	0 to 3	0 to 3	0 to 3	0 to 3	-	-
4000 steps	✓	✓	0 to 7	0 to 7	0 to 7	0 to 4	-	-
8000 steps	✓	-	0 to 15	-	0 to 14	-	-	-
16000 steps	✓	⊙	0 to 31	20 to 24	0 to 14	0 to 4	18	-
32000 steps	⊙	-	0 to 63	-	0 to 14	-	18	-

3. FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs

⊙: Built-in memory capacity ✓: Can be set by change of parameter setting
●: Can be extended by optional memory

Number of steps	Memory capacity setting			Comment capacity setting Unit: Block			File register capacity setting Unit: Block		
	FX1S	FX1N FX1NC	FX2N FX2NC	FX1S	FX1N FX1NC	FX2N FX2NC	FX1S	FX1N FX1NC	FX2N FX2NC
2000 steps	⊙	✓	✓	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3	0 to 3
4000 steps	-	✓	✓	-	0 to 7	0 to 7	-	0 to 7	0 to 7
8000 steps	-	⊙	⊙	-	0 to 15	0 to 15	-	0 to 14	0 to 14
16000 steps	-	-	●	-	-	0 to 31	-	-	0 to 14

4. FX0S/FX0/FX0N/FXU/FX2C PLCs

⊙: Built-in memory capacity ✓: Can be set by change of parameter setting
●: Can be extended by optional memory

Number of steps	Memory capacity setting			Comment capacity setting Unit: Block			File register capacity setting Unit: Block		
	FX0S FX0	FX0N	FXU FX2C	FX0S FX0	FX0N	FXU FX2C	FX0S FX0	FX0N	FXU FX2C
2000 steps	⊙	⊙	⊙	-	0 to 3	0 to 3	-	0 to 3	0 to 3
4000 steps	-	-	●	-	-	0 to 7	-	-	0 to 4
8000 steps	-	-	●	-	-	0 to 8	-	-	0 to 4

Caution on setting the memory capacity

- When one block is set in each capacity setting, the memory capacity is reduced by 500 steps.
  Each setting should satisfy the following expression:

Memory capacity setting range	>	Comment capacity setting	+	File register capacity setting	+	Special unit initial value setting	+	Positioning setting	+	Built-in CC-Link/LT Setup

1) With regard to the comment capacity, up to 50 device comments can be set in one block.
2) With regard to the file register capacity, up to 500 (16-bit) file registers can be set in one block.
3) In the special unit initial value setting, 8 blocks (4000 steps) are used.
4) In the positioning setting, 18 blocks (9000 steps) are used.
5) In the built-in CC-Link/LT setup, 1 block (500 steps) are used.

Cautions

1) After changing the memory capacity setting, make sure to write both programs and parameters together to the PLC.
   If only parameters are written to the PLC, program errors (such as parameter error, circuit error and syntax error) may occur in the PLC.
2) When the memory capacity of the FX3S PLC is 16000 steps, the program capacity is fixed to 4000 steps, and the total of the comment capacity and the file register capacity is limited to 12000 steps (24 blocks). The comment capacity is automatically set when the file register capacity is set.
3) FX3G/FX3GC PLCs operate in the extension mode when the program capacity is 16001 steps or more, or in the standard mode when the program capacity is 16000 steps or less.
   The instruction execution time is longer in the extension mode than in the standard mode.

   Example: LD (basic instruction) execution time
   Standard mode: 0.21 μs
   Extension mode: 0.42 μs
4) The PLC can store symbolic information in the following capacity:
   Make sure that the capacity of symbolic information to be stored does not exceed the available capacity.
   - In the case of built-in memory, 16K memory cassette (FX3U-FLROM-16) and 64K memory cassette (FX3U-FLROM-64 and FX3U-FLROM-64L)
     Symbolic information capacity = Maximum capacity of memory - Capacity of memory set by parameters
   - In the case of FX3U-FLROM-1M
     Fixed to 1300 kB
     It is recommended to use the FX3U-FLROM-1M when there is a large amount of symbolic information to be stored.
     It is possible to check the symbolic information capacity using the memory capacity calculation (offline) of GX Works2.

     → **For datails, refer to the GX Works2 manual.**
5) When symbolic information is stored, it is deleted if the memory capacity set by parameters is changed. After changing the memory capacity, write the symbolic information again.

6.4 Compatible Optional Memory Models

1. FX3U/FX3UC PLCs

Model name	Maximum number of steps	Memory type	Allowable number of times of writing	Remarks
FX3U-FLROM-64	64000	Flash memory	10000 times	Write protect switch is provided.
FX3U-FLROM-16	16000	Flash memory	10000 times	Write protect switch is provided.
FX3U-FLROM-64L	64000	Flash memory	10000 times	Write protect switch and loader function are provided.
FX3U-FLROM-1M	64000	Flash memory	10000 times	Write-protect switch and there is an area (1300 kB) dedicated to the storage of symbolic information.

Model name	FX3U	FX3UC
FX3U-FLROM-64	✓	✓
FX3U-FLROM-16	✓	✓*1
FX3U-FLROM-64L	✓	✓*1
FX3U-FLROM-1M	✓*2	✓*2

*1. Supported in Ver. 2.20 or later.

*2. Supported in Ver. 3.00 or later.

2. FX3S/FX3G/FX3GC PLCs

Model name	Maximum number of steps	Memory type	Allowable number of times of writing	Remarks
FX3G-EEPROM-32L	32000	EEPROM memory	10000 times	Write protect switch and loader function are provided.

Model name	FX3G	FX3GC	FX3S*1
FX3G-EEPROM-32L	✓	-	✓

*1. The FX3S Series PLC can hold 16,000 steps of memory, but user program capacity is limited to 4,000 steps.

3. FX1S/FX1N/FX1NC/FX2N/FX2NC PLCs

Model name	Maximum number of steps	Memory type	Allowable number of times of writing	Remarks
FX-EEPROM-4	4000	EEPROM	10000 times	Write protect switch is provided.
FX1N-EEPROM-8L	8000	EEPROM	10000 times	Write protect switch and loader function are provided.
FX-EEPROM-8		EEPROM	10000 times	Write protect switch is provided.
FX-EEPROM-16	16000	EEPROM	10000 times	Write protect switch is provided.
FX-EPROM-8		EPROM	*1	
FX-RAM-8		RAM	-	
FX2N-ROM-E1 (with extension function)		EEPROM	10000 times	
FX2NC-EEPROM-16		EEPROM	10000 times	Write protect switch is provided.
FX2NC-EEPROM16C (with clock)		EEPROM	10000 times	Write protect switch is provided.
FX2NC-ROM-CE1 (with extension function and clock)		EEPROM	10000 times	

*1. Writing is not made in the state where it connected with the PLC.

Model name	FX1S	FX1N	FX2N	FX1NC	FX2NC
FX-EEPROM-4	-	-	✓	-	-
FX1N-EEPROM-8L	✓ (2000 steps maximum)	✓	-	-	-
FX-EEPROM-8	-	-	✓	-	-
FX-EEPROM-16	-	-	✓	-	-
FX-EPROM-8	-	-	✓	-	-
FX-RAM-8	-	-	✓	-	-
FX2N-ROM-E1 (with extension function)	-	-	✓	-	-
FX2NC-EEPROM-16	-	-	-	-	✓
FX2NC-EEPROM16C (with clock)	-	-	-	-	✓
FX2NC-ROM-CE1 (with extension function and clock)	-	-	-	-	✓

4. FX0S/FX0/FX0N/FXU/FX2C PLCs

Model name	Maximum number of steps	Memory type	Allowable number of times of writing	Remarks
FX-EEPROM-4	4000	EEPROM	10000 times	Write protect switch is provided.
FX-EEPROM-8	8000	EEPROM	10000 times	Write protect switch is provided.
FX-EPROM-8	8000	EPROM		
FX-RAM-8	8000	RAM	-	

Model name	FX0	FX0S	FX0N	FXU	FX2C
FX-EEPROM-4	-	-	✓	✓	✓
FX-EEPROM-8	-	-	✓	✓	✓
FX-EPROM-8	-	-	✓	✓	✓
FX-RAM-8	-	-	✓	✓	✓

Cautions

1) Memory cassettes (except the FX3U-FLROM-1M) which save the symbolic information are applicable also to the FX3U/FX3UC PLC whose version is earlier than Ver. 3.00. In this case, the FX3U/FX3UC PLC operates, but the written symbolic information is invalid.
2) If a memory cassette which saves programs including the block password for which the setting "Read-protect the execution program." is set valid is used for any PLC other than the FX3U/FX3UC PLC (Ver. 3.00 or later), the PLC using such a memory cassette does not run normally.

6.5 Keyword

By registering entry codes in a PLC, it is possible to restrict the PLC program change function, monitor function and current value change function of programming tools, display modules and display units (access restriction).

→ **For the operations and function restriction of display modules, refer to the hardware manual of the PLC.**

→ **For the operations and function restriction of display units, refer to the manual of the display unit.**

6.5.1 PLC applicability and access restriction

1. Differences in operations among keyword types

The keyword change, cancel (deletion) and reset operations vary depending on the type of registered keyword.

Registered keyword	Entered keyword	Change	Cancel	Reset	Outline
Permanent PLC Lock	-				The protect cannot be changed, canceled nor reset.
Keyword Protection (8digits)	Keyword (8 digits)	✓	✓	✓	The keyword (8 digits) can be changed, canceled and reset.
Keyword Protection (16digits)	Keyword (16 digits)	✓	✓	✓	The keyword (16 digits) can be changed, canceled and reset.
Keyword Protection (16digits) + Customer keyword	Keyword (16 digits)	✓	✓	✓	The keyword (16 digits) and customer keyword can be changed, canceled and reset.
	Customer keyword			✓	The customer keyword can be reset.

The security offered by the permanent PLC lock, keyword (8 digits), keyword (16 digits) and customer keyword is limited, and is not complete.

