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### Copyrights

Microsoft product screen shots reprinted with permission from Microsoft Corporation.
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 Test Run 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 provides function block specifications. It does not describe application restrictions or combination restrictions for Controllers, Units, and components.
Refer to the user's manuals for all of the products in the application before you use any of the products.
Keep this manual in a safe place where it will be available for reference during operation.

Features of the Library

The MC Test Run Library is used to perform a test run that the MC Function Module is used.
In this library, a processing to operate axes that an MPG (i.e. a manual pulse generator) was used is provided.
You can use this library to reduce manpower of programming when creating a test run program that an MPG was used.
You can use this library together with motion control instructions of the NJ/NX/NY-series Controller.
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.
This manual covers the following products.

<table>
<thead>
<tr>
<th>Item</th>
<th>Product name</th>
<th>Model numbers</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sysmac Library</td>
<td>MC TestRun Library</td>
<td>SYSMAC-XR001</td>
<td>Version 1.1.0 or higher</td>
</tr>
<tr>
<td>Automation Software</td>
<td>Sysmac Studio</td>
<td></td>
<td>Version 1.14 or higher</td>
</tr>
<tr>
<td>Device</td>
<td>CPU Unit</td>
<td></td>
<td>Version 1.10 or later</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NX701-□□□□</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NJ101-10□□□□*1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NJ301-□□□□</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NJ501-□□□□</td>
<td>Version 1.10 or later</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NX1P2-□□□□□□□□(1)*2</td>
<td>Version 1.13 or later</td>
</tr>
<tr>
<td>Industrial PC</td>
<td></td>
<td>NY5□□□□□□-1□□□□</td>
<td>Version 1.12 or later</td>
</tr>
</tbody>
</table>

*1. You cannot use this function block with the NJ101-90□□□.

*2. You cannot use this function block with the NX1P2-90□□□□□□．

Part of the specifications and restrictions for the CPU Units are given in other manuals. Refer to Related Manuals on page 11.
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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  Intended Audience...............................................................................................1
  Applicable Products............................................................................................2

Manual Structure ..................................................................................................3
  Special Information..............................................................................................3

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Warranty, Limitations of Liability

Warranties

- Exclusive Warranty
  Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied.

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OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY.

Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.
Application Considerations

Suitability of Use

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer’s application or use of the Product. At Buyer’s request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer’s application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

Programmable Products

Omron Companies shall not be responsible for the user’s programming of a programmable Product, or any consequence thereof.

Disclaimers

Performance Data

Data presented in Omron Company websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Omron’s test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Omron’s Warranty and Limitations of Liability.

Change in Specifications

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron’s representative at any time to confirm actual specifications of purchased Product.

Errors and Omissions

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.
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.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="WARNING" /></td>
<td>Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Additionally, there may be severe property damage.</td>
</tr>
<tr>
<td><img src="image2" alt="Caution" /></td>
<td>Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.</td>
</tr>
</tbody>
</table>

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.

When you perform a test run, hold an emergency stop switch in your hand or otherwise prepare for rapid motor 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 a function block that changes an Enabled output variable to TRUE while the processing result is output normally, confirm that Enabled is TRUE before you use the processing result.
• If the Counter Mode is Rotary Mode for the master axis, this function block will always use the shortest way to judge positioning.
• If you use the processing result of this function block to output a command position to a motor, always specify the shortest way specification.
# Related Manuals

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

<table>
<thead>
<tr>
<th>Manual name</th>
<th>Cat. No.</th>
<th>Model numbers</th>
<th>Application</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NX-series CPU Unit Hardware User’s Manual</td>
<td>W535</td>
<td>NX701-xxxxxx</td>
<td>Learning the basic specifications of the NX-series NX701 CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided</td>
<td>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</td>
</tr>
<tr>
<td>NX-series NX1P2 CPU Unit Hardware User’s Manual</td>
<td>W578</td>
<td>NX1P2-xxxxxx</td>
<td>Learning the basic specifications of the NX-series NX1P2 CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided</td>
<td>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</td>
</tr>
<tr>
<td>NJ-series CPU Unit Hardware User’s Manual</td>
<td>W500</td>
<td>NJ501-xxxxxx, NJ301-xxxxxx, NJ101-xxxxxx</td>
<td>Learning the basic specifications of the NJ-series CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided</td>
<td>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</td>
</tr>
<tr>
<td>NY-series IPC Machine Controller Industrial Panel PC Hardware User’s Manual</td>
<td>W557</td>
<td>NYS32-xxxxxx</td>
<td>Learning the basic specifications of the NY-series Industrial Panel PCs, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided</td>
<td>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</td>
</tr>
<tr>
<td>NY-series IPC Machine Controller Industrial Box PC Hardware User’s Manual</td>
<td>W556</td>
<td>NYS12-xxxxxx</td>
<td>Learning the basic specifications of the NY-series Industrial Box PCs, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided</td>
<td>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</td>
</tr>
<tr>
<td>Manual name</td>
<td>Cat. No.</td>
<td>Model numbers</td>
<td>Application</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>----------</td>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>NJ/NX-series CPU Unit Software User’s Manual</td>
<td>W501</td>
<td>NX701-●●●●●●●● NJ501-●●●●●●●● NJ301-●●●●●●●● NJ101-●●●●●●●● NX1P2-●●●●●●●●</td>
<td>Learning how to program and set up an NJ/NX-series CPU Unit. Mainly software information is provided.</td>
<td>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</td>
</tr>
<tr>
<td>NY-series IPC Machine Controller Industrial Panel PC / Industrial Box PC Software User’s Manual</td>
<td>W558</td>
<td>NY532-●●●●●●●● NY512-●●●●●●●●</td>
<td>Learning how to program and set up the Controller functions of an NY-series Industrial PC</td>
<td>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</td>
</tr>
<tr>
<td>NY-series Instructions Reference Manual</td>
<td>W560</td>
<td>NY532-●●●●●●●● NY512-●●●●●●●●</td>
<td>Learning detailed specifications on the basic instructions of an NY-series Industrial PC</td>
<td>The instructions in the instruction set (IEC 61131-3 specifications) are described.</td>
</tr>
<tr>
<td>NJ/NX-series CPU Unit Motion Control User’s Manual</td>
<td>W507</td>
<td>NX701-●●●●●●●● NJ501-●●●●●●●● NJ301-●●●●●●●● NJ101-●●●●●●●● NX1P2-●●●●●●●●</td>
<td>Learning about motion control settings and programming concepts of an NJ/NX-series CPU Unit.</td>
<td>The settings and operation of the CPU Unit and programming concepts for motion control are described.</td>
</tr>
<tr>
<td>NY-series IPC Machine Controller Industrial Panel PC / Industrial Box PC Motion Control User’s Manual</td>
<td>W559</td>
<td>NY532-●●●●●●●● NY512-●●●●●●●●</td>
<td>Learning about motion control settings and programming concepts of an NY-series Industrial PC.</td>
<td>The settings and operation of the Controller and programming concepts for motion control are described.</td>
</tr>
<tr>
<td>NJ/NX-series Motion Control Instructions Reference Manual</td>
<td>W508</td>
<td>NX701-●●●●●●●● NJ501-●●●●●●●● NJ301-●●●●●●●● NJ101-●●●●●●●● NX1P2-●●●●●●●●</td>
<td>Learning about the specifications of the motion control instructions of an NJ/NX-series CPU Unit.</td>
<td>The motion control instructions are described.</td>
</tr>
<tr>
<td>NY-series Motion Control Instructions Reference Manual</td>
<td>W561</td>
<td>NY532-●●●●●●●● NY512-●●●●●●●●</td>
<td>Learning about the specifications of the motion control instructions of an NY-series Industrial PC.</td>
<td>The motion control instructions are described.</td>
</tr>
<tr>
<td>Sysmac Studio Version 1 Operation Manual</td>
<td>W504</td>
<td>SYSMAC-SE2-●●●●●●●●</td>
<td>Learning about the operating procedures and functions of the Sysmac Studio.</td>
<td>Describes the operating procedures of the Sysmac Studio.</td>
</tr>
</tbody>
</table>
Revision History

