MITSUBISHI ELECTRIC

Programmable Controller

MELSEC iQ-F series

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

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

SAFETY PRECAUTIONS

(Read the precautions before using this product.)

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

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

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

⚠ **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.

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

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

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

[Design Precautions]

⚠WARNING

- Make sure to set up the following safety circuits outside the programmable controller to ensure safe system operation even during external power supply problems or programmable controller failure. Otherwise, malfunctions may cause serious accidents.
  - Emergency stop circuits, protection circuits, and protective interlock circuits (for conflicting operations such as forward/reverse rotations or for preventing damage to the equipment such as upper/lower limit positioning) must be configured external to the programmable controller.
  - Note that when the CPU module detects an error, such as a watchdog timer error, during self-diagnosis, all outputs are turned off. Also, when an error occurs in an input/output control block, where it cannot be detected by the CPU module, output control may be disabled. External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
  - Note that the output current of the 24 V DC service power supply varies depending on the model and the absence/presence of extension modules. If an overload occurs, the voltage automatically drops, inputs in the programmable controller are disabled, and all outputs are turned off. External circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
  - Note that when an error occurs in a relay, triac or transistor of an output circuit, the output might stay on or off. For output signals that may lead to serious accidents, external circuits and mechanisms should be designed to ensure safe machinery operation in such a case.
- Construct an interlock circuit in the program so that the whole system always operates on the safe side before executing the control (for data change) of the programmable controller in operation. Read the manual thoroughly and ensure complete safety before executing other controls (program change, parameter change, forced output, and operation status change) to the programmable controller in operation.
  Improper operation may damage machines or cause accidents.
- In an output circuit, when a load current exceeding the current rating or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
- For the operating status of each station after a communication failure of the network, refer to relevant manuals for the network. Incorrect output or malfunction may result in an accident.
- Especially, in the case of a control from an external device to a remote programmable controller, immediate action cannot be taken for a problem on the programmable controller due to a communication failure. Determine the handling method as a system when communication failure occurs along with configuration of interlock circuit on a program, by considering the external equipment and CPU module.
- Do not write any data to the "manufacturer setting area", "system area", and "write-protect area" of the buffer memory in the module. Executing data writing to the "manufacturer setting area", "system area", or "write protect area" may cause malfunction of the programmable controller alarm. For the "manufacturer setting area", "system area", or "write-protect area", refer to ☞ Page 422 List of Buffer Memory Addresses and "Buffer Memory" in MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN).
- If a communication cable is disconnected, the network may be unstable, resulting in a communication failure of multiple stations. Construct an interlock circuit in the program so that the system always operates on the safe side even if communications fail. Incorrect output or malfunction may result in an accident.

⚠WARNING

- 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 may result in an accident.

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

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

*1 Products conforming to the UL explosion-proof standard are as follows:
Manufactured in October 2017 onwards
· FX5 CPU module
FX5UC-32MT/D, FX5UC-32MT/DSS, FX5UC-64MT/D, FX5UC-64MT/DSS, FX5UC-96MT/D, FX5UC-96MT/DSS
· FX5 extension module
FX5-C16EX/D, FX5-C16EX/DS, FX5-C16EYT/D, FX5-C16EYT/DSS, FX5-C32EX/D, FX5-C32EX/DS, FX5-C32EYT/D, FX5-C32EYT/DSS, FX5-C32ET/D, FX5-C32ET/DSS, FX5-232ADP, FX5-485ADP, FX5-C1PS-5V, FX5-CNV-BUSC, FX5-4AD-ADP, FX5-4DA-ADP

[Design Precautions]

⚠CAUTION

- When an inductive load such as a lamp, heater, or solenoid valve is controlled, a large current (approximately ten times greater than normal) may flow when the output is turned from off to on. Take proper measures so that the flowing current does not exceed the value corresponding to the maximum load specification of the resistance load.
- After the CPU module is powered on or is reset, the time taken to enter the RUN status varies depending on the system configuration, parameter settings, and/or program size.
  Design circuits so that the entire system will always operate safely, regardless of this variation in time.
- Simultaneously turn on and off the power supplies of the CPU module and extension modules.
- If a long-time power failure or an abnormal voltage drop occurs, the programmable controller stops, and output is turned off. When the power supply is restored, it will automatically restart (when the RUN/STOP/RESET switch is on RUN side).
- Do not bundle the control line and communication cables together with or lay them close to the main circuit or power line. Keep a distance of 100 mm or more between them. Failure to do so may result in malfunction due to noise.

[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

- Make sure to cut off all phases of the power supply externally before attempting installation or wiring work. Failure to do so may cause electric shock or damage to the product.
- Use the product within the generic environment specifications described in the generic specifications of the user's manual (Hardware) of the CPU module used.
  Never use the product in areas with excessive dust, oily smoke, conductive dust, corrosive gas (salt air, Cl_2, H_2S, SO_2, or NO_2), flammable gas, or vibration or impacts, or expose it to high temperature, condensation, or rain and wind.
  If the product is used in such conditions, electric shock, fire, malfunctions, deterioration or damage may occur.

[Installation Precautions]

⚠CAUTION

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

[Wiring Precautions]

⚠WARNING

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

[Wiring Precautions]

⚠CAUTION

- Do not supply power externally to the [24 +] and [24 V] terminals (24 V DC service power supply) on the CPU module or extension modules. Doing so may damage the product. Note that power may be supplied even when an electronic load which equips with an internal bias power supply is connected.
- Perform class D grounding (grounding resistance: 100 Ω or less) of the grounding terminal on the CPU module and extension modules with a wire 2 ㎟ or thicker.
  Do not use common grounding with heavy electrical systems. For details, refer to the user's manual (Hardware) of the CPU module used.
- Connect the power supply wiring to the dedicated terminals described in the user's manual (Hardware) of the CPU module used. If an AC power supply is connected to a DC input/output terminal or DC power supply terminal, the programmable controller will burn out.
- Do not wire vacant terminals externally. Doing so may damage the product.
- Install module so that excessive force will not be applied to terminal blocks, power connectors, I/O connectors, communication connectors, or communication cables. Failure to do so may result in wire damage/breakage or programmable controller failure.
- Make sure to observe the following precautions to prevent any damage to the machinery or accidents due to malfunction of the programmable controller caused by abnormal data written to the programmable controller due to the effects of noise.
  - Do not bundle the power line, control line and communication cables together with or lay them close to the main circuit, high-voltage line, load line or power line. As a guideline, lay the power line, control line and communication cables at least 100 mm away from the main circuit, high-voltage line, load line or power line.
  - Ground the shield of the shield wire or shielded cable at one point on the programmable controller. However, do not use common grounding with heavy electrical systems.
  - Ground the shield of the analog I/O wire in accordance with the manuals of each model. However, do not use common grounding with heavy electrical systems.
- For Ethernet cables to be used in the system, select the ones that meet the specifications in MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Startup). If not, normal data transmission is not guaranteed.

[Startup and Maintenance Precautions]

⚠WARNING

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

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

[Startup and Maintenance Precautions]

⚠CAUTION

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

[Operating Precautions]

⚠CAUTION

- Construct an interlock circuit in the program so that the whole system always operates on the safe side before executing the control (for data change) of the programmable controller in operation. Read the manual thoroughly and ensure complete safety before executing other controls (program change, parameter change, forced output, and operation status change) to the programmable controller in operation. Improper operation may damage machines or cause accidents.
- Do not send safety-related data. Note that the data may not be sent due to factors such as power off of the programmable controller during data transmission.

[Disposal Precautions]

⚠CAUTION

- When disposing of this product, treat it as industrial waste.
- When disposing of batteries, separate them from other waste according to local regulations. (For details on the Battery Directive in EU countries, refer to the user's manual (Hardware) of the CPU module used.)

[Transportation Precautions]

⚠CAUTION

- When transporting the programmable controller with the optional battery, turn on the programmable controller before shipment, confirm that the battery mode is set using a parameter and the BAT LED is off, and check the battery life. If the programmable controller is transported with the BAT LED ON or the battery exhausted, the battery-backed data may be unstable during transportation.
- The programmable controller is a precision instrument. During transportation, avoid impacts larger than those specified in the general specifications by using dedicated packaging boxes and shock-absorbing palettes. Failure to do so may cause failures in the programmable controller. After transportation, verify operation of the programmable controller and check for damage of the mounting part, etc. For details on the general specifications, refer to the user's manual (Hardware) of the CPU module used.
- When transporting lithium batteries, follow required transportation regulations. (For details on the regulated products, refer to the user's manual (Hardware) of the CPU module used.)
- 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-F series programmable controllers.
This manual describes the functions and programming of the relevant products listed below. Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the MELSEC iQ-F series programmable controller to handle the product correctly.
When applying the program examples provided in this manual to an actual system, ensure the applicability and confirm that it will not cause system control problems.
Please make sure that the end users read this manual.

Relevant products

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

Point

Symbols used in this manual are shown below.
A serial No. is inserted in the "**" mark.

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

Regarding use of this product

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

Note

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

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RELEVANT MANUALS

The following manuals are relevant to this product.

Manual name [manual number]	Description
MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application) [IB-0300253ENG] (This manual)	Functions, input/output signals, buffer memories, parameter settings, programming, and troubleshooting of the Motion module/Simple Motion module
MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Startup) [IB-0300251ENG]	Specifications, procedures before operation, system configuration, wiring, and operation examples of the Motion module/Simple Motion module
MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control) [IB-0300255ENG]	Functions and programming for the synchronous control of the Motion module/ Simple Motion module
MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN) [IB-0300568ENG]	Functions, parameter settings, troubleshooting, and buffer memories of the CC-Link IE TSN network
MELSEC iQ-F FX5 Motion Module/Simple Motion Module Function Block Reference [BCN-B62005-719]	Specifications, functions, and input/output labels of function blocks for the Motion module/Simple Motion module

This manual does not include detailed information on the following:

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

For details, refer to the following.

MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware)

TERMS

Unless otherwise specified, this manual uses the following terms.

Term	Description
4-axis module	Another term for FX5-40SSC-S and FX5-40SSC-G.
8-axis module	Another term for FX5-80SSC-S and FX5-80SSC-G.
Axis	A target for motion control.
Buffer memory	A memory in an intelligent function module, where data (such as setting values and monitoring values) are stored.
CANopen	An open network whose standards are promoted by the non-profit organization CiA. An application layer is defined in which communication profiles and device profiles are defined, and this application layer is applied to the CC-Link IE TSN CAN application protocol.
CC-Link	One of the field-based networks that can handle control and information at the same time.
CC-Link IE Controller Network	One of the control system networks. A backbone network that supports large-scale distributed controller control and bundles field and motion networks.
CC-Link IE Field Basic Network	A network that achieves cyclic transmission by software. Applicable to small-scale equipment that does not require high-speed control.
CC-Link IE Field Network	A high speed and large capacity open field network that is based on Ethernet (1000BASE-T).
CC-Link IE TSN	An open network that uses “TSN (Time-Sensitive Networking)”, which is an extension of the Ethernet standard, to ensure real-time control and handle information from other open networks simultaneously.
CC-Link IE TSN Class	A group of devices and industrial switches with CC-Link IE TSN, classified according to the functions and performance by the CC-Link Partner Association. For CC-Link IE TSN Class, refer to the CC-Link IE TSN Installation Manual (BAP-C3007ENG-001) published by the CC-Link Partner Association.
CC-Link IE TSN Protocol version 2.0	In addition to the time sharing method using IEEE802.1AS for time synchronization, this protocol communicates using the time managed polling method.
Command generation axis	An axis that performs only command generation. "Command generation axis" is not included in the number of controlled axes of the controller.
Communication cycle	Cyclic transmission communication cycle of the cyclic master.
Cyclic transmission	A function by which data is periodically exchanged among stations on the network.
Dedicated instruction	An instruction for using functions of the module.
Device	Various types of memory in a module. Some devices are handled in units of bits and some in units of words.
Disconnection	A process of stopping data link if a data link error occurs.
Extension module	CC-Link IE Remote module without TSN network communication function. In the case of a multi-axis servo amplifier, axes other than axis A are extension modules.
Feedback speed	Feedback values from a device station in a real axis converted to the axis unit system.
Field network	Network used to efficiently control various sensors and drive systems with less wiring in the factory automation field.
Gateway	In general, protocol conversion is required to connect networks that differ from each other due to differences in signaling methods and functions. This function bridges these different networks to enable mutual communication.
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 label: a module specific label (module label), which is generated automatically by GX Works3, and an optional label, which can be created for any specified device.
Grandmaster	A source device or station to synchronize clocks in the time synchronization via PTP (Precision Time Protocol).
GX Works3	The product name of the software package for the MELSEC programmable controllers.
IEEE802.1AS	A protocol for high accuracy time/timing synchronization.
Intelligent device station	A station that exchanges I/O signals (bit data) and I/O data (word data) with another station by cyclic transmission on CC-Link IE Field Network. This station can perform transient 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 module that has functions other than input and output, such as an A/D converter module and D/A converter module.
Label	A variable used in a program.
Link dedicated instruction	Dedicated instruction for the programmable controller to send messages to the specified station using transient transmission.
Link device	A device in a module on CC-Link IE TSN.
Link down	Status in which the communication cable is disconnected or not connected, and communication with the destination device is disabled.

Term	Description
Link up	Status in which the cable is connected to the communication port and communication with the destination device is enabled.
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 a network. Only one station exists per network. The transmission range of each station for cyclic transmission is assigned to the master station.
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. From the module used, GX Works3 automatically generates this label, which can be used as a global label in a CPU module.
Motion control station	A device station that exchanges cyclic data by motion control.
Motion network	A network for high performance/functional drive control. (SSCNET, etc.)
MR Configurator2	The product name of the setup software for the servo amplifier.
MR-J3(W)-B	Servo amplifier model MR-J3-_B_(-RJ)/MR-J3W-_B.
MR-J4(W)-B	Servo amplifier model MR-J4-_B_(-RJ)/MR-J4W_-_B.
MR-J5-G	Servo amplifier model MR-J5-_G_(-RJ).
MR-J5D-G	Servo amplifier model MR-J5D_-_G_.
MR-J5W-G	Servo amplifier model MR-J5W-G.
MR-J5(W)-G	Servo amplifier model MR-J5-_G_(-RJ)/MR-J5W_-_G/MR-J5D_-_G_.
MR-JE-B(F)	Servo amplifier model MR-JE-_B(F).
MR-JET-G	Servo amplifier model MR-JET-_G.
Node	Nodal point at the time of the data link.
Object	Various data held by the CANopen-compatible device station.
Object dictionary	In CANopen, various data such as control parameters/command values held by devices are handled as objects consisting of an Index, Sub Index, object name, data type, etc. These sets are called object dictionaries.
PDO mapping	Write operation to the PDO mapping object (RPDO/TPDO) at the device station, which determines the number of PDO allocated to the device and the assignment of objects in the PDO.
Profile	A file that specifies the specific information of a device (model name, model name, etc.) and the information required for installation, operation, and maintenance.
Relay station	A station that relays data link to other station. Link device data of a network module are transferred to another network module via this station. Multiple network modules are connected to one programmable controller.
Remote device station	A station that exchanges I/O signals (bit data) and I/O data (word data) with another station by cyclic transmission.
Remote I/O station	A station that exchanges I/O signals (bit data) with the master station by cyclic transmission on CC-Link IE Field Network.
Remote station	A station that performs bit basis and word basis cyclic and transient transmissions with the master station on CC-Link IE TSN network.
Return	A process of restarting data link when a station recovers from an error.
Safety main module	Different name for FX5-SF-MU4T5.
Servo amplifier axis	A servo amplifier or virtual servo amplifier controlled by a controller. "Servo amplifier axis" is included in the number of controlled axes of the controller.
SSCNETⅢ/H*1	High speed synchronous communication network between Simple Motion module and servo amplifier.
SSCNETⅢ*1	
Station	Each of the nodes connected to the network is called a station.
Station No.	Each station is numbered and this number is called the station No.
Time sharing	A method in which a communication line is divided into fixed time intervals and different data is sent and received at each interval.
Time synchronization	The clocks of each station are synchronized to the clock of the grand master (the clock source station).
Transient transmission	A function of non-periodic data communication among nodes (station) on network. A function used to send messages to the target station when requested by a link dedicated instruction or the engineering tool. Communication is available with station on another network via relay station, or gateway.

*1 SSCNET: Servo System Controller NETwork

GENERIC TERMS AND ABBREVIATIONS

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

Generic term/abbreviation	Description
CC-Link IE	A generic term for CC-Link IE Field Network, CC-Link IE Controller Network, CC-Link IE Field Basic Network, and CC-Link IE TSN network.
CPU module	An abbreviation for the MELSEC iQ-F series CPU module.
Data link	A generic term for a cyclic transmission and a transient transmission.
Devices compatible with CC-Link IE TSN	A generic term for devices certified as CC-Link IE TSN Class A or CC-Link IE TSN Class B by CC-Link Partner Association.
Device station	A generic term for a local station and remote station on CC-Link IE TSN.
Drive unit	A generic term for motor drive devices such as a servo amplifier.
Engineering tool	A generic term for GX Works3 and MR Configurator2.
FB	An abbreviation for function blocks. A graphical programming language for programmable controllers that is one of the five languages defined in the IEC 61131-3 standard.
FX5-SSC-G	A generic term for the FX5-40SSC-G and FX5-80SSC-G Motion module.
FX5-SSC-S	A generic term for the FX5-40SSC-S and FX5-80SSC-S Simple Motion module.
GOT	An abbreviation for Graphic Operation Terminal. A display device for industrial (FA) equipment.
Intelligent module	The abbreviation for the intelligent function module.
I/O module	A generic term for the I/O modules (extension cable type) and I/O modules (extension connector type).
Manual pulse generator	An abbreviation for a (user-arranged) manual pulse generator.
Motion module	An abbreviation for the MELSEC iQ-F series Motion module.
Network module	A generic term for the following modules: • Ethernet interface module • Module on CC-Link IE TSN (the Motion module and a module on a remote station) • CC-Link IE Controller Network module • Module on CC-Link IE Field Network (a master/local module, and a module on a remote I/O station, a remote device station, and an intelligent device station) • MELSECNET/H network module • MELSECNET/10 network module
PDO	An abbreviation for Process Data Object. A collection of the application objects transmitted periodically between multiple CANopen nodes.
PTP	An abbreviation for Precision Time Protocol. A predefined protocol for time synchronization between devices on a network.
RWr	An abbreviation for a remote register of the link device. This refers to 16-bit (1-word) data input from a device station to the master station. (Not applicable for some local stations.)
RWw	An abbreviation for a remote register of the link device. This refers to 16-bit (1-word) data output from the master station to a device station. (Not applicable for some local stations.)
RX	An abbreviation for remote input of the link device. This refers to bit data input from a device station to the master station. (Not applicable for some local stations.)
RY	An abbreviation for remote output of the link device. This refers to bit data output from the master station to a device station. (Not applicable for some local stations.)
Safety expansion module	A generic term for expansion modules installed to a safety main module.
Safety extension module	A generic term for safety main modules and safety expansion modules.
SDO	An abbreviation for Service Data Object. A message used to access the object entries inside the object dictionary of an optional CANopen node. Used for non-periodic transmission between stations.
Servo network	A generic term for the network between the Simple Motion module/Motion module and drive units. • SSCNETⅢ/H, SSCNETⅢ • CC-Link IE TSN
Simple Motion module	An abbreviation for the MELSEC iQ-F series Simple Motion module.
SLMP	An abbreviation for Seamless Message Protocol. This protocol enables seamless communication between Ethernet and CC-Link or CC-Link IE networks.
SLMPSND	A generic term for the J.SLMPSND, JP.SLMPSND, G.SLMPSND, and GP.SLMPSND.
SSCNETⅢ(/H)	A generic term for SSCNETⅢ/H, SSCNETⅢ.

1 START AND STOP

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

1.1 Start

The Simple Motion module/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 "[Cd.184] Positioning start". • 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.

