



Programmable Controller

MELSEC iQ-R
series

MELSEC iQ-R Motion Module User's Manual (Startup)

-RD78G4
-RD78G8
-RD78G16
-RD78G32
-RD78G64
-RD78GHV
-RD78GHW

WHEN USING A SWITCHING HUB WITH CC-Link IE TSN

A dedicated TSN hub may be required depending on parameter settings or the network topology used to connect modules on CC-Link IE TSN.

Read the following carefully.

[MODE: PLCopen]

☞ Page 42 Structure of Authentication Class B Devices and Ethernet Devices

☞ Page 61 Switching Hub

[MODE: Simple Motion]

☞ Page 92 Structure of Authentication Class B Devices and Ethernet Devices

☞ Page 114 Switching Hub



SAFETY PRECAUTIONS

(Read these precautions before using this product.)

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

The precautions given in this manual are concerned with this product only. Refer to the MELSEC iQ-R Module Configuration Manual for a description of the PLC system safety precautions.

In this manual, the safety precautions are classified into two levels: "⚠ WARNING" and "⚠ CAUTION".

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

Under some circumstances, failure to observe the precautions given under "⚠ CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety.

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

[Design Precautions]

WARNING

- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
 - (1) Emergency stop circuits, protection circuits, and protective interlock circuits for conflicting operations (such as forward/reverse rotations or upper/lower limit positioning) must be configured external to the programmable controller.
 - (2) When the programmable controller detects an abnormal condition, it stops the operation and all outputs are:
 - Turned off if the overcurrent or overvoltage protection of the power supply module is activated.
 - Held or turned off according to the parameter setting if the self-diagnostic function of the CPU module detects an error such as a watchdog timer error.
 - (3) All outputs may be turned on if an error occurs in a part, such as an I/O control part, where the CPU module cannot detect any error. To ensure safety operation in such a case, provide a safety mechanism or a fail-safe circuit external to the programmable controller. For a fail-safe circuit example, refer to "General Safety Requirements" in the MELSEC iQ-R Module Configuration Manual.
 - (4) Outputs may remain on or off due to a failure of a component such as a relay and transistor in an output circuit. Configure an external circuit for monitoring output signals that could cause a serious accident.
 - In an output circuit, when a load current exceeding the rated current 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.
 - Configure a circuit so that the programmable controller is turned on first and then the external power supply. If the external power supply is turned on first, an accident may occur due to an incorrect output or malfunction.
 - When the programmable controller is turned off, configure a circuit so that the external power supply is turned off first and then the programmable controller. If the programmable controller is turned off first, an accident may occur due to an incorrect output or malfunction.
 - For the operating status of each station after a communication failure, refer to manuals for the network used. For the manuals, please consult your local Mitsubishi representative. Incorrect output or malfunction due to a communication failure may result in an accident.
-

[Design Precautions]

WARNING

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents. When a Safety CPU is used, data cannot be modified while the Safety CPU is in SAFETY MODE.
 - Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
 - Do not write any data to the "system area" and "write-protect area" of the buffer memory in the module. Also, do not use any "use prohibited" signals as an output signal from the CPU module to each module. Doing so may cause malfunction of the programmable controller system. For the "system area", "write-protect area", and the "use prohibited" signals, refer to the user's manual for the module used. For areas used for safety communications, they are protected from being written by users, and thus safety communications failure caused by data writing does not occur.
 - If a communication cable is disconnected, the network may be unstable, resulting in a communication failure of multiple stations. Configure an interlock circuit in the program to ensure that the entire system will always operate safely even if communications fail. Incorrect output or malfunction due to a communication failure may result in an accident. When safety communications are used, an interlock by the safety station interlock function protects the system from an incorrect output or malfunction.
 - Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
 - (1) Machine homing is controlled by two kinds of data: a homing direction and a homing speed. Deceleration starts when the proximity dog signal turns on. If an incorrect homing direction is set, motion control may continue without deceleration. To prevent machine damage caused by this, configure an interlock circuit external to the programmable controller.
 - (2) When the module detects an error, the motion slows down and stops or the motion rapidly stops, depending on the stop group setting in parameter. Set the parameter to meet the specifications of a positioning control system. In addition, set the homing parameter and positioning data within the specified setting range.
 - (3) Outputs may remain on or off, or become undefined due to a failure of a component such as an insulation element and transistor in an output circuit, where the module cannot detect any error. In a system that the incorrect output could cause a serious accident, configure an external circuit for monitoring output signals.
 - If safety standards (ex., robot safety rules, etc.) apply to the system using the module, drive unit and servomotor, make sure that the safety standards are satisfied.
 - Construct a safety circuit externally of the module or drive unit if the abnormal operation of the module or drive unit differs from the safety directive operation in the system.
-

[Design Precautions]

CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Doing so may result in malfunction due to electromagnetic interference. Keep a distance of 100 mm or more between those cables.
 - During control of an inductive load such as a lamp, heater, or solenoid valve, a large current (approximately ten times greater than normal) may flow when the output is turned from off to on. Therefore, use a module that has a sufficient current rating.
 - 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 the time.
 - Do not power off the programmable controller or reset the CPU module while the settings are being written. Doing so will make the data in the flash ROM and SD memory card undefined. The values need to be set in the buffer memory and written to the flash ROM and SD memory card again. Doing so also may cause malfunction or failure of the module.
 - When changing the operating status of the CPU module from external devices (such as the remote RUN/STOP functions), select "Do Not Open by Program" for "Opening Method" of "Module Parameter". If "Open by Program" is selected, an execution of the remote STOP function causes the communication line to close. Consequently, the CPU module cannot reopen the line, and external devices cannot execute the remote RUN function.
-

[Security Precautions]

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 external devices via the network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.
-

[Installation Precautions]

WARNING

- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may result in electric shock or cause the module to fail or malfunction.
-

[Installation Precautions]

CAUTION

- Use the programmable controller in an environment that meets the general specifications in the Safety Guidelines included with the base unit. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
 - To mount a module, place the concave part(s) located at the bottom onto the guide(s) of the base unit, and push in the module, and fix it with screw(s). Incorrect interconnection may cause malfunction, failure, or drop of the module.
 - To mount a module with no module fixing hook, place the concave part(s) located at the bottom onto the guide(s) of the base unit, push in the module, and fix it with screw(s). Incorrect interconnection may cause malfunction, failure, or drop of the module.
 - Tighten the screws within the specified torque range. Undertightening can cause drop of the component or wire, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction. For the specified torque range, refer to the MELSEC iQ-R Module Configuration Manual.
 - When using an extension cable, connect it to the extension cable connector of the base unit securely. Check the connection for looseness. Otherwise, poor contact may cause malfunction.
 - When using an SD memory card, fully insert it into the SD memory card slot. Check that it is inserted completely. Otherwise, poor contact may cause malfunction.
 - Securely insert an extended SRAM cassette or a battery-less option cassette into the cassette connector of the CPU module. After insertion, close the cassette cover and check that the cassette is inserted completely. Otherwise, poor contact may cause malfunction.
 - Beware that the module could be very hot while power is on and immediately after power-off.
 - Do not directly touch any conductive parts and electronic components of the module, SD memory card, extended SRAM cassette, battery-less option cassette, or connector. Doing so can cause malfunction or failure of the module.
-

[Wiring Precautions]

WARNING

- Shut off the external power supply (all phases) used in the system before installation and wiring. Failure to do so may result in electric shock or cause the module to fail or malfunction.
 - After installation and wiring, attach a blank cover module (RG60) to each empty slot and an included extension connector protective cover to the unused extension cable connector before powering on the system for operation. Failure to do so may result in electric shock.
-

[Wiring Precautions]

CAUTION

- Individually ground the FG and LG terminals of the programmable controller with a ground resistance of 100 ohms or less. Failure to do so may result in electric shock or malfunction.
 - Use applicable solderless terminals and tighten them within the specified torque range. If any spade solderless terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.
 - Check the rated voltage and signal layout before wiring to the module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause fire or failure.
 - Connectors for external devices must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. Incomplete connections may cause short circuit, fire, or malfunction.
 - Securely connect the connector to the module. Poor contact may cause malfunction.
 - Do not install the control lines or communication cables together with the main circuit lines or power cables. Doing so may result in malfunction due to noise. Keep a distance of 100 mm or more between those cables.
 - Place the cables in a duct or clamp them. If not, dangling cables may swing or inadvertently be pulled, resulting in malfunction or damage to modules or cables.
In addition, the weight of the cables may put stress on modules in an environment of strong vibrations and shocks.
Do not clamp the extension cables with the jacket stripped. Doing so may change the characteristics of the cables, resulting in malfunction.
 - Check the interface type and correctly connect the cable. Incorrect wiring (connecting the cable to an incorrect interface) may cause failure of the module and external device.
 - Tighten the terminal screws or connector screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, fire, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, fire, or malfunction.
 - When disconnecting the cable from the module, do not pull the cable by the cable part. For the cable with connector, hold the connector part of the cable. For the cable connected to the terminal block, loosen the terminal screw. Pulling the cable connected to the module may result in malfunction or damage to the module or cable.
 - Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
 - A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not remove the film during wiring. Remove it for heat dissipation before system operation.
 - Programmable controllers must be installed in control panels. Connect the main power supply to the power supply module in the control panel through a relay terminal block. Wiring and replacement of a power supply module must be performed by qualified maintenance personnel with knowledge of protection against electric shock. For wiring, refer to the MELSEC iQ-R Module Configuration Manual.
 - For Ethernet cables to be used in the system, select the ones that meet the specifications in this manual. If not, normal data transmission is not guaranteed.
-

[Startup and Maintenance Precautions]

WARNING

- Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
 - Correctly connect the battery connector. Do not charge, disassemble, heat, short-circuit, solder, or throw the battery into the fire. Also, do not expose it to liquid or strong shock. Doing so will cause the battery to produce heat, explode, ignite, or leak, resulting in injury and fire.
 - Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal screws, connector screws, or module fixing screws. Failure to do so may result in electric shock.
-

[Startup and Maintenance Precautions]

CAUTION

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
 - Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
 - Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
 - Use any radio communication device such as a cellular phone or PHS (Personal Handy-phone System) more than 25 cm away in all directions from the programmable controller. Failure to do so may cause malfunction.
 - Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may cause the module to fail or malfunction.
-

[Startup and Maintenance Precautions]

CAUTION

- Tighten the screws within the specified torque range. Undertightening can cause drop of the component or wire, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
 - After the first use of the product, do not perform each of the following operations more than 50 times (IEC 61131-2/JIS B 3502 compliant).
Exceeding the limit may cause malfunction.
 - Mounting/removing the module to/from the base unit
 - Inserting/removing the extended SRAM cassette or battery-less option cassette to/from the CPU module
 - Mounting/removing the terminal block to/from the module
 - Connecting/disconnecting the extension cable to/from the base unit
 - After the first use of the product, do not insert/remove the SD memory card to/from the CPU module more than 500 times. Exceeding the limit may cause malfunction.
 - Do not touch the metal terminals on the back side of the SD memory card. Doing so may cause malfunction or failure of the module.
 - Do not touch the integrated circuits on the circuit board of an extended SRAM cassette or a battery-less option cassette. Doing so may cause malfunction or failure of the module.
 - Do not drop or apply shock to the battery to be installed in the module. Doing so may damage the battery, causing the battery fluid to leak inside the battery. If the battery is dropped or any shock is applied to it, dispose of it without using.
 - Startup and maintenance of a control panel must be performed by qualified maintenance personnel with knowledge of protection against electric shock. Lock the control panel so that only qualified maintenance personnel can operate it.
 - Before handling the module, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Wearing a grounded antistatic wrist strap is recommended. Failure to do so may cause the module to fail or malfunction.
 - Use a clean and dry cloth to wipe off dirt on the module.
 - Before testing the operation, set a low speed value for the speed limit parameter so that the operation can be stopped immediately upon occurrence of a hazardous condition.
 - Confirm and adjust the program and each parameter before operation. Unpredictable movements may occur depending on the machine.
 - When using the absolute position system function, on starting up, and when the module or absolute position motor has been replaced, always perform a homing.
 - Before starting the operation, confirm the brake function.
 - Do not perform a megger test (insulation resistance measurement) during inspection.
 - After maintenance and inspections are completed, confirm that the position detection of the absolute position detection function is correct.
 - Lock the control panel and prevent access to those who are not certified to handle or install electric equipment.
-

[Operating Precautions]

CAUTION

- When changing data and operating status, and modifying program of the running programmable controller from an external device such as a personal computer connected to an intelligent function module, read relevant manuals carefully and ensure the safety before operation. Incorrect change or modification may cause system malfunction, damage to the machines, or accidents.
 - Do not power off the programmable controller or reset the CPU module while the setting values in the buffer memory are being written to the flash ROM in the module. Doing so will make the data in the flash ROM and SD memory card undefined. The values need to be set in the buffer memory and written to the flash ROM and SD memory card again. Doing so can cause malfunction or failure of the module.
 - Note that when the reference axis speed is specified for interpolation operation, the speed of the partner axis (2nd, 3rd, or 4th axis) may exceed the speed limit value.
 - Do not go near the machine during test operations or during operations such as teaching. Doing so may lead to injuries.
-

[Computer Connection Precautions]

CAUTION

- When connecting a personal computer to a module having a USB interface, observe the following precautions as well as the instructions described in the manual for the personal computer used. Failure to do so may cause the module to fail.
 - (1) When the personal computer is AC-powered
 - When the personal computer has a 3-pin AC plug or an AC plug with a grounding wire, connect the plug to a grounding receptacle or ground the grounding wire. Ground the personal computer and the module with a ground resistance of 100 ohms or less.
 - When the personal computer has a 2-pin AC plug without a grounding wire, connect the computer to the module by following the procedure below. For power supplied to the personal computer and the module, using the same power source is recommended.
 1. Unplug the personal computer from the AC receptacle.
 2. Check that the personal computer is unplugged. Then, connect the personal computer to the module with a USB cable.
 3. Plug the personal computer into the AC receptacle.
 - (2) When the personal computer is battery-powered
 - The personal computer can be connected to the module without taking specific measures. For details, refer to the following.

Cautions When Using Mitsubishi Programmable Controllers or GOTs Connected to a Personal Computer With the RS-232/USB Interface (FA-A-0298)

When the USB cable used is the GT09-C30USB-5P manufactured by Mitsubishi Electric, specific measures are not required to connect the AC-powered personal computer to the module. However, note that the signal ground (SG) is common for the module and its USB interface. Therefore, if an SG potential difference occurs between the module and the connected devices, it causes failures of the module and the connected devices.
-

[Disposal Precautions]

CAUTION

- When disposing of this product, treat it as industrial waste.
 - When disposing of batteries, separate them from other wastes according to the local regulations. For details on battery regulations in EU member states, refer to the MELSEC iQ-R Module Configuration Manual.
-

[Transportation Precautions]

CAUTION

- When transporting lithium batteries, follow the transportation regulations. For details on the regulated models, refer to the MELSEC iQ-R Module Configuration Manual.
 - The halogens (such as fluorine, chlorine, bromine, and iodine), which are contained in a fumigant used for disinfection and pest control of wood packaging materials, may cause failure of the product. Prevent the entry of fumigant residues into the product or consider other methods (such as heat treatment) instead of fumigation. The disinfection and pest control measures must be applied to unprocessed raw wood.
-

INTRODUCTION

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

This manual describes the specifications, procedures before operation and wiring 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-R 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

RD78G4, RD78G8, RD78G16, RD78G32, RD78G64, RD78GHV, RD78GHW

Point

Symbols used in this manual are shown below.

- [RD78GH]: Symbols indicating that it corresponds to only RD78GH
- [MODE: PLCopen]: Symbols indicating that it corresponds to only the PLCopen motion control FB mode
- [MODE: Simple Motion]: Symbols indicating that it corresponds to only the Simple Motion mode
- Underlined variables (AxisName, etc.): Variables defined by users

COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES

Method of ensuring compliance

To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.

📖 MELSEC iQ-R Module Configuration Manual

📖 Safety Guidelines (This manual is included with the base unit.)

The CE mark on the rating display area of the programmable controller indicates compliance with EMC and Low Voltage Directives.

Additional measures

To ensure that this product maintains EMC and Low Voltage Directives, please refer to one of the following manuals.

📖 MELSEC iQ-R Module Configuration Manual

📖 Safety Guidelines (This manual is included with the base unit.)

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RELEVANT MANUALS

Manual name [manual number]	Description	Supported mode*1	Available form
MELSEC iQ-R Motion Module User's Manual (Startup) [IB-0300406ENG] (This manual)	Specifications, procedures before operation, system configuration, and wiring of the Motion module	[MODE: PLCopen] [MODE: Simple Motion]	Print book e-Manual PDF
MELSEC iQ-R Motion Module User's Manual (Application) [IB-0300411ENG]	Functions, I/O signals, variables, labels, programming, and troubleshooting of the Motion module	[MODE: PLCopen]	Print book e-Manual PDF
MELSEC iQ-R Motion Module User's Manual (Network) [IB-0300426ENG]	Functions, parameter settings, troubleshooting, and buffer memory of CC-Link IE TSN	[MODE: PLCopen] [MODE: Simple Motion]	Print book e-Manual PDF
MELSEC iQ-R Motion Module User's Manual (Application for Simple Motion Mode) [IB-0300572ENG]	Functions, I/O signals, buffer memory, parameter settings, programming, and troubleshooting of the Simple Motion mode	[MODE: Simple Motion]	Print book e-Manual PDF
MELSEC iQ-R Motion Module User's Manual (Advanced Synchronous Control for Simple Motion Mode) [IB-0300575ENG]	Functions and programming for the synchronous control of the Simple Motion mode	[MODE: Simple Motion]	Print book e-Manual PDF
MELSEC iQ-R Programming Manual (Motion Module Instructions, Standard Functions/Function Blocks) [IB-0300431ENG]	Instructions for the Motion module and standard functions/function blocks	[MODE: PLCopen]	Print book e-Manual PDF
MELSEC iQ-R Programming Manual (Motion Control Function Blocks) [IB-0300533ENG]	Motion control function blocks, variables, and programming	[MODE: PLCopen]	Print book e-Manual PDF
Motion Module Quick Start Guide [L03191ENG]	Describes system startup, parameter settings, and programming methods for first-time users of the Motion module	[MODE: PLCopen]	e-Manual PDF
MELSEC iQ-R Motion Module (Simple Motion Mode) Function Block Reference [BCN-B62005-1040]	Specifications, functions, and I/O labels of the function blocks of the Motion module (Simple Motion mode)	[MODE: Simple Motion]	e-Manual PDF

*1 For details, refer to the following.

 Page 19 SUPPORTED MODE

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-R Module Configuration Manual

For programs, refer to the following.

 MELSEC iQ-R Programming Manual (Program Design)

Point

e-Manual refers to the Mitsubishi Electric 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
Actual position	An address that is rounded a position address returned by a slave device. It is affected by a current position change.
Authentication Class	A class classified by CC-Link Partner Association according to functions and performance of CC-Link IE TSN-compatible devices and switching hubs. For details on the authentication Class, refer to the CC-Link IE TSN Installation Manual issued by CC-Link Partner Association (BAP-C3007ENG-001).
Axis	A target to carry out the motion control
Buffer memory	Memory in an intelligent function module to store data such as setting values and monitor values.
Buffer mode	A generic term for multiple start
Continuous update	Continuously reflecting input values to the control while the ContinuousUpdate input of the motion control FB is TRUE
Cumulative current position	A command position address that is not rounded by a ring counter. It is affected by a current position change.
Cyclic transmission	A function by which data is periodically exchanged among stations on the network
Dedicated instruction	An instruction for using functions of the module
Device	A memory of a CPU module to store data. Devices such as X, Y, M, D, and others are provided depending on the intended use.
Disconnection	A process of stopping data link if a data link error occurs
Execute	Set TRUE to the Execute input or the Enable input to the motion control FB
Feed machine position	A command position address that is not rounded by the ring counter. It is based on the home position, and it is not affected by a current position change.
General-purpose hub	An authentication Class A switching hub authorized by CC-Link Partner Association ☞ Page 61 Switching Hub ☞ Page 114 Switching Hub
GX Works3	The product name of the software package for the MELSEC programmable controllers
Hardware reboot	Turning ON the power of the system again or resetting
Input variable	An FB input argument
Intelligent function module	A module that has functions other than input and output, such as an A/D converter module and D/A converter module
Jerk	Chronological change ratio of acceleration or deceleration
Label	Variables used in a program
Link device	A device (RX, RY, RWr, or RWw) in a module on CC-Link IE TSN
Link refresh	Processing of data transfer between link devices of the Motion module and CPU module devices. Link refresh is performed in "END processing" of the sequence scan of the CPU module.
Master station	A station that controls the entire network. This station can perform cyclic transmission and transient transmission with all stations. Only one master station can be used in a network.
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 area	A software that performs the motion control in the Motion module
Motion control FB	An FB that is related to the motion control. Its name starts with MC_ or MCv_.
Motion FB	A motion control FB that takes an axis or an axes group for the argument and changes the axis status or the axes status by execution
Motion control station	A slave station that exchanges cyclic data by using slave labels through motion control
Motion module	Another term for the RD78G(H)
MR-J5-G	MR-J5-_G_(-RJ) servo amplifier
MR-J5D-G	MR-J5D_-_G_ servo amplifier
MR-J5W-G	MR-J5W_-_G_ servo amplifier
Multiple start	Executing another motion control FB to the same axis while a motion control FB is executed
Network area	A software that performs the network control in the Motion module
Object	Various data of a slave device compatible with CANopen
RAS	The abbreviation for Reliability, Availability, and Serviceability. This term refers to usability of automated equipment.
RD78G	Another term for the MELSEC iQ-R series Motion module (compatible with CC-Link IE TSN)
RD78GH	
Real axis	An axis that is linked with a slave device on network
Real drive axis	An axis that is linked with a slave device which supports CC-Link IE TSN compatible with csp/csv/cst mode (sequential command) of the CiA402 drive profile

Term	Description
Real encoder axis	An axis that generates a commanded position from the current position of the encoder connected with a slave device. It is used for the master axis of the single axis synchronous control.
Relay station	A station that relays data link to other station with mounting more than one network modules on one programmable controller.
Remote station	A station that exchanges I/O signals (bit data) and I/O data (word data) with another station by cyclic transmission. A transient transmission is available.
Reserved station	A station which is actually not connected to the network. It is included in the total station number in the network for future connection.
Retrigger	Starting up the Execute input again while executing an FB to a motion control FB that has the Execute input
Return	A process of restarting data link when a station recovers from an error
Safety communications	A function to exchange safety data between safety stations on the same network
Safety connection	A connection established for safety communication
Safety data	Data exchanged through safety communication
Set position	A command position address rounded by the ring counter. It is affected by a current position change.
SLMP	A SeamLess Message Protocol. This protocol is used to access an SLMP-compatible device or a programmable controller connected to an SLMP-compatible device from an external device.
Software reboot	Resetting only motion area and network area without a hard reboot
Standard communications	Communications other than safety communications, such as cyclic transmission and transient transmission of CC-Link IE TSN
Standard station	A slave station other than the Motion control station
Start	Executing a motion FB for the first time to an axis or an axes group
SW	A link special register. Word data that indicates the operating status and data link status of a module on CC-Link IE.
Target position	A command position address that is specified in the motion FB
Transient transmission	A function of data communication unperiodically among nodes (station) on network. A function used to send message to the target station when requested by a link dedicated instruction or the engineering tool Communication is available with station on another network via relay station, or gateway.
TSN hub	An authentication Class B switching hub authorized by CC-Link Partner Association ☞ Page 61 Switching Hub ☞ Page 114 Switching Hub
Virtual axis	An axis that is not linked with a slave device on network
Virtual drive axis	A virtual axis that can generate a command virtually
Virtual encoder axis	An axis that generates a set position from a variable. It is used for the master axis of the single axis synchronous control.
Virtual linked axis	An axis that connects FBs and transmits a command in the single axis synchronous control

GENERIC TERMS AND ABBREVIATIONS

Unless otherwise specified, this manual uses the following generic terms and abbreviations.

Generic term/abbreviation	Description
CC-Link IE	The generic term for the followings: <ul style="list-style-type: none"> • CC-Link IE TSN • CC-Link IE Controller Network (MELSEC iQ-R CC-Link IE Controller Network User's Manual (Application)) • CC-Link IE Field Network (MELSEC iQ-R CC-Link IE Field Network User's Manual (Application))
CPU module	An abbreviation for the MELSEC iQ-R series CPU module
cst	The abbreviation for cyclic synchronous torque mode (One of the control modes for the driver side)
csv	The abbreviation for cyclic synchronous velocity mode (One of the control modes for the driver side)
Data link	A generic term for a cyclic transmission and a transient transmission
Drive unit	A generic term for motor drive devices such as a servo amplifier
Engineering tool	A generic term for GX Works3 and MR Configurator2
Ethernet device	A generic term for the devices supporting IP communication (such as a personal computer, a vision sensor, and a bar code reader)
GOT	A generic term for Mitsubishi Electric Graphic Operation Terminal GOT1000 and GOT2000 series
Motion system	A generic term for software that performs the motion control and the network control
MR-J5(W)-G	A generic term for MR-J5-_G_(-RJ)/MR-J5W_-_G/MR-J5D_-_G_ servo amplifiers
Network module	A generic term for the following modules: <ul style="list-style-type: none"> • Ethernet interface module • Module on CC-Link IE TSN (the Motion module and a module on a remote station) • CC-Link IE Controller Network module • Module on CC-Link IE Field Network (a master/local module, and a module on a remote I/O station, a remote device station, and an intelligent device station) • MELSECNET/H network module • MELSECNET/10 network module • RnENCPU (network part)
PDO	An abbreviation for Process Data Object. It is a group of application objects that are periodically transferred among multiple CANopen nodes.
RAS	An abbreviation for Reliability, Availability, and Serviceability. This term refers to the overall usability of automated equipment.
RD78G(H)	A generic term for RD78G_, RD78GH_ (high performance version)
RWr	An abbreviation for a remote register of the link device. This refers to word data input from a slave station to the master station. (For some areas in a local station, data is input in the opposite direction.)
RWw	An abbreviation for a remote register of the link device. This refers to word data output from the master station to a slave station. (For some areas in a local station, data is output in the opposite direction.)
RX	An abbreviation for remote input of the link device. This refers to bit data input from a slave station to the master station. (For some areas in a local station, data is input in the opposite direction.)
RY	An abbreviation for remote output of the link device. This refers to bit data output from the master station to a slave station. (For some areas in a local station, data is output in the opposite direction.)
Safety CPU	A generic term for the R08SFCPU, R16SFCPU, R32SFCPU, R120SFCPU
Safety station	A generic term for a station that performs safety communications and standard communications
SB	An abbreviation for a link special relay. Bit data that indicates the operating status and data link status of a module on CC-Link IE.
Slave station	A generic term for a local station and remote station on CC-Link IE TSN
Software	A generic term for firmwares that configure the motion system. It consists of add-ons, base system software, and boot software.

SUPPORTED MODE

The Motion module has the PLCopen motion control FB mode and Simple Motion mode. Users can freely switch the mode. When performing the positioning control with the PLCopen Motion Control FB, use the PLCopen motion control FB mode. When performing the positioning control using the buffer memory similarly to the SSCNET III/H compatible Simple Motion module (QD77MS, RD77MS), use the Simple Motion mode.

Supported mode	Applicable model	Reference
PLCopen motion control FB mode	RD78G4, RD78G8, RD78G16, RD78G32, RD78G64, RD78GHV, RD78GHW	PLCopen MOTION CONTROL FB MODE
Simple Motion mode	RD78G4, RD78G8, RD78G16	Simple Motion MODE

Mode selection

The PLCopen motion control FB mode or Simple Motion mode can be set by selecting the model in GX Works3. The mode is set to the PLCopen motion control FB mode by default. For how to switch it to the Simple Motion mode, refer to the following.

☞ Page 87 PROCEDURES BEFORE OPERATIONS

When an applicable model is not mounted on the slot position set in GX Works3, or a non-applicable model is mounted on the set slot position, "module configuration error" occurs in the CPU module.

Precautions

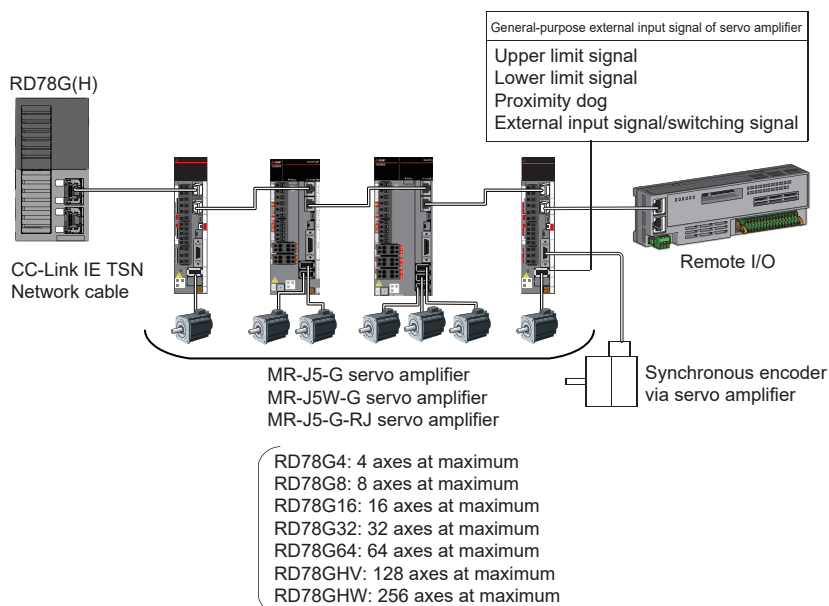
[MODE: Simple Motion]

The following shows the precautions on setting the Simple Motion mode.

- The add-on for Simple Motion control is required for using the Simple Motion mode. SimpleMotion, which is the add-on for Simple Motion mode, is included in the motion system software "Ver. 16 or later".
- The motion control FB of the Motion module cannot be used. Use "MELSEC iQ-R Motion Module (Simple Motion mode) FB" in the Simple Motion mode.
- The setting item of the default mapping differs between the servo amplifiers "MR-J5(W)-G" and "MR-JET-G".

COMPONENT

The following figure shows the components when the RD78G(H) is used.



FUTURE SUPPORT PLANNED

The following functions are mentioned in this manual, but it is planned for a future support.
The information in this page might be changed for improvement without prior notice.

[MODE: PLCopen]

Item	Description
Operation cycle	Auto refresh link devices of motion synchronization stations
Current position change function	MCv_SetPositionTriggered (Trigger current position change) Set position change at control execution during axis operation
Operation profile data	MCv_ProfileSelect (Selects profile data) MCv_ProfileCalc (Calculates profile data) MCv_ChangeCycleTriggered (Changes the current value per cycle) Multidimensional profile Control of operation profile data
Motion system software installation	Motion software package for the RD78G(H) (including files) <ul style="list-style-type: none">• Basic system software simulator DLL• Data definition file (axis data, etc.)• Add-on simulator DLL• The engineering tool window definition file for add-on• Boot software binary for network• Boot software simulator DLL for network

PART 1

PLCopen MOTION CONTROL FB MODE

1 PART NAMES

2 SPECIFICATIONS

3 FUNCTION LIST

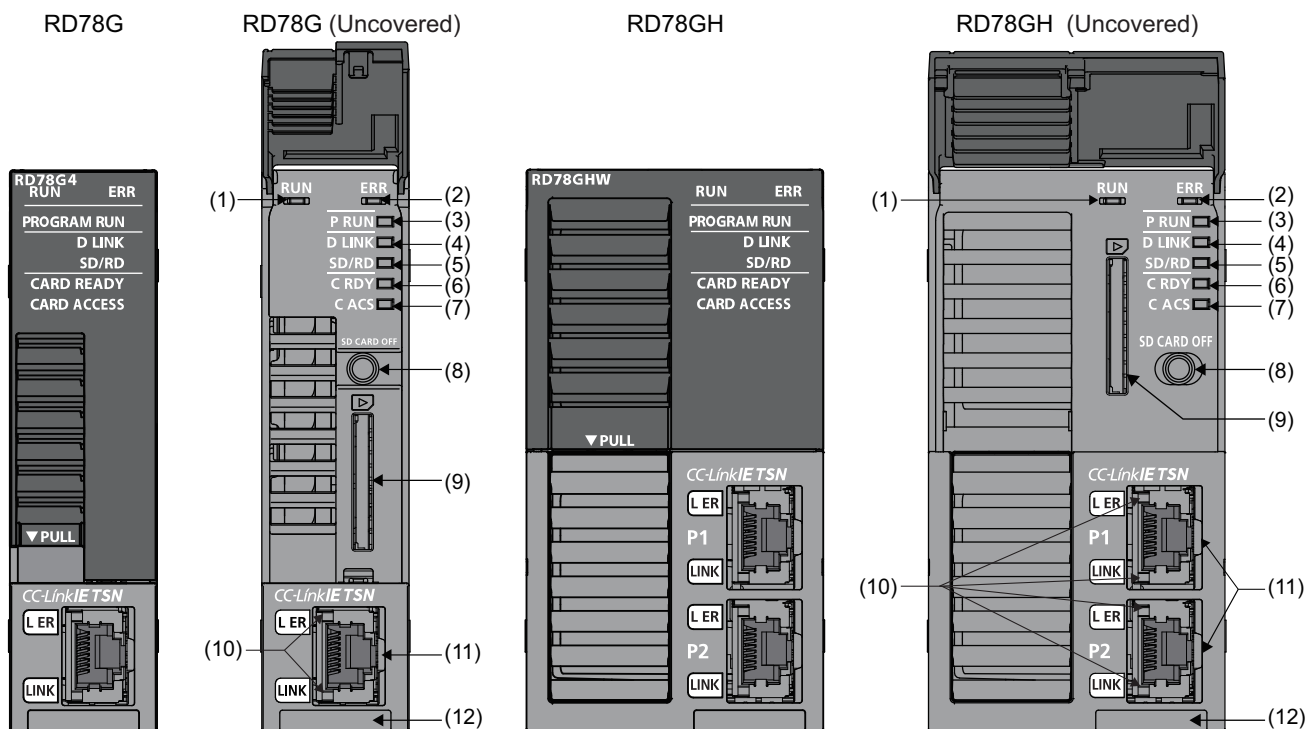
4 PROCEDURES BEFORE OPERATIONS


5 SYSTEM CONFIGURATION

6 INSTALLATION AND WIRING


1 PART NAMES

This chapter describes the part names of the Motion module.



No.	Name	Description
(1)	RUN LED	For details, refer to the following.  Page 23 LED Display Specifications
(2)	ERR LED	
(3)	PROGRAM RUN LED (P RUN is shown inside the cover)	
(4)	D LINK LED	
(5)	SD/RD LED	
(6)	CARD READY LED (C RDY is shown inside the cover)	
(7)	CARD ACCESS LED (C ACS is shown inside the cover)	
(8)	SD memory card access control switch	
(9)	SD memory card slot	
(10)	LEDs for CC-Link IE TSN connector*1	P1 L ER LED
		LINK LED
		P2 L ER LED
		LINK LED
(11)	Ethernet port	Connects to a slave station.
(12)	Serial No. marking	Shows the serial No. printed on the Motion module.

*1 For the details of a two slots product, refer to the following.

 MELSEC iQ-R Module Configuration Manual

1.1 LED Display Specifications

This section lists the LED display specifications of the Motion module.

Description differs during software installation. For details, refer to "MODULE SOFTWARE INSTALLATION" in the following manual.

📖 MELSEC iQ-R Motion Module User's Manual (Application)

□: OFF, ■: ON, ●: Flashing

Name	Description	LED display		Status
RUN LED	Indicates the operating status.	RUN LED■		Operating normally
		RUN LED●		500 ms interval: Clear / Quick clearing
		RUN LED□		Error, Initializing
ERR LED	Indicates the error status.	ERR LED□		Operating normally
		ERR LED■		Error
		ERR LED●		200 ms interval: Error 500 ms interval: A data link faulty station detected
PROGRAM RUN LED	Indicates the execution status of built-in programs.	PROGRAM RUN LED■		Executing program
		PROGRAM RUN LED□		Stopping program
D LINK LED	Indicates the data link status.	D LINK LED■		Data link (cyclic transmission being performed)
		D LINK LED●		Data link (cyclic transmission stopped)
		D LINK LED□		Data link not performed (disconnection)
SD/RD LED	Indicates the data communicating status.	SD/RD LED■		Communicating data ^{*1}
		SD/RD LED□		Not communicating data ^{*1}
CARD READY LED	Indicates the status of SD memory card.	CARD READY LED■		An SD memory card is usable.
		CARD READY LED●		Preparing
		CARD READY LED□		No SD memory card inserted
CARD ACCESS LED	Indicates the access status of SD memory card.	CARD ACCESS LED■		Accessing SD memory card
		CARD ACCESS LED□		Not accessing SD memory card
L ER LED	Indicates the port status.	P1	L ER LED■	Abnormal data received
			L ER LED□	Normal data received
		P2	L ER LED■	Abnormal data received
			L ER LED□	Normal data received
LINK LED	Indicates the link status.	P1	LINK LED■	Link-up
			LINK LED□	Link-down
		P2	LINK LED■	Link-up
			LINK LED□	Link-down

^{*1} Includes cyclic transmission and transient transmission data for CC-Link IE TSN.

Error status can be determined by status of the RUN LED and the ERR LED.

RUN LED	ERR LED	Error status	Description
Off	On, flashing	Major error	An error such as hardware failure or memory failure. The module stops operating.
On	Flashing	Moderate error	An error, such as parameter error, which affect module operation. The module stops operating.
On	On	Minor error	An error such as communication, positioning control, and program error. The module continues operating.

When multiple errors occur, the error status is displayed in the order of major, moderate, and minor.

2 SPECIFICATIONS

2.1 Performance Specifications

This section lists the performance specifications of the RD78G(H).

