MITSUBISHI ELECTRIC

Programmable Controller

MELSEC iQ-F series

MELSEC iQ-F
Predefined Protocol Support for Positioning Function Block Reference (for SMC)

SAFETY PRECAUTIONS

(Read these precautions before use.)

Before using this product, please read this reference and the relevant manuals introduced in this reference carefully and pay full attention to safety in order to handle the product correctly.

Precautions shown in this reference are only for this product. For safety precautions on the programmable controller system, refer to the user's manual (hardware) of the CPU module to be used.

This reference classifies the safety precautions into two categories: [⚠WARNING] and [⚠CAUTION].

⚠ **WARNING**	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ **CAUTION**	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Depending on the circumstances, procedures indicated by [⚠CAUTION] may also cause severe injury.

It is important to follow all precautions for personal safety.

Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

INTRODUCTION

Thank you for purchasing the MELSEC iQ-F series.
This reference describes the module FBs for the applicable modules listed below.
Before using this product, please read this reference and the manuals of relevant products carefully and develop familiarity with the specifications to handle the product correctly.
Please make sure that the end users read this reference.

Applicable modules

- FX5U
- FX5UC

Regarding use of this product

- 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 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.

Note

- If in doubt at any stage during the installation of the product, always consult a professional electrical engineer who is qualified and trained in 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 reference, technical bulletin, catalog, etc. are used as a reference, please use them 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 reference content, specification etc. may be changed without a notice for improvement.
- The information in this reference has been carefully checked and is believed to be accurate; however, if you notice a doubtful point, an error, etc., please contact the nearest Mitsubishi Electric representative. When doing so, please provide the manual number given at the end of this reference.

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RELEVANT MANUALS

Manual name	Description
MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware) [SH-082452ENG]	Describes the details of hardware of the CPU module, including performance specifications, wiring, installation, and maintenance.
MELSEC iQ-F FX5 User's Manual (Application) [JY997D55401]	Basic knowledge required for program design, functions of the CPU module, devices/labels, and descriptions of parameters.
MELSEC iQ-F FX5 User's Manual (MODBUS Communication) [JY997D56101]	Information related to the MODBUS serial communication and MODBUS/TCP communication.
MELSEC iQ-F FX5 Programming Manual (Instructions, Standard Functions/ Function Blocks) [JY997D55801]	Specifications of instructions and functions that can be used in programs.
MELSEC iQ-F FX5 Programming Manual (Program Design) [JY997D55701]	Specifications of ladders, ST, FBD/LD, and other programs and labels.
GX Works3 Operating Manual [SH-081215ENG]	System configuration, parameter settings, and online function operations of GX Works3.
Predefined Protocol Support Tool For Positioning Operating Manual [SH-082176ENG]	System configuration, operation method of functions, and troubleshooting of Predefined Protocol Support Tool For Positioning.
Step Motor Controller (Servo/24 VDC) Operation Manual [JXC*-OMX0011]	Performance specifications, procedures before operation, and troubleshooting of the step motor controller.
Servo Motor Controller (24 VDC) Operation Manual [LEC-OM01006]	Performance specifications, procedures before operation, and troubleshooting of the servo motor controller.
Controller setting Software (ACT Controller) Operation Manual [JXC*-OMU0010]	Operation method of Easy mode and Normal mode, teaching method, and operation method of ACT Controller.

TERMS

Unless otherwise specified, this reference uses the following terms.

Term	Description
FX5	A generic term for FX5UJ, FX5U, and FX5UC programmable controllers.
FX5 CPU module	A generic term for FX5UJ, FX5U, and FX5UC CPU modules.
FX5UJ CPU module	A generic term for FX5UJ-24MR/ES, FX5UJ-24MT/ES, FX5UJ-24MT/ESS, FX5UJ-40MR/ES, FX5UJ-40MT/ES, FX5UJ-40MT/ESS, FX5UJ-60MR/ES, FX5UJ-60MT/ES, and FX5UJ-60MT/ESS.
FX5U CPU module	A generic term for FX5U-32MR/ES, FX5U-32MT/ES, FX5U-32MT/ESS, FX5U-64MR/ES, FX5U-64MT/ES, FX5U-64MT/ESS, FX5U-80MR/ES, FX5U-80MT/ES, FX5U-80MT/ESS, FX5U-32MR/DS, FX5U-32MT/DS, FX5U-32MT/DSS, FX5U-64MR/DS, FX5U-64MT/DS, FX5U-64MT/DSS, FX5U-80MR/DS, FX5U-80MT/DS, and FX5U-80MT/DSS.
FX5UC CPU module	A generic term for FX5UC-32MT/D, FX5UC-32MT/DSS, FX5UC-64MT/D, FX5UC-64MT/DSS, FX5UC-96MT/D, FX5UC-96MT/DSS, FX5UC-32MT/DS-TS, and FX5UC-32MT/DSS-TS.
Engineering tool	A tool for configuring settings and performing programming, debugging, and maintenance for programmable controllers.
JOG operation	Pulses are output to the drive unit only while the JOG start signal is on.
Inching operation	Pulses for minute movement amount are output to the drive unit by manual operation.
Pushing operation	An operation that inputs pulses, and continuously pressurizes the load.

GENERIC TERM/ABBREVIATION

Unless otherwise specified, this reference uses the following generic term and abbreviation.

Generic term/abbreviation	Description
FB	FB is the abbreviation for Function Block. The FB is a generalized circuit block that is repeatedly used in a sequence program and designed to be diverted in the sequence program. This improves the efficiency of the program development and reduces the programming errors, resulting in the improvement in the program quality.
Predefined Protocol Support Tool For Positioning	Predefined Protocol Support Tool For Positioning is a sample tool that has a function specialized for positioning control of an electric actuator connected via the MODBUS RTU communication.

1 OVERVIEW

The FBs in this reference are the FB libraries for connecting the MELSEC iQ-F FX5U or FX5UC series and an SMC controller through the MODBUS RTU connection, and using them.

1.1 Specification Overview

The following shows the features of this function.

Optimal system for low-price devices

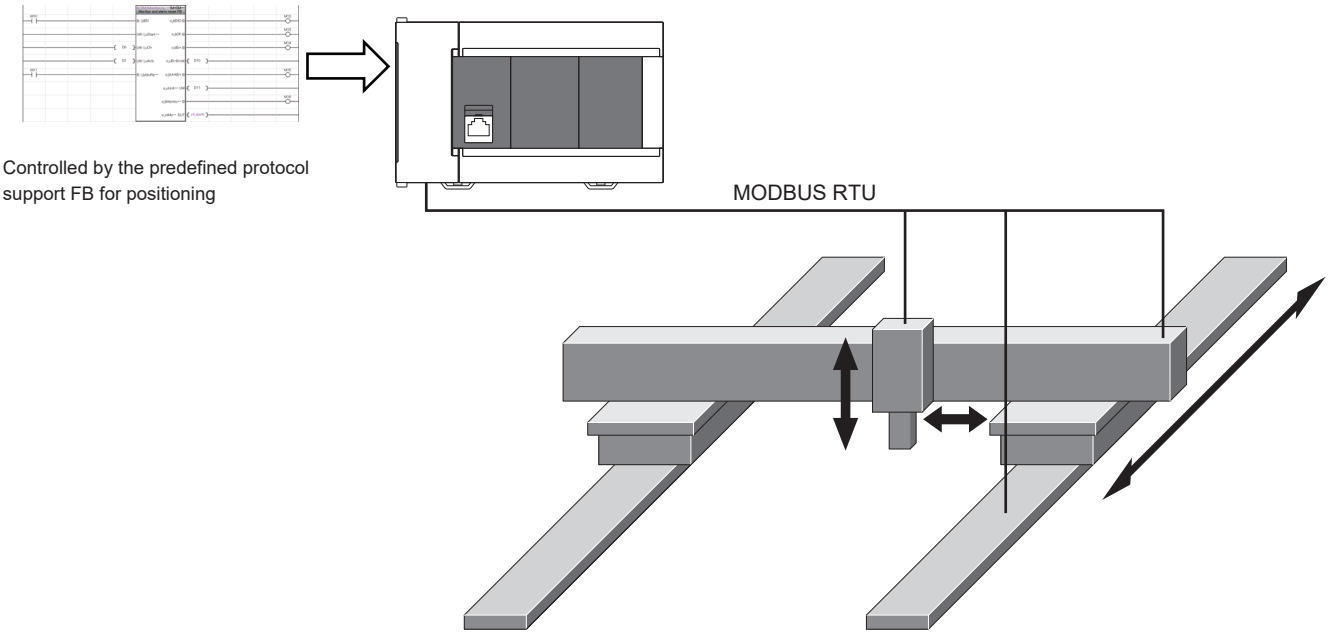
In the easy drive control, easy and low-price system construction can be achieved by using Predefined Protocol Support Function For Positioning and SMC devices together.

Easy startup

Using the program application example described in this reference enables the positioning operation without modifying the program.

Application example

The following shows an example of using this function in a sealing device. Use three controllers by SMC to perform the positioning control.



1.2 FB List

The following table lists the FB libraries in this reference.

Point

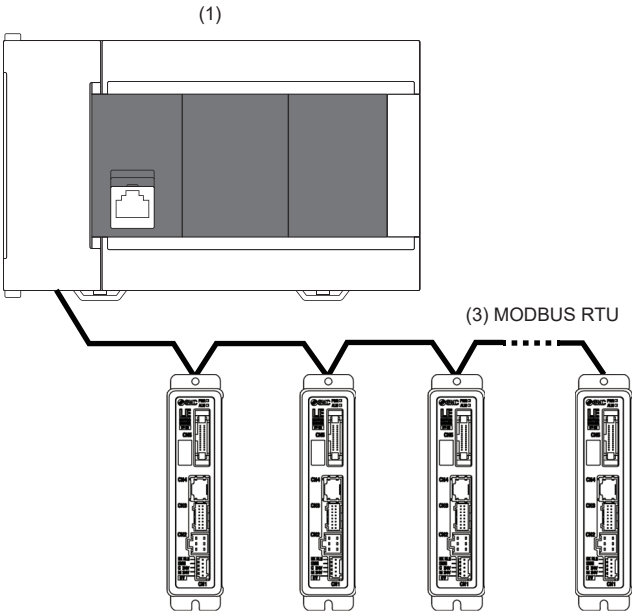
Note that this reference does not describe the FB version information such as "_00A" at the end of FB name.

○: Necessary, —: Unnecessary

FB name	Description	Parameter setting necessity
M+SMCStartHomePositioning_F (Home position return)	Performs the home position return.	○
M+SMCJogInching_F (JOG/inching operation)	Performs the JOG operation or inching operation.	○
M+SMCReadStepData_F (Step data reading)	Reads the step data corresponding to the specified step data No.	○
M+SMCWriteStepData_F (Step data writing)	Writes the step data corresponding to the specified step data No.	○
M+SMCStartPositioning_F (Positioning operation)	Starts the positioning operation for the specified step data No.	○
M+SMCMonitoring_F (Operation monitoring)	Monitors the current position and alarms, and performs the alarm reset.	○
M+SMCServoControl_F (Servo ON/OFF)	Controls the servo ON/OFF.	○

1.3 System Configuration

The following shows a system configuration example for using the FBs described in this reference.



(2) Maximum number of connected modules: 32

No.	Device	
(1)	FX5U CPU, FX5UC CPU	Built-in RS-485 port
		FX5-485-BD
		FX5-485ADP
(2)	SMC controller	LECP6
		LECA6
		JXC51/61
(3)	Serial communication	RS-485 connection

2 DETAILS OF THE FB LIBRARY

2.1 Common Specifications

This section describes the common specifications in this FB library.

Structure list

The following table lists the structures to be used in this FB library.

stStepData (Step data)

Label	Label name	Data type	Setting range*5	Description
uMotionMethod	Operation method	Word [Unsigned]/Bit string [16-bit]	1 and 2	1: Absolute coordinate movement (ABS) 2: Relative coordinate movement (INC)
uSpeed	Speed	Word [Unsigned]/Bit string [16-bit]	1 to 65535	Stores the movement speed to the target position or pushing start position.*1
dPosition	Position	Double word [Signed]/Bit string [32-bit]	-2147483647 to 2147483647	Stores the target position or pushing start position.*2
uUpSpeed	Acceleration	Word [Unsigned]/Bit string [16-bit]	1 to 65535	Stores the acceleration to the movement speed.*3
uDownSpeed	Deceleration	Word [Unsigned]/Bit string [16-bit]	1 to 65535	Stores the deceleration to the movement speed.*3
uPressThrust	Pushing thrust	Word [Unsigned]/Bit string [16-bit]	0 to 100	Stores the pushing operation or positioning operation according to the setting value.*4 0: Positioning operation 1 to 100: Pushing operation torque setting
uPressThreshold	Threshold	Word [Unsigned]/Bit string [16-bit]	0 to 100	If thrust higher than the value is generated at the pushing operation, the INP output is turned on.*6 Set this parameter to a value less than the pushing thrust.*4
uPressSpeed	Pushing speed	Word [Unsigned]/Bit string [16-bit]	1 to 65535	Stores the movement speed at the pushing speed.*1
uPositionThrust	Positioning thrust	Word [Unsigned]/Bit string [16-bit]	0 to 300	Stores the maximum thrust at the positioning operation.*4
dArea1	Area output edge 1	Double word [Signed]/Bit string [32-bit]	-2147483647 to 2147483647	Stores the conditions under which the AREA output turns ON.*2*7 The AREA output turns on when the position is within the range of area output edge 1 (area 1) to area output edge 2 (area 2).
dArea2	Area output edge 2	Double word [Signed]/Bit string [32-bit]	-2147483647 to 2147483647	Stores the conditions under which the AREA output turns ON.*2*7 The AREA output turns on when the position is within the range of area output edge 1 (area 1) to area output edge 2 (area 2).
udWide	Positioning width	Double word [Unsigned]/Bit string [32-bit]	1 to 2147483647	Functions differently between the pushing operation and positioning operation.*2 Positioning operation: Positioning width Pushing operation: Pushing width

*1 The unit is 1 mm/s.
*2 The unit is 0.01 mm.
*3 The unit is 1 mm/s^2.

*4 The unit is %.
*5 The setting range differs depending on the electric actuator.
*6 INP is the output signal name of the SMC controller. For details, refer to the manual of the SMC controller to be used.
*7 AREA is the output signal name of the SMC controller. For details, refer to the manual of the SMC controller to be used.

stMonitoringTable (Monitoring table)

Label	Label name	Data type	Setting range	Description
dCurrentPosition	Current position	Double word [Signed]/Bit string [32-bit]	-2147483647 to 2147483647	Stores the current position.*1
uCurrentSpeed	Current speed	Word [Unsigned]/Bit string [16-bit]	0 to 65535	Stores the current speed.*2
uCurrentThrust	Current thrust	Word [Unsigned]/Bit string [16-bit]	0 to 300	Stores the current thrust.*3
dTargetPosition	Target position	Double word [Signed]/Bit string [32-bit]	-2147483647 to 2147483647	Stores the target position.*1
uStepDataNo	Step data No.	Word [Unsigned]/Bit string [16-bit]	0 to 63	Stores the step data No. at the operation completion or during the operation.
u8CurrentAlmCode	Alarm	Word [Unsigned]/Bit string [16-bit] (0..7)	0 to 255	Indicates the current alarm No.*4
uStatusFlag	Status flag	Word [Unsigned]/Bit string [16-bit]	0000H to FFFFH	Stores the status flag of the SMC controller. For details of the status flag, refer to ☞ Page 11 uStatusFlag (Status flag).
u2StatusChangeFlag	Status change flag	Word [Unsigned]/Bit string [16-bit] (0..1)	0000H to FFFFH	Stores the status change flag of the SMC controller. For details of the status change flag, refer to ☞ Page 12 u2StatusChangeFlag (Status change flag).

*1 The unit is 0.01 mm.
*2 The unit is 1 mm/s.
*3 The unit is %.
*4 If multiple alarms occur simultaneously, up to eight types of alarm Nos. will be saved.

uStatusFlag (Status flag)

Bit No.	Signal name	Description
0	OUT0	For details, refer to the manual of the SMC controller to be used.
1	OUT1	
2	OUT2	
3	OUT3	
4	OUT4	
5	OUT5	
6	—	—
7	—	—
8	BUSY	For details, refer to the manual of the SMC controller to be used.
9	SVRE	
10	SETON	
11	INP	
12	AREA	
13	—	—
14	ESTOP	ON: Emergency stop OFF: Normal operation
15	ALARM	ON: Alarm occurred OFF: No alarm occurred

u2StatusChangeFlag (Status change flag)

Array element No.	Bit No.	Signal name	Description
0	0	IN0	For details, refer to the manual of the SMC controller to be used.
	1	IN1	
	2	IN2	
	3	IN3	
	4	IN4	
	5	IN5	
	6	—	—
	7	—	—
	8	HOLD	For details, refer to the manual of the SMC controller to be used.
	9	SVON	
	10	DRIVE	
	11	RESET	
	12	SETUP	
	13	JOG(-)	ON: Reverse operation OFF: Stop
	14	JOG(+)	ON: Forward operation OFF: Stop
	15	FLGTH	ON: Inching operation OFF: JOG operation
1	0	Input invalid flag	ON: Serial input operation mode OFF: Parallel input operation mode
	1 to 15	—	—

Precautions on FB combinations

The following describes the influences when using multiple FBs of this FB library in combination.

Influence matrix of the communication channel and target axis

The following shows the influence matrices of the communication channel and target axis.

○: Simultaneous processing available, △: FB operation delayed

		Target axis	
		Same axis	Other axis
Communication channel	Same channel	Refer to the influence matrix when the same axis and channel are specified.	△
	Other channel	○	○

Influence matrix when the same axis and channel are specified

The following shows the influence matrices when the same axis and channel are specified.

△: FB operation delayed, ●: Depends on the controller

		Target FB						
		M+SMCStartHomePositioning_F (Home position return)	M+SMCJogInching_F (JOG/Inching operation)	M+SMCReadStepData_F (Step data reading)	M+SMCWriteStepData_F (Step data writing)	M+SMCStartPositioning_F (Positioning operation)	M+SMCMonitoring_F (Operation monitoring)	M+SMCServoControl_F (Servo ON/OFF)
Target FB	M+SMCStartHomePositioning_F (Home position return)	●	●	△	△	●	△	●
	M+SMCJogInching_F (JOG/Inching operation)	●	●	△	△	●	△	●
	M+SMCReadStepData_F (Step data reading)	△	△	△	△	△	△	△
	M+SMCWriteStepData_F (Step data writing)	△	△	△	△	△	△	△
	M+SMCStartPositioning_F (Positioning operation)	●	●	△	△	●	△	●
	M+SMCMonitoring_F (Operation monitoring)	△	△	△	△	△	△	△
	M+SMCServoControl_F (Servo ON/OFF)	●	●	△	△	●	△	●

Precautions

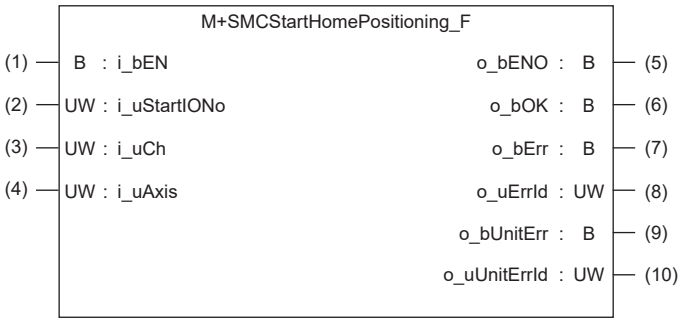
Check the following precautions before using this FB library.

No.	Condition
1	The external device for serial communication and the SMC controller support MODBUS RTU.
2	The MELSEC iQ-F series product and SMC controller are connected by the serial communication.
3	R0 to R1903 (1904 points) of the file register (R) are used in this FB library.
4	Set the channel to be used in Predefined Protocol Support Tool For Positioning. For details, refer to 📖Predefined Protocol Support Tool For Positioning Operating Manual (6.4 Writing Predefined Protocol Information).
5	When using the following FBs, be careful not to use them at the same time with the same target axis specified in i_uAxis (Target axis) or with the same communication channel specified in i_uCh (Target channel). Otherwise, they may not operate normally. • M+SMCStartHomePositioning_F (Home position return) • M+SMCJogInching_F (JOG/Inching operation) • M+SMCStartPositioning_F (Positioning operation) • M+SMCServoControl_F (Servo ON/OFF)
6	When FBs are executed at the same time, specifying the same communication channel in i_uCh (Target axis) delays the FB operation.
7	The FBs check the device name set in the SMC controller. Do not change the set device name.

2.2 M+SMCStartHomePositioning_F (Home Position Return)

Overview

This FB performs the home position return.



Label

Input label

No.	Label	Label name	Data type	Setting range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_uStartIONo	Start I/O No.	Word [Unsigned]/Bit string [16-bit]	—	Setting this label is not required since it is not used in the program in this FB.
(3)	i_uCh	Target channel	Word [Unsigned]/Bit string [16-bit]	1 to 4	Specify the channel number. 1: Built-in RS485 port 2: FX5-485-BD 3, 4: FX5-485ADP
(4)	i_uAxis	Target axis	Word [Unsigned]/Bit string [16-bit]	1 to 32	Specify the axis number set in the SMC controller.*1

*1 The axis number corresponds to the slave station number of MODBUS.

Output label

No.	Label	Label name	Data type	Default value	Description
(5)	o_bENO	Execution status	Bit	OFF	ON: The execution command is on. OFF: The execution command is off.
(6)	o_bOK	Normal completion	Bit	OFF	When this label is on, it indicates that the home position return has been completed.
(7)	o_bErr	Error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the FB.
(8)	o_uErrId	Error code	Word [Unsigned]/Bit string [16-bit]	0	The error code that has occurred in the FB is stored.
(9)	o_bUnitErr	Module error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the module.
(10)	o_uUnitErrId	Module error code	Word [Unsigned]/Bit string [16-bit]	0	The error code that has occurred in the module is stored.

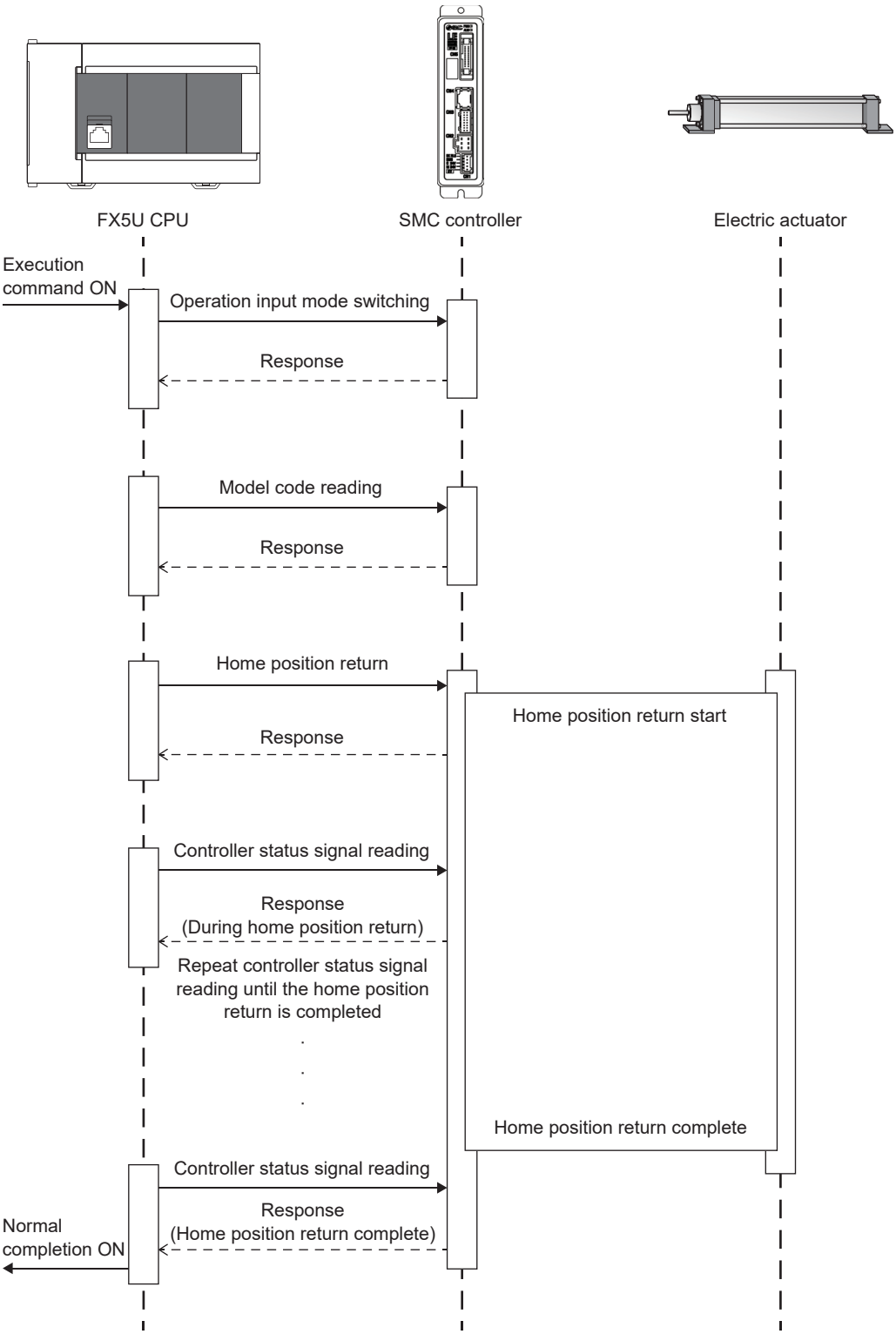
Function overview

Applicable hardware and software

■ Predefined Protocol Support FB For Positioning

Applicable module	Firmware version	Engineering tool
FX5U CPU	1.200 or later	GX Works3 Version 1.065T or later
FX5UC CPU	1.200 or later	GX Works3 Version 1.065T or later

Sequence diagram



Basic specifications

Item	Description
Programming language	—(The program in this FB is not open to the public.)
Number of steps	1079 steps The number of steps of the FB in a program depends on the CPU module used, input and output definition, and option settings of GX Works3. For the option settings of GX Works3, refer to 📖GX Works3 Operating Manual (2.9 Option Setting for Each Function).
Label amount used	• Label: 0.04K points (Word) • Latch label: 0K points (Word) The label amount used in a program depends on the CPU module used, device specified in the argument, and option settings of GX Works3. For the option settings of GX Works3, refer to 📖GX Works3 Operating Manual (2.9 Option Setting for Each Function).
Number of index register points used	• Index register: 2 points • Long index register: 0 points
File register amount used	File register: 1904 points (Word)
FB dependence	No dependence
FB compiling method	Subroutine type
FB operation type	Pulsed execution (multiple scan execution type)

Function description

- Set the axis number of the operation target in i_uAxis (Target axis).
- At rising edge of i_bEN (Execution command), this FB sets the operation input mode to the serial input operation mode and performs the home position return.
- This FB detects the completion of the home position return by checking that the status flag of the SMC controller satisfies both the following conditions, and o_bOK (Normal completion) turns on.

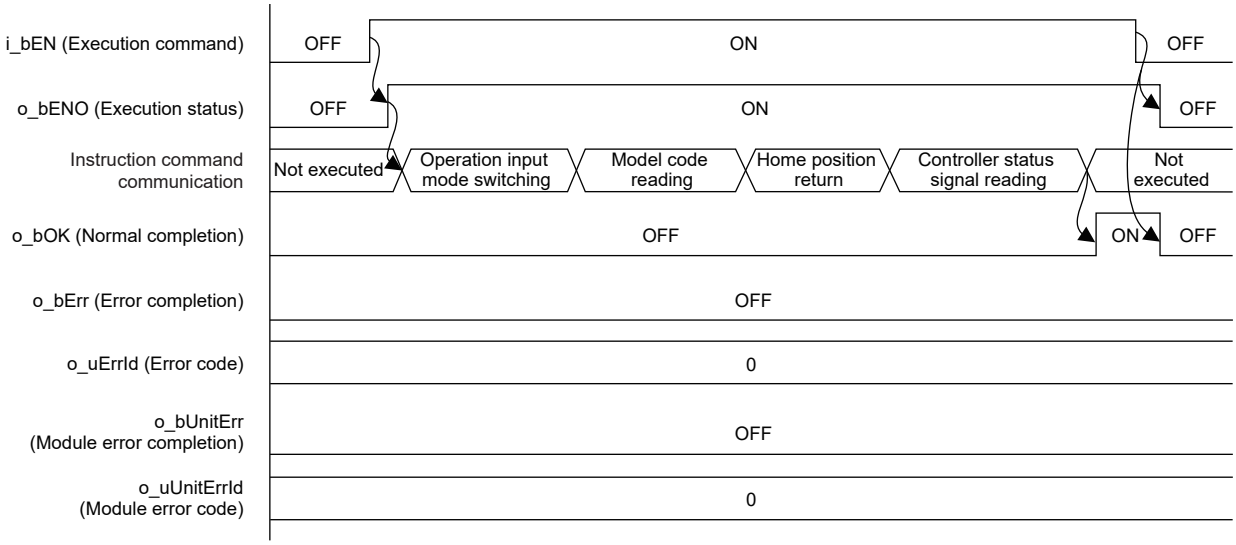
· INP is ON.

· SETON is ON.

- If an error occurs while sending/receiving a predefined protocol, o_bErr (Error completion) turns on and the processing of the FB is interrupted. The error code is stored in o_uErrId (Error code). For details of the error code, refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/7.9 Troubleshooting/Checking absence/presence of errors).
- If an error occurs in the SMC controller and this FB receives an error code, o_bUnitErr (Module error completion) turns on and the processing of the FB is interrupted. The received error code is stored in o_uUnitErrId (Module error code). For details of the error code, refer to ☞ Page 81 Module Error Code.
- If any other error occurs, o_bErr (Error completion) turns on and the processing of the FB is interrupted. For details of the error code, refer to ☞ Page 20 Error code.

