

Programmable Controller

**MELSEC iQ-F**  
series

**MELSEC iQ-F FX5  
Motion Module/  
Simple Motion Module  
User's Manual (Startup)**

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-FX5-40SSC-G  
-FX5-80SSC-G  
-FX5-40SSC-S  
-FX5-80SSC-S




# WHEN USING A SWITCHING HUB WITH CC-LINK IE TSN

To connect modules on CC-Link IE TSN, a dedicated TSN switching hub may be required depending on parameter settings or the network topology used.

Read the following carefully.

 Page 63 Switching hub



 MELSEC iQ-F FX5U Motion Module User's Manual (CC-Link IE TSN)



## SAFETY PRECAUTIONS

(Read these precautions before use.)

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

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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

|  |   |
|--|---|
|  <b>WARNING</b> | Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.                      |
|  <b>CAUTION</b> | Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage. |

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

It is important to follow all precautions for personal safety.

Store this manual in a safe place so that it can be read whenever necessary. Always forward it to the end user.

## [DESIGN PRECAUTIONS]

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### **WARNING**

- Make sure to set up the following safety circuits outside the PLC to ensure safe system operation even during external power supply problems or PLC failure. Otherwise, malfunctions may cause serious accidents.
    - Most importantly, set up the following: an emergency stop circuit, a protection circuit, an interlock circuit for opposite movements (such as normal vs. reverse rotation), and an interlock circuit (to prevent damage to the equipment at the upper and lower positioning limits).
    - Note that when the CPU module detects an error, such as a watchdog timer error, during self-diagnosis, all outputs are turned off. Also, when an error that cannot be detected by the CPU module occurs in an input/output control block, output control may be disabled. External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
    - Note that the output current of the 24 V DC service power supply varies depending on the model and the absence/presence of extension modules. If an overload occurs, the voltage automatically drops, inputs in the PLC are disabled, and all outputs are turned off. External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
    - Note that when an error occurs in a relay, transistor, or triac of an output circuit, the output might stay on or off. For output signals that may lead to serious accidents, external circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
  - Construct an interlock circuit in the program so that the whole system always operates on the safe side before executing the control (for data change) of the PLC in operation.

Read the manual thoroughly and ensure complete safety before executing other controls (for program change, parameter change, forcible output and operation status change) of the PLC in operation. Otherwise, the machine may be damaged and accidents may occur due to erroneous operations.
  - In an output circuit, when a load current exceeding the current rating or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
  - For the operating status of each station after a communication failure of the network, refer to relevant manuals for the network. Incorrect output or malfunction may result in an accident.
  - Especially, in the case of a control from an external device to a remote programmable controller, immediate action cannot be taken for a problem on the programmable controller due to a communication failure. Determine the handling method as a system when communication failure occurs along with configuration of interlock circuit on a program, by considering the external equipment and CPU module.
  - Do not write any data to the "system area" and "write-protect area" of the buffer memory in the module. Executing data writing to the "system area" or "write protect area" may cause malfunction of the programmable controller alarm. For the "system area" or "write-protect area", refer to "List of Buffer Memory Addresses" in MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application) and "Buffer Memory" in MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN).
  - If a communication cable is disconnected, the network may be unstable, resulting in a communication failure of multiple stations. Construct an interlock circuit in the program so that the system always operates on the safe side even if communications fail. Incorrect output or malfunction may result in an accident.
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## **WARNING**

### [Precautions for using products in a UL/cUL Class I, Division 2 environment]

- Products\*<sup>1</sup> with the Cl.I, DIV.2 mark on the rating plate are suitable for use in Class I, Division 2, Groups A, B, C and D hazardous locations, or nonhazardous locations only.  
This mark indicates that the product is certified for use in the Class I, Division 2 environment where flammable gases, vapors, or liquids exist under abnormal conditions. When using the products in the Class I, Division 2 environment, observe the following conditions to reduce the risk of explosion.
  - This device is open-type and is to be installed in an enclosed area under suitable environment which requires a tool or key to open.
  - Warning - Explosion Hazard - Substitution of any component may impair suitability for Class I, Division 2.
  - Warning - Explosion Hazard - Do not disconnect equipment while the circuit is live or unless the area is known to be free of ignitable concentrations.
  - Do not open the cover of the CPU module and remove the battery unless the area is known to be nonhazardous.

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\*1 Products conforming to the UL explosion-proof standard are as follows.

Manufactured in October 2017 onwards

· FX5 CPU module

FX5UC-32MT/D, FX5UC-32MT/DSS, FX5UC-64MT/D, FX5UC-64MT/DSS, FX5UC-96MT/D, FX5UC-96MT/DSS

· FX5 extension module

FX5-C16EX/D, FX5-C16EX/DS, FX5-C16EYT/D, FX5-C16EYT/DSS, FX5-C32EX/D, FX5-C32EX/DS, FX5-C32EYT/D, FX5-C32EYT/DSS, FX5-C32ET/D, FX5-C32ET/DSS, FX5-232ADP, FX5-485ADP, FX5-C1PS-5V, FX5-CNV-BUSC, FX5-4AD-ADP, FX5-4DA-ADP

### [DESIGN PRECAUTIONS]

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## **CAUTION**

- When an inductive load such as a lamp, heater, or solenoid valve is controlled, a large current (approximately ten times greater than normal) may flow when the output is turned from off to on. Take proper measures so that the flowing current does not exceed the value corresponding to the maximum load specification of the resistance load.
- After the CPU module is powered on or is reset, the time taken to enter the RUN status varies depending on the system configuration, parameter settings, and/or program size.  
Design circuits so that the entire system will always operate safely, regardless of this variation in time.
- Simultaneously turn on and off the power supplies of the CPU module and extension modules.
- If a long-time power failure or an abnormal voltage drop occurs, the PLC stops, and output is turned off. When the power supply is restored, it will automatically restart (when the RUN/STOP/RESET switch is on RUN side).

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### [SECURITY PRECAUTIONS]

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## **WARNING**

- To maintain the security (confidentiality, integrity, and availability) of the programmable controller and the system against unauthorized access, denial-of-service (DoS) attacks, computer viruses, and other cyberattacks from unreliable networks and devices via network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.

## [INSTALLATION PRECAUTIONS]

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### **WARNING**

- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work. Failure to do so may cause electric shock or damage to the product.
  - Use the product within the generic environment specifications described in the generic specifications of the user's manual (Hardware) of the CPU module to use.  
Never use the product in areas with excessive dust, oily smoke, conductive dusts, corrosive gas (salt air, Cl<sub>2</sub>, H<sub>2</sub>S, SO<sub>2</sub> or NO<sub>2</sub>), flammable gas, vibration or impacts, or expose it to high temperature, condensation, or rain and wind.  
If the product is used in such conditions, electric shock, fire, malfunctions, deterioration or damage may occur.
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## [INSTALLATION PRECAUTIONS]

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### **CAUTION**

- Do not touch the conductive parts of the product directly. Doing so may cause device failures or malfunctions.
  - When drilling screw holes or wiring, make sure that cutting and wiring debris do not enter the ventilation slits of the PLC. Failure to do so may cause fire, equipment failures or malfunctions.
  - For product supplied together with a dust proof sheet, the sheet should be affixed to the ventilation slits before the installation and wiring work to prevent foreign objects such as cutting and wiring debris.  
However, when the installation work is completed, make sure to remove the sheet to provide adequate ventilation. Failure to do so may cause fire, equipment failures or malfunctions.
  - Install the product on a flat surface. If the mounting surface is rough, undue force will be applied to the PC board, thereby causing nonconformities.
  - Install the product securely using a DIN rail or mounting screws.
  - Connect the expansion board and expansion adapter securely to their designated connectors. Loose connections may cause malfunctions.
  - Make sure to affix the expansion board with tapping screws. Tightening torque should follow the specifications in the user's manual (Hardware) of the CPU module to use. If the screws are tightened outside of the specified torque range, poor connections may cause malfunctions.
  - Work carefully when using a screwdriver such as installation of the product. Failure to do so may cause damage to the product or accidents.
  - Connect the extension cables, peripheral device cables, input/output cables and battery connecting cable securely to their designated connectors. Loose connections may cause malfunctions.
  - When using an SD memory card, insert it into the SD memory card slot. Check that it is inserted completely. Poor contact may cause malfunction.
  - Turn off the power to the PLC before attaching or detaching the following devices. Failure to do so may cause equipment failures or malfunctions.
    - Peripheral devices, expansion board, expansion adapter, and connector conversion adapter
    - Extension modules, bus conversion module, and connector conversion module
    - Battery
-

## [WIRING PRECAUTIONS]

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### **WARNING**

- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work. Failure to do so may cause electric shock or damage to the product.
  - Make sure to attach the terminal cover, provided as an accessory, before turning on the power or initiating operation after installation or wiring work. Failure to do so may cause electric shock.
  - The temperature rating of the cable should be 80°C or more.  
It may differ depending on the extension devices. Refer to the user's manual of the extension device to use for the details.
  - Make sure to wire the screw terminal block in accordance with the following precautions. Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
    - The disposal size of the cable end should follow the dimensions described in the user's manual (Hardware) of the CPU module to use.
    - Tightening torque should follow the specifications in the user's manual (Hardware) of the CPU module to use.
    - Tighten the screws using a Phillips-head screwdriver No. 2 (shaft diameter 6 mm (0.24") or less). Make sure that the screwdriver does not touch the partition part of the terminal block.
  - Make sure to properly wire to the terminal block (European type) in accordance with the following precautions. Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
    - The disposal size of the cable end should follow the dimensions described in the user's manual (Hardware) of the CPU module to use.
    - Tightening torque should follow the specifications in the user's manual (Hardware) of the CPU module to use.
    - Twist the ends of stranded wires and make sure that there are no loose wires.
    - Do not solder-plate the electric wire ends.
    - Do not connect more than the specified number of wires or electric wires of unspecified size.
    - Affix the electric wires so that neither the terminal block nor the connected parts are directly stressed.
  - Make sure to properly wire to the spring clamp terminal block in accordance with the following precautions. Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
    - The disposal size of the cable end should follow the dimensions described in the user's manual (Hardware) of the CPU module to use.
    - Twist the ends of stranded wires and make sure that there are no loose wires.
    - Do not solder-plate the electric wire ends.
    - Do not connect more than the specified number of wires or electric wires of unspecified size.
    - Affix the electric wires so that neither the terminal block nor the connected parts are directly stressed.
-

## [WIRING PRECAUTIONS]

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### CAUTION

- Do not supply power to the [24 +] and [24 V] terminals (24 V DC service power supply) on the CPU module or extension modules. Doing so may cause damage to the product.
  - Perform class D grounding (grounding resistance: 100  $\Omega$  or less) of the grounding terminal on the CPU module and extension modules with a wire 2 mm<sup>2</sup> or thicker.  
Do not use common grounding with heavy electrical systems. Refer to the user's manual (Hardware) of the CPU module to use for the details.
  - Connect the power supply wiring to the dedicated terminals described in the user's manual (Hardware) of the CPU module to use. If an AC power supply is connected to a DC input/output terminal or DC power supply terminal, the PLC will burn out.
  - Do not wire vacant terminals externally. Doing so may damage the product.
  - Install module so that excessive force will not be applied to terminal blocks, power connectors, I/O connectors, communication connectors, or communication cables. Failure to do so may result in wire damage/breakage or PLC failure.
  - Make sure to observe the following precautions in order to prevent any damage to the machinery or accidents due to malfunction of the PLC caused by abnormal data written to the PLC due to the effects of noise.
    - Do not bundle the power line, control line and communication cables together with or lay them close to the main circuit, high-voltage line, load line or power line. As a guideline, lay the power line, control line and communication cables at least 100 mm (3.94") away from the main circuit, high-voltage line, load line or power line.
    - Ground the shield of the shield wire or shielded cable at one point on the PLC. However, do not use common grounding with heavy electrical systems.
    - Ground the shield of the analog input/output cable at one point on the signal receiving side. However, do not use common grounding with heavy electrical systems.
-



## [STARTUP AND MAINTENANCE PRECAUTIONS]

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### **WARNING**

- Do not touch any terminal while the PLC's power is on. Doing so may cause electric shock or malfunctions.
- Before cleaning or retightening terminals, cut off all phases of the power supply externally. Failure to do so in the power ON status may cause electric shock.
- Before modifying the program in operation, forcible output, running or stopping the PLC, read through the manual carefully, and ensure complete safety. An operation error may damage the machinery or cause accidents.
- Do not change the program in the PLC from two or more peripheral equipment devices at the same time. (i.e. from an engineering tool and a GOT) Doing so may cause destruction or malfunction of the PLC program.
- Use the battery for memory backup in conformance to the user's manual (Hardware) of the CPU module to use.
  - Use the battery for the specified purpose only.
  - Connect the battery correctly.
  - Do not charge, disassemble, heat, put in fire, short-circuit, connect reversely, weld, swallow or burn the battery, or apply excessive forces (vibration, impact, drop, etc.) to the battery.
  - Do not store or use the battery at high temperatures or expose to direct sunlight.
  - Do not expose to water, bring near fire or touch liquid leakage or other contents directly.
  - When replacing the battery, make sure to use our specified product (FX3U-32BL).
  - When a battery error occurs ("BAT" LED is lit in red), follow the description in the user's manual (Hardware) of the CPU module to use.

Incorrect handling of the battery may cause excessive generation, bursting, ignition, liquid leakage or deformation, and lead to injury, fire or failures and malfunction of facilities and other equipment.

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## [STARTUP AND MAINTENANCE PRECAUTIONS]

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### **CAUTION**

- Do not disassemble or modify the PLC. Doing so may cause fire, equipment failures, or malfunctions. For repair, contact your local Mitsubishi Electric representative.
  - After the first use of the SD memory card, do not insert/remove the memory card more than 500 times. 500 times or more may cause malfunction.
  - Turn off the power to the PLC before connecting or disconnecting any extension cable. Failure to do so may cause equipment failures or malfunctions.
  - Turn off the power to the PLC before attaching or detaching the following devices. Failure to do so may cause equipment failures or malfunctions.
    - Peripheral devices, expansion board, expansion adapter, and connector conversion adapter
    - Extension modules, bus conversion module, and connector conversion module
    - Battery
  - Do not use the chemicals for cleaning.
  - If there is the possibility of touching the PLC inside a control panel in maintenance, make sure to discharge to avoid the influence of static electricity.
  - Since there are risks such as burn injuries, please do not touch the surface of the equipment with bare hands when it is operating in an environment which exceeds ambient temperature of 50°C.
-

## [OPERATION PRECAUTIONS]

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### CAUTION

- Construct an interlock circuit in the program so that the whole system always operates on the safe side before executing the control (for data change) of the PLC in operation. Read the manual thoroughly and ensure complete safety before executing other controls (for program change, parameter change, forcible output and operation status change) of the PLC in operation. Otherwise, the machine may be damaged and accidents may occur by erroneous operations.
- 

## [DISPOSAL PRECAUTIONS]

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### CAUTION

- Please contact a certified electronic waste disposal company for the environmentally safe recycling and disposal of your device.
  - When disposing of batteries, separate them from other waste according to local regulations. For details on the Battery Directive in EU countries, refer to the user's manual (Hardware) of the CPU module to use.
- 

## [TRANSPORTATION PRECAUTIONS]

---

### CAUTION

- When transporting the PLC with the optional battery, turn on the PLC before shipment, confirm that the battery mode is set using a parameter and the BAT LED is OFF, and check the battery life. If the PLC is transported with the BAT LED ON or the battery exhausted, the battery-backed data may be unstable during transportation.
  - The PLC is a precision instrument. During transportation, avoid impacts larger than those specified in the general specifications by using dedicated packaging boxes and shock-absorbing palettes. Failure to do so may cause failures in the PLC. After transportation, verify operation of the PLC and check for damage of the mounting part, etc. For details on the general specifications, refer to the user's manual (Hardware) of the CPU module to use.
  - When transporting lithium batteries, follow required transportation regulations. For details on the regulated products, refer to the user's manual (Hardware) of the CPU module to use.
  - When fumigants that contain halogen materials such as fluorine, chlorine, bromine, and iodine used for disinfecting and protecting wooden packaging from insects, they cause malfunction when entering our products. Please take necessary precautions to ensure that remaining materials from fumigant do not enter our products, or treat packaging with methods other than fumigation (heat method). Additionally, disinfect and protect wood from insects before packing products.
-

# INTRODUCTION

Thank you for purchasing the Mitsubishi Electric MELSEC iQ-F series programmable controllers.

This manual describes the functions and programming of the relevant products listed below. Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the MELSEC iQ-F series programmable controller to handle the product correctly.

When applying the program examples provided in this manual to an actual system, ensure the applicability and confirm that it will not cause system control problems.

Please make sure that the end users read this manual.

## Relevant products

FX5-40SSC-S, FX5-80SSC-S, FX5-40SSC-G, FX5-80SSC-G

### Point

Symbols used in this manual are shown below.

A serial No. is inserted in the "\*\*\*\*" mark.

- [Pr.\*\*]: Symbols indicating positioning parameter or home position return parameter items
- [Da.\*\*]: Symbols indicating positioning data or block start data items
- [Md.\*\*]: Symbols indicating monitor data items
- [Cd.\*\*]: Symbols indicating control data items
- [FX5-SSC-S]: Symbols indicating compatibility with only FX5-SSC-S
- [FX5-SSC-G]: Symbols indicating compatibility with only FX5-SSC-G

## Regarding use of this product

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult Mitsubishi Electric.
- This product has been manufactured under strict quality control. However when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

## Note

- If in doubt at any stage during the installation of the product, always consult a professional electrical engineer who is qualified and trained in the local and national standards. If in doubt about the operation or use, please consult the nearest Mitsubishi Electric representative.
- Since the examples indicated by this manual, technical bulletin, catalog, etc. are used as a reference, please use it after confirming the function and safety of the equipment and system. Mitsubishi Electric will accept no responsibility for actual use of the product based on these illustrative examples.
- This manual content, specification etc. may be changed, without a notice, for improvement.
- The information in this manual has been carefully checked and is believed to be accurate; however, if you notice a doubtful point, an error, etc., please contact the nearest Mitsubishi Electric representative. When doing so, please provide the manual number given at the end of this manual.

# CONTENTS

|  |           |
|--|-----------|
| WHEN USING A SWITCHING HUB WITH CC-LINK IE TSN                     | 1         |
| SAFETY PRECAUTIONS   | 1         |
| INTRODUCTION   | 9         |
| RELATED MANUALS  | 12        |
| TERMS  | 13        |
| PERIPHERALS  | 14        |
| <b>CHAPTER 1 PART NAMES</b>  | <b>16</b> |
| 1.1 LED Display Specifications                                     | 18        |
| <b>CHAPTER 2 SPECIFICATIONS</b>                                    | <b>20</b> |
| 2.1 General Specifications   | 20        |
| 2.2 Power Supply Specifications                                    | 20        |
| 2.3 Performance Specifications                                     | 20        |
| 2.4 Specifications of Interfaces with External Devices [FX5-SSC-S] | 22        |
| Electrical specifications of input signals                         | 22        |
| 2.5 External Circuit Design  | 24        |
| <b>CHAPTER 3 FUNCTION LIST</b>                                     | <b>41</b> |
| 3.1 Control Functions  | 41        |
| Main functions   | 41        |
| Sub functions  | 44        |
| Common functions   | 46        |
| 3.2 Combination of Main Functions and Sub Functions                | 47        |
| 3.3 Network Function List [FX5-SSC-G]                              | 53        |
| <b>CHAPTER 4 PROCEDURES BEFORE OPERATIONS</b>                      | <b>54</b> |
| <b>CHAPTER 5 WIRING</b>  | <b>56</b> |
| 5.1 Wiring [FX5-SSC-S]   | 56        |
| Precautions  | 56        |
| 5.2 Wiring [FX5-SSC-G]   | 62        |
| Wiring for CC-Link IE TSN  | 62        |
| Precautions  | 63        |
| 5.3 Power supply wiring  | 64        |
| 5.4 Grounding  | 65        |
| 5.5 External Input Connection Connector [FX5-SSC-S]                | 66        |
| Signal layout for external input connection connector              | 66        |
| List of input signal details                                       | 67        |
| Interface internal circuit   | 68        |
| <b>APPENDICES</b>  | <b>71</b> |
| Appendix 1 Component List [FX5-SSC-S]                              | 71        |
| Reference product  | 71        |
| Appendix 2 Component List [FX5-SSC-G]                              | 79        |
| Appendix 3 Connection with External Devices [FX5-SSC-S]            | 80        |
| Connector  | 80        |
| External input signal cable  | 81        |

|  |                |
|--|----------------|
| <b>Appendix 4 How to Check the SERIAL No.</b> .....                    | <b>84</b>      |
| <b>Appendix 5 External Dimensions</b> .....                            | <b>86</b>      |
| <b>Appendix 6 Standard Compliant Models</b> .....                      | <b>88</b>      |
| Models compliant with UL and cUL standards .....                       | 88             |
| EC Directive (CE marking) compliance .....                             | 88             |
| Measures to comply with the EMC Directive .....                        | 88             |
| Precautions for compliance with the EC Directive .....                 | 89             |
| <b>Appendix 7 Open Source Software</b> .....                           | <b>90</b>      |
| <b>Appendix 8 Operation Examples</b> .....                             | <b>92</b>      |
| Operation example [FX5-SSC-S] .....                                    | 92             |
| Program Examples Using Labels [FX5-SSC-S] .....                        | 95             |
| Program Examples Using Buffer Memory [FX5-SSC-S] .....                 | 99             |
| <b>Appendix 9 Setting Example for Motion Modules (FX5-SSC-G)</b> ..... | <b>105</b>     |
| <br><b>INDEX</b> .....   | <br><b>116</b> |
| <hr/>  |                |
| REVISIONS .....  | 118            |
| WARRANTY .....   | 119            |
| TRADEMARKS .....   | 120            |


# RELATED MANUALS


| Manual name [manual number]   | Description  | Available form                |
|---|--|-------------------------------|
| MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Startup) [IB-0300251ENG] (This manual)        | Specifications, procedures before operation, system configuration, wiring, and operation examples of the Motion Module/Simple Motion module      | Print book<br>e-Manual<br>PDF |
| MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application) [IB-0300253ENG]                  | Functions, input/output signals, buffer memories, parameter settings, programming, and troubleshooting of the Motion Module/Simple Motion module | Print book<br>e-Manual<br>PDF |
| MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control) [IB-0300255ENG] | Functions and programming for the synchronous control of the Motion Module/Simple Motion module  | Print book<br>e-Manual<br>PDF |
| MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN) [IB-0300568ENG]                                    | Functions, parameter settings, troubleshooting, and buffer memories of the CC-Link IE TSN network  | Print book<br>e-Manual<br>PDF |

This manual does not include detailed information on the followings:

- General specifications
- Available CPU modules and the number of mountable modules
- Installation

For details, refer to the following.

 MELSEC iQ-F FX5U User's Manual (Hardware)

 MELSEC iQ-F FX5UC User's Manual (Hardware)

## Point

e-Manual refers to the Mitsubishi FA electronic book manuals that can be browsed using a dedicated tool.

e-Manual has the following features:

- Required information can be cross-searched in multiple manuals.
- Other manuals can be accessed from the links in the manual.
- The hardware specifications of each part can be found from the product figures.
- Pages that users often browse can be bookmarked.
- Sample programs can be copied to an engineering tool.

# TERMS

Unless otherwise specified, this manual uses the following terms.

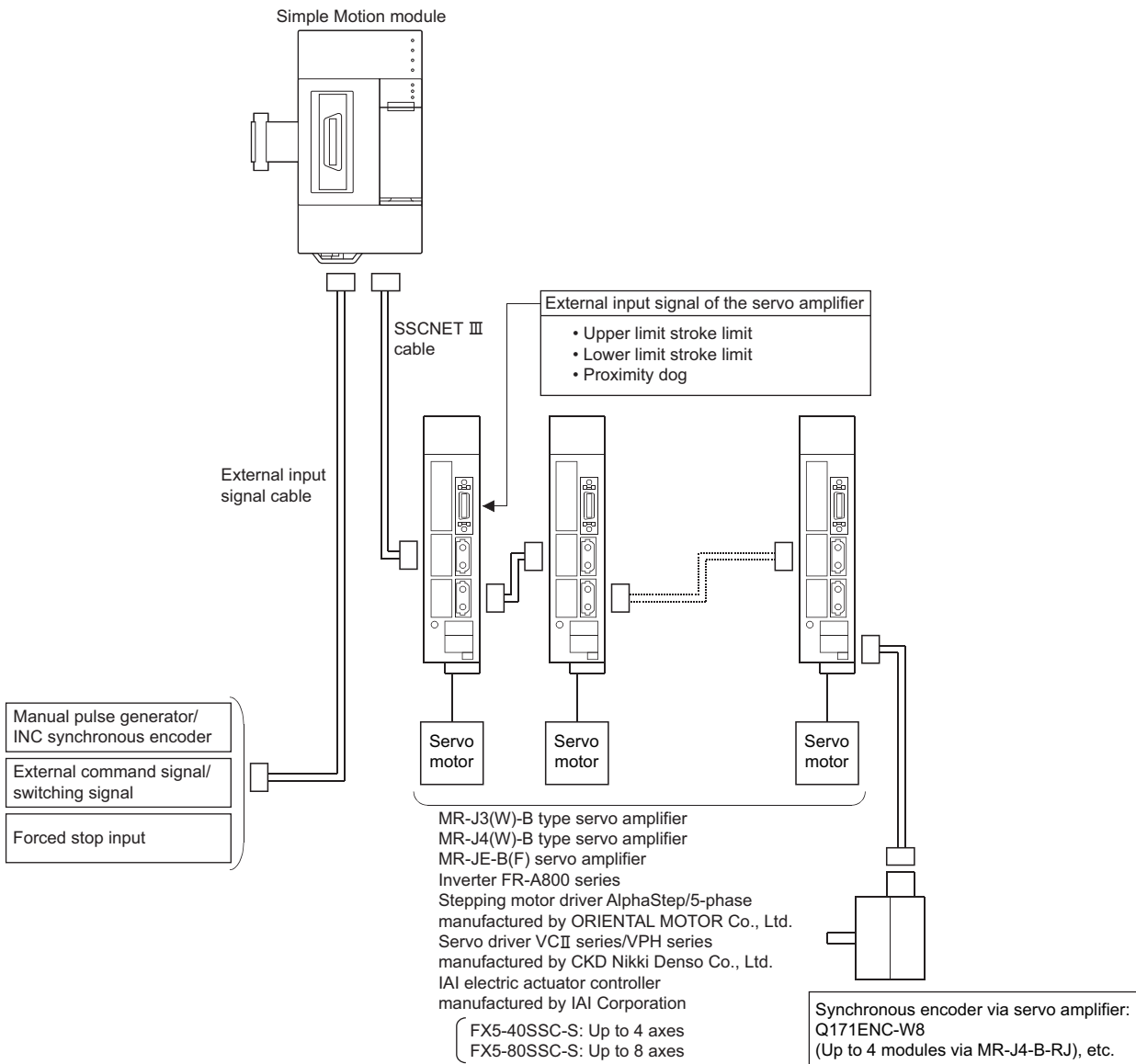
| Term                    | Description   |
|-------------------------|---|
| 4-axis module           | Another term for FX5-40SSC-S and FX5-40SSC-G  |
| 8-axis module           | Another term for FX5-80SSC-S and FX5-80SSC-G  |
| Axis                    | Another term for a servo amplifier  |
| Buffer memory           | A memory in an intelligent function module, where data (such as setting values and monitoring values) are stored. When using the CPU module, the memory is indicated for storing data (such as setting values and monitored values) of the Ethernet function and data used for data communication of the multiple CPU function. |
| CPU module              | The abbreviation for the MELSEC iQ-F series CPU module  |
| Cyclic transmission     | A function by which data are periodically exchanged among stations on the same network using a link device  |
| Data link               | Cyclic transmission and transient transmission  |
| Device                  | A device (X, Y, M, D, or others) in a CPU module  |
| Engineering tool        | A generic term for GX Works3 and MR Configurator2   |
| FX5-SSC-G               | A generic term for the FX5-40SSC-G and FX5-80SSC-G Motion module  |
| FX5-SSC-S               | A generic term for the FX5-40SSC-S and FX5-80SSC-S Simple Motion module   |
| Global label            | A label that is enabled for all program data when creating multiple program data in the project. There are two types of global labels: module label that is automatically generated by GX Works3 and label that can be created for the any of the specified devices.  |
| GX Works3               | The product name of the software package for the MELSEC programmable controllers ([FX5-SSC-S] version 1.007H or later, and [FX5-SSC-G] version 1.072A or later)   |
| Intelligent module      | A module such as the Simple Motion module/Motion module in the MELSEC iQ-F series that contains functions other than I/O functions  |
| Label                   | A label that represents a device in a given character string  |
| Module label            | A label that represents one of memory areas (I/O signals and buffer memory areas) specific to each module in a given character string. GX Works3 automatically generates this label, which can be used as a global label.   |
| Motion module           | An abbreviation for the MELSEC iQ-F series Motion module  |
| MR Configurator2        | The product name of the setup software for the servo amplifier ([FX5-SSC-S] version 1.34L or later, and [FX5-SSC-G] version 1.120A or later)  |
| MR-J3(W)-B              | MR-J3-_B_(-RJ)/MR-J3W-_B_ Servo amplifier series  |
| MR-J4(B)-RJ             | MR-J4-_B_-RJ Servo amplifier series   |
| MR-J4(W)-B              | MR-J4-_B_(-RJ)/MR-J4W-_B_ Servo amplifier series  |
| MR-J5(W)-G              | MR-J5-_G_(-RJ)/MR-J5W-_G_ Servo amplifier series  |
| MR-JE-B(F)              | MR-JE-_B_(F) Servo amplifier series   |
| MR-JET-G                | MR-JET-_G_ Servo amplifier series   |
| Safety main module      | Different name for FX5-SF-MU4T5   |
| Safety expansion module | Generic term for expansion modules installed to a safety main module  |
| Safety extension module | Generic term for safety main modules and safety expansion modules   |
| Servo amplifier         | A generic term for a drive unit<br>Unless specified in particular, indicates the motor driver unit of the sequential command method which is controlled by the Simple Motion module/Motion module (belonging to own station).   |
| Servo network           | A general term for a network between the Simple motion module/Motion module and the drive unit. <ul style="list-style-type: none"> <li>• SSCNETⅢ/H, SSCNETⅢ</li> <li>• CC-Link IE TSN</li> </ul>  |
| Simple Motion module    | The abbreviation for the MELSEC iQ-F series Simple Motion module  |
| SSCNETⅢ*1               | High speed synchronous communication network between Simple Motion module and servo amplifier   |
| SSCNETⅢ/H*1             |   |
| SSCNETⅢ(/H)             | A generic term for SSCNETⅢ/H, SSCNETⅢ   |
| Transient transmission  | A function used to perform communication with another station when requested by a dedicated instruction or from the engineering tool.   |

\*1 SSCNET: Servo System Controller NETwork

# PERIPHERALS

## Peripherals for FX5-SSC-S

The following figure shows the peripherals when the FX5-SSC-S is used.



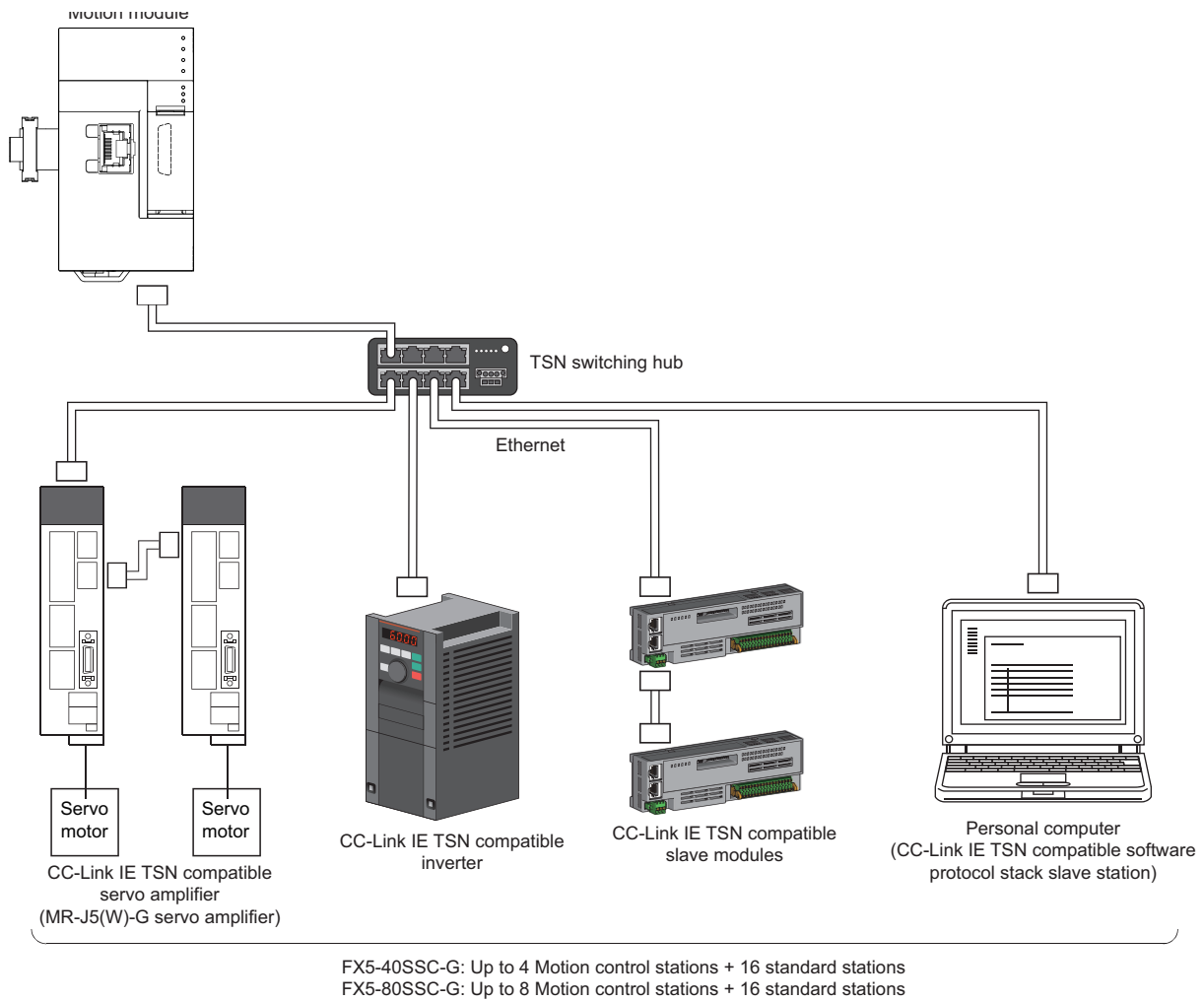
### Point

The external input signal cannot be used depending on the connected device. Confirm the specification of the connected device.



## Peripherals for FX5-SSC-G

The following figure shows the peripherals when the FX5-SSC-G is used.



Using the table below, refer to the manual that is appropriate for the input signal to be used.

| Input signal  | Reference   |
|---|---|
| <ul style="list-style-type: none"> <li>External command signal/switching signal</li> <li>Forced stop input signal</li> <li>Manual pulse generator input signal</li> </ul> | <ul style="list-style-type: none"> <li>MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application)</li> </ul>                  |
| <ul style="list-style-type: none"> <li>Incremental synchronous encoder input signal</li> </ul>  | <ul style="list-style-type: none"> <li>MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control)</li> </ul> |

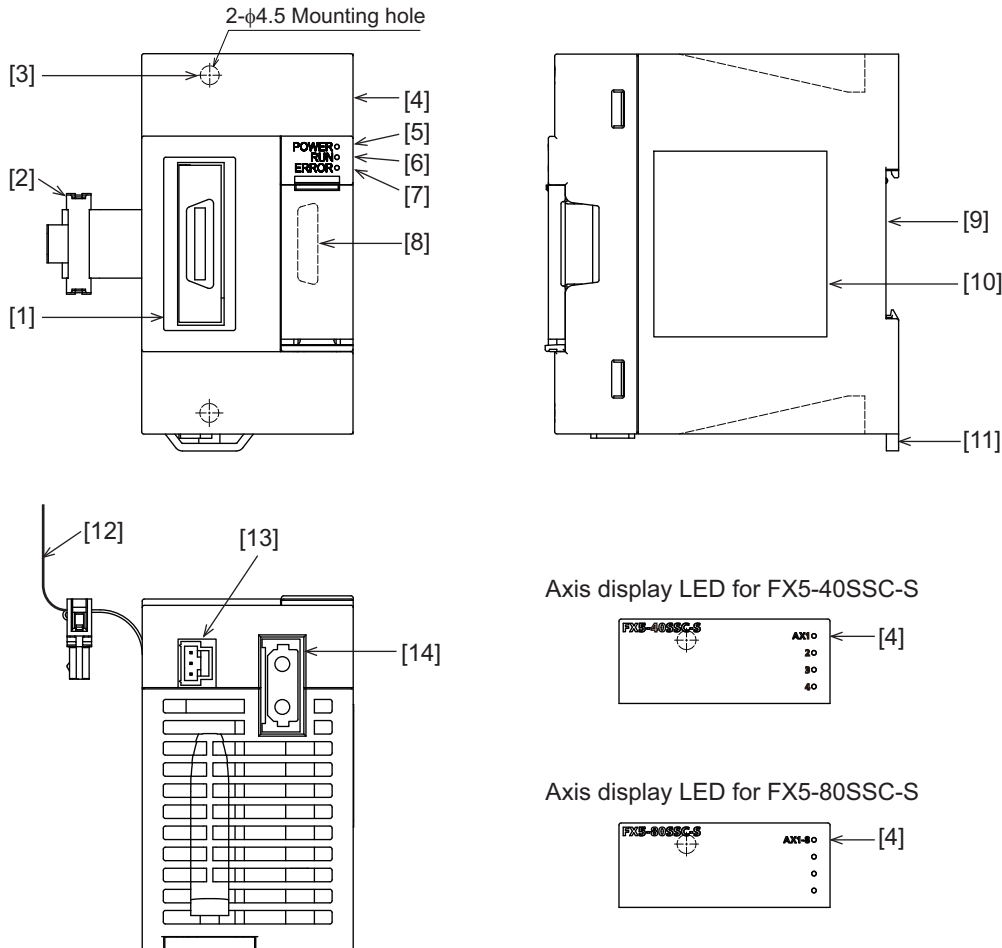
### Restriction

The FX5-SSC-G cannot be used in unison with safety extension modules.