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

- Normal start (☞ Page 142 Block start)
- Multiple axes simultaneous start (☞ Page 28 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

↓

"[Cd.190] PLC READY" ON

↓

"[Cd.191] All axis servo ON" 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

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

• Signal state

Signal name		Signal state		Device
I/O signal	PLC READY signal	ON	CPU module preparation completed	[Cd.190] PLC READY
	READY signal	ON	Preparation completed	[Md.140] Module status: b0
	All axis servo ON	ON	All axis servo ON	[Cd.191] All axis servo ON
	Synchronization flag	ON	The buffer memory can be accessed.	[Md.140] Module status: b1
	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	[Md.141] BUSY
	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	—

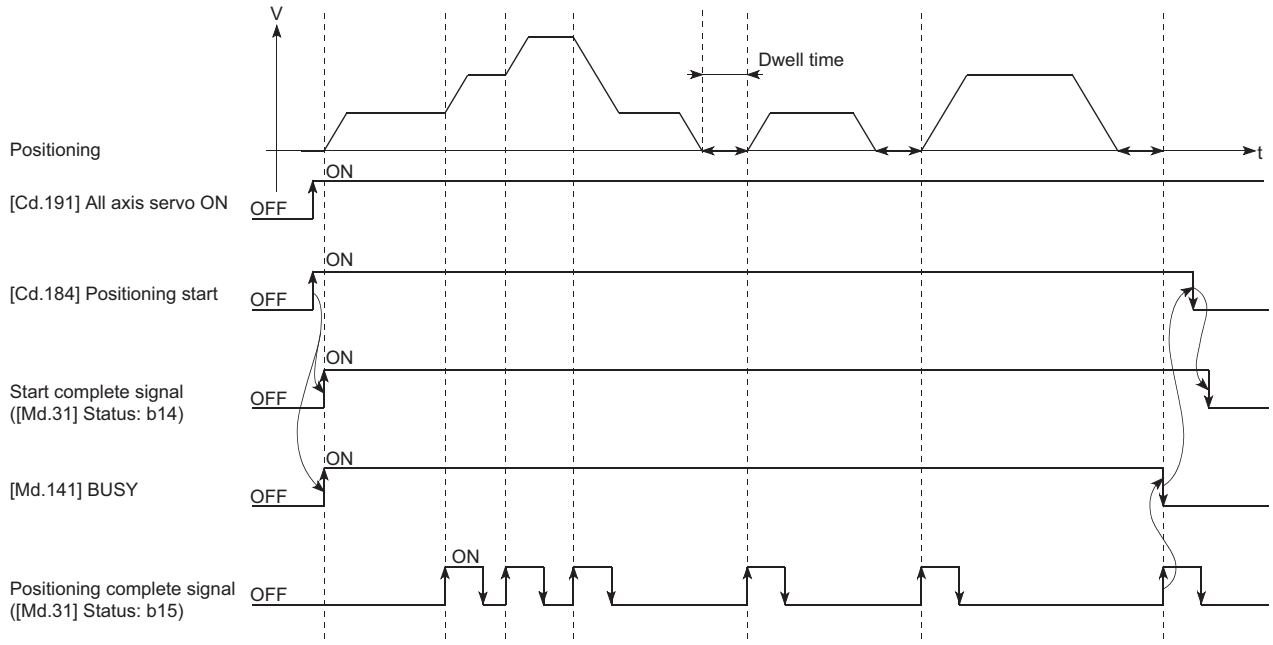
Start by the positioning start [Cd.184]

The operation at starting by the "[Cd.184] Positioning start" is shown below.

- When the "[Cd.184] Positioning start" turns ON, the start complete signal ([Md.31] Status: b14) and "[Md.141] BUSY" turn ON, and the positioning operation starts. It can be seen that the axis is operating when the "[Md.141] BUSY" is ON.
- When the "[Cd.184] Positioning start" turns OFF, the start complete signal ([Md.31] Status: b14) also turns OFF. If the "[Cd.184] Positioning start" 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 "[Md.141] BUSY" is ON, the warning "Start during operation" (warning code: 0900H [FX5-SSC-S], or warning code: 0D00H [FX5-SSC-G])" 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 "[Md.141] BUSY" 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



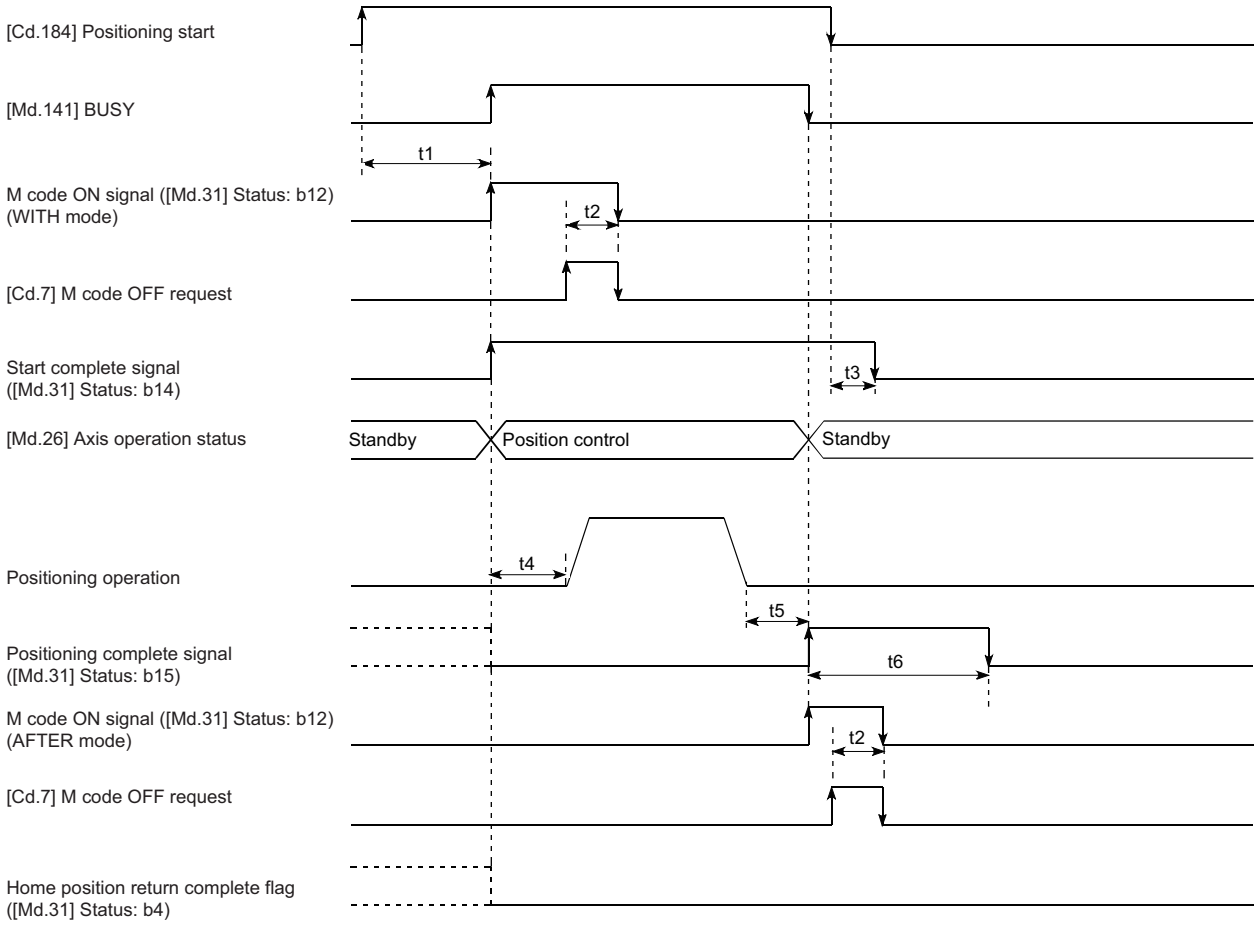
Point

The "[Md.141] BUSY" 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])

Operation cycle		t1*1	t2	t3	t4*2	t5	t6
FX5-SSC-S	0.888	0.3 to 1.4	0 to 0.9	0 to 0.9	3.71 to 4.59	0 to 0.9	Follows parameters
	1.777	0.3 to 1.4	0 to 1.8	0 to 1.8	4.57 to 6.28	0 to 1.8	Follows parameters
FX5-SSC-G	0.500	0.4 to 1.0	0 to 0.5	0 to 0.5	1.8 to 2.0	0 to 0.5	Follows parameters
	1.000	0.4 to 1.5	0 to 1.0	0 to 1.0	3.3 to 3.5	0 to 1.0	Follows parameters
	2.000	0.4 to 2.8	0 to 2.0	0 to 2.0	6.0 to 6.4	0 to 2.0	Follows parameters
	4.000	0.4 to 4.5	0 to 4.0	0 to 4.0	12.0 to 12.2	0 to 4.0	Follows parameters

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

*2 The t4 timing time depends on the setting of the acceleration time, servo parameter, etc.

Start by the external command signal (DI)

[FX5-SSC-S]

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.

[FX5-SSC-G]

When starting positioning control by inputting the external command signal (DI), the start command from the drive unit can be directly input into the Motion module.

■Advance setting

Set the following data in advance.

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
[Pr.95]	External command signal selection	0	Set the external command signal (DI) to be used.	69+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 444 Basic Setting

■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

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

Refer to the following for the setting details.

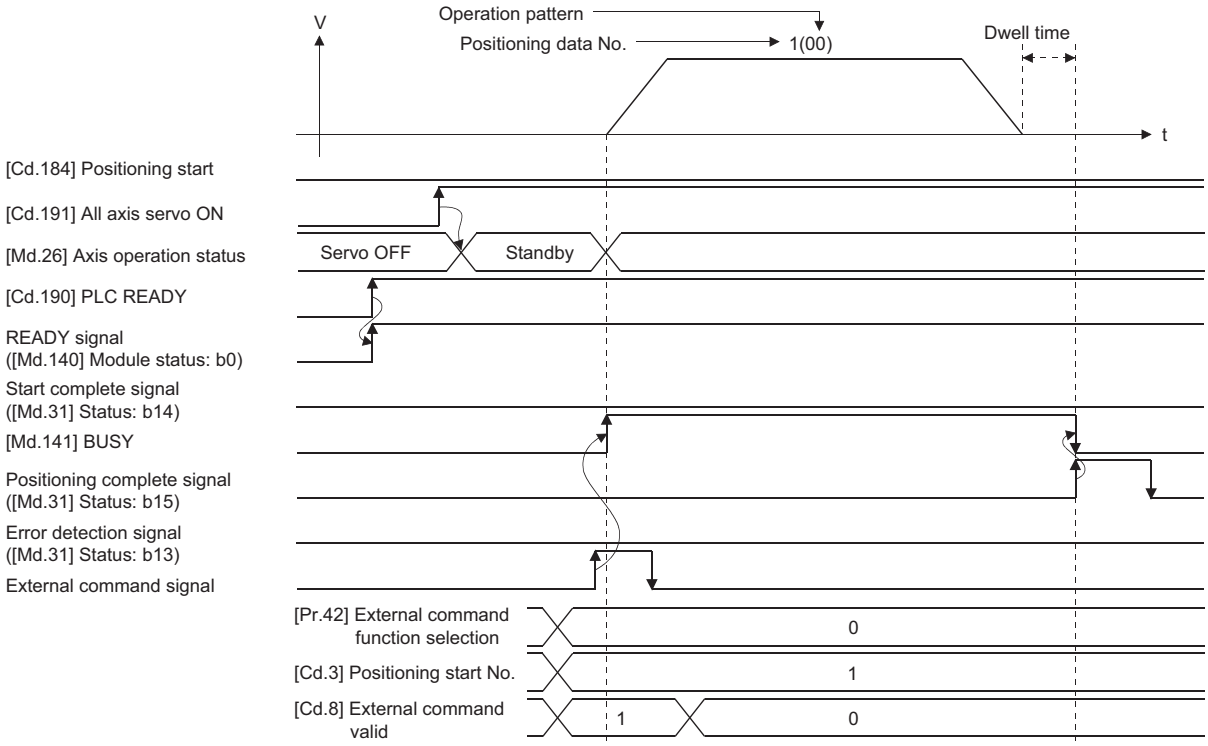
☞ Page 559 Control Data

■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 [FX5-SSC-S], or error code: 1A90H [FX5-SSC-G]) will occur and all simultaneously started axes will not start if the simultaneously started 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 [FX5-SSC-S], or error code: 1A90H [FX5-SSC-G]) will occur and all simultaneously started axes will not start if either of the simultaneously started axes is BUSY.
- The error "Error before simultaneous start" (error code: 1990H [FX5-SSC-S], or error code: 1A90H [FX5-SSC-G]) will occur and all simultaneously started axes will not start if an error occurs during the analysis of the positioning data on the simultaneously started axes.
- No error or warning will occur if only the start axis is the simultaneously started axis.
- This function cannot be used with the sub function ☞ Page 276 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

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

Refer to the following for the setting details.

☞ Page 559 Control Data

Setting examples

The following shows the setting examples in which the axis 1 is used as the start axis and the axis 2 and axis 4 are used as the simultaneously started axes.

Setting item		Setting value	Setting details	Buffer memory address (Axis 1)
[Cd.3]	Positioning start No.	9004	Set the multiple axes simultaneous start control start No. "9004".	4300
[Cd.43]	Simultaneous starting axis	03000301H	Set the axis 2 (01H) to the simultaneously starting axis No.1, and the axis 4 (03H) to the simultaneously starting axis No.2.	4368, 4369
[Cd.30]	Simultaneous starting own axis start data No.	100	The axis 1 starts the positioning data No.100.	4340
[Cd.31]	Simultaneous starting axis start data No.1	200	Immediately after the start of the axis 1, the axis 2 starts the axis 2 positioning data No.200.	4341
[Cd.32]	Simultaneous starting axis start data No.2	300	Immediately after the start of the axis 1, the axis 4 starts the axis 4 positioning data No.300.	4342
[Cd.33]	Simultaneous starting axis start data No.3	0	Will not start simultaneously.	4343

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 "[Cd.190] PLC READY" is turned OFF
- When an error occurs in Simple Motion module/Motion module
- When control is intentionally stopped (Stop signal from CPU module turned ON.)

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 186 Speed-torque Control

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/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
	"[Cd.190] PLC READY" 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)

*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: 1A12H [FX5-SSC-S], or error code: 1B12H [FX5-SSC-G])
Outside linear movement amount range (error code: 1A15H [FX5-SSC-S], or error code: 1B15H [FX5-SSC-G])
Large arc error deviation (error code: 1A17H [FX5-SSC-S], or error code: 1B17H [FX5-SSC-G])
Software stroke limit + (error code: 1A18H [FX5-SSC-S], or error code: 1B18H [FX5-SSC-G])
Software stroke limit - (error code: 1A1AH [FX5-SSC-S], or error code: 1B1AH [FX5-SSC-G])
Sub point setting error (error code: 1A27H [FX5-SSC-S], or error code: 1B27H [FX5-SSC-G])
End point setting error (error code: 1A2BH [FX5-SSC-S], or error code: 1B2BH [FX5-SSC-G])
Center point setting error (error code: 1A2DH [FX5-SSC-S], or error code: 1B2DH [FX5-SSC-G])
Outside radius range (error code: 1A32H [FX5-SSC-S], or error code: 1B32H [FX5-SSC-G])
Illegal setting of ABS direction in unit of degree (error code: 19A4H [FX5-SSC-S], or error code: 1AA4H [FX5-SSC-G])

*2 For the stop signal, it is recommended to perform control while checking the axis is BUSY condition, such as by using the BUSY signal being ON as an interlock. Depending on the timing, the occurrence of "Stop signal ON at start" (error code: 1908H [FX5-SSC-S], or error code: 1A08H [FX5-SSC-G]) can be prevented.

Stop cause		Stop process					
		Home position return control		Major positioning control	High-level positioning control	Manual control	
		Machine home position return control[*3]	Fast home position return control			JOG/ Inching operation	Manual pulse generator operation
Forced stop	Forced stop input to Simple Motion module/Motion module	Immediate stop For the stop method of the servo amplifier, refer to each servo amplifier manual and instruction manual.					—
	Servo READY OFF • Servo amplifier power supply OFF						
	• Servo alarm						
	• Forced stop input to servo amplifier						
Fatal stop (Stop group 1)	Hardware stroke limit upper/lower limit error occurrence	Deceleration stop/rapid stop (Select with "[Pr.37] Stop group 1 sudden stop selection".)					Deceleration stop
Emergency stop (Stop group 2)	Error occurs in a CPU module	Deceleration stop/rapid stop (Select with "[Pr.38] Stop group 2 sudden stop selection".)					Deceleration stop
	"[Cd.190] PLC READY" OFF						
Relatively safe stop (Stop group 3)	Axis error detection (Error other than stop group 1 or 2)[*1]	Deceleration stop/rapid stop (Select with "[Pr.39] Stop group 3 sudden stop selection".)					Deceleration stop
Intentional stop (Stop group 3)	"Axis stop signal" ON from a CPU module[*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 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: 1A12H [FX5-SSC-S], or error code: 1B12H [FX5-SSC-G])
Outside linear movement amount range (error code: 1A15H [FX5-SSC-S], or error code: 1B15H [FX5-SSC-G])
Large arc error deviation (error code: 1A17H [FX5-SSC-S], or error code: 1B17H [FX5-SSC-G])
Software stroke limit + (error code: 1A18H [FX5-SSC-S], or error code: 1B18H [FX5-SSC-G])
Software stroke limit - (error code: 1A1AH [FX5-SSC-S], or error code: 1B1AH [FX5-SSC-G])
Sub point setting error (error code: 1A27H [FX5-SSC-S], or error code: 1B27H [FX5-SSC-G])
End point setting error (error code: 1A2BH [FX5-SSC-S], or error code: 1B2BH [FX5-SSC-G])
Center point setting error (error code: 1A2DH [FX5-SSC-S], or error code: 1B2DH [FX5-SSC-G])
Outside radius range (error code: 1A32H [FX5-SSC-S], or error code: 1B32H [FX5-SSC-G])
Illegal setting of ABS direction in unit of degree (error code: 19A4H [FX5-SSC-S], or error code: 1AA4H [FX5-SSC-G])

*2 For the stop signal, it is recommended to perform control while checking the axis is BUSY condition, such as by using the BUSY signal being ON as an interlock. Depending on the timing, the occurrence of "Stop signal ON at start" (error code: 1908H [FX5-SSC-S], or error code: 1A08H [FX5-SSC-G]) can be prevented.

*3 [FX5-SSC-G]
When using the driver homing method, the stop processing follows the specifications of the servo amplifier.
For details, refer to the manual of the servo amplifier to use.
When using MR-J5(W)-G: MR-J5 User's Manual (Function)

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]).

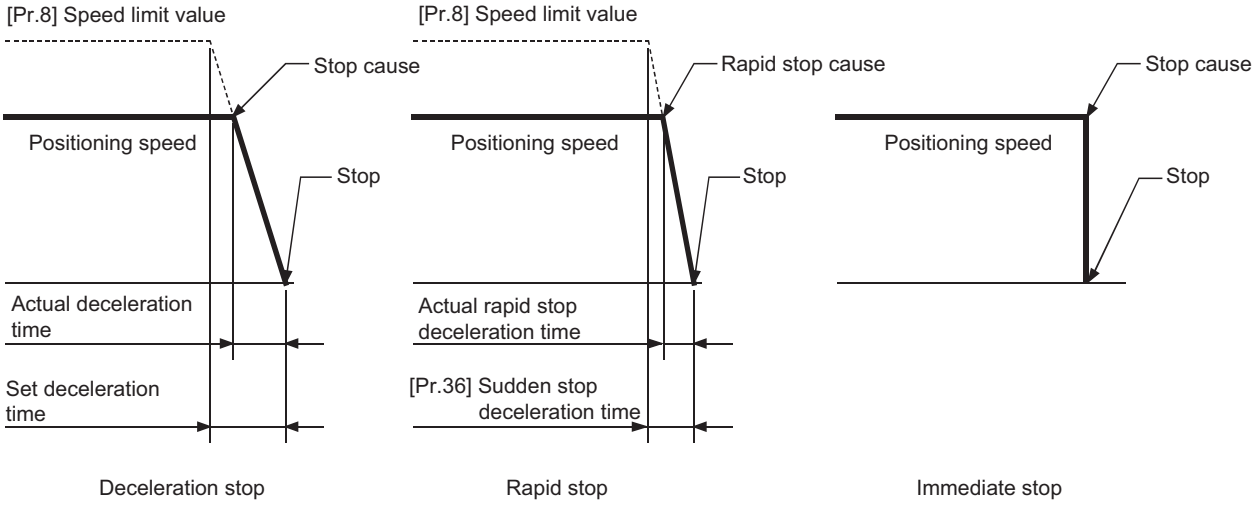
■Rapid stop

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

■Immediate stop

The operation does not decelerate.