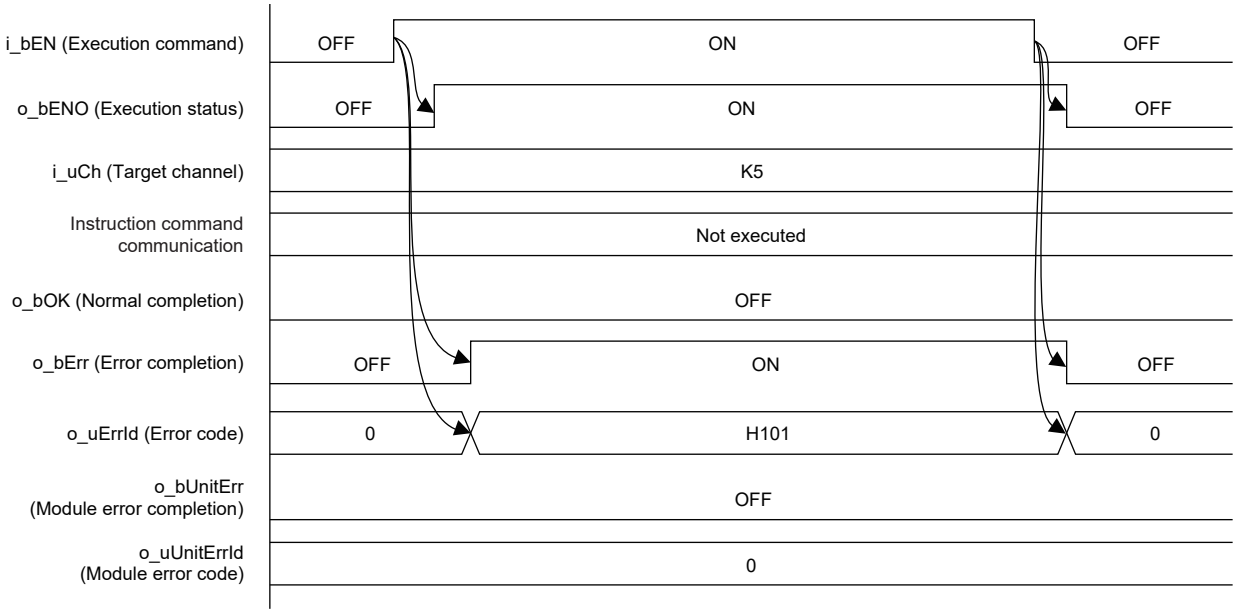
Timing chart of I/O signals

■ Normal completion



■ Error completion

• The target channel is out of range.



Restrictions and precautions

- This FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation.
- This FB uses the index registers Z0 and Z1. When using an interrupt program, do not use these index registers.
- This FB cannot be used in an interrupt program.
- Using the FB in a program that is to be executed only once, such as a subroutine program or a FOR-NEXT loop, has a problem that i_bEN (Execution command) can no longer be turned off and normal operation is not possible; Always use the FB in a program that is capable of turning off the execution command.
- This FB requires the ladder to be configured for every input label.
- In this FB, if i_bEN (Execution command) is turned off after the home position return operation is started and before o_bOK (Normal completion), o_bErr (Error completion), or o_bUnitErr (Module error completion) turns on, the operation of the electric actuator does not stop until the home position return operation is completed.
- This FB uses the CPRTCL instruction. For details, refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/ 7.8 Programming/Predefined protocol support instruction).
- To operate the SMC controller, set the protocol type to the predefined protocol support type with the module parameter of GX Works3. For details of the parameter setting procedures, refer to ☞ Page 19 Parameter setting.
- Change the number of timeouts or retries of the communication in Predefined Protocol Support Tool For Positioning. For details of the setting procedures, refer to 📖Predefined Protocol Support Tool For Positioning Operating Manual (6.2 Setting a Connected Model). If the communication interval for the same channel is short, the command may not be received depending on the connected controller, and a serial communication timeout (CPU error) may occur. In this case, the situation can be avoided by increasing the "transmission standby time" in the protocol transmission/reception settings of the connected device setting.
- Before executing this FB, use M+SMCServoControl_F (Servo ON/OFF) to turn on the servo.

Parameter setting

Set the protocol type to the predefined protocol support type.
Configure the settings by selecting the following menu items in GX Works3.
[Navigation window] ⇨ [Parameter] ⇨ Communication port to be used ⇨ [Basic Settings] For the protocol type setting, select "Predefined Protocol Support Function" for "Communication Protocol Type".
Configure the following settings in the detail settings.

- Data Length: 8 (Default value: 7)
- Parity Bit: None (Default value: Odd)
- Stop Bit: 1 bit (Default value: 1 bit)
- Baud Rate: 38400bps (Default value: 115200bps)

Set the other parameters to the default values.
For details of the parameter setting procedures, refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/7.5 Communication Settings).
In addition, set the channel to be used and write the data in Predefined Protocol Support Tool For Positioning.
For details, refer to 📖Predefined Protocol Support Tool For Positioning Operating Manual (6.4 Writing Predefined Protocol Information).

Performance value

CPU	Measurement condition*3	Processing time	Maximum scan time	Number of scans
FX5U, FX5UC*1*2	Axis 1	2300 ms	1.310 ms	8273

*1 When the program capacity is set to 128K steps, the processing speed may be decreased.
*2 The standard area is used for the labels.
*3 The current position at the start of the measurement is 50.00 mm. Perform the positioning operation in advance so that the current position becomes 50.00 mm.

Error code

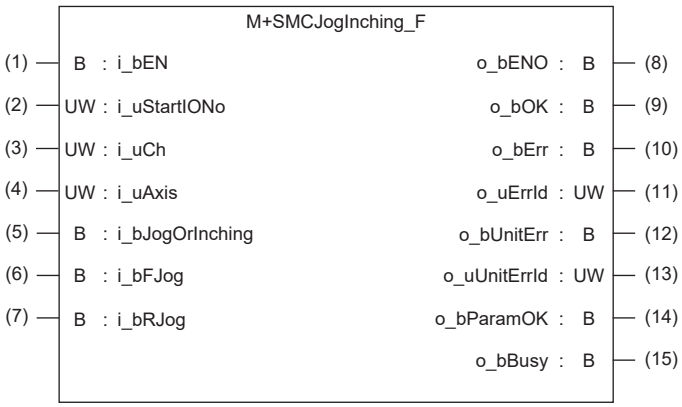
Error code (hexadecimal)	Description	Action
101H	The setting value of i_uCh (Target channel) is out of range. The target channel is not within the range of 1 to 4.	Review and correct the setting and then execute the FB again.
102H	The setting value of i_uAxis (Target axis) is out of range. The target axis is not within the range of 1 to 32.	Review and correct the setting and then execute the FB again.
200H	An unsupported device is connected.	Review and correct the connected device and then execute the FB again.
201H	The execution command has turned off during the processing.	Keep the ON state of the execution command until the normal completion, error completion, or module error completion turns on.*1
203H	The controller is in the emergency stop state or an alarm has occurred.	Check the status of the SMC controller in M+SMCMonitoring_F (Operation monitoring). After checking the status, eliminate the error cause and then execute the FB again.
Predefined protocol error code	This error code occurs during communication.	Refer to MELSEC iQ-F FX5 User's Manual (Serial Communication/7.9 Troubleshooting/Checking absence/presence of errors).

*1 It is output only during one scan.

2.3 M+SMCJogInching_F (JOG/Inching Operation)

Overview

This FB performs the JOG operation or inching operation.



Label

Input label

No.	Label	Label name	Data type	Setting range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_uStartIONo	Start I/O No.	Word [Unsigned]/Bit string [16-bit]	—	Setting this label is not required since it is not used in the program in this FB.
(3)	i_uCh	Target channel	Word [Unsigned]/Bit string [16-bit]	1 to 4	Specify the channel number. 1: Built-in RS485 port 2: FX5-485-BD 3, 4: FX5-485ADP
(4)	i_uAxis	Target axis	Word [Unsigned]/Bit string [16-bit]	1 to 32	Specify the axis number set in the SMC controller.*1
(5)	i_bJogOrInching	JOG/inching switching	Bit	ON, OFF	ON: The inching operation is specified. OFF: The JOG operation is specified.
(6)	i_bFJog	JOG+ command	Bit	ON, OFF	Turn on this label to perform the forward JOG operation or forward inching operation.
(7)	i_bRJog	JOG- command	Bit	ON, OFF	Turn on this label to perform the reverse JOG operation or reverse inching operation.

*1 The axis number corresponds to the slave station number of MODBUS.

Output label

No.	Label	Label name	Data type	Default value	Description
(8)	o_bENO	Execution status	Bit	OFF	ON: The execution command is on. OFF: The execution command is off.
(9)	o_bOK	Normal completion	Bit	OFF	When this label is on, it indicates that the execution of the JOG operation has started without error or the execution of the inching operation has been completed without error.
(10)	o_bErr	Error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the FB.
(11)	o_uErrId	Error code	Word [Unsigned]/Bit string [16-bit]	0	The error code that has occurred in the FB is stored.
(12)	o_bUnitErr	Module error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the module.
(13)	o_uUnitErrId	Module error code	Word [Unsigned]/Bit string [16-bit]	0	The error code that has occurred in the module is stored.

No.	Label	Label name	Data type	Default value	Description
(14)	o_bParamOK	Setting completion flag	Bit	OFF	When this label is on, it indicates that configuring the initial settings to enable the electric actuator has been completed.
(15)	o_bBusy	Busy signal	Bit	OFF	When this label is on, it indicates that the electric actuator is operating.

Function overview

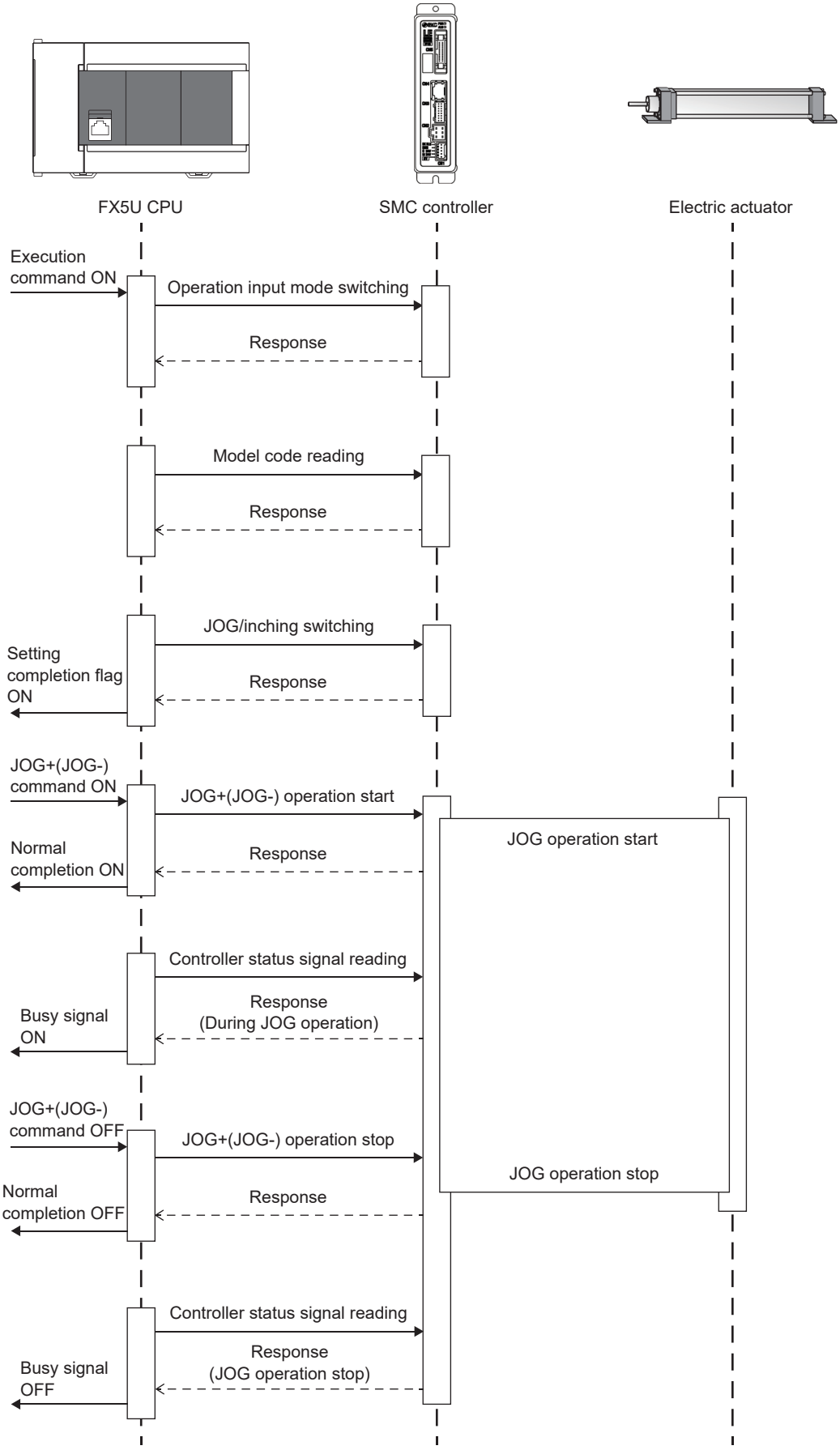
Applicable hardware and software

■ Predefined Protocol Support FB For Positioning

Applicable module	Firmware version	Engineering tool
FX5U CPU	1.200 or later	GX Works3 Version 1.065T or later
FX5UC CPU	1.200 or later	GX Works3 Version 1.065T or later

Sequence diagram

■ For JOG operation



Basic specifications

Item	Description
Programming language	—(The program in this FB is not open to the public.)
Number of steps	1728 steps The number of steps of the FB in a program depends on the CPU module used, input and output definition, and option settings of GX Works3. For the option settings of GX Works3, refer to 📖GX Works3 Operating Manual (2.9 Option Setting for Each Function).
Label amount used	• Label: 0.04K points (Word) • Latch label: 0K points (Word) The label amount used in a program depends on the CPU module used, device specified in the argument, and option settings of GX Works3. For the option settings of GX Works3, refer to 📖GX Works3 Operating Manual (2.9 Option Setting for Each Function).
Number of index register points used	• Index register: 2 points • Long index register: 0 points
File register amount used	File register: 1904 points (Word)
FB dependence	No dependence
FB compiling method	Subroutine type
FB operation type	Real-time execution

Function description

- Set the axis number of the operation target in i_uAxis (Target axis).
- At rising edge of i_bEN (Execution command), this FB sets the operation input mode to the serial input operation mode.
- o_bParamOK (Setting completion flag) turns on when the JOG/inching operation is enabled.
- While the electric actuator is operating, o_bBusy (Busy signal) is on.
- The inching operation starts when both the following conditions are satisfied. This FB detects the completion of the inching operation by checking the OFF state of BUSY, which is the status flag of the SMC controller, and o_bOK (Normal completion) turns on.

· i_bJogOrInching (JOG/inching switching) is on.
· i_bFJog (JOG+ command) or i_bRJog (JOG- command) is turned on from the state in which both of them are OFF.

- For the inching operation, the operation does not decelerate to stop when the command of the operation in the opposite direction turns on while the electric actuator is operating. The electric actuator continues to operate until the inching operation is completed, and the command of the operation in the opposite direction is ignored.
- The JOG operation starts and o_bOK (Normal completion) turns on when both the following conditions are satisfied.

· i_bJogOrInching (JOG/inching switching) is off.
· i_bFJog (JOG+ command) or i_bRJog (JOG- command) is on.

The operation decelerates to stop and o_bOK (Normal completion) turns off when i_bFJog (JOG+ command) or i_bRJog (JOG- command) is switched off from on during the JOG operation.

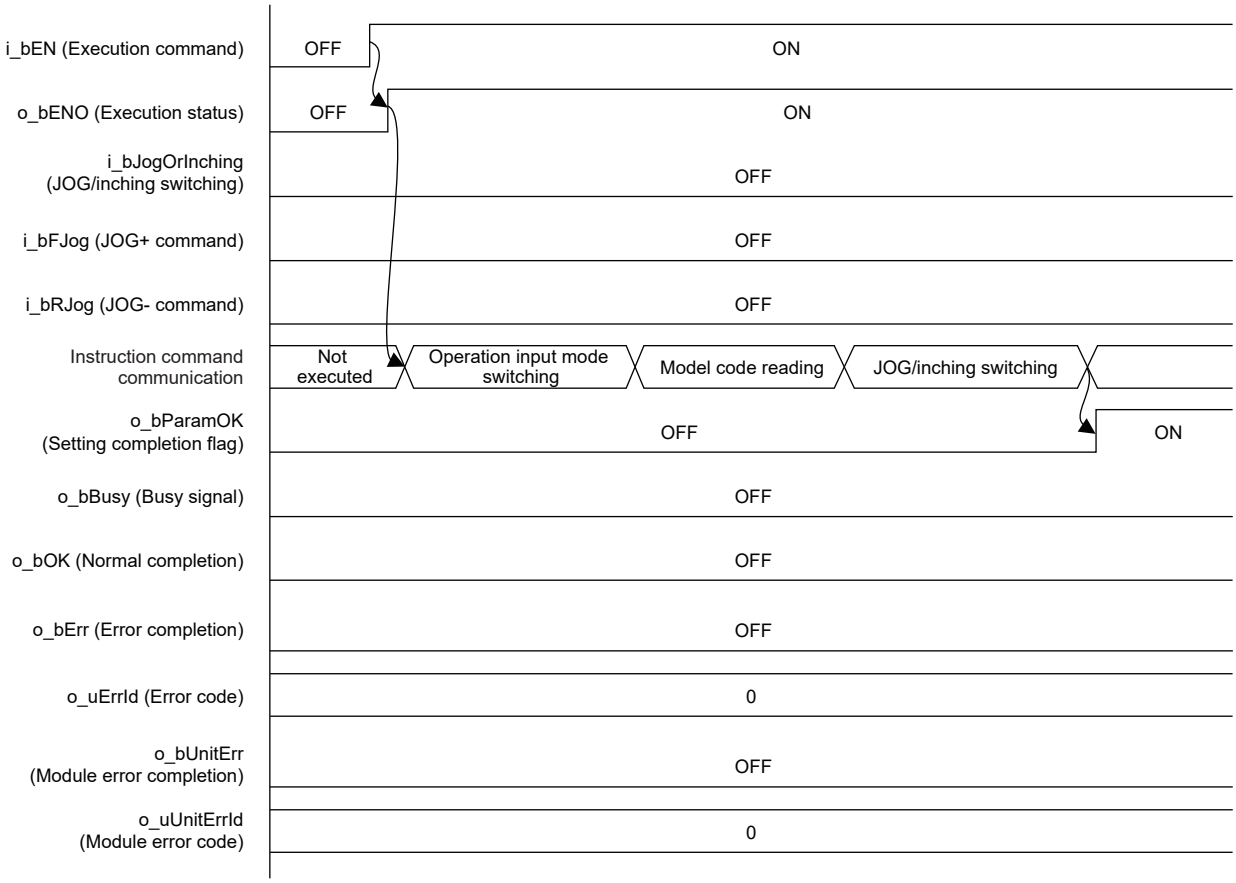
- For the JOG operation, the operation decelerates to stop when both i_bFJog (JOG+ command) and i_bRJog (JOG- command) are turned on. If either of these commands is turned off, the operation which remains on is started.
- The parameter for the JOG/inching operation cannot be changed in this FB. To change the parameter, refer to Controller Setting Software (ACT Controller) Operation Manual.
- If an error occurs while sending/receiving a predefined protocol, o_bErr (Error completion) turns on and the processing of the FB is interrupted. The error code is stored in o_uErrId (Error code). For details of the error code, refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/7.9 Troubleshooting/Checking absence/presence of errors).
- If an error occurs in the SMC controller and this FB receives an error code, o_bUnitErr (Module error completion) turns on and the processing of the FB is interrupted. The received error code is stored in o_uUnitErrId (Module error code). For details of the error code, refer to ☞ Page 81 Module Error Code.
- If any other error occurs, o_bErr (Error completion) turns on and the processing of the FB is interrupted. For details of the error code, refer to ☞ Page 32 Error code.

Timing chart of I/O signals

■ Normal completion

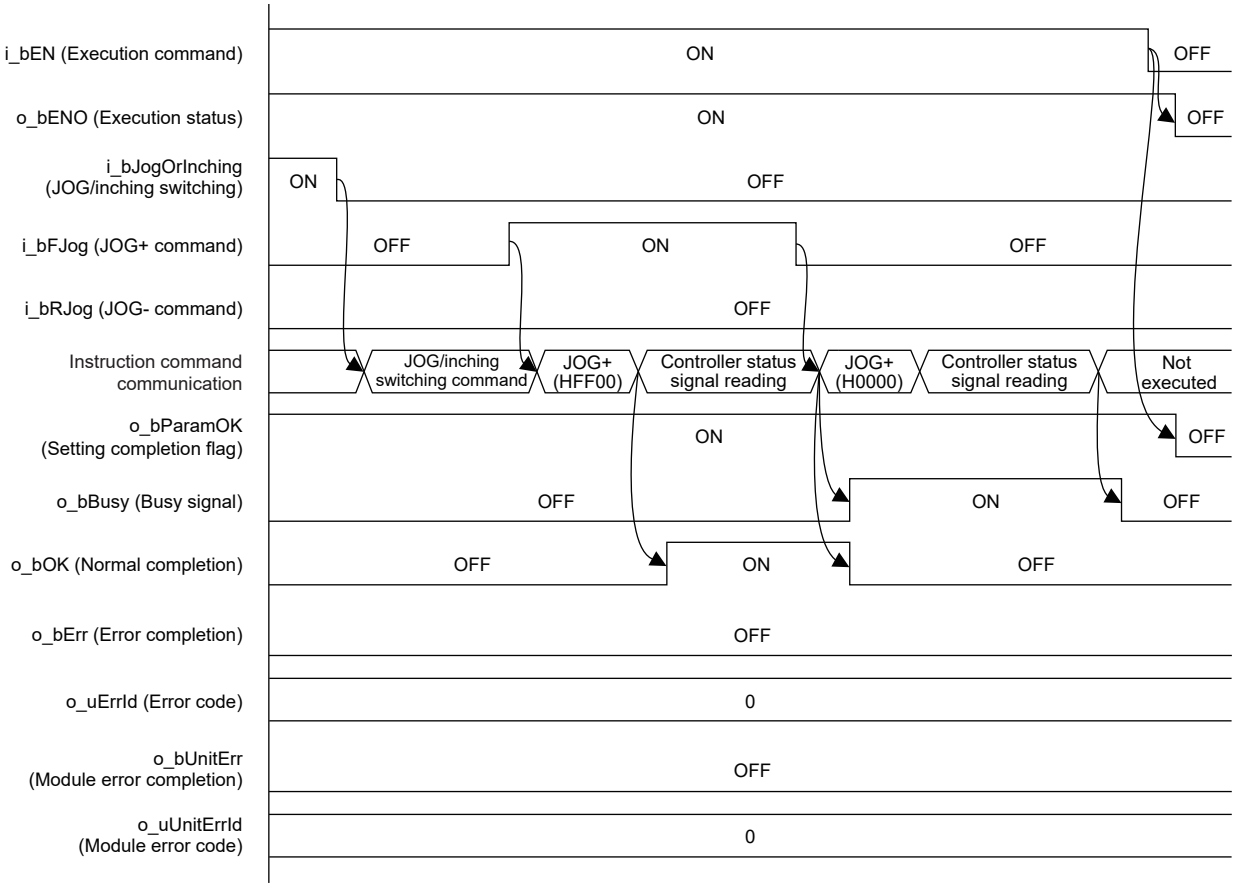
• From rising edge of the execution command ON to setting completion flag ON

The following processing is executed only once at rising edge of the execution command ON.

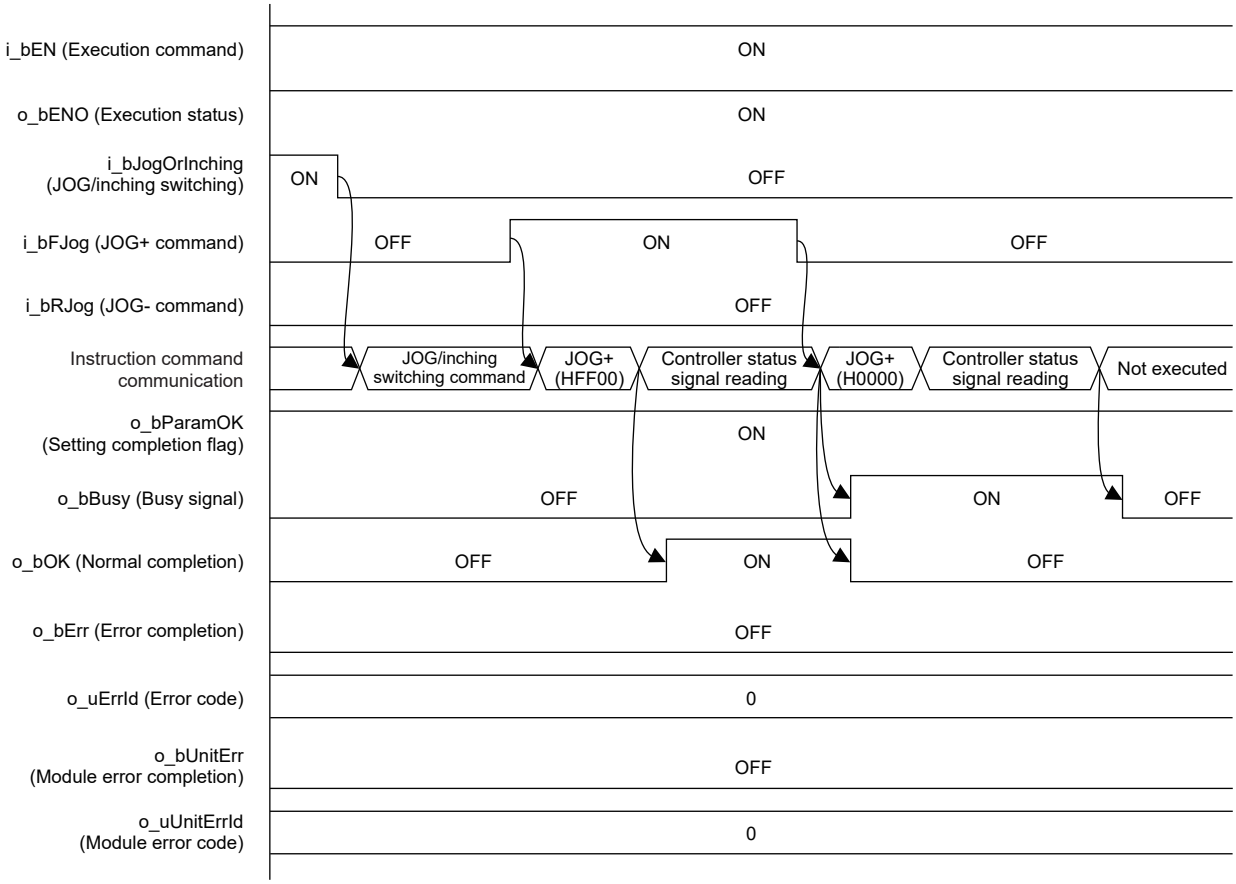


• From the JOG/inching switching command to execution command OFF (Example: Switching from inching operation to JOG operation)

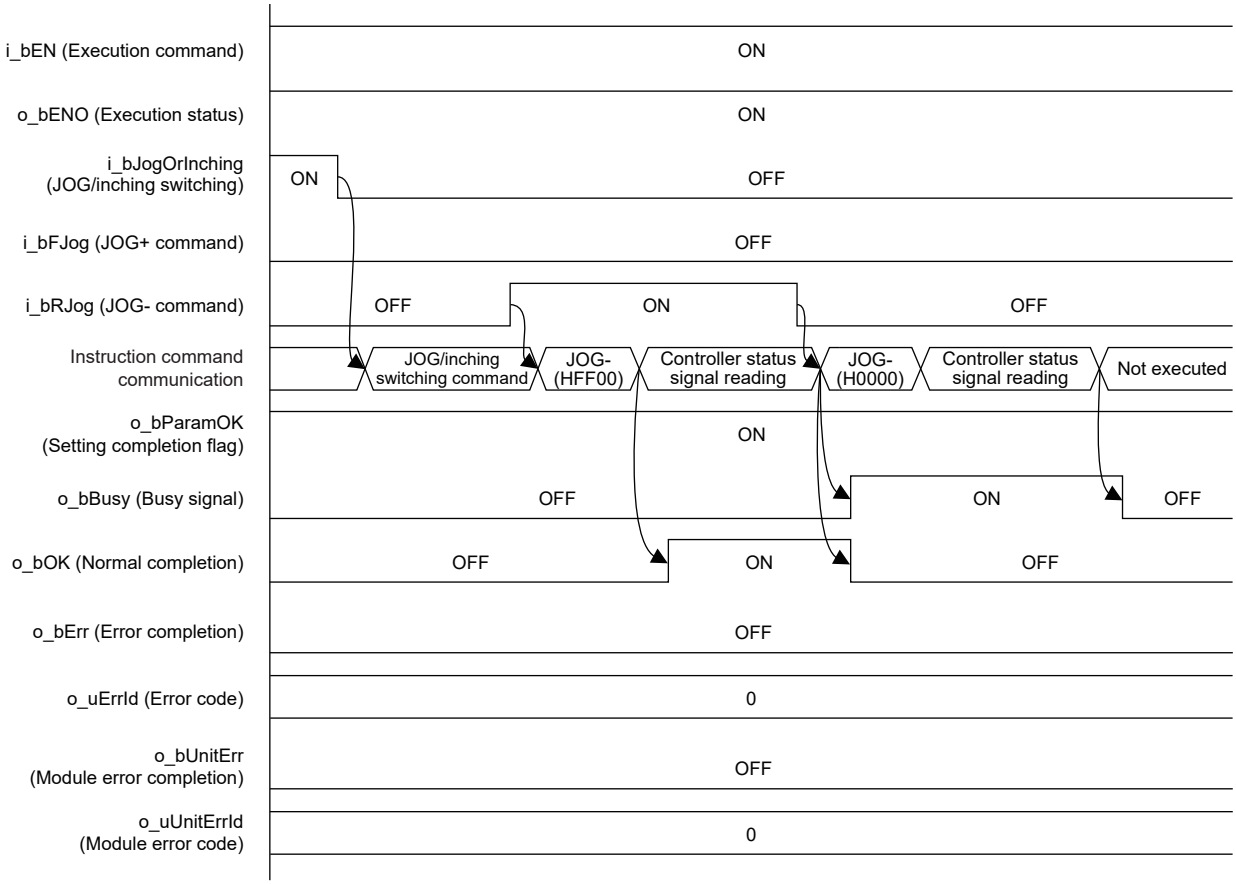
The following processing is executed every time i_bJogOrInching (JOG/inching switching) is changed while i_bEN (Execution command) is on.