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

Cat. No. W546-E1-04

<table>
<thead>
<tr>
<th>Revision code</th>
<th>Date</th>
<th>Revised content</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>April 2015</td>
<td>Original production</td>
</tr>
<tr>
<td>02</td>
<td>December 2015</td>
<td>Corrected mistakes.</td>
</tr>
<tr>
<td>03</td>
<td>July 2016</td>
<td>Changed the manual name.</td>
</tr>
<tr>
<td>04</td>
<td>November 2016</td>
<td>Changed the manual name.</td>
</tr>
</tbody>
</table>
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**.

![Multiview Explorer](image)

**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.

![Library Selection](image)

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.
Procedure to Use Sysmac Libraries Installed Using the Installer

- 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.

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 Studio 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 them 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.

<table>
<thead>
<tr>
<th>Variable</th>
<th>I/O</th>
<th>Data type</th>
<th>Function/function block type to use</th>
<th>Meaning</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN</td>
<td>Input</td>
<td>BOOL</td>
<td>Execute</td>
<td>Execute</td>
<td>The processing is executed while the variable is TRUE.</td>
</tr>
<tr>
<td>Execute</td>
<td></td>
<td></td>
<td>Execute</td>
<td>Execute</td>
<td>The processing is executed when the variable changes to TRUE.</td>
</tr>
<tr>
<td>Enable</td>
<td></td>
<td></td>
<td>Run</td>
<td>Run</td>
<td>The processing is executed while the variable is TRUE.</td>
</tr>
<tr>
<td>Abort</td>
<td></td>
<td>BOOL</td>
<td>Abort</td>
<td>Abort</td>
<td>The processing is aborted. You can select the aborting method.</td>
</tr>
</tbody>
</table>
### Common Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>I/O</th>
<th>Data type</th>
<th>Function/function block type to use</th>
<th>Meaning</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENO</td>
<td>Output</td>
<td>BOOL</td>
<td>OK</td>
<td>Done</td>
<td>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.</td>
</tr>
<tr>
<td>Done</td>
<td>BOOL</td>
<td>OK</td>
<td></td>
<td>Done</td>
<td>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.</td>
</tr>
<tr>
<td>Busy</td>
<td>BOOL</td>
<td>OK</td>
<td>OK</td>
<td>Executing</td>
<td>The variable is TRUE when the processing is in progress. It is FALSE when the processing is not in progress.</td>
</tr>
<tr>
<td>CalcRslt</td>
<td>LREAL</td>
<td>OK</td>
<td></td>
<td>Calculation Result</td>
<td>The calculation result is output.</td>
</tr>
<tr>
<td>Enabled</td>
<td>BOOL</td>
<td>OK</td>
<td></td>
<td>Enabled</td>
<td>The variable is TRUE when the output is enabled. It is used to calculate the control amount for motion control, temperature control, etc.</td>
</tr>
<tr>
<td>Command Aborted</td>
<td>BOOL</td>
<td>OK</td>
<td></td>
<td>Command Aborted</td>
<td>The variable changes to TRUE when the processing is aborted. It changes to FALSE when the processing is re-executed the next time.</td>
</tr>
<tr>
<td>Error</td>
<td>BOOL</td>
<td>OK</td>
<td>OK</td>
<td>Error</td>
<td>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.</td>
</tr>
<tr>
<td>ErrorID</td>
<td>WORD</td>
<td>OK</td>
<td>OK</td>
<td>Error Code</td>
<td>An error code is output.</td>
</tr>
<tr>
<td>ErrorIDEx</td>
<td>DWORD</td>
<td>OK</td>
<td>OK</td>
<td>Expansion Error Code</td>
<td>An expansion error code is output.</td>
</tr>
</tbody>
</table>

### 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 continuously 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`, `CommandAborted`, and `Error` changes to FALSE when `Execute` is changed to FALSE.