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



Deceleration stop　　Rapid stop　　Immediate stop

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/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 281 Stop command processing for deceleration stop function)

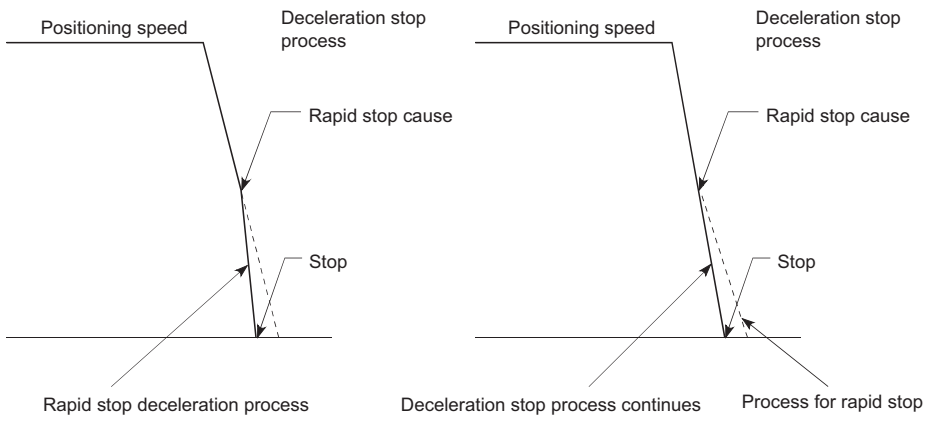
Positioning control during deceleration	Setting value of [Cd.42]	Processing details
Manual control	—	Independently of the [Cd.42] setting, a deceleration curve is re-processed from the speed at stop cause occurrence.
Home position return control*1, positioning control	0: Deceleration curve re-processing	A deceleration curve is re-processed from the speed at stop cause occurrence. (☞ Page 281 Deceleration curve re-processing)
	1: Deceleration curve continuation	The current deceleration curve is continued after stop cause occurrence. (☞ Page 281 Deceleration curve continuation)

*1 [FX5-SSC-G]
When using the driver homing method, the stop processing follows the specifications of the servo amplifier.
For details, refer to the manual of the servo amplifier to use.
When using MR-J5(W)-G: 📖MR-J5 User's Manual (Function)

- 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 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.

[FX5-SSC-S]

- 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.

[FX5-SSC-G]

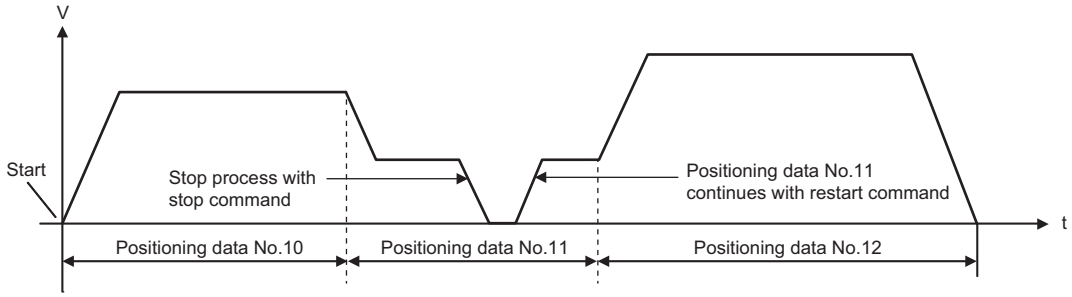
- If stop is input during deceleration for home position return, the operation will stop at that deceleration speed. When using the driver homing method, the stop processing follows the specifications of the servo amplifier. For details, refer to the manual of the servo amplifier to use.
  When using MR-J5(W)-G: 📖MR-J5 User's Manual (Function)

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 [FX5-SSC-S], or warning code: 0D02H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code: 1A08H [FX5-SSC-G]) 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 [FX5-SSC-S], or warning code: 0D02H [FX5-SSC-G]) will occur.
- When stopped with interpolation operation, write "1: Restarts" into "[Cd.6] Restart command" for the reference axis, and then restart.
- If the "[Cd.190] PLC READY" is changed from OFF to ON while stopped, restarting is not possible. If restart is requested, the warning "Restart not possible" (warning code: 0902H [FX5-SSC-S], or warning code: 0D02H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code: 1A46H [FX5-SSC-G]) will occur and the positioning cannot restart.
- If any of reference partner axes executes the positioning operation once after interpolation operation stop, the warning "Restart not possible" (warning code: 0902H [FX5-SSC-S], or warning code: 0D02H [FX5-SSC-G]) will occur, and the positioning cannot restart.

Setting method

Set the following data to execute restart.

n: Axis No. - 1

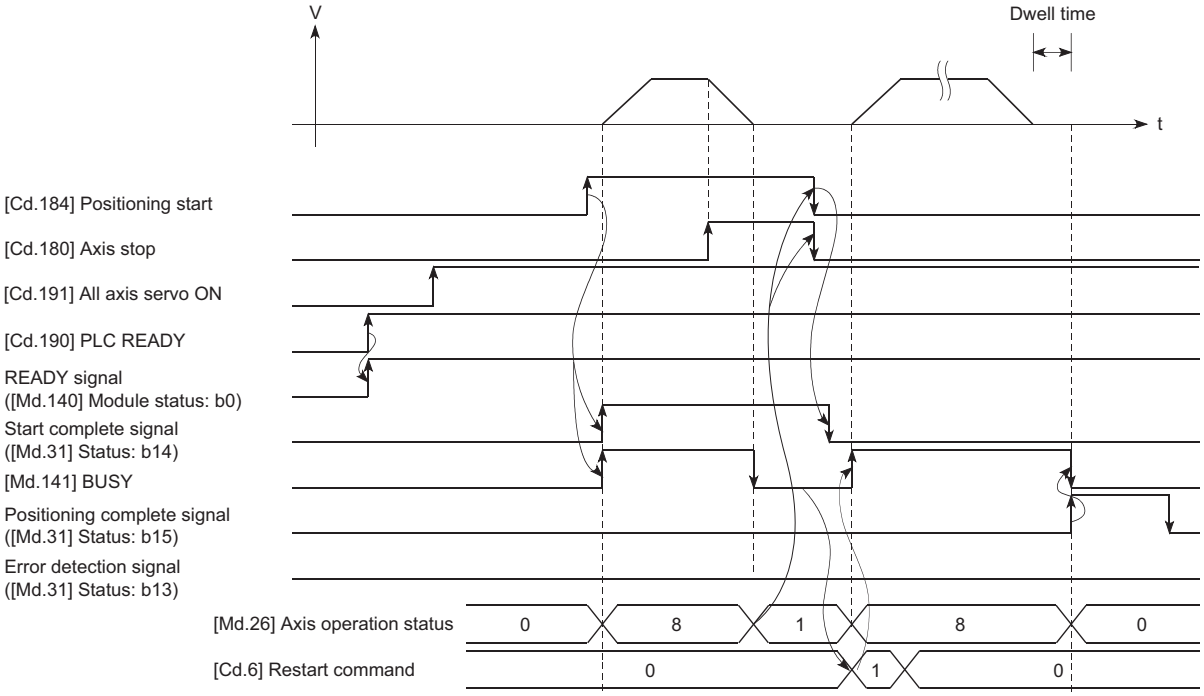
Setting item		Setting value	Setting details	Buffer memory address
[Cd.6]	Restart command	1	Set "1: Restarts".	4303+100n

Refer to the following for the setting details.

☞ Page 559 Control Data

Time chart for restarting

■Operation example



Program example

Refer to the following for the program example of restart.

☞ Page 635 Restart program [FX5-SSC-S]

☞ Page 713 Restart program [FX5-SSC-G]

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 point (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/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/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/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 current value monitor of the Simple Motion module/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/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/Motion module, and a machine home position return must be executed in the following cases.

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.)

[FX5-SSC-G]

  - When "Electronic gear numerator (PA06)", "Electronic gear denominator (PA07)", "Linear encoder resolution setting - Numerator (PL02)", or "Linear encoder resolution setting - Denominator (PL03)" of the servo amplifier is changed
  - When the object "HomeOffset (607CH)" of drive unit is changed

- 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/Motion module is erased due to a memory error, etc. (occurrence of the warning "Home position return data incorrect" (warning code: 093CH [FX5-SSC-S], or warning code: 0D3CH [FX5-SSC-G]))
  - When the "Rotation direction selection/travel direction selection (PA14)" [FX5-SSC-S], or "Travel direction selection (PA14)" [FX5-SSC-G] of servo parameter is changed.
  - The servo alarm "Absolute position erased" (alarm No.: 25) occurs. ([Md.108] Servo status1: b14 ON) (☞ Page 426 Axis monitor data)
  - The servo warning "Absolute position counter warning" (warning No.: E3) occurs. ([Md.108] Servo status1: b14 ON) (☞ Page 426 Axis monitor data)

  [FX5-SSC-G]

  - When "Electronic gear numerator (PA06)", "Electronic gear denominator (PA07)", "Linear encoder resolution setting - Numerator (PL02)", or "Linear encoder resolution setting - Denominator (PL03)" of the servo amplifier is changed
  - When the object "HomeOffset (607CH)" of drive unit is changed
  - When a change of the servo amplifier or motor encoder is detected
  - When connecting a virtual servo amplifier, MR-J5(W)-G was not the servo amplifier connected at the previous home position establishment

- 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.

[FX5-SSC-S]

Refer to the following for how to set the input logic of the proximity dog signal.

☞ Page 323 Input logic setting method for external input signals

■External input signal of the servo amplifier

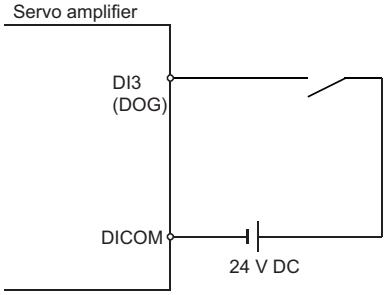
Refer to the servo amplifier manual and instruction manual for details on signal input availability and wiring.

[FX5-SSC-S]

Wire the MR-J3/MR-J4 series servo amplifier as shown in the following drawing. As for the 24 V DC power supply, the polarity of current can be switched.

Ex.

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



[FX5-SSC-G]

Refer to the following for settings of servo parameters when using the external input signal.

☞ Page 321 External Input Signal Select Function

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

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

■Link device [FX5-SSC-G]

Refer to the manual of the device station to be used for wiring.

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

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

☞ Page 218 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 220 Home position return retry function [FX5-SSC-S]
Home position shift function	○*1	×	Page 224 Home position shift function [FX5-SSC-S]

*1 [FX5-SSC-G]
If stop is input during deceleration for home position return, the operation will stop at that deceleration speed.
When using the driver homing method, the stop processing follows the specifications of the servo amplifier. For details, refer to the manual of the servo amplifier to use.
When using MR-J5(W)-G: 📖MR-J5 User's Manual (Function)

*2 [FX5-SSC-G]
The Motion module performs the home position return request for the servo amplifier regardless of the proximity dog signal and position of the work. For home position return specifications executed on the servo amplifier side, the relationship between the proximity dog and the work requires the work to be returned to its position prior to the proximity dog.

2.2 Machine Home Position Return

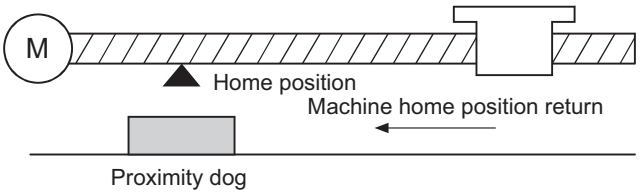
Outline of the machine home position return operation

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/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"

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 41 Machine home position return method to Page 49 Scale origin signal detection method [FX5-SSC-S]

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 [FX5-SSC-G]
Change the setting as necessary by using the servo transient transmission function. For the setting change method, refer to the servo amplifier manual.
MR-J5-G/MR-J5W-G User's Manual (Parameters)

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 manual and instruction 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.)

○: Supported, ×: Not supported

[Pr.43] Home position return method	Operation details	FX5-SSC-S	FX5-SSC-G
Proximity dog method	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	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	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	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	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	[FX5-SSC-S] Refer to the following for details on the driver home position return method. ☞ Page 825 AlphaStep/5-phase stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd. ☞ Page 836 IAI electric actuator controller manufactured by IAI Corporation [FX5-SSC-G] Switches the servo amplifier to the home position return mode and starts the home position return set to the servo amplifier.	○	○

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 [FX5-SSC-S]	◎	◎	○
Count method 1 [FX5-SSC-S]	◎	◎	○
Count method 2 [FX5-SSC-S]	◎	—	○
Data set method [FX5-SSC-S]	—	—	—
Scale origin signal detection method [FX5-SSC-S]	◎	◎	—
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

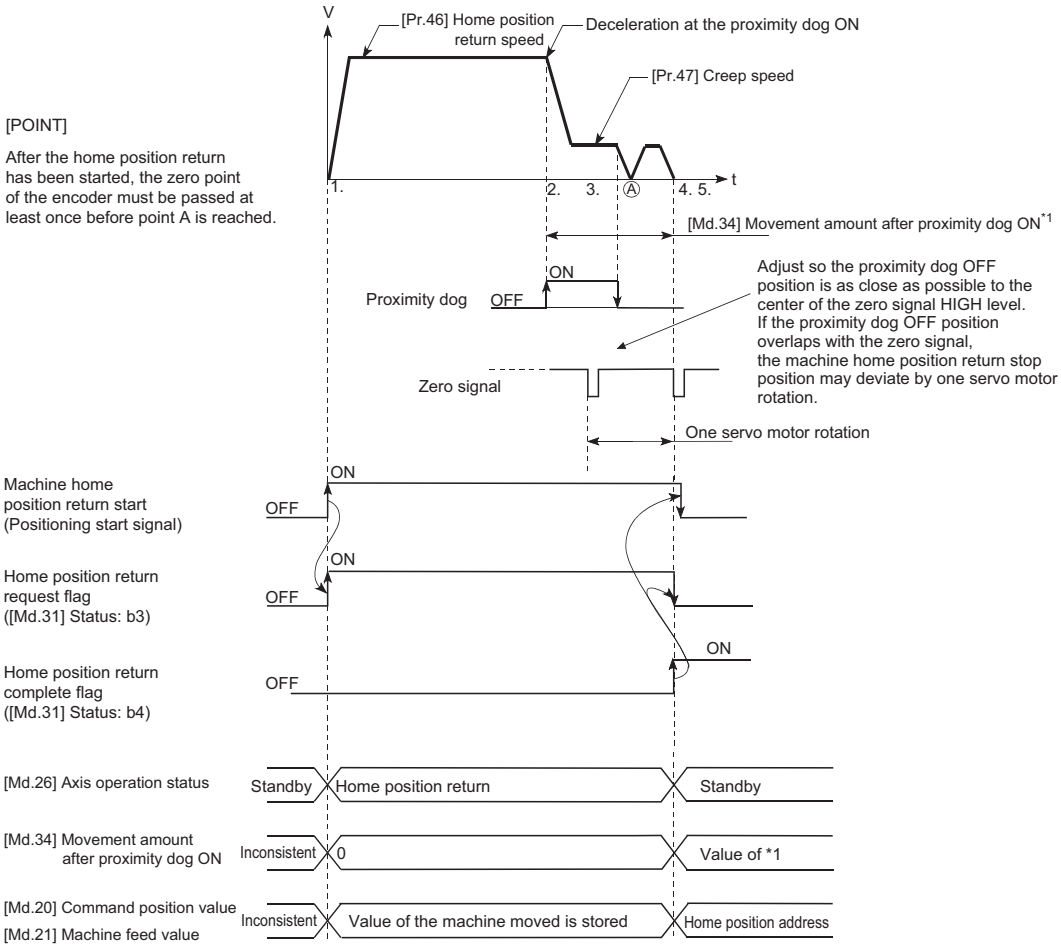
Creep speed

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 [FX5-SSC-S]

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

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.

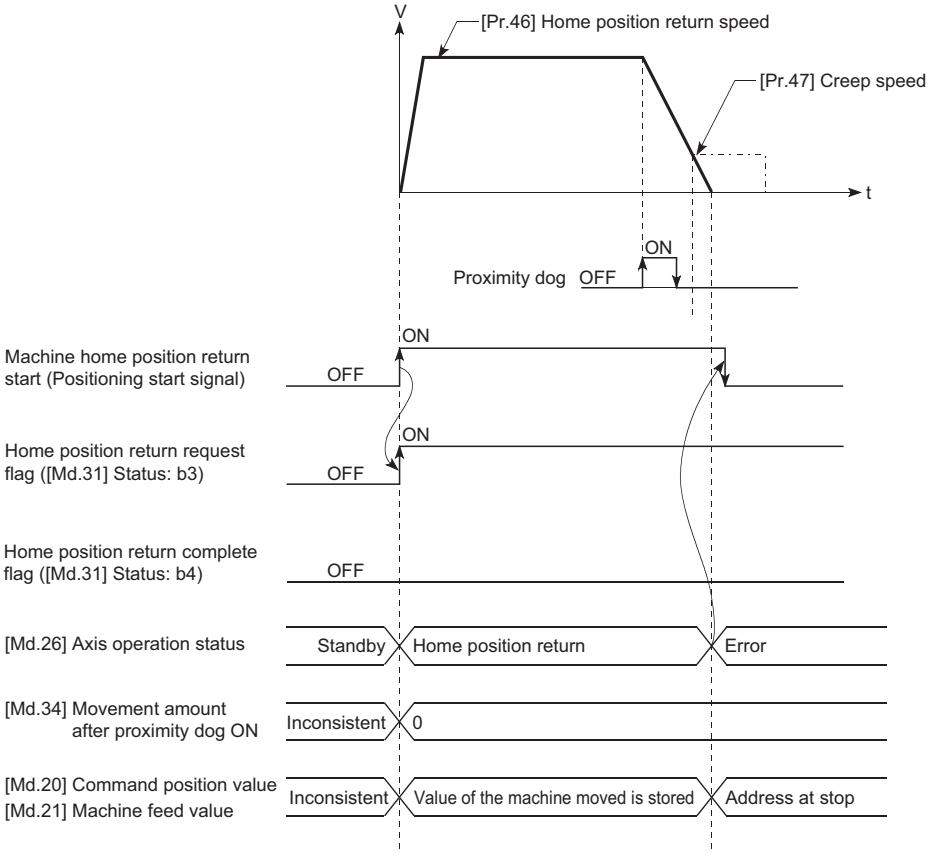
(At this time, the proximity dog must be ON. The workpiece will continue decelerating and stop if the proximity dog is OFF.)

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 [FX5-SSC-S]

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

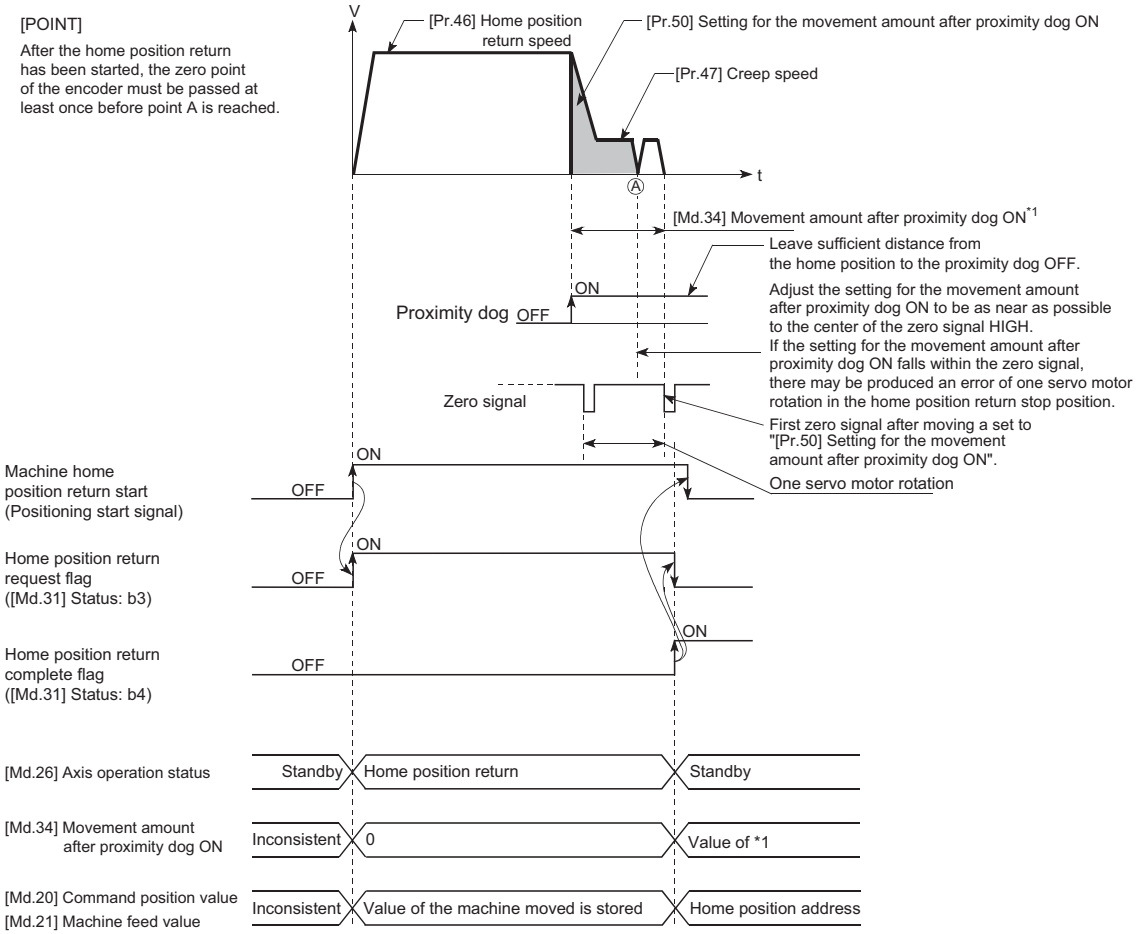
In the home position return for "count method 1", the following are possible:

- Machine home position return with the proximity dog
- Repeating machine home position return 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.