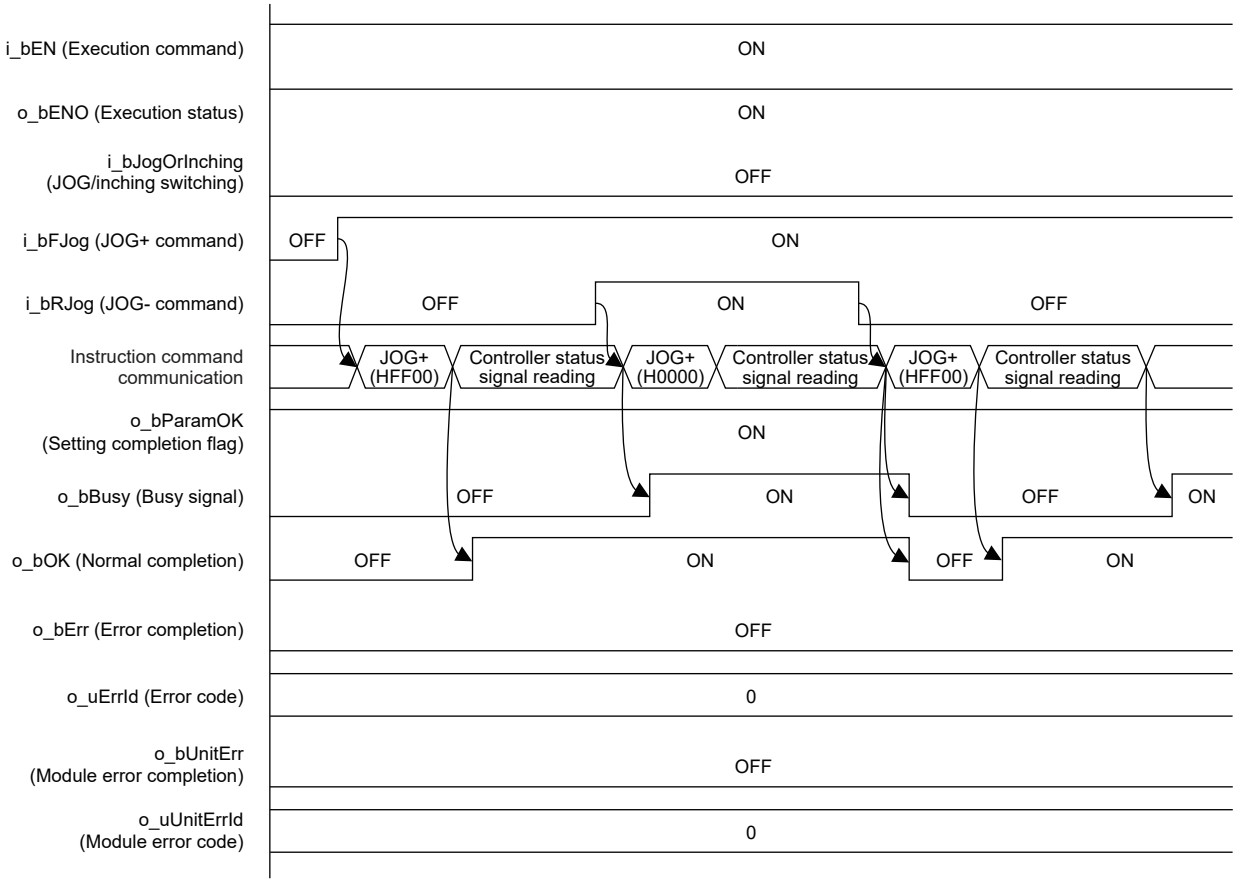
• JOG operation (JOG+ command)



• JOG operation (JOG- command)

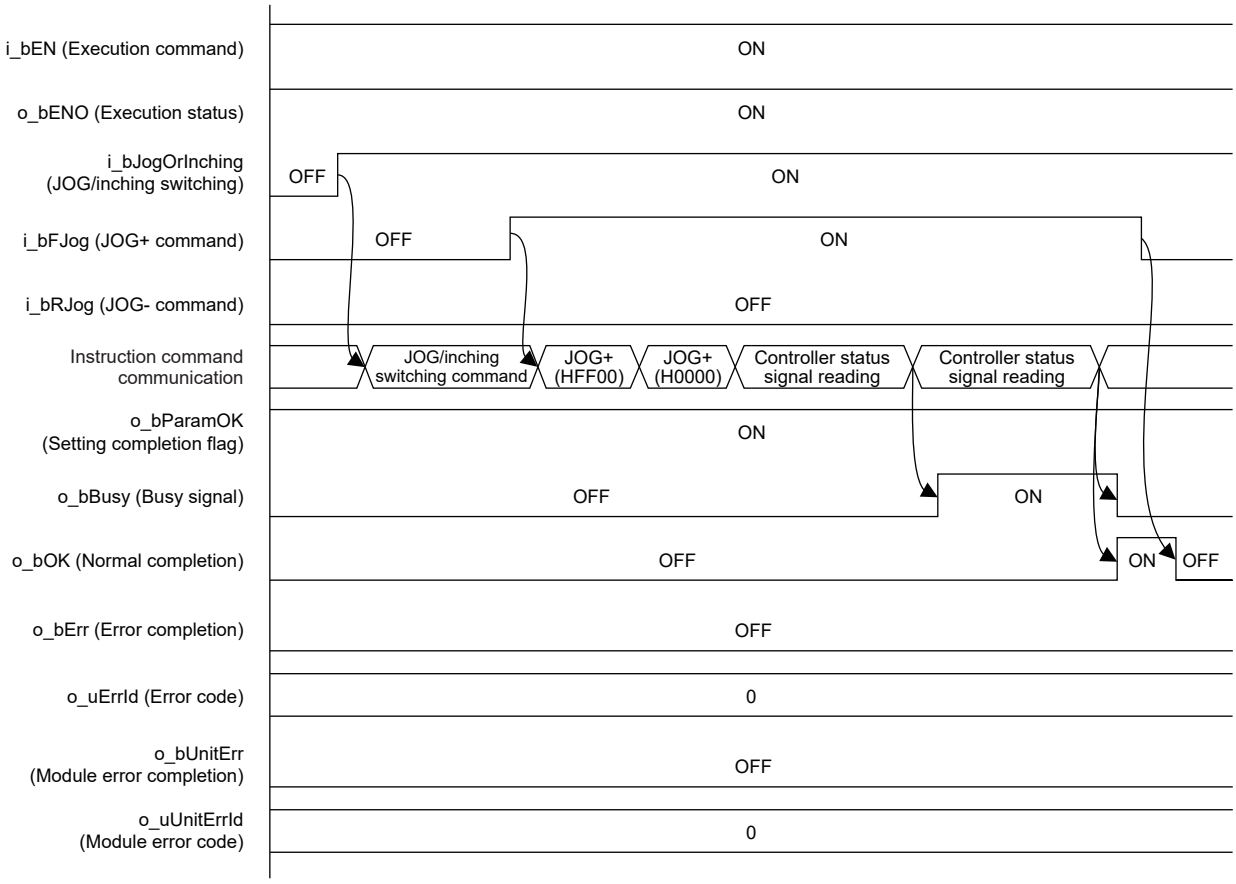


• JOG operation (when both JOG+ command and JOG- command are simultaneously turned on)



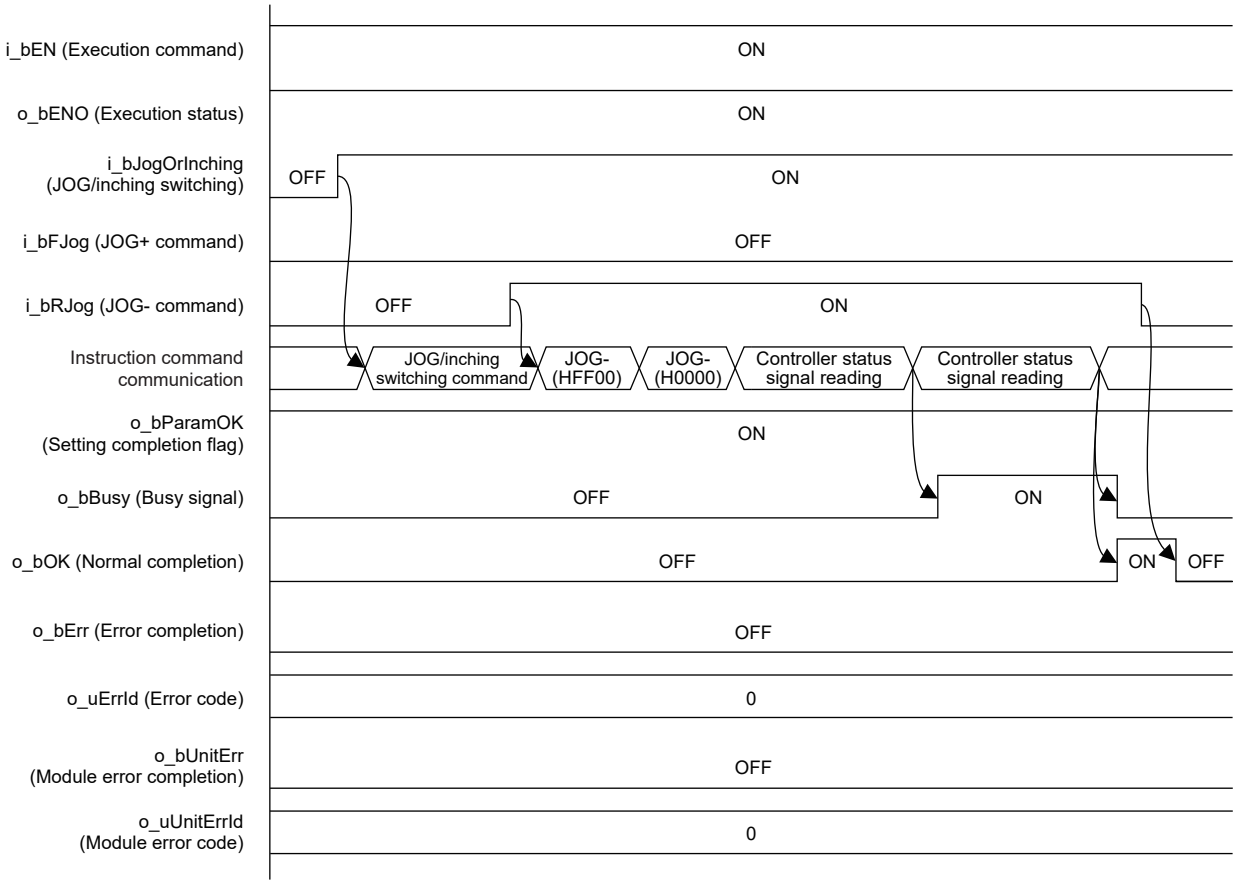
• Inching operation (JOG+ command)

When i_bFJog (JOG+ command) is turned off before o_bOK (Normal completion) turns on, o_bOK (Normal completion) is on only during one scan.

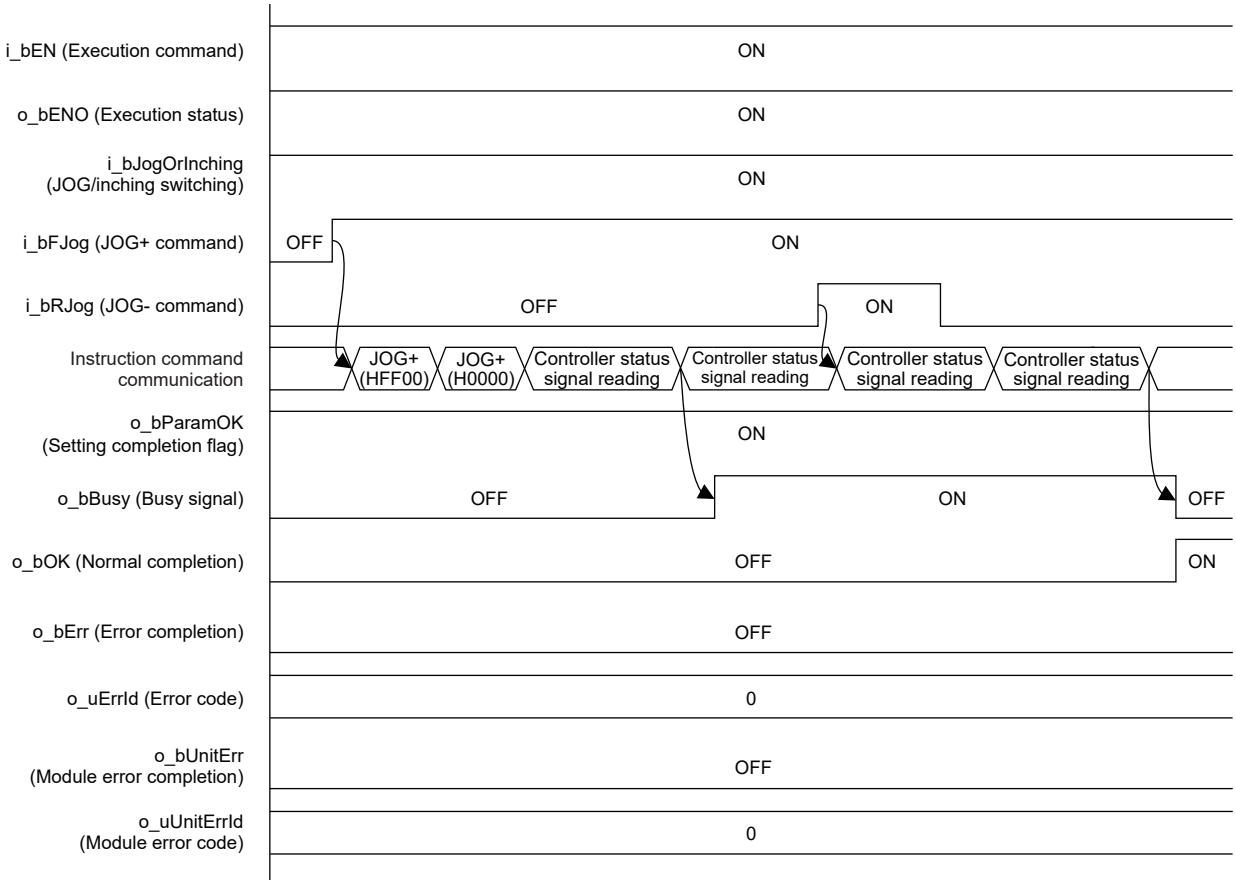


• Inching operation (JOG- command)

When i_bRJog (JOG- command) is turned off before o_bOK (Normal completion) turns on, o_bOK (Normal completion) is on only during one scan.

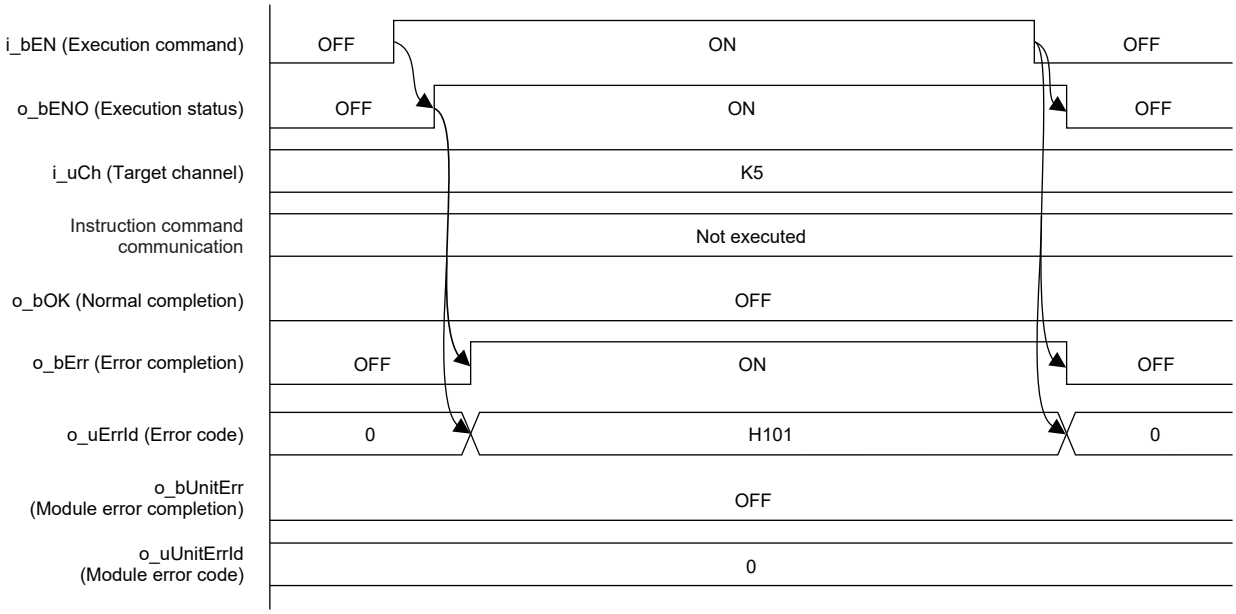


• Inching operation (when both JOG+ command and JOG- command are simultaneously turned on)



■ Error completion

• The target channel is out of range.



Restrictions and precautions

- Do not change i_bJogOrInching (JOG/inching switching) during the operation of i_bFJog (JOG+ command) or i_bRJog (JOG- command). The operation is not guaranteed when i_bJogOrInching (JOG/inching switching) is changed during the operation. The following table lists the status and operation if i_bJogOrInching (JOG/inching switching) is changed during the operation.

i_bJogOrInching (JOG/inching switching)		Output label status	Electric actuator operation
Before change	After change		
OFF: JOG operation	ON: Inching operation	o_bOK (Normal completion): OFF o_bBusy (Busy signal): OFF	Deceleration stop
ON: Inching operation	OFF: JOG operation	o_bOK (Normal completion): ON after the movement for inching movement amount o_bBusy (Busy signal): OFF after the movement for inching movement amount	Deceleration stop after the movement for inching movement amount

*1 The above shows the check results in our environment. The status and operation may differ depending on the device configuration and others.

- If JOG or inching operation is completed in a very short time, o_bBusy (Busy signal) and o_bOK (Normal completion) may not turn on.
- This FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation.
- This FB uses the index registers Z0 and Z1. When using an interrupt program, do not use these index registers.
- This FB cannot be used in an interrupt program.
- Using the FB in a program that is to be executed only once, such as a subroutine program or a FOR-NEXT loop, has a problem that i_bEN (Execution command) can no longer be turned off and normal operation is not possible; Always use the FB in a program that is capable of turning off the execution command.
- This FB requires the ladder to be configured for every input label.
- When i_bFJog (JOG+ command) or i_bRJog (JOG- command) is turned on before o_bParamOK (Setting completion flag) turns on, the JOG+(-) command is ignored. Turn on the JOG+(-) command again after o_bParamOK (Setting completion flag) turns on.
- When i_bEN (Execution command) is turned off while the electric actuator is operating, the electric actuator operation does not stop. Program the processing separately in accordance with the required system operation.
- This FB uses the CPRTCL instruction. For details, refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/ 7.8 Programming/Predefined protocol support instruction).
- To operate the SMC controller, set the protocol type to the predefined protocol support type with the module parameter of GX Works3. For details of the parameter setting procedures, refer to ☞ Page 19 Parameter setting.
- Change the number of timeouts or retries of the communication in Predefined Protocol Support Tool For Positioning. For details of the setting procedures, refer to 📖Predefined Protocol Support Tool For Positioning Operating Manual (6.2 Setting a Connected Model). If the communication interval for the same channel is short, the command may not be received depending on the connected controller, and a serial communication timeout (CPU error) may occur. In this case, the situation can be avoided by increasing the "transmission standby time" in the protocol transmission/reception settings of the connected device setting.
- Before executing this FB, use M+SMCServoControl_F (Servo ON/OFF) to turn on the servo.

Parameter setting

For details of the parameter setting procedures, refer to ☞ Page 19 Parameter setting.

Performance value

CPU	Measurement condition		Processing time	Maximum scan time	Number of scans
	JOG/inching operation	+/-			
FX5U, FX5UC*1*2	JOG operation	JOG+	14.800 ms	1.040 ms	40
		JOG-	13.500 ms	0.985 ms	40
	Inching operation	Inching+ (Movement amount: 10.00 mm, speed: 6 mm/s)	1810 ms	1.010 ms	5988
		Inching- (Movement amount: 10.00 mm, speed: 6 mm/s)	1810 ms	1.030 ms	6005

*1 When the program capacity is set to 128K steps, the processing speed may be decreased.

*2 The standard area is used for the labels.

Error code

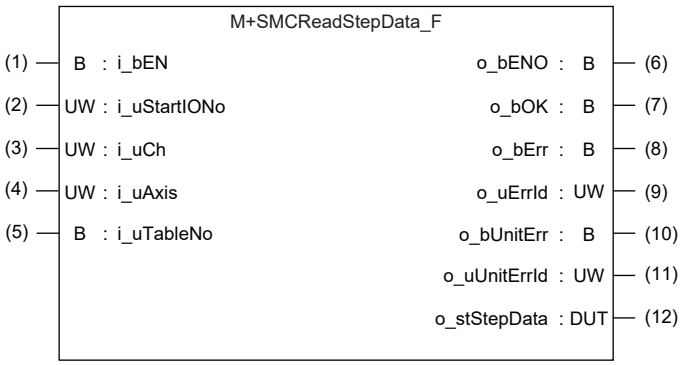
Error code (hexadecimal)	Description	Action
101H	The setting value of i_uCh (Target channel) is out of range. The target channel is not within the range of 1 to 4.	Review and correct the setting and then execute the FB again.
102H	The setting value of i_uAxis (Target axis) is out of range. The target axis is not within the range of 1 to 32.	Review and correct the setting and then execute the FB again.
200H	An unsupported device is connected.	Review and correct the connected device and then execute the FB again.
201H	The execution command has turned off during the processing.	Keep the ON state until the setting completion flag turns on.*1
203H	The controller is in the emergency stop state or an alarm has occurred.	Check the status of the SMC controller in M+SMCMonitoring_F (Operation monitoring). After checking the status, eliminate the error cause and then execute the FB again.
Predefined protocol error code	This error code occurs during communication.	Refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/7.9 Troubleshooting/Checking absence/presence of errors).

*1 It is output only during one scan.

2.4 M+SMCReadStepData_F (Step Data Reading)

Overview

This FB reads the step data corresponding to the specified step data No.



Label

Input label

No.	Label	Label name	Data type	Setting range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_uStartIONo	Start I/O No.	Word [Unsigned]/Bit string [16-bit]	—	Setting this label is not required since it is not used in the program in this FB.
(3)	i_uCh	Target channel	Word [Unsigned]/Bit string [16-bit]	1 to 4	Specify the channel number. 1: Built-in RS485 port 2: FX5-485-BD 3, 4: FX5-485ADP
(4)	i_uAxis	Target axis	Word [Unsigned]/Bit string [16-bit]	1 to 32	Specify the axis number set in the SMC controller.*1
(5)	i_uTableNo	Step data No.	Word [Unsigned]/Bit string [16-bit]	0 to 63	Specify the step data No. of the target to be read.

*1 The axis number corresponds to the slave station number of MODBUS.

Output label

No.	Label	Label name	Data type	Default value	Description
(6)	o_bENO	Execution status	Bit	OFF	ON: The execution command is on. OFF: The execution command is off.
(7)	o_bOK	Normal completion	Bit	OFF	When this label is on, it indicates that reading the step data has been completed.
(8)	o_bErr	Error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the FB.
(9)	o_uErrId	Error code	Word [Unsigned]/Bit string [16-bit]	0	The error code that has occurred in the FB is stored.
(10)	o_bUnitErr	Module error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the module.
(11)	o_uUnitErrId	Module error code	Word [Unsigned]/Bit string [16-bit]	0	The error code that has occurred in the module is stored.
(12)	o_stStepData	Step data	stStepData	—	The step data is stored. For details of the structure, refer to ☞ Page 10 Structure list.

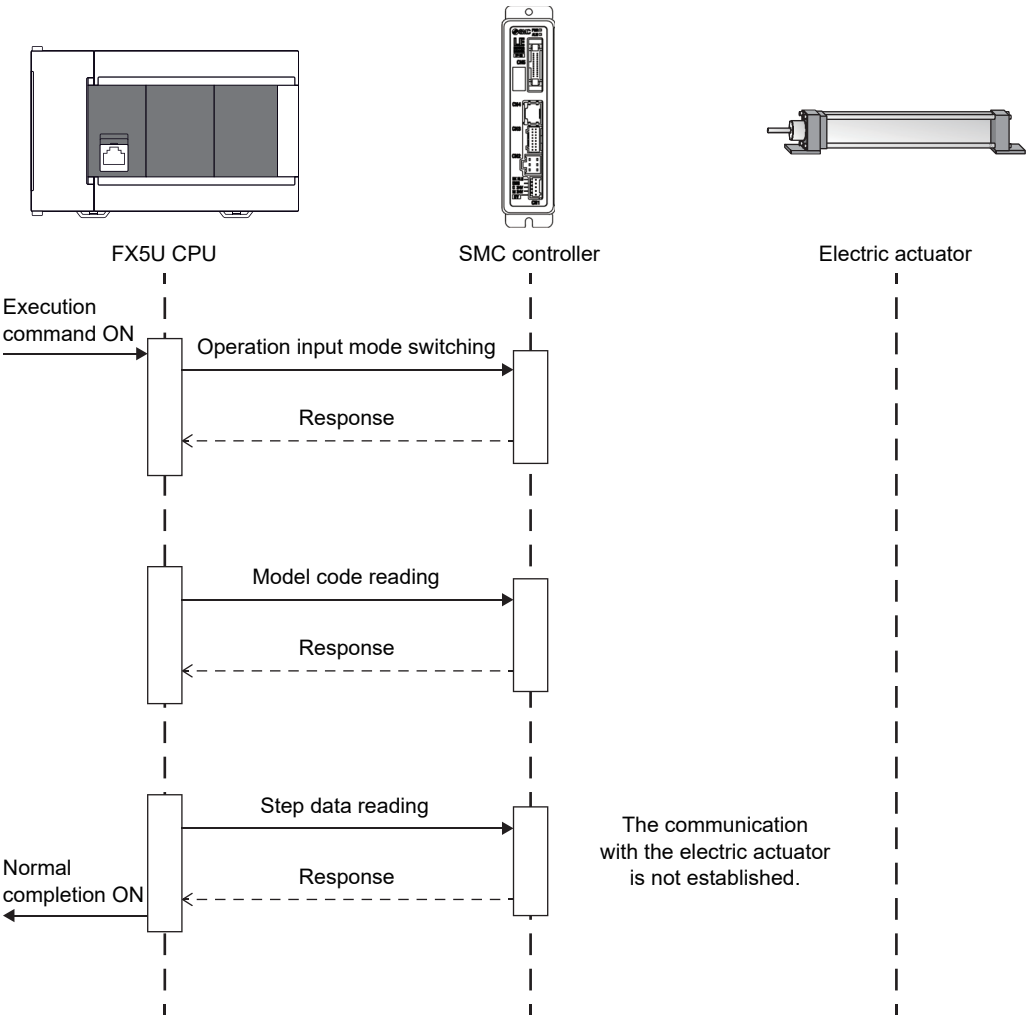
Function overview

Applicable hardware and software

■ Predefined Protocol Support FB For Positioning

Applicable module	Firmware version	Engineering tool
FX5U CPU	1.200 or later	GX Works3 Version 1.065T or later
FX5UC CPU	1.200 or later	GX Works3 Version 1.065T or later

Sequence diagram



Basic specifications

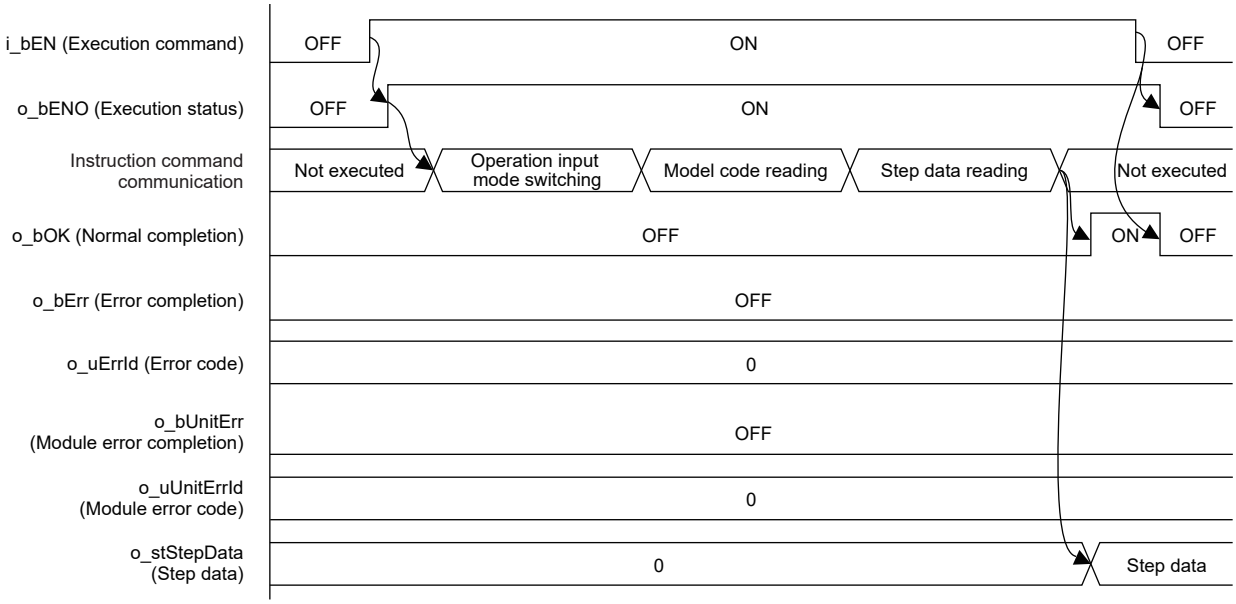
Item	Description
Programming language	—(The program in this FB is not open to the public.)
Number of steps	956 steps The number of steps of the FB in a program depends on the CPU module used, input and output definition, and option settings of GX Works3. For the option settings of GX Works3, refer to 📖GX Works3 Operating Manual (2.9 Option Setting for Each Function).
Label amount used	• Label: 0.06K points (Word) • Latch label: 0K points (Word) The label amount used in a program depends on the CPU module used, device specified in the argument, and option settings of GX Works3. For the option settings of GX Works3, refer to 📖GX Works3 Operating Manual (2.9 Option Setting for Each Function).
Number of index register points used	• Index register: 2 points • Long index register: 0 points
File register amount used	File register: 1904 points (Word)
FB dependence	No dependence
FB compiling method	Subroutine type
FB operation type	Pulsed execution (multiple scan execution type)

Function description

- Set the axis number of the operation target in i_uAxis (Target axis).
- At rising edge of i_bEN (Execution command), this FB sets the operation input mode to the serial input operation mode and reads the step data of the specified step data No. of the SMC controller.
- o_bOK (Normal completion) turns on when reading the step data is completed.
- If an error occurs while sending/receiving a predefined protocol, o_bErr (Error completion) turns on and the processing of the FB is interrupted. The error code is stored in o_uErrId (Error code). For details of the error code, refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/7.9 Troubleshooting/Checking absence/presence of errors).
- If an error occurs in the SMC controller and this FB receives an error code, o_bUnitErr (Module error completion) turns on and the processing of the FB is interrupted. The received error code is stored in o_uUnitErrId (Module error code). For details of the error code, refer to ☞ Page 81 Module Error Code.
- If any other error occurs, o_bErr (Error completion) turns on and the processing of the FB is interrupted. For details of the error code, refer to ☞ Page 37 Error code.

