MITSUBISHI
ELECTRIC

Programmable Controller

MELSEC iQ-R series

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

-RD77MS2
-RD77MS4
-RD77MS8
-RD77MS16
-RD77GF4
-RD77GF8
-RD77GF16
-RD77GF32

SAFETY PRECAUTIONS

(Read these precautions before using this product.)
Before using MELSEC iQ-R series programmable controllers, please read the manuals for the product and the relevant manuals introduced in those manuals carefully, and pay full attention to safety to handle the product correctly. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
The precautions given in this manual are concerned with this product only. For the safety precautions of the programmable controller system, refer to the MELSEC iQ-R Module Configuration Manual.
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. (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. (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. (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. (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.

[Design Precautions]

⚠WARNING

- 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.
- 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 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. Failure to do so may result in an accident due to an incorrect output or malfunction. 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 home position return is controlled by two kinds of data: a home position return direction and a home position return speed. Deceleration starts when the proximity dog signal turns on. If an incorrect home position return 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 home position return 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.

[Design Precautions]

⚠WARNING

- If safety standards (ex., robot safety rules, etc.,) apply to the system using the module, servo amplifier and servo motor, make sure that the safety standards are satisfied.
- Construct a safety circuit externally of the module or servo amplifier if the abnormal operation of the module or servo amplifier differs from the safety directive operation in the system.
- Do not remove the SSCNETⅢ cable while turning on the control circuit power supply of the module and servo amplifier. Do not see directly the light generated from SSCNETⅢ connector of the module or servo amplifier and the end of SSCNETⅢ cable. When the light gets into eyes, you may feel something wrong with eyes. (The light source of SSCNETⅢ complies with class1 defined in JISC6802 or IEC60825-1.)

[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 (IB-0800525). 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 until the hook(s) located at the top snaps into place. 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.
- When using the programmable controller in an environment of frequent vibrations, fix the module with a screw.
- 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. 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. 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. 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.
- When a protective film is attached to the top of the module, remove it before system operation. If not, inadequate heat dissipation of the module may cause a fire, failure, or malfunction.
- 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 the user's manual for the module used. 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) 25 cm or more 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.
- 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.

[Startup and Maintenance Precautions]

⚠CAUTION

- 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 discharge the static electricity may cause the module to fail or malfunction.
- After unpacking, eliminate static electricity from the module to prevent electrostatic discharge from affecting the module. If an electrostatically charged module comes in contact with a grounded metal object, a sudden electrostatic discharge of the module may cause failure. For details on how to eliminate static electricity from the module, refer to the following.
  Antistatic Precautions Before Using MELSEC iQ-R Series Products (FA-A-0368)
- 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 home position return.
- 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 also may 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 functions and programming of the relevant products listed below. Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the MELSEC iQ-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

RD77MS2, RD77MS4, RD77MS8, RD77MS16

RD77GF4, RD77GF8, RD77GF16, RD77GF32

Point

Symbols used in this manual are shown below.

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

- [Pr.**]: Symbols indicating positioning parameter or home position return parameter items
- [Da.**]: Symbols indicating positioning data or block start data items
- [Md.**]: Symbols indicating monitor data items
- [Cd.**]: Symbols indicating control data items
- [RD77MS]: Symbols indicating that it corresponds to only RD77MS
- [RD77GF]: Symbols indicating that it corresponds to only RD77GF

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 (IB-0800525)

The CE mark on the side 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 (IB-0800525)

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RELEVANT MANUALS

Manual name [manual number]	Description	Available form
MELSEC iQ-R Simple Motion Module User's Manual (Application) [IB-0300247ENG] (This manual)	Functions, input/output signals, buffer memory, parameter settings, programming, and troubleshooting of the Simple Motion module	Print book
		e-Manual PDF
MELSEC iQ-R Simple Motion Module User's Manual (Startup) [IB-0300245ENG]	Specifications, procedures before operation, system configuration, wiring, and operation examples of the Simple Motion module	Print book
		e-Manual PDF
MELSEC iQ-R Simple Motion Module User's Manual (Advanced Synchronous Control) [IB-0300249ENG]	Functions and programming for the synchronous control of the Simple Motion module	Print book
		e-Manual PDF
MELSEC iQ-R Simple Motion Module User's Manual (Network) [IB-0300307ENG]	Functions, parameter settings, troubleshooting, and buffer memory of CC-Link IE Field Network	Print book
		e-Manual PDF

This manual does not include information on the module function blocks.
For details, refer to the Function Block Reference for the module used.

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
2-axis module	A generic term for RD77MS2
4-axis module	A generic term for RD77MS4 and RD77GF4
8-axis module	A generic term for RD77MS8 and RD77GF8
16-axis module	A generic term for RD77MS16 and RD77GF16
32-axis module	A generic term for RD77GF32
Axis	Another term for a servo amplifier
Baton pass	A token to send data over a network
Buffer memory	A memory in an intelligent function module, where data (such as setting values and monitoring values) are stored. When using the CPU module, the memory is indicated for storing data (such as setting values and monitored values) of the Ethernet function and data used for data communication of the multiple CPU function.
CC-Link IE Field Network	A high-speed and large-capacity open field network that is based on Ethernet (1000BASE-T)
CPU module	The abbreviation for the MELSEC iQ-R series CPU module
Cyclic transmission	A function by which data are periodically exchanged among stations on the network using link devices
Data link	A generic term for cyclic transmission and transient transmission
Dedicated instruction	An instruction for using functions of the module
Device	A device (X, Y, M, D, or others) in a CPU module
Disconnection	A process of stopping data link if a data link error occurs
Engineering tool	A generic term for GX Works3 and MR Configurator2
Global label	A label that is enabled for all program data when creating multiple program data in the project. There are two types of global labels: module label that is automatically generated by GX Works3 and label that can be created for the any of the specified devices.
GX Works3	The product name of the software package for the MELSEC programmable controllers
Intelligent device station	A station that exchanges I/O signals (bit data) and I/O data (word data) with another station by cyclic transmission. This station responds to a transient transmission request from another station and also issues a transient transmission request to another station.
Intelligent function module	A MELSEC iQ-R series module that has functions other than input and output, such as an A/D converter module and D/A converter module
Label	A label that represents a device in a given character string
Link device	A device (RX, RY, RWr, or RWw) in a module on CC-Link IE Field Network
Link refresh	Automatic data transfer between a link device of the Simple Motion module and a device in a CPU module
Link scan (link scan time)	Time required for all the stations on the network to transmit data. The link scan time depends on data volume and the number of transient transmission requests.
Local station	A station that performs cyclic transmission and transient transmission with the master station and other local stations
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.
MR Configurator2	The product name of the setup software for the servo amplifier
MR-J3(W)-B	MR-J3-_B_(-RJ)/MR-J3W-_B Servo amplifier series
MR-J4(W)-B	MR-J4-_B_(-RJ)/MR-J4W_-_B Servo amplifier series
MR-J4-GF	MR-J4-_GF_(-RJ) Servo amplifier series
MR-JE-B(F)	MR-JE-_B(F) Servo amplifier series
MR-J5(W)-B	MR-J5-_B_(-RJ)/MR-J5W_-_B Servo amplifier series
Network module	A generic term for the following modules: • Ethernet interface module • CC-Link IE Controller Network module • Module on CC-Link IE Field Network • MELSECNET/H network module • MELSECNET/10 network module • RnENCPU (network part)
RD77GF	Another term for the MELSEC iQ-R series Simple Motion module (compatible with CC-Link IE Field Network)
RD77MS	Another term for the MELSEC iQ-R series Simple Motion module (compatible with SSCNETⅢ/H)

Term	Description
Remote device station	A station that exchanges I/O signals (bit data) and I/O data (word data) with another station by cyclic transmission. This station responds to a transient transmission request from another station.
Remote I/O station	A station that exchanges I/O signals (bit data) with the master station by cyclic transmission
Remote input (RX)	Bit data input from a slave station to the master station (For some areas in a local station, data are input in the opposite direction.)
Remote head module	The abbreviation for the RJ72GF15-T2 CC-Link IE Field Network remote head module
Remote output (RY)	Bit data output from the master station to a slave station (For some areas in a local station, data are output in the opposite direction.)
Remote register (RWr)	Word data input from a slave station to the master station (For some areas in a local station, data are input in the opposite direction.)
Remote register (RWw)	Word data output from the master station to a slave station (For some areas in a local station, data are output in the opposite direction.)
Return	A process of restarting data link when a station recovers from an error
Routing	A process of selecting paths for communication with other networks. There are two types of routing: dynamic routing that auto-selects the communication routes, and static routing where communication routes are arbitrarily set.
Safety communications	A function to exchange safety data between safety stations on the same network
Safety station	A generic term for a station that performs safety communications and standard communications
Servo amplifier	A generic term for a drive unit. Unless specified in particular, indicates the motor driver unit of the sequential command method which is controlled by the Simple Motion module (belonging to own station).
Servo network	A generic term for SSCNETⅢ/H, SSCNETⅢ
Simple Motion module	The abbreviation for the MELSEC iQ-R series Simple Motion module
Slave station	A generic term for a local station, remote I/O station, remote device station, and intelligent device station
SSCNETⅢ(/H)	A generic term for SSCNETⅢ/H, SSCNETⅢ
SSCNETⅢ[*1]	High speed synchronous communication network between RD77MS and servo amplifier
SSCNETⅢ/H[*1]	
Submaster station	A station that serves as a master station to control the entire network if the master station is disconnected. Only one master station can be used in a network.
Transient transmission	A function of communication with another station, which is used when requested by a dedicated instruction or the engineering tool

*1 SSCNET: Servo System Controller NETwork

1 START AND STOP

This chapter describes start and stop methods of the positioning control for the Simple Motion module.

1.1 Start

The Simple Motion module operates the start trigger in each control, and starts the positioning control. The following table shows the start signals for each control. This section describes the start using the positioning start signal and the external command signal.

Control details		Start trigger
Major positioning control		• Turns ON the positioning start signal [Y10 to Y2F].*1 • Turns ON the external command signal (DI).
High-level positioning control		
Home position return control		
Manual control	JOG operation	Turns ON the "[Cd.181] Forward run JOG start" or the "[Cd.182] Reverse run JOG start".
	Inching operation	
	Manual pulse generator operation	Operates the manual pulse generator.

*1 The positioning start signal, whose axis No. exceeds the number of controlled axes, cannot be used.

In the control other than the manual control, the following start methods can be selected.

- Normal start (☞ Page 156 Block start)
- Multiple axes simultaneous start (☞ Page 26 Multiple axes simultaneous start)

The positioning data, block start data, and condition data are used for the position specified at the control. The data that can be used varies by the start method.

Servo ON conditions

Setting of servo parameter
↓
PLC READY signal [Y0] ON
↓
All axis servo ON [Y1] ON

Starting conditions

To start the control, the following conditions must be satisfied.

The necessary start conditions must be incorporated in the program so that the control is not started when the conditions are not satisfied.

- Operation state

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Monitor item		Operation state	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Md.26]	Axis operation status	"0: Standby" or "1: Stopped"	2409+100n	1002409+100n

- Signal state

Signal name		Signal state		Device
I/O signal	PLC READY signal	ON	CPU module preparation completed	Y0
	READY signal	ON	Preparation completed	X0
	All axis servo ON	ON	All axis servo ON	Y1
	Synchronization flag[*1]	ON	The buffer memory can be accessed.	X1
	Axis stop signal	OFF	Axis stop signal is OFF	[Cd.180] Axis stop
	M code ON signal	OFF	M code ON signal is OFF	[Md.31] Status: b12
	Error detection signal	OFF	There is no error	[Md.31] Status: b13
	BUSY signal	OFF	BUSY signal is OFF	X10 to X2F[*2]
	Start complete signal	OFF	Start complete signal is OFF	[Md.31] Status: b14
External signal	Forced stop input signal	ON	There is no forced stop input	—
	Stop signal	OFF	Stop signal is OFF	—
	Upper limit (FLS)	ON	Within limit range	—
	Lower limit (RLS)	ON	Within limit range	—

*1 The interlock must be provided so that the buffer memory is accessed after Synchronization flag [X1] turns on. When no interlock is provided, an unexpected value may be read or written.

*2 The BUSY signal, whose axis No. exceeds the number of controlled axes, cannot be used.

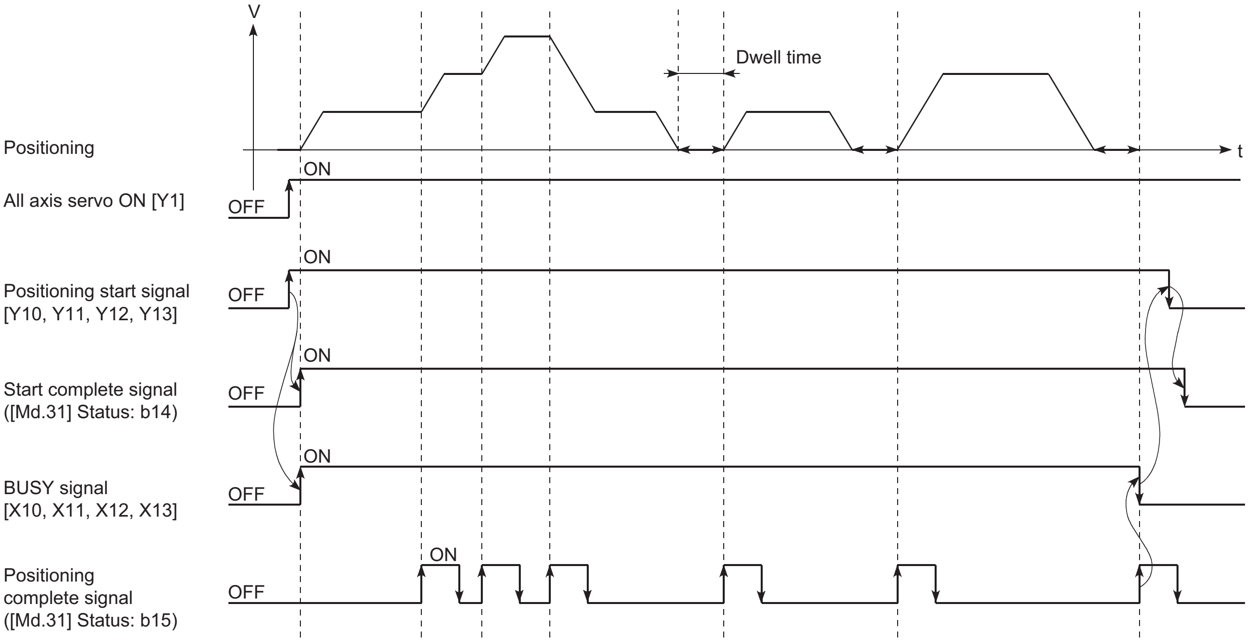
Start by the positioning start signal

The operation at starting by the positioning start signal is shown below.

- When the positioning start signal turns ON, the start complete signal ([Md.31] Status: b14) and BUSY signal turn ON, and the positioning operation starts. It can be seen that the axis is operating when the BUSY signal is ON.
- When the positioning start signal turns OFF, the start complete signal ([Md.31] Status: b14) also turns OFF. If the positioning start signal is ON even after positioning is completed, the start complete signal ([Md.31] Status: b14) will remain ON.
- If the positioning start signal turns ON again while the BUSY signal is ON, the warning "Start during operation" (warning code: 0900H)" will occur.
- The process executed when the positioning operation is completed will differ by whether the next positioning control is executed.

Whether the next positioning control is executed	Processing details
Do not execute the positioning	• If a dwell time is set, the system will wait for the set time to pass, and then positioning will be completed. • When positioning is completed, the BUSY signal will turn OFF and the positioning complete signal ([Md.31] Status: b15) will turn ON. However, when using speed control or when the positioning complete signal output time is "0", the signal will not turn ON. • When the time set in "[Pr.40] Positioning complete signal output time" is passed, the positioning complete signal ([Md.31] Status: b15) will turn OFF.
Execute the positioning	• If a dwell time is set, the system will wait for the set time to pass. • When the set dwell time is passed, the next positioning will start.

■Operation example



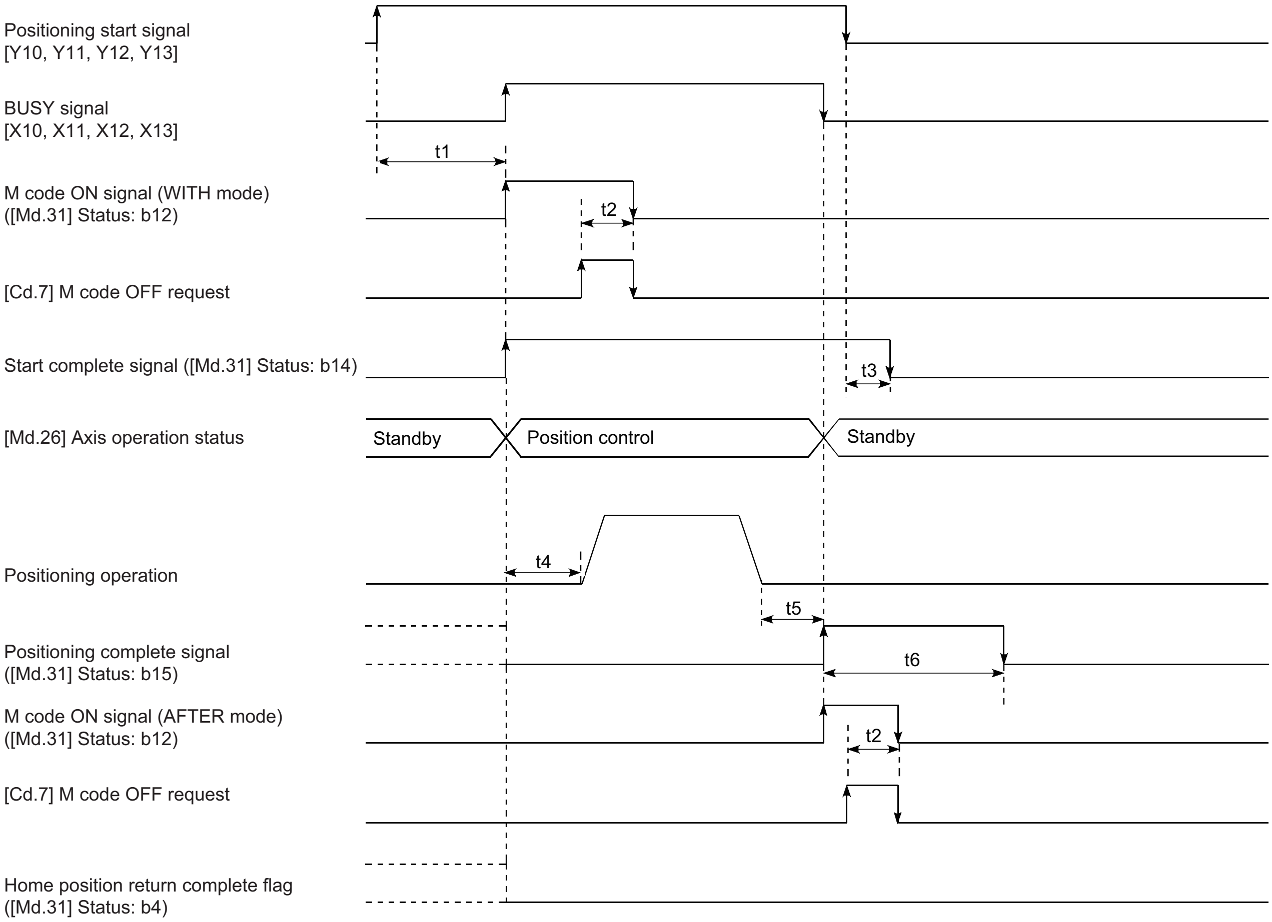
Point

The BUSY signal turns ON even when position control of movement amount 0 is executed. However, since the ON time is short, the ON status may not be detected in the program. (The ON status of the start complete signal ([Md.31] Status: b14), positioning complete signal ([Md.31] Status: b15) and M code ON signal ([Md.31] Status: b12) can be detected in the program.)

■Operation timing and processing time

The following shows details about the operation timing and time during position control.

- Operation example



Point

When the positioning start signal turns ON, if the "positioning complete signal" or the "home position return complete flag" are already ON, the "positioning complete signal" or the "home position return complete flag" will turn OFF when the positioning start signal turns ON.

- Normal timing time (Unit: [ms])

[RD77MS]

Operation cycle	t1[*1]	t2	t3	t4	t5	t6
0.444	0.340 to 0.744	0.000 to 0.444	0.000 to 0.444	1.077 to 1.596	0.000 to 0.444	Follows parameters
0.888	0.549 to 1.246	0.000 to 0.888	0.000 to 0.888	2.152 to 3.183	0.000 to 0.888	Follows parameters
1.777	0.347 to 1.040	0.000 to 1.777	0.000 to 1.777	3.797 to 4.456	0.000 to 1.777	Follows parameters
3.555	0.198 to 0.942	0.000 to 3.555	0.000 to 3.555	5.667 to 8.032	0.000 to 3.555	Follows parameters

[RD77GF]

Operation cycle	t1[*1]	t2	t3	t4	t5	t6
0.50	0.227 to 0.788	0.000 to 0.500	0.000 to 0.500	1.136 to 1.440	0.000 to 0.500	Follows parameters
1.00	0.375 to 1.182	0.000 to 1.000	0.000 to 1.000	2.730 to 2.906	0.000 to 1.000	Follows parameters
2.00	0.278 to 2.222	0.000 to 2.000	0.000 to 2.000	5.839 to 5.899	0.000 to 2.000	Follows parameters
4.00	0.399 to 4.066	0.000 to 4.000	0.000 to 4.000	11.844 to 11.896	0.000 to 4.000	Follows parameters

[*1] The t1 timing time could be delayed by the operation state of other axes.

Start by the external command signal (DI)

[RD77MS]

When starting positioning control by inputting the external command signal (DI), the start command can be directly input into the Simple Motion module. This allows the variation time equivalent to one scan time of the CPU module to be eliminated. This is an effective procedure when operation is to be started as quickly as possible with the start command or when the starting variation time is to be suppressed.

[RD77GF]

When starting positioning control by inputting the external command signal (DI), the start command via link device can be directly input into the Simple Motion module. By using external command signals (block No.7000 to 7004 start), the block start can be executed without sequence programs.

■Advance setting

Set the following data in advance.

[RD77MS]

n: Axis No. - 1

Setting item		Setting value	Setting details	Buffer memory address
[Pr.42]	External command function selection	0	Set to "0: External positioning start".	62+150n

Set the external command signal (DI) to be used in "[Pr.95] External command signal selection".

Refer to the following for the setting details.

☞ Page 496 Basic Setting

[RD77GF]

Start signal	Relevant parameter	Positioning number to be started
External command signal (external positioning start)	[Pr.950] to [Pr.953]	The number set in "[Cd.3] Positioning start No."
External command signal (block No.7000 start)	[Pr.1020] to [Pr.1023]	7000
External command signal (block No.7001 start)	[Pr.1030] to [Pr.1033]	7001
External command signal (block No.7002 start)	[Pr.1040] to [Pr.1043]	7002
External command signal (block No.7003 start)	[Pr.1050] to [Pr.1053]	7003
External command signal (block No.7004 start)	[Pr.1060] to [Pr.1063]	7004

When the start command via link device (block No.7000 to 7004) is executed, the block No. (7000 to 7004) is set in "[Cd.3] Positioning start No." by the Simple Motion module.

Do not overwrite in "[Cd.3] Positioning start No." until the analysis is completed and the operation is started.

Refer to the following for details on the setting method.

☞ Page 346 Link Device External Signal Assignment Function [RD77GF]

■Start method

Set "[Cd.3] Positioning start No." and enable "[Cd.8] External command valid" with a program. Then, turn ON the external command signal (DI).

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.3]	Positioning start No.	1 to 600	Set the positioning data No. to be started.	4300+100n	1004300+100n
[Cd.8]	External command valid	1	Set to "1: Validates an external command.".	4305+100n	1004305+100n

Refer to the following for the setting details.

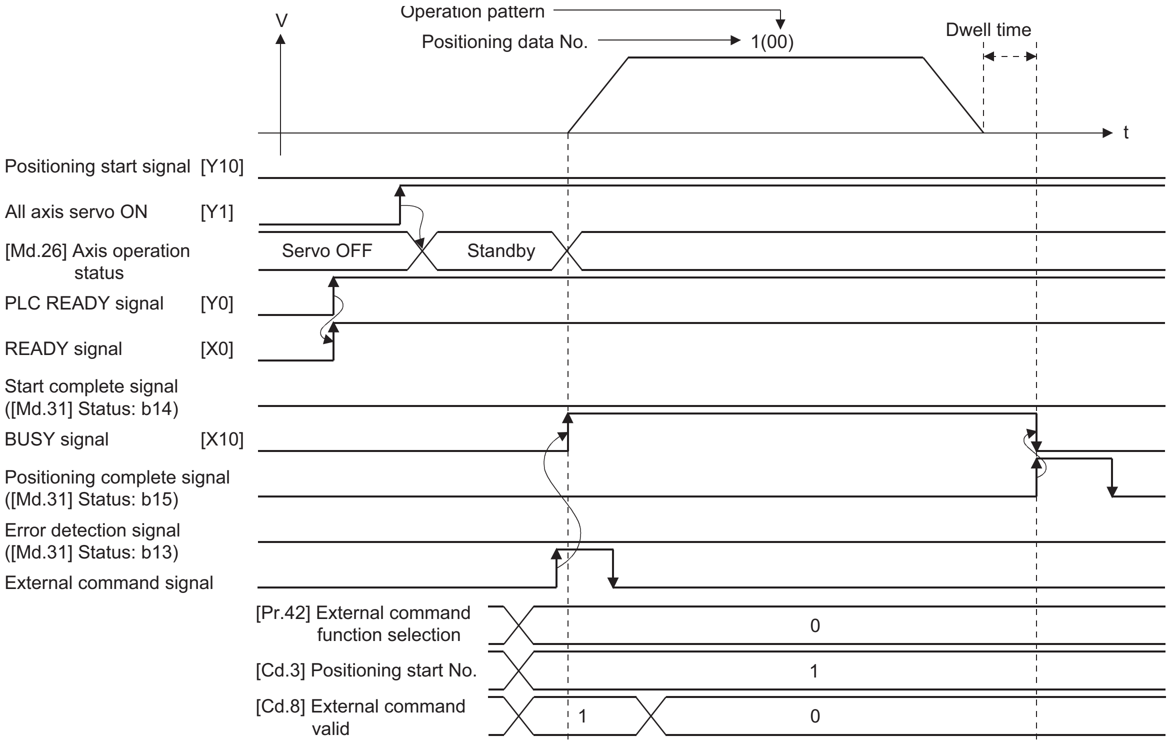
☞ Page 616 Control Data

■Restriction

When starting by inputting the external command signal (DI), the start complete signal ([Md.31] Status: b14) will not turn ON.

■Starting time chart

- Operation example



Multiple axes simultaneous start

The "multiple axes simultaneous start" starts outputting the command to the specified simultaneous starting axis at the same timing as the started axis. A maximum of four axes can be started simultaneously.

Control details

The multiple axes simultaneous start control is carried out by setting the simultaneous start setting data to the multiple axes simultaneous start control buffer memory of the axis control data, "9004" to "[Cd.3] Positioning start No." of the start axis, and then turning ON the positioning start signal.

Set the number of axes to be started simultaneously and axis No. in "[Cd.43] Simultaneous starting axis", and the start data No. of simultaneous starting axis (positioning data No. to be started simultaneously for each axis) in "[Cd.30] Simultaneous starting own axis start data No." and "[Cd.31] Simultaneous starting axis start data No.1" to "[Cd.33] Simultaneous starting axis start data No.3".

Restrictions

- The error "Error before simultaneous start" (error code: 1990H, 1991H) will occur and all simultaneous starting axes will not start if the simultaneous starting axis start data No. is not set to the axis control data on the start axis or set outside the setting range.
- The error "Error before simultaneous start" (error code: 1990H, 1991H) will occur and all simultaneous starting axes will not start if either of the simultaneous starting axes is BUSY.
- The error "Error before simultaneous start" (error code: 1990H, 1991H) will occur and all simultaneous starting axes will not start if an error occurs during the analysis of the positioning data on the simultaneous starting axes.
- No error or warning will occur if only the start axis is the simultaneous starting axis.
- This function cannot be used with the sub function ☞ Page 287 Pre-reading start function.

Procedure

The procedure for multiple axes simultaneous start control is shown below.

1. Set the following axis control data.

- [Cd.43] Simultaneous starting axis
- [Cd.30] Simultaneous starting own axis start data No.
- [Cd.31] Simultaneous starting axis start data No.1
- [Cd.32] Simultaneous starting axis start data No.2
- [Cd.33] Simultaneous starting axis start data No.3

2. Write [9004] in "[Cd.3] Positioning start No.".

3. Turn ON the positioning start signal to be started.

Setting method

The following shows the setting of the data used to execute the multiple axes simultaneous start control with positioning start signals (The axis control data on the start axis is set).

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.3]	Positioning start No.	9004	Set the multiple axes simultaneous start control start No. "9004".	4300+100n	1004300+100n
[Cd.43]	Simultaneous starting axis	Set the number of simultaneous starting axes and target axis.		4368+100n 4369+100n	1004368+100n 1004369+100n
[Cd.30]	Simultaneous starting own axis start data No.	Set the simultaneous starting axis start data No. Set a "0" for the axis other than the simultaneous starting axes.		4340+100n	1004340+100n
[Cd.31]	Simultaneous starting axis start data No.1			4341+100n	1004341+100n
[Cd.32]	Simultaneous starting axis start data No.2			4342+100n	1004342+100n
[Cd.33]	Simultaneous starting axis start data No.3			4343+100n	1004343+100n

The signal of axis 3 and 4 cannot be used in the RD77MS2.

Refer to the following for the setting details.

☞ Page 616 Control Data

Setting examples

The following shows the setting examples in which the axis 10 is used as the start axis and the axis 12 and axis 14 are used as the simultaneous starting axes.

Setting item		Setting value	Setting details	Buffer memory address (Axis 10)
[Cd.3]	Positioning start No.	9004	Set the multiple axes simultaneous start control start No. "9004".	5200
[Cd.43]	Simultaneous starting axis	03000D0BH	Set the axis 12 (0BH) to the simultaneous starting axis No.1, and the axis 14 (0DH) to the simultaneous starting axis No.2.	5268, 5269
[Cd.30]	Simultaneous starting own axis start data No.	100	The axis 10 starts the positioning data No.100.	5240
[Cd.31]	Simultaneous starting axis start data No.1	200	Immediately after the start of the axis 10, the axis 12 starts the axis 12 positioning data No.200.	5241
[Cd.32]	Simultaneous starting axis start data No.2	300	Immediately after the start of the axis 10, the axis 14 starts the axis 14 positioning data No.300.	5242
[Cd.33]	Simultaneous starting axis start data No.3	0	Will not start simultaneously.	5243

Point

The "multiple axes simultaneous start control" carries out an operation equivalent to the "simultaneous start" using the "block start data".

The setting of the "multiple axes simultaneous start control" is easier than that of the "simultaneous start" using the "block start data".

- Setting items for "simultaneous start" using "block start data": Positioning start data, block start data, condition data, and positioning data
- Setting items for "multiple axes simultaneous start control": Positioning data and axis control data

1.2 Stop

The axis stop signal or stop signal from external input signal is used to stop the control.

Create a program to turn ON the axis stop signal [Cd.180] as the stop program.

Each control is stopped in the following cases.

- When each control is completed normally
- When the Servo READY signal is turned OFF
- When a CPU module error occurs
- When the PLC READY signal [Y0] is turned OFF
- When an error occurs in Simple Motion module
- When control is intentionally stopped (Stop signal from CPU module turned ON, "Stop signal" of external input signal turned ON, etc.)

The stop process for the above cases is shown below.

(Excluding when each control is completed normally.)

Refer to the following for the stop process during speed control mode and torque control mode.

☞ Page 203 Speed-torque Control

Refer to the following for the stop process during test mode operation.

☞ Page 409 Stop operation of the test mode operation axes

Stop process

Stop cause		Stop axis	M code ON signal after stop	Axis operation status after stopping ([Md.26])
Forced stop	Forced stop input to Simple Motion module	All axes	No change	Servo OFF
	Servo READY OFF • Servo amplifier power supply OFF	Each axis	No change	Servo amplifier has not been connected
	• Servo alarm			Error
	• Forced stop input to servo amplifier			Servo OFF
Fatal stop (Stop group 1)	Hardware stroke limit upper/lower limit error occurrence	Each axis	No change	Error
Emergency stop (Stop group 2)	Error occurs in a CPU module	All axes	No change	Error
	PLC READY signal [Y0] OFF		Turns OFF	
Relatively safe stop (Stop group 3)	Axis error detection (Error other than stop group 1 or 2)[*1]	Each axis	No change	Error
Intentional stop (Stop group 3)	"Axis stop signal" ON from a CPU module[*2]	Each axis	No change	Stopped (Standby)
	"Stop signal" of external input signal ON[*2]			

[*1] If an error occurs in a positioning data due to an invalid setting value, when the continuous positioning control uses multiple positioning data successively, it automatically decelerates at the previous positioning data. It does not stop rapidly even when the setting value is rapid stop in stop group 3. If any of the following error occurs, the operation is performed up to the positioning data immediately before the positioning data where an error occurred, and then stops immediately.
No command speed (error code: 1A13H, 1A14H)
Outside linear movement amount range (error code: 1A15H, 1A16H)
Large arc error deviation (error code: 1A17H)
Software stroke limit + (error code: 1A18H, 1A19H)
Software stroke limit - (error code: 1A1AH, 1A1BH)
Sub point setting error (error code: 1A27H, 1A28H, 1A29H, 1A2AH, 1A37H)
End point setting error (error code: 1A2BH, 1A2CH)
Center point setting error (error code: 1A2DH, 1A2EH, 1A2FH)
Outside radius range (error code: 1A32H)
Illegal setting of ABS direction in unit of degree (error code: 19A4H, 19A5H)

[*2] It is recommended to control the stop signal after checking the condition while the axis is BUSY, such as incorporating the fact that the BUSY signal is ON as the interlock condition. The error "Stop signal ON at start" (error code: 1908H) can be prevented depending on the timing.

<table>
<tr><th rowspan="3" colspan="2">Stop cause</th><th colspan="6">Stop process</th></tr>
<tr><th colspan="2">Home position return control</th><th rowspan="2">Major positioning control</th><th rowspan="2">High-level positioning control</th><th colspan="2">Manual control</th></tr>
<tr><th>Machine home position return control[1]</th><th>Fast home position return control</th><th>JOG/ Inching operation</th><th>Manual pulse generator operation</th></tr>
<tr><td rowspan="4">Forced stop</td><td>Forced stop input to Simple Motion module</td><td rowspan="4" colspan="5">Immediate stop
For the stop method of the servo amplifier, refer to each servo amplifier instruction manual or manual.</td><td rowspan="4">—</td></tr>
<tr><td>Servo READY OFF
• Servo amplifier power supply OFF</td></tr>
<tr><td>• Servo alarm</td></tr>
<tr><td>• Forced stop input to servo amplifier</td></tr>
<tr><td>Fatal stop
(Stop group 1)</td><td>Hardware stroke limit upper/lower limit error occurrence</td><td colspan="5">Deceleration stop/rapid stop
(Select with "[Pr.37] Stop group 1 rapid stop selection".)</td><td>Deceleration stop</td></tr>
<tr><td rowspan="2">Emergency stop
(Stop group 2)</td><td>Error occurs in a CPU module[2]</td><td rowspan="2" colspan="5">Deceleration stop/rapid stop
(Select with "[Pr.38] Stop group 2 rapid stop selection".)</td><td rowspan="2">Deceleration stop</td></tr>
<tr><td>PLC READY signal [Y0] OFF</td></tr>
<tr><td>Relatively safe stop
(Stop group 3)</td><td>Axis error detection (Error other than stop group 1 or 2)[3]</td><td rowspan="3" colspan="5">Deceleration stop/rapid stop
(Select with "[Pr.39] Stop group 3 rapid stop selection".)</td><td rowspan="3">Deceleration stop</td></tr>
<tr><td rowspan="2">Intentional stop
(Stop group 3)</td><td>"Axis stop signal" ON from a CPU module[4]</td></tr>
<tr><td>"Stop signal" of external input signal ON[4]</td></tr>
</table>

[1] When the driver home position return method is used, the stop process is performed according to the specification of the servo amplifier.

[2] The communication with the servo amplifier is disconnected when a CPU error occurs. The stop operation of the servo amplifier is according to its own specification. Refer to "Forced stop deceleration function" in the servo amplifier instruction manual for details. [RD77GF]

[3] If an error occurs in a positioning data due to an invalid setting value, when the continuous positioning control uses multiple positioning data successively, it automatically decelerates at the previous positioning data. It does not stop rapidly even the setting value is rapid stop in stop group 3. If any of the following error occurs, the operation is performed up to the positioning data immediately before the positioning data where an error occurred, and then stops immediately.
No command speed (error code: 1A13H, 1A14H)
Outside linear movement amount range (error code: 1A15H, 1A16H)
Large arc error deviation (error code: 1A17H)
Software stroke limit + (error code: 1A18H, 1A19H)
Software stroke limit - (error code: 1A1AH, 1A1BH)
Sub point setting error (error code: 1A27H, 1A28H, 1A29H, 1A2AH, 1A37H)
End point setting error (error code: 1A2BH, 1A2CH)
Center point setting error (error code: 1A2DH, 1A2EH, 1A2FH)
Outside radius range (error code: 1A32H)
Illegal setting of ABS direction in unit of degree (error code: 19A4H, 19A5H)

[4] It is recommended to control the stop signal after checking the condition while the axis is BUSY, such as incorporating the fact that the BUSY signal is ON as the interlock condition. The error "Stop signal ON at start" (error code: 1908H) can be prevented depending on the timing.

Point

Provide the emergency stop circuits outside the servo system to prevent cases where danger may result from abnormal operation of the overall system in the event of an external power supply fault or servo system failure.

Types of stop processes

The operation can be stopped with deceleration stop, rapid stop or immediate stop.

■Deceleration stop

The operation stops with "deceleration time 0 to 3" ([Pr.10], [Pr.28], [Pr.29], [Pr.30]). Which time from "deceleration time 0 to 3" to use for control is set in positioning data ([Da.4]).

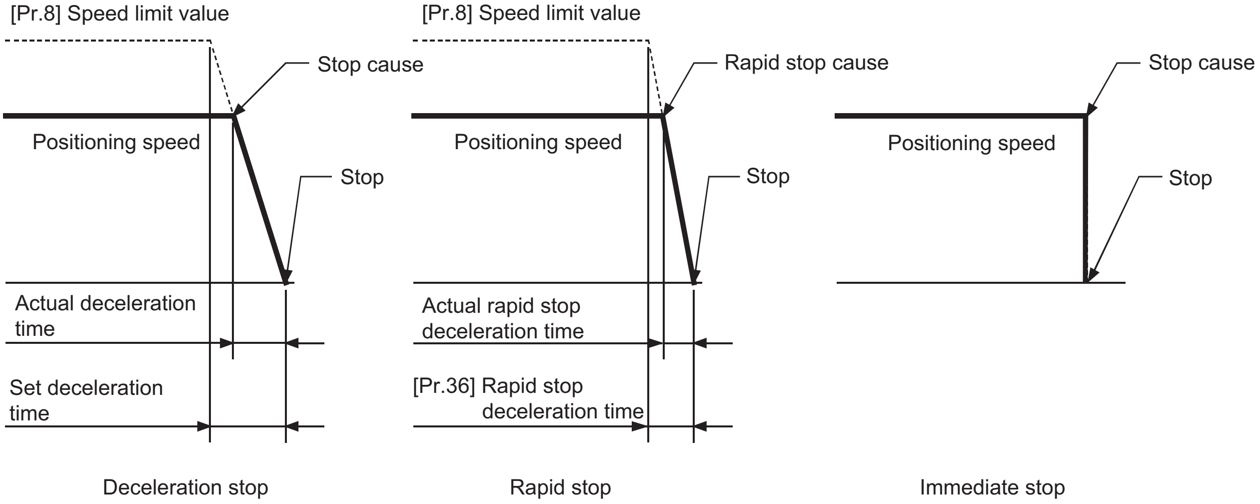
■Rapid stop

The operation stops with "[Pr.36] Rapid stop deceleration time".

■Immediate stop

The operation does not decelerate.

The Simple Motion module immediately stops the command. For the stop method of the servo amplifier, refer to each servo amplifier instruction manual or manual.



Point

"Deceleration stop" and "rapid stop" are selected with the detailed parameter 2 "stop group 1 to 3 rapid stop selection". (The default setting is "deceleration stop".)

Order of priority for stop process

The order of priority for the Simple Motion module stop process is as follows.

(Deceleration stop) < (Rapid stop) < (Immediate stop)

- If the deceleration stop command ON (stop signal ON) or deceleration stop cause occurs during deceleration to speed 0 (including automatic deceleration), operation changes depending on the setting of "[Cd.42] Stop command processing for deceleration stop selection". (☞ Page 291 Stop command processing for deceleration stop function)

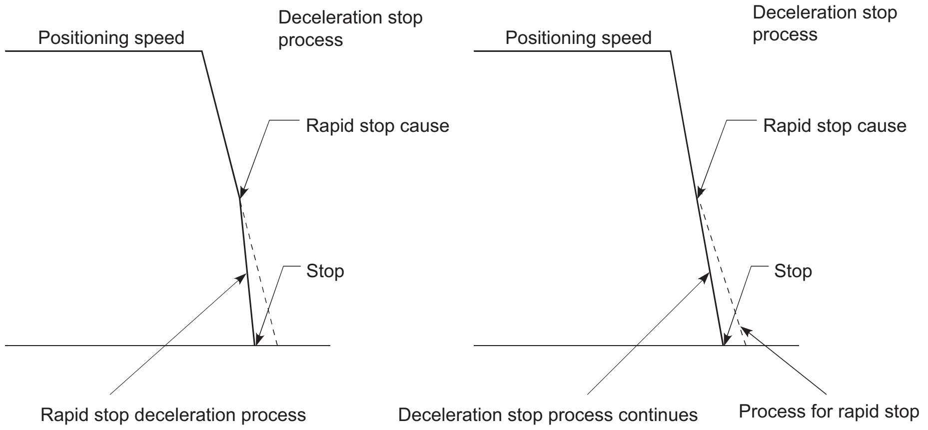
Positioning control during deceleration	Setting value of [Cd.42]	Processing details
Manual control	—	Independently of the [Cd.42] setting, a deceleration curve is re-processed from the speed at stop cause occurrence.
Home position return control[1], positioning control	0: Deceleration curve re-processing	A deceleration curve is re-processed from the speed at stop cause occurrence. (☞ Page 291 Deceleration curve re-processing)
	1: Deceleration curve continuation	The current deceleration curve is continued after stop cause occurrence. (☞ Page 291 Deceleration curve continuation)

*1 When using the driver home position return method, the stop processing follows the specifications of the servo amplifier.

- If the stop signal designated for rapid stop turns ON or a stop cause occurs during deceleration, the rapid stop process will start from that point. However, if the rapid stop deceleration time is longer than the deceleration time, the deceleration stop process will be continued even if a rapid stop cause occurs during the deceleration stop process.

Example

The process when a rapid stop cause occurs during deceleration stop is shown below.



(a) When deceleration stop time > rapid stop deceleration time

(b) When deceleration stop time < rapid stop deceleration time

Inputting the stop signal during deceleration

- Even if stop is input during deceleration (including automatic deceleration), the operation will stop at that deceleration speed.
- If stop is input during deceleration for home position return, the operation will stop at that deceleration speed. If input at the creep speed, the operation will stop immediately. When using the driver home position return method, the stop processing follows the specifications of the servo amplifier.
- If a stop cause, designated for rapid stop, occurs during deceleration, the rapid stop process will start from that point. The rapid stop process during deceleration is carried out only when the rapid stop time is shorter than the deceleration stop time.

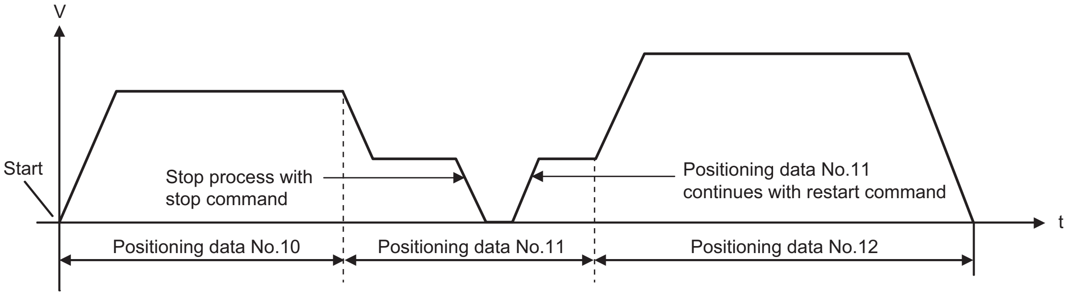
1.3 Restart

When a stop factor occurs during position control and the operation stops, the positioning can be restarted from the stopped position to the position control end point by using the "restart command" ([Cd.6] Restart command). ("Restarting" is not possible when "continuous operation is interrupted.")

This instruction is efficient when performing the remaining positioning from the stopped position in the positioning control of incremental method such as INC linear 1. (Calculation of remaining distance is not required.)

Operation

After a deceleration stop by the stop command is completed, write "1: Restarts" to the "[Cd.6] Restart command" with "[Md.26] Axis operation status" is "stopped" and the positioning restarts.



Restrictions

- Restarting can be executed only when the "[Md.26] Axis operation status" is "stopped (the deceleration stop by stop command is completed)". If the axis operation is not "stopped", restarting is not possible. In this case, the warning "Restart not possible" (warning code: 0902H) will occur, and the process at that time will be continued.
- Do not execute restart while the stop command is ON. If restart is executed while stopped, the error "Stop signal ON at start" (error code: 1908H) will occur, and the "[Md.26] Axis operation status" will change to "Error". Thus, even if the error is reset, the operation cannot be restarted.
- Restarting can be executed even while the positioning start signal is ON. However, make sure that the positioning start signal does not change from OFF to ON while stopped.
- If the positioning start signal is changed from OFF to ON while "[Md.26] Axis operation status" is "stopped", the normal positioning (the positioning data set in "[Cd.3] Positioning start No.") is started.
- If positioning is ended with the continuous operation interrupt request, the operation cannot be restarted. If restart is requested, the warning "Restart not possible" (warning code: 0902H) will occur.
- When stopped with interpolation operation, write "1: Restarts" into "[Cd.6] Restart command" for the reference axis, and then restart.
- If the PLC READY signal [Y0] is changed from OFF to ON while stopped, restarting is not possible. If restart is requested, the warning "Restart not possible" (warning code: 0902H) will occur.
- When the machine home position return and fast home position return is stopped, the error "Home position return restart not possible" (error code: 1946H) will occur and the positioning cannot restarts.
- If any of reference partner axes executes the positioning operation once after interpolation operation stop, the warning "Restart not possible" (warning code: 0902H) will occur, and the positioning cannot restarts.

Setting method

Set the following data to execute restart.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

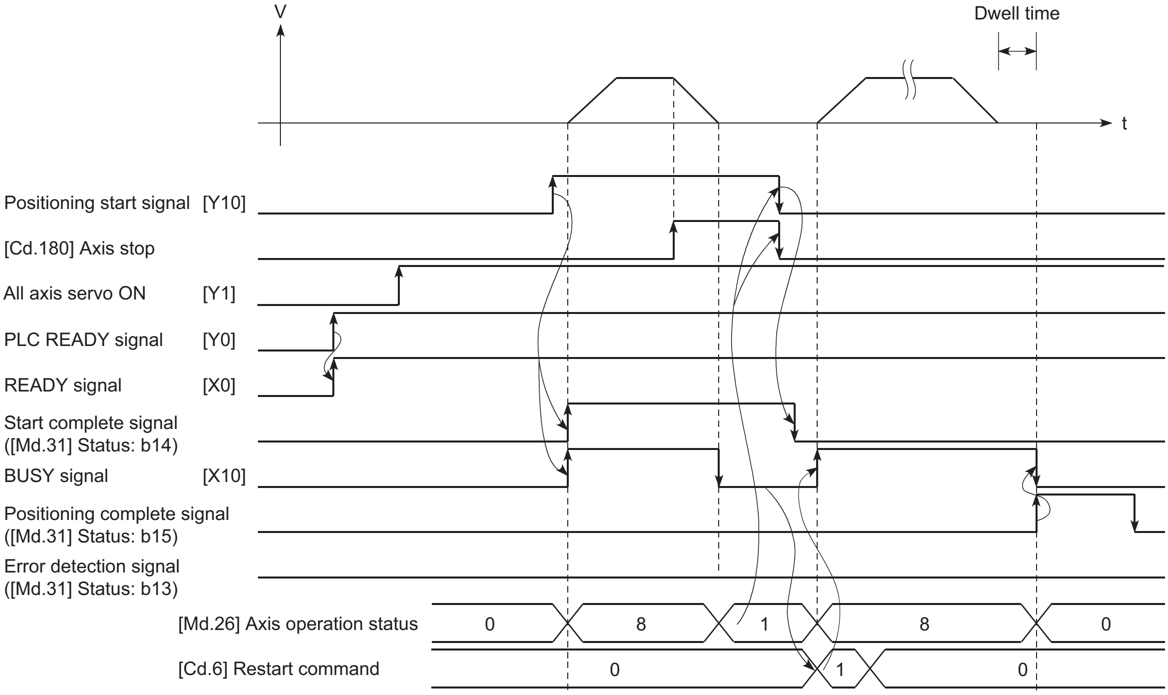
Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.6]	Restart command	1	Set "1: Restarts".	4303+100n	1004303+100n

Refer to the following for the setting details.

☞ Page 616 Control Data

Time chart for restarting

■Operation example



Program example

Refer to the following for the program example of restart.

☞ Page 697 Restart program

2 HOME POSITION RETURN CONTROL

The details and usage of "home position return control" are explained in this chapter.

2.1 Outline of Home Position Return Control

Two types of home position return control

In "home position return control", a position is established as the starting (or "home position") when carrying out positioning control, and positioning is carried out toward that starting point.

It is used to return a machine system at any position other than the home position to the home position when the Simple Motion module issues a "home position return request" with the power turned ON or others, or after a positioning stop.

In the Simple Motion module, the following two control types are defined as "home position return control", following the flow of the home position return work. These two types of home position return control can be executed by setting the "home position return parameters", setting "Positioning start No.9001" and "positioning start No.9002" prepared beforehand in the Simple Motion module to "[Cd.3] Positioning start No.", and turning ON the positioning start signal.

Home position return method	Home position return method operation details
Machine home position return (positioning start No.9001)	Executes the home position return operation to establish a machine home position. The following positioning control is executed based on the home position established by the home position return completion. The machine home position return is required when the machine home position has not been established (the position value monitor of the Simple Motion module and the actual machine position are not matched) due to the power supply ON of the system, etc.
Fast home position return (positioning start No.9002)	Executes the positioning to the home position established by a machine home position return. The fast home position return is operated by specifying the positioning start No.9002, so that the positioning which returns to the home position can be executed without setting the positioning data.

The "machine home position return" above must be carried out in advance to execute the "fast home position return".

⚠CAUTION

- When using an absolute position system, execute a home position return always at the following cases: on starting up and when the controller or absolute position motor has been replaced. Check the home position return request signal using the program, etc. before performing the positioning control. Failure to observe this could lead to an accident such as a collision.

The address information stored in the Simple Motion module cannot be guaranteed while the "home position return request flag" is ON.

The "home position return request flag" turns OFF and the "home position return complete flag" ([Md.31] Status: b4) turns ON if the machine home position return is executed and is completed normally.

The "home position return request flag" ([Md.31] Status: b3) must be turned ON in the Simple Motion module, and a machine home position return must be executed in the following cases.

Point

The reason of the home position return request flag is ON is recorded in event history. [RD77GF]

When not using an absolute position system

- This flag turns on in the following cases:

- System's power supply on or reset
- Servo amplifier power supply on
- Machine home position return start (Unless a machine home position return is completed normally, the home position return request flag does not turn off.)

- This flag turns off by the completion of machine home position return.

When using an absolute position system

- This flag turns on in the following cases:

- When not executing a machine home position return even once after the system starts
- Machine home position return start (Unless a machine home position return is completed normally, the home position return request flag does not turn off.)
- When an absolute position data in the Simple Motion module is erased due to a memory error, etc. (occurrence of the warning "Home position return data incorrect" (warning code: 093CH))
- When the "Rotation direction selection/travel direction selection (PA14)" of servo parameter is changed
- The servo alarm "Absolute position erased" (alarm No.: 25) occurs. ([Md.108] Servo status1: b14 ON) (☞ Page 473 Axis monitor data)
- The servo warning "Absolute position counter warning" (warning No.: E3) occurs. ([Md.108] Servo status1: b14 ON) (☞ Page 473 Axis monitor data)
- When changes of servo amplifiers or motor encoders are detected [RD77GF]
- When a virtual servo amplifier is connected and MR-J4-GF was not the servo amplifier connected at the previous home position establishment [RD77GF]

- This flag turns off by the completion of the machine home position return.

When a home position return is not required

Control can be carried out ignoring the "home position return request flag" ([Md.31] Status: b3) in systems that do not require a home position return.

In this case, the "home position return parameters ([Pr.43] to [Pr.57])" must all be set to their initial values or a value at which an error does not occur.

Wiring the proximity dog

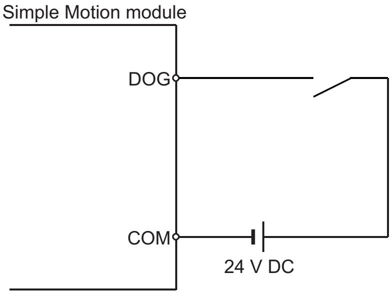
When using the proximity dog signal, wire the signal terminals corresponding to the proximity dog of the device to be used as follows.

■External input signal of the Simple Motion module [RD77MS]

Wire the upper/lower limit stroke limit terminals of the Simple Motion module/servo amplifier as shown in the following drawing. As for the 24 V DC power supply, the direction of current can be switched.

Ex.

When "[Pr.150] Input terminal logic selection" is set to the initial value



■External input signal of the servo amplifier

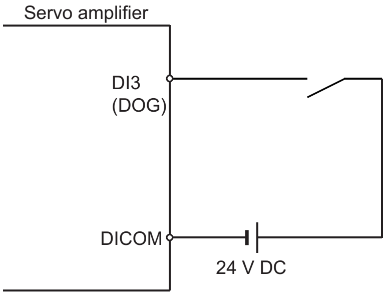
Refer to the servo amplifier instruction manual or manual for details on signal input availability and wiring.

Wire the MR-J3/MR-J4 series servo amplifier or MR-J5(W)-B as shown in the following drawing. As for the 24 V DC power supply, the direction of current can be switched.

Ex.

When "[Pr.22] Input signal logic selection" is set to the initial value [RD77MS]

When the servo parameter "Function selection T-3 (PT29)" is set to the initial value [RD77GF]



■External input signal via CPU (buffer memory of the Simple Motion module)

Refer to the manual of the input module to be used for wiring.

■Link device [RD77GF]

Refer to the manual of the remote input module to be used for wiring.

The logic setting of the stroke limit signal is configured according to "[Pr.913] Upper limit signal (FLS): Link device logic setting" and "[Pr.933] Proximity dog signal (DOG): Link device logic setting".

Home position return sub functions

Refer to "Combination of Main Functions and Sub Functions" in the following manual for details on "sub functions" that can be combined with home position return control.

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

Also refer to the following for details on each sub function.

☞ Page 227 CONTROL SUB FUNCTIONS

[Remarks]

The following two sub functions are only related to machine home position return.

○: Combination possible, △: Restricted, ×: Combination not possible

Sub function name	Machine home position return	Fast home position return	Reference
Home position return retry function	△[*1][*2]	×	Page 229 Home position return retry function [RD77MS]
Home position shift function	○[*1]	×	Page 233 Home position shift function [RD77MS]

[*1] When the driver home position return method is used, available functions follow the specification of the servo amplifier. Confirm the specification of the servo amplifier.

[*2] The Simple Motion module executes the home position return request to the servo amplifier regardless of the status of the proximity dog signal or workpiece position. Depending on the specification of the home position return performed with the servo amplifier, the workpiece may need to be moved before the proximity dog due to the positional relationship between them. Also, depending on the specification of the servo amplifier, the JOG operation cannot be used for moving the workpiece before the proximity dog. Confirm the specification of the servo amplifier for operation methods.

2.2 Machine Home Position Return

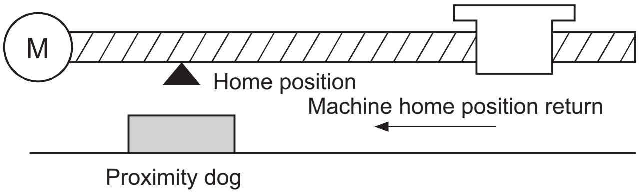
Outline of the machine home position return operation

Machine home position return operation

In a machine home position return, a home position is established.

None of the address information stored in the Simple Motion module, CPU module, or servo amplifier is used at this time.

The position mechanically established after the machine home position return is regarded as the "home position" to be the starting point for positioning control.



The method for establishing a home position by a machine home position return differs according to the method set in "[Pr.43] Home position return method".

The following shows the operation when starting a machine home position return.

■When "[Pr.43] Home position return method" is set to other than "Driver home position return method" [RD77MS]

1. The "machine home position return" is started.
2. The operation starts according to the speed and direction set in the home position return parameters ([Pr.43] to [Pr.57]).
3. The "home position" is established by the method set in "[Pr.43] Home position return method", and the machine stops.

☞ Page 38 Machine home position return method to Page 46 Scale origin signal detection method [RD77MS]

4. If "a" is set as "[Pr.45] Home position address", "a" will be stored as the current position in the "[Md.20] Command position value" and "[Md.21] Machine feed value" which are monitoring the position.
5. The machine home position return is completed.

Point

Use the home position return retry function when the home position is not always in the same direction from the workpiece operation area (when the home position is not set near the upper or lower limit of the machine). The machine home position return may not complete unless the home position return retry function is used.

■When "[Pr.43] Home position return method" is set to "Driver home position return method"

1. Set the home position return parameters of the servo amplifier. [*1]
2. The "machine home position return" is started.
3. The operation starts according to the speed and direction set in the servo amplifier.
4. The "home position" is established and the machine stops.
5. If "a" is set as "[Pr.45] Home position address", "a" will be stored as the current position in the "[Md.20] Command position value" and "[Md.21] Machine feed value" which are monitoring the position.
6. The machine home position return is completed.

[*1] [RD77GF]
Change the setting as necessary by using the servo transient transmission function. For the setting change method, refer to the servo amplifier instruction manual.

Point

The method for establishing a "home position" by a driver home position return method differs according to the setting of the servo amplifier. For details, refer to the servo amplifier instruction manual or manual.

Machine home position return method

The method by which the machine home position is established (method for judging the home position and machine home position return completion) is designated in the machine home position return according to the configuration and application of the positioning method.

The following table shows the methods that can be used for this home position return method. (The home position return method is one of the items set in the home position return parameters. It is set in "[Pr.43] Home position return method" of the basic parameters for home position return.)

[Pr.43] Home position return method	Operation details
Proximity dog method [RD77MS]	Deceleration starts by the OFF → ON of the proximity dog. (Speed is reduced to "[Pr.47] Creep speed".) The operation stops once after the proximity dog turns ON and then OFF. Later the operation restarts and then stops at the first zero signal to complete the home position return. That position is assumed as a home position.
Count method 1 [RD77MS]	The deceleration starts by the OFF → ON of the proximity dog, and the machine moves at the "[Pr.47] Creep speed". The machine stops once after moving the distance set in the "[Pr.50] Setting for the movement amount after proximity dog ON" from the OFF → ON position. Later the operation restarts and then stops at the first zero point to complete the machine home position return.
Count method 2 [RD77MS]	The deceleration starts by the OFF → ON of the proximity dog, and the machine moves at the "[Pr.47] Creep speed. The machine moves the distance set in the "[Pr.50] Setting for the movement amount after proximity dog ON" from the proximity dog OFF → ON position, and stops at that position. The machine home position return is then regarded as completed.
Data set method [RD77MS]	The position where the machine home position return has been performed becomes a home position. The command position value and feed machine value are overwritten to the home position address.
Scale origin signal detection method [RD77MS]	The machine moves in the opposite direction against of "[Pr.44] Home position return direction" at the "[Pr.46] Home position return speed" by the OFF → ON of the proximity dog, and a deceleration stop is carried out once at the first zero signal. Later the operation moves in direction of "[Pr.44] Home position return direction" at the "[Pr.47] Creep speed", and then stops at the detected nearest zero point to complete the machine home position return.
Driver home position return method	Refer to the following for details on the driver home position return method. [RD77MS] ☞ Page 779 AlphaStep/5-phase stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd. ☞ Page 791 IAI electric actuator controller manufactured by IAI Corporation The servo amplifier is switched to the home position return mode and the home position return set in the servo amplifier starts. After the home position return is completed, the servo amplifier is returned to the previous control mode. [RD77GF]

The following shows the signals used for machine home position return.

◎: Necessary, ○: Necessary as required, —: Unnecessary

[Pr.43] Home position return method	Signals required for control		
	Proximity dog	Zero signal	Upper/lower limit
Proximity dog method [RD77MS]	◎	◎	○
Count method 1 [RD77MS]	◎	◎	○
Count method 2 [RD77MS]	◎	—	○
Data set method [RD77MS]	—	—	—
Scale origin signal detection method [RD77MS]	◎	◎	—
Driver home position return method	○[*1]	○[*1]	○[*1]

[*1] Confirm to the home position return specification of the servo amplifier for the signals required for control.

Point

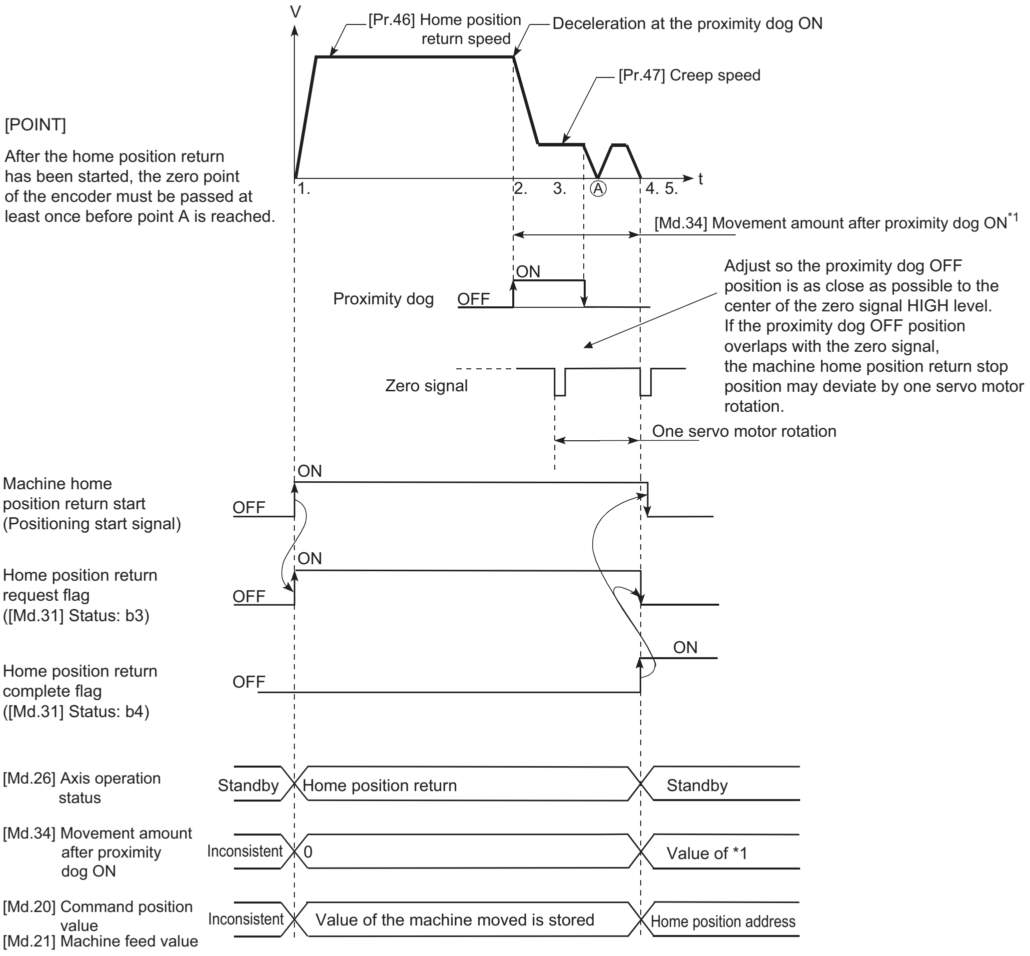
Creep speed

The stopping accuracy is poor when the machine rapidly stops from fast speeds. To improve the machine's stopping accuracy, it is required to slow down the speed before it stops. This speed is set in the "[Pr.47] Creep speed".

Proximity dog method [RD77MS]

The following shows an operation outline of the home position return method "proximity dog method".

Operation chart



[POINT]

After the home position return has been started, the zero point of the encoder must be passed at least once before point A is reached.

1. The machine home position return is started.

(The machine begins the acceleration designated in "[Pr.51] Home position return acceleration time selection", in the direction designated in "[Pr.44] Home position return direction". It then moves at the "[Pr.46] Home position return speed" when the acceleration is completed.)

2. The machine begins decelerating when the proximity dog ON is detected.

3. The machine decelerates to the "[Pr.47] Creep speed", and subsequently moves at that speed.

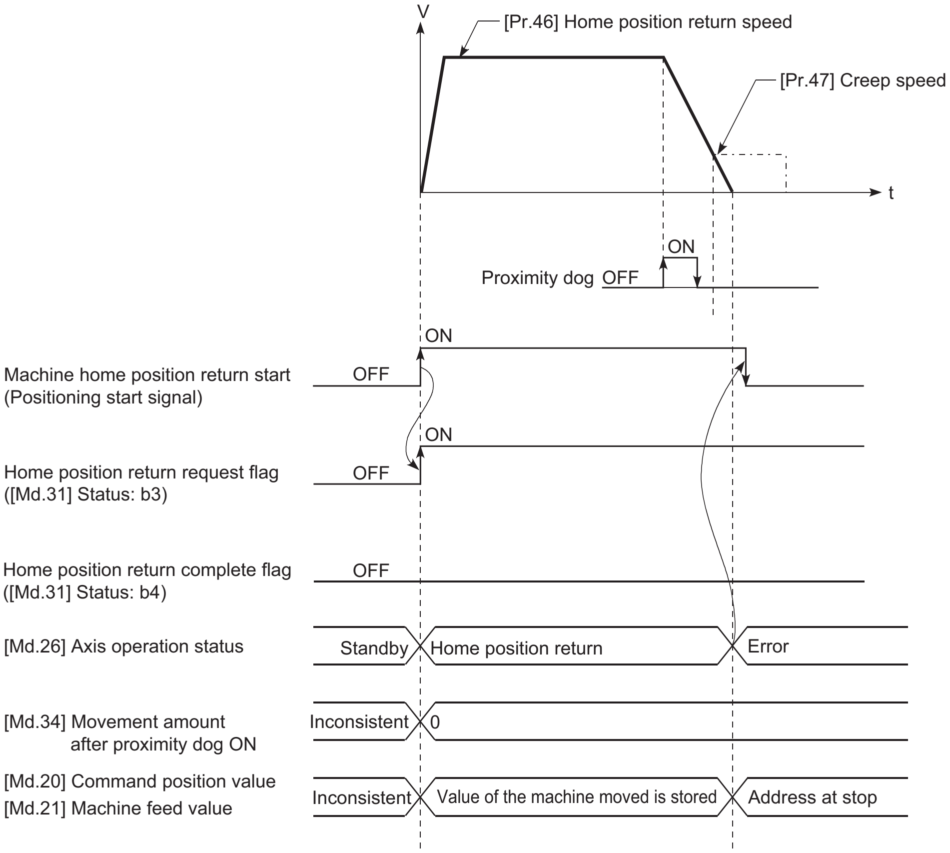
(At this time, the proximity dog must be ON. The workpiece will continue decelerating and stop if the proximity dog is OFF.)

4. After the proximity dog turns OFF, the machine stops. It then restarts and stops at the first zero point.

5. The home position return complete flag ([Md.31] Status: b4) turns from OFF to ON and the home position return request flag ([Md.31] Status: b3) turns from ON to OFF.

Precautions during operation

- When the home position return retry function is not set ("0" is set in "[Pr.48] Home position return retry"), the error "Start at home position" (error code: 1940H) will occur if the machine home position return is attempted again after the machine home position return completion.
- Machine home position return carried out from the proximity dog ON position will start at the "[Pr.47] Creep speed".
- The proximity dog must be ON during deceleration from the home position return speed "[Pr.47] Creep speed".
- When the stop signal stops the machine home position return, carry out the machine home position return again. When restart command is turned ON after the stop signal stops the home position return, the error "Home position return restart not possible" (error code: 1946H) will occur.
- After the home position return has been started, the zero point of the encoder must be passed at least once before point A is reached. However, if selecting "1: Not need to pass servo motor Z-phase after power on" with "Function selection C-4 (PC17)", it is possible to carry out the home position return without passing the zero point. The workpiece will continue decelerating and stop if the proximity dog is turned OFF before it has decelerated to the creep speed, thus causing the error "Dog detection timing fault" (error code: 1941H).



Count method1 [RD77MS]

The following shows an operation outline of the home position return method "count method 1".

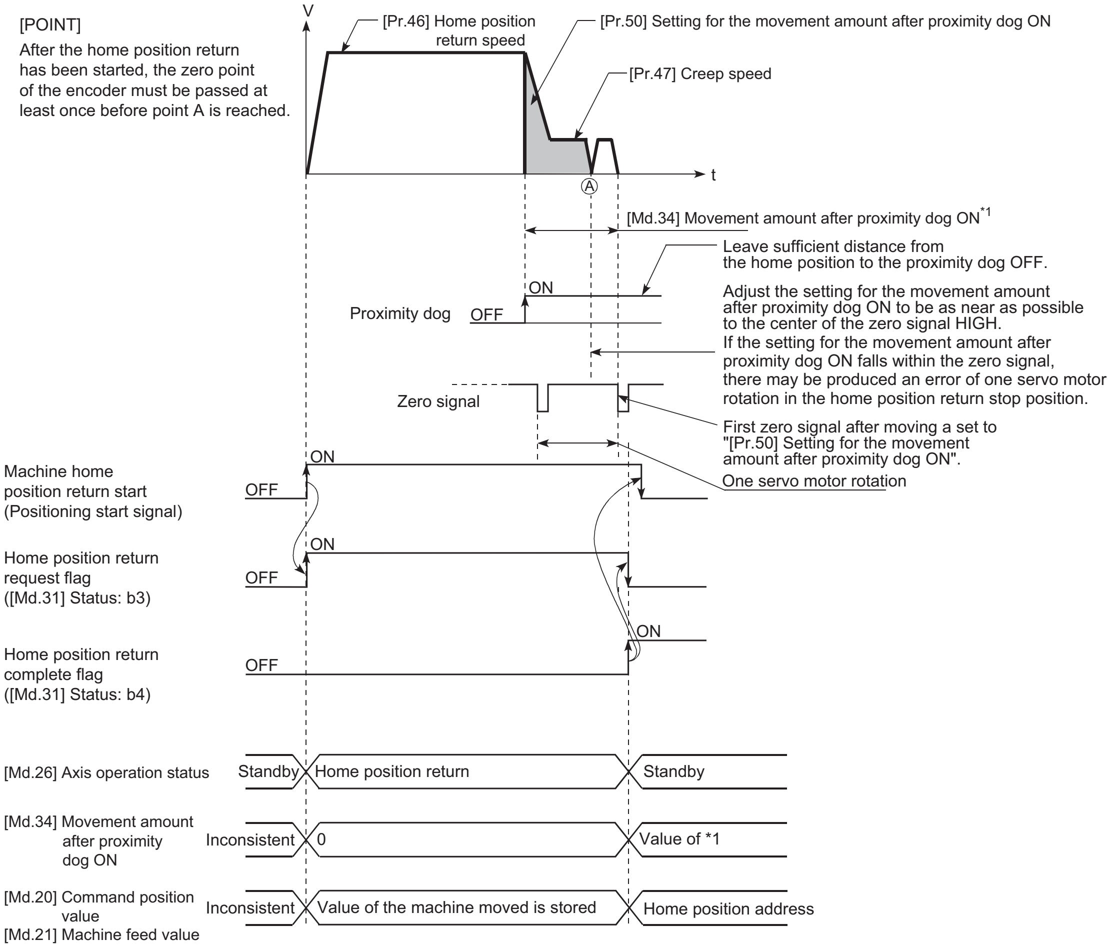
In the home position return with the "count method 1", the following operations can be performed:

- The machine home position return on the proximity dog
- The machine home position return again after the machine home position return is completed

Operation chart

[POINT]

After the home position return has been started, the zero point of the encoder must be passed at least once before point A is reached.



1. The machine home position return is started.

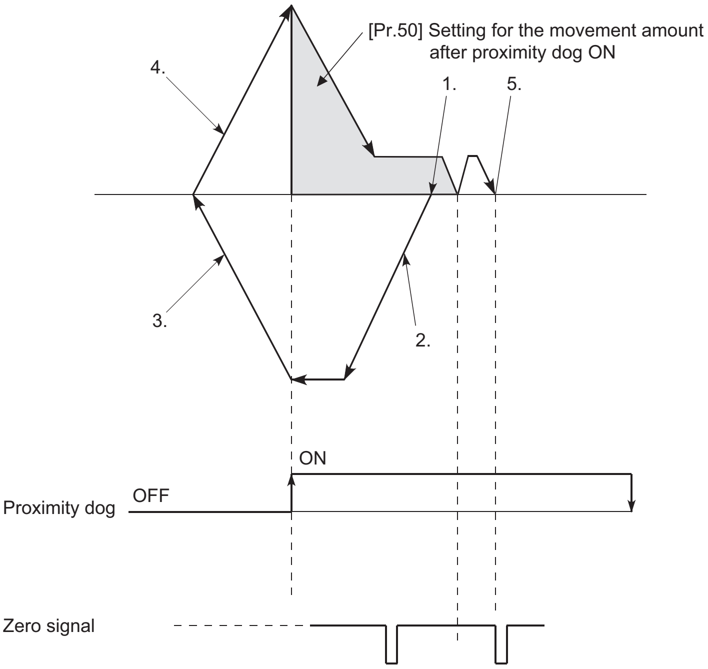
(The machine begins the acceleration designated in "[Pr.51] Home position return acceleration time selection", in the direction designated in "[Pr.44] Home position return direction". It then moves at the "[Pr.46] Home position return speed" when the acceleration is completed.)

2. The machine begins decelerating when the proximity dog ON is detected.
3. The machine decelerates to the "[Pr.47] Creep speed", and subsequently moves at that speed.
4. The machine stops after the workpiece has been moved the amount set in the "[Pr.50] Setting for the movement amount after proximity dog ON" after the proximity dog turned ON. It then restarts and stops at the first zero point.
5. The home position return complete flag ([Md.31] Status: b4) turns from OFF to ON, and the home position return request flag ([Md.31] Status: b3) turns from ON to OFF.

Precautions during operation

- The error "Count method movement amount fault" (error code: 1944H) will occur if the "[Pr.50] Setting for the movement amount after proximity dog ON" is smaller than the deceleration distance from the "[Pr.46] Home position return speed" to "[Pr.47] Creep speed".
- If the speed is changed to a speed faster than "[Pr.46] Home position return speed" by the speed change function (☞ Page 270 Speed change function) during a machine home position return, the distance to decelerate to "[Pr.47] Creep speed" may not be ensured, depending on the setting value of "[Pr.50] Setting for the movement amount after proximity dog ON". In this case, the error "Count method movement amount fault" (error code: 1944H) occurs and the machine home position return is stopped.
- The following shows the operation when a machine home position return is started while the proximity dog is ON.

■Operation when a machine home position return is started at the proximity dog ON position



1. A machine home position return is started.

2. The machine moves at the home position return speed in the opposite direction of a home position return.

3. Deceleration processing is carried out when the proximity dog OFF is detected.

4. After the machine stops, a machine home position return is carried out in the home position return direction.

5. The machine home position return is completed on detection of the first zero signal after the travel of the movement amount set to "[Pr.50] Setting for the movement amount after proximity dog ON" on detection of the proximity dog signal ON.

- Turn OFF the proximity dog at a sufficient distance from the Home position. Although there is no harm in operation if the proximity dog is turned OFF during a machine home position return, it is recommended to leave a sufficient distance from the home position when the proximity dog is turned OFF for the following reason.

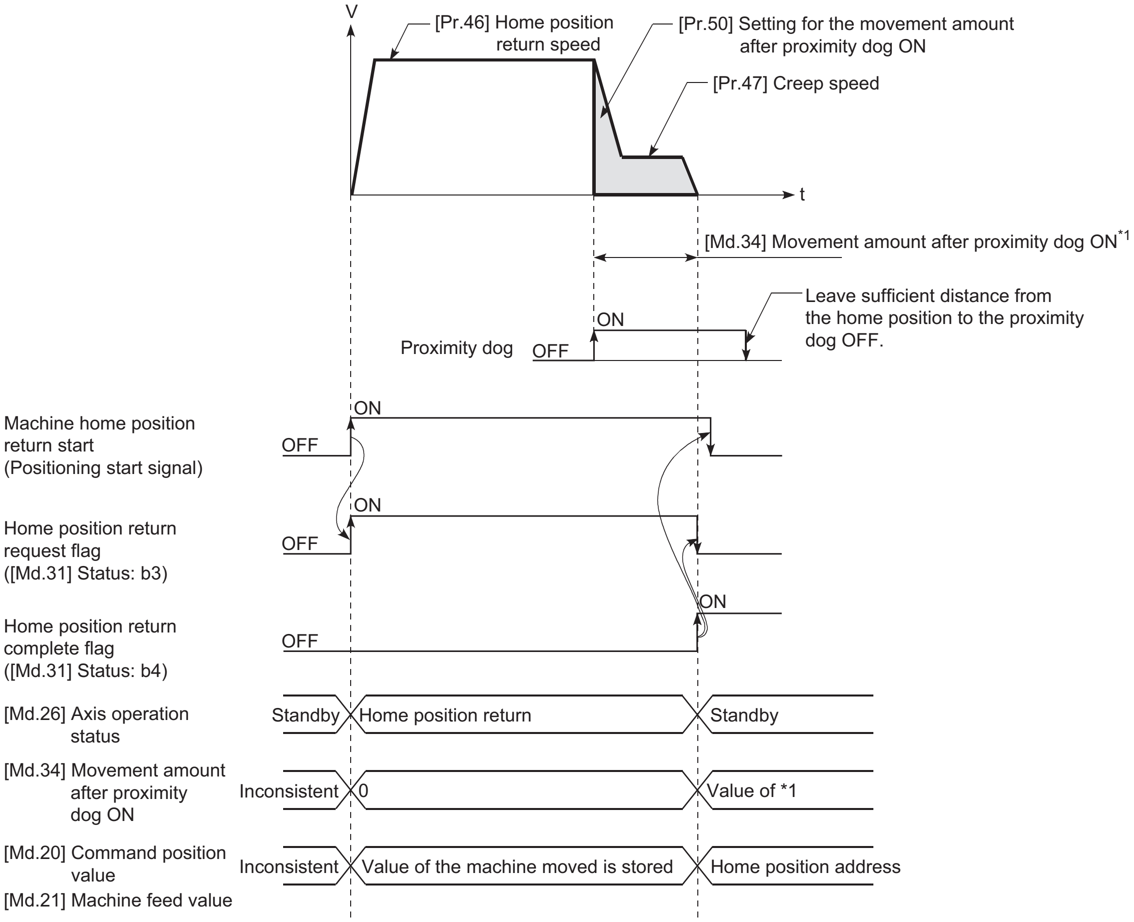
If the machine home position return is performed consecutively after the proximity dog is turned OFF at the time of machine home position return completion, operation will be performed at the home position return speed until the hardware stroke limit (upper/lower limit) is reached. If a sufficient distance cannot be kept, consider the use of the home position return retry function.

- When the stop signal stops the machine home position return, carry out the machine home position return again. When restart command is turned ON after the stop signal stops the home position return, the error "Home position return restart not possible" (error code: 1946H) will occur.
- After the home position return has been started, the zero point of the encoder must be passed at least once before point A is reached. However, if selecting "1: Not need to pass servo motor Z-phase after power on" with "Function selection C-4 (PC17)", it is possible to carry out the home position return without passing the zero point.

Count method2 [RD77MS]

The following shows an operation outline of the home position return method "count method 2".
The "count method 2" method is effective when a "zero signal" cannot be received. (Note that compared to the "count method 1" method, using this method will result in more deviation in the stop position during machine home position return.)

Operation chart



1. The machine home position return is started.

(The machine begins the acceleration designated in "[Pr.51] Home position return acceleration time selection", in the direction designated in "[Pr.44] Home position return direction". It then moves at the "[Pr.46] Home position return speed" when the acceleration is completed.)

2. The machine begins decelerating when the proximity dog ON is detected.

3. The machine decelerates to the "[Pr.47] Creep speed", and subsequently moves at that speed.

4. The command from the Simple Motion module will stop and the machine home position return will be completed when the machine moves the movement amount set in "[Pr.50] Setting for the movement amount after proximity dog ON" from the proximity dog ON position.

Restrictions

When this method is used, a deviation will occur in the stop position (home position) compared to other home position return methods because an error occurs in taking in the proximity dog ON. The error varies by the input type of "[Pr.118] DOG signal selection".

The taking error by the input type is shown below.

10 [μs] when setting "0: Simple Motion module"

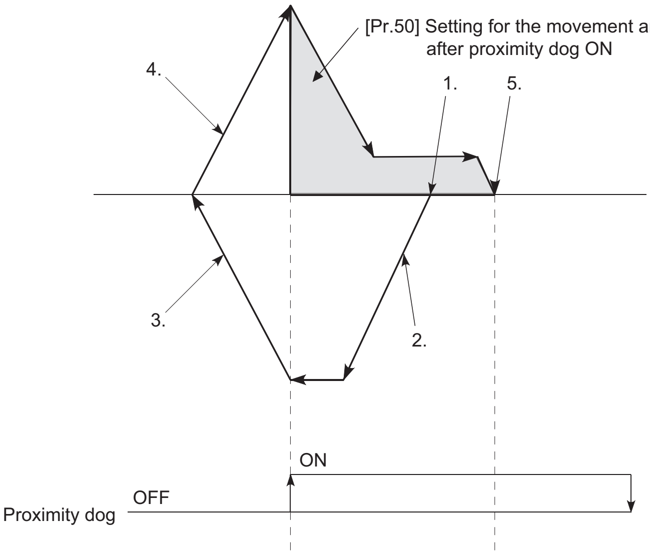
The operation cycle when setting "1: Servo amplifier"

The operation cycle + scan time when setting "2: Buffer memory"

Precautions during operation

- The error "Count method movement amount fault" (error code: 1944H) will occur and the operation will not start if the "[Pr.50] Setting for the movement amount after proximity dog ON" is smaller than the deceleration distance from the "[Pr.46] Home position return speed" to "[Pr.47] Creep speed".
- If the speed is changed to a speed faster than "[Pr.46] Home position return speed" by the speed change function (☞ Page 270 Speed change function) during a machine home position return, the distance to decelerate to "[Pr.47] Creep speed" may not be ensured, depending on the setting value of "[Pr.50] Setting for the movement amount after proximity dog ON". In this case, the error "Count method movement amount fault" (error code: 1944H) occurs and the machine home position return is stopped.
- The following shows the operation when a machine home position return is started while the proximity dog is ON.

■Operation when a home position return is started at the proximity dog ON position



1. A machine home position return is started.

2. The machine moves at the home position return speed in the opposite direction of a home position return.

3. Deceleration processing is carried out when the proximity dog OFF is detected.

4. After the machine stops, a machine home position return is carried out in the home position return direction.

5. The machine home position return is completed after moving the movement amount set in the "[Pr.50] Setting for the movement amount after proximity dog ON".

- Turn OFF the proximity dog at a sufficient distance from the home position. Although there is no harm in operation if the proximity dog is turned OFF during a machine home position return, it is recommended to leave a sufficient distance from the home position when the proximity dog is turned OFF for the following reason.

If the machine home position return is performed consecutively after the proximity dog is turned OFF at the time of machine home position return completion, operation will be performed at the home position return speed until the hardware stroke limit (upper/lower limit) is reached. If a sufficient distance cannot be kept, consider the use of the home position return retry function.

- When the stop signal stops the machine home position return, carry out the machine home position return again. When restart command is turned ON after the stop signal stops the home position return, the error "Home position return restart not possible" (error code: 1946H) will occur.

Data set method [RD77MS]

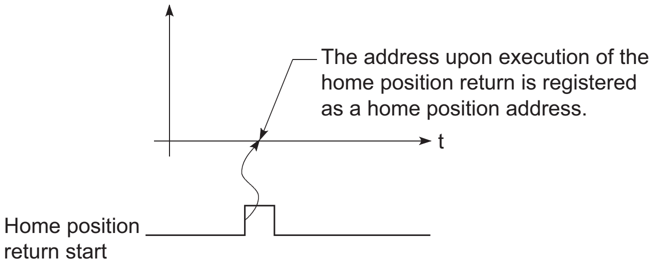
The following shows an operation outline of the home position return method "data set method".

The "Data set method" method is effective when a "Proximity dog" is not used.

With the data set method home position return, the position where the machine home position return has been carried out, is registered into the Simple Motion module as the home position, and the command position value and feed machine value is overwritten to a home position address.

Use the JOG or manual pulse generator operation to move the home position.

Operation chart



Precautions during operation

- The zero point must have been passed before the home position return is carried out after the power supply is turned ON. If the home position return is carried out without passing the zero point even once, the error "Home position return zero point not passed" (error code: 197AH) will occur. When the error "Home position return zero point not passed" (error code: 197AH) occurs, perform the JOG or similar operation so that the servo motor makes more than one revolution after an error reset, before carrying out the machine home position return again. However, if selecting "1: Not need to pass servo motor Z-phase after power on" with "Function selection C-4 (PC17)", it is possible to carry out the home position return without passing the zero point.
- The home position return data used for the data set method is the "home position return direction" and "home position address". The home position return data other than that for the home position return direction and home position address is not used for the data set method home position return method, but if a value is set the outside the setting range, an error will occur when the PLC READY signal [Y0] is turned ON so that the READY signal [X0] is not turned ON. With the home position return data other than that for the home position return direction and home position address, set an arbitrary value (default value can be allowed) within each data setting range so that an error will not occur upon receiving the PLC READY signal [Y0] ON.
- When using the backlash compensation function, set the same movement direction of the JOG or manual pulse generator operation to the home position before the home position return is executed as "home position return direction".

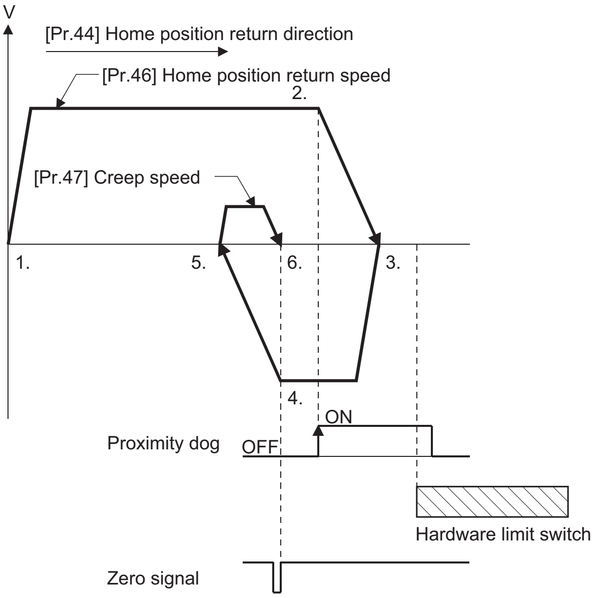
Scale origin signal detection method [RD77MS]

The following shows an operation outline of the home position return method "scale origin signal detection method".

Point

Set "0: Need to pass servo motor Z-phase after power on" in "Function selection C-4 (PC17)". If "1: Not need to pass servo motor Z-phase after power on" is set, the error "Z-phase passing parameter invalid" (error code: 1978H) will occur at the start of scale origin signal detection method home position return.

Operation chart



1. The machine home position return is started.

(The machine begins the acceleration designated in "[Pr.51] Home position return acceleration time selection", in the direction designated in "[Pr.44] Home position return direction". It then moves at the "[Pr.46] Home position return speed" when the acceleration is completed.)

2. The machine begins decelerating when the proximity dog ON is detected.
3. After deceleration stop, the machine moves in the opposite direction against of home position return at the "[Pr.46] Home position return speed".
4. During movement, the machine begins decelerating when the first zero signal is detected.
5. After deceleration stop, the operation moves in direction of home position return at the "[Pr.47] Creep speed", and then stops at the detected nearest zero signal.
6. The home position return complete flag ([Md.31] Status: b4) turns from OFF to ON, and the home position return request flag ([Md.31] Status: b3) turns from ON to OFF.

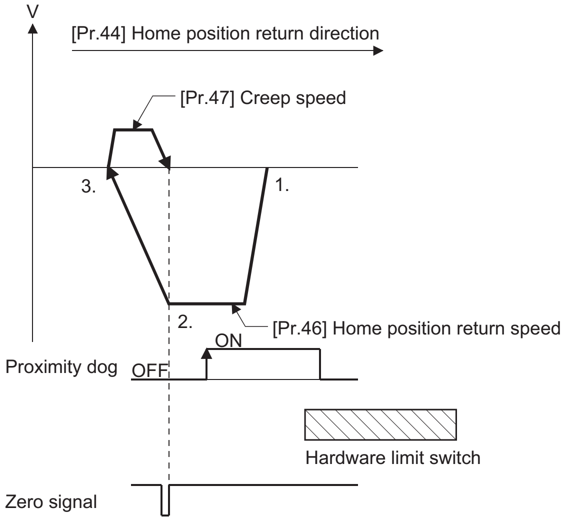
Point

After 3., when the zero signal is in the proximity dog position, deceleration stop (4.) is started at the zero signal without waiting for the proximity dog OFF.

Precautions during operation

- The error "Start at home position" (error code: 1940H) will occur if another machine home position return is attempted immediately after a machine home position return completion when the home position is in the proximity dog ON position.
- The following shows the operation when a machine home position return is started from the proximity dog ON position.

■Operation when a machine home position return is started from the proximity dog ON position



1. The machine moves in the opposite direction against of home position return at the home position return speed.

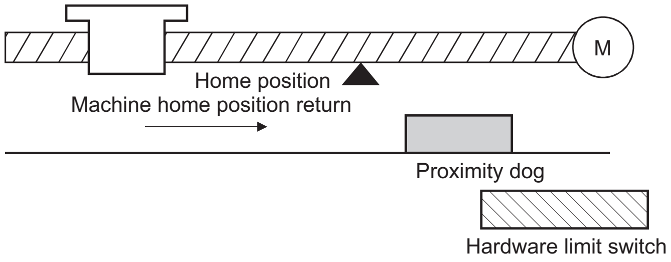
2. The machine begins decelerating when the first zero signal is detected.

3. After deceleration stop, the operation moves in direction of home position return at the creep speed, and then stops at the zero signal to complete the machine home position return.

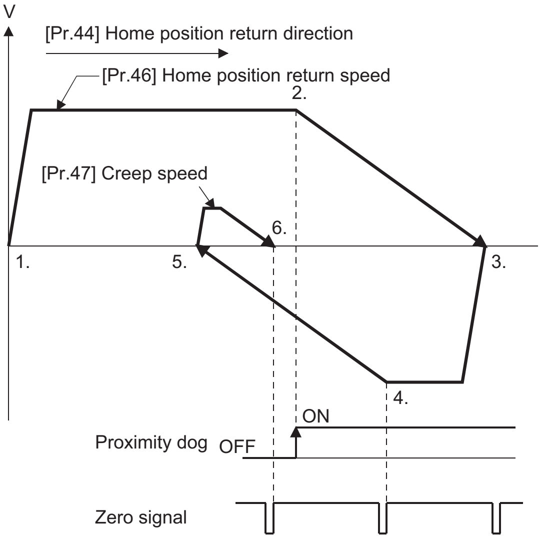
Point

After 1., when the zero signal is in the proximity dog ON position, deceleration stop (2.) is started at the zero signal without waiting for the proximity dog OFF.

- When the stop signal stops the machine home position return, carry out the machine home position return again. When restart command is turned ON after the stop signal stops the home position return, the error "Home position return restart not possible" (error code: 1946H) will occur.
- The home position return retry will not be performed regardless of setting set in "[Pr.48] Home position return retry" in the scale origin signal detection method. When a hardware limit switch is detected during machine home position return, the error "Hardware stroke limit (+)" (error code: 1904H, 1905H) or "Hardware stroke limit (-)" (error code: 1906H, 1907H) will occur.
- Position the proximity dog forward to overlaps with the hardware limit switch in direction of home position return. When the proximity dog is in the opposite direction against of home position return from the machine home position return start position, the error "Hardware stroke limit (+)" (error code: 1904H, 1905H) or "Hardware stroke limit (-)" (error code: 1906H, 1907H) will occur.



- When the zero signal is detected again during deceleration (4.) in the following figure) with detection of zero signal, the operation stops at the zero signal detected lastly to complete the home position return.



- Do not use the scale origin signal detection method home position return with the backlash compensation function.
- When using the direct drive motor, make it passed the Z phase once before reaching 3. in the previous operation chart. (☞ Page 46 Scale origin signal detection method [RD77MS])

Driver home position return method

The home position return is executed based on the positioning pattern set on the driver (servo amplifier) side (hereafter called the "driver side"). Set the setting values of home position return in the parameters of the driver side. Refer to the manual of the driver because the home position return operation and parameters depend on the specification of the driver.

Operation chart

1. The machine home position return is started. (The machine executes the home position return based on the positioning pattern set on the driver side.)
2. The command position value is continuously updated by follow up processing during the home position return.
3. The home position return complete flag ([Md.31] Status: b4) turns from OFF to ON and the home position return request flag ([Md.31] Status: b3) turns from ON to OFF.

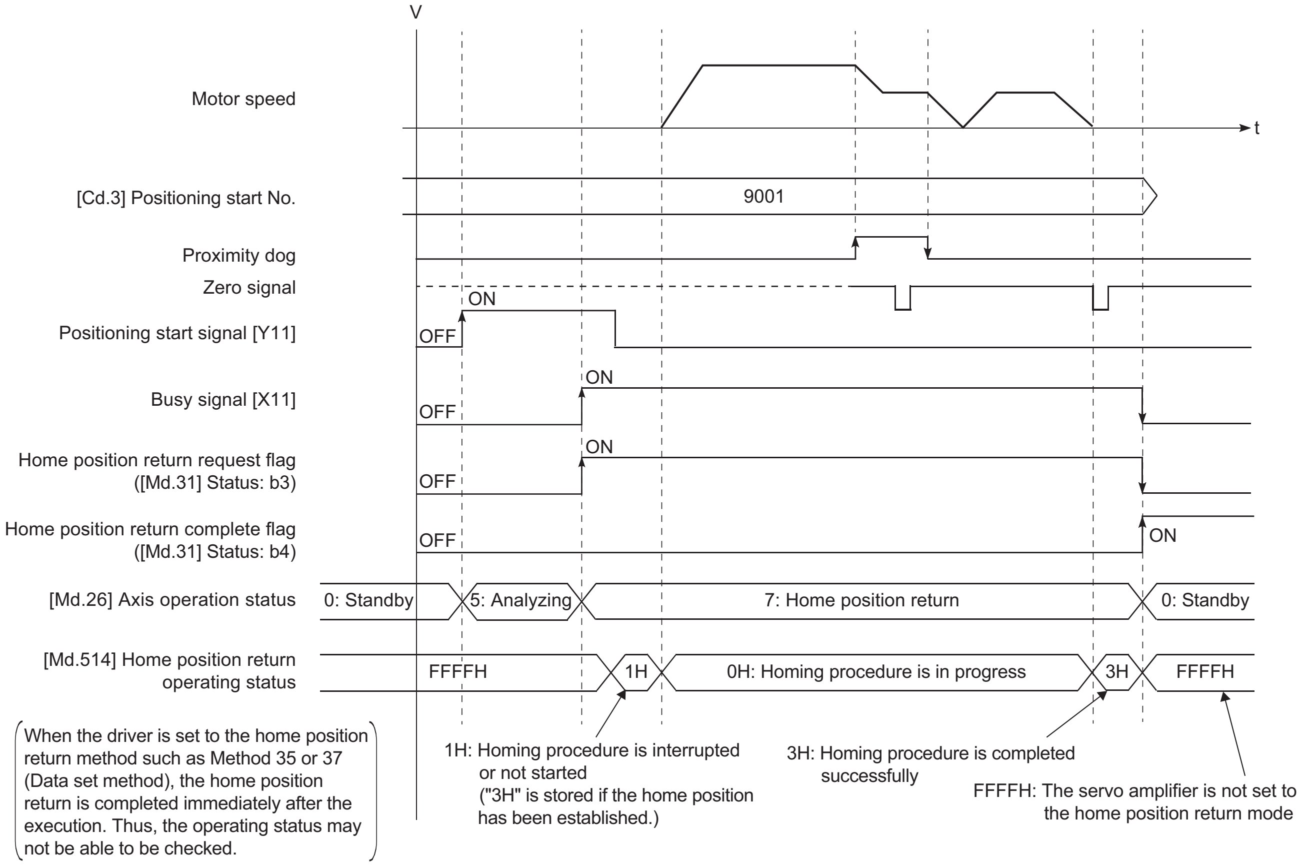
■RD77MS operation chart

Refer to the following.

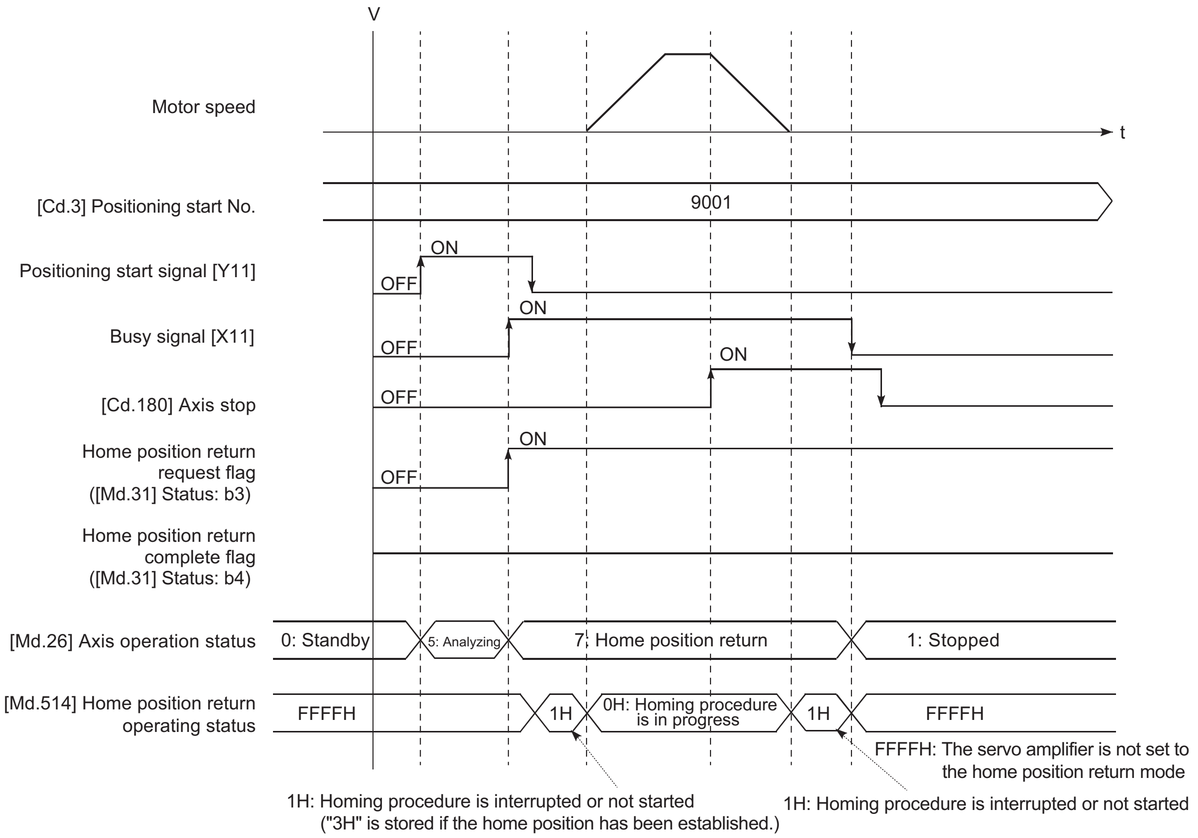
☞ Page 779 AlphaStep/5-phase stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd.

☞ Page 791 IAI electric actuator controller manufactured by IAI Corporation

■RD77GF operation chart



When the machine home position return is stopped



Parameter setting required after the driver home position return method

Refer to the following.

☞ Page 457 Setting items for home position return parameters

Start of the driver home position return method

Set "9001" in "[Cd.3] Positioning start No.", and start the axis.

[RD77GF]

The control mode of the servo amplifier is set to "Home mode".

If Zero speed is not ON ([Md.119] Servo status 2: b3 is not ON) at start for the MR-J4-GF, the home position return operation does not start until Zero speed turns ON. Even in this case, "7: Home position return" is set in "[Md.26] Axis operation status".

Axis stop of the driver home position return method [RD77GF]

When "[Cd.180] Axis stop" is turned ON during the home position return, the "HALT" signal is sent to the servo amplifier. If the servo amplifier which does not support the "HALT" signal is used, the axis is not stopped by this signal. Use the forced stop signal instead. Refer to the servo amplifier instruction manual for support information on the HALT signal and forced stop signal.

The MR-J4-GF supports the HALT signal.

Backlash compensation after the driver home position return method

When "[Pr.11] Backlash compensation amount" is set in the Simple Motion module, whether the backlash compensation is necessary or not is judged from "[Pr.44] Home position return direction" of the Simple Motion module in the axis operation such as positioning after the driver home position return. When the positioning is executed in the same direction as "[Pr.44] Home position return direction", the backlash compensation is not executed. However, when the positioning is executed in the reverse direction against "[Pr.44] Home position return direction", the backlash compensation is executed.

Note that the home position return is executed based on the home position return direction of the driver side parameter during the driver home position return. Therefore, set the same direction to "[Pr.44] Home position return direction" of the Simple Motion module and the last home position return direction of the drive side.

Restrictions

- The home position return cannot be started with the Simple Motion module during servo-off. Thus, the servo amplifier home position return method, Method 35 and 37 (Data set method), cannot be executed during servo-off. [RD77GF]
- When the synchronous control is executed with the axis where the MR-J4-GF software version A0 is used as the servo input axis, do not perform the home position return. The alarms (error excessive and command frequency error) might occur in the servo amplifier of the output axis. [RD77GF]
- To use the home position return method which uses the proximity dog signal and is not based on the Z-phase, it is recommended to use the servo amplifier built-in DI.

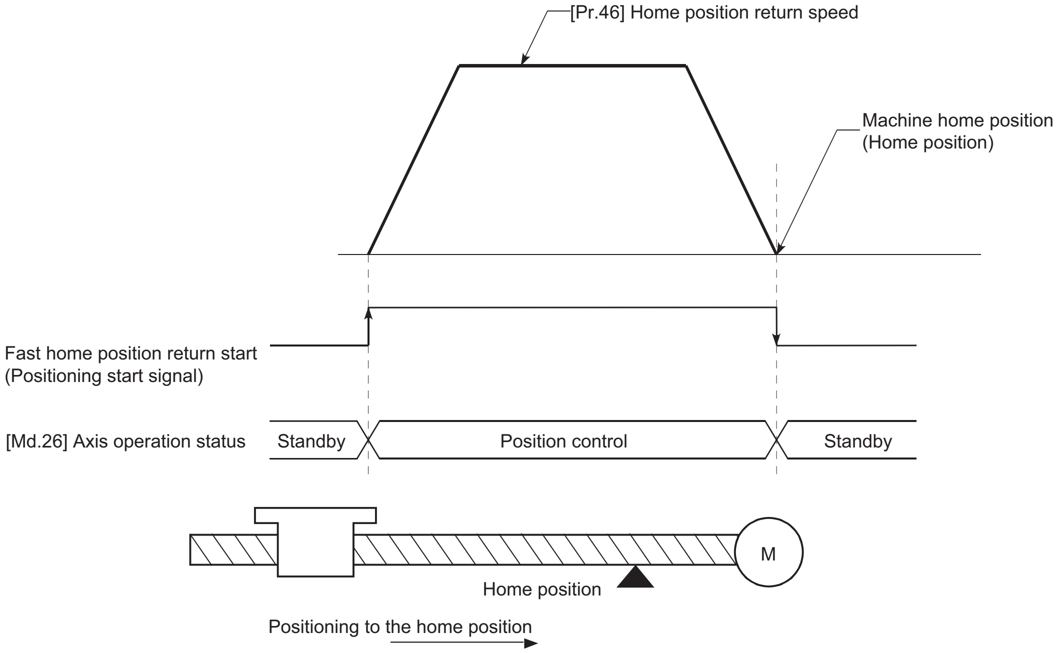
2.3 Fast Home Position Return

Outline of the fast home position return operation

Fast home position return operation

After establishing home position by a machine home position return, positioning control to the home position is executed without using a proximity dog or a zero signal.

The following shows the operation during a basic fast home position return start.

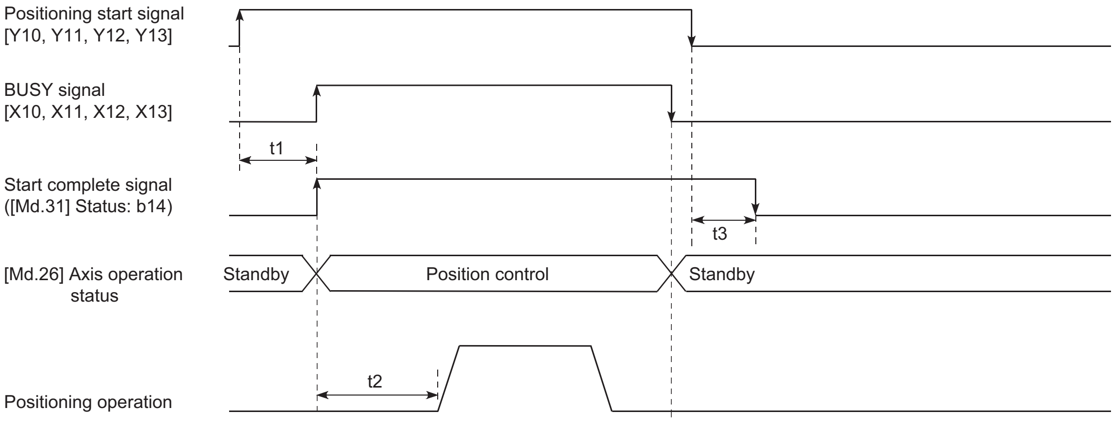


1. The fast home position return is started.
2. Positioning control to the home position established by a machine home position return begins at speed set in "[Pr.46] Home position return speed".
3. The fast home position return is completed.

Operation timing and processing time

The following shows details about the operation timing and time during fast home position return.

■Operation example



- Normal timing time (Unit: [ms])

[RD77MS]

Operation cycle	**t1**[*1]	**t2**	**t3**
0.444	0.186 to 1.228	1.186 to 1.662	0.000 to 0.444
0.888	0.186 to 1.228	2.234 to 2.330	0.000 to 0.888
1.777	0.186 to 1.228	3.932 to 4.550	0.000 to 1.777
3.555	0.186 to 1.228	5.520 to 8.098	0.000 to 3.555

[RD77GF]

Operation cycle	**t1**[*1]	**t2**	**t3**
0.50	0.250 to 0.724	1.267 to 1.465	0.000 to 0.500
1.00	0.280 to 1.221	2.743 to 3.326	0.000 to 1.000
2.00	0.044 to 2.082	5.878 to 6.795	0.000 to 2.000
4.00	0.410 to 4.184	11.867 to 13.716	0.000 to 4.000

[*1] The t1 timing time could be delayed by the operation state of other axes.

Operating restrictions

- The fast home position return can only be executed after the home position is established by executing the machine home position return. If not, the error "Home position return request ON" (error code: 1945H) will occur. (Home position return request flag ([Md.31] Status: b3) must be turned OFF).
- If the fraction pulse is cleared to zero using current value changing or fixed-feed control, execute the fast home position return and an error will occur by a cleared amount.
- When unlimited length feed is executed by speed control and the machine feed value overflows or underflows once, the fast home position return cannot be executed normally.
- The home position return complete flag ([Md.31] Status: b4) is not turned ON.
- The axis operation status during fast home position return is "in position control".

2.4 Selection of the Home Position Return Setting Condition

This function can be set when the servo amplifier to be connected supports the servo parameter "Selection of the home position return setting condition".

Refer to the instruction manual or manual for the servo amplifiers to be connected for confirming if the function is supported or not.

Outline of the home position return setting condition

To execute the home position return when selecting "0: Need to pass servo motor Z-phase after power on" with the servo parameter of the servo amplifier "Function selection C-4 (PC17)", it is necessary that the servo motor has been rotated more than one revolution and passed the Z phase (Motor reference position signal) and that the zero point pass signal ([Md.119] Servo status2: b0) has turned ON.

When selecting "1: Not need to pass servo motor Z-phase after power on" with "Function selection C-4 (PC17)", it is possible to turn the zero point pass signal ([Md.119] Servo status2: b0) ON without passing the zero point.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Monitor item	Buffer memory address	
	Axis 1 to axis 16	Axis 17 to axis 32
[Md.119] Servo status2: b0	2476+100n	1002476+100n

Data setting

To select the "home position return setting condition", set the "servo amplifier" shown in the following table.

Servo parameters are set for each axis.

The "home position return setting condition" is stored into the following buffer memory addresses.

n: Axis No. - 1

Setting item	Setting value	Setting details	Buffer memory address
Function selection C-4 (PC17)	→	0: Need to pass servo motor Z-phase after power on 1: Not need to pass servo motor Z-phase after power on	28480+100n

Refer to the following for information on the setting details.

☞ Page 547 Servo parameters

Since the servo parameters of MR-J5(W)-B are not in the buffer memory, use GX Works3 or axis control data to set them.

Refer to the following for details.

☞ Page 796 Connection with MR-J5(W)-B

Precautions during operation

- Set "Function selection C-4 (PC17)", and then turn off the power supply of the servo amplifier once and switch it on again to make that parameter setting valid.

3 MAJOR POSITIONING CONTROL

The details and usage of the major positioning controls (control functions using the "positioning data") are explained in this chapter.

The major positioning controls include such controls as "positioning control" in which positioning is carried out to a designated position using the address information, "speed control" in which a rotating object is controlled at a constant speed, "speed-position switching control" in which the operation is shifted from "speed control" to "position control" and "position-speed switching control" in which the operation is shifted from "position control" to "speed control".

Execute the required settings to match each control.

3.1 Outline of Major Positioning Controls

"Major positioning controls" are carried out using the "positioning data" stored in the Simple Motion module.

The basic controls such as position control and speed control are executed by setting the required items in this "positioning data", and then starting that positioning data.

The control method for the "major positioning controls" is set in setting item "[Da.2] Control method" of the positioning data. Control defined as a "major positioning control" carries out the following types of control according to the "[Da.2] Control method" setting. However, the position loop is included for commanding to servo amplifier in the speed control set in "[Da.2] Control method". Use the "speed-torque control" to execute the speed control not including position loop. (☞ Page 203 Speed-torque Control)

Major positioning control			**[Da.2] Control method**	**Details**
Position control	Linear control	1-axis linear control	ABS Linear 1 INC Linear 1	Positioning of the designated 1 axis is carried out from the start address (current stop position) to the designated position.
		2-axis linear interpolation control[*1]	ABS Linear 2 INC Linear 2	Using the designated 2 axes, linear interpolation control is carried out from the start address (current stop position) to the designated position.
		3-axis linear interpolation control[*1]	ABS Linear 3 INC Linear 3	Using the designated 3 axes, linear interpolation control is carried out from the start address (current stop position) to the designated position.
		4-axis linear interpolation control[*1]	ABS Linear 4 INC Linear 4	Using the designated 4 axes, linear interpolation control is carried out from the start address (current stop position) to the designated position.
	Fixed-feed control	1-axis fixed-feed control	Fixed-feed 1	Positioning of the designated 1 axis is carried out for a designated movement amount from the start address (current stop position). (The "[Md.20] Command position value" is set to "0" at the start.)
		2-axis fixed-feed control[*1]	Fixed-feed 2	Using the designated 2 axes, linear interpolation control is carried out for a designated movement amount from the start address (current stop position). (The "[Md.20] Command position value" is set to "0" at the start.)
		3-axis fixed-feed control[*1]	Fixed-feed 3	Using the designated 3 axes, linear interpolation control is carried out for a designated movement amount from the start address (current stop position). (The "[Md.20] Command position value" is set to "0" at the start.)
		4-axis fixed-feed control[*1]	Fixed-feed 4	Using the designated 4 axes, linear interpolation control is carried out for a designated movement amount from the start address (current stop position). (The "[Md.20] Command position value" is set to "0" at the start.)
	2-axis circular interpolation control[*1]	Sub point designation	ABS Circular sub INC Circular sub	Using the designated 2 axes, positioning is carried out in an arc path to a position designated from the start point address (current stop position).
		Center point designation	ABS Circular right ABS Circular left INC Circular right INC Circular left	
	3-axis helical interpolation control[*1]	Sub point designation	ABS helical sub INC helical sub	Using two axes of the three axes, the circular interpolation control is carried out. The remaining axis is used for the positioning of the helical, tangent line, or normal line control to follow the circular interpolation control.
		Center point designation	ABS helical right ABS helical left INC helical right INC helical left	

Major positioning control		[Da.2] Control method	Details
Speed control	1-axis speed control	Forward run speed 1 Reverse run speed 1	The speed control of the designated 1 axis is carried out.
	2-axis speed control[*1]	Forward run speed 2 Reverse run speed 2	The speed control of the designated 2 axes is carried out.
	3-axis speed control[*1]	Forward run speed 3 Reverse run speed 3	The speed control of the designated 3 axes is carried out.
	4-axis speed control[*1]	Forward run speed 4 Reverse run speed 4	The speed control of the designated 4 axes is carried out.
Speed-position switching control		Forward run speed/position Reverse run speed/position	The control is continued as position control (positioning for the designated address or movement amount) by turning ON the "speed-position switching signal" after first carrying out speed control.
Position-speed switching control		Forward run position/speed Reverse run position/speed	The control is continued as speed control by turning ON the "position-speed switching signal" after first carrying out position control.
Other control	NOP instruction	NOP	A nonexecutable control method. When this instruction is set, the operation is transferred to the next data operation, and the instruction is not executed.
	Current value changing	Current value changing	"[Md.20] Command position value" is changed to an address set in the positioning data. This can be carried out by either of the following 2 methods. ("[Md.21] Machine feed value" cannot be changed.) • Current value changing using the control method • Current value changing using the current value changing start No. (No.9003).
	JUMP instruction	JUMP instruction	An unconditional or conditional JUMP is carried out to a designated positioning data No.
	LOOP	LOOP	A repeat control is carried out by repeat LOOP to LEND.
	LEND	LEND	Control is returned to the top of the repeat control by repeat LOOP to LEND. After the repeat operation is completed specified times, the next positioning data is run.

*1 Control is carried out so that linear and arc paths are drawn using a motor set in two or more axes directions. This kind of control is called "interpolation control". (☞ Page 71 Interpolation control)

Point

In the RD77MS2, when 3- or 4-axis interpolation is carried out, or axis 3 or axis 4 is designated to the axis to be interpolated for 2-axis interpolation, the error "Illegal interpolation description command" (error code: 1A22H) will occur and the positioning control does not start.

Data required for major positioning control

The following table shows an outline of the "positioning data" configuration and setting details required to carry out the "major positioning controls".

Setting item			Setting details
Positioning data No.1	[Da.1]	Operation pattern	Set the method by which the continuous positioning data (Ex: positioning data No.1, No.2, No.3) will be controlled. (☞ Page 58 Operation patterns of major positioning controls)
	[Da.2]	Control method	Set the control method defined as a "major positioning control". (☞ Page 55 Outline of Major Positioning Controls)
	[Da.3]	Acceleration time No.	Select and set the acceleration time at control start. (Select one of the four values set in [Pr.9], [Pr.25], [Pr.26], and [Pr.27] for the acceleration time.)
	[Da.4]	Deceleration time No.	Select and set the deceleration time at control stop. (Select one of the four values set in [Pr.10], [Pr.28], [Pr.29], and [Pr.30] for the deceleration time.)
	[Da.6]	Positioning address/movement amount	Set the target value during position control. (☞ Page 65 Designating the positioning address)
	[Da.7]	Arc address	Set the sub point or center point address during 2-axis circular interpolation control or 3-axis helical interpolation control.
	[Da.8]	Command speed	Set the speed during the control execution.
	[Da.9]	Dwell time/JUMP destination positioning data No.	The time between the command pulse output is completed to the positioning completed signal is turned ON. Set it for absorbing the delay of the mechanical system to the instruction, such as the delay of the servo system (deviation).
	[Da.10]	M code/Condition data No./ Number of LOOP to LEND repetitions/Number of pitches	Set this item when carrying out sub work (clamp and drill stops, tool replacement, etc.) corresponding to the code No. related to the positioning data execution.
	[Da.20]	Axis to be interpolated No.1	Set an axis to be interpolated during the 2- to 4-axis interpolation operation. (☞ Page 71 Interpolation control)
	[Da.21]	Axis to be interpolated No.2	
	[Da.22]	Axis to be interpolated No.3	
	[Da.27]	M code ON signal output timing	Set the M code ON signal output timing to each positioning data.
	[Da.28]	ABS direction in degrees	Set the ABS direction in degrees to each positioning data.
	[Da.29]	Interpolation speed designation method	Set the interpolation speed designation method to each positioning data.

The settings and setting requirement for the setting details of [Da.1] to [Da.10], [Da.20] to [Da.22] and [Da.27] to [Da.29] differ according to the "[Da.2] Control method". Refer to the following for details.

☞ Page 75 Setting the Positioning Data

Major positioning control sub functions

Refer to "Combination of Main Functions and Sub Functions" in the following manual for details on "sub functions" that can be combined with the major positioning control.

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

Also refer to the following for details on each sub function.

☞ Page 227 CONTROL SUB FUNCTIONS

Point

600 positioning data (positioning data No.1 to 600) items can be set per axis.

Operation patterns of major positioning controls

In "major positioning control" (high-level positioning control), "[Da.1] Operation pattern" can be set to designate whether to continue executing positioning data after the started positioning data. The "operation pattern" includes the following 3 types.

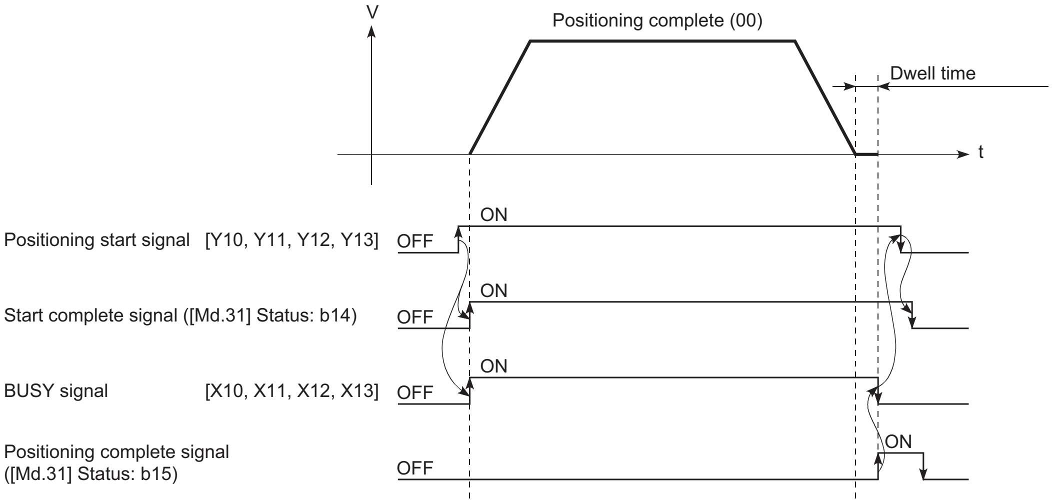
Positioning control	Operation pattern
Positioning complete	Independent positioning control (operation pattern: 00)
Positioning continue	Continuous positioning control (operation pattern: 01)
	Continuous path control (operation pattern: 11)

Independent positioning control (Positioning complete)

This control is set when executing only one designated data item of positioning. If a dwell time is designated, the positioning completes after the designated time elapses.

This data (operation pattern [00] data) becomes the end of block data when carrying out block positioning. (The positioning stops after this data is executed.)

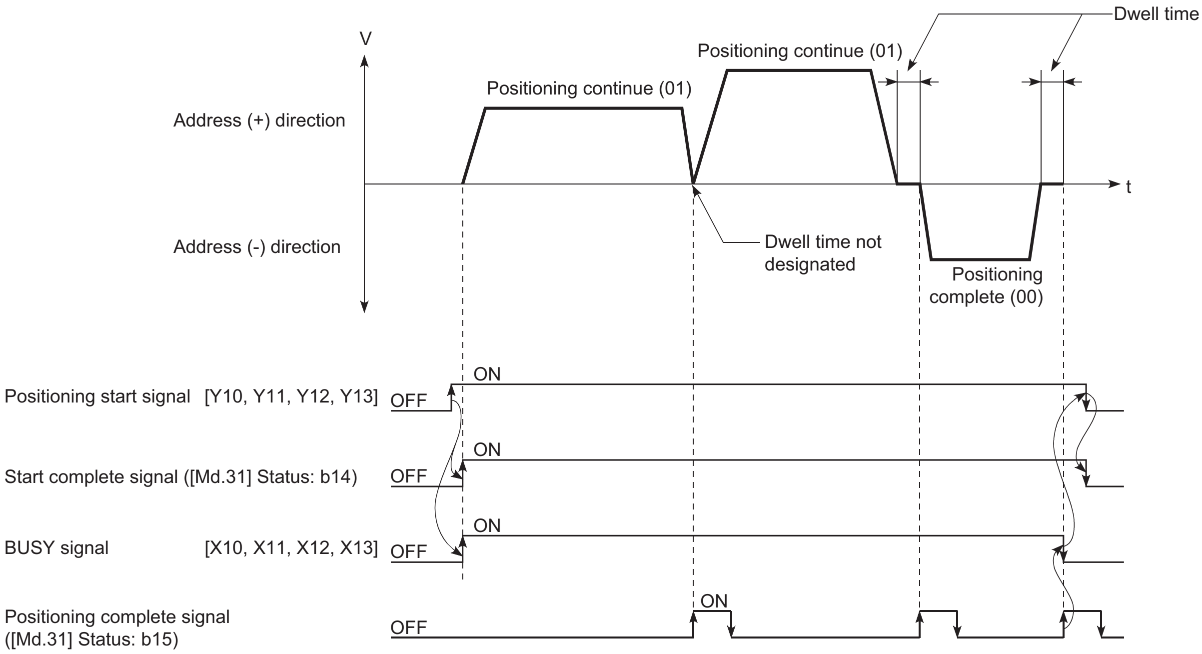
■Operation example



Continuous positioning control

- The machine always automatically decelerates each time the positioning is completed. Acceleration is then carried out after the Simple Motion module command speed reaches 0 to carry out the next positioning data operation. If a dwell time is designated, the acceleration is carried out after the designated time elapses.
- In operation by continuous positioning control (operation pattern "01"), the next positioning No. is automatically executed. Always set operation pattern "00" in the last positioning data to complete the positioning. If the operation pattern is set to positioning continue ("01" or "11"), the operation will continue until operation pattern "00" is found. If the operation pattern "00" cannot be found, the operation may be carried out until the positioning data No.600. If the operation pattern of the positioning data No.600 is not completed, the operation will be started again from the positioning data No.1.

■Operation example

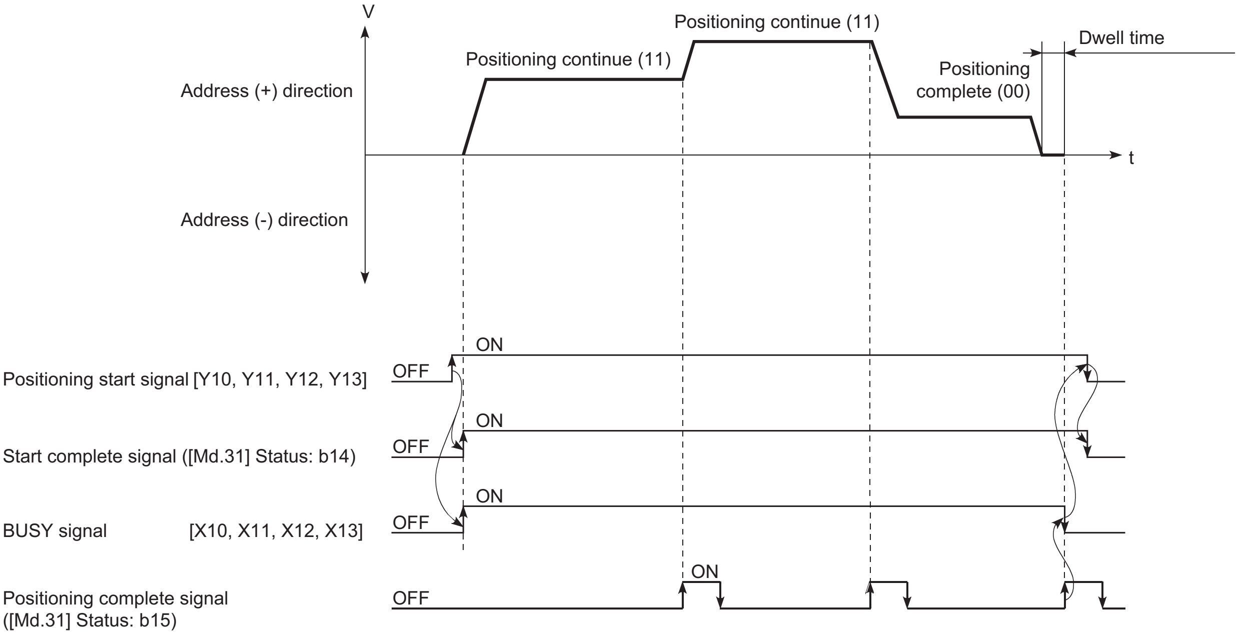


Continuous path control

■Continuous path control

- The speed is changed without deceleration stop between the command speed of the "positioning data No. currently being executed" and the speed of the "positioning data No. to carry out the next operation". The speed is not changed if the current speed and the next speed are equal.
- The speed used in the previous positioning operation is continued when the command speed is set to "-1".
- Dwell time is ignored, even if it is set.
- The next positioning No. is executed automatically in operations by continuous path control (operation pattern "11"). Always complete the positioning by setting operation pattern "00" in the last positioning data. If the operation pattern is set to positioning continue ("01" or "11"), the operation will continue until operation pattern "00" is found. If the operation pattern "00" cannot be found, the operation may be carried out until the positioning data No.600. If the operation pattern of the positioning data No.600 is not complete, the operation will be started again from the positioning data No.1.
- The speed switching includes the "front-loading speed switching mode" in which the speed is changed at the end of the current positioning side, and the "standard speed switching mode" in which the speed is at the start of the next positioning side. (☞ Page 519 [Pr.19] Speed switching mode)
- In the continuous path control, the positioning may be completed before the set address/movement amount and the current data may be switched to the "positioning data that will be run next". This is because a preference is given to the positioning at a command speed. In actuality, the positioning is completed before the set address/movement amount by an amount of remaining distance at speeds less than the command speed. The remaining distance ($\Delta 1$) at speeds less than the command speed is $0 \leq \Delta 1 \leq$ (distance moved in operation cycle at a speed at the time of completion of the positioning). The remaining distance ($\Delta 1$) is output at the next positioning data No.

■Operation example



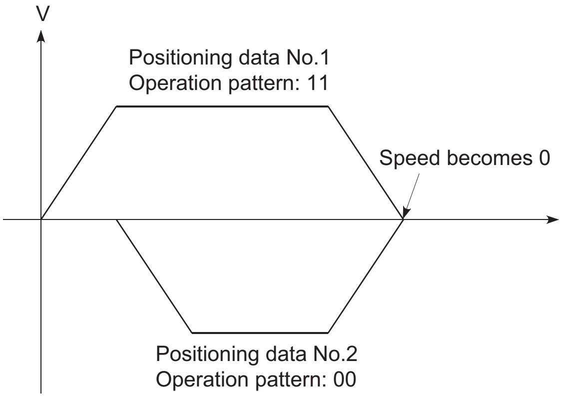
Point

In the continuous path control, a speed variation will not occur using the near-pass function when the positioning data No. is switched.
(☞ Page 245 Near pass function)

■Deceleration stop conditions during continuous path control

Deceleration stops are not carried out in continuous path control, but the machine will carry out a deceleration stop to speed "0" in the following 3 cases.

- When the operation pattern of the positioning data currently being executed is "continuous path control: 11", and the movement direction of the positioning data currently being executed differs from that of the next positioning data. (Only for 1-axis positioning control (Refer to the next point.))

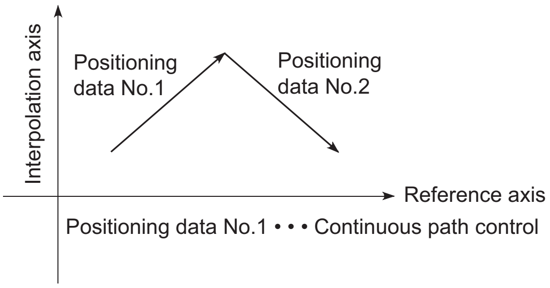


- During operation by step operation. (☞ Page 295 Step function)
- When there is an error in the positioning data to carry out the next operation.

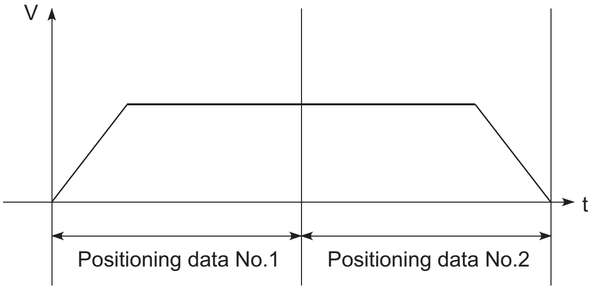
Point

- The movement direction is not checked during interpolation operations. Thus, automatic deceleration to a stop will not be carried out even if the movement direction is changed (See the figures below). Because of this, the interpolation axis may rapidly reverse direction. To avoid this rapid direction reversal in the interpolation axis, set the pass point to continuous positioning control "01" instead of setting it to continuous path control "11".

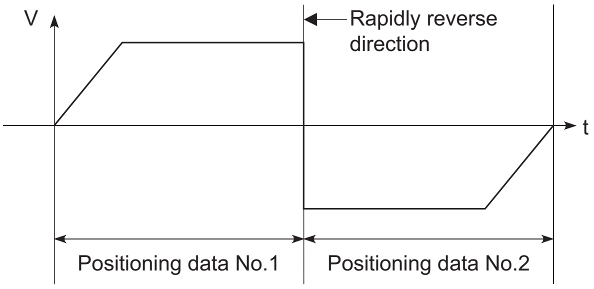
[Positioning by interpolation]



[Reference axis operation]



[Interpolation axis operation]

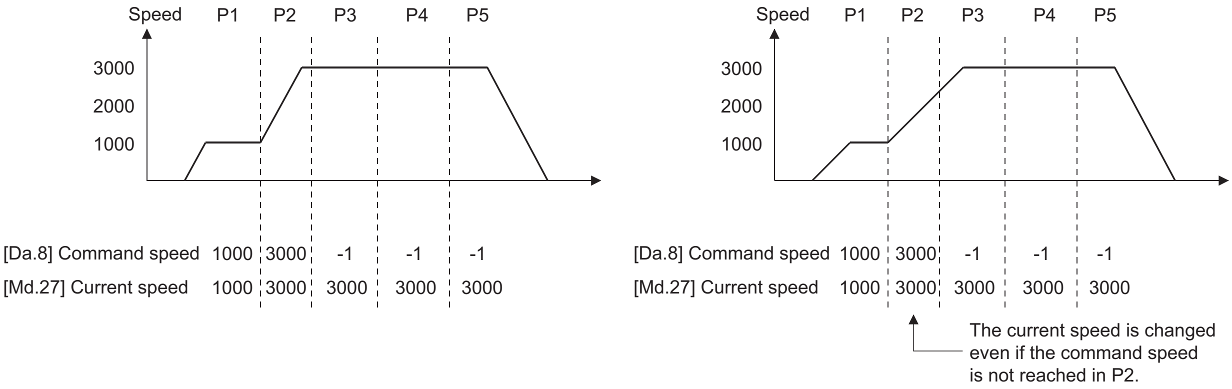


- When a "0" is set in the "[Da.6] Positioning address/movement amount" of the continuous path control positioning data, the command speed is reduced to 0 in an operation cycle. When a "0" is set in the "[Da.6] Positioning address/movement amount" to increase the number of speed change points in the future, change the "[Da.2] Control method" to the "NOP" to make the control nonexecutable. (☞ Page 146 NOP instruction)
- In the continuous path control positioning data, assure a movement distance so that the execution time with that data is 100 ms or longer, or lower the command speed.

■Speed handling

- Continuous path control command speeds are set with each positioning data. The Simple Motion module carries out the positioning at the speed designated with each positioning data.
- The command speed can be set to "-1" in continuous path control. The control will be carried out at the speed used in the previous positioning data No. if the command speed is set to "-1". The "current speed" will be displayed in the command speed when the positioning data is set with an engineering tool. The current speed is the speed of the positioning control being executed currently.
- The speed does not need to be set in each positioning data when carrying out uniform speed control if "-1" is set beforehand in the command speed.
- If the speed is changed or the override function is executed, in the previous positioning data when "-1" is set in the command speed, the operation can be continued at the new speed.
- The error "No command speed" (error code: 1A12H to 1A14H) occurs and positioning cannot be started if "-1" is set in the command speed of the first positioning data at start.

[Relation between the command speed and current speed]



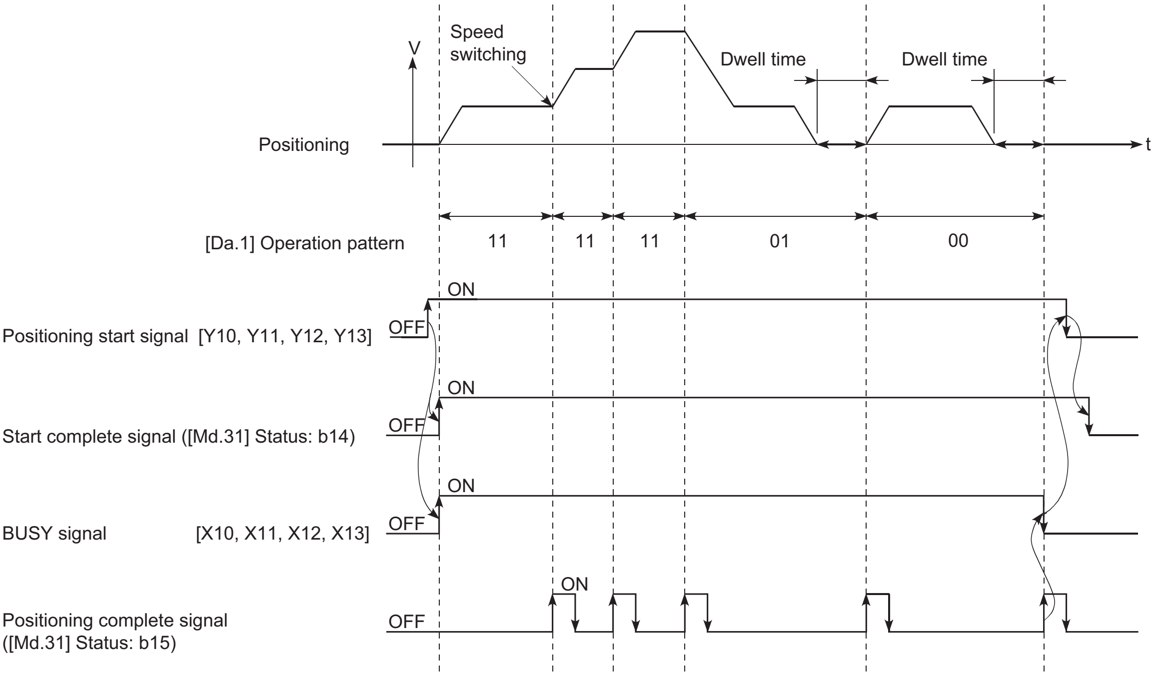
Point

- In the continuous path control, a speed variation will not occur using the near-pass function when the positioning data is switched. (☞ Page 245 Near pass function)
- The Simple Motion module holds the command speed set with the positioning data, and the latest value of the speed set with the speed change request as the "[Md.27] Current speed". It controls the operation at the "current speed" when "-1" is set in the command speed. (Depending on the relation between the movement amount and the speed, the speed command may not reach the command speed value, but even then the current speed will be updated.)
- When the address for speed change is identified beforehand, generate and execute the positioning data for speed change by the continuous path control to carry out the speed change without requesting the speed change with a program.

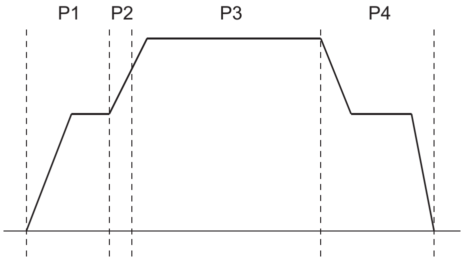
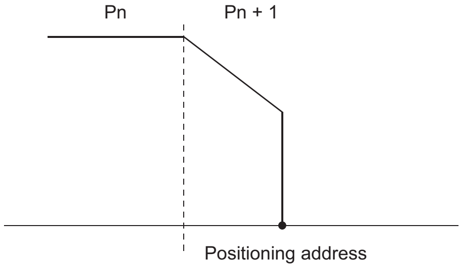
■Speed switching (Standard speed switching mode: Switch the speed when executing the next positioning data.) (☞ Page 519 [Pr.19] Speed switching mode)

- If the respective command speeds differ in the "positioning data currently being executed" and the "positioning data to carry out the next operation", the machine will accelerate or decelerate after reaching the positioning point set in the "positioning data currently being executed" and the speed will change over to the speed set in the "positioning data to carry out the next operation".
- The parameters used in acceleration/deceleration to the command speed set in the "positioning data to carry out the next operation" are those of the positioning data to carry out acceleration/deceleration. Speed switching will not be carried out if the command speeds are the same.

Ex.



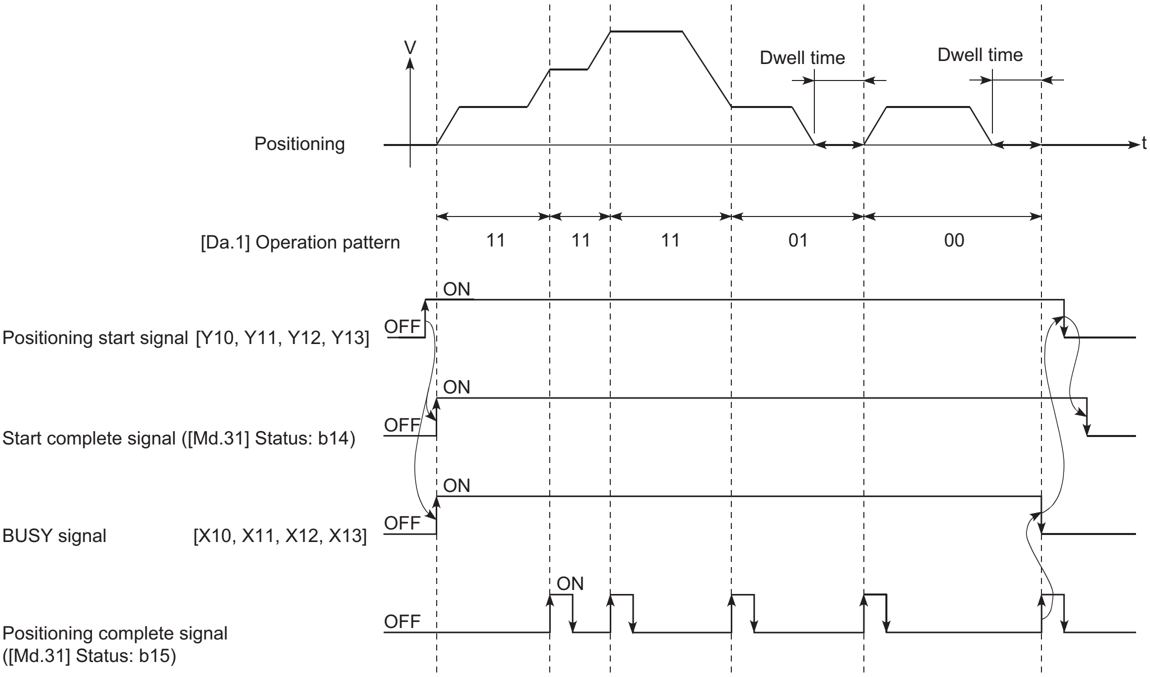
- If the movement amount is small in regard to the target speed, the current speed may not reach the target speed even if acceleration/deceleration is carried out. In this case, the machine is accelerated/decelerated so that it nears the target speed. If the movement amount will be exceeded when automatic deceleration is required (Ex. Operation patterns "00", "01", etc.), the machine will immediately stop at the designated positioning address, and the warning "Insufficient movement amount" (warning code: 0998H) will occur.

[When the speed cannot change over in P2]	[When the movement amount is small during automatic deceleration]
For the following relation of the speed P1 = P4, P2 = P3, P1 < P2  	The movement amount required to carry out the automatic deceleration cannot be secured, so the machine immediately stops in a speed ≠ 0 status. 

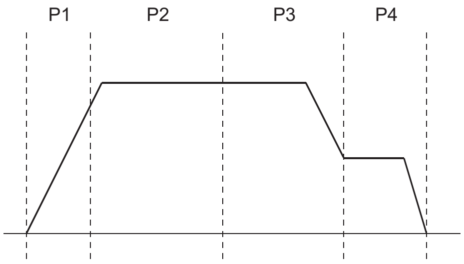
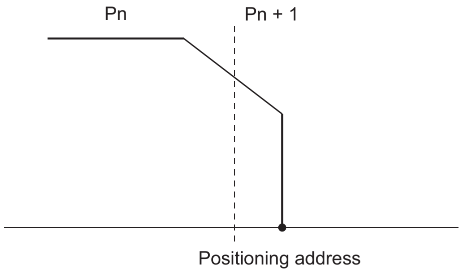
■Speed switching (Front-loading speed switching mode: The speed switches at the end of the positioning data currently being executed.) (☞ Page 519 [Pr.19] Speed switching mode)

- If the respective command speeds differ in the "positioning data currently being executed" and the "positioning data to carry out the next operation", the speed will change over to the speed set in the "positioning data to carry out the next operation" at the end of the "positioning data currently being executed".
- The parameters used in acceleration/deceleration to the command speed set in the "positioning data to carry out the next operation" are those of the positioning data to carry out acceleration/deceleration. Speed switching will not be carried out if the command speeds are the same.

Ex.



- If the movement amount is small in regard to the target speed, the current speed may not reach the target speed even if acceleration/deceleration is carried out. In this case, the machine is accelerated/decelerated so that it nears the target speed. If the movement amount will be exceeded when automatic deceleration is required (Ex. Operation patterns "00", "01", etc.), the machine will immediately stop at the designated positioning address, and the warning "Insufficient movement amount" (warning code: 0998H) will occur.

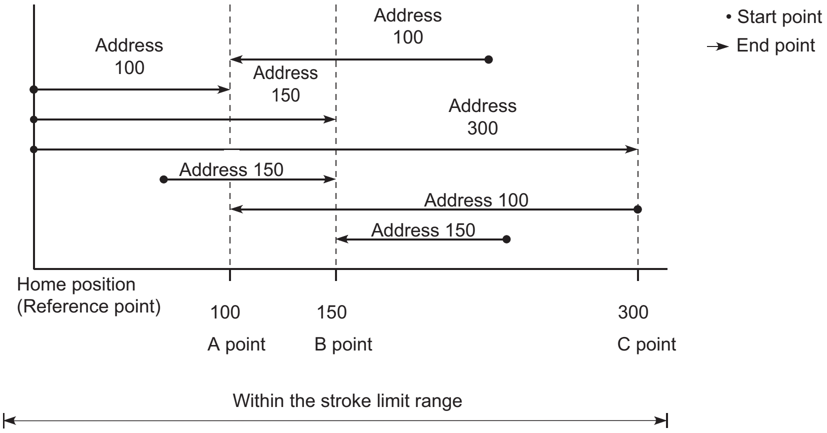
[When the speed cannot change over to the P2 speed in P1]	[When the movement amount is small during automatic deceleration]
For the following relation of the speed P1 = P4, P2 = P3, P1 < P2 	The movement amount required to carry out the automatic deceleration cannot be secured, so the machine immediately stops in a speed ≠ 0 status. 

Designating the positioning address

The following shows the two methods for commanding the position in control using positioning data.

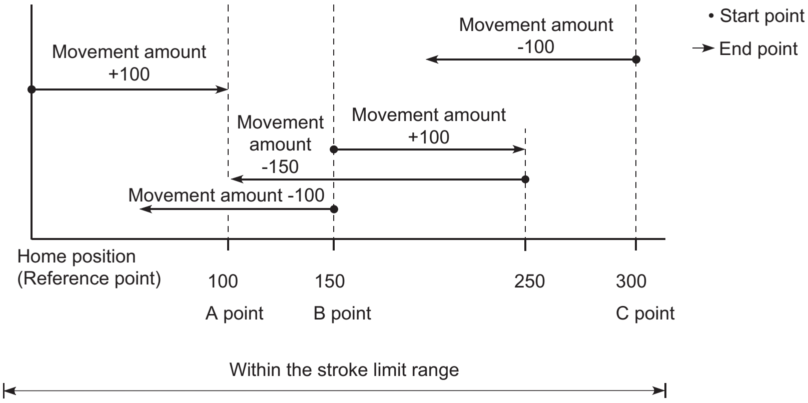
Absolute system

Positioning is carried out to a designated position (absolute address) having the home position as a reference. This address is regarded as the positioning address. (The start point can be anywhere.)



Incremental system

The position where the machine is currently stopped is regarded as the start point, and positioning is carried out for a designated movement amount in a designated movement direction.



Confirming the current value

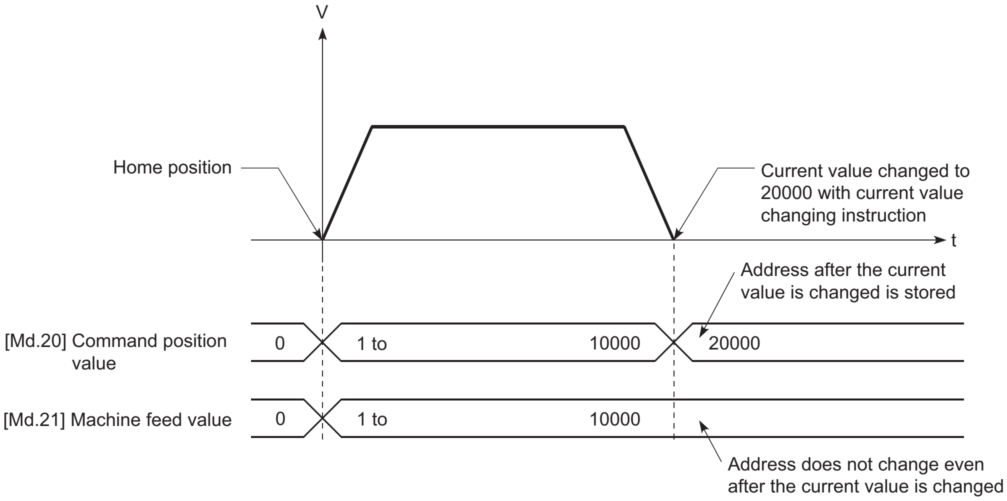
Values showing the current value

The following two types of addresses are used as values to show the position in the Simple Motion module.

These addresses ("command position value" and "machine feed value") are stored in the monitor data area, and used in monitoring the current value display, etc.

Command position value	Machine feed value
• This is the value stored in "[Md.20] Command position value". • This value has an address established with a "machine home position return" as a reference, but the address can be changed by changing the current value to a new value.	• This is the value stored in "[Md.21] Machine feed value". • This value always has an address established with a "machine home position return" as a reference. The address cannot be changed, even if the current value is changed to a new value.

The "command position value" and "machine feed value" are used in monitoring the current value display, etc.



Restriction

Operation cycle error will occur in the current value refresh cycle when the stored "command position value" and "machine feed value" are used in the control.

Monitoring the current value

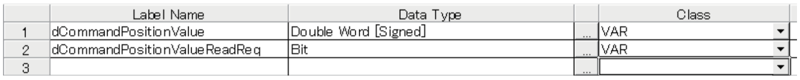
The "command position value" and "machine feed value" are stored in the following buffer memory addresses, and can be read using a "DFROM(P) instruction" or "DMOV(P) instruction" from the CPU module.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Monitor item		Buffer memory addresses	
		Axis 1 to axis 16	Axis 17 to axis 32
[Md.20]	Command position value	2400+100n 2401+100n	1002400+100n 1002401+100n
[Md.21]	Machine feed value	2402+100n 2403+100n	1002402+100n 1002403+100n

Program example

The following shows the program example that stores the command position value of the axis 1 in the specified device when X40 is turned ON.

Classification	Label name	Description
Module label	RD77_1.stnAxMntr_D[0].dCommandPosition_D	Axis 1 Command position value
Global label, local label	Defines the global label or the local label as follows. The settings of Assign (Device/Label) are not required for the label that the assignment device is not set because the unused internal relay and data device are automatically assigned. The following table shows an example for the local label. 	

	Label Name	Data Type		Class
1	dCommandPositionValue	Double Word [Signed]	...	VAR
2	dCommandPositionValueReadReq	Bit	...	VAR
3			...	

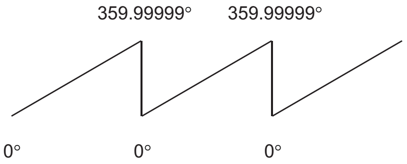
Control unit "degree" handling

When the control unit is set to "degree", the following items differ from when other control units are set.

Command position value and machine feed value addresses

The address of "[Md.20] Command position value" becomes a ring address from 0 to 359.99999°. The address of "[Md.21] Machine feed value" will become a cumulative value. (They will not have a ring structure for values between 0 and 359.99999°.)

However, "[Md.21] Machine feed value" is restored with cumulating the machine feed value before the power supply OFF (the rounded value within the range of 0 to 359.99999°) to the movement amount during the power supply OFF at the communication start with servo amplifier after the power supply ON or CPU module reset.

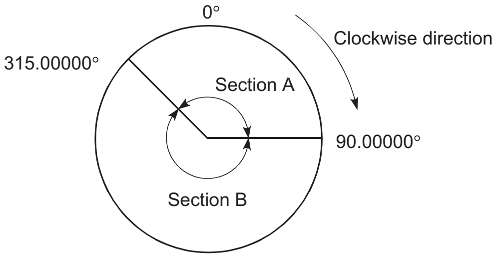


Software stroke limit valid/invalid setting

With the control unit set to "degree", the software stroke limit upper and lower limit values are 0° to 359.99999°.

■Setting to validate software stroke limit

To validate the software stroke limit, set the software stroke limit lower limit value and the upper limit value in a clockwise direction.



- To set the movement range A, set as follows.

Software stroke limit lower limit value	315.00000°
Software stroke limit upper limit value	90.00000°

- To set the movement range B, set as follows.

Software stroke limit lower limit value	90.00000°
Software stroke limit upper limit value	315.00000°

■Setting to invalidate software stroke limit

To invalidate the software stroke limit, set the software stroke limit lower limit value equal to the software stroke limit upper limit value.

The control can be carried out irrespective of the setting of the software stroke limit.

Point

- When the upper/lower limit value of the axis which set the software stroke limit as valid are changed, perform the machine home position return after that.
- When the software stroke limit is set as valid in the incremental data system, perform the machine home position return after power supply on.

Positioning control method when the control unit is set to "degree"

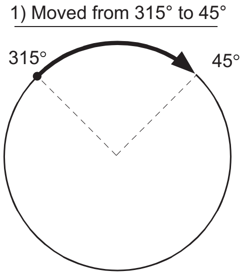
■Absolute system (When the software stroke limit is invalid)

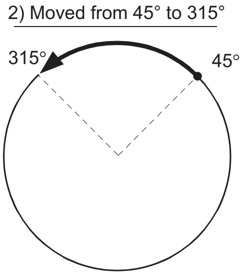
Positioning is carried out in the nearest direction to the designated address, using the current value as a reference. (This is called "shortcut control".)

Ex.

1) Positioning is carried out in a clockwise direction when the current value is moved from 315° to 45°.

2) Positioning is carried out in a counterclockwise direction when the current value is moved from 45° to 315°.


1) Moved from 315° to 45°


2) Moved from 45° to 315°

To designate the positioning direction (not carrying out the shortcut control), the shortcut control is invalidated and positioning in a designated direction is carried out by the "[Cd.40] ABS direction in degrees".

This function can perform only when the software stroke limit is invalid. When the software stroke limit is valid, the error "Illegal setting of ABS direction in unit of degree" (error code: 19A5H) occurs and positioning is not started.

To designate the movement direction in the ABS control, a "1" or "2" is written to the "[Cd.40] ABS direction in degrees" of the buffer memory (initial value: 0).

The value written to the "[Cd.40] ABS direction in degrees" becomes valid only when the positioning control is started.

In the continuous positioning control and continuous path control, the operation is continued with the setting set at the time of start even if the setting is changed during the operation.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Name	Function	Buffer memory address		Initial value
		Axis 1 to axis 16	Axis 17 to axis 32	
[Cd.40] ABS direction in degrees	The ABS movement direction in the unit of degree is designated. 0: Shortcut (direction setting invalid) 1: ABS clockwise 2: ABS counterclockwise	4350+100n	1004350+100n	0

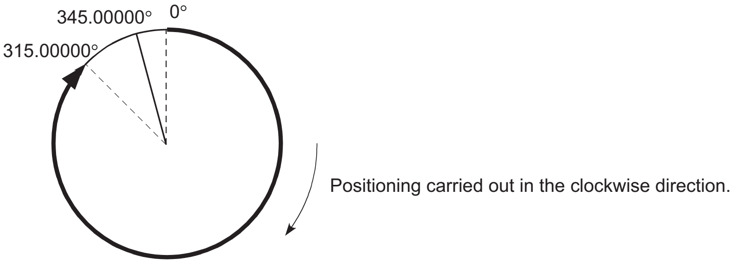
■Absolute system (When the software stroke limit is valid)

The positioning is carried out in a clockwise/counterclockwise direction depending on the software stroke limit range setting method.

Because of this, positioning with "shortcut control" may not be possible.

Ex.

When the current value is moved from 0° to 315°, positioning is carried out in the clockwise direction if the software stroke limit lower limit value is 0° and the upper limit value is 345°.



Point

Positioning addresses are within a range of 0° to 359.99999°.

Use the incremental system to carry out positioning of one rotation or more.

■Incremental system

Positioning is carried out for a designated movement amount in a designated movement direction when in the incremental system of positioning.

The movement direction is determined by the sign (+, -) of the movement amount.

For a positive (+) movement direction	Clockwise
For a negative (-) movement direction	Counterclockwise

Point

Positioning of 360° or more can be carried out with the incremental system.

At this time, set as shown below to invalidate the software stroke limit.

[Software stroke limit upper limit value = Software stroke limit lower limit value]

Set the value within the setting range (0° to 359.99999°).

Interpolation control

Meaning of interpolation control

In "2-axis linear interpolation control", "3-axis linear interpolation control", "4-axis linear interpolation control", "2-axis fixed-feed control", "3-axis fixed-feed control", "4-axis fixed-feed control", "2-axis speed control", "3-axis speed control", "4-axis speed control", "2-axis circular interpolation control", and "3-axis helical interpolation control", each control is performed so that linear and arc paths are drawn using a motor set in two to four axis directions. This kind of control is called "interpolation control".

In interpolation control, the axis in which the control method is set is defined as the "reference axis", and the other axis is defined as the "interpolation axis".

The Simple Motion module controls the "reference axis" following the positioning data set in the "reference axis", and controls the "interpolation axis" corresponding to the reference axis control so that a linear or arc path is drawn.

The following table shows the reference axis and interpolation axis combinations.

—: Setting not required (Use the initial value or a value within the setting range.)

Interpolation control set in "[Da.2] Control method"	2-axis module		4-/8-/16-/32-axis module	
	Reference axis	**Interpolation axis**	**Reference axis**	**Interpolation axis**
2-axis linear interpolation control 2-axis fixed-feed control 2-axis circular interpolation control 2-axis speed control	Any of axes 1 to 2	"Axis to be interpolated No.1" set in reference axis	4-axis module: Any of axes 1 to 4 8-axis module: Any of axes 1 to 8 16-axis module: Any of axes 1 to 16 32-axis module: Any of axes 1 to 32	"Axis to be interpolated No.1" set in reference axis
3-axis linear interpolation control 3-axis fixed-feed control 3-axis speed control	—			"Axis to be interpolated No.1" and "Axis to be interpolated No.2" set in reference axis
4-axis linear interpolation control 4-axis fixed-feed control 4-axis speed control	—			"Axis to be interpolated No.1", "Axis to be interpolated No.2" and "Axis to be interpolated No.3" set in reference axis

The combinations of axes available for the 3-axis helical interpolation control are the same as the ones for the "3-axis linear interpolation control", "3-axis fixed-feed control", and "3-axis speed control". The following table shows the combinations of the reference axis, circular interpolation axis, and linear interpolation axis for the 3-axis helical interpolation control.

Interpolation control set in "[Da.2] Control method"	2-axis module			4-/8-/16-/32-axis module		
	Reference axis	**Circular interpolation axis**	**Linear interpolation axis**	**Reference axis**	**Circular interpolation axis**	**Linear interpolation axis**
3-axis helical interpolation control	—			4-axis module: Any of axes 1 to 4 8-axis module: Any of axes 1 to 8 16-axis module: Any of axes 1 to 16 32-axis module: Any of axes 1 to 32	"Axis to be interpolated No.1" set in reference axis	"Axis to be interpolated No.2" set in reference axis

Setting positioning data

When carrying out interpolation control, the same positioning data Nos. are set for the "reference axis" and the "interpolation axis". The following table shows the "positioning data" setting items for the reference axis and interpolation axis.

◎: Setting always required, ○: Set according to requirements (Set to "—" when not used.), △: Setting restrictions exist

—: Setting not required (Use the initial value or a value within the setting range.)

Setting item			Reference axis setting item	Interpolation axis setting item
Same positioning data Nos	[Da.1]	Operation pattern	◎	—
	[Da.2]	Control method	◎ Linear 2, 3, 4 Fixed-feed 2, 3, 4 Circular sub, Circular right, Circular left Helical sub, Helical right, Helical left Forward run speed 2, 3, 4 Reverse run speed 2, 3, 4	—
	[Da.3]	Acceleration time No.	◎	—
	[Da.4]	Deceleration time No.	◎	—
	[Da.6]	Positioning address/movement amount	△ (Forward run speed 2, 3, and 4. Reverse run speed 2, 3, and 4 not required.)	△ (Forward run speed 2, 3, and 4. Reverse run speed 2, 3, and 4 not required.)
	[Da.7]	Arc address	△ (Only during circular sub, circular right, circular left, helical sub, helical right, and helical left.)	△ (Only during circular sub, circular right, circular left, helical sub, helical right, and helical left.)
	[Da.8]	Command speed	◎	△ (Only during forward run speed 2, 3, 4 and reverse run speed 2, 3, 4).
	[Da.9]	Dwell time/JUMP destination positioning data No.	○	—
	[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches	○	— Set the number of pitch for the linear interpolation axis only during helical sub, helical right, and helical left.
	[Da.20]	Axis to be interpolated No.1	○[1]	—
	[Da.21]	Axis to be interpolated No.2	○[1]	—
	[Da.22]	Axis to be interpolated No.3	○[1]	—
	[Da.27]	M code ON signal output timing	○	—
	[Da.28]	ABS direction in degrees	○	—
	[Da.29]	Interpolation speed designation method	△	—

[1] The axis No. is set to axis to be interpolated No.1 for 2-axis linear interpolation, to axis to be interpolated No.1 and No.2 for 3-axis linear interpolation, and to axis to be interpolated No.1 to No.3 for 4-axis linear interpolation.
If the self-axis is set, the error "Illegal interpolation description command" (error code: 1A22H) will occur. The axes that are not used are not required.

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

Starting the interpolation control

The positioning data Nos. of the reference axis (axis in which interpolation control was set in "[Da.2] Control method") are started when starting the interpolation control. (Starting of the interpolation axis is not required.)

The following errors or warnings will occur and the positioning will not start if both reference axis and the interpolation axis are started.

- Reference axis: Interpolation while interpolation axis BUSY (error code: 1998H)
- Interpolation axis: Control method setting error (error code: 1A24H), start during operation (warning code: 0900H).

Interpolation control continuous positioning

When carrying out interpolation control in which "continuous positioning control" and "continuous path control" are designated in the operation pattern, the positioning method for all positioning data from the started positioning data to the positioning data in which "positioning complete" is set must be set to interpolation control.

The number of the interpolation axes and axes to be interpolated cannot be changed from the intermediate positioning data. When the number of the interpolation axes and axes to be interpolated are changed, the error "Control method setting error" (error code: 1A25H) will occur and the positioning will stop.

Speed during interpolation control

Either the "composite speed" or "reference axis speed" can be designated as the speed during interpolation control. ([Pr.20] Interpolation speed designation method)

Only the "Reference axis speed" can be designated in the following interpolation control.

When a "composite speed" is set and positioning is started, the error "Interpolation mode error" (error code: 199AH) occurs, and the system will not start.

- 4-axis linear interpolation
- 2-axis speed control
- 3-axis speed control
- 4-axis speed control

Cautions

- If any axis exceeds "[Pr.8] Speed limit value" during 2- to 4-axis speed control, the axis exceeding the speed limit value is controlled with the speed limit value. The speeds of the other axes being interpolated are suppressed by the command speed ratio.
- If the reference axis exceeds "[Pr.8] Speed limit value" during 2-axis circular interpolation control, the reference axis is controlled with the speed limit value. (The speed limit does not function on the interpolation axis side.)
- If any axis exceeds "[Pr.8] Speed limit value" during 2- to 4-axis linear interpolation control or 2- to 4-axis fixed-feed control, the axis exceeding the speed limit value is controlled with the speed limit value. The speeds of the other axes being interpolated are suppressed by the movement amount ratio.
- In the 3-axis helical interpolation control, the composite speed of the circular interpolation axis or the speed of the linear interpolation axis is controlled not to exceed "[Pr.8] Speed limit value". (However, when the movement amount of the linear interpolation axis is more than the composite movement amount of the circular interpolation axis, such as when the number of pitches ("[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches") set in the linear interpolation axis is less, the speed of the linear interpolation axis cannot be suppressed with "[Pr.8] Speed limit value".)
- In 2- to 4-axis interpolation, you cannot change the combination of interpolated axes midway through operation.

Point

When the "reference axis speed" is set during interpolation control, set so the major axis side becomes the reference axis. If the minor axis side is set as the reference axis, the major axis side speed may exceed the "[Pr.8] Speed limit value".

Limits to interpolation control

There are limits to the interpolation control that can be executed and speed ([Pr.20] Interpolation speed designation method) that can be set, depending on the "[Pr.1] Unit setting" of the reference axis and interpolation axis. (For example, 2-axis circular interpolation control cannot be executed if the reference axis and interpolation axis units differ.)

The following table shows the interpolation control and speed designation limits.

○: Setting possible, ×: Setting not possible

Interpolation control set in "[Da.2] Control method"	**[Pr.20] Interpolation speed designation method**	**[Pr.1] Unit setting**[1]	
		Reference axis and interpolation axis units are the same, or a combination of "mm" and "inch".[2]	**Reference axis and interpolation axis units differ**[2]
Linear 2 (ABS, INC) Fixed-feed 2	Composite speed	○	×
	Reference axis speed	○	○
Circular sub (ABS, INC) Circular right (ABS, INC) Circular left (ABS, INC)	Composite speed	○[3]	×
	Reference axis speed	×	×
Linear 3 (ABS, INC) Fixed-feed 3	Composite speed	○	×
	Reference axis speed	○	○
Linear 4 (ABS, INC) Fixed-feed 4	Composite speed	×	×
	Reference axis speed	○	○
2 to 4-axis speed control	Composite speed	×	×
	Reference axis speed	○	○
Helical sub (ABS, INC) Helical right (ABS, INC) Helical left (ABS, INC)	Composite speed	○[3]	○[4]
	Reference axis speed	×	×

*1 "mm" and "inch" unit mix possible.
When "mm" and "inch" are mixed, convert as follows for the positioning.
If interpolation control units are "mm", positioning is controlled by calculating position commands from the address, travel value, positioning speed and electronic gear, which have been converted to "mm" using the formula: inch setting value × 25.4 = mm setting value.
If interpolation control units are "inch", positioning is controlled by calculating position commands from the address, travel value, positioning speed and electronic gear, which have been converted to "inch" using the formula: mm setting value/25.4 = inch setting value.

*2 The unit set in the reference axis will be used for the speed unit during control if the units differ or if "mm" and "inch" are combined.

*3 "degree" setting not possible.
The error "Circular interpolation not possible" (error code: 199FH) will occur and the positioning control does not start if 2-axis circular interpolation control and 3-axis helical interpolation control is set when the unit is "degree".
The machine will carry out a deceleration stop if "degree" is set during positioning control.

*4 Only linear interpolation axis can use a unit different from that of the reference axis.

Axis operation status during interpolation control

"Interpolation" will be stored in the "[Md.26] Axis operation status" during interpolation control. "Standby" will be stored when the interpolation operation is terminated. Both the reference axis and interpolation axis will carry out a deceleration stop if an error occurs during control, and "Error" will be stored in the operation status.

3.2 Setting the Positioning Data

Relation between each control and positioning data

The setting requirements and details for the setting items of the positioning data to be set differ according to the "[Da.2] Control method".

The following table shows the positioning data setting items corresponding to the different types of control.

(In this section, it is assumed that the positioning data setting is carried out using an engineering tool.)

◎: Always set

○: Set as required ("—" when not required)

×: Setting not possible (If set, the error "Continuous path control not possible" (error code: 1A1EH to 1A20H) will occur at start.)

△: Setting limited

—: Setting not required (Use the initial value or a value within the setting range.)

Positioning data			**Position control**				**1 to 4 axis speed control**
			1-axis linear control 2/3/4-axis linear interpolation control	**1/2/3/4-axis fixed-feed control**	**2-axis circular interpolation control**	**3-axis helical interpolation control**	
[Da.1]	Operation pattern	Independent positioning control (Positioning complete)	◎	◎	◎	◎	◎
		Continuous positioning control	◎	◎	◎	◎	×
		Continuous path control	◎	×	◎	◎	×
[Da.2]	Control method		Linear 1 Linear 2 Linear 3 Linear 4 [*1]	Fixed-feed 1 Fixed-feed 2 Fixed-feed 3 Fixed-feed 4	Circular sub Circular right Circular left [*1]	Helical sub Helical right Helical left [*1]	Forward run speed 1 Reverse run speed 1 Forward run speed 2 Reverse run speed 2 Forward run speed 3 Reverse run speed 3 Forward run speed 4 Reverse run speed 4
[Da.3]	Acceleration time No.		◎	◎	◎	◎	◎
[Da.4]	Deceleration time No.		◎	◎	◎	◎	◎
[Da.6]	Positioning address/movement amount		◎	◎	◎	◎	—
[Da.7]	Arc address		—	—	◎	◎	—
[Da.8]	Command speed		◎	◎	◎	◎	◎
[Da.9]	Dwell time/JUMP destination positioning data No.		○	○	○	○	—
[Da.10]	M code/Condition data No./ Number of LOOP to LEND repetitions/Number of pitches		○	○	○	○[*2]	○
[Da.20]	Axis to be interpolated No.1		◎: 2 axes, 3 axes, 4 axes, —: 1 axis			◎	◎: 2 axes, 3 axes, 4 axes, —: 1 axis
[Da.21]	Axis to be interpolated No.2		◎: 3 axes, 4 axes, —: 1 axis, 2 axes			◎	◎: 3 axes, 4 axes, —: 1 axis, 2 axes
[Da.22]	Axis to be interpolated No.3		◎: 4 axes, —: 1 axis, 2 axes, 3 axes			—	◎: 4 axes, —: 1 axis, 2 axes, 3 axes
[Da.27]	M code ON signal output timing		○	○	○	○	○
[Da.28]	ABS direction in degrees		○	○	○	○	○
[Da.29]	Interpolation speed designation method		△	△	△	△	△

[*1] Two control systems are available: the absolute (ABS) system and incremental (INC) system.

[*2] Set an M code for the reference axis and set the number of pitches for the linear interpolation axis.

◎: Always set

○: Set as required ("—" when not required)

×: Setting not possible (If set, the error "Continuous path control not possible" (error code: 1A1EH to 1A20H) will occur at start.)

—: Setting not required (Use the initial value or a value within the setting range.)

Positioning data			**Speed-position switching control**	**Position-speed switching control**
[Da.1]	Operation pattern	Independent positioning control (Positioning complete)	◎	◎
		Continuous positioning control	◎	×
		Continuous path control	×	×
[Da.2]	Control method		Forward run speed/position Reverse run speed/position *1	Forward run position/speed Reverse run position/speed
[Da.3]	Acceleration time No.		◎	◎
[Da.4]	Deceleration time No.		◎	◎
[Da.6]	Positioning address/movement amount		◎	◎
[Da.7]	Arc address		—	—
[Da.8]	Command speed		◎	◎
[Da.9]	Dwell time/JUMP destination positioning data No.		○	○
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches		○	○
[Da.20]	Axis to be interpolated No.1		—	—
[Da.21]	Axis to be interpolated No.2		—	—
[Da.22]	Axis to be interpolated No.3		—	—
[Da.27]	M code ON signal output timing		○	○
[Da.28]	ABS direction in degrees		—	—
[Da.29]	Interpolation speed designation method		—	—

*1 Two control systems are available: the absolute (ABS) system and incremental (INC) system.

◎: Always set

○: Set as required ("—" when not required)

×: Setting not possible (If set, the error "Continuous path control not possible" (error code: 1A1EH to 1A20H) will occur at start.)

—: Setting not required (Use the initial value or a value within the setting range.)

Positioning data			**Other control**				
			NOP instruction	**Current value changing**	**JUMP instruction**	**LOOP**	**LEND**
[Da.1]	Operation pattern	Independent positioning control (Positioning complete)	—	◎	—	—	—
		Continuous positioning control	—	◎	—	—	—
		Continuous path control	—	×	—	—	—
[Da.2]	Control method		NOP	Current value changing	JUMP instruction	LOOP	LEND
[Da.3]	Acceleration time No.		—	—	—	—	—
[Da.4]	Deceleration time No.		—	—	—	—	—
[Da.6]	Positioning address/movement amount		—	New address	—	—	—
[Da.7]	Arc address		—	—	—	—	—
[Da.8]	Command speed		—	—	—	—	—
[Da.9]	Dwell time/JUMP destination positioning data No.		—	—	JUMP destination positioning data No.	—	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches		—	○	JUMP condition data No.	Number of LOOP to LEND repetitions	—
[Da.20]	Axis to be interpolated No.1		—	—	—	—	—
[Da.21]	Axis to be interpolated No.2		—	—	—	—	—
[Da.22]	Axis to be interpolated No.3		—	—	—	—	—
[Da.27]	M code ON signal output timing		—	○	—	—	—
[Da.28]	ABS direction in degrees		—	—	—	—	—
[Da.29]	Interpolation speed designation method		—	—	—	—	—

Point

It is recommended that the "positioning data" be set whenever possible with an engineering tool. Execution by a program uses many programs and devices. The execution becomes complicated, and the scan times will increase.

1-axis linear control

In "1-axis linear control" ("[Da.2] Control method" = ABS linear 1, INC linear 1), one motor is used to carry out position control in a set axis direction.

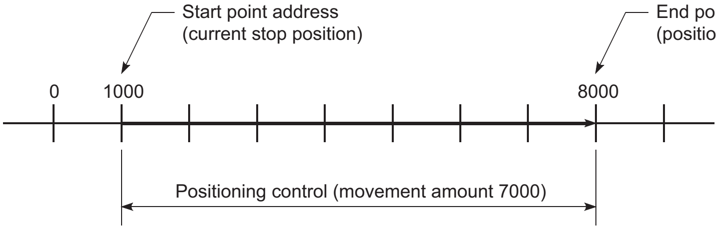
1-axis linear control (ABS linear 1)

■Operation chart

In absolute system 1-axis linear control, positioning is carried out from the current stop position (start point address) to the address (end point address) set in "[Da.6] Positioning address/movement amount".

Ex.

When the start point address (current stop position) is 1000, and the end point address (positioning address) is 8000, positioning is carried out in the positive direction for a movement amount of 7000 (8000 - 1000)



■Setting positioning data

When using 1-axis linear control (ABS linear 1), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting required/not required
[Da.1]	Operation pattern	◎
[Da.2]	Control method	◎ (Set ABS linear 1.)
[Da.3]	Acceleration time No.	◎
[Da.4]	Deceleration time No.	◎
[Da.6]	Positioning address/movement amount	◎
[Da.7]	Arc address	—
[Da.8]	Command speed	◎
[Da.9]	Dwell time/JUMP destination positioning data No.	○
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches	○
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—
[Da.27]	M code ON signal output timing	○
[Da.28]	ABS direction in degrees	○
[Da.29]	Interpolation speed designation method	△

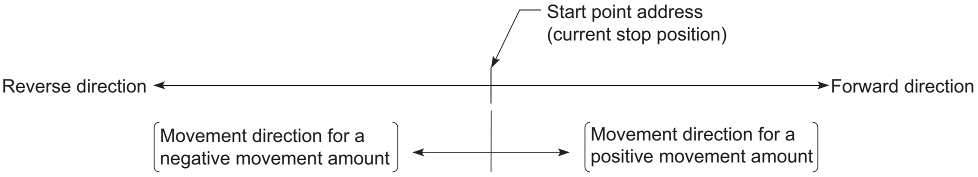
Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

1-axis linear control (INC linear 1)

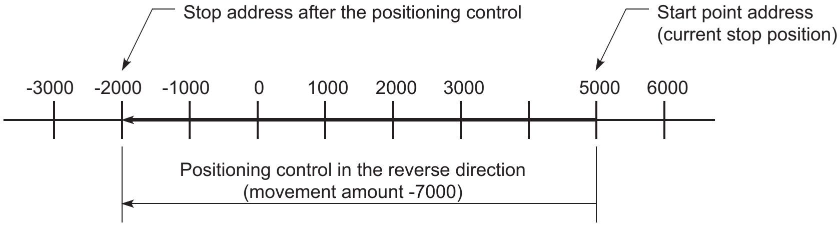
■Operation chart

In incremental system 1-axis linear control, positioning is carried out from the current stop position (start point address) to a position at the end of the movement amount set in "[Da.6] Positioning address/movement amount". The movement direction is determined by the sign of the movement amount.



Ex.

When the start point address is 5000, and the movement amount is -7000, positioning is carried out to the -2000 position.



■Setting positioning data

When using 1-axis linear control (INC linear 1), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting required/not required
[Da.1]	Operation pattern	◎
[Da.2]	Control method	◎ (Set INC linear 1.)
[Da.3]	Acceleration time No.	◎
[Da.4]	Deceleration time No.	◎
[Da.6]	Positioning address/movement amount	◎
[Da.7]	Arc address	—
[Da.8]	Command speed	◎
[Da.9]	Dwell time/JUMP destination positioning data No.	○
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches	○
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—
[Da.27]	M code ON signal output timing	○
[Da.28]	ABS direction in degrees	○
[Da.29]	Interpolation speed designation method	△

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

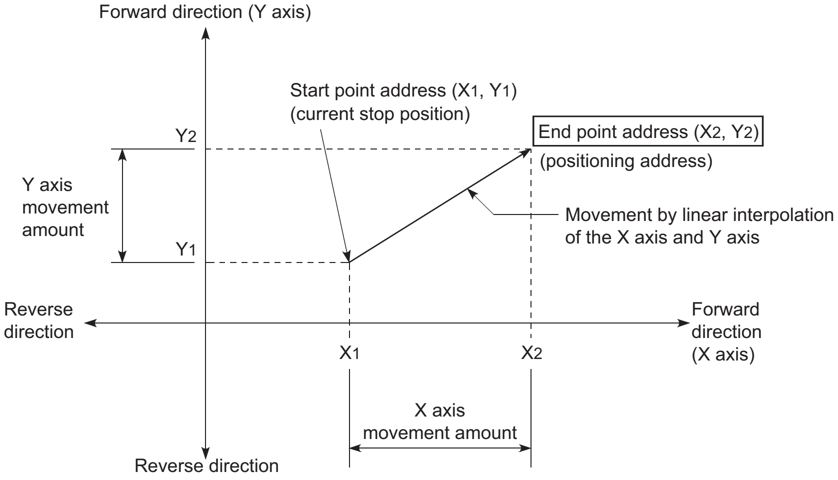
2-axis linear interpolation control

In "2-axis linear interpolation control" ("[Da.2] Control method" = ABS linear 2, INC linear 2), two motors are used to carry out position control in a linear path while carrying out interpolation for the axis directions set in each axis. (Refer to ☞ Page 71 Interpolation control for details on interpolation control.)

2-axis linear interpolation control (ABS linear 2)

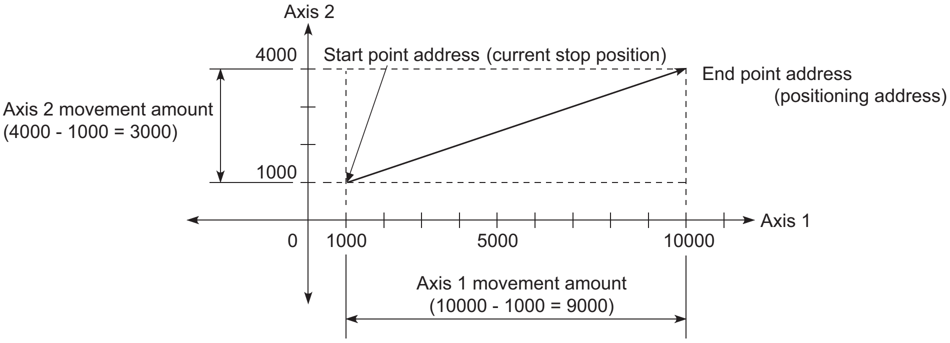
■Operation chart

In absolute system 2-axis linear interpolation control, the designated 2 axes are used. Linear interpolation positioning is carried out from the current stop position (start point address) to the address (end point address) set in "[Da.6] Positioning address/movement amount".



Ex.

When the start point address (current stop position) is (1000, 1000) and the end point address (positioning address) is (10000, 4000), positioning is carried out as follows.



■Restrictions

An error will occur and the positioning will not start in the following cases. The machine will immediately stop if the error is detected during a positioning control.

- If the movement amount of each axis exceeds "1073741824 (= 2^{30})" when "0: Composite speed" is set in "[Pr.20] Interpolation speed designation method", the error "Outside linear movement amount range" (error code: 1A15H, 1A16H) occurs at a positioning start. (The maximum movement amount that can be set in "[Da.6] Positioning address/movement amount" is "1073741824 (= 2^{30})".)

■Setting positioning data

When using 2-axis linear interpolation control (ABS linear 2), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting required/not required for the reference axis	Setting required/not required for the interpolation axis
[Da.1]	Operation pattern	◎	—
[Da.2]	Control method	◎ (Set ABS linear 2.)	—
[Da.3]	Acceleration time No.	◎	—
[Da.4]	Deceleration time No.	◎	—
[Da.6]	Positioning address/movement amount	◎	◎
[Da.7]	Arc address	—	—
[Da.8]	Command speed	◎	—
[Da.9]	Dwell time/JUMP destination positioning data No.	○	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	—	—
[Da.22]	Axis to be interpolated No.3	—	—
[Da.27]	M code ON signal output timing	○	—
[Da.28]	ABS direction in degrees	○	—
[Da.29]	Interpolation speed designation method	△	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

Restriction

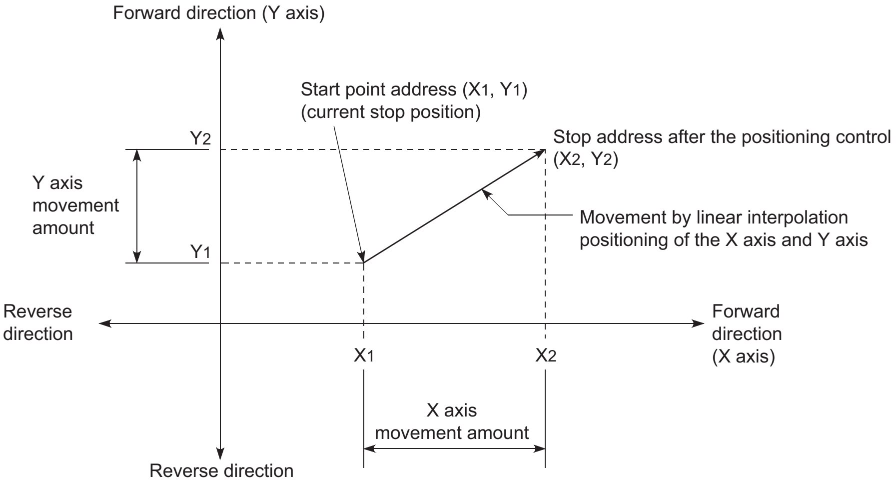
When the "reference axis speed" is set during 2-axis linear interpolation control, set so the major axis side becomes the reference axis. If the minor axis side is set as the reference axis, the major axis side speed may exceed the "[Pr.8] Speed limit value".

2-axis linear interpolation control (INC linear 2)

■Operation chart

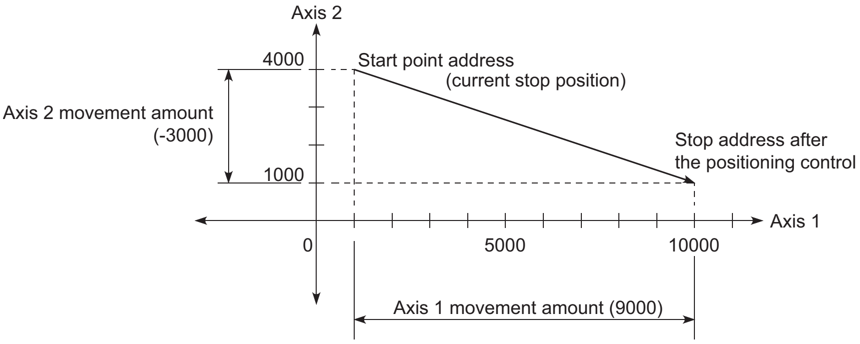
In incremental system 2-axis linear interpolation control, the designated 2 axes are used. Linear interpolation positioning is carried out from the current stop position (start point address) to a position at the end of the movement amount set in "[Da.6] Positioning address/movement amount". The movement direction is determined by the sign of the movement amount.

- Positive movement amount: Positioning control to forward direction (Address increase direction)
- Negative movement amount: Positioning control to reverse direction (Address decrease direction)



Ex.

When the axis 1 movement amount is 9000 and the axis 2 movement amount is -3000, positioning address (10000, 4000) is carried out as follows.



■Restrictions

An error will occur and the positioning will not start in the following cases. The machine will immediately stop if the error is detected during a positioning operation.

- If the movement amount of each axis exceeds "1073741824 (= 2^{30})" when "0: Composite speed" is set in "[Pr.20] Interpolation speed designation method", the error "Outside linear movement amount range" (error code: 1A15H, 1A16H) occurs at a positioning start. (The maximum movement amount that can be set in "[Da.6] Positioning address/movement amount" is "1073741824 (= 2^{30})".)

■Setting positioning data

When using 2-axis linear interpolation control (INC linear 2), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting required/not required for the reference axis	Setting required/not required for the interpolation axis
[Da.1]	Operation pattern	◎	—
[Da.2]	Control method	◎ (Set INC linear 2.)	—
[Da.3]	Acceleration time No.	◎	—
[Da.4]	Deceleration time No.	◎	—
[Da.6]	Positioning address/movement amount	◎	◎
[Da.7]	Arc address	—	—
[Da.8]	Command speed	◎	—
[Da.9]	Dwell time/JUMP destination positioning data No.	○	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	—	—
[Da.22]	Axis to be interpolated No.3	—	—
[Da.27]	M code ON signal output timing	○	—
[Da.28]	ABS direction in degrees	○	—
[Da.29]	Interpolation speed designation method	△	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

Restriction

When the "reference axis speed" is set during 2-axis linear interpolation control, set so the major axis side becomes the reference axis. If the minor axis side is set as the reference axis, the major axis side speed may exceed the "[Pr.8] Speed limit value".

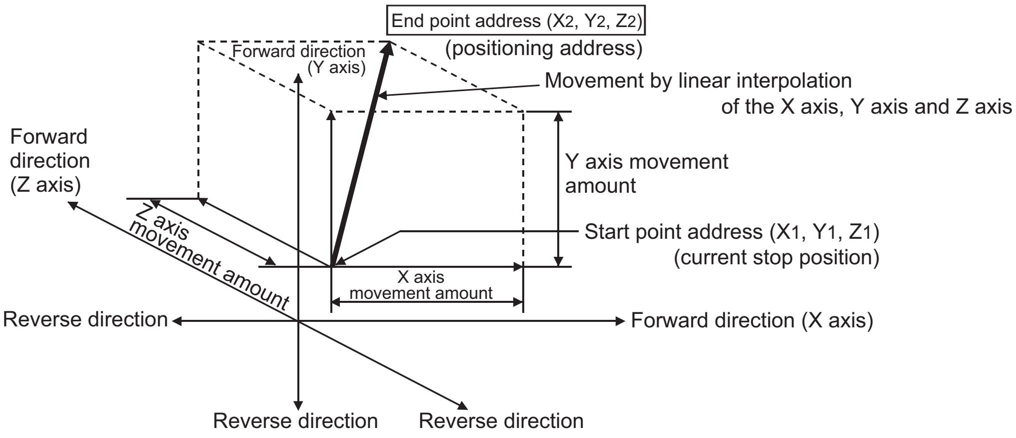
3-axis linear interpolation control

In "3-axis linear interpolation control" ("[Da.2] Control method" = ABS linear 3, INC linear 3), three motors are used to carry out position control in a linear path while carrying out interpolation for the axis directions set in each axis.
(Refer to ☞ Page 71 Interpolation control for details on interpolation control.)

3-axis linear interpolation control (ABS linear 3)

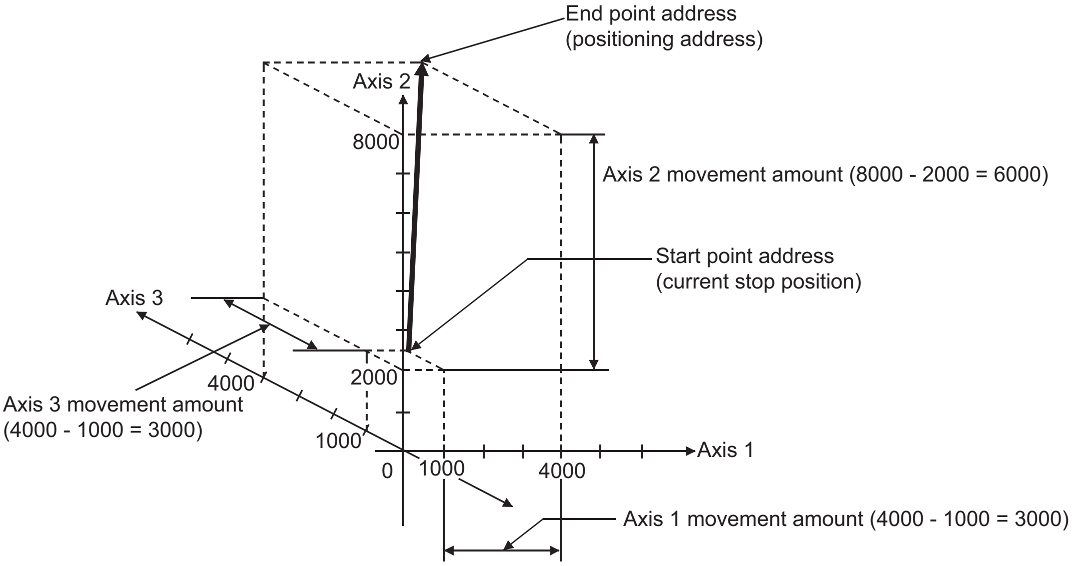
■Operation chart

In the absolute system 3-axis linear interpolation control, the designated 3 axes are used. Linear interpolation positioning is carried out from the current stop position (start point address) to the address (end point address) set in the "[Da.6] Positioning address/movement amount".



Ex.

When the start point address (current stop position) is (1000, 2000, 1000) and the end point address (positioning address) is (4000, 8000, 4000), positioning is carried out as follows.



■Restrictions

An error will occur and the positioning will not start in the following cases. The machine will immediately stop if the error is detected during a positioning control.

- If the movement amount of each axis exceeds "1073741824 (= 2^{30})" when "0: Composite speed" is set in "[Pr.20] Interpolation speed designation method", the error "Outside linear movement amount range" (error code: 1A15H, 1A16H) occurs at a positioning start. (The maximum movement amount that can be set in "[Da.6] Positioning address/movement amount" is "1073741824 (= 2^{30})".)

■Setting positioning data

When using 3-axis linear interpolation control (ABS linear 3), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting required/not required for the reference axis	Setting required/not required for the interpolation axis
[Da.1]	Operation pattern	◎	—
[Da.2]	Control method	◎ (Set ABS linear 3.)	—
[Da.3]	Acceleration time No.	◎	—
[Da.4]	Deceleration time No.	◎	—
[Da.6]	Positioning address/movement amount	◎	◎
[Da.7]	Arc address	—	—
[Da.8]	Command speed	◎	—
[Da.9]	Dwell time/JUMP destination positioning data No.	○	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	◎	—
[Da.22]	Axis to be interpolated No.3	—	—
[Da.27]	M code ON signal output timing	○	—
[Da.28]	ABS direction in degrees	○	—
[Da.29]	Interpolation speed designation method	△	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

Restriction

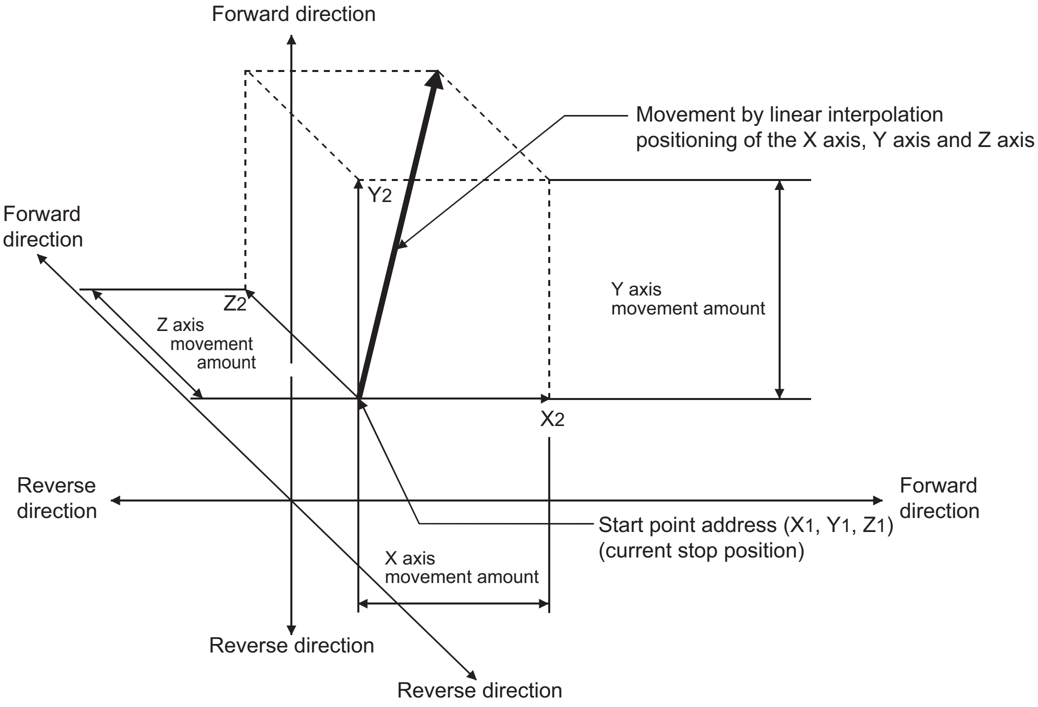
- When the "reference axis speed" is set during 3-axis linear interpolation control, set so the major axis side becomes the reference axis. If the minor axis side is set as the reference axis, the major axis side speed may exceed the "[Pr.8] Speed limit value".
- Refer to ☞ Page 71 Interpolation control for the reference axis and interpolation axis combinations.

3-axis linear interpolation control (INC linear 3)

■Operation chart

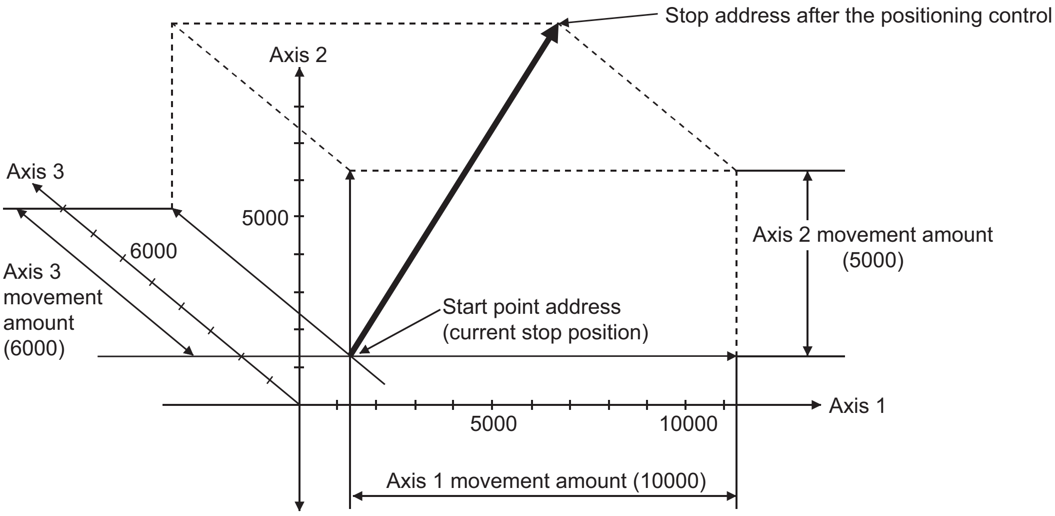
In the incremental system 3-axis linear interpolation control, the designated 3 axes are used. Linear interpolation positioning is carried out from the current stop position (start point address) to a position at the end of the movement amount set in the "[Da.6] Positioning address/movement amount". The movement direction is determined the sign of the movement amount.

- Positive movement amount: Positioning control to forward direction (Address increase direction)
- Negative movement amount: Positioning control to reverse direction (Address decrease direction)



Ex.

When the axis 1 movement amount is 10000, the axis 2 movement amount is 5000 and the axis 3 movement amount is 6000, positioning is carried out as follows.



■Restrictions

An error will occur and the positioning will not start in the following cases. The machine will immediately stop if the error is detected during a positioning operation.

- If the movement amount of each axis exceeds "1073741824 (= 2^{30})" when "0: Composite speed" is set in "[Pr.20] Interpolation speed designation method", the error "Outside linear movement amount range" (error code: 1A15H, 1A16H) occurs at a positioning start. (The maximum movement amount that can be set in "[Da.6] Positioning address/movement amount" is "1073741824 (= 2^{30})".)

■Setting positioning data

When using 3-axis linear interpolation control (INC linear 3), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting required/not required for the reference axis	Setting required/not required for the interpolation axis
[Da.1]	Operation pattern	◎	—
[Da.2]	Control method	◎ (Set INC linear 3.)	—
[Da.3]	Acceleration time No.	◎	—
[Da.4]	Deceleration time No.	◎	—
[Da.6]	Positioning address/movement amount	◎	◎
[Da.7]	Arc address	—	—
[Da.8]	Command speed	◎	—
[Da.9]	Dwell time/JUMP destination positioning data No.	○	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	◎	—
[Da.22]	Axis to be interpolated No.3	—	—
[Da.27]	M code ON signal output timing	○	—
[Da.28]	ABS direction in degrees	○	—
[Da.29]	Interpolation speed designation method	△	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

Restriction

- When the "reference axis speed" is set during 3-axis linear interpolation control, set so the major axis side becomes the reference axis. If the minor axis side is set as the reference axis, the major axis side speed may exceed the "[Pr.8] Speed limit value".
- Refer to ☞ Page 71 Interpolation control for the reference axis and interpolation axis combinations.

4-axis linear interpolation control

In "4-axis linear interpolation control" ("[Da.2] Control method" = ABS linear 4, INC linear 4), four motors are used to carry out position control in a linear path while carrying out interpolation for the axis directions set in each axis. (Refer to ☞ Page 71 Interpolation control for details on interpolation control.)

4-axis linear interpolation control (ABS linear 4)

In the absolute system 4-axis linear interpolation control, the designated 4 axes are used. Linear interpolation positioning is carried out from the current stop position (start point address) to the address (end point address) set in the "[Da.6] Positioning address/movement amount".

■Setting positioning data

When using 4-axis linear interpolation control (ABS linear 4), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting required/not required for the reference axis	Setting required/not required for the interpolation axis
[Da.1]	Operation pattern	◎	—
[Da.2]	Control method	◎ (Set ABS linear 4.)	—
[Da.3]	Acceleration time No.	◎	—
[Da.4]	Deceleration time No.	◎	—
[Da.6]	Positioning address/movement amount	◎	◎
[Da.7]	Arc address	—	—
[Da.8]	Command speed	◎	—
[Da.9]	Dwell time/JUMP destination positioning data No.	○	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	◎	—
[Da.22]	Axis to be interpolated No.3	◎	—
[Da.27]	M code ON signal output timing	○	—
[Da.28]	ABS direction in degrees	○	—
[Da.29]	Interpolation speed designation method	△	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

Restriction

- When the "reference axis speed" is set during 4-axis linear interpolation control, set so the major axis side becomes the reference axis. If the minor axis side is set as the reference axis, the major axis side speed may exceed the "[Pr.8] Speed limit value".
- Refer to ☞ Page 71 Interpolation control for the reference axis and interpolation axis combinations.

4-axis linear interpolation control (INC linear 4)

In the incremental system 4-axis linear interpolation control, the designated 4 axes are used. Linear interpolation positioning is carried out from the current stop position (start point address) to a position at the end of the movement amount set in the "[Da.6] Positioning address/movement amount". The movement direction is determined by the sign of the movement amount.

■Restrictions

An error will occur and the positioning will not start in the following cases. The machine will immediately stop if the error is detected during a positioning operation.

- When the movement amount for each axis exceeds "1073741824 (= 2^{30})", the error "Outside linear movement amount range" (error code: 1A15H, 1A16H) will occur at the positioning start. (The maximum movement amount that can be set in "[Da.6] Positioning address/movement amount" is "1073741824 (= 2^{30})".)

■Setting positioning data

When using 4-axis linear interpolation control (INC linear 4), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		**Setting required/not required for the reference axis**	**Setting required/not required for the interpolation axis**
[Da.1]	Operation pattern	◎	—
[Da.2]	Control method	◎ (Set INC linear 4.)	—
[Da.3]	Acceleration time No.	◎	—
[Da.4]	Deceleration time No.	◎	—
[Da.6]	Positioning address/movement amount	◎	◎
[Da.7]	Arc address	—	—
[Da.8]	Command speed	◎	—
[Da.9]	Dwell time/JUMP destination positioning data No.	○	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	◎	—
[Da.22]	Axis to be interpolated No.3	◎	—
[Da.27]	M code ON signal output timing	○	—
[Da.28]	ABS direction in degrees	○	—
[Da.29]	Interpolation speed designation method	△	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

Restriction

- When the "reference axis speed" is set during 4-axis linear interpolation control, set so the major axis side becomes the reference axis. If the minor axis side is set as the reference axis, the major axis side speed may exceed the "[Pr.8] Speed limit value".
- Refer to ☞ Page 71 Interpolation control for the reference axis and interpolation axis combinations.

Fixed-feed control

In "fixed-feed control" ("[Da.2] Control method" = fixed-feed 1, fixed-feed 2, fixed-feed 3, fixed-feed 4), the motor of the specified axis is used to carry out fixed-feed control in a set axis direction.

In fixed-feed control, any remainder of below control accuracy is rounded down to convert the movement amount designated in the positioning data into the command value to servo amplifier.

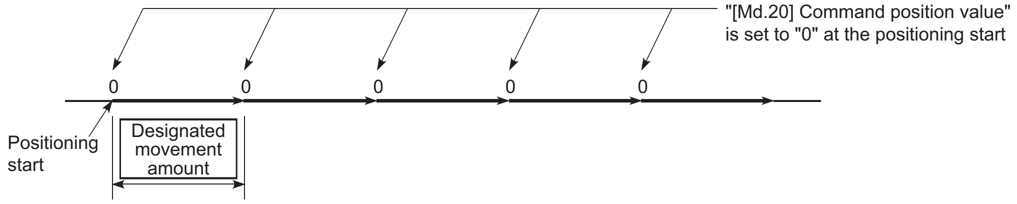
Operation chart

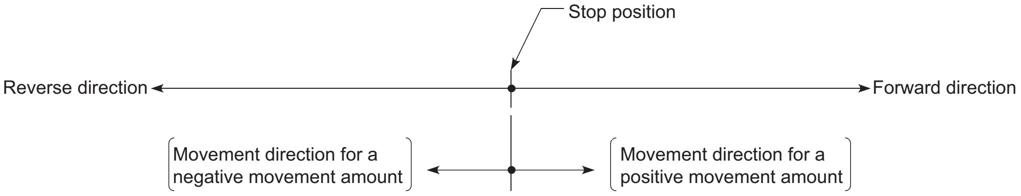
In fixed-feed control, the address ([Md.20] Command position value) of the current stop position (start point address) is set to "0". Positioning is then carried out to a position at the end of the movement amount set in "[Da.6] Positioning address/ movement amount". The movement direction is determined by the movement amount sign.

- Positive movement amount: Positioning control to forward direction (Address increase direction)
- Negative movement amount: Positioning control to reverse direction (Address decrease direction)

Ex.

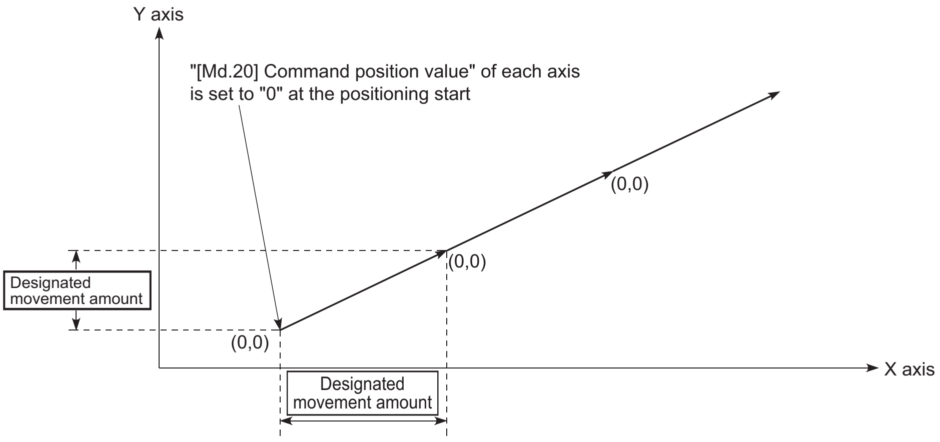
1-axis fixed-feed control





Ex.

2-axis fixed-feed control



■Restrictions

- The error "Continuous path control not possible" (error code: 1A1EH to 1A20H) will occur and the operation cannot start if "continuous path control" is set in "[Da.1] Operation pattern". ("Continuous path control" cannot be set in fixed-feed control.)
- "Fixed-feed" cannot be set in "[Da.2] Control method" in the positioning data when "continuous path control" has been set in "[Da.1] Operation pattern" of the immediately prior positioning data. (For example, if the operation pattern of positioning data No.1 is "continuous path control", fixed-feed control cannot be set in positioning data No.2.) The error "Continuous path control not possible" (error code: 1A1EH to 1A20H) will occur and the machine will carry out a deceleration stop if this type of setting is carried out.
- In 2- or 3-axis fixed-feed control, if the movement amount of each axis exceeds "1073741824 (=2^{30})" when "0: Composite speed" is set in "[Pr.20] Interpolation speed designation method", the error "Outside linear movement amount range" (error code: 1A15H, 1A16H) occurs at a positioning start and the positioning cannot be started. (The maximum movement amount that can be set in "[Da.6] Positioning address/movement amount" is "1073741824 (= 2^{30})".
- In 4-axis fixed-feed control, set "1: Reference axis speed" in "[Pr.20] Interpolation speed designation method". If "0: Composite speed" is set, the error "Interpolation mode error" (error code: 199AH) occurs and the positioning cannot be started.

Setting positioning data

When using fixed-feed control (fixed-feed 1), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting required/not required for the reference axis	Setting required/not required for the interpolation axis
[Da.1]	Operation pattern	◎	—
[Da.2]	Control method	◎	—
[Da.3]	Acceleration time No.	◎	—
[Da.4]	Deceleration time No.	◎	—
[Da.6]	Positioning address/movement amount	◎	◎
[Da.7]	Arc address	—	—
[Da.8]	Command speed	◎	—
[Da.9]	Dwell time/JUMP destination positioning data No.	○	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	○	—
[Da.20]	Axis to be interpolated No.1	—[1]	—
[Da.21]	Axis to be interpolated No.2	—[1]	—
[Da.22]	Axis to be interpolated No.3	—[1]	—
[Da.27]	M code ON signal output timing	○	—
[Da.28]	ABS direction in degrees	○	—
[Da.29]	Interpolation speed designation method	△	—

[1] To use the 2- to 4-axis fixed-feed control (interpolation), it is required to set the axis used as the interpolation axis.

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

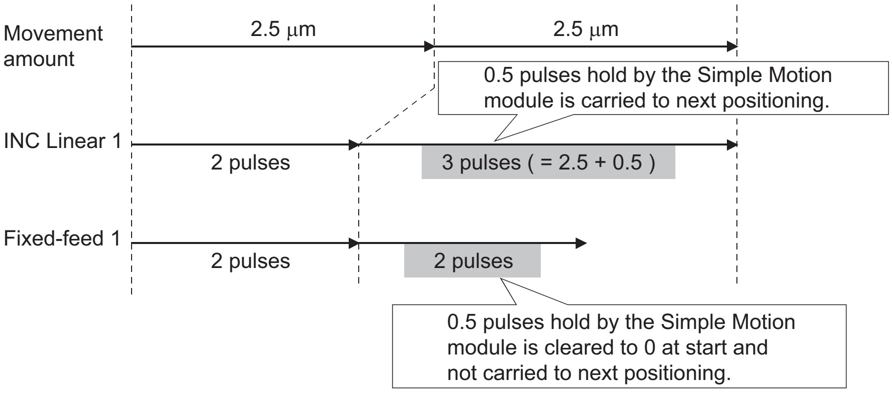
Point

When the movement amount is converted to the actual number of command pulses, a fraction appears after the decimal point, according to the movement amount per pulse. This fraction is normally retained in the Simple Motion module and reflected at the next positioning. For the fixed-feed control, since the movement distance is maintained constant (= the command number of pulses is maintained constant), the control is carried out after the fraction pulse is cleared to zero at start.

[Accumulation/cutoff for fractional pulses]

When movement amount per pulse is 1.0 [μm] and movement for 2.5 [μm] is executed two times.

→ Conversion to command pulses: 2.5 [μm]/1.0 = 2.5 [pulse]



When the "reference axis speed" is set in 2- to 4-axis fixed-feed control, set so the major axis side becomes the reference axis. If the minor axis side is set as the reference axis, the major axis side speed may exceed the "[Pr.8] Speed limit value".

Refer to the following for the combination of the reference axis and the interpolation axis.

☞ Page 71 Interpolation control

2-axis circular interpolation control with sub point designation

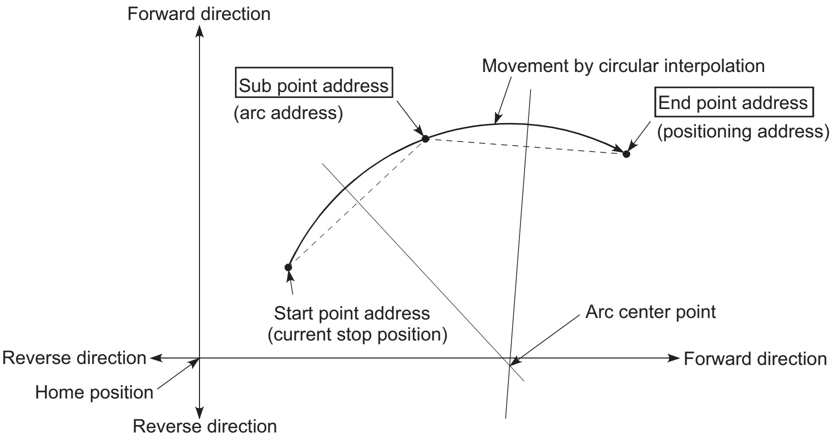
In "2-axis circular interpolation control" ("[Da.2] Control method" = ABS circular sub, INC circular sub), two motors are used to carry out position control in an arc path passing through designated sub points, while carrying out interpolation for the axis directions set in each axis. (Refer to ☞ Page 71 Interpolation control for details on interpolation control.)

2-axis circular interpolation control with sub point designation (ABS circular sub)

■Operation chart

In the absolute system, 2-axis circular interpolation control with sub point designation, positioning is carried out from the current stop position (start point address) to the address (end point address) set in "[Da.6] Positioning address/movement amount", in an arc path that passes through the sub point address set in "[Da.7] Arc address".

The resulting control path is an arc having as its center the intersection point of perpendicular bisectors of a straight line between the start point address (current stop position) and sub point address (arc address), and a straight line between the sub point address (arc address) and end point address (positioning address).



■Restrictions

2-axis circular interpolation control cannot be set in the following cases.

- When "degree" is set in "[Pr.1] Unit setting"
- When the units set in "[Pr.1] Unit setting" are different for the reference axis and interpolation axis. ("mm" and "inch" combinations are possible.)
- When "reference axis speed" is set in "[Pr.20] Interpolation speed designation method"

An error will occur and the positioning start will not be possible in the following cases. The machine will immediately stop if the error is detected during positioning control.

- When the radius exceeds "536870912 (= 2^{29})" (the maximum radius for which 2-axis circular interpolation control is possible is "536870912 (= 2^{29})"): The error "Outside radius range" (error code: 1A32H) will occur at positioning start.
- When the center point address is outside the range of "-2147483648 (-2^{31}) to 2147483647 (2^{31} - 1)": The error "Sub point setting error" (error code: 1A37H) will occur at positioning start.
- When the start point address is the same as the end point address: The error "End point setting error" (error code: 1A2BH) will occur.
- When the start point address is the same as the sub point address: The error "Sub point setting error" (error code: 1A27H) will occur.
- When the end point address is the same as the sub point address: The error "Sub point setting error" (error code: 1A28H) will occur.
- When the start point address, sub point address, and end point address are in a straight line: The error "Sub point setting error" (error code: 1A29H) will occur.

■Setting positioning data

When using 2-axis circular interpolation control with sub point designation (ABS circular sub), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting required/not required for the reference axis	Setting required/not required for the interpolation axis
[Da.1]	Operation pattern	◎	—
[Da.2]	Control method	◎ (Set ABS circular sub.)	—
[Da.3]	Acceleration time No.	◎	—
[Da.4]	Deceleration time No.	◎	—
[Da.6]	Positioning address/movement amount	◎	◎
[Da.7]	Arc address	◎	◎
[Da.8]	Command speed	◎	—
[Da.9]	Dwell time/JUMP destination positioning data No.	○	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	—	—
[Da.22]	Axis to be interpolated No.3	—	—
[Da.27]	M code ON signal output timing	○	—
[Da.28]	ABS direction in degrees	○	—
[Da.29]	Interpolation speed designation method	△	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

Restriction

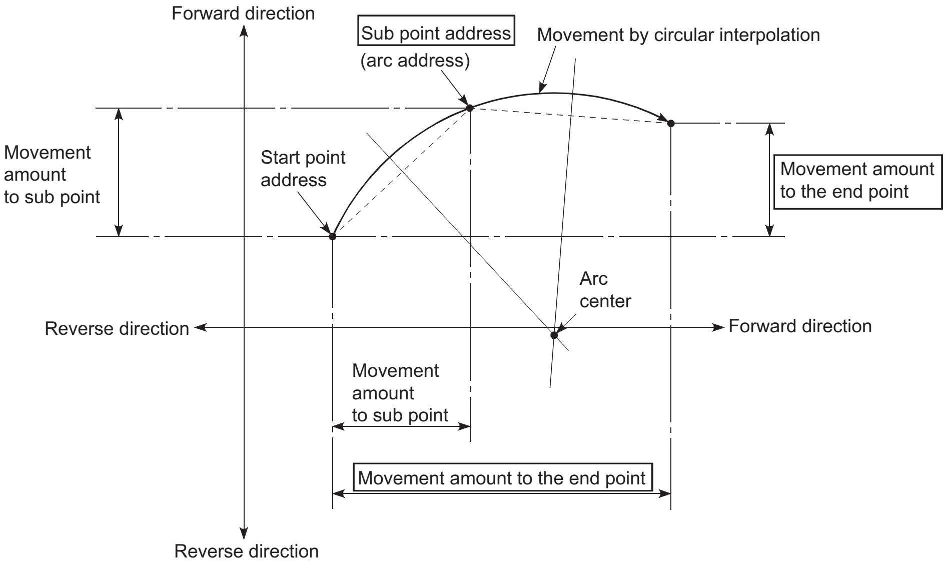
Set a value in "[Da.8] Command speed" so that the speed of each axis does not exceed the "[Pr.8] Speed limit value". (The speed limit does not function for the speed calculated by the Simple Motion module during interpolation control.)

2-axis circular interpolation control with sub point designation (INC circular sub)

■Operation chart

In the incremental system, 2-axis circular interpolation control with sub point designation, positioning is carried out from the current stop position (start point address) to a position at the end of the movement amount set in "[Da.6] Positioning address/ movement amount" in an arc path that passes through the sub point address set in "[Da.7] Arc address". The movement direction depends on the sign (+ or -) of the movement amount.

The resulting control path is an arc having as its center the intersection point of perpendicular bisectors of the straight line between the start point address (current stop position) and sub point address (arc address) calculated from the movement amount to the sub point, and a straight line between the sub point address (arc address) and end point address (positioning address) calculated from the movement amount to the end point.



■Restrictions

2-axis circular interpolation control cannot be set in the following cases.

- When "degree" is set in "[Pr.1] Unit setting"
- When the units set in "[Pr.1] Unit setting" are different for the reference axis and interpolation axis. ("mm" and "inch" combinations are possible.)
- When "reference axis speed" is set in "[Pr.20] Interpolation speed designation method"

An error will occur and the positioning start will not be possible in the following cases. The machine will immediately stop if the error is detected during positioning control.

- When the radius exceeds "536870912 (= 2^{29})" (the maximum radius for which 2-axis circular interpolation control is possible is "536870912 (= 2^{29})"): The error "Outside radius range" (error code: 1A32H) will occur at positioning start.
- When the sub point address is outside the range of "-2147483648 (-2^{31}) to 2147483647 (2^{31} - 1)": The error "Sub point setting error" (error code:1A2AH) will occur.
- When the end point address is outside the range of "-2147483648 (-2^{31}) to 2147483647 (2^{31} - 1)": The error "End point setting error" (error code: 1A2CH) will occur.
- When the center point address is outside the range of "-2147483648 (-2^{31}) to 2147483647 (2^{31} - 1)": The error "Sub point setting error" (error code: 1A37H) will occur at positioning start.
- When the start point address is the same as the end point address: The error "End point setting error" (error code: 1A2BH) will occur.
- When the start point address is the same as the sub point address: The error "Sub point setting error" (error code: 1A27H) will occur.
- When the end point address is the same as the sub point address: The error "Sub point setting error" (error code: 1A28H) will occur.
- When the start point address, sub point address, and end point address are in a straight line: The error "Sub point setting error" (error code: 1A29H) will occur.

■Setting positioning data

When using 2-axis circular interpolation control with sub point designation (INC circular sub), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting required/not required for the reference axis	Setting required/not required for the interpolation axis
[Da.1]	Operation pattern	◎	—
[Da.2]	Control method	◎ (Set INC circular sub.)	—
[Da.3]	Acceleration time No.	◎	—
[Da.4]	Deceleration time No.	◎	—
[Da.6]	Positioning address/movement amount	◎	◎
[Da.7]	Arc address	◎	◎
[Da.8]	Command speed	◎	—
[Da.9]	Dwell time/JUMP destination positioning data No.	○	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	—	—
[Da.22]	Axis to be interpolated No.3	—	—
[Da.27]	M code ON signal output timing	○	—
[Da.28]	ABS direction in degrees	○	—
[Da.29]	Interpolation speed designation method	△	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

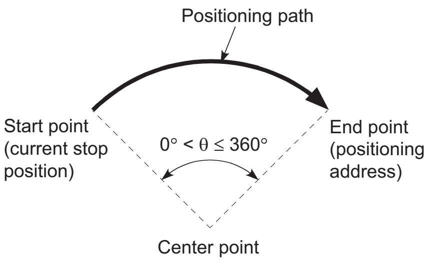
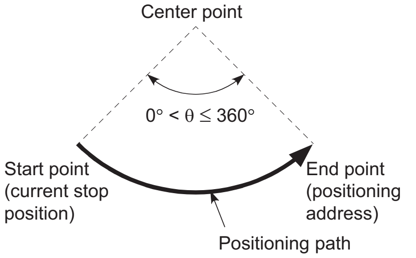
Restriction

Set a value in "[Da.8] Command speed" so that the speed of each axis does not exceed the "[Pr.8] Speed limit value". (The speed limit does not function for the speed calculated by the Simple Motion module during interpolation control.)

2-axis circular interpolation control with center point designation

In "2-axis circular interpolation control" ("[Da.2] Control method" = ABS circular right, INC circular right, ABS circular left, INC circular left), two motors are used to carry out position control in an arc path having an arc address as a center point, while carrying out interpolation for the axis directions set in each axis. (Refer to ☞ Page 71 Interpolation control for details on interpolation control.)

The following table shows the rotation directions, arc center angles that can be controlled, and positioning paths for the different control methods.

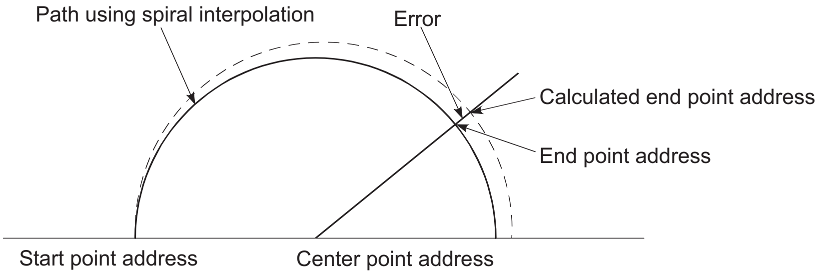
Control method	Rotation direction	Arc center angle that can be controlled	Positioning path
ABS circular right	Clockwise	0° < θ ≤ 360°	
INC circular right			
ABS circular left	Counterclockwise		
INC circular left			

Circular interpolation error compensation

In 2-axis circular interpolation control with center point designation, the arc path calculated from the start point address and center point address may deviate from the position of the end point address set in "[Da.6] Positioning address/movement amount". (Refer to ☞ Page 528 [Pr.41] Allowable circular interpolation error width.)

■Calculated error ≤ "[Pr.41] Allowable circular interpolation error width"

2-axis circular interpolation control to the set end point address is carried out while the error compensation is carried out. (This is called "spiral interpolation".)



In 2-axis circular interpolation control with center point designation, an angular velocity is calculated on the assumption that operation is carried out at a command speed on the arc using the radius calculated from the start point address and center point address, and the radius is compensated in proportion to the angular velocity deviated from that at the start point.

Thus, when there is a difference (error) between a radius calculated from the start point address and center point address (start point radius) and a radius calculated from the end point address and center point address (end point radius), the composite speed differs from the command speed as follows.

Start point radius > End point radius	As compared with the speed without error, the speed becomes slower as end point address is reached.
Start point radius < End point radius	As compared with the speed without error, the speed becomes faster as end point address is reached.

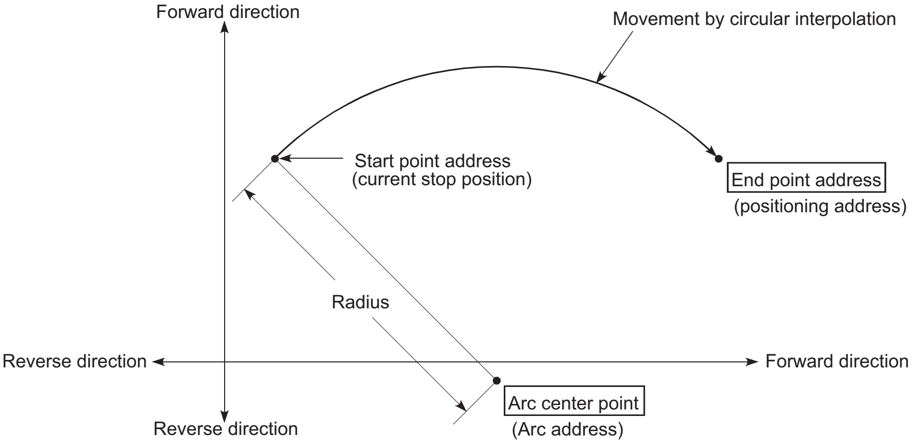
■Calculated error > "[Pr.41] Allowable circular interpolation error width"

At the positioning start, the error "Large arc error deviation" (error code: 1A17H) will occur and the control will not start. The machine will immediately stop if the error is detected during positioning control.

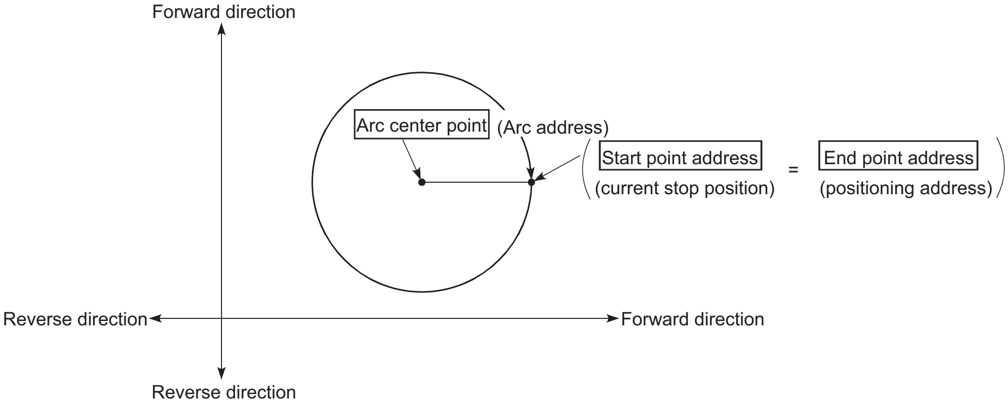
2-axis circular interpolation control with center point designation (ABS circular)

■Operation chart

In the absolute system, 2-axis circular interpolation control with center point designation positioning is carried out from the current stop position (start point address) to the address (end point address) set in "[Da.6] Positioning address/movement amount", in an arc path having as its center the address (arc address) of the center point set in "[Da.7] Arc address".



Positioning of a complete round with a radius from the start point address to the arc center point can be carried out by setting the end point address (positioning address) to the same address as the start point address.



In 2-axis circular interpolation control with center point designation, an angular velocity is calculated on the assumption that operation is carried out at a command speed on the arc using the radius calculated from the start point address and center point address, and the radius is compensated in proportion to the angular velocity deviated from that at the start point.

Thus, when there is a difference (error) between a radius calculated from the start point address and center point address (start point radius) and a radius calculated from the end point address and center point address (end point radius), the composite speed differs from the command speed as follows.

Start point radius > End point radius	As compared with the speed without error, the speed becomes slower as end point address is reached.
Start point radius < End point radius	As compared with the speed without error, the speed becomes faster as end point address is reached.

■Restrictions

2-axis circular interpolation control cannot be set in the following cases.

- When "degree" is set in "[Pr.1] Unit setting"
- When the units set in "[Pr.1] Unit setting" are different for the reference axis and interpolation axis. ("mm" and "inch" combinations are possible.)
- When "reference axis speed" is set in "[Pr.20] Interpolation speed designation method"

An error will occur and the positioning start will not be possible in the following cases. The machine will immediately stop if the error is detected during positioning control.

- When the radius exceeds "536870912 (= 2^{29})" (the maximum radius for which 2-axis circular interpolation control is possible is "536870912 (= 2^{29})"): The error "Outside radius range" (error code: 1A32H) will occur at positioning start.
- When the start point address is the same as the center point address: The error "Center point setting error" (error code: 1A2DH) will occur.
- When the end point address is the same as the center point address: The error "Center point setting error" (error code: 1A2EH) will occur.
- When the center point address is outside the range of -2147483648 (-2^{31}) to 2147483647 (2^{31} - 1): The error "Center point setting error" (error code: 1A2FH) will occur.

■Setting positioning data

When using 2-axis circular interpolation control with center point designation (ABS circular right, ABS circular left), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting required/not required for the reference axis	Setting required/not required for the interpolation axis
[Da.1]	Operation pattern	◎	—
[Da.2]	Control method	◎ (Set ABS circular right or ABS circular left.)	—
[Da.3]	Acceleration time No.	◎	—
[Da.4]	Deceleration time No.	◎	—
[Da.6]	Positioning address/movement amount	◎	◎
[Da.7]	Arc address	◎	◎
[Da.8]	Command speed	◎	—
[Da.9]	Dwell time/JUMP destination positioning data No.	○	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	—	—
[Da.22]	Axis to be interpolated No.3	—	—
[Da.27]	M code ON signal output timing	○	—
[Da.28]	ABS direction in degrees	○	—
[Da.29]	Interpolation speed designation method	△	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

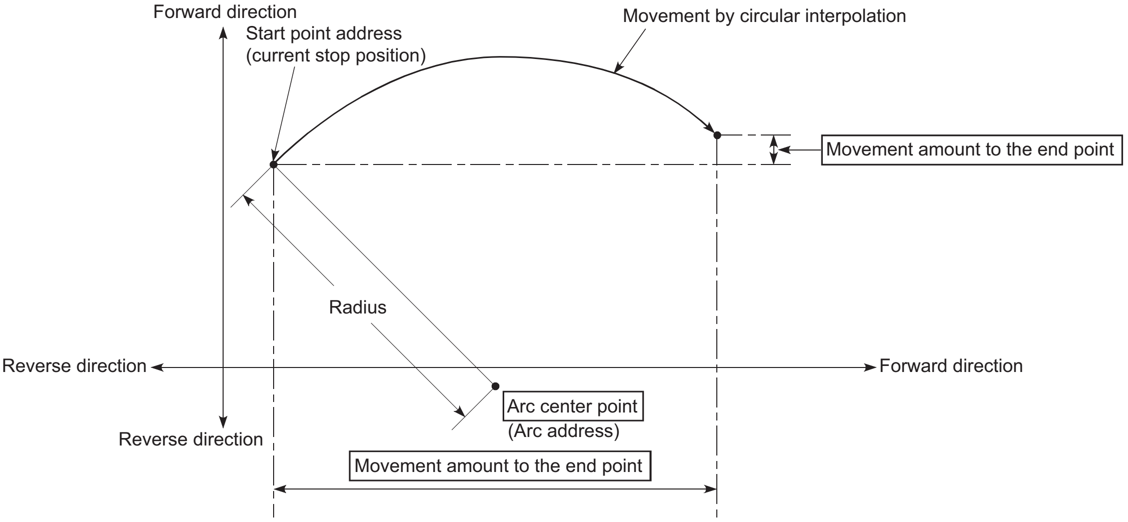
Restriction

Set a value in "[Da.8] Command speed" so that the speed of each axis does not exceed the "[Pr.8] Speed limit value". (The speed limit does not function for the speed calculated by the Simple Motion module during interpolation control.)

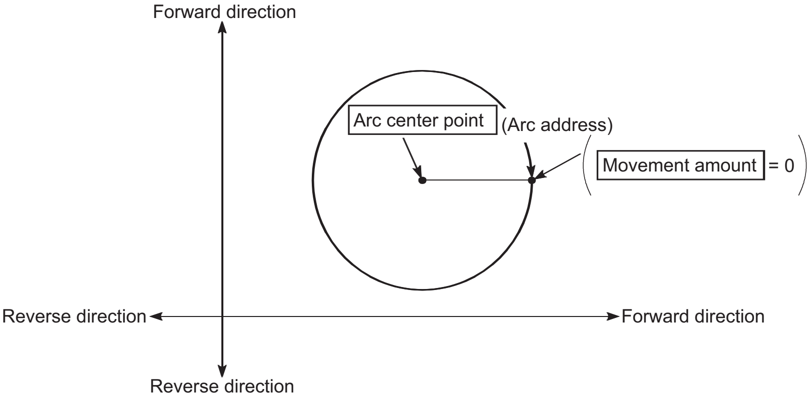
2-axis circular interpolation control with center point designation (INC circular)

■Operation chart

In the incremental system, 2-axis circular interpolation control with center point designation, positioning is carried out from the current stop position (start point address) to a position at the end of the movement amount set in "[Da.6] Positioning address/ movement amount", in an arc path having as its center the address (arc address) of the center point set in "[Da.7] Arc address".



Positioning of a complete round with a radius of the distance from the start point address to the arc center point can be carried out by setting the movement amount to "0".



In 2-axis circular interpolation control with center point designation, an angular velocity is calculated on the assumption that operation is carried out at a command speed on the arc using the radius calculated from the start point address and center point address, and the radius is compensated in proportion to the angular velocity deviated from that at the start point.
Thus, when there is a difference (error) between a radius calculated from the start point address and center point address (start point radius) and a radius calculated from the end point address and center point address (end point radius), the composite speed differs from the command speed as follows.

Start point radius > End point radius	As compared with the speed without error, the speed becomes slower as end point address is reached.
Start point radius < End point radius	As compared with the speed without error, the speed becomes faster as end point address is reached.

■Restrictions

2-axis circular interpolation control cannot be set in the following cases.

- When "degree" is set in "[Pr.1] Unit setting"
- When the units set in "[Pr.1] Unit setting" are different for the reference axis and interpolation axis. ("mm" and "inch" combinations are possible.)
- When "reference axis speed" is set in "[Pr.20] Interpolation speed designation method"

An error will occur and the positioning start will not be possible in the following cases. The machine will immediately stop if the error is detected during positioning control.

- When the radius exceeds "536870912 (= 2^{29})" (the maximum radius for which 2-axis circular interpolation control is possible is "536870912 (= 2^{29})"): The error "Outside radius range" (error code: 1A32H) will occur at positioning start.
- When the end point address is outside the range of -2147483648 (-2^{31}) to 2147483647 (2^{31} - 1): The error "End point setting error" (error code: 1A2CH) will occur.
- When the start point address is the same as the center point address: The error "Center point setting error" (error code: 1A2DH) will occur.
- When the end point address is the same as the center point address: The error "Center point setting error" (error code: 1A2EH) will occur.
- When the center point address is outside the range of -2147483648 (-2^{31}) to 2147483647 (2^{31} - 1): The error "Center point setting error" (error code: 1A2FH) will occur.

■Setting positioning data

When using 2-axis circular interpolation control with center point designation (INC circular right, INC circular left), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting required/not required for the reference axis	Setting required/not required for the interpolation axis
[Da.1]	Operation pattern	◎	—
[Da.2]	Control method	◎ (Set INC circular right or INC circular left.)	—
[Da.3]	Acceleration time No.	◎	—
[Da.4]	Deceleration time No.	◎	—
[Da.6]	Positioning address/movement amount	◎	◎
[Da.7]	Arc address	◎	◎
[Da.8]	Command speed	◎	—
[Da.9]	Dwell time/JUMP destination positioning data No.	○	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	—	—
[Da.22]	Axis to be interpolated No.3	—	—
[Da.27]	M code ON signal output timing	○	—
[Da.28]	ABS direction in degrees	○	—
[Da.29]	Interpolation speed designation method	△	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

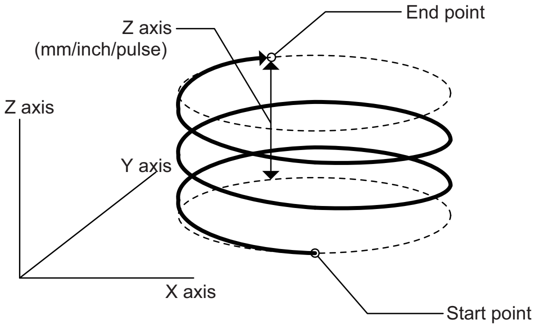
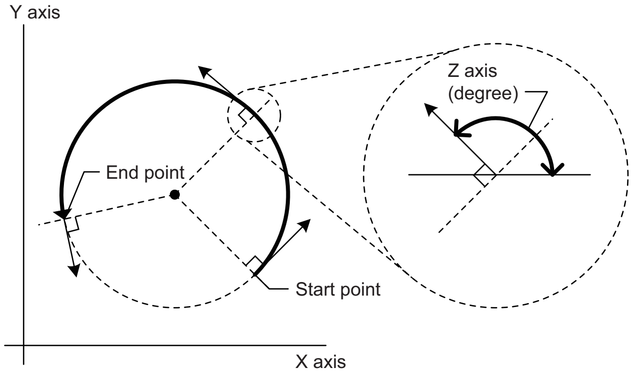
Restriction

Set a value in "[Da.8] Command speed" so that the speed of each axis does not exceed the "[Pr.8] Speed limit value". (The speed limit does not function for the speed calculated by the Simple Motion module during interpolation control.)

3-axis helical interpolation control with sub point designation

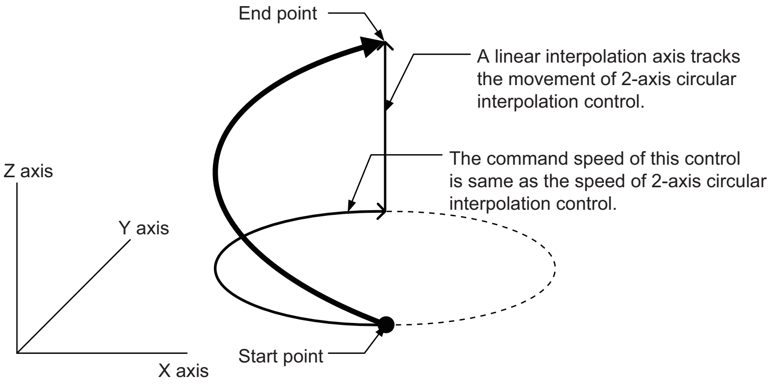
In "3-axis helical interpolation control" ("[Da.2] Control method" = ABS helical sub, INC helical sub), three motors are used to carry out the circular interpolation control of 2 axes. The remaining axis is used for "helical control" or "tangent control and normal line control".

X axis: Reference axis, Y axis: Circular interpolation axis, Z axis: Linear interpolation axis

Control details	Control overview	Positioning path
Helical control		Draws a helical path by following the linear interpolation axis (linear control) to the 2-axis circular interpolation control. ■Unit setting • Reference axis: mm/inch, pulse • Circular interpolation axis: The same as the reference axis • Linear interpolation axis: mm/inch, pulse
Tangent control/ Normal line control		Keeps the direction of the workpiece against the center point of the 2-axis circular interpolation control by following the value of the linear interpolation axis (degree) to the 2-axis circular interpolation control. The figure shown on the left is an example in which the direction of the workpiece is kept to the direction of the tangent or normal line. ■Unit setting • Reference axis: mm/inch, pulse • Circular interpolation axis: The same as the reference axis • Linear interpolation axis: degree

Speed of the 3-axis helical interpolation control

The 2-axis circular interpolation control (Reference axis—Composite speed of the circular interpolation axis) is the target of the command speed of the 3-axis helical interpolation control.

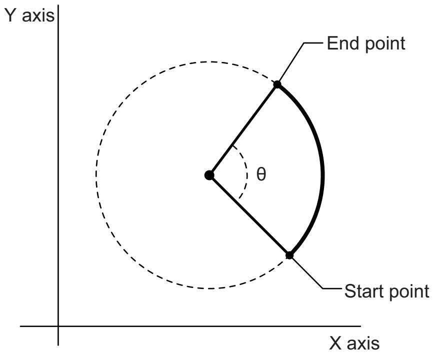


Point

- When the movement amount of the linear interpolation axis is more than the composite movement amount of the circular interpolation axis, the speed of the linear interpolation axis cannot be suppressed with "[Pr.8] Speed limit value".
- When "0: Composite speed" is set in "[Pr.20] Interpolation speed designation method" or "1: Composite speed" is set in "[Da.29] Interpolation speed designation method", the command speed of ABS3/INC3 is the composite speed of the three axes (X axis—Y axis—Z axis). The command speed of the 3-axis helical interpolation control is the composite speed of the two axes (X axis—Y axis). When the continuous path control is performed using ABS3/INC3 and the 3-axis helical interpolation control, the movement speed of the workpiece may change at the positioning data switching; therefore, adjust the command speed not to shake the workpiece.

Rotation angle of circular interpolation axis (X axis-Y axis)

The rotation angle of the circular interpolation axis in the 3-axis helical interpolation control is as follows.



Number of pitch	Control of the circular interpolation axis
0	θ°
1	360° + θ°
2	720° + θ°
⋮	⋮
n	360° × n + θ°
⋮	⋮
999	360° × 999 + θ°

Restriction

When "degree" is set to "[Pr.1] Unit setting", the positioning range of the absolute system is 0 to 359.99999°. If the rotation angle is 360° or larger in the circular interpolation axis (X axis—Y axis), the tangent control and normal line control cannot be performed because 360° or larger angle cannot be set for "[Da.6] Positioning address/movement amount" of the linear interpolation axis (Z axis: degree). To perform the tangent control or normal line control with the rotation of 360° or larger angle, use the incremental system.

Rotation direction when the linear interpolation axis (Z axis) is set in degrees

When "degree" is set to "[Pr.1] Unit setting" for the linear interpolation axis, the rotation direction is determined depending on the axis control data in "[Cd.40] ABS direction in degrees" of the reference axis. To set a rotation direction for each positioning data, set "[Da.28] ABS direction in degrees" of each positioning data.

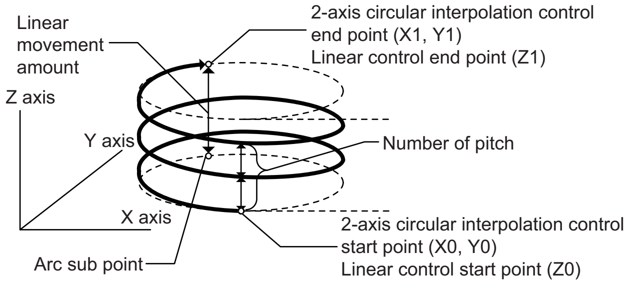
3-axis helical interpolation control with sub point designation (ABS helical sub)

■Operation chart

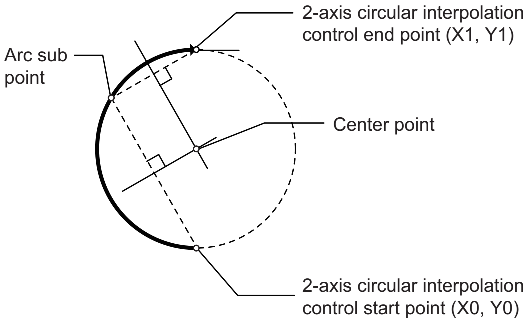
In the absolute system and 3-axis helical interpolation control with sub point designation, the positioning is performed from the current stop position (X0, Y0, Z0) to the position indicated with the arc end point address (X1 and Y1) and the linear interpolation axis end point address (Z1) set in "[Da.6] Positioning address/movement amount". As the positioning to the commanded position, the linear interpolation with the other linear interpolation axes is performed and the positioning target is rotated helically for the number of pitches set in "[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches" of the linear interpolation axis while the circular interpolation through the sub point address (sub point address) set in "[Da.7] Arc address" is performed.

The resulting path is an arc whose center is the intersection point of the perpendicular bisectors of a straight line between the start point address (current stop position) and sub point address (arc address) and a straight line between the sub point address (arc address) and end point address (positioning address).

Operation chart



Top view of the circular interpolation



■Restrictions

In the following cases, the 3-axis helical interpolation control cannot be set.

- When "degree" is set in "[Pr.1] Unit setting" of the reference axis and circular interpolation axis
- When the units set in "[Pr.1] Unit setting" are different between the reference axis and circular interpolation axis (The combination of "mm" and "inch" is possible.)
- When "reference axis speed" is set in "[Pr.20] Interpolation speed designation method"
- When the value out of the range of "0 to 999" is set in the number of pitches ("[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches")

In the following case, an error occurs and the positioning will not start. During the positioning control, the operation stops immediately at the detection of the error.

Error cause	Error code
When the radius exceeds 536870912 (= 2^{29}) (The maximum radius for which the 2-axis circular interpolation control is possible is 536870912 (= 2^{29}).)	The error "Outside radius range" (error code: 1A32H) occurs at the start of the positioning.
When the center point address is out of the range of -2147483648 (-2^{31}) to 2147483647 (2^{31}-1)	The error "Sub point setting error" (error code: 1A37H) occurs at the start of the positioning.
Start point address = End point address	The error "End point setting error" (error code: 1A2BH)
Start point address = Sub point address	The error "Sub point setting error" (error code: 1A27H)
End point address = Sub point address	The error "Sub point setting error" (error code: 1A28H)
When the start point address, sub point address, and end point address are on a straight line	The error "Sub point setting error" (error code: 1A29H)

■Positioning data to be set

When using 3-axis helical interpolation control with sub point designation (ABS helical sub), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting requirement of reference axis	Setting requirement of circular interpolation axis[1]	Setting requirement of linear interpolation axis[2]
[Da.1]	Operation pattern	◎	—	—
[Da.2]	Control method	◎ (Set ABS helical sub.)	—	—
[Da.3]	Acceleration time No.	◎	—	—
[Da.4]	Deceleration time No.	◎	—	—
[Da.6]	Positioning address/movement amount	◎	◎	◎
[Da.7]	Arc address	◎	◎	—
[Da.8]	Command speed	◎	—	—
[Da.9]	Dwell time/JUMP destination positioning data No.	○	—	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches	○	—	◎[3]
[Da.20]	Axis to be interpolated No.1	◎	—	—
[Da.21]	Axis to be interpolated No.2	◎	—	—
[Da.22]	Axis to be interpolated No.3	—	—	—
[Da.27]	M code ON signal output timing	○	—	—
[Da.28]	ABS direction in degrees	○	—	—
[Da.29]	Interpolation speed designation method	△	—	—

[1] Specified in "[Da.20] Axis to be interpolated No.1" of the reference axis.

[2] Specified in "[Da.21] Axis to be interpolated No.2" of the reference axis.

[3] Set the number of pitches for the linear interpolation axis.

Refer to the following for the setting details.

☞ Page 548 Positioning Data

Restriction

Set a value in "[Da.8] Command speed" so that the speed of each axis does not exceed the value in "[Pr.8] Speed limit value". (The speed limit does not function for the speed calculated by the Simple Motion module.)

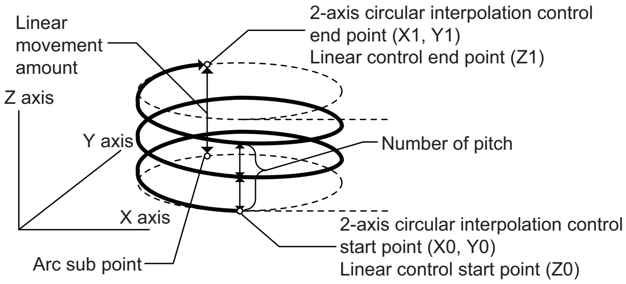
3-axis helical interpolation control with sub point designation (INC helical sub)

■Operation chart

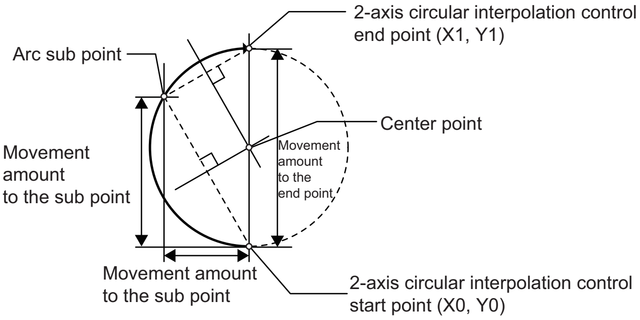
In the incremental system and 3-axis helical interpolation control with sub point designation, the positioning is performed from the current stop position (X0, Y0, Z0) to the position (X1, Y1, Z1) for the movement amount set in "[Da.6] Positioning address/ movement amount". As the positioning to the commanded position, the linear interpolation with the other linear interpolation axes is performed and the positioning target is rotated helically for the number of pitches set in "[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches" of the linear interpolation axis while the circular interpolation through the sub point address (sub point address) set in "[Da.7] Arc address" is performed. The movement direction is determined by the sign of the movement amount.

The resulting path is an arc whose center is the intersection point of the perpendicular bisectors of a straight line between the start point address (current stop position) and the sub point address (arc address) calculated from the movement amount to the sub point, and a straight line between the sub point address (arc address) and the end point address (positioning address) calculated from the movement amount to the end point.

Operation chart



Top view of the circular interpolation



■Restrictions

In the following cases, the 3-axis helical interpolation control cannot be set.

- When "degree" is set in "[Pr.1] Unit setting" of the reference axis and circular interpolation axis
- When the units set in "[Pr.1] Unit setting" are different between the reference axis and circular interpolation axis (The combination of "mm" and "inch" is possible.)
- When "reference axis speed" is set in "[Pr.20] Interpolation speed designation method"
- When the value out of the range of "0 to 999" is set in the number of pitches ("[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches")

In the following case, an error occurs and the positioning will not start. During the positioning control, the operation stops immediately at the detection of the error.

Error cause	Error code
When the radius exceeds 536870912 (= 2^{29}) (The maximum radius for which the 2-axis circular interpolation control is possible is 536870912 (= 2^{29}).)	The error "Outside radius range" (error code: 1A32H) occurs at the start of the positioning.
When the sub point address is out of the range of -2147483648 (-2^{31}) to 2147483647 ($2^{31}-1$)	The error "Sub point setting error" (error code: 1A2AH) occurs at the start of the positioning.
When the end point address is out of the range of -2147483648 (-2^{31}) to 2147483647 ($2^{31}-1$)	The error "End point setting error" (error code: 1A2CH) occurs at the start of the positioning.
When the center point address is out of the range of -2147483648 (-2^{31}) to 2147483647 ($2^{31}-1$)	The error "Sub point setting error" (error code: 1A37H) occurs at the start of the positioning.
Start point address = End point address	The error "End point setting error" (error code: 1A2BH)
Start point address = Sub point address	The error "Sub point setting error" (error code: 1A27H)
End point address = Sub point address	The error "Sub point setting error" (error code: 1A28H)
When the start point address, sub point address, and end point address are on a straight line	The error "Sub point setting error" (error code: 1A29H)

■Positioning data to be set

When using the 3-axis helical interpolation control with sub point designation (INC helical sub), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting requirement of reference axis	Setting requirement of circular interpolation axis[*1]	Setting requirement of linear interpolation axis[*2]
[Da.1]	Operation pattern	◎	—	—
[Da.2]	Control method	◎ (Set INC helical sub.)	—	—
[Da.3]	Acceleration time No.	◎	—	—
[Da.4]	Deceleration time No.	◎	—	—
[Da.6]	Positioning address/movement amount	◎	◎	◎
[Da.7]	Arc address	◎	◎	—
[Da.8]	Command speed	◎	—	—
[Da.9]	Dwell time/JUMP destination positioning data No.	○	—	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches	○	—	◎[*3]
[Da.20]	Axis to be interpolated No.1	◎	—	—
[Da.21]	Axis to be interpolated No.2	◎	—	—
[Da.22]	Axis to be interpolated No.3	—	—	—
[Da.27]	M code ON signal output timing	○	—	—
[Da.28]	ABS direction in degrees	○	—	—
[Da.29]	Interpolation speed designation method	△	—	—

[*1] Specified in "[Da.20] Axis to be interpolated No.1" of the reference axis.

[*2] Specified in "[Da.21] Axis to be interpolated No.2" of the reference axis.

[*3] Set the number of pitches for the linear interpolation axis.

Refer to the following for the setting details.

☞ Page 548 Positioning Data

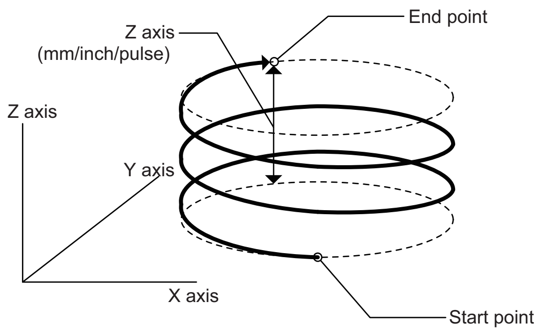
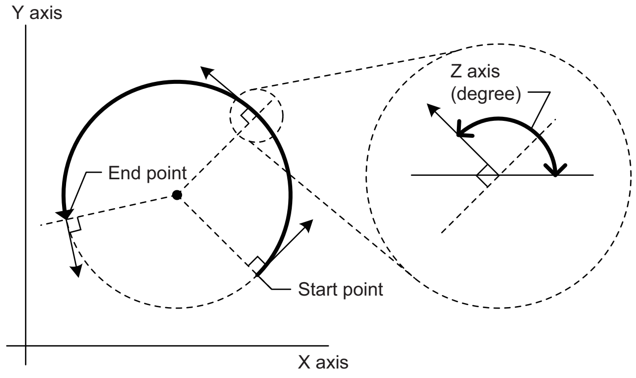
Restriction

Set a value in "[Da.8] Command speed" so that the speed of each axis does not exceed the value in "[Pr.8] Speed limit value". (The speed limit does not function for the speed calculated by the Simple Motion module.)

3-axis helical interpolation control with center point designation

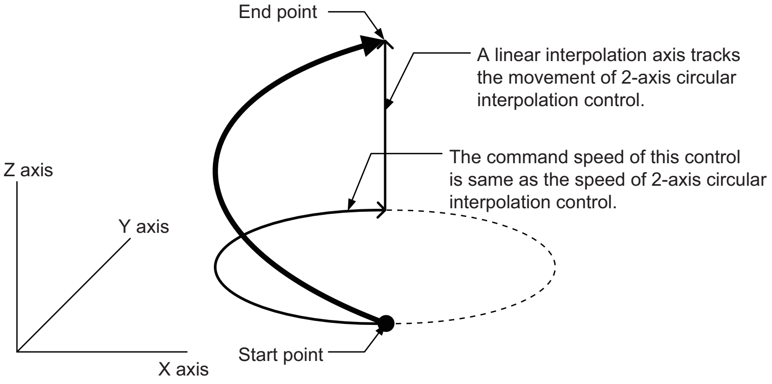
In "3-axis helical interpolation control" ("[Da.2] Control method" = ABS helical right, INC helical right, ABS helical left, INC helical left), three motors are used to carry out the circular interpolation control of 2 axes. The remaining axis is used for "helical control" or "tangent control and normal line control".

X axis: Reference axis, Y axis: Circular interpolation axis, Z axis: Linear interpolation axis

Control details	Control overview	Positioning path
Helical control		Draws a helical path by following the linear interpolation axis (linear control) to the 2-axis circular interpolation control. ■Unit setting • Reference axis: mm/inch, pulse • Circular interpolation axis: The same as the reference axis • Linear interpolation axis: mm/inch, pulse
Tangent control/ Normal line control		Keeps the direction of the workpiece against the center point of the 2-axis circular interpolation control by following the value of the linear interpolation axis (degree) to the 2-axis circular interpolation control. The figure shown on the left is an example in which the direction of the workpiece is kept to the direction of the tangent or normal line. ■Unit setting • Reference axis: mm/inch, pulse • Circular interpolation axis: The same as the reference axis • Linear interpolation axis: degree

Speed of the 3-axis helical interpolation control

The 2-axis circular interpolation control (Reference axis—Composite speed of the circular interpolation axis) is the target of the command speed of the 3-axis helical interpolation control.



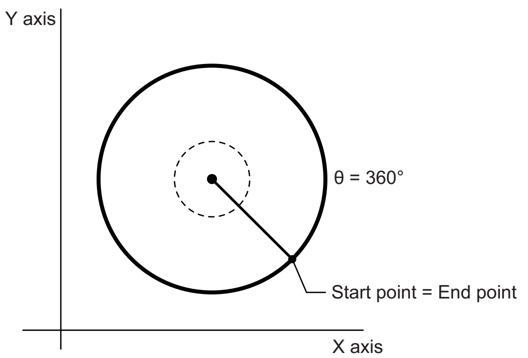
Point

- When the movement amount of the linear interpolation axis is more than the composite movement amount of the circular interpolation axis, the speed of the linear interpolation axis cannot be suppressed with "[Pr.8] Speed limit value".
- When "0: Composite speed" is set in "[Pr.20] Interpolation speed designation method" or "1: Composite speed" is set in "[Da.29] Interpolation speed designation method", the command speed of ABS3/INC3 is the composite speed of the three axes (X axis—Y axis—Z axis). The command speed of the 3-axis helical interpolation control is the composite speed of the two axes (X axis—Y axis). When the continuous path control is performed using ABS3/INC3 and the 3-axis helical interpolation control, the movement speed of the workpiece may change at the positioning data switching; therefore, adjust the command speed not to shake the workpiece.

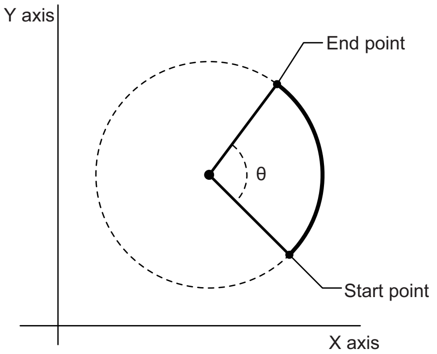
Rotation angle of circular interpolation axis (X axis-Y axis)

The rotation angle of the circular interpolation axis in the 3-axis helical interpolation control is as follows.

True circle



Other than the true circle



Number of pitch	Control of the circular interpolation axis	
	True circle	Other than the true circle
0	360°	θ°
1		360° + θ°
2	720°	720° + θ°
⋮	⋮	⋮
n	360° × n	360° × n + θ°
⋮	⋮	⋮
999	360° × 999	360° × 999 + θ°

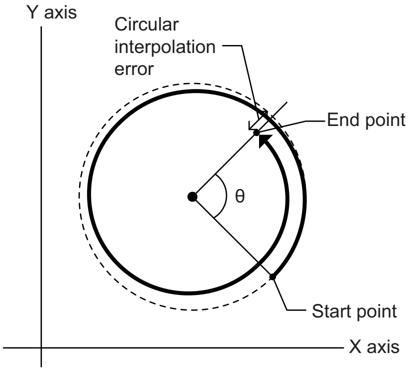
The setting of the true circle is available only when "Start point = End point" is set for the 3-axis helical interpolation (ABS/INC, center point).

Restriction

When "degree" is set to "[Pr.1] Unit setting", the positioning range of the absolute system is 0 to 359.99999°. If the rotation angle is 360° or larger in the circular interpolation axis (X axis—Y axis), the tangent control and normal line control cannot be performed because 360° or larger angle cannot be set for "[Da.6] Positioning address/movement amount" of the linear interpolation axis (Z axis: degree). To perform the tangent control or normal line control with the rotation of 360° or larger angle, use the incremental system.

Error compensation of the circular interpolation axis

In the 3-axis helical interpolation control with center point designation, as well as the 2-axis circular interpolation control, "[Pr.41] Allowable circular interpolation error width" is enabled. When a circular interpolation error occurs, the path of the 2-axis circular interpolation control (X axis—Y axis) becomes spiral as shown below.



Rotation direction when the linear interpolation axis (Z axis) is set in degrees

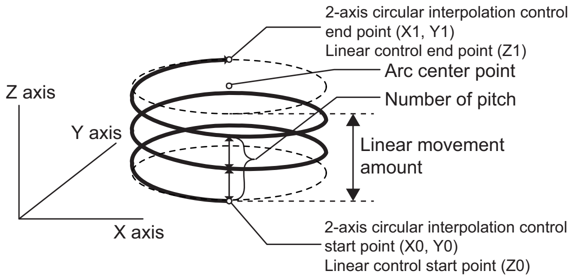
When "degree" is set to "[Pr.1] Unit setting" for the linear interpolation axis, the rotation direction is determined depending on the axis control data in "[Cd.40] ABS direction in degrees" of the reference axis. To set a rotation direction for each positioning data, set "[Da.28] ABS direction in degrees" of each positioning data.

ABS helical right, ABS helical left

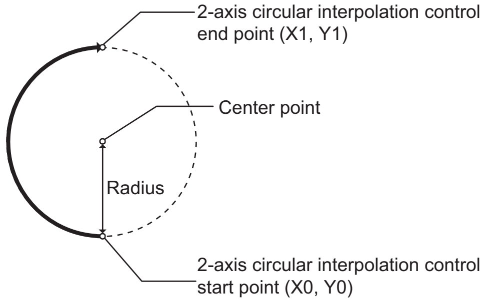
■Operation chart

In the absolute system and 3-axis helical interpolation control with center point designation, the positioning is performed from the current stop position (X0, Y0, Z0) to the position indicated with the arc end point address (X1 and Y1) and the linear interpolation axis end point address (Z1) set in "[Da.6] Positioning address/movement amount". As the positioning to the commanded position, the linear interpolation with the other linear interpolation axes is performed and the positioning target is rotated helically for the number of pitches set in "[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches" of the linear interpolation axis while the circular interpolation of the circle whose center is the center point address (arc address) set in "[Da.7] Arc address" is performed.

Operation chart

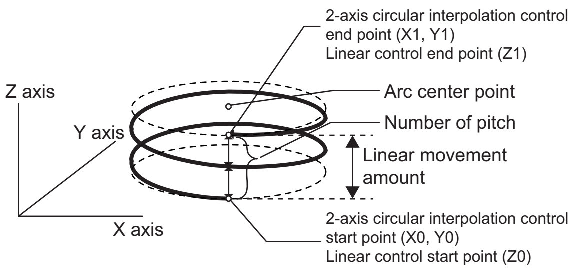


Top view of the circular interpolation

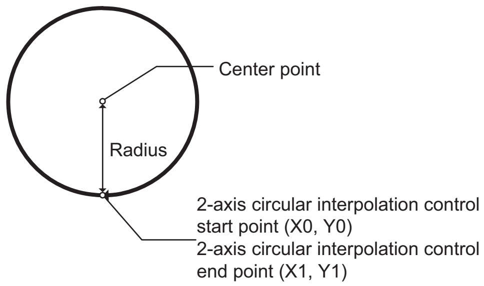


If the end point address (positioning address) of the circular interpolation axis is set to be the same as the start point address, the positioning of a true circle whose radius is from the start point address to the center point of the arc can be performed.

Operation chart



Top view of the circular interpolation



■Restrictions

In the following cases, the 3-axis helical interpolation control cannot be set.

- When "degree" is set in "[Pr.1] Unit setting" of the reference axis and circular interpolation axis
- When the units set in "[Pr.1] Unit setting" are different between the reference axis and circular interpolation axis (The combination of "mm" and "inch" is possible.)
- When "reference axis speed" is set in "[Pr.20] Interpolation speed designation method"
- When the value out of the range of "0 to 999" is set in the number of pitches ("[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches")

In the following case, an error occurs and the positioning will not start. During the positioning control, the operation stops immediately at the detection of the error.

Error cause	Error code
When the radius exceeds 536870912 (= 2^{29}) (The maximum radius for which the 2-axis circular interpolation control is possible is 536870912 (= 2^{29}).)	The error "Outside radius range" (error code: 1A32H) occurs at the start of the positioning.
Start point address = Center point address	The error "Center point setting error" (error code: 1A2DH)
End point address = Center point address	The error "Center point setting error" (error code: 1A2EH)
When the center point address is out of the range of -2147483648 (-2^{31}) to 2147483647 ($2^{31}-1$)	The error "Center point setting error" (error code: 1A2FH)

■Positioning data to be set

When using the 3-axis helical interpolation control with center point designation (ABS helical right, ABS helical left), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting requirement of reference axis	Setting requirement of circular interpolation axis*1	Setting requirement of linear interpolation axis*2
[Da.1]	Operation pattern	◎	—	—
[Da.2]	Control method	◎ (Set ABS helical right or ABS helical left.)	—	—
[Da.3]	Acceleration time No.	◎	—	—
[Da.4]	Deceleration time No.	◎	—	—
[Da.6]	Positioning address/movement amount	◎	◎	◎
[Da.7]	Arc address	◎	◎	—
[Da.8]	Command speed	◎	—	—
[Da.9]	Dwell time/JUMP destination positioning data No.	○	—	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches	○	—	◎*3
[Da.20]	Axis to be interpolated No.1	◎	—	—
[Da.21]	Axis to be interpolated No.2	◎	—	—
[Da.22]	Axis to be interpolated No.3	—	—	—
[Da.27]	M code ON signal output timing	○	—	—
[Da.28]	ABS direction in degrees	○	—	—
[Da.29]	Interpolation speed designation method	△	—	—

*1 Specified in "[Da.20] Axis to be interpolated No.1" of the reference axis.

*2 Specified in "[Da.21] Axis to be interpolated No.2" of the reference axis.

*3 Set the number of pitches for the linear interpolation axis.

Refer to the following for the setting details.

☞ Page 548 Positioning Data

Restriction

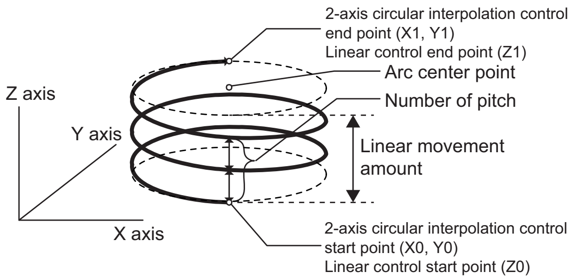
Set a value in "[Da.8] Command speed" so that the speed of each axis does not exceed the value in "[Pr.8] Speed limit value". (The speed limit does not function for the speed calculated by the Simple Motion module.)

INC helical right, INC helical left

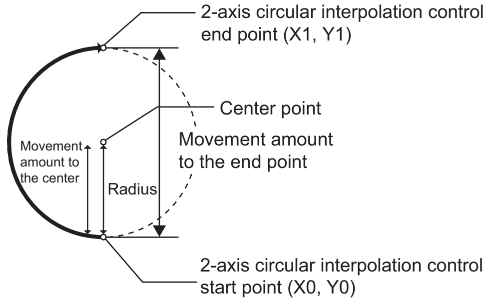
■Operation chart

In the incremental system and 3-axis helical interpolation control with center point designation, the positioning is performed from the current stop position (X0, Y0, Z0) to the position (X1, Y1, Z1) for the movement amount set in "[Da.6] Positioning address/movement amount". As the positioning to the commanded position, the linear interpolation with the other linear interpolation axes is performed and the positioning target is rotated helically for the number of pitches set in "[Da.10] M code/ Condition data No./Number of LOOP to LEND repetitions/Number of pitches" of the linear interpolation axis while the circular interpolation of the circle whose center is the center point address (arc address) set in "[Da.7] Arc address" is performed.

Operation chart

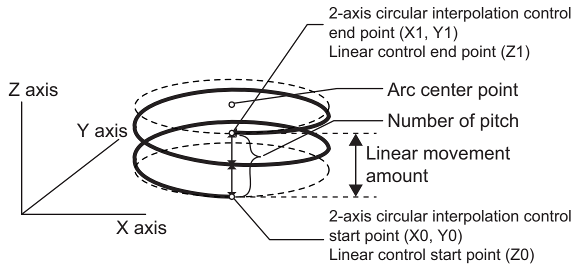


Top view of the circular interpolation

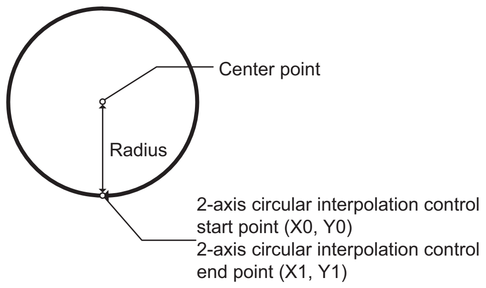


If "0" is set for the movement amount of the circular interpolation axis, the positioning of a true circle whose radius is from the start point address to the center point address of the arc can be performed.

Operation chart



Top view of the circular interpolation



■Restrictions

In the following cases, the 3-axis helical interpolation control cannot be set.

- When "degree" is set in "[Pr.1] Unit setting" of the reference axis and circular interpolation axis
- When the units set in "[Pr.1] Unit setting" are different between the reference axis and circular interpolation axis (The combination of "mm" and "inch" is possible.)
- When "reference axis speed" is set in "[Pr.20] Interpolation speed designation method"
- When the value out of the range of "0 to 999" is set in the number of pitches ("[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches")

In the following case, an error occurs and the positioning will not start. During the positioning control, the operation stops immediately at the detection of the error.

Error cause	Error code
When the radius exceeds 536870912 (= 2^{29}) (The maximum radius for which the 2-axis circular interpolation control is possible is 536870912 (= 2^{29}).)	The error "Outside radius range" (error code: 1A32H) occurs at the start of the positioning.
When the end point address is out of the range of -2147483648 (-2^{31}) to 2147483647 (2^{31}-1)	The error "End point setting error" (error code: 1A2CH) occurs at the start of the positioning.
Start point address = Center point address	The error "Center point setting error" (error code: 1A2DH)
End point address = Center point address	The error "Center point setting error" (error code: 1A2EH)
When the center point address is out of the range of -2147483648 (-2^{31}) to 2147483647 (2^{31}-1)	The error "Center point setting error" (error code: 1A2FH)

■Positioning data to be set

When using the 3-axis helical interpolation control with center point designation (INC helical right, INC helical left), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting requirement of reference axis	Setting requirement of circular interpolation axis[*1]	Setting requirement of linear interpolation axis[*2]
[Da.1]	Operation pattern	◎	—	—
[Da.2]	Control method	◎ (Set INC helical right or INC helical left.)	—	—
[Da.3]	Acceleration time No.	◎	—	—
[Da.4]	Deceleration time No.	◎	—	—
[Da.6]	Positioning address/movement amount	◎	◎	◎
[Da.7]	Arc address	◎	◎	—
[Da.8]	Command speed	◎	—	—
[Da.9]	Dwell time/JUMP destination positioning data No.	○	—	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches	○	—	◎[*3]
[Da.20]	Axis to be interpolated No.1	◎	—	—
[Da.21]	Axis to be interpolated No.2	◎	—	—
[Da.22]	Axis to be interpolated No.3	—	—	—
[Da.27]	M code ON signal output timing	○	—	—
[Da.28]	ABS direction in degrees	○	—	—
[Da.29]	Interpolation speed designation method	△	—	—

*1 Specified in "[Da.20] Axis to be interpolated No.1" of the reference axis.

*2 Specified in "[Da.21] Axis to be interpolated No.2" of the reference axis.

*3 Set the number of pitches for the linear interpolation axis.

Refer to the following for the setting details.

☞ Page 548 Positioning Data

Restriction

Set a value in "[Da.8] Command speed" so that the speed of each axis does not exceed the value in "[Pr.8] Speed limit value". (The speed limit does not function for the speed calculated by the Simple Motion module.)

Speed control

In "speed control" ("[Da.2] Control method" = Forward run: speed 1 to 4, Reverse run: speed 1 to 4), control is carried out in the axis direction in which the positioning data has been set by continuously outputting pulses for the speed set in "[Da.8] Command speed" until the input of a stop command.

The eight types of speed control includes "Forward run: speed 1 to 4" in which the control starts in the forward run direction, and "Reverse run: speed 1 to 4" in which the control starts in the reverse run direction.

Refer to the following for the combination of the reference axis and the interpolation axis.

☞ Page 71 Interpolation control

Operation chart

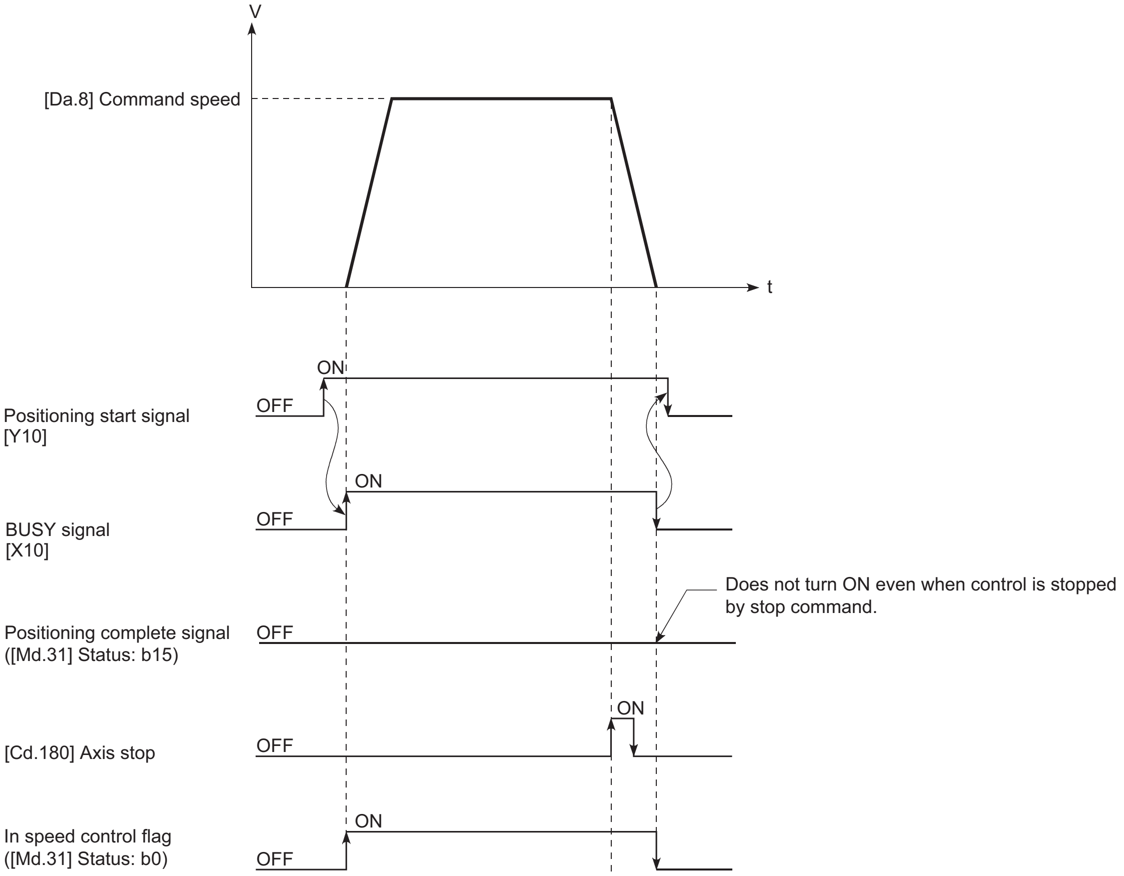
The following charts show the operation timing for 1-axis speed control with axis 1 and 2-axis speed control with axis 2 when the axis 1 is set as the reference axis.

The "in speed control" flag ([Md.31] Status: b0) is turned ON during speed control.

The "Positioning complete signal" is not turned ON.