• If `Execute` is FALSE and `Done`, `CommandAborted`, or `Error` changes to TRUE, `Done`, `CommandAborted`, 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

```
<table>
<thead>
<tr>
<th>Execute</th>
<th>Done</th>
<th>Busy</th>
<th>CommandAborted</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>ErrorID</th>
<th>ErrorIDEx</th>
</tr>
</thead>
<tbody>
<tr>
<td>16#0000</td>
<td></td>
</tr>
</tbody>
</table>
```

### Canceled Execution

```
<table>
<thead>
<tr>
<th>Execute</th>
<th>Abort</th>
<th>Busy</th>
<th>CommandAborted</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>ErrorID</th>
<th>ErrorIDEx</th>
</tr>
</thead>
<tbody>
<tr>
<td>16#0000</td>
<td></td>
</tr>
</tbody>
</table>
```

- **Aborted Execution**

  Execute
  Done
  Busy
  CommandAborted
  Error
  ErrorID 16#0000
  ErrorIDEx 16#00000000

- **Errors**

  Execute
  Done
  Busy
  CommandAborted
  Error
  ErrorID 16#0000 16#0000
  ErrorIDEx 16#00000000 16#00000000
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

![Timing Chart Diagram]
**Errors**

- **Enable**
- **Enabled**
- **CalcRslt**
- **Busy**
- **Error**
- **ErrorID**
- **ErrorIDEx**

ErrorIDEx: 16#00000000

ErrorID: 16#00000000

Busy: Retained

Error: Retained

ErrorID: 16#0000

ErrorIDEx: 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.
Specifications of Individual Function Blocks

<table>
<thead>
<tr>
<th>Function block name</th>
<th>Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPGFilter</td>
<td>MPG Filter</td>
<td>P. 32</td>
</tr>
</tbody>
</table>
The MPGFilter function block creates a command position for the specified axis according to an MPG input.

MPG is an acronym for manual pulse generator. An MPG is sometimes called a manual handle.

<table>
<thead>
<tr>
<th>Function block name</th>
<th>Name</th>
<th>FB/FUN</th>
<th>Graphic expression</th>
<th>ST expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPGFilter</td>
<td>MPG Filter</td>
<td>FB</td>
<td>MPGFilter_instance(</td>
<td>MPGFilter_instance(</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>\OmronLib\MC_TestRun\MPGFilter</td>
<td>Master:=parameter,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Slave:=parameter,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Enable:=parameter,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MPGSetRatios:=parameter,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MaxVel:=parameter,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MPGOpRatio:=parameter,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Enabled=&gt;parameter,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CalcRslt=&gt;parameter,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Busy=&gt;parameter,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Error=&gt;parameter,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ErrorID=&gt;parameter,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ErrorIDEx=&gt;parameter);</td>
</tr>
</tbody>
</table>

### Function Block and Function Information

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library file name</td>
<td>OmronLib_MC_TestRun_V1_1.slr</td>
</tr>
<tr>
<td>Namespace</td>
<td>OmronLib\MC_TestRun</td>
</tr>
<tr>
<td>Function block and function number</td>
<td>00001</td>
</tr>
<tr>
<td>Source code published/not published</td>
<td>Not published</td>
</tr>
<tr>
<td>Function block and function version</td>
<td>1.01</td>
</tr>
</tbody>
</table>

### Compatible Models

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
<th>Model numbers</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Devices</td>
<td>Encoder input device</td>
<td>NX-ECXXXX</td>
<td>Version 1.1 or later</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GX-EC0211/EC0241</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC Servo Drive</td>
<td>R88D-KNXXXX-ECT</td>
<td>Version 2.1 or later</td>
</tr>
<tr>
<td></td>
<td>NX-series Pulse Output Unit</td>
<td>NX-PG0XXXX</td>
<td>Version 1.1 or later</td>
</tr>
</tbody>
</table>
### Variables

#### Input Variables

<table>
<thead>
<tr>
<th>Meaning</th>
<th>Data type</th>
<th>Description</th>
<th>Valid range</th>
<th>Unit</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable</td>
<td>BOOL</td>
<td>TRUE: Execute</td>
<td>TRUE or FALSE</td>
<td>---</td>
<td>FALSE</td>
</tr>
<tr>
<td>MPGSetRatios</td>
<td>OmronLib\MC_TestRun\sMPG_SET_RATIOS</td>
<td>Set the four gear ratios used by the MPG.</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>MaxVel</td>
<td>LREAL</td>
<td>Set the maximum velocity.</td>
<td>Positive number or 0.0</td>
<td>0.0*1</td>
<td>---</td>
</tr>
<tr>
<td>MPG OprRatio</td>
<td>UINT</td>
<td>Specify the MPG gear ratio to use during execution.</td>
<td>1: First gear ratio 2: Second gear ratio 3: Third gear ratio 4: Fourth gear ratio</td>
<td>---</td>
<td>1</td>
</tr>
</tbody>
</table>

*1. A maximum velocity is not applied for a setting of 0.0.