2. PLC applicability

	Characters available in keyword	Number of characters registered as keyword	PLC applicability			
			FX3U, FX3UC	FX3S, FX3G, FX3GC	FX1S, FX1N, FX2N, FX1NC, FX2NC	FX0, FX0S, FX0N, FXU, FX2C
Permanent PLC Lock	-	-	Supported (Ver. 2.61 or later)	Supported	Not supported	Not supported
Keyword Protection (8digits)	0 to 9, A to F	8 characters	Supported	Supported	Supported	Supported
Keyword Protection (16digits)	0 to 9, A to F	16 characters	Supported (Ver. 2.20 or later)	Supported	Not supported	Not supported
Customer keyword	0 to 9, A to F	16 characters	Supported (Ver. 2.61 or later)	Supported	Not supported	Not supported

The security offered by the permanent PLC lock, keyword (8 digits), keyword (16 digits) and customer keyword is limited, and is not complete.

3. Keyword setting and access restriction

<table>
<tr><th>Setting status</th><th>Access restriction</th></tr>
<tr><td>When the permanent PLC Lock is selected</td><td>The following operations are enabled in accordance with the selected protection level.
Once the restriction is set, it cannot be reset any more. For resetting the restriction or for writing programs again to the PLC, all-clear the PLC memory.
<table>
<tr><th rowspan="2">Protection level</th><th colspan="2">Program</th><th rowspan="2">Monitoring</th><th rowspan="2">Present value change</th></tr>
<tr><th>Read</th><th>Write</th></tr>
<tr><td>Write Protection</td><td>✓</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>Read/Write Protection</td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>All Online Operation Protection</td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>When the keyword protection (16digits)+customer keyword is set</td><td>The following operations are enabled in accordance with the selected protection level.
It is not possible to cancel the keywords using the customer keyword.
<table>
<tr><th rowspan="2">Protection level</th><th colspan="2">Program</th><th rowspan="2">Monitoring</th><th rowspan="2">Present value change</th></tr>
<tr><th>Read</th><th>Write</th></tr>
<tr><td>Write Protection</td><td>✓</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>Read/Write Protection</td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>All Online Operation Protection</td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>When the keyword protection (8digits) is set</td><td>
<table>
<tr><th rowspan="2">Protection level</th><th colspan="2">Program</th><th rowspan="2">Monitoring</th><th rowspan="2">Present value change</th></tr>
<tr><th>Read</th><th>Write</th></tr>
<tr><td>Write Protection</td><td>✓</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>Read/Write Protection</td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>All Online Operation Protection</td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>When only the keyword protection (8digits) is set</td><td>
<table>
<tr><th rowspan="2">Protection level</th><th colspan="2">Program</th><th rowspan="2">Monitoring</th><th rowspan="2">Present value change</th></tr>
<tr><th>Read</th><th>Write</th></tr>
<tr><td>Read/Write Protection</td><td></td><td></td><td>✓</td><td>✓</td></tr>
</table></td></tr>
<tr><td>When none of the permanent PLC lock, keyword (16 digits), keyword (8 digits) and customer keyword is set</td><td>All operations are enabled.</td></tr>
</table>

Caution on selecting the permanent PLC lock

- Once the restriction is set, it cannot be reset any more.
  For resetting the restriction or for writing programs again to the PLC, all-clear the PLC memory.

Caution on registering the keywords

- The keywords are provided to restrict accesses from peripheral equipment to programs created by the user. Carefully save and remember the keywords.
  If the user forgets a registered keyword, the online operations from a programming tool to the PLC are disabled depending on the programming tool type and the contents of the registered keyword.
- In an FX3U/FX3UC PLC whose version is earlier than Ver. 2.61, do not use a memory cassette where the customer keyword and permanent PLC lock are set.
  If a memory cassette where the permanent PLC lock is set is used in an FX3U/FX3UC PLC whose version is earlier than Ver. 2.61, the PLC does not function normally.
  If the PLC memory is cleared or the keyword is canceled in an FX3U/FX3UC PLC whose version is earlier than Ver. 2.61 for a memory cassette where the customer keyword and permanent PLC lock are set, access restrictions set by the keyword may not be able to be removed normally.

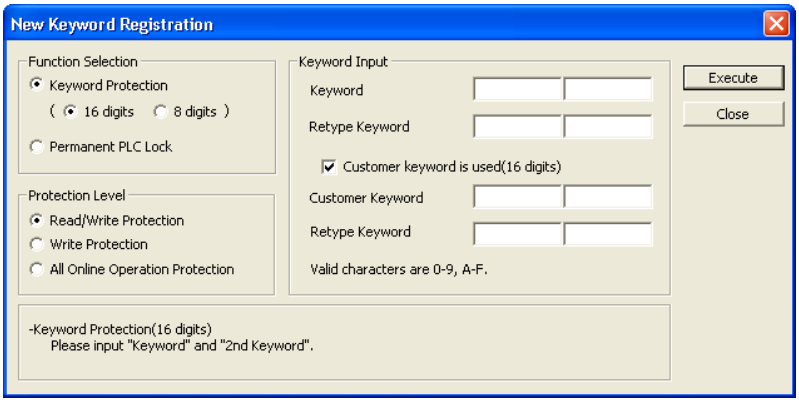
6.5.2 Registering and changing keywords

This subsection explains the operating procedures of GX Works2.

Registering and changing the keywords

1. **Select [Online]-[Password/Keyword]-[New] to open the "New Keyword Registration" dialog box.**

2. **Set "Function Selection", "Keyword Input" and "Protection Level".**



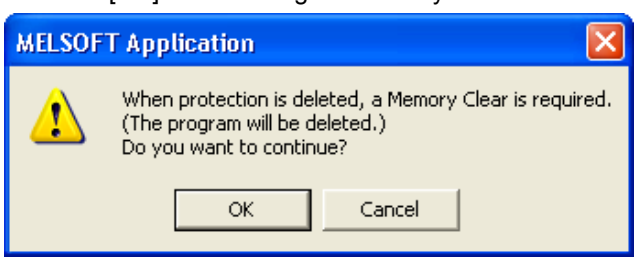
Set item		Contents of setting	Remarks
Function Selection		Select either one among the following choices: • Keyword Protection(16 digits)*1 • Keyword Protection(8 digits) • Permanent PLC Lock*2	When "Permanent PLC Lock" is selected, the restriction cannot be reset any more. For resetting the restriction or for writing programs again to the PLC, all-clear the PLC memory.
Keyword Input	Keyword Protection (16 digits)	Input 16 characters. Available characters are "A" to "F" and "0" to "9".	Input 8 characters in the former position, and 8 characters in the latter position.
	Keyword Protection (8 digits)	Input 8 characters. Available characters are "A" to "F" and "0" to "9".	Input 8 characters in the former position.
	Retype Keyword	Input the same keyword.	This input is required for confirmation.
	Customer keyword*2	Input 16 characters. Available characters are "A" to "F" and "0" to "9".	Input 8 characters in the former position, and 8 characters in the latter position.
	Retype Keyword	Input the same keyword.	This input is required for confirmation.
Protection Level*1		Select either one among the following choices: • Read/Write Protection • Write Protection • All Online Operation Protection	For selecting the protection level, select [Keyword Protection (16 digits)]-[Function Selection], and set "Permanent PLC Lock".

*1. Available in FX3U/FX3UC PLCs Ver. 2.20 or later and all FX3S/FX3G/FX3GC PLCs.

*2. Available in FX3U/FX3UC PLCs Ver. 2.61 or later and all FX3S/FX3G/FX3GC PLCs.

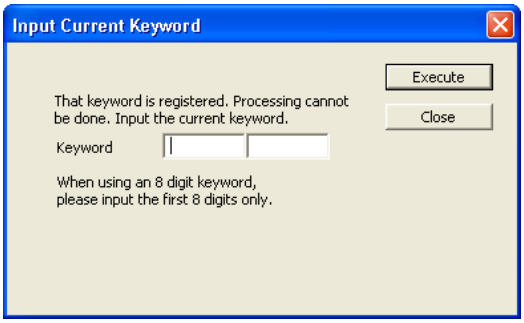
3. **Click the [Execute] button to register the keywords to the PLC.**

If "Permanent PLC Lock" is selected, clicking the [Execute] button opens the following dialog box. Click the [OK] button to register the keywords to the PLC.



Writing a program to a PLC in which the keywords are registered

1. **Select [Online]-[Write to PLC] to open the "Input Current keyword" dialog box.**
2. **Input the keyword protection (8 digits), keyword protection (16 digits) and customer keyword currently registered in the PLC.**



Set item	Contents of setting	Remarks
Keyword Protection (8 digits)	Input 8 characters. Available characters are "A" to "F" and "0" to "9".	-
Keyword Protection (16 digits)*1	Input 16 characters. Available characters are "A" to "F" and "0" to "9".	When the customer keyword*2 is set, 16 characters are available for it.

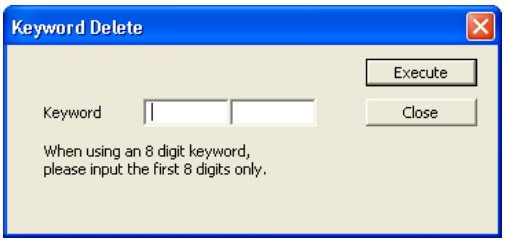
*1. Available in FX3U/FX3UC PLCs Ver. 2.20 or later and all FX3S/FX3G/FX3GC PLCs.

*2. Available in FX3U/FX3UC PLCs Ver. 2.61 or later and all FX3S/FX3G/FX3GC PLCs.

3. **Click the [Execute] button to verify the keywords input by the user through collation with the keywords registered in the PLC.**
   - When the keywords input by the user are verified, the PLC executes "Write to PLC".
   - When the keywords input by the user are not verified, the PLC does not execute "Write to PLC".

Cancelling the keywords

1. **Select [Online]-[Password/Keyword]-[Delete] to open the "Keyword Delete" dialog box.**
2. **Input the keyword protection (8 digits), keyword protection (16 digits) currently registered in the PLC.**

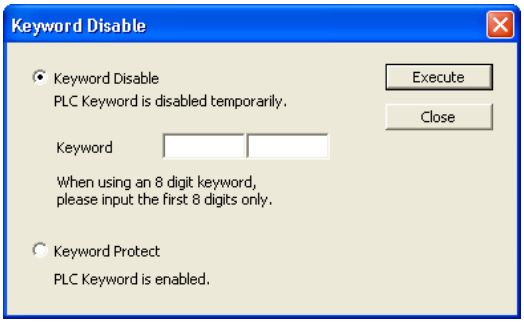


Set item	Contents of setting	Remarks
Keyword Protection (8 digits)	Input 8 characters. Available characters are "A" to "F" and "0" to "9".	-
Keyword Protection (16 digits)	Input 16 characters. Available characters are "A" to "F" and "0" to "9".	It is not possible to cancel the keywords using the customer keyword.