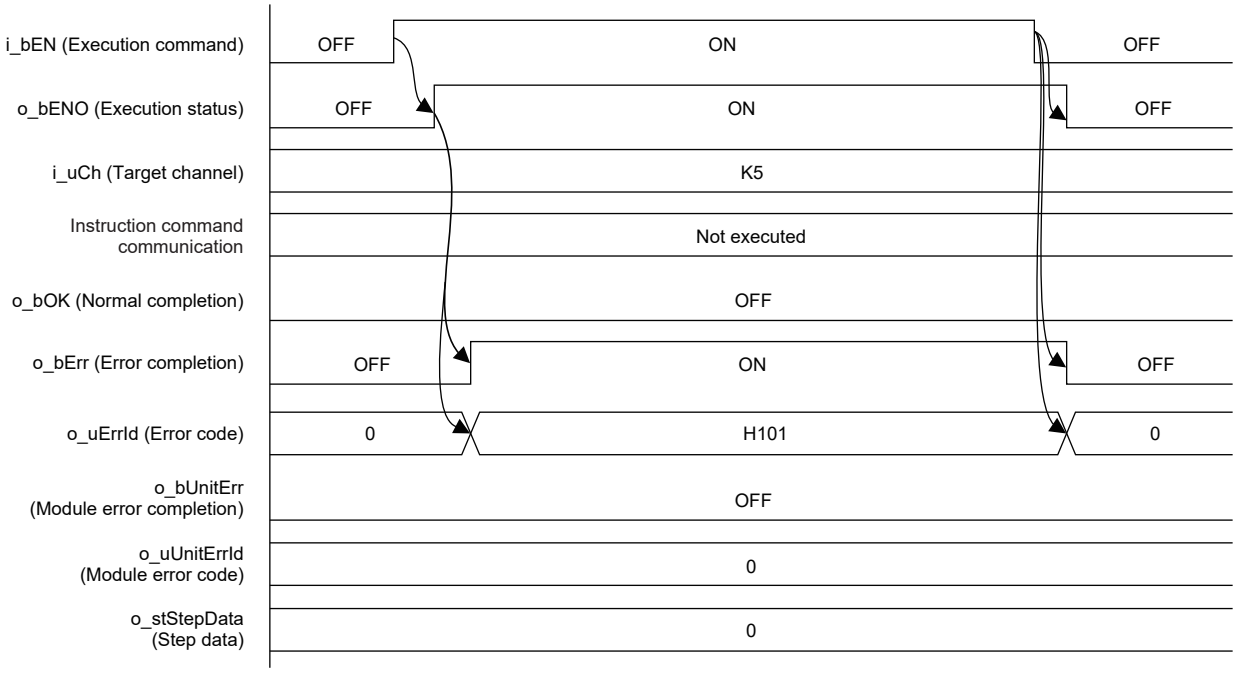
Timing chart of I/O signals

■ Normal completion



■ Error completion

- The target channel is out of range.



Restrictions and precautions

- This FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation.
- This FB uses the index registers Z0 and Z1. When using an interrupt program, do not use these index registers.
- This FB cannot be used in an interrupt program.
- Using the FB in a program that is to be executed only once, such as a subroutine program or a FOR-NEXT loop, has a problem that i_bEN (Execution command) can no longer be turned off and normal operation is not possible; Always use the FB in a program that is capable of turning off the execution command.
- This FB requires the ladder to be configured for every input label.
- This FB uses the CPRTCL instruction. For details, refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/ 7.8 Programming/Predefined protocol support instruction).
- To operate the SMC controller, set the protocol type to the predefined protocol support type with the module parameter of GX Works3. For details of the parameter setting procedures, refer to ☞ Page 19 Parameter setting.
- Change the number of timeouts or retries of the communication in Predefined Protocol Support Tool For Positioning. For details of the setting procedures, refer to 📖Predefined Protocol Support Tool For Positioning Operating Manual (6.2 Setting a Connected Model). If the communication interval for the same channel is short, the command may not be received depending on the connected controller, and a serial communication timeout (CPU error) may occur. In this case, the situation can be avoided by increasing the "transmission standby time" in the protocol transmission/reception settings of the connected device setting.

Parameter setting

For details of the parameter setting procedures, refer to ☞ Page 19 Parameter setting.

Performance value

CPU	Measurement condition	Processing time	Maximum scan time	Number of scans
FX5U, FX5UC*1*2	Axis 1, step data No. 1	51.900 ms	0.964 ms	180

*1 When the program capacity is set to 128K steps, the processing speed may be decreased.
*2 The standard area is used for the labels.

Error code

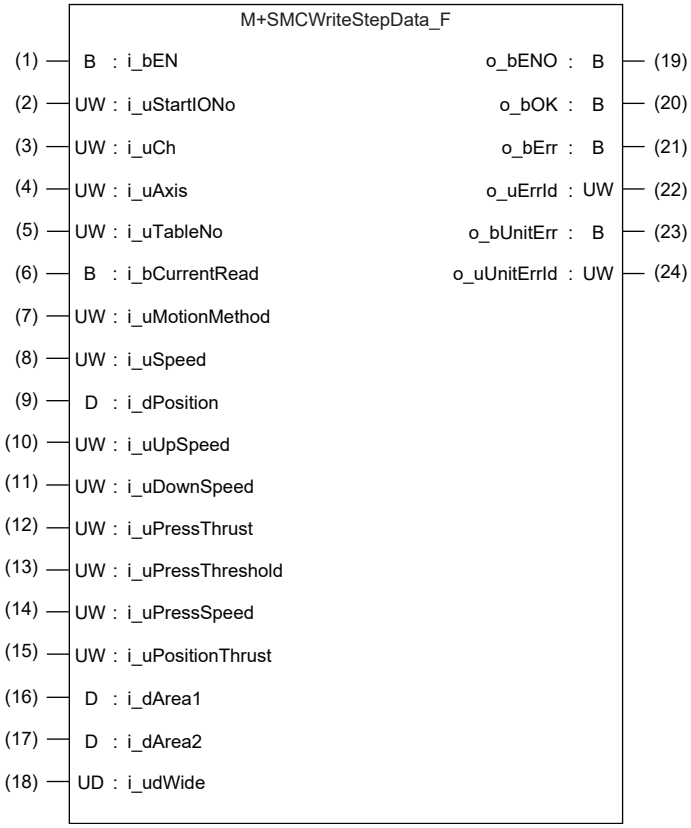
Error code (hexadecimal)	Description	Action
101H	The setting value of i_uCh (Target channel) is out of range. The target channel is not within the range of 1 to 4.	Review and correct the setting and then execute the FB again.
102H	The setting value of i_uAxis (Target axis) is out of range. The target axis is not within the range of 1 to 32.	Review and correct the setting and then execute the FB again.
105H	The setting value of i_uTableNo (Step data No.) is out of range. The step data No. is not within the range of 0 to 63.	Review and correct the setting and then execute the FB again.
200H	An unsupported device is connected.	Review and correct the connected device and then execute the FB again.
201H	The execution command has turned off during the processing.	Keep the ON state of the execution command until the normal completion, error completion, or module error completion turns on.*1
Predefined protocol error code	This error code occurs during communication.	Refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/7.9 Troubleshooting/Checking absence/presence of errors).

*1 It is output only during one scan.

2.5 M+SMCWriteStepData_F (Step Data Writing)

Overview

This FB writes the step data corresponding to the specified step data No.



Label

Input label

No.	Label	Label name	Data type	Setting range*6	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_uStartIONo	Start I/O No.	Word [Unsigned]/Bit string [16-bit]	—	Setting this label is not required since it is not used in the program in this FB.
(3)	i_uCh	Target channel	Word [Unsigned]/Bit string [16-bit]	1 to 4	Specify the channel number. 1: Built-in RS485 port 2: FX5-485-BD 3, 4: FX5-485ADP
(4)	i_uAxis	Target axis	Word [Unsigned]/Bit string [16-bit]	1 to 32	Specify the axis number set in the SMC controller.*1
(5)	i_uTableNo	Step data No.	Word [Unsigned]/Bit string [16-bit]	0 to 63	Specify the step data No. to which the setting value is written.
(6)	i_bCurrentRead	Current position reading	Bit	ON, OFF	ON: The current position of the SMC controller is set to the target position. OFF: Each setting value is written to the SMC controller.
(7)	i_uMotionMethod	Operation method	Word [Unsigned]/Bit string [16-bit]	1 and 2	1: Absolute coordinate movement (ABS) 2: Relative coordinate movement (INC)
(8)	i_uSpeed	Speed	Word [Unsigned]/Bit string [16-bit]	1 to 65535	Specify the movement speed to the target position or pushing start position.*2
(9)	i_dPosition	Position	Double word [Signed]/Bit string [32-bit]	-2147483647 to 2147483647	Specify the target position or pushing start position.*3

No.	Label	Label name	Data type	Setting range*6	Description
(10)	i_uUpSpeed	Acceleration	Word [Unsigned]/Bit string [16-bit]	1 to 65535	Specify the acceleration to the movement speed.*4
(11)	i_uDownSpeed	Deceleration	Word [Unsigned]/Bit string [16-bit]	1 to 65535	Specify the deceleration to the movement speed.*4
(12)	i_uPressThrust	Pushing thrust	Word [Unsigned]/Bit string [16-bit]	0 to 100	Specify the pushing operation or positioning operation according to the setting value.*5 0: Positioning operation 1 to 100: Pushing operation torque setting
(13)	i_uPressThreshold	Threshold	Word [Unsigned]/Bit string [16-bit]	0 to 100	If thrust higher than the value is generated at the pushing operation, the INP output is turned on. Set this parameter to a value less than the pushing thrust.*5
(14)	i_uPressSpeed	Pushing speed	Word [Unsigned]/Bit string [16-bit]	1 to 65535	Specify the movement speed at the pushing operation.*2
(15)	i_uPositionThrust	Positioning thrust	Word [Unsigned]/Bit string [16-bit]	0 to 300	Specify the maximum thrust at the positioning operation.*5
(16)	i_dArea1	Area output edge 1	Double word [Signed]/ Bit string [32-bit]	-2147483647 to 2147483647	Specify the condition under which the AREA output turns on.*3 The AREA output turns on when the position is within the range of area output edge 1 (area 1) to area output edge 2 (area 2).
(17)	i_dArea2	Area output edge 2	Double word [Signed]/ Bit string [32-bit]	-2147483647 to 2147483647	Specify the condition under which the AREA output turns on.*3 The AREA output turns on when the position is within the range of the area output edge 1 (area 1) to area output edge 2 (area 2).
(18)	i_udWide	Positioning width	Double word [Unsigned]/Bit string [32-bit]	1 to 2147483647	Functions differently between the pushing operation and positioning operation.*3 Positioning operation: Positioning width Pushing operation: Pushing width

*1 The axis number corresponds to the slave station number of MODBUS.
*2 The unit is 1 mm/s.
*3 The unit is 0.01 mm.
*4 The unit is 1 mm/s^2.
*5 The unit is %.
*6 The setting range differs depending on the electric actuator.

Output label

No.	Label	Label name	Data type	Default value	Description
(19)	o_bENO	Execution status	Bit	OFF	ON: The execution command is on. OFF: The execution command is off.
(20)	o_bOK	Normal completion	Bit	OFF	When this label is on, it indicates that the step data setting has been completed.
(21)	o_bErr	Error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the FB.
(22)	o_uErrId	Error code	Word [Unsigned]/Bit string [16-bit]	0	The error code that has occurred in the FB is stored.
(23)	o_bUnitErr	Module error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the module.
(24)	o_uUnitErrId	Module error code	Word [Unsigned]/Bit string [16-bit]	0	The error code that has occurred in the module is stored.

Function overview

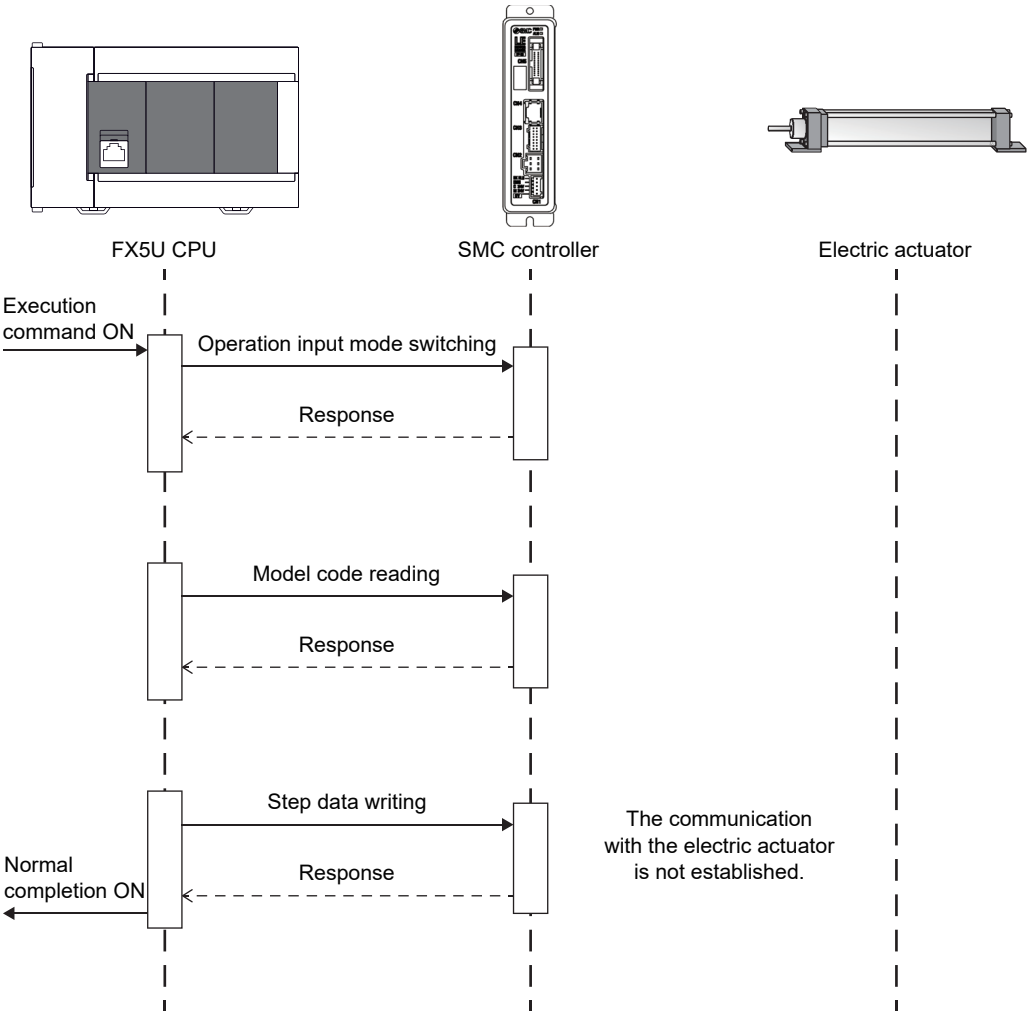
Applicable hardware and software

■ Predefined Protocol Support FB For Positioning

Applicable module	Firmware version	Engineering tool
FX5U CPU	1.200 or later	GX Works3 Version 1.065T or later
FX5UC CPU	1.200 or later	GX Works3 Version 1.065T or later

Sequence diagram

■ When the current position reading is off



Basic specifications

Item	Description
Programming language	—(The program in this FB is not open to the public.)
Number of steps	1170 steps The number of steps of the FB in a program depends on the CPU module used, input and output definition, and option settings of GX Works3. For the option settings of GX Works3, refer to 📖GX Works3 Operating Manual (2.9 Option Setting for Each Function).
Label amount used	• Label: 0.07K points (Word) • Latch label: 0K points (Word) The label amount used in a program depends on the CPU module used, device specified in the argument, and option settings of GX Works3. For the option settings of GX Works3, refer to 📖GX Works3 Operating Manual (2.9 Option Setting for Each Function).
Number of index register points used	• Index register: 2 points • Long index register: 0 points
File register amount used	File register: 1904 points (Word)
FB dependence	No dependence
FB compiling method	Subroutine type
FB operation type	Pulsed execution (multiple scan execution type)

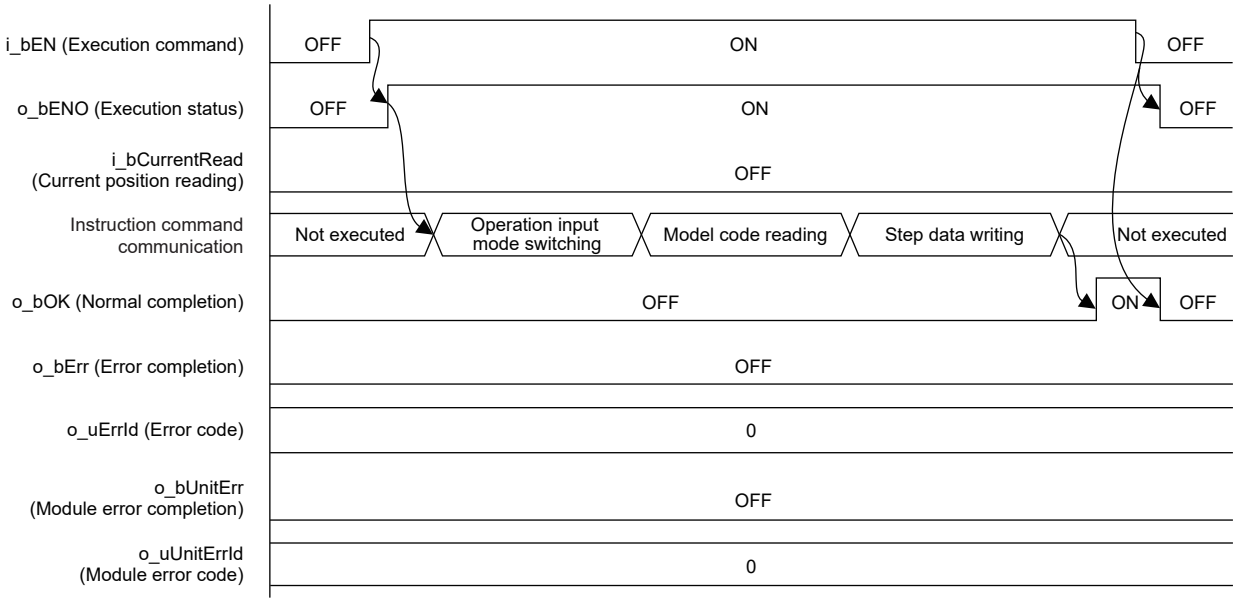
Function description

- By turning on i_bEN (Execution command), this FB sets the operation input mode to the serial input operation mode.
- By turning on i_bEN (Execution command), this FB writes the step data to the specified step data No. of the SMC controller. For details of the step data, refer to the manual of the SMC controller to be used.
- This FB writes the step data to the non-volatile memory of the SMC controller. For details, refer to the manual of each controller.
- o_bOK (Normal completion) turns on when sending the instruction command for step data writing is completed.
- When i_bCurrentRead (Current value reading) is on, set the current position as the target position.
- If an error occurs while sending/receiving a predefined protocol, o_bErr (Error completion) turns on and the processing of the FB is interrupted. The error code is stored in o_uErrId (Error code). For details of the error code, refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/7.9 Troubleshooting/Checking absence/presence of errors).
- If an error occurs in the SMC controller and this FB receives an error code, o_bUnitErr (Module error completion) turns on and the processing of the FB is interrupted. The received error code is stored in o_uUnitErrId (Module error code). For details of the error code, refer to ☞ Page 81 Module Error Code.
- If any other error occurs, o_bErr (Error completion) turns on and the processing of the FB is interrupted. For details of the error code, refer to ☞ Page 44 Error code.

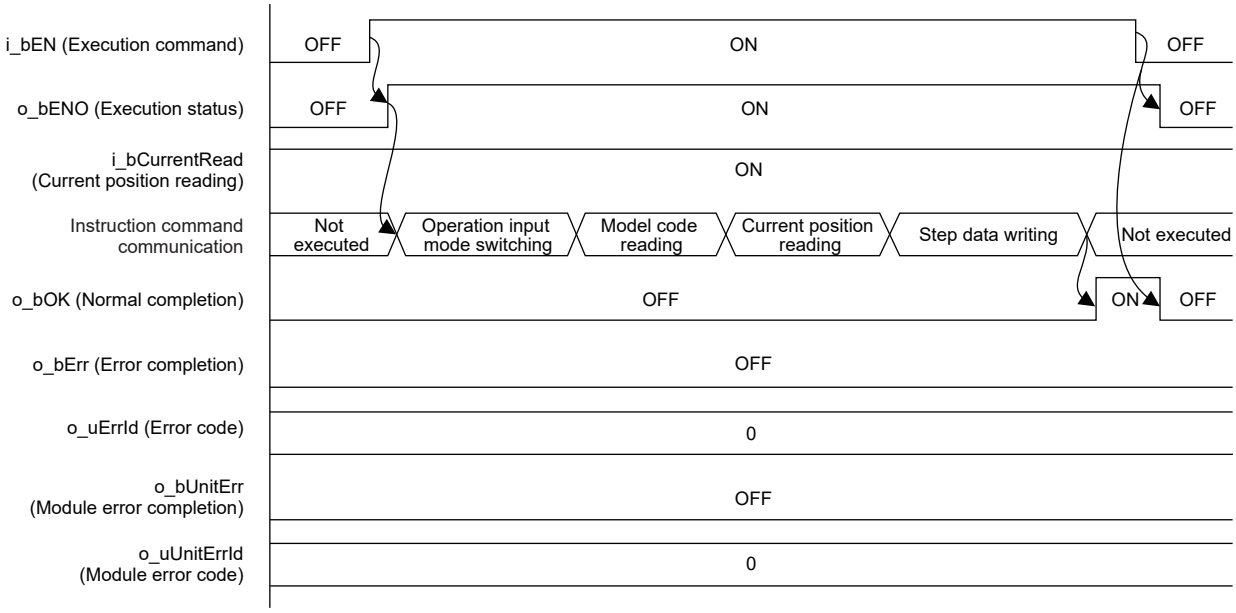
Timing chart of I/O signals

■ Normal completion

• When the current position reading is off

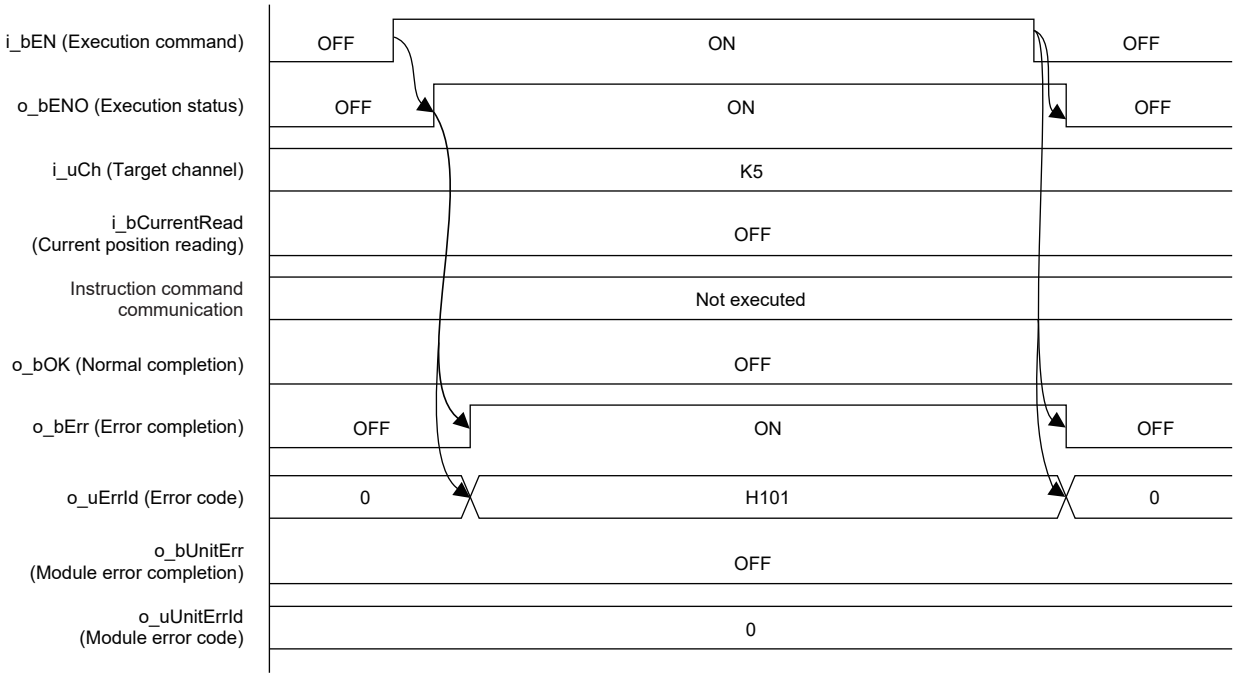


• When the current position reading is on



■ Error completion

- The target channel is out of range.



Restrictions and precautions

- This FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation.
- This FB uses the index registers Z0 and Z1. When using an interrupt program, do not use these index registers.
- This FB cannot be used in an interrupt program.
- Using the FB in a program that is to be executed only once, such as a subroutine program or a FOR-NEXT loop, has a problem that i_bEN (Execution command) can no longer be turned off and normal operation is not possible; Always use the FB in a program that is capable of turning off the execution command.
- This FB requires the ladder to be configured for every input label.
- This FB uses the CPRTCL instruction. For details, refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/ 7.8 Programming/Predefined protocol support instruction).
- To operate the SMC controller, set the protocol type to the predefined protocol support type with the module parameter of GX Works3. For details of the parameter setting procedures, refer to ☞ Page 19 Parameter setting.
- Change the number of timeouts or retries of the communication in Predefined Protocol Support Tool For Positioning. For details of the setting procedures, refer to 📖Predefined Protocol Support Tool For Positioning Operating Manual (6.2 Setting a Connected Model). If the communication interval for the same channel is short, the command may not be received depending on the connected controller, and a serial communication timeout (CPU error) may occur. In this case, the situation can be avoided by increasing the "transmission standby time" in the protocol transmission/reception settings of the connected device setting.
- To set the target position in i_bCurrentRead (Current value reading), the servo ON state must be continued after the home position return.

Parameter setting

For details of the parameter setting procedures, refer to ☞ Page 19 Parameter setting.

Performance value

CPU	Measurement condition[*3*4]		Processing time[*5]	Maximum scan time	Number of scans
FX5U, FX5UC[*1*2]	Current position reading: ON	Axis 1, step data No. 0	62.200 ms	0.933 ms	219
	Current position reading: OFF	Axis 1, step data No. 0	49.600 ms	0.881 ms	173

*1 When the program capacity is set to 128K steps, the processing speed may be decreased.
*2 The standard area is used for the labels.
*3 The step data is as follows. The current position at the start of the measurement is 0 mm when the current position reading is off and 10.00 mm when the current position reading is on.