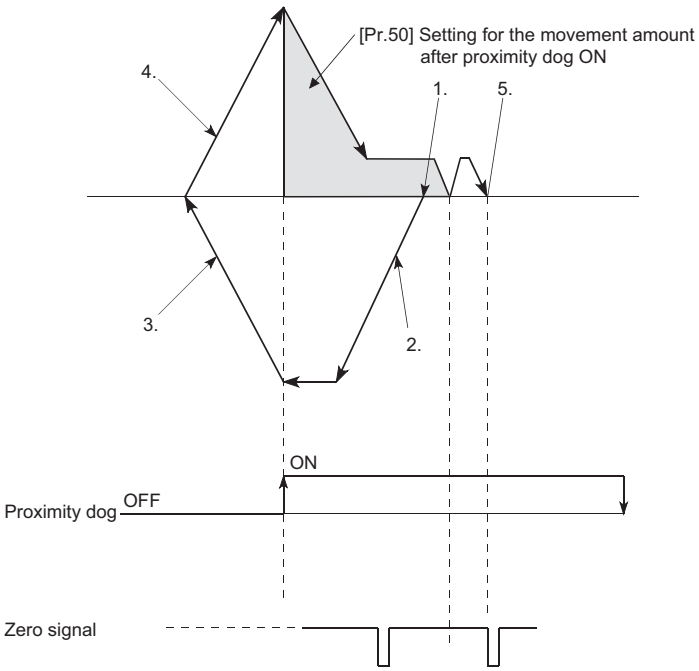
4. The machine stops after the workpiece has been moved the amount set in the "[Pr.50] Setting for the movement amount after proximity dog ON" after the proximity dog turned ON. It then restarts and stops at the first zero point.

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 257 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.

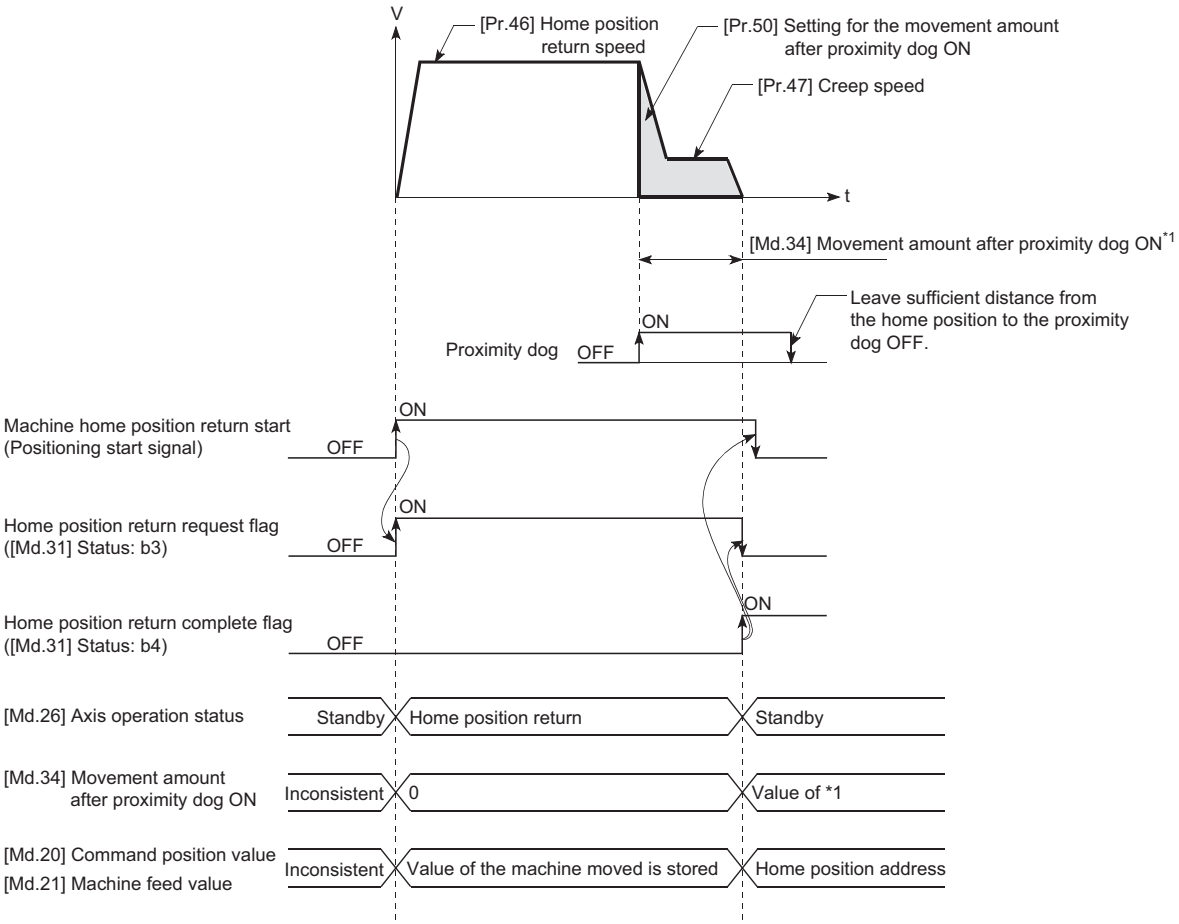
If the machine home position return is performed consecutively after the proximity dog is turned OFF at the time of machine home position return completion, operation will be performed at the home position return speed until the hardware stroke limit (upper/lower limit) is reached. If a sufficient distance 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 [FX5-SSC-S]

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.

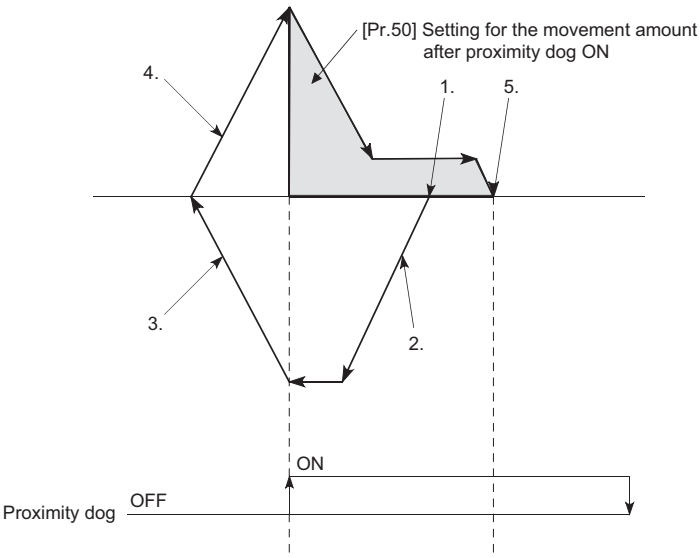
Restrictions

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 of about 1 ms occurs in taking in the proximity dog ON.

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 257 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 [FX5-SSC-S]

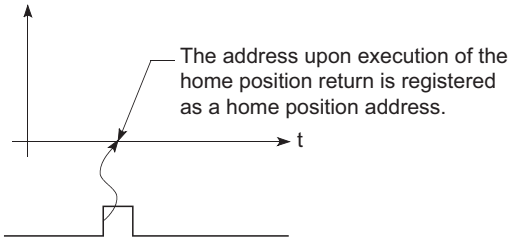
The following shows an operation outline of the home position return method "data set method".

The "Data set method" method is a method in which 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



Home position return start
([Cd.184] Positioning start)

Precautions during operation

- The zero point must be 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 "[Cd.190] PLC READY" is turned ON so that the READY signal ([Md.140] Module status: b0) 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 "[Cd.190] PLC READY" 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".

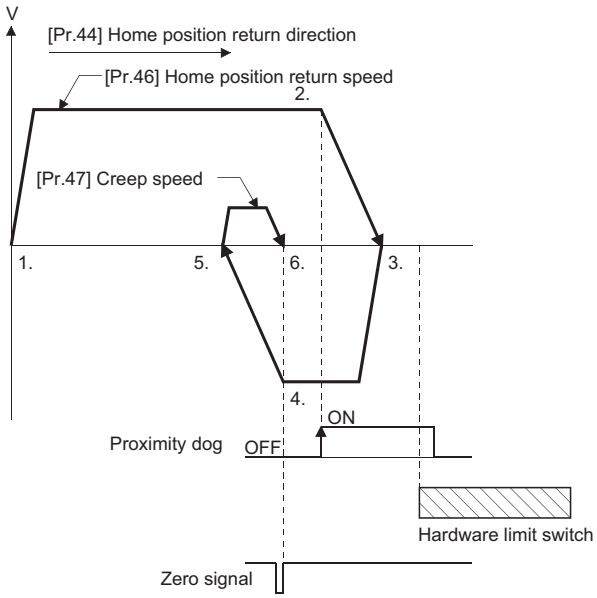
Scale origin signal detection method [FX5-SSC-S]

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.

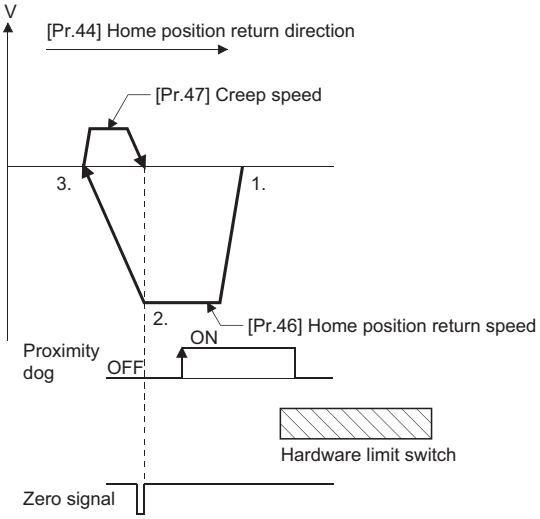
Point

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.

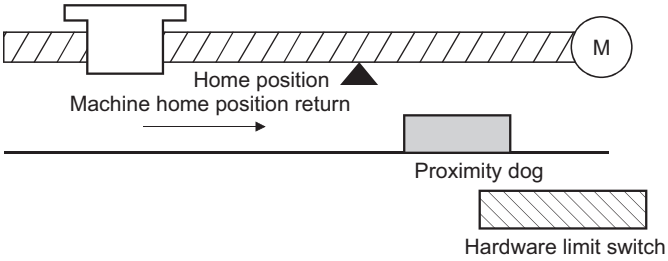
2. The machine begins decelerating when the first zero signal is detected.

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.

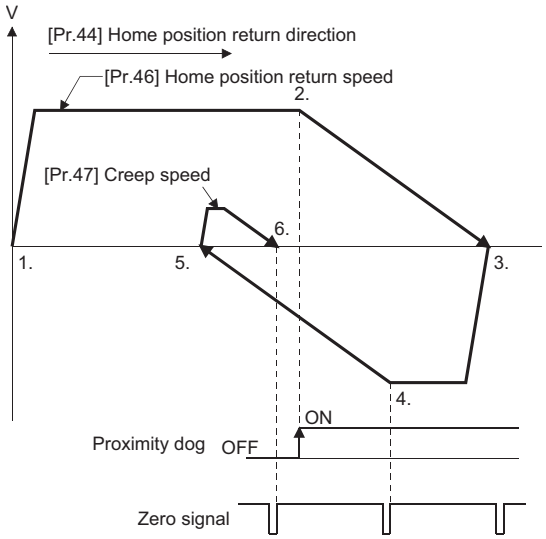
Point

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) or "Hardware stroke limit (-)" (error code: 1906H) 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) or "Hardware stroke limit (-)" (error code: 1906H) 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 49 Scale origin signal detection method [FX5-SSC-S])

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

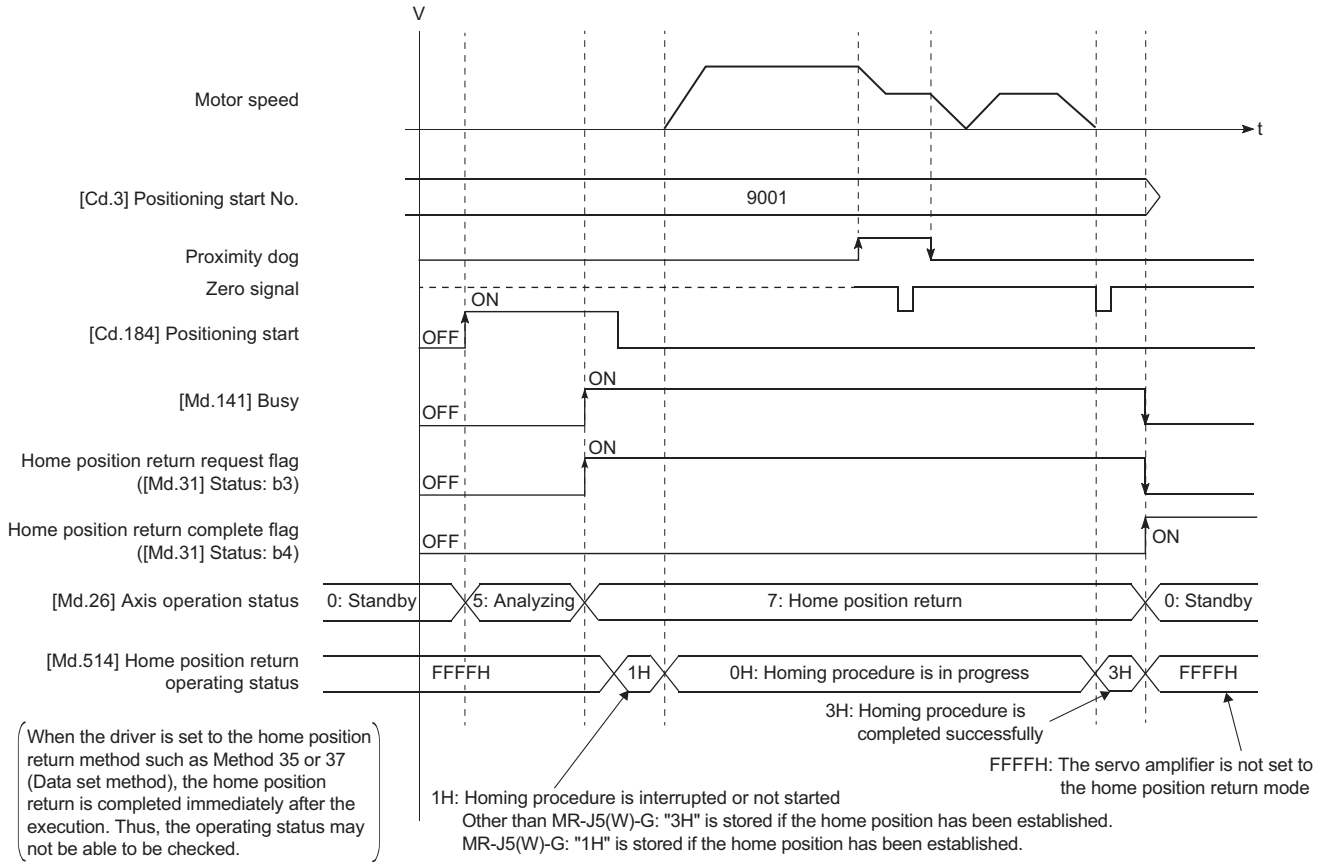
1. The machine home position return is started. (The machine executes the home position return based on the positioning pattern set on the driver side.)
2. The command position value is continuously updated by follow up processing during the home position return.
3. The home position return complete 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.

■Operation chart [FX5-SSC-S]

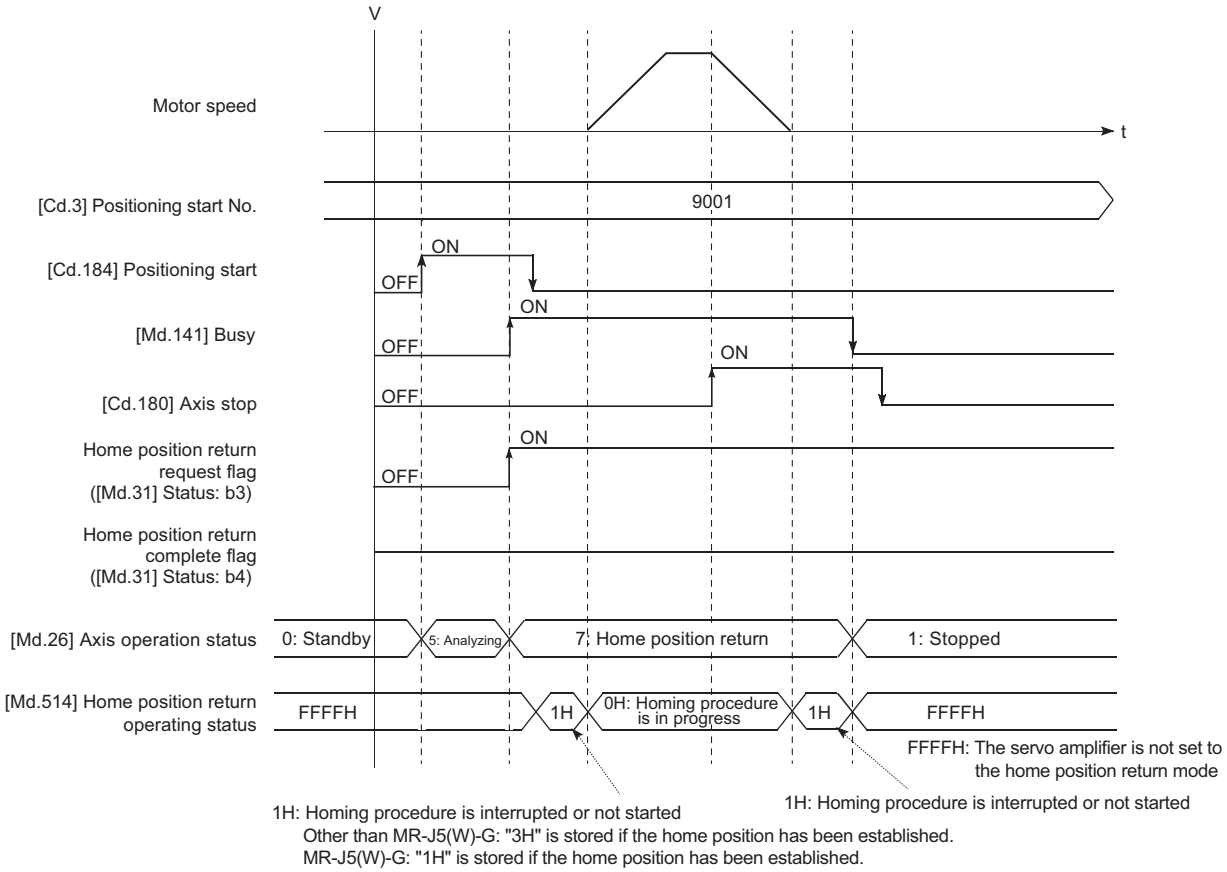
Refer to the following for the operation chart.

☞ Page 825 AlphaStep/5-phase stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd.
☞ Page 836 IAI electric actuator controller manufactured by IAI Corporation

■Operation chart [FX5-SSC-G]



When the machine home position return is stopped



Parameter setting required after the driver home position return method

Refer to the following.

☞ Page 411 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.

[FX5-SSC-G]

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

If Zero speed is not ON ([Md.119] Servo status 2: b3 is not ON) at start for the MR-J5(W)-G, 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".

When home position return starts/completes and the control mode of the servo amplifier does not change within 1 second, the error "Control mode switching error" (error code: 1F04H) occurs.

Axis stop of the driver home position return method [FX5-SSC-G]

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 manual for support information on the HALT signal and forced stop signal.

The MR-J5(W)-G supports the HALT signal.

For MR-J5(W)-G: 📖MR-J5 User's Manual (Function)

Backlash compensation after the driver home position return method

When "[Pr.11] Backlash compensation amount" is set in the Simple Motion module/Motion module, whether the backlash compensation is necessary or not is judged from "[Pr.44] Home position return direction" of the Simple Motion module/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/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/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.

[FX5-SSC-G]

- When home position return is used during synchronous control, the output axis performs the following operations based on the setting of "[Pr.300] Servo input axis type".

[Pr.300] Servo input axis type	Output axis operation during synchronous control
1: Command position value 3: Servo command value	Continues synchronous control after home position return completion.
2: Actual position value 4: Feedback value	Synchronizes with the input axis until home position return completion, following which servo alarm "AL.031.1_Servo motor speed error" or "AL.035.1_Command frequency error" may occur and synchronous control may not be performed.

When "2: Actual position value" or "4: Feedback value" is set in "[Pr.300] Servo input axis type" and the value other than "0" is set in "[Pr.301] Servo input axis smoothing time constant" or "[Pr.303] Servo input axis phase compensation time constant", the warning "Input axis speed display over (warning code: 0E42H)" will occur.