3. **Click the [Execute] button to verify the keywords input by the user through collation with the keywords registered in the PLC.**
   - When the keywords input by the user are verified, the PLC cancels the registered keywords.
   - When the keywords input by the user are not verified, the PLC does not cancel the registered keywords.

Resetting the keywords, and validating the reset keywords (keyword protect)

1. **Select [Online]-[Password/Keyword]-[Disable] to open the "Keyword Disable" dialog box.**
2. **Input the keyword protect (8 digits), keyword protect (16 digits) and customer keyword.**



Set item		Contents of setting	Remarks
Keyword Disable	Keyword Protect (8 digits)	Input 8 characters. Available characters are "A" to "F" and "0" to "9".	-
	Keyword Protect (16 digits)*1	Input 16 characters. Available characters are "A" to "F" and "0" to "9".	When the customer keyword*2 is set, its 16 characters are available for it.
Keyword Protect*1		-	The reset keywords are made valid again.

*1. Available in FX3U/FX3UC PLCs Ver. 2.20 or later and all FX3S/FX3G/FX3GC PLCs.

*2. Available in FX3U/FX3UC PLCs Ver. 2.61 or later and all FX3S/FX3G/FX3GC PLCs.

3. **Click the [Execute] button to reset the keywords or validate the reset keywords again.**

6.6 Parameter setting by GX Works2

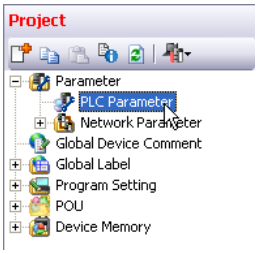
This subsection explains the parameter setting procedures using GX Works2.
The screens explained here are provided for FX3U/FX3UC PLCs.
Set items and their contents vary depending on the PLC. Refer to the following sections.

→ **6.1 Parameter List**
→ **6.2 Parameter Initial Values**
→ **6.3 Memory Capacity Setting Range**

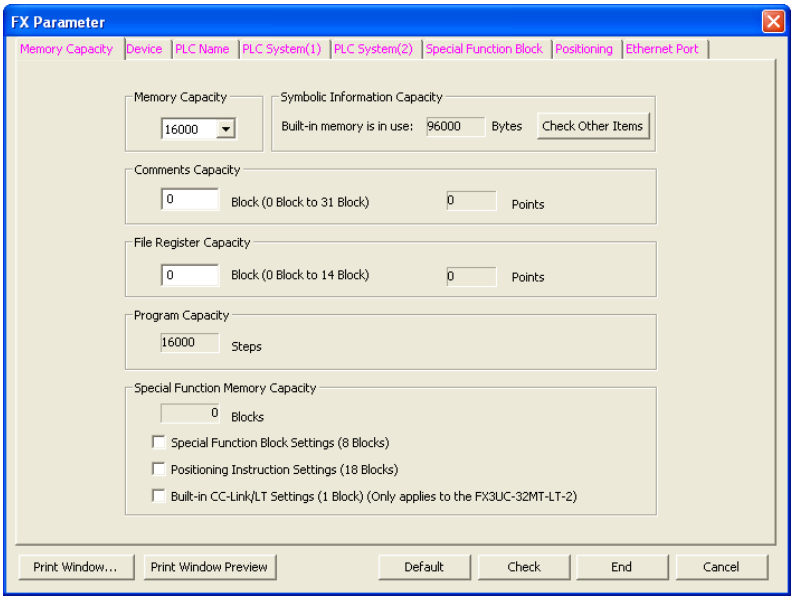
6.6.1 PLC Parameter setting

1 Opening the parameter setting screen

In the project view, double-click [Parameter]-[PLC Parameter].



2 Setting the memory capacity



Set item	Contents of setting	Setting range
Memory Capacity	Select the program capacity. Initial value: 16000*1	Refer to Section 6.3
Symbolic Information Capacity*2	The symbolic information capacity when the built-in memory or a memory cassette is used is displayed here based on the "Memory Capacity" value. Press the [Check Other Items] button to display the symbolic information capacity when a memory cassette is used.	
Comment Capacity	Set the capacity of comments to be stored in the PLC. Initial value: 0 50 device comments/block (500 steps)	
File Register Capacity	Set the file register capacity. Initial value: 0 500 file registers/block (500 steps)	
Program Capacity	The number of steps available for sequence program is displayed here.	
Special Function Memory Capacity*3	Set whether the special unit initial value setting and positioning setting will be used or not.	-
Special Function Block Settings*2	Check this item to make valid the initial value setting function for the special function blocks/units.	-
Positioning Instruction Settings	Check this item to make valid the positioning setting function.	-
Built-in CC-Link/LT Settings*4	Check this item to make valid the station information setting function for the CC-Link/LT.	

*1. This value is the case of FX3U/FX3UC PLC.
Available initial value vary depending on the PLC.

*2. This item is supported only in FX3U/FX3UC PLCs.

*3. This item is supported only in FX3G/FX3GC/FX3U/FX3UC PLCs.

*4. This item is supported only in FX3UC-32MT-LT-2.

Cautions

1) FX3G/FX3GC PLCs operate in the extension mode when the program capacity is 16,001 steps or more, and operate in the standard mode when the program capacity is 16,000 steps or less.
The instruction execution time is longer in the extension mode than in the standard mode.

Example: Time required to execute the basic instruction "LD"
Standard mode: 0.21 μs Extension mode: 0.42 μs

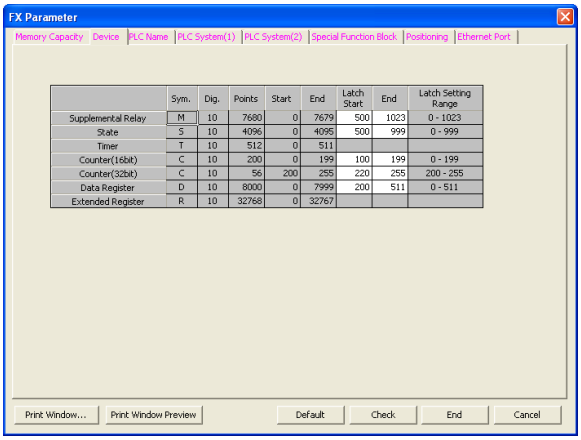
2) In FX3U/FX3UC PLCs Ver. 3.00 or later.
When symbolic information is stored, it is deleted if the memory capacity set by parameters is changed.
After changing the memory capacity, write the symbolic information again.

3) When the memory capacity of the FX3S PLC is 16000 steps, the program capacity is fixed to 4000 steps, and the total of the comment capacity and the file register capacity is limited to 12000 steps (24 blocks).
The comment capacity is automatically set when the file register capacity is set.

3 Setting devices

The "Device" tab is available only in FXU, FX2C, FX2N, FX2NC, FX3U and FX3UC PLCs.

1. Click the "Device" tab, and set devices.

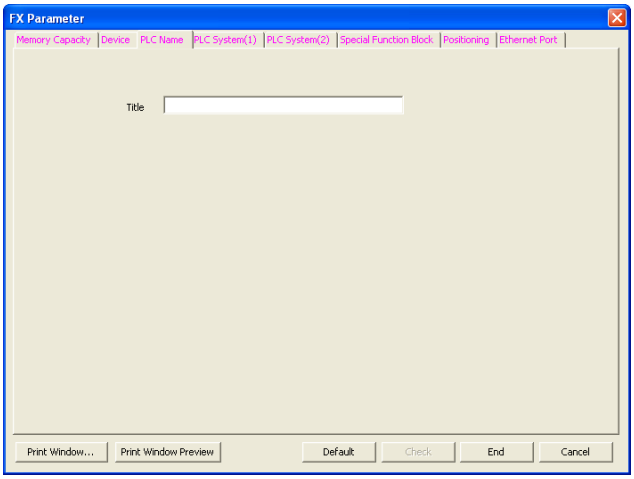


Set item	Contents of setting	Setting range
Supplemental Relay [M]	Set the latched (backed-up) range of auxiliary relays. Initial value: 500 to 1023	0 to 1023
State [S]	Set the latched (backed-up) range of state relays. Initial value: 500 to 999	0 to 999
Timer [T]	The setting displayed here cannot be changed.	-
Counter (16 bits) [C]	Set the latched (backed-up) range of 16-bit counters. Initial value: 100 to 199	0 to 199
Counter (32 bits) [C]	Set the latched (backed-up) range of 32-bit counters. Initial value: 220 to 255	200 to 255
Data Register [D]	Set the latched (backed-up) range of data registers. Initial value: 200 to 511	0 to 511
Extended Register [R]	All extension registers are latched (backed up). This setting is fixed, and cannot be changed.	-

4 Setting the PLC name

The "PLC Name" tab is available only in FX0N, FX1S, FX1N, FX1NC, FXU, FX2C, FX2N, FX2NC, FX3S, FX3G, FX3GC, FX3U and FX3UC PLCs.

1. Click the "PLC Name" tab, and input the program title.

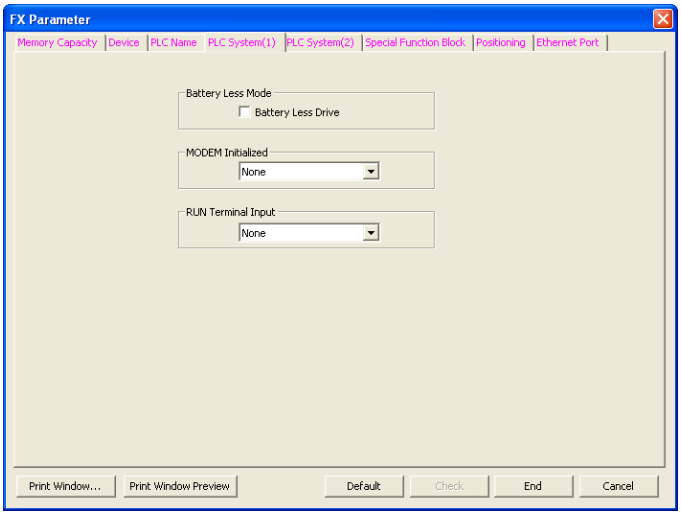


Set item	Contents of setting	Setting range
Title	Input the program title in up to 32 half-width (or 16 full-width) characters.	Up to 32 half-width (or 16 full-width) characters

5 Setting the PLC system (1)

The "PLC System(1)" tab is available only in FX1S, FX1N, FX1NC, FX2N, FX2NC, FX3S, FX3G, FX3GC, FX3U and FX3UC PLCs.

