OMRON

Sysmac Library

User's Manual
for MC Command Table Library
SYSMAC-XR002

SYSMAC
always in control

W545-E1-05

NOTE

Trademarks

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Introduction

Thank you for purchasing an NJ/NX-series CPU Unit or an NY-series Industrial PC.

This manual provides information required to use the function blocks in the MC Command Table Library. (“Function block” is sometimes abbreviated as “FB.”) Please read this manual and make sure you understand the functionality and performance of the NJ/NX-series CPU Unit before you attempt to use it in a control system.

This manual contains the specifications of the Function Block. It does not include restrictions on use of the Controller, Units, or components, or restrictions due to combinations. Make sure to read the user's manual for each product before use.

Keep this manual in a safe place where it will be available for reference during operation.

Features of the Library

The MC Command Table Library is used to continuously perform positioning that the MC Function Module is used. You can use this library together with motion control instructions of the NJ/NX/NY-series Controller.

The program that multiple motion control instructions are used will be unnecessary by using this library.

Refer to the motion control instructions reference manual for details on motion control instructions of the NJ/NX/NY-series Controller.

Intended Audience

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

- Personnel in charge of introducing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of installing and maintaining FA systems.
- Personnel in charge of managing FA systems and facilities.

For programming, this manual is intended for personnel who understand the programming language specifications in international standard IEC 61131-3 or Japanese standard JIS B 3503.

Applicable Products

For the model numbers and versions of an NJ/NX-series CPU Unit, NY-series Industrial PC, and the Sysmac Studio that this library supports, refer to Sysmac Library Version Information in the *SYSMAC-XR□□□ Sysmac Library Catalog* (Cat. No. P102). This catalog can be downloaded from the OMRON website (http://www.ia.omron.com/products/family/3459/download/catalog.html).

Manual Structure

Special Information

Special information in this manual is classified as follows:

Precautions for Safe Use

Precautions on what to do and what not to do to ensure safe usage of the product.

Precautions for Correct Use

Precautions on what to do and what not to do to ensure proper operation and performance.

Additional Information

Additional information to read as required.
This information is provided to increase understanding or make operation easier.

Version Information

Information on differences in specifications and functionality for CPU Units and Industrial PCs with different unit versions and for different versions of the Sysmac Studio are given.

Note References are provided to more detailed or related information.

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Terms and Conditions Agreement

Warranty, Limitations of Liability

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Safety Precautions

Definition of Precautionary Information

The following notation is used in this user's manual to provide precautions required to ensure safe usage of an NJ/NX-series CPU Unit and an NY-series Industrial PC.

The safety precautions that are provided are extremely important to safety. Always read and heed the information provided in all safety precautions.

The following notation is used.

⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Additionally, there may be severe property damage.
⚠ Caution	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

Symbols

	The circle and slash symbol indicates operations that you must not do. The specific operation is shown in the circle and explained in text. This example indicates prohibiting disassembly.
	The triangle symbol indicates precautions (including warnings). The specific operation is shown in the triangle and explained in text. This example indicates a precaution for electric shock.
	The triangle symbol indicates precautions (including warnings). The specific operation is shown in the triangle and explained in text. This example indicates a general precaution.
	The filled circle symbol indicates operations that you must do. The specific operation is shown in the circle and explained in text. This example shows a general precaution for something that you must do.

Cautions

⚠ Caution

Read all related manuals carefully before you use this library.	
Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits.	
Check the user program, data, and parameter settings for proper execution before you use them for actual operation.	

Precautions for Correct Use

Using the Library

- When you use the library, functions or function blocks that are not described in the library manual may be displayed on the Sysmac Studio. Do not use functions or function blocks that are not described in the manual.

Using Sample Programming

- The sample programming shows only the portion of a program that uses the function or function block from the library.
- When using actual devices, also program safety circuits, device interlocks, I/O with other devices, and other control procedures.
- Create a user program that will produce the intended device operation.
- Check the user program for proper execution before you use it for actual operation.

Operation

- When you use the NX-series CPU Unit, use the *_MC_AX[0..63]* (Axis Variable) system-defined variable. If you use the axis variables *_MC_AX1* and *_MC_AX2*, unintended operation may occur for the system.
- When you use the NX-series CPU Unit, do not use this function block for other than the specified tasks. Unintended operation may occur for the system.
- When you perform memory operation, make sure that servo is ON at all times. When you set the servo to OFF during memory operation, set *Enable* to FALSE in the function block. If you do not set *Enable* to FALSE in the function block, unintended operation may occur.
- When you stop memory operation and then restart it again, retain *CurrentSeqNo* (Executing Sequence Number) in order to start from the sequence number at which memory operation was stopped.
- During memory operation, do not perform the multi-execution of instructions regarding the axis/axes group used for memory operation.
- If you execute the MC_Stop or MC_GroupStop instruction during M Code output, the axis/axes group will start motion again after M Code reset. For a deceleration stop during memory operation, set *Stop* (Stop Execution) to TRUE in the function block, and do not use the MC_Stop or MC_GroupStop instruction.
- If you perform an immediate stop for memory operation, execute the MC_ImmediateStop instruction for all axes being used in memory operation. During a single-axis discrete motion, the axis will not stop even if you execute the MC_GroupImmediateStop instruction.

Related Manuals

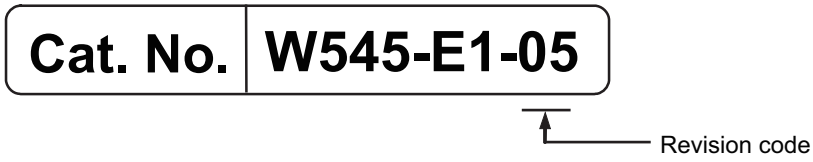
The following are the manuals related to this manual. Use these manuals for reference.

Manual name	Cat. No.	Model numbers	Application	Description
NX-series CPU Unit Hardware User's Manual	W535	NX701-□□□□	Learning the basic specifications of the NX-series NX701 CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided	An introduction to the entire NX701 CPU Unit system is provided along with the following information on the CPU Unit. Features and system configuration Overview Part names and functions General specifications Installation and wiring Maintenance and inspection
NX-series NX102 CPU Unit Hardware User's Manual	W593	NX102-□□□□	Learning the basic specifications of the NX102 CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided.	An introduction to the entire NX102 system is provided along with the following information on the CPU Unit. Features and system configuration Introduction Part names and functions General specifications Installation and wiring Maintenance and Inspection
NX-series NX1P2 CPU Unit Hardware User's Manual	W578	NX1P2-□□□□	Learning the basic specifications of the NX-series NX1P2 CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided	An introduction to the entire NX1P2 CPU Unit system is provided along with the following information on the CPU Unit. Features and system configuration Overview Part names and functions General specifications Installation and wiring Maintenance and Inspection
NJ-series CPU Unit Hardware User's Manual	W500	NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning the basic specifications of the NJ-series CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided	An introduction to the entire NJ-series system is provided along with the following information on the CPU Unit. Features and system configuration Overview Part names and functions General specifications Installation and wiring Maintenance and inspection
NY-series IPC Machine Controller Industrial Panel PC Hardware User's Manual	W557	NY532-□□□□	Learning the basic specifications of the NY-series Industrial Panel PCs, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided	An introduction to the entire NY-series system is provided along with the following information on the Industrial Panel PC. Features and system configuration Introduction Part names and functions General specifications Installation and wiring Maintenance and inspection

Manual name	Cat. No.	Model numbers	Application	Description
NY-series IPC Machine Controller Industrial Box PC Hardware User's Manual	W556	NY512-□□□□	Learning the basic specifications of the NY-series Industrial Box PCs, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided	An introduction to the entire NY-series system is provided along with the following information on the Industrial Box PC. Features and system configuration Introduction Part names and functions General specifications Installation and wiring Maintenance and inspection
NJ/NX-series CPU Unit Software User's Manual	W501	NX701-□□□□ NX102-□□□□ NX1P2-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning how to program and set up an NJ/NX-series CPU Unit. Mainly software information is provided	The following information is provided on a Controller built with an NJ/NX-series CPU Unit. CPU Unit operation CPU Unit features Initial settings Programming based on IEC 61131-3 language specifications
NY-series IPC Machine Controller Industrial Panel PC / Industrial Box PC Software User's Manual	W558	NY532-□□□□ NY512-□□□□	Learning how to program and set up the Controller functions of an NY-series Industrial PC	The following information is provided on NY-series Machine Automation Control Software. Controller operation Controller features Controller settings Programming based on IEC 61131-3 language specifications
NJ/NX-series Instructions Reference Manual	W502	NX701-□□□□ NX102-□□□□ NX1P2-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning detailed specifications on the basic instructions of an NJ/NX-series CPU Unit	The instructions in the instruction set (IEC 61131-3 specifications) are described.
NY-series Instructions Reference Manual	W560	NY532-□□□□ NY512-□□□□	Learning detailed specifications on the basic instructions of an NY-series Industrial PC	The instructions in the instruction set (IEC 61131-3 specifications) are described.
NJ/NX-series CPU Unit Motion Control User's Manual	W507	NX701-□□□□ NX102-□□□□ NX1P2-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning about motion control settings and programming concepts of an NJ/NX-series CPU Unit.	The settings and operation of the CPU Unit and programming concepts for motion control are described.
NY-series IPC Machine Controller Industrial Panel PC / Industrial Box PC Motion Control User's Manual	W559	NY532-□□□□ NY512-□□□□	Learning about motion control settings and programming concepts of an NY-series Industrial PC.	The settings and operation of the Controller and programming concepts for motion control are described.
NJ/NX-series Motion Control Instructions Reference Manual	W508	NX701-□□□□ NX102-□□□□ NX1P2-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	Learning about the specifications of the motion control instructions of an NJ/NX-series CPU Unit.	The motion control instructions are described.
NY-series Motion Control Instructions Reference Manual	W561	NY532-□□□□ NY512-□□□□	Learning about the specifications of the motion control instructions of an NY-series Industrial PC.	The motion control instructions are described.
Sysmac Studio Version 1 Operation Manual	W504	SYSMAC -SE2□□□	Learning about the operating procedures and functions of the Sysmac Studio.	Describes the operating procedures of the Sysmac Studio.

Revision History

A manual revision code appears as a suffix to the catalog number on the front and back covers of the manual.



Revision code	Date	Revised content
01	April 2015	Original production
02	December 2015	Made changes of structure of the manual.
03	July 2016	Changed the manual name.
04	November 2016	Changed the manual name.
05	January 2019	Added compatible models.

Procedure to Use Sysmac Libraries

Procedure to Use Sysmac Libraries Installed Using the Installer

This section describes the procedure to use Sysmac Libraries that you installed using the installer.

There are two ways to use libraries.

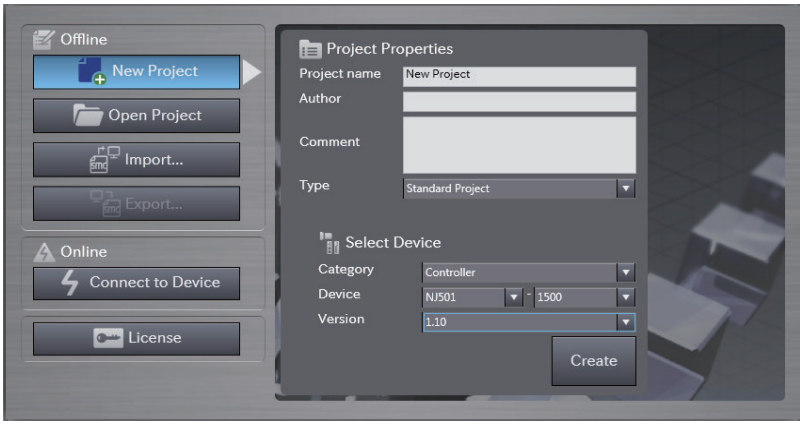
- Using newly installed Sysmac Libraries
- Using upgraded Sysmac Libraries

Version Information

To use Sysmac Libraries, you need the Sysmac Studio version 1.14 or higher.

Using Newly Installed Libraries

1 Start the Sysmac Studio and open or create a new project in which you want to use Sysmac Libraries.

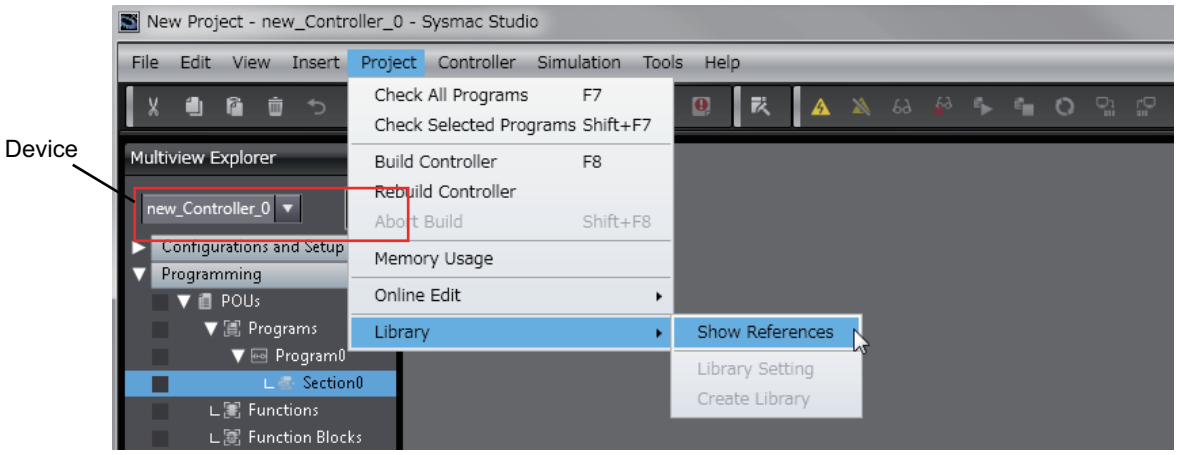


Precautions for Correct Use

If you create a new project, be sure to configure the settings as follows to enable the use of Sysmac Libraries. If you do not configure the following settings, you cannot proceed to the step 2 and later steps.

- Set the project type to Standard Project or Library Project.
- Set the device category to Controller.
- Set the device version to 1.01 or later.

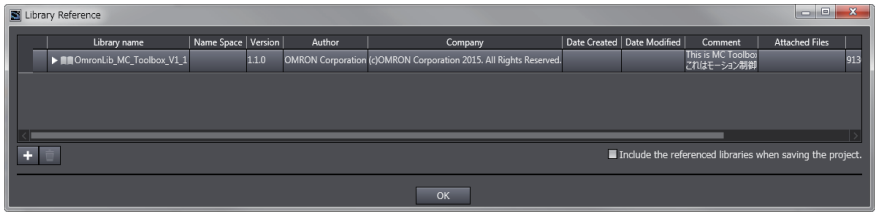
2 Select **Project** – **Library** – **Show References**.