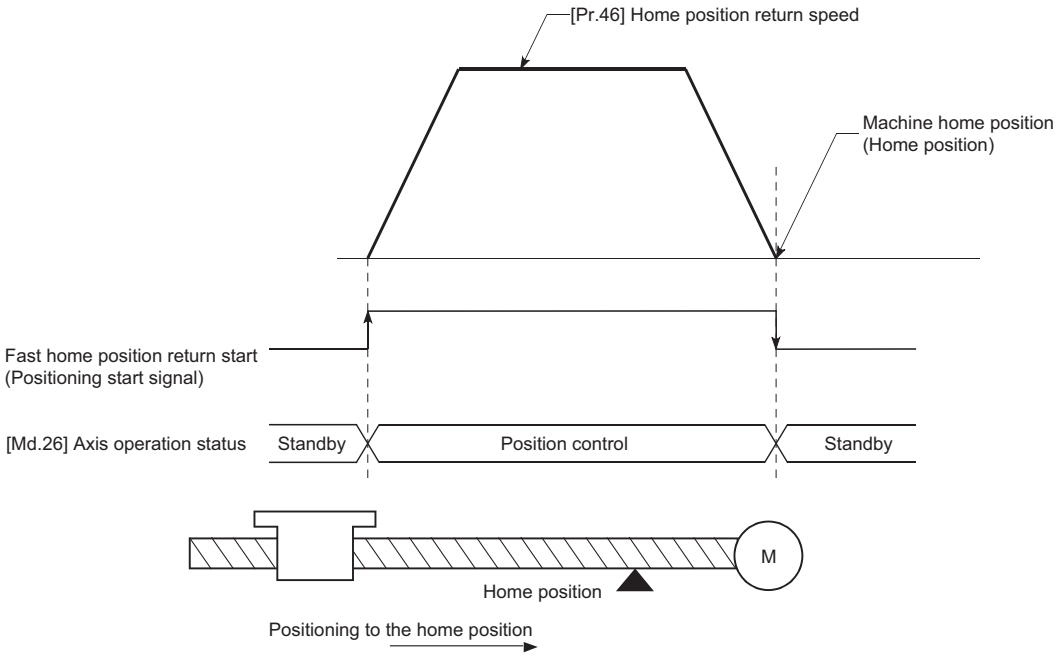
2.3 Fast Home Position Return

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.

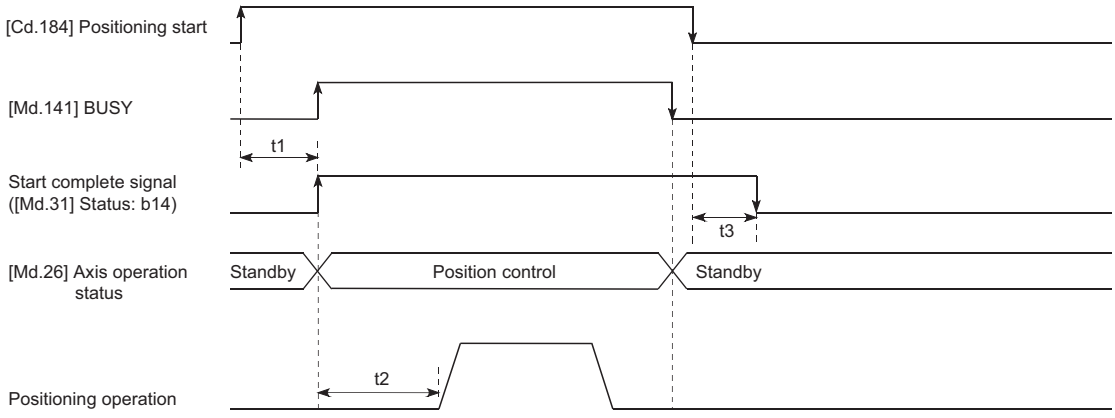


1. The fast home position return is started.
2. Positioning control to the home position established by a machine home position return begins at speed set in "[Pr.46] Home position return speed".
3. The fast home position return is completed.

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])

Operation cycle		t1[*1]	t2[*2]	t3
FX5-SSC-S	0.888	0.3 to 1.4	3.83 to 4.59	0 to 0.9
	1.777	0.3 to 1.4	4.76 to 6.43	0 to 1.8
FX5-SSC-G	0.500	0.4 to 1.0	1.75 to 2.50	0 to 1.0
	1.000	0.4 to 1.5	3.2 to 3.5	0 to 2.0
	2.000	0.4 to 2.8	6.0 to 6.4	0 to 4.0
	4.000	0.4 to 4.5	12.2 to 13.0	0 to 8.0

*1 The t1 timing time could be delayed by the operation state of other axes.
*2 The t2 timing time depends on the setting of the acceleration time, servo parameter, etc.

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 [FX5-SSC-S], or error code 1A45H [FX5-SSC-G]) 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

Monitor item	Buffer memory address
[Md.119] Servo status2: b0	2476+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 496 Servo parameters [FX5-SSC-S]

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/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 186 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	
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.

Major positioning control		[Da.2] Control method	Details
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 74 Interpolation control)

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	[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 61 Operation patterns of major positioning controls)
	[Da.2]	Control method	Set the control method defined as a "major positioning control". (☞ Page 58 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 68 Designating the positioning address)
	[Da.7]	Arc address	Set the sub point or center point address during 2-axis circular 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	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 74 Interpolation control)
	[Da.21]	Axis to be interpolated No.2	
	[Da.22]	Axis to be interpolated No.3	

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

☞ Page 77 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-F FX5 Motion Module/Simple Motion Module User's Manual (Startup)

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

☞ Page 218 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.

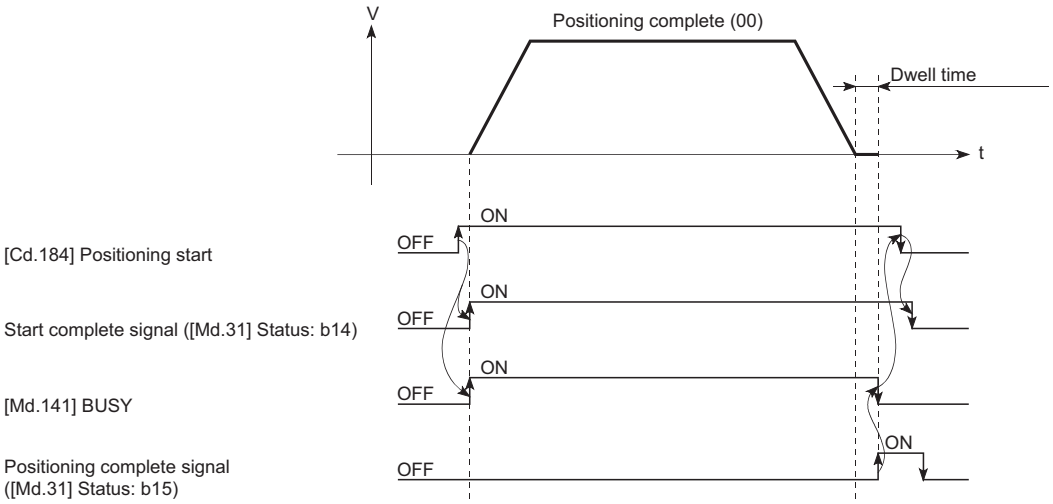
Positioning control	Operation pattern
Positioning complete	Independent positioning control (operation pattern: 00)
Positioning continue	Continuous positioning control (operation pattern: 01)
	Continuous path control (operation pattern: 11)

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.)

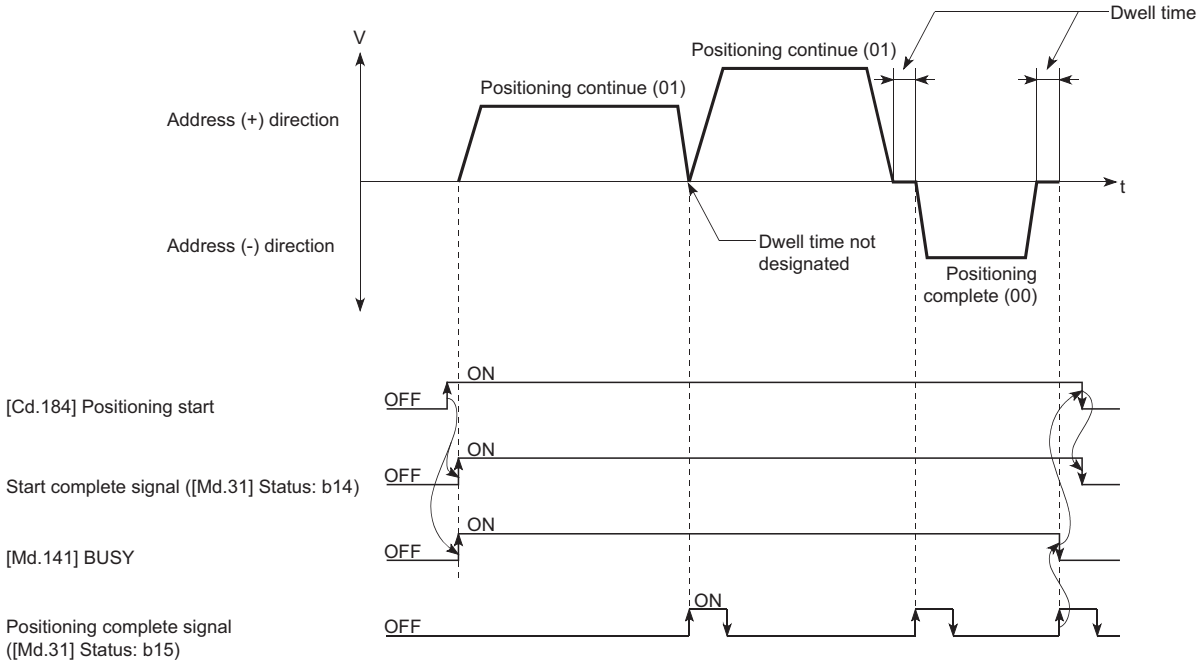
■Operation example



Continuous positioning control

- The machine always automatically decelerates each time the positioning is completed. Acceleration is then carried out after the Simple Motion module/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

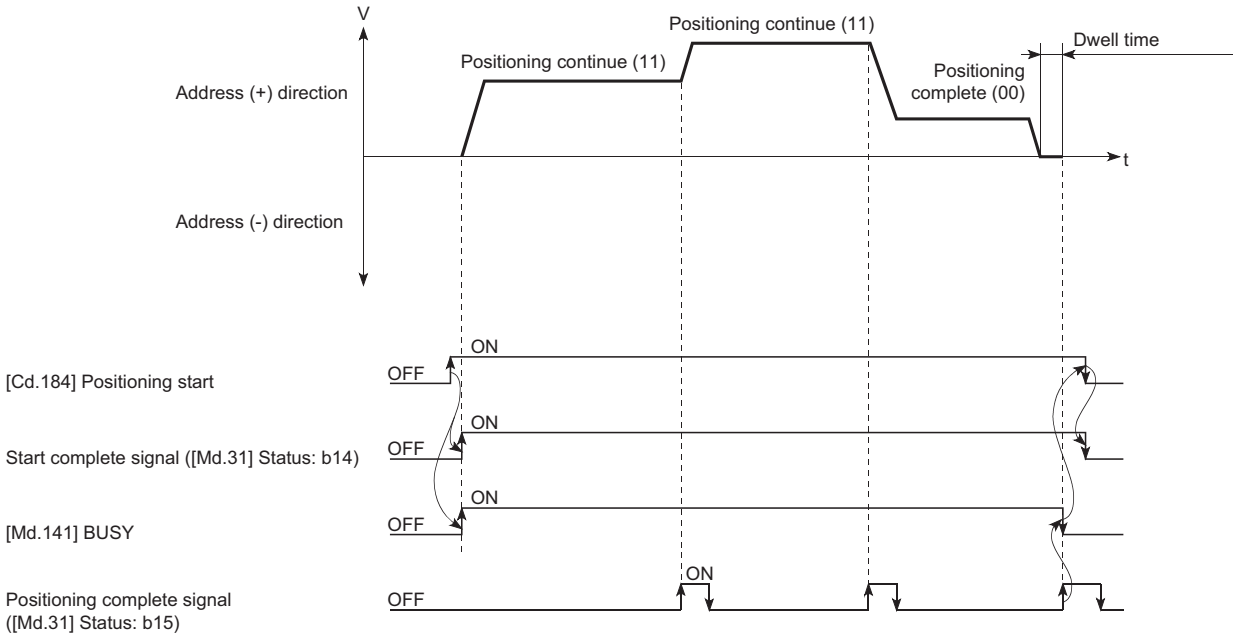


Continuous path control

■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 466 [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



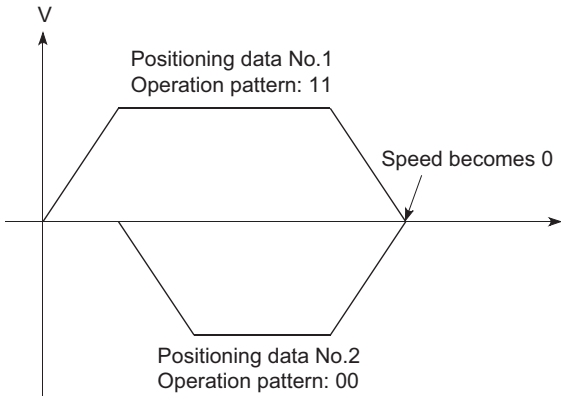
Point

In the continuous path control, a speed variation will not occur using the near-pass function when the positioning data No. is switched.
(☞ Page 237 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.))

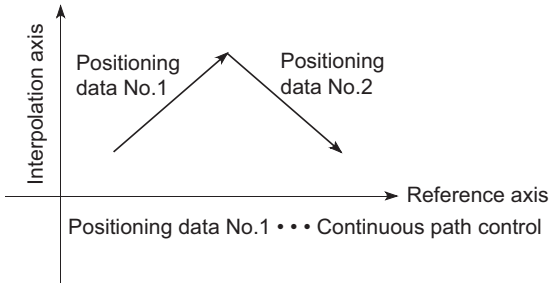


- During operation by step operation. (☞ Page 285 Step function)
- When there is an error in the positioning data to carry out the next operation.

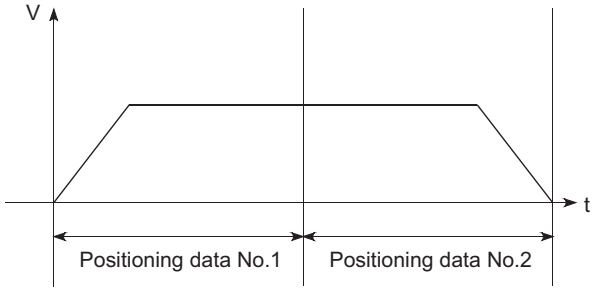
Point

- 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".

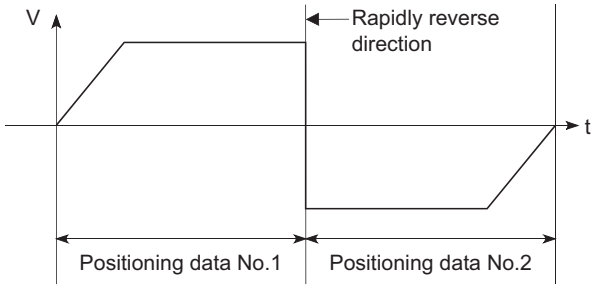
[Positioning by interpolation]



[Reference axis operation]



[Interpolation axis operation]

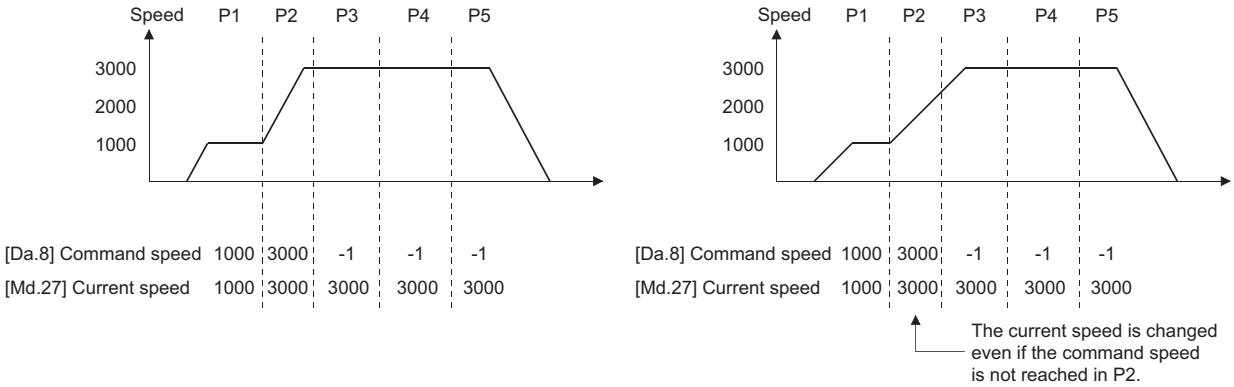


- When a "0" is set in the "[Da.6] Positioning address/movement amount" of the continuous path control positioning data, the command speed is reduced to 0 in an operation cycle. When a "0" is set in the "[Da.6] Positioning address/movement amount" to increase the number of speed change points in the future, change the "[Da.2] Control method" to the "NOP" to make the control nonexecutable. (☞ Page 132 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/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 [FX5-SSC-S], or error code 1B12H [FX5-SSC-G]) 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]



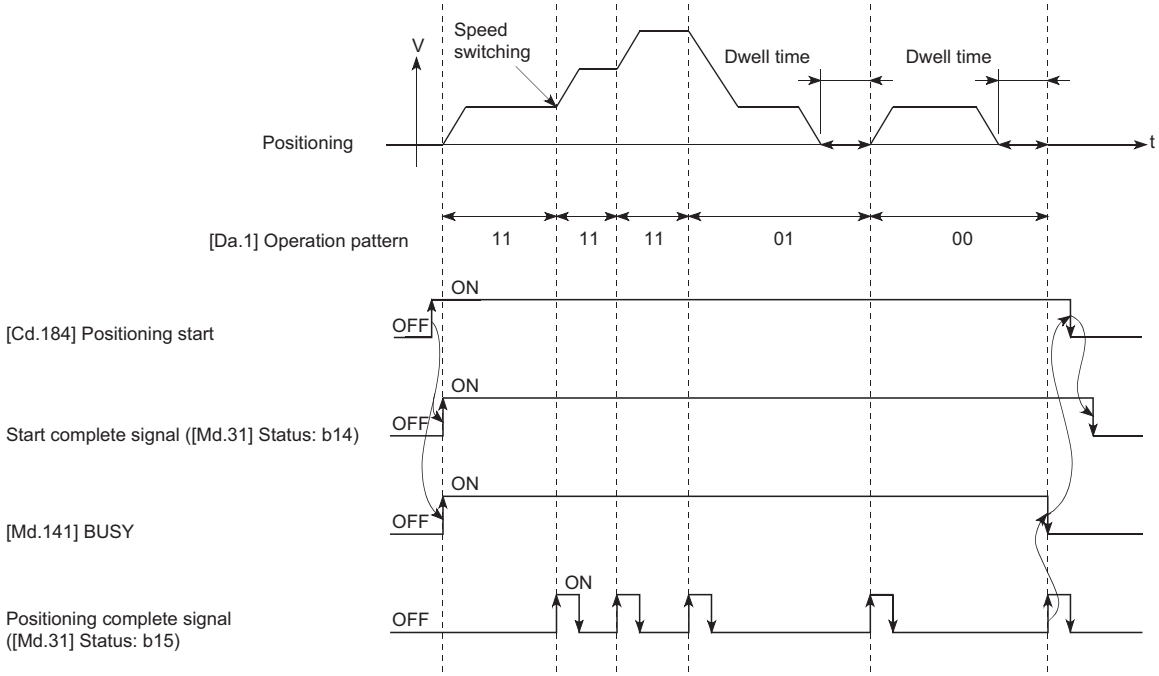
Point

- In the continuous path control, a speed variation will not occur using the near-pass function when the positioning data is switched. (☞ Page 237 Near pass function)
- The Simple Motion module/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.

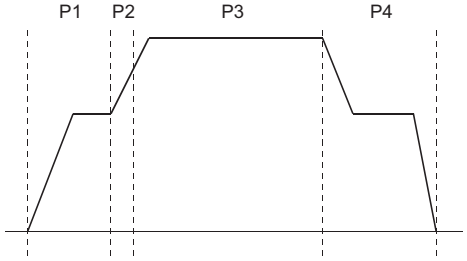
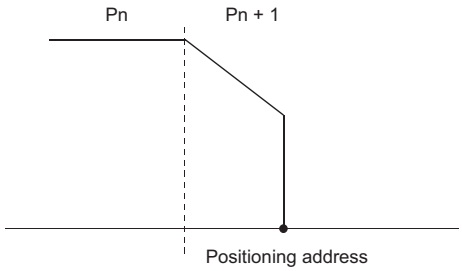
■Speed switching (Standard speed switching mode: Switch the speed when executing the next positioning data.) (☞ Page 466 [Pr.19] Speed switching mode)

- 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.