# 1 PART NAMES

## Part names [FX5-SSC-S]

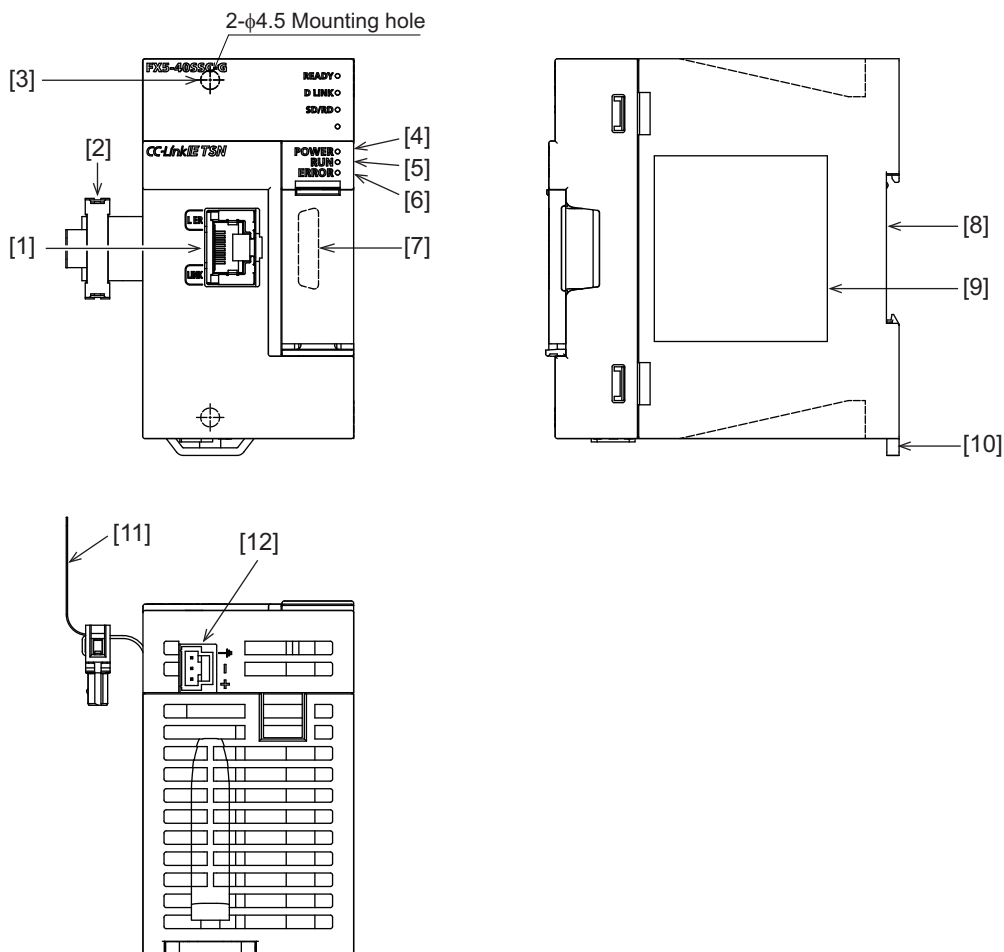
This chapter describes the part names of the FX5-SSC-S.



| No.  | Name   | Description   |
|------|--|---|
| [1]  | External input connection connector  | Connects to a mechanical system input, manual pulse generator/incremental synchronous encoder, or forced stop input. (26-pin connector)<br>For the signal layout, refer to the following.<br>☞ Page 22 Specifications of Interfaces with External Devices [FX5-SSC-S] |
| [2]  | Extension cable  | Connects to a CPU module, etc.  |
| [3]  | Direct mounting hole: 2 holes of $\Phi 4.5$ (0.18") (mounting screw: M4 screw) | Holes which are used when installed directly.   |
| [4]  | Axis display LED   | For details, refer to the following.  |
| [5]  | POWER LED  | ☞ Page 18 LED Display Specifications  |
| [6]  | RUN LED  |   |
| [7]  | ERROR LED  |   |
| [8]  | Extension connector  | Connects to an expansion module on the next tier.   |
| [9]  | DIN rail mounting groove   | Using this slot, the module can be mounted to DIN rail "DIN46277" (width: 35 mm (1.38 inch)).   |
| [10] | Name plate   | Serial No. etc., are printed.   |
| [11] | DIN rail mounting hook   | Hook which is used for mounting the module onto the DIN rail.   |
| [12] | Pullout tab  | Tab for removing from a CPU module, etc.  |
| [13] | Power supply connector   | Connects a module to the power.   |
| [14] | SSCNETIII cable connector  | Connects to a servo amplifier.  |

## Part names [FX5-SSC-G]

This chapter describes the part names of the FX5-SSC-G.



| No.  | Name   | Description  |
|------|--|--|
| [1]  | Modular jack (RJ45)<br>(with cap)  | A port used to connect to CC-Link IE TSN. Connect an ethernet cable to this port.<br>For the wiring and precautions when wiring, refer to the following.<br>☞ Page 62 Wiring [FX5-SSC-G] |
| [2]  | Extension cable  | Connects to a CPU module, etc.   |
| [3]  | Direct mounting hole: 2 holes of $\Phi 4.5$ (0.18") (mounting screw: M4 screw) | Holes which are used when installed directly.  |
| [4]  | POWER LED  | For details, refer to the following.<br>☞ Page 19 LED display specifications [FX5-SSC-G]   |
| [5]  | RUN LED  |  |
| [6]  | ERROR LED  |  |
| [7]  | Extension connector  | Connects to an expansion module on the next tier.  |
| [8]  | DIN rail mounting groove   | Using this slot, the module can be mounted to DIN rail "DIN46277" (width: 35 mm (1.38 inch)).  |
| [9]  | Name plate   | Serial No. etc., are printed.  |
| [10] | DIN rail mounting hook   | Hook which is used for mounting the module onto the DIN rail.  |
| [11] | Pullout tab  | Tab for removing from a CPU module, etc.   |
| [12] | Power supply connector   | Connects a module to the power.  |

# 1.1 LED Display Specifications

## LED display specifications [FX5-SSC-S]

This section lists LED display specifications for FX5-SSC-S.

□: OFF, ■: ON, ●: Flashing

| Simple Motion module status | LED display                                    |   | Description                             |
|-----------------------------|--|---|---|
|                             | 4-axis module                                  | 8-axis module                             |   |
| Normal operation            | AX1 □<br>AX2 □<br>AX3 □<br>AX4 □               | AX1-8 □ <sup>*3</sup>                     | The axes stopped<br>The axes on standby |
|                             | POWER ■ <sup>*1</sup><br>RUN ■<br>ERROR □      | POWER ■ <sup>*1</sup><br>RUN ■<br>ERROR □ |   |
|                             | AX1 ■<br>AX2 □<br>AX3 □<br>AX4 □               | AX1-8 ■ <sup>*4</sup>                     | The axis in operation                   |
|                             | POWER ■ <sup>*1</sup><br>RUN ■<br>ERROR □      | POWER ■ <sup>*1</sup><br>RUN ■<br>ERROR □ |   |
| Operation failure           | AX1 ● <sup>*2</sup><br>AX2 □<br>AX3 □<br>AX4 □ | AX1-8 ● <sup>*2*5</sup>                   | Minor error                             |
|                             | POWER ■ <sup>*1</sup><br>RUN ■<br>ERROR ■      | POWER ■ <sup>*1</sup><br>RUN ■<br>ERROR ■ |   |
|                             | AX1 □<br>AX2 □<br>AX3 □<br>AX4 □               | AX1-8 □                                   | Moderate error<br>Watchdog timer error  |
|                             | POWER ■ <sup>*1</sup><br>RUN ■<br>ERROR ●      | POWER ■ <sup>*1</sup><br>RUN ■<br>ERROR ● |   |

\*1 When the power is supplied for the Simple Motion module, the POWER LED turns ON. When the power is not supplied, all LEDs including the POWER LED turn OFF.

\*2 When an error occurs in the synchronous encoder axis or the command generation axis, only the ERROR LED operates. (The AX LED does not operate.)

\*3 When all axes are stopped or on standby, the AX LED turns OFF.

\*4 When any of the axes is in operation, the AX LED turns ON.

\*5 When an error occurs in any of the axes, the AX LED is flashing.

## LED display specifications [FX5-SSC-G]

This section lists LED display specifications for FX5-SSC-G.

□: OFF, ■: ON, ●: Flashing

| LED        | Description                        | LED display | Status  |
|------------|------------------------------------|-------------|---|
| READY LED  | Displays the PLC READY status.     | READY ■     | PLC READY ON  |
|            |                                    | READY □     | PLC READY OFF   |
| POWER LED  | Displays the power status.         | POWER ■     | Power ON  |
|            |                                    | POWER □     | Power OFF   |
| RUN LED    | Displays the operation status.     | RUN ■       | Normal operation  |
|            |                                    | RUN □       | Error occurring   |
| ERROR LED  | Displays the error status.         | ERROR ■     | Error occurring   |
|            |                                    | ERROR ●     | 200 ms interval: error occurring<br>500 ms interval: erroneous data link station detected |
|            |                                    | ERROR □     | Normal operation  |
| D LINK LED | Displays the data link status.     | D LINK ■    | Data link (cyclic transmission)   |
|            |                                    | D LINK ●    | Data link (cyclic transmission stopped)   |
|            |                                    | D LINK □    | Data link not started (released)  |
| SD/RD LED  | Displays the data transmit status. | SD/RD ■     | Data <sup>*1</sup> transmission in progress   |
|            |                                    | SD/RD □     | Data <sup>*1</sup> transmission not in progress   |
| L ER LED   | Displays the port status.          | L ER ■      | Abnormal data received  |
|            |                                    | L ER □      | Normal data received  |
| LINK LED   | Displays the link status.          | LINK ■      | Link up   |
|            |                                    | LINK □      | Link down   |

\*1 Includes cyclic transmission and transient transmission data for CC-Link IE TSN.

The error status can be categorized as shown below based on the ON status of the RUN LED and ERROR LED.

When multiple errors occur, the error status is displayed in the order of Major error > Moderate error > Minor error.

| RUN LED | ERROR LED      | Error status   | Description  |
|---------|----------------|----------------|--|
| OFF     | ON or flashing | Major error    | An error in which the module stops operation because of a hardware error or memory error, etc.                     |
| ON      | Flashing       | Moderate error | An error related to module operation in which the module stops operation because of a parameter error, etc.        |
| ON      | ON             | Minor error    | An error, such as a communication, positioning control, or program error, in which the module continues operation. |

# 2 SPECIFICATIONS

This chapter describes the specifications of the FX5-SSC-S/FX5-SSC-G.

## 2.1 General Specifications

General specifications except the following are the same as the connected CPU module.

Refer to the CPU module User's Manual for the general specifications that can be used.

| Items                         | Specifications   |   |
|-------------------------------|--|---|
| Operating ambient temperature | 0 to 55°C  |   |
| Dielectric withstand voltage  | 500 V AC for 1 minute                                    | Between all terminals and ground terminal |
| Insulation resistance         | 10 MΩ or higher by 500 V DC insulation resistance tester |   |

## 2.2 Power Supply Specifications

| Items                 |  | Specifications   |           |
|-----------------------|--|--|-----------|
|                       |  | FX5-SSC-S  | FX5-SSC-G |
| External power supply | Power supply voltage                       | 24 V DC +20% -15%  |           |
|                       | Permitted instantaneous power failure time | Operation continues when the instantaneous power failure is shorter than 5 ms. |           |
|                       | Electricity consumption                    | 6 W  | 5.8 W     |
|                       | Power fuse                                 | 1 A  |           |
| Internal power supply | PLC power supply                           | Not used.  |           |

## 2.3 Performance Specifications

This section lists the performance specifications.

| Item                           | Description  |             |                                     |             |
|--------------------------------|--|-------------|-------------------------------------|-------------|
|                                | FX5-40SSC-S  | FX5-80SSC-S | FX5-40SSC-G                         | FX5-80SSC-G |
| Number of controlled axes      | 4 axes   | 8 axes      | 4 axes                              | 8 axes      |
| Operation cycle                | 0.888 ms/1.777 ms  |             | 0.500 ms/1.000 ms/2.000 ms/4.000 ms |             |
| Interpolation function         | 2-, 3-, or 4-axis linear interpolation, 2-axis circular interpolation  |             |                                     |             |
| Control method                 | PTP (Point To Point) control, path control (both linear and arc can be set), speed control, speed-position switching control, position-speed switching control, speed-torque control |             |                                     |             |
| Control unit                   | mm, inch, degree, pulse  |             |                                     |             |
| Positioning data               | 600 data/axis  |             |                                     |             |
| Execution data backup function | Parameters, positioning data, and block start data can be saved on flash ROM. (battery-less backup)  |             |                                     |             |

| Item   |   | Description  |  |             |             |
|--|---|--|--|-------------|-------------|
|  |   | FX5-40SSC-S  | FX5-80SSC-S  | FX5-40SSC-G | FX5-80SSC-G |
| Positioning  | Positioning system  | PTP control: Incremental system/absolute system<br>Speed-position switching control: Incremental system/absolute system<br>Position-speed switching control: Incremental system<br>Path control: Incremental system/absolute system  |  |             |             |
|  | Positioning range   | In absolute system<br>• -214748364.8 to 214748364.7 (μm)<br>• -21474.83648 to 21474.83647 (inch)<br>• 0 to 359.99999 (degree)<br>• -2147483648 to 2147483647 (pulse)<br>In incremental system<br>• -214748364.8 to 214748364.7 (μm)<br>• -21474.83648 to 21474.83647 (inch)<br>• -21474.83648 to 21474.83647 (degree)<br>• -2147483648 to 2147483647 (pulse)<br>In speed-position switching control (INC mode)/position-speed switching control<br>• 0 to 214748364.7 (μm)<br>• 0 to 21474.83647 (inch)<br>• 0 to 21474.83647 (degree)<br>• 0 to 2147483647 (pulse)<br>In speed-position switching control (ABS mode)* <sup>1</sup><br>0 to 359.99999 (degree) |  |             |             |
|  | Speed command   | 0.01 to 20000000.00 (mm/min)<br>0.001 to 2000000.000 (inch/min)<br>0.001 to 2000000.000 (degree/min)* <sup>2</sup><br>1 to 1000000000 (pulse/s)  |  |             |             |
|  | Acceleration/deceleration process                         | Trapezoidal acceleration/deceleration, S-curve acceleration/deceleration   |  |             |             |
|  | Acceleration/deceleration time                            | 1 to 8388608 (ms) (Four patterns can be set for each of acceleration time and deceleration time.)  |  |             |             |
|  | Rapid stop deceleration time                              | 1 to 8388608 (ms)  |  |             |             |
|  | Starting time* <sup>3</sup>                               | 1.777 ms   | <ul style="list-style-type: none"> <li>• For an operation cycle of 0.500 ms: 0.4 to 1.0 ms</li> <li>• For an operation cycle of 1.000 ms: 0.4 to 1.5 ms</li> <li>• For an operation cycle of 2.000 ms: 0.4 to 2.8 ms</li> <li>• For an operation cycle of 4.000 ms: 0.4 to 4.5 ms</li> </ul> |             |             |
| External wiring connection system  | 26-pin connector  | —  |  |             |             |
| Applicable wire size* <sup>4</sup>   | AWG30 to 24 (0.05 to 0.2 mm <sup>2</sup> ) * <sup>4</sup> | —  |  |             |             |
| External input wiring connector  | LD77MHIICON   | —  |  |             |             |
| Distance between stations (maximum)  | SSCNETⅢ/H: 100 m<br>SSCNETⅢ: 50 m                         | 100 m  |  |             |             |
| Manual pulse generator/Incremental synchronous encoder input maximum frequency | Differential-output type                                  | Up to 1 Mpulses/s  | —  |             |             |
|  | Open-collector type                                       | Up to 200 kpulses/s  | —  |             |             |
| Manual pulse generator 1 pulse input magnification                             | 1 to 10000 times  |  |  |             |             |
| Flash ROM write count  | Max. 100000 times   |  |  |             |             |
| Number of occupied I/O points  | 8 points  |  |  |             |             |
| Mass   | Approx. 0.3 kg  |  |  |             |             |

\*<sup>1</sup> The speed-position switching control (ABS mode) can be used only when the control unit is "degree".

\*<sup>2</sup> When "Speed control 10 times multiplier setting for degree axis function" is valid, the setting range is 0.01 to 20000000.00 (degree/min).

\*<sup>3</sup> Time from accepting the positioning start signal until BUSY signal turns ON.

\*<sup>4</sup> AWG24 (0.2 mm<sup>2</sup>) is recommended.

## CC-Link IE TSN [FX5-SSC-G]

For details of the performance specifications of CC-Link IE TSN, refer to "Performance Specifications of CC-Link IE TSN" in the following manual.

 MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN)

## 2.4 Specifications of Interfaces with External Devices [FX5-SSC-S]

### Electrical specifications of input signals

#### External input signal/switching signal

##### ■ Specifications of external input signal/switching signal

| Item                             | Specifications   |              |
|----------------------------------|--|--------------|
| Signal name                      | Proximity dog signal/External input signal/Switching signal  |              |
| Number of input points           | 4 points   |              |
| Input method                     | Positive common/Negative common shared                       |              |
| Common terminal arrangement      | 4 points/common (Common contact: COM)                        |              |
| Isolation method                 | Photocoupler   |              |
| Rated input voltage              | 24 V DC  |              |
| Rated input current ( $I_{IN}$ ) | Approx. 5 mA   |              |
| Operating voltage range          | 19.2 to 26.4 V DC (24 V DC+10/-20%, ripple ratio 5% or less) |              |
| ON voltage/current               | 17.5 V DC or more/3.5 mA or more                             |              |
| OFF voltage/current              | 7 V DC or less/1 mA or less                                  |              |
| Input resistance                 | Approx. 6.8 k $\Omega$                                       |              |
| Response time                    | OFF → ON   | 1 ms or less |
|                                  | ON → OFF   |              |

#### Forced stop input

##### ■ Specifications of forced stop input signal

| Item                             | Specifications   |              |
|----------------------------------|--|--------------|
| Number of input points           | 1 point  |              |
| Input method                     | Positive common/Negative common shared                       |              |
| Common terminal arrangement      | 1 point/common (Common contact: EMI.COM)                     |              |
| Isolation method                 | Photocoupler   |              |
| Rated input voltage              | 24 V DC  |              |
| Rated input current ( $I_{IN}$ ) | Approx. 5 mA   |              |
| Operating voltage range          | 19.2 to 26.4 V DC (24 V DC+10/-20%, ripple ratio 5% or less) |              |
| ON voltage/current               | 17.5 V DC or more/3.5 mA or more                             |              |
| OFF voltage/current              | 7 V DC or less/1 mA or less                                  |              |
| Input resistance                 | Approx. 6.8 k $\Omega$                                       |              |
| Response time                    | OFF → ON   | 4 ms or less |
|                                  | ON → OFF   |              |



# Manual pulse generator/Incremental synchronous encoder input

## Specifications of manual pulse generator/incremental synchronous encoder

| Item   | Specifications   |   |
|--|--|---|
| Signal input form*1                              | Phase A/Phase B (Magnification by 4/Magnification by 2/Magnification by 1), PULSE/SIGN |   |
| Differential-output type (26LS31 or equivalent)  | Maximum input pulse frequency  | 1 Mpulses/s (After magnification by 4, up to 4 Mpulses/s)*2     |
|  | Pulse width  | 1 μs or more  |
|  | Leading edge/trailing edge time  | 0.25 μs or less   |
|  | Phase difference   | 0.25 μs or more   |
|  | Rated input voltage  | 5.5 V DC or less  |
|  | High-voltage   | 2.0 to 5.25 V DC  |
|  | Low-voltage  | 0 to 0.8 V DC   |
|  | Differential voltage   | ±0.2 V  |
|  | Cable length   | Up to 30 m (98.43 ft.)  |
|  | Example of waveform  |   |
| Voltage-output type/Open-collector type (5 V DC) | Maximum input pulse frequency  | 200 kpulses/s (After magnification by 4, up to 800 kpulses/s)*2 |
|  | Pulse width  | 5 μs or more  |
|  | Leading edge/trailing edge time  | 1.2 μs or less  |
|  | Phase difference   | 1.2 μs or more  |
|  | Rated input voltage  | 5.5 V DC or less  |
|  | High-voltage   | 3.0 to 5.25 V DC/2 mA or less                                   |
|  | Low-voltage  | 0 to 1.0 V DC/5 mA or more                                      |
|  | Cable length   | Up to 10 m (32.81 ft.)  |
|  | Example of waveform  |   |

\*1 Set the signal input form in "[Pr.24] Manual pulse generator/Incremental synchronous encoder input selection".

| [Pr.24] Manual pulse generator/Incremental synchronous encoder input selection | [Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection |                                     |
|--|---|-------------------------------------|
|  | Positive logic  | Negative logic                      |
| Phase A/Phase B  | <p>Forward run      Reverse run</p>   | <p>Forward run      Reverse run</p> |
| PULSE/SIGN   | <p>Forward run      Reverse run</p>   | <p>Forward run      Reverse run</p> |

\*2 Maximum input pulse frequency is magnified by 4, when "A-phase/B-phase Magnification by 4" is set in "[Pr.24] Manual pulse generator/Incremental synchronous encoder input selection".

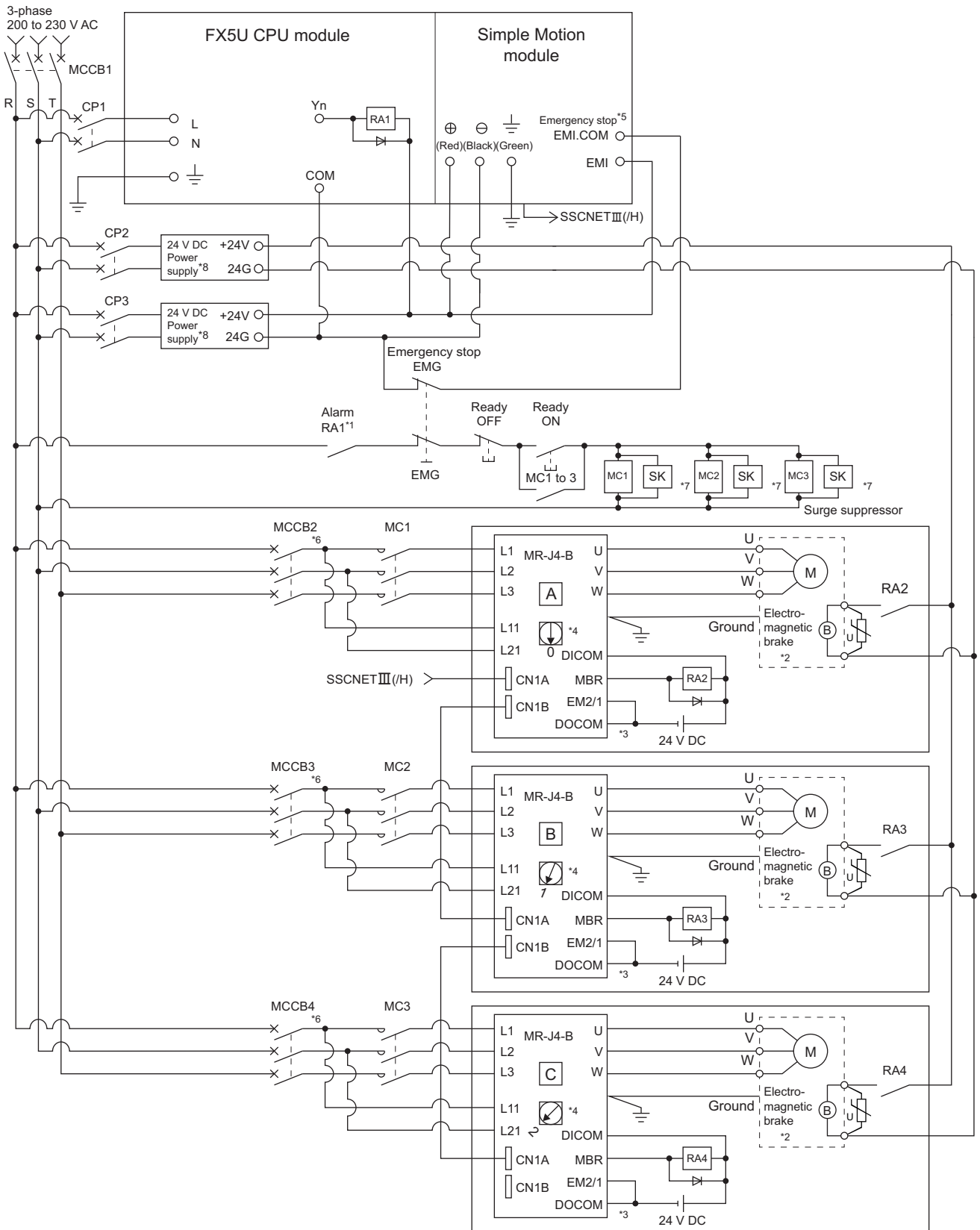
## 2.5 External Circuit Design

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Configure up the power supply circuit and main circuit which turn off the power supply after detection alarm occurrence and servo forced stop. When designing the main circuit of the power supply, make sure to use a circuit breaker (MCCB). The outline diagrams for the external device connection interface are shown below.

# External circuit design [FX5-SSC-S]

## Example when using the forced stop of the Simple Motion module (For MR-J4-B)



- \*1 Configure up the power supply circuit which switches off the electromagnetic contactor (MC) after detecting the alarm occurrence on the CPU module.
- \*2 It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.
- \*3 It is also possible to perform the forced stop using a forced stop terminal of the servo amplifier.
- \*4 Set the axis selection rotary switch of servo amplifier as follows to set the axis No. of servo amplifier.  
  - Axis 1: 0, Axis 2: 1, Axis 3: 2, Axis 4: 3
- \*5 The status of forced stop input signal can be confirmed with "[Md.50] Forced stop input". Be sure that the forced stop 24 V DC power supply is not used with the electromagnetic brake of the motor or the electromagnetic valve power supply.
- \*6 Refer to the servo amplifier instruction manual for selection of the circuit breaker and electromagnetic contactor.
- \*7 The surge suppressor is recommended to be used for an AC relay or electromagnetic contactor (MC) near the servo amplifier. Refer to the servo amplifier instruction manual for selection of the surge suppressor.
- \*8 Wire the electromagnetic brake power supply and the control power supply using a separate power supply.

## Precautions

- Be sure to shut off both of main circuit power supply L1/L2/L3 and control power supply L11/L21 after disconnection of SSCNET communication by the connect/disconnect function of SSCNET communication at the time of exchange of servo amplifier. At this time, it is not possible to communicate between the servo amplifier and Simple Motion module. Therefore, be sure to exchange the servo amplifier after stopping the operating of machine beforehand.
- If the emergency stop signal of the Simple Motion module turns OFF when setting "[Pr.82] Forced stop valid/invalid selection" to "0: Valid (External input signal)", servomotor is stopped with dynamic brake. (The LED display of servo amplifier indicates "E7.1" (Controller forced stop input warning).)
- When the control power supply of servo amplifier is shut off, it is not possible to communicate with the servo amplifier after that.

### Ex.

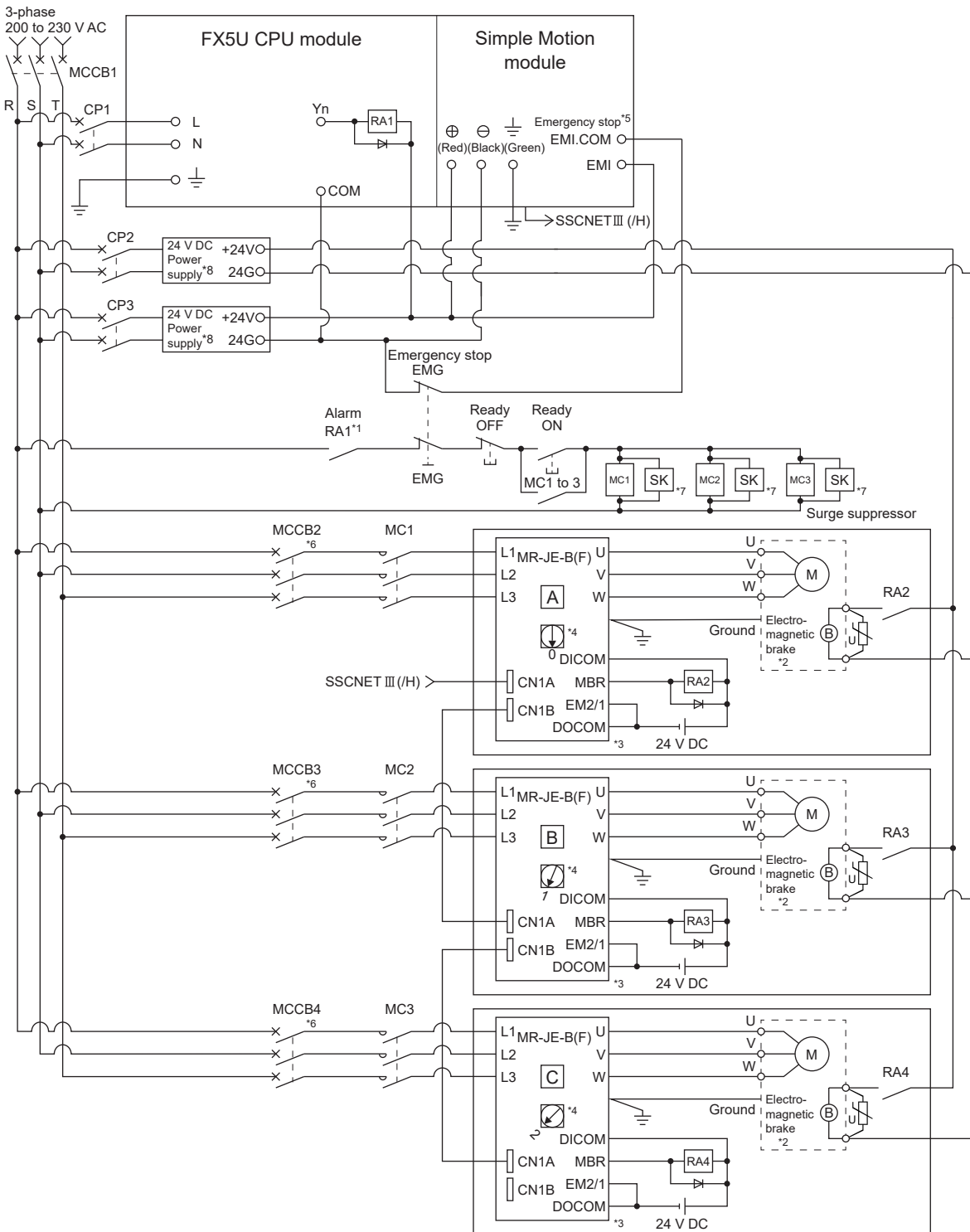
When the control power supply L11/L21 of the servo amplifier B in the figure is shut off, it is also not possible to communicate with the servo amplifier C.

If only a specific servo amplifier main circuit power supply is shut off, be sure to shut off the main circuit power supply L1/L2/L3, and do not shut off the control power supply L11/L21.

## Example when using the forced stop of the Simple Motion module (For MR-JE-B(F))



- The hot line forced stop function is enabled at the MR-JE-B(F) factory-set. (Only MR-JE-B(F))
- This function is used to execute deceleration stop for all axes by outputting the hot line forced stop signal to all axes and generating "E7.1" (Controller forced stop input warning) at the alarm occurrence.
- This function can be disabled by the servo parameter (PA27).
- For using the MR-JE-B(F), configure up the power supply circuit which switches off the all axes electromagnetic contactor (MC) from the CPU module after detecting the alarm occurrence on the CPU module.



- \*1 Configure up the power supply circuit which switches off the electromagnetic contactor (MC) after detecting the alarm occurrence on the CPU module.
- \*2 It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.
- \*3 It is also possible to perform the forced stop using a forced stop terminal of the servo amplifier.
- \*4 Set the axis selection rotary switch of servo amplifier as follows to set the axis No. of servo amplifier.
  - Axis 1: 0, Axis 2: 1, Axis 3: 2, Axis 4: 3
- \*5 The status of forced stop input signal can be confirmed with "[Md.50] Forced stop input". Be sure that the forced stop 24 V DC power supply is not used with the electromagnetic brake of the motor or the electromagnetic valve power supply.
- \*6 Refer to the servo amplifier instruction manual for selection of the circuit breaker and electromagnetic contactor.
- \*7 The surge suppressor is recommended to be used for an AC relay or electromagnetic contactor (MC) near the servo amplifier. Refer to the servo amplifier instruction manual for selection of the surge suppressor.
- \*8 Wire the electromagnetic brake power supply and the control power supply using a separate power supply.

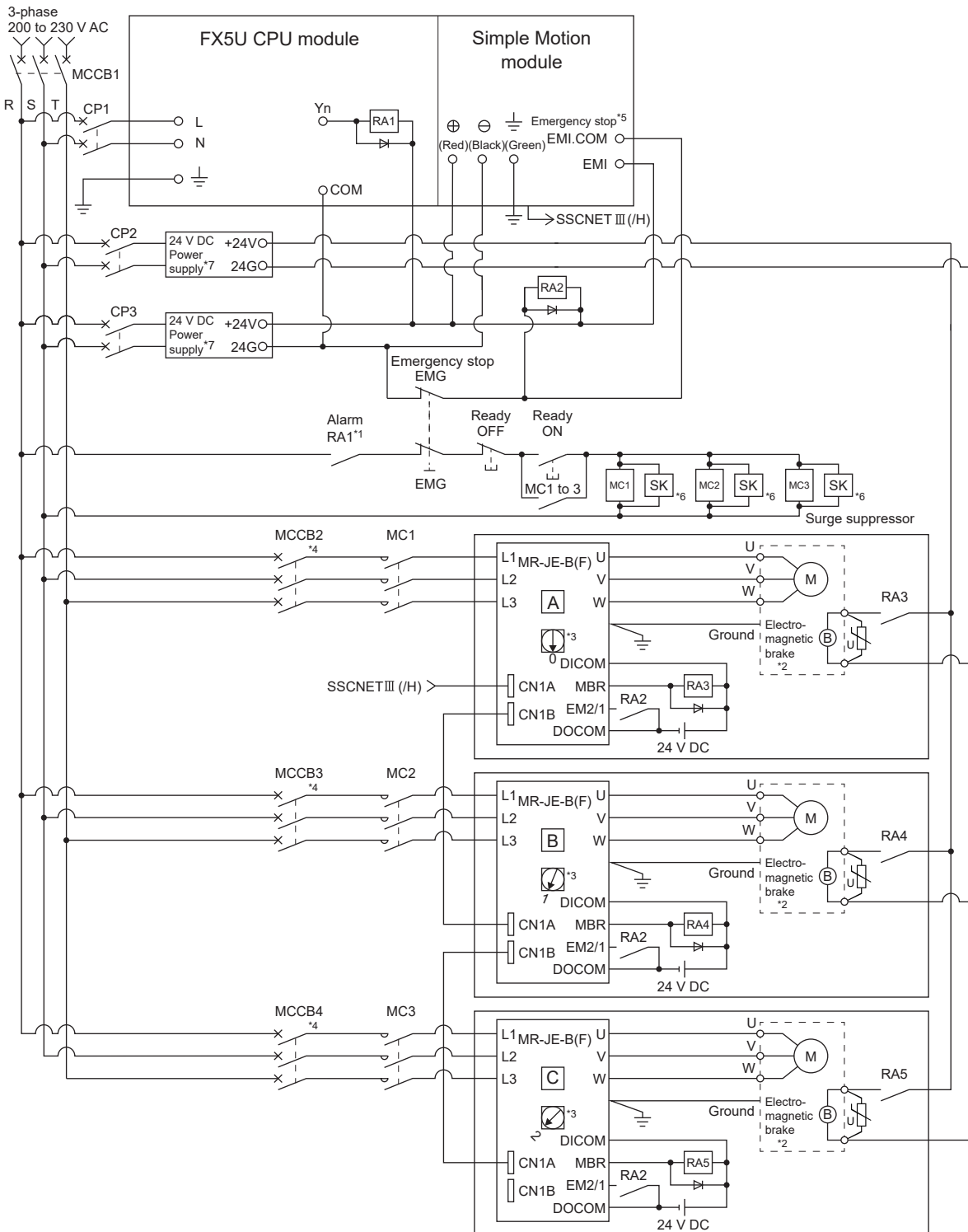
## Precautions

- If the emergency stop signal of the Simple Motion module turns OFF when setting "[Pr.82] Forced stop valid/invalid selection" to "0: Valid (External input signal)", servomotor is stopped with dynamic brake. (The LED display of servo amplifier indicates "E7.1" (Controller forced stop input warning).)

## Example when using the forced stop of the Simple Motion module and MR-JE-B(F)



- The hot line forced stop function is enabled at the MR-JE-B(F) factory-set. (Only MR-JE-B(F))
- This function is used to execute deceleration stop for all axes by outputting the hot line forced stop signal to all axes and generating "E7.1" (Controller forced stop input warning) at the alarm occurrence.
- This function can be disabled by the servo parameter (PA27).
- For using the MR-JE-B(F), configure up the power supply circuit which switches off the all axes electromagnetic contactor (MC) from the CPU module after detecting the alarm occurrence on the CPU module.



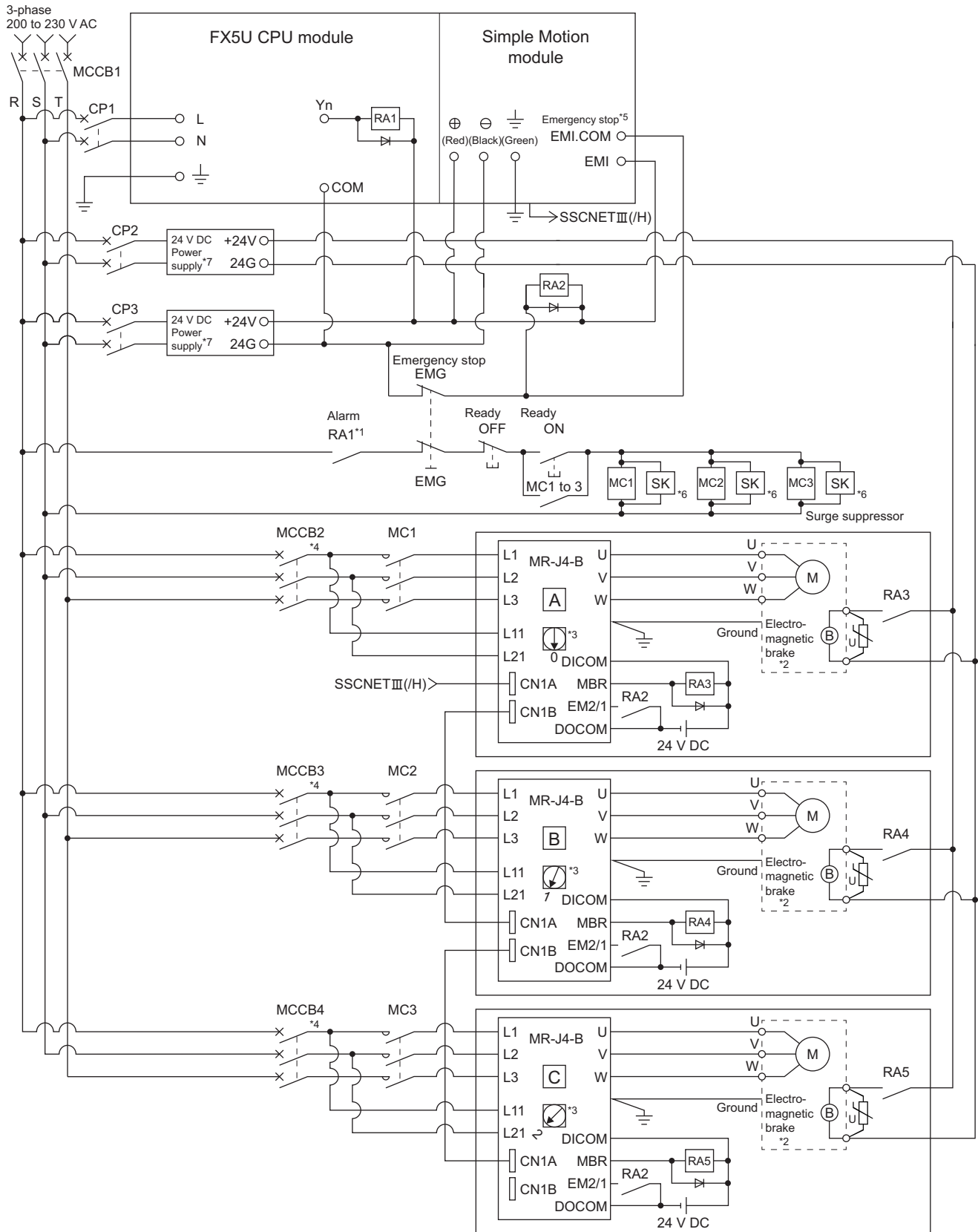
- \*1 Configure up the power supply circuit which switches off the electromagnetic contactor (MC) after detecting the alarm occurrence on the CPU module.
- \*2 It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.
- \*3 Set the axis selection rotary switch of servo amplifier as follows to set the axis No. of servo amplifier.
  - Axis 1: 0, Axis 2: 1, Axis 3: 2, Axis 4: 3
- \*4 Refer to the servo amplifier instruction manual for selection of the circuit breaker and electromagnetic contactor.
- \*5 The status of forced stop input signal can be confirmed with "[Md.50] Forced stop input". Be sure that the forced stop 24 V DC power supply is not used with the electromagnetic brake of the motor or the electromagnetic valve power supply.
- \*6 The surge suppressor is recommended to be used for an AC relay or electromagnetic contactor (MC) near the servo amplifier. Refer to the servo amplifier instruction manual for selection of the surge suppressor.
- \*7 Wire the electromagnetic brake power supply and the control power supply using a separate power supply.

## Precautions

- The dynamic brake operates and servomotor occurs to the free run when EM1 (forced stop) of the servo amplifier is turned OFF. At the time, the display shows "E6.1" (Forced stop warning). During ordinary operation, do not use EM1 (forced stop) of the servo amplifier to alternate stop and run. The service life of the servo amplifier may be shortened.



■ Example when using the forced stop of the Simple Motion module and MR-J4-B



- \*1 Configure up the power supply circuit which switches off the electromagnetic contactor (MC) after detecting the alarm occurrence on the CPU module.
- \*2 It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.
- \*3 Set the axis selection rotary switch of servo amplifier as follows to set the axis No. of servo amplifier.
  - Axis 1: 0, Axis 2: 1, Axis 3: 2, Axis 4: 3
- \*4 Refer to the servo amplifier instruction manual for selection of the circuit breaker and electromagnetic contactor.
- \*5 The status of forced stop input signal can be confirmed with "[Md.50] Forced stop input". Be sure that the forced stop 24 V DC power supply is not used with the electromagnetic brake of the motor or the electromagnetic valve power supply.
- \*6 The surge suppressor is recommended to be used for an AC relay or electromagnetic contactor (MC) near the servo amplifier. Refer to the servo amplifier instruction manual for selection of the surge suppressor.
- \*7 Wire the electromagnetic brake power supply and the control power supply using a separate power supply.

## Precautions

- Be sure to shut off both of main circuit power supply L1/L2/L3 and control power supply L11/L21 after disconnection of SSCNET communication by the connect/disconnect function of SSCNET communication at the time of exchange of servo amplifier. At this time, it is not possible to communicate between the servo amplifier and Simple Motion module. Therefore, be sure to exchange the servo amplifier after stopping the operating of machine beforehand.
- The dynamic brake operates and servomotor occurs to the free run when EM1 (forced stop) of the servo amplifier is turned OFF. At the time, the display shows "E6.1" (Forced stop warning). During ordinary operation, do not use EM1 (forced stop) of the servo amplifier to alternate stop and run. The service life of the servo amplifier may be shortened.
- When the control power supply of servo amplifier is shut off, it is not possible to communicate with the servo amplifier after that.