Precautions for Correct Use

If you have more than one registered device in the project, make sure that the device selected currently is an NJ/NX-series CPU Unit or an NY-series Industrial PC. If you do not select an NJ/NX-series CPU Unit or an NY-series Industrial PC as the device, Library References does not appear in the above menu. When the device selected currently is an NJ/NX-series CPU Unit or an NY-series Industrial PC, the device icon is displayed in the Multiview Explorer.

3 Add the desired Sysmac Library to the list and click the **OK** Button.



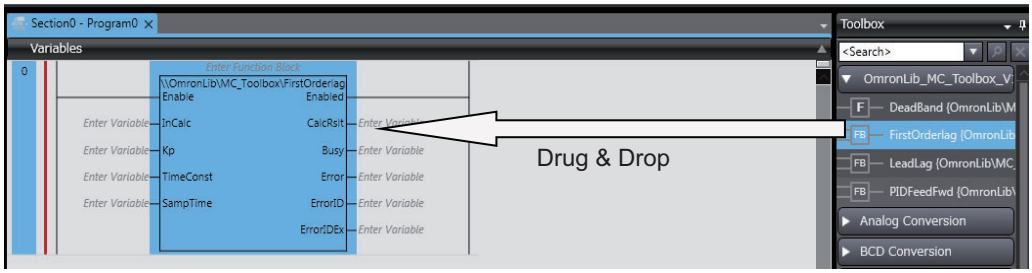
The Sysmac Library file is read into the project.

Now, when you select the Ladder Editor or ST Editor, the function blocks and functions included in a Sysmac Library appear in the Toolbox.

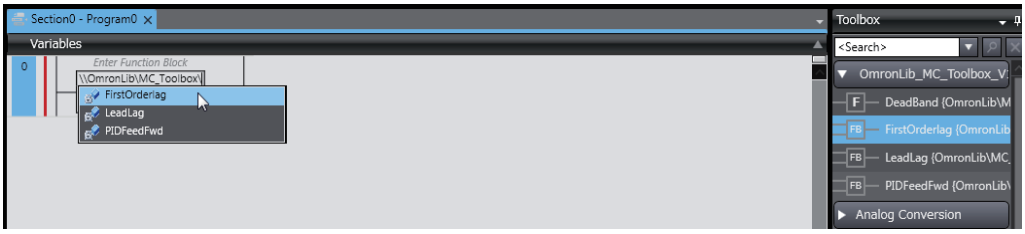
For the procedure for adding and setting libraries in the above screen, refer to the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504).

4 Insert the Sysmac Library's function blocks and functions into the circuit using one of the following two methods.

- Select the desired function block or function in the Toolbox and drag and drop it onto the programming editor.



- Right-click the programming editor, select **Insert Function Block** in the menu, and enter the fully qualified name (\\name of namespace\name of function block).



Precautions for Correct Use

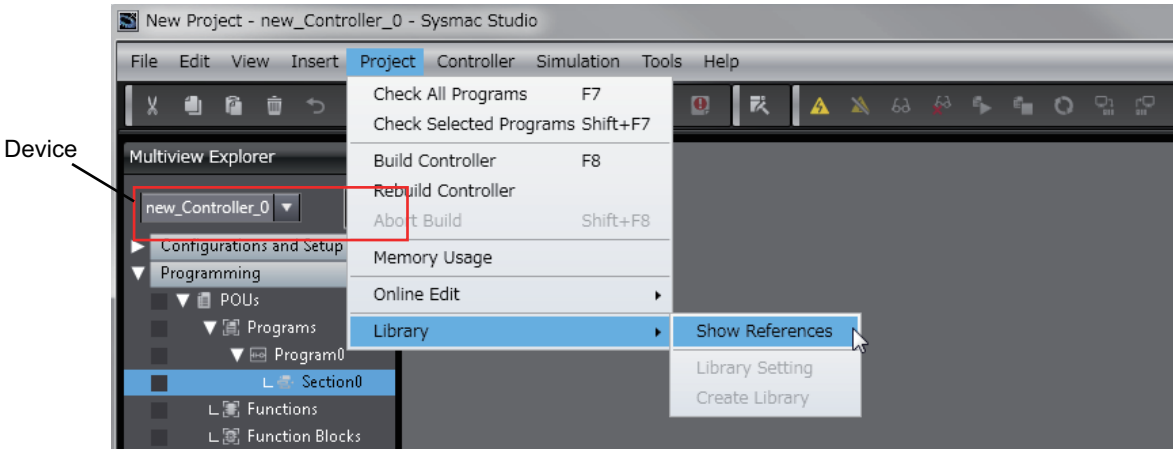
After you upgrade the Sysmac Studio, check all programs and make sure that there is no error of the program check results on the Build Tab Page.

Select **Project** – **Check All Programs** from the Main Menu.

Using Upgraded Libraries

1 Start the Sysmac Studio and open a project in which any old-version Sysmac Library is included.

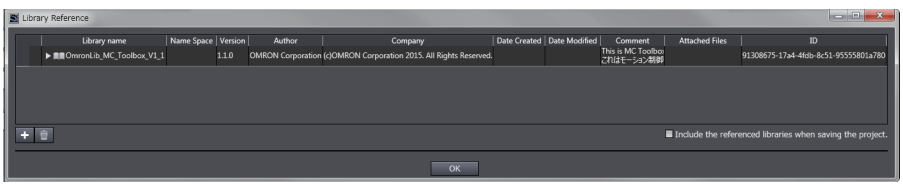
2 Select **Project** – **Library** – **Show References**.



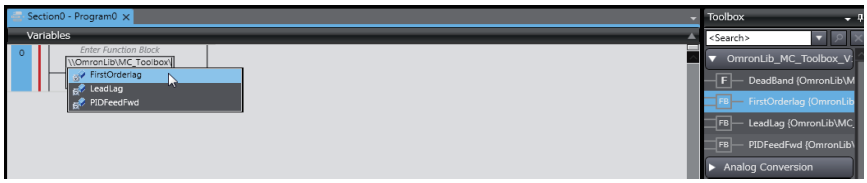
Precautions for Correct Use

If you have more than one registered device in the project, make sure that the device selected currently is an NJ/NX-series CPU Unit or an NY-series Industrial PC. Otherwise, Library References does not appear in the above menu. When the device selected currently is an NJ/NX-series CPU Unit or an NY-series Industrial PC, the device icon is displayed in the Multiview Explorer.

3 Select an old-version Sysmac Library and click the **Delete Reference** Button.



4 Add the desired Sysmac Library to the list and click the **OK** Button.



Procedure to Use Sysmac Libraries Uploaded from a CPU Unit or an Industrial PC

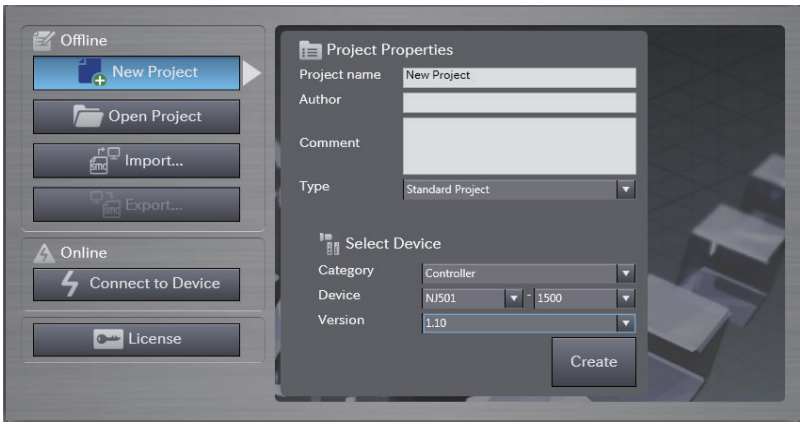
You can use Sysmac Libraries uploaded from a CPU Unit or an Industrial PC to your computer if they are not installed.

The procedure to use uploaded Sysmac Libraries from a CPU Unit or an Industrial PC is as follows.

Version Information

To use Sysmac Libraries, you need the Sysmac Studio version 1.14 or higher.

1 Start the Sysmac Studio and create a new project in which you want to use Sysmac Libraries.



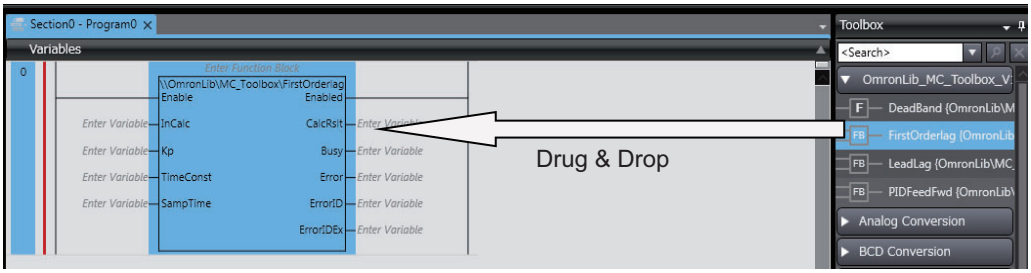
2 Connect the computer to the CPU Unit or the Industrial PC and place it online.

3 Upload POUs in which any Sysmac Library is used to the computer.

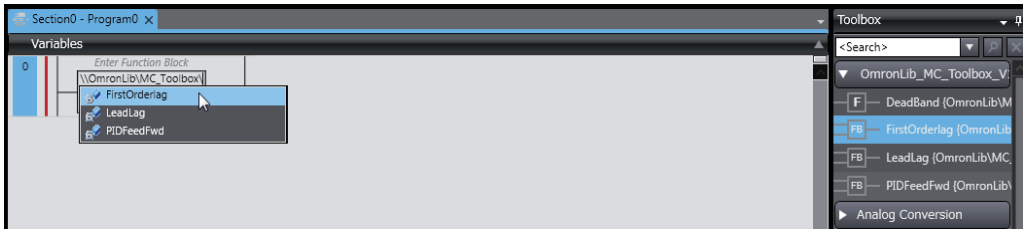
Now, when you select the Ladder Editor or ST Editor, the function blocks and functions included in the Sysmac Library used in the uploaded POUs appear in the Toolbox.

4 Insert the Sysmac Library's function blocks and functions into the circuit using one of the following two methods.

- Select the desired function block or function in the Toolbox and drag and drop it onto the Ladder Editor.



- Right-click the programming editor, select **Insert Function Block** in the menu, and enter the fully qualified name (\\name of namespace\name of function block).



Precautions for Correct Use

- The Sysmac Studio installs library files of the uploaded Sysmac Stutio to the specified folder on the computer if they are not present. However, the Sysmac Studio does not install library files to the specified folder on the computer if they are present.

  The specified folder here means the folder in which library files are installed by the installer.
- Note that uploading Sysmac Libraries from a CPU Unit or an Industrial PC does not install the manual and help files for the Sysmac Libraries, unlike the case where you install then using the installer. Please install the manual and help files using the installer if you need them.

Common Specifications of Function Blocks

Common Variables

This section describes the specifications of variables (*EN*, *Execute*, *Enable*, *Abort*, *ENO*, *Done*, *CalcRslt*, *Enabled*, *Busy*, *CommandAborted*, *Error*, *ErrorID*, and *ErrorIDEx*) that are used for more than one function or function block. The specifications are described separately for functions, for execute-type function blocks, and for enable-type function blocks.

Definition of Input Variables and Output Variables

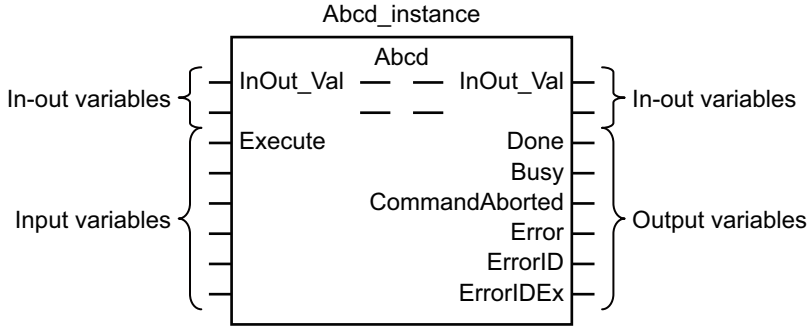
Common input variables and output variables used in functions and function blocks are as follows.

Variable	I/O	Data type	Function/function block type to use			Meaning	Definition
			Function block		Function		
			Execute-type	Enable-type			
EN	Input	BOOL			OK	Execute	The processing is executed while the variable is TRUE.
Execute			OK			Execute	The processing is executed when the variable changes to TRUE.
Enable				OK		Run	The processing is executed while the variable is TRUE.
Abort		BOOL	OK			Abort	The processing is aborted. You can select the aborting method.

Variable	I/O	Data type	Function/function block type to use			Meaning	Definition
			Function block		Function		
			Execute-type	Enable-type			
ENO	Output	BOOL			OK	Done	The variable changes to TRUE when the processing ends normally. It is FALSE when the processing ends in an error, the processing is in progress, or the execution condition is not met.
Done		BOOL	OK			Done	The variable changes to TRUE when the processing ends normally. It is FALSE when the processing ends in an error, the processing is in progress, or the execution condition is not met.
Busy		BOOL	OK	OK		Executing	The variable is TRUE when the processing is in progress. It is FALSE when the processing is not in progress.
CalcRslt		LREAL		OK		Calculation Result	The calculation result is output.
Enabled		BOOL		OK		Enabled	The variable is TRUE when the output is enabled. It is used to calculate the control amount for motion control, temperature control, etc.
Command Aborted		BOOL	OK			Command Aborted	The variable changes to TRUE when the processing is aborted. It changes to FALSE when the processing is re-executed the next time.
Error		BOOL	OK	OK		Error	This variable is TRUE while there is an error. It is FALSE when the processing ends normally, the processing is in progress, or the execution condition is not met.
ErrorID		WORD	OK	OK		Error Code	An error code is output.
ErrorIDEx		DWORD	OK	OK		Expansion Error Code	An expansion error code is output.

Execute-type Function Blocks

- Processing starts when *Execute* changes to TRUE.
- When *Execute* changes to TRUE, *Busy* also changes to TRUE. When processing is completed normally, *Busy* changes to FALSE and *Done* changes to TRUE.
- When continously executes the function blocks of the same instance, change the next *Execute* to TRUE for at least one task period after *Done* changes to FALSE in the previous execution.
- If the function block has a *CommandAborted* (Instruction Aborted) output variable and processing is aborted, *CommandAborted* changes to TRUE and *Busy* changes to FALSE.
- If an error occurs in the function block, *Error* changes to TRUE and *Busy* changes to FALSE.
- For function blocks that output the result of calculation for motion control and temperature control, you can use the BOOL input variable *Abort* to abort the processing of a function block. When *Abort* changes to TRUE, *CommandAborted* changes to TRUE and the execution of the function block is aborted.