Operation method	Speed	Position	Accel-eration	Decel-eration	Pushing thrust	Threshold	Pushing speed	Posi-tioning thrust	Area output edge 1	Area output edge 2	Posi-tioning width
1	10	10000	100	100	0	0	1	0	9900	10000	100

*4 When the current position reading is on, perform the positioning operation in advance so that the current position becomes 10.00 mm.
*5 The processing time is the period from the execution command is turned on until the normal completion turns on.

Error code

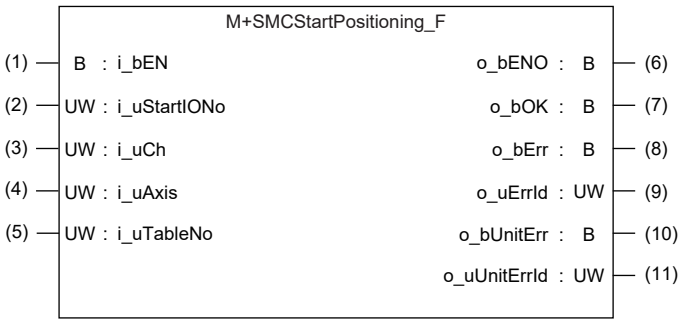
Error code (hexadecimal)	Description	Action
101H	The setting value of i_uCh (Target channel) is out of range. The target channel is not within the range of 1 to 4.	Review and correct the setting and then execute the FB again.
102H	The setting value of i_uAxis (Target axis) is out of range. The target axis is not within the range of 1 to 32.	Review and correct the setting and then execute the FB again.
105H	The setting value of i_uTableNo (Step data No.) is out of range. The step data No. is not within the range of 0 to 63.	Review and correct the setting and then execute the FB again.
200H	An unsupported device is connected.	Review and correct the connected device and then execute the FB again.
201H	The execution command has turned off during the processing.	Keep the ON state of the execution command until the normal completion, error completion, or module error completion turns on.[*1]
Predefined protocol error code	This error code occurs during communication.	Refer to MELSEC iQ-F FX5 User's Manual (Serial Communication/7.9 Troubleshooting/Checking absence/presence of errors).

*1 It is output only during one scan.

2.6 M+SMCStartPositioning_F (Positioning Operation)

Overview

This FB starts the positioning operation for the specified step data No.



Label

Input label

No.	Label	Label name	Data type	Setting range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_uStartIONo	Start I/O No.	Word [Unsigned]/Bit string [16-bit]	—	Setting this label is not required since it is not used in the program in this FB.
(3)	i_uCh	Target channel	Word [Unsigned]/Bit string [16-bit]	1 to 4	Specify the channel number. 1: Built-in RS485 port 2: FX5-485-BD 3, 4: FX5-485ADP
(4)	i_uAxis	Target axis	Word [Unsigned]/Bit string [16-bit]	1 to 32	Specify the axis number set in the SMC controller.*1
(5)	i_uTableNo	Step data No.	Word [Unsigned]/Bit string [16-bit]	0 to 63	Specify the step table No. for which the positioning operation is performed.

*1 The axis number corresponds to the slave station number of MODBUS.

Output label

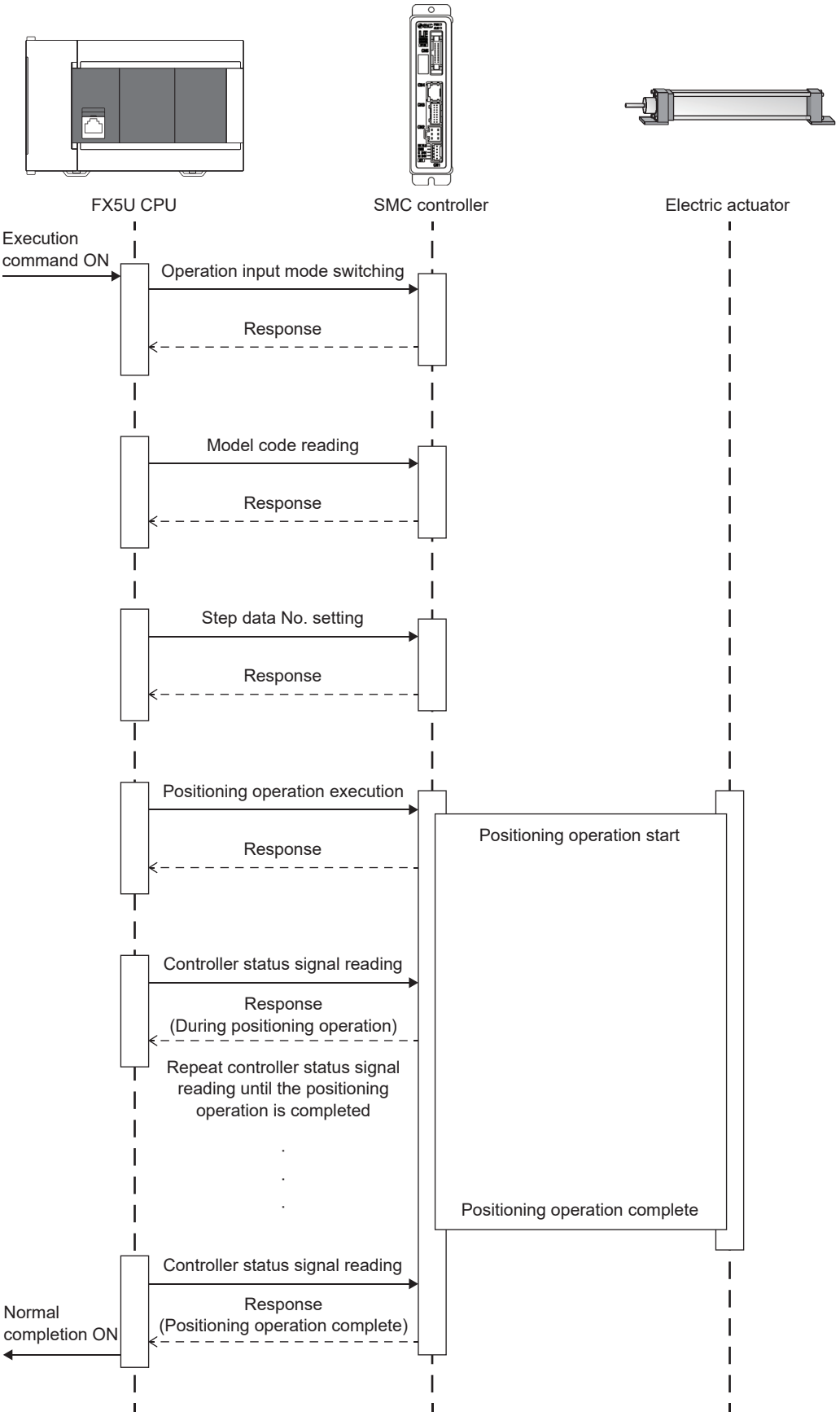
No.	Label	Label name	Data type	Default value	Description
(6)	o_bENO	Execution status	Bit	OFF	ON: The execution command is on. OFF: The execution command is off.
(7)	o_bOK	Normal completion	Bit	OFF	When this label is on, it indicates that the positioning operation has been completed.
(8)	o_bErr	Error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the FB.
(9)	o_uErrId	Error code	Word [Unsigned]/Bit string [16-bit]	0	The error code that has occurred in the FB is stored.
(10)	o_bUnitErr	Module error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the module.
(11)	o_uUnitErrId	Module error code	Word [Unsigned]/Bit string [16-bit]	0	The error code that has occurred in the module is stored.

Applicable hardware and software

■ Predefined Protocol Support FB For Positioning

Applicable module	Firmware version	Engineering tool
FX5U CPU	1.200 or later	GX Works3 Version 1.065T or later
FX5UC CPU	1.200 or later	GX Works3 Version 1.065T or later

Sequence diagram



Basic specifications

Item	Description
Programming language	—(The program in this FB is not open to the public.)
Number of steps	1125 steps The number of steps of the FB in a program depends on the CPU module used, input and output definition, and option settings of GX Works3. For the option settings of GX Works3, refer to 📖GX Works3 Operating Manual (2.9 Option Setting for Each Function).
Label amount used	• Label: 0.04K points (Word) • Latch label: 0K points (Word) The label amount used in a program depends on the CPU module used, device specified in the argument, and option settings of GX Works3. For the option settings of GX Works3, refer to 📖GX Works3 Operating Manual (2.9 Option Setting for Each Function).
Number of index register points used	• Index register: 2 points • Long index register: 0 points
File register amount used	File register: 1904 points (Word)
FB dependence	No dependence
FB compiling method	Subroutine type
FB operation type	Pulsed execution (multiple scan execution type)

Function description

- Specify the axis number of the operation target in i_uAxis (Target axis).
- Set the step data No. to be executed in i_uTableNo (Step data No.).
- At rising edge of i_bEN (Execution command), this FB sets the operation input mode to the serial input operation mode and starts the positioning position.
- This FB detects the completion of the positioning operation by checking that the status flag of the SMC controller satisfies both the following conditions, and o_bOK (Normal completion) turns on.

· INP is ON.

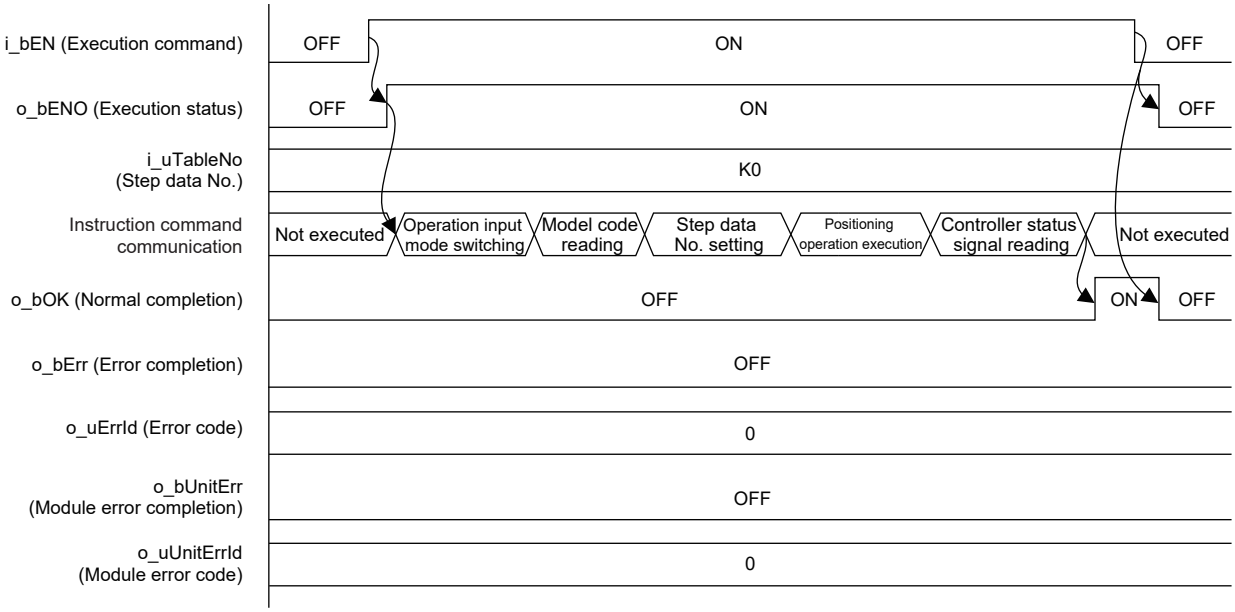
· BUSY is OFF.

· The executed step data Nos. are stored in OUT0 to OUT5.

- If an error occurs while sending/receiving a predefined protocol, o_bErr (Error completion) turns on and the processing of the FB is interrupted. The error code is stored in o_uErrId (Error code). For details of the error code, refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/7.9 Troubleshooting/Checking absence/presence of errors).
- If an error occurs in the SMC controller and this FB receives an error code, o_bUnitErr (Module error completion) turns on and the processing of the FB is interrupted. The received error code is stored in o_uUnitErrId (Module error code). For details of the error code, refer to ☞ Page 81 Module Error Code.
- If any other error occurs, o_bErr (Error completion) turns on and the processing of the FB is interrupted. For details of the error code, refer to ☞ Page 51 Error code.

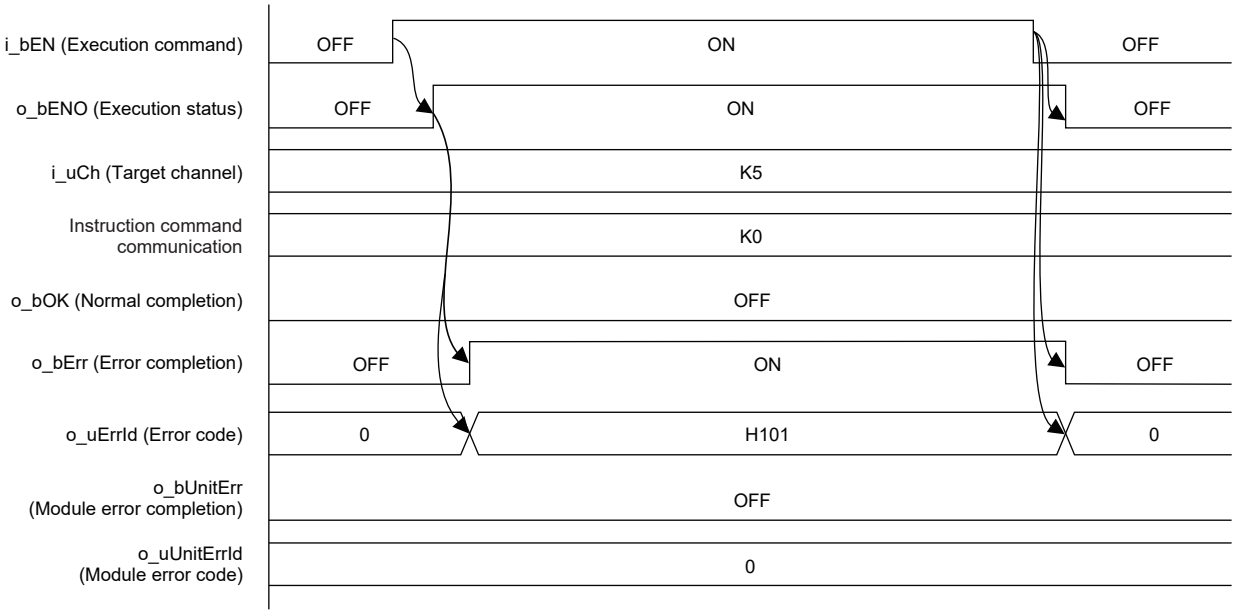
Timing chart of I/O signals

■ Normal completion



■ Error completion

- The target channel is out of range.



Restrictions and precautions

- This FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation.
- This FB uses the index registers Z0 and Z1. When using an interrupt program, do not use these index registers.
- This FB cannot be used in an interrupt program.
- Using the FB in a program that is to be executed only once, such as a subroutine program or a FOR-NEXT loop, has a problem that i_bEN (Execution command) can no longer be turned off and normal operation is not possible; Always use the FB in a program that is capable of turning off the execution command.
- This FB requires the ladder to be configured for every input label.
- In this FB, if i_bEN (Execution command) is turned off after the positioning operation is started and before o_bOK (Normal completion), o_bErr (Error completion), or o_bUnitErr (Module error completion) turns on, the operation of the electric actuator does not stop until the positioning operation is completed.
- This FB uses the CPRTCL instruction. For details, refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/ 7.8 Programming/Predefined protocol support instruction).
- To operate the SMC controller, set the protocol type to the predefined protocol support type with the module parameter of GX Works3. For details of the parameter setting procedures, refer to ☞ Page 19 Parameter setting.
- Change the number of timeouts or retries of the communication in Predefined Protocol Support Tool For Positioning. For details of the setting procedures, refer to 📖Predefined Protocol Support Tool For Positioning Operating Manual (6.2 Setting a Connected Model). If the communication interval for the same channel is short, the command may not be received depending on the connected controller, and a serial communication timeout (CPU error) may occur. In this case, the situation can be avoided by increasing the "transmission standby time" in the protocol transmission/reception settings of the connected device setting.
- Before executing this FB, use M+SMCServoControl_F (Servo ON/OFF) to turn on the servo.

Parameter setting

For details of the parameter setting procedures, refer to ☞ Page 19 Parameter setting.

Performance value

CPU	Measurement condition*3	Processing time	Maximum scan time	Number of scans
FX5U, FX5UC*1*2	Axis 1, step data No. 0	5290 ms	1.330 ms	18836

*1 When the program capacity is set to 128K steps, the processing speed may be decreased.
*2 The standard area is used for the labels.
*3 The step data is as follows. The current position at the start of the measurement is 0.

Operation method	Speed	Position	Accel-eration	Decel-eration	Pushing thrust	Threshold	Pushing speed	Posi-tioning thrust	Area output edge 1	Area output edge 2	Posi-tioning width
1	10	5000	100	100	0	0	5	30	4900	5000	100

Error code

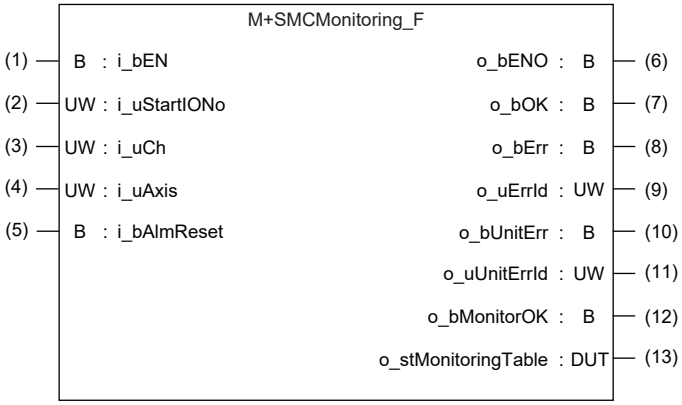
Error code (hexadecimal)	Description	Action
101H	The setting value of i_uCh (Target channel) is out of range. The target channel is not within the range of 1 to 4.	Review and correct the setting and then execute the FB again.
102H	The setting value of i_uAxis (Target axis) is out of range. The target axis is not within the range of 1 to 32.	Review and correct the setting and then execute the FB again.
105H	The setting value of i_uTableNo (Step data No.) is out of range. The step data No. is not within the range of 0 to 63.	Review and correct the setting and then execute the FB again.
200H	An unsupported device is connected.	Review and correct the connected device and then execute the FB again.
201H	The execution command has turned off during the processing.	Keep the ON state of the execution command until the normal completion, error completion, or module error completion turns on.*1
203H	The controller is in the emergency stop state or a major failure has occurred.	Check the status of the SMC controller in M+SMCMonitoring_F (Operation monitoring). After checking the status, eliminate the error cause and then execute the FB again.
Predefined protocol error code	This error code occurs during communication.	Refer to MELSEC iQ-F FX5 User's Manual (Serial Communication/7.9 Troubleshooting/Checking absence/presence of errors).

*1 It is output only during one scan.

2.7 M+SMCMonitoring_F (Operation Monitoring)

Overview

This FB monitors the current position and alarms, and performs the alarm reset.



Label

Input label

No.	Label	Label name	Data type	Setting range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_uStartIONo	Start I/O No.	Word [Unsigned]/Bit string [16-bit]	—	Setting this label is not required since it is not used in the program in this FB.
(3)	i_uCh	Target channel	Word [Unsigned]/Bit string [16-bit]	1 to 4	Specify the channel number. 1: Built-in RS485 port 2: FX5-485-BD 3, 4: FX5-485ADP
(4)	i_uAxis	Target axis	Word [Unsigned]/Bit string [16-bit]	1 to 32	Specify the axis number set in the SMC controller.*1
(5)	i_bAlmReset	Alarm reset	Bit	ON, OFF	ON: The alarm is reset. OFF: No operation is performed.

*1 The axis number corresponds to the slave station number of MODBUS.

Output label

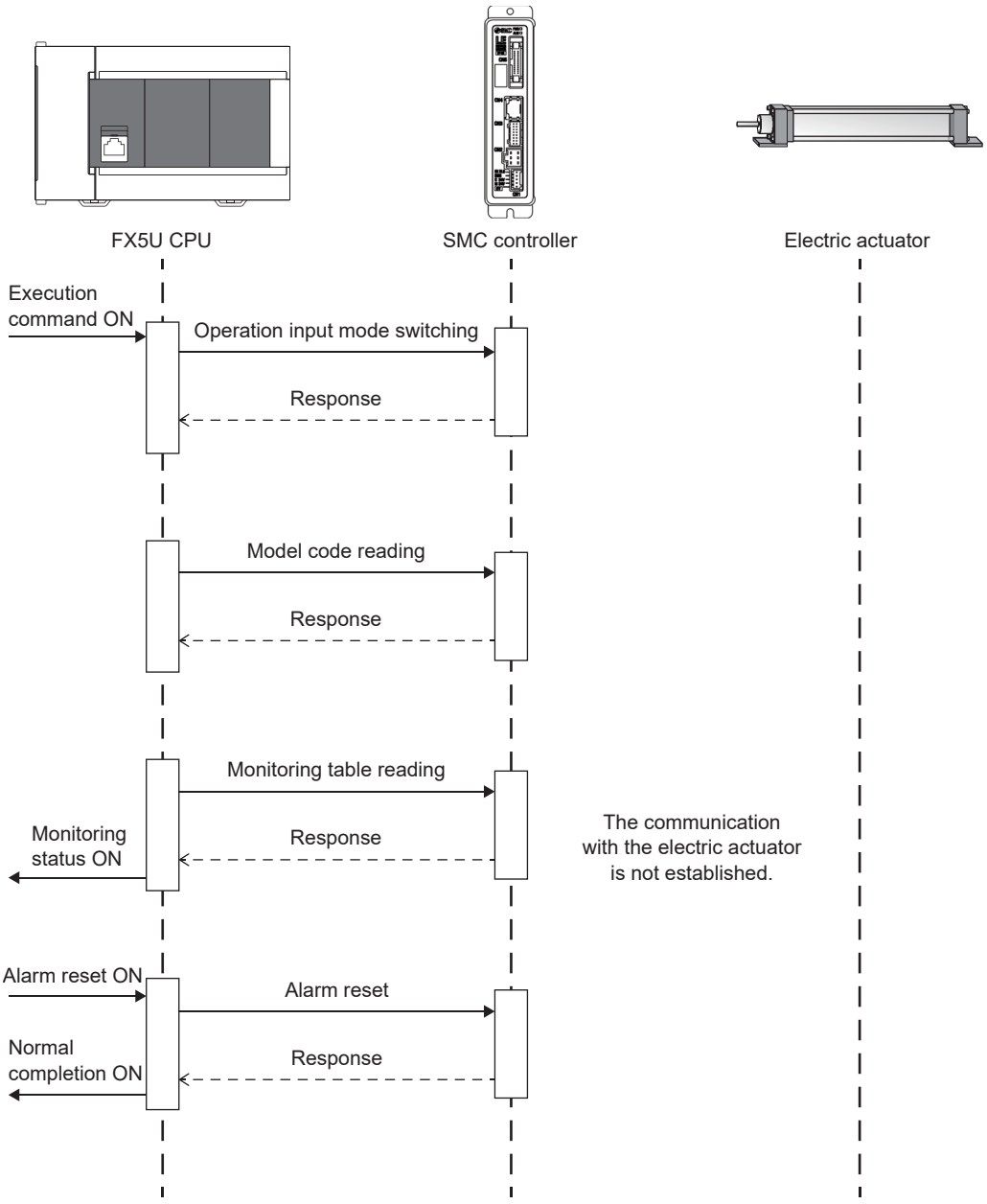
No.	Label	Label name	Data type	Default value	Description
(6)	o_bENO	Execution status	Bit	OFF	ON: The execution command is on. OFF: The execution command is off.
(7)	o_bOK	Normal completion	Bit	OFF	When this label is on, it indicates that the alarm has been cleared without error.
(8)	o_bErr	Error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the FB.
(9)	o_uErrId	Error code	Word [Unsigned]/Bit string [16-bit]	0	The error code that has occurred in the FB is stored.
(10)	o_bUnitErr	Module error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the module.
(11)	o_uUnitErrId	Module error code	Word [Unsigned]/Bit string [16-bit]	0	The error code that has occurred in the module is stored.
(12)	o_bMonitorOK	Monitoring status	Bit	OFF	When this label is on, it indicates that the operation is being monitored without error.
(13)	o_stMonitoringTable	Monitoring table	stMonitoringTable	—	The monitoring table information is stored. For details of the structure, refer to ☞ Page 10 Structure list.

Applicable hardware and software

■ Predefined Protocol Support FB For Positioning

Applicable module	Firmware version	Engineering tool
FX5U CPU	1.200 or later	GX Works3 Version 1.065T or later
FX5UC CPU	1.200 or later	GX Works3 Version 1.065T or later

Sequence diagram



Basic specifications

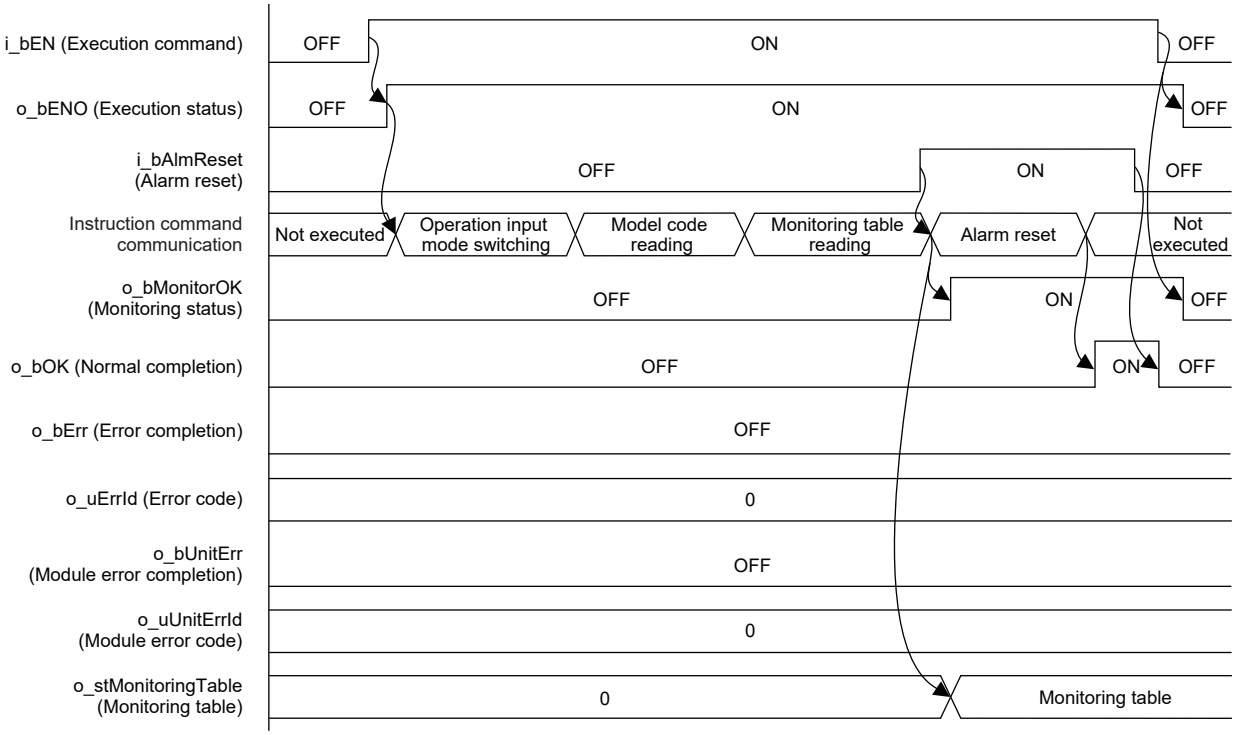
Item	Description
Programming language	—(The program in this FB is not open to the public.)
Number of steps	1267 steps The number of steps of the FB in a program depends on the CPU module used, input and output definition, and option settings of GX Works3. For the option settings of GX Works3, refer to 📖GX Works3 Operating Manual (2.9 Option Setting for Each Function).
Label amount used	• Label: 0.07K points (Word) • Latch label: 0K points (Word) The label amount used in a program depends on the CPU module used, device specified in the argument, and option settings of GX Works3. For the option settings of GX Works3, refer to 📖GX Works3 Operating Manual (2.9 Option Setting for Each Function).
Number of index register points used	• Index register: 2 points • Long index register: 0 points
File register amount used	File register: 1904 points (Word)
FB dependence	No dependence
FB compiling method	Subroutine type
FB operation type	Real-time execution

Function description

- Specify the axis number of the operation target in i_uAxis (Target axis).
- At rising edge of i_bEN (Execution command), this FB sets the operation input mode to the serial input operation mode and starts monitoring of the target axis of the SMC controller. The monitoring data (such as the current position and alarm) is stored in o_stMonitoringTable (Monitoring table).
- While the target axis is being monitored, o_bMonitorOK (Monitoring status) is on.
- After i_bEN (Execution command) is turned on, the alarm is reset by turning on i_bAlmReset (Alarm reset command) while the alarm is occurring. For the alarm reset, the RESET bit of the status change flag of the SMC controller is used.
- o_bOK (Normal completion) turns on when RESET is turned on and off by the instruction command for alarm reset.
- If an error occurs while sending/receiving a predefined protocol, o_bErr (Error completion) turns on and the processing of the FB is interrupted. The error code is stored in o_uErrId (Error code). For details of the error code, refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/7.9 Troubleshooting/Checking absence/presence of errors).
- If an error occurs in the SMC controller and this FB receives an error code, o_bUnitErr (Module error completion) turns on and the processing of the FB is interrupted. The received error code is stored in o_uUnitErrId (Module error code). For details of the error code, refer to ☞ Page 81 Module Error Code.
- If any other error occurs, o_bErr (Error completion) turns on and the processing of the FB is interrupted. For details of the error code, refer to ☞ Page 56 Error code.