#### Output Variables

<table>
<thead>
<tr>
<th>Meaning</th>
<th>Data type</th>
<th>Description</th>
<th>Valid range</th>
<th>Unit</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enabled</td>
<td>BOOL</td>
<td>Changes to TRUE when the function block is executed.</td>
<td>TRUE or FALSE</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>CalcRslt</td>
<td>LREAL</td>
<td>Outputs the position data calculated by the function block.</td>
<td>Depends on data type.</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Busy</td>
<td>BOOL</td>
<td>TRUE when the instruction is acknowledged.</td>
<td>TRUE or FALSE</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Error</td>
<td>BOOL</td>
<td>Outputs TRUE while there is an error.</td>
<td>TRUE or FALSE</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>ErrorID</td>
<td>WORD</td>
<td>Contains the error code when an error occurs.</td>
<td>*1</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>ErrorIDEx</td>
<td>DWORD</td>
<td>Contains the expansion error code when an error occurs.</td>
<td>*1</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

*1. Refer to Troubleshooting on page 40 for details.

#### In-Out Variables

<table>
<thead>
<tr>
<th>Meaning</th>
<th>Data type</th>
<th>Description</th>
<th>Valid range</th>
<th>Unit</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master</td>
<td>_sAXIS_REF</td>
<td>Specify the encoder axis connected to the MPG.</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Slave</td>
<td>_sAXIS_REF</td>
<td>Specify the servo axis to drive.</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
**Function**

The MPGFilter function block outputs to `CalcRslt`, a command position for the specified Slave Axis (Slave) according to the input value from the MPG that is set as the Master Axis (Master).

- When `Enabled` is TRUE, the actual current position of the master axis is output to `CalcRslt`.
- If an error occurs in this function block or if `Enable` changes to FALSE, the current value of `CalcRslt` is retained.
- If you use the processing result of this function block to output a command position to a slave axis (Slave) in Rotary Mode with a motion control instruction, set `Direction` to the shortest way (1: _mcShortestWay).
- Position information input to this function block from the master axis (Master) is managed by an input ring counter that operates for the shortest way. Therefore, if an MPG travel distance that is larger than half of the ring counter range is input in one task period, the motor may turn in an unexpected direction.
- Set the size of the input ring counter of the master axis (Master) to a value that is larger than the minimum ring counter size calculated with the following formula.

Minimum ring counter size = MPG pulse resolution × Maximum MPG travel distance per millisecond × Period of task in which this function block is executed

Here, the ring counter size is the travel distance from the Modulo Minimum Position Setting Value to the Modulo Maximum Position Setting Value in the position count settings in the axis parameters of the MC Function Module.
For details on the position count settings and ring counter, refer to the motion control user’s manual. As an example, the minimum ring counter size is 40 pulses under the following conditions. Therefore, set the distance from the Modulo Minimum Position Setting Value to the Modulo Maximum Position Setting Value in the position count settings in the axis parameters of the MC Function Module to a value that is greater than 40 pulses.

<table>
<thead>
<tr>
<th>Item</th>
<th>Set value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPG pulse resolution</td>
<td>2,000 pulses/rotation</td>
</tr>
<tr>
<td>Maximum MPG travel distance per millisecond</td>
<td>0.001 rotations/ms = 1 rotation/s</td>
</tr>
<tr>
<td>Period of task in which this function block is executed</td>
<td>10 ms</td>
</tr>
</tbody>
</table>

Minimum ring counter size = 2,000 pulses/rotation × 0.001 rotations/ms × 10 ms × 2 = 40 pulses
Precautions for Correct Use

- Confirm that *Enabled* is TRUE before you assign the Processing Result (*CalcRslt*) of this function block to the command position of the slave axis.
- If an error occurs in the Motion Control Function Module, reset the error in the Motion Control Function Module. For details, refer to the motion control user’s manual.
● MPG Set Gear Ratios (MPGSetRatios)

You can set four ratios in MPG Set Gear Ratios (MPGSetRatios). The values that are set in MPGSetRatios when Enable changes to TRUE are used.

The default values in MPGSetRatios are 0. Always set values before you use MPGSetRatios.

Select the gear ratio with MP Gear Ratio (MGOprRatio). If the numerator or denominator of the gear ratio selected with MGOprRatio is 0, an error will occur. You can change the value of MGOprRatio at any time while this function block is enabled.

<table>
<thead>
<tr>
<th>Name</th>
<th>Meaning</th>
<th>Description</th>
<th>Data type</th>
<th>Valid range</th>
<th>Unit</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPGSetRatios</td>
<td>MPG Set Gear Ratios</td>
<td>Set the four gear ratios used by the MPG.</td>
<td>OmronLib\MC_TestRun\sMPG_SET_RATIOS</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Ratio1_Num</td>
<td>First Gear Ratio Numerator</td>
<td>Set the numerator of the first gear ratio.</td>
<td>DINT</td>
<td>-10,000 to 10,000</td>
<td>----</td>
<td>0</td>
</tr>
<tr>
<td>Ratio1_Den</td>
<td>First Gear Ratio Denominator</td>
<td>Set the denominator of the first gear ratio.</td>
<td>DINT</td>
<td>1 to 10,000</td>
<td>----</td>
<td>0</td>
</tr>
<tr>
<td>Ratio2_Num</td>
<td>Second Gear Ratio Numerator</td>
<td>Set the numerator of the second gear ratio.</td>
<td>DINT</td>
<td>-10,000 to 10,000</td>
<td>----</td>
<td>0</td>
</tr>
<tr>
<td>Ratio2_Den</td>
<td>Second Gear Ratio Denominator</td>
<td>Set the denominator of the second gear ratio.</td>
<td>DINT</td>
<td>1 to 10,000</td>
<td>----</td>
<td>0</td>
</tr>
<tr>
<td>Ratio3_Num</td>
<td>Third Gear Ratio Numerator</td>
<td>Set the numerator of the third gear ratio.</td>
<td>DINT</td>
<td>-10,000 to 10,000</td>
<td>----</td>
<td>0</td>
</tr>
<tr>
<td>Ratio3_Den</td>
<td>Third Gear Ratio Denominator</td>
<td>Set the denominator of the third gear ratio.</td>
<td>DINT</td>
<td>1 to 10,000</td>
<td>----</td>
<td>0</td>
</tr>
<tr>
<td>Ratio4_Num</td>
<td>Fourth Gear Ratio Numerator</td>
<td>Set the numerator of the fourth gear ratio.</td>
<td>DINT</td>
<td>-10,000 to 10,000</td>
<td>----</td>
<td>0</td>
</tr>
<tr>
<td>Ratio4_Den</td>
<td>Fourth Gear Ratio Denominator</td>
<td>Set the denominator of the fourth gear ratio.</td>
<td>DINT</td>
<td>1 to 10,000</td>
<td>----</td>
<td>0</td>
</tr>
</tbody>
</table>
● **Restriction to Processing Result**