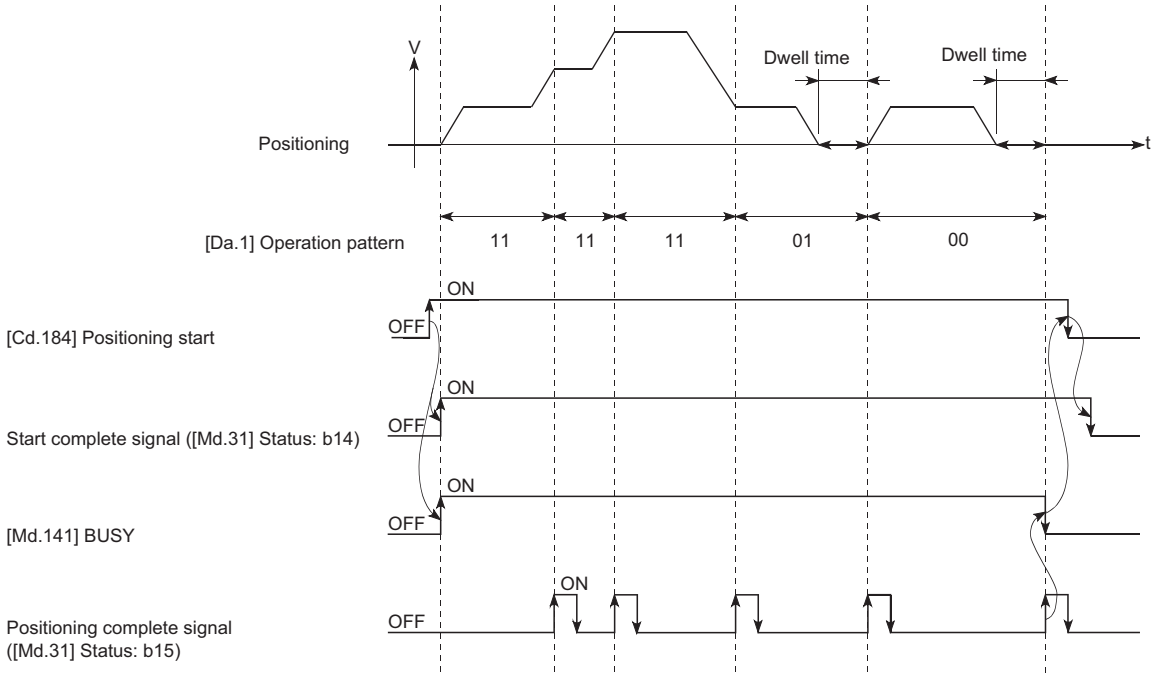
- If the movement amount is small in regard to the target speed, the current speed may not reach the target speed even if acceleration/deceleration is carried out. In this case, the machine is accelerated/decelerated so that it nears the target speed. If the movement amount will be exceeded when automatic 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 [FX5-SSC-S], or warning code 0D58H [FX5-SSC-G]) 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. 

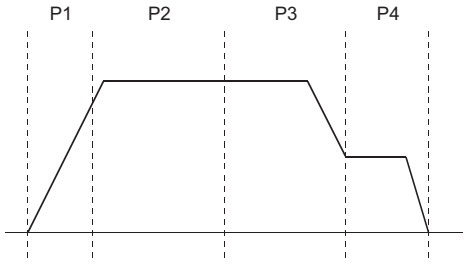
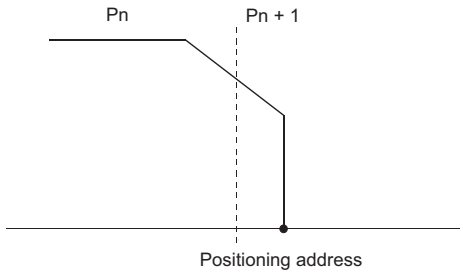
■Speed switching (Front-loading speed switching mode: The speed switches at the end of the positioning data currently being executed.) (☞ Page 466 [Pr.19] Speed switching mode)

- 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 [FX5-SSC-S], or warning code 0D58H [FX5-SSC-G]) will occur.

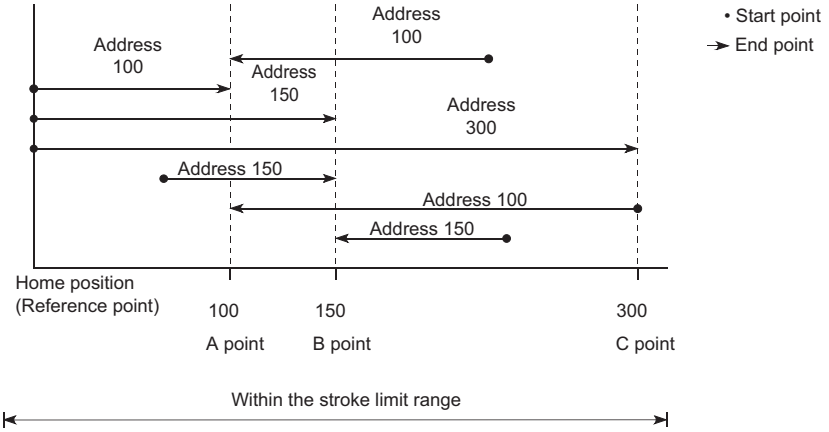
[When the speed cannot change over to the P2 speed in P1]	[When the movement amount is small during automatic deceleration]
For the following relation of the speed P1 = P4, P2 = P3, P1 < P2 	The movement amount required to carry out the automatic deceleration cannot be secured, so the machine immediately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

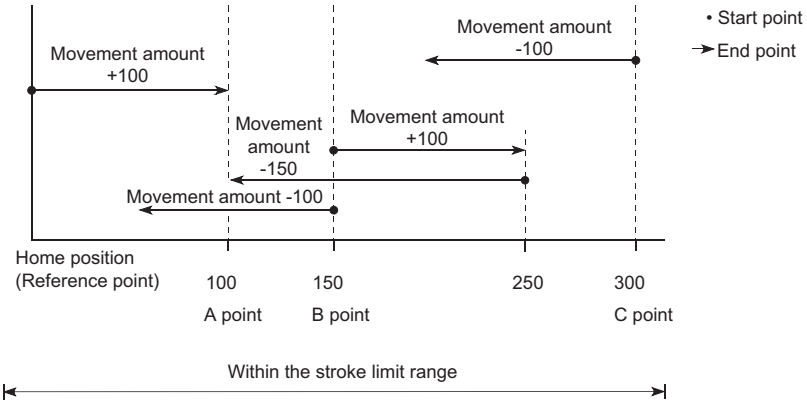
Absolute system

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.



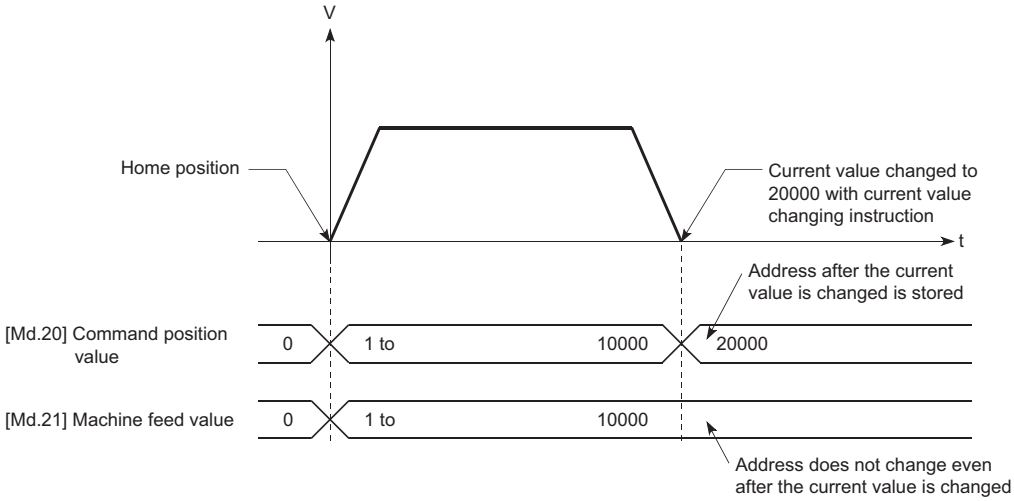
Confirming the current value

Values showing the current value

The following two types of addresses are used as values to show the position in the Simple Motion module/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 "DMOV(P) instruction" from the CPU module.

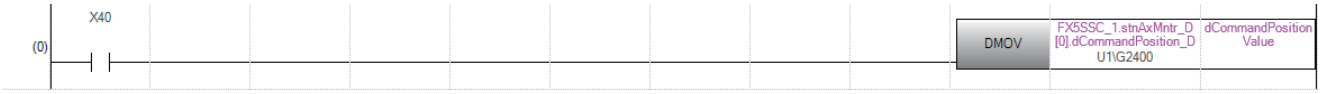
n: Axis No. - 1

Monitor item		Buffer memory addresses
[Md.20]	Command position value	2400+100n 2401+100n
[Md.21]	Machine feed value	2402+100n 2403+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.

[FX5-SSC-S]



[FX5-SSC-G]



Classification	Label name	Description
Module label	FX5SSC_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 are for local labels.	

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

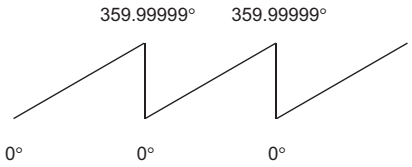
Control unit "degree" handling

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 when the movement amount during the power supply OFF is added to the machine feed value before the power supply OFF (the rounded value within the range of 0 to 359.99999°) at the communication start with servo amplifier after the power supply ON or CPU module reset.

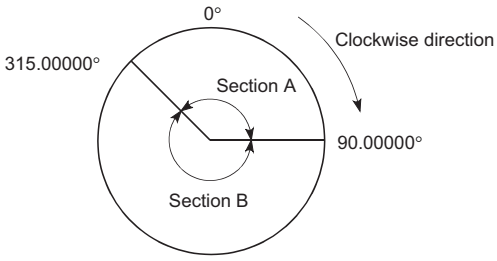


Software stroke limit valid/invalid setting

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"

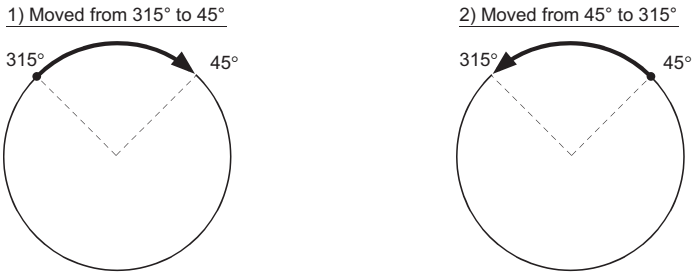
■Absolute system (When the software stroke limit is invalid)

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°.



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: 19A4H [FX5-SSC-S], or error code 1AA4H [FX5-SSC-G]) 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

Name	Function	Buffer memory address	Initial value
[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	0

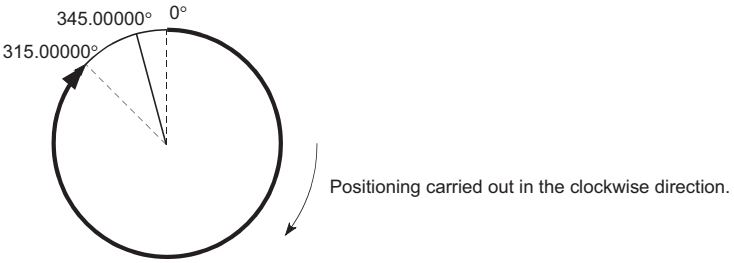
■Absolute system (When the software stroke limit is valid)

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", and "2-axis circular interpolation control", control is carried out 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/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.

Interpolation of "[Da.2] Control method"	Axis definition	
	Reference axis	Interpolation axis
2-axis linear interpolation control 2-axis fixed-feed control 2-axis circular interpolation control 2-axis speed control	4-axis module: Any of axes 1 to 4 8-axis module: Any of axes 1 to 8	"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

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 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, and circular left).	△ (Only during circular sub, circular right, and circular 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	○	—
	[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	—

*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 [FX5-SSC-S], or error code 1B22H [FX5-SSC-G]) will occur. The axes that are not used are not required.

Refer to the following for information on the setting details.

☞ Page 497 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 [FX5-SSC-S], or error code 1A98H [FX5-SSC-G])
- Interpolation axis: Control method setting error (error code: 1A24H [FX5-SSC-S], or error code 1B24H [FX5-SSC-G]), start during operation (warning code: 0900H [FX5-SSC-S], or warning code 0D00H [FX5-SSC-G]).

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: 1A24H [FX5-SSC-S], or error code 1B24H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1A9AH [FX5-SSC-G]) 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 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.

"[Da.2] Control method" interpolation control	[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*3
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	○	○

*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 [FX5-SSC-S], or error code 1A9FH [FX5-SSC-G]) will occur and the positioning control does not start if 2-axis circular interpolation control is set when the unit is "degree".
The machine will immediately stop if "degree" is set during positioning control.

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 [FX5-SSC-S], or error code 1B1EH [FX5-SSC-G]) 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			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	
[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	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		○	○	○	○
[Da.20]	Axis to be interpolated No.1		◎: 2 axes, 3 axes, 4 axes, —: 1 axis			
[Da.21]	Axis to be interpolated No.2		◎: 3 axes, 4 axes, —: 1 axis, 2 axes			
[Da.22]	Axis to be interpolated No.3		◎: 4 axes, —: 1 axis, 2 axes, 3 axes			

*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 [FX5-SSC-S], or error code 1B1EH [FX5-SSC-G]) 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		○	○
[Da.20]	Axis to be interpolated No.1		—	—
[Da.21]	Axis to be interpolated No.2		—	—
[Da.22]	Axis to be interpolated No.3		—	—

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		—	○	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		—	—	—	—	—

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

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.

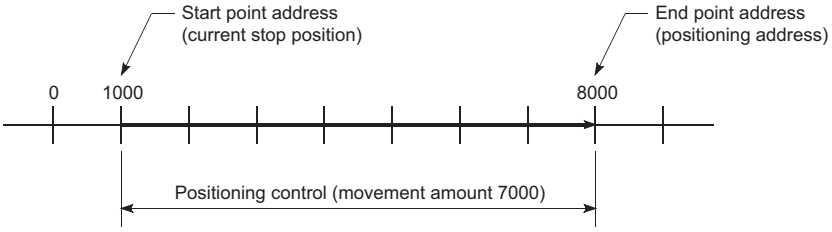
1-axis linear control (ABS linear 1)

■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 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	○
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—

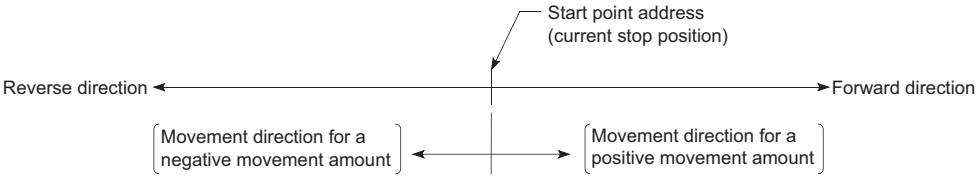
Refer to the following for information on the setting details.

☞ Page 497 Positioning Data

1-axis linear control (INC linear 1)

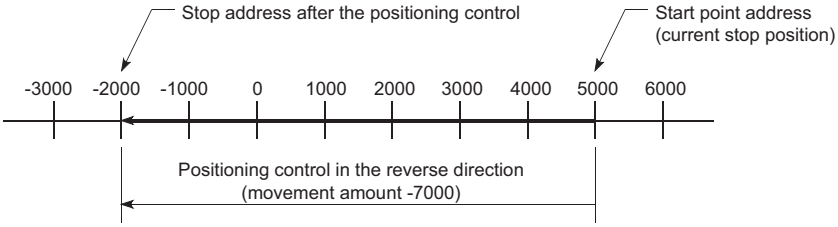
■Operation chart

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 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	○
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—

Refer to the following for information on the setting details.

☞ Page 497 Positioning Data

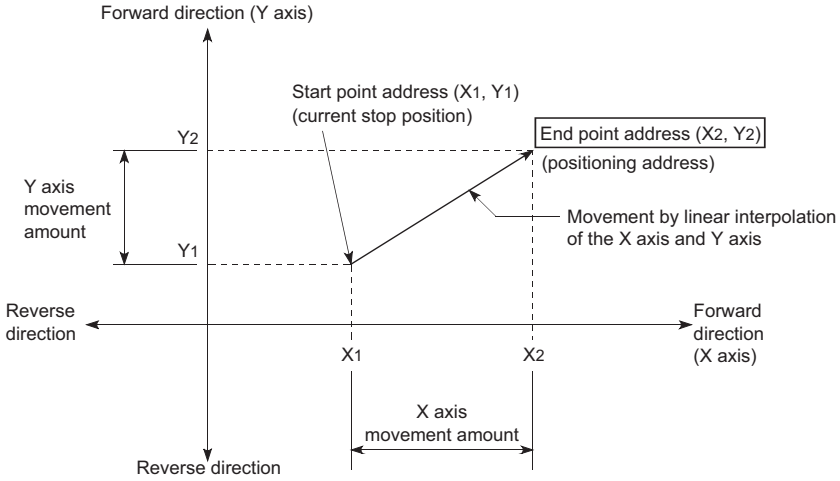
2-axis linear interpolation control

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 74 Interpolation control for details on interpolation control.)

2-axis linear interpolation control (ABS linear 2)

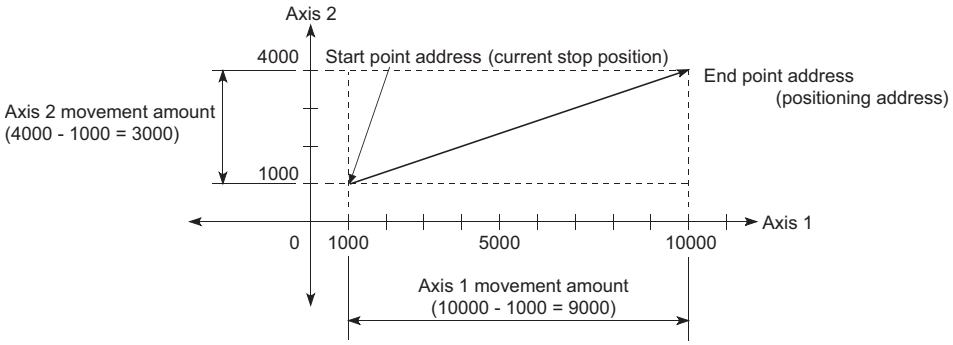
■Operation chart

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 [FX5-SSC-S], or error code 1B15H [FX5-SSC-G]) 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 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	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	—	—
[Da.22]	Axis to be interpolated No.3	—	—

Refer to the following for information on the setting details.

☞ Page 497 Positioning Data

Restriction

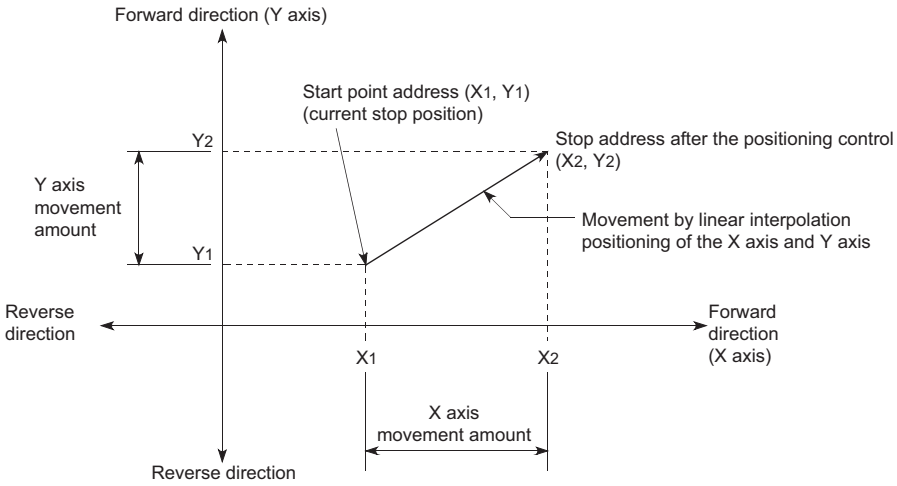
When the "reference axis speed" is set during 2-axis linear interpolation control, set so the major axis side becomes the reference axis. If the minor axis side is set as the reference axis, the major axis side speed may exceed the "[Pr.8] Speed limit value".