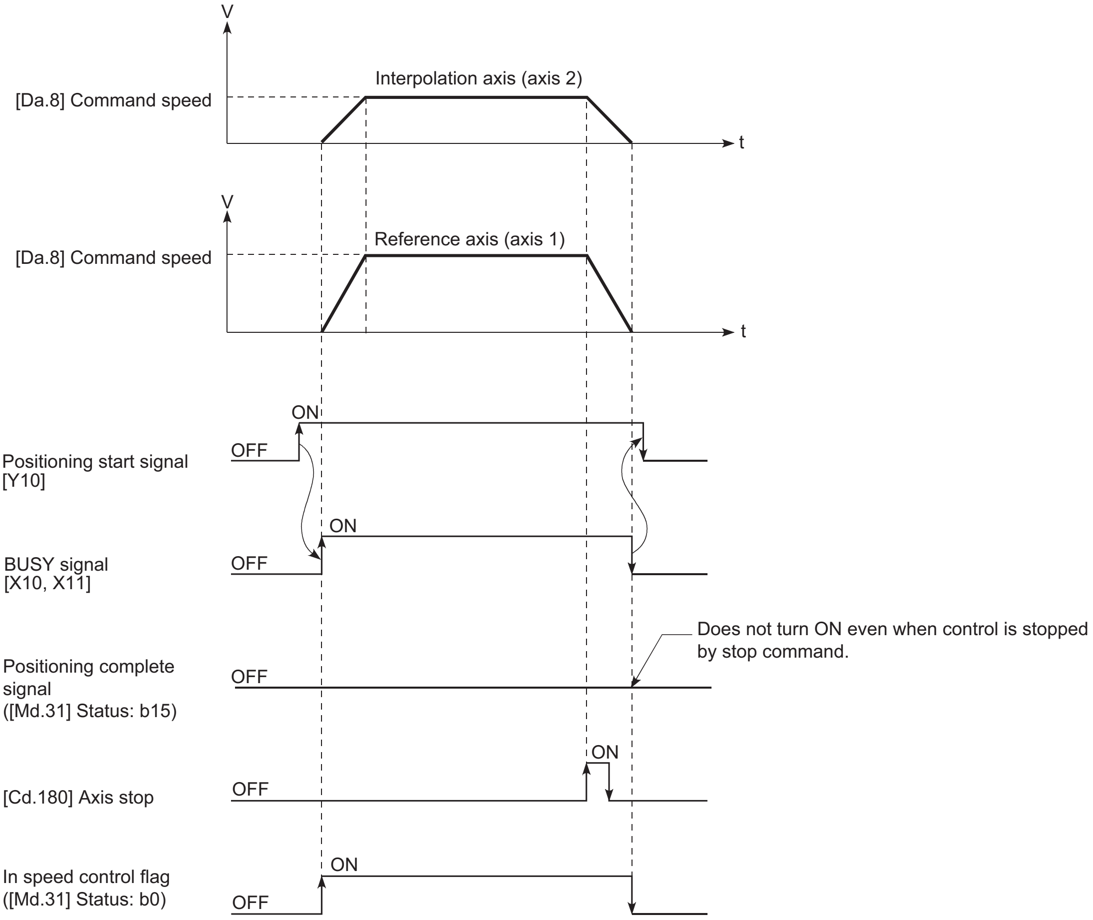
■1-axis speed control

Ex.



■2-axis speed control

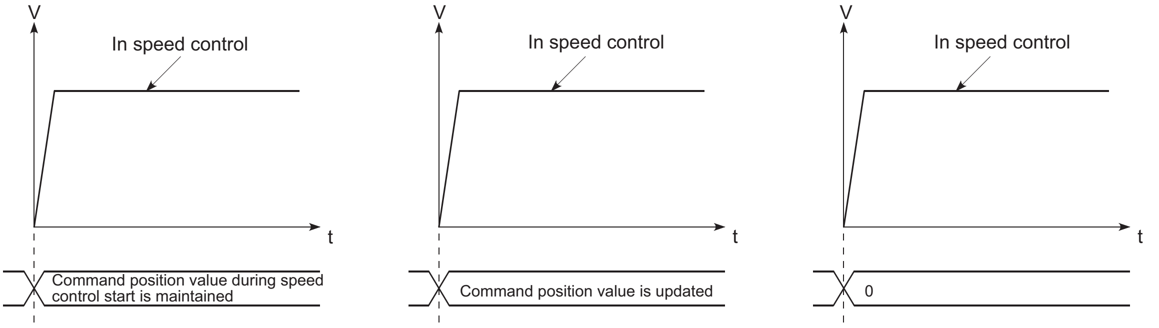
Ex.



Command position value

The following table shows the "[Md.20] Command position value" during speed control corresponding to the "[Pr.21] Command position value during speed control" settings. (However, the parameters use the set value of the reference axis.)

"[Pr.21] Command position value during speed control" setting	[Md.20] Command position value
0: Do not update command position value	The command position value at speed control start is maintained.
1: Update command position value	The command position value is updated.
2: Zero clear command position value	The command position value is fixed at 0.



(a) Command position value not updated

(b) Command position value updated

(c) Command position value zero cleared

Restrictions

- Set "Positioning complete" in "[Da.1] Operation pattern". The error "Continuous path control not possible" (error code: 1A1EH to 1A20H) will occur and the operation cannot start if "continuous positioning control" or "continuous path control" is set in "[Da.1] Operation pattern". ("Continuous positioning control" and "continuous path control" cannot be set in speed control.)
- Set the WITH mode in the output timing when using an M code. The M code will not be output, and the M code ON signal will not turn ON if the AFTER mode is set.
- The error "No command speed" (error code: 1A12H to 1A14H) will occur if the current speed (-1) is set in "[Da.8] Command speed".
- Set "1: Reference axis speed" in "[Pr.20] Interpolation speed designation method". If "0: Composite speed" is set, the error "Interpolation mode error" (error code: 199AH) occurs and the positioning will not start.
- The software stroke limit check is not carried out if the control unit is set to "degree".

■Restriction for the speed limit value

When either of control axes (1 to 4 axes) exceeds the speed limit, that axis is controlled with the speed limit value. The speeds of the other axes are limited at the ratios of "[Da.8] Command speed".

Ex.

When the axis 1 and the axis 2 are used

Setting item		Axis 1 setting	Axis 2 setting
[Pr.8]	Speed limit value	4000.00 mm/min	5000.00 mm/min
[Da.8]	Command speed	8000.00 mm/min	6000.00 mm/min

With the settings shown above, the operation speed in speed control is as follows.

- Axis 1: 4000.00 mm/min (Speed is limited by [Pr.8].)
- Axis 2: 3000.00 mm/min (Speed is limited at a ratio of an axis 1 command speed to an axis 2 command speed.)

Operation runs at speed 1 when a reference axis speed is less than 1 as a result of speed limit. In addition, when the bias speed is set, the set value will be the minimum speed.

Setting positioning data

When using speed control (forward run: speed 1 to 4, reverse run: speed 1 to 4), set the following positioning data.

◎: Always set, ○: Set as required, △: Setting restricted, —: Setting not required

Setting item		Setting required/not required for the reference axis	Setting required/not required for the interpolation axis
[Da.1]	Operation pattern	◎	—
[Da.2]	Control method	◎	—
[Da.3]	Acceleration time No.	◎	—
[Da.4]	Deceleration time No.	◎	—
[Da.6]	Positioning address/movement amount	—	—
[Da.7]	Arc address	—	—
[Da.8]	Command speed	◎	◎
[Da.9]	Dwell time/JUMP destination positioning data No.	—	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	○	—
[Da.20]	Axis to be interpolated No.1	—[1]	—
[Da.21]	Axis to be interpolated No.2	—[1]	—
[Da.22]	Axis to be interpolated No.3	—[1]	—
[Da.27]	M code ON signal output timing	○	—
[Da.28]	ABS direction in degrees	○	—
[Da.29]	Interpolation speed designation method	△	—

[1] When using 2- to 4-axis speed control, it is necessary to set the axis to be used as the interpolation axis.

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

Speed-position switching control (INC mode)

In "speed-position switching control (INC mode)" ("[Da.2] Control method" = Forward run: speed/position, Reverse run: speed/position), the pulses of the speed set in "[Da.8] Command speed" are kept output on the axial direction set to the positioning data. When the "speed-position switching signal" is input, position control of the movement amount set in "[Da.6] Positioning address/movement amount" is exercised.

"Speed-position switching control (INC mode)" is available in two different types: "forward run: speed/position" which starts the axis in the forward run direction and "reverse run: speed/position" which starts the axis in the reverse run direction.

Use the detailed parameter 1 "[Pr.81] Speed-position function selection" with regard to the choice for "speed-position switching control (INC mode)".

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Pr.81]	Speed-position function selection	0	Speed-position switching control (INC mode)	34+150n	1000034+150n

If the set value is other than 0 and 2, it is regarded as 0 and operation is performed in the INC mode.

For details of the setting, refer to the following.

☞ Page 496 Basic Setting

Switching over from speed control to position control

- The control is selected the switching method from speed control to position control by the setting value of "[Cd.45] Speed-position switching device selection".

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.45]	Speed-position switching device selection	→	The device used for speed-position switching is selected. 0: Use the external command signal for switching from speed control to position control [RD77MS] 1: Use the proximity dog signal for switching from speed control to position control 2: Use the "[Cd.46] Speed-position switching command" for switching from speed control to position control 3: Use the link device for switching from speed control to position control[1] [RD77GF]	4366+100n	1004366+100n

[1] For details of the setting, refer to the following.
☞ Page 346 Link Device External Signal Assignment Function [RD77GF]

The switching is performed by using the following device when "2" is set.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.46]	Speed-position switching command	1	Switch from speed control to position control	4367+100n	1004367+100n

- "[Cd.24] Speed-position switching enable flag" must be turned ON to switch over from speed control to position control. (If the "[Cd.24] Speed-position switching enable flag" turns ON after the speed-position switching signal turns ON, the control will continue as speed control without switching over to position control. The control will be switched over from position control to speed control when the speed-position switching signal turns from OFF to ON again. Only position control will be carried out when the "[Cd.24] Speed-position switching enable flag" and speed-position switching signal are ON at the operation start.)

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

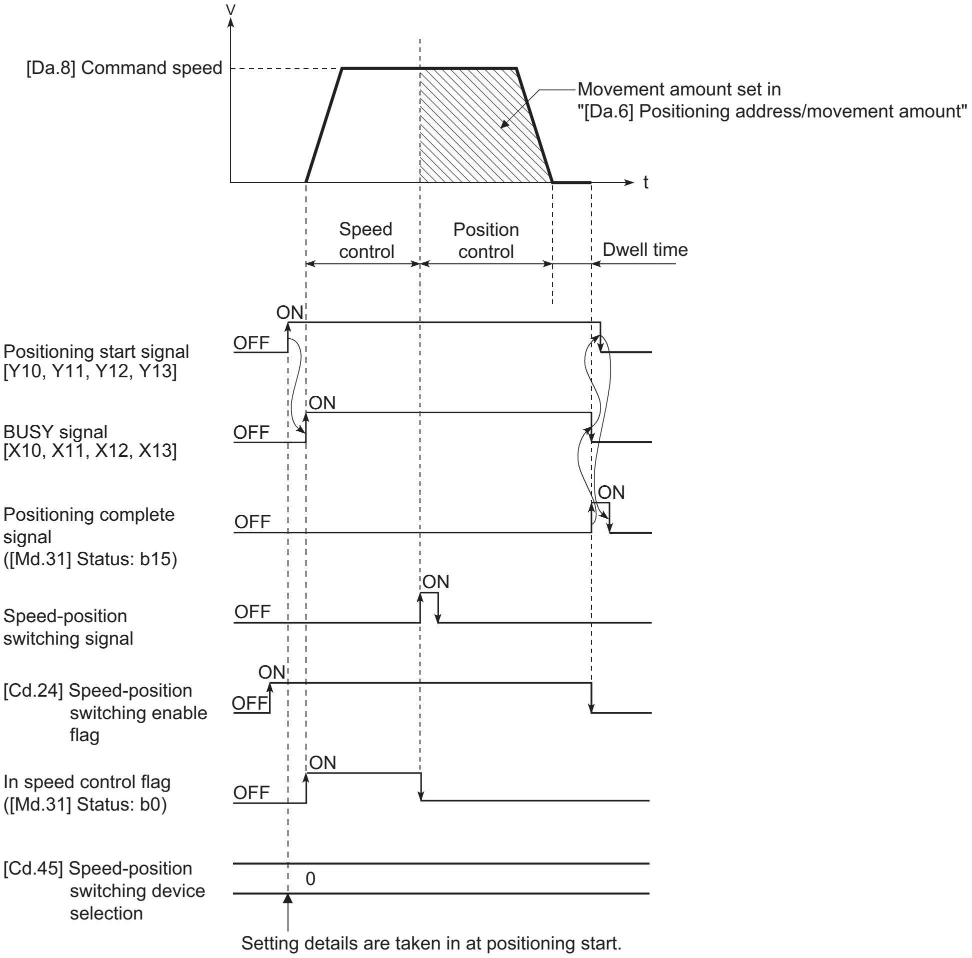
Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.24]	Speed-position switching enable flag	1	Speed control will be taken over by position control when the switching signal set in "[Cd.45] Speed-position switching device selection" turns ON.	4328+100n	1004328+100n

Operation chart

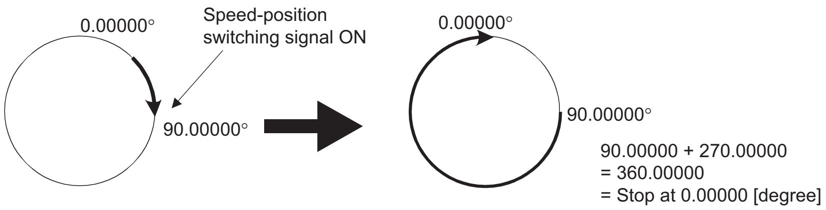
The following chart shows the operation timing for speed-position switching control (INC mode).

The "in speed control flag" ([Md.31] Status: b0) is turned ON during speed control of speed-position switching control (INC mode).

■Operation example

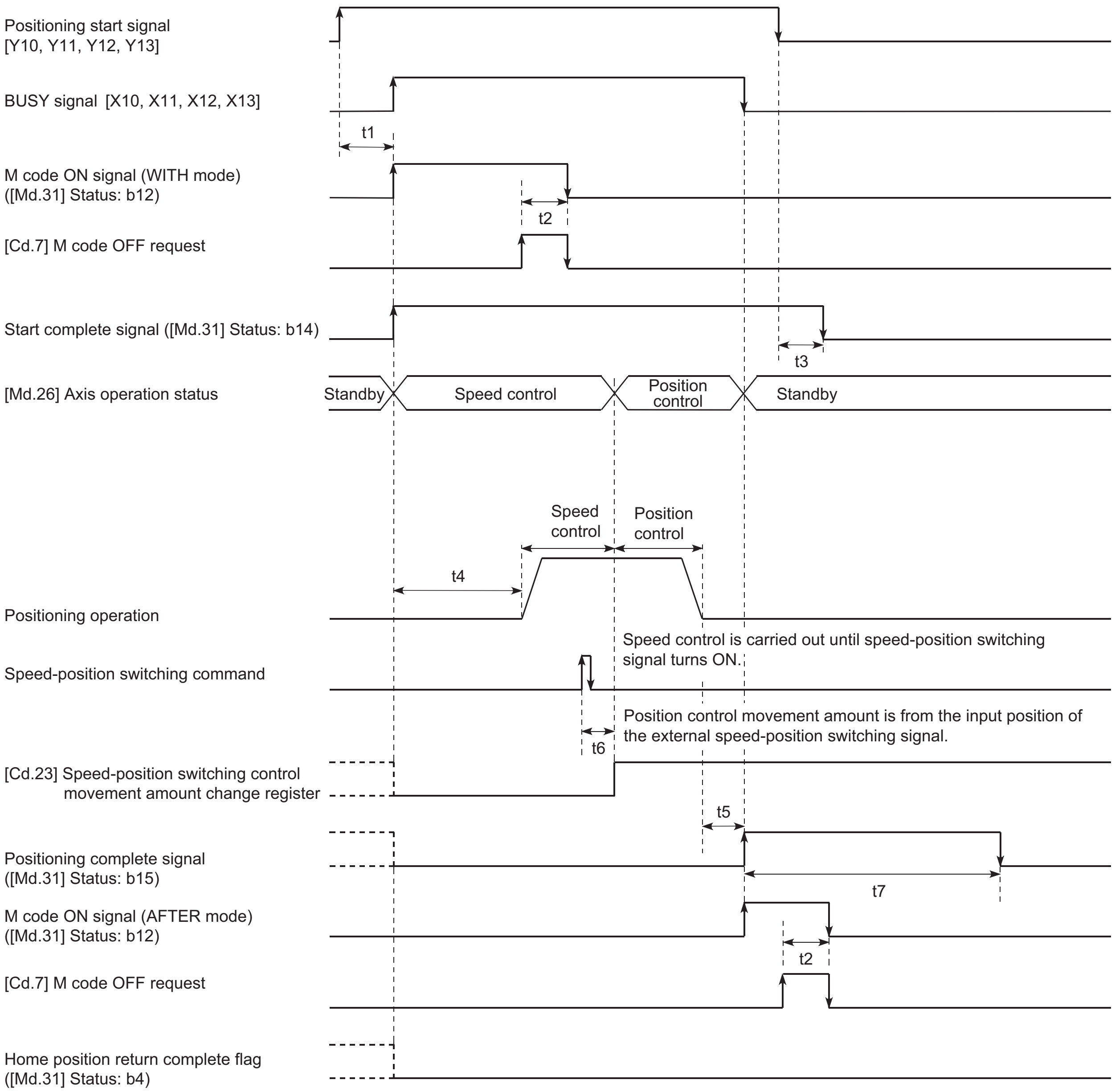


The following operation assumes that the speed-position switching signal is input at the position of the command position value of 90.00000 [degree] during execution of "[Da.2] Control method" "Forward run: speed/position" at "[Pr.1] Unit setting" of "2: degree" and "[Pr.21] Command position value during speed control" setting of "1: Update command position value".
(The value set in "[Da.6] Positioning address/movement amount" is 270.00000 [degree])



Operation timing and processing time

■Operation example



- Normal timing time (Unit: [ms])

[RD77MS]

Operation cycle	t1[*1]	t2	t3	t4	t5	t6[*2]	t7
0.444	0.316 to 1.366	0.000 to 0.444	0.000 to 0.444	0.503 to 1.599	0.000 to 0.444	0.346	Follows parameters
0.888	0.316 to 1.366	0.000 to 0.888	0.000 to 0.888	2.195 to 3.064	0.000 to 0.888	0.346	Follows parameters
1.777	0.316 to 1.366	0.000 to 1.777	0.000 to 1.777	3.798 to 4.459	0.000 to 1.777	0.348	Follows parameters
3.555	0.316 to 1.366	0.000 to 3.555	0.000 to 3.555	5.630 to 7.984	0.000 to 3.555	0.348	Follows parameters

[RD77GF]

Operation cycle	t1[*1]	t2	t3	t4	t5	t6[*2]	t7
0.50	0.329 to 0.824	0.000 to 0.500	0.000 to 0.500	1.167 to 1.666	0.000 to 0.500	0.500	Follows parameters
1.00	0.258 to 1.202	0.000 to 1.000	0.000 to 1.000	2.735 to 2.903	0.000 to 1.000	1.000	Follows parameters
2.00	0.347 to 2.195	0.000 to 2.000	0.000 to 2.000	5.834 to 5.897	0.000 to 2.000	2.000	Follows parameters
4.00	0.706 to 3.240	0.000 to 4.000	0.000 to 4.000	11.836 to 11.885	0.000 to 4.000	4.000	Follows parameters

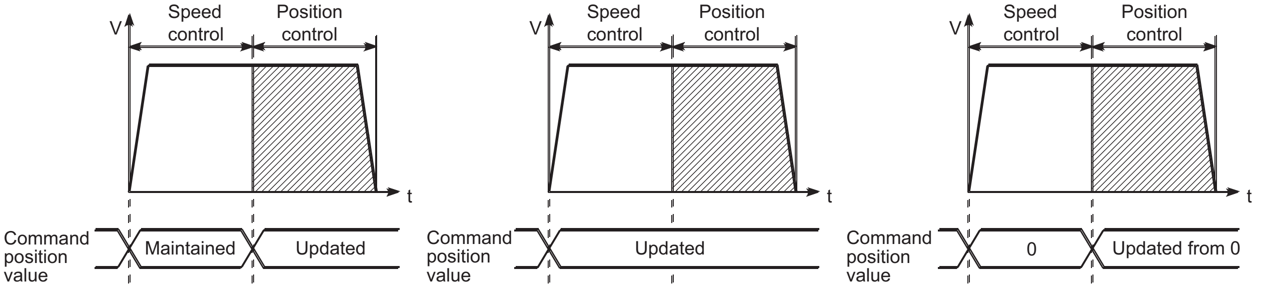
*1 The t1 timing time could be delayed by the operation state of other axes.

*2 When using the proximity dog signal or "[Cd.46] Speed-position switching command", the t6 timing time could be delayed or vary influenced by the PLC scan time or communication with servo amplifier.

Command position value

The following table shows the "[Md.20] Command position value" during speed-position switching control (INC mode) corresponding to the "[Pr.21] Command position value during speed control" settings.

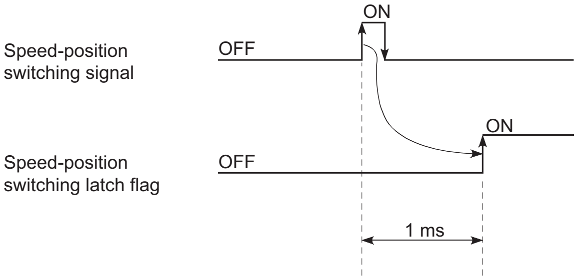
"[Pr.21] Command position value during speed control" setting	[Md.20] Command position value
0: Do not update command position value	The command position value at control start is maintained during speed control, and updated from the switching to position control.
1: Update command position value	The command position value is updated during speed control and position control.
2: Zero clear command position value	The command position value is cleared (set to "0") at control start, and updated from the switching to position control.



(a) Command position value not updated (b) Command position value updated (c) Command position value zero cleared

Switching time from speed control to position control

It takes 1 ms from the time the speed-position switching signal is turned ON to the time the speed-position switching latch flag ([Md.31] Status: b1) turns ON.



Speed-position switching signal setting

- The following table shows the items that must be set to use the external command signals [DI] as speed-position switching signals.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Pr.42]	External command function selection [RD77MS]	2	Speed-position, position-speed switching request.	62+150n	—
[Cd.8]	External command valid	1	Validates an external command.	4305+100n	1004305+100n
[Cd.45]	Speed-position switching device selection	0	Use the external command signal for switching from speed control to position control. [RD77MS]	4366+100n	1004366+100n

Set the external command signal [DI] in "[Pr.95] External command signal selection". Refer to the following for information on the setting details.

☞ Page 496 Basic Setting, ☞ Page 616 Control Data

- The following table shows the items that must be set to use the proximity dog signal (DOG) as speed-position switching signals.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.45]	Speed-position switching device selection	1	Use the proximity dog signal for switching from speed control to position control	4366+100n	1004366+100n

This setting is not required for "[Pr.42] External command function selection" and "[Cd.8] External command valid". Refer to the following for information on the setting details.

☞ Page 616 Control Data

- The following table shows the items that must be set to use "[Cd.46] Speed-position switching command" as speed-position switching signals.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.45]	Speed-position switching device selection	2	Use the "[Cd.46] Speed-position switching command" for switching from speed control to position control	4366+100n	1004366+100n

This setting is not required for "[Pr.42] External command function selection" and "[Cd.8] External command valid". Refer to the following for information on the setting details.

☞ Page 616 Control Data

- The following table shows the items that must be set to use link devices as speed-position switching signals. [RD77GF]

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.45]	Speed-position switching device selection	3	Use the link device for switching from speed control to position control	4366+100n	1004366+100n

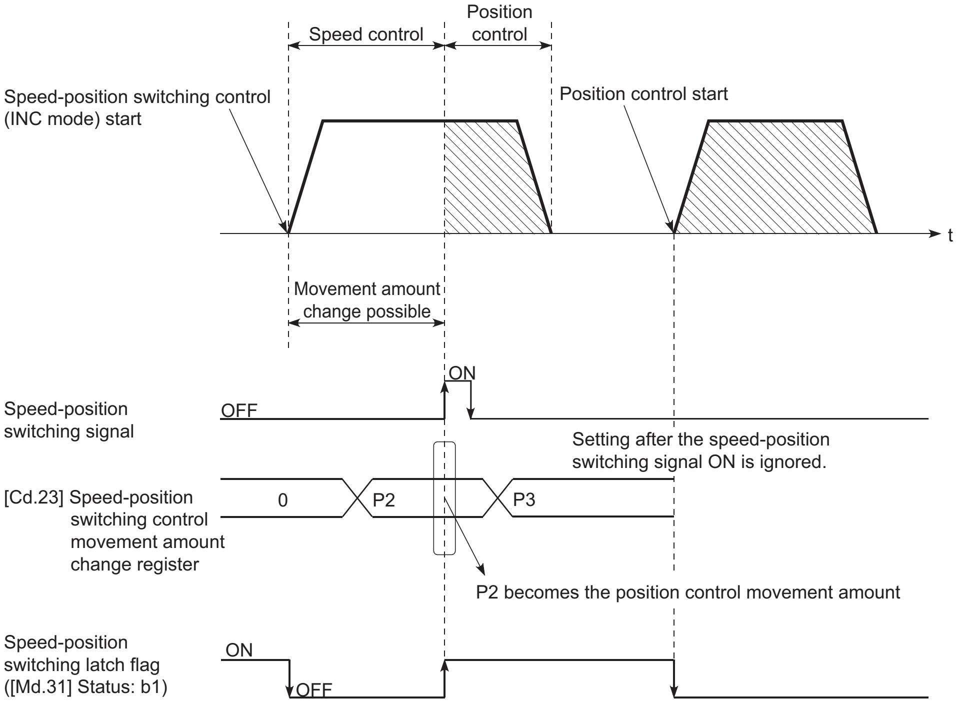
For details of the setting, refer to the following.

☞ Page 616 Control Data

Changing the position control movement amount

In "speed-position switching control (INC mode)", the position control movement amount can be changed during the speed control section.

- The position control movement amount can be changed during the speed control section of speed-position switching control (INC mode). A movement amount change request will be ignored unless issued during the speed control section of the speed-position switching control (INC mode).
- The "new movement amount" is stored in "[Cd.23] Speed-position switching control movement amount change register" by the program during speed control. When the speed-position switching signal is turned ON, the movement amount for position control is stored in "[Cd.23] Speed-position switching control movement amount change register".
- The movement amount is stored in the "[Md.29] Speed-position switching control positioning movement amount" of the axis monitor area from the point where the control changes to position control by the input of a speed-position switching signal from an external device.



Point

- The machine recognizes the presence of a movement amount change request when the data is written to "[Cd.23] Speed-position switching control movement amount change register" with the program.
- The new movement amount is validated after execution of the speed-position switching control (INC mode), before the input of the speed-position switching signal.
- The movement amount change can be enable/disable with the interlock function in position control using the "speed-position switching latch flag" ([Md.31] Status: b1) of the axis monitor area.

Restrictions

- The error "Continuous path control not possible" (error code: 1A1EH to 1A20H) will occur and the operation cannot start if "continuous positioning control" or "continuous path control" is set in "[Da.1] Operation pattern".
- "Speed-position switching control" cannot be set in "[Da.2] Control method" of the positioning data when "continuous path control" has been set in "[Da.1] Operation pattern" of the immediately prior positioning data. (For example, if the operation pattern of positioning data No.1 is "continuous path control", "speed-position switching control" cannot be set in positioning data No.2.) The error "Continuous path control not possible" (error code: 1A1EH to 1A20H) will occur and the machine will carry out a deceleration stop if this type of setting is carried out.
- The error "No command speed" (error code: 1A12H to 1A14H) will occur if "current speed (-1)" is set in "[Da.8] Command speed".
- The software stroke limit range check during speed control is made only when the following is satisfied:

"[Pr.21] Command position value during speed control" is "1: Update command position value".	If the movement amount exceeds the software stroke limit range during speed control in case of the setting of other than "1: Update command position value", the error "Software stroke limit +" (error code: 1993H) or "Software stroke limit -" (error code: 1995H) will occur as soon as speed control is changed to position control and the axis will decelerate to a stop.
When "[Pr.1] Unit setting" is other than "2: degree"	If the unit is "degree", the software stroke limit range check is not performed.

- If the value set in "[Da.6] Positioning address/movement amount" is negative, the error "Outside address range" (error code: 1A30H, 1A31H) will occur.
- Deceleration processing is carried out from the point where the speed-position switching signal is input if the position control movement amount set in "[Da.6] Positioning address/movement amount" is smaller than the deceleration distance from the "[Da.8] Command speed".
- Turn ON the speed-position switching signal in the speed stabilization region (constant speed status). When the switching signal is turned ON while the speed does not reach the command speed, deviation in the stop position may occur because of large deviation in the droop pulse amount. During use of the servo motor, the movement amount is "[Da.6] Positioning address/movement amount" from the assumed motor position based on "[Md.101] Actual position value" at switching of speed control to position control. Therefore, if the signal is turned ON during acceleration/deceleration, the stop position will vary due to large variation of the droop pulse amount. Even though "[Md.29] Speed-position switching control positioning movement amount" is the same, the stop position will change due to a change in droop pulse amount when "[Da.8] Command speed" is different.

Setting positioning data

When using speed-position switching control (INC mode), set the following positioning data.

◎: Always set, ○: Set as required, —: Setting not required

Setting item		Setting required/not required
[Da.1]	Operation pattern	◎
[Da.2]	Control method	◎ (Set "Forward run: speed/position" or "Reverse run: speed/position".)
[Da.3]	Acceleration time No.	◎
[Da.4]	Deceleration time No.	◎
[Da.6]	Positioning address/movement amount	◎
[Da.7]	Arc address	—
[Da.8]	Command speed	◎
[Da.9]	Dwell time/JUMP destination positioning data No.	○
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	○
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—
[Da.27]	M code ON signal output timing	○
[Da.28]	ABS direction in degrees	—
[Da.29]	Interpolation speed designation method	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

Speed-position switching control (ABS mode)

In case of "speed-position switching control (ABS mode)" ("[Da.2] Control method" = Forward run: speed/position, Reverse run: speed/position), the pulses of the speed set in "[Da.8] Command speed" are kept output in the axial direction set to the positioning data. When the "speed-position switching signal" is input, position control to the address set in "[Da.6] Positioning address/movement amount" is exercised.

"Speed-position switching control (ABS mode)" is available in two different types: "forward run: speed/position" which starts the axis in the forward run direction and "reverse run: speed/position" which starts the axis in the reverse run direction.

"Speed-position switching control (ABS mode)" is valid only when "[Pr.1] Unit setting" is "2: degree".

○: Setting allowed, ×: Setting disallowed (If setting is made, the error "Speed-position function selection error" (error code: 1AAEH) will occur when the PLC READY signal [Y0] turns ON.)

Speed-position function selection	[Pr.1] Unit setting			
	mm	inch	degree	pulse
INC mode	○	○	○	○
ABS mode	×	×	○	×

Use the detailed parameter 1 "[Pr.81] Speed-position function selection" to choose "speed-position switching control (ABS mode)".

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Pr.81]	Speed-position function selection	2	Speed-position switching control (ABS mode)	34+150n	1000034+150n

If the set value is other than 0 and 2, it is regarded as 0 and operation is performed in the INC mode. For details of the setting, refer to the following.

☞ Page 496 Basic Setting

Switching over from speed control to position control

- The control is selected the switching method from speed control to position control by the setting value of "[Cd.45] Speed-position switching device selection".

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.45]	Speed-position switching device selection	→	The device used for speed-position switching is selected. 0: Use the external command signal for switching from position control to speed control [RD77MS] 1: Use the proximity dog signal for switching from position control to speed control 2: Use the "[Cd.46] Speed-position switching command" for switching from position control to speed control 3: Use the link device for switching from speed control to position control[1] [RD77GF]	4366+100n	1004366+100n

[1] For details of the setting, refer to the following.
☞ Page 346 Link Device External Signal Assignment Function [RD77GF]

The switching is performed by using the following device when "2" is set.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.46]	Speed-position switching command	1	Switch from speed control to position control	4367+100n	1004367+100n

- "[Cd.24] Speed-position switching enable flag" must be turned ON to switch over from speed control to position control. (If the "[Cd.24] Speed-position switching enable flag" turns ON after the speed-position switching signal turns ON, the control will continue as speed control without switching over to position control. The control will be switched over from speed control to position control when the speed-position switching signal turns from OFF to ON again. Only position control will be carried out when the "[Cd.24] Speed-position switching enable flag" and speed-position switching signal are ON at the operation start.)

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

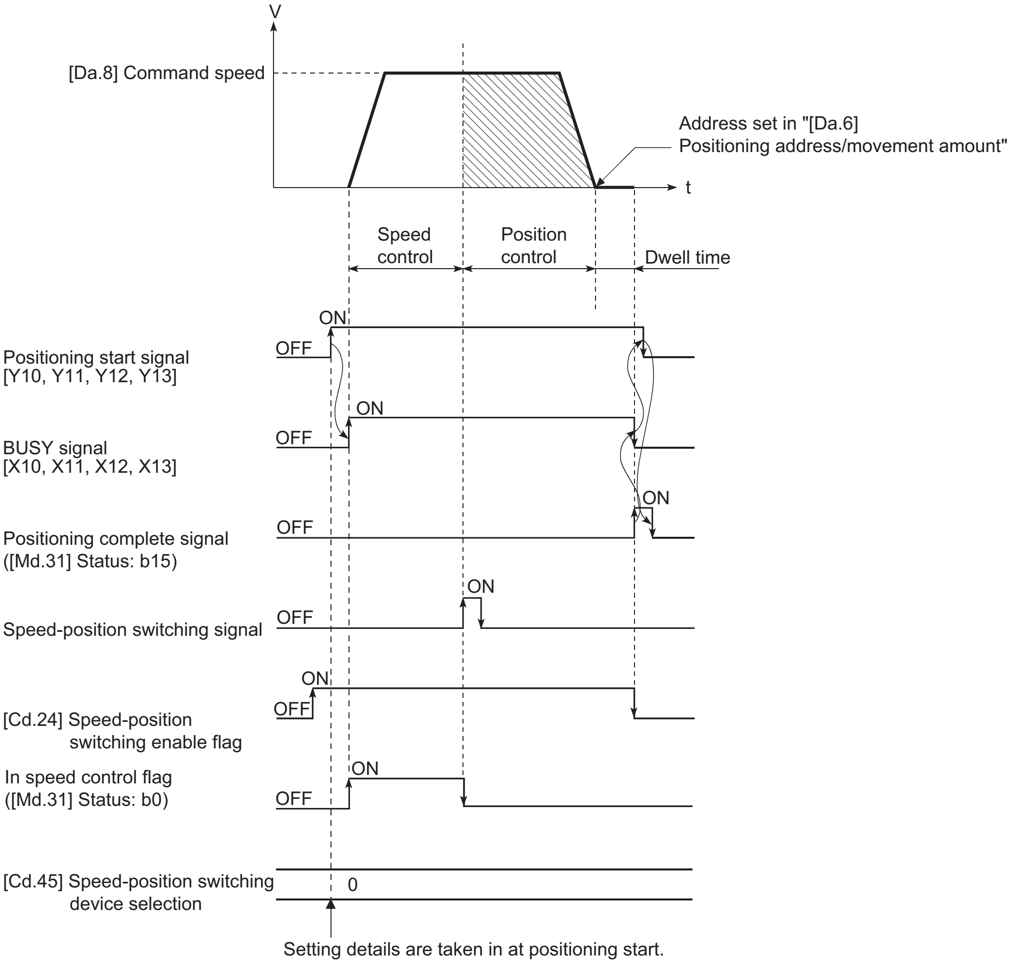
Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.24]	Speed-position switching enable flag	1	Speed control will be taken over by position control when the switching signal set in "[Cd.45] Speed-position switching device selection" turns ON.	4328+100n	1004328+100n

Operation chart

The following chart shows the operation timing for speed-position switching control (ABS mode).

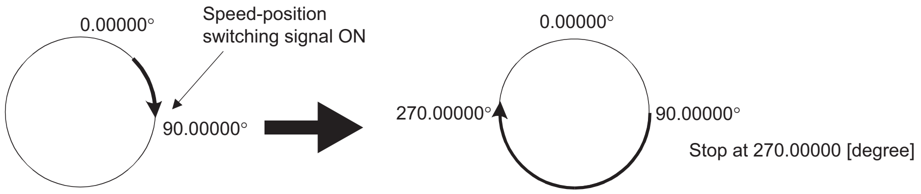
The "in speed control flag" ([Md.31] Status: b0) is turned ON during speed control of speed-position switching control (ABS mode).

■Operation example



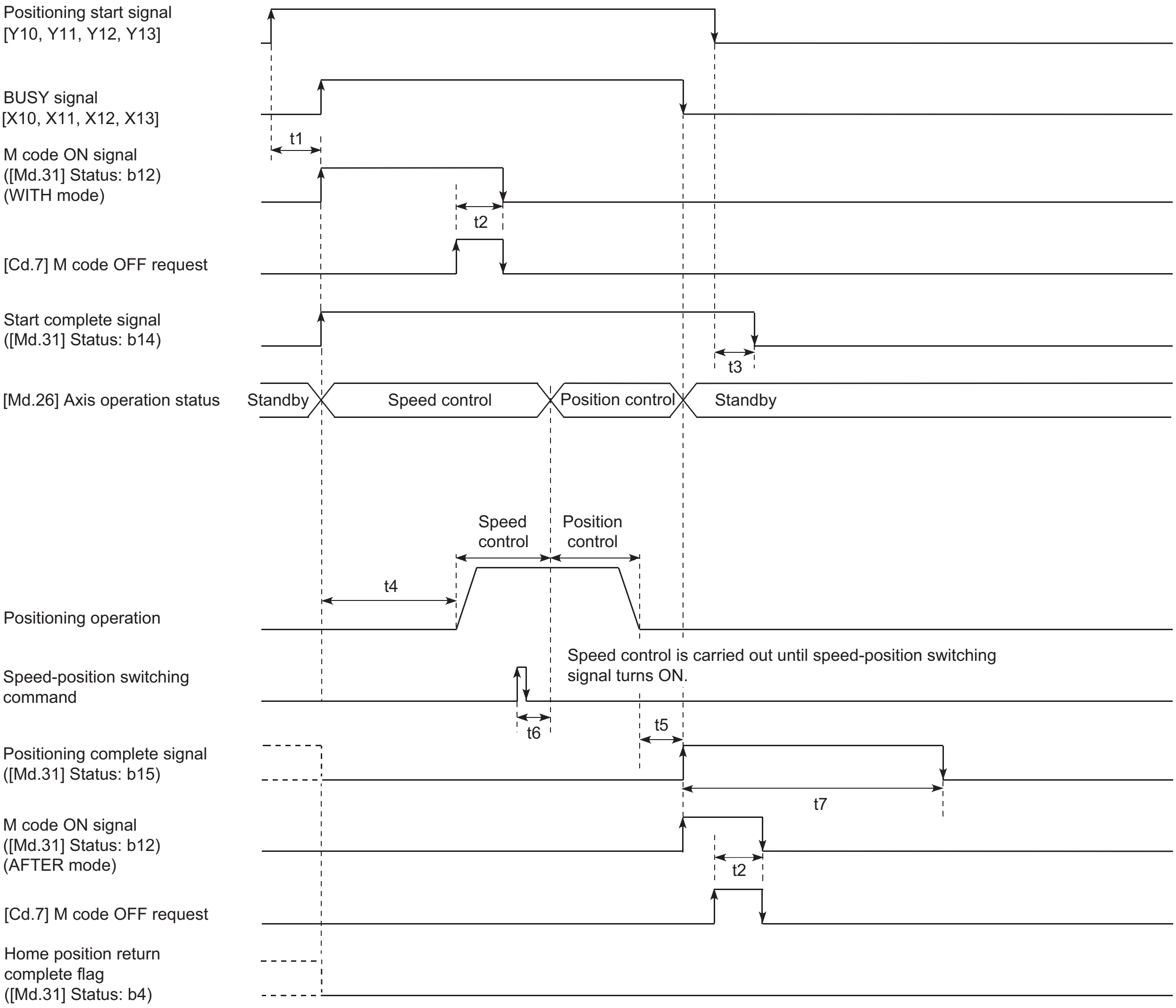
The following operation assumes that the speed-position switching signal is input at the position of the command position value of 90.00000 [degree] during execution of "[Da.2] Control method" "Forward run: speed/position" at "[Pr.1] Unit setting" of "2: degree" and "[Pr.21] Command position value during speed control" setting of "1: Update command position value".

(The value set in "[Da.6] Positioning address/movement amount" is 270.00000 [degree])



Operation timing and processing time

■Operation example



- Normal timing time (Unit: [ms])

[RD77MS]

Operation cycle	t1[*1]	t2	t3	t4	t5	t6[*2]	t7
0.444	0.316 to 1.366	0.000 to 0.444	0.000 to 0.444	0.503 to 1.599	0.000 to 0.444	0.346	Follows parameters
0.888	0.316 to 1.366	0.000 to 0.888	0.000 to 0.888	2.195 to 3.064	0.000 to 0.888	0.346	Follows parameters
1.777	0.316 to 1.366	0.000 to 1.777	0.000 to 1.777	3.798 to 4.459	0.000 to 1.777	0.348	Follows parameters
3.555	0.316 to 1.366	0.000 to 3.555	0.000 to 3.555	5.630 to 7.984	0.000 to 3.555	0.348	Follows parameters

[RD77GF]

Operation cycle	t1[*1]	t2	t3	t4	t5	t6[*2]	t7
0.50	0.260 to 0.748	0.000 to 0.500	0.000 to 0.500	1.157 to 1.447	0.000 to 0.500	0.500	Follows parameters
1.00	0.356 to 1.215	0.000 to 1.000	0.000 to 1.000	2.735 to 2.895	0.000 to 1.000	1.000	Follows parameters
2.00	0.434 to 2.222	0.000 to 2.000	0.000 to 2.000	5.840 to 5.909	0.000 to 2.000	2.000	Follows parameters
4.00	0.304 to 4.176	0.000 to 4.000	0.000 to 4.000	11.830 to 11.899	0.000 to 4.000	4.000	Follows parameters

*1 The t1 timing time could be delayed by the operation state of other axes.

*2 When using the proximity dog signal and "[Cd.46] Speed-position switching command", the t6 timing time could be delayed or vary influenced by the PLC scan time or communication with servo amplifier.

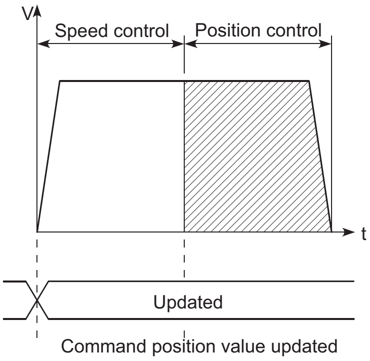
Command position value

The following table shows the "[Md.20] Command position value" during speed-position switching control (ABS mode) corresponding to the "[Pr.21] Command position value during speed control" settings.

"[Pr.21] Command position value during speed control" setting	[Md.20] Command position value
1: Update command position value	The command position value is updated during speed control and position control.

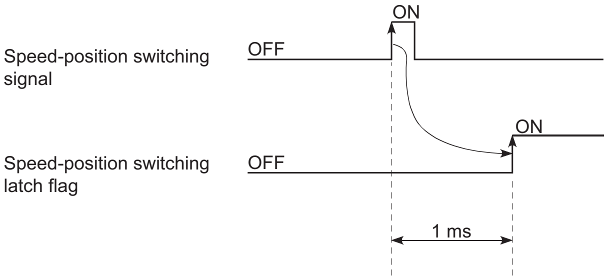
Only "1: Update command position value" is valid for the setting of "[Pr.21] Command position value during speed control" in speed-position switching control (ABS mode).

The error "Speed-position function selection error" (error code: 1AAEH) will occur if the "[Pr.21] Command position value during speed control" setting is other than 1.



Switching time from speed control to position control

It takes 1 ms from the time the speed-position switching signal is turned ON to the time the speed-position switching latch flag ([Md.31] Status: b1) turns ON.



Speed-position switching signal setting

- The following table shows the items that must be set to use the external command signals [DI] as speed-position switching signals.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Pr.42]	External command function selection [RD77MS]	2	Speed-position, position-speed switching request.	62+150n	—
[Cd.8]	External command valid	1	Validates an external command.	4305+100n	1004305+100n
[Cd.45]	Speed-position switching device selection	0	Use the external command signal for switching from speed control to position control. [RD77MS]	4366+100n	1004366+100n

Set the external command signal [DI] in "[Pr.95] External command signal selection". Refer to the following for information on the setting details.

☞ Page 496 Basic Setting, ☞ Page 616 Control Data

- The following table shows the items that must be set to use the proximity dog signal (DOG) as speed-position switching signals.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.45]	Speed-position switching device selection	1	Use the proximity dog signal for switching from speed control to position control.	4366+100n	1004366+100n

The setting is not required for "[Pr.42] External command function selection" and "[Cd.8] External command valid". Refer to the following for information on the setting details.

☞ Page 616 Control Data

- The following table shows the items that must be set to use "[Cd.46] Speed-position switching command" as speed-position switching signals.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.45]	Speed-position switching device selection	2	Use the "[Cd.46] Speed-position switching command" for switching from speed control to position control.	4366+100n	1004366+100n

The setting is not required for "[Pr.42] External command function selection" and "[Cd.8] External command valid". Refer to the following for information on the setting details.

☞ Page 616 Control Data

- The following table shows the items that must be set to use link devices as speed-position switching signals. [RD77GF]

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.45]	Speed-position switching device selection	3	Use the link device for switching from speed control to position control	4366+100n	1004366+100n

For details of the setting, refer to the following.

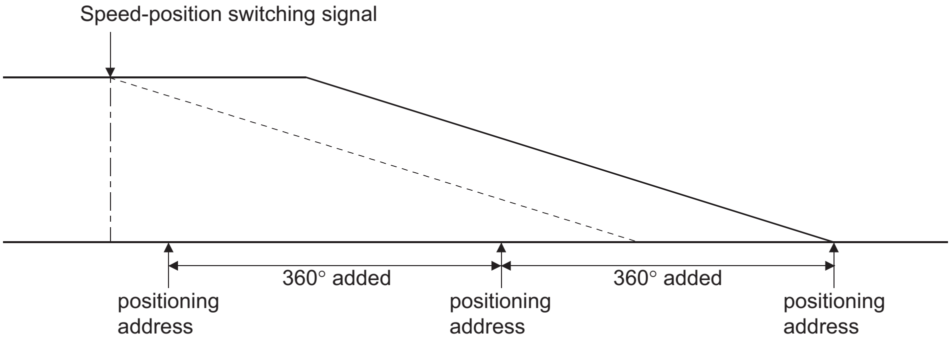
☞ Page 346 Link Device External Signal Assignment Function [RD77GF]

Restrictions

- The error "Continuous path control not possible" (error code: 1A1EH to 1A20H) will occur and the operation cannot start if "continuous positioning control" or "continuous path control" is set in "[Da.1] Operation pattern".
- "Speed-position switching control" cannot be set in "[Da.2] Control method" of the positioning data when "continuous path control" has been set in "[Da.1] Operation pattern" of the immediately prior positioning data. (For example, if the operation pattern of positioning data No.1 is "continuous path control", "speed-position switching control" cannot be set in positioning data No.2.) The error "Continuous path control not possible" (error code: 1A1EH to 1A20H) will occur and the machine will carry out a deceleration stop if this type of setting is carried out.
- The error "No command speed" (error code: 1A12H to 1A14H) will occur if "current speed (-1)" is set in "[Da.8] Command speed".
- If the value set in "[Da.6] Positioning address/movement amount" is negative, the error "Outside address range" (error code: 1A30H, 1A31H) will occur.
- Even though the axis control data "[Cd.23] Speed-position switching control movement amount change register" was set in speed-position switching control (ABS mode), it would not function. The set value is ignored.
- To exercise speed-position switching control (ABS mode), the following conditions must be satisfied:

1) "[Pr.1] Unit setting" is "2: degree"
2) The software stroke limit function is invalid (upper limit value = lower limit value)
3) "[Pr.21] Command position value during speed control" is "1: Update command position value"
4) The "[Da.6] Positioning address/movement amount" setting range is 0 to 359.99999 (degree). If the value is outside of the range, the error "Outside address range" (error code: 1A30H, 1A31H) will occur at a start.
5) The "[Pr.81] Speed-position function selection" setting is "2: Speed-position switching control (ABS mode)".

- If any of the conditions in 1) to 3) is not satisfied in the case of 5), the error "Speed-position function selection error" (error code: 1AAEH) will occur when the PLC READY signal [Y0] turns from OFF to ON.
- If the axis reaches the positioning address midway through deceleration after automatic deceleration started at the input of the speed-position switching signal, the axis will not stop immediately at the positioning address. The axis will stop at the positioning address after N revolutions so that automatic deceleration can always be made. (N: Natural number) In the following example, since making deceleration in the path of dotted line will cause the axis to exceed the positioning addresses twice, the axis will decelerate to a stop at the third positioning address.



Setting positioning data

When using speed-position switching control (ABS mode), set the following positioning data.

◎: Always set, ○: Set as required, —: Setting not required

Setting item		Setting required/not required
[Da.1]	Operation pattern	◎
[Da.2]	Control method	◎ (Set "Forward run: speed/position" or "Reverse run: speed/position".)
[Da.3]	Acceleration time No.	◎
[Da.4]	Deceleration time No.	◎
[Da.6]	Positioning address/movement amount	◎
[Da.7]	Arc address	—
[Da.8]	Command speed	◎
[Da.9]	Dwell time/JUMP destination positioning data No.	○
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	○
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—
[Da.27]	M code ON signal output timing	○
[Da.28]	ABS direction in degrees	—
[Da.29]	Interpolation speed designation method	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

Position-speed switching control

In "position-speed switching control" ("[Da.2] Control method" = Forward run: position/speed, Reverse run: position/speed), before the position-speed switching signal is input, position control is carried out for the movement amount set in "[Da.6] Positioning address/movement amount" in the axis direction in which the positioning data has been set. When the position-speed switching signal is input, the position control is carried out by continuously outputting the pulses for the speed set in "[Da.8] Command speed" until the input of a stop command.

The two types of position-speed switching control are "Forward run: position/speed" in which the control starts in the forward run direction, and "Reverse run: position/speed" in which control starts in the reverse run direction.

Switching over from position control to speed control

- The control is selected the switching method from position control to speed control by the setting value of "[Cd.45] Speed-position switching device selection".

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.45]	Speed-position switching device selection	→	The device used for speed-position switching is selected. 0: Use the external command signal for switching from position control to speed control [RD77MS] 1: Use the proximity dog signal for switching from position control to speed control 2: Use the "[Cd.46] Speed-position switching command" for switching from position control to speed control 3: Use the link device for switching from position control to speed control[1] [RD77GF]	4366+100n	1004366+100n

[1] For details of the setting, refer to the following.
☞ Page 346 Link Device External Signal Assignment Function [RD77GF]

The switching is performed by using the following device when "2" is set.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.46]	Speed-position switching command	1	Switch from position control to speed control	4367+100n	1004367+100n

- "[Cd.26] Position-speed switching enable flag" must be turned ON to switch over from position control to speed control. (If the "[Cd.26] Position-speed switching enable flag" turns ON after the position-speed switching signal turns ON, the control will continue as position control without switching over to speed control. The control will be switched over from position control to speed control when the position-speed switching signal turns from OFF to ON again. Only speed control will be carried out when the "[Cd.26] Position-speed switching enable flag" and position-speed switching signal are ON at the operation start.)

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

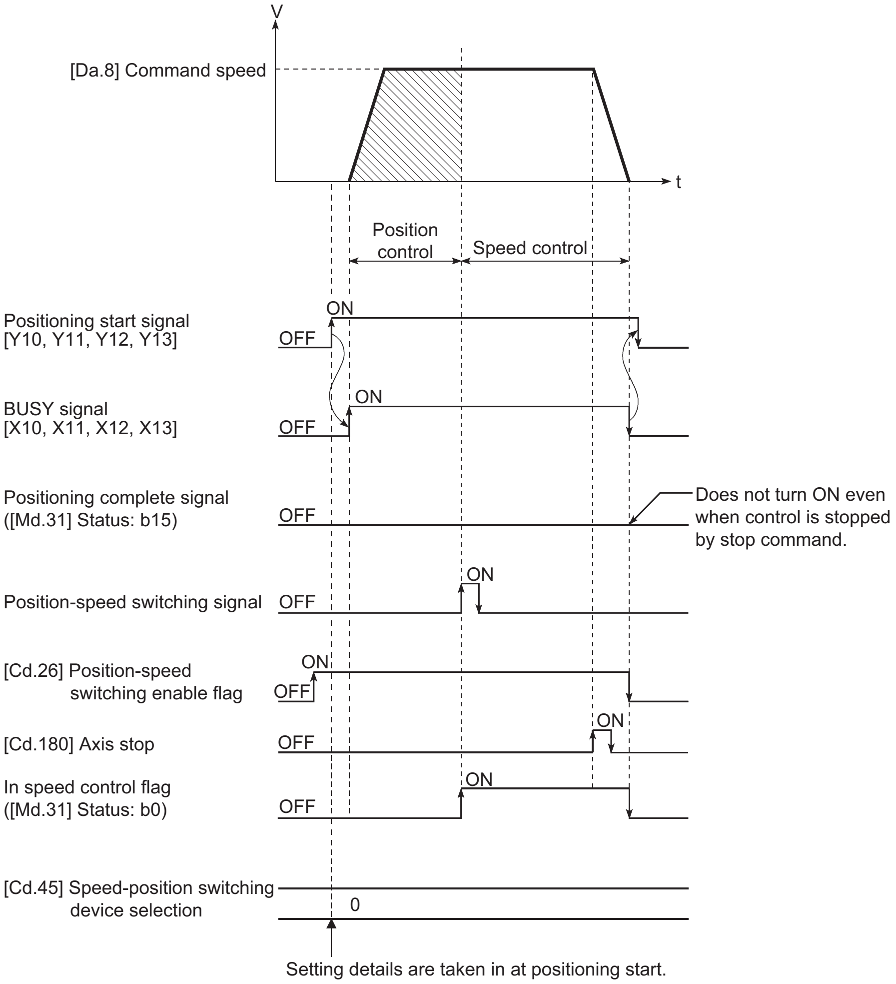
Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.26]	Position-speed switching enable flag	1	Speed control will be taken over by position control when the switching signal set in "[Cd.45] Speed-position switching device selection" turns ON.	4332+100n	1004332+100n

Operation chart

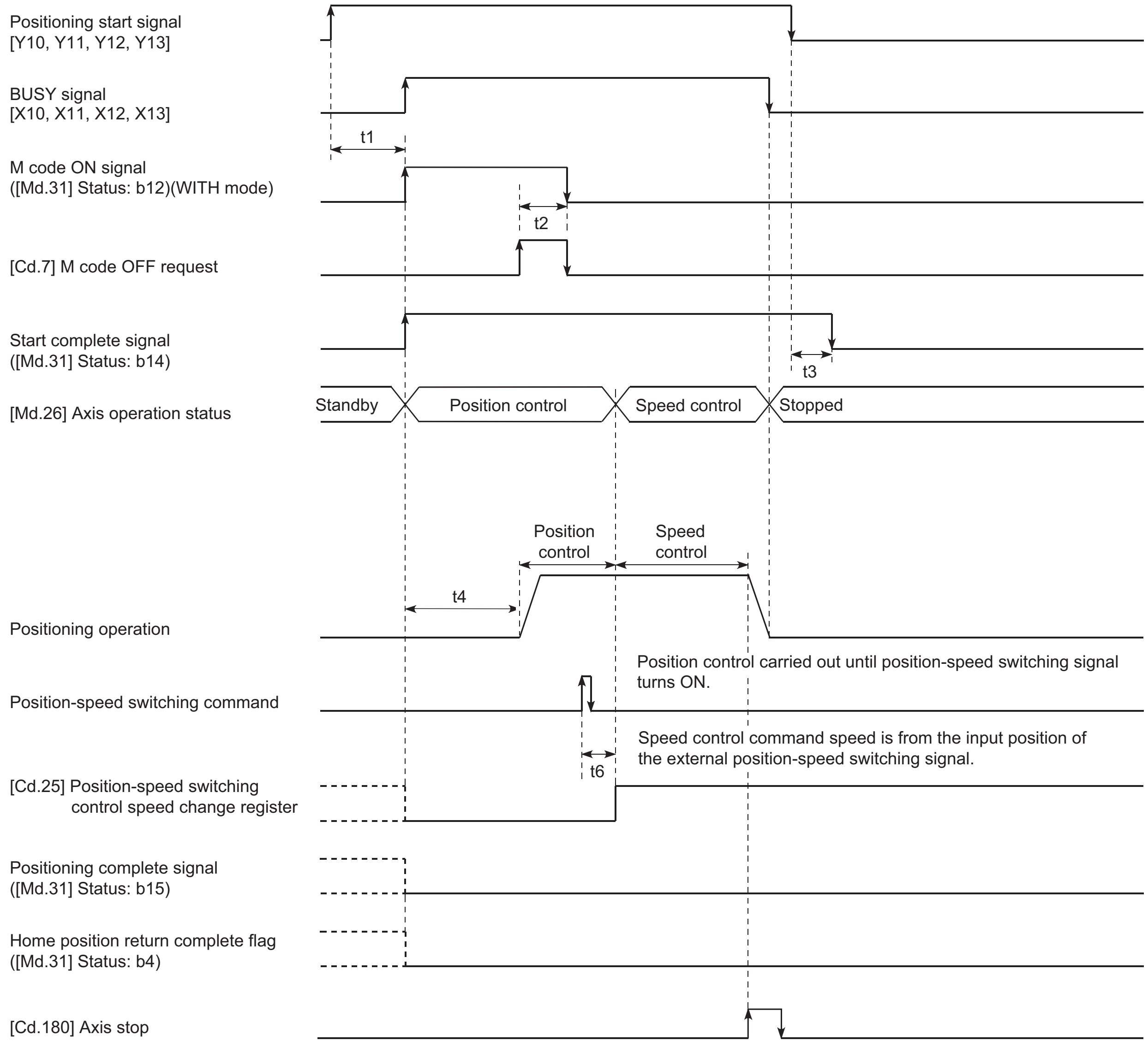
The following chart shows the operation timing for position-speed switching control.

The "in speed control" flag ([Md.31] Status: b0) is turned ON during speed control of position-speed switching control.

■Operation example



Operation timing and processing time



- Normal timing time (Unit: [ms])

[RD77MS]

Operation cycle	t1[*1]	t2	t3	t4	t5	t6[*2]
0.444	0.286 to 1.382	0.000 to 0.444	0.000 to 0.444	0.991 to 1.608	—	0.343
0.888	0.286 to 1.382	0.000 to 0.888	0.000 to 0.888	2.165 to 3.009	—	0.346
1.777	0.286 to 1.382	0.000 to 1.777	0.000 to 1.777	3.777 to 4.406	—	0.347
3.555	0.286 to 1.382	0.000 to 3.555	0.000 to 3.555	5.552 to 7.960	—	0.349

[RD77GF]

Operation cycle	t1[*1]	t2	t3	t4	t5	t6[*2]
0.50	0.243 to 0.799	0.000 to 0.500	0.000 to 0.500	1.134 to 1.394	—	0.500
1.00	0.233 to 1.244	0.000 to 1.000	0.000 to 1.000	2.734 to 2.899	—	1.000
2.00	0.291 to 2.228	0.000 to 2.000	0.000 to 2.000	5.834 to 5.880	—	2.000
4.00	0.270 to 4.141	0.000 to 4.000	0.000 to 4.000	11.822 to 11.889	—	4.000

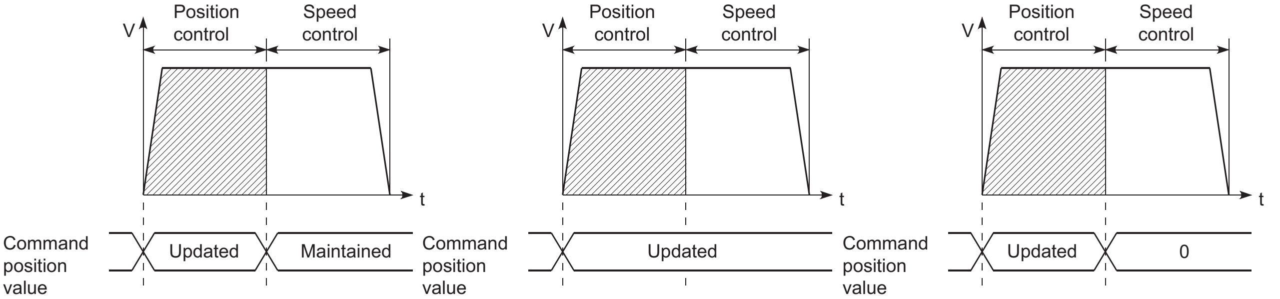
[*1] The t1 timing time could be delayed by the operation state of other axes.

[*2] When using the proximity dog signal and "[Cd.46] Speed-position switching command", the t6 timing time could be delayed or vary influenced by the PLC scan time or communication with servo amplifier.

Command position value

The following table shows the "[Md.20] Command position value" during position-speed switching control corresponding to the "[Pr.21] Command position value during speed control" settings.

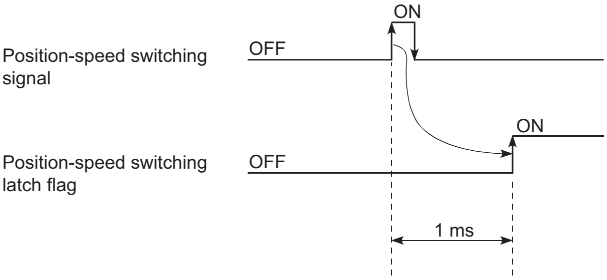
"[Pr.21] Command position value during speed control" setting	[Md.20] Command position value
0: Do not update command position value	The command position value is updated during position control, and the command position value at the time of switching is maintained as soon as position control is switched to speed control.
1: Update command position value	The command position value is updated during position control and speed control.
2: Zero clear command position value	The command position value is updated during position control, and the command position value is cleared (to "0") as soon as position control is switched to speed control.



(a) Command position value not updated (b) Command position value updated (c) Command position value zero cleared

Switching time from position control to speed control

It takes 1 ms from the time the position-speed switching signal is turned ON to the time the position-speed switching latch flag ([Md.31] Status: b5) turns ON.



Position-speed switching signal setting

- The following table shows the items that must be set to use the external command signals [DI] as position-speed switching signals.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Pr.42]	External command function selection [RD77MS]	2	Speed-position, position-speed switching request.	62+150n	—
[Cd.8]	External command valid	1	Validates an external command.	4305+100n	1004305+100n
[Cd.45]	Speed-position switching device selection	0	Use the external command signal for switching from position control to speed control. [RD77MS]	4366+100n	1004366+100n

Set the external command signal [DI] in "[Pr.95] External command signal selection". Refer to the following for information on the setting details.

☞ Page 496 Basic Setting, ☞ Page 616 Control Data

- The following table shows the items that must be set to use the proximity dog signal (DOG) as position-speed switching signals.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.45]	Speed-position switching device selection	1	Use the proximity dog signal for switching from position control to speed control.	4366+100n	1004366+100n

The setting is not required for "[Pr.42] External command function selection" and "[Cd.8] External command valid". Refer to the following for information on the setting details.

☞ Page 616 Control Data

- The following table shows the items that must be set to use "[Cd.46] Speed-position switching command" as position-speed switching signals.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.45]	Speed-position switching device selection	2	Use the "[Cd.46] Speed-position switching command" for switching from position control to speed control.	4366+100n	1004366+100n

The setting is not required for "[Pr.42] External command function selection" and "[Cd.8] External command valid". Refer to the following for information on the setting details.

☞ Page 616 Control Data

- The following table shows the items that must be set to use link devices as position-speed switching signals. [RD77GF]

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.45]	Speed-position switching device selection	3	Use the link device for switching from position control to speed control	4366+100n	1004366+100n

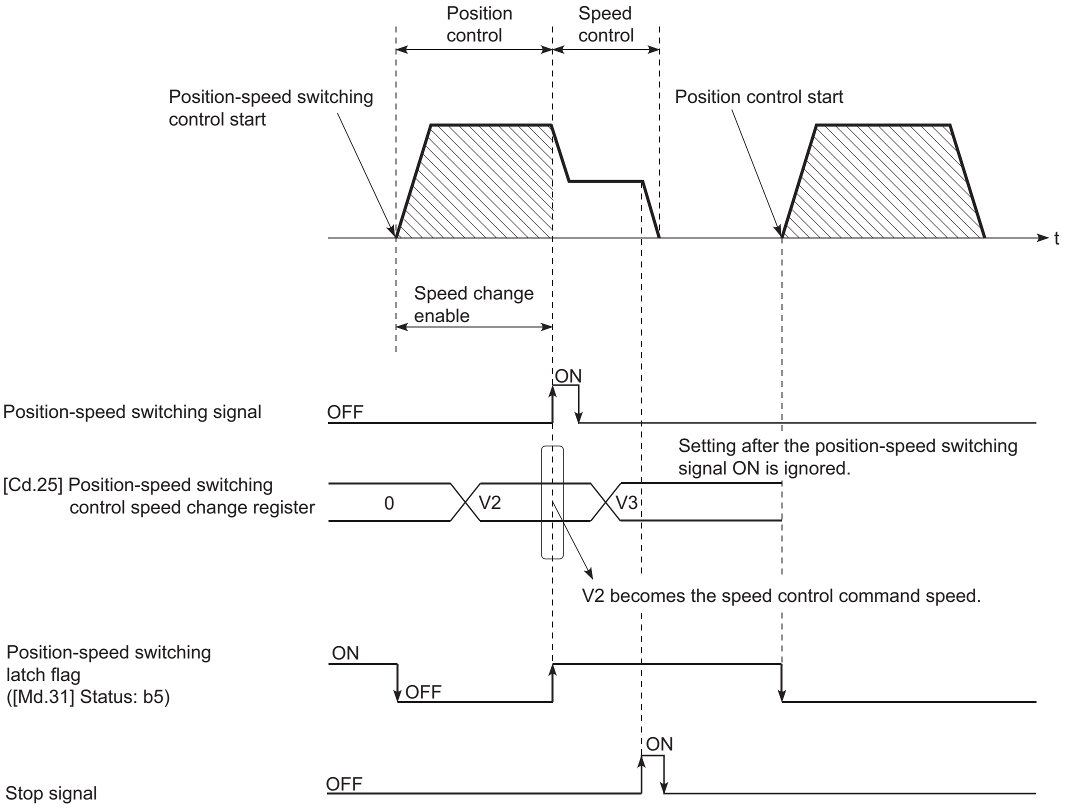
For details of the setting, refer to the following.

☞ Page 346 Link Device External Signal Assignment Function [RD77GF]

Changing the speed control command speed

In "position-speed switching control", the speed control command speed can be changed during the position control.

- The speed control command speed can be changed during the position control of position-speed switching control. A command speed change request will be ignored unless issued during the position control of the position-speed switching control.
- The "new command speed" is stored in "[Cd.25] Position-speed switching control speed change register" by the program during position control. This value then becomes the speed control command speed when the position-speed switching signal turns ON.



Point

- The machine recognizes the presence of a command speed change request when the data is written to "[Cd.25] Position-speed switching control speed change register" with the program.
- The new command speed is validated after execution of the position-speed switching control before the input of the position-speed switching signal.
- The command speed change can be enabled/disabled with the interlock function in speed control using the "position-speed switching latch flag" ([Md.31] Status: b5) of the axis monitor area.

Restrictions

- The error "Continuous path control not possible" (error code: 1A1EH to 1A20H) will occur and the operation cannot start if "continuous positioning control" or "continuous path control" is set in "[Da.1] Operation pattern".
- "Position-speed switching control" cannot be set in "[Da.2] Control method" of the positioning data when "continuous path control" has been set in "[Da.1] Operation pattern" of the immediately prior positioning data. (For example, if the operation pattern of positioning data No.1 is "continuous path control", "position-speed switching control" cannot be set in positioning data No.2.) The error "Continuous path control not possible" (error code: 1A1EH to 1A20H) will occur and the machine will carry out a deceleration stop if this type of setting is carried out.
- The software stroke limit range is only checked during speed control if the "1: Update command position value" is set in "[Pr.21] Command position value during speed control". The software stroke limit range is not checked when the control unit is set to "degree".
- The error "Software stroke limit +" (error code: 1993H) or "Software stroke limit -" (error code: 1995H) will occur and the operation cannot start if the start point address or end point address for position control exceeds the software stroke limit range.
- Deceleration stop will be carried out if the position-speed switching signal is not input before the machine is moved by a specified movement amount. When the position-speed switching signal is input during automatic deceleration by positioning control, acceleration is carried out again to the command speed to continue speed control. When the position-speed switching signal is input during deceleration to a stop with the stop signal, the control is switched to the speed control to stop the machine. Restart is carried out by speed control using the restart command.
- The warning "Speed limit value over" (warning code: 0991H) will occur and control is continued by "[Pr.8] Speed limit value" if a new speed exceeds "[Pr.8] Speed limit value" at the time of change of the command speed.
- If the value set in "[Da.6] Positioning address/movement amount" is negative, the error "Outside address range" (error code: 1A30H, 1A31H) will occur.
- Set WITH mode in the output timing at M code use. The M code will not be output, and the M code ON signal will not turn ON if the AFTER mode is set.

Setting positioning data

When using position-speed switching control, set the following positioning data.

◎: Always set, ○: Set as required, —: Setting not required

Setting item		Setting required/not required
[Da.1]	Operation pattern	◎
[Da.2]	Control method	◎ (Set "Forward run: position/speed" or "Reverse run: position/speed".)
[Da.3]	Acceleration time No.	◎
[Da.4]	Deceleration time No.	◎
[Da.6]	Positioning address/movement amount	◎
[Da.7]	Arc address	—
[Da.8]	Command speed	◎
[Da.9]	Dwell time/JUMP destination positioning data No.	○
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	○
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—
[Da.27]	M code ON signal output timing	○
[Da.28]	ABS direction in degrees	—
[Da.29]	Interpolation speed designation method	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

Current value changing

When the current value is changed to a new value, control is carried out in which the "[Md.20] Command position value" of the stopped axis is changed to a random address set by the user. (The "[Md.21] Machine feed value" is not changed when the current value is changed.)

The two methods for changing the current value are shown below.

- Changing to a new current value using the positioning data
- Changing to a new current value using the start No. (No.9003) for a current value changing

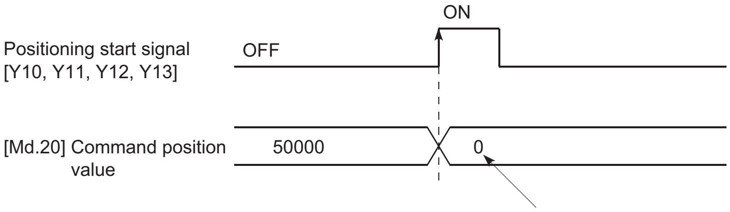
The current value changing using method [1] is used during continuous positioning of multiple blocks, etc.

Changing to a new current value using the positioning data

In "current value changing" ("[Da.2] Control method" = current value changing), "[Md.20] Command position value" is changed to the address set in "[Da.6] Positioning address/movement amount".

■Operation chart

The following chart shows the operation timing for a current value changing. The "[Md.20] Command position value" is changed to the value set in "[Da.6] Positioning address/movement amount" when the positioning start signal turns ON.



Command position value changes to the positioning address designated by the positioning data of the current value changing.

The above chart shows an example when the positioning address is "0".

■Restrictions

- The error "New current value not possible" (error code: 1A1CH, 1A1DH) will occur and the operation cannot start if "continuous path control" is set in "[Da.1] Operation pattern". ("Continuous path control" cannot be set in current value changing.)
- "Current value changing" cannot be set in "[Da.2] Control method" of the positioning data when "continuous path control" has been set in "[Da.1] Operation pattern" of the immediately prior positioning data. (For example, if the operation pattern of positioning data No.1 is "continuous path control", "current value changing" cannot be set in positioning data No.2.) The error "New current value not possible" (error code: 1A1CH, 1A1DH) will occur and the machine will carry out a deceleration stop if this type of setting is carried out.
- The error "Outside new current value range" (error code: 1997H) will occur and the operation cannot start if "degree" is set in "[Pr.1] Unit setting" and the value set in "[Da.6] Positioning address/movement amount (0 to 359.99999 [degree])" is outside the setting range.
- If the value set in "[Da.6] Positioning address/movement amount" is outside the software stroke limit ([Pr.12], [Pr.13]) setting range, the error "Software stroke limit +" (error code: 1A18H) or "Software stroke limit -" (error code: 1A1AH) will occur at the positioning start, and the operation will not start.
- The error "Software stroke limit +" (error code: 1994H) or "Software stroke limit -" (error code: 1996H) will occur if the new position value is outside the software stroke limit range.
- The new current value using the positioning data (No.1 to 600) cannot be changed, if "0: Positioning control is not executed" is set in "[Pr.55] Operation setting for incompletion of home position return" and "home position return request flag" ON. The error "Start at home position return incomplete" (error code: 19A6H) will occur.
- When using an absolute position system, "[Md.20] Command position value" returns to the value of "[Md.21] Machine feed value" at the start of communication with the servo amplifier after cycling the power or resetting the CPU module.

■Setting positioning data

When using current value changing, set the following positioning data.

◎: Always set, ○: Set as required, —: Setting not required

Setting item		Setting required/not required
[Da.1]	Operation pattern	◎
[Da.2]	Control method	◎ (Set the current value changing.)
[Da.3]	Acceleration time No.	—
[Da.4]	Deceleration time No.	—
[Da.6]	Positioning address/movement amount	◎ (Set the address to be changed.)
[Da.7]	Arc address	—
[Da.8]	Command speed	—
[Da.9]	Dwell time/JUMP destination positioning data No.	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	○
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—
[Da.27]	M code ON signal output timing	○
[Da.28]	ABS direction in degrees	—
[Da.29]	Interpolation speed designation method	—

Refer to the following for information on the setting details.

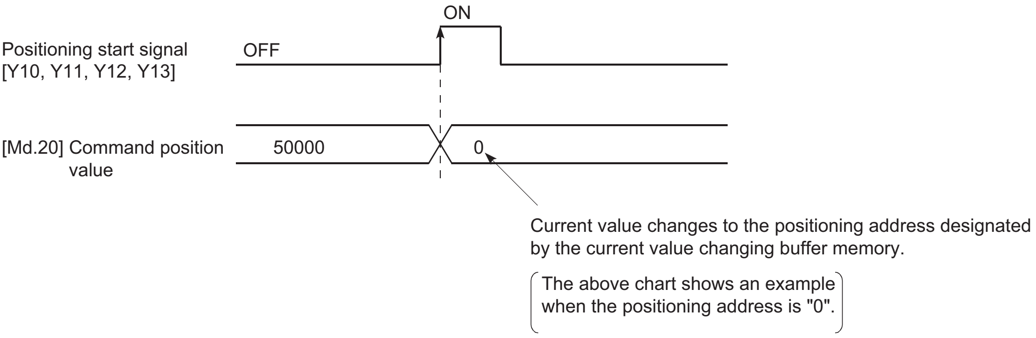
☞ Page 548 Positioning Data

Changing to a new current value using the current value changing start No. (No.9003)

In "current value changing" ("[Cd.3] Positioning start No." = 9003), "[Md.20] Command position value" is changed to the address set in "[Cd.9] New position value".

■Operation chart

The current value is changed by setting the new current value in the current value changing buffer memory "[Cd.9] New position value", setting "9003" in the "[Cd.3] Positioning start No.", and turning ON the positioning start signal.



■Restrictions

- The error "Outside new current value range" (error code: 1997H) will occur if the designated value is outside the setting range when "degree" is set in "Unit setting".
- The error "Software stroke limit +" (error code: 1994H) or "Software stroke limit -" (error code: 1996H) will occur if the designated value is outside the software stroke limit range.
- The current value cannot be changed during stop commands and while the M code ON signal is ON.
- The M code output function is made invalid.
- When using an absolute position system, "[Md.20] Command position value" returns to the value of "[Md.21] Machine feed value" at the start of communication with the servo amplifier after cycling the power or resetting the CPU module.

Point

The new current value can be changed using the current value changing start No. (No.9003) if "0: Positioning control is not executed" is set in "[Pr.55] Operation setting for incompletion of home position return" and home position return request flag is ON.

■Current value changing procedure

The following shows the procedure for changing the current value to a new value.

1. Write the current value to "[Cd. 9] New position value".
2. Write "9003" in "[Cd. 3] Positioning start No.".
3. Turn ON the positioning start signal.

■Setting method for the current value changing function

The following shows an example of a program and data setting to change the current value to a new value with the positioning start signal. (The value "[Md.20] Command position value" is changed to "5000.0 μm" in the example shown.)

- Set the following data. (Set using the program referring to the start time chart.)

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

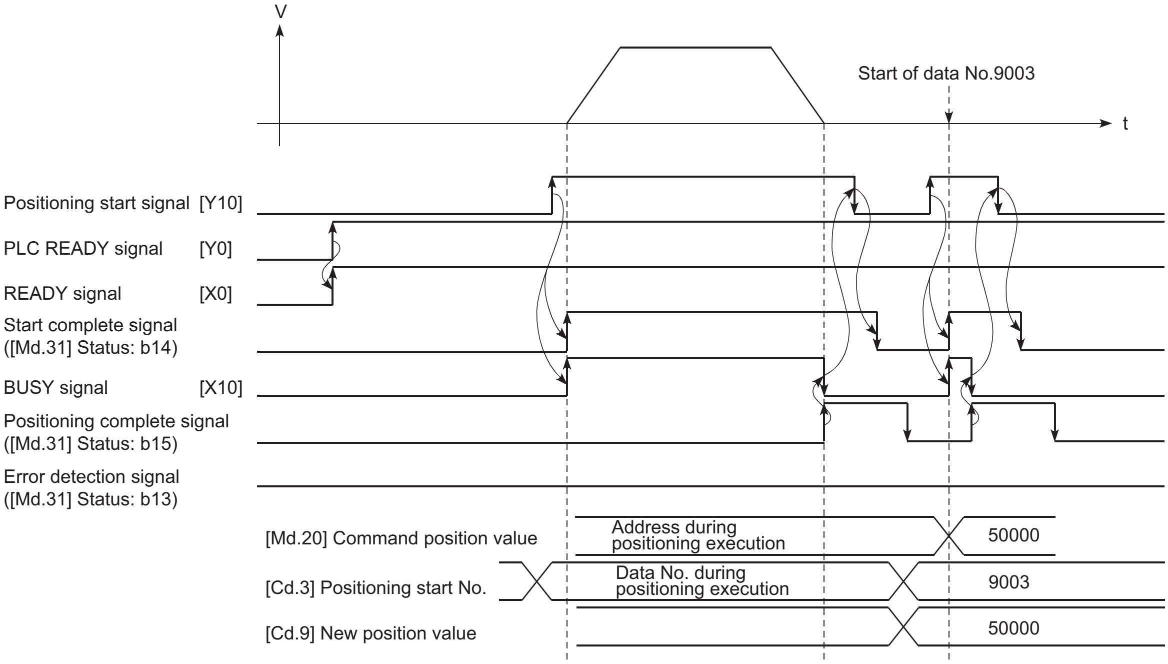
Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.3]	Positioning start No.	9003	Set the start No. "9003" for the new current value.	4300+100n	1004300+100n
[Cd.9]	New position value	50000	Set the new "[Md.20] Command position value".	4306+100n 4307+100n	1004306+100n 1004307+100n

Refer to the following for details on the setting details.

☞ Page 616 Control Data

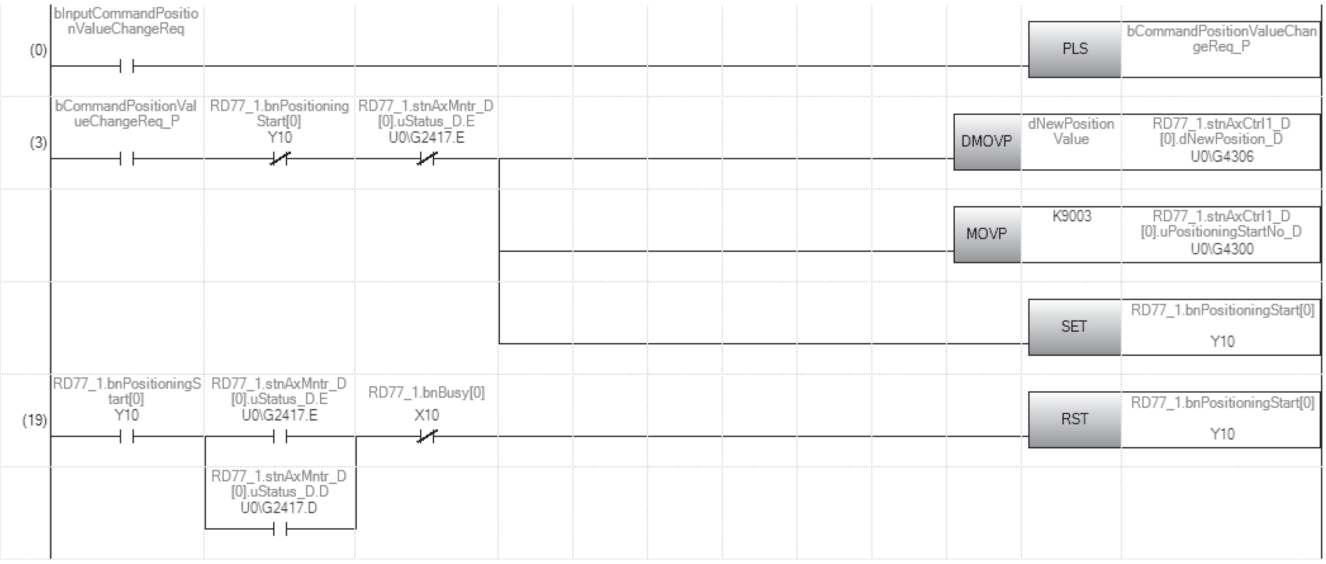
- The following shows a start time chart.

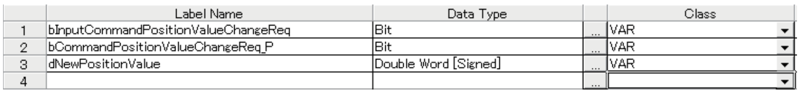
■Operation example



Program example

- Add the following program to the control program, and write it to the CPU module.



<table>
<tr><th>Classification</th><th>Label name</th><th>Description</th></tr>
<tr><td>Module label</td><td>RD77_1.bnPositioningStart[0]</td><td>Axis 1 Positioning start signal</td></tr>
<tr><td></td><td>RD77_1.stnAxMntr_D[0].uStatus_D.E</td><td>Axis 1 Start complete</td></tr>
<tr><td></td><td>RD77_1.stnAxCtrl1_D[0].dNewPosition_D</td><td>Axis 1 New position value</td></tr>
<tr><td></td><td>RD77_1.stnAxCtrl1_D[0].uPositioningStartNo_D</td><td>Axis 1 Positioning start No.</td></tr>
<tr><td></td><td>RD77_1.stnAxMntr_D[0].uStatus_D.D</td><td>Axis 1 Error detection</td></tr>
<tr><td></td><td>RD77_1.bnBusy[0]</td><td>Axis 1 BUSY signal</td></tr>
<tr><td>Global label, local label</td><td colspan="2">Defines the global label or the local label as follows. The settings of Assign (Device/Label) are not required for the label that the assignment device is not set because the unused internal relay and data device are automatically assigned.
The following table shows an example for the local label.

<table>
<tr><th></th><th>Label Name</th><th>Data Type</th><th></th><th>Class</th></tr>
<tr><td>1</td><td>bInputCommandPositionValueChangeReq</td><td>Bit</td><td>...</td><td>VAR</td></tr>
<tr><td>2</td><td>bCommandPositionValueChangeReq_P</td><td>Bit</td><td>...</td><td>VAR</td></tr>
<tr><td>3</td><td>dNewPositionValue</td><td>Double Word [Signed]</td><td>...</td><td>VAR</td></tr>
<tr><td>4</td><td></td><td></td><td>...</td><td></td></tr>
</table>
</td></tr>
</table>

NOP instruction

The NOP instruction is used for the nonexecutable control method.

Operation

The positioning data No. to which the NOP instruction is set transfers, without any processing, to the operation for the next positioning data No.

Setting positioning data

When using the NOP instruction, set the following positioning data.

◎: Always set, ○: Set as required, —: Setting not required

Setting item		Setting required/not required
[Da.1]	Operation pattern	—
[Da.2]	Control method	◎ (Set the NOP instruction.)
[Da.3]	Acceleration time No.	—
[Da.4]	Deceleration time No.	—
[Da.6]	Positioning address/movement amount	—
[Da.7]	Arc address	—
[Da.8]	Command speed	—
[Da.9]	Dwell time/JUMP destination positioning data No.	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	—
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—
[Da.27]	M code ON signal output timing	—
[Da.28]	ABS direction in degrees	—
[Da.29]	Interpolation speed designation method	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

Restrictions

The error "Control method setting error" (error code: 1A26H) will occur if the "NOP instruction" is set for the control method of the positioning data No.600.

Point

Example of NOP instruction usage

If there is a possibility of speed switching or temporary stop (automatic deceleration) at a point between two points during positioning, that data can be reserved with the NOP instruction to change the data merely by the replacement of the identifier.

JUMP instruction

The JUMP instruction is used to control the operation, so it jumps to a positioning data No. set in the positioning data during "continuous positioning control" or "continuous path control".

JUMP instruction includes the following two types of JUMP.

JUMP instruction	Description
Unconditional JUMP	When execution conditions are not set for the JUMP instruction (When "0" is set to the condition data No.)
Conditional JUMP	When execution conditions are set for the JUMP instruction (The conditions are set to the "condition data" used with "high-level positioning control".)

Using the JUMP instruction enables repeating of the same positioning control, or selection of positioning data by the execution conditions during "continuous positioning control" or "continuous path control".

Operation

■Unconditional JUMP

The JUMP instruction is unconditionally executed. The operation jumps to the positioning data No. set in "[Da.9] Dwell time/JUMP destination positioning data No.".

■Conditional JUMP

The block start condition data is used as the JUMP instruction execution conditions.

- When block positioning data No.7000 to 7004 is started: Each block condition data is used.
- When positioning data No.1 to 600 is started: Start block 0 condition data is used.
- When the execution conditions set in "[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches" of the JUMP instruction have been established: the JUMP instruction is executed to jump the operation to the positioning data No. set in "[Da.9] Dwell time/JUMP destination positioning data No.".
- When the execution conditions set in "[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches" of the JUMP instruction have not been established: the JUMP instruction is ignored, and the next positioning data No. is executed.

Restrictions

- When using a conditional JUMP instruction, establish the JUMP instruction execution conditions by the 4th positioning data No. before the JUMP instruction positioning data No. If the JUMP instruction execution conditions are not established by the time the 4th positioning control is carried out before the JUMP instruction positioning data No., the operation will be processed as an operation without established JUMP instruction execution conditions. (During execution of continuous path control/continuous positioning control, the Simple Motion module calculates the positioning data of the positioning data No. four items ahead of the current positioning data.)
- Set JUMP instruction to positioning data No. that "continuous positioning control" or "continuous path control" is set in operation pattern. It cannot set to positioning data No. that "positioning complete" is set in operation pattern.
- Positioning control such as loops cannot be executed by conditional JUMP instructions alone until the conditions have been established. When loop control is executed using JUMP instruction, an axis operation status is "analyzing" during loop control, and the positioning data analysis (start) for other axes are not executed. As the target of the JUMP instruction, specify a positioning data that is controlled by other than JUMP and NOP instructions.

Setting positioning data

When using the JUMP instruction, set the following positioning data.

◎: Always set, ○: Set as required, —: Setting not required

Setting item		Setting required/not required
[Da.1]	Operation pattern	—
[Da.2]	Control method	◎ (Set the JUMP instruction.)
[Da.3]	Acceleration time No.	—
[Da.4]	Deceleration time No.	—
[Da.6]	Positioning address/movement amount	—
[Da.7]	Arc address	—
[Da.8]	Command speed	—
[Da.9]	Dwell time/JUMP destination positioning data No.	◎ (Set the positioning data No.1 to 600 for the JUMP destination.)
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches	◎ (Set the JUMP instruction execution conditions with the condition data No. 0: Unconditional JUMP 1 to 10: Condition data No. ("Simultaneous start" condition data cannot be set.))
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—
[Da.27]	M code ON signal output timing	—
[Da.28]	ABS direction in degrees	—
[Da.29]	Interpolation speed designation method	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

LOOP

The LOOP is used for loop control by the repetition of LOOP to LEND.

Operation

The LOOP to LEND loop is repeated by set repeat cycles.

Setting positioning data

When using the LOOP, set the following positioning data.

◎: Always set, ○: Set as required, —: Setting not required

Setting item		Setting required/not required
[Da.1]	Operation pattern	—
[Da.2]	Control method	◎ (Set the LOOP.)
[Da.3]	Acceleration time No.	—
[Da.4]	Deceleration time No.	—
[Da.6]	Positioning address/movement amount	—
[Da.7]	Arc address	—
[Da.8]	Command speed	—
[Da.9]	Dwell time/JUMP destination positioning data No.	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	◎ (Set the repeat cycles.)
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—
[Da.27]	M code ON signal output timing	—
[Da.28]	ABS direction in degrees	—
[Da.29]	Interpolation speed designation method	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

Restrictions

- The error "Control method LOOP setting error" (error code: 1A33H) will occur if a "0" is set for the repeat cycles.
- Even if LEND is absent after LOOP, no error will occur, but repeat processing will not be carried out.
- Nesting is not allowed between LOOP-LEND's. If such setting is made, only the inner LOOP-LEND is processed repeatedly.

Point

The setting by this control method is easier than that by the special start "FOR loop". (☞ Page 161 Repeated start (FOR loop))

- For special start: Positioning start data, special start data, condition data, and positioning data
- For control method: Positioning data

For the special start FOR to NEXT, the positioning data is required for each of FOR and NEXT points. For the control method, loop can be executed even only by one data.

Also, nesting is enabled by using the control method LOOP to LEND in combination with the special start FOR to NEXT. However, LOOP to LEND cannot be set across block. Always set LOOP to LEND so that the processing ends within one block.

For details of the "block", refer to the following.

☞ Page 151 HIGH-LEVEL POSITIONING CONTROL

LEND

The LEND is used to return the operation to the top of the repeat (LOOP to LEND) loop.

Operation

When the repeat cycle designated by the LOOP becomes 0, the loop is terminated, and the next positioning data No. processing is started. (The operation pattern, if set to "Positioning complete", will be ignored.)

When the operation is stopped after the repeat operation is executed by designated cycles, the dummy positioning data (for example, incremental positioning without movement amount) is set next to LEND.

The following table shows the operation when the positioning complete (00) is set to LOOP and LEND.

Positioning data No.	Operation pattern	Control method	Conditions	Operation
1	Continuous control	ABS2		Executed in the order of the positioning data No.1 → 2 → 3 → 4 → 5 → 2 → 3 → 4 → 5 → 6. (The operation patterns of the positioning data Nos. 2 and 5 are ignored.)
2	Positioning complete	LOOP	Number of loop cycles: 2	
3	Continuous path control	ABS2		
4	Continuous control	ABS2		
5	Positioning complete	LEND		
6	Positioning complete	ABS2		

Setting positioning data

When using the LEND, set the following positioning data.

◎: Always set, ○: Set as required, —: Setting not required

Setting item		Setting required/not required
[Da.1]	Operation pattern	—
[Da.2]	Control method	◎ (Set the LEND.)
[Da.3]	Acceleration time No.	—
[Da.4]	Deceleration time No.	—
[Da.6]	Positioning address/movement amount	—
[Da.7]	Arc address	—
[Da.8]	Command speed	—
[Da.9]	Dwell time/JUMP destination positioning data No.	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches	—
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—
[Da.27]	M code ON signal output timing	—
[Da.28]	ABS direction in degrees	—
[Da.29]	Interpolation speed designation method	—

Refer to the following for information on the setting details.

☞ Page 548 Positioning Data

Restrictions

- Ignore the "LEND" before the "LOOP" is executed.
- When the operation pattern "Positioning complete" has been set between LOOP and LEND, the positioning control is completed after the positioning data is executed, and the LOOP control is not executed.

4 HIGH-LEVEL POSITIONING CONTROL

The details and usage of high-level positioning control (control functions using the "block start data") are explained in this chapter.

High-level positioning control is used to carry out applied control using the "positioning data". Examples of applied control are using conditional judgment to control "positioning data" set with the major positioning control, or simultaneously starting "positioning data" for several different axes.

Read the execution procedures and settings for each control, and set as required.

4.1 Outline of High-level Positioning Control

In "high-level positioning control" the execution order and execution conditions of the "positioning data" are set to carry out more applied positioning. (The execution order and execution conditions are set in the "block start data" and "condition data".)

The following applied positioning controls can be carried out with "high-level positioning control".

High-level positioning control	Details
Block[*1] 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[*2]	Simultaneously executes the designated positioning data of the axis designated with the "condition data". (Outputs command 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.

*1 "1 block" is defined as all the data continuing from the positioning data in which "continuous positioning control" or "continuous path control" is set in the "[Da.1] Operation pattern" to the positioning data in which "independent positioning control (Positioning complete)" is set.

*2 Besides the simultaneous start of "block start data" system, the "simultaneous starts" include the "multiple axes simultaneous start control" of control method. Refer to the following for details.
☞ Page 26 Multiple axes simultaneous start

[RD77GF]

If link devices and external input signals are used in combination, more applied positioning start can be carried out only with a parameter setting.

Ex.

· Repeat the same operation pattern while the switch is ON.

· Start an operation after setting the pattern with a touch panel.

· Start an operation after selecting the positioning No. to be started.

High-level positioning control sub functions

"High-level positioning control" uses the "positioning data" set with the "major positioning control". Refer to "Combination of Main Functions and Sub Functions" in the following manual for details on sub functions that can be combined with the major positioning control.

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

Note that the pre-reading start function cannot be used together with "high-level positioning control".

Data required for high-level positioning control

"High-level positioning control" is executed by setting the required items in the "block start data" and "condition data", then starting that "block start data". Judgment about whether execution is possible, etc., is carried out at execution using the "condition data" designated in the "block start data".

"Block start data" can be set for each No. from 7000 to 7004 (called "block Nos."), and up to 50 points can be set for each axis. (This data is controlled with Nos. called "points" to distinguish it from the positioning data. For example, the 1st block start data item is called the "1st point block start data" or "point No.1 block start data".)

"Condition data" can be set for each No. from 7000 to 7004 (called "block Nos."), and up to 10 data items can be set for each axis.

The "block start data" and "condition data" are set as 1 set for each block No.

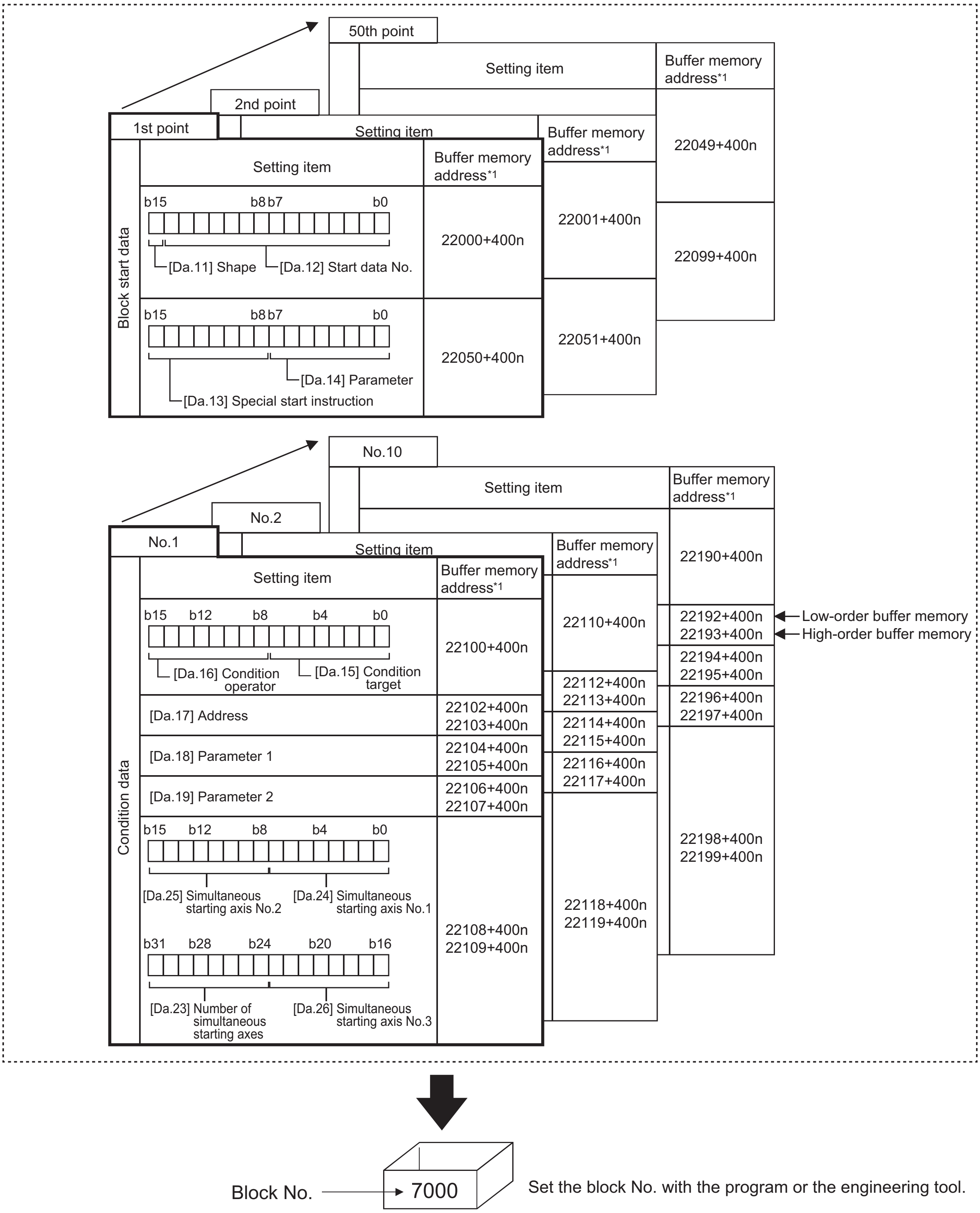
The following table shows an outline of the "block start data" and "condition data" stored in the Simple Motion module.

Setting item			Setting details
Block start data	[Da.11]	Shape	Set whether to end the control after executing only the "block start data" of the shape itself, or continue executing the "block start data" set in the next point.
	[Da.12]	Start data No.	Set the "positioning data No." to be executed.
	[Da.13]	Special start instruction	Set the method by which the positioning data set in [Da.12] will be started.
	[Da.14]	Parameter	Set the conditions by which the start will be executed according to the commands set in [Da.13]. (Designate the "condition data No." and "Number of repetitions".)

Setting item			Setting details
Condition data	[Da.15]	Condition target	Designate the "device", "buffer memory storage details", "positioning data No.", and "link device [RD77GF]" elements for which the conditions are set.
	[Da.16]	Condition operator	Set the judgment method carried out for the target set in [Da.15].
	[Da.17]	Address	Set the buffer memory address in which condition judgment is carried out (only when the details set in [Da.15] are "buffer memory storage details").
	[Da.18]	Parameter 1	Set the required conditions according to the details set in [Da.15], [Da.16] and [Da.23].
	[Da.19]	Parameter 2	
	[Da.23]	Number of simultaneous starting axes	Set the number of axes to be started simultaneously in the simultaneously start.
	[Da.24]	Simultaneous starting axis No.1	Set the simultaneous starting axis in the simultaneously start.
	[Da.25]	Simultaneous starting axis No.2	
	[Da.26]	Simultaneous starting axis No.3	

"Block start data" and "condition data" configuration

The "block start data" and "condition data" corresponding to "block No.7000" can be stored in the buffer memory.



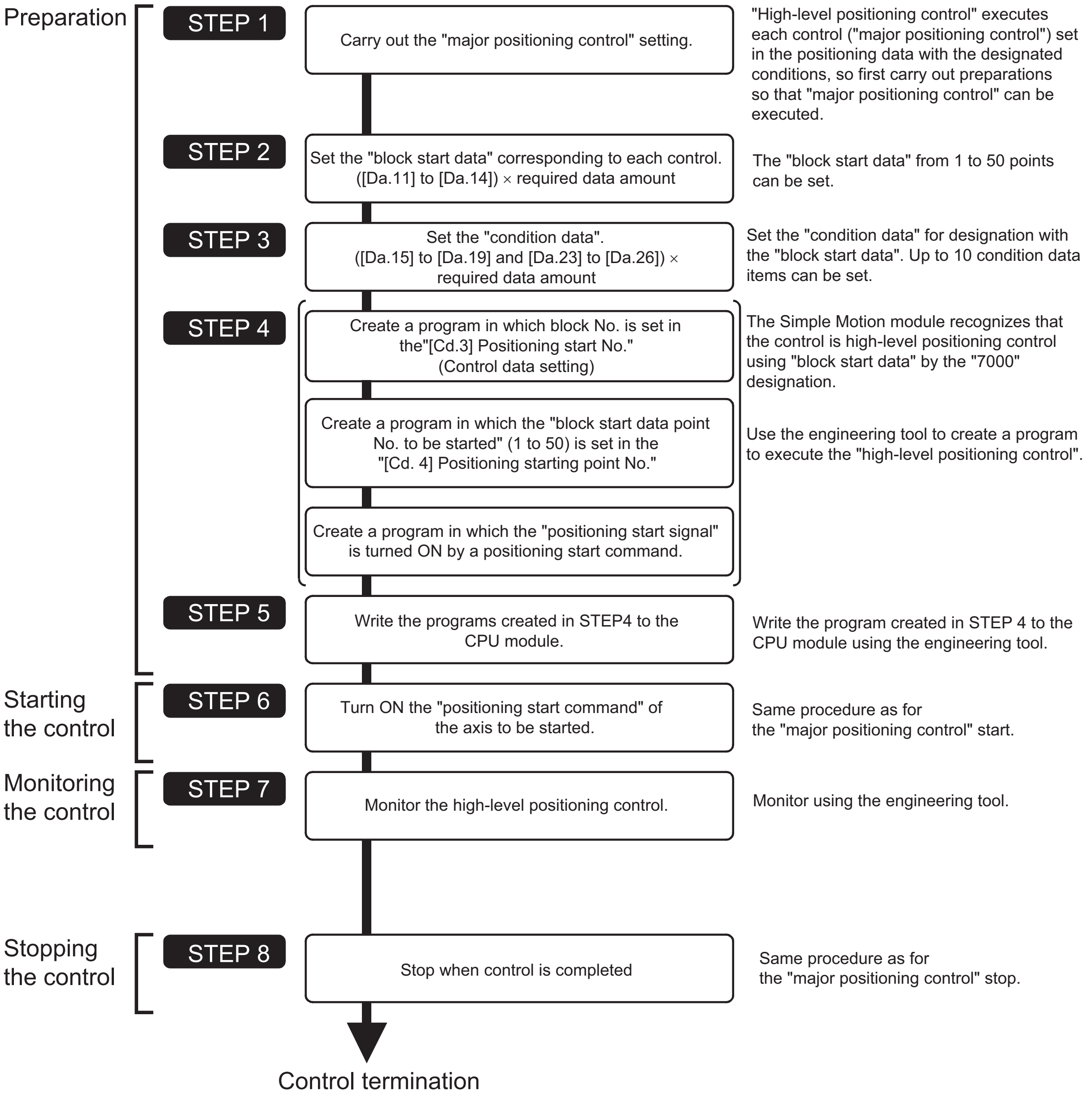
*1 Refer to the following for the buffer memory address of the axis 17 to 32.
☞ Page 480 Positioning data (Block start data)

Set the "block start data" and "condition data" corresponding to the following "block No.7001 to 7004" using the program or the engineering tool to Simple Motion module.

The "block start data" and "condition data" corresponding to "block No.7002 to 7004" are not allocated. Set the data with the engineering tool. [RD77MS]

4.2 High-level Positioning Control Execution Procedure

High-level positioning control is carried out using the following procedure.



Preparation

STEP 1

Carry out the "major positioning control" setting.

"High-level positioning control" executes each control ("major positioning control") set in the positioning data with the designated conditions, so first carry out preparations so that "major positioning control" can be executed.

STEP 2

Set the "block start data" corresponding to each control. ([Da.11] to [Da.14]) × required data amount

The "block start data" from 1 to 50 points can be set.

STEP 3

Set the "condition data". ([Da.15] to [Da.19] and [Da.23] to [Da.26]) × required data amount

Set the "condition data" for designation with the "block start data". Up to 10 condition data items can be set.

STEP 4

Create a program in which block No. is set in the"[Cd.3] Positioning start No." (Control data setting)

Create a program in which the "block start data point No. to be started" (1 to 50) is set in the "[Cd. 4] Positioning starting point No."

Create a program in which the "positioning start signal" is turned ON by a positioning start command.

The Simple Motion module recognizes that the control is high-level positioning control using "block start data" by the "7000" designation.

Use the engineering tool to create a program to execute the "high-level positioning control".

STEP 5

Write the programs created in STEP4 to the CPU module.

Write the program created in STEP 4 to the CPU module using the engineering tool.

Starting the control

STEP 6

Turn ON the "positioning start command" of the axis to be started.

Same procedure as for the "major positioning control" start.

Monitoring the control

STEP 7

Monitor the high-level positioning control.

Monitor using the engineering tool.

Stopping the control

STEP 8

Stop when control is completed

Same procedure as for the "major positioning control" stop.

Control termination

Point

- Five sets of "block start data (50 points)" and "condition data (10 items)" corresponding to "No.7000 to 7004" are set with a program.
- Five sets corresponding to "7000" to "7004" can be set with an engineering tool as well. When writing to the Simple Motion module after setting the "block start data" and the "condition data" corresponding to "7000" to "7004" using an engineering tool, "7000" to "7004" can be set in "[Cd.3] Positioning start No." on STEP4.

4.3 Setting the Block Start Data

Relation between various controls and block start data

The "block start data" must be set to carry out "high-level positioning control".

The setting requirements and details of each "block start data" item to be set differ according to the "[Da.13] Special start instruction" setting.

The following shows the "block start data" setting items corresponding to various control methods.

Also refer to the following for details on "condition data" with which control execution is judged.

☞ Page 164 Setting the Condition Data

(The "block start data" settings in this chapter are assumed to be carried out using the engineering tool.)

◎: One of the two setting items must be set.

○: Set as required (Set to "—" when not used.)

×: Setting not possible

—: Setting not required (Set the initial value or a value within the setting range.)

Block start data setting items			Block start (Normal start)	Condition start	Wait start	Simultaneous start	Repeated start (FOR loop)	Repeated start (FOR condition)	NEXT start[1]
[Da.11]	Shape	0: End	◎	◎	◎	◎	×	×	◎
		1: Continue	◎	◎	◎	◎	◎	◎	◎
[Da.12]	Start data No.		1 to 600						
[Da.13]	Special start instruction		0	1	2	3	4	5	6
[Da.14]	Parameter		—	Condition data No.			Number of repetitions	Condition data No.	—

[1] The "NEXT start" instruction is used in combination with "repeated start (FOR loop)" and "repeated start (FOR condition)". Control using only the "NEXT start" will not be carried out.

Point

It is recommended that the "block start data" be set whenever possible with the engineering tool. Execution by a program uses many programs and devices. The execution becomes complicated, and the scan times will increase.

Block start

In a "block start (normal start)", the positioning data groups of a block are continuously executed in a set PLC starting from the positioning data set in "[Da.12] Start data No." by one start.

The control examples are shown when the "block start data" and "positioning data" are set as shown in the setting examples.

Setting examples

■Block start data setting example

Axis 1 block start data	[Da.11] Shape	[Da.12] Start data No.	[Da.13] Special start instruction	[Da.14] Parameter
1st point	1: Continue	1	0: Block start	—
2nd point	1: Continue	2	0: Block start	—
3rd point	1: Continue	5	0: Block start	—
4th point	1: Continue	10	0: Block start	—
5th point	0: End	15	0: Block start	—
⋮				

■Positioning data setting example

Axis 1 positioning data No.	[Da.1] Operation pattern	
1	00: Positioning complete	
2	11: Continuous path control	1 block[*1]
3	01: Continuous positioning control	
4	00: Positioning complete	
5	11: Continuous path control	1 block
6	00: Positioning complete	
⋮		
10	00: Positioning complete	
⋮		
15	00: Positioning complete	
⋮		

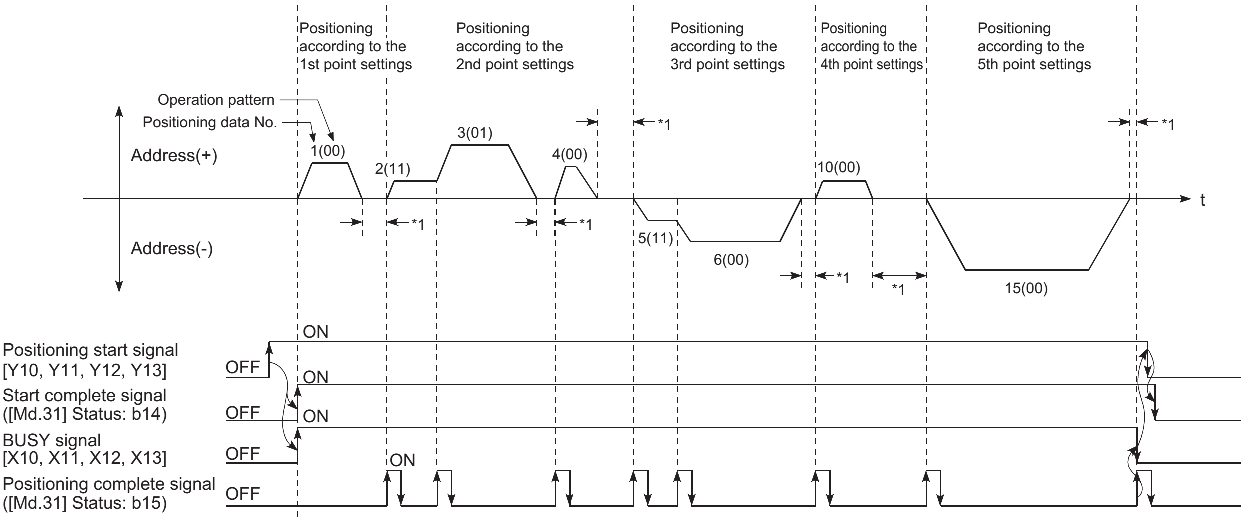
*1 "1 block" is defined as all the data continuing from the positioning data in which "continuous positioning control" or "continuous path control" is set in the "[Da.1] Operation pattern" to the positioning data in which "independent positioning control (Positioning complete)" is set.

Control examples

The following shows the control being executed when the "block start data" of the 1st point of axis 1 is set as shown in the setting examples and started.

- The positioning data is executed in the following order before stopping. Axis 1 positioning data No.1 → 2 → 3 → 4 → 5 → 6 → 10 → 15.

■Operation example



*1 Dwell time of corresponding positioning data

Condition start

In a "condition start", the "condition data" conditional judgment designated in "[Da.14] Parameter" is carried out for the positioning data set in "[Da.12] Start data No.". If the conditions have been established, the "block start data" set in "1: condition start" is executed. If the conditions have not been established, that "block start data" will be ignored, and the "block start data" of the next point will be executed.

The control examples are shown when the "block start data" and "positioning data" are set as shown in the setting examples.

Setting examples

■Block start data setting example

Axis 1 block start data	[Da.11] Shape	[Da.12] Start data No.	[Da.13] Special start instruction	[Da.14] Parameter
1st point	1: Continue	1	1: Condition start	1
2nd point	1: Continue	10	1: Condition start	2
3rd point	0: End	50	0: Block start	—
⋮				

The "condition data Nos." have been set in "[Da.14] Parameter".

■Positioning data setting example

Axis 1 positioning data No.	[Da.1] Operation pattern
1	01: Continuous positioning control
2	01: Continuous positioning control
3	00: Positioning complete
⋮	
10	11: Continuous path control
11	11: Continuous path control
12	00: Positioning complete
⋮	
50	00: Positioning complete
⋮	

Control examples

The following shows the control executed when the "block start data" of the 1st point of axis 1 is set as shown in the setting examples and started.

1. The conditional judgment set in "condition data No.1" is carried out before execution of the axis 1 "positioning data No.1".

→ Conditions established → Execute positioning data No.1, 2, and 3 → Go to the next 2.

→ Conditions not established → Go to the next 2.

2. The conditional judgment set in "condition data No.2" is carried out before execution of the axis 1 "positioning data No.10".

→ Conditions established → Execute positioning data No.10, 11, and 12 → Go to the next 3.

→ Conditions not established → Go to the next 3.

3. Execute axis 1 "positioning data No.50" and stop the control.

Wait start

In a "wait start", the "condition data" conditional judgment designated in "[Da.14] Parameter" is carried out for the positioning data set in "[Da.12] Start data No.". If the conditions have been established, the "block start data" is executed. If the conditions have not been established, the control stops (waits) until the conditions are established.
The control examples are shown when the "block start data" and "positioning data" are set as shown in the setting examples.

Setting examples

■Block start data setting example

Axis 1 block start data	[Da.11] Shape	[Da.12] Start data No.	[Da.13] Special start instruction	[Da.14] Parameter
1st point	1: Continue	1	2: Wait start	3
2nd point	1: Continue	10	0: Block start	—
3rd point	0: End	50	0: Block start	—
⋮				

The "condition data Nos." have been set in "[Da.14] Parameter".

■Positioning data setting example

Axis 1 positioning data No.	[Da.1] Operation pattern
1	01: Continuous positioning control
2	01: Continuous positioning control
3	00: Positioning complete
⋮	
10	11: Continuous path control
11	11: Continuous path control
12	00: Positioning complete
⋮	
50	00: Positioning complete
⋮	

Control examples

The following shows the control executed when the "block start data" of the 1st point of axis 1 is set as shown in the setting examples and started.

1. The conditional judgment set in "condition data No. 3" is carried out before execution of the axis 1 "positioning data No.1".

→ Conditions established → Execute positioning data No.1, 2, and 3 → Go to the next 2.
→ Conditions not established → Control stops (waits) until conditions are established → Go to the above 1.

2. Execute the axis 1 "positioning data No.10, 11, 12, and 50" and stop the control.

Simultaneous start

In a "simultaneous start", the positioning data set in the "[Da.12] Start data No." and positioning data of other axes set in the "condition data" are simultaneously executed (commands are output with the same timing). (The "condition data" is designated with "[Da.14] Parameter".)
The control examples are shown when the "block start data" and "positioning data" are set as shown in the setting examples.

Setting examples

■Block start data setting example

Axis 1 block start data	[Da.11] Shape	[Da.12] Start data No.	[Da.13] Special start instruction	[Da.14] Parameter
1st point	0: End	1	3: Simultaneous start	4
⋮				

It is assumed that the "axis 2 positioning data" for simultaneous starting is set in the "condition data" designated with "[Da.14] Parameter".

■Positioning data setting example

Axis 1 positioning data No.	[Da.1] Operation pattern
1	01: Continuous positioning control
2	01: Continuous positioning control
3	00: Positioning complete
⋮	

Control examples

The following shows the control executed when the "block start data" of the 1st point of axis 1 is set as shown in the setting examples and started.

1. Check the axis operation status of axis 2 which is regarded as the simultaneous starting axis.

→ Axis 2 is standing by → Go to the next 2.

→ Axis 2 is carrying out positioning. → An error occurs and simultaneous start will not be carried out.

2. Simultaneously start the axis 1 "positioning data No.1" and axis 2 positioning data set in "condition data No.4.

Precautions

Positioning data No. executed by simultaneous starting axes is set to condition data ("[Da.18] Parameter 1", "[Da.19] Parameter 2"), but the setting value of start axis (the axis which carries out positioning start) should be "0". If the setting value is set to other than "0", the positioning data set in "[Da.18] Parameter 1", "[Da.19] Parameter 2" is given priority to be executed rather than "[Da.12] Start data No.".
For details, refer to the following.

☞ Page 568 Condition Data

Repeated start (FOR loop)

In a "repeated start (FOR loop)", the data between the "block start data" in which "4: FOR loop" is set in "[Da.13] Special start instruction" and the "block start data" in which "6: NEXT start" is set in "[Da.13] Special start instruction " is repeatedly executed for the number of times set in "[Da.14] Parameter". An endless loop will result if the number of repetitions is set to "0".

(The number of repetitions is set in "[Da.14] Parameter" of the "block start data" in which "4: FOR loop" is set in "[Da.13] Special start instruction".)

The control examples are shown when the "block start data" and "positioning data" are set as shown in the setting examples.

Setting examples

■Block start data setting example

Axis 1 block start data	[Da.11] Shape	[Da.12] Start data No.	[Da.13] Special start instruction	[Da.14] Parameter
1st point	1: Continue	1	4: FOR loop	2
2nd point	1: Continue	10	0: Block start	—
3rd point	0: End	50	6: NEXT start	—
⋮				

The "condition data Nos." have been set in "[Da.14] Parameter".

■Positioning data setting example

Axis 1 positioning data No.	[Da.1] Operation pattern
1	01: Continuous positioning control
2	01: Continuous positioning control
3	00: Positioning complete
⋮	
10	11: Continuous path control
11	00: Positioning complete
⋮	
50	01: Continuous positioning control
51	00: Positioning complete
⋮	

Control examples

The following shows the control executed when the "block start data" of the 1st point of axis 1 is set as shown in the setting examples and started.

1. Execute the axis 1 "positioning data No.1, 2, 3, 10, 11, 50, and 51".
2. Return to the axis 1 "1st point block start data". Again execute the axis 1 "positioning data No.1, 2, 3, 10, 11, 50 and 51", and then stop the control. (Repeat for the number of times (2 times) set in [Da.14].)

Repeated start (FOR condition)

In a "repeated start (FOR condition)", the data between the "block start data" in which "5: FOR condition" is set in "[Da.13] Special start instruction" and the "block start data" in which "6: NEXT start" is set in "[Da.13] Special start instruction" is repeatedly executed until the establishment of the conditions set in the "condition data".

Conditional judgment is carried out as soon as switching to the point of "6: NEXT start" (before positioning of NEXT start point).

(The "condition data" designation is set in "[Da.14] Parameter" of the "block start data" in which "5: FOR condition" is set in "[Da.13] Special start instruction".)

The control examples are shown when the "block start data" and "positioning data" are set as shown in the setting examples.

Setting examples

■Block start data setting example

Axis 1 block start data	[Da.11] Shape	[Da.12] Start data No.	[Da.13] Special start instruction	[Da.14] Parameter
1st point	1: Continue	1	5: FOR condition	5
2nd point	1: Continue	10	0: Block start	—
3rd point	0: End	50	6: NEXT start	—
⋮				

The "condition data Nos." have been set in "[Da.14] Parameter".

■Positioning data setting example

Axis 1 positioning data No.	[Da.1] Operation pattern
1	01: Continuous positioning control
2	01: Continuous positioning control
3	00: Positioning complete
⋮	
10	11: Continuous path control
11	00: Positioning complete
⋮	
50	01: Continuous positioning control
51	00: Positioning complete
⋮	

Control examples

The following shows the control executed when the "block start data" of the 1st point of axis 1 is set as shown in the setting examples and started.

1. Execute the axis 1 "positioning data No.1, 2, 3, 10, and 11".
2. Carry out the conditional judgment set in axis 1 "condition data No.5".[*1]

→ Conditions not established → Execute "Positioning data No.50, 51". Go to the above 1.

→ Conditions established → Execute "Positioning data No.50, 51" and complete the positioning.

[*1] Conditional judgment is carried out as soon as switching to NEXT start point (before positioning of NEXT start point).

Restrictions when using the NEXT start

The "NEXT start" is an instruction indicating the end of the repetitions when executing the repeated start (FOR loop) and the repeated start (FOR condition).

(☞ Page 161 Repeated start (FOR loop), ☞ Page 162 Repeated start (FOR condition))

The following shows the restrictions when setting "6: NEXT start" in the "block start data".

- The processing when "6: NEXT start" is set before execution of "4: FOR loop" or "5: FOR condition" is the same as that for a "0: block start".
- Repeated processing will not be carried out if there is no "6: NEXT start" instruction after the "4: FOR loop" or "5: FOR condition" instruction. (Note that an "error" will not occur.)
- Nesting is not possible between "4: FOR loop" and "6: NEXT start", or between "5: FOR condition" and "6: NEXT start". The warning "FOR to NEXT nest construction" (warning code: 09F1H) will occur if nesting is attempted.

[Operating examples without nesting structure]

Start block data	[Da.13] Special start instruction
1st point	Normal start
2nd point	FOR
3rd point	Normal start
4th point	NEXT → FOR of the 2nd point
5th point	Normal start
6th point	Normal start
7th point	FOR
8th point	Normal start
9th point	NEXT → FOR of the 7th point
⋮	

[Operating examples with nesting structure]

Start block data	[Da.13] Special start instruction
1st point	Normal start
2nd point	FOR
3rd point	Normal start
4th point	FOR
5th point	Normal start
6th point	Normal start
7th point	NEXT → FOR of the 4th point
8th point	Normal start
9th point	NEXT
⋮	

A warning will occur when starting the 4th point "FOR". The JUMP destination of the 7th point "NEXT" is the 4th point. The 9th point "NEXT" is processed as normal start.

4.4 Setting the Condition Data

Relation between various controls and the condition data

"Condition data" is set in the following cases.

- When setting conditions during execution of JUMP instruction (major positioning control)
- When setting conditions during execution of "high-level positioning control"

The "condition data" to be set includes the setting items from [Da.15] to [Da.19] and [Da.23] to [Da.26], but the setting requirements and details differ according to the control method and setting conditions.

The following shows the "condition data" "[Da.15] Condition target" corresponding to the different types of control.

(The "condition data" settings in this chapter are assumed to be carried out using the engineering tool.)

◎: One of the setting items must be set.

×: Setting not possible

Setting item for "[Da.15] Condition target"	High-level positioning control				Major positioning control
	Block start	Wait start	Simultaneous start	Repeated start (For condition)	JUMP instruction
01H: Device X[*1]	◎	◎	×	◎	◎
02H: Device Y[*1]	◎	◎	×	◎	◎
03H: Buffer memory (1 word)	◎	◎	×	◎	◎
04H: Buffer memory (2 words)	◎	◎	×	◎	◎
05H: Positioning data No.	×	×	◎	×	×
11H: RX (1 bit) [RD77GF]	◎	◎	×	◎	◎
12H: RY (1 bit) [RD77GF]	◎	◎	×	◎	◎
13H: RWr (1 bit) [RD77GF]	◎	◎	×	◎	◎
14H: RWw (1 bit) [RD77GF]	◎	◎	×	◎	◎
21H: RX (1 word) [RD77GF]	◎	◎	×	◎	◎
22H: RY (1 word) [RD77GF]	◎	◎	×	◎	◎
23H: RWr (1 word) [RD77GF]	◎	◎	×	◎	◎
24H: RWw (1 word) [RD77GF]	◎	◎	×	◎	◎
31H: RX (2 words) [RD77GF]	◎	◎	×	◎	◎
32H: RY (2 words) [RD77GF]	◎	◎	×	◎	◎
33H: RWr (2 words) [RD77GF]	◎	◎	×	◎	◎
34H: RWw (2 words) [RD77GF]	◎	◎	×	◎	◎

*1 Refer to devices X/Y which belongs to Simple Motion module.

Restriction

It is recommended that the "condition data" be set whenever possible with the engineering tool. Execution by a program uses many programs and devices. The execution becomes complicated, and the scan times will increase.

The setting requirements and details of the following "condition data" [Da.16] to [Da.19] and [Da.23] setting items differ according to the "[Da.15] Condition target" setting.

The following shows the [Da.16] to [Da.19] and [Da.23] setting items corresponding to the "[Da.15] Condition target".

—: Setting not required (Set the initial value or a value within the setting range.)

**: Value stored in buffer memory designated in [Da.17]

[RD77MS]

[Da.15] Condition target	**[Da.16] Condition operator**	**[Da.23] Number of simultaneous starting axes**	**[Da.17] Address**	**[Da.18] Parameter 1**	**[Da.19] Parameter 2**
01H: Device X	07H: DEV = ON 08H: DEV = OFF	—	—	X: 0H, 1H 10H to 1FH[1] Y: 0H, 1H, 10H to 1FH[1]	—
02H: Device Y					
03H: Buffer memory (1 word)[2]	01H: ** = P1 02H: ** ≠ P1 03H: ** ≤ P1 04H: ** ≥ P1 05H: P1 ≤ ** ≤ P2 06H: ** ≤ P1, P2 ≤ **		Buffer memory address	P1 (numeric value)	P2 (numeric value) (Set only when "[Da.16] Condition operator" is [05H] or [06H].)
04H: Buffer memory (2 words)[2]					
05H: Positioning data No.	Setting not possible	2	—	Low-order 16 bits: "[Da.24] Simultaneous starting axis No.1" positioning data No. High-order 16 bits: "[Da.25] Simultaneous starting axis No.2" positioning data No.	—
		3			
		4			Low-order 16 bits: "[Da.26] Simultaneous starting axis No.3" positioning data No. High-order 16 bits: Unusable (Set "0".)

*1 The setting value, whose axis No. exceeds the number of controlled axes, cannot be used.

*2 Comparison of ≤ and ≥ is judged as signed values. (☞ Page 572 [Da.16] Condition operator)

[RD77GF]

[Da.15] **Condition target**	**[Da.16]** **Condition operator**	**[Da.23]** **Number of simultaneous starting axes**	**[Da.17]** **Address**	**[Da.18]** **Parameter 1**	**[Da.19]** **Parameter 2**
01H: Device X	07H: DEV = ON 08H: DEV = OFF	—	—	X: 0H, 1H, 10H to 3FH*1 Y: 0H, 1H, 10H to 3FH*1 RWr (1 bit), RWw (1 bit): 0 to F	—
02H: Device Y					
03H: Buffer memory (1 word)*2	01H: ** = P1 02H: ** ≠ P1 03H: ** ≤ P1 04H: ** ≥ P1 05H: P1 ≤ ** ≤ P2 06H: ** ≤ P1, P2 ≤ **		Buffer memory address	P1 (numeric value)	P2 (numeric value) (Set only when "[Da.16]" is [05H] or [06H].)
04H: Buffer memory (2 words)*2					
05H: Positioning data No.	Setting not possible	2	—	Low-order 16 bits: "[Da.24] Simultaneous starting axis No.1" positioning data No. High-order 16 bits: "[Da.25] Simultaneous starting axis No.2" positioning data No.	—
		3			
		4			Low-order 16 bits: "[Da.26] Simultaneous starting axis No.3" positioning data No. High-order 16 bits: Unusable (Set "0".)
11H: RX (1 bit)	07H: DEV = ON 08H: DEV = OFF	—	Link device No.	—	—
12H: RY (1 bit)					
13H: RWr (1 bit)				0 to 0FH (bit No.)	
14H: RWw (1 bit)					
21H: RX (1 word)	01H: ** = P1 02H: ** ≠ P1 03H: ** ≤ P1 04H: ** ≥ P1 05H: P1 ≤ ** ≤ P2 06H: ** ≤ P1, P2 ≤ **			P1 (numeric value)	P2 (numeric value) (Set only when "[Da.16]" is [05H] or [06H].)
22H: RY (1 word)					
23H: RWr (1 word)					
24H: RWw (1 word)					
31H: RX (2 words)					
32H: RY (2 words)					
33H: RWr (2 words)					
34H: RWw (2 words)					

*1 The setting value, whose axis No. exceeds the number of controlled axes, cannot be used.

*2 Comparison of ≤ and ≥ is judged as signed values. (☞ Page 572 [Da.16] Condition operator)

Judgment whether the condition operator is "=" or "≠" at the start of wait.

Judgment on data is carried out for each operation cycle of the Simple Motion module. Thus, in the judgment on the data such as command position value which varies continuously, the operator "=" may not be detected. If this occurs, use a range operator.

Condition data setting examples

The following shows the setting examples for "condition data".

Setting the device ON/OFF as a condition

[Condition]

Device "X10" (Axis 1 BUSY signal) is OFF

[Da.15] Condition target	[Da.16] Condition operator	[Da.17] Address	[Da.18] Parameter 1	[Da.19] Parameter 2	[Da.23] Number of simultaneous starting axes	[Da.24] Simultaneous starting axis No.1	[Da.25] Simultaneous starting axis No.2	[Da.26] Simultaneous starting axis No.3
01H: Device X	08H: DEV = OFF	—	10H	—	—	—	—	—

Setting the numeric value stored in the "buffer memory" as a condition

[Condition]

The value stored in buffer memory addresses "2400, 2401" ([Md.20] Command position value) is "1000" or larger.

[Da.15] Condition target	[Da.16] Condition operator	[Da.17] Address	[Da.18] Parameter 1	[Da.19] Parameter 2	[Da.23] Number of simultaneous starting axes	[Da.24] Simultaneous starting axis No.1	[Da.25] Simultaneous starting axis No.2	[Da.26] Simultaneous starting axis No.3
04H: Buffer memory (2 words)	04H: ** ≥ P1	2400	1000	—	—	—	—	—

Designating the axis and positioning data No.[1]

[1] The axis and positioning data No. are to be simultaneously started in "simultaneous start".

[Condition]

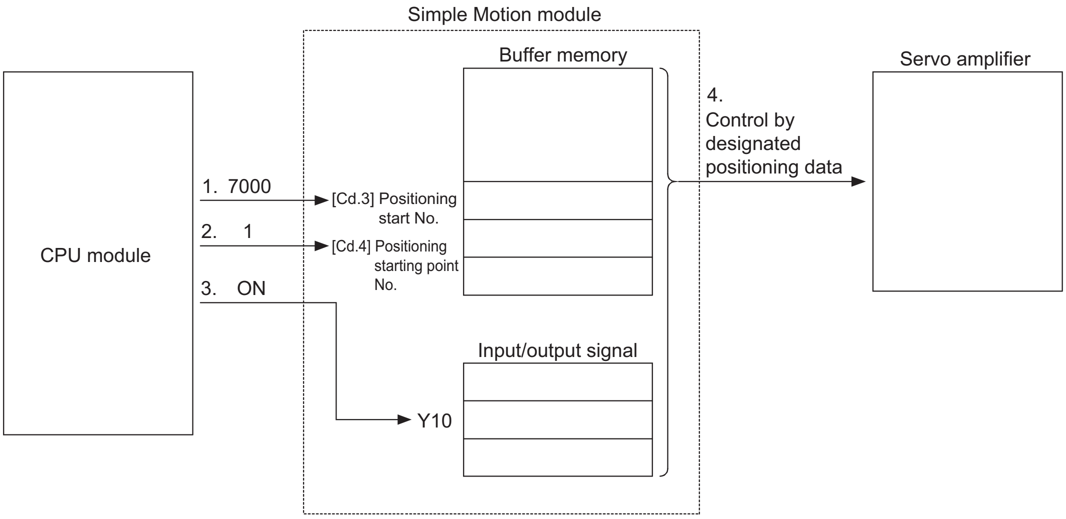
Simultaneous starting "axis 2 positioning data No.3"

[Da.15] Condition target	[Da.16] Condition operator	[Da.17] Address	[Da.18] Parameter 1	[Da.19] Parameter 2	[Da.23] Number of simultaneous starting axes	[Da.24] Simultaneous starting axis No.1	[Da.25] Simultaneous starting axis No.2	[Da.26] Simultaneous starting axis No.3
05H: Positioning data No.	—	—	Low-order 16 bits "0003H"	—	2H: 2 axes	1H: Axis 2	0H	0H

4.5 Start Program for High-level Positioning Control

Starting high-level positioning control

To execute high-level positioning control, a program must be created to start the control in the same method as for major positioning control.
The following shows the procedure for starting the "1st point block start data" (regarded as block No.7000) set in axis 1.



Point

When carrying out a positioning start with the next scan after a positioning operation is completed, turn the Y10 signal OFF and input the start complete signal ([Md.31] Status: b14) as an interlock condition to start after the start complete signal ([Md.31] Status: b14) is turned OFF.

1. Set "7000" in "[Cd.3] Positioning start No.".

(This establishes that the control as "high-level positioning control" using block start data.)

2. Set the point No. of the "block start data" to be started. (In this case "1".)

3. Turn ON the start signal.

4. The positioning data set in the "1st point block start data" is started.

Example of a start program for high-level positioning control

The following shows an example of a start program for high-level positioning control in which the 1st point "block start data" of axis 1 is started. (The block No. is regarded as "7000".)

Control data that require setting

The following control data must be set to execute high-level positioning control. The setting is carried out using a program.
n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.3]	Positioning start No.	7000	Set "7000" to indicate control using "block start data".	4300+100n	1004300+100n
[Cd.4]	Positioning starting point No.	1	Set the point No. of the "block start data" to be started.	4301+100n	1004301+100n

Refer to the following for details on the setting details.

☞ Page 616 Control Data

Start conditions

The following conditions must be fulfilled when starting the control. The required conditions must also be integrated into the program, and configured so the control does not start unless the conditions are fulfilled.

Signal name		**Signal state**		**Device**
Interface signal	PLC READY signal	ON	CPU module preparation completed	Y0
	READY signal	ON	Preparation completed	X0
	All axis servo ON	ON	All axis servo ON	Y1
	Synchronization flag	ON	The buffer memory can be accessed.	X1
	Axis stop signal	OFF	Axis stop signal is OFF	[Cd.180] Axis stop
	Start complete signal	OFF	Start complete signal is OFF	[Md.31] Status: b14
	BUSY signal	OFF	BUSY signal is OFF	X10 to X2F[1]
	Error detection signal	OFF	There is no error	[Md.31] Status: b13
	M code ON signal	OFF	M code ON signal is OFF	[Md.31] Status: b12
External signal	Forced stop input signal	ON	There is no forced stop input	—
	Stop signal	OFF	Stop signal is OFF	—
	Upper limit (FLS)	ON	Within limit range	—
	Lower limit (RLS)	ON	Within limit range	—

[1] The BUSY signal, whose axis No. exceeds the number of controlled axes, cannot be used.

Start time chart

The following chart shows a time chart in which the positioning data No.1, 2, 10, 11, and 12 of the axis 1 are continuously executed as an example.

■Block start data setting example

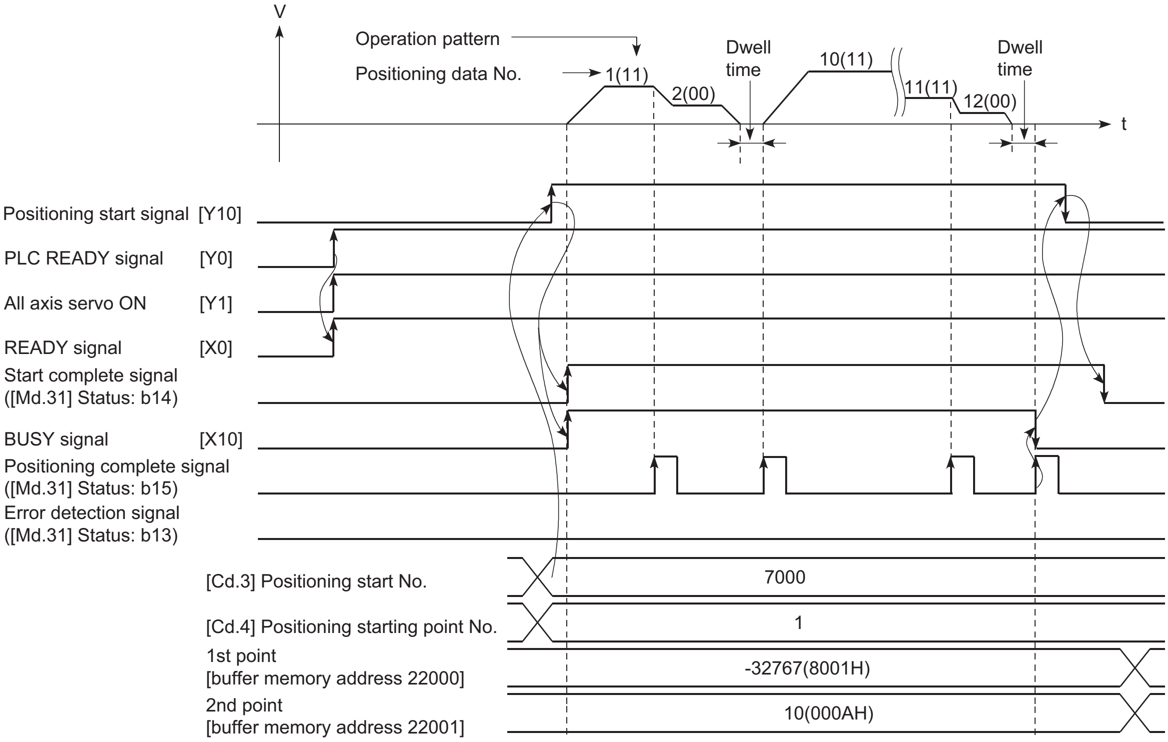
Axis 1 block start data	[Da.11] Shape	[Da.12] Start data No.	[Da.13] Special start instruction	[Da.14] Parameter
1st point	1: Continue	1	0: Block start	—
2nd point	0: End	10	0: Block start	—
⋮				

■Positioning data setting example

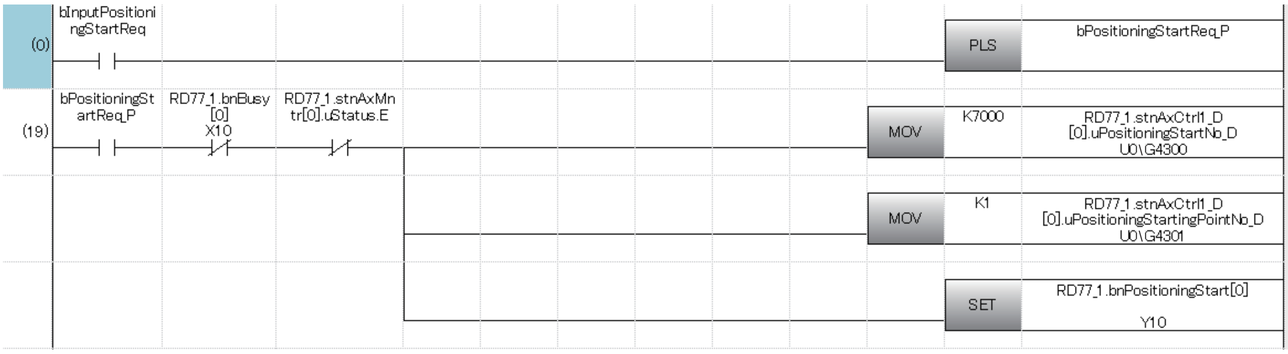
Axis 1 positioning data No.	[Da.1] Operation pattern
1	11: Continuous path control
2	00: Positioning complete
⋮	
10	11: Continuous path control
11	11: Continuous path control
12	00: Positioning complete
⋮	

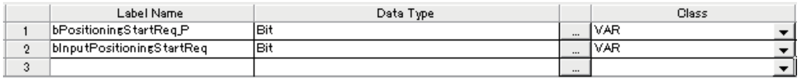
■Start time chart

Ex.



Program example



Classification	Label name	Description
Module label	RD77_1.bnBusy[0]	Axis 1 BUSY signal
	RD77_1.stnAxMntr[0].uStatus.E	Axis 1 Start complete
	RD77_1.stnAxCtrl1_D[0].uPositioningStartNo_D	Axis 1 Positioning start No.
	RD77_1.stnAxCtrl1_D[0].uPositioningStartingPointNo_D	Axis 1 Positioning starting point No.
	RD77_1.bnPositioningStart[0]	Axis 1 Positioning start signal
Global label, local label	Defines the global label or the local label as follows. The settings of Assign (Device/Label) are not required for the label that the assignment device is not set because the unused internal relay and data device are automatically assigned. The following table shows an example for the local label. 	

	Label Name	Data Type		Class
1	bPositioningStartReq_P	Bit	...	VAR
2	bInputPositioningStartReq	Bit	...	VAR
3			...	

5 MANUAL CONTROL

The details and usage of manual control are explained in this chapter.
In manual control, commands are issued during a JOG operation and an inching operation executed by the turning ON of the JOG start signal, or from a manual pulse generator connected to the Simple Motion module or the CC-Link IE Field Network device.
Manual control using a program from the CPU module is explained in this chapter.

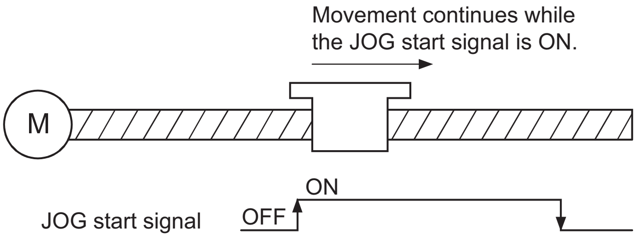
5.1 Outline of Manual Control

Three manual control methods

"Manual control" refers to control in which positioning data is not used, and a positioning operation is carried out in response to signal input from an external device.
The three types of this "manual control" are explained below.

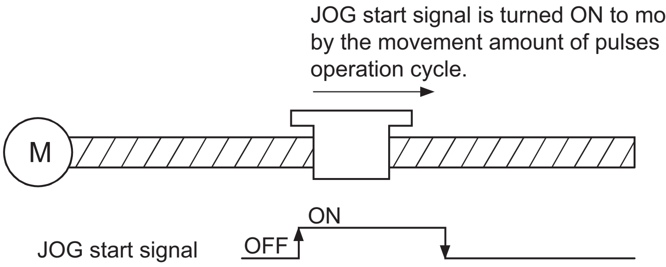
[JOG operation]

"JOG operation" is a control method in which the machine is moved by only a movement amount (commands are continuously output while the JOG start signal is ON). This operation is used to move the workpiece in the direction in which the limit signal is ON, when the operation is stopped by turning the limit signal OFF to confirm the positioning system connection and obtain the positioning data address (☞ Page 307 Teaching function).



[Inching operation]

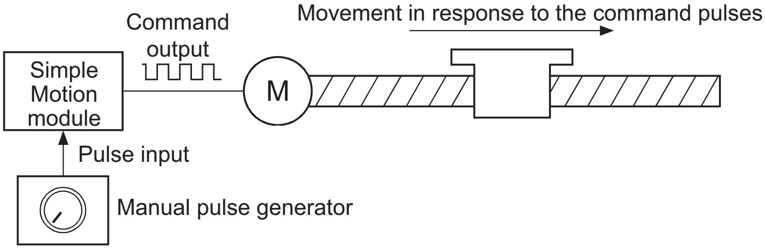
"Inching operation" is a control method in which a minute movement amount of command is output manually in operation cycle. When the "inching movement amount" of the axis control data is set by JOG operation, the workpiece is moved by a set movement amount. (When the "inching movement amount" is set to "0", the machine operates as JOG operation.)



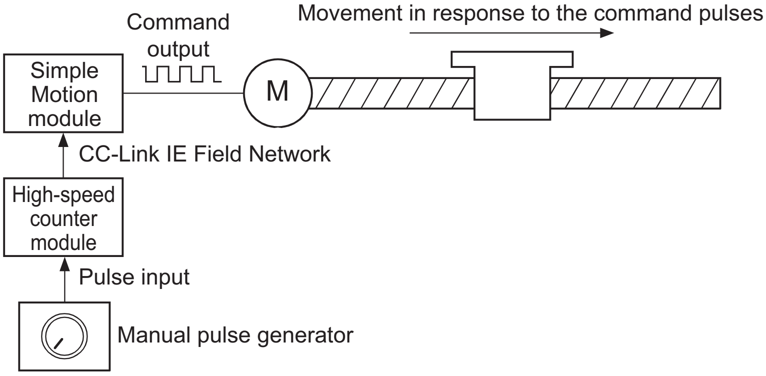
[Manual pulse generator operation]

"Manual pulse generator operation" is a control method in which positioning is carried out in response to the number of pulses input from a manual pulse generator (the number of input command is output). This operation is used for manual fine adjustment, etc., when carrying out accurate positioning to obtain the positioning address.

[RD77MS]



[RD77GF]



■Manual control sub functions

Refer to "Combination of Main Functions and Sub Functions" in the following manual for details on "sub functions" that can be combined with manual control.

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

Also refer to the following for details on each sub function.

☞ Page 227 CONTROL SUB FUNCTIONS

■Monitoring manual control

Refer to the following for directly monitoring the buffer memory using an engineering tool.

☞ Page 576 Monitor Data

Also refer to "Help" in the "Simple Motion Module Setting Function" when monitoring with the monitor functions of an engineering tool.

5.2 JOG Operation

Outline of JOG operation

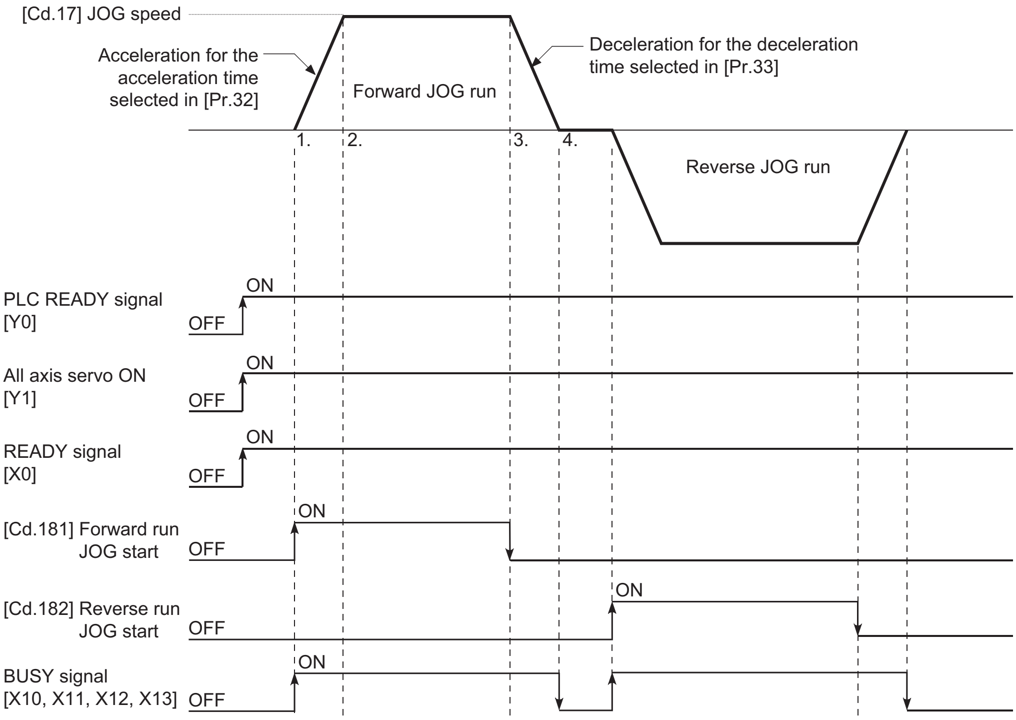
Operation

In JOG operation, the forward run JOG start signal [Cd.181] or reverse run JOG start signal [Cd.182] turns ON, causing pulses to be output to the servo amplifier from the Simple Motion module while the signal is ON. The workpiece is then moved in the designated direction.

The following shows examples of JOG operation.

■Operation example

1. When the start signal turns ON, acceleration begins in the direction designated by the start signal, and continues for the acceleration time designated in "[Pr.32] JOG operation acceleration time selection". At this time, the BUSY signal changes from OFF to ON.
2. When the workpiece being accelerated reaches the speed set in "[Cd.17] JOG speed", the movement continues at this speed. The constant speed movement takes place at 2. and 3.
3. When the start signal is turned OFF, deceleration begins from the speed set in "[Cd.17] JOG speed", and continues for the deceleration time designated in "[Pr.33] JOG operation deceleration time selection".
4. The operation stops when the speed becomes "0". At this time, the BUSY signal changes from ON to OFF.



Restriction

Use the hardware stroke limit function when carrying out JOG operation near the upper or lower limits.
(☞ Page 259 Hardware stroke limit function)
If the hardware stroke limit function is not used, the workpiece may exceed the moving range, causing an accident.

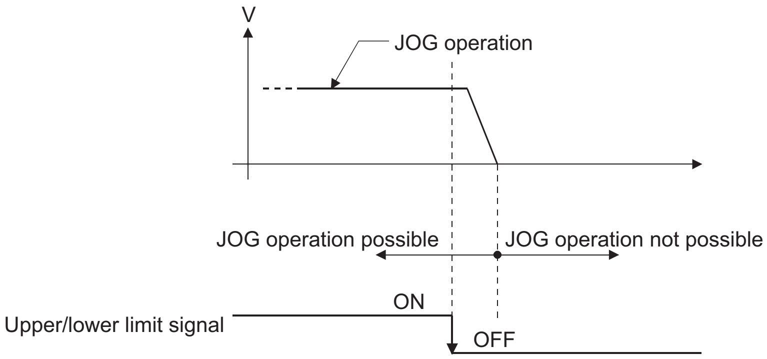
Precautions during operation

The following details must be understood before carrying out JOG operation.

- For safety, set a small value to "[Cd.17] JOG speed" at first and check the movement. Then gradually increase the value.
- The error "Outside JOG speed range" (error code: 1980H) will occur and the operation will not start if the "JOG speed" is outside the setting range at the JOG start.
- The error "JOG speed limit value error" (error code: 1AB7H, 1AB8H) will occur and the operation will not start if "[Pr.31] JOG speed limit value" is set to a value larger than "[Pr.8] Speed limit value".
- If "[Cd.17] JOG speed" exceeds the speed set in "[Pr.31] JOG speed limit value", the workpiece will move at the "[Pr.31] JOG speed limit value" and the warning "JOG speed limit value" (warning code: 0981H, 0982H) will occur in the Simple Motion module.
- The JOG operation can be continued even if an "Axis warning" has occurred.
- Set a "0" in "[Cd.16] Inching movement amount". If a value other than "0" is set, the operation will become an inching operation. (☞ Page 183 Inching Operation)

Operations when stroke limit error occurs

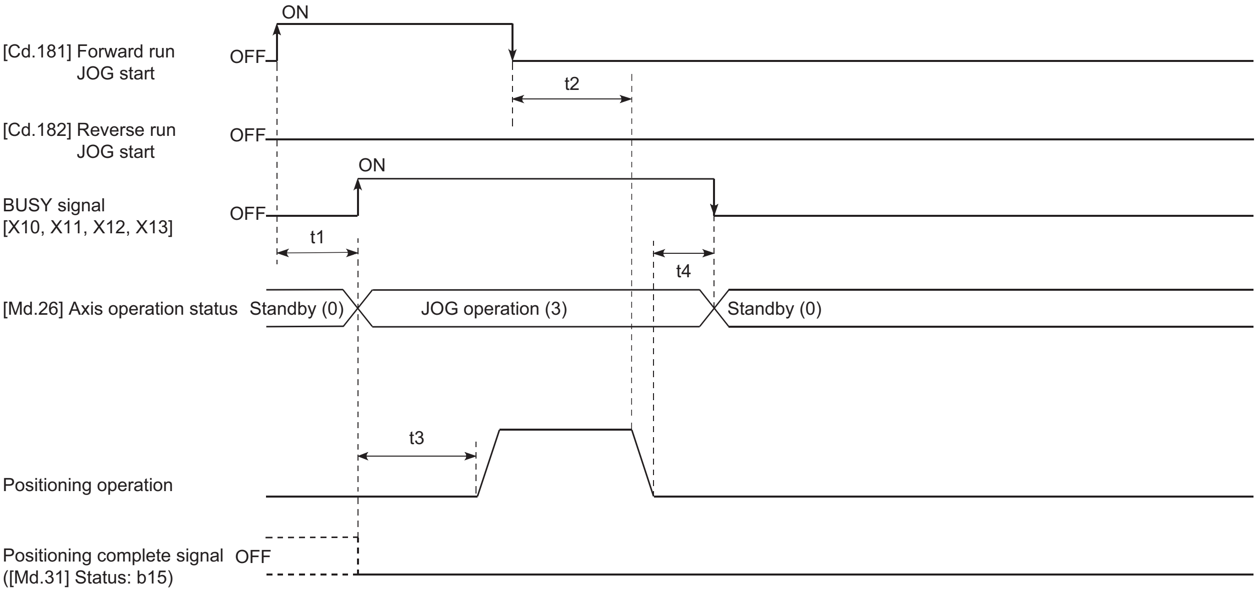
When the operation is stopped by hardware stroke limit error or software stroke limit error, the JOG operation can execute in an opposite way (direction within normal limits) after an error reset. (An error will occur again if JOG start signal is turned ON in a direction to outside the stroke limit.)



Operation timing and processing time

The following drawing shows details of the JOG operation timing and processing time.

■Operation example



Normal timing time (Unit: [ms])

[RD77MS]

Operation cycle	t1[*1]	t2	t3	t4
0.444	0.267 to 2.584	0.000 to 0.444	1.128 to 1.699	0.000 to 0.444
0.888	0.267 to 2.584	0.000 to 0.888	2.328 to 3.036	0.000 to 0.888
1.777	0.267 to 2.584	0.000 to 1.777	4.520 to 4.590	0.000 to 1.777
3.555	0.267 to 2.584	0.000 to 3.555	8.064 to 8.120	0.000 to 3.555

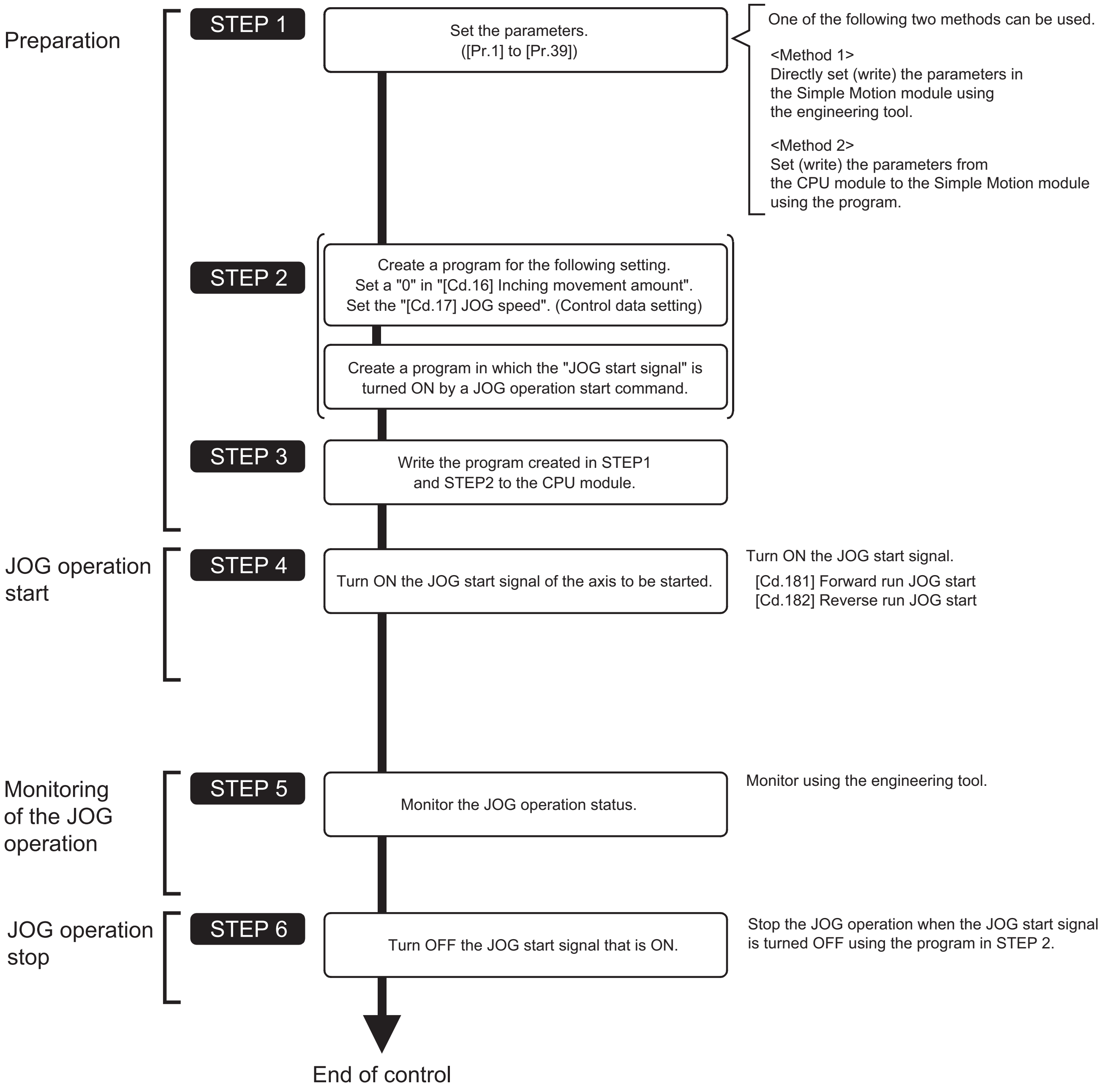
[RD77GF]

Operation cycle	t1[*1]	t2	t3	t4
0.50	0.166 to 0.634	0.000 to 0.500	1.309 to 1.491	0.000 to 0.500
1.00	0.175 to 1.158	0.000 to 1.000	2.794 to 2.934	0.000 to 1.000
2.00	0.252 to 2.152	0.000 to 2.000	5.886 to 5.938	0.000 to 2.000
4.00	0.246 to 4.096	0.000 to 4.000	11.888 to 11.936	0.000 to 4.000

*1 Delays may occur in the t1 timing time due to the operation status of other axes.

JOG operation execution procedure

The JOG operation is carried out by the following procedure.



STEP 1 Set the parameters. ([Pr.1] to [Pr.39])

One of the following two methods can be used.

<Method 1>
Directly set (write) the parameters in the Simple Motion module using the engineering tool.

<Method 2>
Set (write) the parameters from the CPU module to the Simple Motion module using the program.

STEP 2 Create a program for the following setting. Set a "0" in "[Cd.16] Inching movement amount". Set the "[Cd.17] JOG speed". (Control data setting)

Create a program in which the "JOG start signal" is turned ON by a JOG operation start command.

STEP 3 Write the program created in STEP1 and STEP2 to the CPU module.

STEP 4 Turn ON the JOG start signal of the axis to be started.

Turn ON the JOG start signal.
[Cd.181] Forward run JOG start
[Cd.182] Reverse run JOG start

STEP 5 Monitor the JOG operation status.

Monitor using the engineering tool.

STEP 6 Turn OFF the JOG start signal that is ON.

Stop the JOG operation when the JOG start signal is turned OFF using the program in STEP 2.

End of control

Point

- Mechanical elements such as limit switches are considered as already installed.
- Parameter settings work in common for all control using the Simple Motion module.

Setting the required parameters for JOG operation

The "Positioning parameters" must be set to carry out JOG operation.

The following table shows the setting items of the required parameters for carrying out JOG operation. Parameters not shown below are not required to be set for carrying out only JOG operation. (Set the initial value or a value within the setting range.)

◎: Setting always required.

○: Set according to requirements (Set the initial value or a value within the setting range when not used.)

Setting item			Setting requirement
Positioning parameters	[Pr.1]	Unit setting	◎
	[Pr.2]	Number of pulses per rotation (AP) (Unit: pulse)	◎
	[Pr.3]	Movement amount per rotation (AL) (Unit: pulse)	◎
	[Pr.4]	Unit magnification (AM)	◎
	[Pr.7]	Bias speed at start (Unit: pulse/s)	○
	[Pr.8]	Speed limit value (Unit: pulse/s)	◎
	[Pr.9]	Acceleration time 0 (Unit: ms)	◎
	[Pr.10]	Deceleration time 0 (Unit: ms)	◎
	[Pr.11]	Backlash compensation amount (Unit: pulse)	○
	[Pr.12]	Software stroke limit upper limit value (Unit: pulse)	○
	[Pr.13]	Software stroke limit lower limit value (Unit: pulse)	○
	[Pr.14]	Software stroke limit selection	○
	[Pr.15]	Software stroke limit valid/invalid setting	○
	[Pr.17]	Torque limit setting value (Unit: 0.1%)	○
	[Pr.25]	Acceleration time 1 (Unit: ms)	○
	[Pr.26]	Acceleration time 2 (Unit: ms)	○
	[Pr.27]	Acceleration time 3 (Unit: ms)	○
	[Pr.28]	Deceleration time 1 (Unit: ms)	○
	[Pr.29]	Deceleration time 2 (Unit: ms)	○
	[Pr.30]	Deceleration time 3 (Unit: ms)	○
	[Pr.31]	JOG speed limit value (Unit: pulse/s)	◎
	[Pr.32]	JOG operation acceleration time selection	◎
	[Pr.33]	JOG operation deceleration time selection	◎
	[Pr.34]	Acceleration/deceleration process selection	○
	[Pr.35]	S-curve ratio (Unit: %)	○
	[Pr.36]	Rapid stop deceleration time (Unit: ms)	○
	[Pr.37]	Stop group 1 rapid stop selection	○
	[Pr.38]	Stop group 2 rapid stop selection	○
	[Pr.39]	Stop group 3 rapid stop selection	○

Refer to the following for the setting details.

☞ Page 496 Basic Setting

Point

- Parameter settings work in common for all controls using the Simple Motion module. When carrying out other controls ("major positioning control", "high-level positioning control", "home position return positioning control"), set the respective setting items as well.
- Parameters are set for each axis.

Creating start programs for JOG operation

A program must be created to execute a JOG operation. Consider the "required control data setting", "start conditions" and "start time chart" when creating the program.

The following shows an example when a JOG operation is started for axis 1. ("[Cd.17] JOG speed" is set to "100.00 mm/min" in the example shown.)

Required control data setting

The control data shown below must be set to execute a JOG operation. The setting is carried out with the program.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.16]	Inching movement amount	0	Set "0".	4317+100n	1004317+100n
[Cd.17]	JOG speed	10000	Set a value equal to or below the "[Pr.31] JOG speed limit value".	4318+100n 4319+100n	1004318+100n 1004319+100n

Refer to the following for the setting details.

☞ Page 616 Control Data

Start conditions

The following conditions must be fulfilled when starting. The required conditions must also be assembled in the program, and the program must be configured so the operation will not start if the conditions are not fulfilled.

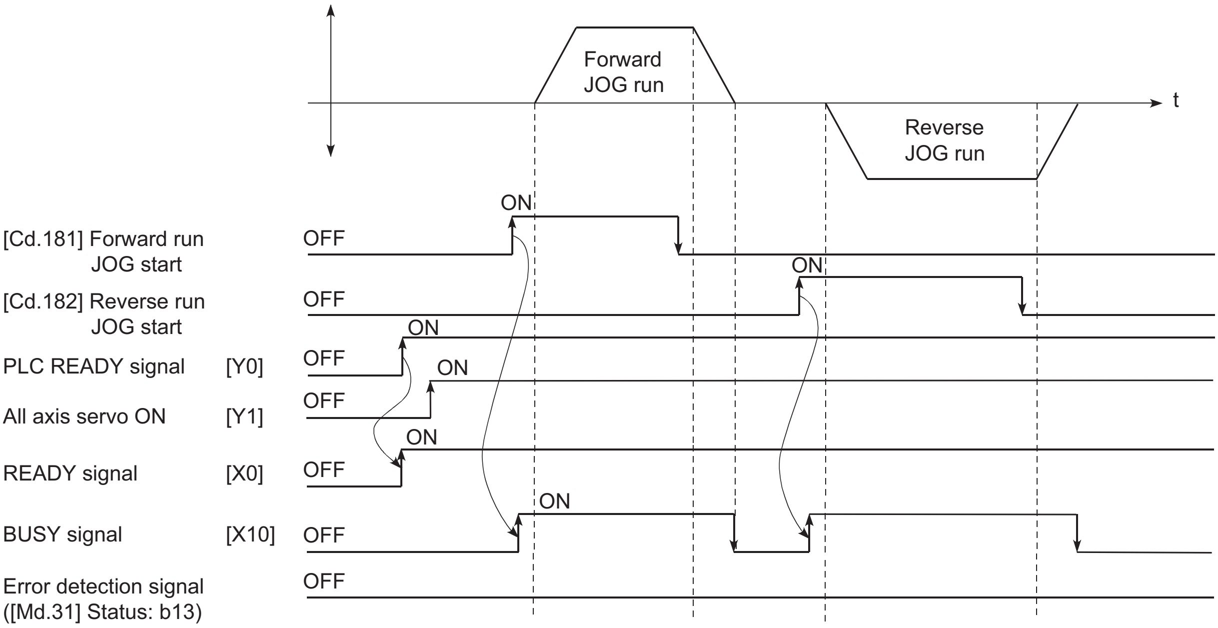
Signal name		**Signal state**		**Device**
Interface signal	PLC READY signal	ON	CPU module preparation completed	Y0
	READY signal	ON	Preparation completed	X0
	All axis servo ON	ON	All axis servo ON	Y1
	Synchronization flag[*1]	ON	The buffer memory can be accessed.	X1
	Axis stop signal	OFF	Axis stop signal is OFF	[Cd.180] Axis stop
	Start complete signal	OFF	Start complete signal is OFF	[Md.31] Status: b14
	BUSY signal	OFF	Not operating	X10 to X2F[*2]
	Error detection signal	OFF	There is no error	[Md.31] Status: b13
	M code ON signal	OFF	M code ON signal is OFF	[Md.31] Status: b12
External signal	Forced stop input signal	ON	There is no forced stop input	—
	Stop signal	OFF	Stop signal is OFF	—
	Upper limit (FLS)	ON	Within limit range	—
	Lower limit (RLS)	ON	Within limit range	—

[*1] The interlock must be provided so that the buffer memory is accessed after Synchronization flag [X1] turns on. When no interlock is provided, an unexpected value may be read or written.

[*2] The BUSY signal, whose axis No. exceeds the number of controlled axes, cannot be used.

Start time chart

■Operation example



Program example

Refer to the following for the program example of the JOG operation.

☞ Page 692 JOG operation setting program

☞ Page 693 JOG operation/inching operation execution program

JOG operation example

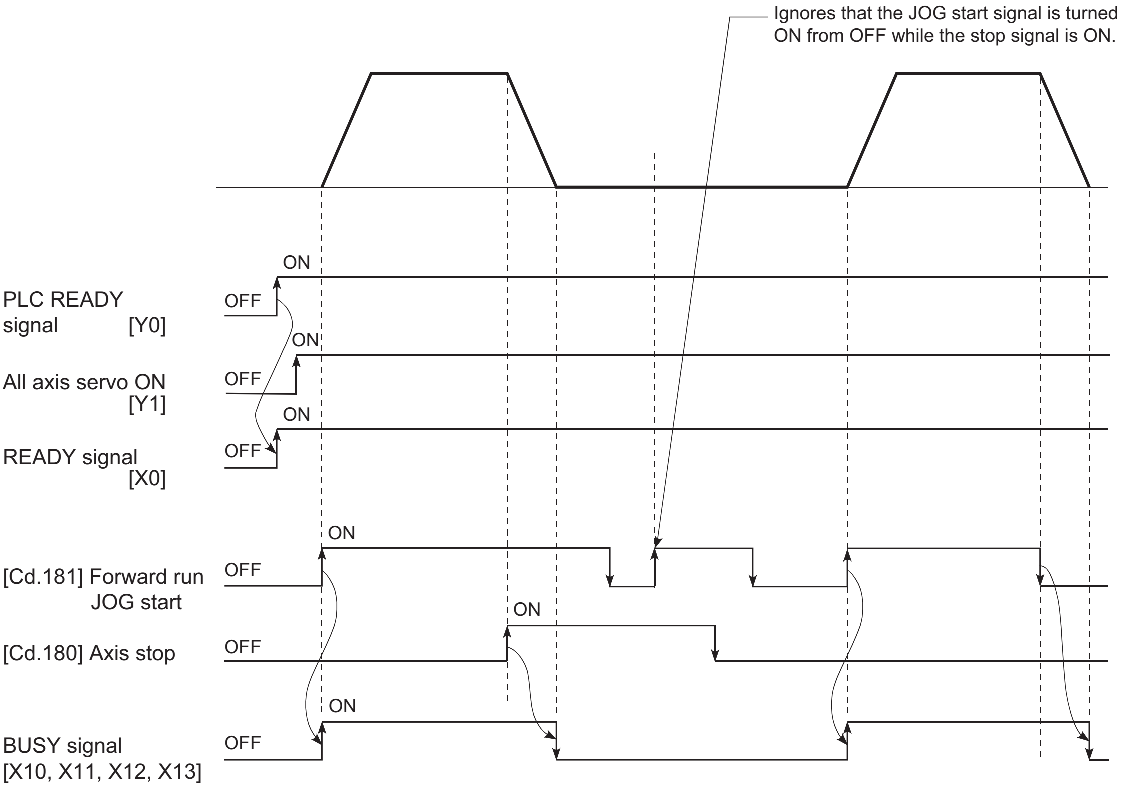
Example 1

When the "stop signal" is turned ON during JOG operation, the JOG operation will stop by the "deceleration stop" method.

If the JOG start signal is turned ON while the stop signal is ON, the error "Stop signal ON at start" (error code: 1908H) will occur.

The inching operation can be re-started when the stop signal is turned OFF and the JOG start signal is turned ON from OFF.

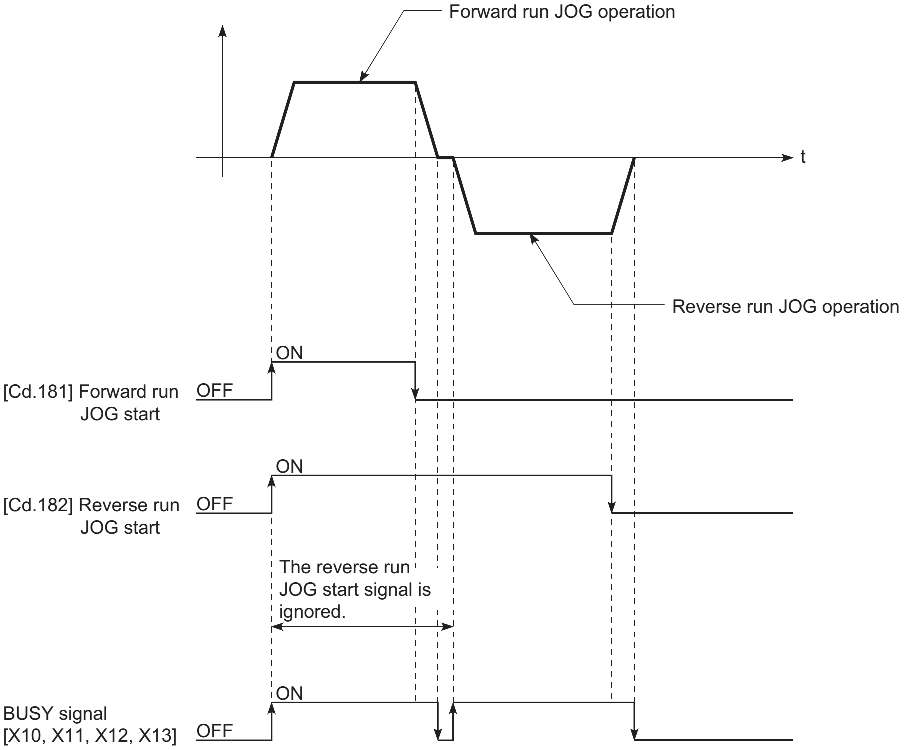
■Operation example



Example 2

When both the "forward run JOG start signal" and "reverse run JOG start signal" are turned ON simultaneously for one axis, the "forward run JOG start signal" is given priority. In this case, the "reverse run JOG start signal" is validated when the BUSY signal of Simple Motion module is turned OFF. If the forward run JOG operation is stopped due to stop by a stop signal or axis error, the reverse run JOG operation will not be executed even if the "reverse run JOG start signal" turns ON.

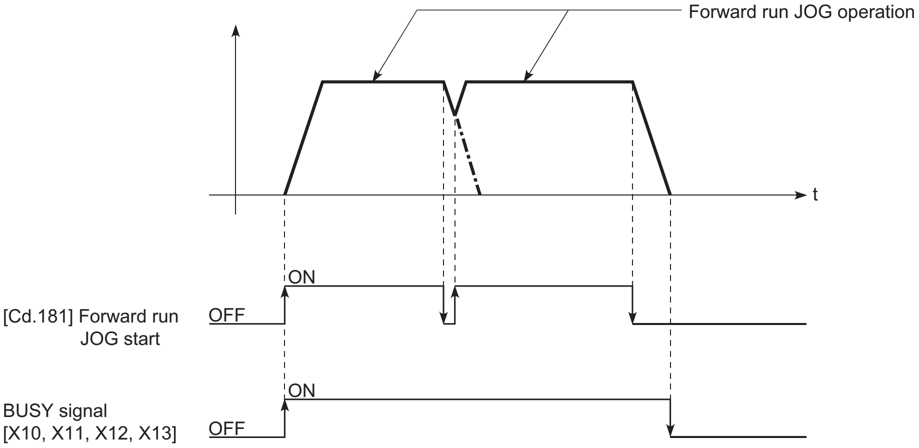
■Operation example



Example 3

When the "JOG start signal" is turned ON again during deceleration caused by the ON → OFF of the "JOG start signal", the JOG operation will be carried out from the time the "JOG start signal" is turned ON.

■Operation example



5.3 Inching Operation

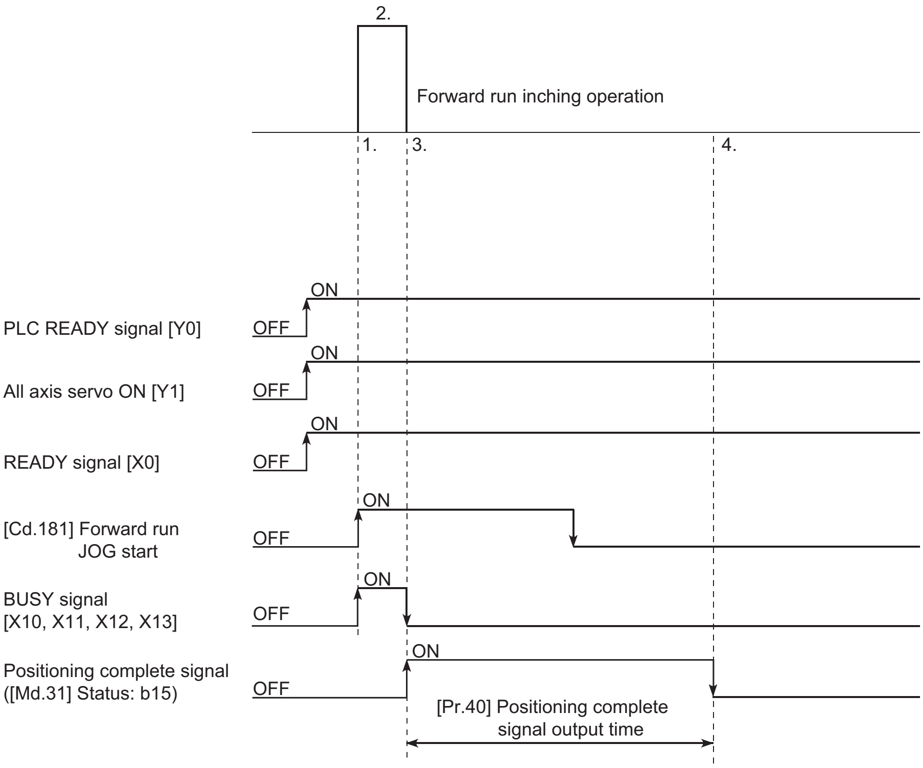
Outline of inching operation

Operation

In inching operation, pulses are output to the servo amplifier at operation cycle to move the workpiece by a designated movement amount after the forward run JOG start signal [Cd.181] or reverse JOG start signal [Cd.182] is turned ON.
The following shows the example of inching operation.

1. When the start signal is turned ON, inching operation is carried out in the direction designated by the start signal. In this case, BUSY signal is turned from OFF to ON.
2. The workpiece is moved by a movement amount set in "[Cd.16] Inching movement amount".
3. The workpiece movement stops when the speed becomes "0". In this case, BUSY signal is turned from ON to OFF. The positioning complete signal is turned from OFF to ON.
4. The positioning complete signal is turned from ON to OFF after a time set in "[Pr.40] Positioning complete signal output time" has been elapsed.

■Operation example



Restriction

When the inching operation is carried out near the upper or lower limit, use the hardware stroke limit function. (☞ Page 259 Hardware stroke limit function)
If the hardware stroke limit function is not used, the workpiece may exceed the movement range, and an accident may result.

Precautions during operation

The following details must be understood before inching operation is carried out.

- Acceleration/deceleration processing is not carried out during inching operation.

(Commands corresponding to the designated inching movement amount are output at operation cycle. When the movement direction of inching operation is reversed and backlash compensation is carried out, the backlash compensation amount and inching movement amount are output at the same operation cycle.)

The "[Cd.17] JOG speed" is ignored even if it is set. The error "Inching movement amount error" (error code: 1981H) will occur in the following case.

([Cd.16] Inching movement amount) × (A) > ([Pr.31] JOG speed limit value)

However, (A) is as follows.

[RD77MS]

Unit setting	**Operation cycle**			
	0.444 ms	**0.888 ms**	**1.777 ms**	**3.555 ms**
When the unit setting is pulse	2250	1125	562.5	281.25
When the unit setting is degree and the "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid	135	67.5	33.75	16.875
When the unit setting is other than the above	1350	675	337.5	168.75

[RD77GF]

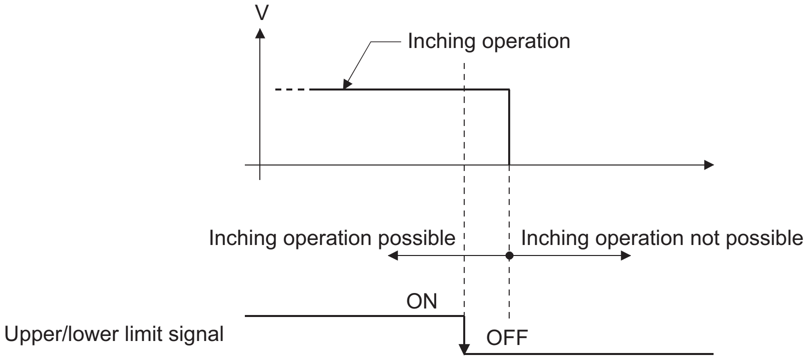
Unit setting	**Operation cycle**			
	0.50 ms	**1.00 ms**	**2.00 ms**	**4.00 ms**
When the unit setting is pulse	2000	1000	500	250
When the unit setting is degree and the "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid	120	60	30	15
When the unit setting is other than the above	1200	600	300	150

- Set a value other than a "0" in "[Cd.16] Inching movement amount".

If a "0" is set, the operation will become JOG operation. (☞ Page 174 JOG Operation)

Operations when stroke limit error occurs

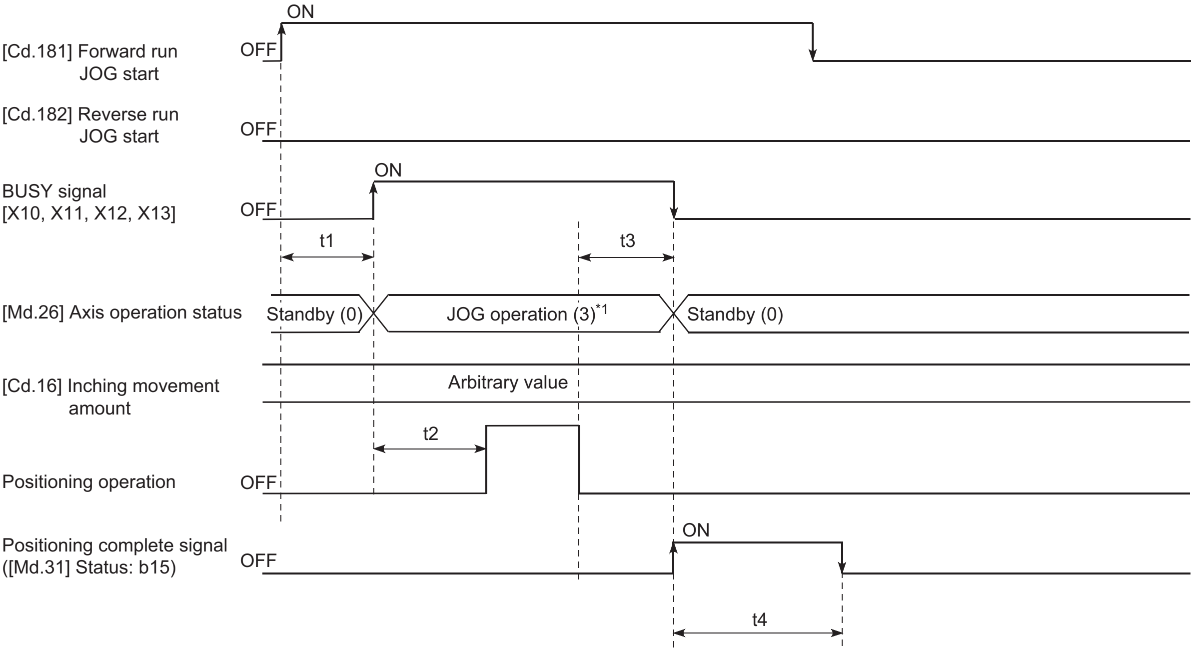
When the operation is stopped by hardware stroke limit error or software stroke limit error, the inching operation can be performed in an opposite way (direction within normal limits) after an error reset. (An error will occur again if JOG start signal is turned ON in a direction to outside the stroke limit.)



Operation timing and processing times

The following drawing shows the details of the inching operation timing and processing time.

■Operation example



*1 "JOG operation" is set in "[Md.26] Axis operation status" even during inching operation.

Normal timing time (Unit: [ms])

[RD77MS]

Operation cycle	t1[*1]	t2	t3	t4
0.444	0.211 to 0.545	1.218 to 1.684	0.000 to 0.444	Follows parameters
0.888	0.412 to 1.141	2.331 to 2.359	0.000 to 0.888	Follows parameters
1.777	0.767 to 1.976	4.524 to 5.706	0.000 to 1.777	Follows parameters
3.555	1.058 to 3.916	8.070 to 8.146	0.000 to 3.555	Follows parameters

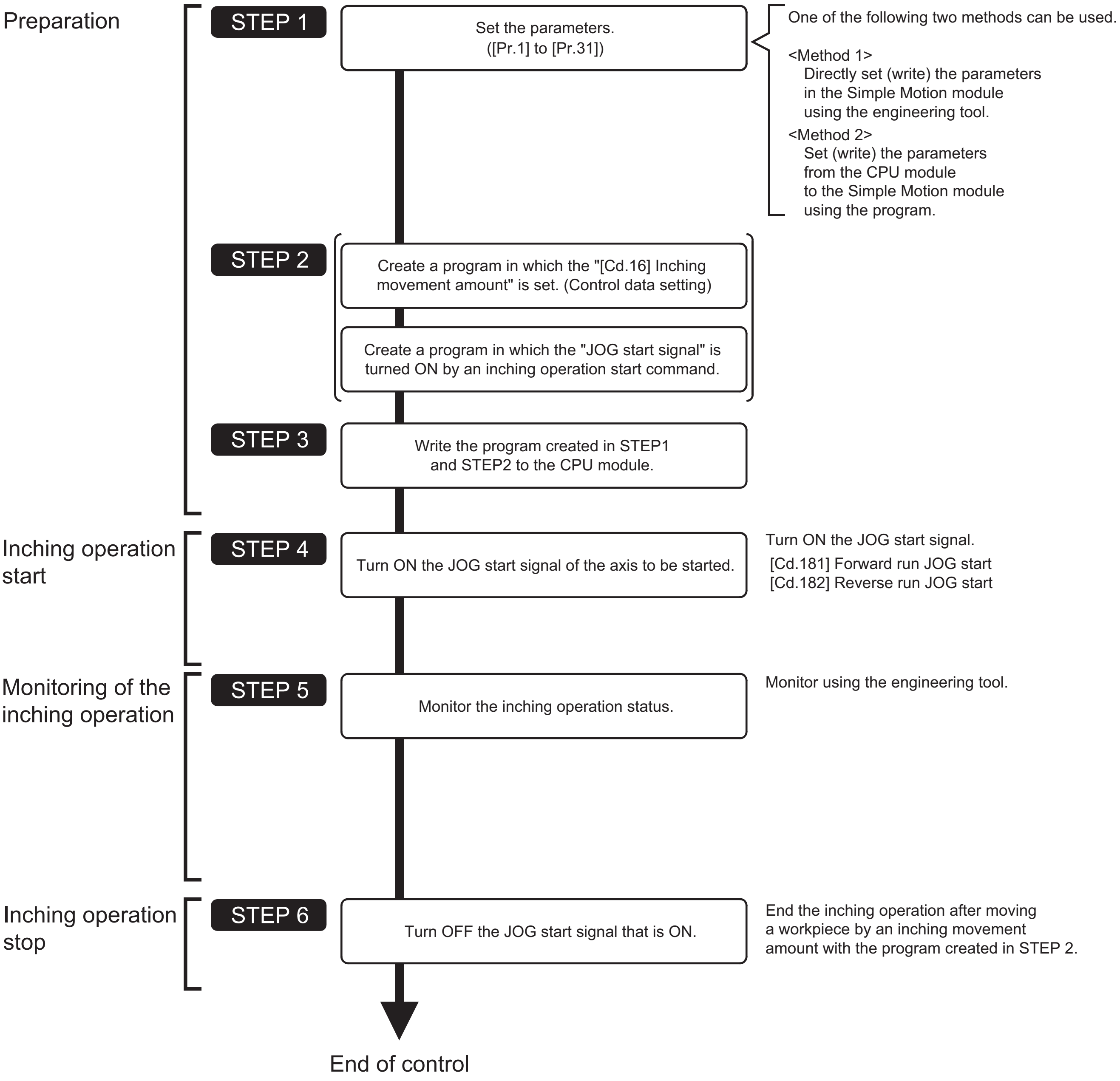
[RD77GF]

Operation cycle	t1[*1]	t2	t3	t4
0.50	0.162 to 0.665	1.320 to 1.494	0.000 to 0.500	Follows parameters
1.00	0.182 to 1.152	2.782 to 2.940	0.000 to 1.000	Follows parameters
2.00	0.204 to 2.112	5.892 to 5.944	0.000 to 2.000	Follows parameters
4.00	0.240 to 4.094	11.894 to 11.943	0.000 to 4.000	Follows parameters

*1 Depending on the operating statuses of the other axes, delay may occur in the t1 timing time.

Inching operation execution procedure

The inching operation is carried out by the following procedure.



Preparation

STEP 1 Set the parameters. ([Pr.1] to [Pr.31])

One of the following two methods can be used.

<Method 1>
Directly set (write) the parameters in the Simple Motion module using the engineering tool.

<Method 2>
Set (write) the parameters from the CPU module to the Simple Motion module using the program.

STEP 2 Create a program in which the "[Cd.16] Inching movement amount" is set. (Control data setting)

Create a program in which the "JOG start signal" is turned ON by an inching operation start command.

STEP 3 Write the program created in STEP1 and STEP2 to the CPU module.

Inching operation start

STEP 4 Turn ON the JOG start signal of the axis to be started.

Turn ON the JOG start signal.
[Cd.181] Forward run JOG start
[Cd.182] Reverse run JOG start

Monitoring of the inching operation

STEP 5 Monitor the inching operation status.

Monitor using the engineering tool.

Inching operation stop

STEP 6 Turn OFF the JOG start signal that is ON.

End the inching operation after moving a workpiece by an inching movement amount with the program created in STEP 2.

End of control

Point

- Mechanical elements such as limit switches are considered as already installed.
- Parameter settings work in common for all control using the Simple Motion module.

Setting the required parameters for inching operation

The "Positioning parameters" must be set to carry out inching operation.

The following table shows the setting items of the required parameters for carrying out inching operation. Parameters not shown below are not required to be set for carrying out only inching operation. (Set the initial value or a value within the setting range.)

◎: Setting always required.

○: Set according to requirements (Set the initial value or a value within the setting range when not used.)

Setting item			Setting requirement
Positioning parameters	[Pr.1]	Unit setting	◎
	[Pr.2]	Number of pulses per rotation (AP) (Unit: pulse)	◎
	[Pr.3]	Movement amount per rotation (AL) (Unit: pulse)	◎
	[Pr.4]	Unit magnification (AM)	◎
	[Pr.11]	Backlash compensation amount (Unit: pulse)	○
	[Pr.12]	Software stroke limit upper limit value (Unit: pulse)	○
	[Pr.13]	Software stroke limit lower limit value (Unit: pulse)	○
	[Pr.14]	Software stroke limit selection	○
	[Pr.15]	Software stroke limit valid/invalid setting	○
	[Pr.17]	Torque limit setting value (Unit: 0.1%)	○
	[Pr.31]	JOG speed limit value (Unit: pulse/s)	◎

Refer to the following for the setting details.

☞ Page 496 Basic Setting

Point

- Positioning parameter settings work in common for all controls using the Simple Motion module. When carrying out other controls ("major positioning control", "high-level positioning control", and "home position return control"), set the respective setting items as well.
- Parameters are set for each axis.

Creating a program to start the inching operation

A program must be created to execute an inching operation. Consider the "required control data setting", "start conditions", and "start time chart" when creating the program.

The following shows an example when an inching operation is started for axis 1. (The example shows the inching operation when a "10.0 μm" is set in "[Cd.16] Inching movement amount".)

Required control data setting

The control data shown below must be set to execute an inching operation. The setting is carried out with the program.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.16]	Inching movement amount	100	Set the setting value so that the JOG speed limit value is not increased larger than the maximum output pulse	4317+100n	1004317+100n

Refer to the following for the setting details.

☞ Page 616 Control Data

Start conditions

The following conditions must be fulfilled when starting. The required conditions must also be assembled in the program, and the program must be configured so the operation will not start if the conditions are not fulfilled.

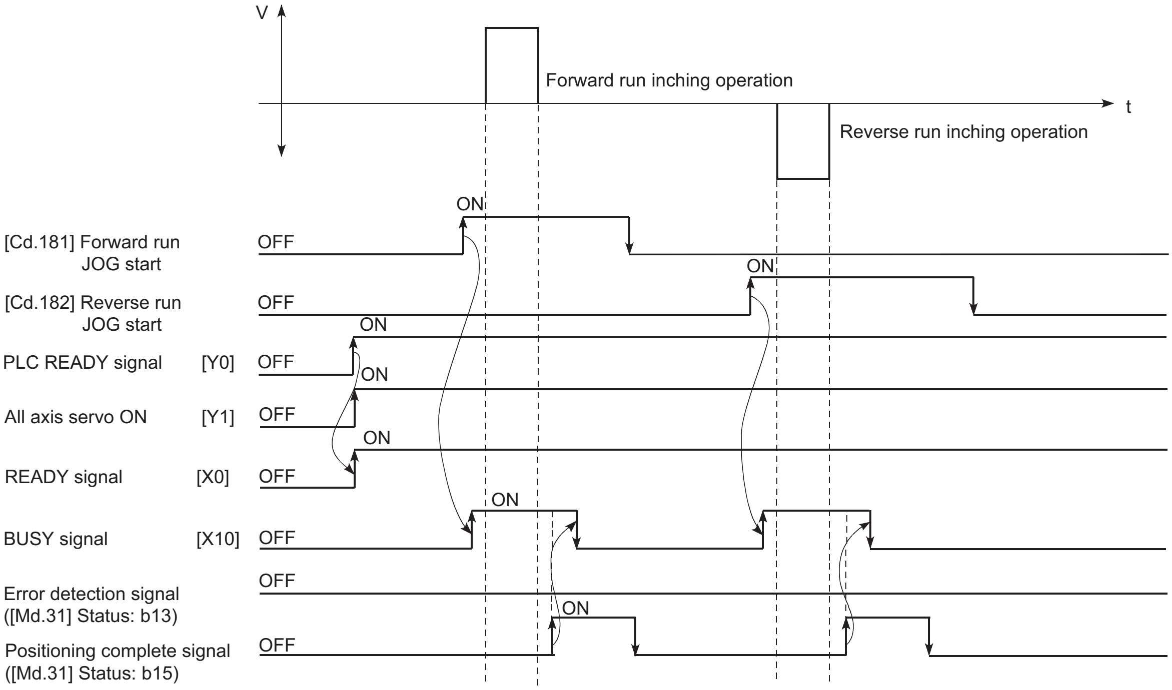
Signal name		Signal state		Device
Interface signal	PLC READY signal	ON	CPU module preparation completed	Y0
	READY signal	ON	Preparation completed	X0
	All axis servo ON	ON	All axis servo ON	Y1
	Synchronization flag[*1]	ON	The buffer memory can be accessed.	X1
	Axis stop signal	OFF	Axis stop signal is OFF	[Cd.180] Axis stop
	Start complete signal	OFF	Start complete signal is OFF	[Md.31] Status: b14
	BUSY signal	OFF	Not operating	X10 to X2F[*2]
	Positioning complete signal	OFF	Positioning complete signal is OFF	[Md.31] Status: b15
	Error detection signal	OFF	There is no error	[Md.31] Status: b13
	M code ON signal	OFF	M code ON signal is OFF	[Md.31] Status: b12
External signal	Forced stop input signal	ON	There is no forced stop input	—
	Stop signal	OFF	Stop signal is OFF	—
	Upper limit (FLS)	ON	Within limit range	—
	Lower limit (RLS)	ON	Within limit range	—

[*1] The interlock must be provided so that the buffer memory is accessed after Synchronization flag [X1] turns on. When no interlock is provided, an unexpected value may be read or written.

[*2] The BUSY signal, whose axis No. exceeds the number of controlled axes, cannot be used.

Start time chart

■Operation example



Program example

Refer to the following for the program example of the inching operation.

☞ Page 693 Inching operation setting program

☞ Page 693 JOG operation/inching operation execution program

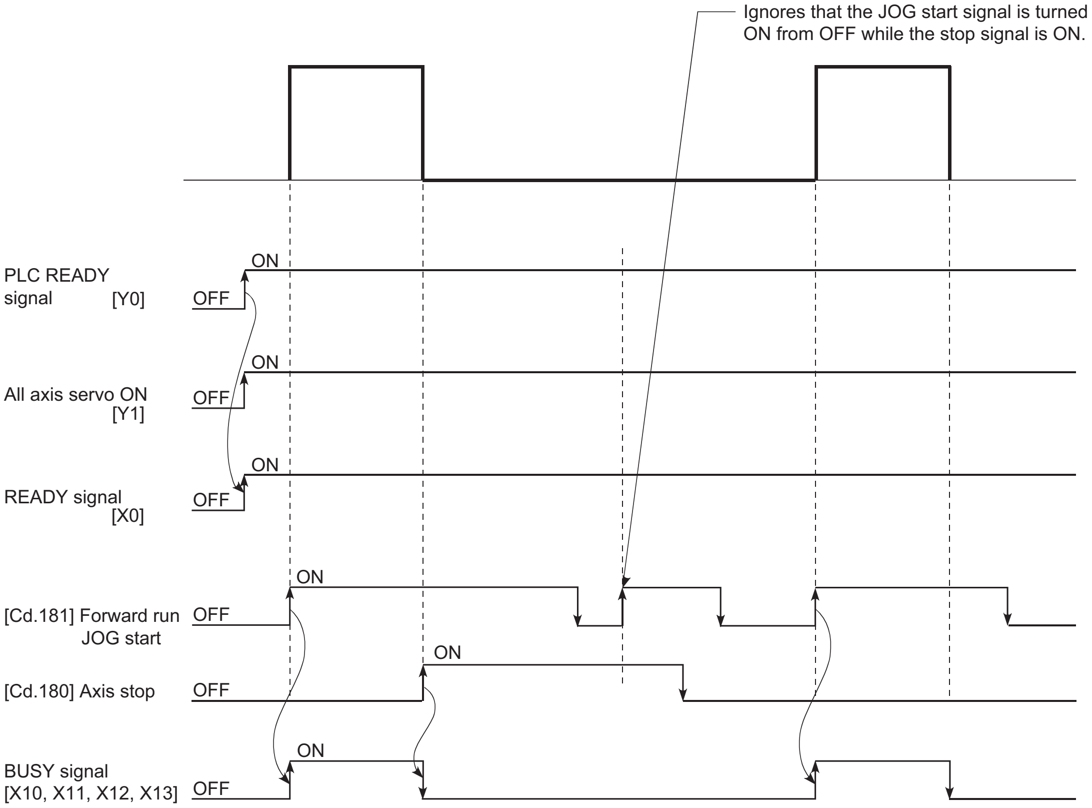
Inching operation example

Example 1

If the JOG start signal is turned ON while the stop signal is ON, the error "Stop signal ON at start" (error code: 1908H) will occur.

The inching operation can be re-started when the stop signal is turned OFF and the JOG start signal is turned ON from OFF.

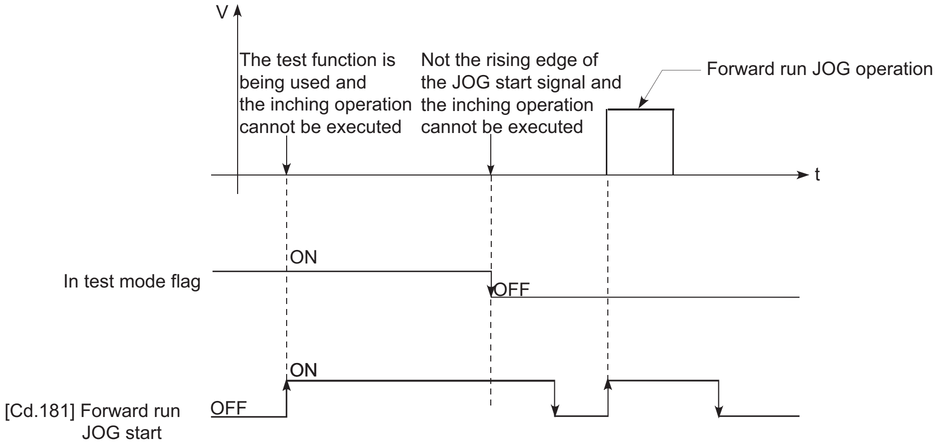
■Operation example



Example 2

If the JOG start signal is turned ON while the test function of GX Works3 is used, the JOG start signal is ignored and the inching operation is not executed.

■Operation example



5.4 Manual Pulse Generator Operation

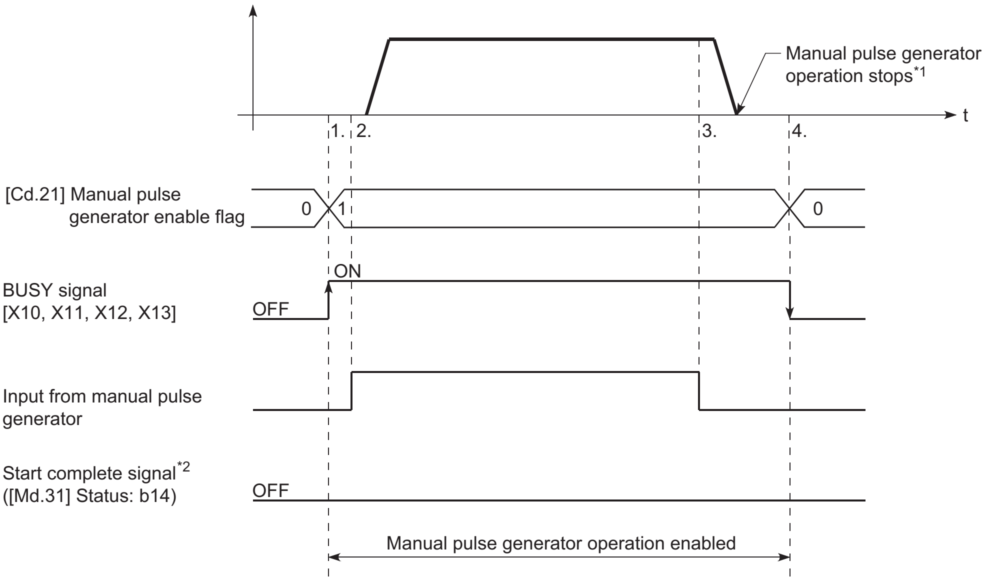
Outline of manual pulse generator operation

Operation

In manual pulse generator operations, pulses are input to the Simple Motion module or the CC-Link IE Field Network device from the manual pulse generator. This causes the same number of input command to be output from the Simple Motion module to the servo amplifier, and the workpiece is moved in the designated direction.
The following shows an example of manual pulse generator operation.

1. When "[Cd.21] Manual pulse generator enable flag" is set to "1", the BUSY signal turns ON and the manual pulse generator operation is enabled.
2. The workpiece is moved corresponding to the number of pulses input from the manual pulse generator.
3. The workpiece movement stops when no more pulses are input from the manual pulse generator.
4. When "[Cd.21] Manual pulse generator enable flag" is set to "0", the BUSY signal turns OFF and the manual pulse generator operation is disabled.

■Operation example



*1 If the input from the manual pulse generator stops or "0" is set in "[Cd.21] Manual pulse generator enable flag" during manual pulse generator operation, the machine will decelerate to a stop.

*2 The start complete signal does not turn ON in manual pulse generator operation.

Restriction

- Create the program so that "[Cd.21] Manual pulse generator enable flag" is always set to "0" (disabled) when a manual pulse generator operation is not carried out. Mistakenly touching the manual pulse generator when the "manual pulse generator enable flag" is set to "1" (enable) can cause accidents or incorrect positioning.
- A pulse generator such as a manual pulse generator is required to carry out manual pulse generator operation.

Precautions during operation

The following details must be understood before carrying out manual pulse generator operation.

- If "[Pr.123] Manual pulse generator speed limit value" is set to a value larger than "[Pr.8] Speed limit value", the error "Manual pulse generator speed limit value error" (error code: 1ABBH) will occur and the operation will not start.
- If "[Cd.21] Manual pulse generator enable flag" is turned ON while the Simple Motion module is BUSY (BUSY signal ON), the warning "Start during operation" (warning code: 0900H) will occur.
- If a stop factor occurs during manual pulse generator operation, the operation will stop, and the BUSY signal will turn OFF. At this time, "[Cd.21] Manual pulse generator enable flag" will remain ON. However, manual pulse generator operation will not be possible. To carry out manual pulse generator operation again, measures must be carried out to eliminate the stop factor. Once eliminated, the operation can be carried out again by turning "[Cd.21] Manual pulse generator enable flag" ON → OFF → ON. (Note that this excludes hardware/software stroke limit error.)
- Command will not be output if an error occurs when the manual pulse generator operation starts.

Restriction

The speed command is issued according to the input from the manual pulse generator irrelevant of the speed limit setting. When the speed command is larger than 62914560 [pulse/s], the servo alarm "Command frequency error" (alarm No.: 35) will occur.

The following calculation formula is used to judge whether or not a servo alarm will occur.

$$\text{(Speed command)} = \begin{array}{l}\text{Number of}\\ \text{input pulses}\\ \text{for one}\\ \text{second}\end{array} \times \begin{array}{l}\text{Manual pulse}\\ \text{generator 1}\\ \text{pulse input}\\ \text{magnification}\end{array} \times \begin{array}{l}\text{Manual pulse}\\ \text{generator 1}\\ \text{pulse movement}\\ \text{amount}\end{array} \times \frac{\text{Number of pulses per rotation}}{\text{Movement amount per rotation}}$$

If a large value is set to the manual pulse generator 1 pulse input magnification, there is a high possibility of the servo alarm "Command frequency error" (alarm No.: 35) occurrence. Note that the servo motor does not work rapidly by rapid pulse input even if the servo alarm does not occur.

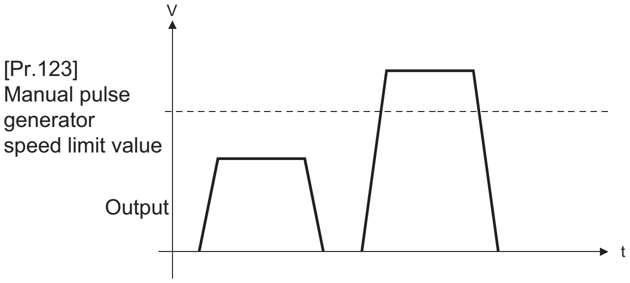
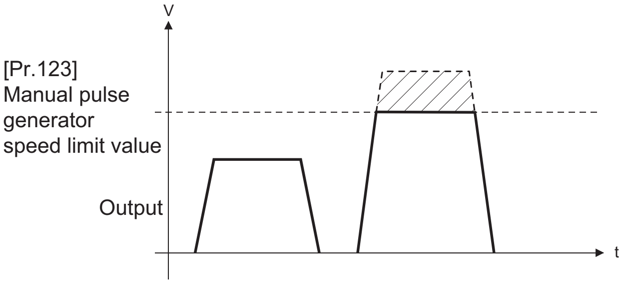
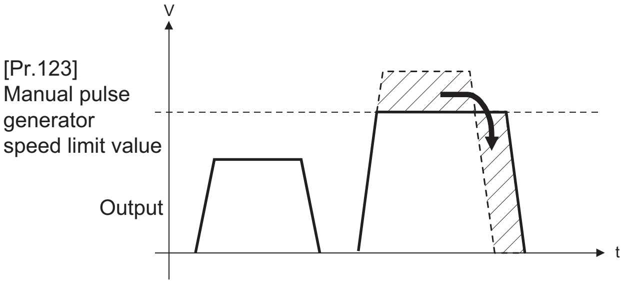
Point

- Only one manual pulse generator can be connected to one Simple Motion module. [RD77MS]
- Connect a manual pulse generator to the CC-Link IE Field Network device set with the link device external signal assignment parameter. [RD77GF]
- The Simple Motion module can simultaneously command to multiple servo amplifiers by one manual pulse generator. (Axis 1 to the number of maximum control axes)

Manual pulse generator speed limit mode

In "[Pr.122] Manual pulse generator speed limit mode", the output operation which exceeds "[Pr.123] Manual pulse generator speed limit value" can be set during manual pulse generator operation.

The setting value and operation for "[Pr.122] Manual pulse generator speed limit mode" are shown below.

Setting value	Operation
0	The speed limit by "[Pr.123] Manual pulse generator speed limit value" is not executed. 
1	The pulses which exceed "[Pr.123] Manual pulse generator speed limit value" are not output.[1] 
2	The pulses which exceed "[Pr.123] Manual pulse generator speed limit value" are output later. The overcarrying movement amount which exceeds "[Pr.123] Manual pulse generator speed limit value" can be checked in "[Md.62] Amount of the manual pulser driving carrying over movement" (-2147483648 to 2147483647). When the movement amount which exceeds "[Pr.123] Manual pulse generator speed limit value" is generated continuously and "[Md.62] Amount of the manual pulser driving carrying over movement" exceeds tolerance (-2147483648 to 2147483647), the error "Overcarrying movement amount overflow in manual pulse generator" (error code: 1982H) occurs and a deceleration stop is executed.[2] 

[1] When exceeding "[Pr.123] Manual pulse generator speed limit value", the input from the manual pulse generator is not the same as the output from the Simple Motion module.

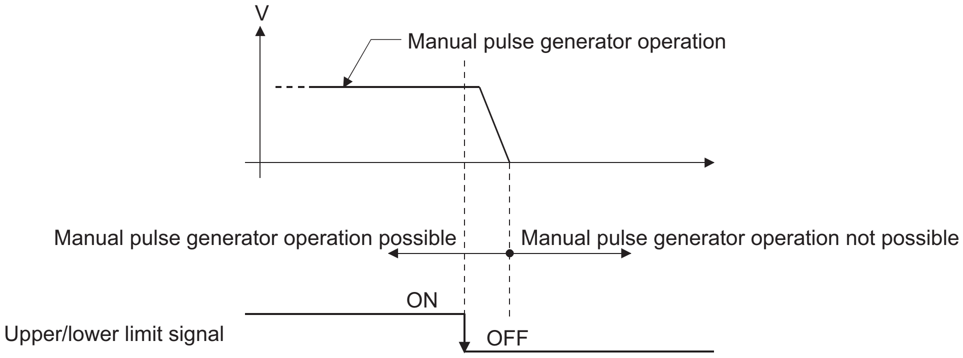
[2] When the pulses which exceed "[Pr.123] Manual pulse generator speed limit value" are large, it takes time between when the input from the manual pulse generator stops and when the output from the Simple Motion module stops.

- When "1: Do not output the exceeding speed limit value" or "2: Output the exceeding speed limit value delay" is set in "[Pr.122] Manual pulse generator speed limit mode", the warning "Outside manual pulse generator speed limit value" (warning code: 0989H) is output at exceeding "[Pr.123] Manual pulse generator speed limit value".
- The warning "Outside manual pulse generator speed limit value" (warning code: 0989H) prevents continuous detection by chattering so that the warning is not detected until the speed less than the speed limit value is kept for 10 seconds or more.
- When "0: Do not execute speed limit" is set in "[Pr.122] Manual pulse generator speed limit mode", the warning "Outside manual pulse generator speed limit value" (warning code: 0989H) will not be output even if the speed limit value is exceeded.

Operations when stroke limit error occurs

When the hardware stroke limit error or the software stroke limit error is detected*1 during operation, the operation will decelerate to a stop. However, in case of "[Md.26] Axis operation status", "Manual pulse generator operation" will continue*1. After stopping, input pulses from a manual pulse generator to the outside direction of the limit range are not accepted, but operation can be executed within the range.

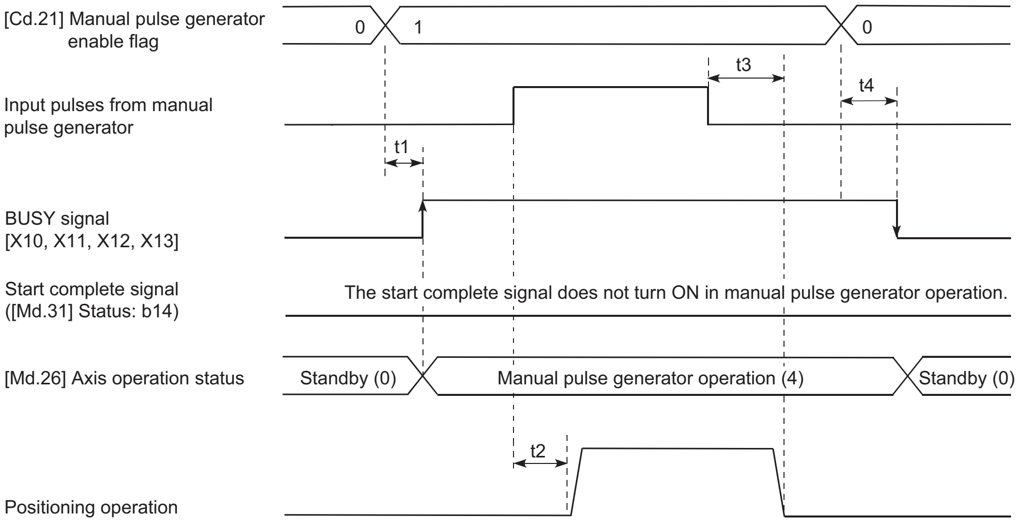
*1 Only when the command position value or the machine feed value overflows or underflows during deceleration, the manual pulse generator operation will terminate as "error occurring". To carry out manual pulse generator operation again, "[Cd.21] Manual pulse generator enable flag" must be turned OFF once and turn ON.



Operation timing and processing time

The following drawing shows details of the manual pulse generator operation timing and processing time.

■Operation example



Normal timing time (Unit: [ms])

[RD77MS]

Operation cycle	t1*1	t2	t3	t4
0.444	0.430 to 0.438	10.065 to 21.810	14.530 to 23.095	7.266 to 15.646
0.888	0.865 to 0.874	10.065 to 21.810	14.530 to 23.095	7.266 to 15.646
1.777	1.735 to 1.748	10.065 to 21.810	14.530 to 23.095	7.266 to 15.646
3.555	3.512 to 3.534	10.065 to 21.810	14.530 to 23.095	7.266 to 15.646

*1 Delays may occur in the t1 timing time due to the operation status of other axes.

Position control by manual pulse generator operation

In manual pulse generator operation, the position is moved by a "manual pulse generator 1 pulse movement amount" per pulse. The command position value in the positioning control by manual pulse generator operation can be calculated using the expression shown below.

Command position value = Number of input pulses × [Cd.20] Manual pulse generator 1 pulse input magnification × Manual pulse generator 1 pulse movement amount

[Pr.1] Unit setting	mm	inch	degree	pulse
Manual pulse generator 1 pulse movement amount	0.1 μm	0.00001 inch	0.00001 degree	1 pulse

For example, when "[Pr.1] Unit setting" is mm and "[Cd.20] Manual pulse generator 1 pulse input magnification" is 2, and 100 pulses are input from the manual pulse generator, the command position value is as follows.

100 × 2 × 0.1 = 20 [μm] ("[Md.20] Command position value" = 200)

The number of pulses output actually to the servo amplifier is "Manual pulse generator 1pulse movement amount/movement amount per pulse".

The movement amount per pulse can be calculated using the expression shown below.

$$\text{Movement amount per pulse} = \frac{\text{[Pr.3] Movement amount per rotation(AL)}}{\text{[Pr.2] Number of pulses per rotation(AP)}} \times \text{[Pr.4] Unit magnification(AM)}$$

For example, when "[Pr.1] Unit setting" is mm and the movement amount per pulse is 1 μm, 0.1/1 = 1/10, i.e., the output to the servo amplifier per pulse from the manual pulse generator is 1/10 pulse. Thus, the Simple Motion module outputs 1 pulse to the servo amplifier after receiving 10 pulses from the manual pulse generator.

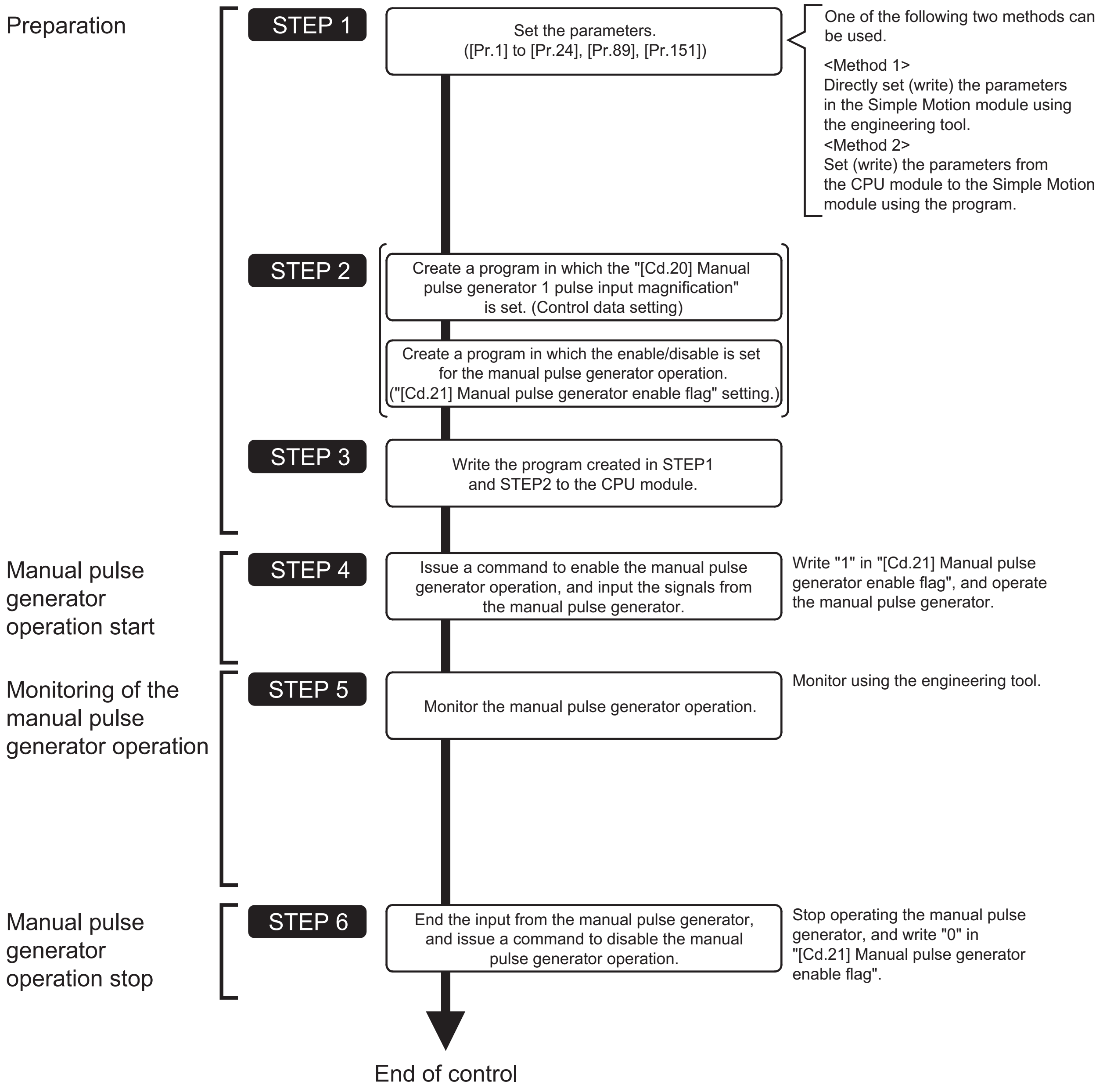
Speed control by manual pulse generation operation

The speed during positioning control by manual pulse generator operation is a speed corresponding to the number of input pulses per unit time, and can be obtained using the following equation.

Output command frequency = Input frequency × [Cd.20] Manual pulse generator 1 pulse input magnification

Manual pulse generator operation execution procedure

The manual pulse generator operation is carried out by the following procedure.



Preparation

STEP 1

Set the parameters.
([Pr.1] to [Pr.24], [Pr.89], [Pr.151])

One of the following two methods can be used.

<Method 1>
Directly set (write) the parameters in the Simple Motion module using the engineering tool.

<Method 2>
Set (write) the parameters from the CPU module to the Simple Motion module using the program.

STEP 2

Create a program in which the "[Cd.20] Manual pulse generator 1 pulse input magnification" is set. (Control data setting)

Create a program in which the enable/disable is set for the manual pulse generator operation. ("[Cd.21] Manual pulse generator enable flag" setting.)

STEP 3

Write the program created in STEP1 and STEP2 to the CPU module.

Manual pulse generator operation start

STEP 4

Issue a command to enable the manual pulse generator operation, and input the signals from the manual pulse generator.

Write "1" in "[Cd.21] Manual pulse generator enable flag", and operate the manual pulse generator.

Monitoring of the manual pulse generator operation

STEP 5

Monitor the manual pulse generator operation.

Monitor using the engineering tool.

Manual pulse generator operation stop

STEP 6

End the input from the manual pulse generator, and issue a command to disable the manual pulse generator operation.

Stop operating the manual pulse generator, and write "0" in "[Cd.21] Manual pulse generator enable flag".

End of control

Point

- Mechanical elements such as limit switches are considered as already installed.
- Parameter settings work in common for all control using the Simple Motion module.

Setting the required parameters for manual pulse generator operation

The "Positioning parameters", "Common parameters" and "Link device external signal assignment parameters" must be set to carry out manual pulse generator operation.

The following table shows the setting items of the required parameters for carrying out manual pulse generator operation. Parameters not shown below are not required to be set for carrying out only manual pulse generator operation. (Set the initial value or a value within the setting range.)

◎: Setting always required.

○: Set according to requirements (Set the initial value or a value within the setting range when not used.)

Setting item			Setting requirement
Positioning parameters	[Pr.1]	Unit setting	◎
	[Pr.2]	Number of pulses per rotation (AP) (Unit: pulse)	◎
	[Pr.3]	Movement amount per rotation (AL) (Unit: pulse)	◎
	[Pr.4]	Unit magnification (AM)	◎
	[Pr.8]	Speed limit value (Unit: pulse/s)	◎
	[Pr.11]	Backlash compensation amount (Unit: pulse)	○
	[Pr.12]	Software stroke limit upper limit value (Unit: pulse)	○
	[Pr.13]	Software stroke limit lower limit value (Unit: pulse)	○
	[Pr.14]	Software stroke limit selection	○
	[Pr.15]	Software stroke limit valid/invalid setting	○
	[Pr.17]	Torque limit setting value (Unit: 0.1%)	○
Common parameters	[Pr.24]	Manual pulse generator/Incremental synchronous encoder input selection	○
	[Pr.89]	Manual pulse generator/Incremental synchronous encoder input type selection	◎
	[Pr.151]	Manual pulse generator/Incremental synchronous encoder input logic selection	○
Link device external signal assignment parameters [RD77GF]	[Pr.700]	Manual pulse generator input: Link device type	◎
	[Pr.701]	Manual pulse generator input: Link device start No.	◎
	[Pr.702]	Manual pulse generator input: Link device count direction setting	◎
	[Pr.703]	Manual pulse generator input: Ring counter maximum value	○
	[Pr.704]	Manual pulse generator input: Ring counter minimum value	○

Refer to the following for the setting details.

☞ Page 496 Basic Setting

Point

- Positioning parameter settings, common parameters settings and link device external signal assignment parameters settings work in common for all controls using the Simple Motion module. When carrying out other controls ("major positioning control", "high-level positioning control", "home position return control"), set the respective setting items as well.
- "Positioning parameters" are set for each axis.

Creating a program to enable/disable the manual pulse generator operation

A program must be created to execute a manual pulse generator operation. Consider the "required control data setting", "start conditions" and "start time chart" when creating the program.

The following shows an example when a manual pulse generator operation is started for axis 1.

Required control data setting

The control data shown below must be set to execute a manual pulse generator operation. The setting is carried out with the program.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.20]	Manual pulse generator 1 pulse input magnification	1	Set the manual pulse generator 1 pulse input magnification. (1 to 10000 times)	4322+100n 4323+100n	1004322+100n 1004323+100n
[Cd.21]	Manual pulse generator enable flag	1 (0)	Set "1: Enable manual pulse generator operation". (Set "0: Disable manual pulse generator operation" when finished with the manual pulse generator operation.)	4324+100n	1004324+100n

Refer to the following for the setting details.

☞ Page 616 Control Data

Start conditions

The following conditions must be fulfilled when starting. The required conditions must also be assembled in the program, and the program must be configured so the operation will not start if the conditions are not fulfilled.

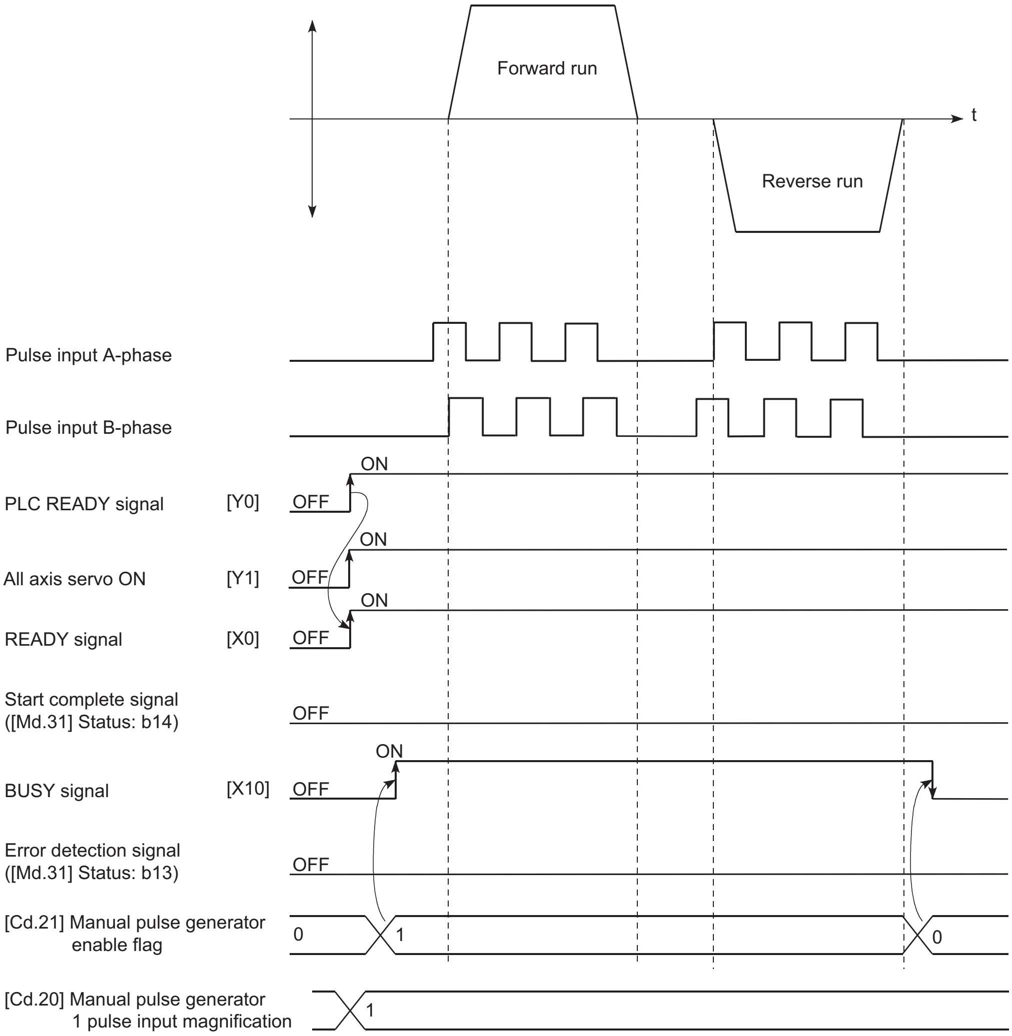
Signal name		Signal state		Device
Interface signal	PLC READY signal	ON	CPU module preparation completed	Y0
	READY signal	ON	Preparation completed	X0
	All axis servo ON	ON	All axis servo ON	Y1
	Synchronization flag[*1]	ON	The buffer memory can be accessed.	X1
	Axis stop signal	OFF	Axis stop signal is OFF	[Cd.180] Axis stop
	Start complete signal	OFF	Start complete signal is OFF	[Md.31] Status: b14
	BUSY signal	OFF	Not operating	X10 to X2F[*2]
	Error detection signal	OFF	There is no error	[Md.31] Status: b13
	M code ON signal	OFF	M code ON signal is OFF	[Md.31] Status: b12
External signal	Forced stop input signal	ON	There is no forced stop input	—
	Stop signal	OFF	Stop signal is OFF	—
	Upper limit (FLS)	ON	Within limit range	—
	Lower limit (RLS)	ON	Within limit range	—

*1 The interlock must be provided so that the buffer memory is accessed after Synchronization flag [X1] turns on. When no interlock is provided, an unexpected value may be read or written.

*2 The BUSY signal, whose axis No. exceeds the number of controlled axes, cannot be used.

Start time chart

■Operation example



Program example

Refer to the following for the program example of the manual pulse generator operation.

☞ Page 694 Manual pulse generator operation program

6 INTER-MODULE SYNCHRONIZATION FUNCTION

This function can synchronize the control timings among multiple modules on the same base.

Control details

This function can synchronize the interrupt program execution cycle of the CPU module and the operation cycle of the Simple Motion module. Refresh which is synchronized with the operation cycle can be executed between some buffer memory addresses[*1] and the devices and labels of the CPU module.

[RD77GF]

Inter-module synchronization setting must be configured.[*2]

The inter-module synchronization cycle is applied as the synchronization communication cycle for CC-Link IE Field Network.

[*1] Buffer memory that can be refreshed in synchronization: "[Cd.183] Execution prohibition flag"

[*2] It is for when the software version of the Simple Motion module is "Ver.04" or before. When its version is "Ver.05" or later, set it as necessary.

Precautions during control

The following shows the available synchronization cycle to synchronize within the Simple Motion modules.

Simple motion module	Supported inter-module synchronization cycle
RD77MS	0.222 ms, 0.444 ms, 0.888 ms, 1.777 ms, 3.555 ms, 7.111 ms
RD77GF	0.50 ms, 1.00 ms, 2.00 ms, 4.00 ms

- When the synchronization cycle except above, the error "Inter-module synchronization cycle unsupported" (error code: 18C0H) will occur.
- There is no need to match the synchronization cycle to the operation cycle of the Simple Motion module. Note that the value of buffer memory address is updated and referred to at the operation cycle. Therefore, when the synchronization cycle is faster than the operation cycle, the monitor data is updated at each operation cycle, and the positioning start signal and control data, etc. are not processed if only the synchronization cycle is ON for only 1 scan. When the synchronization cycle is slower than the operation cycle, data may be skipped in the synchronization cycle interrupt program if the monitor data changes only during 1 operation cycle.
- When executing the simultaneous start using inter-module synchronization, the synchronization cycle and the operation cycle of the Simple Motion module must be matched. Refer to the following for details.
  ☞ Page 201 Simultaneous start using inter-module synchronization
- If the Simple Motion module is not set as a target module of the inter-module synchronization during the online mode, the error "Inter-module synchronization cycle unsupported" (error code: 18C0H) occurs. [RD77GF][*1]

[*1] It is for when the software version of the Simple Motion module is "Ver. 04" or before.

Setting method for inter-module synchronization

The inter-module synchronization can be set at "Synchronization Setting within the Modules" in "System parameter" of the engineering tool.

1. Select "Use" for "Use Inter-module Synchronization Function in System" at "Synchronization Setting within the Modules".
2. Set "Synchronize" in the setting field for the Simple Motion module to be synchronized at "Detailed Setting" of "Select Synchronous Target Unit between Unit".
3. Set the inter-module synchronization cycle at "Fixed Scan Interval Setting of Inter-module Synchronization".

[RD77MS] Select the cycle to be synchronized at "Fixed Scan Interval Setting (Not Set in 0.05 ms unit)".

[RD77GF] Select the cycle to be synchronized at "Fixed Scan Interval Setting (Set in 0.05 ms unit)".

Simultaneous start using inter-module synchronization

This function is used to synchronize the start timing between different modules. It can synchronize the start timing between modules by using with the pre-reading start function together. After starting, the Simple Motion module operates independently.

Refer to the following for "Pre-reading start function".

☞ Page 287 Pre-reading start function

■Procedure

1. Set the Simple Motion module to start simultaneously to the inter-module synchronous target.
2. Set the same cycle between the inter-module synchronization cycle of the CPU module and the operation cycle of the Simple Motion module. If not, the simultaneous start is not guaranteed.
3. Use the pre-reading start function. Execute the positioning start after turning "[Cd.183] Execution prohibition flag" ON.
4. Turn "[Cd.183] Execution prohibition flag" OFF in the same inter-module synchronization cycle during the inter-module synchronous interrupt program (I44).

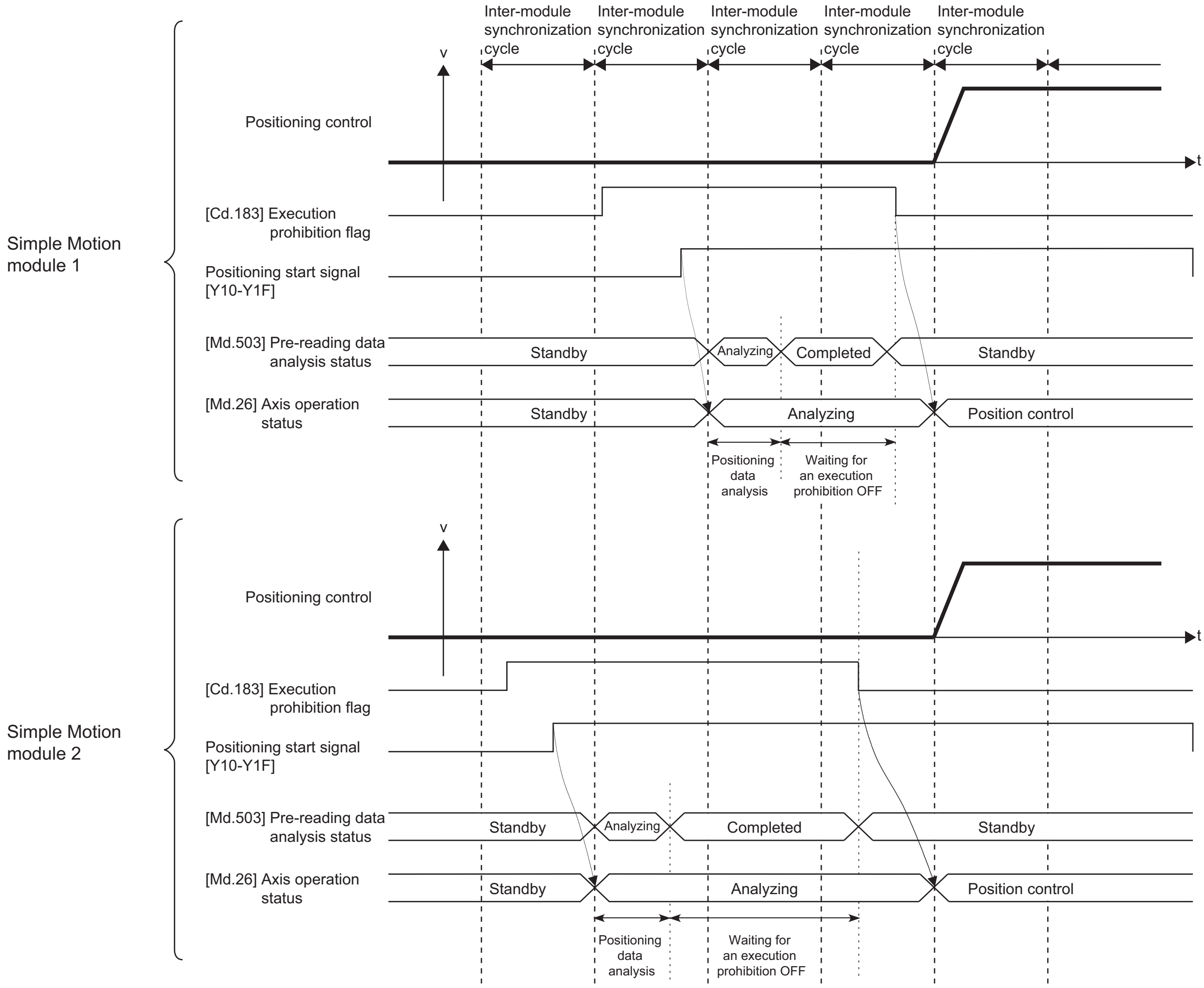
Ex.

To execute the inter-module synchronous interrupt program (I44) as an event, set "Type: Event" and "Detailed Setting Information: Interrupt I44" to the execution type of the program to execute in "Program Setting" of "CPU Parameter".

Precautions

- Turn "[Cd.183] Execution prohibition flag" OFF after "[Md.503] Pre-reading data analysis status" is set to "2: Completed".
- Because each positioning module operates independently after starting, it operates as follows. (Even though an error occurs and the module stops, the module where an error has not occurred continues to operate. Even though the stop signal is input in the program at the same time, the detection timing of the stop signal may not be the same and the stop position may differ.)
- When the inter-module synchronization is enabled, "[Cd.183] Execution prohibition flag" is read during the processing caused by the interrupt of the inter-module synchronous interrupt (I44). Therefore, even if "[Cd.183] Execution prohibition flag" is operated without the inter-module synchronous interrupt (I44), "[Cd.183] Execution prohibition flag" is not read. If the inter-module synchronous interrupt (I44) is used, the processing is executed without any operation of "[Cd.183] Execution prohibition flag" in the event. However, the inter-module synchronization start is not guaranteed.
- When the inter-module synchronous interrupt (I44) exceeds the internal operation process time of the Simple Motion module, the warning "Inter-module synchronization cycle time over [RD77MS]" or "Synchronization cycle time over [RD77GF]" (warning code: 0CC0H) occurs. Even at the time, the module where an error has not occurred continues to operate.

■Operation example



7 EXPANSION CONTROL

The details and usage of expansion control are explained in this chapter.
Expansion control includes the speed-torque control to execute the speed control and torque control not including position loop and the advanced synchronous control to synchronize with input axis using software with "advanced synchronous control parameter" instead of controlling mechanically with gear, shaft, speed change gear or cam, etc.
Execute the required settings to match each control.

7.1 Speed-torque Control

Outline of speed-torque control

This function is used to execute the speed control or torque control that does not include the position loop for the command to servo amplifier.
"Continuous operation to torque control mode" that switches the control mode to torque control mode without stopping the servo motor during positioning operation is also available for tightening a bottle cap or a screw. [RD77MS]
Switch the control mode from "position control mode" to "speed control mode", "torque control mode" or "continuous operation to torque control mode" to execute the "Speed-torque control".

Control mode	Control	Remark
Position control mode	Positioning control, home position return control, JOG operation, Inching operation and Manual pulse generator operation	Control that include the position loop for the command to servo amplifier.
Speed control mode	Speed-torque control	Control that does not include the position loop for the command to servo amplifier.
Torque control mode		
Continuous operation to torque control mode [RD77MS]		Control that does not include the position loop for the command to servo amplifier. Control mode can be switched during positioning control or speed control.

Use the servo amplifiers whose software versions are compatible with each control mode to execute the "Speed-torque control".

Servo amplifier software versions that are compatible with each control mode are shown below. For the support information not listed in the table below, refer to the instruction manual or manual of the servo amplifier to be used.

—: There is no restriction by the version.

Servo amplifier model		**Software version**		
		Speed control	**Torque control**	**Continuous operation to torque control**[1]
MR-J5-_B_	[RD77MS]	—	—	—
MR-J5W_-_B				
MR-J5-_B_-RJ				
MR-J4-_B_/MR-JE-B(F)				
MR-J4W_-_B				
MR-J4-_B_-RJ				
MR-J3-_B_			B3 or later	C7 or later
MR-J3W-_B			—	Not compatible
MR-J3-_BS_				C7 or later
MR-J3-_B_-RJ004		B0 or later	B0 or later	
MR-J3-_B_-RJ006				
MR-J3-_B-RJ080W				
MR-J4-_GF_	[RD77GF]	—	—	Not compatible
MR-J4-_GF_-RJ				

[1] The torque generation direction of servo motor can be changed by setting the servo parameter "Function selection C-B POL reflection selection at torque control (PC29)" for the servo amplifier that is compatible with the continuous operation to torque control. (☞ Page 208 Operation of speed-torque control)
For the servo amplifier that is not compatible with the continuous operation to torque control, the operation is the same as that of when "0: Enabled" is set in servo parameter "Function selection C-B POL reflection selection at torque control (PC29)".
Virtual servo amplifier does not support the continuous operation to torque control.

⚠CAUTION

- If operation that generates torque more than 100% of the rating is performed with an abnormally high frequency in a servo motor stop status (servo lock status) or in a 30 r/min or less low-speed operation status, the servo amplifier may malfunction regardless of the electronic thermal relay protection.

Setting the required parameters for speed-torque control

The "Positioning parameters" must be set to carry out speed-torque control.

The following table shows the setting items of the required parameters for carrying out speed-torque control. Parameters not shown below are not required to be set for carrying out only speed-torque control. (Set the initial value or a value within the setting range.)

◎: Setting always required.

○: Set according to requirements (Set the initial value or a value within the setting range when not used.)

Setting item			**Setting requirement**
Positioning parameters	[Pr.1]	Unit setting	◎
	[Pr.2]	Number of pulses per rotation (AP)	◎
	[Pr.3]	Movement amount per rotation (AL)	◎
	[Pr.4]	Unit magnification (AM)	◎
	[Pr.8]	Speed limit value	◎
	[Pr.12]	Software stroke limit upper limit value	○
	[Pr.13]	Software stroke limit lower limit value	○
	[Pr.14]	Software stroke limit selection	○
	[Pr.22]	Input signal logic selection	◎
	[Pr.83]	Speed control 10 × multiplier setting for degree axis	○
	[Pr.90]	Operation setting for speed-torque control mode	○
	[Pr.127]	Speed limit value input selection at control mode switching [RD77MS]	○
Common parameters	[Pr.82]	Forced stop valid/invalid selection	○

Refer to the following for the setting details.

☞ Page 496 Basic Setting

Point

- Positioning parameter settings and common parameters settings work in common for all controls using the Simple Motion module. When carrying out other controls ("major positioning control", "high-level positioning control", "home position return control"), set the respective setting items as well.
- "Positioning parameters" are set for each axis.

Setting the required data for speed-torque control

Required control data setting for the control mode switching

The control data shown below must be set to execute the control mode switching.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.138]	Control mode switching request	1	Set "1: Switching request" after setting "[Cd.139] Control mode setting".	4374+100n	1004374+100n
[Cd.139]	Control mode setting	→	Set the control mode to switch. 0: Position control mode 10: Speed control mode 20: Torque control mode 30: Continuous operation to torque control mode [RD77MS]	4375+100n	1004375+100n

Refer to the following for the setting details.

☞ Page 616 Control Data

When "30: Continuous operation to torque control mode" is set, set the switching condition of the control mode to switch to the continuous operation to torque control mode.

The control data shown below must be set to set the switching condition of control mode.

n: Axis No. - 1

Setting item		Setting value	Setting details	Buffer memory address
[Cd.153]	Control mode auto-shift selection [RD77MS]	→	Set the switching condition when switching to continuous operation to torque control mode. 0: No switching condition 1: Command position value pass 2: Actual position value pass	4393+100n
[Cd.154]	Control mode auto-shift parameter [RD77MS]	→	Set the condition value when setting the control mode switching condition.	4394+100n 4395+100n

Refer to the following for the setting details.

☞ Page 616 Control Data

Required control data setting for the speed control mode

The control data shown below must be set to execute the speed control.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.140]	Command speed at speed control mode	→	Set the command speed at speed control mode.	4376+100n 4377+100n	1004376+100n 1004377+100n
[Cd.141]	Acceleration time at speed control mode	→	Set the acceleration time at speed control mode.	4378+100n	1004378+100n
[Cd.142]	Deceleration time at speed control mode	→	Set the deceleration time at speed control mode.	4379+100n	1004379+100n

Refer to the following for the setting details.

☞ Page 616 Control Data

Required control data setting for the torque control mode

The control data shown below must be set to execute the torque control.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.143]	Command torque at torque control mode	→	Set the command torque at torque control mode.	4380+100n	1004380+100n
[Cd.144]	Torque time constant at torque control mode (Forward direction)	→	Set the time constant at driving during torque control mode.	4381+100n	1004381+100n
[Cd.145]	Torque time constant at torque control mode (Negative direction)	→	Set the time constant at regeneration during torque control mode.	4382+100n	1004382+100n
[Cd.146]	Speed limit value at torque control mode	→	Set the speed limit value at torque control mode.	4384+100n 4385+100n	1004384+100n 1004385+100n

Refer to the following for the setting details.

☞ Page 616 Control Data

Required control data setting for the continuous operation to torque control mode [RD77MS]

The control data shown below must be set to execute the continuous operation to torque control.

n: Axis No. - 1

Setting item		Setting value	Setting details	Buffer memory address
[Cd.147]	Speed limit value at continuous operation to torque control mode	→	Set the speed limit value at continuous operation to torque control mode.	4386+100n 4387+100n
[Cd.148]	Acceleration time at continuous operation to torque control mode	→	Set the acceleration time at continuous operation to torque control mode.	4388+100n
[Cd.149]	Deceleration time at continuous operation to torque control mode	→	Set the deceleration time at continuous operation to torque control mode.	4389+100n
[Cd.150]	Target torque at continuous operation to torque control mode	→	Set the target torque at continuous operation to torque control mode.	4390+100n
[Cd.151]	Torque time constant at continuous operation to torque control mode (Forward direction)	→	Set the time constant at driving during continuous operation to torque control mode.	4391+100n
[Cd.152]	Torque time constant at continuous operation to torque control mode (Negative direction)	→	Set the time constant at regeneration during continuous operation to torque control mode.	4392+100n

Refer to the following for the setting details.

☞ Page 616 Control Data

Operation of speed-torque control

Switching of control mode (Speed control/Torque control)

■Switching method of control mode

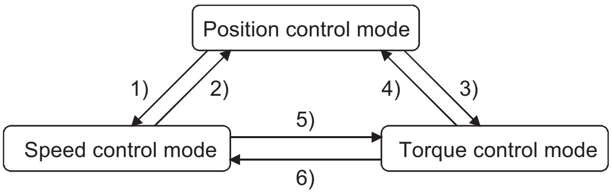
To switch the control mode to the speed control or the torque control, set "1" in "[Cd.138] Control mode switching request" after setting the control mode in "[Cd.139] Control mode setting".

When the mode is switched to the speed control mode or the torque control mode, the control data used in each control mode must be set before setting "1" in "[Cd.138] Control mode switching request".

When the switching condition is satisfied at control mode switching request, "30: Control mode switch" is set in "[Md.26] Axis operation status", and the BUSY signal turns ON. "0" is automatically stored in "[Cd.138] Control mode switching request" by Simple Motion module after completion of switching.

The warning "Control mode switching during BUSY" (warning code: 09E6H) or "Control mode switching during zero speed OFF" (warning code: 09E7H) occurs if the switching condition is not satisfied, and the control mode is not switched.

The following shows the switching condition of each control mode.



Switching operation		Switching condition
1)	Position control mode → Speed control mode	Not during positioning[*1] and during motor stop[*2*3]
2)	Speed control mode → Position control mode	During motor stop[*2*3]
3)	Position control mode → Torque control mode	Not during positioning[*1] and during motor stop[*2*3]
4)	Torque control mode → Position control mode	During motor stop[*2*3]
5)	Speed control mode → Torque control mode	None
6)	Torque control mode → Speed control mode	

*1 BUSY signal is OFF.

*2 ZERO speed ([Md.119] Servo status2: b3) is ON.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Monitor item	Buffer memory address	
	Axis 1 to axis 16	Axis 17 to axis 32
[Md.119] Servo status2: b3	2476+100n	1002476+100n

*3 Change the setting of "Condition selection at mode switching (b12 to b15)" in "[Pr.90] Operation setting for speed-torque control mode" when switching the control mode without waiting for the servo motor to stop. Note that it may cause vibration or impact at control switching. (☞ Page 532 [Pr.90] Operation setting for speed-torque control mode)

The history of control mode switching is stored to the start history at request of control mode switching. (☞ Page 576 System monitor data)

Confirm the control mode with "control mode ([Md.108] Servo status1: b2, b3)" of "[Md.108] Servo status". (☞ Page 585 Axis monitor data)

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Monitor item	Buffer memory address	
	Axis 1 to axis 16	Axis 17 to axis 32
[Md.108] Servo status1: b2, b3	2477+100n	1002477+100n

■Precautions at control mode switching

- The start complete signal and the positioning complete signal do not turn ON at control mode switching.
- When "30: Control mode switch", "31: Speed control", or "32: Torque control" is set in "[Md.26] Axis operation status", the BUSY signal turns ON.
- The motor rotation speed might change momentarily at switching from the speed control mode to the torque control mode. Therefore, it is recommended that the control mode is switched from the speed control to the torque control after the servo motors stop.
- Use the continuous operation to torque control mode for the usage such as pressing a workpiece. When using the continuous operation during the speed control mode for a usage such as pressing a workpiece, set as the following.

- MR-J5(W)-B: Set servo parameter "Function selection B-1 Model adaptive control selection (PB25.0)" to "2: Disabled (PID control)".
- MR-J4(W)-B: Set servo parameter "Function selection B-1 (PB25)" to "2: Disabled (PID control)".

- "In speed control flag" ([Md.31] Status: b0) does not turn ON during the speed control mode in the speed-torque control.

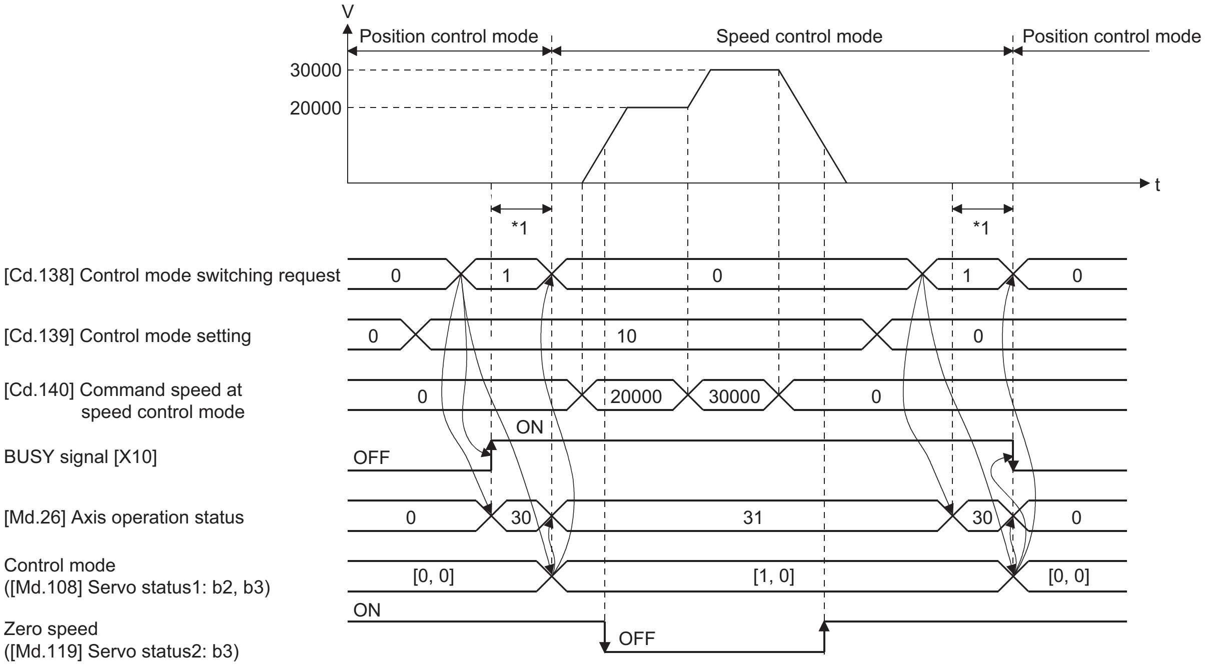
■Operation for "Position control mode ⇔ Speed control mode switching"

When the position control mode is switched to the speed control mode, the command speed immediately after the switching is the speed set in "speed initial value selection (b8 to b11)" of "[Pr.90] Operation setting for speed-torque control mode".

Speed initial value selection ([Pr.90]: b8 to b11)	Command speed to servo amplifier immediately after switching from position control mode to speed control mode
0: Command speed	The speed to servo amplifier immediately after switching is "0".
1: Feedback speed	Motor rotation speed received from servo amplifier at switching.
2: Automatic selection	The command speed is invalid due to the setting of continuous operation to torque control mode. At control mode switching, operation is the same as "0: Command speed".

When the speed control mode is switched to the position control mode, the command position immediately after the switching is the command position value at switching.

The following chart shows the operation timing for axis 1.



*1 [RD77MS] 6 to 11 ms

[RD77GF] The switching time differs by the specification of the servo amplifier. When "ZSP disabled selection at control switching" of the servo parameter "Function selection C-E (PC76)" is set to "0: Enabled" at MR-J4-GF use, the control mode switches after the motor speed becomes zero.

■Operation for "Position control mode ⇔ Torque control mode switching"

When the position control mode is switched to the torque control mode, the command torque immediately after the switching is the torque set in "Torque initial value selection (b4 to b7)" of "[Pr.90] Operation setting for speed-torque control mode".

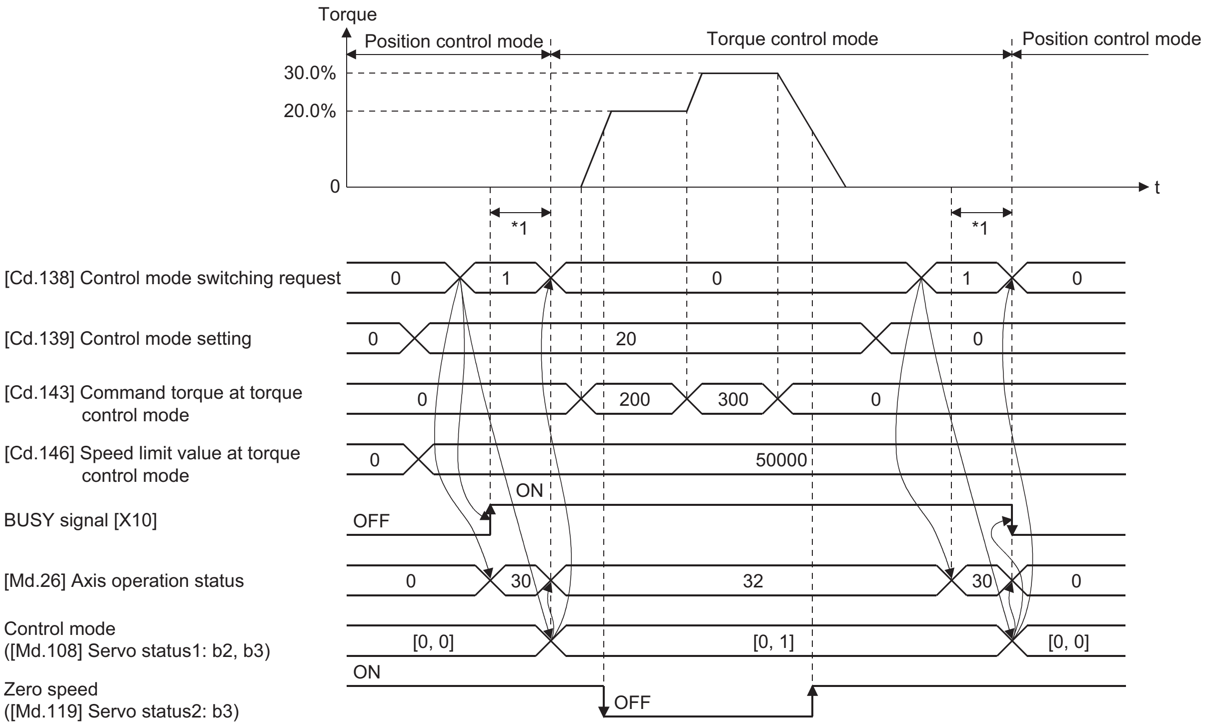
Torque initial value selection ([Pr.90]: b4 to b7)	Command torque to servo amplifier immediately after switching from position control mode to torque control mode
0: Command torque	The value of "[Cd.143] Command torque at torque control mode" at switching.
1: Feedback torque	Motor torque value at switching.

Point

When the servo parameter "Function selection C-B POL reflection selection at torque control (PC29)" is set to "0: Enabled" and "Torque initial value selection" is set to "1: Feedback torque", the warning "Torque initial value selection invalid" (warning code: 09E5H) will occur at control mode switching, and the command value immediately after switching is the same as the case of selecting "0: Command torque". If the feedback torque is selected, set "1: Disabled" in the servo parameter "Function selection C-B POL reflection selection at torque control (PC29)".

When the torque control mode is switched to the position control mode, the command position immediately after the switching is the command position value at switching.

The following chart shows the operation timing for axis 1.



*1 [RD77MS] 6 to 11 ms
[RD77GF] The switching time differs by the specification of the servo amplifier. When "ZSP disabled selection at control switching" of the servo parameter "Function selection C-E (PC76)" is set to "0: Enabled" at MR-J4-GF use, the control mode switches after the motor speed becomes zero.

■Operation for "Speed control mode ⇔ Torque control mode switching"

When the speed control mode is switched to the torque control mode, the command torque immediately after the switching is the torque set in "Torque initial value selection (b4 to b7)" of "[Pr.90] Operation setting for speed-torque control mode".

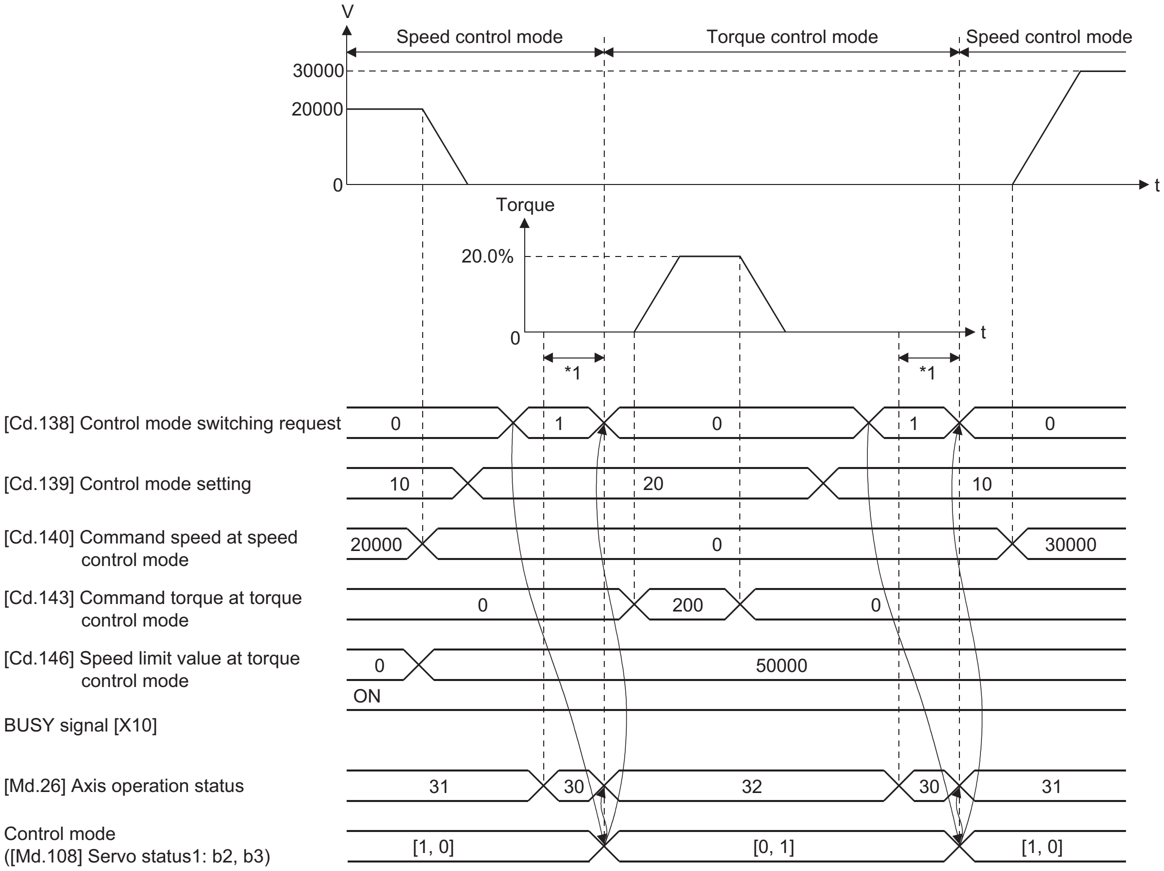
Torque initial value selection ([Pr.90]: b4 to b7)	Command torque to servo amplifier immediately after switching from speed control mode to torque control mode
0: Command torque	The value of "[Cd.143] Command torque at torque control mode" at switching.
1: Feedback torque	Motor torque value at switching.

Point

When the servo parameter "Function selection C-B POL reflection selection at torque control (PC29)" is set to "0: Enabled" and "Torque initial value selection" is set to "1: Feedback torque", the warning "Torque initial value selection invalid" (warning code: 09E5H) will occur at control mode switching, and the command value immediately after switching is the same as the case of selecting "0: Command torque". If the feedback torque is selected, set "1: Disabled" in the servo parameter "Function selection C-B POL reflection selection at torque control (PC29)".

When the torque control mode is switched to the speed control mode, the command speed immediately after the switching is the motor rotation speed at switching.

The following chart shows the operation timing for axis 1.



*1 [RD77MS] 6 to 11 ms
[RD77GF] The switching time differs by the specification of the servo amplifier. When "ZSP disabled selection at control switching" of the servo parameter "Function selection C-E (PC76)" is set to "0: Enabled" at MR-J4-GF use, the control mode switches after the motor speed becomes zero.

Switching of control mode (Continuous operation to torque control) [RD77MS]

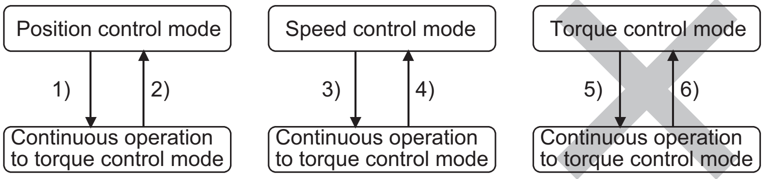
■Switching method of control mode

To switch the control mode to the continuous operation to torque control mode, set "1" in "[Cd.138] Control mode switching request" after setting the control mode to switch to "[Cd.139] Control mode setting" (30: Continuous operation to torque control mode) from position control mode or speed control mode.

The selected control mode can be checked in "[Md.26] Axis operation status".

When the switching condition is satisfied at control mode switching request, "1: Position control mode - continuous operation to torque control mode, speed control mode - continuous operation to torque control mode switching" is set in "[Md.124] Control mode switching status", and the BUSY signal turns ON.

The following shows the switching condition of the continuous operation to torque control mode.



Switching operation		Switching condition
1)	Position control mode → Continuous operation to torque control mode	Not during positioning[1] or during following positioning/synchronous mode • ABS1: 1-axis linear control (ABS) • INC1: 1-axis linear control (INC) • FEED1: 1-axis fixed-feed control • VF1: 1-axis speed control (Forward) • VR1: 1-axis speed control (Reverse) • VPF: Speed-position switching control (Forward) • VPR: Speed-position switching control (Reverse) • PVF: Position-speed switching control (Forward) • PVR: Position-speed switching control (Reverse) • Synchronous control
2)	Continuous operation to torque control mode → Position control mode	During motor stop[2]
3)	Speed control mode → Continuous operation to torque control mode	None
4)	Continuous operation to torque control mode → Speed control mode	
5)	Torque control mode → Continuous operation to torque control mode	Switching is impossible.
6)	Continuous operation to torque control mode → Torque control mode	

*1 BUSY signal is OFF.

*2 ZERO speed ([Md.119] Servo status2: b3) is ON. Change the setting of "Condition selection at mode switching (b12 to b15)" in "[Pr.90] Operation setting for speed-torque control mode" when switching the control mode without waiting for the servo motor to stop. Note that it may cause vibration or impact at control switching. (☞ Page 532 [Pr.90] Operation setting for speed-torque control mode)

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Monitor item	Buffer memory address	
	Axis 1 to axis 16	Axis 17 to axis 32
[Md.119] Servo status2: b3	2476+100n	1002476+100n

The history of control mode switching is stored to the start history at request of control mode switching. (☞ Page 576 System monitor data)

Confirm the status of the continuous operation to torque control mode with "b14: Continuous operation to torque control" of "[Md.125] Servo status3". When the mode is switched to the continuous operation to torque control mode, the value in "control mode (b2, b3)" of "[Md.108] Servo status1" remains the same as before switching the control mode. (☞ Page 585 Axis monitor data)

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Monitor item	Buffer memory address	
	Axis 1 to axis 16	Axis 17 to axis 32
[Md.108] Servo status1: b2, b3	2477+100n	1002477+100n

Point

- When the mode is switched from position control mode to continuous operation to torque control mode, only the switching from continuous operation to torque control mode to position control mode is possible. If the mode is switched to other control modes, the warning "Control mode switching not possible" (warning code: 09EBH) will occur, and the control mode is not switched.
- When the mode is switched from speed control mode to continuous operation to torque control mode, only the switching from continuous operation to torque control mode to speed control mode is possible. If the mode is switched to other control modes, the warning "Control mode switching not possible" (warning code: 09EBH) will occur, and the control mode is not switched.

■Precautions at control mode switching

- The start complete signal and positioning complete signal do not turn ON at control mode switching.
- When "33: Continuous operation to torque control" is set in "[Md.26] Axis operation status" and "1: Position control mode - continuous operation to torque control mode, speed control mode - continuous operation to torque control mode switching" is set in "[Md.124] Control mode switching status", the BUSY signal turns ON.
- When using the continuous operation to torque control mode, use the servo amplifiers that are compatible with the continuous operation to torque control. If the servo amplifiers that are not compatible with the continuous operation to torque control are used, the error "Continuous operation to torque control not supported" (error code: 19E7H) occurs at request of switching to continuous operation to torque control mode, and the operation stops. (In the positioning control, the operation stops according to the setting of "[Pr.39] Stop group 3 rapid stop selection". In the speed control, the mode switches to the position control, and the operation immediately stops.)

■Operation for "Position control mode ⇔ Continuous operation to torque control mode switching"

To switch to the continuous operation to torque control mode, set the control data used in the control mode before setting "1" in "[Cd.138] Control mode switching request".

When the switching condition is satisfied at control mode switching request, "1: Position control mode - continuous operation to torque control mode, speed control mode - continuous operation to torque control mode switching" is set in "[Md.124] Control mode switching status" and the BUSY signal turns ON. (When the control mode switching request is executed while the BUSY signal is ON, the BUSY signal does not turn OFF but stays ON at control mode switching.)

"0" is automatically stored in "[Cd.138] Control mode switching request" and "[Md.124] Control mode switching status" after completion of switching.

When the position control mode is switched to the continuous operation to torque control mode, the command torque and command speed immediately after the switching are the values set according to the following setting in "Torque initial value selection (b4 to b7)" and "Speed initial value selection (b8 to b11)" of "[Pr.90] Operation setting for speed-torque control mode".

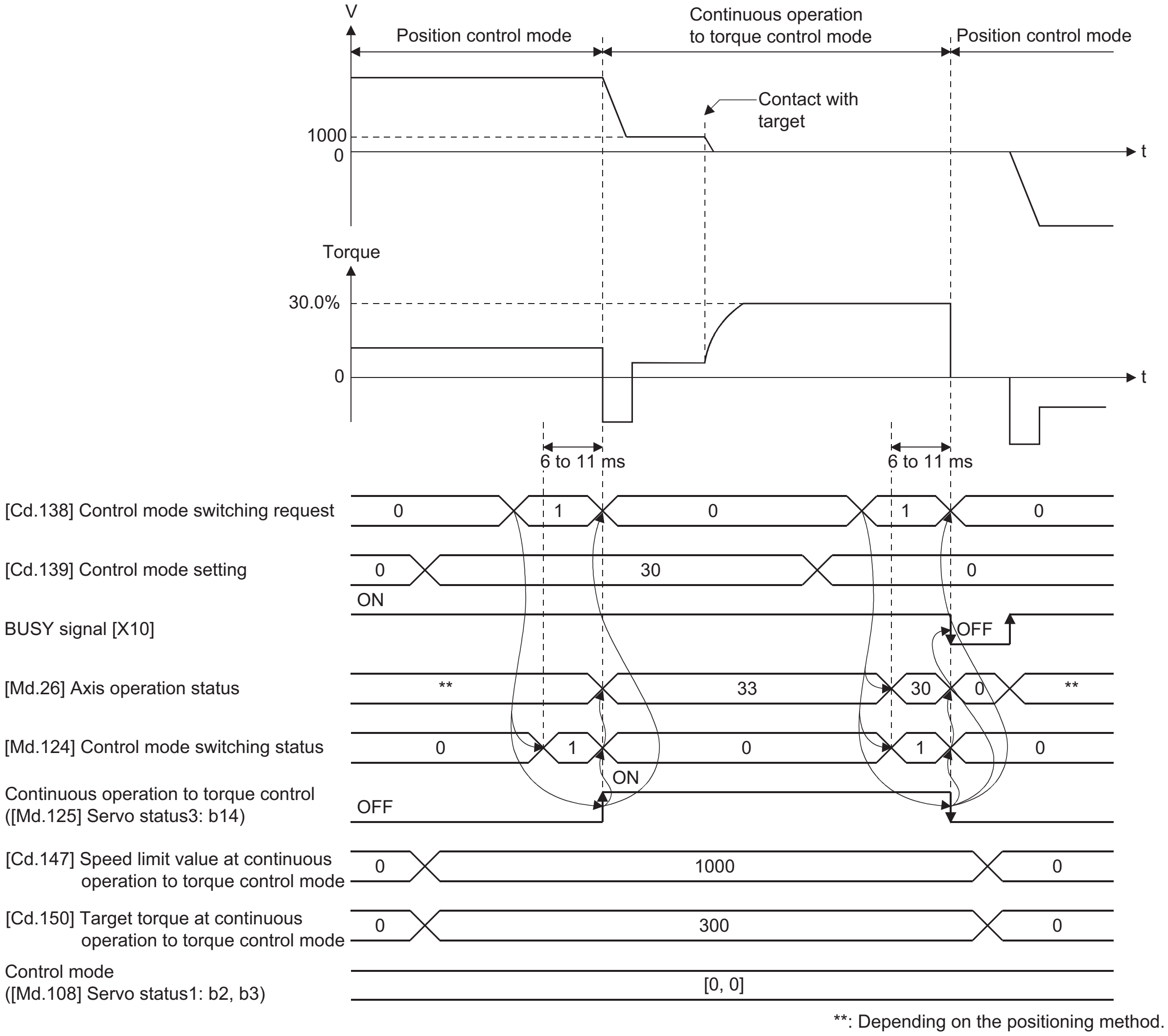
Torque initial value selection ([Pr.90]: b4 to b7)	Command torque to servo amplifier immediately after switching from position control mode to continuous operation to torque control mode
0: Command torque	The value of "[Cd.150] Target torque at continuous operation to torque control mode" at switching.
1: Feedback torque	Motor torque value at switching.

Speed initial value selection ([Pr.90]: b8 to b11)	Command speed to servo amplifier immediately after switching from position control mode to continuous operation to torque control mode
0: Command speed	Speed that the position command at switching is converted into the motor rotation speed. (When the positioning does not start at switching, the speed to servo amplifier immediately after switching is "0".)
1: Feedback speed	Motor rotation speed received from servo amplifier at switching.
2: Automatic selection	The lower speed between speed that position command at switching is converted into the motor rotation speed and motor rotation speed received from servo amplifier at switching.

Point

When the mode is switched to continuous operation to torque control mode in cases where command speed and actual speed are different such as during acceleration/deceleration or when the speed does not reach command speed due to torque limit, set "1: Feedback speed" in "Speed initial value selection (b8 to b11)".

The following chart shows the operation timing for axis 1.



■Operation for "Speed control mode ⇔ Continuous operation to torque control mode switching"

To switch to the continuous operation to torque control mode, set the control data used in the control mode before setting "1" in "[Cd.138] Control mode switching request".

When the switching condition is satisfied at control mode switching request, "1: Position control mode - continuous operation to torque control mode, speed control mode - continuous operation to torque control mode switching" is set in "[Md.124] Control mode switching status" and the BUSY signal turns ON. (When the control mode switching request is executed while the BUSY signal is ON, the BUSY signal does not turn OFF but stays ON at control mode switching.)

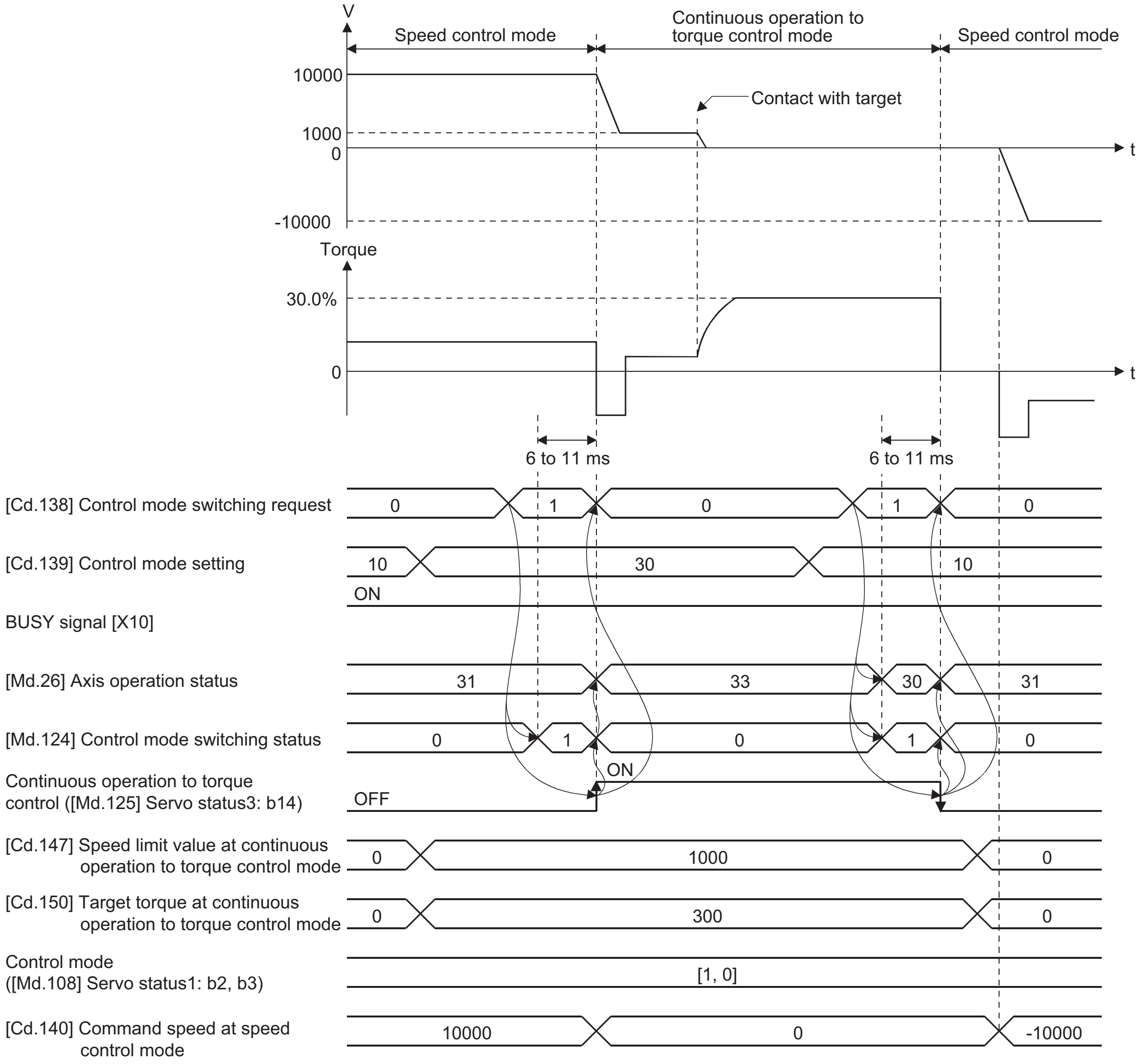
"0" is automatically stored in "[Cd.138] Control mode switching request" and "[Md.124] Control mode switching status" after completion of switching.

When the speed control mode is switched to the continuous operation to torque control mode, the command torque and command speed immediately after the switching are the values set in "Torque initial value selection (b4 to b7)" and "Speed initial value selection (b8 to b11)" of "[Pr.90] Operation setting for speed-torque control mode".