Click the "PLC System(1)" tab, and set "Battery Less Mode", "Battery Mode", "MODEM Initialized" and "RUN Terminal Input".



Set item	Contents of setting	Setting range
Battery Less Mode*1	Select this item to operate the PLC without using the battery. When the check box is checked, the PLC automatically turns OFF the battery error indicator lamp, and clears devices in the latched (backed-up) ranges.	-
Battery Mode*2	Select this item to operate the PLC with the battery.	-
MODEM Initialized	Select this item to automatically initialize the connected modem when the PLC power is turned ON.	-
RUN Terminal Input	Select this item to use an input terminal (X) for RUN input.	None X000 to X017*3

*1. This item can be set only in FX2N/FX2NC/FX3U/FX3UC PLCs.

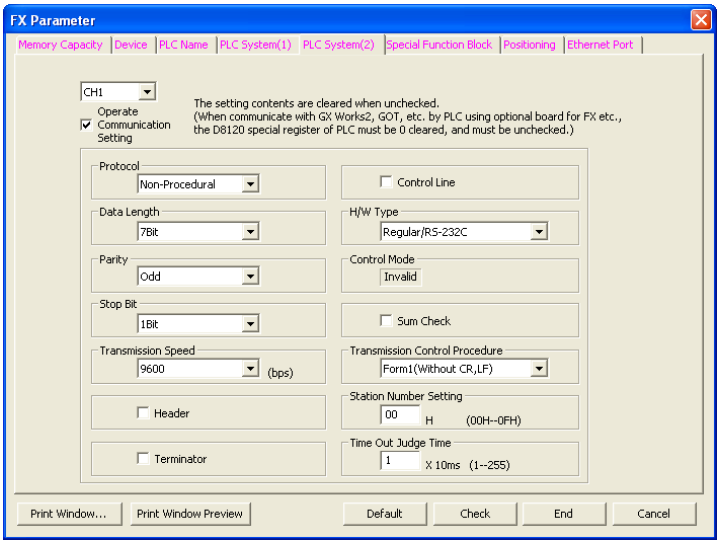
*2. This item can be set only in FX3G/FX3GC PLCs

*3. Up to the built-in input number of main unit.

6 Setting the PLC system (2)

The "PLC System(2)" tab is available only in FX1S, FX1N, FX1NC, FX2N, FX2NC, FX3S, FX3G, FX3GC, FX3U and FX3UC PLCs.

1. **Click the "PLC System(2)" tab.**
2. **Only when setting the communication for a serial port of the extended PLC, select a channel to be set and check the check box "Operate Communication Setting".**
   Uncheck this check box when not setting the communication for a serial port.



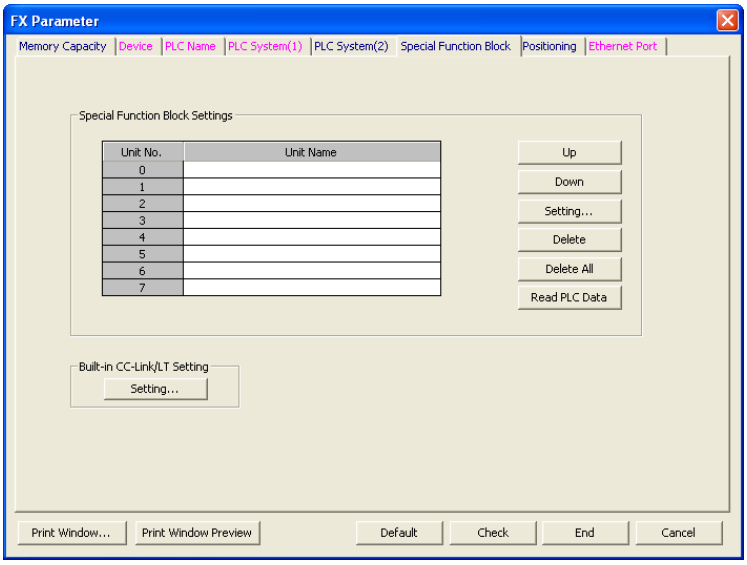
Set item	Contents of setting	Setting range
Channel selection*1	Select a channel in which a serial port is set.	CH1, CH2
Operate Communication Setting	Check this item when using the selected serial port in "computer link", "no-protocol communication" or "inverter communication". Uncheck this item when transferring and monitoring sequence programs in GX Works2 or when using the selected serial port in N : N Network, parallel link, MODBUS communication or FX3U-ENET-ADP.	-
Protocol	Set each item in accordance with the application. → **For details on each item, refer to the data communication manual.**	
Data Length		
Parity		
Stop Bit		
Transmission Speed		
Header		
Terminator		
Control Line		
H/W Type		
Control Mode		
Sum Check		
Transmission Control Procedure		
Station Number Setting		
Time Out Judge Time		

*1. In FX3S PLC, channel is fixed to "CH1".

7 Setting special function block

The "Special Function Block" tab is available only in FX3U, FX3UC PLCs.

1. **Click the "Special Function Block" tab, and then set the special function block/unit name and built-in CC/Link.**
   When setting special units, it is necessary to check in advance the check box "Special Function Block Settings" on the "Memory Capacity" tab.
   When setting the station information in "Built-in CC-Link/LT Setting", it is necessary to check in advance the check box "Built-in CC-Link/LT Setting" on the "Memory Capacity" tab.

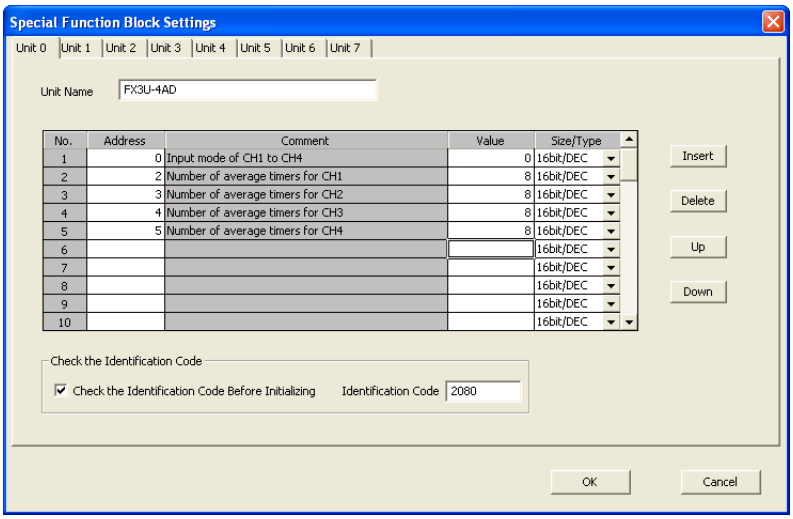


Set item		Contents of setting	Setting range
Special Function Block Setting*1	Unit No.	This is the unit number of each special function block/unit.	-
	Unit Name	Input the name of each special function block/unit whose initial values will be set.	Up to 32 half-width (or 16 full-width) characters
	Up	This button moves the cursor to the upper line (transposes the upper line).	-
	Down	This button moves the cursor to the lower line (transposes the lower line).	-
	Setting	This button displays the "Special Module Initial Setting" dialog box for the selected unit number. → **Refer to the next page.**	-
	Delete	This button deletes the setting of the selected unit number.	-
	Delete All	This button deletes all current setting in the "Special Function Block Setting" field.	-
	Read PLC Data	This button reads the current setting in the "Special Function Block Setting" field from the connected PLC.	-
Built-in CC-Link/LT Setting*2	Setting	This button displays the "Built-in CC-Link/LT Setting" dialog box.	-

*1. Check in advance the check box "Special Function Block Settings" on the "Memory Capacity" tab.

*2. Check in advance the check box "Built-in CC-Link/LT Settings" on the "Memory Capacity" tab. This item can be set only in the FX3UC-32MT-LT-2.

2. On the "Special Function Block Settings" dialog box, set the initial values of the selected special function block/unit.
On the "Special Function Block" tab, select the unit number and click the [Setting] button to display the "Special Function Block Settings" dialog box.
The "Special Function Block " tab is available only in FX3U, FX3UC PLCs.



Set item	Contents of setting	Setting range
"Unit No." tab	Select the unit number of a special function block/unit to be set.	-
Unit Name	Set the name of a special function block/unit whose initial values will be set.	Up to 32 half-width (or 16 full-width) characters
No.	This column indicates the order of initial value setting in the selected unit number. Numbers 1 to 98 can be set.	-
Address	Set the buffer memory address (BFM number) in a decimal value whose initial value will be set.	*1
Comment	This column is displayed when device comments are registered. On the above screen, "Input mode of CH1 to CH4" is registered as the device comment for "U0\G0 (unit No. 0, BFM #0)".	-
Value	Set a value to be set as the initial value of the buffer memory address (BFM number). Set the data length and type of the set value in the "Size/Type" column.	*2
Size/Type	Select the size and type of a value set to the buffer memory among the following choices: 16-bit/DEC 32-bit/DEC 16-bit/HEX 32-bit/HEX	-
Insert	This button inserts a line in the currently selected position.	-
Delete	This button deletes the currently selected line.	-
Up	This button moves the cursor to the upper line (transposes the upper line).	-
Down	This button moves the cursor to the lower line (transposes the lower line).	-
Check the Identification Code Before Initializing	Check this item to check the model code of the special function block/unit before initialization.	-
Identification Code	Set the model code of the function block/unit.	*3

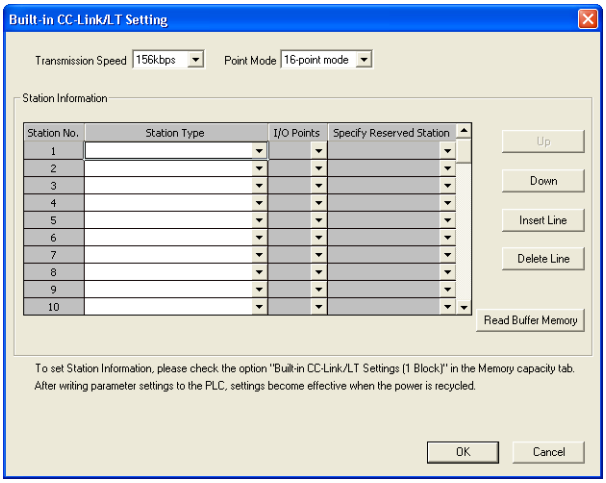
*1. Input the buffer memory addresses (BFM numbers) held in the connected special function block/unit.