Item		RD78G4	RD78G8	RD78G16	RD78G32	RD78G64	RD78GHV	RD78GHW
Number of controlled axes	Real drive axis*1	4 axes	8 axes	16 axes	32 axes	64 axes	128 axes	256 axes
	Virtual drive axis	Total 1024 axes. The number of settable axes depends on the setting of the system memory capacity.*2						
	Virtual linked axis							
	Real encoder axis							
	Virtual encoder axis							
Operation cycle*3		62.5 μs to 8 ms*4					31.25 μs to 8 ms	
Interpolation function		1- to 4-axis linear interpolation 2-axis circular interpolation						
Control method		PTP (Point To Point) control, path control (linear, and arc can be set), speed control, speed-torque control						
Control unit		pulse, m, degree, Revolution, inch, arbitrary unit character string						
Positioning	Positioning range	-10000000000.0 ≤ Positioning range < 10000000000.0						
	Speed command	In position control: 0, +0.0001 to +2500000000.0 In speed control: 0, ±0.0001 to ±2500000000.0						
	Acceleration/ deceleration process	Acceleration/deceleration specification method (acceleration, deceleration, jerk), acceleration/deceleration time constant method						
	Acceleration/ deceleration time	Acceleration/deceleration specification method [Unit] U/s ² [Range] 0.0000, 0.0001 to 2147483647.0						
	Rapid stop deceleration time	Acceleration/deceleration time constant method [Unit] s [Range] 0.000000, 0.000001 to 8400.0						
Flash ROM write count		Up to 100,000 times						
Number of occupied I/O points		32 points/slot (I/O assignment: 32 points)					48 points, 2 slots (I/O assignment: Empty 16 points + 32 points)	
Internal current consumption (5 V DC)		1.93 A					2.33 A	
External dimensions	Height	106 mm (4.17 inch)						
	Width	27.8 mm (1.09 inch) (1 slot width)					56 mm (2.2 inch) (2 slots width)	
	Depth	110 mm (4.33 inch)						
Mass		0.26 kg					0.44 kg	

*1 When a multi-axis drive unit and a general output device are used as multiple axes, the number of those axes are counted.

Ex: The 2-axis drive unit is counted as 2 axes.

*2 For memory capacity, refer to "Memory usage" in the following manual.

📖 MELSEC iQ-R Motion Module User's Manual (Application)

*3 It depends on the number of controlled axes.

*4 For the version of Add-on baseSystem, "Ver. 1.4 or earlier", operation cycle is "125 μs to 4 ms".

2.2 Specifications of Interfaces with External Devices


This section lists the external interfaces.

○: Support possible

Interface name	RD78G	RD78GH	Application
CC-Link IE TSN	1 port	2 ports	Network connection
SD memory card	○	○	Restoration of parameters and logs

CC-Link IE TSN

The specifications of the CC-Link IE TSN is shown below.

Item		RD77GF4	RD77GF8	RD77GF16	RD77GF32	RD78G64	RD78GHV	RD78GHW
Maximum number of link points per network		RX/RY (Slave label)	16K points each (16384 points, 2K bytes)					
		RWr/RWw (including PDO) (Slave label)	8K points each (8192 points, 16K bytes)					
Maximum number of link points per station	Master station	RX/RY (Slave label)	16K points each (16384 points, 2K bytes)					
		RWr/RWw (Slave label)	8K points each (8192 points, 16K bytes)					
Communication speed			• 1 Gbps • 100 Mbps ^{*9}					
Minimum synchronization cycle			62.5 μs ^{*7}				31.25 μs	
Time synchronization accuracy			±1 μs					
Authentication Class			Authentication Class B device					
Maximum number of connectable stations per network ^{*2}			120 stations ^{*3*4*5}					
Maximum number of connectable devices per network			256 devices ^{*6}					
Communication cable			Ethernet cable which satisfies standard( Page 61 Wiring products)					
Number of cascade connections			*11					
Maximum number of networks			239					
Network topology ^{*8}			Line topology, star topology ^{*1} , line + star topology					
Communication method			Time sharing method					
Transient transmission capacity			1920 bytes maximum					
Safety communications ^{*10}	Maximum number of safety connections per station	Master station: 120 connections						
	Maximum number of safety connections per the same communication destination station	1 connection						
	Maximum number of link points per safety connection	• Input: 8 words • Output: 8 words						

*1 TSN hub is required for star topology.

*2 An error will not occur even if there is no station and axis in the network setting.

*3 Even if the station is a multi-axis drive unit device (a device which can control two axes or more), the number of station is counted as one station when it is recognized as one station.

*4 When a slave emulate is carried out, the number of stations is counted according to the connected device setting.

*5 For the version of Add-on baseSystem, "Ver. 1.4 or earlier", the maximum number of stations is "64 stations".

*6 For the version of Add-on baseSystem, "Ver. 1.4 or earlier", the maximum number of devices is "64 devices".

*7 For the version of Add-on baseSystem, "Ver. 1.4 or earlier", the minimum synchronization cycle is "125.00 μs".

*8 When the communication cycle is 31.25 μs or 62.50 μs, the line topology is only available. When connecting with the star + line topology, the communication cycle must be set to 125.00 μs or more.

*9 This speed can be used for the version of Add-on baseSystem, "Ver.1.5 or later".

*10 For the RD78G(H), availability differs depending on the firmware version. For details, refer to "Safety communication" in the following manual.

 MELSEC iQ-R Motion Module User's Manual (Network)

*11 Consult the manufacturer of the switching hub used.

SD memory card

The specifications of the SD memory card is shown below.

Item	Specification
Card type	SD/SDHC memory card
Card capacity	Up to 32G bytes
UHS, UHS-I	Unsupported
Number of times of installation/removal	Within 500 times

Use the recommended SD memory card listed below.

Model ^{*1}	Manufacturer	Card capacity
NZ1MEM-xGBSD	Mitsubishi Electric Corporation	2, 4, 8, 16G bytes

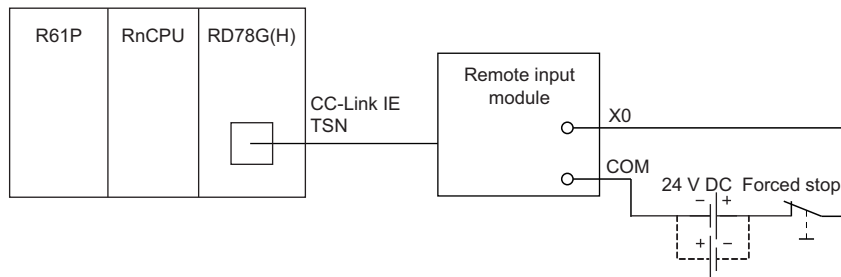
^{*1} The "X" of the model name represents the card capacity.

Before using a commercially available SD memory card, check that the card does not affect the control of the target system on user's own responsibility.

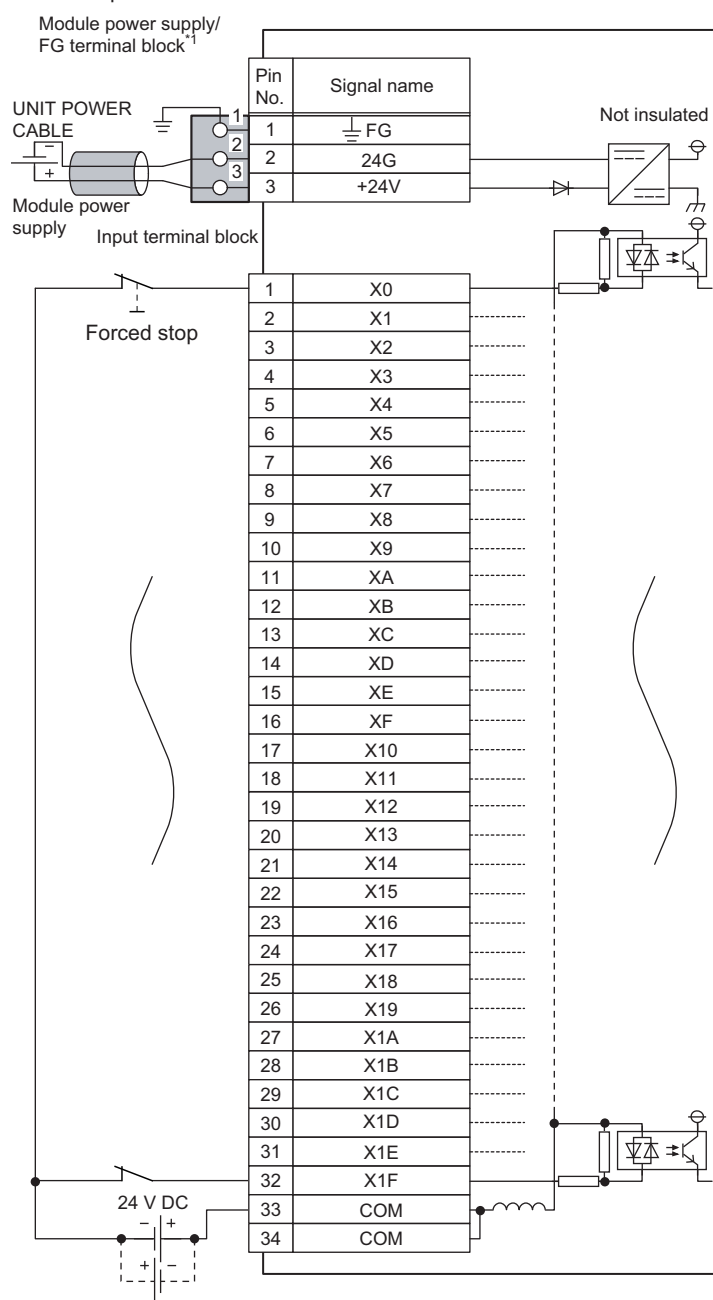
2.3 External Circuit Design

Forced stop circuit

A wiring example which uses a remote input module (NZ2GN2B1-32D) for the forced stop input is shown below. Set AxisName.Pr.ForcedStop_Signal according to the input modules.



<Remote input module NZ2GN2B1-32D>



*1 Only one wire can be connected to a terminal of the terminal block for module power supply and FG. Multiple wires cannot be connected to a terminal. Connecting two or more wires may cause a poor contact.

It is also possible to use the forced stop signal of the drive unit. Operation status of the emergency stop, drive unit forced stop and the Motion controller forced stop are as follows.

Item	Operation when the signal is turned on	Remarks
Emergency stop	Servo OFF	The power supply of the drive unit is shut off by external circuit, and the servomotor stops.
Drive unit forced stop		A stop command from the external circuit to the drive unit is output, and the drive unit stops the servomotor.
Motion controller forced stop		A stop command from the remote input module to the drive unit is output, and the drive unit stops the servomotor.

Shut-off the main circuit power supply of a drive unit when an emergency stop, alarm, servo amplifier forced stop, or remote input module forced stop occurs. Make sure to use molded-case circuit breakers (MCCB) for input wires of a drive unit power supply. For details, refer to the drive unit manual.

MR-J5(W)-G:  MR-J5 User's Manual (Hardware)

3 FUNCTION LIST

There are restrictions in the function that can be used by the software of the Motion module and the version of engineering tool. For details, refer to "Restrictions by the version" in the following manual.

📖 MELSEC iQ-R Motion Module User's Manual (Application)

3.1 Control Functions

The Motion module has several functions. For details on each function, refer to the following.

📖 MELSEC iQ-R Motion Module User's Manual (Application)

Basic specifications

Functions		Details
Axis control function	Technical units	The position command unit and the velocity command unit used in the motion control can be set. Since the unit can be specified freely depending on the control target, intuitive programming and monitoring are available.
	Servo ON/OFF	This function executes servo ON/OFF of the real axis connected to the motion system. The servo ON enables the operation of the real axis.
	Follow up	Reflects the input (current position) from the slave device to the set position of the axis.
	Absolute position control	Restores the current position of an axis.
Basic functions	Operation cycle	In the motion system, operation processing related to the motion control is performed in the fixed cycle (operation cycle).
	Add-on function	The motion system functions can be expanded by installing add-on libraries.
	System memory settings	Sets the memory size used in the add-on library in the system memory (RAM) and the system memory (backup RAM).
	Software reboot	The software reboot (reset the system) is executed by writing the reboot command to the control command. When "Clear" is specified at the software reboot command, the system restarts and all data of the system is deleted.

Motion control


Functions			Details
Start and stop	Start		Starts motion control.
	Retrigger/continuous update		Changes the control of the on-going FB with a retrigger/continuous update.
	Multiple start (buffer mode)		Multiple motion control FBs execute continuously without stopping by executing the motion FB of another instance to the axis and the axes group that are executing the motion control FB.
	Stop		Stops motion cotrol.
	Forced stop		Stops axes by the forced stop signal.
Homing	Homing request		Establishes the start point for carrying out positioning control (home position), and carries out positioning toward that start point. This is used to return a machine system, located at a position other than the home position when the Motion module requires "homing request" such as when the power is turned ON or after positioning stop, to the home position.
	Driver homing method		
	Data set homing method		
	Operation setting for incompletion of homing		Selects whether the axis starts or not, when the homing request is TRUE.
Axis control function	Single axis positioning control		Executes positioning to the specified position by using address information.
	Single axis speed control		Executes the speed control for the specified axis with the specified speed.
	Single axis manual control		Executes the random positioning operation by inputting a signal from an external device. The following method is available. • JOG operation: the machine is moved by only an movement amount.
	Multiple axes positioning control		Uses address information and executes positioning to the specified position using interpolation control.
Direct control	Velocity control		The driver control mode is switched to csv, and the control excluding the position loop is executed.
	Torque control		The driver control mode is switched to cst, and the control is carried out.
Functions related to position	Current position change function		Changes the set position and cumulative current position to an arbitrary address.
	Command in-position		Checks the remaining distance to the target position, and turns the command in-position flag to TRUE.
	Software stroke limit		An address is set as the movable range. Even if a movement command to the address outside the setting range is issued, the command will not be executed.
	Hardware stroke limit		Limit switches are set at the upper/lower limit of the physical movable range, and the control is stopped by the input of a signal from the limit switch.
Functions related to speed	Acceleration/deceleration processing function		Adjusts the acceleration/deceleration of each motion control to the acceleration/deceleration curve suitable for device.
	Speed limit		Limits the command speed to a value within the speed limit value setting range when the command speed during control exceeds the speed limit value.
	Override function		Changes the speed during control.
Functions related to torque	Torque limit		Limits the generated torque to a value within the torque limit value range when the torque generated in the servomotor exceeds the torque limit value.
	Torque limit value change function		Changes the torque limit value during control.
Sub functions of control	Compensation function	Driver unit conversion function	Converts the cumulative current position to the driver command value and pass it to the target position (Target Position). Also, it converts the current position of the driver and calculates the actual position.
		Command filter	Smoothing filter
		Direction limit filter	Limits a direction of an axis.
		Speed limit filter	Limits a speed of axis.
		Backlash compensation filter	Compensates amont of mechanical backlash (play).
	Input variable change in execution		Changes input variables during control.
Common functions	External signal selection		Sets I/O signals to be used in various control.
	Touch probe		Records (latches) arbitrary data at trigger input signal detection.
	Slave emulate		Carries out axis control on the real axis without connecting the slave station.
	Inter-module synchronization function		Synchronizes the control timing among multiple modules on the same base.
Synchronous control	Cam operation		Operates by synchronizing the slave axis with the master axis based on cam table.
	Gear operation		Sets the speed ratio between the master axis and the slave axis, and starts gear operation.
	Addition/Subtraction positioning		Combines the movement amount of 2 axes and transmits.
Operation profile function	Operation profile data		Performs opening profile for the cam and reading/writing for the cam.

Control/Operation/Maintenance

Functions			Details
Logging	Data logging function		Collects the motion system data at a specified interval based on the logging setting (trigger condition or data collection condition) written by the engineering tool and save the result to the data logging file.
	Real-time monitor		Sets the data collection and monitor the collected data (waveform display) in real time in the status where the engineering tool has been connected with the motion system.
	Application function	Event detection	When File save setting is set to "Disabled" in the logging setting, only the trigger detection is executed without saving files.
		Auto logging	When inserting an SD memory card, which holds logging setting, into the motion system, the data logging automatically starts based on the logging setting information on the SD memory card.
RAS functions	Execution time monitor		Monitors the operation cycle processing and the normal task execution time.
	History data	Event history function	Saves the data such as the error detected by the motion system, the operation executed to the module, and the event related to the motion control of start and stop as even history.
		Position data history	The position data history of each axis can be monitored by the engineering tool.
	Servo system recorder		Generates logging setting file which is optimal for analyzing of the error factors and continuously monitors the error status of the motion system and supported slave devices. When an error is detected, the state before and after the occurrence will be recorded for a certain period of time and saved in the file.
File control	File transfer function		Executes file operation based on the specified command.
	Parameter read/write function		Parameters can be read or written.
Module software install			When updating or changing to the new software, users have to install the software again.

3.2 List of Network Function

The following table lists the functions of CC-Link IE TSN. For details on the functions, refer to "Functions" in the following manual.

 MELSEC iQ-R Motion Module User's Manual (Network)

Cyclic transmission

Data are periodically exchanged among stations on the network using slave label.

Function	Description
Communications using slave label	Regularly communicates data between the stations on the same network by using the slave label of the Motion module.
CANopen communication	Controls a servo amplifier supporting the CANopen profile.

Transient transmission

This function is used for communications at any timing.

Function	Description
SLMP communication	Reads/writes data from/in the device memory of the self-station or another station CPU module on the CC-Link IE and the buffer memory of the intelligent function module, via Ethernet from the upper system.
Communications using engineering tool	Configures the settings of or monitors each station using an engineering tool.

Ethernet connection

This function connects an Ethernet device to a module without interfering with CC-Link IE TSN.

Function	Description
Connection with MELSOFT products and a GOT	Allows programming and monitoring of the CPU module using the engineering tool, and monitoring and testing of the CPU module from the GOT via Ethernet.
Connection with SLMP-compatible devices	Connects SLMP-compatible devices (personal computer or a vision sensor, etc.) to RD78G(H).

Security

This function ensures optimal security according to the network environment by restricting access for each communication path to the CPU module.

Function	Description
Remote password	Prevents illegal access of the CPU module from a remote location for each function.
IP filter	Identifies the IP address of the access source to limit access to the Motion module.

RAS

This function improves Reliability, Availability, and Serviceability and makes automated equipments easy to use comprehensively.

Function	Description
Slave station disconnection	In star topology, the data link of the slave station where an error occurred is stopped, and data link continues only for slave stations that are operating normally.
Automatic return	Restarts the data link automatically when the slave station that was disconnected due to an error becomes normal again.
Master station duplication detection	When one network has multiple master stations, detects duplication.
IP address duplication detection	When one network has stations with the same IP address, detects duplication.
Time synchronization	Synchronizes the time of slave stations with the time synchronization source (CPU module of the master station).

Synchronization function

This function synchronizes the operation timing with the timing of different slave stations connected to the same network.

Function	Description
CC-Link IE TSN Network synchronous communication function	Synchronizes control cycles between slave stations over CC-Link IE TSN according to the inter-module synchronization cycle specified in the master station. This allows different slave stations on the same network to operate with the same timing.

Safety communications

This function allows safety data to be exchanged between safety stations on the same network.

Function	Description
Safety communications	Establishes a safety connection and enables one-on-one safety communications periodically between safety stations in the same network.

Troubleshooting

This function shows the status of the module and network by executing diagnostics and operation tests using the engineering tool.

Function	Description
CC-Link IE TSN/CC-Link IE Field diagnostics	Monitors the CC-Link IE TSN status. The network maps, stations where data link is not operating, selected station communications status monitor and so on are displayed on the engineering tool.
Communication test	Checks if transient transmission data can be properly routed from the own station to the communication target.

Others

Function		Description
"CC-Link IE TSN Configuration" window	Parameter setting of a slave station	Sets parameters of slave stations (the number of points and assignment of link devices) in the master station.
	Detection of connected/disconnected devices	Detects connected slave stations and the stations are displayed on the "CCLink IE TSN Configuration" window.
	Parameter processing of a slave station	Reads and saves the parameters from the slave station, and writes the saved parameters to the slave station.
	Command execution to slave stations	Executes commands (Error clear request, Error history clear request) to a slave station.
Network synchronous communication (Motion control station)		The control cycle of the slave station can be synchronized according to the communication cycle specified in the master station.
Automatic detection of connected devices (iQSS)		Reflects the installation status of network configuration in the network configuration setting of the master station on engineering tool. At startup of the system, it supports the network configuration setting of the master station when slave stations are added.
Slave station parameter automatic setting		Parameters of the slave station on CC-Link IE TSN set using the engineering tool are written in the data memory of the CPU module or the SD memory card, and those are automatically set via the master station when the slave station is returned/replaced by power ON or connected.
Label access to the remote device		To slave stations on the network, it allows labels and FBs are used like the proximity module.
Searching CPU modules on the network		Searches Ethernet function installed modules that are connected with the same switching hub as the engineering tool, and it displays the list of the search result.

4 PROCEDURES BEFORE OPERATIONS

This chapter describes the procedures before operation of RD78G(H).

1. Mounting the module

Mount the Motion module to the main base unit or extension base unit.

For details, refer to the following.

📖 MELSEC iQ-R Module Configuration Manual

2. Wiring

Connect the Motion module to external devices.

3. Adding the module

Add the RD78G(H) to the module map of the project using GX Works3.

4. Network construction

Set network parameters in "Module Parameter (Network)" of GX Works3.

- Set the communication cycle setting for Network Configuration Settings.

Set the basic communication cycle according to the number of controlled axes or network device configuration. For a reference of the cycle, refer to the following manual for "Operation Cycle".

📖 MELSEC iQ-R Motion Module User's Manual (Application)

- Set a slave station for Network Configuration Settings.

The slave station controlled in the Motion module needs to be set in the motion control station. Also, when setting in the motion control station, set the basic cycle for the communication cycle.

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

📖 MELSEC iQ-R Motion Module User's Manual (Network)

5. Module setting (module extended parameter)

Configure the settings related to axis control in "Module Extended Parameter" of GX Works3.

For details, refer to "Motion Module Program Creation" in the following manual.

📖 MELSEC iQ-R Programming Manual (Motion Control Function Blocks)

6. Auto refresh setting

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

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

📖 MELSEC iQ-R Motion Module User's Manual (Network)

7. Programming

Create programs.

For details, refer to "Motion Module Program Creation" in the following manual.

📖 MELSEC iQ-R Programming Manual (Motion Control Function Blocks)

8. Writing parameters

Write the set parameters and programs to the Motion module.

- When writing module extended parameters, specify the same storage location in the writing destination of GX Works3 as "Module extended parameter storage location setting" in "Module operation setting" of Module Parameter (Motion).

For details, refer to "Memory and File" in the following manual.

📖 MELSEC iQ-R Motion Module User's Manual (Application)

9. Network diagnostics

Using network diagnostics, check if the cables are connected properly and communication are performed normally with the parameters.

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

📖 MELSEC iQ-R Motion Module User's Manual (Network)

10. Parameter settings in slave devices

Set parameters of the drive unit to use.

For details, refer to each drive unit manual.

MR-J5(W)-G:  MR-J5-G/MR-J5W-G User's Manual (Parameters)

11. Test operation

Check that the program is correctly carried out as created

Point


When multiple slave stations are powered on simultaneously, the startup time of the slave stations may vary. In such a case, the networks are connected in turn, resulting in the possibility of the longer time to complete data links at all stations.

Powering on the master station after all slave stations have started prevents the time required for data links at all stations to increase.


4.1 Communication with the engineering tool

This section describes communication between the motion system and external devices such as GX Works3 (motion control setting function).

For details of the online function, refer to the following manual.

 GX Works3 Operating Manual

For communication for access to other module from a tool such as the engineering tool via the Motion module, refer to "Communications using the engineering tool" in the following manual.

 MELSEC iQ-R Motion Module User's Manual (Network)

Operation of this function for each system status

○: Possible, △: Possible (with restrictions)

Status	Operation availability
STOP	○
RUN	○
Moderate error	○
Major error	△(Communication with the Motion module may not be performed depending on the error status. In that case, monitor the error status on the control CPU side.)

Accessible path

Communication with the Motion module is possible only through connection with the control CPU or own Motion module. Communication via a module other than the control CPU or own Motion module on the base may not be possible depending on the path.

SLMP communication

The labels and files in the motion system can be accessed by using SLMP.

For details on the SLMP communication method, refer to "Transient Transmission" in the following manual.

 MELSEC iQ-R Motion Module User's Manual (Network)

Or, refer to the following manual.

 SLMP Reference Manual

To issue SLMP to the motion system, set the value obtained by "I/O number of the motion module ÷ 16" in "request destination module I/O number" in the request message.

The following shows the commands that can be executed by SLMP addressed to the motion system.

Item		Command	Sub command	Description
Type	Operation			
Remote Control	Read Type Name	0101	0000	Reads the model name and model code of the module to be accessed.
Label	Read Random	041C	0000	Reads the data with a label specified.
	Write Random	141B	0000	Writes the data with a label specified.
File	Read Directory/File	1810	0040	Reads the list information of the file.
	New File	1820	0000	Reserves the storage area of the specified file.
	Delete File	1822	0040	Deletes the file.
	Open File	1827	0040	Opens the file.
	Read File	1828	0000	Reads the contents of the file.
	Write File	1829	0000	Writes the contents to the file.
	Close File	182A	0000	Closes the opened file.

Precautions

The following shows the specifications specific to the SLMP commands for the motion system (points that differ from the descriptions in "SLMP Reference Manual").


- "Model codes" that can be acquired with the Read Type Name command are listed below.

Model name	Model code
RD78G4	6940H
RD78G8	6941H
RD78G16	6942H
RD78G32	6943H
RD78G64	6944H
RD78GHV	6945H
RD78GHW	6946H

- The following shows the read data length of the Label Read Random command. The data type not shown below and Label Write Random command (all data type) are not different from the ones described in SLMP Reference Manual.

Data type name	Data type ID	Read data length (byte)	
		Motion system	SLMP Reference Manual
Bit	1	1	2
String	9	(Number of defined characters of the label + 1) × 2	Number of defined characters of the label + N When the number of defined characters is an odd number, N is "1". When the number of defined characters is an even number, N is "2".

- For "drive No." specified with the File command, refer to "FILE CONTROL" in the following manual.

 MELSEC iQ-R Motion Module User's Manual (Application)

- The file name can be specified in "path name of the directory" of the Read Directory/File command. Only the information of the corresponding file will be returned.
- When the Read Directory/File command is executed via the path other than the Motion module (such as the Ethernet port of the control CPU module), not all the files may be read. For the application in which all the files are enumerated by executing the Read Directory/File multiple times, use the Ethernet port of the Motion module.
- The Open File command does not lock the file access. Therefore, access from other processing or file deletion with the Delete File command is not inhibited even for an opened file. Do not access a file which is being written.
- "Offset address" specified with the Read File and Write File commands can be used in both the even/odd number addresses. There are no restrictions on each drive.
- "All the files locked by the external device that executes the command" cannot be specified for "close type" of the Close File command.

Precautions

Communication with the Motion module is possible only through connection with the control CPU or own Motion module. Communication via a module other than the control CPU or own Motion module on the base may not be possible depending on the path.

Relevant Add-ons, Versions

Communication with the engineering tool is possible without even one add-on being installed.

Point

When file transfer function (Add-on File Transfer) is enabled, transfer time of reading and writing the project data from the engineering tool is shortened by compressing the data.

System memory capacity

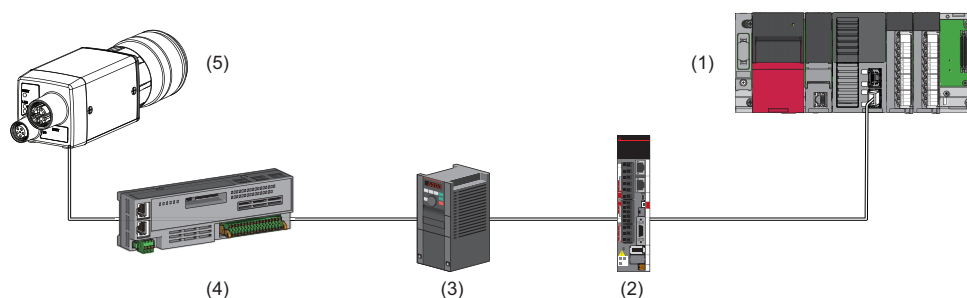
The system memory will not be used because add-on is not used for the communication.

However, when file transfer function (Add-on File Transfer) is enabled, Add-on File Transfer will use the system memory when reading and writing the project data from the engineering tool.

5 SYSTEM CONFIGURATION

CC-Link IE TSN is configured using Ethernet cables. (☞ Page 61 Ethernet cable)

For specifications on connectable devices, refer to the manual of each device.



- (1) Motion module
- (2) Drive unit
- (3) Inverter device
- (4) Remote I/O module
- (5) Ethernet device

Point

[RD78GH]

Both P1 and P2 can be used. When only one connector is used, either P1 or P2 can be connected.

Precautions

A dedicated TSN hub may be required depending on parameter settings or the network topology for connecting modules on CC-Link IE TSN.

Read the following carefully.

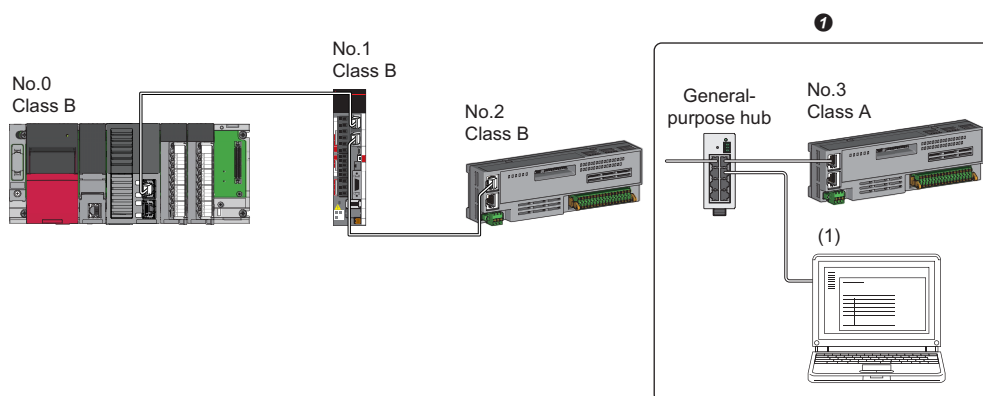
- ☞ Page 42 Structure of Authentication Class B Devices and Ethernet Devices
- ☞ Page 61 Switching Hub

Authentication Class setting

From "Connection Device Information" under "Basic Settings" of the engineering tool, select either of the following items according to devices to be connected.

Connected device information	System configuration	Switching Hub	Supported standard
Authentication Class B Only	Select this if the system is to be configured without connecting the authentication Class A device. <ul style="list-style-type: none"> ☞ Page 44 Connection with modules on CC-Link IE TSN only ☞ Page 46 Connection with modules on CC-Link IE TSN and Ethernet devices 	TSN hub (authentication Class B switching hub)	IEEE 802.1AS
Mixture of Authentication Class B/A or Authentication Class A Only	Select this if the authentication Class A device or Ethernet device is connected to the configuration of an authentication Class B device only. (☞ Page 53 Connection with modules on CC-Link IE TSN and Ethernet devices)	General-purpose hub (authentication Class A switching hub)	IEEE 1588

When "Connection Device Information" is set to "Mixture of Authentication Class B/A or Authentication Class A Only", line topology can be used with the structure with the authentication Class B device only as shown below. To implement this setting, select this when connecting the authentication Class A device and Ethernet device after connecting a general-purpose hub to the end of the network of the authentication Class B device only.



No.0: Master station

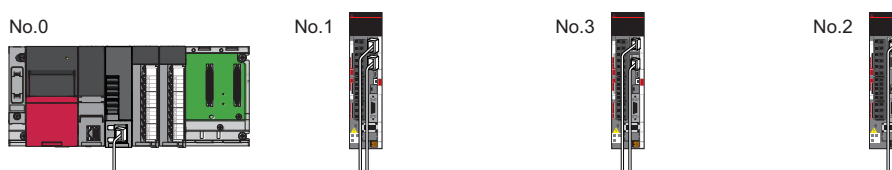
No.1, No.2, No.3: Remote station

(1) Ethernet device

① When the authentication Class A device or Ethernet device is connected

Point

Modules can be connected in any order regardless of the station number. No. □ shown in the following figure represents station No..



Ethernet connection

For connection with MELSOFT products and a GOT, and connection with SLMP-compatible devices, refer to "Ethernet Connection" in the following manual.

☞ MELSEC iQ-R Motion Module User's Manual (Network)

With the Safety CPU

When the Motion module is used with the Safety CPU, the safety communications are available in addition to the standard communications (cyclic transmission and transient transmission).

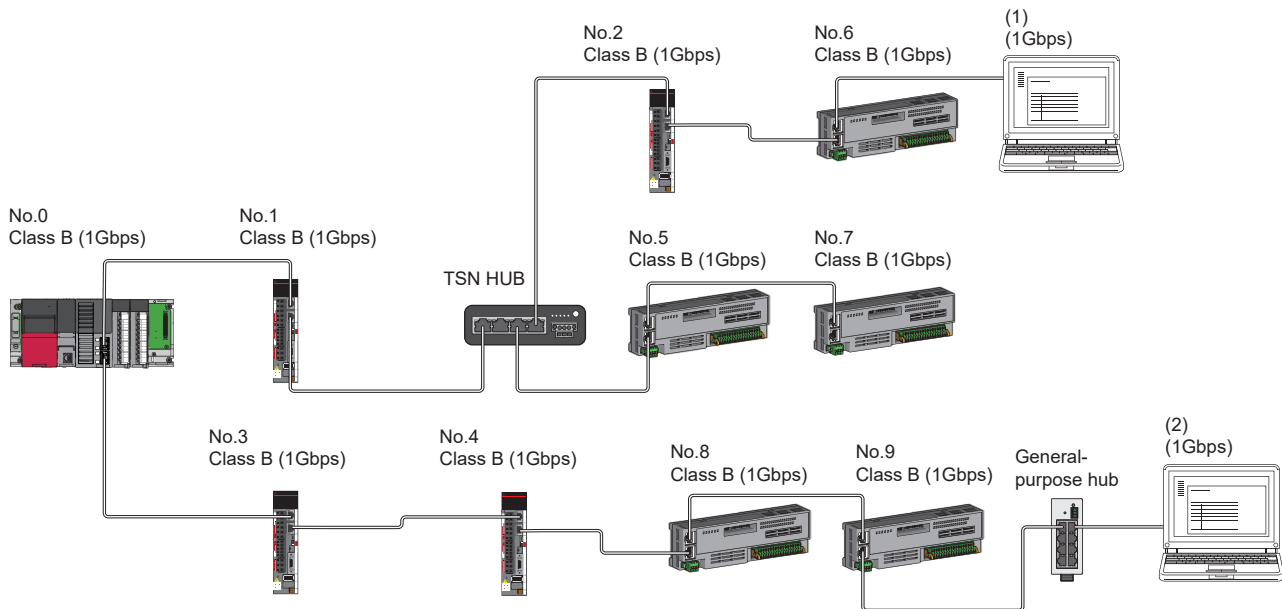
For details on the safety communications, refer to "Safety Communication" in the following manual.

☞ MELSEC iQ-R Motion Module User's Manual (Network)

5.1 Structure of Authentication Class B Devices and Ethernet Devices

The following shows the system configuration when "Connection Device Information" under "Basic Settings" is set to "Authentication Class B Only" in the engineering tool.

When "Connection Device Information" under "Basic Settings" of the master station is set to "Authentication Class B Only", up to 121 devices (one master station and 120 slave stations) can be connected.



No.0: Master station
 No.1, No.2, No.3, No.4, No.5, No.6, No.7, No.8, No.9: Remote station
 (1), (2) Ethernet device
 Class B: Authentication Class B device

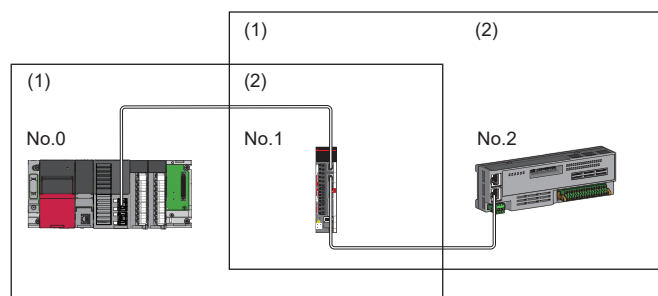
The availability of connection of network configuration devices varies depending on the communication mode and communication speed.

- Unicast mode

Page 43 When the communication speed for the master station is set to 1 Gbps

Page 43 When the communication speed for the master station is set to 100 Mbps

The following terms are used to describe the terms in the tables referenced.



No.0: Master station
 No.1, No.2: Remote station
 (1) Device on the master station side (The master station or a device near the master station)
 (2) Device on the end side (A device far from the master station)

Structure of unicast mode

The following shows the availability of connection with a network configuration device.

When the communication speed for the master station is set to 1 Gbps

The following table lists the availability of connection with a network configuration device when the "Communication Speed" for the master station is set to "1 Gbps".

○: Connection available, △: Connection available via a switching hub, ×: Connection not available

S: TSN hub available

H: General-purpose hub available

Device on the master station side (A device near the master station)		Device on the end side (A device far from the master station)			
		Remote station (Authentication Class B device)		Ethernet device	
		1Gbps	100Mbps	1Gbps	100Mbps
Master station (Authentication Class B device)	1Gbps	○S	×	○SH	△SH
Remote station (Authentication Class B device)	1Gbps	○S	×	○SH	△SH
	100Mbps	×	×	×	○SH

Precautions

When a TSN hub is used, check the TSN hub specifications on the CC-Link Partner Association website (www.cc-link.org).