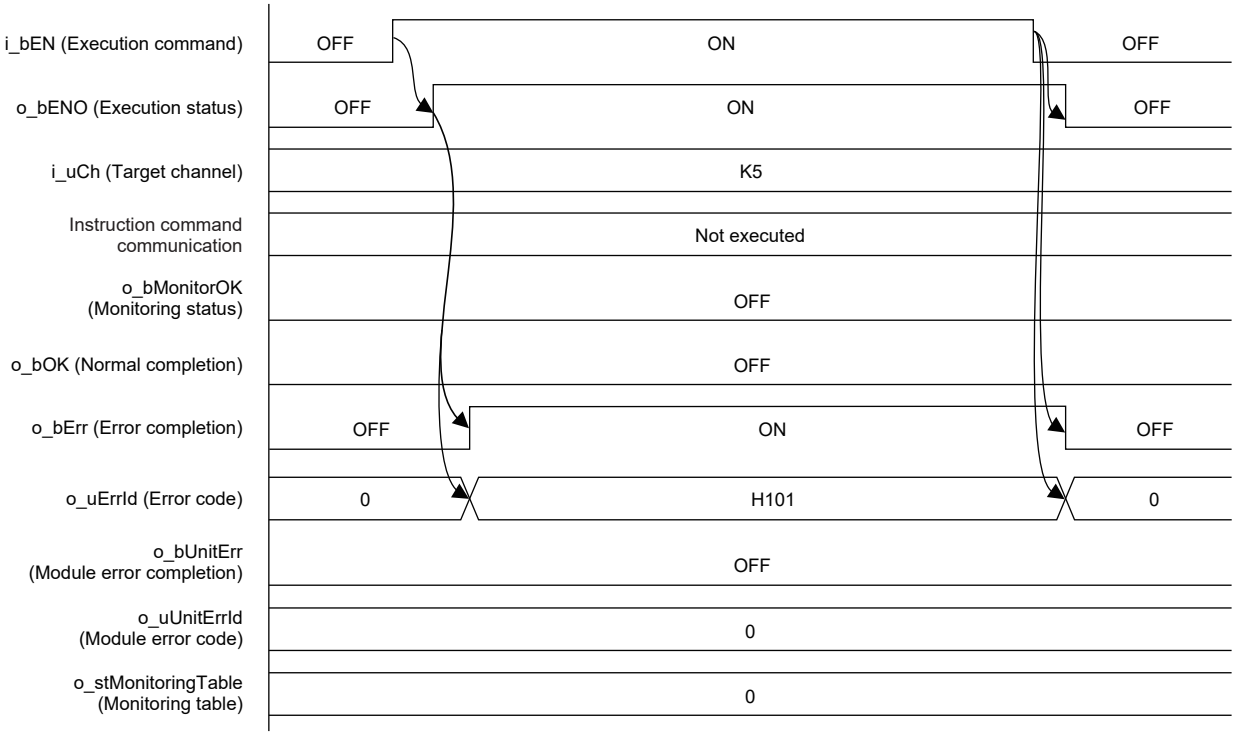
Timing chart of I/O signals

■ Normal completion



■ Error completion

- The target channel is out of range.



Restrictions and precautions

- This FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation.
- This FB uses the index registers Z0 and Z1. When using an interrupt program, do not use these index registers.
- This FB cannot be used in an interrupt program.
- Using the FB in a program that is to be executed only once, such as a subroutine program or a FOR-NEXT loop, has a problem that i_bEN (Execution command) can no longer be turned off and normal operation is not possible; Always use the FB in a program that is capable of turning off the execution command.
- This FB requires the ladder to be configured for every input label.
- This FB uses the CPRTCL instruction. For details, refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/ 7.8 Programming/Predefined protocol support instruction).
- To operate the SMC controller, set the protocol type to the predefined protocol support type with the module parameter of GX Works3. For details of the parameter setting procedures, refer to ☞ Page 19 Parameter setting.
- Change the number of timeouts or retries of the communication in Predefined Protocol Support Tool For Positioning. For details of the setting procedures, refer to 📖Predefined Protocol Support Tool For Positioning Operating Manual (6.2 Setting a Connected Model). If the communication interval for the same channel is short, the command may not be received depending on the connected controller, and a serial communication timeout (CPU error) may occur. In this case, the situation can be avoided by increasing the "transmission standby time" in the protocol transmission/reception settings of the connected device setting.

Parameter setting

For details of the parameter setting procedures, refer to ☞ Page 19 Parameter setting.

Performance value

CPU	Measurement condition		Processing time	Maximum scan time	Number of scans
FX5U, FX5UC*1*2	Axis 1, channel 1	From execution command ON to monitoring status ON	72.600 ms	1.290 ms	249
		From alarm reset ON to normal completion	36.300 ms	1.300 ms	117

*1 When the program capacity is set to 128K steps, the processing speed may be decreased.
*2 The standard area is used for the labels.

Error code

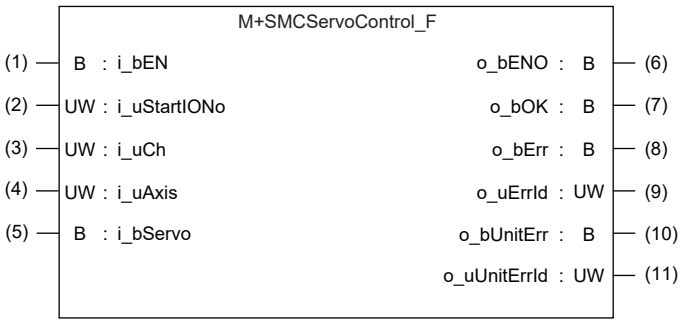
Error code (hexadecimal)	Description	Action
101H	The setting value of i_uCh (Target channel) is out of range. The target channel is not within the range of 1 to 4.	Review and correct the setting and then execute the FB again.
102H	The setting value of i_uAxis (Target axis) is out of range. The target axis is not within the range of 1 to 32.	Review and correct the setting and then execute the FB again.
200H	An unsupported device is connected.	Review and correct the connected device and then execute the FB again.
201H	The execution command has turned off during the processing.	Keep the ON state of the execution command until the normal completion, error completion, or module error completion turns on.*1
Predefined protocol error code	This error code occurs during communication.	Refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/7.9 Troubleshooting/Checking absence/presence of errors).

*1 It is output only during one scan.

2.8 M+SMCServoControl_F (Servo ON/OFF)

Overview

This FB controls the servo ON/OFF.



Label

Input label

No.	Label	Label name	Data type	Setting range	Description
(1)	i_bEN	Execution command	Bit	ON, OFF	ON: The FB is activated. OFF: The FB is not activated.
(2)	i_uStartIONo	Start I/O No.	Word [Unsigned]/Bit string [16-bit]	—	Setting this label is not required since it is not used in the program in this FB.
(3)	i_uCh	Target channel	Word [Unsigned]/Bit string [16-bit]	1 to 4	Specify the channel number. 1: Built-in RS485 port 2: FX5-485-BD 3, 4: FX5-485ADP
(4)	i_uAxis	Target axis	Word [Unsigned]/Bit string [16-bit]	1 to 32	Specify the axis number set in the SMC controller.*1
(5)	i_bServo	Servo ON/OFF switching	Bit	ON, OFF	ON: Servo ON OFF: Servo OFF

*1 The axis number corresponds to the slave station number of MODBUS.

Output label

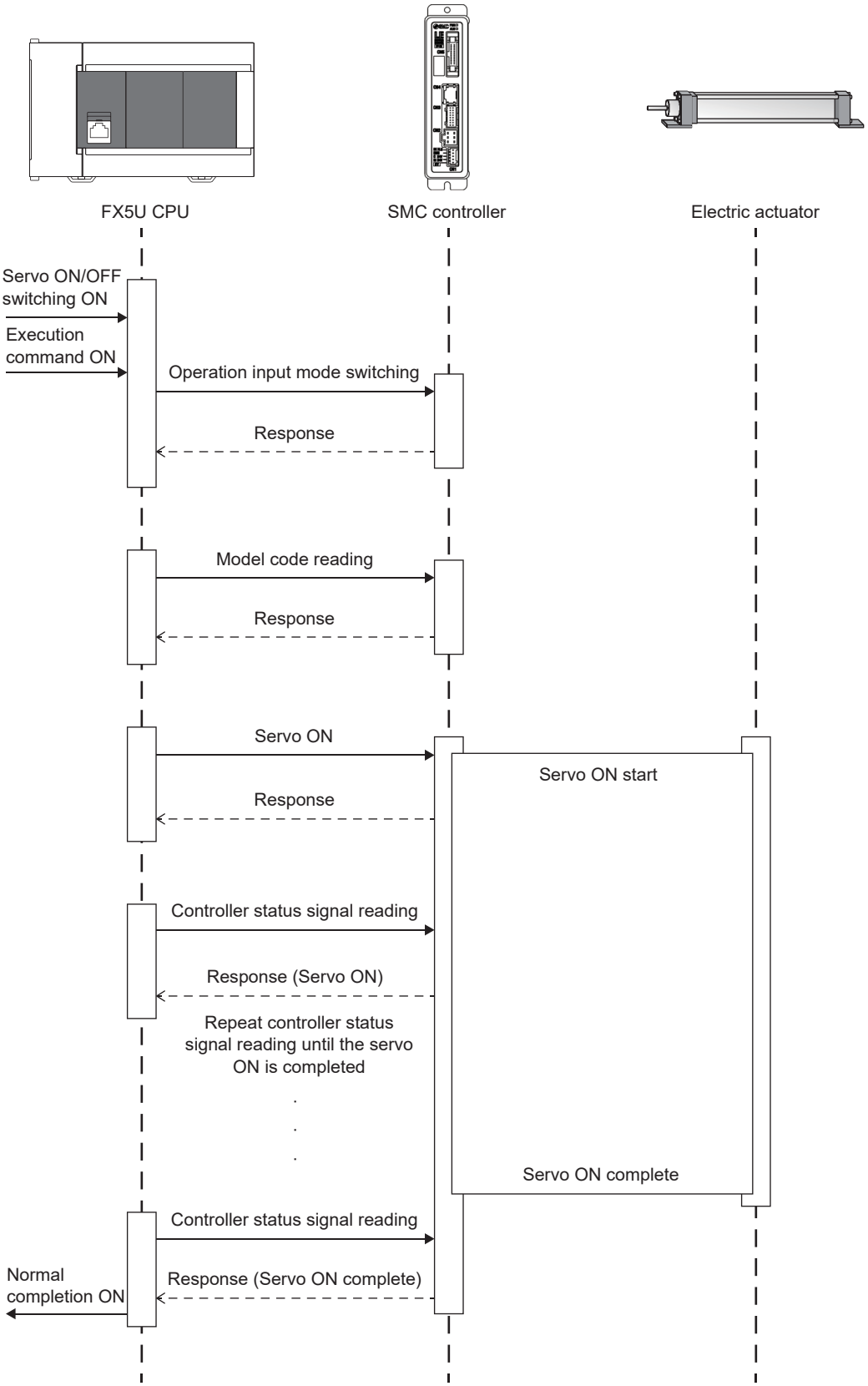
No.	Label	Label name	Data type	Default value	Description
(6)	o_bENO	Execution status	Bit	OFF	ON: The execution command is on. OFF: The execution command is off.
(7)	o_bOK	Normal completion	Bit	OFF	When this label is on, it indicates that the servo ON/OFF has been completed.
(8)	o_bErr	Error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the FB.
(9)	o_uErrId	Error code	Word [Unsigned]/Bit string [16-bit]	0	The error code that has occurred in the FB is stored.
(10)	o_bUnitErr	Module error completion	Bit	OFF	When this label is on, it indicates that an error has occurred in the module.
(11)	o_uUnitErrId	Module error code	Word [Unsigned]/Bit string [16-bit]	0	The error code that has occurred in the module is stored.

Applicable hardware and software

■ Predefined Protocol Support FB For Positioning

Applicable module	Firmware version	Engineering tool
FX5U CPU	1.200 or later	GX Works3 Version 1.065T or later
FX5UC CPU	1.200 or later	GX Works3 Version 1.065T or later

Sequence diagram



Basic specifications

Item	Description
Programming language	—(The program in this FB is not open to the public.)
Number of steps	873 steps The number of steps of the FB in a program depends on the CPU module used, input and output definition, and option settings of GX Works3. For the option settings of GX Works3, refer to 📖GX Works3 Operating Manual (2.9 Option Setting for Each Function).
Label amount used	• Label: 0.04K points (Word) • Latch label: 0K points (Word) The label amount used in a program depends on the CPU module used, device specified in the argument, and option settings of GX Works3. For the option settings of GX Works3, refer to 📖GX Works3 Operating Manual (2.9 Option Setting for Each Function).
Number of index register points used	• Index register: 2 points • Long index register: 0 points
File register amount used	File register: 1904 points (Word)
FB dependence	No dependence
FB compiling method	Subroutine type
FB operation type	Pulsed execution (multiple scan execution type)

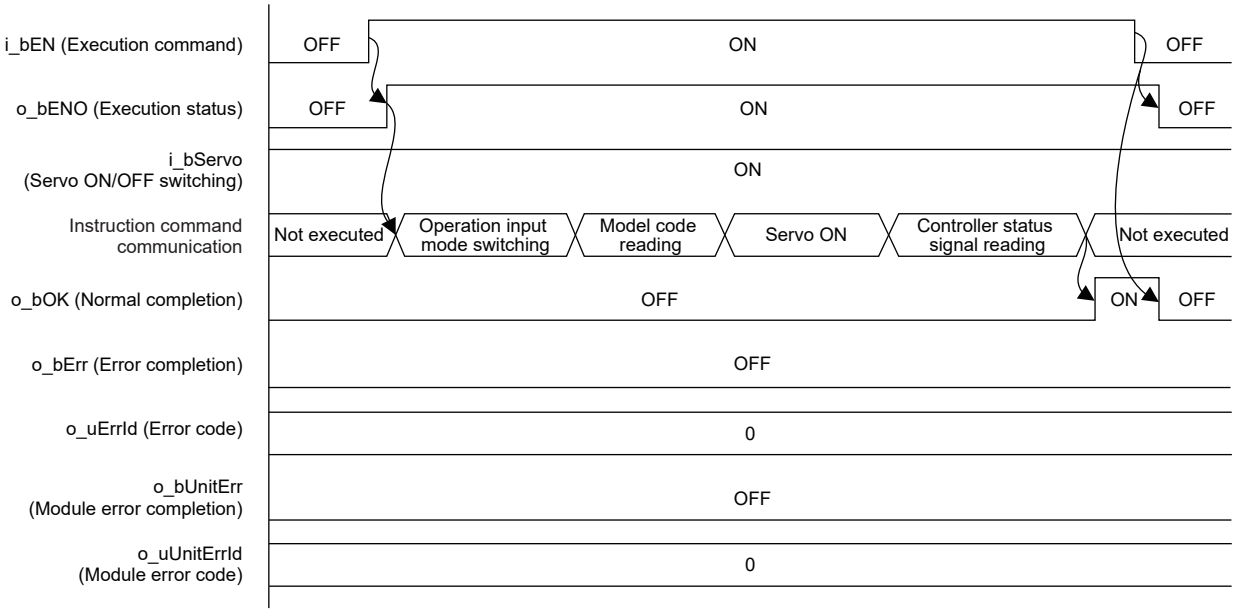
Function description

- Specify the axis number of the operation target in i_uAxis (Target axis).
- At rising edge of i_bEN (Execution command), this FB sets the operation input mode to the serial input operation mode and issues a servo ON request when i_bServo (Servo ON/OFF) is on or a servo OFF request when the label is off.
- This FB detects the completion of the Servo ON/OFF by checking the ON/OFF state of SVON, which is the status flag of the SMC controller, and o_bOK (Normal completion) turns on.
- If an error occurs while sending/receiving a predefined protocol, o_bErr (Error completion) turns on and the processing of the FB is interrupted. The error code is stored in o_uErrId (Error code). For details of the error code, refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/7.9 Troubleshooting/Checking absence/presence of errors).
- If an error occurs in the SMC controller and this FB receives an error code, o_bUnitErr (Module error completion) turns on and the processing of the FB is interrupted. The received error code is stored in o_uUnitErrId (Module error code). For details of the error code, refer to ☞ Page 81 Module Error Code.
- If any other error occurs, o_bErr (Error completion) turns on and the processing of the FB is interrupted. For details of the error code, refer to ☞ Page 62 Error code.

Timing chart of I/O signals

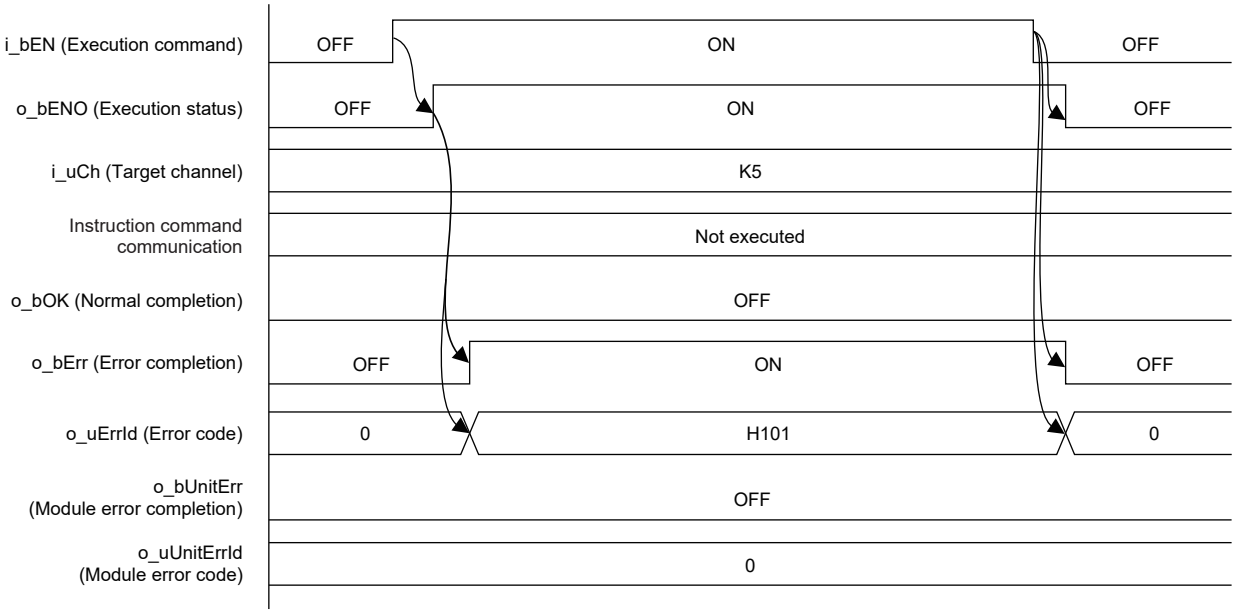
■ Normal completion

• Servo ON



■ Error completion

• The target channel is out of range.



Restrictions and precautions

- This FB does not include error recovery processing. Program the error recovery processing separately in accordance with the required system operation.
- This FB uses the index registers Z0 and Z1. When using an interrupt program, do not use these index registers.
- This FB cannot be used in an interrupt program.
- Using the FB in a program that is to be executed only once, such as a subroutine program or a FOR-NEXT loop, has a problem that i_bEN (Execution command) can no longer be turned off and normal operation is not possible; Always use the FB in a program that is capable of turning off the execution command.
- This FB requires the ladder to be configured for every input label.
- This FB uses the CPRTCL instruction. For details, refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/ 7.8 Programming/Predefined protocol support instruction).
- To operate the SMC controller, set the protocol type to the predefined protocol support type with the module parameter of GX Works3. For details of the parameter setting procedures, refer to ☞ Page 19 Parameter setting.
- Change the number of timeouts or retries of the communication in Predefined Protocol Support Tool For Positioning. For details of the setting procedures, refer to 📖Predefined Protocol Support Tool For Positioning Operating Manual (6.2 Setting a Connected Model). If the communication interval for the same channel is short, the command may not be received depending on the connected controller, and a serial communication timeout (CPU error) may occur. In this case, the situation can be avoided by increasing the "transmission standby time" in the protocol transmission/reception settings of the connected device setting.

Parameter setting

For details of the parameter setting procedures, refer to ☞ Page 19 Parameter setting.

Performance value

CPU	Measurement condition		Processing time	Maximum scan time	Number of scans
FX5U, FX5UC*1*2	Axis 1, channel 1	Switching from the servo ON state to the servo OFF state	54.100 ms	0.921 ms	195
		Switching from the servo OFF state to the servo ON state	3340 ms	0.970 ms	12519

*1 When the program capacity is set to 128K steps, the processing speed may be decreased.
*2 The standard area is used for the labels.

Error code

Error code (hexadecimal)	Description	Action
101H	The setting value of i_uCh (Target channel) is out of range. The target channel is not within the range of 1 to 4.	Review and correct the setting and then execute the FB again.
102H	The setting value of i_uAxis (Target axis) is out of range. The target axis is not within the range of 1 to 32.	Review and correct the setting and then execute the FB again.
200H	An unsupported device is connected.	Review and correct the connected device and then execute the FB again.
201H	The execution command has turned off during the processing.	Keep the ON state of the execution command until the normal completion, error completion, or module error completion turns on.*1
203H	The controller is in the emergency stop state or a major failure has occurred.	Check the status of the SMC controller in M+SMCMonitoring_F (Operation monitoring). After checking the status, eliminate the error cause and then execute the FB again.
Predefined protocol error code	This error code occurs during communication.	Refer to 📖MELSEC iQ-F FX5 User's Manual (Serial Communication/7.9 Troubleshooting/Checking absence/presence of errors).

*1 It is output only during one scan.

3 FB LIBRARY USE PROCEDURE

3.1 Step Data Writing and Positioning Operation

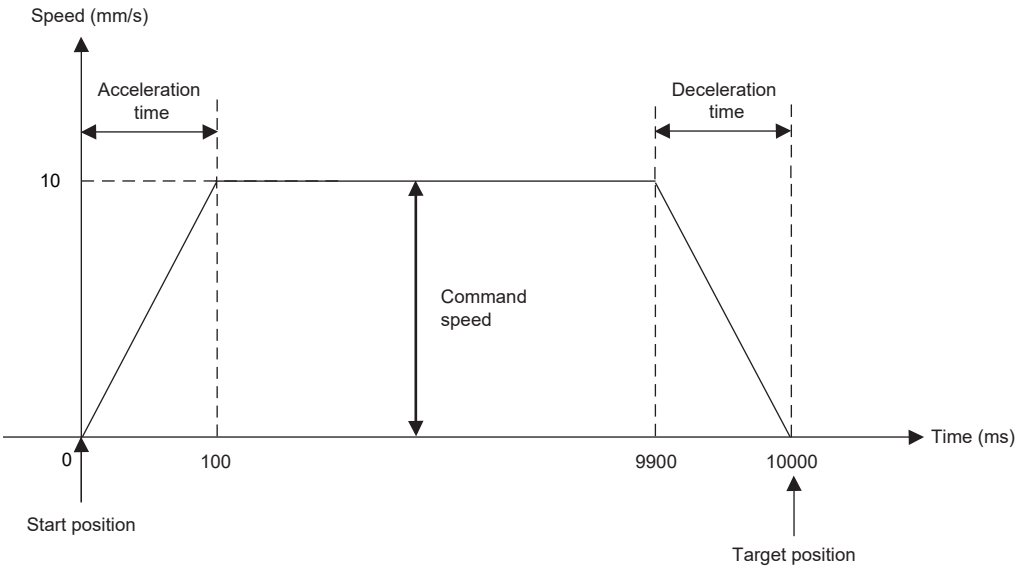
The following shows an example of using this FB library for writing the step data to the SMC controller, and performing the home position return and positioning operation after the servo turns on. The following FBs are used in this example.

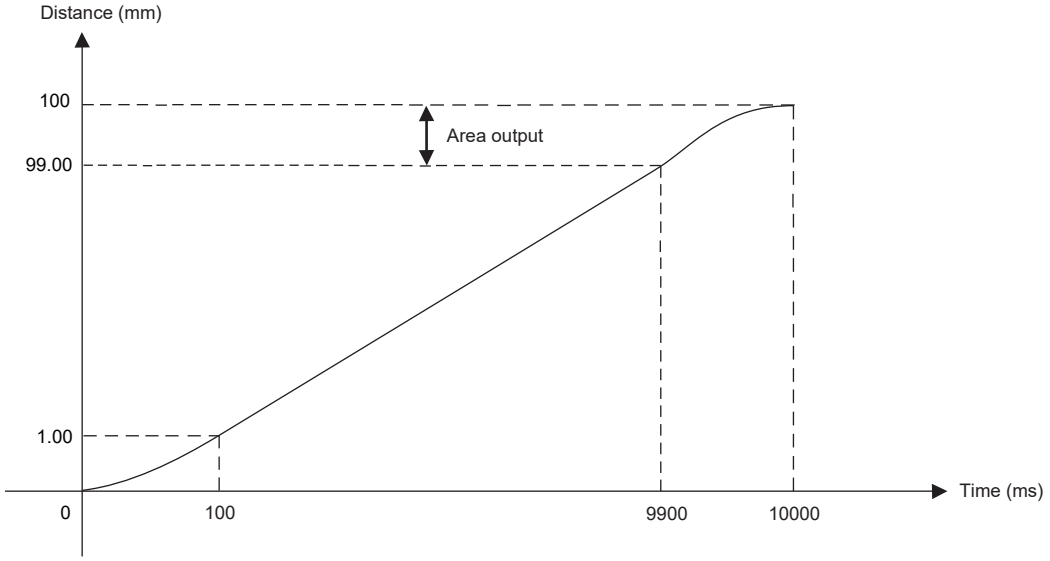
- M+SMCMonitoring_F (Operation monitoring)
- M+SMCWriteStepData_F (Step data writing)
- M+SMCServoControl_F (Servo ON/OFF)
- M+SMCStartHomePositioning_F (Home position return)
- M+SMCStartPositioning_F (Positioning operation)

Overview of program example

Perform monitoring to check the status of the LECP6 controller by SMC. Then, write the step data to the axis 1, step data No. 0 and the axis 2, step data No. 0 of the SMC controller with the following settings. After writing the data, turn on the servo and perform the home position return, then move the electric actuator to the position which is 100 mm away from the home position. If the error code 203H occurs during the operation, reset the alarm that has occurred in the SMC controller.

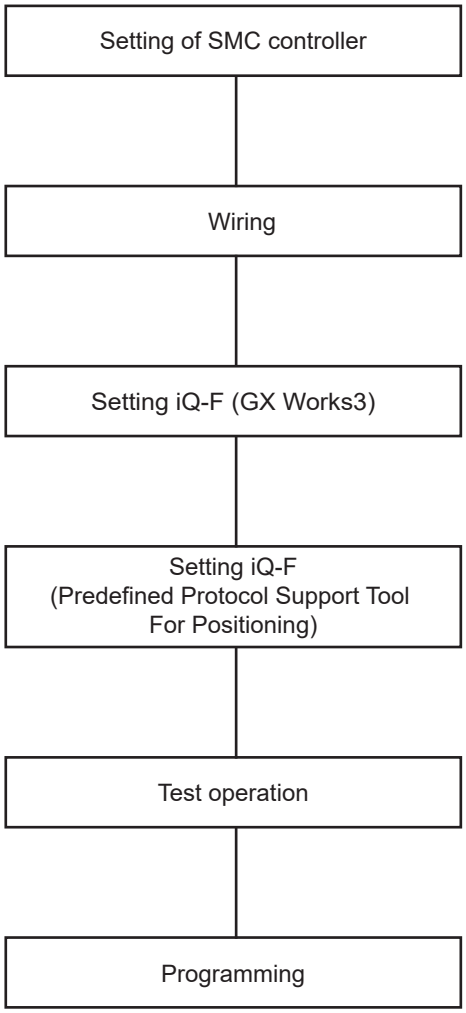
- Operation method: 1 (ABS)
- Speed: 10 mm/s
- Position: 100 mm (0.01 mm × 10000)
- Acceleration: 100 mm/s^2
- Deceleration: 100 mm/s^2
- Pushing thrust: 0%
- Threshold: 0%
- Pushing speed: 5 mm/s
- Positioning thrust: 30%
- Area output edge 1: 99 mm (0.01 mm × 9900)
- Area output edge 2: 100 mm (0.01 mm × 10000)
- Positioning width: 1 mm (0.01 mm × 100)




Distance (mm)
100
99.00
1.00
0
Area output
100
9900
10000
Time (ms)

Operation flow

The following shows the operation flow from the parameter setting and wiring of the SMC controller and programmable controller to using Predefined Protocol Support FB For Positioning.



1. Setting of SMC controller

- Axis No. setting
- Communication setting

For the setting procedure, refer to the manual of the SMC controller to be used.

2. Wiring

- Wiring setting

For the wiring procedure, refer to ☞ Page 66 Wiring.

3. Setting iQ-F (GX Works3)

- Protocol type setting
- Detail setting

For the setting procedure, refer to ☞ Page 19 Parameter setting.

4. Setting iQ-F (Predefined Protocol Support Tool For Positioning)

- Setting the channel to be used
- SMC controller operation (number of retries and time)

For the setting procedure, refer to 📖Predefined Protocol Support Tool For Positioning Operating Manual (6.2 Setting a Connected Model).

5. Test operation

- Setting the step data No. to be executed

This setting is not necessary when the test operation is not performed.

For the setting procedure, refer to 📖Predefined Protocol Support Tool For Positioning Operating Manual (9 POSITIONING TEST).

6. Programming

For the programming procedure, refer to ☞ Page 67 Program contents.