*2. To each buffer memory address (BFM number), set a value within the allowable range in the connected special function block/unit.

*3. Refer to the manual of the connected special function block/unit.

3. Click the [OK] button to finish the setting and close the "Special Module Initial Setting" dialog box.

4. On the "Built-in CC-Linc/LT Setting" dialog box, set the built-in CC-Link/LT. The " Built-in CC-Linc/LT Setting" tab is available only in FX3UC-32MT-LT-2 PLC.



Set item	Contents of setting	Setting range
Transmission Speed	Select the transmission speed of the built-in CC-link/LT among the following choices: 2.5Mbps 625kbps 156kbps	-
Point Mode	Select the point mode of the built-in CC-link/LT between the following choices: 16-point mode 4-point mode	-
Station No.	Set the station number of the built-in CC-link/LT. 1 to 64 can be set.	-
Station Type	Select the station type of the built-in CC-link/LT among the following choices: Remote I/O Station [Input] Remote I/O Station [Output] Remote I/O Station [Input/Output] Remote device station*1	-
I/O Points	Select the number of points in the remote I/O station or remote device station.	1 to 16,32,48,64*2
Specify Reserved Station	Select whether the station is reserved or not in the built-in CC-link/LT.	-
Up	This button moves the cursor to the upper line (transposes the upper line).	-
Down	This button moves the cursor to the lower line (transposes the lower line).	-
Insert Line	This button inserts a line in the currently selected position.	-
Delete Line	This button deletes the currently selected line.	-
Read Buffer Memory	This button reads out the transmission speed, point mode and station information of the built-in CC-link/LT.	-

*1. Select the 16-point mode when using a remote device station. Remote device stations cannot be set in the 4-point mode.
Available station numbers are 49 to 64.

*2. I/O Points setting "32", "48" and "64" are available only when "Remote device station" is selected as the station type.

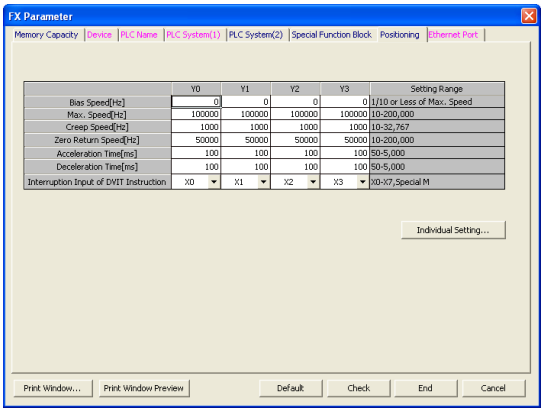
5. Click the [OK] button to finish the setting and close the "Special Module Initial Setting" dialog box.

8 Setting positioning

The positioning setting function is available in all FX3G/FX3GC/FX3U PLCs and FX3UC PLC Ver. 2.20 or later.

1. **Click the "Positioning" tab.**
   The "Positioning" tab is displayed when "Positioning" is checked on the "Memory Capacity" tab.

2. **Set the positioning constants used in the TBL instruction.**
   → For the TBL instruction, refer to the positioning control manual.



Set item	Contents of setting	Setting range
Bias Speed [Hz]	Set the bias speed for each output number of pulse. Initial value: 0	1/10 or less of the maximum speed
Max. Speed [Hz]	Set the maximum speed for each output number of pulse. Initial value: 100000	*1
Creep Speed [Hz]	Set the creep speed in the DSZR instruction for each output number of pulse. Initial value: 1000	10 to 32767*2
Zero Return Speed [Hz]	Set the zero point return speed in the DSZR for each output number of pulse. Initial value: 50000	*1
Acceleration Time [ms]	Set the acceleration time for each output number of pulse. Initial value: 100	50 to 5000
Deceleration Time [ms]	Set the deceleration time for each output number of pulse. Initial value: 100	50 to 5000
Interruption Input of DVIT Instruction*4	Select the interrupt input*3 in the DVIT instruction for each output number of pulse. Specify a user interrupt command device (M) for a pulse output destination device not used in the DVIT instruction. Initial setting: Pulse output destinationY000 : X000 Setting range: X000 to X007, M8460 Pulse output destinationY001 : X001 X000 to X007, M8461 Pulse output destinationY002 : X002 X000 to X007, M8462 Pulse output destinationY003*6 : X003 X000 to X007, M8463	As shown on the left
Y0	Set the pulse output destination.	-
Y1	Set the pulse output destination.	-
Y2*5	Set the pulse output destination.	-
Y3*6	Set the pulse output destination.	-
Setting Range	This button displays the "Individual Setting" dialog box provided to set the table for the TBL instruction. **→ For the setting procedure, refer to the next step.**	-

*1. The setting range is from 10 to 100,000 Hz in FX3G/FX3GC/FX3U/FX3UC PLCs.
The setting range is from 10 to 200,000 Hz in FX3U PLCs when the pulse output destination is the high-speed output special adapter.

*2. The creep speed should satisfy the relationship "Bias speed ≤ Creep speed ≤ Maximum speed."

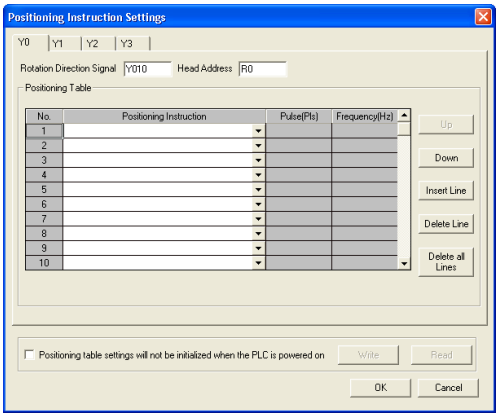
*3. An interrupt input set here cannot be used jointly with a high speed counter, input interrupt, pulse catch input, input in SPD instruction, or interrupt input in DVIT instruction.

*4. This area can be set only in FX3U/FX3UC PLCs.

*5. Y002 is not set in FX3G PLC (14-point and 24-point type) and FX3GC PLC.

*6. Note that this item can only be set if two high-speed output special adapter adapters are connected to the FX3U PLC.

3. Click the [Individual Setting] button to display the "Positioning Instruction Setting" dialog box.
On this dialog box, set the positioning table for each pulse output destination.



Set item		Contents of setting	Setting range
Y0		Set the positioning table for the pulse output destination Y000.	-
Y1		Set the positioning table for the pulse output destination Y001.	-
Y2*1		Set the positioning table for the pulse output destination Y002.	-
Y3*2		Set the positioning table for the pulse output destination Y003.	-
Rotation Direction Signal		Set the relay number of the rotation direction output signal. Initial setting: Pulse output destination Y000: Y010 Pulse output destination Y001: Y011 Pulse output destination Y002*1: Y012 Pulse output destination Y003*2: Y013 → **Refer to the Positioning Control Manual.**	FX3U/FX3UC: Y000 to Y357 FX3G/FX3GC: Y000 to Y177
Head Address		Set the head number of devices storing the set data (pulse number and frequency). 1600 devices (FX3U/FX3UC) or 1200 devices (FX3G/FX3GC) are occupied starting from the head device number set here without regard to the number of axes. Initial setting: R0 → **Refer to the Positioning Control Manual.**	FX3U/FX3UC: D0 to D6400, R0 to R31168 FX3G/FX3GC: D0 to D6800, R0 to R22800
No.		This column shows the table number. Numbers 1 to 100 can be set.	-
Positioning Instruction		Select the positioning type among the following: DDVIT (Interrupt positioning instruction)*3 DPLSV (Variable speed output pulse instruction) DDRVI (Relative positioning instruction) DDRVA (Absolute positioning instruction) → **Refer to the Positioning Control Manual.**	-
Pulse		Set the pulse number output by the operation (instruction) set in "Positioning Instruction" column. → **Refer to the Positioning Control Manual**	Refer to the Positioning Control Manual.
Frequency [Hz]		Set the speed (pulse frequency) output by the operation (instruction) set in "Positioning Instruction" column. → **Refer to the Positioning Control Manual.**	Refer to the Positioning Control Manual.
Up		This button transposes the selected line to the upper line.	-
Down		This button transposes the selected line to the lower line.	-
Insert Line		This button inserts a line in the currently selected position.	-
Delete Line		This button deletes the currently selected line.	-
Delete all Lines		This button deletes the entire setting of the positioning table for the selected pulse output destination.	-
Positioning table settings will not be initialized when the PLC is powered on		A check mark here means not to transfer the positioning setting when PLC turns ON. Put a check mark when changing the positioning setting from a display unit, etc., and then using the changed contents even after restoring the power. At this time, set a latched (battery backed) type device to "Head Address".	-
	Write	This button writes the contents of the positioning table created here to up to 1600 devices (FX3U/FX3UC) or 1200 devices (FX3G/FX3GC) starting from "Head Address".	-
	Read	This button reads the contents of the existing positioning table from 1600 devices (FX3U/FX3UC) or 1200 devices (FX3G/FX3GC) starting from the head device number in the PLC without regard to the number of axes, but does not read device numbers without the "positioning instruction" setting.	-

*1. Y002 is not set in FX3G PLC (14-point and 24-point type) and FX3GC PLC.