When the communication speed for the master station is set to 100 Mbps

The following table lists the availability of connection with a network configuration device when the "Communication Speed" for the master station is set to "100 Mbps".

○: Connection available, ×: Connection not available

S: TSN hub available

H: General-purpose hub available

Device on the master station side (A device near the master station)		Device on the end side (A device far from the master station)			
		Remote station (Authentication Class B device)		Ethernet device	
		1Gbps	100Mbps	1Gbps	100Mbps
Master station (Authentication Class B device)	100Mbps	×	○S*1	×	○SH
Remote station (Authentication Class B device)	1Gbps	×	×	×	×
	100Mbps	×	○S*1	×	○SH

*1 For a slave station with a communication speed of 100 Mbps, set "Communication Period Setting" to "Basic Period".

Precautions

When a TSN hub is used, check the TSN hub specifications on the CC-Link Partner Association website (www.cc-link.org).

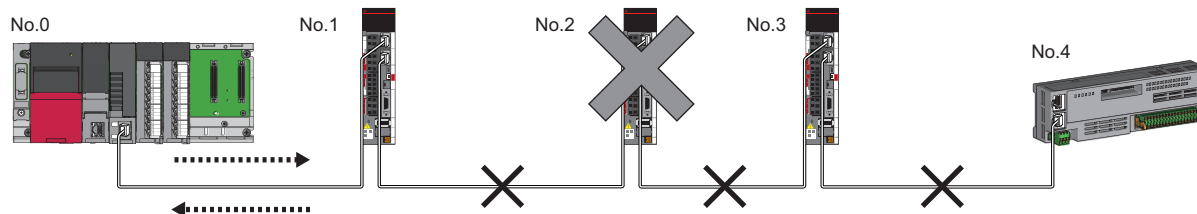
Structure of modules on CC-Link IE TSN only

Connection with modules on CC-Link IE TSN only

■Line topology

The network is configured in a line topology. A TSN hub is not required.

When an error occurs in a slave station, the stations connected after the faulty station will be disconnected.

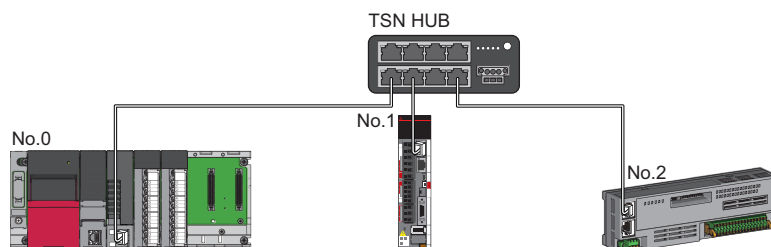


No.0: Master station

No.1, No.2, No.3, No.4: Remote station

■Star topology

The network is configured in a star topology via a TSN hub. This allows devices to be added easily.



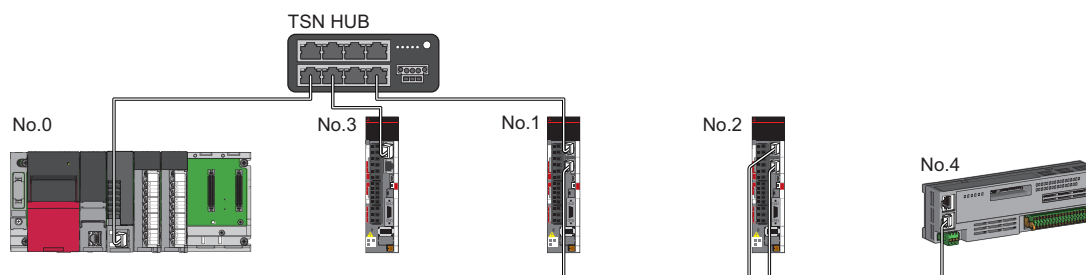
No.0: Master station

No.1, No.2: Remote station

Even when an error occurs in a slave station, a data link can be continued with the stations that are operating normally.

■Coexistence of line and star topologies

Line and star topologies are mixed.



No.0: Master station

No.1, No.2, No.3, No.4: Remote station

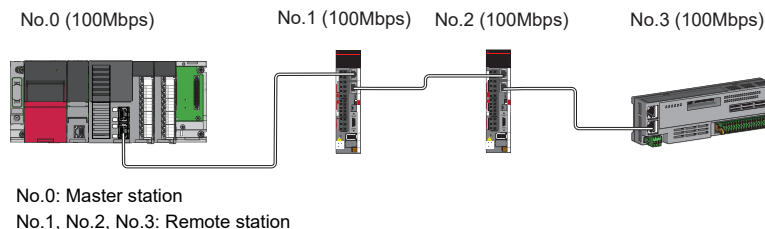
Connection with modules on CC-Link IE TSN with a communication speed of 100 Mbps

This section describes the network topology when "Communication Speed" under "Application Settings" is set to "100 Mbps".

Line topology

Modules are connected in a line topology.

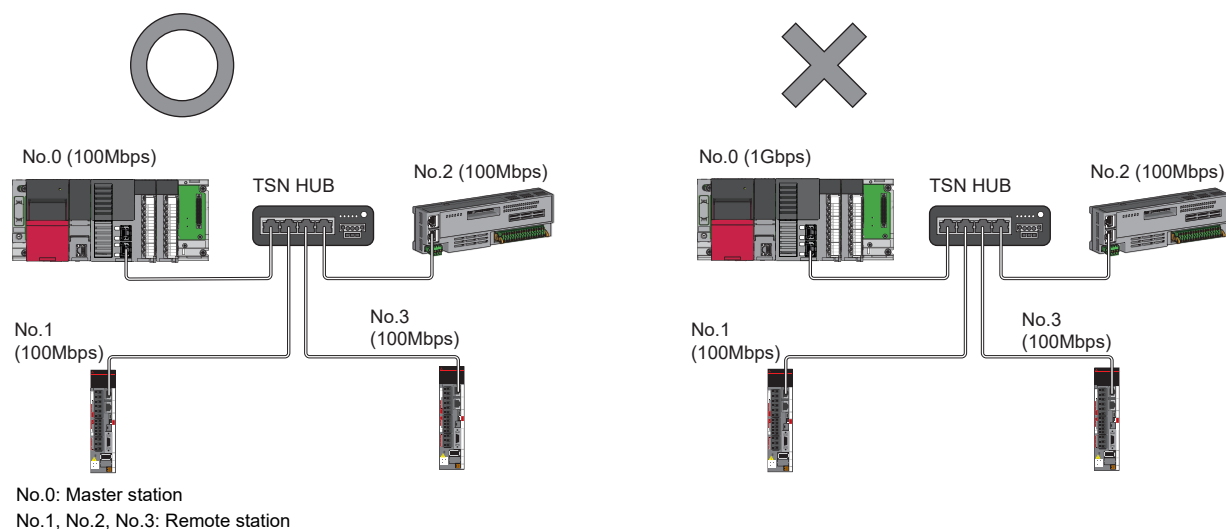
- Adjust the communication speed of each module.



Star topology

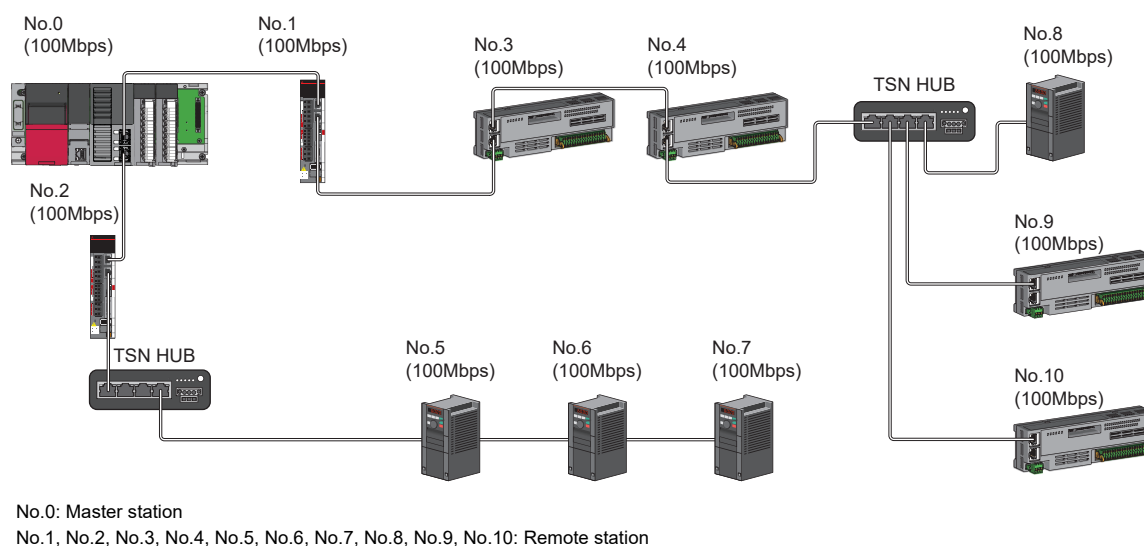
Modules are connected in a star topology via a switching hub.

- Connect the master station and remote station at the same communication speed.



Coexistence of line and star topologies

Line and star topologies can be mixed in the same network configuration.



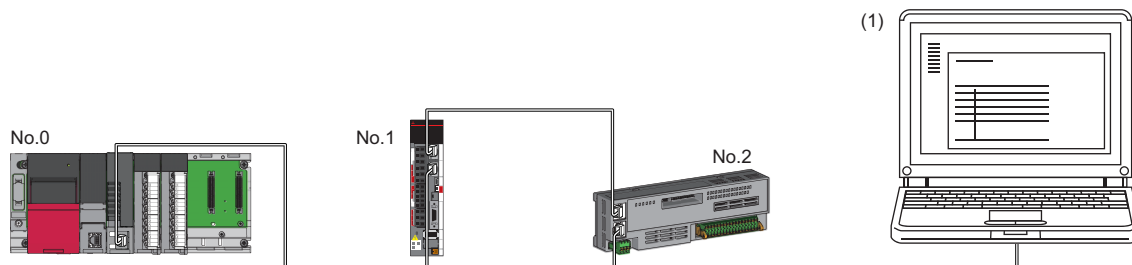
Structure of modules on CC-Link IE TSN and Ethernet devices

Connection with modules on CC-Link IE TSN and Ethernet devices

■Line topology

The network with modules and devices is configured in a line topology. A TSN hub is not required.

Connect an Ethernet device to the end of the network.



No.0: Master station

No.1, No.2: Remote station

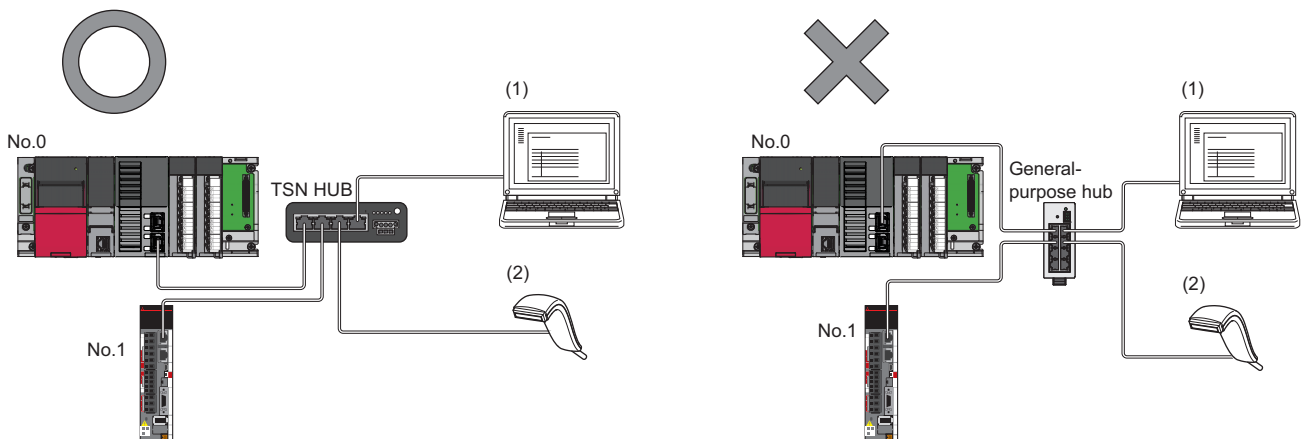
(1) Ethernet device (such as a personal computer)

When an error occurs in a slave station, the stations connected after the faulty station will be disconnected.

■Star topology

Modules or devices are connected in a star topology via a switching hub.

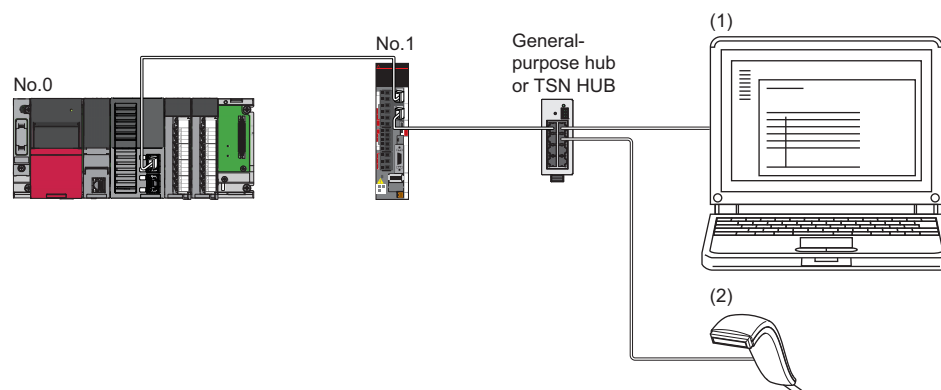
- Because cyclic data is sent to an Ethernet device when the local station is used with an Ethernet device on the end side via a hub, communication may not be possible depending on the type of an Ethernet device.



■Coexistence of line and star topologies

Line and star topologies can be mixed in the same network configuration.

Connect Ethernet devices to the end of the network.



No.0: Master station

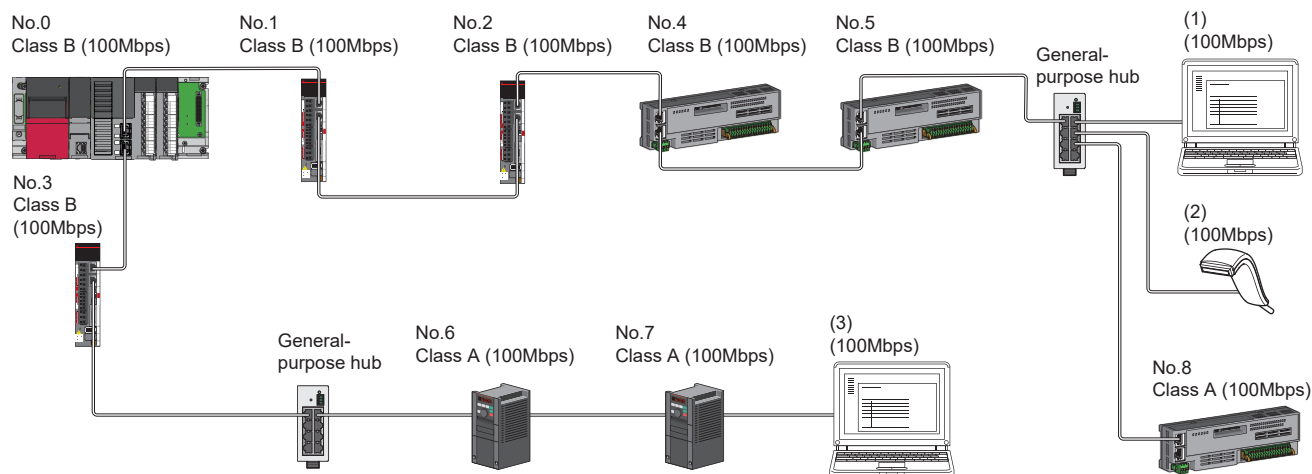
No.1: Remote station

(1), (2): Ethernet device

5.2 Structure of Authentication Class B/A Devices and Ethernet Devices

The following shows the system configuration when "Connection Device Information" under "Basic Settings" is set to "Mixture of Authentication Class B/A or Authentication Class A Only" in the engineering tool.

When "Connection Device Information" under "Basic Settings" of the master station is set to "Mixture of Authentication Class B/A or Authentication Class A Only", up to 121 devices (one master station and 120 slave stations) can be connected.



No.0: Master station

No.1, No.2, No.3, No.4, No.5, No.6, No.7, No.8: Remote station

(1), (2), (3) Ethernet device

Class A: Authentication Class A device

Class B: Authentication Class B device

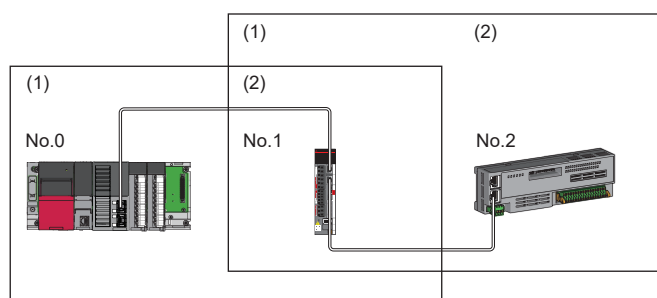
The availability of connection of network configuration devices varies depending on the communication mode and communication speed.

- Unicast mode

Page 48 When the communication speed for the master station is set to 1 Gbps

Page 48 When the communication speed for the master station is set to 100 Mbps

The following terms are used to describe the terms in the tables referenced.



No.0: Master station

No.1, No.2: Remote station

(1) Device on the master station side (The master station or a device near the master station)

(2) Device on the end side (A device far from the master station)

Structure of unicast mode

The following shows the availability of connection with a network configuration device when "Communication Mode" under "Application Settings" is set to "Unicast".

When the communication speed for the master station is set to 1 Gbps

The following table lists the availability of connection with a network configuration device when the "Communication Speed" for the master station is set to "1 Gbps".

○: Connection available, △: Connection available via a switching hub, ×: Connection not available

H: General-purpose hub available

Device on the master station side (A device near the master station)		Device on the end side (A device far from the master station)					
		Remote station (Authentication Class B device)		Remote station (Authentication Class A device)		Ethernet device	
		1Gbps	100Mbps	1Gbps	100Mbps	1Gbps	100Mbps
Master station (Authentication Class B device)	1Gbps	○	×	○H	×	○H	△H
Remote station (Authentication Class B device)	1Gbps	○	×	○H ^{*1}	×	○H	△H
	100Mbps	×	×	×	×	×	×
Remote station (Authentication Class A device)	1Gbps	×	×	○H ^{*1}	×	○H	△H
	100Mbps	×	×	×	×	×	○H

*1 A connection cannot be established if the total cyclic data size of all slave stations on the authentication Class A device side that form a boundary between authentication Class B and authentication Class A exceeds 2K bytes. (Page 57 Calculation of the total cyclic data size)

Precautions

When a TSN hub is used, check the TSN hub specifications on the CC-Link Partner Association website (www.cc-link.org).

When the communication speed for the master station is set to 100 Mbps

The following table lists the availability of connection with a network configuration device when the "Communication Speed" for the master station is set to "100 Mbps".

○: Connection available, ×: Connection not available

H: General-purpose hub available

Device on the master station side (A device near the master station)		Device on the end side (A device far from the master station)					
		Remote station (Authentication Class B device)		Remote station (Authentication Class A device)		Ethernet device	
		1Gbps	100Mbps	1Gbps	100Mbps	1Gbps	100Mbps
Master station (Authentication Class B device)	100Mbps	×	○ ^{*2}	×	○H	×	○H
Remote station (Authentication Class B device)	1Gbps	×	×	×	×	×	×
	100Mbps	×	○ ^{*2}	×	○H ^{*1}	×	○H
Remote station (Authentication Class A device)	1Gbps	×	×	×	×	×	×
	100Mbps	×	×	×	○H ^{*1}	×	○H

*1 A connection cannot be established if the total cyclic data size of all slave stations on the authentication Class A device side that form a boundary between authentication Class B and authentication Class A exceeds 2K bytes. (Page 57 Calculation of the total cyclic data size)

*2 For a slave station with a communication speed of 100 Mbps, set "Communication Period Setting" to "Basic Period".

Precautions

When a TSN hub is used, check the TSN hub specifications on the CC-Link Partner Association website (www.cc-link.org).

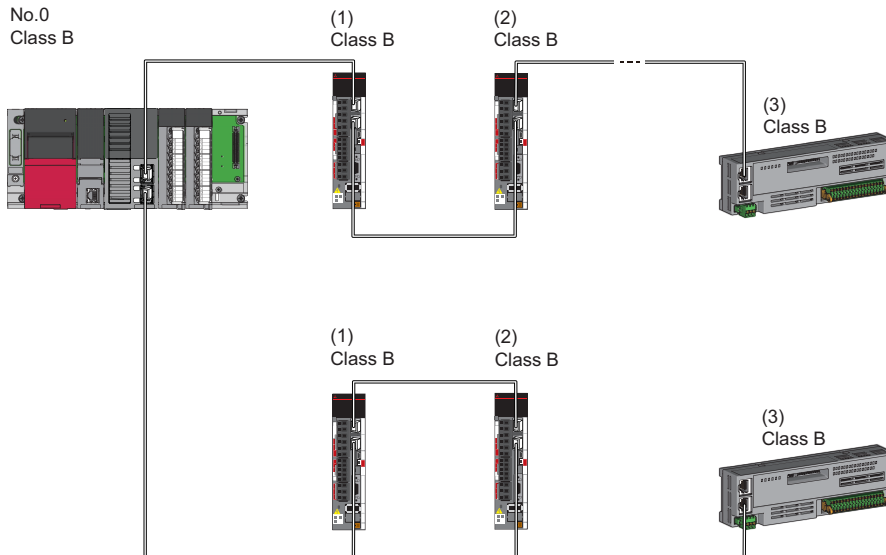
Structure of modules on CC-Link IE TSN

Connection with modules on CC-Link IE TSN only

■Line topology

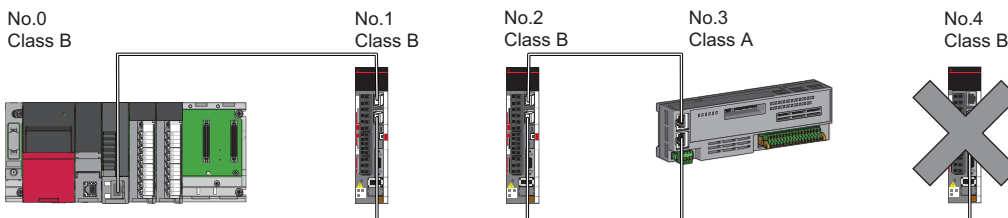
The network is configured in a line topology.

- Up to eight authentication Class B devices can be connected to P1 or P2 of the master station.



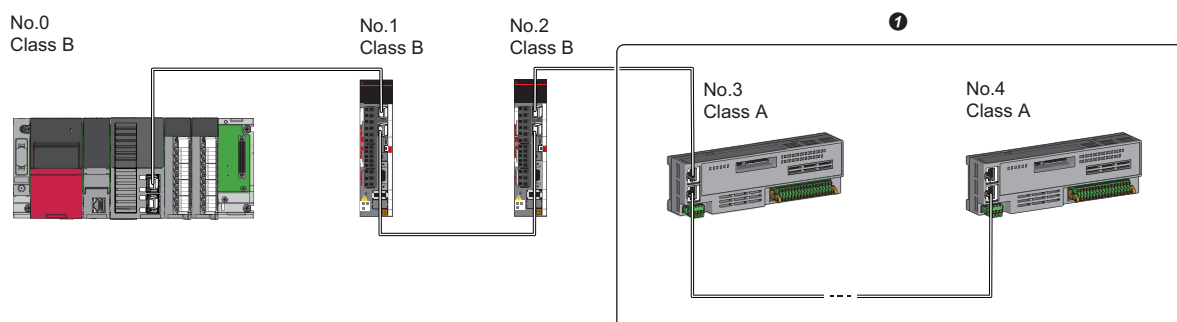
No.0: Master station
 (1) Remote station (1st device)
 (2) Remote station (2nd device)
 (3) Remote station (8th device)
 Class B: Authentication Class B device

- The authentication Class B device cannot be connected to the authentication Class A device.



No.0: Master station
 No.1, No.2, No.3, No.4: Remote station
 Class A: Authentication Class A device
 Class B: Authentication Class B device

- A connection cannot be established if the total cyclic data size of all slave stations on the authentication Class A device side exceeds 2K bytes. This includes the authentication Class A device that forms a boundary between authentication Class B and authentication Class A.



No.0: Master station

No.1, No.2, No.3, No.4: Remote station

Class A: Authentication Class A device

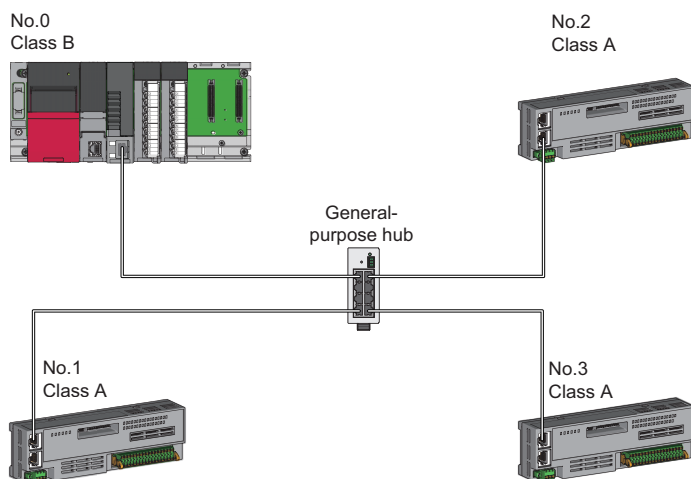
Class B: Authentication Class B device

① Set the total cyclic data size within 2K bytes.

■ Star topology

The network is configured in a star topology via a switching hub.

- When connecting the authentication Class A device to the authentication Class B device or connecting the authentication Class A device to the authentication Class A device in a star topology, connect via a general-purpose hub.



No.0: Master station

No.1, No.2, No.3: Remote station

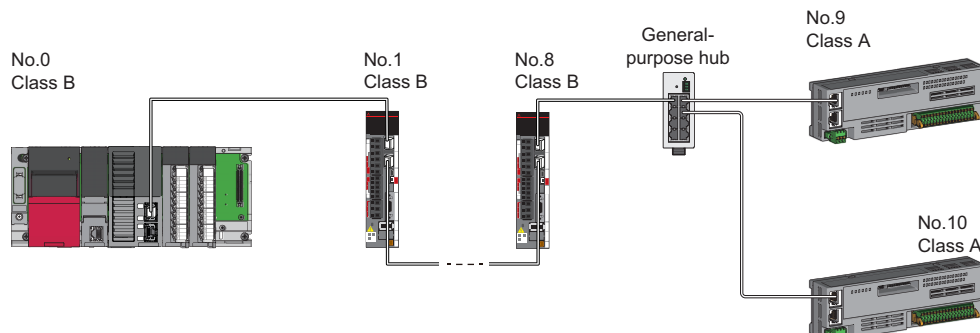
Class A: Authentication Class A device

Class B: Authentication Class B device

■ Coexistence of line and star topologies

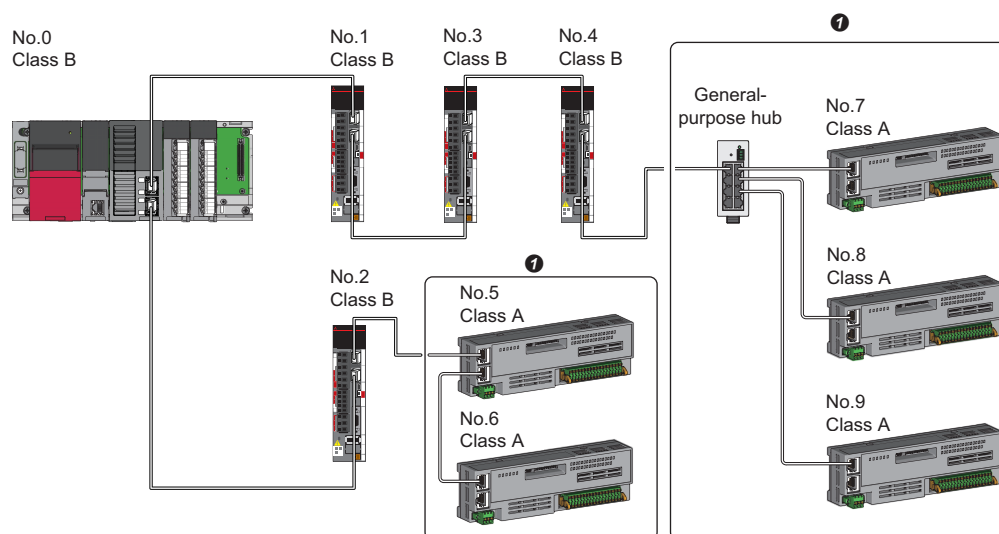
Line and star topologies can be mixed according to the availability of connection described below.

- Up to eight slave stations of authentication Class B can be connected to the transmission path from the master station to the authentication Class B device of the end.
- When connecting an authentication Class B devices, connect them from P1 or P2 of the master station.
- When connecting authentication Class A devices, connect them at the end of an authentication Class B device. In this case, it can be connected in a star topology by using a general-purpose hub.



No.0: Master station
 No.1, No.8, No.9, No.10: Remote station
 Class A: Authentication Class A device
 Class B: Authentication Class B device

- A connection cannot be established if the total cyclic data size of all slave stations on the authentication Class A device side that form a boundary between authentication Class B and authentication Class A exceeds 2K bytes.



No.0: Master station
 No.1, No.2, No.3, No.4, No.5, No.6, No.7, No.8, No.9: Remote station
 Class A: Authentication Class A device
 Class B: Authentication Class B device

① Set the total cyclic data size within 2K bytes.

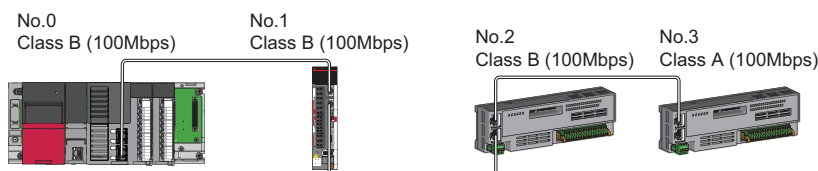
Connection with modules on CC-Link IE TSN with a communication speed of 100 Mbps

This section describes the network topology when "Communication Speed" under "Application Settings" is set to "100 Mbps".

Line topology

Modules are connected in a line topology.

- Adjust the communication speed of the modules.

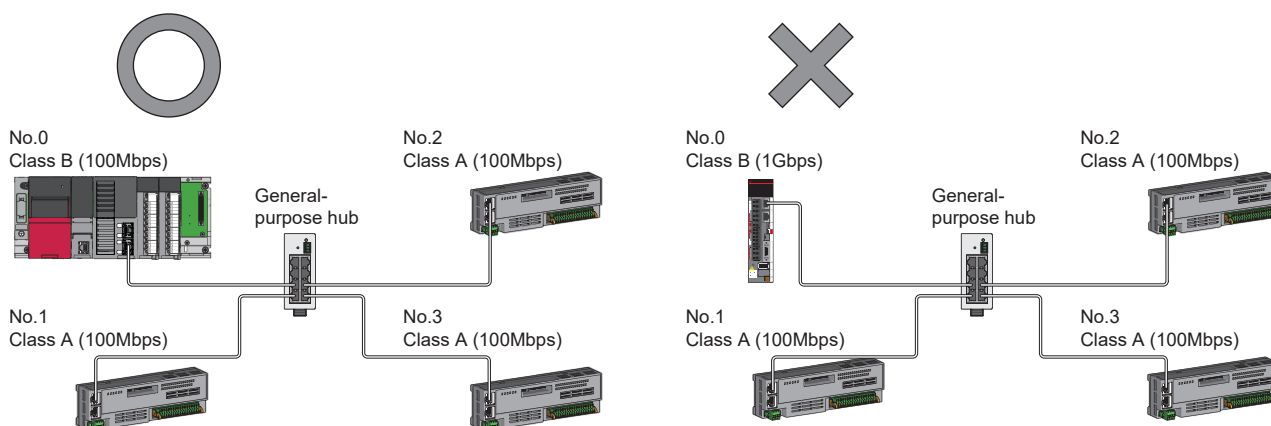


No.0: Master station
No.1, No.2, No.3: Remote station
Class A: Authentication Class A device
Class B: Authentication Class B device

Star topology

Modules are connected in a star topology via a switching hub.

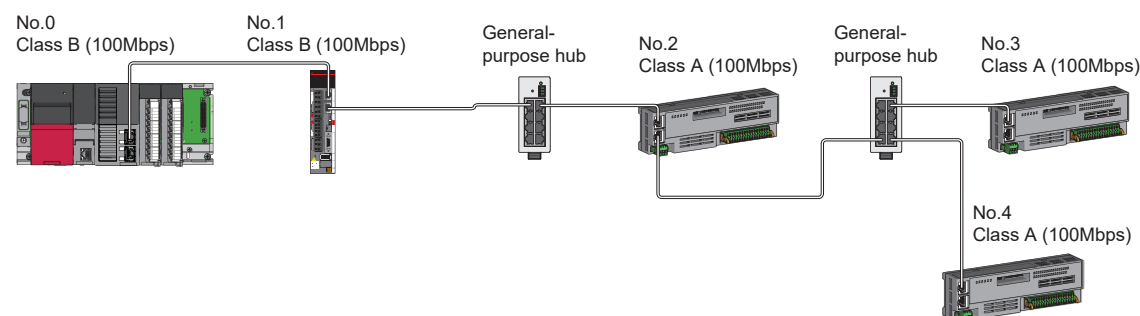
- Connect the master station and remote station at the same communication speed.



No.0: Master station
No.1, No.2, No.3: Remote station
Class A: Authentication Class A device
Class B: Authentication Class B device

Coexistence of line and star topologies

Line and star topologies can be mixed in the same network configuration.



No.0: Master station
No.1, No.2, No.3, No.4: Remote station
Class A: Authentication Class A device
Class B: Authentication Class B device

Structure of modules on CC-Link IE TSN and Ethernet devices

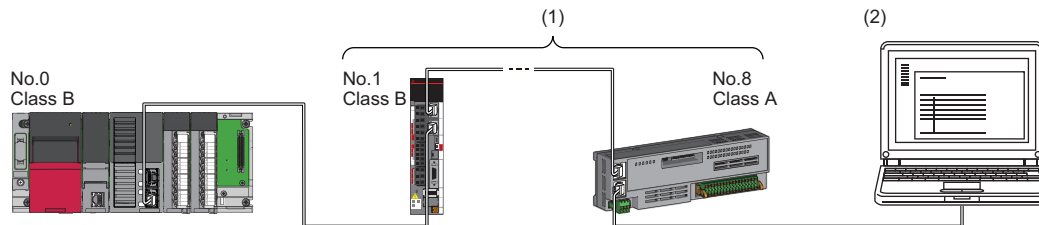
Connection with modules on CC-Link IE TSN and Ethernet devices

■Line topology

The network with modules and devices is configured in a line topology. A general-purpose hub is not required.

Up to eight modules on CC-Link IE TSN can be connected to Ethernet port of the master station at the position indicated with (1).

Connect an Ethernet device at the end.



No.0: Master station
No.1: Remote station (1st module)
No.8: Remote station (8th module)
(2) Ethernet device
Class A: Authentication Class A device
Class B: Authentication Class B device

When an error occurs in some slave stations, the stations connected after the error will be disconnected.

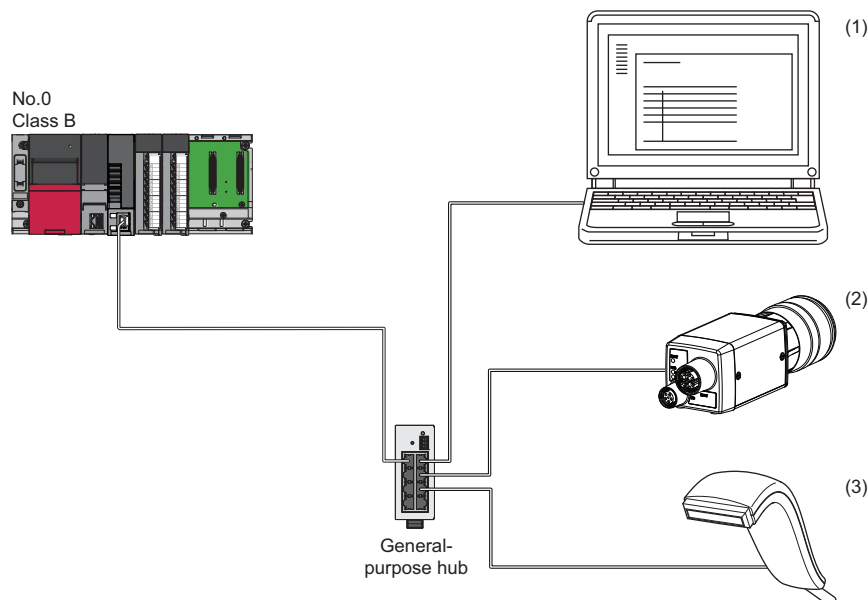
■Star topology

Modules or devices are connected in a star topology via a general-purpose hub. This allows devices to be added easily.

When connecting an Ethernet device with a network communication speed of 100 Mbps, a general-purpose hub is required.

[RD78GH]

A general-purpose hub can be connected to P1 or P2 of the master station respectively.