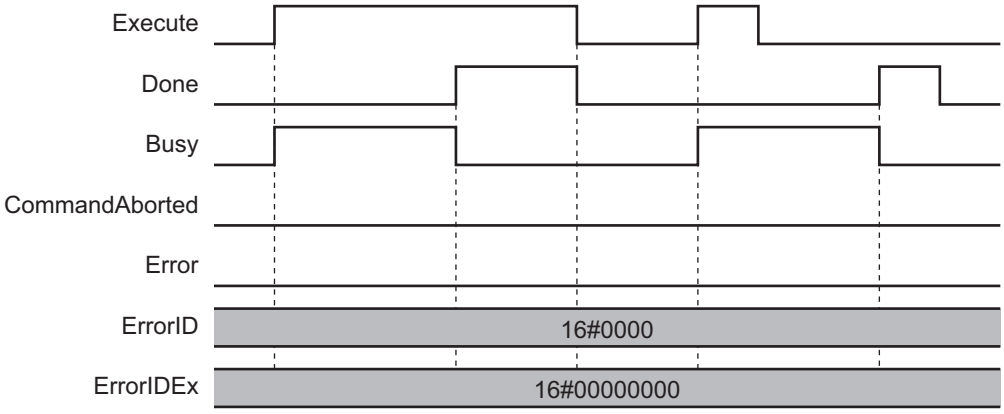


- If *Execute* is TRUE and *Done*, *CommandAborted*, or *Error* changes to TRUE, *Done*, *Command-Aborted*, and *Error* changes to FALSE when *Execute* is changed to FALSE.
- If *Execute* is FALSE and *Done*, *CommandAborted*, or *Error* changes to TRUE, *Done*,*Command-Aborted*, and *Error* changes to TRUE for only one task period.
- If an error occurs, the relevant error code and expansion error code are set in *ErrorID* (Error Code) and *ErrorIDEx* (Expansion Error Code). The error codes are retained even after *Error* changes to FALSE, but *ErrorID* is set to 16#0000 and *ErrorIDEx* is set to 16#0000 0000 when *Execute* changes to TRUE.

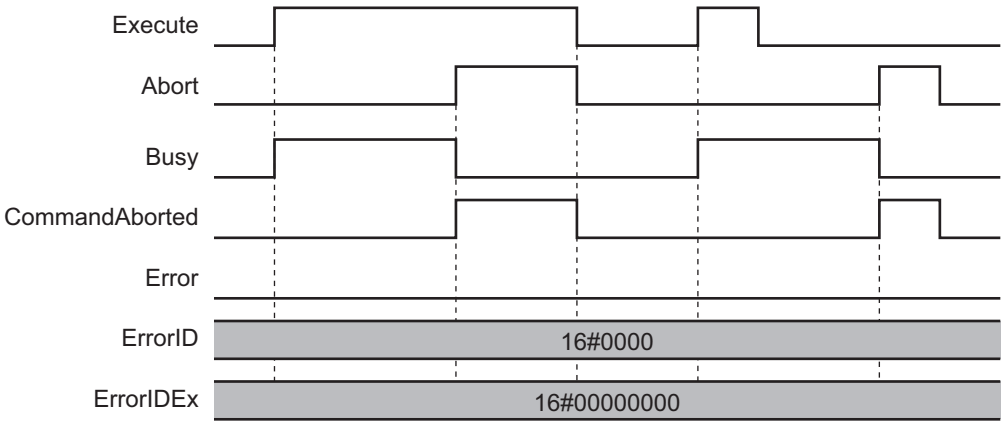
Timing Charts

This section provides timing charts for a normal end, aborted execution, and errors.

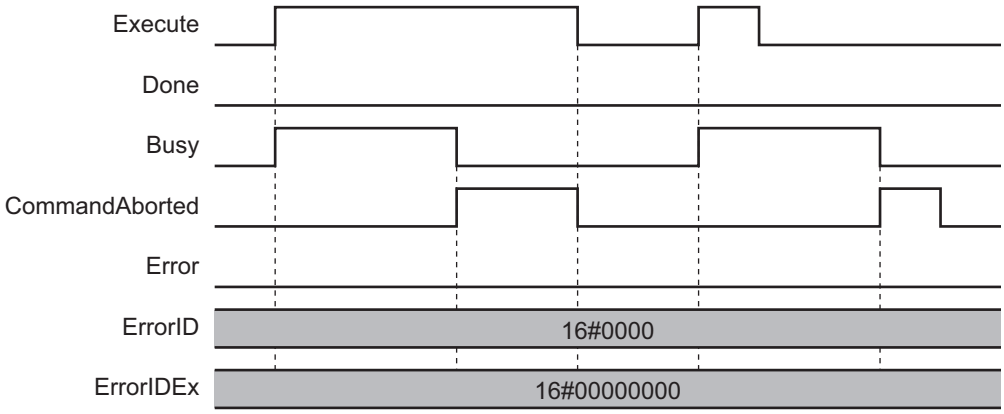
● Normal End



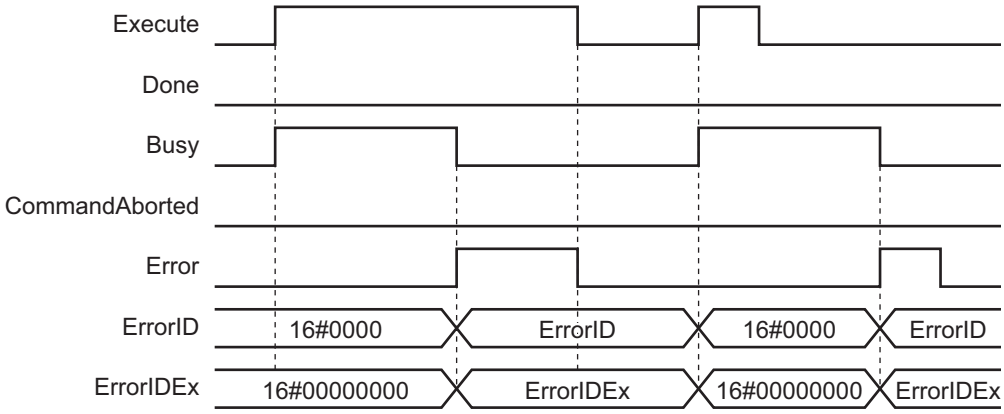
● Canceled Execution



Aborted Execution

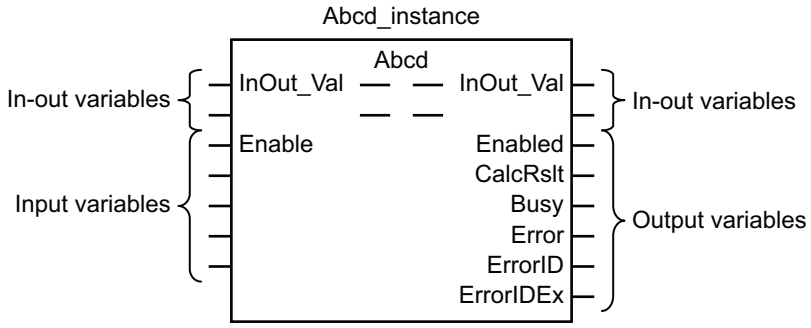


Errors



Enable-type Function Blocks

- Processing is executed while *Enable* is TRUE.
- When *Enable* changes to TRUE, *Busy* also changes to TRUE. *Enabled* is TRUE during calculation of the output value.
- If an error occurs in the function block, *Error* changes to TRUE and *Busy* and *Enabled* change to FALSE. When *Enable* changes to FALSE, *Enabled*, *Busy*, and *Error* change to FALSE.

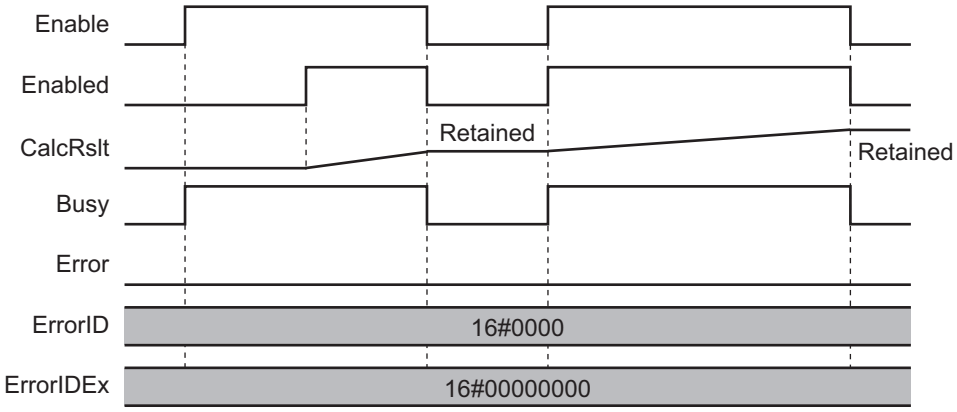


- If an error occurs, the relevant error code and expansion error code are set in *ErrorID* (Error Code) and *ErrorIDEx* (Expansion Error Code). The error codes are retained even after *Error* changes to FALSE, but *ErrorID* is set to 16#0000 and *ErrorIDEx* is set to 16#0000 0000 when *Enable* changes to TRUE.
- For function blocks that calculate the control amount for motion control, temperature control, etc., *Enabled* is FALSE when the value of *CalcRslt* (Calculation Result) is incorrect. In such a case, do not use *CalcRslt*. In addition, after the function block ends normally or after an error occurs, the value of *CalcRslt* is retained until *Enable* changes to TRUE. The control amount will be calculated based on the retained *CalcRslt* value, if it is the same instance of the function block that changed *Enable* to TRUE. If it is a different instance of the function block, the control amount will be calculated based on the initial value.

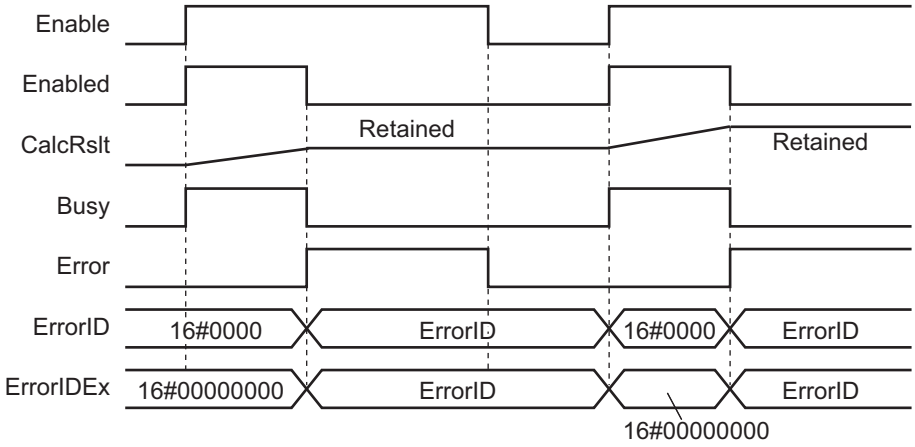
Timing Charts

This section provides timing charts for a normal end and errors.

● Normal End



Errors


Enable
Enabled
CalcRslt
Busy
Error
ErrorID
ErrorIDEx
Retained
Retained
16#0000
ErrorID
16#0000
ErrorID
16#00000000
ErrorID
ErrorID
16#00000000

Precautions

This section provides precautions for the use of this function block.

Nesting

You can nest calls to this function block for up to four levels.

For details on nesting, refer to the software user's manual.

Instruction Options

You cannot use the upward differentiation option for this function block.

Re-execution of Function Blocks

Execute-type function blocks cannot be re-executed by the same instance.

If you do so, the output value will be the initial value.

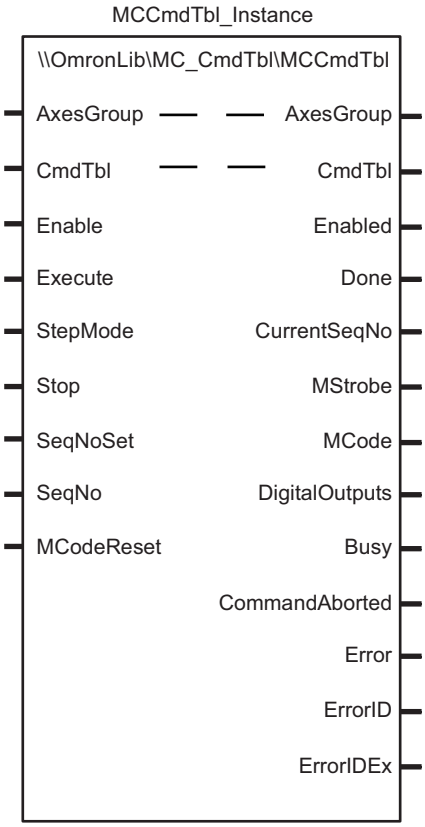
For details on re-execution, refer to the motion control user's manual.

Individual Specifications of Function Blocks

Function block name	Name	Page
MCCmdTbl	Memory Operation	P.32

MCCmdTbl

This is a function block to continuously execute positioning that is specified in memory operation data for axes groups that are defined in the MC Function Module.

Function Block Name	Name	Function block/FUN	Graphic expression	ST expression
MCCmdTbl	Memory Operation	Function block		MCCmdTbl_Instance(AxesGroup:=*parameter*, CmdTbl:=*parameter*, Enable:=*parameter*, Execute:=*parameter*, StepMode:=*parameter*, Stop:=*parameter*, SeqNoSet:=*parameter*, SeqNo:=*parameter*, MCodeReset:=*parameter*, Enabled=>*parameter*, Done=>*parameter*, CurrentSeqNo=>*parameter*, MStrobe=>*parameter*, MCode=>*parameter,* DigitalOutputs=>*parameter*, Busy=>*parameter*, CommandAborted=>*parameter*, Error=>*parameter*, ErrorID=>*parameter*, ErrorIDEx=>*parameter*);

Function Block and Function Information

Item	Description
Library file name	OmronLib_MC_CmdTbl_V1_1.slr
Namespace	OmronLib\MC_CmdTbl
Function block and function number	00002
Source code published/not published	Not published
Function block and function version	1.01
Applicable tasks	Primary periodic task and priority-16 periodic tasks Does not support the priority-5 periodic task for the NX-series CPU Unit.