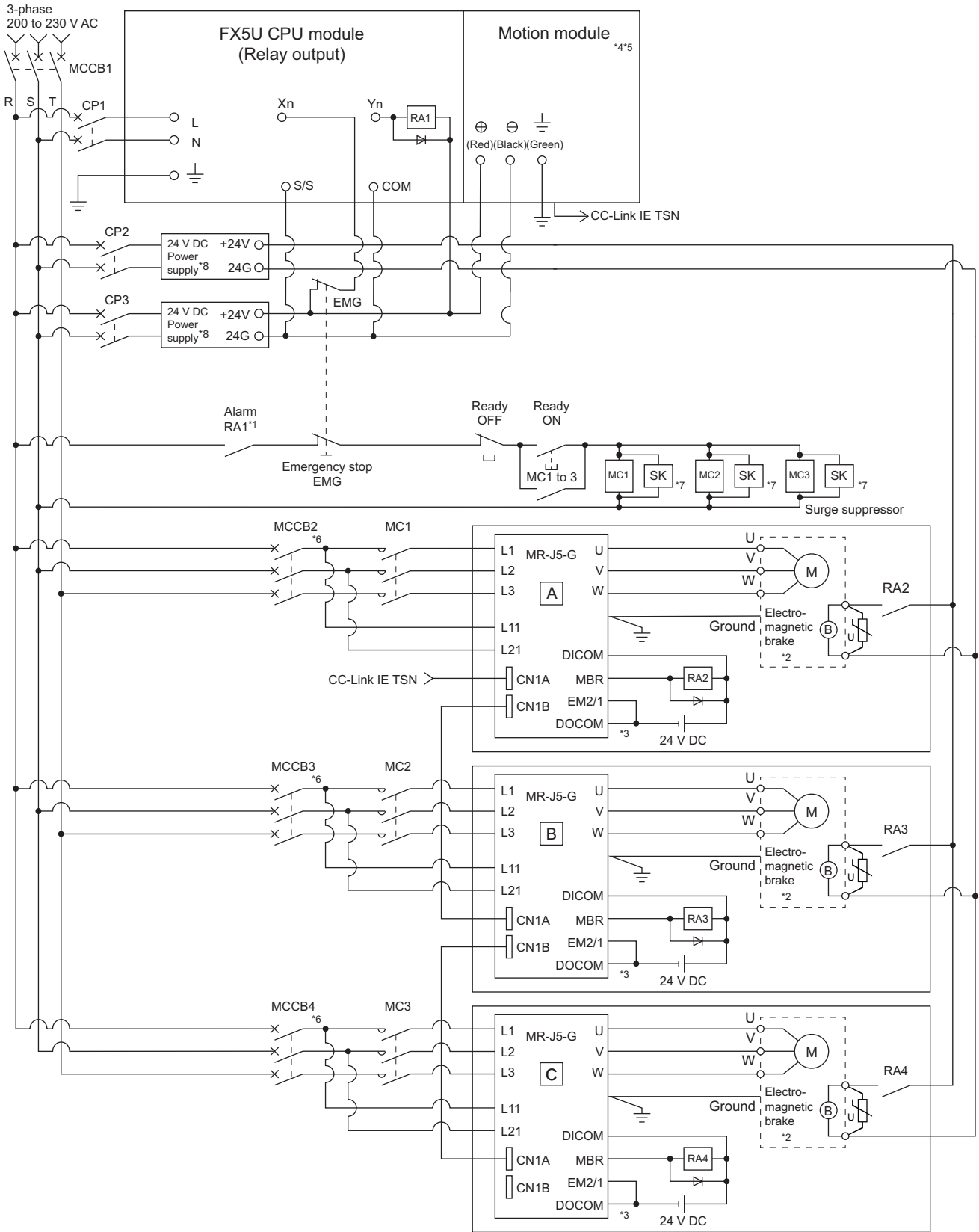
### Ex.

When the control power supply L11/L21 of the servo amplifier B in the figure is shut off, it is also not possible to communicate with the servo amplifier C.

If only a specific servo amplifier main circuit power supply is shut off, be sure to shut off the main circuit power supply L1/L2/L3, and do not shut off the control power supply L11/L21.

# External circuit design [FX5-SSC-G]

## Example when using the forced stop of the Motion module (For MR-J5-G)



- \*1 Configure up the power supply circuit which switches off the electromagnetic contactor (MC) after detecting the alarm occurrence on the CPU module.
- \*2 It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.
- \*3 It is also possible to perform the forced stop using a forced stop terminal of the servo amplifier.
- \*4 It is also possible to perform the forced stop using the emergency stop function of the Motion module.  
For details, refer to "Functions to Limit the Control" in the following manual.  
  - 📖 MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application)
- \*5 The status of forced stop input signal can be confirmed with "[Md.50] Forced stop input".
- \*6 Refer to the servo amplifier instruction manual for selection of the circuit breaker and electromagnetic contactor.
- \*7 The surge suppressor is recommended to be used for an AC relay or electromagnetic contactor (MC) near the servo amplifier.  
Refer to the servo amplifier instruction manual for selection of the surge suppressor.
- \*8 Wire the electromagnetic brake power supply and the control power supply using a separate power supply.

## Precautions

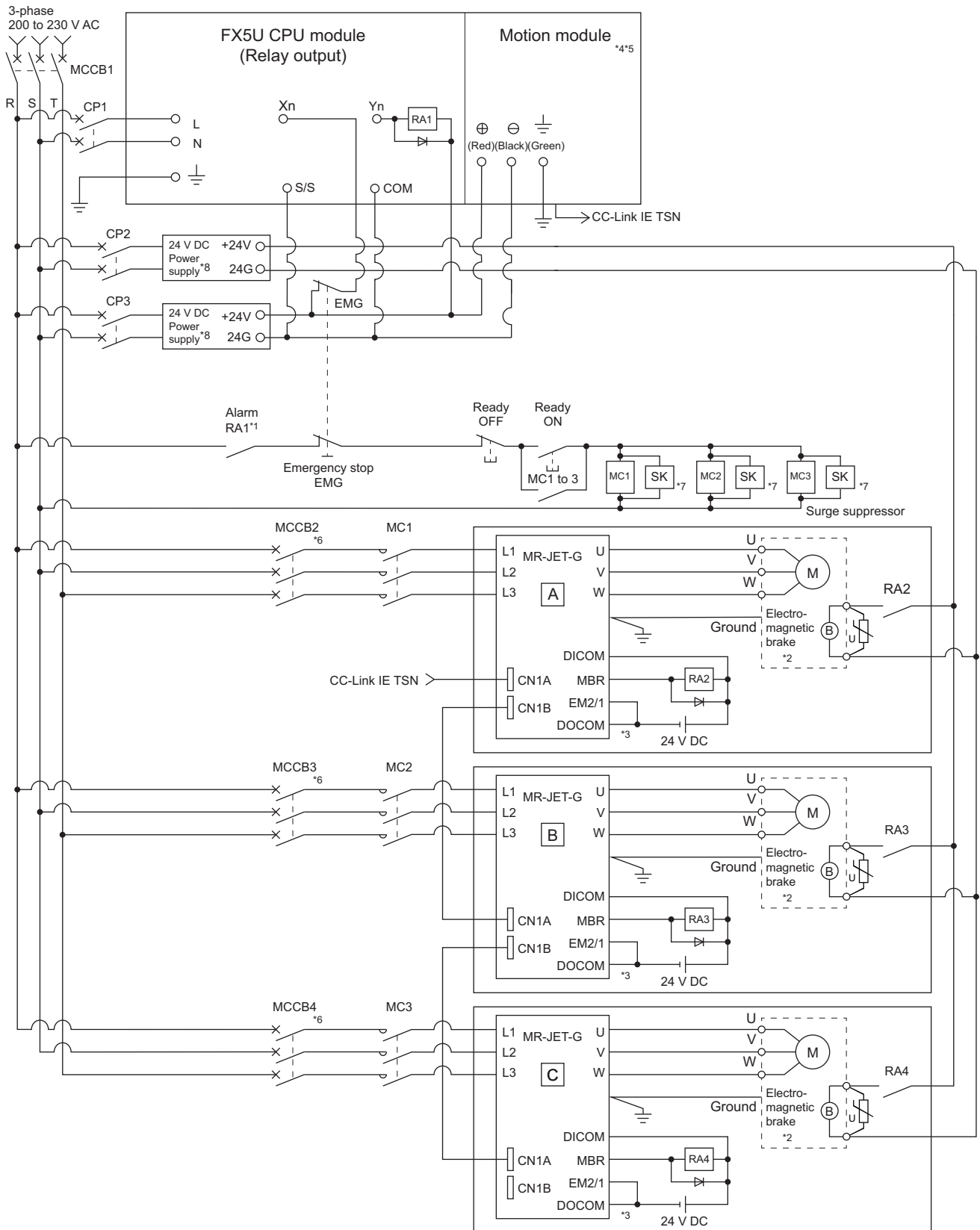
- Be sure to shut off both of main circuit power supply L1/L2/L3 and control power supply L11/L21 after disconnection of CC-Link IE TSN communication by the connect/disconnect function of CC-Link IE TSN communication at the time of exchange of servo amplifier. At this time, it is not possible to communicate between the servo amplifier and Simple Motion module. Therefore, be sure to exchange the servo amplifier after stopping the operating of machine beforehand.
- If the emergency stop signal of the Motion module turns OFF when setting "[Pr.82] Forced stop valid/invalid selection" to "0: Valid (Buffer memory)", servomotor is stopped with dynamic brake.
- When the control power supply of servo amplifier is shut off, it is not possible to communicate with the servo amplifier after that.

### Ex.

When the control power supply L11/L21 of the servo amplifier B in the figure is shut off, it is also not possible to communicate with the servo amplifier C.

If only a specific servo amplifier main circuit power supply is shut off, be sure to shut off the main circuit power supply L1/L2/L3, and do not shut off the control power supply L11/L21.

■ Example when using the forced stop of the Motion module (For MR-JET-G)

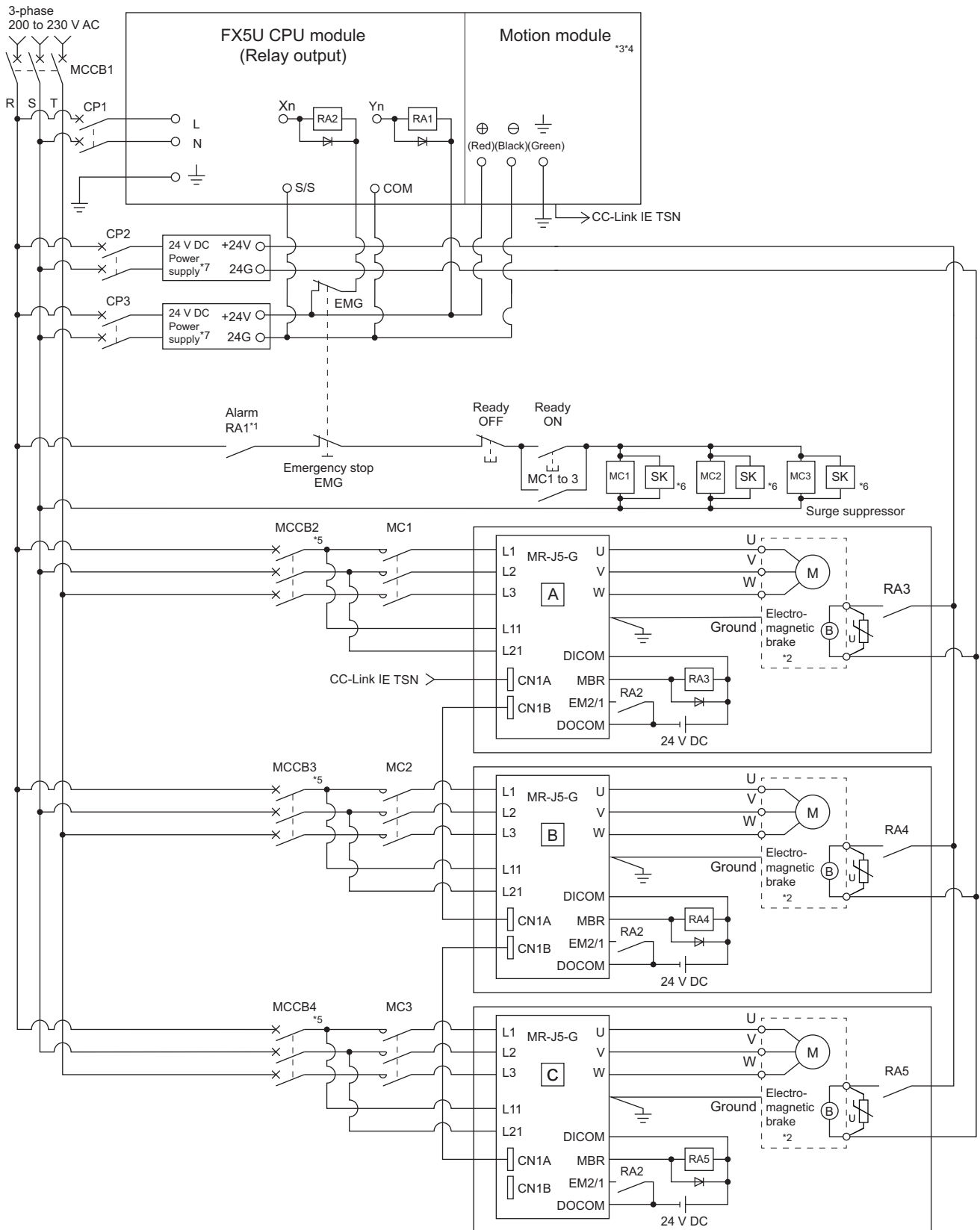


- \*1 Configure up the power supply circuit which switches off the electromagnetic contactor (MC) after detecting the alarm occurrence on the CPU module.
- \*2 It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.
- \*3 It is also possible to perform the forced stop using a forced stop terminal of the servo amplifier.
- \*4 It is also possible to perform the forced stop using the emergency stop function of the Motion module.  
For details, refer to "Functions to Limit the Control" in the following manual.  
📖 MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application)
- \*5 The status of forced stop input signal can be confirmed with "[Md.50] Forced stop input".
- \*6 Refer to the servo amplifier instruction manual for selection of the circuit breaker and electromagnetic contactor.
- \*7 The surge suppressor is recommended to be used for an AC relay or electromagnetic contactor (MC) near the servo amplifier.  
Refer to the servo amplifier instruction manual for selection of the surge suppressor.
- \*8 Wire the electromagnetic brake power supply and the control power supply using a separate power supply.

## Precautions

- Be sure to shut off both of main circuit power supply L1/L2/L3 and control power supply L11/L21 after disconnection of CC-Link IE TSN communication by the connect/disconnect function of CC-Link IE TSN communication at the time of exchange of servo amplifier. At this time, it is not possible to communicate between the servo amplifier and Simple Motion module. Therefore, be sure to exchange the servo amplifier after stopping the operating of machine beforehand.
- If the emergency stop signal of the Motion module turns OFF when setting "[Pr.82] Forced stop valid/invalid selection" to "0: Valid (Buffer memory)", servomotor is stopped with dynamic brake.
- When the control power supply of servo amplifier is shut off, it is not possible to communicate with the servo amplifier after that.

■ Example when using the forced stop of the Motion module and MR-J5-G



- \*1 Configure up the power supply circuit which switches off the electromagnetic contactor (MC) after detecting the alarm occurrence on the CPU module.
- \*2 It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.
- \*3 It is also possible to perform the forced stop using the emergency stop function of the Motion module.  
For details, refer to "Functions to Limit the Control" in the following manual.  
📖 MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application)
- \*4 The status of forced stop input signal can be confirmed with "[Md.50] Forced stop input". Be sure that the forced stop 24 V DC power supply is not used with the electromagnetic brake of the motor or the electromagnetic valve power supply.
- \*5 Refer to the servo amplifier instruction manual for selection of the circuit breaker and electromagnetic contactor.
- \*6 The surge suppressor is recommended to be used for an AC relay or electromagnetic contactor (MC) near the servo amplifier.  
Refer to the servo amplifier instruction manual for selection of the surge suppressor.
- \*7 Wire the electromagnetic brake power supply and the control power supply using a separate power supply.

## Precautions

- Be sure to shut off both of main circuit power supply L1/L2/L3 and control power supply L11/L21 after disconnection of CC-Link IE TSN communication by the connect/disconnect function of CC-Link IE TSN communication at the time of exchange of servo amplifier. At this time, it is not possible to communicate between the servo amplifier and Simple Motion module. Therefore, be sure to exchange the servo amplifier after stopping the operating of machine beforehand.
- The dynamic brake operates and servomotor occurs to the free run when EM1 (forced stop) of the servo amplifier is turned OFF. At the time, the display shows "0E6.1" (Forced stop warning). During ordinary operation, do not use EM1 (forced stop) of the servo amplifier to alternate stop and run. The service life of the servo amplifier may be shortened.
- When the control power supply of servo amplifier is shut off, it is not possible to communicate with the servo amplifier after that.

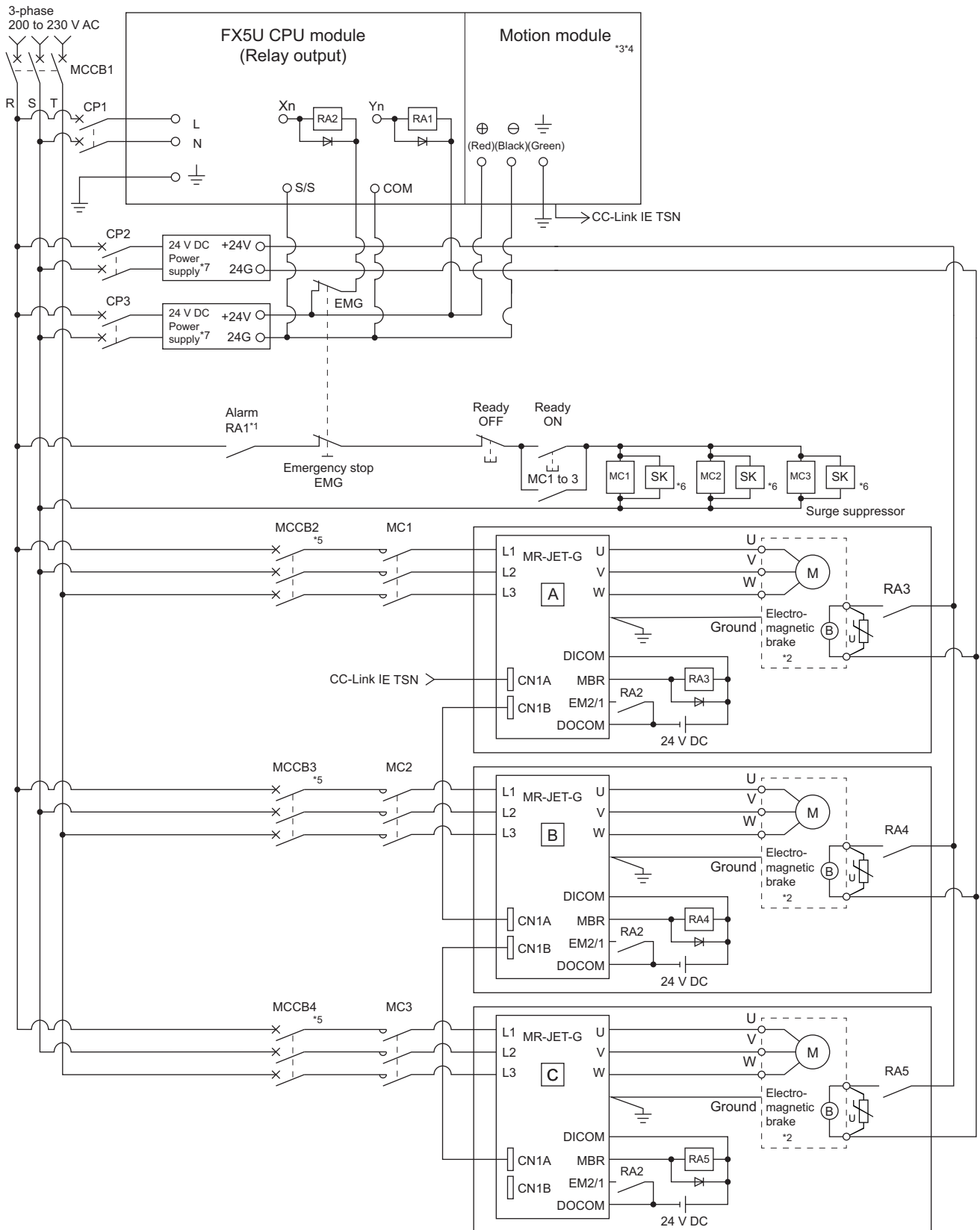
### Ex.

When the control power supply L11/L21 of the servo amplifier B in the figure is shut off, it is also not possible to communicate with the servo amplifier C.

If only a specific servo amplifier main circuit power supply is shut off, be sure to shut off the main circuit power supply L1/L2/L3, and do not shut off the control power supply L11/L21.



## Example when using the forced stop of the Motion module and MR-JET-G



- \*1 Configure up the power supply circuit which switches off the electromagnetic contactor (MC) after detecting the alarm occurrence on the CPU module.
- \*2 It is also possible to use a full wave rectified power supply as the power supply for the electromagnetic brake.
- \*3 It is also possible to perform the forced stop using the emergency stop function of the Motion module.  
For details, refer to "Functions to Limit the Control" in the following manual.  
  - 📖 MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application)
- \*4 The status of forced stop input signal can be confirmed with "[Md.50] Forced stop input". Be sure that the forced stop 24 V DC power supply is not used with the electromagnetic brake of the motor or the electromagnetic valve power supply.
- \*5 Refer to the servo amplifier instruction manual for selection of the circuit breaker and electromagnetic contactor.
- \*6 The surge suppressor is recommended to be used for an AC relay or electromagnetic contactor (MC) near the servo amplifier.  
Refer to the servo amplifier instruction manual for selection of the surge suppressor.
- \*7 Wire the electromagnetic brake power supply and the control power supply using a separate power supply.

## Precautions

- Be sure to shut off both of main circuit power supply L1/L2/L3 and control power supply L11/L21 after disconnection of CC-Link IE TSN communication by the connect/disconnect function of CC-Link IE TSN communication at the time of exchange of servo amplifier. At this time, it is not possible to communicate between the servo amplifier and Simple Motion module. Therefore, be sure to exchange the servo amplifier after stopping the operating of machine beforehand.
- The dynamic brake operates and servomotor occurs to the free run when EM1 (forced stop) of the servo amplifier is turned OFF. At the time, the display shows "0E6.1" (Forced stop warning). During ordinary operation, do not use EM1 (forced stop) of the servo amplifier to alternate stop and run. The service life of the servo amplifier may be shortened.
- When the control power supply of servo amplifier is shut off, it is not possible to communicate with the servo amplifier after that.

# 3 FUNCTION LIST

The functions that can be used are restricted depending on the version of the Simple motion module/Motion module software and engineering tool. For details, refer to "Restrictions by the version" in the following manual.

📖 MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application)

## 3.1 Control Functions

The Simple Motion module/Motion module has several functions. Refer to the following for details on each function.

📖 MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application)

In this manual, the Simple Motion module/Motion module functions are categorized and explained as follows.

### Main functions

#### Home position return control

"Home position return control" is a function (Fast home position return) that established the start point for carrying out positioning control (Machine home position return), and carries out positioning toward that start point. This is used to return a workpiece, located at a position other than the home position when the power is turned ON or after positioning stop, to the home position. The "home position return control" is pre-registered in the Simple Motion module/Motion module as the "Positioning start data No. 9001 (Machine home position return)", and "Positioning start data No. 9002 (Fast home position return)".

#### Major positioning control

This control is carried out using the "Positioning data" stored in the Simple Motion module/Motion module. Positioning control, such as position control and speed control, is executed by setting the required items in this "positioning data" and starting that positioning data. An "operation pattern" can be set in this "positioning data", and with this whether to carry out control with continuous positioning data (ex.: positioning data No. 1, No. 2, No. 3, etc.) can be set.

#### High-level positioning control

This control executes the "positioning data" stored in the Simple Motion module/Motion module using the "block start data". The following types of applied positioning control can be carried out.

- Random blocks, handling several continuing positioning data items as "blocks", can be executed in the designated order.
- "Condition judgment" can be added to position control and speed control.
- The operation of the positioning data that is set for multiple axes can be started simultaneously. (Command is output simultaneously to multiple servo amplifiers.)
- The designated positioning data can be executed repeatedly,  
etc.

#### Manual control

The Simple Motion module/Motion module executes the random positioning operation by inputting a signal into the Simple Motion module/Motion module from an external device.

Use this manual control to move the workpiece to a random position (JOG operation), and to finely adjust the positioning (inching operation, manual pulse generator operation), etc.

#### Expansion control

The following controls other than the positioning control can be executed.

- Speed control and torque control not including position loop for the command to servo amplifier (Speed-torque control).
- Synchronous control that uses "advanced synchronous control parameter" to synchronize with the input axis using software instead of using a mechanical configuration consisting of a gear, shaft, change gear, and cam. (Advanced synchronous control).

The outline of the main functions for positioning control with the Simple Motion module/Motion module is described below.

| Main functions                 |                                      | Details  |  |
|--------------------------------|--------------------------------------|--|--|
| Home position return control   | Machine home position return control | Mechanically establishes the positioning start point using a proximity dog, etc.<br>In the data setting method, no axis movement occurs since the current position is set as the home position.<br>(Positioning start No. 9001)  |  |
|                                | Fast home position return control    | Positions a target to the home position address ([Md.21] Machine feed value) stored in the Simple Motion module/Motion module using machine home position return. (Positioning start No. 9002)   |  |
| Major positioning control      | Position control                     | Linear control<br>(1-axis linear control)<br>(2-axis linear interpolation control)<br>(3-axis linear interpolation control)<br>(4-axis linear interpolation control)   | Positions a target using a linear path to the address set in the positioning data or to the position designated with the movement amount.  |
|                                |                                      | Fixed-feed control<br>(1-axis fixed-feed control)<br>(2-axis fixed-feed control)<br>(3-axis fixed-feed control)<br>(4-axis fixed-feed control)   | Positions a target by the movement amount designated with the amount set in the positioning data.<br>(With fixed-feed control, the "[Md.20] Feed current value" is set to "0" when the control is started.<br>With 2-, 3-, or 4-axis fixed-feed control, the fixed-feed is fed along a linear path obtained by interpolation.) |
|                                |                                      | 2-axis circular interpolation control  | Positions a target using an arc path to the address set in the positioning data, or to the position designated with the movement amount, sub point or center point.  |
|                                | Speed control                        | Speed control<br>(1-axis speed control)<br>(2-axis speed control)<br>(3-axis speed control)<br>(4-axis speed control)  | Continuously outputs the command corresponding to the command speed set in the positioning data.   |
|                                |                                      | Speed-position switching control   | First, carries out speed control, and then carries out position control (positioning with designated address or movement amount) by turning the "speed-position switching signal" ON.  |
|                                | Position-speed switching control     | First, carries out position control, and then carries out speed control (continuous output of the command corresponding to the designated command speed) by turning the "position-speed switching signal" ON.  |  |
|                                | Other control                        | Current value changing   | Changes the feed current value ([Md.20]) to the address set in the positioning data.<br>The following two methods can be used.<br>(The machine feed value ([Md.21]) cannot be changed.)<br>• Current value changing using positioning data<br>• Current value changing using current value changing start No. (No. 9003)       |
|                                |                                      | NOP instruction  | No execution control method. When NOP instruction is set, this instruction is not executed and the operation of the next data is started.  |
|                                |                                      | JUMP instruction   | Unconditionally or conditionally jumps to designated positioning data No.  |
|                                |                                      | LOOP   | Carries out loop control with repeated LOOP to LEND.   |
| LEND                           |                                      | Returns to the beginning of the loop control with repeated LOOP to LEND.   |  |
| High-level positioning control | Block start (Normal start)           | With one start, executes the positioning data in a random block with the set order.  |  |
|                                | Condition start                      | Carries out condition judgment set in the "condition data" for the designated positioning data, and then executes the "block start data".<br>When the condition is established, the "block start data" is executed. When not established, that "block start data" is ignored, and the next point's "block start data" is executed. |  |
|                                | Wait start                           | Carries out condition judgment set in the "condition data" for the designated positioning data, and then executes the "block start data".<br>When the condition is established, the "block start data" is executed. When not established, stops the control until the condition is established. (Waits.)                           |  |
|                                | Simultaneous start                   | Simultaneously executes the designated positioning data of the axis designated with the "condition data". (Outputs commands at the same timing.)   |  |
|                                | Repeated start (FOR loop)            | Repeats the program from the block start data set with the "FOR loop" to the block start data set in "NEXT" for the designated number of times.  |  |
|                                | Repeated start (FOR condition)       | Repeats the program from the block start data set with the "FOR condition" to the block start data set in "NEXT" until the conditions set in the "condition data" are established.   |  |
| Manual control                 | JOG operation                        | Outputs a command to servo amplifier while the JOG start signal is ON.   |  |
|                                | Inching operation                    | Outputs commands corresponding to minute movement amount by manual operation to servo amplifier.<br>(Performs fine adjustment with the JOG start signal.)  |  |
|                                | Manual pulse generator operation     | Outputs pulses commanded with the manual pulse generator to servo amplifier.   |  |

| Main functions    |                              | Details   |
|-------------------|------------------------------|---|
| Expansion control | Speed-torque control         | Carries out the speed control or torque control that does not include the position loop for the command to servo amplifier by switching control mode.                                     |
|                   | Advanced synchronous control | Carries out the synchronous control that synchronizes with the input axis by setting the system such as gear, shaft, change gear and cam to the "advanced synchronous control parameter". |

In "major positioning control" ("high-level positioning control"), "Operation pattern" can be set to designate whether to continue executing positioning data. Outlines of the "operation patterns" are given below.

| [Da.1] Operation pattern                               | Details   |
|--|---|
| Independent positioning control (positioning complete) | When "independent positioning control" is set for the operation pattern of the started positioning data, only the designated positioning data will be executed, and then the positioning will end.  |
| Continuous positioning control                         | When "continuous positioning control" is set for the operation pattern of the started positioning data, after the designated positioning data is executed, the program will stop once, and then the next following positioning data will be executed. |
| Continuous path control                                | When "continuous path control" is set for the operation pattern of the started positioning data, the designated positioning data will be executed, and then without decelerating, the next following positioning data will be executed.               |

## Sub functions

When the main functions are executed, this function compensates and limits controls, or adds functions.

The outline of the functions that assist positioning control using the Simple Motion module/Motion module is described below.

| Sub function   | Details  |  |
|--|--|--|
| Functions characteristic to machine home position return | Home position return retry function [FX5-SSC-S]        | This function retries the home position return with the upper/lower limit switches during the machine home position return. This allows machine home position return to be carried out even if the axis is not returned to before the proximity dog with JOG operation, etc.   |
|  | Home position shift function [FX5-SSC-S]               | After returning to the machine home position, this function compensates the position by the designated distance from the machine home position and sets that position as the home position address.  |
| Functions that compensate control                        | Backlash compensation function                         | This function compensates the mechanical backlash amount. Feed commands equivalent to the set backlash amount are output each time the movement direction changes.   |
|  | Electronic gear function                               | By setting the movement amount per pulse, this function can freely change the machine movement amount per commanded pulse.<br>When the movement amount per pulse is set, a flexible positioning system that matches the machine system can be structured.  |
|  | Near pass function *1                                  | This function suppresses the machine vibration when the speed is changed during continuous path control in the interpolation control.  |
| Functions that limit control                             | Speed limit function                                   | If the command speed exceeds "[Pr.8] Speed limit value" during control, this function limits the commanded speed to within the "[Pr.8] Speed limit value" setting range.   |
|  | Torque limit function                                  | If the torque generated by the servomotor exceeds "[Pr.17] Torque limit setting value" during control, this function limits the generated torque to within the "[Pr.17] Torque limit setting value" setting range.   |
|  | Software stroke limit function                         | If a command outside of the upper/lower limit stroke limit setting range, set in the parameters, is issued, this function will not execute positioning for that command.   |
|  | Hardware stroke limit function                         | This function carries out deceleration stop with the hardware stroke limit switch.   |
|  | Forced stop function                                   | This function stops all axes of the servo amplifier with the forced stop signal.   |
| Functions that change control details                    | Speed change function                                  | This function changes the speed during positioning.<br>Set the new speed in the speed change buffer memory ([Cd.14] New speed value), and change the speed with the speed change request ([Cd.15]).  |
|  | Override function                                      | This function changes the speed within a percentage of 1 to 300% during positioning. This is executed using "[Cd.13] Positioning operation speed override".  |
|  | Acceleration/deceleration time change function         | This function changes the acceleration/deceleration time during speed change.  |
|  | Torque change function                                 | This function changes the "torque limit value" during control.   |
|  | Target position change function                        | This function changes the target position during positioning.<br>Position and speed can be changed simultaneously.   |
| Functions related to positioning start                   | Pre-reading start function                             | This function shortens the virtual start time.   |
| Absolute position system                                 |  | This function restores the absolute position of designated axis.   |
| Functions related to positioning stop                    | Stop command processing for deceleration stop function | Function that selects a deceleration curve when a stop cause occurs during deceleration stop processing to speed 0.  |
|  | Continuous operation interrupt function                | This function interrupts continuous operation. When this request is accepted, the operation stops when the execution of the current positioning data is completed.   |
|  | Step function  | This function temporarily stops the operation to confirm the positioning operation during debugging, etc. The operation can be stopped at each "automatic deceleration" or "positioning data".   |
| Other functions  | Skip function  | This function stops (decelerates to a stop) the positioning being executed when the skip signal is input, and carries out the next positioning.  |
|  | M code output function                                 | This function issues a command for a sub work (clamp or drill stop, tool change, etc.) according to the code No. (0 to 65535) that can be set for each positioning data.   |
|  | Teaching function                                      | This function stores the address positioned with manual control into the "[Da.6] Positioning address/movement amount" having the designated positioning data No. ([Cd.39]).  |
|  | Command in-position function                           | This function calculates the remaining distance for the Simple Motion module/Motion module to reach the positioning stop position. When the value is less than the set value, the "command in-position flag" is set to "1".<br>When using another auxiliary work before ending the control, use this function as a trigger for the sub work. |
|  | Acceleration/deceleration processing function          | This function adjusts the acceleration/deceleration.   |

| Sub function    |   | Details  |
|-----------------|---|--|
| Other functions | Deceleration start flag function                                      | Function that turns ON the flag when the constant speed status or acceleration status switches to the deceleration status during position control, whose operation pattern is "Positioning complete", to make the stop timing known. |
|                 | Speed control 10 times multiplier setting for degree axis function    | This function executes the positioning control by the 10 times speed of the command speed and the speed limit value when the setting unit is "degree".   |
|                 | Operation setting for incompleteness of home position return function | This function is provided to select whether positioning control is operated or not, when the home position return request flag is ON.  |
| Servo ON/OFF    | Servo ON/OFF  | This function executes servo ON/OFF for the servo amplifier connected to the Simple motion module/ Motion module.  |
|                 | Follow up function  | This function monitors the motor rotation amount with the servo turned OFF, and reflects it on the feed current value.   |

\*1 The near pass function is featured as standard and is valid only for setting continuous path control for position control. It cannot be set to be invalid with parameters.

## Common functions

Common control using the Simple Motion module/Motion module for "Parameter initialization function" or "Execution data backup function" can be carried out.

The outline of the functions executed as necessary is described below.

| Common functions  | Details  |
|---|--|
| Parameter initialization function                               | This function returns the setting data stored in the buffer memory/internal memory and flash ROM/internal memory (nonvolatile) of Simple Motion module/Motion module to the default values.<br>The following two methods can be used. <ul style="list-style-type: none"> <li>• Method using a program</li> <li>• Method using an engineering tool</li> </ul>   |
| Execution data backup function                                  | This function writes the execution data being used in the control into the flash ROM/internal memory (nonvolatile).<br>The following two methods can be used. <ul style="list-style-type: none"> <li>• Method using a program</li> <li>• Method using an engineering tool</li> </ul>   |
| External input signal select function                           | This function sets the input type, input terminal, signal logic and input filter for each external input signal of each axis (upper/lower stroke limit signal (FLS/RLS), proximity dog signal (DOG), and stop signal (STOP)).<br>The function enables the assignment of external input signal of each axis to any terminals of 20 points of the external input connection connector on the Simple Motion module/Motion module. |
| History monitor function  | This function monitors start history and current value history of all axes.  |
| Amplifier-less operation function [FX5-SSC-S]                   | This function executes the positioning control of Simple Motion module without connecting to the servo amplifiers.<br>It is used to debug the program at the start-up of the device or simulate the positioning operation.   |
| Virtual servo amplifier function                                | This function executes the operation as the axis (virtual servo amplifier axis) that operates only command (instruction) virtually without servo amplifiers.   |
| Driver communication function [FX5-SSC-S]                       | This function uses the "Master-slave operation function" of servo amplifier. The Simple Motion module controls the master axis and the slave axis is controlled by data communication between servo amplifiers (driver communication) without Simple Motion module.  |
| Mark detection function   | This function is used to latch any data at the input timing of the mark detection signal (DI).   |
| Optional data monitor function                                  | This function is used to store the data selected by user up to 4 data per axis to buffer memory and monitor them.  |
| Event history function [FX5-SSC-G]                              | This function takes errors that occur on the Motion module and event information and collects them in the CPU module or saves them to the SD memory card. Storing the errors in the CPU allows the error history to be checked even after turning OFF the power or resetting.  |
| Connect/disconnect function of SSCNET [FX5-SSC-S] communication | Temporarily connect/disconnect of SSCNET communication is executed during system's power supply ON. This function is used to exchange the servo amplifiers or SSCNET III cables.   |
| Servo transient transmission function [FX5-SSC-G]               | This function reads and writes objects of the slave device via transient transmission.   |
| Hot line forced stop function [FX5-SSC-S]                       | This function is used to execute deceleration stop safety for other axes when the servo alarm occurs in the servo amplifier MR-JE-B(F).  |



## 3.2 Combination of Main Functions and Sub Functions

With positioning control using the Simple Motion module/Motion module, the main functions and sub functions can be combined and used as necessary. A list of the main function and sub function combinations is given below.

### Combination of main functions and operation patterns

○: Combination possible

△: Combination limited

×: Combination not possible

| Main functions               |  | Combination with operation pattern <sup>*1</sup>     |   |
|------------------------------|--|--|---|
| Home position return control | Machine home position return control       | ×  |   |
|                              | Fast home position return control          | ×  |   |
| Major positioning control    | Position control                           | 1-axis linear control                                | ○   |
|                              |  | 2-, 3-, or 4-axis linear interpolation control       | ○   |
|                              |  | 1-axis fixed-feed control                            | △ (Continuous path control cannot be set) |
|                              |  | 2-, 3-, or 4-axis fixed-feed control (interpolation) | △ (Continuous path control cannot be set) |
|                              |  | 2-axis circular interpolation control                | ○   |
|                              | Speed control (1- to 4-axis)               | △ (Only independent positioning control can be set)  |   |
|                              | Speed-position switching control           | △ (Continuous path control cannot be set)            |   |
|                              | Position-speed switching control           | △ (Only independent positioning control can be set)  |   |
|                              | Other control                              | Current value changing                               | △ (Continuous path control cannot be set) |
|                              |  | NOP instruction                                      | ×   |
| JUMP instruction             |  | ×  |   |
| LOOP to LEND                 |  |  |   |
| Manual control               | JOG operation, inching operation           | ×  |   |
|                              | Manual pulse generator operation           | ×  |   |
| Expansion control            | Speed-torque control                       | ×  |   |
|                              | Advanced synchronous control (output axis) | ×  |   |

\*1 The operation pattern is one of the "positioning data" setting items.

## Combination of main functions and sub functions

◎: Always combine

○: Combination possible

△: Combination limited

×: Combination not possible

| Main functions               |  | Functions characteristic to machine home position return [FX5-SSC-S] |                              | Functions that compensate control |                          |                    |
|------------------------------|--|--|------------------------------|-----------------------------------|--------------------------|--------------------|
|                              |  | Home position return retry function                                  | Home position shift function | Backlash compensation function    | Electronic gear function | Near pass function |
| Home position return control | Machine home position return control       | △*1  | ○                            | ○                                 | ○                        | △*2                |
|                              | Fast home position return control          | ×  | ×                            | ○                                 | ○                        |                    |
| Major positioning control    | Position control                           | 1-axis linear control  | ×                            | ×                                 | ○                        | ○                  |
|                              |  | 2-, 3-, or 4-axis linear interpolation control                       | ×                            | ×                                 | ○                        | ○                  |
|                              |  | 1-axis fixed-feed control  | ×                            | ×                                 | ○                        | ○                  |
|                              |  | 2-, 3-, or 4-axis fixed-feed control (interpolation)                 | ×                            | ×                                 | ○                        | ○                  |
|                              |  | 2-axis circular interpolation control                                | ×                            | ×                                 | ○                        | ○                  |
|                              | Speed control (1- to 4-axis)               | ×  | ×                            | ○                                 | ○                        |                    |
|                              | Speed-position switching control           | ×  | ×                            | ○                                 | ○                        |                    |
|                              | Position-speed switching control           |  |                              |                                   |                          |                    |
|                              | Other control                              | Current value changing   | ×                            | ×                                 | ×                        | ×                  |
|                              |  | NOP instruction  |                              |                                   |                          |                    |
| JUMP instruction             |  | ×  | ×                            | ×                                 | ×                        |                    |
| LOOP to LEND                 |  |  |                              |                                   |                          |                    |
| Manual control               | JOG operation, inching operation           | ×  | ×                            | ○                                 | ○                        | ×                  |
|                              | Manual pulse generator operation           | ×  | ×                            | ○                                 | ○                        | ×                  |
| Expansion control            | Speed-torque control                       | ×  | ×                            | ×                                 | ○                        | ×                  |
|                              | Advanced synchronous control (output axis) | ×  | ×                            | ○                                 | ○                        | ×                  |

\*1 Home position return retry function cannot be used during the scale origin signal detection method machine home position return.