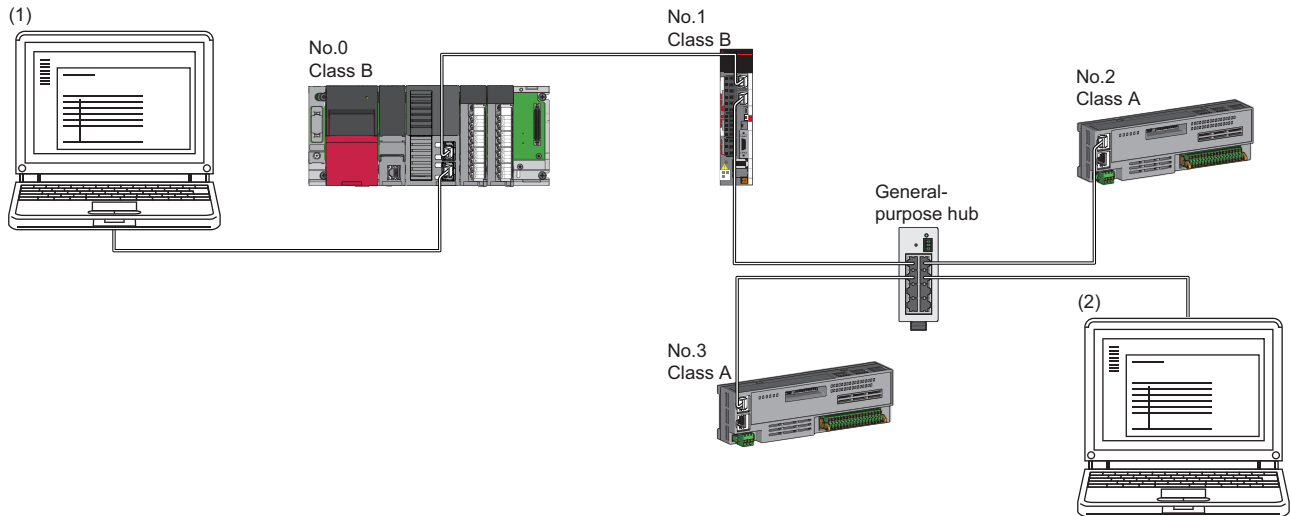
No.0: Master station
(1), (2), (3) Ethernet device (such as a personal computer, vision sensor, or bar code reader)
Class B: Authentication Class B device

Even when an error occurs in a slave station, a data link can be continued with the stations that are operating normally.

■Coexistence of line and star topologies

Line and star topologies can be mixed according to the availability of each connection.

- Connect Ethernet devices at the end.
- When connecting the Ethernet device in a star topology, connect the Ethernet device to the general-purpose hub.



No.0: Master station
No.1, No.2, No.3: Remote station
(1), (2): Ethernet device
Class A: Authentication Class A device
Class B: Authentication Class B device

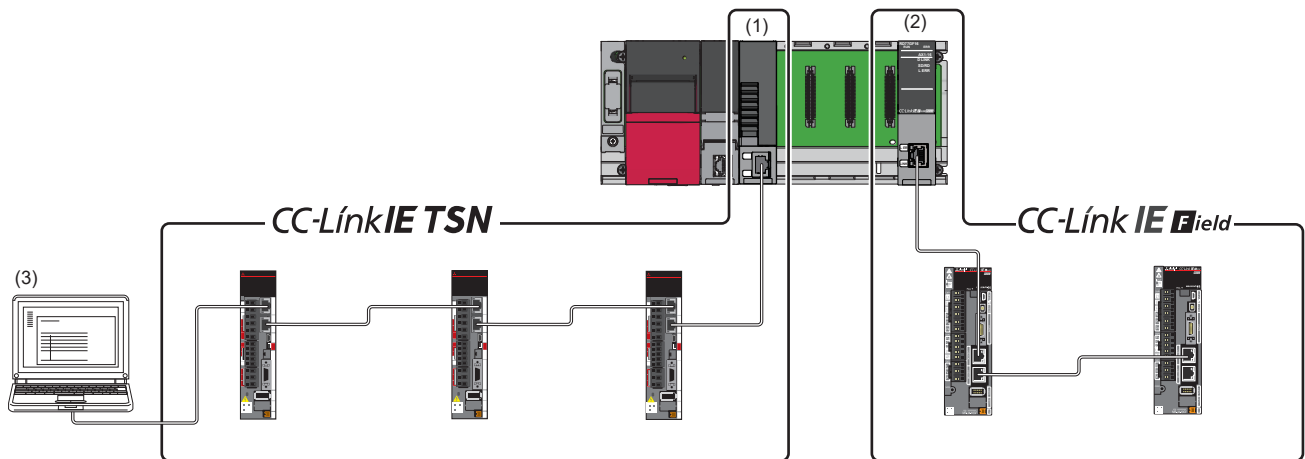
5.3 Structure of CC-Link IE TSN and CC-Link IE Field Network

Set the Motion module and CC-Link IE Field Network master/local-equipped modules to different network numbers, and mount the master station of each network to the same base unit.

Connect Ethernet devices to the end of the network.

For details on CC-Link IE Field Network, refer to the following.

- MELSEC iQ-R Ethernet/CC-Link IE User's Manual (Startup)
- MELSEC iQ-R CC-Link IE Field Network User's Manual (Application)



- (1) Master station (Network No.1)
(2) Master station (Network No.3)
(3) Ethernet device

5.4 Precautions for System Configuration

Devices connected to the same network


Do not connect the devices as described below. Doing so may cause the disconnection of all stations.

- A module on CC-Link IE TSN and a device having different network types (such as CC-Link IE Controller Network or CCLink IE Field Network) other than an Ethernet device are connected to the same network.
- A module on CC-Link IE TSN and an Ethernet device such as a personal computer, both of which are on different networks, are connected to one switching hub.

Adding more than the maximum number of connectable slave stations

If more than the maximum number of connectable slave stations are already connected and further slave stations are added, data link will not be performed in the added 65th and subsequent slave stations, but the other stations will continue data link. Even if the disconnected stations are returned to a system having more than the maximum number of connectable slave stations, the stations may not start data link.

Point

- Whether more than the maximum number of connectable slave stations are connected can be checked using 'Number of connected modules over occurrence status' (SB0099). Number of connected modules detected by 'Number of connected modules over occurrence status' (SB0099) is the total of the slave stations that are currently connected and the disconnected stations (slave stations that were previously connected).
- The number of stations that were previously connected can be cleared by executing the network map update of the CC-Link IE TSN/CC-Link IE Field diagnostics. For details, refer to "Basic Settings" in the following manual.
 MELSEC iQ-R Motion Module User's Manual (Network)
- A data link error may momentarily occur in all the stations and outputs of the connected slave stations may turn off since all stations on the network will be reconnected when executing the network map update. Ensure that the output data is held, if necessary.

Station number of the slave station to be added

Do not duplicate station numbers. Data link may be stopped when the station number is duplicated.

Adding a slave station with no IP address setting


In line topology, do not connect the slave station with no IP address setting at a place other than the end of the line. Data link may not be performed in the slave stations after the slave station with no IP address setting.

CC-Link IE TSN/CC-Link IE Field diagnostics

If the following operations are performed, the actual network configuration and the network map of the CC-Link IE TSN/CC-Link IE Field diagnostics may be a mismatch.

Network configuration	Operation
Star topology	<ul style="list-style-type: none"> • Powering off and on a slave station or switching hub • Connecting/disconnecting an Ethernet cable connected to the switching hub • Disconnecting an Ethernet cable from a slave station and connecting it to another slave station or a switching hub • Disconnecting more than nine stations, or half the number of slave stations or more in the system • Changing the network topology when adding a slave station
Line topology	<ul style="list-style-type: none"> • Simultaneously powering off or on multiple stations • Simultaneously connecting/disconnecting Ethernet cables to/from multiple stations (When a data link faulty station returns, a data link error will occur in all the stations.) • Disconnecting more than nine stations, or half the number of slave stations or more in the system • Changing the network topology when adding a slave station

Point

The actual network configuration and network map can be matched by executing the network map update of the CC-Link IE TSN/CC-Link IE Field diagnostics. For details, refer to "Basic Settings" in the following manual.
 MELSEC iQ-R Motion Module User's Manual (Network)

Calculation of the total cyclic data size

The following shows the calculation formula of the total cyclic data size. The part of the variable surrounded by double quotes (" ") is the setting value of "Network Configuration Settings" under "Basic Settings".

Total cyclic data size = $256 + (106 \times \text{Number of remote stations}) + (\text{Number of "RX Setting" points} \div 8) + (\text{Number of "RWr Setting" points} \times 2)$ [byte]

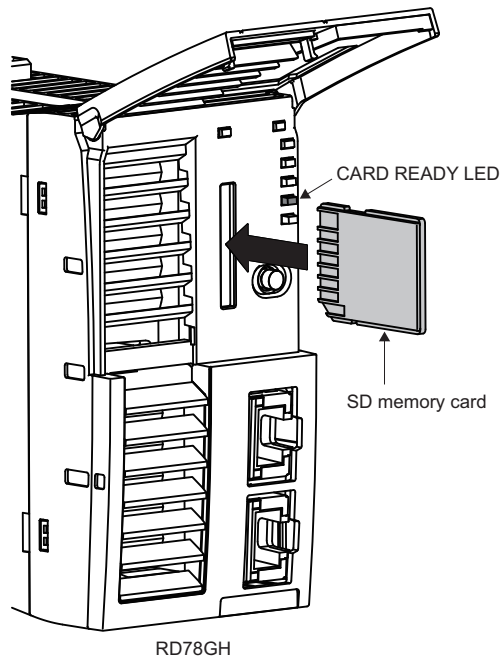
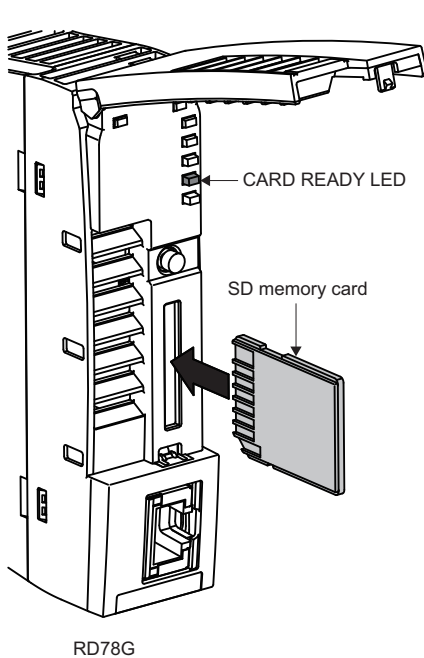
6 INSTALLATION AND WIRING

6.1 Installation and Removal of SD Memory Card

This section describes the methods for installation of an SD memory card to the Motion module, and removal.

Installation of SD memory card

- When installing an SD memory card to the Motion module, take note of the SD memory card position, and install using the following procedure.
1. With the notch facing downwards, insert the SD memory card straight into the slot. After inserting check the SD memory card is inserted all the way in. If the SD memory card is not inserted properly, insufficient contact may cause an operation failure.
 2. The CARD READY LED flickers until the SD memory card can be used. When the CARD READY LED is ON, the SD memory card can be used.
 3. If the CARD READY LED does not turn on after installing an SD memory card, check that `System.Cd.Storage_sdcForcedDisable` and `System.Md.Storage_sdcForcedDisabled` are FALSE.



- Installation of an SD memory card is registered with the event history (type: operation).



When installing an SD memory card, the operation of SD memory card access control switch is not required.

Removal of the SD memory card

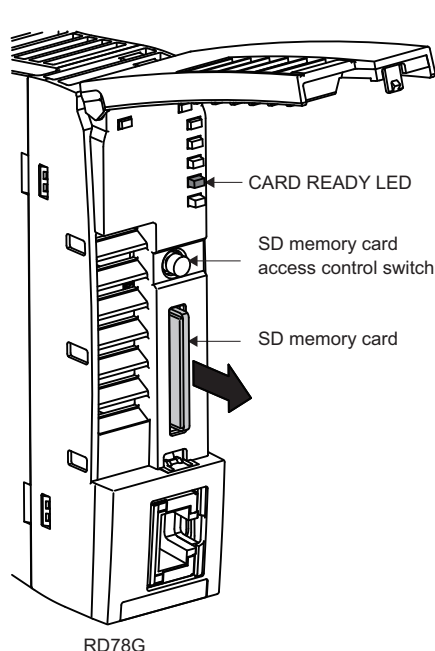
- When removing an SD memory card from the Motion module, remove the SD memory card using the following procedure.

1. Carry out one of the following to stop access of the SD memory card.

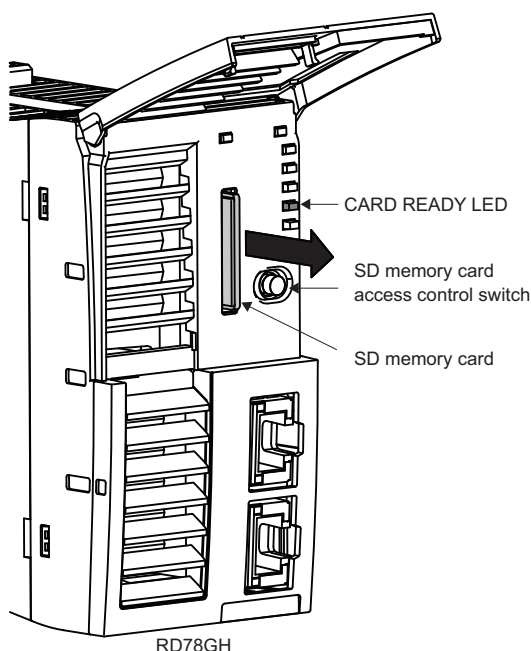
- Hold the SD memory card access control switch for longer than 1s.
- Set `System.Cd.Storage_sdcForcedDisable` to TRUE.

2. During the process of stopping access to the SD memory card, the CARD READY LED flickers, then turns OFF when the process is complete. Before removing, be sure to confirm that the CARD READY LED turns OFF.

3. After pushing in the SD memory card once, pull the SD memory card out straight.



RD78G



RD78GH

- When `System.Cd.Storage_sdcRemovalProhibit` is TRUE, removal using the SD memory card access control switch is ignored. To remove an SD memory card while `System.Cd.Storage_sdcRemovalProhibit` is TRUE, set `System.Cd.Storage_sdcForcedDisable` to TRUE. Then, `System.Cd.Storage_sdcRemovalProhibit` turns FALSE in the system and the SD memory card can be removed.
- Removal of an SD memory card is registered with the event history (type: operation).
- When the SD memory card is removed without it is being disabled, the error "SD Memory card Unload" (error code: 342FH) will be output.
- The access control operation may be rejected depending on the system status (such as initializing, installing software, high system load). In such a case, execute the access control operation again after a while.

Point

- The access control process (CARD READY LED is flashing) may take time.
- Do not remove an SD memory card while the CARD READY LED is not turned OFF. Doing so may damage the data on the SD memory card.
- Even while the SD memory card is accessed (CARD ACCESS LED is ON), holding the SD memory card access control switch for longer than 1s operates the SD memory card forced disable function, and the SD memory card can be stopped access (removal enabled).

Release of the SD memory card forced disable state

The SD memory card forced disable state can be released by turning `System.Cd.Storage_sdcForcedDisable` from TRUE to FALSE. Also, either of the following operation automatically sets `System.Cd.Storage_sdcForcedDisable` to FALSE and the SD memory card is enabled.

Operation

Install the SD memory card again. (The CARD READY LED turns from flashing to ON.)

Turn ON the power of the Motion module again or carry out reset operation.

6.2 Wiring

This section describes wiring for when CC-Link IE TSN is used.

Wiring methods

The following describes connection and disconnection of the Ethernet cable.

■Connecting the cable

1. Push the Ethernet cable connector into the Motion module until it clicks. Pay attention to the direction of the connector.
2. Lightly pull it to check that it is securely connected.
3. Check whether the LINK LED of P1 or P2 of the Ethernet port connected with an Ethernet cable is on. For details about the LED display specifications, refer to the following.

📖 Page 23 LED Display Specifications

The time between the cable connection and the LINK LED turning on 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 "Checking with LED" in the following manual and take corrective actions.

📖 MELSEC iQ-R Motion Module User's Manual (Network)

■Disconnecting the cable

1. Press the latch down and unplug the Ethernet cable.

■Precautions

Be sure to follow the precautions for wiring. Otherwise, some functions may not operate normally. (It may operate normally temporarily.)

- Place the Ethernet cable in a duct or clamp them. If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunction due to poor contact.
- Do not touch the core of the cable-side or module-side connector, and protect it from dirt or dust. If oil from your hand, dirt or dust is attached to the core, it can increase transmission loss, arising a problem in a data link.
- Check that the Ethernet cable is not disconnected or not shorted and there is no problem with the connector connection.
- When connecting the Ethernet cable, refer to the CC-Link IE TSN Cable Installation Manual available from the website of CC-Link Partner Association (www.cc-link.org). The cable installation not following the contents of the manual may cause malfunction.
- Do not use Ethernet cables with broken latches. Doing so may cause the cable to unplug or malfunction.
- Hold the connector part when connecting and disconnecting the Ethernet cable. Pulling the cable connected to the module may result in malfunction or damage to the module or cable.
- For connectors without Ethernet cables, attached connector covers should be placed to prevent foreign matter such as dirt or dust.[RD78GH]
- 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.
- The bend radius of the Ethernet cable is limited. For details, check the specifications of the Ethernet cable to be used.
- In a line topology, do not connect the slave station with no IP address setting between the master station and slave stations, or between slave stations. A data link may not be performed in the slave stations connected from the slave station with no IP address setting onwards. However, if the slave station with no IP address setting is connected at the end of line topology, the slave stations between the master station and the slave station at the end perform a data link.
- Communication with the Ethernet device may not be possible depending on the specifications of the connected Ethernet device or switching hub. If communication is not possible, reduce the communication data volume of the Ethernet device.

Wiring products

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

■Ethernet cable

Use the Ethernet cable that meets the following standards.

Communication speed	Ethernet cable	Connector	Standard
1Gbps	Category 5e or higher, straight cable (shielded, STP)	RJ45 connector	The following conditioning cables: <ul style="list-style-type: none">• IEEE 802.3 (1000BASE-T)• ANSI/TIA/EIA-568-B (Category 5e)
100 Mbps	Category 5 or higher, straight cable (shielded, STP)		The following conditioning cables: <ul style="list-style-type: none">• IEEE 802.3 (100BASE-TX)• ANSI/TIA/EIA-568-B (Category 5)

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

In addition, the connector processing of cable length is available for your preference. 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.)

6

Point

The communication error can occur with the high-frequency noise from the device except CPU unit depending on the connecting environment. The following indicates the countermeasure of the Motion module side to prevent the effect of the high-frequency noise.

Wiring connection

- Use a duplex shield type cable.
- In wiring process, keep a distance with the main circuit lines or power cables.
- Ground the cables with clamping.

■Switching Hub

Use the following industrial switching hub.

Term	Description	Authentication
TSN HUB*1	For the models and usage methods of the switching hubs, refer to the CC-Link Partner Association website (www.cc-link.org).	Authentication Class B device
General-purpose hub		Authentication Class A device

*1 When using a TSN hub, use Add-on baseSystem "Ver.1.8 or later".

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 configuration using a TSN hub and system configuration using a general-purpose hub, setting with an engineering tool is required. (➡ 5 SYSTEM CONFIGURATION)

MEMO

PART 2

Simple Motion MODE

7 PART NAMES

8 SPECIFICATIONS

9 FUNCTION LIST

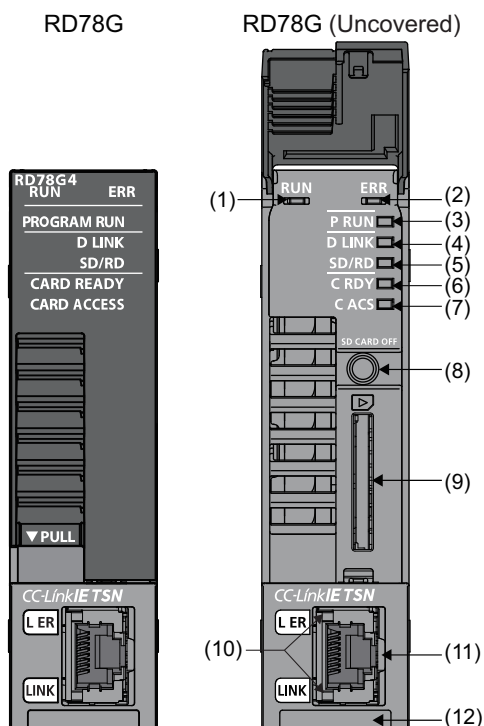
10 PROCEDURES BEFORE OPERATIONS


11 SYSTEM CONFIGURATION

12 INSTALLATION AND WIRING

7 PART NAMES

This chapter describes the part names of the Motion module.



No.	Name	Description
(1)	RUN LED	For details, refer to the following.  Page 65 LED Display Specifications
(2)	ERR LED	
(3)	PROGRAM RUN LED (P RUN is shown inside the cover)	
(4)	D LINK LED	
(5)	SD/RD LED	
(6)	CARD READY LED (C RDY is shown inside the cover)	
(7)	CARD ACCESS LED (C ACS is shown inside the cover)	
(8)	SD memory card access control switch	
(9)	SD memory card slot ^{*1}	
(10)	LEDs for CC-Link IE TSN connector	L ER LED LINK LED
(11)	Ethernet port	
(12)	Serial No. marking	Shows the serial No. printed on the Motion module.

*1 The SD memory card can be used only for software installation.

7.1 LED Display Specifications

This section lists the LED display specifications of the Motion module.

Description differs during software installation. For details, refer to "MODULE SOFTWARE INSTALLATION" in the following manual.

📖 MELSEC iQ-R Motion Module User's Manual (Application for Simple Motion Mode)

□: OFF, ■: ON, ●: Flashing

Name	Description	LED display	Status
RUN LED	Indicates the operating status.	RUN LED■	Operating normally
		RUN LED●	500 ms interval: Clear/Quick-clearing
		RUN LED□	Error occurring, initializing
ERR LED	Indicates the error status.	ERR LED□	Operating normally
		ERR LED■	Error occurring
		ERR LED●	200 ms interval: Error occurring 500 ms interval: Data link error station detected
PROGRAM RUN LED	Indicates the PLC READY status.	PROGRAM RUN LED■	PLC READY ON
		PROGRAM RUN LED□	PLC READY OFF
D LINK LED	Indicates the data link status.	D LINK LED■	Data link (cyclic transmission being performed)
		D LINK LED●	Data link (cyclic transmission stopped)
		D LINK LED□	Data link not performed (disconnection)
SD/RD LED	Indicates the data communication status.	SD/RD LED■	Communicating data ^{*1}
		SD/RD LED□	Not communicating data ^{*1}
CARD READY LED	Indicates the SD memory card status.	CARD READY LED■	SD memory card usable
		CARD READY LED●	Preparing
		CARD READY LED□	Not inserted
CARD ACCESS LED	Indicates the access status of the SD memory card.	CARD ACCESS LED■	Accessing the SD memory card
		CARD ACCESS LED□	Not accessing the SD memory card
L ER LED	Indicates the port status.	L ER LED■	Abnormal data received
		L ER LED□	Normal data received
LINK LED	Indicates the link status.	LINK LED■	Link-up
		LINK LED□	Link-down

^{*1} Includes cyclic transmission and transient transmission data for CC-Link IE TSN.

Error status can be determined by status of the RUN LED and the ERR LED.

RUN LED	ERR LED	Error status	Description
Off	On, flashing	Major error	An error such as hardware failure or memory failure. The module stops operating.
On	Flashing	Moderate error	An error, such as parameter error, which affect module operation. The module stops operating.
On	On	Minor error	An error such as communication, positioning control, and program error. The module continues operating.

When multiple errors occur, the error status is displayed in the order of major, moderate, and minor.

8 SPECIFICATIONS

8.1 Performance Specifications

This section lists the performance specifications of the Motion module.

Item		Description		
		RD78G4	RD78G8	RD78G16
Number of controlled axes		4 axes	8 axes	16 axes
Operation cycle		0.250 ms/0.500 ms/1.000 ms/2.000 ms/4.000 ms		
Interpolation function		2- to 4-axis linear interpolation 2-axis circular interpolation 3-axis helical interpolation		
Control method		PTP (Point To Point) control, path control (linear, circular, and helical 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 (All data can be set from the buffer memory)		
Execution data backup function		Saving the parameters, positioning data, and block start data in the flash ROM (battery-less)		
Positioning	Positioning method	PTP control: Increment method/absolute method Speed-position switching control: Increment method/absolute method Position-speed switching control: Increment method Path control: Increment method/absolute method		
	Positioning range	Absolute method • -214748364.8 to 214748364.7 (μm) • -21474.83648 to 21474.83647 (inch) • 0 to 359.99999 (degree) • -2147483648 to 2147483647 (pulse) Increment method • -214748364.8 to 214748364.7 (μm) • -21474.83648 to 21474.83647 (inch) • -21474.83648 to 21474.83647 (degree) • -2147483648 to 2147483647 (pulse) Speed-position switching control (INC mode)/position-speed switching control • 0 to 214748364.7 (μm) • 0 to 21474.83647 (inch) • 0 to 21474.83647 (degree) • 0 to 2147483647 (pulse) Speed-position switching control (ABS mode)*1 0 to 359.99999 (degree)		
	Speed command	0.01 to 20000000.00 (mm/min) 0.001 to 2000000.000 (inch/min) 0.001 to 2000000.000 (degree/min)*2 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 acceleration/deceleration time each		
	Rapid stop deceleration time	1 to 8388608 (ms)		
	Start time*3			
	Operation cycle 0.250 ms	0.25 to 0.69 ms		
	Operation cycle 0.500 ms	0.38 to 0.84 ms		
	Operation cycle 1.000 ms	0.60 to 1.50 ms		
	Operation cycle 2.000 ms	0.74 to 2.60 ms		
	Operation cycle 4.000 ms	0.77 to 4.50 ms		
Station-to-station distance (max.)		100m		
Number of write accesses to flash ROM		Up to 100000 times		
Number of occupied I/O points		32 points (I/O assignment: Intelligent function module 32 points)		
Internal current consumption (5 V DC)		1.93 A		

Item		Description		
		RD78G4	RD78G8	RD78G16
External dimensions	Height	106 mm (4.17 inch)		
	Width	27.8 mm (1.09 inch) (1 slot width)		
	Depth	110 mm (4.33 inch)		
Mass		0.26 kg		

*1 In the speed-position switching control (ABS mode), only the control unit "degree" can be used.

*2 When "Speed control 10 × multiplier setting for degree axis function" is valid, the speed is 0.01 to 20000000.00 (degree/min).

*3 The time from when the positioning start signal is received until when the BUSY signal turns ON

8.2 Specifications of Interfaces with External Devices


This section lists the external interfaces.

○: Support possible

Interface name	RD78G	Application
CC-Link IE TSN	1 port	Network connection
SD memory card	○	Restoration of parameters and logs

CC-Link IE TSN

The specifications of the CC-Link IE TSN is shown below.

Item		RD77GF4	RD77GF8	RD77GF16
Maximum number of link points per network		RX/RY (Link device)	16K points each (16384 points, 2K bytes)	
		RWr/RWw (including PDO) (Link device)	8K points each (8192 points, 16K bytes)	
Maximum number of link points per station	Master station	RX/RY (Link device)	16K points each (16384 points, 2K bytes)	
		RWr/RWw (Link device)	8K points each (8192 points, 16K bytes)	
Communication speed			• 1 Gbps • 100 Mbps	
Minimum synchronization cycle			250 μs	
Time synchronization accuracy			±1 μs	
Authentication Class			Authentication Class B device	
Maximum number of connectable stations per network*2			120 stations*3*4	
Maximum number of connectable devices per network			256 devices	
Communication cable			Ethernet cable which satisfies standard( Page 114 Wiring products)	
Number of cascade connections			*5	
Maximum number of networks			239	
Network topology			Line topology, star topology*1, line + star topology	
Communication method			Time sharing method	
Transient transmission capacity			1920 bytes maximum	
Safety communications	Maximum number of safety connections per station		Master station: 120 connections	
	Maximum number of safety connections per the same communication destination station		1 connection	
	Maximum number of link points per safety connection		• Input: 8 words • Output: 8 words	

*1 TSN hub is required for star topology.

*2 An error will not occur even if there is no station and axis in the network setting.

*3 Even if the station is a multi-axis drive unit device (a device which can control two axes or more), the number of station is counted as one station when it is recognized as one station.

*4 When a slave emulate is carried out, the number of stations is counted according to the connected device setting.

*5 Consult the manufacturer of the switching hub used.

SD memory card

The specifications of the SD memory card is shown below.

Item	Specification
Card type	SD/SDHC memory card
Card capacity	Up to 32G bytes
UHS, UHS-I	Unsupported
Number of times of installation/removal	Within 500 times

Use the recommended SD memory card listed below.

Model ^{*1}	Manufacturer	Card capacity
NZ1MEM-xGBSD	Mitsubishi Electric Corporation	2, 4, 8, 16G bytes

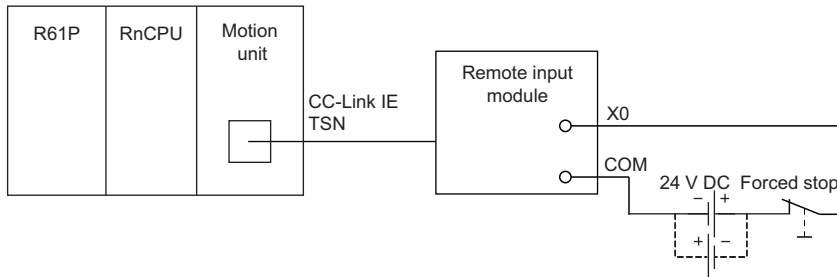
^{*1} The "X" of the model name represents the card capacity.

Before using a commercially available SD memory card, check that the card does not affect the control of the target system on user's own responsibility.

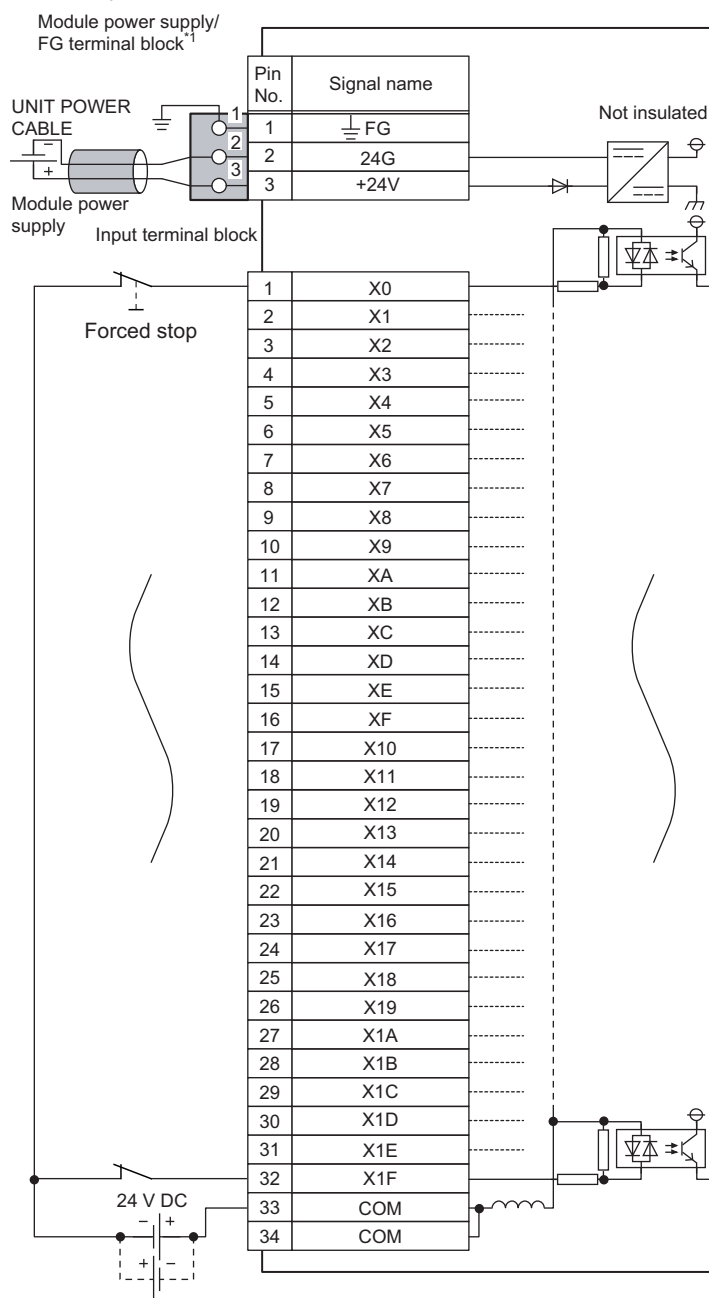
8.3 External Circuit Design

Forced stop circuit

A wiring example which uses a remote input module (NZ2GN2B1-32D) for the forced stop input is shown below. Set AxisName.Pr.ForcedStop_Signal according to the input modules.



<Remote input module NZ2GN2B1-32D>




*1 Only one wire can be connected to a terminal of the terminal block for module power supply and FG. Multiple wires cannot be connected to a terminal. Connecting two or more wires may cause a poor contact.

It is also possible to use the forced stop signal of the drive unit. Operation status of the emergency stop, drive unit forced stop and the Motion controller forced stop are as follows.

Item	Operation when the signal is turned on	Remarks
Emergency stop	Servo OFF	The power supply of the drive unit is shut off by external circuit, and the servomotor stops.
Drive unit forced stop		A stop command from the external circuit to the drive unit is output, and the drive unit stops the servomotor.
Motion controller forced stop		A stop command from the remote input module to the drive unit is output, and the drive unit stops the servomotor.

Shut-off the main circuit power supply of a drive unit when an emergency stop, alarm, servo amplifier forced stop, or remote input module forced stop occurs. Make sure to use molded-case circuit breakers (MCCB) for input wires of a drive unit power supply. For details, refer to the drive unit manual.

MR-J5(W)-G: MR-J5 User's Manual (Hardware)

9 FUNCTION LIST

9.1 Control Functions

The Simple Motion mode has several functions. For details on each function, refer to the following.

📖 MELSEC iQ-R Motion Module User's Manual (Application for Simple Motion Mode)

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 Motion module as "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 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 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 Motion module executes the random positioning operation by inputting a signal into the 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 Motion module is described below.

Main functions			Details
Home position return control	Machine home position return control		Mechanically establishes the positioning start point. (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 Motion module using machine home position return. (Positioning start No. 9002)
Major positioning control	Position control	Linear control (1-axis linear control) (2-axis linear interpolation control) (3-axis linear interpolation control) (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 (1-axis fixed-feed control) (2-axis fixed-feed control) (3-axis fixed-feed control) (4-axis fixed-feed control)	Positions a target by the movement amount designated with the amount set in the positioning data. (With fixed-feed control, the "[Md.20] Feed current value" is set to "0" when the control is started. 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.
		3-axis helical interpolation control	Positions a target using a helical path to a specified position. (Specify the position by specifying the end point address directly or by specifying the relative distance (movement amount) from the current position.)
	Speed control	Speed control (1-axis speed control) (2-axis speed control) (3-axis speed control) (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. The following two methods can be used. (The machine feed value ([Md.21]) cannot be changed.) • Current value changing using positioning data • 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". 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". 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. (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 Motion module is described below.

Sub function		Details
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. 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. 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 0 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. 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. The M code output timing 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 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". 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 incompletion 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 of the servo amplifiers connected to the 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 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	<p>This function returns the setting data stored in the buffer memory/internal memory and flash ROM/internal memory (nonvolatile) of Motion module to the default values.</p> <p>The following two methods can be used.</p> <ul style="list-style-type: none"> • Method using a program • Method using an engineering tool
Execution data backup function	<p>This function writes the execution data being used in the control into the flash ROM/internal memory (nonvolatile).</p> <p>The following two methods can be used.</p> <ul style="list-style-type: none"> • Method using a program • Method using an engineering tool
External input signal select function	<p>This function is used to select from the following signals when using each external input signal of each axis (upper/lower stroke limit signal (FLS/RLS), proximity dog signal (DOG), and stop signal (STOP)).</p> <ul style="list-style-type: none"> • External input signal of servo amplifier • External input signal via CPU (buffer memory)
History monitor function	This function monitors start history and current value history of all axes.
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.
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	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.
Servo transient transmission function	This function reads and writes objects of the slave device via transient transmission.
Test mode	This mode executes the test operation and adjustment of axes using an engineering tool.

9.2 Combination of Main Functions and Sub Functions

With positioning control using the 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 ^{*1}
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	○
		3-axis helical 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 that compensate control		
			Backlash compensation function	Electronic gear function	Near pass function
Home position return control	Machine home position return control		○	○	△*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	○	○	
		3-axis helical 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	○	○	○	◎	○
		3-axis helical 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	○	○	○	○	×
		3-axis helical 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	○	○	○	○	○
		3-axis helical 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	×	○	×	○	△ ^{*4}
			×		×	×
		×	×	×	×	×
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	×	○	○	△ ^{*1}	○	○
		1-axis fixed-feed control	×	○	○	○	○	○
		2-, 3-, or 4-axis fixed-feed control (interpolation)	×	○	○	△ ^{*1}	○	○
		2-axis circular interpolation control	×	○	○	×	×	○
		3-axis helical interpolation control	×	○	○	×	×	○
	Speed control (1- to 4-axis)		×	×	○	×	○	○
	Speed-position switching control		×	○	○	△ ^{*2}	○	○
	Position-speed switching control							
	Other control	Current value changing	×	×	×	×	×	△ ^{*3}
		NOP instruction						×
		JUMP instruction	×	×	×	×	×	×
		LOOP to LEND						
Manual control	JOG operation, inching operation		○	×	△ ^{*4}	×	○	×
	Manual pulse generator operation		○	×	×	×	△ ^{*5}	×
Expansion control	Speed-torque control		×	×	△ ^{*6}	×	○	○
	Advanced synchronous control (output axis)		×	×	△ ^{*7}	×	△ ^{*7}	○

*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-R Motion Module User's Manual (Application for Simple Motion Mode)

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

📖 MELSEC iQ-R Motion Module User's Manual (Advanced Synchronous Control for Simple Motion Mode)

9.3 Network Function List

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)

The symbols in the availability column mean as follows:

○: Available, ×: Not available

Cyclic transmission

This function communicates data periodically among stations on the network using link devices.