Compatible Models

Item	Name	Model numbers	Version
Device	OMRON G5-series AC Servomotors/Servo Drives with built-in EtherCAT Communications	R88D-KN□□-ECT	Ver.2.1

Precautions for Correct Use

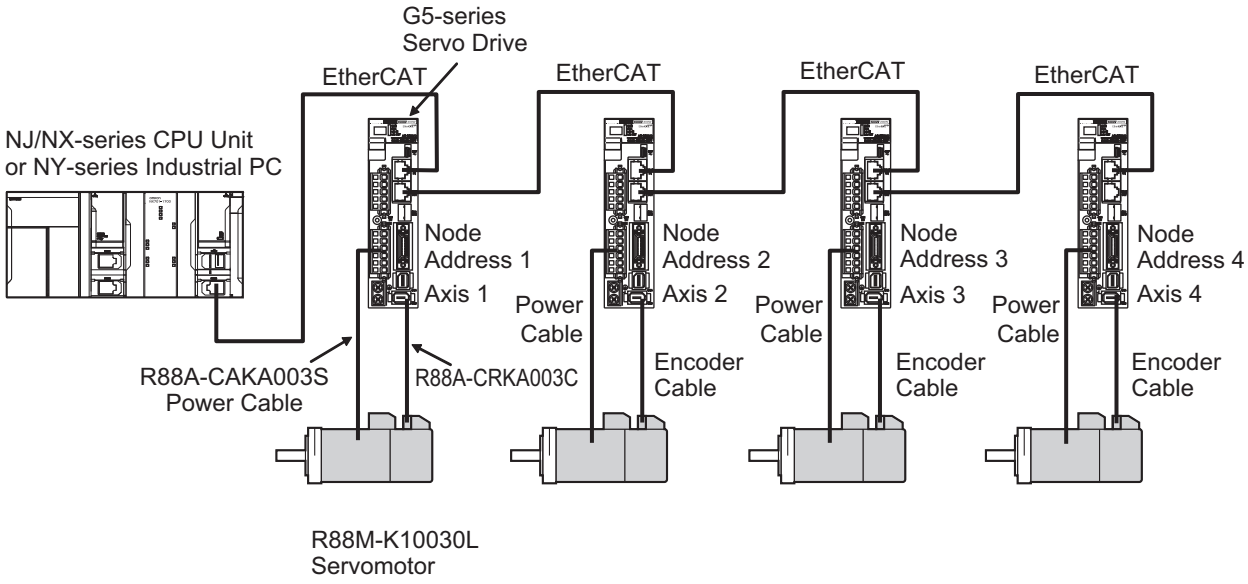
- When you use this function block with NJ101-10□□, you can use a maximum of two real servo axes.
- You cannot use this function block with NJ101-90□□.

Hardware Configuration Diagram

This function block performs positioning for a maximum of 4 axes.

You can specify the operating axes with sequence data.

A configuration example when connecting 4 axes with the OMRON G5-series AC Servomotors/Servo Drives with built-in EtherCAT Communications is given below.



Variables

Input Variables

Name	Meaning	Data type	Valid range	Default	Description
Enable	Memory Operation Enable	BOOL	TRUE or FALSE	FALSE	The memory operation function block is enabled when *Enable* is TRUE. The memory operation function block processing stops and a deceleration stop is performed for all axes when *Enable* is FALSE.
Execute	Execute	BOOL	TRUE or FALSE	FALSE	Positioning starts according to sequence numbers. Positioning restarts according to sequence numbers while *Enable* is TRUE.
StepMode	Operation Mode	BOOL	TRUE or FALSE	FALSE	Selects the operation mode. TRUE: Manual operation (sequence data executed one by one) FALSE: Automatic operation (sequence data executed consecutively)
Stop	Stop Execution	BOOL	TRUE or FALSE	FALSE	Executes operation stop. The axis decelerates to a stop and the sequence number being executed is retained.
SeqNoSet	Sequence Number Set	BOOL	TRUE or FALSE	FALSE	Starts operation from the sequence number specified to the Sequence Number (*SeqNo*).
SeqNo	Sequence Number	UINT	0 to 599	0	Specify sequence number to be set. Uses the value when *SeqNoSet* changes to TRUE.
MCodeReset	M Code Reset	BOOL	TRUE or FALSE	FALSE	Executes M Code reset.

Output Variables

Name	Meaning	Data type	Valid range	Default	Description
Enabled	Memory Operation Enabled	BOOL	TRUE or FALSE	---	*Enabled* is TRUE while *Enable* is TRUE.
Done	Done	BOOL	TRUE or FALSE	---	TRUE when memory operation is completed.
CurrentSeqNo	Executing Sequence Number	UINT	0 to 599	---	Displays executing sequence number. When the function block is *Done*, it displays the sequence number subsequent to the number whose execution is complete.
MStrobe	M Strobe Enabled	BOOL	TRUE or FALSE	---	TRUE during M Strobe output.
MCode	M Code	UINT	0 to 65535	---	Displays M Code.
DigitalOutputs	Digital Output	DWORD	16#00000000 to 16#FFFFFFFF	---	The value set to sequence data digital output is displayed while executing the relevant sequence.
Busy	Executing	BOOL	TRUE or FALSE	---	TRUE while executing memory operation.
CommandAborted	Command Aborted	BOOL	TRUE or FALSE	---	TRUE when the function block execution is aborted.
Error	Error	BOOL	TRUE or FALSE	---	TRUE while there is an error.
ErrorID	Error Code	WORD	*1	---	Contains the error code when an error occurs. A value of 16#0000 indicates normal execution.
ErrorIDEx	Expansion Error Code	DWORD		---	Contains the error code when an error occurs. A value of 16#00000000 indicates normal execution.

*1. Refer to *Troubleshooting* on page 1-49 for details.

In-Out Variables

Name	Meaning	Data type	Valid range	Description
AxesGroup	Axes Group	_sGROUP_REF	---	Specifies the axes group. Specify the enabled axes group.
CmdTbl	Memory Operation Data	OmronLib\MC_CmdTbl\sCMD_DATA	*1	Specifies the memory operation data (operation parameters, sequence data).

*1. Refer to *Memory Operation Data* on page 1-40 for details.

Function

This is a function block to continuously execute positioning that is specified in memory operation data for axes groups that are defined in the MC Function Module.

It performs the following functions.

- Automatic operation mode which executes sequence data consecutively
- Manual operation mode which executes sequence data one by one
- Setting the sequence number from which operation is started
- M Code output and M Code reset functions
- Stop function which stops operation

Execution Conditions

The following conditions must be met to execute the memory operation function block.

- Setting axes and axes groups

  Use the Sysmac Studio to set the axes.

  When you perform interpolation, set the axes group consisting of these axes.
- Creating memory operation data

  Create operation parameters and sequence data.

  Refer to *Sample Programming* on page 1-50 for a creation example of memory operation data.
- Assigning variables to the function block

  Assign the created axes group variables, memory operation data variables, and other required variables to the inputs and outputs variables of the memory operation function block.
- Servo ON and homing

  Change the axes to control to the Servo ON status, and then define home.

Precautions for Correct Use

- When you execute the memory operation function block, check that the axes to control are in servo ON status and the home is defined. If these conditions are not met, a Memory Operation Execution Error (error code: 16#3C09 and expansion error code: 16#00000001) will occur.
- The memory operation function block confirms servo ON status and home defined when started, but not after confirmation. If an error occurs in the MC Function Module due to these factors, an axis/axes group error (error code: 16#3C09 and expansion error code: 16#00000002) will occur in the function block.

Details

Memory Operation Enable (Enable)

If you set *Enable* to TRUE and *Enabled* is TRUE, the commands of *Execute* and *Stop* will be enabled.

When *Enable* is FALSE, the commands will not be sent and the output variable will be initialized.

If you set *Enable* to FALSE during axis motion, the axes will decelerate to a stop following the executing command profile deceleration pattern.

Execute

When you set *Execute* to TRUE during *Enabled*, operation starts according to the content defined in sequence data SeqData (sSEQ_DATA type).

Operation Mode (StepMode)

This variable is used to switch the operation mode between automatic and manual operation.

The automatic operation mode executes sequence data consecutively.

The conditions to stop the automatic operation are given below.

- The END instruction execution
- The sequence data operation pattern is set to independent positioning.
- Stop execution
- Detection of an error or an interruption

The sequence number will return to 0 after the sequence number 599 is executed.

Conversely, the manual operation mode executes sequence data one by one.

When *Execute* changes to TRUE, the mode is defined according to the specified Operation Mode (*StepMode*). When you switch modes, set *Execute* to TRUE again after executing *Stop*.

Stop Execution (Stop)

If the operation stop is executed, the axis will decelerate to a stop in accordance with the deceleration time of the current memory operation data.

The MC_Stop instruction will be executed in the function block during PTP operation and the MC_GroupStop instruction is executed in the function block during interpolation operation.

When the axis stops, the instruction is interrupted and the executing sequence number is not updated.

In dwell time waiting status, the instruction goes to an interruption status without waiting for the dwell time.

If *Stop* is executed while the M code is output, the M code output changes to OFF and the instruction is interrupted.

Precautions for Correct Use

- To decelerate an axis/axes group to a stop, set *Stop* to TRUE in the function block. For deceleration stop during memory operation through function block execution, do not use the MC_Stop or MC_GroupStop instruction.
- If you perform an immediate stop for memory operation, execute the MC_ImmediateStop instruction for all axes being used in memory operation. Use the MC_GroupImmediateStop instruction to perform a multi-axes coordinated control motion.
- During a single-axis discrete motion, the axis will not stop even if you execute the MC_GroupImmediateStop instruction.
- During memory operation, make sure that the axes are in servo ON status at all times. When you set the servo to OFF during memory operation, set *Enable* to FALSE in the function block.

Sequence Number Set (SeqNoSet)

This variable is used to specify the sequence number from which to start operation.

Enter the sequence number from which you want to start operation into Sequence Number (*SeqNo*) and set *SeqNoSet* to TRUE.

When *Execute* changes to TRUE, operation is started from the entered sequence number.

Lookahead

When the lookahead conditions are met in automatic operation mode, next sequence data is read in advance and the operation starts in the pattern specified in the sequence data (*SeqData*) operation pattern (*Ope*).

Lookahead processing is executed when all the following conditions are met.

- The command currently executing is linear interpolation or circular interpolation
- The command for the next sequence data is linear interpolation or circular interpolation
- The command currently executing is not specified to dwell time
- The command currently executing is not specified to M Code
- The operation pattern is specified to either of the consecutive trajectories

If memory operation is interrupted during lookahead by a stop command, disabling the memory operation, or an error detected, the sequence data looked ahead to is discarded.

M Code Reset (MCodeReset)

While *MStrobe* (M Strobe Enabled) is TRUE, if you set *MCodeReset* (M Code Reset) to TRUE, *MStrobe* will be FALSE and the operation will move on to the next sequence number.

Precautions for Correct Use

- If you execute the MC_ImmediateStop or MC_ImmediateGroupStop instruction during M Code output, an error will occur in the function block and M Code output will stop.
- If you execute the MC_Stop or MC_GroupStop instruction during M Code output, the axis/axes group will start motion again after M Code reset. For a deceleration stop during memory operation, set *Stop* to TRUE in the function block, and do not use the MC_Stop or MC_GroupStop instruction.

Error End

When a motion control instruction error or an axis/axes group error is detected during memory operation, the executing motion is interrupted and the function ends abnormally. As well, when during lookahead, the sequence data looked ahead to is discarded. The executing sequence number is not updated.

Operation Restart

- When you restart memory operation, change *Enable* to TRUE, enter the sequence number from which you want to restart into *SeqNo*, set *Execute* to TRUE when *SeqNoSet* is TRUE.
- If an error occurs in an axis/axes group, restart memory operation after clearing the error.
- If an undefined home error occurs, restart memory operation after clearing the error and defining home.

Precautions for Correct Use

When you stop memory operation and then restart it again, retain *CurrentSeqNo* (Executing Sequence Number) in order to start from the sequence number at which memory operation was stopped.

Re-execution of Instruction

This function block cannot be re-executed.

In this function block, a re-execution refers to setting *Execute* to TRUE again during axis motion by executing this function block.

Multi-execution of Instructions

A restriction applies to the instructions that can be used while this function block is in execution.

The MC_Move, MC_MoveLinear, and MC_MoveCircular2D motion control instructions are used in this function block so that multi-execution of instructions depends on the specifications of these instructions.

For details, refer to the CPU Unit motion control user's Manual.

Precautions for Correct Use

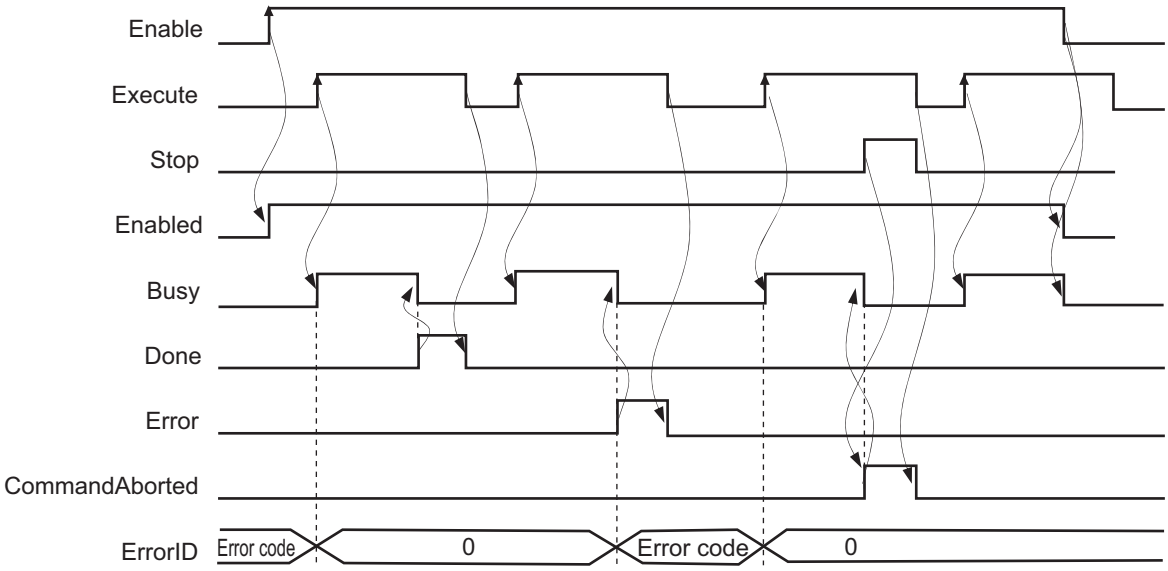
- For a deceleration stop during memory operation, do not use the MC_Stop or MC_GroupStop instruction.
- For a immediate stop during memory operation, use the MC_ImmediateStop and MC_ImmediateGroupStop instructions.
- During memory operation, do not perform the multi-execution of instructions regarding the axis/axes group used for memory operation.

Additional Information

When you execute the MC_SetOverride and MC_GroupSetOverride instructions during memory operation, check the effect of overriding the target velocity before use.

Timing Charts

- *Enabled* (Memory Operation Enabled) changes to TRUE at the same time as *Enable* (Memory Operation Enable) changes to TRUE.
- *Busy* (Executing) changes to TRUE at the same time as *Execute* changes to TRUE, and memory operation starts.
- When memory operation is completed, *Done* (Done) changes to TRUE.
- When an interruption occurs in the Motion Control Function Module during memory operation execution, or when *Stop* (Stop Execution) is executed, *CommandAborted* (Command Aborted) changes to TRUE.
- When an error occurs during memory operation execution, *Error* will change to TRUE and *Busy* (Executing) will change to FALSE. As well, you can find out the cause of the error by referring to the values that are output to *ErrorID* (Error Code) and *ErrorIDEx* (Expansion Error Code).