\*2 The near pass function is featured as standard and is valid only for setting continuous path control for position control.

| Main functions               |  | Functions that limit control                         |                       |                                |                                |                      |   |
|------------------------------|--|--|-----------------------|--------------------------------|--------------------------------|----------------------|---|
|                              |  | Speed limit function                                 | Torque limit function | Software stroke limit function | Hardware stroke limit function | Forced stop function |   |
| Home position return control | Machine home position return control       | ○  | ○                     | ×                              | ◎                              | ○                    |   |
|                              | Fast home position return control          | ○  | ○                     | ×                              | ◎                              | ○                    |   |
| Major positioning control    | Position control                           | 1-axis linear control                                | ○                     | ○                              | ○                              | ◎                    | ○ |
|                              |  | 2-, 3-, or 4-axis linear interpolation control       | ○                     | ○                              | ○                              | ◎                    | ○ |
|                              |  | 1-axis fixed-feed control                            | ○                     | ○                              | ○                              | ◎                    | ○ |
|                              |  | 2-, 3-, or 4-axis fixed-feed control (interpolation) | ○                     | ○                              | ○                              | ◎                    | ○ |
|                              |  | 2-axis circular interpolation control                | ○                     | ○                              | ○                              | ◎                    | ○ |
|                              | Speed control (1- to 4-axis)               | ○  | ○                     | ○                              | ◎                              | ○                    |   |
|                              | Speed-position switching control           | ○  | ○                     | ○                              | ◎                              | ○                    |   |
|                              | Position-speed switching control           |  |                       |                                |                                |                      |   |
|                              | Other control                              | Current value changing                               | ×                     | ×                              | ○                              | ◎                    | ○ |
|                              |  | NOP instruction                                      |                       |                                | ×                              | ×                    |   |
|                              |  | JUMP instruction                                     | ×                     | ×                              | ×                              | ×                    | ○ |
| LOOP to LEND                 |  |  |                       |                                |                                |                      |   |
| Manual control               | JOG operation, inching operation           | ○  | ○                     | ○                              | ◎                              | ○                    |   |
|                              | Manual pulse generator operation           | ×  | ○                     | ○                              | ◎                              | ○                    |   |
| Expansion control            | Speed-torque control                       | ○  | ○                     | ○                              | ◎                              | ○                    |   |
|                              | Advanced synchronous control (output axis) | ×  | ○                     | ○                              | ◎                              | ○                    |   |

○: Combination possible

△: Combination limited

×: Combination not possible

| Main functions               |  | Functions that change control details                |                   |   |                        |                                 |     |
|------------------------------|--|--|-------------------|---|------------------------|---------------------------------|-----|
|                              |  | Speed change function                                | Override function | Acceleration/ deceleration time change function | Torque change function | Target position change function |     |
| Home position return control | Machine home position return control       | △*1  | △*1               | △*1   | ○                      | ×                               |     |
|                              | Fast home position return control          | ○  | ○                 | ○   | ○                      | ×                               |     |
| Major positioning control    | Position control                           | 1-axis linear control                                | ○                 | ○   | ○                      | ○                               | △*2 |
|                              |  | 2-, 3-, or 4-axis linear interpolation control       | ○                 | ○   | ○                      | ○                               | ×   |
|                              |  | 1-axis fixed-feed control                            | ○                 | ○   | ○                      | ○                               | ×   |
|                              |  | 2-, 3-, or 4-axis fixed-feed control (interpolation) | ○                 | ○   | ○                      | ○                               | ×   |
|                              |  | 2-axis circular interpolation control                | ○                 | ○   | ○                      | ○                               | ×   |
|                              | Speed control (1- to 4-axis)               | ○  | ○                 | ○   | ○                      | ×                               |     |
|                              | Speed-position switching control           | ○  | ○                 | ○   | ○                      | ×                               |     |
|                              | Position-speed switching control           |  |                   |   |                        |                                 |     |
|                              | Other control                              | Current value changing                               | ×                 | ×   | ×                      | ×                               | ×   |
|                              |  | NOP instruction                                      |                   |   |                        |                                 |     |
| JUMP instruction             |  | ×  | ×                 | ×   | ×                      | ×                               |     |
| LOOP to LEND                 |  |  |                   |   |                        |                                 |     |
| Manual control               | JOG operation, inching operation           | △*3  | △*3               | △*3   | ○                      | ×                               |     |
|                              | Manual pulse generator operation           | ×  | ×                 | ×   | ○                      | ×                               |     |
| Expansion control            | Speed-torque control                       | ×  | ×                 | ×   | ○                      | ×                               |     |
|                              | Advanced synchronous control (output axis) | ×  | ×                 | ×   | ○                      | ×                               |     |

| Main functions               |                                      | Functions related to positioning start               | Functions related to positioning stop |  | Other functions |                        |   |
|------------------------------|--------------------------------------|--|---------------------------------------|--|-----------------|------------------------|---|
|                              |                                      | Pre-reading start function                           | Step function                         | Stop command processing for deceleration stop function | Skip function   | M code output function |   |
| Home position return control | Machine home position return control | ×  | ×                                     | ○  | ×               | ×                      |   |
|                              | Fast home position return control    | ×  | ×                                     | ○  | ×               | ×                      |   |
| Major positioning control    | Position control                     | 1-axis linear control                                | ○                                     | ○  | ○               | ○                      | ○ |
|                              |                                      | 2-, 3-, or 4-axis linear interpolation control       | ○                                     | ○  | ○               | ○                      | ○ |
|                              |                                      | 1-axis fixed-feed control                            | ○                                     | ○  | ○               | ○                      | ○ |
|                              |                                      | 2-, 3-, or 4-axis fixed-feed control (interpolation) | ○                                     | ○  | ○               | ○                      | ○ |
|                              |                                      | 2-axis circular interpolation control                | ○                                     | ○  | ○               | ○                      | ○ |

| Main functions            |  | Functions related to positioning start | Functions related to positioning stop |  | Other functions |                        |     |
|---------------------------|--|--|---------------------------------------|--|-----------------|------------------------|-----|
|                           |  | Pre-reading start function             | Step function                         | Stop command processing for deceleration stop function | Skip function   | M code output function |     |
| Major positioning control | Speed control (1- to 4-axis)               | ○                                      | ×                                     | ○  | ×               | ○                      |     |
|                           | Speed-position switching control           | ○                                      | ○                                     | ○  | ○               | ○                      |     |
|                           | Position-speed switching control           |  |                                       |  | ×               |                        |     |
|                           | Other control                              | Current value changing                 | ×                                     | ○  | ×               | ○                      | △*4 |
|                           |  | NOP instruction                        |                                       | ×  |                 | ×                      |     |
|                           |  | JUMP instruction                       | ×                                     | ×  | ×               | ×                      | ×   |
| LOOP to LEND              |  |  |                                       |  |                 |                        |     |
| Manual control            | JOG operation, inching operation           | ×                                      | ×                                     | ×  | ×               | ×                      |     |
|                           | Manual pulse generator operation           | ×                                      | ×                                     | ×  | ×               | ×                      |     |
| Expansion control         | Speed-torque control                       | ×                                      | ×                                     | ×  | ×               | ×                      |     |
|                           | Advanced synchronous control (output axis) | ×                                      | ×                                     | ×  | ×               | ×                      |     |

\*1 Invalid during creep speed.

\*2 Invalid during continuous path control.

\*3 Combination with the inching operation is not available. (Inching operation does not perform acceleration/deceleration processing.)

\*4 Change the current value using the positioning data. Disabled for a start of positioning start No. 9003.

○: Combination possible

△: Combination limited

×: Combination not possible

| Main functions               |  | Other functions                                      |                              |  |                                  |  |   |                 |
|------------------------------|--|--|------------------------------|--|----------------------------------|--|---|-----------------|
|                              |  | Teaching function                                    | Command in-position function | Acceleration/ deceleration processing function | Deceleration start flag function | Speed control 10 times multiplier setting for degree axis function | Operation setting for incompleteness of home position return function |                 |
| Home position return control | Machine home position return control       | ×  | ×                            | ○  | ×                                | ○  | ×   |                 |
|                              | Fast home position return control          | ×  | ○                            | ○  | ×                                | ○  | ×   |                 |
| Major positioning control    | Position control                           | 1-axis linear control                                | ×                            | ○  | ○                                | ○  | ○   | ○               |
|                              |  | 2-, 3-, or 4-axis linear interpolation control       | ×                            | ○  | ○                                | △ <sup>*1</sup>  | ○   | ○               |
|                              |  | 1-axis fixed-feed control                            | ×                            | ○  | ○                                | ○  | ○   | ○               |
|                              |  | 2-, 3-, or 4-axis fixed-feed control (interpolation) | ×                            | ○  | ○                                | △ <sup>*1</sup>  | ○   | ○               |
|                              |  | 2-axis circular interpolation control                | ×                            | ○  | ○                                | ×  | ×   | ○               |
|                              | Speed control (1- to 4-axis)               | ×  | ×                            | ○  | ×                                | ○  | ○   |                 |
|                              | Speed-position switching control           | ×  | ○                            | ○  | △ <sup>*2</sup>                  | ○  | ○   |                 |
|                              | Position-speed switching control           |  |                              |  |                                  |  |   |                 |
|                              | Other control                              | Current value changing                               | ×                            | ×  | ×                                | ×  | ×   | △ <sup>*3</sup> |
|                              |  | NOP instruction                                      |                              |  |                                  |  |   | ×               |
| JUMP instruction             |  | ×  | ×                            | ×  | ×                                | ×  | ×   |                 |
| LOOP to LEND                 |  |  |                              |  |                                  |  |   |                 |
| Manual control               | JOG operation, inching operation           | ○  | ×                            | △ <sup>*4</sup>                                | ×                                | ○  | ×   |                 |
|                              | Manual pulse generator operation           | ○  | ×                            | ×  | ×                                | △ <sup>*5</sup>  | ×   |                 |
| Expansion control            | Speed-torque control                       | ×  | ×                            | △ <sup>*6</sup>                                | ×                                | ○  | ○   |                 |
|                              | Advanced synchronous control (output axis) | ×  | ×                            | △ <sup>*7</sup>                                | ×                                | △ <sup>*7</sup>  | ○   |                 |

\*1 Valid for the reference axis only.

\*2 Valid for only the case where a deceleration start is made during position control.

\*3 Valid for a start of positioning start No.9003, but invalid for a start of positioning data (No. 1 to 600).

\*4 Combination with the inching operation is not available. (Inching operation does not perform acceleration/deceleration processing.)

\*5 Valid for "[Md.22] Feedrate" and "[Md.28] Axis feedrate".

\*6 Refer to "Speed-torque Control" in the following manual for acceleration/deceleration processing in the speed-torque control.

📖 MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application)


\*7 For details, refer to "Output Axis Sub Functions" in the following manual.

📖 MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control)

## 3.3 Network Function List [FX5-SSC-G]

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For CC-Link IE TSN functions, refer to "Function List" in the following manual.

 MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN)

# 4 PROCEDURES BEFORE OPERATIONS

## Settings and procedures before operation [FX5-SSC-S]

The following describes the procedures before operation of FX5-SSC-S.

### 1. Mounting the module

Mount the Simple Motion module to the CPU module.

For details, refer to the following.

📖 MELSEC iQ-F FX5U User's Manual (Hardware)

📖 MELSEC iQ-F FX5UC User's Manual (Hardware)

### 2. Wiring

Connect the Simple Motion module to external devices.

### 3. Adding the module

Add the FX5-SSC-S to the module map of the project using an engineering tool.

### 4. Module setting

Set values for the module setting using an engineering tool.

For details, refer to the following.

📖 GX Works3 Operating Manual

### 5. Auto refresh setting

Set values for the refresh settings using an engineering tool.

For details, refer to the following.

📖 GX Works3 Operating Manual

### 6. Checking connection

Check that the Simple Motion module is connected to external devices correctly.

### 7. Programming

Create programs.

For details, refer to "PROGRAMMING [FX5-SSC-S]" in the following manual.

📖 MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application)

### 8. Test operation


Confirm that the created programs are able to execute properly.



## Settings and procedures before operation [FX5-SSC-G]

The following describes the procedures before operation of FX5-SSC-G.

For a setting example, refer to the following.

 Page 105 Setting Example for Motion Modules (FX5-SSC-G)

### 1. Mounting the module

Mount the Motion module.

### 2. Wiring

Connect the Motion module to external devices.

### 3. Adding the module


Add the FX5-SSC-G to the module map of the project using an engineering tool.

### 4. Network configuration

Set values for the network related settings in "Module Parameter (Network)" of the engineering tool.

- Set the communication cycle used for the network configuration settings.


Set the basic communication cycle according to the number of control axes and the network device configuration. Use the communication cycle as a reference for the cycle. For details, refer to "Processing Time" in the following manual.

 MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN)

- Set the slave station in network configuration settings.

The slave stations that are to be controlled with the Motion module must be set to "Motion Control Station". When setting slave stations to "Motion Control Station", set the communication cycle to the basic cycle.


For details, refer to "Basic Settings" in the following manual.

 MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN)

### 5. Module setting (Module Extended Parameter)

Set values for the settings related to axis control in "Module Extended Parameter" of the engineering tool.


For details, refer to "PARAMETER SETTINGS" in the following manual.

 MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN)

### 6. Refresh setting

Set values for the link refresh settings in "Basic Settings" of Module Parameter (Network).

For details, refer to "Basic Settings" in the following manual.

 MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN)

### 7. Programming

Create programs.

For details, refer to "PROGRAMMING [FX5-SSC-G]" in the following manual.

 MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application)

### 8. Writing parameters

Write the set parameters and programs to the Motion module.

### 9. Network diagnostics

Use network diagnostics to check the cable connection status and whether the set parameters were transferred correctly.

For details, refer to "Checking the Network Status" in the following manual.

 MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN)

### 10. Slave device parameter setting

Set parameters for the drive units to be used.

Refer to the relevant drive unit manual for details.

### 11. Test operation

Confirm that the created programs are able to execute properly.

# 5 WIRING

## 5.1 Wiring [FX5-SSC-S]

### Precautions

The precautions for wiring the Simple Motion module are shown below. Execute the work following the precautions below.

#### Warning for wiring

##### **WARNING**

- Completely turn off the externally supplied power used in the system before installation or wiring. Not doing so could result in electric shock or damage to the product.

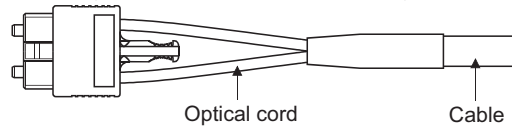
#### Caution for wiring

##### **CAUTION**

- Check the layout of the terminals and then properly route the wires to the module.
- The external input wiring connector must be crimped or pressured with the tool specified by the manufacturer, or must be correctly soldered. Insufficient connections may cause short circuit, fire, or malfunction.
- Be careful not to let foreign matter such as sawdust or wire chips get inside the module. These may cause fires, failure or malfunction.
- The top surface of the module is covered with protective films to prevent foreign objects such as cable off cuts from entering the module when wiring. Do not remove this film until the wiring is complete. Before operating the system, be sure to remove the film to provide adequate ventilation.
- Securely connect the connector for SSCNETIII cable to the bottom connector on the module.
- When removing the cable from the module, do not pull the cable. Hold the connector that is connected to the module. Pulling the cable that is still connected to the module may cause malfunction or damage to the module or cable.
- The external input/output signal cable and the communication cable should not be routed near or bundled with the main circuit cable, power cable and/or other such load - carrying cables other than those for the PLC. These cables should be separated by at least 100 mm (3.94 inch) or more. They can cause electrical interference, surges and inductance that can lead to mis-operation.
- The shielded cable for connecting Simple Motion module can be secured in place. If the shielded cable is not secured, unevenness or movement of the shielded cable or careless pulling on it could result in damage to the Simple Motion module, servo amplifier or shielded cable or defective cable connections could cause mis-operation of the unit.
- If the external input/output signal cable and the power line must be adjacently laid (less than 100 mm (3.94 inch)), use a shielded cable. Ground the shield of the cable securely to the control panel on the Simple Motion module side.
- Forcibly removal the SSCNETIII cable from the Simple Motion module will damage the Simple Motion module and SSCNETIII cables.
- After removal of the SSCNETIII cable, be sure to put a cap on the SSCNETIII connector. Otherwise, adhesion of dirt deteriorates in characteristic and it may cause malfunctions.
- Do not remove the SSCNETIII cable while turning on the power supply of Simple Motion module and servo amplifier. Do not see directly the light generated from SSCNETIII connector and the end of SSCNETIII cable. When the light gets into eye, may feel something wrong with eyes.(The light source of SSCNETIII cable complies with class1 defined in JISC6802 or IEC60825-1.)
- If a power such as a major shock, lateral pressure, haul, sudden bending or twist is added to the SSCNETIII cable, it distorts or breaks inside and optical transmission is not be available. Note that the short SSCNETIII cable can be twisted easily.
- Be sure to use the SSCNETIII cable within the range of operating temperature described in each servo amplifier instruction manual. Especially, as optical fiber for MR-J3BUS\_M and MR-J3BUS\_M-A are made of synthetic resin, it melts down if being left near the fire or high temperature. Therefore, do not make it touched the part which becomes high temperature, such as radiator or regenerative option of servo amplifier, or servomotor.
- When laying the SSCNETIII cable, be sure to secure the minimum cable bend radius or more.
- Put the SSCNETIII cable in the duct or fix the cable at the closest part to the Simple Motion module with bundle material in order to prevent SSCNETIII cable from putting its own weight on SSCNETIII connector. When laying cable, the optical cord should be given loose slack to avoid from becoming smaller than the minimum bend radius, and it should not be twisted. Also, fix and hold it in position with using cushioning such as sponge or rubber which does not contain plasticizing material. If adhesive tape for bundling the cable is used, fire resistant acetate cloth adhesive tape 570F (Teraoka Seisakusho Co., Ltd) is recommended.

## ⚠ CAUTION

- Migrating plasticizer is used for vinyl tape. Keep the MR-J3BUS\_M, and MR-J3BUS\_M-A cables away from vinyl tape because the optical characteristic may be affected. Generally, soft polyvinyl chloride (PVC), polyethylene resin (PE) and fluorine resin contain non-migrating plasticizer and they do not affect the optical characteristic of SSCNET III cable. However, some wire sheaths and cable ties, which contain migrating plasticizer (phthalate ester), may affect MR-J3BUS\_M and MR-J3BUS\_M-A cables (made of plastic). In addition, MR-J3BUS\_M-B cable (made of quartz glass) is not affected by plasticizer.



- : Normally, cable is not affected by plasticizer.
- △: Phthalate ester plasticizer such as DBP and DOP may affect optical characteristic of cable.

| SSCNET III cable | Cord | Cable |
|------------------|------|-------|
| MR-J3BUS_M       | △    | △     |
| MR-J3BUS_M-A     | △    | △     |
| MR-J3BUS_M-B     | ○    | ○     |

- If the adhesion of solvent and oil to the cord part of SSCNET III cable may lower the optical characteristic and machine characteristic. To use the cable in that environment, be sure to do the protection measures to the cord part.
- When keeping the Simple Motion module or servo amplifier, be sure to attach a cap to the connector part so that a dirt should not adhere to the end of SSCNET III connector.
- To protect a light device inside a connector from dust, a cap is attached to the SSCNET III connector for the SSCNET III cable. Therefore, do not remove a cap until just before connecting the SSCNET III cable. Also, when removing the SSCNET III cable, make sure to attach a cap.
- Keep the cap and the tube for protecting light cord end of SSCNET III cable in a plastic bag with a zipper included with the SSCNET III cable to prevent them from becoming dirty.
- When exchanging the Simple Motion module or servo amplifier, make sure to attach a cap to the SSCNET III connector. When asking repair of Simple Motion module or servo amplifier for some troubles, make also sure to attach a cap to the SSCNET III connector. When a cap is not attached, the light device may be damaged at the transit. In this case, exchange or repair of the light device is required.

## Precautions for wiring

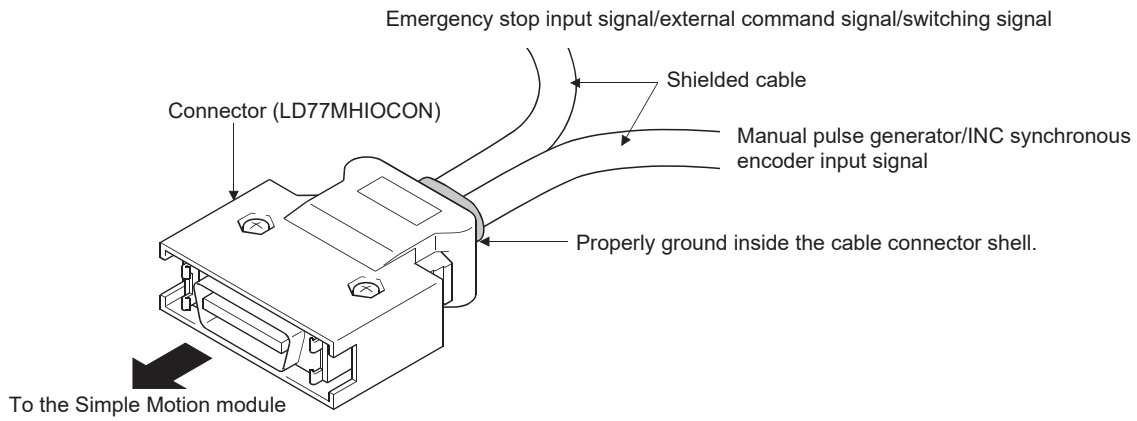
- Use separate cables for connecting to the Simple Motion module and for the power cable that creates surge and inductance.
- The cable for connecting the Simple Motion module should be placed in the duct or secured in place by clamps. If the cable is not placed in the duct or secured by clamps, unevenness or movement of the cable or careless pulling on it could result in damage to the unit or cable or defective cable connections could cause mis-operation of the unit.
- If a duct is being used, separate the cables to connect the Simple Motion module from the power line duct, or use metal piping. Ground the pipes securely after metal piping.
- Use the twisted pair shielded cable (wire size 0.3 mm<sup>2</sup> or more). The shielded must be grounded on the Simple Motion module side.
- Use separate shielded cables for the external input signal, forced stop input, and manual pulse generator/incremental synchronous encoder input for connecting to the Simple Motion module. They can cause electrical interference, surges and inductance that can lead to mis-operation.
- When malfunctioning in environment with a lot of noise, the effects of noise may be reduced by the following measure. Please attach a ferrite core (Ex. TDK co., Ltd. ZCAT3035-1330 or similar) to the Simple Motion module side of the cable connected to the forced stop input signal, external command signal/switching signal, and manual pulse generator/incremental synchronous encoder input signal.
- For wiring, refer to the following and each servo amplifier instruction manual.

📖 MELSEC iQ-F FX5U User's Manual (Hardware)

📖 MELSEC iQ-F FX5UC User's Manual (Hardware)

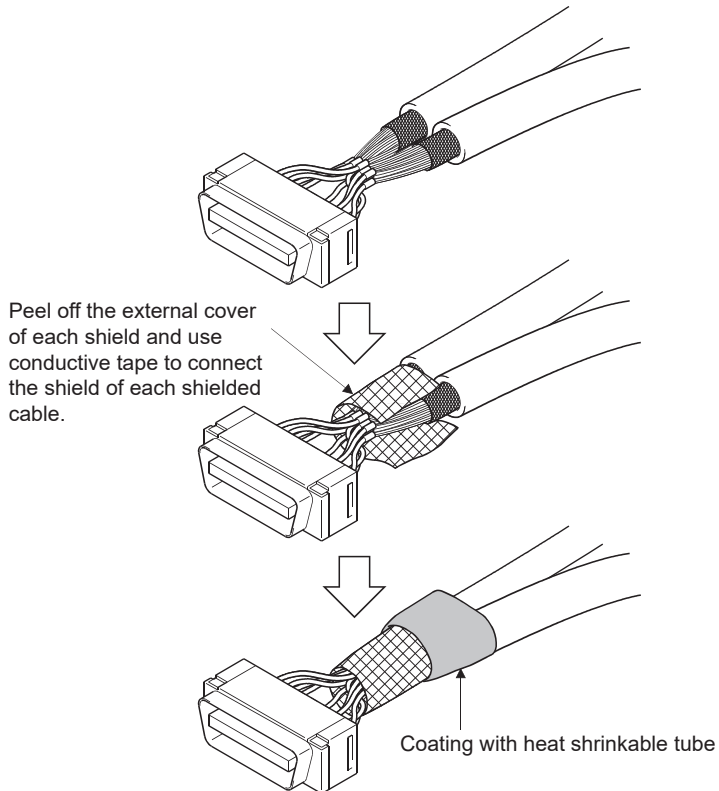
## ■Wiring example of shielded cable

The following shows a wiring example for noise reduction when the connector (LD77MHIOCON) is used.

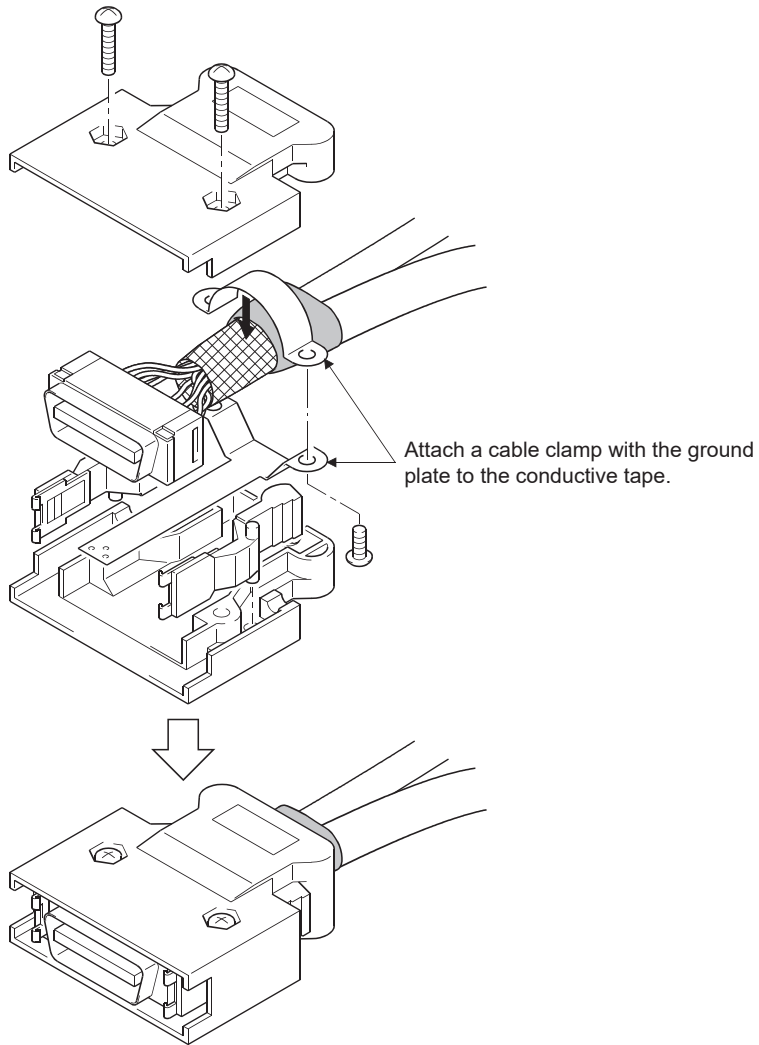


## ■Processing example of shielded cables

Connections of FG wire and each shielded cable



## ■Assembly of connector (LD77MHIOCON)



## Precautions for SSCNETIII cable wiring

SSCNETIII cable is made from optical fiber. If optical fiber is added a power such as a major shock, lateral pressure, haul, sudden bending or twist, its inside distorts or breaks, and optical transmission will not be available. Especially, as optical fiber for MR-J3BUS\_M, MR-J3BUS\_M-A is made of synthetic resin, it melts down if being left near the fire or high temperature. Therefore, do not make it touched the part which becomes high temperature, such as radiator or regenerative option of servo amplifier and servomotor. Be sure to use optical fiber within the range of operating temperature described in each servo amplifier instruction manual. Read described item of this section carefully and handle it with caution.

### ■Minimum bend radius

Make sure to lay the cable with greater radius than the minimum bend radius.

Do not press the cable to edges of equipment or others. For SSCNETIII cable, the appropriate length should be selected with due consideration for the dimensions and arrangement of Simple Motion module or servo amplifier. When closing the door of control panel, pay careful attention for avoiding the case that SSCNETIII cable is hold down by the door and the cable bend becomes smaller than the minimum bend radius.

| Model name of SSCNETIII cable | Minimum bend radius [mm] ([inch])                  |
|-------------------------------|--|
| MR-J3BUS_M                    | 25 (0.98)  |
| MR-J3BUS_M-A                  | Enforced covering cord: 50 (1.97), Cord: 25 (0.98) |
| MR-J3BUS_M-B                  | Enforced covering cord: 50 (1.97), Cord: 30 (1.18) |

### ■Tension

If tension is added on the SSCNETIII cable, the increase of transmission loss occurs because of external force which concentrates on the fixing part of SSCNETIII cable or the connecting part of SSCNETIII connector. At worst, the breakage of SSCNETIII cable or damage of SSCNETIII connector may occur. For cable laying, handle without putting forced tension. (Refer to each servo amplifier instruction manual for the tension strength of SSCNETIII cable.)

### ■Lateral pressure

If lateral pressure is added on the SSCNETIII cable, the cable itself distorts, internal optical fiber gets stressed, and then transmission loss will increase. At worst, the breakage of SSCNETIII cable may occur. As the same condition also occurs at cable laying, do not tighten up SSCNETIII cable with a thing such as nylon band (TY-RAP).

Do not trample it down or tuck it down with the door of control box or others.

### ■Twisting

If the SSCNETIII cable is twisted, it will become the same stress added condition as when local lateral pressure or bend is added. Consequently, transmission loss increases, and the breakage of SSCNETIII cable may occur at worst.

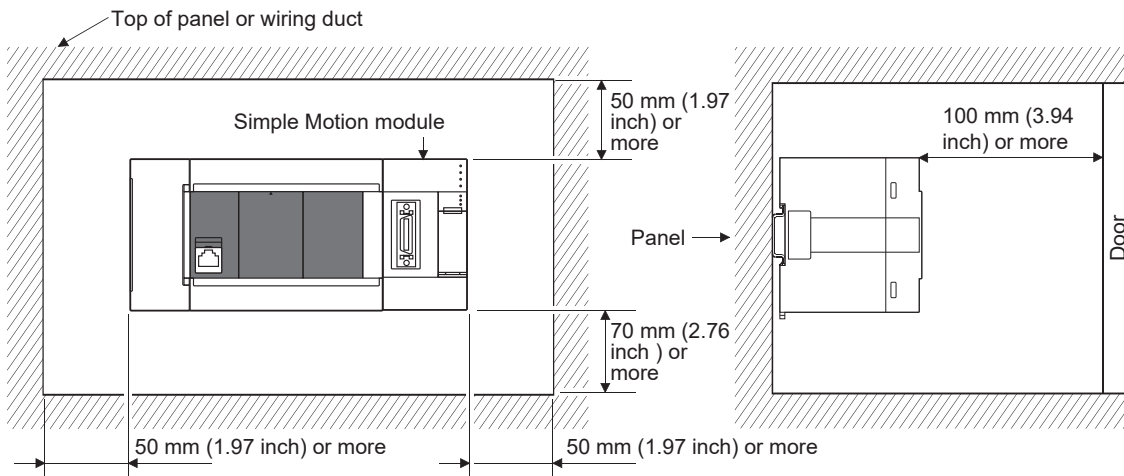
### ■Disposal

When incinerating optical cable (cord) used for SSCNETIII cable, hydrogen fluoride gas or hydrogen chloride gas which is corrosive and harmful may be generated. For disposal of SSCNETIII cable, request for specialized industrial waste disposal services that have incineration facility for disposing hydrogen fluoride gas or hydrogen chloride gas.

## ■Wiring process of SSCNETⅢ cable

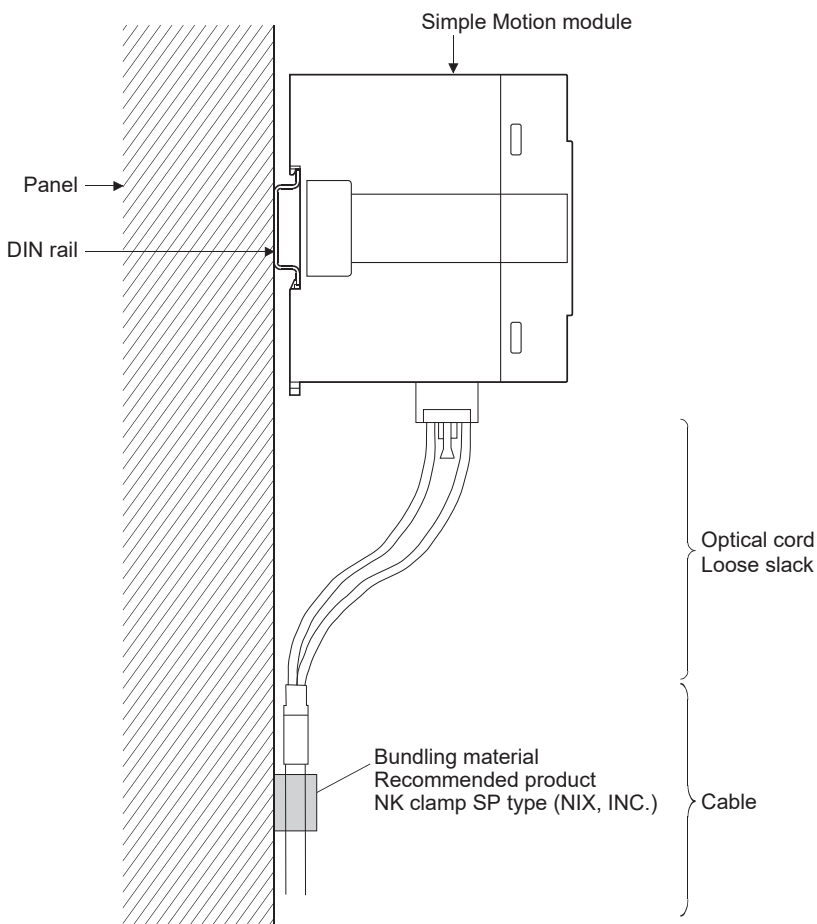
Put the SSCNET cable in the duct or fix the cable at the closest part to the Simple Motion module with bundle material in order to prevent SSCNET cable from putting its own weight on SSCNET connector. Leave the following space for wiring.

- Putting in the duct



- Bundle fixing

Optical cord should be given loose slack to avoid from becoming smaller than the minimum bend radius, and it should not be twisted. When laying cable, fix and hold it in position with using cushioning such as sponge or rubber which does not contain plasticizing material.



## 5.2 Wiring [FX5-SSC-G]

The following describes the wiring methods, wiring products, and precautions for wiring when using the FX5-SSC-G.

### Wiring for CC-Link IE TSN

#### Wiring methods

The following describes connection and disconnection of the Ethernet cable.

##### ■Connecting the cable

1. Turn OFF the power supply of the Motion module and the device being connected.
2. Push the Ethernet cable connector into the Motion module until it clicks. Pay attention to the connector's direction.
3. Lightly pull on the cable to confirm that it is securely connected.
4. Turn ON the power of the Motion module and the external device.
5. Check whether the LINK LED of the port connected to the Ethernet cable is ON.\*1

\*1 The time required for the LINK LED to turn ON after connecting the Ethernet cable may vary. The LINK LED usually turns ON in a few seconds. Note, however, that the time may be extended further if the link-up processing is repeated depending on the status of the device on the line. If the LINK LED does not turn ON, refer to "Troubleshooting using the LEDs" in the following manual and take corrective actions.

 MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application)

##### ■Disconnecting the cable

1. Turn OFF the power supply of the Motion module.
2. Press the latch down and unplug the Ethernet cable.

#### Wiring products

The following describes the devices used for CC-Link IE TSN.

##### ■Ethernet cable

Use an Ethernet cable that meets the following standards.

| Communication speed | Ethernet cable   | Connector      | Standard  |
|---------------------|--|----------------|---|
| 1 Gbps              | Category 5e or higher, straight cable (double-shielded, STP) | RJ45 connector | Cables meeting the following standards: <ul style="list-style-type: none"><li>• IEEE802.3(1000BASE-T)</li><li>• ANSI/TIA/EIA-568-B(Category 5e)</li></ul> |

Cables for CC-Link IE TSN are available for purchase from Mitsubishi Electric System & Service Co., Ltd. (Cable catalogs are also available.)

In addition, processing for connectors of a desired length is offered. Please consult your local Mitsubishi representative.

| Communication speed | Type   | Model (Manufacturer)  |
|---------------------|--|---|
| 1 Gbps              | Category 5e or higher, straight cable (double-shielded, STP) | SC-E5EW series (Mitsubishi Electric System & Service Co., Ltd.) |

#### Point

A communication error may occur due to high-frequency noise from devices other than a programmable controller in a given connection environment. The following describes countermeasures to be taken on the Motion module side to avoid high-frequency noise influence.

Wiring

- Use a double-shielded type cable.
- Do not bundle the Ethernet cable with the main circuit or power cable or place the Ethernet cable near those lines.
- Place the cable in a duct.



## ■ Switching hub

Use the following industrial switching hubs.

| Term                          | Description  | Authentication class          |
|-------------------------------|--|-------------------------------|
| TSN switching hub             | For the models and usage methods of the switching hubs, refer to the CC-Link Partner Association website ( <a href="http://www.cc-link.org">www.cc-link.org</a> ). | Authentication Class B device |
| General-purpose switching hub |  | Authentication Class A device |

A switching hub can be used for cascade connection.

When the switching hub is used for cascade connection, check the specifications of the switching hub used.

### Precautions

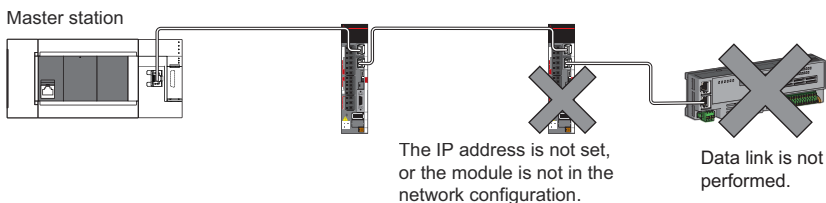
- Since there are different restrictions for system configurations using a TSN switching hub and system configurations using a general-purpose switching hub, setting with an engineering tool is required. For details, refer to "SYSTEM CONFIGURATION" in the following manual.

📖 MELSEC iQ-F Motion Module User's Manual (CC-Link IE TSN)

- Do not configure a ring topology when modules are connected to a switching hub. Doing so causes all stations to fail and prevents data links from being performed.

## Precautions

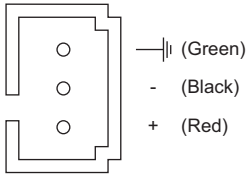
- The bending radius of the Ethernet cable is limited. For details, check the specifications of the Ethernet cable to be used.
- Place the Ethernet cable in a duct or clamp it. Failing to do so may cause dangling cabling to swing or inadvertently be pulled, resulting in damage to the module or cables or a malfunction due to poor contact.
- When installing a cable, do not touch the core of the cable-side or module-side connector, and protect it from dirt or dust. If natural oils from your hands, dirt, or dust becomes attached to the core, it can increase transmission loss and prevent data link from being performed normally.
- Hold the connector part when connecting and disconnecting the Ethernet cable. Pulling cables connected to the module may result in malfunction or damage to the module or cable.
- Confirm that the Ethernet cable is not disconnected or shorted and that there is no problem with the connector connection.
- Do not use an Ethernet cable with a broken latch. Doing so may cause the cable to become unplugged or malfunction.
- For connectors not being connected to Ethernet cables, mount the attached cap to prevent the entry of foreign matter such as dirt or dust.
- The maximum station-to-station distance of the Ethernet cable is 100 m. However, the length may be shorter depending on the operating environment of the cable. For details, contact the manufacturer of the cable used.
- In a line topology, do not connect a slave station with an unset IP address or a slave station that is not in the master station's network configuration between the master station and a slave station or between slave stations.



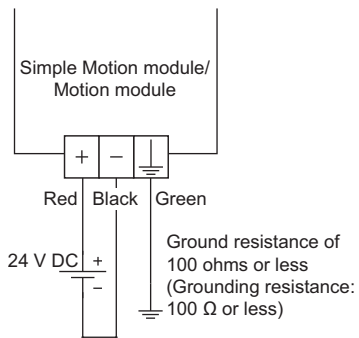
- Communication with the Ethernet device may not be possible depending on the specifications of the connected Ethernet device or switching hub. If communications are not possible, reduce the communication data volume of the Ethernet device.