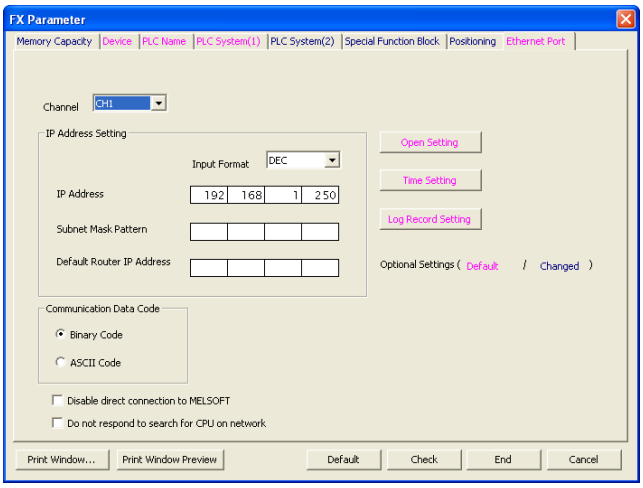
*2. Note that this item can only be set if two high-speed output special adapter adapters are connected to the FX3U PLC.

*3. This area can be set only in FX3U/FX3UC PLCs.

9 Setting the Ethernet port

The Ethernet port setting function is available in FX3U/FX3UC PLCs (Ver.3.10 or later) and FX3S/FX3G/FX3GC PLCs (Ver.2.00 or later).

1. Click the "Ethernet Port" tab.



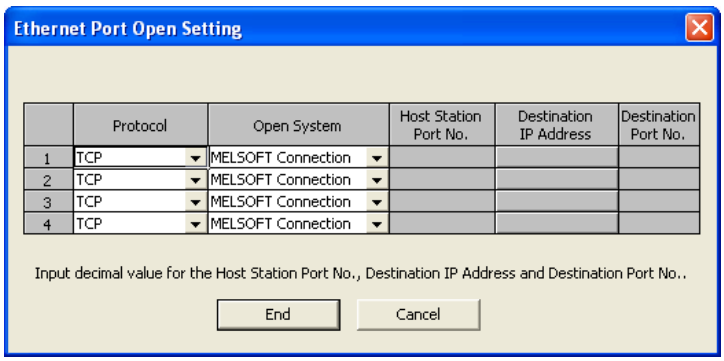
Set item		Contents of setting	Setting range
Channel*1		Select whether or not the Ethernet port is connected. When it is connected, specify the channel connected to the Ethernet port.	None, CH1, CH2
IP Address Setting*2	Input Format	Select the input format and display format used to set the IP address, subnet mask pattern and default router IP address.	DEC, HEX
	IP Address	Set the Ethernet port IP address.	0.0.0.1 to 223.255.255.254 (Decimal) 00.00.00.01 to DF.FF.FF.FE (Hexadecimal)
	Subnet Mask Pattern	Set the subnet mask pattern.	192.0.0.0 to 255.255.255.252 (Decimal) C0.00.00.00 to FF.FF.FF.FC (Hexadecimal)
	Default Router IP Address	Set the IP address of the default router when it is used.	0.0.0.1 to 223.255.255.254 (Decimal) 00.00.00.01 to DF.FF.FF.FE (Hexadecimal)
Communication Data Code		Check the data code used for communication using the MC protocol.	-
Disable direct connection to MELSOFT		Check this item to disable direct connection to the MELSOFT.	-
Do not respond to search for CPU on network		Check this item not to respond to search for CPUs on the network.	-
Open Setting		This button displays the "Ethernet Port Open Setting" dialog box.	-
Time Setting		This button displays the "Ethernet Port Time Setting" dialog box.	-
Log Record Setting		This button displays the "Ethernet Port Log Record Setting" dialog box.	-

*1. In FX3S PLC, channel is fixed to "CH1".

*2. IP Address Setting can be set not only by selecting "PLC Parameter" in the project view but also using the IP address change function.
In this case, the priority is given to the setting by the IP address change function.

2. On the "Ethernet Port" tab, click the "Open Setting" button.

On the "Ethernet Port Open Setting" dialog box, set the protocol, open system and others.
Up to four connections can be set up.

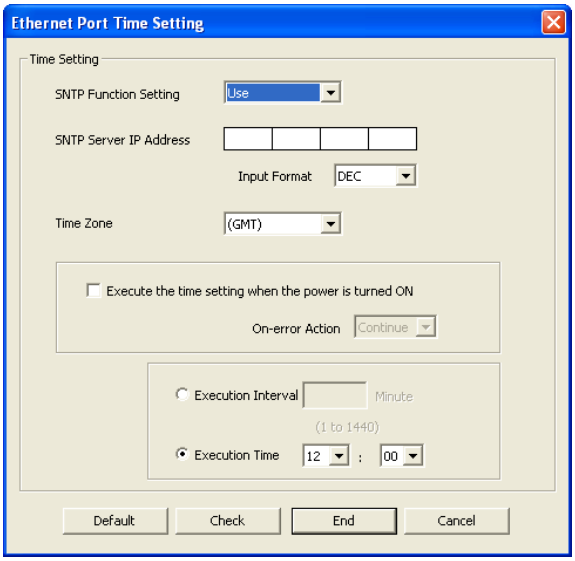


Set item	Contents of setting	Setting range
Protocol	Select a protocol to be used.	Not Set, TCP, UDP
Open System	Select the open system.	TCP: Select "MELSOFT Connection", "MC Protocol" or "Data Monitoring". UDP: The open system is fixed to "MC Protocol".
Host Station Port No.	Set host station port No. (This column is valid only when the selected open system is "MC Protocol" or "Data Monitoring".)	MC protocol: 1025 to 5548 or 5560 to 65534 Data monitoring: 80 (Default), 1025 to 5548 or 5560 to 65534
Destination IP Address	Set destination IP address. (This column is valid only when the selected protocol is "UDP" and the selected open system is "MC Protocol".) When this column is valid, "No Setting" is displayed in red. Click "No Setting" to display the IP address setting dialog which allows setting of the IP address. When setting of the IP address is completed, the entered IP address is displayed in blue.	0.0.0.1 to 255.255.255.254 (decimal)
Destination Port No.	Set destination port No. (This column is valid only when the selected protocol is "UDP" and the selected open system is "MC Protocol".)	1025 to 65534

3. Click the "END" button to finish the setting and close the "Ethernet Port Open Setting" dialog box.

4. On the "Ethernet Port" tab, click the "Time Setting" button.

On the "Ethernet Port Time Setting" dialog box, set the SNTP server IP address and others.



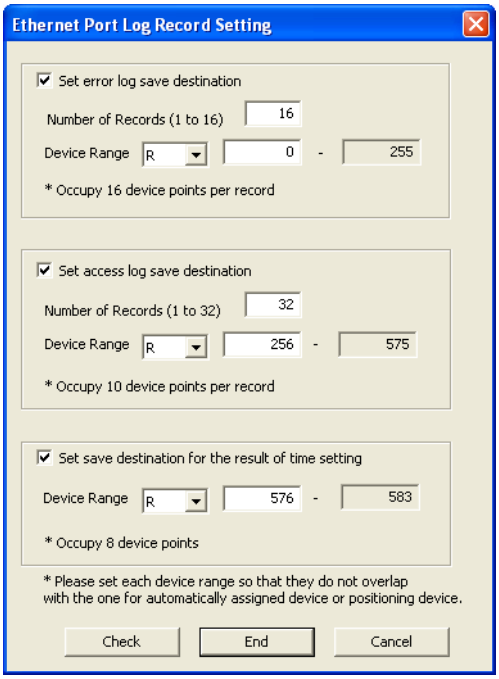
Set item	Contents of setting	Setting range
SNTP Function Setting	Select whether to use the time setting function.	-
SNTP Server IP Address	Set SNTP Server IP Address.	0.0.0.1 to 223.255.255.254 (Decimal) 00.00.00.01 to DF.FF.FF.FE (Hexadecimal)
Input Format	Select the input format used to set the SNTP server IP address.	DEC, HEX
Time Zone	Select the time zone for synchronizing the time among the following choices: GMT-12:00, GMT-11:00, GMT-10:00, GMT-9:00, GMT-8:00, GMT-7:00, GMT-6:00, GMT-5:00, GMT-4:00, GMT-3:30, GMT-3:00, GMT-2:00, GMT-1:00, GMT, GMT+1:00, GMT+2:00, GMT+3:00, GMT+3:30, GMT+4:00, GMT+4:30, GMT+5:00, GMT+5:30, GMT+5:45, GMT+6:00, GMT+6:30, GMT+7:00, GMT+8:00, GMT+9:00, GMT+9:30, GMT+10:00, GMT+11:00, GMT+12:00, GMT+13:00	As shown on the left
Execute time setting at turn ON	Check this item to execute time setting when the power of the PLC main unit is turned ON.	-
On-error Action	Select whether processing is continued or stopped if an error occurs in the time setting executed when the power of the PLC main unit is turned ON.	-
Execution Interval*1	Specify the time interval to execute time setting.	1 to 1440 min
Execution Time*1	Specify the time (in increments of 30 minutes) to execute time setting.	-

*1. Only either one can be selected between "Execution Interval" and "Execution Time".

5. Click the "END" button to finish the setting and close the "Ethernet Port Time Setting " dialog box.

6. On the "Ethernet Port" tab, click the "Log Record Setting" button.

On the "Ethernet Port Log Record Setting" dialog box, set the error log save destination and others.
The user device (D, R) is used to save the error log, etc.
The user device (R) cannot be used in FX3S PLCs.