Function		Description	Availability	
			Standard station	Motion control station
Communications using RX, RY, RWr, and RWw		Communicates data in units of bits and words between the master station and slave stations.	○	×
Link refresh		Automatically transfers data between the link devices of the Motion module and the devices of the CPU module.	○	×
Direct access to link devices		Directly reads or writes the corresponding data to/from link devices (RWw/RWw/RX/RX/SB/SW/LB/LW) of the CC-Link IE Network module using a sequence program.	○	×
Cyclic data assurance		Assures the cyclic data integrity in units of 32 bits or station-based units.	○	×
Communication cycle coexistence		When slave stations with different communication cycles are included in the network, communicates data using multiple communication cycles according to each slave station.	○	×
I/O maintenance settings	Output hold/clear setting during CPU STOP	Set whether to hold or clear the output when the CPU module is changed from RUN to STOP on the sending side.	○	×
	Data link faulty station setting	Set whether to clear or hold input from a disconnected station. Set it on the receiving side.	○	×
Remote device test		Arbitrarily turns on or off the output of the remote station when the CPU module is in STOP state.	○	×
CANopen communication		Controls a servo amplifier that supports the CANopen profile.	○	○

Transient transmission

This function is used for data communications at any timing and has the following three types.

Function		Description	Availability	
			Standard station	Motion control station
Communications using the SLMP		This type of the data communication is used to read/write data from the external device, such as a personal computer or HMI (Human Machine Interface), to devices in the CPU module of the master station and local station and the buffer memory areas of the remote station via an SLMP.	○	○
Communications using engineering tool		Configures the settings of or monitors each station using an engineering tool.	○	○

Ethernet connection

This function connects an Ethernet device to a module without interfering with CC-Link IE TSN.

Function	Description	Availability	
		Standard station	Motion control station
Connection with MELSOFT products	Programming and monitoring of the programmable controller are performed via Ethernet using the engineering tool.	○	○
Connection with SLMP-compatible devices	Connects SLMP-compatible devices (such as a personal computer or a vision sensor) to the Motion module.	○	○

Security

This function builds security according to the network environment by restricting access for each communication path to the CPU module.

Function	Description	Availability	
		Standard station	Motion control station
IP filter	Identifies the IP address of the access source, and prevents unauthorized access.	○	○
Remote password	Permits or prohibits access from the external device to the CPU module via the Motion module.	○	○

RAS

RAS stands for Reliability, Availability, and Serviceability. This function improves overall usability of automated equipment.

Function	Description	Availability	
		Standard station	Motion control station
Slave station disconnection	Stops data link of the station where an error occurred, and continues data link only for stations that are operating normally.	○	○
Automatic return	Restarts the data link automatically when the slave station that was disconnected due to an error becomes normal again.	○	○
Master station duplication detection	When one network has multiple master stations, detects duplication.	○	○
IP address duplication detection	When one network has stations with the same IP address, detects duplication.	○	○
Time synchronization	Synchronizes the time of slave stations with the time synchronization source (the CPU module of the master station).	○	○

Safety communication

This function allows safety data to be exchanged between safety stations on the same network.

Function	Description	Availability	
		Standard station	Motion control station
Safety communication	Establishes a safety connection and enables one-on-one safety communications periodically between safety stations in the same network.	○	○

Troubleshooting

This function checks the status of modules and networks by executing diagnostics and operation tests using the engineering tool.

Function	Description	Availability	
		Standard station	Motion control station
CC-Link IE TSN/CC-Link IE Field diagnostics	Monitors the status of CC-Link IE TSN. The network maps, stations where data link is not operating, selected station communication status monitor, and other items are displayed on the engineering tool.	○	○
Communication test	Checks if transient transmission data can be properly routed from the own station to the communication target.	○	○

Others

Function		Description	Availability	
			Standard station	Motion control station
"CC-Link IE TSN Configuration" window	Parameter setting of a slave station	Sets parameters of slave stations (the number of points and assignment of link devices) in the master station.	○	○
	Detection of connected/disconnected devices	Detects connected slave stations and the stations are displayed on the "CC-Link IE TSN Configuration" window.	○	○
	Parameter processing of a slave station	Reads the parameters from the slave station and saves them, then writes the saved parameters to the slave station.	○	○
	Command execution to slave stations	Executes commands (Error clear request, Error history clear request) to a slave station.	○	○
Network synchronous communication		Control cycles of slave stations can be synchronized according to the one specified in the master station.	×	○
Reserved station setting		A slave station that is set in the parameters and included as a station in the network when its number is counted. This station is reserved for network extension in the future, and thus the station is not actually connected, and is not detected as a faulty station despite being not connected. When a reserved station is set, assignment of link devices does not change even if a slave station is connected (a reserved station is unassigned), thus program modification is not required.	○	×
Error invalid station setting		A slave station that is set to be not detected as a faulty station by the master station. Carry out this setting when replacing a slave station during a data link as well.	○	×
Slave station parameter automatic setting		Saves parameters of the slave station to the master station, and sets the parameters automatically when the slave station is connected or returned to the network.	○	○


10 PROCEDURES BEFORE OPERATIONS

This chapter describes the procedures before operations in the Simple Motion mode.

1. Mounting the module

Mount the Motion module to the main base unit or extension base unit.

For details, refer to the following.

 MELSEC iQ-R Module Configuration Manual

2. Wiring

Connect the Motion module to external devices.

3. Adding the module

Add the RD78G_(S)*1 to the module map of the project using GX Works3.



When the Simple Motion mode is used, "RD78G_(S)" is displayed as the module model name in GX Works3.

*1 " _ " (underscore) indicates the number of control axes (4/8/16).

4. Network construction

Set network parameters in "Module Parameter (Network)" of GX Works3.

- Set the communication cycle setting for "Network Configuration Settings".

Set the basic communication cycle according to the number of control axes or network device configuration. For a reference of the cycle, check the operation cycle.

- For the network configuration, set the slave stations in the control setting with them assigned to axes.

The slave station to be controlled in the Motion module needs to be set in the motion control station. Also, for a station set as the motion control station, set the basic cycle for the communication cycle.

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

 MELSEC iQ-R Motion Module User's Manual (Network)

5. Auto refresh setting

Configure the link refresh settings in "Basic Settings" of "Module Parameter (Network)".

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

 MELSEC iQ-R Motion Module User's Manual (Network)

Configure the refresh settings for the monitor data of the control axis in "Module Parameter (Motion)".

For details, refer to "Module Parameter" in the following manual.

 MELSEC iQ-R Motion Module User's Manual (Application for Simple Motion Mode)

6. Module setting (Simple Motion module setting function (module extended parameter))

Configure the settings related to axis control in "Simple Motion Module Setting Function (Module Extended Parameter)" of the engineering tool.

For details, refer to "Simple Motion Module Setting" in the following manual.

 MELSEC iQ-R Motion Module User's Manual (Application for Simple Motion Mode)

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

 MELSEC iQ-R Motion Module User's Manual (Application for Simple Motion Mode)

Or, refer to the following manual.

 MELSEC iQ-R Motion Module User's Manual (Advanced Synchronous Control for Simple Motion Mode)

7. Programming

Create programs.

For details, refer to "Creating a Program" in the following manual.

 MELSEC iQ-R Motion Module User's Manual (Application for Simple Motion Mode)

8. Writing parameters (CPU module)

Write the parameters set and program created in GX Works3 to the CPU module.

9. Switching the system

Restart the system by powering off and on the system or by resetting the CPU module.


10. Writing parameters (Motion module)

Write the parameters (Simple Motion module setting) set in GX Works3 to the Motion module.

11. Network diagnostics

Using network diagnostics, check if the cables are connected properly and communications are performed normally with the parameters.

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

 MELSEC iQ-R Motion Module User's Manual (Network)

12. Parameter settings in slave devices

Set parameters of the drive unit to use.

For details, refer to each drive unit manual.

For MR-J5(W)-G:  MR-J5-G/MR-J5W-G User's Manual (Parameters)

13. Test mode

Execute the test operation using GX Works3.

For details, refer to "Test mode" in the following manual.

 MELSEC iQ-R Motion Module User's Manual (Application for Simple Motion Mode)

14. Test operation

Check that the program is correctly carried out as created.

Point

When multiple slave stations are powered on simultaneously, the startup time of the slave stations may vary. In such a case, the networks are connected in turn, resulting in the possibility of the longer time to complete data links at all stations.

Powering on the master station after all slave stations have started prevents the time required for data links at all stations to increase.


10.1 Communication with the engineering tool

This section describes communication between the motion system and external devices such as GX Works3 (Simple Motion module setting function).

For details of the online function, refer to the following manual.

 GX Works3 Operating Manual

For communication for access to other module from a tool such as the engineering tool via the Motion module, refer to "Communications using the engineering tool" in the following manual.

 MELSEC iQ-R Motion Module User's Manual (Network)

Operation of this function for each system status

○: Possible, △: Possible (with restrictions)

Status	Operation availability
STOP	○
RUN	○
Moderate error	○
Major error	△ (Communication with the Motion module may not be performed depending on the error status. In that case, monitor the error status on the control CPU side.)

Accessible path

Communication with the Motion module is possible only through connection with the control CPU or own Motion module. Communication via a module other than the control CPU or own Motion module on the base may not be possible depending on the path.

Precautions

The error will occur when accessing to the motion system from multiple devices simultaneously. (Or the error may not occur.) In such a case, try communication again after a while.

Relevant Add-ons, Versions

Communication with the engineering tool is possible without even one add-on being installed.



When file transfer function (Add-on File Transfer) is enabled, transfer time of reading and writing the project data from the engineering tool is shortened by compressing the data.

System memory capacity

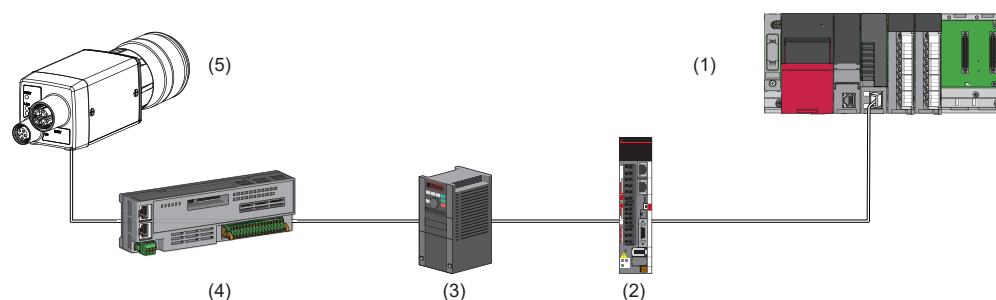
The system memory will not be used because add-on is not used for the communication.

However, when file transfer function (Add-on File Transfer) is enabled, Add-on File Transfer will use the system memory when reading and writing the project data from the engineering tool.

11 SYSTEM CONFIGURATION

CC-Link IE TSN is configured using Ethernet cables. (☞ Page 114 Ethernet cable)

For specifications on connectable devices, refer to the manual of each device.



- (1) Motion module
- (2) Drive unit
- (3) Inverter device
- (4) Remote I/O module
- (5) Ethernet device

Precautions

A dedicated TSN hub may be required depending on parameter settings or the network topology used to connect modules on CC-Link IE TSN.

Read the following carefully.

☞ Page 92 Structure of Authentication Class B Devices and Ethernet Devices

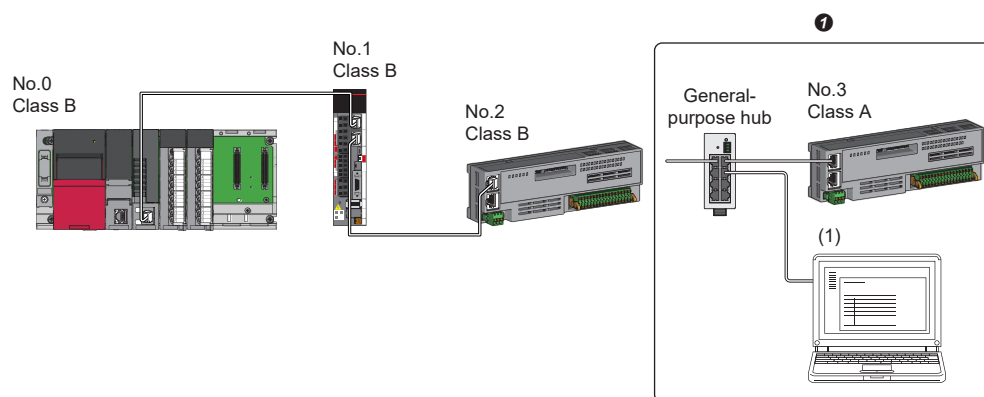
☞ Page 114 Switching Hub

Authentication Class setting

From "Connection Device Information" under "Basic Settings" of the engineering tool, select either of the following items according to devices to be connected.

Connected device information	System configuration	Switching Hub	Supported standard
Authentication Class B Only	Select this if the system is to be configured without connecting the authentication Class A device. <ul style="list-style-type: none"> ☞ Page 94 Connection with modules on CC-Link IE TSN only ☞ Page 97 Connection with modules on CC-Link IE TSN and Ethernet devices 	TSN hub (authentication Class B switching hub)	IEEE802.1AS
Mixture of Authentication Class B/A or Authentication Class A Only	Select this if the authentication Class A device or Ethernet device is connected to the configuration of an authentication Class B device only. (☞ Page 106 Connection with modules on CC-Link IE TSN and Ethernet devices)	General-purpose hub (authentication Class A switching hub)	IEEE1588

When "Connection Device Information" is set to "Mixture of Authentication Class B/A or Authentication Class A Only", line topology can be used with the structure with the authentication Class B device only as shown below. To implement this setting, select this when connecting the authentication Class A device and Ethernet device after connecting a general-purpose hub to the end of the network of the authentication Class B device only.



No.0: Master station

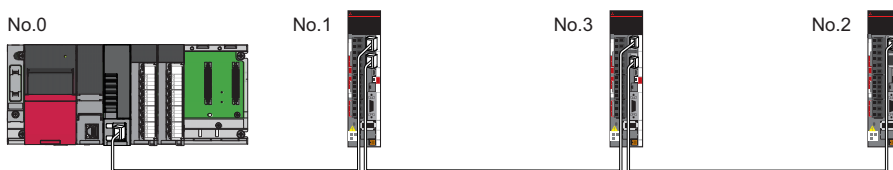
No.1, No.2, No.3: Remote station

(1) Ethernet device

① When the authentication Class A device or Ethernet device is connected



Modules can be connected in any order regardless of the station number. No. □ shown in the following figure represents station No.



Ethernet connection

For connection with MELSOFT products and a GOT, and connection with SLMP-compatible devices, refer to "Ethernet Connection" in the following manual.

☞ MELSEC iQ-R Motion Module User's Manual (Network)

With the Safety CPU

When the Motion module is used with the Safety CPU, the safety communications are available in addition to the standard communications (cyclic transmission and transient transmission).

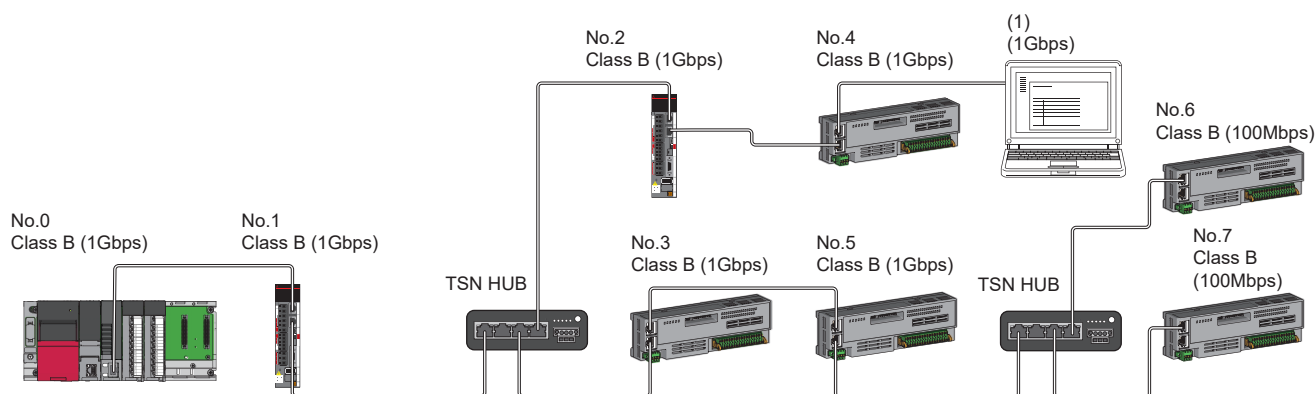
For details on the safety communications, refer to "Safety Communication" in the following manual.

☞ MELSEC iQ-R Motion Module User's Manual (Network)

11.1 Structure of Authentication Class B Devices and Ethernet Devices

The following shows the system configuration when "Connection Device Information" under "Basic Settings" is set to "Authentication Class B Only" in the engineering tool.

When "Connection Device Information" under "Basic Settings" of the master station is set to "Authentication Class B Only", up to 121 devices (one master station and 120 slave stations) can be connected.



No.0: Master station
 No.1, No.2, No.3, No.4, No.5, No.6, No.7: Remote station
 (1) Ethernet device
 Class B: Authentication Class B device

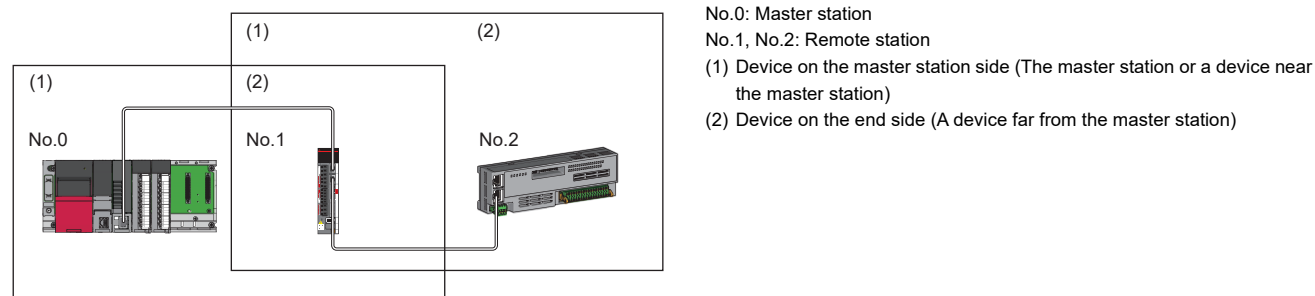
The availability of connection of network configuration devices varies depending on the communication mode and communication speed.

- Unicast mode

Page 93 When the communication speed for the master station is set to 1 Gbps

Page 93 When the communication speed for the master station is set to 100 Mbps

The following terms are used to describe the terms in the tables referenced.



Structure of unicast mode

The following shows the availability of connection with a network configuration device.

When the communication speed for the master station is set to 1 Gbps

The following table lists the availability of connection with a network configuration device when the "Communication Speed" for the master station is set to "1 Gbps".

○: Connection available, △: Connection available via a switching hub, ×: Connection not available

S: TSN hub available

H: General-purpose hub available

Device on the master station side (A device near the master station)		Device on the end side (A device far from the master station)			
		Remote station (Authentication Class B device)		Ethernet device	
		1Gbps	100Mbps	1Gbps	100Mbps
Master station (Authentication Class B device)	1Gbps	○S	△S ^{*1}	○SH	△SH
Remote station (Authentication Class B device)	1Gbps	○S	△S ^{*1*2}	○SH	△SH
	100Mbps	×	○S ^{*1*2}	×	○SH

*1 For a slave station with a communication speed of 100 Mbps, set "Communication Period Setting" to "Low-Speed".

*2 A connection cannot be established if the total cyclic data size of all slave stations on the 100 Mbps device side exceeds 2K bytes. This includes the devices with a communication speed of 100 Mbps that form a boundary between the communication speed of 1 Gbps and 100 Mbps. (☞ Page 110 Calculation of the total cyclic data size)

Precautions

When a TSN hub is used, check the TSN switching hub specifications on the CC-Link Partner Association website (www.cc-link.org).

When the communication speed for the master station is set to 100 Mbps

The following table lists the availability of connection with a network configuration device when the "Communication Speed" for the master station is set to "100 Mbps".

○: Connection available, ×: Connection not available

S: TSN hub available

H: General-purpose hub available

Device on the master station side (A device near the master station)		Device on the end side (A device far from the master station)			
		Remote station (Authentication Class B device)		Ethernet device	
		1Gbps	100Mbps	1Gbps	100Mbps
Master station (Authentication Class B device)	100Mbps	×	○S ^{*1}	×	○SH
Remote station (Authentication Class B device)	1Gbps	×	×	×	×
	100Mbps	×	○S ^{*1}	×	○SH

*1 For a slave station with a communication speed of 100 Mbps, set "Communication Period Setting" to "Basic Period".

Precautions

When a TSN hub is used, check the TSN switching hub specifications on the CC-Link Partner Association website (www.cc-link.org).

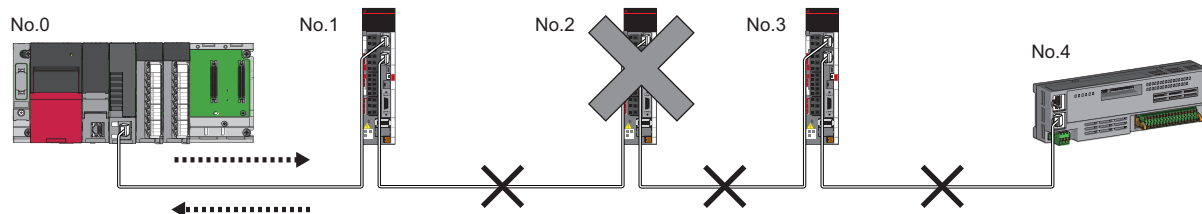
Structure of modules on CC-Link IE TSN only

Connection with modules on CC-Link IE TSN only

■Line topology

The network is configured in a line topology. A TSN hub is not required.

When an error occurs in a slave station, the stations connected after the faulty station will be disconnected.

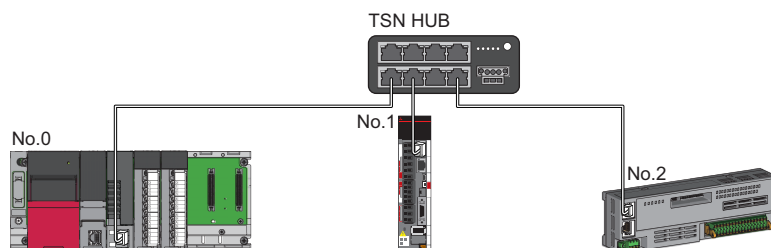


No.0: Master station

No.1, No.2, No.3, No.4: Remote station

■Star topology

The network is configured in a star topology via a TSN hub. This allows devices to be added easily.



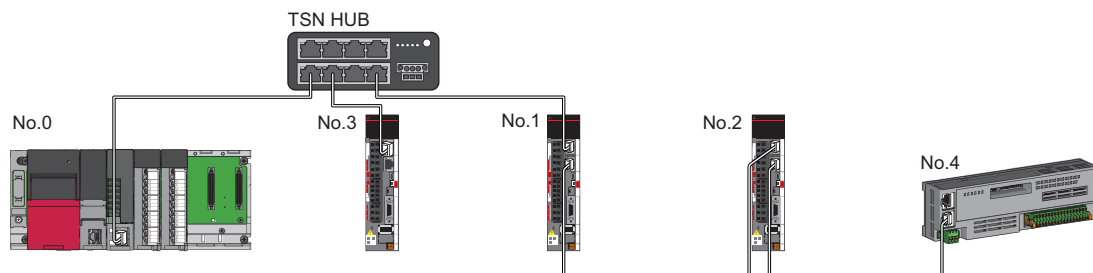
No.0: Master station

No.1, No.2: Remote station

Even when an error occurs in a slave station, a data link can be continued with the stations that are operating normally.

■Coexistence of line and star topologies

Line and star topologies are mixed.



No.0: Master station

No.1, No.2, No.3, No.4: Remote station

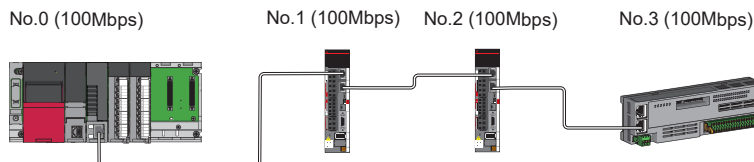
Connection with modules on CC-Link IE TSN with a communication speed of 100 Mbps

This section describes the network topology when "Communication Speed" under "Application Settings" is set to "100 Mbps".

Line topology

The network is configured in a line topology.

- Adjust the communication speed of each module.
- When modules with different communication speeds are connected, connect via a TSN hub or general-purpose hub.

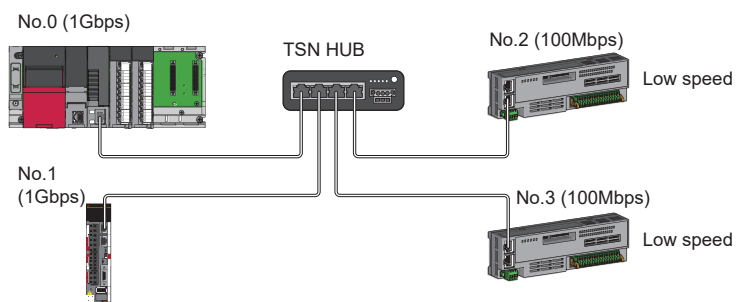


No.0: Master station
No.1, No.2, No.3: Remote station

Star topology

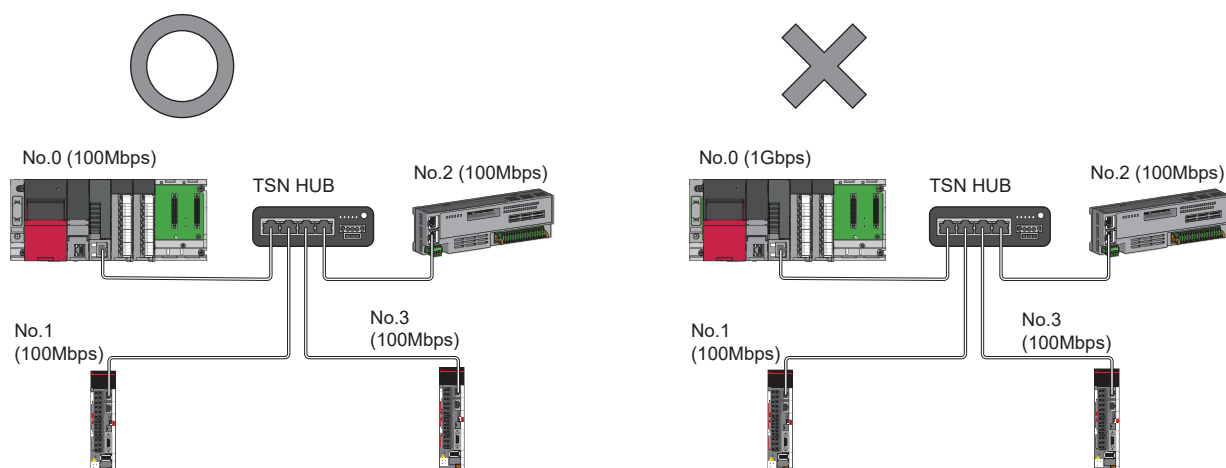
Modules or devices are connected in a star topology via a switching hub.

- When the master station with a communication speed of 1 Gbps and a remote station with a communication speed of 100 Mbps exist in the structure, set "Communication Period Setting" to "Low-Speed" for the remote station with a communication speed of 100 Mbps.



No.0: Master station
No.1, No.2, No.3: Remote station

- Connect the master station and remote station at the same communication speed.

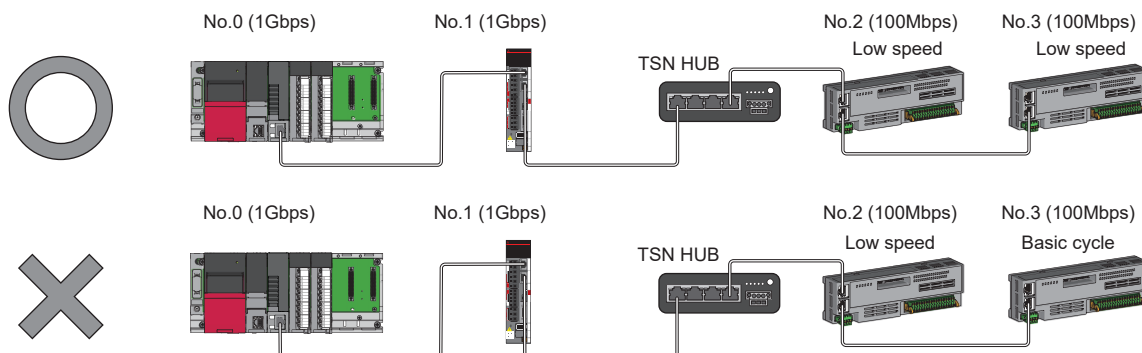


No.0: Master station
No.1, No.2, No.3: Remote station

■Coexistence of line and star topologies

Line and star topologies can be mixed in the same network configuration.

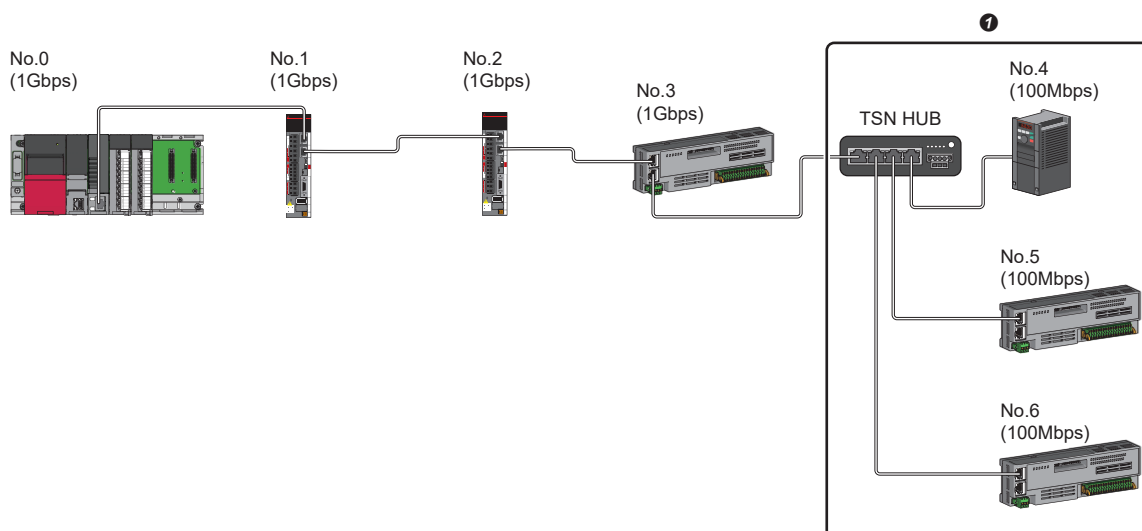
- When the master station with a communication speed of 1 Gbps and a remote station with a communication speed of 100 Mbps exist in the structure, set "Communication Period Setting" to "Low-Speed" for the remote station with a communication speed of 100 Mbps.



No.0: Master station

No.1, No.2, No.3: Remote station

- When the communication speed of the master station is 1 Gbps, a connection cannot be established if the total cyclic data size of all slave stations on the 100 Mbps device side exceeds 2K bytes. This includes the devices with a communication speed of 100 Mbps that form a boundary between the communication speed of 1 Gbps and 100 Mbps.



No.0: Master station

No.1, No.2, No.3, No.4, No.5, No.6: Remote station

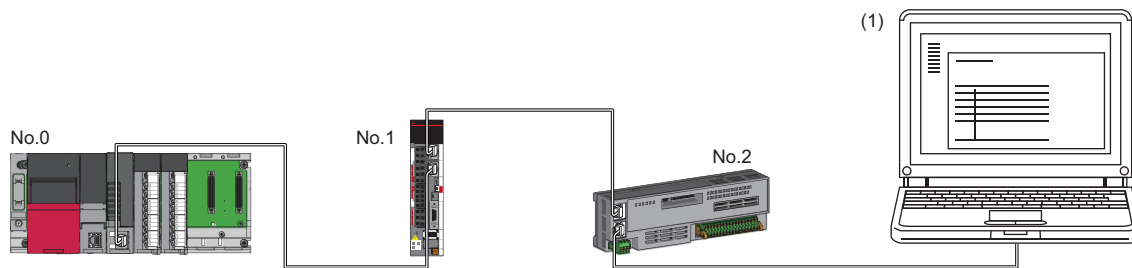
- Set the total cyclic data size within 2K bytes.

Structure of modules on CC-Link IE TSN and Ethernet devices

Connection with modules on CC-Link IE TSN and Ethernet devices

■Line topology

The network with modules and devices is configured in a line topology. A TSN switching hub is not required. Connect Ethernet devices to the end of the network.



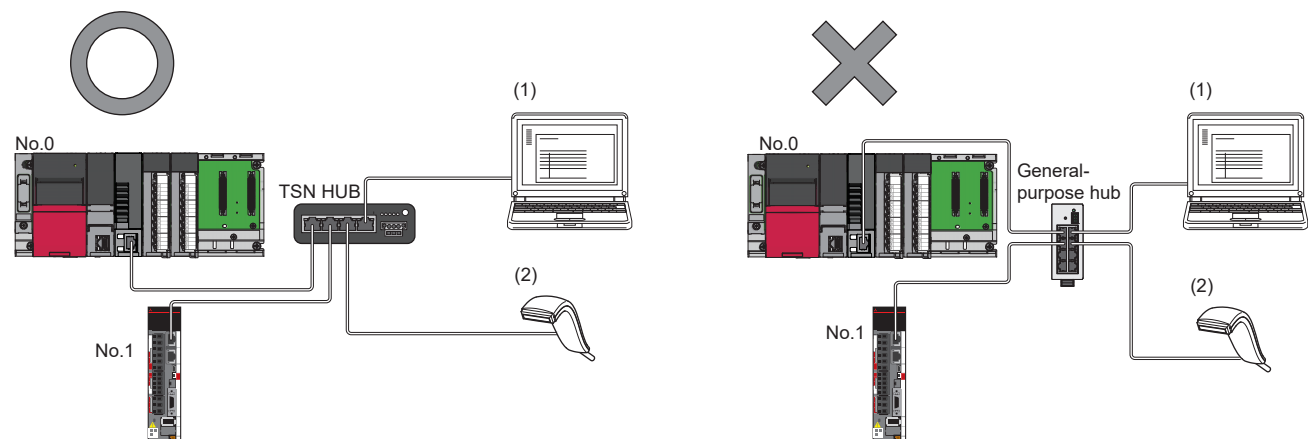
No.0: Master station
No.1, No.2: Remote station
(1) Ethernet device (such as a personal computer)

When an error occurs in a slave station, the stations connected after the faulty station will be disconnected.

■Star topology

Modules or devices are connected in a star topology via a switching hub.

Slave stations cannot be connected with a general-purpose hub. Line and star topologies should be mixed in the same network configuration.

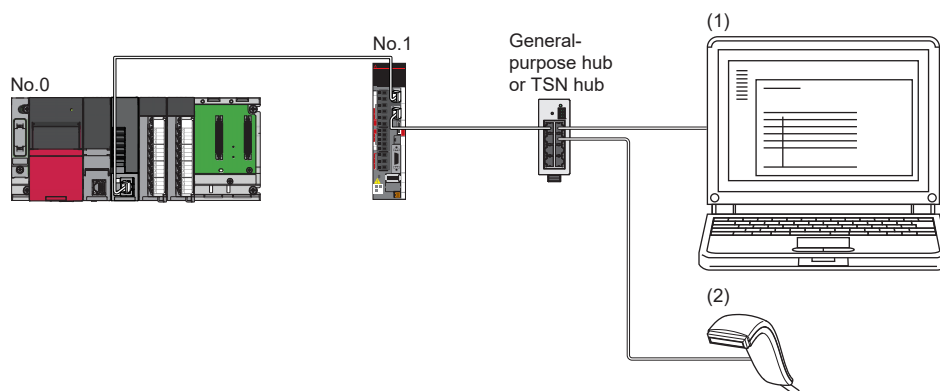


No.0: Master station
No.1: Remote station
(1), (2): Ethernet device

■ Coexistence of line and star topologies

Line and star topologies can be mixed in the same network configuration.

Connect Ethernet devices to the end of the network.

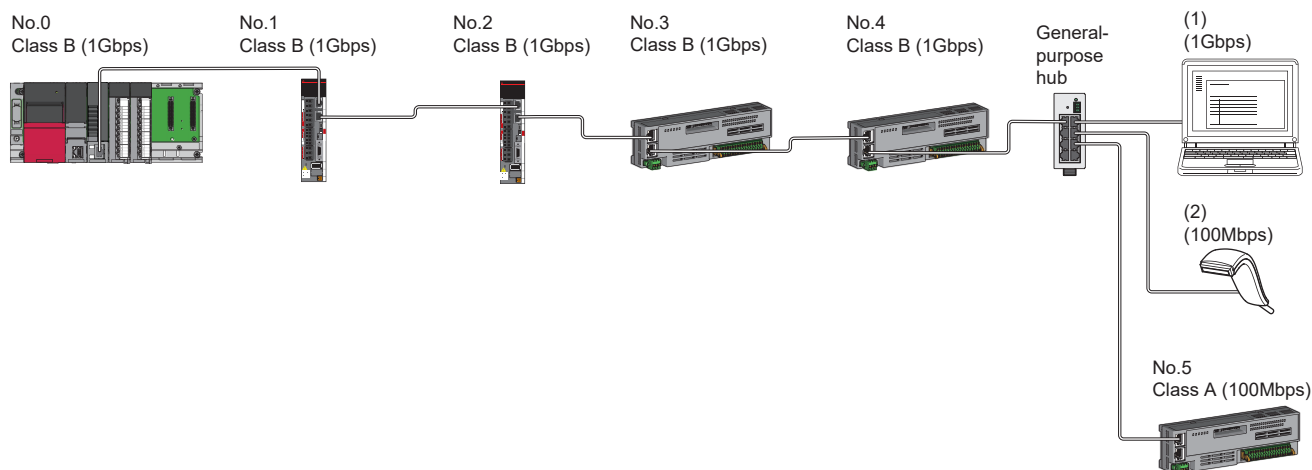


No.0: Master station
No.1: Remote station
(1), (2): Ethernet device

11.2 Structure of Authentication Class B/A Devices and Ethernet Devices

Set "Connection Device Information" under "Basic Settings" to "Mixture of Authentication Class B/A" or "Authentication Class A Only" in the engineering tool.