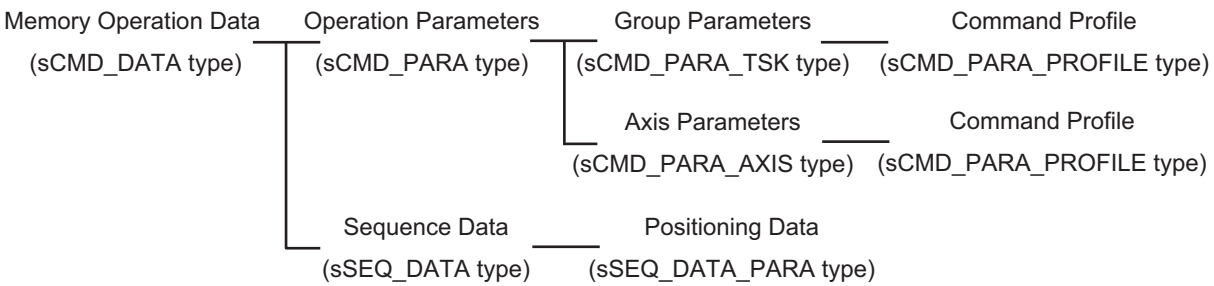


Memory Operation Data

Memory operation data includes operation parameters related to memory operation (velocity, acceleration/deceleration time etc.) and sequence data (position, operation pattern).

You can register up to 600 sequence data.

The memory operation data structure is composed as follows.



Operation Parameter

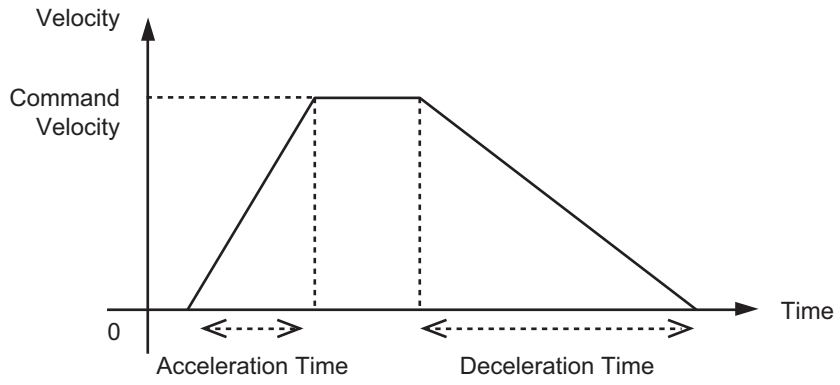
Operation parameters are one of the member variables of memory operation data, with a data type of sCMD_PARA type as defined in this library. This section describes their composition and details.

Name	Data type	Meaning	Valid range	Description
Para	sCMD_PARA	Operation Parameter		Specifies the operation parameters for memory operation.
TskPara	sCMD_PARA_TSK	Group Parameter		Specifies the axes group operation parameters.
Profile	ARRAY[0..3] OF sCMD_PARA_PROFILE	Command Profile		Specifies the acceleration/deceleration patterns (4 patterns) for circular and linear interpolation operation.
Velocity	LREAL	Command Velocity (unit/s)	Positive number	Specifies the command velocity.
AccTime	UINT	Acceleration Time (ms)	0 to 65535	Specifies the acceleration time.
DecTime	UINT	Deceleration Time (ms)	0 to 65535	Specifies the deceleration time.
SCurve	UINT	S-shaped Curve Specification		Reserved
Dir	UINT	Rotation Direction Designation		Reserved
AxisPara	ARRAY[0..3] OF sCMD_PARA_AXIS	Axis Parameter		Specifies the XYZU axes single-axis operation parameters.
Profile	ARRAY[0..3] OF sCMD_PARA_PROFILE	Command Profile		Specifies the acceleration/deceleration patterns (4 patterns) for PTP operation.
Velocity	LREAL	Command Velocity (unit/s)	Positive number	Specifies the command velocity.
AccTime	UINT	Acceleration Time (ms)	0 to 65535	Specifies the acceleration time.
DecTime	UINT	Deceleration Time (ms)	0 to 65535	Specifies the deceleration time.
SCurve	UINT	S-shaped Curve Specification		Reserved
Dir	UINT	Rotation Direction Designation		Specifies the direction of rotation when the operation command is set to PTP operation (absolute travel) and the Count Mode is **Rotary Mode**. 0: Positive direction 1: Shortest way 2: Negative direction 3: Current direction 4: No direction specified

Command Profile (*Profile*)

Sets four command profile patterns (velocity, acceleration time, deceleration time) in advance for PTP, circular interpolation, and linear interpolation operation. You can specify the profile number for each operation command to select which pattern to use.

Further, when you set the Start Velocity of the axis parameter operation settings to a value other than **0**, it will accelerate and decelerate from the start velocity. In this case, the acceleration/deceleration rates used in calculation are those for acceleration and deceleration to velocity **0** and to command velocity. Therefore, the acceleration and deceleration times are shorter than specified.



Sequence Data

Sequence data are one of the member variables of memory operation data. The data type of sequence data is array of sSEQ_DATA as defined in this library. This section describes their composition and details.

Name	Data type	Meaning	Valid range	Description
SeqData	ARRAY[0..599] OF sSEQ_DATA	Sequence Data		Sequence data consist of an array of 600 of the following data.
Cmd	WORD	Operation Command		Specifies the operation command. *1
Ope	UINT	Operation Pattern	0 to 4	Specifies the operation pattern. 0: Independent Positioning 1: Consecutive Positioning 2: Consecutive Trajectory (BlendingNext) 3: Consecutive Trajectory (BlendingPrevious) 4: Consecutive Trajectory (CornerSuperimposed)
SeqDataPara	sSEQ_DATA_PARA	Positioning Data		Specifies positioning data.
Axis	ARRAY[0..3] OF SINT	Specifying Axis	0, 1	Sets the operating axis. 0: Does not operate. 1: Operation specification
Position	ARRAY[0..3] OF LREAL	Target Position (unit)	Negative number, positive number, or 0	Sets the target position and travel distance.
Velocity	LREAL	Interpolation Velocity	0, Positive	Sets interpolation velocity. For 0, the function block operates with the interpolation velocity set in the command profile.
ProfileNo	ARRAY[0..3] OF USINT	Command Profile Number	0 to 3	Sets the command profile number set with parameters.
Aux	ARRAY[0..1] OF LREAL	Auxiliary Position (unit)	Negative number, positive number, or 0	Sets the auxiliary position at circular interpolation.
DwellTime	UINT	Dwell Time (ms)	0 to 65535	Specifies the wait time from axis motion positioning finished until operation completed.
MCode	UINT	M Code	0 to 65535	Sets the M Code in position.
DigitalOutputs	DWORD	Digital Outputs	16#00000000 to 16#FFFFFFFF	Outputs the *DigitalOutputs* output variable of the memory operation function block.

*1. Refer to *Operation Command (Cmd)* on page 1-44 for details.

Operation Command (*Cmd*)

Sets the positioning commands to operate.

The list of commands is as follows. Refer to the motion control instructions reference manual for detailed command operation.

Operation command	Setting value	Description and definition
NOP	16#0000	No operation to be executed. As well, the sequence number of this operation command does not output to *CurrentSeqNo* (Executing Sequence Number).
PTP (ABS)	16#0100	Executes up to 4 axes simultaneous PTP operation (absolute travel).
PTP (INC)	16#0101	Executes up to 4 axes simultaneous PTP operation (relative movement).
Linear interpolation (ABS)	16#0200	Executes up to 4 axes linear interpolation operation (absolute travel).
Linear interpolation (INC)	16#0201	Executes up to 4 axes linear interpolation operation (relative movement).
Circular interpolation (Border point/ABS)	16#0300	Executes circular interpolation (border point/absolute travel).
Circular interpolation (Border point/INC)	16#0301	Executes circular interpolation (border point/relative movement).
Circular interpolation (Center/CW/ABS)	16#0310	Executes circular interpolation (center/CW direction/absolute travel).
Circular interpolation (Center/CW/INC)	16#0311	Executes circular interpolation (center/CW direction/relative movement).
Circular interpolation (Center/CCW/ABS)	16#0312	Executes circular interpolation (center/CCW direction/absolute travel).
Circular interpolation (Center/CCW/INC)	16#0313	Executes circular interpolation (center/CCW direction/relative movement).
Circular interpolation (Radius/CW/ABS)	16#0320	Executes circular interpolation (radius/CW direction/absolute travel).
Circular interpolation (Radius/CW/INC)	16#0321	Executes circular interpolation (radius/CW direction/relative movement).
Circular interpolation (Radius/CCW/ABS)	16#0322	Executes circular interpolation (radius/CCW direction/absolute travel).
Circular interpolation (Radius/CCW/INC)	16#0323	Executes circular interpolation (radius/CCW direction/relative movement).
END	16#1000	Ends automatic operation. After you execute this operation command, the function block changes to *Done*. As well, the sequence number of this operation command does not output to *CurrentSeqNo* (Executing Sequence Number).

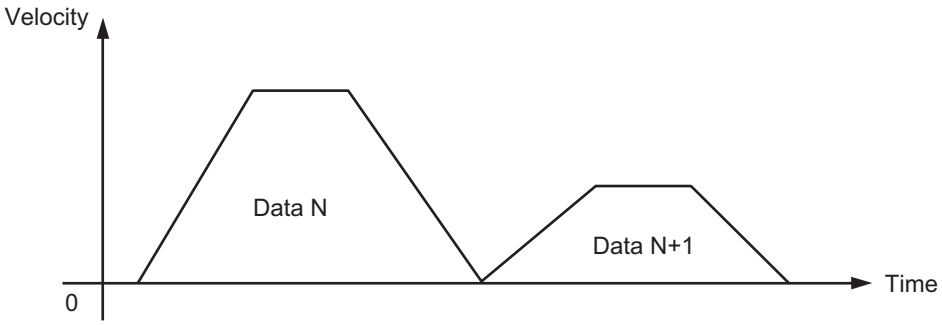
Precautions for Correct Use

If you specify a setting value that is not in the command list, it is treated as a NOP operation command. An error does not occur.

● Consecutive Positioning in Operation Pattern (*Ope*)

The data N operation pattern follows the following trajectory when you specify Consecutive Positioning.

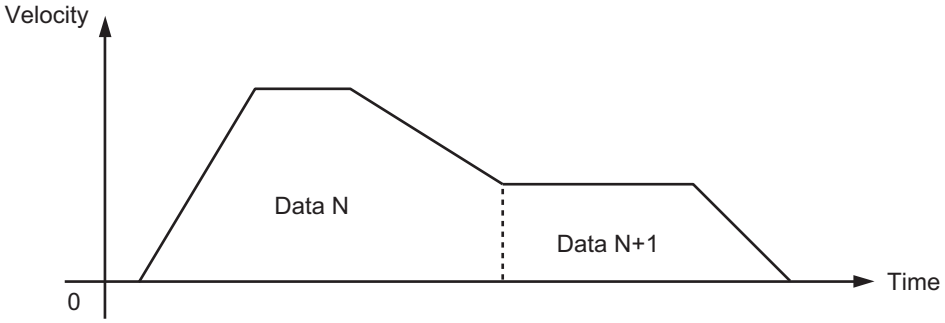
When data N is PTP, data N+1 is started after waiting for all axes to finish positioning.



● Consecutive Trajectory (BlendingNext) in Operation Pattern (*Ope*)

When both data N and data N+1 are either linear interpolation or circular interpolation, if you specify Consecutive Trajectory (BlendingNext) for the data N operation pattern, it will operate at the target position in the current instruction and the target velocity in the buffered instruction as in the following figure.

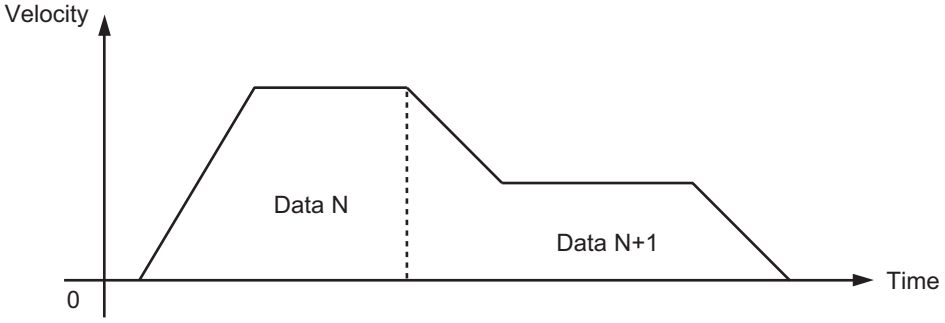
The operation pattern will be Consecutive Positioning instead of Consecutive Trajectory when at least one of data N and data N+1 is PTP.



● Consecutive Trajectory (BlendingPrevious) in Operation Pattern (*Ope*)

When both data N and data N+1 are either linear interpolation or circular interpolation, if you specify Consecutive Trajectory (BlendingPrevious) for the data N operation pattern, it will operate at the target velocity in the current instruction up to the target position in the current instruction as in the following figure. Operation is performed after acceleration/deceleration to the target velocity of the buffered instruction once the target position is reached.

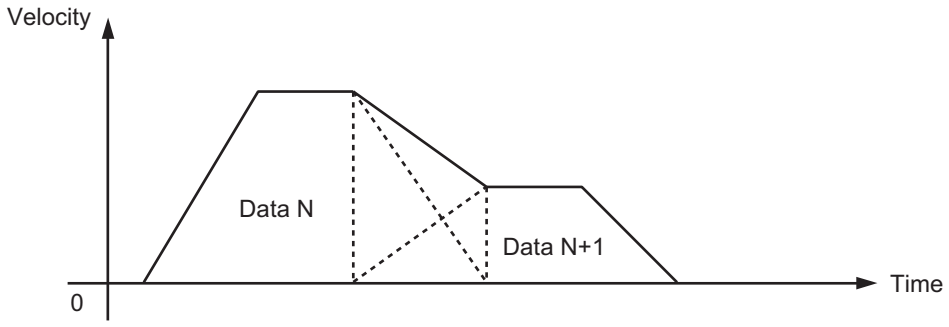
The operation pattern will be Consecutive Positioning instead of Consecutive Trajectory when at least one of data N and data N+1 is PTP.



● Consecutive Trajectory (CornerSuperimposed) in Operation Pattern (*Ope*)

When both data N and data N+1 are either linear interpolation or circular interpolation, if you specify Consecutive Trajectory (CornerSuperimposed) for the data N operation pattern, it will superimpose the current instruction for deceleration and the buffered instruction for acceleration as in the following figure. Operation is executed in the same amount of time as for the deceleration of the current instruction, no matter what is specified as the acceleration for the buffered instruction.