Set item			Contents of setting	Setting range
Set error log save destination			Error log is stored if checked.	-
	Number of Records		Set the number of records in the error log. One record occupies devices 16 points.	1 to 16
	Device Range	Head device type	Select the device type of the error log save destination between "D" and "R".	-
		Head device number	Set the head device number of the error log save destination.	-
		Last device number	The last device number in the occupied range calculated from the head device number and number of records is displayed.	-
Set access log save destination			Access log is stored if checked.	-
	Number of Records		Set the number of records in the access log. One record occupies 10 points.	1 to 32
	Device Range	Head device type	Select the device type of the access log save destination between "D" and "R".	-
		Head device number	Set the head device number of the access log save destination.	-
		Last device number	The last device number in the occupied range calculated from the head device number and number of records is displayed.	-
Set save destination for the result of time setting			Result of time setting is stored if checked.	-
	Device Range	Head device type	Select the device type of the time setting result save destination between "D" and "R".	-
		Head device number	Set the head device number of the time setting result save destination. 8 points are occupied from the head device number.	-
		Last device number	The last device number in the occupied range calculated from the head device number is displayed.	-

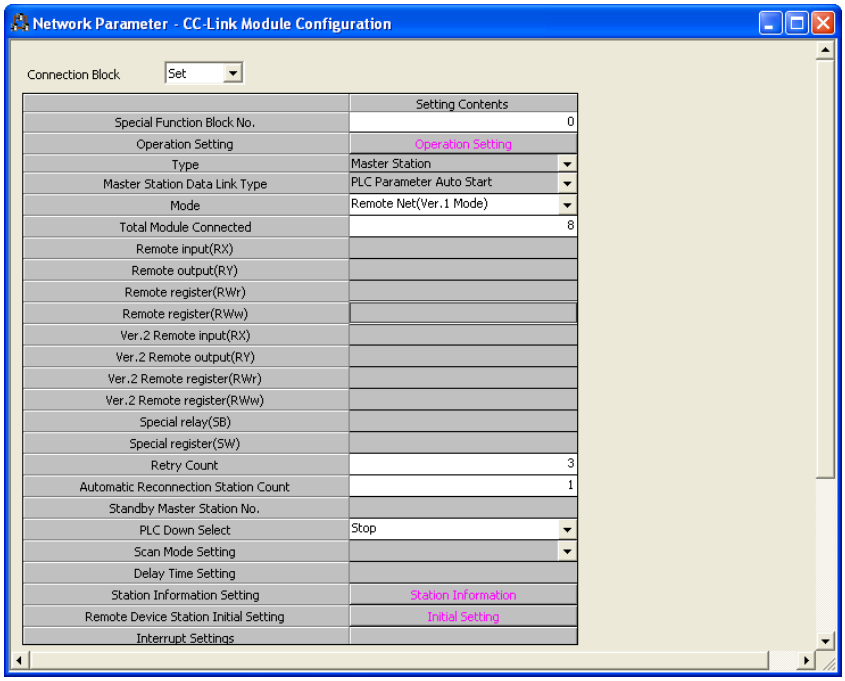
7. Click the "END" button to finish the setting and close the "Ethernet Port Log Record Setting " dialog box.

6.6.2 Network parameter

The following network parameter can be set in parameter setting.

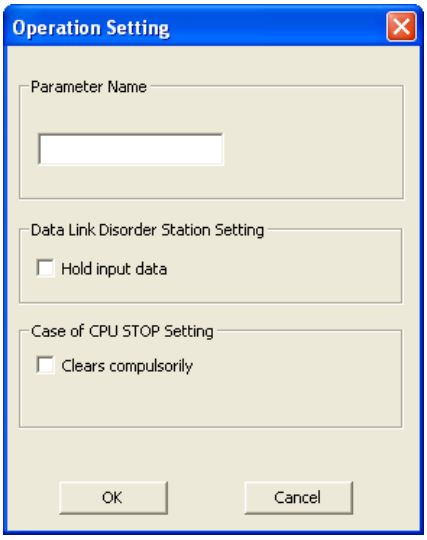
- CC-Link
  The CC-Link parameter is available in FX3U/FX3UC PLCs Ver. 3.10 or later and FX3G/FX3GC PLCs Ver. 2.00 or later.

1. In the project view, double-click [Parameter] - [Network Parameter] - [CC-Link].



Set item		Contents of setting
Connection Block		Select "Set" to set a CC-Link master block.
	Special Function Block No.	Specify the special block number (0 to 7).
	Operation Setting	This button displays the "Operation Setting" dialog box.
	Type	This setting is fixed to "Master Station" when "Set" is selected for "Connection Block".
	Master Station Data Link Type	This setting is fixed to "PLC Parameter Auto Start" when "Set" is selected for "Connection Block".
	Mode	Select the mode among the following choices: Remote Net (Ver.1 Mode) Remote Net (Ver.2 Mode) Remote Net (Additional Mode)
	Total Module Connected	Set the total number of remote I/O stations, remote device stations, and/or intelligent device stations (including reserve stations) connected to the master station.
	Retry Count	Set the number of retries in case a communication error occurs.
	Automatic Reconnection Station Count	Set the number of remote I/O stations, remote device stations, and/or intelligent device stations that can be returned to the system in one link scan.
	PLC Down Select	Select the data link status when an error occurs in the programmable controller CPU on the master station.
	Station Information Setting	This button displays the "CC-Link Station Information" dialog box.
	Remote Device Station Initial Setting	This button displays the "Remote Device Station Initial Setting Target Station No. Setting" dialog box.

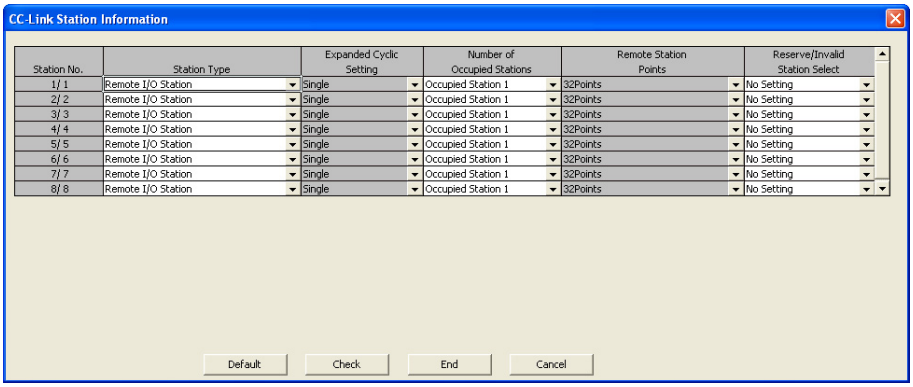
2. Click "Operation Setting" in the "Setting Contents" column on the "Network Parameter - CC-Link Module Configuration" dialog box.



Set item	Contents of setting	Setting range
Parameter Name	Set the parameter name.	8 half-width characters
Data Link Disorder Station Setting	Set whether or not the input data status from a data link disorder station is held.	"Hold input data" not checked: Clear "Hold input data" checked: Hold
Case of CPU STOP Setting	Set the slave station refresh/compulsory clear setting at programmable controller CPU STOP.	"Clears compulsorily" not checked: Refresh "Clears compulsorily" checked: Clears compulsorily

3. Click the [OK] button to finish the setting and close the "Operation Setting " dialog box.

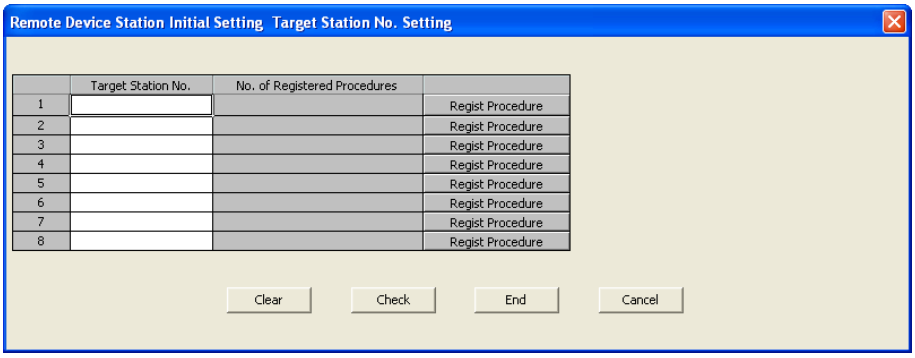
4. Click "Station Information" in the "Setting Contents" column on the "Network Parameter - CC-Link Module Configuration" dialog box.



Set item	Contents of setting
Station Type	• Select the slave station type among the following choices when the mode is set to "Remote Net (Ver.1 Mode)": No Setting Remote I/O Station Remote Device Station Intelligent Device Station • Select the slave station type among the following choices when the mode is set to "Remote Net (Ver. 2 Mode)" or "Remote Net (Additional Mode)": No Setting Ver.1 Remote I/O Station Ver.1 Remote Device Station Ver.1 Intelligent Device Station Ver.2 Remote Device Station Ver.2 Intelligent Device Station
Expanded Cyclic Setting	• The expanded cyclic setting" is fixed to "Single" when the station type is set to "Remote I/O Station", "Remote Device Station", "Intelligent Device Station", "Ver.1 Remote I/O Station", "Ver.1 Remote Device Station" or "Ver.1 Intelligent Device Station". • Select the expanded cyclic setting among the following choices when the mode is set to "Ver.2 Remote Device Station" or "Ver.2 Intelligent Device Station": Single Double Quadruple Octuple
Number of Occupied Stations	Select the number of occupied stations among the following choices: No Setting Occupied Station 1 Occupied Stations 2 Occupied Stations 3 Occupied Stations 4
Remote Station Points	- When "Station Type" is set to "Remote I/O Station", "Remote Device Station", "Intelligent Device Station", "Ver. 1 Remote I/O Station", "Ver. 1 Remote Device Station" or "Ver. 1 Intelligent Device Station", fixed to "32" in the case of "Occupied Station 1" and fixed to "64" in the case of "Occupied Stations 2" - When "Station Type" is set to "Ver. 2 Remote Device Station" or "Ver. 2 Intelligent Device Station" [1] When "Expanded Cyclic Setting" is set to "Single" (32 x "Number of Occupied Stations") [2] When "Expanded Cyclic Setting" is set to "Double", "Quadruple" or "Octuple" (32 x "Number of Occupied Stations" - 16) x "Expanded Cyclic Setting" - When "Station Type" is set to "No Setting" Fixed to "32" in the case of "Occupied Station 1"
Reserve/Invalid Station Select	Select the reserve/invalid station select among the following choices: No Setting Reserved Station Invalid Station

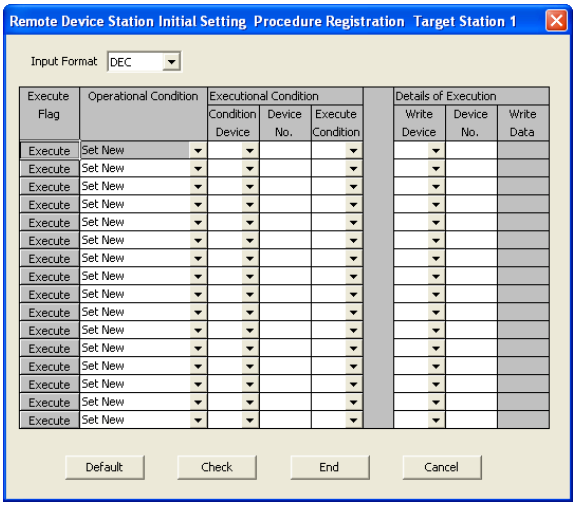
5. Click the "END" button to finish the setting and close the "CC-Link Station Information" dialog box.