Torque initial value selection ([Pr.90]: b4 to b7)	Command torque to servo amplifier immediately after switching from speed control mode to continuous operation to torque control mode
0: Command torque	The value of "[Cd.150] Target torque at continuous operation to torque control mode" at switching.
1: Feedback torque	Motor torque value at switching.

Speed initial value selection ([Pr.90]: b8 to b11)	Command speed to servo amplifier immediately after switching from speed control mode to continuous operation to torque control mode
0: Command speed	The speed commanded to the servo amplifier immediately after switching is the currently commanded speed.
1: Feedback speed	Motor rotation speed received from servo amplifier at switching.
2: Automatic selection	The speed at switching is the lower speed between the currently commanded speed converted into the motor rotation speed and the motor rotation speed received from servo amplifier.

The following chart shows the operation timing for axis 1.



■Operation for switching from "Position control mode" to "Continuous operation to torque control mode" automatically

To switch to the continuous operation to torque control mode automatically when the conditions set in "[Cd.153] Control mode auto-shift selection" and "[Cd.154] Control mode auto-shift parameter" are satisfied, set the control data necessary in the continuous operation to torque control mode, "[Cd.153] Control mode auto-shift selection" and "[Cd.154] Control mode auto-shift parameter", and then set "30: Continuous operation to torque control mode" in "[Cd.139] Control mode setting" and "1: Switching request" in "[Cd.138] Control mode switching request".

In this case, the current control is continued until the setting condition is satisfied after control mode switching request, and "2: Waiting for the completion of control mode switching condition" is set in "[Md.124] Control mode switching status". When the set condition is satisfied, "1: Position control mode - continuous operation to torque control mode, speed control mode - continuous operation to torque control mode switching" is set in "[Md.124] Control mode switching status".

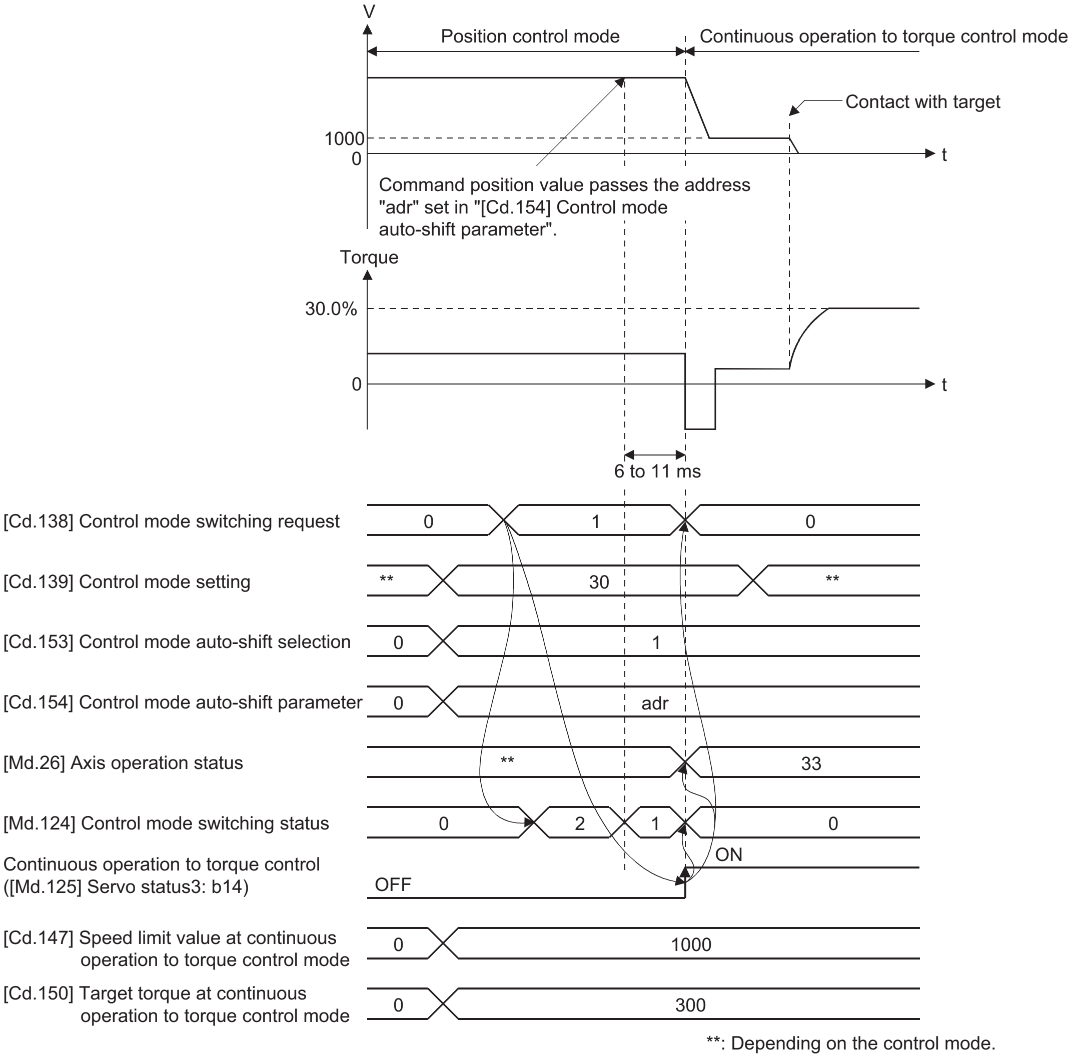
"0" is stored in "[Cd.138] Control mode switching request" and "[Md.124] Control mode switching status" after completion of switching.

If "[Cd.154] Control mode auto-shift parameter" is outside the setting range, the error "Outside control mode auto-shift switching parameter range" (error code: 19E4H) occurs at control mode switching request, and the current processing stops. (In the positioning control, the operation stops according to the setting of "[Pr.39] Stop group 3 rapid stop selection". In the speed control, the mode switches to the position control, and the operation immediately stops.)

Point

- Automatic switching is valid only when the control mode is switched from the position control mode to the continuous operation to torque control mode. When the mode is switched from speed control mode to continuous operation to torque control mode or from continuous operation to torque control mode to other control modes, even if the automatic switching is set, the state is not waiting for the completion of condition, and control mode switching is executed immediately.
- When the mode switching request is executed after setting the switching condition, the state of waiting for the completion of control mode switching condition continues until the setting condition is satisfied. Therefore, if the positioning by automatic switching is interrupted, unexpected control mode switching may be executed in other positioning operations. Waiting for the completion of control mode switching condition can be cancelled by setting "Other than 1: Not request" in "[Cd.138] Control mode switching request" or by turning the axis stop signal ON. When an error occurs, waiting for the completion of control mode switching condition is also cancelled. (In both cases, "0" is stored in "[Cd.138] Control mode switching request".)
- In the state of waiting for the completion of control mode switching condition, if the current values are updated by the current value changing, the fixed-feed control or the speed control (when "2: Clear command position value to zero" is set in "[Pr.21] Command position value during speed control"), an auto-shift judgment is executed based on the updated current value. Therefore, depending on the setting condition, the mode may be switched to the continuous operation to torque control mode immediately after the positioning starts. To avoid this switching, set "1: Switching request" in "[Cd.138] Control mode switching request".

The following chart shows the operation when "1: Command position value pass" is set in "[Cd.153] Control mode auto-shift selection".



Speed control mode

■Operation for speed control mode

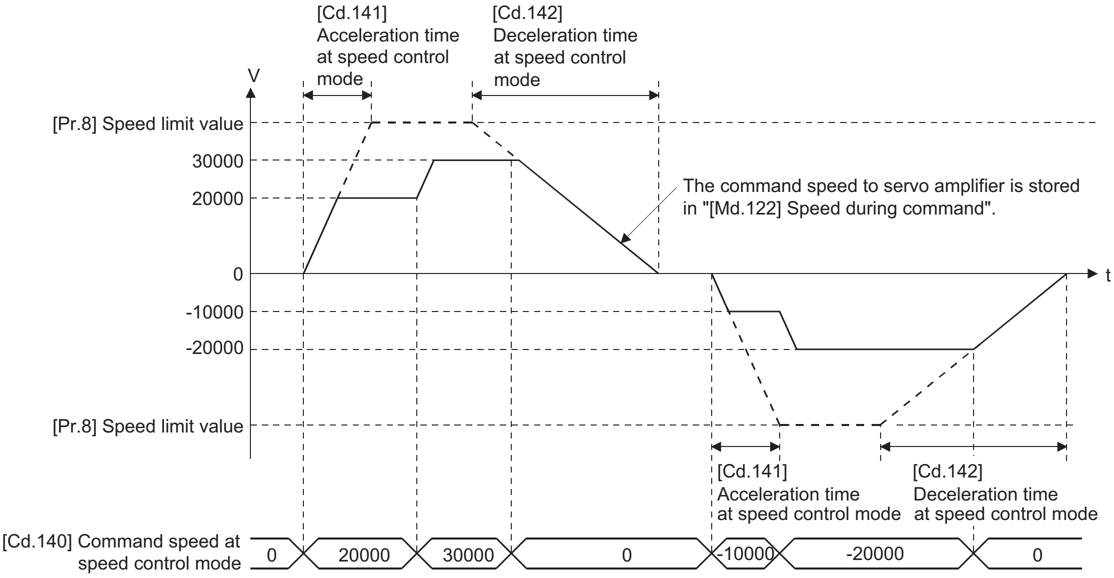
The speed control is executed at the speed set in "[Cd.140] Command speed at speed control mode" in the speed control mode.

Set a positive value for forward rotation and a negative value for reverse rotation. "[Cd.140]" can be changed any time during the speed control mode.

Acceleration/deceleration is performed based on a trapezoidal acceleration/deceleration processing. Set acceleration/deceleration time toward "[Pr.8] Speed limit value" in "[Cd.141] Acceleration time at speed control mode" and "[Cd.142] Deceleration time at speed control mode". The value at speed control mode switching request is valid for "[Cd.141]" and "[Cd.142]".

The command speed during the speed control mode is limited with "[Pr.8] Speed limit value". If the speed exceeding the speed limit value is set, the warning "Speed limit value over" (warning code: 0991H) occurs, and the operation is controlled with the speed limit value.

Confirm the command speed to servo amplifier with "[Md.122] Speed during command".



Point

[RD77GF]

The minimum command unit of the speed to command to the servo amplifier is 0.01 r/min as using the rotary servo motor and 0.01 mm/s as using the linear servo motor. When the smaller values than those are set in "[Cd.140] Command speed at speed control mode" as the command speed, the speed to command to the servo amplifier becomes 0.

■Command position value during speed control mode

"[Md.20] Command position value", "[Md.21] Machine feed value" and "[Md.101] Actual position value" are updated even in the speed control mode.

If the command position value exceeds the software stroke limit, the error "Software stroke limit +" (error code: 1993H) or "Software stroke limit -" (error code: 1995H) occurs and the operation switches to the position control mode. Invalidate the software stroke limit to execute one-way feed.

■Stop cause during speed control mode

The operation for stop cause during speed control mode is shown below.

Item	Operation during speed control mode
"[Cd.180] Axis stop" turned ON.	The motor decelerates to speed "0" according to the setting value of "[Cd.142] Deceleration time at speed control mode". The mode switches to the position control mode when "Zero speed" of "[Md.119] Servo status2" turns ON, and the operation stops.
Stop signal of "[Cd.44] External input signal operation device" turned ON.	
All axis servo ON [Y1] turned OFF.	The servo OFF is not executed during the speed control mode. The command status when the mode is switched to the position control mode becomes valid.
"[Cd.100] Servo OFF command" turned ON.	
The current value reached the software stroke limit.	An error (error code: 1900H, 1904H to 1907H, 1993H, 1995H) occurs. The mode switches to the position control mode at the current position, and the operation immediately stops. (Deceleration processing is not executed.)
The position of the motor reached the hardware stroke limit.	
PLC READY signal [Y0] turned OFF.	
The forced stop input to Simple Motion module.	The mode switches to the position control mode when the servo OFF (Servo ON of "[Md.108] Servo status1" turns OFF) is executed. (While the servo amplifier is servo OFF, even if the mode is switched to position control mode, the servo motor immediately stops.)
The emergency stop input to servo amplifier.	
The servo alarm occurred.	
The servo amplifier's power supply turned OFF.	Stop processing of the controller is immediate stop. (The mode is set to the position control mode at the servo amplifier's power supply ON again.)

Torque control mode

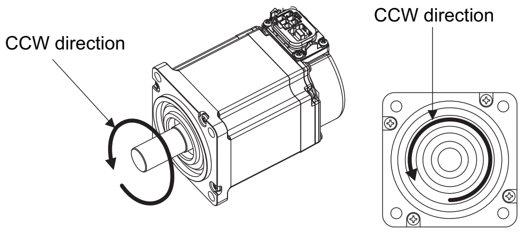
■Operation for torque control mode

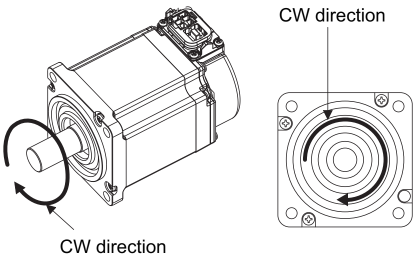
The torque control is executed at the command torque set in "[Cd.143] Command torque at torque control mode" in the torque control mode.

"[Cd.143] Command torque at torque control mode" can be changed any time during torque control mode. The relation between the setting of command torque and the torque generation direction of servo motor varies depending on the setting of servo parameters "Rotation direction selection/travel direction selection (PA14)" and "Function selection C-B POL reflection selection at torque control (PC29)".

Setting value of "Function selection C-B POL reflection selection at torque control (PC29)"	"Rotation direction selection/ travel direction selection (PA14)"	"[Cd.143] Command torque at torque control mode"	Torque generation direction of servo motor*1
0: Enabled	0: Forward rotation (CCW) with the increase of the positioning address	Positive value (Forward direction)	CCW direction
		Negative value (Reverse direction)	CW direction
	1: Reverse rotation (CW) with the increase of the positioning address	Positive value (Forward direction)	CW direction
		Negative value (Reverse direction)	CCW direction
1: Disabled	0: Forward rotation (CCW) with the increase of the positioning address	Positive value (Forward direction)	CCW direction
		Negative value (Reverse direction)	CW direction
	1: Reverse rotation (CW) with the increase of the positioning address	Positive value (Forward direction)	CCW direction
		Negative value (Reverse direction)	CW direction

*1 Refer to the following diagram.

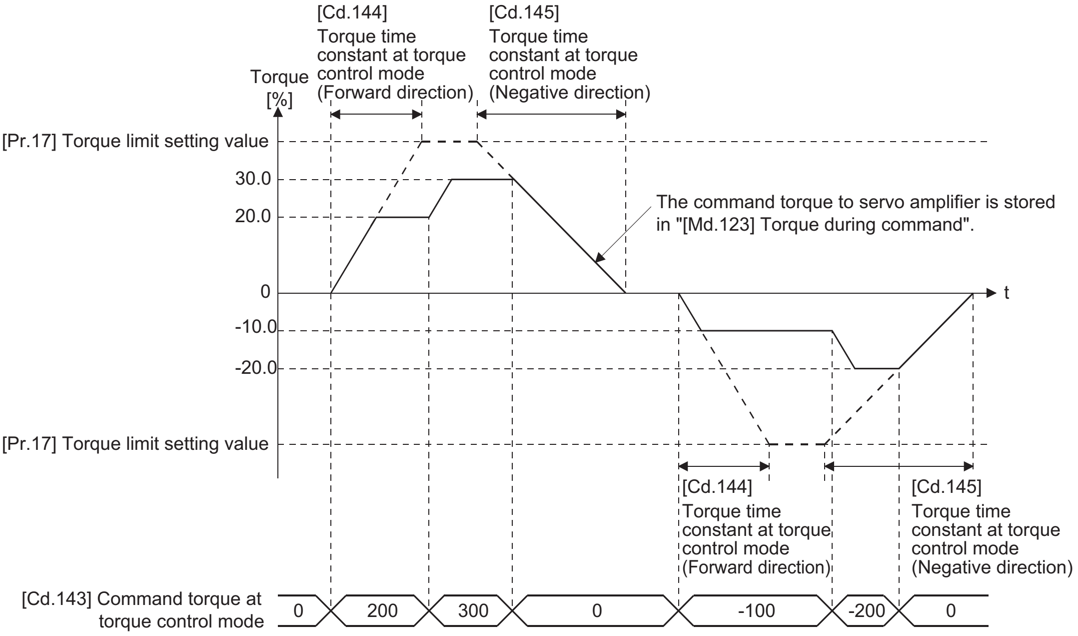




Set time for the command torque to increase from 0% to "[Pr.17] Torque limit setting value" in "[Cd.144] Torque time constant at torque control mode (Forward direction)" and for the command torque to decrease from "[Pr.17] Torque limit setting value" to 0% in "[Cd.145] Torque time constant at torque control mode (Negative direction)". The value at torque control mode switching request is valid for "[Cd.144]" and "[Cd.145]".

The command torque during the torque control mode is limited with "[Pr.17] Torque limit setting value". If the torque exceeding the torque limit setting value is set, the warning "Torque limit value over" (warning code: 09E4H) occurs, and the operation is controlled with the torque limit setting value.

Confirm the command torque to servo amplifier with "[Md.123] Torque during command".



■Speed during torque control mode

The speed during the torque control mode is controlled with "[Cd.146] Speed limit value at torque control mode". At this time, "Speed limit" ([Md.119] Servo status2: b4) turns ON.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Monitor item	Buffer memory address	
	Axis 1 to axis 16	Axis 17 to axis 32
[Md.119] Servo status2: b4	2476+100n	1002476+100n

"[Cd.146] Speed limit value at torque control mode" is set to a positive value regardless of the rotation direction. (Controlled by the same value for forward and reverse directions.)

In addition, "[Cd.146] Speed limit value at torque control mode" is limited with "[Pr.8] Speed limit value". If the speed exceeding the speed limit value is set, the warning "Speed limit value over" (warning code: 0991H) occurs, and the operation is controlled with the speed limit value.

The acceleration/deceleration processing is invalid for "[Cd.146] Speed limit value at torque control mode".

Point

The actual motor speed may not reach the speed limit value depending on the machine load situation during the torque control.

■Command position value during torque control mode

"[Md.20] Command position value", "[Md.21] Machine feed value" and "[Md.101] Actual position value" are updated even in the torque control mode.

If the command position value exceeds the software stroke limit, the error "Software stroke limit +" (error code: 1993H) or "Software stroke limit -" (error code: 1995H) occurs and the operation switches to the position control mode. Invalidate the software stroke limit to execute one-way feed.

■Stop cause during torque control mode

The operation for stop cause during torque control mode is shown below.

Item	Operation during torque control mode
"[Cd.180] Axis stop" turned ON.	The speed limit value commanded to servo amplifier is "0" regardless of the setting value of "[Cd.146] Speed limit value at torque control mode". The mode switches to the position control mode when "Zero speed" of "[Md.119] Servo status2" turns ON, and the operation immediately stops. (Deceleration processing is not executed.) The value of command torque is not changed. It might take time to reach the speed "0" depending on the current torque command value.
Stop signal of "[Cd.44] External input signal operation device" turned ON.	
All axis servo ON [Y1] turned OFF.	The servo OFF is not executed during the torque control mode. The command status when the mode is switched to the position control mode becomes valid.
"[Cd.100] Servo OFF command" turned ON.	
The current value reached the software stroke limit.	An error (error code: 1900H, 1904H to 1907H, 1993H, 1995H) occurs. The mode switches to the position control mode at the current position, and the operation immediately stops. (Deceleration processing is not executed.)
The position of the motor reached the hardware stroke limit.	
PLC READY signal [Y0] turned OFF.	
The forced stop input to Simple Motion module.	The mode switches to the position control mode when the servo OFF (Servo ON of "[Md.108] Servo status1" turns OFF) is executed. (While the servo amplifier is servo OFF, even if the mode is switched to position control mode, the servo motor immediately stops.)
The emergency stop input to servo amplifier.	
The servo alarm occurred.	
The servo amplifier's power supply turned OFF.	Stop processing of the controller is immediate stop. (The mode is set to the position control mode at the servo amplifier's power supply ON again.)

Continuous operation to torque control mode [RD77MS]

■Operation for continuous operation to torque control mode

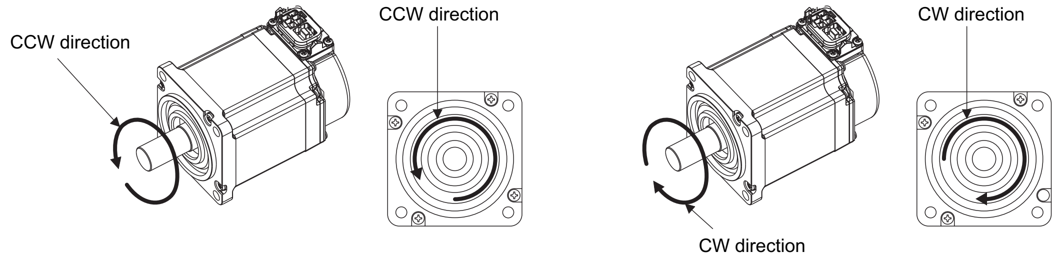
In continuous operation to torque control, the torque control can be executed without stopping the operation during the positioning in position control mode or speed command in speed control mode.

During the continuous operation to torque control mode, the torque control is executed at the command torque set in "[Cd.150] Target torque at continuous operation to torque control mode" while executing acceleration/deceleration to reach the speed set in "[Cd.147] Speed limit value at continuous operation to torque control mode".

"[Cd.147] Speed limit value at continuous operation to torque control mode" and "[Cd.150] Target torque at continuous operation to torque control mode" can be changed any time during the continuous operation to torque control mode. The relation between the setting value of command torque and the torque generation direction of servo motor is fixed regardless of the setting of servo parameters "Rotation direction selection/travel direction selection (PA14)" and "Function selection C-B POL reflection selection at torque control (PC29)".

"Rotation direction selection/travel direction selection (PA14)"	"[Cd.150] Target torque at continuous operation to torque control mode"	Torque generation direction of servo motor[1]
0: Forward rotation (CCW) with the increase of the positioning address	Positive value (Forward direction)	CCW direction
	Negative value (Reverse direction)	CW direction
1: Reverse rotation (CW) with the increase of the positioning address	Positive value (Forward direction)	CCW direction
	Negative value (Reverse direction)	CW direction

[1] Refer to the following diagram.



Restriction

Regardless of the setting in "Rotation direction selection/travel direction selection (PA14)", set a positive value when torque command is in CCW direction of servo motor and a negative value when torque command is in CW direction of servo motor in "[Cd.150] Target torque at continuous operation to torque control mode".
If the setting is incorrect, the motor may rotate in an opposite direction.

Point

- The motor rotates in a direction according to the setting in "[Cd.150] Target torque at continuous operation to torque control mode". Set the value corresponding to the motor rotation direction in "[Cd.147] Speed limit value at continuous operation to torque control mode".
- Speed is not limited for reverse torque generation direction.

■Torque command setting method

During the continuous operation to torque control mode, set time for the command torque to increase from 0% to "[Pr.17] Torque limit setting value" in "[Cd.151] Torque time constant at continuous operation to torque control mode (Forward direction)" and for the command torque to decrease from "[Pr.17] Torque limit setting value" to 0% in "[Cd.152] Torque time constant at continuous operation to torque control mode (Negative direction)". The value at continuous operation to torque control mode switching request is valid for "[Cd.151]" and "[Cd.152]".

The command torque during the continuous operation to torque control mode is limited with "[Pr.17] Torque limit setting value".

If torque exceeding the torque limit setting value is commanded, the warning "Torque limit value over" (warning code: 09E4H) occurs, and the operation is controlled with the torque limit setting value.

Confirm the command torque to servo amplifier with "[Md.123] Torque during command".

During the continuous operation to torque control mode, "Torque limit" ("[Md.108] Servo status1": b13) does not turn ON. Confirm the current torque value in "[Md.104] Motor current value".

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Monitor item	Buffer memory address	
	Axis 1 to axis 16	Axis 17 to axis 32
[Md.108] Servo status1: b13	2477+100n	1002477+100n

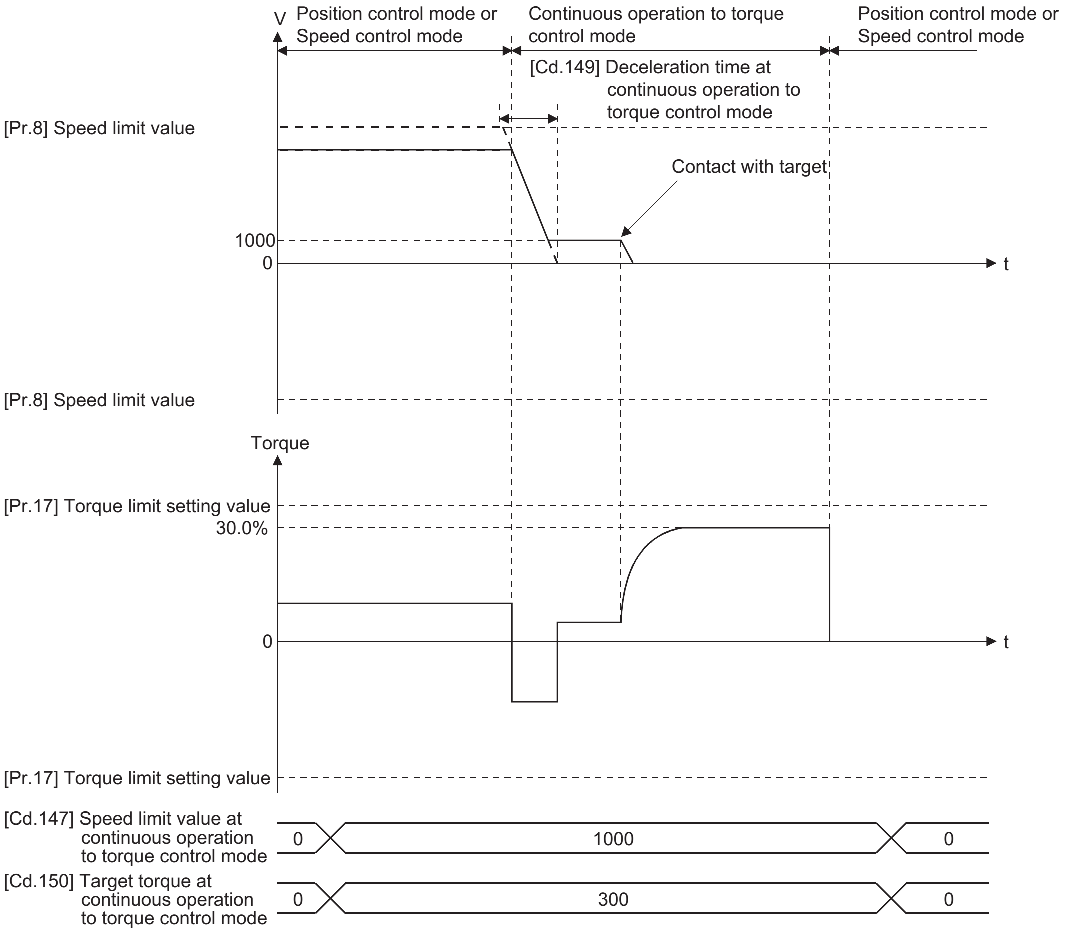
■Speed limit value setting method

Acceleration/deceleration is performed based on a trapezoidal acceleration/deceleration processing.

Set acceleration/deceleration time toward "[Pr.8] Speed limit value" in "[Cd.148] Acceleration time at continuous operation to torque control mode" and "[Cd.149] Deceleration time at continuous operation to torque control mode". The value at continuous operation to torque control mode switching is valid for "[Cd.148]" and "[Cd.149]".

"[Cd.147] Speed limit value at continuous operation to torque control mode" is limited with "[Pr.8] Speed limit value". If the speed exceeding the speed limit value is commanded, the warning "Speed limit value over" (warning code: 0991H) occurs, and the operation is controlled with the speed limit value.

Confirm the command speed to servo amplifier with "[Md.122] Speed during command".



■Precautions at continuous operation to torque control mode

For functions of the servo amplifier that are not available during the continuous operation to torque control mode, refer to the instruction manual or manual of the servo amplifier to be connected.

Point

If vibration occurs during the continuous operation to torque control, lower the value of the servo parameter "Torque feedback loop gain (PB03)" and check if the issue has been solved.

Restriction

Set the system configuration with an unlimited operation range during the continuous operation to torque control mode as a stroke limit signal of the servo amplifier cannot be used during the continuous operation to torque control mode.

Use the software stroke limit function on the Simple Motion module side to restrict the set position.

■Speed during continuous operation to torque control mode

The speed during the continuous operation to torque control mode is controlled with an absolute value of the value set in "[Cd.147] Speed limit value at continuous operation to torque control mode" as command speed. When the speed reaches the absolute value of "[Cd.147] Speed limit value at continuous operation to torque control mode", "Speed limit" ([Md.119] Servo status2: b4) turns ON.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Monitor item	Buffer memory address	
	Axis 1 to axis 16	Axis 17 to axis 32
[Md.119] Servo status2: b4	2476+100n	1002476+100n

In addition, "[Cd.147] Speed limit value at continuous operation to torque control mode" is limited with "[Pr.8] Speed limit value". If the command speed exceeding the speed limit value is set, the warning "Speed limit value over" (warning code: 0991H) occurs, and the operation is controlled with the speed limit value.

Point

The actual motor speed may not reach the command speed depending on the machine load situation during the continuous operation to torque control mode.

■Command position value during continuous operation to torque control mode

"[Md.20] Command position value", "[Md.21] Machine feed value" and "[Md.101] Actual position value" are updated even in the continuous operation to torque control mode.

If the command position value exceeds the software stroke limit, the error "Software stroke limit +" (error code: 1993H) or "Software stroke limit -" (error code: 1995H) occurs and the operation switches to the position control mode. Invalidate the software stroke limit to execute one-way feed.

■Stop cause during continuous operation to torque control mode

The operation for stop cause during continuous operation to torque control mode is shown below.

Item	Operation during continuous operation to torque control mode
"[Cd.180] Axis stop" turned ON.	The speed limit value commanded to servo amplifier is "0" regardless of the setting value of "[Cd.147] Speed limit value at continuous operation to torque control mode". The mode switches to the position control mode when "Zero speed" of "[Md.119] Servo status2" turns ON, and the operation immediately stops. (Deceleration processing is not executed.) The value of command torque is not changed. It might take time to reach the speed "0" depending on the current torque command value.
Stop signal of "[Cd.44] External input signal operation device" turned ON.	
All axis servo ON [Y1] turned OFF.	The servo OFF is not executed during the continuous operation to torque control mode. The command status when the mode is switched to the position control mode becomes valid.
"[Cd.100] Servo OFF command" turned ON.	
The current value reached the software stroke limit.	An error (error code: 1900H, 1904H to 1907H, 1993H, 1995H) occurs. The mode switches to the position control mode at the current position, and the operation immediately stops. (Deceleration processing is not executed.)[1] When the operation immediately stops, the motor may start hunting depending on the motor speed. Therefore, be sure not to reach the limit in high speed and not to turn OFF the PLC READY signal [Y0].
The position of the motor reached the hardware stroke limit.	
PLC READY signal [Y0] turned OFF.	
The forced stop input to Simple Motion module.	The mode switches to the position control mode when the servo OFF (Servo ON of "[Md.108] Servo status1" turns OFF) is executed.[1] (While the servo amplifier is servo OFF, even if the mode is switched to position control mode, the servo motor immediately stops.)
The emergency stop input to servo amplifier.	
The servo alarm occurred.	
The servo amplifier's power supply turned OFF.	Stop processing of the controller is immediate stop. (The mode is set to the position control mode at the servo amplifier's power supply ON again.)

*1 When the mode has switched from the speed control mode to the continuous operation to torque control mode, the mode switches to the position control mode after switching the speed control mode once. Therefore, it takes the following time to switch to the position control mode.
Switching time for the speed control mode + Switching time for the position control mode

7.2 Advanced synchronous control

"Advanced synchronous control" can be achieved using software instead of controlling mechanically with gear, shaft, speed change gear or cam, etc.

"Advanced synchronous control" synchronizes movement with the input axis (servo input axis or synchronous encoder axis), by setting "advanced synchronous control parameters" and starting synchronous control on each output axis.

Refer to the following for details of advanced synchronous control.

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

8 CONTROL SUB FUNCTIONS

The details and usage of the "sub functions" added and used in combination with the main functions are explained in this chapter.

A variety of sub functions are available, including functions specifically for machine home position return and generally related functions such as control compensation, etc. More appropriate, finer control can be carried out by using these sub functions. Each sub function is used together with a main function by creating matching parameter settings and programs. Read the execution procedures and settings for each sub function, and set as required.

8.1 Outline of Sub Functions

"Sub functions" are functions that compensate, limit, add functions, etc., to the control when the main functions are executed. These sub functions are executed by parameter settings, operation from the engineering tool, sub function programs, etc.

Outline of sub functions

The following table shows the types of sub functions available.

Sub function		**Details**
Functions characteristic to machine home position return	Home position return retry function [RD77MS]	This function retries the home position return with the upper/lower limit switches during machine home position return. This allows machine home position return to be carried out even if the axis is not returned to before the proximity dog with JOG operation, etc.
	Home position shift function [RD77MS]	After returning to the machine home position, this function compensates the position by the designated distance from the machine home position and sets that position as the home position address.
Functions that compensate control	Backlash compensation function	This function compensates the mechanical backlash. Feed command 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 servo motor 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 changed speed in the speed change buffer memory ([Cd.14] New speed value), and change the speed with the speed change request ([Cd.15] Speed change request).
	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 the execution of positioning. At the same time, this also can change the speed.
Functions related to positioning start	Pre-reading start function	This function shortens the virtual start time.
Absolute position system function		This function restores the absolute position of designated axis.

Sub function		Details
Functions related to positioning stop	Stop command processing for deceleration stop function	This function 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 the positioning being executed (decelerates to a stop) 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 positioning address ([Da.6] Positioning address/movement amount) having the designated positioning data No.
	Command in-position function	This function calculates the remaining distance for the Simple Motion module to reach the positioning stop position, and when the value is less than the set value, sets the "command in-position flag". When using another sub work before ending the control, use this function as a trigger for the sub work.
	Acceleration/deceleration processing function	This function adjusts the control acceleration/deceleration.
	Deceleration start flag function	This function 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 × multiplier setting for degree axis function	This function executes the positioning control by the 10 × 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 Simple Motion module.
	Follow up function	This function monitors the motor rotation amount with the servo turned OFF, and reflects it on the command position 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.

8.2 Sub Functions Specifically for Machine Home Position Return

The sub functions specifically for machine home position return include the "home position return retry function" and "home position shift function". Each function is executed by parameter setting.

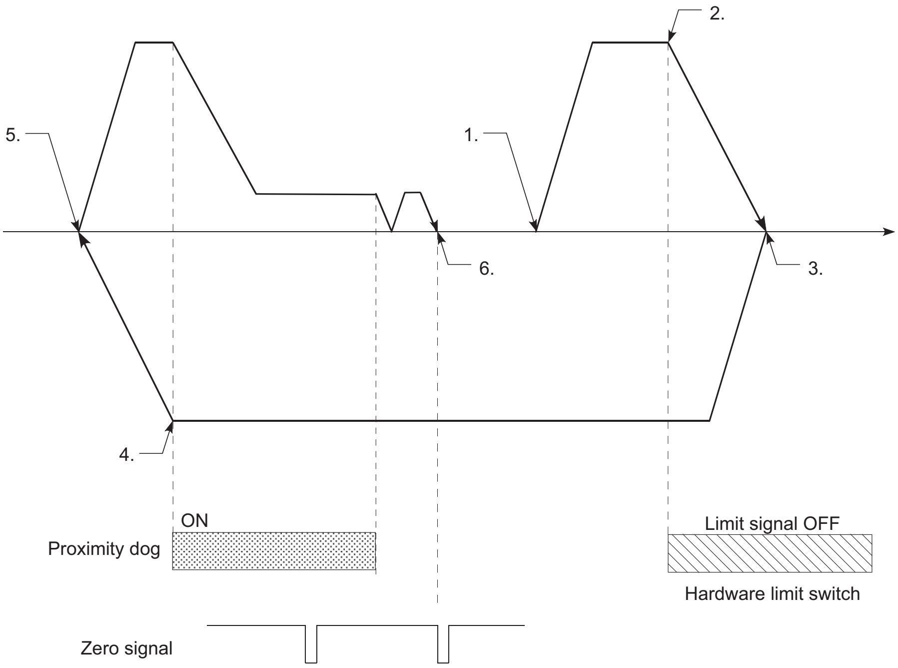
Home position return retry function [RD77MS]

When the workpiece goes past the home position without stopping during positioning control, it may not move back in the direction of the home position although a machine home position return is commanded, depending on the workpiece position. This normally means the workpiece has to be moved to a position before the proximity dog by a JOG operation, etc., to start the machine home position return again. However, by using the home position return retry function, a machine home position return can be carried out regardless of the workpiece position.

Control details

The following drawing shows the operation of the home position return retry function.

■Home position return retry point return retry operation when the workpiece is within the range between the upper and lower limits.



1. The movement starts in the "[Pr.44] Home position return direction" by a machine home position return start.

2. The operation decelerates when the limit signal OFF is detected.

3. After stopping due to the limit signal OFF detection, the operation moves at the "[Pr.46] Home position return speed" in the opposite direction of the "[Pr.44] Home position return direction".

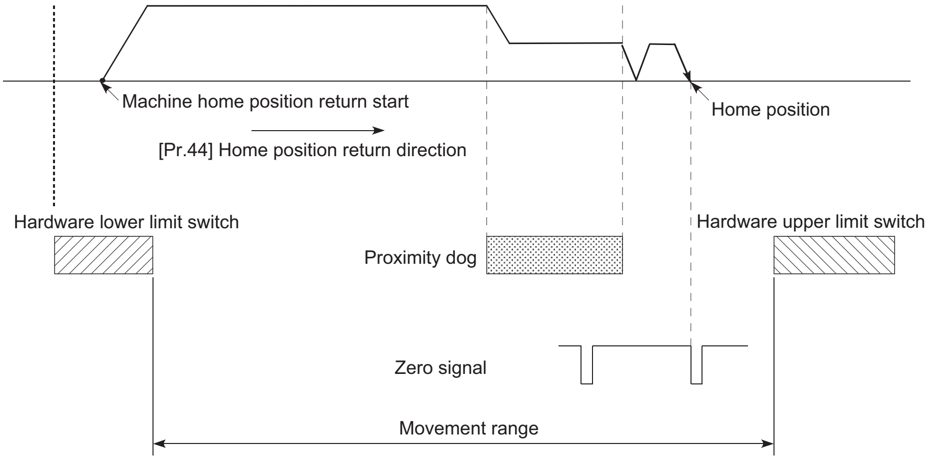
4. The operation decelerates when the proximity dog turns OFF.

5. After stopping due to the proximity dog OFF, a machine home position return is carried out in the "[Pr.44] Home position return direction". (The zero point of the encoder must be passed at least once depending on the home position return method.)

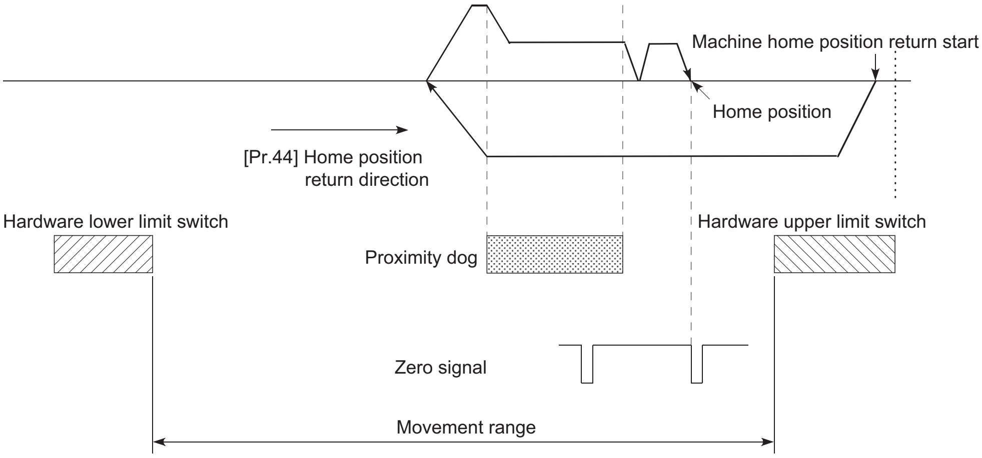
6. Machine home position return completion.

■Home position return retry operation when the workpiece is outside the range between the upper and lower limits.

- When the direction from the workpiece to the home position is the same as the "[Pr.44] Home position return direction", a normal machine home position return is carried out. The example shown below is for when "0: Positive direction" is set in "[Pr.44] Home position return direction".



- When the direction from the workpiece to the home position is the opposite direction from the "[Pr.44] Home position return direction", the operation carries out a deceleration stop when the proximity dog turns OFF, and then carries out a machine home position return in the direction set in "[Pr.44] Home position return direction". The example shown below is for when "0: Positive direction" is set in "[Pr.44] Home position return direction".

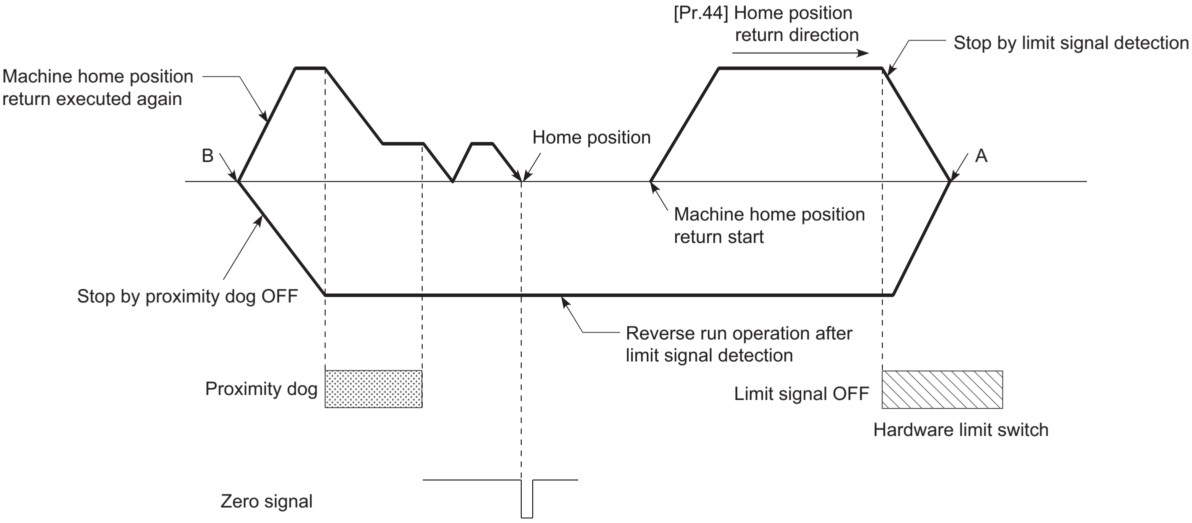


Point

- When the "0: Positive direction" is selected in "[Pr.44] Home position return direction", the upper limit switch is set to the limit switch in the home position return direction.
- When the "1: Negative direction" is selected in "[Pr.44] Home position return direction", the lower limit switch is set to the limit switch in the home position return direction.
- If inverting the install positions of upper/lower limit switches, hardware stroke limit function cannot be operated properly. If any problem is found for home position return operation, review "Rotation direction selection/travel direction selection (PA14)" and the wiring for the upper/lower limit switch.

■Setting the dwell time during a home position return retry

The home position return retry function can perform such function as the dwell time using "[Pr.57] Dwell time during home position return retry" when the reverse run operation is carried out due to detection by the limit signal for upper and lower limits and when the machine home position return is executed after the proximity dog is turned OFF to stop the operation. "[Pr.57] Dwell time during home position return retry" is validated when the operation stops at the "A" and "B" positions in the following drawing. (The dwell time is the same value at both positions "A" and "B".)



Precaution during control

- The following table shows whether the home position return retry function may be executed by the "[Pr.43] Home position return method".

[Pr.43] Home position return method	Execution status of home position return retry function
Proximity dog method [RD77MS]	○: Execution possible
Count method 1 [RD77MS]	○: Execution possible
Count method 2 [RD77MS]	○: Execution possible
Data set method [RD77MS]	—
Scale origin signal detection method [RD77MS]	×: Execution not possible
Driver home position return method	—

- Always establish upper/lower limit switches at the upper/lower limit positions of the machine. If the home position return retry function is used without hardware stroke limit switches, the motor will continue rotation until a hardware stroke limit signal is detected.
- Do not configure a system so that the servo amplifier power turns OFF by the upper/lower limit switches which is connected to the Simple Motion module. If the servo amplifier power is turned OFF, the home position return retry cannot be carried out.
- The operation decelerates upon detection of the hardware limit signal, and the movement starts in the opposite direction. In this case, however, the error "Hardware stroke limit (+)" (error code: 1904H, 1905H) or "Hardware stroke limit (-)" (error code: 1906H, 1907H) does not occur.

Point

The settings of the upper/lower stroke limit signal are shown below. The home position return retry function can be used with either setting. (☞ Page 259 Hardware stroke limit function)

- External input signal of Simple Motion module
- External input signal of servo amplifier
- External input signal via CPU (buffer memory of Simple Motion module)

Setting method

To use the "home position return retry function", set the required details in the parameters shown in the following table, and write them to the Simple Motion module.

When the parameters are set, the home position return retry function will be added to the machine home position return control. The set details are validated at the rising edge (OFF → ON) of the PLC READY signal [Y0]. Set "[Pr.57] Dwell time during home position return retry" according to the user's requirements.

Setting item		Setting value	Setting details	Factory-set initial value
[Pr.48]	Home position return retry	1	Set "1: Carry out home position return retry by limit switch".	0
[Pr.57]	Dwell time during home position return retry	→	Set the deceleration stop time during home position return retry. (Random value between 0 and 65535 (ms))	0

Refer to the following for the setting details.

☞ Page 496 Basic Setting

Point

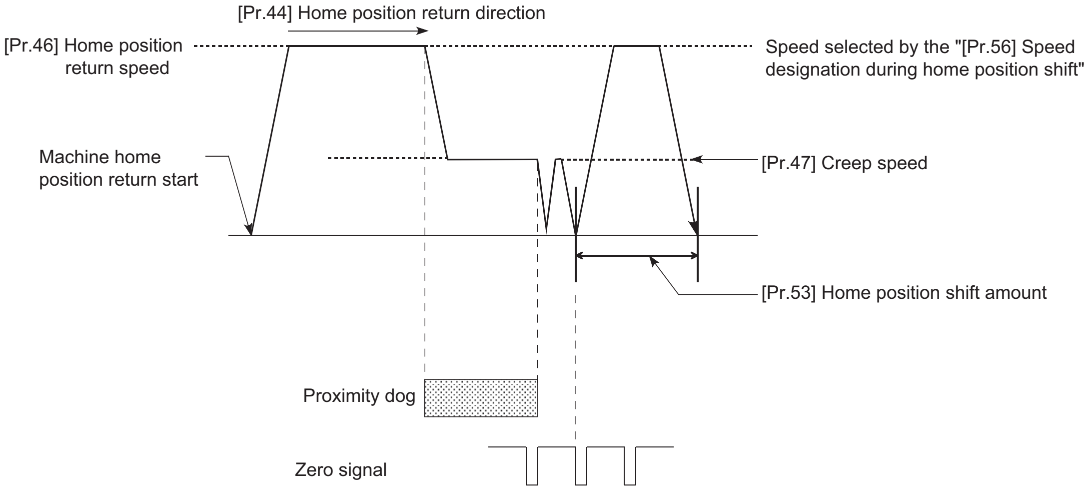
- Parameters are set for each axis.
- It is recommended that the parameters be set whenever possible with the engineering tool. Execution by a program uses many programs and devices. The execution becomes complicated, and the scan times will increase.

Home position shift function [RD77MS]

When a machine home position return is carried out, the home position is normally established using the proximity dog and zero signal. However, by using the home position shift function, the machine can be moved a designated movement amount from the position where the zero signal was detected. A mechanically established home position can then be interpreted at that point.

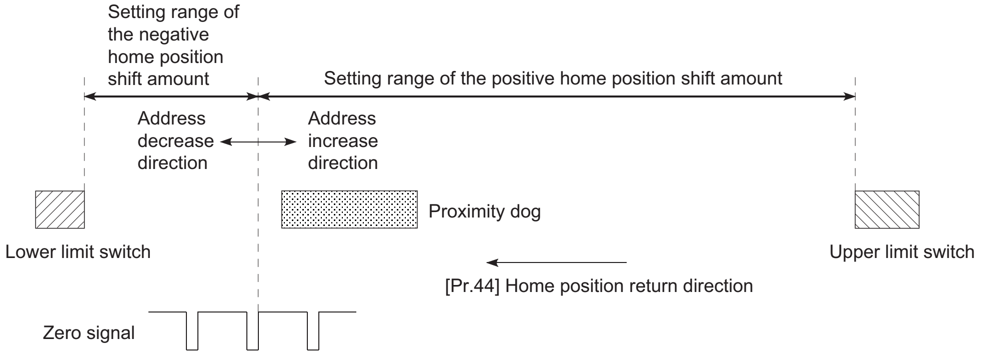
Control details

The following drawing shows the operation of the home position shift function.



Setting range for the home position shift amount

Set the home position shift amount within the range from the detected zero signal to the upper/lower limit switches.

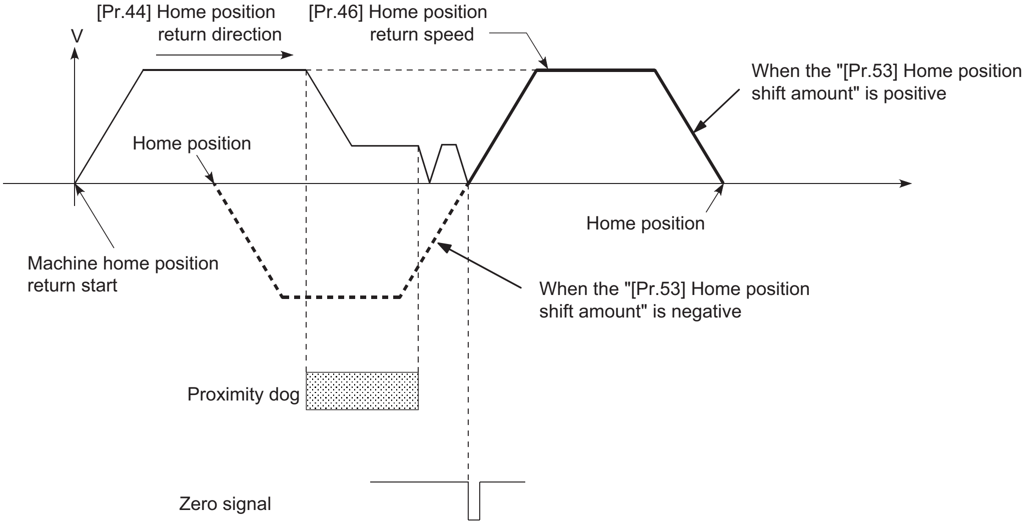


Movement speed during home position shift

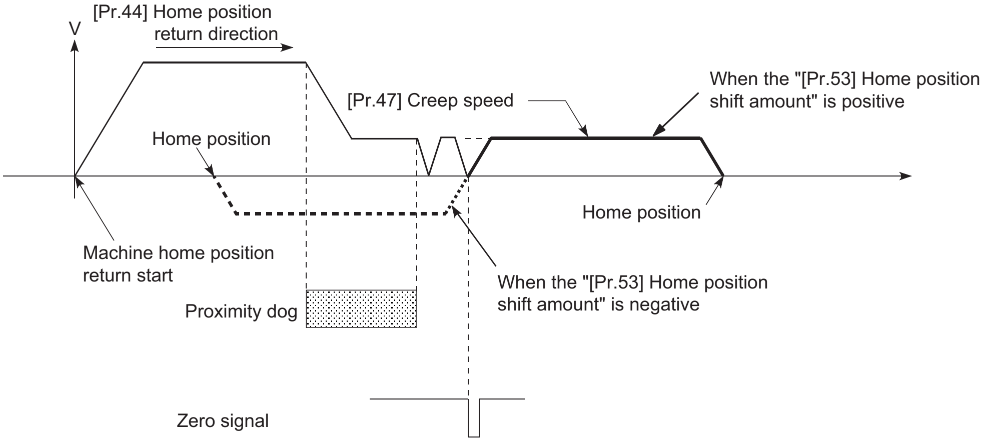
When using the home position shift function, the movement speed during the home position shift is set in "[Pr.56] Speed designation during home position shift". The movement speed during the home position shift is selected from either the "[Pr.46] Home position return speed" or the "[Pr.47] Creep speed". For the acceleration/deceleration time, the value specified in "[Pr.51] Home position return acceleration time selection" or "[Pr.52] Home position return deceleration time selection" is used.

The following drawings show the movement speed during the home position shift when a mechanical home position return is carried out by the proximity dog method.

■Home position shift operation at the "[Pr.46] Home position return speed" (When "[Pr.56] Speed designation during home position shift" is 0)



■Home position shift operation at the "[Pr.47] Creep speed" (When "[Pr.56] Speed designation during home position shift" is 1)



Precautions during control

- The following data are set after the home position shift amount is complete.

  - Home position return complete flag ([Md.31] Status: b4)
  - [Md.20] Command position value
  - [Md.21] Machine feed value
  - [Md.26] Axis operation status

Home position return request flag ([Md.31] Status: b3) is reset after completion of the home position shift.

- "[Pr.53] Home position shift amount" is not added to "[Md.34] Movement amount after proximity dog ON". The movement amount immediately before the home position shift operation, considering proximity dog ON as "0", is stored.

Setting method

To use the "home position shift function", set the required details in the parameters shown in the following table, and write them to the Simple Motion module.

When the parameters are set, the home position shift function will be added to the machine home position return control. The set details are validated at the rising edge (OFF → ON) of the PLC READY signal [Y0].

Setting item		Setting value	Setting details	Factory-set initial value
[Pr.53]	Home position shift amount	→	Set the shift amount during the home position shift.	0
[Pr.56]	Speed designation during home position shift	→	Select the speed during the home position shift 0: [Pr.46] Home position return speed 1: [Pr.47] Creep speed	0

Refer to the following for the setting details.

☞ Page 496 Basic Setting

Point

- Parameters are set for each axis.
- It is recommended that the parameters be set whenever possible with the engineering tool. Execution by a program uses many programs and devices. The execution becomes complicated, and the scan times will increase.

8.3 Functions for Compensating the Control

The sub functions for compensating the control include the "backlash compensation function", "electronic gear function", and "near pass function". Each function is executed by parameter setting or program creation and writing.

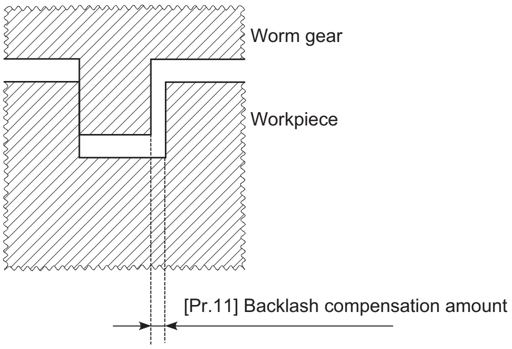
Backlash compensation function

The "backlash compensation function" compensates the backlash amount in the mechanical system.

Control details

When the backlash compensation amount is set, an extra amount of command equivalent to the set backlash amount is output every time the movement direction changes.

The following drawing shows the operation of the backlash compensation function.



Precautions during control

- The feed command of the backlash compensation amount are not added to the "[Md.20] Command position value" or "[Md.21] Machine feed value".
- Always carry out a machine home position return before starting the control when using the backlash compensation function (when "[Pr.11] Backlash compensation amount" is set). The backlash in the mechanical system cannot be correctly compensated if a machine home position return is not carried out.
- Backlash compensation, which includes the movement amount and "[Pr.11] Backlash compensation amount", is output the moment at the moving direction changes.

  Refer to the following for details on the setting.

  ☞ Page 515 [Pr.11] Backlash compensation amount
- Backlash compensation cannot be made when the speed control mode, torque control mode or continuous operation to torque control mode.
- In an axis operation such as positioning after home position return, whether the backlash compensation is necessary or not is judged from "[Pr.44] Home position return direction" of the Simple Motion module. When the positioning is executed in the same direction as "[Pr.44] Home position return direction", the backlash compensation is not executed. However, when the positioning is executed in the reverse direction against "[Pr.44] Home position return direction", the backlash compensation is executed.

Setting method

To use the "backlash compensation function", set the "backlash compensation amount" in the parameter shown in the following table, and write it to the Simple Motion module.

The set details are validated at the rising edge (OFF → ON) of the PLC READY signal [Y0].

Setting item		Setting value	Setting details	Factory-set initial value
[Pr.11]	Backlash compensation amount	→	Set the backlash compensation amount.	0
[Pr.44]	Home position return direction	→	Set the same direction as the last home position return direction of the servo amplifier when using the driver home position return method.	0

Refer to the following for the setting details.

☞ Page 496 Basic Setting

Point

- Parameters are set for each axis.
- It is recommended that the parameters be set whenever possible with the engineering tool. Execution by a program uses many programs and devices. The execution becomes complicated, and the scan times will increase.

Electronic gear function

The "electronic gear function" adjusts the actual machine movement amount and number of pulse output to servo amplifier according to the parameters set in the Simple Motion module.

The "electronic gear function" has the following three functions ([A] to [C]).

[A] During machine movement, the function increments in the Simple Motion module values less than one pulse that could not be output, and outputs the incremented amount when the total incremented value reached one pulse or more.

[B] When machine home position return is completed, current value changing is completed, speed control is started (except when command position value is updated), or fixed-feed control is started, the function clears to "0" the cumulative values of less than one pulse which could not be output. (If the cumulative value is cleared, an error will occur by a cleared amount in the feed machine value. Control can be constantly carried out at the same machine movement amount, even when the fixed-feed control is continued.)

[C] The function compensates the mechanical system error of the command movement amount and actual movement amount by adjusting the "electronic gear". (The "movement amount per pulse" value is defined by "[Pr.2] Number of pulses per rotation (AP)", "[Pr.3] Movement amount per rotation (AL)" and "[Pr.4] Unit magnification (AM)".)

The Simple Motion module automatically carries out the processing for [A] and [B].

[RD77MS]

The "electronic gear function" is different from the "electronic gear function" of the servo amplifier. For the "electronic gear function" of the servo amplifier, refer to the instruction manual or manual of the servo amplifier.

Precautions

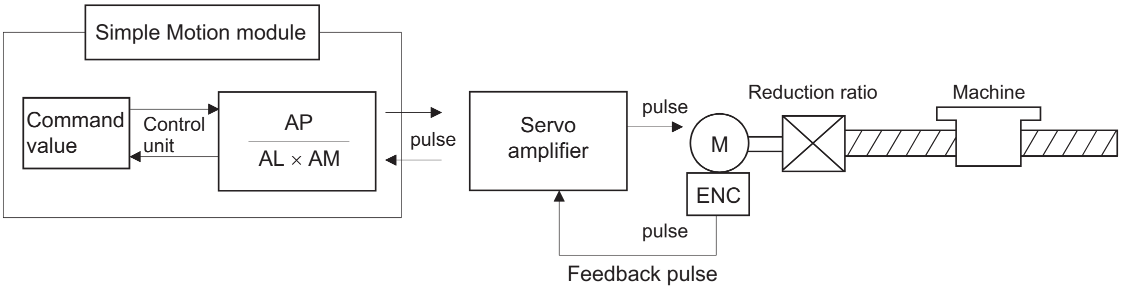
[RD77MS]

When MR-J5(W)-B series is used, there are restrictions on the electronic gear setting of the servo amplifier depending on the operation mode and encoder resolution. For details, refer to the following.

☞ Page 796 Connection with MR-J5(W)-B

Basic concept of the electronic gear

The electronic gear is an item which determines how many rotations (rotations by how many pulses) the motor must make in order to move the machine according to the programmed movement amount.



The basic concept of the electronic gear is represented by the following expression.

[Pr.2] (Number of pulses per rotation) = AP

[Pr.3] (Movement amount per rotation) = AL

[Pr.4] (Unit magnification) = AM

Movement amount per rotation that considered unit magnification = ΔS

$$\text{Electronic gear} = \frac{AP}{\Delta S} = \frac{AP}{AL \times AM} \cdots (1)$$

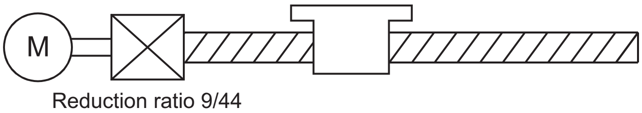
Set values for AP, AL and AM so that this related equation is established.

However, because values to be set for AP, AL and AM have the settable range, values calculated (reduced) from the above related equation must be contained in the setting range for AP, AL and AM.

■For "Ball screw" + "Reduction gear"

Ex.

When the ball screw pitch is 10 mm, the motor is the HG-KR (4194304 pulses/rev) and the reduction ratio is 9/44.



First, find how many millimeters the load (machine) will travel (ΔS) when the motor turns one revolution (AP).

AP (Number of pulses per rotation) = 4194304 [pulse]

ΔS (Movement amount per rotation) = Ball screw pitch × Reduction ratio

= 10 [mm] × 9/44

= 10000.0 [μm] × 9/44

When the control unit is "mm", the minimum command unit is 0.1 μm.

Point

When using a motor HK-KT (67108864 pulses/rev), set the servo parameters of the MR-J5(W)-B as follows.

Electronic gear numerator (PA06): 16

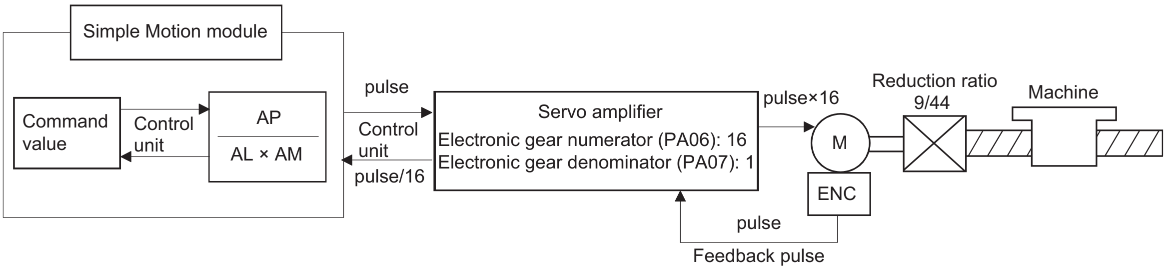
Electronic gear denominator (PA07): 1

Therefore, AP (Number of pulses per rotation) becomes the following value.

AP (Number of pulses per rotation)

= 67108864 [pulse] × 1/16

= 4194304 [pulse]



Substitute this for the above expression (1).

At this time, make calculation with the reduction ratio 9/44 remaining as a fraction.

$$\frac{AP}{\Delta S} = \frac{4194304\ [\text{pulse}]}{10000.0\ [\mu\text{m}] \times 9/44}$$

$$= \frac{4194304 \times 44}{10000.0 \times 9}$$

$$= \frac{184549376}{90000.0}$$

$$= \frac{23068672}{11250.0} = \frac{23068672(\text{AP})}{11250.0(\text{AL}) \times 1(\text{AM})}$$

$$= \frac{23068672(\text{AP})}{1125.0(\text{AL}) \times 10(\text{AM})}$$

Thus, AP, AL and AM to be set are as follows. These two examples of settings are only examples. There are settings other than these examples.

Setting value	Setting item
AP = 23068672	[Pr.2]
AL = 11250.0	[Pr.3]
AM = 1	[Pr.4]

or

Setting value	Setting item
AP = 23068672	[Pr.2]
AL = 1125.0	[Pr.3]
AM = 10	[Pr.4]

■When "pulse" is set as the control unit

When using pulse as the control unit, set the electronic gear as follows.

AP = "Number of pulses per rotation"

AL = "Movement amount per rotation"

AM = 1

Ex.

When the motor is the HG-KR (4194304 pulses/rev)

Setting value	Setting item
AP = 4194304	[Pr.2]
AL = 4194304	[Pr.3]
AM = 1	[Pr.4]

Point

When using a motor HK-KT (67108864 pulses/rev), set the servo parameters of the MR-J5(W)-B as follows.

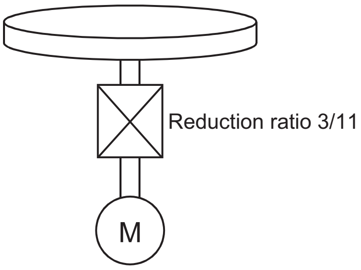
Electronic gear numerator (PA06): 16

Electronic gear denominator (PA07): 1

■When "degree" is set as the control unit for a rotary axis

Ex.

When the rotary axis is used, the motor is HG-KR (4194304 pulses/rev) and the reduction ratio is 3/11.



First, find how many degrees the load (machine) will travel (ΔS) when the motor turns one revolution (AP).

AP (Number of pulses per rotation) = 4194304 [pulse]

ΔS (Movement amount per rotation)

= 360.00000 [degree] × Reduction ratio

= 360.00000 × 3/11

Point

When using a motor HK-KT (67108864 pulses/rev), set the servo parameters of the MR-J5(W)-B as follows.

Electronic gear numerator (PA06): 16

Electronic gear denominator (PA07): 1

Therefore, AP (Number of pulses per rotation) becomes the following value.

AP (Number of pulses per rotation)

= 67108864 [pulse] × 1/16

= 4194304 [pulse]

Substitute this for the above expression (1).

At this time, make calculation with the reduction ratio 3/11 remaining as a fraction.

$$\frac{AP}{\Delta S} = \frac{4194304\ [\text{pulse}]}{360.00000\ [\text{degree}] \times 3/11}$$

$$= \frac{4194304\ [\text{pulse}] \times 11}{360.00000\ [\text{degree}] \times 3}$$

$$= \frac{46137344}{1080.00000}$$

$$= \frac{2883584}{67.50000} = \frac{2883584(AP)}{67.50000(AL) \times 1(AM)}$$

$$= \frac{2883584(AP)}{0.06750(AL) \times 1000(AM)}$$

Thus, AP, AL and AM to be set are as follows. These two examples of settings are only examples. There are settings other than these examples.

Setting value	Setting item
AP = 2883584	[Pr.2]
AL = 67.50000	[Pr.3]
AM = 1	[Pr.4]

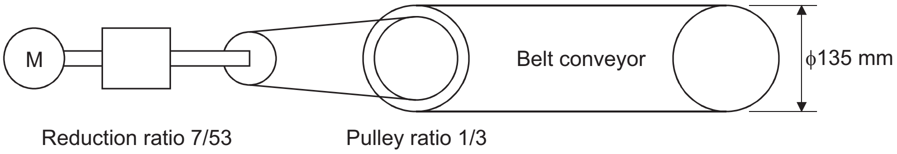
or

Setting value	Setting item
AP = 2883584	[Pr.2]
AL = 0.06750	[Pr.3]
AM = 1000	[Pr.4]

■When "mm" is set as the control unit for conveyor drive (calculation including π)

Ex.

When the belt conveyor drive is used, the conveyor diameter is 135 mm, the pulley ratio is 1/3, the motor is HG-KR (4194304 pulses/rev) and the reduction ratio is 7/53.



As the travel value of the conveyor is used to exercise control, set "mm" as the control unit.

First, find how many millimeters the load (machine) will travel (ΔS) when the motor turns one revolution (AP).

AP (Number of pulses per rotation) = 4194304 [pulse]

ΔS (Movement amount per rotation)

= 135000.0 [μm] × π × Reduction ratio

= 135000.0 [μm] × π × 7/53 × 1/3

Point

When using a motor HK-KT (67108864 pulses/rev), set the servo parameters of the MR-J5(W)-B as follows.

Electronic gear numerator (PA06): 16

Electronic gear denominator (PA07): 1

Therefore, AP (Number of pulses per rotation) becomes the following value.

AP (Number of pulses per rotation)

= 67108864 [pulse] × 1/16

= 4194304 [pulse]

Substitute this for the above expression (1).

At this time, make calculation with the reduction ratio 7/53 × 1/3 remaining as a fraction.

$$\frac{AP}{\Delta S} = \frac{AP}{AL \times AM} = \frac{4194304\ [\text{pulse}]}{135000.0\ [\mu\text{m}] \times \pi \times 7/53 \times 1/3}$$

$$= \frac{4194304 \times 53 \times 3}{135000.0 \times \pi \times 7}$$

$$= \frac{166723584}{236250 \times \pi}$$

Here, make calculation on the assumption that π is equal to 3.141592654.

$$\frac{AP}{\Delta S} = \frac{AP}{AL \times AM} = \frac{166723584}{742201.2645075}$$

AL has a significant number to first decimal place, round down numbers to two decimal places.

$$\frac{AP}{\Delta S} = \frac{AP}{AL \times AM} = \frac{166723584}{742201.2} = \frac{166723584(AP)}{742201.2(AL) \times 1(AM)}$$

Thus, AP, AL and AM to be set are as follows.

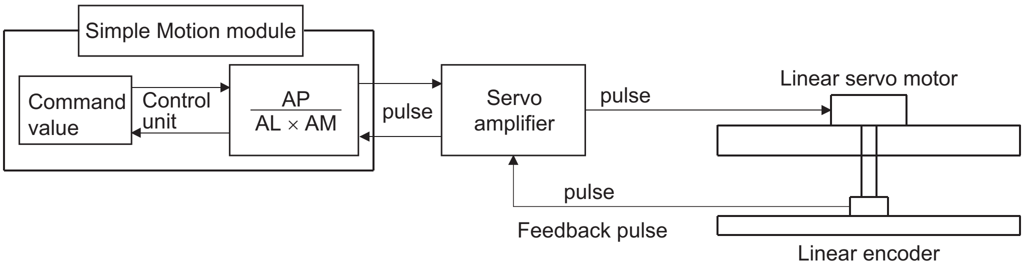
Setting value	Setting item
AP = 166723584	[Pr.2]
AL = 742201.2	[Pr.3]
AM = 1	[Pr.4]

This setting will produce an error for the true machine value, but it cannot be helped.
This error is as follows.

$$\left[\frac{7422012/166723584}{2362500\pi/166723584} - 1\right] \times 100 = -8.69 \times 10^{-6}\ [\%]$$

AP (Number of pulses per rotation) = 4194304 [pulse]
ΔS (Movement amount per rotation)
= 135000.0 [μm] × π × Reduction ratio
= 135000.0 [μm] × π × 7/53 × 1/3
It is equivalent to an about 86.9 [μm] error in continuous 1 km feed.

■Number of pulses/movement amount at linear servo use



Calculate the number of pulses (AP) and movement amount (AL × AM) for the linear encoder in the following conditions.

$$\text{Linear encoder resolution} = \frac{\text{Number of pulses (AP)}}{\text{Movement amount (AL} \times \text{AM)}}$$

Ex.

Linear encoder resolution: 0.05 [μm] per pulse

$$\frac{1\ [\text{pulse}]}{0.05\ [\mu\text{m}]} = \frac{\text{Number of pulses (AP) [pulse]}}{\text{Movement amount (AL} \times \text{AM) } [\mu\text{m}]} = \frac{20}{1.0}$$

Set the number of pulses in "[Pr.2] Number of pulses per rotation (AP)", the movement amount in "[Pr.3] Movement amount per rotation (AL)", and the unit magnification in "[Pr.4] Unit magnification (AM)" in the actual setting.
Set AP, AL, and AM as shown below.

When using MR-J4(W)-B	Set the same value in AP, AL, and AM as the value set in the servo parameter "Linear encoder resolution - Numerator (PL02)" and "Linear encoder resolution - Denominator (PL03)". Refer to each servo amplifier instruction manual for details.
When using MR-J5(W)-B [RD77MS]	Set the same value in AP, AL, and AM as the value set in the servo parameter "Electronic gear numerator (PA06)", "Electronic gear denominator (PA07)", "Linear encoder resolution - Numerator (PL02)" and "Linear encoder resolution - Denominator (PL03)". Refer to each servo amplifier manual for details.

When set to the following,

Setting values
Linear encoder resolution - Numerator (PL02): 1 [μm] Linear encoder resolution - Denominator (PL03): 20 [μm]
[RD77MS] Electronic gear numerator (PA06): 1 Electronic gear denominator (PA07): 1

The values of AP, AL and AM are shown below.

Setting value	Setting item
AP = 20	[Pr.2]
AL = 1.0	[Pr.3]
AM = 1	[Pr.4]

The method for compensating the error

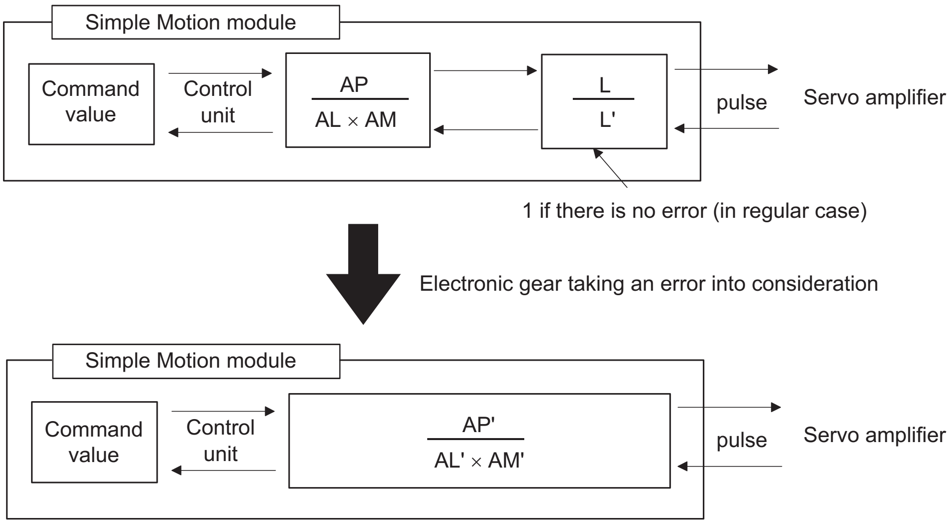
When the position control is carried out using the "Electronic gear" set in a parameter, this may produce an error between the command movement amount (L) and the actual movement amount (L'). With Simple Motion module, this error is compensated by adjusting the electronic gear.

The "Error compensation amount", which is used for error compensation, is defined as follows:

$$\text{Error compensation amount} = \frac{\text{Command movement amount (L)}}{\text{Actual movement amount (L')}}$$

The electronic gear including an error compensation amount is shown below.

$$\frac{AP}{AL \times AM} \times \frac{L}{L'} = \frac{AP'}{AL' \times AM'}$$



■Calculation example

(Conditions)

Number of pulses per rotation (AP) : 4194304 [pulse]
Movement amount per rotation (AL) : 5000.0 [µm]
Unit magnification (AM) : 1

(Positioning results)

Command movement amount (L) : 100 [mm]
Actual movement amount (L') : 101 [mm]

(Compensation value)

$$\frac{AP}{AL \times AM} \times \frac{L}{L'} = \frac{4194304}{5000.0 \times 1} \times \frac{100}{101} = \frac{4194304(AP')}{5050(AL') \times 1(AM')}$$

Number of pulses per rotation (AP') : 4194304 • • • [Pr.2]
Movement amount per rotation (AL') : 5050.0 • • • • [Pr.3]
Unit magnification (AM') : 1 • • • • • • • [Pr.4]

Set the post-compensation "[Pr.2] Number of pulses per rotation (AP')", "[Pr.3] Movement amount per rotation (AL')", and "[Pr.4] Unit magnification (AM')" in the parameters, and write them to the Simple Motion module. The set details are validated at the rising edge (OFF → ON) of the PLC READY signal [Y0].

Near pass function

When continuous pass control is carried out using interpolation control, the near pass function is carried out.

The "near pass function" is a function to suppress the mechanical vibration occurring at the time of switching the positioning data when continuous pass control is carried out using interpolation control.

[Near pass function]

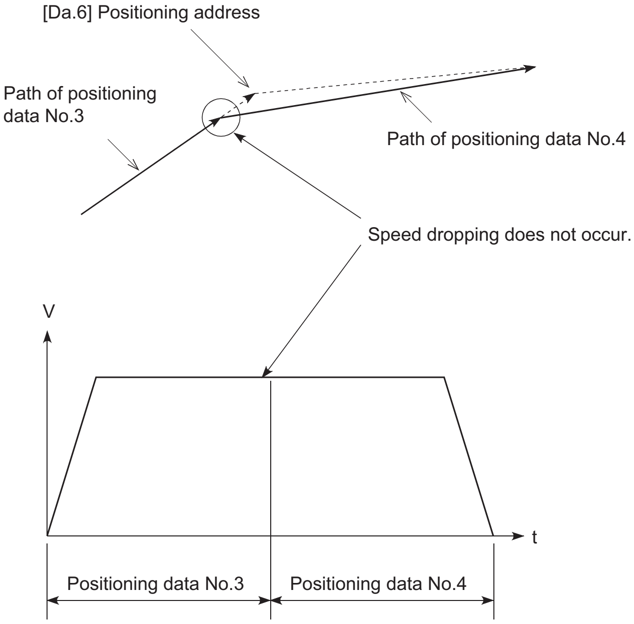
The extra movement amount occurring at the end of each positioning data unit being continuously executed is carried over to the next positioning data unit. Alignment is not carried out, and thus the output speed drops are eliminated, and the mechanical vibration occurring during speed changes can be suppressed.

Because alignment is not carried out, the operation is controlled on a path that passes near the position set in "[Da.6] Positioning address/movement amount".

Control details

The following drawing shows the path of the continuous path control by the 2-axis linear interpolation control.

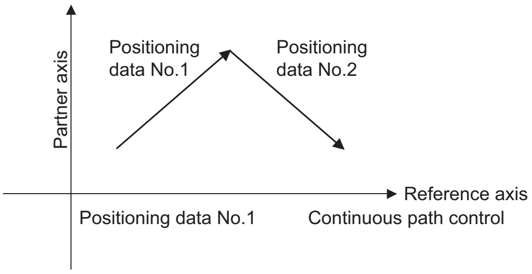
■The path of the near pass



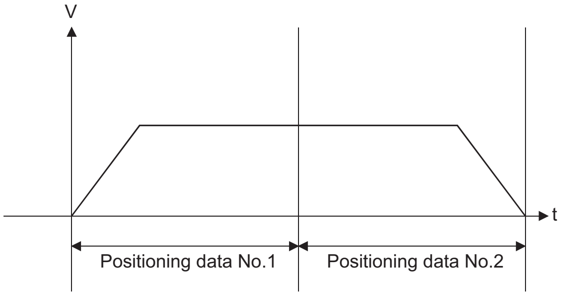
Precautions during control

- If the movement amount designated by the positioning data is small when the continuous path control is executed, the output speed may not reach the designated speed.
- The movement direction is not checked during interpolation operation. Therefore, a deceleration stops are not carried out even if the movement direction changes. (See below) For this reason, the output will rapidly reverse when the reference axis movement direction changes. To prevent the rapid output reversal, assign not the continuous path control "11", but the continuous positioning control "01" to the positioning data of the passing point.

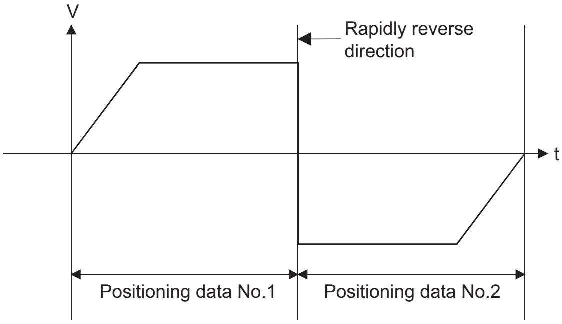
■Positioning by interpolation



■Operation of reference axis



■Operation of partner axis for interpolation



8.4 Functions to Limit the Control

Functions to limit the control include the "speed limit function", "torque limit function", "software stroke limit function", "hardware stroke limit function", and "forced stop function". Each function is executed by parameter setting or program creation and writing.

Speed limit function

The speed limit function 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".

Relation between the speed limit function and various controls

The following table shows the relation of the "speed limit function" and various controls.

◎: Always set

—: Setting not required (Use the initial value or a value within the setting range.)

Control type			Speed limit function	Speed limit value
Home position return control	Machine home position return control		◎	[Pr.8] Speed limit value The speed limit value follows the specifications of the servo amplifier when using the driver home position return method.
	Fast home position return control		◎	[Pr.8] Speed limit value
Major positioning control	Position control	1-axis linear control	◎	
		2 to 4-axis linear interpolation control	◎	
		1-axis fixed-feed control	◎	
		2 to 4-axis fixed-feed control (interpolation)	◎	
		2-axis circular interpolation control	◎	
		3-axis helical interpolation control	◎	
	1 to 4-axis speed control		◎	
	Speed-position switching control, Position-speed switching control		◎	
	Other control	Current value changing	—	Setting value invalid
		JUMP instruction, NOP instruction, LOOP to LEND	—	
Manual control	JOG operation, Inching operation		◎	[Pr.31] JOG speed limit value
	Manual pulse generator operation		—	Setting is invalid
Expansion control	Speed-torque control		◎	[Pr.8] Speed limit value

Precautions during control

- If any axis exceeds "[Pr.8] Speed limit value" during 2- to 4-axis speed control, the axis exceeding the speed limit value is controlled with the speed limit value. The speeds of the other axes being interpolated are suppressed by the command speed ratio.
- If the reference axis exceeds "[Pr.8] Speed limit value" during 2-axis circular interpolation control, the reference axis is controlled with the speed limit value (The speed limit does not function on the interpolation axis side.)
- If any axis exceeds "[Pr.8] Speed limit value" during 2- to 4-axis linear interpolation control or 2- to 4-axis fixed-feed control, the axis exceeding the speed limit value is controlled with the speed limit value. The speeds of the other axes being interpolated are suppressed by the movement amount ratio.
- In the 3-axis helical interpolation control, the composite speed of the circular interpolation axis or the speed of the linear interpolation axis is controlled not to exceed "[Pr.8] Speed limit value". (However, when the movement amount of the linear interpolation axis is more than the composite movement amount of the circular interpolation axis, such as when the number of pitches ("[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches") set in the linear interpolation axis is less, the speed of the linear interpolation axis cannot be suppressed with "[Pr.8] Speed limit value".)

Point

When the "reference axis speed" is set during interpolation control, set so the major axis side becomes the reference axis. If the minor axis side is set as the reference axis, the major axis side speed may exceed the "[Pr.8] Speed limit value".

Setting method

To use the "speed limit function", set the "speed limit value" in the parameters shown in the following table, and write them to the Simple Motion module.

The set details are validated at the next start after they are written to the Simple Motion module.

Setting item		Setting value	Setting details	Factory-set initial value
[Pr.8]	Speed limit value	→	Set the speed limit value (max. speed during control).	200000
[Pr.31]	JOG speed limit value	→	Set the speed limit value during JOG operation (max. speed during control). (Note that "[Pr.31] JOG speed limit value" shall be less than or equal to "[Pr.8] Speed limit value".)	20000

Refer to the following for the setting details.

☞ Page 496 Basic Setting

Point

- Parameters are set for each axis.
- It is recommended that the parameters be set whenever possible with the engineering tool. Execution by a program uses many programs and devices. The execution becomes complicated, and the scan times will increase.

Torque limit function

The "torque limit function" limits the generated torque to a value within the "torque limit value" setting range when the torque generated in the servo motor exceeds the "torque limit value".
The "torque limit function" protects the deceleration function, limits the power of the operation pressing against the stopper, etc. It controls the operation so that unnecessary force is not applied to the load and machine.

Relation between the torque limit function and various controls

The following table shows the relation of the "torque limit function" and various controls.

○: Set when required (Set to " — " when not used.)

—: Setting not required (Use the initial value or a value within the setting range.)

Control type			Torque limit function	Torque limit value *1
Home position return control	Machine home position return control		○	[RD77MS] "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value". After the "[Pr.47] Creep speed" is reached, this value becomes the "[Pr.54] Home position return torque limit value". [RD77GF] "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value".*2 The home position return method that can change the torque limit value during the home position return is set in home position return parameters of the servo amplifier.*3
	Fast home position return control		○	"[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value".
Major positioning control	Position control	1-axis linear control	○	
		2 to 4-axis linear interpolation control	○	
		1-axis fixed-feed control	○	
		2 to 4-axis fixed-feed control (interpolation)	○	
		2-axis circular interpolation control	○	
		3-axis helical interpolation control	○	
	1 to 4-axis speed control		○	
	Speed-position switching control, Position-speed switching control		○	
	Other control	Current value changing	—	Setting value is invalid.
		JUMP instruction, NOP instruction, LOOP to LEND	—	
Manual control	JOG operation, Inching operation		○	"[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value".
	Manual pulse generator operation		○	
Expansion control	Speed-torque control		○	Torque limit value is continued after control mode switching.

*1 Shows the torque limit value when "[Cd.22] New torque value/forward new torque value" or "[Cd.113] New reverse torque value" is set to "0".

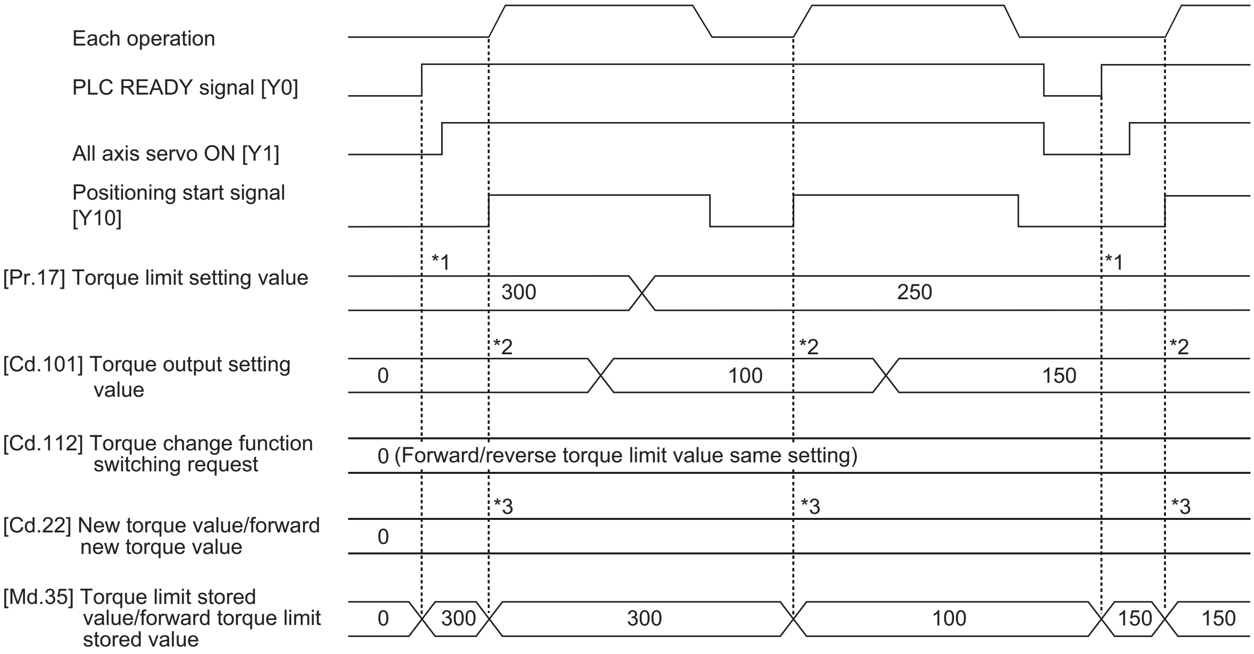
*2 Valid for the value set at start only. It cannot be changed during the home position return.

*3 Refer to the servo amplifier instruction manual for the setting method.

Control details

The following drawing shows the operation of the torque limit function.

■Operation example



*1 The torque limit setting value or torque output setting value becomes effective at the PLC READY signal [Y0] rising edge (however, after the servo is turned ON.)
If the torque output setting value is "0" or larger than the torque limit setting value, the torque limit setting value will be its value.

*2 The torque limit setting value or torque output setting value becomes effective at the positioning start signal [Y10] rising edge.
If the torque output setting value is "0" or larger than the torque limit setting value, the torque limit setting value will be its value.

*3 The torque change value is cleared to "0" at the positioning start signal [Y10] rising edge.

Precautions during control

- When limiting the torque at the "[Pr.17] Torque limit setting value", confirm that "[Cd.22] New torque value/forward new torque value" or "[Cd.113] New reverse torque value" is set to "0". If this parameter is set to a value besides "0", the setting value will be validated, and the torque will be limited at that value. (Refer to ☞ Page 280 Torque change function for details about the "new torque value".)
- When the "[Pr.54] Home position return torque limit value" exceeds the "[Pr.17] Torque limit setting value", the error "Home position return torque limit value error" (error code: 1B0DH, 1B0EH) occurs.
- When the operation is stopped by torque limiting, the droop pulse will remain in the deviation counter. If the load torque is eliminated, operation for the amount of droop pulses will be carried out. Note that the movement might start rapidly as soon as the load torque is eliminated.

Setting method

- To use the "torque limit function", set the "torque limit value" in the parameters shown in the following table, and write them to the Simple Motion module.

The set details are validated at the rising edge (OFF → ON) of the PLC READY signal [Y0].

Setting item		Setting value	Setting details	Factory-set initial value
[Pr.17]	Torque limit setting value	→	Set the torque limit value[1] in 0.1% unit.	3000
[Pr.54]	Home position return torque limit value [RD77MS]	→	Set the torque limit value after the speed reaches "[Pr.47] Creep speed" in 0.1% unit.	3000

The set details are validated at the rising edge (OFF → ON) of the positioning start signal [Y10].

Setting item		Setting value	Setting details	Factory-set initial value
[Cd.101]	Torque output setting value[2]	→	Set the torque output value in 0.1% unit.	0

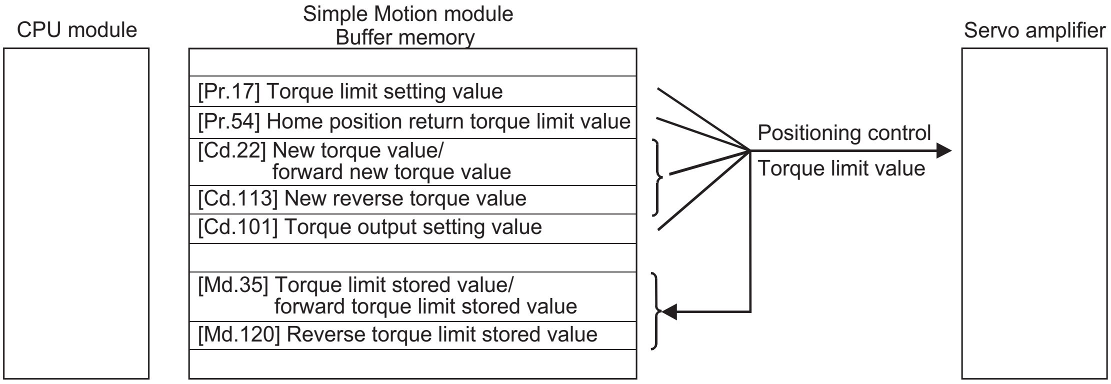
[1] Torque limit value: Will be an upper limit value of the torque change value. If a larger value has been mistakenly input for the torque change value, it is restricted within the torque limit setting values to prevent an erroneous entry. (Even if a value larger than the torque limit setting value has been input to the torque change value, the torque value is not changed.)

[2] Torque output setting value: Taken at the positioning start and used as a torque limit value. If the value is "0" or the torque limit setting value or larger, the parameter "torque limit setting value" is taken at the start.

Refer to the following for the setting details.

☞ Page 496 Basic Setting, ☞ Page 616 Control Data

- The "torque limit value" set in the Simple Motion module is set in the "[Md.35] Torque limit stored value/forward torque limit stored value" or "[Md.120] Reverse torque limit stored value".



- The following table shows the storage details of "[Md.35] Torque limit stored value/forward torque limit stored value" and "[Md.120] Reverse torque limit stored value".

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Monitor item		Monitor value	Storage details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Md.35]	Torque limit stored value/forward torque limit stored value	→	The "torque limit value/forward torque limit stored value" valid at that time is stored. ([Pr.17], [Pr.54], [Cd.22] or [Cd.101])	2426+100n	1002426+100n
[Md.120]	Reverse torque limit stored value	→	The "reverse torque limit stored value" is stored depending on the control status. ([Pr.17], [Pr.54], [Cd.22], [Cd.101] or [Cd.113])	2491+100n	1002491+100n

Refer to the following for information on the storage details.

☞ Page 576 Monitor Data

Point

- Parameters are set for each axis.
- It is recommended that the parameters be set whenever possible with the engineering tool. Execution by a program uses many programs and devices. The execution becomes complicated, and the scan times will increase.
- Use "[Md.120] Reverse torque limit stored value" and "[Cd.113] New reverse torque value" only when "1: Forward/reverse torque limit value individual setting" is set in "[Cd.112] Torque change function switching request". (☞ Page 280 Torque change function)

Software stroke limit function

In the "software stroke limit function" the address established by a machine home position return is used to set the upper and lower limits of the moveable range of the workpiece. Movement commands issued to addresses outside that setting range will not be executed.

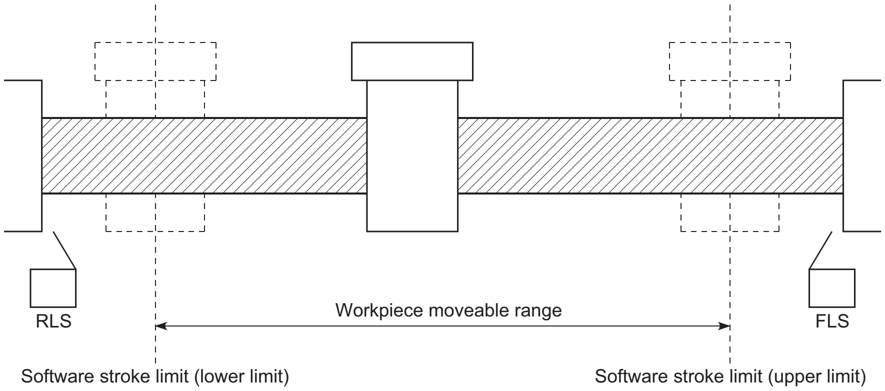
In the Simple Motion module, the "command position value" and "machine feed value" are used as the addresses indicating the current position. However, in the "software stroke limit function", the address used to carry out the limit check is designated in the "[Pr.14] Software stroke limit selection". Refer to the following for details on the "command position value" and "machine feed value".

☞ Page 66 Confirming the current value

The upper and lower limits of the moveable range of the workpiece are set in "[Pr.12] Software stroke limit upper limit value"/ "[Pr.13] Software stroke limit lower limit value".

Differences in the moveable range

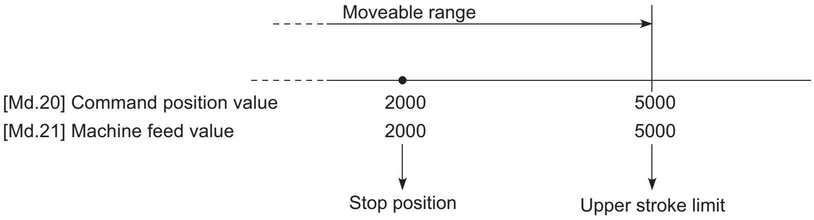
The following drawing shows the moveable range of the workpiece when the software stroke limit function is used.



The following drawing shows the differences in the operation when "[Md.20] Command position value" and "[Md.21] Machine feed value" are used in the moveable range limit check.

■Conditions

Assume the current stop position is 2000, and the upper stroke limit is set to 5000.

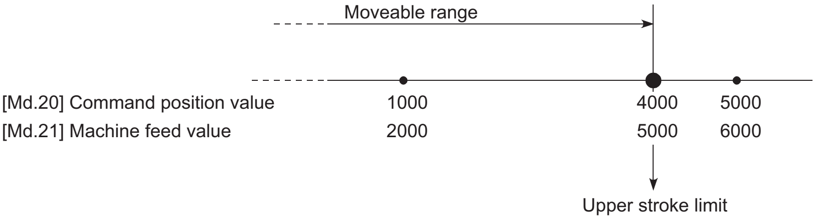


■Current value changing

When the current value is changed by a new current value command from 2000 to 1000, the command position value will change to 1000, but the machine feed value will stay the same at 2000.

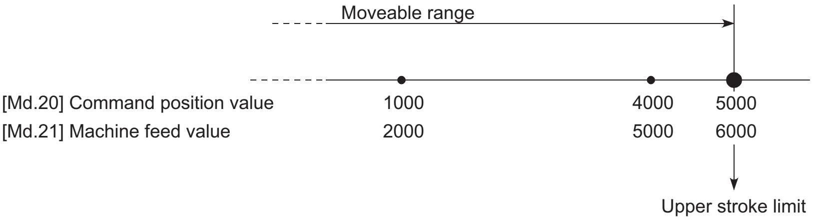
- When the machine feed value is set at the limit

The machine feed value of 5000 (command position value: 4000) becomes the upper stroke limit.



- When the command position value is set at the limit

The command position value of 5000 (machine feed value: 6000) becomes the upper stroke limit.



Point

When "machine feed value" is set in "[Pr.14] Software stroke limit selection", the moveable range becomes an absolute range referenced on the home position. When "command position value" is set, the moveable range is the relative range from the "command position value".

Software stroke limit check details

Check details		Processing when an error occurs
1)	An error shall occur if the current value[*1] is outside the software stroke limit range[*2]. (Check "[Md.20] Command position value" or "[Md.21] Machine feed value".)	The error "Software stroke limit +" (error code: 1993H, 1A18H) or "Software stroke limit -" (error code: 1995H, 1A1AH) will occur.
2)	An error shall occur if the command address is outside the software stroke limit range. (Check "[Da.6] Positioning address/movement amount".)	

*1 Check whether the "[Md.20] Command position value" or "[Md.21] Machine feed value" is set in "[Pr.14] Software stroke limit selection".

*2 Moveable range from the "[Pr.12] Software stroke limit upper limit value" to the "[Pr.13] Software stroke limit lower limit value".

Relation between the software stroke limit function and various controls

◎: Check valid

○: Check is not made when the command position value is not updated (☞ Page 520 [Pr.21] Command position value during speed control) at the setting of "command position value" in "[Pr.14] Software stroke limit selection" during speed control.

—: Check not carried out (check invalid).

△: Valid only when "0: valid" is set in the "[Pr.15] Software stroke limit valid/invalid setting".

Control type			Limit check	Processing at check
Home position return control	Machine home position return control	Data set method	◎	The home position return control will not be performed if the home position address is outside the software stroke limit range.
		Other than "Data set method"	—	Check not carried out.
	Fast home position return control		—	
Major positioning control	Position control	1-axis linear control	◎	Checks 1) and 2) in ☞ Page 254 Software stroke limit check details are carried out. For speed control: The axis decelerates to a stop when it exceeds the software stroke limit range. For position control: The axis comes to an immediate stop when it exceeds the software stroke limit range.
		2 to 4-axis axis linear interpolation control	◎	
		1-axis fixed-feed control	◎	
		2 to 4-axis fixed-feed control (interpolation)	◎	
		2-axis circular interpolation control	◎	
		3-axis helical interpolation control	◎	
	1 to 4-axis speed control		○[*1][*2]	
	Speed-position switching control, Position-speed switching control		○[*1][*2]	
	Other control	Current value changing	◎	The current value will not be changed if the new position value is outside the software stroke limit range.
		JUMP instruction, NOP instruction, LOOP to LEND	—	Check not carried out.
Manual control	JOG operation, Inching operation		△[*3]	Check 1) in ☞ Page 254 Software stroke limit check details is carried out. The machine will carry out a deceleration stop when the software stroke limit range is exceeded. If the address is outside the software stroke limit range, the operation can only be started toward the moveable range.
	Manual pulse generator operation		△[*3]	
Expansion control	Speed-torque control		◎	Check 1) in ☞ Page 254 Software stroke limit check details is carried out. The mode switches to the position control mode when the software stroke limit range is exceeded, and the operation immediately stops.

[*1] The value in "[Md.20] Command position value" will differ according to the "[Pr.21] Command position value during speed control" setting.

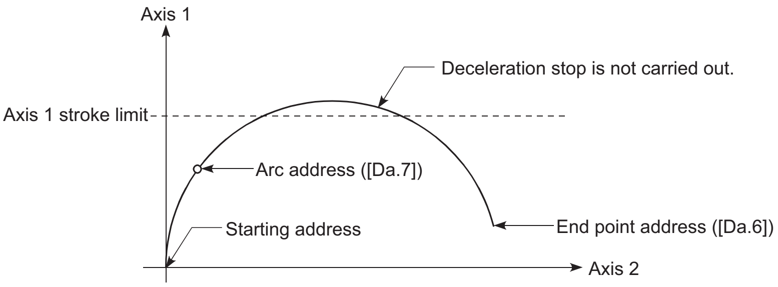
[*2] When the unit is "degree", check is not made during speed control.

[*3] When the unit is "degree", check is not carried out.

Precautions during software stroke limit check

- A machine home position return must be executed beforehand for the "software stroke limit function" to function properly.
- During interpolation control, a stroke limit check is carried out for the every current value of both the reference axis and the interpolation axis. Every axis will not start if an error occurs, even if it only occurs in one axis.
- During 2-axis circular interpolation control and 3-axis helical interpolation control (reference axis and interpolation axis), the "[Pr.12] Software stroke limit upper limit value"/"[Pr.13] Software stroke limit lower limit value" may be exceeded. In this case, a deceleration stop will not be carried out even if the stroke limit is exceeded. Always install an external limit switch if there is a possibility the stroke limit will be exceeded.

Ex.



Point

The software stroke limit check is carried out for the following addresses during 2-axis circular interpolation control.

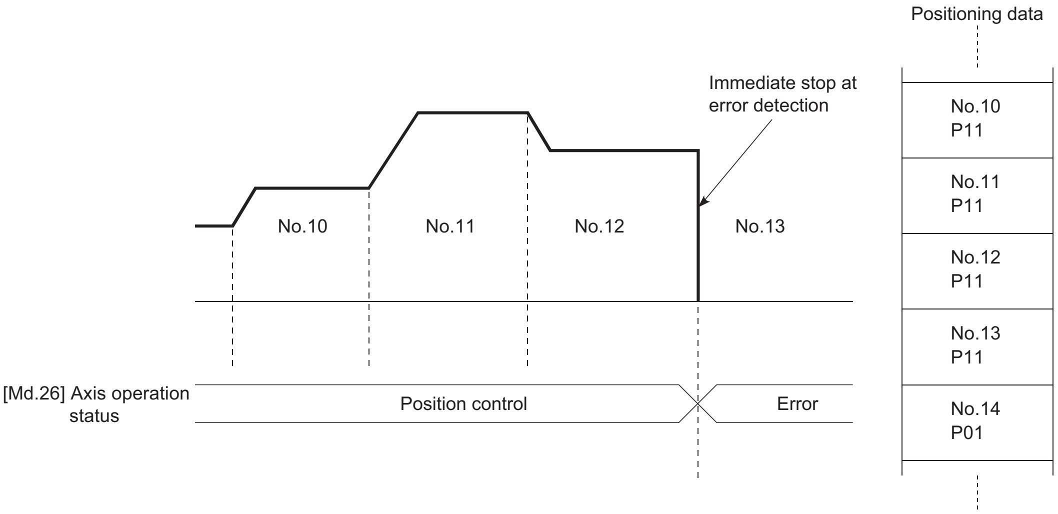
(Note that "[Da.7] Arc address" is carried out only for 2-axis circular interpolation control with sub point designation.)

Current value/end point address ([Da.6])/arc address ([Da.7])

- If an error is detected during continuous path control, the axis stops immediately on completion of execution of the positioning data located right before the positioning data in error.

Ex.

If the positioning address of positioning data No.13 is outside the software stroke limit range, the operation immediately stops after positioning data No.12 has been executed.



- During simultaneous start, a stroke limit check is carried out for the current values of every axis to be started. Every axis will not start if an error occurs, even if it only occurs in one axis.

Setting method

To use the "software stroke limit function", set the required values in the parameters shown in the following table, and write them to the Simple Motion module.

The set details are validated at the rising edge (OFF → ON) of the PLC READY signal [Y0].

Setting item		Setting value	Setting details	Factory-set initial value
[Pr.12]	Software stroke limit upper limit value	→	Set the upper limit value of the moveable range.	2147483647
[Pr.13]	Software stroke limit lower limit value	→	Set the lower limit value of the moveable range.	-2147483648
[Pr.14]	Software stroke limit selection	→	Set whether to use the "[Md.20] Command position value" or "[Md.21] Machine feed value" as the "current value".	0: Command position value
[Pr.15]	Software stroke limit valid/invalid setting	0: Valid	Set whether the software stroke limit is validated or invalidated during manual control (JOG operation, Inching operation, manual pulse generator operation).	0: Valid

Refer to the following for the setting details.

☞ Page 496 Basic Setting

Invalidating the software stroke limit

To invalidate the software stroke limit, set the following parameters as shown, and write them to the Simple Motion module. (Set the value within the setting range.)

(To invalidate only the manual operation, set "1: software stroke limit invalid" in the "[Pr.15] Software stroke limit valid/invalid setting".)

The set details are validated at the rising edge (OFF → ON) of the PLC READY signal [Y0].

When the unit is "degree", the software stroke limit check is not performed during speed control (including speed control in speed-position switching control or position-speed switching control) or during manual control, independently of the values set in [Pr.12], [Pr.13] and [Pr.15].

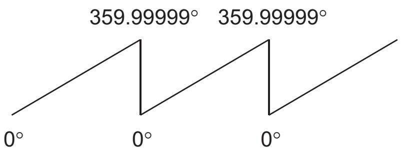
Point

- Parameters are set for each axis.
- It is recommended that the parameters be set whenever possible with the engineering tool. Execution by a program uses many programs and devices. The execution becomes complicated, and the scan times will increase.

Setting when the control unit is "degree"

■Current value address

The "[Md.20] Command position value" address is a ring address between 0 and 359.99999°.

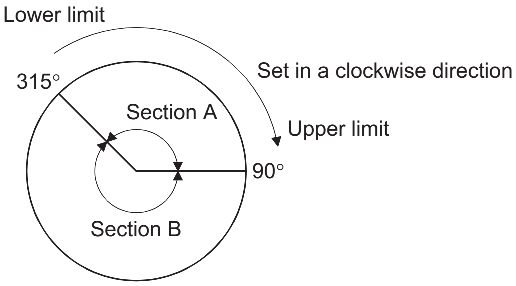


■Setting the software stroke limit

The upper limit value/lower limit value of the software stroke limit is a value between 0 and 359.99999°.

- Setting when the software stroke limit is to be validated.

When the software stroke limit is to be validated, set the upper limit value in a clockwise direction from the lower limit value.



Set as follows to set the movement range of section A or B in the above figure.

Section set as movement range	Software stroke limit lower limit value	Software stroke limit upper limit value
Section A	315.00000°	90.00000°
Section B	90.00000°	315.00000°

Hardware stroke limit function

⚠WARNING

- When the hardware stroke limit is required to be wired, ensure to wire it in the negative logic using b-contact. If it is set in positive logic using a-contact, a serious accident may occur.

In the "hardware stroke limit function", limit switches are set at the upper/lower limit of the physical moveable range, and the control is stopped (by deceleration stop) by the input of a signal from the limit switch.

Damage to the machine can be prevented by stopping the control before the upper/lower limit of the physical moveable range is reached.

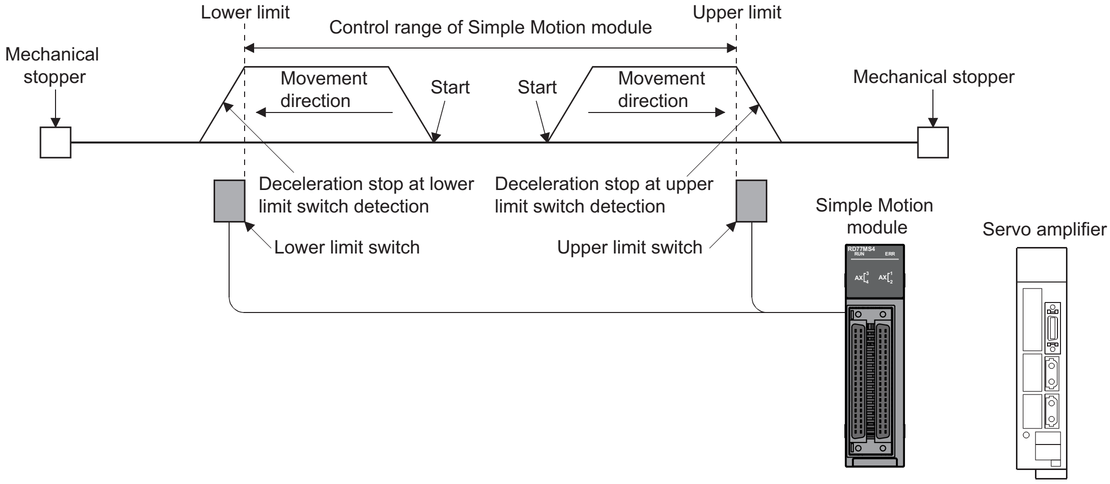
The hardware stroke limit is able to use the following signals. (☞ Page 521 [Pr.116] to [Pr.119] FLS/RLS/DOG/STOP signal selection)

- External input signal of Simple Motion module [RD77MS]
- External input signal of servo amplifier
- External input signal via CPU (buffer memory of Simple Motion module)
- Input signal on CC-Link IE Field Network (link device) [RD77GF]

Control details

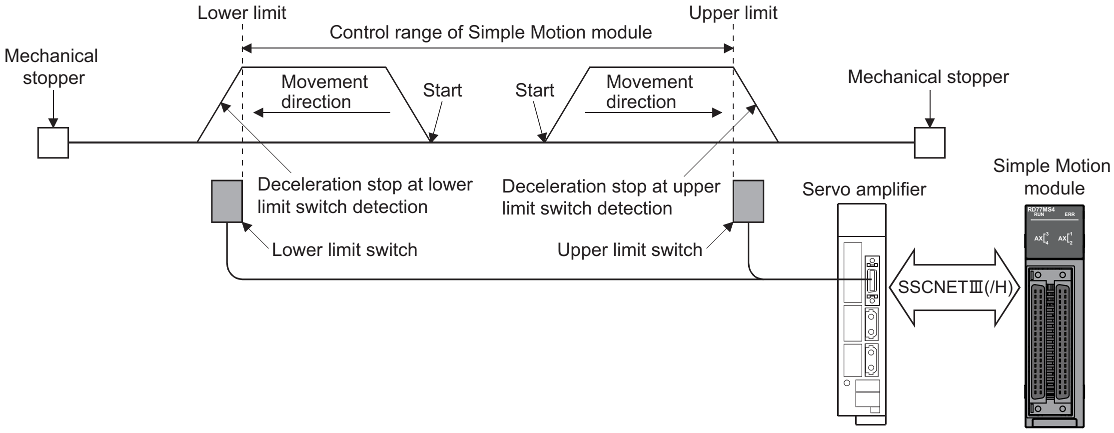
The following drawing shows the operation of the hardware stroke limit function.

■External input signal of Simple Motion module [RD77MS]



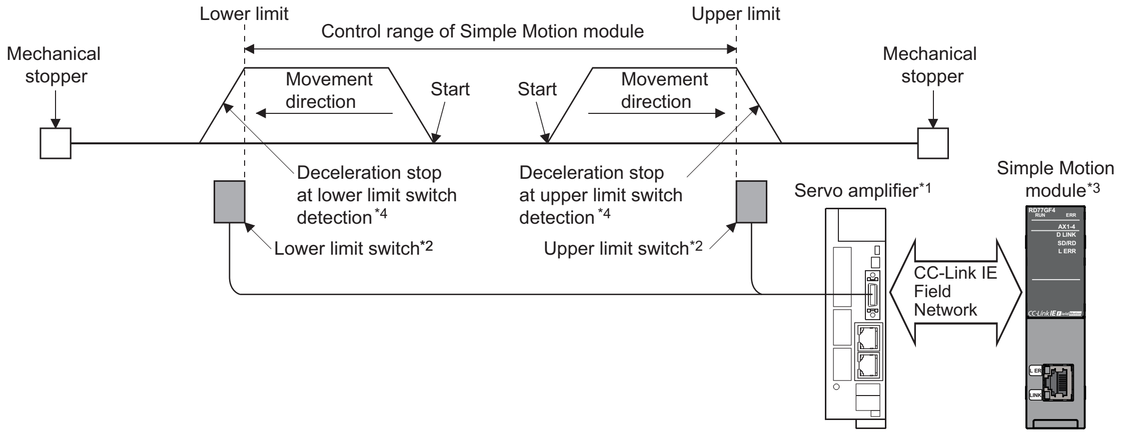
■External input signal of servo amplifier

- [RD77MS]



- [RD77GF]

For the operation when the servo amplifier stroke limit is detected, confirm the specifications of the servo amplifier to be used. The following shows the case of MR-J4-GF use.



*1 Set the following servo parameters properly.
- Set "0: Input from servo amplifier" to "sensor input method selection" of the servo parameter "Function selection D-4 (PD41)".
- Assign the LSP/LSN signals with the servo parameter "Input device selection 1 to 3 (PD03 to 05)".

For details, refer to the following.

☞ Page 263 Servo parameter setting [RD77GF]

*2 The signal to be wired differs by the servo parameter "Rotation direction selection/travel direction selection (PA14)".

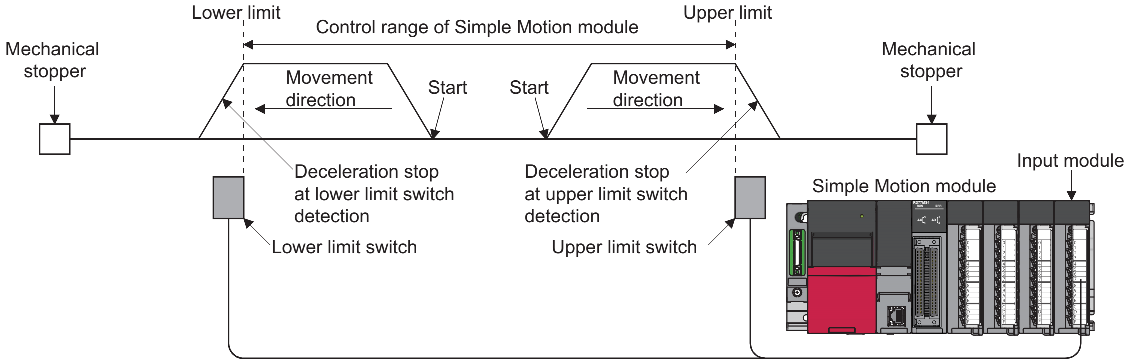
Setting value of "Rotation direction selection/travel direction selection (PA14)"	Signal name of servo amplifier	
	Lower limit	**Upper limit**
0: Forward rotation (CCW) with the increase of the positioning address	LSN	LSP
1: Reverse rotation (CW) with the increase of the positioning address	LSP	LSN

*3 Set the same value in "[Pr.22] Input signal logic selection" as the value set in the input logic setting of the servo amplifier. For the input logic specification of the servo amplifier, refer to the instruction manual of the servo amplifier to be used.

*4 The stop process differs by the setting of "Stroke limit enabling condition selection" of the servo parameter "Function selection D-4 (PD41)". Refer to the following for details. [RD77GF]

☞ Page 249 Torque limit function

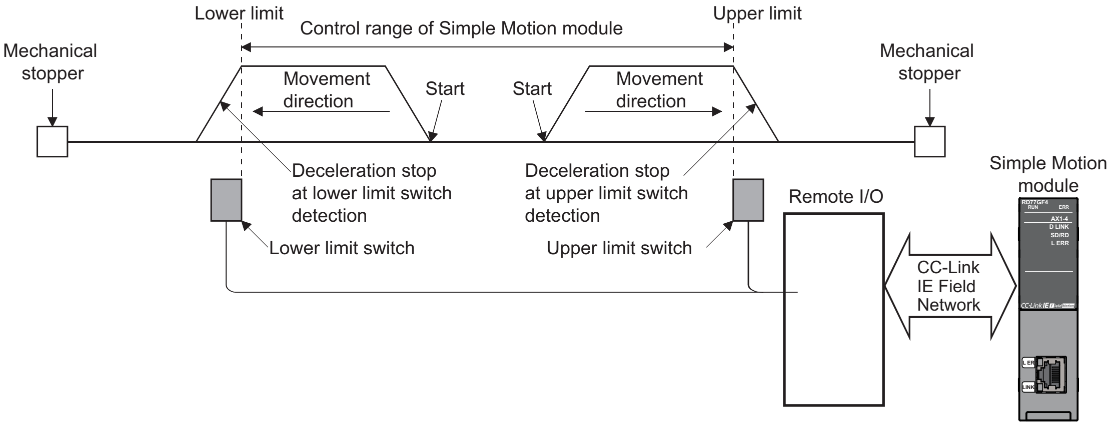
■External input signal via CPU (buffer memory of Simple Motion module)



Set the servo parameter properly. For details, refer to the following. [RD77GF]

☞ Page 263 Servo parameter setting [RD77GF]

■Link device [RD77GF]



Set the servo parameter properly. For details, refer to the following.

☞ Page 263 Servo parameter setting [RD77GF]

Wiring the hardware stroke limit

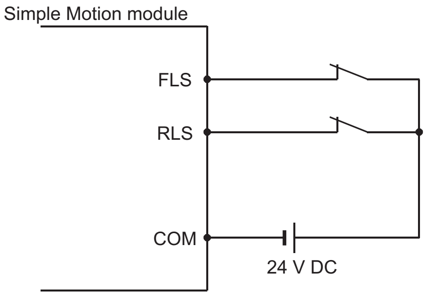
When using the hardware stroke limit function, wire the signal terminals corresponding to the upper/lower stroke limit of the device to be used as shown in the following drawing.

■External input signal of the Simple Motion module [RD77MS]

Wire the upper/lower limit stroke limit terminals of the Simple Motion module/servo amplifier as shown in the following drawing. As for the 24 V DC power supply, the direction of current can be switched.

Ex.

When "[Pr.150] Input terminal logic selection" is set to the initial value



■External input signal of the servo amplifier

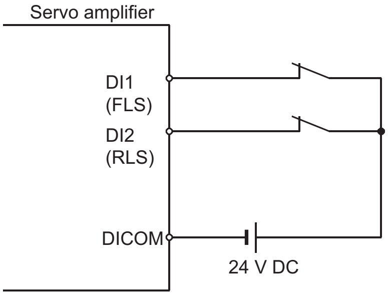
Refer to the instruction manual or manual of the servo amplifier to be used for details on input and wiring of the signal.

- [RD77MS]

Wire the MR-J3/MR-J4 series servo amplifier and MR-J5(W)-B as shown in the following drawing. As for the 24 V DC power supply, the direction of current can be switched.

Ex.

When "[Pr.22] Input signal logic selection" is set to the initial value



- [RD77GF]

When using the MR-J4-GF, execute the parameter setting and wiring related to the LSP/LSN signals. (☞ Page 259 Control details)

■External input signal via CPU (buffer memory of the Simple Motion module)

For the wiring, refer to the manual of the module into which the external input signal is to be input.

At MR-JE-B(F) use, refer to the following.

☞ Page 769 Connection with MR-JE-B(F)

■Link device [RD77GF]

For the wiring, refer to the manual of the remote input module to be used.

The logic setting of the stroke limit signal follows "[Pr.913] Upper limit signal (FLS): Link device logic setting" and "[Pr.923] Lower limit signal (RLS): Link device logic setting".

Point

Wire the limit switch installed in the direction to which "Command position value" increases as upper limit switch and the limit switch installed in the limit switch installed in the direction to which "Command position value" decreases as lower limit switch.

If inverting the install positions of upper/lower limit switches, hardware stroke limit function cannot be operated properly. In addition, the servo motor does not stop.

The increase/decrease of "Command position value" and the motor rotation direction/movement direction can be changed by the parameters depending on the servo amplifier. Refer to the servo amplifier instruction manual or manual for details.

When the hardware stroke limit function is not used

[RD77MS]

Set the logic of FLS and RLS to the "negative logic" (initial value) with "[Pr.22] Input signal logic selection" or "[Pr.150] Input terminal logic selection" and input the signal which always turns ON. Otherwise, set the logic of FLS and RLS to the "positive logic" with "[Pr.22] Input signal logic selection" or "[Pr.150] Input terminal logic selection" and always turn OFF the input.

[RD77GF]

Set the logic of FLS and RLS to the "negative logic" (initial value) with "[Pr.22] Input signal logic selection" and input the signal which always turns ON. Otherwise, set the logic of FLS and RLS to the "positive logic" with "[Pr.22] Input signal logic selection" and always turn OFF the input.

Servo parameter setting [RD77GF]

Set the servo parameter shown below appropriately at MR-J4-GF use. Otherwise, the stroke limit signal cannot be released.
The following table shows the relation between the control details and the stop process with each setting of the Simple Motion module and the servo amplifier, at the stroke limit detection.

Control details for Simple Motion module	Controller setting	Servo parameter setting		Actual signal input	Stop process at hardware stroke limit detection[2][3]
	[Pr.116] FLS signal selection [Pr.117] RLS signal selection [Pr.118] DOG signal selection	Function selection D-4 (PD41) Stroke limit enabling condition selection[1]	Function selection D-4 (PD41) Sensor input type selection		
Other than home position return	1: Servo amplifier	0: Stroke limit always enabled	0: Input from servo amplifier	Servo amplifier	Controller, servo amplifier[4]
		1: Enabled only for home position return mode			Controller
		0: Stroke limit always enabled	1: Input from controller	Servo amplifier	—[5]
		1: Enabled only for home position return mode			
	Other than "1: Servo amplifier"[6]	0: Stroke limit always enabled	0: Input from servo amplifier	Servo amplifier	—[5]
		1: Enabled only for home position return mode			
		0: Stroke limit always enabled		Controller	—[5]
		1: Enabled only for home position return mode			
		0: Stroke limit always enabled	1: Input from controller	Servo amplifier	—[7]
		1: Enabled only for home position return mode			
		0: Stroke limit always enabled		Controller	Controller
		1: Enabled only for home position return mode			
Home position return	1: Servo amplifier	—[8]	0: Input from servo amplifier	Servo amplifier	Controller, servo amplifier[4]
			1: Input from controller	Servo amplifier	—[5]
	Other than "1: Servo amplifier"[6]		0: Input from servo amplifier	Servo amplifier	—[5]
				Controller	—[5]
			1: Input from controller	Servo amplifier	—[7]
				Controller	Controller, servo amplifier[4]

*1 When setting to "0: Stroke limit always enabled", the operation at the hardware stroke limit stop differs. For details, refer to the following.
☞ Page 265 Precautions during control

*2 For details on the stop process of the Simple Motion module, refer to the following.
☞ Page 28 Stop

*3 For details on the stop process of the servo amplifier, refer to the instruction manual of the servo amplifier (Motion mode).

*4 When the software version of the Simple Motion module is "Ver.01":
The error "Servo parameter PD41 setting error" (error code: 1B78H) occurs.

*5 When the software version of the Simple Motion module is "Ver.01":
The error "Servo parameter PD41 setting error" (error code: 1B78H) occurs. The cyclic transmission is not performed
When the software version of the Simple Motion module is "Ver.02" or later:
The error "Servo amplifier external input signal select error" (error code: 1AD4H) occurs. The stroke limit signal cannot be released and the servo ON is not possible.

*6 When the software version of the Simple Motion module is "Ver.02":
The consistency is checked even when "15: Invalid" is set.

*7 The stroke limit signal cannot be released.

*8 Even if either "0: Stroke limit always enabled" or "1: Enabled only for home position return mode" is set during home position return, both operations will be the same.

Point

The consistency between "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection" and "[Pr.118] DOG signal selection" in controller setting and the servo parameter "Function selection D-4 (PD41)" is checked at the start of connection with the servo amplifier.

When the software version of the Simple Motion module is "Ver.01":

- At the diagnostic error, the error "Servo parameter PD41 setting error" (error code: 1B78H) occurs in the Simple Motion module and the cyclic transmission with the servo amplifier of the corresponding axis is not performed.

When the software version of the Simple Motion module is "Ver.02" or later:

- At the diagnostic error, the error "Servo amplifier external input signal select error" (error code: 1AD4H) occurs and the stroke limit cannot be released. (The cyclic transmission with the servo amplifier of the corresponding axis is performed.) In addition, the connected servo amplifier cannot be the servo ON status. Change the setting of the Simple Motion module and the connected servo amplifier, and connect again.
- To specify"1: Servo amplifier" in the controller setting, it is required to set "1: Servo amplifier" in all of the "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection" and "[Pr.118] DOG signal selection". If the setting is incorrect, the error occurs in the consistency diagnostics.
- When "1: Servo amplifier" is set in the controller setting, ON/OFF may be displayed repeatedly in "[Md.30] External input signal" during the consistency diagnostics. When the external signal of the servo amplifier is operated before the current value restoration completion of the corresponding axis (can be checked with "[Md.190] Controller position value restoration completion status"), the consistency error may be detected incorrectly.

Precautions during control

- If the machine is stopped outside the Simple Motion module control range (outside the upper/lower limit switches), or if stopped by hardware stroke limit detection, the starting for the "home position return control", "major positioning control", and "high-level positioning control" and the control mode switching cannot be executed. To carry out these types of control again, return the workpiece to the Simple Motion module control range by a "JOG operation", "inching operation" or "manual pulse generator operation".
- When "[Pr.22] Input signal logic selection" or "[Pr.150] Input terminal logic selection" is set to the initial value, the Simple Motion module cannot carry out the positioning control if FLS (limit switch for upper limit) is separated from DICOM or RLS (limit switch for lower limit) is separated from DICOM (including when wiring is not carried out).
- When the MR-J4-GF is connected, the operation at the hardware stroke limit stop and the error that occurs at the hardware stroke limit stop differ by the setting of "Stroke limit enabling condition selection" of the servo parameter "Function selection D-4 (PD41)" and "[AL. 99 Stroke limit warning] selection" of "Function selection C-6 (PC19)". [RD77GF]

"Stroke limit enabling condition selection" of "Function selection D-4 (PD41)"[*1]	"[AL. 99 Stroke limit warning] selection" of "Function selection C-6 (PC19)"[*1]	The operation at the hardware stroke limit stop	The error that occurs at the hardware stroke limit stop[*2]
1: Enabled only for home position return mode	0: Enabled	The stop process is executed in the Simple Motion module.[*3]	The error "Hardware stroke limit (+)" (error code: 1904H, 1905H) or "Hardware stroke limit (-)" (error code: 1906H, 1907H) will occur in the Simple Motion module.
	1: Disabled		
0: Stroke limit always enabled	0: Enabled	The stop process is executed in the servo amplifier and the servo amplifier becomes servo-lock status. The Simple Motion module performs the process of deceleration stop and rapid stop depending on the setting of "[Pr.37] Stop group 1 rapid stop selection". However, the command is ignored. (At the time, the motor actual position value deviates from the position command. However, it is not reflected in "[Md.102] Deviation counter value".) (Refer to the following drawing.)	In addition to the error "Hardware stroke limit (+)" (error code: 1904H, 1905H) or "Hardware stroke limit (-)" (error code: 1906H, 1907H) in the Simple Motion module, the servo warning "Stroke limit warning" (warning No.: 99) will occur even in the servo amplifier.[*4]
	1: Disabled		The error "Hardware stroke limit (+)" (error code: 1904H, 1905H) or "Hardware stroke limit (-)" (error code: 1906H, 1907H) will occur in the Simple Motion module.[*5]

*1 For details on the servo parameter, refer to the instruction manual of the servo amplifier (Motion mode).

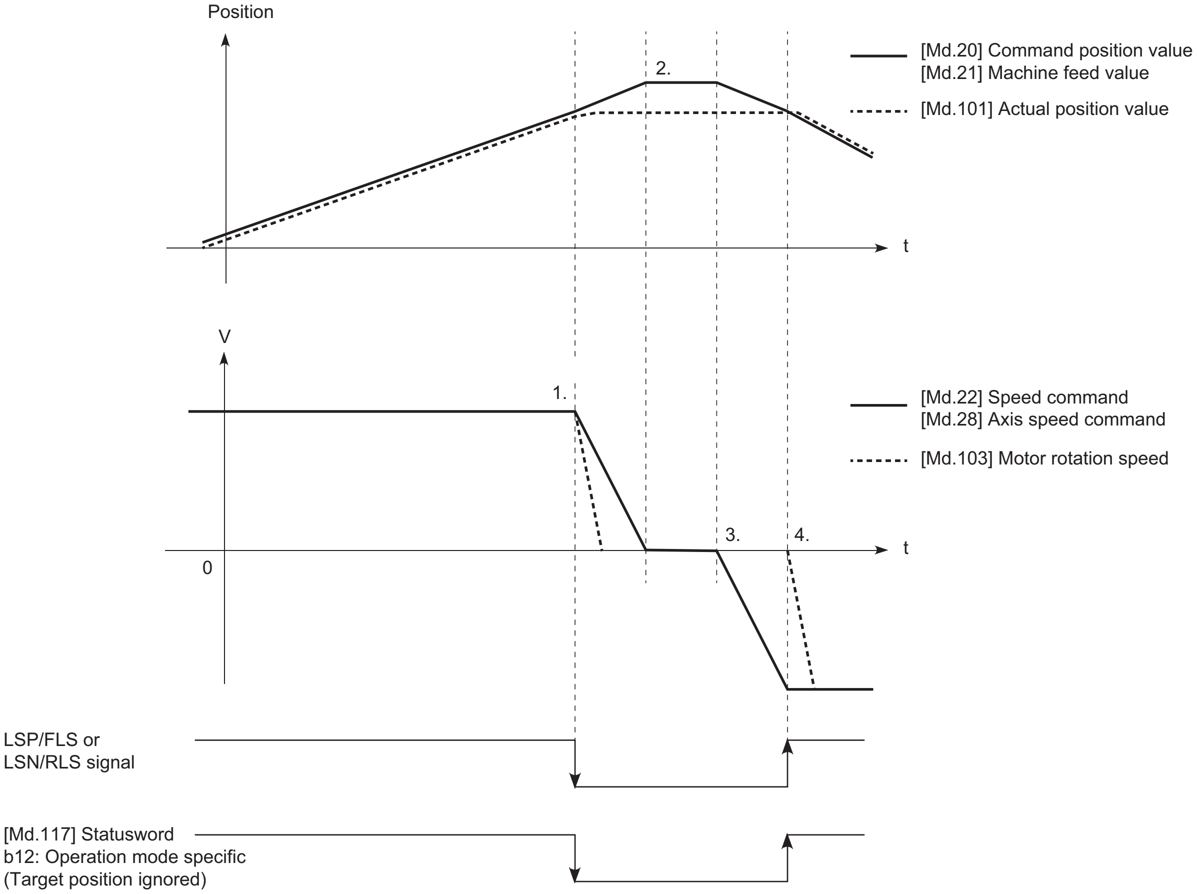
*2 The error that occurs at the hardware stroke limit detection cannot be invalidated for safety purpose on the Simple Motion module. For the servo amplifier, it is possible to invalidate the error to prevent repeatedly occurring errors to the hardware stroke limit in the entire servo system because of the error occurrence on the Simple Motion module.

*3 When stopping at the hardware stroke limit while the home position return is being carried out, the operation will be the same as when "0: Stroke limit always enabled" is set.

*4 Although the servo amplifier warning will be cleared automatically after the occurrence causes are removed, the Simple Motion module requires error reset. For details on error reset, refer to the following.
☞ Page 709 Clearing errors and warnings

*5 Although the servo amplifier warning will not be output, the stop process by the servo amplifier will be executed.

When "0: Stroke limit always enabled" is set to the servo parameter "Function selection D-4 (PD41)" [RD77GF]



1. When the LSP/FLS or LSN/RLS signal is detected, the sop process is executed in both the Simple Motion module and the servo amplifier.
2. After completion of the stop process of Simple Motion module, it stops with the status where the motor actual position value deviates from the position command. (The position command from the Simple Motion module to the outside of the stroke limit is ignored in the servo amplifier.)
3. After stopped and when manual operation is performed to the direction toward the inside of the stroke limit, the position command (command position value and feed machine value) and speed command of the Simple Motion module are updated. However, the servo motor does not operate.
4. When the position command from the Simple Motion module becomes "the command position where the LSP/FLS or LSN/RLS signal is detected", the servo motor starts operation to the inside of the stroke limit.

Point

- To stop the motor holding the interpolation status and the relation between input axis and output axis at the stroke limit detection of the servo amplifier, set "Stroke limit enabling condition selection" of the servo parameter "Function selection D-4 (PD41)" to "1: Enabled only for home position return mode".
- When the external input signal is turned ON (limit signal OFF) in the status where the real motor current value deviates from the position command with the stop by the hardware stroke limit, the motor makes rapid movement to the position command of the Simple Motion module. Restore the deviation between the motor actual position value and the position command by manual operation to the inside of the stroke limit. (Set the servo OFF status in "[Cd.100] Servo OFF command", so that restoring the position command to the motor actual position value by follow up is possible. After the restoration, set the servo ON again and move the motor to the inside of the stroke limit with manual operation.)
- When the command position of the Simple Motion module stops at the stroke limit side closer than the motor actual position value by the stroke limit detection and the manual operation is performed to the inside of the stroke limit, the operation of the motor actual position value follows the command position from the controller.

Forced stop function

⚠ WARNING

- When the forced stop is required to be wired, ensure to wire it in the negative logic using b-contact.
- Provided safety circuit outside the Simple Motion module so that the entire system will operate safety even when the "[Pr.82] Forced stop valid/invalid selection" is set "1: Invalid". Be sure to use the forced stop signal (EMI) of the servo amplifier.

"Forced stop function" stops all axes of the servo amplifier with the forced stop signal (The initial value is set to "0: Valid (External input signal)" [RD77MS] or "1: Invalid" [RD77GF].)

The forced stop input valid/invalid is selected by "[Pr.82] Forced stop valid/invalid selection".

Control details

When "[Pr.82] Forced stop valid/invalid selection" is set to other than "1: Invalid", the forced stop signal is sent to all axes after the forced stop input is turned on.

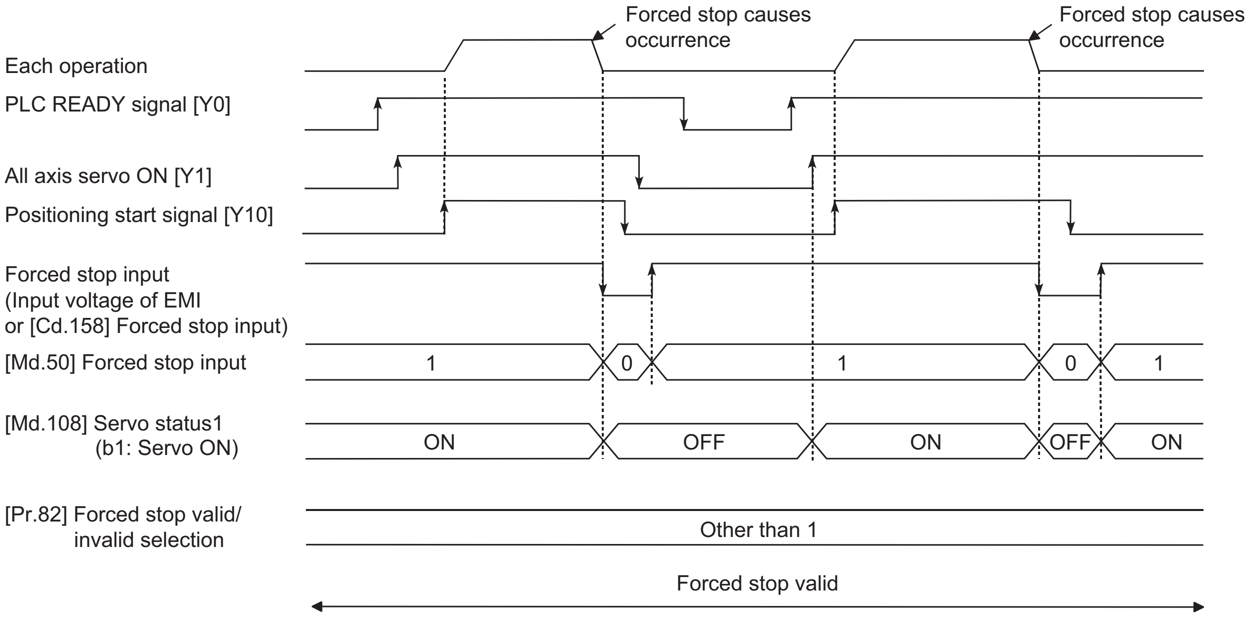
Refer to the servo amplifier instruction manual or manual for the operation of the servo amplifier after the forced stop signal is sent.

The outline of the forced stop process is shown below.

Stop cause		**Stop axis**	**M code ON signal after stop**	**Axis operation status ([Md.26]) after stopping**	**Stop process**					
					Home position return control		**Major positioning control**	**High-level positioning control**	**Manual control**	
					Machine home position return control	**Fast home position return control**			**JOG/ Inching operation**	**Manual pulse generator operation**
Forced stop	"Forced stop input signal" OFF from an external device	All axes	No change	Servo OFF	Immediate stop					—
	"[Cd.158] Forced stop input" OFF									

The following drawing shows the operation of the forced stop function.

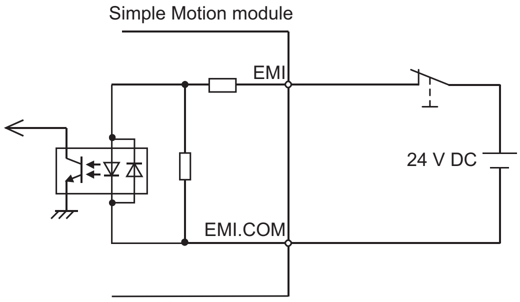
■Operation example



Wiring the forced stop

[RD77MS]

When using the forced stop function with the external input signal, wire the terminals of the Simple Motion module forced stop input as shown in the following drawing. As for the 24 V DC power supply, the direction of current can be switched.



[RD77GF]

For the wiring for using the forced stop function, refer to the manual of the remote input module to be used.

Setting the forced stop

To use the "Forced stop function", set the following data using a program.

"[Pr.82] Forced stop valid/invalid selection" is validated at the rising edge (OFF → ON) of the PLC READY signal [Y0] and "[Cd.158] Forced stop input" conducts checks in the operation cycle.

"[Cd.158] Forced stop input" is validated only when "[Pr.82] Forced stop valid/invalid selection" is set to "2: Valid (Buffer memory)".

When "[Pr.82] Forced stop valid/invalid selection" is set to "3: Valid (Link device)", set the link device external signal assignment function. [RD77GF]

Setting item		Setting value	Setting details		Buffer memory address
[Pr.82]	Forced stop valid/invalid selection	→	Set the forced stop function.		35
			0: Valid (External input signal) [RD77MS]	Forced stop from the external input signal is used	
			1: Invalid	Forced stop is not used	
			2: Valid (Buffer memory)	Forced stop from the buffer memory is used	
			3: Valid (Link device) [RD77GF]	Forced stop from the link device is used	
[Cd.158]	Forced stop input	→	Set the forced stop information to the buffer memory.		5945
			0: Forced stop ON (Forced stop)*1	Forced stop	
			1: Forced stop OFF (Forced stop release)	Forced stop release	

*1 A value other than "1" is regarded as "0".

Refer to the following for the setting details.

☞ Page 496 Basic Setting

How to check the forced stop

To use the states (ON/OFF) of forced stop input, set the parameters shown in the following table.

Monitor item		Monitor value	Storage details	Buffer memory address
[Md.50]	Forced stop input	→	Stores the states (ON/OFF) of forced stop input. 0: Forced stop input ON (Forced stop) 1: Forced stop input OFF (Forced stop release)	4231

Refer to the following for the setting details.

☞ Page 576 Monitor Data

Precautions during control

- After the "Forced stop input" is released, the servo ON/OFF is valid for the status of all axis servo ON [Y1].
- If the setting value of "[Pr.82] Forced stop valid/invalid selection" is outside the range, the error "Forced stop valid/invalid setting error" (error code: 1B71H) occurs.
- The "[Md.50] Forced stop input" is stored "1" by setting "[Pr.82] Forced stop valid/invalid selection" to "1: invalid".
- When the "Forced stop input" is turned ON during operation, the error "Servo READY signal OFF during operation" (error code: 1902H) does not occur.
- The status of the signal that is not selected in "[Pr.82] Forced stop valid/invalid selection" is ignored.
- The stop could be delayed up to one operation cycle compared to the forced stop by the external input signal, because "[Cd.158] Forced stop input" is checked in operation cycle. [RD77MS]
- Errors cannot be cleared by "[Cd.5] Axis error reset" during forced stop. Clear errors after forced stop is released. [RD77GF]

8.5 Functions to Change the Control Details

Functions to change the control details include the "speed change function", "override function", "acceleration/deceleration time change function", "torque change function" and "target position change function". Each function is executed by parameter setting or program creation and writing.

Refer to "Combination of Main Functions and Sub Functions" in the following manual for combination with the main functions.

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

Both the "speed change function" or "override function" change the speed, but the differences between the functions are shown below. Use the function that corresponds to the application.

"Speed change function"

- The speed is changed at any time, only in the control being executed.
- The new speed is directly set.

"Override function"

- The speed is changed for all control to be executed.
- The new speed is set as a percent (%) of the command speed.

Point

"Speed change function" and "Override function" cannot be used in the manual pulse generator operation and speed-torque control.

Speed change function

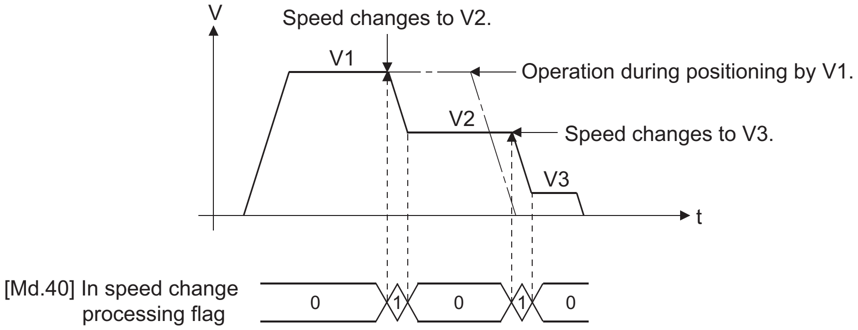
The speed control function is used to change the speed during control to a newly designated speed at any time.

The new speed is directly set in the buffer memory, and the speed is changed by a speed change command ([Cd.15] Speed change request) or external command signal.

During the machine home position return, a speed change to the creep speed cannot be carried out after deceleration start because the proximity dog ON is detected. When the speed change function is enabled and the speed is slower than the creep speed, the speed change is disabled and the speed accelerates to the creep speed after the proximity dog ON is detected.

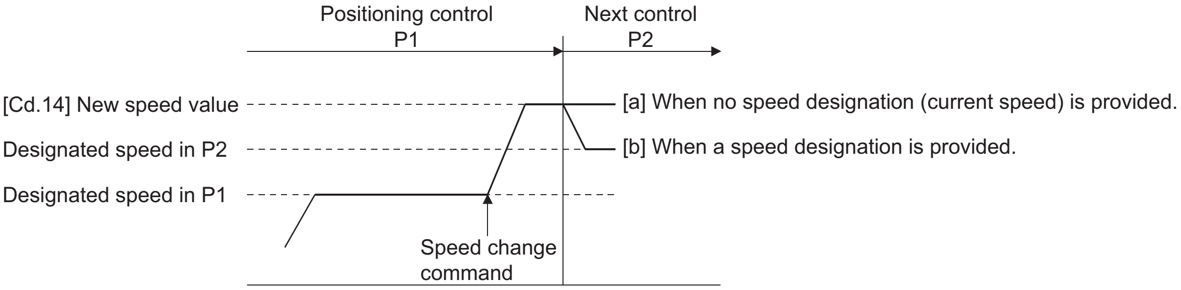
Control details

The following drawing shows the operation during a speed change.

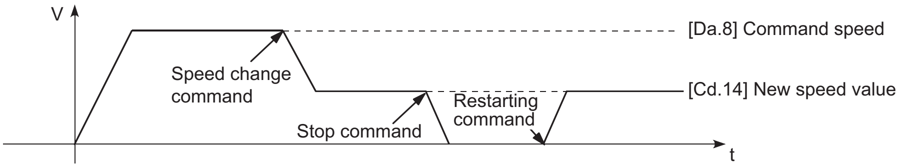


Precautions during control

- At the speed change during continuous path control, when no speed designation (current speed) is provided in the next positioning data, the next positioning data is controlled at the "[Cd.14] New speed value". Also, when a speed designation is provided in the next positioning data, the next positioning data is controlled at its "[Da.8] Command speed".

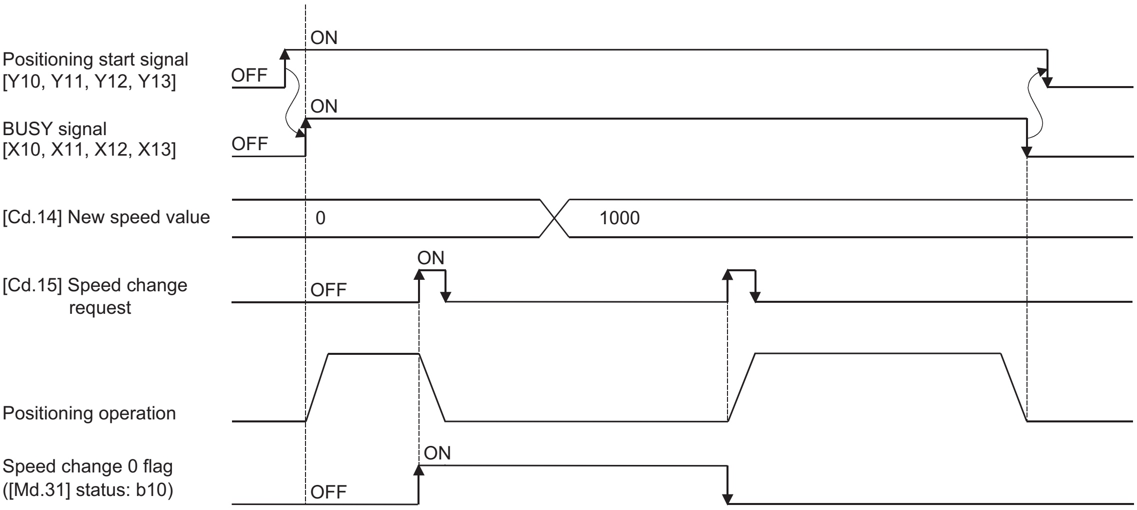


- When changing the speed during continuous path control, the speed change will be ignored if there is not enough distance remaining to carry out the change.
- When the stop command was given to make a stop after a speed change that had been made during position control, the restarting speed depends on the "[Cd.14] New speed value".



- When the speed is changed by setting "[Cd.14] New speed value" to "0", the operation is carried out as follows.

- When "[Cd.15] Speed change request" is turned ON, the speed change 0 flag ([Md.31] Status: b10) turns ON. (During interpolation control, the speed change 0 flag on the reference axis side turns ON.)
- The axis stops, but "[Md.26] Axis operation status" does not change, and the BUSY signal remains ON. (If a stop signal is input, the BUSY signal will turn OFF, and "[Md.26] Axis operation status" will change to "stopped".) In this case, setting the "[Cd.14] New speed value" to a value besides "0" will turn OFF the speed change 0 flag ([Md.31] Status: b10), and enable continued operation.
- Operation example



- The warning "Deceleration/stop speed change" (warning code: 0990H) occurs and the speed cannot be changed in the following cases.

- During deceleration by a stop command
- During automatic deceleration during positioning control

- The warning "Speed limit value over" (warning code: 0991H) occurs and the speed is controlled at the "[Pr.8] Speed limit value" when the value set in "[Cd.14] New speed value" is larger than the "[Pr.8] Speed limit value".
- When the speed is changed during interpolation control, the required speed is set in the reference axis.

- When carrying out consecutive speed changes, be sure there is an interval between the speed changes of 10 ms or more. (If the interval between speed changes is short, the Simple Motion module will not be able to track, and it may become impossible to carry out commands correctly.)
- When a speed change is requested simultaneously for multiple axes, change the speed one by one. Therefore, the start timing of speed change is different for each axis.
- Speed change cannot be carried out during the machine home position return. A request for speed change is ignored.
- When deceleration is started by the speed change function, the deceleration start flag does not turn ON.
- The speed change function cannot be used during speed control mode, torque control mode or continuous operation to torque control mode. Refer to the following for the speed change during speed control mode or continuous operation to torque control mode.

☞ Page 203 Speed-torque Control

Setting method from the CPU module

The following shows the data settings and program example for changing the control speed of axis 1 by the command from the CPU module. (In this example, the control speed is changed to "20.00 mm/min".)

- Set the following data. (Set using the program referring to the speed change time chart.)

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

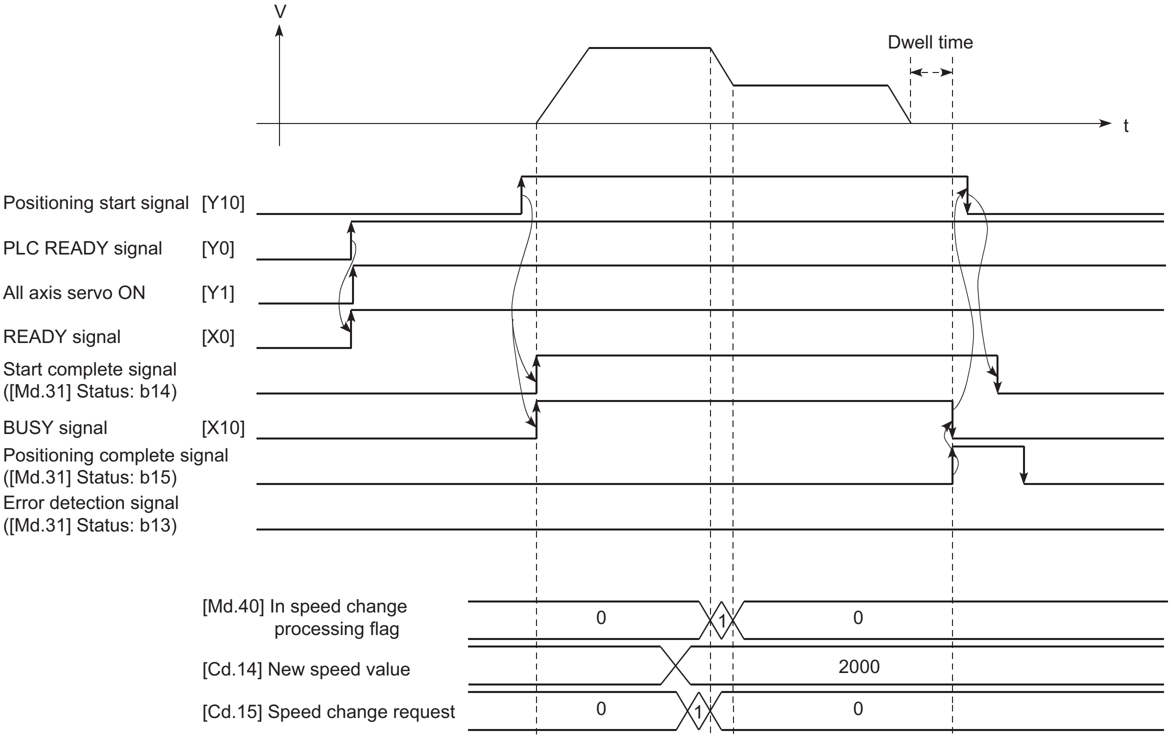
Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.14]	New speed value	2000	Set the new speed.	4314+100n 4315+100n	1004314+100n 1004315+100n
[Cd.15]	Speed change request	1	Set "1: Change the speed".	4316+100n	1004316+100n

Refer to the following for the setting details.

☞ Page 616 Control Data

- The following shows the speed change time chart.

■Operation example



Program example

Refer to the following for the program example of the speed change program.

☞ Page 694 Speed change program

Setting method using an external command signal

The speed can also be changed using an "external command signal".

The following shows the data settings and program example for changing the control speed of axis 1 using an "external command signal". (In this example, the control speed is changed to "10000.00 mm/min".)

- Set the following data to change the speed using an external command signal. (Set using the program referring to the speed change time chart.)

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Pr.42]	External command function selection [RD77MS]	1	Set "1: External speed change request".	62+150n	—
[Cd.8]	External command valid	1	Set "1: Validates an external command.".	4305+100n	1004305+100n
[Cd.14]	New speed value	1000000	Set the new speed.	4314+100n 4315+100n	1004314+100n 1004315+100n

[RD77MS]

Set the external command signal (DI) to be used in "[Pr.95] External command signal selection".

Refer to the following for the setting details.

☞ Page 496 Basic Setting, ☞ Page 616 Control Data

[RD77GF]

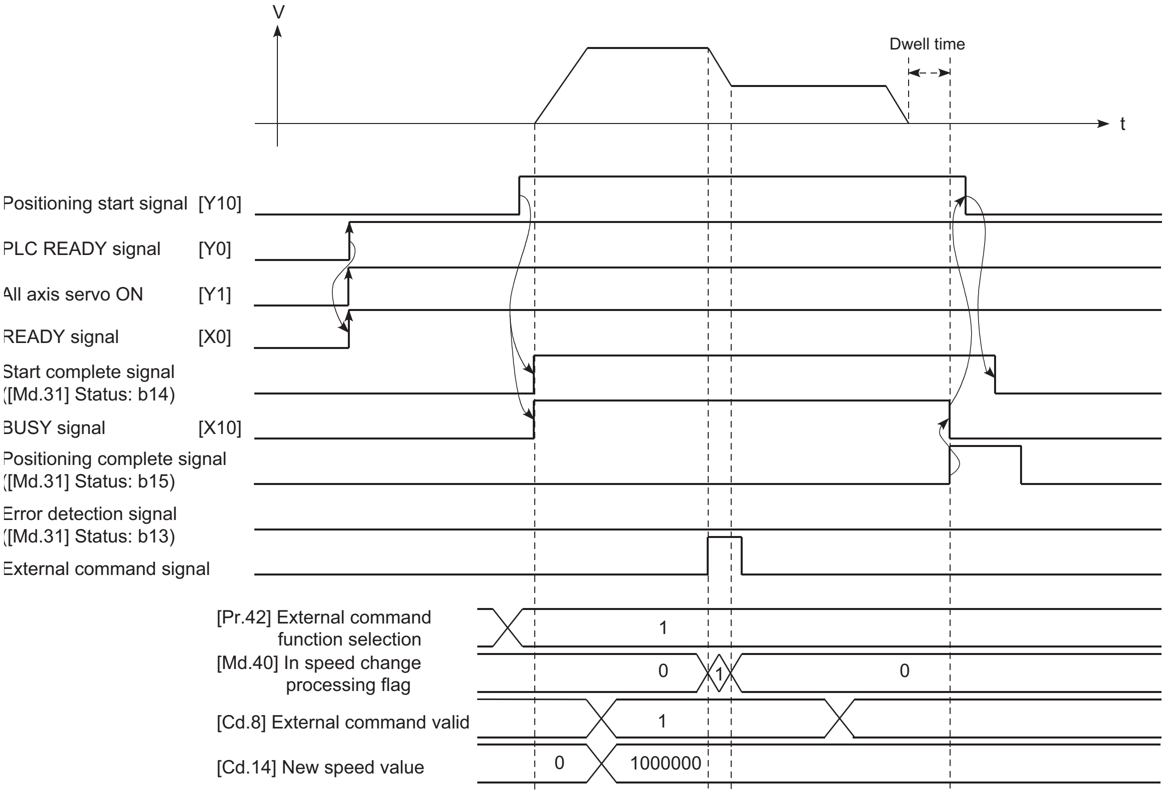
Set the link device to be used in "[Pr.960] External speed change request: Link device type" to "[Pr.963] External speed change request: Link device logic setting".

Refer to the following for the setting details.

☞ Page 346 Link Device External Signal Assignment Function [RD77GF]

- The following shows the speed change time chart.

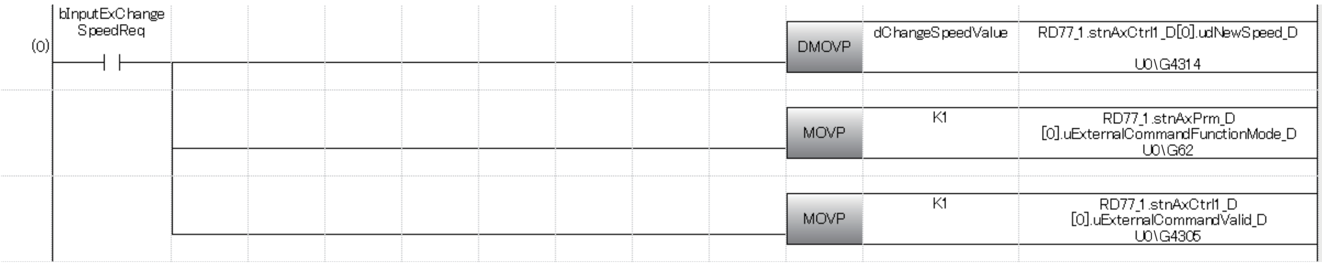
■Operation example



Program example

- Add the following program to the control program, and write it to the CPU module.

[RD77MS example]

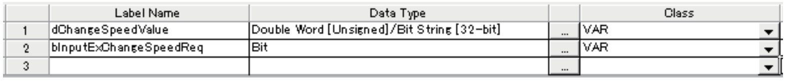


(0) bInputExChange SpeedReq

DMOVP dChangeSpeedValue RD77_1.stnAxCtrl1_D[0].udNewSpeed_D U0\G4314

MOVP K1 RD77_1.stnAxPrm_D [0].uExternalCommandFunctionMode_D U0\G62

MOVP K1 RD77_1.stnAxCtrl1_D [0].uExternalCommandValid_D U0\G4305

Classification	Label name	Description
Module label	RD77_1.stnAxPrm_D[0].uExternalCommandFunctionMode_D	Axis 1 External command function selection
	RD77_1.stnAxCtrl1_D[0].uExternalCommandValid_D	Axis 1 External command valid
	RD77_1.stnAxCtrl1_D[0].udNewSpeed_D	Axis 1 New speed value
Global label, local label	Defines the global label or the local label as follows. The settings of Assign (Device/Label) are not required for the label that the assignment device is not set because the unused internal relay and data device are automatically assigned. The following table shows an example for the local label.  Label Name / Data Type / Class 1 dChangeSpeedValue / Double Word [Unsigned]/Bit String [32-bit] / VAR 2 bInputExChangeSpeedReq / Bit / VAR 3	

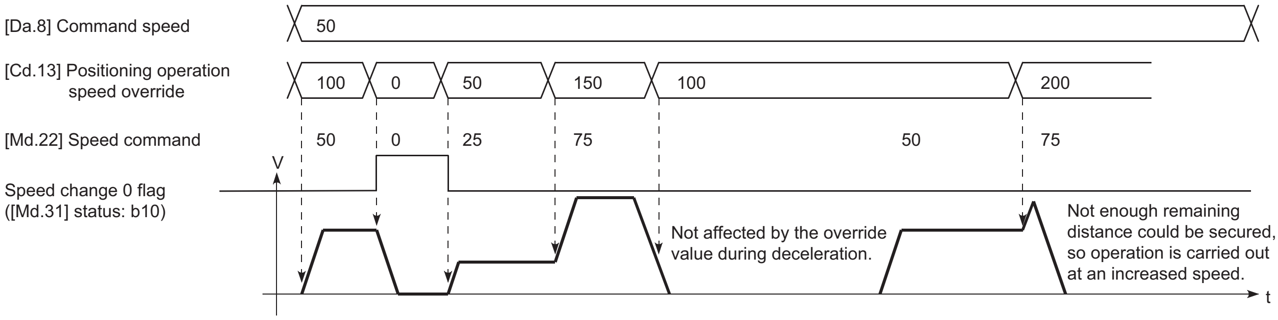
Override function

The override function changes the command speed by a designated percentage (0 to 300%) for all control to be executed. The speed can be changed by setting the percentage (%) by which the speed is changed in "[Cd.13] Positioning operation speed override".

Control details

The following shows that operation of the override function.

- A value changed by the override function is monitored by "[Md.22] Speed command".
- If "[Cd.13] Positioning operation speed override" is set to 100%, the speed will not change.
- If "[Cd.13] Positioning operation speed override" is set with a value less than "100 (%)" and "[Md.22] Speed command" is less than "1", the warning "Less than minimum speed" (warning code: 0904H) occurs and "[Md.22] Speed command" is set with "1" in any speed unit.
- If "[Cd.13] Positioning operation speed override" is set to "0 (%)", the speed is set to "0" and the speed change 0 flag ([Md.31] Status: b10) is set to "1". At the time, the warning "Less than minimum speed" (warning code: 0904H) does not occur.
- If there is not enough remaining distance to change the speed due to the "override function", when the speed is changed during the position control of speed-position switching control or position-speed switching control, the operation will be carried out at the speed that could be changed.
- If the speed changed by the override function is greater than the "[Pr.8] Speed limit value", the warning "Speed limit value over" (warning code: 0991H) will occur and the speed will be controlled at the "[Pr.8] Speed limit value". The "[Md.39] In speed limit flag" will turn ON.



Precaution during control

- When changing the speed by the override function during continuous path control, the speed change will be ignored if there is not enough distance remaining to carry out the change.
- The warning "Deceleration/stop speed change" (warning code: 0990H) occurs and the speed cannot be changed by the override function in the following cases. (The value set in "[Cd.13] Positioning operation speed override" is validated after a deceleration stop.)

- During deceleration by a stop command
- During automatic deceleration during positioning control

- When the speed is changed by the override function during interpolation control, the required speed is set in the reference axis.
- When carrying out consecutive speed changes by the override function, be sure there is an interval between the speed changes of 10 ms or more. (If the interval between speed changes is short, the Simple Motion module will not be able to track, and it may become impossible to carry out commands correctly.)
- When a machine home position return is performed, the speed change by the override function cannot be carried out after a deceleration start to the creep speed following the detection of proximity dog ON. When the override is enabled during home position return and the speed is changed, the override is disabled and the speed accelerates to the creep speed after the proximity dog ON is detected. [RD77MS]

- When deceleration is started by the override function, the deceleration start flag does not turn ON.
- The override function cannot be used during speed control mode, torque control mode or continuous operation to torque control mode.
- The override function cannot be used during driver home position return.

Setting method

The following shows the data settings and program example for setting the override value of axis 1 to "200%".

- Set the following data. (Set using the program referring to the speed change time chart.)

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

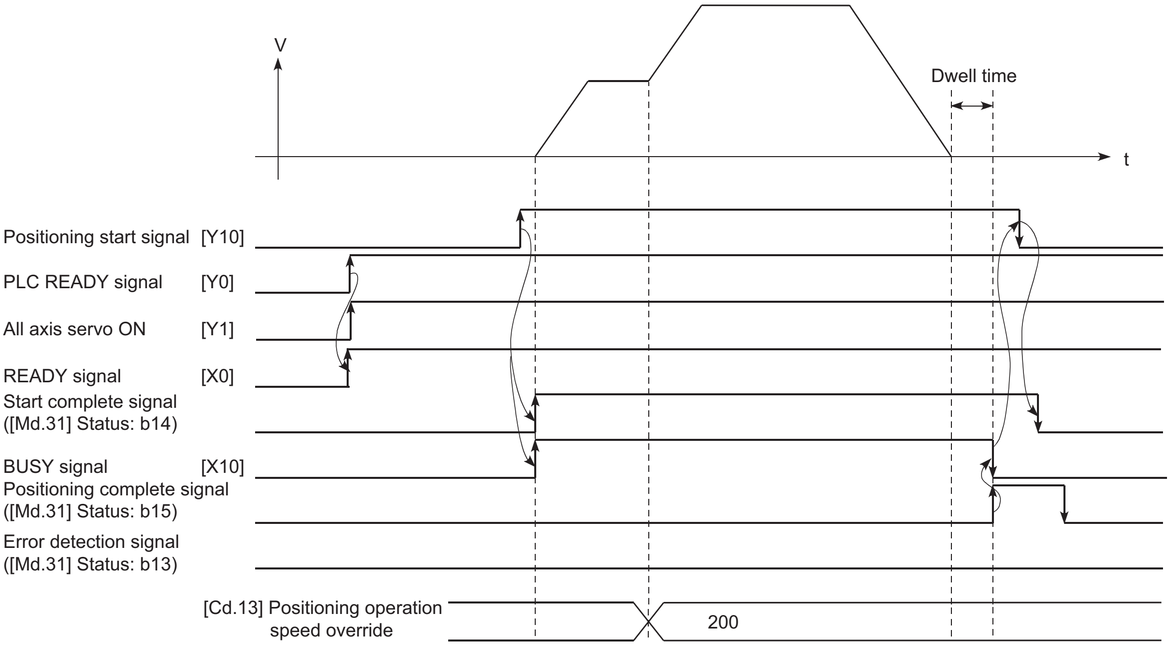
Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.13]	Positioning operation speed override	200	Set the new speed as a percentage (%).	4313+100n	1004313+100n

Refer to the following for the setting details.

☞ Page 616 Control Data

- The following shows a time chart for changing the speed using the override function.

■Operation example



Program example

Add the following program to the control program, and write it to the CPU module.

☞ Page 694 Override program

Acceleration/deceleration time change function

The "acceleration/deceleration time change function" is used to change the acceleration/deceleration time during a speed change to a random value when carrying out the speed change by the "speed change function" and "override function".
In a normal speed change (when the acceleration/deceleration time is not changed), the acceleration/deceleration time previously set in the parameters ([Pr.9], [Pr.10], and [Pr.25] to [Pr.30] values) is set in the positioning parameter data items [Da.3] and [Da.4], and control is carried out with that acceleration/deceleration time. However, by setting the new acceleration/deceleration time ([Cd.10], [Cd.11]) in the control data, and issuing an acceleration/deceleration time change enable command ([Cd.12] Acceleration/deceleration time change value during speed change, enable/disable) to change the speed when the acceleration/deceleration time change is enabled, the speed will be changed with the new acceleration/deceleration time ([Cd.10], [Cd.11]).

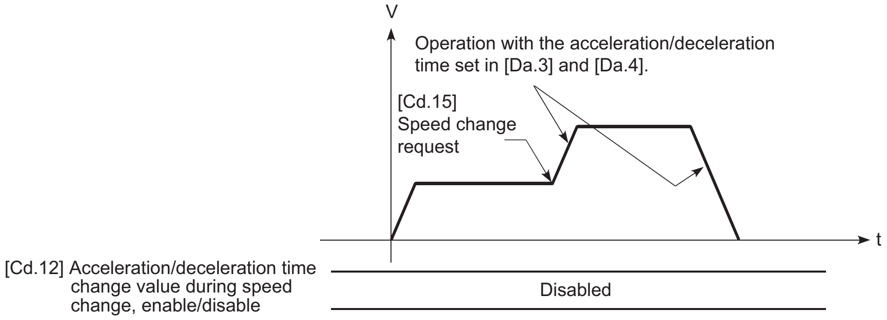
Control details

After setting the following two items, carry out the speed change to change the acceleration/deceleration time during the speed change.

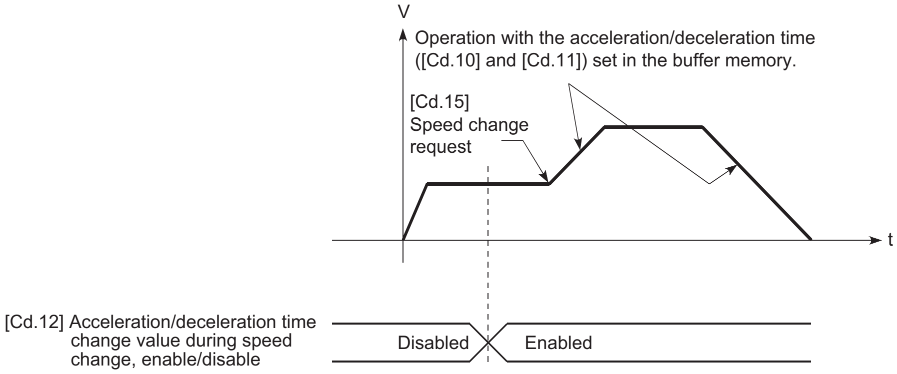
- Set change value of the acceleration/deceleration time ("[Cd.10] New acceleration time value", "[Cd.11] New deceleration time value")
- Setting acceleration/deceleration time change to enable ("[Cd.12] Acceleration/deceleration time change value during speed change, enable/disable")

The following drawing shows the operation during an acceleration/deceleration time change.

[For an acceleration/deceleration time change disable setting]



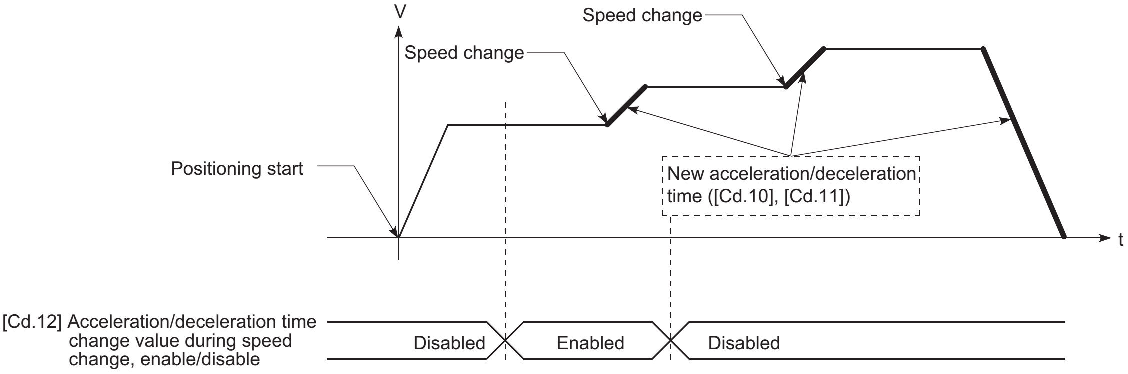
[For an acceleration/deceleration time change enable setting]



Precautions during control

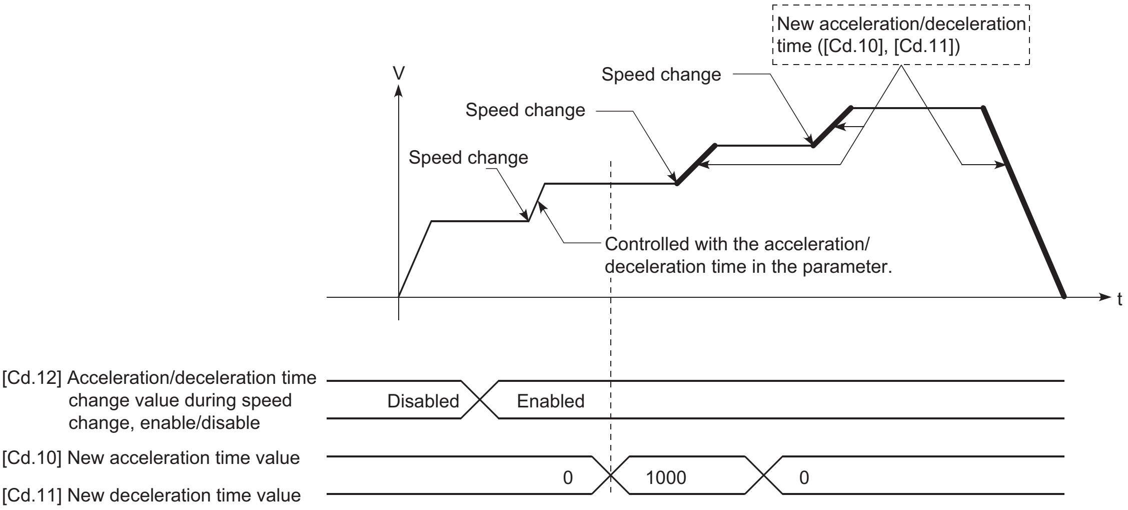
- When "0" is set in "[Cd.10] New acceleration time value" and "[Cd.11] New deceleration time value", the acceleration/deceleration time will not be changed even if the speed is changed. In this case, the operation will be controlled at the acceleration/deceleration time previously set in the parameters.
- The "new acceleration/deceleration time" is valid during execution of the positioning data for which the speed was changed. In continuous positioning control and continuous path control, the speed is changed and control is carried out with the previously set acceleration/deceleration time at the changeover to the next positioning data, even if the acceleration/deceleration time is changed to the "new acceleration/deceleration time ([Cd.10], [Cd.11])".
- Even if the acceleration/deceleration time change is set to disable after the "new acceleration/deceleration time" is validated, the positioning data for which the "new acceleration/deceleration time" was validated will continue to be controlled with that value. (The next positioning data will be controlled with the previously set acceleration/deceleration time.)

Ex.



- If the "new acceleration/deceleration time" is set to "0" and the speed is changed after the "new acceleration/deceleration time" is validated, the operation will be controlled with the previous "new acceleration/deceleration time".

Ex.



- The acceleration/deceleration change function cannot be used during speed control mode, torque control mode or continuous operation to torque control mode. Refer to the following for the acceleration/deceleration processing during speed control mode or continuous operation to torque control mode.

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Point

If the speed is changed when an acceleration/deceleration change is enabled, the "new acceleration/deceleration time" will become the acceleration/deceleration time of the positioning data being executed. The "new acceleration/deceleration time" remains valid until the changeover to the next positioning data. (The automatic deceleration processing at the completion of the positioning will also be controlled by the "new acceleration/deceleration time".)

Setting method

To use the "acceleration/deceleration time change function", write the data shown in the following table to the Simple Motion module using the program.

The set details are validated when a speed change is executed after the details are written to the Simple Motion module.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.10]	New acceleration time value	→	Set the new acceleration time.	4308+100n 4309+100n	1004308+100n 1004309+100n
[Cd.11]	New deceleration time value	→	Set the new deceleration time.	4310+100n 4311+100n	1004310+100n 1004311+100n
[Cd.12]	Acceleration/deceleration time change value during speed change, enable/disable	1	Set "1: Acceleration/deceleration time change enable".	4312+100n	1004312+100n

Refer to the following for the setting details.

☞ Page 616 Control Data

Program example

Add the following program to the control program, and write it to the CPU module.

☞ Page 695 Acceleration/deceleration time change program

Torque change function

The "torque change function" is used to change the torque limit value during torque limiting.

The torque limit value at the control start is the value set in the "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value".

The following two change methods in the torque change function.

Torque change function	Details
Forward/reverse torque limit value same setting	The forward torque limit value[*1] and reverse torque limit value[*2] are changed to the same value by the new torque value. (Use this method when they need not be separately set.)
Forward/reverse torque limit value individual setting	The forward torque limit value[*1] and reverse torque limit value[*2] are individually changed respectively by the forward new torque value and new reverse torque value.

*1 Forward torque limit value: The limit value to the generated torque during CW regeneration at the CCW driving of the servo motor.

*2 Reverse torque limit value: The limit value to the generated torque during CCW regeneration at the CW driving of the servo motor.

Set previously "same setting" or "individual setting" of the forward/reverse torque limit value in "[Cd.112] Torque change function switching request". Set the new torque value (forward new torque value/new reverse torque value) in the axis control data ([Cd.22] or [Cd.113]) shown below.

Torque change function	Setting items		
	Torque change function switching request ([Cd.112])	New torque value ([Cd.22], [Cd.113])	
Forward/reverse torque limit value same setting	0: Forward/reverse torque limit value same setting	[Cd.22]	New torque value/forward new torque value
		[Cd.113]	Setting invalid
Forward/reverse torque limit value individual setting	1: Forward/reverse torque limit value individual setting	[Cd.22]	New torque value/forward new torque value
		[Cd.113]	New reverse torque value

Control details

The torque value (forward new torque value/new reverse torque value) of the axis control data can be changed at all times.

The torque can be limited with a new torque value from the time the new torque value has been written to the Simple Motion module.

Note that the delay time until a torque control is executed is max. operation cycle after torque change value was written.

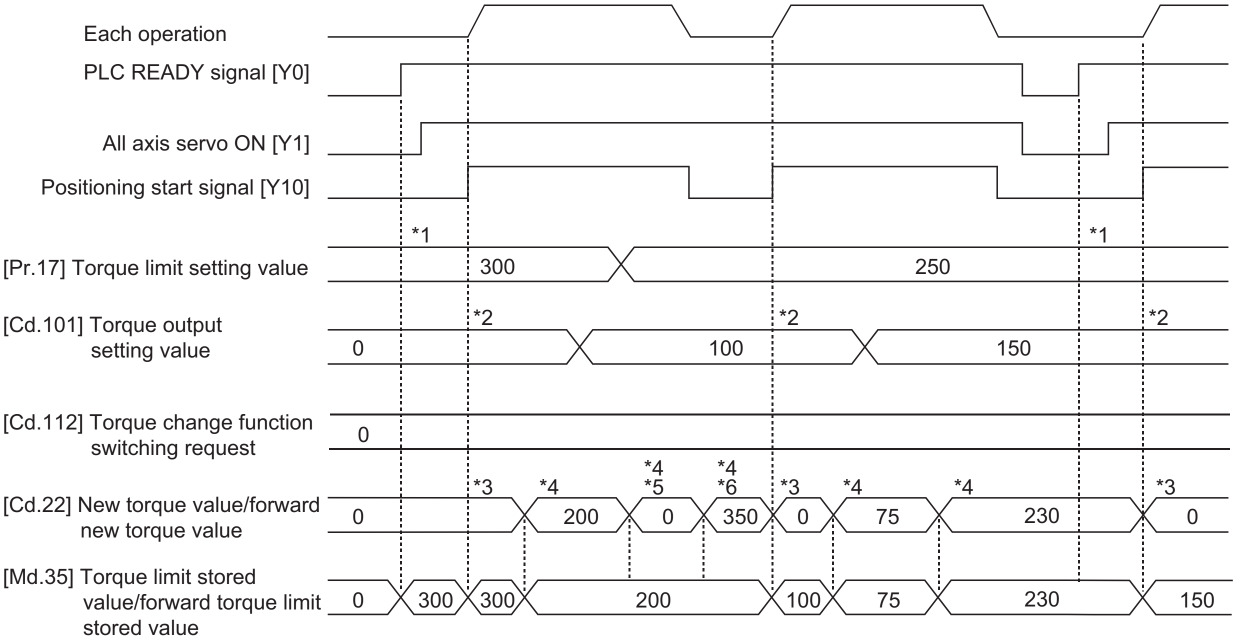
The toque limiting is not carried out from the time the power supply is turned ON to the time the PLC READY signal [Y0] is turned ON.

The new torque value ([Cd.22], [Cd.113]) is cleared to zero at the leading edge (OFF to ON) of the positioning start signal [Y10], at the start of JOG operation, and at the start of synchronous control.

The torque setting range is from 0 to "[Pr.17] Torque limit setting value". (When the setting value is 0, a torque change is considered not to be carried out, and it becomes to the value set in "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value". The torque change range is 1 to "[Pr.17] Torque limit setting value".)

The following drawing shows the operation at the same setting and the operation at the individual setting for the forward new torque value and new reverse torque value.

■Operation example 1



*1 The torque limit setting value or torque output setting value becomes effective at the PLC READY signal [Y0] rising edge (however, after the servo is turned ON.)
If the torque output setting value is "0" or larger than the torque limit setting value, the torque limit setting value will be its value.

*2 The torque limit setting value or torque output setting value becomes effective at the positioning start signal [Y10] rising edge, and the torque limit value is updated.
If the torque output setting value is "0" or larger than the torque limit setting value, the torque limit setting value will be its value.

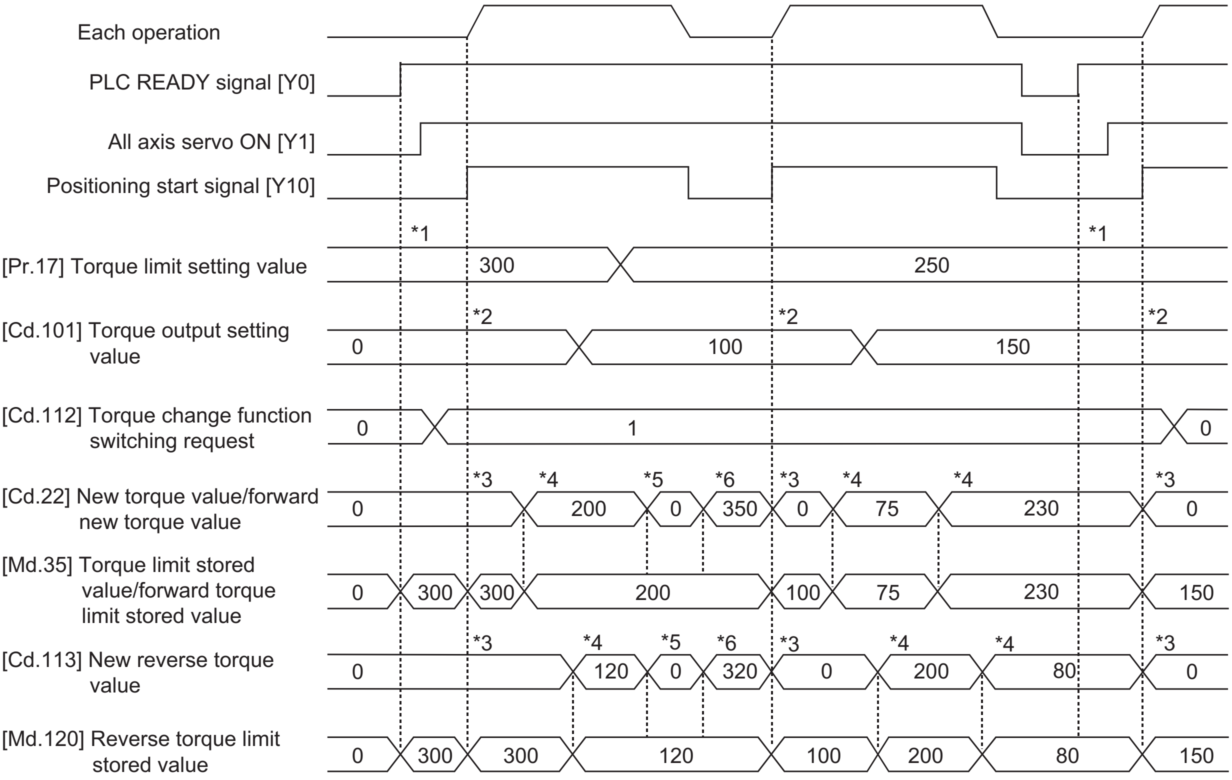
*3 The torque change value is cleared to "0" at the positioning start signal [Y10] rising edge.

*4 The torque limit value is changed by the torque changed value.

*5 When the new torque value is 0, a torque change is considered not to be carried out.

*6 When the change value exceeds the torque limit value, a torque change is considered not to be carried out.

■Operation example 2



*1 The torque limit setting value or torque output setting value becomes effective at the PLC READY signal [Y0] rising edge (however, after the servo is turned ON.)

*2 The torque limit setting value or torque output setting value becomes effective at the positioning start signal [Y10] rising edge, and the torque limit value is updated.

*3 The torque change value is cleared to "0" at the positioning start signal [Y10] rising edge.

*4 The torque limit value is changed by the torque changed value.

*5 When the new torque value is 0, a torque change is considered not to be carried out.

*6 When the change value exceeds the torque limit value, a torque change is considered not to be carried out.

Precautions during control

- If a value besides "0" is set in the new torque value, the torque generated by the servo motor will be limited by the setting value. To limit the torque with the value set in "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value", set "0" to the new torque value.

Setting value of "[Cd.112] Torque change function switching request"	Setting item (New torque value)
0: Forward/reverse torque limit value same setting	[Cd.22] New torque value/forward new torque value
1: Forward/reverse torque limit value individual setting	[Cd.22] New torque value/forward new torque value [Cd.113] New reverse torque value

- The "[Cd.22] New torque value/forward new torque value" or "[Cd.113] New reverse torque value" is validated when written to the Simple Motion module. (Note that it is not validated from the time the power supply is turned ON to the time the PLC READY signal [Y0] is turned ON.)
- If the setting value of "[Cd.22] New torque value/forward new torque value" is outside the setting range, the warning "Outside new torque value range/outside forward new torque value range" (warning code: 0907H) will occur and the torque will not be changed. If the setting value of "[Cd.113] New reverse torque value" is outside the setting range, the warning "Outside new reverse torque value range" (warning code: 0932H) will occur and the torque will not be changed.
- If the time to hold the new torque value is not more than 10 ms, a torque change may not be executed.
- When changing from "0: Forward/reverse torque limit value same setting" to "1: Forward/reverse torque limit value individual setting" by the torque change function, set "0" or same value set in "[Cd.22] New torque value/forward new torque value" in "[Cd.113] New reverse torque value" before change.

Setting method

To use the "torque change function", write the data shown in the following table to the Simple Motion module using the program.

The set details are validated when written to the Simple Motion module.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.112]	Torque change function switching request	0: Forward/reverse torque limit value same setting 1: Forward/reverse torque limit value individual setting	Sets "same setting/individual setting" of the forward torque limit value and reverse torque limit value. • Set "0" normally. (When the forward torque limit value and reverse torque limit value are not divided.) • When a value except "1" is set, it operates as "forward/reverse torque limit value same setting".	4363+100n	1004363+100n
[Cd.22]	New torque value/forward new torque value	0 to [Pr.17] Torque limit setting value	When "0" is set to "[Cd.112] Torque change function switching request", a new torque limit value is set. (This value is set to the forward torque limit value and reverse torque limit value.) When "1" is set to "[Cd.112] Torque change function switching request", a new forward torque limit value is set.	4325+100n	1004325+100n
[Cd.113]	New reverse torque value	0 to [Pr.17] Torque limit setting value	"1" is set in "[Cd.112] Torque change function switching request", a new reverse torque limit value is set. • When "0" is set in "[Cd.112] Torque change function switching request", the setting value is invalid.	4364+100n	1004364+100n

Refer to the following for the setting details.

☞ Page 616 Control Data

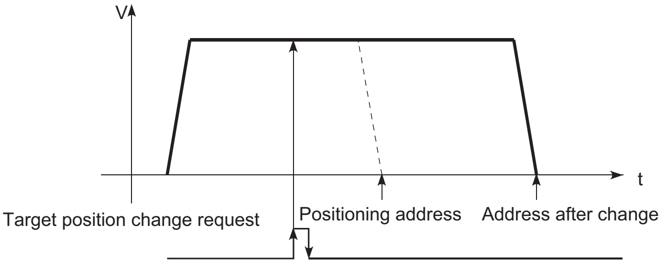
Target position change function

The "target position change function" is a function to change a target position to a newly designated target position at any timing during the position control (1-axis linear control). A command speed can also be changed simultaneously.
The target position and command speed changed are set directly in the buffer memory, and the target position change is executed by "[Cd.29] Target position change request flag".

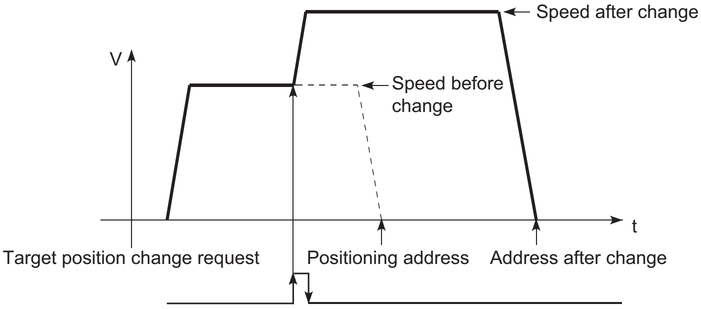
Details of control

The following charts show the details of control of the target position change function.

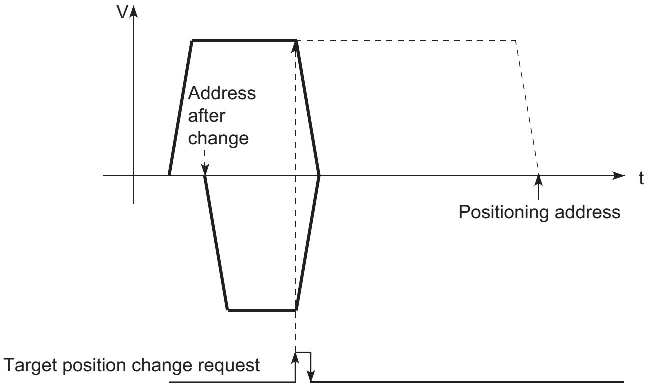
■When the address after change is positioned away from the start point more than the positioning address:



■When the speed is changed simultaneously with changing the address:



■When the direction of the operation is changed:



Precautions during operation

- If the positioning movement direction from the stop position to a new target position is reversed, stop the operation once and then position to the new target position. (☞ Page 284 When the direction of the operation is changed:)
- If a command speed exceeding the speed limit value is set to change the command speed, the warning "Speed limit value over" (warning code: 0991H) will occur and the new command speed will be the speed limit value. Also, if the command speed change disables the remaining distance to the target value from being assured, the warning "Insufficient remaining distance" will occur (warning code: 0994H, 0995H).
- In the following cases, a target position change request given is ignored and the warning "Target position change not possible" (warning code: 099BH to 09A1H) occurs.

- During interpolation control
- While a new target position value (address) is outside the software stroke limit range
- While decelerating to a stop by a stop cause
- While the positioning data whose operation pattern is continuous path control is executed
- While the speed change 0 flag ([Md.31] Status: b10) is turned ON

- When a command speed is changed, the current speed is also changed. When the next positioning speed uses the current speed in the continuous positioning, the next positioning operation is carried out at the new speed value. When the speed is set with the next positioning data, the speed becomes the current speed and the operation is carried out at the current speed.
- When a target position change request is given during automatic deceleration in position control and the movement direction is reversed, the positioning control to a new position is performed after the positioning has stopped once. If the movement direction is not reversed, the speed accelerates to the command speed again and the positioning to the new position is performed.
- If the constant speed status is regained or the output is reversed by a target position change made while "[Md.48] Deceleration start flag" is ON, the deceleration start flag remains ON. (☞ Page 316 Deceleration start flag function)
- Carrying out the target position change to the ABS linear 1 in degrees may carry out the positioning to the new target position after the operation decelerates to stop once, even the movement direction is not reversed.

Restriction

When carrying out the target position change continuously, take an interval of 10 ms or longer between the times of the target position changes. Also, take an interval of 10 ms or longer when the speed change and override is carried out after changing the target position or the target position change is carried out after the speed change and override.

Setting method from the CPU module

The following shows the data settings and program example for changing the target position of axis 1 by the command from the CPU module. (In this example, the target position value is changed to "300.0 μm" and the command speed is changed to "10000.00 mm/min".)

- The following data is set. (Set using the program referring to the target position change time chart.)

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

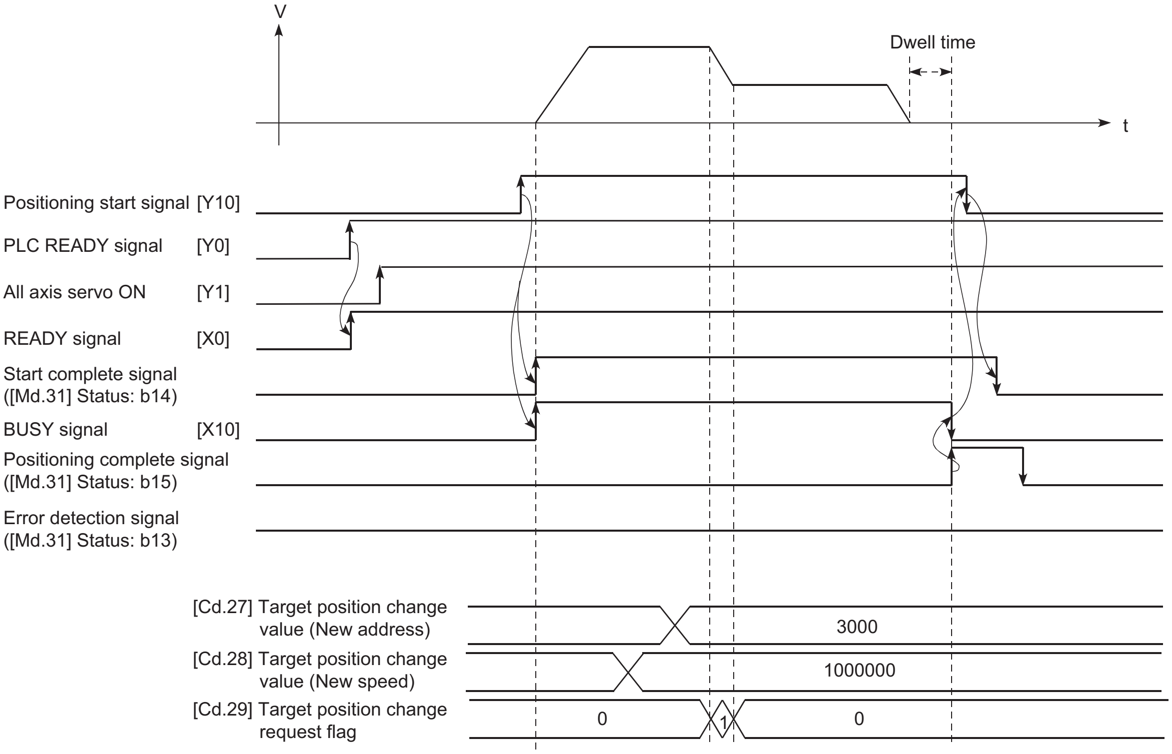
Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.27]	Target position change value (New address)	3000	Set the new address.	4334+100n 4335+100n	1004334+100n 1004335+100n
[Cd.28]	Target position change value (New speed)	1000000	Set the new speed.	4336+100n 4337+100n	1004336+100n 1004337+100n
[Cd.29]	Target position change request flag	1	Set "1: Requests a change in the target position".	4338+100n	1004338+100n

Refer to the following for details on the setting details.

☞ Page 616 Control Data

- The following shows the time chart for target position change.

■Operation example



Program example

Add the following program to the control program, and write it to the CPU module.

☞ Page 697 Target position change program

8.6 Functions Related to Start

A function related to start includes the "pre-reading start function". This function is executed by parameter setting or program creation and writing.

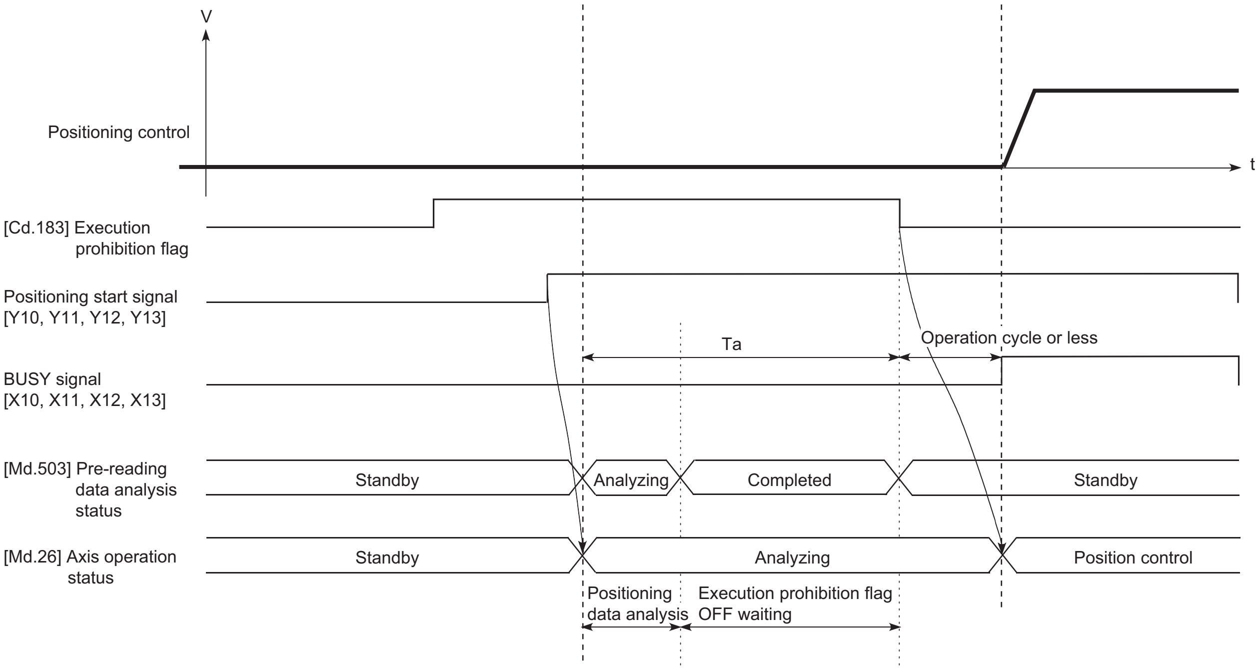
Pre-reading start function

The "pre-reading start function" does not start servo while the execution prohibition flag is ON if a positioning start request is given with the execution prohibition flag ON, and starts servo within operation cycle after OFF of the execution prohibition flag is detected. The positioning start request is given when the axis is in a standby status, and the execution prohibition flag is turned OFF at the axis operating timing.

Controls

The pre-reading start function is performed by turning ON the positioning start signal with the execution prohibition flag ([Cd.183]) ON. However, if positioning is started with the execution prohibition flag ON, the positioning data is analyzed but servo start is not provided. While the execution prohibition flag is ON, "[Md.26] Axis operation status" remains unchanged from "5: Analyzing". The servo starts within operation cycle after the execution prohibition flag has turned OFF, and "[Md.26] Axis operation status" changes to the status (e.g. position control, speed control) that matches the control method. Turn OFF the execution prohibition flag after "2: Completed" is set to "[Md.503] Pre-reading data analysis status". (Refer to the following figure.)

■Operation example

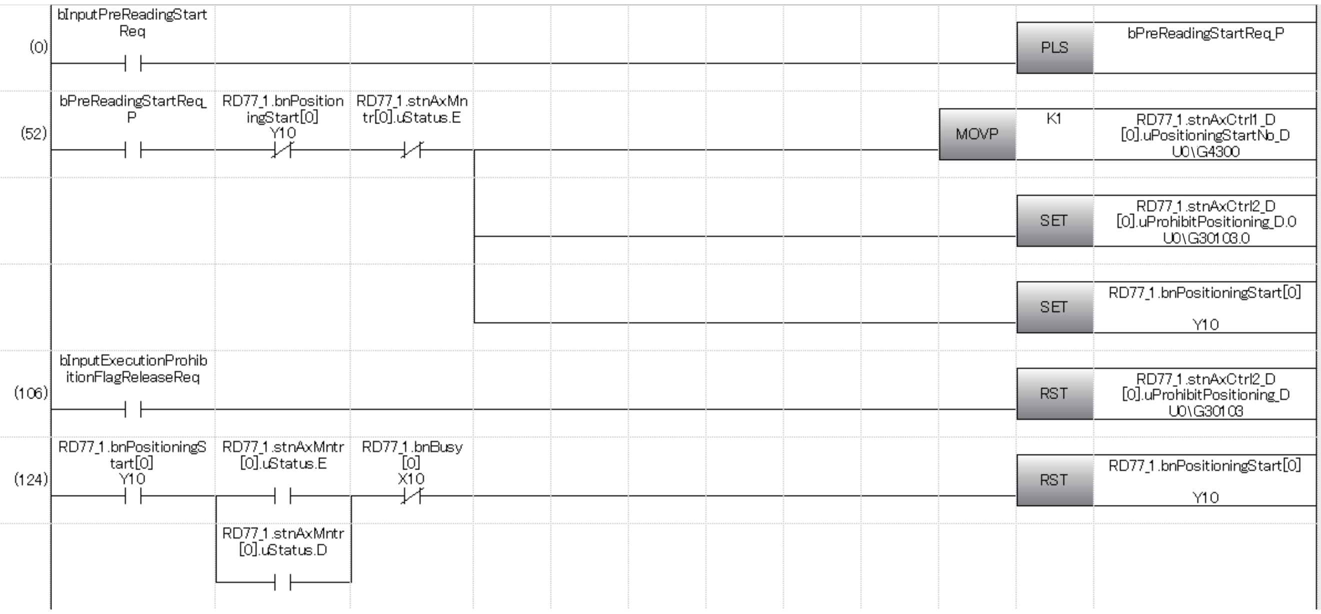


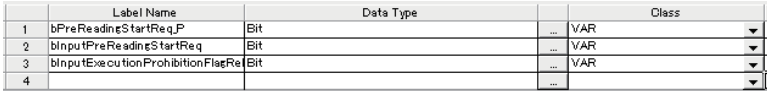
Precautions during control

- After positioning data analysis, the system is put in an execution prohibition flag OFF waiting status. Any change made to the positioning data in the execution prohibition flag OFF waiting status is not reflected on the positioning data. Change the positioning data before turning ON the positioning start signal.
- The pre-reading start function is invalid if the execution prohibition flag is turned OFF between when the positioning start signal has turned ON and when positioning data analysis is completed (Ta < start time, Ta: Reference to the above figure).
- The data No. which can be executed positioning start using "[Cd.3] Positioning start No." with the pre-reading start function are No.1 to 600 only. Performing the pre-reading start function at the setting of No.7000 to 7004 or 9001 to 9004 will result in the error "Outside start No. range" (error code: 19A3H).
- Always turn ON the execution prohibition flag at the same time or before turning ON the positioning start signal. Pre-reading may not be started if the execution prohibition flag is turned ON during Ta after the positioning start signal is turned ON. The pre-reading start function is invalid if the execution prohibition flag is turned ON after positioning start with the execution prohibition flag OFF. (It is made valid at the next positioning start.)

Program example

Refer to the following for the program example.



Classification	Label name	Description
Module label	RD77_1.bnBusy[0]	Axis 1 BUSY signal
	RD77_1.bnPositioningStart[0]	Axis 1 Positioning start signal
	RD77_1.stnAxMntr[0].uStatus.D	Axis 1 Error detection
	RD77_1.stnAxMntr[0].uStatus.E	Axis 1 Start complete
	RD77_1.stnAxCtrl1_D[0].uPositioningStartNo_D	Axis 1 Positioning start No.
	RD77_1.stnAxCtrl2_D[0].uProhibitPositioning_D.0	Axis 1 Execution prohibition flag
	RD77_1.stnAxCtrl2_D[0].uProhibitPositioning_D	
Global label, local label	Defines the global label or the local label as follows. The settings of Assign (Device/Label) are not required for the label that the assignment device is not set because the unused internal relay and data device are automatically assigned. The following table shows an example for the local label. 	

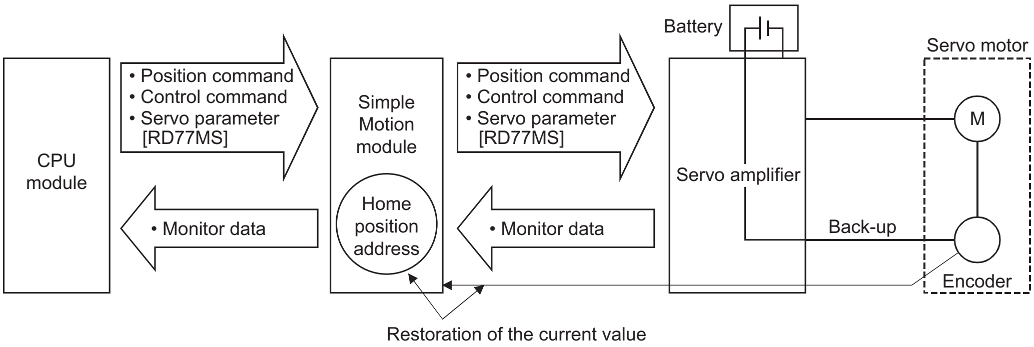
	Label Name	Data Type		Class
1	bPreReadingStartReq_P	Bit	...	VAR
2	bInputPreReadingStartReq	Bit	...	VAR
3	bInputExecutionProhibitionFlagRe	Bit	...	VAR
4			...	

8.7 Absolute Position System

The Simple Motion module can construct an absolute position system by installing the absolute position system and connecting it through SSCNETⅢ/H.

The following describes precautions when constructing the absolute position system.

The configuration of the absolute position system is shown below.



Setting for absolute positions

For constructing an absolute position system, use a servo amplifier and a servo motor which enable absolute position detection.

- Setting for MR-J4(W)-B or MR-J4-GF

It is necessary to install a battery for retaining the location of the home position return in the servo amplifier.

To use the absolute position system, select "1: Enabled (used in absolute position detection system)" in "Absolute position detection system (PA03)" in the amplifier setting for the servo parameters. In addition, select "0: Invalid" in "Absolute position counter warning (AL.E3) selection (PC18)" for the MR-J4-GF. Refer to each servo amplifier instruction manual for details of the absolute position system.

n: Axis No. - 1

Item	Buffer memory address
Absolute position detection system (PA03)	28403+100n

- Setting for MR-J5(W)-B

Select "1: Enabled (absolute position detection system)" in the servo parameter "Absolute position detection system selection (PA03.0)".

To connect the MR-J5(W)-B, set "Electronic gear numerator (PA06)" and "Electronic gear denominator (PA07)" so that their ratio becomes 1:16.

Precautions

- When "degree" is used for the setting unit, the absolute position system can be used in infinite feed.
- When a unit other than "degree" is used for the setting unit, infinite feed is not possible when using the absolute position system.
- The following parameters are used to connect the absolute position system to the servo amplifier. Perform all changes to the following parameters before connecting the servo amplifier. When the following parameters are changed after the servo amplifier is connected, the command position value and the motor position may not match.

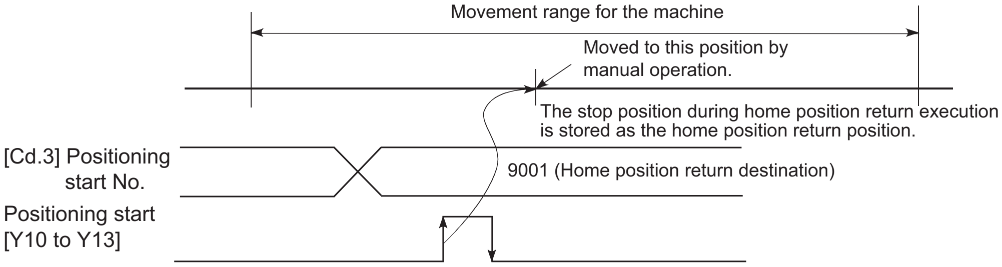
[Pr.1] Unit setting
[Pr.2] Number of pulses per rotation (AP)
[Pr.3] Movement amount per rotation (AL)
[Pr.4] Unit magnification (AM)
[Pr.11] Backlash compensation amount

Home position return

In the absolute position system, a home position can be determined through home position return.

In the "Data set method" home position return method, the location to which the location of the home position is moved by manual operation (JOG operation/manual pulse generator operation) is treated as the home position.

■Operation example



8.8 Functions Related to Stop

Functions related to stop include the "stop command processing for deceleration stop function", "Continuous operation interrupt function" and "step function". Each function is executed by parameter setting or program creation and writing.

Stop command processing for deceleration stop function

The "stop command processing for deceleration stop function" is provided to set the deceleration curve if a stop cause occurs during deceleration stop processing (including automatic deceleration).

This function is valid for both trapezoidal and S-curve acceleration/deceleration processing methods.

Refer to the following for details of the stop cause.

☞ Page 28 Stop process

The "stop command processing for deceleration stop function" performs the following two operations.

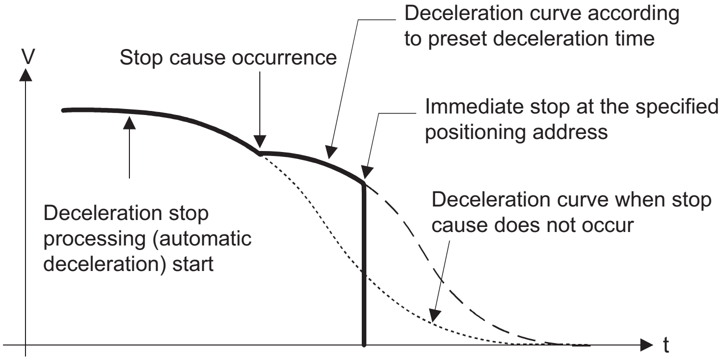
Control

The operation of "stop command processing for deceleration stop function" is explained below.

■Deceleration curve re-processing

A deceleration curve is re-processed starting from the speed at stop cause occurrence until at a stop, according to the preset deceleration time.

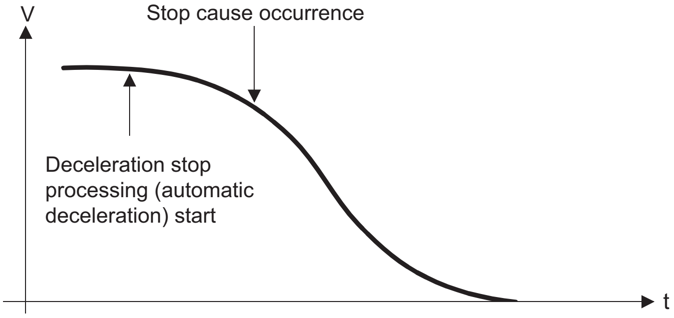
If a stop cause occurs during automatic deceleration of position control, the deceleration stop processing stops as soon as the target has reached the positioning address specified in the positioning data that is currently executed.



■Deceleration curve continuation

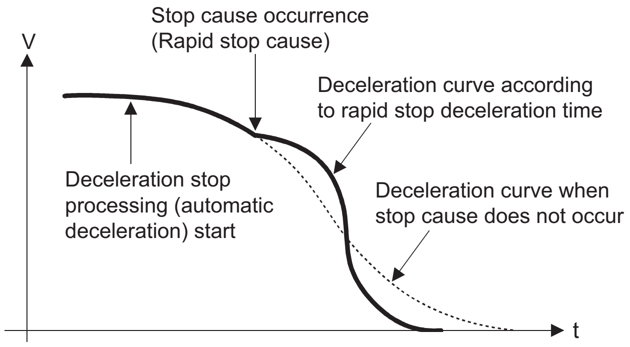
The current deceleration curve is continued after a stop cause has occurred.

If a stop cause occurs during automatic deceleration of position control, the deceleration stop processing may be complete before the target has reached the positioning address specified in the positioning data that is currently executed.

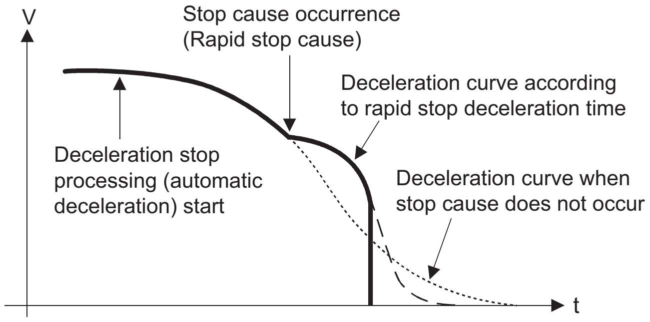


Precautions for control

- In manual control (JOG operation, inching operation, manual pulse generator operation) and speed-torque control, the stop command processing for deceleration stop function is invalid.
- The stop command processing for deceleration stop function is valid when "0: Normal deceleration stop" is set in "[Pr.37] Stop group 1 rapid stop selection" to "[Pr.39] Stop group 3 rapid stop selection" as the stopping method for stop cause occurrence.
- The stop command processing for deceleration stop function is invalid when "1: Rapid stop" is set in "[Pr.37] Stop group 1 rapid stop selection" to "[Pr.39] Stop group 3 rapid stop selection". (A deceleration curve is re-processed starting from the speed at stop cause occurrence until at a stop, according to the "[Pr.36] Rapid stop deceleration time".) In the position control (including position control of speed/position changeover control or position/speed changeover control) mode, positioning may stop immediately depending on the stop cause occurrence timing and "[Pr.36] Rapid stop deceleration time" setting.



(Rapid stop in front of the specified positioning address)



(Immediate stop at the specified positioning address)

Setting method

To use the "stop command processing for deceleration stop function", set the following control data in a program.

The set data are made valid as soon as they are written to the buffer memory. The PLC READY signal [Y0] is irrelevant.

Setting item		Setting value	Setting details	Buffer memory address
[Cd.42]	Stop command processing for deceleration stop selection	→	Set the stop command processing for deceleration stop function. 0: Deceleration curve re-processing 1: Deceleration curve continuation	5907

Refer to the following for the setting details.

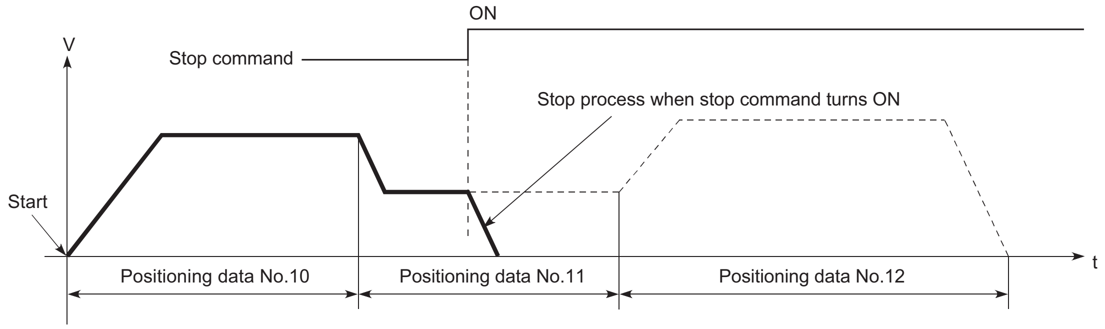
☞ Page 616 Control Data

Continuous operation interrupt function

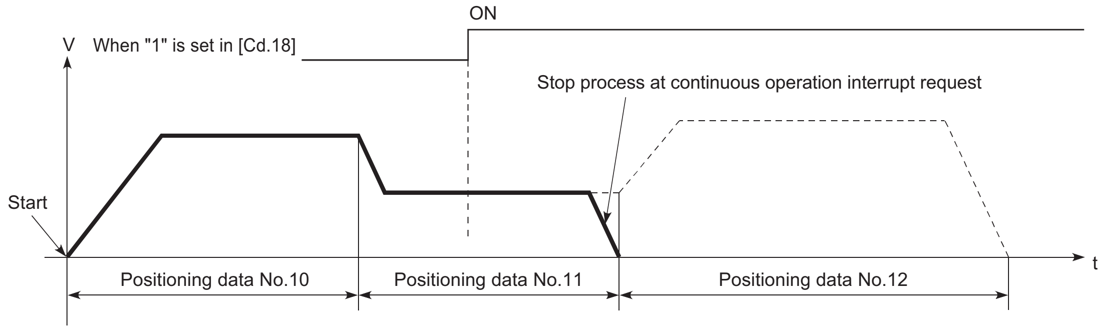
During positioning control, the control can be interrupted during continuous positioning control and continuous path control (continuous operation interrupt function). When "continuous operation interruption" is execution, the control will stop when the operation of the positioning data being executed ends. To execute continuous operation interruption, set "1: Interrupts continuous operation control or continuous path control" for "[Cd.18] Interrupt request during continuous operation".

Operation during continuous operation interruption

When the stop command is ON

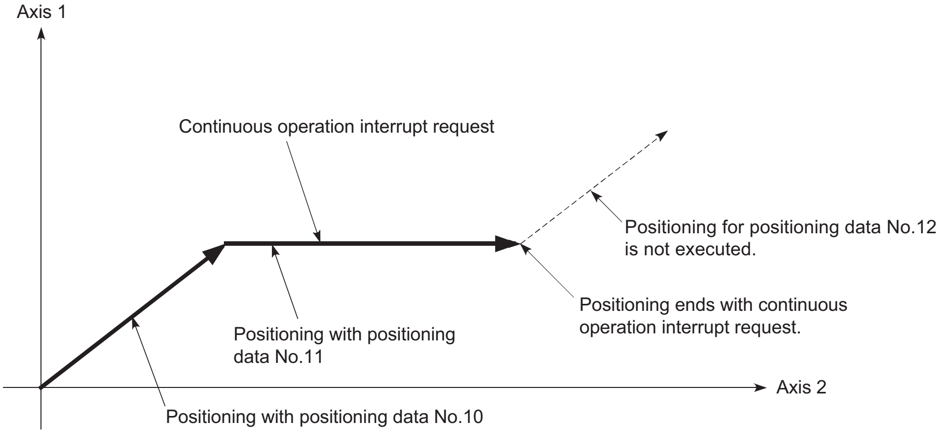


When "1" is set in [Cd.18]



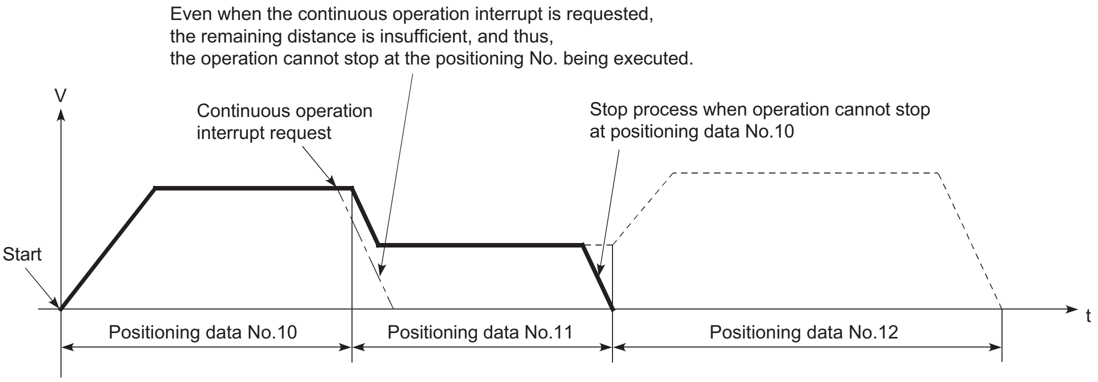
Restrictions

- When the "continuous operation interrupt request" is executed, the positioning will end. Thus, after stopping, the operation cannot be "restarted". When "[Cd.6] Restart command" is issued, the warning "Restart not possible" (warning code: 0902H) will occur.
- Even if the stop command is turned ON after executing the "continuous operation interrupt request", the "continuous operation interrupt request" cannot be canceled. Thus, if "restart" is executed after stopping by turning the stop command ON, the operation will stop when the positioning data No. where "continuous operation interrupt request" was executed is completed.



- If the operation cannot be decelerated to a stop because the remaining distance is insufficient when "continuous operation interrupt request" is executed with continuous path control, the interruption of the continuous operation will be postponed until the positioning data shown below.

- Positioning data No. have sufficient remaining distance
- Positioning data No. for positioning complete (pattern: 00)
- Positioning data No. for continuous positioning control (pattern: 01)



- When operation is not performed (BUSY signal is OFF), the interrupt request during continuous operation is not accepted. It is cleared to 0 at a start or restart.

Control data requiring settings

Set the following data to interrupt continuous operation.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.18]	Interrupt request during continuous operation	1	Set "1: Interrupts continuous operation control or continuous path control.".	4320+100n	1004320+100n

Refer to the following for the setting details.

☞ Page 616 Control Data

Step function

The "step function" is used to confirm each operation of the positioning control one by one.

It is used in debugging work for major positioning control, etc.

A positioning operation in which a "step function" is used is called a "step operation".

In step operations, the timing for stopping the control can be set. (This is called the "step mode".) Control stopped by a step operation can be continued by setting "step continues (to continue the control)" in the "step start information".

Relation between the step function and various controls

The following table shows the relation between the "step function" and various controls.

○: Set when required, ×: Setting not possible

Control type			Step function	Step applicability
Home position return control	Machine home position return control		×	Step operation not possible
	Fast home position return control		×	
Major positioning control	Position control	1-axis linear control	○	Step operation possible
		2 to 4-axis linear interpolation control	○	
		1-axis fixed-feed control	○	
		2 to 4-axis fixed-feed control (interpolation)	○	
		2-axis circular interpolation control	○	
		3-axis helical interpolation control	○	
	1 to 4-axis speed control		×	Step operation not possible
	Speed-position switching control, Position-speed switching control		○	Step operation possible
	Other control	Current value changing	○	
		JUMP instruction, NOP instruction, LOOP to LEND	×	Step operation not possible
Manual control	JOG operation, Inching operation		×	Step operation not possible
	Manual pulse generator operation		×	
Expansion control	Speed-torque control		×	

Step mode

In step operations, the timing for stopping the control can be set. This is called the "step mode". (The "step mode" is set in the control data "[Cd.34] Step mode".)

The following shows the two types of "step mode" functions.

■Deceleration unit step

The operation stops at positioning data requiring automatic deceleration. (A normal operation will be carried out until the positioning data requiring automatic deceleration is found. Once found, that positioning data will be executed, and the operation will then automatically decelerate and stop.)

■Data No. unit step

The operation automatically decelerates and stops for each positioning data. (Even in continuous path control, an automatic deceleration and stop will be forcibly carried out.)

Step start request

Control stopped by a step operation can be continued by setting "step continues" (to continue the control) in the "step start information". (The "step start information" is set in the control data "[Cd.36] Step start information".)

The following table shows the results of starts using the "step start information" during step operation.

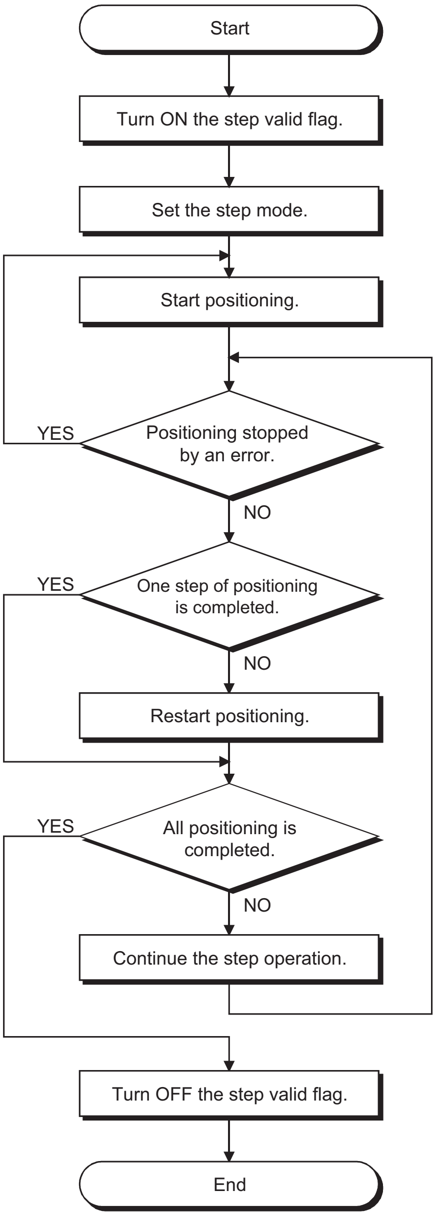
Stop status in the step operation	[Md.26] Axis operation status	[Cd.36] Step start information	Step start results
1 step of positioning stopped normally	Step standby	1: Continues step operation	The next positioning data is executed.

The warning "Step not possible" (warning code: 0996H) will occur if the "[Md.26] Axis operation status" is as shown below or the step valid flag is OFF when step start information is set.

[Md.26] Axis operation status	Step start results
Standby	Step not continued by warning
Stopped	
Interpolation	
JOG operation	
Manual pulse generator operation	
Analyzing	
Special start standby	
Home position return	
Position control	
Speed control	
Speed control in speed-position switching control	
Position control in speed-position switching control	
Speed control in position-speed switching control	
Position control in position-speed switching control	
Synchronous control	
Control mode switch	
Speed control	
Torque control	
Continuous operation to torque control	

Using the step operation

The following shows the procedure for checking positioning data using the step operation.



Write "1" (carry out step operation) in "[Cd.35] Step valid flag".

Set in "[Cd.34] Step mode".

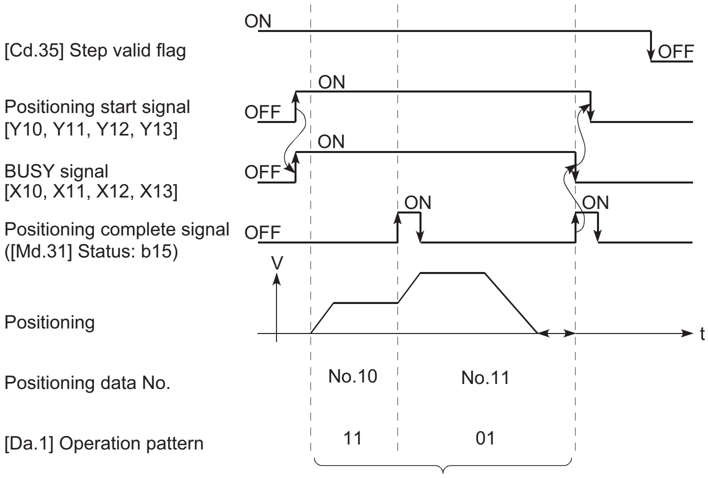
Write "1" (restart) to "[Cd.6] Restart command" and check whether the positioning data operates normally.

Write "1" (step continue) in "[Cd.36] Step start information", and check whether the next positioning data operates normally.

Write "0" (carry out no step operation) in "[Cd.35] Step valid flag".

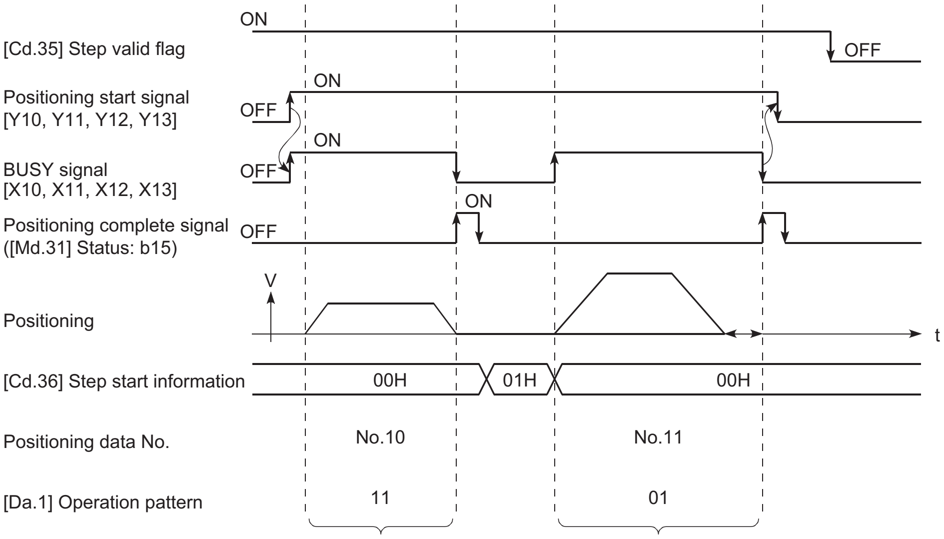
Control details

- The following drawing shows a step operation example during a "deceleration unit step".



No positioning data No. unit, so operation pattern becomes one step of unit for carrying out automatic deceleration.

- The following drawing shows a step operation example during a "data No. unit step".



Operation pattern becomes one step of positioning data No. unit, regardless of continuous path control (11).

Precautions during control

- When step operation is carried out using interpolation control positioning data, the step function settings are carried out for the reference axis.
- When the step valid flag is ON, the step operation will start from the beginning if the positioning start signal is turned ON while "[Md.26] Axis operation status" is "step standby". (The step operation will be carried out from the positioning data set in "[Cd.3] Positioning start No.".)

Step function settings

To use the "step function", write the data shown in the following table to the Simple Motion module using the program. Refer to the following for the timing of the settings.

☞ Page 297 Using the step operation

The set details are validated after they are written to the Simple Motion module.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.34]	Step mode	→	Set "0: Stepping by deceleration units" or "1: Stepping by data No. units".	4344+100n	1004344+100n
[Cd.35]	Step valid flag	1	Set "1: Validates step operations".	4345+100n	1004345+100n
[Cd.36]	Step start information	→	Set "1: Continues step operation", depending on the stop status.	4346+100n	1004346+100n

Refer to the following for the setting details.

☞ Page 616 Control Data

8.9 Other Functions

Other functions include the "skip function", "M code output function", "teaching function", "command in-position function", "acceleration/deceleration processing function", "deceleration start flag function", "speed control 10 × multiplier setting for degree axis function" and "operation setting for incompletion of home position return function".
Each function is executed by parameter setting or program creation and writing.

Skip function

The "skip function" is used to stop (deceleration stop) the control of the positioning data being executed at the time of the skip signal input, and execute the next positioning data.
A skip is executed by a skip command ([Cd.37] Skip command) or external command signal.
The "skip function" can be used during control in which positioning data is used.

Relation between the skip function and various controls

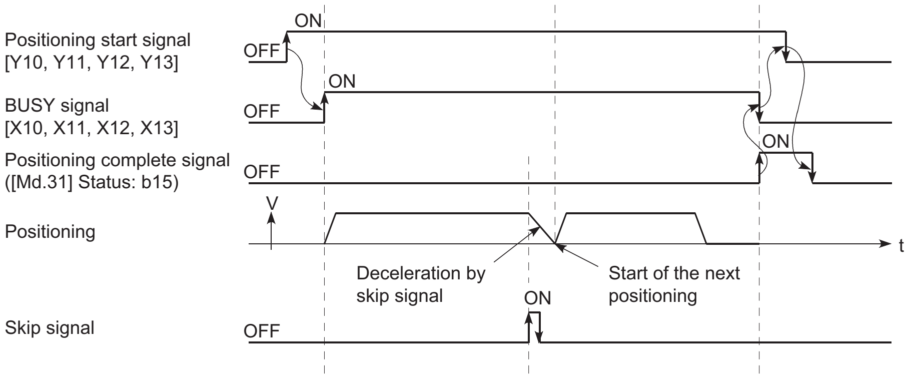
The following table shows the relation between the "skip function" and various controls.
○: Set when required, ×: Setting not possible

Control type			Skip function	Skip applicability
Home position return control	Machine home position return control		×	Skip operation not possible
	Fast home position return control		×	
Major positioning control	Position control	1-axis linear control	○	Skip operation possible
		2 to 4-axis linear interpolation control	○	
		1-axis fixed-feed control	○	
		2 to 4-axis fixed-feed control (interpolation)	○	
		2-axis circular interpolation control	○	
		3-axis helical interpolation control	○	
	1 to 4-axis speed control		×	Skip operation not possible
	Speed-position switching control		○	Skip operation possible
	Position-speed switching control		×	Skip operation not possible
	Other control	Current value changing	○	Skip operation possible
		JUMP instruction, NOP instruction, LOOP to LEND	×	Skip operation not possible
Manual control	JOG operation, Inching operation		×	Skip operation not possible
	Manual pulse generator operation		×	
Expansion control	Speed-torque control		×	

Control details

The following drawing shows the skip function operation.

■Operation example



Precautions during control

- If the skip signal is turned ON at the last of an operation, a deceleration stop will occur and the operation will be terminated.
- When a control is skipped (when the skip signal is turned ON during a control), the positioning complete signals will not turn ON.
- When the skip signal is turned ON during the dwell time, the remaining dwell time will be ignored, and the next positioning data will be executed.
- When a control is skipped during interpolation control, the reference axis skip signal is turned ON. When the reference axis skip signal is turned ON, a deceleration stop will be carried out for every axis, and the next reference axis positioning data will be executed.
- The M code ON signals will not turn ON when the M code output is set to the AFTER mode. (In this case, the M code will not be stored in "[Md.25] Valid M code".)
- The skip cannot be carried out by the speed control and position-speed switching control.
- If the skip signal is turned ON with the M code signal turned ON, the transition to the next data is not carried out until the M code signal is turned OFF.

Setting method from the CPU module

The following shows the settings and program example for skipping the control being executed in axis 1 with a command from the CPU module.

■Setting data

Set the following data.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.37]	Skip command	1	Set "1: Skip request".	4347+100n	1004347+100n

Refer to the following for the setting details.

☞ Page 616 Control Data

- Add the following program to the control program, and write it to the CPU module.

When the "skip command" is input, the value "1" (skip request) set in "[Cd.37] Skip command" is written to the buffer memory of the Simple Motion module.

Program example

Refer to the following for the program example.

☞ Page 696 Skip program

Setting method using an external command signal

The skip function can also be executed using an "external command signal".

The following shows the settings and program example for skipping the control being executed in axis 1 using an "external command signal".

- Set the following data to execute the skip function using an external command signal. (The setting is carried out using the program.)

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Pr.42]	External command function selection [RD77MS]	3	Set "3: Skip request".	62+150n	—
[Cd.8]	External command valid	1	Set "1: Validate external command".	4305+100n	1004305+100n

[RD77MS]

Set the external command signal (DI) to be used in "[Pr.95] External command signal selection".

Refer to the following for the setting details.

☞ Page 496 Basic Setting, ☞ Page 616 Control Data

[RD77GF]

Set the link device to be used in "[Pr.970] Skip request: Link device type" to "[Pr.973] Skip request: Link device logic setting".

Refer to the following for the setting details.

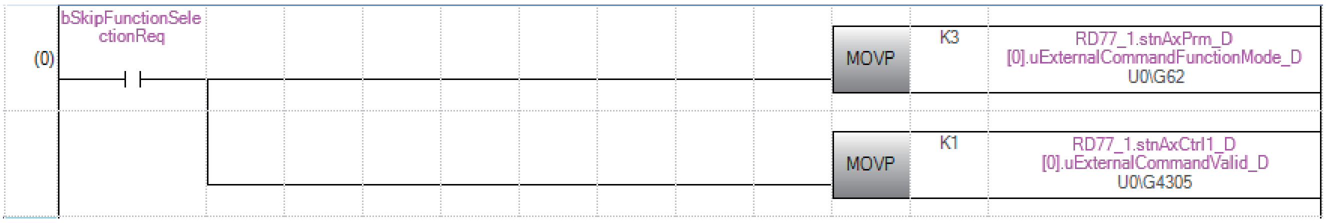
☞ Page 346 Link Device External Signal Assignment Function [RD77GF]

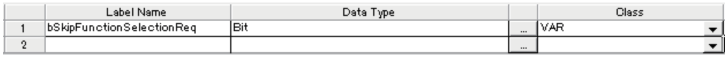
- Add the following program to the control program, and write it to the CPU module.

Program example

Refer to the following for the program example.

[RD77MS example]



Classification	Label name	Description
Module label	RD77_1.stnAxPrm_D[0].uExternalCommandFunctionMode_D	Axis 1 External command function selection
	RD77_1.stnAxCtrl1_D[0].uExternalCommandValid_D	Axis 1 External command valid
Global label, local label	Defines the global label or the local label as follows. The settings of Assign (Device/Label) are not required for the label that the assignment device is not set because the unused internal relay and data device are automatically assigned. The following table shows an example for the local label.  Label Name / Data Type / Class 1 / bSkipFunctionSelectionReq / Bit / VAR 2	

M code output function

The "M code output function" is used to command sub work (clamping, drill rotation, tool replacement, etc.) related to the positioning data being executed.

When the M code ON signal ([Md.31] Status: b12) is turned ON during positioning execution, a No. called the M code is stored in "[Md.25] Valid M code".

These "[Md.25] Valid M code" are read from the CPU module, and used to command auxiliary work. M codes can be set for each positioning data. (Set in setting item "[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches" of the positioning data.)

The timing for outputting (storing) the M codes can also be set in the "M code output function".

M code ON signal output timing

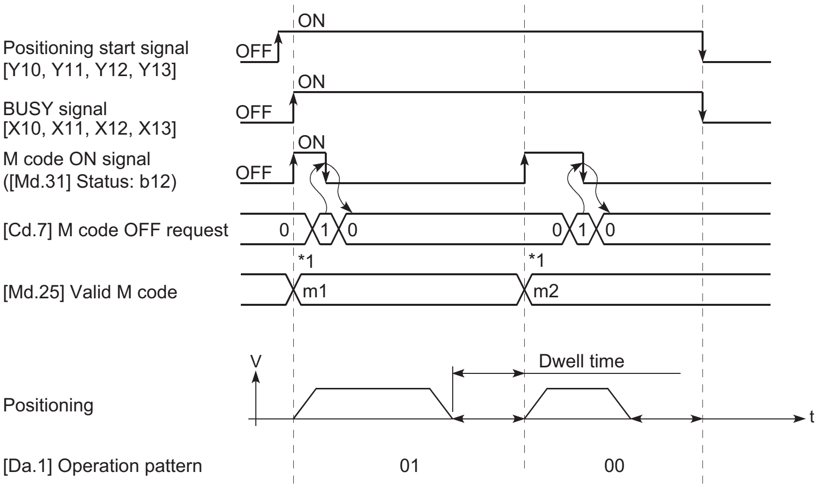
The timing for outputting (storing) the M codes can be set in the "M code output function". (The M code is stored in "[Md.25] Valid M code" when the M code ON signal is turned ON.)

The following shows the two types of timing for outputting M codes: the "WITH mode" and the "AFTER mode".

■WITH mode

The M code ON signal is turned ON at the positioning start, and the M code is stored in "[Md.25] Valid M code".

Ex.

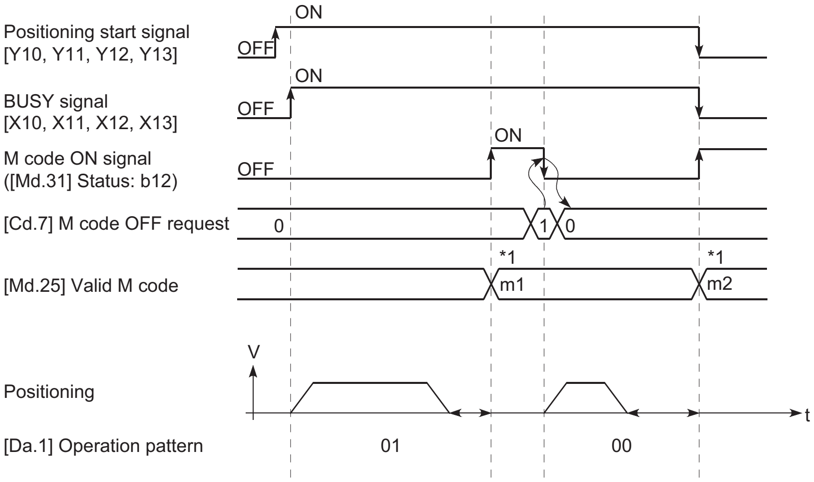


*1 m1 and m2 indicate set M codes.

■AFTER mode

The M code ON signal is turned ON at the positioning completion, and the M code is stored in "[Md.25] Valid M code".

Ex.



*1 m1 and m2 indicate set M codes.

M code ON signal OFF request

When the M code ON signal is ON, it must be turned OFF by the program.

To turn OFF the M code ON signal, set "1" (turn OFF the M code signal) in "[Cd.7] M code OFF request".

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.7]	M code OFF request	1	Set "1: Turn OFF the M code ON signal".	4304+100n	1004304+100n

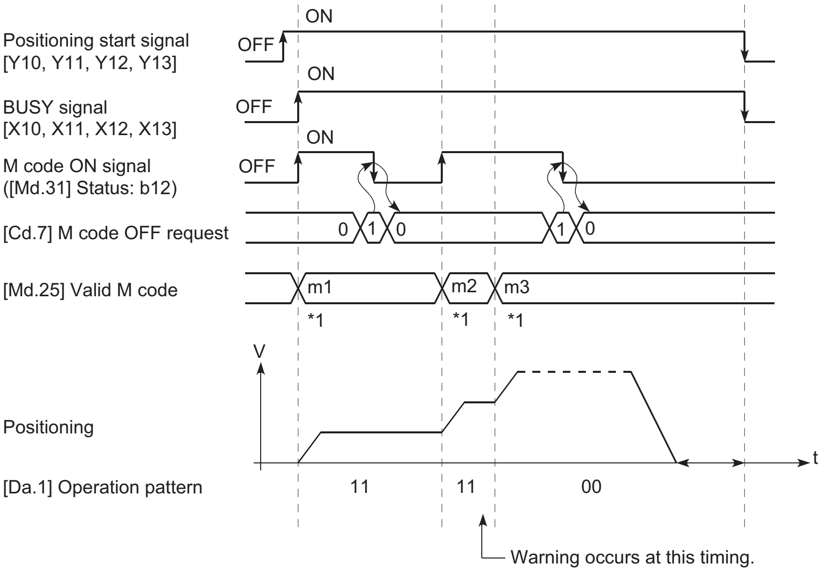
Refer to the following for the setting details.

☞ Page 616 Control Data

The next positioning data will be processed as follows if the M code ON signal is not turned OFF. (The processing differs according to the "[Da.1] Operation pattern".)

[Da.1] Operation pattern		Processing
00	Independent positioning control (Positioning control)	The next positioning data will not be executed until the M code ON signal is turned OFF.
01	Continuous positioning control	
11	Continuous path control	The next positioning data will be executed. If the M code is set to the next positioning data, the warning "M code ON signal ON" (warning code: 0992H) will occur.

■Operation example



*1 m1 and m3 indicate set M codes.

Point

If the M code output function is not required, set "0" in the setting item of the positioning data "[Da.10] M code/ Condition data No./Number of LOOP to LEND repetitions/Number of pitches".

Precautions during control

- During interpolation control, the reference axis M code ON signal is turned ON.
- The M code ON signal will not turn ON if "0" is set in "[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches". (The M code will not be output, and the previously output value will be held in "[Md.25] Valid M code".)
- If the M code ON signal is ON at the positioning start, the error "M code ON signal start" (error code: 19A0H) will occur, and the positioning will not start.
- If the PLC READY signal [Y0] is turned OFF, the M code ON signal will turn OFF and "0" will be stored in "[Md.25] Valid M code".
- If the positioning operation time is short during continuous path control, there will not be enough time to turn OFF the M code ON signal and the warning "M code ON signal ON" (warning code: 0992H) may occur. In this case, set a "0" in the "[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches" of that section's positioning data to prevent the M code from being output for avoiding the warning occurrence.
- In the AFTER mode during speed control, the M code is not output and the M code ON signal does not turn ON.
- If current value changing where "9003" has been set to "[Cd.3] Positioning start No." is performed, the M code output function is made invalid.

Setting method

The following shows the settings to use the "M code output function".

- Set the M code No. in the positioning data "[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches".
- Set the timing to output the M code ON signal. The "WITH mode/AFTER mode" also can be set for each positioning data.

Set the required value in the following parameter, and write it to the Simple Motion module. The set details are validated at the rising edge (OFF → ON) of the PLC READY signal [Y0].

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting value**	**Setting details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Pr.18]	M code ON signal output timing	→	Set the timing to output the M code ON signal. 0: WITH mode 1: AFTER mode	27+150n	1000027+150n

Refer to the following for the setting details.

☞ Page 496 Basic Setting

Reading M codes

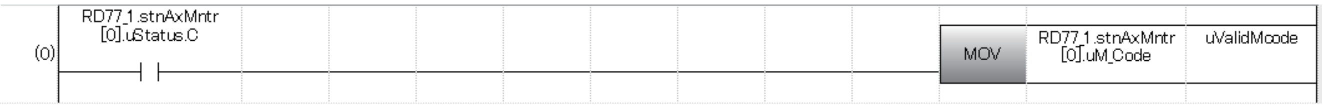
"M codes" are stored in the following buffer memory when the M code ON signal turns ON.
n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

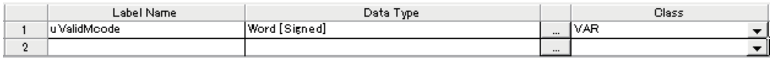
Monitor item		Monitor value	Storage details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Md.25]	Valid M code	→	The M code No. ([Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches) set in the positioning data is stored.	2408+100n	1002408+100n

Refer to the following for information on the storage details.
☞ Page 576 Monitor Data
The following shows a program example for reading the "[Md.25] Valid M code" to the data register (D110) of the CPU module. (The read value is used to command the sub work.)
Read M codes not as "rising edge commands", but as "ON execution commands".

Program example

Refer to the following for the program example.



Classification	Label name	Description
Module label	RD77_1.stnAxMntr[0].uStatus.C	Axis 1 M code ON
	RD77_1.stnAxMntr[0].uM_Code	Axis 1 Valid M code
Global label, local label	Defines the global label or the local label as follows. The settings of Assign (Device/Label) are not required for the label that the assignment device is not set because the unused internal relay and data device are automatically assigned. The following table shows an example for the local label. 	

	Label Name	Data Type		Class
1	uValidMcode	Word [Signed]	...	VAR
2			...	

Teaching function

The "teaching function" is used to set addresses aligned using the manual control (JOG operation, inching operation manual pulse generator operation) in the positioning data addresses ("[Da.6] Positioning address/movement amount", "[Da.7] Arc address").

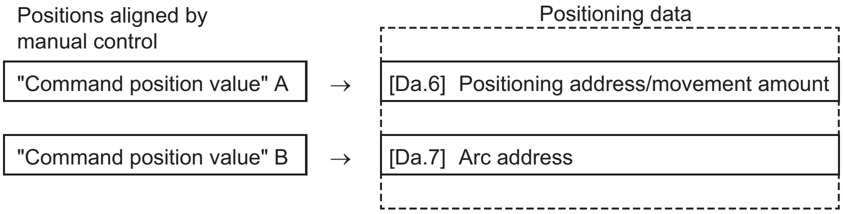
Control details

■Teaching timing

Teaching is executed using the program when the BUSY signal is OFF. (During manual control, teaching can be carried out as long as the axis is not BUSY, even when an error or warning has occurred.)

■Addresses for which teaching is possible

The addresses for which teaching is possible are "command position values" ([Md.20] Command position value) having the home position as a reference. The settings of the "movement amount" used in incremental system positioning cannot be used. In the teaching function, these "command position values" are set in the "[Da.6] Positioning address/movement amount" or "[Da.7] Arc address".



Precautions during control

- Before teaching, a "machine home position return" must be carried out to establish the home position. (When a current value changing, etc., is carried out, "[Md.20] Command position value" may not show absolute addresses having the home position as a reference.)
- Teaching cannot be carried out for positions to which movement cannot be executed by manual control (positions to which the workpiece cannot physically move). (During 2-axis circular interpolation control with center point designation, etc., teaching of "[Da.7] Arc address" cannot be carried out if the center point of the arc is not within the moveable range of the workpiece.)
- Writing to the flash ROM can be executed up to 100,000 times. If writing to the flash ROM exceeds 100,000 times, the writing may become impossible (assured value is up to 100,000 times). If the error "Flash ROM write number error" (error code: 1080H) occurs when writing to the flash ROM has been completed, check whether or not the program is created so as to write continuously to the flash ROM.

Data used in teaching

The following control data is used in teaching.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.1]	Flash ROM write request	1	Write the set details to the flash ROM (backup the changed data).	5900	—
[Cd.38]	Teaching data selection	→	Sets to which "command position value" is written. 0: Written to "[Da.6] Positioning address/movement amount". 1: Written to "[Da.7] Arc address".	4348+100n	1004348+100n
[Cd.39]	Teaching positioning data No.	→	Designates the data to be taught. (Teaching is carried out when the setting value is 1 to 600.) When teaching has been completed, this data is zero cleared.	4349+100n	1004349+100n

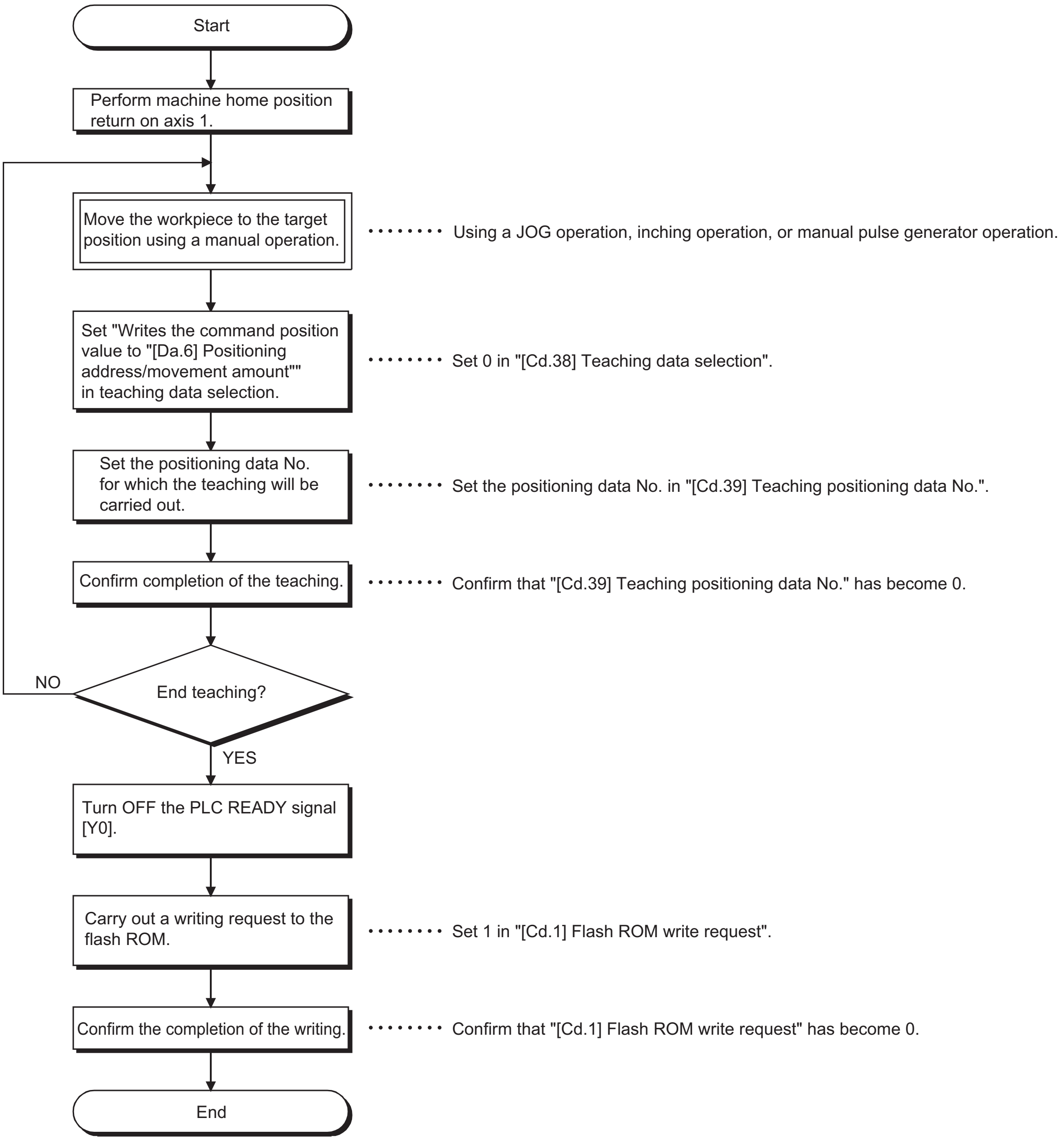
Refer to the following for the setting details.

☞ Page 616 Control Data

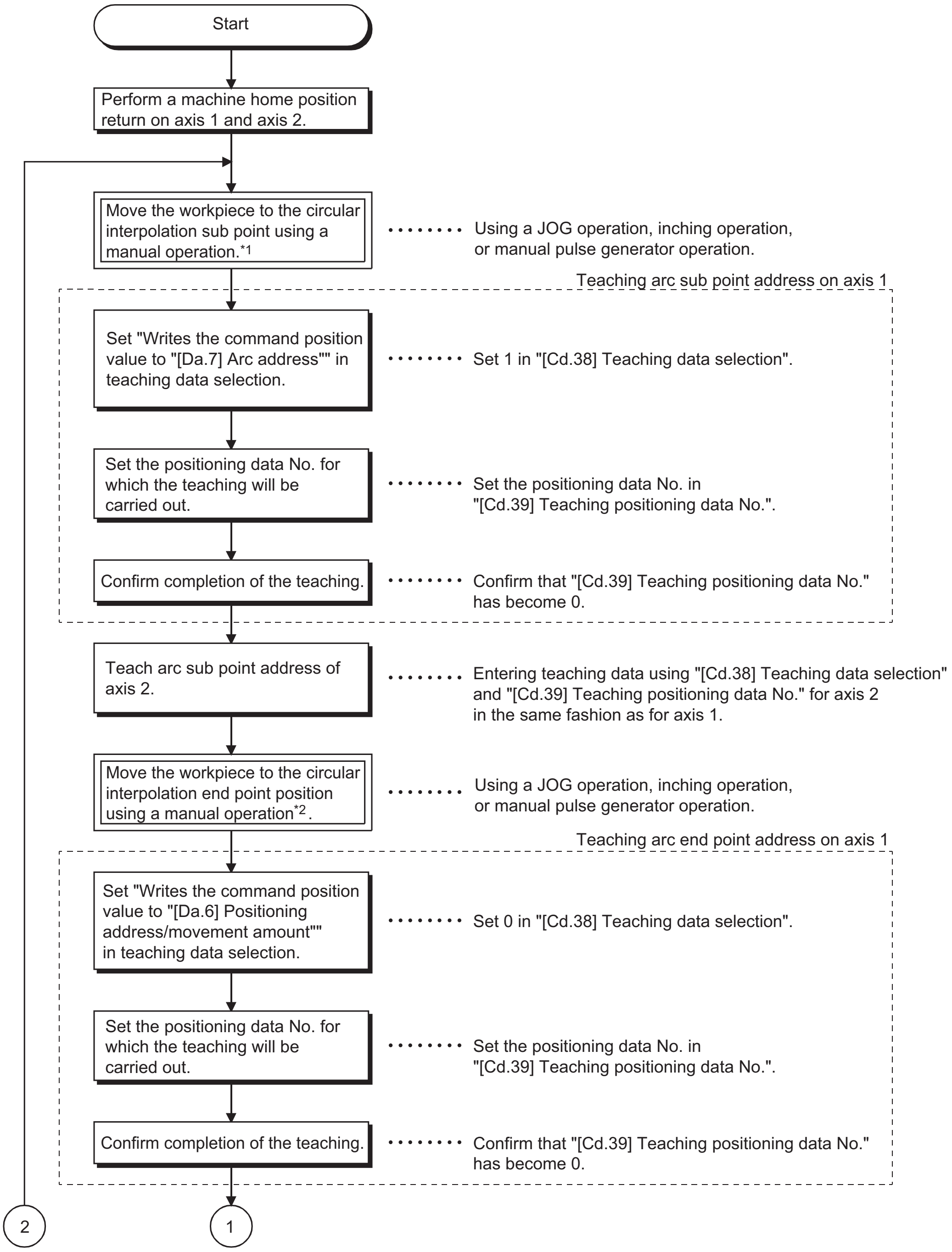
Teaching procedure

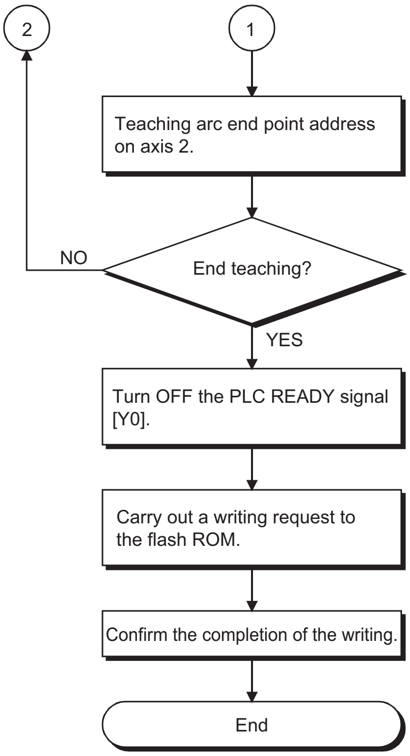
The following shows the procedure for a teaching operation.

- When teaching to the "[Da.6] Positioning address/movement amount" (Teaching example on axis 1)



- When teaching to the "[Da.7] Arc address", then teaching to the "[Da.6] Positioning address/movement amount" (Teaching example for 2-axis circular interpolation control with sub point designation on axis 1 and axis 2)



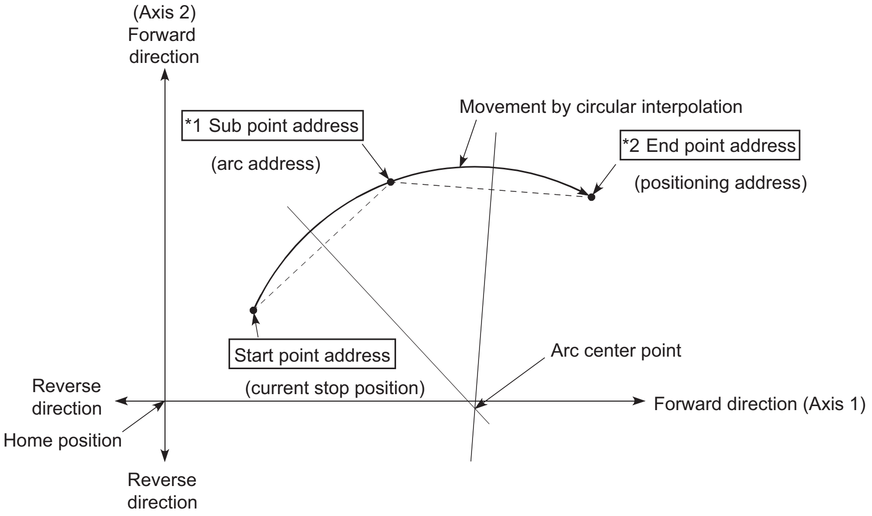


Entering teaching data using "[Cd.38] Teaching data selection" and "[Cd.39] Teaching positioning data No." for axis 2 in the same fashion as for axis 1.

Set 1 in "[Cd.1] Flash ROM write request".

Confirm that "[Cd.1] Flash ROM write request" has become 0.

■Motion path



*1 The sub point address is stored in the arc address.

*2 The end point address is stored in the positioning address.

Teaching program example

The following shows a program example for setting (writing) the positioning data obtained with the teaching function to the Simple Motion module.

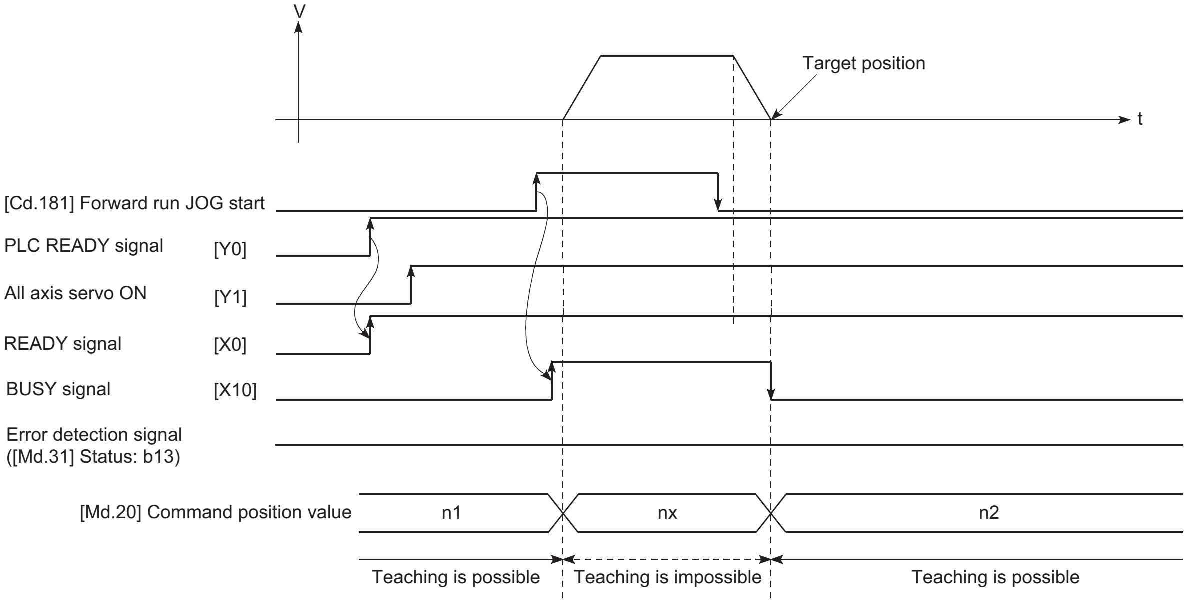
■Setting conditions

When setting the command position value as the positioning address, write it when the BUSY signal is OFF.

■Operation example

The following example shows a program carrying out the teaching of axis 1.

- Move the workpiece to the target position using a JOG operation (or an inching operation, a manual pulse generator operation).



Point

- Confirm the teaching function and teaching procedure before setting the positioning data.
- The positioning addresses that are written are absolute address (ABS) values.
- The positioning data written by the teaching function overwrites the data of buffer memory only. Therefore, read from the buffer memory and write to the flash ROM before turning the power OFF as necessary.

Program example

Refer to the following for the program example.

☞ Page 696 Teaching program

Command in-position function

The "command in-position function" checks the remaining distance to the stop position during the automatic deceleration of positioning control, and sets "1". This flag is called the "command in-position flag". The command in-position flag is used as a front-loading signal indicating beforehand the completion of the position control.

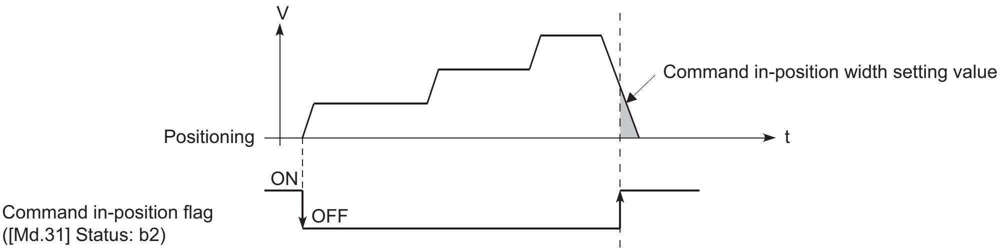
Control details

The following shows control details of the command in-position function.

- When the remaining distance to the stop position during the automatic deceleration of positioning control becomes equal to or less than the value set in "[Pr.16] Command in-position width", "1" is stored in the command in-position flag ([Md.31] Status: b2).

■Command in-position width check

Remaining distance ≤ "[Pr.16] Command in-position width" setting value

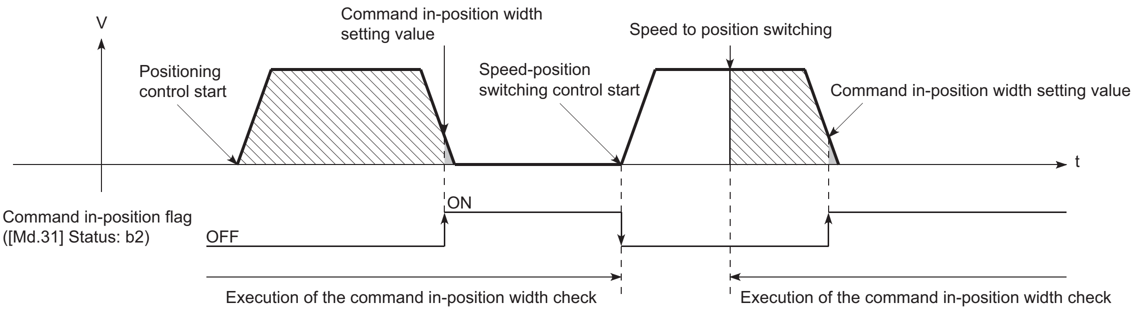


- A command in-position width check is carried out every operation cycle.

Precautions during control

- A command in-position width check will not be carried out in the following cases.

- During speed control
- During speed control in speed-position switching control
- During speed control in position-speed switching control
- During speed control mode
- During torque control mode
- During continuous operation to torque control mode



- The command in-position flag will be turned OFF in the following cases. ("0" will be stored in "[Md.31] Status: b2".)

- At the positioning control start
- At the speed control start
- At the speed-position switching control, position-speed switching control start
- At the home position return control start
- At the JOG operation start
- At the inching operation start
- When the manual pulse generator operation is enabled

- The "[Pr.16] Command in-position width" and command in-position flag ([Md.31] Status: b2) of the reference axis are used during interpolation control. When the "[Pr.20] Interpolation speed designation method" is "Composite speed", the command in-position width check is carried out in the remaining distance on the composite axis (line/arc connecting the start point address and end point address).

Setting method

To use the "command in-position function", set the required value in the parameter shown in the following table, and write it to the Simple Motion module.

The set details are validated at the rising edge (OFF → ON) of the PLC READY signal [Y0].

Setting item		Setting value	Setting details	Factory-set initial value
[Pr.16]	Command in-position width	→	Turn ON the command in-position flag, and set the remaining distance to the stop position of the position control.	100

Refer to the following for the setting details.

☞ Page 496 Basic Setting

Confirming the command in-position flag

The "command in-position flag" is stored in the following buffer memory.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Monitor item		Monitor value	Storage details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Md.31]	Status	→	The command in-position flag is stored in the "b2" position.	2417+100n	1002417+100n

Refer to the following for information on the storage details.

☞ Page 576 Monitor Data

Point

- Parameters are set for each axis.
- It is recommended that the parameters be set whenever possible with the engineering tool. Execution by a program uses many programs and devices. The execution becomes complicated, and the scan times will increase.

Acceleration/deceleration processing function

The "acceleration/deceleration processing function" adjusts the acceleration/deceleration of each control to the acceleration/deceleration curve suitable for device.

Setting the acceleration/deceleration time changes the slope of the acceleration/deceleration curve.

The following two methods can be selected for the acceleration/deceleration curve:

- Trapezoidal acceleration/deceleration
- S-curve acceleration/deceleration

Refer to the following for acceleration/deceleration processing of speed-torque control.

☞ Page 203 Speed-torque Control

"Acceleration/deceleration time 0 to 3" control details and setting

In the Simple Motion module, four types each of acceleration time and deceleration time can be set. By using separate acceleration/deceleration times, control can be carried out with different acceleration/deceleration times for positioning control, JOG operation, home position return, etc.

Set the required values for the acceleration/deceleration time in the parameters shown in the following table, and write them to the Simple Motion module.

The set details are validated when written to the Simple Motion module.

Setting item		Setting value	Setting details	Factory-set initial value
[Pr.9]	Acceleration time 0	→	Set the acceleration time at a value within the range of 1 to 8388608 ms.	1000
[Pr.25]	Acceleration time 1	→		1000
[Pr.26]	Acceleration time 2	→		1000
[Pr.27]	Acceleration time 3	→		1000
[Pr.10]	Deceleration time 0	→	Set the deceleration time at a value within the range of 1 to 8388608 ms.	1000
[Pr.28]	Deceleration time 1	→		1000
[Pr.29]	Deceleration time 2	→		1000
[Pr.30]	Deceleration time 3	→		1000

Refer to the following for the setting details.

☞ Page 496 Basic Setting

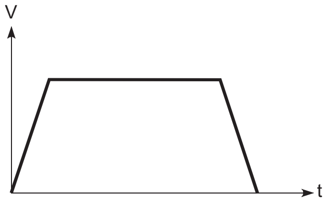
"Acceleration/deceleration method setting" control details and setting

In the "acceleration/deceleration method setting", the acceleration/deceleration processing method is selected and set. The set acceleration/deceleration processing is applied to all acceleration/deceleration. (except for inching operation, manual pulse generator operation and speed-torque control.)

The two types of "acceleration/deceleration processing method" are shown below.

■Trapezoidal acceleration/deceleration processing method

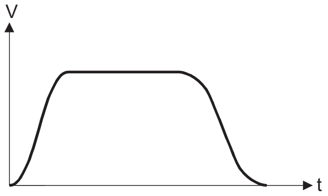
This is a method in which linear acceleration/deceleration is carried out based on the acceleration time, deceleration time, and speed limit value set by the user.



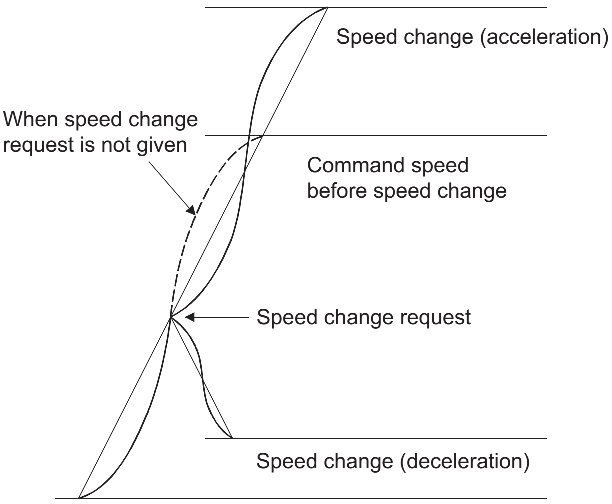
■S-curve acceleration/deceleration processing method

In this method, the motor burden is reduced during starting and stopping.

This is a method in which acceleration/deceleration is carried out gradually, based on the acceleration time, deceleration time, speed limit value, and "[Pr.35] S-curve ratio" (1 to 100%) set by the user.



When a speed change request or override request is given during S-curve acceleration/deceleration processing, S-curve acceleration/deceleration processing begins at a speed change request or override request start.



Set the required values for the "acceleration/deceleration method setting" in the parameters shown in the following table, and write them to the Simple Motion module.

The set details are validated when written to the Simple Motion module.

Setting item		Setting value	Setting details	Factory-set initial value
[Pr.34]	Acceleration/deceleration process selection	→	Set the acceleration/deceleration method. 0: Trapezoidal acceleration/deceleration processing 1: S-curve acceleration/deceleration processing	0
[Pr.35]	S-curve ratio	→	Set the acceleration/deceleration curve when "1" is set in "[Pr.34] Acceleration/deceleration process selection".	100

Refer to the following for the setting details.

☞ Page 496 Basic Setting

Point

- Parameters are set for each axis.
- It is recommended that the parameters be set whenever possible with the engineering tool. Execution by a program uses many programs and devices. The execution becomes complicated, and the scan times will increase.

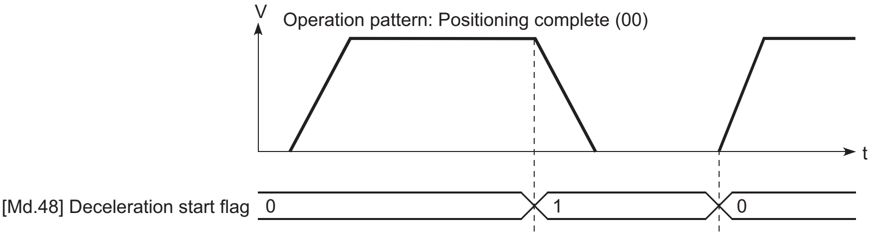
Deceleration start flag function

The "deceleration start flag function" 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". This function can be used as a signal to start the operation to be performed by other equipment at each end of position control or to perform preparatory operation, etc. for the next position control.

Control details

When deceleration for a stop is started in the position control whose operation pattern is "Positioning complete", "1" is stored into "[Md.48] Deceleration start flag". When the next operation start is made or the manual pulse generator operation enable status is gained, "0" is stored. (Reference to the figure below)

■Start made with positioning data No. specified



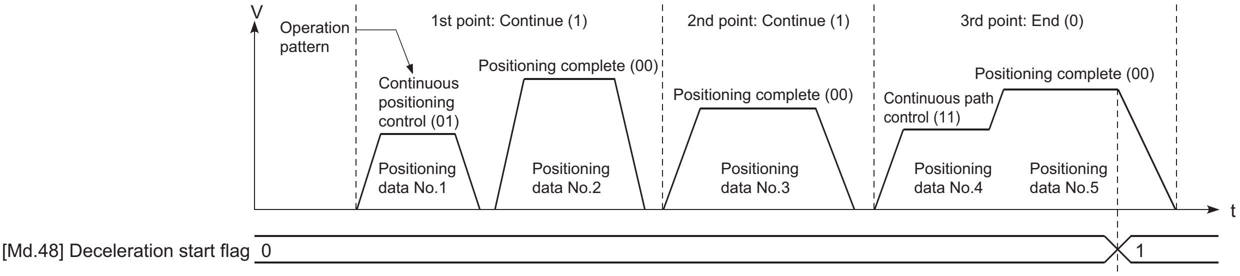
■Block start

At a block start, this function is valid for only the position control whose operation pattern is "Positioning complete" at the point whose shape has been set to "End". (Reference to the figure below)

The following table indicates the operation of the deceleration start flag in the case of the following block start data and positioning data.

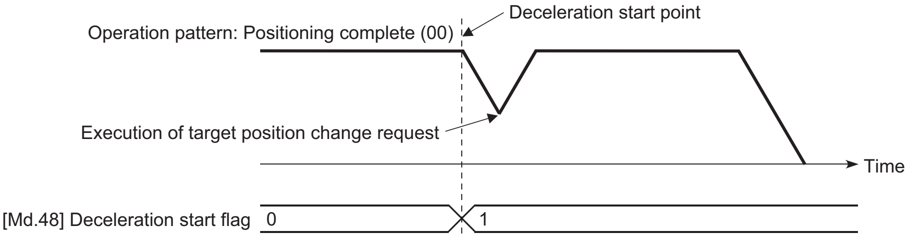
Block start data	[Da.11] Shape	[Da.12] Start data No.	[Da.13] Special start instruction
1st point	1: Continue	1	0: Block start
2nd point	1: Continue	3	0: Block start
3rd point	0: End	4	0: Block start
⋮			

Positioning Data No.	[Da.1] Operation pattern
1	01: Continuous positioning control
2	00: Positioning complete
3	00: Positioning complete
4	11: Continuous path control
5	00: Positioning complete
⋮	

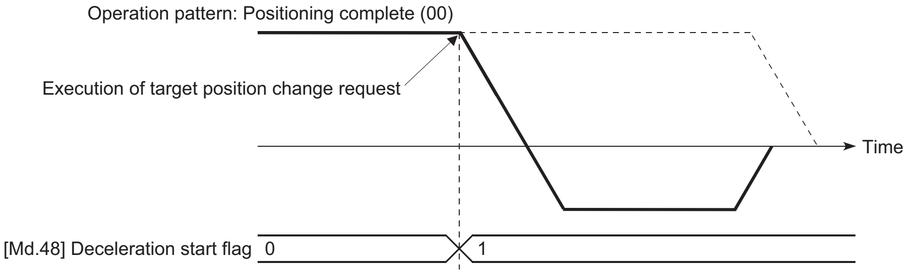


Precautions during control

- The deceleration start flag function is valid for the control method of "1-axis linear control", "2-axis linear interpolation control", "3-axis linear interpolation control", "4-axis linear interpolation control", "speed-position switching control" or "position-speed switching control". In the case of linear interpolation control, the function is valid for only the reference axis. For details, refer to "Combination of Main Functions and Sub Functions" in the following manual.
  📖MELSEC iQ-R Simple Motion Module User's Manual (Startup)
- The deceleration start flag does not turn ON when the operation pattern is "continuous positioning control" or "continuous path control".
- The deceleration start flag function is invalid for a home position return, JOG operation, inching operation, manual pulse generator operation, speed-torque control and deceleration made with a stop signal.
- The deceleration start flag does not turn ON when a speed change or override is used to make deceleration.
- If a target position change is made while the deceleration start flag is ON, the deceleration start flag remains ON.