When "Connection Device Information" under "Basic Settings" of the master station is set to "Mixture of Authentication Class B/A" or "Authentication Class A Only", up to 121 devices (one master station and 120 slave stations) can be connected.



No.0: Master station

No.1, No.2, No.3, No.4, No.5: Remote station

(1), (2) Ethernet device

Class A: Authentication Class A device

Class B: Authentication Class B device

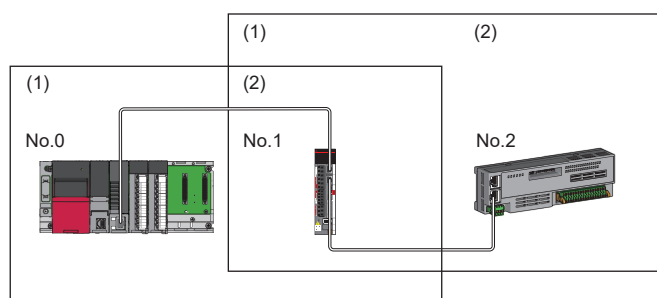
The availability of connection of network configuration devices varies depending on the communication mode and communication speed.

- Unicast mode

Page 100 When the communication speed for the master station is set to 1 Gbps

Page 100 When the communication speed for the master station is set to 100 Mbps

The following terms are used to describe the terms in the tables referenced.



No.0: Master station

No.1, No.2: Remote station

(1) Device on the master station side (The master station or a device near the master station)

(2) Device on the end side (A device far from the master station)

Structure of unicast mode

The following shows the availability of connection with a network configuration device when "Communication Mode" under "Application Settings" is set to "Unicast".

When the communication speed for the master station is set to 1 Gbps

The following table lists the availability of connection with a network configuration device when the "Communication Speed" for the master station is set to "1 Gbps".

○: Connection available, △: Connection available via a switching hub, ×: Connection not available

H: General-purpose hub available

Device on the master station side (A device near the master station)		Device on the end side (A device far from the master station)					
		Remote station (Authentication Class B device)		Remote station (Authentication Class A device)		Ethernet device	
		1Gbps	100Mbps	1Gbps	100Mbps	1Gbps	100Mbps
Master station (Authentication Class B device)	1Gbps	○	×	○H	△H*1	○H	△H
Remote station (Authentication Class B device)	1Gbps	○	×	○H*2	△H*1*2	○H	△H
	100Mbps	×	×	×	×	×	×
Remote station (Authentication Class A device)	1Gbps	×	×	○H*2	△H*1*2	○H	△H
	100Mbps	×	×	×	○H*1*2	×	○H

*1 For a slave station with a communication speed of 100 Mbps, set "Communication Period Setting" to "Low-Speed".

*2 A connection cannot be established if the total cyclic data size of all slave stations on the authentication Class A device side that form a boundary between authentication Class B and authentication Class A exceeds 2K bytes. (Page 110 Calculation of the total cyclic data size)

Precautions

When a TSN hub is used, check the TSN switching hub specifications on the CC-Link Partner Association website (www.cc-link.org).

When the communication speed for the master station is set to 100 Mbps

The following table lists the availability of connection with a network configuration device when the "Communication Speed" for the master station is set to "100 Mbps".

○: Connection available, ×: Connection not available

H: General-purpose hub available

Device on the master station side (A device near the master station)		Device on the end side (A device far from the master station)					
		Remote station (Authentication Class B device)		Remote station (Authentication Class A device)		Ethernet device	
		1Gbps	100Mbps	1Gbps	100Mbps	1Gbps	100Mbps
Master station (Authentication Class B device)	100Mbps	×	○*2	×	○H	×	○H
Remote station (Authentication Class B device)	1Gbps	×	×	×	×	×	×
	100Mbps	×	○*2	×	○H*1	×	○H
Remote station (Authentication Class A device)	1Gbps	×	×	×	×	×	×
	100Mbps	×	×	×	○H*1	×	○H

*1 A connection cannot be established if the total cyclic data size of all slave stations on the authentication Class A device side that form a boundary between authentication Class B and authentication Class A exceeds 2K bytes. (Page 110 Calculation of the total cyclic data size)

*2 For a slave station with a communication speed of 100 Mbps, set "Communication Period Setting" to "Basic Period" or "Normal-Speed".

Precautions

When a TSN hub is used, check the TSN switching hub specifications on the CC-Link Partner Association website (www.cc-link.org).

Structure with modules on CC-Link IE TSN

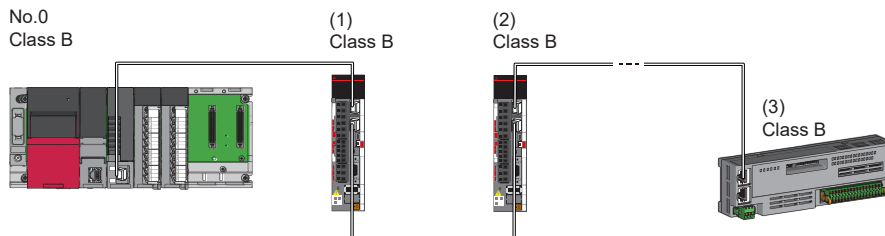
Connection with modules on CC-Link IE TSN only

■Line topology

The network is configured in a line topology.

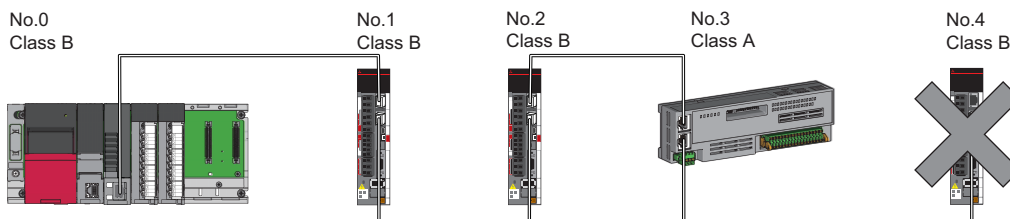
- Up to eight authentication Class B devices can be connected to P1 or P2 of the master station.

11



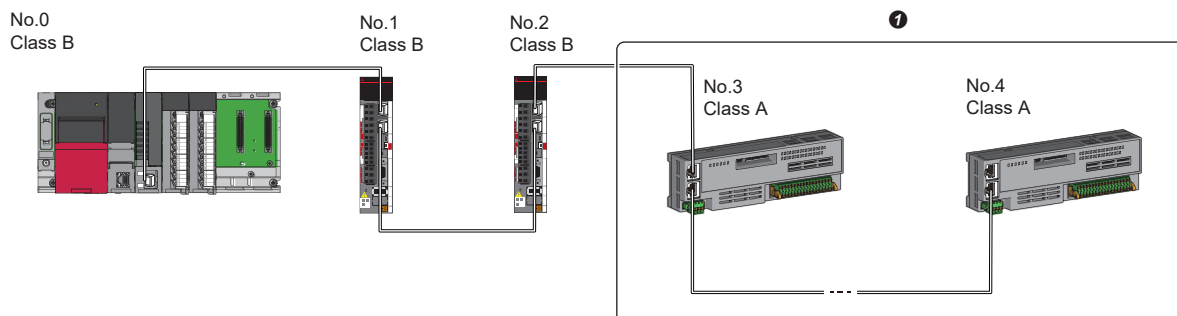
No.0: Master station
 (1) Remote station (1st device)
 (2) Remote station (2nd device)
 (3) Remote station (8th device)
 Class B: Authentication Class B device

- The authentication Class B device cannot be connected to the authentication Class A device.



No.0: Master station
 No.1, No.2, No.3, No.4: Remote station
 Class A: Authentication Class A device
 Class B: Authentication Class B device

- A connection cannot be established if the total cyclic data size of all slave stations on the authentication Class A device side exceeds 2K bytes. This includes the authentication Class A device that forms a boundary between authentication Class B and authentication Class A.



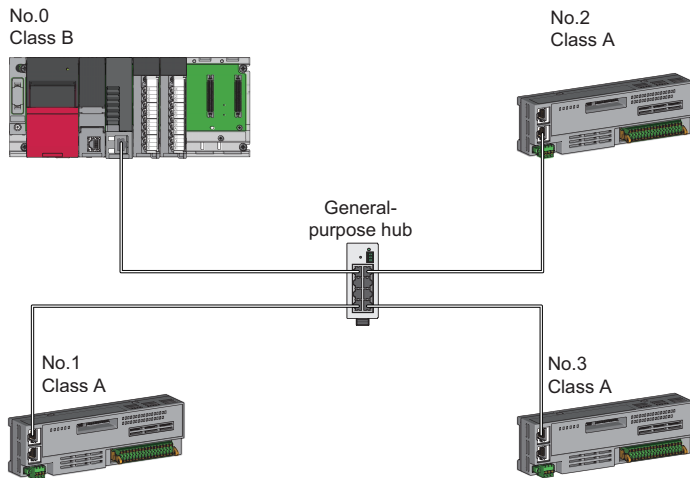
No.0: Master station
 No.1, No.2, No.3, No.4: Remote station
 Class A: Authentication Class A device
 Class B: Authentication Class B device

- ① Set the total cyclic data size within 2K bytes.

■Star topology

Modules or devices are connected in a star topology via a switching hub.

- When connecting the authentication Class A device to the authentication Class B device or connecting the authentication Class A device to the authentication Class A device in a star topology, connect via a general-purpose hub.

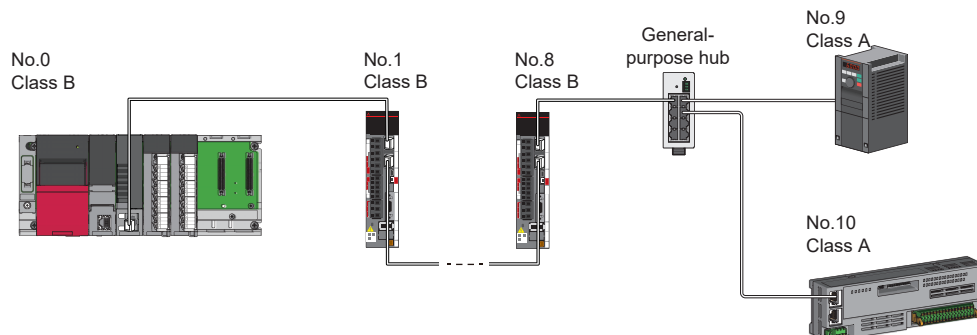


No.0: Master station
No.1, No.2, No.3: Remote station
Class A: Authentication Class A device
Class B: Authentication Class B device

■ Coexistence of line and star topologies

Line and star topologies can be mixed according to the availability of connection described below.

- Up to eight slave stations of authentication Class B can be connected to the transmission path from the master station to the authentication Class B device of the end.
- When connecting an authentication Class B devices, connect them from P1 of the master station.
- When connecting authentication Class A devices, connect them at the end of an authentication Class B device. In this case, they can be connected in a star topology by using a general-purpose hub.



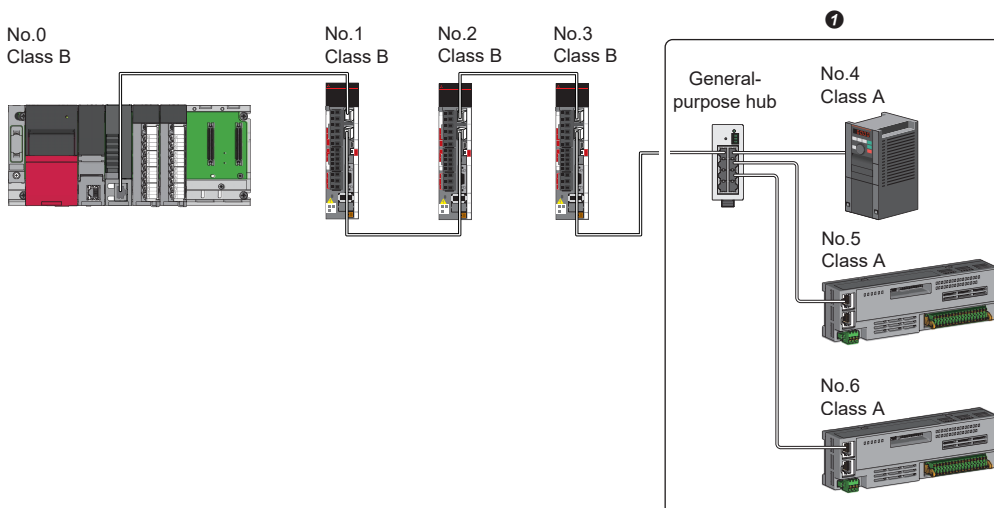
No.0: Master station

No.1, No.8, No.9, No.10: Remote station

Class A: Authentication Class A device

Class B: Authentication Class B device

- A connection cannot be established if the total cyclic data size of all slave stations on the authentication Class A device side that form a boundary between authentication Class B and authentication Class A exceeds 2K bytes.



No.0: Master station

No.1, No.2, No.3, No.4, No.5, No.6: Remote station

Class A: Authentication Class A device

Class B: Authentication Class B device

- ① Set the total cyclic data size within 2K bytes.

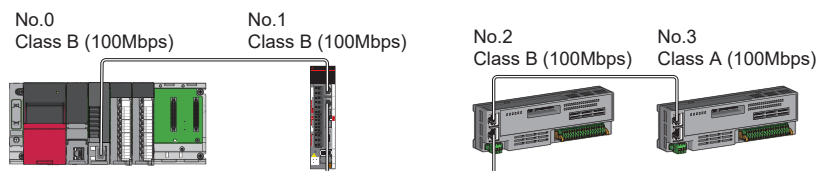
Connection with modules on CC-Link IE TSN with a communication speed of 100 Mbps

This section describes the network topology when "Communication Speed" under "Application Settings" is set to "100 Mbps".

Line topology

The network is configured in a line topology.

- Adjust the communication speed of the module.
- When connecting modules with different communication speeds, connect via a general-purpose hub.

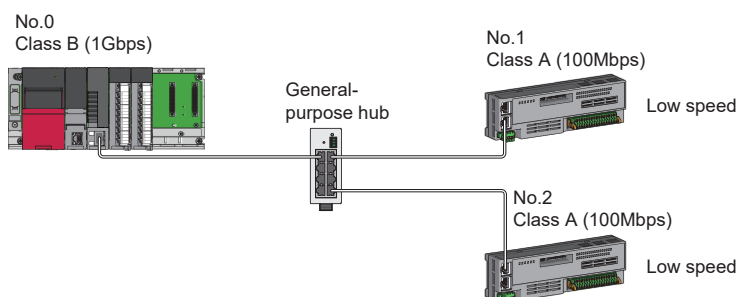


No.0: Master station
No.1, No.2, No.3: Remote station
Class A: Authentication Class A device
Class B: Authentication Class B device

Star topology

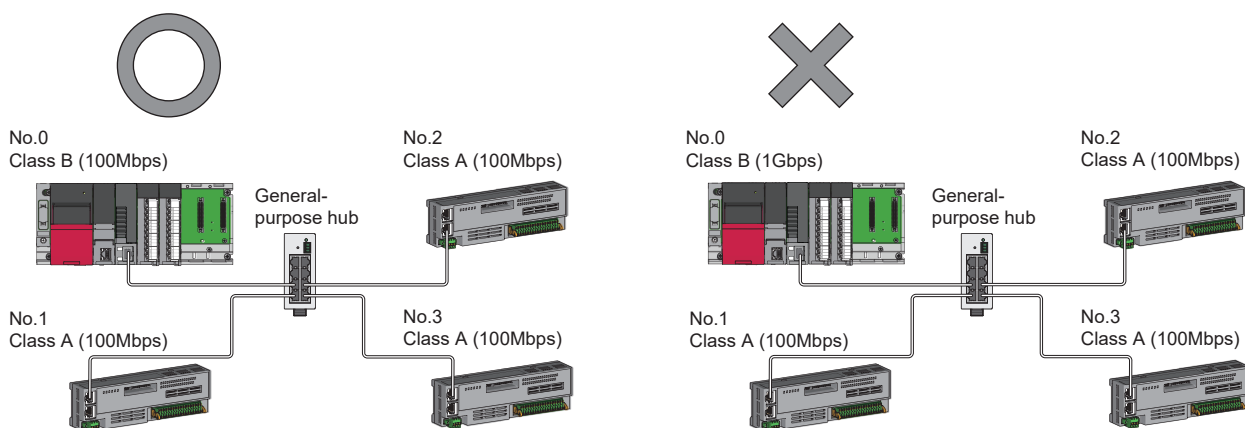
Modules or devices are connected in a star topology via a switching hub.

- When the master station with a communication speed of 1 Gbps and a remote station with a communication speed of 100 Mbps exist in the structure, set "Communication Period Setting" to "Low-Speed" for the remote station with a communication speed of 100 Mbps.



No.0: Master station
No.1, No.2: Remote station
Class A: Authentication Class A device
Class B: Authentication Class B device

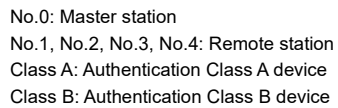
- Connect the master station and local station at the same communication speed.



No.0: Master station
No.1, No.2, No.3: Remote station
Class A: Authentication Class A device
Class B: Authentication Class B device

Line and star topologies can be mixed in the same network configuration.

- 11



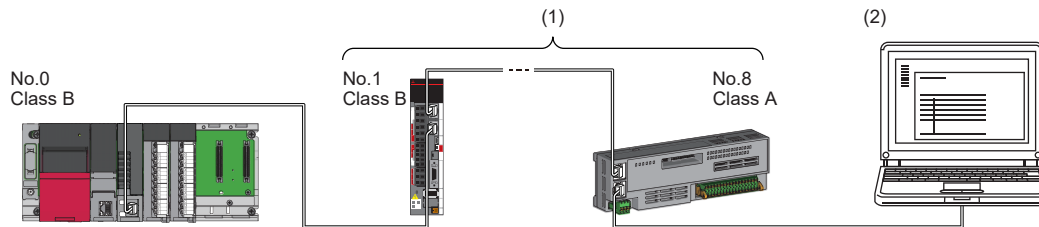
Structure of modules on CC-Link IE TSN and Ethernet devices

Connection with modules on CC-Link IE TSN and Ethernet devices

■Line topology

The network with modules and devices is configured in a line topology. A general-purpose hub is not required.

Up to eight modules on CC-Link IE TSN can be connected to P1 of the master station at the position indicated with (1). Connect Ethernet devices to the end of the network.



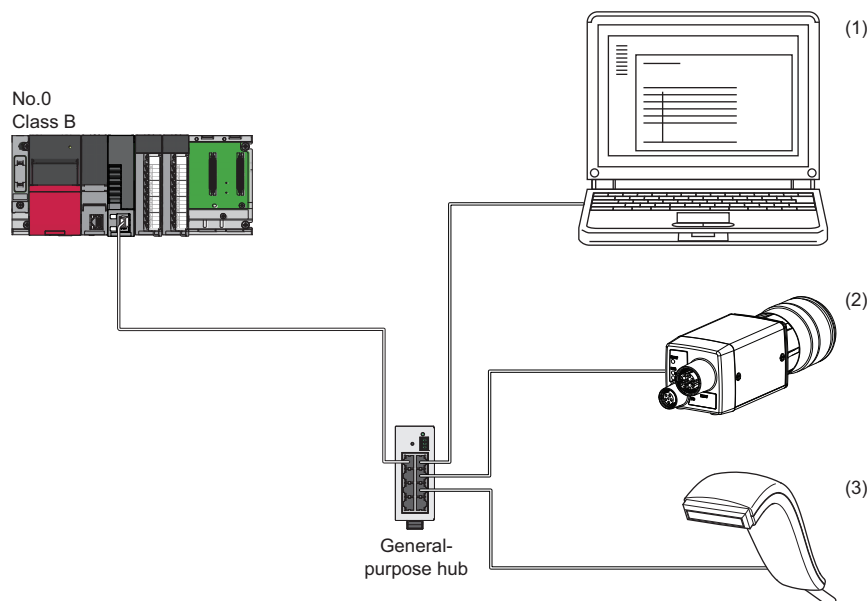
No.0: Master station
No.1: Remote station (1st module)
No.8: Remote station (8th module)
(2) Ethernet device
Class A: Authentication Class A device
Class B: Authentication Class B device

When an error occurs in a slave station, the stations connected after the faulty station will be disconnected.

■Star topology

Modules or devices are connected in a star topology via a general-purpose hub. This allows devices to be added easily.

When connecting an Ethernet device with a network communication speed of 100 Mbps, a general-purpose hub is required.



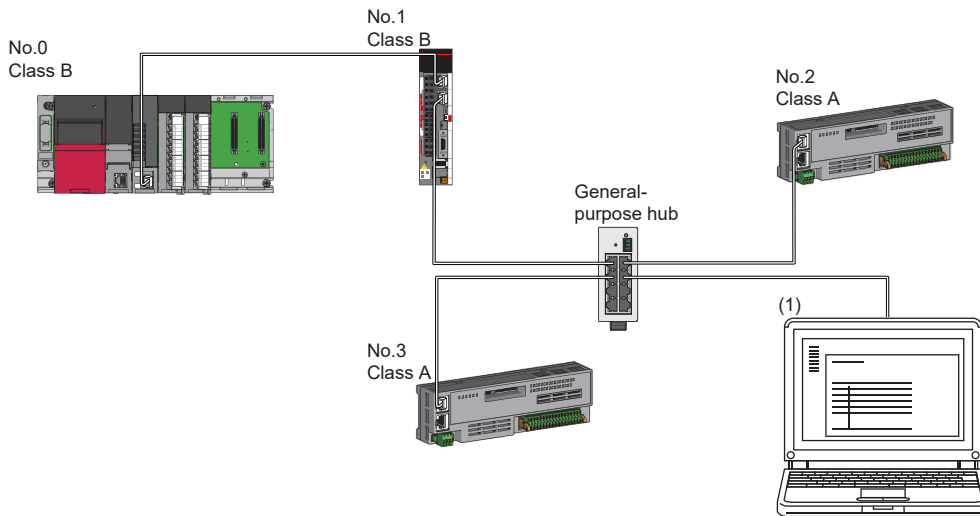
No.0: Master station
(1), (2), (3) Ethernet device (such as a personal computer, vision sensor, or bar code reader)
Class B: Authentication Class B device

Even when an error occurs in a slave station, a data link can be continued with the stations that are operating normally.

■Coexistence of line and star topologies

Line and star topologies can be mixed according to the availability of each connection.

- Connect Ethernet devices at the end of a line topology.
- When connecting the Ethernet device in a star topology, connect the Ethernet device to the general-purpose hub.



No.0: Master station
No.1, No.2, No.3: Remote station
(1) Ethernet device
Class A: Authentication Class A device
Class B: Authentication Class B device

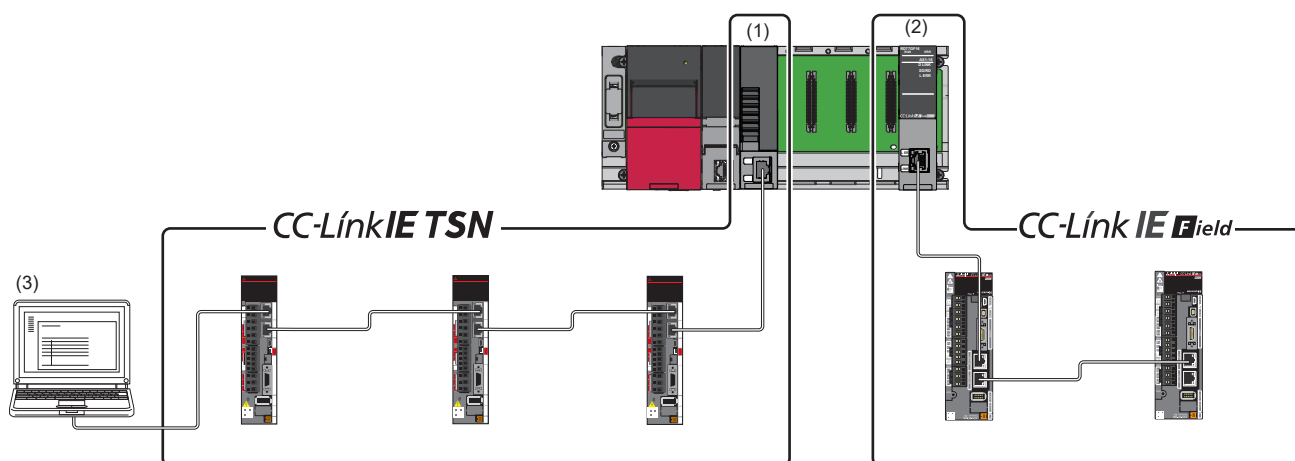
11.3 Structure of the CC-Link IE TSN and CC-Link IE Field Network

Set the Motion module and CC-Link IE Field Network master/local-equipped modules to different network numbers, and mount the master station of each network to the same base unit.

Connect Ethernet devices to the end of the network.

For details on CC-Link IE Field Network, refer to the following.

- MELSEC iQ-R Ethernet/CC-Link IE User's Manual (Startup)
- MELSEC iQ-R CC-Link IE Field Network User's Manual (Application)



- (1) Master station (Network No.1)
(2) Master station (Network No.3)
(3) Ethernet device

11.4 Precautions for System Configuration

Devices connected to the same network

Do not connect the devices as described below. Doing so may cause the disconnection of all stations.


- A module on CC-Link IE TSN and a device having network types other than an Ethernet device (such as CC-Link IE Controller Network and CC-Link IE Field Network) are connected to the same network.
- A module on CC-Link IE TSN and an Ethernet device (such as a personal computer), both of which are on different networks, are connected to one switching hub.

Adding more than the maximum number of connectable slave stations

If more than the maximum number of connectable slave stations are already connected and further slave stations are added, data link will not be performed in the added slave stations, but the other stations will continue data link.

Even if the disconnected stations are returned to a system having more than the maximum number of connectable slave stations, the stations may not start data link.

Point

- Whether more than the maximum number of connectable slave stations are connected can be checked using 'Number of connected modules over occurrence status' (SB0099). Number of connected modules detected by 'Number of connected modules over occurrence status' (SB0099) is the total of the slave stations that are currently connected and the disconnected stations (slave stations that were previously connected).
- The number of stations that were previously connected can be cleared by executing the network map update of the CC-Link IE TSN/CC-Link IE Field diagnostics. For details, refer to "Basic Settings" in the following manual.
 MELSEC iQ-R Motion Module User's Manual (Network)
- A data link error may momentarily occur in all the stations and outputs of the connected slave stations may turn off since all stations on the network will be reconnected when executing the network map update. Ensure that the output data is held, if necessary.

Station number of the slave station to be added

Do not duplicate station numbers. Data link may be stopped when the station number is duplicated.

Adding a slave station with no IP address setting


In line topology, do not connect the slave station with no IP address setting at a place other than the end of the line. Data link may not be performed in the slave stations after the slave station with no IP address setting.

CC-Link IE TSN/CC-Link IE Field diagnostics

If the following operations are performed, the actual network configuration and the network map of the CC-Link IE TSN/CC-Link IE Field diagnostics may be a mismatch.

Network configuration	Operation
Star topology	<ul style="list-style-type: none">• Powering off and on a slave station or switching hub• Connecting/disconnecting an Ethernet cable connected to the switching hub• Disconnecting an Ethernet cable from a slave station and connecting it to another slave station or a switching hub• Disconnecting more than nine stations, or half the number of slave stations or more in the system• Changing the network topology when adding a slave station
Line topology	<ul style="list-style-type: none">• Simultaneously powering off or on multiple stations• Simultaneously connecting/disconnecting Ethernet cables to/from multiple stations (When a data link faulty station returns, a data link error will occur in all the stations.)• Disconnecting more than nine stations, or half the number of slave stations or more in the system• Changing the network topology when adding a slave station

Point

The actual network configuration and network map can be matched by executing the network map update of the CC-Link IE TSN/CC-Link IE Field diagnostics. For details, refer to "Basic Settings" in the following manual.
 MELSEC iQ-R Motion Module User's Manual (Network)

Calculation of the total cyclic data size

The following shows the calculation formula of the total cyclic data size. The part of the variable surrounded by double quotes (" ") is the setting value of "Network Configuration Settings" under "Basic Settings".

Total cyclic data size = $256 + (106 \times \text{Number of remote stations}) + (\text{Number of "RX Setting" points} \div 8) + (\text{Number of "RWw Setting" points} \times 2)$ [byte]

12 INSTALLATION AND WIRING

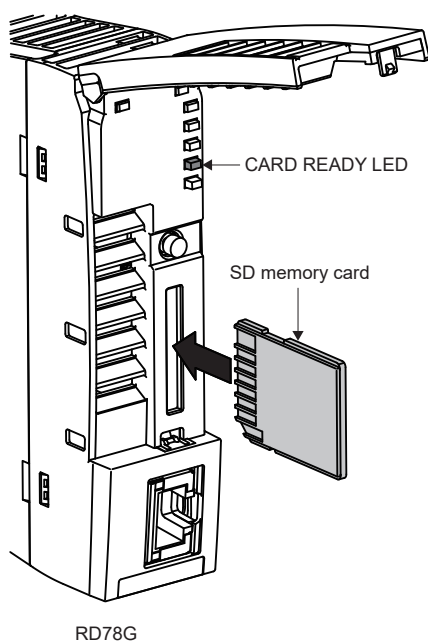
12.1 Installation and Removal of SD Memory Card

This section describes the methods for installation of an SD memory card to the Motion module, and removal.

Installation of SD memory card

- When installing an SD memory card to the Motion module, take note of the SD memory card position, and install using the following procedure.
1. With the notch facing downwards, insert the SD memory card straight into the slot. After inserting check the SD memory card is inserted all the way in. If the SD memory card is not inserted properly, insufficient contact may cause an operation failure.
 2. The CARD READY LED flickers until the SD memory card can be used. When the CARD READY LED is ON, the SD memory card can be used.
 3. If the CARD READY LED does not turn on after installing an SD memory card, check that `System.Cd.Storage_sdcForcedDisable` and `System.Md.Storage_sdcForcedDisabled` are FALSE.

12



- Installation of an SD memory card is registered with the event history (type: operation).



When installing an SD memory card, the operation of SD memory card access control switch is not required.

Removal of the SD memory card

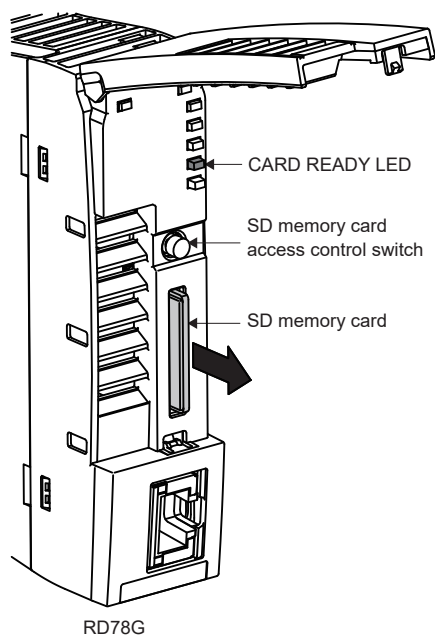
- When removing an SD memory card from the Motion module, remove the SD memory card using the following procedure.

1. Carry out one of the following to stop access of the SD memory card.

- Hold the SD memory card access control switch for longer than 1s.
- Set `System.Cd.Storage_sdcForcedDisable` to `TRUE`.

2. During the process of stopping access to the SD memory card, the CARD READY LED flickers, then turns OFF when the process is complete. Before removing, be sure to confirm that the CARD READY LED turns OFF.

3. After pushing in the SD memory card once, pull the SD memory card out straight.



- When `System.Cd.Storage_sdcRemovalProhibit` is `TRUE`, removal using the SD memory card access control switch is ignored. To remove an SD memory card while `System.Cd.Storage_sdcRemovalProhibit` is `TRUE`, set `System.Cd.Storage_sdcForcedDisable` to `TRUE`. Then, `System.Cd.Storage_sdcRemovalProhibit` turns `FALSE` in the system and the SD memory card can be removed.
- Removal of an SD memory card is registered with the event history (type: operation).
- When the SD memory card is removed without it being disabled, the error "SD Memory card Unload" (error code: 342FH) will be output.
- The access control operation may be rejected depending on the system status (such as initializing, installing software, high system load). In such a case, execute the access control operation again after a while.

Point

- The access control process (CARD READY LED is flashing) may take time.
- Do not remove an SD memory card while the CARD READY LED is not turned OFF. Doing so may damage the data on the SD memory card.
- Even while the SD memory card is accessed (CARD ACCESS LED is ON), holding the SD memory card access control switch for longer than 1s operates the SD memory card forced disable function, and the SD memory card can be stopped access (removal enabled).

Release of the SD memory card forced disable state

The SD memory card forced disable state can be released by turning `System.Cd.Storage_sdcForcedDisable` from `TRUE` to `FALSE`. Also, either of the following operation automatically sets `System.Cd.Storage_sdcForcedDisable` to `FALSE` and the SD memory card is enabled.

Operation

Install the SD memory card again. (The CARD READY LED turns from flashing to ON.)

Turn ON the power of the Motion module again or carry out reset operation.

12.2 Wiring


This section describes wiring for when CC-Link IE TSN is used.

Wiring methods

The following describes connection and disconnection of the Ethernet cable.

■Connecting the cable

1. Push the Ethernet cable connector into the Motion module until it clicks. Pay attention to the direction of the connector.
2. Lightly pull it to check that it is securely connected.
3. Check whether the LINK LED of P1 of the Ethernet port connected with an Ethernet cable is on. For details about the LED display specifications, refer to the following.

 Page 23 LED Display Specifications

The time between the cable connection and the LINK LED turning on 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 "Checking with LED" in the following manual and take corrective actions.

 MELSEC iQ-R Motion Module User's Manual (Network)

■Disconnecting the cable

1. Press the latch down and unplug the Ethernet cable.

■Precautions

Be sure to follow the precautions for wiring. Otherwise, some functions may not operate normally. (It may operate normally temporarily.)

- Place the Ethernet cable in a duct or clamp them. If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunction due to poor contact.
- Do not touch the core of the cable-side or module-side connector, and protect it from dirt or dust. If oil from your hand, dirt or dust is attached to the core, it can increase transmission loss, arising a problem in a data link.
- Check that the Ethernet cable is not disconnected or not shorted and there is no problem with the connector connection.
- When connecting the Ethernet cable, refer to the CC-Link IE TSN Cable Installation Manual available from the website of CC-Link Partner Association (www.cc-link.org). The cable installation not following the contents of the manual may cause malfunction.
- Do not use Ethernet cables with broken latches. Doing so may cause the cable to unplug or malfunction.
- Hold the connector part when connecting and disconnecting the Ethernet cable. Pulling the cable connected to the module may result in malfunction or damage to the module or cable.
- 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.
- The bend radius of the Ethernet cable is limited. For details, check the specifications of the Ethernet cable to be used.
- In a line topology, do not connect the slave station with no IP address setting between the master station and slave stations, or between slave stations. A data link may not be performed in the slave stations connected from the slave station with no IP address setting onwards. However, if the slave station with no IP address setting is connected at the end of line topology, the slave stations between the master station and the slave station at the end perform a data link.
- Communication with the Ethernet device may not be possible depending on the specifications of the connected Ethernet device or switching hub. If communication is not possible, reduce the communication data volume of the Ethernet device.

Wiring products

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

■Ethernet cable

Use the Ethernet cable that meets the following standards.

Communication speed	Ethernet cable	Connector	Standard
1Gbps	Category 5e or higher, straight cable (shielded, STP)	RJ45 connector	The following conditioning cables: <ul style="list-style-type: none">• IEEE 802.3 (1000BASE-T)• ANSI/TIA/EIA-568-B (Category 5e)
100 Mbps	Category 5 or higher, straight cable (shielded, STP)		The following conditioning cables: <ul style="list-style-type: none">• IEEE 802.3 (1000BASE-TX)• ANSI/TIA/EIA-568-B (Category 5)

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

In addition, the connector processing of cable length is available for your preference. 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

The communication error can occur with the high-frequency noise from the device except CPU unit depending on the connecting environment. The following indicates the countermeasure of the Motion module side to prevent the effect of the high-frequency noise.

Wiring connection

- Use a duplex shield type cable.
- In wiring process, keep a distance with the main circuit lines or power cables.
- Ground the cables with clamping.

■Switching Hub

Use the following industrial switching hub.

Term	Description	Authentication
TSN HUB	For the models and usage methods of the switching hubs, refer to the CC-Link Partner Association website (www.cc-link.org).	Authentication Class B device
General-purpose 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.