- If the result of multiplying the master axis velocity by the gear ratio exceeds the Maximum Velocity \((MaxVel)\), \(MaxVel\) is used as the upper limit to the command speed for the slave axis.
- If a value that exceeds the maximum jog velocity of the slave axis is set for \(MaxVel\), the maximum jog velocity is used as the upper limit to the command speed for the slave axis. The maximum jog velocity is set in the axis parameters. For details, refer to the motion control user’s manual.
- Travel distances that cause \(MaxVel\) to be exceeded are ignored.

![Diagram](image1)

● **Prohibiting Outputs Outside of the Operating Range**

If an error for a limit occurs in the MC Function Module, reset the error in the MC Function Module and then use the MPG to move the axis to within the normal range. You cannot move the axis in the opposite direction. Operation in the direction of the limit becomes possible when the normal range is entered from outside the software limit or limit input.

- Positive/Negative Software Limit Exceeded (16#64450000 or 16#64460000)
- Positive/Negative Limit Input Detected (16#644A0000 or 16#644B0000)

![Diagram](image2)
### Precautions for Correct Use

- You can use only the Rotary Mode for the Count Mode of the Master Axis (Master) input to this function block. An error occurs when the function block is executed if Linear Mode is set for the Count Mode of the Master Axis (Master). You can use either Linear Mode or Rotary Mode as the Count Mode of the Slave Axis (Slave).

- If you specify the same axis for the master axis (Master) and slave axis (Slave), a Master and Slave Defined as Same Axis minor fault (error code: 16#3C0E, expansion error code: 16#00000010) will occur.
Errors

If an error occurs during function block execution, Error will change to TRUE. You can find out the cause of the error by referring to the values output by ErrorID (Error Code) and ErrorIDEx (Expansion Error Code). Error is cleared when Enable to this function block changes to TRUE.

Precautions for Correct Use

- This function block uses the MC_ReadAxisParameter (Read Axis Parameters) instruction. Before you use this function block, read the precautions for correct use for the MC_ReadAxisParameter (Read Axis Parameters) instruction. Refer to the motion control instructions reference manual for information on the MC_ReadAxisParameter instruction.

- The axis parameters that are set when this function block is enabled are used by the function block. If you write the axis parameters with the MC_Write (Write MC Setting) instruction or MC_WriteAxisParameter (Write Axis Parameters) instruction, the written axis parameters are read.

- During execution of an instance, do not execute the same instance.

For details, refer to information on the MC_ReadAxisParameter instruction in the motion control instructions reference manual.
## Troubleshooting

<table>
<thead>
<tr>
<th>Error code</th>
<th>Expansion error code</th>
<th>Status (event name)</th>
<th>Description</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>16#0000</td>
<td>16#00000000</td>
<td>Normal end</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>16#3C0E</td>
<td>16#00000001</td>
<td>Input Value Out of Range</td>
<td>The MPGSetRatios input parameter for this function block exceeded the valid range for the input variable.</td>
<td>Correct the value set for MPGSetRatios so that it is within the valid range.</td>
</tr>
<tr>
<td>16#3C0E</td>
<td>16#00000002</td>
<td>Input Value Out of Range</td>
<td>The MaxVel input parameter for this function block exceeded the valid range for the input variable.</td>
<td>Correct the value set for MaxVel so that it is within the valid range.</td>
</tr>
<tr>
<td>16#3C0E</td>
<td>16#00000003</td>
<td>Instruction Execution Error Caused by Count Mode Setting</td>
<td>A Counter Mode other than Rotary Mode was specified for the axis specified with Master.</td>
<td>Set the axis specified with Master to Rotary Mode.</td>
</tr>
<tr>
<td>16#3C0E</td>
<td>16#00000004</td>
<td>Master Axis Type Error</td>
<td>The axis type of the axis specified with Master is not set to an encoder axis or a virtual encoder axis.</td>
<td>Specify an encoder axis or a virtual encoder axis for the axis specified with Master.</td>
</tr>
<tr>
<td>16#3C0E</td>
<td>16#00000005</td>
<td>Slave Axis Type Error</td>
<td>The axis type of the axis specified with Slave is not set to a servo axis or a virtual servo axis.</td>
<td>Set the axis specified with Slave to a servo axis or a virtual servo axis.</td>
</tr>
<tr>
<td>16#3C0E</td>
<td>16#00000007</td>
<td>MPG Gear Ratio Error</td>
<td>The axis specified for the MPGOperRatio input variable to the function block is out of range.</td>
<td>Correct the value set for MPGOperRatio so that it is within the valid range.</td>
</tr>
<tr>
<td>16#3C0E</td>
<td>16#00000008</td>
<td>MPG Output Position Overflow</td>
<td>An overflow occurred in the processing result (i.e., the slave axis command position) for this function block.</td>
<td>Make corrections so that the slave axis position does not overflow.</td>
</tr>
<tr>
<td>16#3C0E</td>
<td>16#00000009</td>
<td>MPG Output Position Underflow</td>
<td>An underflow occurred in the processing result (i.e., the slave axis command position) for this function block.</td>
<td>Make corrections so that the slave axis position does not underflow.</td>
</tr>
<tr>
<td>16#3C0E</td>
<td>16#00000010</td>
<td>Master and Slave Defined as Same Axis</td>
<td>The same axis is specified for the Master and Slave input variables to this function block.</td>
<td>Correct the parameters so that different axes are specified for the Master and Slave input variables to the instruction.</td>
</tr>
<tr>
<td>16#3C0E</td>
<td>16#00000011</td>
<td>Master Axis Parameter Read Failure</td>
<td>A failure occurred in reading the master axis parameters for the MC_ReadAxisParameter instruction that is used in this function block.</td>
<td>Remove the cause of the error according to the event code for the MC_ReadAxisParameter (Read Axis Parameters) instruction.</td>
</tr>
<tr>
<td>16#3C0E</td>
<td>16#00000012</td>
<td>Slave Axis Parameter Read Failure</td>
<td>A failure occurred in reading the slave axis parameters for the MC_ReadAxisParameter instruction that is used in this function block.</td>
<td>Remove the cause of the error according to the event code for the MC_ReadAxisParameter (Read Axis Parameters) instruction.</td>
</tr>
</tbody>
</table>
Sample Programming