# 5.3 Power supply wiring

## Power supply connector



## Power supply wiring

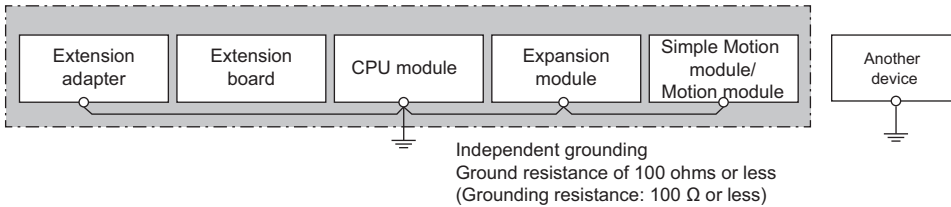


# 5.4 Grounding

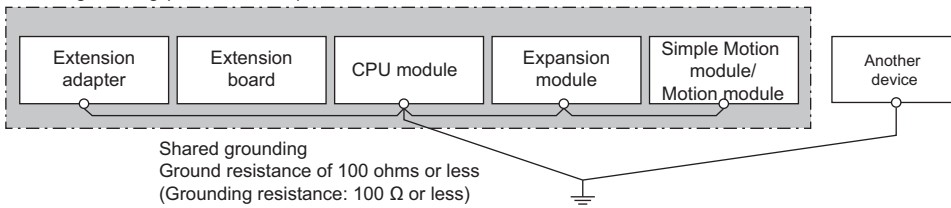
Observe the following:

- Provide grounding with a ground resistance of 100Ω or less.
- Provide independent grounding when possible.
- If independent grounding cannot be provided, provide "shared grounding" as shown below.

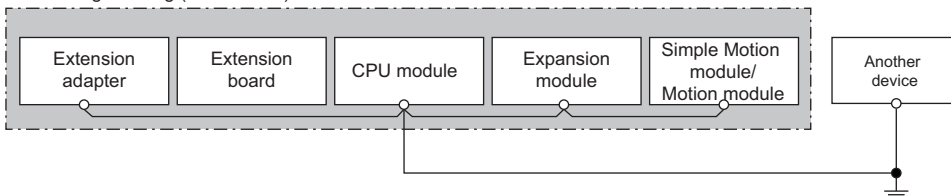
Independent grounding (Best condition)



Shared grounding (Good condition)



Common grounding (Not allowed)

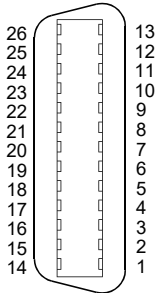


- Limit the distance between the grounding point and the programmable controller as much as possible and keep the grounding wire short.

# 5.5 External Input Connection Connector [FX5-SSC-S]

## Signal layout for external input connection connector

The signal layout for the external input connection connector of Simple Motion module is shown below.

| Pin layout<br>(Front view of the module)  | Pin No. | Signal name  | Pin No.   | Signal name  |              |  |
|---|---------|--------------|---|--------------|--------------|--|
|  | 1       | No connect*5 | 14  | No connect*5 |              |  |
|   | 2       | SG           | Signal ground   | 15           | SG           | Signal ground  |
|   | 3       | HA*1*2*3     | Manual pulse generator/<br>Incremental synchronous<br>encoder A phase/PULSE | 16           | HB*1*2*3     | Manual pulse generator/<br>Incremental synchronous<br>encoder B phase/SIGN |
|   | 4       | HAH*1*2*4    |   | 17           | HBH*1*2*4    |  |
|   | 5       | HAL*1*2*4    |   | 18           | HBL*1*2*4    |  |
|   | 6       | No connect*5 |   | 19           | No connect*5 |  |
|   | 7       |              |   | 20           |              |  |
|   | 8       |              |   | 21           |              |  |
|   | 9       |              |   | 22           |              |  |
|   | 10      | EMI          | Forced stop input signal  | 23           | EMI.COM      | Forced stop input signal<br>common   |
|   | 11      | DI1*6        | External command/<br>Switching signal                                       | 24           | DI2*6        | External command/<br>Switching signal                                      |
|   | 12      | DI3*6        |   | 25           | DI4*6        |  |
|   | 13      | COM*7        | Common (COM)  | 26           | COM*7        | Common (COM)   |

- \*1 Input type from manual pulse generator/incremental synchronous encoder is switched in "[Pr.89] Manual pulse generator/Incremental synchronous encoder input type selection". (Only the value specified for axis 1 is valid).  
0: Differential-output type  
1: Voltage-output/open-collector type (Default value)
- \*2 Set the signal input form in "[Pr.24] Manual pulse generator/Incremental synchronous encoder input selection".
- \*3 Manual pulse generator/Incremental synchronous encoder input selection/open-collector type  
Connect the A-phase/PULSE signal to HA, and the B-phase/SIGN signal to HB.
- \*4 Manual pulse generator/Incremental synchronous encoder input selection in Differential-output type  
Connect the A-phase/PULSE signal to HAH, and the A-phase/PULSE inverse signal to HAL.  
Connect the B-phase/SIGN signal to HBH, and the B-phase/SIGN inverse signal to HBL.
- \*5 Do not connect to any of the terminal explained as "No connect".
- \*6 Set the external command signal [DI] in "[Pr.95] External command signal selection".
- \*7 DI1 to DI4 common terminal arrangement is COM(Common contact), 4 points/common.

# List of input signal details

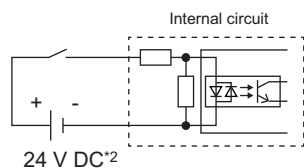
| Signal name                             | Pin No.  | Signal details |   |    |
|---|--|----------------|---|----|
| Differential-output type                | HAH (A+)   | 4              | <p>(1) Phase A/Phase B</p> <ul style="list-style-type: none"> <li>Input the pulse signal from the manual pulse generator/incremental synchronous encoder A phase and B phase.</li> <li>If the A phase leads the B phase, the positioning address will increase at the rising and falling edges of each phase.</li> <li>If the B phase leads the A phase, the positioning address will decrease at the rising and falling edges of each phase.</li> </ul> <p>(a) Magnification by 4</p> <p>[When increased]</p> <p>[When decreased]</p> <p>(b) Magnification by 2</p> <p>[When increased]</p> <p>[When decreased]</p>  |    |
|   | HAL (A-)   | 5              |   |    |
|   | Manual pulse generator/ Incremental synchronous encoder B phase/SIGN | HBH (B+)       |   | 17 |
|   |  | HBL (B-)       |   | 18 |
| Voltage-output type/open-collector type | HA (A)   | 3              | <p>(2) PULSE/SIGN</p> <p>Input the pulse signal for counting the increased/decreased pulse in the pulse input (PULSE). Input the signal for controlling forward run and reverse run in the direction sign (SIGN).</p> <p>1) "[Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection" is positive logic</p> <ul style="list-style-type: none"> <li>The motor will forward run when the direction sign is HIGH.</li> <li>The motor will reverse run when the direction sign is LOW.</li> </ul> <p>2) "[Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection" is negative logic</p> <ul style="list-style-type: none"> <li>The motor will forward run when the direction sign is LOW.</li> <li>The motor will reverse run when the direction sign is HIGH.</li> </ul> |    |
|   | HB (B)   | 16             | <p>[When increased]</p> <p>[When decreased]</p> <p>[When increased]</p> <p>[When decreased]</p>   |    |

| Signal name                                  | Pin No.  | Signal details  |
|--|----------|---|
| External command signal/<br>Switching signal | (DI1)    | 11  |
|  | (DI2)    | 24  |
|  | (DI3)    | 12  |
|  | (DI4)    | 25  |
| Common (COM)                                 | 13<br>26 | • Common for external command/switching signals.  |
| Forced stop input signal (EMI)               | 10       | • This signal is input when batch forced stop is available for all axes of servo amplifier. |
| Forced stop input signal common (EMI.COM)    | 23       | EMI ON (Opened): Forced stop<br>EMI OFF (24 V DC input): Forced stop release                |
| Signal ground (SG)                           | 2<br>15  | The signal ground in the case of using manual pulse generator/INC synchronous encoder.      |

## Interface internal circuit

The outline diagrams of the internal circuits for the external device connection interface (for the Simple Motion module) are shown below.

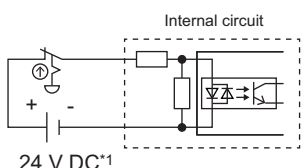
### Interface between external command signals/switching signals

| Input or Output | Signal name                                  | Pin No. | Pin No.  |    |    |    | Wiring example  | Description                                  |
|-----------------|--|---------|----------|----|----|----|---|--|
|                 |  |         | 1        | 2  | 3  | 4  |   |  |
| Input           | External command signal/<br>Switching signal | DI_**1  | 11       | 24 | 12 | 25 |  | External command signal/<br>Switching signal |
|                 |  | COM     | 13<br>26 |    |    |    |   |  |

\*1 \_ = 1 to 4

\*2 As for the 24 V DC polarity, both "+" and "-" are possible.

### Interface with forced stop input signals

| Input or Output | Signal name       | Pin No. | Wiring example | Description  |                          |
|-----------------|-------------------|---------|----------------|--|--------------------------|
| Input           | Forced stop input | EMI     | 10             |  | Forced stop input signal |
|                 |                   | EMI.COM | 23             |  |                          |

\*1 As for the 24 V DC polarity, both "+" and "-" are possible.

## Manual pulse generator/Incremental synchronous encoder input

### Interface between manual pulse generator/incremental synchronous encoder (Differential-output type)

| Input or Output        | Signal name                           | Pin No.  | Wiring example |
|------------------------|---------------------------------------|----------|----------------|
| Input <sup>*1,*2</sup> | Manual pulse generator, phase A/PULSE | HAH (A+) | 4              |
|                        |                                       | HAL (A-) | 5              |
|                        | Manual pulse generator, phase B/SIGN  | HBH (B+) | 17             |
|                        |                                       | HBL (B-) | 18             |
|                        | Signal ground                         | SG       | 2<br>15        |

\*1 Set "0: Differential-output type" in "[Pr.89] Manual pulse generator/Incremental synchronous encoder input type selection" if the manual pulse generator/Incremental synchronous encoder of differential-output type is used.

The default value is "1: Voltage-output/open-collector type".

\*2 Set the signal input form in "[Pr.24] Manual pulse generator/Incremental synchronous encoder input selection".

### Interface between manual pulse generator/Incremental synchronous encoder (Voltage-output type/open-collector type)

| Input or Output        | Signal name                           | Pin No. | Wiring example |
|------------------------|---------------------------------------|---------|----------------|
| Input <sup>*1,*2</sup> | Manual pulse generator, phase A/PULSE | HA (A)  | 3              |
|                        | Manual pulse generator, phase B/SIGN  | HB (B)  | 16             |
|                        | Signal ground                         | SG      | 2<br>15        |

\*1 Set "1: Voltage-output/open-collector type" in "[Pr.89] Manual pulse generator/Incremental synchronous encoder input type selection" if the manual pulse generator/Incremental synchronous encoder of voltage-output/open-collector type is used.

The default value is "1: Voltage-output/open-collector type".

\*2 Set the signal input form in "[Pr.24] Manual pulse generator/Incremental synchronous encoder input selection".

## Wiring example for manual pulse generator/incremental synchronous encoder

Wire the manual pulse generator/incremental synchronous encoder of differential output type and voltage output type/open-collector type as follows.

Switch the input type of FX5-SSC-S by "[Pr.89] Manual pulse generator/Incremental synchronous encoder input type selection".

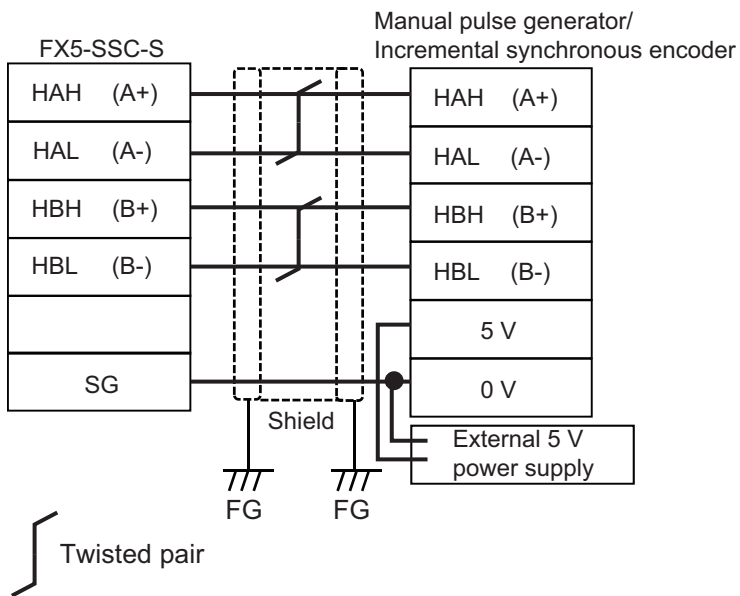
Use the external 5 V power supply (5 V DC±5%) for the power supply of the manual pulse generator/incremental synchronous encoder.

Connect the 0 V (-) of the manual pulse generator/incremental synchronous encoder and the SG of FX5-SSC-S.

Select the external power supply with due consideration for the capacity of manual pulse generator/incremental synchronous encoder.

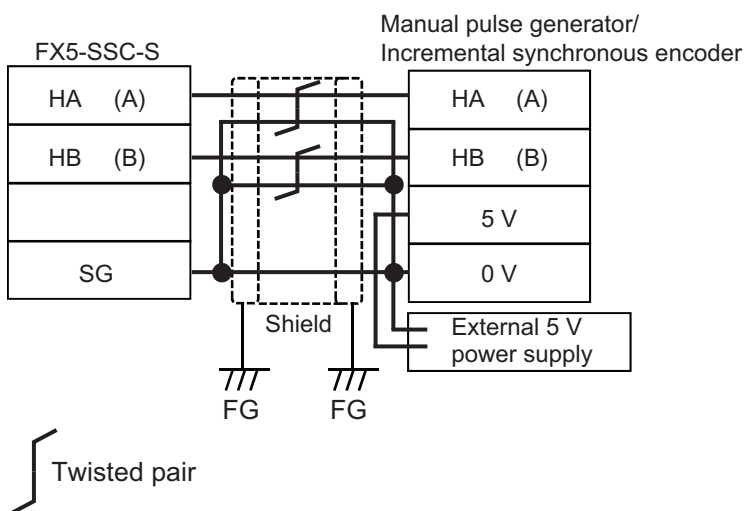
### Manual pulse generator/Incremental synchronous encoder of differential output type

Recommended wiring example



### Manual pulse generator/Incremental synchronous encoder of voltage output type/open-collector type

Recommended wiring example






# APPENDICES

## Appendix 1 Component List [FX5-SSC-S]

The positioning system using the Simple Motion module is configured of the following devices.

| No. | Part name                   | Type                       | Remarks   |
|-----|-----------------------------|----------------------------|---|
| 1   | Simple Motion module        | FX5-40SSC-S<br>FX5-80SSC-S |  <p>S: Compatible with SSCNETⅢ(H)<br/>Number of controlled axes (40 = 4 axes, 80 = 8 axes)</p>   |
| 2   | Servo amplifier             | —                          | —   |
| 3   | SSCNETⅢ cable               | —                          | Cables are needed for connecting the Simple Motion module with a servo amplifier, or between servo amplifiers. (☞ Page 71 Reference product)  |
| 4   | External input signal cable | —                          | Cables are needed for connecting the Simple Motion module with an external device. (Prepare them referring to the manuals for the connected devices and information given in the following.<br>☞ Page 66 Signal layout for external input connection connector) |

### Reference product

#### Connection cable

The cables for connecting between the Simple Motion module and servo amplifiers. Refer to each servo amplifier instruction manual for details.

#### ■SSCNETⅢ cable

For long distance cables of up to 100 m and cables with an ultra-long bending life, refer to SSCNETⅢ cables manufactured by Mitsubishi Electric System & Service Co., Ltd. (☞ Page 72 SSCNETⅢ cables manufactured by Mitsubishi Electric System & Service Co., Ltd (SC-J3BUS\_M-C))

\_ = Cable length

(015: 0.15 m (0.49 ft.), 03: 0.3 m (0.98 ft.), 05: 0.5 m (1.64 ft.), 1: 1 m (3.28 ft.), 3: 3 m (9.84 ft.), 5: 5 m (16.40 ft.), 10: 10 m (32.81 ft.), 20: 20 m (65.62 ft.), 30: 30 m (98.43 ft.), 40: 40 m (131.23 ft.), 50: 50 m (164.04 ft.))

| Model name   |               | Cable length [m (ft.)] | Description  |
|--|---------------|------------------------|--|
| MR-J3BUS_M<br>(Standard cord for inside panel)     | MR-J3BUS015M  | 0.15 (0.49)            | <ul style="list-style-type: none"> <li>Simple Motion module ↔ MR-J4(W)-B/MR-JE-B(F)/MR-J3(W)-B</li> <li>MR-J4(W)-B/MR-JE-B(F)/MR-J3(W)-B ↔ MR-J4(W)-B/MR-JE-B(F)/MR-J3(W)-B</li> </ul> |
|  | MR-J3BUS03M   | 0.3 (0.98)             |  |
|  | MR-J3BUS05M   | 0.5 (1.64)             |  |
|  | MR-J3BUS1M    | 1 (3.28)               |  |
|  | MR-J3BUS3M    | 3 (9.84)               |  |
| MR-J3BUS_M-A<br>(Standard cable for outside panel) | MR-J3BUS5M-A  | 5 (16.40)              |  |
|  | MR-J3BUS10M-A | 10 (32.81)             |  |
|  | MR-J3BUS20M-A | 20 (65.62)             |  |
| MR-J3BUS_M-B<br>(Long distance cable)              | MR-J3BUS30M-B | 30 (98.43)             |  |
|  | MR-J3BUS40M-B | 40 (131.23)            |  |
|  | MR-J3BUS50M-B | 50 (164.04)            |  |

## ■SSCNETⅢ cables manufactured by Mitsubishi Electric System & Service Co., Ltd (SC-J3BUS\_M-C)

### Point

- For details of the SSCNETⅢ cables, consult your nearest Mitsubishi representative.
- Do not look directly at the light generated by the CN1A and CN1B connectors of the servo amplifier or the tip of the SSCNETⅢ cable. The light can cause discomfort if it enters the eyes.

Cables are available in lengths from 1 m to 100 m in increments of 1 m. A number indicating the cable length (1 to 100) is included in the "\_" portion of the model name.

| Model name   | Cable length [m] | Bending life | Description         |
|--------------|------------------|--------------|---------------------|
| SC-J3BUS_M-C | 1 to 100         | Ultra-long   | Long distance cable |

## Connection connector

The connector for the external input wiring.

[External input wiring connector]

| Part name            | Specification                                |
|----------------------|--|
| Applicable connector | LD77MHIOCON                                  |
| Applicable wire size | AWG30 to 24 (0.05 to 0.2 mm <sup>2</sup> )*1 |

\*1 AWG24 (0.2 mm<sup>2</sup>) is recommended.

## Specifications of recommended manual pulse generator

| Item                      | Specification  |
|---------------------------|--|
| Model name                | MR-HDP01   |
| Ambient temperature       | -10 to 60°C (14 to 140 °F)   |
| Pulse resolution          | 25 pulses/rev (100 pulses/rev after magnification by 4)  |
| Output method             | Voltage-output, Output current Max. 20 mA  |
| Power supply voltage      | 4.5 to 13.2 V DC   |
| Current consumption       | 60 mA  |
| Output level              | "H" level: Power supply voltage*1 - 1 V or more (in no load)<br>"L" level: 0.5 V or less (with maximum leading-in) |
| Life time                 | 1000000 revolutions (at 200 r/min)   |
| Permitted axial loads     | Radial load: Max. 19.6 N<br>Thrust load: Max. 9.8 N  |
| Weight                    | 0.4 [kg]   |
| Number of max. revolution | Instantaneous Max. 600 r/min. normal 200 r/min   |
| Pulse signal status       | 2 signals: A phase, B phase, 90° phase difference  |
| Start friction torque     | 0.06 N·m (20°C (68°F))   |

\*1 Use a stabilized power supply of voltage 5 V DC ± 0.25 V.

## Manual pulse generator that the operation has been checked

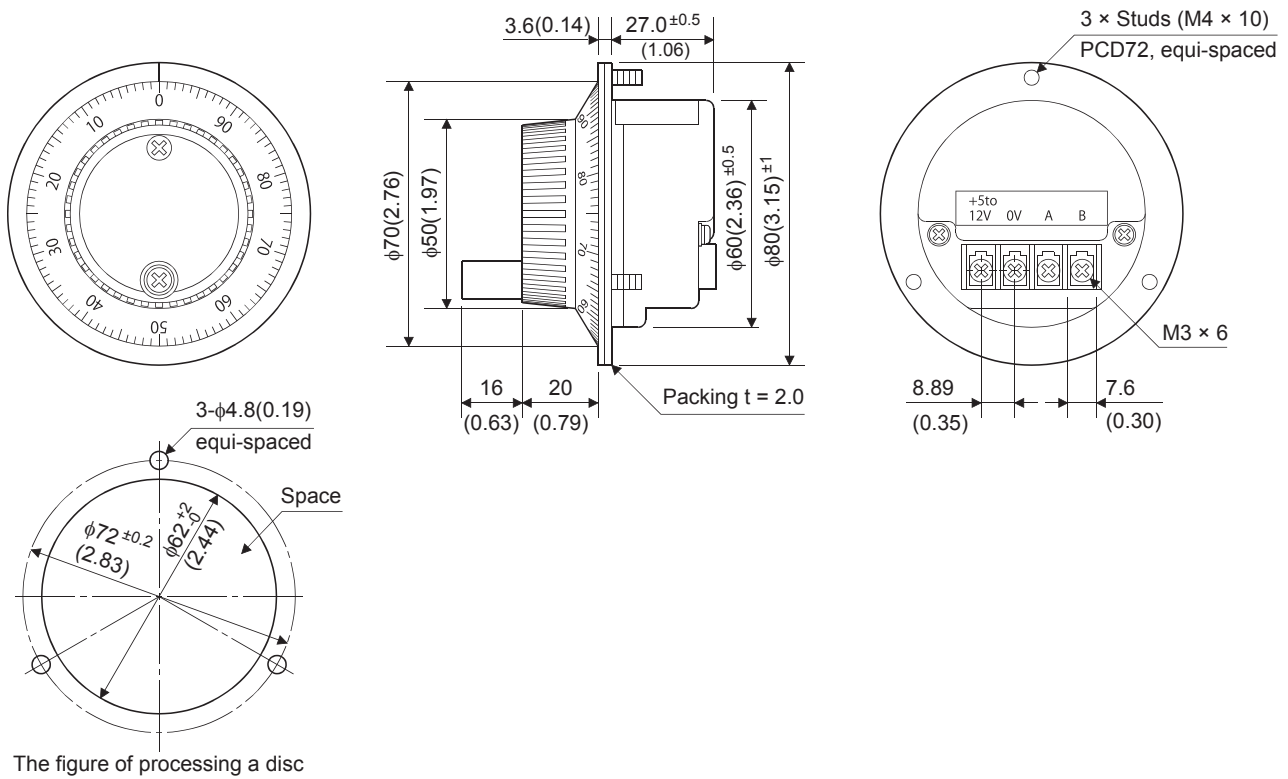
| Manufacturer          | Model name           |
|-----------------------|----------------------|
| Nemicon Corporation*1 | UFO-M2-0025-2Z1-B00E |

\*1 Contact: <http://www.nemicon.co.jp/nemicon/>

## External dimension drawing of manual pulse generator

MR-HDP01 (Manufactured by Mitsubishi Electric Corporation)

[Unit: mm (inch)]



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## Serial absolute synchronous encoder specifications

| Item                              | Specifications  |
|-----------------------------------|---|
| Model name                        | Q171ENC-W8*1  |
| Ambient temperature               | -5 to 55°C (23 to 131°F)  |
| Resolution                        | 4194304 pulses/rev  |
| Transmission method               | Serial communications (Connected to MR-J4-B-RJ)   |
| Direction of increasing addresses | CCW (viewed from end of shaft)  |
| Protective construction           | Dustproof/Waterproof (IP67: Except for the shaft-through portion.)                                    |
| Permitted speed at power ON       | 3600 r/min  |
| Permitted speed at power OFF*2    | 500 r/min   |
| Permitted axial loads             | Radial load: Up to 19.6 N, Thrust load: Up to 9.8 N   |
| Runout at input shaft tip         | 0.02 mm (0.00079 inch) or less, (15 mm (0.59 inch) from tip)  |
| Start friction torque             | 0.04 N•m (20°C (68°F))  |
| Recommended coupling              | Bellows coupling  |
| Permitted angular acceleration    | 40000 rad/s <sup>2</sup>  |
| Vibration resistance              | 5 G (50 to 200 Hz)  |
| Shock resistance                  | 50 G (11 ms or less)  |
| Internal current consumption [A]  | 0.25  |
| Mass [kg]                         | 0.6   |
| Connecting cable [m (ft.)]        | Q170ENCCBL_M (_ = Cable length: 2 (6.56), 5 (16.40), 10 (32.81), 20 (65.62), 30 (98.43), 50 (164.04)) |
| Communications method             | Differential driver/receiver  |
| Transmission distance             | Up to 50 m (164.04 ft.)   |

\*1 When "o-ring" is required, please purchase separately by a customer.

\*2 If it exceeds a permitted speed at power OFF, a position displacement is generated.



The serial absolute synchronous encoder backs up the absolute position with the battery for back up of absolute position data of the servo amplifier (MR-J4-B-RJ) it is connected to.

## Specifications of serial absolute synchronous encoder input (CN2L) of servo amplifier

| Item   | Specifications   |
|--|--|
| Applicable types                                 | Q171ENC-W8   |
| Applicable signal types                          | Differential-output type: (SN75C1168 or equivalent)  |
| Transmission method                              | Serial communications  |
| Synchronous method                               | Counter-clock-wise (viewed from end of shaft)  |
| Communication speed                              | 2.5 Mbps   |
| Position detection method                        | Absolute (ABS) method  |
| Resolution                                       | 4194304 pulses/rev (22 bit)  |
| Number of modules                                | 1/module (MR-J4-B-RJ)  |
| External connector type                          | 20 pin connector   |
| Applicable connector for the external connection | MR-J3CN2 (Optional)  |
| Applicable wire                                  | J14B103715-00 12 pairs   |
| Connecting cable [m (ft.)]                       | Q170ENCCBL_M-A (_ = Cable length: 2 (6.56), 5 (16.40), 10 (32.81), 20 (65.62), 30 (98.43), 50 (164.04))        |
| Cable length                                     | Up to 50 m (164.04 ft.)  |
| Back up the absolute position.                   | Depends on the battery (MR-BAT6V1SET).   |
| Battery service life time (value in actual)      | 10000 [h] (When MR-BAT6V1SET is used while the device is turned OFF at the ambient temperature of 25°C (77°F)) |

## Serial absolute synchronous encoder cable

Generally use the serial absolute synchronous encoder cables available as our products. If the required length is not found in our products, fabricate the cable by a customer side.

### ■ Selection

The following table indicates the serial absolute synchronous encoder cables used with the serial absolute synchronous encoder. Connector sets (MR-J3CN2) are also available for your fabrication.

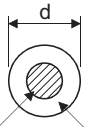
| Cable model    | Cable length [m (ft.)]   | Wire model                     |
|----------------|--|--------------------------------|
| Q170ENCCBL_M-A | 2 (6.56), 5 (16.40), 10 (32.81), 20 (65.62), 30 (98.43), 50 (164.04) | J14B103715-00 12 pairs (BLACK) |

Use the following or equivalent twisted pair cables as the serial absolute synchronous encoder cables.

| Connector sets type | Description               |
|---------------------|---------------------------|
| MR-J3CN2            | Servo amplifier connector |

| Wire model                     | Core size [mm <sup>2</sup> ] | Number of cores | Characteristics of one core    |                             |   | Finished OD [mm] <sup>*2</sup> |
|--------------------------------|------------------------------|-----------------|--------------------------------|-----------------------------|---|--------------------------------|
|                                |                              |                 | Structure [Number of wires/mm] | Conductor resistance [Ω/km] | Insulating sheath OD d [mm] <sup>*1</sup> |                                |
| J14B103715-00 12 pairs (BLACK) | 0.2                          | 24 (12 pairs)   | 40/0.08                        | 105 or less                 | 0.88                                      | 9.0                            |

\*1 d is as shown below.



Conductor    Insulation sheath

\*2 Standard OD (Outside Diameter). Maximum OD is about 10% larger.

## ⚠ CAUTION

- When fabricating the encoder cable, do not make incorrect connection. Wrong connection will cause runaway or explosion.

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## ■Q170ENCCBL\_M-A

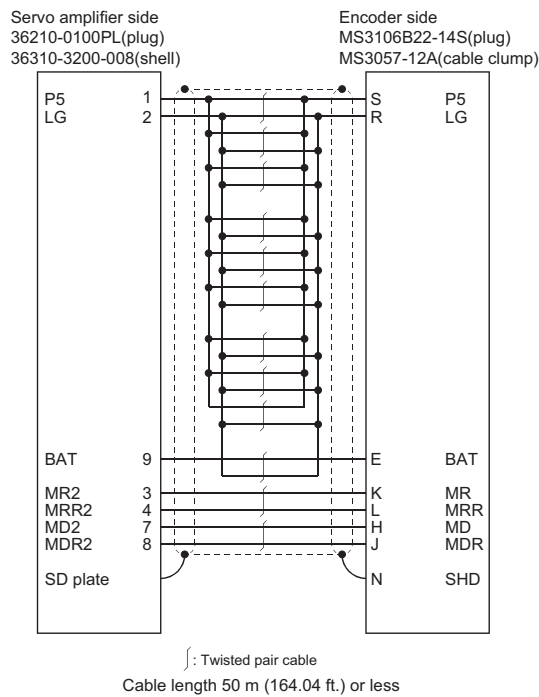
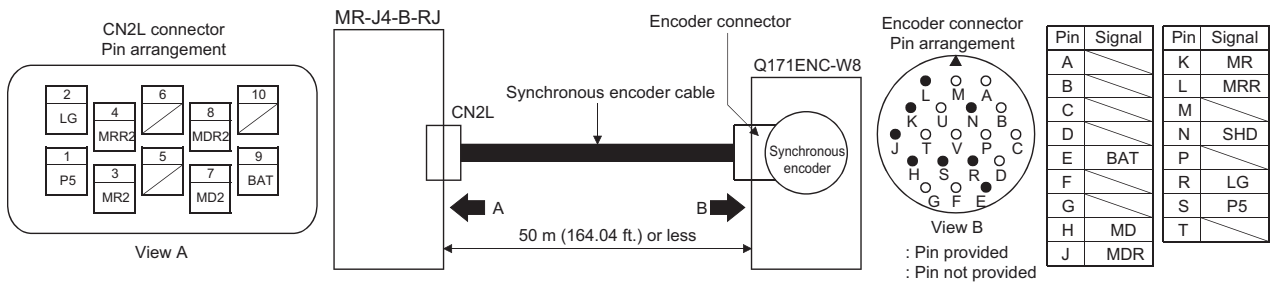
- Model explanation

Type: Q170ENCCBL\_M - A

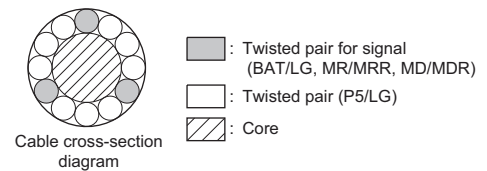
| Symbol | Cable length [m (ft.)] |
|--------|------------------------|
| 2      | 2 (6.56)               |
| 5      | 5 (16.40)              |
| 10     | 10 (32.81)             |
| 20     | 20 (65.62)             |
| 30     | 30 (98.43)             |
| 50     | 50 (164.04)            |

- Connection diagram

When fabricating a cable, use the recommended wire and connector set MR-J3CN2 for encoder cable given above, and make the cable as shown in the following connection diagram. Maximum cable length is 50 m (164.04 ft.).



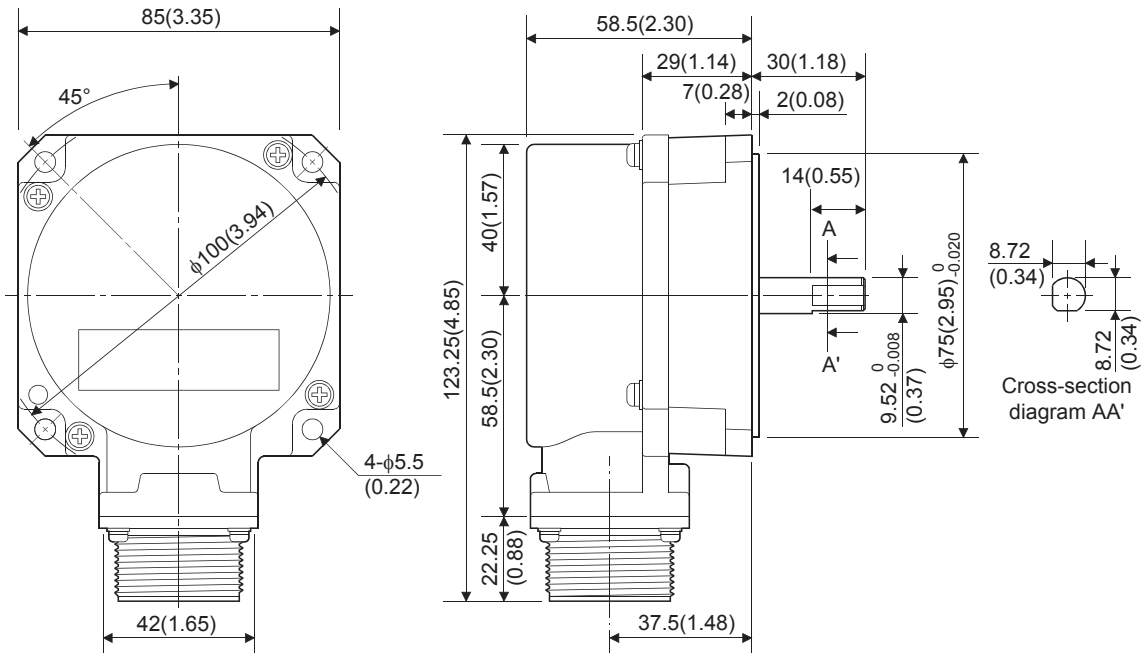
Layout twisted pair for signal to avoid contact.



## External dimension drawing of serial absolute synchronous encoder

### Serial absolute synchronous encoder (Q171ENC-W8)

[Unit: mm (inch)]



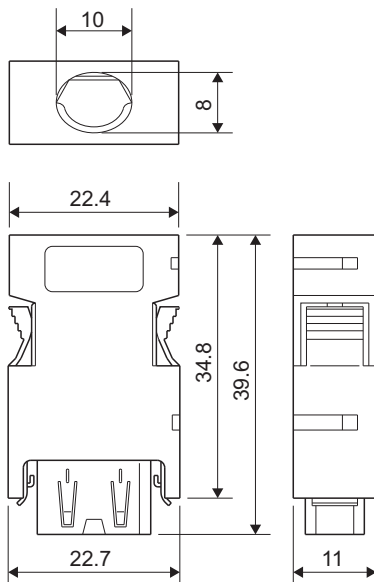
## Cable connector for serial absolute synchronous encoder (3M Japan Limited make (SCR type))

### Type

Plug: 36210-0100PL

Shell: 36310-3200-008

[Unit: mm (inch)]

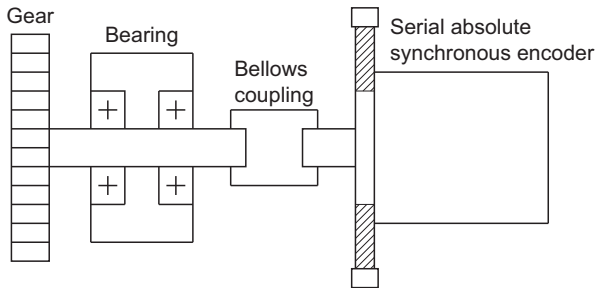


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## Mounting of serial absolute synchronous encoder

This section describes precautions for handling the serial absolute synchronous encoder.

- If the serial absolute synchronous encoder is linked to a chain, a timing belt, or gears, the machine side rotary shaft should be supported by a separate bearing and connected to the serial absolute synchronous encoder through a bellows coupling. Ensure that excessive force (greater than the permitted shaft load) is not applied to the shaft of the serial absolute synchronous encoder.



| Item                 | Radial direction | Thrust direction |
|----------------------|------------------|------------------|
| Permitted shaft load | Up to 19.6 N     | Up to 9.8 N      |

- Excessive load applied to the shaft of the serial absolute synchronous encoder by large mounting errors in eccentricity or angle of deviation may impair encoder function or extremely shorten encoder life. Minimize loads applied to the shaft so that they remain within the permitted shaft load range.

### CAUTION

- The serial absolute synchronous encoder contains a glass disk and precision mechanism. Take care when handling it. Encoder function may be impaired if it is dropped or subjected to shocks or vibrations exceeding the prescribed limits.
- Do not connect the shaft of the serial absolute synchronous encoder directly to the machine side rotary shaft. The shaft should be supported by a separate bearing and mounted using a bellows coupling.
- Never hit the end of the serial absolute synchronous encoder shaft with a hammer or similar object when doing things such as connecting the bellows coupling to it. Excessive shock applied to the serial absolute synchronous encoder may damage it.
- The serial absolute synchronous encoder uses optical parts. Mount it in an atmosphere containing as little moisture, oil, and dust as possible.
- In any place where the serial absolute synchronous encoder is exposed to water and/or oil, provide protection from oil and water, e.g. mount a cover. In addition, run the cable downward to prevent oil and/or water from travelling on the cable into the serial absolute synchronous encoder. When it is necessary to mount the serial absolute synchronous encoder vertically or obliquely, set up a trap on the cable.
- Use the serial absolute synchronous encoder within the specified temperature range (-5 to 55°C).
- Do not use rigid couplings. Doing so applies an excessive bending load to the axis, and may break the axis of the servo motor or cause deterioration of the bearings.



# Appendix 2 Component List [FX5-SSC-G]

The positioning system using the Motion module is configured of the following devices.

| No. | Part name                                   | Type        | Remarks   |
|-----|---|-------------|---|
| 1   | Motion module                               | FX5-40SSC-G | FX5- <span style="border: 1px dashed black; padding: 0 2px;">  </span> SSC-G<br>↑                   ↑<br>G: Compatible with CC-Link IE TSN<br>Number of controlled axes (40 = 4 axes, 80 = 8 axes)                |
|     |   | FX5-80SSC-G |   |
| 2   | Drive unit                                  | —           | —   |
| 3   | Slave device compatible with CC-Link IE TSN | —           | —   |
| 4   | CC-Link IE TSN Network cable                | —           | Cables are needed for connecting the Motion module with a drive unit/slave device compatible with CC-Link IE TSN, or between drive units/slave devices compatible with CC-Link IE TSN. (☞ Page 62 Ethernet cable) |
| 5   | Ethernet HUB                                | —           | Switching HUB are needed for connecting the Motion module, a drive unit, and other brand drive units in star topology. (☞ Page 63 Switching hub)  |

## Operation-verified manual pulse generator

| Manufacturer                 | Model name |
|------------------------------|------------|
| Tokyo Sokuteikizai Co., Ltd. | RE46A2CO2B |

When using a manual pulse generator with the FX5-SSC-G, connect the encoder with the input part of the CPU module or the extension high-speed pulse input/output module, then import the manual pulse generator data using the high-speed counter function of the CPU module.

For details of the high-speed counter function, refer to the following manual.

☞ MELSEC iQ-F FX5 User's Manual (Application)

For the wiring of the high-speed counter, refer to the following manuals.

☞ MELSEC iQ-F FX5U User's Manual (Hardware)

☞ MELSEC iQ-F FX5UC User's Manual (Hardware)

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# Appendix 3 Connection with External Devices [FX5-SSC-S]

## Connector

Mounted onto an external input connection connector of the Simple Motion module and used for wiring an external device. The "external device connector" includes the following 3 types.

### Connector type

| Type                         |                        | Model name   |                |
|------------------------------|------------------------|--------------|----------------|
|                              |                        | Connector    | Connector case |
| Soldering type (LD77MHIOCON) | One-touch lock style   | 10126-3000PE | 10326-52F0-008 |
| Soldering type*1             | Screw tightening style | 10126-3000PE | 10326-52A0-008 |
| Pressure-displacement type*1 | One-touch lock style   | 10126-6000EL | 10326-3210-000 |

\*1 Make sure to purchase the connector which is sold separately since this is not an option.

### Specifications of the connector

| Part name            | Specification  |   |
|----------------------|--|---|
| Applicable connector | Soldering type (One-touch lock style/Screw tightening style) | Pressure-displacement type (One-touch lock style) |
| Applicable wire size | AWG30 to AWG24 (0.05 to 0.2 mm <sup>2</sup> )                | AWG28 (twisted, 0.08 mm <sup>2</sup> )            |

The external input wiring connector has been prepared. Please purchase them by a customer.