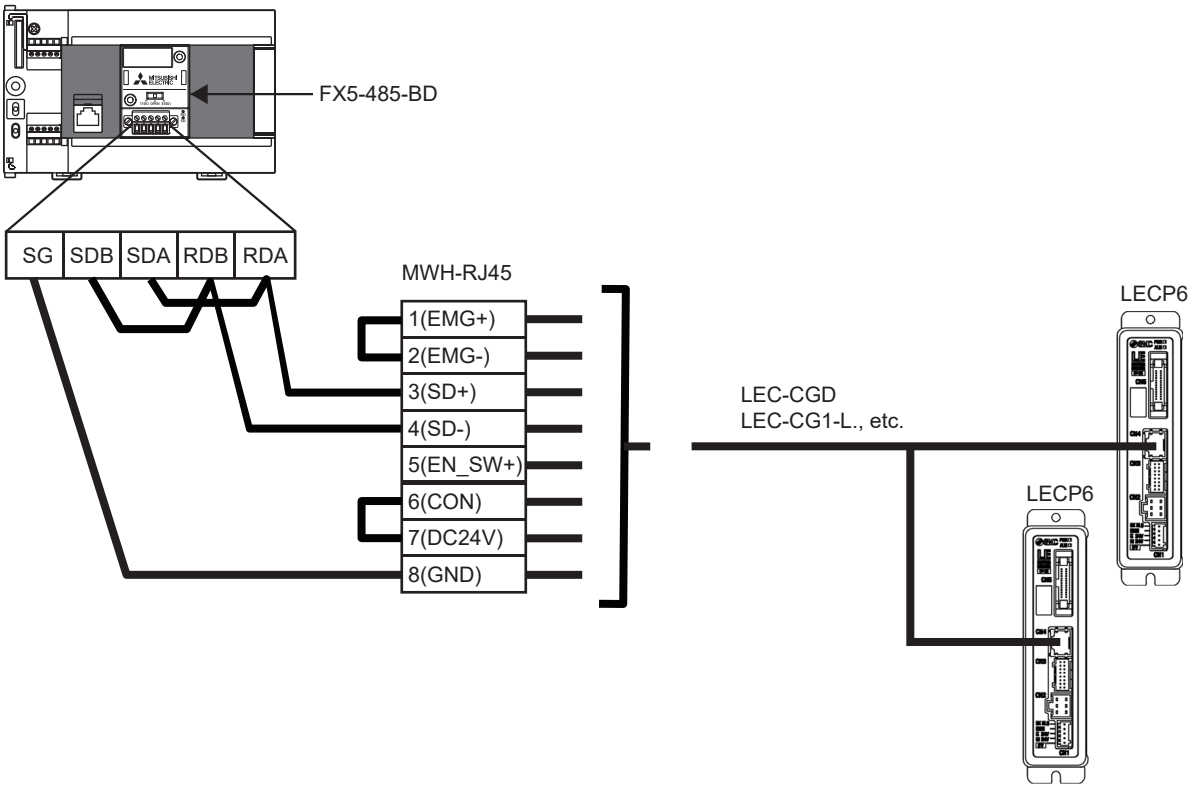
System configuration

For the system configuration example, refer to ☞ Page 9 System Configuration.

Wiring

In this example, perform wiring as follows.

For details, refer to the manual of the SMC controller to be used.



Pre-setting

Set the termination resistor in the FX5U CPU module. Set the termination resistor to 110 Ω using the termination resistor selector switch.

Parameter setting

For the parameter setting procedure of the FX5U CPU module, refer to ☞ Page 19 Parameter setting.

FB library registration

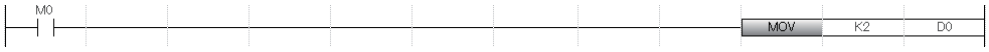
For the operating procedure to register the FB library to GX Works3, refer to 🕮GX Works3 Operating Manual (10.4 Enhanced Use of Application Library/MELSOFT Library).

Enhanced use of FB library

For the operating procedure to use FBs and structures included in the registered FB library in the program, refer to 🕮GX Works3 Operating Manual (10.3 Enhancing Use of User Library/Enhanced use of libraries/Utilizing an element).

Program contents

Target channel setting



Sets the target channel to 2

Target axis setting



Sets the target axes to 1 and 2

Step data No. setting



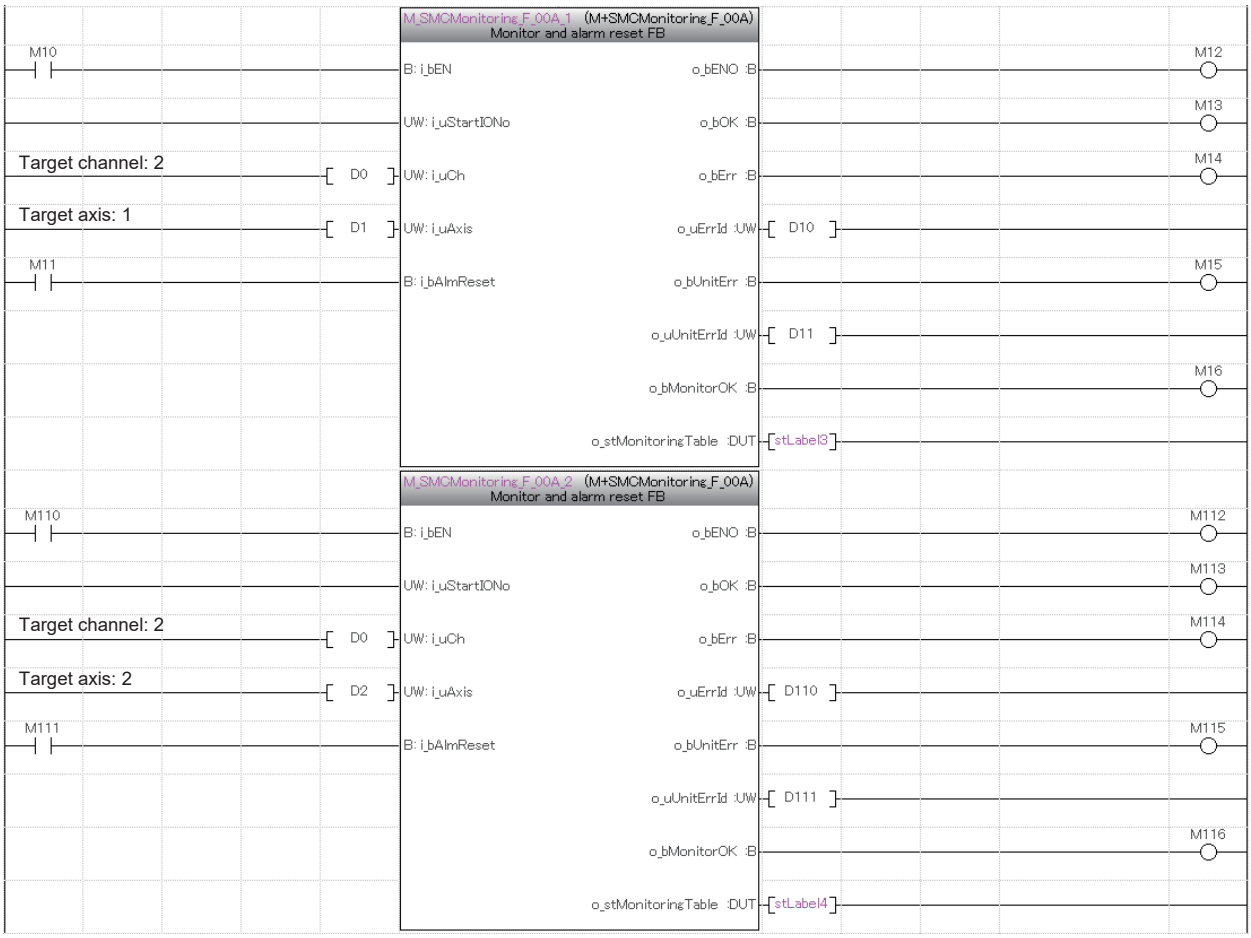
Sets the step data Nos. to 0 (axis 1) and 0 (axis 2)

SMC controller monitoring

By turning on i_bEN (Execution command), the status of the SMC controller is monitored in M+SMCMonitoring_F (Operation monitoring).

When o_bMonitorOK (Monitoring status) is on, the monitoring table information of the SMC controller is stored in o_stMonitoringTable (Monitoring table).

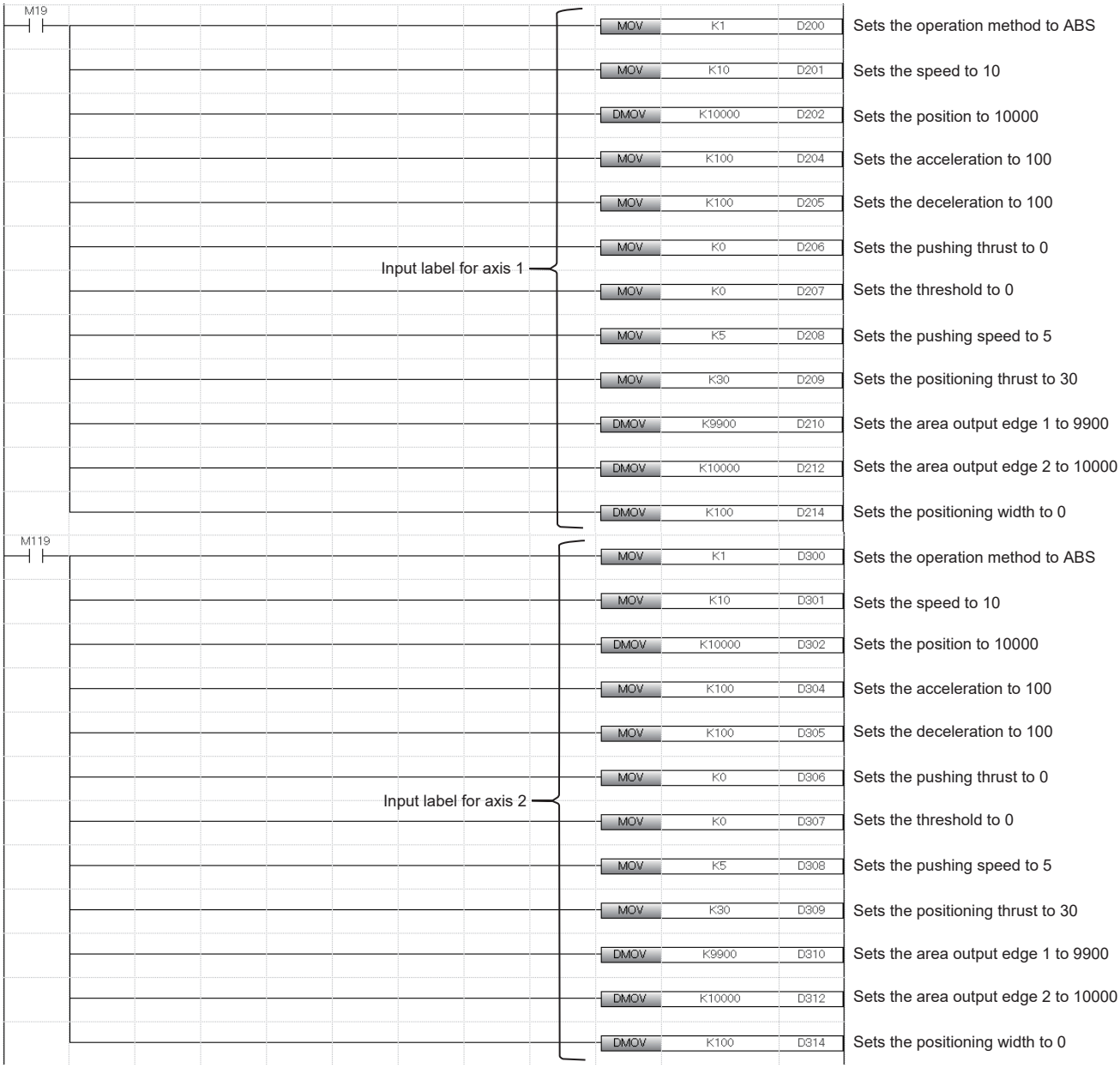
For how to access the local labels stLabel3 and stLabel4 of the structure type (stMonitoringTable), refer to ☞ Page 73 Acquiring the alarm that has occurred in the SMC controller.



For o_stMonitoringTable (Monitoring table), refer to ☞ Page 10 Structure list.

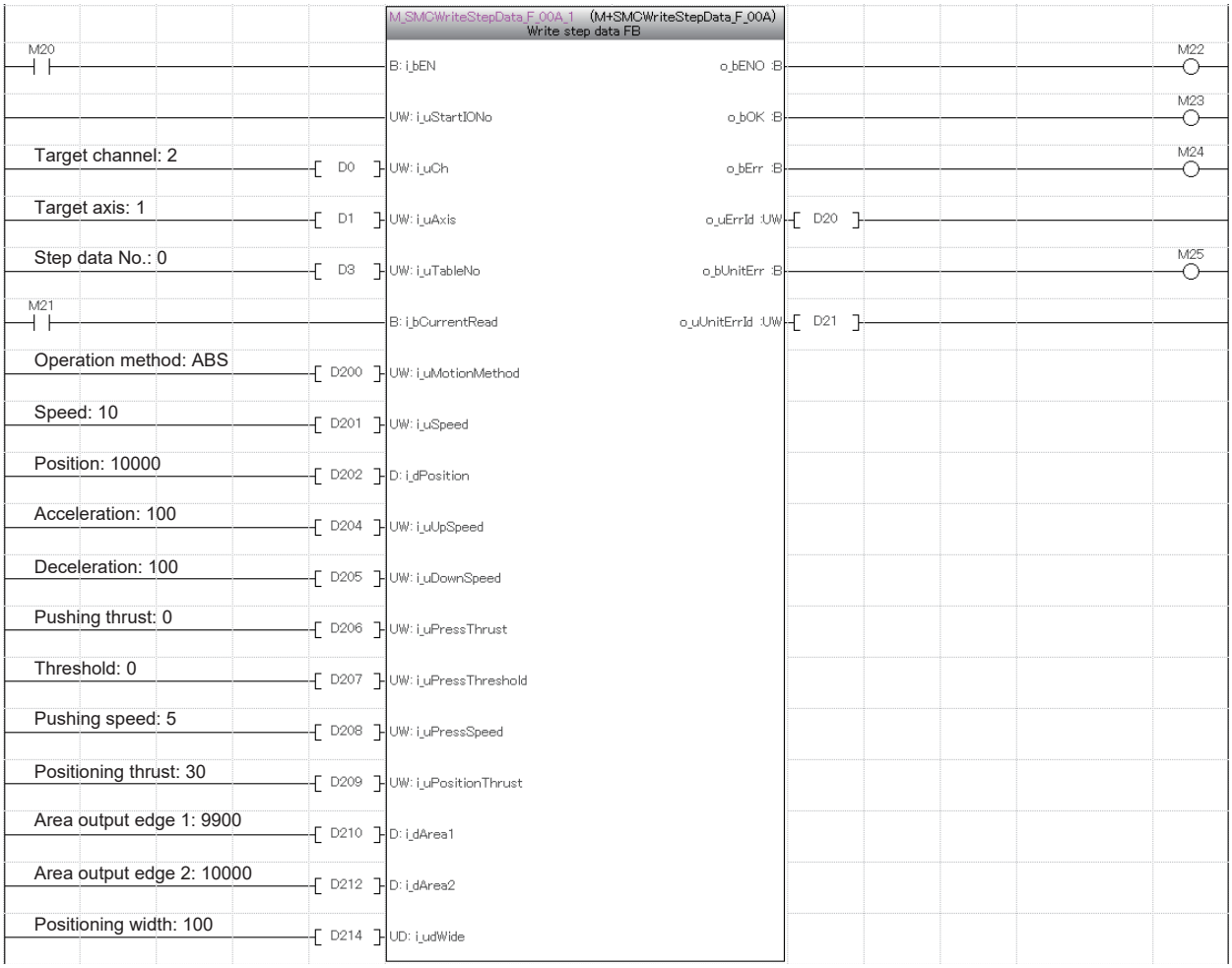
Step data (input label) setting

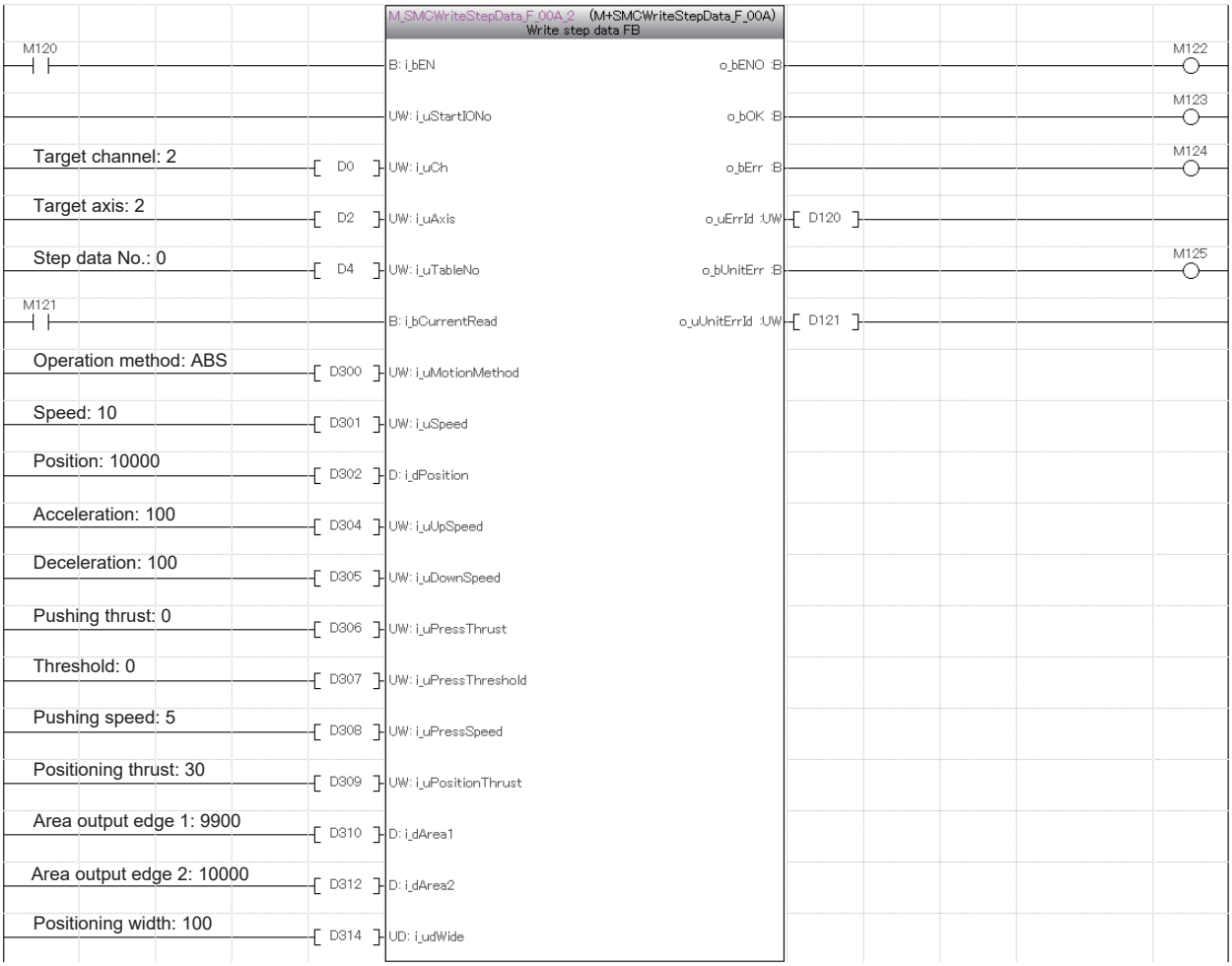
The following shows an example of setting the input label of M+SMCWriteStepData_F (Step data writing) by turning on M19 and M119.



Step data setting

By turning on i_bEN (Execution command), the positioning operation information is written to the step data of the target axis by M+SMCWriteStepData_F (Step data writing).



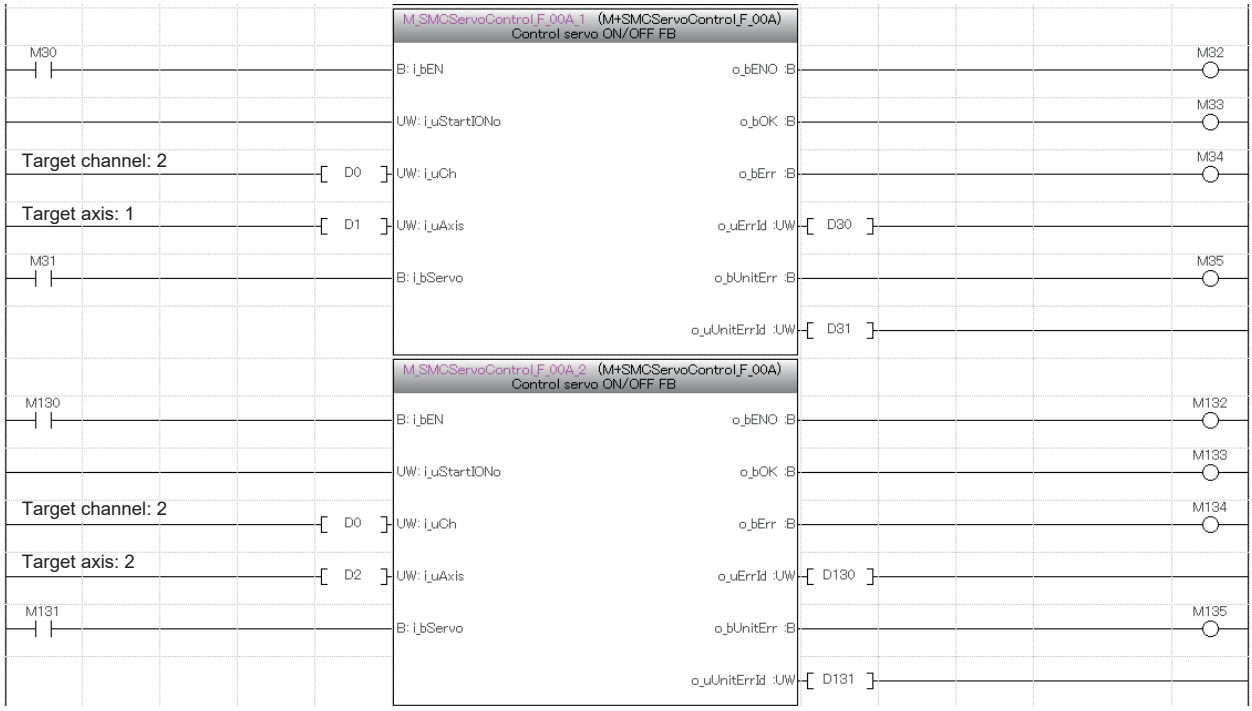


Point

The step data can be set by using Predefined Protocol Support Tool For Positioning as well.
In that case, setting by M+SMCWriteStepData_F (Step data writing) is not necessary.
For details of setting by tools, refer to the following.
Predefined Protocol Support Tool For Positioning Operating Manual (7.2 Setting and Editing Positioning Data)

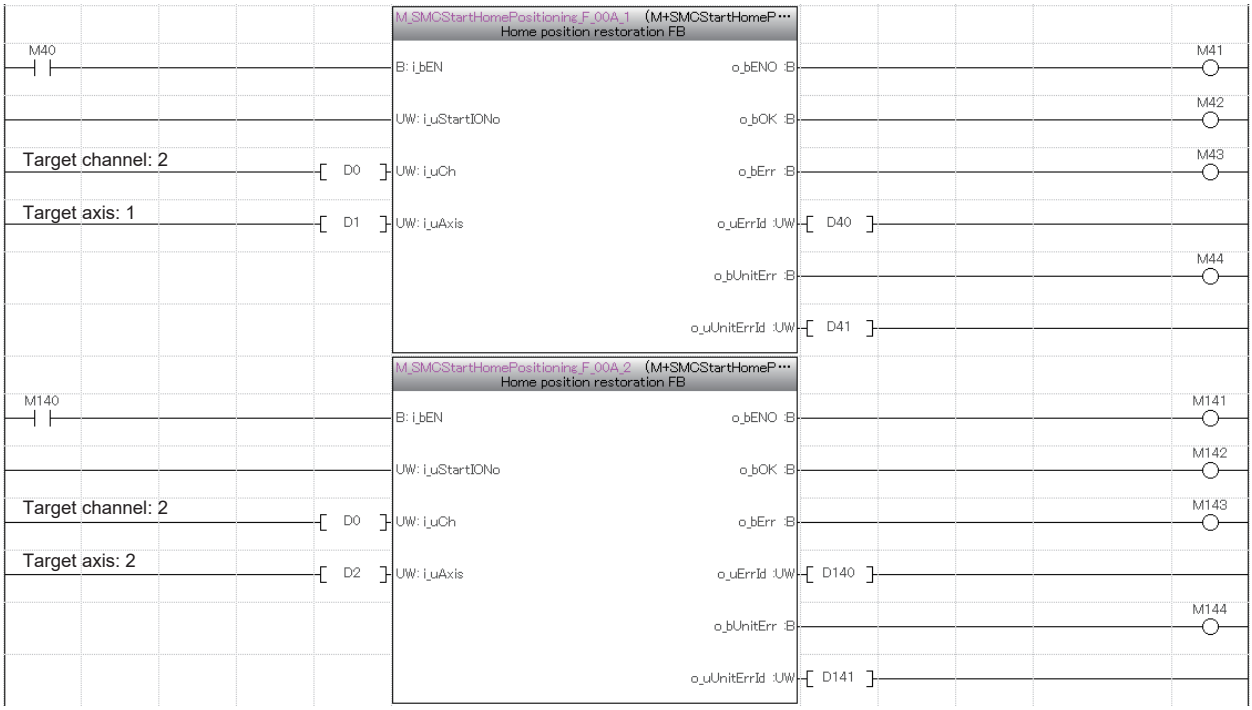
Servo ON

By turning on i_bEN (Execution command) after turning on i_bServo (Servo ON/OFF), the servo is turned on by M+SMCServoControl_F (Servo ON/OFF). When performing maintenance of the target axis, turn off the servo.



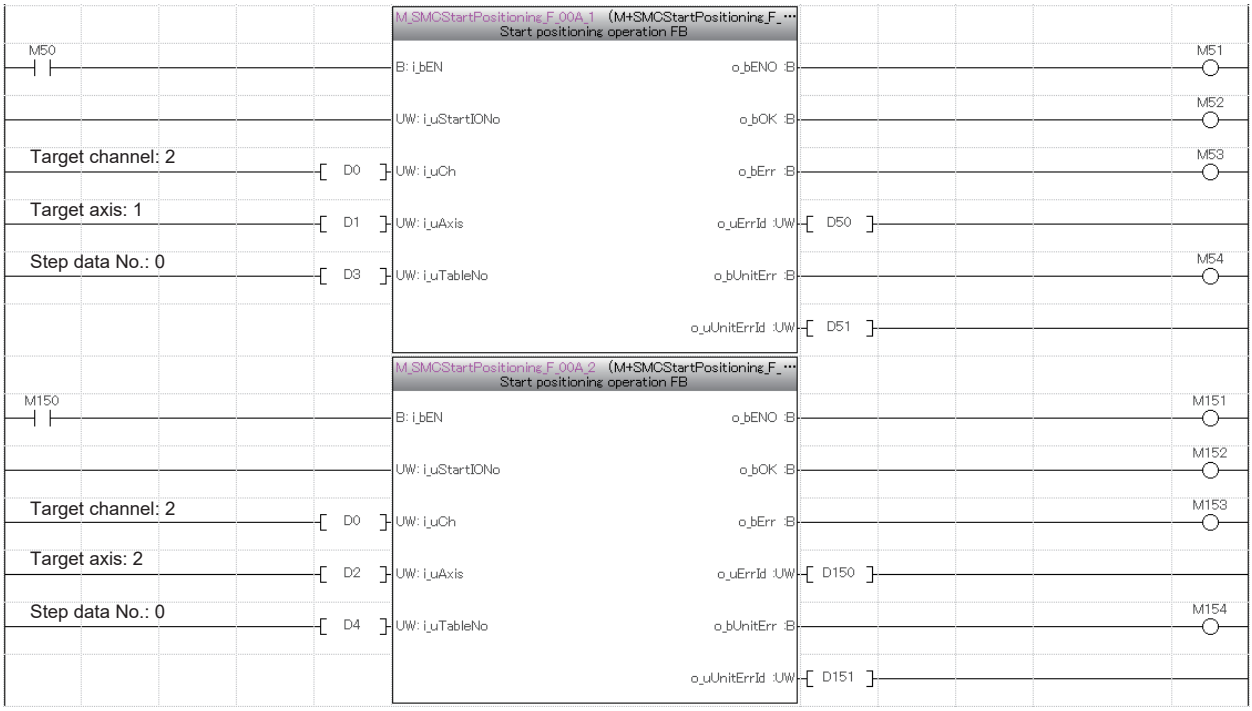
Performing the home position return

By turning on i_bEN (Execution command), the home position return is performed by M+SMCStartHomePositioning_F (Home position return).