- When the movement direction is reversed by a target position change, the deceleration start flag turns ON.



- During position control of position-speed switching control, the deceleration start flag is turned ON by automatic deceleration. The deceleration start flag remains ON if position control is switched to speed control by the position-speed switching signal after the deceleration start flag has turned ON.
- If the condition start of a block start is not made since the condition is not satisfied, the deceleration start flag turns ON when the shape is "End".
- When an interrupt request during continuous operation is issued, the deceleration start flag turns ON at a start of deceleration in the positioning data being executed.

Setting method

To use the "deceleration start flag function", set "1" to the following control data using a program.
The set data is made valid on the rising edge (OFF to ON) of the PLC READY signal [Y0].

Setting item		Setting value	Setting details	Buffer memory address
[Cd.41]	Deceleration start flag valid	→	Set whether the deceleration start flag function is made valid or invalid. 0: Deceleration start flag invalid 1: Deceleration start flag valid	5905

Refer to the following for the setting details.
☞ Page 616 Control Data

Checking of deceleration start flag

The "deceleration start flag" is stored into the following buffer memory addresses.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Monitor item		Monitor value	Storage details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Md.48]	Deceleration start flag	→	0: Status other than below 1: Status from deceleration start to next operation start or manual pulse generator operation enable	2499+100n	1002499+100n

Refer to the following for information on the storage details.

☞ Page 576 Monitor Data

Speed control 10 x multiplier setting for degree axis function

The "Speed control 10 × multiplier setting for degree axis function" is provided to execute the positioning control by 10 × speed of the setting value in the command speed and the speed limit value when the setting unit is "degree".

Control details

When "Speed control 10 multiplier specifying function for degree axis" is valid, this function related to the command speed, monitor data, speed limit value, is shown below.

■Command speed

- Parameters

- "[Pr.7] Bias speed at start"
- "[Pr.46] Home position return speed"
- "[Pr.47] Creep speed"
- "[Cd.14] New speed value"
- "[Cd.17] JOG speed"
- "[Cd.25] Position-speed switching control speed change register"
- "[Cd.28] Target position change value (New speed)"
- "[Cd.140] Command speed at speed control mode"
- "[Da.8] Command speed"

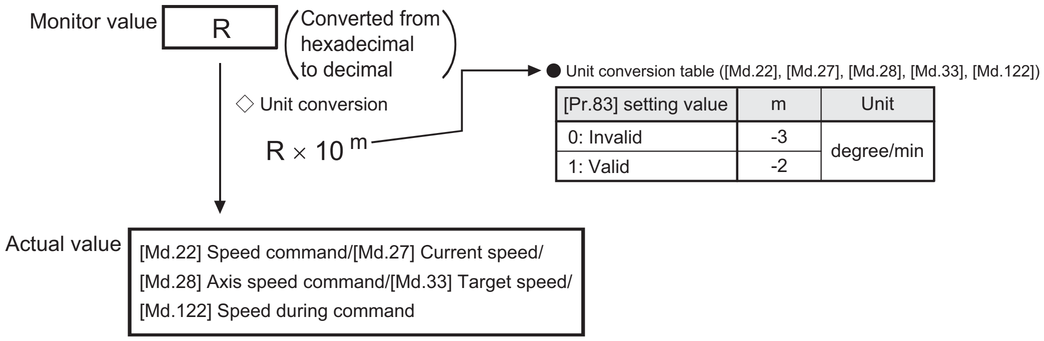
- Major positioning control

- For "2 to 4 axis linear interpolation control" and "2 to 4 axis fixed-feed control", the positioning control is performed at decuple speed of command speed, when "[Pr.83] Speed control 10 × multiplier setting for degree axis" of reference axis is valid.
- For "2 to 4 axis speed control", "[Pr.83] Speed control 10 × multiplier setting for degree axis" is evaluated whether it is valid for each axis. If valid, the positioning control will be performed at decuple speed of command speed.

■Monitor data

- "[Md.22] Speed command"
- "[Md.27] Current speed"
- "[Md.28] Axis speed command"
- "[Md.33] Target speed"
- "[Md.122] Speed during command"

For the above monitoring data, "[Pr.83] Speed control 10 × multiplier setting for degree axis" is evaluated whether it is valid for each axis. If valid, unit conversion value is changed ($\times 10^{-3} \rightarrow \times 10^{-2}$). The unit conversion table of monitor value is shown below.



● Unit conversion table ([Md.22], [Md.27], [Md.28], [Md.33], [Md.122])

[Pr.83] setting value	m	Unit
0: Invalid	-3	degree/min
1: Valid	-2	

[Md.22] Speed command/[Md.27] Current speed/
[Md.28] Axis speed command/[Md.33] Target speed/
[Md.122] Speed during command

■Speed limit value

- "[Pr.8] Speed limit value"
- "[Pr.31] JOG speed limit value"
- "[Cd.146] Speed limit value at torque control mode"
- "[Cd.147] Speed limit value at continuous operation to torque control mode"

For the speed limit value, "[Pr.83] Speed control 10 × multiplier setting for degree axis" is evaluated whether it is valid for each axis. If valid, the positioning control will be performed at decuple speed of setting value (max. speed).

Setting method

Set "Valid/Invalid" by "[Pr.83] Speed control 10 × multiplier setting for degree axis".

Normally, the speed specification range is 0.001 to 2000000.000 [degree/min], but it will be decupled and become 0.01 to 20000000.00 [degree/min] by setting "[Pr.83] Speed control 10 × multiplier setting for degree axis" to valid.

To use the "Speed control 10 × multiplier setting for degree axis function", set the parameters shown in the following table.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Pr.83]	Speed control 10 × multiplier setting for degree axis	→	Set the speed control 10 × multiplier setting for degree axis. 0: Invalid 1: Valid	63+150n	1000063+150n

Refer to the following for the setting details.

☞ Page 496 Basic Setting

Operation setting for incompletion of home position return function

The "Operation setting for incompletion of home position return function" is provided to select whether positioning control is operated or not when the home position return request flag is ON.

Control details

When "[Pr.55] Operation setting for incompletion of home position return" is valid, this function related to the command speed, monitor data, speed limit value, is shown below.

○: Positioning start possible (Execution possible), ×: Positioning start impossible (Execution not possible)

Positioning control	**[Pr.55] Operation setting for incompletion of home position return**	
	"0: Positioning control is not executed." and "home position return request flag ON"	**"1: Positioning control is executed." and "home position return request flag ON"**
• Machine home position return • JOG operation • Inching operation • Manual pulse generator operation • Current value changing using current value changing start No. (No.9003).	○[*1]	○[*1]
When the following cases at block start, condition start, wait start, repeated start, multiple axes simultaneous start and pre-reading start • 1-axis linear control • 2/3/4-axis linear interpolation control • 1/2/3/4-axis fixed-feed control • 2-axis circular interpolation control (with sub point designation/center point designation) • 3-axis helical interpolation control (with sub point designation/center point designation) • 1/2/3/4-axis speed control • Speed-position switching control (INC mode/ ABS mode) • Position-speed switching control • Current value changing using positioning data No. (No.1 to 600).	×	○[*1]
Control mode switching	×	○[*1]

*1 There may be restrictions in the operation for incompletion of home position return depending on the setting or specifications of the servo amplifier. Refer to the servo amplifier instruction manual or manual for details.

Precautions during control

- The error "Start at home position return incomplete" (error code: 19A6H) occurs if the home position return request flag ([Md.31] Status: b3) is executed the positioning control by turning on, when "0: Positioning control is not executed" is selected the operation setting for incompletion of home position return setting, and positioning control will not be performed. At this time, operation with the manual control (JOG operation, inching operation, manual pulse generator operation) is available.
- When the home position return request flag ([Md.31] Status: b3) is ON, starting Fast home position return will result in the error "Home position return request ON" (error code: 1945H) despite the setting value of "[Pr.55] Operation setting for incompletion of home position return", and Fast home position return will not be performed.

Setting method

To use the "Operation setting for incompletion of home position return", set the following parameters using a program.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Pr.55]	Operation setting for incompletion of home position return	→	Set the operation setting for incompletion of home position return. 0: Positioning control is not executed. 1: Positioning control is executed.	87+150n	1000087+150n

Refer to the following for the setting details.

☞ Page 496 Basic Setting

8.10 Servo ON/OFF

Servo ON/OFF

This function executes servo ON/OFF of the servo amplifiers connected to the Simple Motion module.

By establishing the servo ON status with the servo ON command, servo motor operation is enabled.

The following two signals can be used to execute servo ON/OFF.

- All axis servo ON [Y1]
- [Cd.100] Servo OFF command

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item	**Buffer memory address**	
	Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.100] Servo OFF command	4351+100n	1004351+100n

A list of the "All axis servo ON [Y1]" and "[Cd.100] Servo OFF command" is given below.

○: Servo ON (Servo operation enabled)

×: Servo OFF (Servo operation disabled)

Setting item		**[Cd.100] Servo OFF command**			
		Setting value "0"	**Command to servo amplifier**	**Setting value "1"**	**Command to servo amplifier**
All axis servo ON [Y1]	OFF	×	Servo ON command: OFF Ready ON command: OFF	×	Servo ON command: OFF Ready ON command: OFF
	ON	○	Servo ON command: ON Ready ON command: ON	×	Servo ON command: OFF Ready ON command: ON

Point

When the delay time of "Electromagnetic brake sequence output (PC02)" is used, execute the servo ON to OFF by "[Cd.100] Servo OFF command". (When all axis servo ON [Y1] is turned ON to OFF, set "1" in "[Cd.100] Servo OFF command" and execute the servo OFF. Then, turn off [Y1] after delay time passes.) Refer to each servo amplifier instruction manual or manual for details of servo ON command OFF and ready ON command OFF from Simple Motion module.

[RD77GF]

The status of the current value restoration can be checked with the following monitor data.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Monitor item		**Monitor value**	**Storage details**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Md.190]	Controller position value restoration completion status	→	Store the controller current value restoration completion status of a connected slave device. 0: Incomplete restoration 1: Complete INC restoration 2: Complete ABS restoration If the current value has been restored using the INC restoration method, "1" is set. If the current value has been restored using the ABS restoration method, "2" is set. If the slave device is disconnected, "0" is set. Fetch cycle: 16.0 [ms]	468232+2048n	1468232+2048n

- When the software version of the Simple Motion module is "Ver.01"
  After the initial communication with the servo amplifier is completed, the current value is restored in the Simple Motion module. The servo ON status is not established until the current value restoration is completed.

- When the software version of the Simple Motion module is "Ver.02" or later
  After the initial communication with the servo amplifier is completed, the servo ON status is not established if the status is one of the following conditions.

- The error "Servo amplifier external input signal select error" (error code: 1AD4H) occurs at the consistency check of the external input signal.[*1]
- The current value restoration is not completed.[*2]

[*1] Refer to the following for details.
☞ Page 263 Servo parameter setting [RD77GF]

[*2] After the initial communication with the servo amplifier is completed, the current value is restored in the Simple Motion module.

Servo ON (Servo operation enabled)

The following shows the procedure for servo ON.

1. Make sure that the servo amplifier LED indicates "b_".

(The initial value for "All axis servo ON [Y1]" is "OFF".)

2. Set "0" for "[Cd.100] Servo OFF command".

3. Turn ON "All axis servo ON [Y1]".

Now the servo amplifier turns ON the servo (servo operation enabled state). (The servo amplifier LED indicates "d_".)

Servo OFF (Servo operation disabled)

The following shows the procedure for servo OFF.

1. Set "1" for "[Cd.100] Servo OFF command". (The servo amplifier LED indicates "c_".)

(If the "[Cd.100] Servo OFF command" set "0" again, after the servo operation enabled.)

2. Turn OFF "All axis servo ON [Y1]".

(The servo amplifier LED indicates "b_".)

Point

- If the servo motor is rotated by external force during the servo OFF status, follow up processing is performed.
- Change between servo ON or OFF status while operation is stopped (position control mode). The servo OFF command of during positioning in position control mode, manual pulse control, home position return, speed control mode, torque control mode and continuous operation to torque control mode will be ignored.
- When the servo OFF is given to all axes, "All axis servo ON [Y1]" is applied even if all axis servo ON command is turned ON to OFF with "[Cd.100] Servo OFF command" set "0".

Follow up function

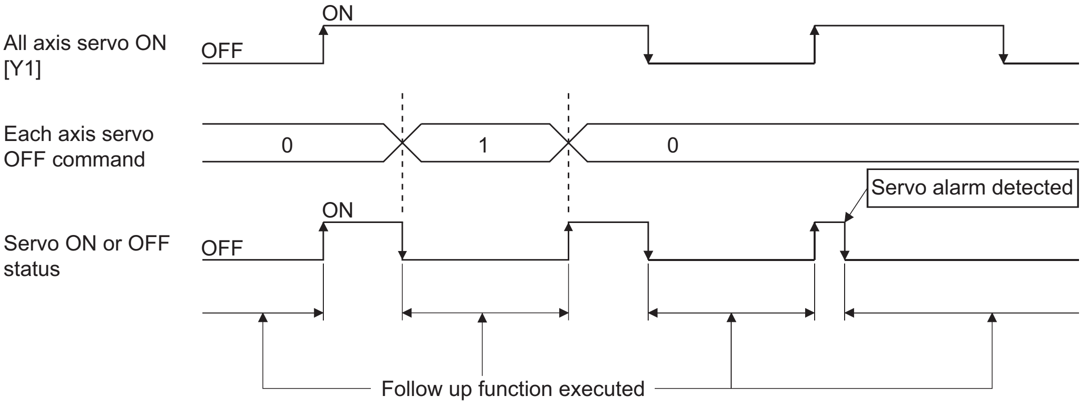
Follow up function

The follow up function monitors the number of motor rotations (actual position value) with the servo OFF and reflects the value in the command position value.

If the servo motor rotates during the servo OFF, the servo motor will not just rotate for the amount of droop pulses at switching the servo ON next time, so that the positioning can be performed from the stop position.

Execution of follow up

Follow up function is executed continually during the servo OFF status.



Point

The follow up function performs the process if the "Simple Motion module and the servo amplifier is turned ON" and "servo OFF" regardless of the presence of the absolute position system.

9 COMMON FUNCTIONS

The details and usage of the "common functions" executed according to the user's requirements are explained in this chapter. Common functions include functions required when using the Simple Motion module, such as parameter initialization and execution data backup.

Read the setting and execution procedures for each common function indicated in this chapter thoroughly, and execute the appropriate function where required.

9.1 Outline of Common Functions

"Common functions" are executed according to the user's requirements, regardless of the control method, etc.

These common functions are executed by an engineering tool or programs.

The following table shows the functions included in the "common functions".

Common function	**Details**	**Means**	
		Program	**Engineering tool**
Parameter initialization function	This function returns the setting data stored in the buffer memory/internal memory and flash ROM/internal memory (nonvolatile) of Simple Motion module to the default values.	○	○
Execution data backup function	This function writes the "execution data", currently being used for control, to the flash ROM/internal memory (nonvolatile).	○	○
External input signal select function	[RD77MS] This function sets the input type, input terminal, signal logic and input filter for each external input signal of each axis (upper/lower stroke limit signal (FLS/RLS), proximity dog signal (DOG), and stop signal (STOP)). The function enables the assignment of external input signal of each axis to any terminals of the external input connection connector on the Simple Motion module. [RD77GF] This function sets the input type and signal logic for each external input signal of each axis (upper/lower limit signal (FLS/RLS), proximity dog signal (DOG), and stop signal (STOP)).	○	○
Link device external signal assignment function [RD77GF]	This function assigns link devices to external signals of the Simple Motion module.	○	○
History monitor function	This function monitors start history and current value history of all axes.	—	○
Amplifier-less operation function	This function executes the positioning control of Simple Motion module without connecting to the servo amplifiers. It is used to debug the program at the start-up of the device or simulate the positioning operation.	○	—
Virtual servo amplifier function	This function executes the operation as the axis (virtual servo amplifier axis) that operates only command (instruction) virtually without servo amplifiers.	○	○
Driver communication function [RD77MS]	This function uses the "Master-slave operation function" of servo amplifier. The Simple Motion module controls the master axis and the slave axis is controlled by data communication between servo amplifiers (driver communication) without Simple Motion module.	○	○
Mark detection function	This function is used to latch any data at the input timing of the mark detection signal (DI).	○	○
Optional data monitor function [RD77MS]	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 collects errors and event information occurred in the Simple Motion module in the CPU module, and saves them to an SD memory card. This function enables to check the error history even after the power OFF or reset by holding the error contents in the CPU module.	—	○
Connect/disconnect function of SSCNET communication [RD77MS]	Temporarily connect/disconnect of SSCNET communication is executed during system's power supply ON. This function is used to exchange the servo amplifiers or SSCNETⅢ cables.	○	—
Servo cyclic transmission function [RD77GF]	This function reads and writes objects of slave devices with cyclic transmission.	○	○
Servo transient transmission function [RD77GF]	This function reads and writes objects of slave devices with transient transmission.	○	—

Common function	Details	Means	
		Program	Engineering tool
Online module change [RD77MS]	Allows to replace a module without stopping the system. For procedures for the online module change, refer to the following. 📖MELSEC iQ-R Online Module Change Manual		
Test mode	This mode executes the test operation and adjustment of axes using an engineering tool.	—	○
Servo parameter change function [RD77GF]	This function transfers servo parameters. Servo parameters, which are controlled by servo amplifiers, can be changed with a Simple Motion module.	○	—
Positioning data, start block data write/read functions [RD77MS]	This function is used to write/read optional positioning data and block start data by using the control data for positioning data and block start data.	○	—
Hot line forced stop function	This function is used to execute deceleration stop safety for other axes when the servo alarm occurs in the servo amplifier MR-JE-B(F).	○	○

9.2 Parameter Initialization Function

The "parameter initialization function" is used to return the setting data set in the buffer memory/internal memory and flash ROM/internal memory (nonvolatile) of Simple Motion module to the default values.

Parameter initialization means

- Initialization is executed with a program.
- Initialization is executed by an engineering tool.

Refer to "Help" in the "Simple Motion Module Setting Function" for the execution method by an engineering tool.

Control details

The following table shows the setting data initialized by the "parameter initialization function".

(The data initialized are "buffer memory/internal memory" and "flash ROM/internal memory (nonvolatile)" setting data.)

Target area	
Parameters	Servo network composition parameters
	Common parameters
	Basic parameters
	Detailed parameters
	Home position return basic parameters
	Home position return detailed parameters
	Extended parameters
	Link device external signal assignment parameters [RD77GF]
	Servo object specification parameters [RD77GF]
Servo parameters	Servo amplifier parameters [RD77MS]
Mark detection	Mark detection setting parameters
Synchronous control parameters	Servo input axis parameters
	Synchronous encoder axis parameters
	Synchronous encoder axis parameters via link device [RD77GF]
	Synchronous parameters
Positioning data	Positioning data (No.1 to 100)
	Positioning data (No.101 to 600)
Block start data	Block start data (block No.7000 to 7001)
	Condition data (block No.7000 to 7001)
	Block start data (block No.7002 to 7004)
	Condition data (block No.7002 to 7004)
Cam data	

Precautions during control

- Parameter initialization is only executed when the positioning control is not carried out (when the PLC READY signal [Y0] is OFF). The warning "In PLC READY" (warning code: 0905H) will occur if executed when the PLC READY signal [Y0] is ON.
- Writing to the flash ROM is up to 100,000 times. If writing to the flash ROM exceeds 100,000 times, the writing may become impossible, and the error "Flash ROM write error" (error code: 1931H) will occur.
- A "CPU module reset" or "CPU module power restart" must be carried out after the parameters are initialized.
- If an error occurs on the parameter set in the Simple Motion module when the PLC READY signal [Y0] is turned ON, the READY signal [X0] will not be turned ON and the control cannot be carried out.
- When using initialized parameters, write the module parameters whose module extended parameter storage location setting has been set to "Simple Motion Module" to the CPU module. When the module parameters whose module extended parameter storage location setting has been set to "CPU module" are written to the CPU module, the module extended parameters that have been set with an engineering tool are reflected to the buffer memory. Initialize the parameters using the engineering tool. [RD77GF]

Restriction

The writing time to the flash ROM and the time for parameter initialization are shown below.

- The writing time to the flash ROM: up to 5 seconds [RD77MS], up to 4 seconds [RD77GF]
- The time for parameter initialization: approximately 5 seconds[*1] [RD77MS], up to 30 seconds [RD77GF]

Do not turn the power ON/OFF or reset the CPU module during parameter initialization.

If the power is turned OFF or the CPU module is reset to forcibly end the process, the data backed up in the flash ROM/internal memory (nonvolatile) will be lost.

[*1] If free time except for the positioning control is short, it may take approximately 30 seconds.

Parameter initialization method

- Parameter initialization can be carried out by writing the data shown in the table below to the buffer memory of Simple Motion module. The initialization of the parameter is executed at the time point the data is written to the buffer memory of Simple Motion module.

Setting item		Setting value	Setting details	Buffer memory address
[Cd.2]	Parameter initialization request	1	Set "1: Requests parameter initialization.".	5901

Refer to the following for the setting details.

☞ Page 616 Control Data

When the initialization is complete, "0" will be set in "[Cd.2] Parameter initialization request" by the Simple Motion module automatically.

9.3 Execution Data Backup Function

When the buffer memory data of Simple Motion module is rewritten from the CPU module, "the data backed up in the flash ROM/internal memory (nonvolatile)" of Simple Motion module may differ from "the execution data being used for control (buffer memory data)". In this case, the execution data will be lost when the power supply of CPU module is turned OFF.
The "execution data backup function" is used to back up the execution data by writing to the flash ROM/internal memory (nonvolatile). The data backed up will be written to the buffer memory when the power is turned ON next time.

Point

When the Simple Motion module is replaced, all the data in the Simple Motion module including absolute position data can be backed up (read to) in the personal computer and restored to (written to) the Simple Motion module again by using the backup/restore function of an engineering tool. Refer to "Help" in the "Simple Motion Module Setting Function" for details.

Execution data backup means

- The backup is executed with a program.
- The data is written to the flash ROM by an engineering tool.

Refer to "Help" in the "Simple Motion Module Setting Function" for the flash ROM write method by an engineering tool.

Control details

- The following shows the data that can be written to the flash ROM/internal memory (nonvolatile) using the "execution data backup function".

Target area	
Parameters	Servo network composition parameters
	Common parameters
	Basic parameters
	Detailed parameters
	Home position return basic parameters
	Home position return detailed parameters
	Extended parameters
	Link device external signal assignment parameters [RD77GF]
	Servo object specification parameters [RD77GF]
Servo parameters	Servo amplifier parameters [RD77MS]
Mark detection	Mark detection setting parameters
Synchronous control parameters	Servo input axis parameters
	Synchronous encoder axis parameters
	Synchronous encoder axis parameters via link device [RD77GF]
	Synchronous parameters
Positioning data	Positioning data (No.1 to 100)
	Positioning data (No.101 to 600)
Block start data	Block start data (block No.7000 to 7001)
	Condition data (block No.7000 to 7001)
	Block start data (block No.7002 to 7004)
	Condition data (block No.7002 to 7004)

- The module parameters are stored in the CPU module. Therefore, these parameters cannot be backed up in the flash ROM in the Simple Motion module.
- The cam data (cam storage area) is separately saved in the flash ROM/internal memory (nonvolatile). Therefore, it is not a target of the backup function.

Precautions during control

- Data can only be written to the flash ROM when the positioning control is not carried out (when the PLC READY signal [Y0] is OFF). The warning "In PLC READY" (warning code: 0905H) will occur if executed when the PLC READY signal [Y0] is ON.
- Writing to the flash ROM can be executed up to 100,000 times. If writing to the flash ROM exceeds 100,000 times, the writing may become impossible, and the error "Flash ROM write error" (error code: 1931H) will occur.
- After the power supply is turned ON or the CPU module is reset once, writing to the flash ROM using a program is limited to up to 25 times. If the 26th writing is executed, the error "Flash ROM write number error" (error code: 1080H) will occur. If this error occurs, carry out the error reset or power OFF → ON/CPU module reset operation again.
- When using backed up parameters, write the module parameters whose module extended parameter storage location setting has been set to "Simple Motion Module" to the CPU module. [RD77GF]

Restriction

The writing time to the flash ROM is shown below.

- The writing time to the flash ROM: up to 5 seconds [RD77MS], up to 4 seconds [RD77GF]

Do not turn the power ON/OFF or reset the CPU module during executing the flash ROM writing.

If the power is turned OFF or the CPU module is reset to forcibly end the process, the data backed up in the flash ROM/internal memory (nonvolatile) will be lost.

Execution data backup method

- Refer to the following for the data transmission processing at the backup of the execution data.

☞ Page 665 Data transmission process

- Execution data backup can be carried out by writing the data shown in the table below to the buffer memory of Simple Motion module. The writing to the flash ROM/internal memory (nonvolatile) is executed at the time point the data is written to the buffer memory of Simple Motion module.

Setting item		Setting value	Setting details	Buffer memory address
[Cd.1]	Flash ROM write request	1	Set "1: Requests write access to flash ROM.".	5900

Refer to the following for the setting details.

☞ Page 616 Control Data

When the writing to the flash ROM/internal memory (nonvolatile) is complete, "0" will be set in "[Cd.1] Flash ROM write request" by the Simple Motion module automatically.

9.4 External Input Signal Select Function

The "external input signal select function" sets the following items for each external input signal of each axis (upper/lower stroke limit signal (FLS/RLS), proximity dog signal (DOG), and stop signal (STOP)):

[RD77MS]

Input type, input terminal, signal logic, and input filter

The function enables the assignment of external input signal of each axis to any terminals of the external input connection connector on the Simple Motion module.

[RD77GF]

Input type and signal logic

Input type/input terminal setting method

This function sets the input type and input terminal used for the external input signals used in each axis (upper/lower stroke limit signal (FLS/RLS), proximity dog signal (DOG), and stop signal (STOP)). The setting method is shown below.

Setting item		Initial value	Setting details
[Pr.116]	FLS signal selection	0001H [RD77MS] 000FH [RD77GF]	■Set with a hexadecimal. H _ _ _ _ → Input type Set the input type used as the external input signal. 0 (0000H) : Simple Motion module [RD77MS] 1 (0001H) : Servo amplifier*1 2 (0002H) : Buffer memory 3 (0003H) : Link device*2 [RD77GF] 15 (000FH) : Invalid → Input terminal*3 [RD77MS] When the input type is set with "0: Simple Motion module", set the input terminal of the external input connection connector to be used. The setting value can be set until "0AH" at RD77MS2 use. The setting is not required when the value other than "0" is set. (The setting is ignored.)
[Pr.117]	RLS signal selection	0001H [RD77MS] 000FH [RD77GF]	
[Pr.118]	DOG signal selection	0001H [RD77MS] 000FH [RD77GF]	
[Pr.119]	STOP signal selection	0002H	

*1 The setting is not available in "[Pr.119] STOP signal selection". If it is set, the error "STOP signal selection error" (error code: 1AD3H) occurs and the PLC READY signal [Y0] is not turned ON.

*2 For details, refer to the following.

☞ Page 346 Link Device External Signal Assignment Function [RD77GF]

*3 The input terminals corresponding to the setting values are shown in the following table. "00H" is set as "No setting". (The control by the external input signal is disabled.)

For details of the pin Nos., refer to "External Input Connection Connector of the RD77MS" in the following manual.

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

Setting value	Pin No.	Input terminal	Setting value	Pin No.	Input terminal
01H	1A1	SIN1	0BH	2A1	SIN11
02H	1A2	SIN2	0CH	2A2	SIN12
03H	1A3	SIN3	0DH	2A3	SIN13
04H	1A4	SIN4	0EH	2A4	SIN14
05H	1A5	SIN5	0FH	2A5	SIN15
06H	1B1	SIN6	10H	2B1	SIN16
07H	1B2	SIN7	11H	2B2	SIN17
08H	1B3	SIN8	12H	2B3	SIN18
09H	1B4	SIN9	13H	2B4	SIN19
0AH	1B5	SIN10	14H	2B5	SIN20

Point

[RD77MS]

- Set the external command signal (DI) using "[Pr.95] External command signal selection". As for the terminal of the external input connection connector of the Simple Motion module, DI No. is defined to each SIN No. in advance.
- When the input type of "[Pr.116] FLS signal selection" to "[Pr.119] STOP signal selection" is set with "0: Simple Motion module", the external input connection connector terminal of the Simple Motion module is used in duplicate with the external command signal (DI). The available range is shown below.
  RD77MS2: 1A1 to 1A5, 1B1 to 1B5
  RD77MS4/RD77MS8/RD77MS16: 1A1 to 1A5, 1B1 to 1B5, 2A1 to 2A5, 2B1 to 2B5

[RD77GF]

- When the connection with the servo amplifier is started, the consistency between "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", "[Pr.118] DOG signal selection" and the setting of the servo parameter is checked. For detail, refer to the following.
  ☞ Page 259 Hardware stroke limit function
- To specify "1: Servo amplifier" in the controller setting, it is required to set "1: Servo amplifier" in all of the "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection" and "[Pr.118] DOG signal selection". If the setting is incorrect, the error occurs in the consistency diagnostics.
- To change "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection" and "[Pr.118] DOG signal selection" after connecting with the servo amplifier, connect with the corresponding servo amplifier again after changing and execute the consistency diagnostics again. If the axis operates without the consistency diagnostics for the reconnection, the external input signal may not be input correctly.

The setting details of the input type/input terminal are shown below. [RD77MS]

Pin No.[*1]	DI No.	Definition of FLS/RLS/DOG/STOP	Pin No.[*1]	DI No.	Definition of FLS/RLS/DOG/STOP
1A1	DI1	The signal set with the input terminal setting in "[Pr.116] FLS signal selection" to "[Pr.119] STOP signal selection".	2A1	DI11	The signal set with the input terminal setting in "[Pr.116] FLS signal selection" to "[Pr.119] STOP signal selection".
1A2	DI2		2A2	DI12	
1A3	DI3		2A3	DI13	
1A4	DI4		2A4	DI14	
1A5	DI5		2A5	DI15	
1B1	DI6		2B1	DI16	
1B2	DI7		2B2	DI17	
1B3	DI8		2B3	DI18	
1B4	DI9		2B4	DI19	
1B5	DI10		2B5	DI20	

[*1] For details of the pin Nos., refer to "External Input Connection Connector of the RD77MS" in the following manual.
🕮MELSEC iQ-R Simple Motion Module User's Manual (Startup)

Set the input terminal and buffer memory No. to be used for each setting value of the "external signal selection" such as "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", "[Pr.118] DOG signal selection" and "[Pr.119] STOP signal selection".

■When "0: Simple Motion module" is set to the input type [RD77MS]

The pin No. to be used is set as the setting details (input terminal) of "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", "[Pr.118] DOG signal selection", and "[Pr.119] STOP signal selection".

■When "1: Servo amplifier" is set to the input type

The following table shows the pin No. of the external input signal of the servo amplifier to be used.

(Note): At MR-JE-B(F) use, refer to the following.

☞ Page 769 Connection with MR-JE-B(F)

Pin No. of servo amplifier[*1]	Signal name
CN3-19(DI3)	DOG
CN3-12(DI2)	RLS
CN3-2(DI1)	FLS
Buffer memory[*2]	STOP

[*1] This servo amplifier means about MR-J4-_B_(-RJ) or MR-J5-_B_(-RJ). For details, refer to the servo amplifier instruction manual or manual to be used.

[*2] The stop signal cannot be input from the external input signal of the servo amplifier. To input the stop signal, set "[Cd.44] External input signal operation device". Refer to the following for the setting details.
☞ Page 616 System control data

■When "2: Buffer memory" is set to the input type

Uses the control data shown below to operate the external input signals (upper/lower stroke limit signal, proximity dog signal, and stop signal).

Setting item		Setting value	Setting details	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.44]	External input signal operation device	→	Set the status of the upper/lower limit signal, the proximity dog signal and the stop signal.	5928 to 5931	1005928 to 1005931

Refer to the following for the setting details.

☞ Page 618 [Cd.44] External input signal operation device

■When "3: Link device" is set to the input type [RD77GF]

Refer to the following for the setting details.

☞ Page 346 Link Device External Signal Assignment Function [RD77GF]

Input logic setting method for external input signals

The signal logic can be switched according to the external input signals (upper/lower stroke limit signal (FLS/RLS), proximity dog signal (DOG), stop signal (STOP), and external command signal/switching signal (DI)) of the servo amplifier or external device connected with the Simple Motion module.

For the system that does not use the upper/lower limit signal with b-contact, this function enables the control without wiring by setting "Positive logic" to the parameter logic setting.

When using the upper/lower limit signal, be sure to use in the negative logic (b-contact).

For the interface of the logic selection, the setting area varies depending on the input type and signal type of the external signal.

The logic setting method for external input signals (upper/lower limit signal, proximity dog signal and stop signal) is shown below.

Input type of "[Pr.116] FLS signal selection" to "[Pr.119] STOP signal selection"	Signal type	Setting area
0: Simple Motion module [RD77MS]	FLS/RLS/DOG/STOP	[Pr.150] Input terminal logic selection
	Manual pulse generator	[Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection
1: Servo amplifier	FLS/RLS/DOG	[Pr.22] Input signal logic selection
2: Buffer memory	FLS/RLS/DOG/STOP	
3: Link device [RD77GF]	FLS	[Pr.913] Link device logic setting
	RLS	[Pr.923] Link device logic setting
	DOG	[Pr.933] Link device logic setting
	STOP	[Pr.943] Link device logic setting

Precautions

[RD77GF]

When the MR-J4-GF is connected, set the logic of the upper/lower limit signal (FLS/RLS) and proximity dog signal (DOG) as shown below. If the setting is incorrect, the external input signal may be detected incorrectly during the home position return or positioning operation. For the input logic specification of the servo amplifier, refer to the instruction manual of the servo amplifier to be used.

- When the external input signal of the servo amplifier is used
  Set the same value in "[Pr.22] Input signal logic selection" as the value set in the input logic setting of the servo amplifier to be connected.
- When other than the external input signal of the servo amplifier is used
  Change the servo parameter "Function selection T-3 (PT29)" to "1: Dog detection with on".

■External input signals from the servo amplifier and buffer memory (upper/lower stroke limit signal (FLS/RLS), proximity dog signal (DOG), and stop signal (STOP))

Use the following parameter to switch the logic of the external input signals from the servo amplifier and buffer memory (upper/lower stroke limit signal (FLS/RLS), proximity dog signal (DOG), and stop signal (STOP)).

Setting item		Initial value	Setting details
[Pr.22]	Input signal logic selection	0	Select the logic of the signal which is input to the Simple Motion module from the external device. 0: Negative logic 1: Positive logic (Always "0" is set to the part not used.)

Refer to the following for the setting details.

☞ Page 513 Detailed parameters1

When the external input signal of the servo amplifier is used, set the same value as the value set in the input logic setting of the servo amplifier. If the value is not same as the value of the input logic setting, the limit signal may be detected during the home position return. For the input logic specification of the servo amplifier, refer to the instruction manual of the servo amplifier to be used. [RD77GF]

■External input signals from the external device (upper/lower stroke limit signal (FLS/RLS), proximity dog signal (DOG), stop signal (STOP), and external command signal/switching signal (DI)) [RD77MS]

Use the following parameter to switch the logic of the external input signals from the external device connected with the Simple Motion module (upper/lower stroke limit signal (FLS/RLS), proximity dog signal (DOG), stop signal (STOP), and external command signal/switching signal (DI)).

Setting item		Initial value	Setting details
[Pr.150]	Input terminal logic selection	0	Select the logic for the input signal from the external device connected with the Simple Motion module. 0: ON at leading edge (When the current is flowed through the input signal terminal: ON, When the current is not flowed through the input signal terminal: OFF) 1: ON at trailing edge (When the current is flowed through the input signal terminal: OFF, When the current is not flowed through the input signal terminal: ON) [Input terminal range] RD77MS2: b0 to b9 RD77MS4/RD77MS8/RD77MS16: b0 to b19

Refer to the following for the setting details.

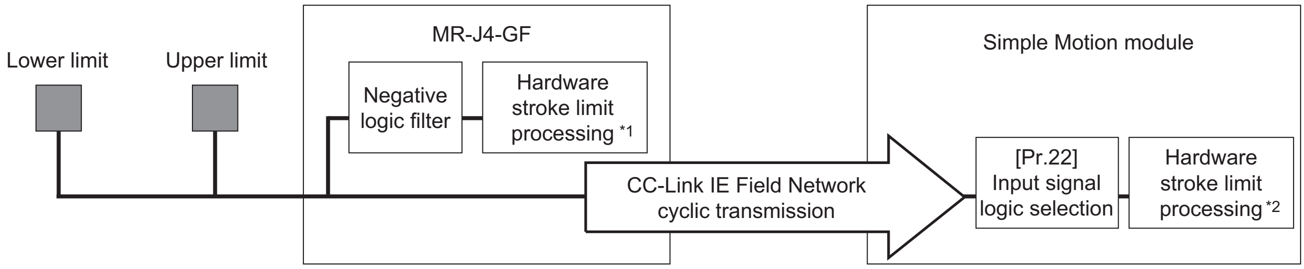
☞ Page 499 Common parameters

■External input signals when the MR-J4-GF is connected [RD77GF]

The data exchanging of the external input signal when the Simple Motion module is connected with the MR-J4-GF is shown below.

- When the external input signal of the servo amplifier is used

[The process of upper/lower limit switch (FLS/RLS) signal]



Upper/lower limit signal input	MR-J4-GF		→	Data in CC-Link IE Field Network cyclic transmission	→	Simple Motion module	
	External input signal logic	**Hardware stroke limit error detection*1**				**External input signal logic**	**Hardware stroke limit error detection*2**
ON	Negative logic (b-contact)	Detect	→	ON	→	Negative logic (b-contact)	Not detect
OFF		Not detect		OFF			Detect

*1 When the servo parameter "Function selection D-4 (PD41)" is set to "0: Stroke limit always enabled", the error stop is performed in the servo amplifier side not even during home position return.

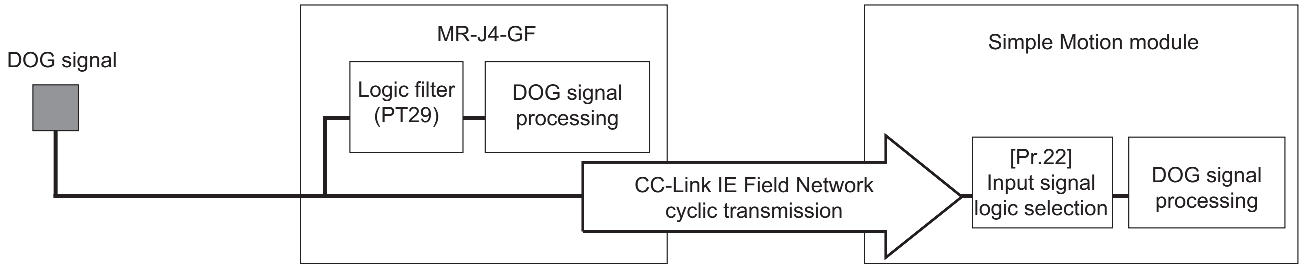
*2 The hardware stroke limit error processing is not performed in the Simple Motion module side during home position return.

Precautions

Do not establish the setting in the following cases because the operation of the servo amplifier differs from the operation of the Simple Motion module.

Upper/lower limit signal input	MR-J4-GF		→	Data in CC-Link IE Field Network cyclic transmission	→	Simple Motion module	
	External input signal logic	**Hardware stroke limit error detection**				**External input signal logic**	**Hardware stroke limit error detection**
ON	Negative logic (b-contact)	Not detect	→	ON	→	Positive logic (a-contact)	Detect
OFF		Detect		OFF			Not detect

[The process of proximity dog (DOG) signal]



Proximity dog signal input	**MR-J4-GF**		→	**Data in CC-Link IE Field Network cyclic transmission**	→	**Simple Motion module**	
	External input signal logic (PT29)	**Processing with proximity dog signal detection**				**External input signal logic**	**Processing with proximity dog signal detection**
ON	0: Dog detection with off	Not proceed	→	ON	→	Positive logic	Not proceed
	1: Dog detection with on	Proceed				Negative logic	Proceed
OFF	0: Dog detection with off	Proceed		OFF		Positive logic	Proceed
	1: Dog detection with on	Not proceed				Negative logic	Not proceed

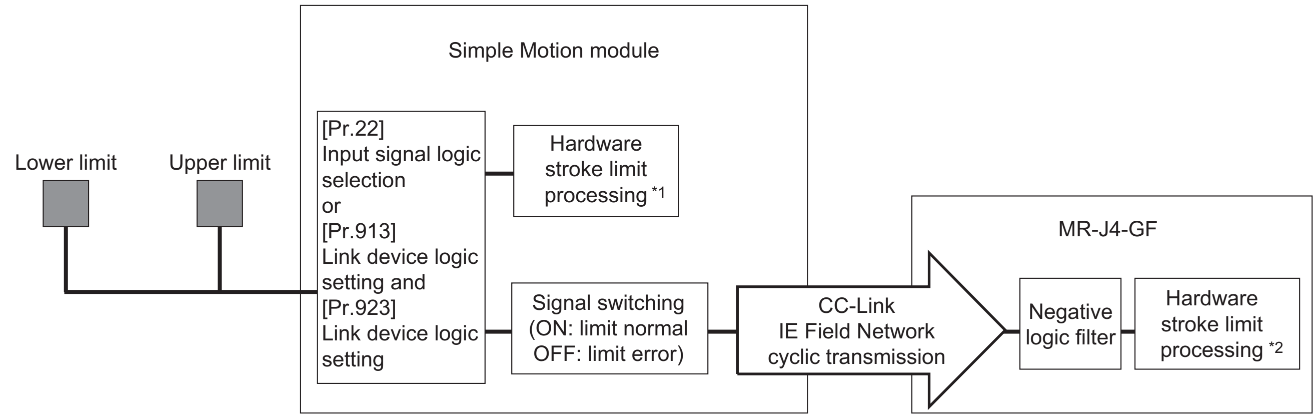
Precautions

Do not establish the setting in the following cases because the operation of the servo amplifier differs from the operation of the Simple Motion module.

Proximity dog signal input	**MR-J4-GF**		→	**Data in CC-Link IE Field Network cyclic transmission**	→	**Simple Motion module**	
	External input signal logic (PT29)	**Processing with proximity dog signal detection**				**External input signal logic**	**Processing with proximity dog signal detection**
ON	0: Dog detection with off	Not proceed	→	ON	→	Negative logic	Proceed
	1: Dog detection with on	Proceed				Positive logic	Not proceed
OFF	0: Dog detection with off	Proceed		OFF		Negative logic	Not proceed
	1: Dog detection with on	Not proceed				Positive logic	Proceed

- When other than the external input signal of the servo amplifier is used

[The process of upper/lower limit switch (FLS/RLS) signal]

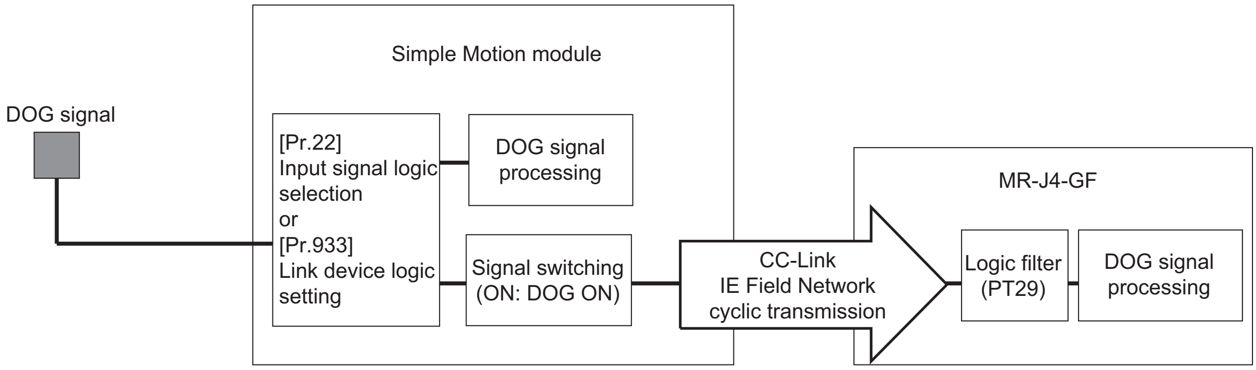


Upper/lower limit signal input	**Simple Motion module**		→	**Data in CC-Link IE Field Network cyclic transmission**	→	**MR-J4-GF**	
	External input signal logic	**Hardware stroke limit error detection*1**				**External input signal logic**	**Hardware stroke limit error detection*2**
ON	Negative logic (b-contact)	Not detect	→	ON	→	Negative logic (b-contact)	Not detect
	Positive logic (a-contact)	Detect		OFF			Detect
OFF	Negative logic (b-contact)	Detect		OFF			Detect
	Positive logic (a-contact)	Not detect		ON			Not detect

*1 The hardware stroke limit error processing is not performed in the Simple Motion module side during home position return.

*2 When the servo parameter "Function selection D-4 (PD41)" is set to "0: Stroke limit always enabled", the error stop is performed in the servo amplifier side not even during home position return.

[The process of proximity dog (DOG) signal]



Proximity dog signal input	**Simple Motion module**		**→**	**Data in CC-Link IE Field Network cyclic transmission**	**→**	**MR-J4-GF**	
	External input signal logic	**Processing with proximity dog signal detection**				**External input signal logic (PT29)**	**Processing with proximity dog signal detection**
ON	Negative logic	Proceed	→	ON	→	1: Dog detection with on	Proceed
	Positive logic	Not proceed		OFF			Not proceed
OFF	Negative logic	Not proceed		OFF			Not proceed
	Positive logic	Proceed		ON			Proceed

Precautions

Do not establish the setting in the following cases because the operation of the servo amplifier differs from the operation of the Simple Motion module.

Proximity dog signal input	**Simple Motion module**		**→**	**Data in CC-Link IE Field Network cyclic transmission**	**→**	**MR-J4-GF**	
	External input signal logic	**Processing with proximity dog signal detection**				**External input signal logic (PT29)**	**Processing with proximity dog signal detection**
ON	Negative logic	Proceed	→	ON	→	0: Dog detection with off	Not proceed
	Positive logic	Not proceed		OFF			Proceed
OFF	Negative logic	Not proceed		OFF			Proceed
	Positive logic	Proceed		ON			Not proceed

■External input signals and external command signals via link device [RD77GF]

Use the following parameters to switch the logic for inputting various external input signals and external command signals from link devices of the CC-Link IE Field Network. [RD77GF]

Signal type	Setting item		Initial value	Setting details
External input signals	[Pr.903]	Forced stop signal (EMI): Link device logic setting	0	Select the logic for the input signal from the external device connected with the Simple Motion module. 0: Negative logic 1: Positive logic
	[Pr.913]	Upper limit signal (FLS): Link device logic setting		
	[Pr.923]	Lower limit signal (RLS): Link device logic setting		
	[Pr.933]	Proximity dog signal (DOG): Link device logic setting		
	[Pr.943]	Stop signal (STOP): Link device logic setting		
External command signals	[Pr.953]	External positioning start request: Link device logic setting		
	[Pr.963]	External speed change request: Link device logic setting		
	[Pr.973]	Skip request: Link device logic setting		
	[Pr.983]	Speed-position control switching request: Link device logic setting		
	[Pr.993]	Main shaft clutch control request: Link device logic setting		
	[Pr.1003]	Auxiliary shaft clutch control request: Link device logic setting		
	[Pr.1013]	Synchronous encoder axis start request: Link device logic setting		
	[Pr.1023]	Block No.7000 start request: Link device logic setting		
	[Pr.1033]	Block No.7001 start request: Link device logic setting		
	[Pr.1043]	Block No.7002 start request: Link device logic setting		
	[Pr.1053]	Block No.7003 start request: Link device logic setting		
	[Pr.1063]	Block No.7004 start request: Link device logic setting		
	[Pr.811]	Mark detection signal detection direction setting		Set the signal detection direction. 0: Rising detection 1: Falling detection

Refer to the following for the setting details.

☞ Page 496 Basic Setting

■Manual pulse generator/Incremental synchronous encoder input [RD77MS]

Use the following parameter to switch the external input signal logic for the manual pulse generator/incremental synchronous encoder.

Setting item		Initial value	Setting details
[Pr.151]	Manual pulse generator/ Incremental synchronous encoder input logic selection	0	Select the input signal logic to the Simple Motion module from the manual pulse generator/incremental synchronous encoder. 0: Negative logic 1: Positive logic

Refer to the following for the setting details.

☞ Page 496 Basic Setting

■Precautions on parameter setting

- The logic switching parameters are validated when the PLC READY signal [Y0] is turned OFF to ON. (The logic is negative right after power-on.)
- If the logic of each signal is set erroneously, the operation may not be carried out correctly. Before setting, check the specifications of the equipment to be used.

Input filter setting method for external input signals

The input filter is used to suppress chattering when the external input signal is chattering by noise, etc.

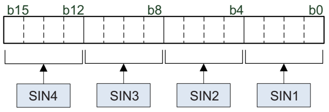
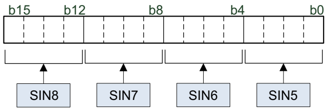
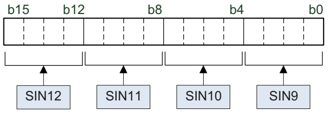
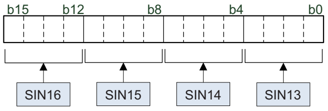
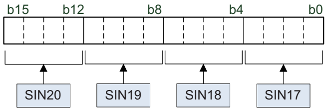
The setting area of the input filter varies by the input type of "[Pr.116] FLS signal selection" to "[Pr.119] STOP signal selection".

Input type of "[Pr.116] FLS signal selection" to "[Pr.119] STOP signal selection"	Setting area
0: Simple Motion module [RD77MS]	[Pr.153] External input signal digital filter setting
1: Servo amplifier	Servo parameter "Input filter setting (PD11)[*1]"
2: Buffer memory	No setting (No input filter when the buffer memory is set.)
3: Link device [RD77GF]	Set at the slave station side

[*1] Refer to the instruction manual or manual of the servo amplifier to be used.

■External input signals from the external device connected with the Simple Motion module (upper/lower stroke limit signal (FLS/RLS), proximity dog signal (DOG), stop signal (STOP), and external command signal/switching signal (DI)) [RD77MS]

Use the following parameter to set the input filter of the external input signals from the external device connected with the Simple Motion module (upper/lower stroke limit signal (FLS/RLS), proximity dog signal (DOG), stop signal (STOP), and external command signal/switching signal (DI)).

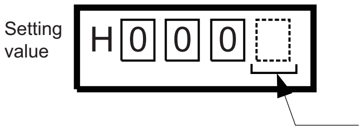
Setting item		Initial value	Setting details		
[Pr.153]	External input signal digital filter setting	6666H	Filter setting 1		0H: 3.2 ms 1H: 2.4 ms 2H: 1.6 ms 3H: 1.2 ms 4H: 0.8 ms 5H: 0.4 ms 6H: 0.2 ms
			Filter setting 2		
			Filter setting 3		
			Filter setting 4		
			Filter setting 5		

Precautions

- "[Pr.153] External input signal digital filter setting" is not a parameter for each axis.
- "[Pr.153] External input signal digital filter setting" becomes valid when the power supply is turned ON, the CPU module is reset, or the PLC READY signal [Y0] is turned ON.
- When lengthening the filter setting time, the signal detection timing will be slow.
- When "[Pr.153] External input signal digital filter setting" is set with a value other than "0 to 6", note that the module may cause a failure.

■External input signals from the servo amplifier (upper/lower stroke limit signal (FLS/RLS) and proximity dog signal (DOG))

Use the following parameter to set the input filter of the external input signals from the servo amplifier (upper/lower stroke limit signal (FLS/RLS) and proximity dog signal (DOG)).

Setting item		Initial value	Setting details
PD11	Input filter setting	4H	■Set with a hexadecimal.  ● Input filter setting 0H: None 1H: 0.888 ms 2H: 1.777 ms 3H: 2.666 ms 4H: 3.555 ms

The description is for the MR-J4-_B_(-RJ). Refer to the instruction manual of the servo amplifier to be used for details.

Precautions

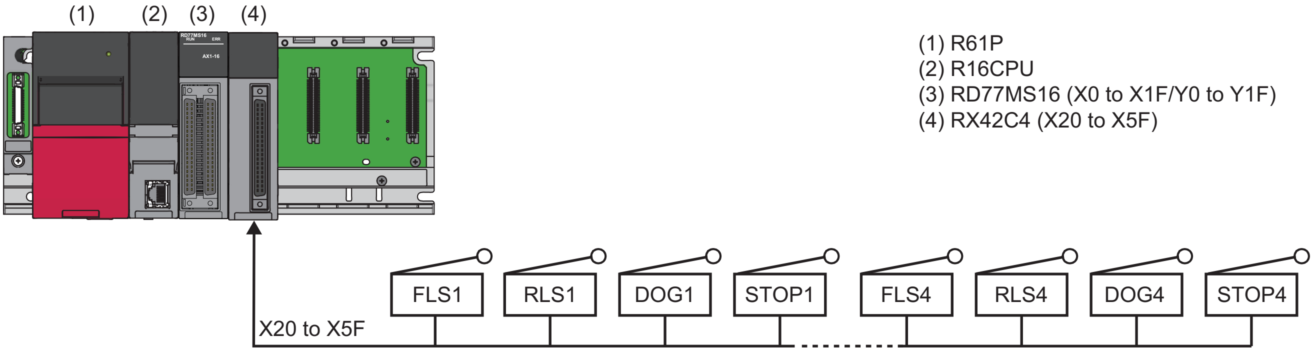
- The servo parameter is transferred from the Simple Motion module to the servo amplifier after the power supply is turned ON or the CPU module is reset.
- The input filter setting of the servo parameter (PD11) becomes valid when the power supply of the servo amplifier is turned ON from OFF. After executing the above process, turn the power supply of the servo amplifier ON from OFF and turn the power supply of the system or reset the CPU module again.

Program

The following shows the program example to operate "[Cd.44] External input signal operation device" of axis 1, axis 4, axis 8, and axis 16 using the limit switch connected to the input module when "2: Buffer memory" is set in "[Pr.116] FLS signal selection" to "[Pr.119] STOP signal selection".

■System configuration

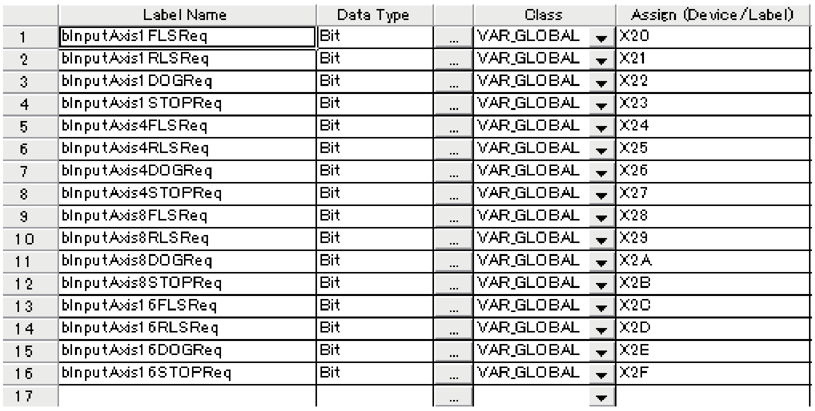
The following figure shows the system configuration used for the program examples.



(1) R61P
(2) R16CPU
(3) RD77MS16 (X0 to X1F/Y0 to Y1F)
(4) RX42C4 (X20 to X5F)

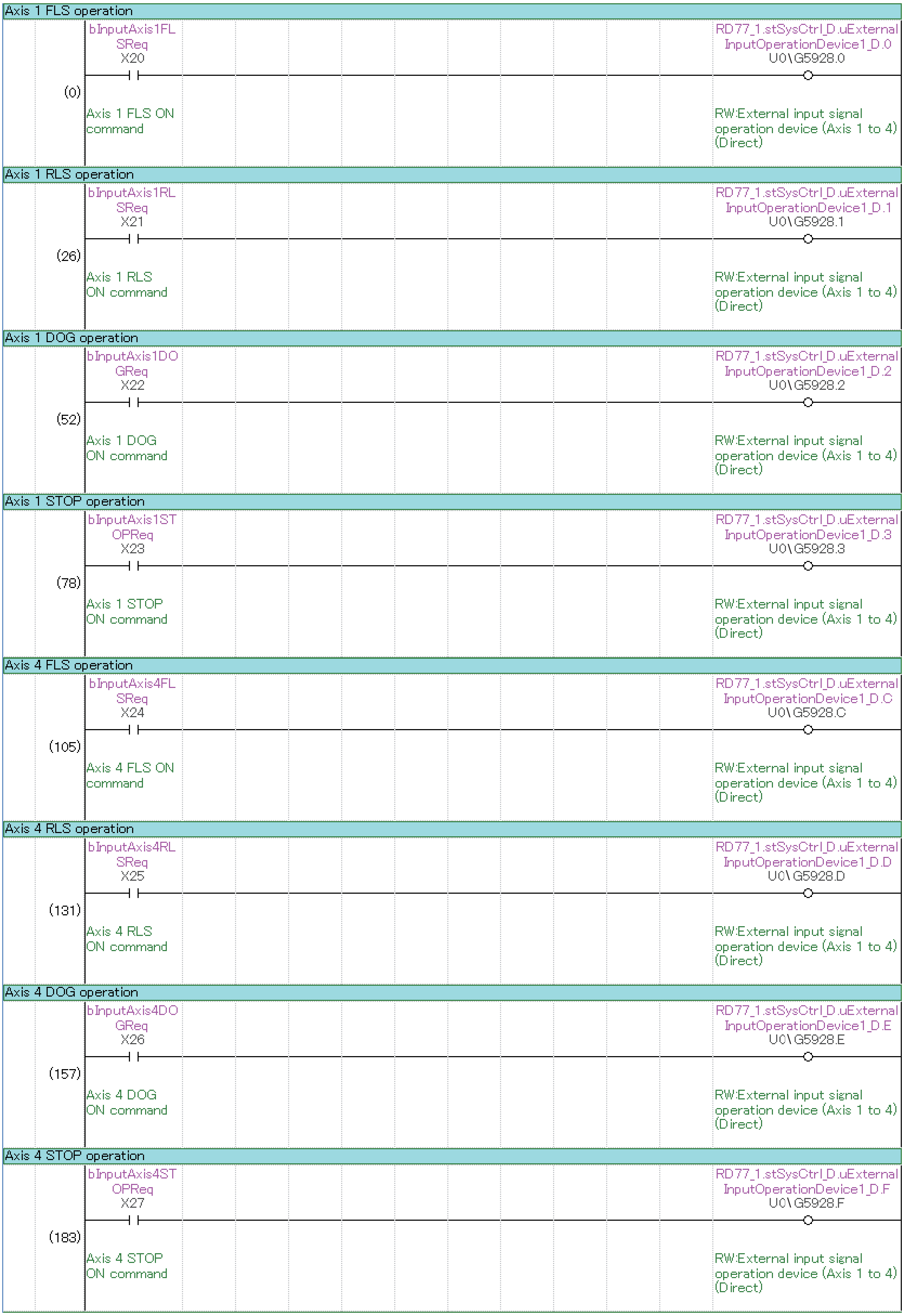
■List of labels to be used

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

Classification	Label name	Description
Module label	RD77_1.stSysCtrl_D.uExternalInputOperationDevice1_D.0	Axis 1 FLS
	RD77_1.stSysCtrl_D.uExternalInputOperationDevice1_D.1	Axis 1 RLS
	RD77_1.stSysCtrl_D.uExternalInputOperationDevice1_D.2	Axis 1 DOG
	RD77_1.stSysCtrl_D.uExternalInputOperationDevice1_D.3	Axis 1 STOP
	RD77_1.stSysCtrl_D.uExternalInputOperationDevice1_D.C	Axis 4 FLS
	RD77_1.stSysCtrl_D.uExternalInputOperationDevice1_D.D	Axis 4 RLS
	RD77_1.stSysCtrl_D.uExternalInputOperationDevice1_D.E	Axis 4 DOG
	RD77_1.stSysCtrl_D.uExternalInputOperationDevice1_D.F	Axis 4 STOP
	RD77_1.stSysCtrl_D.uExternalInputOperationDevice2_D.C	Axis 8 FLS
	RD77_1.stSysCtrl_D.uExternalInputOperationDevice2_D.D	Axis 8 RLS
	RD77_1.stSysCtrl_D.uExternalInputOperationDevice2_D.E	Axis 8 DOG
	RD77_1.stSysCtrl_D.uExternalInputOperationDevice2_D.F	Axis 8 STOP
	RD77_1.stSysCtrl_D.uExternalInputOperationDevice4_D.C	Axis 16 FLS
	RD77_1.stSysCtrl_D.uExternalInputOperationDevice4_D.D	Axis 16 RLS
	RD77_1.stSysCtrl_D.uExternalInputOperationDevice4_D.E	Axis 16 DOG
	RD77_1.stSysCtrl_D.uExternalInputOperationDevice4_D.F	Axis 16 STOP
Global label	Defines the global labels to set the assignment device as follows. 	

	Label Name	Data Type		Class	Assign (Device/Label)
1	bInputAxis1FLSReq	Bit	...	VAR_GLOBAL	X20
2	bInputAxis1RLSReq	Bit	...	VAR_GLOBAL	X21
3	bInputAxis1DOGReq	Bit	...	VAR_GLOBAL	X22
4	bInputAxis1STOPReq	Bit	...	VAR_GLOBAL	X23
5	bInputAxis4FLSReq	Bit	...	VAR_GLOBAL	X24
6	bInputAxis4RLSReq	Bit	...	VAR_GLOBAL	X25
7	bInputAxis4DOGReq	Bit	...	VAR_GLOBAL	X26
8	bInputAxis4STOPReq	Bit	...	VAR_GLOBAL	X27
9	bInputAxis8FLSReq	Bit	...	VAR_GLOBAL	X28
10	bInputAxis8RLSReq	Bit	...	VAR_GLOBAL	X29
11	bInputAxis8DOGReq	Bit	...	VAR_GLOBAL	X2A
12	bInputAxis8STOPReq	Bit	...	VAR_GLOBAL	X2B
13	bInputAxis16FLSReq	Bit	...	VAR_GLOBAL	X2C
14	bInputAxis16RLSReq	Bit	...	VAR_GLOBAL	X2D
15	bInputAxis16DOGReq	Bit	...	VAR_GLOBAL	X2E
16	bInputAxis16STOPReq	Bit	...	VAR_GLOBAL	X2F
17			...		

Program example



Axis 1 FLS operation

(0)
bInputAxis1FLSReq X20 — Axis 1 FLS ON command
RD77_1.stSysCtrl_D.uExternalInputOperationDevice1_D.0 U0\G5928.0 — RW:External input signal operation device (Axis 1 to 4)(Direct)

Axis 1 RLS operation

(26)
bInputAxis1RLSReq X21 — Axis 1 RLS ON command
RD77_1.stSysCtrl_D.uExternalInputOperationDevice1_D.1 U0\G5928.1 — RW:External input signal operation device (Axis 1 to 4)(Direct)

Axis 1 DOG operation

(52)
bInputAxis1DOGReq X22 — Axis 1 DOG ON command
RD77_1.stSysCtrl_D.uExternalInputOperationDevice1_D.2 U0\G5928.2 — RW:External input signal operation device (Axis 1 to 4)(Direct)

Axis 1 STOP operation

(78)
bInputAxis1STOPReq X23 — Axis 1 STOP ON command
RD77_1.stSysCtrl_D.uExternalInputOperationDevice1_D.3 U0\G5928.3 — RW:External input signal operation device (Axis 1 to 4)(Direct)

Axis 4 FLS operation

(105)
bInputAxis4FLSReq X24 — Axis 4 FLS ON command
RD77_1.stSysCtrl_D.uExternalInputOperationDevice1_D.C U0\G5928.C — RW:External input signal operation device (Axis 1 to 4)(Direct)

Axis 4 RLS operation

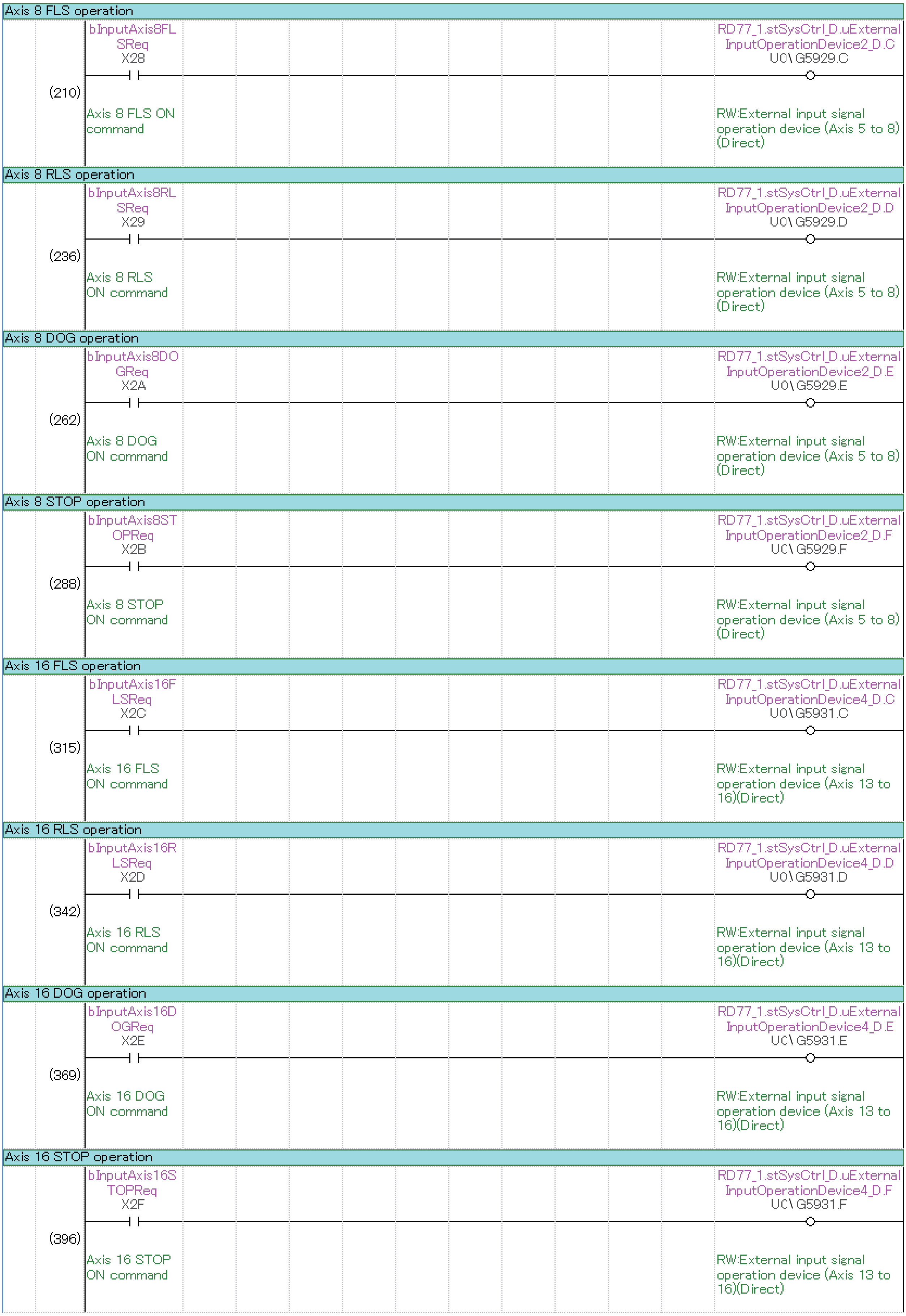
(131)
bInputAxis4RLSReq X25 — Axis 4 RLS ON command
RD77_1.stSysCtrl_D.uExternalInputOperationDevice1_D.D U0\G5928.D — RW:External input signal operation device (Axis 1 to 4)(Direct)

Axis 4 DOG operation

(157)
bInputAxis4DOGReq X26 — Axis 4 DOG ON command
RD77_1.stSysCtrl_D.uExternalInputOperationDevice1_D.E U0\G5928.E — RW:External input signal operation device (Axis 1 to 4)(Direct)

Axis 4 STOP operation

(183)
bInputAxis4STOPReq X27 — Axis 4 STOP ON command
RD77_1.stSysCtrl_D.uExternalInputOperationDevice1_D.F U0\G5928.F — RW:External input signal operation device (Axis 1 to 4)(Direct)



Axis 8 FLS operation

(210) bInputAxis8FLSReq X28 — RD77_1.stSysCtrl_D.uExternalInputOperationDevice2_D.C U0\G5929.C

Axis 8 FLS ON command — RW:External input signal operation device (Axis 5 to 8)(Direct)

Axis 8 RLS operation

(236) bInputAxis8RLSReq X29 — RD77_1.stSysCtrl_D.uExternalInputOperationDevice2_D.D U0\G5929.D

Axis 8 RLS ON command — RW:External input signal operation device (Axis 5 to 8)(Direct)

Axis 8 DOG operation

(262) bInputAxis8DOGReq X2A — RD77_1.stSysCtrl_D.uExternalInputOperationDevice2_D.E U0\G5929.E

Axis 8 DOG ON command — RW:External input signal operation device (Axis 5 to 8)(Direct)

Axis 8 STOP operation

(288) bInputAxis8STOPReq X2B — RD77_1.stSysCtrl_D.uExternalInputOperationDevice2_D.F U0\G5929.F

Axis 8 STOP ON command — RW:External input signal operation device (Axis 5 to 8)(Direct)

Axis 16 FLS operation

(315) bInputAxis16FLSReq X2C — RD77_1.stSysCtrl_D.uExternalInputOperationDevice4_D.C U0\G5931.C

Axis 16 FLS ON command — RW:External input signal operation device (Axis 13 to 16)(Direct)

Axis 16 RLS operation

(342) bInputAxis16RLSReq X2D — RD77_1.stSysCtrl_D.uExternalInputOperationDevice4_D.D U0\G5931.D

Axis 16 RLS ON command — RW:External input signal operation device (Axis 13 to 16)(Direct)

Axis 16 DOG operation

(369) bInputAxis16DOGReq X2E — RD77_1.stSysCtrl_D.uExternalInputOperationDevice4_D.E U0\G5931.E

Axis 16 DOG ON command — RW:External input signal operation device (Axis 13 to 16)(Direct)

Axis 16 STOP operation

(396) bInputAxis16STOPReq X2F — RD77_1.stSysCtrl_D.uExternalInputOperationDevice4_D.F U0\G5931.F

Axis 16 STOP ON command — RW:External input signal operation device (Axis 13 to 16)(Direct)

9.5 Link Device External Signal Assignment Function [RD77GF]

This function assigns link devices to the external signals of the Simple Motion module. Signals such as the upper/lower limit signal and proximity dog signal can be assigned to link devices.

Signals that can be assigned

The following signals used in the Simple Motion module can be assigned to the link devices of the CC-Link IE Field Network. Multiple external signals can be assigned to the same link device.

■Bit device

- External input signal

○: Setting possible ×: Setting not possible

External signal	RX			RY			RWr			RWw			Settable points
	1 bit	1 word	2 words	1 bit	1 word	2 words	1 bit	1 word	2 words	1 bit	1 word	2 words	
Forced stop signal (EMI)	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 module[1]
Upper limit signal (FLS)	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis
Lower limit signal (RLS)	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis
Proximity dog signal (DOG)	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis
Stop signal (STOP)	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis

*1 Only the setting value for the axis 1 is valid.

- External command signal

○: Setting possible ×: Setting not possible

External signal	RX			RY			RWr			RWw			Settable points
	1 bit	1 word	2 words	1 bit	1 word	2 words	1 bit	1 word	2 words	1 bit	1 word	2 words	
External positioning start request	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis
External speed change request	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis
Skip request	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis
Speed-position control switching request[*1]	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis
Main shaft clutch control request[*1]	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis
Auxiliary shaft clutch control request[*1]	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis
Synchronous encoder axis start request[*1]	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis
Block No.7000 start request[*2]	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis
Block No.7001 start request[*2]	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis
Block No.7002 start request[*2]	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis
Block No.7003 start request[*2]	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis
Block No.7004 start request[*2]	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis
Input signal for mark detection[*1*3]	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 mark detection setting

*1 The high-accuracy processing is executed with these signals using synchronous input timing information only when the following conditions are satisfied. When the following conditions are not satisfied, the processing is performed with the link scan cycle. For the synchronous input timing acquisition function, refer to the following.
📖CC-Link IE Field Network Remote I/O Module User's Manual
[Conditions for high-accuracy processing]
- RX of the remote input module that supports the "synchronous input timing acquisition function" is assigned.
- The synchronous input timing acquisition function is enabled.
- Link refresh is executed for the synchronous input timing information of the input signal used.

*2 The block start can be executed from any link device directly by using the signals for block No.7000 to 7004 start.
☞ Page 20 Start

*3 The input signal for mark detection is set with mark detection parameters. For details, refer to the following.
☞ Page 377 Mark Detection Function

■Word device

- External input signal

○: Setting possible ×: Setting not possible

External signal	RX			RY			RWr			RWw			Settable points
	1 bit	1 word	2 words	1 bit	1 word	2 words	1 bit	1 word	2 words	1 bit	1 word	2 words	
Manual pulse generator input[*1]	×	○	○	×	○	○	×	○	○	×	○	○	1 point/1 axis
Synchronous encoder input[*1]	×	○	○	×	○	○	×	○	○	×	○	○	1 point/1 axis

*1 When RX or RY is assigned, the setting must be configured in increments of 16 points.

Operation when a data link error occurs during communication

■Bit device

Signals turn OFF regardless of the logic setting.

■Word device

Manual pulse generator operation: When manual pulse generator operation start is in operation, the operation stops.

Synchronous encoder axis: When the axis is on counter enabling status, it is changed to counter disabling status.

Setting method

Set this function with link device external signal assignment parameters. The setting becomes valid when the PLC READY signal [Y0] is turned ON.

Monitoring method

The input status of each bit device signal can be monitored with the following signals.

- External input signal

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Monitor item		**Storage details**	**Buffer memory address**	
			Axis 1 to axis 16	**Axis 17 to axis 32**
[Md.30]	External input signal	Stores the states (ON/OFF) of the external input signal. • Upper limit signal (FLS) • Lower limit signal (RLS) • Proximity dog signal (DOG) • Stop signal (STOP)	2416+100n	1002416+100n
[Md.50]	Forced stop input	Stores the states (ON/OFF) of the forced stop input (EMI).	4231	

- External command signal

j: Synchronous encoder axis No. - 1 (j: Axis No. - 17 for axis 17 to axis 32)

k: Mark detection setting No. - 1

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Monitor item		**Storage details**	**Buffer memory address**	
			Axis 1 to axis 16	**Axis 17 to axis 32**
[Md.325]	Synchronous encoder axis status	b6: Start request flag	35210+20j	1035210+20j
[Md.802]	Mark detection signal monitor	Monitors the state (ON/OFF) of the mark detection signal.	54961+80k	
[Md.900]	External command signal monitor	Monitors the status of the external command signals assigned to link devices. • b0: External positioning start request flag • b1: External speed change request flag • b2: Skip request flag • b3: Speed-position control switching request flag • b4: Main shaft clutch control request flag • b5: Auxiliary shaft clutch control request flag • b7: Block No.7000 start request flag • b8: Block No.7001 start request flag • b9: Block No.7002 start request flag • b10: Block No.7003 start request flag • b11: Block No.7004 start request flag	59328+100n	1059328+100n

Related buffer memory areas

Each external signal can be assigned by setting the following buffer memory areas. Assigning the forced stop signal (EMI) is valid only for the setting value of the axis 1.

■For bit device setting

- Link device type

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting details/setting value	Initial value	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Pr.900]	Forced stop signal (EMI): Link device type	Set link device type for use. 11H: RX (1 bit) 12H: RY (1 bit) 13H: RWr (1 bit) 14H: RWw (1 bit) Others: Invalid Fetch cycle: PLC READY signal [Y0] OFF to ON	0	440000+320n	1440000+320n
[Pr.910]	Upper limit signal (FLS): Link device type		0	440010+320n	1440010+320n
[Pr.920]	Lower limit signal (RLS): Link device type		0	440020+320n	1440020+320n
[Pr.930]	Proximity dog signal (DOG): Link device type		0	440030+320n	1440030+320n
[Pr.940]	Stop signal (STOP): Link device type		0	440040+320n	1440040+320n
[Pr.950]	External positioning start request: Link device type		0	440050+320n	1440050+320n
[Pr.960]	External speed change request: Link device type		0	440060+320n	1440060+320n
[Pr.970]	Skip request: Link device type		0	440070+320n	1440070+320n
[Pr.980]	Speed-position control switching request: Link device type		0	440080+320n	1440080+320n
[Pr.990]	Main shaft clutch control request: Link device type		0	440090+320n	1440090+320n
[Pr.1000]	Auxiliary shaft clutch control request: Link device type		0	440100+320n	1440100+320n
[Pr.1020]	Block No.7000 start request: Link device type		0	440120+320n	1440120+320n
[Pr.1030]	Block No.7001 start request: Link device type		0	440130+320n	1440130+320n
[Pr.1040]	Block No.7002 start request: Link device type		0	440140+320n	1440140+320n
[Pr.1050]	Block No.7003 start request: Link device type		0	440150+320n	1440150+320n
[Pr.1060]	Block No.7004 start request: Link device type		0	440160+320n	1440160+320n

- Link device start No.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting details/setting value	Initial value	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Pr.901]	Forced stop signal (EMI): Link device start No.	Set link device type for use. If the setting value is outside the setting range, the error "Outside link device start No. range" (error code: 1CC0H) occurs and the corresponding external signal becomes invalid. Fetch cycle: PLC READY signal [Y0] OFF to ON	0	440001+320n	1440001+320n
[Pr.911]	Upper limit signal (FLS): Link device start No.		0	440011+320n	1440011+320n
[Pr.921]	Lower limit signal (RLS): Link device start No.		0	440021+320n	1440021+320n
[Pr.931]	Proximity dog signal (DOG): Link device start No.		0	440031+320n	1440031+320n
[Pr.941]	Stop signal (STOP): Link device start No.		0	440041+320n	1440041+320n
[Pr.951]	External positioning start request: Link device start No.		0	440051+320n	1440051+320n
[Pr.961]	External speed change request: Link device start No.		0	440061+320n	1440061+320n
[Pr.971]	Skip request: Link device start No.		0	440071+320n	1440071+320n
[Pr.981]	Speed-position control switching request: Link device start No.		0	440081+320n	1440081+320n
[Pr.991]	Main shaft clutch control request: Link device start No.		0	440091+320n	1440091+320n
[Pr.1001]	Auxiliary shaft clutch control request: Link device start No.		0	440101+320n	1440101+320n
[Pr.1021]	Block No.7000 start request: Link device start No.		0	440121+320n	1440121+320n
[Pr.1031]	Block No.7001 start request: Link device start No.		0	440131+320n	1440131+320n
[Pr.1041]	Block No.7002 start request: Link device start No.		0	440141+320n	1440141+320n
[Pr.1051]	Block No.7003 start request: Link device start No.		0	440151+320n	1440151+320n
[Pr.1061]	Block No.7004 start request: Link device start No.		0	440161+320n	1440161+320n

- Link device bit specification

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting details/setting value**	**Initial value**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Pr.902]	Forced stop signal (EMI): Link device bit specification	Set the bit No. that used in occasion when "13H: RWr (1 bit)" and "14H: RWw (1 bit)" had been set to link device type. Setting range: 00H to 1FH If the setting value is outside the setting range, the error "Outside the link device bit specification range" (error code: 1CC1H) occurs and the corresponding external signal becomes invalid. Fetch cycle: PLC READY signal [Y0] OFF to ON	0	440002+320n	1440002+320n
[Pr.912]	Upper limit signal (FLS): Link device bit specification		0	440012+320n	1440012+320n
[Pr.922]	Lower limit signal (RLS): Link device bit specification		0	440022+320n	1440022+320n
[Pr.932]	Proximity dog signal (DOG): Link device bit specification		0	440032+320n	1440032+320n
[Pr.942]	Stop signal (STOP): Link device bit specification		0	440042+320n	1440042+320n
[Pr.952]	External positioning start request: Link device bit specification		0	440052+320n	1440052+320n
[Pr.962]	External speed change request: Link device bit specification		0	440062+320n	1440062+320n
[Pr.972]	Skip request: Link device bit specification		0	440072+320n	1440072+320n
[Pr.982]	Speed-position control switching request: Link device bit specification		0	440082+320n	1440082+320n
[Pr.992]	Main shaft clutch control request: Link device bit specification		0	440092+320n	1440092+320n
[Pr.1002]	Auxiliary shaft clutch control request: Link device bit specification		0	440102+320n	1440102+320n
[Pr.1022]	Block No.7000 start request: Link device bit specification		0	440122+320n	1440122+320n
[Pr.1032]	Block No.7001 start request: Link device bit specification		0	440132+320n	1440132+320n
[Pr.1042]	Block No.7002 start request: Link device bit specification		0	440142+320n	1440142+320n
[Pr.1052]	Block No.7003 start request: Link device bit specification		0	440152+320n	1440152+320n
[Pr.1062]	Block No.7004 start request: Link device bit specification		0	440162+320n	1440162+320n

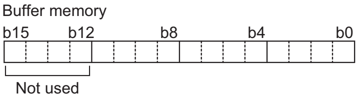
- Link device logic setting

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting details/setting value**	**Initial value**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Pr.903]	Forced stop signal (EMI): Link device logic setting	Set the logic for assignment signal. Only the setting of b0 is effective. 0: Negative logic The link device status and signal status are not inverted. When the link device is set to 0, the corresponding signal is set to 0. When the link device is set to 1, the corresponding signal is set to 1. 1: Positive logic The link device status and signal status are inverted. When the link device is set to 0, the corresponding signal is set to 1. When the link device is set to 1, the corresponding signal is set to 0. Fetch cycle: PLC READY signal [Y0] OFF to ON	0	440003+320n	1440003+320n
[Pr.913]	Upper limit signal (FLS): Link device logic setting		0	440013+320n	1440013+320n
[Pr.923]	Lower limit signal (RLS): Link device logic setting		0	440023+320n	1440023+320n
[Pr.933]	Proximity dog signal (DOG): Link device logic setting		0	440033+320n	1440033+320n
[Pr.943]	Stop signal (STOP): Link device logic setting		0	440043+320n	1440043+320n
[Pr.953]	External positioning start request: Link device logic setting		0	440053+320n	1440053+320n
[Pr.963]	External speed change request: Link device logic setting		0	440063+320n	1440063+320n
[Pr.973]	Skip request: Link device logic setting		0	440073+320n	1440073+320n
[Pr.983]	Speed-position control switching request: Link device logic setting		0	440083+320n	1440083+320n
[Pr.993]	Main shaft clutch control request: Link device logic setting		0	440093+320n	1440093+320n
[Pr.1003]	Auxiliary shaft clutch control request: Link device logic setting		0	440103+320n	1440103+320n
[Pr.1023]	Block No.7000 start request: Link device logic setting		0	440123+320n	1440123+320n
[Pr.1033]	Block No.7001 start request: Link device logic setting		0	440133+320n	1440133+320n
[Pr.1043]	Block No.7002 start request: Link device logic setting		0	440143+320n	1440143+320n
[Pr.1053]	Block No.7003 start request: Link device logic setting		0	440153+320n	1440153+320n
[Pr.1063]	Block No.7004 start request: Link device logic setting		0	440163+320n	1440163+320n

■For bit device monitor

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

<table>
<tr><th colspan="2" rowspan="2">Storage item</th><th rowspan="2">Storage details/Storage value</th><th rowspan="2">Initial value</th><th colspan="2">Buffer memory address</th></tr>
<tr><th>Axis 1 to axis 16</th><th>Axis 17 to axis 32</th></tr>
<tr><td>[Md.900]</td><td>External command signal monitor</td><td>Monitors the status of the external command signals assigned to link devices.

<table>
<tr><th colspan="2">Storage item</th><th>Meaning</th></tr>
<tr><td>b0</td><td>External positioning start request flag</td><td>0: Signal status OFF/No link device assigned
1: Signal status ON</td></tr>
<tr><td>b1</td><td>External speed change request flag</td><td></td></tr>
<tr><td>b2</td><td>Skip request flag</td><td></td></tr>
<tr><td>b3</td><td>Speed-position control switching request flag</td><td></td></tr>
<tr><td>b4</td><td>Main shaft clutch control request flag</td><td></td></tr>
<tr><td>b5</td><td>Auxiliary shaft clutch control request flag</td><td></td></tr>
<tr><td>b6</td><td>Not used</td><td></td></tr>
<tr><td>b7</td><td>Block No.7000 start request flag</td><td></td></tr>
<tr><td>b8</td><td>Block No.7001 start request flag</td><td></td></tr>
<tr><td>b9</td><td>Block No.7002 start request flag</td><td></td></tr>
<tr><td>b10</td><td>Block No.7003 start request flag</td><td></td></tr>
<tr><td>b11</td><td>Block No.7004 start request flag</td><td></td></tr>
</table>
The status of the signals to which the link device logic setting is reflected is stored.
Refresh cycle: Operation cycle</td><td>0</td><td>59328+100n</td><td>1059328+100n</td></tr>
</table>

■For word device setting

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting details/setting value	Initial value	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Pr.700]	Manual pulse generator input: Link device type	Set link device type for use. 21H: RX (1 word) 22H: RY (1 word) 23H: RWr (1 word) 24H: RWw (1 word) 31H: RX (2 words) 32H: RY (2 words) 33H: RWr (2 words) 34H: RWw (2 words) Others: Invalid Fetch cycle: PLC READY signal [Y0] OFF to ON	0	450240+100n	1450240+100n
[Pr.701]	Manual pulse generator input: Link device start No.	Set link device No. for use. If the setting value is outside the setting range, the error "Outside link device start No. range" (error code: 1CC0H) occurs and the corresponding external signal becomes invalid. Fetch cycle: PLC READY signal [Y0] OFF to ON	0	450241+100n	1450241+100n
[Pr.702]	Manual pulse generator input: Link device count direction setting	Set the relationship between link device count direction and assignment signal count direction. Only the setting of b0 is effective. 0: Plus count (The signal will also be plus counted while the link device is plus count.) 1: Minus count (The signal will be minus counted while the link device is plus count.) Fetch cycle: PLC READY signal [Y0] OFF to ON	0	450246+100n	1450246+100n
[Pr.703]	Manual pulse generator input: Ring counter maximum value	Set the maximum and minimum value when the link device value is ring counter. • When the ring counter maximum value is equal to the ring counter minimum value, the setting depends on the link device type setting. 1 word: -32768 to 32767 2 words: -2147483648 to 214748647 • When the link device type is a 1-word device and a value outside the range of 1 word is set, the setting is ignored. • When the ring counter maximum value is smaller than the ring counter minimum value, the error "Outside the link device maximum/minimum value specification range" (error code: 1CC2H) occurs. Fetch cycle: PLC READY signal [Y0] OFF to ON	0	450242+100n 450243+100n	1450242+100n 1450243+100n
[Pr.704]	Manual pulse generator input: Ring counter minimum value		0	450244+100n 450245+100n	1450244+100n 1450245+100n

Point

For the mark detection assignment parameters, refer to the following.

☞ Page 377 Mark Detection Function

For the parameters related to the synchronous encoder axis, refer to "Synchronous encoder axis parameters via link device" in the following manual.

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

Restrictions

- When using the link device, the fetch timing of the signal disperses in one link scan cycle.
- Set the movement amount per link scan so that the following formula is satisfied. If not, the actual movement amount of the synchronous encoder and the movement amount counted by the Simple Motion module may not be matched.

$$\text{(Movement amount per link scan)} = \left(\frac{|\text{(Ring counter maximum value) - (Ring counter minimum value) + 1}|}{2}\right)$$

Event history detailed code at error occurrence

When an error of external signal assignment parameters has occurred, the following items are stored in the detailed information of the event history.

■Detailed information 1

Axis No. where the error has occurred

■Detailed information 2

Parameter where the error has occurred (Refer to the following.)

External signal	
External input signal	Forced stop signal (EMI)
	Upper limit signal (FLS)
	Lower limit signal (RLS)
	Proximity dog signal (DOG)
	Stop signal (STOP)
External command signal	External positioning start request
	External speed change request
	Skip request
	Speed-position control switching request
	Main shaft clutch control request
	Auxiliary shaft clutch control request
	Synchronous encoder axis start request
	Block No.7000 start request
	Block No.7001 start request
	Block No.7002 start request
	Block No.7003 start request
	Block No.7004 start request
External input signal	Manual pulse generator input
	Synchronous encoder input

For mark detection, refer to the following.

☞ Page 377 Mark Detection Function

9.6 History Monitor Function

This function monitors start history and current value history stored in the buffer memory of the Simple Motion module on the operation monitor of an engineering tool.

Start history

The start history logs of operations such as positioning operation, JOG operation, and manual pulse generator operation can be monitored. The latest 64 logs[*1] are stored all the time. This function allows users to check the operation sequence (whether the operations have been started in a predetermined sequence) at system start-up.

For the start history check method, refer to "Help" in the "Simple Motion Module Setting Function" of an engineering tool.

*1 GX Works3 can be monitored 256 times. [RD77GF]

Point

Set the clock of CPU module.

Refer to the following for setting method.

📖GX Works3 Operating Manual

There may be an error in tens of ms between the clock data of the CPU and the time data of the Simple Motion module.

Current value history

The current value history data of each axis can be monitored. The following shows about the current value history data of each axis.

Monitor details	Monitor item
Latest backup data The number of backup: Once	Command position value
	Servo command value
	Encoder position within one revolution[*1]
	Encoder multiple revolution counter
	Time 1 (Year: month)[*2]
	Time 2 (Day: hour)[*2]
	Time 3 (Minute: second)[*2]
	Latest backup data pointer
Backup data at the power disconnection The number of backup: 10 times	Command position value
	Servo command value
	Encoder position within one revolution[*1]
	Encoder multiple revolution counter
	Time 1 (Year: month)[*2]
	Time 2 (Day: hour)[*2]
	Time 3 (Minute: second)[*2]
	Backup data pointer
Backup data at the power on The number of backup: 10 times	Command position value
	Servo command value
	Encoder position within one revolution[*1]
	Encoder multiple revolution counter
	Time 1 (Year: month)[*2]
	Time 2 (Day: hour)[*2]
	Time 3 (Minute: second)[*2]
	Error/warning code at current value restoration
Home position return data The number of backup: Once	Command position value
	Servo command value
	Encoder position within one revolution[*1]
	Encoder multiple revolution counter
	Time 1 (Year: month)[*2]
	Time 2 (Day: hour)[*2]
	Time 3 (Minute: second)[*2]

[*1] When MR-J5(W)-B is connected, the value is multiplied by the multiplicative inverse for the electronic gear ratio of the servo amplifier (command unit). The same data as MR-J4(W)-B can be stored by configuring the electronic gear setting of the servo amplifier. [RD77MS]

[*2] Displays a value set by the clock function of the CPU module.

■Latest backup data

The latest backup data outputs the following data saved in the fixed cycle to the buffer memory.

- Command position value
- Servo command value
- Encoder position within one revolution[*1]
- Encoder multiple revolution counter
- Time 1 (Year: month) data
- Time 2 (Day: hour) data
- Time 3 (Minute: second) data
- Latest backup data pointer

[*1] When MR-J5(W)-B is connected, the value is multiplied by the multiplicative inverse for the electronic gear ratio of the servo amplifier (command unit). The same data as MR-J4(W)-B can be stored by configuring the electronic gear setting of the servo amplifier. [RD77MS]

The latest backup data starts outputting the data after the power on.

After the home position is established in the absolute system, the data becomes valid and outputs the current value.

The following servo amplifier and servo motor are connected artificially during amplifier-less operation. Therefore, the encoder position within one revolution and encoder multiple revolution counter made virtually by the command value are output.

[RD77MS]

[Pr.97] SSCNET setting	[Pr.100] Connected device	Servo amplifier type	Motor type
1: SSCNETⅢ/H	00001400H: MR-J5-_B_(-RJ), MR-J5W_-_B (2-, 3-axis type)	MR-J5-10B	Rotary servo motor (Resolution per servo motor rotation: 4194304 pulses/rev)
	Other than "00001400H: MR-J5-_B_(-RJ), MR-J5W_-_B (2-, 3-axis type)"	MR-J4-10B	HG-KR053 (Resolution per servo motor rotation: 4194304 pulses/rev)
0: SSCNETⅢ	—	MR-J3-10B	HF-KP053 (Resolution per servo motor rotation: 262144 pulse/rev)

[RD77GF]

Servo amplifier type	Motor type
MR-J4-10GF	HG-KR053 (Resolution per servo motor rotation: 4194304 pulses/rev)

■Backup data at the power disconnection

- The detail of the latest backup data right before the power disconnection is output to the buffer memory.
- The backup data at the power disconnection starts being output after the power on.
- The detail of the latest backup data right before the power disconnection used in the absolute system setting is output, regardless of the setting of the absolute system or incremental system.
- If the data has never been used in the absolute system in the incremental system setting, "0" is output in all storage items.

■Backup data at the power on

- After the power on, the detail of the data which restored the current value is output to the buffer memory.
- The backup data at the power on starts being output after the power on.
- If the current value cannot be restored in the absolute system, "0" is set to the command position value and servo command value.
- The warning "Home position return data incorrect" (warning code: 093CH) is set in the error/warning code at current value restoration.
- When the incremental system is set, the detail of the backup data at the power on used in the absolute system setting is output. If the data has never been used in the absolute system, "0" is output in all storage items.

■Home position return data

The following data saved at home position return completion to the buffer memory.

- Command position value at home position return completion
- Servo command value at home position return completion
- Encoder position within one revolution of absolute position reference point data[*1]
- Encoder multiple revolution counter of absolute position reference point data
- Time 1 (Year: month) data
- Time 2 (Day: hour) data
- Time 3 (Minute: second) data

[*1] When MR-J5(W)-B is connected, the value is multiplied by the multiplicative inverse for the electronic gear ratio of the servo amplifier (command unit). The same data as MR-J4(W)-B can be stored by configuring the electronic gear setting of the servo amplifier. [RD77MS]

The data becomes valid only when the absolute system is set.

If the data has never been used in the absolute system in the incremental system setting, "0" is output in all storage items.

9.7 Amplifier-less Operation Function

The positioning control of Simple Motion module without servo amplifiers connection can be executed in the amplifier-less function. This function is used to debug of user program or simulate of positioning operation at the start.

Amplifier-less operation of the RD77MS

Control details

Switch the mode from the normal operation mode (with servo amplifier connection) to the amplifier-less operation mode (without servo amplifier connection) to use the amplifier-less operation function.

Operation for each axis without servo amplifier connection as the normal operation mode can be executed during amplifier-less operation mode. The start method of positioning control is also the same procedure of normal operation mode.

The normal operation (with servo amplifier connection) is possible by switching from the amplifier-less operation mode to the normal operation mode after amplifier-less operation.

The current value management (command position value, machine feed value) at the switching the normal operation mode and amplifier-less operation mode is shown below.

"Absolute position detection system (PA03)"[*1]	Current value management at the operation mode switching	
	Normal operation mode → Amplifier-less operation mode	Amplifier-less operation mode → Normal operation mode
"0: Disabled (used in incremental system)"	The command position value and machine feed value are "0".	The command position value and machine feed value are "0". (At the communication start to the servo amplifiers)
"1: Enabled (used in absolute position detection system)"	The amplifier-less operation mode starts with the address that the servo amplifier's power supply was finally turned OFF. However, the home position is not established in the normal operation mode, the command position value and machine feed value are "0".	The command position value and machine feed value are restored according to the actual position of servo motor. (At the communication start to the servo amplifiers) However, when the home position is not established in the normal operation mode before switching to the amplifier-less operation mode, the command position value and machine feed value are not restored. Execute the home position return. When the mode is switched to the normal operation mode after moving that exceeds the range "-2147483648(-2^{31}) to 2147483647(2^{31}-1) [pulse]" from the actual position of servo motor during amplifier-less operation mode, the command position value and machine feed value might be not restored correctly.

*1 For MR-J3(W)-B/MR-J4(W)-B. For MR-J5(W)-B, set "Absolute position detection system selection (PA03.0)".

■Point for control details

- Switch of the normal operation mode and amplifier-less operation mode is executed by the batch of all axes. Switch of the operation mode for each axis cannot be executed.
- Only axis that operated either the following before switching to the amplifier-less operation mode becomes the connection status during amplifier-less operation.

- "[Pr.100] Connected device" is set, and then the written to flash ROM is executed. (Turn the power supply ON or reset the CPU module after written to flash ROM.)
- "[Pr.100] Connected device" is set, and then the PLC READY signal [Y0] is turned ON.) (Servo amplifier connection is unnecessary.)

- Suppose the following servo amplifier and servo motor are connected during amplifier-less operation mode.

[Pr.97] SSCNET setting	[Pr.100] Connected device	Servo amplifier type	Motor type
1: SSCNETⅢ/H	00001400H: MR-J5-_B_(-RJ), MR-J5W_-_B (2-, 3-axis type)	MR-J5-10B	Rotary servo motor (Resolution per servo motor rotation: 4194304 pulses/rev)
	Other than "00001400H: MR-J5-_B_(-RJ), MR-J5W_-_B (2-, 3-axis type)"	MR-J4-10B	HG-KR053 (Resolution per servo motor rotation: 4194304 pulses/rev)
0: SSCNETⅢ	—	MR-J3-10B	HF-KP053(Resolution per servo motor rotation: 262144 pulse/rev)

Restrictions

- Some monitor data differ from the actual servo amplifier during amplifier-less operation mode.

n: Axis No. - 1

Item		Description	Buffer memory address
[Md.102]	Deviation counter value	Always "0".	2452+100n 2453+100n
[Md.105]	Connected device	As the following connected devices artificially. • When "1: SSCNETⅢ/H" is set in "[Pr.97] SSCNET setting" 00001000H: MR-J4-_B_(-RJ), MR-J4W_-_B (2-, 3-axis type) • When "0: SSCNETⅢ" is set in "[Pr.97] SSCNET setting" 00000100H: MR-J3-_B, MR-J3W-_B (2-axis type)	58660+32n 58661+32n
[Md.106]	Servo amplifier software No.	Always "0".	2464+100n ⋮ 2469+100n
[Md.107]	Parameter error No.	Always "0".	2470+100n
[Md.108]	Servo status1	• READY ON (b0), Servo ON (b1): Changed depending on the all axis servo ON [Y1] and "[Cd.100] Servo OFF command". • Control mode (b2, b3): Indicates control mode. • Gain switching (b4): Always OFF • Fully closed loop control switching (b5): Always OFF • Servo alarm (b7): Always OFF • In-position (b12): Always ON • Torque limit (b13): Changed depending on "[Md.104] Motor current value". (Refer to the 2nd and 3rd bullets of restrictions for details.) • Absolute position lost (b14): Always OFF • Servo warning (b15): Always OFF	2477+100n
[Md.109]	Regenerative load ratio/Optional data monitor output 1	Always "0".	2478+100n
[Md.110]	Effective load torque/Optional data monitor output 2	Always "0".	2479+100n
[Md.111]	Peak torque ratio/Optional data monitor output 3	Always "0".	2480+100n
[Md.112]	Optional data monitor output 4	Always "0".	2481+100n
[Md.119]	Servo status2	• Zero point pass (b0): Always ON • Zero speed (b3): Changed depending on the command speed. • Speed limit (b4): Always ON when the value other than "0" is set to the command torque at torque control mode. Otherwise, always OFF. • PID control (b8): Always OFF	2476+100n

- The operation of the following function differs from the normal operation mode during amplifier-less operation mode.

Function	Operation
External signal selection function	When "1: Servo amplifier" is set in "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", and "[Pr.118] DOG signal selection", the status of external signal at the amplifier-less operation mode start is shown below. • Upper/lower limit signal (FLS, RLS): ON • Proximity dog signal (DOG): OFF Change "[Md.30] External input signal" to change the signal status. (Refer to the 3rd bullet of restrictions for details.) When "2: Buffer memory" is set in "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", and "[Pr.118] DOG signal selection", the upper/lower limit signal (FLS, RLS) and proximity dog signal (DOG) follow the buffer memory status of Simple Motion module during amplifier-less operation mode.
Torque limit function	Turns ON/OFF torque limit ([Md.108] Servo status1: b13) depending on "[Md.104] Motor current value". (Refer to the 3rd bullet of restrictions for details.)

- The operation of the following monitor data differs from the normal operation mode during amplifier-less operation mode.

n: Axis No. - 1

Item		Description	Buffer memory address
[Md.30]	External input signal	When "1: Servo amplifier" is set in "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", and "[Pr.118] DOG signal selection", the external input signal status can be operated by turning ON/OFF the "b0: Lower limit signal", "b1: Upper limit signal" or "b6: Proximity dog signal" during amplifier-less operation mode.	2416+100n
[Md.104]	Motor current value	"0" is set at the amplifier-less operation mode start. The motor current value can be emulated by changing this monitor data in user side during amplifier-less operation mode.	2456+100n

- When the power supply is turned OFF → ON or CPU module is reset during amplifier-less operation mode, the mode is switched to the normal operation mode.
- The operation of servo motor or the timing of operation cycle, etc. at the amplifier-less operation is different from the case where the servo amplifiers are connected at the normal operation mode. Confirm the operation finally with a real machine.
- The amplifier-less operation cannot be used in the test mode. Do not request to switch to the amplifier-less operation mode during test mode.
- The amplifier-less operation cannot be used in the fully closed loop system, linear servo or direct drive motor.
- Even if the PLC READY signal [Y0] is turned ON by changing "[Pr.100] Connected device" from "00000000H: Servo series is not set" to other than "0", the setting does not become valid. (The axis connecting status remains disconnection.)
- The operation cannot be changed to amplifier-less operation when connected and not connected servo amplifier axes are mixed. Change to amplifier-less operation when all axes are connected, or disconnect all axes of the servo amplifier.
- The synchronous encoder via servo amplifier cannot be used during amplifier-less operation mode.

Data list

The data used in the amplifier-less operation function is shown below.

- System control data

Setting item		Setting value	Setting details	Buffer memory address
[Cd.137]	Amplifier-less operation mode switching request	→	Switch operation mode. ABCDH: Switch from the normal operation mode to the amplifier-less operation mode. 0000H: Switch from the amplifier-less operation mode to the normal operation mode	5926

- System monitor data

Monitor item		Monitor value	Storage details	Buffer memory address
[Md.51]	Amplifier-less operation mode status	→	Indicate the current operation mode. 0: Normal operation mode 1: Amplifier-less operation mode	4232

Operation mode switching procedure

- Switch from the normal operation mode to the amplifier-less operation mode

1. Stop all operating axes, and then confirm that the BUSY signal for all axes turned OFF.
2. Turn OFF the PLC READY signal [Y0].
3. Confirm that the READY signal [X0] turned OFF.
4. Set "ABCDH" in "[Cd.137] Amplifier-less operation mode switching request".
5. Confirm that "1: Amplifier-less operation mode" was set in "[Md.51] Amplifier-less operation mode status".

- Switch from the amplifier-less operation mode to the normal operation mode

1. Stop all operating axes, and then confirm that the BUSY signal for all axes turned OFF.

2. Turn OFF the PLC READY signal [Y0].

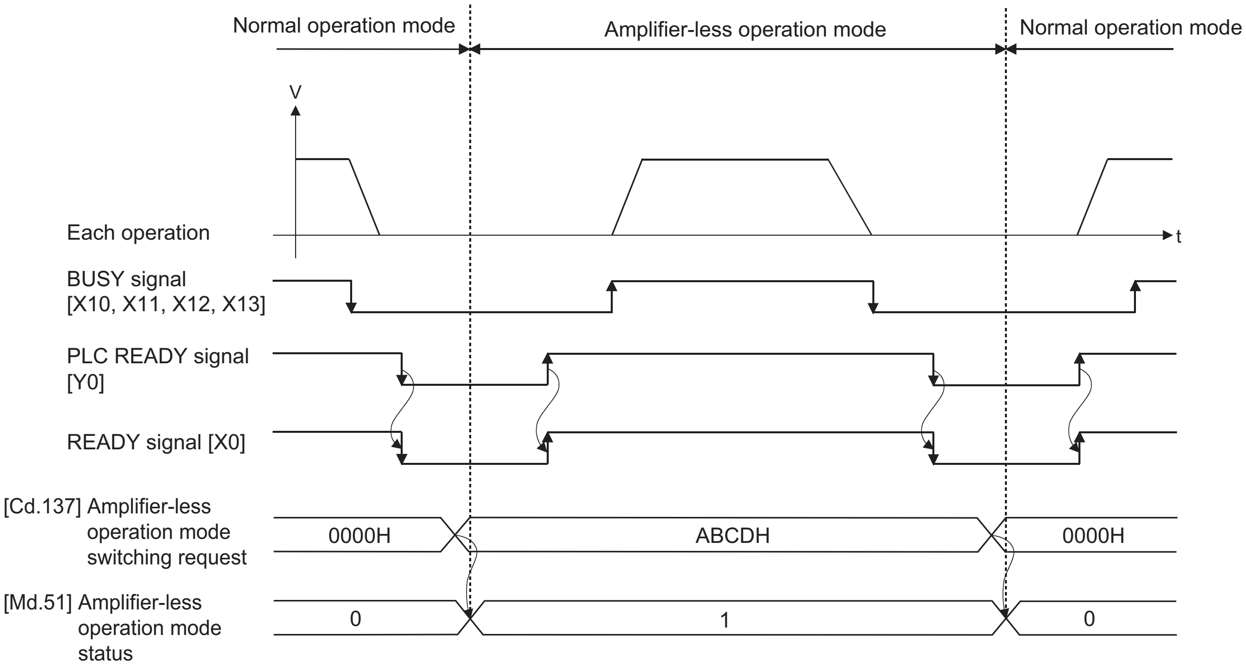
3. Confirm that the READY signal [X0] turned OFF.

4. Set "0000H" in "[Cd.137] Amplifier-less operation mode switching request".

5. Confirm that "0: Normal operation mode" was set in "[Md.51] Amplifier-less operation mode status".

■Operation example

The following drawing shows the operation for the switching of the normal operation mode and amplifier-less operation mode



■Point for operation mode switching procedure

- Switch the "normal operation mode" and "amplifier-less operation mode" after confirming the all input signals except synchronization flag [X1] OFF. When switching the normal operation mode and amplifier-less operation mode in the status that any one of input signals except the synchronization flag [X1] is ON, the error "Error when switching from normal operation mode to amplifier-less operation mode" (error code: 18B0H) or "Error when switching from amplifier-less operation mode to normal operation mode" (error code: 18B1H) will occur, and the switching of operation mode will not execute.
- When the operation mode is switched with the servo amplifiers connected, the communication to the servo amplifiers is shown below.

- At switching from normal operation mode to amplifier-less operation mode: The communication for all axes during connection is disconnected. (The servo amplifier LED indicates "AA".)
- At switching from amplifier-less operation mode to normal operation mode: The communication to the servo amplifiers during connection is started.

- Even if the servo amplifiers are not connected, the switching of operation mode is possible.
- The forced stop is invalid regardless of the setting in "[Pr.82] Forced stop valid/invalid selection" during the amplifier-less operation mode.
- Only "0000H" and "ABCDH" are valid for "[Cd.137] Amplifier-less operation mode switching request". Switching to the amplifier-less operation mode can be accepted only when "[Cd.137] Amplifier-less operation mode switching request" is switched from "0000H" to "ABCDH". Switching to the normal operation mode can be accepted only when "[Cd.137] Amplifier-less operation mode switching request" is switched from "ABCDH" to "0000H".

Amplifier-less operation of the RD77GF

Control details

Switch the mode from the normal operation mode (with servo amplifier connection) to the amplifier-less operation mode (without servo amplifier connection) to use the amplifier-less operation function.

Operation for each axis without servo amplifier connection as the normal operation mode can be executed by connecting a virtual servo amplifier during amplifier-less operation mode. The start method of positioning control is also the same procedure of normal operation mode.

■Point for control details

- Switch of the normal operation mode and amplifier-less operation mode is executed by the batch of all axes.
- An axis in the amplifier-less operation mode is connected as a "virtual servo amplifier axis". For operations and restrictions of the virtual servo amplifier axis, refer to the following.

  ☞ Page 367 Virtual servo amplifier function of the RD77GF

Restrictions

- Some monitor data differ from the actual servo amplifier during amplifier-less operation mode.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		**Description**	**Buffer memory address**	
			Axis 1 to axis 16	**Axis 17 to axis 32**
[Md.102]	Deviation counter value	Always "0".	2452+100n 2453+100n	1002452+100n 1002453+100n
[Md.105]	Connected device	As the following connected devices artificially. • MR-J4-GF	58660+32n 58661+32n	1058660+32n 1058661+32n
[Md.108]	Servo status 1	• READY ON (b0), Servo ON (b1): Changed depending on the all axis servo ON [Y1] and "[Cd.100] Servo OFF command". • Control mode (b2, b3): Indicates control mode. • Gain switching (b4): Always OFF • Fully closed loop control switching (b5): Always OFF • Servo alarm (b7): Always OFF • In-position (b12): Always ON • Torque limit (b13): Changed depending on "[Md.104] Motor current value". (Refer to the 2nd and 3rd bullets of restrictions for details.) • Absolute position lost (b14): Turns ON if a connected device is not the MR-J4-GF and a home position is established when a virtual servo amplifier is connected. Turns OFF when a home position return is executed. • Servo warning (b15): Always OFF	2477+100n	1002477+100n
[Md.170]	Optional receive PDO data 1	Always "0".	468204+2048n 468205+2048n 468206+2048n 468207+2048n	1468204+2048n 1468205+2048n 1468206+2048n 1468207+2048n
[Md.171]	Optional receive PDO data 2	Always "0".	468208+2048n 468209+2048n 468210+2048n 468211+2048n	1468208+2048n 1468209+2048n 1468210+2048n 1468211+2048n
[Md.172]	Optional receive PDO data 3	Always "0".	468212+2048n 468213+2048n 468214+2048n 468215+2048n	1468212+2048n 1468213+2048n 1468214+2048n 1468215+2048n
[Md.173]	Optional receive PDO data 4	Always "0".	468216+2048n 468217+2048n 468218+2048n 468219+2048n	1468216+2048n 1468217+2048n 1468218+2048n 1468219+2048n
[Md.119]	Servo status 2	• Zero point pass (b0): Always ON • Zero speed (b3): Changed depending on the command speed. • Speed limit (b4): Always ON when the value other than "0" is set to the command torque at torque control mode. Otherwise, always OFF. • PID control (b8): Always OFF	2476+100n	1002476+100n

- The operation of the following function differs from the normal operation mode during amplifier-less operation mode.

Function	Operation
External signal selection function	When "1: Servo amplifier" is set in "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", and "[Pr.118] DOG signal selection", the status of external signal at the amplifier-less operation mode start is shown below. • Upper/lower limit signal (FLS, RLS): ON • Proximity dog signal (DOG): OFF Change "[Md.30] External input signal" to change the signal status. (Refer to the 3rd bullet of restrictions for details.) When "2: Buffer memory" is set in "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", and "[Pr.118] DOG signal selection", the upper/lower limit signal (FLS, RLS) and proximity dog signal (DOG) follow the buffer memory status of Simple Motion module during amplifier-less operation mode.
Torque limit function	Turns ON/OFF torque limit ([Md.108] Servo status1]: b13) depending on "[Md.104] Motor current value". (Refer to the 3rd bullet of restrictions for details.)

- The operation of the following monitor data differs from the normal operation mode during amplifier-less operation mode.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Description	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Md.30]	External input signal	When "1: Servo amplifier" is set in "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", and "[Pr.118] DOG signal selection", the external input signal status can be operated by turning ON/OFF the "b0: Lower limit signal", "b1: Upper limit signal" or "b6: Proximity dog signal" during amplifier-less operation mode.	2416+100n	1002416+100n
[Md.104]	Motor current value	"0" is set at the amplifier-less operation mode start. The motor current value can be emulated by changing this monitor data in user side during amplifier-less operation mode.	2456+100n	1002456+100n

- When the power supply is turned OFF → ON or CPU module is reset during amplifier-less operation mode, the mode is switched to the normal operation mode.
- The operation of servo motor or the timing of operation cycle, etc. at the amplifier-less operation is different from the case where the servo amplifiers are connected at the normal operation mode. Confirm the operation finally with a real machine.
- The operation mode cannot be switched to the amplifier-less operation mode in the test mode. Do not request to switch to the amplifier-less operation mode during test mode.
- The amplifier-less operation cannot be used in the fully closed loop system, linear servo or direct drive motor.
- The synchronous encoder via servo amplifier cannot be used during amplifier-less operation mode.
- When the normal operation mode is switched to the amplifier-less operation mode, only the axes which are not connected to the CC-Link IE Field Network are switched to virtual servo amplifier axes. When axes (stations) which are connected to the CC-Link IE Field Network exist, the axes (stations) are not switched to virtual servo amplifier axes. (The value of "[Md.51] Amplifier-less operation mode status" is not changed from "0: Normal operation mode".) When the amplifier-less operation mode is switched to the normal operation mode, virtual servo amplifier axes are disconnected only for the axes (stations) which are not connected to the CC-Link IE Field Network.
- When the amplifier-less operation mode is switched to the normal operation mode, reconnecting the CC-Link IE Field Network is required to connect axes.

Data list

The data used in the amplifier-less operation function is shown below.

- System control data

Setting item		Setting value	Setting details	Buffer memory address
[Cd.137]	Amplifier-less operation mode switching request	→	Switch operation mode. ABCDH: Switch from the normal operation mode to the amplifier-less operation mode. 0000H: Switch from the amplifier-less operation mode to the normal operation mode.	5926

Point

- Changing the setting of "[Cd.137] Amplifier-less operation mode switching request" from "0000H" to "ABCDH" is equivalent to setting "FFFFH" in "[Cd.701] Virtual servo amplifier operation station specification" and setting "0001H" in "[Cd.700] Virtual servo amplifier operation command".
- Changing the setting of "[Cd.137] Amplifier-less operation mode switching request" from "ABCDH" to "0000H" is equivalent to setting "FFFFH" in "[Cd.701] Virtual servo amplifier operation station specification" and setting "0011H" in "[Cd.700] Virtual servo amplifier operation command".

- System monitor data

Monitor item		Monitor value	Storage details	Buffer memory address
[Md.51]	Amplifier-less operation mode status	→	Indicate the current operation mode. 0: Normal operation mode 1: Amplifier-less operation mode	4232

Point

- Only when virtual servo amplifiers are connected to all axes set in the network configuration settings, "1: Amplifier-less operation mode" is set in "[Md.51] Amplifier-less operation mode status".
- When all axes are connected as virtual servo amplifier axes at power ON, "1: Amplifier-less operation mode" is set in "[Md.51] Amplifier-less operation mode status" and the operation mode cannot be switched to the normal operation mode.

Operation mode switching procedure

- Switch from the normal operation mode to the amplifier-less operation mode

1. Confirm that all axes are disconnected from the network.
2. Set "ABCDH" in "[Cd.137] Amplifier-less operation mode switching request".
3. Confirm that "1: Amplifier-less operation mode" was set in "[Md.51] Amplifier-less operation mode status".

- Switch from the amplifier-less operation mode to the normal operation mode

1. Stop all operating axes, and then confirm that the BUSY signal for all axes turned OFF.
2. Confirm that the axes are disconnected from the network.
3. Set "0000H" in "[Cd.137] Amplifier-less operation mode switching request".
4. Confirm that "0: Normal operation mode" was set in "[Md.51] Amplifier-less operation mode status".

The servo amplifier can be directly switched to a virtual servo amplifier with "[Cd.700] Virtual servo amplifier operation command". Refer to the following for details.

☞ Page 367 Virtual servo amplifier function of the RD77GF

■Operation chart

Refer to the following.

☞ Page 361 Operation example

■Point for operation mode switching procedure

- The forced stop is invalid regardless of the setting in "[Pr.82] Forced stop valid/invalid selection" during the amplifier-less operation mode.
- Only "0000H" and "ABCDH" are valid for "[Cd.137] Amplifier-less operation mode switching request". Switching to the amplifier-less operation mode can be accepted only when "[Cd.137] Amplifier-less operation mode switching request" is switched from "0000H" to "ABCDH". Switching to the normal operation mode can be accepted only when "[Cd.137] Amplifier-less operation mode switching request" is switched from "ABCDH" to "0000H".

9.8 Virtual Servo Amplifier Function

This function executes the operation virtually without connecting servo amplifiers (regarded as connected). The synchronous control with virtually input command is possible by using the virtual servo amplifier axis as servo input axis of synchronous control. Also, it can be used as simulation operation for axes without servo amplifiers.

Virtual servo amplifier function of the RD77MS

Control details

- When "00000FFFH, 00001FFEH, 00001FFFH" is set in "[Pr.100] Connected device" set in the flash ROM, it operates as virtual servo amplifier immediately after power supply ON.
- When "00000000H" is set in "[Pr.100] Connected device" set in the flash ROM, it operates as virtual servo amplifier by setting "00000FFFH, 00001FFEH, 00001FFFH" in "[Pr.100] Connected device" of buffer memory and by turning the PLC READY signal [Y0] OFF to ON after power supply ON.
- Do not connect the actual servo amplifier to axis set as virtual servo amplifier. If MR-J4(W)-B is connected, the LED display status remains "Ab" and the servo amplifier is not recognized. When MR-J5(W)-B is connected, the servo alarm "Connection mode error 1" (alarm No.: 3E.9) occurs and the servo amplifier is not recognized. If the power of MR-J5(W)-B is reset after the servo alarm occurs, the LED display status remains "Ab" and the servo amplifier is not recognized. The following servo amplifiers cannot be connected until the end station.
- The command position value and machine feed value of virtual servo amplifier are as follows.

- When the absolute position detection system is invalid, both the command position value and machine feed value are set to "0".
- When the absolute position detection system is valid, the address at the latest power supply OFF is set if the home position has been established. If the home position has not been established, the both of command position value and machine feed value are set to "0".

- When the virtual servo amplifier is set in the system setting of the engineering tool, "0: Disabled (used in incremental system)" is set in "used in absolute position detection system (PA03)"[*1]. Set "1: Enabled (absolute position detection system)" to the buffer memory to use as absolute position system.

[*1] For MR-J3(W)-B/MR-J4(W)-B. For MR-J5(W)-B, set "Absolute position detection system selection (PA03.0)".

Point

Do not make to operate by switching between the actual servo amplifier and virtual servo amplifier. When a value except "00000000H" is set in "[Pr.100] Connected device" set in the flash ROM, the connected device is not changed even if the "[Pr.100] Connected device" of buffer memory is changed after power supply ON and then the PLC READY signal [Y0] is turned OFF to ON. To change the connected device, write to the flash ROM and turn the power ON again or reset the CPU module.

Restrictions

- The following monitor data of virtual servo amplifier differ from the actual servo amplifier.

n: Axis No. - 1

Item		Description	Buffer memory address
[Md.102]	Deviation counter value	Always "0".	2452+100n 2453+100n
[Md.105]	Connected device	As the following connected devices artificially. • When "1: SSCNETⅢ/H" is set in "[Pr.97] SSCNET setting" and "00001FFEH: Virtual servo amplifier (MR-J5-B)" is set in "[Pr.100] Connected device" 00001400H: MR-J5-_B_(-RJ), MR-J5W_-_B (2-, 3-axis type) • When "1: SSCNETⅢ/H" is set in "[Pr.97] SSCNET setting" and "00001FFFH: Virtual servo amplifier (MR-J4-B)" is set in "[Pr.100] Connected device" 00001000H: MR-J4-_B_(-RJ), MR-J4W_-_B (2-, 3-axis type) • When "0: SSCNETⅢ" is set in "[Pr.97] SSCNET setting" 00000100H: MR-J3-_B, MR-J3W-_B (2-axis type)	58660+32 58661+32
[Md.106]	Servo amplifier software No.	Always "0".	2464+100n ⋮ 2469+100n

Item		Description	Buffer memory address
[Md.107]	Parameter error No.	Always "0".	2470+100n
[Md.108]	Servo status1	• READY ON (b0), Servo ON (b1): Changed depending on the all axis servo ON [Y1] and "[Cd.100] Servo OFF command" • Control mode (b2, b3): Indicates control mode. • Gain switching (b4): Always OFF • Fully closed loop control switching (b5): Always OFF • Servo alarm (b7): Always OFF • In-position (b12): Always ON • Torque limit (b13): Changed depending on "[Md.104] Motor current value". (Refer to the 2nd and 3rd bullets of restrictions for details.) • Absolute position lost (b14): Always OFF • Servo warning (b15): Always OFF	2477+100n
[Md.109]	Regenerative load ratio/Optional data monitor output 1	Always "0".	2478+100n
[Md.110]	Effective load torque/Optional data monitor output 2	Always "0".	2479+100n
[Md.111]	Peak torque ratio/Optional data monitor output 3	Always "0".	2480+100n
[Md.112]	Optional data monitor output 4	Always "0".	2481+100n
[Md.119]	Servo status2	• Zero point pass (b0): Always ON • Zero speed (b3): Changed depending on the command speed • Speed limit (b4): Always ON when the value other than "0" is set to the command torque at torque control mode. Otherwise, always OFF. • PID control (b8): Always OFF	2476+100n

- The operation of the following function of virtual servo amplifier differs from the actual servo amplifier.

Function	Operation
External signal selection function	When "1: Servo amplifier" is set in "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", and "[Pr.118] DOG signal selection", the external signal status immediately after the power supply ON is shown below. • Upper/lower limit signal (FLS, RLS): ON • Proximity dog signal (DOG): OFF Change "[Md.30] External input signal" to change the signal status. (Refer to the 3rd bullet of restrictions for details.) When "2: Buffer memory" is set in "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", and "[Pr.118] DOG signal selection", the upper/lower limit signal (FLS, RLS) and proximity dog signal (DOG) follow the buffer memory status of the Simple Motion module even with a virtual servo amplifier.
Torque limit function	Turns ON/OFF torque limit ([Md.108] Servo status1: b13) depending on "[Md.104] Motor current value". (Refer to the 3rd bullet of restrictions for details.)

- The following monitor data of virtual servo amplifier differ from the actual servo amplifiers. The writing operation is possible in the virtual servo amplifier.

n: Axis No. - 1

Item		Description	Buffer memory address
[Md.30]	External input signal	When "1: Servo amplifier" is set in "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", and "[Pr.118] DOG signal selection", the external input signal status can be operated by turning ON/OFF the following signals. • b0: Lower limit signal • b1: Upper limit signal • b6: Proximity dog signal	2416+100n
[Md.104]	Motor current value	"0" is set after immediately power supply ON. The motor current value can be emulated by changing this monitor data in user side.	2456+100n

Setting method

Set "[Pr.100] Connected device" as follows based on the value in "[Pr.97] SSCNET setting".

Setting value of "[Pr.97] SSCNET setting"	Setting value of "[Pr.100] Connected device"
0: SSCNETⅢ	00000FFFH: Virtual servo amplifier (MR-J3-B)
1: SSCNETⅢ/H	00001FFEH: Virtual servo amplifier (MR-J5-B) 00001FFFH: Virtual servo amplifier (MR-J4-B)

Virtual servo amplifier function of the RD77GF

Control details

- The operation that actual servo amplifiers and virtual servo amplifiers are connected is possible following the classification shown in the table below.

Module operation mode setting	Switching between actual servo amplifiers and virtual servo amplifiers	Only virtual servo amplifiers
Online mode	Operation possible	Operation possible
Offline mode	Operation not possible	

- In the offline mode, virtual servo amplifiers are connected to all the stations to which "MR-J4-GF" is set in the network configuration settings when the module power supply is ON.
- In the online mode, whether virtual servo amplifiers can be connected or not and how to connect virtual servo amplifiers vary according to the network configuration settings. The following shows the connecting/disconnecting methods of virtual servo amplifiers.

Connecting method A	Use the virtual servo amplifier operation command device. Specify an axis No. where a virtual servo amplifier is connected or disconnected for "[Cd.701] Virtual servo amplifier operation station specification" and set "0001H" or "0011H" in "[Cd.700] Virtual servo amplifier operation command". (A virtual servo amplifier axis can be connected or disconnected while the module power supply is ON.)
Connecting method B	A virtual servo amplifier is automatically connected at power ON. (A virtual servo amplifier axis cannot be connected or disconnected while the module power supply is ON.)
Connecting method C	Use "[Cd.137] Amplifier-less operation mode switching request". (A virtual servo amplifier axis can be connected or disconnected while the module power supply is ON.)

The connecting method of virtual servo amplifiers is determined by the parameter combinations at power ON as shown below.

[Pr.100] Connected device	[Pr.101] Virtual servo amplifier setting	Connecting method of virtual servo amplifiers
No setting (0)	—	Connection not possible
Set (Not 0)	0: Use real servo amplifier	Connecting method A/C
	1: Use as virtual servo amplifier	Connecting method B

- The connecting status of virtual servo amplifiers can be monitored using the connecting status monitor device of virtual servo amplifiers.
- Virtual servo amplifiers are connected with the absolute position detection system enabled. The command position value and machine feed value at connection are as follows.

- The address at the latest power supply OFF is set if the home position has been established.
- Both the command position value and machine feed value are set to "0" if the home position has not been established.

- Switching to virtual servo amplifiers is also possible in the amplifier-less operation function. When virtual servo amplifiers are connected to all axes, "1: Amplifier-less operation mode" is set in "[Md.51] Amplifier-less operation mode status". For details, refer to the following.

  ☞ Page 362 Amplifier-less operation of the RD77GF

Restrictions

- The following monitor data of virtual servo amplifier differs from the actual servo amplifier.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Description	Buffer memory address	
			Axis 1 to axis 16	**Axis 17 to axis 32**
[Md.102]	Deviation counter value	Always "0".	2452+100n 2453+100n	1002452+100n 1002453+100n
[Md.105]	Connected device	As the following connected devices artificially. • MR-J4-GF	58660+32n 58661+32n	1058660+32n 1058661+32n
[Md.108]	Servo status 1	• READY ON (b0), Servo ON (b1): Changed depending on the all axis servo ON [Y1] and "[Cd.100] Servo OFF command". • Control mode (b2, b3): Indicates control mode. • Gain switching (b4): Always OFF • Fully closed loop control switching (b5): Always OFF • Servo alarm (b7): Always OFF • In-position (b12): Always ON • Torque limit (b13): Changed depending on "[Md.104] Motor current value". (Refer to the 2nd and 3rd bullets of restrictions for details.) • Absolute position lost (b14): Turns ON if a connected device is not the MR-J4-GF and a home position is established when a virtual servo amplifier is connected. Turns OFF when a home position return is executed. • Servo warning (b15): Always OFF	2477+100n	1002477+100n
[Md.170]	Optional receive PDO data 1	Always "0".	468204+2048n 468205+2048n 468206+2048n 468207+2048n	1468204+2048n 1468205+2048n 1468206+2048n 1468207+2048n
[Md.171]	Optional receive PDO data 2	Always "0".	468208+2048n 468209+2048n 468210+2048n 468211+2048n	1468208+2048n 1468209+2048n 1468210+2048n 1468211+2048n
[Md.172]	Optional receive PDO data 3	Always "0".	468212+2048n 468213+2048n 468214+2048n 468215+2048n	1468212+2048n 1468213+2048n 1468214+2048n 1468215+2048n
[Md.173]	Optional receive PDO data 4	Always "0".	468216+2048n 468217+2048n 468218+2048n 468219+2048n	1468216+2048n 1468217+2048n 1468218+2048n 1468219+2048n
[Md.119]	Servo status 2	• Zero point pass (b0): Always ON • Zero speed (b3): Changed depending on the command speed. • Speed limit (b4): Always ON when the value other than "0" is set to the command torque at torque control mode. Otherwise, always OFF. • PID control (b8): Always OFF	2476+100n	1002476+100n

- The operation of the following function of virtual servo amplifier differs from the actual servo amplifier.

Function	Operation
External signal selection function	When "1: Servo amplifier" is set in "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", and "[Pr.118] DOG signal selection", the external signal status immediately after the power supply ON is shown below. • Upper/lower limit signal (FLS, RLS): ON • Proximity dog signal (DOG): OFF Change "[Md.30] External input signal" to change the signal status. (Refer to the 3rd bullet of restrictions for details.) When "2: Buffer memory" is set in "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", and "[Pr.118] DOG signal selection", the upper/lower limit signal (FLS, RLS) and proximity dog signal (DOG) follow the buffer memory status of the Simple Motion module even with a virtual servo amplifier.
Torque limit function	Turns ON/OFF torque limit ([Md.108] Servo status1: b13) depending on "[Md.104] Motor current value". (Refer to the 3rd bullet of restrictions for details.)

- The following monitor data of virtual servo amplifier differ from the actual servo amplifiers. The writing operation is possible in the virtual servo amplifier.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		**Description**	**Buffer memory address**	
			Axis 1 to axis 16	**Axis 17 to axis 32**
[Md.30]	External input signal	When "1: Servo amplifier" is set in "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", and "[Pr.118] DOG signal selection", the external input signal status can be operated by turning ON/OFF the following signals. • b0: Lower limit signal • b1: Upper limit signal • b6: Proximity dog signal	2416+100n	1002416+100n
[Md.104]	Motor current value	"0" is set after immediately power supply ON. The motor current value can be emulated by changing this monitor data in user side.	2456+100n	1002456+100n

- When a slave device is connected to the axis (station) operating as a virtual servo amplifier, the slave device is connected to the CC-Link IE Field Network. However, the synchronous communication is not in operation.
- When a virtual servo amplifier is disconnected, reconnecting the CC-Link IE Field Network is required to reconnect the slave stations.
- The station operating as a virtual servo amplifier becomes a data link faulty station. To not to detect the station as a data link faulty station, set the station as the error invalid station.
- The axis operating as a virtual servo amplifier are artificially connected to the following types of servo amplifier and servo motor.

Servo amplifier type: MR-J4-10GF
Motor type: HG-KR053 (Resolution per servo motor rotation: 4194304 pulses/rev)

Additionally, the axis operates regarded as the following values of servo parameters are set.

Item		**Description**
PA03	Absolute position detection system	1: Enabled (used in absolute position detection system)
PA14	Rotation direction selection/travel direction selection	Holds and uses the value at the latest servo amplifier connection. (0 at initialization)
PC07	Zero speed	50 r/min
PC29	Function selection C-B	1000h ×_ _ _: POL reflection selection at torque control 1: Enabled
PC76	Function selection C-E	0011h _ _ × _: ZSP disabled selection at control switching 1: Disabled (control mode switching regardless of the range of ZSP)
PT07	Home position shift distance	0
PT45	Home position return type	37 (Data set type)

Setting method

Set "[Pr.101] Virtual servo amplifier setting" as follows.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		**Setting details/setting value**	**Buffer memory address**	
			Axis 1 to axis 16	**Axis 17 to axis 32**
[Pr.101]	Virtual servo amplifier setting	Set if use as virtual servo amplifier axis. It will be read when the power supply is ON. 0: Use real servo amplifier 1: Use as virtual servo amplifier	58022+32n	1058022+32n

- Virtual servo amplifier operation command

Setting item		**Setting details/setting value**	**Buffer memory address**	
			Axis 1 to axis 16	**Axis 17 to axis 32**
[Cd.700]	Virtual servo amplifier operation command	Set the following operation requests according to the operation. 0001H: Virtual servo amplifier connection 0011H: Virtual servo amplifier disconnection After the processing is completed, "0" is stored.	5952	
[Cd.701]	Virtual servo amplifier operation station specification	Set a station No. where a virtual servo amplifier is connected or disconnected by the virtual servo amplifier operation command. 0: Connection/disconnection not commanded 1: Connection/disconnection commanded	5954	1005954

- Virtual servo amplifier connection status monitor data

Item		**Details**	**Buffer memory address**	
			Axis 1 to axis 16	**Axis 17 to axis 32**
[Md.700]	Virtual servo amplifier connected station monitor	Stores the station where a virtual servo amplifier is connected. 0: Virtual servo amplifier not connected 1: Virtual servo amplifier connected	60900	1060900

9.9 Driver Communication Function [RD77MS]

This function uses the "Master-slave operation function" of servo amplifier. The Simple Motion module controls master axis and the slave axis is controlled by data communication between servo amplifiers (driver communication) without Simple Motion module.

There are restrictions in the function that can be used by the version of servo amplifier. Refer to each servo amplifier instruction manual or manual for details.

The following shows the number of settable axes for the master axis and slave axis.

Network	**Servo amplifier**		**Module**	**Combination of number of settable axes**		**Remark**
				Master axis	**Slave axis**	
SSCNETⅢ	MR-J3-_B_ MR-J3-_BS_ MR-J3-_B_-RJ006[*1]		RD77MS2	1 axis	1 axis or more per master axis	The axes other than the master axis and slave axis can be used as normal axis.
			RD77MS4	1 axis to 2 axes		
			RD77MS8	1 axis to 4 axes		
			RD77MS16	1 axis to 4 axes		
SSCNETⅢ/H	MR-J4-_B_ MR-J4-_B_-RJ *2	MR-J5-_B_ MR-J5-_B_-RJ *2*3	RD77MS2	1 axis		
			RD77MS4	1 axis to 2 axes		
			RD77MS8	1 axis to 4 axes		
			RD77MS16	1 axis to 8 axes		

*1 The fully closed loop control servo amplifier can be set for the master axis only. It cannot be set for the slave axis.

*2 In the fully closed loop system, the servo amplifier can be set for the master axis only. It cannot be set for the slave axis. Also, it cannot be used with the linear servo motors or direct drive motors. Refer to each servo amplifier instruction manual or manual for details.

*3 When using MR-J5-_B_/MR-J5-_B_-RJ, set all the master and slave axes to be used in combination to MR-J5-_B_/MR-J5-_B_-RJ. If MR-J4-_B_/MR-J4-_B_-RJ is included, the error "Master axis amplifier type error" (error code: 1C96H) will occur.

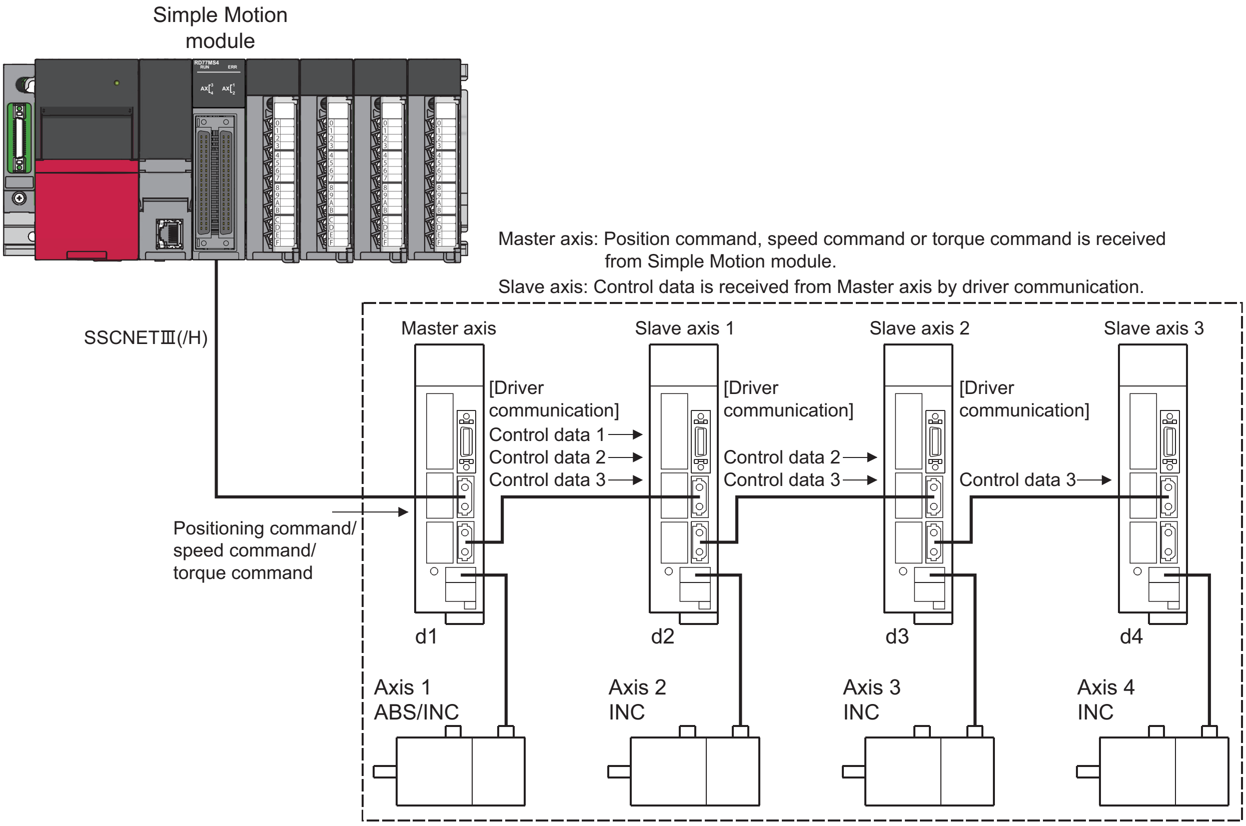
Control details

Set the master axis and slave axis in the servo parameter.

Execute each control of Simple Motion module for the master axis. (However, be sure to execute the servo ON/OFF of slave axis and error reset at servo alarm occurrence in the slave axis.)

The servo amplifier set as master axis receives command (positioning command, speed command, torque command) from the Simple Motion module, and send the control data to the servo amplifier set as slave axis by driver communication between servo amplifiers.

The servo amplifier set as the slave axis is controlled with the control data transmitted from master axis by driver communication between servo amplifiers.



Point

- When the communication is disconnected due to a fault in the servo amplifier, it is not possible to communicate with the axis after the faulty axis. Therefore, when connecting the SSCNETⅢ cable, connect the master axis in the closest position to the Simple Motion module.
- This function is used for the case to operate by multiple motors in one system. Connect the master axis and slave axis without slip.

Precautions during control

⚠CAUTION

- In the operation by driver communication, the positioning control or JOG operation of the master axis is not interrupted even if the servo alarm occurs in the slave axis. Be sure to stop by user program.

■Servo amplifier

- Use the servo amplifiers compatible with the driver communication for the axis to execute the driver communication.
- The combination of the master axis and slave axis is set in the servo parameters. The setting is valid by turning ON or resetting the system's power supply after writing the servo parameters to the Simple Motion module.
- Check the operation enabled status of driver communication in "[Md.52] Communication between amplifiers axes searching flag". The operation cannot be changed to amplifier-less operation when connected and not connected servo amplifier axes are mixed. Change to amplifier-less operation when all axes are connected, or disconnect all axes of the servo amplifier.
- When connecting/disconnecting at driver communication function use, it can be executed only for the head axis (servo amplifier connected directly to the Simple Motion module). The servo amplifier other than the head axis can be disconnected, however it cannot be connected again.
- Differences between SSCNETⅢ connection and SSCNETⅢ/H connection in driver communication function are shown below.

Item	SSCNETIII	SSCNETIII/H
Communication with the servo amplifiers after controller's power supply ON	The servo amplifiers cannot be operated until the connection with all system setting axes is confirmed.	The servo amplifiers cannot be operated until the connection with all driver communication setting axes is confirmed. The normal operation axis (driver communication unset up axis) can be connected after the network is established.
Connect/disconnect with servo amplifier	Only the first axis (servo amplifier connected directly to the Simple Motion module) can connect/disconnect. Servo amplifiers other than the first axis can be disconnected but cannot be connected.	Only the first axis (servo amplifier connected directly to the Simple Motion module) can connect/disconnect. Only normal axes (axes not set to driver communication) other than the first axis can be connected when they are disconnected. However, when axes set to driver communication are disconnected, they cannot communicate with servo amplifiers that were connected after disconnecting. (The servo amplifier's LED display remains "AA".)

- If all axes set to driver communication are not detected at the start of communication with the servo amplifier, all axes including independent axes cannot be operated. (The servo amplifier's LED display remains "Ab".) Check the operation enabled status with "[Md.52] Communication between amplifiers axes searching flag". When all independent axes and axes set to driver communication are connected, "0: Search end" is set in "[Md.52] Communication between amplifiers axes searching flag".

Monitor item		Monitor value	Storage details	Buffer memory address
[Md.52]	Communication between amplifiers axes searching flag	→	The detection status of axis that set communication between amplifiers is stored. 0: Search end 1: Searching	4234

■Home position return control, positioning control, manual control, expansion control, and synchronous control

- Do not start the slave axis. The command to servo amplifier is invalid even if the slave axis is started.
- The home position return request flag ([Md.31] Status: b3) of slave axis is always ON. There is no influence for control of slave axis.
- There are some restrictions for data used as the positioning control of slave axis. The external input signals such as FLS or RLS, and the parameters such as software stroke limit are invalid. Refer to ☞ Page 374 I/O signals of slave axis and ☞ Page 374 Data used for positioning control of slave axis for details.
- For setting the slave axis as a servo input axis, set "2: Actual position value" or "4: Feedback value" in "[Pr.300] Servo input axis type". Otherwise, the slave axis does not operate as an input axis.
- At the driver communication operation, only the switching to positioning control mode, speed control mode, and torque control mode are possible. When the mode is switched to continuous operation to torque control mode for the master axis, the warning "Control mode switching not possible" (warning code: 09EBH) will occur, and the control mode is not switched.

■Absolute position system

Set "0: Disabled (incremental system)" in "Absolute position detection system (PA03)"[*1] of servo parameter for slave axis. If "1: Enabled (used in absolute position detection system)" is set, the warning "Home position return data incorrect" (warning code: 093CH) will occur and the home position return of slave axis cannot be executed.

[*1] For MR-J3(W)-B/MR-J4(W)-B. For MR-J5(W)-B, set "Absolute position detection system selection (PA03.0)".

■I/O signals of slave axis

- Input signal: All signals cannot be used. The error detection signal turns ON "Error detection" ([Md.31] Status: b13).
- Output signal: All signals cannot be used.

■Data used for positioning control of slave axis

- Only the following axis monitor data are valid in slave axis.

Item		Remark
[Md.23]	Axis error No.	Valid for only servo alarm detection.
[Md.35]	Torque limit stored value/forward torque limit stored value	—
[Md.103]	Motor rotation speed	—
[Md.104]	Motor current value	—
[Md.107]	Parameter error No.	—
[Md.108]	Servo status1	The following bits are valid. • b0: READY ON • b1: Servo ON • b7: Servo alarm The slave axis is always controlled in torque control mode, "control mode (b2, b3)" is set to torque control mode (0, 1).
[Md.109]	Regenerative load ratio/Optional data monitor output 1	—
[Md.110]	Effective load torque/Optional data monitor output 2	—
[Md.111]	Peak torque ratio/Optional data monitor output 3	—
[Md.112]	Optional data monitor output 4	—
[Md.114]	Servo alarm	—
[Md.119]	Servo status2	The following bit is valid. • b0: Zero point pass (Execute home position return to the master axis.)
[Md.120]	Reverse torque limit stored value	—

- Only the following axis control data are valid in slave axis.

Item		Remark
[Cd.5]	Axis error reset	Reset is valid for only servo alarm detection.
[Cd.22]	New torque value/forward new torque value	—
[Cd.100]	Servo OFF command	—
[Cd.101]	Torque output setting value	—
[Cd.112]	Torque change function switching request	—
[Cd.113]	New reverse torque value	—

Servo parameter

Set the following parameters for the axis to execute the driver communication. (Refer to each servo amplifier instruction manual or manual for details.)

[MR-J3-_B_/MR-J3-_BS_/MR-J3-_B_-RJ006 use]

n: Axis No. - 1

Setting item			Setting details	Buffer memory address
Input/output setting	PA04	Forced stop deceleration function selection	Disable deceleration stop function at the master axis and slave axis.[*1]	28404+100n
	PD15	Driver communication setting	Set the master axis and slave axis.	65534+340n
	PD16	Driver communication setting Master transmit data selection 1	Set the transmitted data at master axis setting.	65535+340n
	PD17	Driver communication setting Master transmit data selection 2		65536+340n
	PD20	Driver communication setting Master axis No. selection 1 for slave	Set the axis No. of master axis at slave axis setting.	65539+340n
	PD30	Master-slave operation Torque command coefficient on slave	Set the parameter at slave axis setting.	65549+340n
	PD31	Master-slave operation Speed limit coefficient on slave		65550+340n
	PD32	Master-slave operation Speed limit adjusted value on slave		65551+340n

[*1] At MR-J3-_B_/MR-J3-_B_-RJ006 use, it is not necessary to change the setting since the initial value is disabled. However, it is required to set disabled since the initial value is enabled at MR-J3-_BS_ use.

When the slave axis is not allocated for the master axis, only the master axis operates independently.

Point

- The servo parameters are transmitted from Simple Motion module to servo amplifier after power supply ON or reset of the CPU module. Execute flash ROM writing of Simple Motion module after writing the servo parameter to buffer memory, and then turn the power supply ON or reset the CPU module.
- The servo parameters for driver communication setting (PD15 to PD17, PD20) become valid by turning the servo amplifier's power supply OFF to ON. Turn the servo amplifier's power supply OFF to ON after executing the above shown in the 1st bullet. Then, turn the system's power supply ON again or reset the CPU module.
- In the driver communication function, the torque generation direction for slave axis can be set in "Rotation direction selection/travel direction selection (PA14)".

[MR-J4-_B_/MR-J4-_B_-RJ/MR-J5-_B_/MR-J5-_B_-RJ use]

n: Axis No. - 1

Setting item			Setting details	Buffer memory address
Input/output setting	PA04	Forced stop deceleration function selection	Disable deceleration stop function at the master axis and slave axis.	28404+100n
	PD15	Driver communication setting	Set the master axis and slave axis.	65534+340n
	PD16	Driver communication setting Master transmit data selection 1	Set the transmitted data at master axis setting.	65535+340n
	PD17	Driver communication setting Master transmit data selection 2		65536+340n
	PD20	Driver communication setting Master axis No. selection 1 for slave	Set the axis No. of master axis at slave axis setting.	65539+340n
	PD30	Master-slave operation Torque command coefficient on slave	Set the parameter at slave axis setting.	65549+340n
	PD31	Master-slave operation Speed limit coefficient on slave		65550+340n
	PD32	Master-slave operation Speed limit adjusted value on slave		65551+340n

When the slave axis is not allocated for the master axis, only the master axis operates independently.

At slave setting, set only "Driver communication setting Master axis No. selection 1 for slave (PD20)" in the master axis No. selection normally.

Since the servo parameters of MR-J5(W)-B are not in the buffer memory, use GX Works3 or axis control data to set them.

Refer to the following for details.

☞ Page 796 Connection with MR-J5(W)-B

Point

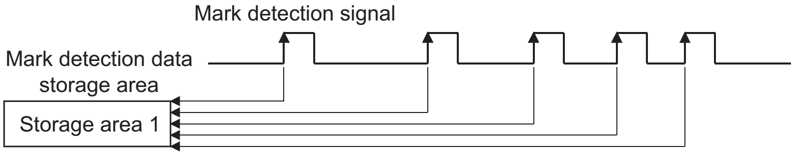
- The servo parameters are transmitted from Simple Motion module to servo amplifier after power supply ON or reset of the CPU module. Execute flash ROM writing of Simple Motion module after writing the servo parameter to buffer memory, and then turn the power supply ON or reset the CPU module.
- The servo parameters for driver communication setting (PA04, PD15 to PD17, PD20) become valid by turning the servo amplifier's power supply OFF to ON. Turn the servo amplifier's power supply OFF to ON after executing the above shown in the 1st bullet. Then, turn the system's power supply ON again or reset the CPU module.
- In the driver communication function, the torque generation direction for slave axis can be set in "Rotation direction selection/travel direction selection (PA14)".

9.10 Mark Detection Function

Any data can be latched at the input timing of the mark detection signal (DI).
Also, only data within a specific range can be latched by specifying the data detection range.
The following three modes are available for execution of mark detection.

Continuous detection mode

The latched data is always stored to the first of mark detection data storage area at mark detection.

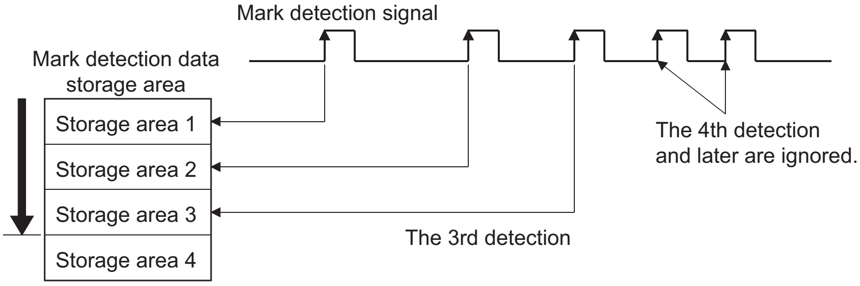


Specified number of detections mode

The latched data from a specified number of detections is stored.
The detected position for a specified number of detections can be collected when the mark detection signal is continuously input at high speed.

Ex.

Number of detections: 3

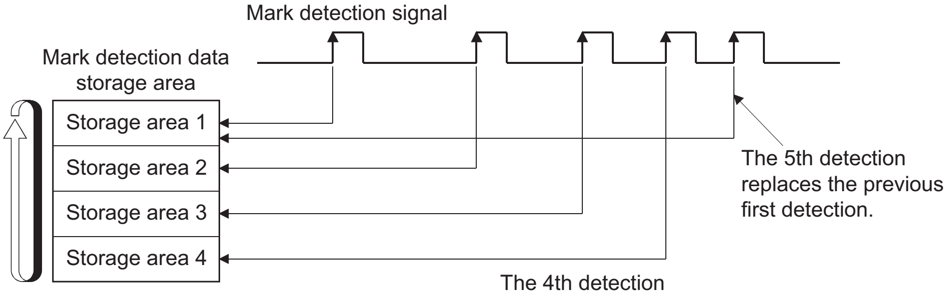


Ring buffer mode

The latched data is stored in a ring buffer for a specified number of detections.
The latched data is always stored at mark detection.

Ex.

Number of detections: 4



Performance specifications

[RD77MS]

Item	Performance specifications			
	RD77MS2	RD77MS4	RD77MS8	RD77MS16
Number of mark detection settings	Up to 16			
Input signal	External input signal (DI1 to DI10)	External input signal (DI1 to DI20)		
Input signal detection direction	Selectable for leading edge or trailing edge in logic setting of external input signal			
Input signal compensation time	Correctable within the range of -32768 to 32767 μs			
Detection accuracy	10 μs			
Latch data	11 types + Optional buffer memory data (2 words) (Command position value, Machine feed value, Actual position value, Servo input axis position value, Synchronous encoder axis position value, Synchronous encoder axis position value per cycle, Position value after composite main shaft gear, Position value per cycle after main shaft gear, Position value per cycle after auxiliary shaft gear, Cam axis position value per cycle, Cam axis position value per cycle (real position))			
Number of continuous latch data storage	Up to 32			
Latched data range	Settable in the range of -2147483648 to 2147483647			

[RD77GF]

Item	Performance specifications			
	RD77GF4	RD77GF8	RD77GF16	RD77GF32
Number of mark detection settings	Up to 16			Up to 32
Input signal	Link device (RX, RY, RWr, RWw)			
Input signal detection direction	Selectable for leading edge or trailing edge in "[Pr.811] Mark detection signal detection direction setting".			
Input signal compensation time	Correctable within the range of -32768 to 32767 μs			
Detection accuracy	High-accuracy (recommended): 0.1μs[*1] Normal: Link scan cycle			
Latch data	11 types + Optional buffer memory data (2 words) (Command position value, Machine feed value, Actual position value, Servo input axis position value, Synchronous encoder axis position value, Synchronous encoder axis position value per cycle, Position value after composite main shaft gear, Position value per cycle after main shaft gear, Position value per cycle after auxiliary shaft gear, Cam axis position value per cycle, Cam axis position value per cycle (real position))			
Number of continuous latch data storage	Up to 32			
Latched data range	Settable in the range of -2147483648 to 2147483647			

[*1] When all the following conditions are satisfied, the high-accuracy detection is possible.
- RX of the remote input module that supports the "synchronous input timing acquisition function" is assigned.
- The "synchronous input timing acquisition function" is enabled.
- Link refresh is executed for the synchronous input timing information of the input signal used.

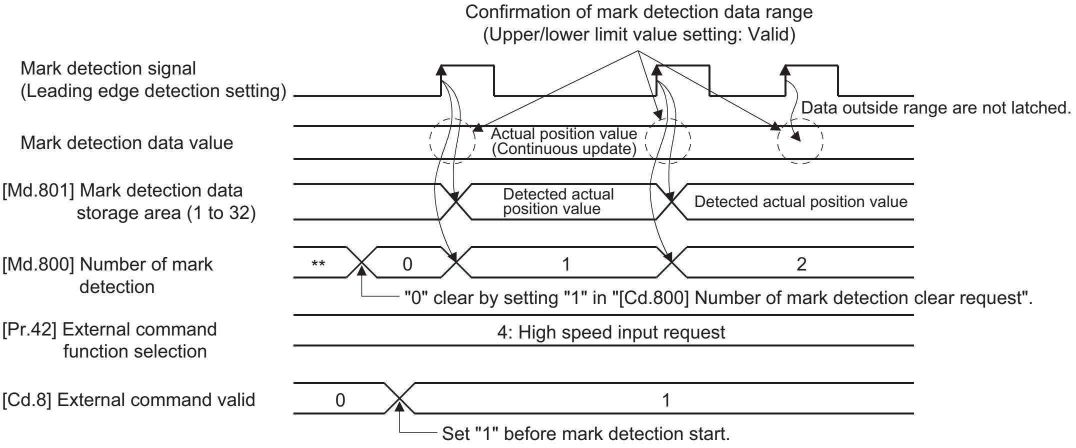
For the "synchronous input timing acquisition function", refer to the following.
🕮CC-Link IE Field Network Remote I/O Module User's Manual

Operation for mark detection function

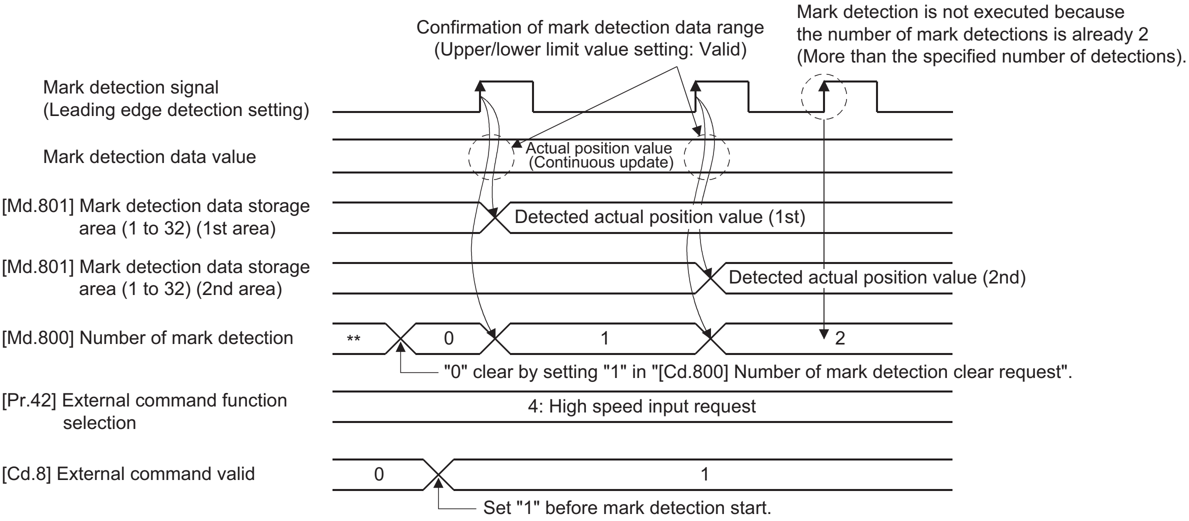
Operations done at mark detection are shown below.

- Calculations for the mark detection data are estimated at leading edge/trailing edge of the mark detection signal. However, when the specified number of detections mode is set, the current number of mark detection is checked, and then it is judged whether to execute the mark detection.
- When a mark detection data range is set, it is first confirmed whether the mark detection data is within the range or not. Data outside the range are not detected.
- The mark detection data is stored in the mark detection data storage area according to the mark detection mode, and then the number of mark detection is updated.

■Continuous detection mode



■Specified number of detection mode (Number of detections: 2)



Point

A delay for one link scan occurs from the mark detection signal input to the update of "[Md.800] Number of mark detection" and "[Md.801] Mark detection data storage area (1 to 32)". [RD77GF]

How to use mark detection function

An example for mark detection using the following signal or link device is shown below.

- The external command signal (DI2) of axis 2 [RD77MS]
- RX100 [RD77GF]

The mark detection target is axis 1 actual position value, and the all range is detected in continuous detection mode.

- Allocate the input signal (DI2) to the external command signal of axis 2, and set the "high speed input request" for mark detection. [RD77MS]

n: Axis No. - 1

Setting item		Setting value	Setting details/setting value	Buffer memory address
[Pr.95]	External command signal selection	2	Set "2: DI2" to the external command signal of axis 2.	219 (69+150n)
[Pr.42]	External command function selection	4	Set "4: High speed input request" as the function used in the external command signal of axis 2.	212 (62+150n)

- Set the following mark detection setting parameters. The optional mark detection setting No. can be set.

k: Mark detection setting No. - 1

Setting item		Setting value	Setting details/setting value	Buffer memory address
[Pr.800]	Mark detection signal setting [RD77MS]	2	Set "2: Axis 2" to the external input signal for mark detection.	54000+20k
[Pr.801]	Mark detection signal compensation time	0	Set "0: (No compensation)" to the compensation time such as delay of sensor.	54001+20k
[Pr.802]	Mark detection data type	2	Set "2: Actual position value" to the target data for mark detection.	54002+20k
[Pr.803]	Mark detection data axis No.	1	Set "1: Axis 1" to the axis No. of target data for mark detection.	54003+20k
[Pr.805]	Latch data range upper limit value	0	Set "0" to the valid upper limit value for latch data at mark detection. (Mark detection for all range is executed by setting the same value as lower limit value.)	54006+20k 54007+20k
[Pr.806]	Latch data range lower limit value	0	Set "0" to the valid lower limit value for latch data at mark detection. (Mark detection for all range is executed by setting the same value as upper limit value.)	54008+20k 54009+20k
[Pr.807]	Mark detection mode setting	0	Set "0: Continuous detection mode" to the mark detection mode.	54010+20k
[Pr.808]	Mark detection signal link device type [RD77GF]	0	Set "11H: RX (1 bit)" for the link device type to be used.	54011+20k
[Pr.809]	Mark detection signal link device No. [RD77GF]	0	Set "100H" for the link device No. to be used.	54012+20k
[Pr.810]	Mark detection signal link device bit specification [RD77GF]	0	Setting not required	54013+20k
[Pr.811]	Mark detection signal detection direction setting [RD77GF]	0	Set "0: Rising detection" for the signal detection direction.	54014+20k

- Turn the power supply OFF or reset of the CPU module to validate the setting parameters.
- The mark detection starts by setting "1: Validates an external command." in "[Cd.8] External command valid" of axis 2 with the program. Refer to "[Md.800] Number of mark detection" or "[Md.801] Mark detection data storage area (1 to 32)" of the set detection setting No. for the number of mark detections and mark detection data.

List of parameters and data

The following shows the configuration of parameters and data for mark detection function.

Buffer memory address	Item	Mark detection setting No.
54000 to 54019	Mark detection setting parameter [Pr.800] to [Pr.811]	Mark detection setting 1
54020 to 54039		Mark detection setting 2
54040 to 54059		Mark detection setting 3
⋮		⋮
54300 to 54319		Mark detection setting 16
54321 to 54339		Mark detection setting 17
⋮		⋮
54621 to 54639		Mark detection setting 32
54640 to 54649	Mark detection control data [Cd.800], [Cd.801], [Cd.802]	Mark detection setting 1
54650 to 54659		Mark detection setting 2
54660 to 54669		Mark detection setting 3
⋮		⋮
54790 to 54799		Mark detection setting 16
54800 to 54809		Mark detection setting 17
⋮		⋮
54950 to 54959		Mark detection setting 32
54960 to 55039	Mark detection monitor data [Md.800], [Md.801], [Md.802]	Mark detection setting 1
55040 to 55119		Mark detection setting 2
55120 to 55199		Mark detection setting 3
⋮		⋮
56160 to 56239		Mark detection setting 16
56240 to 56319		Mark detection setting 17
⋮		⋮
57440 to 57519		Mark detection setting 32

Refer to the following for the range of mark detection setting No. that can be used for each module.

☞ Page 378 Performance specifications

The following shows the parameters and data used in the mark detection function.

Mark detection setting parameters

k: Mark detection setting No. - 1

Setting item		Setting details/setting value	Default value	Buffer memory address
[Pr.800]	Mark detection signal setting [RD77MS]	Set the external input signal (high speed input request) for mark detection. 0: Invalid 1 to 2: External command signal of axis 1 to axis 2 (2-axis module) 1 to 4: External command signal of axis 1 to axis 4 (4-axis module) 1 to 8: External command signal of axis 1 to axis 8 (8-axis module) 1 to 16: External command signal of axis 1 to axis 16 (16-axis module) Fetch cycle: At power supply ON	0	54000+20k
[Pr.801]	Mark detection signal compensation time	Set the compensation time such as delay of sensor. Set a positive value to compensate for a delay. -32768 to 32767 [μs] Fetch cycle: At power supply ON or PLC READY signal [Y0] OFF to ON	0	54001+20k
[Pr.802]	Mark detection data type	Set the target data for mark detection. 0 to 12: Data type -1: Optional 2 word buffer memory Fetch cycle: At power supply ON	0	54002+20k
[Pr.803]	Mark detection data axis No.	Set the axis No. of target data for mark detection. 1 to 2: Axis 1 to axis 2 (2-axis module) 1 to 4: Axis 1 to axis 4 (4-axis module) 1 to 8: Axis 1 to axis 8 (8-axis module) 1 to 16: Axis 1 to axis 16 (16-axis module) 1 to 32: Axis 1 to axis 32 (32-axis module) 801 to 804: Synchronous encoder axis 1 to axis 4 [RD77MS] 801 to 804: Synchronous encoder axis 1 to axis 4 (4-axis module) [RD77GF] 801 to 808: Synchronous encoder axis 1 to axis 8 (8-axis module) [RD77GF] 801 to 816: Synchronous encoder axis 1 to axis 16 (16-axis module) [RD77GF] 801 to 832: Synchronous encoder axis 1 to axis 32 (32-axis module) [RD77GF] Fetch cycle: At power supply ON	0	54003+20k
[Pr.804]	Mark detection data buffer memory No.	Set the optional buffer memory No. Set this parameter as an even number. 0 to 98302: Optional buffer memory [RD77MS] 0 to 4194302: Optional buffer memory [RD77GF] Fetch cycle: At power supply ON	0	54004+20k 54005+20k
[Pr.805]	Latch data range upper limit value	Set the valid upper limit value for latch data at mark detection. -2147483648 to 2147483647 Fetch cycle: At power supply ON, PLC READY signal [Y0] OFF to ON, or request (Latch data range change)	0	54006+20k 54007+20k
[Pr.806]	Latch data range lower limit value	Set the valid lower limit value for latch data at mark detection -2147483648 to 2147483647 Fetch cycle: At power supply ON, PLC READY signal [Y0] OFF to ON, or request (Latch data range change)	0	54008+20k 54009+20k
[Pr.807]	Mark detection mode setting	Set the continuous detection mode or specified number of detection mode. 0: Continuous detection mode 1 to 32: Specified number of detection mode (Set the number of detections.) -1 to -32: Ring buffer mode (Set the value that made the number of buffers into negative value.) Fetch cycle: At power supply ON or PLC READY signal [Y0] OFF to ON	0	54010+20k
[Pr.808]	Mark detection signal link device type [RD77GF]	Set link device type for use. Others: Invalid 11H: RX (1 bit) 12H: RY(1 bit) 13H: RWr(1 bit) 14H: RWw(1 bit) Fetch cycle: At power supply ON	0	54011+20k
[Pr.809]	Mark detection signal link device No. [RD77GF]	Set link device No. for use. Fetch cycle: At power supply ON	0	54012+20k
[Pr.810]	Mark detection signal link device bit specification [RD77GF]	Set the bit No. that used in occasion when "13H: RWr (1 bit)" and "14H: RWw (1 bit)" had been set to "[Pr.808] Mark detection signal link device type". 00H to 0FH Fetch cycle: At power supply ON	0	54013+20k

Setting item		Setting details/setting value	Default value	Buffer memory address
[Pr.811]	Mark detection signal detection direction setting [RD77GF]	Set the signal detection direction. Only the setting of b0 is effective. 0: Rising detection 1: Falling detection Fetch cycle: At power supply ON	0	54014+20k

Point

The above parameters are valid with the value set in the flash ROM of the Simple Motion module when the power ON or the CPU module reset. Except for a part, the value is not fetched by turning the PLC READY signal [Y0] ON from OFF. Therefore, write to the flash ROM after setting the value in the buffer memory to change.

[Pr.800] Mark detection signal setting [RD77MS]

Set the input signal for mark detection.

Setting value	Setting details
0	Invalid
1 to 2	External command signal (DI) of axis 1 to axis 2 (2-axis module)
1 to 4	External command signal (DI) of axis 1 to axis 4 (4-axis module)
1 to 8	External command signal (DI) of axis 1 to axis 8 (8-axis module)
1 to 16	External command signal (DI) of axis 1 to axis 16 (16-axis module)

If a value other than the above is set, the warning "Outside mark detection signal setting range" (warning code: 0936H) occurs and the target mark detection is not available.

Set "4: High speed input request" in "[Pr.42] External command function selection" and set "1: Validates an external command." in "[Cd.8] External command valid".

[Pr.801] Mark detection signal compensation time

Compensate the input timing of the mark detection signal.

Set this parameter to compensate such as delay of sensor input. (Set a positive value to compensate for a delay.)

[Pr.802] Mark detection data type

Set the data that latched at mark detection.

The target data is latched by setting "0 to 12". Set the axis No. in "[Pr.803] Mark detection data axis No.".

Optional 2 word buffer memory is latched by setting "-1". Set the buffer memory No. in "[Pr.804] Mark detection data buffer memory No.".

Setting value	Data name
0	Command position value
1	Machine feed value
2	Actual position value
3	Servo input axis position value
6	Synchronous encoder axis position value
7	Synchronous encoder axis position value per cycle
8	Position value after composite main shaft gear
9	Position value per cycle after main shaft gear
10	Position value per cycle after auxiliary shaft gear
11	Cam axis position value per cycle
12	Cam axis position value per cycle (Real position)
-1	Optional 2 words buffer memory

If a value other than the above is set, the warning "Outside mark detection data type setting range" (warning code: 0937H) occurs and the target mark detection is not available.

[Pr.803] Mark detection data axis No.

Set the axis No. of data that latched at mark detection.

[Pr.802] Mark detection data type			[Pr.803] Mark detection data axis No.				
Setting value	**Data name**	**Unit**	**2-axis module**	**4-axis module**	**8-axis module**	**16-axis module**	**32-axis module**
0	Command position value	10^{-1} [μm], 10^{-5} [inch], 10^{-5} [degree], [pulse]	1 to 2	1 to 4	1 to 8	1 to 16	1 to 32
1	Machine feed value						
2	Actual position value						
3	Servo input axis position value						
6	Synchronous encoder axis position value	Synchronous encoder axis position unit	801 to 804 [RD77MS]				—
7	Synchronous encoder axis position value per cycle		—	801 to 804 [RD77GF]	801 to 808 [RD77GF]	801 to 816 [RD77GF]	801 to 832 [RD77GF]
8	Position value after composite main shaft gear	Main input axis position unit	1 to 2	1 to 4	1 to 8	1 to 16	1 to 32
9	Position value per cycle after main shaft gear	Cam axis cycle unit					
10	Position value per cycle after auxiliary shaft gear						
11	Cam axis position value per cycle						
12	Cam axis position value per cycle (Real position)[*1]						

[*1] Cam axis position value per cycle that considered delay of the servo system.

If a value other than the above is set, the warning "Outside mark detection data axis No. setting range" (warning code: 0938H) occurs and the target mark detection is not available.

[Pr.804] Mark detection data buffer memory No.

Set the No. of optional 2 words buffer memory that latched at mark detection.

Set this No. as an even No.

If a value other than the above is set, the warning "Outside mark detection data buffer memory No. setting range" (warning code: 0939H) occurs and the target mark detection is not available.

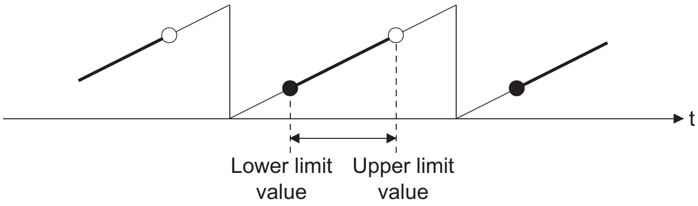
[Pr.805] Latch data range upper limit value, [Pr.806] Latch data range lower limit value

Set the upper limit value and lower limit value of the latch data at mark detection.

When the data at mark detection is within the range, they are stored in "[Md.801] Mark detection data storage area (1 to 32)" and the "[Md.800] Number of mark detection" is incremented by 1. The mark detection processing is not executed.

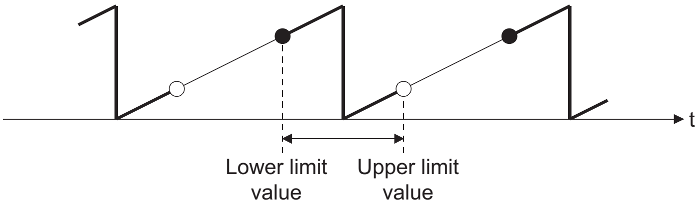
- Upper limit value > Lower limit value

The mark detection is executed when the mark detection data is "greater or equal to the lower limit value and less than the upper limit value".



- Upper limit value < Lower limit value

The mark detection is executed when the mark detection data is "greater or equal to the lower limit value or less than the upper limit value".



- Upper limit value = Lower limit value

The mark detection range is not checked. The mark detection is executed for all range.

[Pr.807] Mark detection mode setting

Set the data storage method of mark detection.

Mode	Setting value	Operation for mark detection	Mark detection data storage method
Continuous detection mode	0	Always	The data is updated in the mark detection data storage area 1.
Specified number of detection mode	1 to 32	Number of detections (If the number of mark detection is the number of detections or more, the mark detection is not executed.)	The data is stored to the mark detection data storage area "n". n = (1 + Number of mark detection)
Ring buffer mode	-1 to -32	Always (The mark detection data storage area 1 to 32 is used as a ring buffer for the number of detections.)	

[Pr.808] Mark detection signal link device type [RD77GF]

Set link device type for use.

Setting value	Setting details
11H	RX (1 bit)
12H	RY (1 bit)
13H	RWr (1 bit)
14H	RWw (1 bit)

Values other than the above are invalid.

[Pr.809] Mark detection signal link device No. [RD77GF]

Set link device No. for use.

When a link device No. out of the range is set, the warning "Mark detection link device start No. specification" (warning code: 092EH) occurs and mark detection for the specified No. cannot be used.

[Pr.810] Mark detection signal link device bit specification [RD77GF]

Set the bit No. that used in occasion when "13H: RWr (1 bit)" and "14H: RWw (1 bit)" had been set to "[Pr.808] Mark detection signal link device type".

When a value out of the range is set, the warning "Mark detection link device bit specification" (warning code: 092FH) occurs and mark detection for the specified No. cannot be used.

[Pr.811] Mark detection signal detection direction setting [RD77GF]

Set the signal detection direction. Only the setting of b0 is effective.

0: Rising detection

1: Falling detection

Mark detection control data

k: Mark detection setting No. - 1

Setting item		Setting details/setting value	Default value	Buffer memory address
[Cd.800]	Number of mark detection clear request	Set "1" to execute "0" clear of number of mark detections. "0" is automatically set after completion by "0" clear of number of mark detections. 1: 0 clear of number of mark detections Fetch cycle: Operation cycle	0	54640+10k
[Cd.801]	Mark detection invalid flag	Set this flag to invalidate mark detection temporarily. 1: Mark detection: Invalid Others: Mark detection: Valid Fetch cycle: Operation cycle	0	54641+10k
[Cd.802]	Latch data range change request	Request the processing of latch data range change. Set the following value depending on the timing of updating the change value. 1: Change in the next Operation cycle of the requested 2: Change in the next DI input of the requested "0" is automatically set after the change is completed. Fetch cycle: Operation cycle or at conditions established (DI input)	0	54642+10k

[Cd.800] Number of mark detection clear request

Set "1" to execute "0" clear of "[Md.800] Number of mark detection". "0" is automatically set after completion by "0" clear of "[Md.800] Number of mark detection".

[Cd.801] Mark detection invalid flag

Set "1" to invalidate mark detection temporarily. The mark detection signal during invalidity is ignored.

[Cd.802] Latch data range change request

Request the processing of latch data range change. Set the following value depending on the timing of updating the change value.

1: Change in the next Operation cycle of the requested

2: Change in the next DI input of the requested

- "0" is automatically set after receiving the latch data range change request. (It indicates that the latch data range change is completed.)
- "[Pr.805] Latch data range upper limit value" and "[Pr.806] Latch data range lower limit value" at latch data range change request are used as the change value.
- Restrictions according to the type of latch data range change request are shown below.

○: Possible, ×: Not possible

Types of change request	[Cd.801] Mark detection invalid flag	Changing possibility
1: Change in the next Operation cycle of the requested	1: Mark detection: Invalid	○
	Other than 1: Mark detection: Valid	
2: Change in the next DI input of the requested	1: Mark detection: Invalid	×
	Other than 1: Mark detection: Valid	○

Mark detection monitor data

k: Mark detection setting No. - 1

Storage item		Storage details/storage value	Buffer memory address
[Md.800]	Number of mark detection	The number of mark detections is stored. "0" clear is executed at power supply ON. Continuous detection mode: 0 to 65535 (Ring counter) Specified number of detection mode: 0 to 32 Ring buffer mode: 0 to (number of buffers - 1) Refresh cycle: At conditions established (Mark detection)	54960+80k
[Md.801]	Mark detection data storage area 1 ⋮ Mark detection data storage area 32	The latch data at mark detection is stored. Data for up to 32 times are stored in the specified number of detection mode. Data are stored as a ring buffer for number of detections in the ring buffer mode. -2147483648 to 2147483647 Refresh cycle: At conditions established (Mark detection)	54962+80k 54963+80k ⋮ 55024+80k 55025+80k
[Md.802]	Mark detection signal monitor [RD77GF]	The state (ON/OFF) of the mark detection signal is stored. 0: Mark detection signal OFF 1: Mark detection signal ON Refresh cycle: Operation cycle	54961+80k

[Md.800] Number of mark detection

The counter value is incremented by 1 at mark detection. Preset "0" clear in "[Cd.800] Number of mark detection clear request" to execute the mark detection in specified number of detections mode or ring buffer mode.

[Md.801] Mark detection data storage area (1 to 32)

The latch data at mark detection is stored. Data for up to 32 times can be stored in the specified number of detection mode or ring buffer mode.

[Md.802] Mark detection signal monitor [RD77GF]

The state (ON/OFF) of the mark detection signal is stored.

Precautions

- When the data of "[Pr.802] Mark detection data type" or "[Pr.803] Mark detection data axis No." is selected incorrectly, the incorrect latch data is stored. For the data of "[Pr.802] Mark detection data type", set the item No. instead of specifying the buffer memory No. directly.
- When "9: Position value per cycle after main shaft gear" or "10: Position value per cycle after auxiliary shaft gear" is set to "[Pr.802] Mark detection data type" and the mark detection is executed right after the cam axis length per cycle is changed during synchronous control, the data before the cam axis length per cycle is changed may be latched. At the time, the latch data is calculated based on the executing cam axis length per cycle. Therefore, the value different from the actual output monitor data may be latched.
- The mark detection function of the Simple Motion module is not linked to the touch probe function of the servo amplifier. To use the touch probe function, access the related object of the touch probe using the servo cyclic transmission function or the servo transient transmission function. [RD77GF]
- When "8: Position value after composite main shaft gear" to "12: Cam axis position value per cycle (real position)" are set to "[Pr.802] Mark detection data type" and the mark detection is executed other than during synchronous control, the value different from the actual output monitor data may be latched.
- If the mark detection signal is input at the timing when the latch target data is changed significantly such as by the current position change or the home position return, the correct data cannot be latched.
  During the current position change or the home position return, use the data such as "[Cd.801] Mark detection invalid flag" to temporarily disable the mark detection.

9.11 Optional Data Monitor Function [RD77MS]

Registered monitor

The data of the registered monitor is refreshed every operation cycle.

This function is used to store the data (refer to following table) up to four points per axis to the buffer memory and monitor them.

■Data that can be set

○: Possible, —: Not possible ("0" is stored.)

Data type		Unit	Used point	Monitoring possibility			
				MR-J3(W)-B	MR-J4(W)-B	MR-JE-B(F)	MR-J5(W)-B
1	Effective load ratio	[%]	1 word	○	○	○	○
2	Regenerative load ratio	[%]		○	○	○	○
3	Peak load ratio	[%]		○	○	○	○
4	Load inertia moment ratio	[× 0.1]		○	○	○	○
5	Model loop gain	[rad/s]		○	○	○	○
6	Bus voltage	[V]		○	○	○	○
7	Servo motor speed[1]	[r/min]		○	○	○	○
8	Encoder multiple revolution counter	[rev]		○	○	○	○
9	Unit power consumption	[W]		—	○	○	○
10	Instantaneous torque	[× 0.1%]		—	○	○	○
12	Servo motor thermistor temperature	[℃]		○	○	○	○
13	Torque equivalent to disturbance	[× 0.1%]		—	○	○	○
14	Overload alarm margin	[× 0.1%]		—	○	○	○
15	Excessive error alarm margin	[× 16 pulses]		—	○	○	○[2]
16	Settling time	[ms]		—	○	○	○
17	Overshoot amount	[pulse]		—	○	○	○[2]
18	Internal temperature of encoder	[℃]		—	○	○	○
20	Position feedback	[pulse]	2 words	○	○	○	○[2]
21	Encoder position within one revolution	[pulse]		○	○	○	○[2]
22	Selected droop pulse[3]	[pulse]		○	○	○	○[2]
23	Unit total power consumption	[Wh]		—	○	○	○
24	Load-side encoder information 1	[pulse]		○[4]	○[4][5]	—	○[4][5]
25	Load-side encoder information 2	—		○[4]	○[4][5]	—	○[4][5]
26	Z-phase counter	[pulse]		—	○[6]	○[6]	○[2][6]
27	Servo motor side/load-side position deviation	[pulse]		—	○[4]	○[4]	○[2][4]
28	Servo motor side/load-side speed deviation	[× 0.01 r/min]		—	○[4]	○[4]	○[4]
30	Unit power consumption (2 words)	[W]		—	○	○	○
Most significant bit1 + address value	Optional address of registered monitor	—	—	○	○	○	○

*1 The motor rotation speed that took the average every 227 [ms].
Use the servo amplifiers of version compatible with the monitor of motor speed.
Always "0" if the monitor is executed for the servo amplifier which does not support this function.

*2 The value is multiplied by the multiplicative inverse for the electronic gear ratio of the servo amplifier (command unit). The same data as MR-J4(W)-B can be stored by configuring the electronic gear setting of the servo amplifier. [RD77MS]

*3 The data set to "Droop pulse monitor selection for controller display" of "Fully closed loop function selection 3 (PE10)" is monitored.

*4 It can be monitored when using the fully closed loop control.

*5 It can be monitored when using the synchronous encoder via servo amplifier.

*6 It can be monitored when using the linear servo motors.

Refer to each servo amplifier instruction manual or manual for details of the data monitored.

■List of parameters and data

The parameters and data used in the registered monitor of the optional data monitor function is shown below.

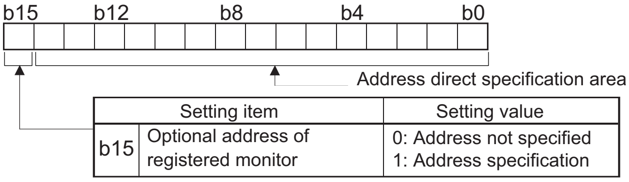
- Extended parameter

n: Axis No. - 1

Setting item		Setting details/setting value	Buffer memory address
[Pr.91]	Optional data monitor: Data type setting 1	• Set the data type monitored in optional data monitor function every data type setting. (☞ Page 388 Data that can be set) • When "0: No setting" is set, the stored value of "[Md.109] Regenerative load ratio/Optional data monitor output 1" to "[Md.112] Optional data monitor output 4" is different every data type setting 1 to 4.	100+150n
[Pr.92]	Optional data monitor: Data type setting 2		101+150n
[Pr.93]	Optional data monitor: Data type setting 3		102+150n
[Pr.94]	Optional data monitor: Data type setting 4		103+150n

[When specifying the optional address of registered monitor]

Switches to direct specification of the registered monitor address for each optional data monitor data type.



	Setting item	Setting value
b15	Optional address of registered monitor	0: Address not specified 1: Address specification

- The optional address of registered monitor is used to retrieve data not selectable with each connected device. For details, contact the manufacturer of the connected device.

Point

- The monitor address of optional data monitor is registered to servo amplifier with initialized communication after the power supply is turned ON or the CPU module is reset.
- Set the data type of "used point: 2 words" in "[Pr.91] Optional data monitor: Data type setting 1" or "[Pr.93] Optional data monitor: Data type setting 3". If it is set in "[Pr.92] Optional data monitor: Data type setting 2" or "[Pr.94] Optional data monitor: Data type setting 4", the warning "Optional data monitor data type setting error" (warning code: 0933H) will occur with initialized communication to servo amplifier, and "0" is set in "[Md.109] Regenerative load ratio/Optional data monitor output 1" to "[Md.112] Optional data monitor output 4".
- Set "0" in "[Pr.92] Optional data monitor: Data type setting 2" when the data type of "used point: 2 words" is set in "[Pr.91] Optional data monitor: Data type setting 1", and set "0" in "[Pr.94] Optional data monitor: Data type setting 4" when the data type of "used point: 2 words" is set in "[Pr.93] Optional data monitor: Data type setting 3". When other than "0" is set, the warning "Optional data monitor data type setting error" (warning code: 0933H) will occur with initialized communication to servo amplifier, and "0" is set in "[Md.109] Regenerative load ratio/Optional data monitor output 1" to "[Md.112] Optional data monitor output 4".
- When the data type of "used point: 2 words" is set, the monitor data of low-order is "[Md.109] Regenerative load ratio/Optional data monitor output 1" or "[Md.111] Peak torque ratio/Optional data monitor output 3".
- Refer to ☞ Page 388 Data that can be set for the data type that can be monitored on each servo amplifier. When the data type that cannot be monitored is set, "0" is stored to the monitor output.
- When directly specifying addresses for each optional data monitor type, specify the addresses in bit0 to bit14 of "[Pr.91] Optional data monitor: Data type setting 1" to "[Pr.94] Optional data monitor: Data type setting 4" and set "1" in bit15.
- When monitoring data that is 2-word type, set the lowermost data in "[Pr.91] Optional data monitor: Data type setting 1" and the uppermost data in "[Pr.92] Optional data monitor: Data type setting 2", or set the lowermost data in "[Pr.93] Optional data monitor: Data type setting 3" and the uppermost data in "[Pr.94] Optional data monitor: Data type setting 4".

- Axis monitor data

n: Axis No. - 1

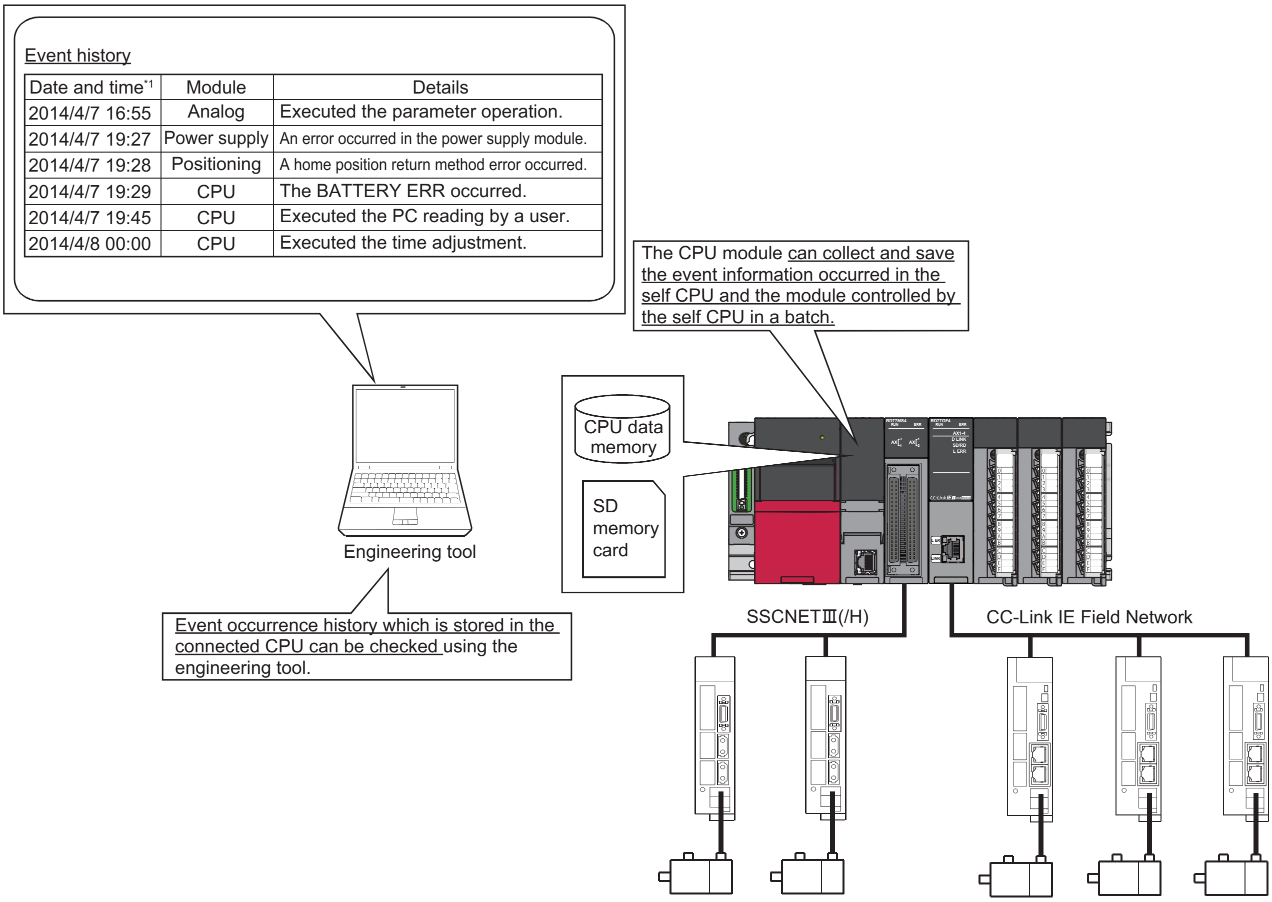
Storage item		Storage details/storage value	Buffer memory address
[Md.109]	Regenerative load ratio/Optional data monitor output 1	• The content set in "[Pr.91] Optional data monitor: Data type setting 1" is stored at optional data monitor data type setting. • The regenerative load ratio is stored when nothing is set.	2478+100n
[Md.110]	Effective load torque/Optional data monitor output 2	• The content set in "[Pr.92] Optional data monitor: Data type setting 2" is stored at optional data monitor data type setting. • The effective load ratio is stored when nothing is set.	2479+100n
[Md.111]	Peak torque ratio/Optional data monitor output 3	• The content set in "[Pr.93] Optional data monitor: Data type setting 3" is stored at optional data monitor data type setting. • The peak torque ratio is stored when nothing is set.	2480+100n
[Md.112]	Optional data monitor output 4	• The content set in "[Pr.94] Optional data monitor: Data type setting 4" is stored at optional data monitor data type setting. • "0" is stored when nothing is set.	2481+100n

Point

When the communication interrupted by the servo amplifier's power supply OFF or disconnection of communication cable with servo amplifiers during optional data monitor, "0" is stored in [Md.109] to [Md.112].

9.12 Event History Function

The "event history function" is used to save the error information and the operation for the module as an event in the data memory or an SD memory card of the CPU module. The saved event information can be displayed with an engineering tool and the occurrence history can be checked in chronological order. The detail information of the error also can be checked by referring to "Optional information" in event history.



Event history

Date and time[*1]	Module	Details
2014/4/7 16:55	Analog	Executed the parameter operation.
2014/4/7 19:27	Power supply	An error occurred in the power supply module.
2014/4/7 19:28	Positioning	A home position return method error occurred.
2014/4/7 19:29	CPU	The BATTERY ERR occurred.
2014/4/7 19:45	CPU	Executed the PC reading by a user.
2014/4/8 00:00	CPU	Executed the time adjustment.

The CPU module can collect and save the event information occurred in the self CPU and the module controlled by the self CPU in a batch.

Event occurrence history which is stored in the connected CPU can be checked using the engineering tool.

*1 Displays a value set by the clock function of the CPU module.

Event occurred in the Simple Motion module

The items saved in the event history are shown in the table below.

For events related to the CC-Link IE Field Network, refer to "Event List" in the following manual. [RD77GF]

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

Event type	Category	Details	Event item	Event code
System	Error	An error is detected by the Simple Motion module.	Major error	03C00 to 03FFF
			Moderate error	02000 to 03BFF
			Minor error	01000 to 01FFF
	Warning	A warning is detected by the Simple Motion module.	Warning	00800 to 00FFF
	Information	The event shown on the right column is detected by the Simple Motion module.	Home position return request ON [RD77GF]	00000 to 007FF
Operation	Information	The operation shown on the right column by a user is detected by the Simple Motion module.	Module initialization (Parameter initialization)	20010
			Module backup (Execution data backup)	20011
			Online module change [RD77MS]	20030
			Writing an object with servo transient transmission [RD77GF]	20050

Detailed information of error/warning event

The items displayed in the detailed information, which vary depending on each error category, are configured by the items shown in the table below.

Error category	Detailed information 1	Detailed information 2	Detailed information 3
H/W error	—	—	—
Positioning control in common Home position return Absolute position restoration Manual control Positioning operation Block start data Positioning data Speed-torque control Cam data operation	Axis information • Axis in which an event occurred[*1] • Axis operation status • Start No.[*6] • Data No. in which an event occurred[*6] • Factor axis • Block start Point No. at start[*6] • Block start Point No. at occurrence[*6]	Current value • Command position value • Actual current value • Speed command • Unit	Signal • PLC READY signal [Y0] • All axis servo ON [Y1] • BUSY • External input signal ([Md.30]) • Servo status 1 • Servo status 2 • Servo status 3
Synchronous control (Input axis)	Axis information • Axis in which an event occurred (For a synchronous encoder axis, 800 + Axis No.) • Axis operation status (For a synchronous encoder axis, always 0)	—	—
Synchronous control (Output axis)	Axis information • Axis in which an event occurred • Axis operation status • Cam data No. when an error occurred	Current value • Command position value • Unit	—
Servo amplifier	Axis information • Axis in which an event occurred • Axis operation status • Start No.[*2*6] • Data No. in which an event occurred[*2*6] • Block start Point No. at start[*6] • Block start Point No. at occurrence[*6] • Connected device • Servo alarm	Current value • Command position value • Actual current value • Unit • Motor rotation speed (0.01 r/min)[*3] • Motor current value (0.1%)	Signal • Servo status 1 • Servo status 2 • Servo status 3
I/F • Hold error • Flash ROM error • CPU module error • Dedicated instruction	System information • Number of write accesses to flash ROM	—	—
Parameter setting range error • Common parameter • Basic parameter • Detailed parameter • Home position return parameter • Extended parameter • Servo parameter	Axis information • Axis in which an event occurred[*4]	Setting value [RD77MS] • Parameter 1 • Setting value 1 • Parameter 2 • Setting value 2 • Parameter 3 • Setting value 3 [RD77GF] • Parameter 1 • Setting value 1 • Parameter 2 • Setting value 2 Displays the number of parameters in which an error occurred.	Setting value [RD77MS] • Parameter 4 • Setting value 4 • Parameter 5 • Setting value 5 • Parameter 6 • Setting value 6 [RD77GF] • Parameter 3 • Setting value 3 • Parameter 4 • Setting value 4 Displays the number of parameters in which an error occurred.
Driver home position return	Axis information • Axis in which an event occurred • Operation alarm • Absolute position detection system • Rotation direction selection	Signal • External input signal ([Md.30]) • Servo status 1 • Servo status 2 • Servo status 7 • Home position return status[*5]	—
Optical hub unit	System information • Optical hub unit No. • Alarm detailed No.	—	—

Error category	Detailed information 1	Detailed information 2	Detailed information 3
SLMP communication [RD77GF]	Axis information • Axis in which an event occurred • Request object Index • Request object SubIndex • SDO Abort Code	—	—
Servo amplifier connection [RD77GF]	Axis information • Axis in which an event occurred • Error causes	—	—

*1 For an error code which is independent of an axis, the information for an axis in which an event occurred is not displayed.
(For an error code which is independent of an axis, refer to the following.
☞ Page 700 TROUBLESHOOTING)

*2 Output only at positioning control. Otherwise, "-" is output.
At the time other than the positioning control (during home position return or JOG operation, etc.), judge the timing of when an error occurred by the axis operation status.

*3 The unit is mm/s at a linear servo motor use.

*4 For common parameters, an axis in which an event occurred is set to "Axis 1".

*5 Home position return status (Statusword: b10, b12, b13)
The home position return status is displayed based on the bit values of Statusword.

Statusword bit value	Home position return status
b13 = 0, b12 = 0, b10 = 0	Homing procedure is in progress
b13 = 0, b12 = 0, b10 = 1	Homing procedure is interrupted or not started
b13 = 0, b12 = 1, b10 = 0	Homing is attained, but target is not reached
b13 = 0, b12 = 1, b10 = 1	Homing procedure is completed successfully
b13 = 1, b12 = 0, b10 = 0	Homing error occurred, velocity is not 0
b13 = 1, b12 = 0, b10 = 1	Homing error occurred, velocity is 0

*6 The following table shows the display of the start No., data No. in which an event occurred, block start point No. at start, and block start point No. at occurrence.

Details of start (Positioning start No.)		Start No.	Occurred data No.	Point No. at block start	No. at block start occurrence
Positioning start (1 to 600)	At start (Analyzing)	Started positioning No. (1 to 600)	← (Same as start No.)*1	Not displayed	
	Operating		Data No. in which an error occurred (1 to 600)		
Block start (7000 to 7004)	At start (Analyzing)	Started block start No. (7000 to 7004)	Start data No. of point No. at block start (1 to 600)*1	Started block start point No. (1 to 50)	← (Same as point No. at block start)
	Operating		Data No. in which an error occurred (1 to 600)	Started block start point No. (1 to 50)	Block start point No. in which an error occurred (1 to 50)
Home position return (9001)	At start (Analyzing)	9001	Not displayed	Not displayed	
	Operating				
Fast home position return (9002)	At start (Analyzing)	9002			
	Operating				
Current value changing (9003)	At start (Analyzing)	9003			
	Operating				
Multiple axes simultaneous start (9004)	At start (Analyzing)	9004	Data No. at start (1 to 600)*1		
	Operating		Data No. in which an error occurred (1 to 600)		

Details of start (Positioning start No.)		Start No.	Occurred data No.	Point No. at block start	No. at block start occurrence
JOG operation	At start (Analyzing)	9010	Not displayed	Not displayed	
	Operating				
Manual pulse generator operation	At start (Analyzing)	9011			
	Operating				
Speed-torque control	Mode switching	9030 to 9042			
	Operating				
Positioning start No. outside the setting range		Setting value out of the range			
Test mode JOG operation	At start (Analyzing)	The number of operation axes 1 axis: 1 2 to 4 axes: 9004	1		
	Operating				
Test mode Current value changing		The number of operation axes 1 axis: 1 2 to 4 axes: 9004	1		
Test mode Positioning operation	At start (Analyzing)	The number of operation axes 1 axis: 1 2 to 4 axes: 9004	1		
	Operating				

*1 At start (during analyzing), "0" is displayed when the error processing is executed before fetching the start data No. from the buffer memory.
When a value outside the setting range is set, a setting value outside the range is displayed.

Detailed information of event

The items displayed in the detailed information, which vary depending on each operation, are configured by the items shown in the table below.

System event details	Optional information 1	Optional information 2	Optional information 3
Home position return request ON [RD77GF]	■System information • Axis in which an event occurred	■System information • The cause of home position return request ON	—

Operation event details	Optional information 1	Optional information 2	Optional information 3
Parameter initialization	■System information • Cumulative numbers of writing to flash ROM	—	—
Execution data backup	■System information • Cumulative numbers of writing to flash ROM	—	—
Online module change [RD77MS]	—	—	—
Writing an object with servo transient transmission*1 [RD77GF]	■System information • Axis No. which issued servo transient transmission	■System information • Object index • Object subindex • Object size	■System information • SDO Abort code

*1 When continuous writing is requested, the event is stored only at the first communication.

Event information skipped

When the module errors of the Simple Motion module frequently occur in the intervals shorter than the event history collection intervals of the CPU module, the event history storage area in the Simple Motion module might be full of error information which the CPU module has not collected. If a new module error occurs in this state, the Simple Motion module discards the module error information and outputs the message "*HST.LOSS*" (The event information has been erased.) which indicates the event information has been erased.

9.13 Connect/Disconnect Function of SSCNET Communication [RD77MS]

Temporarily connect/disconnect of SSCNET communication is executed during system's power supply ON. This function is used to exchange the servo amplifiers or SSCNETⅢ cables.

Control details

Set the connect/disconnect request of SSCNET communication in "[Cd.102] SSCNET control command", and the status for the command accept waiting or execute waiting is stored in "[Md.53] SSCNET control status". Use this buffer memory to connect the servo amplifiers disconnected by this function.

When the power supply module of head axis of SSCNET system (servo amplifier connected directly to the Simple Motion module) turns OFF/ON, this function is not necessary.

Precautions during control

- Confirm the LED display of the servo amplifier for "AA" after completion of SSCNET communication disconnect processing. And then, turn OFF the servo amplifier's power supply.
- The "[Md.53] SSCNET control status" only changes into the "-1: Execute waiting" even if the "Axis No.: Disconnect command of SSCNET communication" or "-10: Connect command of SSCNET communication" is set in "[Cd.102] SSCNET control command". The actual processing is not executed. Set "-2: Execute command" in "[Cd.102] SSCNET control command" to execute.
- When the "Axis No.: Disconnect command of SSCNET communication" is set to axis not connect or virtual servo amplifier, the status will not change without "[Md.53] SSCNET control status" becoming "-1: Execute waiting".
- Operation failure may occur in some axes if the servo amplifier's power supply is turned OFF without using the disconnect function. Be sure to turn OFF the servo amplifier's power supply by the disconnect function.
- Execute the connect/disconnect command to the A-axis for multiple-axis servo amplifier.
- When using the driver communication function, it can be disconnected by executing the connect/disconnect command, however it cannot be connected again.
- The connect/disconnect/execute command cannot be accepted during amplifier-less operation mode. "[Md.53] SSCNET control status" will be "0: Command accept waiting" (The disconnection is released.). If being switched to the amplifier-less operation mode when "[Md.53] SSCNET control status" is "1: Disconnected axis existing", the disconnected axis is automatically connected when switching to the normal operation mode again. If being switched to the amplifier-less operation mode when "[Md.53] SSCNET control status" is "-1: Execute waiting", the connect/disconnect command becomes invalid.

Data list

The data for the connect/disconnect function of SSCNET communication is shown below.

■System control data

Setting item		Setting value	Setting details	Buffer memory address
[Cd.102]	SSCNET control command	→	The connect/disconnect command of SSCNET communication is executed. 0: No command Axis No.[1]: Disconnect command of SSCNET communication (Axis No. to be disconnected) -2: Execute command -10: Connect command of SSCNET communication Except above setting: Invalid	5932

[1] 1 to the maximum control axes

■System monitor data

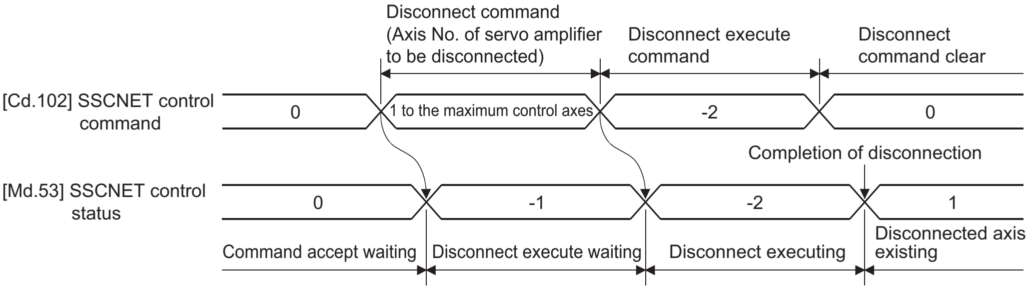
Monitor item		Monitor value	Storage details	Buffer memory address
[Md.53]	SSCNET control status	→	The connect/disconnect status of SSCNET communication is stored. 1: Disconnected axis existing 0: Command accept waiting -1: Execute waiting -2: Executing	4233

Procedure to connect/disconnect

Procedure to connect/disconnect at the exchange of servo amplifiers or SSCNETⅢ cables is shown below.

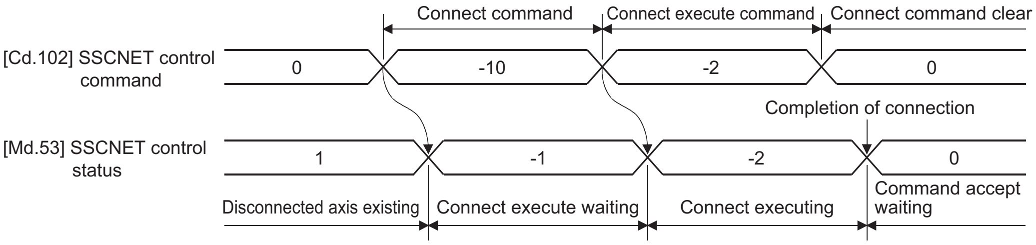
■Procedure to disconnect

1. Set the axis No. to disconnect in "[Cd.102] SSCNET control command". (Setting value: 1 to the maximum control axes)
2. Check that "-1: Execute waiting" is stored in "[Md.53] SSCNET control status". (Disconnect execute waiting)
3. Set "-2: Execute command" in "[Cd.102] SSCNET control command".
4. Check that "1: Disconnected axis existing" is stored in "[Md.53] SSCNET control status". (Completion of disconnection. "20: Servo amplifier has not been connected" is stored in "[Md.26] Axis operation status".)
5. Turn OFF the servo amplifier's power supply after checking the LED display "AA" of servo amplifier to be disconnected.



■Procedure to connect

1. Turn ON the servo amplifier's power supply.
2. Set "-10: Connect command of SSCNET communication" in "[Cd.102] SSCNET control command".
3. Check that "-1: Execute waiting" is set in "[Md.53] SSCNET control status". (Connect execute waiting)
4. Set "-2: Execute command" in "[Cd.102] SSCNET control command".
5. Check that "0: Command accept waiting" is set in "[Md.53] SSCNET control status". (Completion of connection)
6. Resume operation of servo amplifier after checking "0: Standby" in "[Md.26] Axis operation status" of the connected axis.



Point

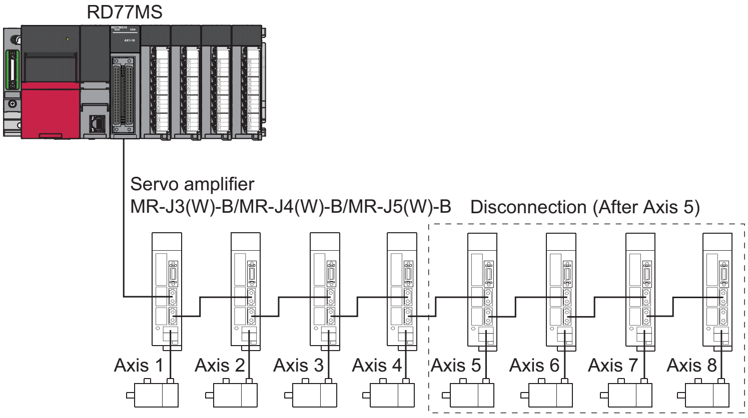
When "-1: Execute waiting" is set in "[Md.53] SSCNET control status", the command of execute waiting can be canceled if "0: No command" is set in "[Cd.102] SSCNET control command".

Program

The following shows the program example to connect/disconnect the servo amplifiers connected after Axis 5.

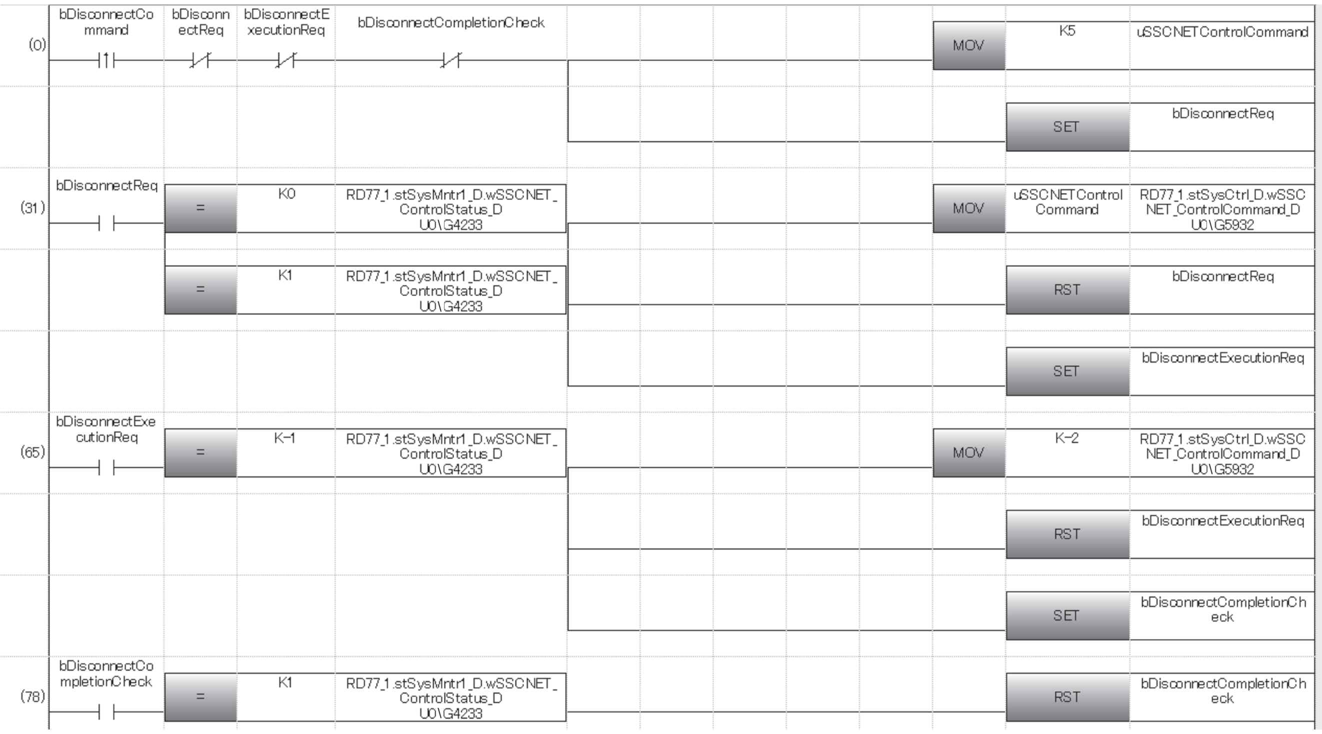
Disconnect procedure	Connect procedure
Turn OFF the servo amplifier's power supply after checking the LED display "AA" of servo amplifier by turning bDisconnectCommand from OFF to ON.	Resume operation of servo amplifier after checking the "[Md.26] Axis operation status" of the connected servo amplifier by turning bConnectCommand from OFF to ON.

■System configuration

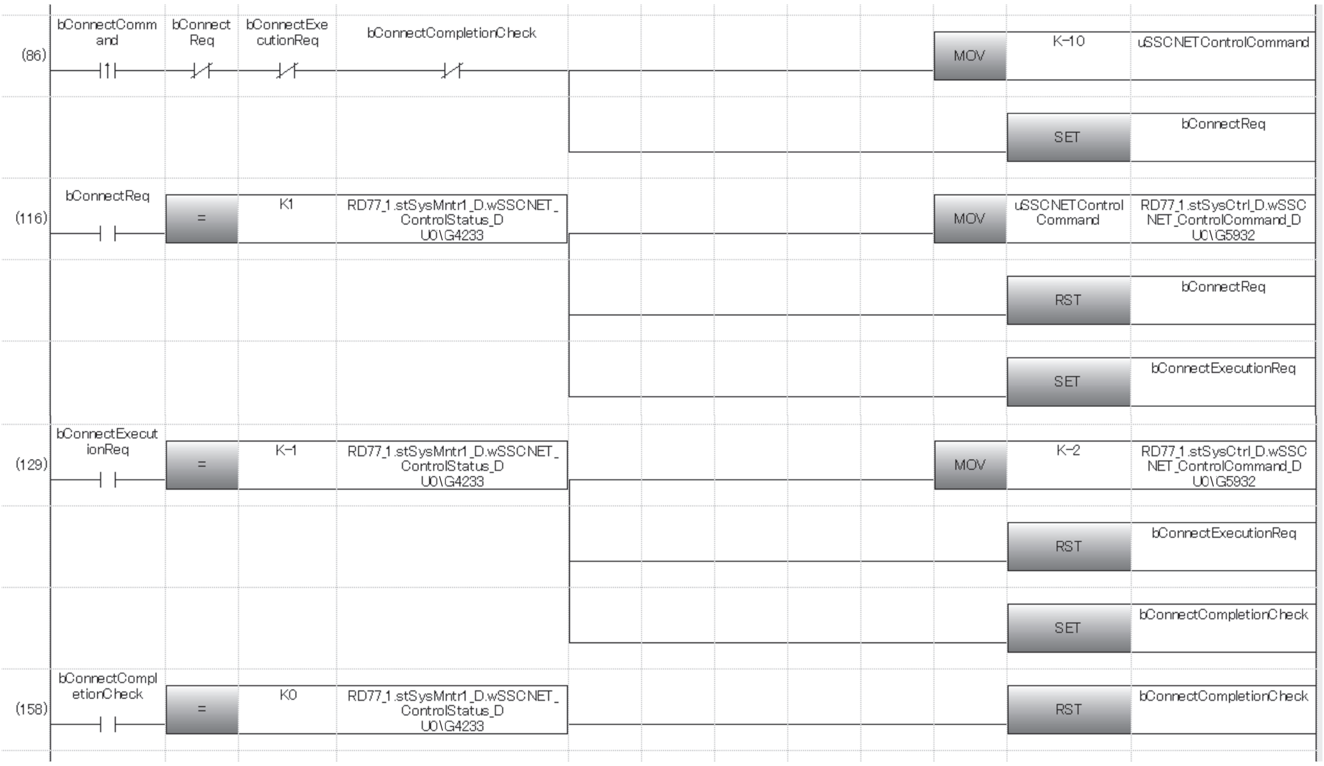


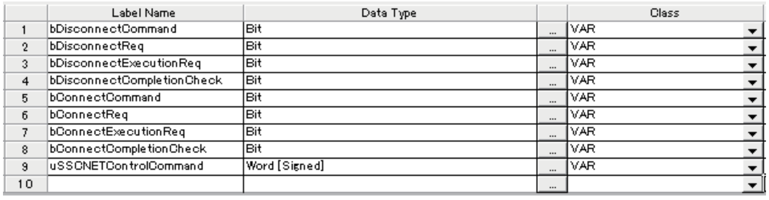
Program example

■Disconnect operation



■Connect operation



<table>
<tr><th>Classification</th><th>Label name</th><th>Description</th></tr>
<tr><td>Module label</td><td>RD77_1.stSysMntr1_D.wSSCNET_ControlStatus_D</td><td>Axis 1 SSCNET control status</td></tr>
<tr><td></td><td>RD77_1.stSysCtrl_D.wSSCNET_ControlCommand_D</td><td>Axis 1 SSCNET control command</td></tr>
<tr><td>Global label, local label</td><td colspan="2">Defines the global label or the local label as follows. The settings of Assign (Device/Label) are not required for the label that the assignment device is not set because the unused internal relay and data device are automatically assigned.
The following table shows an example for the local label.

<table>
<tr><th></th><th>Label Name</th><th>Data Type</th><th></th><th>Class</th></tr>
<tr><td>1</td><td>bDisconnectCommand</td><td>Bit</td><td>...</td><td>VAR</td></tr>
<tr><td>2</td><td>bDisconnectReq</td><td>Bit</td><td>...</td><td>VAR</td></tr>
<tr><td>3</td><td>bDisconnectExecutionReq</td><td>Bit</td><td>...</td><td>VAR</td></tr>
<tr><td>4</td><td>bDisconnectCompletionCheck</td><td>Bit</td><td>...</td><td>VAR</td></tr>
<tr><td>5</td><td>bConnectCommand</td><td>Bit</td><td>...</td><td>VAR</td></tr>
<tr><td>6</td><td>bConnectReq</td><td>Bit</td><td>...</td><td>VAR</td></tr>
<tr><td>7</td><td>bConnectExecutionReq</td><td>Bit</td><td>...</td><td>VAR</td></tr>
<tr><td>8</td><td>bConnectCompletionCheck</td><td>Bit</td><td>...</td><td>VAR</td></tr>
<tr><td>9</td><td>uSSCNETControlCommand</td><td>Word [Signed]</td><td>...</td><td>VAR</td></tr>
<tr><td>10</td><td></td><td></td><td>...</td><td></td></tr>
</table></td></tr>
</table>

9.14 Servo Cyclic Transmission Function [RD77GF]

The "servo cyclic transmission function" reads and writes objects of a slave device with cyclic transmission. The cyclic transmission is appropriate for communication of fixed cycle data.

For the objects that can be read and written with the cyclic transmission, refer to the manual of the slave device.

With the servo cyclic transmission, up to four points can be set per axis.

Control details

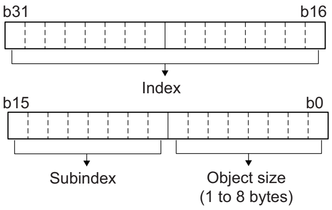
The following shows the parameters and data used in the "servo cyclic transmission function".

The data to be sent with the settings of "[Pr.500] Optional send PDO 1" to "[Pr.503] Optional send PDO 4" is set with "[Cd.170] Optional send PDO data 1" to "[Cd.173] Optional send PDO data 4". (Up to 16 bytes of data can be sent in total.)

The data received with the settings of "[Pr.506] Optional receive PDO 1" to "[Pr.509] Optional receive PDO 4" can be monitored with "[Md.170] Optional receive PDO data 1" to "[Md.173] Optional receive PDO data 4". (Up to 16 bytes of data can be received in total.)

■Extended parameter

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting details/setting value	Initial value	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Pr.500]	Optional send PDO 1	 • Set an object to be sent (written) and received (read). • When the index and subindex are "0", the setting is invalid. • When the object size is out of the range, the setting is regarded as "4". Example) To specify an INTEGER32 object (4 bytes) with object index "2088H" and subindex "00H", specify "20880004H". Fetch cycle: At power supply ON	4H	460000+256n 460001+256n	1460000+256n 1460001+256n
[Pr.501]	Optional send PDO 2		4H	460002+256n 460003+256n	1460002+256n 1460003+256n
[Pr.502]	Optional send PDO 3		4H	460004+256n 460005+256n	1460004+256n 1460005+256n
[Pr.503]	Optional send PDO 4		4H	460006+256n 460007+256n	1460006+256n 1460007+256n
[Pr.506]	Optional receive PDO 1		4H	460012+256n 460013+256n	1460012+256n 1460013+256n
[Pr.507]	Optional receive PDO 2		4H	460014+256n 460015+256n	1460014+256n 1460015+256n
[Pr.508]	Optional receive PDO 3		4H	460016+256n 460017+256n	1460016+256n 1460017+256n
[Pr.509]	Optional receive PDO 4		4H	460018+256n 460019+256n	1460018+256n 1460019+256n

Point

- Objects read and written with the servo cyclic transmission are registered in the slave devices at communication initialization that is executed after the power supply is turned ON or the CPU module is reset.
- When the object size exceeds 4 bytes, use any of the following parameters.
  "[Pr.500] Optional send PDO 1" (Set "0" for "[Pr.501] Optional send PDO 2".)
  "[Pr.502] Optional send PDO 3" (Set "0" for "[Pr.503] Optional send PDO 4".)
  "[Pr.506] Optional receive PDO 1" (Set "0 for "[Pr.507] Optional receive PDO 2".)
  "[Pr.508] Optional receive PDO 3" (Set "0 for "[Pr.509] Optional receive PDO 4".)
  When the above setting is not configured, the warning "Servo cyclic transmission setting warning" (warning code: 0933H) occurs after the power supply is turned ON or the CPU module is reset and the servo cyclic transmission is not executed. ("[Cd.170] Optional receive PDO data 1" to "[Cd.173] Optional send PDO data 4" are not sent. "0" is stored in "[Md.170] Optional receive PDO data 1" to "[Md.173] Optional receive PDO data 4".)
- For the index, subindex, and object size that can be specified, refer to the manual of the slave device. When an object not supported by the slave device is specified, the error "SLMP communication error" (error code: 1CB2H) occurs at cyclic transmission start and the connection to the slave device cannot be executed.

■Axis control data

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting details/setting value	Initial value	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.170]	Optional send PDO data 1	• Sends the specified data to the objects set in "[Pr.500] Optional send PDO 1" to "[Pr.503] Optional send PDO 4" with each operation cycle. • Stores 0 when not set. Fetch cycle: At request (Command request)	0	534768+2048n 534769+2048n 534770+2048n 534771+2048n	1534768+2048n 1534769+2048n 1534770+2048n 1534771+2048n
[Cd.171]	Optional send PDO data 2		0	534772+2048n 534773+2048n 534774+2048n 534775+2048n	1534772+2048n 1534773+2048n 1534774+2048n 1534775+2048n
[Cd.172]	Optional send PDO data 3		0	534776+2048n 534777+2048n 534778+2048n 534779+2048n	1534776+2048n 1534777+2048n 1534778+2048n 1534779+2048n
[Cd.173]	Optional send PDO data 4		0	534780+2048n 534781+2048n 534782+2048n 534783+2048n	1534780+2048n 1534781+2048n 1534782+2048n 1534783+2048n

■Axis monitor data

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Storage item		Storage details/Storage value	Initial value	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Md.170]	Optional receive PDO data 1	• Stores the data of the objects set in "[Pr.506] Optional receive PDO 1" to "[Pr.509] Optional receive PDO 4" with each operation cycle. • Stores 0 when not set. Fetch cycle: At request (Command request)	0	468204+2048n 468205+2048n 468206+2048n 468207+2048n	1468204+2048n 1468205+2048n 1468206+2048n 1468207+2048n
[Md.171]	Optional receive PDO data 2		0	468208+2048n 468209+2048n 468210+2048n 468211+2048n	1468208+2048n 1468209+2048n 1468210+2048n 1468211+2048n
[Md.172]	Optional receive PDO data 3		0	468212+2048n 468213+2048n 468214+2048n 468215+2048n	1468212+2048n 1468213+2048n 1468214+2048n 1468215+2048n
[Md.173]	Optional receive PDO data 4		0	468216+2048n 468217+2048n 468218+2048n 468219+2048n	1468216+2048n 1468217+2048n 1468218+2048n 1468219+2048n

Point

When the communication interrupted due to power supply OFF of the slave device or disconnection of a communication cable, "0" is stored in "[Md.170] Optional receive PDO data 1" to "[Md.173] Optional receive PDO data 4". However, the contents in remote registers (RWr, RWw) are held.

9.15 Servo Transient Transmission Function [RD77GF]

The "servo transient transmission function" reads and writes objects of a slave device with transient transmission. The transient transmission is appropriate for communication of the data that does not need to be read or written at a fixed cycle and the large data.

For the objects that can be read and written with the transient transmission, refer to the manual of the slave device.

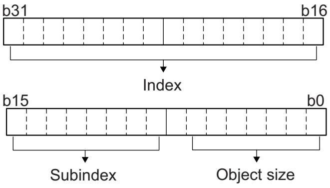
With the servo transient transmission, up to four points can be set per axis and the setting can be changed at any time.

Control details

The following shows the parameters and data used in the "servo transient transmission function".

■Extended parameter

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting details/setting value	Initial value	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Pr.512]	Optional SDO 1	■Specify an object to which the servo transient transmission is executed.  At reading: Reads an object using SDO Upload of SLMP. "0 to 126" can be specified as the object size. "0" indicates the "default size" and "1 to 126" indicates the number of bytes of the object. When the object size is out of the range, the size is regarded as "0". At writing: Writes an object using the Download command of SLMP. "1 to 126" can be specified as the object size. When the object size is out of the range, the size is regarded as "4". Example) To specify an UNSIGNED32 object with object index "6099H" and subindex "02H", specify the following values. Reading: "60990200H" (default size) Writing: "60990204H" (size of 4 bytes) Fetch cycle: At request (Servo transient request)	0	460024+256n 460025+256n	1460024+256n 1460025+256n
[Pr.513]	Optional SDO 2		0	460026+256n 460027+256n	1460026+256n 1460027+256n
[Pr.514]	Optional SDO 3		0	460028+256n 460029+256n	1460028+256n 1460029+256n
[Pr.515]	Optional SDO 4		0	460030+256n 460031+256n	1460030+256n 1460031+256n

Point

- The servo transient processing is a set of operations from a request send to a response reception. This operation is performed in the order of setting Nos.
- For the index, subindex, and object size that can be specified, refer to the manual of the slave device. When an object not supported by the slave device is specified, the processing is completed with an error.

■Control data for slave device operation

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting details/setting value	Initial value	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.160]	Optional SDO transfer request 1	Requests the servo transient transmission. • Changes to values being processed are not accepted. However, if "0: No request" is written while "2: Continuous read request" or "12: Continuous write request" is being processed, the continuous reading/writing operation is stopped after the transient processing being executed is completed. • The setting value is automatically cleared to "0" when the processing is completed. 1: Self read request 2: Continuous read request 11: Self write request 12: Continuous write request Others: No request Fetch cycle: Main cycle	0	534796+2048n	1534796+2048n
[Cd.161]	Optional SDO transfer request 2		0	534797+2048n	1534797+2048n
[Cd.162]	Optional SDO transfer request 3		0	534798+2048n	1534798+2048n
[Cd.163]	Optional SDO transfer request 4		0	534799+2048n	1534799+2048n
[Cd.164]	Optional SDO transfer data 1	Stores data of up to 126 bytes (63 words). • When an object is read, a read value is stored when communication is normally completed. When an error occurs, the value is not updated. When the read data exceeds 126 bytes, the data of up to 126 bytes is stored. • To write an object, specify data to be written. Do not change the setting until the processing is completed. Fetch cycle: At request (Command request)	0	534800+2048n ⋮ 534862+2048n	1534800+2048n ⋮ 1534862+2048n
[Cd.165]	Optional SDO transfer data 2		0	534864+2048n ⋮ 534926+2048n	1534864+2048n ⋮ 1534926+2048n
[Cd.166]	Optional SDO transfer data 3		0	534928+2048n ⋮ 534990+2048n	1534928+2048n ⋮ 1534990+2048n
[Cd.167]	Optional SDO transfer data 4		0	534992+2048n ⋮ 535054+2048n	1534992+2048n ⋮ 1535054+2048n

■Monitor data for slave device operation

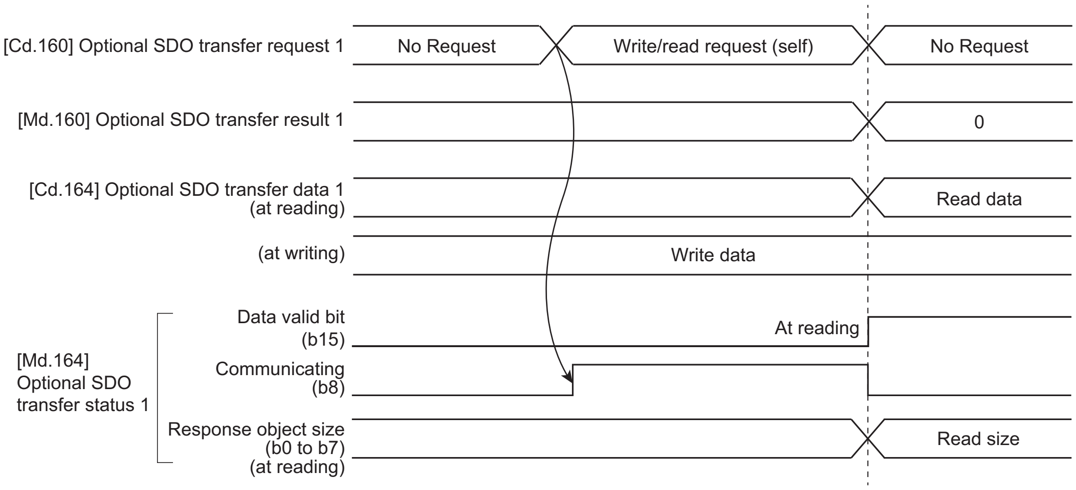
n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Storage item		Storage details/Storage value	Initial value	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Md.160]	Optional SDO transfer result 1	Stores a response code (SDO Abort code) of a slave device for the transient request. (For details of the code, refer to the manual of the slave device.) When a response code cannot be acquired because of a communication error or other causes, "0" is stored. Fetch cycle: At request (Command request)	0	468192+2048n 468193+2048n	1468192+2048n 1468193+2048n
[Md.161]	Optional SDO transfer result 2		0	468194+2048n 468195+2048n	1468194+2048n 1468195+2048n
[Md.162]	Optional SDO transfer result 3		0	468196+2048n 468197+2048n	1468196+2048n 1468197+2048n
[Md.163]	Optional SDO transfer result 4		0	468198+2048n 468199+2048n	1468198+2048n 1468199+2048n
[Md.164]	Optional SDO transfer status 1	Stores the processing status of the transient request. • b7 to 0: Response object size (byte) Stores the size of objects that the slave device has responded when the processing is completed. When the size of the responded objects exceeds 126 bytes, the value is fixed to 126 bytes. • b8: Communicating Turns ON during the transient transmission. • b9: Communication error detection Turns ON when an error is detected with the transient transmission. It remains ON until the transient transmission is normally completed. Error causes are as follows. - Normal error - Receiving an error response from a slave device (SDO Abort code) (Example: When the index, subindex, or size specified with "[Pr.512] Optional SDO 1" to "[Pr.515] Optional SDO 4" is incorrect) • b15: Data valid bit Turns ON when a read request is normally completed. Turns OFF when a read error is detected. Fetch cycle: At request (Command request)	0	468200+2048n	1468200+2048n
[Md.165]	Optional SDO transfer status 2		0	468201+2048n	1468201+2048n
[Md.166]	Optional SDO transfer status 3		0	468202+2048n	1468202+2048n
[Md.167]	Optional SDO transfer status 4		0	468203+2048n	1468203+2048n

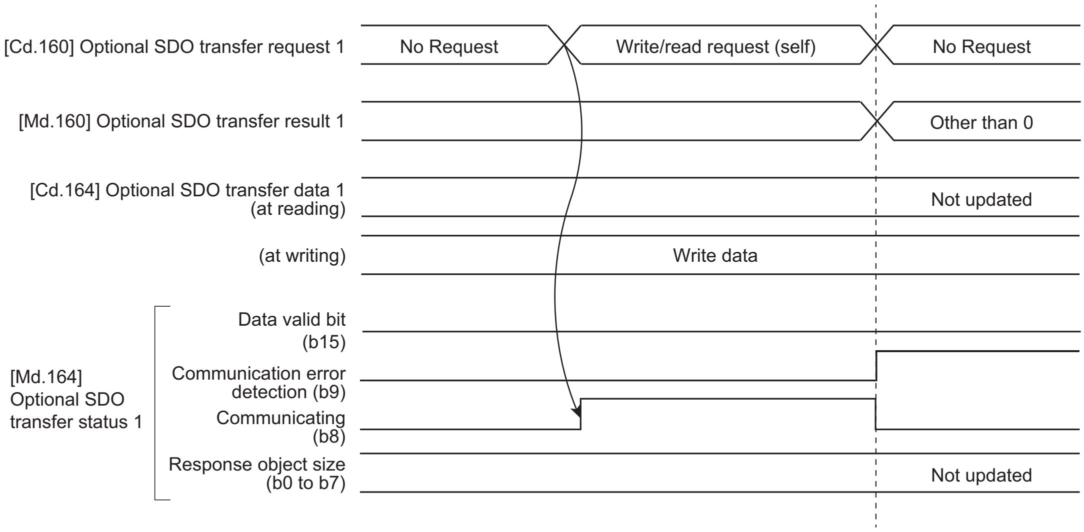
■Sending/receiving timing

The following shows sending/receiving timing of the servo transient transmission.

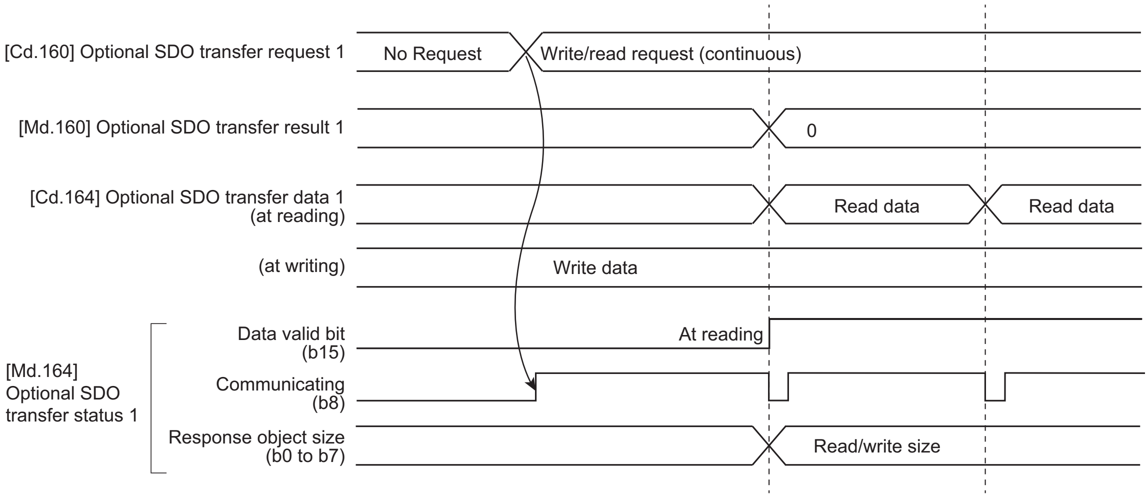
- Sending/receiving timing of self read/write (Normal operation)



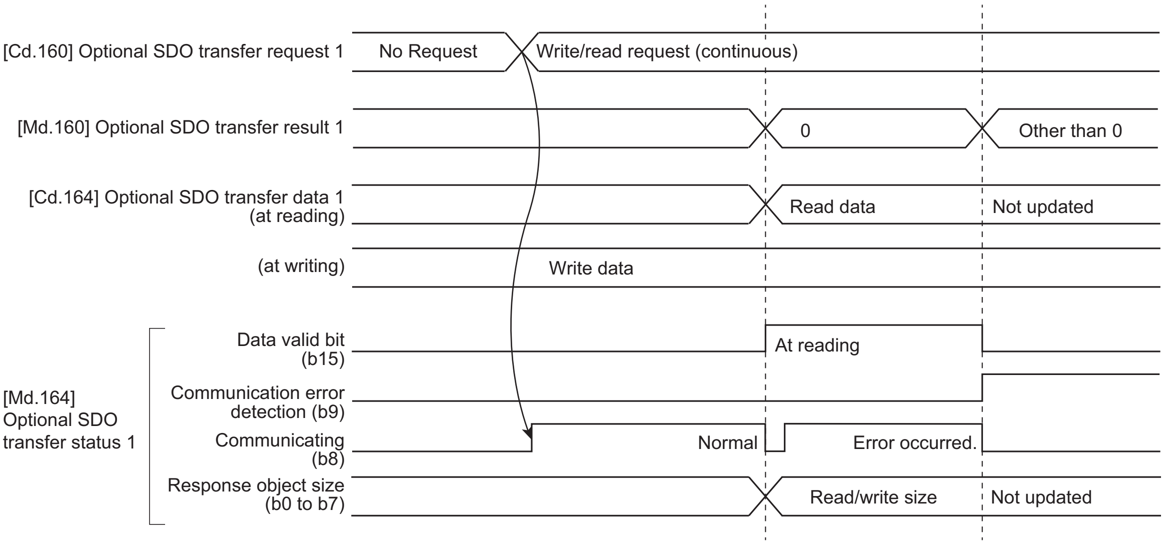
- Sending/receiving timing of self read/write (Operation failure)



- Sending/receiving timing of continuous read/write (Normal operation)



- Sending/receiving timing of continuous read/write (Operation failure)



Data transmission order

With the servo transient transmission, up to four points can be registered per axis and the transient transmission is executed one by one in order.

The processing performance of when transient send requests are executed for multiple axes at the same time depends on the network communication mode as follows.

Communication mode setting	Transmission order ("→" means one link scan.)
Normal mode	Setting 1 (All axes) → Setting 2 (All axes) → Setting 3 (All axes) → Setting 4 (All axes) → Setting 1 (All axes) → •••
High-speed mode[*1]	Setting 1 (Axis 1) → ••• → Setting 4 (Axis 1) → Setting 1 (Axis 2) → ••• → Setting 4 (Axis 2) → ⋮ Setting 1 (Maximum controlled axis) → ••• → Setting 4 (Maximum controlled axis) → Setting 1 (axis 1) → •••

*1 The priority of transient transmission is low in the high-speed mode, so that the transient transmission processing of multiple axes is slower than the processing in the normal mode.

Precautions

Obtains home position data of the driver by the transient transmission function in the driver home position return method. Therefore, if the slave object is read and written with transient transmission while the driver home position return is being carried out, the error "ABS reference point read error" (error code: 1975H) may occur.

9.16 Online Module Change [RD77MS]

Allows to replace a module without stopping the system. For procedures for the online module change, refer to the following.

📖MELSEC iQ-R Online Module Change Manual

9.17 Test Mode

The "test mode" is used to execute the test operation and adjustment of axes using an engineering tool. This mode can execute the test operation and adjustment for multiple axes simultaneously. Therefore, a system such as a tandem configuration can be started up smoothly.

The test mode request for the Simple Motion module is carried out by starting the test operation using the engineering tool. When the test mode request is accepted correctly, the test display is displayed and each function of the test mode can be selected.

For details of the operation method of the test mode, refer to "Help" in the "Simple Motion Module Setting Function" of an engineering tool.

List of specifications

The following shows the list of function specifications of the test mode.

Function	Operation
Operation axis selection	Select the axis to execute the test operation up to 4 axes.
Servo ON	Execute servo ON for the axis to execute the test operation. Execute the magnetic pole detection when the linear servo or direct drive motor is included in the selected operation axis.
Servo OFF	Execute servo OFF for the axis to execute the test operation.
JOG operation	Execute the JOG operation up to 4 axes simultaneously.*1
Home position return	Execute the home position return of the axis No. selected as the start axis.
Current value changing	Execute the current value changing up to 4 axes simultaneously.*1
Positioning operation	Execute the positioning operation up to 4 axes simultaneously.*1
Stop	Execute the stop request for the axis during the test operation.
Rapid stop	Execute the rapid stop request for the axis during the test operation.
Error reset	Execute the error clear request and reset the warning/error/servo alarm.
Software stroke limit check valid/invalid	Stroke limit check valid/invalid can be selected when the software stroke limit is valid.
Hardware stroke limit check valid/invalid	Stroke limit check valid/invalid can be selected when FLS or RLS signal setting is valid.*2

*1 If the operation axis selection is set to 2 to 4 axes, the operation starts at multiple axes simultaneous start (9004).

*2 For the MR-J4-GF, when the LSP/LSN signal of the servo amplifier is used for the stroke limit signal and stop process is executed on the servo amplifier side, hardware stroke limit check cannot be invalidated with this function. (Servo parameters need to be changed.)
For details, refer to the following.
☞ Page 259 Hardware stroke limit function

Precautions

When the JOG operation or the positioning operation from the test mode is started, "1" is stored in "[Md.44] Positioning data No. being executed". However, the positioning data No.1 of buffer memory is not used.

Differences from normal operation

The following shows differences between the normal operation and the operation during the test mode.

Item			During test mode	During normal operation
JOG operation	—		JOG operation is executed based on the setting values on the JOG operation display.[1]	JOG operation is executed based on the setting values of the positioning parameters.
	Axis monitor data	[Md.44] Positioning data No. being executed	"1" is stored when the JOG operation is executed.	"0" is stored when the JOG operation is executed.
		[Md.46] Last executed positioning data No.		
		[Md.47] Positioning data being executed: Positioning identifier	"04h" is stored during forward JOG run and "05h" is stored during reverse JOG run.	"0" is stored during JOG operation.
	Event history	Data No. in which an event occurred	"1" is displayed.	Not displayed.
Home position return	Proximity dog method [RD77MS]		Regardless of the setting of the home position return retry function, the home position return can be executed again even after the home position return is completed.	If the home position return is executed again after the home position return completion while the home position return retry function is not set, the error "Start at home position" (error code: 1940H) occurs and the home position return is not executed.
Current value changing			The current value changing is executed based on the setting values on the current value changing display.	[For a new current value using the positioning data] The current value changing is executed based on the setting values of "[Da.6] Positioning address/ movement amount". [For a new current value using the current value changing start No. (No.9003)] The current value changing is executed based on the setting values of "[Cd.9] New position value".
Positioning operation			Positioning operation is executed based on the setting values on the positioning operation display.[1]	Positioning operation is executed based on the setting values of the positioning data.

[1] Refer to the following for the parameters used in JOG operation and positioning operation.
☞ Page 407 Parameters to be used during the test mode

Parameters to be used during the test mode

During the test mode, the test operation is executed using the parameters set on each test function display of the engineering tool.

■List of the parameters to be used during JOG operation

Parameter item	During test mode	During normal operation
JOG operation	The setting values on the JOG operation display	The value set in "[Cd.17] JOG speed"
Acceleration time constant		The value set in the positioning parameters
Deceleration time constant		
Rapid stop deceleration time constant		
S-curve ratio[1]		The value set in "[Pr.34] Acceleration/deceleration process selection" and "[Pr.35] S-curve ratio"
Torque limit value		The value set in "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value"
Stop process at error occurrence		The value set in "[Pr.37] Stop group 1 rapid stop selection", "[Pr.38] Stop group 2 rapid stop selection", "[Pr.39] Stop group 3 rapid stop selection"
Stroke limit valid/invalid setting		The software stroke limit upper/lower limit value set with the fixed parameter The FLS/RLS signal set with the external input signal parameters

[1] During the test mode operation, the operation differs depending on the S-curve ratio setting.
0%: Trapezoidal acceleration/deceleration, 1 to 100%: S-curve acceleration/deceleration

■List of the parameters to be used during positioning operation

Parameter item	During test mode	During normal operation
Movement amount	The setting values on the positioning operation display	The value set in the positioning data
Command speed		The value set in the positioning parameters
Acceleration time constant		
Deceleration time constant		
Rapid stop deceleration time constant		
S-curve ratio[*1]		The value set in "[Pr.34] Acceleration/deceleration process selection" and "[Pr.35] S-curve ratio"
Torque limit value		The value set in "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value"
Stop process at error occurrence		The value set in "[Pr.37] Stop group 1 rapid stop selection", "[Pr.38] Stop group 2 rapid stop selection", "[Pr.39] Stop group 3 rapid stop selection"
Stroke limit valid/invalid setting		The software stroke limit upper/lower limit value set with the fixed parameter The FLS/RLS signal set with the external input signal parameters
Operation permission for incompletion of home position return		The operation setting for incompletion of home position return set in the home position return data

*1 During the test mode operation, the operation differs depending on the S-curve ratio setting.
0%: Trapezoidal acceleration/deceleration, 1 to 100%: S-curve acceleration/deceleration

Precautions

- Parameters not described above operate with the value set in the buffer memory before the shift to the test mode.
- The torque limit value cannot be changed during JOG/positioning operation that is started from the test mode.

Request of the shift to/cancel of the test mode

The data transmission process of parameters is executed when the shift to the test mode is requested.
Refer to the following for the parameters whose data is transferred.
☞ Page 666 (3) Validate parameters when PLC READY signal [Y0] changes from OFF to ON
The operation cannot be shifted to the test mode in the following cases.

- When the PLC READY signal [Y0] is ON
- When any of axes is in operation
- When a parameter error occurs during the shift to the test mode

When canceling the test mode, execute the cancel request after stopping all axes. The test mode cannot be canceled if any of axes is in operation.

Precautions

- When the data transmission process is executed, "b0: READY ON" is turned ON and "b1: Servo ON" is turned OFF in "[Md.108] Servo status1". (The servo amplifier LED indicates "C_".)
- When the cancel request of the test mode is executed, "b0: READY ON" ([Md.108] Servo status1) and "b1: Servo ON" ([Md.108] Servo status1) are turned ON/OFF following to the setting of all axis servo ON [Y1] and "[Cd.100] Servo OFF command".

Stop operation of the test mode operation axes

When the following stop causes occur for the test mode operation axes, the stop process is performed for the all axes in which the test mode is in operation.

When the test operation is executed for multiple axes, the stop process is performed for the test mode operation axes in which a stop command or stop cause does not occur even if a stop command or stop cause occurs for each test mode operation axis.

Stop cause	**Stop process**	
	Axis in which a stop cause occurs	**Axis in which a stop cause does not occur**
Forced stop input to Simple Motion module	Immediate stop For the stop method of the servo amplifier, refer to each servo amplifier instruction manual.	
Servo READY OFF[*1] • Servo amplifier power supply OFF • Servo alarm • Forced stop input to servo amplifier	Immediate stop For the stop method of the servo amplifier, refer to each servo amplifier instruction manual.	Deceleration stop/rapid stop Select with the "Stop process at error occurrence".
"All axes rapid stop request" from the test mode	Rapid stop	
Hardware stroke limit upper/lower limit error occurrence[*1][*2]	Deceleration stop/rapid stop Select with the "Stop process at error occurrence".	
Error occurs in a CPU module		
Error in test mode[*3][*4]		
Axis error detection (Error other than stop group 1 or 2)[*1]		
"Deceleration stop requested" input from the test mode		
"Axis stop signal" ON from a CPU module[*1]		

[*1] The stop process is not executed for the axes in which a stop cause does not occur during home position return.

[*2] When the hardware stroke limit function is not used, the software stroke limit range check is not performed.

[*3] If a stop cause occurs, the test mode is canceled.

[*4] An error in test mode occurs when the personal computer cannot communicate with the CPU module.

Precautions

When the test mode operation axis is servo OFF by servo OFF from the test display or the servo alarm occurrence, etc, "b0: READY ON" is turned ON and "b1: Servo ON" is turned OFF in "[Md.108] Servo status1". (The servo amplifier LED indicates "C_".)

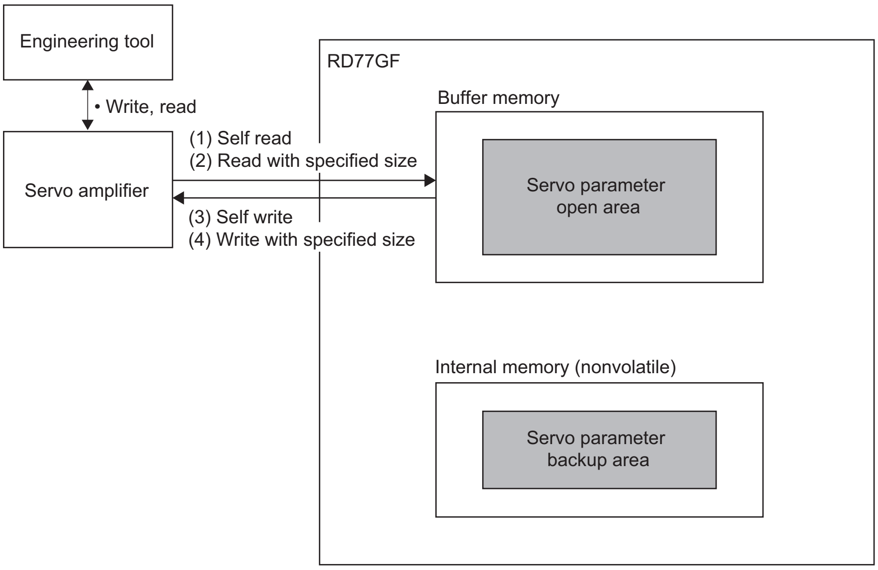
To execute the test operation again, execute servo ON of the test mode operation axis from the test display.

9.18 Servo Parameter Change Function [RD77GF]

This function transfers servo parameters. Servo parameters, which are controlled by servo amplifiers, can be changed with a Simple Motion module.

Control details

The following shows the storage destination and the transfer timing of servo parameters.



Point

- When servo amplifier parameters are edited using an engineering tool, write to the servo amplifier using the engineering tool.
- With the Simple Motion module, the parameters in the servo amplifier can be read or written.

■(1) [Servo amplifier → Open area] Self read

1. Specify the object index of a parameter to be read for "[Cd.131] Parameter No.".

2. Set "100" in "[Cd.130] Servo parameter read/write request".

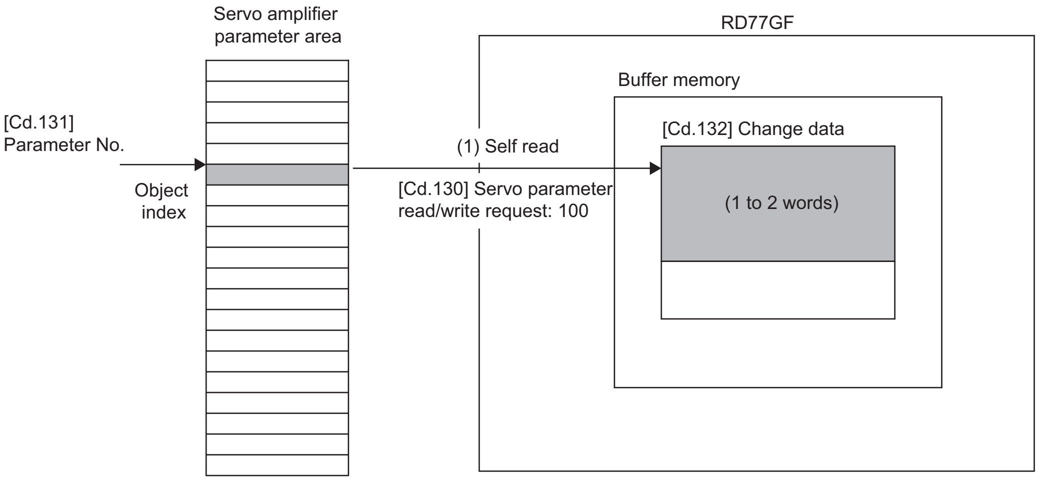
- The Simple Motion module reads the parameter using the SDO Upload command of SLMP.

3. Confirm that "0" is set in "[Cd.130] Servo parameter read/write request".

(Reading is completed.)

4. The read value is set in "[Cd.132] Change data".

- For the size of the data to be stored, refer to the servo amplifier instruction manual.



■(2) [Open area → Servo amplifier] Self write

1. Specify the object index of a parameter to be read for "[Cd.131] Parameter No.".

2. Set the data to be written for "[Cd.132] Change data".

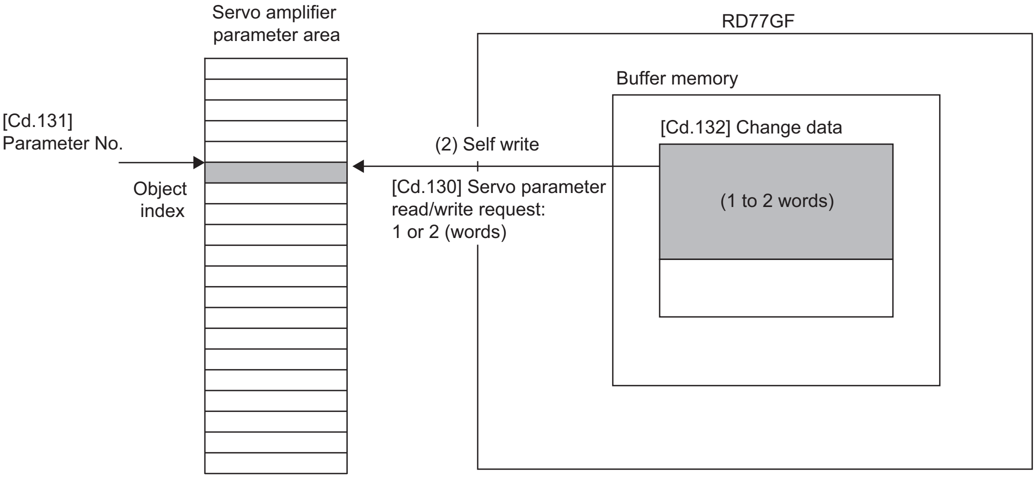
- For the size of the object to be written, refer to the servo amplifier instruction manual.

3. Set "1" or "2" (number of the words of the object) in "[Cd.130] Servo parameter read/write request".

- The Simple Motion module writes the parameter using the SDO Download command of SLMP.

4. Confirm that "0" is set in "[Cd.130] Servo parameter read/write request".

(Writing is completed.)



Point

To save the written parameter to the nonvolatile memory of the servo amplifier, operate the Store parameters (1010H) object using the servo transient transmission function. For details, refer to the servo amplifier instruction manual.

■(3) [Servo amplifier → Open area] Read with specified size

1. Specify the number of parameters to be read for "[Cd.121] Parameter size". Specify the start object of the parameters to be read for "[Cd.122] Parameter offset".

2. Set "1000" in "[Cd.120] Servo parameter operation request".

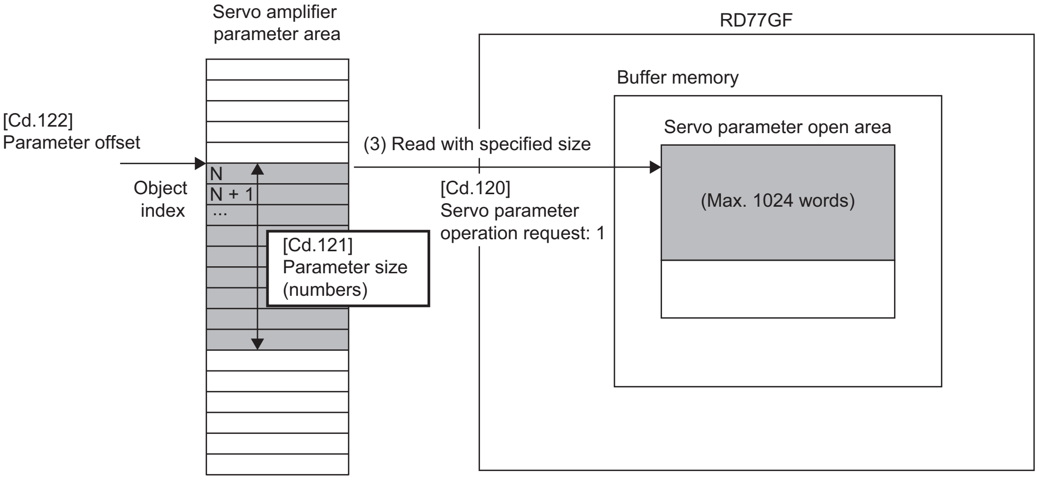
- The Simple Motion module reads the parameters using the SDO Upload command of SLMP.

3. Confirm that "0" is set in "[Cd.120] Servo parameter operation request".

(Reading is completed.)

4. The read value is set in "[Cd.125] Request data".

- The arrangement of the data to be stored in the buffer memory depends on the object size. For the object size of the data to be read, refer to the servo amplifier instruction manual.



■(4) [Open area → Servo amplifier] Write with specified size

1. Specify the number of parameters to be written and the size (number of bytes) per object for "[Cd.121] Parameter size". Specify the start object of the parameters to be written for "[Cd.122] Parameter offset".

2. Set the data to be written for "[Cd.125] Request data".

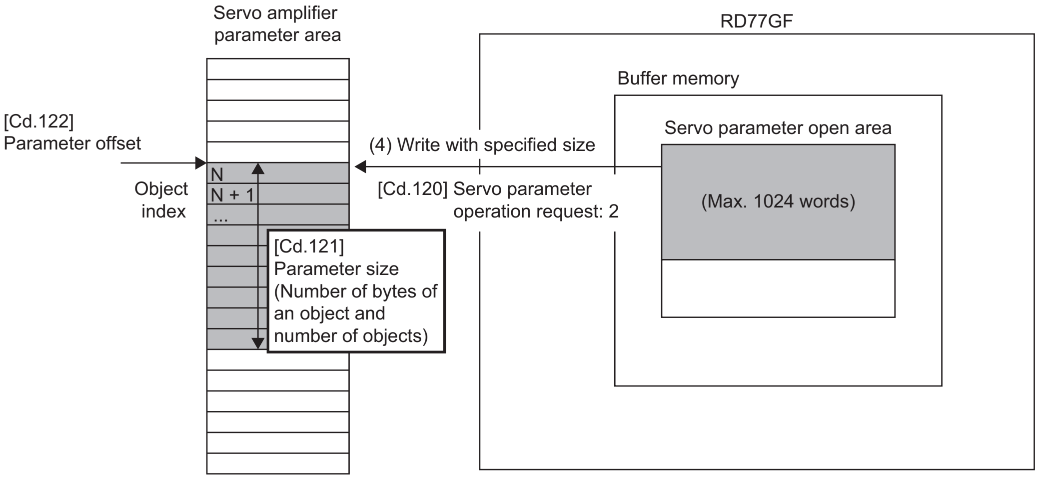
- The arrangement of the data to be stored in the buffer memory depends on the object size. For the object size of the data to be written, refer to the servo amplifier instruction manual.

3. Set "1000" in "[Cd.120] Servo parameter operation request".

- The Simple Motion module writes the parameters using the SDO Download command of SLMP.

4. Check that "0" is set in "[Cd.120] Servo parameter operation request".

(Writing is completed.)



Point

To save the written parameters to the nonvolatile memory of the servo amplifier, operate the Store parameters (1010H) object using the servo transient transmission function. For details, refer to the servo amplifier instruction manual.

Restrictions

■When "[Cd.130] Servo parameter read/write request" is used

- When a request is sent in the following status, "3: Error" is stored in "[Cd.130] Servo parameter read/write request".

- Communication with the servo amplifier is not established or a communication error occurs.
- The servo amplifier does not support the SLMP command.
- An error response is received from the servo amplifier.

- Even though the value of "[Cd.130] Servo parameter read/write request" is changed during a servo parameter transmission, the change is not accepted. Change the value of "[Cd.130] Servo parameter read/write request" after it is set to "0".
- The maximum size of the parameter area that can be transferred is 2 words per axis.

■When "[Cd.120] Servo parameter operation request" is used

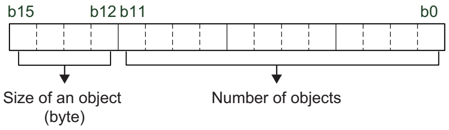
- When a request is sent in the following status, "-1: Operation error" is stored in "[Cd.120] Servo parameter operation request".

- Communication with the servo amplifier is not established or a communication error occurs.
- "[Cd.121] Parameter size" is outside the range.
- The servo amplifier does not support the SLMP command.
- An error response is received from the servo amplifier.

- Even though the value of "[Cd.120] Servo parameter operation request" is changed during a servo parameter transmission, the change is not accepted. Change the value of "[Cd.120] Servo parameter operation request" after it is set to "0".
- The maximum size of the parameter area that can be transferred is 1024 words per axis.
- When both "[Cd.130] Servo parameter read/write request" and "[Cd.120] Servo parameter operation request" are requested at the same time, "[Cd.130] Servo parameter read/write request" is accepted first.

Data list

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Setting item		Setting details/setting value	Initial value	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Cd.130]	Servo parameter read/write request	Set the read request or the write request of a servo parameter. 1: 1 word write request 2: 2 words write request 100: Read request Others: Not request After the processing is completed, "0" is automatically stored. (When the processing fails, "3" is stored.) Fetch cycle: Main cycle	0	4354+100n	1004354+100n
[Cd.131]	Parameter No.	Set the object index of the servo parameter to be changed. Fetch cycle: At request	0000H	4355+100n	1004355+100n
[Cd.132]	Change data	When the servo parameter is written, set the change value of the servo parameter. When the servo parameter is read, the read value of the servo parameter is stored. Fetch cycle: At request	0	4356+100n 4357+100n	1004356+100n 1004357+100n
[Cd.120]	Servo parameter operation request	0: No request 1000: Read with specified size (Servo amplifier → Open area) 1001: Write with specified size (Open area → Servo amplifier) After the processing is completed, "0" is automatically stored. When the processing fails, "-1" is stored. If the size of the parameters set in [Cd.121] exceeds the upper limit, "-2" is stored. Fetch cycle: Main cycle	0	533728+2048n	1533728+2048n
[Cd.121]	Parameter size	Specify the parameter size (number of parameters) to be operated.  Specify the following values according to the setting value of "[Cd.120] Servo parameter operation request". [1000: Read with specified size] • Specify the number of the parameter objects to be read for "Number of objects". (Range: 1 to 1024) • Set "0" for "Size of an object". (Even if another value is set, it is ignored.) [1001: Write with specified size] • Specify the number of the parameter objects to be written for "Number of objects". (Range: 1 to 1024) • Set the number of bytes per object for "Size of an object". (Range: 1 to 15) The maximum size of the parameters to be transferred at once is 1024 words (2048 bytes). For example, the maximum value of "Number of objects" is "512" when "Size of an object" is "4 bytes". Fetch cycle: At request	0	533729+2048n	1533729+2048n
[Cd.122]	Parameter offset	Specify the start index of the servo parameter object to be operated. Fetch cycle: At request	0	533730+2048n	1533730+2048n
[Cd.125]	Request data	Servo parameter data to be operated Fetch cycle: At request (Command request)	0	533732+2048n ⋮ 534755+2048n	1533732+2048n ⋮ 1534755+2048n

9.19 Positioning Data, Start Block Data Write/Read Functions [RD77MS]

This function is used to write/read optional positioning data and block start data by using the following control data for positioning data and block start data.

This function allows the positioning data No.101 to 600 and the start block data No.2 to 4, which are not stored in the buffer memory, to be written/read by operating the control data without using the engineering tool.

n: Axis No. - 1

Setting item		Setting value	Buffer memory address
[Cd.220]	Positioning data control request	For details of the setting values, refer to the following. ☞ Page 654 Control data for positioning data, block start data	34416+18n
[Cd.221]	Positioning data No. setting		34417+18n
[Cd.222]	Block start data control request		34418+18n
[Cd.223]	Block No. setting		34419+18n
[Cd.224]	Block start data type setting		34420+18n
[Cd.225]	Block start data No. setting		34421+18n
[Cd.226]	Positioning data/block start data setting value		34422+18n to 34433+18n

Point

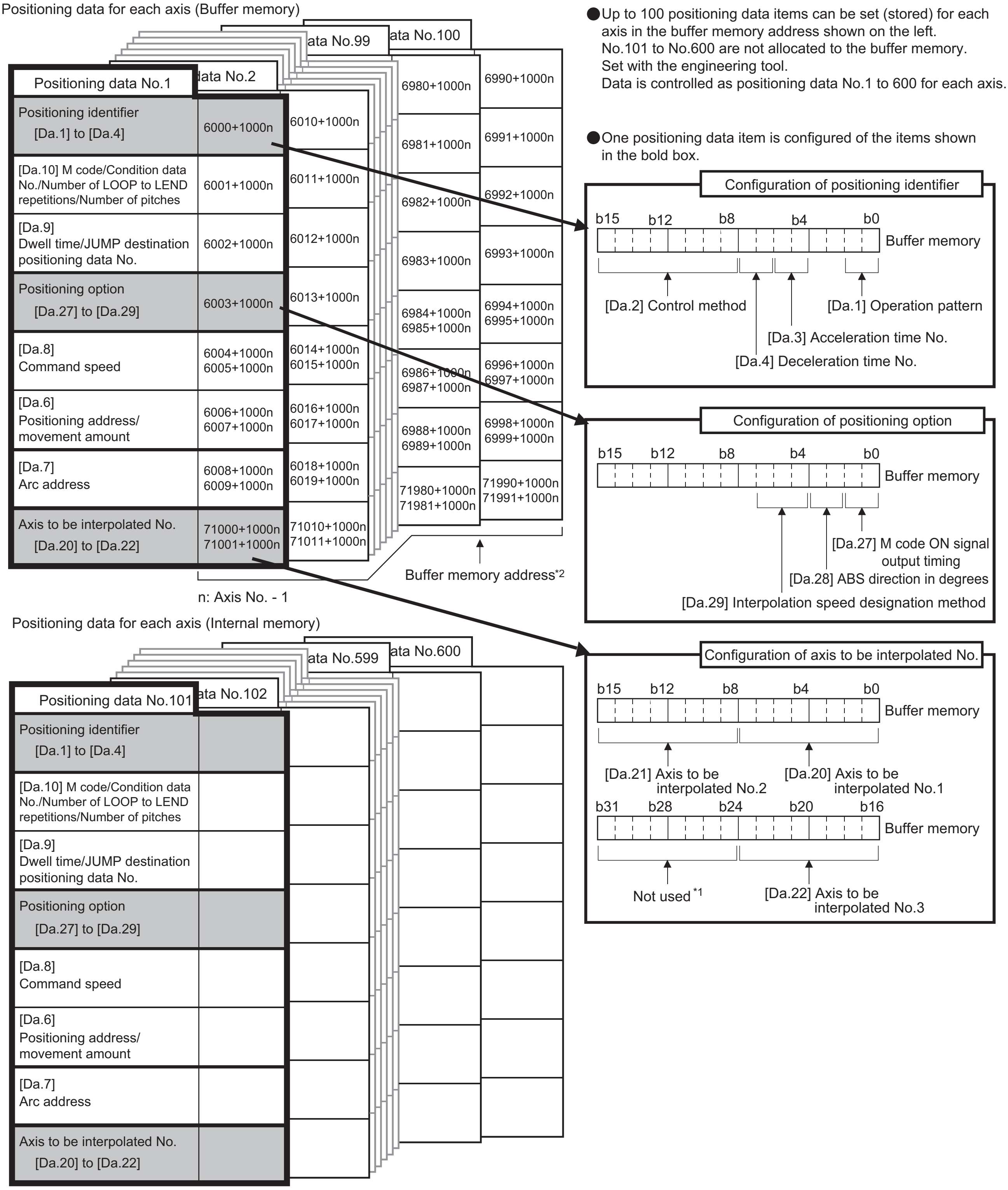
- Rewrite the positioning data and the start block data by following the procedures of "Rewriting method for positioning data", "Rewriting method for block start data", and "Rewriting method for condition data". If the writing order is wrong, an unpredictable value might be set. For details, refer to the following.
  ☞ Page 417 Rewriting method for positioning data
  ☞ Page 422 Rewriting method for block start data
  ☞ Page 424 Rewriting method for condition data
- Data which are written by "[Cd.220] Positioning data control request" and "[Cd.222] Block start data control request" are lost by turning off the power.
  When it is necessary to save the data, write the data to the flash ROM of the Simple Motion module by "[Cd.1] Flash ROM write request".
- Do not execute "[Cd.220] Positioning data control request" and "[Cd.222] Block start data control request" at the same time since "[Cd.226] Positioning data/block start data setting value" is common to "[Cd.220] Positioning data control request" and "[Cd.222] Block start data control request". If they are executed at the same time, an unpredictable value might be set.
- Do not execute "[Cd.220] Positioning data control request" and the direct operation to the buffer memory of the positioning data or "[Cd.222] Block start data control request" and the direct operation to the buffer memory of the block start data or condition data at the same time. If they are executed at the same time, an unpredictable value might be set.
- When setting the values which are outside of the range to "[Cd.220] Positioning data control request" or "[Cd.222] Block start data control request", the request is ignored. Also, the setting values of "[Cd.220] Positioning data control request" and "[Cd.222] Block start data control request" are not changed.
- If the setting value of "[Cd.220] Positioning data control request" or "[Cd.222] Block start data control request" is "_ _01H (Write request)", the data item which write invalid flag is on is not written and the data item which write invalid flag is off is written.
- When executing "[Cd.220] Positioning data control request" or "[Cd.222] Block start data control request" to the larger axis than the setting value of "[Pr.152] Maximum number of control axes", the request is ignored. Also, the setting values of "[Cd.220] Positioning data control request" and "[Cd.222] Block start data control request" are not changed.

Positioning data write function

This function is used to write/read optional positioning data by using the following control data.

Setting item		Setting value
[Cd.220]	Positioning data control request	For details of the setting values, refer to the following. ☞ Page 654 Control data for positioning data, block start data
[Cd.221]	Positioning data No. setting	
[Cd.226]	Positioning data/block start data setting value	

The positioning data stored in the buffer memory of the Simple Motion module is the following configuration.



- ●Up to 100 positioning data items can be set (stored) for each axis in the buffer memory address shown on the left. No.101 to No.600 are not allocated to the buffer memory. Set with the engineering tool. Data is controlled as positioning data No.1 to 600 for each axis.
- ●One positioning data item is configured of the items shown in the bold box.

---

*1 Always "0" is set to the part not used.

*2 Refer to the following for the buffer memory address of the axis 17 to 32.
☞ Page 548 Positioning Data

Rewriting method for positioning data

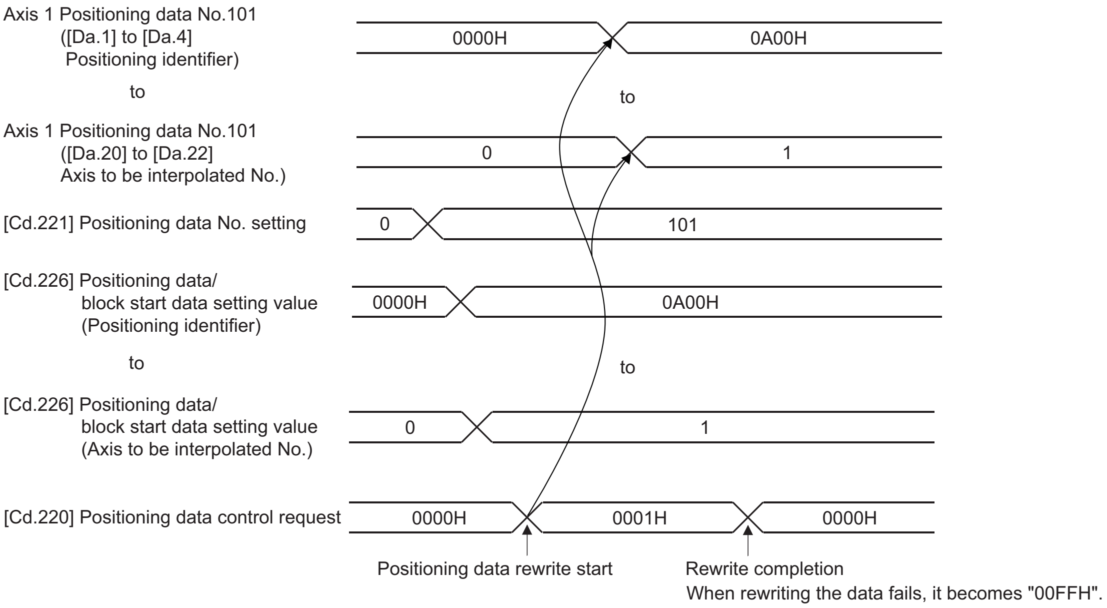
1. Specify the positioning data No. in "[Cd.221] Positioning data No. setting".

2. Specify the setting value in "[Cd.226] Positioning data/block start data setting value".

3. Set "_ _01H: Write request" in "[Cd.220] Positioning data control request". It is possible to specify necessity of writing for each data by operating bit 8 to bit 15 of "[Cd.220] Positioning data control request".

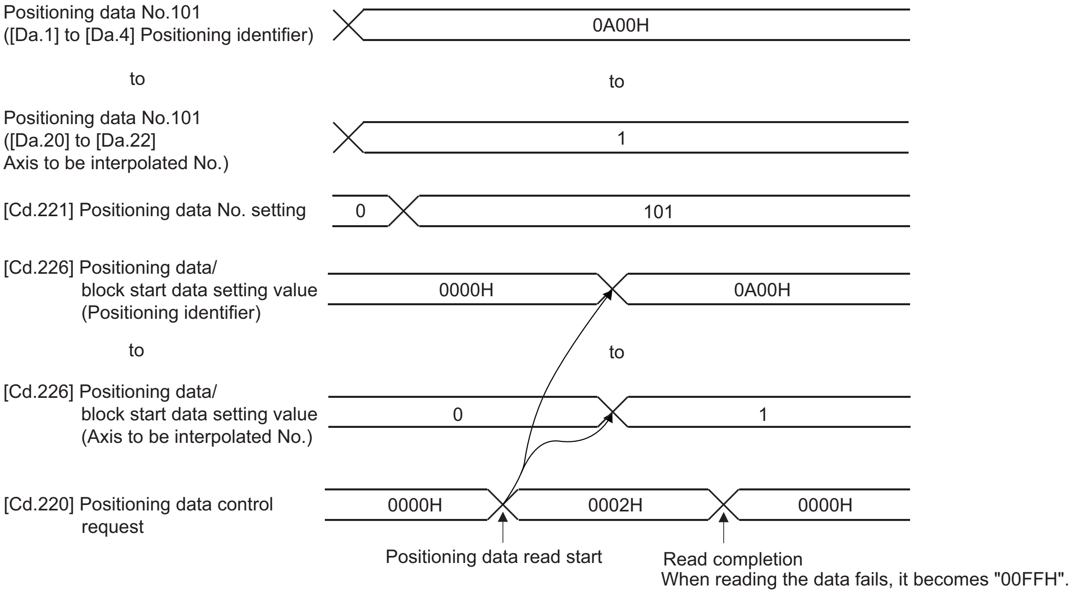
4. "[Cd.226] Positioning data/block start data setting value" is written to the positioning data No. specified in "[Cd.221] Positioning data No. setting". When writing the data succeeds, "[Cd.220] Positioning data control request" becomes "0000H: No control request (Control end)".

5. When the setting value of "[Cd.221] Positioning data No. setting" is outside the range, "[Cd.220] Positioning data control request" becomes "00FFH: Write/read error". "[Cd.220] Positioning data control request" is detected with the continuous detection. Returning "00FFH: Write/read error" to "0000H: No control request (Control end)" manually is not required.



Reading method for positioning data

1. Specify the positioning data No. to "[Cd.221] Positioning data No. setting".
2. Set "0002H: Read request" in "[Cd.220] Positioning data control request".
3. The positioning data specified in "[Cd.221] Positioning data No. setting" is read to "[Cd.226] Positioning data/block start data setting value". When reading the data succeeds, "[Cd.220] Positioning data control request" becomes "0000H: No control request (Control end)".
4. When the setting value of "[Cd.221] Positioning data No. setting" is outside the range, "[Cd.220] Positioning data control request" becomes "00FFH: Write/read error". "[Cd.220] Positioning data control request" is detected with the continuous detection. Returning "00FFH: Write/read error" to "0000H: No control request (Control end)" manually is not required.



Block start data write function

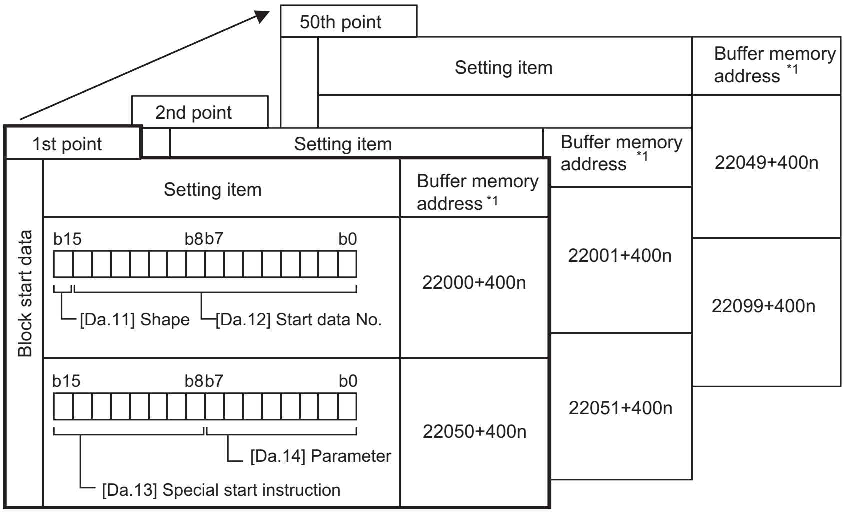
This function is used to write/read optional block start data or condition data by using the following control data.
When specifying "0: Block start data" in "[Cd.224] Block start data type setting", it is possible to write/read block start data.
When specifying "1: Condition data", it is possible to write/read condition data.