### ■Specialized tool

- Manual harness tool for pressure-displacement type (Manufactured by Sumitomo 3M Limited.)

| Model name                                       |
|--|
| 10960 (Press body)                               |
| 10962 (Fixture unit)                             |
| 10963 (Fixture block)                            |
| 10964-1 (Cable clamp (small) for 14 to 50 poles) |

- Contact for the specialized tool

Sumitomo 3M Limited: [http://solutions.3m.com/wps/portal/3M/ja\\_JP/WW2/Country/](http://solutions.3m.com/wps/portal/3M/ja_JP/WW2/Country/)

# External input signal cable

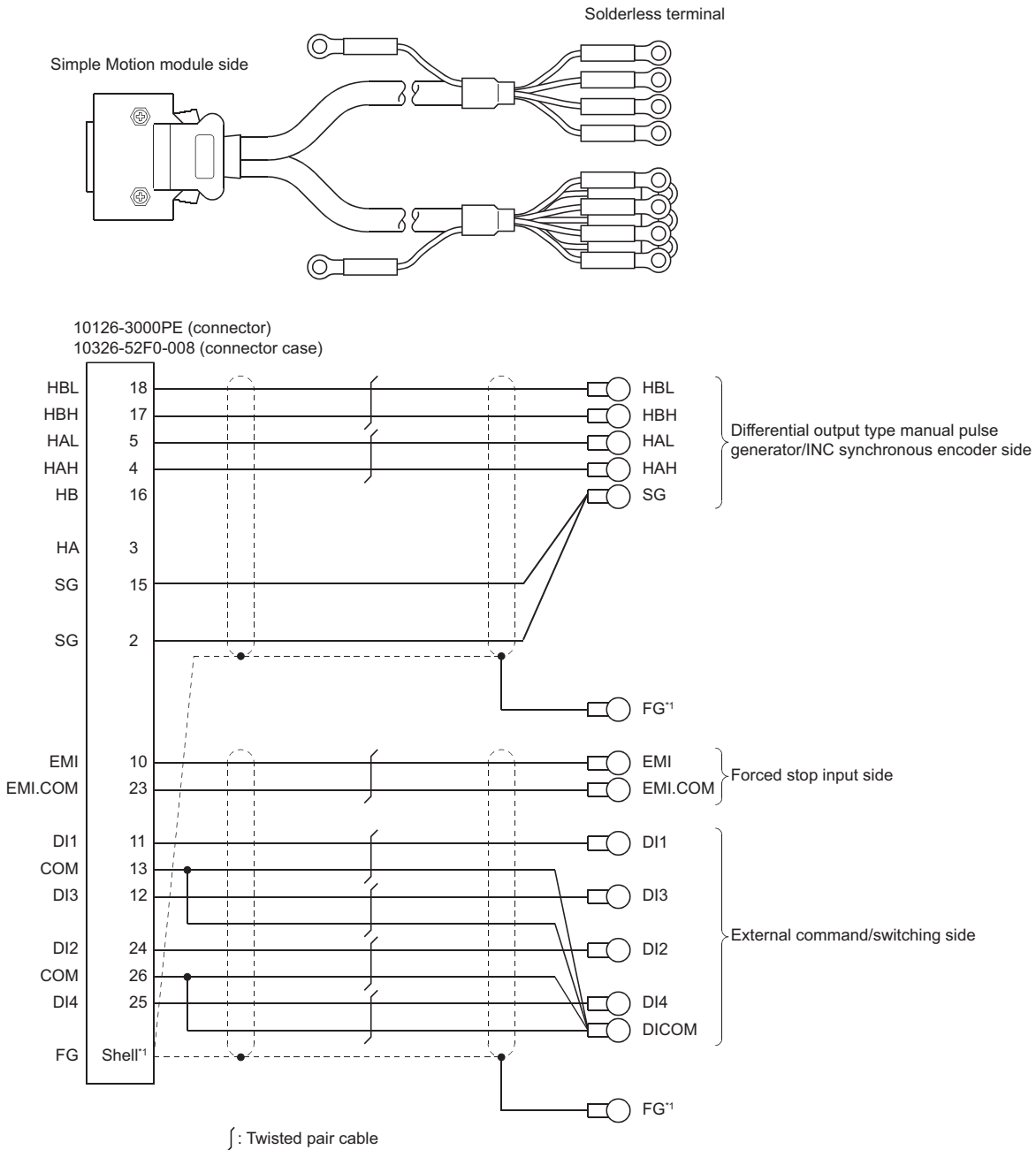
The external input signal cable is not prepared as an option. Fabricate the cable on the customer side.

## Connection diagram

Make the cable as shown in the following connection diagram.

### ■Differential-output type

Make the cable within 30 m (98.5 ft.).

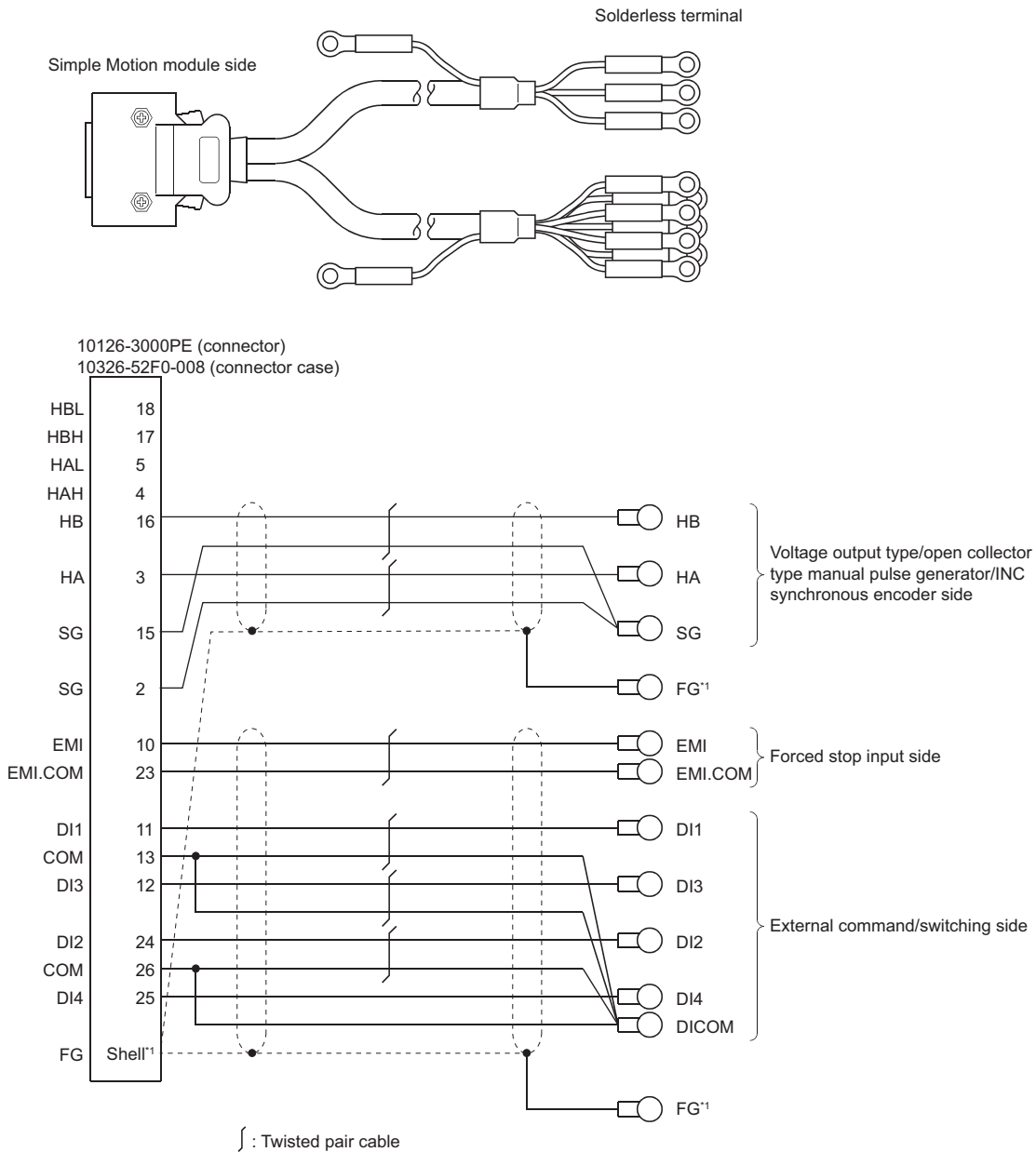


\*1 Make sure to perform shield treatment on the used equipment side. Also, connect it to the shell of connector side.



## ■ Voltage-output type/Open-collector type

Make the cable within 10 m (32.81 ft.).

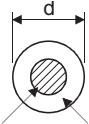


\*1 Make sure to perform shield treatment on the used equipment side. Also, connect it to the shell of connector side.

- The following table indicates the external input wiring connector cables. Make selection according to your operating conditions.

| Wire model              | Core size                     | Number of cores | Characteristics of one core    |                                      |   | Finish OD [mm] <sup>*2</sup> |
|-------------------------|-------------------------------|-----------------|--------------------------------|--------------------------------------|---|------------------------------|
|                         |                               |                 | Structure [Number of wires/mm] | Conductor resistance [ $\Omega$ /km] | Insulating sheath OD d [mm] <sup>*1</sup> |                              |
| 20276FACBL 7/0.18 mm×4P | AWG25 (0.16 mm <sup>2</sup> ) | 8 (4 pairs)     | 7/0.18TA                       | 115                                  | 1.0                                       | 6.8                          |
| 20276FACBL 7/0.18 mm×5P | AWG25 (0.16 mm <sup>2</sup> ) | 10 (5 pairs)    | 7/0.18TA                       | 115                                  | 1.0                                       | 7.3                          |

\*1 d is as shown below.



Conductor    Insulation sheath

\*2 Standard OD. Max. OD is about 10% larger.

## CAUTION

- When fabricating the cable, do not make incorrect connection. Wrong connection will cause runaway or explosion.

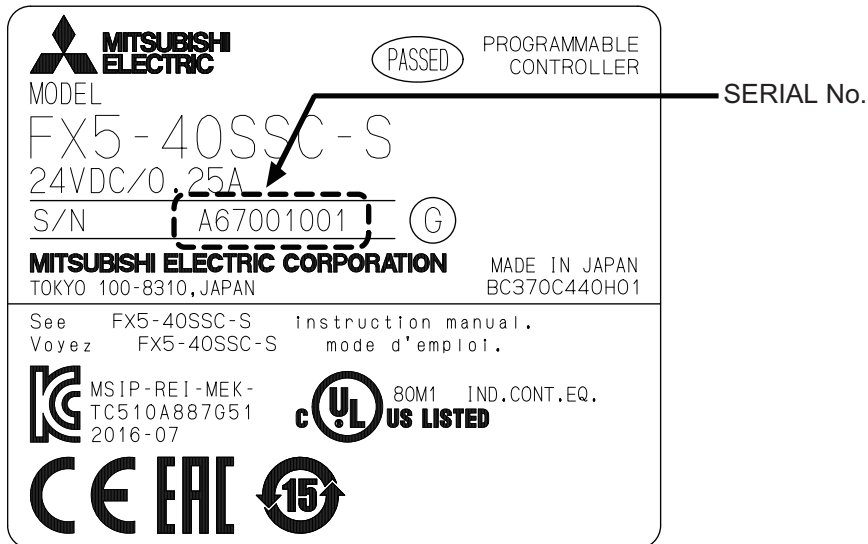
# Appendix 4 How to Check the SERIAL No.

The SERIAL No. of the Simple Motion module/Motion module can be checked in the following method.

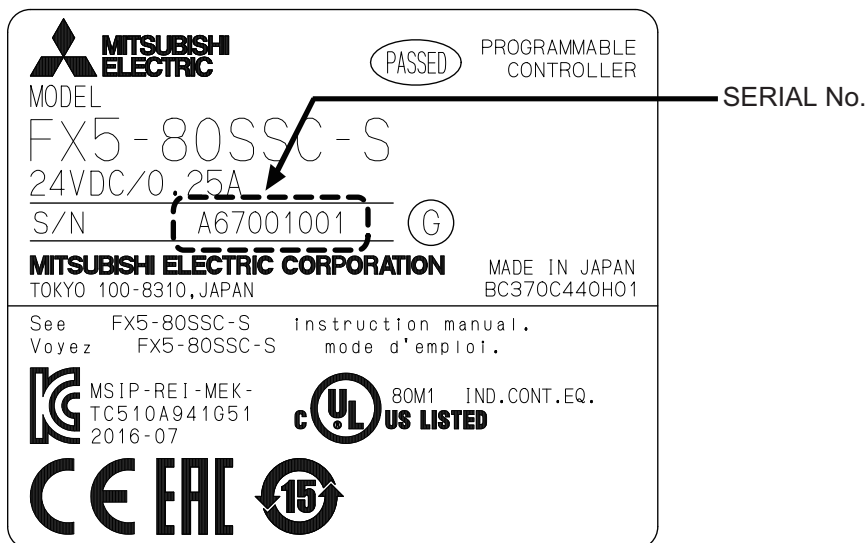
## Confirming the serial No. on the rating plate

The rating plate is situated on the side face of the Simple Motion module/Motion module.



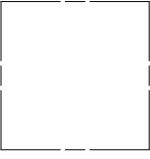




- FX5-40SSC-S





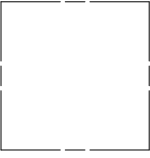




- FX5-80SSC-S



• FX5-40SSC-G

|   |  |   |  |
|---|--|---|--|
|                                      |  |  |  |
| CC-Link IE TSN Class B  |  | MOTION MODULE   |  |
| MODEL <b>FX5-40SSC-G</b>  |  | SERIAL No.  |  |
| 24VDC/0.24A   |  |  |  |
| S/N <b>A0Z001001</b>  |  |   |  |
| MAC ADD. 38E08E □□ □□□□   |  |   |  |
| <b>MITSUBISHI ELECTRIC CORPORATION</b><br>TOKYO 100-8310, JAPAN   |  | MADE IN JAPAN<br>BC370C587H01   |  |
| See FX5-40SSC-G instruction manual.<br>Voyez FX5-40SSC-G mode d'emploi.   |  |   |  |
|                                      |  |  |  |
| 80M1 IND.CONT.EQ.   |  |  |  |
|  R-R-MEK-<br>TC511A023G51<br>2020-12 |  |   |  |

• FX5-80SSC-G

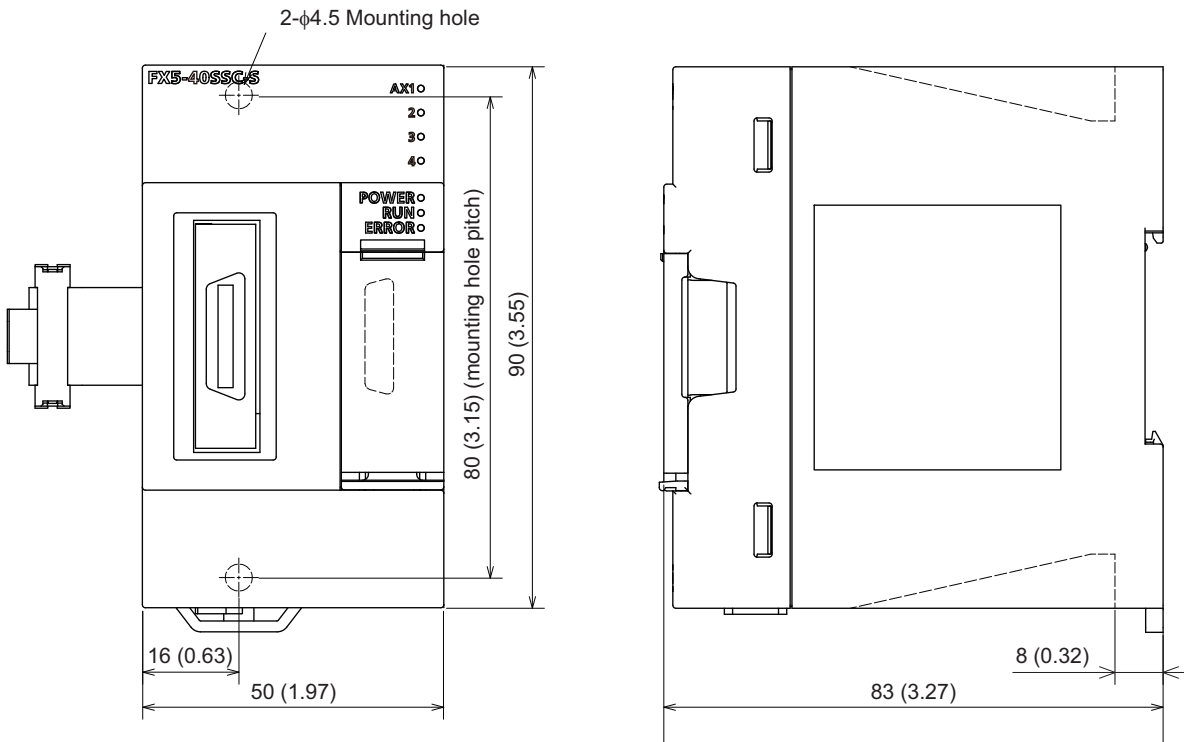
|   |  |   |  |
|---|--|---|--|
|                                        |  |    |  |
| CC-Link IE TSN Class B  |  | MOTION MODULE   |  |
| MODEL <b>FX5-80SSC-G</b>  |  | SERIAL No.  |  |
| 24VDC/0.24A   |  |   |  |
| S/N <b>A0Z001001</b>  |  |   |  |
| MAC ADD. 38E08E □□ □□□□   |  |   |  |
| <b>MITSUBISHI ELECTRIC CORPORATION</b><br>TOKYO 100-8310, JAPAN   |  | MADE IN JAPAN<br>BC370C587H01   |  |
| See FX5-80SSC-G instruction manual.<br>Voyez FX5-80SSC-G mode d'emploi.   |  |   |  |
|                                      |  |  |  |
| 80M1 IND.CONT.EQ.   |  |  |  |
|  R-R-MEK-<br>TC511A024G51<br>2020-12 |  |   |  |

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# Appendix 5 External Dimensions

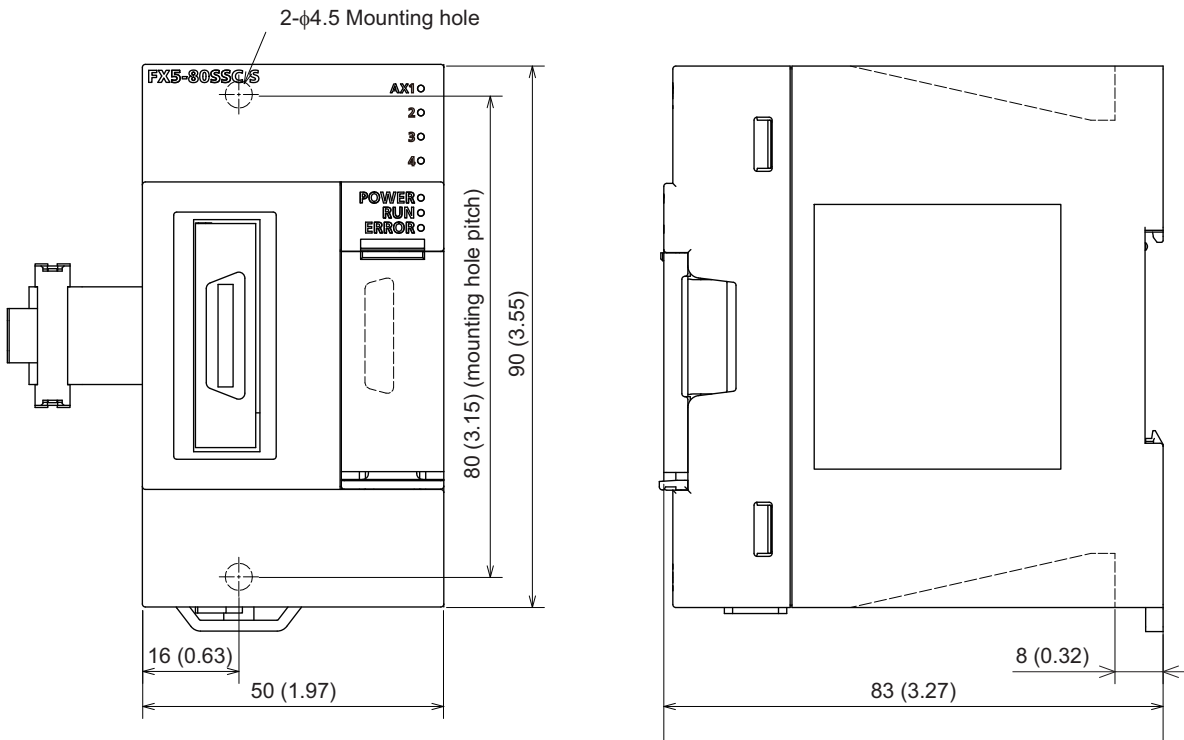
## FX5-40SSC-S

[Unit: mm (inch)]



## FX5-80SSC-S

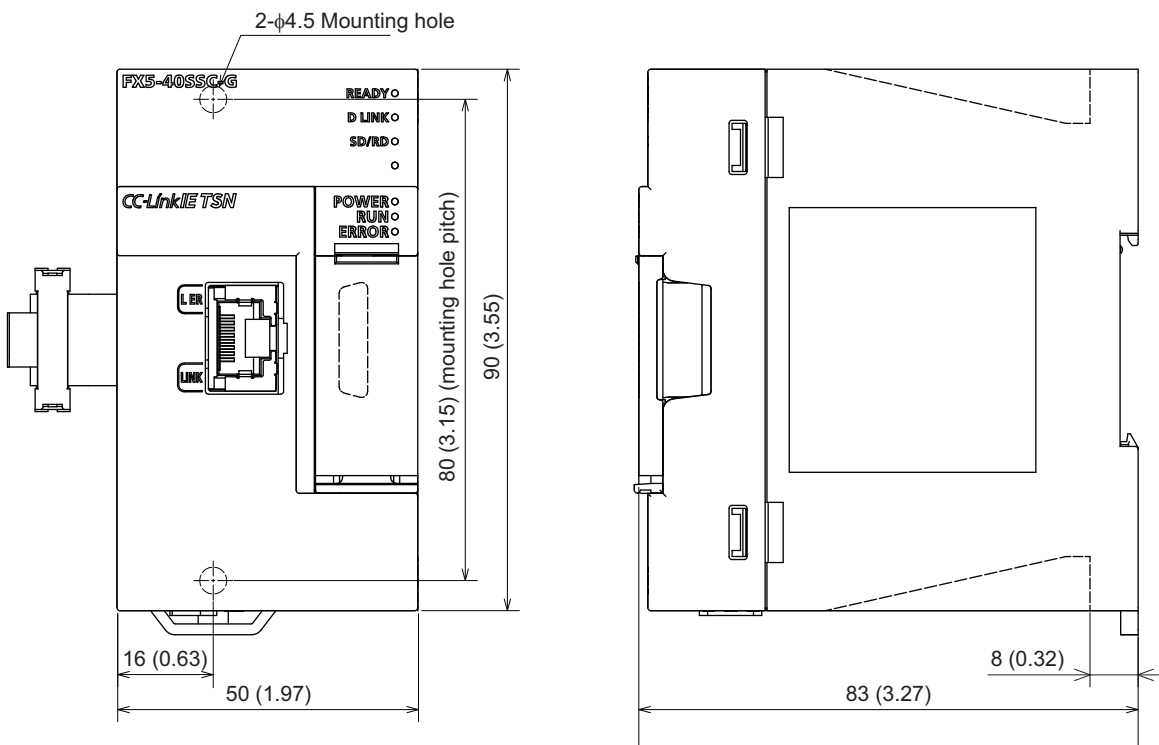
[Unit: mm (inch)]





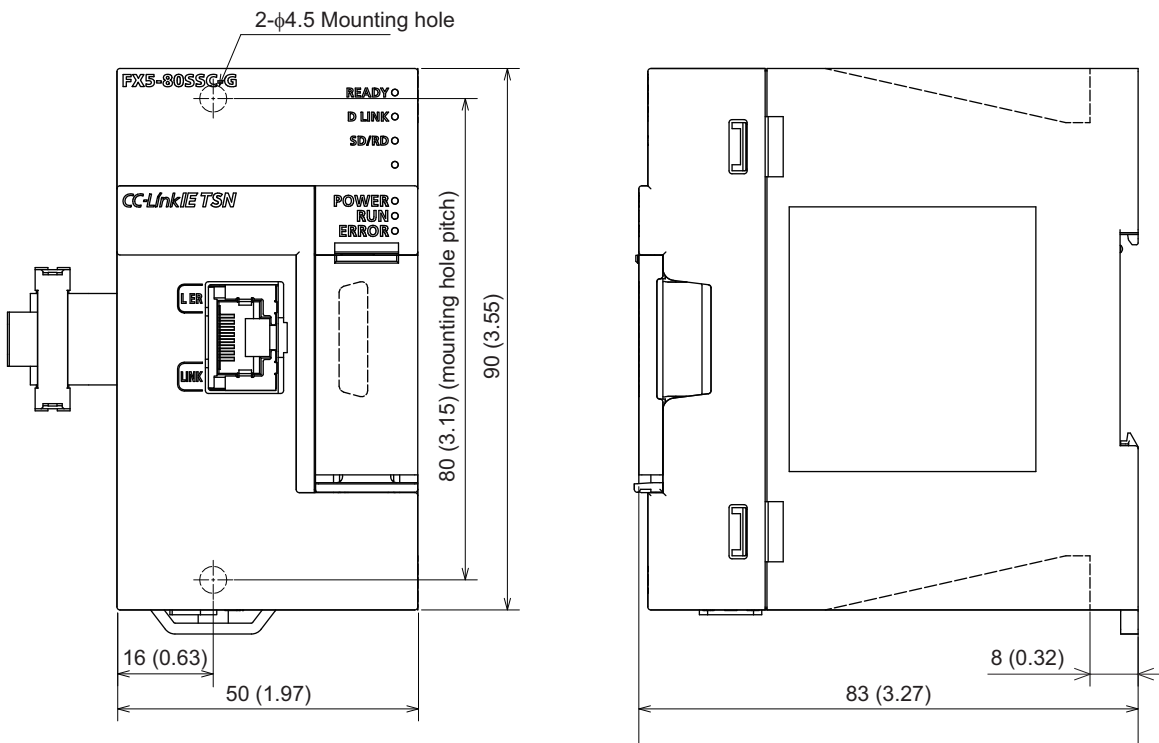
## FX5-40SSC-G

[Unit: mm (inch)]



## FX5-80SSC-G

[Unit: mm (inch)]



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# Appendix 6 Standard Compliant Models

## Models compliant with UL and cUL standards

The FX5-SSC-S and FX5-SSC-G are compliant with the EC Directive (EMC Directive) and UL standards (UL, cUL).

For models compliant with the UL Standards, please consult your local Mitsubishi representative.

UL, cUL File Number: E95239

## EC Directive (CE marking) compliance

The entire machinery manufactured by using this product is not guaranteed to conform to the following directives.

The manufacturer of the machinery must determine whether to declare conformity to the EMC Directive and the Low Voltage Directive (LVD).

For details, consult Mitsubishi Electric separately.

## Measures to comply with the EMC Directive

The following product, when used in accordance with instructions given by the relevant document, shows conformity to the EU directive (2014/30/EU) for electromagnetic compatibility through direct testing (using the following specified standards) and design analysis (by creating a technical structure file).

### CAUTION

Use this product in a general industrial environment.

### Product conformity item

Type: Programmable controller (open-type device)

Target products: FX5 manufactured in the following periods

|   |                          |
|---|--------------------------|
| Manufactured on and after October 1, 2014 | FX5-40SSC-S              |
| Manufactured on and after October 1, 2016 | FX5-80SSC-S              |
| Manufactured on and after January 1, 2021 | FX5-40SSC-G, FX5-80SSC-G |

| Electromagnetic Compatibility (EMC) Directive                                 | Remarks   |
|---|---|
| EN 61131-2:2007 Programmable Controllers<br>-Equipment requirements and tests | The product has been tested for all related items from the following.<br>EMI<br>• Radiated emission<br>• Conducted emission<br>EMS<br>• Radiated electromagnetic field<br>• Fast transient burst<br>• Electrostatic discharge<br>• High-energy surge<br>• Voltage drops and interruptions<br>• Conducted RF<br>• Power frequency magnetic field [FX5-SSC-S] |

## Precautions for compliance with the EC Directive

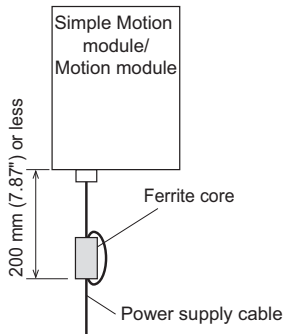
### Precautions when using the product

Attach a ferrite core to the power supply cable (on the Simple Motion module/Motion module side).

Attach the ferrite core with the cable wrapped around it two times at a location that is 200 mm or less from the Simple Motion module/Motion module side connector.

For the ferrite core, use a core that is equivalent to the following:

- Model: ZCAT3035-1330 manufactured by TDK Corporation



### Power source of 24 V DC power supply voltage

Supply power to the 24 V DC power supply voltage of the FX5-SSC-S/FX5-SSC-G from the AC/DC power supply installed in the same control panel.

# Appendix 7 Open Source Software

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The software of the Motion module includes the following open software.

- Distributed software as a free software in which copyright of a third party exists.

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# Appendix 8 Operation Examples

[FX5-SSC-S]

This chapter describes the programming procedure and the basic program of the Simple Motion module. When applying the program examples provided in this manual to an actual system, properly verify the applicability and reliability of the control on the system.

[FX5-SSC-G]

For the programming procedure and the basic program of the Motion module, refer to "PROGRAMMING [FX5-SSC-G]" in the following manual.

 MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application)

## Operation example [FX5-SSC-S]

### Overall configuration

The program examples show the programs of the following operations.



- Machine home position return execution
- Execution of 1-axis linear control using axis 1
- JOG operation execution

The following table shows the overall configuration of the positioning control operation examples. Note that the programs in the list are the ones using the axis 1 only.

| No. | Program name                          | Description  |
|-----|---------------------------------------|--|
| 1   | PLC READY signal ON program           | Notifies the Simple Motion module that the CPU module is normal before the start of positioning control.   |
| 2   | All axis servo ON program             | Enables the servo amplifier to operate.  |
| 3   | Positioning start No. setting program | Sets the positioning data that are executed with a positioning start program. The operation example is the case when the start No. is for machine home position return or the positioning data No.1 of the axis 1 is used. |
| 4   | Positioning start program             | Starts the machine home position return or the positioning control using positioning data.   |
| 5   | JOG operation setting program         | Sets the JOG operation speed.  |
| 6   | JOG operation execution program       | Starts the JOG operation.  |

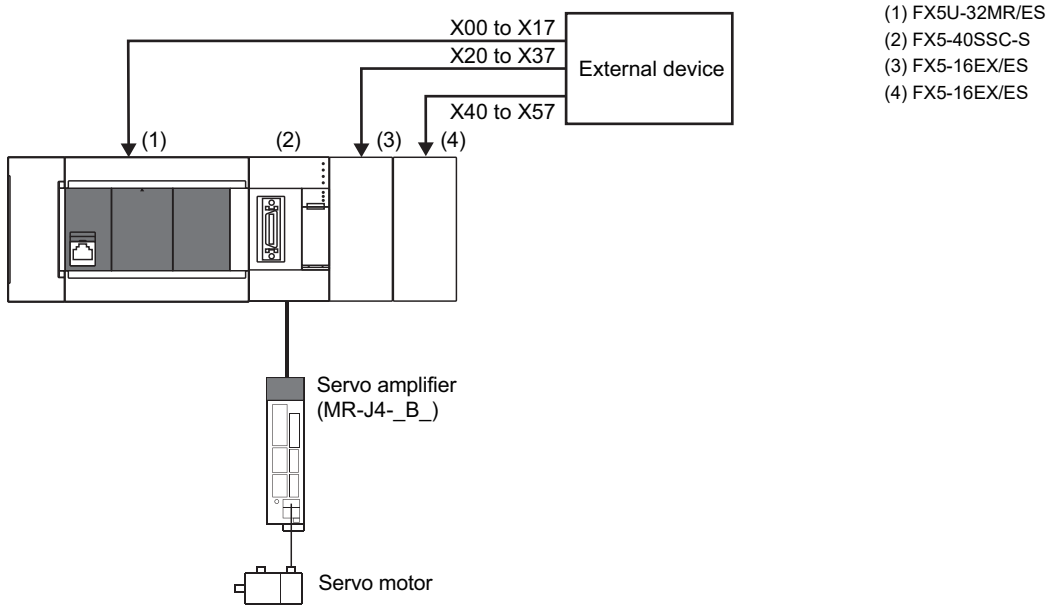
### Programming procedure

Take the following steps to create a program for the motion control:

- 1.** Set the system structure setting and parameter setting of the Simple Motion module setting for the initial setting.  
 Page 93 System setting, Page 94 Parameters
- 2.** Set the positioning data of the Simple Motion module setting.  
 Page 94 Positioning data
- 3.** Program examples of each control

## System configuration

The following figure shows the system configuration used for the program examples in this section.

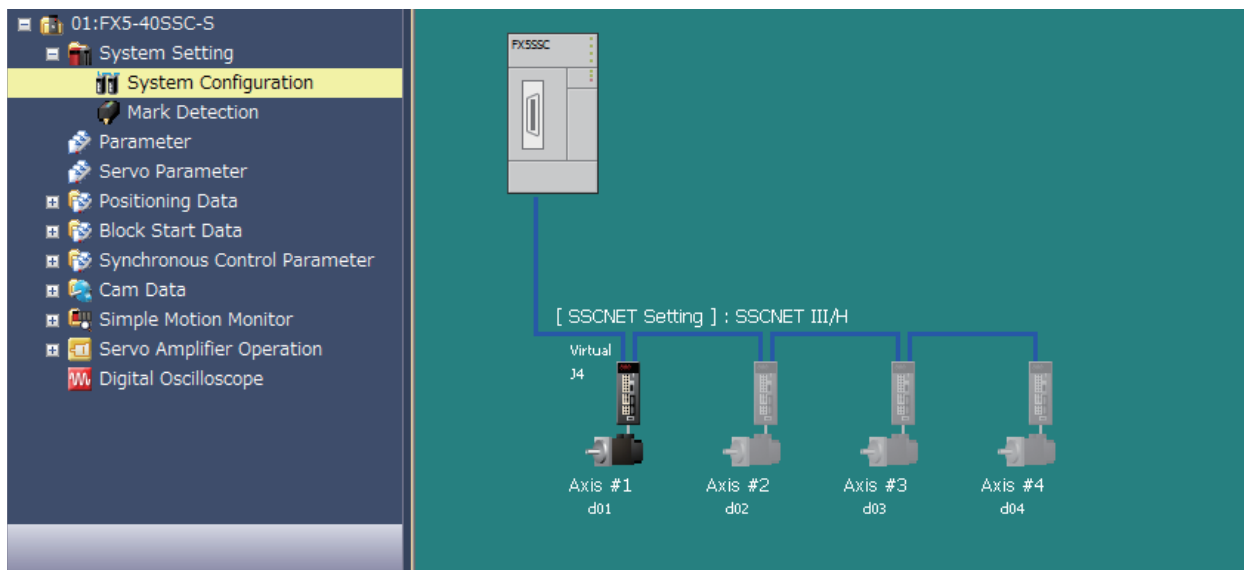


## Initial setting details

Set the system setting, parameters and positioning data using the engineering tool.

### System setting

The system setting is shown below.



A

## ■Parameters

The following table lists parameters. Use the default values for the setting items not listed here or the setting items for the axes not described here.

| Setting item                          |   | Setting value (Axis 1)                          |
|---------------------------------------|---|---|
| Common parameters                     | [Pr.82] Forced stop valid/invalid selection       | 1: Invalid                                      |
| Basic parameters 1                    | [Pr.1] Unit setting                               | 0: mm   |
|                                       | [Pr.2] Number of pulses per rotation (AP)         | 4194304 pulses                                  |
|                                       | [Pr.3] Movement amount per rotation (AL)          | 250000.0 μm                                     |
| Detailed parameters 1                 | [Pr.22] Input signal logic selection: Lower limit | 1: Positive logic                               |
|                                       | [Pr.22] Input signal logic selection: Upper limit | 1: Positive logic                               |
|                                       | [Pr.116] FLS signal selection: input type         | 2(0002h): Buffer memory                         |
|                                       | [Pr.117] RLS signal selection: input type         | 2(0002h): Buffer memory                         |
|                                       | [Pr.118] DOG signal selection: input type         | 2(0002h): Buffer memory                         |
| Home position return basic parameters | [Pr.46] Home position return speed                | 50.00 mm/min                                    |
|                                       | [Pr.47] Creep speed                               | 15.00 mm/min                                    |
|                                       | [Pr.48] Home position return retry                | 1: Retry home position return with limit switch |

## ■Positioning data

The following table lists positioning data. Use the default values for the setting items not listed here or the setting items for the axes not described here.

| Setting item (Axis 1 Positioning data) | Setting value (Positioning data No.1)            | Setting value (Positioning data No.2)                             | Setting value (Positioning data No.3)                             |
|--|--|---|---|
| Operation pattern                      | 0: Positioning complete                          |   |   |
| Control method                         | 01h: ABS Linear 1<br>1-axis linear control (ABS) | 06h: FWD V/P<br>Speed-position switching control<br>(forward run) | 08h: FWD P/V<br>Position-speed switching control<br>(forward run) |
| Axis to be interpolated                | —  |   |   |
| Acceleration time No.                  | 0: 1000  |   |   |
| Deceleration time No.                  | 0: 1000  |   |   |
| Positioning address                    | -10000.0 μm                                      | 2500.0 μm   | 2000.0 μm   |
| Arc address                            | —  |   |   |
| Command speed                          | 20.00 mm/min                                     | 180.00 mm/min   | 180.00 mm/min   |
| Dwell time                             | 300 ms   | 0 ms  | 300 ms  |
| M code                                 | 9843   | 0   | 0   |




# Program Examples Using Labels [FX5-SSC-S]

## List of labels to be used

The following table lists the labels used for the program examples in this section. I/O signals or buffer memory areas of the modules shown in the system configuration are described in the programs using the labels.

For details on the global labels, refer to "LABELS" in the following manual.

 MELSEC iQ-F FX5 Programming Manual (Program Design)

### ■Module label

The following table lists the module labels of the Simple Motion module used for the program examples in this section.

| Device name   | Device     | Label name  | Signal name   |
|---------------|------------|---|---|
|               | Axis 1     |   |   |
| I/O signals   | U1G31500.0 | FX5SSC_1.stSysMntr2_D.bReady_D                    | READY   |
|               | U1G31500.1 | FX5SSC_1.stSysMntr2_D.bSynchronizationFlag_D      | Synchronization flag  |
|               | U1G31501.0 | FX5SSC_1.stSysMntr2_D.bnBusy_D[0]                 | Axis 1 BUSY signal  |
|               | U1G5950.0  | FX5SSC_1.stSysCtrl_D.bPLC_Ready_D                 | PLC READY   |
|               | U1G5951.0  | FX5SSC_1.stSysCtrl_D.bAllAxisServoOn_D            | All axis servo ON   |
| Buffer memory | U1G2417.3  | FX5SSC_1.stnAxMntr_D[0].uStatus_D.3               | Axis 1 Home position return request flag                                |
|               | U1G2417.D  | FX5SSC_1.stnAxMntr_D[0].uStatus_D.D               | Axis 1 Error detection  |
|               | U1G2417.F  | FX5SSC_1.stnAxMntr_D[0].uStatus_D.F               | Axis 1 Positioning complete   |
|               | U1G4326    | FX5SSC_1.stnAxCtrl1_D[0].udVP_NewMovementAmount_D | Axis 1 Speed-position switching control movement amount change register |
|               | U1G4328    | FX5SSC_1.stnAxCtrl1_D[0].uEnableVP_Switching_D    | Axis 1 Speed-position switching enable flag                             |
|               | U1G4330    | FX5SSC_1.stnAxCtrl1_D[0].udPV_NewSpeed_D          | Axis 1 Position-speed switching control speed change register           |
|               | U1G4332    | FX5SSC_1.stnAxCtrl1_D[0].uEnablePV_Switching_D    | Axis 1 Position-speed switching enable flag                             |

## Global label

The following table lists the global labels, which are created by a user if necessary, used for the program examples in this section. Set the following in the global label of the engineering tool.