The operation pattern will be Consecutive Positioning instead of Consecutive Trajectory when at least one of data N and data N+1 is PTP.



Specifying Axis (*Axis*)

Specifies which axis is used for positioning with *Axis* (Specifying Axis) in the sequence data.

When you specify 0: Does not operate, the target axis stays at the current position.

Target Position (*Position*)

Sets the target position data with long reals (LREAL).

● For Single-axis Control

Sets *Position* (Target Position) of the operating axis. Simultaneous operation is up to 4 axes.

Specify the target position as an absolute position when the position specification is absolute.

Specify the target position as a relative position when the position specification is relative.

● For Linear Interpolation Operation

Sets *Position* (Target Position) of the operating axis in linear interpolation. Simultaneous operation is up to 4 axes.

Specify the target position as an absolute position when the position specification is absolute.

Specify the target position as a relative position when the position specification is relative.

● For Circular Interpolation

Sets the target position data (end point) of the operating axis in circular interpolation.

Specify the end point/border point as an absolute position when the position specification is absolute.

Specify the end point/border point as a relative position from the start point when the position specification is relative.

Interpolation Velocity (*Velocity*)

Sets the interpolation velocity for linear and circular interpolations. Do not use this variable for PTP.

When you set the interpolation velocity to 0.0, the velocity specified in the command profile is treated as interpolation velocity.

Command Profile Number (*ProfileNo*)

Specifies the command profile pattern with parameters set to PTP, linear interpolation, and circular interpolation.

The command profile pattern for each axis is used for PTP operation.

The command profile pattern for a group is used for linear and circular interpolation operation.

Auxiliary Position (*Aux*)

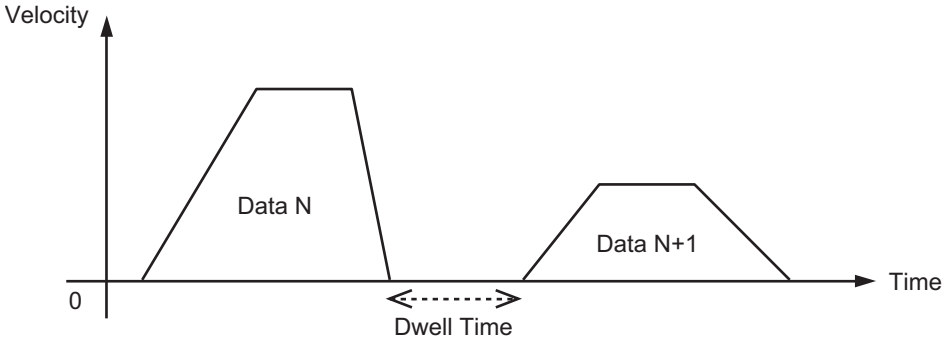
Sets the auxiliary position for circular interpolation.

- When you select the center, set Auxiliary Position 1 (Aux[0]) to center X coordinates and Auxiliary Position 2 (Aux[1]) to center Y coordinates.
- When you select the border point, set Auxiliary Position 1 (Aux[0]) to border point X coordinates and Auxiliary Position 2 (Aux[1]) to border point Y coordinates.
- When you select the radius, set Auxiliary Position 1 (Aux[0]) to arc radius.

Dwell Time (*DwellTime*)

When the dwell time of data N is set to a value other than 0 ms, it will wait the specified time before executing data N+1. After the dwell time, it executes data N+1.

When the operation pattern is Consecutive Trajectory and the dwell time is set, the operation pattern changes to Consecutive Operation. As well, when the operation pattern is Independent Operation and the dwell time is set, operation ends after dwell time.



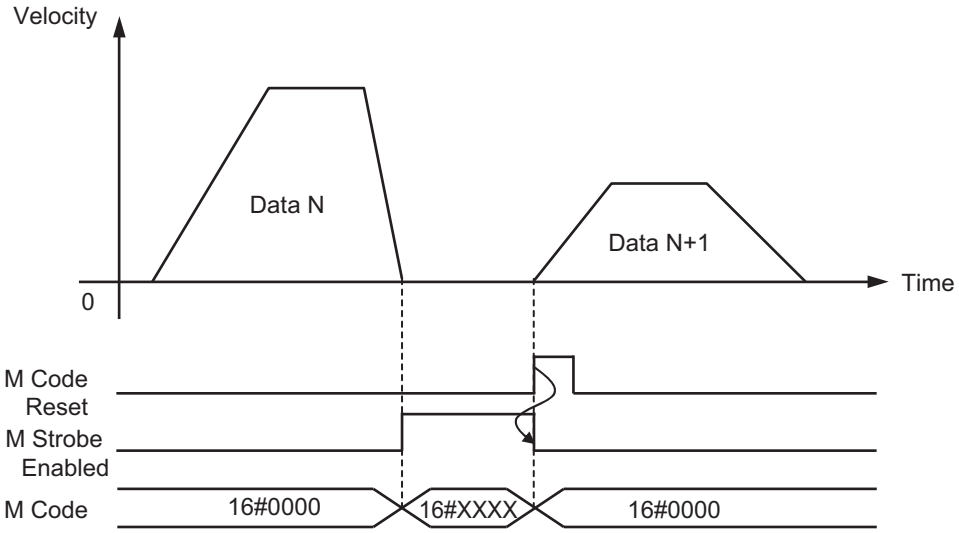
Precautions for Correct Use

You can set the dwell time in units of ms, but the elapsed time monitoring will exceed the specified time by a maximum of one task period, because it is executed in the task period for which the memory operation function block is allocated.

M Code (*MCode*)

If you set the M Code of data N to a value other than 16#0000, *MCode* (M Code) is output and *MStrobe* (M Strobe Enabled) changes to TRUE. It waits to execute data N+1 until *MCodeReset* (M Code Reset) is executed. While waiting for execution, the function block is in *Busy* (Executing) status. After M Code reset, it transitions to the next sequence number.

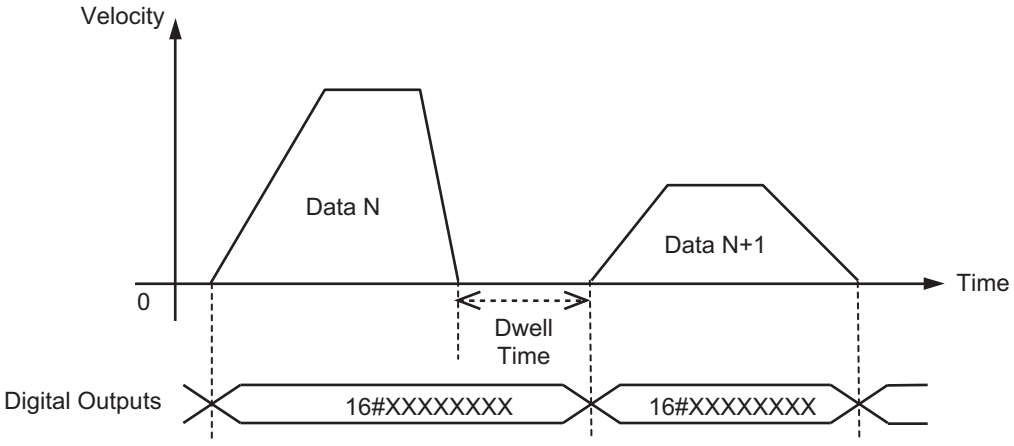
When the operation pattern is Consecutive Trajectory and the M Code is set, the operation pattern changes to Consecutive Operation. As well, when the operation pattern is Independent Operation and the M Code is set, operation ends after M Code reset.



Digital Outputs (*DigitalOutputs*)

During target sequence execution, the value set to data N digital output is output as the *DigitalOutputs* output variable in the function block.

You can use this for Out Control of valves and cylinders interlocked with axis operation, among other things.



Troubleshooting

Error code	Expansion error code	Status	Cause	Correction
16#0000	16#00000000	Normal end	---	---
16#3C09	16#00000001	Memory operation execute error	Conditions for enabling the memory operation function block are not met. • Composition axis is undefined home • Composition axis is not in *StandStill* status	Correct the cause at left.
16#3C09	16#00000002	Axis/axes group error detected	An axis error or an axes group error occurred.	*1
16#3C09	16#00000003	Operation parameter error	The operation parameter settings are not correct.	Check the settings of the memory operation parameters.
16#3C09	16#00000004	Sequence number error	In setting the sequence number, the set sequence number is out of range.	Set the sequence number within range.
16#3C09	16#00000005	Sequence data error	The sequence data settings are not correct.	Check the settings of the operation data.

*1. For details, refer to the motion control user's manual.

Sample Programming

The sample programming below is implemented to execute the memory operation function block for the hardware configuration that is given in *Hardware Configuration Diagram* on page 1-33.

Control contents are set with sequence data.

Precautions for Correct Use

- The sample programming shows only the portion of a program that uses the function or function block from the library.
- When using actual devices, also program safety circuits, device interlocks, I/O with other devices, and other control procedures.
- Create a user program that will produce the intended device operation.
- Check the user program for proper execution before you use it for actual operation.
- When you execute the memory operation function block, confirm the axis settings, axes group settings, memory operation data, and user program. As well, implement an external emergency stop circuit so that you can stop the motor safely if needed.

Additional Information

- This function block has four levels of interior function block nesting. The depth of the nesting levels is limited by the CPU Unit version or the Industrial PC version. When you nest this function block, refer to the software user's manual to confirm the depth limits on nesting levels.
- The Name space *OmronLib\MC_CmdTbl* is set for the memory operation function block and the data type of memory operation data. Declare and use namespace with reference to the software user's manual.

The sample performs processes in the following order.

1. When you set *Start* to TRUE, the control targets (4 axes) execute servo ON and homing.
2. When servo is ON and home is completed, *Ready* changes to TRUE.
3. If *Ready* is not TRUE and the function block is not in Immediate Stop status, set *Enable* to TRUE.
4. Execute memory operation by setting *Execute* to TRUE.
5. If an immediate stop event occurs, execute the MC_GroupImmediateStop instruction and, for each axis, the MC_ImmediateStop instruction.

Ladder Diagram

● External Variables

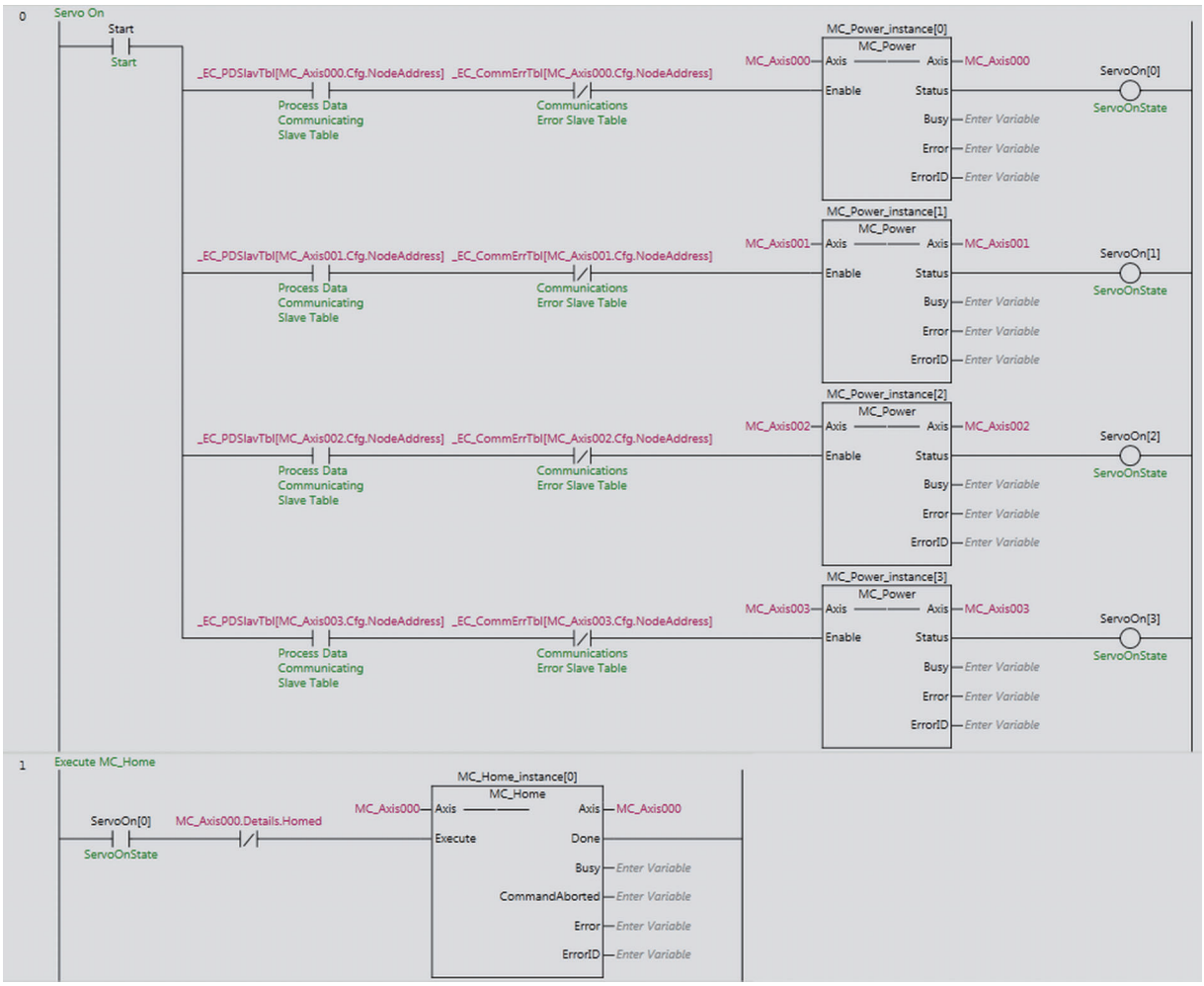
Variable name	Data type	Constant	Comment
MC_Group000	_sGROUP_REF	✓	
MC_Axis000	_sAXIS_REF	✓	
MC_Axis001	_sAXIS_REF	✓	
MC_Axis002	_sAXIS_REF	✓	
MC_Axis003	_sAXIS_REF	✓	
_EC_PDSlavTbl	ARRAY[1..512] OF BOOL *1	✓	Process Data Communicating Slave Table
_EC_CommErrTbl	ARRAY[1..512] OF BOOL *1	✓	Communications Error Slave Table