6. Click "Initial Setting" in the "Setting Contents" column on the "Network Parameter - CC-Link Module Configuration" dialog box.



Set item	Contents of setting	Setting range
Target Station No.	Set the station number of the unit to be initialized.	FX3U/FX3UC: 1 to 16 FX3G/FX3GC: 1 to 12
No. of Registered Procedures	Displays the number of procedures registered on the "Remote Device Station Initial Setting Procedure Registration" dialog box.	-

Click the "Regist Procedure" button to display the "Remote Device Station Initial Setting Procedure Registration" dialog box.



Set item		Contents of setting	Setting range
Input Format		Select the data input format and display format of "Write Data" when "Write Device" in "Details of Execution" is set to "RWw".	DEC, HEX
Execute Flag		Select whether or not the initial setting is to be actually executed.	Execute, Only Set
Operational Condition		Select whether the initial setting operation condition is to be set anew or same as the previous condition.	Set New, Same as Prev. Set
Executional Condition	Condition Device	Select the device used as the initial setting execution condition.	RX, SB
	Device No.	Set the device number used as the initial setting execution condition. • When "Condition Device" is set to "RX" Remote Net (Ver.1 Mode): 00 to 7FH Remote Net (Ver.2 Mode), Remote Net (Additional Mode): 00 to DFH • When "Condition Device" is set to "SB" Remote Net (Ver.1 Mode): 00 to FFH Remote Net (Ver.2 Mode), Remote Net (Additional Mode): 00 to 1FFH	As shown on the left
	Execute Condition	Select the initial setting execution condition.	ON, OFF

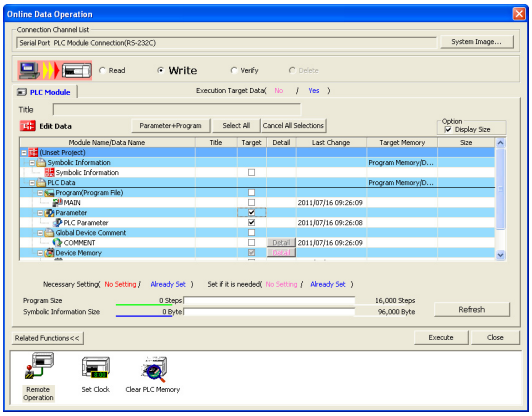
Set item		Contents of setting	Setting range
Details of Execution	Write Device	Select the device to which the initial setting execution contents are written.	RY, RWw
	Device No.	Set the device number to which the initial setting execution contents are written. • When "Write Device" is set to "RY" Remote Net (Ver.1 Mode): 00 to 7FH Remote Net (Ver.2 Mode), Remote Net (Additional Mode): 00 to DFH • When "Write Device" is set to "RWw" Remote Net (Ver.1 Mode): 00 to FH Remote Net (Ver.2 Mode), Remote Net (Additional Mode): 00 to 1FH	As shown on the left
	Write Data	Set the contents of the initial settings. • When "Write Device" is set to "RY" Select "ON" or "OFF". • When "Write Device" is set to "RWw" 0 to 65535 (DEC), 0 to FFFFH (HEX)	As shown on the left

Click the "END" button to finish the setting and close the " Remote device station Initial Setting Procedure Registration" dialog box.

7. Click the "END" button to finish the setting and close the "Remote Device Station Initial Setting Target Station No. Setting" dialog box.

6.6.3 Transferring parameters (, sequence program and symbolic information*1) to the PLC

1. Select [Online]-[Write to PLC] from the tool menu to display the "Online Data Operation" dialog box.



2. Check the "Parameter", and click the [Execute] button.

The selected contents are transferred to the PLC.
The transferred parameters become valid when the PLC mode switches from STOP to RUN.
When the communication setting is changed in the step 7 "Setting the PLC system (2)", turn OFF the power of the PLC once, and then turn it ON again.

*1. The Symbolic information is supported in the FX3U/FX3UC PLCs Ver. 3.00 or later.

Cautions

1) Make sure to write both the program and parameters to the PLC after changing the memory capacity setting.
If only the parameters are written to the PLC, program errors (such as parameter error, circuit error and syntax error) may occur in the PLC.

2) In FX3U/FX3UC PLCs Ver. 3.00 or later.
When symbolic information is stored, it is deleted if the memory capacity set by parameters is changed.
After changing the memory capacity, write the symbolic information again.

7. Other Functions

7.1 Symbolic information storage and block password

7.1.1 Storage of symbolic information

The FX3U/FX3UC PLC Ver. 3.00 or later can store symbolic information (data indicating the program configuration such as structure and labels).
By using this function, you can read symbolic information from the PLC, and edit labels, function blocks, etc. GX Works2 Ver. 1.62Q or later is required to store symbolic information.

→ **For details on symbolic information, refer to the GX Works2 manual.**

Cautions

1) When symbolic information is stored, it is deleted if the memory capacity set by parameters is changed. After changing the memory capacity, write the symbolic information again.
2) Memory cassettes (except for the FX3U-FLROM-1M) which save symbolic information are also supported by FX3U/FX3UC PLCs whose version is earlier than Ver. 3.00. In that case, the FX3U/FX3UC PLC operates, but the written symbolic information is invalid.
3) For writing symbolic information and changing the set values of timers and counters using a peripheral device, it is recommended to create programs with set values specified indirectly.
If the set values are specified directly, programs cannot be restored from symbolic information after the set values are changed.

7.1.2 Block password

In the FX3U/FX3UC PLC Ver. 3.00 or later, the setting "Read-protect the execution program" is available for the block password.

→ **For details on block password, refer to the GX Works2 manual.**

Cautions

1) In the PLC written by the computer using a project including a block password for which the setting "Read protect the execution program" is valid, restoration of programs is enabled only when the PLC stores the symbolic information.
For editing programs using a peripheral equipment which cannot read symbolic information (only supported by GX Works2 Ver.1.62Q or later), do not use a block password for which the setting "Read-protect the execution program" is valid.
2) When a peripheral equipment tries to read an execution program from the PLC that has been written to by a computer using a project including a block password for which the setting "Read-protect the execution program" is valid, a communication error occurs and reading is disabled.
3) For writing a program using a peripheral equipment other than GX Works2 (Ver. 1.62Q or later) to a PLC that as been written to by a computer using a project including a block password for which the setting "Read protect the execution program" is valid, execute "Clear PLC memory" to clear programs before writing.
If a program is written without executing "Clear PLC memory" in advance, the written program cannot be read.
4) It is not possible to write programs including the block password for which the setting "Read-protect the execution program." is valid to any PLC other than the FX3U/FX3UC PLC whose version is 3.00 or later.
5) If a memory cassette which saves programs including a block password for which the setting "Read-protect the execution program." is valid is used for any PLC other than the FX3U/FX3UC PLC (Ver. 3.00 or later), the PLC using such a memory cassette does not run normally.

MEMO

Warranty

Please confirm the following product warranty details before using this product.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company. However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place. Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.
2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
   a) Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
   b) Failure caused by unapproved modifications, etc., to the product by the user.
   c) When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
   d) Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
   e) Relay failure or output contact failure caused by usage beyond the specified Life of contact (cycles).
   f) Failure caused by external irresistible forces such as fires or abnormal voltages, and failure caused by force majeure such as earthquakes, lightning, wind and water damage.
   g) Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
   h) Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

2. Onerous repair term after discontinuation of production

1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued.
   Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.
2) Product supply (including repair parts) is not available after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation of damages caused by any cause found not to be the responsibility of Mitsubishi, loss in opportunity, lost profits incurred to the user or third person by Failures of Mitsubishi products, special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products, replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

6. Product application

1) In using the Mitsubishi MELSEC programmable logic controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable logic controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.
2) The Mitsubishi programmable logic controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for Railway companies or Public service purposes shall be excluded from the programmable logic controller applications.
   In addition, applications in which human life or property that could be greatly affected, such as in aircraft, medical applications, incineration and fuel devices, manned transportation, equipment for recreation and amusement, and safety devices, shall also be excluded from the programmable logic controller range of applications.
   However, in certain cases, some applications may be possible, providing the user consults their local Mitsubishi representative outlining the special requirements of the project, and providing that all parties concerned agree to the special circumstances, solely at the users discretion.

Revision History

Date of preparation	Revision	Description
1/2009	A	First Edition.
7/2009	B	Special auxiliary relay and special data register for FX3U-CF-ADP instructions was added.
2/2010	C	• Manual name of a related manual was changed. • Keyword operation is changed. Support of Permanent PLC Lock and Customer keyword (FX3U,FX3UC).
7/2011	D	• Supports Read from PLC / Write to PLC of symbolic information. • Support of the setting "Read-protect the execution program" for block passwords. • Supports connection of FX3U-FLROM-1M.
2/2012	E	• FX3GC Series PLC was added. • Special parameter setting by GX Woks2 was added. • Special parameter error (M8489 and D8489) was added. • The error code for parameter error was added. • The error code for special block error was added.
5/2012	F	• Instructions was added: DHSCS_I • Support special parameter in the FX3G and FX3GC PLCs.
9/2012	G	• Support special parameter (Ethernet adapter).
2/2013	H	• The description is changed "Ethernet Adapter" to "Ethernet Port".
5/2013	J	• FX3S Series PLC was added.
9/2013	K	• Supported in FX3S series version 1.10 • Supported in FX3G series version 2.20 • FX3S-30M□/E□-2AD PLC was added. • FX3G-4EX-BD and FX3G-2EYT-BD connection was added.
4/2015	L	• A part of the cover design is changed.

FXCPU

Structured Programming Manual

Device & Common

MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE: TOKYO BUILDING, 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

MODEL	FX-KP-DK-E
MODEL CODE	09R925

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(MEE)

Effective April 2015