This sample programming operates a servomotor based on a pulse signal input from an MPG.

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.

Conditions

- An MPG is assigned to an encoder axis in the Motion Control Function Module. It is used as the master axis. The Axis Variable is MC_Axis000.
- The servomotor is assigned to a servo axis and used as the slave axis. The Axis Variable is MC_Axis001.
- The first to fourth gear ratios are set to the following values (numerator, denominator) = (1,1), (10,1), (100,1), and (1000,1).
- The Second Gear Ratio (10,1) is used.

Processing

1. Confirm that the slave axis can communicate and then turn ON the servo for the slave axis.
2. Confirm that the master axis can communicate and that an error has not occurred in the slave axis, and then enable the MPGFilter function block.
3. If the MPGFilter function block is enabled and the slave axis status is Standstill, execute the MC_SyncMoveAbsolute instruction for the slave axis. Assign the processing result CalcPosition from the MPGFilter function block to the command position.
4. If an error occurs in the MPGFilter function block, execute the MC_ImmediateStop instruction for the slave axis.
5. If an error occurs in the slave axis, receive the reset command and execute the MC_Reset instruction for the slave axis.

Ladder Diagram

- External Variables

<table>
<thead>
<tr>
<th>Name</th>
<th>Data type</th>
<th>Constant</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC_Axis000</td>
<td>_sAXIS_REF</td>
<td>✓</td>
<td>Axis 0 (Master Axis)</td>
</tr>
<tr>
<td>MC_Axis001</td>
<td>_sAXIS_REF</td>
<td>✓</td>
<td>Axis 1 (Slave Axis)</td>
</tr>
<tr>
<td>_EC_PDSlavlTbl</td>
<td>ARRAY[1..512] OF BOOL*1</td>
<td>✓</td>
<td>Checking activity of process data communications</td>
</tr>
</tbody>
</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

<table>
<thead>
<tr>
<th>Name</th>
<th>Data type</th>
<th>Initial value</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPG_FILTER_instance</td>
<td>Omron-Lib\MC_TestRun\MPGFILTER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POWER1_instance</td>
<td>MC_Power</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYNC_MOVE-ABS1_instance</td>
<td>MC_SyncMoveAbsolute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IMD_STOP1_instance</td>
<td>MC_ImmediateStop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESET1_instance</td>
<td>MC_Reset</td>
<td></td>
<td></td>
</tr>
<tr>
<td>InitFlag</td>
<td>BOOL</td>
<td>FALSE</td>
<td>Parameters initialization</td>
</tr>
<tr>
<td>MasterNode</td>
<td>UINT</td>
<td>1</td>
<td>Master axis node address</td>
</tr>
<tr>
<td>SlaveNode</td>
<td>UINT</td>
<td>2</td>
<td>Slave axis node address</td>
</tr>
<tr>
<td>SetRatios</td>
<td>Omron-Lib\MC_TestRun\SetsRATIOS</td>
<td></td>
<td>First to fourth gear ratios</td>
</tr>
<tr>
<td>SelectRatio</td>
<td>UINT</td>
<td>0</td>
<td>Selected gear ratio</td>
</tr>
<tr>
<td>MaxVelocity</td>
<td>LREAL</td>
<td>0.0</td>
<td>Maximum slave axis velocity</td>
</tr>
<tr>
<td>SlaveServoOn</td>
<td>BOOL</td>
<td>FALSE</td>
<td>Servo ON for slave axis</td>
</tr>
<tr>
<td>CalcPosition</td>
<td>LREAL</td>
<td>0.0</td>
<td>Position calculated by MPGFilter function block</td>
</tr>
<tr>
<td>MPGOn</td>
<td>BOOL</td>
<td>FALSE</td>
<td>Start of MPGFilter function block</td>
</tr>
<tr>
<td>MPGFilterEn</td>
<td>BOOL</td>
<td>FALSE</td>
<td>MPGFilter function block enabled state</td>
</tr>
<tr>
<td>MPGFilterErr</td>
<td>BOOL</td>
<td>FALSE</td>
<td>MPGFilter function block error</td>
</tr>
<tr>
<td>ResetSlave</td>
<td>BOOL</td>
<td>FALSE</td>
<td>Slave axis error reset</td>
</tr>
</tbody>
</table>
● Programming