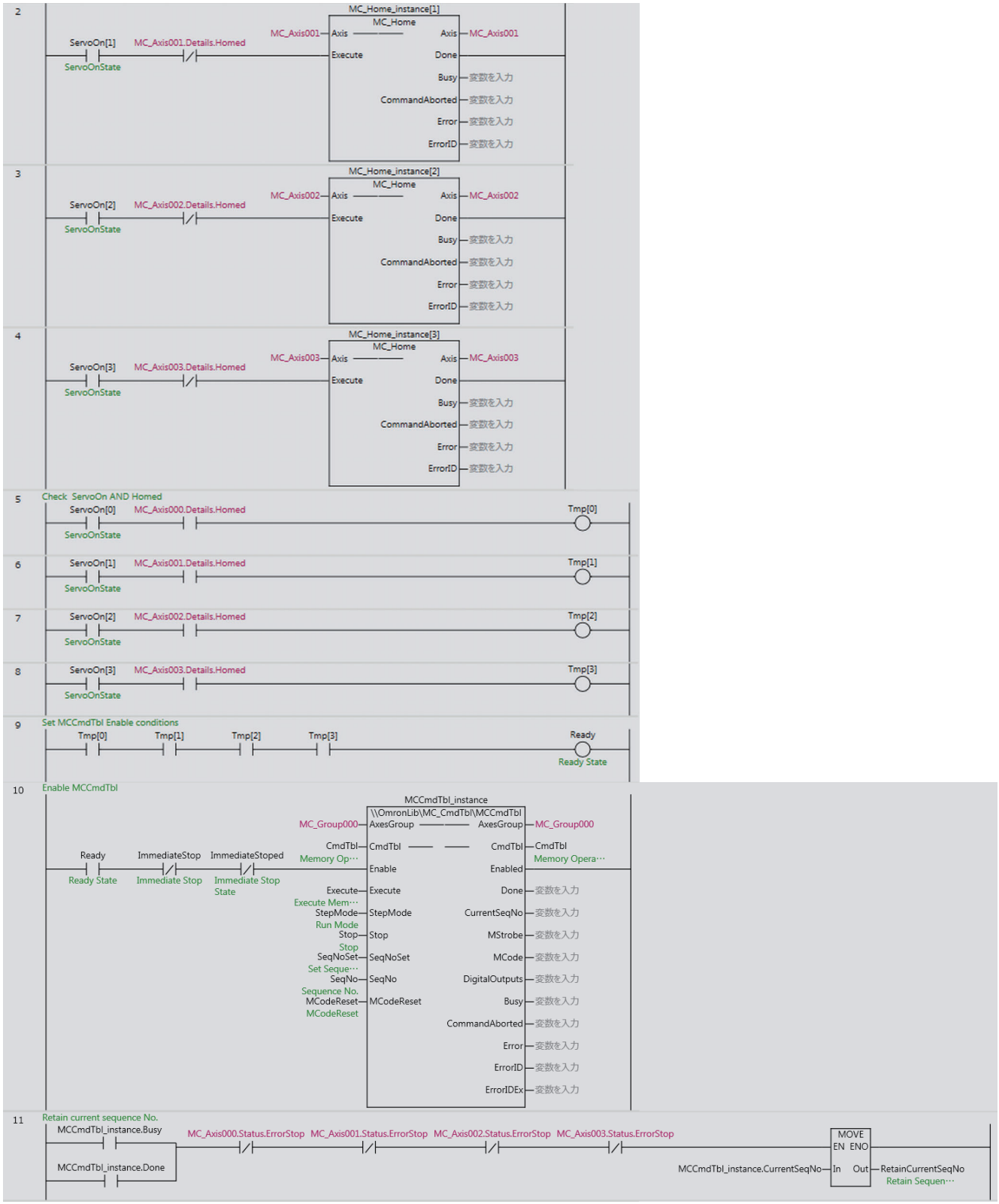
*1. The data type is ARRAY[1..192] OF BOOL for the NJ501-□□□□ or NJ301-□□□□ and ARRAY[1..64] OF BOOL for the NJ101-10□□.

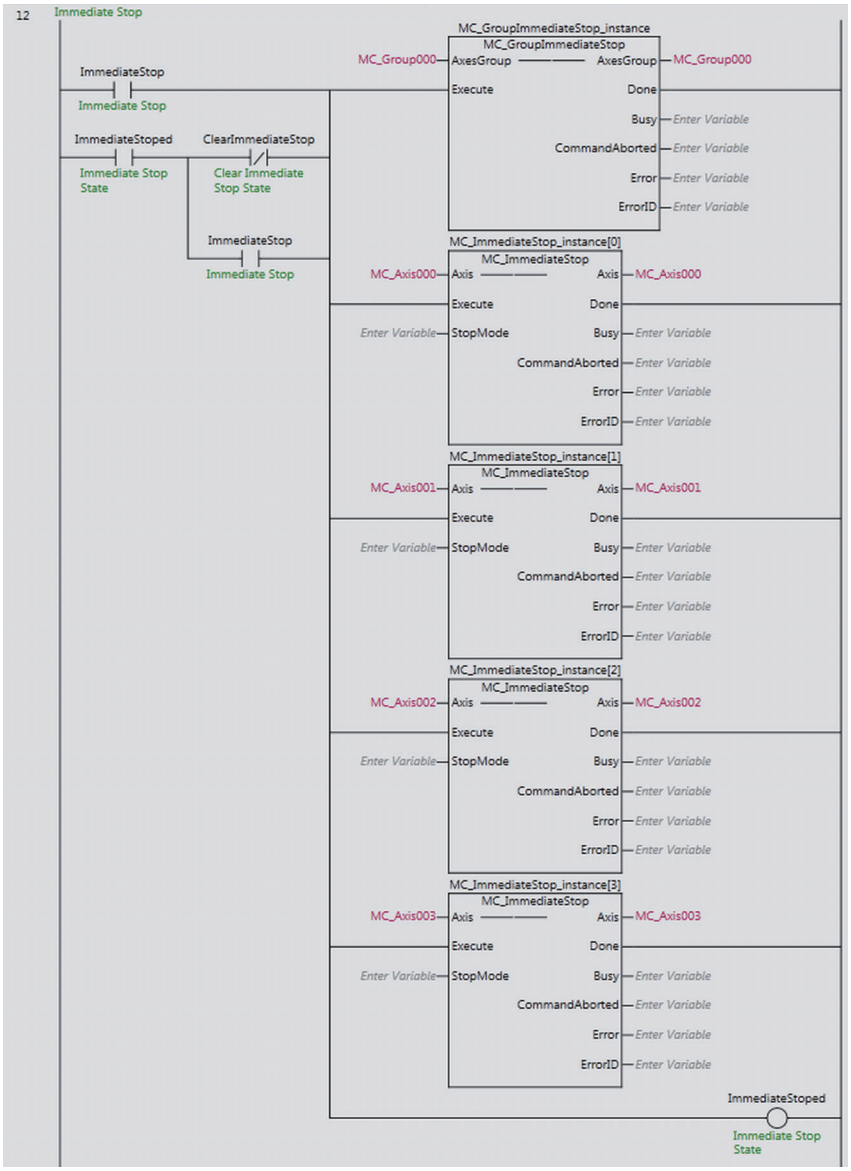
● Internal Variables

Variable name	Data type	Comment
MCCmdTbl_instance	OmronLib\MC_CmdTbl\MCCmdTbl	
MC_Power_instance	ARRAY[0..3] OF MC_Power	
MC_Home_instance	ARRAY[0..3] OF MC_Home	
MC_ImmediateStop_instance	ARRAY[0..3] OF MC_ImmediateStop	
MC_GroupImmediateStop_instance	MC_GroupImmediateStop	
ServoOn	ARRAY[0..3] OF BOOL	ServoOn State
Tmp	ARRAY[0..3] OF BOOL	
ImmediateStop	BOOL	Immediate Stop
ClearImmediateStop	BOOL	Clear Immediate Stop State
ImmediateStoped	BOOL	Immediate Stop State
Ready	BOOL	Ready State
CmdTbl	OmronLib\MC_CmdTbl\sCMD_DATA	Memory Operation Data
Execute	BOOL	Execute Memory Operation
MCodeReset	BOOL	MCodeReset
SeqNo	UINT	Squence No.
SeqNoSet	BOOL	Set Sequence No.
StepMode	BOOL	Run Mode
Stop	BOOL	Stop
Start	BOOL	Start
RetainCurrentSeqNo	UINT	Retain Sequence No.

Programs


0
Servo On
Start
Start
_EC_PDSlavTbl[MC_Axis000.Cfg.NodeAddress]
Process Data Communicating Slave Table
_EC_CommErrTbl[MC_Axis000.Cfg.NodeAddress]
Communications Error Slave Table
MC_Power_instance[0]
MC_Power
MC_Axis000
Axis
Enable
Status
Busy
Error
ErrorID
Enter Variable
ServoOn[0]
ServoOnState
_EC_PDSlavTbl[MC_Axis001.Cfg.NodeAddress]
_EC_CommErrTbl[MC_Axis001.Cfg.NodeAddress]
MC_Power_instance[1]
MC_Axis001
ServoOn[1]
_EC_PDSlavTbl[MC_Axis002.Cfg.NodeAddress]
_EC_CommErrTbl[MC_Axis002.Cfg.NodeAddress]
MC_Power_instance[2]
MC_Axis002
ServoOn[2]
_EC_PDSlavTbl[MC_Axis003.Cfg.NodeAddress]
_EC_CommErrTbl[MC_Axis003.Cfg.NodeAddress]
MC_Power_instance[3]
MC_Axis003
ServoOn[3]
1
Execute MC_Home
ServoOn[0]
ServoOnState
MC_Axis000.Details.Homed
MC_Home_instance[0]
MC_Home
Execute
Done
CommandAborted
Error
ErrorID


2
MC_Home_instance[1]
MC_Home
ServoOn[1]
MC_Axis001.Details.Homed
ServoOnState
MC_Axis001
Axis
Execute
Done
Busy
CommandAborted
Error
ErrorID
変数を入力
3
MC_Home_instance[2]
ServoOn[2]
MC_Axis002.Details.Homed
MC_Axis002
4
MC_Home_instance[3]
ServoOn[3]
MC_Axis003.Details.Homed
MC_Axis003
5
Check ServoOn AND Homed
ServoOn[0]
MC_Axis000.Details.Homed
Tmp[0]
6
Tmp[1]
7
Tmp[2]
8
Tmp[3]
9
Set MCCmdTbl Enable conditions
Ready
Ready State
10
Enable MCCmdTbl
MCCmdTbl_instance
\\OmronLib\MC_CmdTbl\MCCmdTbl
MC_Group000
AxesGroup
CmdTbl
Memory Op…
Memory Opera…
Enable
Enabled
Execute
Execute Mem…
StepMode
Run Mode
Stop
SeqNoSet
Set Seque…
SeqNo
Sequence No.
MCodeReset
Done
CurrentSeqNo
MStrobe
MCode
DigitalOutputs
Busy
CommandAborted
Error
ErrorID
ErrorIDEx
ImmediateStop
ImmediateStoped
Immediate Stop State
11
Retain current sequence No.
MCCmdTbl_instance.Busy
MCCmdTbl_instance.Done
MC_Axis000.Status.ErrorStop
MC_Axis001.Status.ErrorStop
MC_Axis002.Status.ErrorStop
MC_Axis003.Status.ErrorStop
MOVE
EN ENO
MCCmdTbl_instance.CurrentSeqNo
In
Out
RetainCurrentSeqNo
Retain Sequen…


12
Immediate Stop
MC_GroupImmediateStop_instance
MC_GroupImmediateStop
MC_Group000
AxesGroup
AxesGroup
MC_Group000
ImmediateStop
Execute
Done
Immediate Stop
Busy
Enter Variable
ImmediateStoped
ClearImmediateStop
CommandAborted
Enter Variable
Immediate Stop State
Clear Immediate Stop State
Error
Enter Variable
ErrorID
Enter Variable
ImmediateStop
MC_ImmediateStop_instance[0]
MC_ImmediateStop
Immediate Stop
MC_Axis000
Axis
Axis
MC_Axis000
Execute
Done
Enter Variable
StopMode
Busy
Enter Variable
CommandAborted
Enter Variable
Error
Enter Variable
ErrorID
Enter Variable
MC_ImmediateStop_instance[1]
MC_ImmediateStop
MC_Axis001
Axis
Axis
MC_Axis001
Execute
Done
Enter Variable
StopMode
Busy
Enter Variable
CommandAborted
Enter Variable
Error
Enter Variable
ErrorID
Enter Variable
MC_ImmediateStop_instance[2]
MC_ImmediateStop
MC_Axis002
Axis
Axis
MC_Axis002
Execute
Done
Enter Variable
StopMode
Busy
Enter Variable
CommandAborted
Enter Variable
Error
Enter Variable
ErrorID
Enter Variable
MC_ImmediateStop_instance[3]
MC_ImmediateStop
MC_Axis003
Axis
Axis
MC_Axis003
Execute
Done
Enter Variable
StopMode
Busy
Enter Variable
CommandAborted
Enter Variable
Error
Enter Variable
ErrorID
Enter Variable
ImmediateStoped
Immediate Stop State

Structured text (ST)

● External Variables

Variable name	Data type	Constant	Comment
MC_Group000	_sGROUP_REF	✓	
MC_Axis000	_sAXIS_REF	✓	
MC_Axis001	_sAXIS_REF	✓	
MC_Axis002	_sAXIS_REF	✓	
MC_Axis003	_sAXIS_REF	✓	
_EC_PDSlavTbl	ARRAY[1..512] OF BOOL *1	✓	Process Data Communicating Slave Table
_EC_CommErrTbl	ARRAY[1..512] OF BOOL *1	✓	Communications Error Slave Table

*1. The data type is ARRAY[1..192] OF BOOL for the NJ501-□□□□ or NJ301-□□□□ and ARRAY[1..64] OF BOOL for the NJ101-10□□.