- When "0: Block start data" is set in "[Cd.224] Block start data type setting"

Setting item		Setting value
[Cd.222]	Block start data control request	0000H: No control request (Control end) _ _01H: Write request 0002H: Read request 00FFH: Write/read error
[Cd.223]	Block No. setting	0 to 4
[Cd.225]	Block start data No. setting	1 to 50
[Cd.226]	Positioning data/block start data setting value	• Shape and start data No. ([Da.11] and [Da.12])*1 • Special start instruction and parameter ([Da.13] and [Da.14])*1 • Not used (Setting not required): "0" is set at reading.

*1 For the setting values, refer to the following.
☞ Page 462 Setting items for block start data

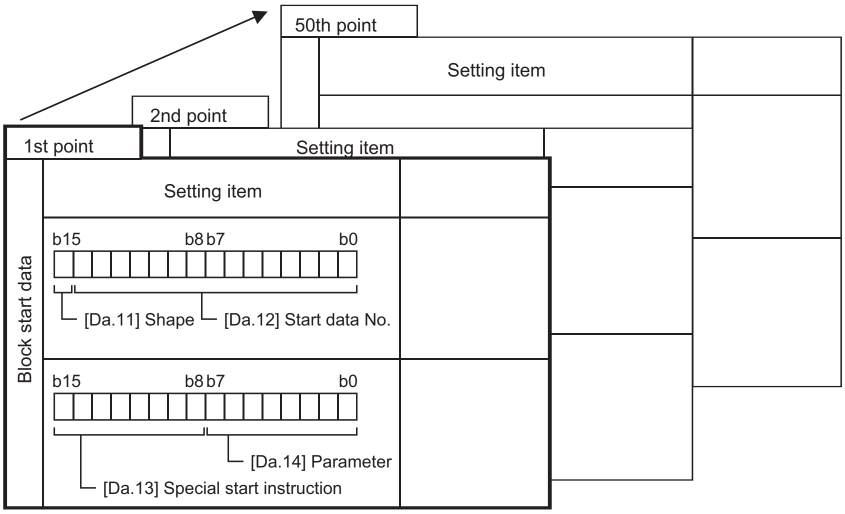
Block No.0 to 1 for each axis (Buffer memory)



- Up to 50 block start data points can be set (stored) for each axis in the buffer memory addresses shown on the left.
- Items in a single unit of block start data are shown included in a bold frame.
- Each axis has five start blocks (block Nos. 0 to 4). Start block 2 to 4 are not allocated to the buffer memory.
Set with the engineering tool.

n: Axis No. - 1

Block No.2 to 4 for each axis (Internal memory)



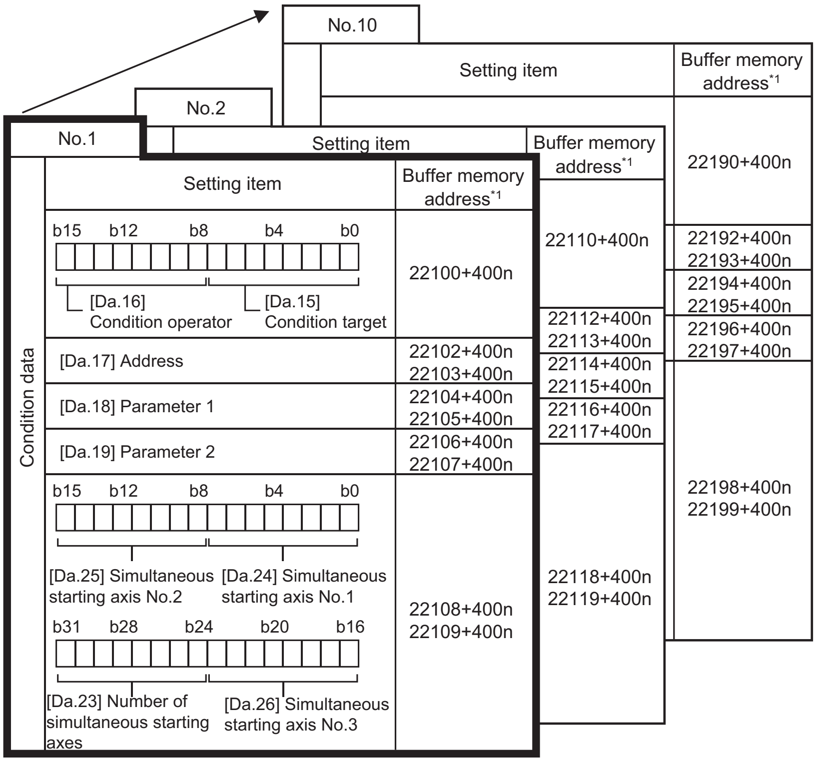
*1 Refer to the following for the buffer memory address of the axis 17 to 32.
☞ Page 548 Positioning Data

- When "1: Condition data" is set in "[Cd.224] Block start data type setting"

Setting item		Setting value
[Cd.222]	Block start data control request	0000H: No control request (Control end) _ _01H: Write request 0002H: Read request 00FFH: Write/read error
[Cd.223]	Block No. setting	0 to 4
[Cd.225]	Block start data No. setting	1 to10
[Cd.226]	Positioning data/block start data setting value	• Condition target and condition operator ([Da.15] and [Da.16])*1 • Address ([Da.17])*1 • Parameter 1 ([Da.18])*1 • Parameter 2 ([Da.19])*1 • Simultaneous starting axis ([Da.23] to [Da.26])*1 • Not used (Setting not required): "0" is set at reading.

*1 For the setting values, refer to the following.
☞ Page 462 Setting items for condition data

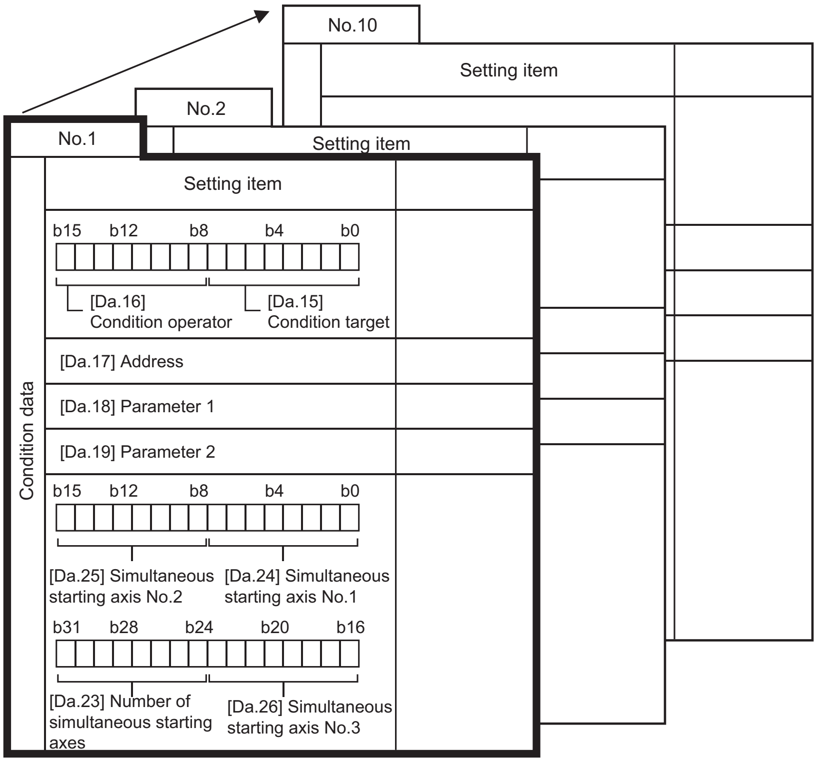
Block No.0 to 1 for each axis (Buffer memory)



n: Axis No. - 1

- Up to 10 condition data items can be set (stored) for each block No. in the buffer memory addresses shown on the left.
- Items in a single unit of condition data are shown included in a bold frame.
- Each axis has five start blocks (block Nos. 0 to 4).
  Start block 2 to 4 are not allocated to the buffer memory.
  Set with the engineering tool.

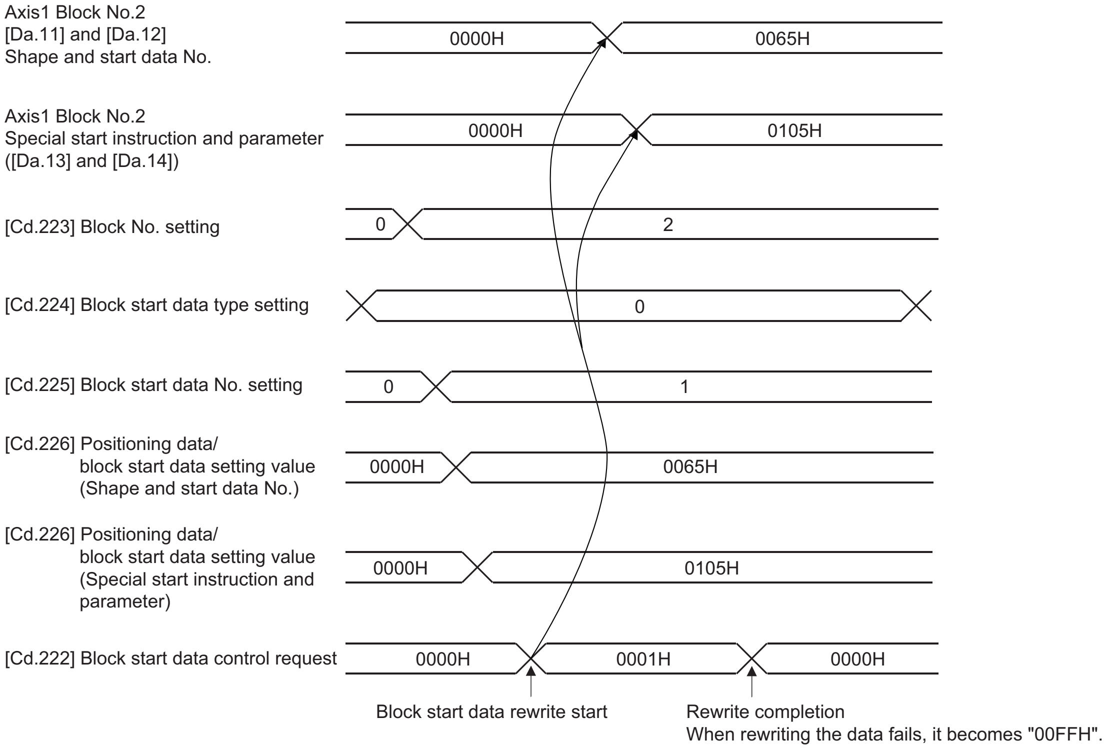
Block No.2 to 4 for each axis (Internal memory)



[1] Refer to the following for the buffer memory address of the axis 17 to 32.
☞ Page 548 Positioning Data

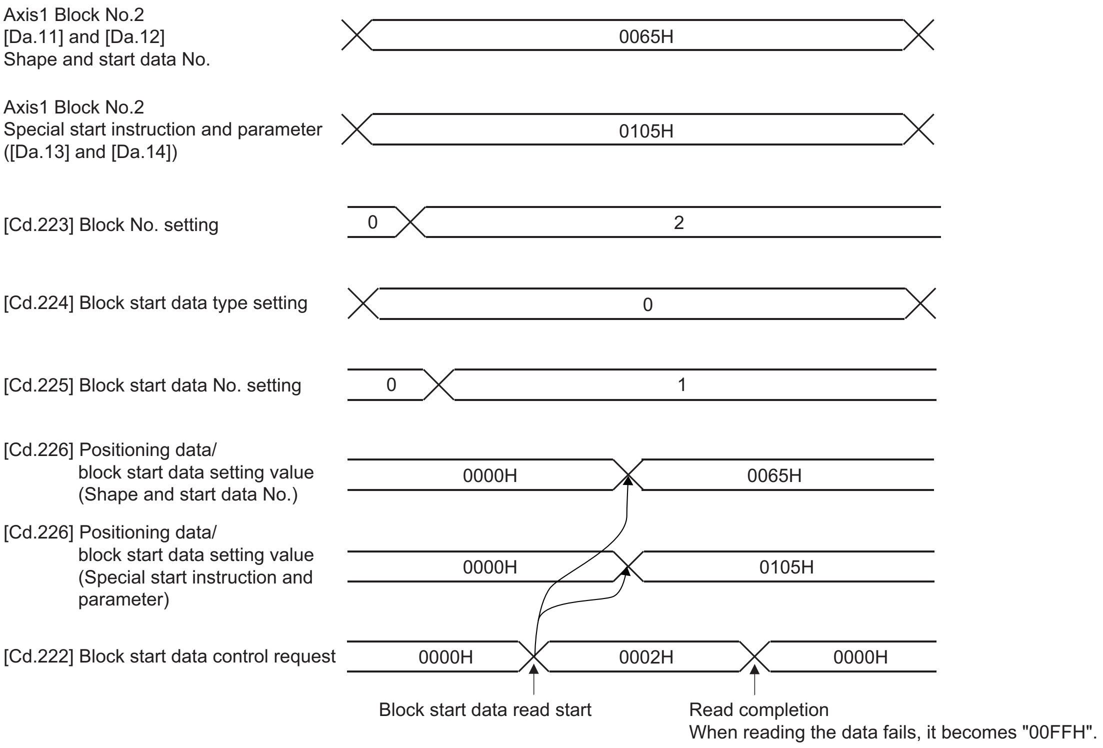
Rewriting method for block start data

1. Specify the block No. in "[Cd.223] Block No. setting".
2. Specify "0: Block start data" in "[Cd.224] Block start data type setting".
3. Specify the block start data No. in "[Cd.225] Block start data No. setting".
4. Specify the setting value in "[Cd.226] Positioning data/block start data setting value".
5. Set "_ _01H: Write request" in "[Cd.222] Block start data control request". It is possible to specify necessity of writing for each data by operating bit 8 to bit 9 of "[Cd.222] Block start data control request".
6. "[Cd.226] Positioning data/block start data setting value" is written in the block start data No. specified in "[Cd.225] Block start data No. setting" of the block No. specified in "[Cd.223] Block No. setting". When writing the data succeeds, "[Cd.222] Block start data control request" becomes "0000H: No control request (Control end)".
7. When the setting values of "[Cd.223] Block No. setting", "[Cd.224] Block start data type setting", and "[Cd.225] Block start data No. setting" are outside the range, "[Cd.222] Block start data control request" becomes "00FFH: Write/read error". "[Cd.222] Block start data control request" is detected with the continuous detection. Returning "00FFH: Write/read error" to "0000H: No control request (Control end)" manually is not required.



Reading method for block start data

1. Specify the block No. in "[Cd.223] Block No. setting".
2. Specify "0: Block start data" in "[Cd.224] Block start data type setting".
3. Specify the block start data No. in "[Cd.225] Block start data No. setting".
4. Set "0002H: Read request" in "[Cd.222] Block start data control request".
5. The block start data of the block start data No. specified in "[Cd.225] Block start data No. setting" of the block No. specified in "[Cd.223] Block No. setting" is read to "[Cd.226] Positioning data/block start data setting value". When reading the data succeeds, "[Cd.222] Block start data control request" becomes "0000H: No control request (Control end)".
6. When the setting values of "[Cd.223] Block No. setting", "[Cd.224] Block start data type setting", and "[Cd.225] Block start data No. setting" are outside the range, "[Cd.222] Block start data control request" becomes "00FFH: Write/read error". "[Cd.222] Block start data control request" is detected with the continuous detection. Returning "00FFH: Write/read error" to "0000H: No control request (Control end)" manually is not required.



Rewriting method for condition data

1. Specify the block No. in "[Cd.223] Block No. setting".

2. Specify "1: Condition data" in "[Cd.224] Block start data type setting".

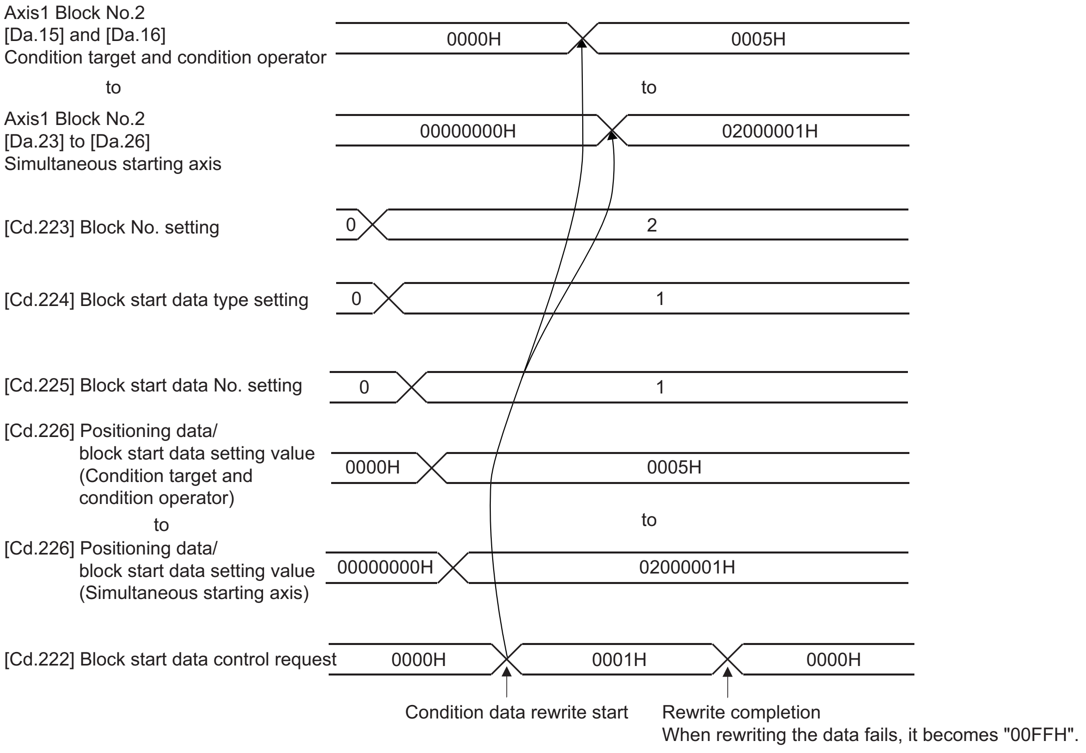
3. Specify the condition data No. in "[Cd.225] Block start data No. setting".

4. Specify the setting value in "[Cd.226] Positioning data/block start data setting value".

5. Set "_ _01H: Write request" in "[Cd.222] Block start data control request". It is possible to specify necessity of writing for each data by operating bit 8 to bit 12 of "[Cd.222] Block start data control request".

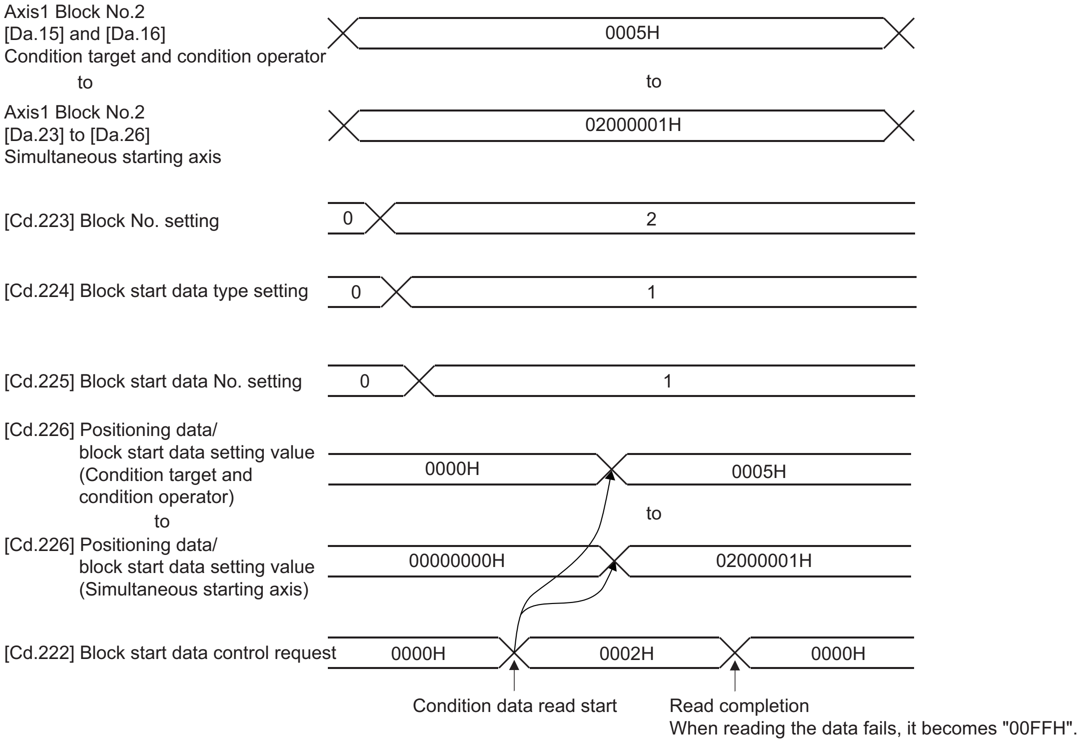
6. "[Cd.226] Positioning data/block start data setting value" is written in the condition data No. specified in "[Cd.225] Block start data No. setting" of the block No. specified in "[Cd.223] Block No. setting". When writing the data succeeds, "[Cd.222] Block start data control request" becomes "0000H: No control request (Control end)".

7. When the setting values of "[Cd.223] Block No. setting", "[Cd.224] Block start data type setting", and "[Cd.225] Block start data No. setting" are outside the range, "[Cd.222] Block start data control request" becomes "00FFH: Write/read error". "[Cd.222] Block start data control request" is detected with the continuous detection. Returning "00FFH: Write/read error" to "0000H: No control request (Control end)" manually is not required.



Reading method for condition data

1. Specify the block No. in "[Cd.223] Block No. setting".
2. Specify "1: Condition data" in "[Cd.224] Block start data type setting".
3. Specify the condition data No. in "[Cd.225] Block start data No. setting".
4. Set "0002H: Read request" in "[Cd.222] Block start data control request".
5. The condition data of the condition data No. specified in "[Cd.225] Block start data No. setting" of the block No. specified in "[Cd.223] Block No. setting" is read to "[Cd.226] Positioning data/block start data setting value". When reading the data succeeds, "[Cd.222] Block start data control request" becomes "0000H: No control request (Control end)".
6. When the setting values of "[Cd.223] Block No. setting", "[Cd.224] Block start data type setting", and "[Cd.225] Block start data No. setting" are outside the range, "[Cd.222] Block start data control request" becomes "00FFH: Write/read error". "[Cd.222] Block start data control request" is detected with the continuous detection. Returning "00FFH: Write/read error" to "0000H: No control request (Control end)" manually is not required.



9.20 Hot Line Forced Stop Function [RD77MS]

This function is used to execute deceleration stop safety for other axes when the servo alarm occurs in the servo amplifier MR-JE-B.

Control details

The hot line forced stop function is set in the servo parameter. This function can execute deceleration stop for other axes without via Simple Motion module by notifying the servo alarm occurrence. For details, refer to the following.

📖MR-JE-_B Servo Amplifier Instruction Manual

This function is enabled at the MR-JE-B factory-set. To disable this function, set "1: Disabled" in the servo parameter "Hot line forced stop function Hot line forced stop function selection (PA27)".

Also, when the system is configured with MR-JE-B and MR-J4(W)-B/MR-JE-BF, this function can execute deceleration stop for MR-J4(W)-B/MR-JE-BF at the servo alarm occurrence in MR-JE-B. To execute deceleration stop for MR-J4(W)-B/MR-JE-BF, set "2: Enabled" in the servo parameter of MR-J4(W)-B/MR-JE-BF "Hot line forced stop function Deceleration to stop selection (PA27)". ("0: Disabled" is set at factory-set.)

The following shows the setting value of the servo parameter (PA27) and the operation of servo amplifier.

[MR-JE-B]

Setting value of "Hot line forced stop function Hot line forced stop function selection (PA27)"	**Output hot line**	**Deceleration stop when receiving the hot line signal**
0: Enabled (Initial value)	Enabled	Enabled
1: Disabled	Disabled	Disabled

[MR-J4(W)-B/MR-JE-BF]

Setting value of "Hot line forced stop function Deceleration to stop selection (PA27)"	**Output hot line**	**Deceleration stop when receiving the hot line signal**
0: Disabled (Initial value)	Disabled	Disabled
2: Enabled	Disabled	Enabled

Use the software version that supports the hot line forced stop function for the servo amplifier to use the hot line forced stop function.

The following table shows the software version of servo amplifier that supports the hot line forced stop function.

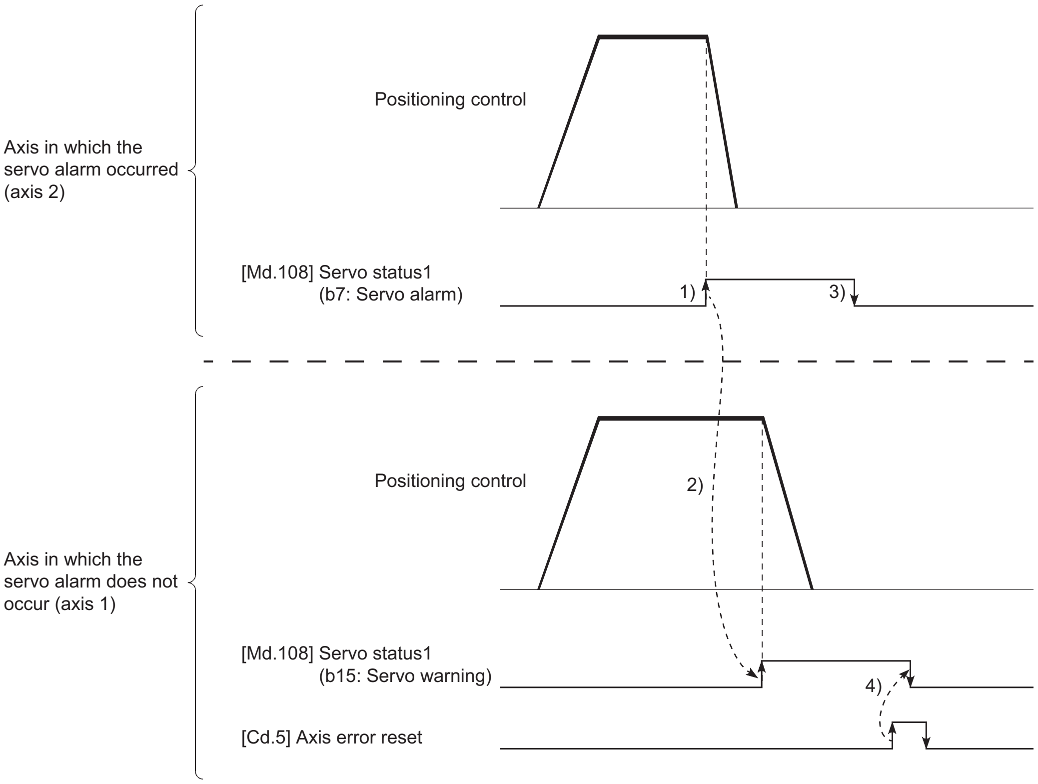
Servo amplifier type	**Software version**
MR-J4(W)-B	B7 or later
MR-JE-B	B6 or later

*1 The servo amplifier except above does not support the hot line forced stop function. Therefore, it does not output the hot line or execute deceleration stop by receiving the hot line signal.

Precautions during control

- The servo warning "Controller forced stop warning" (warning No.: E7) occurs in the axis where the hot line forced stop function executes deceleration stop.
- To clear the servo warning "Controller forced stop warning" (warning No.: E7) occurred by the hot line forced stop function, set "1" in "[Cd.5] Axis error reset" for each axis after the factor is removed in the axis where the servo alarm occurred. Even if "1" is set in "[Cd.5] Axis error reset" before the factor is not removed, the servo warning "Controller forced stop warning" (warning No.: E7) is not cleared.

- The following shows the timing chart at the servo alarm occurrence.



1) The servo alarm occurs in axis 2 and the servo motor stops with dynamic brake.
2) The notification from the alarm occurrence axis is received in axis 1. The servo warning ("[Md.108] servo status1": b15) is turned ON and the deceleration stop is executed.
3) The servo alarm ("[Md.108] Servo status1": b7) is turned OFF by removing the servo alarm factor of axis 2.
4) The warning ("[Md.108] Servo status1": b15) is turned OFF by "[Cd.5] Axis error reset" of axis 1.

10 PARAMETER SETTING

This chapter describes the parameter setting of the Simple Motion module. By setting parameters, the parameter setting by program is not needed.
The parameter setting has two types including the module parameter and Simple Motion module setting (Module extended parameter [RD77GF]).

10.1 Parameter Setting Procedure

1. Add the Simple Motion module to the engineering tool.

🖱 Navigation window ⇨ "Parameter" ⇨ "Module Information" ⇨ Right-click ⇨ [Add New Module]

2. The parameter setting has two types including the module parameter and Simple Motion module setting. Select either of them from the tree on the following window.

🖱 Navigation window ⇨ "Parameter" ⇨ "Module Information" ⇨ Target module

3. Write the settings to the CPU module with the engineering tool.

🖱 [Online] ⇨ [Write to PLC]

4. The settings are reflected by resetting the CPU module or powering off and on the system.

10.2 Module Parameters

Set the module parameter. The module parameter has the following settings.

[RD77MS]

- Refresh settings

[RD77GF]

Module parameter (Motion)

- Module operation setting (Module extended parameter storage location setting)
- Refresh settings

Module parameter (Network)*1

- Required settings
- Basic settings
- Application settings

*1 For details, refer to "PARAMETER SETTINGS" in the following manual.
🕮MELSEC iQ-R Simple Motion Module User's Manual (Network)

Select the module parameter from the tree on the following window.

🖱 Navigation window ⇨ "Parameter" ⇨ "Module Information" ⇨ Target module ⇨ "Module Parameter"

Refresh settings

Configure the setting to transfer the values in the buffer memory of the Simple Motion module to devices or module labels in the CPU module. By configuring these refresh settings, reading the data by program is not needed.

Select the transfer destination from the following at "Target".

- Module Label (☞ Page 429 Module Label)
- Refresh Data Register (RD) (☞ Page 429 Refresh Data Register (RD))
- Device (☞ Page 429 Device)

Module Label

Transfer the setting of the buffer memory to the corresponding module label of each buffer memory area. Items of all axes are automatically set to "Enable" by setting "Command position value" of the axis 1 to "Enable".

Refresh Data Register (RD)

Transfer the setting of the buffer memory to the refresh data register (RD) of the CPU module. All transfer destinations are automatically set by setting the top device to "Top Device Name".

Device

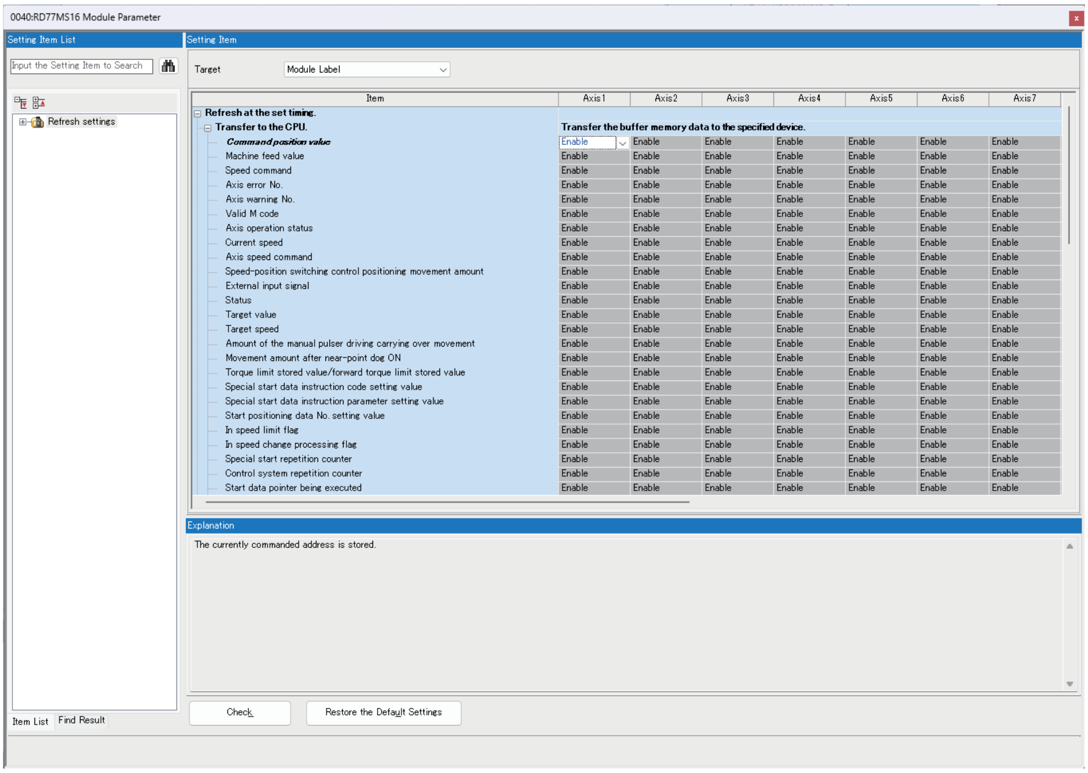
Transfer the setting of the buffer memory to the specified device of the CPU module. The device X, Y, M, L, B, D, W, R, ZR, and RD can be specified. To use the bit device X, Y, M, L, or B, set a No. which is divisible by 16 points (example: X10, Y120, M16). The data in the buffer memory is stored in devices for 16 points from the set No.

Ex.

When X10 is set, data is stored in X10 to X1F.

Setting item

The refresh setting has the following items.



0040:RD77MS16 Module Parameter

Target: Module Label

Item	Axis1	Axis2	Axis3	Axis4	Axis5	Axis6	Axis7
Refresh at the set timing.							
Transfer to the CPU.	**Transfer the buffer memory data to the specified device.**						
Command position value	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Machine feed value	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Speed command	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Axis error No.	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Axis warning No.	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Valid M code	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Axis operation status	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Current speed	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Axis speed command	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Speed-position switching control positioning movement amount	Enable	Enable	Enable	Enable	Enable	Enable	Enable
External input signal	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Status	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Target value	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Target speed	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Amount of the manual pulser driving carrying over movement	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Movement amount after near-point dog ON	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Torque limit stored value/forward torque limit stored value	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Special start data instruction code setting value	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Special start data instruction parameter setting value	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Start positioning data No. setting value	Enable	Enable	Enable	Enable	Enable	Enable	Enable
In speed limit flag	Enable	Enable	Enable	Enable	Enable	Enable	Enable
In speed change processing flag	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Special start repetition counter	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Control system repetition counter	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Start data pointer being executed	Enable	Enable	Enable	Enable	Enable	Enable	Enable

Explanation

The currently commanded address is stored.

Item			Reference
Refresh at the set timing.	Transfer to the CPU.	Command position value	Page 585 [Md.20] Command position value
		Machine feed value	Page 586 [Md.21] Machine feed value
		Speed command	Page 587 [Md.22] Speed command
		Axis error No.	Page 588 [Md.23] Axis error No.
		Axis warning No.	Page 588 [Md.24] Axis warning No.
		Valid M code	Page 588 [Md.25] Valid M code
		Axis operation status	Page 589 [Md.26] Axis operation status
		Current speed	Page 589 [Md.27] Current speed
		Axis speed command	Page 590 [Md.28] Axis speed command
		Speed-position switching control positioning amount	Page 591 [Md.29] Speed-position switching control positioning movement amount
		External input signal	Page 591 [Md.30] External input signal
		Status	Page 592 [Md.31] Status
		Target value	Page 593 [Md.32] Target value
		Target speed	Page 594 [Md.33] Target speed
		Amount of the manual pulser driving carrying over movement	Page 600 [Md.62] Amount of the manual pulser driving carrying over movement
		Movement amount after proximity dog ON	Page 595 [Md.34] Movement amount after proximity dog ON [RD77MS]
		Torque limit stored value/forward torque limit stored value	Page 595 [Md.35] Torque limit stored value/forward torque limit stored value
		Special start data instruction code setting value	Page 596 [Md.36] Special start data instruction code setting value
		Special start data instruction parameter setting value	Page 596 [Md.37] Special start data instruction parameter setting value
		Start positioning data No. setting value	Page 596 [Md.38] Start positioning data No. setting value
		In speed limit flag	Page 597 [Md.39] In speed limit flag
		In speed change processing flag	Page 597 [Md.40] In speed change processing flag

Item			Reference
Refresh at the set timing.	Transfer to the CPU.	Special start repetition counter	Page 597 [Md.41] Special start repetition counter
		Control system repetition counter	Page 597 [Md.42] Control system repetition counter
		Start data pointer being executed	Page 598 [Md.43] Start data pointer being executed
		Positioning data No. being executed	Page 598 [Md.44] Positioning data No. being executed
		Block No. being executed	Page 598 [Md.45] Block No. being executed
		Last executed positioning data No.	Page 598 [Md.46] Last executed positioning data No.
		Positioning data being executed (Positioning identifier)	Page 599 [Md.47] Positioning data being executed
		Positioning data being executed (M code)	
		Positioning data being executed (Dwell time)	
		Positioning data being executed (Command speed)	
		Positioning data being executed (Positioning address)	
		Positioning data being executed (Arc address)	
		Home position return re-travel value	Page 601 [Md.100] Home position return re-travel value [RD77MS]
		Actual position value	Page 602 [Md.101] Actual position value
		Deviation counter value	Page 603 [Md.102] Deviation counter value
		Motor rotation speed	Page 603 [Md.103] Motor rotation speed
		Motor current value	Page 604 [Md.104] Motor current value
		Servo status3	Page 612 [Md.125] Servo status3 [RD77MS]
		Servo status5	Page 612 [Md.127] Servo status5 [RD77MS]
		Servo amplifier software No.1	Page 604 [Md.106] Servo amplifier software No. [RD77MS]
		Servo amplifier software No.2	
		Servo amplifier software No.3	
		Servo amplifier software No.4	
		Servo amplifier software No.5	
		Servo amplifier software No.6	
		Parameter error No.	Page 605 [Md.107] Parameter error No. [RD77MS]
		Servo status2	Page 610 [Md.119] Servo status2
		Servo status1	Page 606 [Md.108] Servo status1
		Regenerative load ratio/Optional data monitor output 1	Page 607 [Md.109] Regenerative load ratio/Optional data monitor output 1 [RD77MS]
		Effective load torque/Optional data monitor output 2	Page 607 [Md.110] Effective load torque/Optional data monitor output 2 [RD77MS]
		Peak torque ratio/Optional data monitor output 3	Page 607 [Md.111] Peak torque ratio/Optional data monitor output 3 [RD77MS]
		Optional data monitor output 4	Page 607 [Md.112] Optional data monitor output 4 [RD77MS]
		Semi/Fully closed loop status	Page 608 [Md.113] Semi/Fully closed loop status
		Servo alarm	Page 608 [Md.114] Servo alarm
		Encoder option information	Page 609 [Md.116] Encoder option information [RD77MS]
		Reverse torque limit stored value	Page 610 [Md.120] Reverse torque limit stored value
		Speed during command	Page 611 [Md.122] Speed during command
		Torque during command	Page 611 [Md.123] Torque during command
		Control mode switching status	Page 611 [Md.124] Control mode switching status [RD77MS]
		Positioning data being executed (Axis to be interpolated)	Page 599 [Md.47] Positioning data being executed
		Deceleration start flag	Page 599 [Md.48] Deceleration start flag
		Servo status7	Page 613 [Md.500] Servo status7 [RD77MS]
		Driver operation alarm No.	Page 613 [Md.502] Driver operation alarm No. [RD77MS]
		Pre-reading data analysis status	Page 613 [Md.503] Pre-reading data analysis status
Refresh Group		Refresh Group	Page 432 Refresh group
		Group [n] (n: 1-64)	
Refresh Timing (I/O)[1]		Refresh Timing	—

[1] The setting cannot be changed from the default in the Simple Motion module.

■Refresh group

Set the refresh timing of the specified refresh destination.

Setting value	Description
At the Execution Time of END Instruction	Performs refresh at END processing of the CPU module.
At the Execution Time of Specified Program	Performs refresh at the execution of the program specified with "Group [n] (n: 1-64)".

Refresh processing time

A refresh processing time [μs] is a constituent of the scan time of the CPU module. For details on the scan time, refer to the following.

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

The refresh processing time [μs], which is taken for refresh processing, is given by:

- Refresh processing time [μs] = Refresh read time (refresh data transfer to the CPU module)

The refresh read time varies depending on the settings of "Target".

■When "Target" is a module label or a refresh data register (RD)

The following table shows the refresh read time with an R_CPU used.

Classification	Number of the axis set	When using the refresh settings
Refresh read time	1	22.58 μs
	2	33.56 μs
	3	44.54 μs
	4	55.52 μs
	5	66.50 μs
	6	77.48 μs
	7	88.46 μs
	8	99.44 μs
	9	110.42 μs
	10	121.40 μs
	11	132.38 μs
	12	143.36 μs
	13	154.34 μs
	14	165.32 μs
	15	176.30 μs
	16	187.28 μs
	17	198.26 μs
	18	209.24 μs
	19	220.22 μs
	20	231.20 μs
	21	242.18 μs
	22	253.16 μs
	23	264.14 μs
	24	275.12 μs
	25	286.10 μs
	26	297.08 μs
	27	308.06 μs
	28	319.04 μs
	29	330.02 μs
	30	341.00 μs
	31	351.98 μs
	32	362.96 μs

■When "Target" is a specified device

Calculate the refresh read time according to the number of items and the number of their transfer data (word) that are set to be refreshed. For the calculation method, refer to the following.

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

In addition, substitute the following values in the calculation formula to calculate the refresh read time.

Item	Description
Number of refresh settings	The number of items that are set to be refreshed
Refresh time (A) of each of the first to nth set items	0.05 μs per one word of each of the first to nth set items[1]

[1] This value is the time with an R_CPU used.

Ex.

If all the 1184 items (1344 words in total) of the RD77MS16 are set in the refresh read settings

1184 × 0.98 + 0.05 × 1344 + 11.6 = 1239.12 μs

The refresh read time, therefore, is 1239.12 μs.

Module extended parameter storage location setting [RD77GF]

Set the module extended parameter storage location. The setting is common for all axes.

Module extended parameter storage location setting	Description
CPU module	The module extended parameter is stored in the CPU module or SD memory card. At power ON, the module extended parameter stored in the CPU module is reflected to the buffer memory.
Simple Motion module	The module extended parameter is stored in the Simple Motion module. At power ON, the module extended parameter backed up with the flash ROM write function is reflected to the buffer memory.

"Simple Motion module" is set by default.

The module parameter is stored only in the "CPU module".

Ex.

The following describes how to use the setting values of the module extended parameter storage location setting.

Module extended parameter storage location setting	Application
CPU module	Set "CPU module" to use the module extended parameter which is set in the "parameter setting" of the engineering tool. The parameters are managed unitary in the CPU module. The advantages are as follows: • Storing the parameters only in the CPU module facilitates the parameter management. • Module replacement can be completed only by exchanging the modules. (Note that the home position return is required after the replacement.) • When the parameters in the CPU module have been stored in SD cards, the parameters can be changed only by exchanging the SD cards.
Simple Motion module	Set "Simple Motion Module" to use the module extended parameter which is changed with programs after power supply OFF. The module extended parameters are managed with the Simple Motion module. The advantages are as follows: • MELSEC-Q series Simple Motion module program assets can be diverted without any changes. • The module extended parameters set with the teaching function or programs can be used after power supply OFF by registering the module extended parameters to the Simple Motion module with the flash ROM write function.

Point

To use the positioning data changed with programs after power supply OFF, set "Simple Motion Module". By using the flash ROM write function, the changed module extended parameter can be used after power supply ON.

10.3 Simple Motion Module Setting (Module Extended Parameter [RD77GF])

Set the required setting for the Simple Motion module. Refer to "Help" in the "Simple Motion Module Setting Function" of the engineering tool for details.

Select the Simple Motion module setting (module extended parameter [RD77GF]) from the tree on the following window.

[RD77MS]

🖱 Navigation window ⇨ "Parameter" ⇨ "Module Information" ⇨ Target module ⇨ "Simple Motion module setting"

[RD77GF]

🖱 Navigation window ⇨ "Parameter" ⇨ "Module Information" ⇨ Target module ⇨ "Module Extended Parameter"

11 SPECIFICATIONS OF I/O SIGNALS WITH CPU MODULES

11.1 List of Input/Output Signals with CPU Modules

The Simple Motion module uses following input/output points for exchanging data with the CPU module.[*1]

- 2-axis module/4-axis module/8-axis module/16-axis module…32 points
- 32-axis module…64 points [RD77GF]

The input/output signals of the Simple Motion module are shown below.

[*1] The input/output signals, whose axis Nos. exceed the number of controlled axes, cannot be used.

Point

- The following input/output Nos. (X/Y) are shown in the case that the start input/output No. of the Simple Motion module is 0.
- The use prohibited signals are used by the system, and cannot be used by a customer. If these devices are used, the function of the Simple Motion module will not be guaranteed.

Signal direction: Simple Motion module → CPU module		
Device No.	**Signal name**	
X0	READY	
X1	Synchronization flag	
X2	Use prohibited	
⋮		
XF		
X10	Axis 1	BUSY[*1]
X11	Axis 2	
X12	Axis 3	
X13	Axis 4	
X14	Axis 5	
X15	Axis 6	
X16	Axis 7	
X17	Axis 8	
X18	Axis 9	
X19	Axis 10	
X1A	Axis 11	
X1B	Axis 12	
X1C	Axis 13	
X1D	Axis 14	
X1E	Axis 15	
X1F	Axis 16	
X20	Axis 17	
X21	Axis 18	
X22	Axis 19	
X23	Axis 20	
X24	Axis 21	
X25	Axis 22	
X26	Axis 23	
X27	Axis 24	
X28	Axis 25	
X29	Axis 26	
X2A	Axis 27	
X2B	Axis 28	
X2C	Axis 29	
X2D	Axis 30	
X2E	Axis 31	
X2F	Axis 32	
X30	Use prohibited	
⋮		
X3F		

Signal direction: CPU module → Simple Motion module		
Device No.	**Signal name**	
Y0	PLC READY	
Y1	All axis servo ON	
Y2	Use prohibited	
⋮		
YF		
Y10	Axis 1	Positioning start[*1]
Y11	Axis 2	
Y12	Axis 3	
Y13	Axis 4	
Y14	Axis 5	
Y15	Axis 6	
Y16	Axis 7	
Y17	Axis 8	
Y18	Axis 9	
Y19	Axis 10	
Y1A	Axis 11	
Y1B	Axis 12	
Y1C	Axis 13	
Y1D	Axis 14	
Y1E	Axis 15	
Y1F	Axis 16	
Y20	Axis 17	
Y21	Axis 18	
Y22	Axis 19	
Y23	Axis 20	
Y24	Axis 21	
Y25	Axis 22	
Y26	Axis 23	
Y27	Axis 24	
Y28	Axis 25	
Y29	Axis 26	
Y2A	Axis 27	
Y2B	Axis 28	
Y2C	Axis 29	
Y2D	Axis 30	
Y2E	Axis 31	
Y2F	Axis 32	
Y30	Use prohibited	
⋮		
Y3F		

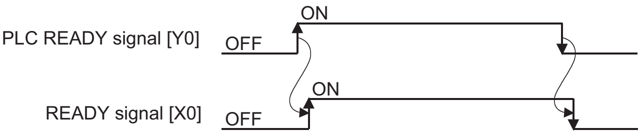
[*1] The BUSY signal and positioning start signal, whose axis Nos. exceed the number of controlled axes, cannot be used.

Point

- The M code ON signal, error detection signal, start complete signal and positioning complete signal are assigned to the bit of "[Md.31] Status".
- The axis stop signal, forward run JOG start signal, reverse run JOG start signal, execution prohibition flag are assigned to the buffer memory [Cd.180] to [Cd.183].

11.2 Details of Input Signals

The ON/OFF timing and conditions of the input signals are shown below.

Device No.	Signal name			Details
X0	READY		ON: READY OFF: Not READY/Watch dog timer error	• When the PLC READY signal [Y0] turns from OFF to ON, the parameter setting range is checked. If no error is found, this signal turns ON. • When the PLC READY signal [Y0] turns OFF, this signal turns OFF. • When watch dog timer error occurs, this signal turns OFF. • This signal is used for interlock in a program, etc. 
X1	Synchronization flag		OFF: Module access disabled ON: Module access enabled	• After the CPU module is turned ON or the CPU module is reset, this signal turns ON if the access from the CPU module to the Simple Motion module is possible. • When "Asynchronous" is selected in the module synchronization setting of the CPU module, this signal can be used as interlock for the access from a program to the Simple Motion module.
X10 ⋮ X2F	Axis 1 ⋮ Axis 32	BUSY[*1]	OFF: Not BUSY ON: BUSY	• This signal turns ON at the start of positioning, home position return or JOG operation. It turns OFF when the "[Da.9] Dwell time/JUMP destination positioning data No." has passed after positioning stops. (This signal remains ON during positioning.) • This signal turns OFF when the positioning is stopped with step operation. • During manual pulse generator operation, this signal turns ON while the "[Cd.21] Manual pulse generator enable flag" is ON. • This signal turns OFF at error completion or positioning stop.

[*1] The BUSY signal, whose axis No. exceeds the number of controlled axes, cannot be used.

Point

The BUSY signal turns ON even when position control of movement amount 0 is executed. However, since the ON time is short, the ON status may not to be detected in the program.

11.3 Details of Output Signals

The ON/OFF timing and conditions of the output signals are shown below.

Device No.	Signal name			Details
Y0	PLC READY		OFF: PLC READY OFF ON: PLC READY ON	(a) This signal notifies the Simple Motion module that the CPU module is normal. • It is turned ON/OFF with the program. (b) When the data (parameter, etc.) are changed, this signal is turned OFF depending on the parameter. (☞ Page 658 Memory Configuration and Data Process) (c)The following processes are carried out when this signal turns from OFF to ON. • The parameter setting range is checked. • The READY signal [X0] turns ON. (d) The following processes are carried out when this signal turns from ON to OFF. In these cases, the OFF time should be set to 100 ms or more. • The READY signal [X0] turns OFF. • The operating axis stops. • The M code ON signal ([Md.31] Status: b12) for each axis turns OFF, and "0" is stored in "[Md.25] Valid M code". (e) When parameters or positioning data (No.1 to 600) are written from the engineering tool or CPU module to the flash ROM, this signal will turn OFF.
Y1	All axis servo ON		OFF: Servo OFF ON: Servo ON	• All the servo amplifiers connected to the Simple Motion module are set to servo ON or servo OFF.
Y10 ⋮ Y2F	Axis 1 ⋮ Axis 32	Positioning start[*1]	OFF: Positioning start not requested ON: Positioning start requested	• Home position return operation or positioning operation is started. • The positioning start signal is valid at the rising edge, and the operation is started. • When this signal turns ON during BUSY, the warning "Start during operation" (warning code: 0900H) will occur.

[*1] The positioning signal, whose axis No. exceeds the number of controlled axes, cannot be used.

12 DATA USED FOR POSITIONING CONTROL

The parameters and data used to carry out positioning control with the Simple Motion module are explained in this chapter.
With the positioning system using the Simple Motion module, the various parameters and data explained in this chapter are used for control. The parameters and data include parameters set according to the device configuration, such as the system configuration, and parameters and data set according to each control.
Read this section thoroughly and make settings according to each control or application.

12.1 Types of Data

Parameters and data required for control

The parameters and data required to carry out control with the Simple Motion module include the "setting data", "monitor data" and "control data" shown below.

Setting data

The data is set beforehand according to the machine and application. Set the data with programs or engineering tools. The data set for the buffer memory can also be saved in the flash ROM or internal memory (nonvolatile) in the Simple Motion module.

Restriction

The setting data can be backed up only in the flash ROM/internal memory (nonvolatile) of the Simple Motion module. It cannot be backed up in the CPU module and the SD memory card mounted to the CPU module.

The setting data is classified as follows.

Classification			Item	Description
[RD77MS] Simple Motion module setting [RD77GF] Simple Motion module setting (module extended parameters)	Parameters	Servo network composition parameters		Parameters for the network. Set the device to be used and the network according to the system configuration.
		Common parameters		Parameters that are independent of axes and related to the overall system. Set according to the system configuration when the system is started up.
		Positioning parameters	Basic parameters 1[*1]	Set according to the machine and applicable motor when the system is started up.
			Basic parameters 2	
			Detailed parameters 1	Set according to the system configuration when the system is started up.
			Detailed parameters 2[*2]	
		Home position return parameters	Home position return basic parameters	Set the values required for carrying out home position return control.
			Home position return detailed parameters	
		Extended parameters [RD77MS]		Set according to the system configuration when the system is started up.
		Link device external signal assignment parameters [RD77GF]		Set according to the network configuration when the system is started up.
		Servo object specification parameters [RD77GF]		Set the data that is determined by the specification of the servo being used when the system is started up.
	Servo parameters [RD77MS]	Servo amplifier parameters (PA, PB, PC, PD, PE, PS, PF, Po, PL)		Set the data that is determined by the specification of the servo being used when the system is started up.
	Mark detection	Mark detection setting parameters		Set the parameters for mark detection.
	Positioning data	Positioning data		Set the data for "major positioning control".
	Block start data	Block start data		Set the block start data for "high-level positioning control".
		Condition data		Set the condition data for "high-level positioning control".
		Memo data		Set the condition judgment values for the condition data used in "high-level positioning control".
	Synchronous control parameters	Servo input axis parameters		Set the parameters for synchronous control.
		Synchronous encoder axis parameters		
		Synchronous encoder axis parameters via link device [RD77GF]		
		Synchronous parameters		
	Cam data			Set the cam data to be used for synchronous control.

*1 If the setting of the basic parameters 1 is incorrect, the rotation direction may be reversed, or no operation may take place.

*2 Detailed parameters 2 are data items for using the functions of Simple Motion module to the fullest. Set as required.

- The following methods are available for data setting. In this manual, the method using the engineering tool will be explained. (Refer to the next "Point".)

- Set using the engineering tool.
- Create the program for data setting and execute it.

- The basic parameters 1, detailed parameters 1, home position return parameters, "[Pr.83] Speed control 10 × multiplier setting for degree axis", "[Pr.89] Manual pulse generator/Incremental synchronous encoder input type selection", "[Pr.90] Operation setting for speed-torque control mode", "[Pr.95] External command signal selection", "[Pr.122] Manual pulse generator speed limit mode", "[Pr.123] Manual pulse generator speed limit value" and "[Pr.127] Speed limit value input selection at control mode switching" become valid when the PLC READY signal [Y0] turns from OFF to ON.
- The basic parameters 2, detailed parameters 2 (excluding "[Pr.83] Speed control 10 × multiplier setting for degree axis", "[Pr.90] Operation setting for speed-torque control mode", "[Pr.95] External command signal selection", "[Pr.122] Manual pulse generator speed limit mode", "[Pr.123] Manual pulse generator speed limit value" and "[Pr.127] Speed limit value input selection at control mode switching") become valid immediately when they are written to the buffer memory, regardless of the state of the PLC READY signal [Y0].
- Even when the PLC READY signal [Y0] is ON, the values or contents of the following can be changed: basic parameters 2, detailed parameters 2, positioning data, and block start data.
- The servo parameter is transmitted from the Simple Motion module to the servo amplifier when the initialized communication carried out after the power supply is turned ON or the CPU module is reset. The power supply is turned ON or the CPU module is reset after writing servo parameter in flash ROM of Simple Motion module if the servo parameter is transmitted to the servo amplifier.
- The only valid data assigned to basic parameter 2, detailed parameter 2, positioning data or block start data are the data read at the moment when a positioning or JOG operation is started. Once the operation has started, any modification to the data is ignored. Exceptionally, however, modifications to the following are valid even when they are made during a positioning operation: acceleration time 0 to 3, deceleration time 0 to 3, and external command function.

Setting data that can be changed during operation	Details
Acceleration time 0 to 3, deceleration time 0 to 3	Positioning data are pre-read and pre-analyzed. Modifications to the data four or more steps after the current step are valid.
External command function selection	The value at the time of detection is valid.

Point

- The "setting data" is created for each axis.
- The "setting data" parameters have determined default values, and are set to the default values before shipment from the factory. (Parameters related to axes that are not used are left at the default value.)
- The "setting data" can be initialized with the engineering tool or the program.
- It is recommended to set the "setting data" with the engineering tool. The program for data setting is complicated and many devices must be used. This will increase the scan time.

Monitor data

The data indicates the control status. The data is stored in the buffer memory. Monitor the data as necessary.

The monitor data is classified as follows.

Item	Description
System monitor data	Monitors the specifications and the operation history of Simple Motion module.
Axis monitor data	Monitors the data related to the operating axis, such as the current position and speed.
Servo network composition status	Monitors the data related to the current network state.
Synchronous control monitor data	Monitors the data for synchronous control.
Mark detection monitor data	Monitors the data for mark detection.
Monitor area for slave device operation [RD77GF]	Monitors the data of when slave devices are operated.

- The following methods are available for data monitoring:
  - Set using the engineering tool.
  - Create the program for monitoring and execute it.
- In this manual, the method using the engineering tool will be explained.

Control data

The data is used by users to control the positioning system.

The control data is classified as follows.

Item	Description
System control data	Writes/initializes the "positioning data" in the module. Sets the setting for operation of all axes.
Axis control data	Makes settings related to the operation, and controls the speed change during operation, and stops/restarts the operation for each axis. Output signals (axis stop signal, JOG start signal and execution prohibition flag) from the CPU module to the Simple Motion module.
Synchronous control data	Sets the data for synchronous control.
Mark detection control data	Sets the data for mark detection control.
Control data for slave device operation [RD77GF]	Sets the control data to operate slave devices.
Control data for positioning data and block start data [RD77MS]	Sets the data to control the positioning data and the block start data.

- Control using the control data is carried out with the program. "[Cd.41] Deceleration start flag valid" is valid for only the value at the time when the PLC READY signal [Y0] turns from OFF to ON.

Setting items for servo network composition parameters

The setting items for the "servo network composition parameters" are shown below.

Servo network composition parameter		Remark
[Pr.100]	Connected device	Sets the SSCNET device to be connected with the Simple Motion module. [RD77MS] Sets the slave device supporting the motion mode for which axis control is performed by the Simple Motion module. [RD77GF]
[Pr.101]	Virtual servo amplifier setting [RD77GF]	Sets if use as virtual servo amplifier axis. It will be read when the power supply is ON.

Setting items for common parameters

The setting items for the "common parameters" are shown below. The "common parameters" are independent of axes and related to the overall system.

○: Set as required ("—" when not required)

—: Setting not required (When the value is the default value or within the setting range, there is no problem.)

Common parameter		Home position return control	Major positioning control			
			Position control			
			1-axis linear control 2/3/4-axis linear interpolation control	1/2/3/4-axis fixed-feed control	2-axis circular interpolation control	3-axis helical interpolation control
[Pr.24]	Manual pulse generator/Incremental synchronous encoder input selection [RD77MS]	—	—	—	—	—
[Pr.82]	Forced stop valid/invalid selection	○	○	○	○	○
[Pr.89]	Manual pulse generator/Incremental synchronous encoder input type selection [RD77MS]	—	—	—	—	—
[Pr.96]	Operation cycle setting	—	—	—	—	—
[Pr.97]	SSCNET setting [RD77MS]	—	—	—	—	—
[Pr.150]	Input terminal logic selection [RD77MS]	○	○	○	○	○
[Pr.151]	Manual pulse generator/Incremental synchronous encoder input logic selection [RD77MS]	—	—	—	—	—
[Pr.152]	Maximum number of control axes	○	○	○	○	○
[Pr.153]	External input signal digital filter setting [RD77MS]	○	○	○	○	○
[Pr.155]	Q series compatible function setting [RD77MS]	—	—	—	—	—

Common parameter		Major positioning control			
		1 to 4 axis speed control	Speed-position or position-speed control	Other control	
				Current value changing	JUMP instruction, NOP instruction, LOOP to LEND
[Pr.24]	Manual pulse generator/Incremental synchronous encoder input selection [RD77MS]	—	—	—	—
[Pr.82]	Forced stop valid/invalid selection	○	○	○	○
[Pr.89]	Manual pulse generator/Incremental synchronous encoder input type selection [RD77MS]	—	—	—	—
[Pr.96]	Operation cycle setting	—	—	—	—
[Pr.97]	SSCNET setting [RD77MS]	—	—	—	—
[Pr.150]	Input terminal logic selection [RD77MS]	○	○	○	○
[Pr.151]	Manual pulse generator/Incremental synchronous encoder input logic selection [RD77MS]	—	—	—	—
[Pr.152]	Maximum number of control axes	○	○	○	○
[Pr.153]	External input signal digital filter setting [RD77MS]	○	○	○	○
[Pr.155]	Q series compatible function setting [RD77MS]	—	—	—	—

◎: Always set

○: Set as required ("—" when not required)

—: Setting not required (When the value is the default value or within the setting range, there is no problem.)

Common parameter		**Manual control**			**Expansion control**	**Related sub function**
		Manual pulse generator operation	**Inching operation**	**JOG operation**	**Speed-torque control**	
[Pr.24]	Manual pulse generator/Incremental synchronous encoder input selection [RD77MS]	◎	—	—	—	—
[Pr.82]	Forced stop valid/invalid selection	○	○	○	○	☞ Page 267 Forced stop function
[Pr.89]	Manual pulse generator/Incremental synchronous encoder input type selection [RD77MS]	◎	—	—	—	—
[Pr.96]	Operation cycle setting	—	—	—	—	—
[Pr.97]	SSCNET setting [RD77MS]	—	—	—	—	—
[Pr.150]	Input terminal logic selection [RD77MS]	○	○	○	○	—
[Pr.151]	Manual pulse generator/Incremental synchronous encoder input logic selection [RD77MS]	◎	—	—	—	—
[Pr.152]	Maximum number of control axes	○	○	○	○	—
[Pr.153]	External input signal digital filter setting [RD77MS]	○	○	○	○	—
[Pr.155]	Q series compatible function setting [RD77MS]	○	—	—	—	—

Setting items for positioning parameters

The setting items for the "positioning parameters" are shown below. The "positioning parameters" are set for each axis for all controls achieved by the Simple Motion module.

Home position return control

◎: Always set, ○: Set as required ("—" when not required), △: Setting restricted,
—: Setting not required (When the value is the default value or within the setting range, there is no problem.)

Positioning parameter		Home position return control
Basic parameters 1	[Pr.1] Unit setting	◎
	[Pr.2] Number of pulses per rotation (AP) (Unit: pulse)	◎
	[Pr.3] Movement amount per rotation (AL)	◎
	[Pr.4] Unit magnification (AM)	◎
	[Pr.7] Bias speed at start	○
Basic parameters 2	[Pr.8] Speed limit value	◎
	[Pr.9] Acceleration time 0	◎
	[Pr.10] Deceleration time 0	◎
Detailed parameters 1	[Pr.11] Backlash compensation amount	○
	[Pr.12] Software stroke limit upper limit value	—
	[Pr.13] Software stroke limit lower limit value	—
	[Pr.14] Software stroke limit selection	—
	[Pr.15] Software stroke limit valid/invalid setting	—
	[Pr.16] Command in-position width	—
	[Pr.17] Torque limit setting value	△
	[Pr.18] M code ON signal output timing	—
	[Pr.19] Speed switching mode	—
	[Pr.20] Interpolation speed designation method	—
	[Pr.21] Command position value during speed control	—
	[Pr.22] Input signal logic selection	◎
	[Pr.81] Speed-position function selection	—
	[Pr.116] FLS signal selection	○
	[Pr.117] RLS signal selection	○
	[Pr.118] DOG signal selection	○
	[Pr.119] STOP signal selection	○

Positioning parameter		**Home position return control**
Detailed parameters 2	[Pr.25] Acceleration time 1	○
	[Pr.26] Acceleration time 2	○
	[Pr.27] Acceleration time 3	○
	[Pr.28] Deceleration time 1	○
	[Pr.29] Deceleration time 2	○
	[Pr.30] Deceleration time 3	○
	[Pr.31] JOG speed limit value	—
	[Pr.32] JOG operation acceleration time selection	—
	[Pr.33] JOG operation deceleration time selection	—
	[Pr.34] Acceleration/deceleration process selection	○
	[Pr.35] S-curve ratio	○
	[Pr.36] Rapid stop deceleration time	○
	[Pr.37] Stop group 1 rapid stop selection	○
	[Pr.38] Stop group 2 rapid stop selection	○
	[Pr.39] Stop group 3 rapid stop selection	○
	[Pr.40] Positioning complete signal output time	—
	[Pr.41] Allowable circular interpolation error width	—
	[Pr.42] External command function selection [RD77MS]	○
	[Pr.83] Speed control 10 × multiplier setting for degree axis	○
	[Pr.84] Restart allowable range when servo OFF to ON	○
	[Pr.90] Operation setting for speed-torque control mode	—
	[Pr.95] External command signal selection [RD77MS]	○
	[Pr.122] Manual pulse generator speed limit mode	—
	[Pr.123] Manual pulse generator speed limit value	—
	[Pr.127] Speed limit value input selection at control mode switching	—

Major positioning control

◎: Always set, ○: Set as required ("—" when not required), △: Setting restricted,
—: Setting not required (When the value is the default value or within the setting range, there is no problem.)

Positioning parameter		Major positioning control							
		Position control				1 to 4 axis speed control	Speed-position or position-speed control	Other control	
		1-axis linear control 2/3/4-axis linear interpolation control	1/2/3/4-axis fixed-feed control	2-axis circular interpolation control	3-axis helical interpolation control			Current value changing	JUMP instruction, NOP instruction, LOOP to LEND
Basic parameters 1	[Pr.1] Unit setting	◎	◎	△	△	◎	◎	◎	◎
	[Pr.2] Number of pulses per rotation (AP) (Unit: pulse)	◎	◎	◎	◎	◎	◎	◎	◎
	[Pr.3] Movement amount per rotation (AL)	◎	◎	◎	◎	◎	◎	◎	◎
	[Pr.4] Unit magnification (AM)	◎	◎	◎	◎	◎	◎	◎	◎
	[Pr.7] Bias speed at start	○	○	○	○	○	○	—	—
Basic parameters 2	[Pr.8] Speed limit value	◎	◎	◎	◎	◎	◎	—	—
	[Pr.9] Acceleration time 0	◎	◎	◎	◎	◎	◎	—	—
	[Pr.10] Deceleration time 0	◎	◎	◎	◎	◎	◎	—	—

Positioning parameter		Major positioning control							
		Position control				1 to 4 axis speed control	Speed-position or position-speed control	Other control	
		1-axis linear control 2/3/4-axis linear interpolation control	1/2/3/4-axis fixed-feed control	2-axis circular interpolation control	3-axis helical interpolation control			Current value changing	JUMP instruction, NOP instruction, LOOP to LEND
Detailed parameters 1	[Pr.11] Backlash compensation amount	○	○	○	○	○	○	—	—
	[Pr.12] Software stroke limit upper limit value	○	○	○	○	○	○	○	—
	[Pr.13] Software stroke limit lower limit value	○	○	○	○	○	○	○	—
	[Pr.14] Software stroke limit selection	○	○	○	○	○	○	○	—
	[Pr.15] Software stroke limit valid/invalid setting	—	—	—	—	—	—	—	—
	[Pr.16] Command in-position width	○	○	○	○	—	○	—	—
	[Pr.17] Torque limit setting value	○	○	○	○	○	○	—	—
	[Pr.18] M code ON signal output timing	○	○	○	○	○	○	○	—
	[Pr.19] Speed switching mode	○	○	○	○	—	—	—	—
	[Pr.20] Interpolation speed designation method	△	△	△	△	△	—	—	—
	[Pr.21] Command position value during speed control	—	—	—	—	○	○	—	—
	[Pr.22] Input signal logic selection	◎	◎	◎	◎	◎	◎	◎	◎
	[Pr.81] Speed-position function selection	—	—	—	—	—	◎	—	—
	[Pr.116] FLS signal selection	○	○	○	○	○	○	—	—
	[Pr.117] RLS signal selection	○	○	○	○	○	○	—	—
	[Pr.118] DOG signal selection	—	—	—	○	—	○	—	—
	[Pr.119] STOP signal selection	○	○	○	○	○	○	○	○

Positioning parameter		Major positioning control							
		Position control				1 to 4 axis speed control	Speed-position or position-speed control	Other control	
		1-axis linear control 2/3/4-axis linear interpolation control	1/2/3/4-axis fixed-feed control	2-axis circular interpolation control	3-axis helical interpolation control			Current value changing	JUMP instruction, NOP instruction, LOOP to LEND
Detailed parameters 2	[Pr.25] Acceleration time 1	○	○	○	○	○	○	—	—
	[Pr.26] Acceleration time 2	○	○	○	○	○	○	—	—
	[Pr.27] Acceleration time 3	○	○	○	○	○	○	—	—
	[Pr.28] Deceleration time 1	○	○	○	○	○	○	—	—
	[Pr.29] Deceleration time 2	○	○	○	○	○	○	—	—
	[Pr.30] Deceleration time 3	○	○	○	○	○	○	—	—
	[Pr.31] JOG speed limit value	—	—	—	—	—	—	—	—
	[Pr.32] JOG operation acceleration time selection	—	—	—	—	—	—	—	—
	[Pr.33] JOG operation deceleration time selection	—	—	—	—	—	—	—	—
	[Pr.34] Acceleration/ deceleration process selection	○	○	○	○	○	○	—	—
	[Pr.35] S-curve ratio	○	○	○	○	○	○	—	—
	[Pr.36] Rapid stop deceleration time	○	○	○	○	○	○	—	—
	[Pr.37] Stop group 1 rapid stop selection	○	○	○	○	○	○	—	—
	[Pr.38] Stop group 2 rapid stop selection	○	○	○	○	○	○	—	—
	[Pr.39] Stop group 3 rapid stop selection	○	○	○	○	○	○	—	—
	[Pr.40] Positioning complete signal output time	○	○	○	○	○	○	○	—

Positioning parameter		Major positioning control							
		Position control				1 to 4 axis speed control	Speed-position or position-speed control	Other control	
		1-axis linear control 2/3/4-axis linear interpolation control	1/2/3/4-axis fixed-feed control	2-axis circular interpolation control	3-axis helical interpolation control			Current value changing	JUMP instruction, NOP instruction, LOOP to LEND
Detailed parameters 2	[Pr.41] Allowable circular interpolation error width	—	—	○	○	—	—	—	—
	[Pr.42] External command function selection [RD77MS]	○	○	○	○	○	◎	○	—
	[Pr.83] Speed control 10 × multiplier setting for degree axis	○	○	○	○	○	○	—	—
	[Pr.84] Restart allowable range when servo OFF to ON	○	○	○	○	○	○	○	○
	[Pr.90] Operation setting for speed-torque control mode	—	—	—	—	—	—	—	—
	[Pr.95] External command signal selection [RD77MS]	○	○	○	○	○	◎	○	—
	[Pr.122] Manual pulse generator speed limit mode	—	—	—	—	—	—	—	—
	[Pr.123] Manual pulse generator speed limit value	—	—	—	—	—	—	—	—
	[Pr.127] Speed limit value input selection at control mode switching	—	—	—	—	—	—	—	—

Manual control

◎: Always set, ○: Set as required ("—" when not required), △: Setting restricted,

—: Setting not required (When the value is the default value or within the setting range, there is no problem.)

Positioning parameter		**Manual control**		
		Manual pulse generator operation	**Inching operation**	**JOG operation**
Basic parameters 1	[Pr.1] Unit setting	◎	◎	◎
	[Pr.2] Number of pulses per rotation (AP) (Unit: pulse)	◎	◎	◎
	[Pr.3] Movement amount per rotation (AL)	◎	◎	◎
	[Pr.4] Unit magnification (AM)	◎	◎	◎
	[Pr.7] Bias speed at start	—	—	○
Basic parameters 2	[Pr.8] Speed limit value	—	◎	◎
	[Pr.9] Acceleration time 0	—	—	◎
	[Pr.10] Deceleration time 0	—	—	◎
Detailed parameters 1	[Pr.11] Backlash compensation amount	○	○	○
	[Pr.12] Software stroke limit upper limit value	○	○	○
	[Pr.13] Software stroke limit lower limit value	○	○	○
	[Pr.14] Software stroke limit selection	○	○	○
	[Pr.15] Software stroke limit valid/invalid setting	○	○	○
	[Pr.16] Command in-position width	—	—	—
	[Pr.17] Torque limit setting value	△	△	△
	[Pr.18] M code ON signal output timing	—	—	—
	[Pr.19] Speed switching mode	—	—	—
	[Pr.20] Interpolation speed designation method	—	—	—
	[Pr.21] Command position value during speed control	—	—	—
	[Pr.22] Input signal logic selection	◎	◎	◎
	[Pr.81] Speed-position function selection	—	—	—
	[Pr.116] FLS signal selection	○	○	○
	[Pr.117] RLS signal selection	○	○	○
	[Pr.118] DOG signal selection	—	—	—
	[Pr.119] STOP signal selection	○	○	○

Positioning parameter		**Manual control**		
		Manual pulse generator operation	**Inching operation**	**JOG operation**
Detailed parameters 2	[Pr.25] Acceleration time 1	—	—	○
	[Pr.26] Acceleration time 2	—	—	○
	[Pr.27] Acceleration time 3	—	—	○
	[Pr.28] Deceleration time 1	—	—	○
	[Pr.29] Deceleration time 2	—	—	○
	[Pr.30] Deceleration time 3	—	—	○
	[Pr.31] JOG speed limit value	—	◎	◎
	[Pr.32] JOG operation acceleration time selection	—	—	◎
	[Pr.33] JOG operation deceleration time selection	—	—	◎
	[Pr.34] Acceleration/deceleration process selection	—	—	○
	[Pr.35] S-curve ratio	—	—	○
	[Pr.36] Rapid stop deceleration time	—	—	○
	[Pr.37] Stop group 1 rapid stop selection	—	—	○
	[Pr.38] Stop group 2 rapid stop selection	—	—	○
	[Pr.39] Stop group 3 rapid stop selection	—	—	○
	[Pr.40] Positioning complete signal output time	—	—	—
	[Pr.41] Allowable circular interpolation error width	—	—	—
	[Pr.42] External command function selection [RD77MS]	—	—	○
	[Pr.83] Speed control 10 × multiplier setting for degree axis	○	○	○
	[Pr.84] Restart allowable range when servo OFF to ON	○	○	○
	[Pr.90] Operation setting for speed-torque control mode	—	—	—
	[Pr.95] External command signal selection [RD77MS]	—	—	○
	[Pr.122] Manual pulse generator speed limit mode	○	—	—
	[Pr.123] Manual pulse generator speed limit value	○	—	—
	[Pr.127] Speed limit value input selection at control mode switching	—	—	—

Expansion control

◎: Always set, ○: Set as required ("—" when not required), ×: Setting not possible,

—: Setting not required (When the value is the default value or within the setting range, there is no problem.)

Positioning parameter		Expansion control
		Speed-torque control
Basic parameters 1	[Pr.1] Unit setting	◎
	[Pr.2] Number of pulses per rotation (AP) (Unit: pulse)	◎
	[Pr.3] Movement amount per rotation (AL)	◎
	[Pr.4] Unit magnification (AM)	◎
	[Pr.7] Bias speed at start	×
Basic parameters 2	[Pr.8] Speed limit value	◎
	[Pr.9] Acceleration time 0	—
	[Pr.10] Deceleration time 0	—
Detailed parameters 1	[Pr.11] Backlash compensation amount	—
	[Pr.12] Software stroke limit upper limit value	○
	[Pr.13] Software stroke limit lower limit value	○
	[Pr.14] Software stroke limit selection	○
	[Pr.15] Software stroke limit valid/invalid setting	—
	[Pr.16] Command in-position width	—
	[Pr.17] Torque limit setting value	○
	[Pr.18] M code ON signal output timing	—
	[Pr.19] Speed switching mode	—
	[Pr.20] Interpolation speed designation method	—
	[Pr.21] Command position value during speed control	—
	[Pr.22] Input signal logic selection	◎
	[Pr.81] Speed-position function selection	—
	[Pr.116] FLS signal selection	○
	[Pr.117] RLS signal selection	○
	[Pr.118] DOG signal selection	—
	[Pr.119] STOP signal selection	○

Positioning parameter		Expansion control
		Speed-torque control
Detailed parameters 2	[Pr.25] Acceleration time 1	—
	[Pr.26] Acceleration time 2	—
	[Pr.27] Acceleration time 3	—
	[Pr.28] Deceleration time 1	—
	[Pr.29] Deceleration time 2	—
	[Pr.30] Deceleration time 3	—
	[Pr.31] JOG speed limit value	—
	[Pr.32] JOG operation acceleration time selection	—
	[Pr.33] JOG operation deceleration time selection	—
	[Pr.34] Acceleration/deceleration process selection	—
	[Pr.35] S-curve ratio	—
	[Pr.36] Rapid stop deceleration time	—
	[Pr.37] Stop group 1 rapid stop selection	—
	[Pr.38] Stop group 2 rapid stop selection	—
	[Pr.39] Stop group 3 rapid stop selection	—
	[Pr.40] Positioning complete signal output time	—
	[Pr.41] Allowable circular interpolation error width	—
	[Pr.42] External command function selection [RD77MS]	—
	[Pr.83] Speed control 10 × multiplier setting for degree axis	○
	[Pr.84] Restart allowable range when servo OFF to ON	—
	[Pr.90] Operation setting for speed-torque control mode	○
	[Pr.95] External command signal selection [RD77MS]	—
	[Pr.122] Manual pulse generator speed limit mode	—
	[Pr.123] Manual pulse generator speed limit value	—
	[Pr.127] Speed limit value input selection at control mode switching	○

Checking the positioning parameters

[Pr.1] to [Pr.90], [Pr.95], [Pr.116] to [Pr.119], [Pr.122], [Pr.123], [Pr.127] are checked with the following timing.

- When the "PLC READY signal [Y0]" output from the CPU module to the Simple Motion module changes from OFF to ON

Point

"High-level positioning control" is carried out in combination with the "major positioning control".
Refer to the "major positioning control" parameter settings for details on the parameters required for "high-level positioning control".

Setting items for home position return parameters

When carrying out "home position return control", the "home position return parameters" must be set. The setting items for the "home position return parameters" are shown below.

The "home position return parameters" are set for each axis.

◎: Always set

○: Set as required

—: Setting not required (When the value is the default value or within the setting range, there is no problem.)

R: Set when using the "Home position return retry function" ("—" when not set)

S: Set when using the "Home position shift function" ("—" when not set)

Home position return parameters			**Machine home position return control**						**Fast home position return control**
Home position return basic parameters	[Pr.43]	Home position return method[1]	Proximity dog method [RD77MS]	Count method 1 [RD77MS]	Count method 2 [RD77MS]	Data set method [RD77MS]	Scale origin signal detection method [RD77MS]	Driver home position return method	—
	[Pr.44]	Home position return direction	◎	◎	◎	◎	◎	○[2]	—
	[Pr.45]	Home position address	◎	◎	◎	◎	◎	◎	◎
	[Pr.46]	Home position return speed	◎	◎	◎	—	◎	—	◎
	[Pr.47]	Creep speed [RD77MS]	◎	◎	◎	—	◎	—	—
	[Pr.48]	Home position return retry [RD77MS]	R	R	R	—	—	—	—
Home position return detailed parameters	[Pr.50]	Setting for the movement amount after proximity dog ON [RD77MS]	—	◎	◎	—	—	—	—
	[Pr.51]	Home position return acceleration time selection	◎	◎	◎	—	◎	—	◎
	[Pr.52]	Home position return deceleration time selection	◎	◎	◎	—	◎	—	◎
	[Pr.53]	Home position shift amount [RD77MS]	S	S	S	—	S	—	—
	[Pr.54]	Home position return torque limit value [RD77MS]	○	○	○	—	○	—	◎
	[Pr.55]	Operation setting for incompletion of home position return	○	○	○	○	○	○	—
	[Pr.56]	Speed designation during home position shift [RD77MS]	S	S	S	—	S	—	—
	[Pr.57]	Dwell time during home position return retry [RD77MS]	R	R	R	—	—	—	—

*1 For details, refer to the following.
☞ Page 535 [Pr.43] Home position return method

*2 The home position return operation follows the home position return direction set in the driver (servo amplifier) and does not refer to "[Pr.44] Home position return direction". However, "[Pr.44] Home position return direction" must be set when using the backlash compensation function. When the positioning is executed in the reverse direction against "[Pr.44] Home position return direction", the backlash compensation is executed in the axis operation such as positioning after the driver home position return. Set the same direction to "[Pr.44] Home position return direction" of the Simple Motion module and the last home position return direction of the driver (servo amplifier).

Checking the home position return parameters

[Pr.43] to [Pr.57] are checked with the following timing.

- When the "PLC READY signal [Y0]" output from the CPU module to the Simple Motion module changes from OFF to ON

Setting items for extended parameters [RD77MS]

The setting items for the "extended parameters" are shown below. The "extended parameters" are set for each axis.

Extended parameter		Related sub function
[Pr.91]	Optional data monitor: Data type setting 1	☞ Page 388 Optional Data Monitor Function [RD77MS]
[Pr.92]	Optional data monitor: Data type setting 2	
[Pr.93]	Optional data monitor: Data type setting 3	
[Pr.94]	Optional data monitor: Data type setting 4	
[Pr.128]	Torque limit selection (Stepping driver)	☞ Page 779 AlphaStep/5-phase stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd.

Setting items for servo parameters [RD77MS]

The servo parameters are used to control the servo motor and the data that is determined by the specification of the servo amplifier being used. The setting item is different depending on the servo amplifier being used.

Servo parameter		Remark
PA01 or later	PA group	Setting items are different according to the servo series.
PB01 or later	PB group	
PC01 or later	PC group	
PD01 or later	PD group	
PE01 or later	PE group	
PS01 or later	PS group	
PF01 or later	PF group	
Po01 or later	Po group	
PL01 or later	PL group	

Setting items for positioning data

Positioning data must be set for carrying out any "major positioning control". The table below lists the items to be set for producing the positioning data.

One to 600 positioning data items can be set for each axis.

◎: Always set

○: Set as required ("—" when not required)

×: Setting not possible (If set, the error "Continuous path control not possible" (error code: 1A1EH to 1A20H) will occur at start.)

△: Setting limited

—: Setting not required (When the value is the default value or within the setting range, there is no problem.)

Positioning data			Position control				1 to 4 axis speed control
			1-axis linear control 2/3/4-axis linear interpolation control	1-axis fixed-feed control, 2/3/4-axis fixed-feed control	2-axis circular interpolation control	3-axis helical interpolation control	
[Da.1]	Operation pattern	Independent positioning control (Positioning complete)	◎	◎	◎	◎	◎
		Continuous positioning control	◎	◎	◎	◎	×
		Continuous path control	◎	×	◎	◎	×
[Da.2]	Control method		Linear 1 Linear 2 Linear 3 Linear 4 *1	Fixed-feed 1 Fixed-feed 2 Fixed-feed 3 Fixed-feed 4	Circular sub Circular right Circular left *1	Helical sub Helical right Helical left *1	Forward run speed 1 Reverse run speed 1 Forward run speed 2 Reverse run speed 2 Forward run speed 3 Reverse run speed 3 Forward run speed 4 Reverse run speed 4
[Da.3]	Acceleration time No.		◎	◎	◎	◎	◎
[Da.4]	Deceleration time No.		◎	◎	◎	◎	◎
[Da.6]	Positioning address/ movement amount		◎	◎	◎	◎	—
[Da.7]	Arc address		—	—	◎	◎	—
[Da.8]	Command speed		◎	◎	◎	◎	◎
[Da.9]	Dwell time/JUMP destination positioning data No.		○	○	○	○	—
[Da.10]	M code/Condition data No./ Number of LOOP to LEND repetitions/Number of pitches		○	○	○	○*2	○
[Da.20]	Axis to be interpolated 1		◎: 2 axes, 3 axes, 4 axes, —: 1 axis				
[Da.21]	Axis to be interpolated 2		◎: 3 axes, 4 axes, —: 1 axis, 2 axes				
[Da.22]	Axis to be interpolated 3		◎: 4 axes, —: 1 axis, 2 axes, 3 axes				
[Da.27]	M code ON signal output timing		○	○	○	○	○
[Da.28]	ABS direction in degrees		○	○	○	○	○
[Da.29]	Interpolation speed designation method		△	△	△	△	△

*1 Two control systems are available: the absolute (ABS) system and incremental (INC) system.

*2 Set an M code for the reference axis and set the number of pitches for the linear interpolation axis.

◎: Always set

○: Set as required ("—" when not required)

×: Setting not possible (If set, the error "Continuous path control not possible" (error code: 1A1EH to 1A20H) will occur at start.)

—: Setting not required (When the value is the default value or within the setting range, there is no problem.)

Positioning data			Speed-position switching control	Position-speed switching control
[Da.1]	Operation pattern	Independent positioning control (Positioning complete)	◎	◎
		Continuous positioning control	◎	×
		Continuous path control	×	×
[Da.2]	Control method		Forward run speed/position Reverse run speed/position *1	Forward run position/speed Reverse run position/speed
[Da.3]	Acceleration time No.		◎	◎
[Da.4]	Deceleration time No.		◎	◎
[Da.6]	Positioning address/movement amount		◎	◎
[Da.7]	Arc address		—	—
[Da.8]	Command speed		◎	◎
[Da.9]	Dwell time/JUMP destination positioning data No.		○	○
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches		○	○
[Da.20]	Axis to be interpolated 1		—	—
[Da.21]	Axis to be interpolated 2		—	—
[Da.22]	Axis to be interpolated 3		—	—
[Da.27]	M code ON signal output timing		○	○
[Da.28]	ABS direction in degrees		○	○
[Da.29]	Interpolation speed designation method		—	—

*1 Two control systems are available: the absolute (ABS) system and incremental (INC) system.

◎: Always set

○: Set as required ("—" when not required)

×: Setting not possible (If set, the error "Continuous path control not possible" (error code: 1A1EH to 1A20H) will occur at start.)

—: Setting not required (When the value is the default value or within the setting range, there is no problem.)

Positioning data			Other control				
			NOP instruction	Current value changing	JUMP instruction	LOOP	LEND
[Da.1]	Operation pattern	Independent positioning control (Positioning complete)	—	◎	—	—	—
		Continuous positioning control	—	◎	—	—	—
		Continuous path control	—	×	—	—	—
[Da.2]	Control method		NOP	Current value changing	JUMP instruction	LOOP	LEND
[Da.3]	Acceleration time No.		—	—	—	—	—
[Da.4]	Deceleration time No.		—	—	—	—	—
[Da.6]	Positioning address/movement amount		—	New address	—	—	—
[Da.7]	Arc address		—	—	—	—	—
[Da.8]	Command speed		—	—	—	—	—
[Da.9]	Dwell time/JUMP destination positioning data No.		—	—	JUMP destination positioning data No.	—	—
[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches		—	○	JUMP condition data No.	Number of LOOP to LEND repetitions	—
[Da.20]	Axis to be interpolated 1		—	—	—	—	—
[Da.21]	Axis to be interpolated 2		—	—	—	—	—
[Da.22]	Axis to be interpolated 3		—	—	—	—	—
[Da.27]	M code ON signal output timing		—	○	—	—	—
[Da.28]	ABS direction in degrees		○	○	○	○	○
[Da.29]	Interpolation speed designation method		—	—	—	—	—

Checking the positioning data

[Da.1] to [Da.10], [Da.20] to [Da.22], [Da.27] to [Da.29] are checked at the following timings:

- Startup of a positioning operation

Setting items for block start data

The "block start data" must be set when carrying out "high-level positioning control". The setting items for the "block start data" are shown below.

Up to 50 points of "block start data" can be set for each axis.

○: Set as required ("—" when not required)

—: Setting not required (When the value is the default value or within the setting range, there is no problem.)

Block start data		Block start (Normal start)	Condition start	Wait start	Simultaneous start	Repeated start (FOR loop)	Repeated start (FOR condition)
[Da.11]	Shape (end/continue)	○	○	○	○	○	○
[Da.12]	Start data No.	○	○	○	○	○	○
[Da.13]	Special start instruction	—	○	○	○	○	○
[Da.14]	Parameter	—	○	○	○	○	○

Checking the block start data

[Da.11] to [Da.14] are checked with the following timing.

- When "Block start data" starts

Setting items for condition data

When carrying out "high-level positioning control" or using the JUMP instruction in the "major positioning control", the "condition data" must be set as required. The setting items for the "condition data" are shown below.

Up to 10 "condition data" items can be set for each axis.

○: Set as required ("—" when not required)

△: Setting limited

—: Setting not required (When the value is the default value or within the setting range, there is no problem.)

Condition data		Major positioning control		High-level positioning control					
		Other than JUMP instruction	JUMP instruction	Block start (Normal start)	Condition start	Wait start	Simultaneous start	Repeated start (FOR loop)	Repeated start (FOR condition)
[Da.15]	Condition target	—	○	—	○	○	○	—	○
[Da.16]	Condition operator	—	○	—	○	○	○	—	○
[Da.17]	Address	—	△	—	△	△	—	—	△
[Da.18]	Parameter 1	—	○	—	○	○	△	—	○
[Da.19]	Parameter 2	—	△	—	△	△	△	—	△
[Da.23]	Number of simultaneous starting axes	—	—	—	—	—	○	—	—
[Da.24]	Simultaneous starting axis No.1	—	—	—	—	—	○	—	—
[Da.25]	Simultaneous starting axis No.2	—	—	—	—	—	○	—	—
[Da.26]	Simultaneous starting axis No.3	—	—	—	—	—	○	—	—

Checking the condition data

[Da.15] to [Da.19], [Da.23] to [Da.26] are checked with the following timing.

- When "Block start data" starts
- When "JUMP instruction" starts

Types and roles of monitor data

The monitor data area in the buffer memory stores data relating to the operating state of the positioning system, which are monitored as required while the positioning system is operating.

The following data are available for monitoring.

Item	Description
System monitoring	Monitoring of the specification and operation history of Simple Motion module. (system monitor data [Md.1], [Md.3] to [Md.8], [Md.19], [Md.50] to [Md.54], [Md.59], [Md.60], [Md.63], [Md.130] to [Md.135], servo network composition status [Md.105])
Axis operation monitoring	Monitoring of the current position and speed, and other data related to the movements of axes. (axis monitor data [Md.20] to [Md.48], [Md.62], [Md.100] to [Md.117], [Md.119], [Md.120], [Md.122] to [Md.127], [Md.500], [Md.502], [Md.503], [Md.514], [Md.900])

Monitoring the system

■Monitoring the positioning system operation history

Monitoring details			Corresponding item
Monitor whether the system is in the test mode			[Md.1] In test mode flag
History of data that started an operation	Start information		[Md.3] Start information
	Start No.		[Md.4] Start No.
	Start*1	Year: month	[Md.54] Start (Year: month)
		Day: hour	[Md.5] Start (Day: hour)
		Minute: second	[Md.6] Start (Minute: second)
		ms	[Md.60] Start (ms)
	Error upon starting		[Md.7] Error judgment
	Pointer No. next to the pointer No. where the latest history is stored		[Md.8] Start history pointer
Number of write accesses to the flash ROM after the power is switched ON	Number of write accesses to flash ROM		[Md.19] Number of write accesses to flash ROM
Forced stop input signal (EMI) turn ON/OFF	Forced stop input signal (EMI) information		[Md.50] Forced stop input
Monitor whether the system is in amplifier-less operation			[Md.51] Amplifier-less operation mode status
Monitor the detection status of axis that set communication between amplifiers			[Md.52] Communication between amplifiers axes searching flag
Monitor the connect/disconnect status of SSCNET communication			[Md.53] SSCNET control status
Store the module information			[Md.59] Module information
Monitor the connection status of the optical hub unit			[Md.63] Optical hub unit installation information
Monitor the first two digits of manufacture information of the module			[Md.130] F/W version
Monitor the RUN status of digital oscilloscope			[Md.131] Digital oscilloscope running flag
Monitor the current operation cycle.			[Md.132] Operation cycle setting
Monitor whether the operation cycle time exceeds operation cycle.			[Md.133] Operation cycle over flag
Monitor the time that took for operation every operation cycle.			[Md.134] Operation time
Monitor the maximum value of operation time after each module's power supply ON.			[Md.135] Maximum operation time

*1 Displays a value set by the clock function of the CPU module.

Monitoring the axis operation state

■Monitoring the position

Monitor details	Corresponding item
Monitor the current machine feed value	[Md.21] Machine feed value
Monitor the command position value	[Md.20] Command position value
Monitor the current target value	[Md.32] Target value

■Monitoring the speed

Monitor details				Corresponding item
Monitor the current speed	During independent axis control		Indicates the speed of each axis	[Md.22] Speed command
	During interpolation control	When "0: Composite speed" is set for "[Pr.20] Interpolation speed designation method"	Indicates the composite speed	
		When "1: Reference axis speed" is set for "[Pr.20] Interpolation speed designation method"	Indicates the reference axis speed	
	Monitor "[Da.8] Command speed" currently being executed.			[Md.27] Current speed
	Constantly indicates the speed of each axis			[Md.28] Axis speed command
Monitor the current target speed				[Md.33] Target speed
Monitor the command speed at speed control mode or continuous operation to torque control mode in the speed-torque control				[Md.122] Speed during command

■Monitoring the status of servo amplifier

Monitor details	Corresponding item
Monitor the real current value "command position value - (command pulse - feedback pulse)".	[Md.101] Actual position value
Monitor the pulse droop.	[Md.102] Deviation counter value
Monitor the motor speed of servo motor.	[Md.103] Motor rotation speed
Monitor the current value of servo motor.	[Md.104] Motor current value
Monitor the servo amplifier type of each axis.	[Md.105] Connected device
Monitor the software No. of servo amplifier. [RD77MS]	[Md.106] Servo amplifier software No.[*1]
Monitor the parameter No. that an error occurred. [RD77MS]	[Md.107] Parameter error No.
Monitor the status (servo status) of servo amplifier.	[Md.108] Servo status1
	[Md.119] Servo status2
Monitor the status (servo status) of servo amplifier [RD77MS].	[Md.125] Servo status3
	[Md.126] Servo status4
	[Md.127] Servo status5
	[Md.500] Servo status7
• Monitor the percentage of regenerative power to permissible regenerative value. [RD77MS] • Monitor the content of "[Pr.91] Optional data monitor: Data type setting 1" at optional data monitor data type setting. [RD77MS]	[Md.109] Regenerative load ratio[*1]/Optional data monitor output 1
• Monitor the continuous effective load current. [RD77MS] • Monitor the content of "[Pr.92] Optional data monitor: Data type setting 2" at optional data monitor data type setting. [RD77MS]	[Md.110] Effective load torque[*1]/Optional data monitor output 2
• Monitor the maximum generated torque. [RD77MS] • Monitor the content of "[Pr.93] Optional data monitor: Data type setting 3" at optional data monitor data type setting. [RD77MS]	[Md.111] Peak torque ratio[*1]/Optional data monitor output 3
Monitor the content of "[Pr.94] Optional data monitor: Data type setting 4" at optional data monitor data type setting. [RD77MS]	[Md.112] Optional data monitor output 4
Monitor the status of semi closed loop control/fully closed loop control.	[Md.113] Semi/Fully closed loop status
Monitor the alarm of servo amplifier.	[Md.114] Servo alarm
Monitor the option information of encoder. [RD77MS]	[Md.116] Encoder option information
Monitor CiA402 Statusword of servo amplifier. [RD77GF]	[Md.117] Statusword
Monitor the driver operation alarm No. [RD77MS]	[Md.502] Driver operation alarm No.[*1]
Monitor the home position return operating status of servo amplifier. [RD77GF]	[Md.514] Home position return operating status

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*1 For the RD77GF, the monitor information can be acquired by using the servo transient transmission function and servo cyclic transmission function.

■Monitoring the state

Monitor details	Corresponding item
Monitor the latest error code that occurred with the axis	[Md.23] Axis error No.
Monitor the latest warning code that occurred with the axis	[Md.24] Axis warning No.
Monitor the valid M codes	[Md.25] Valid M code
Monitor the axis operation state	[Md.26] Axis operation status
Monitor the movement amount after the current position control switching when using "speed-position switching control".	[Md.29] Speed-position switching control positioning movement amount
Monitor the external input/output signal and flag	[Md.30] External input signal
	[Md.31] Status
Monitor the movement amount from proximity dog ON to machine home position return completion.	[Md.34] Movement amount after proximity dog ON
Monitor the current torque limit value	[Md.35] Torque limit stored value/forward torque limit stored value
	[Md.120] Reverse torque limit stored value
Monitor the "instruction code" of the special start data when using special start	[Md.36] Special start data instruction code setting value
Monitor the "instruction parameter" of the special start data when using special start	[Md.37] Special start data instruction parameter setting value
Monitor the "start data No." of the special start data when using special start	[Md.38] Start positioning data No. setting value
Monitor whether the speed is being limited	[Md.39] In speed limit flag
Monitor whether the speed is being changed	[Md.40] In speed change processing flag
Monitor the remaining number of repetitions (special start)	[Md.41] Special start repetition counter
Monitor the remaining number of repetitions (control system)	[Md.42] Control system repetition counter
Monitor the "start data" point currently being executed	[Md.43] Start data pointer being executed
Monitor the "positioning data No." currently being executed	[Md.44] Positioning data No. being executed
Monitor the block No.	[Md.45] Block No. being executed
Monitor the "positioning data No." executed last	[Md.46] Last executed positioning data No.
Monitor the positioning data currently being executed	[Md.47] Positioning data being executed
Monitor switching from the constant speed status or acceleration status to the deceleration status during position control whose operation pattern is "Positioning complete"	[Md.48] Deceleration start flag
Monitor the carrying over movement amount which exceeds "[Pr.123] Manual pulse generator speed limit value".	[Md.62] Amount of the manual pulser driving carrying over movement
Monitor the distance that travels to zero point after stop once at home position return.	[Md.100] Home position return re-travel value
Monitor the command torque at torque control mode or continuous operation to torque control mode in the speed-torque control.	[Md.123] Torque during command
Monitor the switching status of control mode.	[Md.124] Control mode switching status
Monitor the positioning data analysis status.	[Md.503] Pre-reading data analysis status
Monitor the status of the external command signals assigned to link devices.	[Md.900] External command signal monitor

Types and roles of control data

Operation of the positioning system is achieved through the execution of necessary controls. (Data required for controls are given through the default values when the power is switched ON, which can be modified as required by the program.)
Items that can be controlled are described below.

Controlling the system data	Setting and resetting "setting data" of Simple Motion module. (system control data [Cd.1], [Cd.2])
Controlling the operation	Setting operation parameters, changing speed during operation, interrupting or restarting operation, etc. (system control data [Cd.41], [Cd.42], [Cd.44], [Cd.102], [Cd.137], [Cd.158], axis control data [Cd.3] to [Cd.40], [Cd.43], [Cd.45], [Cd.46], [Cd.100], [Cd.101], [Cd.108], [Cd.112], [Cd.113], [Cd.130] to [Cd.133], [Cd.136], [Cd.138] to [Cd.154], [Cd.180] to [Cd.183])
Controlling data for positioning data and block start data	Writing and reading the optional positioning data and the block start data. (System control data [Cd.220] to [Cd.226])

Controlling the system data

■Setting and resetting the setting data

Control details	Controlled data item
Write setting data from buffer memory to flash ROM.	[Cd.1] Flash ROM write request
Reset (initialize) parameters.	[Cd.2] Parameter initialization request

Controlling the operation

■Controlling the operation

Control details	Corresponding item
Set which positioning to execute (start No.).	[Cd.3] Positioning start No.
Set start point No. for executing block start.	[Cd.4] Positioning starting point No.
Clear (reset) the axis error ([Md.23]) and warning ([Md.24]).	[Cd.5] Axis error reset
Issue instruction to restart (When axis operation is stopped).	[Cd.6] Restart command
Stop continuous control.	[Cd.18] Interrupt request during continuous operation
Set start data No. of own axis at multiple axes simultaneous starting.	[Cd.30] Simultaneous starting own axis start data No.
Set start data No.1 for axes that start up simultaneously.	[Cd.31] Simultaneous starting axis start data No.1
Set start data No.2 for axes that start up simultaneously.	[Cd.32] Simultaneous starting axis start data No.2
Set start data No.3 for axes that start up simultaneously.	[Cd.33] Simultaneous starting axis start data No.3
Stop (deceleration stop) the current positioning operation and execute the next positioning operation.	[Cd.37] Skip command
Specify write destination for teaching results.	[Cd.38] Teaching data selection
Specify data to be taught.	[Cd.39] Teaching positioning data No.
Set number of simultaneous starting axes and target axis.	[Cd.43] Simultaneous starting axis
Set the status of the external input signal (upper/lower limit switch signal, proximity dog signal, stop signal).	[Cd.44] External input signal operation device
Set the information of the forced stop to the buffer memory.	[Cd.158] Forced stop input
Stop axis in control.	[Cd.180] Axis stop
Execute start request of JOG operation or inching operation.	[Cd.181] Forward run JOG start
	[Cd.182] Reverse run JOG start
Execute pre-reading at positioning start.	[Cd.183] Execution prohibition flag

■Controlling operation per step

Control details	Corresponding item
Set unit to carry out step.	[Cd.34] Step mode
Stop positioning operation after each operation.	[Cd.35] Step valid flag
Continuous operation from stopped step.	[Cd.36] Step start information

■Controlling the speed

Control details	Corresponding item
When changing acceleration time during speed change, set new acceleration time.	[Cd.10] New acceleration time value
When changing deceleration time during speed change, set new deceleration time.	[Cd.11] New deceleration time value
Set acceleration/deceleration time validity during speed change.	[Cd.12] Acceleration/deceleration time change value during speed change, enable/disable
Change positioning operation speed between 0 and 300% range.	[Cd.13] Positioning operation speed override
Set new speed when changing speed during operation.	[Cd.14] New speed value
Issue instruction to change speed in operation to [Cd.14] value. (Only during positioning operation and JOG operation).	[Cd.15] Speed change request
Set inching movement amount.	[Cd.16] Inching movement amount
Set JOG speed.	[Cd.17] JOG speed

■Change operation mode

Control details	Corresponding item
Change operation mode.	[Cd.137] Amplifier-less operation mode switching request

■Making settings related to operation

Control details	Corresponding item
Turn M code ON signal OFF.	[Cd.7] M code OFF request
Validate external command signal.	[Cd.8] External command valid
Set new value when changing current value.	[Cd.9] New position value
Change home position return request flag from "ON to OFF".	[Cd.19] Home position return request flag OFF request
Set scale per pulse of number of input pulses from manual pulse generator.	[Cd.20] Manual pulse generator 1 pulse input magnification
Set manual pulse generator operation validity.	[Cd.21] Manual pulse generator enable flag
Change "[Md.35] Torque limit stored value/forward torque limit stored value".	[Cd.22] New torque value/forward new torque value
Change movement amount for position control during speed-position switching control (INC mode).	[Cd.23] Speed-position switching control movement amount change register
Validate switching signal set in "[Cd.45] Speed-position switching device selection".	[Cd.24] Speed-position switching enable flag
Change speed for speed control during position-speed switching control.	[Cd.25] Position-speed switching control speed change register
Validate switching signal set in "[Cd.45] Speed-position switching device selection".	[Cd.26] Position-speed switching enable flag
Set new positioning address when changing target position during positioning.	[Cd.27] Target position change value (New address)
Set new speed when changing target position during positioning.	[Cd.28] Target position change value (New speed)
Set up a flag when target position is changed during positioning.	[Cd.29] Target position change request flag
Set absolute (ABS) moving direction in degrees.	[Cd.40] ABS direction in degrees
Set whether "[Md.48] Deceleration start flag" is valid or invalid	[Cd.41] Deceleration start flag valid
Set the stop command processing for deceleration stop function (deceleration curve re-processing/ deceleration curve continuation)	[Cd.42] Stop command processing for deceleration stop selection
Set the device used for speed-position switching.	[Cd.45] Speed-position switching device selection
Switch speed-position control.	[Cd.46] Speed-position switching command
Turn the servo OFF for each axis.	[Cd.100] Servo OFF command
Set torque limit value	[Cd.101] Torque output setting value
Set the connect/disconnect of SSCNET communication.	[Cd.102] SSCNET control command
Set whether gain switching is execution or not.	[Cd.108] Gain switching command flag
Set "same setting/individual setting" of the forward torque limit value or reverse torque limit value in the torque change function.	[Cd.112] Torque change function switching request
Change "[Md.120] Reverse torque limit stored value".	[Cd.113] New reverse torque value
Set the semi closed loop control/fully closed loop control.	[Cd.133] Semi/Fully closed loop switching request

Control details		Corresponding item
Set the PI-PID switching to servo amplifier.		[Cd.136] PI-PID switching request
Speed-torque control	Switch the control mode.	[Cd.138] Control mode switching request
	Set the control mode to switch.	[Cd.139] Control mode setting
	Set the command speed during speed control mode.	[Cd.140] Command speed at speed control mode
	Set the acceleration time during speed control mode.	[Cd.141] Acceleration time at speed control mode
	Set the deceleration time during speed control mode.	[Cd.142] Deceleration time at speed control mode
	Set the command torque during torque control mode.	[Cd.143] Command torque at torque control mode
	Set the time constant at driving of torque control mode.	[Cd.144] Torque time constant at torque control mode (Forward direction)
	Set the time constant at regeneration of torque control mode.	[Cd.145] Torque time constant at torque control mode (Negative direction)
	Set the speed limit value during torque control mode.	[Cd.146] Speed limit value at torque control mode
	Set the command speed during continuous operation to torque control mode.	[Cd.147] Speed limit value at continuous operation to torque control mode
	Set the acceleration time during continuous operation to torque control mode.	[Cd.148] Acceleration time at continuous operation to torque control mode
	Set the deceleration time during continuous operation to torque control mode.	[Cd.149] Deceleration time at continuous operation to torque control mode
	Set the target torque during continuous operation to torque control mode.	[Cd.150] Target torque at continuous operation to torque control mode
	Set the time constant at driving of continuous operation to torque control mode.	[Cd.151] Torque time constant at continuous operation to torque control mode (Forward direction)
	Set the time constant at regeneration of continuous operation to torque control mode.	[Cd.152] Torque time constant at continuous operation to torque control mode (Negative direction)
	Set the switching conditions for switching to continuous operation to torque control mode.	[Cd.153] Control mode auto-shift selection
	Set the condition value when "[Cd.153] Control mode auto-shift selection" is set.	[Cd.154] Control mode auto-shift parameter

Controlling the data for positioning data and block start data

■Controlling the data for positioning data and block start data [RD77MS]

Control details	Corresponding item
Set when writing and reading the positioning data.	[Cd.220] Positioning data control request
Specify the positioning data No. required for write/read.	[Cd.221] Positioning data No. setting
Set when writing and reading the block start data or the condition data.	[Cd.222] Block start data control request
Specify the block No. required for write/read.	[Cd.223] Block No. setting
Specify the block type required for write/read.	[Cd.224] Block start data type setting
Specify the data No. required for write/read.	[Cd.225] Block start data No. setting
Set the positioning data/block start data setting value.	[Cd.226] Positioning data/block start data setting value

12.2 List of Buffer Memory Addresses

The following shows the relation between the buffer memory addresses and the various items.

Do not use the buffer memory address that not been described here for a "Maker setting".

References for the list of buffer memory addresses in this section are shown below.

Buffer memory address	Reference
Buffer memory addresses for positioning data	"Help" in "Simple Motion Module Setting Function" of the engineering tool[*1]
Buffer memory addresses used in synchronous control	Refer to "List of Buffer Memory Addresses (for Synchronous Control)" in the following manual. 📖MELSEC iQ-R Simple Motion Module User's Manual (Advanced Synchronous Control)
Buffer memory addresses used in network	Refer to "Buffer Memory" in the following manual. 📖MELSEC iQ-R Simple Motion Module User's Manual (Network)

*1 Simple Motion Module Setting Function ⇨ "Help" ⇨ "List of buffer memory address"

[Basic setting]

■Common parameters

Item		Fetch cycle	Buffer memory address
[Pr.24]	Manual pulse generator/Incremental synchronous encoder input selection [RD77MS]	PLC READY signal [Y0] OFF to ON	33
[Pr.82]	Forced stop valid/invalid selection		35
[Pr.89]	Manual pulse generator/Incremental synchronous encoder input type selection [RD77MS]		67
[Pr.96]	Operation cycle setting	At power supply ON/the CPU module reset	105
[Pr.97]	SSCNET setting [RD77MS]		106
[Pr.150]	Input terminal logic selection [RD77MS]	At power supply ON/the CPU module reset/PLC READY signal [Y0] OFF to ON	58000 58001
[Pr.151]	Manual pulse generator/Incremental synchronous encoder input logic selection [RD77MS]		58002
[Pr.152]	Maximum number of control axes	At power supply ON/the CPU module reset	58003
[Pr.153]	External input signal digital filter setting 1 (SIN1 to 4) [RD77MS] External input signal digital filter setting 2 (SIN5 to 8) [RD77MS] External input signal digital filter setting 3 (SIN9 to 12) [RD77MS] External input signal digital filter setting 4 (SIN13 to 16) [RD77MS] External input signal digital filter setting 5 (SIN17 to 20) [RD77MS]	At power supply ON/the CPU module reset/PLC READY signal [Y0] OFF to ON	58004 58005 58006 58007 58008
[Pr.155]	Q series compatible function setting [RD77MS]		58010

■Positioning parameters: Basic parameters 1

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Pr.1]	Unit setting	PLC READY signal [Y0] OFF to ON	0+150n	1000000+150n
[Pr.2]	Number of pulses per rotation (AP)		2+150n 3+150n	1000002+150n 1000003+150n
[Pr.3]	Movement amount per rotation (AL)		4+150n 5+150n	1000004+150n 1000005+150n
[Pr.4]	Unit magnification (AM)		1+150n	1000001+150n
[Pr.7]	Bias speed at start		6+150n 7+150n	1000006+150n 1000007+150n

■Positioning parameters: Basic parameters 2

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Pr.8]	Speed limit value	When the next each control starts	10+150n 11+150n	1000010+150n 1000011+150n
[Pr.9]	Acceleration time 0		12+150n 13+150n	1000012+150n 1000013+150n
[Pr.10]	Deceleration time 0		14+150n 15+150n	1000014+150n 1000015+150n

■Positioning parameters: Detailed parameters 1

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Pr.11]	Backlash compensation amount	PLC READY signal [Y0] OFF to ON	17+150n	1000017+150n
[Pr.12]	Software stroke limit upper limit value		18+150n 19+150n	1000018+150n 1000019+150n
[Pr.13]	Software stroke limit lower limit value		20+150n 21+150n	1000020+150n 1000021+150n
[Pr.14]	Software stroke limit selection		22+150n	1000022+150n
[Pr.15]	Software stroke limit valid/invalid setting		23+150n	1000023+150n
[Pr.16]	Command in-position width		24+150n 25+150n	1000024+150n 1000025+150n
[Pr.17]	Torque limit setting value		26+150n	1000026+150n
[Pr.18]	M code ON signal output timing		27+150n	1000027+150n
[Pr.19]	Speed switching mode		28+150n	1000028+150n
[Pr.20]	Interpolation speed designation method		29+150n	1000029+150n
[Pr.21]	Command position value during speed control		30+150n	1000030+150n
[Pr.22]	Input signal logic selection		31+150n	1000031+150n
[Pr.81]	Speed-position function selection		34+150n	1000034+150n
[Pr.116]	FLS signal selection	At power supply ON/the CPU module reset/PLC READY signal [Y0] OFF to ON	116+150n	1000116+150n
[Pr.117]	RLS signal selection		117+150n	1000117+150n
[Pr.118]	DOG signal selection		118+150n	1000118+150n
[Pr.119]	STOP signal selection		119+150n	1000119+150n

■Positioning parameters: Detailed parameters 2

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Pr.25]	Acceleration time 1	When the next each control starts	36+150n 37+150n	1000036+150n 1000037+150n
[Pr.26]	Acceleration time 2		38+150n 39+150n	1000038+150n 1000039+150n
[Pr.27]	Acceleration time 3		40+150n 41+150n	1000040+150n 1000041+150n
[Pr.28]	Deceleration time 1		42+150n 43+150n	1000042+150n 1000043+150n
[Pr.29]	Deceleration time 2		44+150n 45+150n	1000044+150n 1000045+150n
[Pr.30]	Deceleration time 3		46+150n 47+150n	1000046+150n 1000047+150n
[Pr.31]	JOG speed limit value		48+150n 49+150n	1000048+150n 1000049+150n
[Pr.32]	JOG operation acceleration time selection		50+150n	1000050+150n
[Pr.33]	JOG operation deceleration time selection		51+150n	1000051+150n
[Pr.34]	Acceleration/deceleration process selection		52+150n	1000052+150n
[Pr.35]	S-curve ratio		53+150n	1000053+150n
[Pr.36]	Rapid stop deceleration time		54+150n 55+150n	1000054+150n 1000055+150n
[Pr.37]	Stop group 1 rapid stop selection		56+150n	1000056+150n
[Pr.38]	Stop group 2 rapid stop selection		57+150n	1000057+150n
[Pr.39]	Stop group 3 rapid stop selection		58+150n	1000058+150n
[Pr.40]	Positioning complete signal output time		59+150n	1000059+150n
[Pr.41]	Allowable circular interpolation error width		60+150n 61+150n	1000060+150n 1000061+150n
[Pr.42]	External command function selection [RD77MS]	At conditions established (DI input)	62+150n	—
[Pr.83]	Speed control 10 × multiplier setting for degree axis	PLC READY signal [Y0] OFF to ON	63+150n	1000063+150n
[Pr.84]	Restart allowable range when servo OFF to ON	At start	64+150n 65+150n	1000064+150n 1000065+150n
[Pr.90]	Operation setting for speed-torque control mode	PLC READY signal [Y0] OFF to ON	68+150n	1000068+150n
[Pr.95]	External command signal selection [RD77MS]		69+150n	—
[Pr.122]	Manual pulse generator speed limit mode		121+150n	1000121+150n
[Pr.123]	Manual pulse generator speed limit value		122+150n 123+150n	1000122+150n 1000123+150n
[Pr.127]	Speed limit value input selection at control mode switching [RD77MS]		125+150n	—

■Home position return parameters: Home position return basic parameters

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Pr.43]	Home position return method	PLC READY signal [Y0] OFF to ON	70+150n	1000070+150n
[Pr.44]	Home position return direction		71+150n	1000071+150n
[Pr.45]	Home position address		72+150n 73+150n	1000072+150n 1000073+150n
[Pr.46]	Home position return speed		74+150n 75+150n	1000074+150n 1000075+150n
[Pr.47]	Creep speed [RD77MS]		76+150n 77+150n	—
[Pr.48]	Home position return retry [RD77MS]		78+150n	—

■Home position return parameters: Home position return detailed parameters

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Pr.50]	Setting for the movement amount after proximity dog ON [RD77MS]	PLC READY signal [Y0] OFF to ON	80+150n 81+150n	—
[Pr.51]	Home position return acceleration time selection		82+150n	1000082+150n
[Pr.52]	Home position return deceleration time selection		83+150n	1000083+150n
[Pr.53]	Home position shift amount [RD77MS]		84+150n 85+150n	—
[Pr.54]	Home position return torque limit value [RD77MS]		86+150n	—
[Pr.55]	Operation setting for incompletion of home position return		87+150n	1000087+150n
[Pr.56]	Speed designation during home position shift [RD77MS]		88+150n	—
[Pr.57]	Dwell time during home position return retry [RD77MS]		89+150n	—

■Extended parameters

n: Axis No. - 1

Item		Fetch cycle	Buffer memory address
[Pr.91]	Optional data monitor: Data type setting 1 [RD77MS]	At power supply ON/the CPU module reset (The transmission to the servo amplifier is performed only at the initial communication)	100+150n
[Pr.92]	Optional data monitor: Data type setting 2 [RD77MS]		101+150n
[Pr.93]	Optional data monitor: Data type setting 3 [RD77MS]		102+150n
[Pr.94]	Optional data monitor: Data type setting 4 [RD77MS]		103+150n
[Pr.128]	Torque limit selection (Stepping driver) [RD77MS]	At power supply ON/the CPU module reset/PLC READY signal [Y0] OFF to ON	141+150n

[Monitor data]

■System monitor data

p: Pointer No. - 1

Item			Refresh cycle	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Md.1]	In test mode flag		Immediate	4000	
[Md.3]	Start information	Start history*1	At start	87010+10p	
[Md.4]	Start No.			87011+10p	
[Md.54]	Start (Year: month)			87012+10p	
[Md.5]	Start (Day: hour)			87013+10p	
[Md.6]	Start (Minute: second)			87014+10p	
[Md.60]	Start (ms)			87015+10p	
[Md.7]	Error judgment			87016+10p	
[Md.8]	Start history pointer			87000	
[Md.19]	Number of write accesses to flash ROM		Immediate	4224 4225	
[Md.50]	Forced stop input		Operation cycle	4231	
[Md.51]	Amplifier-less operation mode status		Immediate	4232	
[Md.52]	Communication between amplifiers axes searching flag [RD77MS]			4234	
[Md.53]	SSCNET control status [RD77MS]			4233	
[Md.59]	Module information		At power supply ON	31332	
[Md.63]	Optical hub unit installation information [RD77MS]		Immediate	4288	
[Md.130]	F/W version		At power supply ON	4006 4007	
[Md.131]	Digital oscilloscope running flag		Main cycle	4011	

Item		Refresh cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Md.132]	Operation cycle setting	At power supply ON	4238	
[Md.133]	Operation cycle over flag	Immediate	4239	
[Md.134]	Operation time	Operation cycle	4008	
[Md.135]	Maximum operation time	Immediate	4009	
[Md.700]	Virtual servo amplifier connected station monitor [RD77GF]	Operation cycle	60900	1060900

*1 Displays a value set by the clock function of the CPU module.

■Axis monitor data

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Refresh cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Md.20]	Command position value	Operation cycle	2400+100n 2401+100n	1002400+100n 1002401+100n
[Md.21]	Machine feed value		2402+100n 2403+100n	1002402+100n 1002403+100n
[Md.22]	Speed command		2404+100n 2405+100n	1002404+100n 1002405+100n
[Md.23]	Axis error No.	Immediate	2406+100n	1002406+100n
[Md.24]	Axis warning No.		2407+100n	1002407+100n
[Md.25]	Valid M code		2408+100n	1002408+100n
[Md.26]	Axis operation status		2409+100n	1002409+100n
[Md.27]	Current speed		2410+100n 2411+100n	1002410+100n 1002411+100n
[Md.28]	Axis speed command	Operation cycle	2412+100n 2413+100n	1002412+100n 1002413+100n
[Md.29]	Speed-position switching control positioning movement amount	Immediate	2414+100n 2415+100n	1002414+100n 1002415+100n
[Md.30]	External input signal	Operation cycle	2416+100n	1002416+100n
[Md.31]	Status	Immediate	2417+100n	1002417+100n
[Md.32]	Target value		2418+100n 2419+100n	1002418+100n 1002419+100n
[Md.33]	Target speed		2420+100n 2421+100n	1002420+100n 1002421+100n
[Md.34]	Movement amount after proximity dog ON [RD77MS]		2424+100n 2425+100n	—
[Md.35]	Torque limit stored value/forward torque limit stored value		2426+100n	1002426+100n
[Md.36]	Special start data instruction code setting value		2427+100n	1002427+100n
[Md.37]	Special start data instruction parameter setting value		2428+100n	1002428+100n
[Md.38]	Start positioning data No. setting value		2429+100n	1002429+100n
[Md.39]	In speed limit flag		2430+100n	1002430+100n
[Md.40]	In speed change processing flag		2431+100n	1002431+100n
[Md.41]	Special start repetition counter		2432+100n	1002432+100n
[Md.42]	Control system repetition counter		2433+100n	1002433+100n
[Md.43]	Start data pointer being executed		2434+100n	1002434+100n
[Md.44]	Positioning data No. being executed		2435+100n	1002435+100n
[Md.45]	Block No. being executed	At start	2436+100n	1002436+100n

Item			Refresh cycle	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Md.46]	Last executed positioning data No.		Immediate	2437+100n	1002437+100n
[Md.47]	Positioning data being executed	Positioning identifier		2438+100n	1002438+100n
		M code		2439+100n	1002439+100n
		Dwell time		2440+100n	1002440+100n
		Positioning option		2441+100n	1002441+100n
		Command speed		2442+100n 2443+100n	1002442+100n 1002443+100n
		Positioning address		2444+100n 2445+100n	1002444+100n 1002445+100n
		Arc address		2446+100n 2447+100n	1002446+100n 1002447+100n
		Axis to be interpolated		2496+100n 2497+100n	1002496+100n 1002497+100n
[Md.48]	Deceleration start flag			2499+100n	1002499+100n
[Md.62]	Amount of the manual pulser driving carrying over movement			2422+100n 2423+100n	1002422+100n 1002423+100n
[Md.100]	Home position return re-travel value [RD77MS]		At conditions established (At home position return re-travel)	2448+100n 2449+100n	—
[Md.101]	Actual position value		Operation cycle	2450+100n 2451+100n	1002450+100n 1002451+100n
[Md.102]	Deviation counter value			2452+100n 2453+100n	1002452+100n 1002453+100n
[Md.103]	Motor rotation speed			2454+100n 2455+100n	1002454+100n 1002455+100n
[Md.104]	Motor current value			2456+100n	1002456+100n
[Md.106]	Servo amplifier software No. [RD77MS]		At servo amplifier's power supply ON	2464+100n 2465+100n 2466+100n 2467+100n 2468+100n 2469+100n	—
[Md.107]	Parameter error No. [RD77MS]		Immediate	2470+100n	—
[Md.108]	Servo status1		Operation cycle	2477+100n	1002477+100n
[Md.109]	Regenerative load ratio/Optional data monitor output 1 [RD77MS]			2478+100n	—
[Md.110]	Effective load torque/Optional data monitor output 2 [RD77MS]			2479+100n	—
[Md.111]	Peak torque ratio/Optional data monitor output 3 [RD77MS]			2480+100n	—
[Md.112]	Optional data monitor output 4 [RD77MS]			2481+100n	—
[Md.113]	Semi/Fully closed loop status			2487+100n	1002487+100n
[Md.114]	Servo alarm		Immediate	2488+100n	1002488+100n
[Md.116]	Encoder option information [RD77MS]		At servo amplifier's power supply ON	2490+100n	—
[Md.117]	Statusword [RD77GF]		Operation cycle	2482+100n	1002482+100n
[Md.119]	Servo status2			2476+100n	1002476+100n
[Md.120]	Reverse torque limit stored value		Immediate	2491+100n	1002491+100n
[Md.122]	Speed during command		Operation cycle (Only at the speed control mode/the continuous operation to torque control mode)	2492+100n 2493+100n	1002492+100n 1002493+100n
[Md.123]	Torque during command		Operation cycle (Only at the torque control mode/the continuous operation to torque control mode)	2494+100n	1002494+100n

Item		Refresh cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Md.124]	Control mode switching status [RD77MS]	Operation cycle (Only at the continuous operation to torque control mode)	2495+100n	—
[Md.125]	Servo status3 [RD77MS]	Operation cycle	2458+100n	—
[Md.126]	Servo status4 [RD77MS]		2459+100n	—
[Md.127]	Servo status5 [RD77MS]		2460+100n	—
[Md.500]	Servo status7 [RD77MS]		59300+100n	—
[Md.502]	Driver operation alarm No. [RD77MS]	Immediate	59302+100n	—
[Md.503]	Pre-reading data analysis status	Operation cycle	59303+100n	1059303+100n
[Md.514]	Home position return operating status [RD77GF]		2457+100n	1002457+100n

■Servo network composition status

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Refresh cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Md.105]	Connected device	At servo amplifier's power supply ON	58660+32n 58661+32n	1058660+32n 1058661+32n

[Control data]

■System control data

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Cd.1]	Flash ROM write request	103 ms [RD77MS] 116 ms [RD77GF]	5900	
[Cd.2]	Parameter initialization request		5901	
[Cd.41]	Deceleration start flag valid	PLC READY signal [Y0] OFF to ON	5905	
[Cd.42]	Stop command processing for deceleration stop selection	At conditions established (At deceleration stop causes occurrence)	5907	
[Cd.44]	External input signal operation device	Operation cycle	5928 (1 to 4 axis) 5929 (5 to 8 axis) 5930 (9 to 12 axis) 5931 (13 to 16 axis)	1005928 (17 to 20 axis) 1005929 (21 to 24 axis) 1005930 (25 to 28 axis) 1005931 (29 to 32 axis)
[Cd.102]	SSCNET control command [RD77MS]	3.5 ms	5932	
[Cd.137]	Amplifier-less operation mode switching request	3.5 ms [RD77MS] 16.0 ms [RD77GF]	5926	
[Cd.158]	Forced stop input	Operation cycle	5945	
[Cd.700]	Virtual servo amplifier operation command [RD77GF]	16.0 ms	5952	
[Cd.701]	Virtual servo amplifier operation station specification [RD77GF]	At request	5954	1005954

■Axis control data

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Cd.3]	Positioning start No.	At start	4300+100n	1004300+100n
[Cd.4]	Positioning starting point No.		4301+100n	1004301+100n
[Cd.5]	Axis error reset	14.2 ms [RD77MS] 16.0 ms [RD77GF]	4302+100n	1004302+100n
[Cd.6]	Restart command		4303+100n	1004303+100n
[Cd.7]	M code OFF request	Operation cycle	4304+100n	1004304+100n

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Cd.8]	External command valid	At request	4305+100n	1004305+100n
[Cd.9]	New position value		4306+100n 4307+100n	1004306+100n 1004307+100n
[Cd.10]	New acceleration time value		4308+100n 4309+100n	1004308+100n 1004309+100n
[Cd.11]	New deceleration time value		4310+100n 4311+100n	1004310+100n 1004311+100n
[Cd.12]	Acceleration/deceleration time change value during speed change, enable/disable		4312+100n	1004312+100n
[Cd.13]	Positioning operation speed override	Operation cycle	4313+100n	1004313+100n
[Cd.14]	New speed value	At request	4314+100n 4315+100n	1004314+100n 1004315+100n
[Cd.15]	Speed change request	Operation cycle	4316+100n	1004316+100n
[Cd.16]	Inching movement amount	At start	4317+100n	1004317+100n
[Cd.17]	JOG speed		4318+100n 4319+100n	1004318+100n 1004319+100n
[Cd.18]	Interrupt request during continuous operation	Operation cycle	4320+100n	1004320+100n
[Cd.19]	Home position return request flag OFF request	14.2 ms [RD77MS] 16.0 ms [RD77GF]	4321+100n	1004321+100n
[Cd.20]	Manual pulse generator 1 pulse input magnification	Operation cycle (At manual pulse generator enabled)	4322+100n 4323+100n	1004322+100n 1004323+100n
[Cd.21]	Manual pulse generator enable flag	Operation cycle	4324+100n	1004324+100n
[Cd.22]	New torque value/forward new torque value		4325+100n	1004325+100n
[Cd.23]	Speed-position switching control movement amount change register	At request	4326+100n 4327+100n	1004326+100n 1004327+100n
[Cd.24]	Speed-position switching enable flag		4328+100n	1004328+100n
[Cd.25]	Position-speed switching control speed change register		4330+100n 4331+100n	1004330+100n 1004331+100n
[Cd.26]	Position-speed switching enable flag		4332+100n	1004332+100n
[Cd.27]	Target position change value (New address)		4334+100n 4335+100n	1004334+100n 1004335+100n
[Cd.28]	Target position change value (New speed)		4336+100n 4337+100n	1004336+100n 1004337+100n
[Cd.29]	Target position change request flag	Operation cycle	4338+100n	1004338+100n
[Cd.30]	Simultaneous starting own axis start data No.	At start	4340+100n	1004340+100n
[Cd.31]	Simultaneous starting axis start data No.1		4341+100n	1004341+100n
[Cd.32]	Simultaneous starting axis start data No.2		4342+100n	1004342+100n
[Cd.33]	Simultaneous starting axis start data No.3		4343+100n	1004343+100n
[Cd.34]	Step mode		4344+100n	1004344+100n
[Cd.35]	Step valid flag		4345+100n	1004345+100n
[Cd.36]	Step start information	14.2 ms [RD77MS] 16.0 ms [RD77GF]	4346+100n	1004346+100n
[Cd.37]	Skip command	Operation cycle (During positioning operation)	4347+100n	1004347+100n
[Cd.38]	Teaching data selection	At request	4348+100n	1004348+100n
[Cd.39]	Teaching positioning data No.	103 ms [RD77MS] 116 ms [RD77GF]	4349+100n	1004349+100n
[Cd.40]	ABS direction in degrees	At start	4350+100n	1004350+100n
[Cd.43]	Simultaneous starting axis		4368+100n 4369+100n	1004368+100n 1004369+100n
[Cd.45]	Speed-position switching device selection		4366+100n	1004366+100n

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Cd.46]	Speed-position switching command	Vary with operation cycle[*1] [RD77MS] Inter-module synchronization cycle [RD77GF]	4367+100n	1004367+100n
[Cd.100]	Servo OFF command	Operation cycle	4351+100n	1004351+100n
[Cd.101]	Torque output setting value	At start	4352+100n	1004352+100n
[Cd.108]	Gain switching command flag	Operation cycle	4359+100n	1004359+100n
[Cd.112]	Torque change function switching request		4363+100n	1004363+100n
[Cd.113]	New reverse torque value		4364+100n	1004364+100n
[Cd.130]	Servo parameter read/write request	Main cycle	4354+100n	1004354+100n
[Cd.131]	Parameter No. (Setting for servo parameters to be changed) [RD77MS]	At request	4355+100n	1004355+100n
	Parameter No. (Object index for servo parameters to be changed) [RD77GF]			
[Cd.132]	Change data		4356+100n 4357+100n	1004356+100n 1004357+100n
[Cd.133]	Semi/Fully closed loop switching request	Operation cycle (The servo amplifiers for fully closed loop control only)	4358+100n	1004358+100n
[Cd.136]	PI-PID switching request	Operation cycle	4365+100n	1004365+100n
[Cd.138]	Control mode switching request		4374+100n	1004374+100n
[Cd.139]	Control mode setting	At request (Mode switching)	4375+100n	1004375+100n
[Cd.140]	Command speed at speed control mode	Operation cycle (At speed control mode)	4376+100n 4377+100n	1004376+100n 1004377+100n
[Cd.141]	Acceleration time at speed control mode	At request (Mode switching)	4378+100n	1004378+100n
[Cd.142]	Deceleration time at speed control mode		4379+100n	1004379+100n
[Cd.143]	Command torque at torque control mode	Operation cycle (At torque control mode)	4380+100n	1004380+100n
[Cd.144]	Torque time constant at torque control mode (Forward direction)	At request (Mode switching)	4381+100n	1004381+100n
[Cd.145]	Torque time constant at torque control mode (Negative direction)		4382+100n	1004382+100n
[Cd.146]	Speed limit value at torque control mode	Operation cycle (At torque control mode)	4384+100n 4385+100n	1004384+100n 1004385+100n
[Cd.147]	Speed limit value at continuous operation to torque control mode [RD77MS]	Operation cycle (At continuous operation to torque control mode)	4386+100n 4387+100n	—
[Cd.148]	Acceleration time at continuous operation to torque control mode [RD77MS]	At request (Mode switching)	4388+100n	—
[Cd.149]	Deceleration time at continuous operation to torque control mode [RD77MS]		4389+100n	—
[Cd.150]	Target torque at continuous operation to torque control mode [RD77MS]	Operation cycle (At continuous operation to torque control mode)	4390+100n	—
[Cd.151]	Torque time constant at continuous operation to torque control mode (Forward direction) [RD77MS]	At request (Mode switching)	4391+100n	—
[Cd.152]	Torque time constant at continuous operation to torque control mode (Negative direction) [RD77MS]		4392+100n	—
[Cd.153]	Control mode auto-shift selection [RD77MS]		4393+100n	—
[Cd.154]	Control mode auto-shift parameter [RD77MS]		4394+100n 4395+100n	—
[Cd.180]	Axis stop	Operation cycle	30100+10n	1030100+10n
[Cd.181]	Forward run JOG start		30101+10n	1030101+10n
[Cd.182]	Reverse run JOG start		30102+10n	1030102+10n

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Cd.183]	Execution prohibition flag	At start	30103+10n	1030103+10n

*1 When the operation cycle is 0.444 ms: 0.444
When the operation cycle is other than 0.444 ms: 0.888

■Control data for positioning data or block start data

n: Axis No. - 1

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Cd.220]	Positioning data control request [RD77MS]	Main cycle	34416+18n	—
[Cd.221]	Positioning data No. setting [RD77MS]	At request	34417+18n	—
[Cd.222]	Block start data control request [RD77MS]	Main cycle	34418+18n	—
[Cd.223]	Block No. setting [RD77MS]	At request	34419+18n	—
[Cd.224]	Block start data type setting [RD77MS]		34420+18n	—
[Cd.225]	Block start data No. setting [RD77MS]		34421+18n	—
[Cd.226]	Positioning data/block start data setting value [RD77MS]		34422+18n 34433+18n	—

[Positioning data]

■Positioning data

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Memory area	Item			Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
Positioning data No.1	[Da.1]	Operation pattern	Positioning identifier	6000+1000n	1006000+1000n
	[Da.2]	Control method			
	[Da.3]	Acceleration time No.			
	[Da.4]	Deceleration time No.			
	[Da.6]	Positioning address/movement amount		6006+1000n 6007+1000n	1006006+1000n 1006007+1000n
	[Da.7]	Arc address		6008+1000n 6009+1000n	1006008+1000n 1006009+1000n
	[Da.8]	Command speed		6004+1000n 6005+1000n	1006004+1000n 1006005+1000n
	[Da.9]	Dwell time/JUMP destination positioning data No.		6002+1000n	1006002+1000n
	[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches		6001+1000n	1006001+1000n
	[Da.20]	Axis to be interpolated No.1	Axis to be interpolated	71000+1000n 71001+1000n	1071000+1000n 1071001+1000n
	[Da.21]	Axis to be interpolated No.2			
	[Da.22]	Axis to be interpolated No.3			
	[Da.27]	M code ON signal output timing	Positioning option	6003+1000n	1006003+1000n
	[Da.28]	ABS direction in degrees			
	[Da.29]	Interpolation speed designation method			

Memory area	Item			Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
No.2	[Da.1] Operation pattern [Da.2] Control method [Da.3] Acceleration time No. [Da.4] Deceleration time No. [Da.6] Positioning address/movement amount [Da.7] Arc address [Da.8] Command speed [Da.9] Dwell time/JUMP destination positioning data No. [Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches [Da.20] Axis to be interpolated No.1 [Da.21] Axis to be interpolated No.2 [Da.22] Axis to be interpolated No.3 [Da.27] M code ON signal output timing [Da.28] ABS direction in degrees [Da.29] Interpolation speed designation method			6010+1000n ⋮ 6019+1000n 71010+1000n 71011+1000n	1006010+1000n ⋮ 1006019+1000n 1071010+1000n 1071011+1000n
No.3				6020+1000n ⋮ 6029+1000n 71020+1000n 71021+1000n	1006020+1000n ⋮ 1006029+1000n 1071020+1000n 1071021+1000n
⋮				⋮	
No.100				6990+1000n ⋮ 6999+1000n 71990+1000n 71991+1000n	1006990+1000n ⋮ 1006999+1000n 1071990+1000n 1071991+1000n
[RD77MS] No.101 ⋮ No.600				Set with the engineering tool.	—
[RD77GF] No.101	[Da.1]	Operation pattern	Positioning identifier	200000+5000n	1200000+5000n
	[Da.2]	Control method			
	[Da.3]	Acceleration time No.			
	[Da.4]	Deceleration time No.			
	[Da.6]	Positioning address/movement amount		200006+5000n 200007+5000n	1200006+5000n 1200007+5000n
	[Da.7]	Arc address		200008+5000n 200009+5000n	1200008+5000n 1200009+5000n
	[Da.8]	Command speed		200004+5000n 200005+5000n	1200004+5000n 1200005+5000n
	[Da.9]	Dwell time/JUMP destination positioning data No.		200002+5000n	1200002+5000n
	[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions/ Number of pitches		200001+5000n	1200001+5000n
	[Da.20]	Axis to be interpolated No.1	Axis to be interpolated	280000+5000n 280001+5000n	1280000+5000n 1280001+5000n
	[Da.21]	Axis to be interpolated No.2			
	[Da.22]	Axis to be interpolated No.3			
	[Da.27]	M code ON signal output timing	Positioning option	200003+5000n	1200003+5000n
	[Da.28]	ABS direction in degrees			
	[Da.29]	Interpolation speed designation method			
[RD77GF] No.102	[Da.1] Operation pattern [Da.2] Control method [Da.3] Acceleration time No. [Da.4] Deceleration time No. [Da.6] Positioning address/movement amount [Da.7] Arc address [Da.8] Command speed [Da.9] Dwell time/JUMP destination positioning data No. [Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches [Da.20] Axis to be interpolated No.1 [Da.21] Axis to be interpolated No.2 [Da.22] Axis to be interpolated No.3 [Da.27] M code ON signal output timing [Da.28] ABS direction in degrees [Da.29] Interpolation speed designation method			200010+5000n ⋮ 200019+5000n 280010+5000n 280011+5000n	1200010+5000n ⋮ 1200019+5000n 1280010+5000n 1280011+5000n
[RD77GF] No.103				200020+5000n ⋮ 200029+5000n 280020+5000n 280021+5000n	1200020+5000n ⋮ 1200029+5000n 1280020+5000n 1280021+5000n
⋮				⋮	
[RD77GF] No.600				204990+5000n ⋮ 204999+5000n 284990+5000n 284991+5000n	1204990+5000n ⋮ 1204999+5000n 1284990+5000n 1284991+5000n

[Block start data]

■Positioning data (Block start data)

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Memory area	Item				Buffer memory address	
					Axis 1 to axis 16	Axis 17 to axis 32
Start block 0	Block start data 1st point	[Da.11] [Da.12]	Shape Start data No.		22000+400n	1022000+400n
		[Da.13] [Da.14]	Special start instruction Parameter		22050+400n	1022050+400n
	2nd point	[Da.11] [Da.12]	Shape Start data No.		22001+400n	1022001+400n
		[Da.13] [Da.14]	Special start instruction Parameter		22051+400n	1022051+400n
	3rd point	[Da.11] [Da.12]	Shape Start data No.		22002+400n	1022002+400n
		[Da.13] [Da.14]	Special start instruction Parameter		22052+400n	1022052+400n
	⋮				⋮	
	50th point	[Da.11] [Da.12]	Shape Start data No.		22049+400n	1022049+400n
		[Da.13] [Da.14]	Special start instruction Parameter		22099+400n	1022099+400n
	Condition data No.1	[Da.15]	Condition target		22100+400n	1022100+400n
		[Da.16]	Condition operator			
		[Da.17]	Address		22102+400n 22103+400n	1022102+400n 1022103+400n
		[Da.18]	Parameter 1		22104+400n 22105+400n	1022104+400n 1022105+400n
		[Da.19]	Parameter 2		22106+400n 22107+400n	1022106+400n 1022107+400n
		[Da.23]	Number of simultaneous starting axes	Simultaneous starting axis	22108+400n 22109+400n	1022108+400n 1022109+400n
		[Da.24]	Simultaneous starting axis No.1			
		[Da.25]	Simultaneous starting axis No.2			
		[Da.26]	Simultaneous starting axis No.3			
	Condition data No.2				22110+400n ⋮ 22119+400n	1022110+400n ⋮ 1022119+400n
	Condition data No.3				22120+400n ⋮ 22129+400n	1022120+400n ⋮ 1022129+400n
	⋮				⋮	
	Condition data No.10				22190+400n ⋮ 22199+400n	1022190+400n ⋮ 1022199+400n
Start block 1	Block start data				22200+400n ⋮ 22299+400n	1022200+400n ⋮ 1022299+400n
	Condition data				22300+400n ⋮ 22399+400n	1022300+400n ⋮ 1022399+400n

Memory area		Item				Buffer memory address	
						Axis 1 to axis 16	Axis 17 to axis 32
[RD77MS]	Start block 2	Block start data				Set with the engineering tool.	—
		Condition data					
	Start block 3	Block start data					
		Condition data					
	Start block 4	Block start data					
		Condition data					
[RD77GF]	Start block 2	Block start data 1st point	[Da.11] [Da.12]	Shape Start data No.		360000+600n	1360000+600n
			[Da.13] [Da.14]	Special start instruction Parameter		360050+600n	1360050+600n
		2nd point	[Da.11] [Da.12]	Shape Start data No.		360001+600n	1360001+600n
			[Da.13] [Da.14]	Special start instruction Parameter		360051+600n	1360051+600n
		3rd point	[Da.11] [Da.12]	Shape Start data No.		360002+600n	1360002+600n
			[Da.13] [Da.14]	Special start instruction Parameter		360052+600n	1360052+600n
		⋮				⋮	
		50th point	[Da.11] [Da.12]	Shape Start data No.		360049+600n	1360049+600n
			[Da.13] [Da.14]	Special start instruction Parameter		360099+600n	1360099+600n
		Condition data No.1	[Da.15]	Condition target		360100+600n	1360100+600n
			[Da.16]	Condition operator			
			[Da.17]	Address		360102+600n 360103+600n	1360102+600n 1360103+600n
			[Da.18]	Parameter 1		360104+600n 360105+600n	1360104+600n 1360105+600n
			[Da.19]	Parameter 2		360106+600n 360107+600n	1360106+600n 1360107+600n
			[Da.23]	Number of simultaneous starting axes	Simultaneous starting axis	360108+600n 360109+600n	1360108+600n 1360109+600n
			[Da.24]	Simultaneous starting axis No.1			
			[Da.25]	Simultaneous starting axis No.2			
			[Da.26]	Simultaneous starting axis No.3			
		Condition data No.2				360110+600n ⋮ 360119+600n	1360110+600n ⋮ 1360119+600n
		Condition data No.3				360120+600n ⋮ 360129+600n	1360120+600n ⋮ 1360129+600n
		⋮				⋮	
		Condition data No.10				360190+600n ⋮ 360199+600n	1360190+600n ⋮ 1360199+600n
	Start block 3 and 4	Block start data				360200+600n ⋮ 360599+600n	1360200+600n ⋮ 1360599+600n
		Condition data					

Servo parameters

The following shows the relation between the buffer memory addresses of servo parameters and the various items.

Since the servo parameters of MR-J5(W)-B are not in the buffer memory, use GX Works3 or axis control data to set them. Refer to the following for details.

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The setting range is different depending on the servo amplifier model. Refer to each servo amplifier instruction manual or manual for details.

■Servo network composition parameters

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Servo amplifier parameter No.	Fetch cycle	Buffer memory address	
				Axis 1 to axis 16	Axis 17 to axis 32
[Pr.100]	Connected device	—	At power supply ON/the CPU module reset/PLC READY signal [Y0] OFF to ON	58020+32n 58021+32n	1058020+32n 1058021+32n
[Pr.101]	Virtual servo amplifier setting [RD77GF]	—		58022+32n	1058022+32n

■Servo parameters [RD77MS]

n: Axis No. - 1

Item	Servo amplifier parameter No.	Buffer memory address
—	PA01	28401+100n
—	PA02	28402+100n
—	PA03	28403+100n
—	PA04	28404+100n
—	PA05	28405+100n
—	PA06	28406+100n
—	PA07	28407+100n
—	PA08	28408+100n
—	PA09	28409+100n
—	PA10	28410+100n
—	PA11	28411+100n
—	PA12	28412+100n
—	PA13	28413+100n
—	PA14	28414+100n
—	PA15	28415+100n
—	PA16	28416+100n
—	PA17	28417+100n
—	PA18	28418+100n
—	PA19	64464+70n
—	PA20	64400+70n
—	PA21	64401+70n
—	PA22	64402+70n
—	PA23	64403+70n
—	PA24	64404+70n
—	PA25	64405+70n
—	PA26	64406+70n
—	PA27	64407+70n
—	PA28	64408+70n
—	PA29	64409+70n
—	PA30	64410+70n
—	PA31	64411+70n
—	PA32	64412+70n
—	PB01	28419+100n

Item	Servo amplifier parameter No.	Buffer memory address
—	PB02	28420+100n
—	PB03	28421+100n
—	PB04	28422+100n
—	PB05	28423+100n
—	PB06	28424+100n
—	PB07	28425+100n
—	PB08	28426+100n
—	PB09	28427+100n
—	PB10	28428+100n
—	PB11	28429+100n
—	PB12	28430+100n
—	PB13	28431+100n
—	PB14	28432+100n
—	PB15	28433+100n
—	PB16	28434+100n
—	PB17	28435+100n
—	PB18	28436+100n
—	PB19	28437+100n
—	PB20	28438+100n
—	PB21	28439+100n
—	PB22	28440+100n
—	PB23	28441+100n
—	PB24	28442+100n
—	PB25	28443+100n
—	PB26	28444+100n
—	PB27	28445+100n
—	PB28	28446+100n
—	PB29	28447+100n
—	PB30	28448+100n
—	PB31	28449+100n
—	PB32	28450+100n
—	PB33	28451+100n
—	PB34	28452+100n
—	PB35	28453+100n
—	PB36	28454+100n
—	PB37	28455+100n
—	PB38	28456+100n
—	PB39	28457+100n
—	PB40	28458+100n
—	PB41	28459+100n
—	PB42	28460+100n
—	PB43	28461+100n
—	PB44	28462+100n
—	PB45	28463+100n
—	PB46	64413+70n
—	PB47	64414+70n
—	PB48	64415+70n
—	PB49	64416+70n
—	PB50	64417+70n
—	PB51	64418+70n
—	PB52	64419+70n
—	PB53	64420+70n
—	PB54	64421+70n

Item	Servo amplifier parameter No.	Buffer memory address
—	PB55	64422+70n
—	PB56	64423+70n
—	PB57	64424+70n
—	PB58	64425+70n
—	PB59	64426+70n
—	PB60	64427+70n
—	PB61	64428+70n
—	PB62	64429+70n
—	PB63	64430+70n
—	PB64	64431+70n
—	PC01	28464+100n
—	PC02	28465+100n
—	PC03	28466+100n
—	PC04	28467+100n
—	PC05	28468+100n
—	PC06	28469+100n
—	PC07	28470+100n
—	PC08	28471+100n
—	PC09	28472+100n
—	PC10	28473+100n
—	PC11	28474+100n
—	PC12	28475+100n
—	PC13	28476+100n
—	PC14	28477+100n
—	PC15	28478+100n
—	PC16	28479+100n
—	PC17	28480+100n
—	PC18	28481+100n
—	PC19	28482+100n
—	PC20	28483+100n
—	PC21	28484+100n
—	PC22	28485+100n
—	PC23	28486+100n
—	PC24	28487+100n
—	PC25	28488+100n
—	PC26	28489+100n
—	PC27	28490+100n
—	PC28	28491+100n
—	PC29	28492+100n
—	PC30	28493+100n
—	PC31	28494+100n
—	PC32	28495+100n
—	PC33	64432+70n
—	PC34	64433+70n
—	PC35	64434+70n
—	PC36	64435+70n
—	PC37	64436+70n
—	PC38	64437+70n
—	PC39	64438+70n
—	PC40	64439+70n
—	PC41	64440+70n
—	PC42	64441+70n
—	PC43	64442+70n

Item	Servo amplifier parameter No.	Buffer memory address
—	PC44	64443+70n
—	PC45	64444+70n
—	PC46	64445+70n
—	PC47	64446+70n
—	PC48	64447+70n
—	PC49	64448+70n
—	PC50	64449+70n
—	PC51	64450+70n
—	PC52	64451+70n
—	PC53	64452+70n
—	PC54	64453+70n
—	PC55	64454+70n
—	PC56	64455+70n
—	PC57	64456+70n
—	PC58	64457+70n
—	PC59	64458+70n
—	PC60	64459+70n
—	PC61	64460+70n
—	PC62	64461+70n
—	PC63	64462+70n
—	PC64	64463+70n
—	PD01	65520+340n
—	PD02	65521+340n
—	PD03	65522+340n
—	PD04	65523+340n
—	PD05	65524+340n
—	PD06	65525+340n
—	PD07	65526+340n
—	PD08	65527+340n
—	PD09	65528+340n
—	PD10	65529+340n
—	PD11	65530+340n
—	PD12	65531+340n
—	PD13	65532+340n
—	PD14	65533+340n
—	PD15	65534+340n
—	PD16	65535+340n
—	PD17	65536+340n
—	PD18	65537+340n
—	PD19	65538+340n
—	PD20	65539+340n
—	PD21	65540+340n
—	PD22	65541+340n
—	PD23	65542+340n
—	PD24	65543+340n
—	PD25	65544+340n
—	PD26	65545+340n
—	PD27	65546+340n
—	PD28	65547+340n
—	PD29	65548+340n
—	PD30	65549+340n
—	PD31	65550+340n
—	PD32	65551+340n

Item	Servo amplifier parameter No.	Buffer memory address
—	PD33	65552+340n
—	PD34	65553+340n
—	PD35	65554+340n
—	PD36	65555+340n
—	PD37	65556+340n
—	PD38	65557+340n
—	PD39	65558+340n
—	PD40	65559+340n
—	PD41	65560+340n
—	PD42	65561+340n
—	PD43	65562+340n
—	PD44	65563+340n
—	PD45	65564+340n
—	PD46	65565+340n
—	PD47	65566+340n
—	PD48	65567+340n
—	PE01	65568+340n
—	PE02	65569+340n
—	PE03	65570+340n
—	PE04	65571+340n
—	PE05	65572+340n
—	PE06	65573+340n
—	PE07	65574+340n
—	PE08	65575+340n
—	PE09	65576+340n
—	PE10	65577+340n
—	PE11	65578+340n
—	PE12	65579+340n
—	PE13	65580+340n
—	PE14	65581+340n
—	PE15	65582+340n
—	PE16	65583+340n
—	PE17	65584+340n
—	PE18	65585+340n
—	PE19	65586+340n
—	PE20	65587+340n
—	PE21	65588+340n
—	PE22	65589+340n
—	PE23	65590+340n
—	PE24	65591+340n
—	PE25	65592+340n
—	PE26	65593+340n
—	PE27	65594+340n
—	PE28	65595+340n
—	PE29	65596+340n
—	PE30	65597+340n
—	PE31	65598+340n
—	PE32	65599+340n
—	PE33	65600+340n
—	PE34	65601+340n
—	PE35	65602+340n
—	PE36	65603+340n
—	PE37	65604+340n

Item	Servo amplifier parameter No.	Buffer memory address
—	PE38	65605+340n
—	PE39	65606+340n
—	PE40	65607+340n
—	PE41	65608+340n
—	PE42	65609+340n
—	PE43	65610+340n
—	PE44	65611+340n
—	PE45	65612+340n
—	PE46	65613+340n
—	PE47	65614+340n
—	PE48	65615+340n
—	PE49	65616+340n
—	PE50	65617+340n
—	PE51	65618+340n
—	PE52	65619+340n
—	PE53	65620+340n
—	PE54	65621+340n
—	PE55	65622+340n
—	PE56	65623+340n
—	PE57	65624+340n
—	PE58	65625+340n
—	PE59	65626+340n
—	PE60	65627+340n
—	PE61	65628+340n
—	PE62	65629+340n
—	PE63	65630+340n
—	PE64	65631+340n
—	PS01	65712+340n
—	PS02	65713+340n
—	PS03	65714+340n
—	PS04	65715+340n
—	PS05	65716+340n
—	PS06	65717+340n
—	PS07	65718+340n
—	PS08	65719+340n
—	PS09	65720+340n
—	PS10	65721+340n
—	PS11	65722+340n
—	PS12	65723+340n
—	PS13	65724+340n
—	PS14	65725+340n
—	PS15	65726+340n
—	PS16	65727+340n
—	PS17	65728+340n
—	PS18	65729+340n
—	PS19	65730+340n
—	PS20	65731+340n
—	PS21	65732+340n
—	PS22	65733+340n
—	PS23	65734+340n
—	PS24	65735+340n
—	PS25	65736+340n
—	PS26	65737+340n

Item	Servo amplifier parameter No.	Buffer memory address
—	PS27	65738+340n
—	PS28	65739+340n
—	PS29	65740+340n
—	PS30	65741+340n
—	PS31	65742+340n
—	PS32	65743+340n
—	PF01	65632+340n
—	PF02	65633+340n
—	PF03	65634+340n
—	PF04	65635+340n
—	PF05	65636+340n
—	PF06	65637+340n
—	PF07	65638+340n
—	PF08	65639+340n
—	PF09	65640+340n
—	PF10	65641+340n
—	PF11	65642+340n
—	PF12	65643+340n
—	PF13	65644+340n
—	PF14	65645+340n
—	PF15	65646+340n
—	PF16	65647+340n
—	PF17	65648+340n
—	PF18	65649+340n
—	PF19	65650+340n
—	PF20	65651+340n
—	PF21	65652+340n
—	PF22	65653+340n
—	PF23	65654+340n
—	PF24	65655+340n
—	PF25	65656+340n
—	PF26	65657+340n
—	PF27	65658+340n
—	PF28	65659+340n
—	PF29	65660+340n
—	PF30	65661+340n
—	PF31	65662+340n
—	PF32	65663+340n
—	PF33	65664+340n
—	PF34	65665+340n
—	PF35	65666+340n
—	PF36	65667+340n
—	PF37	65668+340n
—	PF38	65669+340n
—	PF39	65670+340n
—	PF40	65671+340n
—	PF41	65672+340n
—	PF42	65673+340n
—	PF43	65674+340n
—	PF44	65675+340n
—	PF45	65676+340n
—	PF46	65677+340n
—	PF47	65678+340n

Item	Servo amplifier parameter No.	Buffer memory address
—	PF48	65679+340n
—	Po01	65680+340n
—	Po02	65681+340n
—	Po03	65682+340n
—	Po04	65683+340n
—	Po05	65684+340n
—	Po06	65685+340n
—	Po07	65686+340n
—	Po08	65687+340n
—	Po09	65688+340n
—	Po10	65689+340n
—	Po11	65690+340n
—	Po12	65691+340n
—	Po13	65692+340n
—	Po14	65693+340n
—	Po15	65694+340n
—	Po16	65695+340n
—	Po17	65696+340n
—	Po18	65697+340n
—	Po19	65698+340n
—	Po20	65699+340n
—	Po21	65700+340n
—	Po22	65701+340n
—	Po23	65702+340n
—	Po24	65703+340n
—	Po25	65704+340n
—	Po26	65705+340n
—	Po27	65706+340n
—	Po28	65707+340n
—	Po29	65708+340n
—	Po30	65709+340n
—	Po31	65710+340n
—	Po32	65711+340n
—	PL01	65744+340n
—	PL02	65745+340n
—	PL03	65746+340n
—	PL04	65747+340n
—	PL05	65748+340n
—	PL06	65749+340n
—	PL07	65750+340n
—	PL08	65751+340n
—	PL09	65752+340n
—	PL10	65753+340n
—	PL11	65754+340n
—	PL12	65755+340n
—	PL13	65756+340n
—	PL14	65757+340n
—	PL15	65758+340n
—	PL16	65759+340n
—	PL17	65760+340n
—	PL18	65761+340n
—	PL19	65762+340n
—	PL20	65763+340n

Item	Servo amplifier parameter No.	Buffer memory address
—	PL21	65764+340n
—	PL22	65765+340n
—	PL23	65766+340n
—	PL24	65767+340n
—	PL25	65768+340n
—	PL26	65769+340n
—	PL27	65770+340n
—	PL28	65771+340n
—	PL29	65772+340n
—	PL30	65773+340n
—	PL31	65774+340n
—	PL32	65775+340n
—	PL33	65776+340n
—	PL34	65777+340n
—	PL35	65778+340n
—	PL36	65779+340n
—	PL37	65780+340n
—	PL38	65781+340n
—	PL39	65782+340n
—	PL40	65783+340n
—	PL41	65784+340n
—	PL42	65785+340n
—	PL43	65786+340n
—	PL44	65787+340n
—	PL45	65788+340n
—	PL46	65789+340n
—	PL47	65790+340n
—	PL48	65791+340n

Mark detection function

The following shows the relation between the buffer memory addresses for mark detection function and the various items.

■Mark detection parameters

k: Mark detection setting No. - 1

Item		Fetch cycle	Buffer memory address
[Pr.800]	Mark detection signal setting [RD77MS]	At power supply ON	54000+20k
[Pr.801]	Mark detection signal compensation time	At power supply ON/PLC READY signal [Y0] OFF to ON	54001+20k
[Pr.802]	Mark detection data type	At power supply ON	54002+20k
[Pr.803]	Mark detection data axis No.		54003+20k
[Pr.804]	Mark detection data buffer memory No.		54004+20k 54005+20k
[Pr.805]	Latch data range upper limit value	At power supply ON/PLC READY signal [Y0] OFF to ON/at request (Latch data range change)	54006+20k 54007+20k
[Pr.806]	Latch data range lower limit value		54008+20k 54009+20k
[Pr.807]	Mark detection mode setting		54010+20k
[Pr.808]	Mark detection signal link device type [RD77GF]	At power supply ON	54011+20k
[Pr.809]	Mark detection signal link device No. [RD77GF]		54012+20k
[Pr.810]	Mark detection signal link device bit specification [RD77GF]		54013+20k
[Pr.811]	Mark detection signal detection direction setting [RD77GF]		54014+20k

■Mark detection control data

k: Mark detection setting No. - 1

Item		Fetch cycle	Buffer memory address
[Cd.800]	Number of mark detection clear request	Operation cycle	54640+10k
[Cd.801]	Mark detection invalid flag		54641+10k
[Cd.802]	Latch data range change request	Operation cycle/at conditions established (DI input)	54642+10k

■Mark detection monitor data

k: Mark detection setting No. - 1

Item			Refresh cycle	Buffer memory address
[Md.800]	Number of mark detection		At conditions established (Mark detection)	54960+80k
[Md.801]	Mark detection data storage area (1 to 32)	1		54962+80k 54963+80k
		2		54964+80k 54965+80k
		3		54966+80k 54967+80k
		⋮		⋮
		32		55024+80k 55025+80k
[Md.802]	Mark detection signal monitor [RD77GF]		Operation cycle	54961+80k

Link device external signal assignment

The following shows the relation between the buffer memory addresses for link device external signal assignment and the various items.

■Link device external signal assignment parameters (bit device) [RD77GF]

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Pr.900]	Forced stop signal (EMI): Link device type	PLC READY signal [Y0] OFF to ON	440000+320n	1440000+320n
[Pr.901]	Forced stop signal (EMI): Link device start No.		440001+320n	1440001+320n
[Pr.902]	Forced stop signal (EMI): Link device bit specification		440002+320n	1440002+320n
[Pr.903]	Forced stop signal (EMI): Link device logic setting		440003+320n	1440003+320n
[Pr.910]	Upper limit signal (FLS): Link device type		440010+320n	1440010+320n
[Pr.911]	Upper limit signal (FLS): Link device start No.		440011+320n	1440011+320n
[Pr.912]	Upper limit signal (FLS): Link device bit specification		440012+320n	1440012+320n
[Pr.913]	Upper limit signal (FLS): Link device logic setting		440013+320n	1440013+320n
[Pr.920]	Lower limit signal (RLS): Link device type		440020+320n	1440020+320n
[Pr.921]	Lower limit signal (RLS): Link device start No.		440021+320n	1440021+320n
[Pr.922]	Lower limit signal (RLS): Link device bit specification		440022+320n	1440022+320n
[Pr.923]	Lower limit signal (RLS): Link device logic setting		440023+320n	1440023+320n
[Pr.930]	Proximity dog signal (DOG): Link device type		440030+320n	1440030+320n
[Pr.931]	Proximity dog signal (DOG): Link device start No.		440031+320n	1440031+320n
[Pr.932]	Proximity dog signal (DOG): Link device bit specification		440032+320n	1440032+320n
[Pr.933]	Proximity dog signal (DOG): Link device logic setting		440033+320n	1440033+320n
[Pr.940]	Stop signal (STOP): Link device type		440040+320n	1440040+320n
[Pr.941]	Stop signal (STOP): Link device start No.		440041+320n	1440041+320n
[Pr.942]	Stop signal (STOP): Link device bit specification		440042+320n	1440042+320n
[Pr.943]	Stop signal (STOP): Link device logic setting		440043+320n	1440043+320n
[Pr.950]	External positioning start request: Link device type		440050+320n	1440050+320n
[Pr.951]	External positioning start request: Link device start No.		440051+320n	1440051+320n

Item		**Fetch cycle**	**Buffer memory address**	
			Axis 1 to axis 16	**Axis 17 to axis 32**
[Pr.952]	External positioning start request: Link device bit specification	PLC READY signal [Y0] OFF to ON	440052+320n	1440052+320n
[Pr.953]	External positioning start request: Link device logic setting		440053+320n	1440053+320n
[Pr.960]	External speed change request: Link device type		440060+320n	1440060+320n
[Pr.961]	External speed change request: Link device start No.		440061+320n	1440061+320n
[Pr.962]	External speed change request: Link device bit specification		440062+320n	1440062+320n
[Pr.963]	External speed change request: Link device logic setting		440063+320n	1440063+320n
[Pr.970]	Skip request: Link device type		440070+320n	1440070+320n
[Pr.971]	Skip request: Link device start No.		440071+320n	1440071+320n
[Pr.972]	Skip request: Link device bit specification		440072+320n	1440072+320n
[Pr.973]	Skip request: Link device logic setting		440073+320n	1440073+320n
[Pr.980]	Speed-position control switching request: Link device type		440080+320n	1440080+320n
[Pr.981]	Speed-position control switching request: Link device start No.		440081+320n	1440081+320n
[Pr.982]	Speed-position control switching request: Link device bit specification		440082+320n	1440082+320n
[Pr.983]	Speed-position control switching request: Link device logic setting		440083+320n	1440083+320n
[Pr.990]	Main shaft clutch control request: Link device type		440090+320n	1440090+320n
[Pr.991]	Main shaft clutch control request: Link device start No.		440091+320n	1440091+320n
[Pr.992]	Main shaft clutch control request: Link device bit specification		440092+320n	1440092+320n
[Pr.993]	Main shaft clutch control request: Link device logic setting		440093+320n	1440093+320n
[Pr.1000]	Auxiliary shaft clutch control request: Link device type		440100+320n	1440100+320n
[Pr.1001]	Auxiliary shaft clutch control request: Link device start No.		440101+320n	1440101+320n
[Pr.1002]	Auxiliary shaft clutch control request: Link device bit specification		440102+320n	1440102+320n
[Pr.1003]	Auxiliary shaft clutch control request: Link device logic setting		440103+320n	1440103+320n
[Pr.1020]	Block No.7000 start request: Link device type		440120+320n	1440120+320n
[Pr.1021]	Block No.7000 start request: Link device start No.		440121+320n	1440121+320n
[Pr.1022]	Block No.7000 start request: Link device bit specification		440122+320n	1440122+320n
[Pr.1023]	Block No.7000 start request: Link device logic setting		440123+320n	1440123+320n
[Pr.1030]	Block No.7001 start request: Link device type		440130+320n	1440130+320n
[Pr.1031]	Block No.7001 start request: Link device start No.		440131+320n	1440131+320n
[Pr.1032]	Block No.7001 start request: Link device bit specification		440132+320n	1440132+320n
[Pr.1033]	Block No.7001 start request: Link device logic setting		440133+320n	1440133+320n
[Pr.1040]	Block No.7002 start request: Link device type		440140+320n	1440140+320n
[Pr.1041]	Block No.7002 start request: Link device start No.		440141+320n	1440141+320n
[Pr.1042]	Block No.7002 start request: Link device bit specification		440142+320n	1440142+320n
[Pr.1043]	Block No.7002 start request: Link device logic setting		440143+320n	1440143+320n
[Pr.1050]	Block No.7003 start request: Link device type		440150+320n	1440150+320n
[Pr.1051]	Block No.7003 start request: Link device start No.		440151+320n	1440151+320n
[Pr.1052]	Block No.7003 start request: Link device bit specification		440152+320n	1440152+320n
[Pr.1053]	Block No.7003 start request: Link device logic setting		440153+320n	1440153+320n
[Pr.1060]	Block No.7004 start request: Link device type		440160+320n	1440160+320n
[Pr.1061]	Block No.7004 start request: Link device start No.		440161+320n	1440161+320n
[Pr.1062]	Block No.7004 start request: Link device bit specification		440162+320n	1440162+320n
[Pr.1063]	Block No.7004 start request: Link device logic setting		440163+320n	1440163+320n

■Link device external signal assignment parameters (word device) [RD77GF]

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Pr.700]	Manual pulse generator input: Link device type	PLC READY signal [Y0] OFF to ON	450240+100n	1450240+100n
[Pr.701]	Manual pulse generator input: Link device start No.		450241+100n	1450241+100n
[Pr.702]	Manual pulse generator input: Link device count direction setting		450246+100n	1450246+100n
[Pr.703]	Manual pulse generator input: Ring counter maximum value		450242+100n 450243+100n	1450242+100n 1450243+100n
[Pr.704]	Manual pulse generator input: Ring counter minimum value		450244+100n 450245+100n	1450244+100n 1450245+100n

■Axis monitor

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Refresh cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Md.900]	External command signal monitor [RD77GF]	Operation cycle	59328+100n	1059328+100n

Slave device operation

The following shows the relation between the buffer memory addresses for slave device operation and the various items.

■Control data for slave device operation [RD77GF]

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Cd.120]	Servo parameter operation request	Main cycle	533728+2048n	1533728+2048n
[Cd.121]	Parameter size	At request	533729+2048n	1533729+2048n
[Cd.122]	Parameter offset		533730+2048n	1533730+2048n
[Cd.125]	Request data	At request (Command request)	533732+2048n ⋮ 534755+2048n	1533732+2048n ⋮ 1534755+2048n
[Cd.160]	Optional SDO transfer request 1	Main cycle	534796+2048n	1534796+2048n
[Cd.161]	Optional SDO transfer request 2		534797+2048n	1534797+2048n
[Cd.162]	Optional SDO transfer request 3		534798+2048n	1534798+2048n
[Cd.163]	Optional SDO transfer request 4		534799+2048n	1534799+2048n
[Cd.164]	Optional SDO transfer data 1	At request (Command request)	534800+2048n ⋮ 534862+2048n	1534800+2048n ⋮ 1534862+2048n
[Cd.165]	Optional SDO transfer data 2		534864+2048n ⋮ 534926+2048n	1534864+2048n ⋮ 1534926+2048n
[Cd.166]	Optional SDO transfer data 3		534928+2048n ⋮ 534990+2048n	1534928+2048n ⋮ 1534990+2048n
[Cd.167]	Optional SDO transfer data 4		534992+2048n ⋮ 535054+2048n	1534992+2048n ⋮ 1535054+2048n

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Cd.170]	Optional send PDO data 1	At request (Command request)	534768+2048n 534769+2048n 534770+2048n 534771+2048n	1534768+2048n 1534769+2048n 1534770+2048n 1534771+2048n
[Cd.171]	Optional send PDO data 2		534772+2048n 534773+2048n 534774+2048n 534775+2048n	1534772+2048n 1534773+2048n 1534774+2048n 1534775+2048n
[Cd.172]	Optional send PDO data 3		534776+2048n 534777+2048n 534778+2048n 534779+2048n	1534776+2048n 1534777+2048n 1534778+2048n 1534779+2048n
[Cd.173]	Optional send PDO data 4		534780+2048n 534781+2048n 534782+2048n 534783+2048n	1534780+2048n 1534781+2048n 1534782+2048n 1534783+2048n

■Monitor data for slave device operation [RD77GF]

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Refresh cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Md.160]	Optional SDO transfer result 1	At request (Command request)	468192+2048n 468193+2048n	1468192+2048n 1468193+2048n
[Md.161]	Optional SDO transfer result 2		468194+2048n 468195+2048n	1468194+2048n 1468195+2048n
[Md.162]	Optional SDO transfer result 3		468196+2048n 468197+2048n	1468196+2048n 1468197+2048n
[Md.163]	Optional SDO transfer result 4		468198+2048n 468199+2048n	1468198+2048n 1468199+2048n
[Md.164]	Optional SDO transfer status 1		468200+2048n	1468200+2048n
[Md.165]	Optional SDO transfer status 2		468201+2048n	1468201+2048n
[Md.166]	Optional SDO transfer status 3		468202+2048n	1468202+2048n
[Md.167]	Optional SDO transfer status 4		468203+2048n	1468203+2048n
[Md.170]	Optional receive PDO data 1		468204+2048n 468205+2048n 468206+2048n 468207+2048n	1468204+2048n 1468205+2048n 1468206+2048n 1468207+2048n
[Md.171]	Optional receive PDO data 2		468208+2048n 468209+2048n 468210+2048n 468211+2048n	1468208+2048n 1468209+2048n 1468210+2048n 1468211+2048n
[Md.172]	Optional receive PDO data 3		468212+2048n 468213+2048n 468214+2048n 468215+2048n	1468212+2048n 1468213+2048n 1468214+2048n 1468215+2048n
[Md.173]	Optional receive PDO data 4		468216+2048n 468217+2048n 468218+2048n 468219+2048n	1468216+2048n 1468217+2048n 1468218+2048n 1468219+2048n
[Md.190]	Controller position value restoration completion status	16.0 ms	468232+2048n	1468232+2048n

Servo object specification area

The following shows the relation between the buffer memory addresses for servo object specification area and the various items.

■Servo object specification area [RD77GF]

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Fetch cycle	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Pr.500]	Optional send PDO 1	At power supply ON	460000+256n 460001+256n	1460000+256n 1460001+256n
[Pr.501]	Optional send PDO 2		460002+256n 460003+256n	1460002+256n 1460003+256n
[Pr.502]	Optional send PDO 3		460004+256n 460005+256n	1460004+256n 1460005+256n
[Pr.503]	Optional send PDO 4		460006+256n 460007+256n	1460006+256n 1460007+256n
[Pr.506]	Optional receive PDO 1		460012+256n 460013+256n	1460012+256n 1460013+256n
[Pr.507]	Optional receive PDO 2		460014+256n 460015+256n	1460014+256n 1460015+256n
[Pr.508]	Optional receive PDO 3		460016+256n 460017+256n	1460016+256n 1460017+256n
[Pr.509]	Optional receive PDO 4		460018+256n 460019+256n	1460018+256n 1460019+256n
[Pr.512]	Optional SDO 1	At request (Servo transient request)	460024+256n 460025+256n	1460024+256n 1460025+256n
[Pr.513]	Optional SDO 2		460026+256n 460027+256n	1460026+256n 1460027+256n
[Pr.514]	Optional SDO 3		460028+256n 460029+256n	1460028+256n 1460029+256n
[Pr.515]	Optional SDO 4		460030+256n 460031+256n	1460030+256n 1460031+256n

12.3 Basic Setting

The setting items of the setting data are explained in this section.

Servo network composition parameters of the RD77MS

n: Axis No. - 1

Item		Setting details	Default value	Buffer memory address
[Pr.100]	Connected device	Used to select the SSCNET device to connect to the Simple Motion module. [POINT] • Be sure to set up the connected device. Communication with the SSCNET device is not started by the initial value "0" in default value.	0	58020+32n 58021+32n

[Pr.100] Connected device

When the setting value which is different from the connected device is set, the error "Connected device setting error" (error code: 193EH) occurs. When connecting with the connected device with the setting value other than above, the warning "Incompatible device" (warning code: 0C81H) occurs.

■Identification code

Set with a hexadecimal.

Mitsubishi electric (Vendor ID: 0000)

Identification code	Model	Remark	Network
0100	MR-J3-_B_, MR-J3W-_B (2-axis type)		SSCNETⅢ
0101	MR-J3-_B_-RJ006 (For fully closed loop control) MR-J3-_BS_ (For safety servo)		SSCNETⅢ
0102	MR-J3-_B_-RJ004 (For linear servo motor)		SSCNETⅢ
0107	MR-J3-_B-RJ080W (For direct drive motor)		SSCNETⅢ
0180	MR-J3W-0303BN6		SSCNETⅢ
0FFF	Virtual servo amplifier (MR-J3-B)		SSCNETⅢ
1000	MR-J4-_B_(-RJ), MR-J4W_-_B (2-, 3-axis type)		SSCNETⅢ/H
1400	MR-J5-_B_(-RJ), MR-J5W_-_B (2-, 3-axis type)		SSCNETⅢ/H
1FFE	Virtual servo amplifier (MR-J5-B)		SSCNETⅢ/H
1FFF	Virtual servo amplifier (MR-J4-B)		SSCNETⅢ/H
1200	MR-JE-B(F)		SSCNETⅢ/H
2000	FR-A800-1[*1]	Inverter	SSCNETⅢ/H
2001	FR-A800-2[*1]	Inverter	SSCNETⅢ/H
4100	FR-A700 (Inverter)	Inverter	SSCNETⅢ
4101	FR-A700-NA (Inverter)	Inverter	SSCNETⅢ
4102	FR-A700-EC (Inverter)	Inverter	SSCNETⅢ
4103	FR-A700-CHT (Inverter)	Inverter	SSCNETⅢ

*1 Refer to the FR-A800 series instruction manual for details.

ORIENTAL MOTOR (Vendor ID: 0003)

Identification code	Model	Remark	Network
2029	5-phase (ST)		SSCNETⅢ/H
202A	αSTEP (AZ)		SSCNETⅢ/H

CKD NIKKI DENSO (Vendor ID: 0008)

Identification code	Model	Remark	Network
0102	VCⅡ (Manufactured by CKD NIKKI DENSO CO., LTD.) (For linear stage)		SSCNETⅢ
0107	VCⅡ (Manufactured by CKD NIKKI DENSO CO., LTD.) (For direct drive motor)		SSCNETⅢ
0302	VPH (Manufactured by CKD NIKKI DENSO CO., LTD.) (For linear stage)		SSCNETⅢ
0307	VPH (Manufactured by CKD NIKKI DENSO CO., LTD.) (For direct drive motor)		SSCNETⅢ
1000	VCⅡ (Manufactured by CKD NIKKI DENSO CO., LTD.)		SSCNETⅢ/H
1300	VPH (Manufactured by CKD NIKKI DENSO CO., LTD.)		SSCNETⅢ/H

IAI (Vendor ID: 000A)

Identification code	Model	Remark	Network
2001	IAI electric actuator controller		SSCNETⅢ/H

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 482 Servo network composition parameters

Servo network composition parameters of the RD77GF

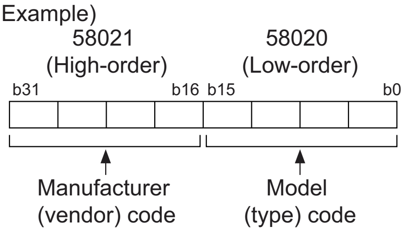
n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		**Setting details**	**Default value**	**Buffer memory address**	
				Axis 1 to axis 16	**Axis 17 to axis 32**
[Pr.100]	Connected device	Used to set the slave device supporting the motion mode for which axis control is performed by the Simple Motion module. [POINT] • Be sure to set up the connected device. Axes cannot be controlled by the initial value "0" in default value.	0	58020+32n 58021+32n	1058020+32n 1058021+32n
[Pr.101]	Virtual servo amplifier setting	Used to set if use as virtual servo amplifier axis.	0	58022+32n	1058022+32n

[Pr.100] Connected device

■Identification code

Set the slave device supporting the motion mode for which axis control is performed by the Simple Motion module.



Refer to the manual of each slave device for the manufacturer (vendor) code.

Point

- For the slave device for which axis control is performed by the Simple Motion module, the synchronous communication is valid regardless of the setting of "Network Synchronous Communication" in the network configuration settings of the engineering tool.
- Set the slave device for which axis control is performed by the Simple Motion module within the range from 1 to maximum number of control axes in the network configuration settings of the engineering tool.

When a setting value different from the value of the connected device is set or a slave device which does not operate in the motion mode is connected, the error "Connected device setting error" (error code: 193EH) is output.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 482 Servo network composition parameters

[Pr.101] Virtual servo amplifier setting

Set if use as virtual servo amplifier axis.

0: Use real servo amplifier

1: Use as virtual servo amplifier

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 482 Servo network composition parameters

Common parameters

<table>
<tr><th rowspan="2">Item</th><th colspan="3">Setting value, setting range</th><th rowspan="2">Default value</th><th rowspan="2">Buffer memory address</th></tr>
<tr><th colspan="2">Value set with the engineering tool</th><th>Value set with a program</th></tr>
<tr><td rowspan="4">[Pr.24]
Manual pulse generator/ Incremental synchronous encoder input selection [RD77MS]</td><td colspan="2">0: A-phase/B-phase multiplied by 4</td><td>0</td><td rowspan="4">0</td><td rowspan="4">33</td></tr>
<tr><td colspan="2">1: A-phase/B-phase multiplied by 2</td><td>1</td></tr>
<tr><td colspan="2">2: A-phase/B-phase multiplied by 1</td><td>2</td></tr>
<tr><td colspan="2">3: pulse/SIGN</td><td>3</td></tr>
<tr><td rowspan="4">[Pr.82]
Forced stop valid/invalid selection</td><td colspan="2">0: Valid (External input signal) [RD77MS]</td><td>0</td><td rowspan="4">0 [RD77MS]
1 [RD77GF]</td><td rowspan="4">35</td></tr>
<tr><td colspan="2">1: Invalid</td><td>1</td></tr>
<tr><td colspan="2">2: Valid (Buffer memory)</td><td>2</td></tr>
<tr><td colspan="2">3: Valid (Link device) [RD77GF]</td><td>3</td></tr>
<tr><td rowspan="2">[Pr.89]
Manual pulse generator/ Incremental synchronous encoder input type selection [RD77MS]</td><td colspan="2">0: Differential output type</td><td>0</td><td rowspan="2">1</td><td rowspan="2">67</td></tr>
<tr><td colspan="2">1: Voltage output/open collector type</td><td>1</td></tr>
<tr><td rowspan="9">[Pr.96]
Operation cycle setting</td><td colspan="2">0000H: 0.888 ms [RD77MS]</td><td>0000H [RD77MS]</td><td rowspan="9">FFFFH</td><td rowspan="9">105</td></tr>
<tr><td colspan="2">0001H: 1.777 ms [RD77MS]</td><td>0001H [RD77MS]</td></tr>
<tr><td colspan="2">0002H: 3.555 ms [RD77MS]</td><td>0002H [RD77MS]</td></tr>
<tr><td colspan="2">0200H: 0.444 ms [RD77MS]</td><td>0200H [RD77MS]</td></tr>
<tr><td colspan="2">0021H: 0.50 ms [RD77GF]</td><td>0021H [RD77GF]</td></tr>
<tr><td colspan="2">0022H: 1.00 ms [RD77GF]</td><td>0022H [RD77GF]</td></tr>
<tr><td colspan="2">0023H: 2.00 ms [RD77GF]</td><td>0023H [RD77GF]</td></tr>
<tr><td colspan="2">0024H: 4.00 ms [RD77GF]</td><td>0024H [RD77GF]</td></tr>
<tr><td colspan="2">FFFFH: Automatic setting</td><td>FFFFH</td></tr>
<tr><td rowspan="2">[Pr.97]
SSCNET setting [RD77MS]</td><td colspan="2">0: SSCNETⅢ</td><td>0</td><td rowspan="2">1</td><td rowspan="2">106</td></tr>
<tr><td colspan="2">1: SSCNETⅢ/H</td><td>1</td></tr>
<tr><td rowspan="3">[Pr.150]
Input terminal logic selection [RD77MS]</td><td>b0: SIN1</td><td rowspan="3">0: ON at leading edge
1: ON at trailing edge</td><td rowspan="3">0
1</td><td rowspan="3">0</td><td rowspan="3">58000, 58001</td></tr>
<tr><td>to</td></tr>
<tr><td>b19: SIN20</td></tr>
<tr><td rowspan="2">[Pr.151]
Manual pulse generator/ Incremental synchronous encoder input logic selection [RD77MS]</td><td colspan="2">0: Negative logic</td><td>0</td><td rowspan="2">0</td><td rowspan="2">58002</td></tr>
<tr><td colspan="2">1: Positive logic</td><td>1</td></tr>
<tr><td rowspan="2">[Pr.152]
Maximum number of control axes</td><td colspan="2">0: No setting</td><td>0</td><td rowspan="2">0</td><td rowspan="2">58003</td></tr>
<tr><td colspan="2">1 to maximum number of control axes</td><td>1 to maximum number of control axes</td></tr>
<tr><td rowspan="7">[Pr.153]
External input signal digital filter setting [RD77MS]</td><td colspan="2">0H: 3.2 ms</td><td>0H</td><td rowspan="7">6666H</td><td rowspan="7">58004
58005
58006
58007
58008</td></tr>
<tr><td colspan="2">1H: 2.4 ms</td><td>1H</td></tr>
<tr><td colspan="2">2H: 1.6 ms</td><td>2H</td></tr>
<tr><td colspan="2">3H: 1.2 ms</td><td>3H</td></tr>
<tr><td colspan="2">4H: 0.8 ms</td><td>4H</td></tr>
<tr><td colspan="2">5H: 0.4 ms</td><td>5H</td></tr>
<tr><td colspan="2">6H: 0.2 ms</td><td>6H</td></tr>
<tr><td>[Pr.155]
Q series compatible function setting [RD77MS]</td><td>bit0: Servo parameter transfer setting at PLC ready [Y0] ON</td><td>0: Invalid
1: Valid</td><td>0
1</td><td>0000H</td><td>58010</td></tr>
</table>

[Pr.24] Manual pulse generator/Incremental synchronous encoder input selection [RD77MS]

Set the manual pulse generator/incremental synchronous encoder input pulse mode.

Manual pulse generator/Incremental synchronous encoder input selection	Setting value
A-phase/B-phase multiplied by 4	0
A-phase/B-phase multiplied by 2	1
A-phase/B-phase multiplied by 1	2
pulse/SIGN	3

Set the positive logic or negative logic in "[Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection".

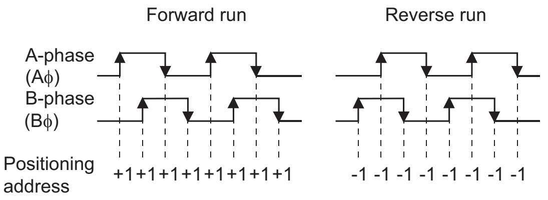
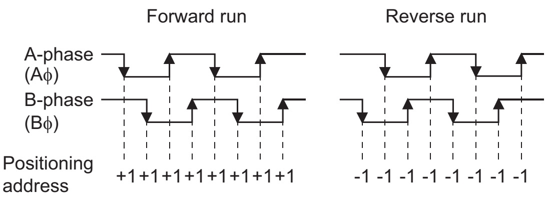
■A-phase/B-phase mode

When the A-phase is 90° ahead of the B-phase, the motor will forward run.

When the B-phase is 90° ahead of the A-phase, the motor will reverse run.

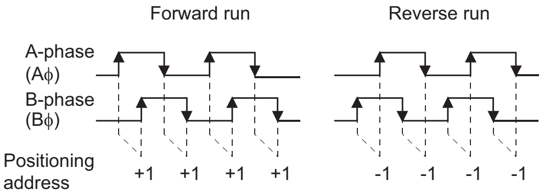
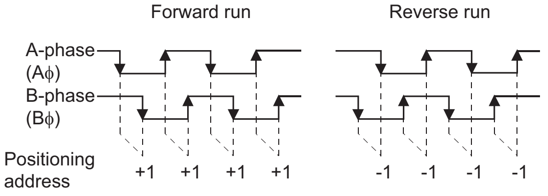
- A-phase/B-phase multiplied by 4

The positioning address increases or decreases at rising or falling edges of A-phase/B-phase.

<table>
<tr><th colspan="2">[Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection</th></tr>
<tr><th>Positive logic</th><th>Negative logic</th></tr>
<tr><td> </td><td> </td></tr>
</table>

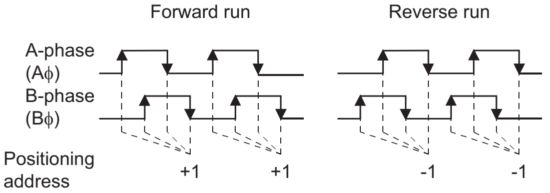
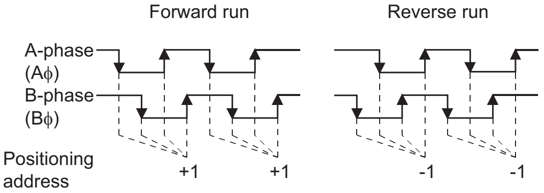
- A-phase/B-phase multiplied by 2

The positioning address increases or decreases at twice rising or twice falling edges of A-phase/B-phase.

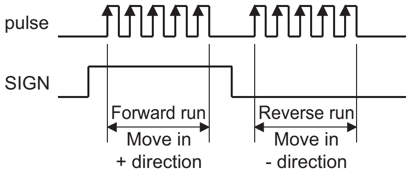
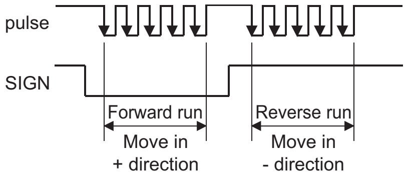
<table>
<tr><th colspan="2">[Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection</th></tr>
<tr><th>Positive logic</th><th>Negative logic</th></tr>
<tr><td> </td><td> </td></tr>
</table>

- A-phase/B-phase multiplied by 1

The positioning address increases or decreases at twice rising or twice falling edges of A-phase/B-phase.

<table>
<tr><th colspan="2">[Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection</th></tr>
<tr><th>Positive logic</th><th>Negative logic</th></tr>
<tr><td> </td><td> </td></tr>
</table>

■pulse/SIGN

[Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection	
Positive logic	**Negative logic**
Forward run and reverse run are controlled with the ON/OFF of the direction sign (SIGN). The motor will forward run when the direction sign is HIGH. The motor will reverse run when the direction sign is LOW.	Forward run and reverse run are controlled with the ON/OFF of the direction sign (SIGN). The motor will forward run when the direction sign is LOW. The motor will reverse run when the direction sign is HIGH.
	

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 469 Common parameters

[Pr.82] Forced stop valid/invalid selection

Set the forced stop valid/invalid.

All axes of the servo amplifier are made to batch forced stop when the forced stop input signal is turned on after the forced stop valid/invalid selection is set to "0: Valid (External input signal)", "2: Valid (Buffer memory)", or "3: Valid (Link device)". The error "Servo READY signal OFF during operation" (error code: 1902H) does not occur if the forced input signal is turned on during operation.

Forced stop valid/invalid selection	Setting value
"Valid (External input signal)" (Forced stop from the external input signal is used.) [RD77MS]	0
"Invalid" (Forced stop is not used.)	1
"Valid (Buffer memory)" (Forced stop from the buffer memory is used.)	2
"Valid (Link device)" (Forced stop from the link device is used.) [RD77GF]	3

Point

- If the setting is other than 0 to 3, the error "Forced stop valid/invalid setting error" (error code: 1B71H) occurs.
- The "[Md.50] Forced stop input" is stored "1" by setting "Forced stop valid/invalid selection" to invalid.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 469 Common parameters

[Pr.89] Manual pulse generator/Incremental synchronous encoder input type selection [RD77MS]

Set the input type from the manual pulse generator/incremental synchronous encoder.

Manual pulse generator/Incremental synchronous encoder input type selection	Setting value
Differential output type	0
Voltage output/open collector type	1

Refer to "External Input Connection Connector of the RD77MS" in the following manual for details of the input type.
📖MELSEC iQ-R Simple Motion Module User's Manual (Startup)

Point

The "Manual pulse generator/Incremental synchronous encoder input type selection" is included in common parameters. However, it will be valid at the leading edge (OFF to ON) of the PLC READY signal [Y0].

■Buffer memory address

Refer to the following for the buffer memory address in this area.
☞ Page 469 Common parameters

[Pr.96] Operation cycle setting

Set the operation cycle.

Operation cycle setting		Setting value
0.888 ms	[RD77MS]	0000H
1.777 ms		0001H
3.555 ms		0002H
0.444 ms[*1]		0200H
0.50 ms	[RD77GF]	0021H
1.00 ms		0022H
2.00 ms		0023H
4.00 ms		0024H
Automatic setting		FFFFH

[*1] Available only when "1: SSCNETⅢ/H" is set in "[Pr.97] SSCNET setting". If "0: SSCNETⅢ" is set, the error "Operation cycle setting error" (error code: 1B73H) occurs.

Point

- In this parameter, the value set in flash ROM of Simple Motion module is valid at power supply ON or CPU module reset. Fetch by PLC READY signal [Y0] OFF to ON is not executed. Execute flash ROM writing to change after setting a value to buffer memory. Confirm the current operation cycle in "[Md.132] Operation cycle setting".
- Confirm that "[Md.133] Operation cycle over flag" does not turn ON or the warning "Inter-module synchronization cycle time over [RD77MS]" or "Synchronization cycle time over [RD77GF]" (warning code: 0CC0H) does not occur. If the operation cycle over flag or the warning "Inter-module synchronization cycle time over [RD77MS]" or "Synchronization cycle time over [RD77GF]" (warning code: 0CC0H) is detected, correct the positioning content or increase the operation cycle.

[RD77MS]

When "FFFFH: Automatic setting" is set, the optimum operation cycle is set according to "[Pr.152] Maximum number of control axes". Confirm the set operation cycle in "[Md.132] Operation cycle setting".

"[Md.133] Operation cycle over flag" may turn ON depending on the positioning content. In this case, confirm "[Md.135] Maximum operation time" and change the operation cycle setting.

[Pr.97] SSCNET setting	[Pr.152] Maximum number of control axes	Operation cycle
SSCNETⅢ/H	1 to 4	0.444 ms
	5 to 8	0.888 ms
	9 to 16	1.777 ms
SSCNETⅢ	1 to 8	0.888 ms
	9 to 16	1.777 ms

[RD77GF]

When the inter-module synchronization is used, "[Pr.96] Operation cycle setting" is ignored and the operation cycle is operated with the inter-module synchronization cycle.

When the inter-module synchronization is not used and "FFFFH: Automatic setting" is set in "[Pr.96] Operation cycle setting", the operation cycle is set to 4.00 ms.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 469 Common parameters

[Pr.97] SSCNET setting [RD77MS]

Set the servo network.

SSCNET setting	Setting value
SSCNETⅢ	0
SSCNETⅢ/H	1

The connectable servo amplifier differs by this parameter. When unconnectable connected device is set in "[Pr.100] Connected device", the warning "Incompatible device" (warning code: 0C81H) occurs at the power supply ON or PLC READY signal [Y0] ON.

Point

In this parameter, the value set in flash ROM of Simple Motion module is valid at power supply ON or CPU module reset. Fetch by PLC READY signal [Y0] OFF to ON is not executed. Execute flash ROM writing to change after setting a value to buffer memory.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 469 Common parameters

[Pr.150] Input terminal logic selection [RD77MS]

Set the external input signal logic (upper/lower limit signal, stop signal, proximity dog signal, and external command/switching signal) from the external device of the Simple Motion module.

Input terminal logic selection	Setting value
ON at leading edge (When the current is flowed through the input signal terminal: ON, When the current is not flowed through the input signal terminal: OFF)	0
ON at trailing edge (When the current is flowed through the input signal terminal: OFF, When the current is not flowed through the input signal terminal: ON)	1

■RD77MS2

Bit	Input terminal	Bit	Input terminal
b0	SIN1	b5	SIN6
b1	SIN2	b6	SIN7
b2	SIN3	b7	SIN8
b3	SIN4	b8	SIN9
b4	SIN5	b9	SIN10

■RD77MS4/8/16

Bit	Input terminal	Bit	Input terminal
b0	SIN1	b10	SIN11
b1	SIN2	b11	SIN12
b2	SIN3	b12	SIN13
b3	SIN4	b13	SIN14
b4	SIN5	b14	SIN15
b5	SIN6	b15	SIN16
b6	SIN7	b16	SIN17
b7	SIN8	b17	SIN18
b8	SIN9	b18	SIN19
b9	SIN10	b19	SIN20

Point

A mismatch in the setting may disable normal operation. Be careful when changing the default value.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 469 Common parameters

[Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection [RD77MS]

Set the input signal logic from the manual pulse generator/incremental synchronous encoder.

Manual pulse generator/Incremental synchronous encoder input logic selection	Setting value
Negative logic	0
Positive logic	1

Refer to the following for the negative logic/positive logic.

☞ Page 500 [Pr.24] Manual pulse generator/Incremental synchronous encoder input selection [RD77MS]

Point

A mismatch in the signal logic will disable normal operation. Be careful of this when you change from the default value.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 469 Common parameters

[Pr.152] Maximum number of control axes

Set the maximum number of control axes.

Maximum number of control axes	Setting value
[RD77MS] No setting (Controls with the maximum number of control axes for each module.) [RD77GF] Automatic setting (The maximum value of the axis No., whose setting of "[Pr.100] Connected device" is valid, is set to the maximum number of control axes. When the settings of axis 2, 15 and 29 are valid, the maximum number of control axes is set to 29 axes. If the settings of axes are all invalid, the maximum number of control axes is set to 1 axis.)	0
Maximum number of control axes (Controls the axes until the set axis No.)	1 to maximum number of control axes[1]

[1] The maximum number of control axes for each module is as follows.
RD77MS: 16
RD77GF: 32

- When the maximum number of control axes exceeds the maximum number of control axes of the Simple Motion module (such as when setting "3" for the 2-axis module), the warning "Outside maximum number of control axes" (warning code: 093AH) occurs and the module is controlled as set with "0: No setting". (The warning occurs in the axis 1.)
- When "[Pr.100] Connected device" is set with a value other than "0: No setting" in the axis which is out of the maximum number of control axes, the warning "Outside control axis setting" (warning code: 093BH) occurs to these axes and the axes does not communicate with servo amplifiers. (The servo amplifier's LED display remains "Ab".)

Point

- In this parameter, the value set in flash ROM of Simple Motion module is valid at power supply ON or CPU module reset. Fetch by PLC READY signal [Y0] OFF to ON is not executed. Execute flash ROM writing to change the value after setting a value to buffer memory. (It is necessary to establish the value at power supply ON or CPU module reset.)
- The servo input axis (synchronous control) and virtual servo amplifier of the axes which are out of the maximum number of control axes are out of the target.
- This parameter is used when the number of actual used control axes is less than the maximum number of control axes of each module and to suppress the operation cycle.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

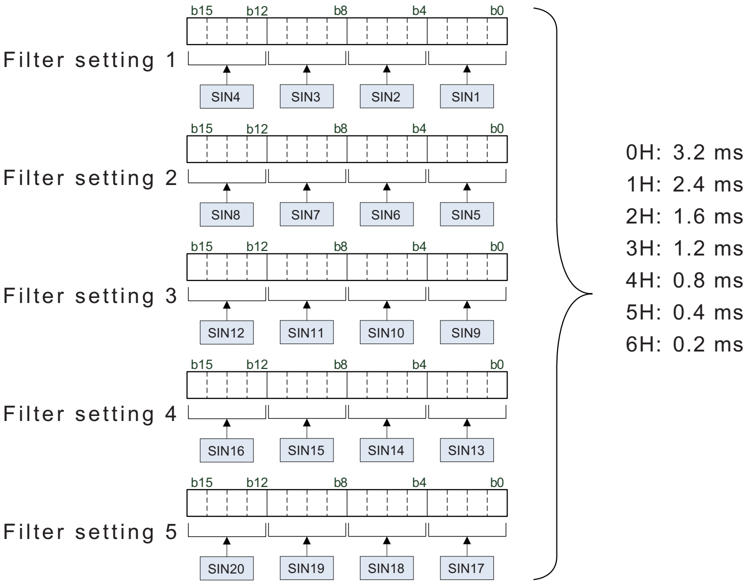
☞ Page 469 Common parameters

[Pr.153] External input signal digital filter setting [RD77MS]

Set the digital filter for each input signal (SIN1 to SIN20).

Point

- This parameter is used to suppress chattering when the external input signal is chattering by noise, etc.
- When lengthening the filter setting time, the signal detection timing will be slow.



■Precaution

- When a value other than "0 to 6" is set, note that the module may cause a failure.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 469 Common parameters

[Pr.155] Q series compatible function setting [RD77MS]

Set valid/invalid of the Q series compatible function.

■bit0: Servo parameter transmission setting at PLC READY signal [Y0] ON

Set whether transmitting the servo parameters to the servo amplifier or not at PLC READY signal [Y0] ON.

0: Invalid

1: Valid

The target servo parameters are as follows.

- Auto tuning mode (PA08)
- Auto tuning response (PA09)
- Feed forward gain (PB04)
- Load to motor inertia ratio/load to motor mass ratio (PB06)
- Model loop gain (PB07)
- Position loop gain (PB08)
- Speed loop gain (PB09)
- Speed integral compensation (PB10)
- Speed differential compensation (PB11)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 469 Common parameters

Basic parameters1

This section describes the details on the basic parameter 1.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		Setting value, setting range		Default value	Buffer memory address	
		Value set with the engineering tool	Value set with a program		Axis 1 to axis 16	Axis 17 to axis 32
[Pr.1] Unit setting		0: mm	0	3	0+150n	1000000+150n
		1: inch	1			
		2: degree	2			
		3: pulse	3			
Movement amount per pulse	[Pr.2] Number of pulses per rotation (AP) (Unit: pulse)	1 to 200000000	1 to 200000000	20000	2+150n 3+150n	1000002+150n 1000003+150n
	[Pr.3] Movement amount per rotation (AL)	The setting value range differs according to the "[Pr.1] Unit setting".		20000	4+150n 5+150n	1000004+150n 1000005+150n
	[Pr.4] Unit magnification (AM)	1: 1 times	1	1	1+150n	1000001+150n
		10: 10 times	10			
		100: 100 times	100			
		1000: 1000 times	1000			
[Pr.7] Bias speed at start		The setting value range differs according to the "[Pr.1] Unit setting".		0	6+150n 7+150n	1000006+150n 1000007+150n

[Pr.1] Unit setting

Set the unit used for defining positioning operations. Choose from the following units depending on the type of the control target: mm, inch, degree, or pulse. Different units can be defined for different axes.

Ex.

Different units (mm, inch, degree, and pulse) are applicable to different systems:

- mm or inch: X-Y table, conveyor (Select mm or inch depending on the machine specifications.)
- degree: Rotating body (360 degrees/rotation)
- pulse: X-Y table, conveyor

Point

- When you change the unit, note that the values of other parameters and data will not be changed automatically.
  After changing the unit, check if the parameter and data values are within the allowable range.
- Set "2: degree" to exercise speed-position switching control (ABS mode).
- Set "2: degree", when executing unlimited length feed in the absolute system.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 469 Positioning parameters: Basic parameters 1

[Pr.2] to [Pr.4] Electronic gear (Movement amount per pulse)

Mechanical system value used when the Simple Motion module performs positioning control.

The settings are made using [Pr.2] to [Pr.4].

The electronic gear is expressed by the following equation.

$$\text{Electronic gear} = \frac{\text{[Pr.2] Number of pulses per rotation (AP)}}{\text{[Pr.3] Movement amount per rotation (AL)} \times \text{[Pr.4] Unit magnification (AM)}}$$

When positioning has been performed, an error (mechanical system error) may be produced between the specified movement amount and the actual movement amount.

The error can be compensated by adjusting the value set in electronic gear.

☞ Page 238 Electronic gear function

Point

- Set the electronic gear within the following range. If the value outside the setting range is set, the error "Outside electronic gear setting range" (error code: 1A68H) will occur.

$$0.001 \leq \text{Electronic gear} \left(\frac{\text{AP}}{\text{AL} \times \text{AM}} \right) \leq 320000$$

- The result of below calculation (round up after decimal point) is a minimum pulse when the command position value is updated at follow up processing. (The movement amount for droop pulse is reflected as the command position value when the droop pulse becomes more than above calculated value in pulse unit of motor end.)

[Pr.2]Number of pulses per rotation (AP) / ([Pr.3] Movement amount per rotation (AL) × [Pr.4] Unit magnification (AM)) [pulse]

Refer to the following for the follow up processing.

☞ Page 325 Follow up function

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 469 Positioning parameters: Basic parameters 1

[Pr.2] Number of pulses per rotation (AP)

Set the number of pulses required for a complete rotation of the motor shaft.

If you are using the Mitsubishi servo amplifier MR-J4(W)-B/MR-JE-B(F)/MR-J3(W)-B, set the value given as the "resolution per servo motor rotation" in the speed/position detector specifications.

Number of pulses per rotation (AP) = Resolution per servo motor rotation

When using MR-J5(W)-B, refer to the following.

☞ Page 238 Electronic gear function

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 469 Positioning parameters: Basic parameters 1

[Pr.3] Movement amount per rotation (AL), [Pr.4] Unit magnification (AM)

The amount how the workpiece moves with one motor rotation is determined by the mechanical structure.

If the worm gear lead (μm/rev) is PB and the deceleration rate is 1/n, then

Movement amount per rotation (AL) = PB × 1/n

However, the maximum value that can be set for this "movement amount per rotation (AL)" parameter is 20000000.0 μm (20 m). Set the "movement amount per rotation (AL)" as shown below so that the "movement amount per rotation (AL)" does not exceed this maximum value.

Movement amount per rotation (AL)

= PB × 1/n

= Movement amount per rotation (AL) × Unit magnification (AM)[1]

[1] The unit magnification (AM) is a value of 1, 10, 100 or 1000. If the "PB × 1/n" value exceeds 20000000.0 μm (20 m), adjust with the unit magnification so that the "movement amount per rotation (AL)" does not exceed 20000000.0 μm (20 m).

[Pr.1] setting value	Value set with the engineering tool (unit)	Value set with a program (unit)
0: mm	0.1 to 20000000.0 (μm)	1 to 200000000 (× 10^{-1} μm)
1: inch	0.00001 to 2000.00000 (inch)	1 to 200000000 (× 10^{-5} inch)
2: degree	0.00001 to 2000.00000 (degree)	1 to 200000000 (× 10^{-5} degree)
3: pulse	1 to 200000000 (pulse)	1 to 200000000 (pulse)

Refer to the following for information about electric gear.

☞ Page 238 Electronic gear function

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 469 Positioning parameters: Basic parameters 1

[Pr.7] Bias speed at start

Set the bias speed (minimum speed) upon starting. When using a stepping motor, etc., set it to start the motor smoothly. (If the motor speed at start is low, the stepping motor does not start smoothly.)

The specified "bias speed at start" will be valid during the following operations:

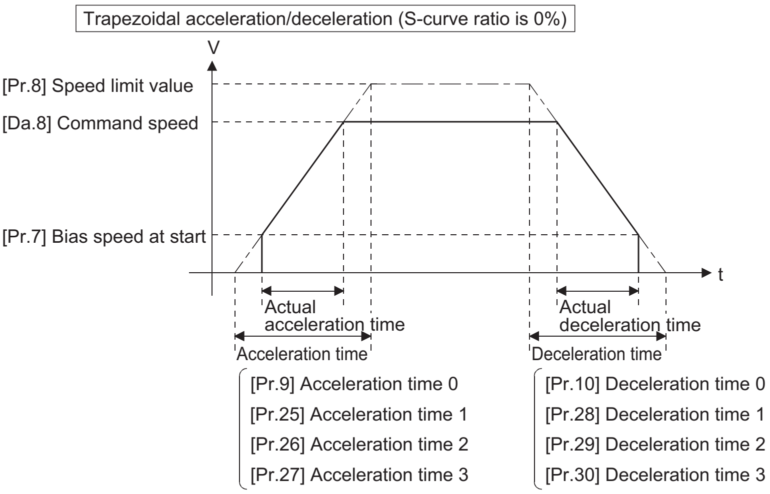
- Positioning operation
- Home position return operation
- JOG operation

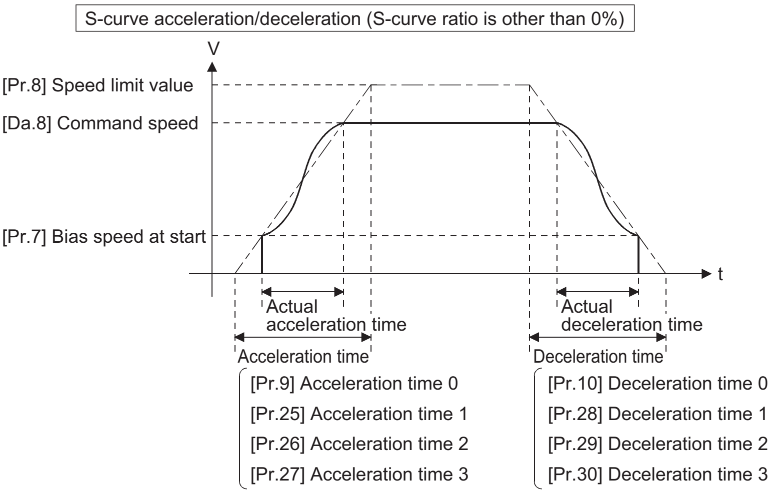
Set the value that the bias speed should not exceed "[Pr.8] Speed limit value".

[Pr.1] setting value	Value set with the engineering tool (unit)	Value set with a program (unit)
0: mm	0.00 to 20000000.00 (mm/min)	0 to 2000000000 (× 10^{-2} mm/min)
1: inch	0.000 to 2000000.000 (inch/min)	0 to 2000000000 (× 10^{-3} inch/min)
2: degree	0.000 to 2000000.000 (degree/min)*1	0 to 2000000000 (× 10^{-3} degree/min)*2
3: pulse	0 to 1000000000 (pulse/s)	0 to 1000000000 (pulse/s)

*1 Range of speed limit value when "[Pr.83] Speed control 10 × multiplier setting for degree axis" is set to valid: 0.00 to 20000000.00 (degree/min)

*2 Range of speed limit value when "[Pr.83] Speed control 10 × multiplier setting for degree axis" is set to valid: 0 to 2000000000 (× 10^{-2} degree/min)





Point

For the 2-axis or more interpolation control, the bias speed at start is applied by the setting of "[Pr.20] Interpolation speed designation method".

- "0: Composite speed": Bias speed at start set to the reference axis is applied to the composite command speed.
- "1: Reference axis speed": Bias speed at start is applied to the reference axis.

■Precautionary notes

- "[Pr.7] Bias speed at start" is valid regardless of motor type. Set "0" when using the motor other than the stepping motor. Otherwise, it may cause vibration or impact even though an error does not occur.
- Set "[Pr.7] Bias speed at start" according to the specification of stepping motor driver. If the setting is outside the range, it may cause the following troubles by rapid speed change or overload.

- Stepping motor steps out.
- An error occurs in the stepping motor driver.

- In synchronous control, when "[Pr.7] Bias speed at start" is set to the servo input axis, the bias speed at start is applied to the servo input axis. Note that the unexpected operation might be generated to the output axis.
- Set "[Pr.7] Bias speed at start" within the following range.

"[Pr.8] Speed limit value" ≥ "[Pr.46] Home position return speed" ≥ "[Pr.47] Creep speed" ≥ "[Pr.7] Bias speed at start"

- If the data ("[Da.8] Command speed" of positioning data, "[Da.8] Command speed" of next point for continuous path control, or "[Cd.14] New speed value" for speed change function) is less than "[Pr.7] Bias speed at start", the warning "Below bias speed" (warning code: 0908H) will occur and it will operate at "[Pr.7] Bias speed at start".
- When using S-curve acceleration/deceleration processing and bias speed at start together, S-curve acceleration/deceleration processing is carried out based on the acceleration/deceleration time set by user, "[Pr.8] Speed limit value" and "[Pr.35] S-curve ratio" (1 to 100%) in the section of acceleration/deceleration from bias speed at start to command speed.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 469 Positioning parameters: Basic parameters 1

Basic parameters2

This section describes the details on the basic parameter 2.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item	Setting value, setting range		Default value	Buffer memory address	
	Value set with the engineering tool	Value set with a program		Axis 1 to axis 16	Axis 17 to axis 32
[Pr.8] Speed limit value	The setting range differs depending on the "[Pr.1] Unit setting".		200000	10+150n 11+150n	1000010+150n 1000011+150n
[Pr.9] Acceleration time 0	1 to 8388608 (ms)	1 to 8388608 (ms)	1000	12+150n 13+150n	1000012+150n 1000013+150n
[Pr.10] Deceleration time 0	1 to 8388608 (ms)	1 to 8388608 (ms)	1000	14+150n 15+150n	1000014+150n 1000015+150n

[Pr.8] Speed limit value

Set the maximum speed during positioning, home position return and speed-torque operations.

[Pr.1] setting value	Value set with the engineering tool (unit)	Value set with a program (unit)
0: mm	0.01 to 20000000.00 (mm/min)	1 to 2000000000 (× 10^{-2} mm/min)
1: inch	0.001 to 2000000.000 (inch/min)	1 to 2000000000 (× 10^{-3} inch/min)
2: degree	0.001 to 2000000.000 (degree/min)[*1]	1 to 2000000000 (× 10^{-3} degree/min)[*2]
3: pulse	1 to 1000000000 (pulse/s)	1 to 1000000000 (pulse/s)

[*1] Range of speed limit value when "[Pr.83] Speed control 10 × multiplier setting for degree axis" is set to valid: 0.01 to 20000000.00 (degree/min).

[*2] Range of speed limit value when "[Pr.83] Speed control 10 × multiplier setting for degree axis" is set to valid: 1 to 2000000000 (× 10^{-2} degree/min)

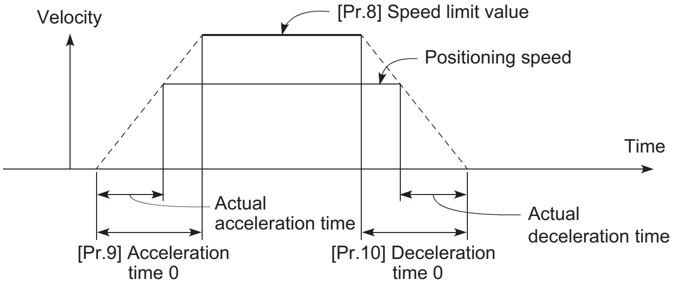
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 470 Positioning parameters: Basic parameters 2

[Pr.9] Acceleration time 0, [Pr.10] Deceleration time 0

"[Pr.9] Acceleration time 0" specifies the time for the speed to increase from zero to the "[Pr.8] Speed limit value" ("[Pr.31] JOG speed limit value" at JOG operation control). "[Pr.10] Deceleration time 0" specifies the time for the speed to decrease from the "[Pr.8] Speed limit value" ("[Pr.31] JOG speed limit value" at JOG operation control) to zero.



- If the positioning speed is set lower than the parameter-defined speed limit value, the actual acceleration/deceleration time will be relatively short. Thus, set the maximum positioning speed equal to or only a little lower than the parameter-defined speed limit value.
- These settings are valid for home position return, positioning and JOG operations.
- When the positioning involves interpolation, the acceleration/deceleration time defined for the reference axis is valid.

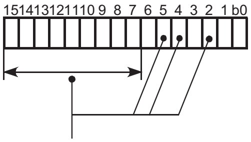
■Buffer memory address

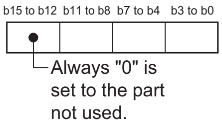
Refer to the following for the buffer memory address in this area.

☞ Page 470 Positioning parameters: Basic parameters 2

Detailed parameters1

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item	Setting value, setting range		Default value	Buffer memory address	
	Value set with the engineering tool	Value set with a program		Axis 1 to axis 16	Axis 17 to axis 32
[Pr.11] Backlash compensation amount	The setting value range differs according to the "[Pr.1] Unit setting".		0	17+150n	1000017+150n
[Pr.12] Software stroke limit upper limit value			2147483647	18+150n 19+150n	1000018+150n 1000019+150n
[Pr.13] Software stroke limit lower limit value			-2147483648	20+150n 21+150n	1000020+150n 1000021+150n
[Pr.14] Software stroke limit selection	0: Apply software stroke limit on command position value	0	0	22+150n	1000022+150n
	1: Apply software stroke limit on machine feed value	1			
[Pr.15] Software stroke limit valid/invalid setting	0: Software stroke limit valid during JOG operation, inching operation and manual pulse generator operation	0	0	23+150n	1000023+150n
	1: Software stroke limit invalid during JOG operation, inching operation and manual pulse generator operation	1			
[Pr.16] Command in-position width	The setting value range differs depending on the "[Pr.1] Unit setting".		100	24+150n 25+150n	1000024+150n 1000025+150n
[Pr.17] Torque limit setting value	0.1 to 1000.0 (%)	1 to 10000 (× 0.1%)	3000	26+150n	1000026+150n
[Pr.18] M code ON signal output timing	0: WITH mode	0	0	27+150n	1000027+150n
	1: AFTER mode	1			
[Pr.19] Speed switching mode	0: Standard speed switching mode	0	0	28+150n	1000028+150n
	1: Front-loading speed switching mode	1			
[Pr.20] Interpolation speed designation method	0: Composite speed	0	0	29+150n	1000029+150n
	1: Reference axis speed	1			
[Pr.21] Command position value during speed control	0: Do not update command position value	0	0	30+150n	1000030+150n
	1: Update command position value	1			
	2: Clear command position value to zero	2			
[Pr.22] Input signal logic selection	b0 Lower limit b1 Upper limit b2 Not used b3 Stop signal b4 Not used b5 Not used b6 Proximity dog signal b7 to b15 Not used 0: Negative logic 1: Positive logic	 Always "0" is set to the part not used.	0	31+150n	1000031+150n
[Pr.81] Speed-position function selection	0: Speed-position switching control (INC mode)	0	0	34+150n	1000034+150n
	2: Speed-position switching control (ABS mode)	2			

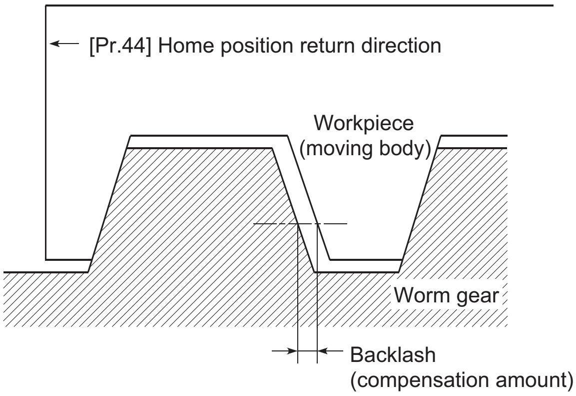
Item	Setting value, setting range		Default value	Buffer memory address	
	Value set with the engineering tool	Value set with a program		Axis 1 to axis 16	Axis 17 to axis 32
[Pr.116] FLS signal selection	b0 to b3: Input type 0 (0000H): Simple Motion module [RD77MS] 1 (0001H): Servo amplifier[1] 2 (0002H): Buffer memory 3 (0003H): Link device [RD77GF] 15 (000FH): Invalid b4 to b11: Input terminal [RD77MS] RD77MS: 01H to 0AH RD77MS4/8/16: 01H to 14H b12 to b15: Not used		0001H [RD77MS] 000FH [RD77GF]	116+150n	1000116+150n
[Pr.117] RLS signal selection			0001H [RD77MS] 000FH [RD77GF]	117+150n	1000117+150n
[Pr.118] DOG signal selection			0001H [RD77MS] 000FH [RD77GF]	118+150n	1000118+150n
[Pr.119] STOP signal selection			0002H	119+150n	1000119+150n

[1] The setting is not available in "[Pr.119] STOP signal selection".

[Pr.11] Backlash compensation amount

The error that occurs due to backlash when moving the machine via gears can be compensated.

(When the backlash compensation amount is set, commands equivalent to the compensation amount will be output each time the direction changes during positioning.)



- The backlash compensation is valid after machine home position return. Thus, if the backlash compensation amount is set or changed, always carry out machine home position return once.
- "[Pr.2] Number of pulses per rotation(AP)", "[Pr.3] Movement amount per rotation(AL)", "[Pr.4] Unit magnification(AM)" and "[Pr.11] Backlash compensation amount" which satisfies the following (1) can be set up.

$$0 \leq \frac{\text{([Pr.11] Backlash compensation amount)} \times \text{([Pr.2] Number of pulses per rotation (AP))}}{\text{([Pr.3] Movement amount per rotation (AL))} \times \text{([Pr.4] Unit magnification (AM))}} \text{(= A)} \leq 4194303 \text{ (pulse): (1)}$$

(round down after decimal point)

The error "Backlash compensation amount error" (error code: 1AA0H) occurs when the setting is outside the range of the calculation result of (1).

A servo alarm (error code: 2031, 2035, etc.) may occur by kinds of servo amplifier (servo motor), load inertia moment and the amount of command of a cycle time (Simple Motion module) even if the setting is within the calculation result of (1).

Reduce the setting value of "[Pr.11] Backlash compensation amount" or increase the operation cycle by "[Pr.96] Operation cycle setting" if a servo alarm occurs. Use the value of the following (2) as a measure that a servo alarm does not occur.

$$A \leq \frac{\text{(Motor instantaneous permissible speed (r/min))} \times \text{(Encoder resolution (pulse/rev))} \times \text{(Operation cycle (ms))}}{60 \text{ (s)} \times 1000 \text{ (ms)}} \text{(pulse): (2)}$$

The backlash compensation amount is output all at one operation cycle.

[Pr.1] setting value	Value set with the engineering tool (unit)	Value set with a program (unit)[*1]
0: mm	0 to 6553.5 (μm)	0 to 65535 ($\times 10^{-1}$ μm)
1: inch	0 to 0.65535 (inch)	0 to 65535 ($\times 10^{-5}$ inch)
2: degree	0 to 0.65535 (degree)	0 to 65535 ($\times 10^{-5}$ degree)
3: pulse	0 to 65535 (pulse)	0 to 65535 (pulse)

*1 0 to 32767: Set as a decimal
32768 to 65535: Convert into hexadecimal and set

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 470 Positioning parameters: Detailed parameters 1

[Pr.12] Software stroke limit upper limit value

Set the upper limit for the machine's movement range during positioning control.

[Pr.1] setting value	Value set with the engineering tool (unit)	Value set with a program (unit)
0: mm	-214748364.8 to 214748364.7 (μm)	-2147483648 to 2147483647 (× 10^{-1} μm)
1: inch	-21474.83648 to 21474.83647 (inch)	-2147483648 to 2147483647 (× 10^{-5} inch)
2: degree	0 to 359.99999 (degree)	0 to 35999999 (× 10^{-5} degree)
3: pulse	-2147483648 to 2147483647 (pulse)	-2147483648 to 2147483647 (pulse)

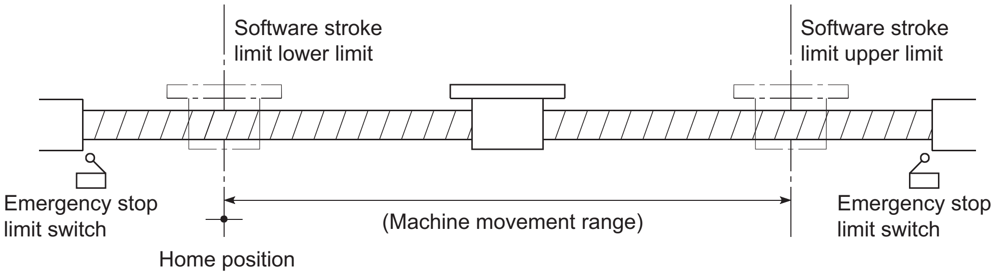
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 470 Positioning parameters: Detailed parameters 1

[Pr.13] Software stroke limit lower limit value

Set the lower limit for the machine's movement range during positioning control.



- Generally, the home position is set at the lower limit or upper limit of the stroke limit.
- By setting the upper limit value or lower limit value of the software stroke limit, overrun can be prevented in the software. However, an emergency stop limit switch must be installed nearby outside the range. To invalidate the software stroke limit, set the setting value to "upper limit value = lower limit value". (If it is within the setting range, the setting value can be anything.) When the unit is "degree", the software stroke limit check is invalid during speed control (including the speed control in speed-position and position-speed switching control) or during manual control.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 470 Positioning parameters: Detailed parameters 1

[Pr.14] Software stroke limit selection

Set whether to apply the software stroke limit on the "command position value" or the "machine feed value". The software stroke limit will be validated according to the set value. To invalidate the software stroke limit, set the setting value to "command position value".

When "2: degree" is set in "[Pr.1] Unit setting", set the setting value of software stroke limit to "command position value". The error "Software stroke limit selection" (error code: 1AA5H) will occur if "machine feed value" is set.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 470 Positioning parameters: Detailed parameters 1

[Pr.15] Software stroke limit valid/invalid setting

Set whether to validate the software stroke limit during JOG/Inching operation and manual pulse generator operation.

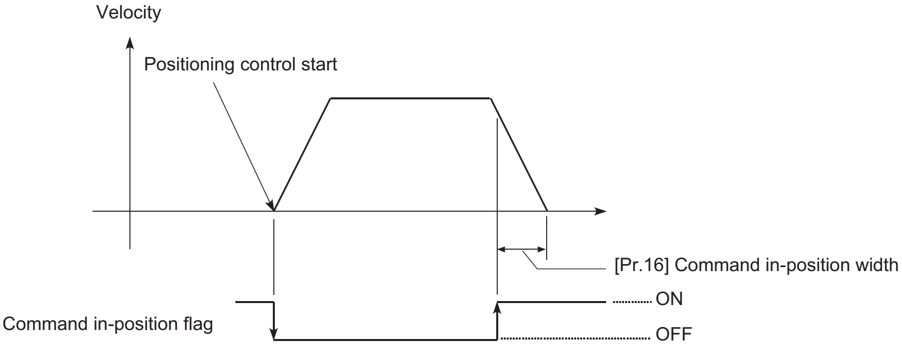
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 470 Positioning parameters: Detailed parameters 1

[Pr.16] Command in-position width

Set the remaining distance that turns the command in-position flag ON. When the remaining distance to the stop position during the automatic deceleration of positioning control becomes equal to or less than the value set in the command in-position width, the command in-position flag turns ON.



[Pr.1] setting value	Value set with the engineering tool (unit)	Value set with a program (unit)
0: mm	0.1 to 214748364.7 (μm)	1 to 2147483647 (× 10^{-1} μm)
1: inch	0.00001 to 21474.83647 (inch)	1 to 2147483647 (× 10^{-5} inch)
2: degree	0.00001 to 21474.83647 (degree)	1 to 2147483647 (× 10^{-5} degree)
3: pulse	1 to 2147483647 (pulse)	1 to 2147483647 (pulse)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 470 Positioning parameters: Detailed parameters 1

[Pr.17] Torque limit setting value

Set the maximum value of the torque generated by the servo motor as a percentage between 0.1 and 1000.0%.

The torque limit function limits the torque generated by the servo motor within the set range.

If the torque required for control exceeds the torque limit value, it is controlled with the set torque limit value.

☞ Page 249 Torque limit function

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 470 Positioning parameters: Detailed parameters 1

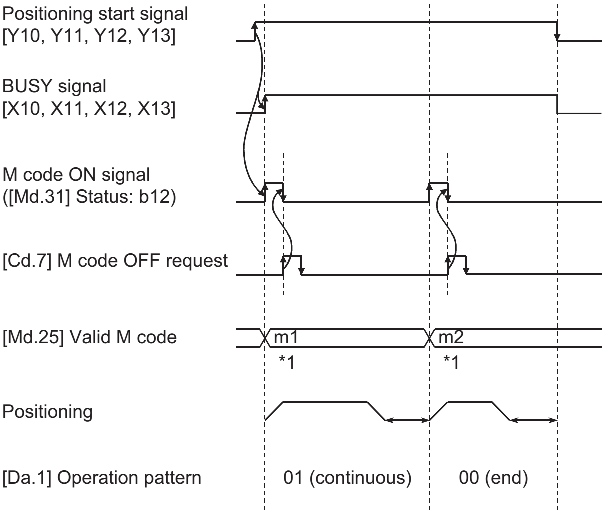
[Pr.18] M code ON signal output timing

This parameter sets the M code ON signal output timing.

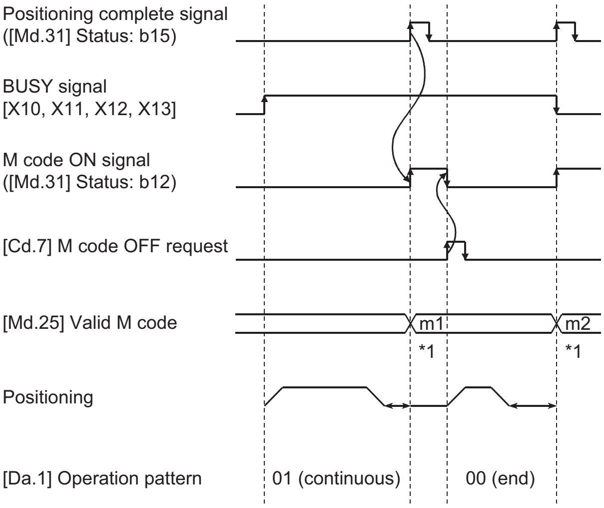
Choose either WITH mode or AFTER mode as the M code ON signal output timing.

■Operation example

WITH mode: An M code is output and the M code ON signal is turned ON when a positioning operation starts.



AFTER mode[*2]: An M code is output and the M code ON signal is turned ON when a positioning operation completes.



[*1] m1 and m2 indicate set M codes.

[*2] If AFTER mode is used with speed control, an M code will not be output and the M code ON signal will not be turned ON.

An M code is a number between 0 and 65535 that can be assigned to each positioning data ([Da.10]).

The program can be coded to read an M code from the buffer memory address specified by "[Md.25] Valid M code" whenever the M code ON signal turns ON so that a command for the sub work (e.g. clamping, drilling, or tool change) associated with the M code can be issued.

- The M code ON signal output timing can be set to each positioning data using the positioning option of the positioning data ([Da.27]).

■Buffer memory address

Refer to the following for the buffer memory address in this area.

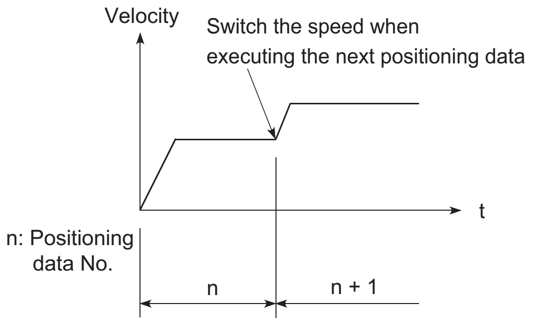
☞ Page 470 Positioning parameters: Detailed parameters 1

[Pr.19] Speed switching mode

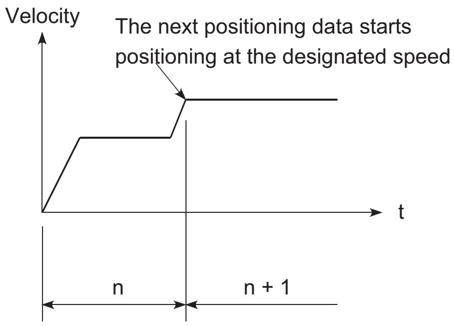
Set whether to switch the speed switching mode with the standard switching or front-loading switching mode.

- Speed of positioning data No.n > Speed of positioning data No.n + 1.
  The speed decelerates by deceleration time No. of positioning data No.n + 1.
- Speed of positioning data No.n < Speed of positioning data No.n + 1.
  The speed accelerates by acceleration time No. of positioning data No.n + 1.

Setting value	Details
0: Standard switching	Switch the speed when executing the next positioning data.
1: Front-loading switching	The speed switches at the end of the positioning data currently being executed.



<For standard switching>



<For front-loading switching>

■Buffer memory address

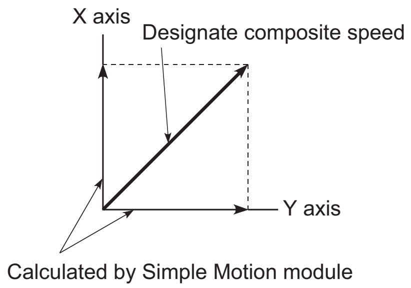
Refer to the following for the buffer memory address in this area.

☞ Page 470 Positioning parameters: Detailed parameters 1

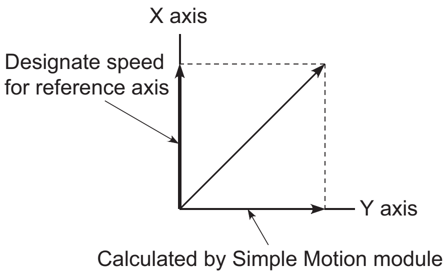
[Pr.20] Interpolation speed designation method

When carrying out linear interpolation/circular interpolation, set whether to designate the composite speed or reference axis speed.

Setting value	Details
0: Composite speed	The movement speed for the control target is designated, and the speed for each axis is calculated by the Simple Motion module.
1: Reference axis speed	The axis speed set for the reference axis is designated, and the speed for the other axis carrying out interpolation is calculated by the Simple Motion module.



<When composite speed is designated>



<When reference axis speed is designated>

Point

When the 4-axis linear interpolation or 2 to 4-axis speed control is performed, specify the reference axis speed.
If the composite speed is specified, the error "Interpolation mode error" (error code: 199AH) occurs when the positioning operation starts.
When the 2-axis circular interpolation control or 3-axis helical interpolation control is performed, specify the composite speed. If the reference axis speed is specified, the error "Interpolation mode error" (error code: 199BH) occurs when the positioning operation starts.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 470 Positioning parameters: Detailed parameters 1

[Pr.21] Command position value during speed control

Specify whether you wish to enable or disable the update of "[Md.20] Command position value" while operations are performed under the speed control (including the speed control in speed-position and position-speed switching control).

Setting value	Details
0: The update of the command position value is disabled	The command position value will not change. (The value at the beginning of the speed control will be kept.)
1: The update of the command position value is enabled	The command position value will be updated. (The command position value will change from the initial.)
2: The command position value is cleared to zero	The command position value will be set initially to zero and change from zero while the speed control is in effect.

Point

- When the speed control is performed over two to four axes, the choice between enabling and disabling the update of "[Md.20] Command position value" depends on how the reference axis is set.
- Set "1" to exercise speed-position switching control (ABS mode).

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 470 Positioning parameters: Detailed parameters 1

[Pr.22] Input signal logic selection

Set the input signal logic that matches the signaling specification of the external input signal (upper/lower limit switch, proximity dog) of servo amplifier connected to the Simple Motion module or "[Cd.44] External input signal operation device".

■Negative logic

- The current is not flowed through the input signal contact.

  - FLS, RLS: Limit signal ON
  - DOG, DI, STOP: Invalid

- The current is flowed through the input signal contact.

  - FLS, RLS: Limit signal OFF
  - DOG, DI, STOP: Valid

■Positive logic

Opposite the concept of negative logic.

Point

- A mismatch in the signal logic will disable normal operation. Be careful of this when you change from the default value.
- When using the servo amplifier input, the logic selection setting for FLS/RLS is ignored. (The LSP/LSN input is used for the MR-J4-GF.) [RD77GF]

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 470 Positioning parameters: Detailed parameters 1

[Pr.81] Speed-position function selection

Select the mode of speed-position switching control.

0: INC mode

2: ABS mode

Point

If the setting is other than 0 and 2, operation is performed in the INC mode with the setting regarded as 0.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 470 Positioning parameters: Detailed parameters 1

[Pr.116] to [Pr.119] FLS/RLS/DOG/STOP signal selection

■Input type

Set the input type whose external input signal (upper/lower limit signal (FLS/RLS), proximity dog signal (DOG) or stop signal (STOP)) is used.

0 (0000H): Simple Motion module (Uses the external input signal of the Simple Motion module.) [RD77MS]

1 (0001H): Servo amplifier[*1][*2] (Uses the external input signal of the servo amplifier.)

2 (0002H): Buffer memory (Uses the buffer memory of the Simple Motion module.)

3 (0003H): Link device (Uses link devices.) [RD77GF]

15 (000FH): Invalid (Does not use the external input signal.)

[*1] The setting is not available in "[Pr.119] STOP signal selection". If it is set, the error "STOP signal selection error" (error code: 1AD3H) occurs and the PLC READY signal [Y0] is not turned ON.

[*2] At MR-JE-B(F) use, refer to the following.

☞ Page 769 Connection with MR-JE-B(F)

■Input terminal [RD77MS]

When the input type is set with "0: Simple Motion module", set the input terminal. The setting is not required when the value other than "0" is set.

00H: No setting (The control by the external input signal is disabled.)

- [RD77MS2]

01H to 0AH: Set the input terminal.

- [RD77MS4/RD77MS8/RD77MS16]

01H to 14H: Set the input terminal.

Setting value	Pin No.	Input terminal	Setting value	Pin No.	Input terminal
01H	1A1	SIN1	0BH	2A1	SIN11
02H	1A2	SIN2	0CH	2A2	SIN12
03H	1A3	SIN3	0DH	2A3	SIN13
04H	1A4	SIN4	0EH	2A4	SIN14
05H	1A5	SIN5	0FH	2A5	SIN15
06H	1B1	SIN6	10H	2B1	SIN16
07H	1B2	SIN7	11H	2B2	SIN17
08H	1B3	SIN8	12H	2B3	SIN18
09H	1B4	SIN9	13H	2B4	SIN19
0AH	1B5	SIN10	14H	2B5	SIN20

■Buffer memory address

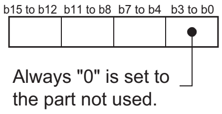
Refer to the following for the buffer memory address in this area.

☞ Page 470 Positioning parameters: Detailed parameters 1

Detailed parameters2

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item	Setting value, setting range		Default value	Buffer memory address	
	Value set with the engineering tool	Value set with a program		Axis 1 to axis 16	Axis 17 to axis 32
[Pr.25] Acceleration time 1	1 to 8388608 (ms)	1 to 8388608 (ms)	1000	36+150n 37+150n	1000036+150n 1000037+150n
[Pr.26] Acceleration time 2				38+150n 39+150n	1000038+150n 1000039+150n
[Pr.27] Acceleration time 3				40+150n 41+150n	1000040+150n 1000041+150n
[Pr.28] Deceleration time 1				42+150n 43+150n	1000042+150n 1000043+150n
[Pr.29] Deceleration time 2				44+150n 45+150n	1000044+150n 1000045+150n
[Pr.30] Deceleration time 3				46+150n 47+150n	1000046+150n 1000047+150n
[Pr.31] JOG speed limit value	The setting range differs depending on the "[Pr.1] Unit setting".		20000	48+150n 49+150n	1000048+150n 1000049+150n
[Pr.32] JOG operation acceleration time selection	0: [Pr.9] Acceleration time 0	0	0	50+150n	1000050+150n
	1: [Pr.25] Acceleration time 1	1			
	2: [Pr.26] Acceleration time 2	2			
	3: [Pr.27] Acceleration time 3	3			
[Pr.33] JOG operation deceleration time selection	0: [Pr.10] Deceleration time 0	0	0	51+150n	1000051+150n
	1: [Pr.28] Deceleration time 1	1			
	2: [Pr.29] Deceleration time 2	2			
	3: [Pr.30] Deceleration time 3	3			
[Pr.34] Acceleration/ deceleration process selection	0: Trapezoid acceleration/deceleration process	0	0	52+150n	1000052+150n
	1: S-curve acceleration/deceleration process	1			
[Pr.35] S-curve ratio	1 to 100 (%)	1 to 100 (%)	100	53+150n	1000053+150n
[Pr.36] Rapid stop deceleration time	1 to 8388608 (ms)	1 to 8388608 (ms)	1000	54+150n 55+150n	1000054+150n 1000055+150n
[Pr.37] Stop group 1 rapid stop selection	0: Normal deceleration stop	0	0	56+150n	1000056+150n
	1: Rapid stop	1			
[Pr.38] Stop group 2 rapid stop selection	0: Normal deceleration stop	0		57+150n	1000057+150n
	1: Rapid stop	1			
[Pr.39] Stop group 3 rapid stop selection	0: Normal deceleration stop	0		58+150n	1000058+150n
	1: Rapid stop	1			
[Pr.40] Positioning complete signal output time	0 to 65535 (ms)	0 to 65535 (ms) 0 to 32767: Set as a decimal 32768 to 65535: Convert into hexadecimal and set	300	59+150n	1000059+150n
[Pr.41] Allowable circular interpolation error width	The setting value range differs depending on the "[Pr.1] Unit setting".		100	60+150n 61+150n	1000060+150n 1000061+150n
[Pr.42] External command function selection [RD77MS]	0: External positioning start	0	0	62+150n	—
	1: External speed change request	1			
	2: Speed-position, position-speed switching request	2			
	3: Skip request	3			
	4: High speed input request	4			

Item	Setting value, setting range		Default value	Buffer memory address	
	Value set with the engineering tool	Value set with a program		Axis 1 to axis 16	Axis 17 to axis 32
[Pr.83] Speed control 10 × multiplier setting for degree axis	0: Invalid	0	0	63+150n	1000063+150n
	1: Valid	1			
[Pr.84] Restart allowable range when servo OFF to ON	0, 1 to 327680 [pulse] 0: restart not allowed		0	64+150n 65+150n	1000064+150n 1000065+150n
[Pr.90] Operation setting for speed-torque control mode	b0 to b3 Not used		0000H	68+150n	1000068+150n
	b4 to b7 Torque initial value selection 0: Command torque 1: Feedback torque				
	b8 to b11 Speed initial value selection 0: Command speed 1: Feedback speed 2: Automatic selection				
	b12 to b15 Condition selection at mode switching [RD77MS] 0: Switching conditions valid (for switching control mode) 1: Zero speed ON condition invalid (for switching control mode) [RD77GF] 0: Check the switching conditions in Simple Motion module 1: According to the servo amplifier specification				
[Pr.95] External command signal selection [RD77MS]	0: Not used	0	0	69+150n	—
	1 to 20: DI1 to DI20	1 to 20			
[Pr.122] Manual pulse generator speed limit mode	0: Do not execute speed limit 1: Do not output the exceeding speed limit value 2: Output the exceeding speed limit value delay	0 1 2	0	121+150n	1000121+150n
[Pr.123] Manual pulse generator speed limit value	The setting value range differs depending on the "[Pr.1] Unit setting".		20000	122+150n 123+150n	1000122+150n 1000123+150n
[Pr.127] Speed limit value input selection at control mode switching	1: Input disable	1	0	125+150n	—
	Other than 1: Input enable	Other than 1			

[Pr.25] Acceleration time 1 to [Pr.27] Acceleration time 3

These parameters set the time for the speed to increase from zero to the "[Pr.8] Speed limit value" ("[Pr.31] JOG speed limit value" at JOG operation control) during a positioning operation.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.28] Deceleration time 1 to [Pr.30] Deceleration time 3

These parameters set the time for the speed to decrease from the "[Pr.8] Speed limit value" ("[Pr.31] JOG speed limit value" at JOG operation control) to zero during a positioning operation.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.31] JOG speed limit value

Set the maximum speed for JOG operation.

[Pr.1] setting value	Value set with the engineering tool (unit)	Value set with a program (unit)
0: mm	0.01 to 20000000.00 (mm/min)	1 to 2000000000 (× 10^{-2} mm/min)
1: inch	0.001 to 2000000.000 (inch/min)	1 to 2000000000 (× 10^{-3} inch/min)
2: degree	0.001 to 2000000.000 (degree/min)[*1]	1 to 2000000000 (× 10^{-3} degree/min)[*2]
3: pulse	1 to 1000000000 (pulse/s)	1 to 1000000000 (pulse/s)

*1 The range of JOG speed limit value when "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid: 0.01 to 20000000.00 (degree/min)

*2 The range of JOG speed limit value when "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid: 1 to 2000000000 (× 10^{-2} degree/min)

Point

Set the "JOG speed limit value" to a value less than "[Pr.8] Speed limit value". If the "speed limit value" is exceeded, the error "JOG speed limit value error" (error code: 1AB7H) will occur.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.32] JOG operation acceleration time selection

Set which of "acceleration time 0 to 3" to use for the acceleration time during JOG operation.

0: Use value set in "[Pr.9] Acceleration time 0".

1: Use value set in "[Pr.25] Acceleration time 1".

2: Use value set in "[Pr.26] Acceleration time 2".

3: Use value set in "[Pr.27] Acceleration time 3".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.33] JOG operation deceleration time selection

Set which of "deceleration time 0 to 3" to use for the deceleration time during JOG operation.

0: Use value set in "[Pr.10] Deceleration time 0".

1: Use value set in "[Pr.28] Deceleration time 1".

2: Use value set in "[Pr.29] Deceleration time 2".

3: Use value set in "[Pr.30] Deceleration time 3".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

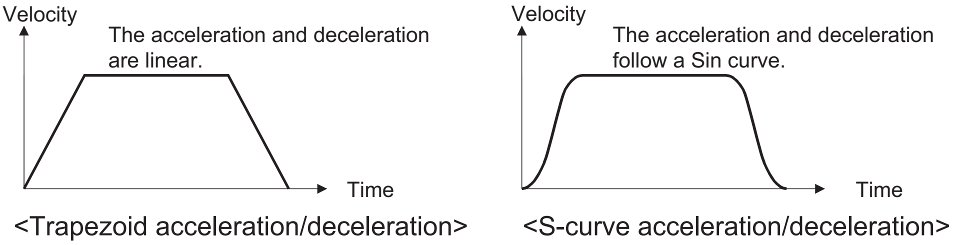
☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.34] Acceleration/deceleration process selection

Set whether to use trapezoid acceleration/deceleration or S-curve acceleration/deceleration for the acceleration/deceleration process.

Refer to the following for details.

☞ Page 314 Acceleration/deceleration processing function



<Trapezoid acceleration/deceleration> <S-curve acceleration/deceleration>

■Buffer memory address

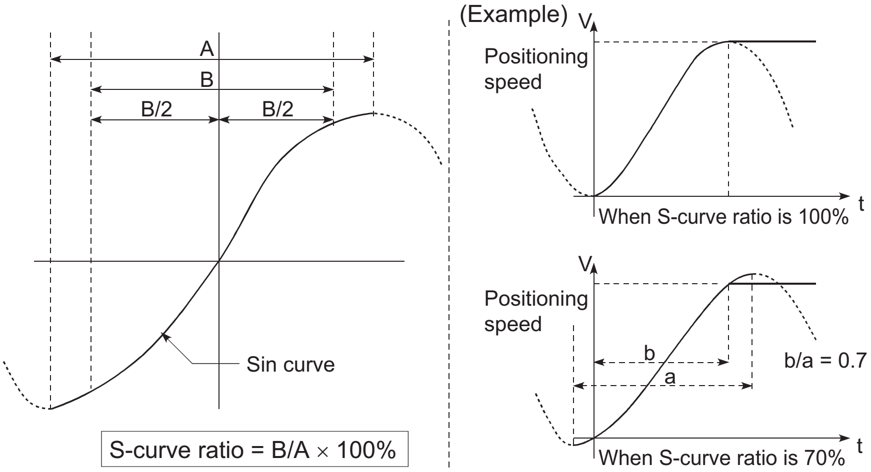
Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.35] S-curve ratio

Set the S-curve ratio (1 to 100%) for carrying out the S-curve acceleration/deceleration process.

The S-curve ratio indicates where to draw the acceleration/deceleration curve using the Sin curve as shown below.



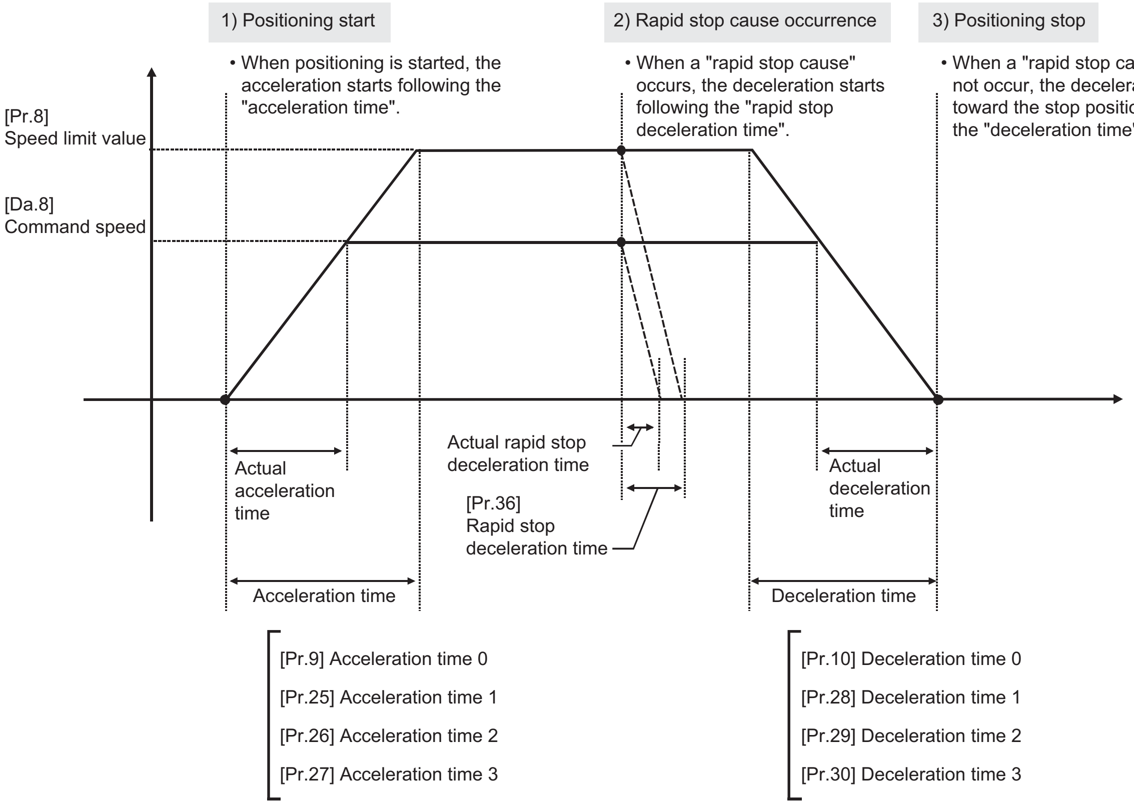
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.36] Rapid stop deceleration time

Set the time to reach speed 0 from "[Pr.8] Speed limit value" ("[Pr.31] JOG speed limit value" at JOG operation control) during the rapid stop. The illustration below shows the relationships with other parameters.



■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.37] to [Pr.39] Stop group 1/2/3 rapid stop selection

Set the method to stop when the stop causes in the following stop groups occur.

Stop group	Details
Stop group 1	Stop with hardware stroke limit
Stop group 2	Error occurrence of the CPU module, PLC READY signal [Y0] OFF
Stop group 3	Axis stop signal from the CPU module, Error occurrence (excludes errors in stop groups 1 and 2: includes only the software stroke limit errors during JOG operation, speed control, speed-position switching control, and position-speed switching control)

The methods of stopping include "0: Normal deceleration stop" and "1: Rapid stop".

If "1: Rapid stop" is selected, the axis will rapidly decelerate to a stop when the stop cause occurs.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

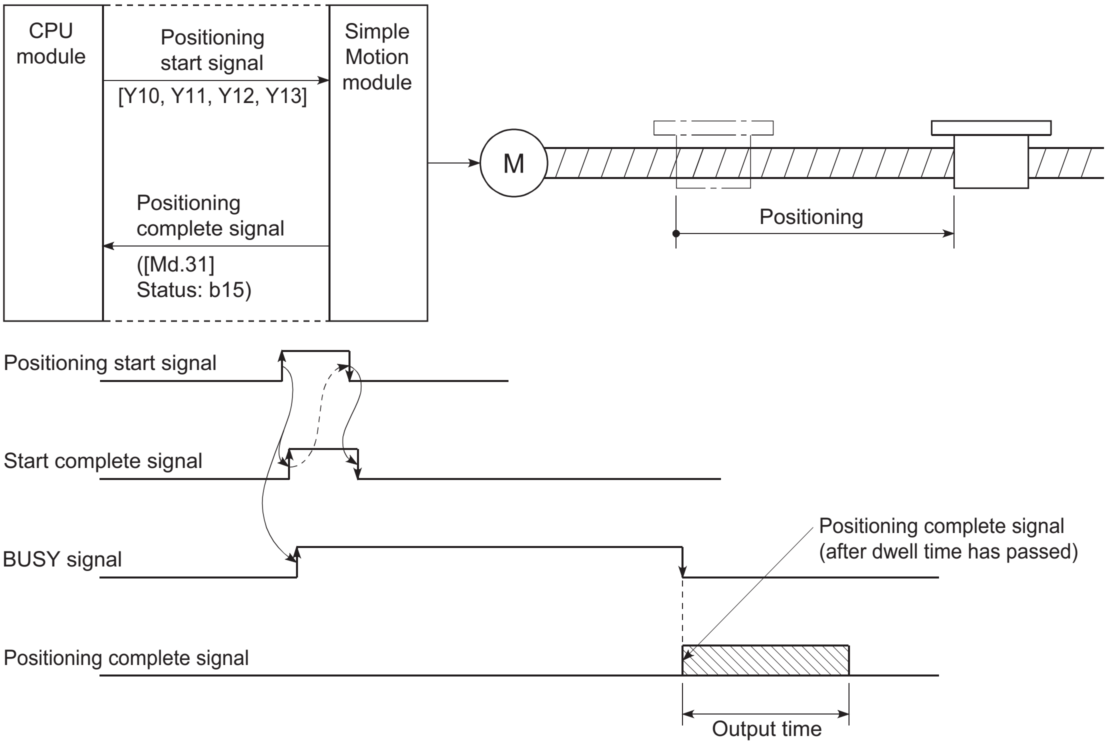
[Pr.40] Positioning complete signal output time

Set the output time of the positioning complete signal output from the Simple Motion module.

A positioning completes when the specified dwell time has passed after the Simple Motion module had terminated the command output.

For the interpolation control, the positioning completed signal of interpolation axis is output only during the time set to the reference axis.

■Operation example



■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.41] Allowable circular interpolation error width

The allowable error range of the calculated arc path and end point address is set.[1]

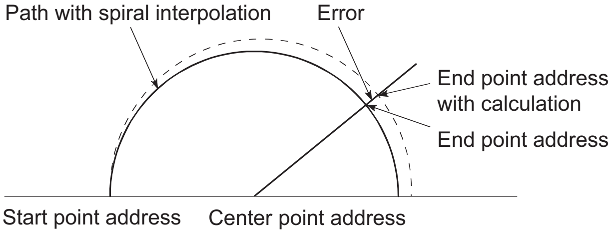
If the error of the calculated arc path and end point address is within the set range, circular interpolation will be carried out to the set end point address while compensating the error with spiral interpolation.

The allowable circular interpolation error width is set in the following axis buffer memory addresses.

Ex.

· If axis 1 is the reference axis, set in the axis 1 buffer memory addresses [60, 61].

· If axis 4 is the reference axis, set in the axis 4 buffer memory addresses [510, 511].



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[1] In 2-axis circular interpolation control with center point designation, the arc path calculated with the start point address and center point address and the end point address may deviate.

[Pr.1] setting value	Value set with the engineering tool (unit)	Value set with a program (unit)
0: mm	0 to 10000.0 (μm)	0 to 100000 (× 10^{-1} μm)
1: inch	0 to 1.00000 (inch)	0 to 100000 (× 10^{-5} inch)
2: degree	0 to 1.00000 (degree)	0 to 100000 (× 10^{-5} degree)
3: pulse	0 to 100000 (pulse)	0 to 100000 (pulse)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.42] External command function selection [RD77MS]

Select a command with which the external command signal should be associated.

Setting value	Details
0: External positioning start	The external command signal input is used to start a positioning operation.
1: External speed change request	The external command signal input is used to change the speed in the current positioning operation. The new speed should be set in the "[Cd.14] New speed value".
2: Speed-position, position-speed switching request	The external command signal input is used to switch from the speed control to the position control while in the speed-position switching control mode, or from the position control to the speed control while in the position-speed switching control mode. To enable the speed-position switching control, set the "[Cd.24] Speed-position switching enable flag" to "1". To enable the position-speed switching control, set the "[Cd.26] Position-speed switching enable flag" to "1".
3: Skip request	The external command signal input is used skip the current positioning operation.
4: High speed input request	The external command signal input is used to execute the mark detection. And, also set to use the external command signal in the synchronous control.

Point

To enable the external command signal, set the "[Cd.8] External command valid" to "1".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.83] Speed control 10 x multiplier setting for degree axis

Set the speed control 10 × multiplier setting for degree axis when you use command speed and speed limit value set by the positioning data and the parameter at "[Pr.1] Unit setting" setup degree by ten times at the speed.

0: Invalid

1: Valid

Normally, the speed specification range is 0.001 to 2000000.000 [degree/min], but it will be decupled and become 0.01 to 20000000.00 [degree/min] by setting "[Pr.83] Speed control 10 × multiplier setting for degree axis" to valid.

Refer to the following for details on the speed control 10 × multiplier setting for degree axis.

☞ Page 319 Speed control 10 x multiplier setting for degree axis function

[Pr.83] setting value	Value set with the engineering tool (unit)	Value set with a program (unit)
0: Invalid	0.001 to 2000000.000 (degree/min)	1 to 2000000000 ($\times 10^{-3}$ degree/min)
1: Valid	0.01 to 20000000.00 (degree/min)	1 to 2000000000 ($\times 10^{-2}$ degree/min)

Point

The "Speed control 10 × multiplier setting for degree axis" is included in detailed parameters 2. However, it will be valid at the leading edge (OFF to ON) of the PLC READY signal [Y0].

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.84] Restart allowable range when servo OFF to ON

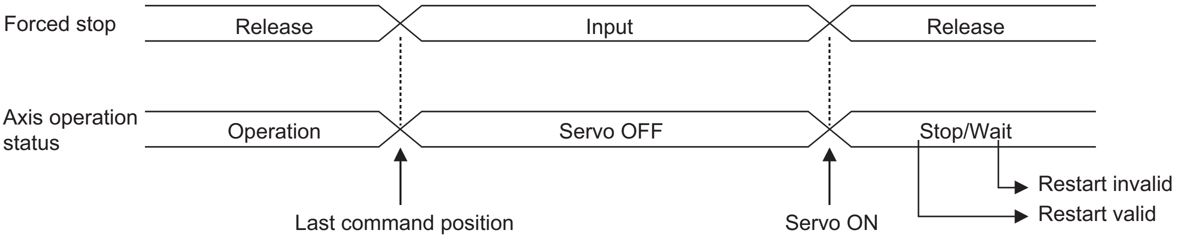
■Restart function at switching servo OFF to ON

The restart function at switching servo OFF to ON performs continuous positioning operation (positioning start, restart) when switching servo OFF to ON while the Simple Motion module is stopped (including forced stop, servo forced stop).

Restart at switching servo OFF to ON can be performed when the difference between the last command position of Simple Motion module at stop and the current value at switching servo OFF to ON is equal to or less than the value set in the buffer memory for the restart allowable range setting.

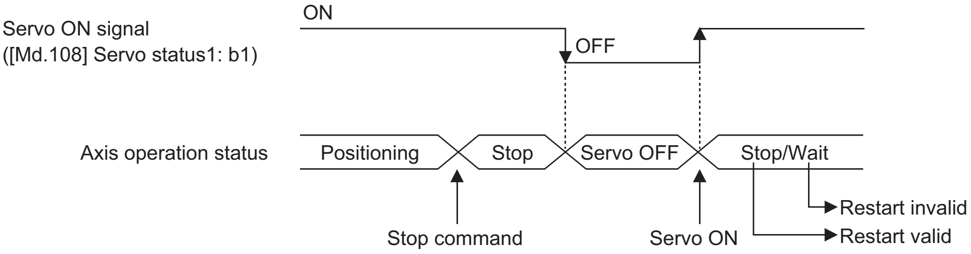
- Servo emergency stop processing

- When the difference between the last command position of Simple Motion module at the forced stop input or the servo forced stop input and the current value at the forced stop release or the servo forced stop release is equal to or less than the value set in the buffer memory for the restart allowable range setting, the positioning operation is judged as stopped and can be restarted.
- When the difference between the last command position of Simple Motion module at the forced stop input or the servo forced stop input and the current value at the forced stop release or the servo forced stop release is greater than the value set in the buffer memory for the restart allowable range setting, the positioning operation is judged as on-standby and cannot be restarted.



- Processing at switching the servo ON signal from OFF to ON

- When the difference between the last command position of Simple Motion module at switching the servo ON signal from ON to OFF and the current value at switching the servo ON signal from OFF to ON is equal to or less than the value set in the buffer memory for the restart allowable range setting, the positioning operation is judged as stopped and can be restarted.
- When the difference between the last command position of Simple Motion module at switching the servo ON signal from ON to OFF and the current value at switching the servo ON signal from OFF to ON is greater than the value set in the buffer memory for the restart allowable range setting, the positioning operation is judged as on-standby and cannot be restarted.



■Setting method

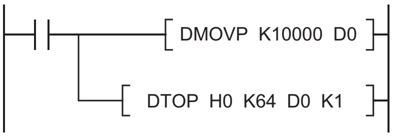
For performing restart at switching servo OFF to ON, set the restart allowable range in the following buffer memory.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item	Setting range	Default value	Buffer memory address	
			Axis 1 to axis 16	Axis 17 to axis 32
[Pr.84] Restart allowable range when servo OFF to ON	0, 1 to 327680 [pulse] 0: restart not allowed	0	64+150n 65+150n	1000064+150n 1000065+150n

- Setting example

A program to set the restart allowable range for axis 1 to 10000 pulses is shown below.



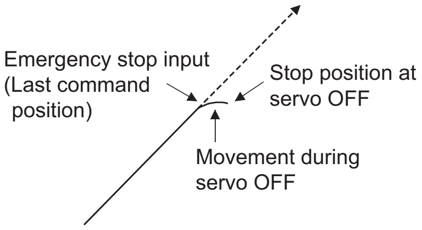
Restart allowable range (10000 pulses) is stored in D0, D1.

Data for D0, D1 is stored in buffer memory 64, 65 of the Simple Motion module.

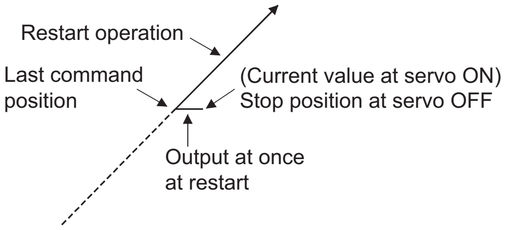
Point

- The difference between the last command position at servo OFF and the current value at servo ON is output at once at the first restart. If the restart allowable range is large at this time, an overload may occur on the servo side. Set a value which does not affect the mechanical system by output once to the restart allowable range when switching servo OFF to ON.
- The restart at switching servo OFF to ON is valid only at switching servo OFF to ON at the first time. At the second time or later, the setting for restart allowable range when switching servo OFF to ON is disregarded.
- Execute servo OFF when the mechanical system is in complete stop state. The restart at switching servo OFF to ON cannot be applied to a system in which the mechanical system is operated by external pressure or other force during servo OFF.
- Restart can be executed only while the axis operation status is "stop". Restart cannot be executed when the axis operation status is other than "stop".
- When the PLC READY signal [Y0] is switched from OFF to ON during servo OFF, restart cannot be executed. If restart is requested, the warning "Restart not possible" (warning code: 0902H) occurs.
- Do not restart while a stop command is ON. When restart is executed during a stop, the error "Stop signal ON at start" (error code: 1908H) occurs and the axis operation status becomes "ERR". Therefore, restart cannot be performed even if the error is reset.
- Restart can also be executed while the positioning start signal is ON. However, do not set the positioning start signal from OFF to ON during a stop. If the positioning start signal is switched from OFF to ON, positioning is performed from the positioning data No. set in "[Cd.3] Positioning start No." or from the positioning data No. of the specified point.
- When positioning is terminated by a continuous-operation interrupt request, restart cannot be performed. If a restart request is executed, the warning "Restart not possible" (warning code: 0902H) occurs.

[Operation at emergency stop input]



[Operation at restart]



■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.90] Operation setting for speed-torque control mode

Operation setting of the speed control mode, torque control mode or continuous operation to torque control mode at the speed-torque control is executed.

■Torque initial value selection

Set the torque initial value at switching to torque control mode or to continuous operation to torque control mode.

Setting value	Details
0: Command torque	Command torque value at switching. (following axis control data) Switching to torque control mode: "[Cd.143] Command torque at torque control mode" Switching to continuous operation to torque control mode: "[Cd.150] Target torque at continuous operation to torque control mode"
1: Feedback torque	Motor torque value at switching.

■Speed initial value selection

Set the initial speed at switching from position control mode to speed control mode or the initial speed at switching from position control mode or from speed control mode to continuous operation to torque control mode.

Setting value	Details
0: Command speed	Speed that position command at switching is converted into the motor rotation speed.
1: Feedback speed	Motor rotation speed received from servo amplifier at switching
2: Automatic selection	The lower speed between speed that position command at switching is converted into the motor rotation speed and motor rotation speed received from servo amplifier at switching. (This setting is valid only when continuous operation to torque control mode is used. At switching from position control mode to speed control mode, operation is the same as "0: Command speed".)

■Condition selection at mode switching

Set the valid/invalid of switching conditions for switching control mode.

[RD77MS]

0: Switching conditions valid (for switching control mode)

1: Zero speed ON condition invalid (for switching control mode)

[RD77GF]

0: Check the switching conditions in Simple Motion module

1: According to the servo amplifier specification

Point

- The "Operation setting for speed-torque control mode" is included in detailed parameters 2. However, it will be valid at the leading edge (OFF to ON) of the PLC READY signal [Y0].
- Set as follows to switch the control mode without waiting for the servo motor to stop. Note that it may cause vibration or impact at control switching.

[RD77MS]

Set "Condition selection at mode switching (b12 to b15)" to "1: Zero speed ON condition invalid (for switching control mode)".

[RD77GF]

Set "Condition selection at mode switching (b12 to b15)" to "1: According to the servo amplifier specification". When using the MR-J4-GF, set "ZSP disabled selection at control switching" of the servo parameter "Function selection C-E (PC76)" to "1: Disabled".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.95] External command signal selection [RD77MS]

Set the external command signal.

■RD77MS2

Setting value	Details
0: Not used	External command signal is not used.
1: DI1	DI1 is used as external command signal.
⋮	⋮
10: DI10	DI10 is used as external command signal.

■RD77MS4/RD77MS8/RD77MS16

Setting value	Details
0: Not used	External command signal is not used.
1: DI1	DI1 is used as external command signal.
⋮	⋮
20: DI20	DI20 is used as external command signal.

- Pin Nos. and input terminals corresponding to the external command signals (DI Nos.) are shown below.

DI No.	Pin No.	Input terminal	DI No.	Pin No.	Input terminal
DI1	1A1	SIN1	DI11	2A1	SIN11
DI2	1A2	SIN2	DI12	2A2	SIN12
DI3	1A3	SIN3	DI13	2A3	SIN13
DI4	1A4	SIN4	DI14	2A4	SIN14
DI5	1A5	SIN5	DI15	2A5	SIN15
DI6	1B1	SIN6	DI16	2B1	SIN16
DI7	1B2	SIN7	DI17	2B2	SIN17
DI8	1B3	SIN8	DI18	2B3	SIN18
DI9	1B4	SIN9	DI19	2B4	SIN19
DI10	1B5	SIN10	DI20	2B5	SIN20

Point

- The "External command signal selection" is included in detailed parameters 2. However, it will be valid at the leading edge (OFF to ON) of the PLC READY signal [Y0].
- Same external command signal can be used in the multiple axes.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.122] Manual pulse generator speed limit mode

Set how to output when the output by manual pulse generator operation exceeds "[Pr.123] Manual pulse generator speed limit value".

0: Do not execute speed limit

1: Do not output the exceeding speed limit value

2: Output the exceeding speed limit value delay

Point

The "Manual pulse generator speed limit mode" is included in detailed parameters 2. However, it will be valid at the leading edge (OFF to ON) of the PLC READY signal [Y0].

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.123] Manual pulse generator speed limit value

Set the maximum speed during manual pulse generator operation.

Point

- The "Manual pulse generator speed limit value" is included in detailed parameters 2. However, it will be valid at the leading edge (OFF to ON) of the PLC READY signal [Y0].
- Set the "Manual pulse generator speed limit value" to a value less than "[Pr.8] Speed limit value". If the "speed limit value" is exceeded, the error "Manual pulse generator speed limit value error" (error code: 1ABAH) will occur.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

[Pr.127] Speed limit value input selection at control mode switching [RD77MS]

Set whether to input the value of the "[Pr.8] Speed limit value" at speed-torque control mode switching.

Point

The "Speed limit value input selection at control mode switching" is included in detailed parameters 2. However, it will be valid at the leading edge (OFF to ON) of the PLC READY signal [Y0].

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Positioning parameters: Detailed parameters 2

Home position return basic parameters

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item	Setting value, setting range		Default value	Buffer memory address	
	Value set with the engineering tool	Value set with a program		Axis 1 to axis 16	Axis 17 to axis 32
[Pr.43] Home position return method	0: Proximity dog method [RD77MS]	0	0 [RD77MS] 8 [RD77GF]	70+150n	1000070+150n
	4: Count method 1 [RD77MS]	4			
	5: Count method 2 [RD77MS]	5			
	6: Data set method [RD77MS]	6			
	7: Scale origin signal detection method [RD77MS]	7			
	8: Driver home position return method	8			
[Pr.44] Home position return direction	0: Positive direction (address increment direction)	0	0	71+150n	1000071+150n
	1: Negative direction (address decrement direction)	1			
[Pr.45] Home position address	The setting value range differs depending on the "[Pr.1] Unit setting".		0	72+150n 73+150n	1000072+150n 1000073+150n
[Pr.46] Home position return speed			1	74+150n 75+150n	1000074+150n 1000075+150n
[Pr.47] Creep speed [RD77MS]			1	76+150n 77+150n	—
[Pr.48] Home position return retry [RD77MS]	0: Do not retry home position return with limit switch	0	0	78+150n	—
	1: Retry home position return with limit switch	1			

[Pr.43] Home position return method

Set the "home position return method" for carrying out machine home position return.

Setting value	Details	Reference
0: Proximity dog method [RD77MS]	After decelerating at the proximity dog ON, stop at the zero signal and complete the machine home position return.	Page 39 Proximity dog method [RD77MS]
4: Count method 1 [RD77MS]	After decelerating at the proximity dog ON, move the designated distance, and complete the machine home position return with the zero signal.	Page 41 Count method1 [RD77MS]
5: Count method 2 [RD77MS]	After decelerating at the proximity dog ON, move the designated distance, and complete the machine home position return.	Page 43 Count method2 [RD77MS]
6: Data set method [RD77MS]	The position where the machine home position return has been made will be the home position.	Page 45 Data set method [RD77MS]
7: Scale origin signal detection method [RD77MS]	After deceleration stop at the proximity dog ON, move to the opposite direction against the home position return direction, and move to the home position return direction after deceleration stop once at the detection of the first zero signal. Then, it stops at the detected nearest zero signal, and completes the machine home position return.	Page 46 Scale origin signal detection method [RD77MS]
8: Driver home position return method	Carry out the home position return operation on the driver side. The home position return operation and parameters depend on the specifications of the driver.	[RD77MS] Page 779 AlphaStep/5-phase stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd. Page 791 IAI electric actuator controller manufactured by IAI Corporation [RD77GF] Page 49 Driver home position return method

When setting the home position return method that cannot be executed, the error "Home position return method invalid" (error code: 1979H) occurs and the home position return is not executed.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

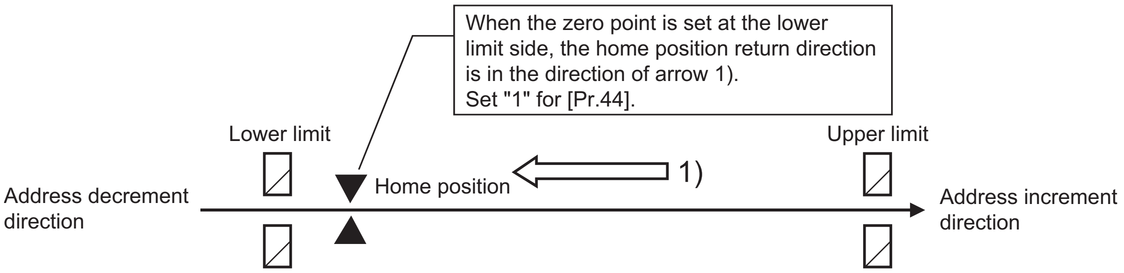
☞ Page 471 Home position return parameters: Home position return basic parameters

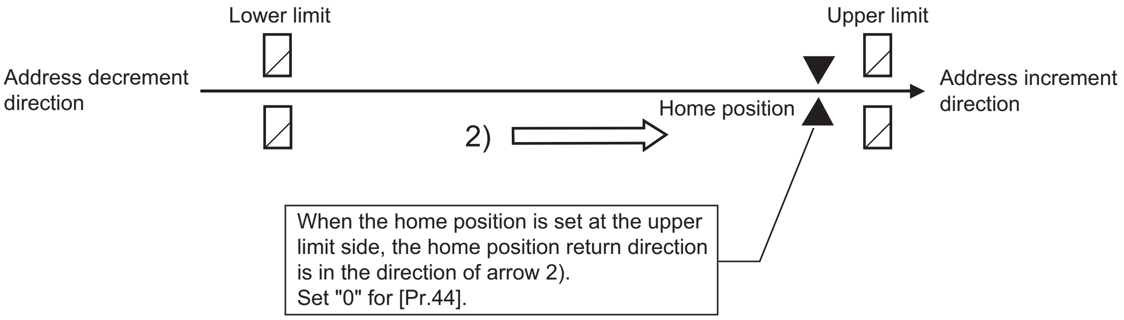
[Pr.44] Home position return direction

Set the direction to start movement when starting machine home position return.

Setting value	Details
0: Positive direction (address increment direction)	Moves in the direction that the address increments. (Arrow 2))
1: Negative direction (address decrement direction)	Moves in the direction that the address decrements. (Arrow 1))

Normally, the home position is set near the lower limit or the upper limit, so "[Pr.44] Home position return direction" is set as shown below.





■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Home position return parameters: Home position return basic parameters

[Pr.45] Home position address

Set the address used as the reference point for positioning control (ABS system).

(When the machine home position return is completed, the stop position address is changed to the address set in "[Pr.45] Home position address". At the same time, the "[Pr.45] Home position address" is stored in "[Md.20] Command position value" and "[Md.21] Machine feed value".)

[Pr.1] setting value	Value set with the engineering tool (unit)	Value set with a program (unit)
0: mm	-214748364.8 to 214748364.7 (μm)	-2147483648 to 2147483647 ($\times 10^{-1}$ μm)
1: inch	-21474.83648 to 21474.83647 (inch)	-2147483648 to 2147483647 ($\times 10^{-5}$ inch)
2: degree	0 to 359.99999 (degree)	0 to 35999999 ($\times 10^{-5}$ degree)
3: pulse	-2147483648 to 2147483647 (pulse)	-2147483648 to 2147483647 (pulse)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Home position return parameters: Home position return basic parameters

[Pr.46] Home position return speed

Set the speed for home position return.

Fast home position return is carried out at the home position return speed. [RD77GF]

[Pr.1] setting value	Value set with the engineering tool (unit)	Value set with a program (unit)
0: mm	0.01 to 20000000.00 (mm/min)	1 to 2000000000 (× 10^{-2} mm/min)
1: inch	0.001 to 2000000.000 (inch/min)	1 to 2000000000 (× 10^{-3} inch/min)
2: degree	0.001 to 2000000.000 (degree/min)[*1]	1 to 2000000000 (× 10^{-3} degree/min)[*2]
3: pulse	1 to 1000000000 (pulse/s)	1 to 1000000000 (pulse/s)

*1 The range of home position return speed when "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid: 0.01 to 20000000.00 (degree/min)

*2 The range of home position return speed when "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid: 1 to 2000000000 (× 10^{-2} degree/min)

Point

[RD77MS]

Set the "home position return speed" to less than "[Pr.8] Speed limit value". If the "speed limit value" is exceeded, the error "Outside speed limit value range" (error code: 1A69H) will occur, and home position return will not be executed. The "home position return speed" should be equal to or faster than the "[Pr.7] Bias speed at start" and "[Pr.47] Creep speed".

[RD77GF]

Set the "home position return speed" to less than "[Pr.8] Speed limit value". If the "speed limit value" is exceeded, the error "Outside speed limit value range" (error code: 1A69H) will occur, and home position return will not be executed.

■Buffer memory address

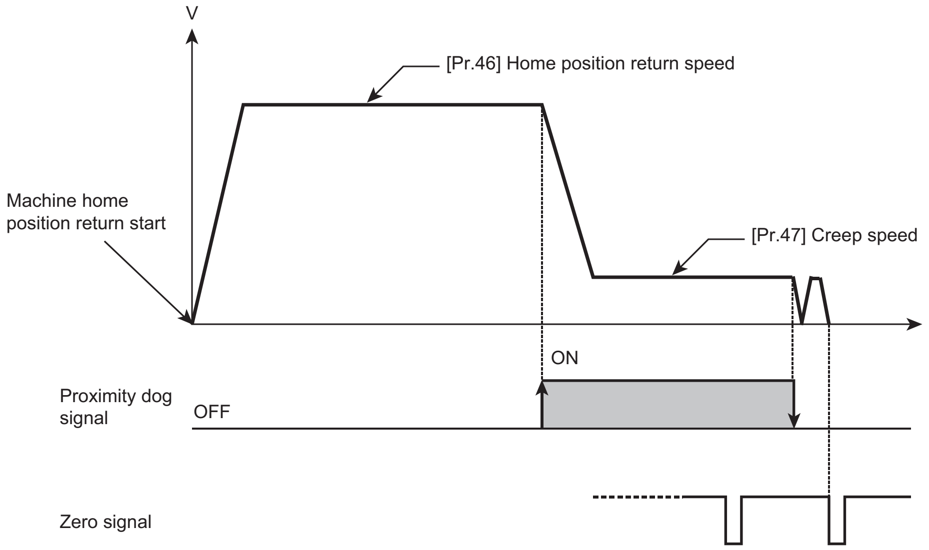
Refer to the following for the buffer memory address in this area.