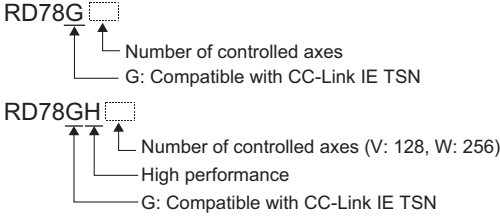
Precautions

Since there are different restrictions for system configuration using a TSN hub and system configuration using a general-purpose hub, setting with an engineering tool is required. (➡ 11 SYSTEM CONFIGURATION)

APPENDICES

Appendix 1 Component List

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

No.	Part name	Type	Remarks
1	Motion module	RD78G4	 <p>RD78G</p> <p>Number of controlled axes</p> <p>G: Compatible with CC-Link IE TSN</p> <p>RD78GH</p> <p>Number of controlled axes (V: 128, W: 256)</p> <p>High performance</p> <p>G: Compatible with CC-Link IE TSN</p>
		RD78G8	
		RD78G16	
		RD78G32	
		RD78G64	
		RD78GHV	
		RD78GHW	
2	Drive unit	—	—
3	Slave device compatible with CC-Link IE TSN	—	—
4	CC-Link IE TSN Network cable	—	<p>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.</p> <p>For details, refer to the following.</p> <p>☞ Page 61 Ethernet cable[MODE: PLCopen]</p> <p>☞ Page 114 Ethernet cable[MODE: Simple Motion]</p>
5	Ethernet HUB	—	<p>Switching HUB are needed for connecting the Motion module, a drive unit, and other brand drive units in star topology.</p> <p>For details, refer to the following.</p> <p>☞ Page 61 Ethernet cable[MODE: PLCopen]</p> <p>☞ Page 114 Ethernet cable[MODE: Simple Motion]</p>

Specifications of recommended manual pulse generator [MODE: Simple Motion]

Item	Specification
Model name	MR-HDP01
Ambient temperature	-10 to 60°C
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) "L" level: 0.5 V or less (with maximum leading-in)
Life time	1000000 rotations or more (at 200 r/min)
Permitted axis load	Radial load: Max. 19.6 N Thrust load: Max. 9.8 N
Mass	0.4 kg
Max. rotation speed	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)

*1 When using a separate power supply, use a stabilized power supply of voltage 5 V DC±0.25 V DC.

A

External dimension drawing of manual pulse generator [MODE: Simple Motion]

MR-HDP01 (manufactured by Mitsubishi Electric Corporation)

[Unit: mm]

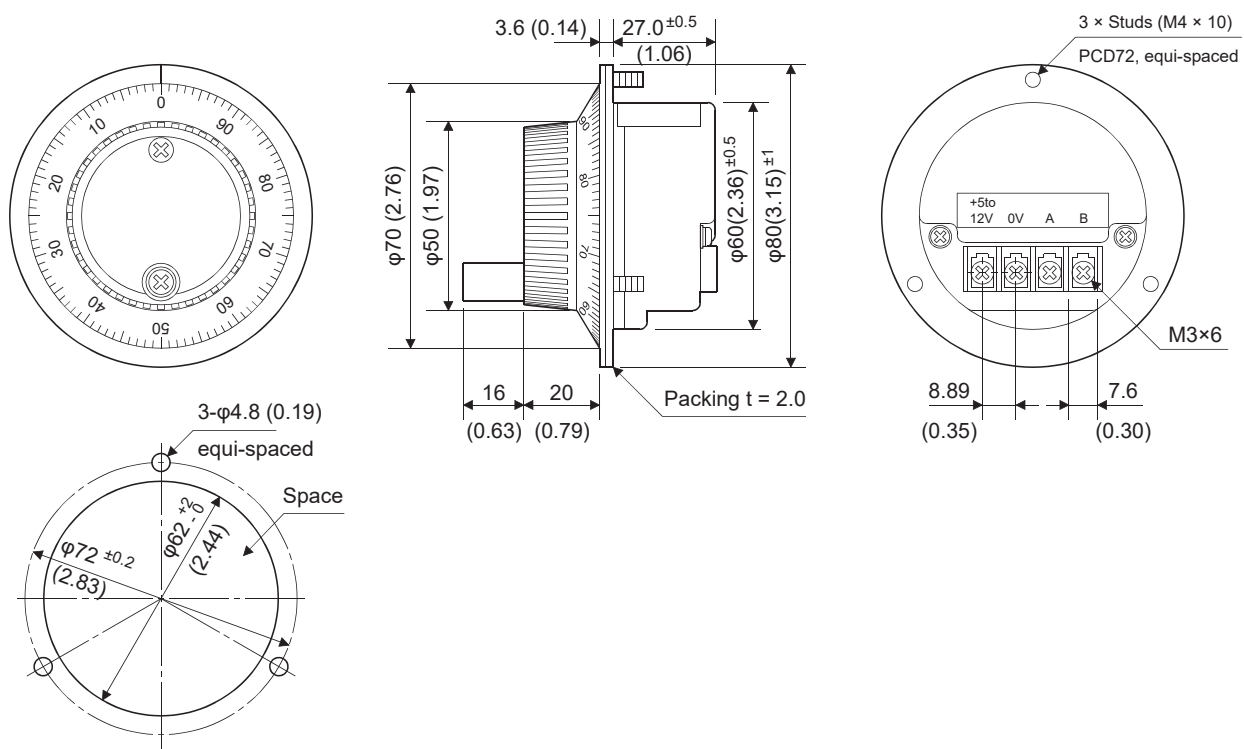
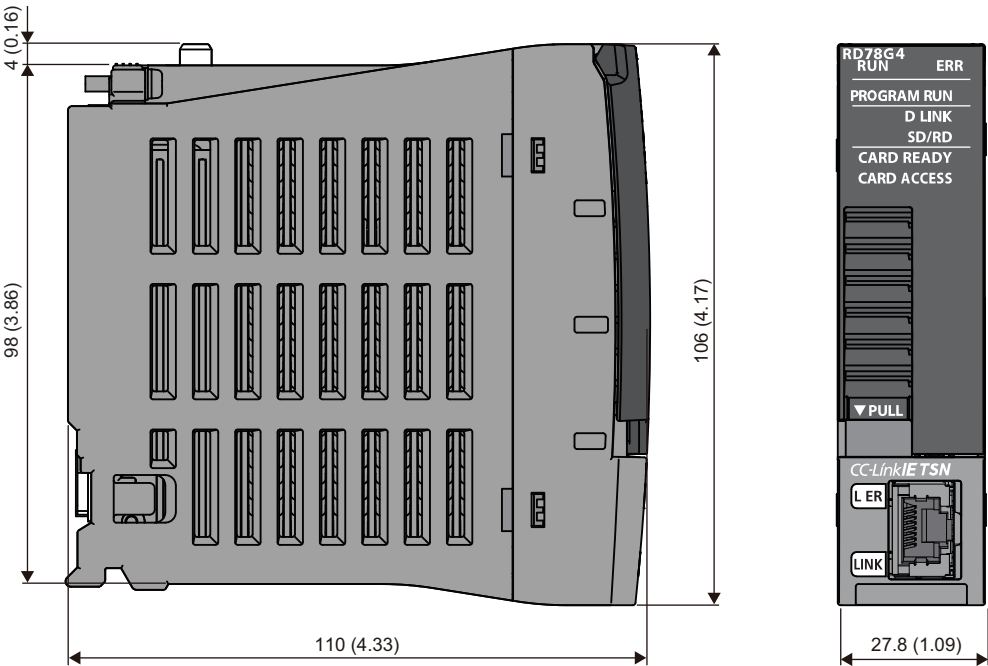


Figure of processing a disc

Appendix 2 External Dimensions

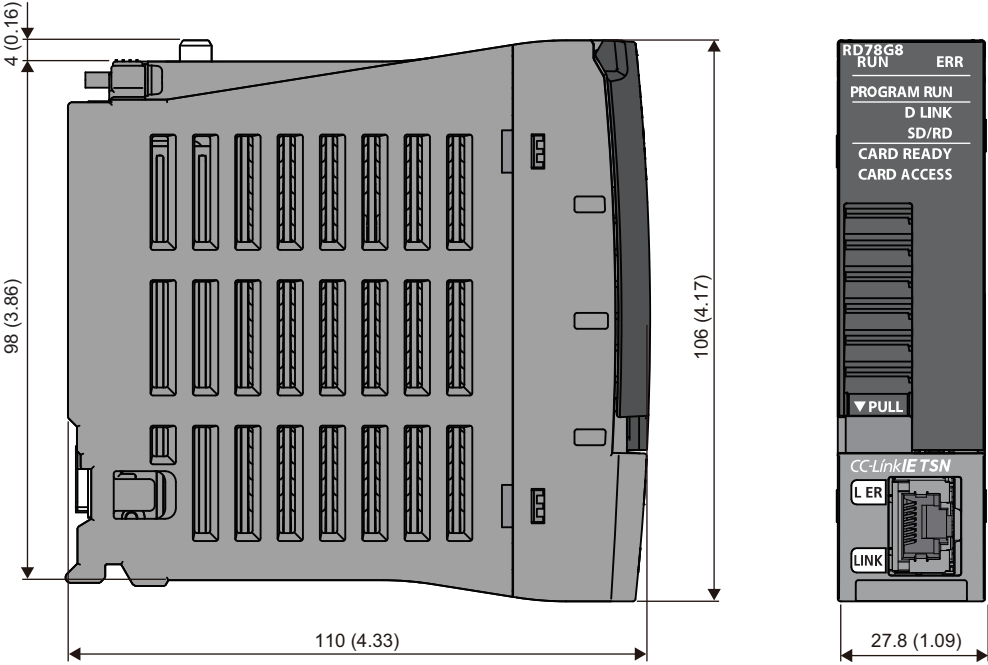
RD78G4

[Unit: mm (inch)]



RD78G8

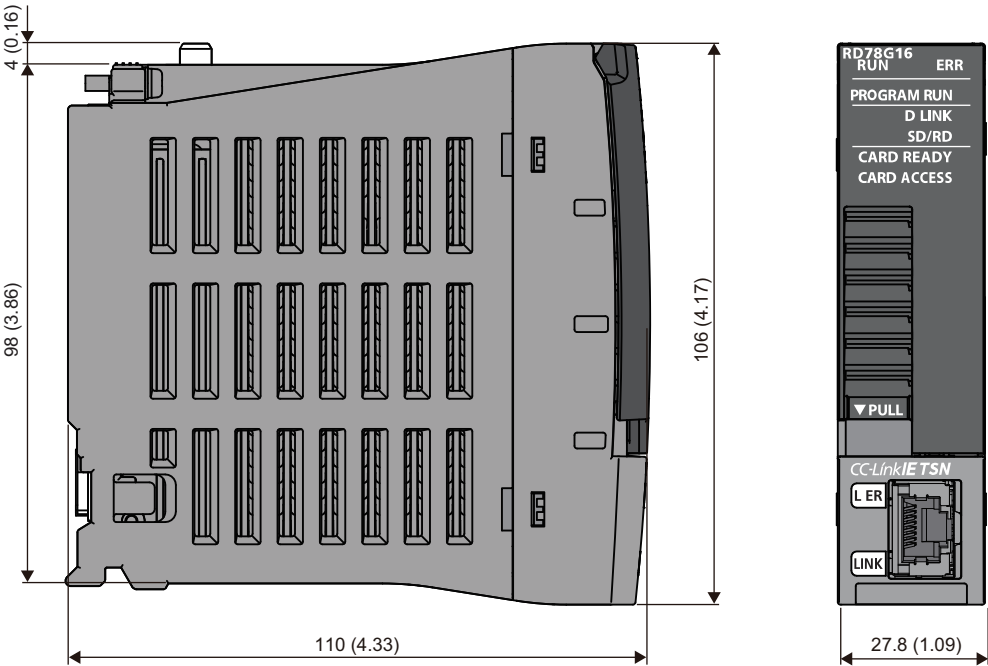
[Unit: mm (inch)]



A

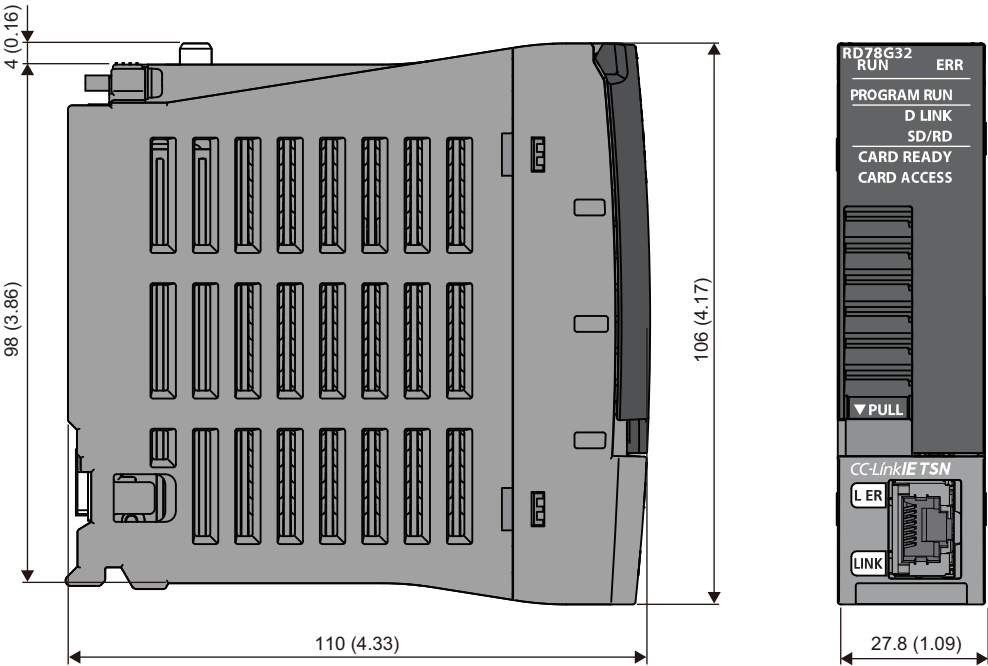
RD78G16

[Unit: mm (inch)]



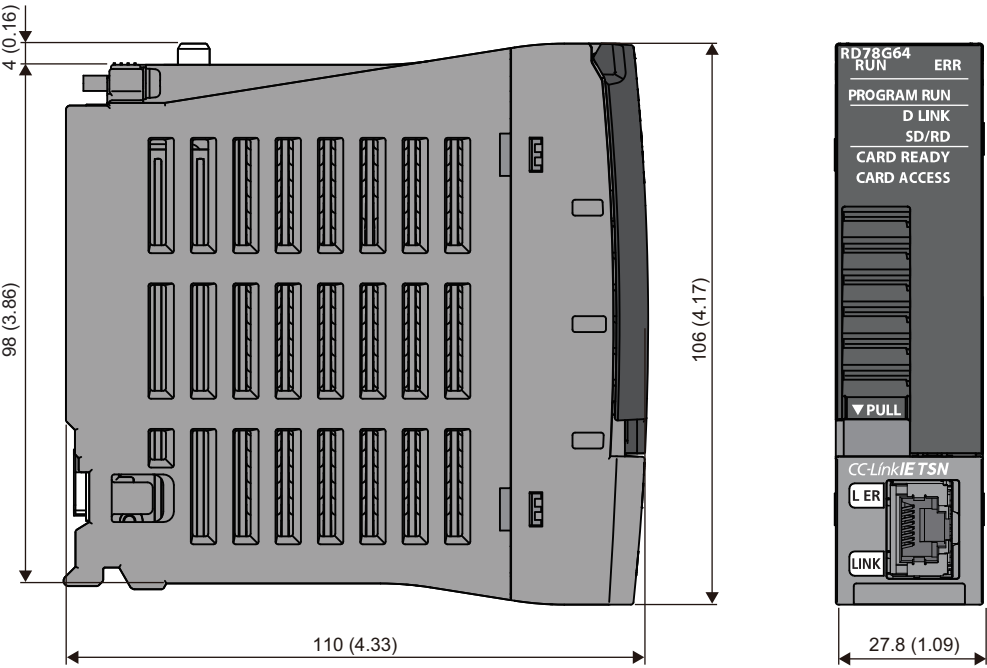
RD78G32

[Unit: mm (inch)]



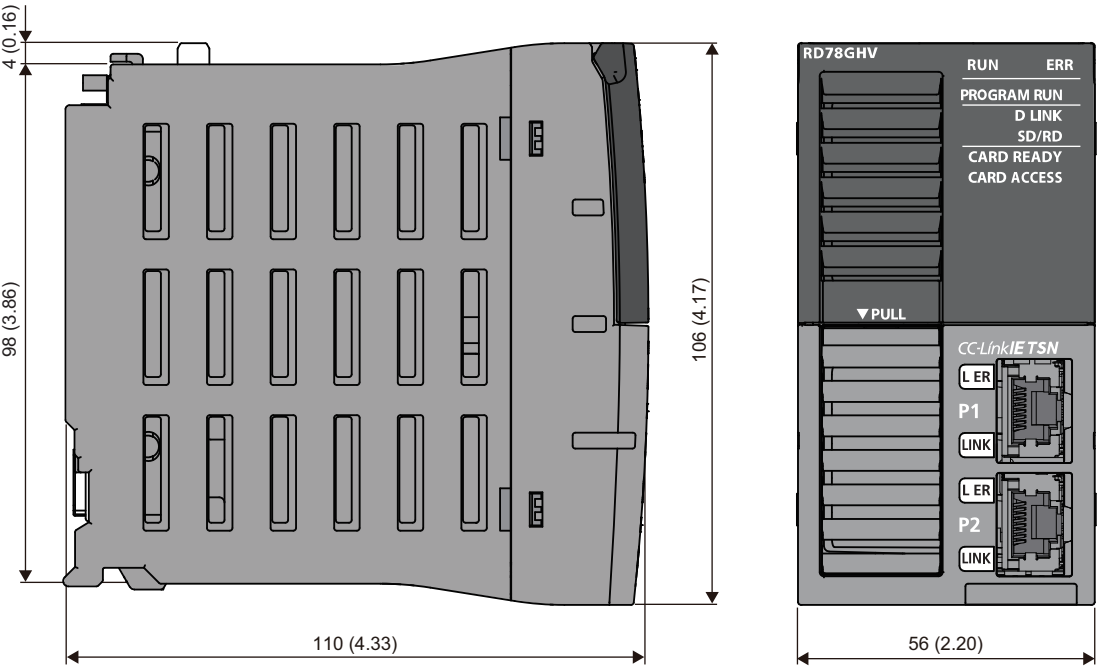
RD78G64

[Unit: mm (inch)]



RD78GHV

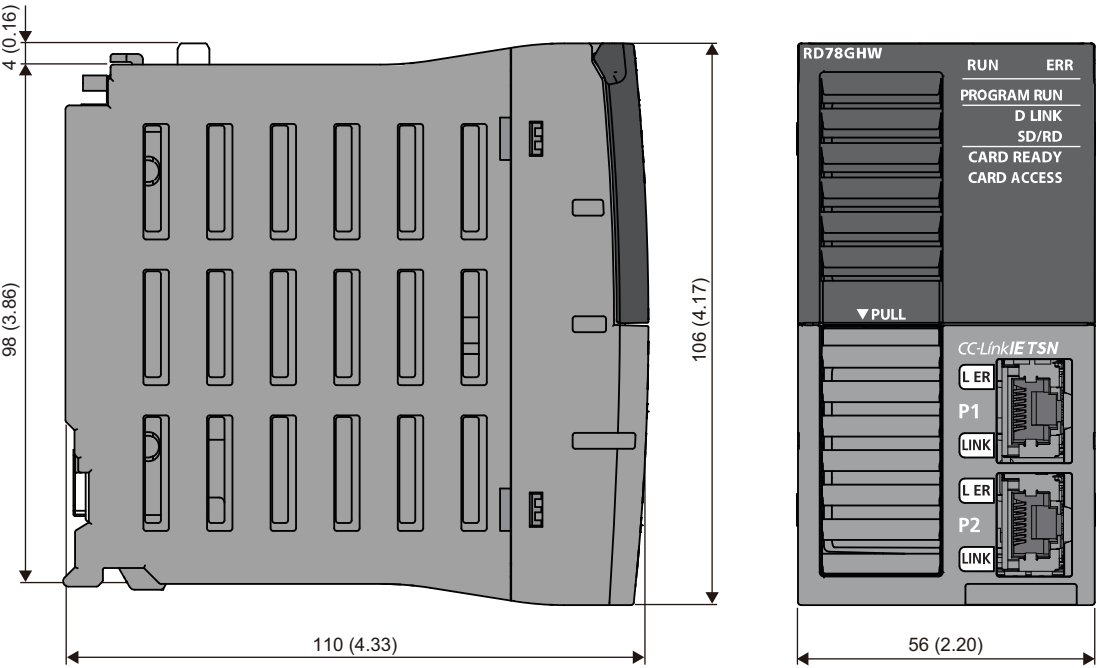
[Unit: mm (inch)]



A

RD78GHW

[Unit: mm (inch)]



Appendix 3 Open Source Software

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 4 Setting Example of Motion Module [MODE: Simple Motion]

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.

In this section, "_" in "RD78G_(S)" or "RD78G_" indicates the number of control axes.

Preparation

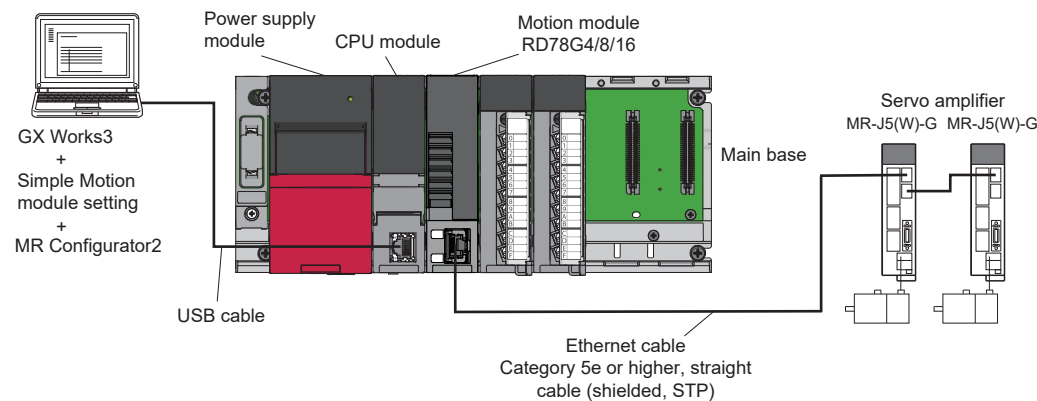
■Preparing the module/engineering tool and checking the version

Category		Model name	Supported version
Module	CPU module	R00CPU R01CPU R02CPU	Version 12 or later
		R04CPU R08CPU R16CPU R32CPU R120CPU	Version 44 or later
		R04ENCPU R08ENCPU R16ENCPU R32ENCPU R120ENCPU	Version 44 or later
	Motion module	RD78G4 RD78G8 RD78G16	070716 or later <div> <div>070716</div> <div> <div>Version of the base system software (2 digits)</div> <div>Version of the boot software (for control) (2 digits)</div> <div>Version of the boot software (for network) (2 digits)</div> </div> </div>
Engineering tool	Servo amplifier	MR-J5(W)-G	Version B2 or later
	Programming tool for programmable controller	GX Works3	Version 1.075D or later
	Simple Motion module setting ^{*1}	—	Version 1.165X or later
	Servo amplifier setting/monitoring tool	MR Configurator2	Version 1.100E or later

A


^{*1} This is the same tool as when using the RD77MS. It is a different tool from the one for the PLCopen motion control FB mode.

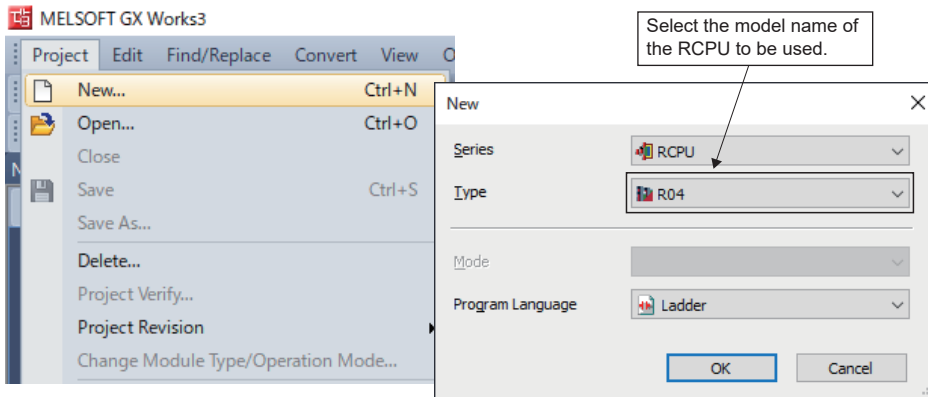
■System configuration



Project creation

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

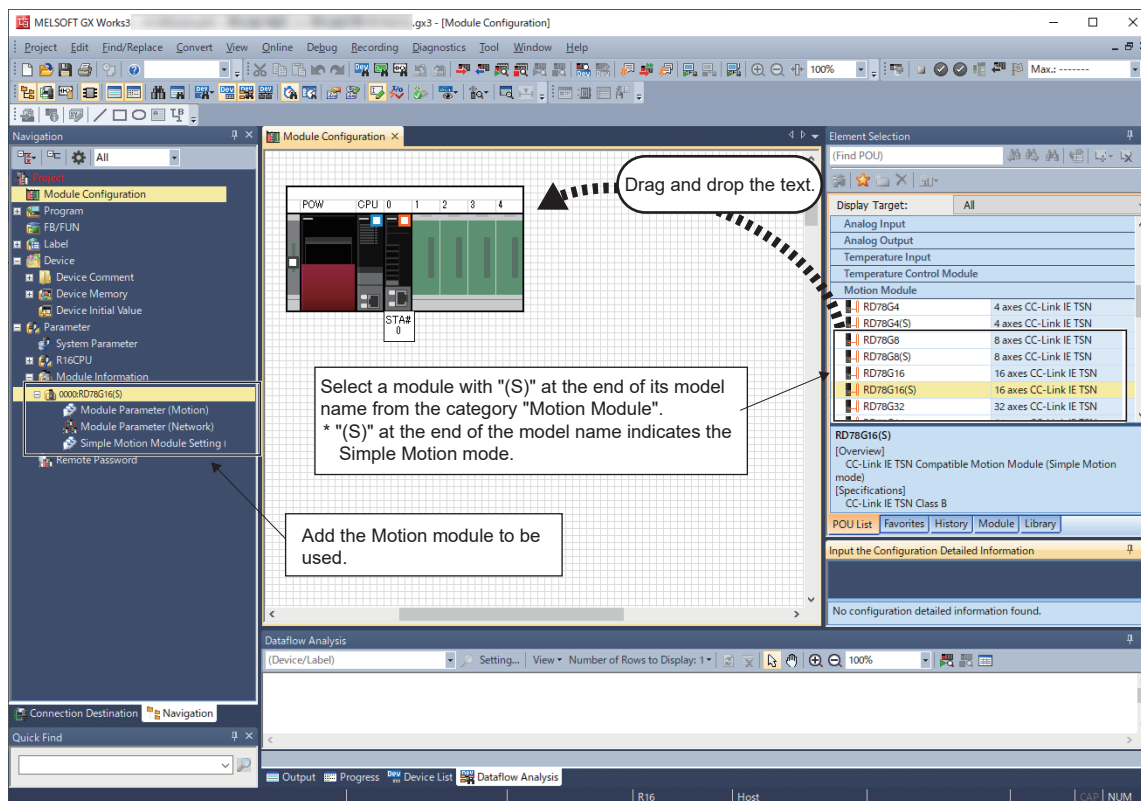
 [Project]⇒[New Project]



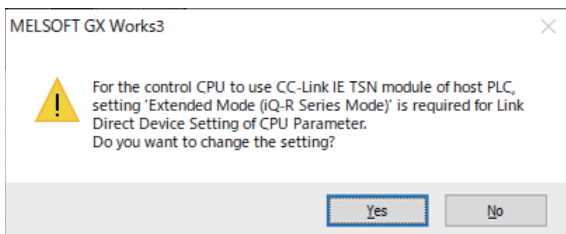
System configuration setting

■ Adding a module

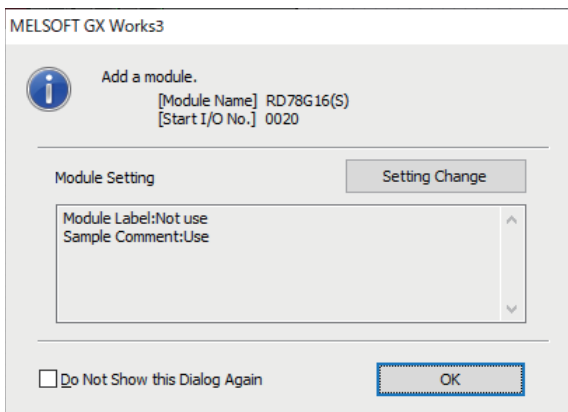
- In the "Element Selection" window of the module map, select the base, power supply, and Motion module to be used, and drag and drop them.



- If the following message appears during the setting of RD78G_(S), click "Yes".



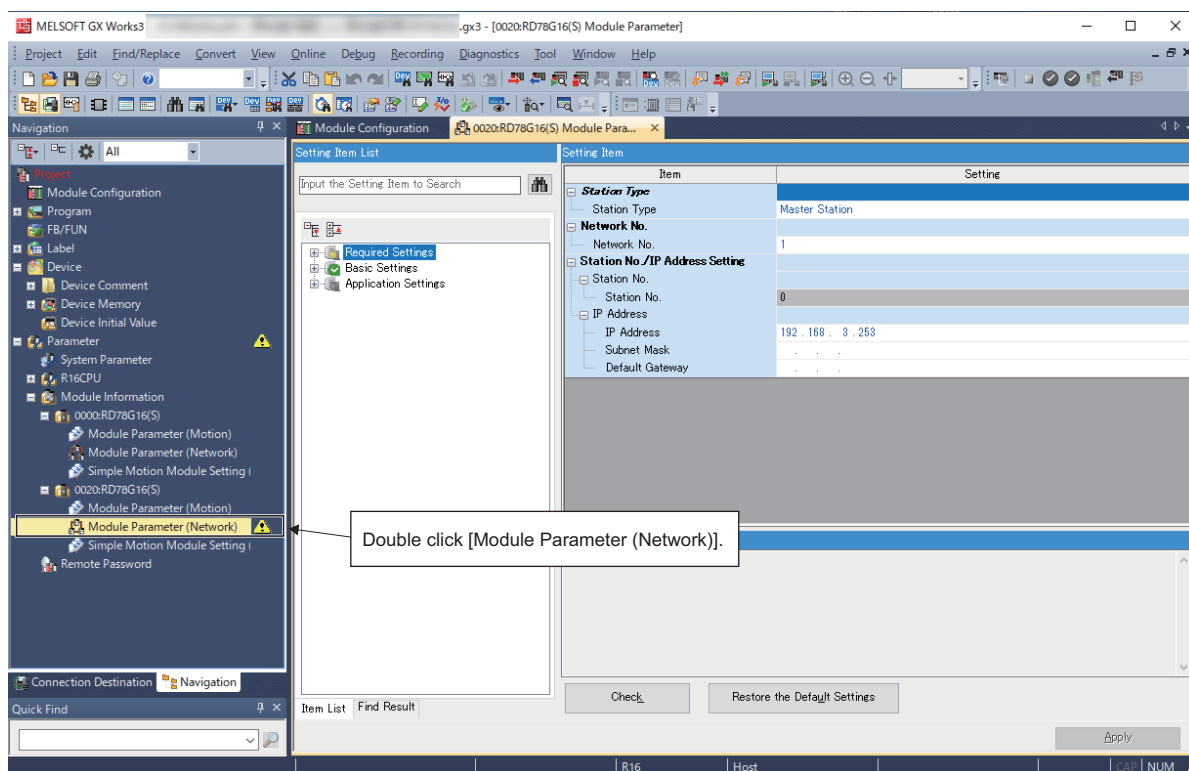
- If not using module labels or module FBs, set "Module Label" to "Not use".



■Network parameter setting

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

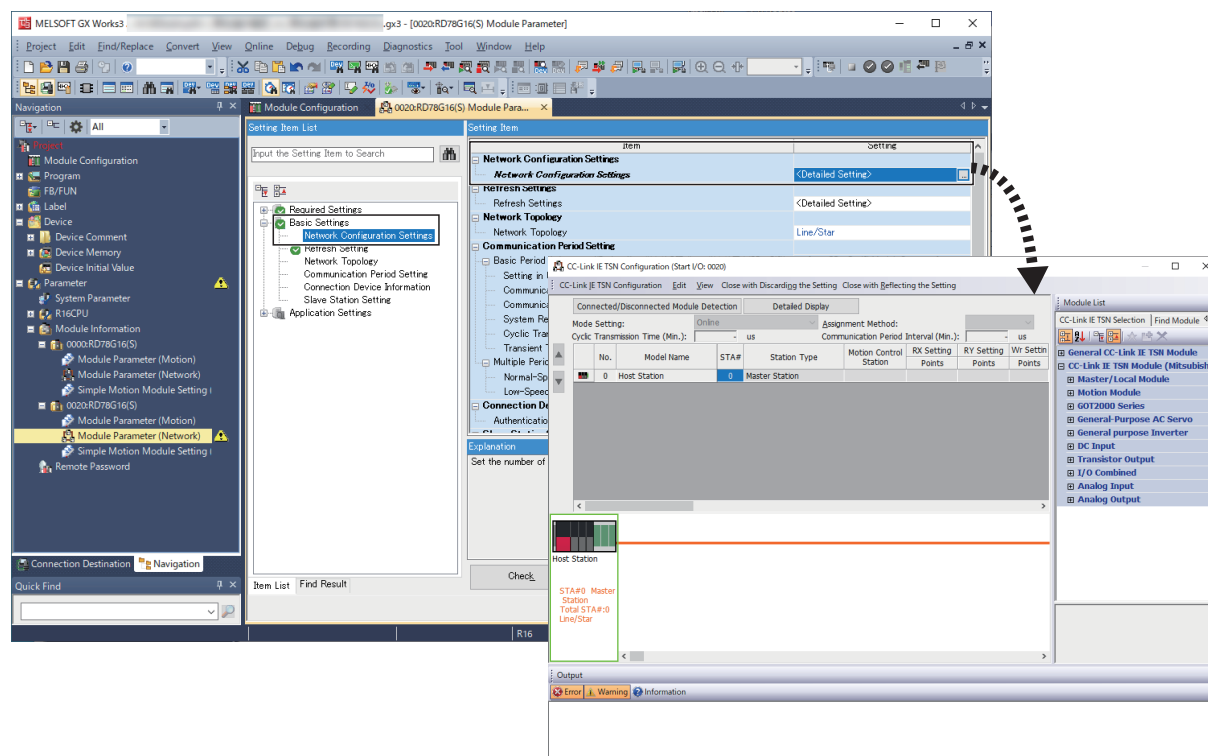
☞ Double click Navigation window⇒[Parameter]⇒[Module Information]⇒[Target module]⇒[Module Parameter (Network)]



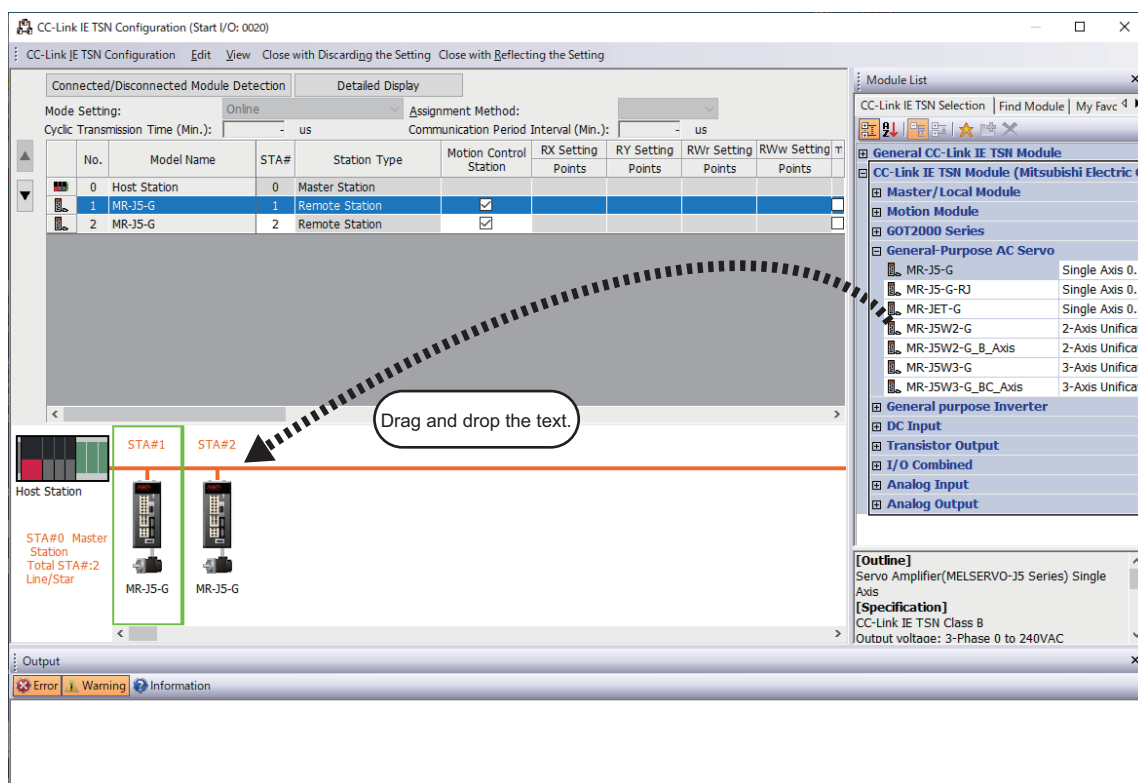
■Network configuration setting

- 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

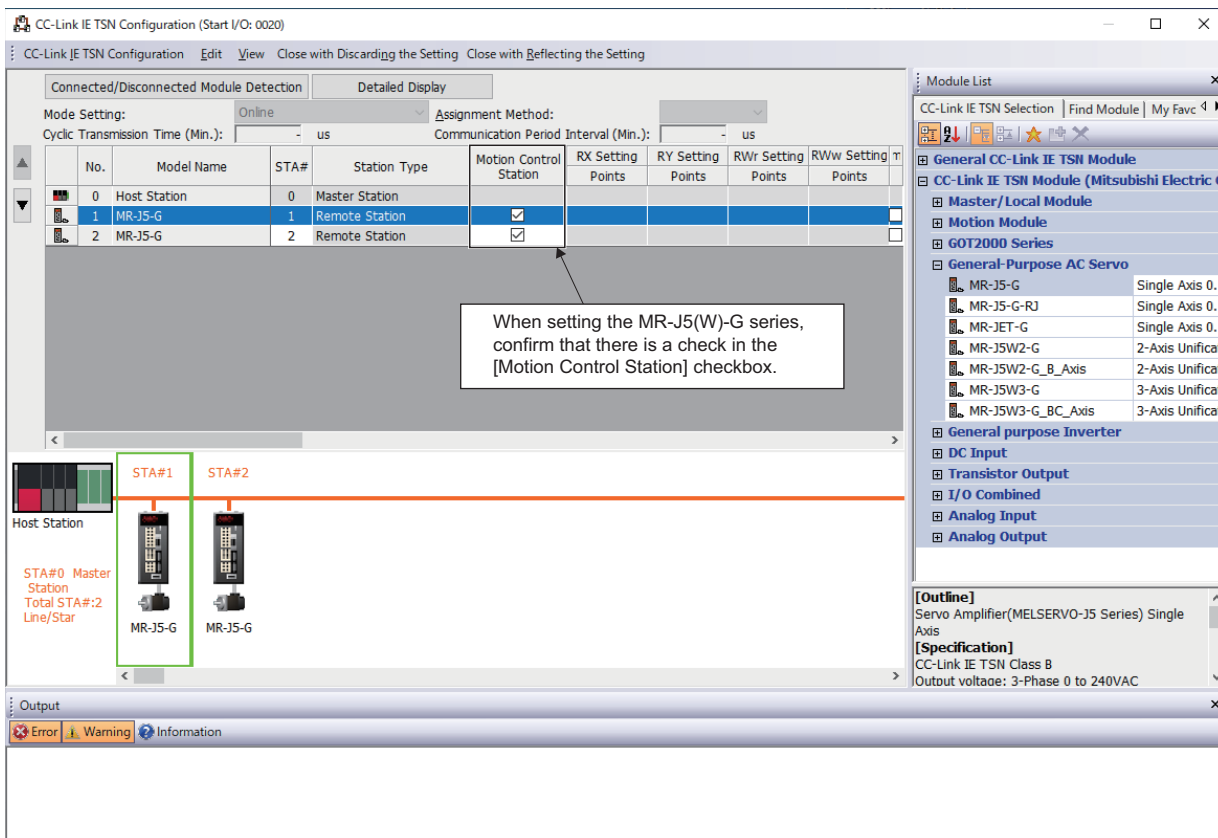


- Select and add modules from "Module List" on the "CC-Link IE TSN Configuration" screen.
- A default station No. and I/O point No. are set when a module is added. IP addresses are set automatically in the order in which the modules were added via drag and drop according to the setting and station No.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