● Internal Variables

Variable name	Data type	Comment
MCCmdTbl_instance	OmronLib\MC_CmdTbl\MCCmdTbl	
MC_Power_instance	ARRAY[0..3] OF MC_Power	
MC_Home_instance	ARRAY[0..3] OF MC_Home	
MC_ImmediateStop_instance	ARRAY[0..3] OF MC_ImmediateStop	
MC_GroupImmediateStop_instance	MC_GroupImmediateStop	
ServoOn	ARRAY[0..3] OF BOOL	ServoOn State
ImmediateStop	BOOL	Immediate Stop
ClearImmediateStop	BOOL	Clear Immediate Stop State
ImmediateStoped	BOOL	Immediate Stop State
Ready	BOOL	Ready State
CmdTbl	OmronLib\MC_CmdTbl\sCMD_DATA	Memory Operation Data
Execute	BOOL	Execute Memory Operation
MCodeReset	BOOL	MCodeReset
SeqNo	UINT	Squence No.
SeqNoSet	BOOL	Set Sequence No.
StepMode	BOOL	Run Mode
Stop	BOOL	Stop
Start	BOOL	Start
RetainCurrentSeqNo	UINT	Retain Sequence No.
Tmp1	ARRAY[0..3] OF BOOL	
Tmp2	ARRAY[0..3] OF BOOL	
Tmp3	ARRAY[0..3] OF BOOL	

● Programs

```
// Servo On
Tmp1[0]:=Start AND _EC_PDSlavTbl[MC_Axis000.Cfg.NodeAddress] AND NOT(_EC_CommEr-
rTbl[MC_Axis000.Cfg.NodeAddress]);
Tmp1[1]:=Start AND _EC_PDSlavTbl[MC_Axis001.Cfg.NodeAddress] AND NOT(_EC_CommEr-
rTbl[MC_Axis001.Cfg.NodeAddress]);
Tmp1[2]:=Start AND _EC_PDSlavTbl[MC_Axis002.Cfg.NodeAddress] AND NOT(_EC_CommEr-
rTbl[MC_Axis002.Cfg.NodeAddress]);
Tmp1[3]:=Start AND _EC_PDSlavTbl[MC_Axis003.Cfg.NodeAddress] AND NOT(_EC_CommEr-
rTbl[MC_Axis003.Cfg.NodeAddress]);
```

```
// Enable MC_Power
MC_Power_instance[0](Axis:=MC_Axis000, Enable:=Tmp1[0], Status=>ServoOn[0]);
MC_Power_instance[1](Axis:=MC_Axis001, Enable:=Tmp1[1], Status=>ServoOn[1]);
MC_Power_instance[2](Axis:=MC_Axis002, Enable:=Tmp1[2], Status=>ServoOn[2]);
MC_Power_instance[3](Axis:=MC_Axis003, Enable:=Tmp1[3], Status=>ServoOn[3]);

// Check Servo-On and NOT homed
Tmp2[0]:=ServoOn[0] AND NOT(MC_Axis000.Details.Homed);
Tmp2[1]:=ServoOn[1] AND NOT(MC_Axis001.Details.Homed);
Tmp2[2]:=ServoOn[2] AND NOT(MC_Axis002.Details.Homed);
Tmp2[3]:=ServoOn[3] AND NOT(MC_Axis003.Details.Homed);

// Execute MC_Home instance
MC_Home_instance[0](Axis:=MC_Axis000, Execute:=Tmp2[0]);
MC_Home_instance[1](Axis:=MC_Axis001, Execute:=Tmp2[1]);
MC_Home_instance[2](Axis:=MC_Axis002, Execute:=Tmp2[2]);
MC_Home_instance[3](Axis:=MC_Axis003, Execute:=Tmp2[3]);

// Check Servo-On and Homed
Tmp3[0]:=ServoOn[0] AND MC_Axis000.Details.Homed;
Tmp3[1]:=ServoOn[1] AND MC_Axis001.Details.Homed;
Tmp3[2]:=ServoOn[2] AND MC_Axis002.Details.Homed;
Tmp3[3]:=ServoOn[3] AND MC_Axis003.Details.Homed;

// Set MCCmdTbl Enable conditions
Ready:=Tmp3[0] AND Tmp3[1] AND Tmp3[2] AND Tmp3[3];

// Enble MCCmdTbl
MCCmdTbl_instance(
  AxesGroup:=MC_Group000,
  CmdTbl:=CmdTbl,
  Enable:=Ready AND NOT(ImmediateStop) AND NOT(ImmediateStoped),
  Execute:=Execute,
  StepMode:=StepMode,
  Stop:=Stop,
  SeqNoSet:=SeqNoSet,
  SeqNo:=SeqNo,
  MCodeReset:=MCodeReset
);

// Retain current sequence No.
IF (MCCmdTbl_instance.Busy OR MCCmdTbl_instance.Done) AND NOT(MC_Axis000.Sta-
tus.ErrorStop)
AND NOT(MC_Axis001.Status.ErrorStop)
AND NOT(MC_Axis002.Status.ErrorStop)
AND NOT(MC_Axis003.Status.ErrorStop) THEN
  RetainCurrentSeqNo:=MCCmdTbl_instance.CurrentSeqNo;
END_IF;

// Immediate Stop
IF ImmediateStop OR ImmediateStoped THEN
  ImmediateStoped:=TRUE;
  IF ClearImmediateStop  AND NOT(ImmediateStop) THEN
    ImmediateStoped:=FALSE;
  END_IF;
END_IF;

// Execute Immediate Stop
MC_GroupImmediateStop_instance(AxesGroup:=MC_Group000, Execute:=ImmediateStoped);
MC_ImmediateStop_instance[0](Axis:=MC_Axis000, Execute:=ImmediateStoped);
MC_ImmediateStop_instance[1](Axis:=MC_Axis001, Execute:=ImmediateStoped);
MC_ImmediateStop_instance[2](Axis:=MC_Axis002, Execute:=ImmediateStoped);
MC_ImmediateStop_instance[3](Axis:=MC_Axis003, Execute:=ImmediateStoped);
```

External Circuits To Retain Executing Sequence Number

Through an external circuit such as the above, the currently executing sequence number is retained in the *RetainCurrentSeqNo* internal variable.

Even if it is stopped with *Stop*, the value of this internal variable is not cleared.

Appendix

Referring to Library Information

When you make an inquiry to OMRON about the library, you can refer to the library information to identify the library to ask about.

The library information is useful in identifying the target library among the libraries provided by OMRON or created by the user.

The library information consists of the attributes of the library and the attributes of function blocks and functions contained in the library.

- Attributes of libraries

  Information for identifying the library itself
- Attributes of function blocks and functions

  Information for identifying the function block and function contained in the library

Use the Sysmac Studio to access the library information.

Attributes of Libraries, Function Blocks and Functions

The following attributes of libraries, function blocks and functions are provided as the library information.

● Attributes of Libraries

No.*1	Attribute	Description
(1)	Library file name	The name of the library file
(2)	Library version	The version of the library
(3)	Author	The name of creator of the library
(4)	Comment	The description of the library*2

*1. These numbers correspond to the numbers shown on the screen images in the next section, *Referring to Attributes of Libraries, Function Blocks and Functions* on page 61.

*2. It is provided in English and Japanese.

● Attributes of Function Blocks and Functions

No.*1	Attribute	Description
(5)	FB/FUN name	The name of the function block or function
(6)	Name space	The name of name space for the function block or function
(7)	FB/FUN version	The version of the function block or function
(8)	Author	The name of creator of the function block or function
(9)	FB/FUN number	The function block number or function number
(10)	Comment	The description of the function block or function*2

*1. These numbers correspond to the numbers shown on the screen images in the next section, *Referring to Attributes of Libraries, Function Blocks and Functions* on page 61.

*2. It is provided in English and Japanese.

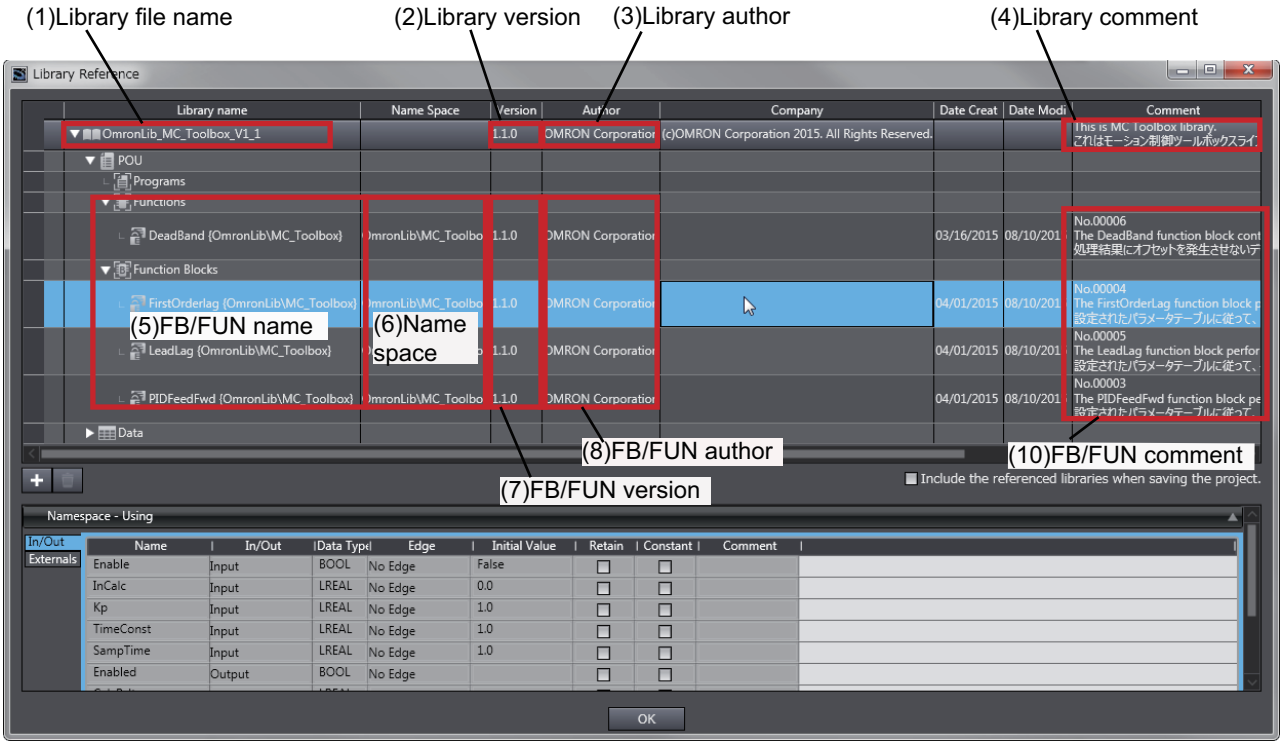
Referring to Attributes of Libraries, Function Blocks and Functions

You can refer to the attributes of libraries, function blocks and functions of the library information at the following locations on the Sysmac Studio.

- Library Reference Dialog Box
- Toolbox Pane
- Ladder Editor

(a) Library Reference Dialog Box

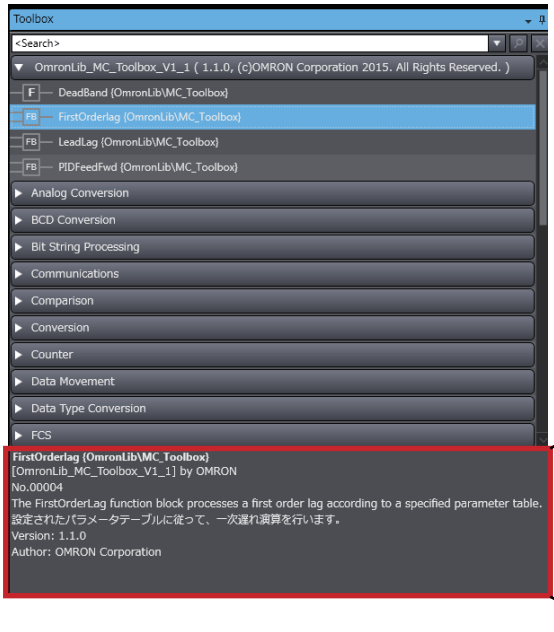
When you refer to the libraries, the library information is displayed at the locations shown below.



(b) Toolbox Pane

Select a function block and function to display its library information at the bottom of the Toolbox Pane.

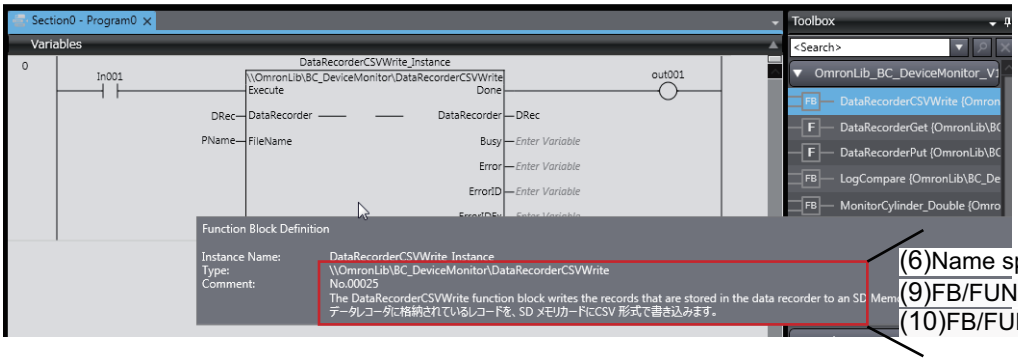
The text “by OMRON” which is shown on the right of the library name (1) indicates that this library was provided by OMRON.



(5)FB/FUN name (6)Name space
(1)Library file name
(9)FB/FUN number
(10)FB/FUN comment
(7)FB/FUN version
(8)FB/FUN author

(c) Ladder Editor

Place the mouse on a function block and function to display the library information in a tooltip.



(6)Name space (5)FB/FUN name
(9)FB/FUN number
(10)FB/FUN comment

Referring to Function Block and Function Source Codes

You can refer to the source codes of function blocks and functions provided by OMRON to customize them to suit the user's environment.

User function blocks and user functions can be created based on the copies of these source codes.

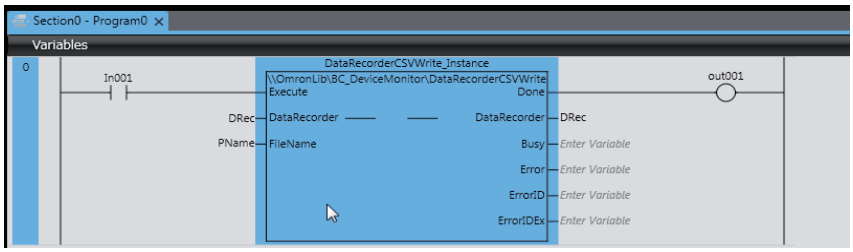
The following are the examples of items that you may need to customize.

- Customizing the size of arrays to suit the memory capacity of the user's Controller
- Customizing the data types to suit the user-defined data types

Note that you can access only function blocks and functions whose Source code published/not published is set to Published in the library information shown in their individual specifications.

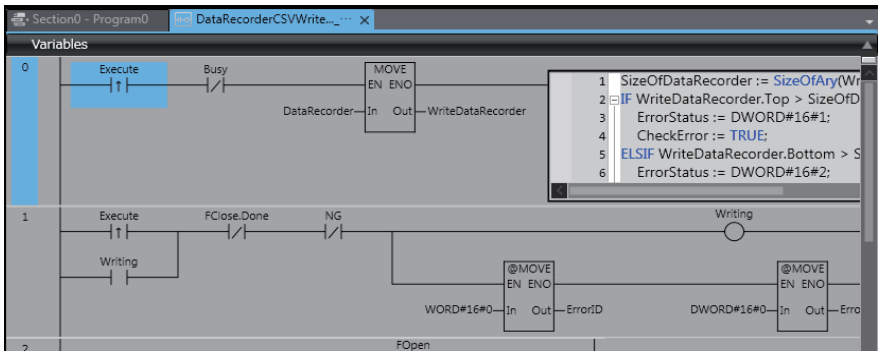
Use the following procedure to refer to the source codes of function blocks and functions.

1 Select a function block or function in the program.



2 Double-click or right-click and select **To Lower Layer** from the menu.

The source code is displayed.



Precautions for Correct Use

For function blocks and functions whose source codes are not published, the following dialog box is displayed in the above step 2. Click the **Cancel** button.

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