☞ Page 471 Home position return parameters: Home position return basic parameters

[Pr.47] Creep speed [RD77MS]

Set the creep speed after proximity dog ON (the low speed just before stopping after decelerating from the home position return speed). The creep speed is set within the following range.

([Pr.46] Home position return speed) ≥ ([Pr.47] Creep speed) ≥ ([Pr.7] Bias speed at start)



[Pr.1] setting value	Value set with the engineering tool (unit)	Value set with a program (unit)
0: mm	0.01 to 20000000.00 (mm/min)	1 to 2000000000 (× 10^{-2} mm/min)
1: inch	0.001 to 2000000.000 (inch/min)	1 to 2000000000 (× 10^{-3} inch/min)
2: degree	0.001 to 2000000.000 (degree/min)[*1]	1 to 2000000000 (× 10^{-3} degree/min)[*2]
3: pulse	1 to 1000000000 (pulse/s)	1 to 1000000000 (pulse/s)

*1 The range of home position return speed when "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid: 0.01 to 20000000.00 (degree/min)

*2 The range of home position return speed when "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid: 1 to 2000000000 (× 10^{-2} degree/min)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Home position return parameters: Home position return basic parameters

[Pr.48] Home position return retry [RD77MS]

Set whether to carry out home position return retry.

Refer to the following for the operation of home position return retry.

☞ Page 229 Home position return retry function [RD77MS]

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 471 Home position return parameters: Home position return basic parameters

Home position return detailed parameters

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

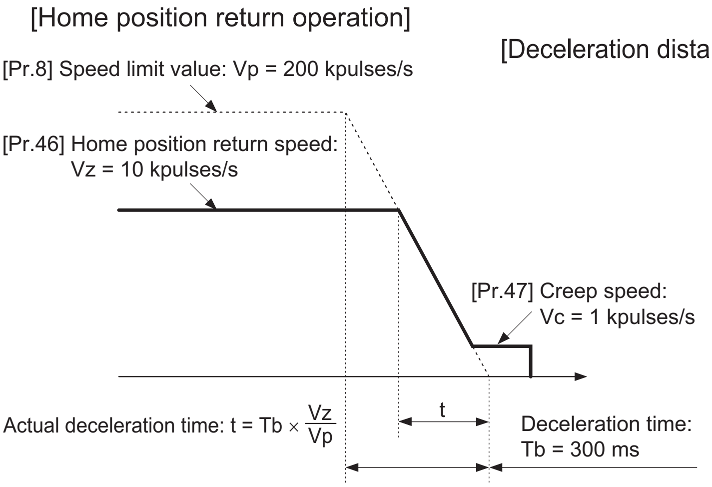
Item	**Setting value, setting range**		**Default value**	**Buffer memory address**	
	Value set with the engineering tool	**Value set with a program**		**Axis 1 to axis 16**	**Axis 17 to axis 32**
[Pr.50] Setting for the movement amount after proximity dog ON [RD77MS]	The setting value range differs depending on the "[Pr.1] Unit setting".		0	80+150n 81+150n	—
[Pr.51] Home position return acceleration time selection	0: [Pr.9] Acceleration time 0	0	0	82+150n	1000082+150n
	1: [Pr.25] Acceleration time 1	1			
	2: [Pr.26] Acceleration time 2	2			
	3: [Pr.27] Acceleration time 3	3			
[Pr.52] Home position return deceleration time selection	0: [Pr.10] Deceleration time 0	0	0	83+150n	1000083+150n
	1: [Pr.28] Deceleration time 1	1			
	2: [Pr.29] Deceleration time 2	2			
	3: [Pr.30] Deceleration time 3	3			
[Pr.53] Home position shift amount [RD77MS]	The setting value range differs depending on the "[Pr.1] Unit setting".		0	84+150n 85+150n	—
[Pr.54] Home position return torque limit value [RD77MS]	0.1 to 1000.0 (%)	1 to 10000 (× 0.1%)	3000	86+150n	—
[Pr.55] Operation setting for incompletion of home position return	0: Positioning control is not executed.	0	0	87+150n	1000087+150n
	1: Positioning control is executed.	1			
[Pr.56] Speed designation during home position shift [RD77MS]	0: Home position return speed	0	0	88+150n	—
	1: Creep speed	1			
[Pr.57] Dwell time during home position return retry [RD77MS]	0 to 65535 (ms)	0 to 65535 (ms) 0 to 32767: Set as a decimal 32768 to 65535: Convert into hexadecimal and set	0	89+150n	—

[Pr.50] Setting for the movement amount after proximity dog ON [RD77MS]

When using the count method 1 or 2, set the movement amount to the home position after the proximity dog signal turns ON. (The movement amount after proximity dog ON should be equal to or greater than the sum of the "distance covered by the deceleration from the home position return speed to the creep speed" and "distance of movement in 10 ms at the home position return speed".)

■Setting example

Assuming that the "[Pr.8] Speed limit value" is set to 200 kpulses/s, "[Pr.46] Home position return speed" to 10 kpulses/s, "[Pr.47] Creep speed" to 1 kpulses/s, and deceleration time to 300 ms, the minimum value of "[Pr.50] Setting for the movement amount after proximity dog ON" is calculated as follows:



$$[\text{Deceleration distance}] = \frac{1}{2} \times \frac{Vz}{1000} \times t + \underbrace{0.01 \times Vz}_{\text{Movement amount for 10 ms at home position return speed.}}$$

$$= \frac{Vz}{2000} \times \frac{Tb \times Vz}{Vp} + 0.01 \times Vz$$

$$= \frac{10 \times 10^3}{2000} \times \frac{300 \times 10 \times 10^3}{200 \times 10^3} + 0.01 \times 10 \times 10^3$$

$$= 75 + 100$$

$$= 175$$

↓

"[Pr.50] Setting for the movement amount after proximity dog ON" should be equal to or larger than 175.

[Pr.1] setting value	Value set with the engineering tool (unit)	Value set with a program (unit)
0: mm	0 to 214748364.7 (μm)	0 to 2147483647 ($\times 10^{-1}$ μm)
1: inch	0 to 21474.83647 (inch)	0 to 2147483647 ($\times 10^{-5}$ inch)
2: degree	0 to 21474.83647 (degree)	0 to 2147483647 ($\times 10^{-5}$ degree)
3: pulse	0 to 2147483647 (pulse)	0 to 2147483647 (pulse)

Point

Regardless of the unit setting, calculate the movement amount in the same procedure as for the setting example.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 Home position return parameters: Home position return detailed parameters

[Pr.51] Home position return acceleration time selection

Set which of "acceleration time 0 to 3" to use for the acceleration time during home position return.

0: Use the value set in "[Pr.9] Acceleration time 0".

1: Use the value set in "[Pr.25] Acceleration time 1".

2: Use the value set in "[Pr.26] Acceleration time 2".

3: Use the value set in "[Pr.27] Acceleration time 3".

This setting is valid only at fast home position return. [RD77GF]

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 Home position return parameters: Home position return detailed parameters

[Pr.52] Home position return deceleration time selection

Set which of "deceleration time 0 to 3" to use for the deceleration time during home position return.

0: Use the value set in "[Pr.10] Deceleration time 0".

1: Use the value set in "[Pr.28] Deceleration time 1".

2: Use the value set in "[Pr.29] Deceleration time 2".

3: Use the value set in "[Pr.30] Deceleration time 3".

This setting is valid only at fast home position return. [RD77GF]

■Buffer memory address

Refer to the following for the buffer memory address in this area.

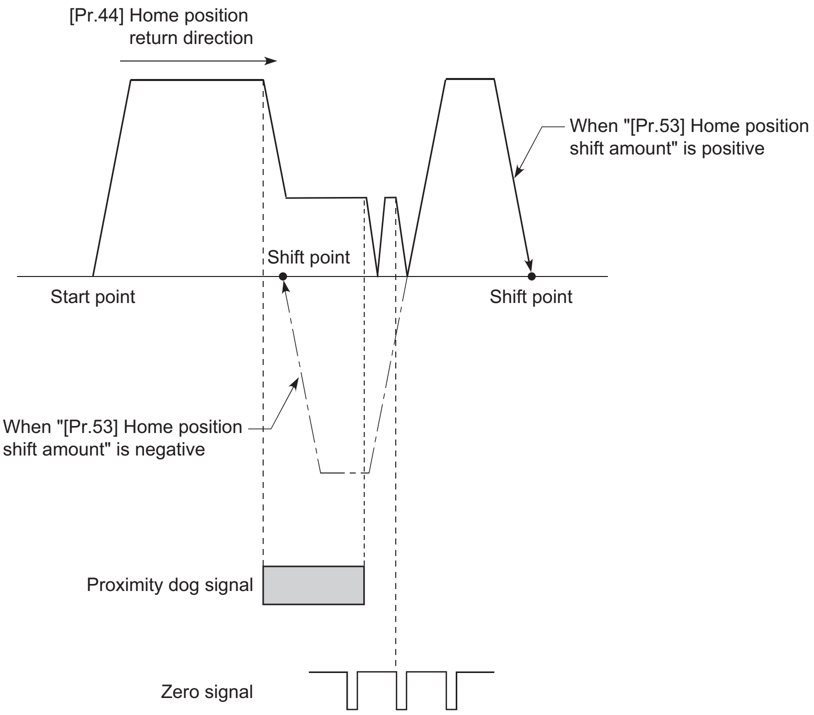
☞ Page 472 Home position return parameters: Home position return detailed parameters

[Pr.53] Home position shift amount [RD77MS]

Set the amount to shift (move) from the position stopped at with machine home position return.

The home position shift function is used to compensate the home position stopped at with machine home position return.

If there is a physical limit to the home position, due to the relation of the proximity dog installation position, use this function to compensate the home position to an optimum position.



[Pr.1] setting value	Value set with the engineering tool (unit)	Value set with a program (unit)
0: mm	-214748364.8 to 214748364.7 (μm)	-2147483648 to 2147483647 ($\times 10^{-1}$ μm)
1: inch	-21474.83648 to 21474.83647 (inch)	-2147483648 to 2147483647 ($\times 10^{-5}$ inch)
2: degree	-21474.83648 to 21474.83647 (degree)	-2147483648 to 2147483647 ($\times 10^{-5}$ degree)
3: pulse	-2147483648 to 2147483647 (pulse)	-2147483648 to 2147483647 (pulse)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 Home position return parameters: Home position return detailed parameters

[Pr.54] Home position return torque limit value [RD77MS]

Set the value to limit the servo motor torque after reaching the creep speed during machine home position return.

Refer to the following for details on the torque limits.

☞ Page 249 Torque limit function

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 Home position return parameters: Home position return detailed parameters

[Pr.55] Operation setting for incompletion of home position return

Set whether the positioning control is executed or not (When the home position return request flag is ON.).

0: Positioning control is not executed.

1: Positioning control is executed.

- When the home position return request flag is ON, selecting "0: Positioning control is not executed" will result in the error "Start at home position return incomplete" (error code: 19A6H), and positioning control will not be performed. At this time, operation with the manual control (JOG operation, inching operation, manual pulse generator operation) is available. The positioning control can be executed even if the home position return request flag is ON when selecting "1: Positioning control is executed".
- The following shows whether the positioning control is possible to start/restart or not when selecting "0: Positioning control is not executed".

Start possible	Machine home position return, JOG operation, inching operation, manual pulse generator operation, and current value changing using current value changing start No. (9003)
Start/restart impossible control	When the following cases at block start, condition start, wait start, repeated start, multiple axes simultaneous start and pre-reading start 1-axis linear control, 2/3/4-axis linear interpolation control, 1/2/3/4-axis fixed-feed control, 2-axis circular interpolation control (with sub point designation/center point designation), 3-axis helical interpolation control (with sub point designation/center point designation), 1/2/3/4-axis speed control, speed-position switching control (INC mode/ ABS mode), position-speed switching control, and current value changing using current value changing (No.1 to 600)

- When the home position return request flag is ON, starting the fast home position return will result in the error "Home position return request ON" (error code: 1945H) despite the setting value of "Operation setting for incompletion of home position return", and the fast home position return will not be executed.

⚠CAUTION

- Do not execute the positioning control in home position return request signal ON for the axis which uses in the positioning control. Failure to observe this could lead to an accident such as a collision.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 Home position return parameters: Home position return detailed parameters

[Pr.56] Speed designation during home position shift [RD77MS]

Set the operation speed for when a value other than "0" is set for "[Pr.53] Home position shift amount". Select the setting from "[Pr.46] Home position return speed" or "[Pr.47] Creep speed".

0: Designate "[Pr.46] Home position return speed" as the setting value.

1: Designate "[Pr.47] Creep speed" as the setting value.

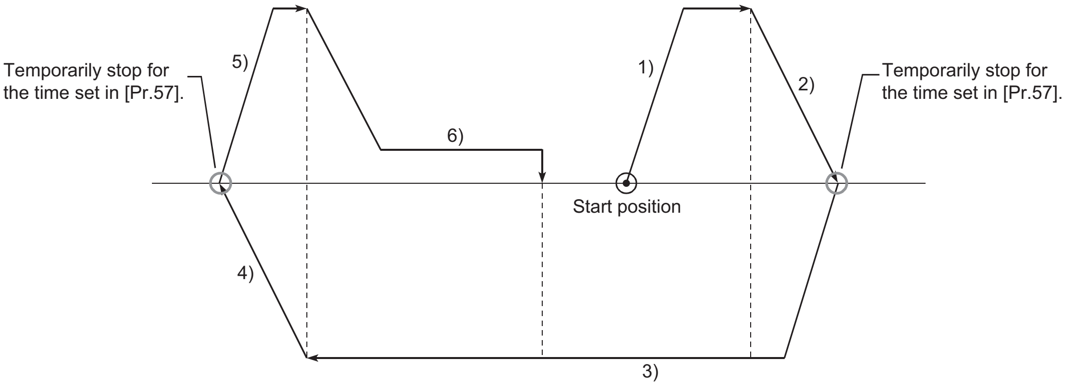
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 Home position return parameters: Home position return detailed parameters

[Pr.57] Dwell time during home position return retry [RD77MS]

When home position return retry is validated (when "1" is set for [Pr.48]), set the stop time after decelerating in 2) and 4) in the following drawing.



■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 Home position return parameters: Home position return detailed parameters

Extended parameters

n: Axis No. - 1

Item	Setting value, setting range		Default value	Buffer memory address
	Value set with the engineering tool	Value set with a program		
[Pr.91] Optional data monitor: Data type setting 1 [RD77MS]	0: No setting 1: Effective load ratio*1 2: Regenerative load ratio 3: Peak load ratio 4: Load inertia moment ratio*1 5: Model loop gain*1 6: Bus voltage*1 7: Servo motor speed*1 8: Encoder multiple revolution counter 9: Unit power consumption 10: Instantaneous torque*1 12: Servo motor thermistor temperature 13: Torque equivalent to disturbance*1 14: Overload alarm margin 15: Excessive error alarm margin 16: Settling time 17: Overshoot amount 18: Internal temperature of encoder 20: Position feedback*2 21: Encoder position within one revolution*2 22: Selected droop pulse*2 23: Unit total power consumption*2 24: Load-side encoder information 1*2 25: Load-side encoder information 2*2 26: Z-phase counter*2 27: Servo motor side/load-side position deviation*2 28: Servo motor side/load-side speed deviation*2 30: Unit power consumption (2 words)*2 Most significant bit1 + address value: Optional address of registered monitor	0 1 2 3 4 5 6 7 8 9 10 12 13 14 15 16 17 18 20 21 22 23 24 25 26 27 28 30 Most significant bit1 + address value	0	100+150n
[Pr.92] Optional data monitor: Data type setting 2 [RD77MS]			0	101+150n
[Pr.93] Optional data monitor: Data type setting 3 [RD77MS]			0	102+150n
[Pr.94] Optional data monitor: Data type setting 4 [RD77MS]			0	103+150n
[Pr.128] Torque limit selection (Stepping driver) [RD77MS]	0: Limit by Specification on Driver Side 1: Limit by Torque Limit Value (+/-) of Simple Motion	0 1	0	141+150n

*1 The name differs depending on the connected device.

*2 Used point: 2 words

[Pr.91] to [Pr.94] Optional data monitor: Data type setting [RD77MS]

Set the data type monitored by the optional data monitor function.

Setting value	Data type	Used point
0	No setting[*1]	1 word
1	Effective load ratio[*2]	
2	Regenerative load ratio	
3	Peak load ratio	
4	Load inertia moment ratio[*2]	
5	Model loop gain[*2]	
6	Bus voltage[*2]	
7	Servo motor speed[*2]	
8	Encoder multiple revolution counter	
9	Unit power consumption	
10	Instantaneous torque[*2]	
12	Servo motor thermistor temperature	
13	Torque equivalent to disturbance[*2]	
14	Overload alarm margin	
15	Excessive error alarm margin	
16	Settling time	
17	Overshoot amount	
18	Internal temperature of encoder	
20	Position feedback	2 words
21	Encoder position within one revolution	
22	Selected droop pulse	
23	Unit total power consumption	
24	Load-side encoder information 1	
25	Load-side encoder information 2	
26	Z-phase counter	
27	Servo motor side/load-side position deviation	
28	Servo motor side/load-side speed deviation	
30	Unit power consumption (2 words)	
Most significant bit1 + address value: Optional address of registered monitor	Registered monitor addresses	—

[*1] The stored value of "[Md.109] Regenerative load ratio/Optional data monitor output 1" to "[Md.112] Optional data monitor output 4" is different every data type setting 1 to 4. (☞ Page 585 Axis monitor data)

[*2] The name differs depending on the connected device.

Point

- The monitor address of optional data monitor is registered to servo amplifier with initialized communication after power supply ON or CPU module reset.
- Set the data type of "used point: 2 words" in "[Pr.91] Optional data monitor: Data type setting 1" or "[Pr.93] Optional data monitor: Data type setting 3". If it is set in "[Pr.92] Optional data monitor: Data type setting 2" or "[Pr.94] Optional data monitor: Data type setting 4", the warning "Optional data monitor data type setting error" (warning code: 0933H) will occur with initialized communication to servo amplifier and "0" will be set in "[Md.109] Regenerative load ratio/Optional data monitor output 1" to "[Md.112] Optional data monitor output 4".
- Set "0" in "[Pr.92] Optional data monitor: Data type setting 2" when the data type of "used point: 2 words" is set in "[Pr.91] Optional data monitor: Data type setting 1", and set "0" in "[Pr.94] Optional data monitor: Data type setting 4" when the data type of "used point: 2 words" is set in "[Pr.93] Optional data monitor: Data type setting 3". When setting other than "0", the warning "Optional data monitor data type setting error" (warning code: 0933H) will occur with initialized communication to servo amplifier and "0" will be set in "[Md.109] Regenerative load ratio/Optional data monitor output 1" to "[Md.112] Optional data monitor output 4".
- When the data type of "used point: 2 words" is set, the monitor data of low-order is "[Md.109] Regenerative load ratio/Optional data monitor output 1" or "[Md.111] Peak torque ratio/Optional data monitor output 3".
- Refer to ☞ Page 388 Optional Data Monitor Function [RD77MS] for the data type that can be monitored on each servo amplifier. When the data type that cannot be monitored is set, "0" is stored to the monitor output.
- When directly specifying addresses for each optional data monitor type, specify the addresses in bit0 to bit14 of "[Pr.91] Optional data monitor: Data type setting 1" to "[Pr.94] Optional data monitor: Data type setting 4" and set "1" in bit15.
- When monitoring 2-word data, set the lower data to "[Pr.91] Optional data monitor: Data type setting 1" and the upper data to "[Pr.92] Optional data monitor: Data type setting 2", or set the lower data to "[Pr.93] Optional data monitor: Data type setting 3" and the upper data to "[Pr.94] Optional data monitor: Data type setting 4".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 Extended parameters

[Pr.128] Torque limit selection (Stepping driver) [RD77MS]

Set whether to use the torque limit value of the Simple Motion module or the torque limit value of the driver during stepping driver control. Operation assumes "0: Limit by Specification on Driver Side", if a value other than "0" or "1" is set.

0: Limit by Specification on Driver Side

1: Limit by Torque Limit Value (+/-) of Simple Motion

Point

This parameter is valid for AlphaStep stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 Extended parameters

Servo parameters

Parameters of MR-J5(W)-B

For details of the setting items, refer to the manual of each servo amplifier.

Since the servo parameters of MR-J5(W)-B are not in the buffer memory, use GX Works3 or axis control data to set them. Refer to the following for details.

☞ Page 796 Connection with MR-J5(W)-B

The default value of each parameter indicates the value to be stored in the internal memory area.

Do not change other than the buffer memory addresses of the parameters described in each servo amplifier manual.

Point

Set the parameter value and switch power off once (The parameter is transferred to servo amplifier from Simple Motion module), and then switch it on again to make that parameter setting valid.

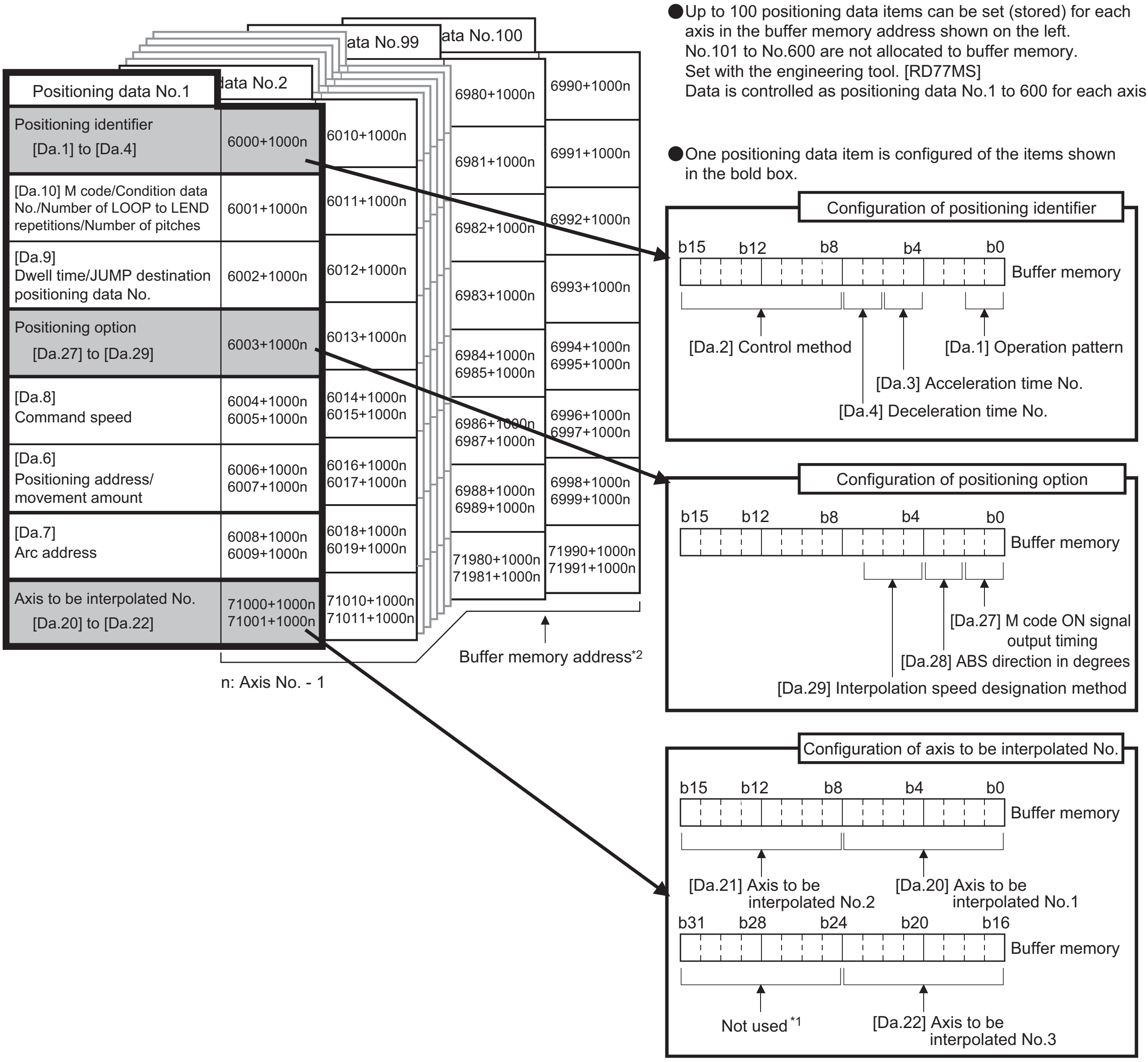
Parameters of MR-J4(W)-B/MR-J3(W)-B

Refer to each servo amplifier instruction manual for details of the parameter list and setting items. Do not change other than the buffer memory addresses of the parameters described in each servo amplifier instruction manual.

12.4 Positioning Data

Before explaining the positioning data setting items [Da.1] to [Da.10], [Da.20] to [Da.22], [Da.27] to [Da.29], the configuration of the positioning data is shown below.

The positioning data stored in the buffer memory of the Simple Motion module is the following configuration.



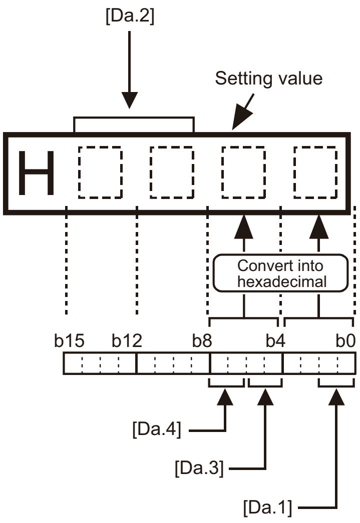
- ●Up to 100 positioning data items can be set (stored) for each axis in the buffer memory address shown on the left.
  No.101 to No.600 are not allocated to buffer memory.
  Set with the engineering tool. [RD77MS]
  Data is controlled as positioning data No.1 to 600 for each axis.
- ●One positioning data item is configured of the items shown in the bold box.

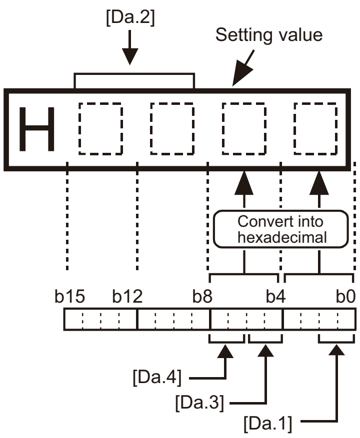
*1 Always "0" is set to the part not used.

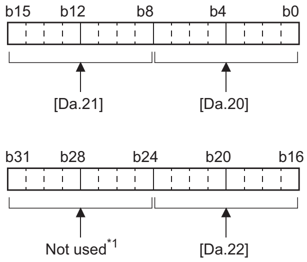
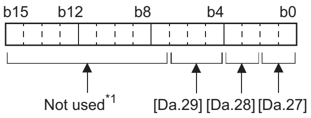
*2 Refer to the following for the buffer memory address of the axis 17 to 32.
☞ Page 478 Positioning data

The following explains the positioning data setting items [Da.1] to [Da.10], [Da.20] to [Da.22] and [Da.27] to [Da.29]. (The buffer memory addresses shown are those of the "positioning data No.1".)

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		**Setting value**			**Default value**	**Buffer memory address**	
		Value set with the engineering tool	**Value set with a program**			**Axis 1 to axis 16**	**Axis 17 to axis 32**
Positioning identifier	[Da.1] Operation pattern	00: Positioning complete	00		0000H	6000+1000n	1006000+1000n
		01: Continuous positioning control	01				
		11: Continuous path control	11				
	[Da.2] Control method	01H: ABS Linear 1	01H				
		02H: INC Linear 1	02H				
		03H: Feed 1	03H				
		04H: FWD V1	04H				
		05H: RVS V1	05H				
		06H: FWD V/P	06H				
		07H: RVS V/P	07H				
		08H: FWD P/V	08H				
		09H: RVS P/V	09H				
		0AH: ABS Linear 2	0AH				
		0BH: INC Linear 2	0BH				
		0CH: Feed 2	0CH				
		0DH: ABS ArcMP	0DH				
		0EH: INC ArcMP	0EH				
		0FH: ABS ArcRGT	0FH				
		10H: ABS ArcLFT	10H				
		11H: INC ArcRGT	11H				
		12H: INC ArcLFT	12H				
		13H: FWD V2	13H				
		14H: RVS V2	14H				
		15H: ABS Linear 3	15H				
		16H: INC Linear 3	16H				
		17H: Feed 3	17H				
		18H: FWD V3	18H				
		19H: RVS V3	19H				
		1AH: ABS Linear 4	1AH				
		1BH: INC Linear 4	1BH				
		1CH: Feed 4	1CH				
		1DH: FWD V4	1DH				
		1EH: RVS V4	1EH				
		20H: Helical interpolation control with sub point specified (ABS)	20H				
		21H: Helical interpolation control with sub point specified (INC)	21H				

Item		Setting value			Default value	Buffer memory address	
		Value set with the engineering tool	Value set with a program			Axis 1 to axis 16	Axis 17 to axis 32
Positioning identifier	[Da.2] Control method	22H: Helical interpolation control with center point specified (ABS, CW)	22H		0000H	6000+1000n	1006000+1000n
		23H: Helical interpolation control with center point specified (ABS, CCW)	23H				
		24H: Helical interpolation control with center point specified (INC, CW)	24H				
		25H: Helical interpolation control with center point specified (INC, CCW)	25H				
		80H: NOP	80H				
		81H: Address CHG	81H				
		82H: JUMP	82H				
		83H: LOOP	83H				
		84H: LEND	84H				
	[Da.3] Acceleration time No.	0: [Pr.9] Acceleration time 0	00				
		1: [Pr.25] Acceleration time 1	01				
		2: [Pr.26] Acceleration time 2	10				
		3: [Pr.27] Acceleration time 3	11				
	[Da.4] Deceleration time No.	0: [Pr.10] Deceleration time 0	00				
		1: [Pr.28] Deceleration time 1	01				
		2: [Pr.29] Deceleration time 2	10				
		3: [Pr.30] Deceleration time 3	11				
[Da.6] Positioning address/ movement amount		The setting value range differs according to the "[Da.2] Control method".			0	6006+1000n 6007+1000n	1006006+1000n 1006007+1000n
[Da.7] Arc address					0	6008+1000n 6009+1000n	1006008+1000n 1006009+1000n
[Da.8] Command speed		The setting value range differs depending on the "[Pr.1] Unit setting".			0	6004+1000n 6005+1000n	1006004+1000n 1006005+1000n
		-1: Current speed (Speed set for previous positioning data No.)	-1				
[Da.9] Dwell time/ JUMP destination positioning data No.	Dwell time	The setting value range differs according to the "[Da.2] Control method".			0	6002+1000n	1006002+1000n
	JUMP destination positioning data No.						
[Da.10] M code/ Condition data No./ Number of LOOP to LEND repetitions/ Number of pitches	M code				0	6001+1000n	1006001+1000n
	Condition data No.						
	Number of LOOP to LEND repetitions						

Item		Setting value			Default value	Buffer memory address	
		Value set with the engineering tool	Value set with a program			Axis 1 to axis 16	Axis 17 to axis 32
Axis to be interpolated	[Da.20] Axis to be interpolated No.1	0: Axis 1 selected 1: Axis 2 selected 2: Axis 3 selected 3: Axis 4 selected 4: Axis 5 selected 5: Axis 6 selected 6: Axis 7 selected 7: Axis 8 selected 8: Axis 9 selected 9: Axis 10 selected A: Axis 11 selected B: Axis 12 selected C: Axis 13 selected D: Axis 14 selected E: Axis 15 selected F: Axis 16 selected 10: Axis 17 selected 11: Axis 18 selected 12: Axis 19 selected 13: Axis 20 selected 14: Axis 21 selected 15: Axis 22 selected 16: Axis 23 selected 17: Axis 24 selected 18: Axis 25 selected 19: Axis 26 selected 1A: Axis 27 selected 1B: Axis 28 selected 1C: Axis 29 selected 1D: Axis 30 selected 1E: Axis 31 selected 1F: Axis 32 selected	0H 1H 2H 3H 4H 5H 6H 7H 8H 9H AH BH CH DH EH FH 10H 11H 12H 13H 14H 15H 16H 17H 18H 19H 1AH 1BH 1CH 1DH 1EH 1FH	 *1: Always "0" is set to the part not used.	0000H	71000+1000n 71001+1000n	1071000+1000n 1071001+1000n
	[Da.21] Axis to be interpolated No.2						
	[Da.22] Axis to be interpolated No.3						
Positioning option	[Da.27] M code ON signal output timing	0: Uses the setting value of "[Pr.18] M code ON signal output timing". 1: WITH mode 2: AFTER mode	0 1 2	 *1: Always "0" is set to the part not used.	0000H	6003+1000n	1006003+1000n
	[Da.28] ABS direction in degrees	0: Uses the setting value of "[Cd.40] ABS direction in degrees". 1: ABS circular right 2: ABS circular left 3: Takes a shortcut. (Specified direction ignored.)	0 1 2 3				
	[Da.29] Interpolation speed designation method	0: Uses the setting value of "[Pr.20] Interpolation speed designation method". 1: Composite speed 2: Reference axis speed	0 1 2				

[Da.1] Operation pattern

The operation pattern designates whether positioning of a certain data No. is to be ended with just that data, or whether the positioning for the next data No. is to be carried out in succession.

Operation pattern	Setting value	Details
Positioning complete	00	Set to execute positioning to the designated address, and then complete positioning.
Continuous positioning control	01	Positioning is carried out successively in order of data Nos. with one start signal. The operation halts at each position indicated by a positioning data.
Continuous path control	11	Positioning is carried out successively in order of data Nos. with one start signal. The operation does not stop at each positioning data.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Positioning data

[Da.2] Control method

Set the "control method" for carrying out positioning control.

Point

- When "JUMP instruction" is set for the control method, the "[Da.9] Dwell time/JUMP destination positioning data No." and "[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches" setting details will differ.
- In case you selected "LOOP" as the control method, the "[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches" should be set differently from other cases.
- Refer to the following for details on the control methods.

☞ Page 55 MAJOR POSITIONING CONTROL

- If "degree" is set for "[Pr.1] Unit setting", 2-axis circular interpolation control and 3-axis helical interpolation control cannot be carried out. (The error "Circular interpolation not possible" (error code: 199FH) will occur when executed.)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Positioning data

[Da.3] Acceleration time No.

Set which of "acceleration time 0 to 3" to use for the acceleration time during positioning.

0: Use the value set in "[Pr.9] Acceleration time 0".

1: Use the value set in "[Pr.25] Acceleration time 1".

2: Use the value set in "[Pr.26] Acceleration time 2".

3: Use the value set in "[Pr.27] Acceleration time 3".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Positioning data

[Da.4] Deceleration time No.

Set which of "deceleration time 0 to 3" to use for the deceleration time during positioning.

0: Use the value set in "[Pr.10] Deceleration time 0".

1: Use the value set in "[Pr.28] Deceleration time 1".

2: Use the value set in "[Pr.29] Deceleration time 2".

3: Use the value set in "[Pr.30] Deceleration time 3".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Positioning data

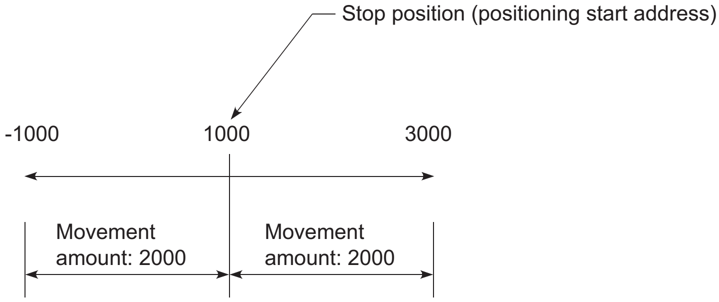
[Da.6] Positioning address/movement amount

Set the address to be used as the target value for positioning control.

The setting value range differs according to the "[Da.2] Control method".

■Absolute (ABS) system, current value changing

- The setting value (positioning address) for the ABS system and current value changing is set with an absolute address (address from home position).

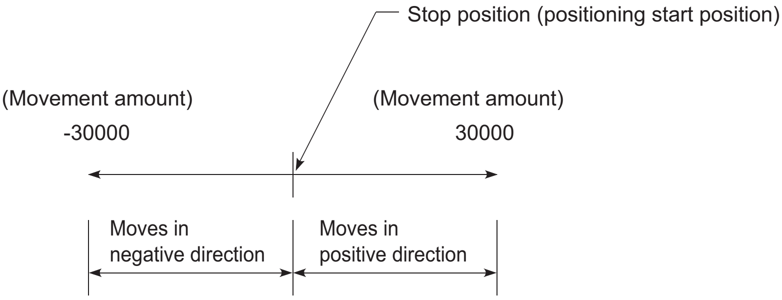


■Incremental (INC) system, fixed-feed 1, fixed-feed 2, fixed-feed 3, fixed-feed 4

- The setting value (movement amount) for the INC system is set as a movement amount with sign.

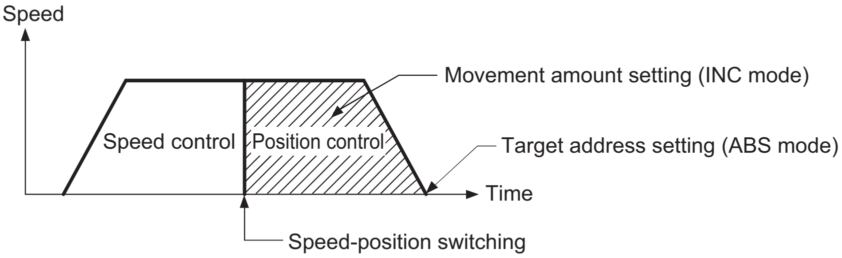
When movement amount is positive: Moves in the positive direction (address increment direction)

When movement amount is negative: Moves in the negative direction (address decrement direction)



■Speed-position switching control

- INC mode: Set the amount of movement after the switching from speed control to position control.
- ABS mode: Set the absolute address which will be the target value after speed control is switched to position control. (The unit is "degree" only)



■Position-speed switching control

- Set the amount of movement before the switching from position control to speed control.

● When "[Pr.1] Unit setting" is "mm"

The table below lists the control methods that require the setting of the positioning address or movement amount and the associated setting ranges.

(With any control method excluded from the table below, neither the positioning address nor the movement amount needs to be set.)

[Da.2] setting value	Value set with the engineering tool (μm)	Value set with a program[*1] (× 10^{-1} μm)
ABS Linear 1: 01H ABS Linear 2: 0AH ABS Linear 3: 15H ABS Linear 4: 1AH Current value changing: 81H	• Set the address -214748364.8 to 214748364.7	• Set the address -2147483648 to 2147483647
INC Linear 1: 02H INC Linear 2: 0BH INC Linear 3: 16H INC Linear 4: 1BH Fixed-feed 1: 03H Fixed-feed 2: 0CH Fixed-feed 3: 17H Fixed-feed 4: 1CH	• Set the movement amount -214748364.8 to 214748364.7	• Set the movement amount -2147483648 to 2147483647
Forward run speed/position: 06H Reverse run speed/position: 07H Forward run position/speed: 08H Reverse run position/speed: 09H	• Set the movement amount 0 to 214748364.7	• Set the movement amount 0 to 2147483647
ABS circular sub: 0DH ABS circular right: 0FH ABS circular left: 10H	• Set the address -214748364.8 to 214748364.7	• Set the address -2147483648 to 2147483647
INC circular sub: 0EH INC circular right: 11H INC circular left: 12H	• Set the movement amount -214748364.8 to 214748364.7	• Set the movement amount -2147483648 to 2147483647
ABS helical sub: 20H ABS helical right: 22H ABS helical left: 23H	• Set the address -214748364.8 to 214748364.7	• Set the address -2147483648 to 2147483647
INC helical sub: 21H INC helical right: 24H INC helical left: 25H	• Set the movement amount -214748364.8 to 214748364.7	• Set the movement amount -2147483648 to 2147483647

[*1] Set an integer because the program cannot handle fractions.
(The value will be converted properly within the system.)

● When "[Pr.1] Unit setting" is "degree"

The table below lists the control methods that require the setting of the positioning address or movement amount and the associated setting ranges.

(With any control method excluded from the table below, neither the positioning address nor the movement amount needs to be set.)

[Da.2] setting value	Value set with the engineering tool (degree)	Value set with a program[*1] (× 10^{-5} degree)
ABS Linear 1: 01H ABS Linear 2: 0AH ABS Linear 3: 15H ABS Linear 4: 1AH Current value changing: 81H	• Set the address 0 to 359.99999	• Set the address 0 to 35999999
INC Linear 1: 02H INC Linear 2: 0BH INC Linear 3: 16H INC Linear 4: 1BH Fixed-feed 1: 03H Fixed-feed 2: 0CH Fixed-feed 3: 17H Fixed-feed 4: 1CH	• Set the movement amount -21474.83648 to 21474.83647	• Set the movement amount -2147483648 to 2147483647[*2]
Forward run speed/position: 06H Reverse run speed/position: 07H	In INC mode • Set the movement amount 0 to 21474.83647 In ABS mode • Set the address 0 to 359.99999	In INC mode • Set the movement amount 0 to 2147483647 In ABS mode • Set the address 0 to 35999999
Forward run position/speed: 08H Reverse run position/speed: 09H	• Set the movement amount 0 to 21474.83647	• Set the movement amount 0 to 2147483647
ABS helical sub: 20H[*3] ABS helical right: 22H[*3] ABS helical left: 23H[*3]	• Set the address 0 to 359.99999	• Set the address 0 to 35999999
INC helical sub: 21H[*3] INC helical right: 24H[*3] INC helical left: 25H[*3]	• Set the movement amount -21474.83648 to 21474.83647	• Set the movement amount -2147483648 to 2147483647[*2]

*1 Set an integer because the program cannot handle fractions.
(The value will be converted properly within the system.)

*2 When the software stroke limit is valid, -35999999 to 35999999 is set.

*3 The axis where "degree" can be set in the 3-axis helical interpolation control is only the linear interpolation axis.

● When "[Pr.1] Unit setting" is "pulse"

The table below lists the control methods that require the setting of the positioning address or movement amount and the associated setting ranges.

(With any control method excluded from the table below, neither the positioning address nor the movement amount needs to be set.)

[Da.2] setting value	Value set with the engineering tool (pulse)	Value set with a program (pulse)
ABS Linear 1: 01H ABS Linear 2: 0AH ABS Linear 3: 15H ABS Linear 4: 1AH Current value changing: 81H	• Set the address -2147483648 to 2147483647	• Set the address -2147483648 to 2147483647
INC Linear 1: 02H INC Linear 2: 0BH INC Linear 3: 16H INC Linear 4: 1BH Fixed-feed 1: 03H Fixed-feed 2: 0CH Fixed-feed 3: 17H Fixed-feed 4: 1CH	• Set the movement amount -2147483648 to 2147483647	• Set the movement amount -2147483648 to 2147483647
Forward run speed/position: 06H Reverse run speed/position: 07H Forward run position/speed: 08H Reverse run position/speed: 09H	• Set the movement amount 0 to 2147483647	• Set the movement amount 0 to 2147483647
ABS circular sub: 0DH ABS circular right: 0FH ABS circular left: 10H	• Set the address -2147483648 to 2147483647	• Set the address -2147483648 to 2147483647
INC circular sub: 0EH INC circular right: 11H INC circular left: 12H	• Set the movement amount -2147483648 to 2147483647	• Set the movement amount -2147483648 to 2147483647
ABS helical sub: 20H ABS helical right: 22H ABS helical left: 23H	• Set the address -2147483648 to 2147483647	• Set the address -2147483648 to 2147483647
INC helical sub: 21H INC helical right: 24H INC helical left: 25H	• Set the movement amount -2147483648 to 2147483647	• Set the movement amount -2147483648 to 2147483647

● When "[Pr.1] Unit setting" is "inch"

The table below lists the control methods that require the setting of the positioning address or movement amount and the associated setting ranges.

(With any control method excluded from the table below, neither the positioning address nor the movement amount needs to be set.)

[Da.2] setting value	Value set with the engineering tool (inch)	Value set with a program[*1] (× 10^{-5} inch)
ABS Linear 1: 01H ABS Linear 2: 0AH ABS Linear 3: 15H ABS Linear 4: 1AH Current value changing: 81H	• Set the address -21474.83648 to 21474.83647	• Set the address -2147483648 to 2147483647
INC Linear 1: 02H INC Linear 2: 0BH INC Linear 3: 16H INC Linear 4: 1BH Fixed-feed 1: 03H Fixed-feed 2: 0CH Fixed-feed 3: 17H Fixed-feed 4: 1CH	• Set the movement amount -21474.83648 to 21474.83647	• Set the movement amount -2147483648 to 2147483647
Forward run speed/position: 06H Reverse run speed/position: 07H Forward run position/speed: 08H Reverse run position/speed: 09H	• Set the movement amount 0 to 21474.83647	• Set the movement amount 0 to 2147483647
ABS circular sub: 0DH ABS circular right: 0FH ABS circular left: 10H	• Set the address -21474.83648 to 21474.83647	• Set the address -2147483648 to 2147483647
INC circular sub: 0EH INC circular right: 11H INC circular left: 12H	• Set the movement amount -21474.83648 to 21474.83647	• Set the movement amount -2147483648 to 2147483647
ABS helical sub: 20H ABS helical right: 22H ABS helical left: 23H	• Set the address -21474.83648 to 21474.83647	• Set the address -2147483648 to 2147483647
INC helical sub: 21H INC helical right: 24H INC helical left: 25H	• Set the movement amount -21474.83648 to 21474.83647	• Set the movement amount -2147483648 to 2147483647

[*1] Set an integer because the program cannot handle fractions.
(The value will be converted properly within the system.)

■Buffer memory address

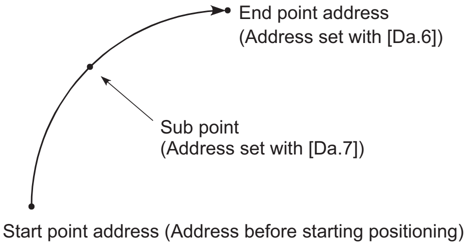
Refer to the following for the buffer memory address in this area.

☞ Page 478 Positioning data

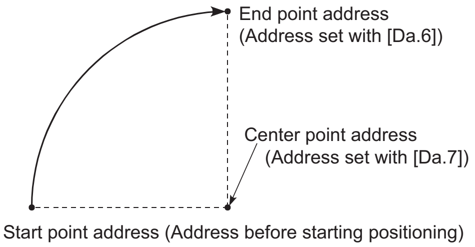
[Da.7] Arc address

The arc address is data required only when carrying out 2-axis circular interpolation control or 3-axis helical interpolation control.

- When carrying out circular interpolation with sub point designation, set the sub point (passing point) address as the arc address.
- When carrying out circular interpolation with center point designation, set the center point address of the arc as the arc address.



<(1) Circular interpolation with sub point designation>



<(2) Circular interpolation with center point designation>

When not carrying out 2-axis circular interpolation control or 3-axis helical interpolation control, the value set in "[Da.7] Arc address" will be invalid.

■When "[Pr.1] Unit setting" is "mm"

The table below lists the control methods that require the setting of the arc address and shows the setting range.

(With any control method excluded from the table below, the arc address does not need to be set.)

[Da.2] setting value	Value set with the engineering tool (μm)	Value set with a program[1] ($\times 10^{-1}$ μm)
ABS circular sub: 0DH ABS circular right: 0FH ABS circular left: 10H	• Set the address -214748364.8 to 214748364.7[2]	• Set the address -2147483648 to 2147483647
INC circular sub: 0EH INC circular right: 11H INC circular left: 12H	• Set the movement amount -214748364.8 to 214748364.7[2]	• Set the movement amount -2147483648 to 2147483647[2]
ABS helical sub: 20H ABS helical right: 22H ABS helical left: 23H	• Set the address -214748364.8 to 214748364.7	• Set the address -2147483648 to 2147483647
INC helical sub: 21H INC helical right: 24H INC helical left: 25H	• Set the movement amount -214748364.8 to 214748364.7[2]	• Set the movement amount -2147483648 to 2147483647

[1] Set an integer because the program cannot handle fractions.
(The value will be converted properly within the system.)

[2] Note that the maximum radius that 2-axis circular interpolation control is possible is 536870912 ($\times 10^{-1}$ μm), although the setting value can be input within the range shown in the above table, as an arc address.

■When "[Pr.1] Unit setting" is "degree"

No control method requires the setting of the arc address by "degree".

■When "[Pr.1] Unit setting" is "pulse"

The table below lists the control methods that require the setting of the arc address and shows the setting range.

(With any control method excluded from the table below, the arc address does not need to be set.)

[Da.2] setting value	Value set with the engineering tool (pulse)	Value set with a program (pulse)
ABS circular sub: 0DH ABS circular right: 0FH ABS circular left: 10H	• Set the address -2147483648 to 2147483647[1]	• Set the address -2147483648 to 2147483647
INC circular sub: 0EH INC circular right: 11H INC circular left: 12H	• Set the movement amount -2147483648 to 2147483647[1]	• Set the movement amount -2147483648 to 2147483647[1]
ABS helical sub: 20H ABS helical right: 22H ABS helical left: 23H	• Set the address -2147483648 to 2147483647	• Set the address -2147483648 to 2147483647
INC helical sub: 21H INC helical right: 24H INC helical left: 25H	• Set the movement amount -2147483648 to 2147483647[1]	• Set the movement amount -2147483648 to 2147483647[1]

*1 Note that the maximum radius that 2-axis circular interpolation control is possible is 536870912 (pulse), although the setting value can be input within the range shown in the above table, as an arc address.

■When "[Pr.1] Unit setting" is "inch"

The table below lists the control methods that require the setting of the arc address and shows the setting range.

(With any control method excluded from the table below, the arc address does not need to be set.)

[Da.2] setting value	Value set with the engineering tool (inch)	Value set with a program[1] (× 10^{-5} inch)
ABS circular sub: 0DH ABS circular right: 0FH ABS circular left: 10H	• Set the address -21474.83648 to 21474.83647[2]	• Set the address -2147483648 to 2147483647
INC circular sub: 0EH INC circular right: 11H INC circular left: 12H	• Set the movement amount -21474.83648 to 21474.83647[2]	• Set the movement amount -2147483648 to 2147483647[2]
ABS helical sub: 20H ABS helical right: 22H ABS helical left: 23H	• Set the address -21474.83648 to 21474.83647	• Set the address -2147483648 to 2147483647
INC helical sub: 21H INC helical right: 24H INC helical left: 25H	• Set the movement amount -21474.83648 to 21474.83647[2]	• Set the movement amount -2147483648 to 2147483647[2]

*1 Set an integer because the program cannot handle fractions.
(The value will be converted properly within the system.)

*2 Note that the maximum radius that 2-axis circular interpolation control is possible is 536870912 (× 10^{-5} inch), although the setting value can be input within the range shown in the above table, as an arc address.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Positioning data

[Da.8] Command speed

Set the command speed for positioning.

- If the set command speed exceeds "[Pr.8] Speed limit value", positioning will be carried out at the speed limit value.
- If "-1" is set for the command speed, the current speed (speed set for previous positioning data No.) will be used for positioning control. Use the current speed for uniform speed control, etc. If "-1" is set for continuing positioning data, and the speed is changed, the following speed will also change.

Note that when starting positioning, if the "-1" speed is set for the positioning data that carries out positioning control first, the error "No command speed" (error code: 1A12H) will occur, and the positioning will not start.

Refer to the following for details on the errors.

☞ Page 722 List of Error Codes

[Pr.1] setting value	Value set with the engineering tool (unit)	Value set with a program (unit)
0: mm	0.01 to 20000000.00 (mm/min)	1 to 2000000000 (× 10^{-2} mm/min)
1: inch	0.001 to 2000000.000 (inch/min)	1 to 2000000000 (× 10^{-3} inch/min)
2: degree	0.001 to 2000000.000 (degree/min)[*1]	1 to 2000000000 (× 10^{-3} degree/min)[*2]
3: pulse	1 to 1000000000 (pulse/s)	1 to 1000000000 (pulse/s)

[*1] The range of command speed when "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid: 0.01 to 20000000.00 (degree/min)

[*2] The range of command speed when "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid: 1 to 2000000000 (× 10^{-2} degree/min)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Positioning data

[Da.9] Dwell time/JUMP destination positioning data No.

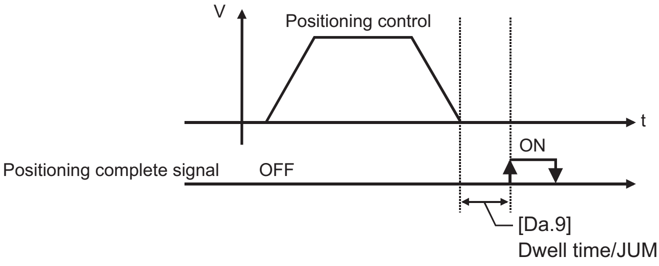
Set the "dwell time" or "positioning data No." corresponding to the "[Da.2] Control method".

- When a method other than "JUMP instruction" is set for "[Da.2] Control method": Set the "dwell time".
- When "JUMP instruction" is set for "[Da.2] Control method": Set the "positioning data No." for the JUMP destination.

When the "dwell time" is set, the setting details of the "dwell time" will be as follows according to "[Da.1] Operation pattern".

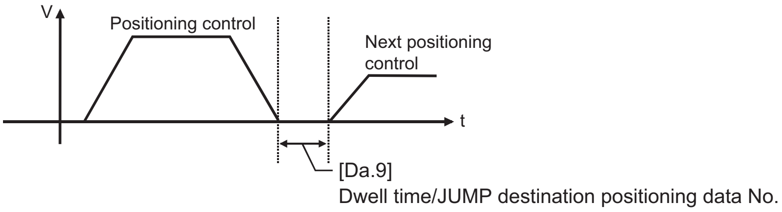
■When "[Da.1] Operation pattern" in "00: Positioning complete"

- Set the time from when the positioning ends to when the "positioning complete signal" turns ON as the "dwell time".



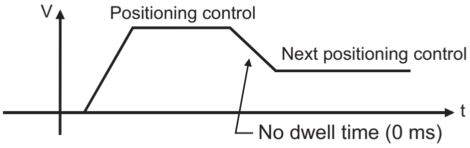
■When "[Da.1] Operation pattern" is "01: Continuous positioning control"

- Set the time from when positioning control ends to when the next positioning control starts as the "dwell time".



■When "[Da.1] Operation pattern" is "11: Continuous path control"

- The setting value is irrelevant to the control. (The "dwell time" is 0 ms.)



[Da.2] setting value	Setting item	Value set with the engineering tool	Value set with a program[1]
JUMP instruction: 82H	Positioning data No.	1 to 600	1 to 600
Other than JUMP instruction	Dwell time	0 to 65535 (ms)	0 to 65535 (ms)

[1] 0 to 32767: Set as a decimal
32768 to 65535: Convert into hexadecimal and set

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Positioning data

[Da.10] M code/Condition data No./No. of LOOP to LEND repetitions/No. of pitches

Set an "M code", a "condition data No.", the "Number of LOOP to LEND repetitions" or the "Number of pitches" depending on how the "[Da.2] Control method" is set.[1]

[1] The condition data specifies the condition for the JUMP instruction to be executed. (A JUMP will take place when the condition is satisfied.)

■If a method other than "JUMP instruction", "LOOP", and "3-axis helical interpolation control" is selected as the "[Da.2] Control method"

Set an "M code".

If no "M code" needs to be output, set "0" (default value).

■If "JUMP instruction" or "LOOP" is selected as the "[Da.2] Control method"

Set the "condition data No." for JUMP.

- 0: Unconditional JUMP to the positioning data specified by "[Da.9] Dwell time/JUMP destination positioning data No.".
- 1 to 10: JUMP performed according to the condition data No. specified (a number between 1 and 10). Make sure that you specify the number of LOOP to LEND repetitions by a number other than "0". The error "Control method LOOP setting error" (error code: 1A33H) will occur if you specify "0".

■If "3-axis helical interpolation control" is selected as the "[Da.2] Control method"

Set the number of pitches for the linear interpolation axis. The rotation speed of the circular interpolation is set with the number of pitch.

[Da.2] setting value	Setting item	Value set with the engineering tool	Value set with a program[1]
JUMP instruction: 82H	Condition data No.	0 to 10	0 to 10
Helical interpolation: 20H to 25H	Number of pitches	0 to 999	0 to 999
LOOP: 83H	Repetition count	1 to 65535	1 to 65535
Other than the above	M code	0 to 65535	0 to 65535

[1] 0 to 32767: Set as a decimal
32768 to 65535: Convert into hexadecimal and set

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Positioning data

[Da.20] Axis to be interpolated No.1 to [Da.22] Axis to be interpolated No.3

Set the axis to be interpolated to execute the 2 to 4-axis interpolation operation. Set the circular interpolation axis and the linear interpolation axis to execute the 3-axis helical interpolation control.

2-axis interpolation	Set the target axis No. in "[Da.20] Axis to be interpolated No.1".
3-axis interpolation	Set the target axis No. in "[Da.20] Axis to be interpolated No.1" and "[Da.21] Axis to be interpolated No.2".
4-axis interpolation	Set the target axis No. in "[Da.20] Axis to be interpolated No.1" to "[Da.22] Axis to be interpolated No.3".
3-axis helical interpolation	Set the circular interpolation axis in "[Da.20] Axis to be interpolated No.1" and the linear interpolation axis No. in "[Da.21] Axis to be interpolated No.2".

Set the axis set as axis to be interpolated.[1]

0: Axis 1	8: Axis 9	10: Axis 17	18: Axis 25
1: Axis 2	9: Axis 10	11: Axis 18	19: Axis 26
2: Axis 3	A: Axis 11	12: Axis 19	1A: Axis 27
3: Axis 4	B: Axis 12	13: Axis 20	1B: Axis 28
4: Axis 5	C: Axis 13	14: Axis 21	1C: Axis 29
5: Axis 6	D: Axis 14	15: Axis 22	1D: Axis 30
6: Axis 7	E: Axis 15	16: Axis 23	1E: Axis 31
7: Axis 8	F: Axis 16	17: Axis 24	1F: Axis 32

[1] The setting value, whose axis No. exceeds the number of controlled axes, cannot be used.

Point

- Do not specify the own axis No. or the value outside the range. Otherwise, the error "Illegal interpolation description command" (error code: 1A22H) will occur during the program execution.
- When the same axis No. or axis No. of own axis is set to multiple axis to be interpolated No., the error "Illegal interpolation description command" (error code: 1A22H) will occur during the program execution.)
- Do not specify the axis to be interpolated No.2 and axis to be interpolated No.3 for 2-axis interpolation, and do not specify the axis to be interpolated No.3 for 3-axis interpolation. The setting value is ignored.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Positioning data

[Da.27] M code ON signal output timing

Set the M code ON signal output timing to each positioning data.

Refer to the following for setting details.

☞ Page 518 [Pr.18] M code ON signal output timing

0: Uses the setting value of "[Pr.18] M code ON signal output timing".
1: WITH mode
2: AFTER mode

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Positioning data

[Da.28] ABS direction in degrees

Set "[Cd.40] ABS direction in degrees" to each positioning data.

Refer to the following for setting details.

☞ Page 519 [Pr.20] Interpolation speed designation method

0: Uses the setting value of "[Cd.40] ABS direction in degrees".

1: ABS circular right

2: ABS circular left

3: Takes a shortcut. (Specified direction ignored.)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Positioning data

[Da.29] Interpolation speed designation method

Set the interpolation speed designation method to each positioning data.

Refer to the following for setting details.

☞ Page 519 [Pr.20] Interpolation speed designation method

0: Uses the setting value of "[Pr.20] Interpolation speed designation method".

1: Composite speed

2: Reference axis speed

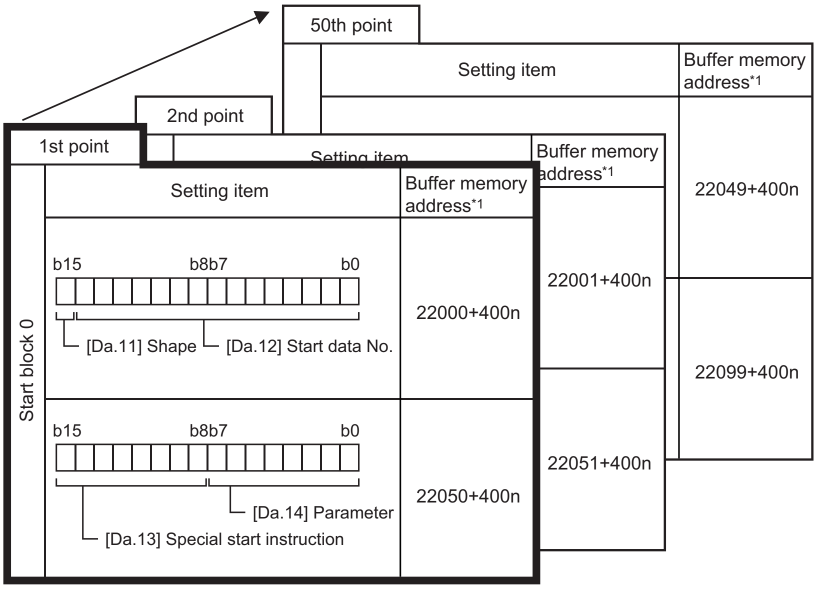
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Positioning data

12.5 Block Start Data

Before explaining the block start data setting items [Da.11] to [Da.14], the configuration of the block start data is shown below.
The block start data stored in the buffer memory of the Simple Motion module is the following configuration.



- Up to 50 block start data points can be set (stored) for each axis in the buffer memory addresses shown on the left.
- Items in a single unit of block start data are shown included in a bold frame.
- Each axis has five start blocks (block Nos. 0 to 4).
  Start block 2 to 4 are not allocated to buffer memory. Set with the engineering tool. [RD77MS]

n: Axis No. - 1

*1 Refer to the following for the buffer memory address of the axis 17 to 32.
☞ Page 480 Positioning data (Block start data)

The following explains the block start data setting items [Da.11] to [Da.14]. (The buffer memory addresses shown are those of the "1st point block start data (block No.7000)".)

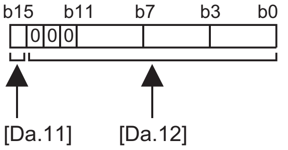
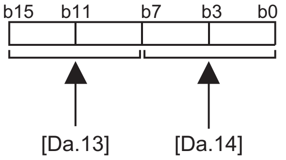
Point

- To perform a high-level positioning control using block start data, set a number between 7000 and 7004 to the "[Cd.3] Positioning start No." and use the "[Cd.4] Positioning starting point No." to specify a point No. between 1 and 50, a position counted from the beginning of the block.
- The number between 7000 and 7004 specified here is called the "block No.".
- With the Simple Motion module, up to 50 "block start data" points and up to 10 "condition data" items can be assigned to each "block No.".

Block No.[*1]	Axis	Block start data	Condition	Buffer memory	Engineering tool
7000	Axis 1	Start block 0	Condition data (1 to 10)	Supports the settings	Supports the settings
	⋮		⋮		
	Maximum control axis No.		Condition data (1 to 10)		
7001	Axis 1	Start block 1	Condition data (1 to 10)		
	⋮		⋮		
	Maximum control axis No.		Condition data (1 to 10)		
7002	Axis 1	Start block 2	Condition data (1 to 10)	— [RD77MS] Supports the settings [RD77GF]	
	⋮		⋮		
	Maximum control axis No.		Condition data (1 to 10)		
7003	Axis 1	Start block 3	Condition data (1 to 10)		
	⋮		⋮		
	Maximum control axis No.		Condition data (1 to 10)		
7004	Axis 1	Start block 4	Condition data (1 to 10)		
	⋮		⋮		
	Maximum control axis No.		Condition data (1 to 10)		

*1 Setting cannot be made when the "Pre-reading start function" is used. If you set any of Nos. 7000 to 7004 and perform the Pre-reading start function, the error "Outside start No. range" (error code: 19A3H)" will occur.
Refer to the following for details.
☞ Page 287 Pre-reading start function

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item	Setting value			Default value	Buffer memory address	
	Value set with the engineering tool	Value set with a program			Axis 1 to axis 16	Axis 17 to axis 32
[Da.11] Shape	0: End	0		0000H	22000+400n	1022000+400n
	1: Continue	1				
[Da.12] Start data No.	Positioning data No: 1 to 600 (01H to 258H)	01H to 258H				
[Da.13] Special start instruction	0: Block start (normal start)	00H		0000H	22050+400n	1022050+400n
	1: Condition start	01H				
	2: Wait start	02H				
	3: Simultaneous start	03H				
	4: FOR loop	04H				
	5: FOR condition	05H				
	6: NEXT start	06H				
[Da.14] Parameter	Condition data No.: 1 to 10 (01H to 0AH) Number of repetitions: 0 to 255 (00H to FFH)	00H to FFH				

[Da.11] Shape

Set whether to carry out only the local "block start data" and then end control, or to execute the "block start data" set in the next point.

Setting value	Setting details
0: End	Execute the designated point's "block start data", and then complete the control.
1: Continue	Execute the designated point's "block start data", and after completing control, execute the next point's "block start data".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 480 Positioning data (Block start data)

[Da.12] Start data No.

Set the "positioning data No." designated with the "block start data".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 480 Positioning data (Block start data)

[Da.13] Special start instruction

Set the "special start instruction" for using "high-level positioning control". (Set how to start the positioning data set in "[Da.12] Start data No.".)

Setting value	Setting details
00H: Block start (Normal start)	Execute the random block positioning data in the set order with one start.
01H: Condition start	Carry out the condition judgment set in "condition data" for the designated positioning data, and when the conditions are established, execute the "block start data". If not established, ignore that "block start data", and then execute the next point's "block start data".
02H: Wait start	Carry out the condition judgment set in "condition data" for the designated positioning data, and when the conditions are established, execute the "block start data". If not established, stop the control (wait) until the conditions are established.
03H: Simultaneous start	Simultaneous execute (output command at same timing) the positioning data with the No. designated for the axis designated in the "condition data". Up to four axes can start simultaneously.
04H: Repeated start (FOR loop)	Repeat the program from the block start data with the "FOR loop" to the block start data with "NEXT" for the designated number of times.
05H: Repeated start (FOR condition)	Repeat the program from the block start data with the "FOR condition" to the block start data with "NEXT" until the conditions set in the "condition data" are established.
06H: NEXT start	Set the end of the repetition when "04H: Repetition start (FOR loop)" or "05H: Repetition start (FOR condition)" is set.

Refer to the following for details on the control.

☞ Page 151 HIGH-LEVEL POSITIONING CONTROL

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 480 Positioning data (Block start data)

[Da.14] Parameter

Set the value as required for "[Da.13] Special start instruction".

[Da.13] Special start instruction	Setting value	Setting details
Block start (Normal start)	—	Not used. (There is no need to set.)
Condition start	1 to 10	Set the condition data No. (Data No. of "condition data" is set up for the condition judgment.) (Refer to ☞ Page 568 Condition Data for details on the condition data.)
Wait start		
Simultaneous start		
Repeated start (FOR loop)	0 to 255	Set the number of repetitions.
Repeated start (FOR condition)	1 to 10	Set the condition data No. (Data No. of "condition data" is set up for the condition judgment.)

■Buffer memory address

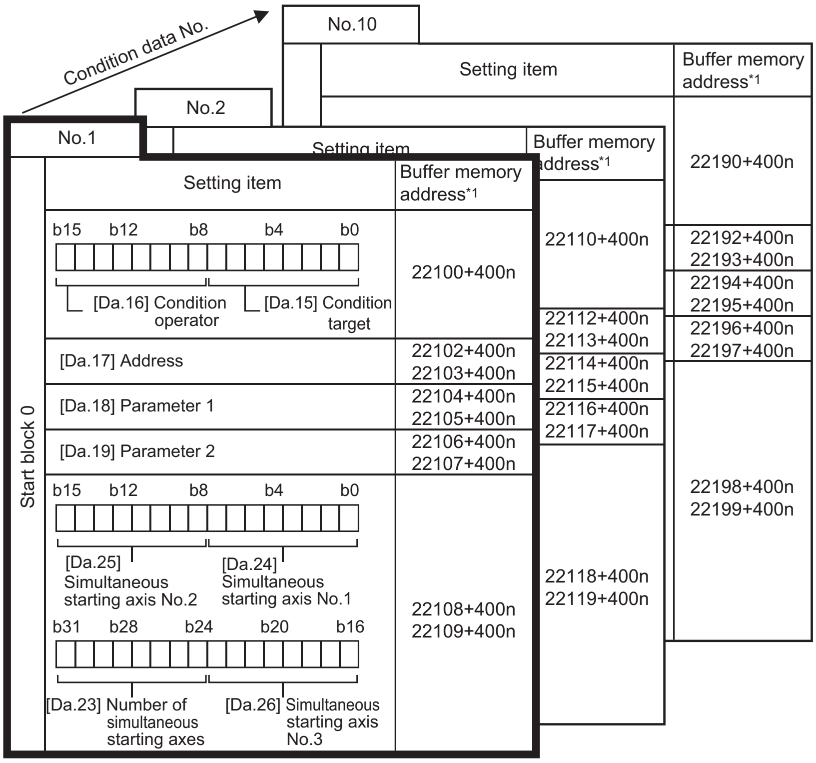
Refer to the following for the buffer memory address in this area.

☞ Page 480 Positioning data (Block start data)

12.6 Condition Data

Before explaining the condition data setting items [Da.15] to [Da.19] and [Da.23] to [Da.26], the configuration of the condition data is shown below.

The condition data stored in the buffer memory of the Simple Motion module is the following configuration.



n: Axis No. - 1

- ● Up to 10 condition data points can be set (stored) for each block No. in the buffer memory addresses shown on the left.
- ● Items in a single unit of condition data are shown included in a bold frame.
- ● Each axis has five start blocks (block Nos. 0 to 4).
  Start block 2 to 4 are not allocated to buffer memory. Set with the engineering tool. [RD77MS]

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[1] Refer to the following for the buffer memory address of the axis 17 to 32.
☞ Page 480 Positioning data (Block start data)

The following explains the condition data setting items [Da.15] to [Da.19] and [Da.23] to [Da.26]. (The buffer memory addresses shown are those of the "condition data No.1 (block No.7000)".)

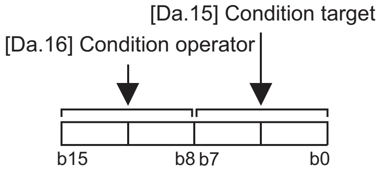
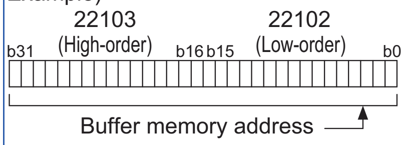
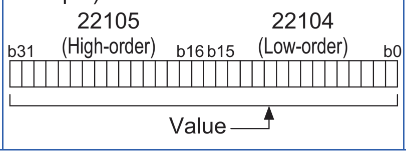
Point

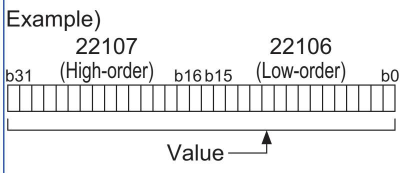
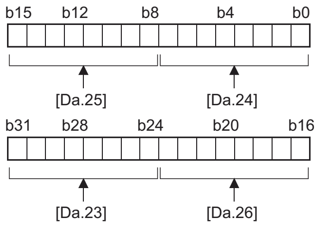
- To perform a high-level positioning control using block start data, set a number between 7000 and 7004 to the "[Cd.3] Positioning start No." and use the "[Cd.4] Positioning starting point No." to specify a point No. between 1 and 50, a position counted from the beginning of the block.
- The number between 7000 and 7004 specified here is called the "block No.".
- With the Simple Motion module, up to 50 "block start data" points and up to 10 "condition data" items can be assigned to each "block No.".

Block No.[*1]	Axis	Block start data	Condition	Buffer memory	Engineering tool
7000	Axis 1	Start block 0	Condition data (1 to 10)	Supports the settings	Supports the settings
	⋮		⋮		
	Maximum control axis No.		Condition data (1 to 10)		
7001	Axis 1	Start block 1	Condition data (1 to 10)		
	⋮		⋮		
	Maximum control axis No.		Condition data (1 to 10)		
7002	Axis 1	Start block 2	Condition data (1 to 10)	— [RD77MS] Supports the settings [RD77GF]	
	⋮		⋮		
	Maximum control axis No.		Condition data (1 to 10)		
7003	Axis 1	Start block 3	Condition data (1 to 10)		
	⋮		⋮		
	Maximum control axis No.		Condition data (1 to 10)		
7004	Axis 1	Start block 4	Condition data (1 to 10)		
	⋮		⋮		
	Maximum control axis No.		Condition data (1 to 10)		

*1 Setting cannot be made when the "Pre-reading start function" is used. If you set any of Nos. 7000 to 7004 and perform the Pre-reading start function, the error "Outside start No. range" (error code: 19A3H) will occur.
Refer to the following for details.
☞ Page 287 Pre-reading start function

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

Item		**Setting value**			**Default value**	**Buffer memory address**	
		Value set with the engineering tool	**Value set with a program**			**Axis 1 to axis 16**	**Axis 17 to axis 32**
Condition identifier	[Da.15] Condition target	01: Device X	01H		0000H	22100+400n	1022100+400n
		02: Device Y	02H				
		03: Buffer memory (1-word)	03H				
		04: Buffer memory (2-word)	04H				
		05: Positioning data No.	05H				
		11: RX (1-bit) [RD77GF]	11H				
		12: RY (1-bit) [RD77GF]	12H				
		13: RWr (1-bit) [RD77GF]	13H				
		14: RWw (1-bit) [RD77GF]	14H				
		21: RX (1-word) [RD77GF]	21H				
		22: RY (1-word) [RD77GF]	22H				
		23: RWr (1-word) [RD77GF]	23H				
		24: RWw (1-word) [RD77GF]	24H				
		31: RX (2-word) [RD77GF]	31H				
		32: RY (2-word) [RD77GF]	32H				
		33: RWr (2-word) [RD77GF]	33H				
		34: RWw (2-word) [RD77GF]	34H				
	[Da.16] Condition operator	01: ** = P1	01H				
		02: ** ≠ P1	02H				
		03: ** ≤ P1	03H				
		04: ** ≥ P1	04H				
		05: P1 ≤ ** ≤ P2	05H				
		06: ** ≤ P1, P2 ≤ **	06H				
		07: DEV = ON	07H				
		08: DEV = OFF	08H				
[Da.17] Address		Buffer memory address		Example) 	0000H	22102+400n 22103+400n	1022102+400n 1022103+400n
[Da.18] Parameter 1		Value		Example) 	0000H	22104+400n 22105+400n	1022104+400n 1022105+400n

Item		Setting value			Default value	Buffer memory address	
		Value set with the engineering tool	Value set with a program			Axis 1 to axis 16	Axis 17 to axis 32
[Da.19] Parameter 2		Value			0000H	22106+400n 22107+400n	1022106+400n 1022107+400n
Simultaneous starting axis	[Da.23] Number of simultaneous starting axes	2: 2 axes	2H		0000H	22108+400n 22109+400n	1022108+400n 1022109+400n
		3: 3 axes	3H				
		4: 4 axes	4H				
	[Da.24] Simultaneous starting axis No.1	0: Axis 1 selected 1: Axis 2 selected 2: Axis 3 selected 3: Axis 4 selected 4: Axis 5 selected 5: Axis 6 selected 6: Axis 7 selected 7: Axis 8 selected 8: Axis 9 selected 9: Axis 10 selected A: Axis 11 selected B: Axis 12 selected C: Axis 13 selected D: Axis 14 selected E: Axis 15 selected F: Axis 16 selected 10: Axis 17 selected 11: Axis 18 selected 12: Axis 19 selected 13: Axis 20 selected 14: Axis 21 selected 15: Axis 22 selected 16: Axis 23 selected 17: Axis 24 selected 18: Axis 25 selected 19: Axis 26 selected 1A: Axis 27 selected 1B: Axis 28 selected 1C: Axis 29 selected 1D: Axis 30 selected 1E: Axis 31 selected 1F: Axis 32 selected	0H 1H 2H 3H 4H 5H 6H 7H 8H 9H AH BH CH DH EH FH 10H 11H 12H 13H 14H 15H 16H 17H 18H 19H 1AH 1BH 1CH 1DH 1EH 1FH				
	[Da.25] Simultaneous starting axis No.2						
	[Da.26] Simultaneous starting axis No.3						

[Da.15] Condition target

Set the condition target as required for each control.

Setting value	Setting details
01H: Device X	Set the state (ON/OFF) of an I/O signal as a condition.
02H: Device Y	
03H: Buffer memory (1-word)	Set the value stored in the buffer memory as a condition. 03H: The target buffer memory is "1-word (16 bits)" 04H: The target buffer memory is "2-word (32 bits)"
04H: Buffer memory (2-word)	
05H: Positioning data No.	Select only for "simultaneous start".
11H: RX (1-bit) [RD77GF]	Set the state (ON/OFF) of a link device as a condition.
12H: RY (1-bit) [RD77GF]	
13H: RWr (1-bit) [RD77GF]	
14H: RWw (1-bit) [RD77GF]	
21H: RX (1-word) [RD77GF]	Set the value stored in the link device as a condition. 21H to 24H: The target link device is "1-word (16 bits)" 31H to 34H: The target link device is "2-word (32 bits)"
22H: RY (1-word) [RD77GF]	
23H: RWr (1-word) [RD77GF]	
24H: RWw (1-word) [RD77GF]	
31H: RX (2-word) [RD77GF]	
32H: RY (2-word) [RD77GF]	
33H: RWr (2-word) [RD77GF]	
34H: RWw (2-word) [RD77GF]	

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 480 Positioning data (Block start data)

[Da.16] Condition operator

Set the condition operator as required for the "[Da.15] Condition target".

[Da.15] Condition target	Setting value	Setting details
01H: Device X 02H: Device Y 11H: RX (1-bit) [RD77GF] 12H: RY (1-bit) [RD77GF] 13H: RWr (1-bit) [RD77GF] 14H: RWw (1-bit) [RD77GF]	07H: DEV = ON	[RD77MS] When the state (ON/OFF) of an I/O signal is set as a condition, select ON or OFF as the trigger. [RD77GF] When the state (ON/OFF) of an I/O signal or link device is set as a condition, select ON or OFF as the trigger.
	08H: DEV = OFF	
03H: Buffer memory (1-word) 04H: Buffer memory (2-word) 21H: RX (1-word) [RD77GF] 22H: RY (1-word) [RD77GF] 23H: RWr (1-word) [RD77GF] 24H: RWw (1-word) [RD77GF] 31H: RX (2-word) [RD77GF] 32H: RY (2-word) [RD77GF] 33H: RWr (2-word) [RD77GF] 34H: RWw (2-word) [RD77GF]	01H: ** = P1	[RD77MS] Select how to use the value (**) in the buffer memory as a part of the condition. [RD77GF] Select how to use the value (**) in the buffer memory or link device as a part of the condition.
	02H: ** ≠ P1	
	03H: ** ≤ P1	
	04H: ** ≥ P1	
	05H: P1 ≤ ** ≤ P2	
	06H: ** ≤ P1, P2 ≤ **	

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 480 Positioning data (Block start data)

[Da.17] Address

Set the address as required for the "[Da.15] Condition target".

[Da.15] Condition target	Setting value	Setting details
01H: Device X	—	Not used. (There is no need to set.)
02H: Device Y		
03H: Buffer memory (1-word)	Value (Buffer memory address)	Set the target "buffer memory address". (For 2-word, set the low-order buffer memory address.)
04H: Buffer memory (2-word)		
05H: Positioning data No.	—	Not used. (There is no need to set.)
11H: RX (1-bit) [RD77GF]	Value (Link device No.)	Set the target "link device start No.". (For 2-word, set the low-order link device.)
12H: RY (1-bit) [RD77GF]		
13H: RWr (1-bit) [RD77GF]		
14H: RWw (1-bit) [RD77GF]		
21H: RX (1-word) [RD77GF]		
22H: RY (1-word) [RD77GF]		
23H: RWr (1-word) [RD77GF]		
24H: RWw (1-word) [RD77GF]		
31H: RX (2-word) [RD77GF]		
32H: RY (2-word) [RD77GF]		
33H: RWr (2-word) [RD77GF]		
34H: RWw (2-word) [RD77GF]		

*1 The buffer memory address setting range when the buffer memory is specified is as follows.

[Da.15] Condition target	Buffer memory address range
03H: Buffer memory (1-word)	0 to 98303 [RD77MS] 0 to 4194303 [RD77GF]
04H: Buffer memory (2-word)	0 to 98302 [RD77MS] 0 to 4194302 [RD77GF]

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 480 Positioning data (Block start data)

[Da.18] Parameter 1

Set the parameters as required for the "[Da.16] Condition operator" and "[Da.23] Number of simultaneous starting axes".

[Da.16] Condition operator	[Da.23] Number of simultaneous starting axes	Setting value	Setting details
01H: ** = P1	—	Value	The value of P1 should be equal to or smaller than the value of P2. (P1 ≤ P2) If P1 is greater than P2 (P1 > P2), the error "Condition data error" (error code: 1A00H to 1A05H) will occur.
02H: ** ≠ P1			
03H: ** ≤ P1			
04H: ** ≥ P1			
05H: P1 ≤ ** ≤ P2			
06H: ** ≤ P1, P2 ≤ **			
07H: DEV = ON		Value (bit No.)	Set the device bit No. X: 0H to 1H, 10H to 3FH*1 Y: 0H, 1H, 10H to 3FH*1 RWr (1-bit), RWw (1-bit): 0 to F [RD77GF]
08H: DEV = OFF			
—	2 to 4	Value (positioning data No.)	Set the positioning data No. for starting axis set in "[Da.24] Simultaneous starting axis No.1" and/or "[Da.25] Simultaneous starting axis No.2". Low-order 16-bit: Simultaneous starting axis No.1 positioning data No.1 to 600 (01H to 258H) High-order 16-bit: Simultaneous starting axis No.2 positioning data No.1 to 600 (01H to 258H)

*1 The setting value, whose axis No. exceeds the number of controlled axes, cannot be used.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 480 Positioning data (Block start data)

[Da.19] Parameter 2

Set the parameters as required for the "[Da.16] Condition operator" and "[Da.23] Number of simultaneous starting axes".

[Da.16] Condition operator	[Da.23] Number of simultaneous starting axes	Setting value	Setting details
01H: ** = P1	—	—	Not used. (No need to be set.)
02H: ** ≠ P1			
03H: ** ≤ P1			
04H: ** ≥ P1			
05H: P1 ≤ ** ≤ P2		Value	The value of P2 should be equal to or greater than the value of P1. (P1 ≤ P2) If P1 is greater than P2 (P1 > P2), the error "Condition data error" (error code: 1A00H to 1A05H) will occur.
06H: ** ≤ P1, P2 ≤ **			
07H: DEV = ON		—	Not used. (No need to be set.)
08H: DEV = OFF			
—	2 to 3		
	4	Value (positioning data No.)	Set the positioning data No. for starting axis set in "[Da.26] Simultaneous starting axis No.3" Low-order 16-bit: Simultaneous starting axis No.3 positioning data No.1 to 600 (01H to 258H) High-order 16-bit: Not used (Set "0")

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 480 Positioning data (Block start data)

[Da.23] Number of simultaneous starting axes

Set the number of simultaneous starting axes to execute the simultaneous start.

Number of axes	Details
2	Simultaneous start by 2 axes of the starting axis and axis set in "[Da.24] Simultaneous starting axis No.1".
3	Simultaneous start by 3 axes of the starting axis and axis set in "[Da.24] Simultaneous starting axis No.1" and "[Da.25] Simultaneous starting axis No.2".
4	Simultaneous start by 4 axes of the starting axis and axis set in "[Da.24] Simultaneous starting axis No.1" to "[Da.26] Simultaneous starting axis No.3".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 480 Positioning data (Block start data)

[Da.24] Simultaneous starting axis No.1 to [Da.26] Simultaneous starting axis No.3

Set the simultaneous starting axis to execute the 2 to 4-axis simultaneous start.

Simultaneous starting axis	Details
2-axis interpolation	Set the target axis No. in "[Da.24] Simultaneous starting axis No.1".
3-axis interpolation	Set the target axis No. in "[Da.24] Simultaneous starting axis No.1" and "[Da.25] Simultaneous starting axis No.2".
4-axis interpolation	Set the target axis No. in "[Da.24] Simultaneous starting axis No.1" to "[Da.26] Simultaneous starting axis No.3".

Set the axis set as simultaneous starting axis.[1]

0: Axis 1	8: Axis 9	10: Axis 17	18: Axis 25
1: Axis 2	9: Axis 10	11: Axis 18	19: Axis 26
2: Axis 3	A: Axis 11	12: Axis 19	1A: Axis 27
3: Axis 4	B: Axis 12	13: Axis 20	1B: Axis 28
4: Axis 5	C: Axis 13	14: Axis 21	1C: Axis 29
5: Axis 6	D: Axis 14	15: Axis 22	1D: Axis 30
6: Axis 7	E: Axis 15	16: Axis 23	1E: Axis 31
7: Axis 8	F: Axis 16	17: Axis 24	1F: Axis 32

[1] The setting value, whose axis No. exceeds the number of controlled axes, cannot be used.

Point

- Do not specify the own axis No. or the value outside the range. Otherwise, the error "Condition data error" (error code: 1A00H to 1A05H) will occur during the program execution.
- When the same axis No. is set to multiple simultaneous starting axis Nos. or the value outside the range is set to the number of simultaneous starting axes, the error "Condition data error" (error code: 1A00H to 1A05H) will occur during the program execution.
- Do not specify the simultaneous starting axis No.2 and simultaneous starting axis No.3 for 2-axis simultaneously start, and not specify the simultaneous starting axis No.3 for 3-axis simultaneously start. The setting value is ignored.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 480 Positioning data (Block start data)

12.7 Monitor Data

The setting items of the monitor data are explained in this section.

System monitor data

Unless noted in particular, the monitor value is saved as binary data.

[Md.1] In test mode flag

Whether the mode is the test mode from the engineering tool or not is stored.

Storage value	In test mode flag
0	When not in test mode
1	When in test mode

- When not in test mode: OFF
- When in test mode: ON

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

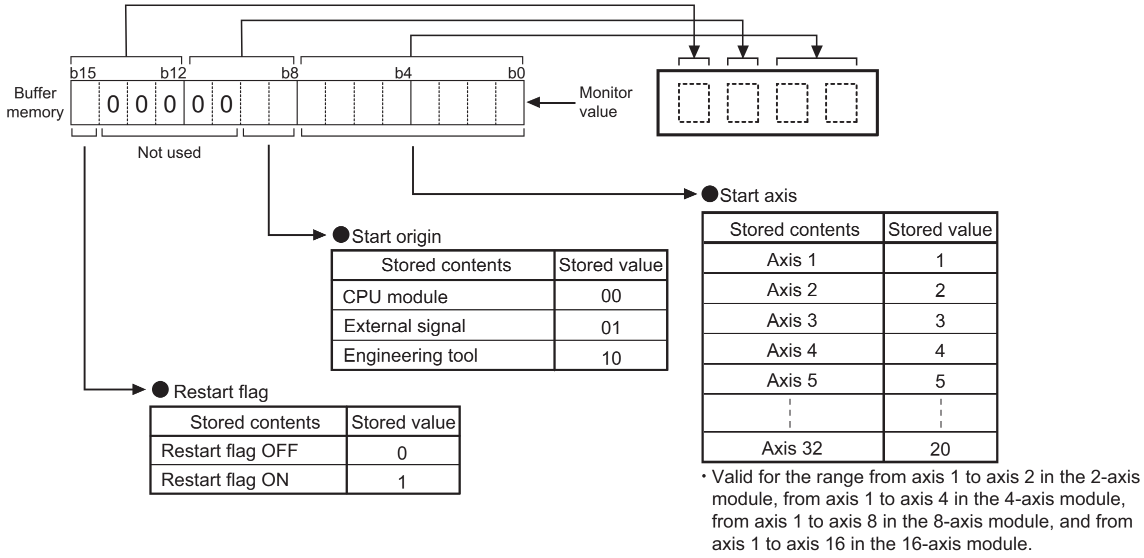
☞ Page 472 System monitor data

[Md.3] Start information

This area stores the start information (restart flag, start origin, and start axis):

- Restart flag: Indicates whether the operation has or has not been halted and restarted.
- Start origin: Indicates the source of the start signal.
- Start axis: Indicates the started axis.

The information shown in the diagram below is stored.



●Start origin

Stored contents	Stored value
CPU module	00
External signal	01
Engineering tool	10

●Restart flag

Stored contents	Stored value
Restart flag OFF	0
Restart flag ON	1

●Start axis

Stored contents	Stored value
Axis 1	1
Axis 2	2
Axis 3	3
Axis 4	4
Axis 5	5
⋮	⋮
Axis 32	20

- Valid for the range from axis 1 to axis 2 in the 2-axis module, from axis 1 to axis 4 in the 4-axis module, from axis 1 to axis 8 in the 8-axis module, and from axis 1 to axis 16 in the 16-axis module.

Refresh cycle: At start

Point

If a start signal is issued against an operating axis, a record relating to this event may be output before a record relating to an earlier start signal is output.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.4] Start No.

The start No. is stored.

Storage value	Start No.
001 to 600(0001H to 0258H) 7000 (1B58H) 7001 (1B59H) 7002 (1B5AH) 7003 (1B5BH) 7004 (1B5CH)	Positioning operation
9010 (2332H)	Jog operation
9011 (2333H)	Manual pulse generator
9001 (2329H)	Machine HPR
9002 (232AH)	Fast HPR
9003 (232BH)	Current value changing
9004 (232CH)	Simultaneous start
9020 (233CH)	Synchronous control operation
9030 (2346H)	Position control mode → speed control mode switching
9031 (2347H)	Position control mode → torque control mode switching
9032 (2348H)	Speed control mode → torque control mode switching
9033 (2349H)	Torque control mode → speed control mode switching
9034 (234AH)	Speed control mode → position control mode switching
9035 (234BH)	Torque control mode → position control mode switching
9036 (234CH)	Outside the range of control mode setting
9037 (234DH)	Position control mode → continuous operation to torque control mode switching
9038 (234EH)	Continuous operation to torque control mode → position control mode switching
9039 (234FH)	Speed control mode → continuous operation to torque control mode switching
9040 (2350H)	Continuous operation to torque control mode → speed control mode switching
9041 (2351H)	Torque control mode → continuous operation to torque control mode switching
9042 (2352H)	Continuous operation to torque control mode → torque control mode switching

At start from the test mode, the stored value differs depending on the number of operation axes. Refer to the following for details.

☞ Page 406 Test Mode

1 axis: 1

2 to 4 axes: Simultaneous starting of multiple axes (9004)

Refresh cycle: At start

Point

If a start signal is issued against an operating axis, a record relating to this event may be output before a record relating to an earlier start signal is output.

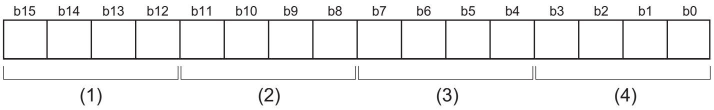
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.54] Start (Year: month)

The starting time (Year: month) is stored.

Buffer memory configuration	Stored contents		Storage value
	(1)	Year (tens place)	0 to 9
	(2)	Year (ones place)	0 to 9
	(3)	Month (tens place)	0, 1
	(4)	Month (ones place)	0 to 9

Refresh cycle: At start

Point

If a start signal is issued against an operating axis, a record relating to this event may be output before a record relating to an earlier start signal is output.

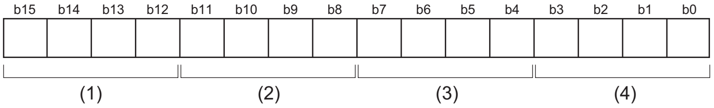
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.5] Start (Day: hour)

The starting time (Day: hour) is stored.

Buffer memory configuration	Stored contents		Storage value
	(1)	Day (tens place)	0 to 3
	(2)	Day (ones place)	0 to 9
	(3)	Hour (tens place)	0 to 2
	(4)	Hour (ones place)	0 to 9

Refresh cycle: At start

Point

If a start signal is issued against an operating axis, a record relating to this event may be output before a record relating to an earlier start signal is output.

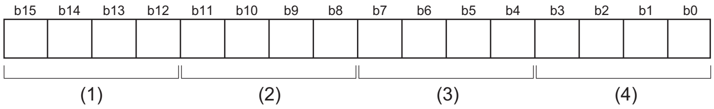
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.6] Start (Minute: second)

The starting time (Minute: second) is stored.

Buffer memory configuration	Stored contents		Storage value
	(1)	Minute (tens place)	0 to 5
	(2)	Minute (ones place)	0 to 9
	(3)	Second (tens place)	0 to 5
	(4)	Second (ones place)	0 to 9

Refresh cycle: At start

Point

If a start signal is issued against an operating axis, a record relating to this event may be output before a record relating to an earlier start signal is output.

■Buffer memory address

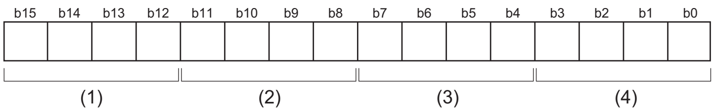
Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.60] Start (ms)

The starting time (ms) is stored.

000 (ms) to 999 (ms)

Buffer memory configuration	Stored contents		Storage value
	(1)	0	0
	(2)	ms (hundreds place)	0 to 9
	(3)	ms (tens place)	0 to 9
	(4)	ms (ones place)	0 to 9

Refresh cycle: At start

Point

If a start signal is issued against an operating axis, a record relating to this event may be output before a record relating to an earlier start signal is output.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.7] Error judgment

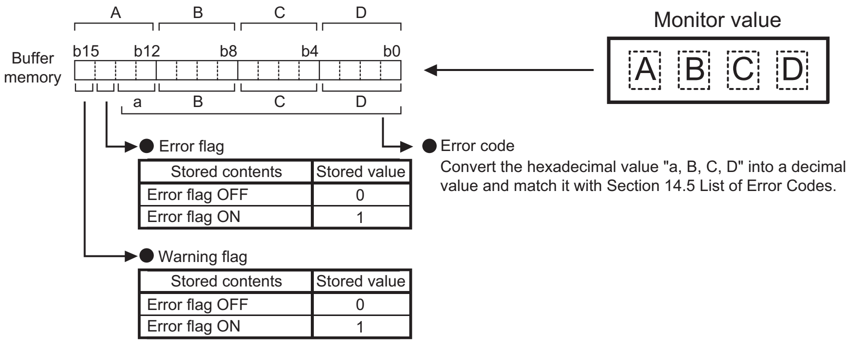
This area stores the following results of the error judgment performed upon starting:

- Warning flag

BUSY start
Control mode switching during BUSY
Control mode switching during zero speed OFF
Outside control mode range
Control mode switching

- Error flag
- Error code

The results of the error judgment shown in the diagram below are stored.



Error code
Convert the hexadecimal value "a, B, C, D" into a decimal value and match it with Section 14.5 List of Error Codes.

Error flag

Stored contents	Stored value
Error flag OFF	0
Error flag ON	1

Warning flag

Stored contents	Stored value
Error flag OFF	0
Error flag ON	1

Refresh cycle: At start

Point

If a start signal is issued against an operating axis, a record relating to this event may be output before a record relating to an earlier start signal is output.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.8] Start history pointer

Indicates a pointer No. that is next to the pointer No. assigned to the latest of the existing start history records.

The storage value (Pointer No.) is 0 to 63.

Refresh cycle: At start

Point

If a start signal is issued against an operating axis, a record relating to this event may be output before a record relating to an earlier start signal is output.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.19] Number of write accesses to flash ROM

Stores the number of write accesses to the flash ROM after the power is switched ON.

The storage value is 0 to 25. The count is cleared to "0" when the number of write accesses reaches 26 and an error reset operation is performed.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.50] Forced stop input

This area stores the forced stop input (EMI) ON/OFF status.

Storage value	Forced stop input
0	Forced stop input ON (Forced stop)
1	Forced stop input OFF (Forced stop release)

Refresh cycle: Operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.51] Amplifier-less operation mode status

Indicates a current operation mode.

Storage value	Operation mode
0	Normal operation mode
1	Amplifier-less operation mode

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.52] Communication between amplifiers axes searching flag [RD77MS]

Stores the detection status of the axis that sets communication between amplifiers.

Storage value	Detection status
0	Search end
1	Searching

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.53] SSCNET control status [RD77MS]

Stores the connect/disconnect status of SSCNET communication.

Storage value	SSCNET control status
1	Disconnected axis existing
0	Command accept waiting
-1	Execute waiting
-2	Executing

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.59] Module information

Stores the module information.

Storage value	Unit information
4000H	RD77MS2
4001H	RD77MS4
4002H	RD77MS8
4003H	RD77MS16
5001H	RD77GF4
5002H	RD77GF8
5003H	RD77GF16
5004H	RD77GF32

Refresh cycle: At power supply ON

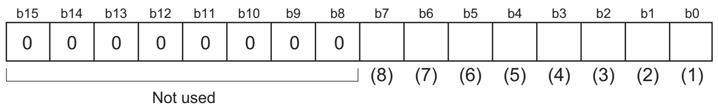
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.63] Optical hub unit installation information [RD77MS]

Checks the connection status of the optical hub unit and stores the data as bit data.

Buffer memory configuration	Stored items		Storage value
	(1)	Optical hub unit No.1 to 8*1	0: Not installed 1: Installed
	(2)		
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

*1 No.1 to 8 show the connection order from the Simple Motion module.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.130] F/W version

Stores the first two digits of the module manufacture information.

- Monitoring is carried out with a hexadecimal display.

Refresh cycle: At power supply ON

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.131] Digital oscilloscope running flag

Stores the RUN status of the digital oscilloscope.

Storage value	RUN status of digital oscilloscope
0	Stop
1	Run
-1	Stop by error

Refresh cycle: Main cycle

Point

- When an error occurs in setting data of digital oscilloscope at power supply ON, "-1: Stop by error" is stored. Write the setting again using an engineering tool.
- When the offline digital oscilloscope function is validated, "1: Run" is stored from the start of the unit. If an engineering tool is not compatible with the offline digital oscilloscope function, the operation to set "0: Stop" cannot be executed. Therefore, update to the latest engineering tool.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.132] Operation cycle setting

Stores the current operation cycle.

Storage value		Operation cycle
RD77MS	0000H	0.888 ms
	0001H	1.777 ms
	0002H	3.555 ms
	0200H	0.444 ms
RD77GF	0021H	0.500 ms
	0022H	1.000 ms
	0023H	2.000 ms
	0024H	4.000 ms

Refresh cycle: At power supply ON

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.133] Operation cycle over flag

This flag turns ON when the operation cycle time exceeds operation cycle.

Storage value	Operation cycle over flag
0	OFF
1	ON (Operation cycle over occurred.)

Refresh cycle: Immediate

Point

Latch status of operation cycle over is indicated. When this flag turns ON, correct the positioning detail or change the operation cycle longer than current setting.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.134] Operation time

Stores the time (unit: µs) that took for operation every operation cycle.

Refresh cycle: Operation cycle

Point

When digital oscilloscope is executed in the following conditions, operation cycle will increase about 30 µs.

- Probe data: 16CH
- Bit data: 16CH
- Trigger data: 8CH
- Sampling cycle: Same as operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.135] Maximum operation time

Stores the maximum value of operation time (unit: μs) after each module's power supply ON.

Refresh cycle: Immediate

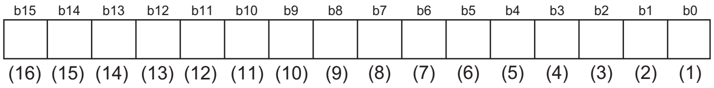
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

[Md.700] Virtual servo amplifier connected station monitor [RD77GF]

Stores the station where a virtual servo amplifier is connected.

<table>
<tr><th>Buffer memory configuration</th><th colspan="3">Stored items[1]</th><th>Storage value</th></tr>
<tr><td rowspan="16">
</td><td>(1)</td><td>1 station</td><td>17 station</td><td rowspan="16">0: Virtual Servo Amplifier not connected
1: Virtual Servo Amplifier connected</td></tr>
<tr><td>(2)</td><td>2 station</td><td>18 station</td></tr>
<tr><td>(3)</td><td>3 station</td><td>19 station</td></tr>
<tr><td>(4)</td><td>4 station</td><td>20 station</td></tr>
<tr><td>(5)</td><td>5 station</td><td>21 station</td></tr>
<tr><td>(6)</td><td>6 station</td><td>22 station</td></tr>
<tr><td>(7)</td><td>7 station</td><td>23 station</td></tr>
<tr><td>(8)</td><td>8 station</td><td>24 station</td></tr>
<tr><td>(9)</td><td>9 station</td><td>25 station</td></tr>
<tr><td>(10)</td><td>10 station</td><td>26 station</td></tr>
<tr><td>(11)</td><td>11 station</td><td>27 station</td></tr>
<tr><td>(12)</td><td>12 station</td><td>28 station</td></tr>
<tr><td>(13)</td><td>13 station</td><td>29 station</td></tr>
<tr><td>(14)</td><td>14 station</td><td>30 station</td></tr>
<tr><td>(15)</td><td>15 station</td><td>31 station</td></tr>
<tr><td>(16)</td><td>16 station</td><td>32 station</td></tr>
</table>

[1] Valid for the range from 1 to 4 stations in the 4-axis module, from 1 to 8 stations in the 8-axis module, from 1 to 16 stations in the 16-axis module, and from axis 1 to 32 stations in the 32-axis module.

Refresh cycle: Operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 472 System monitor data

Axis monitor data

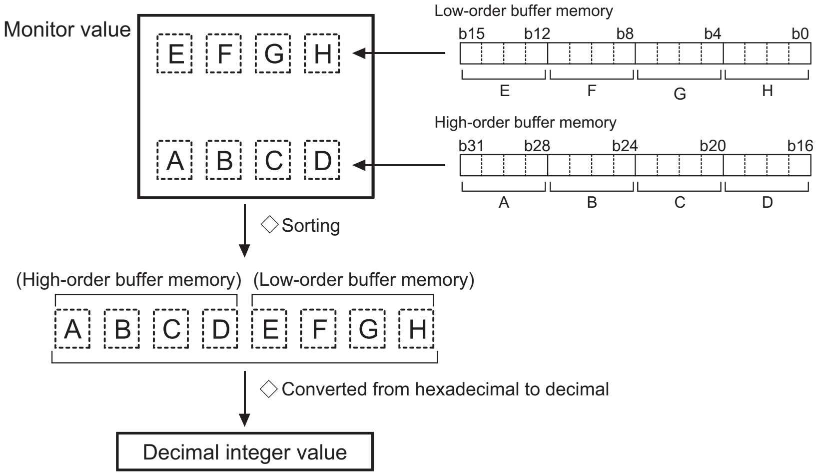
[Md.20] Command position value

The currently commanded address is stored. (Different from the actual motor position during operation)

The current position address is stored.

If "degree" is selected as the unit, the addresses will have a ring structure for values between 0 and 359.99999°.

As shown in the diagram below, the hexadecimal monitor value is changed to a decimal integer value. The decimal integer value can be converted into other units by multiplying said value by the following conversion values.



Unit	Converted values
µm	× 10^{-1}
inch	× 10^{-5}
degree	× 10^{-5}
pulse	× 10^{0}

- The home position address is stored when the machine home position return is completed.
- When the current value is changed with the current value changing function, the changed value is stored.

Refresh cycle: Operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.21] Machine feed value

The address of the current position according to the machine coordinates will be stored. (Different from the actual motor position during operation)

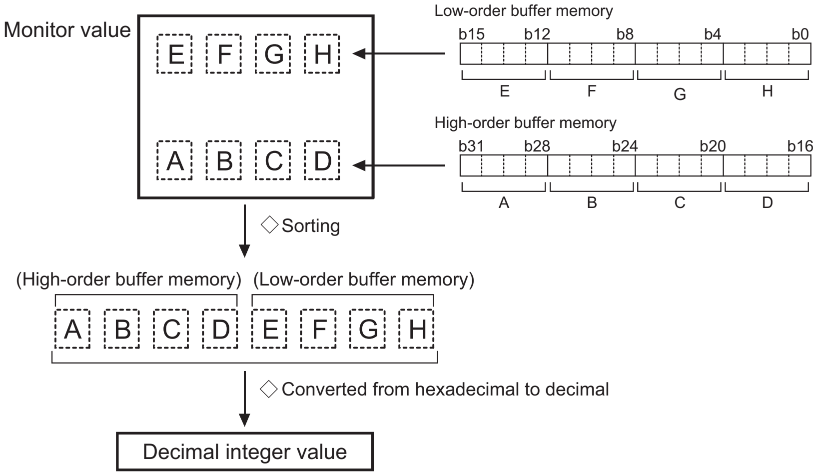
Note that the current value changing function will not change the machine feed value.

Under the speed control mode, the machine feed value is constantly updated always, irrespective of the parameter setting.

The value will not be cleared to "0" at the beginning of fixed-feed control.

Even if "degree" is selected as the unit, the addresses will become a cumulative value. (They will not have a ring structure for values between 0 and 359.99999°). However, the machine feed value is restored with cumulating the machine feed value before the power supply OFF (the rounded value within the range of 0 to 359.99999°) to the movement amount during the power supply OFF at the communication start with servo amplifier after the power supply ON or CPU module reset.

As shown in the diagram below, the hexadecimal monitor value is changed to a decimal integer value. The decimal integer value can be converted into other units by multiplying said value by the following conversion values.



Unit	Converted values
μm	× 10^{-1}
inch	× 10^{-5}
degree	× 10^{-5}
pulse	× 10^{0}

- Machine coordinates: Characteristic coordinates determined with machine

Refresh cycle: Operation cycle

■Buffer memory address

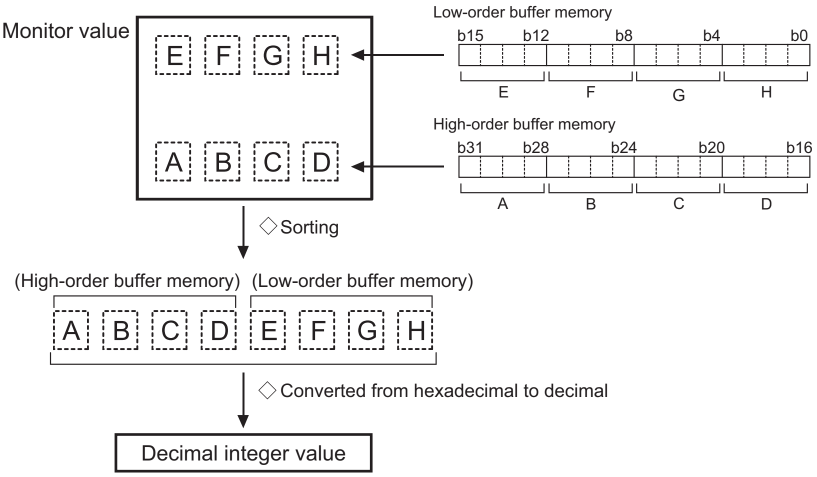
Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.22] Speed command

The speed of the operating workpiece is stored. (May be different from the actual motor speed during operation)

As shown in the diagram below, the hexadecimal monitor value is changed to a decimal integer value. The decimal integer value can be converted into other units by multiplying said value by the following conversion values.



Unit	Converted values
mm/min	$\times 10^{-2}$
inch/min	$\times 10^{-3}$
degree/min	$\times 10^{-3}$*1
pulse/s	$\times 10^{0}$

*1 When "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid, becomes "$\times 10^{-2}$".

- During interpolation operation, the speed is stored in the following manner.

Reference axis	Composite speed or reference axis speed (Set with [Pr.20])
Interpolation axis	0

Refresh cycle: Operation cycle

Point

In case of the single axis operation, "[Md.22] Speed command" and "[Md.28] Axis speed command" are identical.

In the composite mode of the interpolation operation, "[Md.22] Speed command" is a speed in a composite direction and "[Md.28] Axis speed command" is that in each axial direction.

The absolute value is displayed in "[Md.22] Speed command". The operation direction can be checked in "[Md.20] Command position value".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.23] Axis error No.

When an axis error is detected, the error code corresponding to the error details is stored.

- The latest error code is always stored. (When a new axis error occurs, the error code is overwritten.)
- When "[Cd.5] Axis error reset" is set to "1", the axis error No. is cleared (set to 0).
- Monitoring is carried out with a hexadecimal display.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.24] Axis warning No.

Whenever an axis warning is reported, a related warning code is stored.

- This area stores the latest warning code always. (Whenever an axis warning is reported, a new warning code replaces the stored warning code.)
- When the "[Cd.5] Axis error reset" is set to "1", the axis warning No. is cleared to "0".
- Monitoring is carried out with a hexadecimal display.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.25] Valid M code

This area stores an M code that is currently active (i.e. set to the positioning data relating to the current operation).

When the PLC READY signal [Y0] is OFF, the value is set to "0".

The value stored is 0 to 65535.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.26] Axis operation status

This area stores the axis operation status.

Storage value	Axis operation status
-2	Step standby
-1	Error
0	Standby
1	Stopped
2	Interpolation
3	JOG operation
4	Manual pulse generator operation
5	Analyzing
6	Special start standby
7	Home position return
8	Position control
9	Speed control
10	Speed control in speed-position switching control
11	Position control in speed-position switching control
12	Position control in position-speed switching control
13	Speed control in position-speed switching control
15	Synchronous control
16	Test mode JOG operation
20	Servo amplifier has not been connected/servo amplifier power OFF
21	Servo OFF
30	Control mode switch
31	Speed control
32	Torque control
33	Continuous operation to torque control [RD77MS]

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.27] Current speed

The "[Da.8] Command speed" used by the positioning data currently being executed is stored.

- If "[Da.8] Command speed" is set to "-1", this area stores the command speed set by the positioning data used one step earlier.
- If "[Da.8] Command speed" is set to a value other than "-1", this area stores the command speed set by the current positioning data.
- When speed change function is executed, this area stores "[Cd.14] New speed value". (For details of change speed function, refer to ☞ Page 270 Speed change function)

The storage value converted into other units can be checked by multiplying said value by the following conversion values.

Unit	Conversion value
mm/min	$\times 10^{-2}$
inch/min	$\times 10^{-3}$
degree/min	$\times 10^{-3}$[*1]
pulse/s	$\times 10^{0}$

*1 When "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid, becomes "$\times 10^{-2}$".

Refresh cycle: Immediate

■Buffer memory address

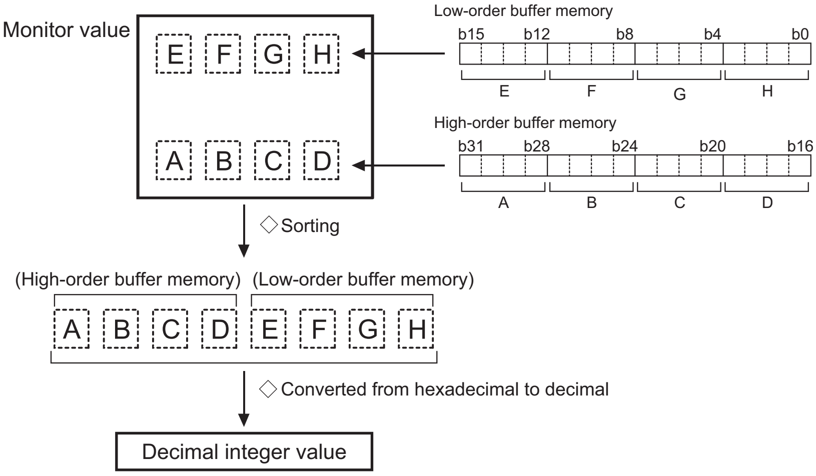
Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.28] Axis speed command

The speed which is actually output as a command at that time in each axis is stored. (May be different from the actual motor speed)"0" is stored when the axis is at a stop. (☞ Page 587 [Md.22] Speed command)

As shown in the diagram below, the hexadecimal monitor value is changed to a decimal integer value. The decimal integer value can be converted into other units by multiplying said value by the following conversion values.



Unit	Conversion value
mm/min	× 10^{-2}
inch/min	× 10^{-3}
degree/min	× 10^{-3}*1
pulse/s	× 10^{0}

Refresh cycle: Operation cycle

*1 When "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid, becomes "× 10^{-2}".

Point

The absolute value is displayed in "[Md.28] Axis speed command". The operation direction can be checked in "[Md.20] Command position value".

■Buffer memory address

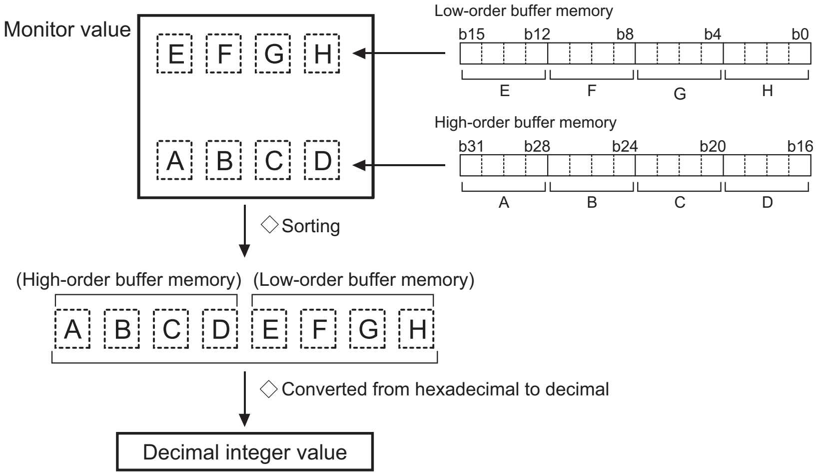
Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.29] Speed-position switching control positioning movement amount

The movement amount for the position control to end after changing to position control with the speed-position switching control is stored. When the control method is "Reverse run: position/speed", the negative value is stored.

As shown in the diagram below, the hexadecimal monitor value is changed to a decimal integer value. The decimal integer value can be converted into other units by multiplying said value by the following conversion values.



Unit	Conversion value
µm	$\times 10^{-1}$
inch	$\times 10^{-5}$
degree	$\times 10^{-5}$
pulse	$\times 10^{0}$

Refresh cycle: Immediate

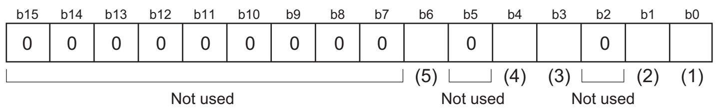
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.30] External input signal

The state (ON/OFF) of the external input signal is stored.

Buffer memory configuration	Stored items		Storage value
	(1)	Lower limit signal[*1]	0: OFF 1: ON
	(2)	Upper limit signal[*1]	
	(3)	Stop signal[*1]	
	(4)	External command signal/ switching signal	
	(5)	Proximity dog signal[*1]	

[*1] This area stores the states of the external input signal (Simple Motion module), external input signal (servo amplifier) or buffer memory of Simple Motion module set by "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", "[Pr.118] DOG signal selection", and "[Pr.119] STOP signal selection".

Refresh cycle: Operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

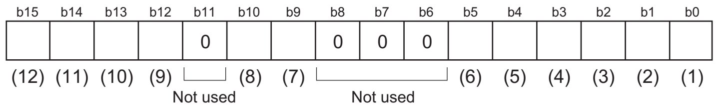
☞ Page 473 Axis monitor data

[Md.31] Status

This area stores the states (ON/OFF) of various flags.

Information on the following flags is stored.

Flag	Details
In speed control flag	This signal that comes ON under the speed control can be used to judge whether the operation is performed under the speed control or position control. The signal goes OFF when the power is switched ON, under the position control, and during JOG operation or manual pulse generator operation. During the speed-position or position-speed switching control, this signal comes ON only when the speed control is in effect. During the speed-position switching control, this signal goes OFF when the speedposition switching signal executes a switching over from speed control to position control. During the position-speed switching control, this signal comes ON when the position-speed switching signal executes a switching over from position control to speed control.
Speed-position switching latch flag	This signal is used during the speed-position switching control for interlocking the movement amount change function. During the speed-position switching control, this signal comes ON when position control takes over. This signal goes OFF when the next positioning data is processed, and during JOG operation or manual pulse generator operation.
Command in-position flag	This signal is ON when the remaining distance is equal to or less than the command in-position range (set by a detailed parameter). This signal remains OFF with data that specify the continuous path control (P11) as the operation pattern. The state of this signal is monitored every operation cycle except when the monitoring is canceled under the speed control or while the speed control is in effect during the speed-position or position-speed switching control. While operations are performed with interpolation, this signal comes ON only in respect of the starting axis. (This signal goes OFF in respect of all axes upon starting.)
Home position return request flag	This signal comes ON when a home position return is required and goes OFF at completion of a home position return. For details of home position return request flag, refer to ☞ Page 34 Outline of Home Position Return Control
Home position return complete flag	This signal comes ON when a machine home position return operation completes normally. This signal goes OFF when the operation start.
Position-speed switching latch flag	This signal is used during the position-speed switching control for interlocking the command speed change function. During the position-speed switching control, this signal comes ON when speed control takes over. This signal goes OFF when the next positioning data is processed, and during JOG operation or manual pulse generator operation.
Axis warning detection flag	This signal comes ON when an axis warning is reported and goes OFF when the axis error reset signal comes ON.
Speed change 0 flag	This signal comes ON when the speed is "0" by the speed change or override. Otherwise, it goes OFF.
M code ON	In the WITH mode, this signal turns ON when the positioning data operation is started. In the AFTER mode, this signal turns ON when the positioning data operation is completed. This signal turns OFF with "[Cd.7] M code OFF request". When M code is not designated (when "[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions" is "0"), this signal will remain OFF. With using continuous path control for the positioning operation, the positioning will continue even when this signal does not turn OFF. However, the warning "M code ON signal ON" (warning code: 0992H) will occur. When the PLC READY signal [Y0] turns OFF, the M code ON signal will also turn OFF. If operation is started while the M code is ON, the error "M code ON signal start" (error code: 19A0H) will occur.
Error detection	This signal turns ON when an error occurs, and turns OFF when the error is reset on "[Cd.5] Axis error reset". (☞ Page 722 List of Error Codes)
Start complete	This signal turns ON when the positioning start signal turns ON and the Motion module starts the positioning process. (The start complete signal also turns ON during home position return control.)
Positioning complete	This signal turns ON for the time set in "[Pr.40] Positioning complete signal output time" from the instant when the positioning control for each positioning data No. is completed. For the interpolation control, the positioning complete signal of interpolation axis turns ON during the time set to the reference axis. (It does not turn ON when "[Pr.40] Positioning complete signal output time" is "0".) If positioning (including home position return), JOG/Inching operation, or manual pulse generator operation is started while this signal is ON, the signal will turn OFF. This signal will not turn ON when speed control or positioning is canceled midway.

Buffer memory configuration	Stored items		Storage value
	(1)	In speed control flag	0: OFF 1: ON
	(2)	Speed-position switching latch flag	
	(3)	Command in-position flag	
	(4)	Home position return request flag	
	(5)	Home position return complete flag	
	(6)	Position-speed switching latch flag	
	(7)	Axis warning detection	
	(8)	Speed change 0 flag	
	(9)	M code ON	
	(10)	Error detection	
	(11)	Start complete	
	(12)	Positioning complete	

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.32] Target value

This area stores the target value ([Da.6] Positioning address/movement amount) for a positioning operation.

- At the beginning of positioning control and current value changing: Stores the value of "[Da.6] Positioning address/ movement amount".
- At the home position shift operation of home position return control: Stores the value of home position shift amount.
- At other times: Stores "0".

The storage value converted into other units can be checked by multiplying said value by the following conversion values.

Unit	Conversion value
μm	$\times 10^{-1}$
inch	$\times 10^{-5}$
degree	$\times 10^{-5}$
pulse	$\times 10^{0}$

Refresh cycle: Immediate

■Buffer memory address

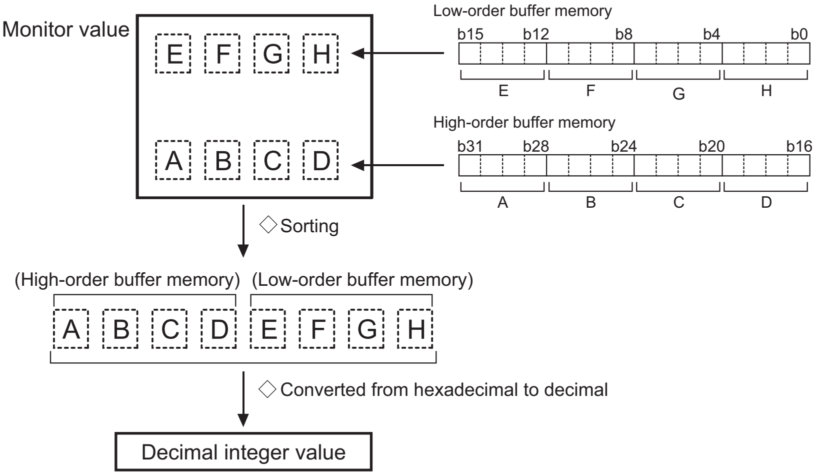
Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.33] Target speed

- During operation with positioning data: The actual target speed, considering the override and speed limit value, etc., is stored. "0" is stored when positioning is completed.
- During interpolation of position control: The composite speed or reference axis speed is stored in the reference axis address, and "0" is stored in the interpolation axis address.
- During interpolation of speed control: The target speeds of each axis are stored in the monitor of the reference axis and interpolation axis.
- During JOG operation: The actual target speed, considering the JOG speed limit value for the JOG speed, is stored.
- During manual pulse generator operation: "0" is stored.

As shown in the diagram below, the hexadecimal monitor value is changed to a decimal integer value. The decimal integer value can be converted into other units by multiplying said value by the following conversion values.



Unit	Conversion value
mm/min	× 10^{-2}
inch/min	× 10^{-3}
degree/min	× 10^{-3}*1
pulse/s	× 10^{0}

*1 When "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid, becomes "× 10^{-2}".

Refresh cycle: Immediate

Point

The target speed is when an override is made to the command speed.

When the speed limit value is overridden, the target speed is restricted to the speed limit value. The target speed changes every time data is switched, but does not change in an acceleration/deceleration state inside each piece of data (changes with the speed change because the target speed changes.)

■Buffer memory address

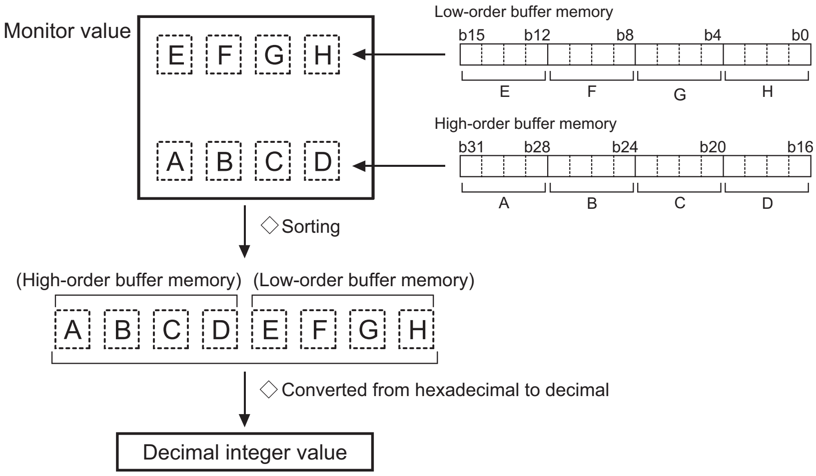
Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.34] Movement amount after proximity dog ON [RD77MS]

- "0" is stored when machine home position return starts.
- After machine home position return starts, the movement amount from the proximity dog ON to the machine home position return completion is stored. (Movement amount: Movement amount to machine home position return completion using proximity dog ON as "0".)

As shown in the diagram below, the hexadecimal monitor value is changed to a decimal integer value. The decimal integer value can be converted into other units by multiplying said value by the following conversion values.



Unit	Conversion value
µm	× 10^{-1}
inch	× 10^{-5}
degree	× 10^{-5}
pulse	× 10^{0}

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.35] Torque limit stored value/forward torque limit stored value

[RD77MS]

"[Pr.17] Torque limit setting value", "[Cd.101] Torque output setting value", "[Cd.22] New torque value/forward new torque value", or "[Pr.54] Home position return torque limit value" is stored.

- The stored value is 1 to 10000 (× 0.1%).
- During positioning start, JOG operation start, manual pulse generator operation: "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value" is stored.
- When a value is set in "[Cd.22] New torque value/forward new torque value" during operation: "[Cd.22] New torque value/forward new torque value" is stored.
- When home position return: "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value" is stored. However, "[Pr.54] Home position return torque limit value" is stored after the speed reaches "[Pr.47] Creep speed".

[RD77GF]

"[Pr.17] Torque limit setting value", "[Cd.101] Torque output setting value", or "[Cd.22] New torque value/forward new torque value" is stored.

- The stored value is 1 to 10000 (× 0.1%).
- During positioning start, JOG operation start, manual pulse generator operation: "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value" is stored.
- When a value is set in "[Cd.22] New torque value/forward new torque value" during operation: "[Cd.22] New torque value/forward new torque value" is stored.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.36] Special start data instruction code setting value

The "instruction code" used with special start and indicated by the start data pointer currently being executed is stored.

Storage value	Special start data instruction code setting value
0	Block start
1	Condition start
2	Wait start
3	Simultaneous start
4	FOR loop
5	FOR condition
6	NEXT

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.37] Special start data instruction parameter setting value

The "instruction parameter" used with special start and indicated by the start data pointer currently being executed is stored.

The stored value differs according to the value set for "[Md.36] Special start data instruction code setting value".

Setting value of "[Md.36] Special start data instruction code setting value"	Storage value	Stored contents
Block start, NEXT	None	None
Condition start, Wait start, Simultaneous start, FOR condition	1 to 10	Condition data No.
FOR loop	0 to 255	Number of repetitions

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.38] Start positioning data No. setting value

The "positioning data No." indicated by the start data pointer currently being executed is stored.

The stored value is 1 to 600, and 9001 to 9003.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.39] In speed limit flag

Stores whether the in speed limit is in progress or not.

Storage value	In speed limit flag
0	Not in speed limit (OFF)
1	In speed limit (ON)

- If the speed exceeds the "[Pr.8] Speed limit value" ("[Pr.31] JOG speed limit value" at JOG operation control) due to a speed change or override, the speed limit functions, and the in speed limit flag turns ON.
- When the speed drops to less than "[Pr.8] Speed limit value" ("[Pr.31] JOG speed limit value" at JOG operation control), or when the axis stops, the in speed limit flag turns OFF.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.40] In speed change processing flag

Stores whether the in speed change is in progress or not.

Storage value	In speed limit flag
0	Not in speed limit (OFF)
1	In speed limit (ON)

- The speed change process flag turns ON when the speed is changed during positioning control.
- After the speed change process is completed or when deceleration starts with the stop signal during the speed change process, the in speed change process flag turns OFF.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.41] Special start repetition counter

- This area stores the remaining number of repetitions during "repetitions" specific to special starting.
- The stored value is 0 to 255.
- The count is decremented by one (-1) at the loop end.
- The control comes out of the loop when the count reaches "0".
- This area stores "0" within an infinite loop.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.42] Control system repetition counter

- This area stores the remaining number of repetitions during "repetitions" specific to control system.
- The stored value is 0000H to FFFFH.
- The count is decremented by one (-1) at the loop start.
- The loop is terminated with the positioning data of the control method "LEND", after the counter becomes "0".

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.43] Start data pointer being executed

- This area stores a point No. (1 to 50) attached to the start data currently being executed.
- This area stores "0" after completion of a positioning operation.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.44] Positioning data No. being executed

- This area stores a positioning data No. attached to the positioning data currently being executed.
- The stored value is 1 to 600, and 9001 to 9003.
- This area stores "0" when the JOG/inching operation is executed.
- This area stores "1" during the JOG operation or the positioning operation from the test mode. For details, refer to ☞ Page 406 Test Mode.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.45] Block No. being executed

- When the operation is controlled by "block start data", this area stores a block No. (7000 to 7004) attached to the block currently being executed.
- At other times, this area stores "0".

Refresh cycle: At start

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.46] Last executed positioning data No.

- This area stores the positioning data No. attached to the positioning data that was executed last time.
- The stored value is 1 to 600, and 9001 to 9003.
- The value is retained until a new positioning operation is executed.
- This area stores "0" when the JOG/inching operation is executed.
- This area stores "1" when the JOG operation or the positioning operation from the test mode is executed. For details, refer to ☞ Page 406 Test Mode.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.47] Positioning data being executed

- The details of the positioning data currently being executed (data given by "[Md.44] Positioning data No. being executed") are stored in the buffer memory addresses.
- "04h" or "05h" is stored in the control method of the positioning identifier during the JOG operation from the test mode. For details, refer to ☞ Page 406 Test Mode.

n: axis No. - 1 (when axis 7 to axis 32n: axis No. - 17)

Buffer memory address		Storage items	Reference
Axis 1 to 16	Axis 17 to 32		
6000+1000n	1006000+1000n	Positioning identifier	Page 552 [Da.1] Operation pattern to Page 552 [Da.4] Deceleration time No.
6006+1000n 6007+1000n	1006006+1000n 1006007+1000n	Positioning address	Page 553 [Da.6] Positioning address/movement amount
6008+1000n 6009+1000n	1006008+1000n 1006009+1000n	Arc address	Page 558 [Da.7] Arc address
6004+1000n 6005+1000n	1006004+1000n 1006005+1000n	Command speed	Page 560 [Da.8] Command speed
6002+1000n	1006002+1000n	Dwell time/JUMP destination positioning data No.	Page 561 [Da.9] Dwell time/JUMP destination positioning data No.
6001+1000n	1006001+1000n	M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitch	Page 562 [Da.10] M code/Condition data No./No. of LOOP to LEND repetitions/No. of pitches
71000+1000n 71001+1000n	10071000+1000n 10071001+1000n	Axis to be interpolated	Page 563 [Da.20] Axis to be interpolated No.1 to [Da.22] Axis to be interpolated No.3
6003+1000n	1006003+1000n	Positioning option	Page 563 [Da.27] M code ON signal output timing to Page 564 [Da.29] Interpolation speed designation method

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.48] Deceleration start flag

- "1" is stored when the constant speed status or acceleration status switches to the deceleration status during position control whose operation pattern is "Positioning complete".
- "0" is stored at the next operation start or manual pulse generator operation enable.

Refresh cycle: Immediate

Point

This parameter is possible to monitor when "[Cd.41] Deceleration start flag valid" is valid.

■Buffer memory address

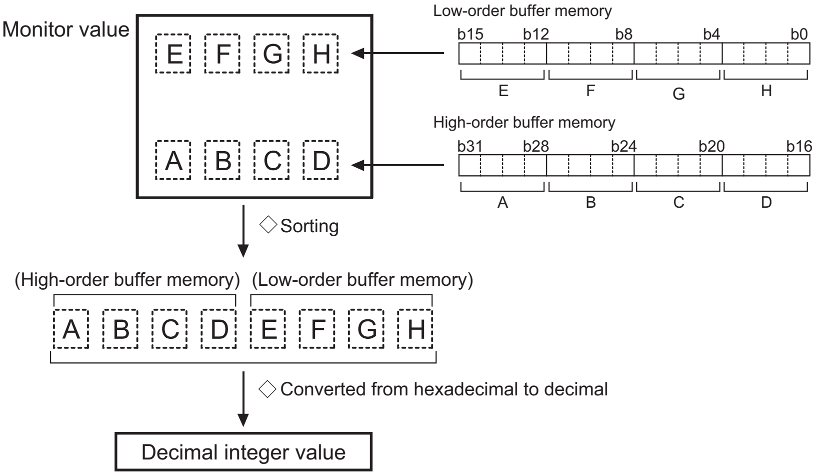
Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.62] Amount of the manual pulser driving carrying over movement

When "2: Output over value of speed limit later" is set in "[Pr.122] Manual pulse generator speed limit mode", this area stores the carrying over movement amount which exceeds "[Pr.123] Manual pulse generator speed limit value".

As shown in the diagram below, the hexadecimal monitor value is changed to a decimal integer value. The decimal integer value can be converted into other units by multiplying said value by the following conversion values.



Unit	Conversion value
μm	× 10^{-1}
inch	× 10^{-5}
degree	× 10^{-5}
pulse	× 10^{0}

Refresh cycle: Immediate

■Buffer memory address

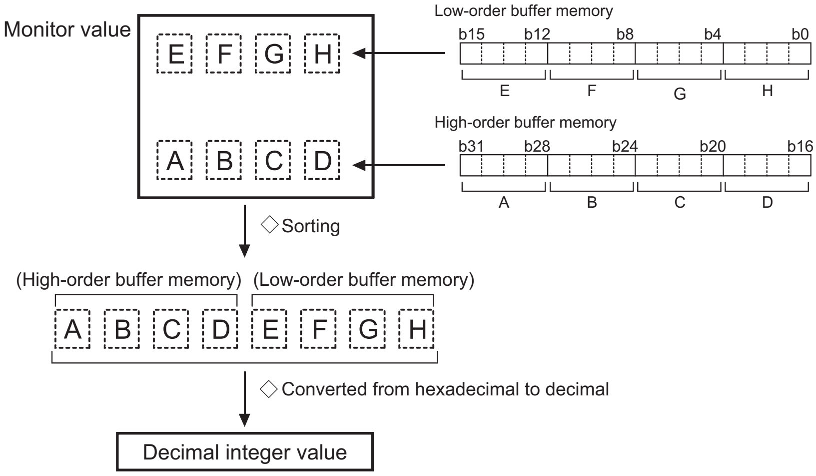
Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.100] Home position return re-travel value [RD77MS]

This area stores the travel distance during the home position return travel to the zero point that was executed last time. "0" is stored at machine home position return start. (Depends on the setting unit.)

As shown in the diagram below, the hexadecimal monitor value is changed to a decimal integer value. The decimal integer value can be converted into other units by multiplying said value by the following conversion values.



Unit	Conversion value
µm	× 10^{-1}
inch	× 10^{-5}
degree	× 10^{-5}
pulse	× 10^{0}

Ex.

mm

(Buffer memory details × 0.1) µm

Refresh cycle: At conditions established (At home position return re-travel)

■Buffer memory address

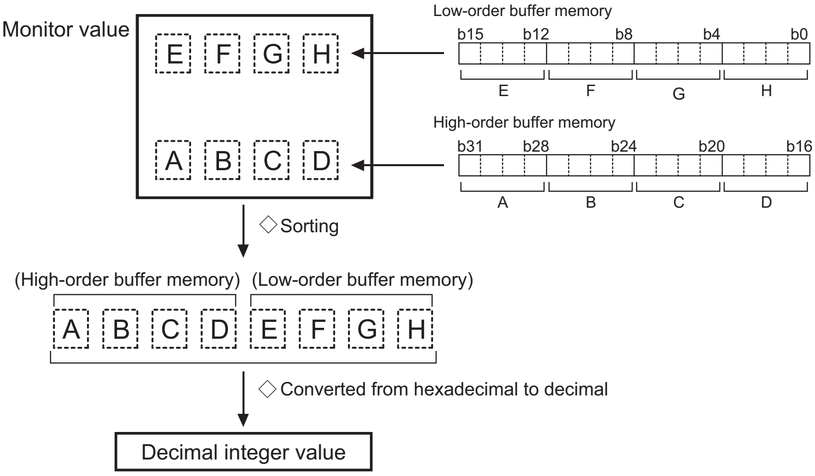
Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.101] Actual position value

This area stores the current value "command position value - (command pulse - feedback pulse)". (Depends on the setting unit.)

As shown in the diagram below, the hexadecimal monitor value is changed to a decimal integer value. The decimal integer value can be converted into other units by multiplying said value by the following conversion values.



Unit	Conversion value
µm	× 10^{-1}
inch	× 10^{-5}
degree	× 10^{-5}
pulse	× 10^{0}

Ex.

mm

(Buffer memory details × 0.1) µm

Refresh cycle: Operation cycle

■Buffer memory address

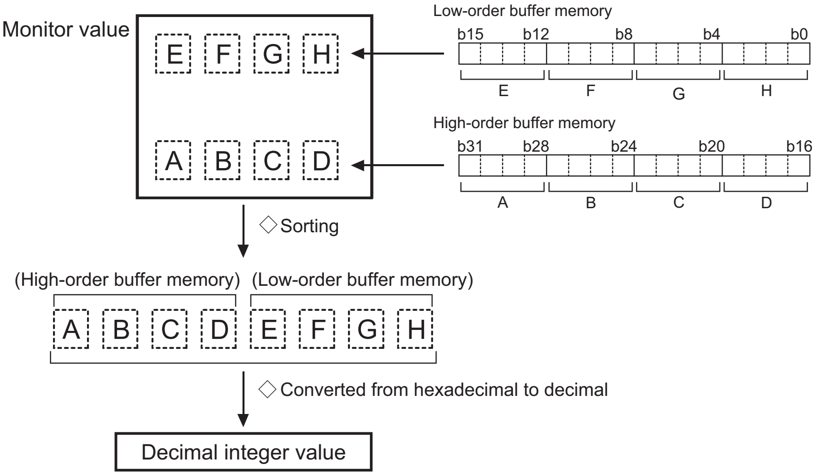
Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.102] Deviation counter value

This area stores the droop pulse.

As shown in the diagram below, the hexadecimal monitor value is changed to a decimal integer value. The decimal integer value can be converted into other units by multiplying said value by the following conversion values.



Unit	Conversion value
pulse	× 10^0

Ex.

(Buffer memory details × 1) pulse

Refresh cycle: Operation cycle

■Buffer memory address

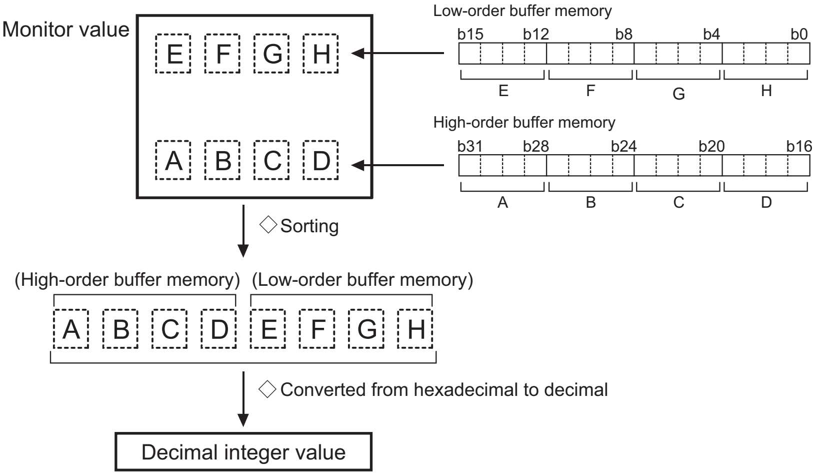
Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.103] Motor rotation speed

This area stores the motor speed updated in real time.

As shown in the diagram below, the hexadecimal monitor value is changed to a decimal integer value. The decimal integer value can be converted into other units by multiplying said value by the following conversion values.



Unit	Conversion value
r/min[*1]	× 10^{-2}

[*1] The unit is mm/s at linear servo use.

Ex.

(Buffer memory × 0.01) r/min

Refresh cycle: Operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.104] Motor current value

This area stores the current value of the motor.

The storage value converted into other units can be checked by multiplying said value by the following conversion values.

Unit	Conversion value
%	× 10^{-1}

(Buffer memory × 0.1)%

Refresh cycle: Operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.106] Servo amplifier software No. [RD77MS]

- This area stores the software No. of the servo amplifier used.
- This area is update when the control power of the servo amplifier is turned ON.

Refresh cycle: Servo amplifier's power supply ON

Ex.

For software No. "B35W200_A0"

Buffer memory address	Monitor value[*1]	Storage value
2464	422D	-B
2465	3533	35
2466	3257	W2
2467	3030	00
2468	4120	SPACE A
2469	2030	0 SPACE

[*1] The monitor value is the character code (ASCII format).

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.107] Parameter error No. [RD77MS]

- When a servo parameter error occurs, the area that corresponds to the parameter No. affected by the error comes ON.
- When the "[Cd.5] Axis error reset" is set to "1" after remove the error factor of servo amplifier side, the servo alarm is cleared (set to "0").

SSCNET setting	Servo amplifier	Storage value	Parameter No.
SSCNETⅢ/H	MR-J5(W)-B	1 to 48	PA01 to PA48
		257 to 355	PB01 to PB99
		513 to 611	PC01 to PC99
		769 to 867	PD01 to PD99
		1025 to 1123	PE01 to PE99
		1281 to 1379	PF01 to PF99
		1793 to 1891	Po01 to Po99
		2561 to 2659	PS01 to PS99
		2817 to 2915	PL01 to PL99
	MR-J4(W)-B	1 to 64	PA01 to PA64
		65 to 128	PB01 to PB64
		129 to 192	PC01 to PC64
		193 to 256	PD01 to PD64
		257 to 320	PE01 to PE64
		321 to 384	PF01 to PF64
		385 to 448	Po01 to Po64
		449 to 512	PS01 to PS64
		513 to 576	PL01 to PL64
SSCNETⅢ	MR-J3(W)-B	1 to 18	PA01 to PA18
		19 to 63	PB01 to PB45
		64 to 95	PC01 to PC32
		96 to 127	PD01 to PD32
		128 to 167	PE01 to PE40
		168 to 183	PF01 to PF16
		184 to 199	Po01 to Po16
		200 to 231	PS01 to PS32
		232	PA19

Refresh cycle: Immediate

■Buffer memory address

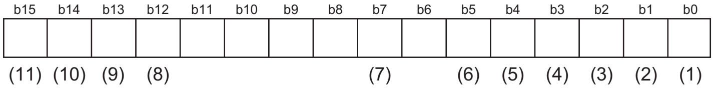
Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.108] Servo status1

This area stores the servo status1.

- READY ON: Indicates the ready ON/OFF.
- Servo ON: Indicates the servo ON/OFF.
- Control mode: Indicates the control mode of the servo amplifier.
- Gain switching: Turns ON during the gain switching.
- Fully closed loop control switching: Turns ON during the fully closed loop control.
- Servo alarm: Turns ON during the servo alarm.
- In-position: The dwell pulse turns ON within the servo parameter "in-position".
- Torque limit: Turns ON when the servo amplifier is having the torque restricted.
- Absolute position lost: Turns ON when the servo amplifier is lost the absolute position.
- Servo warning: Turns ON during the servo warning.

Buffer memory configuration	Stored items		Storage value
	(1)	READY ON	0: OFF 1: ON
	(2)	Servo ON	
	(3)	Control mode[*1]	
	(4)		
	(5)	Gain switching	
	(6)	Fully closed loop control switching	
	(7)	Servo alarm	
	(8)	In-position	
	(9)	Torque limit	
	(10)	Absolute position lost	
	(11)	Servo warning	

*1 Control mode is as follows.

b2	b3	Control mode
0	0	Position control mode
1	0	Speed control mode
0	1	Torque control mode

Refresh cycle: Operation cycle

Point

- When the forced stop of controller and servo amplifier occurs, the servo warning is turned ON. When the forced stop is reset, the servo warning is turned OFF.
- Confirm the status during continuous operation to torque control mode with "[Md.125] Servo status3". [RD77MS]
- When the control mode status of the servo amplifier (Modes of operation display: 6061h) is not CSV or CST, "Position control mode" is stored. [RD77GF]

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.109] Regenerative load ratio/Optional data monitor output 1 [RD77MS]

- The rate of regenerative power to the allowable regenerative power is indicated as a percentage.
- When the regenerative option is used, the rate to the allowable regenerative power of the option is indicated.

(Buffer memory) %

- This area stores the content set in "[Pr.91] Optional data monitor: Data type setting 1" at optional data monitor data type setting.

Refresh cycle: Operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.110] Effective load torque/Optional data monitor output 2 [RD77MS]

- The continuous effective load current is indicated.
- The effective value for the past 15 seconds is displayed considering a rated current as 100%.

(Buffer memory) %

- This area stores the content set in "[Pr.92] Optional data monitor: Data type setting 2" at optional data monitor data type setting.

Refresh cycle: Operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.111] Peak torque ratio/Optional data monitor output 3 [RD77MS]

- The maximum torque is indicated. (Holding value)
- The peak values for the past 15 seconds are indicated, rated torque being 100%.

(Buffer memory) %

- This area stores the content set in "[Pr.93] Optional data monitor: Data type setting 3" at optional data monitor data type setting.

Refresh cycle: Operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.112] Optional data monitor output 4 [RD77MS]

This area stores the content set in "[Pr.94] Optional data monitor: Data type setting 4" at optional data monitor data type setting. ("0" is stored when the optional data monitor data type is not set.)

Refresh cycle: Operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.113] Semi/Fully closed loop status

The switching status of semi closed loop control/fully closed loop control is indicated.

Storage value	Semi/Fully closed loop status
0	In semi closed loop control
1	In fully closed loop control

Refresh cycle: Operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

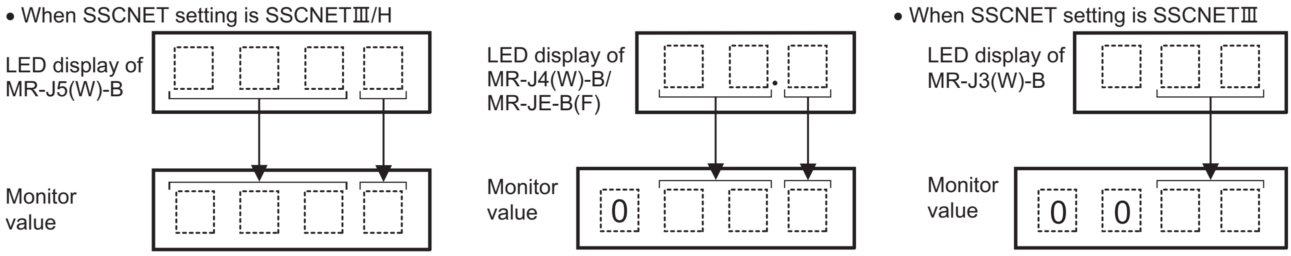
☞ Page 473 Axis monitor data

[Md.114] Servo alarm

- This area stores the servo alarm code and servo warning code displayed in LED of servo amplifier.
- When the "[Cd.5] Axis error reset" is set to "1" after remove the error factor of servo amplifier side, the servo alarm is cleared (set to "0").

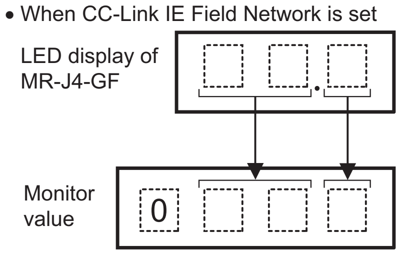
Ex.

[RD77MS]



Ex.

[RD77GF]



Refresh cycle: Immediate

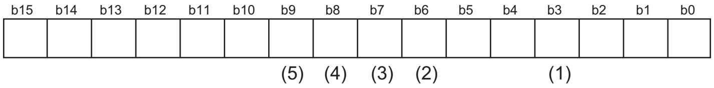
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.116] Encoder option information [RD77MS]

The option information of encoder is indicated.

Buffer memory configuration	Stored items		Storage value
	(1)	ABS/INC mode distinction for magnetism type encoder[1]	0: INC mode 1: ABS mode
	(2)	Connecting to single-revolution ABS encoder[1]	0: Multi-revolution ABS/INC 1: Single-revolution ABS
	(3)	Connecting to magnetism type encoder[1]	0: No connection 1: Magnetism type encoder
	(4)	Compatible with continuous operation to torque control	0: Incompatible 1: Compatible
	(5)	Compatible with scale measurement mode	

[1] Servo amplifier compatible with direct drive motor use (Refer to the instruction manual or manual of each servo amplifier for details.)

Refresh cycle: Servo amplifier's power supply ON

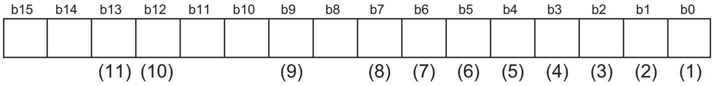
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.117] Statusword [RD77GF]

This area stores Statusword.

Buffer memory configuration	Stored items		Storage value
	(1)	Ready to switch on	0: OFF 1: ON
	(2)	Switched on	
	(3)	Operation enabled	
	(4)	Fault	
	(5)	Voltage enabled	
	(6)	Quick stop	
	(7)	Switch on disabled	
	(8)	Warning	
	(9)	Remote	
	(10)	Operation mode specific	
	(11)		

Refresh cycle: Operation cycle

■Buffer memory address

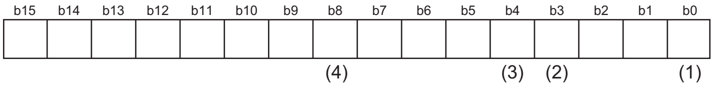
Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.119] Servo status2

This area stores the servo status2.

- Zero point pass: Turns ON if the zero point of the encoder has been passed even once.
- Zero speed: Turns ON when the motor speed is lower than the servo parameter "zero speed."
- Speed limit: Turns ON during the speed limit in torque control mode.
- PID control: Turns ON when the servo amplifier is PID control.

Buffer memory configuration	Stored items		Storage value
	(1)	Zero point pass	0: OFF 1: ON
	(2)	Zero speed	
	(3)	Speed limit	
	(4)	PID control	

Refresh cycle: Operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.120] Reverse torque limit stored value

[RD77MS]

"[Pr.17] Torque limit setting value", "[Cd.101] Torque output setting value", "[Cd.113] New reverse torque value", or "[Pr.54] Home position return torque limit value" is stored.

- The stored value is 1 to 10000 (× 0.1%).
- At the positioning start/JOG operation start/manual pulse generator operation: "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value" is stored.
- When a value is set in "[Cd.22] New torque value/forward new torque value" or "[Cd.113] New reverse torque value" during operation.: "[Cd.22] New torque value/forward new torque value" is stored when "0" is set in "[Cd.112] Torque change function switching request". "[Cd.113] New reverse torque value" is stored when "1" is set in "[Cd.112] Torque change function switching request".
- At the home position return: "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value" is stored. However, "[Pr.54] Home position return torque limit value" is stored after the speed reaches "[Pr.47] Creep speed".

[RD77GF]

"[Pr.17] Torque limit setting value", "[Cd.101] Torque output setting value", or "[Cd.113] New reverse torque value" is stored.

- The stored value is 1 to 10000 (× 0.1%)
- At the positioning start/JOG operation start/manual pulse generator operation: "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value" is stored.
- When a value is set in "[Cd.22] New torque value/forward new torque value" or "[Cd.113] New reverse torque value" during operation.: "[Cd.22] New torque value/forward new torque value" is stored when "0" is set in "[Cd.112] Torque change function switching request". "[Cd.113] New reverse torque value" is stored when "1" is set in "[Cd.112] Torque change function switching request".

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.122] Speed during command

- This area stores the command speed during speed control mode.
- This area stores the command speed during continuous operation to torque control mode.
- "0" is stored other than during speed control mode or continuous operation to torque control mode.

The storage value converted into other units can be checked by multiplying said value by the following conversion values.

Unit	Conversion value
mm/min	× 10^{-2}
inch/min	× 10^{-3}
degree/min	× 10^{-3}[*1]
pulse/s	× 10^{0}

*1 When "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid, becomes "× 10^{-2}".

Refresh cycle: Operation cycle (Speed control mode and continuous operation to torque control mode only)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.123] Torque during command

- This area stores the command torque during torque control mode. (Buffer memory × 0.1)%
- This area stores the command torque during continuous operation to torque control mode.
- "0" is stored other than during torque control mode or continuous operation to torque control mode.

The storage value converted into other units can be checked by multiplying said value by the following conversion values.

Unit	Conversion value
%	× 10^{-1}

Refresh cycle: Operation cycle (Torque control mode and continuous operation to torque control mode only)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.124] Control mode switching status [RD77MS]

This area stores the switching status of control mode.

Storage value	Control mode switching status
0	Not during control mode switching
1	Position control mode⇔continuous operation to torque control mode, speed control mode⇔continuous operation to torque control mode switching
2	Waiting for the completion of control mode switching condition

Refresh cycle: Operation cycle (Only at continuous operation to torque control mode)

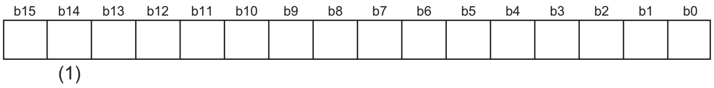
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.125] Servo status3 [RD77MS]

- This area stores the servo status3.
- Continuous operation to torque control mode: Turn ON when the continuous operation to torque control mode.

Buffer memory configuration	Servo status3		Storage value
	(1)	Continuous operation to torque control mode	0: OFF 1: ON

Refresh cycle: Operation cycle

■Buffer memory address

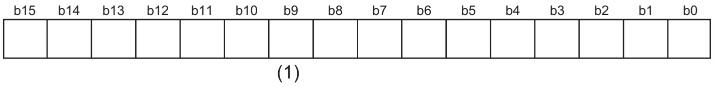
Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.126] Servo status4 [RD77MS]

This area stores the servo status4.

- Magnetic pole detection completion flag: Turns ON when the magnetic pole detection is completed.

Buffer memory configuration	Servo status4		Storage value
	(1)	Magnetic pole detection completion flag	0: OFF 1: ON

Refresh cycle: Operation cycle

■Buffer memory address

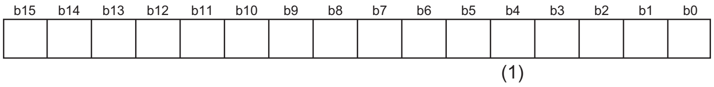
Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.127] Servo status5 [RD77MS]

This area stores the servo status5.

- Gain switching 2: Turns ON during gain switching 2

Buffer memory configuration	Servo status5		Storage value
	(1)	Gain switching 2	0: OFF 1: ON

Refresh cycle : Operation cycle

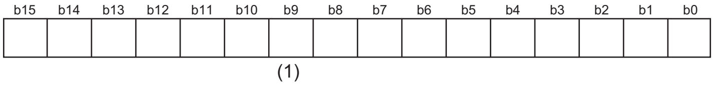
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.500] Servo status7 [RD77MS]

- This area stores the servo status7.

Buffer memory configuration	Stored items		Storage value
	(1)	Driver operation alarm	0: OFF 1: ON

Refresh cycle: Operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.502] Driver operation alarm No. [RD77MS]

- This area stores the driver operation alarm No.
- Upper 2 digits: Driver operation alarm (b8 to b15)
- Lower 2 digits: Detailed No. (b0 to b7)

Refresh cycle: Immediate

Ex.

When the driver operation alarm is "10H" and the detailed No. is "23H", "1023H" is displayed.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.503] Pre-reading data analysis status

Use this monitor when using the pre-reading start function.

- This area stores the positioning data analysis status.

Storage value	Pre-reading data analysis status
0	Standby
1	Analyzing
2	Completed

Refresh cycle: Operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

[Md.514] Home position return operating status [RD77GF]

This area stores the home position return operating status.

Storage value	HPR operating status
FFFFH	The servo amplifier is not set to the home position return mode
0000H	Home position return is in progress
0001H	Home position return is interrupted or not started
0002H	Home position return is completed, but the target has not been reached
0003H	Home position return is completed successfully
0004H	Home position return error occurred, speed is not 0
0005H	Home position return error occurred, speed is 0

Refresh cycle: Operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 473 Axis monitor data

Servo network composition status

[Md.105] Connected device

[RD77MS]

This area stores the vendor ID and module code of each axis when the power of the connected device is turned ON.

It is not cleared if the power of the connected device is turned OFF.

Vender ID	Model code
0000: Mitsubishi Electric	0100: MR-J3-_B, MR-J3W-_B (2-axis type) 0101: MR-J3-_B-RJ006 (for fully closed loop control) MR-J3-_BS_ (safety support) 0102: MR-J3-_B-RJ004 (direct drive motor) 0107: MR-J3-_B-RJ080W (linear motor) 0180: MR-J3W-0303BN6 0FFF: Virtual servo amplifier (MR-J3-B standard) 1000: MR-J4-_B_(-RJ), MR-J4W_-_B (2-, 3-axis type) 1400: MR-J5-_B_(-RJ), MR-J5W_-_B (2-, 3-axis type) 1FFE: Virtual servo amplifier (MR-J5-B) 1FFF: Virtual servo amplifier (MR-J4-B) 2000: FR-A800-1 (general-purpose Inverter) 2001: FR-A800-2 (general-purpose Inverter) 4100: FR-A700 (general-purpose Inverter) 4101: FR-A700-NA (general-purpose Inverter) 4102: FR-A700-EC (general-purpose Inverter) 4103: FR-A700-CHT (general-purpose Inverter)
0003: Oriental motor	2029: 5-phase (ST) 202A: αSTEP (AZ)
0008: CKD NIKKI DENSO	0102: VCⅡ (CKD NIKKI DENSO) (linear motor) 0107: VCⅡ (CKD NIKKI DENSO) (direct drive motor) 0302: VPH (CKD NIKKI DENSO) (linear motor) 0307: VPH (CKD NIKKI DENSO) (direct drive motor) 1000: VCⅡ (CKD NIKKI DENSO) 1300: VPH (CKD NIKKI DENSO)
000A: IAI	2001: IAI Driver for Electric Actuator

[RD77GF]

This area stores the manufacturer (vendor) ID and model (type) code of each axis when the power of the connected device operating in the motion mode is turned ON.

It is not cleared if the power of the connected device is turned OFF.

Refresh cycle: Servo amplifier's power supply ON

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Servo network composition status

12.8 Control Data

The setting items of the control data are explained in this section.

System control data

[Cd.1] Flash ROM write request

- Writes not only "positioning data (No.1 to 600)" and "block start data (No.7000 to 7004)" stored in the buffer memory/ internal memory area, but also "parameters" and "servo parameters" to the flash ROM/internal memory (nonvolatile).
- The Simple Motion module resets the value to "0" automatically when the write access completes. (This indicates the completion of write operation.)

Fetch cycle: 103 [ms] [RD77MS]

Fetch cycle: 116 [ms] [RD77GF]

Point

- Do not turn the power OFF or reset the CPU module while writing to the flash ROM. If the power is turned OFF or the CPU module is reset to forcibly end the process, the data backed up in the flash ROM will be lost.
- Do not write the data to the buffer memory before writing to the flash ROM is completed.
- The number of writes to the flash ROM with the program is 25 max. while the power is turned ON. Writing to the flash ROM beyond 25 times will cause the error "Flash ROM write number error" (error code: 1080H). Refer to ☞ Page 722 List of Error Codes for details.
- Monitoring is the number of writes to the flash ROM after the power is switched ON by the "[Md.19] Number of write accesses to flash ROM".

■Setting value

- Set with a decimal.

Setting value	Details
1	Flash ROM write request

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 System control data

■Default value

Set to "0".

[Cd.2] Parameter initialization request

- Requests initialization of setting data.
- The Simple Motion module resets the value to "0" automatically when the initialization completes. (This indicates the completion of the initialization.)

Refer to the following for initialized setting data.

☞ Page 328 Parameter Initialization Function

Initialization: Resetting of setting data to default values

Fetch cycle: 103 [ms] [RD77MS]

Fetch cycle: 116 [ms] [RD77GF]

Point

After completing the initialization of setting data, switch the power ON or reset the CPU module.

■Setting value

- Set with a decimal.

Setting value	Details
1	Parameter initialization request

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 System control data

■Default value

Set to "0".

[Cd.41] Deceleration start flag valid

Sets whether "[Md.48] Deceleration start flag" is made valid or invalid.

Fetch cycle: PLC READY signal [Y0] OFF → ON

Point

The "[Cd.41] Deceleration start flag valid" become valid when the PLC READY signal [Y0] turns from OFF to ON.

■Setting value

- Set with a decimal.

Setting value	Details
0	Deceleration start flag invalid
1	Deceleration start flag valid

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 System control data

■Default value

Set to "0".

[Cd.42] Stop command processing for deceleration stop selection

- Sets the stop command processing for deceleration stop function (deceleration curve re-processing/deceleration curve continuation).

Fetch cycle: At conditions established (At deceleration stop causes occurrence)

■Setting value

- Set with a decimal.

Setting value	Details
0	Deceleration curve re-processing
1	Deceleration curve continuation

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 System control data

■Default value

Set to "0".

[Cd.44] External input signal operation device

Operates the external input signal status (Upper/lower limit signal, proximity dog signal, stop signal) of the Simple Motion module when "2" is set in "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", "[Pr.118] DOG signal selection", and "[Pr.119] STOP signal selection".

Fetch cycle: Operation cycle

■Setting value

- Set with a hexadecimal.

Buffer memory address		Details	Setting value
5928	b0	Axis 1 Upper limit signal (FLS)	When "[Pr.22] Input signal logic selection" is negative logic 0: OFF 1: ON When "[Pr.22] Input signal logic selection" is positive logic 0: ON 1: OFF
	b1	Axis 1 Lower limit signal (RLS)	
	b2	Axis 1 Proximity dog signal (DOG)	
	b3	Axis 1 STOP signal (STOP)	
	b4 to b7	For axis 2	
	b8 to b11	For axis 3	
	b12 to b15	For axis 4	
5929	b0 to b3	For axis 5	
	b4 to b7	For axis 6	
	b8 to b11	For axis 7	
	b12 to b15	For axis 8	
5930	b0 to b3	For axis 9	
	b4 to b7	For axis 10	
	b8 to b11	For axis 11	
	b12 to b15	For axis 12	
5931	b0 to b3	For axis 13	
	b4 to b7	For axis 14	
	b8 to b11	For axis 15	
	b12 to b15	For axis 16	
1005928	b0 to b3	For axis 17	
	b4 to b7	For axis 18	
	b8 to b11	For axis 19	
	b12 to b15	For axis 20	
1005929	b0 to b3	For axis 21	
	b4 to b7	For axis 22	
	b8 to b11	For axis 23	
	b12 to b15	For axis 24	
1005930	b0 to b3	For axis 25	
	b4 to b7	For axis 26	
	b8 to b11	For axis 27	
	b12 to b15	For axis 28	
1005931	b0 to b3	For axis 29	
	b4 to b7	For axis 30	
	b8 to b11	For axis 31	
	b12 to b15	For axis 32	

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 System control data

■Default value

Set to "0000H".

[Cd.102] SSCNET control command [RD77MS]

Sets the connect/disconnect command of SSCNET communication.

■Setting value

- Set with a decimal.

Setting value	Details
0	No command
Axis No.[*1]	Disconnect command of SSCNET communication (Axis No. to be disconnected)
-2	Execute command
-10	Connect command of SSCNET communication
Except above setting	Invalid

[*1] 1 to the maximum control axes.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 System control data

Fetch cycle: 3.5 [ms]

■Default value

Set to "0".

[Cd.137] Amplifier-less operation mode switching request

Sets the switching request of the normal operation mode and amplifier-less operation mode.

Fetch cycle: 3.5 [ms] [RD77MS]

Fetch cycle: 16.0 [ms] [RD77GF]

■Setting value

- Set with a hexadecimal.

Setting value	Details
ABCDH	Change from normal operation mode to amplifier-less operation mode
0000H	Change from amplifier-less operation mode to normal operation mode

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 System control data

■Default value

Set to "0000H".

[Cd.158] Forced stop input

Sets the forced stop information.

Fetch cycle: Operation cycle

■Setting value

- Set with a hexadecimal.

Setting value	Details
0000H	Forced stop ON (Forced stop)
0001H	Forced stop OFF (Forced stop release)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 System control data

■Default value

Set to "0000H".

[Cd.700] Virtual servo amplifier operation command [RD77GF]

Set the operation request according to an operation.

Fetch cycle: 16.0 [ms]

■Setting value

- Set with a hexadecimal.

After the processing is completed, "0" is stored.

Setting value	Details
0001H	Virtual servo amplifier connection
0011H	Virtual servo amplifier disconnection

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 System control data

■Default value

Set to "0000H".

[Cd.701] Virtual servo amplifier operation station specification [RD77GF]

Set a station No. where a virtual servo amplifier is connected or disconnected by the virtual servo amplifier operation command.[1]

[1] Valid for the range from 1 to 4 stations in the 4-axis module, from 1 to 8 stations in the 8-axis module, from 1 to 16 stations in the 16-axis module, and from axis 1 to 32 stations in the 32-axis module.

Fetch cycle: At request

Point

- The following requests are ignored.

[Connection request]

Virtual servo amplifier connection request for a station where a virtual servo amplifier has already been connected

Virtual servo amplifier connection request for a station where a virtual servo amplifier cannot be connected

[Disconnection request]

Virtual servo amplifier disconnection request for a station where no virtual servo amplifier is connected

Virtual servo amplifier disconnection request for a station where only virtual servo amplifiers can be connected

- If the following request is issued, the warning "Virtual servo amplifier operation warning" (warning code: 0C84H) occurs and the target axis is not connected or disconnected.

Virtual servo amplifier connection/disconnection request for a station where "Baton pass status of each station" (SW00A0 to SW00A7) is set to "Baton pass normal station"

■Setting value

- Set with a hexadecimal.

Setting item			Details
b0	1 station	17 station	0: Connection/disconnection not commanded 1: Connection/disconnection commanded
b1	2 station	18 station	
b2	3 station	19 station	
b3	4 station	20 station	
b4	5 station	21 station	
b5	6 station	22 station	
b6	7 station	23 station	
b7	8 station	24 station	
b8	9 station	25 station	
b9	10 station	26 station	
b10	11 station	27 station	
b11	12 station	28 station	
b12	13 station	29 station	
b13	14 station	30 station	
b14	15 station	31 station	
b15	16 station	32 station	

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 System control data

■Default value

Set to "0000H".

Axis control data

[Cd.3] Positioning start No.

Sets the positioning start No. (Only 1 to 600 for the Pre-reading start function. For details, refer to ☞ Page 287 Pre-reading start function.)

Fetch cycle: At start

■Setting value

- Set with a decimal.

Setting value	Details
1 to 600	Positioning data No.
7000 to 7004	Block start designation
9001	Machine home position return
9002	Fast-home position return
9003	Current value changing
9004	Simultaneous starting of multiple axes

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.4] Positioning starting point No.

- Sets a "starting point No." (1 to 50) if block start data is used for positioning. (Handled as "1" if the value other than 1 to 50 is set.)
- The Simple Motion module resets the value to "0" automatically when the continuous operation is interrupted.

Fetch cycle: At start

■Setting range

- Set with a decimal.

Setting range of [Cd.4]
1 to 50

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.5] Axis error reset

- Clears the axis error detection, axis error No., axis warning detection and axis warning No.
- When the axis operation state of Simple Motion module is "in error occurrence", the error is cleared and the Simple Motion module is returned to the "waiting" state.
- Clears the both of Simple Motion module errors and servo amplifier alarms by axis error reset. (Some servo amplifier alarms cannot be reset even if error reset is requested. At the time, "0" is not stored in [Cd.5] by the Simple Motion module. It remains "1". Set "0" in [Cd.5] and then set "1" to execute the error reset again by user side. For details, refer to each servo amplifier instruction manual.)
- The Simple Motion module resets the value to "0" automatically after the axis error reset is completed. (This indicates that the axis error reset is completed.)
- The error cannot be reset during a forced stop. Execute the axis error reset after the forced stop is released. [RD77GF]

Fetch cycle: 14.2 [ms] [RD77MS]

Fetch cycle: 16.0 [ms] [RD77GF]

■Setting value

- Set with a decimal.

Setting value	Details
1	Axis error is reset.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.6] Restart command

- When "1" is set in [Cd.6] after the positioning is stopped for any reason (while the axis operation state is "stopped"), the positioning will be carried out again from the stop position to the end point of the stopped positioning data.
- The Simple Motion module resets the value to "0" automatically after restart acceptance is completed. (This indicates that the restart acceptance is completed.)

Fetch cycle: 14.2 [ms] [RD77MS]

Fetch cycle: 16.0 [ms] [RD77GF]

■Setting value

- Set with a decimal.

Setting value	Details
1	Restarts

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.7] M code OFF request

- The M code ON signal turns OFF.
- After the M code ON signal turns OFF, "0" is stored by the Simple Motion module automatically. (This indicates that the OFF request is completed.)

Fetch cycle: Operation cycle

■Setting value

- Set with a decimal.

Setting value	Details
1	M code ON signal turns OFF.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.8] External command valid

Validates or invalidates external command signals.

Fetch cycle: At request by external command signal

■Setting value

- Set with a decimal.

Setting value	Details
0	Invalidates an external command.
1	Validates an external command.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.9] New position value

When changing the "Command position value" using the start No. "9003", use this data item to specify a new feed value.

Fetch cycle: At change request

■Setting range

- Set with a decimal.
- The setting value range differs according to the "[Pr.1] Unit setting".

Setting of "[Pr.1] Unit setting"	Setting value depending on program (unit)
0: mm	-2147483648 to 2147483647 ($\times 10^{-1}$ μm)
1: inch	-2147483648 to 2147483647 ($\times 10^{-5}$ inch)
2: degree	0 to 35999999 ($\times 10^{-5}$ degree)
3: pulse	-2147483648 to 2147483647 (pulse)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.10] New acceleration time value

When changing the acceleration time during a speed change, use this data item to specify a new acceleration time.

Fetch cycle: At change request

■Setting range

- Set with a decimal.

Setting range of [Cd.10] (unit)
0 to 8388608 (ms)

Ex.

When the "[Cd.10] New acceleration time value" is set as "60000 ms", the buffer memory stores "60000".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.11] New deceleration time value

When changing the deceleration time during a speed change, use this data item to specify a new deceleration time.

Fetch cycle: At change request

■Setting range

- Set with a decimal.

Setting range of [Cd.11] (unit)
0 to 8388608 (ms)

Ex.

When the "[Cd.11] New deceleration time value" is set as "60000 ms", the buffer memory stores "60000".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.12] Accel/decel[*1] time change value during speed change, enable/disable

[*1] "Accel/decel" is an abbreviation for "Acceleration/deceleration".

Enables or disables modifications to the acceleration/deceleration time during a speed change.

Fetch cycle: At change request

■Setting value

- Set with a decimal.

Setting value	Details
1	Enables modifications to acceleration/deceleration time
Other than 1	Disables modifications to acceleration/deceleration time

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.13] Positioning operation speed override

- To use the positioning operation speed override function, use this data item to specify an "override" value.

If the command speed is set to less than the minimum unit using the override function, the speed is raised to the minimum unit and the warning "Less than minimum speed" (warning code: 0904H) occurs.

If the override value "0 (%)" is set, the speed is set to "0" and the speed change 0 flag is set to "1". At the time, the warning "Less than minimum speed" (warning code: 0904H) does not occur.

For details of the override function, refer to the following.

☞ Page 275 Override function

Fetch cycle: Operation cycle

■Setting range

- Set with a decimal.

Setting range of [Cd.13] (unit)
0 to 300 (%)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "100".

[Cd.14] New speed value

- When changing the speed, use this data item to specify a new speed.
- The operation halts if you specify "0".

Fetch cycle: At change request

■Setting range

- Set with a decimal.
- The setting range differs according to the setting of "[Pr.1] Unit setting".

Setting of "[Pr.1] Unit setting"	Setting value depending on program (unit)
0: mm	0 to 2000000000 (× 10^{-2} mm/min)
1: inch	0 to 2000000000 (× 10^{-3} inch/min)
2: degree[*1]	0 to 2000000000 (× 10^{-3} degree/min)
3: pulse	0 to 1000000000 (pulse/s)

[*1] When "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid, the setting range is 0 to 2000000000 (× 10^{-2} degree/min).

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

Ex.

When the "[Cd.14] New speed value" is set as "20000.00 mm/min", the buffer memory stores "2000000".

■Default value

Set to "0".

[Cd.15] Speed change request

- After setting the "[Cd.14] New speed value", set this data item to "1" to execute the speed change (through validating the new speed value).
- The Simple Motion module resets the value to "0" automatically when the speed change request has been processed. (This indicates the completion of speed change request.)

Fetch cycle: Operation cycle

■Setting value

- Set with a decimal.

Setting value	Details
1	Executes speed change.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.16] Inching movement amount

- Use this data item to set the amount of movement by inching.
- The machine performs a JOG operation if "0" is set.

Fetch cycle: At start

■Setting range

- Set a value within the following range.

Setting of "[Pr.1] Unit setting"	Setting value depending on program (unit)[*1]
0: mm	0 to 65535 (× 10^{-1} µm)
1: inch	0 to 65535 (× 10^{-5} inch)
2: degree	0 to 65535 (× 10^{-5} degree)
3: pulse	0 to 65535 (pulse)

[*1] 0 to 32767: Set as a decimal
32768 to 65535: Convert into hexadecimal and set

Ex.

When the "[Cd.16] Inching movement amount" is set as "1.0 µm", the buffer memory stores "10".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.17] JOG speed

Use this data item to set the JOG speed.

Fetch cycle: At start

■Setting range

- Set with a decimal.
- The setting range differs according to the setting of "[Pr.1] Unit setting".

Setting of "[Pr.1] Unit setting"	Setting value depending on program (unit)
0: mm	1 to 2000000000 (× 10^{-2} mm/min)
1: inch	1 to 2000000000 (× 10^{-3} inch/min)
2: degree[*1]	1 to 2000000000 (× 10^{-3} degree/min)
3: pulse	1 to 1000000000 (pulse/s)

*1 When "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid, the setting range is 1 to 2000000000 (× 10^{-2} degree/min).

Ex.

When the "[Cd.17] JOG speed" is set as "20000.00 mm/min", the buffer memory stores "2000000".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.18] Interrupt request during continuous operation

- To interrupt a continuous operation, set "1" to this data item.
- After processing the interruption request ("1"), the Simple Motion module automatically resets the value to "0".

Fetch cycle: Operation cycle

■Setting value

- Set with a decimal.

Setting value	Details
1	Interrupts continuous operation control or continuous path control.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.19] Home position return request flag OFF request

- The program can use this data item to forcibly turn the home position return request flag from ON to OFF.
- The Simple Motion module resets the value to "0" automatically when the home position return request flag is turned OFF. (This indicates the completion of home position return request flag OFF request.)

Fetch cycle: 14.2 [ms] [RD77MS]

Fetch cycle: 16.0 [ms] [RD77GF]

Point

This parameter is made valid when the increment system is valid.

■Setting value

- Set with a decimal.

Setting value	Details
1	Turns the "home position return request flag" from ON to OFF.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.20] Manual pulse generator 1 pulse input magnification

- This data item determines the factor by which the number of pulses from the manual pulse generator is magnified.
- Value "0": read as "1".
- Value "10001 or more" or negative value: read as "10000".

Fetch cycle: Operation cycle (At manual pulse generator enabled)

■Setting range

- Set with a decimal.

Setting range of [Cd.20]
1 to 10000

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "1".

[Cd.21] Manual pulse generator enable flag

This data item enables or disables operations using a manual pulse generator.

Fetch cycle: Operation cycle

■Setting value

- Set with a decimal.

Setting value	Details
0	Disable manual pulse generator operation.
1	Enable manual pulse generator operation.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.22] New torque value/forward new torque value

- When "0" is set to "[Cd.112] Torque change function switching request", a new torque limit value is set. (This value is set to the forward torque limit value and reverse torque limit value.) When "1" is set to "[Cd.112] Torque change function switching request", a new forward torque limit value is set.
- Set a value within "0" to "[Pr.17] Torque limit setting value". Set a ratio against the rated torque in 0.1% unit. (The new torque value is invalid when "0" is set, and "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value" becomes valid. The range of torque change is 1 to "[Pr.17] Torque limit setting value".)

Fetch cycle: Operation cycle

■Setting range

- Set with a decimal.

Setting range of [Cd.22] (Unit)
0 to "[Pr.17] Torque limit setting value" (× 0.1%)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.23] Speed-position switching control movement amount change register

- During the speed control stage of the speed-position switching control (INC mode), it is possible to change the specification of the movement amount during the position control stage. For that, use this data item to specify a new movement amount.
- The new movement amount has to be set during the speed control stage of the speed-position switching control (INC mode).
- The value is reset to "0" when the next operation starts.

Fetch cycle: At switching request

■Setting range

- Set with a decimal.
- Set a value within the following range.

Setting of "[Pr.1] Unit setting"	Setting value depending on program (unit)
0: mm	0 to 2147483647 (× 10^{-1} μm)
1: inch	0 to 2147483647 (× 10^{-5} inch)
2: degree	0 to 2147483647 (× 10^{-5} degree)
3: pulse	0 to 2147483647 (pulse)

Ex.

If "[Cd.23] Speed-position switching control movement amount change register" is set as "20000.0 μm", the buffer memory stores "200000".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.24] Speed-position switching enable flag

Sets whether the switching signal set in "[Cd.45] Speed-position switching device selection" is enabled or not.

Fetch cycle: At switching request

■Setting value

- Set with a decimal.

Setting value	Details
0	Speed control will not be taken over by position control even when the signal set in "[Cd.45] Speed-position switching device selection" comes ON.
1	Speed control will be taken over by position control even when the signal set in "[Cd.45] Speed-position switching device selection" comes ON.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.25] Position-speed switching control speed change register

- During the position control stage of the position-speed switching control, it is possible to change the specification of the speed during the speed control stage. For that, use this data item to specify a new speed.
- The new speed has to be set during the position control stage of the position-speed switching control.
- The value is reset to "0" when the next operation starts.

Fetch cycle: At switching request

■Setting range

- Set with a decimal.
- The setting value range differs according to the "[Pr.1] Unit setting".

Setting of "[Pr.1] Unit setting"	Setting value depending on program (unit)
0: mm	0 to 2000000000 (× 10^{-2} mm/min)
1: inch	0 to 2000000000 (× 10^{-3} inch/min)
2: degree[*1]	0 to 2000000000 (× 10^{-3} degree/min)
3: pulse	0 to 1000000000 (pulse/s)

[*1] When "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid, the setting range is 0 to 2000000000 (× 10^{-2} degree/min).

Ex.

If "[Cd.25] Position-speed switching control speed change register" is set as "2000.00 mm/min", the buffer memory stores "200000".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.26] Position-speed switching enable flag

Sets whether the switching signal set in "[Cd.45] Speed-position switching device selection" is enabled or not.

Fetch cycle: At switching request

■Setting value

- Set with a decimal.

Setting value	Details
0	Position control will not be taken over by speed control even when the signal set in "[Cd.45] Speed-position switching device selection" comes ON.
1	Position control will be taken over by speed control when the signal set in "[Cd.45] Speed-position switching device selection" comes ON.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.27] Target position change value (New address)

- When changing the target position during a positioning operation, use this data item to specify a new positioning address.

Fetch cycle: At change request

■Setting range

- Set with a decimal.
- The setting value range differs according to the "[Pr.1] Unit setting".

Setting of "[Pr.1] Unit setting"	Setting value depending on program (ABS) (unit)	Setting value depending on program (INC) (unit)
0: mm	-2147483648 to 2147483647 (× 10^{-1} μm)	-2147483648 to 2147483647 (× 10^{-1} μm)
1: inch	-2147483648 to 2147483647 (× 10^{-5} inch)	-2147483648 to 2147483647 (× 10^{-5} inch)
2: degree	0 to 35999999 (× 10^{-5} degree)	-2147483648 to 2147483647 (× 10^{-5} degree)
3: pulse	-2147483648 to 2147483647 (pulse)	-2147483648 to 2147483647 (pulse)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.28] Target position change value (New speed)

- When changing the target position during a positioning operation, use this data item to specify a new speed.
- The speed will not change if "0" is set.

Fetch cycle: At change request

■Setting range

- Set with a decimal.
- The setting value range differs according to the "[Pr.1] Unit setting".

Setting of "[Pr.1] Unit setting"	Value set with a program (unit)
0: mm	0 to 2000000000 (× 10^{-2} mm/min)
1: inch	0 to 2000000000 (× 10^{-3} inch/min)
2: degree[*1]	0 to 2000000000 (× 10^{-3} degree/min)
3: pulse	0 to 1000000000 (pulse/s)

[*1] When "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid, the setting range is 0 to 2000000000 (×10^{-2} degree/min).

Ex.

If "[Cd.28] Target position change value (New speed)" is set as "10000.00 mm/min", the buffer memory stores "1000000".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.29] Target position change request flag

- Requests a change in the target position during a positioning operation.
- The Simple Motion module resets the value to "0" automatically when the new target position value has been written. (This indicates the completion of target position change request.)

Fetch cycle: Operation cycle

■Setting value

- Set with a decimal.

Setting value	Details
1	Requests a change in the target position

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.30] Simultaneous starting own axis start data No.

Use this data item to specify a start data No. of own axis at multiple axes simultaneous starting.

Fetch cycle: At start

■Setting range

- Set with a decimal.

Setting range of [Cd.30]
1 to 600

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.31] Simultaneous starting axis start data No.1

Use this data item to specify a start data No.1 for each axis that starts simultaneously.

Fetch cycle: At start

■Setting range

- Set with a decimal.

Setting range of [Cd.31]
1 to 600

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.32] Simultaneous starting axis start data No.2

Use this data item to specify a start data No.2 for each axis that starts simultaneously.

Point

For 2 axis simultaneous starting, the axis setting is not required. (Setting value is ignored.)

Fetch cycle: At start

■Setting range

- Set with a decimal.

Setting range of [Cd.32]
1 to 600

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.33] Simultaneous starting axis start data No.3

Use this data item to specify a start data No.3 for each axis that starts simultaneously.

Point

For 2 axis simultaneous starting and 3 axis simultaneous starting, the axis setting is not required. (Setting value is ignored.)

Fetch cycle: At start

■Setting range

- Set with a decimal.

Setting range of [Cd.33]
1 to 600

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.34] Step mode

To perform a step operation, use this data item to specify the units by which the stepping should be performed.

Fetch cycle: At start

■Setting value

- Set with a decimal.

Setting value	Details
0	Stepping by deceleration units
1	Stepping by data No. units

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.35] Step valid flag

This data item validates or invalidates step operations.

Fetch cycle: At start

■Setting value

- Set with a decimal.

Setting value	Details
0	Invalidates step operations
1	Validates step operations

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.36] Step start information

- To continue the step operation when the step function is used, set "1" in the data item.
- The Simple Motion module resets the value to "0" automatically when processing of the step start request completes.

Fetch cycle: 14.2 [ms] [RD77MS]

Fetch cycle: 16.0 [ms] [RD77GF]

■Setting value

- Set with a decimal.

Setting value	Details
1	Continues step operation

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.37] Skip command

- To skip the current positioning operation, set "1" in this data item.
- The Simple Motion module resets the value to "0" automatically when processing of the skip request completes.

Fetch cycle: Operation cycle (During positioning operation)

■Setting value

- Set with a decimal.

Setting value	Details
1	Issues a skip request to have the machine decelerate, stop, and then start the next positioning operation.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.38] Teaching data selection

- This data item specifies the teaching result write destination.
- Data are cleared to zero when the teaching ends.

Fetch cycle: At operation request

■Setting value

- Set with a decimal.

Setting value	Details
0	Takes the command position value as a positioning address.
1	Takes the command position value as an arc data.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.39] Teaching positioning data No.

- This data item specifies data to be produced by teaching.
- If a value between 1 and 600 is set, a teaching operation is done.
- The value is cleared to "0" when the Simple Motion module is initialized, when a teaching operation completes, and when an illegal value (601 or higher) is entered.

Fetch cycle: 103 [ms] [RD77MS]

Fetch cycle: 116 [ms] [RD77GF]

■Setting range

- Set with a decimal.

Setting range of [Cd.39]
1 to 600

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.40] ABS direction in degrees

This data item specifies the ABS moving direction carrying out the position control when "degree" is selected as the unit.

Fetch cycle: At start

■Setting value

- Set with a decimal.

Setting value	Details
0	Takes a shortcut. (Specified direction ignored.)
1	ABS circular right
2	ABS circular left

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.43] Simultaneous starting axis

- Set the number of simultaneous starting axes and target axis. When "2" is set to the number of simultaneous starting axes, set the target axis No. to the simultaneous starting axis No.1. When "3" is set to the number of simultaneous starting axes, set the target axis No. to the simultaneous starting axis No.1 and 2. When "4" is set to the number of simultaneous starting axes, set the target axis No. to the simultaneous starting axis No.1 to 3.
- When the same axis No. or axis No. of own axis is set to the multiple simultaneous starting axis No, or the value outside the range is set to the number of simultaneous starting axes, the error "Error before simultaneous start" (error code: 1990H, 1991H) occurs and the operation is not executed.

Point

Do not set the simultaneous starting axis No.2 and 3 for 2-axis interpolation, and do not set the simultaneous starting axis No.3 for 3-axis interpolation. The setting value is ignored.

Fetch cycle: At start

■Setting value

- Set with a hexadecimal.

Buffer memory address		Details	Setting value	
Low-order	b0 to b7	Simultaneous starting axis No.1	00H to 1FH[*1]	Axis 1 to Axis 32
	b8 to b15	Simultaneous starting axis No.2		
High-order	b0 to b7	Simultaneous starting axis No.3		
	b8 to b15	Number of simultaneous starting axes	02H to 04H	Axis 2 to Axis 4

[*1] The value of 10 to 1F can be set for the 32-axis module.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0000H".

[Cd.45] Speed-position switching device selection

Select the device used for speed-position switching.

Point

If the setting is outside the range at start, operation is performed with the setting regarded as "0". [RD77MS]

If the setting is outside the range at start, operation is performed with the setting regarded as "3". [RD77GF]

Fetch cycle: At start

■Setting value

- Set with a decimal.

Setting value	Details	
	Speed-position switching control	Position-speed switching control
0	Use the external command signal for switching from speed control to position control. [RD77MS]	Use the external command signal for switching from position control to speed control. [RD77MS]
1	Use the proximity dog signal for switching from speed control to position control.	Use the proximity dog signal for switching from position control to speed control.
2	Use "[Cd.46] Speed-position switching command" for switching from speed control to position control.	Use "[Cd.46] Speed-position switching command" for switching from position control to speed control.
3	Use the link device for switching from speed control to position control. [RD77GF]	Use the link device for switching from position control to speed control. [RD77GF]

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0". [RD77MS]

Set to "3". [RD77GF]

[Cd.46] Speed-position switching command

Speed-position control switching is performed when "2" is set in "[Cd.45] Speed-position switching device selection". Other than setting value is ignored.

Point

This parameter is made valid only when "2" is set in "[Cd.45] Speed-position switching device selection" at start.

Fetch cycle: Vary with operation cycle [RD77MS]

Operation cycle	Fetch cycle
0.444 ms	0.444 ms
0.888 ms	0.888 ms
1.777 ms	
3.555 ms	

Fetch cycle: Inter-module synchronization cycle [RD77GF]

■Setting value

- Set with a decimal.

Setting value	Details	
	Speed-position switching control	Position-speed switching control
0	Not switch from speed control to position control	Not switch from position control to speed control
1	Switch from speed control to position control	Switch from position control to speed control

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.100] Servo OFF command

Executes servo OFF for each axis.

Fetch cycle: Operation cycle

Point

To execute servo ON for axes other than axis 1 being servo OFF, write "1" to storage buffer memory address of axis 1 and then turn ON all axis servo ON [Y1].

■Setting value

- Set with a decimal.

Setting value	Details
0	Servo ON
1	Servo OFF

Valid only during servo ON for all axes.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.101] Torque output setting value

Sets the torque output value. Set a ratio against the rated torque in 0.1% unit.

Fetch cycle: At start

Point

- If the "[Cd.101] Torque output setting value" is "0", the "[Pr.17] Torque limit setting value" will be its value.
- If a value beside "0" is set in the "[Cd.101] Torque output setting value", the torque generated by the servo motor will be limited by that value.
- The "[Pr.17] Torque limit setting value" of the detailed parameter becomes effective at the PLC READY signal [Y0] leading edge.
- The "[Cd.101] Torque output setting value" (refer to the start) axis control data can be changed at all times. Therefore in the "[Cd.101] Torque output setting value" is used when you must change.

(☞ Page 280 Torque change function)

■Setting range

- Set with a decimal.

Setting range of [Cd.101]
0 to 10000 (× 0.1%)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.108] Gain switching command flag

The command required to carry out "gain switching" of the servo amplifier from the Simple Motion module.

Fetch cycle: Operation cycle

Point

- For other than MR-J5(W)-B

If the setting is other than "0" and "1", operation is turned OFF in the "gain switching" with the setting regard as "0".

Refer to each servo amplifier instruction manual for details of the gain switching.

- For MR-J5(W)-B

If the setting is outside the range (other than "0" to "3"[*1]), the gain switching command and the gain switching 2 command are set to OFF with the setting value regard as "0".

Refer to the following for details of the gain switching command and the gain switching 2 command.

☞ Page 796 Connection with MR-J5(W)-B

[*1] "3" is for manufacturer setting.

■Setting value

- Set with a decimal.

For other than MR-J5(W)-B

Setting value	Details
0	Gain switching command OFF
1	Gain switching command ON

For MR-J5(W)-B

Setting value	Details
0	Gain switching command OFF
1	Gain switching command ON
2	Gain switching 2 command ON

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.112] Torque change function switching request

Sets "same setting/individual setting" of the forward torque limit value or reverse torque limit value in the torque change function.

Fetch cycle: Operation cycle

Point

- Set "0" normally. (when the forward torque limit value and reverse torque limit value are not divided.)
- When a value except "1" is set, it operates as "forward/reverse torque limit value same setting".

■Setting value

- Set with a decimal.

Setting value	Details
0	Forward/reverse torque limit value same setting
1	Forward/reverse torque limit value individual setting

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.113] New reverse torque value

- "1" is set in "[Cd.112] Torque change function switching request", a new reverse torque limit value is set. (when "0" is set in "[Cd.112] Torque change function switching request", the setting value is invalid.)
- Set a value within "0" to "[Pr.17] Torque limit setting value". Set a ratio against the rated torque in 0.1% unit. (The new torque value is invalid when "0" is set, and "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value" becomes valid. The range of torque change is 1 to "[Pr.17] Torque limit setting value".

Fetch cycle: Operation cycle

■Setting range

- Set with a decimal.

Setting range of [Cd.113]
0 to "[Pr.17] Torque limit setting value" (× 0.1%)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.130] Servo parameter read/write request

[RD77MS]

- To change the servo parameter after it is transferred, set the write request of the servo parameter. Set "0001H" or "0002H" after setting "[Cd.131] Parameter No." and "[Cd.132] Change data".
- To change the servo parameter stored in the internal memory of the Simple Motion module, set the read/write request of the servo parameter.
  For writing, set "0022H" after setting "[Cd.131] Parameter No." and "[Cd.132] Change data".
  For reading, set "0032H" after setting "[Cd.131] Parameter No.".
- Set "0001H" to MR-J4(W)-B and MR-J3(W)-B, and "0002H" to the VCII series/VPH series.
- The Simple Motion module resets the value to "0" automatically when the parameter read/write access completes. (The Simple Motion module resets the value to "3" at failure.)

[RD77GF]

- Set the read/write request of the servo parameter.
  For reading, set "100" after setting "[Cd.131] Parameter No. (object index of the servo parameters to be changed)".
  For writing, set "1" or "2" after setting "[Cd.131] Parameter No. (object index of the servo parameters to be changed)" and "[Cd.132] Change data".
- The Simple Motion module resets the value to "0" automatically when the parameter read/write access completes. (The Simple Motion module resets the value to "3" at failure.)

Fetch cycle: Main cycle[*1]

[*1] Cycle of processing executed at free time except for the positioning control. It changes by status of axis start.

Point

[RD77MS]

- If this control data is set to "0001H" or "0002H" in the following states, it becomes "0003H".
  - The connection with the servo amplifier is not established or there is an error in the communication.
  - "[Cd.131] Parameter No." is outside the setting range.
  - The servo amplifier does not support the writing of the specified number of words.
- If this control data is set to "0022H" or "0032H" in the following states, it becomes "0003H".
  - The servo amplifier used is other than MR-J5(W)-B.
  - "[Cd.131] Parameter No." is outside the setting range.

■Setting value

[RD77MS]

- Set with a hexadecimal.

Setting value	Details
0001H	1 word write request
0002H	2 words write request
0003H	Read/write failure
0022H	2 words write request to internal memory
0032H	2 words read request from internal memory
Other than the above	Not request

[RD77GF]

- Set with a decimal.

Setting value	Details
1	1 word write request
2	2 words write request
100	Read request
Other than the above	Not request

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0000H". [RD77MS]

Set to "0". [RD77GF]

[Cd.131] Parameter No. (Setting for servo parameters to be changed) [RD77MS]

Set the servo parameter to be changed.

Fetch cycle: At change request

■Setting value

- Set with a hexadecimal.

Buffer memory address	Details	Setting value		
		MR-J5(W)-B	MR-J4(W)-B	VCII series/VPH series
b0 to b7	Parameter No. setting	01H to 80H	01H to 40H	01H to 99H
b8 to b11	Parameter group	0H: PA group 1H: PB group 2H: PC group 3H: PD group 4H: PEgroup 5H: PF group 9H: Po group AH: PS group BH: PL group	0H: PA group 1H: PB group 2H: PC group 3H: PD group 4H: PE group 5H: PF group 9H: Po group AH: PS group BH: PL group	0H: Group 0 1H: Group 1 2H: Group 2 3H: Group 3 4H: Group 4 5H: Group 5 6H: Group 6 7H: Group 7 8H: Group 8 9H: Group 9
b12 to b15	Writing mode	Fixed to 0	Fixed to 0	0H: Write to RAM

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0000H".

[Cd.131] Parameter No. (Object index for servo parameters to be changed) [RD77GF]

Set the object index corresponding to the servo parameter to be changed.

Fetch cycle: At change request

■Setting value

- Refer to the servo amplifier instruction manual for the object index list.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0000H".

[Cd.132] Change data

Set the change value of servo parameter set in "[Cd.131] Parameter No. (Setting for servo parameters to be changed)" or "[Cd.131] Parameter No. (Object index for servo parameters to be changed)".

Fetch cycle: At change request

■Setting value

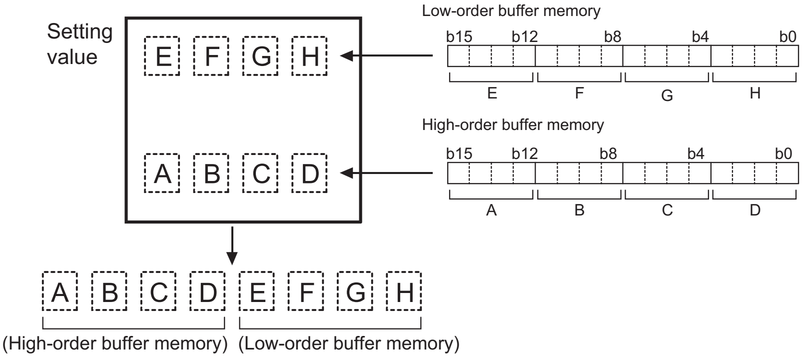
- Set with a decimal or hexadecimal.

[1 word write request]

When "0001H" or "1" is set in "[Cd.130] Servo parameter read/write request", set the change value to low-order buffer memory. The value set to high-order buffer memory is invalid.

[2 words write request]

When "0002H", "2" or "0022H" is set in "[Cd.130] Servo parameter read/write request", set the change value to high-order buffer memory and low-order buffer memory.



■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.133] Semi/Fully closed loop switching request

Set the switching of semi closed control and fully closed loop control.

Fetch cycle: Operation cycle (Fully closed loop control servo amplifier only)

■Setting value

- Set with a decimal.

Setting value	Details
0	Semi closed loop control
1	Fully closed loop control

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.136] PI-PID switching request

Set the PI-PID switching to servo amplifier.

Fetch cycle: Operation cycle

■Setting value

- Set with a decimal.

Setting value	Details
1	PID control switching request
Other than 1	Not request

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.138] Control mode switching request

- Request the control mode switching. Set "1" after setting "[Cd.139] Control mode setting".
- The Simple Motion module sets "0" at completion of control mode switching.

Fetch cycle: Operation cycle

■Setting value

- Set with a decimal.

Setting value	Details
1	Switching request
Other than 1	Not request

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.139] Control mode setting

Set the control mode to be changed in the speed-torque control.

Fetch cycle: At request (Mode switching)

■Setting value

- Set with a decimal.

Setting value	Details
0	Position control mode
10	Speed control mode
20	Torque control mode
30	Continuous operation to torque control mode [RD77MS]

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.140] Command speed at speed control mode

Set the command speed at speed control mode.

Fetch cycle: Operation cycle (At speed control mode)

■Setting range

- Set with a decimal.
- The setting value range differs according to the "[Pr.1] Unit setting".

Setting of "[Pr.1] Unit setting"	Setting value depending on program (unit)
0: mm	-2000000000 to 2000000000 (× 10^{-2} mm/min)
1: inch	-2000000000 to 2000000000 (× 10^{-3} inch/min)
2: degree*1	-2000000000 to 2000000000 (× 10^{-3} degree/min)
3: pulse	-1000000000 to 1000000000 (pulse/s)

*1 When "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid, the setting range is -2000000000 to 2000000000 (× 10^{-2} degree/min).

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.141] Acceleration time at speed control mode

Set the acceleration time at speed control mode. (Set the time for the speed to increase from "0" to "[Pr.8] Speed limit value".)

Fetch cycle: At request (Mode switching)

■Setting range

Setting range of [Cd.141]*1
0 to 65535 (ms)

*1 0 to 32767: Set as a decimal
32768 to 65535: Convert into hexadecimal and set

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "1000".

[Cd.142] Deceleration time at speed control mode

Set the deceleration time at speed control mode. (Set the time for the speed to decrease from "[Pr.8] Speed limit value" to "0".)

Fetch cycle: At request (Mode switching)

■Setting range

Setting range of [Cd.142]*1
0 to 65535 (ms)

*1 0 to 32767: Set as a decimal
32768 to 65535: Convert into hexadecimal and set

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "1000".

[Cd.143] Command torque at torque control mode

Set the command torque at torque control mode. Set a ratio against the rated torque in 0.1% unit.

-10000 to 10000 (× 0.1%)

Fetch cycle: Operation cycle (At torque control mode)

■Setting range

- Set with a decimal.

Setting range of [Cd.143]
-10000 to 10000 (× 0.1%)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.144] Torque time constant at torque control mode (Forward direction)

Set the time constant at driving during torque control mode. (Set the time for the torque to increase from "0" to "[Pr.17] Torque limit setting value".)

Fetch cycle: At request (Mode switching)

■Setting range

Setting range of [Cd.144][*1]
0 to 65535 (ms)

[*1] 0 to 32767: Set as a decimal
32768 to 65535: Convert into hexadecimal and set

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "1000".

[Cd.145] Torque time constant at torque control mode (Negative direction)

Set the time constant at regeneration during torque control mode. (Set the time for the torque to decrease from "[Pr.17] Torque limit setting value" to "0".)

Fetch cycle: At request (Mode switching)

■Setting range

-

Setting range of [Cd.145][*1]
0 to 65535 (ms)

[*1] 0 to 32767: Set as a decimal
32768 to 65535: Convert into hexadecimal and set

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "1000".

[Cd.146] Speed limit value at torque control mode

Set the speed limit value at torque control mode.

Fetch cycle: Operation cycle (At torque control mode)

■Setting range

- Set with a decimal.
- The setting value range differs according to the "[Pr.1] Unit setting".

Setting of "[Pr.1] Unit setting"	Setting value depending on program (unit)
0: mm	0 to 2000000000 (× 10^{-2} mm/min)
1: inch	0 to 2000000000 (× 10^{-3} inch/min)
2: degree[*1]	0 to 2000000000 (× 10^{-3} degree/min)
3: pulse	0 to 1000000000 (pulse/s)

*1 When "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid, the setting range is 0 to 2000000000 (× 10^{-2} degree/min).

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "1".

[Cd.147] Speed limit value at continuous operation to torque control mode [RD77MS]

Set the speed limit value at continuous operation to torque control mode.

Fetch cycle: Operation cycle (At continuous operation to torque control mode)

■Setting range

- Set with a decimal.
- The setting value range differs according to the "[Pr.1] Unit setting".

Setting of "[Pr.1] Unit setting"	Setting value depending on program (unit)
0: mm	-2000000000 to 2000000000 (× 10^{-2} mm/min)
1: inch	-2000000000 to 2000000000 (× 10^{-3} inch/min)
2: degree[*1]	-2000000000 to 2000000000 (× 10^{-3} degree/min)
3: pulse	-1000000000 to 1000000000 (pulse/s)

*1 When "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid, the setting range is -2000000000 to 2000000000 (× 10^{-2} degree/min).

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.148] Acceleration time at continuous operation to torque control mode [RD77MS]

Set the acceleration time at continuous operation to torque control mode. (Set the time for the speed to increase from "0" to "[Pr.8] Speed limit value".)

Fetch cycle: At request (Mode switching)

■Setting range

Setting range of [Cd.148][1]
0 to 65535 (ms)

[1] 0 to 32767: Set as a decimal
32768 to 65535: Convert into hexadecimal and set

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "1000".

[Cd.149] Deceleration time at continuous operation to torque control mode [RD77MS]

Set the deceleration time at continuous operation to torque control mode. (Set the time for the speed to decrease from "[Pr.8] Speed limit value" to "0".)

Fetch cycle: At request (Mode switching)

■Setting range

Setting range of [Cd.149][1]
0 to 65535 (ms)

[1] 0 to 32767: Set as a decimal
32768 to 65535: Convert into hexadecimal and set

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "1000".

[Cd.150] Target torque at continuous operation to torque control mode [RD77MS]

Set the target torque at continuous operation to torque control mode. Set a ratio against the rated torque in 0.1% unit.

Fetch cycle: Operation cycle (At continuous operation to torque control mode)

■Setting range

- Set with a decimal.

Setting range of [Cd.150]
-10000 to 10000 (× 0.1%)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.151] Torque time constant at continuous operation to torque control mode (Forward direction) [RD77MS]

Set the time constant at driving during continuous operation to torque control mode. (Set the time for the torque to increase from "0" to "[Pr.17] Torque limit setting value".)

Fetch cycle: At request (Mode switching)

■Setting range

Setting range of [Cd.151][1]
0 to 65535 (ms)

[1] 0 to 32767: Set as a decimal
32768 to 65535: Convert into hexadecimal and set

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "1000".

[Cd.152] Torque time constant at continuous operation to torque control mode (Negative direction) [RD77MS]

Set the time constant at regeneration during continuous operation to torque control mode. (Set the time for the torque to decrease from "[Pr.17] Torque limit setting value" to "0".)

Fetch cycle: At request (Mode switching)

■Setting range

Setting range of [Cd.152][1]
0 to 65535 (ms)

[1] 0 to 32767: Set as a decimal
32768 to 65535: Convert into hexadecimal and set

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "1000".

[Cd.153] Control mode auto-shift selection [RD77MS]

Set the switching condition when switching to continuous operation to torque control mode.

Fetch cycle: At request (Mode switching)

■Setting value

- Set with a decimal.

Setting value	Details	
0	No switching condition	Switching is executed at switching request to continuous operation to torque control mode.
1	Command position value pass	Switching is executed when "[Md.20] Command position value" passes the address set in "[Cd.154] Control mode auto-shift parameter" after switching request to continuous operation to torque control mode.
2	Actual position value pass	Switching is executed when "[Md.101] Actual position value" passes the address set in "[Cd.154] Control mode auto-shift parameter" after switching request to continuous operation to torque control mode.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.154] Control mode auto-shift parameter [RD77MS]

- Set the condition value when setting the control mode switching condition.
- The setting value differs depending on the value set in "[Cd.153] Control mode auto-shift selection". When "1" or "2" is set in "[Cd.153] Control mode auto-shift selection": Set the switching address.

Fetch cycle: At request (Mode switching)

■Setting range

- Set with a decimal.
- The setting value range differs according to the "[Pr.1] Unit setting".

Setting of "[Pr.1] Unit setting"	Setting value depending on program (unit)
0: mm	-2147483648 to 2147483647 ($\times 10^{-1}$ μm)
1: inch	-2147483648 to 2147483647 ($\times 10^{-5}$ inch)
2: degree	0 to 35999999 ($\times 10^{-5}$ degree)
3: pulse	-2147483648 to 2147483647 (pulse)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.180] Axis stop

- When the axis stop signal turns ON, the home position return control, positioning control, JOG operation, inching operation, manual pulse generator operation, speed-torque control, etc. will stop.
- By turning the axis stop signal ON during positioning operation, the positioning operation will be "stopped".
- Whether to decelerate stop or rapidly stop can be selected with "[Pr.39] Stop group 3 rapid stop selection".
- During interpolation control of the positioning operation, if the axis stop signal of any axis turns ON, all axes in the interpolation control will decelerate and stop.

Fetch cycle: Operation cycle

■Setting value

- Set with a decimal.

Setting value	Details
1	Axis stop requested
Other than 1	Axis stop not requested

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.181] Forward run JOG start, [Cd.182] Reverse run JOG start

- When the JOG start signal is ON, JOG operation will be carried out at the "[Cd.17] JOG speed". When the JOG start signal turns OFF, the operation will decelerate and stop.
- When inching movement amount is set, the designated movement amount is output for one operation cycle and then the operation stops.

Fetch cycle: Operation cycle

■Setting value

- Set with a decimal.

Setting value	Details
1	JOG started
Other than 1	JOG not started

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

[Cd.183] Execution prohibition flag

If the execution prohibition flag is ON when the positioning start signal turns ON, positioning control does not start until the execution prohibition flag turns OFF. Used with the "Pre-reading start function". (☞ Page 287 Pre-reading start function)

Fetch cycle: At start

■Setting value

- Set with a decimal.

Setting value	Details
1	During execution prohibition
Other than 1	Not during execution prohibition

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 475 Axis control data

■Default value

Set to "0".

Control data for positioning data, block start data

[Cd.220] Positioning data control request [RD77MS]

Set when reading/writing positioning data.

Fetch cycle: Main cycle

■Setting value

- Set with a hexadecimal.

Setting value	Details
0000H	No control request (Control end)
_ _01H[*1]	Write request
0002H	Read request
00FFH	Write/read request

[*1] By setting "01" to low-order 8 bits, the write invalid flag of high-order 8 bits can be set.

Buffer memory address		Details	Setting value
High-order	b8	Positioning identifier ([Da.1] to [Da.4])	Write invalid flag ON: Write invalid OFF: Write valid
	b9	M code/Condition data No./Number of LOOP to LEND repetitions([Da.10])	
	b10	Dwell time/JUMP destination positioning data No.([Da.9])	
	b11	Positioning option ([Da.27] to [Da.29])	
	b12	Command speed ([Da.8])	
	b13	Positioning address/movement amount ([Da.6])	
	b14	Arc address ([Da.7])	
	b15	Axis to be interpolated([Da.20] to [Da.22])	

Point

"0000H" is automatically stored when the positioning data read/write access completes. "00FFH" is automatically stored at reading/writing failure.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Control data for positioning data or block start data

■Default value

Set to "0000H".

[Cd.221] Positioning data No. setting [RD77MS]

Specify the positioning data No. where write/read is to be executed.

Fetch cycle: At request

■Setting value

- Set with a decimal.

Setting range of [Cd.221]
1 to 600

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Control data for positioning data or block start data

■Default value

Set to "0".

[Cd.222] Block start data control request [RD77MS]

Set when writing or reading block start data or condition data.

Fetch cycle: Main cycle

■Setting value

- Set with a hexadecimal.

Setting value	Details
0000H	No control request (Control end)
_ _01H*1	Write request
0002H	Read request
00FFH	Write/read error

*1 By setting "01" to low-order 8 bits, the write invalid flag of high-order 8 bits can be set.

Buffer memory address		Details		Setting value
		Block start data	Condition start data	
High-order	b8	Shape, start data No. ([Da.11] to [Da.12])	Condition target, condition operator ([Da.15] to [Da.16])	Write invalid flag ON: Write invalid OFF: Write valid
	b9	Special start instruction, parameter ([Da.13] to [Da.14])	Address ([Da.17])	
	b10	Unusable (set to 0)	Parameter 1 ([Da.18])	
	b11		Parameter 1 ([Da.19])	
	b12		Number of simultaneous starting axes ([Da.23] to [Da.26])	
	b13		Unusable (set to 0)	
	b14			
	b15			

Point

"0000H" is automatically stored when the block start data or the condition data read/write access completes.
"00FFH" is automatically stored at reading/writing failure.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Control data for positioning data or block start data

■Default value

Set to "0000H".

[Cd.223] Block No. setting [RD77MS]

Specify the block No. where write/read is to be executed.

Fetch cycle: At request

■Setting range

- Set with a decimal.

Setting range of [Cd.223]
0 to 4

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Control data for positioning data or block start data

■Default value

Set to "0".

[Cd.224] Block start data type setting [RD77MS]

Specify the block type where write/read is to be executed.

Fetch cycle: At request

■Setting value

- Set with a decimal.

Setting value	Details
0	Block start data
1	Condition data

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Control data for positioning data or block start data

■Default value

Set to "0".

[Cd.225] Block start data No. setting [RD77MS]

Specify the data No. where write/read is to be executed.

Fetch cycle: At request

■Setting value

- Set with a decimal.
- The setting value range differs according to the "[Cd.224] Block start data type setting".

Setting value of "[Cd.224] Block start data type setting"	Setting range of [Cd.225]
0: Block start data	1 to 50
1: Condition data	1 to 10

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Control data for positioning data or block start data

■Setting value

Set to "0".

[Cd.226] Positioning data/block start data setting value [RD77MS]

Set the setting value of positioning data/block start data.

Fetch cycle: At request

■Setting value

- Set with a hexadecimal.
- The setting value range differs according to the "[Cd.220] Positioning data control request", "[Cd.224] Block start data type setting" or "[Cd.225] Block start data No. setting".

When "[Cd.220] Positioning data control request" is "0001H: Write request" or "0002H: Read request"

Offset	Positioning data
+0	Positioning identifier ([Da.1] to [Da.4])
+1	M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches ([Da.10])
+2	Dwell time/JUMP destination positioning data No. ([Da.9])
+3	Positioning option ([Da.27] to [Da.29])
+4, 5	Command speed ([Da.8])
+6, 7	Positioning address/movement amount ([Da.6])
+8, 9	Arc address ([Da.7])
+10, 11	Axis to be interpolated ([Da.20] to [Da.22])

When "[Cd.220] Positioning data control request" is "0001H: Write request" or "0002H: Read request" and "[Cd.224] Block start data type setting" is "0: Block start data"

Offset	Block start data
+0	Shape, start No. ([Da.11], [Da.12])
+1	Special start instruction, parameter ([Da.13], [Da.14])
+2 to +11	Not used

When "[Cd.220] Positioning data control request" is "0001H: Write request" or "0002H: Read request" and "[Cd.224] Block start data type setting" is "0: Block start data"

Offset	Condition data
+0	Condition target, condition operator ([Da.15], [Da.16])
+2	Address ([Da.17])
+4	Parameter 1 ([Da.18])
+6	Parameter 2 ([Da.19])
+8	Number of simultaneous starting axes ([Da.23] to [Da.26])
+9 to 11	Not used

Point

For the setting for each data, refer to the following.

- For the setting item for positioning data [Da.1] to [Da.10], [Da.20] to [Da.22], [Da.27] to [Da.29]
  ☞ Page 459 Setting items for positioning data
- For the setting item for block start data [Da.11] to [Da.14]
  ☞ Page 462 Setting items for block start data
- For the setting item for condition data [Da.15] to [Da.19], [Da.23] to [Da.26]
  ☞ Page 462 Setting items for condition data

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 478 Control data for positioning data or block start data

■Default value

Set to "0000H".

12.9 Memory Configuration and Data Process

The memory configuration and data transmission of Simple Motion module are explained in this section.
The Simple Motion module is configured of four memories. By understanding the configuration and roles of two memories, the internal data transmission process of Simple Motion module, such as "when the power is turned ON" or "when the PLC READY signal [Y0] changes from OFF to ON", can be easily understood. This also allows the transmission process to be carried out correctly when saving or changing the data.

Configuration and roles

The Simple Motion module is configured of the following four memories.
○: Setting and storage area provided, —: Setting and storage area not provided
Possible: Data is held even when power is turned OFF, Not possible: Data is lost when power is turned OFF.

Memory configuration	Role	Area configuration						
		Parameter area[*1]	Monitor data area	Control data area	Positioning data area[*1]		Block start data area[*1]	
					(No.1 to 100)	(No.101 to 600)	(No.7000 to 7001)	(No.7002 to 7004)
Buffer memory	Area that can be directly accessed with a program with a CPU module	○	○	○	○	— [RD77MS] ○ [RD77GF]	○	— [RD77MS] ○ [RD77GF]
Internal memory	Area that can be set only with the engineering tool	—	—	—	—	○ [RD77MS] — [RD77GF]	—	○ [RD77MS] — [RD77GF]
	Area that can be set only using buffer memory	—	—	—	—	—	—	—
Flash ROM	Area for backing up data required for positioning	○	—	—	○	○	○	○
Internal memory (nonvolatile)	Area for backing up servo parameter or cam data	—	—	—	—	—	—	—

Memory configuration	Role	Area configuration				Backup
		Servo parameter area[*1]		Synchronous control area[*1]	Cam area[*1]	
		When MR-J3(W)-B/ MR-J4(W)-B is used	When MR-J5(W)-B is used [RD77MS]			
Buffer memory	Area that can be directly accessed with a program with a CPU module	○ [RD77MS] — [RD77GF]	—	○	—	Not possible
Internal memory	Area that can be set only with the engineering tool	—	○[*2]	—	—	Not possible
	Area that can be set only using buffer memory	—	—	—	○	Not possible
Flash ROM	Area for backing up data required for positioning	—	—	○[*3]	—	Possible
Internal memory (nonvolatile)	Area for backing up servo parameter or cam data	○ [RD77MS] — [RD77GF]	○	—	○	Possible

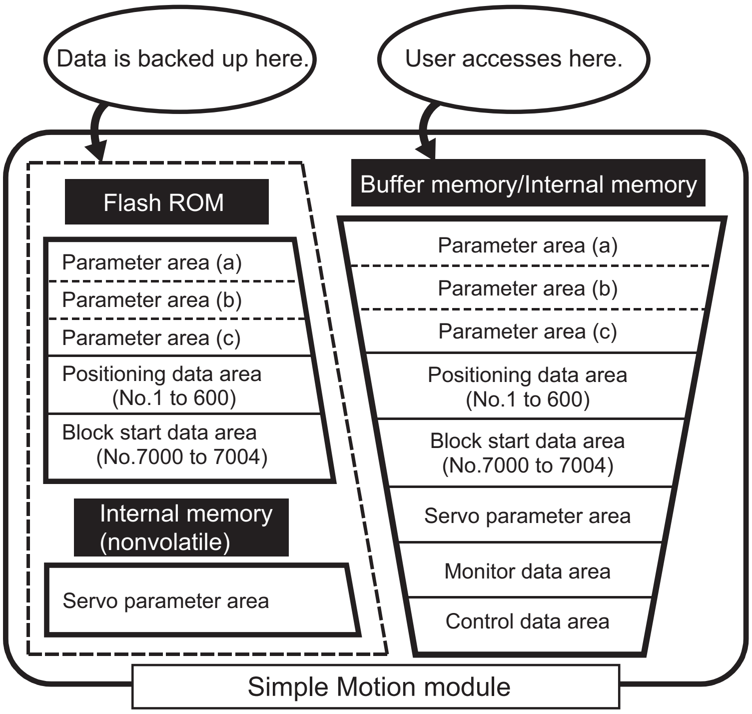
*1 The areas are included in the Simple Motion module setting (module extended parameter).
*2 Can be set by using the axis control data ([Cd.130] to [Cd.132]).
*3 Parameter only

Details of areas

Area name	Description
Parameter area	Area where parameters, such as positioning parameters and home position return parameters, required for positioning control are set and stored.
Monitor data area	Area where the operation status of positioning system is stored.
Control data area	Area where data for operating and controlling positioning system is set and stored.
Positioning data area (No.1 to 600)	Area where positioning data No.1 to 600 is set and stored.
Block start data area (No.7000 to 7004)	Area where information required only when carrying out block No.7000 to 7004 high-level positioning is set and stored.
Servo parameter area	Area where parameters, such as servo parameters, required for positioning control on servo amplifier are set and stored.
Synchronous control area[*1]	Area where parameters and control data required for synchronous control are set and stored. Also, the operation status of synchronous control is stored.
Cam area[*1]	Area where cam data, etc. are set and stored. There are cam storage area and cam open area.

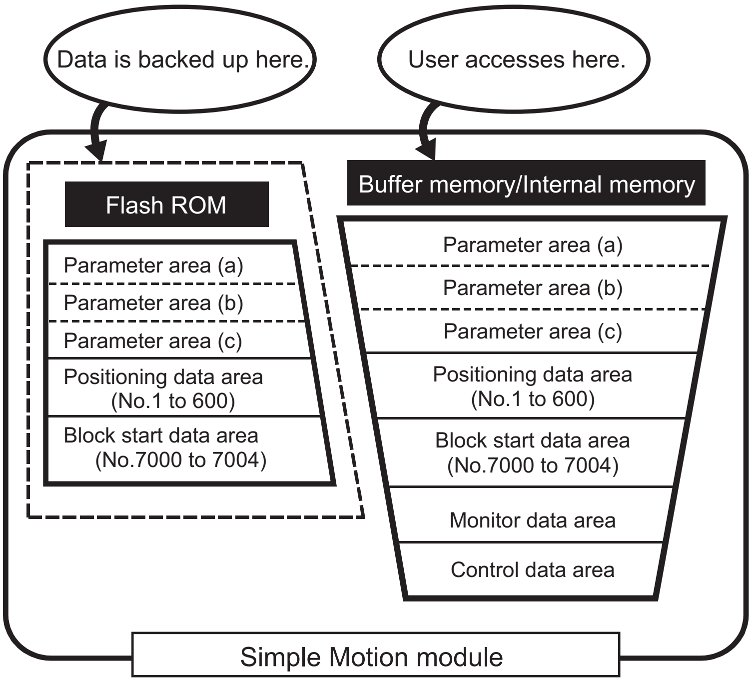
*1 Refer to the following manual for details of synchronous control area and cam area.
📖MELSEC iQ-R Simple Motion Module User's Manual (Advanced Synchronous Control)

■RD77MS area



Area name	Description	
Parameter area (a)	Parameters validated when PLC READY signal [Y0] changes from OFF to ON	[Pr.1] to [Pr.7], [Pr.11] to [Pr.24], [Pr.43] to [Pr.57], [Pr.81] to [Pr.83], [Pr.89] to [Pr.95], [Pr.100], [Pr.116] to [Pr.119], [Pr.122], [Pr.123], [Pr.127], [Pr.128], [Pr.150], [Pr.151], [Pr.153], [Pr.155], [Pr.801], [Pr.805] to [Pr.807]
Parameter area (b)	Parameters validated when the TO command is executed from the CPU module (validated when the next control is started after the TO command is executed, at request, and at conditions established.)	[Pr.8] to [Pr.10], [Pr.25] to [Pr.41], [Pr.84]
Parameter area (c)	Parameters validated with power supply ON/CPU module reset	[Pr.91] to [Pr.94], [Pr.96], [Pr.97], [Pr.100], [Pr.116] to [Pr.119], [Pr.128], [Pr.150] to [Pr.153], [Pr.155], [Pr.800] to [Pr.807]

■RD77GF area



Area name	Description	
Parameter area (a)	Parameters validated when PLC READY signal [Y0] changes from OFF to ON	[Pr.1] to [Pr.7], [Pr.11] to [Pr.22], [Pr.43] to [Pr.46], [Pr.51], [Pr.52], [Pr.55], [Pr.81] to [Pr.83], [Pr.90], [Pr.100], [Pr.116] to [Pr.119], [Pr.122], [Pr.123], [Pr.700] to [Pr.704], [Pr.801], [Pr.805] to [Pr.807], [Pr.900] to [Pr.903], [Pr.910] to [Pr.913], [Pr.920] to [Pr.923], [Pr.930] to [Pr.933], [Pr.940] to [Pr.943], [Pr.950] to [Pr.953], [Pr.960] to [Pr.963], [Pr.970] to [Pr.973], [Pr.980] to [Pr.983], [Pr.990] to [Pr.993], [Pr.1000] to [Pr.1003], [Pr.1020] to [Pr.1023], [Pr.1030] to [Pr.1033], [Pr.1040] to [Pr.1043], [Pr.1050] to [Pr.1053], [Pr.1060] to [Pr.1063]
Parameter area (b)	Parameters validated when the TO command is executed from the CPU module (validated when the next control is started after the TO command is executed, at request, and at conditions established.)	[Pr.8] to [Pr.10], [Pr.25] to [Pr.41], [Pr.84]
Parameter area (c)	Parameters validated with power supply ON/ CPU module reset	[Pr.96], [Pr.100], [Pr.101], [Pr.116] to [Pr.119], [Pr.152], [Pr.500] to [Pr.509], [Pr.801] to [Pr.811]

Buffer memory area configuration

The buffer memory of Simple Motion module is configured of the following types of areas.

n: Axis No. - 1 (n: Axis No. - 17 for axis 17 to axis 32)

k: Mark detection setting No. - 1

j: Synchronous encoder axis No. - 1 (j: Axis No. - 17 for axis 17 to axis 32)

Buffer memory area configuration		**Buffer memory address**[*1]		**Writing possibility**
		Axis 1 to axis 16	**Axis 17 to axis 32**	
Parameter area	Servo network composition parameter	58020+32n to 58022+32n	1058020+32n to 1058022+32n	Possible
	Common parameter	33, 35, 67, 105, 106, 58000 to 58008, 58010		
	Basic parameter	0+150n to 15+150n	1000000+150n to 1000015+150n	
	Detailed parameter	17+150n to 69+150n 116+150n to 123+150n 125+150n to 127+150n	1000017+150n to 1000069+150n 1000116+150n to 1000123+150n 1000126+150n to 1000127+150n	
	Home position return basic parameter	70+150n to 78+150n	1000070+150n to 1000078+150n	
	Home position return detailed parameter	80+150n to 91+150n	1000080+150n to 1000091+150n	
	Extended parameter [RD77MS]	100+150n to 103+150n, 141+150n	—	
	Mark detection setting parameter	54000+20k to 54019+20k		
	Link device external signal assignment parameter [RD77GF]	440000+320n to 440319+320n 450240+100n to 450339+100n	1440000+320n to 1440319+320n 1450240+100n to 1450339+100n	
	Servo object specification parameter [RD77GF]	460000+256n to 460255+256n	1460000+256n to 1460255+256n	
Monitor data area	System monitor data	4000 to 4299, 31300 to 31549 60900 to 60949, 87000 to 87649	1060900 to 1060949	Not possible
	Axis monitor data	2400+100n to 2499+100n 59300+100n to 59399+100n	1002400+100n to 1002499+100n 1059300+100n to 1059399+100n	
	Servo network composition monitor	58660+32n to 59299+32n	1058660+32n to 1059299+32n	
	Mark detection monitor data	54960+80k to 55039+80k		
	Monitor for slave device operation [RD77GF]	468192+2048n to 468255+2048n	1468192+2048n to 1468255+2048n	
Control data area	System control data	5900 to 5999	1005900 to 1005999	Possible
	Axis control data	4300+100n to 4399+100n 30100+10n to 30109+10n	1004300+100n to 1004399+100n 1030100+10n to 1030109+10n	
	Control data for positioning data and block start data	34416+18n to 34703+18n	—	
	Mark detection control data	54640+10k to 54649+10k		
	Control data for slave device operation [RD77GF]	533728+2048n to 535066+2048n	1533728+2048n to 1535066+2048n	

Buffer memory area configuration			Buffer memory address[1]		Writing possibility
			Axis 1 to axis 16	Axis 17 to axis 32	
Positioning data area (No.1 to 100)	Positioning data		6000+1000n to 6999+1000n 71000+1000n, 71001+1000n	1006000+1000n to 1006999+1000n 1071000+1000n, 1071001+1000n	Possible
Positioning data area (No.101 to 600)			[RD77MS] Set with the engineering tool. [RD77GF] 200000+5000n to 204999+5000n 280000+5000n to 284999+5000n	1200000+5000n to 1204999+5000n 1280000+5000n to 1284999+5000n	
Block start data area (No.7000)	Block start data		22000+400n to 22049+400n	1022000+400n to 1022049+400n	
			22050+400n to 22099+400n	1022050+400n to 1022099+400n	
	Condition data		22100+400n to 22199+400n	1022100+400n to 1022199+400n	
Block start data area (No.7001)	Block start data		22200+400n to 22249+400n	1022200+400n to 1022249+400n	
			22250+400n to 22299+400n	1022250+400n to 1022299+400n	
	Condition data		22300+400n to 22399+400n	1022300+400n to 1022399+400n	
Block start data area (No.7002)	Block start data		[RD77MS] Set with the engineering tool. [RD77GF] 360000+600n to 360099+600n	1360000+600n to 1360099+600n	
	Condition data		[RD77GF] 360100+600n to 360199+600n	1360100+600n to 1360199+600n	
Block start data area (No.7003)	Block start data		[RD77GF] 360200+600n to 360599+600n	1360200+600n to 1360599+600n	
	Condition data				
Block start data area (No.7004)	Block start data				
	Condition data				
Servo parameter area[2] [RD77MS]	PA group	PA01 to PA18	28401+100n to 28418+100n	—	Possible
		PA19	64464+70n		
		PA20 to PA32	64400+70n to 64412+70n		
	PB group		28419+100n to 28463+100n		
			64413+70n to 64431+70n		
	PC group		28464+100n to 28495+100n		
			64432+70n to 64463+70n		
	PD group		65520+340n to 65567+340n		
	PE group		65568+340n to 65631+340n		
	PS group		65712+340n to 65743+340n		
	PF group		65632+340n to 65679+340n		
	Po group		65680+340n to 65711+340n		
	PL group		65744+340n to 65791+340n		
Synchronous control area[3]	Servo input axis parameter		32800+10n to 32805+10n	1032800+10n to 1032805+10n	Possible
	Servo input axis monitor data		33120+10n to 33127+10n	1033120+10n to 1033127+10n	Not possible
	Synchronous encoder axis parameter		34720+20j to 34735+20j	1034720+20j to 1034735+20j	Possible
	Synchronous encoder axis control data		35040+10j to 35047+10j	1035040+10j to 1035047+10j	Possible
	Synchronous encoder axis monitor data		35200+20j to 35212+20j	1035200+20j to 1035212+20j	Not possible
	Synchronous encoder axis parameter via link device [RD77GF]		35520+20j to 35539+20j	1035520+20j to 1035539+20j	Possible
	Synchronous control system control data		36320, 36322	1036320, 1036322	Possible
	Synchronous parameter		36400+200n to 36513+200n	1036400+200n to 1036513+200n	Possible
	Synchronous control monitor data		42800+40n to 42835+40n	1042800+40n to 1042835+40n	Not possible
	Control data for synchronous control		44080+20n to 44090+20n	1044080+20n to 1044090+20n	Possible
	Cam operation control data		[RD77MS] 45000 to 53791 [RD77GF] 53780 to 53791, 600000 to 866295		Possible
	Cam operation monitor data		53800 to 53801		Not possible

Buffer memory area configuration		Buffer memory address[1]		Writing possibility
		Axis 1 to axis 16	Axis 17 to axis 32	
CC-Link IE Field Network area[4] [RD77GF]	Link device (RX)	100000 to 101023		Not possible
	Link device (RY)	101024 to 102047		Possible
	Link device (RWw)	102048 to 110239		Possible
	Link device (RWr)	110240 to 118431		Not possible
	Link device (SB)	118432 to 118463		Possible/Not possible
	Link device (SW)	118464 to 118975		Possible/Not possible
	System area	118976 to 119455, 119698 to 119711, 119954 to 119967, 120210 to 120223, 120466 to 120511, 120516 to 120519, 120537 to 120543, 120548 to 120551, 120569 to 120575, 124416 to 124479, 124496 to 129967, 130345 to 130351, 130473 to 165535		Not possible
	Slave station offset/size information	119456 to 119697, 119712 to 119953, 119968 to 120209, 120224 to 120465		Not possible
	Station information	120512 to 120515, 120520 to 120536, 120544 to 120547, 120552 to 120568, 120576 to 124415		Not possible

*1 Use of skipped address Nos. is prohibited. If used, the system may not operate correctly.

*2 Since the servo parameters of MR-J5(W)-B are not in the buffer memory, use GX Works3 or axis control data to set them. For details, refer to the following.
☞ Page 796 Connection with MR-J5(W)-B

*3 For details, refer to "List of Buffer Memory Addresses (for Synchronous Control)" in the following manual.
📖MELSEC iQ-R Simple Motion Module User's Manual (Advanced Synchronous Control)

*4 For details, refer to "Buffer Memory" in the following manual.
📖MELSEC iQ-R Simple Motion Module User's Manual (Network)

Point

The servo parameters can be read from or written to the servo amplifier using MR Configurator2.

[RD77MS]

When the parameter of the servo amplifier side is changed by the following method, the Simple Motion module reads parameters automatically, and the data is transmitted to the servo parameter area in the buffer memory and internal memory (nonvolatile).

- When changing the servo parameters by the auto tuning.
- When the servo parameter is changing after the MR Configurator2 is connected directly with the servo amplifier.

Data transmission timing

The parameters of the Simple Motion module are classified as the module parameter or Simple Motion module setting (module extended parameter [RD77GF]). Each parameter is reflected in the buffer memory of the Simple Motion module at the following reflection timing.

Parameter reflection timing	**Operation**	**Parameter setting value reflected in the buffer memory**	
		Module parameter[*1]	**Simple Motion module setting (module extended parameter [RD77GF])**[*2]
Power ON	Power ON	Parameter set with the engineering tool[*3]	[RD77MS] Parameter stored in the Simple Motion module [RD77GF] • When the module extended parameter storage location setting is set to "Simple Motion Module": Parameter stored in the Simple Motion module • When the module extended parameter storage location setting is set to "CPU module": Parameter set with the engineering tool
Module initialization	[Cd.2] Module initialization request	Initial value (factory-set value)	

[*1] Some module parameters are reflected in the Simple Motion module by turning the PLC READY signal [Y0] from OFF to ON.

[*2] When no parameter to be reflected exists at the reflection timing, refer to the following.
☞ Page 665 (1) Transmitting data when power is turned ON or CPU module is reset

[*3] When parameters are not set with the engineering tool, the initial values are reflected.

Precautions for module extended parameters [RD77GF]

- To write the file of module extended parameters, specify the same writing destination as that of the module extended parameter storage location setting. When a different writing destination is specified, the written module extended parameter is not validated. The warning "Module extended parameter storage location warning" (warning code: 0B0FH) occurs in the following conditions.

- When the module extended parameter storage location setting is set to "Simple Motion Module" and a change in a module extended parameter on the CPU module side is detected (A warning is output when the power supply is turned ON.)
- When the module extended parameter storage location setting is set to "CPU module" and data is written to the flash ROM on the Simple Motion module side (A warning is output when the parameter is initialized or writing to the flash ROM is requested. The flash ROM on the Simple Motion module side is overwritten with the module extended parameters on the CPU module side when the power supply is turned ON.)

- If the file of module extended parameters does not exist in the storage location set in the module extended parameter storage location setting or the file size exceeds 4 MB, the error "Module extended parameter acquisition error (error code: 1937H)" occurs when the power supply is turned ON.
- To use the module extended parameters stored in the SD memory card of the CPU module, set "CPU module" in the module extended parameter storage location setting. In addition, set "Memory Card Parameter" of the CPU module so that the module extended parameters can be used.

Data transmission process

The data is transmitted between the memories of Simple Motion module with steps (1) to (10) shown below.
The data transmission patterns correspond to the numbers (1) to (10) in the following referential drawings.

The data transmission pattern		**Referential drawing**	
		RD77MS	**RD77GF**
(1)	Transmitting data when power is turned ON or CPU module is reset	Page 672 Pattern (1) to (5)	Page 676 Pattern (1) to (5)
(2)	Transmitting data with TO command from CPU module		
(3)	Validate parameters when PLC READY signal [Y0] changes from OFF to ON		
(4)	Accessing with FROM command from CPU module		
(5)	Reading the servo parameter from the servo amplifier [RD77MS]		—
(6)	Writing the flash ROM by a CPU module request	Page 673 Pattern (6) and (7)	Page 677 Pattern (6) and (7)
(7)	Writing the flash ROM by a request from the engineering tool		
(8)	Reading data from buffer memory/internal memory to the engineering tool	Page 674 Pattern (8) and (9)	Page 678 Pattern (8) and (9)
(9)	Writing data from the engineering tool to buffer memory/internal memory		
(10)	Transmitting servo parameter [RD77MS]	Page 675 Pattern (10)	—

(1) Transmitting data when power is turned ON or CPU module is reset

■RD77MS

When the power is turned ON or the CPU module is reset, the "parameter area (c)*1", "positioning data", "block start data" and "servo parameter" stored (backed up) in the flash ROM/internal memory (nonvolatile) are transmitted to the buffer memory and internal memory.

*1 For details, refer to the following.
☞ Page 659 Details of areas

■RD77GF

When the power is turned ON or the CPU module is reset, the following parameters are transmitted to the buffer memory and internal memory.

Classification of parameters	**Module extended parameter storage location setting**	**Parameter transmitted at power supply ON/CPU module reset**
Module parameter	—	Parameter stored in the CPU module*1
Module extended parameter*1*2*3	CPU module	Module extended parameter stored in the CPU module or SD memory card
	Simple Motion module	Module extended parameter stored in the Simple Motion module

*1 When the module parameter of the Simple Motion module does not exist in the CPU module, the setting of module extended parameter storage location is regarded as the Simple Motion module.
*2 When the module extended parameter cannot be acquired from the set storage location or is corrupted, the error "Module extended parameter acquisition error" (error code: 1937H, 1938H, 1939H) occurs and the initial value is set in the buffer memory.
*3 Indicates Parameter area (c).
For details, refer to the following.
☞ Page 659 Details of areas

Precautions

- To use the module extended parameter set with programs after power supply OFF, back up the parameter in the Simple Motion module by using the flash ROM write function.
- To use the module extended parameter backed up in the Simple Motion module, set "Simple Motion Module" in the module extended parameter storage location setting.

(2) Transmitting data with TO command from CPU module

The parameters or data is written from the CPU module to the buffer memory using the TO command[1].

At this time, when the "parameter area (b)[2]", "positioning data", "block start data", and "control data" are written into the buffer memory with the TO command, it is simultaneously valid.

[1] [RD77MS]
"Positioning data (No.101 to 600)" and "Block start data (No.7002 to 7004)" can be set with only the engineering tool.
When using MR-J5(W)-B, "servo parameter" can be set only from GX Works3 or the axis control data ([Cd.130] to [Cd.132]).

[2] For details, refer to the following.
☞ Page 659 Details of areas

Point

[RD77MS]

When a value other than "0" has been set to the servo network composition parameter "[Pr.100] Connected device" inside the internal memory (nonvolatile), the power is turned ON or CPU module is reset to transmit the servo parameter inside the internal memory (nonvolatile) to the servo amplifier (servo amplifier LED indicates "b_"). After that, the TO command writes the servo parameter from the CPU module to the buffer memory so that the servo parameter in the buffer memory is not transmitted to the servo amplifier even if the PLC READY signal [Y0] is turned OFF then ON. Change the servo parameter with the above method, after setting the servo network composition parameter "[Pr.100] Connected device" inside the internal memory (nonvolatile), to "0".

(3) Validate parameters when PLC READY signal [Y0] changes from OFF to ON

When the PLC READY signal [Y0] changes from OFF to ON, the data stored in the buffer memory's "parameter area (a)[1]" is validated.

[1] For details, refer to the following.
☞ Page 659 Details of areas

Point

The setting values of the parameters that correspond to parameter area (b) are valid when written into the buffer memory with the TO command. However, the setting values of the parameters that correspond to parameter area (a) are not validated until the PLC READY signal [Y0] changes from OFF to ON.

(4) Accessing with FROM command from CPU module

The data is read from the buffer memory to the CPU module using the FROM command[1].

[1] [RD77MS]
"Positioning data (No.101 to 600)" and "Block start data (No.7002 to 7004)" can be read with only the engineering tool.
When using MR-J5(W)-B, "servo parameter" can be set only from GX Works3 or the axis control data ([Cd.130] to [Cd.132]).

(5) Reading the servo parameter from the servo amplifier [RD77MS]

When the parameter of the servo amplifier is changed, the servo parameter is read automatically from the servo amplifier to the buffer memory/internal memory and internal memory (nonvolatile).

Point

The servo parameters can be individually changed from Simple Motion module with the axis control data.

(6) Writing the flash ROM by a CPU module request

The following transmission process is carried out by setting "1" in "[Cd.1] Flash ROM write request".

- The "parameters", "positioning data (No.1 to 600)", "block start data (No.7000 to 7004)" and "servo parameter[1]" in the buffer memory/internal memory area are transmitted to the flash ROM/internal memory (nonvolatile).

[1] The servo parameters are transmitted only when the RD77MS is used.

(7) Writing the flash ROM by a request from the engineering tool

The following transmission processes are carried out with the [flash ROM write request] from the engineering tool. This transmission process is the same as (6) above.

- The "parameters", "positioning data (No.1 to 600)", "block start data (No.7000 to 7004)" and "servo parameter[1]" in the buffer memory/internal memory area are transmitted to the flash ROM/internal memory (nonvolatile).

[1] The servo parameters are transmitted only when the RD77MS is used.

Point

- Do not turn the power OFF or reset the CPU module while writing to the flash ROM. If the power is turned OFF or the CPU module is reset to forcibly end the process, the data backed up in the flash ROM/internal memory (nonvolatile) will be lost.
- Do not write the data to the buffer memory/internal memory before writing to the flash ROM is completed.
- The number of writes to the flash ROM with the program is 25 max. while the power is turned ON. Writing to the flash ROM beyond 25 times will cause the error "Flash ROM write number error" (error code: 1080H). Refer to ☞ Page 722 List of Error Codes for details.
- Monitoring is the number of writes to the flash ROM after power supply ON by the "[Md.19] Number of write accesses to flash ROM".

(8) Reading data from buffer memory/internal memory to the engineering tool

The following transmission processes are carried out with the [Read from module] from the engineering tool.

- The "parameters", "positioning data (No.1 to 600)", "block start data (No.7000 to 7004)" and "servo parameter[1]" in the buffer memory/internal memory area are transmitted to the engineering tool via the CPU module.

The following transmission processes are carried out with the [Monitor] from the engineering tool.

- The "monitor data" in the buffer memory area is transmitted to the engineering tool via the CPU module.

[1] The servo parameters are transmitted only when the RD77MS is used.

(9) Writing data from the engineering tool to buffer memory/internal memory

The following transmission processes are carried out with the [Write to module] from the engineering tool.

- The "parameters", "positioning data (No.1 to 600)", "block start data (No.7000 to 7004)" and "servo parameter[1]" in the engineering tool are transmitted to the buffer memory/internal memory via the CPU module.

At this time, when [Flash ROM automatic write] is set with the engineering tool, the transmission processes indicated with "(7) Writing the flash ROM by a request from the engineering tool" are carried out.

[1] The servo parameters are transmitted only when the RD77MS is used.

(10) Transmitting servo parameter [RD77MS]

The servo parameter in the buffer memory/internal memory area is transmitted to the servo amplifier by the following timing.

- The servo parameter is transmitted to the servo amplifier when communications with servo amplifier start. The "servo parameter" in the buffer memory area is transmitted to the servo amplifier.
- When bit0 of "[Pr.155] Q series compatible function setting" is ON, "servo parameter" of the buffer memory area and the internal memory area is transmitted to the internal memory (nonvolatile) and the servo amplifier when the PLC READY signal [Y0] turns from OFF to ON. The READY signal [X0] turns ON after the servo parameters transmission is completed. The time between the PLC READY signal [Y0] turning ON and the READY signal [X0] turning ON is longer than the time when the transmission function is disabled.

- "Auto tuning mode (PA08)"
- "Auto tuning response (PA09)"
- "Feed forward gain (PB04)"
- "Load to motor inertia ratio/load to motor mass ratio (PB06)"
- "Model loop gain (PB07)"
- "Position loop gain (PB08)"
- "Speed loop gain (PB09)"
- "Speed integral compensation (PB10)"
- "Speed differential compensation (PB11)"

Point

- When the PLC READY signal [Y0] is turned ON, the warning "SSCNET communication error" (warning code: 093EH) occurs, "Rotation direction selection/travel direction selection (PA14)" is changed by the program or the engineering tool after the servo parameter is transmitted to servo amplifier (LED of the servo amplifier is indicated "b_", "C_", or "d_"). When "Rotation direction selection/travel direction selection (PA14)" is changed, transmit the servo parameter to servo amplifier.
- When the communication with the servo amplifier is disconnected while the parameters are transmitted by the servo parameter transmission function at turning the PLC READY signal [Y0] to ON from OFF, the parameter transmission process of the target axis is interrupted. When the axis that its data transmission process is interrupted exists while the parameters are transmitted by the servo parameter transmission function at turning the PLC READY signal [Y0] to ON from OFF, the READY signal [X0] does not turn ON. In that case, establish the communication with the servo amplifier again and turn the PLC READY signal [Y0] to ON from OFF.

■About the communication start with servo amplifier

Communication with servo amplifier is valid when following conditions are realized together.

- The power of Simple Motion module and servo amplifier is turned ON.
- The servo network composition parameter "[Pr.100] Connected device" in the buffer memory of the Simple Motion module is set with a value other than "0".

When the power is turned ON or the CPU module is reset, the data stored in the flash ROM/internal memory (nonvolatile) is transmitted to the buffer memory/internal memory.

Therefore, when the servo network composition parameter "[Pr.100] Connected device" stored in the internal memory (nonvolatile) is set with a value other than "0" and the module is started up in order of the servo amplifier and the Simple Motion module (even before the RUN LED of the CPU module is turned ON), the communication with the servo amplifier is started and the servo parameter stored in the internal memory (nonvolatile) is transmitted to the servo amplifier.

■How to transfer the servo parameter setup from the program/engineering tool to the servo amplifier

The servo series of servo network composition parameter "[Pr.100] Connected device" inside the internal memory (nonvolatile) set to "0". (Initial value: "0")

The setting value of the parameters that correspond to the servo network composition parameter "[Pr.100] Connected device" inside the internal memory (nonvolatile) becomes valid when the power is turned ON or the CPU module is reset, after the communication with servo amplifier is not started.

However, the PLC READY signal [Y0] is changed from OFF to ON after setting the servo network composition parameters ("[Pr.100] Connected device": except for 0) with the program/engineering tool the communication with servo amplifier starts.

■How to transfer the servo parameter which wrote it in the internal memory (nonvolatile) to servo amplifier

Flash ROM writing carried out after the servo parameter is set up in the buffer memory/internal memory.

After that, when the power is turned ON or the CPU module is reset, the servo parameters stored in the internal memory (nonvolatile) is transmitted to the buffer memory/internal memory.

When the servo parameter is written in the internal memory (nonvolatile), it is unnecessary to use a setup from the program/engineering tool.

■Servo parameter of the buffer memory/internal memory

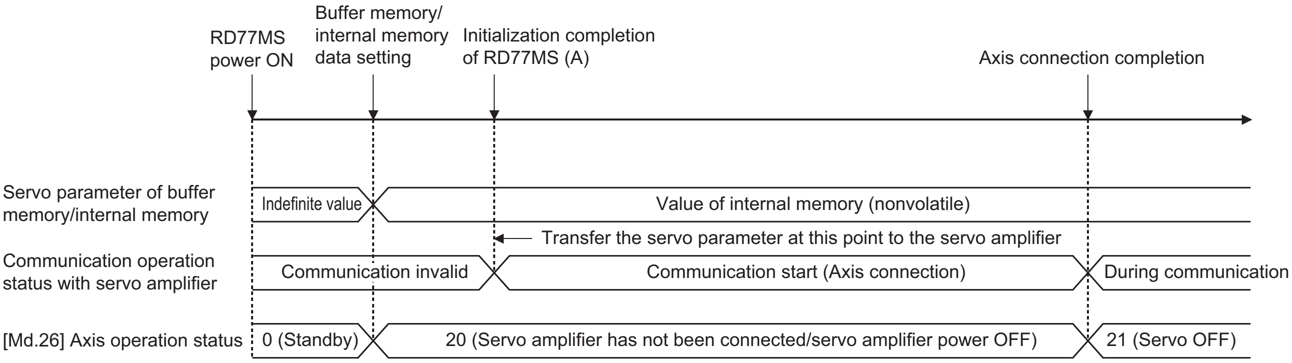
The following shows details about the operation timing and details at transmitting the servo parameter of the buffer memory/internal memory.

Point

- When the servo parameter is written in the internal memory (nonvolatile), it is unnecessary to use a setup from the program/engineering tool.
- Axis connection time varies depending on the number of axes and the servo amplifier's power supply ON timing. And, time when "20: Servo amplifier has not been connected/servo amplifier power OFF" is set in "[Md.26] Axis operation status" is also varies.

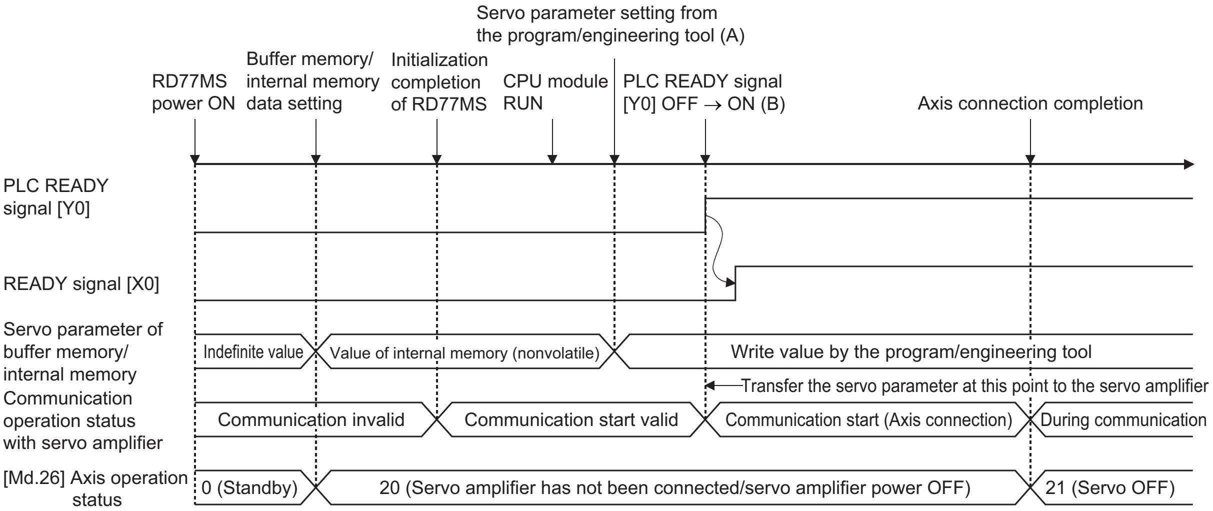
- When the servo amplifier's power supply is turned ON before the system's power supply ON and the servo network composition parameter "[Pr.100] Connected device" ≠ "0" is stored in the internal memory (nonvolatile)

Communication start timing with the servo amplifier	Initialization completion ((A) in the following figure)
Servo parameter to be transferred	The data stored (backed up) in the internal memory (nonvolatile).



- When the servo amplifier's power supply is turned ON before the system's power supply ON and the servo network composition parameter "[Pr.100] Connected device" = "0" is stored in the internal memory (nonvolatile)

Communication start timing with the servo amplifier	The PLC READY signal [Y0] is turned ON from OFF. ((B) in the following figure)
Servo parameter to be transferred	The data written from the program/engineering tool before the PLC READY signal [Y0] ON. ((A) in the following figure)[*1]

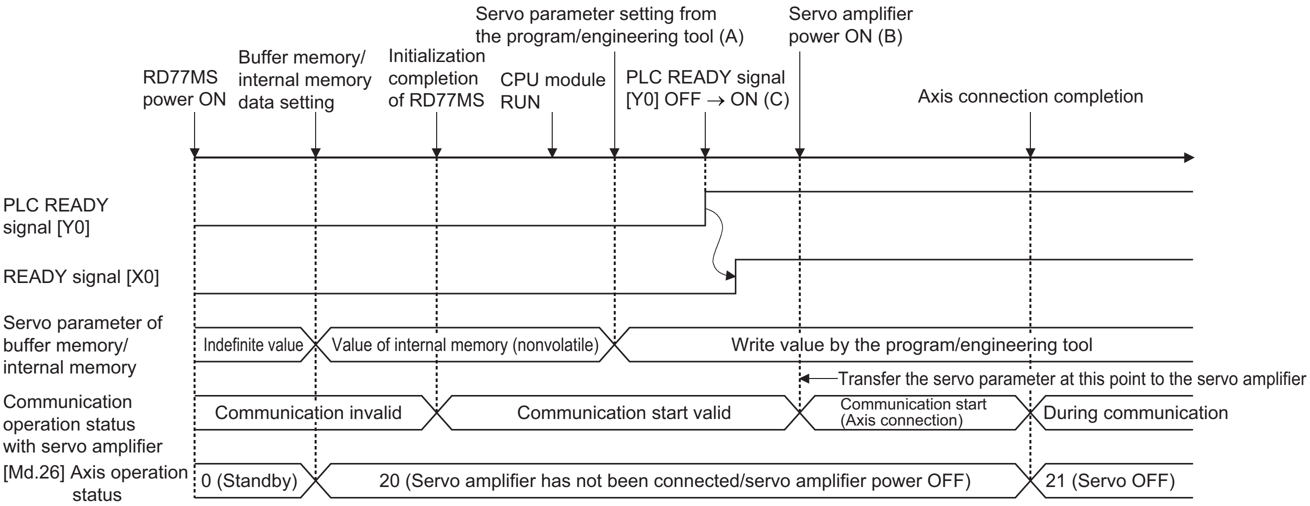


*1 There are restrictions according to the software versions of the Simple Motion module when reading/writing the servo parameters stored in the internal memory by using the axis control data ([Cd.130] to [Cd.132]) in the state of the servo network configuration parameter "[Pr.100] Connected device" = "0" stored in the internal memory.

Software versions of the Simple Motion module	Details
"Ver.14" or earlier	"[Cd.130] Servo parameter read/write request" becomes "0003H: Read/write failure", and no servo parameters can be read/written.
"Ver.15" or later	"[Cd.130] Servo parameter read/write request" becomes "0000H: Not request (read/write completion)", and the read/write completes normally.

- When the servo amplifier's power supply is turned ON after the PLC READY signal [Y0] is turned OFF to ON ((C) in the following figure)

Communication start timing with the servo amplifier	When the servo amplifier had started ((B) in the following figure)
Servo parameter to be transferred	The data written from the program/engineering tool before the PLC READY signal [Y0] ON. ((A) in the following figure)



■How to change individually the servo parameter after transfer of servo parameter

The servo parameters can be individually changed from Simple Motion module with the following axis control data.

n: Axis No. - 1

Setting item		Setting details	Buffer memory address
[Cd.130]	Servo parameter read/ write request	Set the write request of servo parameter. Set "0001H" or "0002H" after setting "[Cd.131] Parameter No. (Setting for servo parameters to be changed)" and "[Cd.132] Change data". 0001H: 1 word write request 0002H: 2 words write request	4354+100n
[Cd.131]	Parameter No. (Setting for servo parameters to be changed)	Set the servo parameter to be changed.	4355+100n
[Cd.132]	Change data	Set the change value of servo parameter set in "[Cd.131] Parameter No. (Setting for servo parameters to be changed)".	4356+100n 4357+100n

Point

- Both of the servo parameter area (internal memory (nonvolatile) and buffer memory/internal memory) of Simple Motion module and the parameter of servo amplifier are changed.
- When the servo parameters that become valid by turning ON the servo amplifier's power supply are changed, be sure to turn ON twice the servo amplifier's power supply after change. (The servo amplifier's RAM data are changed by parameter setting, but the servo amplifier's EEPROM data are not changed. The EEPROM data before the change are overwritten to RAM by the servo amplifier's power supply ON again, and then the servo amplifier starts. After that, the changed data are written to the servo amplifier's EEPROM in an initial communication with Simple Motion module. Therefore, the changed data are overwritten to the RAM data by turning the servo amplifier's power supply ON again.)
- If "[Cd.130] Servo parameter read/write request" is set to "0001H: 1 word write request" or "0002H: 2 words write request" in the following states, it becomes "0003H: Read/write failure ".
  - The communication with the servo amplifier is not established or there is an error in the communication.
  - "[Cd.131] Parameter No." is outside the setting range.
  - The servo amplifier does not support the writing of the specified number of words.

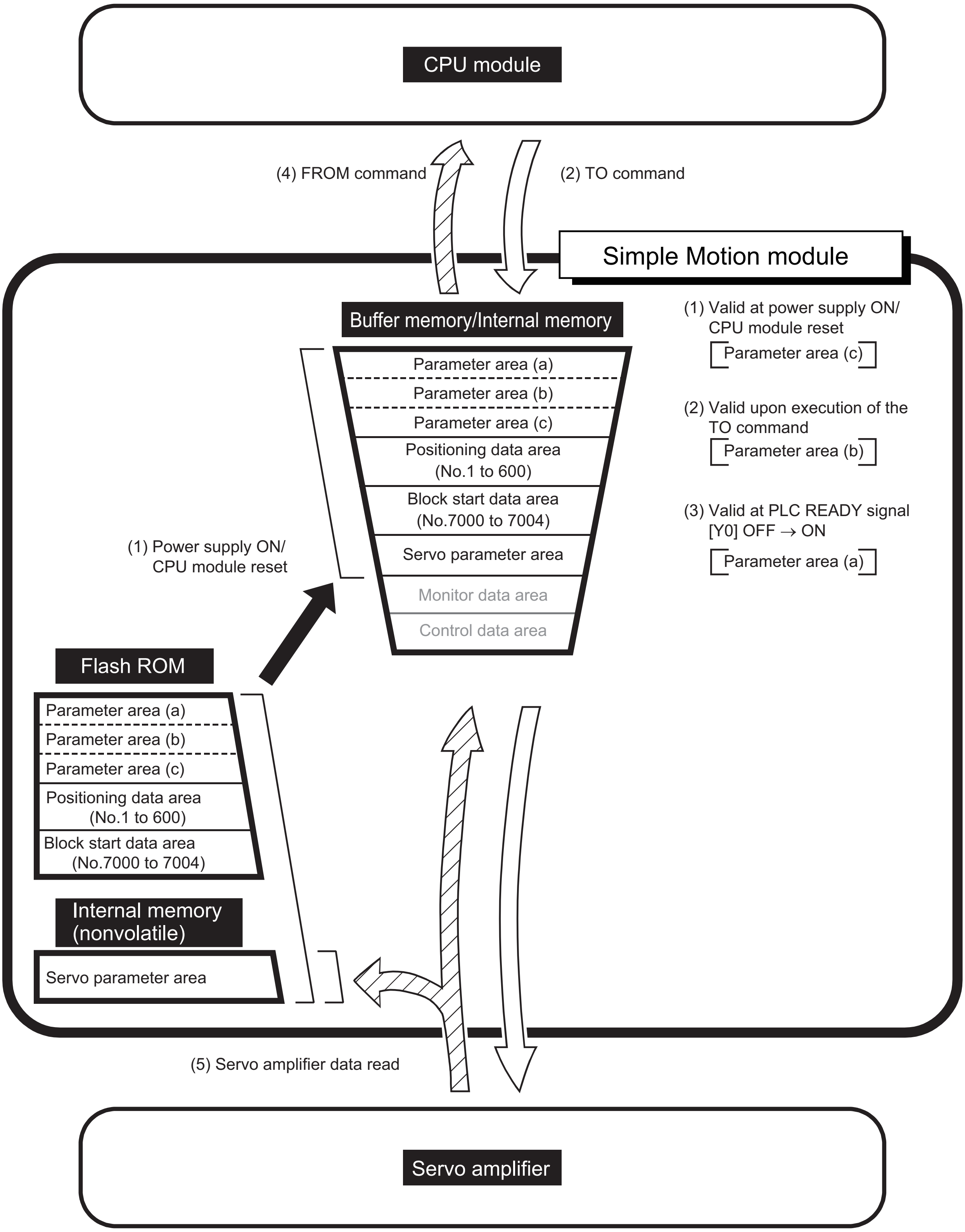
■Transfer from the CPU module to the Simple Motion module

When MR-J5(W)-B is used, setting "0022H: 2 words write request to internal memory" or "0032H: 2 words read request from internal memory" in "[Cd.130] Servo parameter read/write request" of the axis control data reads/writes the servo parameters to "Servo parameter (When MR-J5(W)-B is used)" of the internal memory. For details of how to read and write from/to "Servo parameter (When MR-J5(W)-B is used)" of the internal memory by using the axis control data, refer to the following.

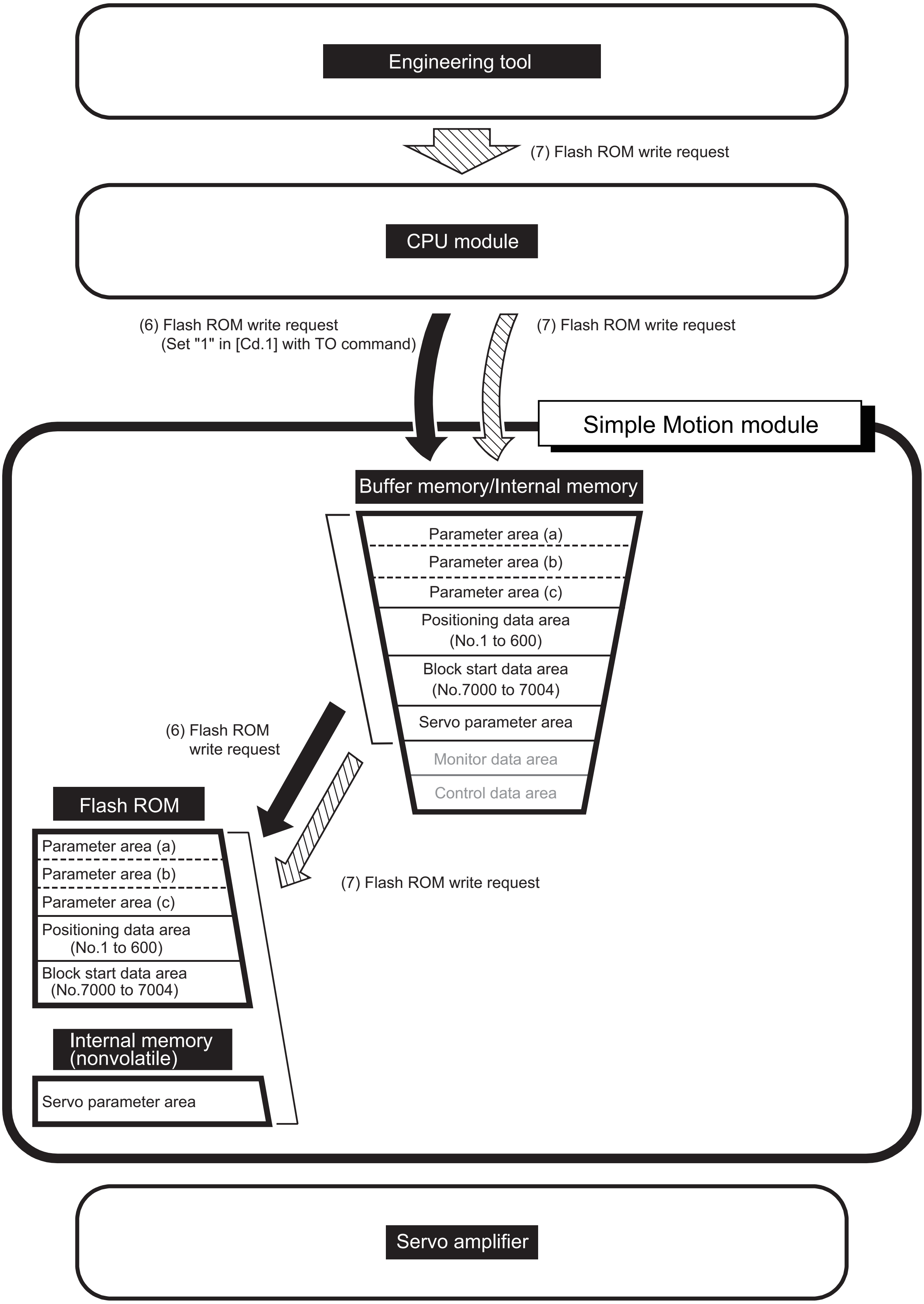
☞ Page 796 Connection with MR-J5(W)-B

Data transmission patterns [RD77MS]

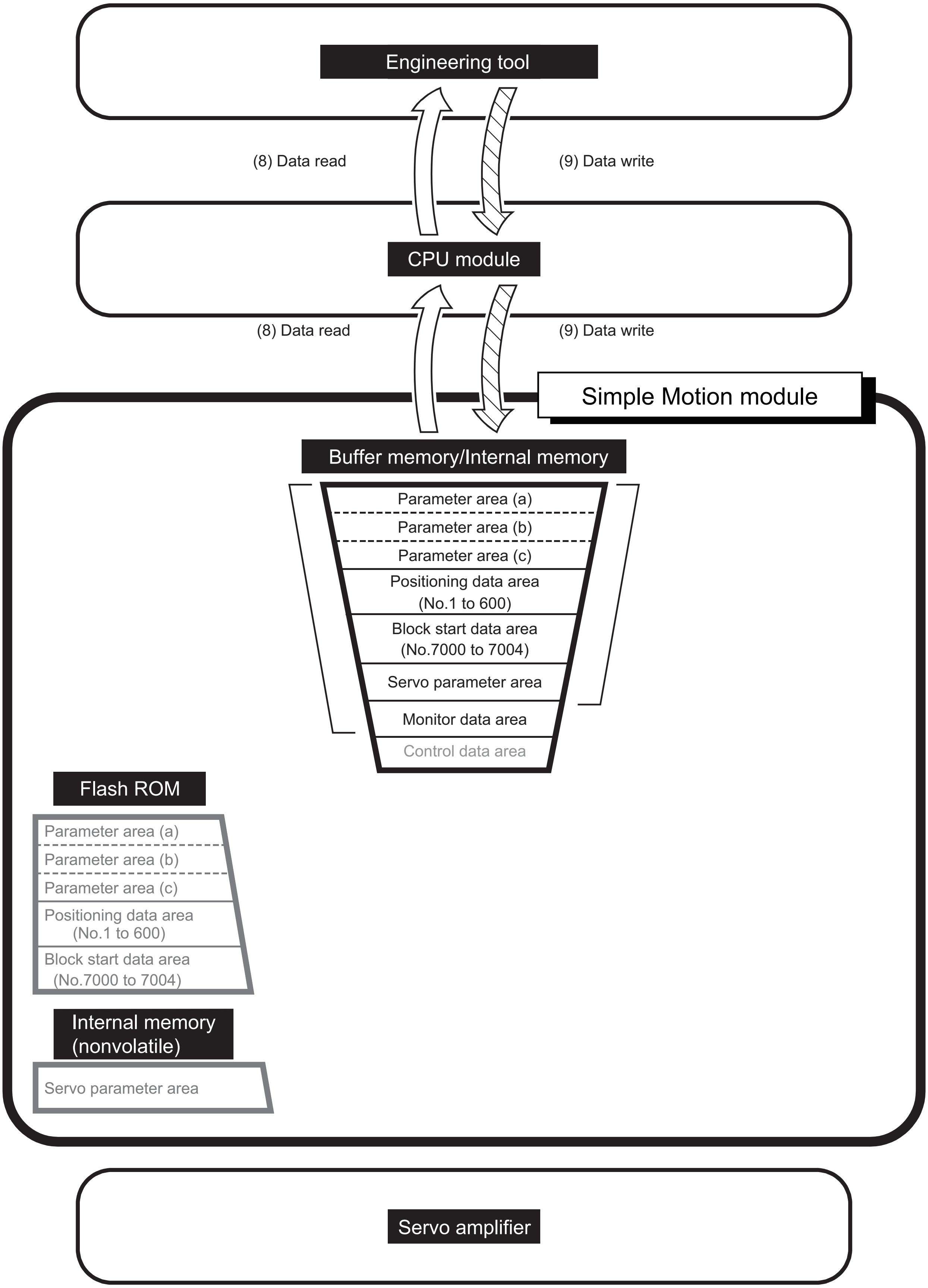
■Pattern (1) to (5)



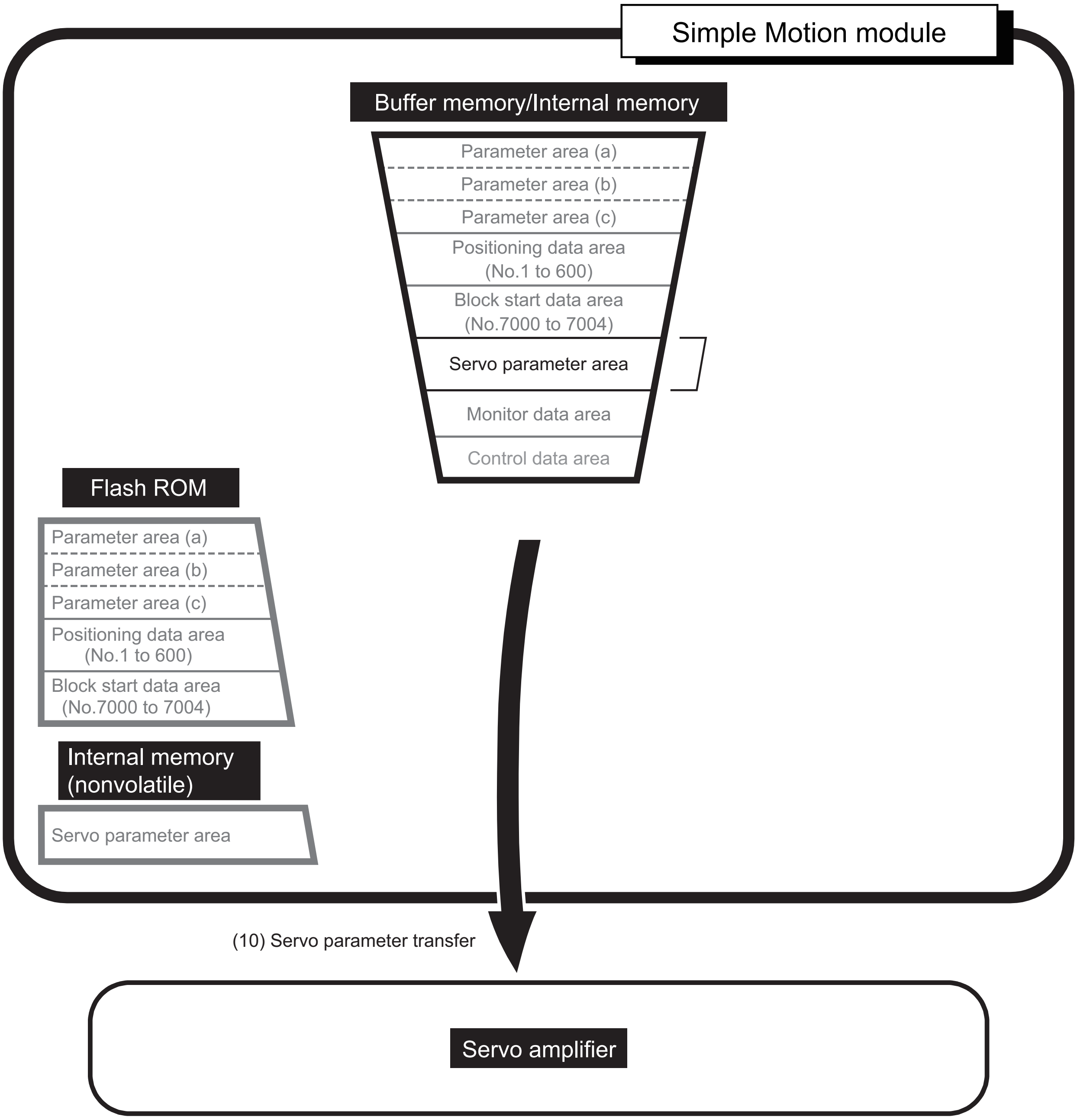
■Pattern (6) and (7)



■Pattern (8) and (9)

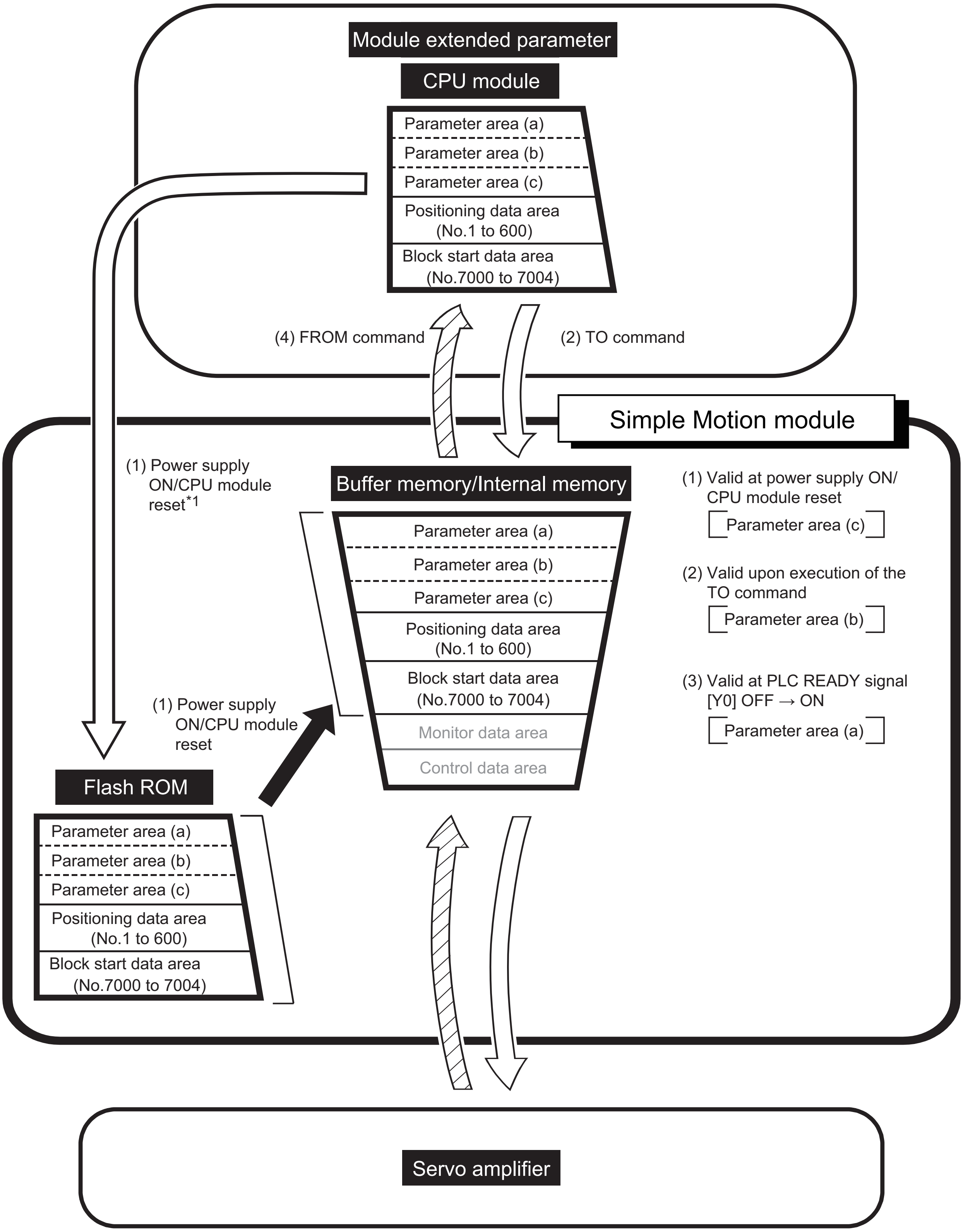


■Pattern (10)


Simple Motion module
Buffer memory/Internal memory
Parameter area (a)
Parameter area (b)
Parameter area (c)
Positioning data area (No.1 to 600)
Block start data area (No.7000 to 7004)
Servo parameter area
Monitor data area
Control data area
Flash ROM
Parameter area (a)
Parameter area (b)
Parameter area (c)
Positioning data area (No.1 to 600)
Block start data area (No.7000 to 7004)
Internal memory (nonvolatile)
Servo parameter area
(10) Servo parameter transfer
Servo amplifier

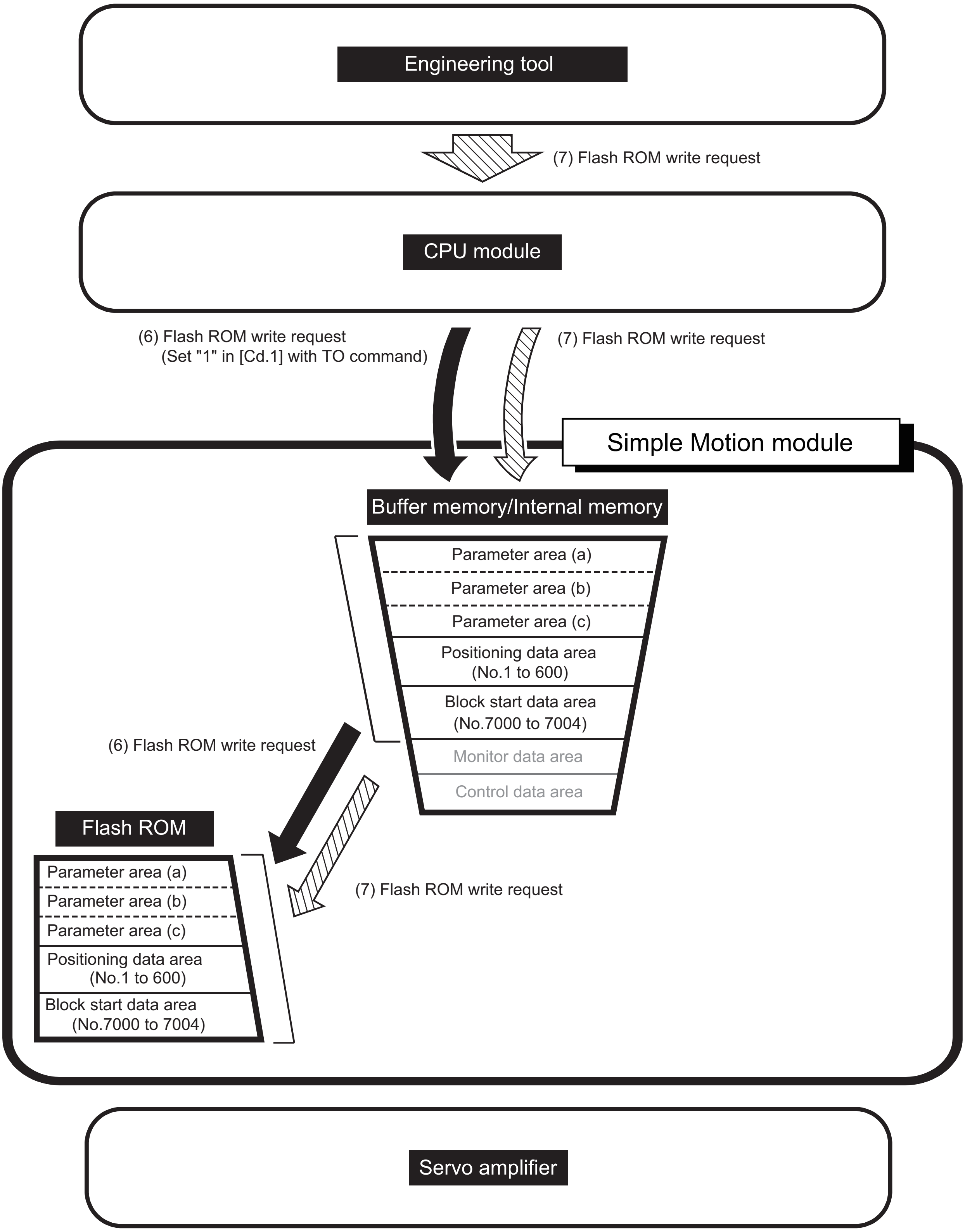
Data transmission patterns [RD77GF]

■Pattern (1) to (5)

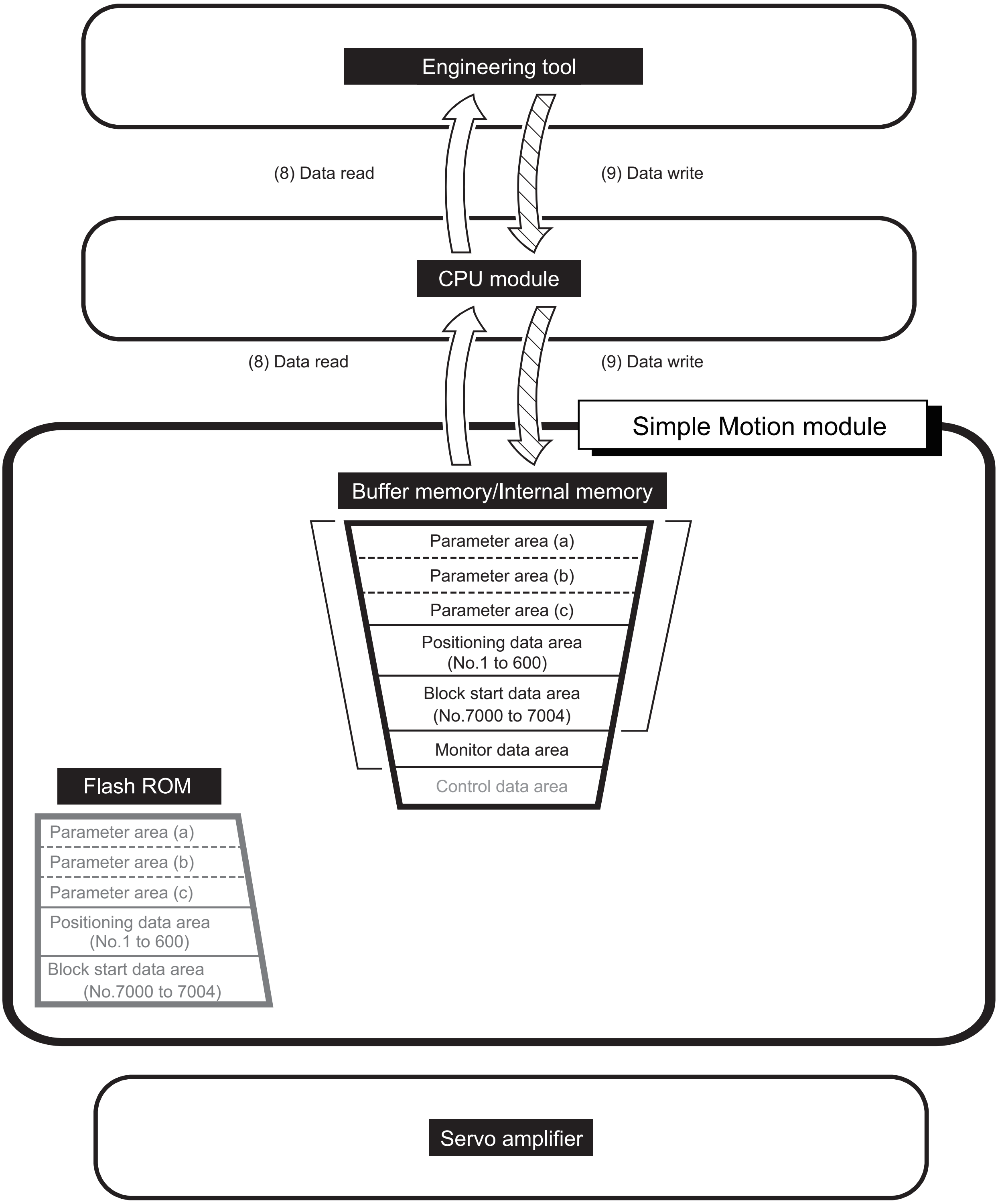


[1] When the module extended parameter storage location setting is set to "CPU module"

■Pattern (6) and (7)



■Pattern (8) and (9)



13 PROGRAMMING

This chapter describes the programs required to carry out positioning control with the Simple Motion module.
The program required for control is created allowing for the "start conditions", "start time chart", "device settings" and general control configuration. (The parameters, positioning data, block start data and condition data, etc., must be set in the Simple Motion module according to the control to be executed, and a setting program for the control data or a start program for the various controls must be created.)