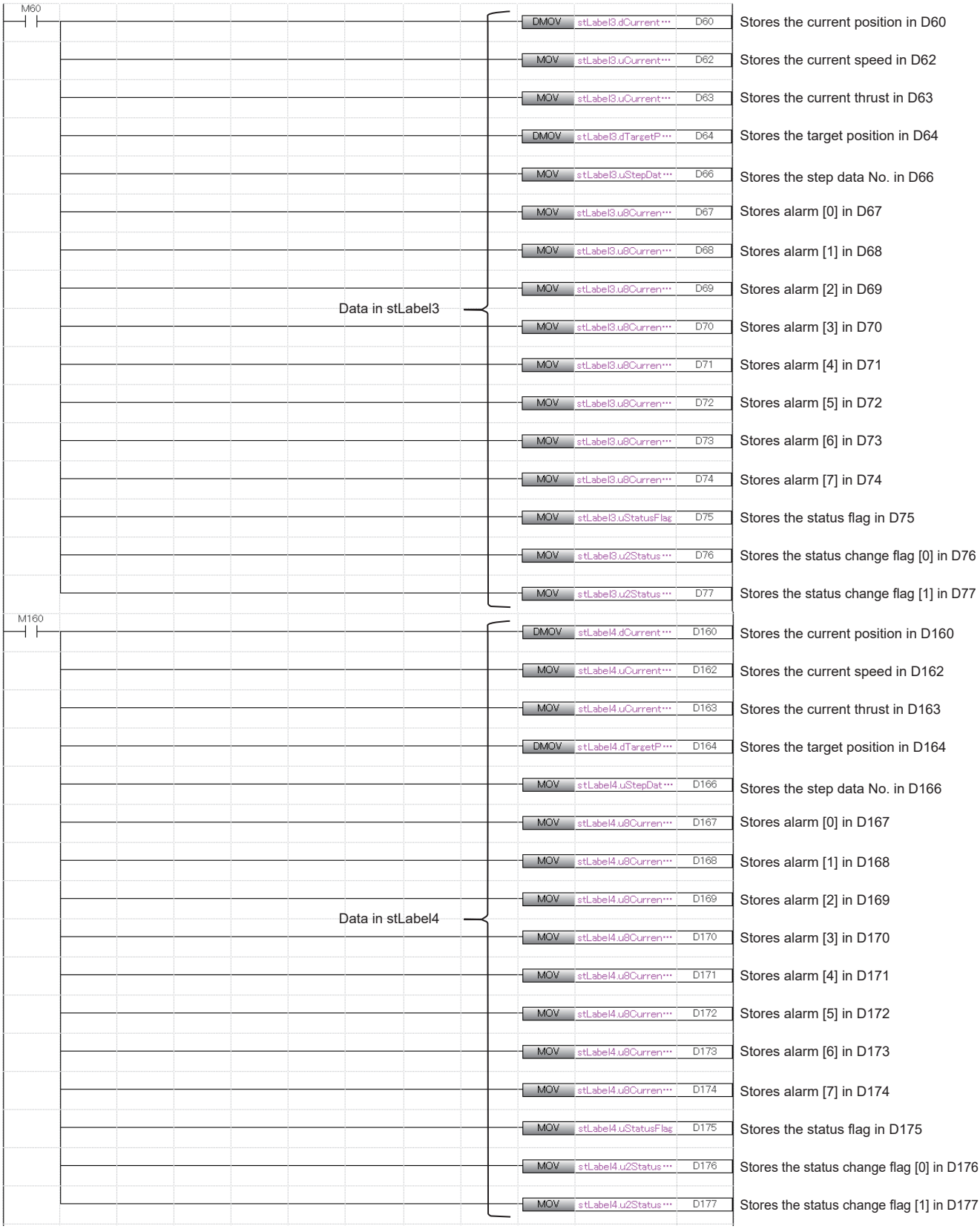
Performing the positioning operation

By turning on i_bEN (Execution command), the positioning operation of the set step data No. is performed by M+SMCStartPositioning_F (Positioning operation).



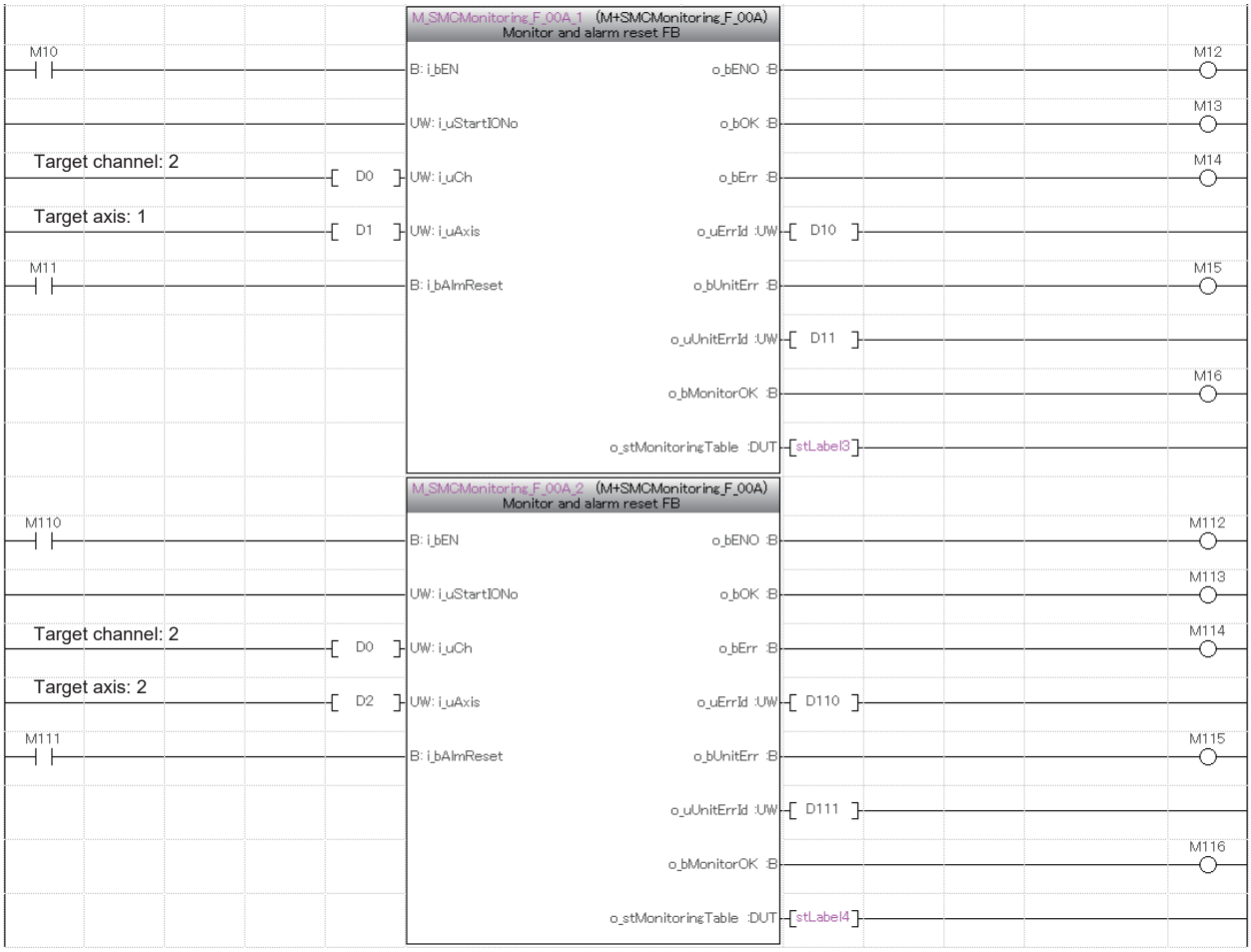
Acquiring the alarm that has occurred in the SMC controller

If the 203H error occurs in the home position return or positioning operation, an alarm has occurred in the SMC controller. The following shows an example of storing the data in the local labels stLabel3 and stLabel4 of the structure type (stMonitoringTable) in the data register (D) by turning on M60 and M160.



Resetting the alarm that has occurred in the SMC controller

When an error code is stored in D67 or D167, the alarm that has occurred in the SMC controller is reset by M+SMCMonitoring_F (Operation monitoring) by turning on i_bAlmReset (Alarm reset).



3.2 JOG Operation and Current Position Reading

The following shows an example of using this FB library for performing the JOG/inching operation and reading the current position after the operation. The following FBs are used in this example.

- M+SMCMonitoring_F (Operation monitoring)
- M+SMCServoControl_F (Servo ON/OFF)
- M+SMCJogInching_F (JOG/inching operation)
- M+SMCWriteStepData_F (Step data writing)
- M+SMCReadStepData_F (Step data reading)

Overview of program example

Perform monitoring to check the status of the SMC controller. Then, turn on the servo, and perform the JOG operation on the axis 1 of the SMC controller by the parameter set to the SMC controller. The current position after the movement by JOG operation is read and set to the position of the step data No. 0. The position of the set step data is read.

Operation flow

Refer to ☞ Page 65 Operation flow.

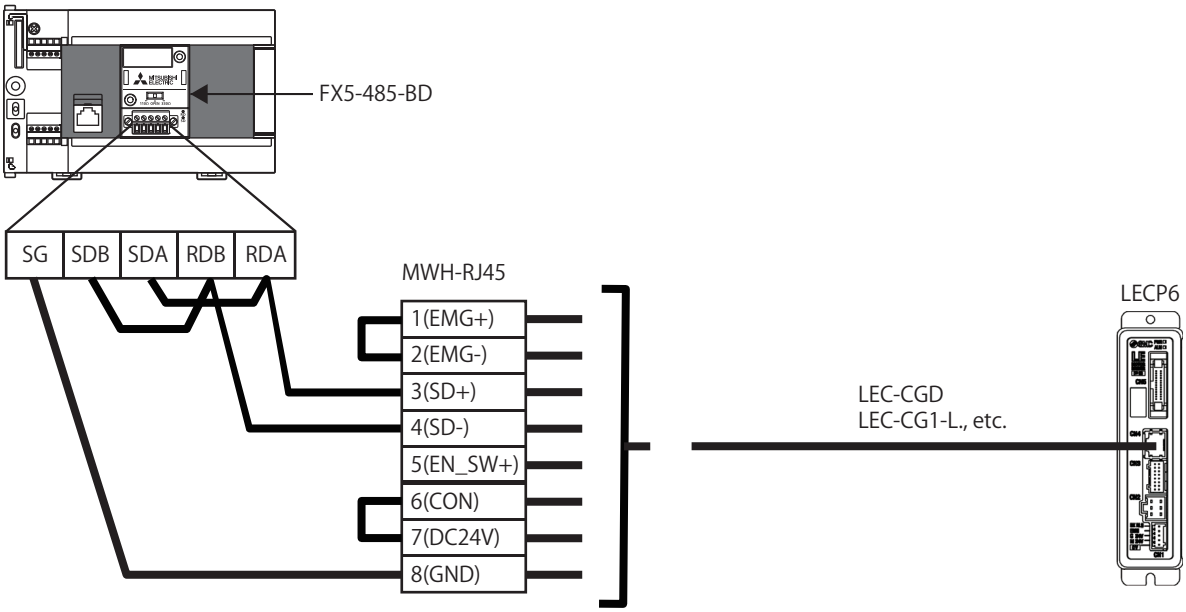
System configuration

Refer to ☞ Page 9 System Configuration.

Wiring

In this example, perform wiring as follows.

For details, refer to the manual of the SMC controller to be used.



Pre-setting

Set the termination resistor in the FX5U CPU module. Set the termination resistor to 110 Ω using the termination resistor selector switch.

Parameter setting

For the parameter setting procedure of the FX5U CPU module, refer to ☞ Page 19 Parameter setting.

FB library registration

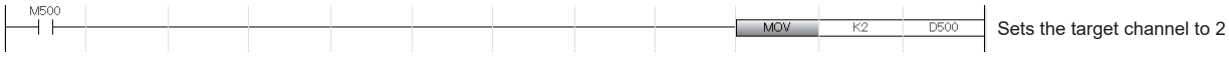
For the operating procedure to register the FB library to GX Works3, refer to 📖GX Works3 Operating Manual (10.4 Enhanced Use of Application Library/MELSOFT Library).

Enhanced use of FB library

For the operating procedure to use FBs and structures included in the registered FB library in the program, refer to 📖GX Works3 Operating Manual (10.3 Enhancing Use of User Library/Enhanced use of libraries/Utilizing an element).

Program contents

Target channel setting



Target axis setting



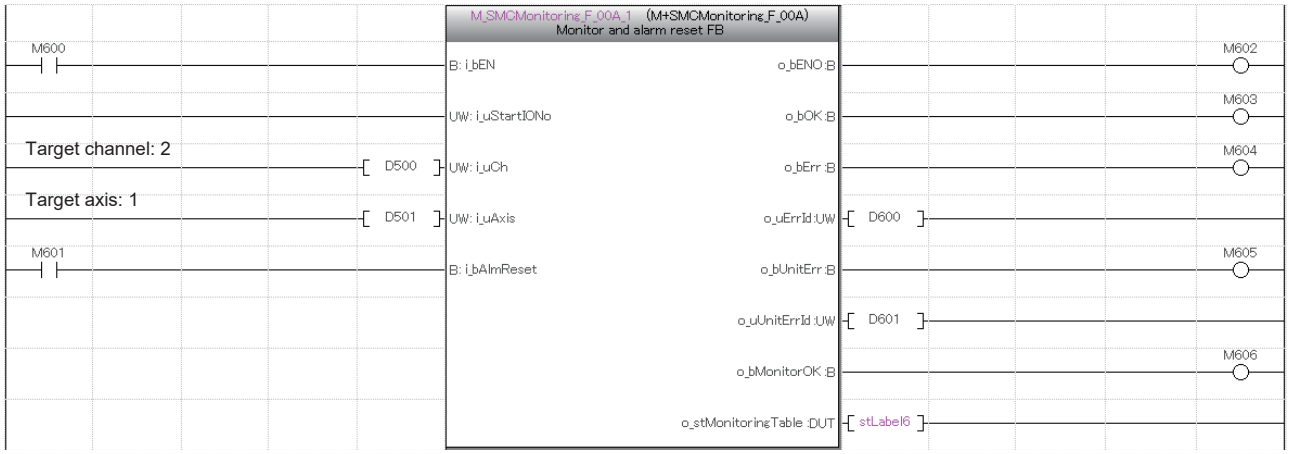
Step data No. setting



SMC controller monitoring

By turning on i_bEN (Execution command), the status of the SMC controller is monitored in M+SMCMonitoring_F (Operation monitoring).

When o_bMonitorOK (Monitoring status) is on, the monitoring table information of the SMC controller is stored in o_stMonitoringTable (Monitoring table).



For o_stMonitoringTable (Monitoring table), refer to ☞ Page 10 Structure list.

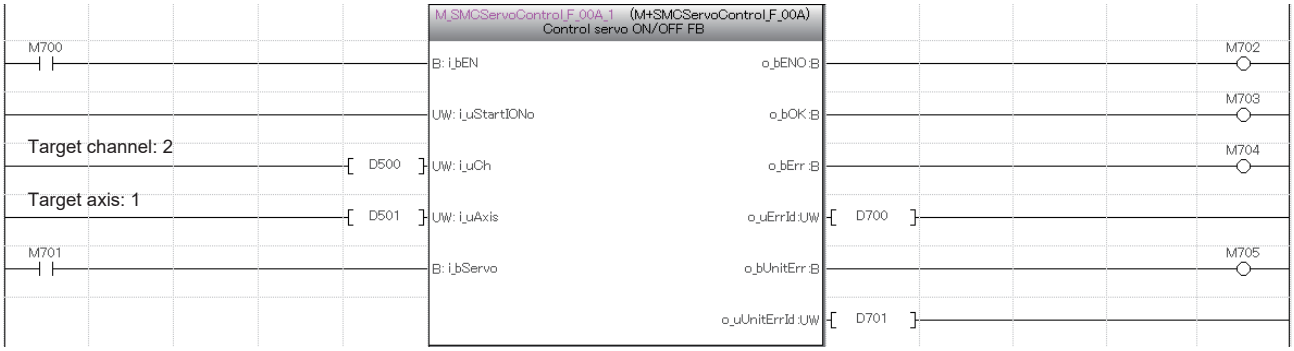
The following shows an example of storing the data in the local label stLabel6 of the structure type (stMonitoringTable) in the data register (D) by turning on M607.



Stores the current position in D602
Stores the current speed in D604
Stores the current thrust in D605
Stores the target position in D606
Stores the step data No. in D608
Stores alarm [0] in D609
Stores alarm [1] in D610
Stores alarm [2] in D611
Stores alarm [3] in D612
Stores alarm [4] in D613
Stores alarm [5] in D614
Stores alarm [6] in D615
Stores alarm [7] in D616
Stores the status flag in D617
Stores the status change flag [0] in D618
Stores the status change flag [1] in D619

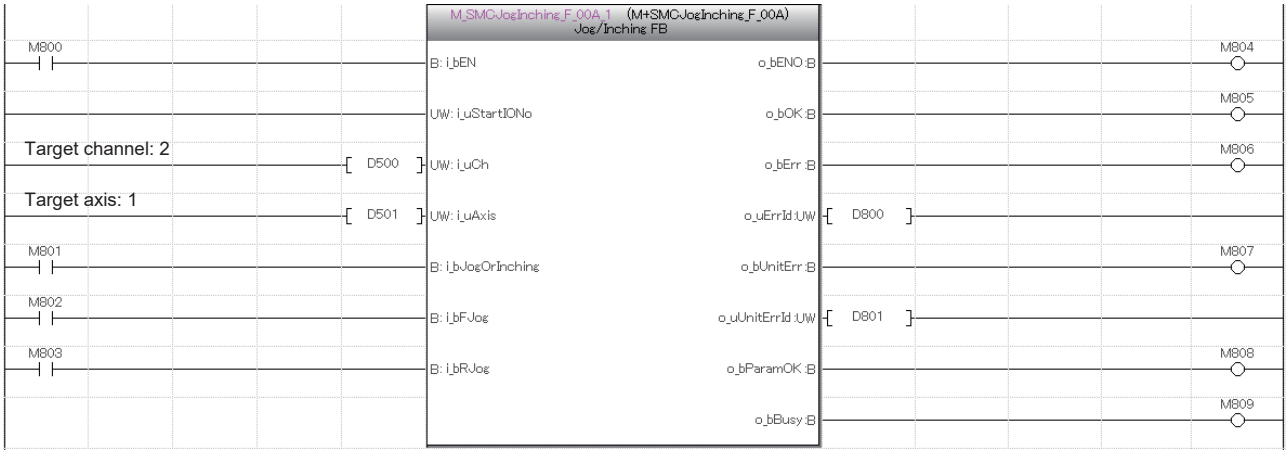
Servo ON

By turning on i_bEN (Execution command) after turning on i_bServo (Servo ON/OFF), the servo is turned on by M+SMCServoControl_F (Servo ON/OFF). When performing maintenance of the target axis, turn off the servo.



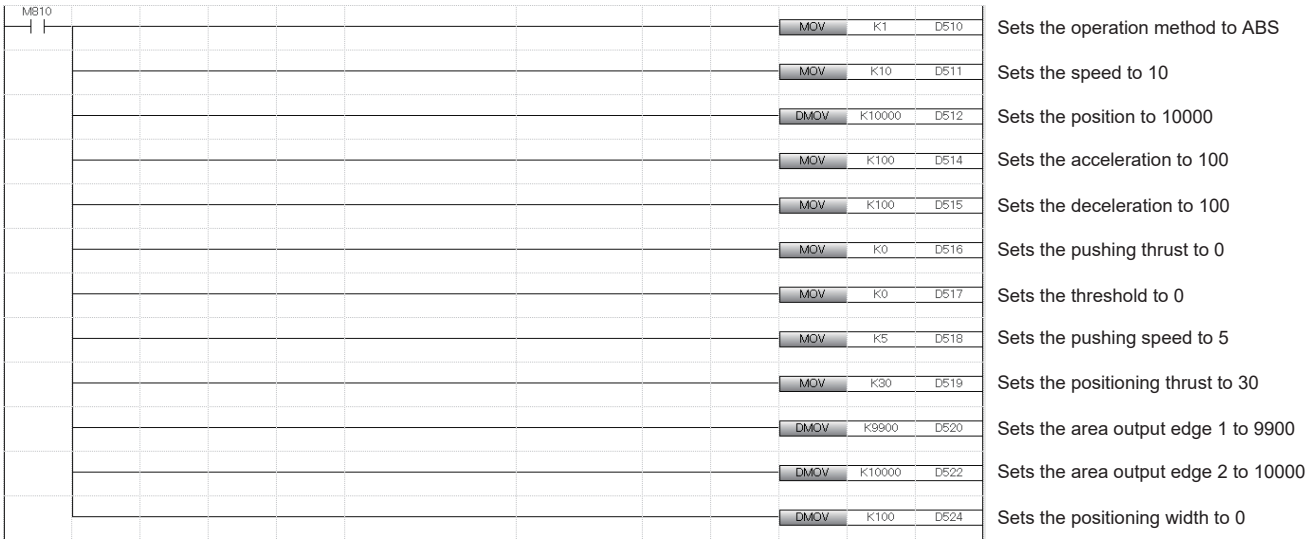
Performing the JOG operation

Turn on i_bEN (Execution command) and execute M+SMCJogInching_F (JOG/inching operation).
After o_bParamOK (Setting completion flag) is turned on, turn on i_bFJog (JOG+ command) or i_bRJog (JOG- command) to perform JOG operation.



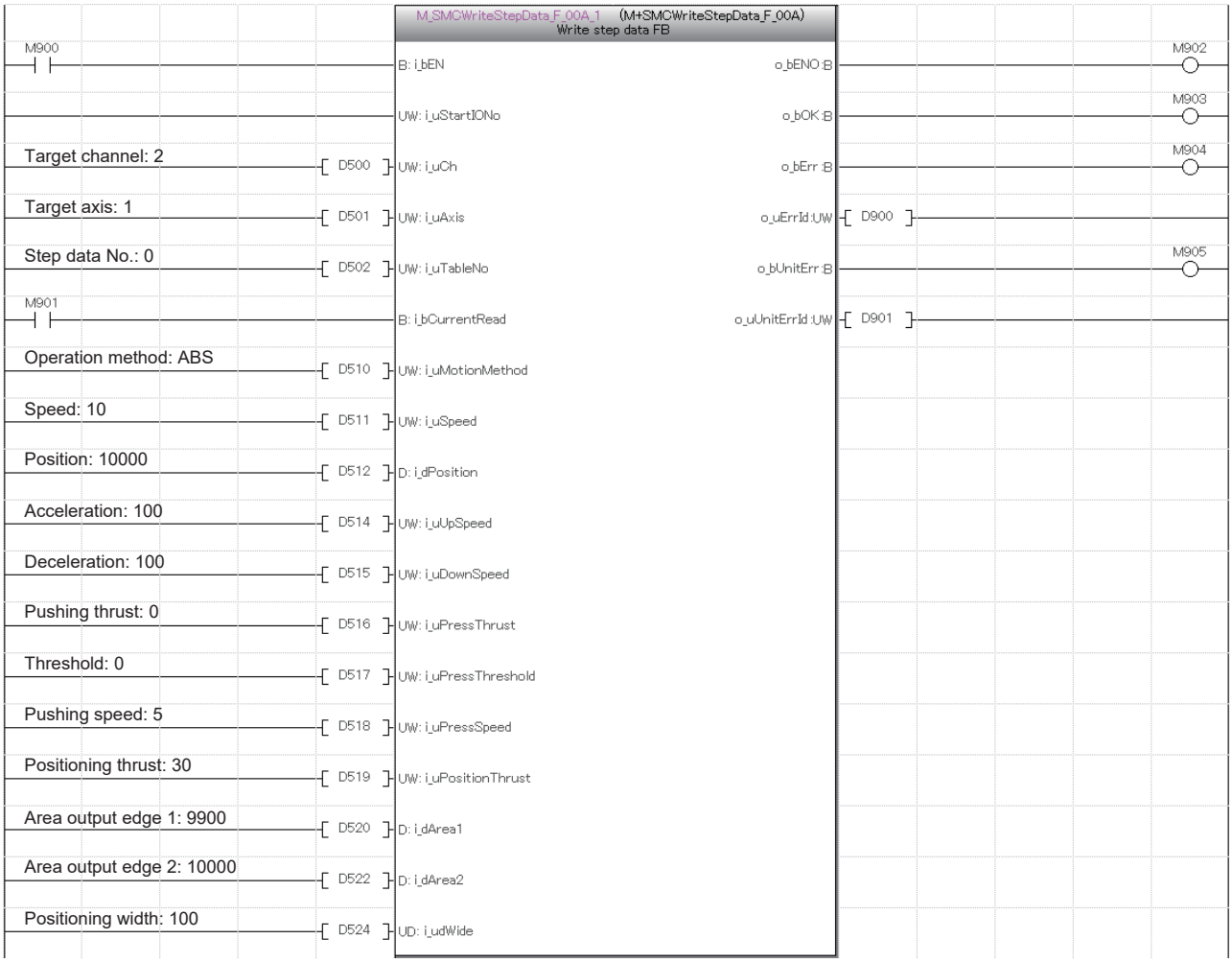
Step data (input label) setting

The following shows an example of setting the input label of M+SMCWriteStepData_F (Step data writing) by turning on M810.



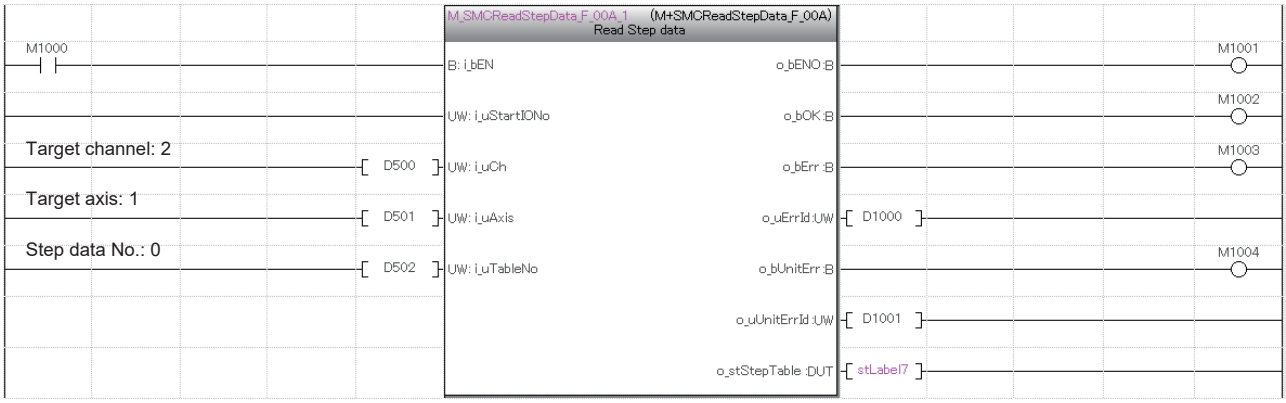
Current position reading

By turning on i_bEN (Execution command) after turning on i_bCurrentRead (Current position reading), the current position after the JOG operation is set to the step data position by M+SMCWriteStepData_F (Step data writing). Because i_bCurrentRead (Current position reading) is turned on, the value of i_dPosition (Position) is ignored.

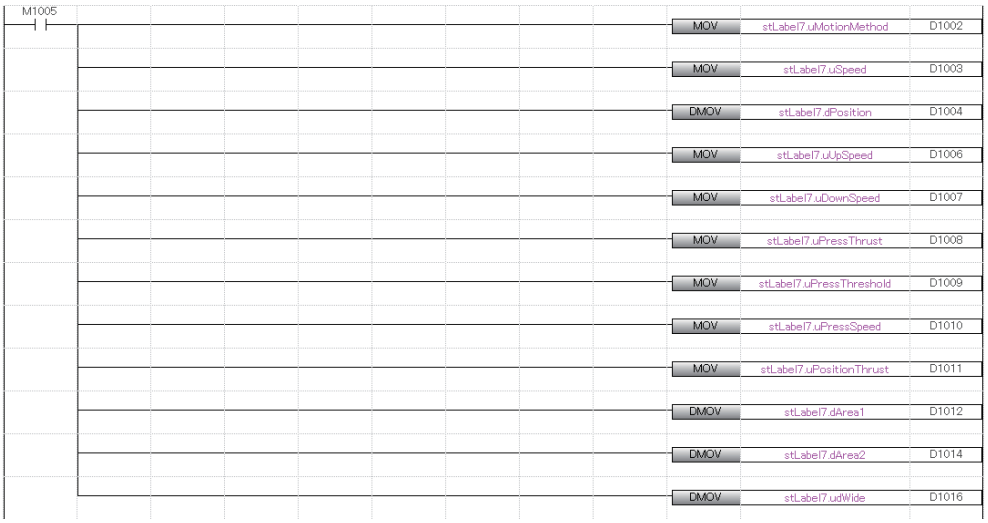


Step data reading

By turning on i_bEN (Execution command), the set step data position is read by M+SMCReadStepData_F (Step data reading). The read step data is stored in the local label stLabel7 of the structure type (stStepData).



The following shows an example of storing the data in the local label stLabel7 of the structure type (stStepData) in the data register (D) by turning on M1005.



Stores the operation method in D1002

Stores the speed in D1003

Stores the position in D1004

Stores the acceleration in D1006

Stores the deceleration in D1007

Stores the pushing thrust in D1008

Stores the threshold in D1009

Stores the pushing speed in D1010

Stores the positioning thrust in D1011

Stores the area output edge 1 in D1012

Stores the area output edge 2 in D1014

Stores the positioning width in D1016

APPENDIX

Appendix 1 Module Error Code

The following table lists the error codes to be stored in o_uUnitErrId (Module error code).

Error code	Name	Cause
01	Illegal function	An undefined function code was specified.
02	Outside the address range	• A number outside the range was specified for the reading or writing start number. • The test code is not 0000H in the echo back. • Data was attempted to be written to a write-protected number (address). • Data was attempted to be written to a parameter protected from writing in the parameter protect setting. • Data was attempted to be written to a parameter protected from writing in the operation mode (parallel/serial).
03	Outside the number of access points	• A value outside the range was specified for the reading or writing last number. • Data more than 256 bytes was attempted to be sent. • In Function 05 (Forced signal output), the data of the specified "terminal status" is other than FF00H(ON) or 0000H(OFF). • In Function 0F (Output signal batch writing), the specified "number of writing points" is larger than 256. • The specified size of reading or writing is 0.

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I

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REVISIONS

*The manual number is given on the bottom left of the back cover.

Revision date	*Manual number	Description
November 2020	SH(NA)-082354ENG-A	First edition
April 2022	SH(NA)-082354ENG-B	■Added or modified parts RELEVANT MANUALS, Section 1.3, Section 2.2, Section 2.6, Section 2.8, Chapter 3

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