- External input (command)

|    | Label Name                                       | Data Type | Class      | Assign (Device/Label) |
|----|--|-----------|------------|-----------------------|
| 1  | bInputOPRStartReq                                | Bit       | VAR_GLOBAL | X3                    |
| 2  | bInputFastOPRStartReq                            | Bit       | VAR_GLOBAL | X4                    |
| 3  | bInputStartPositioningNoReq                      | Bit       | VAR_GLOBAL | X5                    |
| 4  | bInputSpeedPositionSwitchingReq                  | Bit       | VAR_GLOBAL | X6                    |
| 5  | bInputSpeedPositionSwitchingEnableReq            | Bit       | VAR_GLOBAL | X7                    |
| 6  | bInputSpeedPositionSwitchingDisableReq           | Bit       | VAR_GLOBAL | X10                   |
| 7  | bInputChangeSpeedPositionSwitchingMovementAmount | Bit       | VAR_GLOBAL | X11                   |
| 8  | bInputStartAdvancedPositioningReq                | Bit       | VAR_GLOBAL | X12                   |
| 9  | bInputSetJogSpeedReq                             | Bit       | VAR_GLOBAL | X15                   |
| 10 | bInputForwardJogStartReq                         | Bit       | VAR_GLOBAL | X16                   |
| 11 | bInputReverseJogStartReq                         | Bit       | VAR_GLOBAL | X17                   |
| 12 | bInputPositionSpeedSwitchingReq                  | Bit       | VAR_GLOBAL | X40                   |
| 13 | bInputPositionSpeedSwitchingEnableReq            | Bit       | VAR_GLOBAL | X41                   |
| 14 | bInputPositionSpeedSwitchingDisableReq           | Bit       | VAR_GLOBAL | X42                   |
| 15 | bInputChangePositionSpeedSwitchingSpeedReq       | Bit       | VAR_GLOBAL | X43                   |
| 16 | bAllAxisServoOnReq                               | Bit       | VAR_GLOBAL | X57                   |

- Internal relays and data devices (Unused internal relays and data devices are automatically assigned and do not require setting.)

|    | Label Name                 | Data Type                                  | Class      | Assign (Device/Label) |
|----|----------------------------|--|------------|-----------------------|
| 1  | bABRSTReq                  | Bit  | VAR_GLOBAL |                       |
| 2  | bBasicParamSetComp         | Bit  | VAR_GLOBAL |                       |
| 3  | bDuringJogInchingOperation | Bit  | VAR_GLOBAL |                       |
| 4  | bDuringMPGOperation        | Bit  | VAR_GLOBAL |                       |
| 5  | bFastOPRStartReq           | Bit  | VAR_GLOBAL |                       |
| 6  | bFastOPRStartReq_H         | Bit  | VAR_GLOBAL |                       |
| 7  | bInitializeParameterReq    | Bit  | VAR_GLOBAL |                       |
| 8  | bJOG_bENO                  | Bit  | VAR_GLOBAL |                       |
| 9  | bJOG_bErr                  | Bit  | VAR_GLOBAL |                       |
| 10 | bJOG_bOK                   | Bit  | VAR_GLOBAL |                       |
| 11 | bOPRParamSetComp           | Bit  | VAR_GLOBAL |                       |
| 12 | bPositioningStartReq       | Bit  | VAR_GLOBAL |                       |
| 13 | bStartPositioning_bENO     | Bit  | VAR_GLOBAL |                       |
| 14 | bStartPositioning_bErr     | Bit  | VAR_GLOBAL |                       |
| 15 | bStartPositioning_bOK      | Bit  | VAR_GLOBAL |                       |
| 16 | bWriteFlashReq             | Bit  | VAR_GLOBAL |                       |
| 17 | udJogOperationSpeed        | Double Word [Unsigned]/Bit String [32-bit] | VAR_GLOBAL |                       |
| 18 | udMovementAmount           | Double Word [Unsigned]/Bit String [32-bit] | VAR_GLOBAL |                       |
| 19 | udSpeed                    | Double Word [Signed]                       | VAR_GLOBAL |                       |
| 20 | uInchingMovementAmount     | Word [Unsigned]/Bit String [16-bit]        | VAR_GLOBAL |                       |
| 21 | uJOG_uErrId                | Word [Unsigned]/Bit String [16-bit]        | VAR_GLOBAL |                       |
| 22 | uPositioningStartNo        | Word [Unsigned]/Bit String [16-bit]        | VAR_GLOBAL |                       |
| 23 | uStartPositioning_uErrId   | Word [Unsigned]/Bit String [16-bit]        | VAR_GLOBAL |                       |

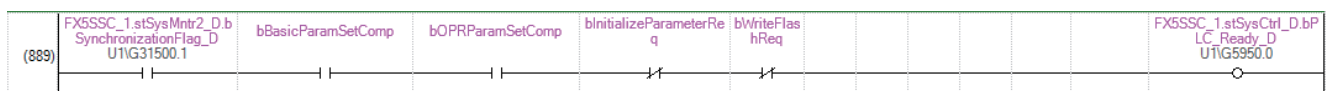
## Program example

The program examples use the module function blocks (FBs) and module labels displayed in "Module POU".

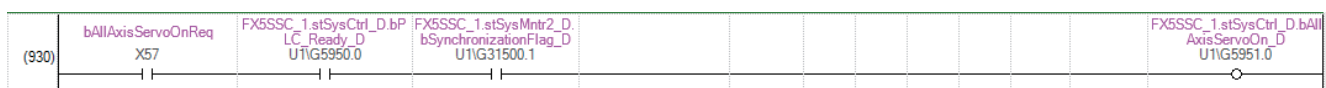
For details on module function blocks, refer to "Simple Motion Module FB/Motion Module FB" in the following manual.

MELSEC iQ-F FX5 Motion Module/Simple Motion Module Function Block Reference

### PLC READY signal ON program



### All axis servo ON program

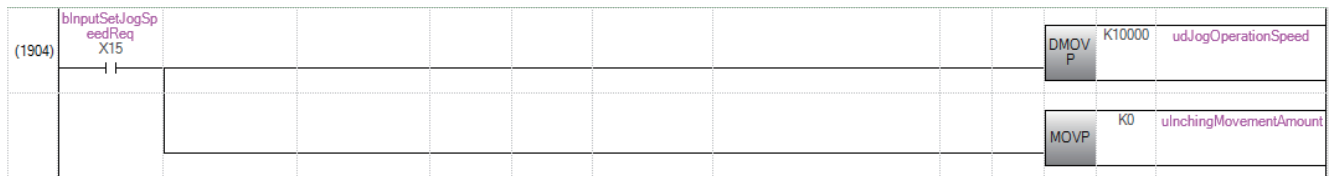




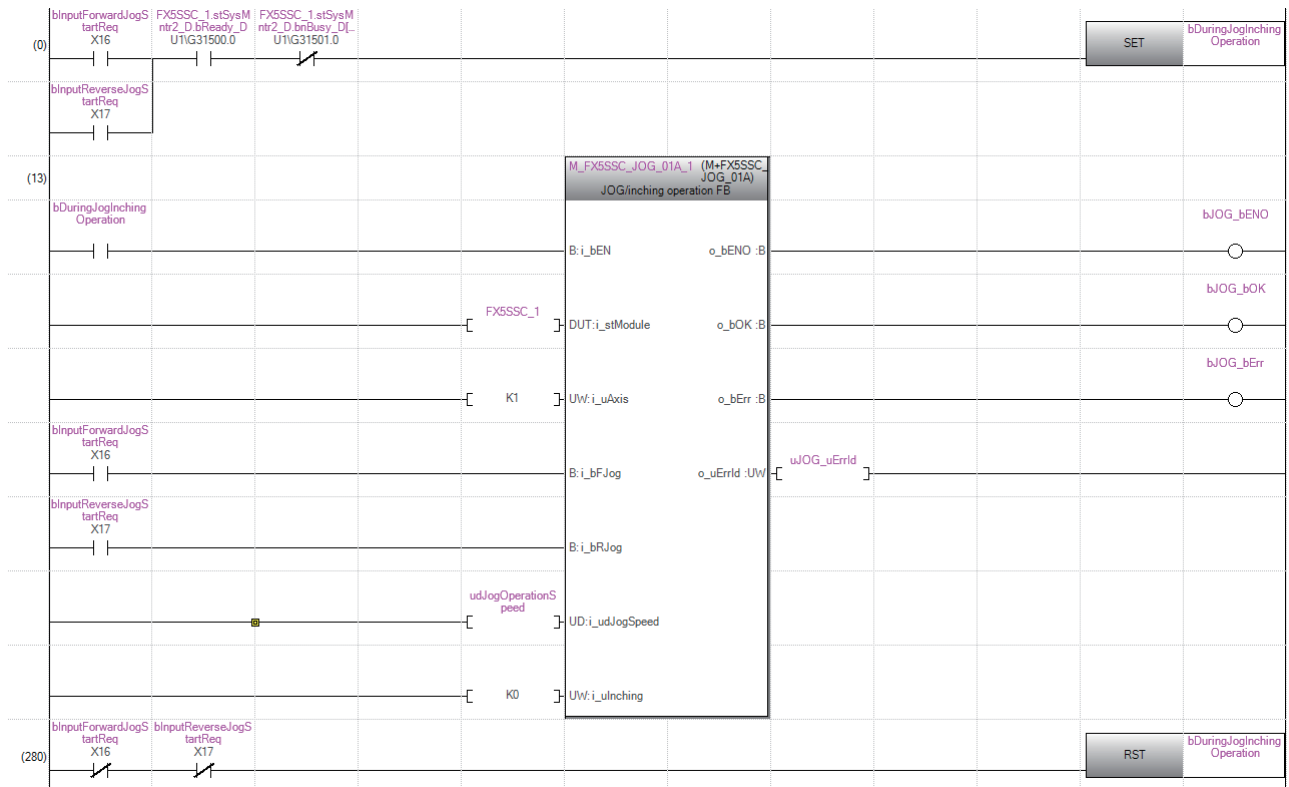
## ■ Positioning start program



## ■ JOG operation setting program



## ■ JOG operation execution program



# Program Examples Using Buffer Memory [FX5-SSC-S]

## List of devices to be used

In the program examples, the devices to be used are assigned as follows.

In addition, change the module access device, external inputs, internal relays, data registers, and timers according to the system used.

### ■Buffer memory address of Simple Motion module, external inputs, internal relay

| Device name                                   | Device                   |        |        |  | Application                                     | Description at device ON             |   |
|---|--------------------------|--------|--------|--|---|--------------------------------------|---|
|   | Axis 1                   | Axis 2 | Axis 3 | Axis 4                                       |   |                                      |   |
| Buffer memory address of Simple Motion module | U1\G31500.0              |        |        |  | READY signal                                    | READY                                |   |
|   | U1\G31500.1              |        |        |  | Synchronization flag                            | Buffer memory accessible             |   |
|   | U1\G2417.C               | —      |        |  | M code ON signal                                | M code outputting                    |   |
|   | U1\G2417.D               |        |        |  | Error detection signal                          | Error detection                      |   |
|   | U1\G31501.0              |        |        |  | BUSY signal                                     | BUSY (operating)                     |   |
|   | U1\G2417.E               |        |        |  | Start complete signal                           | Start completed                      |   |
|   | U1\G5950                 |        |        |  | PLC READY signal                                | CPU module preparation completed     |   |
|   | U1\G5951                 |        |        | All axis servo ON signal                     | All axis servo ON signal                        |                                      |   |
|   | U1\G30101                | —      |        |  | Forward run JOG start signal                    | Starting forward run JOG             |   |
|   | U1\G30102                |        |        |  | Reverse run JOG start signal                    | Starting reverse run JOG             |   |
|   | U1\G30104                |        |        |  | Positioning start signal                        | Requesting start                     |   |
|   | External input (command) | X3     | —      |  |   | Machine home position return command | Commanding machine home position return |
|   |                          | X4     |        |  |   | Fast home position return command    | Commanding fast home position return    |
| X5  |                          |        |        | Positioning start command                    | Commanding positioning start                    |                                      |   |
| X6  |                          |        |        | Speed-position switching operation command   | Commanding speed-position switching operation   |                                      |   |
| X7  |                          |        |        | Speed-position switching enable command      | Commanding speed-position switching enable      |                                      |   |
| X10   |                          |        |        | Speed-position switching prohibit command    | Commanding speed-position switching prohibit    |                                      |   |
| X11   |                          |        |        | Movement amount change command               | Commanding movement amount change               |                                      |   |
| X12   |                          |        |        | High-level positioning control start command | Commanding high-level positioning control start |                                      |   |
| X15   |                          |        |        | JOG operation speed setting command          | Commanding JOG operation speed setting          |                                      |   |
| X16   |                          |        |        | Forward run JOG/inching command              | Commanding forward run JOG/inching operation    |                                      |   |
| X17   |                          |        |        | Reverse run JOG/inching command              | Commanding reverse run JOG/inching operation    |                                      |   |
| X40   |                          |        |        | Position-speed switching operation command   | Position-speed switching operation command      |                                      |   |
| X41   |                          |        |        | Position-speed switching enable command      | Position-speed switching enable command         |                                      |   |
| X42   |                          |        |        | Position-speed switching prohibit command    | Position-speed switching prohibit command       |                                      |   |
| X43   |                          |        |        | Speed change command                         | Speed change command                            |                                      |   |
| X53   |                          |        |        | PLC READY signal ON                          | PLC READY signal ON                             |                                      |   |
| X55   |                          |        |        | For Unit (degree)                            | For Unit (degree)                               |                                      |   |
| X56   |                          |        |        | Positioning start signal command             | Commanding positioning start                    |                                      |   |
| X57   |                          |        |        | All axis servo ON command                    | All axis servo ON command                       |                                      |   |

| Device name    | Device |        |                                   |                             | Application                               | Description at device ON               |
|----------------|--------|--------|-----------------------------------|-----------------------------|---|--|
|                | Axis 1 | Axis 2 | Axis 3                            | Axis 4                      |   |  |
| Internal relay | M3     | —      |                                   |                             | Fast home position return command         | Commanding fast home position return   |
|                | M4     |        |                                   |                             | Fast home position return command storage | Fast home position return command held |
|                | M5     |        |                                   |                             | Positioning start command pulse           | Positioning start commanded            |
|                | M6     |        |                                   |                             | Positioning start command storage         | Positioning start command held         |
|                | M7     |        |                                   |                             | JOG/inching operation termination         | JOG/inching operation termination      |
|                | M9     |        |                                   |                             | Manual pulse generator operating flag     | Manual pulse generator operating flag  |
|                | M25    |        |                                   |                             | Parameter initialization command storage  | Parameter initialization command held  |
|                | M27    |        |                                   |                             | Flash ROM write command storage           | Flash ROM write command held           |
|                | M50    | —      | Parameter setting complete device | Parameter setting completed |   |  |

### ■Data registers and timers

| Device name   | Device |        |        |        | Application                                      | Storage details  |
|---------------|--------|--------|--------|--------|--|--|
|               | Axis 1 | Axis 2 | Axis 3 | Axis 4 |  |  |
| Data register | D0     | —      |        |        | Home position return request flag                | [Md.31] Status: b3   |
|               | D1     |        |        |        | Speed (low-order 16 bits)                        | [Cd.25] Position-speed switching control speed change register           |
|               | D3     |        |        |        | Movement amount (low-order 16 bits)              | [Cd.23] Speed-position switching control movement amount change register |
|               | D5     |        |        |        | Inching movement amount                          | [Cd.16] Inching movement amount  |
|               | D6     |        |        |        | JOG operation speed (low-order 16 bits)          | [Cd.17] JOG speed  |
|               | D32    |        |        |        | Start No.  | —  |
|               | Code   |        |        |        | U1\G2417   |  |
| U1\G4300      |        |        |        |        | Positioning start No.                            | [Cd.3] Positioning start No.   |
| U1\G4301      |        |        |        |        | Positioning starting point No.                   | [Cd.4] Positioning starting point No.                                    |
| U1\G4326      |        |        |        |        | Speed-position switching control movement amount | [Cd.23] Speed-position switching control movement amount change register |
| U1\G4328      |        |        |        |        | Speed-position switching enable flag             | [Cd.24] Speed-position switching enable flag                             |
| U1\G4330      |        |        |        |        | Position-speed switching control speed change    | [Cd.25] Position-speed switching control speed change register           |
| U1\G4332      |        |        |        |        | Position-speed switching enable flag             | [Cd.26] Position-speed switching enable flag                             |

### Program example

#### ■PLC READY signal ON program

| No.7 [Cd.190] PLC READY signal ON program |                      |                                   |  |                                 |                     |  |
|---|----------------------|-----------------------------------|--|---------------------------------|---------------------|--|
| (7956)                                    | SM403                | M50                               | M25                                      | M27                             | X53                 | <PLC ready signal ON/OFF><br>U1G5950.0 |
| (7956)                                    | 1 scan OFF after RUN | Parameter setting complete device | Parameter initialization command storage | Flash ROM write command storage | PLC READY signal ON | PLC READY signal                       |

#### ■All axis servo ON program

| No.8 [Cd.191] All axis servo ON signal ON program |                           |                  |                      |  |  |                                  |
|---|---------------------------|------------------|----------------------|--|--|----------------------------------|
| (8063)  | X57                       | U1G5950.0        | U1G31500.1           |  |  | <All axes servo ON><br>U1G5951.0 |
| (8063)  | All axis servo ON command | PLC READY signal | Synchronization flag |  |  | All axis servo ON signal         |

## ■ Positioning start No. setting program

| No.9 Positioning start number setting program  |  |                          |  |
|--|--|--------------------------|--|
| (1) Machine HPR  |  |                          |  |
| (8159)   | X3   |                          | <Writing Machine HPR (9001)>   |
| (8159)   | Machine HPR command                        | MOV P                    | K9001 Start number D32   |
| (2) Fast HPR   |  |                          |  |
| (8272)   | X4   |                          | <Extracting HPR request flag ON/OFF>   |
| (8272)   | Fast HPR command                           | WAND P                   | U1/G2417 Status H8 D0 HPR request flag   |
|  |  |                          | <Enabling fast HPR start>  |
|  |  | D0 HPR request flag = K0 | SET M3 Fast HPR command  |
|  |  |                          | <Writing fast HPR (9002)>  |
|  |  | MOV P                    | K9002 Start number D32   |
|  |  |                          | <Holding the fast HPR command>   |
|  |  |                          | SET M4 Fast HPR command storage  |
| (3) Positioning with positioning data No. 1  |  |                          |  |
| (8453)   | X5   |                          | <Positioning data No. 1 setting>   |
| (8453)   | Positioning start command                  | MOV P                    | K1 Start number D32  |
| (4) Speed-position switching operation (Positioning data No. 2)<br>(In the ABS mode, new movement amount write is not needed.) |  |                          |  |
| (8513)   | X6   |                          | <Positioning data No. 2 setting>   |
| (8513)   | Speed/position switching operation command | MOV P                    | K2 Start number D32  |
| (8577)   | X7   |                          | <Setting speed/position switching signal enable>   |
| (8577)   | Speed/position switching enable command    | MOV P                    | K1 U1/G4328 Speed/position switching enable flag   |
| (8641)   | X10  |                          | <Setting speed/position switching signal prohibit>   |
| (8641)   | Speed/position switching prohibit command  | MOV P                    | K0 U1/G4328 Speed/position switching enable flag   |
| (8707)   | X11  |                          | <Writing movement amount after change>   |
| (8707)   | Movement amount change command             | DMOV P                   | D3 Movement amount (low-order 16 bits) U1/G4326 Speed/position switching control movement amount |



| (5) Position/speed switching operation (positioning data No. 3)                                   |  |   |  |      |                                 |  |
|---|--|---|--|------|---------------------------------|--|
| (8772)  | X40  |   |  |      |                                 | <Positioning data No.3 setting>                        |
| (8772)  | Position/speed switching operation command   |   |  | MOV  | K3                              | Start number D32                                       |
| (8831)  | X41  | X42                                       |  |      |                                 | <Setting position/speed switching signal enable>       |
| (8831)  | Position/speed switching enable command      | Position/speed switching prohibit command |  | MOV  | K1                              | U1/G4332 Position/speed switching enable flag          |
| (8897)  | X41  | X42                                       |  |      |                                 | <Setting position/speed switching signal prohibit>     |
| (8897)  | Position/speed switching enable command      | Position/speed switching prohibit command |  | MOV  | K0                              | U1/G4332 Position/speed switching enable flag          |
| (8965)  | X43  |   |  |      |                                 | <Writing speed after change>                           |
| (8965)  | Speed change command                         |   |  | DMOV | D1<br>Speed (low-order 16 bits) | U1/G4330 Position/speed switching control speed change |
| (6) High-level positioning control  |  |   |  |      |                                 |  |
|   | X12  |   |  |      |                                 | <Writing block positioning (7000)>                     |
| (9007)  | High-level positioning control start command |   |  | MOV  | K7000                           | Start number D32                                       |
|   |  |   |  |      |                                 | <Writing positioning start point number (1)>           |
|   |  |   |  | MOV  | K1                              | U1/G4301 Positioning starting point No.                |
| (7) Fast HPR command and fast HPR command storage OFF<br>(Not required when fast HPR is not used) |  |   |  |      |                                 |  |
|   | X3   |   |  |      |                                 | <Fast HPR command OFF>                                 |
| (9127)  | Machine HPR command                          |   |  | RST  |                                 | M3 Fast HPR command                                    |
|   | X5   |   |  |      |                                 | <Fast HPR command storage OFF>                         |
|   | Positioning start command                    |   |  | RST  |                                 | M4 Fast HPR command storage                            |
|   | X6   |   |  |      |                                 |  |
|   | Speed/position switching operation command   |   |  |      |                                 |  |
|   | X40  |   |  |      |                                 |  |
|   | Position/speed switching operation command   |   |  |      |                                 |  |
|   | X12  |   |  |      |                                 |  |
|   | High-level positioning control start command |   |  |      |                                 |  |
|   | M6   |   |  |      |                                 |  |
|   | Positioning start command storage            |   |  |      |                                 |  |



## ■ Positioning start program

| No.10 Positioning start program   |                                   |                                   |                                 |                           |                            |                                       |                  |                          |  |  |
|---|-----------------------------------|-----------------------------------|---------------------------------|---------------------------|----------------------------|---------------------------------------|------------------|--------------------------|--|--|
| (When fast HPR is not performed, contacts of M3 and M4 are not needed.)                 |                                   |                                   |                                 |                           |                            |                                       |                  |                          |  |  |
| (When M code is not used, contacts of U0.G2417.C are not needed.)                       |                                   |                                   |                                 |                           |                            |                                       |                  |                          |  |  |
| (When JOG/inching operation is not performed, contacts of M7 are not needed.)           |                                   |                                   |                                 |                           |                            |                                       |                  |                          |  |  |
| (When manual pulse generator operation is not performed, contacts of M9 is not needed.) |                                   |                                   |                                 |                           |                            |                                       |                  |                          |  |  |
| (9228)  | X56                               |                                   |                                 |                           |                            |                                       |                  |                          |  | <Pulse conversion of positioning start command>      |
| (9228)  | Positioning start signal command  |                                   |                                 |                           |                            |                                       |                  |                          |  | PLS M5<br>Positioning start command pulse            |
| <Holding the positioning start command>   |                                   |                                   |                                 |                           |                            |                                       |                  |                          |  |  |
| (9356)  | Positioning start command pulse   | Positioning start signal (axis 1) | Start complete signal (axis 1)  | M code ON signal (axis 1) | JOG/inching operation flag | Manual pulse generator operating flag | Fast HPR command |                          |  | SET M6<br>Positioning start command storage          |
|   |                                   |                                   |                                 |                           |                            |                                       | M3               | M4                       |  |  |
|   |                                   |                                   |                                 |                           |                            |                                       | Fast HPR command | Fast HPR command storage |  |  |
| <Positioning start No. setting>   |                                   |                                   |                                 |                           |                            |                                       |                  |                          |  |  |
| (9427)  | Positioning start command storage |                                   |                                 |                           |                            |                                       |                  |                          |  | MOV P D32 Start number U1G4300 Positioning start No. |
| <Executing positioning start>   |                                   |                                   |                                 |                           |                            |                                       |                  |                          |  |  |
|   |                                   |                                   |                                 |                           |                            |                                       |                  |                          |  | SET U1G30104.0<br>Positioning start signal (axis 1)  |
| <Positioning start command storage OFF>   |                                   |                                   |                                 |                           |                            |                                       |                  |                          |  |  |
|   |                                   |                                   |                                 |                           |                            |                                       |                  |                          |  | RST M6<br>Positioning start command storage          |
| <Positioning start signal OFF>  |                                   |                                   |                                 |                           |                            |                                       |                  |                          |  |  |
| (9560)  | Positioning start signal (axis 1) | Start complete signal (axis 1)    | BUSY signal (axis 1)            |                           |                            |                                       |                  |                          |  | RST U1G30104.0<br>Positioning start signal (axis 1)  |
|   |                                   | U1G2417.D                         | Error detection signal (axis 1) |                           |                            |                                       |                  |                          |  |  |

## ■JOG operation setting program

| No.12 JOG operation setting program |          |          |  |  |  |     |    |       |  |
|-------------------------------------|----------|----------|--|--|--|-----|----|-------|--|
|                                     |          |          |  |  |  |     |    |       | <JOG operation speed (100.00 mm/min) setting>                                  |
| (9801)                              | X15<br>↓ |          |  |  |  |     |    |       | DMOVP K10000 D6<br>JOG operation speed (low-order 16 bits)                     |
|                                     |          |          |  |  |  |     |    |       | <JOG operation speed (1200.000 degrees/min) setting>                           |
|                                     |          | X55<br>↓ |  |  |  |     |    |       | DMOVP K1200000 D6<br>For unit (degree) JOG operation speed (low-order 16 bits) |
|                                     |          |          |  |  |  |     |    |       | <Setting the inching movement amount to (0)>                                   |
|                                     |          |          |  |  |  |     |    |       | MOV K0 D5<br>Inching movement amount   |
|                                     |          |          |  |  |  |     |    |       | <Writing JOG operation speed>  |
|                                     |          |          |  |  |  | TOP | H1 | K4317 | D5<br>Inching movement amount<br>K3  |

## ■JOG operation execution program

| No.14 JOG operation/inching operation execution program |          |                            |   |  |  |  |  |  |   |
|---|----------|----------------------------|---|--|--|--|--|--|---|
|   |          |                            |   |  |  |  |  |  | <JOG/inching operation flag ON>                     |
| (10240)   | X16<br>↓ | U1G31500.0<br>READY signal | U1G31501.0<br>BUSY signal (axis 1)                  |  |  |  |  |  | SET M7<br>JOG/inching operation flag                |
|   | X17<br>↓ |                            |   |  |  |  |  |  |   |
| (10363)   |          |                            |   |  |  |  |  |  | <JOG/inching operation end>                         |
| (10363)   | X16<br>↓ | X17<br>↓                   |   |  |  |  |  |  | RST M7<br>JOG/inching operation flag                |
| (10402)   |          |                            |   |  |  |  |  |  | <Executing forward run JOG/inching operation>       |
| (10402)   | X16<br>↓ | M7<br>↓                    | U1G30102.0<br>Reverse run JOG start signal (axis 1) |  |  |  |  |  | U1G30101.0<br>Forward run JOG start signal (axis 1) |
| (10465)   |          |                            |   |  |  |  |  |  | <Executing reverse run JOG/inching operation>       |
| (10465)   | X17<br>↓ | M7<br>↓                    | U1G30101.0<br>Forward run JOG start signal (axis 1) |  |  |  |  |  | U1G30102.0<br>Reverse run JOG start signal (axis 1) |

# Appendix 9 Setting Example for Motion Modules (FX5-SSC-G)

This sections describes the setting procedure all the way up to servo ON when combining the Motion module and servo amplifier MR-J5(W)-G.

The construction method of the program is the same as for the Simple Motion module.

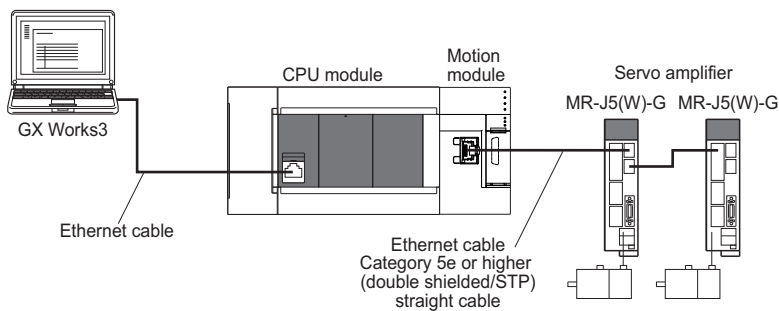
## Preparation

### ■Preparing the module/engineering tool and checking the version

| Category         |                       | Model                      | Compatible version                    |
|------------------|-----------------------|----------------------------|---------------------------------------|
| Module           | CPU module            | FX5U<br>FX5UC              | Version 1.230 or later                |
|                  | Motion module         | FX5-40SSC-G<br>FX5-80SSC-G | No restriction                        |
|                  | Servo amplifier       | MR-J5(W)-G                 | Version B2 or later                   |
| Engineering tool | PLC software package  | GX Works3                  | Version 1.072A or later               |
|                  | Servo set-up software | MR Configurator2           | Version 1.120A or later <sup>*1</sup> |

\*1 MR Configurator2 version 1.120A is not included in GX Works3 version 1.072A. For details, contact your local sales representative.

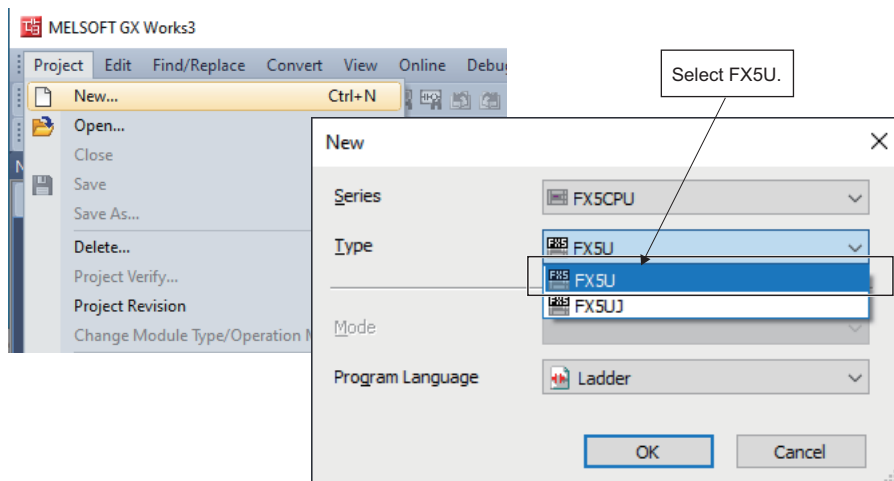
### ■System configuration



## Project creation

1. Starting GX Works3.
  - Start GX Works3.
2. Creating a new project.
  - Create a new project.

[Project]⇒[New Project]



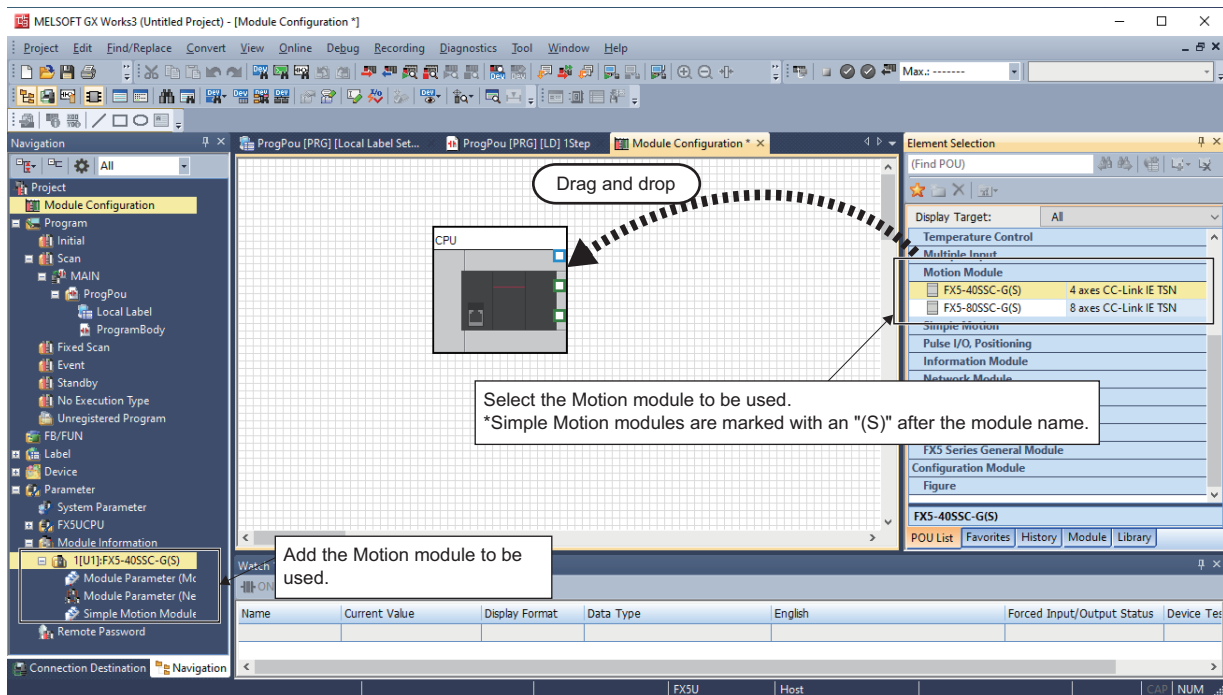
\*The Motion module cannot be used with FX5UJ.

A

## System configuration setting

### ■ Adding a module

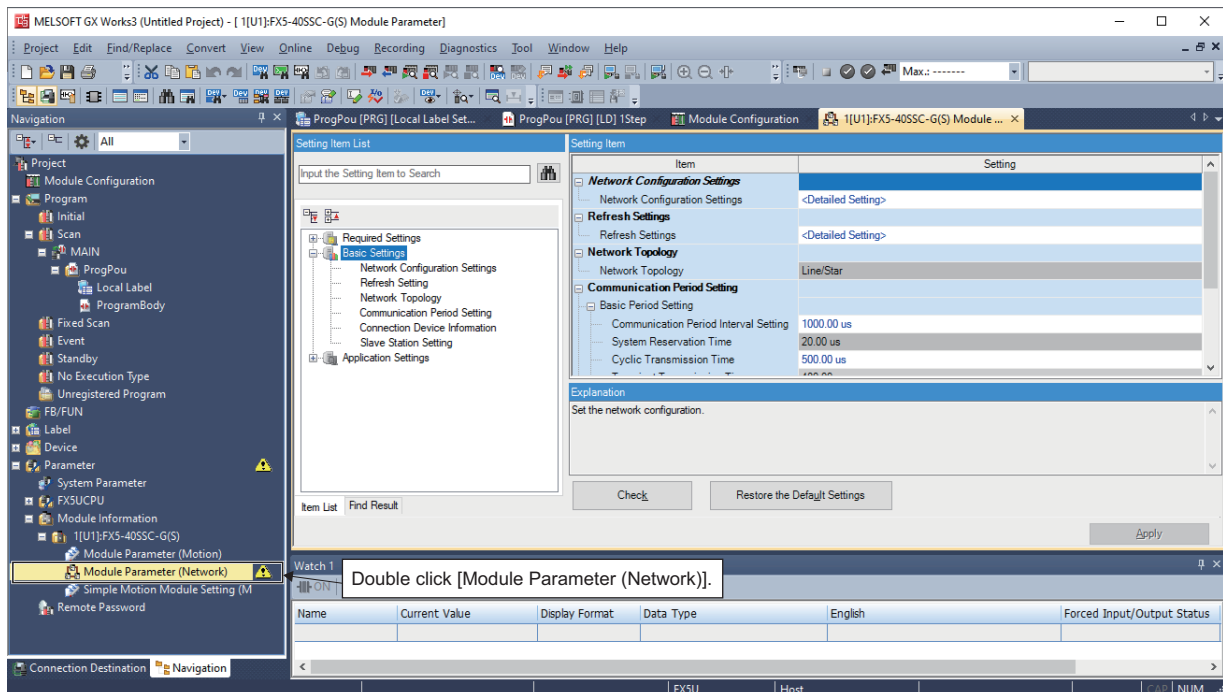
- In the "Element Selection" window of the module configuration, select the Motion module to be used and drag and drop it.



### ■ Network parameter setting

- Open the parameter setting screen and set the servo amplifier to be used and the servo parameters.

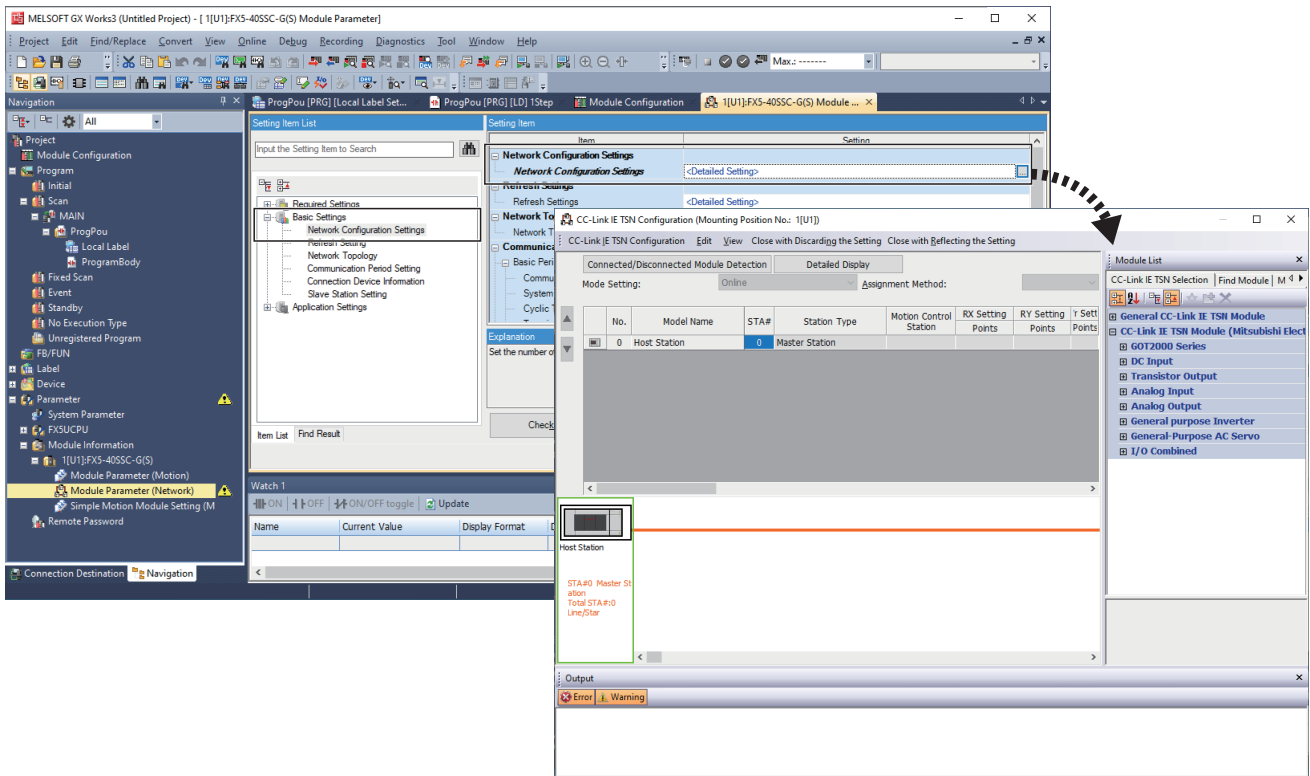
☞ Double click [Navigation] window⇒[Parameter]⇒[Module Information]⇒[Target module]⇒[Module Parameter (Network)]



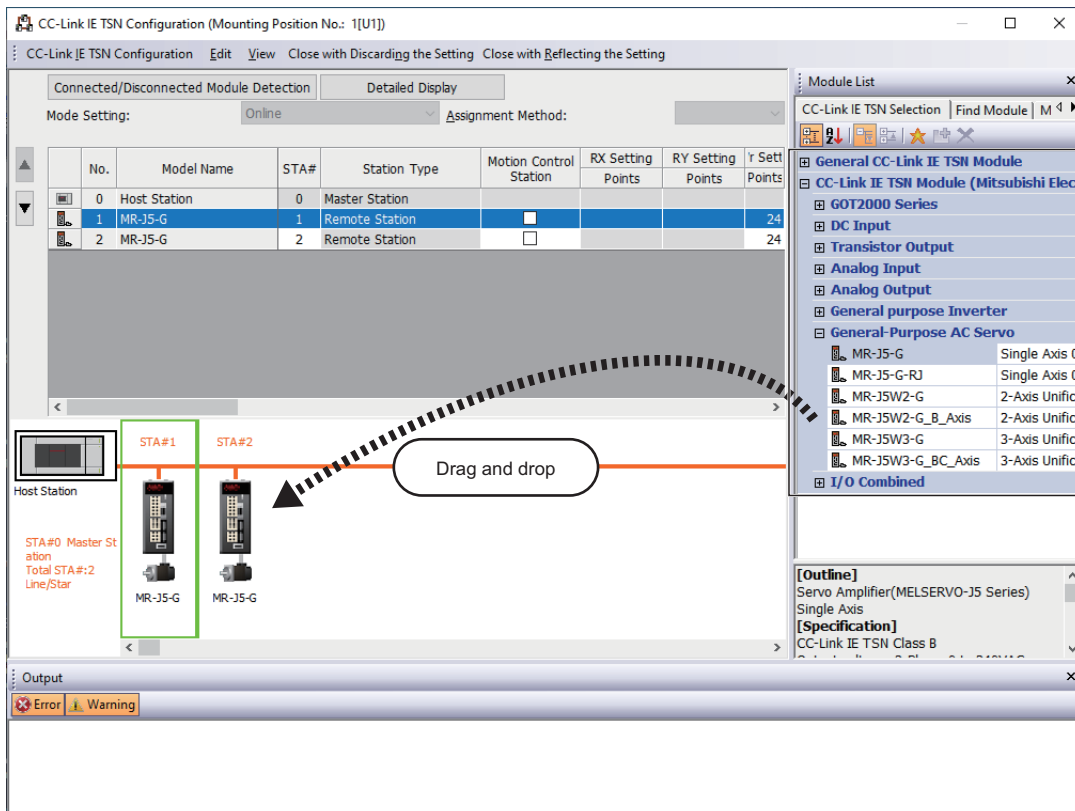
## ■ Network configuration setting

- Start the network configuration

☞ Double click [Navigation] window⇒[Parameter]⇒[Module Information]⇒[Target module]⇒[Module Parameter (Network)]⇒[Basic Settings]⇒[Network Configuration Settings] (or click the button on the right side)⇒"CC-Link IE TSN Configuration" screen

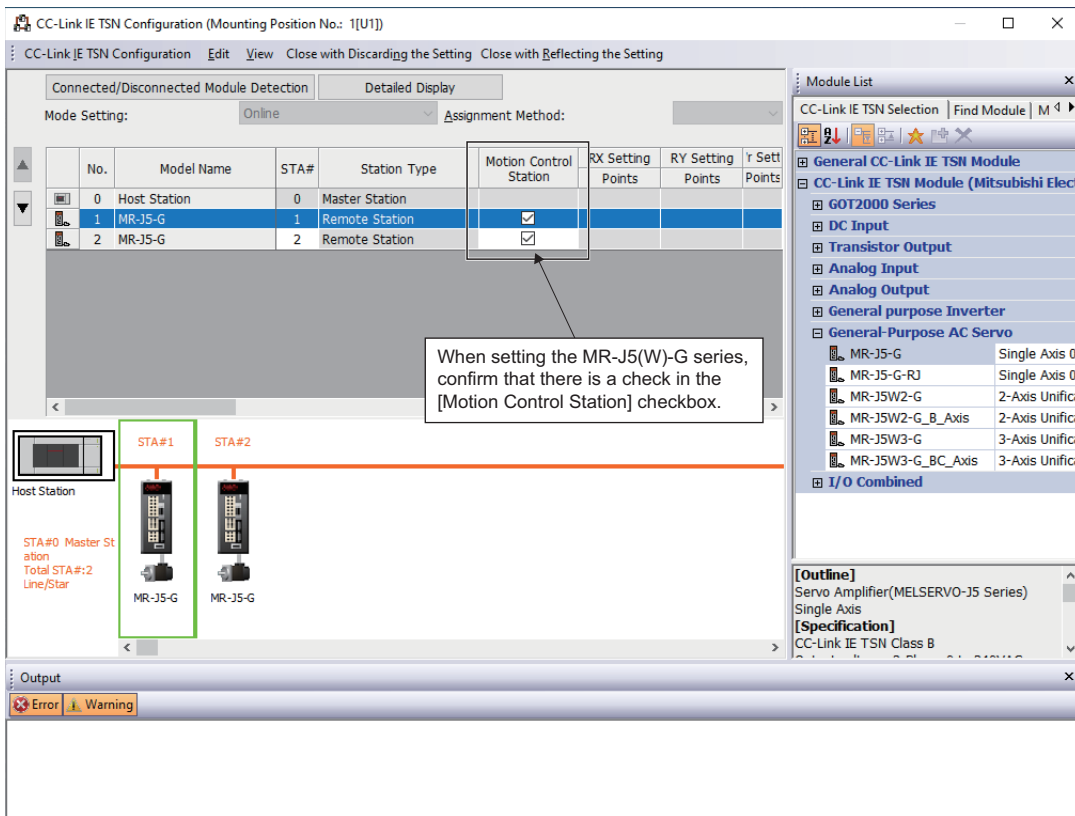


- Select and add modules from "Module List" on the "CC-Link IE TSN Configuration" screen.
- A default station No. and I/O point No. are set when a module is added. IP addresses are set automatically in the order in which the modules were added via drag and drop according to the setting and station No. of the master station.