13.1 Precautions for Creating Program

The common precautions to be taken when writing data from the CPU module to the buffer memory of the Simple Motion module are described below.

Reading/writing the data

Setting the data explained in this chapter (various parameters, positioning data, block start data) should be set using an engineering tool. When set with the program, many programs and devices must be used. This will not only complicate the program, but will also increase the scan time. When rewriting the positioning data during continuous path control or continuous positioning control, rewrite the data four positioning data items before the actual execution. If the positioning data is not rewritten before the positioning data four items earlier is executed, the process will be carried out as if the data was not rewritten.

Restrictions to speed change execution interval

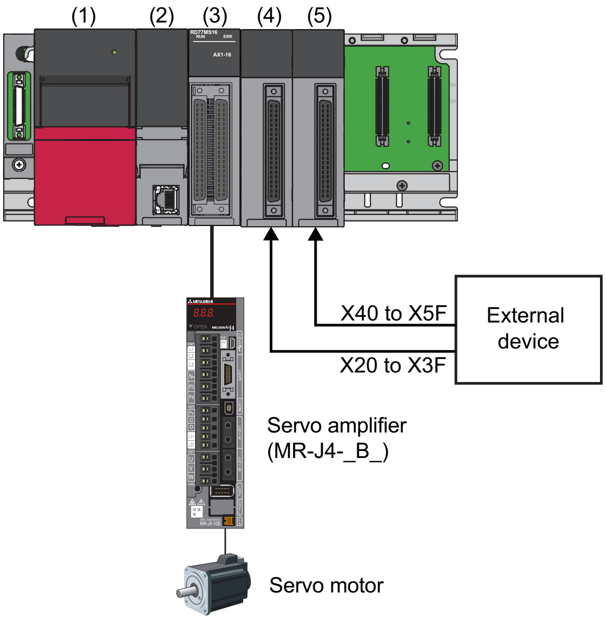
Be sure there is an interval between the speed changes of 10 ms or more when carrying out consecutive speed changes by the speed change function or override function with the Simple Motion module.

Process during overrun

Overrun is prevented by the setting of the upper and lower stroke limits with the detailed parameter 1. However, this applies only when the Simple Motion module is operating correctly. From a system safety perspective, creating an external circuit that includes a boundary limit switch that turns OFF the main circuit power of the servo amplifier when activated is recommended.

System configuration

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



(1) R61P
(2) R16CPU
(3) RD77MS16 (X0 to X1F/Y0 to Y1F)
(4) RX40C7 (X20 to X3F)
(5) RX40C7 (X40 to X5F)

13.2 List of Labels Used

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

Module label

[RD77MS example]

Classification	Label name	Description
Start I/O No.	RD77_1.uIO	Start I/O No.
Input signal	RD77_1.bReady	RD77 READY
	RD77_1.bSynchronizationFlag	RD77 Synchronization flag
	RD77_1.bSynchronizationFlag_D	
	RD77_1.bnBusy[0]	Axis 1 BUSY signal
	RD77_1.bnBusy_D[0]	
Output signal	RD77_1.bAllAxisServoOn	RD77 All axis servo ON
	RD77_1.bPLC_Ready	PLC READY signal
	RD77_1.bnPositioningStart[0]	Axis 1 Positioning start signal
Parameter	RD77_1.stnAxPrm_D[0].dHomePosition_D	Axis 1 Home position address
	RD77_1.stnAxPrm_D[0].dSoftwareStrokeLowerLimit_D	Axis 1 Software stroke limit lower limit value
	RD77_1.stnAxPrm_D[0].dSoftwareStrokeUpperLimit_D	Axis 1 Software stroke limit upper limit value
	RD77_1.stnAxPrm_D[0].uExternalCommandFunctionMode_D	Axis 1 External command function selection
	RD77_1.stnAxPrm_D[0].uHomingDirection_D	Axis 1 Home position return direction
	RD77_1.stnAxPrm_D[0].uHomingMethod_D	Axis 1 Home position return method
	RD77_1.stnAxPrm_D[0].uHomingRetry_D	Axis 1 Home position return retry
	RD77_1.stnAxPrm_D[0].uUnitMagnification_D	Axis 1 Unit magnification (AM)
	RD77_1.stnAxPrm_D[0].uUnit_D	Axis 1 Unit setting
	RD77_1.stnAxPrm_D[0].uVP_Mode_D	Axis 1 Speed-position function selection
	RD77_1.stnAxPrm_D[0].uV_CommandPosition_D	Axis 1 Command position value during speed control
	RD77_1.stnAxPrm_D[0].udCreepSpeed_D	Axis 1 Creep speed
	RD77_1.stnAxPrm_D[0].udHomingSpeed_D	Axis 1 Home position return speed
	RD77_1.stnAxPrm_D[0].udMovementAmountPerRotation_D	Axis 1 Movement amount per rotation (AL)
	RD77_1.stnAxPrm_D[0].udPulsesPerRotation_D	Axis 1 Number of pulses per rotation (AP)
Axis monitor data	RD77_1.stnAxMntr[0].uM_Code	Axis 1 Valid M code
	RD77_1.stnAxMntr[0].uStatus.3	Axis 1 Home position return request flag
	RD77_1.stnAxMntr[0].uStatus.9	Axis 1 Axis warning detection
	RD77_1.stnAxMntr[0].uStatus.C	Axis 1 M code ON
	RD77_1.stnAxMntr[0].uStatus.D	Axis 1 Error detection
	RD77_1.stnAxMntr_D[0].uStatus_D.D	
	RD77_1.stnAxMntr[0].uStatus.E	Axis 1 Start complete
	RD77_1.stnAxMntr_D[0].uStatus_D.E	
	RD77_1.stnAxMntr_D[0].uStatus_D.F	Axis 1 Positioning complete
	RD77_1.stnAxMntr_D[0].dCommandPosition_D	Axis 1 Command position value
System monitor data	RD77_1.stSysMntr1_D.wSSCNET_ControlStatus_D	SSCNET control status
Axis control data 1	RD77_1.stnAxCtrl1_D[0].dNewPosition_D	Axis 1 New position value
	RD77_1.stnAxCtrl1_D[0].uClearHomingRequestFlag_D	Axis 1 Home position return request flag OFF request
	RD77_1.stnAxCtrl1_D[0].uClear_M_Code_D	Axis 1 M code OFF request
	RD77_1.stnAxCtrl1_D[0].uEnablePV_Switching_D	Axis 1 Position-speed switching enable flag
	RD77_1.stnAxCtrl1_D[0].uExternalCommandValid_D	Axis 1 External command valid
	RD77_1.stnAxCtrl1_D[0].uForwardNewTorque_D	Axis 1 New torque value/forward new torque value
	RD77_1.stnAxCtrl1_D[0].uInterruptOperation_D	Axis 1 Interrupt request during continuous operation
	RD77_1.stnAxCtrl1_D[0].uOverride_D	Axis 1 Positioning operation speed override
	RD77_1.stnAxCtrl1_D[0].uPositioningStartNo_D	Axis 1 Positioning start No.
	RD77_1.stnAxCtrl1_D[0].uPositioningStartingPointNo_D	Axis 1 Positioning starting point No.
	RD77_1.stnAxCtrl1_D[0].uSkip_D	Axis 1 Skip command

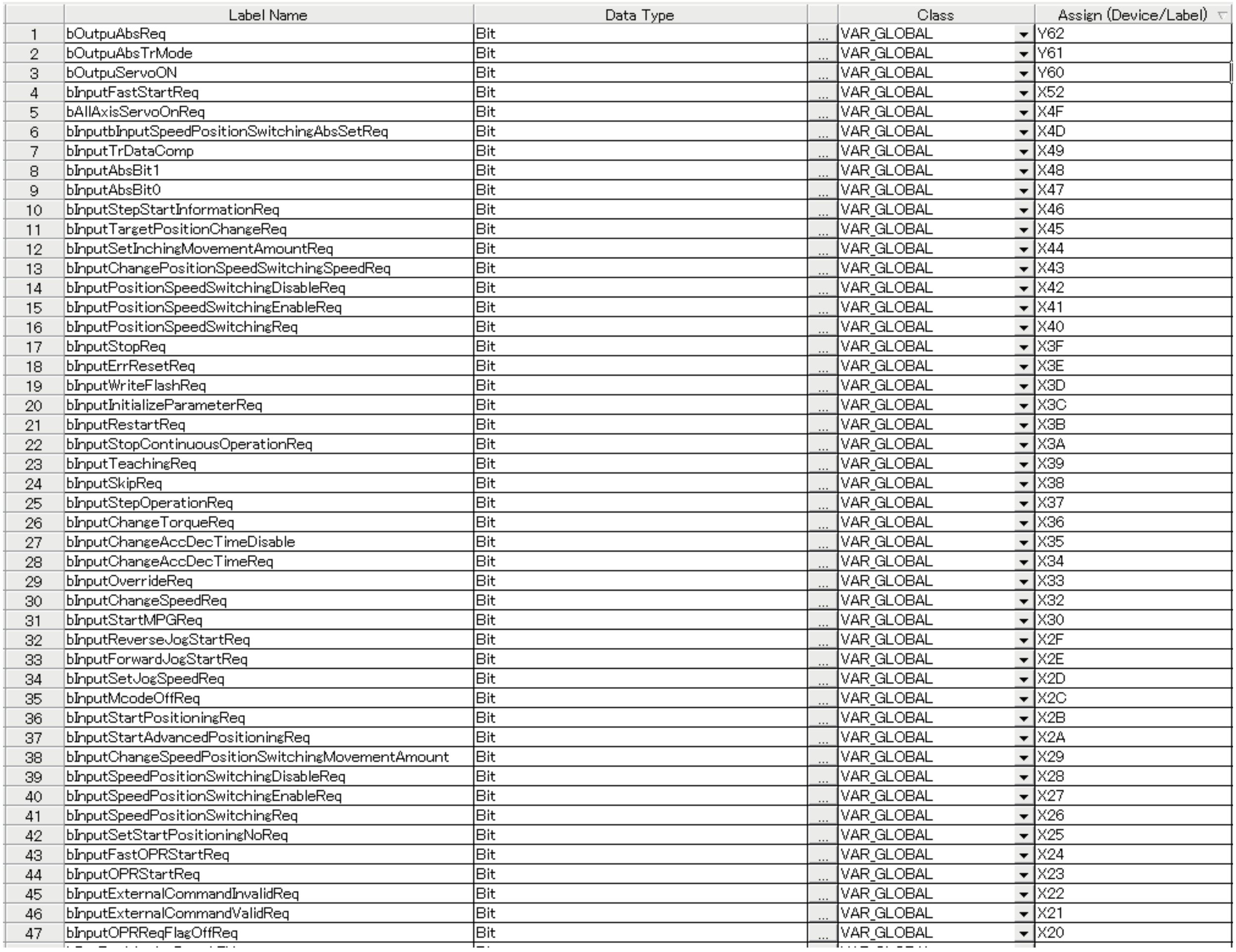
Classification	Label name	Description
Axis control data 1	RD77_1.stnAxCtrl1_D[0].uStepMode_D	Axis 1 Step mode
	RD77_1.stnAxCtrl1_D[0].uStepStartInformation_D	Axis 1 Step start information
	RD77_1.stnAxCtrl1_D[0].uStepValid_D	Axis 1 Step valid flag
	RD77_1.stnAxCtrl1_D[0].uTeachingDataSelection_D	Axis 1 Teaching data selection
	RD77_1.stnAxCtrl1_D[0].uTeachingPositioningDataNo_D	Axis 1 Teaching positioning data No.
	RD77_1.stnAxCtrl1_D[0].udNewSpeed_D	Axis 1 New speed value
	RD77_1.stnAxCtrl1_D[0].udPV_NewSpeed_D	Axis 1 Position-speed switching control speed change register
	RD77_1.stnAxCtrl1_D[0].udVP_NewMovementAmount_D	Axis 1 Speed-position switching control movement amount change register
System control data	RD77_1.stSysCtrl_D.wSSCNET_ControlCommand_D	SSCNET control command
Axis control data 2	RD77_1.stnAxCtrl2_D[0].uProhibitPositioning_D	Axis 1 Execution prohibition flag
	RD77_1.stnAxCtrl2_D[0].uProhibitPositioning_D.0	
	RD77_1.stnAxCtrl2_D[0].uStopAxis_D	Axis 1 Axis stop
	RD77_1.stnAxCtrl2_D[0].uStopAxis_D.0	
Servo network composition parameter	RD77_1.stnSvNetPrm_D[0].udConnectedDevice_D	Axis 1 Connected device

Global label

The following describes the global labels used in the program examples. Set the global labels as follows.

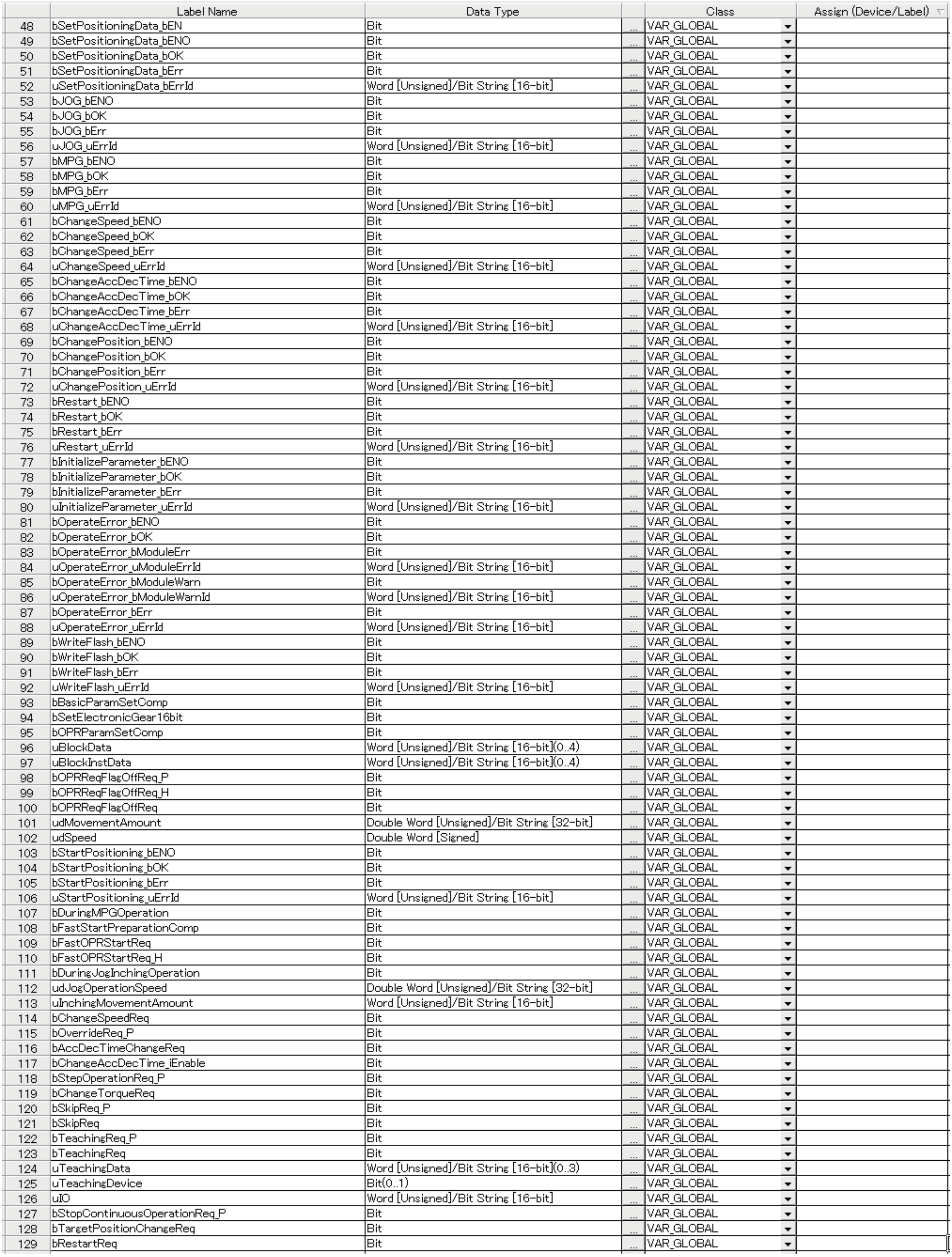
[RD77MS example]

- Global label that the assignment device is to be set

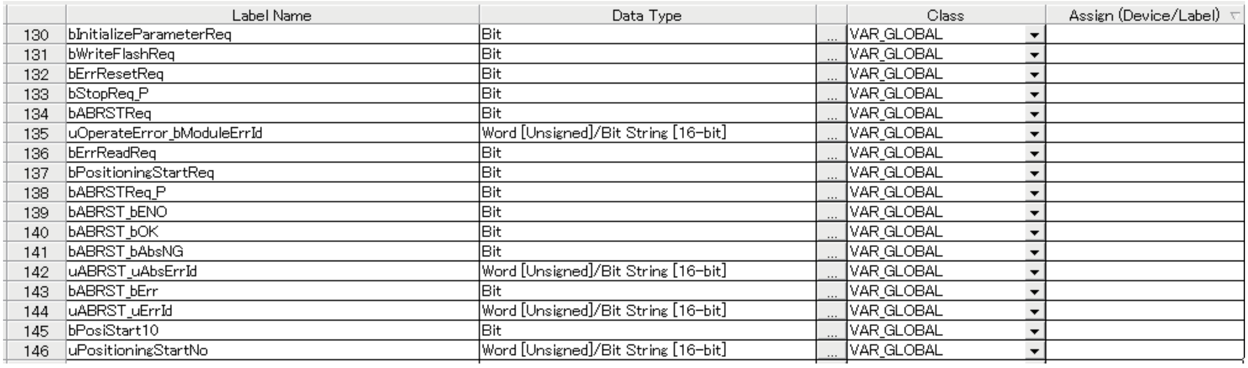


	Label Name	Data Type		Class	Assign (Device/Label)
1	bOutpuAbsReq	Bit	...	VAR_GLOBAL	Y62
2	bOutpuAbsTrMode	Bit	...	VAR_GLOBAL	Y61
3	bOutpuServoON	Bit	...	VAR_GLOBAL	Y60
4	bInputFastStartReq	Bit	...	VAR_GLOBAL	X52
5	bAllAxisServoOnReq	Bit	...	VAR_GLOBAL	X4F
6	bInputbInputSpeedPositionSwitchingAbsSetReq	Bit	...	VAR_GLOBAL	X4D
7	bInputTrDataComp	Bit	...	VAR_GLOBAL	X49
8	bInputAbsBit1	Bit	...	VAR_GLOBAL	X48
9	bInputAbsBit0	Bit	...	VAR_GLOBAL	X47
10	bInputStepStartInformationReq	Bit	...	VAR_GLOBAL	X46
11	bInputTargetPositionChangeReq	Bit	...	VAR_GLOBAL	X45
12	bInputSetInchingMovementAmountReq	Bit	...	VAR_GLOBAL	X44
13	bInputChangePositionSpeedSwitchingSpeedReq	Bit	...	VAR_GLOBAL	X43
14	bInputPositionSpeedSwitchingDisableReq	Bit	...	VAR_GLOBAL	X42
15	bInputPositionSpeedSwitchingEnableReq	Bit	...	VAR_GLOBAL	X41
16	bInputPositionSpeedSwitchingReq	Bit	...	VAR_GLOBAL	X40
17	bInputStopReq	Bit	...	VAR_GLOBAL	X3F
18	bInputErrResetReq	Bit	...	VAR_GLOBAL	X3E
19	bInputWriteFlashReq	Bit	...	VAR_GLOBAL	X3D
20	bInputInitializeParameterReq	Bit	...	VAR_GLOBAL	X3C
21	bInputRestartReq	Bit	...	VAR_GLOBAL	X3B
22	bInputStopContinuousOperationReq	Bit	...	VAR_GLOBAL	X3A
23	bInputTeachingReq	Bit	...	VAR_GLOBAL	X39
24	bInputSkipReq	Bit	...	VAR_GLOBAL	X38
25	bInputStepOperationReq	Bit	...	VAR_GLOBAL	X37
26	bInputChangeTorqueReq	Bit	...	VAR_GLOBAL	X36
27	bInputChangeAccDecTimeDisable	Bit	...	VAR_GLOBAL	X35
28	bInputChangeAccDecTimeReq	Bit	...	VAR_GLOBAL	X34
29	bInputOverrideReq	Bit	...	VAR_GLOBAL	X33
30	bInputChangeSpeedReq	Bit	...	VAR_GLOBAL	X32
31	bInputStartMPGReq	Bit	...	VAR_GLOBAL	X30
32	bInputReverseJogStartReq	Bit	...	VAR_GLOBAL	X2F
33	bInputForwardJogStartReq	Bit	...	VAR_GLOBAL	X2E
34	bInputSetJogSpeedReq	Bit	...	VAR_GLOBAL	X2D
35	bInputMcodeOffReq	Bit	...	VAR_GLOBAL	X2C
36	bInputStartPositioningReq	Bit	...	VAR_GLOBAL	X2B
37	bInputStartAdvancedPositioningReq	Bit	...	VAR_GLOBAL	X2A
38	bInputChangeSpeedPositionSwitchingMovementAmount	Bit	...	VAR_GLOBAL	X29
39	bInputSpeedPositionSwitchingDisableReq	Bit	...	VAR_GLOBAL	X28
40	bInputSpeedPositionSwitchingEnableReq	Bit	...	VAR_GLOBAL	X27
41	bInputSpeedPositionSwitchingReq	Bit	...	VAR_GLOBAL	X26
42	bInputSetStartPositioningNoReq	Bit	...	VAR_GLOBAL	X25
43	bInputFastOPRStartReq	Bit	...	VAR_GLOBAL	X24
44	bInputOPRStartReq	Bit	...	VAR_GLOBAL	X23
45	bInputExternalCommandInvalidReq	Bit	...	VAR_GLOBAL	X22
46	bInputExternalCommandValidReq	Bit	...	VAR_GLOBAL	X21
47	bInputOPRReqFlagOffReq	Bit	...	VAR_GLOBAL	X20

- Global label that the assignment device is not to be set (The unused internal relay and data device are automatically assigned when the assignment device is not set.)



	Label Name	Data Type		Class	Assign (Device/Label)
48	bSetPositioningData_bEN	Bit	...	VAR_GLOBAL	
49	bSetPositioningData_bENO	Bit	...	VAR_GLOBAL	
50	bSetPositioningData_bOK	Bit	...	VAR_GLOBAL	
51	bSetPositioningData_bErr	Bit	...	VAR_GLOBAL	
52	uSetPositioningData_bErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
53	bJOG_bENO	Bit	...	VAR_GLOBAL	
54	bJOG_bOK	Bit	...	VAR_GLOBAL	
55	bJOG_bErr	Bit	...	VAR_GLOBAL	
56	uJOG_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
57	bMPG_bENO	Bit	...	VAR_GLOBAL	
58	bMPG_bOK	Bit	...	VAR_GLOBAL	
59	bMPG_bErr	Bit	...	VAR_GLOBAL	
60	uMPG_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
61	bChangeSpeed_bENO	Bit	...	VAR_GLOBAL	
62	bChangeSpeed_bOK	Bit	...	VAR_GLOBAL	
63	bChangeSpeed_bErr	Bit	...	VAR_GLOBAL	
64	uChangeSpeed_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
65	bChangeAccDecTime_bENO	Bit	...	VAR_GLOBAL	
66	bChangeAccDecTime_bOK	Bit	...	VAR_GLOBAL	
67	bChangeAccDecTime_bErr	Bit	...	VAR_GLOBAL	
68	uChangeAccDecTime_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
69	bChangePosition_bENO	Bit	...	VAR_GLOBAL	
70	bChangePosition_bOK	Bit	...	VAR_GLOBAL	
71	bChangePosition_bErr	Bit	...	VAR_GLOBAL	
72	uChangePosition_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
73	bRestart_bENO	Bit	...	VAR_GLOBAL	
74	bRestart_bOK	Bit	...	VAR_GLOBAL	
75	bRestart_bErr	Bit	...	VAR_GLOBAL	
76	uRestart_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
77	bInitializeParameter_bENO	Bit	...	VAR_GLOBAL	
78	bInitializeParameter_bOK	Bit	...	VAR_GLOBAL	
79	bInitializeParameter_bErr	Bit	...	VAR_GLOBAL	
80	uInitializeParameter_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
81	bOperateError_bENO	Bit	...	VAR_GLOBAL	
82	bOperateError_bOK	Bit	...	VAR_GLOBAL	
83	bOperateError_bModuleErr	Bit	...	VAR_GLOBAL	
84	uOperateError_uModuleErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
85	bOperateError_bModuleWarn	Bit	...	VAR_GLOBAL	
86	uOperateError_bModuleWarnId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
87	bOperateError_bErr	Bit	...	VAR_GLOBAL	
88	uOperateError_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
89	bWriteFlash_bENO	Bit	...	VAR_GLOBAL	
90	bWriteFlash_bOK	Bit	...	VAR_GLOBAL	
91	bWriteFlash_bErr	Bit	...	VAR_GLOBAL	
92	uWriteFlash_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
93	bBasicParamSetComp	Bit	...	VAR_GLOBAL	
94	bSetElectronicGear16bit	Bit	...	VAR_GLOBAL	
95	bOPRParamSetComp	Bit	...	VAR_GLOBAL	
96	uBlockData	Word [Unsigned]/Bit String [16-bit](0..4)	...	VAR_GLOBAL	
97	uBlockInstData	Word [Unsigned]/Bit String [16-bit](0..4)	...	VAR_GLOBAL	
98	bOPRReqFlagOffReq_P	Bit	...	VAR_GLOBAL	
99	bOPRReqFlagOffReq_H	Bit	...	VAR_GLOBAL	
100	bOPRReqFlagOffReq	Bit	...	VAR_GLOBAL	
101	udMovementAmount	Double Word [Unsigned]/Bit String [32-bit]	...	VAR_GLOBAL	
102	udSpeed	Double Word [Signed]	...	VAR_GLOBAL	
103	bStartPositioning_bENO	Bit	...	VAR_GLOBAL	
104	bStartPositioning_bOK	Bit	...	VAR_GLOBAL	
105	bStartPositioning_bErr	Bit	...	VAR_GLOBAL	
106	uStartPositioning_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
107	bDuringMPGOperation	Bit	...	VAR_GLOBAL	
108	bFastStartPreparationComp	Bit	...	VAR_GLOBAL	
109	bFastOPRStartReq	Bit	...	VAR_GLOBAL	
110	bFastOPRStartReq_H	Bit	...	VAR_GLOBAL	
111	bDuringJogInchingOperation	Bit	...	VAR_GLOBAL	
112	udJogOperationSpeed	Double Word [Unsigned]/Bit String [32-bit]	...	VAR_GLOBAL	
113	uInchingMovementAmount	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
114	bChangeSpeedReq	Bit	...	VAR_GLOBAL	
115	bOverrideReq_P	Bit	...	VAR_GLOBAL	
116	bAccDecTimeChangeReq	Bit	...	VAR_GLOBAL	
117	bChangeAccDecTime_iEnable	Bit	...	VAR_GLOBAL	
118	bStepOperationReq_P	Bit	...	VAR_GLOBAL	
119	bChangeTorqueReq	Bit	...	VAR_GLOBAL	
120	bSkipReq_P	Bit	...	VAR_GLOBAL	
121	bSkipReq	Bit	...	VAR_GLOBAL	
122	bTeachingReq_P	Bit	...	VAR_GLOBAL	
123	bTeachingReq	Bit	...	VAR_GLOBAL	
124	uTeachingData	Word [Unsigned]/Bit String [16-bit](0..3)	...	VAR_GLOBAL	
125	uTeachingDevice	Bit(0..1)	...	VAR_GLOBAL	
126	uIO	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
127	bStopContinuousOperationReq_P	Bit	...	VAR_GLOBAL	
128	bTargetPositionChangeReq	Bit	...	VAR_GLOBAL	
129	bRestartReq	Bit	...	VAR_GLOBAL	



	Label Name	Data Type		Class	Assign (Device/Label)
130	bInitializeParameterReq	Bit	...	VAR_GLOBAL	
131	bWriteFlashReq	Bit	...	VAR_GLOBAL	
132	bErrResetReq	Bit	...	VAR_GLOBAL	
133	bStopReq_P	Bit	...	VAR_GLOBAL	
134	bABRSTReq	Bit	...	VAR_GLOBAL	
135	uOperateError_bModuleErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
136	bErrReadReq	Bit	...	VAR_GLOBAL	
137	bPositioningStartReq	Bit	...	VAR_GLOBAL	
138	bABRSTReq_P	Bit	...	VAR_GLOBAL	
139	bABRST_bENO	Bit	...	VAR_GLOBAL	
140	bABRST_bOK	Bit	...	VAR_GLOBAL	
141	bABRST_bAbsNG	Bit	...	VAR_GLOBAL	
142	uABRST_uAbsErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
143	bABRST_bErr	Bit	...	VAR_GLOBAL	
144	uABRST_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
145	bPosiStart10	Bit	...	VAR_GLOBAL	
146	uPositioningStartNo	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	

13.3 Creating a Program

The "positioning control operation program" actually used is explained in this section.

General configuration of program

The general configuration of the positioning control operation program is shown below.

No.	Program name	Remark
1a	Basic parameter setting	• The program is not required when the parameter, positioning data, block start data, and servo parameter are set using an engineering tool. • The setting of the home position return parameters is not required when the machine home position return control is not executed.
1b	Home position return parameter setting program	
1c	Unit "degree" setting program	
2	Positioning data setting program	
3	Block start data setting program	
4	Servo parameter setting program	
5	Home position return request OFF program	Not required when the fast home position return is executed.
6	External command function valid setting program	—
7	PLC READY signal [Y0] ON program	
8	All axis servo ON [Y1] program	
9	Positioning start No. setting program	
10	Positioning start program	—
11	M code OFF program	Not required when the M code output function is not used.
12	JOG operation setting program	Not required when the JOG operation is not used.
13	Inching operation setting program	Not required when the inching operation is not used.
14	JOG operation/inching operation execution program	Not required when the JOG operation or the inching operation is not used.
15	Manual pulse generator operation program	Not required when the manual pulse generator operation is not used.
16	Speed change program	Add the program as necessary.
17	Override program	
18	Acceleration/deceleration time change program	
19	Torque change program	
20	Step operation program	
21	Skip program	
22	Teaching program	
23	Continuous operation interrupt program	
24	Target position change program	
25	Restart program	
26	Parameter initialization program	
27	Flash ROM write program	
28	Error reset program	
29	Axis stop program	—

13.4 Positioning Program Examples

For details of the module FB, refer to "Simple Motion Module FB" in the following manual.

📖MELSEC iQ-R Simple Motion Module Function Block Reference

Parameter setting program

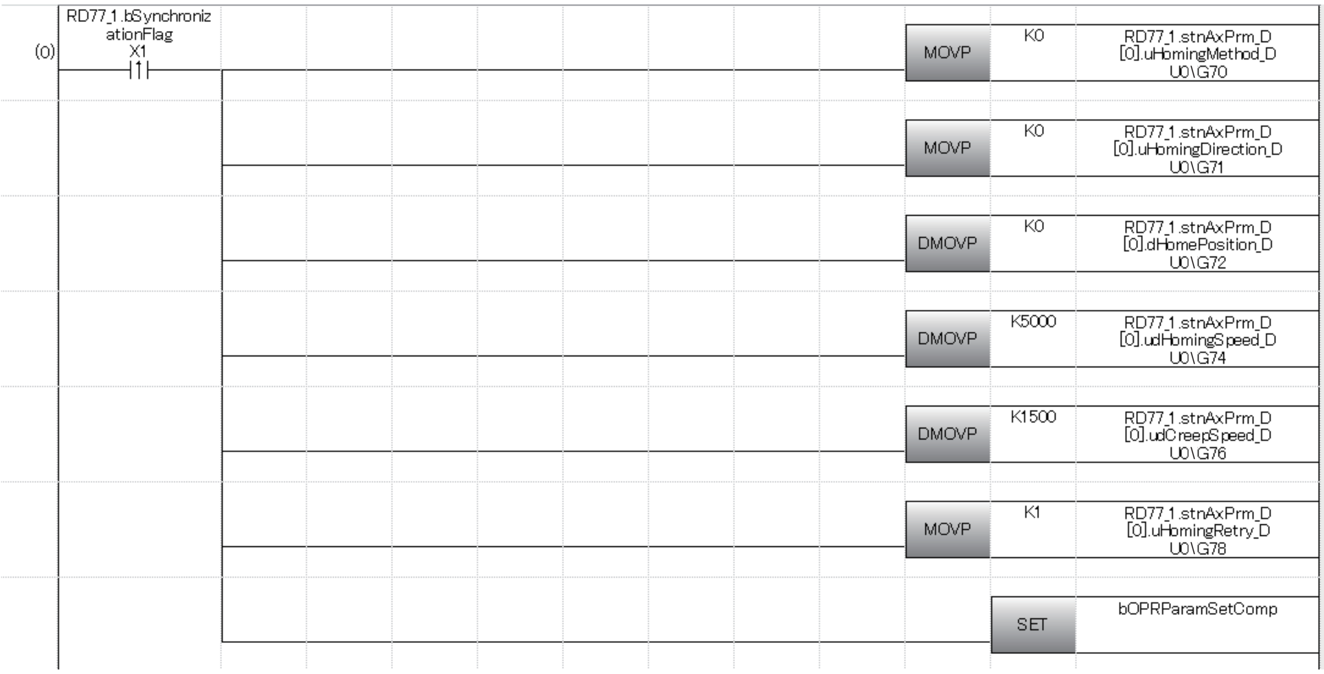
The program is not required when the parameter is set by "Module Parameter" using an engineering tool.

■Setting for basic parameter 1 (axis 1)

```
(0) RD77_1.bSynchronizationFlag X1 -|↑|-
    MOV    K0         RD77_1.stnAxPrm_D[0].uUnit_D U0\G0
    MOV    K1         RD77_1.stnAxPrm_D[0].uUnitMagnification_D U0\G1
    DMOVP  K4194304   RD77_1.stnAxPrm_D[0].udPulsesPerRotation_D U0\G2
    DMOVP  K250000    RD77_1.stnAxPrm_D[0].udMovementAmountPerRotation_D U0\G4
    SET    bBasicParamSetComp
```

■Setting for home position return basic parameter (axis 1)

[RD77MS example]



```
(0) RD77_1.bSynchronizationFlag X1 -|↑|-
    MOVP   K0      RD77_1.stnAxPrm_D[0].uHomingMethod_D U0\G70
    MOVP   K0      RD77_1.stnAxPrm_D[0].uHomingDirection_D U0\G71
    DMOVP  K0      RD77_1.stnAxPrm_D[0].dHomePosition_D U0\G72
    DMOVP  K5000   RD77_1.stnAxPrm_D[0].udHomingSpeed_D U0\G74
    DMOVP  K1500   RD77_1.stnAxPrm_D[0].udCreepSpeed_D U0\G76
    MOVP   K1      RD77_1.stnAxPrm_D[0].uHomingRetry_D U0\G78
    SET    bOPRParamSetComp
```

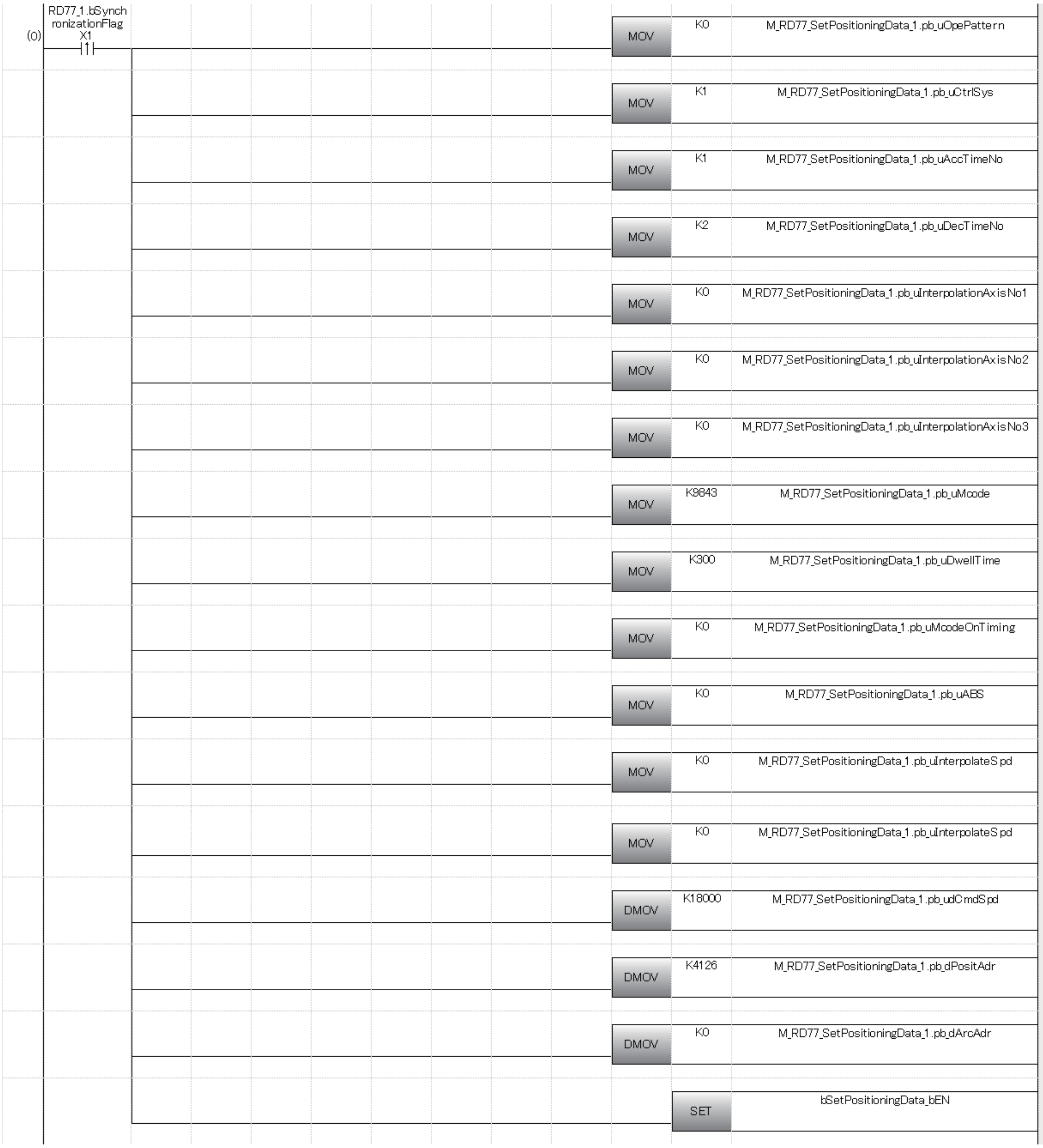
■Unit "degree" setting (axis 1) program

```
(0) RD77_1.bSynchronizationFlag X1 (rising edge)
    bInputbInputSpeedPositionSwitchingAbsSetReq X4D
        MOVP   K2  RD77_1.stnAxPrm_D[0].uUnit_D                        U0\G0
        DMOVP  K0  RD77_1.stnAxPrm_D[0].dSoftwareStrokeUpperLimit_D    U0\G18
        DMOVP  K0  RD77_1.stnAxPrm_D[0].dSoftwareStrokeLowerLimit_D    U0\G20
        MOVP   K1  RD77_1.stnAxPrm_D[0].uV_CommandPosition_D           U0\G30
        MOVP   K2  RD77_1.stnAxPrm_D[0].uVP_Mode_D                     U0\G34
```

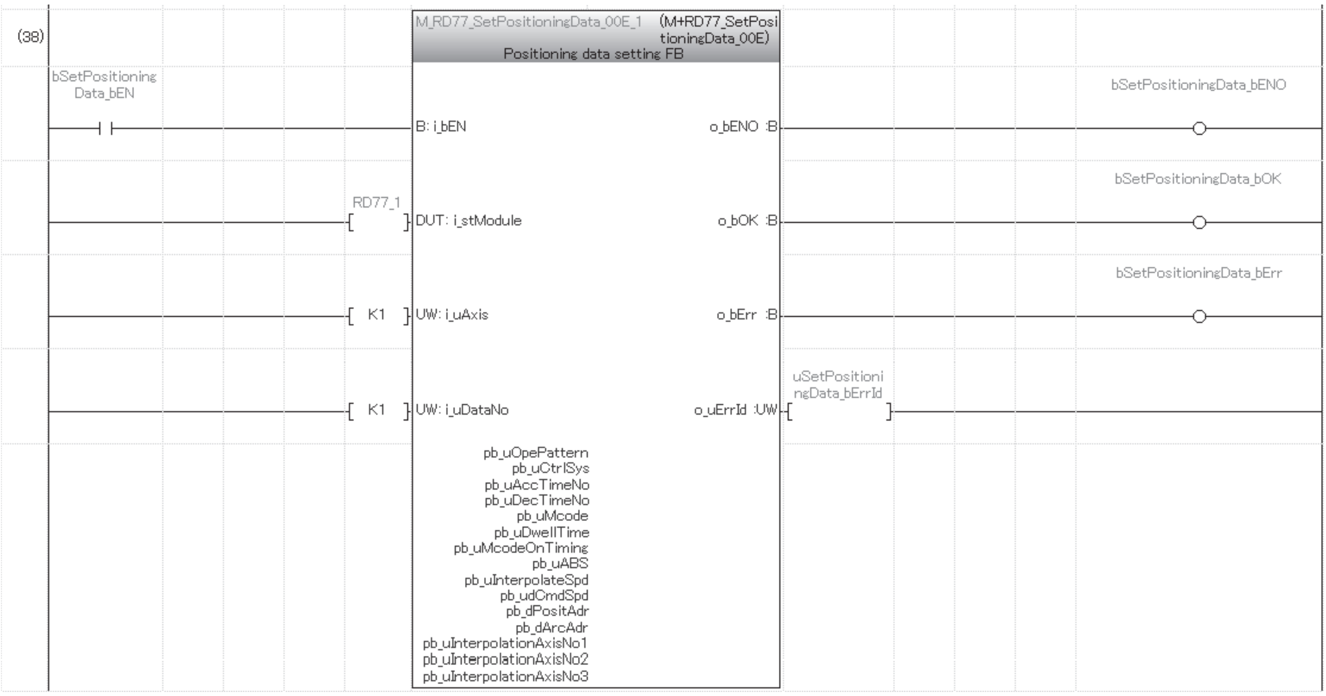
Positioning data setting program

The program is not required when the data is set by "Positioning Data" using an engineering tool.

[RD77MS example]

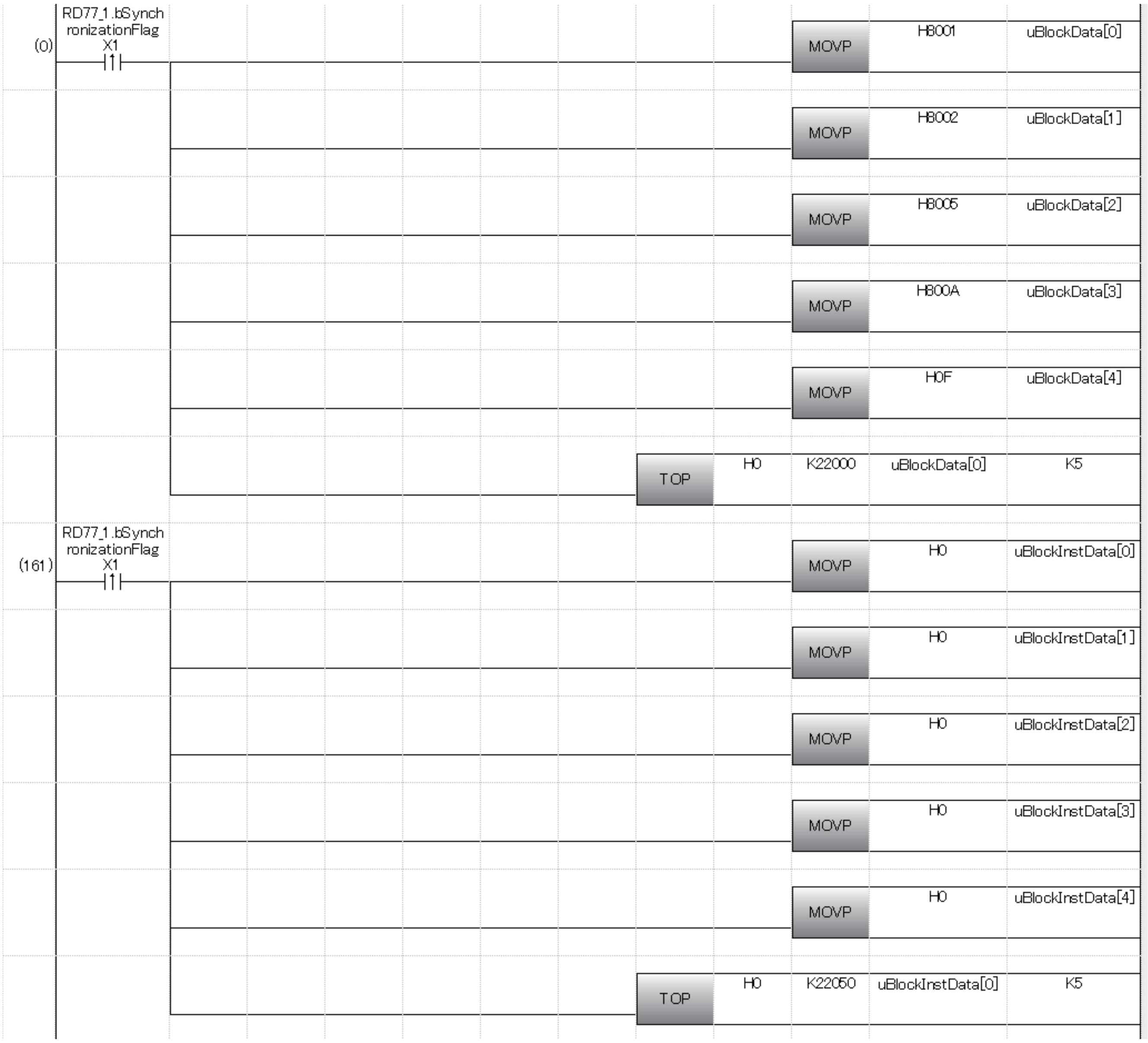


```
(0) RD77_1.bSynchronizationFlag X1
MOV  K0      M_RD77_SetPositioningData_1.pb_uOpePattern
MOV  K1      M_RD77_SetPositioningData_1.pb_uCtrlSys
MOV  K1      M_RD77_SetPositioningData_1.pb_uAccTimeNo
MOV  K2      M_RD77_SetPositioningData_1.pb_uDecTimeNo
MOV  K0      M_RD77_SetPositioningData_1.pb_uInterpolationAxisNo1
MOV  K0      M_RD77_SetPositioningData_1.pb_uInterpolationAxisNo2
MOV  K0      M_RD77_SetPositioningData_1.pb_uInterpolationAxisNo3
MOV  K9843   M_RD77_SetPositioningData_1.pb_uMcode
MOV  K300    M_RD77_SetPositioningData_1.pb_uDwellTime
MOV  K0      M_RD77_SetPositioningData_1.pb_uMcodeOnTiming
MOV  K0      M_RD77_SetPositioningData_1.pb_uABS
MOV  K0      M_RD77_SetPositioningData_1.pb_uInterpolateSpd
MOV  K0      M_RD77_SetPositioningData_1.pb_uInterpolateSpd
DMOV K18000  M_RD77_SetPositioningData_1.pb_udCmdSpd
DMOV K4126   M_RD77_SetPositioningData_1.pb_dPositAdr
DMOV K0      M_RD77_SetPositioningData_1.pb_dArcAdr
SET          bSetPositioningData_bEN
```


(38)
M_RD77_SetPositioningData_00E_1
(M+RD77_SetPositioningData_00E)
Positioning data setting FB
bSetPositioning Data_bEN
B: i_bEN
o_bENO :B
bSetPositioningData_bENO
RD77_1
DUT: i_stModule
o_bOK :B
bSetPositioningData_bOK
K1
UW: i_uAxis
o_bErr :B
bSetPositioningData_bErr
K1
UW: i_uDataNo
o_uErrId :UW
uSetPositioningData_bErrId
pb_uOpePattern
pb_uCtrlSys
pb_uAccTimeNo
pb_uDecTimeNo
pb_uMcode
pb_uDwellTime
pb_uMcodeOnTiming
pb_uABS
pb_uInterpolateSpd
pb_udCmdSpd
pb_dPositAdr
pb_dArcAdr
pb_uInterpolationAxisNo1
pb_uInterpolationAxisNo2
pb_uInterpolationAxisNo3

Block start data setting program

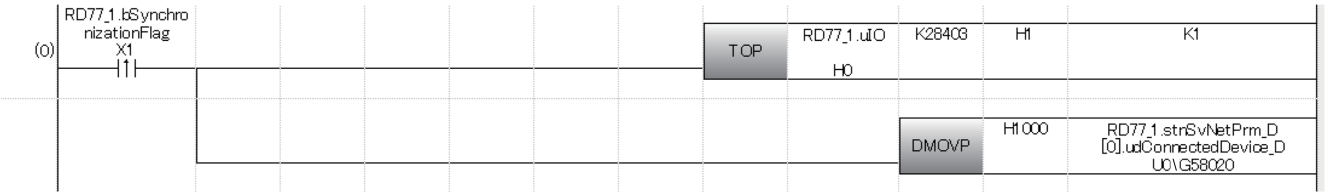
The program is not required when the data is set by "Block Start Data" using an engineering tool.



Servo parameter setting program

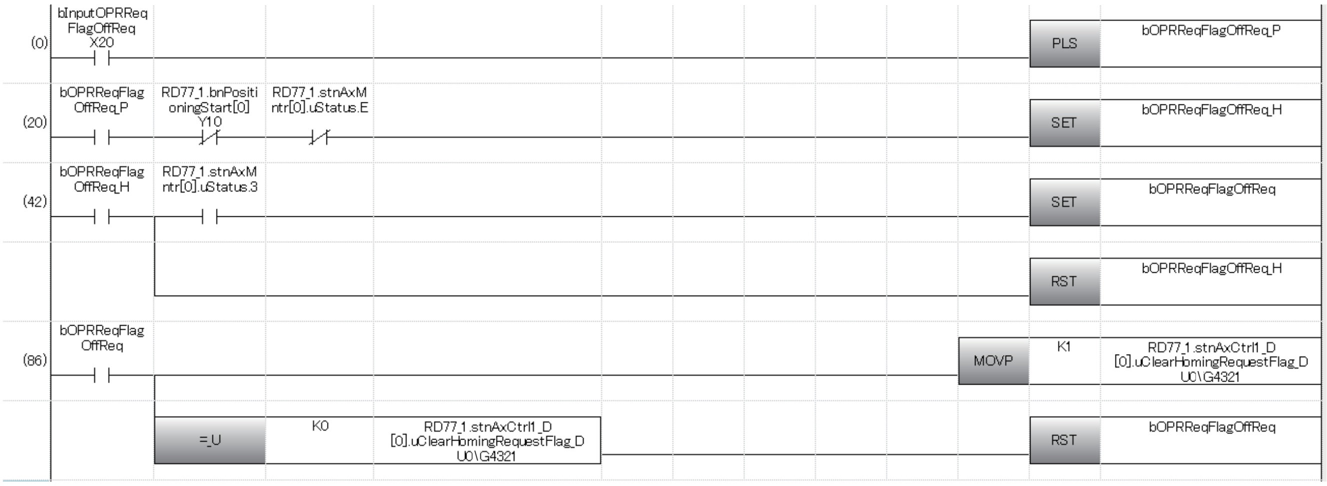
The program is not required when the parameter is set by "Servo Parameter" using an engineering tool.

[RD77MS example]

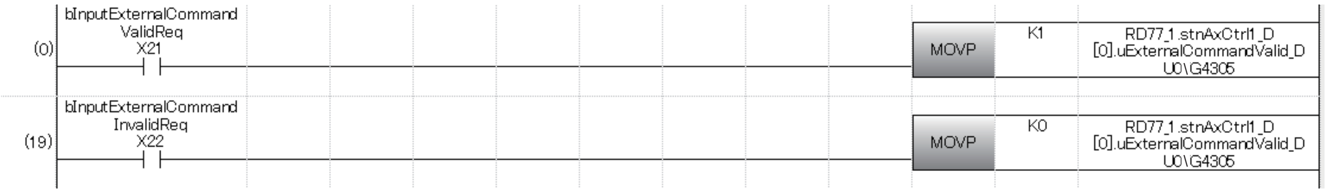


Home position return request OFF program

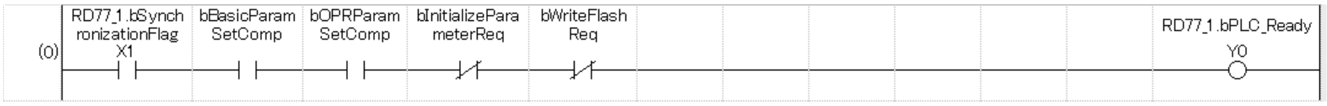
The program is not required when "1: Positioning control is executed." is set in "[Pr.55] Operation setting for incompletion of home position return" by "Home Position Return Detailed Parameters" using an engineering tool.



External command function valid setting program



PLC READY signal [Y0] ON program

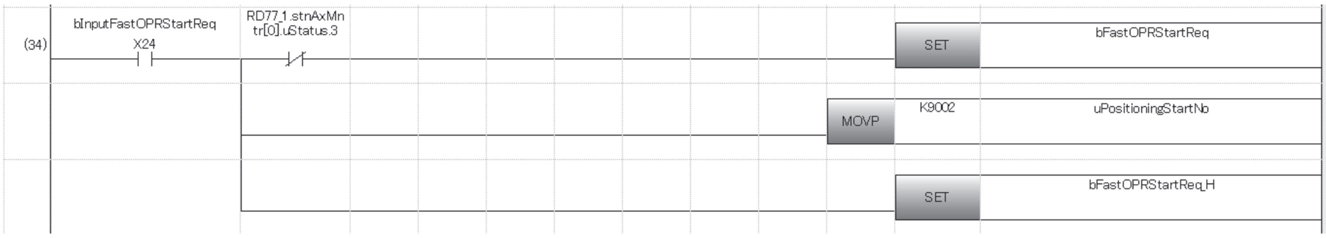


All axis servo ON [Y1] program

Positioning start No. setting program

■Machine home position return

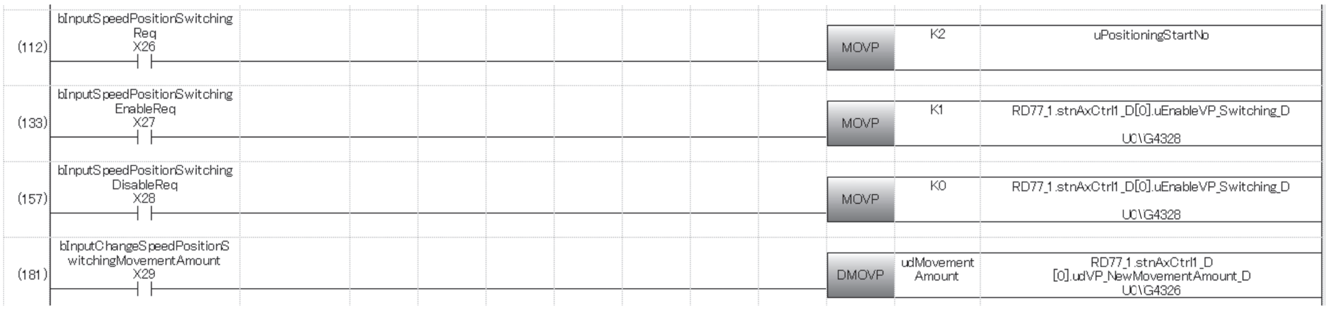
■Fast home position return



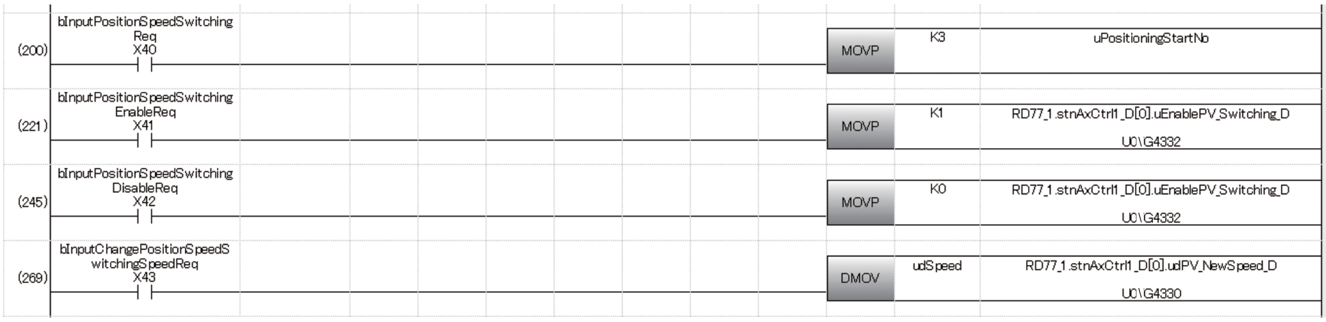
■Positioning with positioning data No.1

■Speed-position switching operation (Positioning data No.2)

In the ABS mode, new movement amount is not needed to be written.



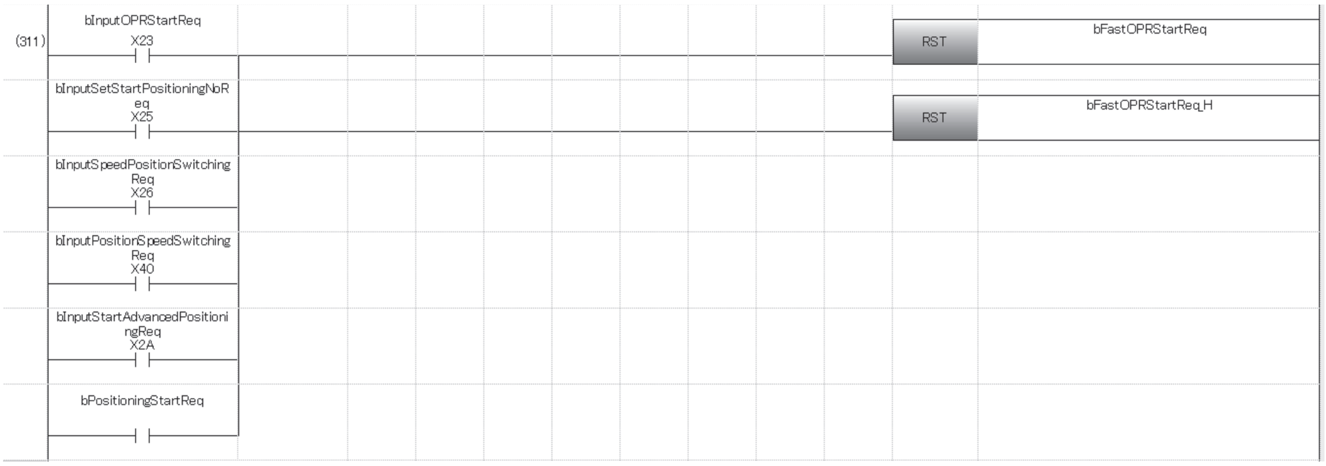
■Position-speed switching operation (Positioning data No.3)



■High-level positioning control

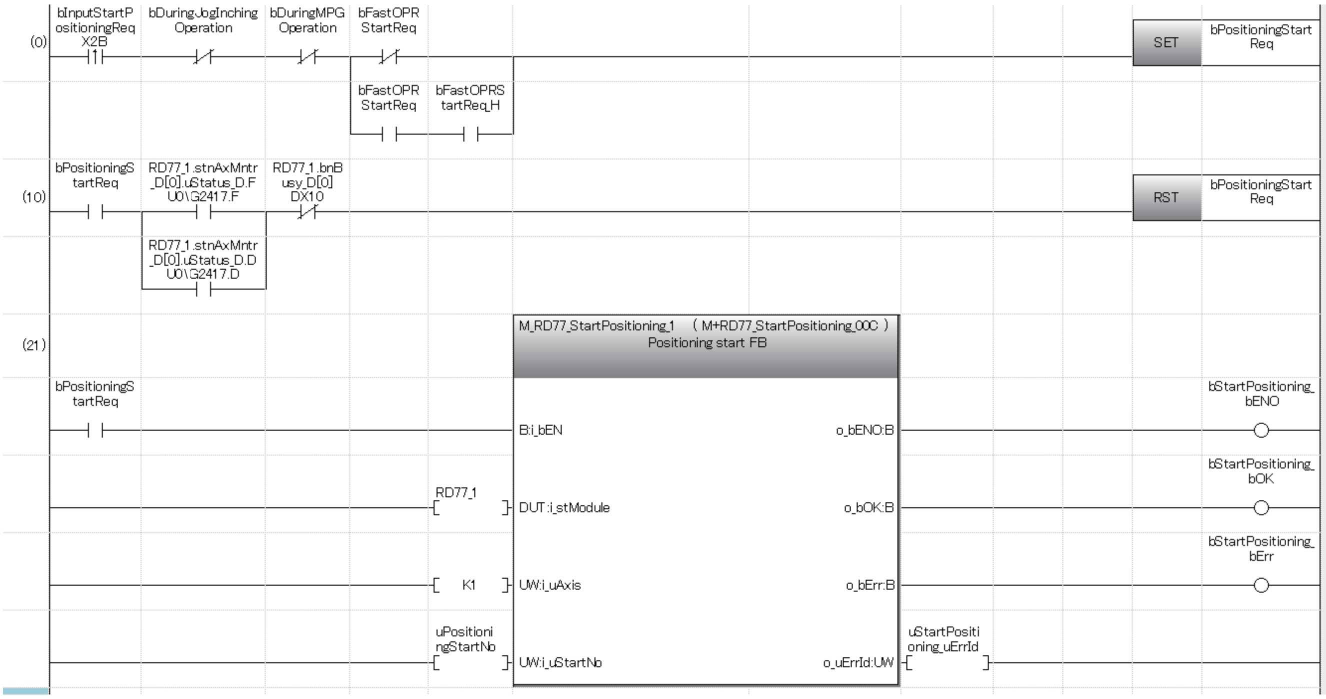
■Fast home position return command and fast home position return command storage OFF

Not required when fast home position return is not used.



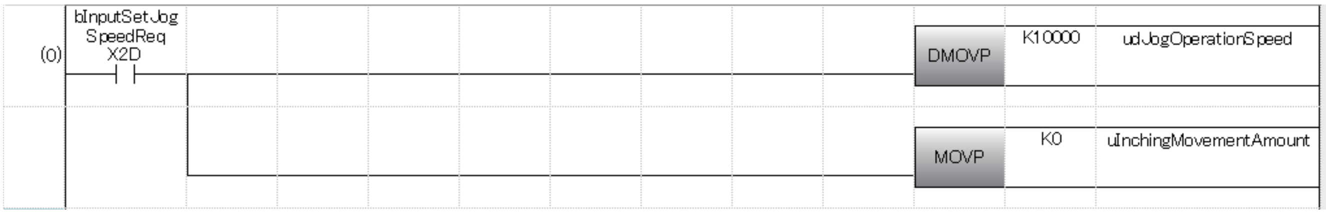
Positioning start program

[RD77MS example]

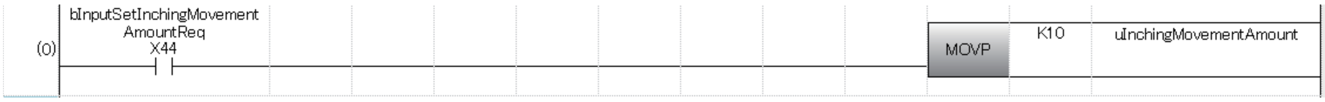


M code OFF program

JOG operation setting program

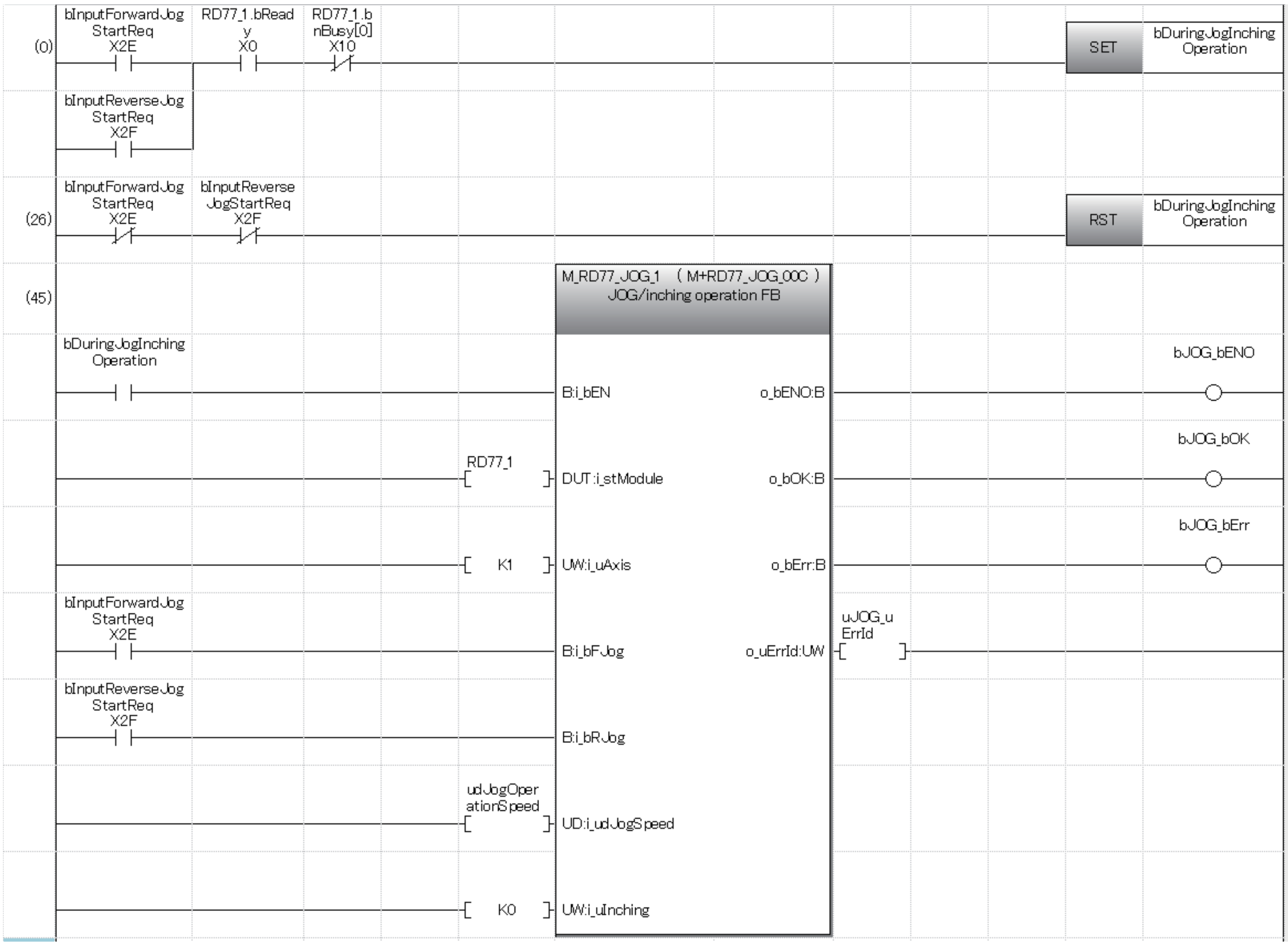


Inching operation setting program



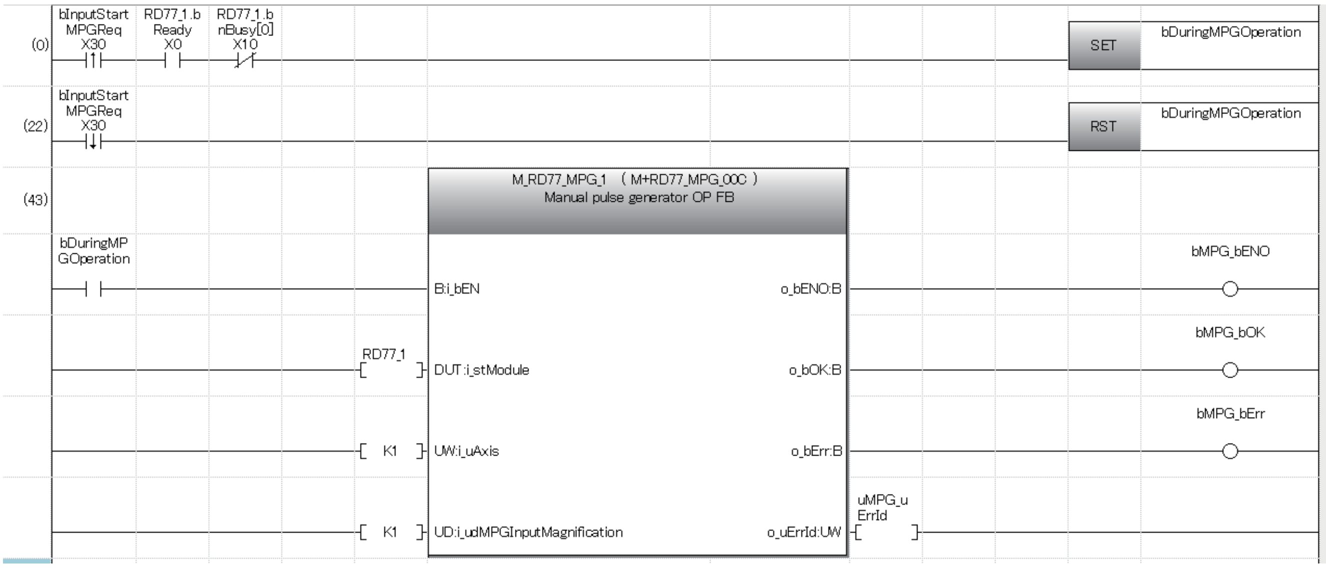
JOG operation/inching operation execution program

[RD77MS example]



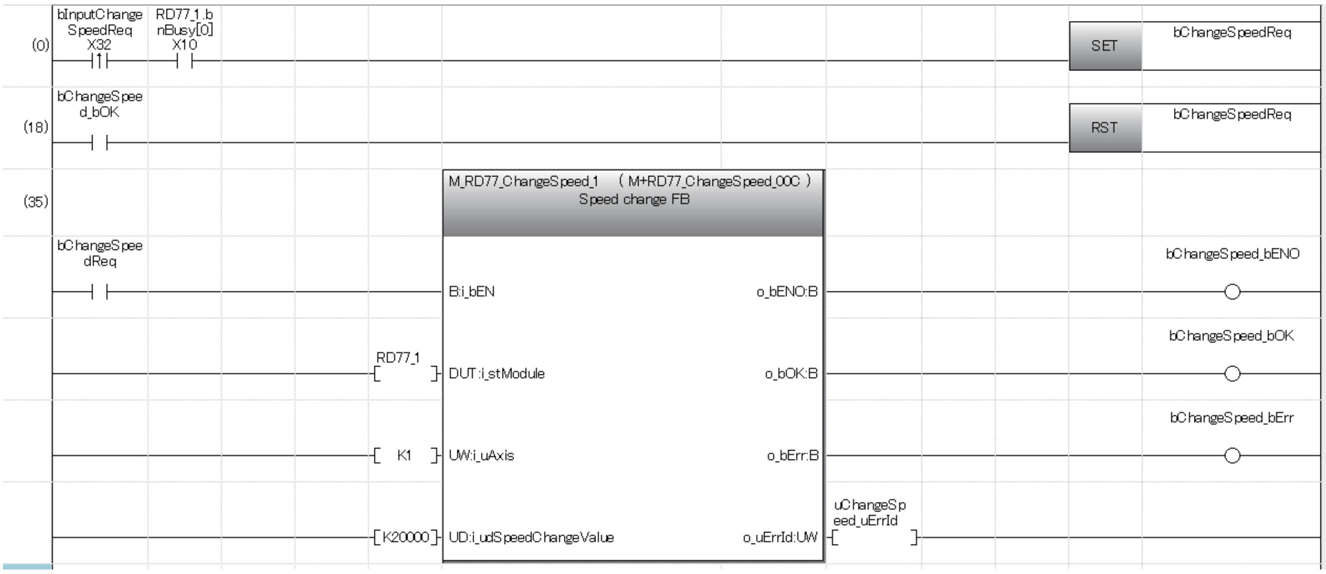
Manual pulse generator operation program

[RD77MS example]

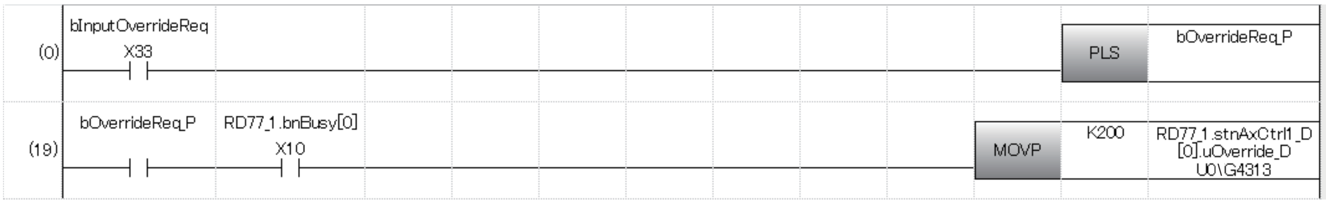


Speed change program

[RD77MS example]

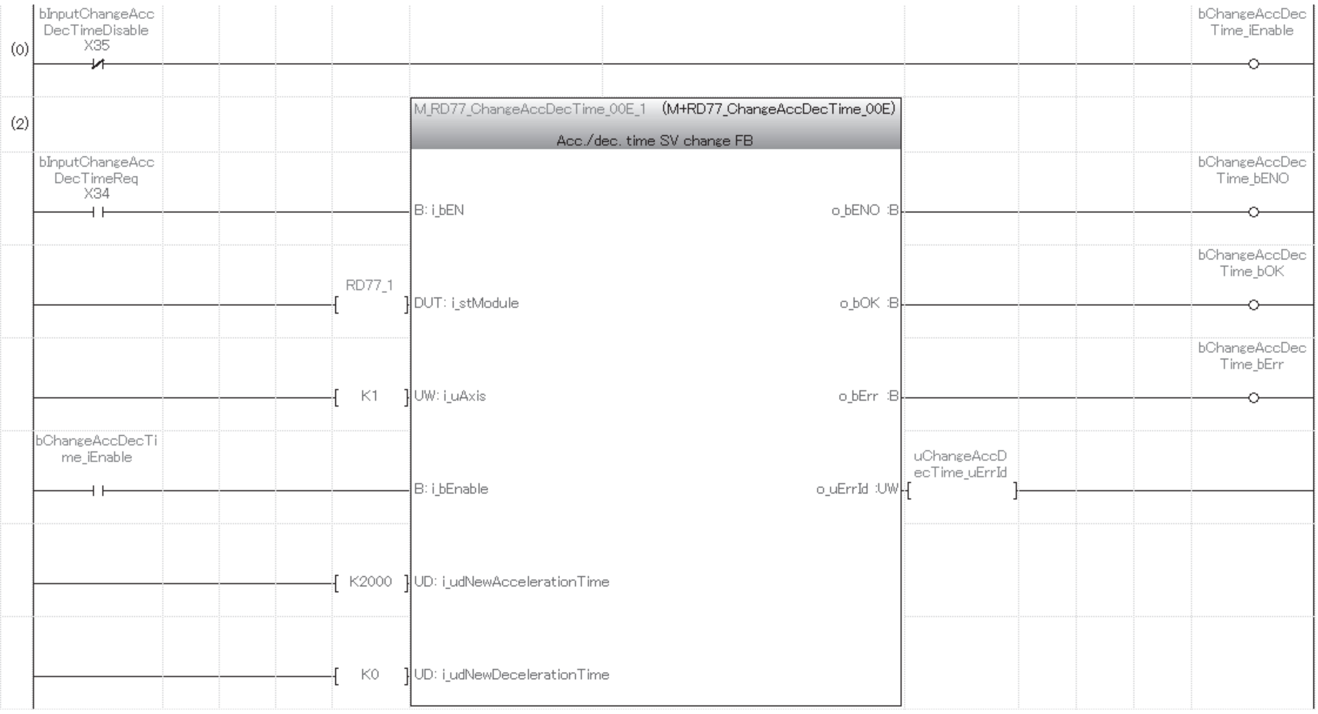


Override program

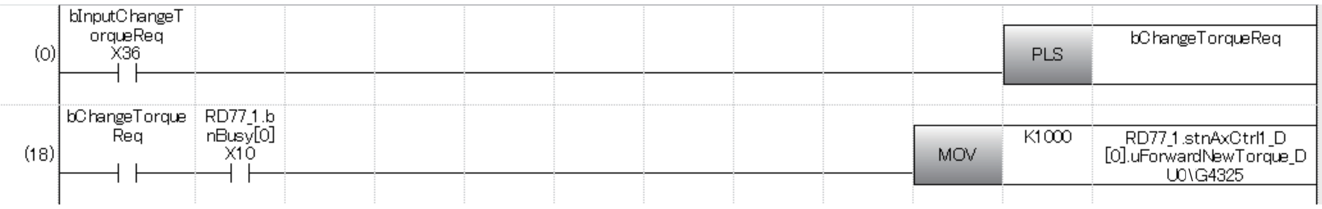


Acceleration/deceleration time change program

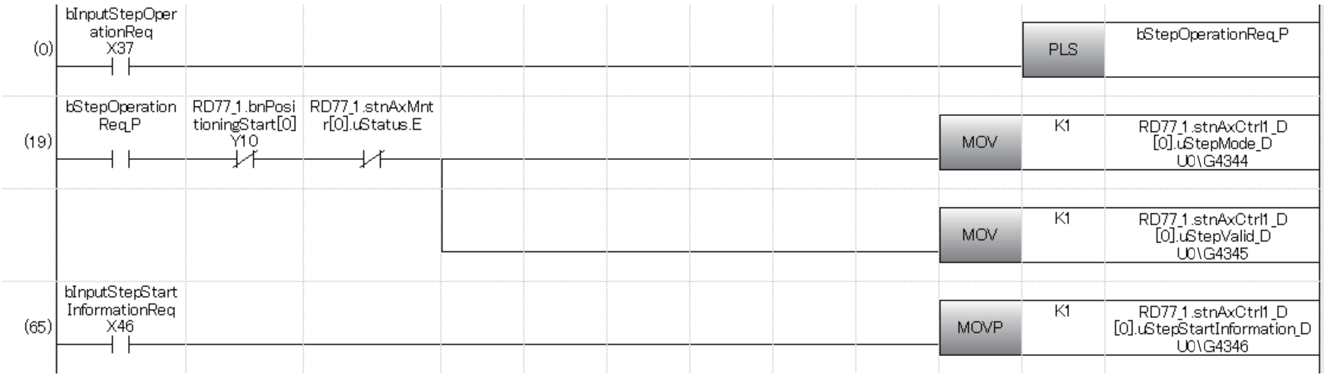
[RD77MS example]



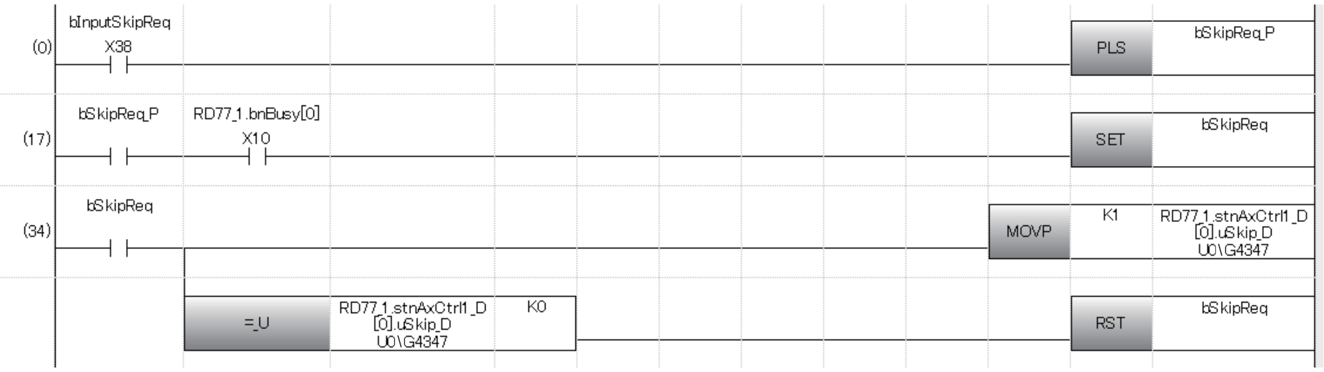
Torque change program



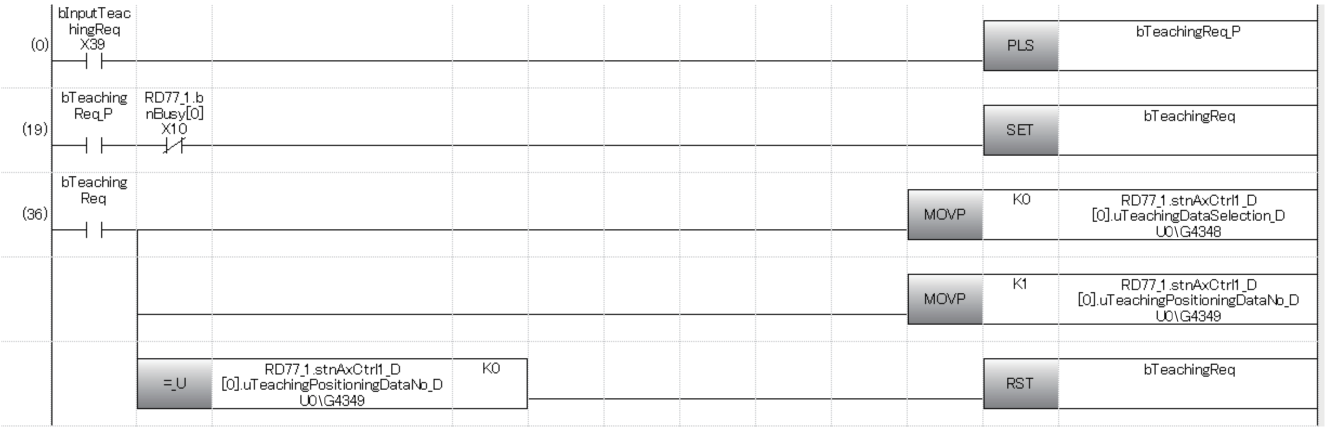
Step operation program



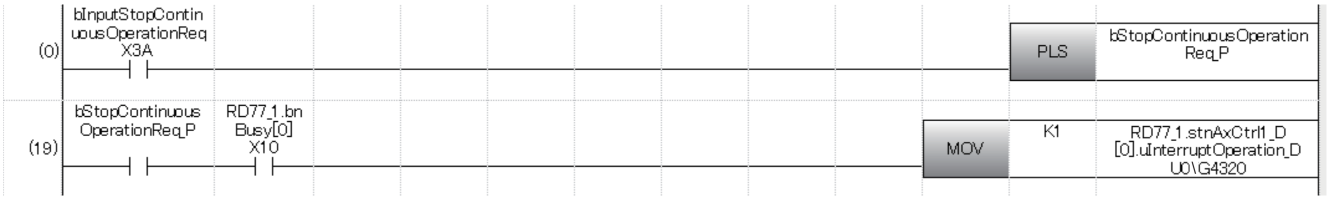
Skip program



Teaching program

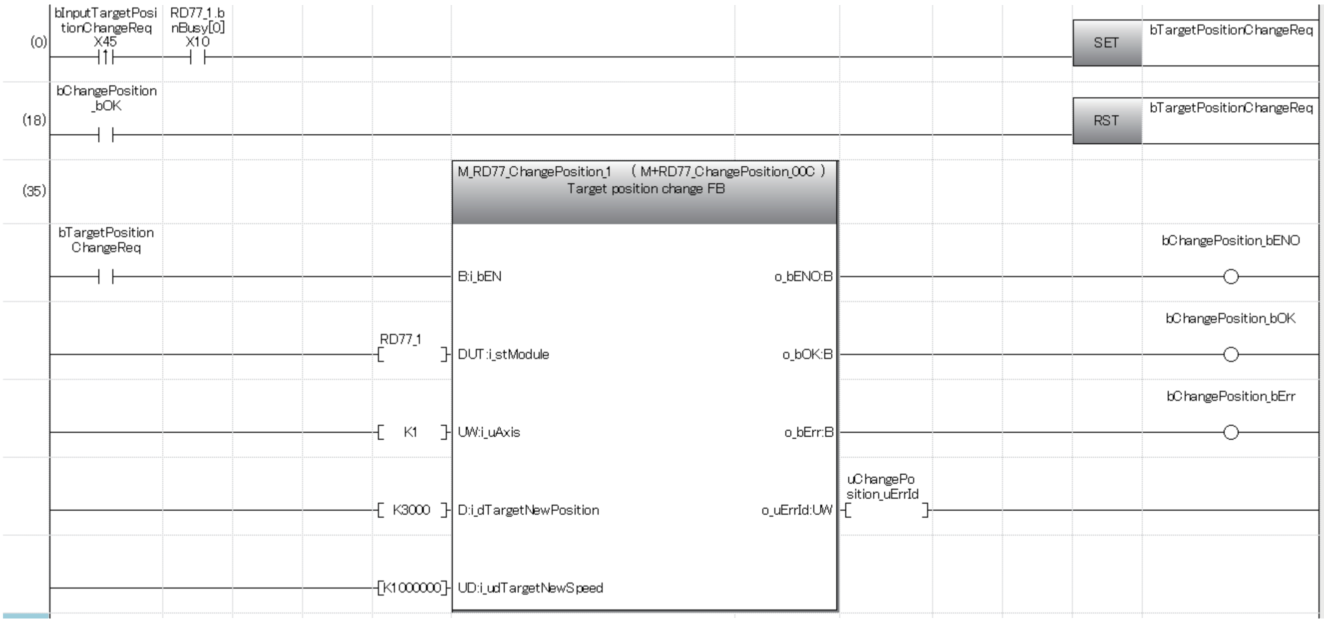


Continuous operation interrupt program



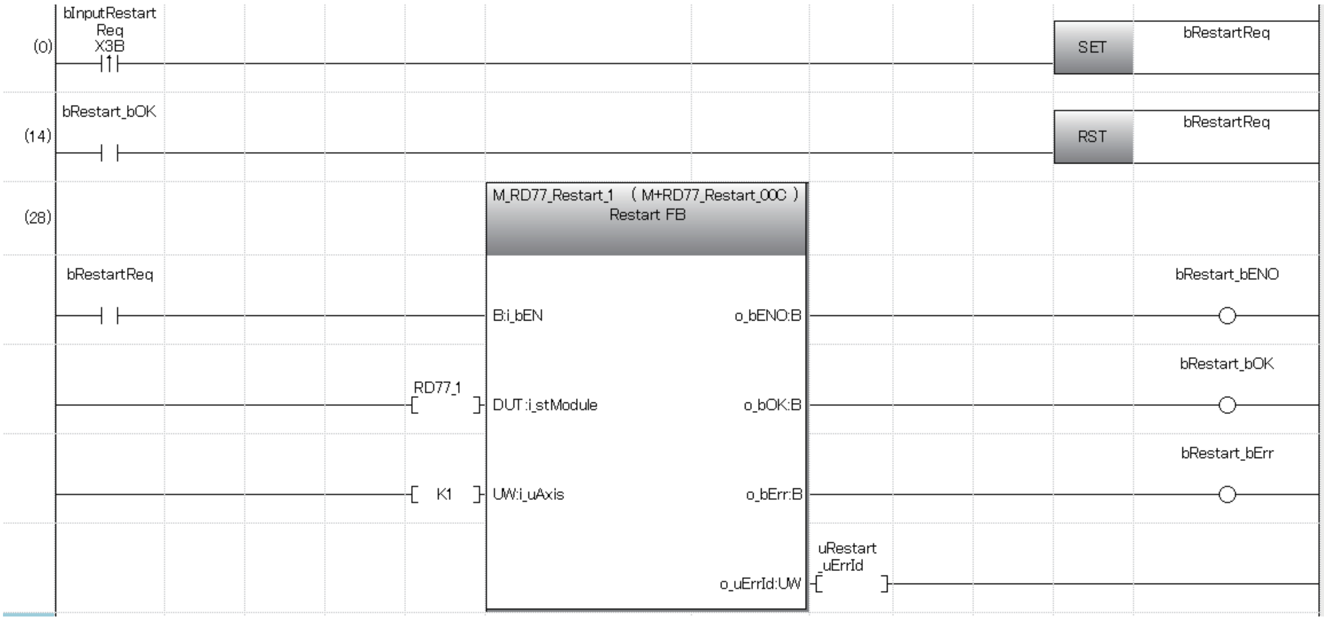
Target position change program

[RD77MS example]



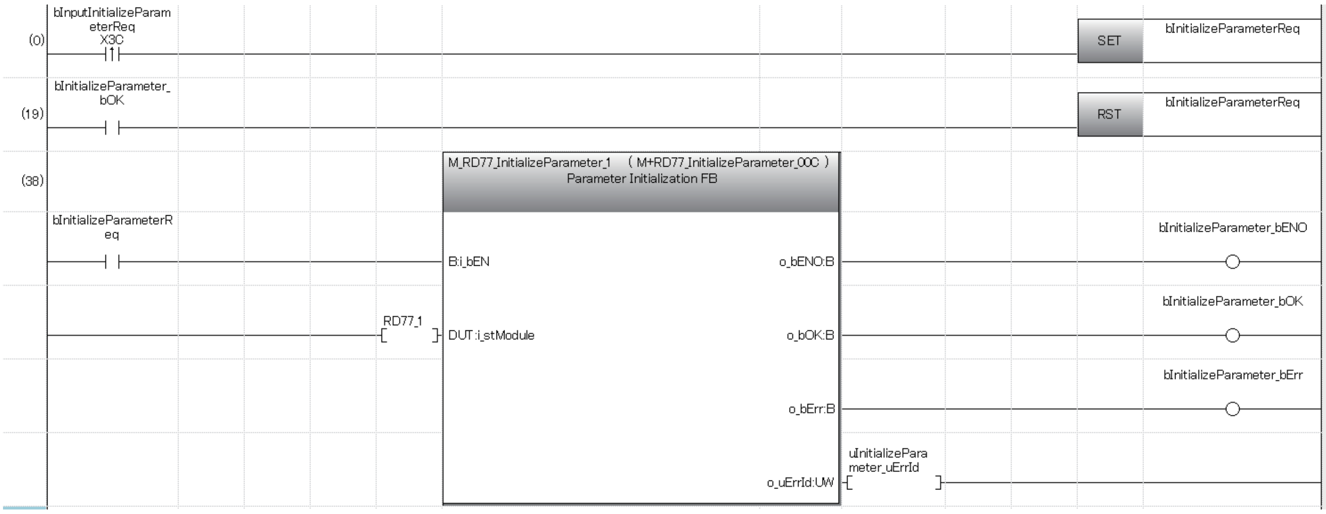
Restart program

[RD77MS example]



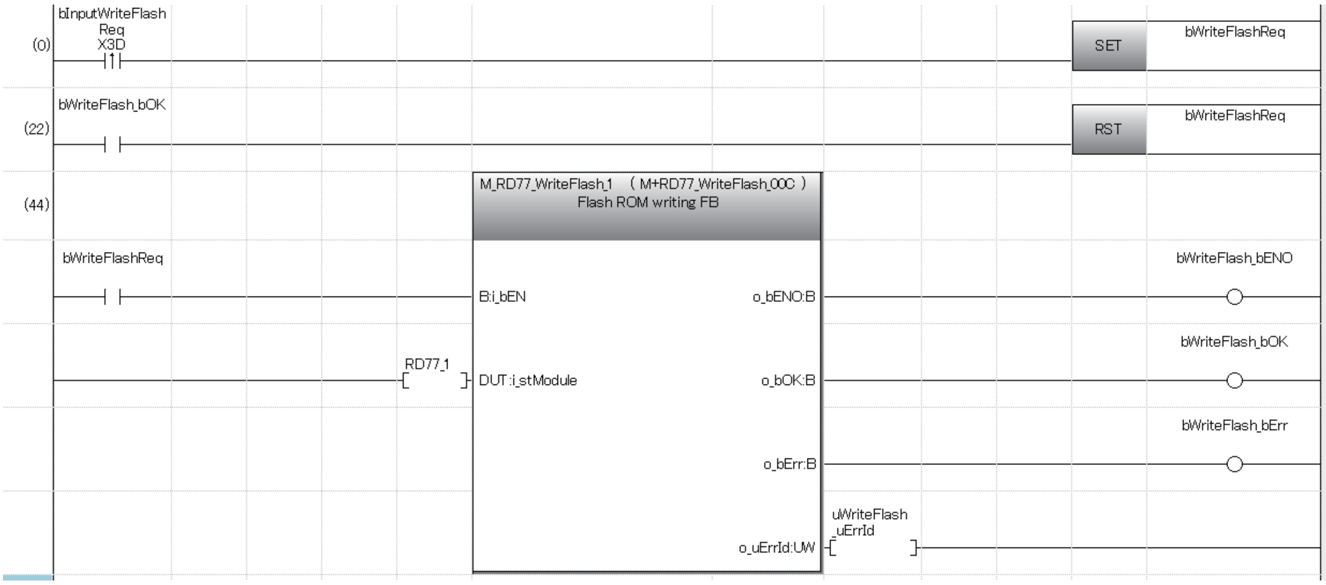
Parameter initialization program

[RD77MS example]



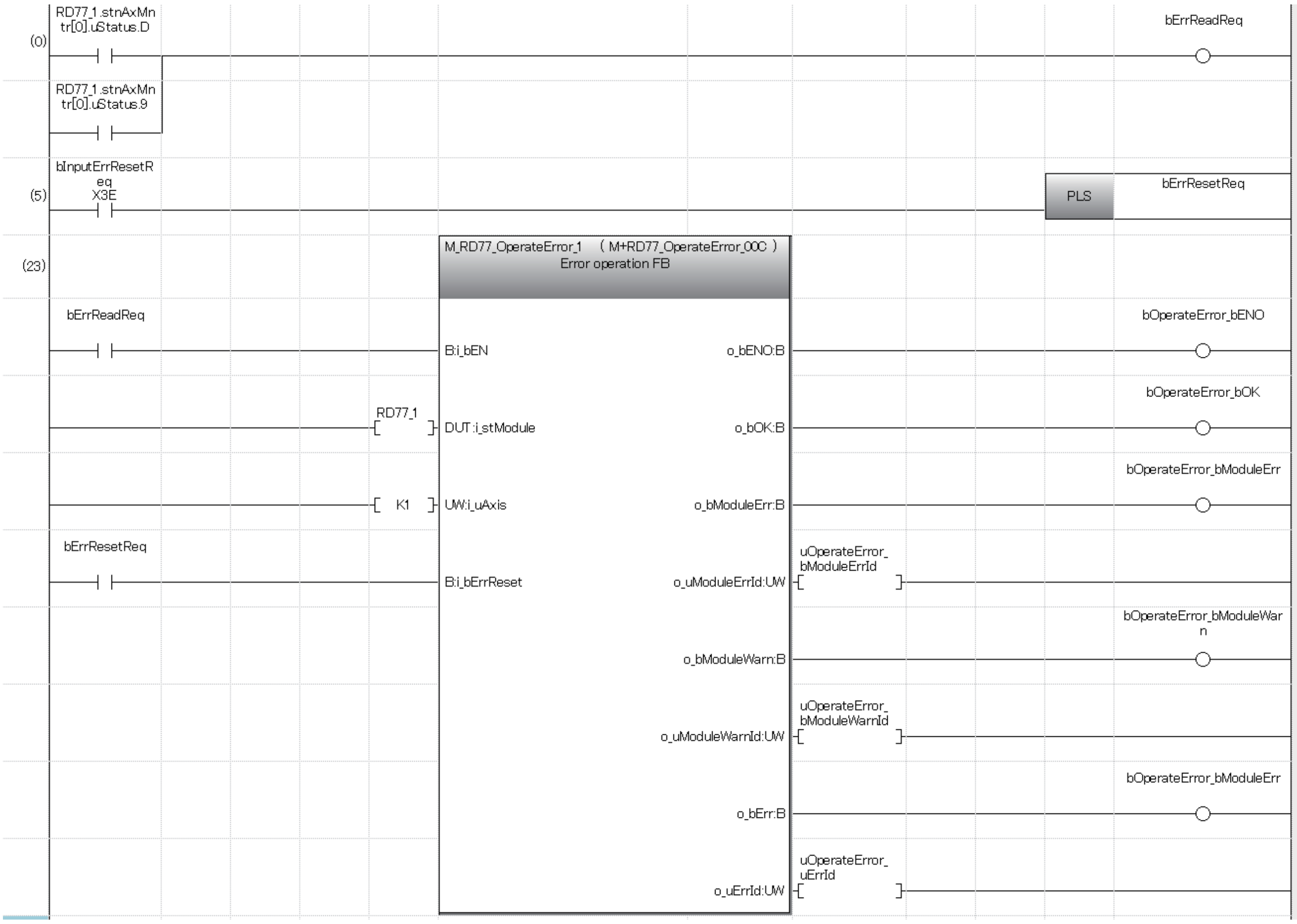
Flash ROM write program

[RD77MS example]

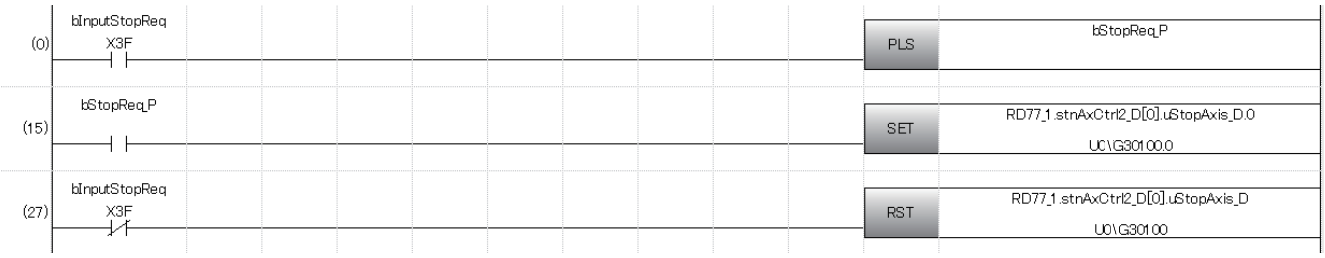


Error reset program

[RD77MS example]



Axis stop program



14 TROUBLESHOOTING

This chapter describes details of error occurred by using the Simple Motion module and troubleshooting.

14.1 Troubleshooting Procedure

When a trouble occurs, execute the troubleshooting in the order shown below.

1. Check that each module is mounted correctly.
 (📖MELSEC iQ-R Module Configuration Manual)
2. Check the LEDs of the power supply module and CPU module.
(📖MELSEC iQ-R CPU Module User's Manual (Startup))
3. Check the LED status of each module to confirm whether an error does not occur in a module. (☞ Page 700 Troubleshooting using the LEDs)
4. Check whether an error does not occur in a module using the module diagnostics of an engineering tool. (☞ Page 703 Troubleshooting using the module status)

Troubleshooting using the LEDs

Primary diagnostics can be executed without the engineering tool by checking the status of the LED display, so that the range of the trouble cause can be reduced.
The following shows the correspondence relation between each LED and status of the Simple Motion module.

LED Display of the RD77MS

□: OFF, ■: ON, ●: Flashing

RD77MS status	LED display		Description	Remedy
Normal operation	RUN ■ ERR □	AX1 □ AX2 □ AX3 □ AX4 □	The axes stopped The axes on standby	—
		AX1-8 □[*1]		
		AX1-16 □[*1]		
	RUN ■ ERR □	AX1 ■ AX2 □ AX3 □ AX4 □	The axis in operation	Turned ON from the positioning start until the axis stops caused by completion, stop, or an error. (One-to-one correspondence with the BUSY signal.)
		AX1-8 ■[*2]		
		AX1-16 ■[*2]		
Operation failure	RUN ■ ERR ■	AX1 ● AX2 □ AX3 □ AX4 □	Minor error	Check the error code on the module diagnostics or event history using the engineering tool, and take a measure against the error described in the list of error codes.
		AX1-8 ●[*3]		
		AX1-16 ●[*3]		
	RUN ■ ERR ●	AX1 □ AX2 □ AX3 □ AX4 □	Moderate error Watchdog timer error	If the RUN LED is not ON after the power is turned ON from OFF, the module might be faulty. Therefore, it is required to exchange the module.
		AX1-8 □		
		AX1-16 □		

RD77MS status	LED display		Description	Remedy
Online module change	RUN ● ERR □	AX1 □ AX2 □ AX3 □ AX4 □	Module remove selection in operation	—
		AX1-8 □		
		AX1-16 □		
	RUN □ ERR □	AX1 □ AX2 □ AX3 □ AX4 □	Module change in operation	—
		AX1-8 □		
		AX1-16 □		

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

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

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

LED Display of the RD77GF

□: OFF, ■: ON, ●: Flashing

RD77GF status	LED display		Description	Remedy
Normal operation	RUN ■ ERR □	AX1-4 □*1	The axes stopped The axes on standby	—
		AX1-8 □*1		
		AX1-16 □*1		
		AX1-32 □*1		
	RUN ■ ERR □	AX1-4 ■*2	The axis in operation	Turned ON from the positioning start until the axis stops caused by completion, stop, or an error. (One-to-one correspondence with the BUSY signal.)
		AX1-8 ■*2		
		AX1-16 ■*2		
		AX1-32 ■*2		
Operation failure	RUN ■ ERR ■	AX1-4 ●*3	Minor error (related to axis)	Check the error code on the module diagnostics or event history using the engineering tool, and take a measure against the error described in the list of error codes.
		AX1-8 ●*3		
		AX1-16 ●*3		
		AX1-32 ●*3		
	RUN ■ ERR ■	AX1-4 □*4	Minor error (general)	
		AX1-8 □*4		
		AX1-16 □*4		
		AX1-32 □*4		
	RUN ■ ERR ●	AX1-4 □	Flashing (every 500 ms): A data link faulty station detected Flashing (every 200 ms): Moderate error	
		AX1-8 □		
		AX1-16 □		
		AX1-32 □		
	RUN □ ERR ■	AX1-4 □	Major error	If the RUN LED is not ON after the power is turned ON from OFF, the module might be faulty. Therefore, it is required to exchange the module.
		AX1-8 □		
		AX1-16 □		
		AX1-32 □		

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

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

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

*4 The AX LED does not turn OFF when the axis is in operation or a minor error (related to axis) has occurred.

□: OFF, ■: ON, ●: Flashing

Status	LED display	Description	Remedy
Indicates the data link status.	D LINK ■[*1]	Data link (cyclic transmission being performed)	Refer to "Checking with LED" in the following. 📖 MELSEC iQ-R Simple Motion Module User's Manual (Network)
	D LINK ●[*1]	Data link (cyclic transmission stopped)	
	D LINK □[*1]	Data link not performed (disconnection)	
Indicates the data sending/ receiving status.	SD/RD ■	Data being sent or received	—
	SD/RD □	Data not sent nor received	
Indicates the receive data and line error status.	L ERR ■	Abnormal data received	Refer to "Checking with LED" in the following. 📖 MELSEC iQ-R Simple Motion Module User's Manual (Network)
	L ERR □	Normal data received	
Indicates the port status.	L ER ■	Abnormal data received	
	L ER □	Normal data received	
Indicates the link status.	LINK ■	Link-up	
	LINK □	Link-down	

[*1] The LED is always OFF in offline mode.

When the RUN LED turns off

Check item	Action
Is the power supplied for the power supply module?	Check that the voltage supplied to the power supply module is within the rated range.
Is the LED of the power supply module turned on?	If the LED is not turned on, refer to the following. 📖MELSEC iQ-R CPU Module User's Manual (Application)
Is the power supply capacity sufficient?	Calculate the total current consumption of the modules connected with the base unit (CPU module, I/O modules, and intelligent function modules) and check that the power supply capacity is not insufficient.
Is the module connected with the base unit correctly?	Check the state of connection with the module.

If there is no problem on the above check items, a hardware failure may have occurred. Reset the CPU module and check that the RUN LED turns on.

If not, the possible cause is a hardware failure. Please consult your local Mitsubishi representative, explaining a detailed description of the problem.

When the ERR LED flashes

Check item	Action
Is there a moderate error?	• An error may have occurred in the CPU module. Check the error occurred in the CPU module and take a corrective action. • A hardware failure may have occurred. Reset the CPU module and check that the RUN LED turns on. If not, the possible cause is a hardware failure. Please consult your local Mitsubishi representative, explaining a detailed description of the problem.

When the ERR LED turns on and AX LED flashes

Check item	Action
Is there a minor error?	Check the error code and take a corrective action.

When the ERR LED turns on

Check item	Action
Is there a synchronous encoder axis error?	Check the error code and take a corrective action.

ERR LED may not correspond to the axis operation status. To check the latest operation status, refer to the error detection signal ([Md.31] Status: b13).

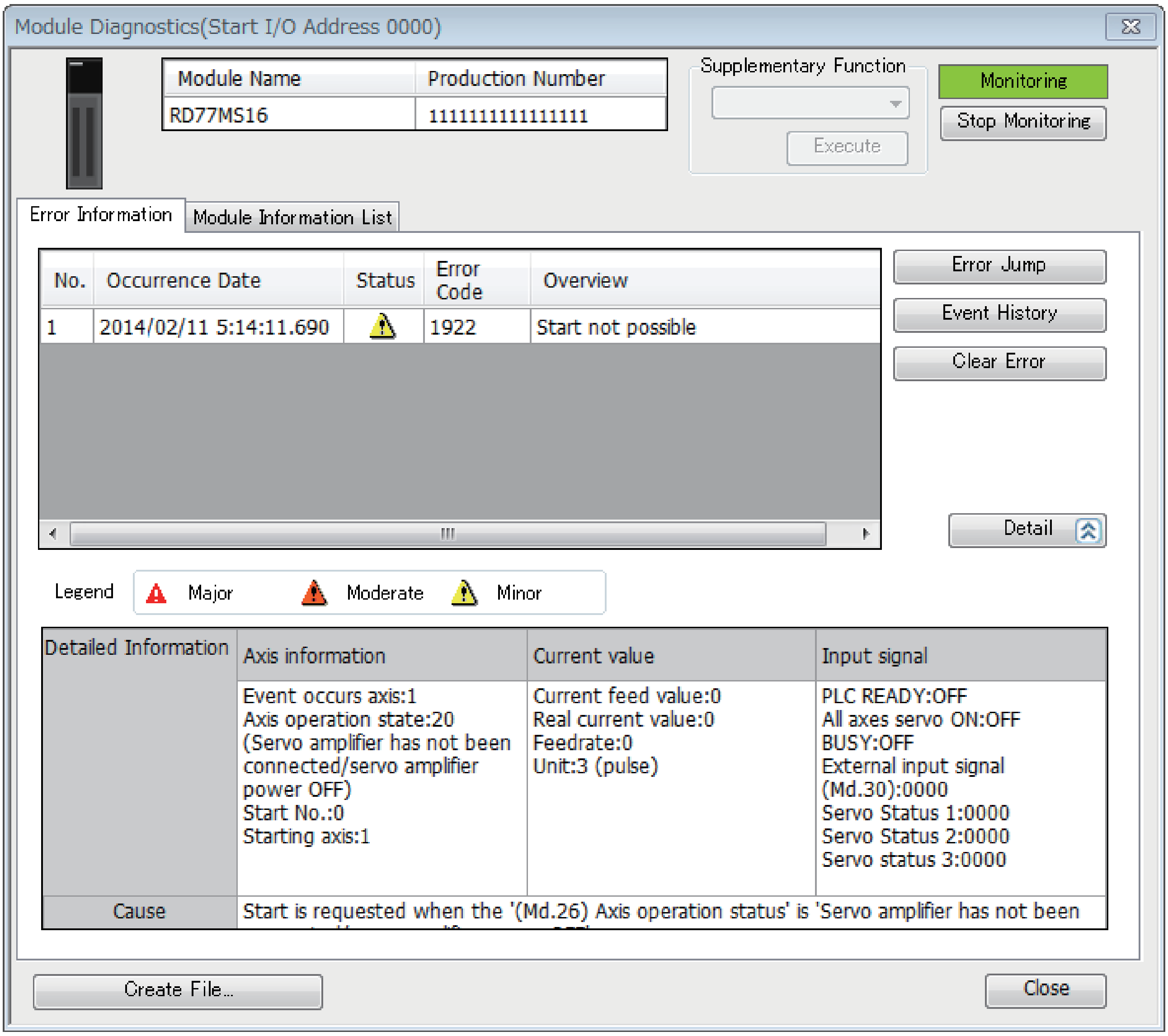
Other than those above

Reset the CPU module and check that the module is in the normal status.

If the status is not changed, the possible cause is a hardware failure. Please consult your local Mitsubishi representative, explaining a detailed description of the problem.

Troubleshooting using the module status

Error codes (warning codes) and error history occurred in the Simple Motion module can be checked on the module diagnostics display of an engineering tool.



Module Diagnostics(Start I/O Address 0000)

Module Name	Production Number
RD77MS16	1111111111111111

No.	Occurrence Date	Status	Error Code	Overview
1	2014/02/11 5:14:11.690	⚠	1922	Start not possible

Legend: ⚠ Major ⚠ Moderate ⚠ Minor

Detailed Information	Axis information	Current value	Input signal
	Event occurs axis:1 Axis operation state:20 (Servo amplifier has not been connected/servo amplifier power OFF) Start No.:0 Starting axis:1	Current feed value:0 Real current value:0 Feedrate:0 Unit:3 (pulse)	PLC READY:OFF All axes servo ON:OFF BUSY:OFF External input signal (Md.30):0000 Servo Status 1:0000 Servo Status 2:0000 Servo status 3:0000
Cause	Start is requested when the '(Md.26) Axis operation status' is 'Servo amplifier has not been		

Point

The error shown on the display may not correspond to "[Md.23] Axis error No.". Refer to "[Md.23] Axis error No." to check the latest error information.

14.2 Troubleshooting by Symptom

Troubleshooting when a motor does not rotate

Check items and corrective actions for troubleshooting when a motor does not rotate are described below.

Check item	Action
Is the PLC READY signal [Y0] turned ON?	Review the program to turn ON the PLC READY signal [Y0].
Is the servo amplifier powered ON?	Power on the servo amplifier.
Is there an error in the servo amplifier?	Check the error code of the servo amplifier and take a corrective action.
Is the wiring between the Simple Motion module and servo amplifier correct?	Check the wiring between the Simple Motion module and servo amplifier, and correct it.
Is the wiring between the servo amplifier and motor correct?	Check the wiring between the servo amplifier and motor, and correct it.
Is the wiring of the limit signal correct?	Check the wiring and logic setting of the limit signal, and correct the wiring.
Is there an error in the Simple Motion module? (ERR LED is on or flashing)	Check the error code and take a corrective action.
Isn't the value in "[Md.26] Axis operation status" "1: stopped"?	• Review the stop program. • Review whether the stop signal (STOP) is not input erroneously.
Is the value in "[Md.20] Command position value" changed after positioning control is performed?	Review the start program.
Is the cumulative pulse of servo amplifier changed after positioning control is performed?	Refer to each servo amplifier instruction manual or manual and check that the function to suppress the motor rotation is not working.
Is the speed change 0 flag ([Md.31] Status: b10) ON?	When the speed is changed 0 by the speed change function, review the speed value to be changed. Review the set value when "[Cd.13] Positioning operation speed override" is set to "0%".

If a motor does not rotate even after the above items are checked, the possible cause is a hardware failure.

Please consult your local Mitsubishi representative, explaining a detailed description of the problem.

Troubleshooting when a motor does not rotate as intended.

Check items and corrective actions for troubleshooting when a motor does not rotate as intended are described below.

■When a motor rotates only in the opposite direction

Check item	Action
Is the value in "Rotation direction selection/travel direction selection (PA14)" correct?	Check that the value in "Rotation direction selection/travel direction selection (PA14)" matches the settings of servo amplifier. When "Rotation direction selection/travel direction selection (PA14)" has been changed, turn the servo amplifier power supply ON again from OFF or reset the controller, and execute the home position return.

■When a motor does not rotate at the set speed

Check item	Action
Does the value in "[Md.28] Axis speed command"[*1] indicate the set speed?	[When "[Md.28] Axis speed command"[*1] indicates the set speed] • Check that the values in "[Pr.2] Number of pulses per rotation (AP)", "[Pr.3] Movement amount per rotation (AL)", and "[Pr.4] Unit magnification (AM)" meet the system. • When the servo amplifier has the electronic gear function, check that the settings meet the system.
	[When "[Md.28] Axis speed command"[*1] does not indicate the set speed] • Check that the speed is not limited by the value in "[Pr.8] Speed limit value". • In the JOG operation, check that the speed is not limited by the value in "[Pr.31] JOG speed limit value". • In the JOG operation, check that Forward run JOG start signal [Cd.181] and Reverse run JOG start signal [Cd.182] do not repeatedly turn ON and OFF.

*1 Speed control mode and continuous operation to torque control mode: "[Md.122] Speed during command"

■When the set position is not reached

Check item	Action
Does the value in "[Md.20] Command position value" indicate the intended position when the motor stops?	[When the position set in "[Md.20] Command position value" is reached] • Check that the values in "[Pr.2] Number of pulses per rotation (AP)", "[Pr.3] Movement amount per rotation (AL)", and "[Pr.4] Unit magnification (AM)" meet the system. • When the servo amplifier has the electronic gear function, check that the settings meet the system.
	[When the position set in "[Md.20] Command position value" is not reached] • Check that the motor is not stopped by Axis stop signal [Cd.180]. If a motor is stopped by the stop command, the value "1: stopped" is stored in "[Md.26] Axis operation status".

■When a communication time-out occurs on the engineering tool

Check item	Action
Is the communication cycle set for the operation cycle time sufficiently long?	Check the positioning details, or change the setting of "[Pr.96] Operation cycle setting" to a longer value. In addition, when a communication time-out occurs when performing flash ROM writing or parameter initialization from the engineering tool, perform communication load reduction by turning OFF the power supply of the connected servo amplifier, etc., to shorten the operation processing time.

■When parameters are not applied

Check item	Action
Is the fetch timing of each parameter correct?	Check the fetch timing of each parameter. For details, refer to each function description or the following. ☞ Page 659 Details of areas If parameters are not applied after restarting the module, check if the execution data backup has been performed. For details, refer to the following. ☞ Page 330 Execution Data Backup Function

■When a servo amplifier cannot be connected

Check item	Action
Is there any poor contact of a connector or cable disconnection?	Check the SSCNETⅢ cable. (Check for connection failure and damage)

14.3 Error and Warning Details

Error type

Errors detected by the Simple Motion module include parameter setting range errors, errors at operation start or during operation and errors detected by servo amplifier.

Simple Motion module detection parameter setting range errors

The parameters are checked when the power is turned ON and at the rising edge (OFF → ON) of the PLC READY signal [Y0]. An error will occur if there is a mistake in the parameter setting details at that time.

When this kind of error occurs, the READY signal [X0] does not turn ON.

To cancel this kind of error, set the correct value in the parameter for which the error occurred, and then turn ON the PLC READY signal [Y0].

Simple Motion module detection errors at operation start or during operation

The errors that occur at operation start or during operation such as the positioning control, JOG operation, or manual pulse generator operation. If an axis error occurs during interpolation operation, the error code will be stored in both the reference axis and the interpolation axis.

Note that the axis error No. will be stored only in the reference axis during analysis of the positioning data set in each point of the positioning start data table in the following cases.

- When the interpolation axis is BUSY.
- When the error occurs in positioning data or parameters unrelated to interpolation control.

If the error occurs at the simultaneous start of a positioning operation, the axis error storage details will differ depending on whether the error occurred before or after the simultaneous start.

- If the error (illegal axis No., other axis BUSY, etc.) occurs before the simultaneous start, the error "Error before simultaneous start" (error code: 1990H to 1991H) will occur for the start axis.
- If the error (positioning data error, software stroke limit error, etc.) occurs after the simultaneous start, an error code corresponding to the axis in which the error occurred will be stored. Because a simultaneous start cannot be carried out due to this, the error "Simultaneous start not possible" (error code: 199EH) will be stored in all axes in which an error has not occurred.

The axis operation status will be displayed as "error occurring" for axes in which an error occurred.

If an error occurs during operation, any moving axes will deceleration stop, and their operation status will be displayed as "error occurring".

All axes will decelerate to a stop during interpolation operations, even if the error occurs in only one axis.

Servo amplifier detection errors

The errors that occur when the hardware error of the servo amplifier or servo motor or the servo parameter error occurs.

The servo is turned off at the error occurrence and the axis stops.

Remove the error factor and reset the error, reset the controller, or turn the servo amplifier power supply ON again from OFF.

Error code classification

Item	Error code	Classification of errors
Minor errors	1860H to 18BFH	Dedicated instruction errors
	18C0H to 18FFH	Inter-module synchronization errors
	1900H to 193FH	Positioning control common errors
	1940H to 197FH	Home position return errors
	1980H to 198FH	JOG, inching and manual pulse generator operation errors
	1990H to 19EFH	Positioning operation errors
	19F0H to 19FFH	Block start data errors
	1A00H to 1A0FH	Condition data errors
	1A10H to 1A5FH	Positioning data errors
	1A60H to 1A9FH	Basic parameter errors
	1AA0H to 1AFFH	Detailed parameter errors
	1B00H to 1B3FH	Home position return parameter errors
	1B40H to 1B9FH	Extended/Common parameter errors
	1BA0H to 1BDFH	Synchronous control input axis errors
	1BE0H to 1C3FH	Synchronous control output axis errors
	1C80H to 1CBFH	Errors for servo amplifier, inverter, amplifier manufactured by other companies, and head module
	1CC0H to 1CCFH	Link device external signal assignment errors
Moderate errors	3000H to 30FFH	Initial process errors

Error storage

When an error occurs, the error detection signal turns ON, and the error code corresponding to the error details is stored in "[Md.23] Axis error No.". Note that there is a delay of up to operation cycle after the error detection signal turns ON until the error code is stored.

When an alarm occurs on servo amplifier, the alarm No. displayed in LED of servo amplifier is stored in "[Md.114] Servo alarm". Check the error details and remedies with "[Md.114] Servo alarm".

Axis No.[1]	Error detection signal	Error code	Servo alarm
1	[Md.31] Status: b13	[Md.23] Axis error No.[2]	[Md.114] Servo alarm
2			
3			
4			
5			
⋮			
32			

*1 It differs by the module that is used.

*2 A new error code is stored in "[Md.23] Axis error No." every time an error occurs.

Point

When any error that is independent of an axis is detected, it is stored in the axis error No. of axis 1. (These errors are stored in the axis error No. of axis 1 for the system which does not use the axis 1.)

For the synchronous encoder axis, "b4: Error detection flag" of "[Md.325] Synchronous encoder axis status" for target axis turns ON, and the input axis error No. is stored in "[Md.326] Synchronous encoder axis error No.".

Warning type

Warnings detected by the Simple Motion module include system warnings, axis warnings and warnings detected by servo amplifier.

Simple Motion module detection system warnings

- System control data setting warnings: An axis warning for axis 1 will occur.
- Positioning data setting warnings: An axis warning for each axis will occur. Note that a warning will occur for the reference axis when an interpolation designation or axis setting warning occurs.

Simple Motion module detection axis warnings

- Axis warnings that occur at operation start or during operation such as the positioning operation, JOG operation or manual pulse generator operation.
- Axis warnings that occur due to system warnings: The axis operation status does not change even though an axis warning occurs.

Servo amplifier detection warnings

The warnings that occur when the hardware error of the servo amplifier or servo motor occurs or the servo parameter is inapplicable.

The servo may not be turned off depending on the warning. However, an error occurs or the operation cannot be executed normally if the warning is remained.

When the warning cause is removed, the warning is automatically released in the servo amplifier. However, the state that the warning occurs is continued in the Simple Motion module.

Reset it as necessary.

Warning code classification

Item	Warning code	Classification of warnings
Warnings	0900H to 093FH	Positioning control common warnings
	0980H to 098FH	JOG, inching and manual pulse generator operation warnings
	0990H to 09EFH	Positioning operation warnings
	09F0H to 09FFH	Block start data warnings
	0A10H to 0A5FH	Positioning data warnings
	0BA0H to 0BDFH	Synchronous control input axis warnings
	0BE0H to 0C3FH	Synchronous control output axis warnings
	0C40H to 0C7FH	Cam data operation warnings
	0C80H to 0CBFH	Warnings for servo amplifier, inverter, amplifier manufactured by other companies, and head module
	0CC0H to 0CCFH	Inter-module synchronization cycle warnings
	0CD0H to 0CDFH	Link device external signal assignment warnings

Warning storage

When an axis warning occurs, the warning code corresponding to the warning details is stored in "[Md.24] Axis warning No.".

When an axis warning occurs in a positioning operation, etc., axis warning detection ([Md.31] Status: b9) for axis status storage turns ON.

When a warning occurs on servo amplifier, the warning No. displayed in LED of servo amplifier is stored in "[Md.114] Servo alarm". Check the warning details and remedies with "[Md.114] Servo alarm".

Warning detection signal	Warning code	Servo alarm
[Md.31] Status: b9	[Md.24] Axis warning No.[1]	[Md.114] Servo alarm

[1] A new warning code is stored in "[Md.24] Axis warning No." every time a warning occurs.

For the synchronous encoder axis, "b5: Warning detection flag" of "[Md.325] Synchronous encoder axis status" for target axis turns ON, and the input axis warning No. is stored in "[Md.327] Synchronous encoder axis warning No.".

Clearing errors and warnings

Remove the cause of error or warning following the actions described in the sections below before canceling an error or warning state by resetting the error.

☞ Page 710 List of Warning Codes, ☞ Page 722 List of Error Codes

How to clear errors or warnings

An error or warning state is canceled after the following processing is carried out by setting "1" in "[Cd.5] Axis error reset".

- Axis error detection signal is turned OFF.
- "[Md.23] Axis error No." is cleared.
- "[Md.24] Axis warning No." is cleared.
- "[Md.26] Axis operation status" is changed from "Error" to "Standby".
- "Axis warning detection ([Md.31] Status: b9)" is turned OFF.

Point

When servo amplifier alarms cannot be reset even if error reset is requested, "0" is not stored in "[Cd.5] Axis error reset" by Simple Motion module. It remains "1". Set "0" in "[Cd.5] Axis error reset" and then set "1" to execute the error reset again by user side.

For the synchronous encoder axis, an error or warning state is canceled after the following processing is carried out by setting "1" in "[Cd.323] Synchronous encoder axis error reset" for target axis.

- "b4: Error detection flag" of "[Md.325] Synchronous encoder axis status" is turned OFF.
- "[Md.326] Synchronous encoder axis error No." is cleared.
- "b5: Warning detection flag" of "[Md.325] Synchronous encoder axis status" is turned OFF.
- "[Md.327] Synchronous encoder axis warning No." is cleared.

14.4 List of Warning Codes

Simple Motion module detection warning

Warning code (Hexadecimal)	Warning name	Error details and causes	Remedy
0900H	Start during operation	• The start request is issued while the axis is BUSY. • Positioning was started during speed control mode/ torque control mode. [Operation status at warning occurrence] Position control mode: The operation continues. Speed control mode/torque control mode: The operation continues. (Positioning start is not executed.)	• Normalize the start request ON timing. • When in speed control mode/torque control mode, start positioning after switching to the position control mode.
0902H	Restart not possible	The restart command is issued when the axis operation status is not "Stopped". [Operation status at warning occurrence] Continues the operation.	Normalize the start request ON timing. (Do not issue the restart command when the axis operation status is not stopped.)
0903H	Teaching in BUSY	The teaching request is issued while the axis is BUSY. [Operation status at warning occurrence] The warning is issued for the axis designated at the time of the teaching request.	Carry out the teaching request when the axis is not BUSY.
0904H	Less than minimum speed	The overridden speed becomes "0". [Operation status at warning occurrence] The system is controlled with the currently executing unit of 1.	Prevent the overridden speed from being reduced to 0.
0905H	In PLC READY	The request for writing to the flash ROM is issued when the PLC READY signal [Y0] is turned ON. [Operation status at warning occurrence] The warning for axis 1 is issued.	Request to write when the PLC READY signal [Y0] is OFF.
0906H	Illegal override value	A value other than 0 to 300 is set for the override value. [Operation status at warning occurrence] When a setting value is 301 or more: Controlled at 300.	Set a value within the setting range.
0907H	Outside new torque value range/outside forward new torque value range	A new torque value/forward new torque value exceeds the torque limit setting value.*1 [Operation status at warning occurrence] The torque change is not carried out.	Set a new torque value/forward new torque value equal to or less than the torque limit setting value.
0908H	Below bias speed	The command speed is below the bias speed at start. [Operation status at warning occurrence] Operates by the bias speed at start.	Re-set the command speed/bias speed at start so that the command speed is equal to or larger than the bias speed at start.
092EH	Mark detection link device start No. specification [RD77GF]	The corresponding station does not exist in link device that has been set to mark detection signal link device start No.. [Operation status at warning occurrence] The setting No. of which the mark detection setting parameter is outside the range is invalid.	Review the mark detection signal link device start No. setting.
092FH	Mark detection link device bit specification [RD77GF]	Bit other than 0 to F has been specified in mark detection signal link device. [Operation status at warning occurrence] The setting No. of which the mark detection setting parameter is outside the range is invalid.	Review the mark detection signal link device bit No. setting.
0931H	Operation cycle time over error [RD77GF]	The calculation process time of the positioning etc. exceeds the operation cycle. [Operation status at warning occurrence] The operation continues.	Review the content of the positioning or operation cycle setting (inter-module synchronization cycle setting value) longer than the current setting.
0932H	Outside new reverse torque value range	A new reverse torque value exceeds the torque limit setting value. [Operation status at warning occurrence] The torque change is not carried out.	Set a value which does not exceed the torque limit setting value as the new reverse torque value.

Warning code (Hexadecimal)	Warning name	Error details and causes	Remedy
0933H	Optional data monitor data type setting error [RD77MS]	In the optional data monitor, 2-word data is not set correctly. [Operation status at warning occurrence] The value is not stored to the monitor output correctly.	Set the 2-word data to "[Pr.91] Optional data monitor: Data type setting 1" or "[Pr.93] Optional data monitor: Data type setting 3" and 0 to "[Pr.92] Optional data monitor: Data type setting 2" or "[Pr.94] Optional data monitor: Data type setting 4".
	Servo cyclic transmission setting warning [RD77GF]	The size setting over 5 bytes of servo cyclic transmission is incorrect. [Operation status at warning occurrence] The servo cyclic transmission is not executed.	• The specification of data over 5 bytes will be set to "[Pr.500] Optional send PD01" or "[Pr.502] Optional send PDO3", and "0" will be set to "[Pr.501] Optional send PDO2" or "[Pr.503] Optional send PDO4". • The specification of data over 5 bytes will be set to "[Pr.506] Optional receive PD01" or "[Pr.508] Optional receive PDO3", and "0" will be set to "[Pr.507] Optional receive PDO2" or "[Pr.509] Optional receive PDO4".
0935H	VCⅡ series parameter setting error	The servo parameter "Absolute position detection system (PA03)"*2is different from VCⅡ series. [Operation status at warning occurrence] The operation is executed by the setting of VCⅡ series.	Match the setting of the servo parameter "Absolute position detection system (PA03)"*2 to the setting of VCⅡ series, and turn the PLC READY signal [Y0] from OFF to ON.
0934H	Carryover command pulse over	The command pulses that exceed the maximum command pulses occur continuously and the excessive number of times is exceeded. [Operation status at warning occurrence] The operation continues.	• Set a smaller backlash compensation amount. • Reduce the command speed.
0936H	Outside mark detection signal setting range	The mark detection signal setting is outside the range. [Operation status at warning occurrence] The setting No. of which the mark detection setting parameter is outside the range is invalid.	Set a value within the setting range.
0937H	Outside mark detection data type setting range	The mark detection data type setting is outside the range. [Operation status at warning occurrence] The setting No. of which the mark detection setting parameter is outside the range is invalid.	Set a value within the setting range.
0938H	Outside mark detection data axis No. setting range	When the mark detection data type setting is not "Optional 2 word buffer memory", the mark detection data type setting is outside the range. [Operation status at warning occurrence] The setting No. of which the mark detection setting parameter is outside the range is invalid.	Set a value within the setting range.
0939H	Outside mark detection data buffer memory No. setting range	When the mark detection data type setting is "Optional 2 word buffer memory", the mark detection data buffer memory No. is outside the range or odd number. [Operation status at warning occurrence] The setting No. of which the mark detection setting parameter is outside the range is invalid.	Set a value with an even number within the setting range.
093AH	Outside maximum number of control axes	The common parameter "[Pr.152] Maximum number of control axes" exceeds the number of control axes of Simple Motion module. [Operation status at warning occurrence] Controlled as "0: No setting".	Correct the setting value.
093BH	Outside control axis setting	"[Pr.100] Connected device" is set to the axis that exceeded the "[Pr.152] Maximum number of control axes". [Operation status at warning occurrence] The communication with the connected device is not executed.	Correct the "[Pr.152] Maximum number of control axes" or "[Pr.100] Connected device".
093CH	Home position return data incorrect	• The backup data for absolute position restoration is illegal. • The home position return has never been executed after the system start. • The home position return is started, but not completed correctly. • "Absolute position erased" in the driver is detected. • "Rotation direction selection (PA14)" of the servo parameter has been changed. [Operation status at warning occurrence] The operation continues.	Execute home position return.

Warning code (Hexadecimal)	Warning name	Error details and causes	Remedy
093EH	SSCNET communication error	Data received from servo amplifier is in error. [Operation status at warning occurrence] The operation continues.	• Check the SSCNETⅢ cable. • Check the servo motor and encoder cable. • Take measures against noise. • Check whether the rotation direction selection/travel direction selection (PA14) is set "0 → 1" or "1 → 0" in the user program or the engineering tool.
0980H	Speed change during deceleration	The speed change request is issued during deceleration stop with JOG start signal OFF. [Operation status at warning occurrence] The speed change is not carried out.	Do not carry out the JOG speed change during deceleration with the JOG start signal OFF.
0981H	JOG speed limit value	The JOG speed*3 exceeds the JOG speed limit value at start. [Operation status at warning occurrence] • When the speed exceeds the JOG speed limit, the JOG operation is carried out with the JOG speed limit value. • While the speed is limited by the JOG speed limit value, the "[Md.39] In speed limit flag" is turned ON.	Set a value within the setting range.
0982H	JOG speed limit value	The new speed value*3 exceeds the JOG speed limit value when the speed is changed during operation. [Operation status at warning occurrence] • When the speed exceeds the JOG speed limit, the JOG operation is carried out with the JOG speed limit value. • While the speed is limited by the JOG speed limit value, the "[Md.39] In speed limit flag" is turned ON.	Set a value within the setting range.
0988H	Outside manual pulse generator input magnification range	The manual pulse generator 1 pulse input magnification is set to 0, 10001 or more, or negative value. [Operation status at warning occurrence] • When input magnification is set at 10001 or more, or negative value: Re-set to 10000. • When input magnification is set at 0: Re-set to 1.	Set the manual pulse generator 1 pulse input magnification to within the setting range.
0989H	Outside manual pulse generator speed limit value	The manual pulse generator speed exceeds "[Pr.123] Manual pulse generator speed limit value". [Operation status at warning occurrence] • When the speed exceeds the detailed parameter 2 "Manual pulse generator speed limit value", the manual pulse generator operation is executed following the detailed parameter 2 "Manual pulse generator speed limit mode". • "In speed limit flag" is turned ON while the speed is controlled with the detailed parameter 2 "Manual pulse generator speed limit value".	Adjust speed of manual pulse generator or "[Cd.20] Manual pulse generator 1 pulse input magnification" not to exceed the speed limit value.
0990H	Deceleration/stop speed change	The speed change request is issued during deceleration stop. [Operation status at warning occurrence] The speed change is not carried out.	Do not carry out the speed change during deceleration with a stop command, during stoppage, or during automatic deceleration with position control.

Warning code (Hexadecimal)	Warning name	Error details and causes	Remedy
0991H	Speed limit value over	• Setting speeds[3] exceed the speed limit value when starting/restarting the positioning or when changing the speed at the positioning[4]. (At the interpolation control, either of reference axes or interpolation axes exceeds the speed limit value.) • "[Cd.140] Command speed at speed control mode" exceeds "[Pr.8] Speed limit value" during the speed control mode. • "[Cd.146] Speed limit value at torque control mode" exceeds "[Pr.8] Speed limit value" during the torque control mode. • "[Cd.147] Speed limit value at continuous operation to torque control mode" exceeds "[Pr.8] Speed limit value" during the continuous operation to torque control mode. [Operation status at warning occurrence] [Position control mode] • The speed is controlled with the speed limit value. • The "[Md.39] In speed limit flag" is turned ON. [Speed control mode/Torque control mode/Continuous operation to torque control mode] • The speed is controlled with the speed limit value. (The "[Md.39] In speed limit flag" is not turned ON.)	Review each speed so that setting speeds do not exceed the speed limit value.
0992H	M code ON signal ON	The M code ON signal is turned ON when the positioning data is executed. [Operation status at warning occurrence] Continues executing the positioning data.	Normalize the ON and OFF timings of the "M code OFF request".
0993H	Speed-position switching (during acceleration) signal ON	The switching signal for speed-position switching control (INC mode) is turned ON during acceleration. [Operation status at warning occurrence] The operation is continued.	Turn ON the speed-position switching signal in the speed stabilization region (constant speed status).
0994H	Insufficient remaining distance	At a continuous operation interrupt request, the distance required deceleration stop is not long enough. [Operation status at warning occurrence] • When a command speed is changed: Change to a value as near a new speed value as possible. • When a target position is changed: Adjust the speed to a value as near the command speed as possible, and then change to a target position. (When the operation pattern is a continuous path control, ignore the operations stated above.)	Give a request at the position where there is an enough remaining distance.
0995H	Insufficient remaining distance	At a speed change request, the remaining distance is shorter than the distance required for speed change. [Operation status at warning occurrence] • When a command speed is changed: Change to a value as near a new speed value as possible. • When a target position is changed: Adjust the speed to a value as near the command speed as possible, and then change to a target position. (When the operation pattern is a continuous path control, ignore the operations stated above.)	Give a request at the position where there is an enough remaining distance.
0996H	Step not possible	Code 1 is set for the step start information when the step is outside standby. [Operation status at warning occurrence] The step will not start.	Do not set a "1" to the step start information when the step is not in standby state.
0997H	Illegal external command function	The detailed parameter 2 "External command function selection" setting range is exceeded. [Operation status at warning occurrence] Even if the external command signal is turned ON, the system will not perform anything.	Set the detailed parameter 2 "External command function selection" to within the setting range.
0998H	Insufficient movement amount	The movement amount is not large enough for automatic deceleration. [Operation status at warning occurrence] The system stops immediately after it reaches the positioning address.	Set a decelerating address or a movement amount to the positioning data.

Warning code (Hexadecimal)	Warning name	Error details and causes	Remedy
0999H	Illegal teaching data No.	The positioning data No. is set outside the setting range. [Operation status at warning occurrence] Teaching is not carried out when the setting value is 0 or 601 or more. (The setting value is automatically reset to "0" by the Simple Motion module even when a "0" or "601" or more is set.)	Set the positioning data No. to within the setting range.
099AH	Illegal teaching data selection	The teaching data selection set value is outside the setting range. [Operation status at warning occurrence] Teaching is not carried out.	Set the teaching data selection set value to within the setting range.
099BH	Target position change not possible	• A target position change request was given for the control method other than ABS1 and INC1. • A target position change request was given during speed control mode, torque control mode or continuous operation to torque control mode. [Operation status at warning occurrence] The target position change is not carried out.	Do not turn ON the target position change request in the following cases. • A control method other than ABS1 and INC1 is used. • During speed control mode • During torque control mode • During continuous operation to torque control mode
099CH	Target position change not possible	A target position change request is turned ON during continuous path control. [Operation status at warning occurrence] The target position change is not carried out.	Do not turn ON the target position change request when an operating pattern "continuous path control" is used.
099DH	Target position change not possible	A target position change request was given during deceleration to a stop. [Operation status at warning occurrence] The target position change is not carried out.	Do not turn ON the target position change request during deceleration stop.
099EH	Target position change not possible	A target position change request was issued when speed change 0 flag ([Md.31] Status: b10) was ON. [Operation status at warning occurrence] The target position change is not carried out.	Do not turn ON the target position change request when speed change 0 flag ([Md.31] Status: b10) is ON.
099FH	Target position change not possible	"[Cd.27] Target position change value (New address)" is outside the software stroke limit range (+). [Operation status at warning occurrence] The target position change is not carried out.	Correct the setting value.
09A0H	Target position change not possible	"[Cd.27] Target position change value (New address)" is outside the software stroke limit range (-). [Operation status at warning occurrence] The target position change is not carried out.	Correct the setting value.
09A1H	Target position change not possible	"[Cd.27] Target position change value (New address)" is out of range (0 to 359.99999 [degree]). [Operation status at warning occurrence] The target position change is not carried out.	Correct the setting value.
09E4H	Torque limit value over	• A value exceeding "[Pr.17] Torque limit setting value" is set to "[Cd.143] Command torque at torque control mode" at torque control mode. • A value exceeding "[Pr.17] Torque limit setting value" is set to "[Cd.150] Target torque at continuous operation to torque control mode" at continuous operation to torque control mode. [Operation status at warning occurrence] The torque is controlled with the torque limit setting value.	Review the setting value so that the setting torque is not exceeded the torque limit setting value.
09E5H	Torque initial value selection invalid	At switching the control mode, the servo parameter "Function selection C-B POL reflection selection at torque control (PC29)" is "0: Enabled" on the axis that set feedback torque into the torque initial value selection. [Operation status at warning occurrence] The initial value selection is controlled as the command torque.	• Use a servo amplifier which supports the servo parameter "Function selection C-B POL reflection selection at torque control (PC29)" and set (PC29) to "1: Disabled". • At switching the control mode, set the torque initial value selection to command torque.
09E6H	Control mode switching during BUSY	Control mode switching was executed from the position control mode to the speed control mode/torque control mode while BUSY was turned ON. [Operation status at warning occurrence] The control mode is not switched. (Positioning during operation continues.)	Switch the control mode after turning BUSY OFF.

Warning code (Hexadecimal)	Warning name	Error details and causes	Remedy
09E7H	Control mode switching during zero speed OFF	Control mode was changed when "Zero speed" ([Md.119] Servo status2) was turned OFF. [Operation status at warning occurrence] The control mode is not switched. (Current operation continues.)	Switch the control mode after turning "Zero speed" ([Md.119] Servo status2) ON.
09E8H	Outside control mode range	Control mode switching request was performed by specifying a value outside the range for "[Cd.139] Control mode setting". [Operation status at warning occurrence] The control mode is not switched. (Current operation continues.)	Switch the control mode after setting a value within the range for "[Cd.139] Control mode setting".
09E9H	Control mode switching	Control mode switching request was performed during the control mode switching. [Operation status at warning occurrence] Control mode switching request is not accepted.	Carry out the control mode switching request after completing the control mode switching.
09EAH	Illegal control mode switching	• Switching to the speed/torque control mode is requested to the axis which does not support the control mode switching. • Switching to the continuous operation to torque control mode is requested to the axis which does not support the control mode switching. [Operation status at warning occurrence] Control mode switching request is not accepted.	• Do not use the speed/torque control to the axis which does not support the control mode switching. • Do not use the continuous operation to torque control to the axis which does not support the control mode switching.
09EBH	Control mode switching not possible	• Control mode switching was performed from the position control mode to the continuous operation to torque control mode and then from the continuous operation to torque control mode to the speed control mode. • Control mode switching was performed from the speed control mode to the continuous operation to torque control mode and then from the continuous operation to torque control mode to the position control mode. • Control mode switching was performed between the torque control mode and continuous operation to torque control mode. [Operation status at warning occurrence] The control mode is not switched. (Current operation continues.)	Review so that control mode switching is performed between the position control mode and continuous operation to torque control mode or between the speed control mode and continuous operation to torque control mode.
09F0H	No operation termination setting	In the positioning by block starting, the 50th point of the positioning start data is set to CONTINUE. [Operation status at warning occurrence] The operation is terminated.	Set the operation termination to the 50th point.
09F1H	FOR to NEXT nest construction	FOR to NEXT is nested. [Operation status at warning occurrence] The operation is continued.	Make 1 nest construction for FOR to NEXT.
0A10H	Outside command speed range	• The speed change value is outside the setting range when changing the speed during operation[*5] • "[Cd.140] Command speed at speed control mode" is outside the setting range during the speed control mode. • "[Cd.146] Speed limit value at torque control mode" is outside the setting range during the torque control mode. [Operation status at warning occurrence] • The speed change value is controlled as the "maximum value within the setting range". • The "[Md.39] In speed limit flag" is turned ON.	• Set the speed change value to within the setting range. • Set "[Cd.140] Command speed at speed control mode" to within the setting range during the speed control mode. • Set "[Cd.146] Speed limit value at torque control mode" to within the setting range during the torque control mode.
0A56H	Speed limit value outside range at switching control mode [RD77MS]	The value set "[Pr.8] Speed limit value" is outside the range when switching the control mode. [Operation status at warning occurrence] The previous speed limit value is continued.	Set the speed limit value within the range.

Warning code (Hexadecimal)	Warning name	Error details and causes	Remedy
0B0FH	Module extended parameter storage location warning [RD77GF]	• Module extended parameter in Simple Motion module was changed when module extended parameter storage location setting is "CPU module". • Module extended parameter in CPU module is changed when module extended parameter storage location setting is "Simple Motion Module". [Operation status at warning occurrence] The module extended parameter for which writing operation was executed is ignored.	Check the module extended parameter storage location setting of module parameter (motion) and then operate it according to storage location. (Module extended parameter has not been specified in storage location will be ignored.)
0C80H	Driver warning	Warnings occur in the driver. [Operation status at warning occurrence] The operation continues.	Check the contents of the warning and take actions according to "[Md.114] Servo alarm". (For the details of "[Md.114] Servo alarm", refer to the instruction manual of each driver.)
0C81H	Incompatible device	Incompatible device is connected. [Operation status at warning occurrence] The operation continues.	Please contact with our sales representative.
0C83H	SLMP communication warning [RD77GF]	Object cannot be acquired because error was detected in SLMP communication after connecting to amplifier. [Operation status at warning occurrence] The operation continues.	• Check the Abort Code and take corrective actions according to causes. • Check the object content used in specified servo object area. (Refer to the driver instruction manual for Abort Code details and object available to be sent.)
0C84H	Virtual servo amplifier operation warning [RD77GF]	Virtual servo amplifier connection/disconnection has already been executed to stations that connected with network. [Operation status at warning occurrence] The virtual servo amplifier is not connected or disconnected.	Please execute virtual servo amplifier connection/ disconnection after the corresponding station disconnected from network.
0CC0H	Inter-module synchronization cycle time over [RD77MS]	The calculation process time of the inter-module synchronous interrupt (I44) exceeds the internal operation process time of the Simple Motion module. [Operation status at warning occurrence] The operation continues.	• Set the operation time longer. • Review the number of steps of the inter-module synchronous interrupt (I44) to be short.
	Synchronization cycle time over [RD77GF]	The cyclic processing did not finish before the start timing for the next synchronization cycle. [Operation status at warning occurrence] The operation continues.	• Set the operation cycle (inter-module synchronization cycle) to longer than the current value. • Reduce the operation cycle time by review the content of the positioning.

[1] When the torque change function is used with the individual setting for new torque value and new reverse torque value, it indicates outside forward new torque value.

[2] For MR-J3(W)-B/MR-J4(W)-B. For MR-J5(W)-B, set "Absolute position detection system selection (PA03.0)".

[3] This speed is a value in which override value is considered when override function is used. ("[Cd.13] Positioning operation speed override" is set other than 100 [%].)

[4] The speed change by position-speed switching control, target position change function, or override function is contained.

[5] The speed change by position-speed switching control or target position change function is contained.

Warnings related to synchronous control are described below.

Warning code (Hexadecimal)	Warning name	Error details and causes	Remedy
0BD0H	Input axis phase compensation amount over	Phase compensation amount of input axis is equal or lower than the minimum value (-2147483648), or exceeding the maximum value (2147483647). [Operation status at warning occurrence] The input axis operation continues. It is controlled with the minimum or maximum value.	• Set a smaller phase compensation advance time. • Decrease the input axis speed.
0BD1H	Input axis rotation direction restriction amount over	Rotation direction restriction amount of input axis is equal or lower than the minimum value (-2147483648), or exceeding the maximum value (2147483647). [Operation status at warning occurrence] The input axis operation continues. It is controlled with the minimum or maximum value.	• Confirm the enabled direction of the rotation direction restriction setting. (The setting may be reversed.) • Check if the input axis moves to the reverse direction of the enabled direction.
0BD2H	Input axis speed display over	Monitor speed display of input axis is equal or lower than the minimum value (-2147483648), or exceeding the maximum value (2147483647). [Operation status at warning occurrence] The input axis operation continues. The minimum or maximum value is displayed as the speed display of monitor data.	• Set a lower value if the number of decimal places for speed command setting is available in the input axis setting. • Switch the units from minute to second if the speed command time unit setting is available in the input axis setting. • Decrease the input axis speed.
0BD3H	Synchronous encoder via servo amplifier battery warning	Voltage of the servo amplifier battery connected with a synchronous encoder decreased to 3.2 V or less. [Operation status at warning occurrence] The synchronous encoder control continues.	Replace the battery.
0BE4H	Outside main shaft clutch control setting range	• The synchronous parameter "[Pr.405] Main shaft clutch control setting" was set to outside the setting range during the synchronous control. • The synchronous parameter "[Pr.405] Main shaft clutch control setting" was set from a setting other than "No Clutch" to "No Clutch" during the synchronous control. [Operation status at warning occurrence] Synchronous control continues by the previous main shaft clutch control setting.	• Set a value within the range. • Do not change the settings other than "No Clutch" to "No Clutch".
0BF4H	Outside auxiliary shaft clutch control setting range	• The synchronous parameter "[Pr.422] Auxiliary shaft clutch control setting" was set to outside the setting range during the synchronous control. • The synchronous parameter "[Pr.422] Auxiliary shaft clutch control setting" was set from a setting other than "No Clutch" to "No Clutch" during the synchronous control. [Operation status at warning occurrence] Synchronous control continues by the previous auxiliary shaft clutch control setting.	• Set a value within the range. • Do not change the settings other than "No Clutch" to "No Clutch".
0C01H	Outside speed change ratio denominator range	The synchronous parameter "[Pr.437] Speed change ratio: Denominator" is set to 0 or lower during synchronous control. [Operation status at warning occurrence] Synchronous control continues by the previous speed change ratio (Denominator).	Set a value within the range of 1 to 2147483647.
0C10H	Outside cam No. range	[RD77MS] The synchronous parameter "[Pr.440] Cam No." is set to other than 0 to 256 during synchronous control. [Operation status at warning occurrence] Synchronous control continues by the previous cam No.	[RD77MS] Set a value within the range of 0 to 256.
		[RD77GF] The synchronous parameter "[Pr.440] Cam No." is set to other than 0 to 1024 during synchronous control. [Operation status at warning occurrence] Synchronous control continues by the previous cam No.	[RD77GF] Set a value within the range of 0 to 1024.
0C11H	Cam not registered	When changing the synchronous parameter "[Pr.440] Cam No.", the cam data of the changed cam No. does not exist on the Cam open area during synchronous control. [Operation status at warning occurrence] Synchronous control continues by the previous cam No.	Specify the cam No. of an existing cam data.

Warning code (Hexadecimal)	Warning name	Error details and causes	Remedy
0C12H	Cam axis length per cycle outside range	Set the value of synchronous parameter "Cam axis length per cycle" ([Pr.439]) less than 0. [Operation status at warning occurrence] Synchronous control continues by the previous cam axis length per cycle.	Set a value within the range of 1 to 2147483647.
0C14H	Cam axis phase compensation amount over	Phase compensation amount of cam axis is equal or lower than the minimum value (-2147483648), or exceeding the maximum value (2147483647). [Operation status at warning occurrence] Synchronous control continues. The operation is controlled with the minimum or maximum value.	• Set a smaller cam axis phase compensation advance time. • Decrease the cam axis input value speed.
0C15H	Cam axis length per cycle change invalid	"Cam axis length per cycle" ([Pr.439]) will be changed when the cam data which is stroke ratio data format and the cam data starting point is other than 0 is used in synchronous controlling. [Operation status at warning occurrence] Synchronous control continues by the previous cam axis length per cycle.	Use the cam data which the cam data starting position is 0.
0C40H	Outside operation cam No. range	[RD77MS] "[Cd.601] Operation cam No." is other than 1 to 256. [Operation status at warning occurrence] Cam data writing/reading is not executed.	[RD77MS] Set a value within the range of 1 to 256.
		[RD77GF] "[Cd.601] Operation cam No." is other than 1 to 1024. [Operation status at warning occurrence] Cam data writing/reading is not executed.	[RD77GF] Set a value within the range of 1 to 1024.
0C41H	Read cam not registered	Cam data of the specified cam No. does not exist on the cam open area during the cam data reading operation. [Operation status at warning occurrence] Cam data writing/reading is not executed.	[RD77MS] • Specify the cam No. of an existing cam data. • When writing the cam data from a programming tool, turn the PLC READY signal [Y0] from OFF to ON and open the cam data on the cam open area.
			[RD77GF] • Specify the cam No. of an existing cam data. • When writing the cam data from a programming tool, turn ON the module power supply or open the cam data in open area after transfer.
0C42H	Outside cam data first position range	• "[Cd.602] Cam data first position" is outside the range of "1 to Cam resolution" for the stroke ratio data format cam. • "[Cd.602] Cam data first position" is outside the range of "0 to (Coordinate number - 1)" for the coordinate data format cam. [Operation status at warning occurrence] Cam data writing/reading is not executed.	• Set a value within the range of "1 to Cam resolution" for the stroke ratio data format cam. • Set a value within the range of "0 to (Coordinate number - 1)" for the coordinate data format cam.

Warning code (Hexadecimal)	Warning name	Error details and causes	Remedy
0C43H	Outside number of cam data operation points range	[RD77MS] • "[Cd.603] Number of cam data operation points" is outside the range of 1 to 4096 for the stroke ratio data format cam. • "[Cd.603] Number of cam data operation points" is outside the range of 1 to 2048 for the coordinate data format cam. • First position and number of operation points which exceed the cam resolution or coordinate number are set during the cam data writing operation. [Operation status at warning occurrence] Cam data writing/reading is not executed.	[RD77MS] • Set a value within the range of 1 to 4096 for the stroke ratio data format cam. • Set a value within the range of 1 to 2048 for the coordinate data format cam. • Set "Cam data first position + (Number of cam data operation points - 1)" not to exceed the cam resolution. • Set "Cam data first position + Number of cam data operation points" not to exceed the number of coordinates.
		[RD77GF] • "[Cd.603] Number of cam data operation points" is outside the range of 1 to 32768 for the stroke ratio data format cam. • "[Cd.603] Number of cam data operation points" is outside the range of 1 to 65535 for the coordinate data format cam. • First position and number of operation points which exceed the cam resolution or coordinate number are set during the cam data writing operation. [Operation status at warning occurrence] Cam data writing/reading is not executed.	[RD77GF] • Set a value within the range of 1 to 32768 for the stroke ratio data format cam. • Set a value within the range of 1 to 65535 for the coordinate data format cam. • Set "Cam data first position + (Number of cam data operation points - 1)" not to exceed the cam resolution. • Set "Cam data first position + Number of cam data operation points" not to exceed the number of coordinates.
0C44H	Outside cam data format range	[RD77MS] "[Cd.604] Cam data format" is other than 1 or 2 during the cam data writing operation. [Operation status at warning occurrence] Cam data writing/reading is not executed.	[RD77MS] Set 1 or 2.
		[RD77GF] • "Cam data method" ([Cd.604]) is outside the setting range during the cam data writing operation. • The cam data created by a free-form curve is read during the cam data reading (cam storage area) operation. [Operation status at warning occurrence] Cam data writing/reading is not executed.	[RD77GF] • Set within the range. • Do not read the cam data created by a free-form curve.
0C45H	Outside cam resolution/coordinate number range	[RD77MS] • "[Cd.605] Cam resolution/coordinate number" is other than "256/512/1024/2048/4096/8192/16384/32768" for the stroke ratio data format cam during the cam data writing operation. • "[Cd.605] Cam resolution/coordinate number" is outside the range of "2 to 16384" for the coordinate data format cam during the cam data writing operation. [Operation status at warning occurrence] Cam data writing/reading is not executed.	[RD77MS] • Set a value within the range of "256/512/1024/ 2048/ 4096/8192/16384/32768" for the stroke ratio data format cam. • Set a value within the range of 2 to 16384 for the coordinate data format cam.
		[RD77GF] • "[Cd.605] Cam resolution/coordinate number" is other than "256/512/1024/2048/4096/8192/16384/32768" for the stroke ratio data format cam during the cam data writing operation. • "[Cd.605] Cam resolution/coordinate number" is outside the range of "2 to 65535" for the coordinate data format cam during the cam data writing operation. [Operation status at warning occurrence] Cam data writing/reading is not executed.	[RD77GF] • Set a value within the range of "256/512/1024/ 2048/ 4096/8192/16384/32768" for the stroke ratio data format cam. • Set a value within the range of 2 to 65535 for the coordinate data format cam.
0C46H	Outside cam data starting position range	"[Cd.606] Cam data starting point" is outside the range from "0 to (Cam resolution - 1)" during the cam data writing operation. [Operation status at warning occurrence] Cam data writing/reading is not executed.	Set a value within the range of "0 to (Cam resolution - 1)".

Warning code (Hexadecimal)	Warning name	Error details and causes	Remedy
0C47H	Cam storage area capacity over	• The free area in the cam storage area is insufficient during the cam data writing operation. • The writable area is insufficient due to the decoupling of free area. [Operation status at warning occurrence] Cam data writing/reading is not executed.	• Decrease the number of cam data (number of cams, cam resolution, and coordinate number). • Erase the cam data and rewrite it.
0C48H	Cam open area capacity over	• The free area in the cam open area is insufficient during the cam data writing operation. • The writable area is insufficient due to the decoupling of free area. [Operation status at warning occurrence] Cam data writing/reading is not executed.	• Decrease the number of cam data (number of cams, cam resolution, and coordinate number). • Erase the cam data and rewrite it.
0C49H	Coordinate data error	• Input value of coordinate data is a negative value during the cam data writing operation. • Input value of coordinate data is not "$X_n < X_{n+1}$" during the cam data writing operation. [Operation status at warning occurrence] Cam data writing/reading is not executed.	• Set the Input value of coordinate data to 0 or more. • Set the Input value of coordinate data to "$X_n < X_{n+1}$".
0C4AH	Cam data reading operation inhibit	Cam data reading operation is executed with the cam data read password set. [Operation status at warning occurrence] Cam data writing/reading is not executed.	[RD77MS] Delete the cam data read password with a programming tool.
			[RD77GF] • When the module extended parameter storage location setting is set to "Simple Motion Module", delete the cam data read password with a programming tool. • When the module extended parameter storage location setting is set to "CPU module", delete the read file password, and switch the power on again or reset the CPU module.
0C4BH	Cam data writing operation inhibit	Cam data writing operation is executed with the cam data write password set. [Operation status at warning occurrence] Cam data writing/reading is not executed.	[RD77MS] Delete the cam data write password with a programming tool.
			[RD77GF] • When the module extended parameter storage location setting is set to "Simple Motion Module", delete the cam data write password with a programming tool. • When the module extended parameter storage location setting is set to "CPU module", delete the write file password, and switch the power on again or reset the CPU module.
0C50H	Outside cam auto-generation cam No. range	[RD77MS] "[Cd.609] Cam auto-generation cam No." is outside the range of 1 to 256. [Operation status at warning occurrence] Cam auto-generation is not executed.	[RD77MS] Set a value within the range of 1 to 256.
		[RD77GF] "[Cd.609] Cam auto-generation cam No." is outside the range of 1 to 1024. [Operation status at warning occurrence] Cam auto-generation is not executed.	[RD77GF] Set a value within the range of 1 to 1024.
0C51H	Outside cam auto-generation type range	[RD77MS] "[Cd.610] Cam auto-generation type" is other than 1. [Operation status at warning occurrence] Cam auto-generation is not executed.	[RD77MS] Set 1.
		[RD77GF] "[Cd.610] Cam auto-generation type" is outside the setting range. [Operation status at warning occurrence] Cam auto-generation is not executed.	[RD77GF] Set within the range.
0C52H	Cam auto-generation cam storage area capacity over	• The free area in the cam storage area is insufficient. • The writable area is insufficient due to the decoupling of free area. [Operation status at warning occurrence] Cam auto-generation is not executed.	• Decrease the number of cam data (number of cams, cam resolution, and coordinate number). • Erase the cam data and rewrite it.

Warning code (Hexadecimal)	Warning name	Error details and causes	Remedy
0C53H	Cam auto-generation cam open area capacity over	• The free area in the cam open area is insufficient. • The writable area is insufficient due to the decoupling of free area. [Operation status at warning occurrence] Cam auto-generation is not executed.	• Decrease the number of cam data (number of cams, cam resolution, and coordinate number). • Erase the cam data and rewrite it.
0C54H	Outside cam auto-generation value range	"[Cd.611] Cam auto-generation data" is outside the setting range. [Operation status at warning occurrence] Cam auto-generation is not executed.	Set a value within the setting range for the cam auto-generation.
0C55H	Cam auto-generation calculation disable	"[Cd.611] Cam auto-generation data" is set to the value that the cam pattern cannot be generated. (Such as when the sheet synchronization width is larger than the sheet length in the cam for a rotary cutter) [Operation status at warning occurrence] Cam auto-generation is not executed.	Review the setting value of the cam auto-generation data.
0C56H	Cam auto-generation data write inhibit	Cam auto-generation is executed with the cam data write password set. [Operation status at warning occurrence] Cam auto-generation is not executed.	[RD77MS] Delete the cam data write password with a programming tool.
			[RD77GF] • When the module extended parameter storage location setting is set to "Simple Motion Module", delete the cam data write password with a programming tool. • When the module extended parameter storage location setting is set to "CPU module", delete the write file password, and switch the power on again or reset the CPU module.
0C60H	Outside cam position calculation cam No. range	[RD77MS] "[Cd.613] Cam position calculation: Cam No." is outside the range of 0 to 256. [Operation status at warning occurrence] Cam position calculation is not executed.	[RD77MS] Set a value within the range of 0 to 256.
		[RD77GF] "[Cd.613] Cam position calculation: Cam No." is outside the range of 0 to 1024. [Operation status at warning occurrence] Cam position calculation is not executed.	[RD77GF] Set a value within the range of 0 to 1024.
0C61H	Cam position calculation cam not registered	Cam data of the specified cam No. does not exist on the cam open area during the cam position calculation. [Operation status at warning occurrence] Cam position calculation is not executed.	[RD77MS] • Specify the cam No. of an existing cam data. • When writing the cam data from a programming tool, turn the PLC READY signal [Y0] from OFF to ON and open the cam data ON the cam open area.
			[RD77GF] • Specify the cam No. of an existing cam data. • When writing the cam data from a programming tool, turn ON the module power supply or open the cam data in open area after transfer.
0C62H	Outside cam position calculation cam axis length per cycle range	"[Cd.615] Cam position calculation: Cam axis length per cycle" is set to 0 or lower. [Operation status at warning occurrence] Cam position calculation is not executed.	Set a value within the range of 1 to 2147483647.
0C63H	Outside cam position calculation cam axis position value per cycle range	"[Cd.617] Cam position calculation: Cam axis position value per cycle" is outside the range of 0 to "Cam axis length per cycle". [Operation status at warning occurrence] Cam position calculation is not executed.	Set a value within the range of 0 to "Cam axis length per cycle".
0C64H	Cam position calculation cam axis 1 cycle position value calculation disable	Corresponding cam axis position value per cycle could not be calculated during cam axis position value per cycle calculation. (Occurs in reciprocated cam pattern) [Operation status at warning occurrence] Cam position calculation is not executed.	Set "[Cd.614] Cam position calculation: Stroke amount", "[Cd.616] Cam position calculation: Cam reference position", and "[Cd.618] Cam position calculation: Cam axis command position value" within the range of reciprocated cam pattern stroke.

Servo amplifier detection warning

For details of servo amplifier detection warnings, refer to each servo amplifier instruction manual or manual.

14.5 List of Error Codes

Simple Motion module detection error

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
0000H	Normal	—	—
1080H	Flash ROM write number error	Data is written to the flash ROM continuously 25 times or more from the program. [Operation status at error occurrence] The system does not write data to the flash ROM.	Review the program so that data is not written continuously to the flash ROM. (Using "[Md.19]", the number of flash ROM write times can be monitored.) (If this error has occurred in a proper using method, writing is enabled by resetting the error, switching power OFF, then ON, or resetting the CPU module.)
1810H	Connection failure [RD77GF]	A connection failure was detected in the network. [Operation status at error occurrence] The operation is continued.	Correct the wiring status.
1811H	CPU module stop error [RD77GF]	A stop error of the CPU module was detected. [Operation status at error occurrence] The data link is stopped.	Check the error of the CPU module and take corrective action using the module diagnostics of the engineering tool.
1830H	Receive queue full [RD77GF]	Number of reception requests of transient transmission (link dedicated instruction) exceeded upper limit of simultaneously processable requests. [Operation status at error occurrence] The operation is continued.	Lower the transient transmission usage frequency, and then perform again.
1845H	Transient data buffer full [RD77GF]	Too many processings of transient transmission (link dedicated instruction) and cannot perform transient transmission. [Operation status at error occurrence] The operation is continued.	Correct the transient transmission execution count.
1867H	Dedicated instruction I/F error	Mismatching occurs between the CPU module and the Simple Motion module. [Operation status at error occurrence] At start: The system does not operate.	A trouble occurs. Repair.
18B0H	Error when switching from normal operation mode to amplifier-less operation mode	Input signals other than synchronization flag [X1] are ON when switching from the normal operation mode to the amplifier-less operation mode. [Operation status at error occurrence] The operation mode is not changed.	Switch the operation mode after confirming that all input signals other than synchronization flag [X1] are OFF.
18B1H	Error when switching from amplifier-less operation mode to normal operation mode	Input signals other than synchronization flag [X1] are ON when switching from the amplifier-less operation mode to the normal operation mode. [Operation status at error occurrence] The operation mode is not changed.	Switch the operation mode after confirming that all input signals other than synchronization flag [X1] are OFF.
18C0H	Inter-module synchronization cycle unsupported	The setting value of the inter-module synchronization cycle is unsupported. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	[RD77MS] Set the inter-module synchronization cycle into the supported range, and switch the power on again or reset the PLC.
			[RD77GF] Set any one of "0.5 ms", "1.0 ms", "2.0 ms" or "4.0 ms" for inter-module synchronous cycle and switch the power on again or reset the CPU module.
18D0H	Control slave station inter-module synchronization target mismatch [RD77GF]	The network synchronization communication setting in the network configuration setting of the master station does not match the network synchronization communication setting of the controlled slave station (synchronization enable/disabled). [Operation status at error occurrence] The cyclic communication is executed asynchronously.	• Set the "Network Synchronous Communication" for the corresponding local station to the "Synchronous" in "Network Configuration" under "Basic Settings" of the master station. • Set the corresponding module to the same setting as the master station using the local station's inter-module synchronization setting.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
18D1H	Inter-module synchronization transmission skip occurrence [RD77GF]	Cyclic transmission skip occurred. [Operation status at error occurrence] The operation is continued.	• Increase the "Inter-module synchronization cycle setting" in System Parameters so that the synchronization interrupt program's execution time does not exceed the inter-module synchronization cycle. • Reduce the program processing time by reducing the program volume so that the inter-module synchronization cycle is not exceeded when the synchronization interrupt program's execution time is decreased. • Reduce the refresh processing time by reducing the data targeted for synchronization refreshing so that the inter-module synchronization cycle is not exceeded when the synchronization interrupt program's execution time is decreased. • Set modules not requiring synchronization to asynchronous so that the inter-module synchronization cycle is not exceeded when the synchronization interrupt program's execution time is decreased.
18D2H	Synchronous watch dog counter error [RD77GF]	Proper communication was not possible between the CC-Link IE Field Network synchronization slaves. [Operation status at error occurrence] The operation is continued.	• Set the inter-module synchronization cycle to longer than the current value in "Fixed Scan Interval Setting" under "Synchronization Setting within the Modules" in the system parameters. • Check if the switching hub and the cables are connected properly. • After taking the above corrective actions, power on the system again or reset the CPU module.
1900H	PLC READY OFF during operation	The PLC READY signal [Y0] is turned OFF during operation. [Operation status at error occurrence] The system stops with the setting (deceleration stop/ rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 2). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Review the program which turns ON/OFF PLC READY signal [Y0].
1902H	Servo READY signal OFF during operation	The servo READY signal is turned OFF during operation. [Operation status at error occurrence] During operation: The system stops immediately.	Check the servo amplifier power, wiring with the servo amplifier, and connection of connectors.
1903H	Test mode faults during operation	The personal computer cannot communicate with the CPU module. [Operation status at error occurrence] The system stops with the setting (deceleration stop/ rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 2). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Check that there is no error on the personal computer side I/F to which a cable is connected.
1904H	Hardware stroke limit (+)	Start is requested when the hardware stroke limit (upper limit signal FLS) is turned OFF. [Operation status at error occurrence] The system does not start.	• Check the wiring of upper limit signal FLS. • Check if the specification of the limit switch and the setting of the "[Pr.22] Input signal logic selection" match. • If hardware stroke limit (limit switch) is unnecessary system for installation, wire to always turn ON the upper limit signal (FLS) input of the Simple Motion module.
1905H	Hardware stroke limit (+)	The hardware stroke limit (upper limit signal FLS) is turned OFF during operation. [Operation status at error occurrence] The system stops with the setting (deceleration stop/ rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 1). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	After making an axis error reset, perform manual control operation to move the axis to the other position in order that the upper limit signal (FLS) will not turn OFF.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1906H	Hardware stroke limit (-)	Start is requested when the hardware stroke limit (lower limit signal RLS) is turned OFF. [Operation status at error occurrence] The system does not start.	• Check the wiring of lower limit signal RLS. • Check if the specification of the limit switch and the setting of the "[Pr.22] Input signal logic selection" match. • If hardware stroke limit (limit switch) is unnecessary system for installation, wire to always turn ON the lower limit signal (RLS) input of the Simple Motion module.
1907H	Hardware stroke limit (-)	The hardware stroke limit (lower limit signal RLS) is turned OFF during operation. [Operation status at error occurrence] The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 1). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	After making an axis error reset, perform manual control operation to move the axis to the other position in order that the lower limit signal (RLS) will not turn OFF.
1908H	Stop signal ON at start	Start is requested when a stop signal is turned ON. [Operation status at error occurrence] The system does not start.	After clearing the stop command status, then review the timing of start.
1909H	Stop signal ON at start	Start is requested when an external stop is turned ON. [Operation status at error occurrence] The system does not start.	After clearing the external stop signal, then review the timing of start.
190AH	READY OFF → ON during BUSY	The PLC READY signal [Y0] is turned from OFF to ON when BUSY signal is turned ON. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Turn ON the PLC READY signal [Y0] with the BUSY signals of all axes OFF.
190BH	Unsupported servo amplifier connection	A servo amplifier/driver which is not supported is connected. [Operation status at error occurrence] The target axis is not connected to the servo amplifier.	Connect supported servo amplifier/driver.
190CH	Unit replacement during the operation	The Unit is replaced during operation. [Operation status at error occurrence] The operation is stopped.	Replace the unit after confirming that the machine has stopped.
1920H	Start not possible	Start is requested when start is not possible in the axis operation state. [Operation status at error occurrence] The system does not start positioning.	Do not request the start when the axis operation state is other than "0: Standby", "1: Stopped", and "-2: Step standby".
1921H	Start not possible	Start is requested when the "[Md.26] Axis operation status" is "-1: Error". [Operation status at error occurrence] The system does not start positioning.	Do not request the start when the axis operation state is other than "0: Standby", "1: Stopped", and "-2: Step standby".
1922H	Start not possible	Start is requested when the "[Md.26] Axis operation status" is "20: Servo amplifier has not been connected/servo amplifier power OFF". [Operation status at error occurrence] The system does not start positioning.	Do not request the start when the axis operation state is other than "0: Standby", "1: Stopped", and "-2: Step standby".
1923H	Start not possible	Start is requested when the "[Md.26] Axis operation status" is "21: Servo OFF". [Operation status at error occurrence] The system does not start positioning.	Do not request the start when the axis operation state is other than "0: Standby", "1: Stopped", and "-2: Step standby".
1924H	Start not possible	Start is requested when communication with servo amplifier is error. [Operation status at error occurrence] The system does not start positioning.	Check the wiring with the servo amplifier and connection of connectors.
1925H	Start not possible	Start is requested when the "[Md.26] Axis operation status" in the axis to be interpolated is "-1: Error", "20: Servo amplifier has not been connected/servo amplifier power OFF", and "21: Servo OFF". [Operation status at error occurrence] The system does not start positioning.	Do not request the start when the "[Md.26] Axis operation status" in the axis to be interpolated is other than "0: Standby", "1: Stopped", and "-2: Step standby".

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1926H	Start not possible	[RD77MS] Start is requested when "[Cd.100] Servo OFF command" is turned ON. [Operation status at error occurrence] The system does not start positioning.	[RD77MS] Set "0: Servo ON" in the "[Cd.100] Servo OFF command".
		[RD77GF] • Start is requested when "[Cd.100] Servo OFF command" is turned ON. • Start is requested when current value restoration is uncompleted. • Start is requested when the servo amplifier external input signal select error occurs. [Operation status at error occurrence] The system does not start positioning.	[RD77GF] • Set "0: Servo ON" in the "[Cd.100] Servo OFF command". • Execute the start request after checking the completion of "[Md.190] Controller position value restoration completion status". • Execute the start request after removing the servo amplifier external input signal select error.
1927H	Start not possible	Start is requested when the servo alarm occurs. [Operation status at error occurrence] The system does not start positioning.	Reset the error after removing the servo alarm referring to the "Servo Amplifier Instruction Manual".
1928H	Start not possible	Start is requested during the forced stop of controller. [Operation status at error occurrence] The system does not start positioning.	Remove the cause of forced stop.
1929H	Start not possible	Start is requested when the servo READY signal is turned OFF. [Operation status at error occurrence] The system does not start positioning.	Do not request the start when the servo READY signal is turned OFF.
1930H	Hold error [RD77GF]	The "CPU error output mode setting" of module parameter (network) is "Hold". [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Change the setting of the module parameter (network) "Output Mode upon CPU Error" to "Clear".
1931H	Flash ROM write error	Data is not written to the flash ROM. [Operation status at error occurrence] At start: The system does not operate.	The flash ROM is expected to be at the end of its writable life.
1932H	Flash ROM sum check error	While data is written to the flash ROM, the power is turned OFF. [Operation status at error occurrence] At start: The system does not operate.	Reset the parameter and write it to a Flash ROM again.
1933H	Flash ROM sum check error	While data is written to the flash ROM in the synchronous control area, the power is turned OFF. [Operation status at error occurrence] At start: The system does not operate.	Reset the parameter and write to the flash ROM again.
1934H	Synchronous restoration data sum check error	Synchronous restoration data reading is failure. [Operation status at error occurrence] The synchronous control initial value cannot be restored.	The internal memory (nonvolatile) is expected to be at the end of its writable life. Exchange the module.
1937H	Module extended parameter acquisition error [RD77GF]	Module extended parameter can not be loaded. (No filter or Size over) [Operation status at error occurrence] The default value is set for the buffer memory.	Switch the power on again or reset the PLC after the module extended parameter is written into the storage location which is supported by the module extended parameter storage location setting. Correct cam data and prevent file size from exceeding 4MB.
1938H	Module extended parameter acquisition error [RD77GF]	Module extended parameter can not be loaded. (Data error) [Operation status at error occurrence] The default value is set for the buffer memory.	Switch the power on again or reset the PLC after the module extended parameter is written into the storage location which is supported by the module extended parameter storage location setting.
1939H	Module extended parameter acquisition error [RD77GF]	Module extended parameter can not be loaded. (Retry counts over) [Operation status at error occurrence] The default value is set for the buffer memory.	• Switch the power on again or reset the PLC. • Set the module extended parameter storage location setting in "Simple Motion Module".

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
193EH	Connected device setting error	[RD77MS] The setting value (vendor ID, identification code) of the "[Pr.100] Connected device" and the actually connected device is mismatch. [Operation status at error occurrence] The communication between the connected devices or later of target axis is not executed.	[RD77MS] Match the setting value of the "[Pr.100] Connected device" to the actually connected device.
		[RD77GF] • The setting value (vendor ID, identification code) of the "[Pr.100] Connected device" and the actually connected device is mismatch. • An unsupported device is connected with synchronous communication function. • The control mode of the connected device is not the cyclic synchronous position mode. • The points of RWr or RWw in network configuration setting is incorrect. • An amplifier which not set in network configuration setting is connected. [Operation status at error occurrence] The communication with the connected device of target axis is not executed.	[RD77GF] • Match the setting value of the "[Pr.100] Connected device" to the actually connected device. • Check if the connected device is set in network configuration setting. • Check if the corresponding connected device supports the synchronous communication. • Check if the parameter used in servo cyclic transmission is set correctly.
193FH	Operation cycle time over error	The calculation process time of the positioning etc. exceeds the operation cycle. [Operation status at error occurrence] The operation continues.	[RD77MS] Review the content of the positioning or "[Pr.96] Operation cycle setting" longer than the current setting.
			[RD77GF] Review the content of the positioning or operation cycle setting (inter-module synchronization cycle setting value) longer than the current setting.
1940H	Start at home position	• When the home position return retry invalid is set, the proximity dog method machine home position return is started with the home position return complete flag turned ON. • Scale origin signal detection method machine home position return is started with the home position return complete flag turned ON and the proximity dog signal turned ON. [Operation status at error occurrence] The machine home position return does not start.	• Validate the home position return retry function (set value: 1). • Move the work piece from the current position (on home position) using the manual control operation, then carry out a machine home position return again.
1941H	Dog detection timing fault	The proximity dog signal is turned OFF during the deceleration from a home position return speed to a creep speed by the proximity dog method machine home position return. [Operation status at error occurrence] The system stops with the setting (deceleration stop/ rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	• Lower the home position return speed. • Increase the dog signal input time.
1944H	Count method movement amount fault	In the count method 1 and 2 machine home position return, a parameter "Setting for the movement amount after proximity dog ON" is smaller than a distance necessary for deceleration stop from a home position return speed. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3).	• Calculate the movement distance using a speed limit, home position return speed, and deceleration time, and set the movement amount after proximity dog ON so that the distance becomes a deceleration distance or longer. • Lower the home position return speed. • Adjust the proximity dog position so that the movement amount after proximity dog ON becomes longer.
1945H	Home position return request ON	The home position return request flag is turned ON when a fast-home position return is started (positioning start No.9002). [Operation status at error occurrence] The fast-home position return does not start.	Execute the machine home position return (positioning start No.9001).

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1946H	Home position return restart not possible	The restart command is turned ON after the machine home position return is stopped using a stop signal. [Operation status at error occurrence] The restart is not carried out.	Start the machine home position return (positioning start No.9001) again.
194BH	Driver home position return error	A driver alarm was detected during home position return for the stepping motor driver. [Operation status at error occurrence] Home position return is completed at an error occurrence position.	Check the contents of driver alarm , and then execute home position return again.
194CH	Home position return mode timeout error	The data is not loaded from the stepping motor driver properly upon the home position return. [Operation status at error occurrence] Home position return is completed at an error occurrence position.	Execute home position return again. If the same error is displayed again, the hardware of the Simple Motion module or the stepping motor driver is faulty. Please consult your local Mitsubishi representative.
194DH	Home position return operation timeout error	The data is not loaded from the stepping motor driver properly upon the home position return. [Operation status at error occurrence] Home position return is completed at an error occurrence position.	Execute home position return again. If the same error is displayed again, the hardware of the Simple Motion module or the stepping motor driver is faulty. Please consult your local Mitsubishi representative.
194EH	Home position return finish timeout error	The data is not loaded from the stepping motor driver properly upon the home position return. [Operation status at error occurrence] Home position return is completed at an error occurrence position.	Execute home position return again. If the same error is displayed again, the hardware of the Simple Motion module or the stepping motor driver is faulty. Please consult your local Mitsubishi representative.
1974H	ZCT read error	The data is not loaded from the servo amplifier properly upon the home position return. [Operation status at error occurrence] The home position return does not complete.	• Execute home position return again. • When the servo parameter "Function selection C-4 (PC17)" is changed to "1: Not need to pass servo motor Z-phase after power on", transfer the parameter from the Simple Motion module to the servo amplifier and turn the power supply of the servo amplifier OFF. Then, turn it ON and execute home position return again.
1975H	ABS reference point read error	• The data is not loaded from the servo amplifier properly upon the home position return. • The in-position signal is not turned ON within 1.5 seconds after moving an axis to the home position. [Operation status at error occurrence] The home position return does not complete.	• Execute home position return again. • Adjust the servo gain and in-position range, and execute home position return again.
1977H	Encoder ABS data not established	Home position return is started on the direct drive motor when the absolute position data of the encoder has not been established. [Operation status at error occurrence] The home position return does not start.	Turn the power supplies of the system or servo amplifier from OFF to ON after passing the zero point of the motor by the JOG operation, etc.
1978H	Z-phase passing parameter invalid	Servo amplifier parameter "Function selection C-4 (PC17)" is not set to "0: Need to pass servo motor Z-phase after power on" in the machine home position return of scale origin signal detection method. [Operation status at error occurrence] The home position return does not start.	Set "0: Need to pass servo motor Z-phase after power on" in the servo parameter "Function selection C-4 (PC17)".
1979H	Home position return method invalid	Home position return is started with the home position return method which is not supported by the connected device. [Operation status at error occurrence] The home position return does not start.	Correct to the available home position return method.
197AH	Home position return zero point not passed	The zero point is not passed when the dog method, count method or scale origin signal detection method home position return is re-started, or data set method home position return is executed. [Operation status at error occurrence] The home position return does not complete.	Turn the motor more than one revolution using JOG or positioning operation.
197EH	An encoder initial communication error at turning on servo amplifier power supply	A communication error between the servo amplifier and encoder occurred at the turning on servo amplifier power supply. [Operation status at error occurrence] The current value restoration does not start.	Check the motor and encoder cables.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1980H	Outside JOG speed range	At the time of JOG starting, the JOG speed comes out of a specified range. [Operation status at error occurrence] The JOG operation is not carried out when the JOG speed is outside the setting range at the time of JOG start.	Bring the JOG speed into the setting range.
1981H	Inching movement amount error	The inching movement amount dose not satisfy the setting conditions[*1]. (The setting value is large.) [Operation status at error occurrence] The inching operation is not carried out when the inching movement amount exceeds a JOG speed limit at the time of inching start.	Set a smaller inching movement amount so that the setting condition is satisfied.
1982H	Overcarrying movement amount overflow in manual pulse generator	The movement amount which exceeds the detailed parameter 2 "Manual pulse generator speed limit value" is generated continuously and the "Amount of the manual pulser driving carrying over movement" exceeds tolerance (-2147483648 to 2147483647). [Operation status at error occurrence] The system decelerates to a stop.	• Adjust input pulses so as not to occur the movement amount, which exceeds the detailed parameter 2 "Manual pulse generator speed limit value", continuously. • Change the detailed parameter 2 "Manual pulse generator speed limit mode" to a value other than "2: Output over value of speed limit later".
1983H	Manual pulse generator connection station via link device undetected [RD77GF]	The link device that set as manual pulse generator was unconnected or disconnected. [Operation status at error occurrence] A manual pulse generator operation is not carried out.	Check the connection status of the target station.
1990H	Error before simultaneous start	<When multiple axes are started and controlled simultaneously> • The partner axis for simultaneous start is BUSY. • The partner axis for simultaneous start is not present. [Operation status at error occurrence] At start: The system does not operate. During operation: The operation is terminated.	Normalize the simultaneous start axis.
1991H	Error before simultaneous start	<When multiple axes are started and controlled simultaneously> • The same axis No. is set to multiple simultaneous start axes. • The own axis No. is set to a simultaneous start axis. • The number of simultaneous start axes is outside the setting range of 2 to 4. • The "Simultaneous starting axis start data No." of the start axis is 0 or is outside the setting range. • The "Simultaneous starting axis start data No." of the start axis and the partner axis for simultaneous start is 0 or is outside the setting range. [Operation status at error occurrence] At start: The system does not operate. During operation: The operation is terminated.	Normalize the simultaneous starting own axis start data No. and the simultaneous starting axis start data No. (1 to 3).

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1993H	Software stroke limit +	The command position exceeds the upper limit of the software stroke limit. [Operation status at error occurrence] At operation start: The system does not operate. During operation: • The system stops immediately when the positioning address during position control (including position control in speed-position switching control or position-speed switching control) is switched to the data outside the software stroke limit range. • During speed control (including speed control in speed-position switching control or position-speed switching control), the system stops at the setting (normal deceleration stop only) of rapid stop selection (stop group 3) in the detailed parameter 2 when the command position value or machine feed value during manual control is outside the software stroke limit range. At speed control mode/torque control mode/continuous operation to torque control mode: The system switches to the position control mode and stops immediately when the command position value is outside the software stroke limit range.	At operation start: Set the command position value within the software stroke limit by the manual control operation. At speed control mode/torque control mode/continuous operation to torque control mode: Review the operation so that the command position value does not exceed the software stroke limit.
1994H	Software stroke limit +	The new position value exceeds the upper limit of the software stroke limit. [Operation status at error occurrence] In the analysis of new current value: Current value is not changed.	Set the new position value within the software stroke limit.
1995H	Software stroke limit -	The command position exceeds the lower limit of the software stroke limit. [Operation status at error occurrence] At operation start: The system does not operate. During operation: • The system stops immediately when the positioning address during position control (including position control in speed-position switching control or position-speed switching control) is switched to the data outside the software stroke limit range. • During speed control (including speed control in speed-position switching control or position-speed switching control), the system stops at the setting (normal deceleration stop only) of rapid stop selection (stop group 3) in the detailed parameter 2 when the command position value or machine feed value during manual control is outside the software stroke limit range. At speed control mode/torque control mode/continuous operation to torque control mode: The system switches to the position control mode and stops immediately when the command position value is outside the software stroke limit range.	At operation start: Set the command position value within the software stroke limit by the manual control operation. At speed control mode/torque control mode/continuous operation to torque control mode: Review the operation so that the command position value does not exceed the software stroke limit.
1996H	Software stroke limit -	The new position value exceeds the lower limit of the software stroke limit. [Operation status at error occurrence] In the analysis of new current value: Current value is not changed.	Set the new position value within the software stroke limit.
1997H	Outside new current value range	The new current address is outside the ranges of 0 to 359.99999, where the control unit is set to "degree". [Operation status at error occurrence] Current value is not changed.	Bring the new position value into the setting range.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1998H	Interpolation while interpolation axis BUSY	Interpolation is started during the operation of the interpolation axis. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the control method.
1999H	Unit group unmatched	The reference and interpolation axis units are different at the parameter "interpolation speed designation method" setting of "composite speed". [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the positioning data or change the parameter "Unit setting" of the axis to be interpolated.
199AH	Interpolation mode error	For starting, a composite speed is designated in the reference axis parameter "Interpolation speed designation method" using the speed interpolation control or 4-axis linear interpolation control. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Set the "Interpolation speed designation method" correctly.
199BH	Interpolation mode error	For starting, a reference axis speed is designated in the reference axis parameter "Interpolation speed designation method" using the circular interpolation control or helical interpolation control. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Set the "Interpolation speed designation method" correctly.
199CH	Control method setting error	• The control method setting value is outside the setting range. • The number of control axes or the axis to be interpolated differs from the previous data when continuous positioning control or continuous path control is to be exercised for continuously. • The NOP instruction was set to the control method of positioning data No.600. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the control method, axis to be interpolated or parameter.
199EH	Simultaneous start not possible	Among the axes to be started simultaneously, there is an axis on which an error other than this error occurs. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	In the error history, check the axis where the error other than this error occurred, and remove the error factor. Correct the block start data and positioning data.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
199FH	Circular interpolation not possible	Circular interpolation or helical interpolation is carried out on an axis in the unit of degree. [Operation status at error occurrence] The operation is terminated.	Correct the control method.
19A0H	M code ON signal start	The positioning start is carried out when an M code ON signal is turned ON. [Operation status at error occurrence] The system does not operate at start.	After turning OFF the M code ON signal, start the system.
19A1H	PLC READY OFF start	The positioning start is carried out when the PLC READY signal [Y0] is turned OFF. [Operation status at error occurrence] The system does not operate at start.	Check the program which turns ON/OFF the PLC READY signal [Y0], and turn ON the PLC READY signal [Y0]. Then start the system.
19A2H	READY OFF start	The positioning start is carried out when the READY signal [X0] is turned OFF. [Operation status at error occurrence] The system does not operate at start.	Check the READY ON signal [X0], and then start the system.
19A3H	Outside start No. range	• At the start of positioning, the setting value of the "positioning start No." of the axis control data is outside the ranges of 1 to 600, 7000 to 7004, and 9001 to 9004. • At a Pre-reading start, the "positioning start No." setting of the axis control data is other than 1 to 600. [Operation status at error occurrence] The system does not operate at start.	Normalize the positioning start No.
19A4H	Illegal setting of ABS direction in unit of degree	The setting value of the "[Cd.40] ABS direction in degrees" is outside the setting range when the software stroke limit is invalid. [Operation status at error occurrence] At start: The system does not operate. During operation: The system decelerates to a stop. (Note that, in the continuous positioning control and continuous path control, the system continues operating with the setting set at the time of start even if the setting is changed during the operation.)	Correct the "[Cd.40] ABS direction in degrees".
19A5H	Illegal setting of ABS direction in unit of degree	The setting value of the "[Cd.40] ABS direction in degrees" is set other than "0" when the software stroke limit is valid. [Operation status at error occurrence] At start: The system does not operate. During operation: The system decelerates to a stop. (Note that, in the continuous positioning control and continuous path control, the system continues operating with the setting set at the time of start even if the setting is changed during the operation.)	• Set "0" when the software stroke limits are valid. • Invalidate the software stroke limit. (To invalidate, set the software stroke limit upper limit value to the software stroke limit lower limit value.)
19A6H	Start at home position return incomplete	• When executing operation setting at home position return incomplete, positioning was started at home position return request ON. • When executing operation setting at home position return incomplete, control mode switching was executed at home position return request ON. [Operation status at error occurrence] At start: The system does not operate. At control mode switching: The mode is not changed.	• Start after the home position return is executed. • Switch the control mode after the home position return is executed. • For systems which can operate the positioning control and speed-torque control though the home position return request is ON, set "1" to the setting value of the operation setting at home position return incomplete.
19E4H	Outside control mode auto-shift switching parameter range	When setting the control mode auto-shift switching selection, the control mode auto-shift switching parameter is outside the range. [Operation status at error occurrence] During positioning control: The system stops with the setting of the detailed parameter 2 Rapid stop selection (stop group 3). During speed control mode: The mode is switched to position control mode, and the system stops immediately.	Set the control mode auto-shift switching parameter within the range and switch to the continuous operation to torque control mode.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
19E7H	Continuous operation to torque control not supported	Switching to the continuous operation to torque control mode is requested to a servo amplifier which does not support the continuous operation to torque control. [Operation status at error occurrence] During positioning control: The system stops with the setting of the detailed parameter 2 Rapid stop selection (stop group 3). During speed control mode: The mode is switched to position control mode, and the system stops immediately.	Use a servo amplifier which supports the continuous operation to torque control.
19F0H	Illegal condition data No.	The condition data No. is outside the setting range when a block using the condition data is started by a special starting (conditional start, wait start, simultaneous start, FOR (condition)). (1 ≤ Condition data No. ≤ 10) [Operation status at error occurrence] The operation is terminated.	Review the condition data No.
19F1H	Error before simultaneous start	<When blocks are started simultaneously> The partner axis for simultaneous start is BUSY. [Operation status at error occurrence] At start: The system does not operate. During operation: The operation is terminated.	Normalize the simultaneous start axis.
19F2H	Special start instruction error	No applicable special start instruction is present. [Operation status at error occurrence] The operation is terminated.	Correct the instruction code of the special start.
1A00H	Condition data error	The condition setting values are not set or outside the setting range. [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1A01H	Condition data error	The condition operator setting values are not set or outside the setting range. [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1A02H	Condition data error	The parameter 1 is outside the range when the condition operator is a bit operator. [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1A03H	Condition data error	An unusable condition operator is set for the set condition. [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1A04H	Condition data error	• The conditional operator has been [parameter 1 is greater than parameter 2] with 05H (P1 ≤ ** ≤ P2). • The conditional operator has been [parameter 1 is greater than parameter 2] with 06H (** ≤ P1, P2 ≤ **). [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1A05H	Condition data error	[RD77MS] The setting value of "address" is outside the setting range when the condition target is set to "Buffer memory (1-word/2-word)". (1-word: 0 to 98303, 2-word: 0 to 98302) [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
		[RD77GF] • The setting value of "address" is outside the setting range when the condition target is set to "Buffer memory (1-word/2-word)". (1-word: 0 to 4194303, 2-word: 0 to 4194302) • When the condition target is set to link device, the station in which the link device assigned does not exist. [Operation status at error occurrence] The operation is terminated.	

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1A0CH	Condition data error	The same axis No. is set in "[Da.24] Simultaneous starting axis No.1", [Da.25] Simultaneous starting axis No.2" and [Da.26] Simultaneous starting axis No.3". [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1A0DH	Condition data error	The axis No. is set in "[Da.24] Simultaneous starting axis No.1", [Da.25] Simultaneous starting axis No.2" and [Da.26] Simultaneous starting axis No.3", that is larger than the common parameter "[Pr.152] Maximum number of control axes". [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1A0EH	Condition data error	The self axis is set in "[Da.24] Simultaneous starting axis No.1", [Da.25] Simultaneous starting axis No.2" and [Da.26] Simultaneous starting axis No.3". [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1A0FH	Condition data error	The "[Da.23] Number of simultaneous starting axes" is outside the setting range, or the "[Da.23] Number of simultaneous starting axes" is larger than the "[Pr.152] Maximum number of control axes". [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1A10H	Illegal data No.	The designation of a JUMP destination is executed currently. [Operation status at error occurrence] The positioning data is not executed.	Normalize the positioning data.
1A11H	Illegal data No.	• The positioning data No. tried to be executed is outside the ranges of 1 to 600, 7000 to 7004, and 9001 to 9004. • The designation of a JUMP destination is outside the ranges of 1 to 600. [Operation status at error occurrence] The positioning data is not executed.	Normalize the positioning data.
1A12H	No command speed	At the start of positioning, a current speed (-1) is set for the command speed of the positioning data to be initially executed. [Operation status at error occurrence] The operation does not start at positioning start.	Normalize the positioning data.
1A13H	No command speed	The current speed is set by speed control. [Operation status at error occurrence] The operation does not start at positioning start.	Normalize the positioning data.
1A14H	No command speed	The current speed is set for speed-position or position-speed switching control. [Operation status at error occurrence] The operation does not start at positioning start.	Normalize the positioning data.
1A15H	Outside linear movement amount range	When "[Pr.20] Interpolation speed designation method" performs a linear interpolation in setting a "composite speed", the axis movement amount for each positioning data exceeds 1073741824(2^{30}). [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops immediately.	Review the positioning address.
1A16H	Outside linear movement amount range	The positioning address is -360.00000 or less or 360.00000 or more using INC instruction, where the control unit is set to "degree" and "[Pr.12] Software stroke limit upper limit value" is not equal to "[Pr.13] Software stroke limit lower limit value". [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops immediately.	Review the positioning address.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1A17H	Large arc error deviation	When an arc or a helical is interpolated by the designation of the center point, a difference between a radius of start point—center point and a radius of end point—center point exceeds the parameter "Circular interpolation error allowable limit". [Operation status at error occurrence] At start: The circular interpolation control by center point designation is not executed. During operation: The system stops immediately.	• Correct the center point address (arc address) • Correct the end address (positioning address) • Correct the circular interpolation error allowable limit value.
1A18H	Software stroke limit +	The setting value of the "[Da.6] Positioning address/ movement amount" exceeds "[Pr.12] Software stroke limit upper limit value". [Operation status at error occurrence] At operation start: The system does not operate. In the analysis of new current value: Current value is not changed. During operation: • The system stops immediately when the positioning address during position control (including position control in speed-position switching control or position-speed switching control) is switched to the data outside the software stroke limit range. • During speed control (including speed control in speed-position switching control or position-speed switching control), the system stops at the setting (normal deceleration stop only) of rapid stop selection (stop group 3) in the detailed parameter 2 when the command position value or machine feed value during manual control is outside the software stroke limit range. At speed control mode/torque control mode/continuous operation to torque control mode: The system switches to the position control mode and stops immediately when the command position value is outside the software stroke limit range.	At operation start, during operation: Correct the "[Da.6] Positioning address/movement amount". At operation start: Set the command position value within the software stroke limit by the manual control operation.
1A19H	Software stroke limit +	In the circular interpolation or helical interpolation with sub points designated, the sub point exceeds "[Pr.12] Software stroke limit upper limit value". [Operation status at error occurrence] At operation start: The system does not start.	At operation start, during operation: Correct the "[Da.6] Positioning address/movement amount" and the "[Da.7] Arc address". At operation start: Set the command position value within the software stroke limit by the manual control operation.
1A1AH	Software stroke limit -	The setting value of the "[Da.6] Positioning address/ movement amount" exceeds "[Pr.13] Software stroke limit lower limit value". [Operation status at error occurrence] At operation start: The system does not operate. In the analysis of new current value: Current value is not changed. During operation: • The system stops immediately when the positioning address during position control (including position control in speed-position switching control or position-speed switching control) is switched to the data outside the software stroke limit range. • During speed control (including speed control in speed-position switching control or position-speed switching control), the system stops at the setting (normal deceleration stop only) of rapid stop selection (stop group 3) in the detailed parameter 2 when the command position value or machine feed value during manual control is outside the software stroke limit range. At speed control mode/torque control mode/continuous operation to torque control mode: The system switches to the position control mode and stops immediately when the command position value is outside the software stroke limit range.	At operation start, during operation: Correct the "[Da.6] Positioning address/movement amount". At operation start: Set the command position value within the software stroke limit by the manual control operation.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1A1BH	Software stroke limit -	In the circular interpolation or helical interpolation with sub points designated, the sub point exceeds "[Pr.13] Software stroke limit lower limit value". [Operation status at error occurrence] At operation start: The system does not start.	At operation start, during operation: Correct the "[Da.6] Positioning address/movement amount" and the "[Da.7] Arc address". At operation start: Set the command position value within the software stroke limit by the manual control operation.
1A1CH	New current value not possible	The control method sets an operation pattern (continuous path control) using new current positioning data. [Operation status at error occurrence] Current value is not changed.	• Do not designate a current value changing using the positioning data following the continuous path control. • Do not designate positioning data following continuous path control using a "current value changing".
1A1DH	New current value not possible	The operation pattern sets a "new current value" in the control method using the data following the "continuous path control" positioning data. [Operation status at error occurrence] Current value is not changed.	• Do not designate a current value changing using the positioning data following the continuous path control. • Do not designate positioning data following continuous path control using a "current value changing".
1A1EH	Continuous path control not possible	"[Da.1] Operation pattern" is "Continuous positioning control" or "Continuous path control" when "[Da.2] Control method" is "Speed control" or "Position-speed switching control". [Operation status at error occurrence] The system does not operate at start.	Correct the "[Da.1] Operation pattern" or "[Da.2] Control method".
1A1FH	Continuous path control not possible	"[Da.1] Operation pattern" is "Continuous path control" when "[Da.2] Control method" is "Fixed-feed" or "Speed-position switching control". [Operation status at error occurrence] The system does not operate at start.	Correct the "[Da.1] Operation pattern" or "[Da.2] Control method".
1A20H	Continuous path control not possible	"[Da.1] Operation pattern" is "Continuous path control" when "[Da.2] Control method" is "Speed control", "Fixed-feed", "Position-speed switching control" or "Speed-position switching control". [Operation status at error occurrence] The system does not operate at start.	Correct the "[Da.1] Operation pattern" or "[Da.2] Control method".
1A21H	Outside operation pattern range	The operation pattern set value is 2. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the operation pattern.
1A22H	Illegal interpolation description command	In the interpolation control, the axis to be interpolated is set as follows: • The self axis • Not present axis • The axis No. exceeds the maximum number of control axes. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	• Correct the "[Da.2] Control method". • Correct the axis to be interpolated. • Correct the maximum number of control axes.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1A23H	Command speed setting error	The command speed is outside the setting range. Linear interpolation, circular interpolation, helical interpolation: Reference axis is outside the setting range. Speed control interpolation: Either of reference axis and interpolation axis is outside the speed range. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the command speed.
1A24H	Control method setting error	The control method setting value is outside the setting range. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the control method, axis to be interpolated or parameter.
1A25H	Control method setting error	The number of control axes or the axis to be interpolated differs from the previous data when continuous positioning control or continuous path control is to be exercised for continuously. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the control method, axis to be interpolated or parameter.
1A26H	Control method setting error	The NOP instruction was set to the control method of positioning data No.600. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the control method, axis to be interpolated or parameter.
1A27H	Sub point setting error	Start point is equal to sub point in the circular interpolation or helical interpolation with sub points designated. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops immediately.	Correct the sub address (arc address).
1A28H	Sub point setting error	End point is equal to sub point in the circular interpolation or helical interpolation with sub points designated. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops immediately.	Correct the sub address (arc address).
1A29H	Sub point setting error	Start point, end point, and sub point are in line with each other in the circular interpolation or helical interpolation with sub points designated. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops immediately.	Correct the sub address (arc address).
1A2AH	Sub point setting error	Sub point address is outside the range of -2147483648 to 2147483647 in the circular interpolation or helical interpolation with sub points designated. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops immediately.	Correct the sub address (arc address).

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1A2BH	End point setting error	Start point is equal to end point in the circular interpolation or helical interpolation with sub points designated. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops immediately.	Correct the end address (positioning address).
1A2CH	End point setting error	End point address is outside the range of -2147483648 to 2147483647 in the circular interpolation or helical interpolation with auxiliary point designation and center point designation. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops immediately.	Correct the end address (positioning address).
1A2DH	Center point setting error	Start point is equal to center point in the circular interpolation or helical interpolation with center point designation. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops immediately.	Correct the center point address (arc address).
1A2EH	Center point setting error	End point is equal to center point in the circular interpolation or helical interpolation with center point designation. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops immediately.	Correct the center point address (arc address).
1A2FH	Center point setting error	Center point address is outside the range of -2147483648 to 2147483647 in the circular interpolation or helical interpolation with center point designation. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops immediately.	Correct the center point address (arc address).
1A30H	Outside address range	In the speed-position switching control and the position-speed switching control, the setting value of a positioning address is negative. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the positioning address.
1A31H	Outside address range	In ABS1, ABS2, ABS3 and ABS4, the setting value of a positioning address is outside the range of 0 to 359.99999 degrees. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the positioning address.
1A32H	Outside radius range	The arc radius exceeds 536870912. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops immediately.	Correct the positioning data.
1A33H	Control method LOOP setting error	A "0" is set in the repeating times of the control method "LOOP". [Operation status at error occurrence] The operation is terminated.	Set 1 to 65535 in the repeating time of LOOP.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1A34H	M code ON timing error	The setting value of the positioning data "[Da.27] M code ON signal output timing" is outside the setting range. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3).	Correct the setting range of the "[Da.27] M code ON signal output timing" within "0 to 2".
1A35H	Interpolation speed designation method error	The setting value of the positioning data "[Da.29] Interpolation speed designation method" is outside the setting range. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3).	Correct the setting range of the "[Da.29] Interpolation speed designation method" within "0 to 2".
1A36H	Outside number of pitch	The number of pitches set in "[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches" of the linear axis is outside the setting range when the helical interpolation control has been performed. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3).	Correct the number of pitches set in "[Da.10] M code/ Condition data No./Number of LOOP to LEND repetitions/Number of pitches" of the linear axis within "0 to 999".
1A37H	Sub point setting error	The sub point address is outside the range of -2147483648 to 2147483647 when the circular interpolation control or helical interpolation control has been performed with the sub point being specified. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops immediately.	Correct the sub address (arc address).
1A60H	Outside unit setting range	The set value of the basic parameter 1 "Unit setting" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1A61H	Outside pulse number per rotation range	The set value of the basic parameter 1 "Number of pulses per rotation" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1A62H	Outside movement amount per rotation range	The set value of the basic parameter 1 "Movement amount per rotation" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1A63H	Outside unit magnification range	• The set value of the basic parameter 1 "Unit magnification" is outside the setting range. • "Movement amount per rotation (AL)" × "Unit magnification (AM)" exceeds 2147483648. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	• Set AL and AM values which make "Movement amount per rotation (AL)" × "Unit magnification (AM)" within 2147483647, and then turn the PLC READY signal [Y0] from OFF to ON. • With the setting brought into the setting range, turn the PLC READY signal [Y0] from OFF to ON.
1A66H	Outside bias speed range	The setting value of the basic parameter 1 "Bias speed at start" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1A67H	Outside bias speed range	The bias speed exceeds the speed limit value. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Set the bias speed equal to or less than the speed limit value and turn the PLC READY signal [Y0] from OFF to ON.
1A68H	Outside electronic gear setting range	The set value of the electronic gear is outside the setting range. Setting range: 0.001 ≤ Electronic gear ≤ 320000 Electronic gear = [Pr.2]/([Pr.3] × [Pr.4]) [Operation status at error occurrence] The READY signal [X0] is not turned ON.	"[Pr.2] Number of pulses per rotation (AP)" "[Pr.3] Movement amount per rotation (AL)" "[Pr.4] Unit magnification (AM)" Review these parameters.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1A69H	Outside speed limit value range	The setting value of the basic parameter 2 "[Pr.8] Speed limit value" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: READY signal [X0] is not turned ON. At start: The system does not operate.	When the PLC READY signal [Y0] is not turned ON after the setting is set within the setting range, turn the PLC READY signal [Y0] from OFF to ON.
1A6AH	Outside speed limit value range	The setting value of the basic parameter 2 "[Pr.8] Speed limit value" exceeds the command speed limit value. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: READY signal [X0] is not turned ON. At start: The system does not operate.	After the speed limit value is set so as not to exceed the command speed limit value, turn the PLC READY signal [Y0] from OFF to ON.
1A6BH	Outside acceleration time 0 range	The setting value of the basic parameter 2 "Acceleration time 0" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: READY signal [X0] is not turned ON. At start: The system does not operate.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1A6CH	Outside deceleration time 0 range	The setting value of the basic parameter 2 "Deceleration time 0" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: READY signal [X0] is not turned ON. At start: The system does not operate.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AA0H	Backlash compensation amount error	The calculation result of the following equation is smaller than 0 or larger than 4194304. $0 \leq \frac{[Pr.11] \times [Pr.2]}{[Pr.3] \times [Pr.4]} \leq 4194303$ [Operation status at error occurrence] The READY signal [X0] is not turned ON.	"[Pr.2] Number of pulses per rotation (AP)", "[Pr.3] Movement amount per rotation (AL)", "[Pr.4] Unit magnification (AM)", "[Pr.11] Backlash compensation amount" Review the items above.
1AA1H	Software stroke limit upper limit	In the unit of "degree", the setting value of the detailed parameter 1 "Software stroke limit upper limit value" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AA2H	Software stroke limit upper limit	In a unit other than "degree", the software stroke limit upper limit value is smaller than the setting value of the software stroke limit lower limit value. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	In a unit other than "degree", set so that the "[Pr.13] Software stroke limit lower limit value" is smaller than the "[Pr.12] Software stroke limit upper limit value", turn the PLC READY signal [Y0] from OFF to ON.
1AA3H	Software stroke limit lower limit	In the unit of "degree", the setting value of the detailed parameter 1 "Software stroke limit lower limit value" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AA4H	Software stroke limit lower limit	In a unit other than "degree", the software stroke limit upper limit value is smaller than the setting value of the software stroke limit lower limit value. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	In a unit other than "degree", set so that the "[Pr.13] Software stroke limit lower limit value" is smaller than the "[Pr.12] Software stroke limit upper limit value", turn the PLC READY signal [Y0] from OFF to ON.
1AA5H	Software stroke limit selection	• The setting value of the detailed parameter 1 "Software stroke limit selection" is outside the setting range. • In the unit of "degree", "1: Apply software stroke limit on machine feed value" is set. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	• Bring the setting into the setting range. • In the unit of "degree", set "0: Apply software stroke limit on command position value".
1AA6H	Software stroke limit valid/invalid setting	The setting value of the detailed parameter 1 "Software stroke limit valid/invalid setting" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1AA7H	Command in-position width	The setting value of the detailed parameter 1 "Command in-position width" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AA8H	Illegal torque limit setting value	The setting value of the detailed parameter 1 "Torque limit setting value" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AA9H	M code ON timing error	The setting value of the detailed parameter 1 "M code ON signal output timing" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AAAH	Speed switching mode error	The setting value of the detailed parameter 1 "Speed switching mode" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AABH	Interpolation speed designation method error	The setting value of the detailed parameter 1 "Interpolation speed designation method" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AACH	Current value update request error	The setting value of the detailed parameter 1 "command position value during speed control" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AAEH	Speed-position function selection error	The detailed parameter 1 "Speed-position function selection" is preset to 2 and the following three conditions are not satisfied: • Unit is "degree". • Software stroke limits are invalid. • Update command position value. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	• Speed-position switching control (ABS mode) should satisfy the conditions given on the left. • When speed-position switching control (ABS mode) is not to be exercised, set 0 to speed-position function selection and turn the PLC READY signal [Y0] from OFF to ON.
1AB1H	Acceleration time 1 setting error	The setting value of the detailed parameter 2 "Acceleration time 1" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AB2H	Acceleration time 2 setting error	The setting value of the detailed parameter 2 "Acceleration time 2" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1AB3H	Acceleration time 3 setting error	The setting value of the detailed parameter 2 "Acceleration time 3" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AB4H	Deceleration time 1 setting error	The setting value of the detailed parameter 2 "Deceleration time 1" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AB5H	Deceleration time 2 setting error	The setting value of the detailed parameter 2 "Deceleration time 2" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AB6H	Deceleration time 3 setting error	The setting value of the detailed parameter 2 "Deceleration time 3" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AB7H	JOG speed limit value error	The setting value of the detailed parameter 2 "[Pr.31] JOG speed limit value" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start.	When the PLC READY signal [Y0] is not turned ON after the setting value is corrected, turn the PLC READY signal [Y0] from OFF to ON.
1AB8H	JOG speed limit value error	The setting value of the detailed parameter 2 "[Pr.31] JOG speed limit value" exceeds the "[Pr.8] Speed limit value". [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start.	When the PLC READY signal [Y0] is not turned ON after the setting value is set to equal to or less than the "[Pr.8] Speed limit value", turn the PLC READY signal [Y0] from OFF to ON.
1AB9H	JOG speed limit value error	The setting value of the detailed parameter 2 "[Pr.31] JOG speed limit value" is smaller than the "[Pr.7] Bias speed at start". [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start.	When the PLC READY signal [Y0] is not turned ON after the setting value is set to equal to or more than the "[Pr.7] Bias speed at start", turn the PLC READY signal [Y0] from OFF to ON.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1ABAH	Manual pulse generator speed limit value error	The setting value of the detailed parameter 2 "Manual pulse generator speed limit value" is outside the setting range. [Operation status at error occurrence] At the power on or when the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not operate.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1ABBH	Manual pulse generator speed limit value error	The setting value of the detailed parameter 2 "Manual pulse generator speed limit value" exceeds the "speed limit value". [Operation status at error occurrence] At the power on or when the power supply is turned from OFF to ON, or the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not operate.	Set a value equal to or less than the speed limit value.
1ABCH	JOG acceleration time selection setting error	The setting value of the detailed parameter 2 "JOG operation acceleration time selection" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1ABDH	JOG deceleration time selection setting error	The setting value of the detailed parameter 2 "JOG operation deceleration time selection" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1ABEH	Acceleration/deceleration process selection setting error	The setting value of the detailed parameter 2 "Acceleration/deceleration process selection" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1ABFH	S-curve ratio setting error	The setting value of the detailed parameter 2 "S-curve ratio" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1AC0H	Illegal rapid stop deceleration time	The setting value of the detailed parameter 2 "Rapid stop deceleration time" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AC1H	Stop group 1 rapid stop selection error	The setting value of the detailed parameter 2 "Stop group 1 rapid stop selection" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AC2H	Stop group 2 rapid stop selection error	The setting value of the detailed parameter 2 "Stop group 2 rapid stop selection" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AC3H	Stop group 3 rapid stop selection error	The setting value of the detailed parameter 2 "Stop group 3 rapid stop selection" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AC4H	Outside allowance circular interpolation error width	The setting value of the detailed parameter 2 "Allowance circular interpolation error width" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1AC5H	External command function selection error	The setting value of the detailed parameter 2 "External command function selection" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AC6H	Manual pulse generator speed limit mode error	The setting value of the detailed parameter 2 "[Pr.122] Manual pulse generator speed limit mode" is outside the setting range. [Operation status at error occurrence] At the power on or when the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not operate.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1ACAH	External input signal selection error	The setting value of the detailed parameter 1 "External input signal selection" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1ACBH	Input signal logic selection setting error	The setting values of the detailed parameter 1 "Input signal logic selection" are different in the axis that uses the same input signal. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	With the setting of the axis is matched, turn the PLC READY signal [Y0] from OFF to ON.
1ACCH	Restart allowable range error	The setting value of the detailed parameter 2 "Restart allowable range when servo OFF to ON" is outside the setting range. [Operation status at error occurrence] When the PLC READY signal [Y0] is turned from OFF to ON: The READY signal [X0] is not turned ON. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 3). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1ACDH	Speed control 10 × multiplier setting for degree axis error	The setting value of the detailed parameter 2 "Speed control 10 × multiplier setting for degree axis" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1ACEH	Operation setting for speed-torque control mode error	The setting value of the detailed parameter 2 "Operation setting for speed-torque control mode" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1ACFH	External command signal selection error	The setting value of the detailed parameter 2 "External command signal selection" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AD0H	FLS signal selection error	The setting value of the detailed parameter 1 "FLS signal selection" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AD1H	RLS signal selection error	The setting value of the detailed parameter 1 "RLS signal selection" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AD2H	DOG signal selection error	The setting value of the detailed parameter 1 "DOG signal selection" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1AD3H	STOP signal selection error	The setting value of the detailed parameter 1 "STOP signal selection" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1AD4H	Servo amplifier external input signal select error [RD77GF]	When the servo amplifier is connected, an error occurs in the consistency diagnosis for the external signal input settings of the Simple Motion module and the servo amplifier. [Operation status at error occurrence] The servo does not power ON.	Review the external input signal settings of the servo amplifier and the Simple Motion module. (Refer to the servo amplifier instruction manual for the external input signal setting.)
1B00H	Home position return method error	The setting value of the home position return basic parameter "Home position return method" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1B01H	Home position return direction error	The setting value of the home position return basic parameter "Home position return direction" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1B02H	Home position address setting error	The setting value of the home position return basic parameter "Home position address" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1B03H	Home position return speed error	The setting value of the home position return basic parameter "[Pr.46] Home position return speed" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1B04H	Home position return speed error	The setting value of the home position return basic parameter "[Pr.46] Home position return speed" exceeds the "[Pr.8] Speed limit value". [Operation status at error occurrence] The READY signal [X0] is not turned ON.	After the setting value is set to equal to or less than the "[Pr.8] Speed limit value", turn the PLC READY signal [Y0] from OFF to ON.
1B05H	Home position return speed error	The setting value of the home position return basic parameter "[Pr.46] Home position return speed" is smaller than "[Pr.7] Bias speed at start". [Operation status at error occurrence] The READY signal [X0] is not turned ON.	After the setting value is set to equal to or more than "[Pr.7] Bias speed at start", turn the PLC READY signal [Y0] from OFF to ON.
1B06H	Creep speed error	The setting value of the home position return basic parameter "[Pr.47] Creep speed" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1B07H	Creep speed error	The setting value of the home position return basic parameter "[Pr.47] Creep speed" is larger than the "[Pr.46] Home position return speed". [Operation status at error occurrence] The READY signal [X0] is not turned ON.	After the setting value is set to equal to or less than the "[Pr.46] Home position return speed", turn the PLC READY signal [Y0] from OFF to ON.
1B08H	Creep speed error	The setting value of the home position return basic parameter "[Pr.47] Creep speed" is smaller than the "[Pr.7] Bias speed at start". [Operation status at error occurrence] The READY signal [X0] is not turned ON.	After the setting value is set to equal to or more than the "[Pr.7] Bias speed at start", turn the PLC READY signal [Y0] from OFF to ON.
1B09H	Home position return retry error	The setting value of the home position return basic parameter "Home position return retry" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1B0AH	Setting for the movement amount after proximity dog ON error	The setting value of the home position return detailed parameter "Setting for the movement amount after proximity dog ON" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1B0BH	Home position return acceleration time selection error	The setting value of the home position return detailed parameter "Home position return acceleration time selection" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1B0CH	Home position return deceleration time selection error	The setting value of the home position return detailed parameter "Home position return deceleration time selection" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1B0DH	Home position return torque limit value error	The setting value of the home position return detailed parameter "Home position return torque limit value" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1B0EH	Home position return torque limit value error	The home position return detailed parameter "Home position return torque limit value" has exceeded the detailed parameter 1 "Torque limit setting value". [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1B10H	Speed designation during home position shift error	The setting value of the home position return detailed parameter "Speed designation during home position shift" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1B11H	Operation setting for incompletion of home position return error	The setting value of the home position return detailed parameter "Operation setting for incompletion of home position return" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1B70H	Manual pulse generator/ Incremental synchronous encoder input selection error	The setting value of the common parameter "Manual pulse generator/Incremental synchronous encoder input selection" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1B71H	Forced stop valid/ invalid setting error	The setting value of the common parameter "Forced stop valid/invalid setting" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1B72H	Manual pulse generator/ Incremental synchronous encoder input type selection error	The setting value of the common parameter "Manual pulse generator/Incremental synchronous encoder input type selection" is outside the setting range. [Operation status at error occurrence] The communication between servo amplifiers of target axis is not executed. (The servo amplifier's LED display remains "Ab".)	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1B73H	Operation cycle setting error	The setting value of the common parameter "Operation cycle setting" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	With the setting brought into the setting range, write to the flash ROM and switch the power on again or reset the PLC.
1B75H	Manual pulse generator/ Incremental synchronous encoder input logic selection error	The setting value of the common parameter "[Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection" is outside the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct the setting value, turn the PLC READY signal [Y0] from OFF to ON.
1B78H	Servo parameter PD41 setting error [RD77GF]	Servo parameter PD41 (Stroke limit enabling condition selection) is not set to "1: Enabled only for home position return mode". [Operation status at error occurrence] The communication with the corresponding servo amplifier is not executed.	Set "1: Enabled only for home position return mode" in the servo parameter PD41 (Stroke limit enabling condition selection).

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1C80H	Driver error	Errors occur in the driver. [Operation status at error occurrence] The motor stops. (The stop method follows the specifications of the driver.)	Confirm the alarm code by "[Md.114] Servo alarm" and refer to the driver instruction manual for details.
1C81H	Communication retry counter error	The Simple Motion module detects the communication retry counter errors with the driver. [Operation status at error occurrence] The system stops immediately. (The driver stops by the communication error.)	• Check the SSCNETⅢ cable. (Connection error or damage) • Replace the driver in which the alarm (communication error) occurred. • Replace the Simple Motion module.
1C82H	WDT error	The Simple Motion module detects the WDT error of the driver. [Operation status at error occurrence] The system stops immediately.	Replace the driver in which the WDT occurred.
1C83H	Unsupported operation cycle	The setting value of the operation cycle to which amplifier does not correspond is set up. [Operation status at error occurrence] The system stops immediately.	With the setting brought into the supported range, switch the power on again or reset the PLC.
1C84H	Amplifier electronic gear setting error [RD77MS]	When the resolution of the rotary servo motor is 67108864 pulse/rev using MR-J5(W)-B, the set values of the servo parameter "Electronic gear - Numerator (PA06)" and "Electronic gear - Denominator (PA07)" are mismatch. [Operation status at error occurrence] The communication start process with the servo amplifier of the corresponding axis is not completed. (The servo amplifier's LED display remains "A_".)	With "Electronic gear - Numerator (PA06)" and "Electronic gear - Denominator (PA07)" set by a correct combination, turn the PLC READY signal [Y0] from OFF to ON. After that reconnect the servo amplifier. <Electronic gear - Numerator (PA06)> 16 <Electronic gear - Denominator (PA07)> 1
1C90H	Number of master axis error	Number of axes set for the master axis in servo parameter "Driver communication setting (PD15)" exceed the setting range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Set the number of master axis not more than the number can be set in servo parameter "PD15".
1C91H	Master axis No. error	Servo parameters "Driver communication setting Master axis No. selection (1 to 4) for slave (PD20 to PD23)" are set the self axis. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Review the master axis No. of servo parameters "PD20 to PD23".
1C92H	Master axis setting error	Not setting the master axis in Servo parameters" Driver communication setting Master axis No. selection (1 to 4) for slave (PD20 to PD23) ". [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Review the master axis No. of servo parameters "PD20 to PD23".
1C93H	Driver communication setting error	• Setting the driver communication to servo amplifier which does not support the driver communication. • The driver communication setting is different in the module and the servo amplifier. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	• Confirm the driver communication and the actually connected servo amplifier. • After setting "The driver communication setting", write to a flash ROM and switch the power on again or reset the PLC. After that turning the power of servo amplifier on again, switch the power on again or reset the PLC.
1C96H	Master axis amplifier type error [RD77MS]	The servo series of the master axis corresponding to the slave axis is different. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	• If the slave axis is MR-J4(W)-B, set MR-J4(W)-B for the master axis. • If the slave axis is MR-J5(W)-B, set MR-J5(W)-B for the master axis.
1CB2H	SLMP communication error [RD77GF]	The connection is disconnected for error is detected in the SLMP communication during amplifier connecting. [Operation status at error occurrence] The communication with the corresponding servo amplifier is not executed.	• Check the Abort Code and take corrective actions according to causes. • Check the object content used in servo cyclic transmission. (Refer to the driver instruction manual for Abort Code details and object available to be sent.)
1CB3H	Servo object specification error [RD77GF]	The object size specification of the servo object specification data is outside the setting range. [Operation status at error occurrence] The communication with the corresponding servo amplifier is not executed.	Review the parameter setting.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1CBDH	Connection servo amplifier speed unit setting error [RD77GF]	The unsupported speed unit (SI unit velocity) is connected to the set servo amplifier. [Operation status at error occurrence] The communication with the corresponding servo amplifier is not executed.	Please refer to the "Servo Amplifier Instruction Manual" to change the speed unit to (0.01 r/min) or (0.01 mm/s).
1CBEH	The optical hub unit connection error [RD77MS]	• The number of the optical hub units exceeds the connectable number per system. • The optical hub unit is connected to the route that passes OUT2 or OUT3. [Operation status at error occurrence] The communication with the servo amplifier connected to the sub route or the unit which exceeds the connectable number is not executed.	• Set the number of the optical hub units that is not more than the connectable number. • When connecting the optical hub unit to the later optical hub unit, connect to the route which is diverged from OUT1.
1CBFH	The optical hub unit communication error [RD77MS]	Communication with the optical hub unit is error. [Operation status at error occurrence] The operation continues or the communication with the servo amplifier is disconnected by the error occurred in the corresponding unit.	• Check if there is any problem with the SSCNETⅢ cable. • Check if there is any problem with the power supply. • Replace the optical hub unit.
1CC0H	Outside link device start No. range [RD77GF]	The corresponding station does not exist in link device. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Review the link device start No. setting.
1CC1H	Outside the link device bit specification range [RD77GF]	Bit other than 0 to F is specified. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Review the setting of link device bit specification.
1CC2H	Outside the link device maximum/minimum value specification range [RD77GF]	The maximum value in the ring counter range is set smaller than the minimum value. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Review the maximum value/minimum value of ring counter.
2220H	Parameter error [RD77GF]	The parameter setting is corrupted. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Check the detailed information of the error by executing module diagnostics of the engineering tool, and write the displayed parameter. If the error occurs again even after taking the above, the possible cause is a hardware failure of the module. Please consult your local Mitsubishi representative.
2221H	Network parameters error [RD77GF]	The set value is out of the range. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Check the detailed information of the error by executing module diagnostics using the engineering tool, and correct the parameter setting corresponding to the displayed No.
24C0H	Bus error [RD77GF]	An error was detected on the system bus. [Operation status at error occurrence] The operation is carried out according to "CPU Module Operation Setting at Error Detection (Moderate)" of "I/O Assignment Setting" in the system parameter setting. Stop: The READY signal [X0] is always OFF. Continue: The READY signal [X0] does not turn ON when the PLC READY signal [Y0] changes from OFF to ON.	• Take measures against noise. • After CPU module is reset, switch to RUN. If the same error is displayed again, the hardware fault might occur in module, base unit or extension cable. Please consult your sales representative.
24C1H	Bus error [RD77GF]	An error was detected on the system bus. [Operation status at error occurrence] The operation is carried out according to "CPU Module Operation Setting at Error Detection (Moderate)" of "I/O Assignment Setting" in the system parameter setting. Stop: The READY signal [X0] is always OFF. Continue: The READY signal [X0] does not turn ON when the PLC READY signal [Y0] changes from OFF to ON.	• Take measures against noise. • After CPU module is reset, switch to RUN. If the same error is displayed again, the hardware fault might occur in module, base unit or extension cable. Please consult your sales representative.
24C2H	Bus error [RD77GF]	An error was detected on the system bus. [Operation status at error occurrence] The operation is carried out according to "CPU Module Operation Setting at Error Detection (Moderate)" of "I/O Assignment Setting" in the system parameter setting. Stop: The READY signal [X0] is always OFF. Continue: The READY signal [X0] does not turn ON when the PLC READY signal [Y0] changes from OFF to ON.	• Take measures against noise. • After CPU module is reset, switch to RUN. If the same error is displayed again, the hardware fault might occur in module, base unit or extension cable. Please consult your sales representative.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
24C3H	Bus error [RD77GF]	An error was detected on the system bus. [Operation status at error occurrence] The operation is carried out according to "CPU Module Operation Setting at Error Detection (Moderate)" of "I/O Assignment Setting" in the system parameter setting. Stop: The READY signal [X0] is always OFF. Continue: The READY signal [X0] does not turn ON when the PLC READY signal [Y0] changes from OFF to ON.	• Take measures against noise. • After CPU module is reset, switch to RUN. If the same error is displayed again, the hardware fault might occur in module, base unit or extension cable. Please consult your sales representative.
24C6H	Bus error [RD77GF]	An error was detected on the system bus. [Operation status at error occurrence] The operation is carried out according to "CPU Module Operation Setting at Error Detection (Moderate)" of "I/O Assignment Setting" in the system parameter setting. Stop: The READY signal [X0] is always OFF. Continue: The READY signal [X0] does not turn ON when the PLC READY signal [Y0] changes from OFF to ON.	• Take measures against noise. • After CPU module is reset, switch to RUN. If the same error is displayed again, the hardware fault might occur in module, base unit or extension cable. Please consult your sales representative.
2600H	Inter-module synchronization process error [RD77GF]	The cyclic processing does not finish before the start timing for the next inter-module synchronization cycle. [Operation status at error occurrence] The operation is carried out according to "CPU Module Operation Setting at Error Detection (Moderate)" of "I/O Assignment Setting" in the system parameter setting. Stop: The READY signal [X0] is always OFF. Continue: The READY signal [X0] does not turn ON when the PLC READY signal [Y0] changes from OFF to ON.	• Increase the value set in "Fixed Scan Interval Setting" under "Synchronization Setting within the Modules" in the system parameters so that the link scan time does not exceed the inter-module synchronization cycle. • Reduce the number of cyclic assignment points and the number of connected slave modules, and decrease the link scan time.
2610H	Inter-module synchronization signal fault	Inter-module synchronization fault is detected. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	• Take measures against noise. • After the Simple Motion module is reset, switch to RUN. If the same error is displayed again, the hardware fault might occur in the CPU module, base unit, extension cable or Simple Motion module. Please consult your sales representative.
2611H	Inter-module synchronization signal fault	Inter-module synchronization fault is detected. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	• Take measures against noise. • After the Simple Motion module is reset, switch to RUN. If the same error is displayed again, the hardware fault might occur in the CPU module, base unit, extension cable or Simple Motion module. Please consult your sales representative.
3000H	Inter-module synchronization parameter error [RD77GF]	• RD77GF is not set as a target in "Synchronization Setting within the Modules" in the system parameters. • A station in which "Station Type" is set to "Submaster station" is set in "Network Configuration Settings" of "Basic Settings". [Operation status at error occurrence] The READY signal [X0] is not turned ON.	Correct parameter shown in cause.
3001H	Faults	Hardware is faulty. [Operation status at error occurrence] The system stops.	[RD77MS] Check that there is no influence from noise. [RD77GF] • Take measures against noise. • After the Simple Motion module is reset, switch to RUN. If the same error is displayed again, the hardware fault might occur in CPU module, base unit, extension cable or Simple Motion module. Please consult your sales representative.
3002H	Internal circuit fault	Hardware is faulty. [Operation status at error occurrence] The system stops.	[RD77MS] Check that there is no influence from noise. [RD77GF] • Take measures against noise. • After the Simple Motion module is reset, switch to RUN. If the same error is displayed again, the hardware fault might occur in CPU module, base unit, extension cable or Simple Motion module. Please consult your sales representative.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
3004H	Cyclic points error [RD77GF]	In "RWw/RWr Setting" of "Network Configuration Setting" in "Basic Setting", the points set in remote device station (Safety station) is less than 16 points. [Operation status at error occurrence] The data link is stopped.	In "RWw/RWr Setting" of "Network Configuration Setting" in "Basic Setting", set 16 points or more in the remote device station (Safety station).
3010H	F/W error	Hardware is faulty. [Operation status at error occurrence] The system stops.	Replace the Simple Motion module.
3020H	CPU module error	An error is detected in the CPU module. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 2). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Check the error of the CPU module and take corrective action using the module diagnostics.
3021H	CPU module error	An error is detected in the CPU module. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 Rapid stop selection (stop group 2). (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Check the error of the CPU module and take corrective action using the module diagnostics.
3031H	Station No. duplication detection [RD77GF]	• A station with the same station No. was found in the same network. • Multiple master stations and submaster stations were detected in the same network. [Operation status at error occurrence] The data link is stopped.	Correct the station No. or station type of the station where the error was detected.
3040H	Response data creation failure [RD77GF]	Response data of the dedicated instruction cannot be created. [Operation status at error occurrence] The operation is carried out according to "CPU Module Operation Setting at Error Detection (Moderate)" of "I/O Assignment Setting" in the system parameter setting. Stop: The READY signal [X0] is always OFF. Continue: The READY signal [X0] does not turn ON when the PLC READY signal [Y0] changes from OFF to ON.	• Increase the request interval. • Decrease the number of request nodes. • Wait for a response to the previous request before sending the next request. • Correct the timeout value.
3060H	Inter-module synchronization cycle mismatch [RD77GF]	The inter-module synchronization cycle setting does not match the master station setting. [Operation status at error occurrence] The operation is carried out according to "CPU Module Operation Setting at Error Detection (Moderate)" of "I/O Assignment Setting" in the system parameter setting. Stop: The READY signal [X0] is always OFF. Continue: The READY signal [X0] does not turn ON when the PLC READY signal [Y0] changes from OFF to ON.	Correct the parameter so that all modules performing inter-module synchronization have the same frequency setting.
3061H	Inter-module synchronization target mismatch [RD77GF]	The network synchronization communication setting in the network configuration setting of the master station does not match the inter-module synchronization target module of the own station. [Operation status at error occurrence] The operation is carried out according to "CPU Module Operation Setting at Error Detection (Moderate)" of "I/O Assignment Setting" in the system parameter setting. Stop: The READY signal [X0] is always OFF. Continue: The READY signal [X0] does not turn ON when the PLC READY signal [Y0] changes from OFF to ON.	Check the network configuration setting and check if inter-module synchronization is set.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
3062H	Inter-module synchronization signal failure via network [RD77GF]	Inter-module synchronization cycle failure occurred between networks. [Operation status at error occurrence] The operation is carried out according to "CPU Module Operation Setting at Error Detection (Moderate)" of "I/O Assignment Setting" in the system parameter setting. Stop: The READY signal [X0] is always OFF. Continue: The READY signal [X0] does not turn ON when the PLC READY signal [Y0] changes from OFF to ON.	• Check the network status and take corrective action using the CC-Link IE Field Network diagnostics of the engineering tool. • Check if the switching hub and the cables are connected properly. • If the request source is another network, check if the routing parameters are set correctly, and take corrective action. • If the error occurs again even after taking the above, please consult your local Mitsubishi representative.
3065H	Network refresh setting error [RD77GF]	RWw of the servo amplifier is set in the transmission destination of link refresh setting or link transmission setting. [Operation status at error occurrence] The operation is carried out according to "CPU Module Operation Setting at Error Detection (Moderate)" of "I/O Assignment Setting" in the system parameter setting. Stop: The READY signal [X0] is always OFF. Continue: The READY signal [X0] does not turn ON when the PLC READY signal [Y0] changes from OFF to ON.	Check the detailed information of the error by executing module diagnostics using the engineering tool, and correct the parameter setting corresponding to the displayed No.
3C00H	Hardware failure [RD77GF]	A hardware failure was detected. [Operation status at error occurrence] The system stops.	• Set the inter-module synchronization cycle to longer than the current value. • Take measures against noise. • After CPU module is reset, switch to RUN. If the same error is displayed again, the hardware fault might occur in module, base unit or extension cable. Please consult your sales representative.
3C01H	Hardware failure [RD77GF]	A hardware failure was detected. [Operation status at error occurrence] The system stops.	• Take measures against noise. • After CPU module is reset, switch to RUN. If the same error is displayed again, the hardware fault might occur in module, base unit or extension cable. Please consult your sales representative.
3C02H	Hardware failure [RD77GF]	A hardware failure was detected. [Operation status at error occurrence] The system stops.	• Take measures against noise. • After CPU module is reset, switch to RUN. If the same error is displayed again, the hardware fault might occur in module, base unit or extension cable. Please consult your sales representative.
3C03H	Hardware failure [RD77GF]	A hardware failure was detected. [Operation status at error occurrence] The system stops.	• Take measures against noise. • After CPU module is reset, switch to RUN. If the same error is displayed again, the hardware fault might occur in module, base unit or extension cable. Please consult your sales representative.
3C0FH	Hardware failure [RD77GF]	A hardware failure was detected. [Operation status at error occurrence] The system stops.	• Take measures against noise. • After CPU module is reset, switch to RUN. If the same error is displayed again, the hardware fault might occur in module, base unit or extension cable. Please consult your sales representative.
3C10H	Hardware failure [RD77GF]	A hardware failure was detected. [Operation status at error occurrence] The system stops.	• Take measures against noise. • After CPU module is reset, switch to RUN. If the same error is displayed again, the hardware fault might occur in module, base unit or extension cable. Please consult your sales representative.
3C11H	Hardware failure [RD77GF]	A hardware failure was detected. [Operation status at error occurrence] The system stops.	• Take measures against noise. • After CPU module is reset, switch to RUN. If the same error is displayed again, the hardware fault might occur in module, base unit or extension cable. Please consult your sales representative.
3C14H	Hardware failure [RD77GF]	A hardware failure was detected. [Operation status at error occurrence] The system stops.	Reset the CPU module, and run it again. If the error occurs again even after taking the above, the possible cause is a hardware failure of the error module or CPU module. Please consult your local Mitsubishi representative.
3C2FH	Memory error [RD77GF]	An error was detected in the memory. [Operation status at error occurrence] The system stops.	Reset the CPU module, and run it again. If the error occurs again even after taking the above, the possible cause is a hardware failure of the error module. Please consult your local Mitsubishi representative.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
3E00H	Network module error [RD77GF]	An error was detected in the network module. [Operation status at error occurrence] The system stops.	Reset the CPU module, and run it again. If the error occurs again even after taking the above, the possible cause is a hardware failure of the error module. Please consult your local Mitsubishi representative.
3E01H	Own station network type error [RD77GF]	Network type of the own station is unexpected setting. [Operation status at error occurrence] The system stops.	Rewrite the module parameter by the engineering tool. If the error occurs again even after taking the above, the possible cause is a hardware failure of the error module. Please consult your local Mitsubishi representative.

[1] Setting condition: "[Cd.16] Inching movement amount × (A) ≤ [Pr.31] JOG speed limit value"
Use the following values for (A).

[RD77MS]

Unit setting	Operation cycle			
	0.444 ms	0.888 ms	1.777 ms	3.555 ms
When unit is set to pulse	2250	1125	562.5	281.25
When unit is set to degree and "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid	135	67.5	33.75	16.875
When unit setting is other than the above	1350	675	337.5	168.75

[RD77GF]

Unit setting	Operation cycle			
	0.50 ms	1.00 ms	2.00 ms	4.00 ms
When unit is set to pulse	2000	1000	500	250
When unit is set to degree and "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid	120	60	30	15
When unit setting is other than the above	1200	600	300	150

Errors related to synchronous control are described below.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1BA0H	Outside input axis type setting range	Setting values of input axis parameters "[Pr.300] Servo input axis type" and "[Pr.320] Synchronous encoder axis type" are outside the setting range. [Operation status at error occurrence] The setting becomes invalid for input axis.	Set a value within the setting range.
1BA1H	Outside input axis unit setting range	Setting value of the input axis parameter "[Pr.321] Synchronous encoder axis unit setting" is outside the setting range. [Operation status at error occurrence] The setting becomes invalid for input axis.	Set a value within the setting range.
1BA2H	Outside input axis unit conversion denominator range	The input axis parameter "[Pr.323] Synchronous encoder axis unit conversion: Denominator" is set to 0 or lower. [Operation status at error occurrence] The setting becomes invalid for input axis.	Set a value within the range of 1 to 2147483647.
1BA3H	Outside input axis length per cycle range	The input axis parameter "[Pr.324] Synchronous encoder axis length per cycle" is set to 0 or lower. [Operation status at error occurrence] The setting becomes invalid for input axis.	Set a value within the range of 1 to 2147483647.
1BA4H	Outside input axis smoothing time constant range	The input axis parameters "[Pr.301] Servo input axis smoothing time constant" and "[Pr.325] Synchronous encoder axis smoothing time constant" are set other than 0 to 5000. [Operation status at error occurrence] The setting becomes invalid for input axis.	Set a value within the range of 0 to 5000.
1BA5H	Outside input axis rotation direction restriction setting range	The input axis parameters "[Pr.304] Servo input axis rotation direction restriction" and "[Pr.328] Synchronous encoder axis rotation direction restriction" are set other than 0 to 2. [Operation status at error occurrence] The setting becomes invalid for input axis.	Set a value within the range of 0 to 2.
1BA6H	Input axis unit conversion overflow	Internal operation overflow occurred because the unit conversion ratio (unit conversion: Numerator/unit conversion: Denominator) of the input axis is too large. [Operation status at error occurrence] The input axis operation is immediately stopped, and a connection becomes invalid.	• Set a smaller unit conversion ratio (unit conversion: Numerator/unit conversion: Denominator) of the input axis. • Decrease the input axis speed.
1BA7H	Speed-position switching control start in servo input axis not possible	When the input axis parameter "[Pr.300] Servo input axis type" is command position value or read current value, the speed-position switching control is started with the detailed parameter 1 "[Pr.21] Command position value during speed control" set to other than "1: Update of command position value". [Operation status at error occurrence] The speed-position switching control does not start.	• Set "[Pr.300] Servo input axis type" to "Servo command value" or "Feedback value". • Set "[Pr.21] Command position value during speed control" to "1: Update of command position value".
1BA8H	Synchronous encoder via servo amplifier communication error	• The hardware of the synchronous encoder or the servo amplifier is faulty. • The synchronous encoder cable is disconnected. • Communication to the synchronous encoder cannot be established. [Operation status at error occurrence] The connection of synchronous encoder axis becomes invalid.	• Replace the synchronous encoder or the servo amplifier. • Check the synchronous encoder cable. • Check the connected synchronous encoder. • Check whether the synchronous encoder cable is faulty.
1BA9H	Synchronous encoder via servo amplifier battery error	The battery which the servo amplifier connected synchronous encoder is empty or the battery is disconnected. [Operation status at error occurrence] The synchronous encoder control continues.	Replace the battery or check the battery connection of the servo amplifier.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1BAAH	Synchronous encoder via servo amplifier invalid error	[RD77MS] • The servo amplifier axis set as synchronous encoder via servo amplifier is not supported with scale measurement mode. • In system construction, the unset up servo amplifier axis is set as the synchronous encoder via servo amplifier. • In system construction, the axis set to "Invalid" at the external synchronization encoder input is set as the synchronous encoder via servo amplifier. • The servo amplifier axis set as synchronous encoder via servo amplifier is connected to the encoder except Q171ENC-W8 (including the linear scale, etc.). [Operation status at error occurrence] The READY signal [X0] is not turned ON.	[RD77MS] With the setting brought into the setting range, switch the power on again or reset the PLC.
		[RD77GF] • In system construction, the unset up servo amplifier axis is set as the synchronous encoder via servo amplifier. • The servo amplifier axis set as synchronous encoder via servo amplifier is not supported with scale measurement mode. • The servo amplifier axis set as synchronous encoder via servo amplifier is connected to the linear scale. [Operation status at error occurrence] The READY signal [X0] is not turned ON.	[RD77GF] With remove causes, switch the power on again or reset the PLC.
1BAEH	Synchronous encoder connection station via link device undetected	The link device which set as the synchronous encoder axis input is unconnected with the corresponding station or disconnected. [Operation status at error occurrence] The synchronous encoder axis start is not executed.	Check the connection status of the target station.
1BE0H	Outside main input axis No. range	• Setting value of the synchronous parameter "[Pr.400] Main input axis No." is outside the setting range. • The same servo input axis No. as the output axis is set in the synchronous parameter "[Pr.400] Main input axis No.". [Operation status at error occurrence] Synchronous control does not start.	• Set within the range. • Do not set up the same servo input axis No. as the output axis.
1BE1H	Outside sub input axis No. range	• Setting value of the synchronous parameter "[Pr.401] Sub input axis No." is outside the setting range. • The same servo input axis No. as the output axis is set in the synchronous parameter "[Pr.401] Sub input axis No.". [Operation status at error occurrence] Synchronous control does not start.	• Set within the range. • Do not set up the same servo input axis No. as the output axis.
1BE2H	Outside main shaft gear: denominator range	The synchronous parameter "[Pr.404] Main shaft gear: Denominator" is set to 0 or lower. [Operation status at error occurrence] Synchronous control does not start.	Set a value within the range of 1 to 2147483647.
1BE3H	Main shaft gear operation overflow	Overflow (sign reversion) occurred in input values, because the main shaft gear ratio is too large. [Operation status at error occurrence] Synchronous control is immediately stopped.	• Set a smaller absolute value for the synchronous parameter "[Pr.403] Main shaft gear: Numerator". • Set a larger value for the synchronous parameter "[Pr.404] Main shaft gear: Denominator". • Decrease the input axis speed.
1BE4H	Outside main shaft clutch control setting range	Setting value of the synchronous parameter "[Pr.405] Main shaft clutch control setting" is outside the setting range. [Operation status at error occurrence] Synchronous control does not start.	Set within the range.
1BE5H	Outside main shaft clutch reference address setting range	Setting value of the synchronous parameter "[Pr.406] Main shaft clutch reference address setting" is outside the setting range. [Operation status at error occurrence] Synchronous control does not start.	Set within the range.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1BE6H	Outside main shaft clutch smoothing method range	Setting value of the synchronous parameter "[Pr.411] Main shaft clutch smoothing method" is outside the setting range. [Operation status at error occurrence] Synchronous control does not start.	Set within the range.
1BE7H	Outside main shaft clutch smoothing time constant range	Setting value of the synchronous parameter "[Pr.412] Main shaft clutch smoothing time constant" is outside the setting range. [Operation status at error occurrence] Synchronous control does not start.	Set within the range.
1BE8H	Composite main shaft gear operation overflow	The composite value is overflowed (sign reverse) because the input values of main input axis and sub input axis are large. [Operation status at error occurrence] Synchronous control is immediately stopped.	Lower the input values of main input axis and sub input axis.
1BF0H	Outside auxiliary shaft No. range	• Setting value of the synchronous parameter "[Pr.418] Auxiliary shaft axis No." is outside the setting range. • The same servo input axis No. as the output axis is set in the synchronous parameter "[Pr.418] Auxiliary shaft axis No.". [Operation status at error occurrence] Synchronous control does not start.	• Set within the range. • Do not set the same servo input axis No. of the output axis.
1BF2H	Outside auxiliary shaft gear: denominator range	The synchronous parameter "[Pr.421] Auxiliary shaft gear: Denominator" is set to 0 or lower. [Operation status at error occurrence] Synchronous control does not start.	Set a value within the range of 1 to 2147483647.
1BF3H	Auxiliary shaft gear operation overflow	Overflow (sign reversion) occurred in input values, because the auxiliary shaft gear ratio is too large. [Operation status at error occurrence] Synchronous control is immediately stopped.	• Set a smaller absolute value for the synchronous parameter "[Pr.420] Auxiliary shaft gear: Numerator". • Set a larger value for the synchronous parameter "[Pr.421] Auxiliary shaft gear: Denominator". • Decrease the input axis speed.
1BF4H	Outside auxiliary shaft clutch control setting range	Setting value of the synchronous parameter "[Pr.422] Auxiliary shaft clutch control setting" is outside the setting range. [Operation status at error occurrence] Synchronous control does not start.	Set within the range.
1BF5H	Outside auxiliary shaft clutch reference address setting range	Setting value of the synchronous parameter "[Pr.423] Auxiliary shaft clutch reference address setting" is outside the setting range. [Operation status at error occurrence] Synchronous control does not start.	Set within the range.
1BF6H	Outside auxiliary shaft clutch smoothing method range	Setting value of the synchronous parameter "[Pr.428] Auxiliary shaft clutch smoothing method" is outside the setting range. [Operation status at error occurrence] Synchronous control does not start.	Set within the range.
1BF7H	Outside auxiliary shaft clutch smoothing time constant range	Setting value of the synchronous parameter "[Pr.429] Auxiliary shaft clutch smoothing time constant" is outside the setting range. [Operation status at error occurrence] Synchronous control does not start.	Set within the range.
1BF8H	Composite auxiliary shaft gear operation overflow	The composite value is overflowed (sign reverse) because the input values of main shaft and auxiliary shaft are large. [Operation status at error occurrence] Synchronous control is immediately stopped.	Lower the input values of main shaft and auxiliary shaft.
1C00H	Outside speed change gear range	Setting value of the synchronous parameter "[Pr.434] Speed change gear" is outside the setting range. [Operation status at error occurrence] Synchronous control does not start.	Set within the range.
1C01H	Outside speed change ratio: denominator range	The synchronous parameter "[Pr.437] Speed change ratio: Denominator" is set to 0 or lower. [Operation status at error occurrence] Synchronous control does not start.	Set a value within the range of 1 to 2147483647.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1C02H	Outside speed change gear smoothing time constant range	The synchronous parameter "[Pr.435] Speed change gear smoothing time constant" is set other than 0 to 5000. [Operation status at error occurrence] Synchronous control does not start.	Set a value within the range of 0 to 5000.
1C03H	Speed change gear overflow	Overflow (sign reversion) occurred in input values, because the speed change ratio of speed change gear is too large. [Operation status at error occurrence] Synchronous control is immediately stopped.	• Set a smaller absolute value for the synchronous parameter "[Pr.436] Speed change ratio: Numerator". • Set a larger value for the synchronous parameter "[Pr.437] Speed change ratio: Denominator". • Decrease the input axis speed.
1C10H	Outside cam No. range	The synchronous parameter "[Pr.440] Cam No." is set to other than 0 to 256. [Operation status at error occurrence] Synchronous control does not start.	Set a value within the range of 0 to 256.
1C11H	Cam not registered	Cam data specified in the synchronous parameter "[Pr.440] Cam No." does not exist on the cam open area. [Operation status at error occurrence] Synchronous control does not start.	Specify the cam No. of an existing cam data.
1C12H	Cam axis length per cycle outside range	Set the value of synchronous parameter "[Pr.439] Cam axis length per cycle" less than 0. [Operation status at error occurrence] Synchronous control does not start.	Set a value within the range of 1 to 2147483647.
1C13H	Outside output axis smoothing time constant range	The synchronous parameter "[Pr.447] Output axis smoothing time constant" is set to other than 0 to 5000. [Operation status at error occurrence] Synchronous control does not start.	Set a value within the range of 0 to 5000.
1C20H	Outside setting method of position value per cycle after main shaft gear range	The synchronous parameter "[Pr.460] Setting method of position value per cycle after main shaft gear" is set to other than 0 to 2. [Operation status at error occurrence] Synchronous control does not start.	Set a value within the range of 0 to 2.
1C21H	Outside position value per cycle after main shaft gear (Initial setting) range	The synchronous parameter "[Pr.465] Position value per cycle after main shaft gear (Initial setting)" is other than 0 to (Cam axis length per cycle - 1). [Operation status at error occurrence] Synchronous control does not start.	Set within the range of 0 to (Cam axis length per cycle - 1).
1C22H	Outside setting method of position value per cycle after auxiliary shaft gear range	The synchronous parameter "[Pr.461] Setting method of position value per cycle after auxiliary shaft gear" is set to other than 0 to 2. [Operation status at error occurrence] Synchronous control does not start.	Set a value within the range of 0 to 2.
1C23H	Outside position value per cycle after auxiliary shaft gear (Initial setting) range	The synchronous parameter "[Pr.466] Position value per cycle after auxiliary shaft gear (Initial setting)" is other than 0 to (Cam axis length per cycle - 1). [Operation status at error occurrence] Synchronous control does not start.	Set within the range of 0 to (Cam axis length per cycle - 1).
1C24H	Outside cam axis position restoration object range	The synchronous parameter "[Pr.462] Cam axis position restoration object" is set to other than 0 to 2. [Operation status at error occurrence] Synchronous control does not start.	Set a value within the range of 0 to 2.
1C25H	Outside setting method of cam reference position range	The synchronous parameter "[Pr.463] Setting method of cam reference position " is set to other than 0 to 2. [Operation status at error occurrence] Synchronous control does not start.	Set a value within the range of 0 to 2.
1C26H	Outside setting method of cam axis position value per cycle range	• The synchronous parameter "[Pr.464] Setting method of cam axis position value per cycle" is set to other than 0 to 3. • "3: Position value per cycle after auxiliary shaft gear" is established when the auxiliary shaft does not exist. [Operation status at error occurrence] Synchronous control does not start.	• Set a value within the range of 0 to 3. • Set other than "3: Position value per cycle after auxiliary shaft gear" when the auxiliary shaft does not exist.

Error code (Hexadecimal)	Error name	Error details and causes	Remedy
1C27H	Outside cam axis position value per cycle (Initial setting) range	The synchronous parameter "[Pr.468] Cam axis position value per cycle (Initial setting)" is set other than 0 to (Cam axis length per cycle - 1). [Operation status at error occurrence] Synchronous control does not start.	Set within the range of 0 to (Cam axis length per cycle - 1).
1C28H	Cam axis position value per cycle restoration disable	Cam axis position value per cycle corresponding to the command position value at synchronous control start could not be restored when the synchronous parameter "[Pr.462] Cam axis position restoration object" was "0: Cam axis position value per cycle restoration". (Occurs in reciprocated cam pattern) [Operation status at error occurrence] Synchronous control does not start.	• Start synchronous control after moving the command position value as to fit within the stroke of two-way operation cam pattern. • Set the cam reference position as to fit within the stroke of two-way operation cam pattern.
1C29H	Cam axis command position value restoration disable	Restoration could not be completed when the synchronous parameter "[Pr.462] Cam axis position restoration object" was "2: Cam axis command position value restoration", because the difference between the restored cam axis command position value and the command position value at synchronous control start (pulse command unit) was larger than the servo parameter "In-position range". [Operation status at error occurrence] Synchronous control does not start.	• Start synchronous control after calculating the cam axis command position value to be restored, using the cam position calculation function, and moving the command position value. • Set a larger setting value for the servo parameter "In-position range", if the current value is extremely small (such as 0).

Servo amplifier detection error

For details of servo amplifier detection errors, refer to each servo amplifier instruction manual or manual.

APPENDICES

Appendix 1 Module Label

The functions of the Simple Motion module can be set by using module labels.

Default module label

The names of the default module labels are defined with the following configuration.

■Module label of I/O signals

"Module name"_"[x]"."Label name"_"[ax]"

- "Module name": Indicates the character string of a module model name.
- "[x]": A number starting from 1 for identifying modules with the same module name
- "Label name": Unique label name of a module
- "[ax]": Indicates the axis No. corresponding to the module label. A numerical value from 0 to 31 is used for [ax] according to the axes from 1 to 32.

■Module label of buffer memory areas

"Module name"_"[x]"."Data type"_"_D[ax]"."Label name"_"D"

- "Module name": Indicates the character string of a module model name.
- "[x]": A number starting from 1 for identifying modules with the same module name
- "Data type": Indicates the classification of a buffer memory area.
- "[ax]": Indicates the axis No. corresponding to the module label. A numerical value from 0 to 31 is used for [ax] according to the axes from 1 to 32.
- "Label name": Unique label name of a module
- "D": Indicates whether the module label is for auto refresh or direct access. For direct access, "_D" is added after the label name and to "[ax]". The following shows the differences between auto refresh and direct access.

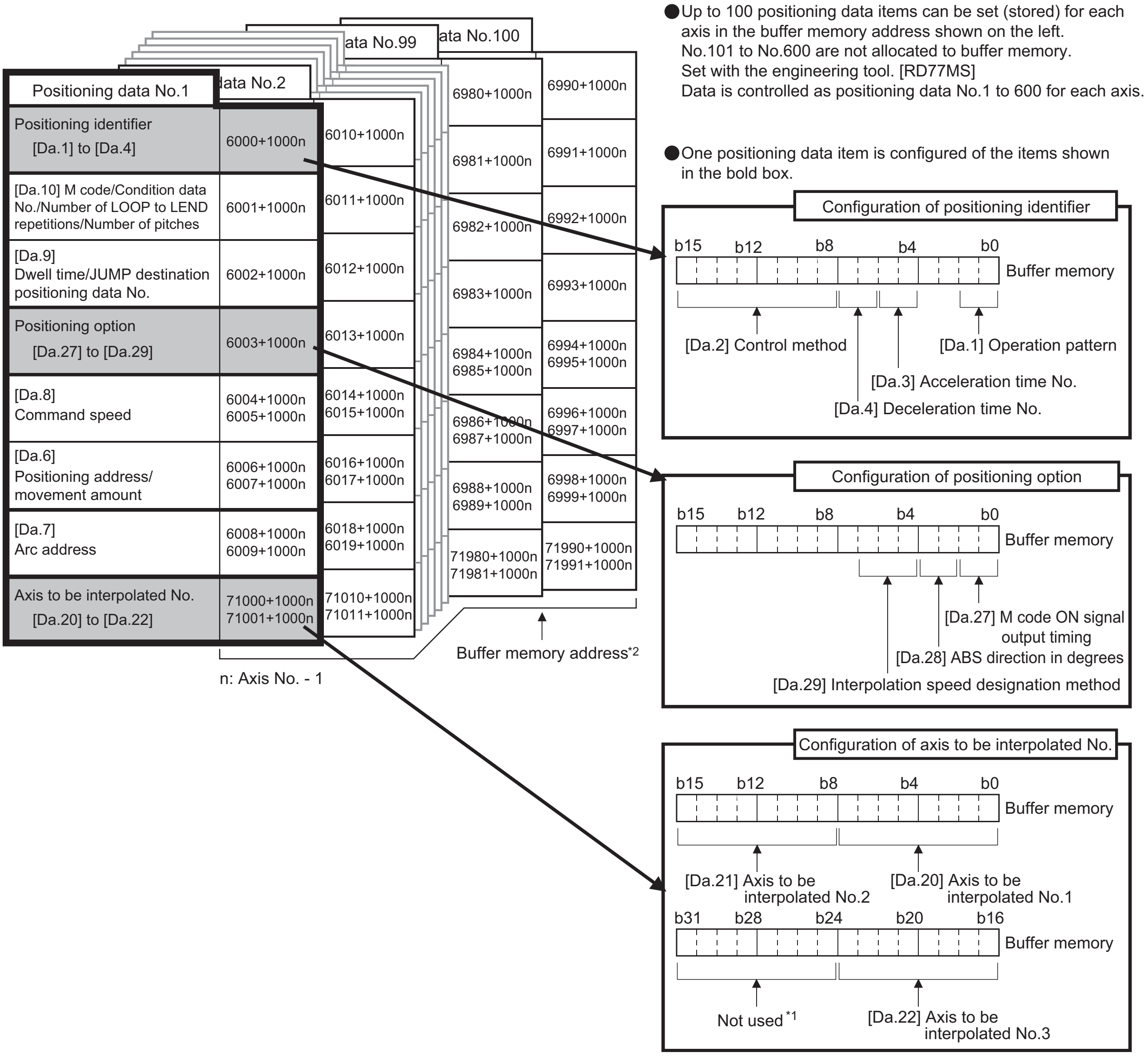
Type	Description	Access timing
Auto refresh	Reading/writing data from/to the module label is reflected to the Simple Motion module at auto refresh. The execution time of a program can be shortened. To use auto refresh, "Refresh Destination" must be set to "Module Label" in "Refresh settings" of "Module Parameter".	At auto refresh
Direct access	Reading/writing data from/to the module label is reflected to the Simple Motion module immediately. The execution time is longer than the one at auto refresh, but the responsiveness is high.	At reading/writing data from/to the module label

Appendix 2 How to Find Buffer Memory Addresses

This section describes how to find the buffer memory addresses of positioning data, block start data, and condition data.

Positioning data

Positioning data has the following structure.



Positioning data No.1		data No.2	ata No.99	ata No.100
Positioning identifier [Da.1] to [Da.4]	6000+1000n	6010+1000n	6980+1000n	6990+1000n
[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches	6001+1000n	6011+1000n	6981+1000n	6991+1000n
[Da.9] Dwell time/JUMP destination positioning data No.	6002+1000n	6012+1000n	6982+1000n	6992+1000n
Positioning option [Da.27] to [Da.29]	6003+1000n	6013+1000n	6983+1000n	6993+1000n
[Da.8] Command speed	6004+1000n 6005+1000n	6014+1000n 6015+1000n	6984+1000n 6985+1000n	6994+1000n 6995+1000n
[Da.6] Positioning address/ movement amount	6006+1000n 6007+1000n	6016+1000n 6017+1000n	6986+1000n 6987+1000n	6996+1000n 6997+1000n
[Da.7] Arc address	6008+1000n 6009+1000n	6018+1000n 6019+1000n	6988+1000n 6989+1000n	6998+1000n 6999+1000n
Axis to be interpolated No. [Da.20] to [Da.22]	71000+1000n 71001+1000n	71010+1000n 71011+1000n	71980+1000n 71981+1000n	71990+1000n 71991+1000n

n: Axis No. - 1

Buffer memory address*2

- Up to 100 positioning data items can be set (stored) for each axis in the buffer memory address shown on the left.
  No.101 to No.600 are not allocated to buffer memory.
  Set with the engineering tool. [RD77MS]
  Data is controlled as positioning data No.1 to 600 for each axis.
- One positioning data item is configured of the items shown in the bold box.

*1 Always "0" is set to the part not used.

*2 Refer to the following for the buffer memory address of the axis 17 to 32.

☞ Page 478 Positioning data

When setting positioning data using a program, determine buffer memory addresses using the following calculation formula and set the addresses.

- $6000^{*1} + (1000 \times (Ax - 1)) + 10 \times (N - 1) + S$

*1 The value is 71000 when setting "[Da.20]" to "[Da.22]".

For each variable, substitute a number following the description below.

Variable	Description
Ax	The axis No. of the buffer memory address to be determined. Substitute a number from 1 to 32.
N	The positioning data No. of the buffer memory address to be determined. Substitute a number from 1 to 100.
S	Substitute one of the following numbers according to the buffer memory address to be determined. • Positioning identifier ([Da.1] to [Da.4], [Da.20] to [Da.22]): 0 • [Da.10] M code/Condition data No./Number of LOOP to LEND repetitions/Number of pitches: 1 • [Da.9] Dwell time/JUMP destination positioning data No.: 2 • Positioning option ([Da.27] to [Da.29]): 3 • [Da.8] Command speed (lower 16 bits): 4 • [Da.8] Command speed (upper 16 bits): 5 • [Da.6] Positioning address/movement amount (lower 16 bits): 6 • [Da.6] Positioning address/movement amount (upper 16 bits): 7 • [Da.7] Arc address (lower 16 bits): 8 • [Da.7] Arc address (upper 16 bits): 9

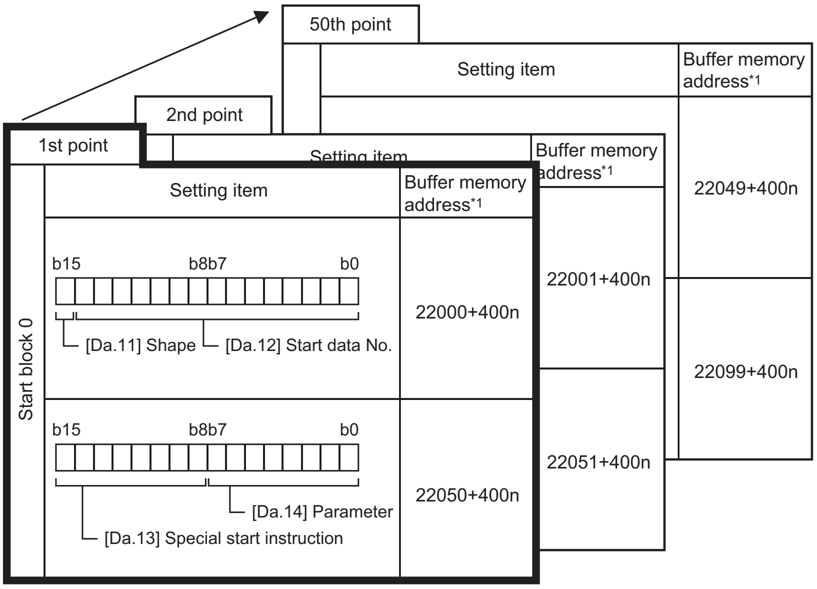
Ex.

When the buffer memory address of "[Da.9] Dwell time/JUMP destination positioning data No." of the positioning data No.1 of axis 2 is determined

6000 + (1000 × (2 - 1)) + 10 × (1 - 1) + 2 = 7002

Block start data

Block start data consists of five start blocks from Start block 0 to 4, and the block start data of 1 to 50 points is assigned to each block. The start blocks are assigned to each axis. Block start data has the following structure.



n: Axis No. - 1

- Up to 50 block start data points can be set (stored) for each axis in the buffer memory addresses shown on the left.
- Items in a single unit of block start data are shown included in a bold frame.
- Each axis has five start blocks (block Nos. 0 to 4).
Start block 2 to 4 are not allocated to buffer memory. Set with the engineering tool. [RD77MS]

[1] Refer to the following for the buffer memory address of the axis 17 to 32.
☞ Page 480 Positioning data (Block start data)

When setting block start data using a program, determine buffer memory addresses using the following calculation formula and set the addresses.

■[Da.11] Shape, [Da.12] Start data No.

Use the following calculation formula.

- 22000 + (400 × (Ax - 1)) + (200 × M) + (P - 1)

For each variable, substitute a number following the description below.

Variable	Description
Ax	The axis No. of the buffer memory address to be determined. Substitute a number from 1 to 32.
M	The start block No. of the buffer memory address to be determined. Substitute a number from 0 to 4.
P	The block start data point of the buffer memory address to be determined. Substitute a number from 1 to 50.

Ex.

When the buffer memory address that satisfies the following conditions is determined

- Axis 3
- Start block No.2
- Block start data point: 40

22000 + (400 × (3 - 1)) + (200 × 2) + (40 - 1) = 23239

■[Da.13] Special start instruction, [Da.14] Parameter

Use the following calculation formula.

- 22050 + (400 × (Ax - 1)) + (200 × M) + (P - 1)

For each variable, substitute a number following the description below.

Variable	Description
Ax	The axis No. of the buffer memory address to be determined. Substitute a number from 1 to 32.
M	The start block No. of the buffer memory address to be determined. Substitute a number from 0 to 4.
P	The block start data point of the buffer memory address to be determined. Substitute a number from 1 to 50.

Ex.

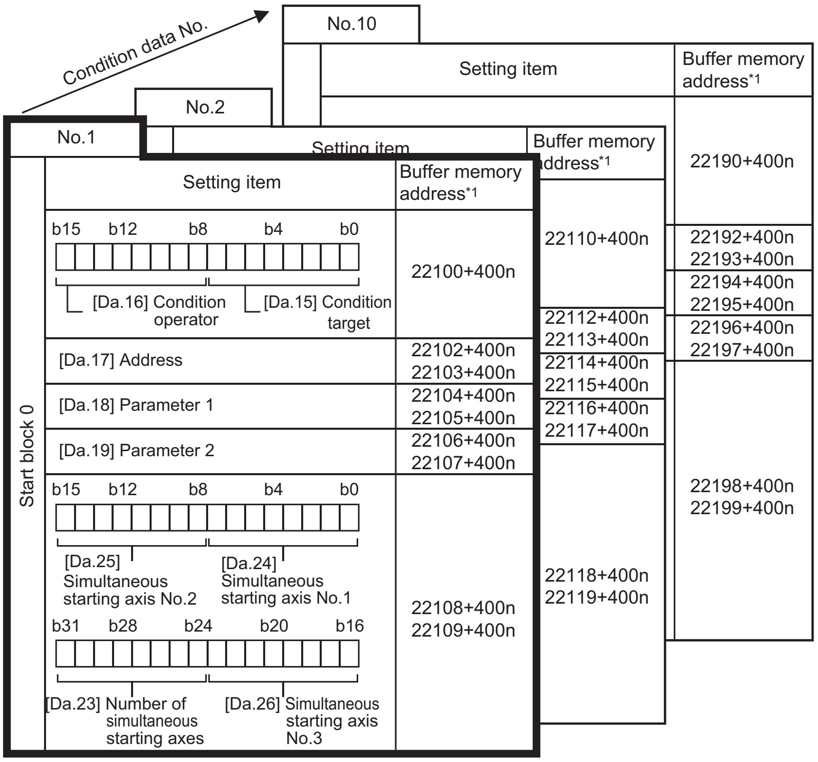
When the buffer memory address that satisfies the following conditions is determined

- Axis 2
- Start block No.1
- Block start data point: 25

22050 + (400 × (2 - 1)) + (200 × 1) + (25 - 1) = 22674

Condition data

Condition data consists of five start blocks from Start block 0 to 4, and the condition data No.1 to 10 are assigned to each block. The start blocks are assigned to each axis. Condition data has the following structure.



- ● Up to 10 condition data points can be set (stored) for each block No. in the buffer memory addresses shown on the left.
- ● Items in a single unit of condition data are shown included in a bold frame.
- ● Each axis has five start blocks (block Nos. 0 to 4).
  Start block 2 to 4 are not allocated to buffer memory. Set with the engineering tool. [RD77MS]

n: Axis No. - 1

*1 Refer to the following for the buffer memory address of the axis 17 to 32.
☞ Page 480 Positioning data (Block start data)

When setting block start data using a program, determine buffer memory addresses using the following calculation formula and set the addresses.

- 22100 + (400 × (Ax - 1)) + (200 × M) + (10 × (Q - 1)) + R

For each variable, substitute a number following the description below.

Variable	Description
Ax	The axis No. of the buffer memory address to be determined. Substitute a number from 1 to 32.
M	The start block No. of the buffer memory address to be determined. Substitute a number from 0 to 4.
Q	The condition data No. of the buffer memory address to be determined. Substitute a number from 1 to 10.
R	Substitute one of the following numbers according to the buffer memory address to be determined. • [Da.15] Condition target: 0 • [Da.16] Condition operator: 0 • [Da.17] Address (lower 16 bits): 2 • [Da.17] Address (upper 16 bits): 3 • [Da.18] Parameter 1 (lower 16 bits): 4 • [Da.18] Parameter 1 (upper 16 bits): 5 • [Da.19] Parameter 2 (lower 16 bits): 6 • [Da.19] Parameter 2 (upper 16 bits): 7 • [Da.23] to [Da.26] Simultaneous starting axis (lower 16 bits): 8 • [Da.23] to [Da.26] Simultaneous starting axis (upper 16 bits): 9

Ex.

When the buffer memory address that satisfies the following conditions is determined

- Axis 4
- Start block No.3
- Condition data No.5
- [Da.19] Parameter 2 (lower 16 bits)

22100 + (400 × (4 - 1)) + (200 × 3) + (10 × (5 - 1)) + 6 = 23946

Appendix 3 Compatible Devices with SSCNETIII(/H) [RD77MS]

Optical hub unit

The SSCNETⅢ/H Compatible Optical Hub Unit MR-MV200 is a unit that enables the branching of SSCNETⅢ/H communication on 1 line (3 branches for 1 input). SSCNETⅢ/H communication can be branched by installing this unit in a SSCNETⅢ/H system.

MR-MV200 is compatible with all slave equipment that supports SSCNETⅢ/H communication.

The settings on MR-MV200, the Simple Motion module and an engineering tool are not required.

Set the communication type to SSCNETⅢ/H for the SSCNET setting.

SSCNETⅢ/H communication equipment set in the system setting can be connected.

The specifications of the Simple Motion module related to the connection of MR-MV200 are shown below.