0

1

2

3

4

5

Sysmac Library User's Manual for MC Test Run Library (W546)
The contents of the inline ST are given below.

```plaintext
// Node Number
MasterNode:=MC_Axis000.Cfg.NodeAddress;
SlaveNode :=MC_Axis001.Cfg.NodeAddress;

// 1st Gear ratio
SetRatios.Ratio1_Den:=1;
SetRatios.Ratio1_Num:=1;

// 2nd Gear ratio
SetRatios.Ratio2_Den:=10;
SetRatios.Ratio2_Num:=1;

// 3rd Gear ratio
SetRatios.Ratio3_Den:=100;
SetRatios.Ratio3_Num:=1;

// 4th Gear ratio
SetRatios.Ratio4_Den:=1000;
SetRatios.Ratio4_Num:=1;

MaxVelocity:=1000.0;
SelectRatio:=2;
InitFlag:=FALSE;
```
## Structured Text (ST)

### External Variables

<table>
<thead>
<tr>
<th>Name</th>
<th>Data type</th>
<th>Constant</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC_Axis000</td>
<td>_sAXIS_REF</td>
<td>✓</td>
<td>Axis 0 (Master Axis)</td>
</tr>
<tr>
<td>MC_Axis001</td>
<td>_sAXIS_REF</td>
<td>✓</td>
<td>Axis 1 (Slave Axis)</td>
</tr>
<tr>
<td>_EC_PDSlavTbl</td>
<td>ARRAY[1..512] OF BOOL*1 ✓</td>
<td>Checking activity of process data communications</td>
<td></td>
</tr>
</tbody>
</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

<table>
<thead>
<tr>
<th>Name</th>
<th>Data type</th>
<th>Initial value</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPGFILTER_instance</td>
<td>Omron-Lib\MC_TestRun\MPGFILTER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POWER1_instance</td>
<td>MC_Power</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYNC_MOVE-ABS1_instance</td>
<td>MC_SyncMoveAbsolute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IMD_STOP1_instance</td>
<td>MC_ImmediateStop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESET1_instance</td>
<td>MC_Reset</td>
<td></td>
<td></td>
</tr>
<tr>
<td>InitFlag</td>
<td>BOOL</td>
<td>FALSE</td>
<td>Parameters initialization</td>
</tr>
<tr>
<td>MasterNode</td>
<td>UINT</td>
<td>1</td>
<td>Master axis node address</td>
</tr>
<tr>
<td>SlaveNode</td>
<td>UINT</td>
<td>2</td>
<td>Slave axis node address</td>
</tr>
<tr>
<td>SetRatios</td>
<td>Omron-Lib\MC_TestRun\sMPG_SET_RATIOS</td>
<td></td>
<td>First to fourth gear ratios</td>
</tr>
<tr>
<td>SelectRatio</td>
<td>UINT</td>
<td>0</td>
<td>Selected gear ratio</td>
</tr>
<tr>
<td>MaxVelocity</td>
<td>LREAL</td>
<td>0.0</td>
<td>Maximum slave axis velocity</td>
</tr>
<tr>
<td>SlaveServoOn</td>
<td>BOOL</td>
<td>FALSE</td>
<td>Servo ON for slave axis</td>
</tr>
<tr>
<td>Power1On</td>
<td>BOOL</td>
<td>FALSE</td>
<td>Servo ON status</td>
</tr>
<tr>
<td>CalcPosition</td>
<td>LREAL</td>
<td>0.0</td>
<td>Position calculated by MPGFilter function block</td>
</tr>
<tr>
<td>MPGOn</td>
<td>BOOL</td>
<td>FALSE</td>
<td>Start of MPGFilter function block</td>
</tr>
<tr>
<td>MPGFilterEn</td>
<td>BOOL</td>
<td>FALSE</td>
<td>MPGFilter function block enabled state</td>
</tr>
<tr>
<td>Power1Enable</td>
<td>BOOL</td>
<td>FALSE</td>
<td>MC_Power instance execution</td>
</tr>
<tr>
<td>MPGFilter1Enable</td>
<td>BOOL</td>
<td>FALSE</td>
<td>MPGFilter instance execution</td>
</tr>
<tr>
<td>SyncMove1Execute</td>
<td>BOOL</td>
<td>FALSE</td>
<td>MC_SyncMoveAbsolute instance execution</td>
</tr>
<tr>
<td>ImdStop1Execute</td>
<td>BOOL</td>
<td>FALSE</td>
<td>MC_ImmediateStop instance execution</td>
</tr>
<tr>
<td>Reset1Execute</td>
<td>BOOL</td>
<td>FALSE</td>
<td>MC_Reset instance execution</td>
</tr>
</tbody>
</table>
### Programming