2-axis linear interpolation control (INC linear 2)

■Operation chart

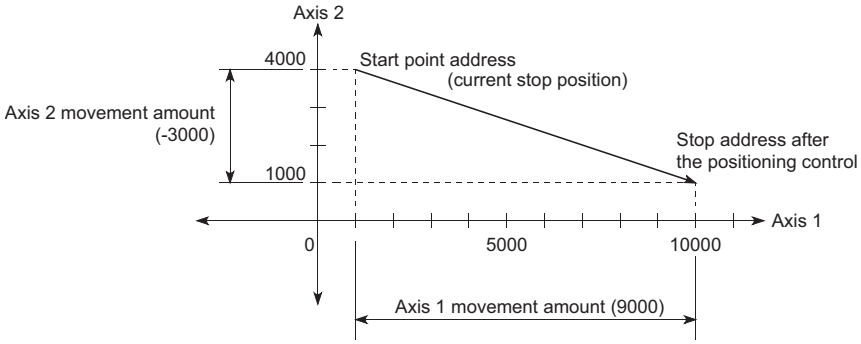
In incremental system 2-axis linear interpolation control, the designated 2 axes are used. Linear interpolation positioning is carried out from the current stop position (start point address) to a position at the end of the movement amount set in "[Da.6] Positioning address/movement amount". The movement 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 [FX5-SSC-S], or error code 1B15H [FX5-SSC-G]) 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 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	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	—	—
[Da.22]	Axis to be interpolated No.3	—	—

Refer to the following for information on the setting details.

☞ Page 497 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".

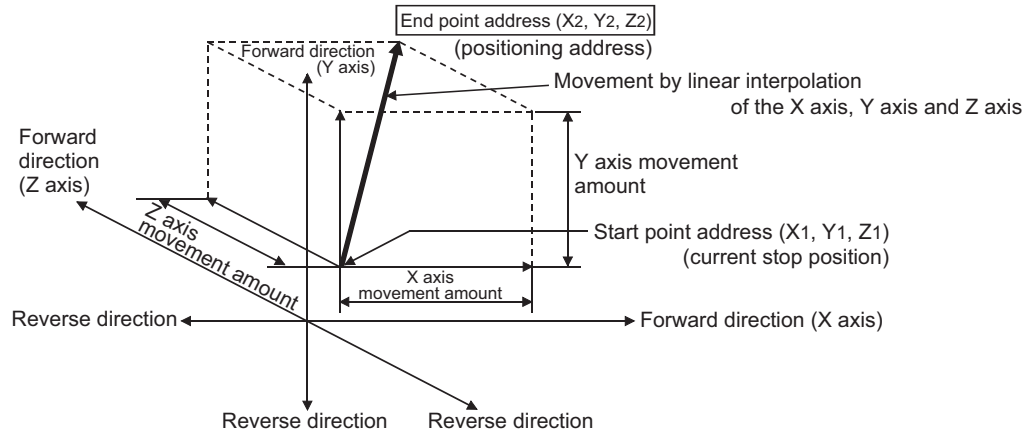
3-axis linear interpolation control

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 74 Interpolation control for details on interpolation control.)

3-axis linear interpolation control (ABS linear 3)

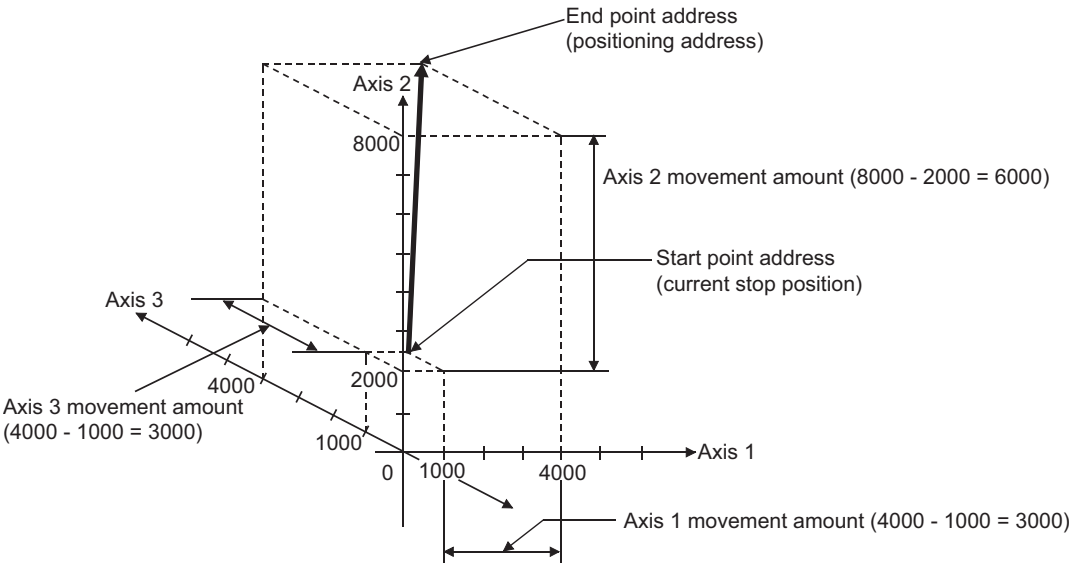
■Operation chart

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 [FX5-SSC-S], or error code 1B15H [FX5-SSC-G]) 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 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	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	◎	—
[Da.22]	Axis to be interpolated No.3	—	—

Refer to the following for information on the setting details.

☞ Page 497 Positioning Data

Restriction

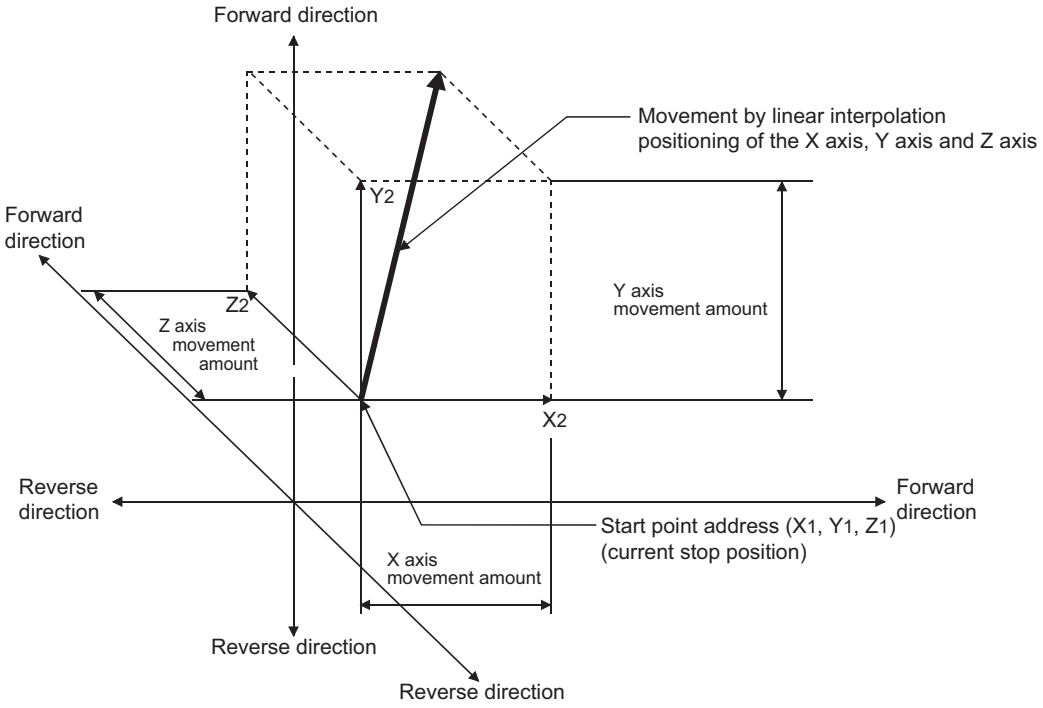
- When the "reference axis speed" is set during 3-axis linear interpolation control, set so the major axis side becomes the reference axis. If the minor axis side is set as the reference axis, the major axis side speed may exceed the "[Pr.8] Speed limit value".
- Refer to ☞ Page 74 Interpolation control for the reference axis and interpolation axis combinations.

3-axis linear interpolation control (INC linear 3)

■Operation chart

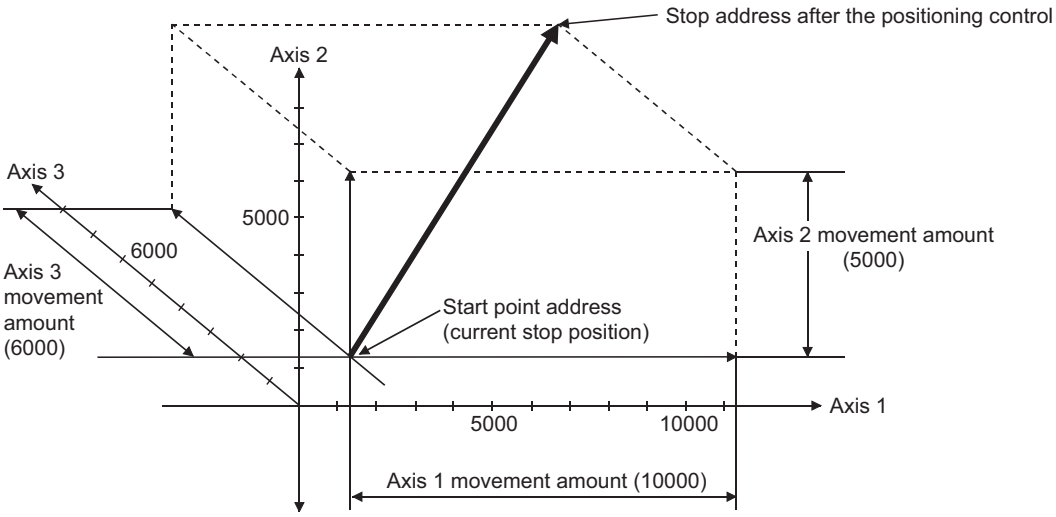
In the incremental system 3-axis linear interpolation control, the designated 3 axes are used. Linear interpolation positioning is carried out from the current stop position (start point address) to a position at the end of the movement amount set in the "[Da.6] Positioning address/movement amount". 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 [FX5-SSC-S], or error code 1B15H [FX5-SSC-G]) 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 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	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	◎	—
[Da.22]	Axis to be interpolated No.3	—	—

Refer to the following for information on the setting details.

☞ Page 497 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 74 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 74 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 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	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	◎	—
[Da.22]	Axis to be interpolated No.3	◎	—

Refer to the following for information on the setting details.

☞ Page 497 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 74 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 [FX5-SSC-S], or error code 1B15H [FX5-SSC-G]) 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 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	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	◎	—
[Da.22]	Axis to be interpolated No.3	◎	—

Refer to the following for information on the setting details.

☞ Page 497 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 74 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.

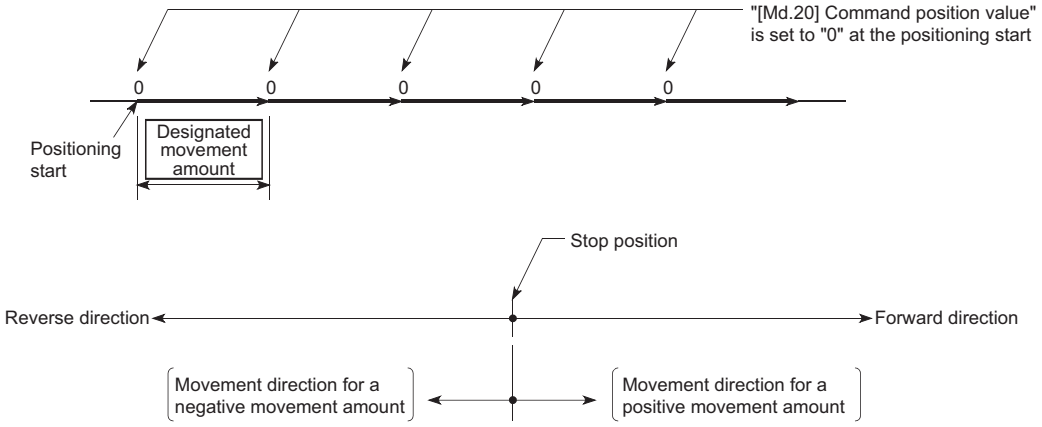
Operation chart

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)

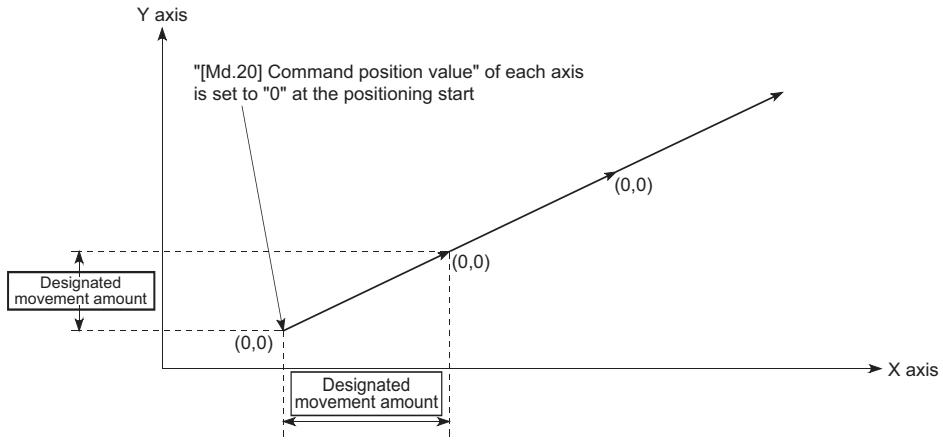
Ex.

1-axis fixed-feed control



Ex.

2-axis fixed-feed control



■Restrictions

- The error "Continuous path control not possible" (error code: 1A1EH [FX5-SSC-S], or error code 1B1EH [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B1EH [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B15H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1A9AH [FX5-SSC-G]) 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 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	○	—
[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	—

*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 497 Positioning Data

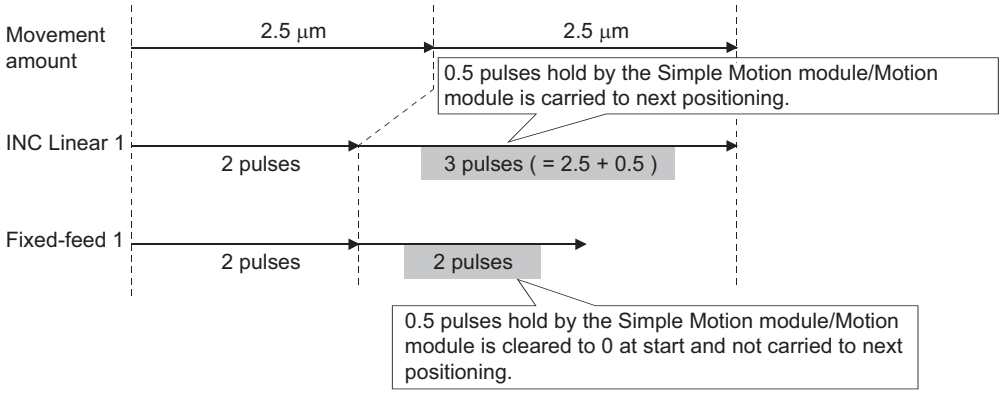
Point

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/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 74 Interpolation control

2-axis circular interpolation control with sub point designation

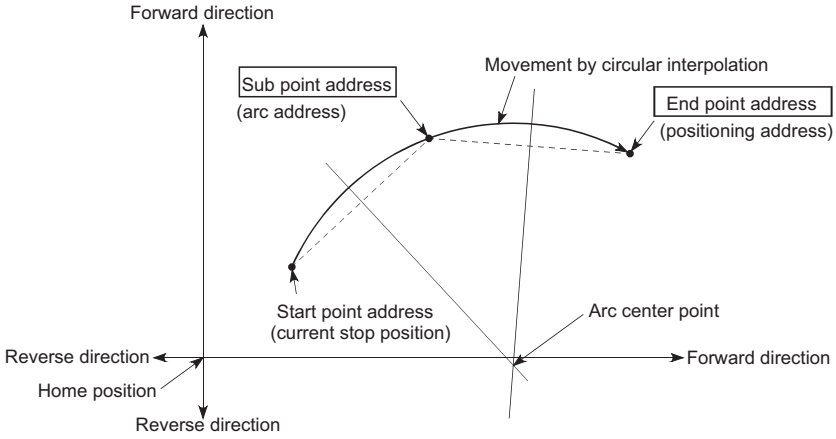
In "2-axis circular interpolation control" ("[Da.2] Control method" = ABS circular sub, INC circular sub), two motors are used to carry out position control in an arc path passing through designated sub points, while carrying out interpolation for the axis directions set in each axis. (Refer to ☞ Page 74 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 [FX5-SSC-S], or error code 1B32H [FX5-SSC-G]) 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: 1A27H [FX5-SSC-S], or error code 1B27H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B2BH [FX5-SSC-G]) will occur.
- When the start point address is the same as the sub point address: The error "Sub point setting error" (error code: 1A27H [FX5-SSC-S], or error code 1B27H [FX5-SSC-G]) will occur.
- When the end point address is the same as the sub point address: The error "Sub point setting error" (error code: 1A27H [FX5-SSC-S], or error code 1B27H [FX5-SSC-G]) 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: 1A27H [FX5-SSC-S], or error code 1B27H [FX5-SSC-G]) 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 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	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	—	—
[Da.22]	Axis to be interpolated No.3	—	—

Refer to the following for information on the setting details.

☞ Page 497 Positioning Data

Restriction

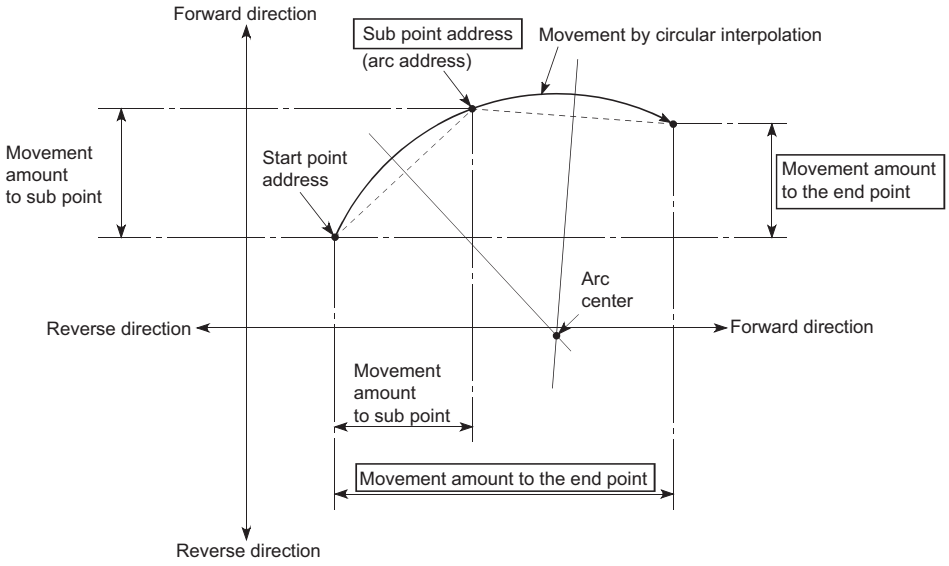
Set a value in "[Da.8] Command speed" so that the speed of each axis does not exceed the "[Pr.8] Speed limit value". (The speed limit does not function for the speed calculated by the Simple Motion module/Motion module during interpolation control.)

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 [FX5-SSC-S], or error code 1B32H [FX5-SSC-G]) 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: 1A27H [FX5-SSC-S], or error code 1B27H [FX5-SSC-G]) 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: 1A2BH [FX5-SSC-S], or error code 1B2BH [FX5-SSC-G]) 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: 1A27H [FX5-SSC-S], or error code 1B27H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B2BH [FX5-SSC-G]) will occur.
- When the start point address is the same as the sub point address: The error "Sub point setting error" (error code: 1A27H [FX5-SSC-S], or error code 1B27H [FX5-SSC-G]) will occur.
- When the end point address is the same as the sub point address: The error "Sub point setting error" (error code: 1A27H [FX5-SSC-S], or error code 1B27H [FX5-SSC-G]) 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: 1A27H [FX5-SSC-S], or error code 1B27H [FX5-SSC-G]) 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 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	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	—	—
[Da.22]	Axis to be interpolated No.3	—	—

Refer to the following for information on the setting details.

☞ Page 497 Positioning Data

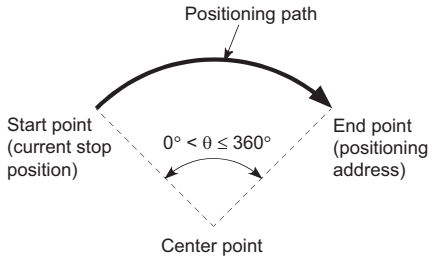
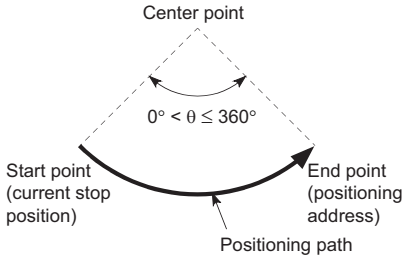
Restriction

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/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 74 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.