■PDO mapping setting

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

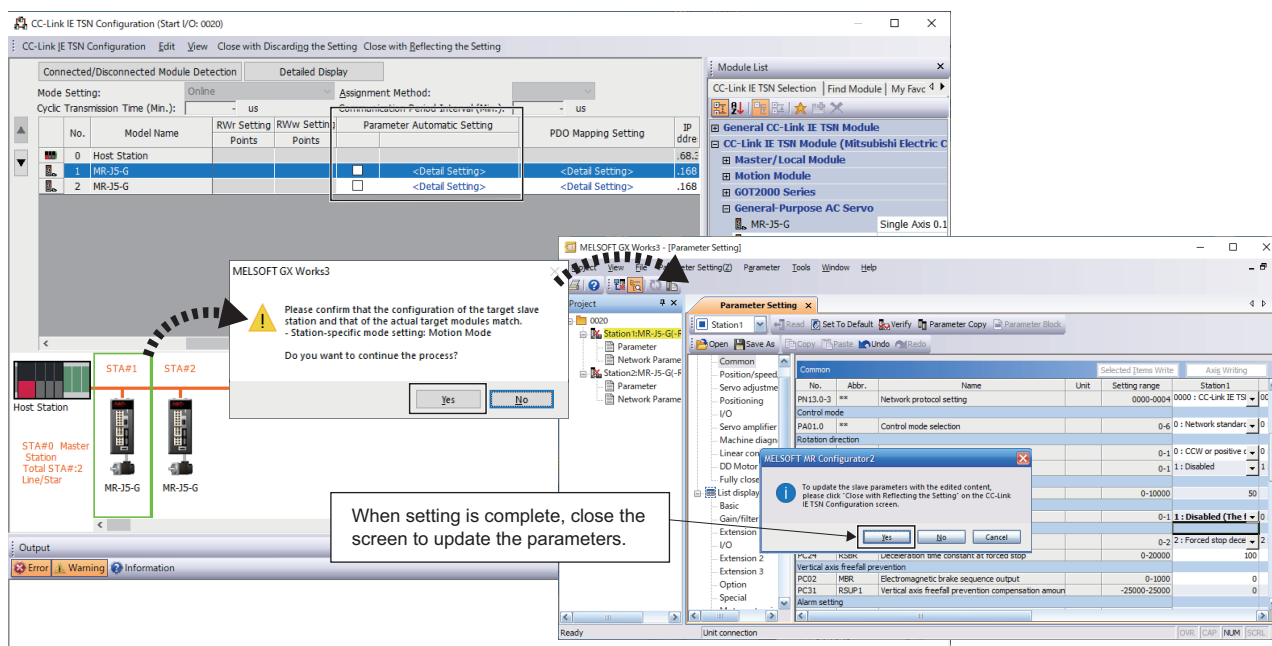


■ Servo parameter setting

- Set the servo parameters. For the setting details, refer to the following.

☞ Page 128 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 overwritten automatically from the controller. When an error occurs, reset said error after resetting the Motion module or MR-J5(W)-G

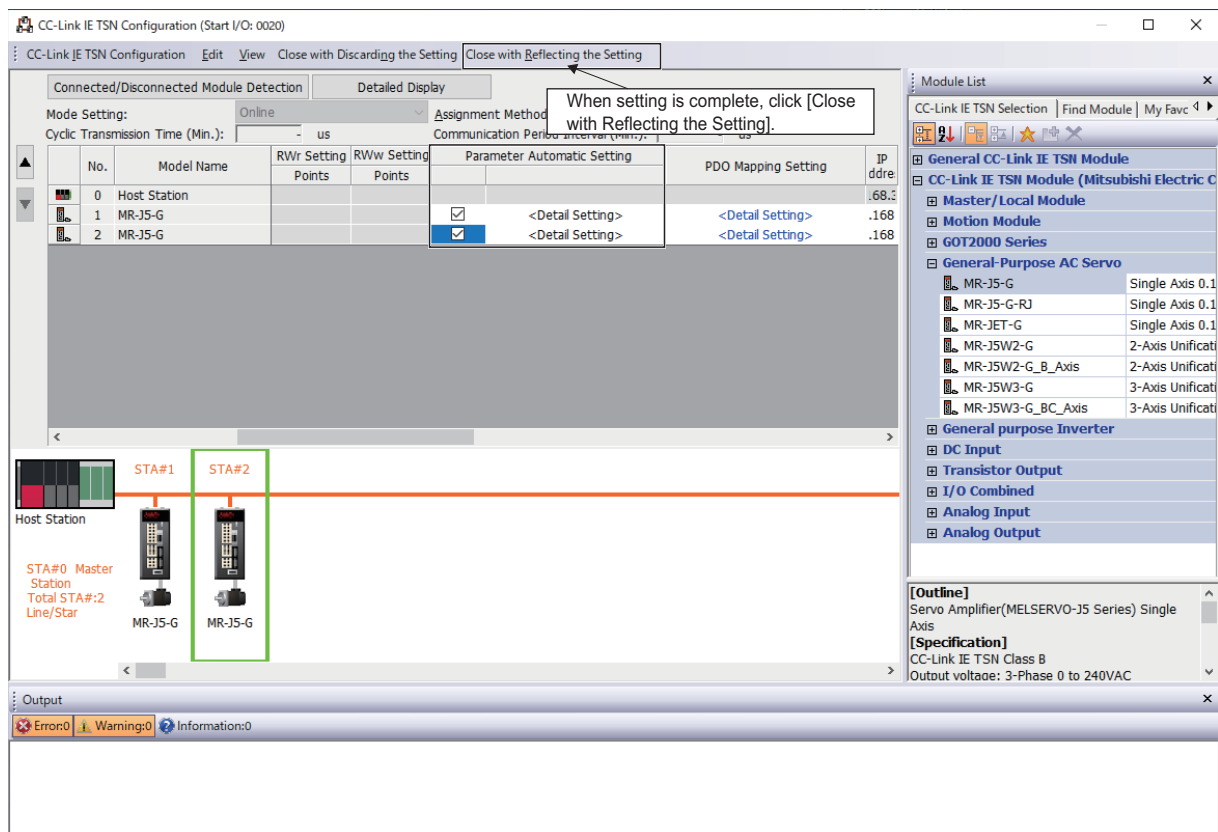
Classification	No.	Name	Default value	Setting value
Basic setting	PA06	Electronic gear numerator ^{*1}	1	<ul style="list-style-type: none"> • When using the rotary servo motor HK-KT series: 16 • Other (when not using the rotary servo motor HK-KT series): 1
	PA07	Electronic gear denominator ^{*1}	1	1
Expansion setting	PC79.0	DI status read selection ^{*1}	0h	Eh bit1: Returns the ON/OFF status of the DI1 pin. bit2: Returns the ON/OFF status of the DI2 pin. bit3: Returns the ON/OFF status of the DI3 pin.
I/O setting	PD41.2	Limit switch enabled status selection ^{*1}	0h	1h (only enabled in homing mode)
	PD41.3	Sensor input method selection ^{*1}	0h	1h: Input from controller (C_FLS/C_RLS/C_DOG)
	PD60.0	DI pin polarity selection ^{*1}	0h	0h bit0: DI pin polarity selection 1 (Turns on with 24 V input) bit1: DI pin polarity selection 2 (Turns on with 24 V input) bit2: DI pin polarity selection 3 (Turns on with 24 V input)
Positioning control	PT01.1	Speed/acceleration/deceleration unit selection ^{*2}	0h	0h
	PT08	Homing position data ^{*1}	0	0
	PT15	Software position limit +	0	0
	PT17	Software position limit -	0	0
	PT29.0	Device input polarity ^{*1}	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

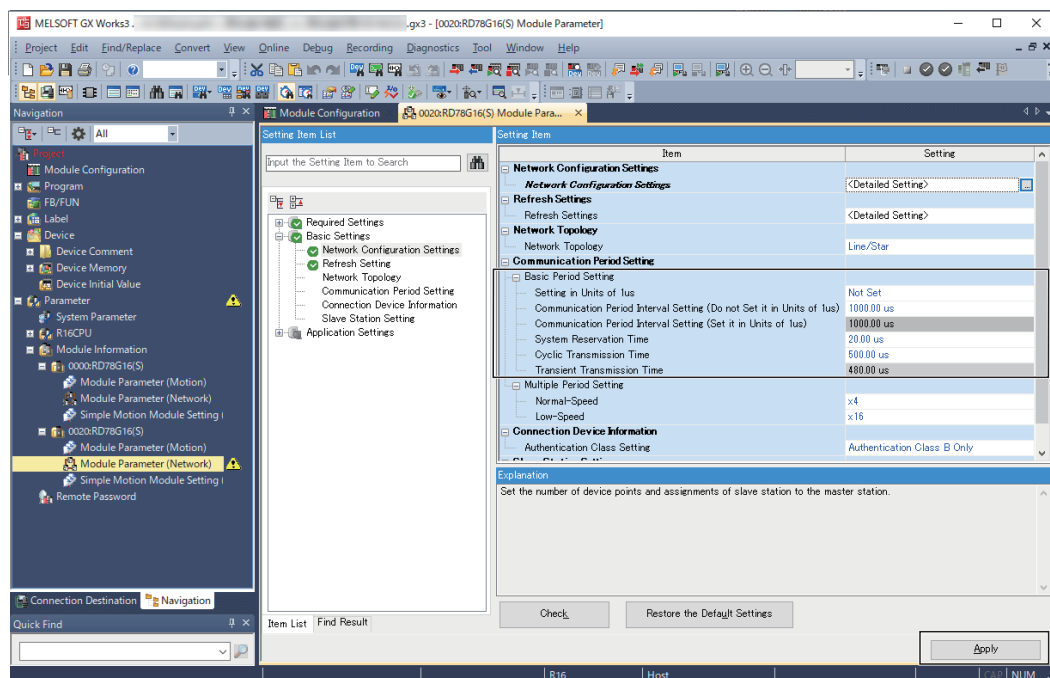
Place a check in the checkbox in "Parameter Automatic Setting".



■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).

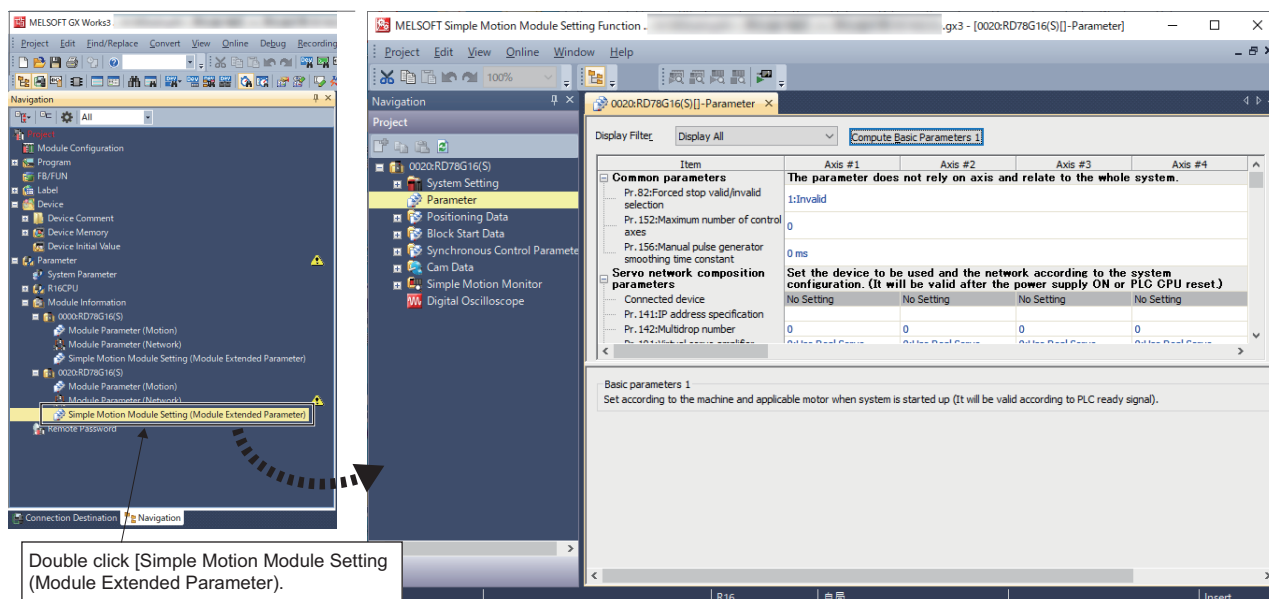


Simple Motion Module Setting

■Starting the Simple Motion Module Setting

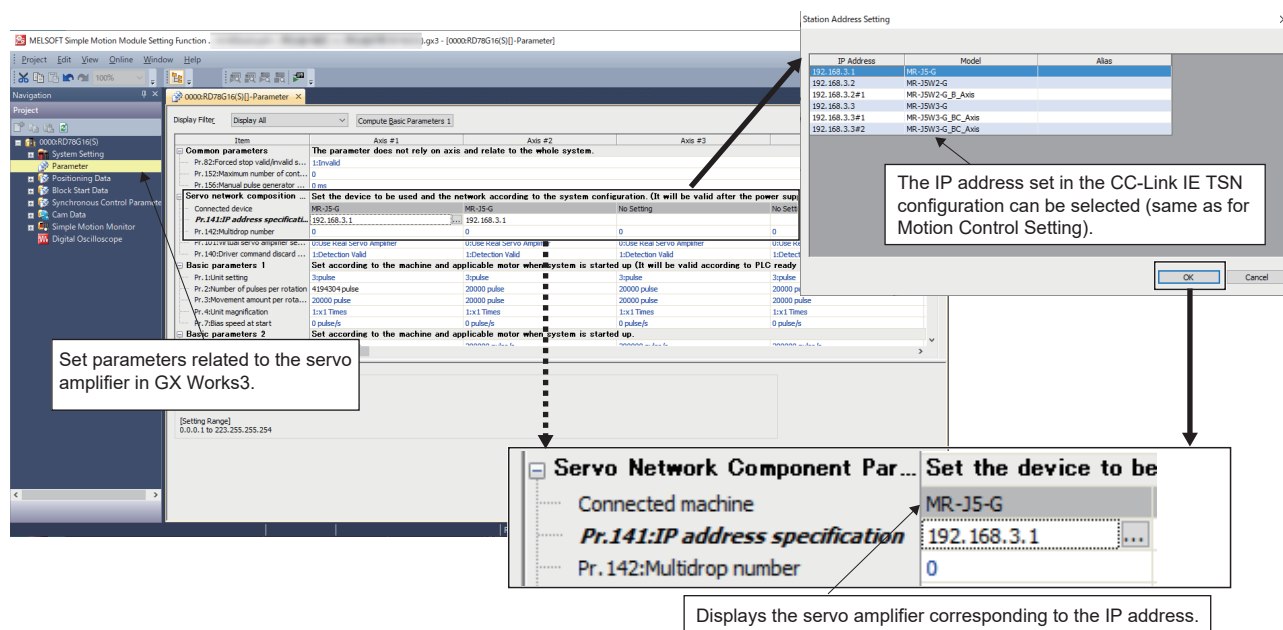
Start the Simple Motion Module Setting screen.

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



■Setting the axis

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

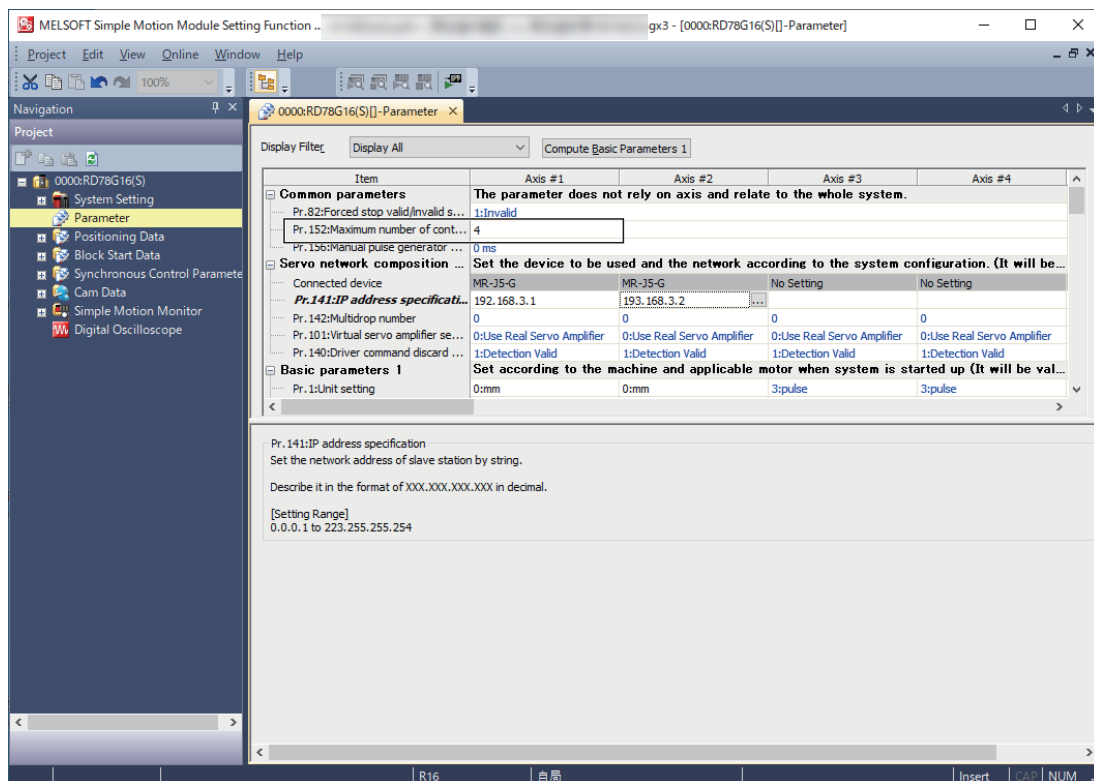


■Setting the maximum number of control axes

If "communication cycle interval setting (operation cycle)" is changed from the default value, change "[Pr.152] Maximum number of control axes" as well.

Communication cycle interval setting	Recommended setting of "[Pr.152] Maximum number of control axes"*1
250.00μs	4
500.00μs	8
1000.00μs	16

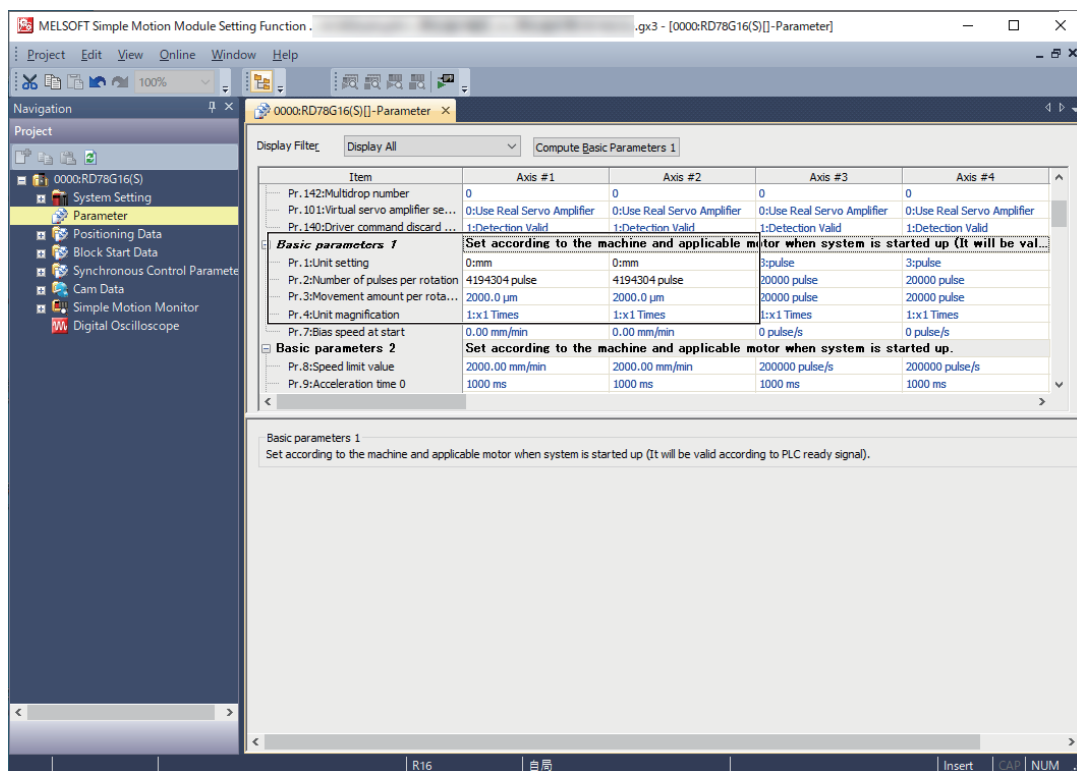
*1 In the case of 4-axis and 8-axis modules, the maximum number of axes of the module is the default value "0".



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



- 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

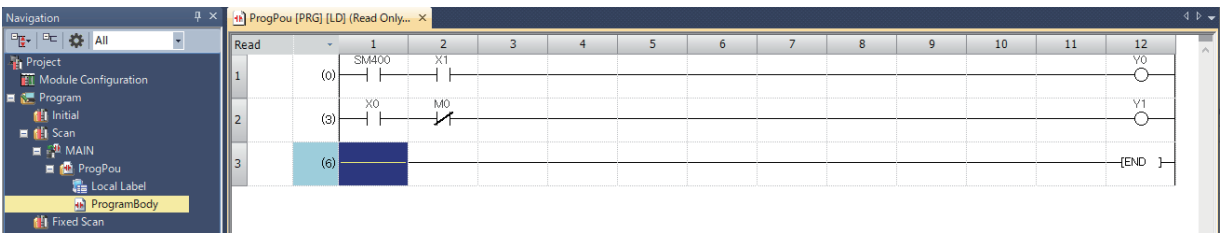
Pr. 91: Optional data monitor : Data type setting 1	Pr. 591: Optional data monitor : Data type expansion setting 1	Pr. 92: Optional data monitor : Data type setting 2	Pr. 592: Optional data monitor : Data type expansion setting 2
H2B12: Load Side Encoder Information ...	H0020	H0020	H0020
H2B12: Load Side Encoder Information ...	0: No Setting	0: No Setting	0: No Setting
H0000	H0000	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	-2.3 μm	-2.1 μm
Md.21: Machine feed value	-2.3 μm	-2.1 μm
Md.23: Axis error No.	-	-
Md.24: Axis warning No.	-	-
Md.26: Axis operation status	Servo OFF	Servo OFF
Md.28: Axis feedrate	0.00 mm/min	0.00 mm/min
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	-5 pulse	0 pulse
Md.103: Motor rotation speed	0.31 r/min	0.41 r/min
Md.104: Motor current value	0.0 %	0.0 %
Md.108: Servo status 1 : Servo alarm	OFF	OFF
Md.108: Servo status 1 : Servo warning	OFF	OFF
Md.114: Servo alarm	-	-
Md.109: Regenerative load ratio/Optional data monitor output 1	50963079	21020209
Md.110: Effective load ratio/Optional data monitor output 2	-	-

Program

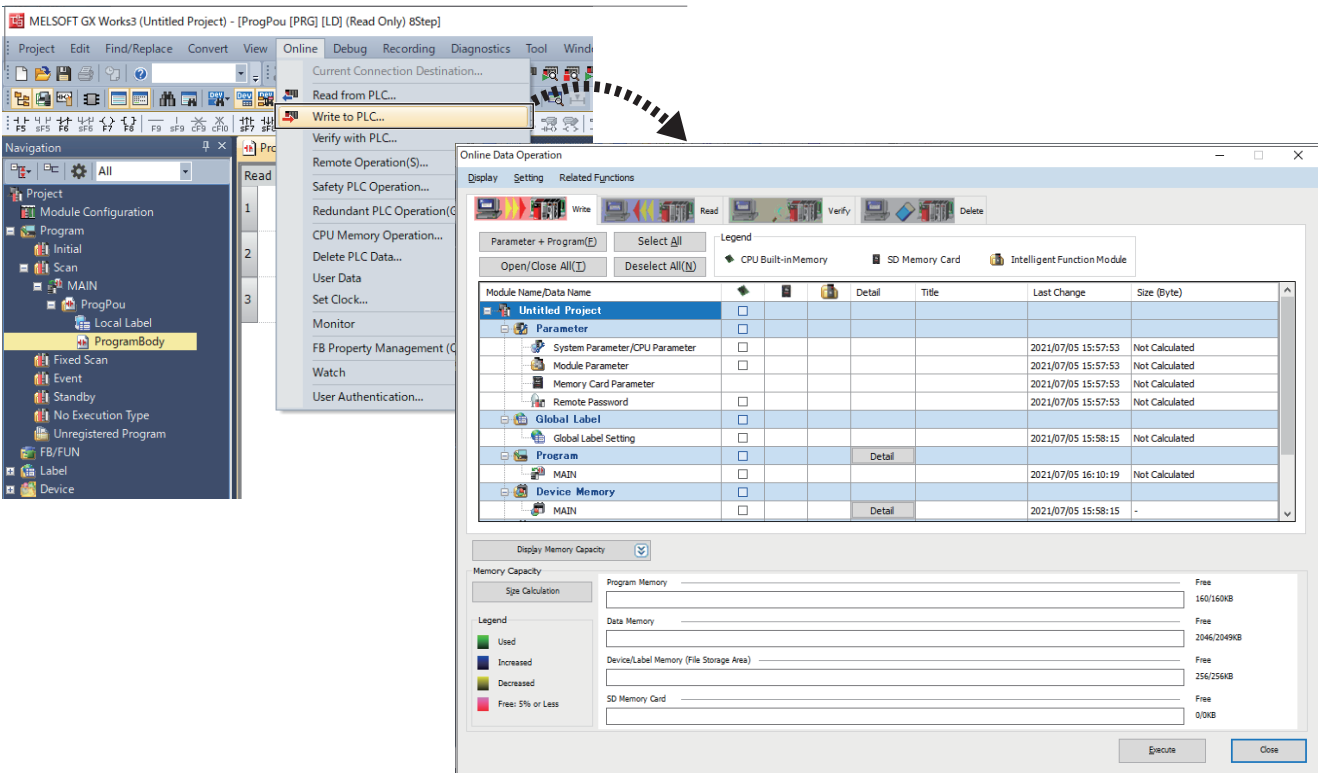
The I/O No. of the Motion module starts from 0. In the program below, PLC READY of the Motion module with the I/O No. "0" is turned ON and the servo ON of the axis used can be executed.



Writing/reading of data and operation mode switching

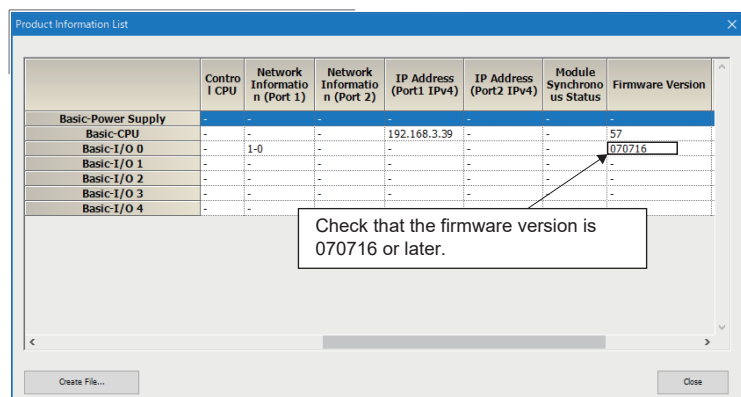
■Writing/reading of data

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



■Operation mode switching of RD78G

1. Check that the firmware version of the RD78G module is 070716 or later (Simple Motion mode-compatible version) in "Product Information List" of "System Monitor".

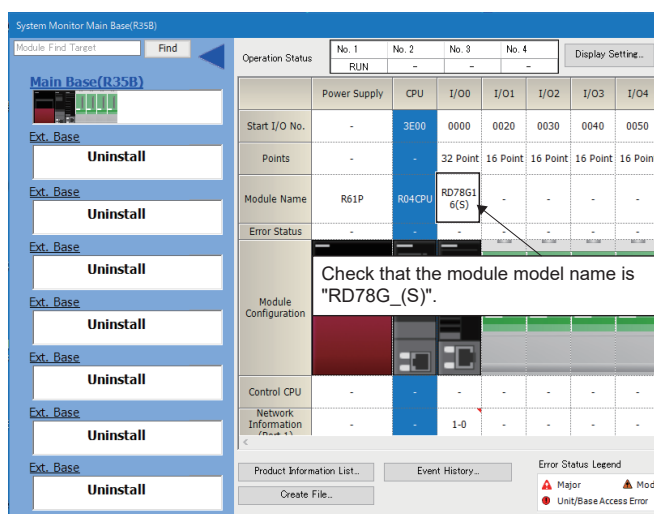
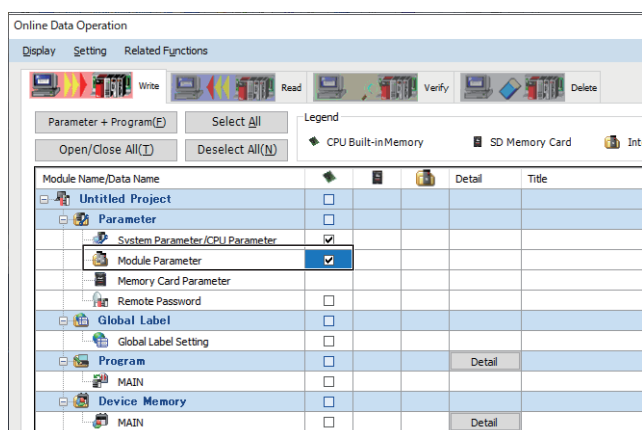


2. If not, upgrade the version of the basic system software, boot software, and network boot software.*1

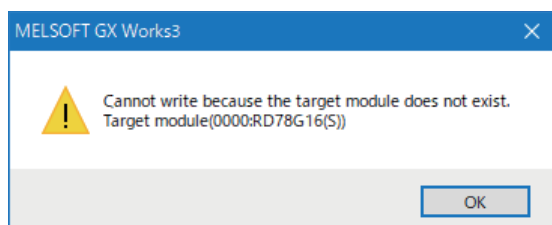
*1 For details, refer to "Software Installation to the Own Module" in the following manual.

📖 MELSEC iQ-R Motion Module User's Manual (Application for Simple Motion Mode)

3. Write "Module Parameter" in which RD78G_(S) is set in the module information to the CPU module to set the Motion module to the Simple Motion mode. After the data is written, reset the CPU module and check that the module model name is "RD78G_(S)" in "System Monitor". The operation mode can be checked in the buffer memory Un\G16252849 as well. (0: PLCopen motion control FB mode, 1: Simple Motion mode)



4. When the module parameter is not written and the operation is performed, the data of the Simple Motion module setting cannot be written and the following message appears. (The same message appears when the operation is performed on the version that is not compatible with the Simple Motion mode.)



- When using in the absolute position system, change the servo parameter "[AL.0E3 Absolute position counter warning] selection (PC29.5)" from "1: Enabled (default value) to "0: Invalid".*1

*1 When it is not set, the servo alarm [AL.0E3 Absolute position counter warning] occurs in the system of infinite feed, and the absolute position is lost.

■Updating the firmware version

The firmware version of the Motion module cannot be updated from the engineering tool in the Simple Motion mode. Use the SD memory card to update the firmware version.



In the PLCopen motion control FB mode, the Simple Motion mode add-on can be written with the "motion control setting function" by selecting [Tool] ⇒ [Add-on Management] or [Install Motion Software]. When the installation operation is performed from the engineering tool, the mode is required to be switched to the PLCopen motion control FB mode once.

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REVISIONS

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

Revision date	*Manual number	Description
July 2019	IB(NA)-0300406ENG-A	First edition
January 2020	IB(NA)-0300406ENG-B	■ Added models RD78GHV, RD78GHW ■ Added or modified parts WHEN USING A HUB WITH CC-Link IE TSN, TERMS, GENERIC TERMS AND ABBREVIATIONS, FUTURE SUPPORT PLANNED, Chapter 1, 5, Section 1.1, 2.1, 2.2, 3.1, 3.2, 5.1, 5.2, 5.3, 6.2, INDEX, WARRANTY, TRADEMARKS
August 2020	IB(NA)-0300406ENG-C	■ Added or modified parts WHEN USING A SWITCHING HUB WITH CC-Link IE TSN, SAFETY PRECAUTIONS, RELEVANT MANUALS, TERMS, GENERIC TERMS AND ABBREVIATIONS, FUTURE SUPPORT PLANNED, Chapter 3, 4, 5, Section 1.1, 2.1, 2.2, 3.1, 3.2, 4.1, 5.1, 5.2, 5.3, 6.1, 6.2, INDEX
August 2021	IB(NA)-0300406ENG-D	■ Added or modified parts WHEN USING A SWITCHING HUB WITH CC-Link IE TSN, SAFETY PRECAUTIONS, INTRODUCTION, COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES, RELEVANT MANUALS, TERMS, GENERIC TERMS AND ABBREVIATIONS, SUPPORTED MODE, COMPONENT, FUTURE SUPPORT PLANNED, Chapter 4, 5, 7, 8, 9, 10, 11, 12, Section 1.1, 2.1, 2.2, 2.3, 3.1, 3.2, 4.1, 5.1, 5.2, 5.3, 6.1, 6.2, INDEX, WARRANTY, TRADEMARKS

Japanese manual number: IB-0300405-E

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WARRANTY

Warranty

1. Warranty period and coverage

We will repair any failure or defect hereinafter referred to as "failure" in our FA equipment hereinafter referred to as the "Product" arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit are repaired or replaced.

[Term]

For terms of warranty, please contact your original place of purchase.

[Limitations]

(1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule.

It can also be carried out by us or our service company upon your request and the actual cost will be charged. However, it will not be charged if we are responsible for the cause of the failure.

(2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.

(3) Even during the term of warranty, the repair cost will be charged on you in the following cases;

1. a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
2. a failure caused by any alteration, etc. to the Product made on your side without our approval
3. a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
4. a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
5. any replacement of consumable parts (battery, fan, smoothing capacitor, etc.)
6. a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
7. a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
8. any other failures which we are not responsible for or which you acknowledge we are not responsible for

2. Term of warranty after the stop of production

(1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.

(2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

3. Service in overseas countries

Our regional FA Center in overseas countries will accept the repair work of the Product. However, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:

- (1) Damages caused by any cause found not to be the responsibility of Mitsubishi.
- (2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.
- (3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.
- (4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Change of Product specifications

Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

6. Application and use of the Product

(1) For the use of our Motion module, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in the Motion module, and a backup or fail-safe function should operate on an external system to the Motion module when any failure or malfunction occurs.

(2) Our Motion module is designed and manufactured as a general purpose product for use at general industries.

Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used

In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used. We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

(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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Specifications subject to change without notice.