// Set Parameters

```plaintext
IF ( InitFlag=FALSE ) THEN
  MasterNode:=MC_Axis000.Cfg.NodeAddress; // Master Axis's node number
  SlaveNode:=MC_Axis001.Cfg.NodeAddress;   // Slave Axis's node number

  // 1st Gear Ratio
  SetRatios.Ratio1_Num:=1;
  SetRatios.Ratio1_Den:=1;

  // 2nd Gear Ratio
  SetRatios.Ratio2_Num:=10;
  SetRatios.Ratio2_Den:=1;

  // 3rd Gear Ratio
  SetRatios.Ratio3_Num:=100;
  SetRatios.Ratio3_Den:=1;

  // 4th Gear Ratio
  SetRatios.Ratio4_Num:=1000;
  SetRatios.Ratio4_Den:=1;

  // Max Velocity
  MaxVelocity:=1000.0;

  // Select Ratio
  SelectRatio:=2;  // 2nd Gear Ratio

  // Flag Reset
  InitFlag:=FALSE;
END_IF;

// Slave's Servo On

// Check the Slave's EtherCAT process data communication available before it's Servo
// On will be started.

IF ( (SlaveServoOn=TRUE) AND (_EC_PDSlavTbl[SlaveNode]=TRUE) ) THEN
  Power1Enable:=TRUE;
ELSE
  Power1Enable:=FALSE;
END_IF;

// Calculate MPG data

// Check both the Master's EtherCAT process data communication and the Slave's status
// available, before MPGFilter will be started.

IF ( (MPGOn=TRUE) AND (_EC_PDSlavTbl[MasterNode]=TRUE) AND (MC_Axis001.Status.Error-
  Stop=FALSE) ) THEN
  MPGFilterEn:=TRUE;
ELSE
  MPGFilterEn:=FALSE;
END_IF;

// Output calculated MPG data to the Slave Axis using MC_SyncMoveAbsolute.

IF ( (MPGOn=TRUE) AND (Power1On=TRUE) AND (MPGFilterEn=TRUE) AND (MC_Axis000.Sta-
  tus.Disabled=TRUE) ) THEN
  SyncMove1Execute:=TRUE;
ELSE
  SyncMove1Execute:=FALSE;
END_IF;

// If the MPGFilter will be occurred Error event, the Slave Axis have to be stopped
// immediately.

IF (MPGFilterErr=TRUE) THEN
  ImdStop1Execute:=TRUE;
ELSE
  ImdStop1Execute:=FALSE;
END_IF;
```
// Reset the Slave Axis when it is Error Status
IF ( (ResetSlave=TRUE) AND (MC_Axis001.Status.ErrorStop=TRUE) ) THEN
  Reset1Execute:=TRUE;
ELSE
  Reset1Execute:=FALSE;
END_IF;

// Instance of MC_Power
POWER1_instance(
  Axis   :=MC_Axis001,
  Enable :=Power1Enable,
  Status =>Power1On,
  Busy   =>Power1Bsy,
  Error  =>Power1Err,
  ErrorID=>Power1ErrID);

// Instance of MPGFilter
MPGFILTER_instance(
  Master       :=MC_Axis000,
  Slave        :=MC_Axis001,
  Enable       :=MPGFilterEn,
  sMPGSetRatios:=SetRatios,
  MaxVel       :=MaxVelocity,
  MPG0prRatio  :=SelectRatio,
  Enabled      =>MPGFilterEn,
  CalcRslt     =>CalcPosition,
  Busy         =>MPGFilterBsy,
  Error        =>MPGFilterErr,
  ErrorID      =>MPGFilterErrID,
  ErrorIDEx    =>MPGFilterErrIDEx);

// Instance of MC_SyncMoveAbsolute
SYNC_MOVEABS1_instance(
  Axis          :=MC_Axis001,
  Execute       :=SyncMove1Execute,
  Position      :=CalcPosition,
  Direction     :=_mcShortestWay,
  BufferMode    :=_mcAborting,
  InPosition    =>SyncMove1InPos,
  Busy          =>SyncMove1Bsy,
  Active        =>SyncMove1Act,
  CommandAborted=>SyncMove1CA,
  Error         =>SyncMove1Err,
  ErrorID       =>SyncMove1ErrID);

// Instance of MC_ImmediateStop
IMD_STOP1_instance(
  Axis          :=MC_Axis001,
  Execute       :=ImdStop1Execute,
  StopMode      :=_mcImmediateStop,
  Done          =>ImdStop1Dn,
  Busy          =>ImdStop1Bsy,
  CommandAborted=>ImdStop1CA,
  Error         =>ImdStop1Err,
  ErrorID       =>ImdStop1ErrID);

// Instance of MC_Reset
RESET1_instance(
  Axis   :=MC_Axis001,
  Execute:=Reset1Execute,
  Done   =>Reset1Dn,
  Busy   =>Reset1Bsy,
  Failure=>Reset1Failure,
  Error  =>Reset1Err,
  ErrorID=>Reset1ErrID);
Appendix
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

<table>
<thead>
<tr>
<th>No.*1</th>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Library file name</td>
<td>The name of the library file</td>
</tr>
<tr>
<td>(2)</td>
<td>Library version</td>
<td>The version of the library</td>
</tr>
<tr>
<td>(3)</td>
<td>Author</td>
<td>The name of creator of the library</td>
</tr>
<tr>
<td>(4)</td>
<td>Comment</td>
<td>The description of the library*2</td>
</tr>
</tbody>
</table>

*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 51.

*2. It is provided in English and Japanese.

#### Attributes of Function Blocks and Functions

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

*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 51.

*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.

1. Library file name
2. Library version
3. Library author
4. Library comment
5. FB/FUN name
6. Name space
7. FB/FUN version
8. FB/FUN author
9. FB/FUN comment
(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.

(c) Ladder Editor

Place the mouse on a function block and function to display the library information in a tooltip.
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.
Controllers & I/O
- Machine Automation Controllers (MAC) • Motion Controllers  
- Programmable Logic Controllers (PLC) • Temperature Controllers • Remote I/O

Robotics
- Industrial Robots • Mobile Robots

Operator Interfaces
- Human Machine Interface (HMI)

Motion & Drives
- Machine Automation Controllers (MAC) • Motion Controllers • Servo Systems  
- Frequency Inverters

Vision, Measurement & Identification
- Vision Sensors & Systems • Measurement Sensors • Auto Identification Systems

Sensing
- Photoelectric Sensors • Fiber-Optic Sensors • Proximity Sensors  
- Rotary Encoders • Ultrasonic Sensors

Safety
- Safety Light Curtains • Safety Laser Scanners • Programmable Safety Systems  
- Safety Mats and Edges • Safety Door Switches • Emergency Stop Devices  
- Safety Switches & Operator Controls • Safety Monitoring/Force-guided Relays

Control Components
- Power Supplies • Timers • Counters • Programmable Relays  
- Digital Panel Meters • Monitoring Products

Switches & Relays
- Limit Switches • Pushbutton Switches • Electromechanical Relays  
- Solid State Relays

Software
- Programming & Configuration • Runtime