## ■PDO mapping setting

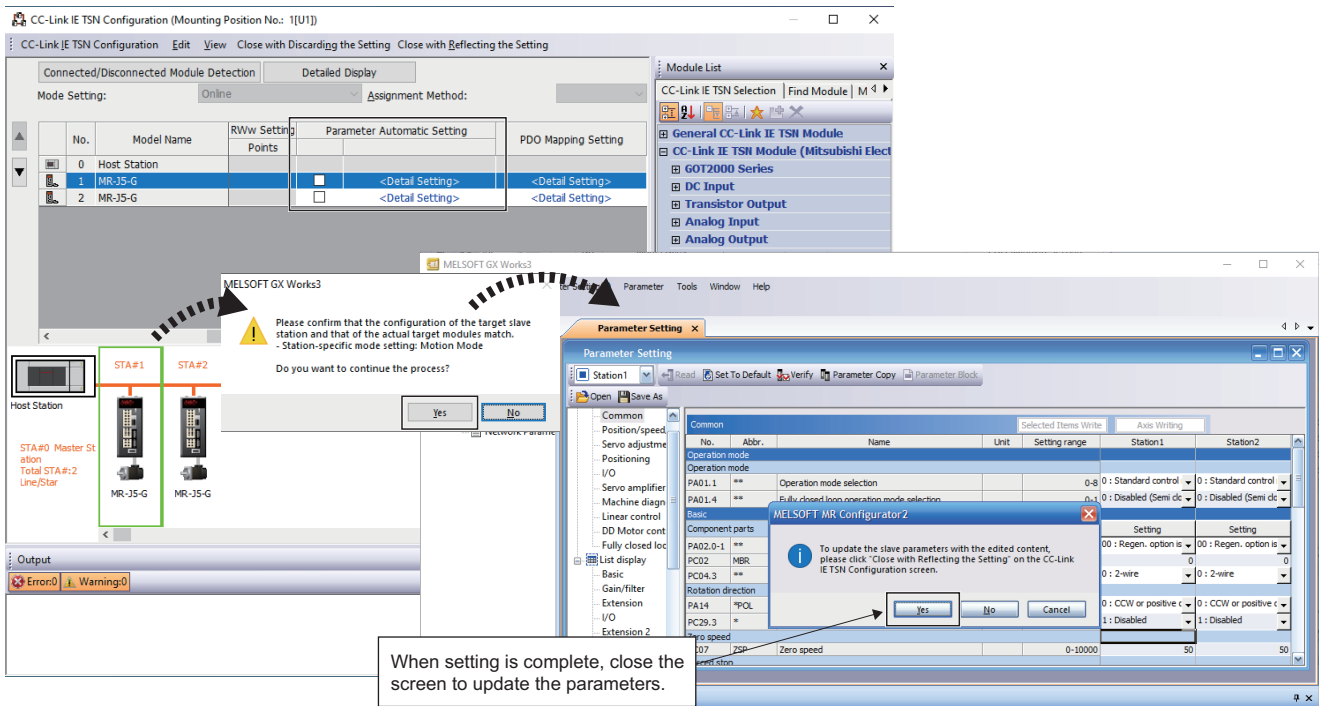
- When using a Motion module, PDO mapping setting is not required as the PDO mapping is fixed to the external signal of the servo amplifier.



## ■Servo parameter setting

- Set the servo parameters. For the setting details, refer to the following.  
 ➔ Page 109 Servo parameter setting value when using MR-J5(W)-G

🖱 Double click the servo amplifier icon or [Detail Setting] in "Parameter Automatic Setting"



## ■ Servo parameter setting value when using MR-J5(W)-G

Set the parameters of MR-J5(W)-G as shown below when executing motion control with MR-J5(W)-G. When the parameters are not set as shown below, the error "Servo parameter invalid" (error code: 1DC8H) occurs and the values will be rewritten from the Motion module.

When an error occurs, reset said error after resetting the Motion module or MR-J5(W)-G.

| No.    | Name   | Default value | Setting value   |
|--------|--|---------------|---|
| PA06   | Electronic gear numerator <sup>*1</sup>                      | 1             | <ul style="list-style-type: none"> <li>When using the rotary servo motor HK-KT series: 16</li> <li>Other (when not using the rotary servo motor HK-KT series): 1</li> </ul> |
| PA07   | Electronic gear denominator <sup>*1</sup>                    | 1             | 1   |
| PC79.0 | DI status read selection <sup>*1</sup>                       | 0h            | Eh  |
| PD41.2 | Limit switch enabled status selection <sup>*1</sup>          | 0h            | 1h (only enabled in homing mode)  |
| PD41.3 | Sensor input method selection <sup>*1</sup>                  | 0h            | 1h (Input from controller (FLS/RLS/DOG))  |
| PD60   | DI pin polarity selection <sup>*1</sup>                      | 00000000h     | 00000000h   |
| PT01.1 | Speed/acceleration/deceleration unit selection <sup>*2</sup> | 0h            | 0h  |
| PT08   | Homing position data <sup>*1</sup>                           | 0             | 0h  |
| PT15   | Software position limit +                                    | 0             | 0   |
| PT17   | Software position limit -                                    | 0             | 0   |
| PT29.0 | Device input polarity 1 <sup>*1</sup>                        | 0h            | 1h: Dog detection with on   |

\*1 The parameter is enabled after resetting the Motion module or MR-J5(W)-G.

\*2 The parameter is enabled after resetting the MR-J5(W)-G.

## ■ Reflecting the network configuration setting

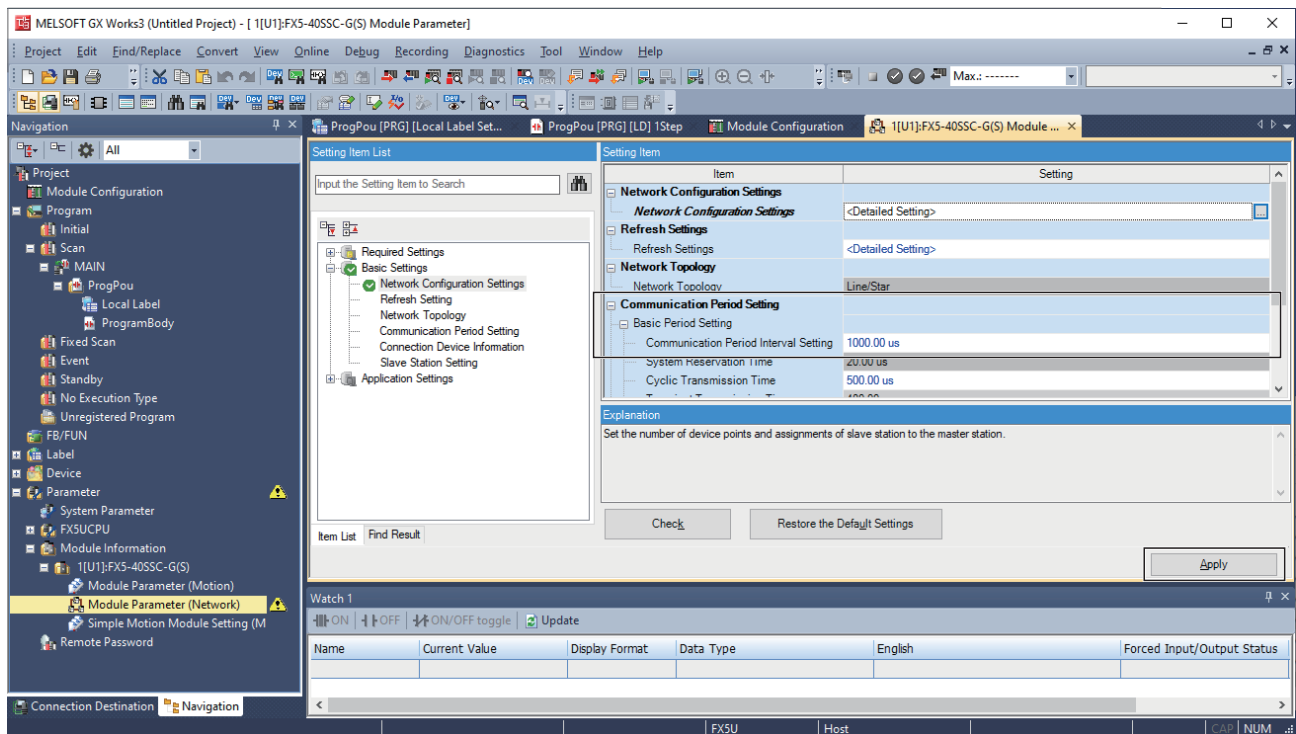
Place a check in the checkbox in "Parameter Automatic Setting".



## ■Applying the operation cycle setting and module parameters

The operation cycle is set in "Communication Period Interval Setting" of "Communication Period Setting".

Click [Apply] to apply the settings in Module Parameters (Network).

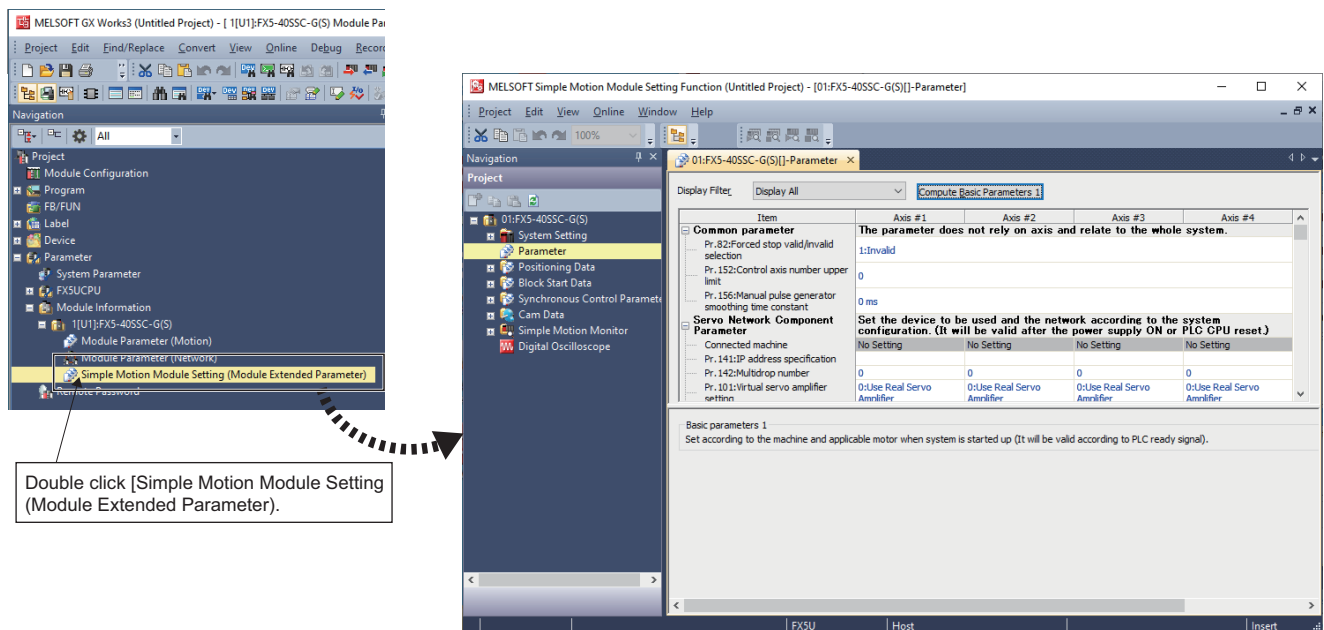


## Simple Motion Module Setting

### ■Starting the Simple Motion Module Setting

Start the Simple Motion Module Setting screen.

Double click [Navigation] window ⇒ [Parameter] ⇒ [Module Information] ⇒ [Target module] ⇒ [Simple Motion Module Setting (Module Extended Parameter)]



Double click [Simple Motion Module Setting (Module Extended Parameter)].



## ■Setting the axis

Set the servo network configuration parameters "[Pr.141: IP address specification]" and "[Pr.142] Multidrop number".

In general, set parameters related to the servo amplifier on the GX Works3 side in the same way as for FX5-SSC-S.

The IP address set in the CC-Link IE TSN configuration can be selected (same as for Motion Control Setting).

Displays the servo amplifier corresponding to the IP address.

| Item  | Axis #1   | Axis #2                    |
|---|---|----------------------------|
| Pr.152:Control axis number upper limit  | 0   | 0                          |
| Pr.156:Manual pulse generator strobe time (ms)  | 0 ms  | 0 ms                       |
| <b>Servo Network Component Parameter</b>  | <b>Set the device to be used and the network according to the machine and applicable motor when system is started up (It will be overwritten after the power supply ON or PLC CPU reset).</b> |                            |
| Connected machine   | MR-J5-G   | MR-J5-G                    |
| Pr.141:IP address specification   | 192.168.3.1   | 192.168.3.1                |
| Pr.142:Multidrop number   | 0   | 0                          |
| 0:Use Real Servo Amplifier  | 0:Use Real Servo Amplifier  | 0:Use Real Servo Amplifier |
| 1:Detection Valid   | 1:Detection Valid   | 1:Detection Valid          |
| <b>Basic parameters 1</b>   |   |                            |
| <b>Set according to the machine and applicable motor when system is started up (It will be overwritten after the power supply ON or PLC CPU reset).</b> |   |                            |
| Pr.1:Unit setting   | 0:mm  | 0:mm                       |
| Pr.2:Number of pulses per rotation  | 4194304 pulse   | 4194304 pulse              |
| Pr.3:Movement amount per rotation   | 2000.0 μm   | 2000.0 μm                  |
| Pr.4:Unit magnification   | 1:x1 Times  | 1:x1 Times                 |
| Pr.7:Bias speed at start  | 0.00 mm/min   | 0.00 mm/min                |
| <b>Basic parameters 2</b>   |   |                            |
| <b>Set according to the machine and applicable motor when system is started up (It will be overwritten after the power supply ON or PLC CPU reset).</b> |   |                            |

## ■Setting the electronic gear

- When using a rotary MR-J5(W)-G motor, set the resolution of the electronic gear to the MR-J4(W)-B motor resolution (22 bit, or 4194304 pulse) instead of 26 bit (67108864 pulse).

The Motion module automatically overwrites the electronic gear of the servo amplifier parameters. For details, refer to the following.

← Page 109 Servo parameter setting value when using MR-J5(W)-G

| Item  | Axis #1   | Axis #2                |
|---|---|------------------------|
| Pr.152:Control axis number upper limit  | 0   | 0                      |
| Pr.156:Manual pulse generator sm...   | 0 ms  | 0 ms                   |
| <b>Servo Network Component Par...</b>   | <b>Set the device to be used and the network according to the machine and applicable motor when system is started up (It will be overwritten after the power supply ON or PLC CPU reset).</b> |                        |
| Connected machine   | MR-J5-G   | MR-J5-G                |
| Pr.141:IP address specification   | 192.168.3.1   | 192.168.3.1            |
| Pr.142:Multidrop number   | 0   | 0                      |
| 0:Use Real Servo Am...  | 0:Use Real Servo Am...  | 0:Use Real Servo Am... |
| 1:Detection Valid   | 1:Detection Valid   | 1:Detection Valid      |
| <b>Basic parameters 1</b>   |   |                        |
| <b>Set according to the machine and applicable motor when system is started up (It will be overwritten after the power supply ON or PLC CPU reset).</b> |   |                        |
| Pr.1:Unit setting   | 0:mm  | 0:mm                   |
| Pr.2:Number of pulses per rotation  | 4194304 pulse   | 4194304 pulse          |
| Pr.3:Movement amount per rotation   | 2000.0 μm   | 2000.0 μm              |
| Pr.4:Unit magnification   | 1:x1 Times  | 1:x1 Times             |
| Pr.7:Bias speed at start  | 0.00 mm/min   | 0.00 mm/min            |
| <b>Basic parameters 2</b>   |   |                        |
| <b>Set according to the machine and applicable motor when system is started up (It will be overwritten after the power supply ON or PLC CPU reset).</b> |   |                        |

Connected machine  
Axes can be set with Module Parameter (Network).  
Please set the CC IE TSN Configuration by selecting Module Parameter (Network) - Basic Settings

- The basic position information per rotation for the servo amplifier is 26 bit (67108864 pulse).

| No. | Item                                      | Unit     | Axis1    | Axis2    |
|-----|---|----------|----------|----------|
| 1   | Cumulative feedback pulses                | pulse    | 63679    | 23465    |
| 2   | Servo motor speed                         | r/min, m | 0        | 0        |
| 3   | Droop pulse                               | pulse    | -1       | 2        |
| 4   | Cumulative cmd. pulses                    | pulse    | -270     | 139      |
| 5   | Command pulse frequency                   | kpulse/s | 0        | 0        |
| 6   | Regenerative load ratio                   | %        | 0        | 0        |
| 7   | Effective load ratio                      | %        | 0        | 0        |
| 8   | Peak load ratio                           | %        | 0        | 0        |
| 9   | Torque/Instantaneous torque               | %        | 0        | 0        |
| 10  | Within one-revolution position            | pulse    | 17613714 | 40666003 |
| 11  | ABS counter                               | rev      | -16005   | -153     |
| 12  | Load inertia moment ratio                 | times    | 0.62     | 2.76     |
| 13  | Bus voltage                               | V        | 286      | 287      |
| 14  | Load side encoder cumulative F/B pulses   | pulse    | 0        | 0        |
| 15  | Load side droop pulses                    | pulse    | 0        | 0        |
| 16  | Load side encoder information 1           |          | 17613714 | 40666003 |
| 17  | Load side encoder information 2           |          | -16005   | -153     |
| 18  | Servo motor thermistor temperature        | °C       | 9999     | 9999     |
| 19  | Cumulative feedback pulses (Motor unit)   | pulse    | 63679    | 23465    |
| 20  | Electrical angle                          | pulse    | 17613651 | 40665964 |
| 21  | Servo motor/load side position difference | pulse    | 0        | 0        |
| 22  | Servo motor/load side speed difference    | r/min    | 0        | 0        |
| 23  | Internal temperature of encoder           | °C       | 39       | 39       |
| 24  | Settling time                             | ms       | 0        | 0        |
| 25  | Oscillation detection frequency           | Hz       | 0        | 0        |
| 26  | Number of tough drive operations          | times    | 0        | 0        |
| 27  | Unit power consumption                    | W        | 12       | 12       |
| 28  | Unit total power consumption              | Wh       | 1        | 1        |

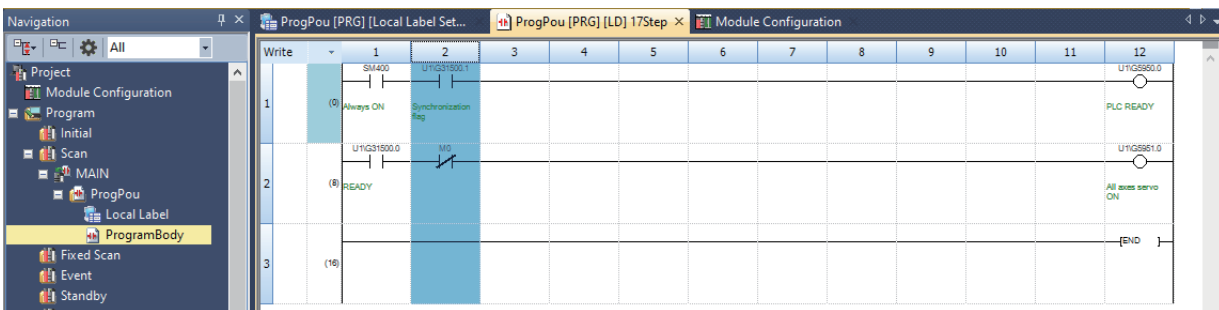
| Expansion parameters  | Set according to the system configuratio |   |
|---|--|---|
| Pr.91:Optional data monitor : Data type setting 1           | H2B12:Load Side Encoder Information ...  | H2B12:Load Side Encoder Information ... |
| Pr.91:Optional data monitor : Data type expansion setting 1 | H0020                                    | H0020                                   |
| Pr.92:Optional data monitor : Data type setting 2           | 0:No Setting                             | 0:No Setting                            |
| Pr.92:Optional data monitor : Data type expansion setting 2 | H0000                                    | H0000                                   |

When "Load Side Encoder Information" is retrieved in the optional data monitor.

| Axis Monitor  | Axis #1              | Axis #2              |
|---|----------------------|----------------------|
| Md.20:Feed current value  | 16 pulse             | 8 pulse              |
| Md.21:Machine feed value  | 16 pulse             | 8 pulse              |
| Md.22:Axis error No.  | -                    | -                    |
| Md.24:Axis warning No.  | -                    | -                    |
| Md.26:Axis operation status                                     | Waiting              | Waiting              |
| Md.28:Axis feed speed   | 0 pulse/s            | 0 pulse/s            |
| Md.44:Positioning data No. being executed                       | -                    | -                    |
| Md.47:Positioning data being executed : Operation pattern       | Positioning Complete | Positioning Complete |
| Md.47:Positioning data being executed : Control method          | -                    | -                    |
| Md.47:Positioning data being executed : Acceleration time No.   | 0:1000               | 0:1000               |
| Md.47:Positioning data being executed : Deceleration time No.   | 0:1000               | 0:1000               |
| Md.47:Positioning data being executed : Axis to be interpolated | -                    | -                    |
| Md.47:Positioning data being executed : M-code                  | -                    | -                    |
| Md.102:deviation counter  | 0 pulse              | -3 pulse             |
| Md.103:Motor rotation speed                                     | 0.67 r/min           | 0.07 r/min           |
| Md.104:Motor current value                                      | 0.1 %                | 0.1 %                |
| Md.108:Servo status 1 : Servo alarm                             | OFF                  | OFF                  |
| Md.108:Servo status 1 : Servo warning                           | OFF                  | OFF                  |
| Md.109:Regenerative load ratio/Optional data monitor output-1   | 17838575             | 40765718             |
| Md.109:Regenerative load ratio/Optional data monitor output-2   | -                    | -                    |

## Program

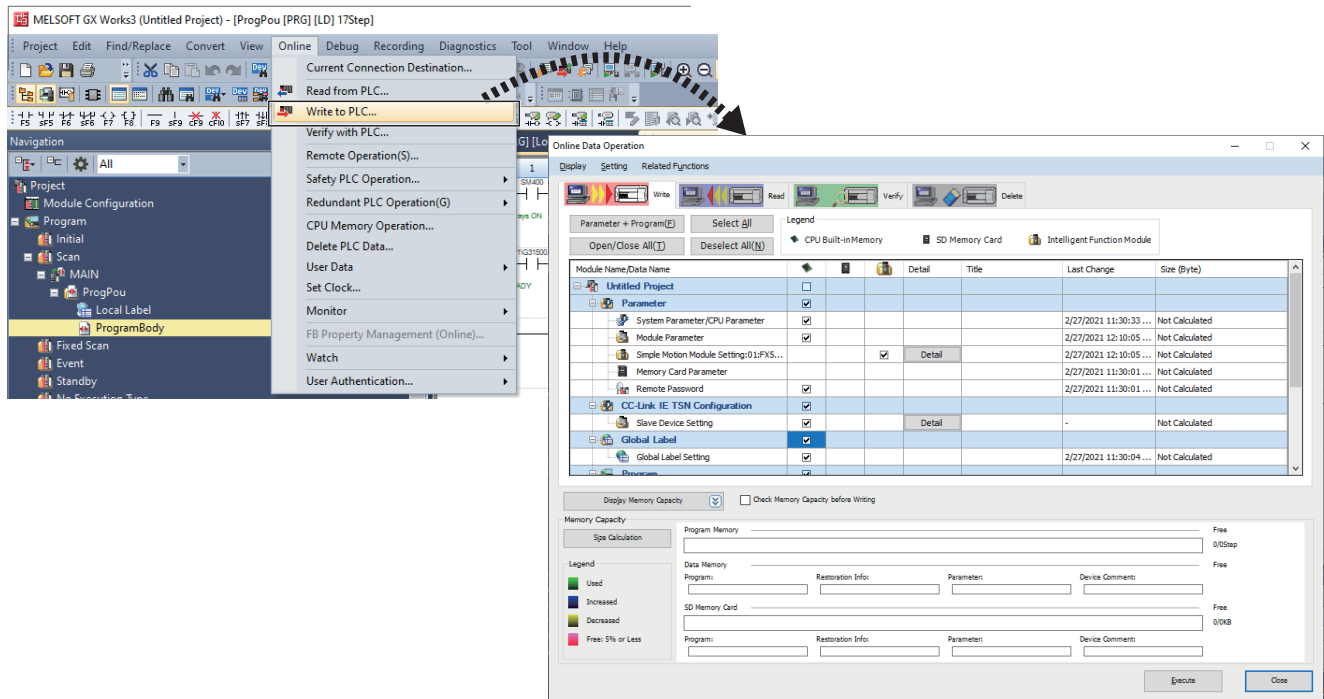
The Motion module performs control with the buffer memory instead of using the XY signal for the PLC READY, servo ON command, and start command. In addition, the I/O No. starts from 1. In the program below, PLC READY of Start I/O No. 1 Motion module is turned ON and the servo ON of the axis used can be executed.



## Writing/reading of data

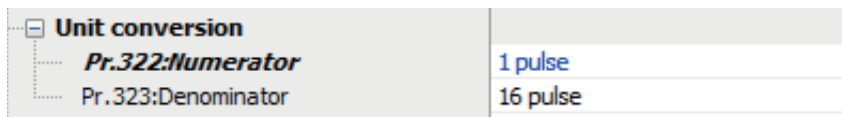
Data, including data set in the Simple Motion Module Setting, is written/read from GX Works3.

However, the initial writing/reading of Simple Motion Module Setting data should be performed after first writing module parameters set with the Motion module to the CPU module.



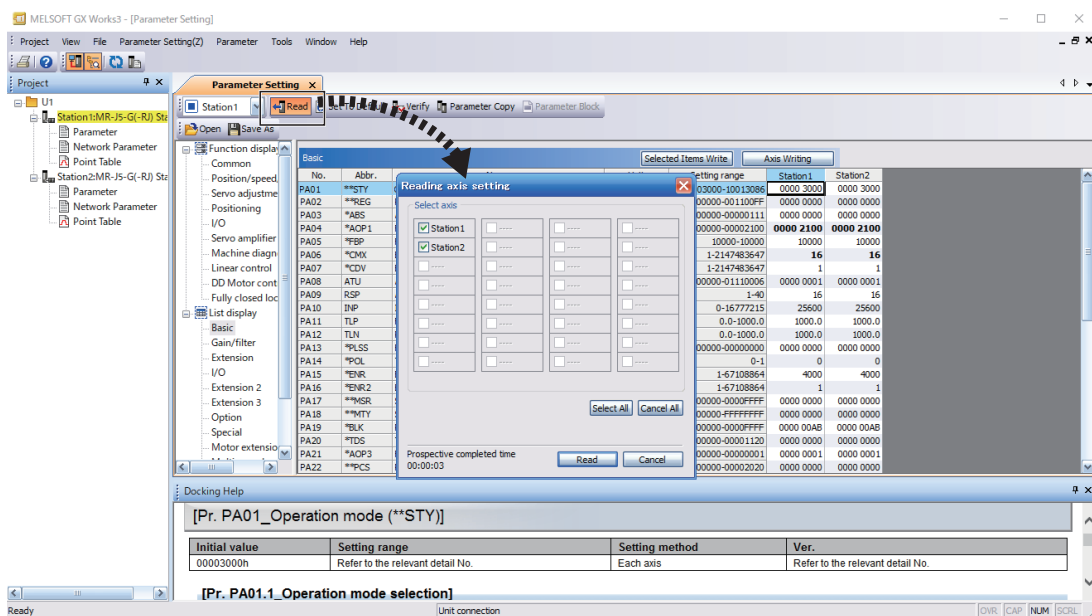
## Precautions

- When using an HK-KT motor as a serial ABS synchronous encoder while said motor is connected to the MR-J5-B-RJ, the resolution becomes 67108864 (pulse/rev). As such, it is necessary to adjust "[Pr.322] Synchronous encoder axis unit conversion: Numerator" and "[Pr.323] Synchronous encoder axis unit conversion: Denominator" when processing cannot be changed with the Q171ENC-W8.



- To perform mark detection for an axis performing dog method home position return, etc. with the input signal of the servo amplifier, it is necessary to either perform mark detection using the DOG signal of an axis not performing home position return, or use the home position return DOG signal via the buffer memory.
- When the error "Servo parameter invalid" (error code: 1DC8H) occurs, the error state is cleared when the Motion module is restarted or the servo amplifier is turned OFF and ON. To reflect changes made to parameters in a project, reopen the servo parameter setting screen and apply the servo parameters to the project by directly reading said parameters from the servo amplifier via "Read".

For the FX5CPU, "Automatic update of saved parameters" is not supported by parameter automatic saving setting of the slave stations. Note that the servo parameters are not changed even if slave device settings are read from the CPU module.



- Turning off the power supply of the servo amplifier while changing servo parameters to the recommended setting may cause the servo parameters to become corrupted. Turn off the power supply of the servo amplifier after confirming that the Motion module is on one of the following states.

- The error "Servo parameter invalid" (error code: 1DC8H) occurs
- "[Md.190] Controller current value restoration complete status" is "1: Complete INC restoration" or "2: Complete ABS restoration"

# MEMO

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A

# INDEX

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## A

---

|   |    |
|---|----|
| Absolute position system . . . . .                  | 44 |
| Acceleration/deceleration processing function . . . | 44 |
| Acceleration/deceleration time change function . .  | 44 |
| Amplifier-less operation function . . . . .         | 46 |
| Applicable wire size . . . . .                      | 21 |

## B

---

|  |    |
|--|----|
| Backlash compensation function . . . . . | 44 |
| Block start (Normal start) . . . . .     | 42 |

## C

---

|   |    |
|---|----|
| Combination of Main Functions and Sub Functions     | 47 |
| Command in-position function . . . . .              | 44 |
| Common (COM) . . . . .                              | 68 |
| Common functions . . . . .                          | 46 |
| Component List . . . . .                            | 71 |
| Condition start . . . . .                           | 42 |
| Connect/disconnect function of SSCNET communication | 46 |
| Connection with External Devices . . . . .          | 80 |
| Continuous operation interrupt function . . . . .   | 44 |
| Continuous path control . . . . .                   | 43 |
| Continuous positioning control . . . . .            | 43 |
| Current value changing . . . . .                    | 42 |

## D

---

|  |    |
|--|----|
| Deceleration start flag function . . . . . | 45 |
| Driver communication function . . . . .    | 46 |

## E

---

|   |           |
|---|-----------|
| Electronic gear function . . . . .              | 44        |
| Execution data backup function . . . . .        | 46        |
| Expansion control . . . . .                     | 41        |
| External Dimensions . . . . .                   | 86,88,105 |
| External input signal select function . . . . . | 46        |
| External input wiring connector . . . . .       | 21        |

## F

---

|   |    |
|---|----|
| Fast home position return control . . . . .     | 42 |
| Fixed-feed control . . . . .                    | 42 |
| Follow up function . . . . .                    | 45 |
| Forced stop function . . . . .                  | 44 |
| Forced stop input signal (EMI) . . . . .        | 68 |
| Forced stop input signal common (EMI.COM) . . . | 68 |

## H

---

|   |    |
|---|----|
| Hardware stroke limit function . . . . .      | 44 |
| High-level positioning control . . . . .      | 41 |
| History monitor function . . . . .            | 46 |
| Home position return control . . . . .        | 41 |
| Home position return retry function . . . . . | 44 |
| Home position shift function . . . . .        | 44 |
| Hot line forced stop function . . . . .       | 46 |

## I

---

|  |    |
|--|----|
| Inching operation . . . . .                            | 42 |
| Independent positioning control (positioning complete) | 43 |
| internal circuit . . . . .                             | 68 |

## J

---

|                            |    |
|----------------------------|----|
| JOG operation . . . . .    | 42 |
| JUMP instruction . . . . . | 42 |

## L

---

|                          |    |
|--------------------------|----|
| LEND . . . . .           | 42 |
| Linear control . . . . . | 42 |
| LOOP . . . . .           | 42 |

## M

---

|  |    |
|--|----|
| M code output function . . . . .               | 44 |
| Machine home position return control . . . . . | 42 |
| Major positioning control . . . . .            | 41 |
| Manual control . . . . .                       | 41 |
| Manual pulse generator operation . . . . .     | 42 |
| Manual pulse generator/Incremental synchronous |    |
| encoder A phase/PULSE . . . . .                | 67 |
| Manual pulse generator/Incremental synchronous |    |
| encoder B phase/SIGN . . . . .                 | 67 |
| Mark detection function . . . . .              | 46 |
| Mass . . . . .                                 | 21 |

## N

---

|   |    |
|---|----|
| Near pass function . . . . .            | 44 |
| NOP instruction . . . . .               | 42 |
| Number of controlled axes . . . . .     | 20 |
| Number of occupied I/O points . . . . . | 21 |

## O

---

|   |    |
|---|----|
| OPERATION EXAMPLES . . . . .                          | 92 |
| Operation setting for incompleteness of home position |    |
| return function . . . . .                             | 45 |
| Optional data monitor function . . . . .              | 46 |
| Override function . . . . .                           | 44 |

## P

---

|   |    |
|---|----|
| Parameter initialization function . . . . . | 46 |
| Performance Specifications . . . . .        | 20 |
| Position-speed switching control . . . . .  | 42 |
| Pre-reading start function . . . . .        | 44 |

## R

---

|  |    |
|--|----|
| Repeated start (FOR condition) . . . . . | 42 |
| Repeated start (FOR loop) . . . . .      | 42 |

## S

---

|                              |    |
|------------------------------|----|
| Signal ground (SG) . . . . . | 68 |
|------------------------------|----|

|   |    |
|---|----|
| Simultaneous start . . . . .  | 42 |
| Skip function . . . . .   | 44 |
| Software stroke limit function . . . . .  | 44 |
| Speed change function . . . . .   | 44 |
| Speed control 10 times multiplier setting for degree axis<br>function . . . . . | 45 |
| Speed limit function . . . . .  | 44 |
| Speed-position switching control . . . . .                                      | 42 |
| Speed-torque control . . . . .  | 43 |
| Step function . . . . .   | 44 |
| Stop command processing for deceleration stop function<br>44                    |    |
| Sub functions . . . . .   | 44 |
| Synchronous control . . . . .   | 43 |

## T

---

|   |    |
|---|----|
| Target position change function . . . . . | 44 |
| Teaching function . . . . .               | 44 |
| Torque change function . . . . .          | 44 |
| Torque limit function . . . . .           | 44 |

## V

---

|  |    |
|--|----|
| Virtual servo amplifier function . . . . . | 46 |
|--|----|

## W

---

|                      |    |
|----------------------|----|
| Wait start . . . . . | 42 |
|----------------------|----|



# REVISIONS

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

| Revision date | *Manual number      | Description  |
|---------------|---------------------|--|
| November 2014 | IB(NA)-0300251-A    | First edition  |
| January 2015  | IB(NA)-0300251-B    | <ul style="list-style-type: none"> <li>■Added or modified parts</li> </ul> SAFETY PRECAUTIONS, RELEVANT MANUALS, TERMS, Section 2.5, 3.1, 3.4, Chapter 4, Section 5.1, 5.2, Chapter 6, Appendix 2  |
| August 2015   | IB(NA)-0300251-C    | <ul style="list-style-type: none"> <li>■Added functions</li> </ul> Command generation axis <ul style="list-style-type: none"> <li>■Added or modified parts</li> </ul> Section 1.1, 2.3, 3.2, Chapter 6   |
| October 2016  | IB(NA)-0300251-D    | <ul style="list-style-type: none"> <li>■Added models</li> </ul> FX5-80SSC-S <ul style="list-style-type: none"> <li>■Added functions</li> </ul> Inverter FR-A800 series, Stepping motor driver AlphaStep/5-phase manufactured by ORIENTAL MOTOR Co., Ltd., Servo driver VCI series/VPH series manufactured by CKD Nikki Denso Co., Ltd., IAI electric actuator controller manufactured by IAI Corporation <ul style="list-style-type: none"> <li>■Added or modified parts</li> </ul> SAFETY PRECAUTIONS, INTRODUCTION, TERMS, PERIPHERALS, Chapter 1, Section 1.1, Chapter 2, Section 2.3, 2.4, 2.5, 3.1, Chapter 4, Section 5.1, 5.2, Chapter 6, Section 6.1, 6.2, Appendix 1, 2, 3, 4, WARRANTY |
| March 2021    | IB(NA)-0300251ENG-E | <ul style="list-style-type: none"> <li>■Added models</li> </ul> FX5-40SSC-G, FX5-80SSC-G <ul style="list-style-type: none"> <li>■Added or modified parts</li> </ul> WHEN USING A SWITCHING HUB WITH CC-LINK IE TSN, SAFETY PRECAUTIONS, INTRODUCTION, RELEVANT MANUALS, TERMS, PERIPHERALS, Chapter 1, Section 1.1, Chapter 2, Section 2.1, 2.2, 2.3, 2.4, 2.5, Chapter 3, Section 3.1, 3.2, 3.3, Chapter 4, Section 5.1, 5.2, 5.3, 5.4, 5.5, Appendix 1, 2, 3, 4, 5, 6, 7, 8, 9, WARRANTY, TRADEMARKS   |
| March 2021    | IB(NA)-0300251ENG-F | <ul style="list-style-type: none"> <li>■Added or modified parts</li> </ul> Section 2.5   |

Japanese manual number: IB-0300250-D

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# WARRANTY

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## 1. Gratis Warranty Term and Gratis Warranty Range

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### [Gratis Warranty Range]

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- (2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
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- (2) The Mitsubishi programmable controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for railway companies or public service purposes shall be excluded from the programmable controller applications.  
In addition, applications in which human life or property that could be greatly affected, such as in aircraft, medical applications, incineration and fuel devices, manned transportation, equipment for recreation and amusement, and safety devices, shall also be excluded from the programmable controller range of applications. However, in certain cases, some applications may be possible, providing the user consults their local Mitsubishi representative outlining the special requirements of the project, and providing that all parties concerned agree to the special circumstances, solely at the user's discretion.
- (3) Mitsubishi shall have no responsibility or liability for any problems involving programmable controller trouble and system trouble caused by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.

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Model: FX5SSC-U-S-E

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