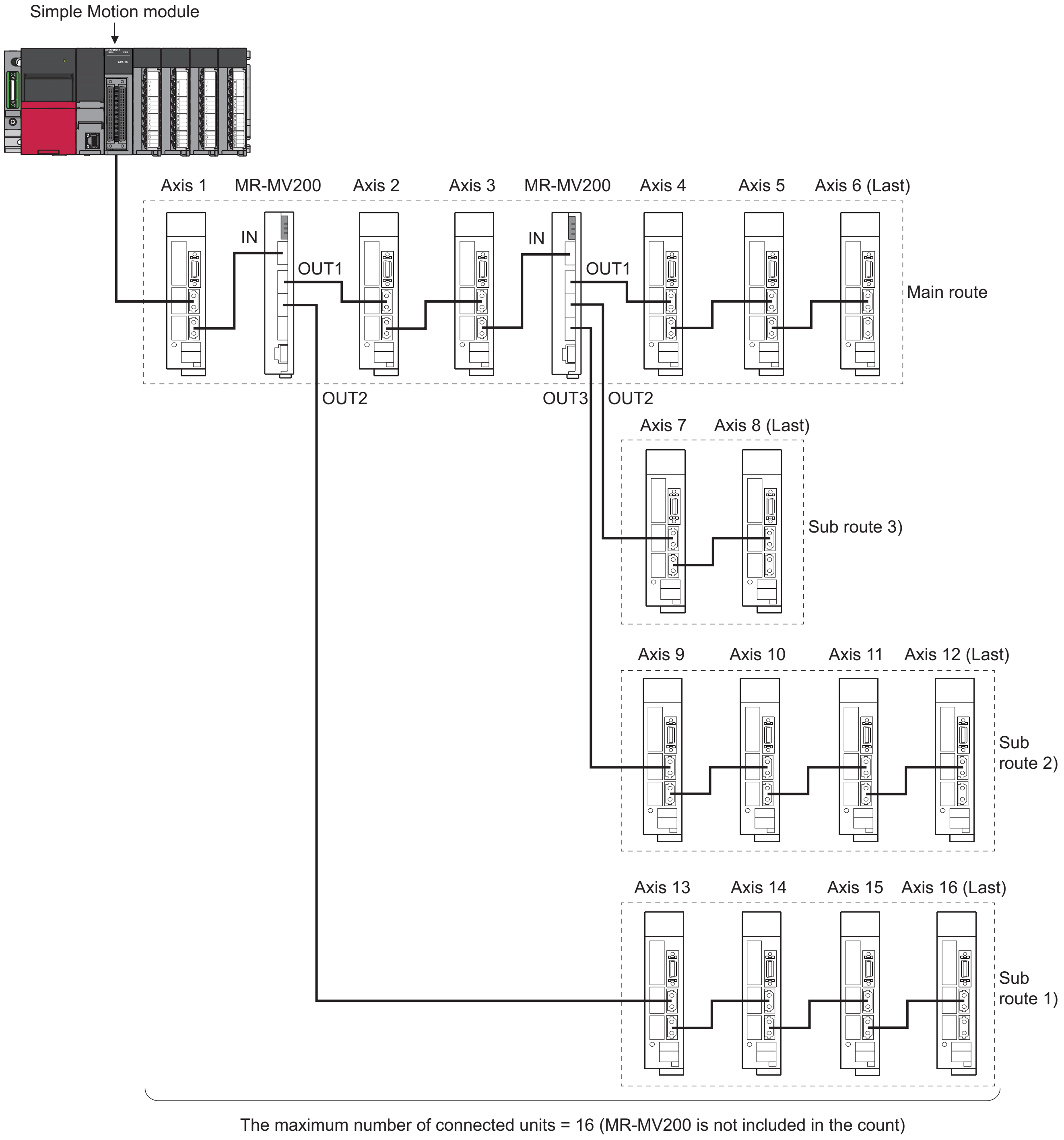
Item	Specification
SSCNETⅢ/H communication cycle	0.444 ms or more
The number of connected units	Up to 8 units
The number of axes connected to the servo amplifier	Up to 16 axes
The number of driver communication groups	Up to 8 groups

System configuration

The system configuration using MR-MV200 is shown below.

The transmission route that passes through the MR-MV200 IN connector (CN1A connector for servo amplifier) and OUT1connector (CN1B connector for servo amplifier) is called the "Main route", and the transmission routes that pass through OUT2 connector and OUT3 connectors are called the "Sub route".

MR-MV200 can only be connected on the main route. If MR-MV200 is connected on the sub route, the error "The optical hub unit connection error" (error code: 1CBEH) occurs and MR-MV200 does not communicate with the Simple Motion module.



Point

- A servo amplifier can be connected between the Simple Motion module and MR-MV200, and between MR-MV200 units.
- When turning OFF the power supply of the equipment connected to MR-MV200, use the connect/disconnect function of SSCNET communication. Refer to the following for the connect/disconnect function of SSCNET communication.

☞ Page 395 Connect/Disconnect Function of SSCNET Communication [RD77MS]

Driver communication function can be only performed between servo amplifiers on the same route starting from the Simple Motion module until the last module.

Driver communication is not performed between servo amplifiers on different sub routes, or between a servo amplifier on the main route of the later MR-MV200 and a servo amplifier on a sub route.

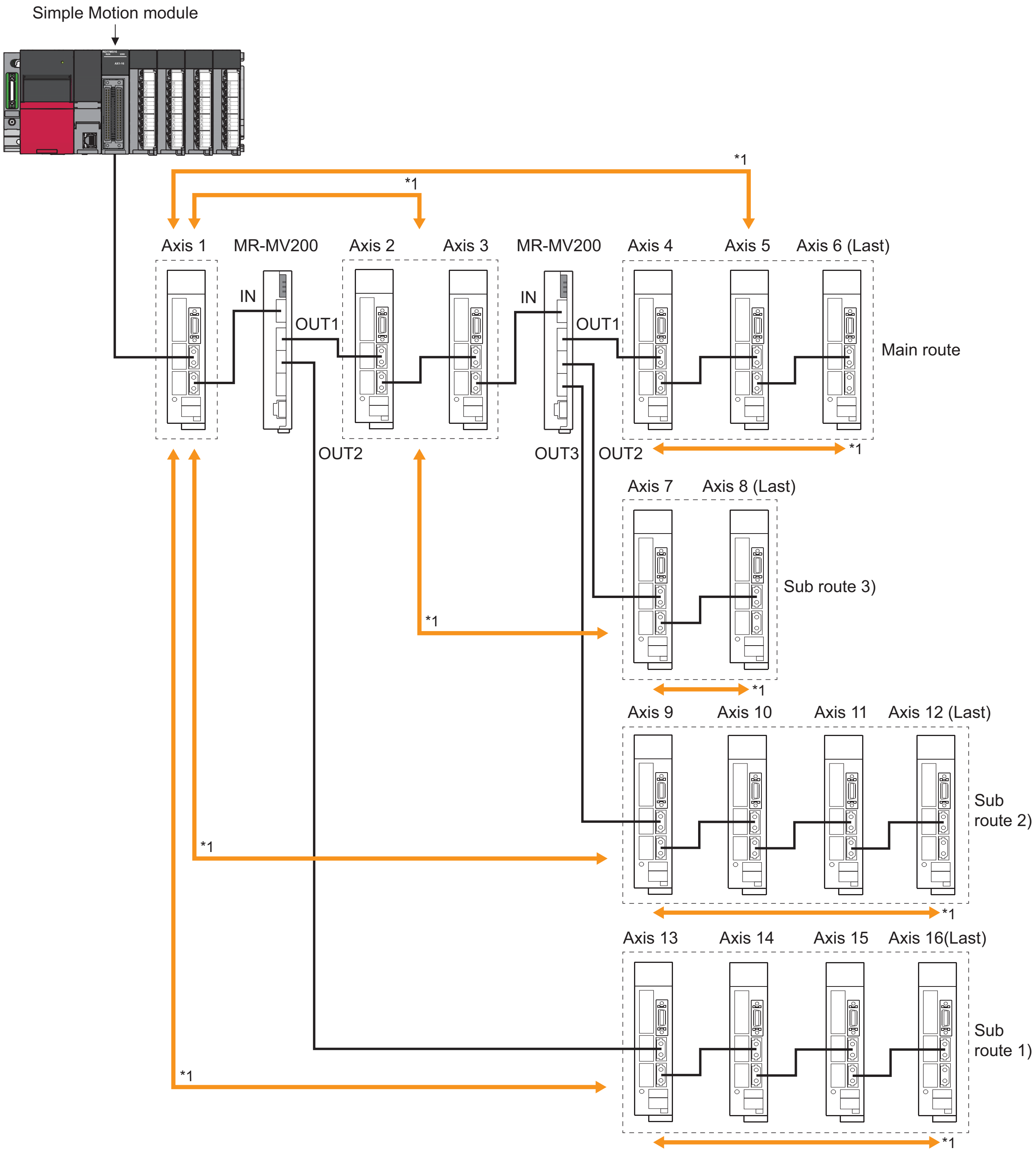
When an axis set for driver communication is in a position where driver communication cannot be performed, or when the connection of an axis set for driver communication is not confirmed, all servo amplifiers including those that are on axes not set to driver communication, cannot communicate with the Simple Motion module.

Routes where driver communication function is possible are shown below.

○: Support possible, ×: Support not possible

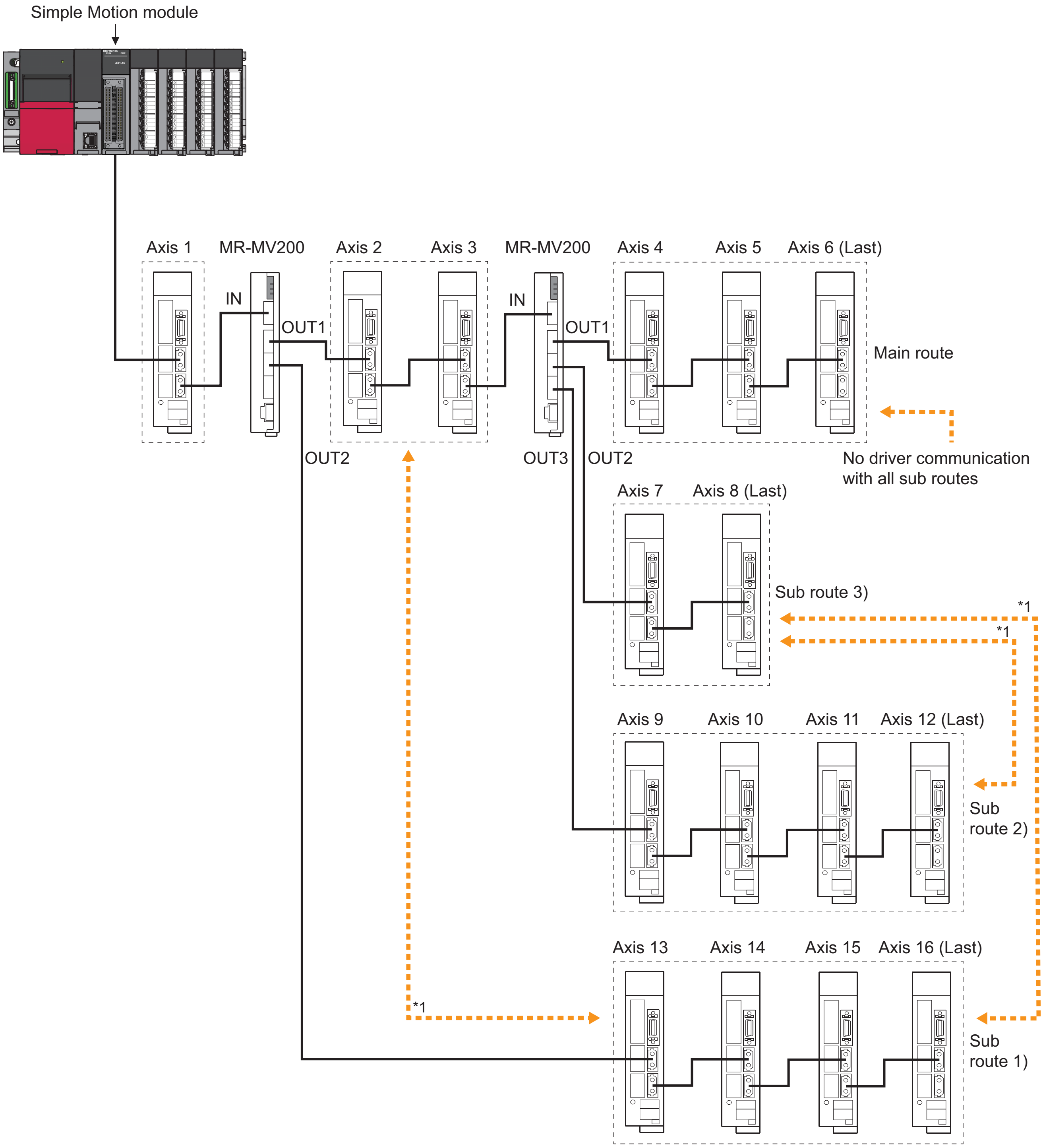
Route	Supported
Within the main route	○
Within the same sub route	○
Between different sub routes	×
Between main route and sub route (Between slaves on first MR-MV200 (main route) and sub route)	○
Between main route and sub route(Between slaves on later MR-MV200 (main route) and sub route)	×

■Servo amplifier layout where driver communication is possible



*1: Driver communication function is possible.

■Servo amplifier layout where driver communication is not possible



*1: Driver communication function is not possible.

Monitor data

The dedicated signal related to MR-MV200 is shown below.

■[Md.63] Optical hub unit installation information

Checks the installation status (0: Not installed/1: Installed) of MR-MV200 and stores as bit data.

"1" is stored to the installation status of MR-MV200 connected with the slave equipment.

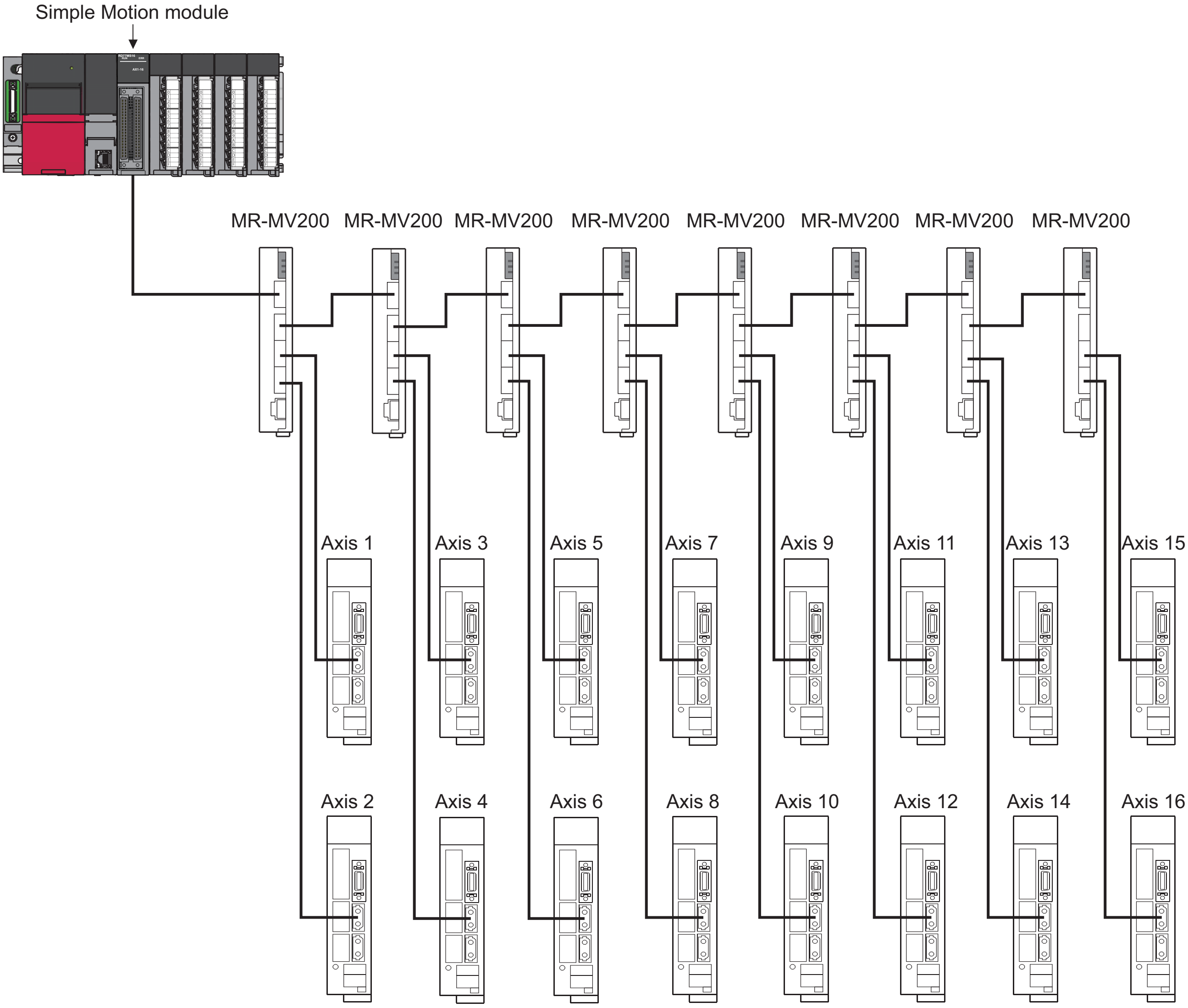
Under the following conditions, "0" is stored to the installation status of MR-MV200 not connected with the slave equipment.

- When MR-MV200 is connected to the end of the route
- When the slave equipment is not connected to the later MR-MV200 either

Usage example

The following shows a usage example of MR-MV200.

Even if the power supply of the servo amplifier at any position is turned OFF, the other servo amplifiers can continue to operate.



Connection with MR-JE-B(F)

The servo amplifier MR-JE-B(F) can be connected using SSCNETⅢ/H.

Comparisons of specifications with MR-J5(W)-B/MR-J4(W)-B

Item		**MR-JE-B(F)**	**MR-J5(W)-B/MR-J4(W)-B**
[Pr.100] Connected device		00001200H: MR-JE-_B(F)	00001000H: MR-J4-_B_(-RJ), MR-J4W_-_B (2-, 3-axis type) 00001400H: MR-J5-_B_(-RJ), MR-J5W_-_B (2-, 3-axis type)
Operation mode		Standard	Standard/Fully closed/Linear/Direct drive
Detailed parameter 1	[Pr.116] FLS signal selection	External input signals of servo amplifier are available.[*1]	External input signals of servo amplifier are available.
	[Pr.117] RLS signal selection		
	[Pr.118] DOG signal selection		
Control loop (semi/fully) switching command		Invalid	Valid when using servo amplifier for fully closed loop control
Encoder resolution		131072 pulses/rev	4194304 pulses/rev
Amplifier-less operation function		Possible[*2]	Possible
Driver communication		Not possible	Possible
Virtual servo amplifier function		Not possible	Possible

*1 When the software version of the servo amplifier MR-JE-B is "C4" or before:
When "1: Servo amplifier" is set in "[Pr.116] FLS signal selection" to "[Pr.118] DOG signal selection" at MR-JE-B use, the axis error or warning does not occur and the external signal (upper/lower limit switch, proximity dog) cannot be operated. To use the external input signal at MR-JE-B use, set "2: Buffer memory". Refer to the following for the program and the system configuration.
☞ Page 332 External Input Signal Select Function

*2 Operates artificially as the following servo amplifier and servo motor during amplifier-less operation mode.
Servo amplifier type: MR-J4-10B
Motor type: HG-KR053 (Resolution per servo motor rotation: 4194304 pulses)

Restriction

The servo amplifier MR-JE-B(F) is integrated with the main circuit power supply and the control power supply. Therefore, when the power of the servo amplifier is turned OFF, the controller cannot communicate with the axes after the axis whose power is turned OFF.

Inverter FR-A700 series

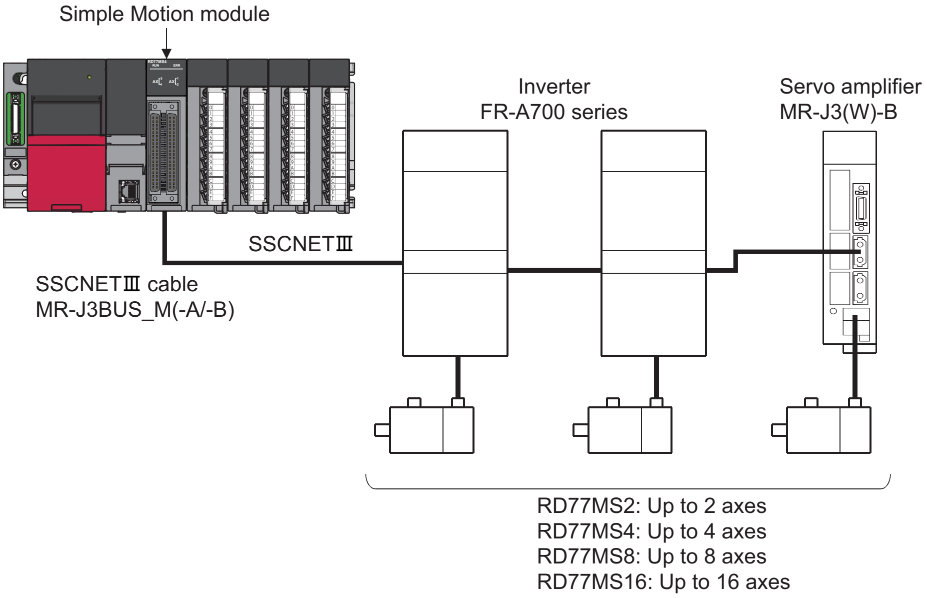
FR-A700 series can be connected via SSCNETⅢ by using built-in option FR-A7AP and FR-A7NS.

Connecting method

■System configuration

The system configuration using FR-A700 series is shown below.

Set "0: SSCNETⅢ" in "[Pr.97] SSCNET setting" to use FR-A700 series.



■Parameter setting

To connect FR-A700 series, execute flash ROM writing after setting the following parameters to buffer memory. The setting value is valid when the power supply is turned ON or the CPU module is reset.

"[Pr.97] SSCNET setting": "0: SSCNETⅢ"

"[Pr.100] Connected device": "00004100H: FR-A700 (Inverter)", "00004101H: FR-A700-NA (Inverter)", "00004102H: FR-A700-EC (Inverter)", "00004103H: FR-A700-CHT (Inverter)"

■Control of FR-A700 series parameters

Parameters set in FR-A700 series are not controlled by Simple Motion module. Set the parameters by connecting FR-A700 series directly with the operation panel on the front of inverter (FR-DU07/FR-PU07) or FR Configurator that is inverter setup software. Confirm the instruction manual of FR-A700 series for details of the setting items.

Point

In the state of connecting between FR-A700 series and Simple Motion module, only a part of parameters can be set if the parameter of the inverter "[Pr.77] Parameter write selection" is in the initial state. Set "2: Write parameters during operation" to rewrite the parameters of FR-A700 series.

■Reset selection/disconnected PU detection/PU stop selection

When PU stop is executed in FR-A700 series, position error excessive, etc. occur because a command from Simple Motion module does not stop. Set "0 to 3" in the parameter of the inverter "[Pr.75] Reset selection/ disconnected PU detection/PU stop selection". To stop FR-A700 series, use the stop signal and the forced stop of Simple Motion module, or use the output stop (MRS) of FR-A700 series.

Setting item		Default value	Setting value	Details
[Pr.75]	Reset selection/disconnected PU detection/ PU stop selection	14*1	0	• Reset input is always enabled. • If the PU is disconnected, operation will be continued. • PU stop is disabled at SSCNETⅢ connection.
			1	• A reset can be input only when the protective function is activated. • If the PU is disconnected, operation will be continued. • PU stop is disabled at SSCNETⅢ connection.
			2	• Reset input is always enabled. • When the PU is disconnected, the inverter trips. • PU stop is disabled at SSCNETⅢ connection.
			3	• A reset can be input only when the protective function is activated. • When the PU is disconnected, the inverter trips. • PU stop is disabled at SSCNETⅢ connection.
			14	• Reset input is always enabled. • If the PU is disconnected, operation will be continued. • Deceleration stop by PU stop in any operation mode.
			15	• A reset can be input only when the protective function is activated. • If the PU is disconnected, operation will be continued. • Deceleration stop by PU stop in any operation mode.
			16	• Reset input is always enabled. • When the PU is disconnected, the inverter trips. • Deceleration stop by PU stop in any operation mode.
			17	• A reset can be input only when the protective function is activated. • When the PU is disconnected, the inverter trips. • Deceleration stop by PU stop in any operation mode.

*1 Note that the default value is set to "14". (Change the value to "0 to 3".)

■In-position range

Set the servo parameter "In-position range (PA10)" and the parameter of the inverter "[Pr.426] In-position width" to be matched. Otherwise, it may not operate correctly.

n: Axis No. - 1

Setting item		Default value	Setting range	Buffer memory address
PA10	In-position range	100 (pulse)	0 to 65535 (pulse)	28410+100n

Setting item		Default value	Setting range	Details
[Pr.426]	In-position width	100 (pulse)	0 to 32767 (pulse)	When droop pulses have fallen below the setting value, the in-position signal turns ON.

■Optional data monitor setting

The following table shows data types that can be set.

Data type	Name at FR-A700 series use
Effective load ratio	Motor load factor
Load inertia moment ratio	Load inertia ratio
Model loop gain	Position loop gain
Bus voltage	Converter output voltage
Encoder multiple revolution counter	Encoder multiple revolution counter
Position feedback	Position feedback
Encoder position within one revolution	Encoder position within one revolution
Optional address of registered monitor	—

Precautions

When FR-A700 series is used, each data is delayed for "update delay time + communication cycle" because of the update cycle of the inverter. The following table shows the update delay time of each data.

Data type	Update delay time of FR-A700 series
Effective load ratio	12.5 ms
Load inertia moment ratio	56 ms or more (up to 2500 ms)
Model loop gain	56 ms or more (up to 2500 ms)
Bus voltage	9.888 ms
Encoder multiple revolution counter	222 µs
Position feedback	222 µs
Encoder position within one revolution	222 µs

■External input signal

Set as follows to fetch the external input signal (FLS/RLS/DOG) via FR-A700 series.

- Set "1: Servo amplifier" in "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", and "[Pr.118] DOG signal selection".
- Set the parameters of the inverter as below. (Otherwise, each signal remains OFF.)

Setting item		Default value	Setting value	Details
[Pr.178]	STF terminal function selection	60	60	Use with the default value.
[Pr.179]	STR terminal function selection	61	61	Use with the default value.
[Pr.185]	JOG terminal function selection	5	76	Set 76 (Proximity dog).
[Pr.449]	SSCNETⅢ input filter setting	4	0: None 1: 0.88 ms 2: 1.77 ms 3: 2.66 ms 4: 3.55 ms	Set the input filter setting value at reading an external signal.

- Set the servo parameter of Simple Motion module "Input filter setting (PD11)" to be the same value as the parameter of the inverter "[Pr.449] SSCNETⅢ input filter setting".

Setting item		Default value	Setting value	Details
PD11	Input filter setting	4	0: None 1: 0.88 ms 2: 1.77 ms 3: 2.66 ms 4: 3.55 ms	Set the input filter setting value at reading an external signal.

Comparisons of specifications with MR-J3(W)-B

Item		FR-A700 series[*1]	MR-J3(W)-B
[Pr.100] Connected device		00004100H: FR-A700 (Inverter) 00004101H: FR-A700-NA (Inverter) 00004102H: FR-A700-EC (Inverter) 00004103H: FR-A700-CHT (Inverter)	00000100H: MR-J3-_B, MR-J3W-_B (2-axis type)
Control of servo amplifier parameters		Set directly by inverter. (Not controlled by Simple Motion module.)	Controlled by Simple Motion module.
Detailed parameter 1	[Pr.116] FLS signal selection	External input signals of FR-A700 series are available.	External input signals of servo amplifier are available.
	[Pr.117] RLS signal selection		
	[Pr.118] DOG signal selection		
Extended parameter	[Pr.91] to [Pr.94] Optional data monitor: Data type setting	The following items can be monitored. 1: Motor load factor 4: Load inertia ratio 5: Position loop gain 6: Converter output voltage 8: Encoder multiple revolution counter 20: Position feedback 21: Encoder position within one revolution	The following items can be monitored. 1: Effective load ratio 2: Regenerative load ratio 3: Peak load ratio 4: Load inertia moment ratio 5: Model loop gain 6: Bus voltage 7: Servo motor speed 8: Encoder multiple revolution counter 12: Servo motor thermistor temperature 20: Position feedback 21: Encoder position within one revolution 22: Selected droop pulse 24: Load-side encoder information 1 25: Load-side encoder information 2
Absolute position system		Not possible	Possible
Positioning control, Expansion control		Position control mode, Speed control mode, Torque control mode	Position control mode, Speed control mode, Torque control mode, Continuous operation to torque control mode
Gain switching command		Valid	Valid
PI-PID switching command		Valid	Valid
Control loop (semi/fully) switching command		Invalid	Valid when using servo amplifier for fully closed loop control
Servo parameter write/read		Not possible	Possible
Amplifier-less operation function		Possible[*2*3]	Possible[*3]
Driver communication		Not possible	Possible[*4]
Monitoring of servo parameter error No.		Not possible	Possible
Servo alarm/warning		Error codes/warning codes detected by FR-A700 series are stored in "Servo alarm/warning".	Alarm codes/warning codes detected by servo amplifier are stored in "Servo alarm/warning".
Programming tool		MR Configurator2 is not available. Use FR-DU07/FR-PU07 or FR Configurator.	MR Configurator2 is available.

[*1] Confirm the specifications of FR-A700 series for details.

[*2] Parameters set in FR-A700 series are not controlled by Simple Motion module. Therefore, the operation is the same as when the servo parameter "Rotation direction selection/travel direction selection (PA14)" is set as below during amplifier-less operation mode.

Setting item		Setting value	Details
PA14	Rotation direction selection/travel direction selection	0	Positioning address increase: CCW or positive direction
			Positioning address decrease: CW or negative direction

[*3] During the amplifier-less operation, the following types of servo amplifier and servo motor are pseudo-connected.
- Servo amplifier type: MR-J3-10B
- Motor type: HF-KP053 (Resolution per servo motor rotation: 262144 pulses/rev)

[*4] Refer to each servo amplifier instruction manual for the servo amplifiers that can be used.

Precautions during control

■Absolute position system (ABS)/Incremental system (INC)

When using FR-A700 series, absolute position system (ABS) cannot be used. Even though "1: used in absolute position detection system" is set in the servo parameter "Absolute position detection system (PA03)", the servo amplifier operates as incremental system.

- When the Simple Motion module is powered ON, home position return request is turned ON and the command position value is set to 0. (The command position value is also set to 0 if only the power of inverter is turned OFF to ON.)
- The warnings at absolute position system "Home position return data incorrect" (warning code: 093CH) and "SSCNET communication error" (warning code: 093EH) are not detected.

■Control mode

Control modes that can be used are shown below.

- Position control mode (speed control including position control and position loop)
- Speed control mode (speed control not including position loop)
- Torque control mode (torque control)

However, it is not available to switch to continuous operation to torque control mode of expansion control "Speed-torque control". If the mode is switched to continuous operation to torque control mode, the error "Continuous operation to torque control not supported" (error code: 19E7H) occurs and the operation stops.

"1: Feedback torque" cannot be set in "Torque initial value selection (b4 to b7)" of "[Pr.90] Operation setting for speed-torque control mode". If it is set, the warning "Torque initial value selection invalid" (warning code: 09E5H) occurs and the command value immediately after switching is the same as the case of selecting "0: Command torque".

■Driver communication

The driver communication is not supported. If the driver communication is set in a servo parameter, the error "Driver communication setting error" (error code: 1C93H) will occur when the power is turned ON.

■Monitor data

"0" is always stored in "[Md.107] Parameter error No.". Also, "Absolute position lost" ([Nd.108] Servo status1: b14) is always turned OFF.

■Control mode switching of speed-torque control

The axis connected with FR-A700 series takes more time to switch the control mode than the axis connected with the servo amplifier.

Switching operation	Switching time at the servo amplifier use	Switching time at FR-A700 series use
Position control mode → Speed control mode	6 to 11 ms	19 to 24 ms
Speed control mode → Position control mode		
Position control mode → Torque control mode		
Torque control mode → Position control mode		
Speed control mode → Torque control mode		
Torque control mode → Speed control mode		

FR-A700 series detection error/warning

When an error occurs at FR-A700 series, the error code (1C80H) is stored in "[Md.23] Axis error No.". An alarm No. of FR-A700 series is stored in "[Md.114] Servo alarm". However, "0" is always stored in "[Md.107] Parameter error No.".

When a warning occurs at FR-A700 series, the warning code (0C80H) is stored in "[Md.24] Axis warning No.". A warning No. of FR-A700 series is stored in "[Md.114] Servo alarm". However, "0" is always stored in "[Md.107] Parameter error No.".

Confirm the instruction manual of FR-A700 series for details of errors and warnings.

Inverter FR-A800 series

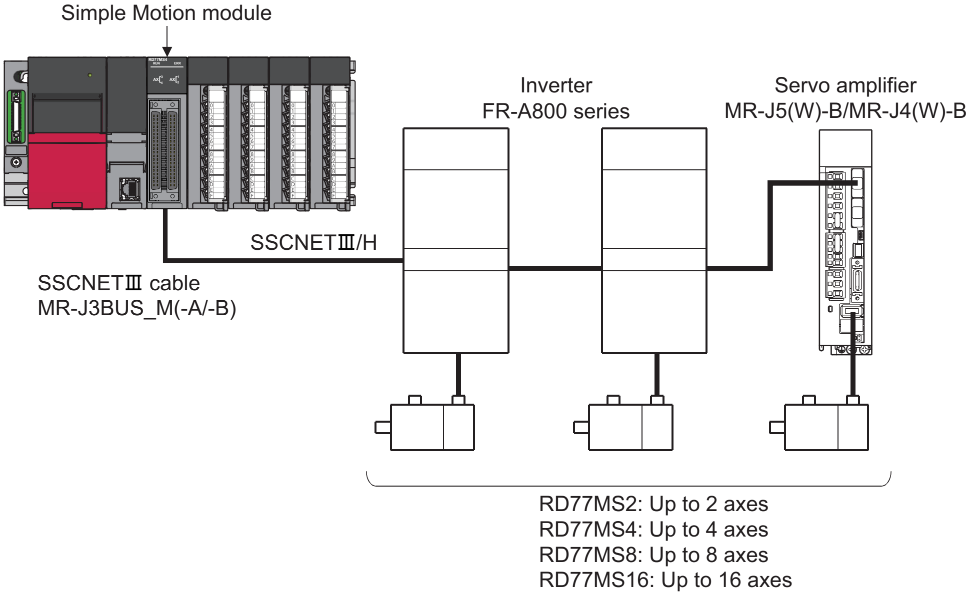
FR-A800 series can be connected via SSCNETⅢ/H by using built-in option FR-A8AP and FR-A8NS.

Connecting method

■System configuration

The system configuration using FR-A800 series is shown below.

Set "1: SSCNETⅢ/H" in "[Pr.97] SSCNET setting" to use FR-A800 series.



■Parameter setting

To connect FR-A800 series, execute flash ROM writing after setting the following parameters to buffer memory. The setting value is valid when the power supply is turned ON or the CPU module is reset.

"[Pr.97] SSCNET setting": "1: SSCNETⅢ/H"

"[Pr.100] Connected device": "00002000H: FR-A800-1", "00002001H: FR-A800-2"

■Control of FR-A800 series parameters

Parameters set in FR-A800 series are not controlled by Simple Motion module. Set the parameters by connecting FR-A800 series directly with the operation panel on the front of inverter (FR-DU08/FR-LU08/FR-PU07) or FR Configurator2 that is inverter setup software. Confirm the instruction manual of FR-A800 series for details of the setting items.

Point

In the state of connecting between FR-A800 series and Simple Motion module, only a part of parameters can be set if the parameter of the inverter "[Pr.77] Parameter write selection" is in the initial state. Set "2: Write parameters during operation" to rewrite the parameters of FR-A800 series.

■In-position range

Set the servo parameter "In-position range (PA10)" in the parameter of the inverter "[Pr.426] In-position width". When the position of the cam axis is restored in advanced synchronous control, a check is performed by the servo parameter "In-position range" (PA10). However, because the servo parameter settings are not performed in FR-A800 series, the "In-position range" is checked as 100 [pulse] (fixed value).

■Optional data monitor setting

The following table shows data types that can be set.

Data type	Name at FR-A800 series use
Effective load ratio	Motor load factor
Load inertia moment ratio	Load inertia ratio
Model loop gain	Position loop gain
Bus voltage	Converter output voltage
Encoder multiple revolution counter	Encoder multiple revolution counter
Position feedback	Position feedback
Encoder position within one revolution	Encoder position within one revolution
Optional address of registered monitor	—

Precautions

When FR-A800 series is used, each data is delayed for "update delay time + communication cycle" because of the update cycle of the inverter. The following table shows the update delay time of each data.

Data type	Update delay time of FR-A800 series
Effective load ratio	10 ms
Load inertia moment ratio	10 ms
Model loop gain	10 ms
Bus voltage	5 ms
Encoder multiple revolution counter	222 μs
Position feedback	222 μs
Encoder position within one revolution	222 μs

■External input signal

Set as follows to fetch the external input signal (FLS/RLS/DOG) via FR-A800 series.

- Set "1: Servo amplifier" in "[Pr.116] FLS signal selection", "[Pr.117] RLS signal selection", and "[Pr.118] DOG signal selection".
- Refer to the instruction manual of FR-A800 series for parameter settings on the inverter side.

Comparisons of specifications with MR-J5(W)-B/MR-J4(W)-B

Item		FR-A800 series*1	MR-J5(W)-B/MR-J4(W)-B
[Pr.100] Connected device		00002000H: FR-A800-1 00002001H: FR-A800-2	00001000H: MR-J4-_B_(-RJ), MR-J4W_-_B (2-, 3-axis type) 00001400H: MR-J5-_B_(-RJ), MR-J5W_-_B (2-, 3-axis type)
Control of servo amplifier parameters		Set directly by inverter. (Not controlled by Simple Motion module.)	Controlled by Simple Motion module.
Detailed parameter 1	[Pr.116] FLS signal selection	External input signals of FR-A800 series are available.	External input signals of servo amplifier are available.
	[Pr.117] RLS signal selection		
	[Pr.118] DOG signal selection		
Extended parameter	[Pr.91] to [Pr.94] Optional data monitor: Data type setting	The following items can be monitored. 1: Motor load factor 4: Load inertia ratio 5: Position loop gain 6: Converter output voltage 8: Encoder multiple revolution counter 20: Position feedback 21: Encoder position within one revolution Most significant bit + address value: Optional address of registered monitor	The following items can be monitored. 1: Effective load ratio 2: Regenerative load ratio 3: Peak load ratio 4: Load inertia moment ratio 5: Model loop gain 6: Bus voltage 7: Servo motor speed 8: Encoder multiple revolution counter 9: Unit power consumption 10: Instantaneous torque 12: Servo motor thermistor temperature 13: Torque equivalent to disturbance 14: Overload alarm margin 15: Excessive error alarm margin 16: Settling time 17: Overshoot amount 18: Internal temperature of encoder 20: Position feedback 21: Encoder position within one revolution 22: Selected droop pulse 23: Unit total power consumption 24: Load-side encoder information 1 25: Load-side encoder information 2 26: Z-phase counter 27: Servo motor side/load-side position deviation 28: Servo motor side/load-side speed deviation 30: Unit power consumption (2 words) Most significant bit + address value: Optional address of registered monitor
Absolute position system		Not possible	Possible
Home position return method		Proximity dog method, Count method 1, Count method 2, Data set method, Scale origin signal detection method	
Positioning control, Expansion control		Position control mode, Speed control mode, Torque control mode	Position control mode, Speed control mode, Torque control mode, Continuous operation to torque control mode
Gain switching command		Valid	Valid
PI-PID switching command		Valid	Valid
Control loop (semi/fully) switching command		Invalid	Valid when using servo amplifier for fully closed loop control
Servo parameter write/read		Not possible	Possible*2
Amplifier-less operation function		Possible*3*4	Possible
Driver communication		Not possible	Possible*5
Monitoring of servo parameter error No.		Not possible	Possible
Servo alarm/warning		Error codes/warning codes detected by FR-A800 series are stored in "Servo alarm/warning".	Alarm codes/warning codes detected by servo amplifier are stored in "Servo alarm/warning".
Programming tool		MR Configurator2 is not available. Use FR-DU08/FR-LU08/FR-PU07 or FR Configurator2.	MR Configurator2 is available.

[1] Confirm the specifications of FR-A800 series for details.

[2] Since the servo parameters of MR-J5(W)-B are not in the buffer memory, for the setting of the servo parameters, refer to the following.
☞ Page 796 Connection with MR-J5(W)-B

[3] During the amplifier-less operation, the following types of servo amplifier and servo motor are pseudo-connected.
- Servo amplifier type: MR-J4-10B
- Motor type: HG-KR053 (Resolution per servo motor rotation: 4194304 pulses/rev)

[4] Parameters set in FR-A800 series are not controlled by Simple Motion module. Therefore, the operation is the same as when the servo parameter "Rotation direction selection/travel direction selection (PA14)" is set as below during amplifier-less operation mode.

Setting item		Setting value	Details
PA14	Rotation direction selection/travel direction selection	0	Positioning address increase: CCW or positive direction
			Positioning address decrease: CW or negative direction

[5] Refer to the servo amplifier instruction manual for the servo amplifiers that can be used.

Precautions during control

■Absolute position system (ABS)/Incremental system (INC)

When using FR-A800 series, absolute position system (ABS) cannot be used. Even though "1: Enable (used in absolute position detection system)" is set in the servo parameter "Absolute position detection system (PA03)"[1], the servo amplifier operates as incremental system.

[1] For MR-J4(W)-B. For MR-J5(W)-B, set "Absolute position detection system selection (PA03.0)".

- When the Simple Motion module is powered ON, home position return request is turned ON and the command position value is set to 0. (The command position value is also set to 0 if only the power of inverter is turned OFF to ON.)
- The warnings at absolute position system "Home position return data incorrect" (warning code: 093CH) and "SSCNET communication error" (warning code: 093EH) are not detected.

■Control mode

Control modes that can be used are shown below.

- Position control mode (speed control including position control and position loop)
- Speed control mode (speed control not including position loop)
- Torque control mode (torque control)

However, it is not available to switch to continuous operation to torque control mode of expansion control "Speed-torque control". If the mode is switched to continuous operation to torque control mode, the error "Continuous operation to torque control not supported" (error code: 19E7H) occurs and the operation stops.

"1: Feedback torque" cannot be set in "Torque initial value selection (b4 to b7)" of "[Pr.90] Operation setting for speed-torque control mode". If it is set, the warning "Torque initial value selection invalid" (warning code: 09E5H) occurs and the command value immediately after switching is the same as the case of selecting "0: Command torque".

■Servo parameter change request

Change request of servo parameter ("[Cd.130] Servo parameter read/write request" to "[Cd.132] Change data") cannot be executed. If 1 word/2 words write is executed to FR-A800 series, the parameter write is failure, and "0003H: Read/write failure" is stored in "[Cd.130] Servo parameter read/write request".

■Driver communication

The driver communication is not supported.

■Monitor data

"0" is always stored in "[Md.107] Parameter error No.". Also, "Absolute position lost" ([Md.108] Servo status1: b14) is always turned OFF.

■Command speed

If FR-A800 series is operated at a command speed more than the maximum speed, the stop position may be overshoot.

FR-A800 series detection error/warning

When an error occurs at FR-A800 series, the error code (1C80H) is stored in "[Md.23] Axis error No.". An alarm No. of FR-A800 series is stored in "[Md.114] Servo alarm". However, "0" is always stored in "[Md.107] Parameter error No.".

When a warning occurs at FR-A800 series, the warning code (0C80H) is stored in "[Md.24] Axis warning No.". A warning No. of FR-A800 series is stored in "[Md.114] Servo alarm". However, "0" is always stored in "[Md.107] Parameter error No.".

Confirm the instruction manual of FR-A800 series for details of errors and warnings.

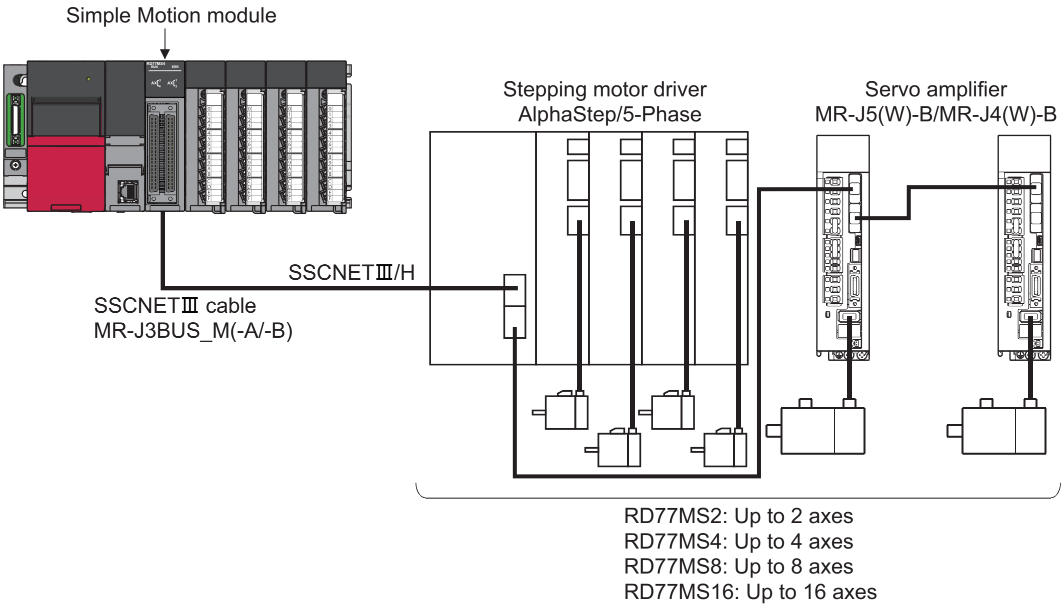
AlphaStep/5-phase stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd.

The ORIENTAL MOTOR Co., Ltd. made stepping motor driver AlphaStep/5-phase can be connected via SSCNETⅢ/H.
For details of stepping motor driver, please contact your nearest Oriental Motor branch or sales office.

Connecting method

■System configuration

The system configuration using AlphaStep/5-phase is shown below.



■Parameter setting

To connect AlphaStep/5-phase, set the following parameters.

n: Axis No. - 1

Setting item		Setting value	Initial value	Buffer memory address
[Pr.100]	Connected device	00032029H: 5-Phase (ST) 0003202AH: αSTEP (AZ)	0	58020+32n 58021+32n

Point

All the stepping motor driver axes that can be connected need to be set in the system setting regardless of the number of stepping motors.
(For example, when a 2-axis unit is used and only 1 motor is connected, the settings for two axes are required in the system setting.)
Parameters set in AlphaStep/5-phase are not controlled by the Simple Motion module.

Comparisons of specifications with MR-J5(W)-B/MR-J4(W)-B

Item		AlphaStep	5-phase	MR-J5(W)-B/MR-J4(W)-B
[Pr.100] Connected device		0003202AH: αSTEP (AZ)	00032029H: 5-Phase (ST)	00001000H: MR-J4-_B_(-RJ), MR-J4W_-_B (2-, 3-axis type) 0001400H: MR-J5-_B_(-RJ), MR-J5W_-_B (2-, 3-axis type)
Control of servo amplifier parameters		Controlled by AlphaStep.	Controlled by 5-phase	Controlled by Simple Motion module.
Detailed parameters 1	[Pr.116] FLS signal selection	External input signals of AlphaStep are available.	External input signals of 5-phase are available.	External input signals of servo amplifier are available.
	[Pr.117] RLS signal selection			
	[Pr.118] DOG signal selection			
Extended parameters	[Pr.91] to [Pr.94] Optional data monitor: Data type setting	The following items can be monitored. 1: Effective load ratio[*1] 3: Peak load ratio[*1] 8: Encoder multiple revolution counter 20: Position feedback 21: Encoder position within one revolution 29: External encoder counter value Most significant bit1 + address value: Optional address of registered monitor	The following items can be monitored. 8: Encoder multiple revolution counter 20: Position feedback 29: External encoder counter value Most significant bit1 + address value: Optional address of registered monitor	The following items can be monitored. 1: Effective load ratio 2: Regenerative load ratio 3: Peak load ratio 4: Load inertia moment ratio 5: Model loop gain 6: Bus voltage 7: Servo motor speed 8: Encoder multiple revolution counter 9: Unit power consumption 10: Instantaneous torque 12: Servo motor thermistor temperature 13: Torque equivalent to disturbance 14: Overload alarm margin 15: Excessive error alarm margin 16: Settling time 17: Overshoot amount 18: Internal temperature of encoder 20: Position feedback 21: Encoder position within one revolution 22: Selected droop pulse 23: Unit total power consumption 24: Load-side encoder information 1 25: Load-side encoder information 2 26: Z-phase counter 27: Servo motor side/load-side position deviation 28: Servo motor side/load-side speed deviation 30: Unit power consumption (2 words) Most significant bit1 + address value: Optional address of registered monitor
	[Pr.128] Torque limit selection (Stepping driver)[*2]	The following items can be set. 0: Limit by Specification on Driver Side 1: Limit by Torque Limit Value (+/-) of Simple Motion	Setting is not possible. (Fixed by "Limit by Specification on Driver Side")	Setting is not possible. (Fixed by "Limit by Torque Limit Value (+/-) of Simple Motion")
Absolute position system		Possible	Not possible	Possible
Unlimited length feed		Possible	Possible	Possible
Home position return method		Count method 2, Data set method, Driver home position return method	Count method 2, Data set method, Driver home position return method	Proximity dog method, Count method 1, Count method 2, Data set method, Scale origin signal detection method
Positioning control, Expansion control		Position control mode Speed control mode[*1] Torque control mode[*1]	Position control mode	Position control mode, Speed control mode, Torque control mode, Continuous operation to torque control mode
Gain switching command		Invalid	Invalid	Valid
PI-PID switching command		Invalid	Invalid	Valid
Control loop (semi/fully) switching command		Invalid	Invalid	Valid when using servo amplifier for fully closed loop control
Amplifier-less operation		Not possible[*3]	Not possible[*3]	Possible[*4]
Servo parameter change request		Possible	Possible	Possible (1 word write[*5])
Driver communication		Not possible	Not possible	Possible

Item	AlphaStep	5-phase	MR-J5(W)-B/MR-J4(W)-B
Monitoring of servo parameter error No.	Not possible	Not possible	Possible
Servo alarm/warning	Alarm codes/warning codes detected by AlphaStep and operation error codes during driver home position return method are stored in "Servo alarm/warning".	Alarm codes/warning codes detected by 5-phase and operation error codes during driver home position return method are stored in "Servo alarm/warning".	Alarm codes/warning codes detected by servo amplifier are stored in "Servo alarm/warning".
[Md.108] Servo status 1	b0: READY ON b1: Servo ON b2, b3: Control mode[*1] b7: Servo alarm b8: Torque limit[*1] b12: In-position b13: Current cutback b14: Absolute position lost	b0: READY ON b1: Servo ON b7: Servo alarm b12: In-position b13: Current cutback b14: Absolute position lost	b0: READY ON b1: Servo ON b2, b3: Control mode b4: Gain switching b5: Fully closed loop switching control b7: Servo alarm b12: In-position b13: Torque limit b14: Absolute position lost b15: Servo warning
[Md.119] Servo status 2	b3: Zero speed[*1] b4: Speed limit[*1]	—	b0: Zero passage b3: Zero speed b4: Speed limit b8: PID control
[Md.500] Servo status 7	b9: Driver operation alarm	b9: Driver operation alarm	—
Programming tool	Test mode is available. MR Configurator2 is not available. Use AlphaStep data editing software.	Test mode is available. MR Configurator2 is not available. Use 5-phase data editing software.	Test mode is available. MR Configurator2 is available.
Servo input axis type	Setting possible (Restrictions[*6])	Setting possible (Restrictions[*6])	Setting possible

*1 It can be used only in the AlphaStep which supports speed-torque control and torque limit function. Refer to the AlphaStep manual for the version of compatible driver.

*2 Operation assumes "0: Limit by Specification on Driver Side", if a value other than "0" or "1" is set.

*3 Set as the unconnected status during amplifier-less operation.

*4 During the amplifier-less operation, the following types of servo amplifier and servo motor are pseudo-connected.
For MR-J4(W)-B
- Servo amplifier type: MR-J4-10B
- Motor type: HG-KR053 (Resolution per servo motor rotation: 4194304 pulses/rev)
For MR-J5(W)-B
- Servo amplifier type: MR-J5-10B
- Motor type: Rotary servo motor (Resolution per servo motor rotation: 4194304 pulses/rev)

*5 For MR-J5(W)-B, 2 words write is possible.

*6 When using an absolute position system (ABS), "3: Servo command value" or "4: Feedback value" of the servo input axis type cannot be used. If it is set, the current value of the servo input axis might be not restored correctly. Therefore, set "1: Command position value" or "2: Actual current value" before using.

Precautions during control

■Absolute position system (ABS)/Incremental system (INC)

The ABS/INC setting is performed by the connected AlphaStep/5-phase.

For the INC setting, the restriction is shown below.

- When the power of the Simple Motion module is turned off and on again, "[Md.20] Command position value" is undefined.

■Home position return

The method and some operation of the home position return using the AlphaStep/5-phase differ from those of the home position return using the servo amplifier.

- Home position return method that can be used

○: Possible, ×: Not possible

[Pr.43] Home position return method	Possible/Not possible
Proximity dog method	×[1]
Count method 1	×[1]
Count method 2	○
Data set method	○
Scale origin signal detection method	×[1]
Driver home position return method	○

[1] The error "Home position return method invalid" (error code: 1979H) occurs and home position return is not performed.

- Driver home position return method

The following shows an operation outline of the home position return method "Driver home position return method".

The home position return is executed based on the positioning pattern set in the AlphaStep/5-phase. Set the setting values of home position return in the parameters of the AlphaStep/5-phase. The operation of home position return and "[Pr.22] Input signal logic selection" of the parameters ([Pr.116] FLS signal selection, [Pr.117] RLS signal selection, and [Pr.118] DOG signal selection) depend on the specification of the AlphaStep/5-phase, so that refer to the AlphaStep/5-phase manual and match the settings. For parameters that can be set by the Simple Motion module, refer to the following.

☞ Page 457 Setting items for home position return parameters

This method is not available except for the stepping driver. If the method is executed, the error "Home position return method invalid" (error code: 1979H) occurs.

- Backlash compensation after the driver home position return method

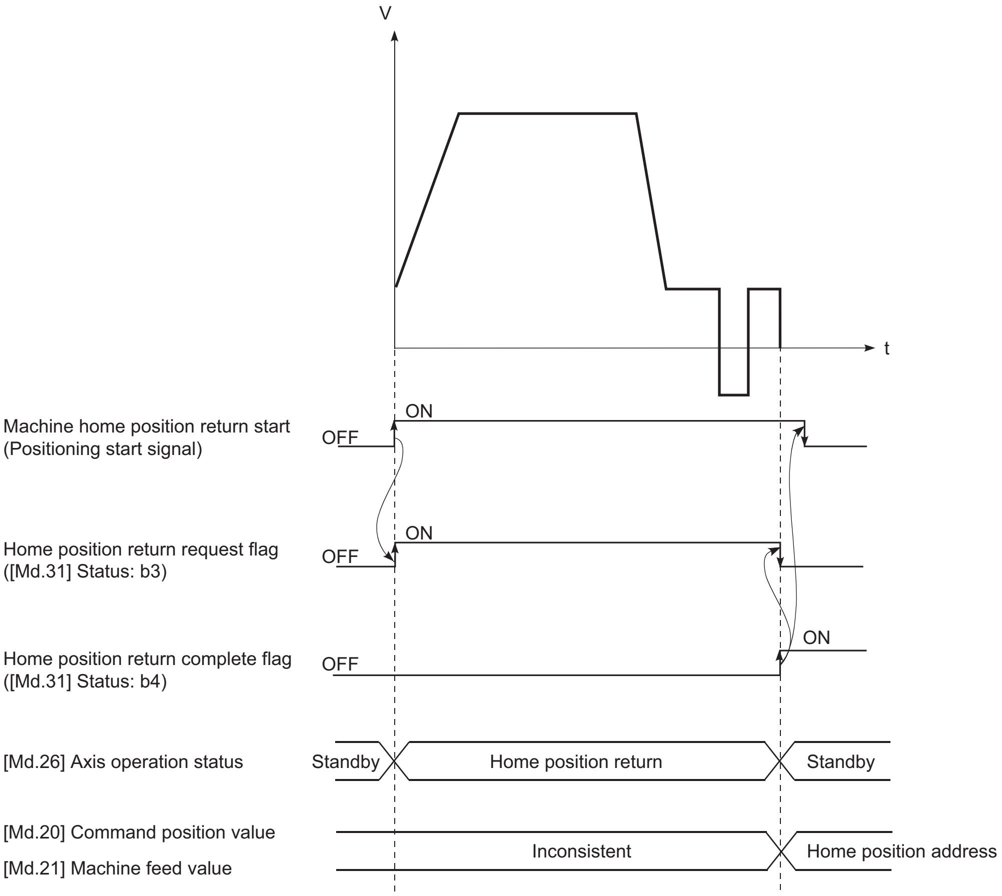
When "[Pr.11] Backlash compensation amount" is set in the Simple Motion module, whether the backlash compensation is necessary or not is judged from "[Pr.44] Home position return direction" of the Simple Motion module in the axis operation such as positioning after the driver home position return. When the positioning is executed in the same direction as "[Pr.44] Home position return direction", the backlash compensation is not executed. However, when the positioning is executed in the reverse direction against "[Pr.44] Home position return direction", the backlash compensation is executed.

Note that the home position return is executed based on the home position return direction of the parameter of the AlphaStep/5-phase during the driver home position return. Therefore, set the same direction to "[Pr.44] Home position return direction" of the Simple Motion module and the home position return direction of the parameter of the AlphaStep/5-phase.

[Operation chart]

The machine home position return is started.

(The home position return is executed based on the positioning pattern set in the AlphaStep/5-phase.)



■Servo OFF

- For 5-phase (open loop control configuration), if the motor is moved by an external force when servo OFF occurs, it is not possible to detect the position and position information is not updated.
- Do not rotate the motors during servo OFF. If the motors are rotated, a position displacement occurs.
- For 5-phase (open loop control configuration), the "Home position return request flag" ([Md.31] Status: b3) turns ON in a servo OFF state. After turning servo ON, perform a home position return again.
- For 5-phase (open loop control configuration), when an encoder is installed, checking position displacement and maladjustments is possible by monitoring "position feedback" and "external encoder counter value" in the optional data monitor. Refer to the manual of AlphaStep/5-phase for the units and increase direction of the encoder count value, and checking methods.

■Control mode

- When the AlphaStep supports the speed-torque control, position control mode (position control, and speed control including position loop, etc.), speed control mode of expansion control (speed control not including position loop), and torque control mode (torque control) can be used. It is not available to switch to continuous operation to torque control mode of expansion control. If the mode is switched to continuous operation to torque control mode, the warning "Illegal control mode switching" (warning code: 09EAH) occurs and the switching is not executed.
  "1: Feedback torque" cannot be set in "Torque initial value selection (b4 to b7)" of "[Pr.90] Operation setting for the speed-torque control mode". If it is set, the warning "Torque initial value selection invalid" (warning code: 09E5H) occurs and the command value immediately after switching is the same as the case of selecting "0: Command torque".
- When the AlphaStep does not support the speed-torque control, Position control mode (position control, and speed control including position loop) can be used. Speed control mode and torque control mode of expansion control (speed control not including position loop, torque control, continuous operation to torque control) cannot be used. If a control mode switch is performed, the warning "Illegal control mode switching" (warning code: 09EAH) occurs and the switching is not executed.

■Servo parameter

- Control of servo parameters

Parameters of AlphaStep/5-phase are not controlled by the Simple Motion module. Therefore, even though the parameter of AlphaStep/5-phase is changed during the communication between the Simple Motion module and AlphaStep/5-phase, the change is not applied to the buffer memory of the Simple Motion module.

- Servo parameter change request

Change request of servo parameter ("[Cd.130] Servo parameter read/write request" to "[Cd.132] Change data") can be executed. The servo parameter of AlphaStep/5-phase is controlled in a unit of 2 words. However, "0001H: 1 word write request" and "0002H: 2 words write request" can be set in "[Cd.130] Servo parameter read/write request".

Refer to the AlphaStep/5-phase manual for the specification method of parameters to change.

When the power of AlphaStep/5-phase is turned off, the parameter changed by the servo parameter change request becomes invalid, and the value written by AlphaStep/5-phase data editing software becomes valid.

■Optional data monitor

The following shows data types that can be set.

Data type	Unit
Effective load ratio*1	[%]
Peak load ratio*1	[%]
Encoder multiple revolution counter	[rev]
Position feedback (Used point: 2 words)	[pulse]
Encoder position within one revolution (Used point: 2 words)	[pulse]
External encoder counter value (Used point: 2 words)	[pulse]
Optional address of registered monitor	—

*1 It can be used only in the AlphaStep which supports speed-torque control and torque limit function. Refer to the manual of AlphaStep for the version of compatible driver.

■Gain switching command, PI-PID switching request, and Semi/Fully closed loop switching request

Gain switching command, PI-PID switching request, and Semi/Fully closed loop switching request are not available.

■Driver communication

The driver communication is not supported.

If the driver communication is set in a servo parameter, the setting is ignored.

■Torque limit

- When the AlphaStep does not support the torque limit function, the torque limit set by the Simple Motion module is ignored. Set the torque limit value with the parameter on the AlphaStep.
- When the driver is set to the AlphaStep which supports the torque limit function, and "[Cd.112] Torque change function switching request" is set to "1: Forward/reverse torque limit value individual setting", "[Md.35] Torque limit stored value/ forward torque limit stored value" or "[Md.120] Reverse torque limit stored value", whichever has lower value is applied for torque limit value.
- Refer to the manual of driver for the range of torque limit value of the AlphaStep. Error or warning does not occur even when torque limit of the AlphaStep exceeds maximum value in the Simple Motion module.

■Axis monitor data

- When the AlphaStep does not support the speed-torque control and the torque limit function, "[Md.104] Motor current value" is always "0".
- "Zero passage" ([Md.119] Servo status 2: b0) is always OFF.
- When the AlphaStep does not support speed-torque control, "Zero speed" ([Md.119] Servo status 2: b3) and "Speed limit" ([Md.119] Servo status 2: b4) are always OFF.
- "[Md.113] Semi/Fully closed loop status" is always "0".
- "[Md.107] Parameter error No." is always "0".
- "In-position" ([Md.108] Servo status 1: b12) is OFF during the axis operation. It is turned ON when the axis operation is completed.
- When data cannot be specified is set to "[Pr.91] Optional data monitor: Data type setting 1" to "[Pr.94] Optional data monitor: Data type setting 4", "0" is set to "[Md.109] Regenerative load ratio/Optional data monitor output 1" to "[Md.112] Optional data monitor output 4". Refer to the following for data can be specified.

☞ Page 784 Optional data monitor

■Amplifier-less operation

The amplifier-less operation cannot be used to the AlphaStep/5-phase axis. If the amplifier-less operation is used, the AlphaStep/5-phase set axis is not connected.

■In-position range

When the position of the cam axis is restored in advanced synchronous control, a check is performed by the servo parameter "In-position range" (PA10). However, because the servo parameter settings are not performed in AlphaStep/5-phase, the "In-position range" is checked as 100 [pulse].

AlphaStep/5-phase detection error/warning

■Error

When an error occurs on AlphaStep/5-phase, the error detection signal turns ON, and the error code (1C80H) is stored in "[Md.23] Axis error No.". The servo alarms (0x00 to 0xFF) of AlphaStep/5-phase are stored in "[Md.114] Servo alarm". The alarm detailed No. is not stored. However, "0" is always stored in "[Md.107] Parameter error No.".

When the driver home position return method is selected and a home position return error is detected, the error "Driver home position return error" (error code: 194BH) is stored in "[Md.23] Axis error No.". Also, "Driver operation alarm" ([Md.500] Servo status 7: b9) is turned ON and the operation alarm generated on the AlphaStep/5-phase is stored in "[Md.502] Driver operation alarm No.".

Confirm the specifications of AlphaStep/5-phase for details.

■Warning

No warning occurs on AlphaStep/5-phase.

Servo driver VCII series/VPH series manufactured by CKD NIKKI DENSO CO., LTD.

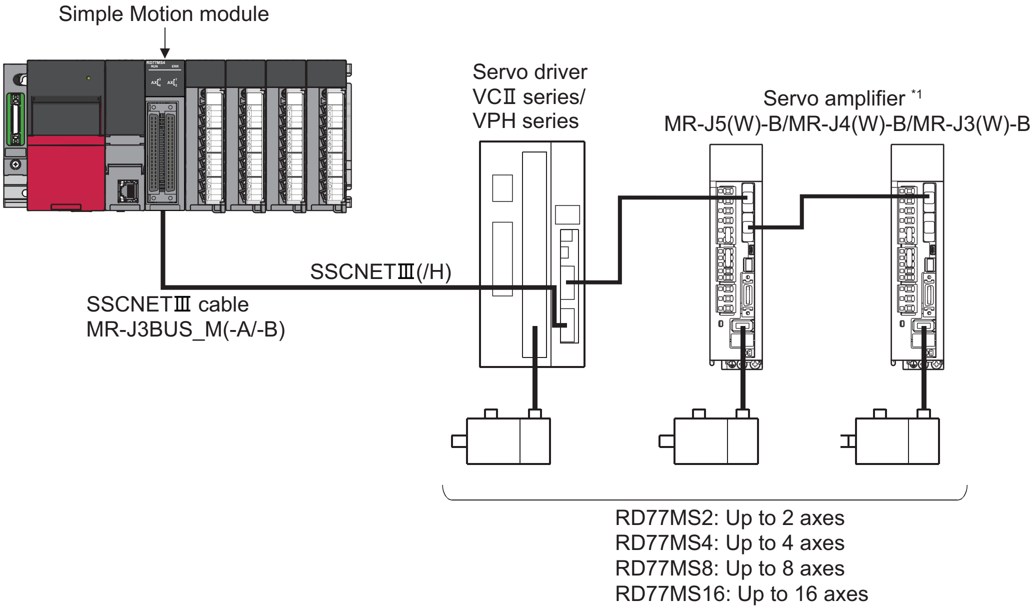
The direct drive τDISC/τiD roll/τServo compass/τLinear stage, etc. manufactured by CKD NIKKI DENSO CO., LTD. can be controlled by connecting with the servo driver VCⅡ series/VPH series manufactured by the same company using SSCNETⅢ or SSCNETⅢ/H.

Contact to CKD NIKKI DENSO overseas sales office for details of VCⅡ series/VPH series.

Connecting method

■System configuration

The system configuration using VCⅡ series/VPH series is shown below.



*1: MR-JE-_B can be connected via SSCNETⅢ/H.

■Parameter setting

To connect VCⅡ series/VPH series, set the following parameters.

n: Axis No.-1

Setting item		Setting value	Default value	Buffer memory address
[Pr.100]	Connected device	00080102H: VCⅡ (Manufactured by CKD NIKKI DENSO CO., LTD.) (For linear stage)[*1] 00080107H: VCⅡ (Manufactured by CKD NIKKI DENSO CO., LTD.) (For direct drive motor)[*1] 00080302H: VPH (Manufactured by CKD NIKKI DENSO CO., LTD.) (For linear stage)[*1] 00080307H: VPH (Manufactured by CKD NIKKI DENSO CO., LTD.) (For direct drive motor)[*1] 00081000H: VCⅡ (Manufactured by CKD NIKKI DENSO CO., LTD.)[*2] 00081300H: VPH (Manufactured by CKD NIKKI DENSO CO., LTD.)[*2]	0	58020+32n 58021+32n

*1 For SSCNETⅢ connection

*2 For SSCNETⅢ/H connection

Point

Parameters set in VCⅡ series/VPH series are not controlled by the Simple Motion module.

Comparisons of specifications with MR-J5(W)-B/MR-J4(W)-B/MR-J3(W)-B

Item		VCII series/VPH series[*1]	MR-J5(W)-B/MR-J4(W)-B	MR-J3(W)-B
[Pr.100] Connected device		00080102H: VCⅡ (Manufactured by CKD NIKKI DENSO CO., LTD.) (For linear stage) 00080107H: VCⅡ (Manufactured by CKD NIKKI DENSO CO., LTD.) (For direct drive motor) 00080302H: VPH (Manufactured by CKD NIKKI DENSO CO., LTD.) (For linear stage) 00080307H: VPH (Manufactured by CKD NIKKI DENSO CO., LTD.) (For direct drive motor) 00081000H: VCⅡ (Manufactured by CKD NIKKI DENSO CO., LTD.) 00081300H: VPH (Manufactured by CKD NIKKI DENSO CO., LTD.)	00001000H: MR-J4-_B_(-RJ), MR-J4W_-_B (2-, 3-axis type) 0001400H: MR-J5-_B_(-RJ), MR-J5W_-_B (2-, 3-axis type)	00000100H: MR-J3-_B_, MR-J3W-_B (2-axis type) 00000101H: MR-J3-_B_-RJ006 (For fully closed loop control) 00000101H: MR-J3-_BS_ (For safety servo) 00000102H: MR-J3-_B_-RJ004 (For linear servo motor) 00000107H: MR-J3-_B-RJ080W (For direct drive motor)
Control of servo amplifier parameters		Controlled by VCⅡ series/VPH series.	Controlled by Simple Motion module.	
Input filter setting		Setting is not available. (fixed to 0.88 ms)	Setting is available.	
Detailed parameter 1	[Pr.116] FLS signal selection	External input signals of VCⅡ series/VPH series are available.	External input signals of servo amplifier are available.	
	[Pr.117] RLS signal selection			
	[Pr.118] DOG signal selection			
Extended parameter	[Pr.91] to [Pr.94] Optional data monitor: Data type setting	The following items can be monitored. 1: Effective load ratio 2: Regenerative load ratio 3: Peak load ratio 5: Position loop gain 6: Bus voltage[*2] 8: Encoder multiple revolution counter 20: Position feedback 21: Encoder position within one revolution Most significant bit1 + address value: Optional address of registered monitor	The following items can be monitored. 1: Effective load ratio 2: Regenerative load ratio 3: Peak load ratio 4: Load inertia moment ratio 5: Model loop gain 6: Bus voltage 7: Servo motor speed 8: Encoder multiple revolution counter 9: Unit power consumption 10: Instantaneous torque 12: Servo motor thermistor temperature 13: Torque equivalent to disturbance 14: Overload alarm margin 15: Excessive error alarm margin 16: Settling time 17: Overshoot amount 18: Internal temperature of encoder 20: Position feedback 21: Encoder position within one revolution 22: Selected droop pulse 23: Unit total power consumption 24: Load-side encoder information 1 25: Load-side encoder information 2 26: Z-phase counter 27: Servo motor side/load-side position deviation 28: Servo motor side/load-side speed deviation 30: Unit power consumption (2 words) Most significant bit1 + address value: Optional address of registered monitor	The following items can be monitored. 1: Effective load ratio 2: Regenerative load ratio 3: Peak load ratio 4: Load inertia moment ratio 5: Model loop gain 6: Bus voltage 7: Servo motor speed 8: Encoder multiple revolution counter 12: Servo motor thermistor temperature 20: Position feedback 21: Encoder position within one revolution 22: Selected droop pulse 24: Load-side encoder information 1 25: Load-side encoder information 2 Most significant bit1 + address value: Optional address of registered monitor
Absolute position system		Possible[*3]	Possible	
Unlimited length feed		Possible[*4]	Possible	
Home position return method		Proximity dog method, Count method 1, Count method 2, Data set method, Scale origin signal detection method		

Item	VCII series/VPH series*1	MR-J5(W)-B/MR-J4(W)-B	MR-J3(W)-B
Positioning control, Expansion control	Position control mode, Speed control mode, Torque control mode	Position control mode, Speed control mode, Torque control mode, Continuous operation to torque control mode	
Torque limit value change	Possible (Separate setting: Restrictions*5)	Possible	
Gain switching command	Valid	Valid	
PI-PID switching command	VCⅡ series: Valid VPH series: Invalid	Valid	
Control loop (semi/fully) switching command	Invalid	Valid when using servo amplifier for fully closed loop control	
Amplifier-less operation function	Possible*6		
Servo parameter change request	Possible (2 words write)	Possible (1 word write*7)	
Driver communication	Not possible	Possible*8	
Monitoring of servo parameter error No.	Not possible	Possible	
Servo alarm/warning	Alarm codes/warning codes detected by VCⅡ series/VPH series are stored in "Servo alarm/warning".	Alarm codes/warning codes detected by servo amplifier are stored in "Servo alarm/warning".	
Programming tool	Test mode is available. MR Configurator2 is not available. Use VCⅡ/VPH data editing software.	Test mode is available. MR Configurator2 is available.	

*1 Confirm the specifications of VCⅡ series/VPH series for details.

*2 It can be monitored when using VPH series.

*3 The direct drive τDISC series manufactured by CKD NIKKI DENSO CO., LTD. can restore the absolute position in the range from -2147483648 to 2147483647. Confirm the specifications of VCⅡ series/VPH series for restrictions by the version of VCⅡ series/VPH series.

*4 When using the virtual encoder pulse number function of VCⅡ series/VPH series, the unlimited length feed is available. When this function is not used, the unlimited length feed is not available. Confirm the specifications of VCⅡ series/VPH series for details of this function.

*5 The specification of torque limit direction differs by the version of VCⅡ series/VPH series. Confirm the specifications of VCⅡ series/VPH series for details.

*6 During the amplifier-less operation, the following types of servo amplifier and servo motor are pseudo-connected.
For SSCNETⅢ connection
- Servo amplifier type: MR-J3-10B
- Motor type: HF-KP053 (Resolution per servo motor rotation: 262144 pulses/rev)
For SSCNETⅢ/H connection
- Servo amplifier type: MR-J4-10B
- Motor type: HG-KR053 (Resolution per servo motor rotation: 4194304 pulses/rev)

*7 For MR-J5(W)-B, 2 words write is possible.

*8 Refer to each servo amplifier instruction manual or manual for the servo amplifiers that can be used.

Precautions during control

■Absolute position system (ABS)/Incremental system (INC)

The ABS/INC setting is performed by the connected VCⅡ series/VPH series.

■Unlimited length feed

When using the virtual encoder pulse number function of VCⅡ series/VPH series, the unlimited length feed is available. When this function is not used, the servo alarm 61468 (F01CH) "Absolute encoder over flow error" occurs after "Encoder multiple revolution counter × Encoder resolution + Encoder position within one revolution" exceeds the range of -2147483648 to 2147483647, and the operation stops.

■Home position return

When "1" is set in the first digit of the parameter of VCⅡ series/VPH series "Select function for SSCNETⅢ on communicate mode", it is possible to carry out the home position return without passing the zero point. (Return to origin after power is supplied will be executed when passing of Motor Z phase is not necessary.) When "0" is set, the error "Home position return zero point not passed" (error code: 197AH) occurs because the home position return is executed without passing the motor Z phase (Motor reference position signal).

When the parameter of VPH series "Marker (zero point/Z-phase) transit selection in communication mode (P800)" is set to "Zero return operation allowed", it is possible to carry out the home position return without passing the zero point. When "Zero return operation allowed after the marker is passed" is set, the error "Home position return zero point not passed" (error code: 197AH) occurs because the home position is executed without passing the motor Z phase.

■Control mode

Control modes that can be used are shown below.

- Position control mode (speed control including position control and position loop)
- Speed control mode (speed control not including position loop)
- Torque control mode (torque control)

However, it is not available to switch to continuous operation to torque control mode of expansion control "Speed-torque control". If the mode is switched to continuous operation to torque control mode, the error "Continuous operation to torque control not supported" (error code: 19E7H) occurs and the operation stops.

"1: Feedback torque" cannot be set in "Torque initial value selection (b4 to b7)" of "[Pr.90] Operation setting for speed-torque control mode". If it is set, the warning "Torque initial value selection invalid" (warning code: 09E5H) occurs and the command value immediately after switching is the same as the case of selecting "0: Command torque".

■Servo parameter

- Control of servo parameters

Parameters of VCⅡ series/VPH series are not controlled by Simple Motion module. Therefore, even though the parameter of VCⅡ series/VPH series is changed during the communication between Simple Motion module and VCⅡ series/VPH series, it does not reflect to the buffer memory of the Simple motion module.

- Servo parameter change request

Change request of servo parameter ("[Cd.130] Servo parameter read/write request" to "[Cd.132] Change data") can be executed. However, the servo parameter of VCⅡ series/VPH series is controlled in a unit of 2 words, so that it is necessary to set "0002H: 2 words write request" in "[Cd.130] Servo parameter read/write request" for executing the parameter write. If 1 word write is executed to VCⅡ series/VPH series, the parameter write is failure, and "0003H: Read/write failure" is stored in "[Cd.130] Servo parameter read/write request".

When the servo parameter of VCⅡ series/VPH series is changed by the servo parameter change request, the parameter value after changing the servo parameter cannot be confirmed using VCⅡ/VPH data editing software. Also, when the power of VCⅡ series/VPH series is turned OFF, the parameter changed by the servo parameter change request becomes invalid, and the value written by VCⅡ/VPH data editing software becomes valid.

■Optional data monitor

The following table shows data types that can be set.

Data type	Unit
Effective load ratio	[%]
Regenerative load ratio	[%]
Peak load ratio	[%]
Model loop gain	[rad/s]
Bus voltage[*1]	[V]
Encoder multiple revolution counter	[rev]
Position feedback (Used point: 2 words)	[pulse]
Encoder position within one revolution (Used point: 2 words)	[pulse]

[*1] It can be monitored when using VPH series.

■Gain switching command, PI-PID switching request, Semi/Fully closed loop switching request

Gain switching command and PI-PID switching request are available.

Semi/fully closed loop switching request becomes invalid.

■Driver communication

The driver communication is not supported. If the driver communication is set in a servo parameter, the error "Driver communication setting error" (error code: 1C93H) will occur when the power is turned ON, and any servo amplifiers including VCⅡ series/VPH series cannot be connected.

VCII series/VPH series detection error/warning

When an error occurs at VCⅡ series/VPH series, the error detection signal turns ON, and the error code (1C80H) is stored in "[Md.23] Axis error No.". The servo alarm of VCⅡ series/VPH series (0x00 to 0xFF) is stored in "[Md.114] Servo alarm". The alarm detailed No. is not stored. However, "0" is always stored in "[Md.107] Parameter error No.".

Confirm the specifications of VCⅡ series/VPH series for details of errors and warnings.

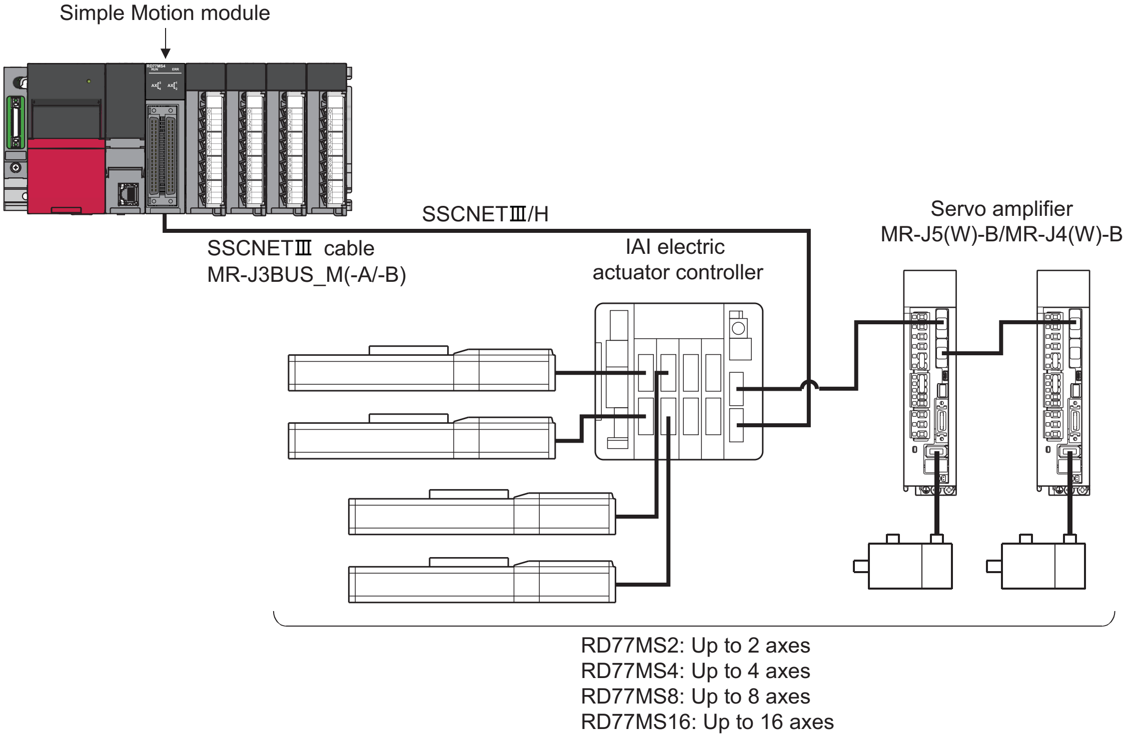
IAI electric actuator controller manufactured by IAI Corporation

The IAI Corporation made IAI electric actuator controller can be connected via SSCNETⅢ/H. Contact your nearest IAI sales office for details of IAI electric actuator controller.

Connecting method

■System configuration

The system configuration using IAI electric actuator controller is shown below.



■Parameter setting

To connect IAI electric actuator controller, set the following parameters.

n: Axis No.-1

Setting item		Setting value	Default value	Buffer memory address
[Pr.100]	Connected device	000A2001H: IAI Controller for Electric Actuator	0	58020+32n 58021+32n

Point

Parameters set in IAI electric actuator controller are not controlled by the Simple Motion module.

Comparisons of specifications with MR-J5(W)-B/MR-J4(W)-B

Item		IAI electric actuator controller	MR-J5(W)-B/MR-J4(W)-B
[Pr.100] Connected device		000A2001H: IAI Controller for Electric Actuator	00001000H: MR-J4-_B_(-RJ), MR-J4W_-_B (2-, 3-axis type) 00001400H: MR-J5-_B_(-RJ), MR-J5W_-_B (2-, 3-axis type)
Control of servo amplifier parameters		Controlled by IAI electric actuator controller.	Controlled by Simple Motion module.
Detailed parameter 1	[Pr.116] FLS signal selection	External input signals of IAI electric actuator controller are not available.	External input signals of servo amplifier are available.
	[Pr.117] RLS signal selection		
	[Pr.118] DOG signal selection		
Extended parameter	[Pr.91] to [Pr.94] Optional data monitor: Data type setting	Most significant bit1 + address value: Optional address of registered monitor	The following items can be monitored. 1: Effective load ratio 2: Regenerative load ratio 3: Peak load ratio 4: Load inertia moment ratio 5: Model loop gain 6: Bus voltage 7: Servo motor speed 8: Encoder multiple revolution counter 9: Unit power consumption 10: Instantaneous torque 12: Servo motor thermistor temperature 13: Torque equivalent to disturbance 14: Overload alarm margin 15: Excessive error alarm margin 16: Settling time 17: Overshoot amount 18: Internal temperature of encoder 20: Position feedback 21: Encoder position within one revolution 22: Selected droop pulse 23: Unit total power consumption 24: Load-side encoder information 1 25: Load-side encoder information 2 26: Z-phase counter 27: Servo motor side/load-side position deviation 28: Servo motor side/load-side speed deviation 30: Unit power consumption (2 words) Most significant bit1 + address value: Optional address of registered monitor
Absolute position system		Possible	Possible
Unlimited length feed		Not possible	Possible
Home position return method		Driver home position return method	Proximity dog method, Count method 1, Count method 2, Data set method, Scale origin signal detection method
Positioning control, Expansion control		Position control mode	Position control mode, Speed control mode, Torque control mode, Continuous operation to torque control mode
Gain switching command		Invalid	Valid
PI-PID switching command		Invalid	Valid
Control loop (semi/fully) switching command		Invalid	Valid when using servo amplifier for fully closed loop control
Amplifier-less operation function		Not possible[*1]	Possible[*2]
Servo parameter change request		Not possible	Possible (1 word write[*3])
Driver communication		Not possible	Possible
Monitoring of servo parameter error No.		Not possible	Possible
Servo alarm/warning		Alarm codes/warning codes detected by IAI electric actuator controller and operation error codes during driver home position return method are stored in "Servo alarm/warning".	Alarm codes/warning codes detected by servo amplifier are stored in "Servo alarm/warning".

Item	IAI electric actuator controller	MR-J5(W)-B/MR-J4(W)-B
[Md.108] Servo status 1	b0: READY ON b1: Servo ON b7: Servo alarm b12: In-position b13: Current cutback b14: Absolute position lost	b0: READY ON b1: Servo ON b2 to b3: Control mode b4: Gain switching b5: Fully closed loop control switching b7: Servo alarm b12: In-position b13: Torque limit b14: Absolute position lost b15: Servo warning
[Md.119] Servo status 2	—	b0: Zero passage b3: Zero speed b4: Speed limit b8: PID control
[Md.500] Servo status 7	b9: Driver operation alarm	—
Programming tool	Test mode is available. MR Configurator2 is not available. Use IAI electric actuator controller editing software.	Test mode is available. MR Configurator2 is available.

*1 Set as the unconnected status during amplifier-less operation.

*2 During the amplifier-less operation, the following types of servo amplifier and servo motor are pseudo-connected.
For MR-J4(W)-B
- Servo amplifier type: MR-J4-10B
- Motor type: HG-KR053 (Resolution per servo motor rotation: 4194304 pulses/rev)
For MR-J5(W)-B
- Servo amplifier type: MR-J5-10B
- Motor type: Rotary servo motor (Resolution per servo motor rotation: 4194304 pulses/rev)

*3 For MR-J5(W)-B, 2 words write is possible.

Precautions during control

■Absolute position system (ABS)/Incremental system (INC)

The ABS/INC setting is performed by the connected IAI electric actuator controller.

■Home position return

The method and some operation of the home position return using the IAI electric actuator controller differ from those of the home position return using the servo amplifier.

- Home position return method that can be used

○: Possible, ×: Not possible

[Pr.43] Home position return method	Possible/Not possible
Proximity dog method	×[*1]
Count method 1	×[*1]
Count method 2	×[*1]
Data set method	×[*1]
Scale origin signal detection method	×[*1]
Driver home position return method	○

*1 The error "Home position return method invalid" (error code: 1979H) occurs and home position return is not performed.

- Driver home position return method

The following shows an operation outline of the home position return method "Driver home position return method".
The home position return is executed based on the positioning pattern set in the IAI electric actuator controller. Set the setting values of home position return in the parameters of the IAI electric actuator controller. The operation of home position return and "[Pr.22] Input signal logic selection" of the parameters ([Pr.116] FLS signal selection, [Pr.117] RLS signal selection, and [Pr.118] DOG signal selection) depend on the specification of the IAI electric actuator controller, so that refer to the IAI electric actuator controller manual and match the settings. For parameters that can be set by the Simple Motion module, refer to the following.

☞ Page 457 Setting items for home position return parameters

This method is not available except for the stepping driver (including the IAI electric actuator controller). If the method is executed, the error "Home position return method invalid" (error code: 1979H) occurs.

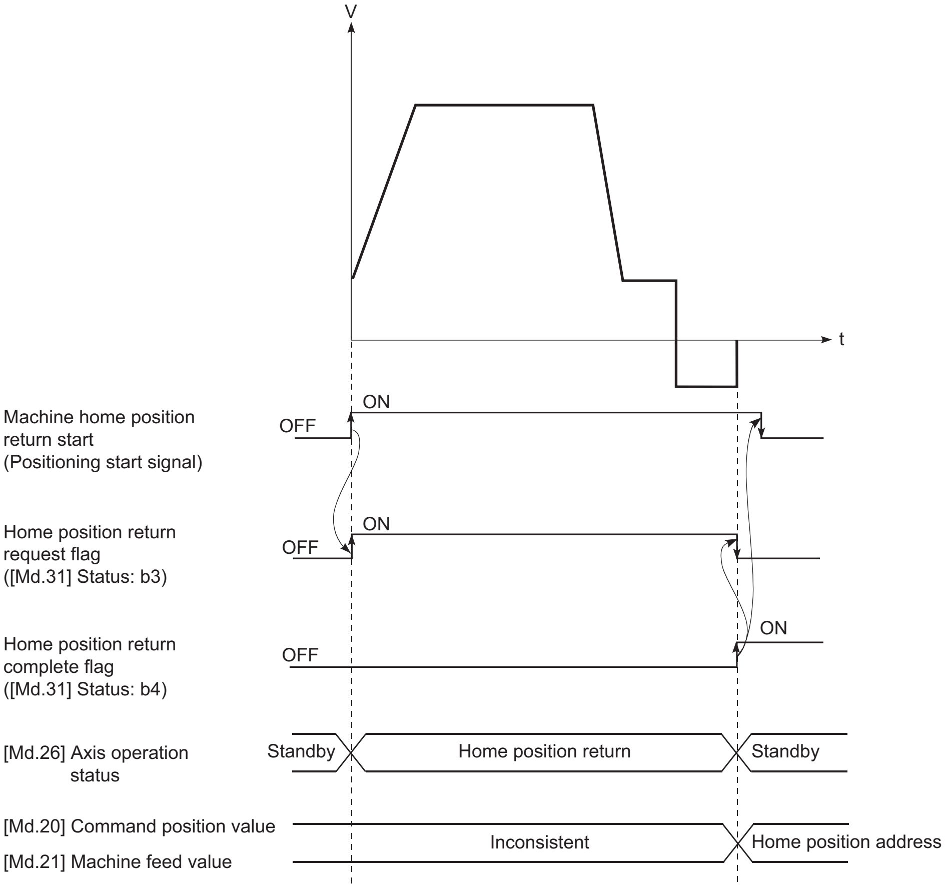
- Backlash compensation after the driver home position return method

When "[Pr.11] Backlash compensation amount" is set in the Simple Motion module, set the positive direction in "[Pr.44] Home position return direction".

[Operation chart]

The machine home position return is started.

(The home position return is executed based on the positioning pattern set in the IAI electric actuator controller.)



■Servo OFF

The system is closed loop configuration. If the motor is moved by an external force, the position information is updated.

■Control mode

Position control mode (position control, and speed control including position loop) can be used. Speed control mode and torque control mode of expansion control (speed control not including position loop, torque control, continuous operation to torque control) cannot be used. If a control mode switch is performed, the warning "Illegal control mode switching" (warning code: 09EAH) occurs and the switching is not executed.

■Servo parameter

- Control of servo parameters

Parameters of IAI electric actuator controller are not controlled by the Simple Motion module. Therefore, even though the parameter of IAI electric actuator controller is changed during the communication between the Simple Motion module and IAI electric actuator controller, the change is not applied to the buffer memory.

■Optional data monitor

The following table shows data type that can be set.

Data type	Unit
Optional address of registered monitor	—

■Gain switching command, PI-PID switching request, and Semi/Fully closed loop switching request

Gain switching command, PI-PID switching request, and Semi/Fully closed loop switching request are not available.

■Driver communication

The driver communication is not supported.

If the driver communication is set in a servo parameter, the setting is ignored.

■Axis monitor data

- "[Md.104] Motor current value" is always "0".
- "Zero passage" ([Md.119] Servo status 2: b0) is always OFF.
- "Zero speed" ([Md.119] Servo status 2: b3) and "Speed limit" ([Md.119] Servo status 2: b4) are always OFF.
- "[Md.113] Semi/Fully closed loop status" is always "0".
- "[Md.107] Parameter error No." is always "0".
- "In-position" ([Md.108] Servo status 1: b12) is OFF during the axis operation. It is turned ON when the axis operation is completed.
- When data cannot be specified is set to "[Pr.91] Optional data monitor: Data type setting 1" to "[Pr.94] Optional data monitor: Data type setting 4", "0" is set to "[Md.109] Regenerative load ratio/Optional data monitor output 1" to "[Md.112] Optional data monitor output 4". Refer to the following for the data that can be set.
  ☞ Page 388 Optional Data Monitor Function [RD77MS]

■Amplifier-less operation

The amplifier-less operation cannot be used to the IAI electric actuator controller axis. If the amplifier-less operation is used, the IAI electric actuator controller set axis is not connected.

■In-position range

When the position of the cam axis is restored in synchronous control, a check is performed by the servo parameter "In-position range" (PA10). However, because the servo parameter settings are not performed in IAI electric actuator controller, the "In-position range" is checked as 100 [pulse].

■Operation cycle

The operation cycle is restricted depending on the number of control axes per IAI electric actuator controller. When the setting over the following restriction is set and the controller is connected, it cannot be connected and the error "Unsupported operation cycle" (error code: 1C83H) occurs.

Number of control axes	Operation cycle
Up to 4 axes	Compatible with 0.444 ms or more
5 axes or more	Compatible with 0.888 ms or more

IAI electric actuator controller detection error/warning

■Error

When an error occurs on IAI electric actuator controller, the error detection signal turns ON, and the error code (1C80H) is stored in "[Md.23] Axis error No.". The servo alarms (0x00 to 0xFF) of IAI electric actuator controller are stored in "[Md.114] Servo alarm". The alarm detailed No. is not stored. However, "0" is always stored in "[Md.107] Parameter error No.".

When the driver home position return method is selected and a home position return error is detected, the error "Driver home position return error" (error code: 194BH) is stored in "[Md.23] Axis error No.". Also, "Driver operation alarm" ([Md.500] Servo status 7: b9) is turned ON and the operation alarm generated on the IAI electric actuator controller is stored in "[Md.502] Driver operation alarm No.".

Confirm the specifications of IAI electric actuator controller for details.

■Warning

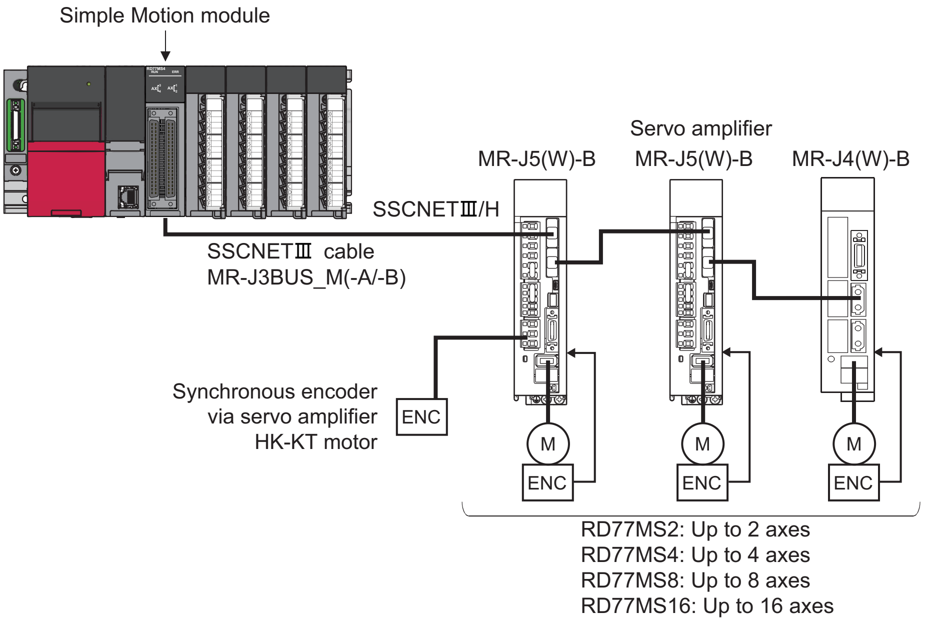
No warning occurs on IAI electric actuator controller.

Connection with MR-J5(W)-B

MR-J5(W)-B can be connected via SSCNETⅢ/H.
MR-J5(W)-B has new functions such as battery-less, one-connector/one-touch lock, simple converter, predictive maintenance, quick tuning, machine diagnosis, motor incorrect wiring detection, disconnection detection, ENC communication diagnosis.

System configuration

The system configuration using MR-J5(W)-B is shown below.



Setting method

■Servo parameter

Since the servo parameters of MR-J5(W)-B are not in the buffer memory, set the servo parameters with one of the following methods.

Method	details
When using GX Works3	The servo parameters can be set easily. Set the servo parameters in GX Works3 and perform "Write to module".
When using the axis control data before the servo parameter transfer	The servo parameters can be set with the sequence program by using the axis control data. The servo parameters can be set even if the servo amplifier is not connected. Refer to the following for details on the write/read method. ☞ Page 797 How to read and write the servo parameter using the axis control data
How to change individually the servo parameter after transfer of servo parameter	The servo parameters can be individually changed from Simple Motion module. For details, refer to the following. ☞ Page 799 How to change individually the servo parameter after transfer of servo parameter

- How to read and write the servo parameter using the axis control data

The following axis control data and setting values are used.

n: Axis No. - 1

Setting item		**Setting value**	**Factory-set initial value**	**Buffer memory address**
[Cd.130]	Servo parameter read/write request[1]	0000H: Not request (read/write completion) 0003H: Read/write failure 0022H: 2 words write request to internal memory 0032H: 2 words read request from internal memory	0	4354+100n
[Cd.131]	Parameter No. (Setting for servo parameters to be changed)	Set the servo parameter to be changed.	0000H	4355+100n
[Cd.132]	Change data	Set the change value of servo parameter set in "[Cd.131] Parameter No.".	0	4356+100n 4357+100n

[1] Refer to the following for details on "0001H: 1 word write request" and "0002H: 2 words write request".
☞ Page 799 How to change individually the servo parameter after transfer of servo parameter

[How to write the servo parameter using the axis control data]

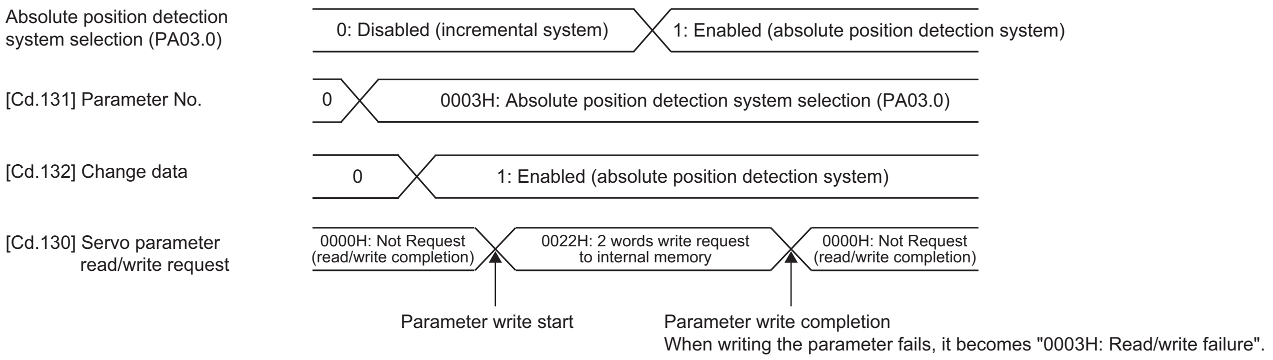
1. Set the servo parameter No. in "[Cd.131] Parameter No.".

2. Set the setting value for the servo parameter in "[Cd.132] Change data" in 2 words.

3. Set "0022H: 2 words write request to internal memory" in "[Cd.130] Servo parameter read/write request".

4. The Simple Motion module writes "[Cd.132] Change data" to the servo parameter of "[Cd.131] Parameter No.".
When writing the data succeeds, "[Cd.130] Servo parameter read/write request" becomes "0000H: Not request (read/write completion)".
When writing the data fails, "[Cd.130] Servo parameter read/write request" becomes "0003H: Read/write failure".
("[Cd.130] Servo parameter read/write request" is detected with the continuous detection. Returning "0003H: Read/write failure" to "0000H: Not request (read/write completion)" manually is not required.)

5. The servo parameters written by this method are lost when the power is turned OFF. To save them, backup the execution data. Refer to the following for the details on the execution data backup method.
☞ Page 330 Execution Data Backup Function



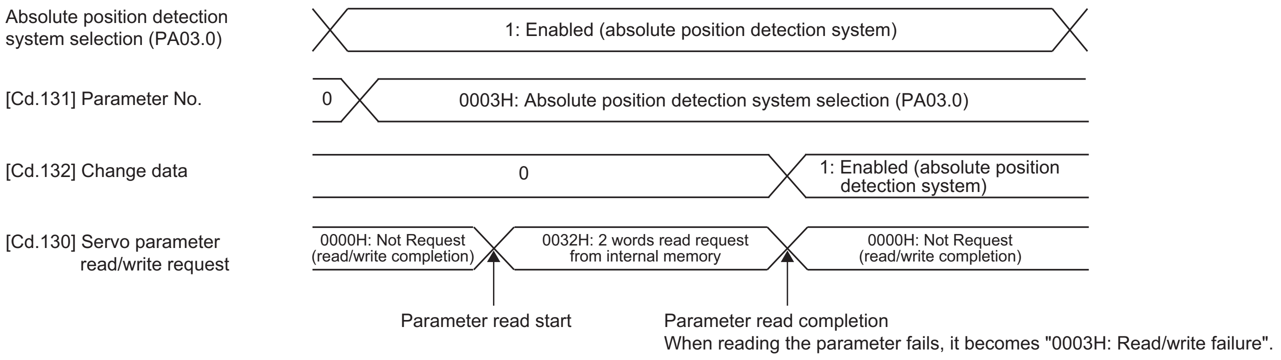
Refer to the following for the timing of transferring the written servo parameter to the servo amplifier.
☞ Page 665 Data transmission process

[How to read the servo parameter using the axis control data]

1. Set the servo parameter No. in "[Cd.131] Parameter No.".

2. Set "0032H: 2 words read request from internal memory" in "[Cd.130] Servo parameter read/write request".

3. The Simple Motion module reads "[Cd.132] Change data" from the servo parameter of "[Cd.131] Parameter No.".
When reading the data succeeds, "[Cd.130] Servo parameter read/write request" becomes "0000H: Not request (read/write completion)".
When reading the data fails, "[Cd.130] Servo parameter read/write request" becomes "0003H: Read/write failure".
("[Cd.130] Servo parameter read/write request" is detected with the continuous detection. Returning "0003H: Read/write failure" to "0000H: Not request (read/write completion)" manually is not required.)



- How to change individually the servo parameter after transfer of servo parameter

The following axis control data and setting values are used.

n: Axis No. - 1

Setting item		Setting value	Factory-set initial value	Buffer memory address
[Cd.130]	Servo parameter read/write request[1]	0000H: Not request (read/write completion) 0001H: 1 word write request 0002H: 2 words write request 0003H: Read/write failure	0	4354+100n
[Cd.131]	Parameter No. (Setting for servo parameters to be changed)	Set the servo parameter to be changed.	0000H	4355+100n
[Cd.132]	Change data	Set the change value of servo parameter set in "[Cd.131] Parameter No.".	0	4356+100n 4357+100n

[1] Refer to the following for details on "0022H: 2 words write request to internal memory" and "0032H: 2 words read request from internal memory ".
☞ Page 797 How to read and write the servo parameter using the axis control data

Since the servo parameters of MR-J5(W)-B is in unit of 2 words, use "0002H: 2 words write request" in "[Cd.130] Servo parameter read/write request". When "0001H: 1 word write request" is used, only the lower 1 word is written. Refer to the following for the setting details.

☞ Page 671 How to change individually the servo parameter after transfer of servo parameter

■Servo amplifier electronic gear setting

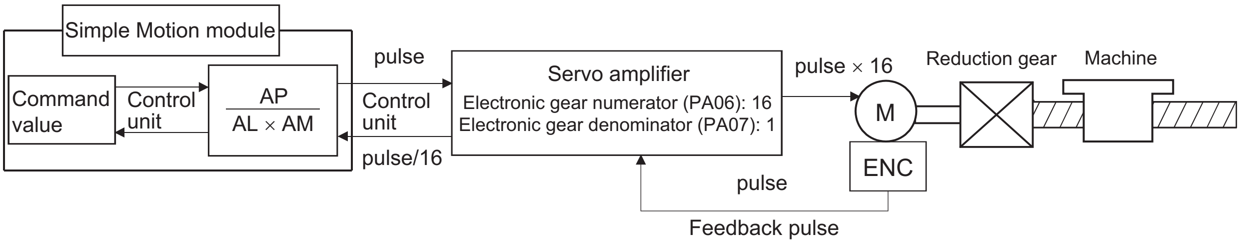
When a rotary servo motor is used with the Simple Motion module, the control is performed with the encoder resolution of 4194304 pulses/rev. Therefore, when a rotary servo motor with the encoder resolution of 67108864 pulses/rev such as an HK-KT motor is used, set 16 in the servo parameter "Electronic gear numerator (PA06)" and 1 in "Electronic gear denominator (PA07)".

For the electronic gears such as "[Pr.2] Number of pulses per rotation (AP)", calculate with the encoder resolution of 4194304 pulses/rev. Refer to the following for the setting details.

☞ Page 238 Electronic gear function

Ex.

When HK-KT (67108864 pulses/rev) is used



If the setting of the servo parameters "Electronic gear numerator (PA06)" and "Electronic gear denominator (PA07)" are different when MR-J5(W)-B is connected, the error "Amplifier electronic gear setting error" (error code: 1C84H) occurs. When the error has occurred, set the servo parameters "Electronic gear numerator (PA06)" and "Electronic gear denominator (PA07)", turn the PLC READY signal OFF and ON, and reconnect with the servo amplifier.

When the error "Amplifier electronic gear setting error" (error code: 1C84H) occurs, the LED display status of the servo amplifier becomes "b_". However, the servo amplifier will not be servo ON status even if the all axis servo ON [Y1] is turned ON.

The servo amplifier connected from the axis that the error "Amplifier electronic gear setting error" (error code: 1C84H) has occurred becomes servo ON status as the all axis servo ON [Y1] is turned ON.

■Gain switching command

- When "1: Gain switching command ON" is set in "[Cd.108] Gain switching command flag", the gain switching is commanded to the servo amplifier, and the load inertia moment ratio and each gain are switched to PB29 to PB36 and PB56 to PB60. "Gain switching" ([Md.108] Servo status: b4) is turned ON during the gain switching.
- When "2: Gain switching 2 command ON" is set in "[Cd.108] Gain switching command flag", the gain switching 2 is commanded to the servo amplifier, and the load inertia moment ratio and each gain are switched to PB67 to PB79. "Gain switching 2" ([Md.127] Servo status 5: b4) is turned on during the gain switching 2.
- The following shows the servo parameters switched by the gain switching and gain switching 2. Refer to the manual of the servo amplifier for details on the gain switching and gain switching 2.

Control gain	Before gain switching		After gain switching		After gain switching 2	
	Servo parameter	Abbreviation	Servo parameter	Abbreviation	Servo parameter	Abbreviation
Load to motor inertia ratio/load to motor mass ratio	PB06	GD2	PB29	GD2B	PB67	GD2C
Model control gain	PB07	PG1	PB60	PG1B	PB79	PG1C
Position control gain	PB08	PG2	PB30	PG2B	PB68	PG2C
Speed control gain	PB09	VG2	PB31	VG2B	PB69	VG2C
Speed integral compensation	PB10	VIC	PB32	VICB	PB70	VICC
Vibration suppression control 1 - Vibration frequency	PB19	VRF11	PB33	VRF1B	PB71	VRF1C
Vibration suppression control 1 - Resonance frequency	PB20	VRF12	PB34	VRF2B	PB72	VRF2C
Vibration suppression control 1 - Vibration frequency damping	PB21	VRF13	PB35	VRF3B	PB73	VRF3C
Vibration suppression control 1 - Resonance frequency damping	PB22	VRF14	PB36	VRF4B	PB74	VRF4C
Vibration suppression control 2 - Vibration frequency	PB52	VRF21	PB56	VRF21B	PB75	VRF21C
Vibration suppression control 2 - Resonance frequency	PB53	VRF22	PB57	VRF22B	PB76	VRF22C
Vibration suppression control 2 - Vibration frequency damping	PB54	VRF23	PB58	VRF23B	PB77	VRF23C
Vibration suppression control 2 - Resonance frequency damping	PB55	VRF24	PB59	VRF24B	PB78	VRF24C

Comparisons of specifications with MR-J5(W)-B and MR-J4(W)-B

Item	MR-J5(W)-B	MR-J4(W)-B
[Pr.100] connected device	00001400H: MR-J5-_B_(-RJ), MR-J5W_-_B (2-, 3-axis type)	00001000H: MR-J4-_B_(-RJ), MR-J4W_-_B (2-, 3-axis type)
Control of servo amplifier parameters	Controlled by Simple Motion module[1] (Reading and changing 32 bit parameters are available)	Controlled by Simple Motion module (Reading and changing 32 bit parameters are available)
Operation mode	Semi closed loop control system, Fully closed loop control system, Linear servo system, Direct drive servo system	
Encoder resolution (for semi closed loop control system/fully closed loop control system)	4194304 pulse/rev[2]	4194304 pulse/rev
HPR method	Proximity dog method, Count method 1, Count method 2, Data set method, Scale origin signal detection method	
Positioning control, Expansion control	Position control mode, Speed control mode, Torque control mode, Continuous operation to torque control mode	
Gain switching command	Valid	
Gain switching 2 command	Valid	Invalid
PI-PID switching command	Valid	
Control loop (semi/fully) switching command	Valid when using servo amplifier for fully closed loop control	
Amplifier-less operation function	Possible	
Driver communication	Possible	
Synchronous encoder via servo amplifier	HK-KT motor (resolution: 4194304 pulse/rev)[3]	HG-KR motor, HG-MR motor, Q171ENC-W8 (resolution: 4194304 pulse/rev)

[1] The access method of the servo amplifier is different. For details, refer to the following.
☞ Page 796 Servo parameter

[2] When a rotary servo motor with the encoder resolution of 67108864 pulses/rev such as an HK-KT motor is used, set 16 in the servo parameter "Electronic gear numerator (PA06)" and 1 in "Electronic gear denominator (PA07)" so that the resolution is 4194304 pulses/rev. For details, refer to the following.
☞ Page 799 Servo amplifier electronic gear setting

[3] Even if an HK-KT motor (encoder resolution: 67108864 pulses/rev) is used, the resolution is changed to 4194304 pulses/rev by the internal processing of the Simple Motion module.

Point

When a high-precision synchronous at the load side is required for multiple axes, such as the interpolation control and synchronous control, construct a system using the servo amplifiers from the same series.

Precautions

■Detection of the servo alarm

The error "Driver error" (error code: 1C80H) occurs at the time of servo alarm detection, and the warning "Driver warning" (warning code: 0C80H) occurs at the time of servo warning detection. The alarm code and warning code of the servo amplifier are stored in "[Md.114] Servo alarm".

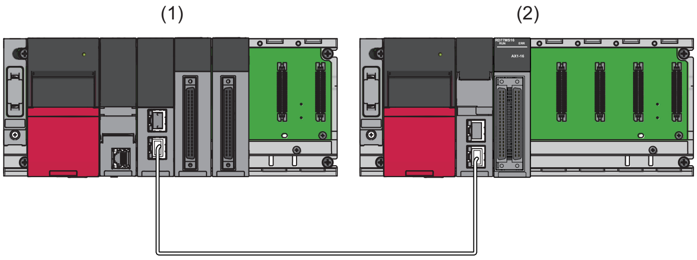
Refer to each servo amplifier manual for details on the servo amplifier detection warnings and errors.

Appendix 4 Operation Examples of When the Remote Head Module Is Mounted [RD77MS]

This section describes operation examples of when the remote head module is mounted.

System configuration example

The following system configuration is used to explain an example of operation.



(1) Master station (Network No. 1, station No. 0)
- Power supply module: R61P
- CPU module: R04CPU
- Master/local module: RJ71GF11-T2 (Start I/O No.: 0000H to 001FH)
- Input module: RX41C4 (Start I/O No.: 0020H to 003FH)
- Input module: RX41C4 (Start I/O No.: 0040H to 005FH)

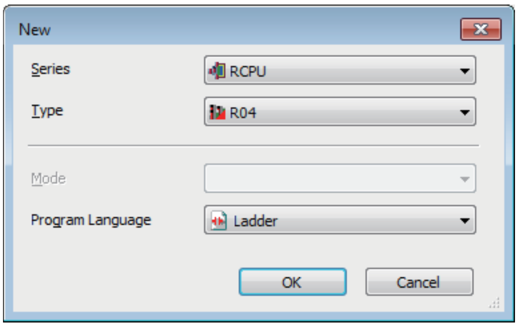
(2) Intelligent device station (Network No. 1, station No. 1)
- Power supply module: R61P
- Remote head module: RJ72GF15-T2
- Simple Motion module: RD77MS16 (Start I/O No.: 0100H to 011FH)

Setting in the master station

Connect the engineering tool to the CPU module of the master station and set parameters.

1. Create the project with the following settings.

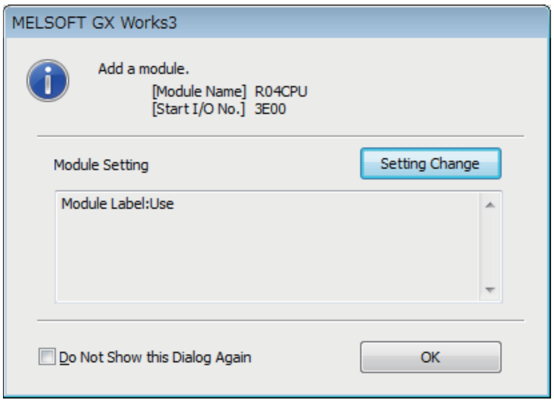
[Project] ⇨ [New]



New

Series	RCPU
Type	R04
Mode	
Program Language	Ladder

2. Configure the setting to use the module labels and add the module labels of the CPU module.



MELSOFT GX Works3

Add a module.
[Module Name] R04CPU
[Start I/O No.] 3E00

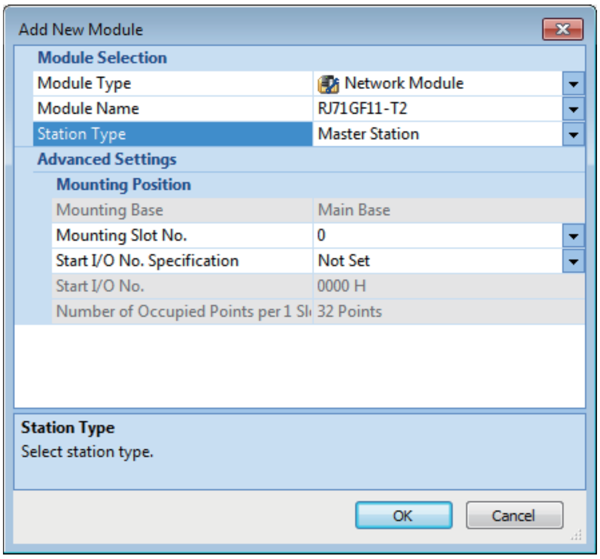
Module Setting

Module Label:Use

☐ Do Not Show this Dialog Again

3. Add the master/local module with the following settings.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ Right-click ⇨ [Add New Module]

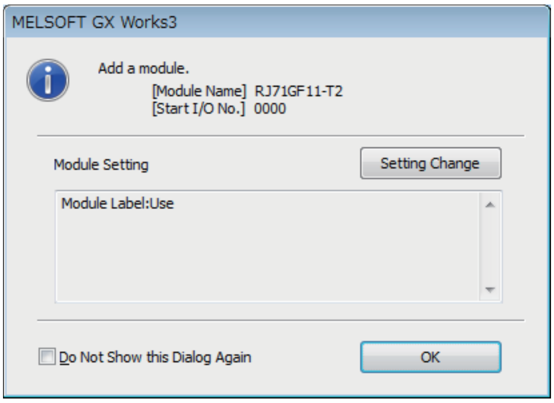


Add New Module

Module Selection	
Module Type	Network Module
Module Name	RJ71GF11-T2
Station Type	Master Station
Advanced Settings	
Mounting Position	
Mounting Base	Main Base
Mounting Slot No.	0
Start I/O No. Specification	Not Set
Start I/O No.	0000 H
Number of Occupied Points per 1 Sl	32 Points

Station Type
Select station type.

4. Configure the setting to use the module labels and add the module labels of the master/local module.



MELSOFT GX Works3

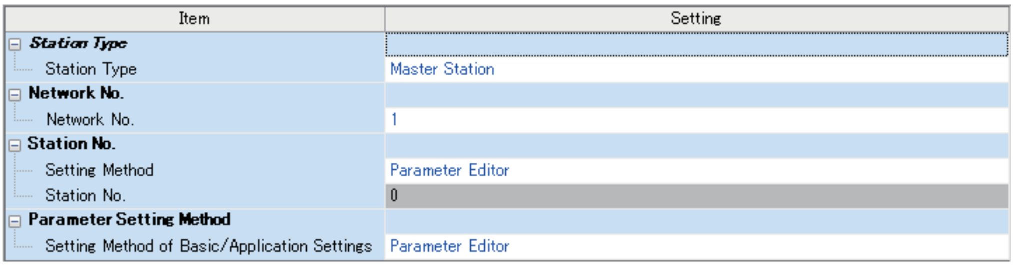
Add a module.
[Module Name] RJ71GF11-T2
[Start I/O No.] 0000

Module Setting

Module Label:Use

5. Set "Required Settings" of "Module Parameter" of the master/local module as shown below.

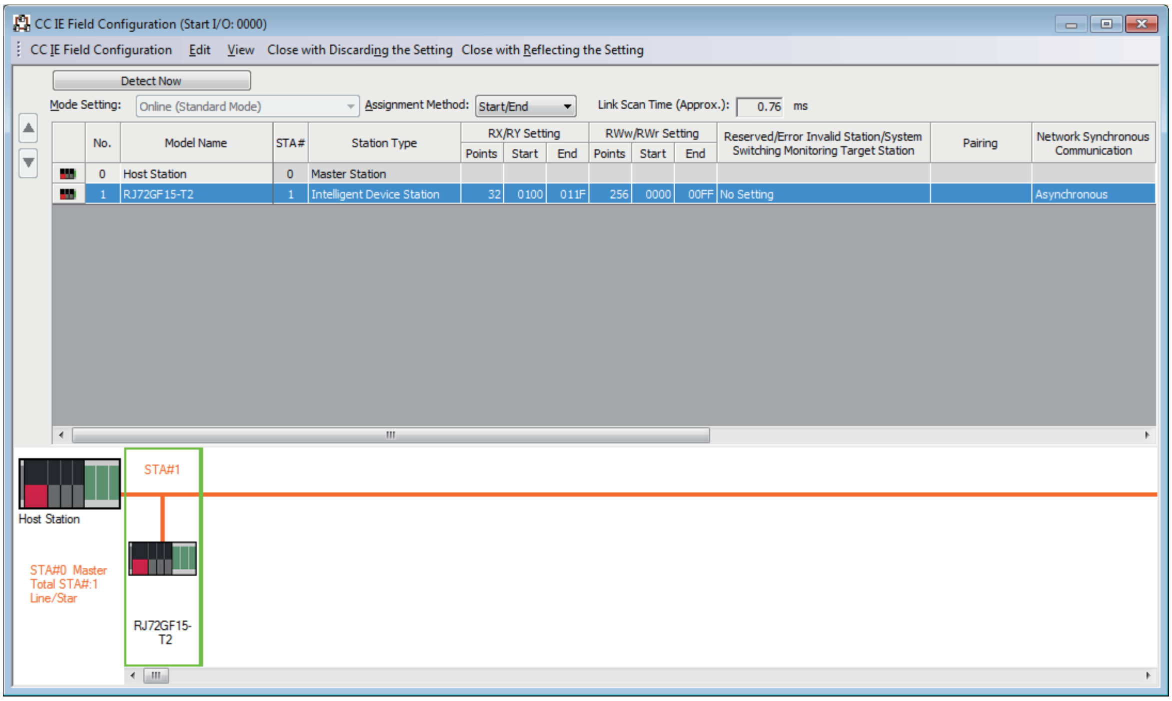
[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [RJ71GF11-T2] ⇨ [Required Settings]



Item	Setting
Station Type	
Station Type	Master Station
Network No.	
Network No.	1
Station No.	
Setting Method	Parameter Editor
Station No.	0
Parameter Setting Method	
Setting Method of Basic/Application Settings	Parameter Editor

6. Set "Network Configuration Settings" of "Module Parameter" of the master/local module as shown below.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [RJ71GF11-T2] ⇨ [Basic Settings] ⇨ [Network Configuration Settings]



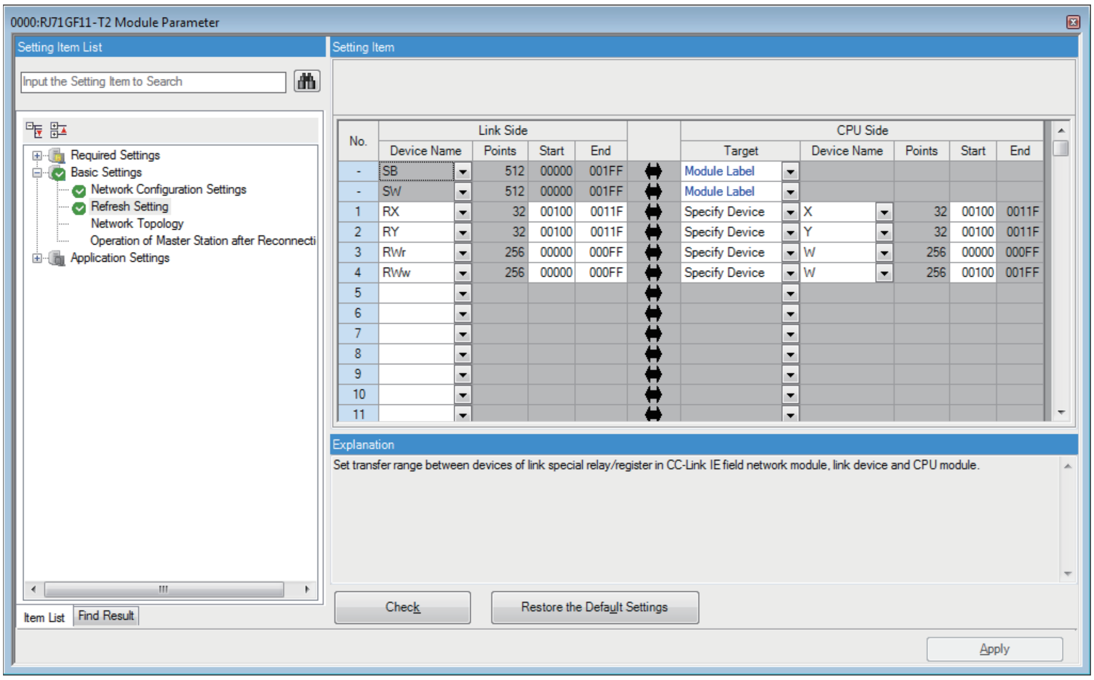
CC IE Field Configuration (Start I/O: 0000)

Mode Setting: Online (Standard Mode) Assignment Method: Start/End Link Scan Time (Approx.): 0.76 ms

	No.	Model Name	STA#	Station Type	RX/RY Setting			RWw/RWr Setting			Reserved/Error Invalid Station/System Switching Monitoring Target Station	Pairing	Network Synchronous Communication
					Points	Start	End	Points	Start	End			
	0	Host Station	0	Master Station									
	1	RJ72GF15-T2	1	Intelligent Device Station	32	0100	011F	256	0000	00FF	No Setting		Asynchronous

7. Set "Refresh Setting" of "Module Parameter" of the master/local module as shown below.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [RJ71GF11-T2] ⇨ [Basic Settings] ⇨ [Refresh Setting]



No.	Link Side					CPU Side				
	Device Name	Points	Start	End		Target	Device Name	Points	Start	End
-	SB	512	00000	001FF	↔	Module Label				
-	SW	512	00000	001FF	↔	Module Label				
1	RX	32	00100	0011F	↔	Specify Device	X	32	00100	0011F
2	RY	32	00100	0011F	↔	Specify Device	Y	32	00100	0011F
3	RWr	256	00000	000FF	↔	Specify Device	W	256	00000	000FF
4	RWw	256	00000	000FF	↔	Specify Device	W	256	00100	001FF
5					↔					
6					↔					
7					↔					
8					↔					
9					↔					
10					↔					
11					↔					

Set transfer range between devices of link special relay/register in CC-Link IE field network module, link device and CPU module.

8. Write the set parameters to the CPU module on the master station. Then reset the CPU module or power off and on the system.

[Online] ⇨ [Write to PLC]

Point

For parameters of the master/local module which are not described in this procedure, set default values. For details on parameters of the master/local module, refer to the following.

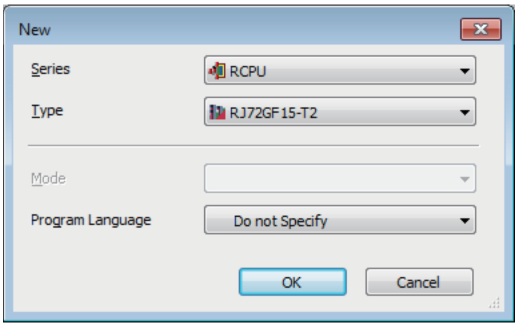
MELSEC iQ-R CC-Link IE Field Network User's Manual (Application)

Setting in the intelligent device station

Connect the engineering tool to the remote head module of the intelligent device station and set parameters.

1. Create the project with the following settings.

[Project] ⇨ [New]

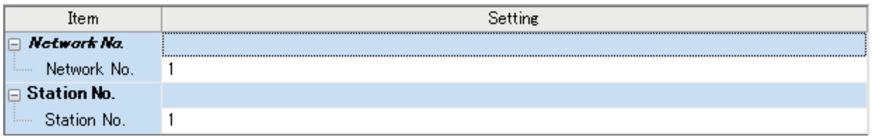


New

Series	RCPU
Type	RJ72GF15-T2
Mode	
Program Language	Do not Specify

2. Set "Network Required Setting" of "CPU Parameter" of the remote head module as shown below.

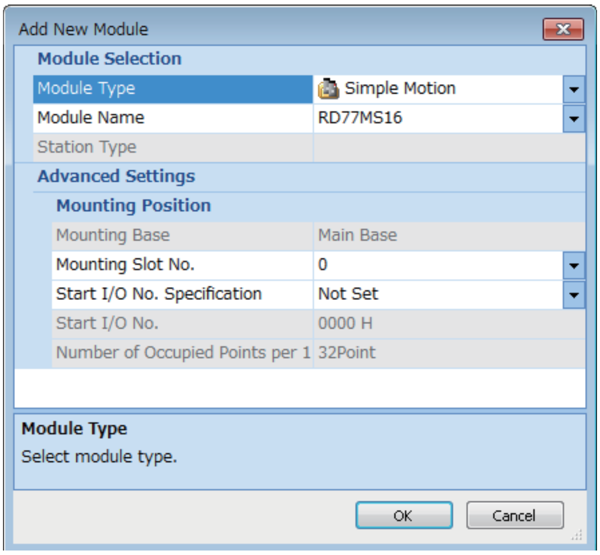
[Navigation window] ⇨ [Parameter] ⇨ [RJ72GF15-T2] ⇨ [CPU Parameter] ⇨ [Network Required Setting]



Item	Setting
Network No.	
Network No.	1
Station No.	
Station No.	1

3. Add the RD77MS with the following settings.

Navigation window ⇨ [Parameter] ⇨ [Module Information] ⇨ Right-click ⇨ [Add New Module]

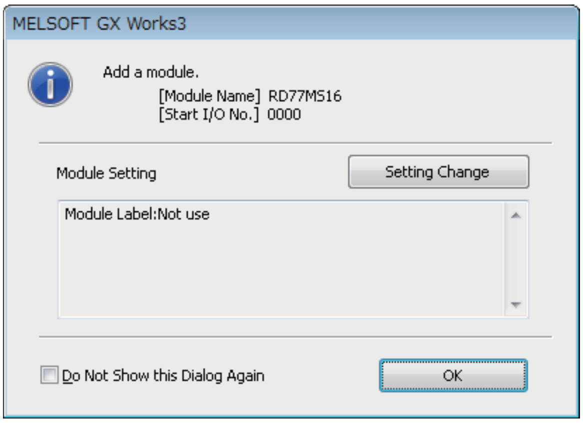


Add New Module

Module Selection	
Module Type	Simple Motion
Module Name	RD77MS16
Station Type	
Advanced Settings	
Mounting Position	
Mounting Base	Main Base
Mounting Slot No.	0
Start I/O No. Specification	Not Set
Start I/O No.	0000 H
Number of Occupied Points per 1	32Point

Module Type
Select module type.

4. Configure the setting not to use the module labels.



Add a module.
[Module Name] RD77MS16
[Start I/O No.] 0000

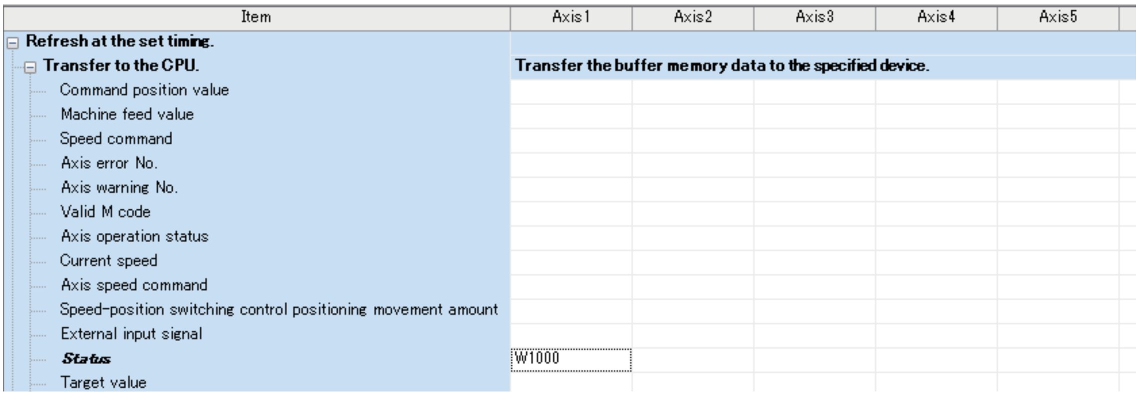
Module Setting

Module Label:Not use

☐ Do Not Show this Dialog Again

5. Set "Refresh Setting" of "Module Parameter" of RD77MS as shown below.

[Navigation window] ⇨ [Parameter] ⇨ [Module Information] ⇨ [RD77MS16] ⇨ [Module Parameter] ⇨ [Refresh Setting]



Item	Axis1	Axis2	Axis3	Axis4	Axis5
Refresh at the set timing.					
Transfer to the CPU.	**Transfer the buffer memory data to the specified device.**				
Command position value					
Machine feed value					
Speed command					
Axis error No.					
Axis warning No.					
Valid M code					
Axis operation status					
Current speed					
Axis speed command					
Speed-position switching control positioning movement amount					
External input signal					
Status	W1000				
Target value					

6. Since the parameters are already set with a program in this program example, use default values for module parameter settings of the engineering tool. When setting module parameters with the engineering tool, refer to the following.

☞ Page 429 Module Parameters

7. Write the set parameters to the remote head module on the intelligent device station. Then reset the remote head module or power off and on the system.

[Online] ⇨ [Write to PLC]

Point

For parameters of the remote head module which are not described in this procedure, set default values. For details on parameters of the remote head module, refer to the following.

📖MELSEC iQ-R CC-Link IE Field Network Remote Head Module User's Manual (Application)

Checking the network status

After setting parameters to the master station and the intelligent device station, check whether data link is normally performed between the master station and the intelligent device station. Check the network status using the CC-Link IE Field Network diagnostics of the engineering tool.

For how to perform the CC-Link IE Field Network diagnostics from the master station, refer to the following.

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

Program examples

Write the programs to the CPU module on the master station.

Module label

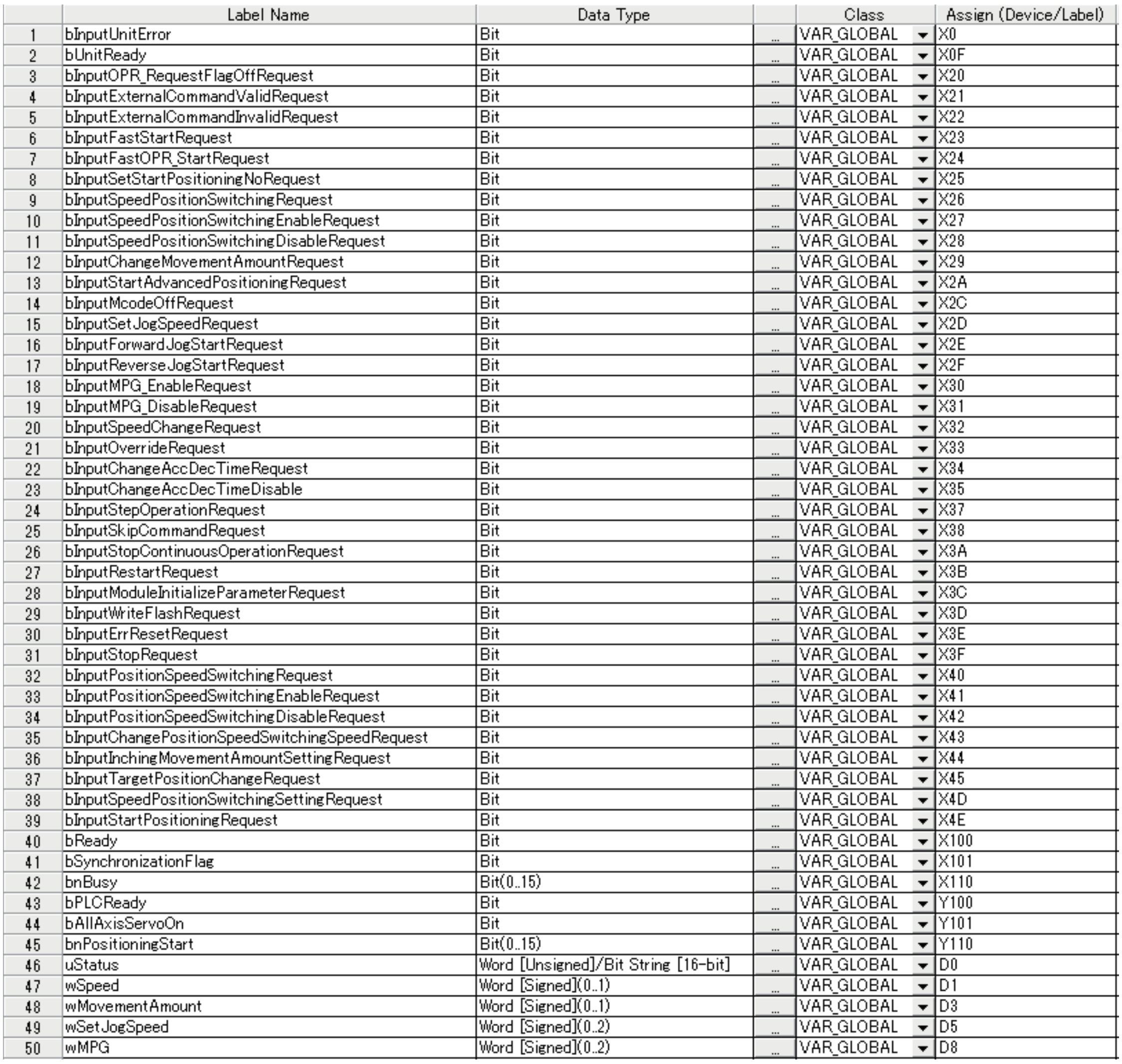
For the program examples, the module labels of the CPU module and master/local module are used.

Label name	Description	Device
RCPU.stSM.bAfter_RUN1_Scan_ON	ON for one scan after RUN	SM402
RCPU.stSM.bAfter_RUN1_Scan_OFF	OFF for one scan after RUN	SM403
GF11_1.bSts_DataLinkError	Data link error status of own station	SB0049
GF11_1.bnSts_DataLinkError_Station[1]	Data link status of each station (station No. 1)	SW00B0.0

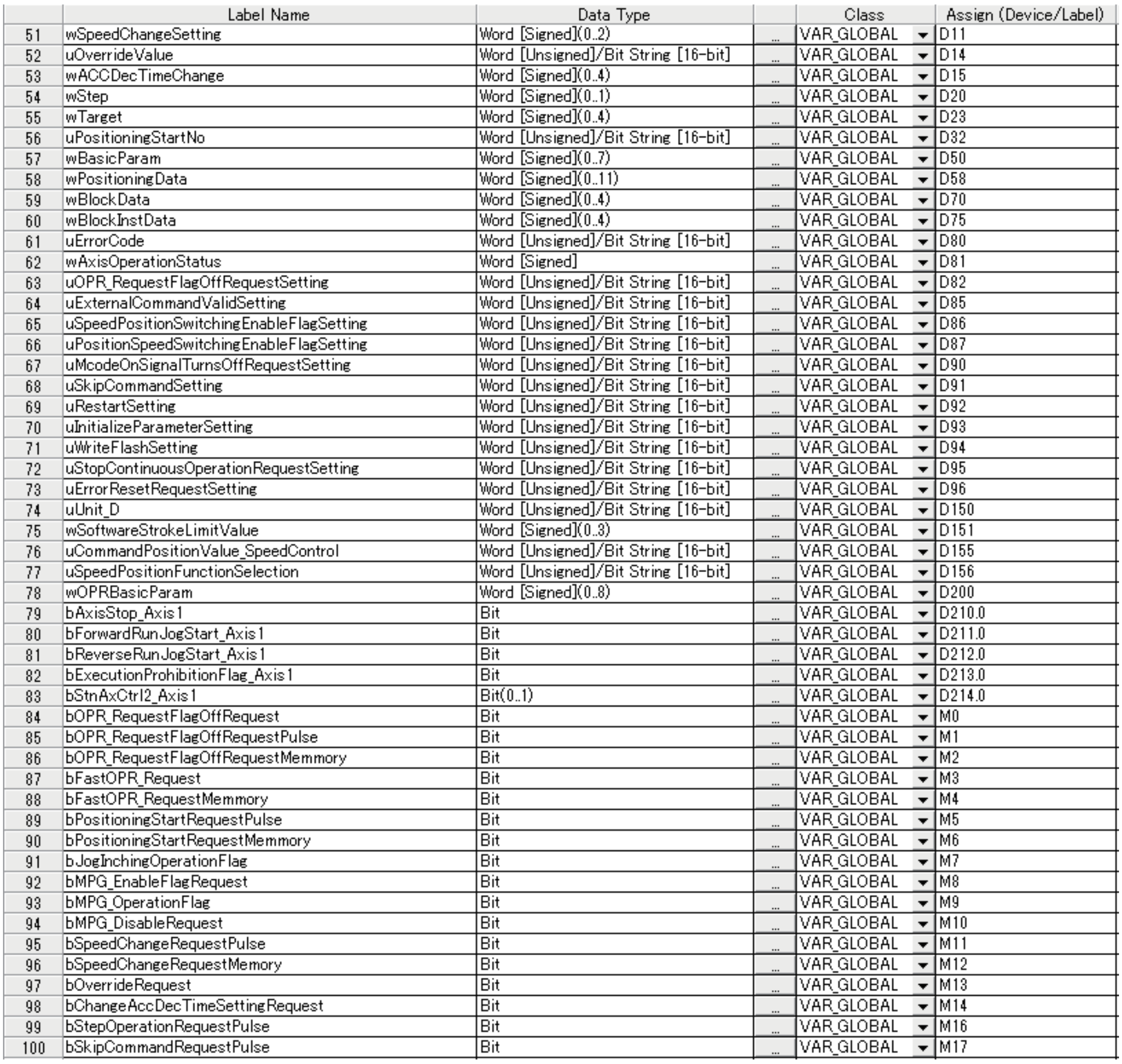
Global label

■List of global labels

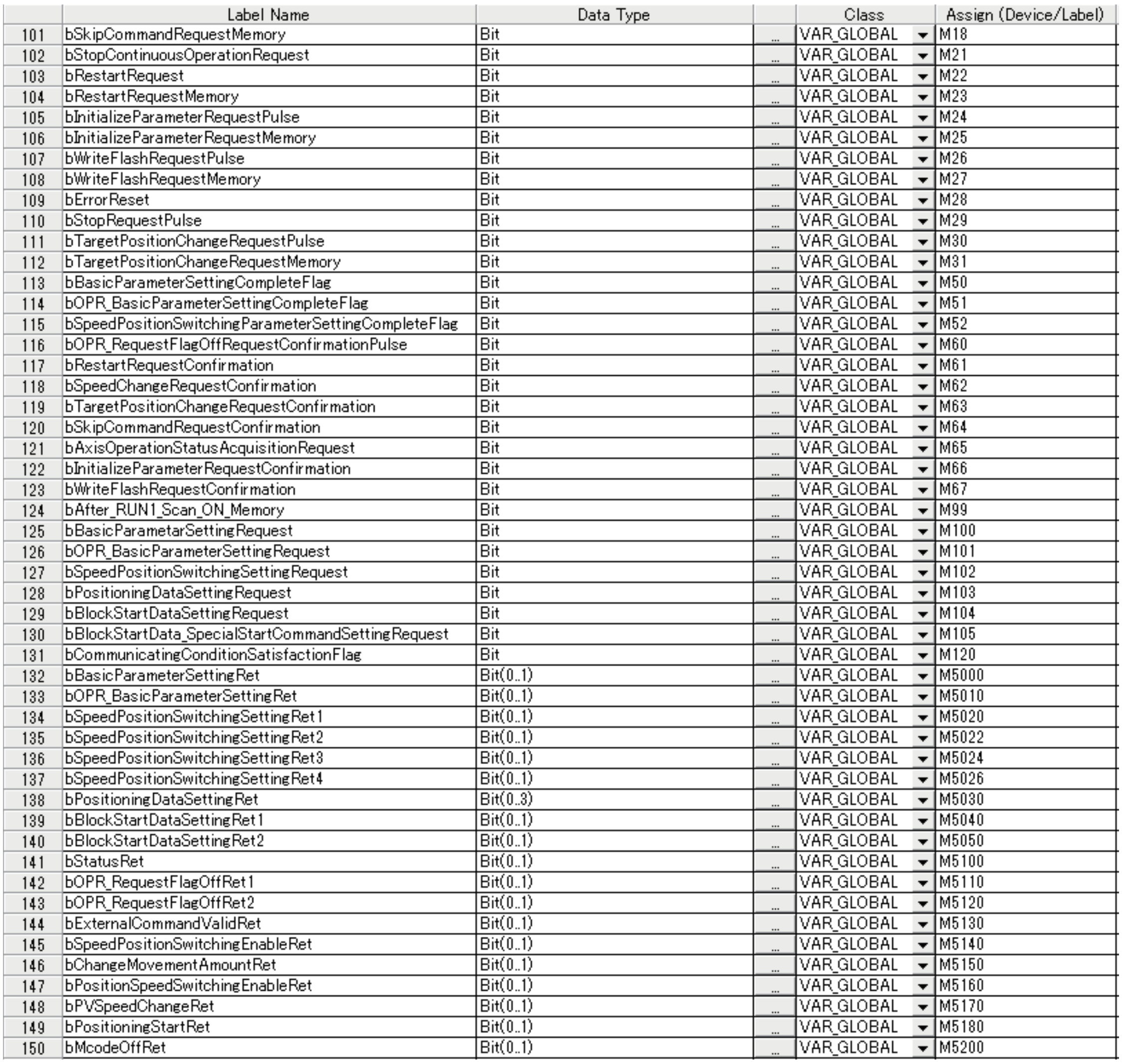
Define global labels as shown below:



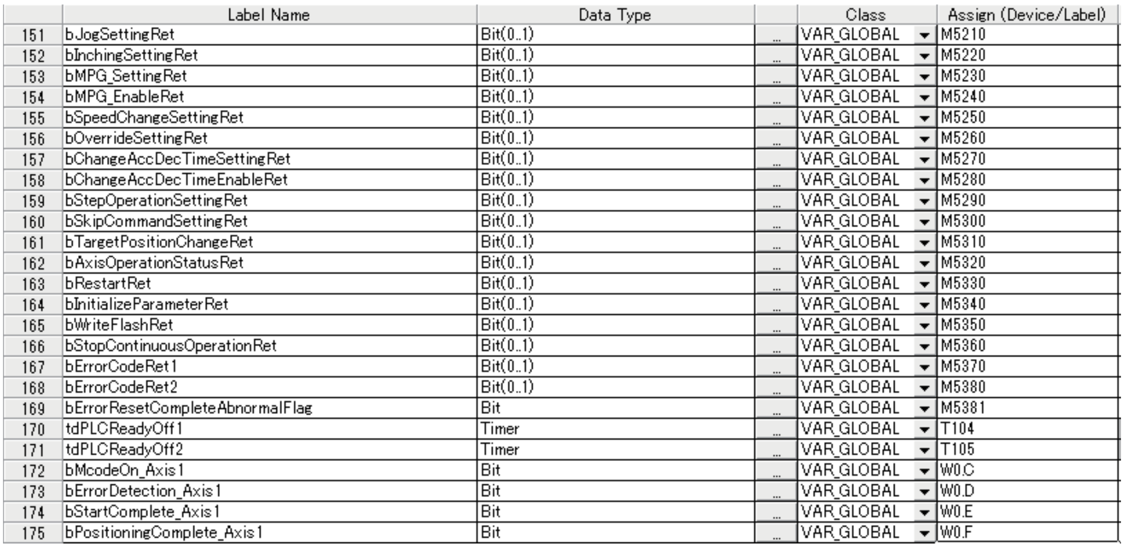
	Label Name	Data Type		Class	Assign (Device/Label)
1	bInputUnitError	Bit	...	VAR_GLOBAL	X0
2	bUnitReady	Bit	...	VAR_GLOBAL	X0F
3	bInputOPR_RequestFlagOffRequest	Bit	...	VAR_GLOBAL	X20
4	bInputExternalCommandValidRequest	Bit	...	VAR_GLOBAL	X21
5	bInputExternalCommandInvalidRequest	Bit	...	VAR_GLOBAL	X22
6	bInputFastStartRequest	Bit	...	VAR_GLOBAL	X23
7	bInputFastOPR_StartRequest	Bit	...	VAR_GLOBAL	X24
8	bInputSetStartPositioningNoRequest	Bit	...	VAR_GLOBAL	X25
9	bInputSpeedPositionSwitchingRequest	Bit	...	VAR_GLOBAL	X26
10	bInputSpeedPositionSwitchingEnableRequest	Bit	...	VAR_GLOBAL	X27
11	bInputSpeedPositionSwitchingDisableRequest	Bit	...	VAR_GLOBAL	X28
12	bInputChangeMovementAmountRequest	Bit	...	VAR_GLOBAL	X29
13	bInputStartAdvancedPositioningRequest	Bit	...	VAR_GLOBAL	X2A
14	bInputMcodeOffRequest	Bit	...	VAR_GLOBAL	X2C
15	bInputSetJogSpeedRequest	Bit	...	VAR_GLOBAL	X2D
16	bInputForwardJogStartRequest	Bit	...	VAR_GLOBAL	X2E
17	bInputReverseJogStartRequest	Bit	...	VAR_GLOBAL	X2F
18	bInputMPG_EnableRequest	Bit	...	VAR_GLOBAL	X30
19	bInputMPG_DisableRequest	Bit	...	VAR_GLOBAL	X31
20	bInputSpeedChangeRequest	Bit	...	VAR_GLOBAL	X32
21	bInputOverrideRequest	Bit	...	VAR_GLOBAL	X33
22	bInputChangeAccDecTimeRequest	Bit	...	VAR_GLOBAL	X34
23	bInputChangeAccDecTimeDisable	Bit	...	VAR_GLOBAL	X35
24	bInputStepOperationRequest	Bit	...	VAR_GLOBAL	X37
25	bInputSkipCommandRequest	Bit	...	VAR_GLOBAL	X38
26	bInputStopContinuousOperationRequest	Bit	...	VAR_GLOBAL	X3A
27	bInputRestartRequest	Bit	...	VAR_GLOBAL	X3B
28	bInputModuleInitializeParameterRequest	Bit	...	VAR_GLOBAL	X3C
29	bInputWriteFlashRequest	Bit	...	VAR_GLOBAL	X3D
30	bInputErrResetRequest	Bit	...	VAR_GLOBAL	X3E
31	bInputStopRequest	Bit	...	VAR_GLOBAL	X3F
32	bInputPositionSpeedSwitchingRequest	Bit	...	VAR_GLOBAL	X40
33	bInputPositionSpeedSwitchingEnableRequest	Bit	...	VAR_GLOBAL	X41
34	bInputPositionSpeedSwitchingDisableRequest	Bit	...	VAR_GLOBAL	X42
35	bInputChangePositionSpeedSwitchingSpeedRequest	Bit	...	VAR_GLOBAL	X43
36	bInputInchingMovementAmountSettingRequest	Bit	...	VAR_GLOBAL	X44
37	bInputTargetPositionChangeRequest	Bit	...	VAR_GLOBAL	X45
38	bInputSpeedPositionSwitchingSettingRequest	Bit	...	VAR_GLOBAL	X4D
39	bInputStartPositioningRequest	Bit	...	VAR_GLOBAL	X4E
40	bReady	Bit	...	VAR_GLOBAL	X100
41	bSynchronizationFlag	Bit	...	VAR_GLOBAL	X101
42	bnBusy	Bit(0..15)	...	VAR_GLOBAL	X110
43	bPLCReady	Bit	...	VAR_GLOBAL	Y100
44	bAllAxisServoOn	Bit	...	VAR_GLOBAL	Y101
45	bnPositioningStart	Bit(0..15)	...	VAR_GLOBAL	Y110
46	uStatus	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D0
47	wSpeed	Word [Signed](0..1)	...	VAR_GLOBAL	D1
48	wMovementAmount	Word [Signed](0..1)	...	VAR_GLOBAL	D3
49	wSetJogSpeed	Word [Signed](0..2)	...	VAR_GLOBAL	D5
50	wMPG	Word [Signed](0..2)	...	VAR_GLOBAL	D8



	Label Name	Data Type		Class	Assign (Device/Label)
51	wSpeedChangeSetting	Word [Signed](0..2)	...	VAR_GLOBAL	D11
52	uOverrideValue	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D14
53	wACCDecTimeChange	Word [Signed](0..4)	...	VAR_GLOBAL	D15
54	wStep	Word [Signed](0..1)	...	VAR_GLOBAL	D20
55	wTarget	Word [Signed](0..4)	...	VAR_GLOBAL	D23
56	uPositioningStartNo	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D32
57	wBasicParam	Word [Signed](0..7)	...	VAR_GLOBAL	D50
58	wPositioningData	Word [Signed](0..11)	...	VAR_GLOBAL	D58
59	wBlockData	Word [Signed](0..4)	...	VAR_GLOBAL	D70
60	wBlockInstData	Word [Signed](0..4)	...	VAR_GLOBAL	D75
61	uErrorCode	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D80
62	wAxisOperationStatus	Word [Signed]	...	VAR_GLOBAL	D81
63	uOPR_RequestFlagOffRequestSetting	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D82
64	uExternalCommandValidSetting	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D85
65	uSpeedPositionSwitchingEnableFlagSetting	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D86
66	uPositionSpeedSwitchingEnableFlagSetting	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D87
67	uMcodeOnSignalTurnsOffRequestSetting	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D90
68	uSkipCommandSetting	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D91
69	uRestartSetting	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D92
70	uInitializeParameterSetting	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D93
71	uWriteFlashSetting	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D94
72	uStopContinuousOperationRequestSetting	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D95
73	uErrorResetRequestSetting	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D96
74	uUnit_D	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D150
75	wSoftwareStrokeLimitValue	Word [Signed](0..3)	...	VAR_GLOBAL	D151
76	uCommandPositionValue_SpeedControl	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D155
77	uSpeedPositionFunctionSelection	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	D156
78	wOPRBasicParam	Word [Signed](0..8)	...	VAR_GLOBAL	D200
79	bAxisStop_Axis1	Bit	...	VAR_GLOBAL	D210.0
80	bForwardRunJogStart_Axis1	Bit	...	VAR_GLOBAL	D211.0
81	bReverseRunJogStart_Axis1	Bit	...	VAR_GLOBAL	D212.0
82	bExecutionProhibitionFlag_Axis1	Bit	...	VAR_GLOBAL	D213.0
83	bStnAxCtrl2_Axis1	Bit(0..1)	...	VAR_GLOBAL	D214.0
84	bOPR_RequestFlagOffRequest	Bit	...	VAR_GLOBAL	M0
85	bOPR_RequestFlagOffRequestPulse	Bit	...	VAR_GLOBAL	M1
86	bOPR_RequestFlagOffRequestMemmory	Bit	...	VAR_GLOBAL	M2
87	bFastOPR_Request	Bit	...	VAR_GLOBAL	M3
88	bFastOPR_RequestMemmory	Bit	...	VAR_GLOBAL	M4
89	bPositioningStartRequestPulse	Bit	...	VAR_GLOBAL	M5
90	bPositioningStartRequestMemmory	Bit	...	VAR_GLOBAL	M6
91	bJogInchingOperationFlag	Bit	...	VAR_GLOBAL	M7
92	bMPG_EnableFlagRequest	Bit	...	VAR_GLOBAL	M8
93	bMPG_OperationFlag	Bit	...	VAR_GLOBAL	M9
94	bMPG_DisableRequest	Bit	...	VAR_GLOBAL	M10
95	bSpeedChangeRequestPulse	Bit	...	VAR_GLOBAL	M11
96	bSpeedChangeRequestMemory	Bit	...	VAR_GLOBAL	M12
97	bOverrideRequest	Bit	...	VAR_GLOBAL	M13
98	bChangeAccDecTimeSettingRequest	Bit	...	VAR_GLOBAL	M14
99	bStepOperationRequestPulse	Bit	...	VAR_GLOBAL	M16
100	bSkipCommandRequestPulse	Bit	...	VAR_GLOBAL	M17



	Label Name	Data Type		Class	Assign (Device/Label)
101	bSkipCommandRequestMemory	Bit	...	VAR_GLOBAL	M18
102	bStopContinuousOperationRequest	Bit	...	VAR_GLOBAL	M21
103	bRestartRequest	Bit	...	VAR_GLOBAL	M22
104	bRestartRequestMemory	Bit	...	VAR_GLOBAL	M23
105	bInitializeParameterRequestPulse	Bit	...	VAR_GLOBAL	M24
106	bInitializeParameterRequestMemory	Bit	...	VAR_GLOBAL	M25
107	bWriteFlashRequestPulse	Bit	...	VAR_GLOBAL	M26
108	bWriteFlashRequestMemory	Bit	...	VAR_GLOBAL	M27
109	bErrorReset	Bit	...	VAR_GLOBAL	M28
110	bStopRequestPulse	Bit	...	VAR_GLOBAL	M29
111	bTargetPositionChangeRequestPulse	Bit	...	VAR_GLOBAL	M30
112	bTargetPositionChangeRequestMemory	Bit	...	VAR_GLOBAL	M31
113	bBasicParameterSettingCompleteFlag	Bit	...	VAR_GLOBAL	M50
114	bOPR_BasicParameterSettingCompleteFlag	Bit	...	VAR_GLOBAL	M51
115	bSpeedPositionSwitchingParameterSettingCompleteFlag	Bit	...	VAR_GLOBAL	M52
116	bOPR_RequestFlagOffRequestConfirmationPulse	Bit	...	VAR_GLOBAL	M60
117	bRestartRequestConfirmation	Bit	...	VAR_GLOBAL	M61
118	bSpeedChangeRequestConfirmation	Bit	...	VAR_GLOBAL	M62
119	bTargetPositionChangeRequestConfirmation	Bit	...	VAR_GLOBAL	M63
120	bSkipCommandRequestConfirmation	Bit	...	VAR_GLOBAL	M64
121	bAxisOperationStatusAcquisitionRequest	Bit	...	VAR_GLOBAL	M65
122	bInitializeParameterRequestConfirmation	Bit	...	VAR_GLOBAL	M66
123	bWriteFlashRequestConfirmation	Bit	...	VAR_GLOBAL	M67
124	bAfter_RUN1_Scan_ON_Memory	Bit	...	VAR_GLOBAL	M99
125	bBasicParametarSettingRequest	Bit	...	VAR_GLOBAL	M100
126	bOPR_BasicParameterSettingRequest	Bit	...	VAR_GLOBAL	M101
127	bSpeedPositionSwitchingSettingRequest	Bit	...	VAR_GLOBAL	M102
128	bPositioningDataSettingRequest	Bit	...	VAR_GLOBAL	M103
129	bBlockStartDataSettingRequest	Bit	...	VAR_GLOBAL	M104
130	bBlockStartData_SpecialStartCommandSettingRequest	Bit	...	VAR_GLOBAL	M105
131	bCommunicatingConditionSatisfactionFlag	Bit	...	VAR_GLOBAL	M120
132	bBasicParameterSettingRet	Bit(0..1)	...	VAR_GLOBAL	M5000
133	bOPR_BasicParameterSettingRet	Bit(0..1)	...	VAR_GLOBAL	M5010
134	bSpeedPositionSwitchingSettingRet1	Bit(0..1)	...	VAR_GLOBAL	M5020
135	bSpeedPositionSwitchingSettingRet2	Bit(0..1)	...	VAR_GLOBAL	M5022
136	bSpeedPositionSwitchingSettingRet3	Bit(0..1)	...	VAR_GLOBAL	M5024
137	bSpeedPositionSwitchingSettingRet4	Bit(0..1)	...	VAR_GLOBAL	M5026
138	bPositioningDataSettingRet	Bit(0..3)	...	VAR_GLOBAL	M5030
139	bBlockStartDataSettingRet1	Bit(0..1)	...	VAR_GLOBAL	M5040
140	bBlockStartDataSettingRet2	Bit(0..1)	...	VAR_GLOBAL	M5050
141	bStatusRet	Bit(0..1)	...	VAR_GLOBAL	M5100
142	bOPR_RequestFlagOffRet1	Bit(0..1)	...	VAR_GLOBAL	M5110
143	bOPR_RequestFlagOffRet2	Bit(0..1)	...	VAR_GLOBAL	M5120
144	bExternalCommandValidRet	Bit(0..1)	...	VAR_GLOBAL	M5130
145	bSpeedPositionSwitchingEnableRet	Bit(0..1)	...	VAR_GLOBAL	M5140
146	bChangeMovementAmountRet	Bit(0..1)	...	VAR_GLOBAL	M5150
147	bPositionSpeedSwitchingEnableRet	Bit(0..1)	...	VAR_GLOBAL	M5160
148	bPVSpeedChangeRet	Bit(0..1)	...	VAR_GLOBAL	M5170
149	bPositioningStartRet	Bit(0..1)	...	VAR_GLOBAL	M5180
150	bMcodeOffRet	Bit(0..1)	...	VAR_GLOBAL	M5200



	Label Name	Data Type		Class	Assign (Device/Label)
151	bJogSettingRet	Bit(0..1)	...	VAR_GLOBAL	M5210
152	bInchingSettingRet	Bit(0..1)	...	VAR_GLOBAL	M5220
153	bMPG_SettingRet	Bit(0..1)	...	VAR_GLOBAL	M5230
154	bMPG_EnableRet	Bit(0..1)	...	VAR_GLOBAL	M5240
155	bSpeedChangeSettingRet	Bit(0..1)	...	VAR_GLOBAL	M5250
156	bOverrideSettingRet	Bit(0..1)	...	VAR_GLOBAL	M5260
157	bChangeAccDecTimeSettingRet	Bit(0..1)	...	VAR_GLOBAL	M5270
158	bChangeAccDecTimeEnableRet	Bit(0..1)	...	VAR_GLOBAL	M5280
159	bStepOperationSettingRet	Bit(0..1)	...	VAR_GLOBAL	M5290
160	bSkipCommandSettingRet	Bit(0..1)	...	VAR_GLOBAL	M5300
161	bTargetPositionChangeRet	Bit(0..1)	...	VAR_GLOBAL	M5310
162	bAxisOperationStatusRet	Bit(0..1)	...	VAR_GLOBAL	M5320
163	bRestartRet	Bit(0..1)	...	VAR_GLOBAL	M5330
164	bInitializeParameterRet	Bit(0..1)	...	VAR_GLOBAL	M5340
165	bWriteFlashRet	Bit(0..1)	...	VAR_GLOBAL	M5350
166	bStopContinuousOperationRet	Bit(0..1)	...	VAR_GLOBAL	M5360
167	bErrorCodeRet1	Bit(0..1)	...	VAR_GLOBAL	M5370
168	bErrorCodeRet2	Bit(0..1)	...	VAR_GLOBAL	M5380
169	bErrorResetCompleteAbnormalFlag	Bit	...	VAR_GLOBAL	M5381
170	tdPLCReadyOff1	Timer	...	VAR_GLOBAL	T104
171	tdPLCReadyOff2	Timer	...	VAR_GLOBAL	T105
172	bMcodeOn_Axis1	Bit	...	VAR_GLOBAL	W0.C
173	bErrorDetection_Axis1	Bit	...	VAR_GLOBAL	W0.D
174	bStartComplete_Axis1	Bit	...	VAR_GLOBAL	W0.E
175	bPositioningComplete_Axis1	Bit	...	VAR_GLOBAL	W0.F

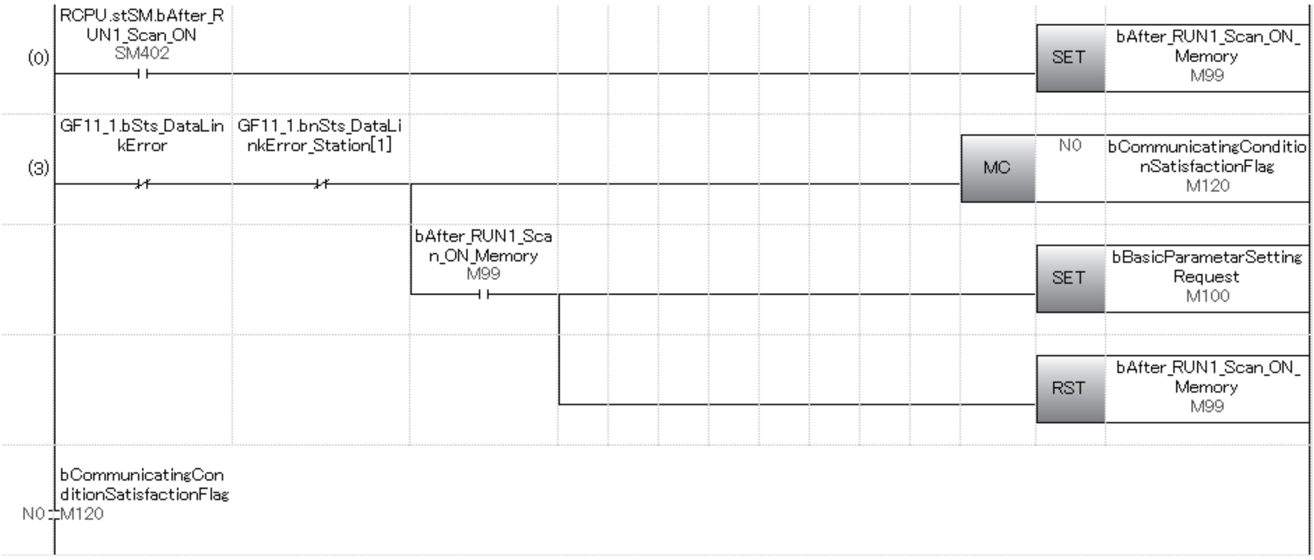
■Details of arrayed labels

Out of global labels listed in the above table, the arrayed labels are listed in the table below.

Label name	Assigned device	Description
bnBusy[0]	X110	Axis 1: BUSY signal
bnBusy[1]	X111	Axis 2: BUSY signal
bnBusy[2]	X112	Axis 3: BUSY signal
bnBusy[3]	X113	Axis 4: BUSY signal
bnBusy[4]	X114	Axis 5: BUSY signal
bnBusy[5]	X115	Axis 6: BUSY signal
bnBusy[6]	X116	Axis 7: BUSY signal
bnBusy[7]	X117	Axis 8: BUSY signal
bnBusy[8]	X118	Axis 9: BUSY signal
bnBusy[9]	X119	Axis 10: BUSY signal
bnBusy[10]	X11A	Axis 11: BUSY signal
bnBusy[11]	X11B	Axis 12: BUSY signal
bnBusy[12]	X11C	Axis 13: BUSY signal
bnBusy[13]	X11D	Axis 14: BUSY signal
bnBusy[14]	X11E	Axis 15: BUSY signal
bnBusy[15]	X11F	Axis 16: BUSY signal
bnPositioningStart[0]	Y110	Axis 1: Positioning start signal
bnPositioningStart[1]	Y111	Axis 2: Positioning start signal
bnPositioningStart[2]	Y112	Axis 3: Positioning start signal
bnPositioningStart[3]	Y113	Axis 4: Positioning start signal
bnPositioningStart[4]	Y114	Axis 5: Positioning start signal
bnPositioningStart[5]	Y115	Axis 6: Positioning start signal
bnPositioningStart[6]	Y116	Axis 7: Positioning start signal
bnPositioningStart[7]	Y117	Axis 8: Positioning start signal
bnPositioningStart[8]	Y118	Axis 9: Positioning start signal
bnPositioningStart[9]	Y119	Axis 10: Positioning start signal
bnPositioningStart[10]	Y11A	Axis 11: Positioning start signal
bnPositioningStart[11]	Y11B	Axis 12: Positioning start signal
bnPositioningStart[12]	Y11C	Axis 13: Positioning start signal
bnPositioningStart[13]	Y11D	Axis 14: Positioning start signal
bnPositioningStart[14]	Y11E	Axis 15: Positioning start signal
bnPositioningStart[15]	Y11F	Axis 16: Positioning start signal
wSpeed[0]	D1	Speed
wSpeed[1]	D2	
wMovementAmount[0]	D3	Movement amount
wMovementAmount[1]	D4	
wSetJogSpeed[0]	D5	Inching movement amount
wSetJogSpeed[1]	D6	JOG operation speed
wSetJogSpeed[2]	D7	
wMPG[0]	D8	Manual pulse generator 1 pulse input magnification
wMPG[1]	D9	
wMPG[2]	D10	Manual pulse generator operation enable
wSpeedChangeSetting[0]	D11	New speed value
wSpeedChangeSetting[1]	D12	
wSpeedChangeSetting[2]	D13	Speed change request
wACCDecTimeChange[0]	D15	New acceleration time value
wACCDecTimeChange[1]	D16	
wACCDecTimeChange[2]	D17	New deceleration time value
wACCDecTimeChange[3]	D18	
wACCDecTimeChange[4]	D19	Acceleration/deceleration time change during speed change, enable/disable selection

Label name	Assigned device	Description
wStep[0]	D20	Step mode
wStep[1]	D21	Step valid flag
wTarget[0]	D23	Target position change (New address)
wTarget[1]	D24	
wTarget[2]	D25	Target position change (New speed)
wTarget[3]	D26	
wTarget[4]	D27	Target position change request flag
wBasicParam[0]	D50	Basic parameter: Unit setting
wBasicParam[1]	D51	Basic parameter: Unit magnification
wBasicParam[2]	D52	Basic parameter: Number of pulses per rotation (16 bits)
wBasicParam[3]	D53	
wBasicParam[4]	D54	Basic parameter: Movement amount per rotation
wBasicParam[5]	D55	
wBasicParam[6]	D56	Basic parameter: Bias speed at start
wBasicParam[7]	D57	
wPositioningData[0]	D58	Operation pattern/Control method/Acceleration time No./Deceleration time No.
wPositioningData[1]	D59	M code/Condition data/Number of LOOP to LEND repetitions
wPositioningData[2]	D60	Dwell time/JUMP destination positioning data No.
wPositioningData[3]	D61	Positioning option
wPositioningData[4]	D62	Command speed
wPositioningData[5]	D63	
wPositioningData[6]	D64	Positioning address/movement amount
wPositioningData[7]	D65	
wPositioningData[8]	D66	Arc address
wPositioningData[9]	D67	
wPositioningData[10]	D68	Axis to be interpolated
wPositioningData[11]	D69	
wBlockData[0]	D70	Block start data (Shape, Start data No.) 1
wBlockData[1]	D71	Block start data (Shape, Start data No.) 2
wBlockData[2]	D72	Block start data (Shape, Start data No.) 3
wBlockData[3]	D73	Block start data (Shape, Start data No.) 4
wBlockData[4]	D74	Block start data (Shape, Start data No.) 5
wBlockInstData[0]	D75	Block start data (Special start instruction) 1
wBlockInstData[1]	D76	Block start data (Special start instruction) 2
wBlockInstData[2]	D77	Block start data (Special start instruction) 3
wBlockInstData[3]	D78	Block start data (Special start instruction) 4
wBlockInstData[4]	D79	Block start data (Special start instruction) 5
wSoftwareStrokeLimitValue[0]	D151	Software stroke limit upper limit value
wSoftwareStrokeLimitValue[1]	D152	
wSoftwareStrokeLimitValue[2]	D153	Software stroke limit lower limit value
wSoftwareStrokeLimitValue[3]	D154	
wOPRBasicParam[0]	D200	Axis 1: Home position return method
wOPRBasicParam[1]	D201	Axis 1: Home position return direction
wOPRBasicParam[2]	D202	Axis 1: Home position address
wOPRBasicParam[3]	D203	
wOPRBasicParam[4]	D204	Axis 1: Home position return speed
wOPRBasicParam[5]	D205	
wOPRBasicParam[6]	D206	Axis 1: Creep speed
wOPRBasicParam[7]	D207	
wOPRBasicParam[8]	D208	Axis 1: Home position return retry

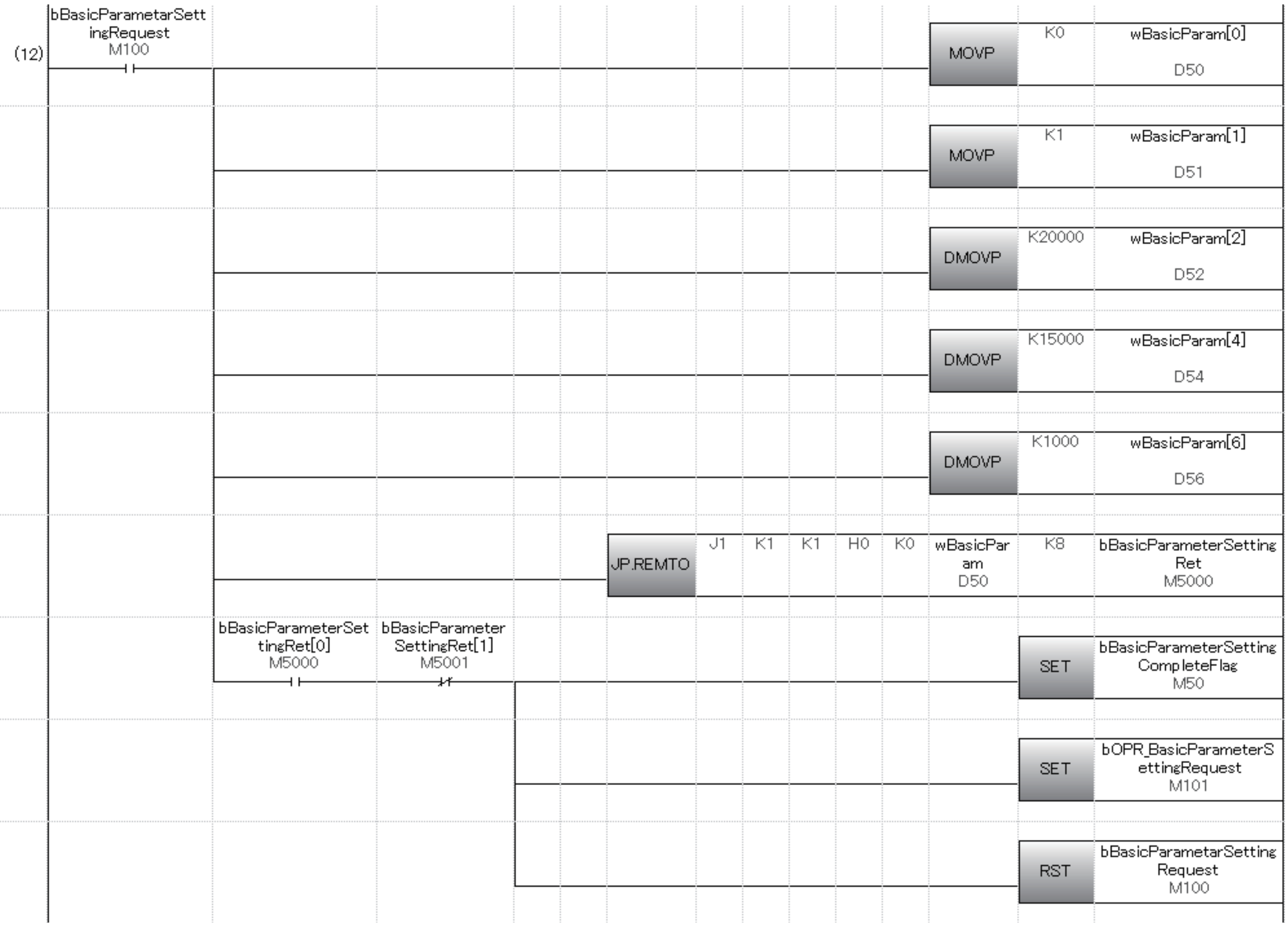
Checking the operation status of the master station



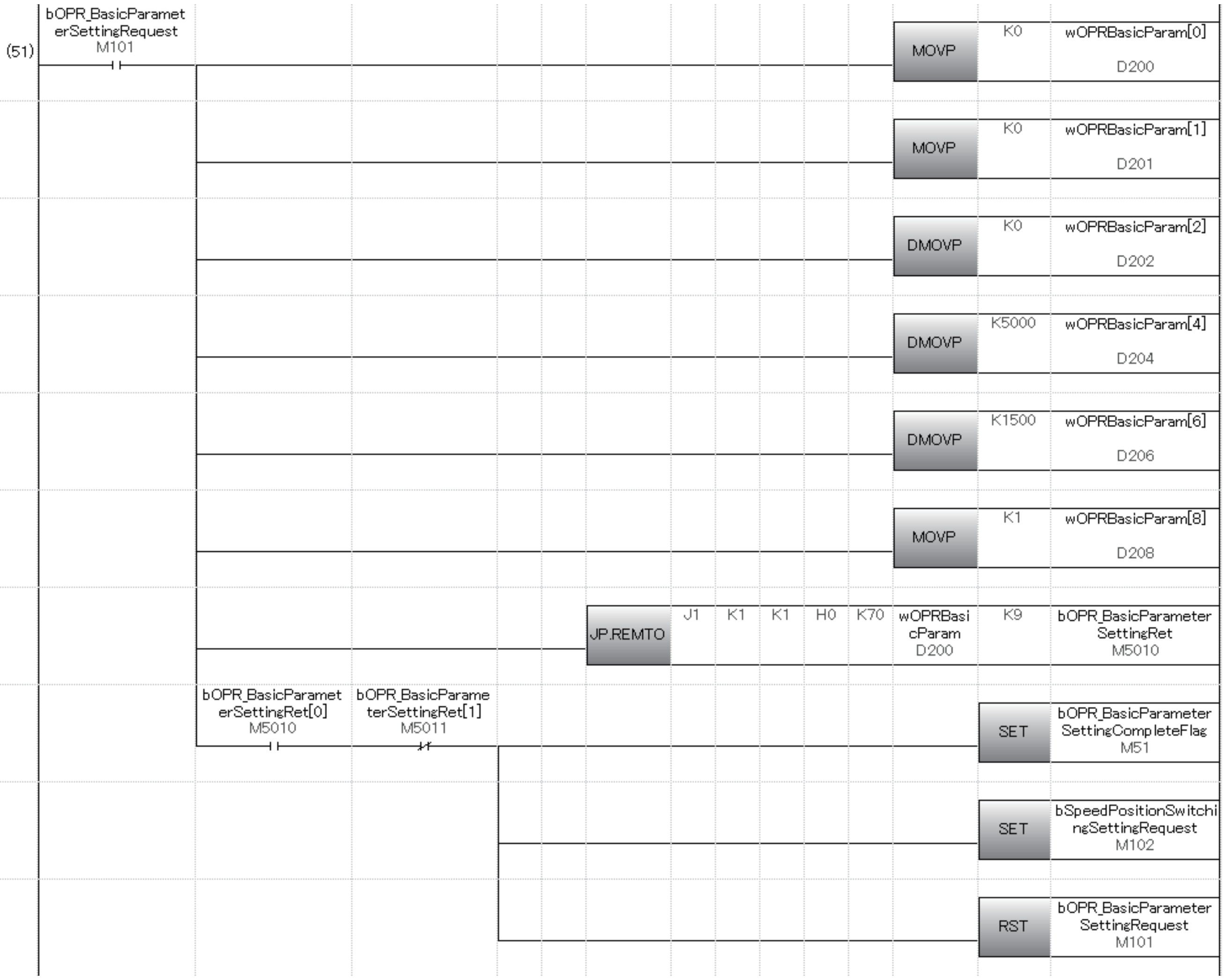
Parameter setting program

When parameters are set in "Module Parameter" of the engineering tool, this program is unnecessary.

■Setting of basic parameter 1 (axis 1)



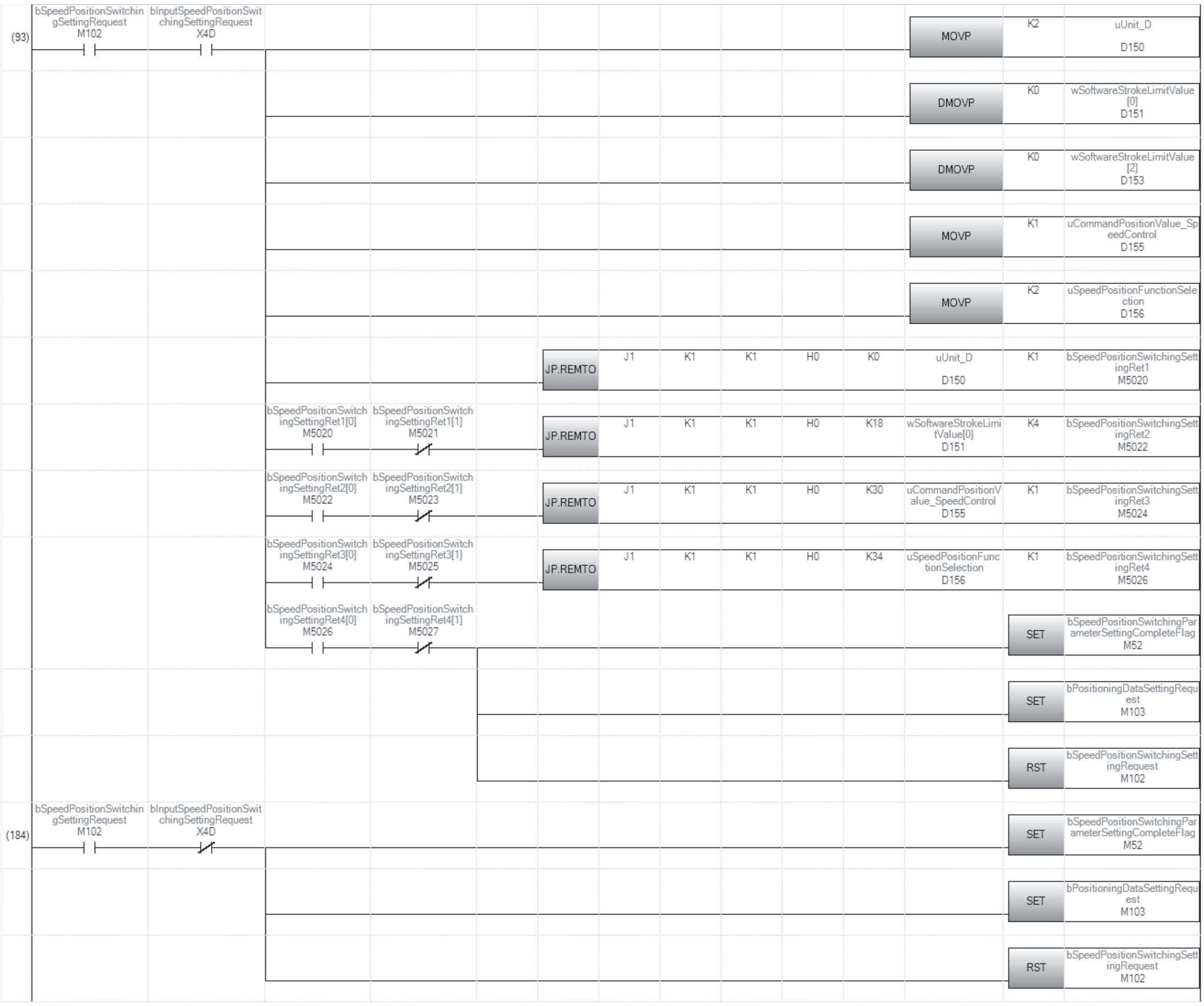
■Setting of home position return basic parameter (axis 1)



```
(51)  bOPR_BasicParameterSettingRequest M101
        MOVP    K0      wOPRBasicParam[0] D200
        MOVP    K0      wOPRBasicParam[1] D201
        DMOVP   K0      wOPRBasicParam[2] D202
        DMOVP   K5000   wOPRBasicParam[4] D204
        DMOVP   K1500   wOPRBasicParam[6] D206
        MOVP    K1      wOPRBasicParam[8] D208
        JP.REMTO J1 K1 K1 H0 K70 wOPRBasicParam D200 K9 bOPR_BasicParameterSettingRet M5010
      bOPR_BasicParameterSettingRet[0] M5010   bOPR_BasicParameterSettingRet[1] M5011 (normally closed)
        SET     bOPR_BasicParameterSettingCompleteFlag M51
        SET     bSpeedPositionSwitchingSettingRequest M102
        RST     bOPR_BasicParameterSettingRequest M101
```

■Parameter setting program for the speed-position switching control (ABS mode) (for axis 1)

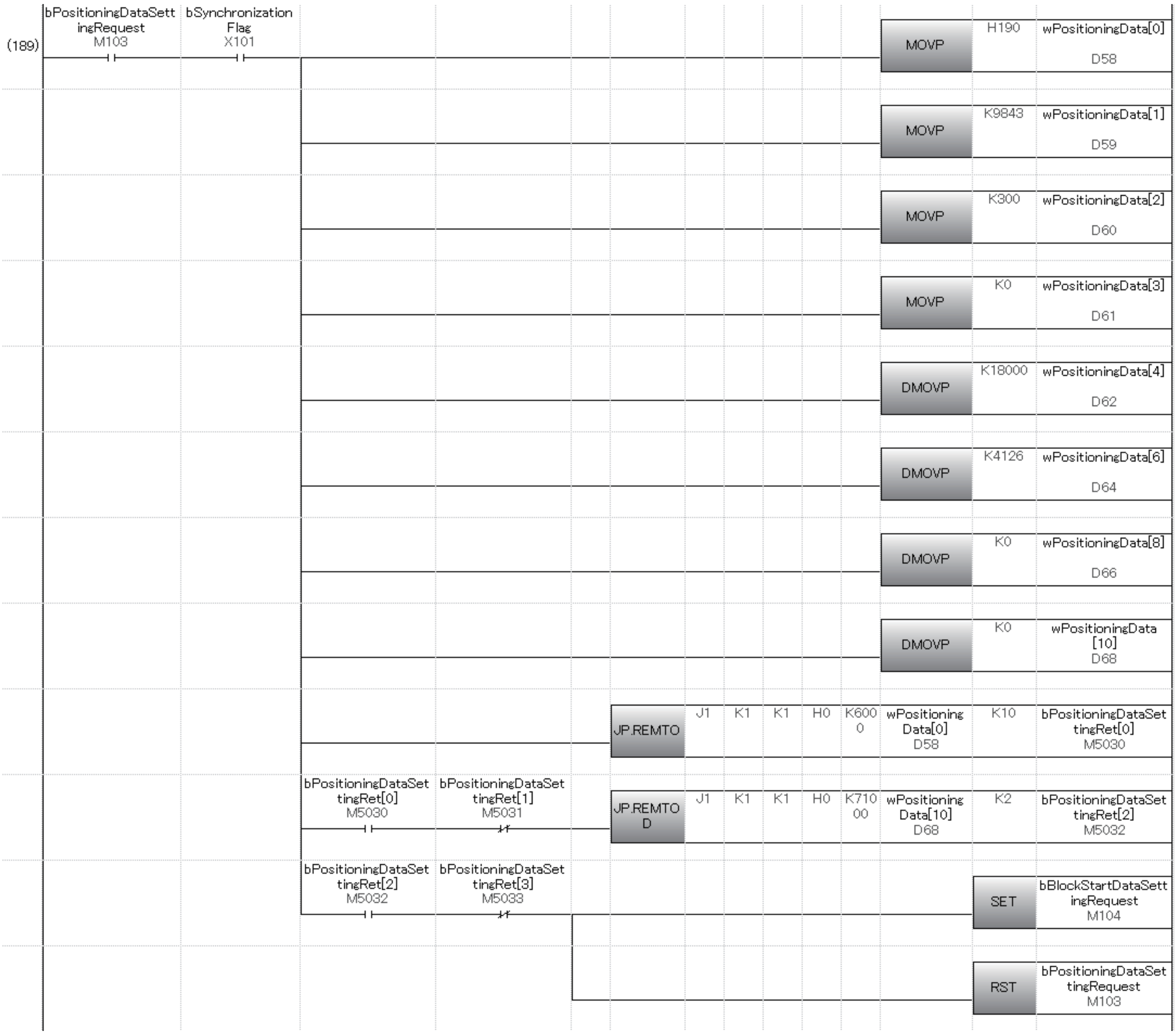
This program is unnecessary when the speed-position switching control (ABS mode) is not executed.



Positioning data setting program

■For positioning data No.1 (Axis 1)

When positioning data is set in "Module Extended Parameter" of the engineering tool, this program is unnecessary.

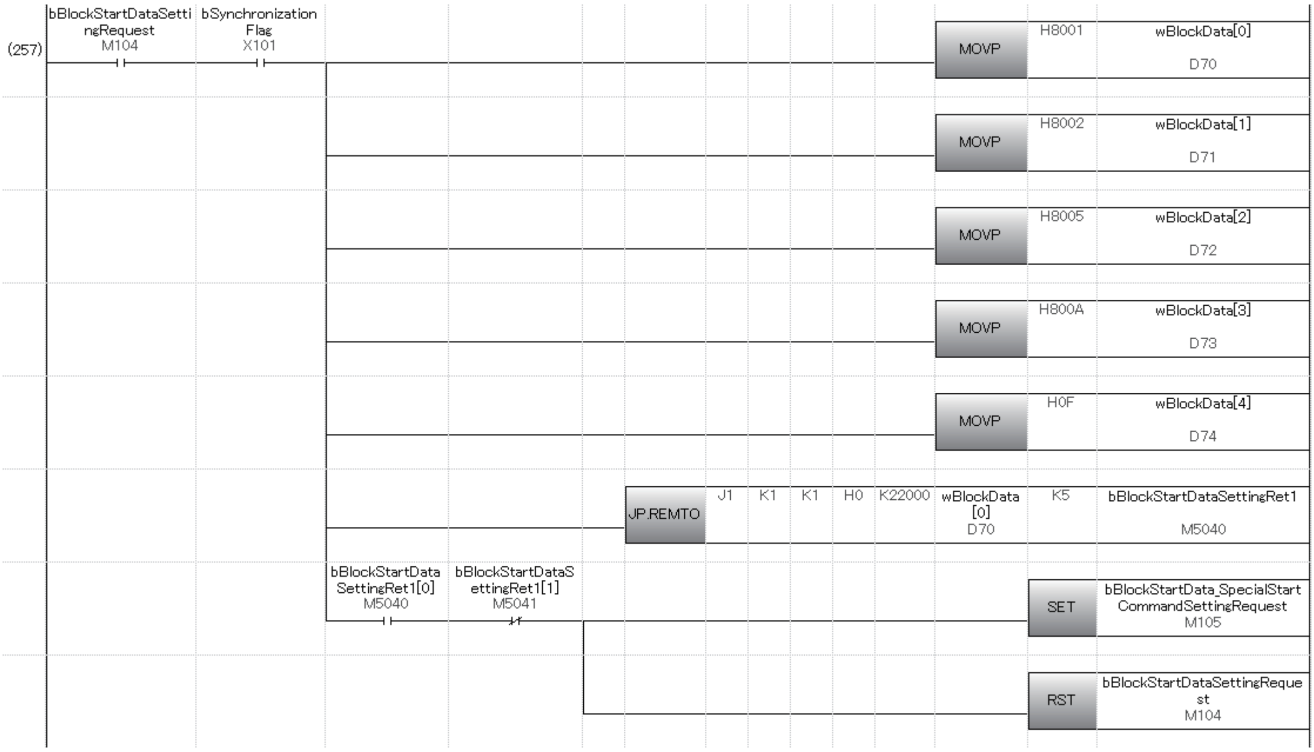


```
(189) bPositioningDataSettingRequest M103   bSynchronizationFlag X101
      MOVP   H190    wPositioningData[0] D58
      MOVP   K9843   wPositioningData[1] D59
      MOVP   K300    wPositioningData[2] D60
      MOVP   K0      wPositioningData[3] D61
      DMOVP  K18000  wPositioningData[4] D62
      DMOVP  K4126   wPositioningData[6] D64
      DMOVP  K0      wPositioningData[8] D66
      DMOVP  K0      wPositioningData[10] D68
      JP.REMTO  J1  K1  K1  H0  K6000  wPositioningData[0] D58  K10  bPositioningDataSettingRet[0] M5030
      bPositioningDataSettingRet[0] M5030   bPositioningDataSettingRet[1] M5031
      JP.REMTOD  J1  K1  K1  H0  K71000  wPositioningData[10] D68  K2  bPositioningDataSettingRet[2] M5032
      bPositioningDataSettingRet[2] M5032   bPositioningDataSettingRet[3] M5033
      SET  bBlockStartDataSettingRequest M104
      RST  bPositioningDataSettingRequest M103
```

Block start data setting program

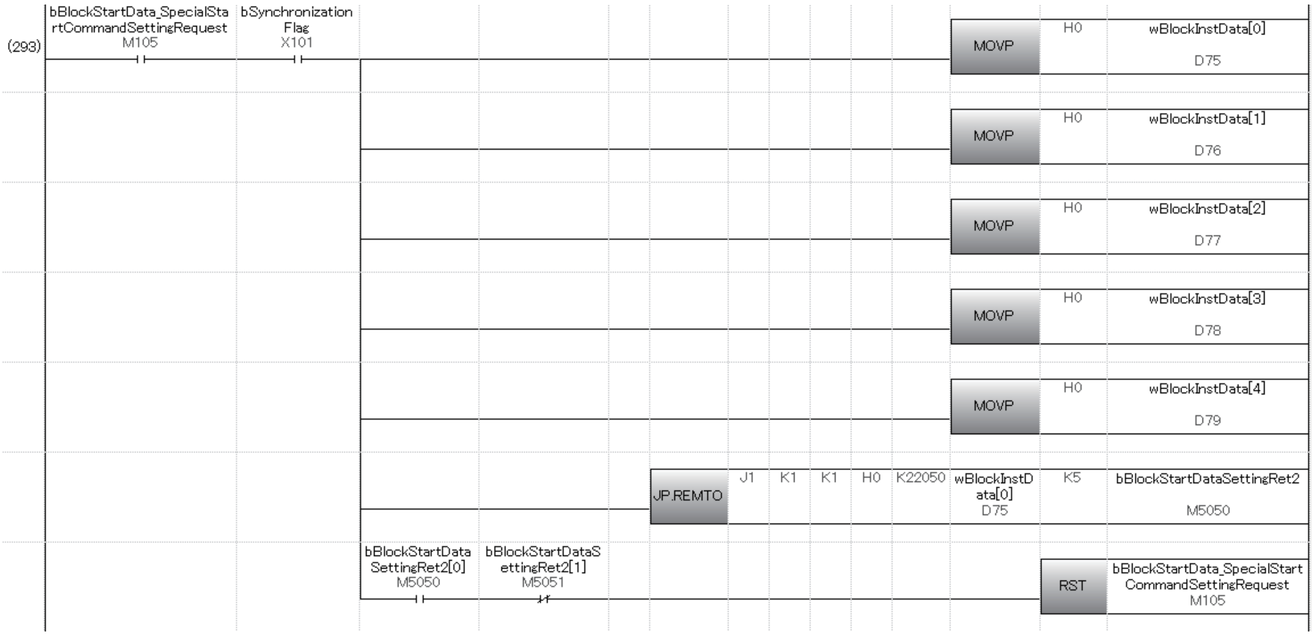
■For the setting of start block 0 block start data (Axis 1) 1 to 5 points

When block start data is set in "Module Extended Parameter" of the engineering tool, this program is unnecessary.



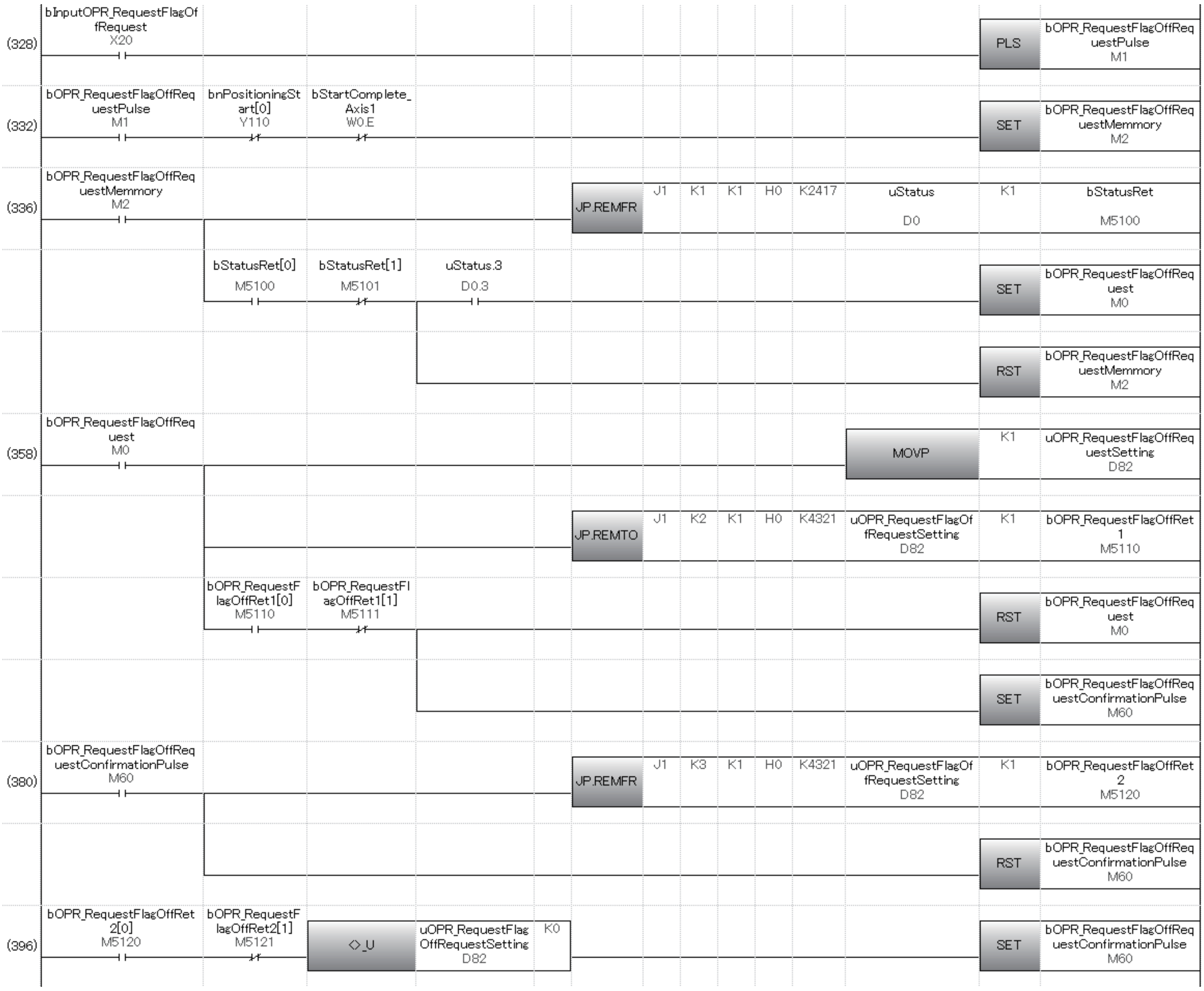
Setting Special start instruction to Normal start

When block start data is set in "Module Extended Parameter" of the engineering tool, this program is unnecessary.

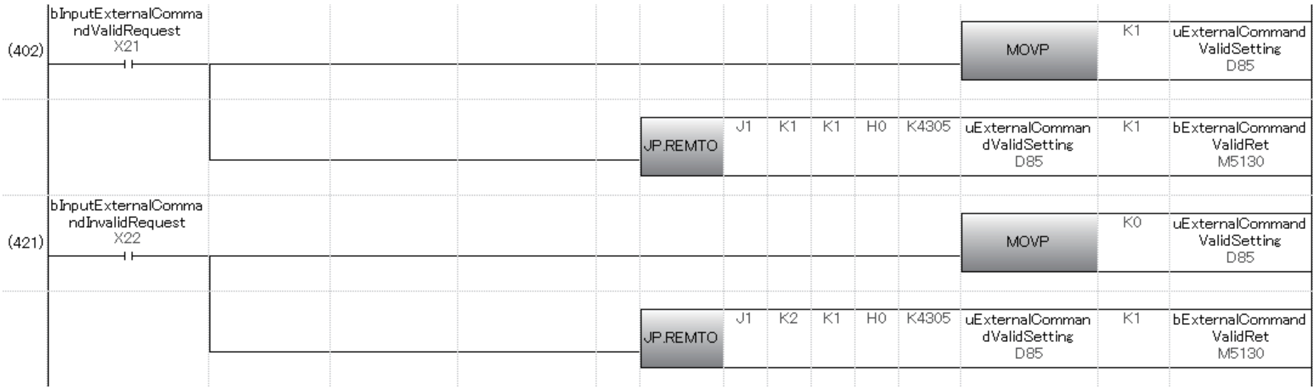


Home position return request OFF program

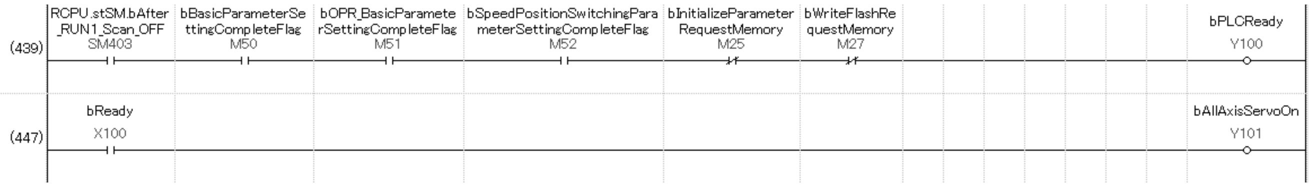
When "Setting of operation during uncompleted OPR" is set to "1: Execute the positioning control" in "Module Parameter" of the engineering tool, this program is unnecessary.



External command function valid setting program



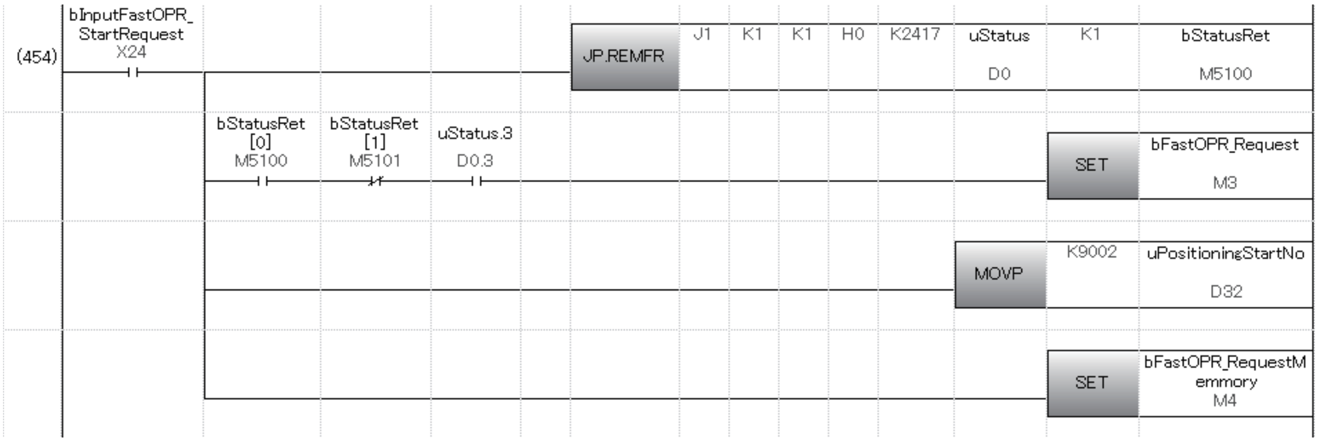
PLC READY signal [Y0] + All axis servo ON signal [Y1] ON program



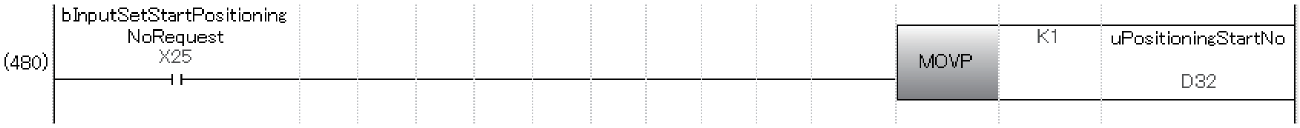
Positioning start No. setting program

■Machine home position return

■Fast home position return

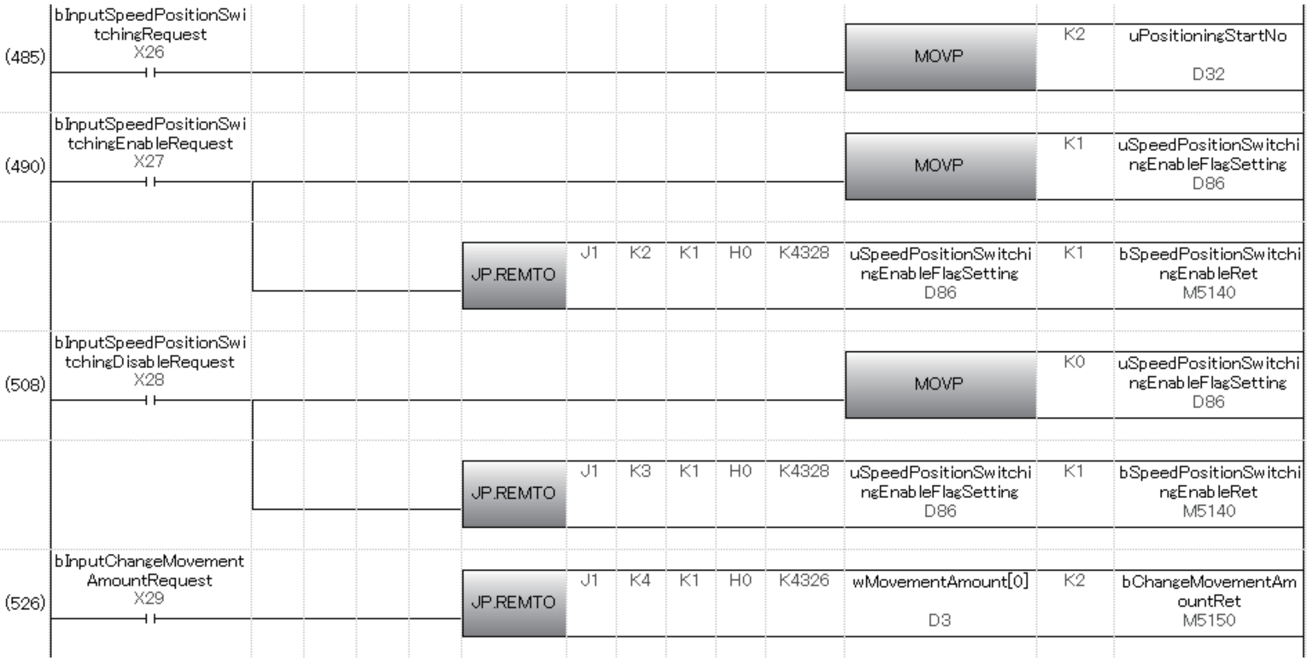


■Positioning with the positioning data No.1



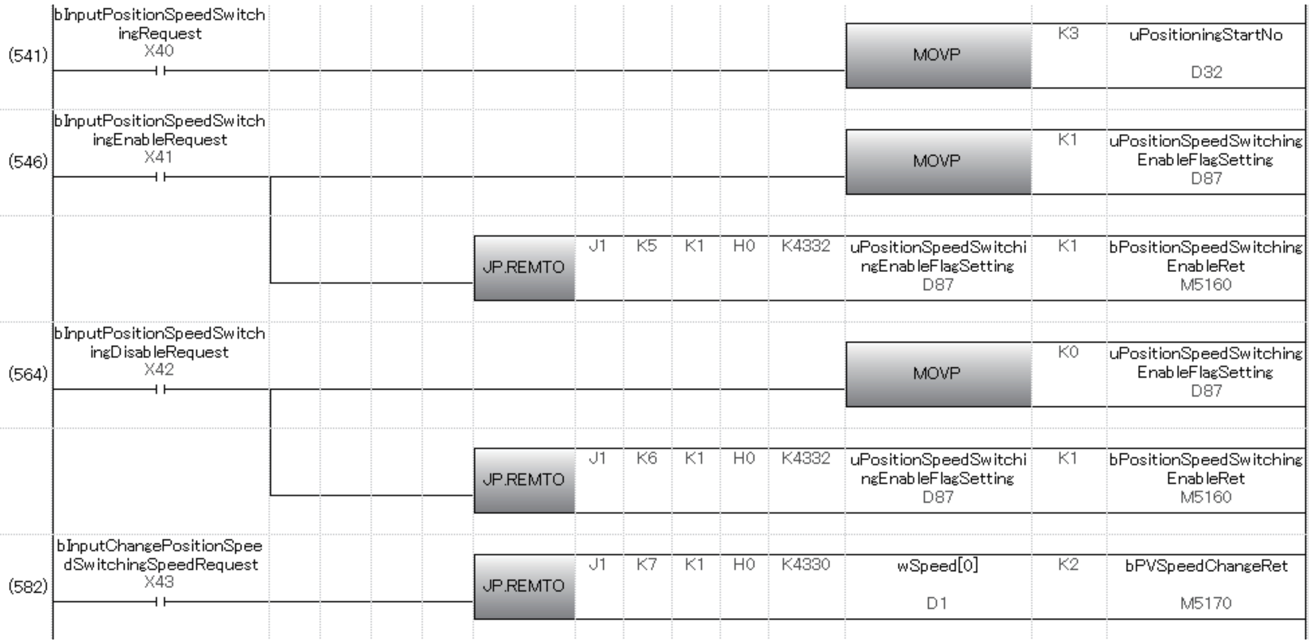
■Speed-position switching control (positioning data No.2)

For the ABS mode, writing the target movement amount after change is unnecessary.



```
(485) bInputSpeedPositionSwitchingRequest X26
      MOVP K2 uPositioningStartNo D32
(490) bInputSpeedPositionSwitchingEnableRequest X27
      MOVP K1 uSpeedPositionSwitchingEnableFlagSetting D86
      JP.REMTO J1 K2 K1 H0 K4328 uSpeedPositionSwitchingEnableFlagSetting D86 K1 bSpeedPositionSwitchingEnableRet M5140
(508) bInputSpeedPositionSwitchingDisableRequest X28
      MOVP K0 uSpeedPositionSwitchingEnableFlagSetting D86
      JP.REMTO J1 K3 K1 H0 K4328 uSpeedPositionSwitchingEnableFlagSetting D86 K1 bSpeedPositionSwitchingEnableRet M5140
(526) bInputChangeMovementAmountRequest X29
      JP.REMTO J1 K4 K1 H0 K4326 wMovementAmount[0] D3 K2 bChangeMovementAmountRet M5150
```

■Position-speed switching control (positioning data No.3)



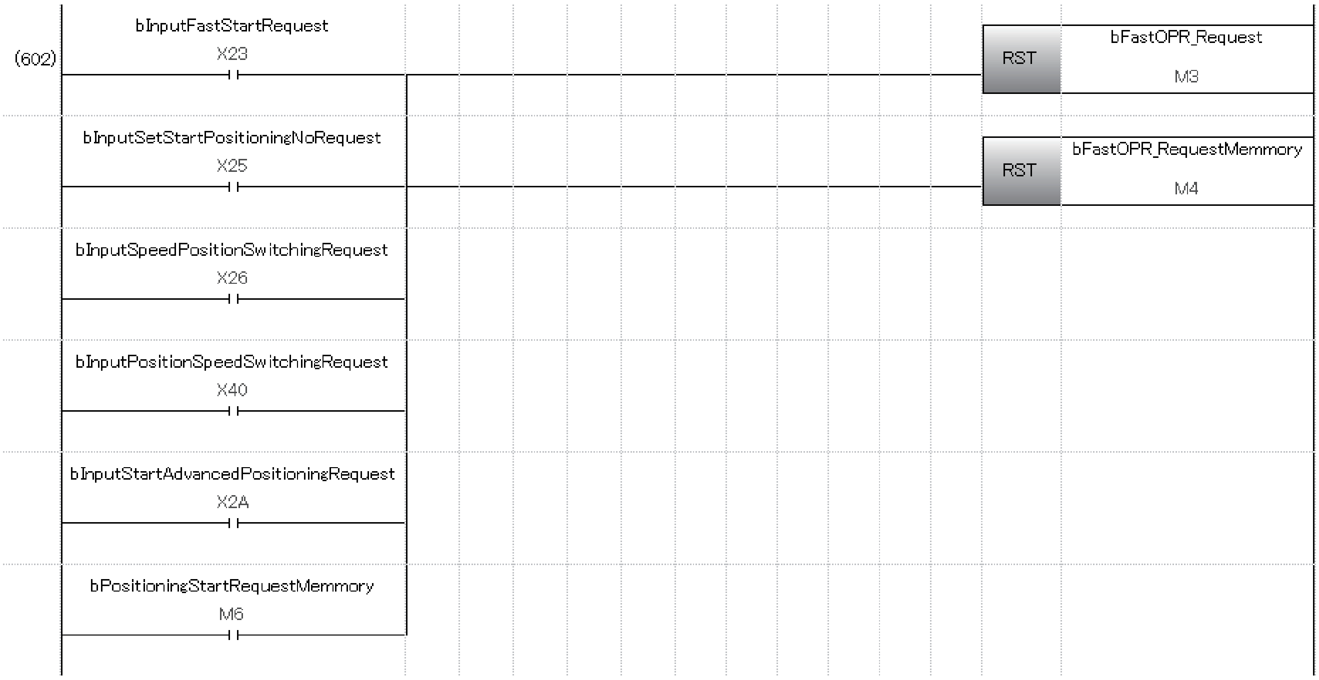
```
(541) bInputPositionSpeedSwitchingRequest X40
      MOVP K3 uPositioningStartNo D32
(546) bInputPositionSpeedSwitchingEnableRequest X41
      MOVP K1 uPositionSpeedSwitchingEnableFlagSetting D87
      JP.REMTO J1 K5 K1 H0 K4332 uPositionSpeedSwitchingEnableFlagSetting D87 K1 bPositionSpeedSwitchingEnableRet M5160
(564) bInputPositionSpeedSwitchingDisableRequest X42
      MOVP K0 uPositionSpeedSwitchingEnableFlagSetting D87
      JP.REMTO J1 K6 K1 H0 K4332 uPositionSpeedSwitchingEnableFlagSetting D87 K1 bPositionSpeedSwitchingEnableRet M5160
(582) bInputChangePositionSpeedSwitchingSpeedRequest X43
      JP.REMTO J1 K7 K1 H0 K4330 wSpeed[0] D1 K2 bPVSpeedChangeRet M5170
```

■Advanced positioning control

```
(597) bInputStartAdvancedPositioningRequest X2A
      MOVP K7000 uPositioningStartNo D32
```

■Turning off a fast home position return command and fast home position return command storage

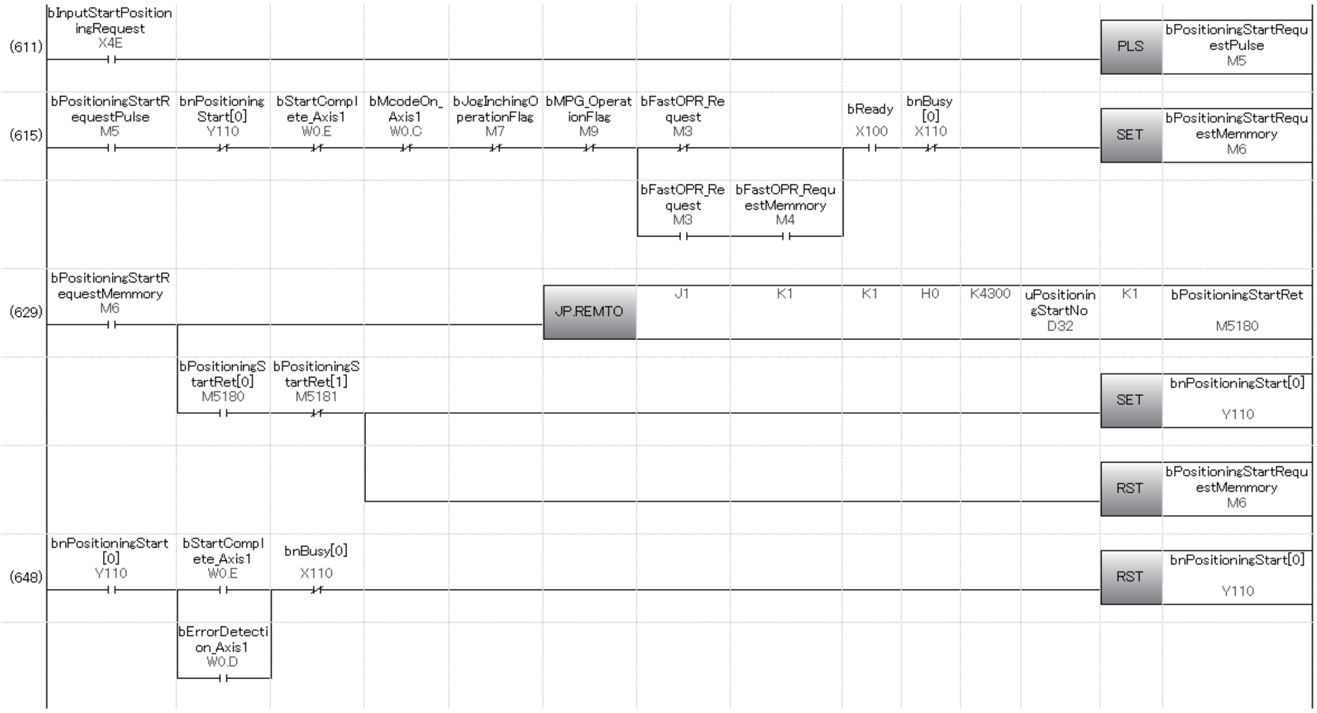
This program is unnecessary when the fast home position return is not used.



Positioning start program

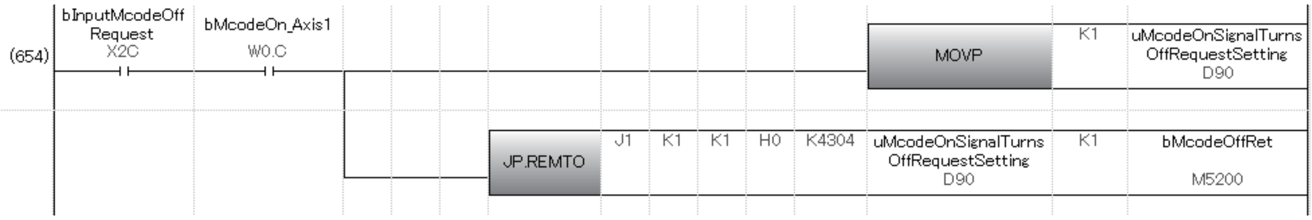
■For positioning start signal [Y10]

- The contacts of bFastOPR_Request and bFastOPR_RequestMemory are unnecessary when the fast home position return is not used.
- The contact of bInputUnitError4 is unnecessary when the M code is not used.
- The contact of bJogInchingOperationFlag is unnecessary when the JOG operation/inching operation is not used.
- The contact of bMPG_OperationFlag is unnecessary when the manual pulse generator operation is not used.

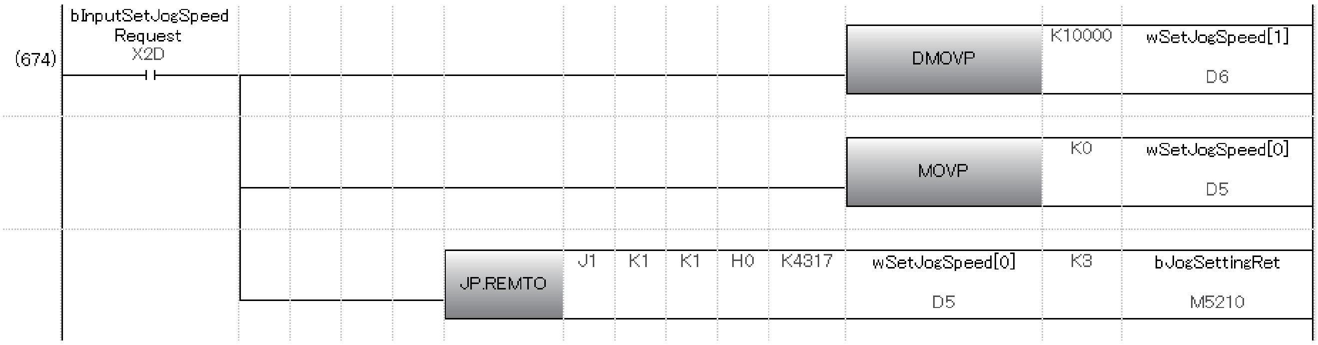


M code OFF program

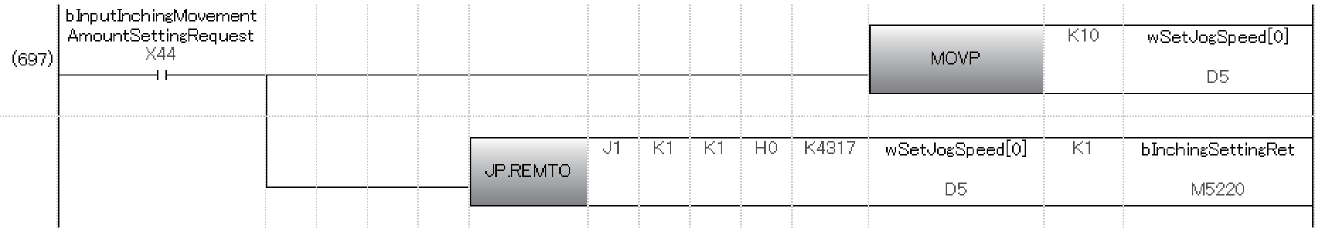
This program is unnecessary when the M code is not used.



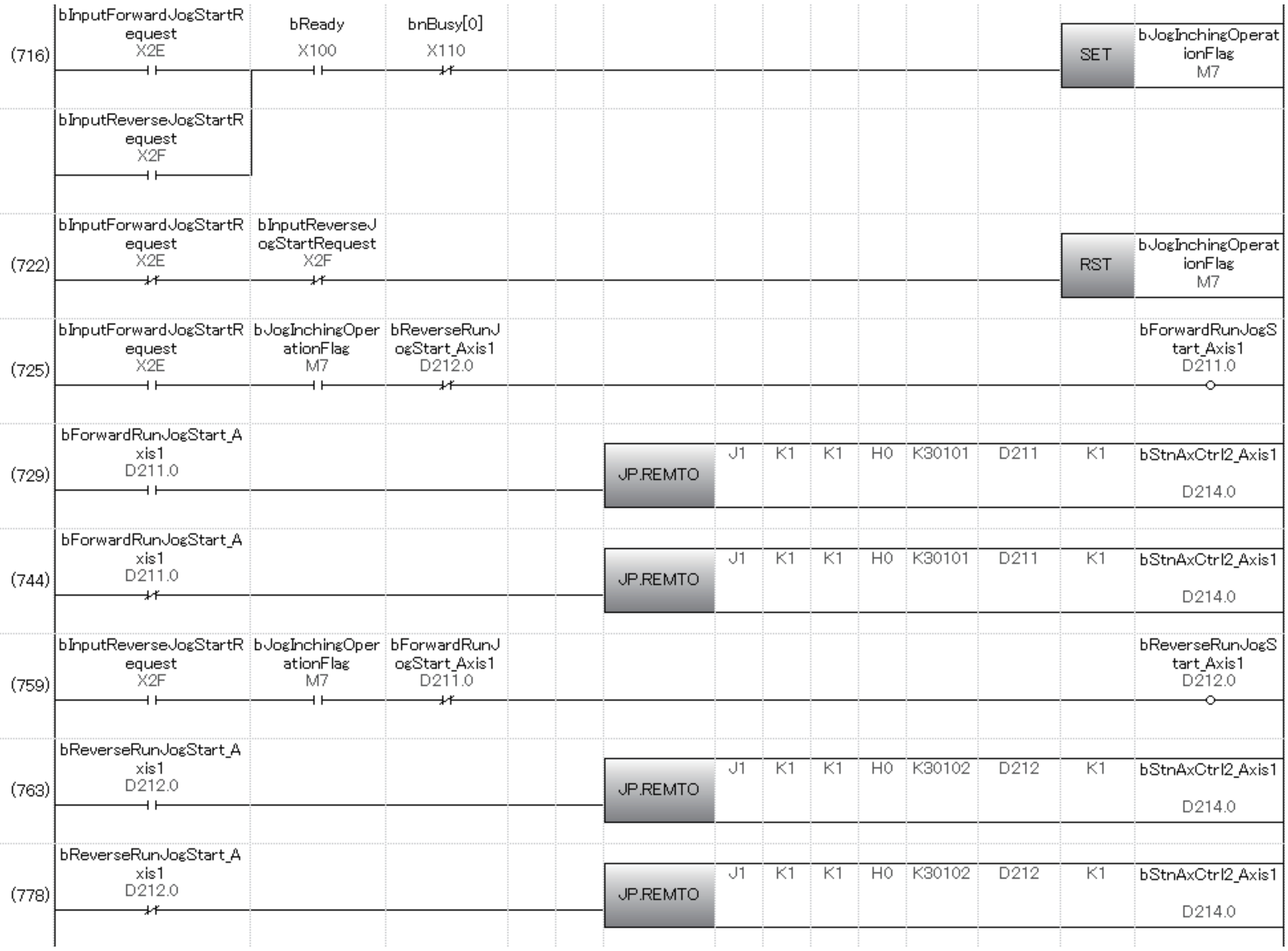
JOG operation setting program



Inching operation setting program

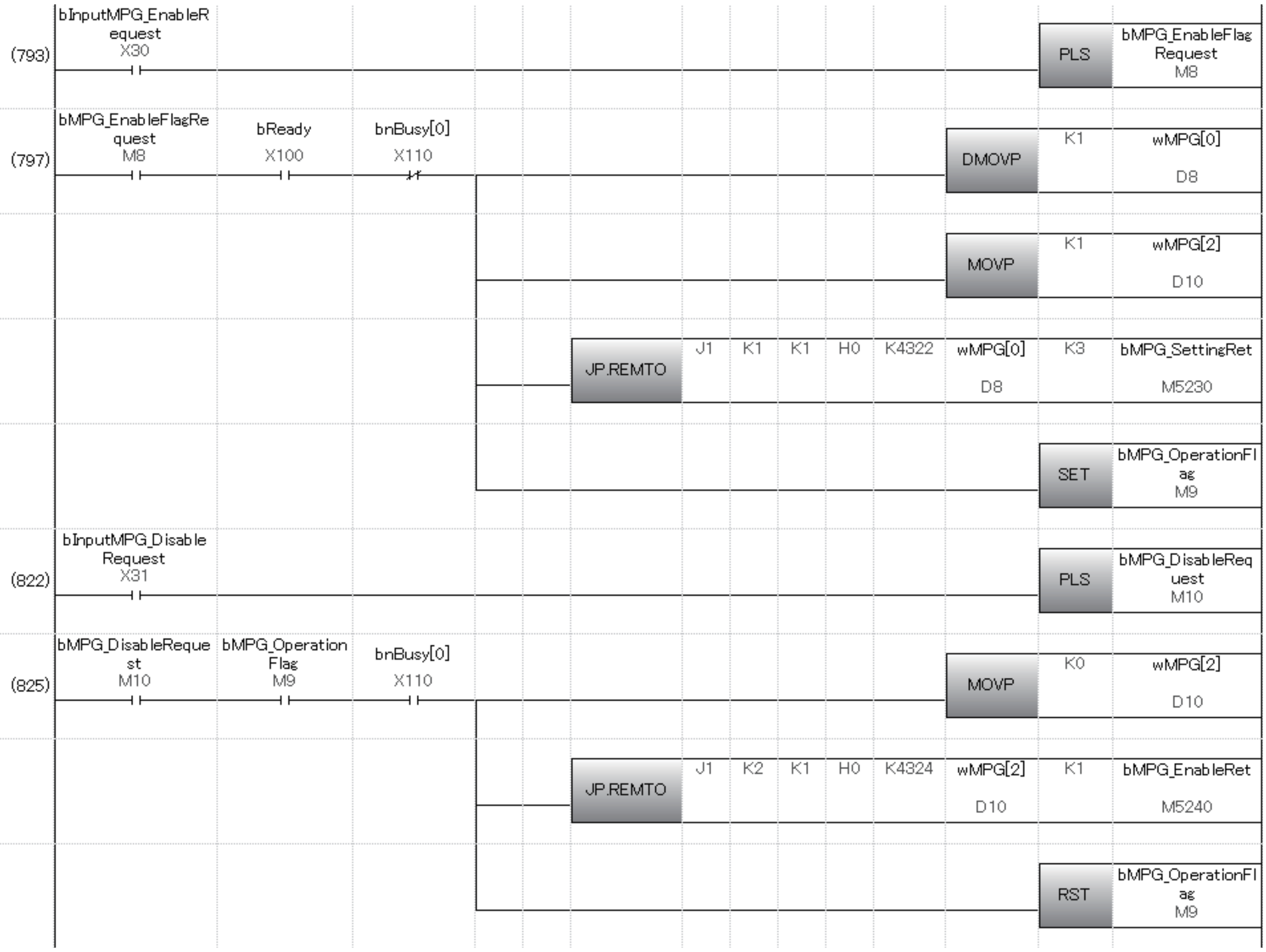


JOG operation/inching operation execution program

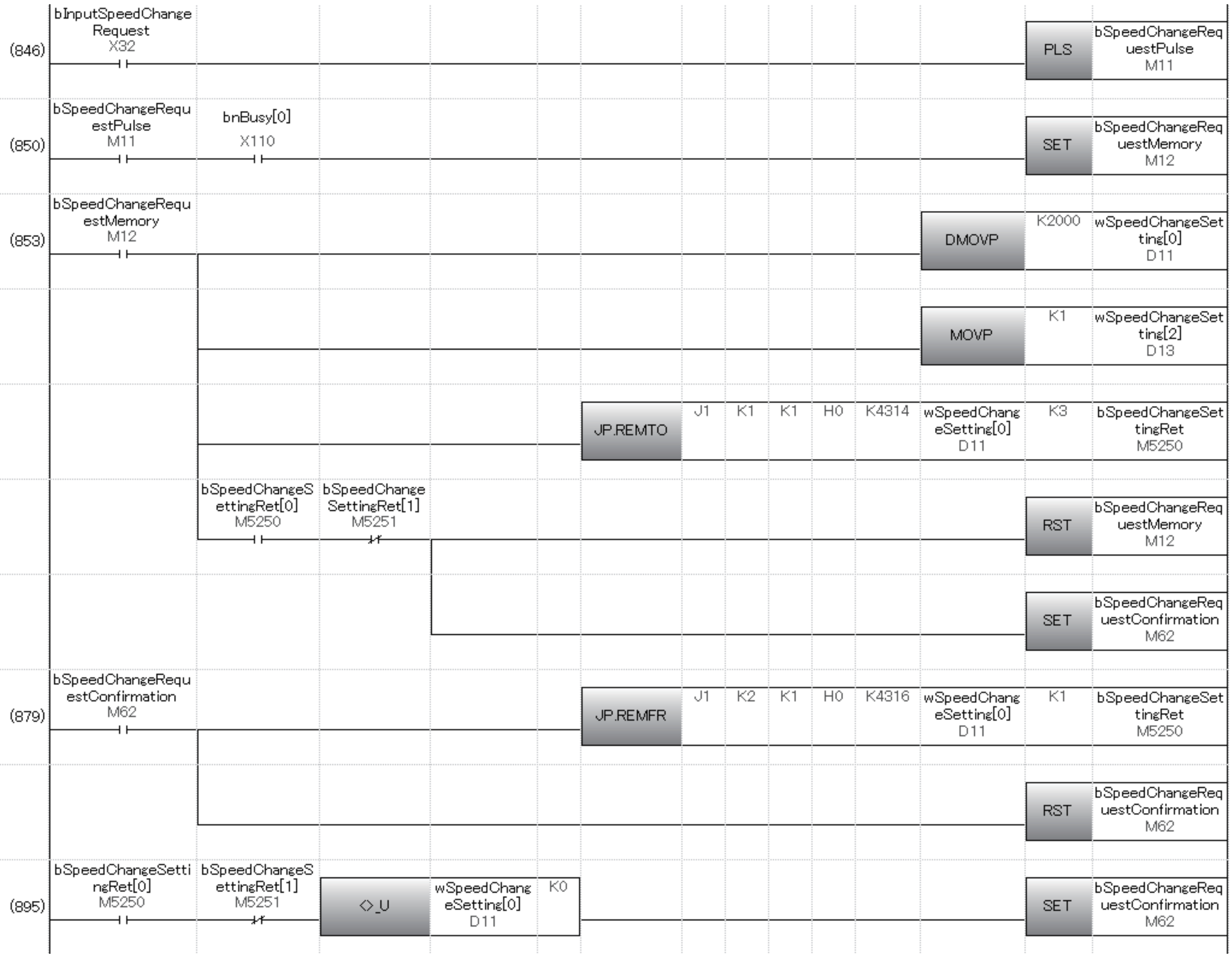


```
(716) bInputForwardJogStartRequest X2E ─┤ ├─┬─ bReady X100 ─┤ ├─ bnBusy[0] X110 ─┤/├─ [SET bJogInchingOperationFlag M7]
      bInputReverseJogStartRequest X2F ─┤ ├─┘

(722) bInputForwardJogStartRequest X2E ─┤/├─ bInputReverseJogStartRequest X2F ─┤/├─ [RST bJogInchingOperationFlag M7]

(725) bInputForwardJogStartRequest X2E ─┤ ├─ bJogInchingOperationFlag M7 ─┤ ├─ bReverseRunJogStart_Axis1 D212.0 ─┤/├─ ( bForwardRunJogStart_Axis1 D211.0 )

(729) bForwardRunJogStart_Axis1 D211.0 ─┤ ├─ [JP.REMTO J1 K1 K1 H0 K30101 D211 K1 bStnAxCtrl2_Axis1 D214.0]

(744) bForwardRunJogStart_Axis1 D211.0 ─┤/├─ [JP.REMTO J1 K1 K1 H0 K30101 D211 K1 bStnAxCtrl2_Axis1 D214.0]

(759) bInputReverseJogStartRequest X2F ─┤ ├─ bJogInchingOperationFlag M7 ─┤ ├─ bForwardRunJogStart_Axis1 D211.0 ─┤/├─ ( bReverseRunJogStart_Axis1 D212.0 )

(763) bReverseRunJogStart_Axis1 D212.0 ─┤ ├─ [JP.REMTO J1 K1 K1 H0 K30102 D212 K1 bStnAxCtrl2_Axis1 D214.0]

(778) bReverseRunJogStart_Axis1 D212.0 ─┤/├─ [JP.REMTO J1 K1 K1 H0 K30102 D212 K1 bStnAxCtrl2_Axis1 D214.0]
```

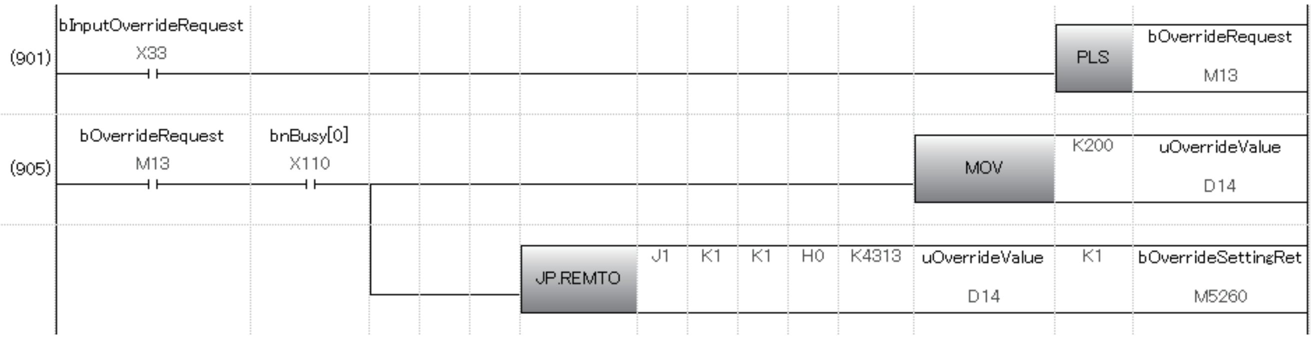
Manual pulse generator operation program



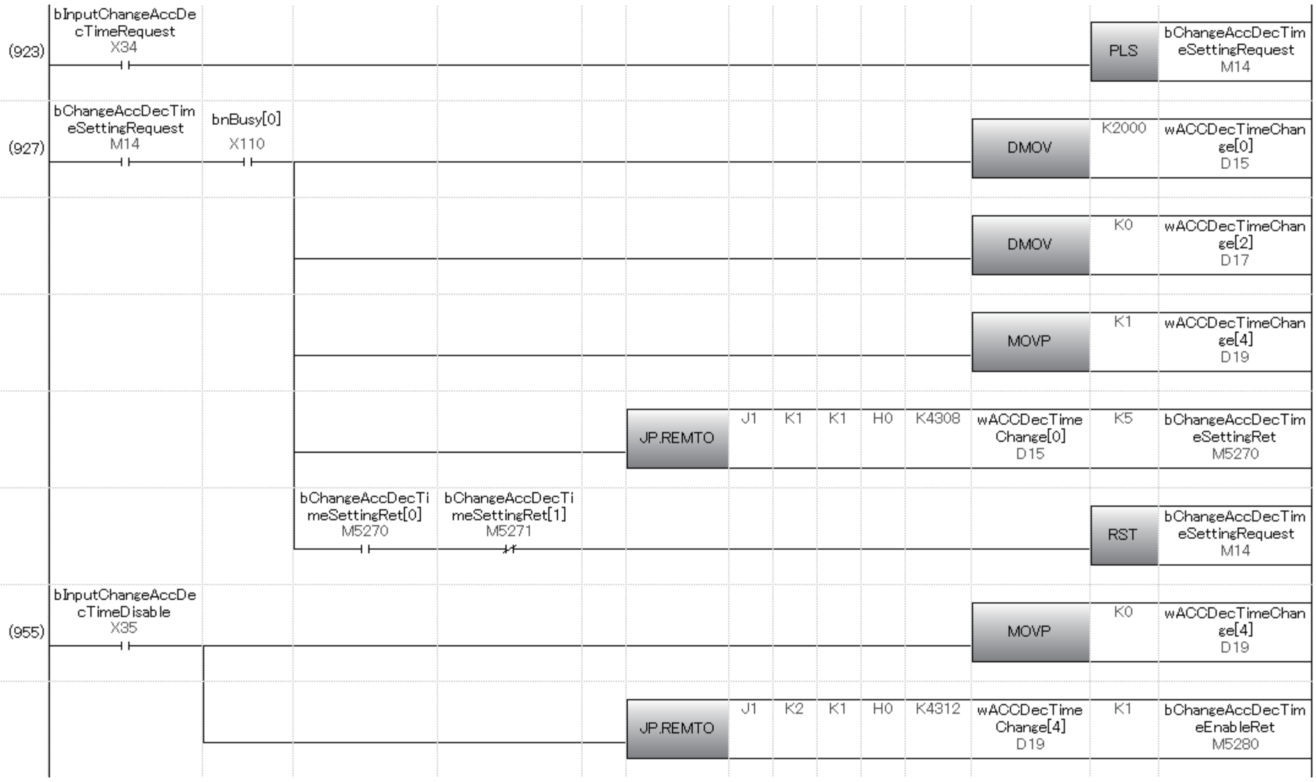
Speed change program



Override program

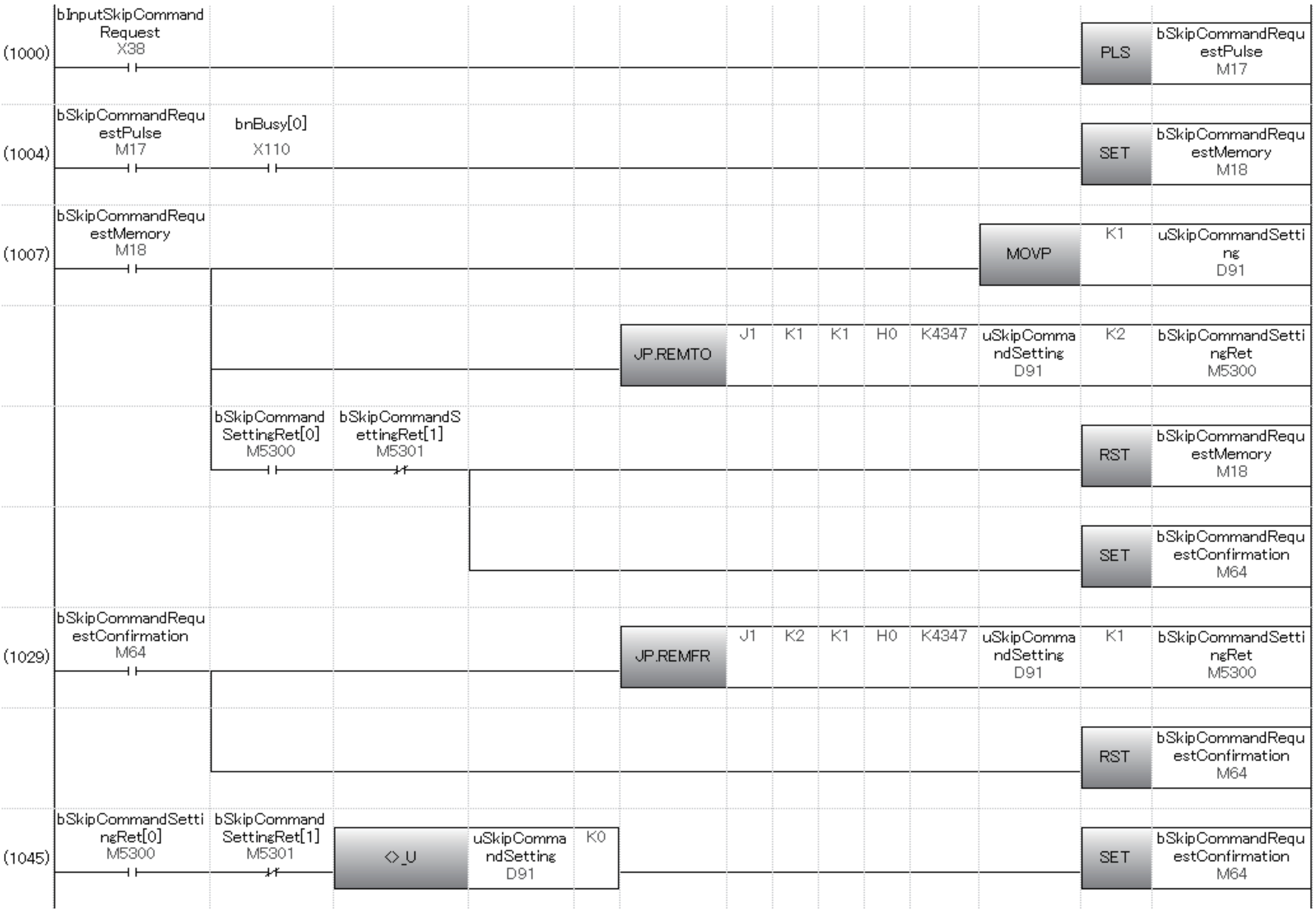


Acceleration/deceleration time change program

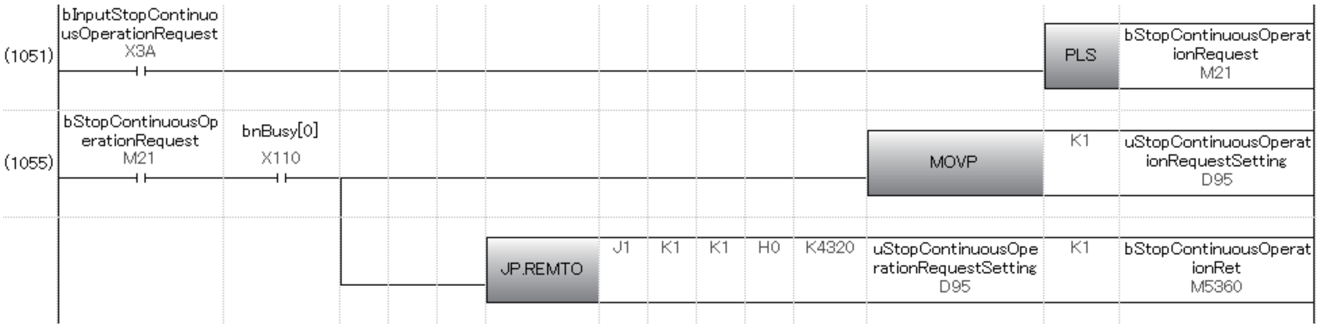


Step operation program

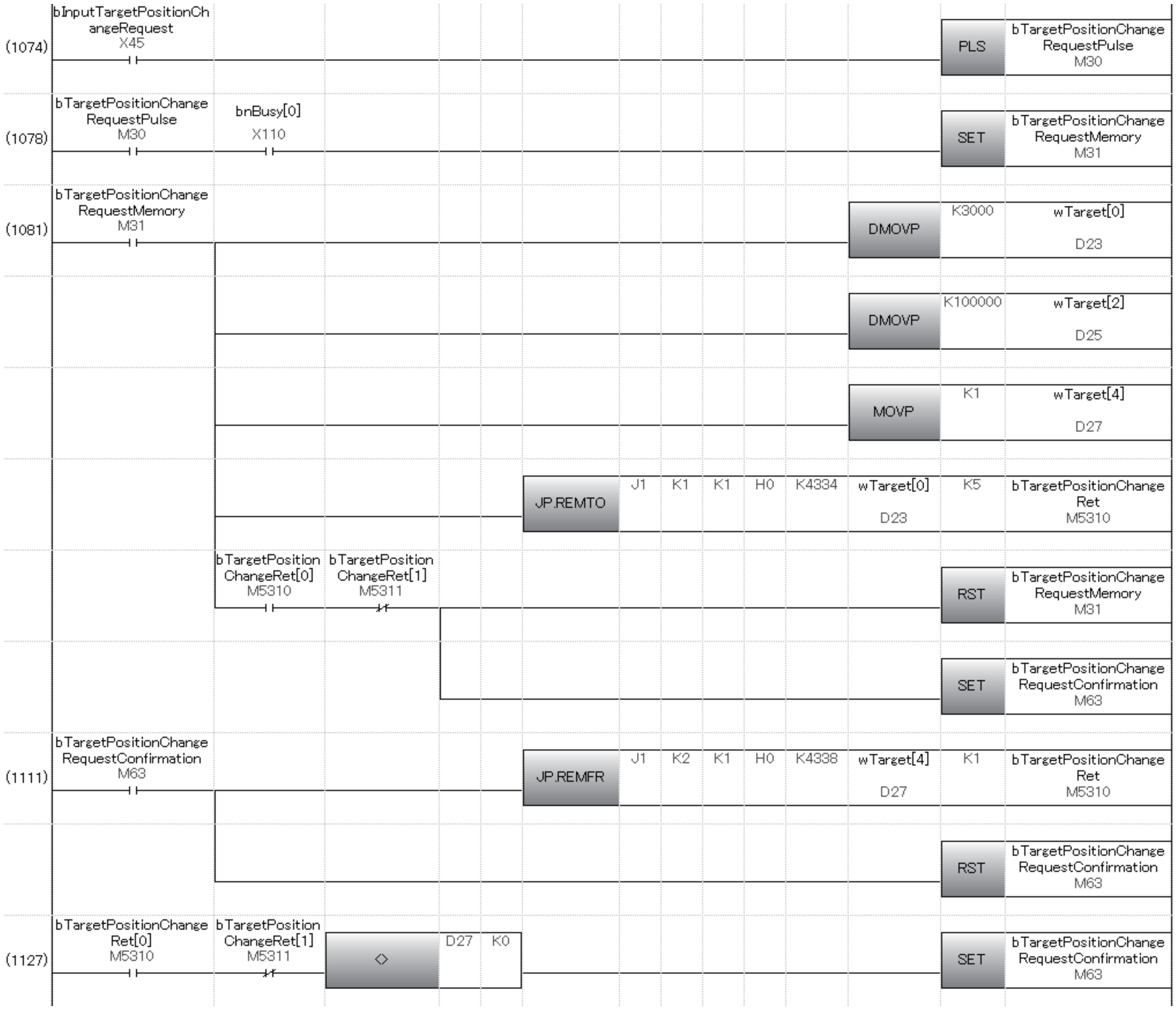
Skip program



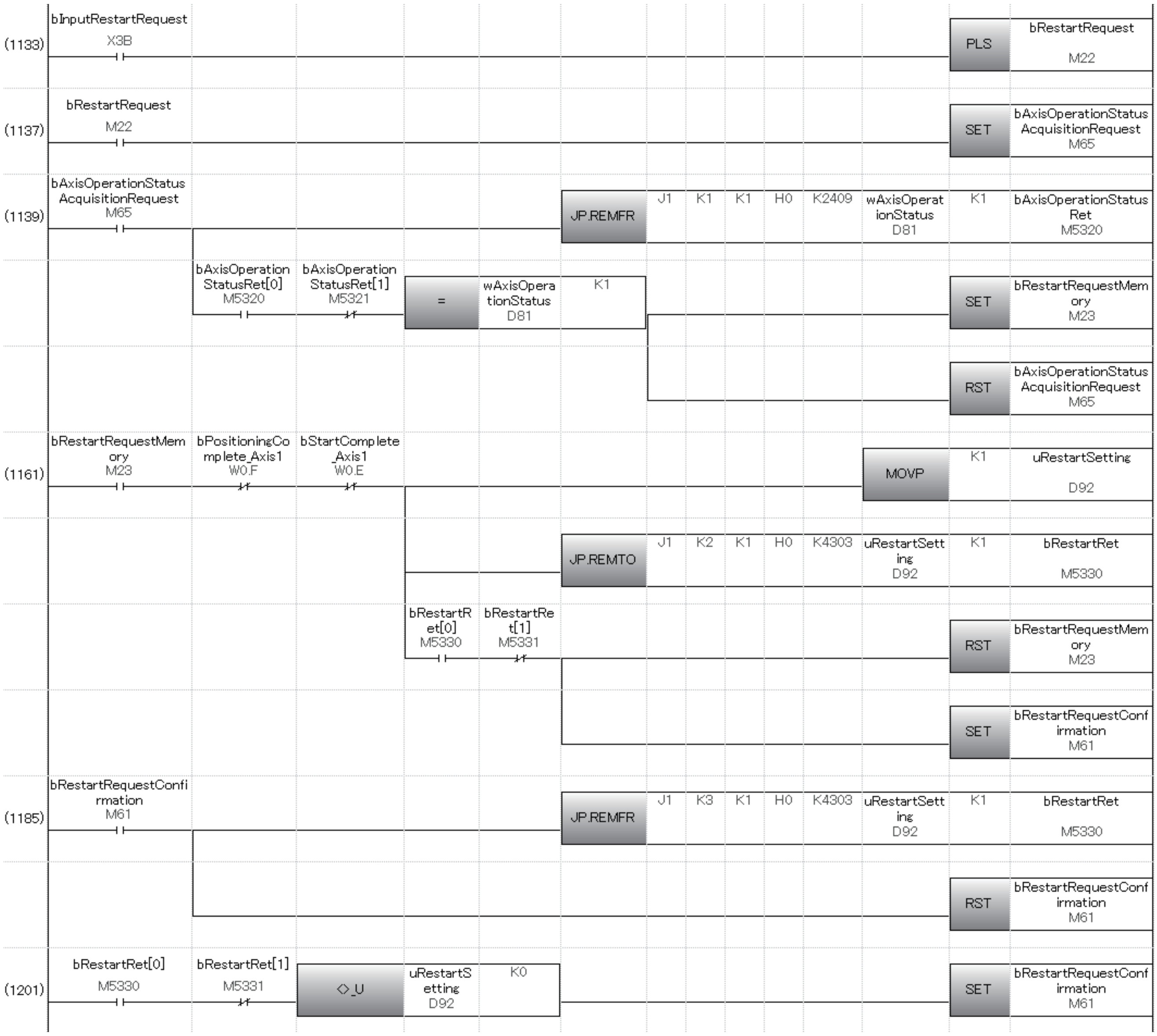
Continuous operation interrupt program



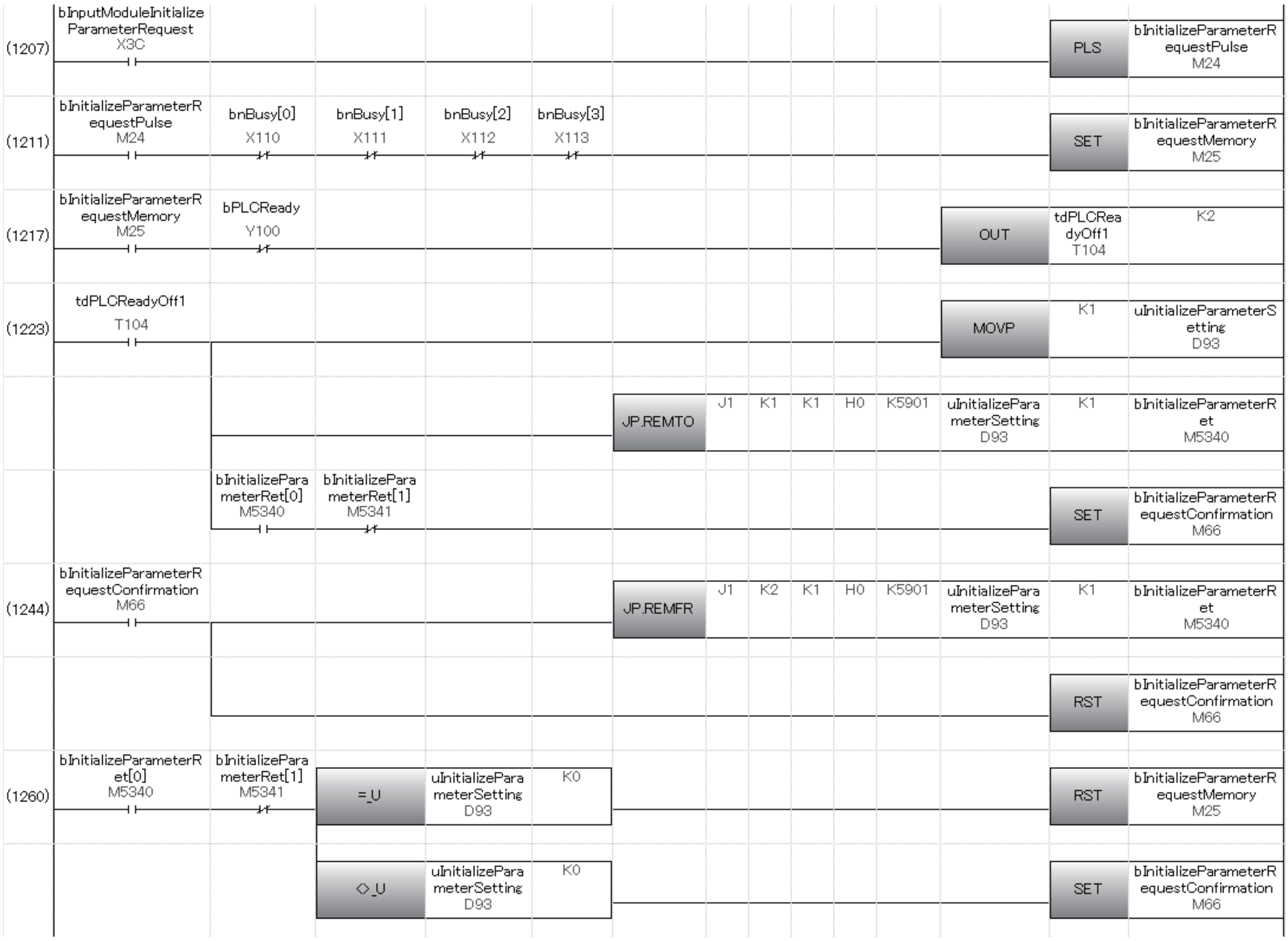
Target position change program



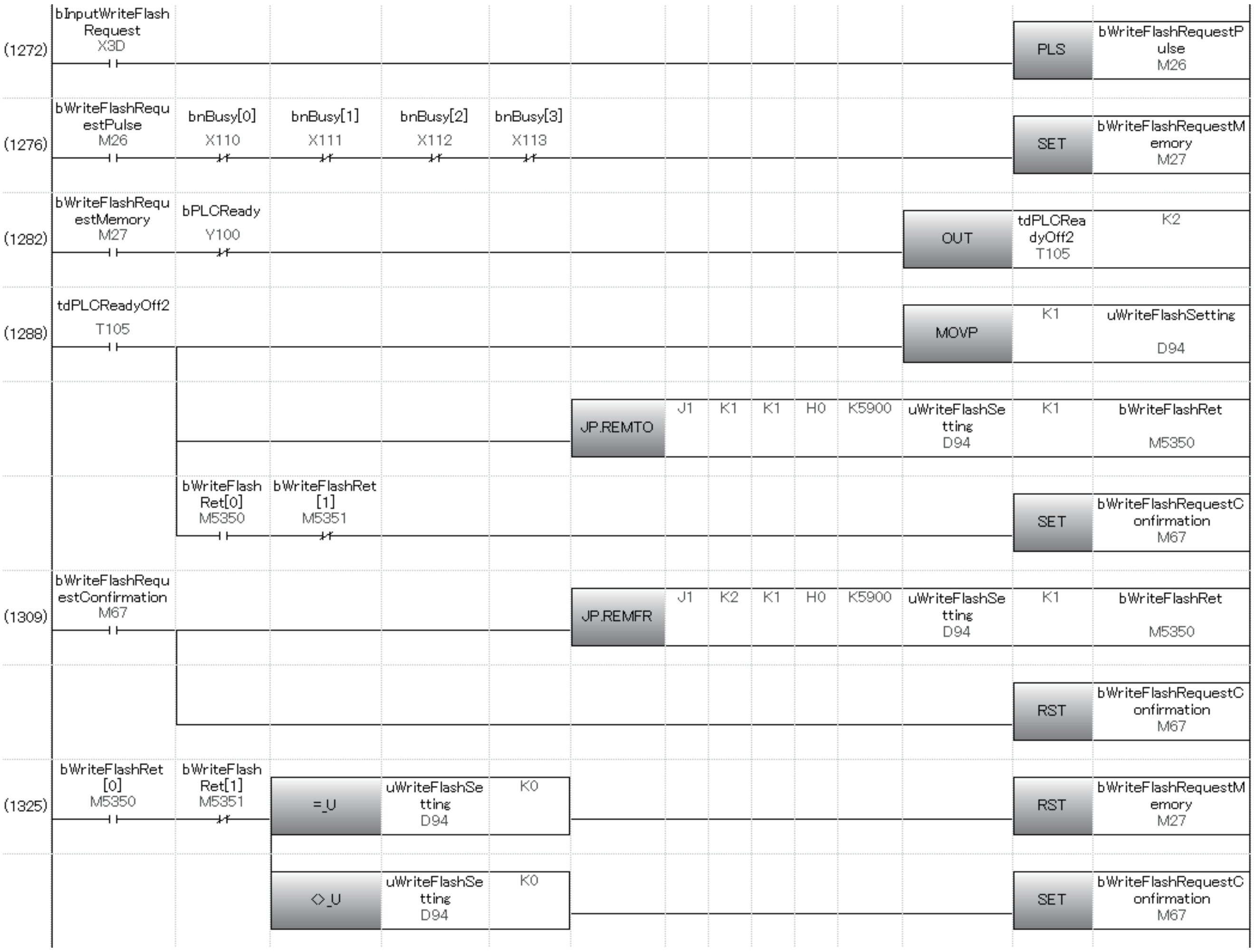
Restart program



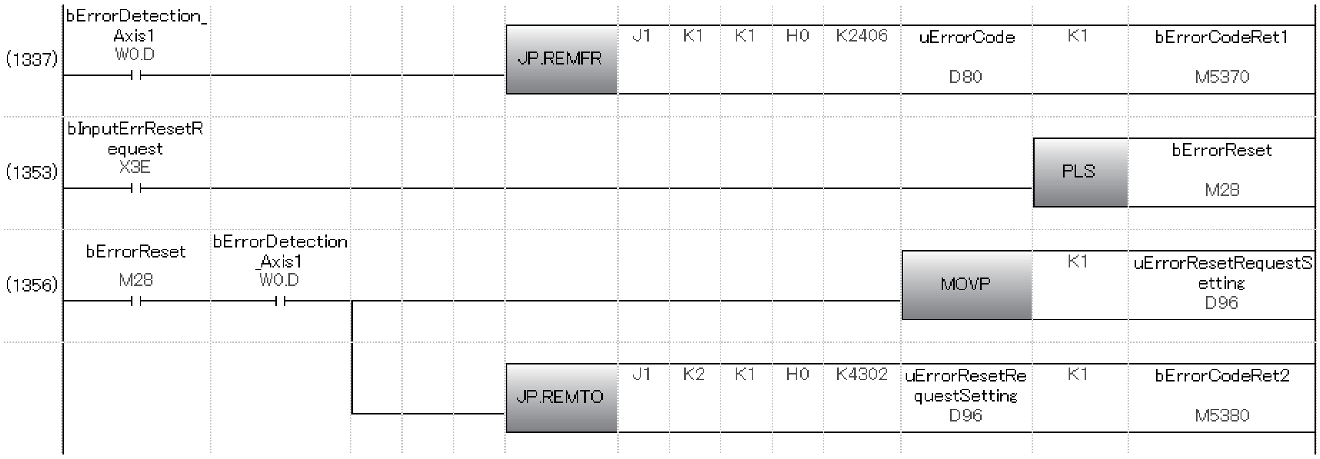
Parameter initialization program



Flash ROM write program



Error reset program

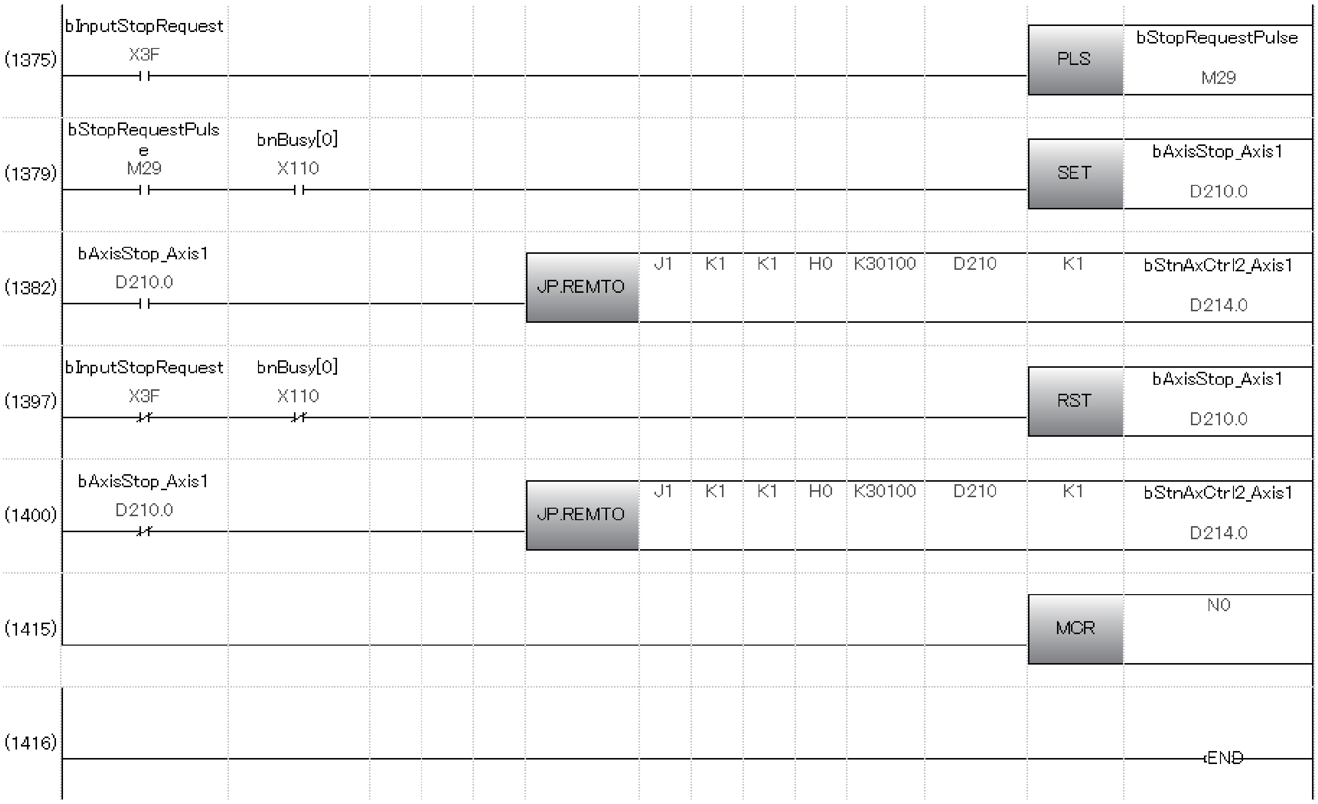


This program stores and resets only error codes.

To reset warnings, create OR circuits for the error detection signal (Axis 1) W0.D and warning detection signal (Axis 1) W0.9 with step 1356.

In addition, create a program to store the warning codes by referring to step 1337.

Stop program



The RD77MS operation when the remote head module is mounted

This section describes the RD77MS operation for when the RD77MS is used with the remote head module disconnected.

The RD77MS operation with the remote head module disconnected

An output signal is turned off when the remote head module is disconnected because "CPU error output mode setting" of the RD77MS is fixed to "0: Clear". Thus, if the remote head module is disconnected during positioning operation, the PLC READY signal [Y0] is turned off from on, the error "PLC READY OFF during operation" (error code: 1900H) occurs, and the positioning operation decelerates to stop.

To carry out positioning after the remote head module is re-connected, clear the error state with an error reset and start the positioning again.

Restrictions when the remote head module is mounted

The following shows the restrictions when the remote head module is mounted.

No.	Item	Description
1	Module Label	Module Label cannot be used.
2	Module function blocks	Module function blocks cannot be used.
3	Auto refresh	Only specified device can be used.
4	Dedicated instruction	Dedicated instruction cannot be used.
5	Interrupt function	Interrupt function cannot be used.
6	Inter-module synchronization	Inter-module synchronization cannot be used with remote head module redundant system

Supported version of GX Works3

The following shows the version of GX Works3 which supports the remote head module.

No.	Part name	Software version
1	GX Works3	1.025B

Appendix 5 Restrictions by the version

The software versions corresponding to each Simple Motion module are shown below.

Model	Version
	GX Works3
RD77MS	1.000A
RD77GF	1.020W

There are restrictions in the function that can be used by the software of the Simple Motion module and the version of engineering tool.

The combination of each version and function is shown below.

[RD77MS]

—: There is no restriction by the version.

Function	Software version	GX Works3	Reference
Event history Flash ROM writing	Ver.03 or later	—	Page 391 Event History Function
Inter-module synchronization start		—	Page 200 INTER-MODULE SYNCHRONIZATION FUNCTION
Advanced synchronous control Slippage smoothing method (Linear: Input value follow up)		1.007H or later	[1]
Cam axis length per cycle change			
MR-JE-B(F)			Page 769 Connection with MR-JE-B(F)
Hot line forced stop function		—	Page 426 Hot Line Forced Stop Function [RD77MS]
Online module change		—	Page 405 Online Module Change [RD77MS]
3-axis helical interpolation control		1.007H or later	Page 102 3-axis helical interpolation control with sub point designation Page 108 3-axis helical interpolation control with center point designation
Monitor of rotation direction using synchronous control monitor			[1]
Forced stop (Input from the buffer memory)	Ver.05 or later	1.010L or later	Page 267 Forced stop function
Test mode			Page 406 Test Mode
Optical hub unit		—	Page 763 Optical hub unit
Offline digital oscilloscope		1.010L or later	—
AlphaStep/5-phase stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd.	Ver.06 or later	1.010L or later	Page 779 AlphaStep/5-phase stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd.
Servo driver manufactured by CKD NIKKI DENSO CO., LTD. (VPH series)	Ver.07 or later	1.020W or later	Page 786 Servo driver VCII series/VPH series manufactured by CKD NIKKI DENSO CO., LTD.
Inverter (FR-A800 series)			Page 775 Inverter FR-A800 series
[Pr.127] Speed limit value input selection at control mode switching	Ver.08 or later	1.025B or later	Page 522 Detailed parameters2
IAI electric actuator controller manufactured by IAI Corporation			Page 791 IAI electric actuator controller manufactured by IAI Corporation
Speed-torque control using AlphaStep stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd.	Ver.09 or later	1.045X or later	Page 779 AlphaStep/5-phase stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd.
[Pr.128] Torque limit selection (Stepping driver)			
Supports the servo parameter transmission function at PLC READY signal [Y0] ON	Ver.10 or later	1.060N or later	Page 668 (10) Transmitting servo parameter [RD77MS]
Positioning data, start block data write/read functions	Ver.11 or later	—	Page 415 Positioning Data, Start Block Data Write/Read Functions [RD77MS]
Supports MR-J5(W)-B	Ver.13 or later	1.085P or later	Page 796 Connection with MR-J5(W)-B

[1] Refer to the following manual for details.
📖MELSEC iQ-R Simple Motion Module User's Manual (Advanced Synchronous Control)

[RD77GF]

—: There is no restriction by the version.

Function	**4-axis/8-axis/16-axis module**		**32-axis module**		**Reference**
	Software version	**GX Works3**	**Software version**	**GX Works3**	
Support for "0" in "Stroke limit enabling condition selection" of the servo parameter "Function selection D-4 (PD41)"	Ver.02 or later	—	Ver.05 or later	1.030G or later	—
Station-based block data assurance		1.020W or later			*1
Data link faulty station setting					
Synchronous encoder via servo amplifier		1.022Y or later			*2
Linear servo motor control mode/Direct drive motor control mode/Fully closed loop control mode					—
Safety communication function[*3]	Ver.05 or later	1.030G or later			*4
Normal mode setting of communication mode					
"Not Use" setting of inter-module synchronization function					Page 200 INTER-MODULE SYNCHRONIZATION FUNCTION
Start history monitor (256 points)					Page 354 History Monitor Function
iQ Sensor Solution data backup/restoration function[*3]		—		—	—

*1 Refer to "Cyclic Transmission" in the following manual for details.
📖MELSEC iQ-R Simple Motion Module User's Manual (Network)

*2 Refer to "Synchronous Encoder Axis" in the following manual for details.
📖MELSEC iQ-R Simple Motion Module User's Manual (Advanced Synchronous Control)

*3 There are restrictions on the CPU module to be used. For details, refer to the following.
📖MELSEC iQ-R CPU Module User's Manual (Application)

*4 Refer to "Safety Communication Function" in the following manual for details.
📖MELSEC iQ-R Simple Motion Module User's Manual (Network)

MEMO

INDEX

REVISIONS

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

Revision date	*Manual number	Description
June 2014	IB(NA)-0300247ENG-A	First edition
February 2015	IB(NA)-0300247ENG-B	■Added functions 3-axis helical interpolation control, Inter-module synchronization function, Online module change, Hot line forced stop function ■Added or modified parts RELEVANT MANUALS, TERMS, Section 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 4.3, 4.4, 5.1, 5.2, 5.3, 5.4, Chapter 6, Section 7.1, 8.2, 8.4, 8.5, 8.6, 8.8, 8.9, 9.1, 9.2, 9.3, 9.4, 9.5, 9.8, 9.9, 9.10, 9.11, 9.13, 9.14, Chapter 10, Section 11.3, 12.1, 12.2, 12.3, 12.4, 12.5, 12.6, 12.7, 12.8, 12.9, 13.1, 13.2, 13.3, 13.4, 14.1, 14.2, 14.3, 14.4, 14.5, Appendix 2, 3, 4
May 2015	IB(NA)-0300247ENG-C	■Added functions Test mode, Optical hub unit MR-MV200, Offline digital oscilloscope ■Added or modified parts Section 1.1, 1.2, 3.1, 3.2, 5.4, 7.1, 8.1, 8.4, 8.9, 8.10, 9.1, 9.8, 9.10, 9.11, 9.14, 12.1, 12.2, 12.3, 12.4, 12.7, 12.8, 14.3, 14.5, Appendix 3, 4
March 2016	IB(NA)-0300247ENG-D	■Added models RD77GF4, RD77GF8, RD77GF16 ■Added functions Link device external signal assignment function, Servo cyclic transmission function, Servo transient transmission function, Servo parameter change function, Inverter FR-A800 series, AlphaStep/5-phase stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd., Servo driver VPH series manufactured by Nikki Denso Co., Ltd. ■Added or modified parts SAFETY PRECAUTIONS, INTRODUCTION, RELEVANT MANUALS, TERMS, Section 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 3.1, 3.2, 4.1, 4.3, 4.4, 4.5, Chapter 5, Section 5.1, 5.2, 5.3, 5.4, Chapter 6, 7, Section 7.1, 7.2, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, 9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 9.11, 9.12, 9.13, 9.14, 9.15, 9.16, 9.17, 9.18, 9.19, Chapter 10, Section 10.2, 10.3, 12.1, 12.2, 12.3, 12.4, 12.5, 12.6, 12.7, 12.8, 12.9, 13.1, 13.2, 13.4, 14.1, 14.3, 14.4, 14.5, Appendix 2, 3, 4, WARRANTY
December 2016	IB(NA)-0300247ENG-E	■Added models RD77GF32 ■Added functions [RD77MS] IAI electric actuator controller manufactured by IAI Corporation ■Added or modified parts SAFETY PRECAUTIONS, INTRODUCTION, TERMS, Section 1.1, 1.2, 1.3, 2.2, 2.3, 2.4, 3.1, 3.2, 4.1, 4.4, 4.5, 5.2, 5.3, 5.4, Chapter 6, Section 7.1, 8.1, 8.3, 8.4, 8.5, 8.7, 8.8, 8.9, 8.10, 9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.10, 9.11, 9.12, 9.14, 9.15, 9.17, 9.18, 10.2, 11.1, 11.2, 11.3, 12.1, 12.2, 12.3, 12.4, 12.5, 12.6, 12.7, 12.8, 12.9, 14.1, 14.3, 14.4, 14.5, Appendix 1, 2, 3, 4
June 2018	IB(NA)-0300247ENG-F	■Added functions [RD77MS] AlphaStep stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd.: Speed-torque control, torque limit function ■Added or modified parts SAFETY PRECAUTIONS, RELEVANT MANUALS, TERMS, Section 1.1, 1.2, 2.2, 3.1, 3.2, 4.1, 4.3, 4.4, 7.1, 8.1, 8.2, 8.4, 8.5, 8.8, 9.1, 9.4, 9.7, 9.8, 9.9, 9.10, 9.11, 9.12, 9.14, 9.15, 9.17, 9.18, 9.19, 11.1, 12.1, 12.2, 12.3, 12.4, 12.6, 12.7, 12.8, 12.9, 14.4, 14.5, Appendix 2, 3, 4, 5
July 2022	IB(NA)-0300247ENG-G	■Added functions [RD77MS] MR-J5(W)-B, Positioning data, start block data write/read functions ■Added or modified parts SAFETY PRECAUTIONS, COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES, TERMS, Section 1.1, 1.2, 1.3, 2.1, 2.2, 2.4, 3.1, 3.2, 4.1, 4.3, 4.4, 4.5, 5.1, 5.2, 5.3, 5.4, Chapter 6, Section 7.1, 8.2, 8.3, 8.4, 8.5, 8.7, 8.9, 8.10, 9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 9.11, 9.12, 9.13, 9.14, 9.15, 9.16, 9.17, 9.18, 9.19, 9.20, 10.2, 10.3, 12.1, 12.2, 12.3, 12.4, 12.5, 12.6, 12.7, 12.8, 12.9, 13.1, 13.3, 13.4, 14.1, 14.2, 14.4, 14.5, Appendix 1, 2, 3, 4, 5, WARRANTY, TRADEMARKS
October 2023	IB(NA)-0300247ENG-H	■Added or modified parts SAFETY PRECAUTIONS, Section 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.1, 3.2, 4.3, 4.4, 4.5, 5.2, 5.3, 5.4, Chapter 6, Section 7.1, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, 9.6, 9.7, 9.8, 9.9, 9.10, 9.11, 9.12, 9.17, 10.2, 11.1, 12.1, 12.2, 12.3, 12.4, 12.6, 12.7, 12.8, 12.9, 13.2, 14.2, 14.4, 14.5, Appendix 2, 3, INFORMATION AND SERVICES, TRADEMARKS
June 2024	IB(NA)-0300247ENG-J	■Added or modified parts Section 12.3, 12.9

Japanese manual number: IB-0300246-M

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 Simple motion module, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in the Simple motion module, and a backup or fail-safe function should operate on an external system to the Simple motion module when any failure or malfunction occurs.

(2) Our Simple 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.

INFORMATION AND SERVICES

For further information and services, please contact your local Mitsubishi Electric sales office or representative.
Visit our website to find our locations worldwide.

MITSUBISHI ELECTRIC Factory Automation Global Website
Locations Worldwide
www.MitsubishiElectric.com/fa/about-us/overseas/

TRADEMARKS

IB(NA)-0300247ENG-J(2406)MEE
MODEL: RD77-U-APP-E
MODEL CODE: 1XB014

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