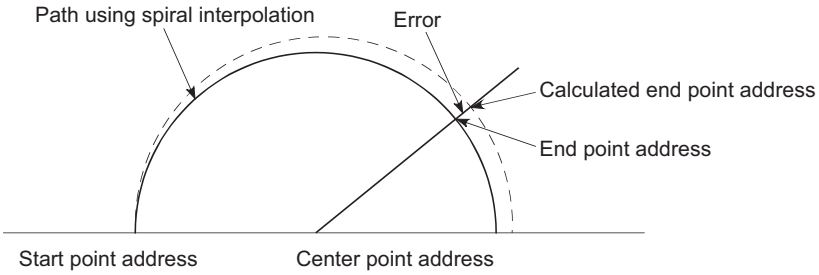
Control method	Rotation direction	Arc center angle that can be controlled	Positioning path
ABS circular right INC circular right	Clockwise	$0° < \theta \leq 360°$	
ABS circular left INC circular left	Counterclockwise		

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 476 [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.

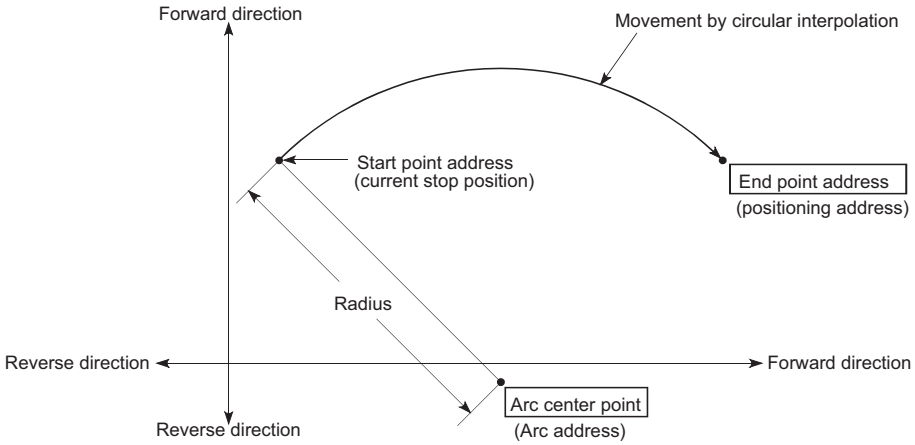
■Calculated error > "[Pr.41] Allowable circular interpolation error width"

At the positioning start, the error "Large arc error deviation" (error code: 1A17H [FX5-SSC-S], or error code 1B17H [FX5-SSC-G]) will occur and the control will not start. The machine will immediately stop if the error is detected during positioning control.

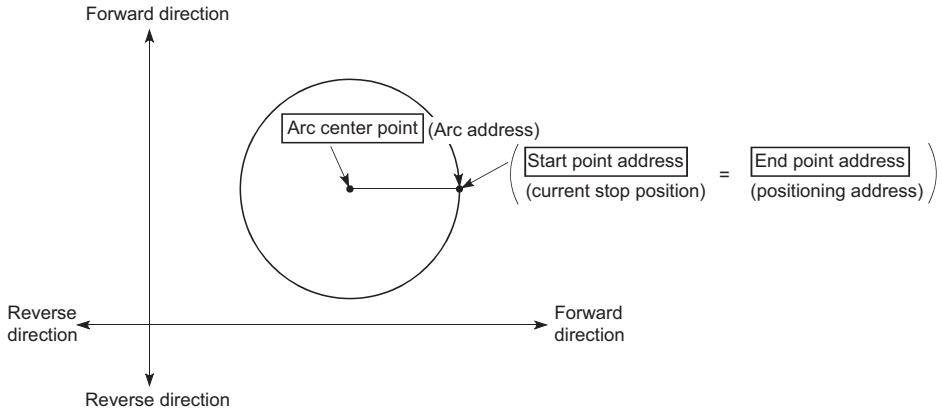
2-axis circular interpolation control with center point designation (ABS circular)

■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 [FX5-SSC-S], or error code 1B32H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B2DH [FX5-SSC-G]) will occur.
- When the end point address is the same as the center point address: The error "Center point setting error" (error code: 1A2DH [FX5-SSC-S], or error code 1B2DH [FX5-SSC-G]) 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: 1A2DH [FX5-SSC-S], or error code 1B2DH [FX5-SSC-G]) 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 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	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	—	—
[Da.22]	Axis to be interpolated No.3	—	—

Refer to the following for information on the setting details.

☞ Page 497 Positioning Data

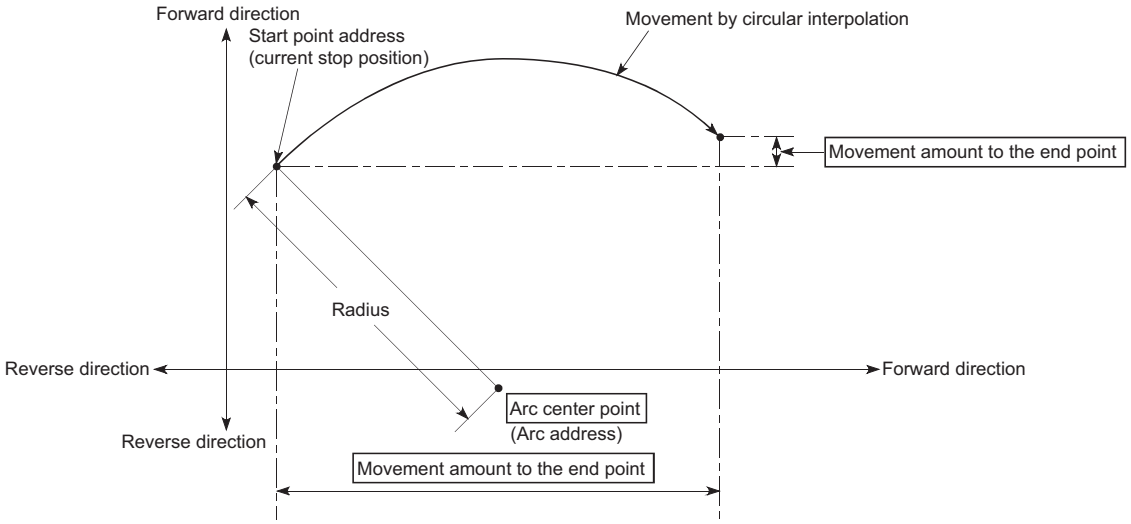
Restriction

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/Motion module during interpolation control.)

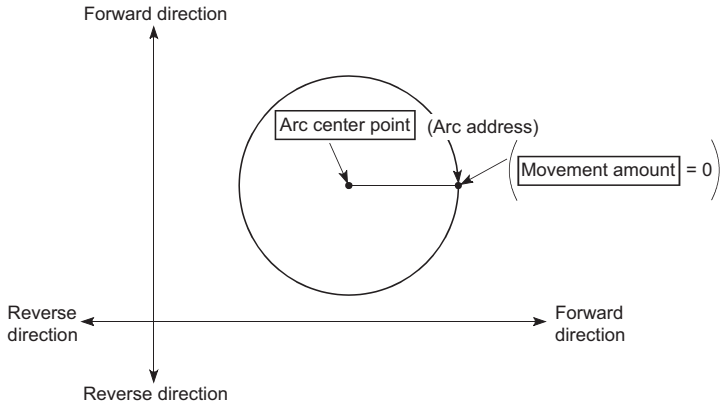
2-axis circular interpolation control with center point designation (INC circular)

■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 [FX5-SSC-S], or error code 1B32H [FX5-SSC-G]) 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: 1A2BH [FX5-SSC-S], or error code 1B2BH [FX5-SSC-G]) will occur.
- When the start point address is the same as the center point address: The error "Center point setting error" (error code: 1A2DH [FX5-SSC-S], or error code 1B2DH [FX5-SSC-G]) will occur.
- When the end point address is the same as the center point address: The error "Center point setting error" (error code: 1A2DH [FX5-SSC-S], or error code 1B2DH [FX5-SSC-G]) 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: 1A2DH [FX5-SSC-S], or error code 1B2DH [FX5-SSC-G]) 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 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	○	—
[Da.20]	Axis to be interpolated No.1	◎	—
[Da.21]	Axis to be interpolated No.2	—	—
[Da.22]	Axis to be interpolated No.3	—	—

Refer to the following for information on the setting details.

☞ Page 497 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/Motion module during interpolation control.)

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 74 Interpolation control

Operation chart

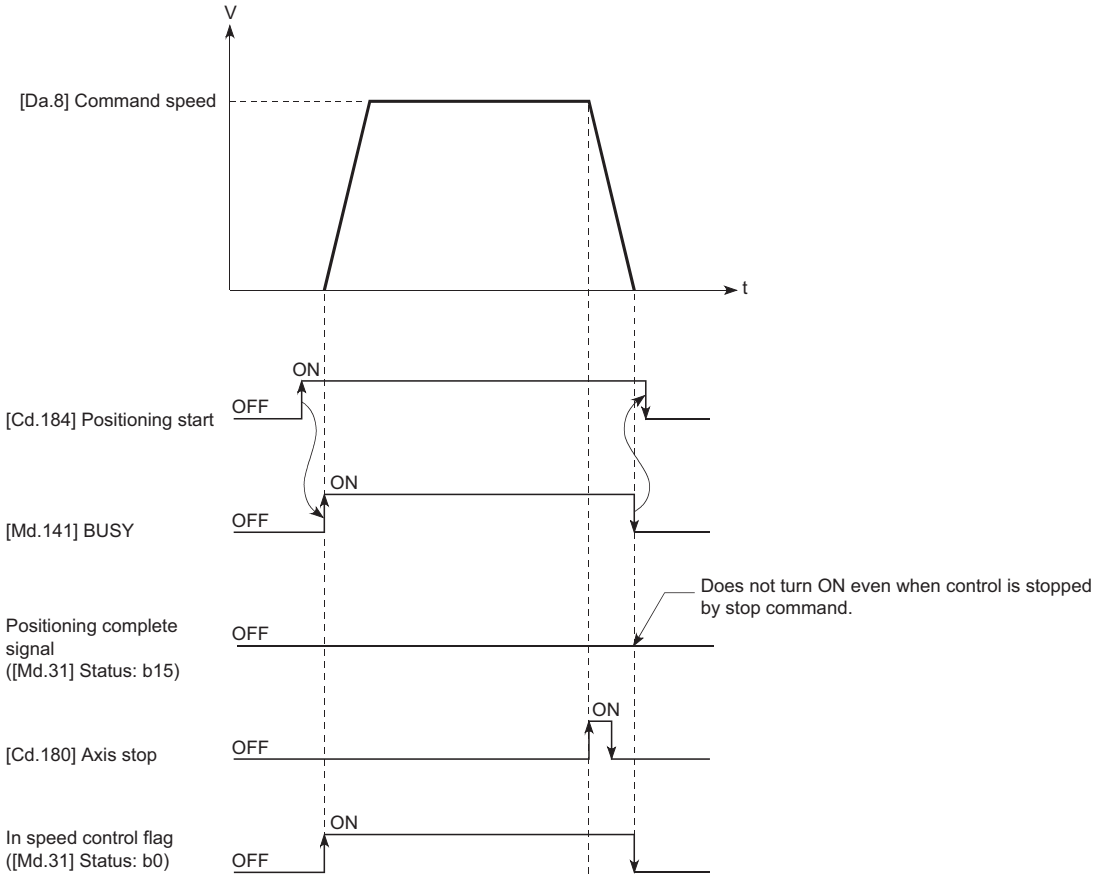
The following charts show the operation timing for 1-axis speed control with axis 1 and 2-axis speed control with axis 2 when the axis 1 is set as the reference axis.

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

The "Positioning complete signal" is not turned ON.

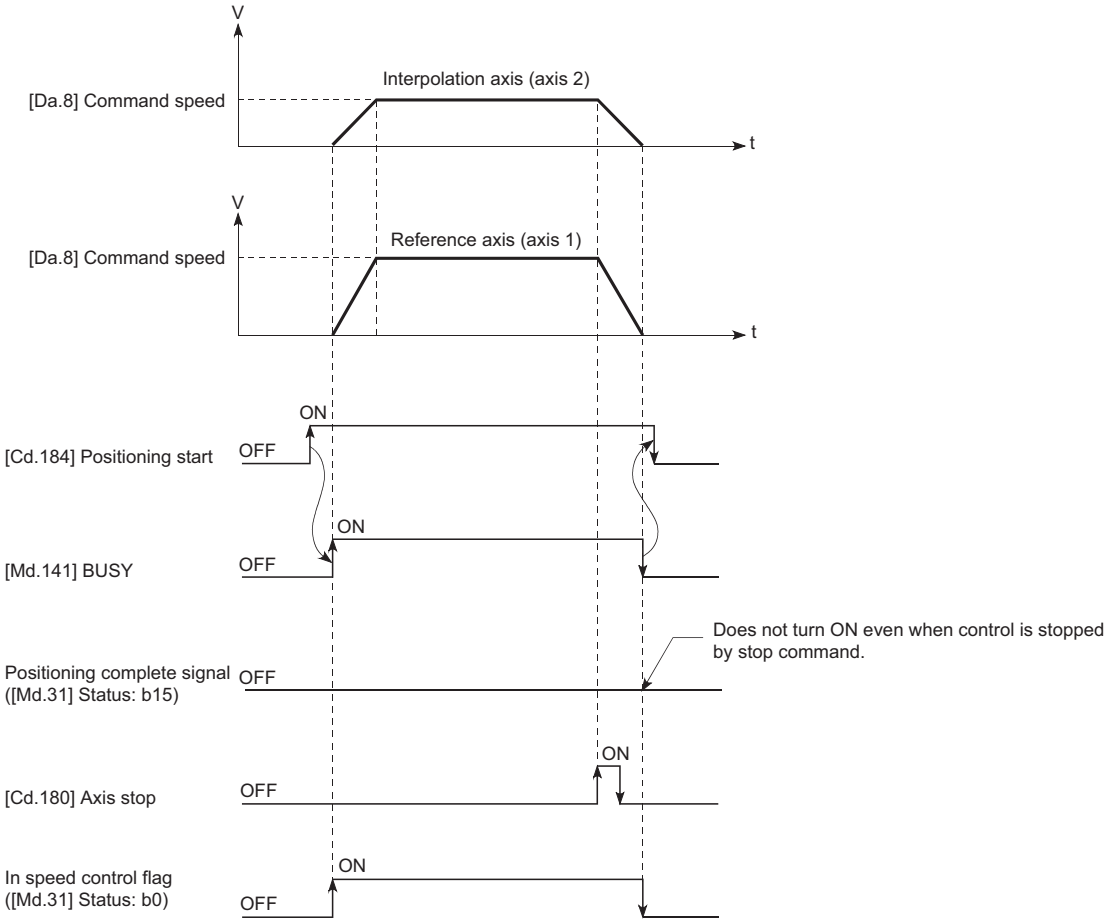
■1-axis speed control

Ex.



■2-axis speed control

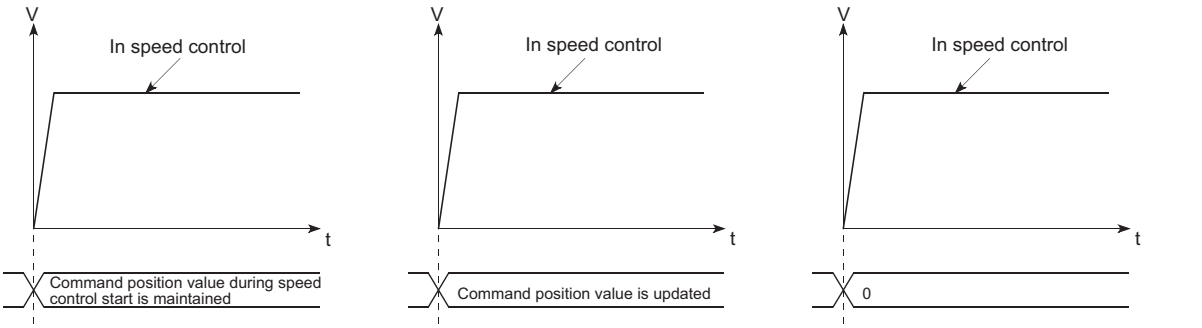
Ex.



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 [FX5-SSC-S], or error code 1B1EH [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B12H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1A9AH [FX5-SSC-G]) occurs and the positioning cannot be started.
- The software stroke limit check is not carried out if the control unit is set to "degree".

■Restriction for the speed limit value

When any 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 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	○	—
[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	—

*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 497 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

Setting item		Setting value	Setting details	Buffer memory address
[Pr.81]	Speed-position function selection	0	Speed-position switching control (INC mode)	34+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 444 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

Setting item		Setting value	Setting details	Buffer memory address
[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 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	4366+100n

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

n: Axis No. - 1

Setting item		Setting value	Setting details	Buffer memory address
[Cd.46]	Speed-position switching command	1	Speed control will be taken over by position control	4367+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

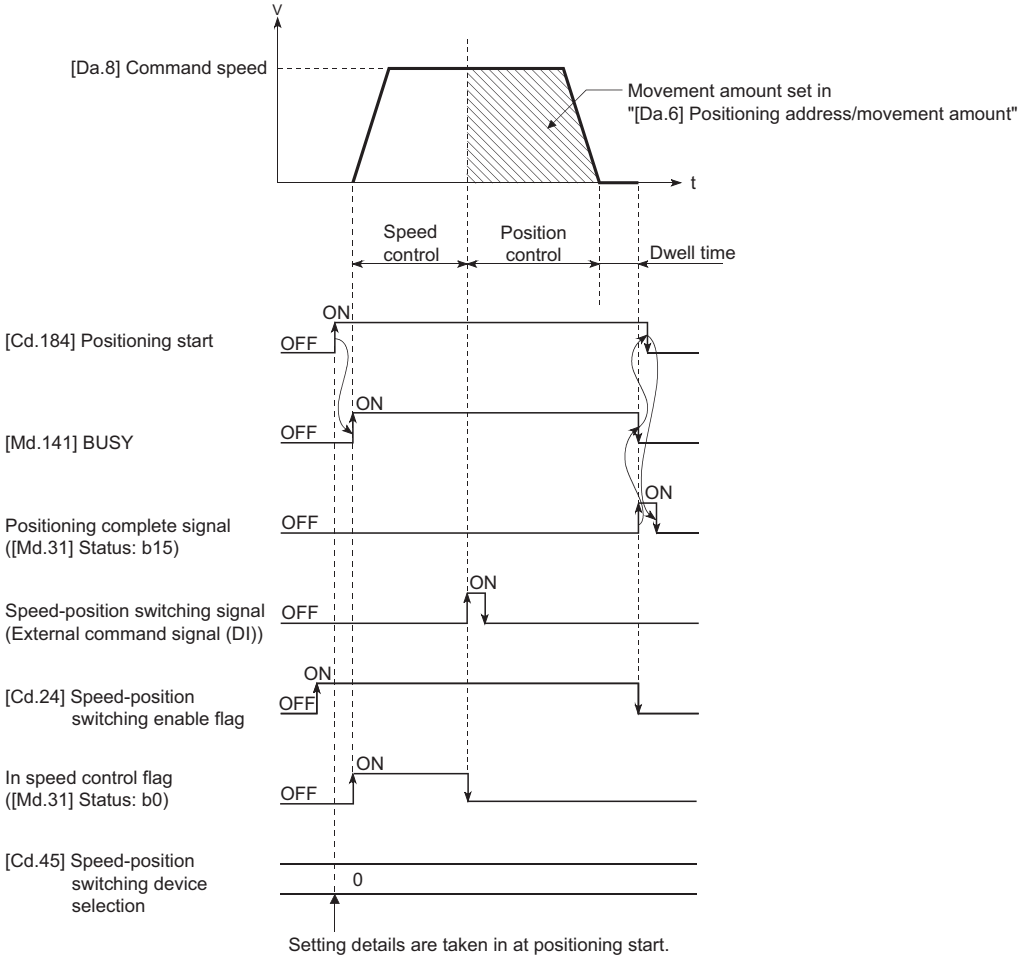
Setting item		Setting value	Setting details	Buffer memory address
[Cd.24]	Speed-position switching enable flag	1	Speed control will be taken over by position control when switching signal set in "[Cd.45] Speed-position switching device selection" turns ON.	4328+100n

Operation chart

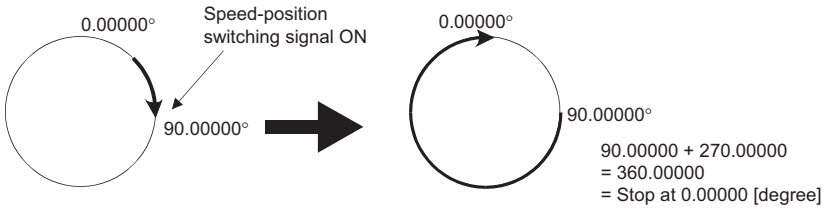
The following chart shows the operation timing for speed-position switching control (INC mode).
The "in speed control flag" ([Md.31] Status: b0) is turned ON during speed control of speed-position switching control (INC mode).

■Operation example

• When using the external command signal (DI) as speed-position switching signal

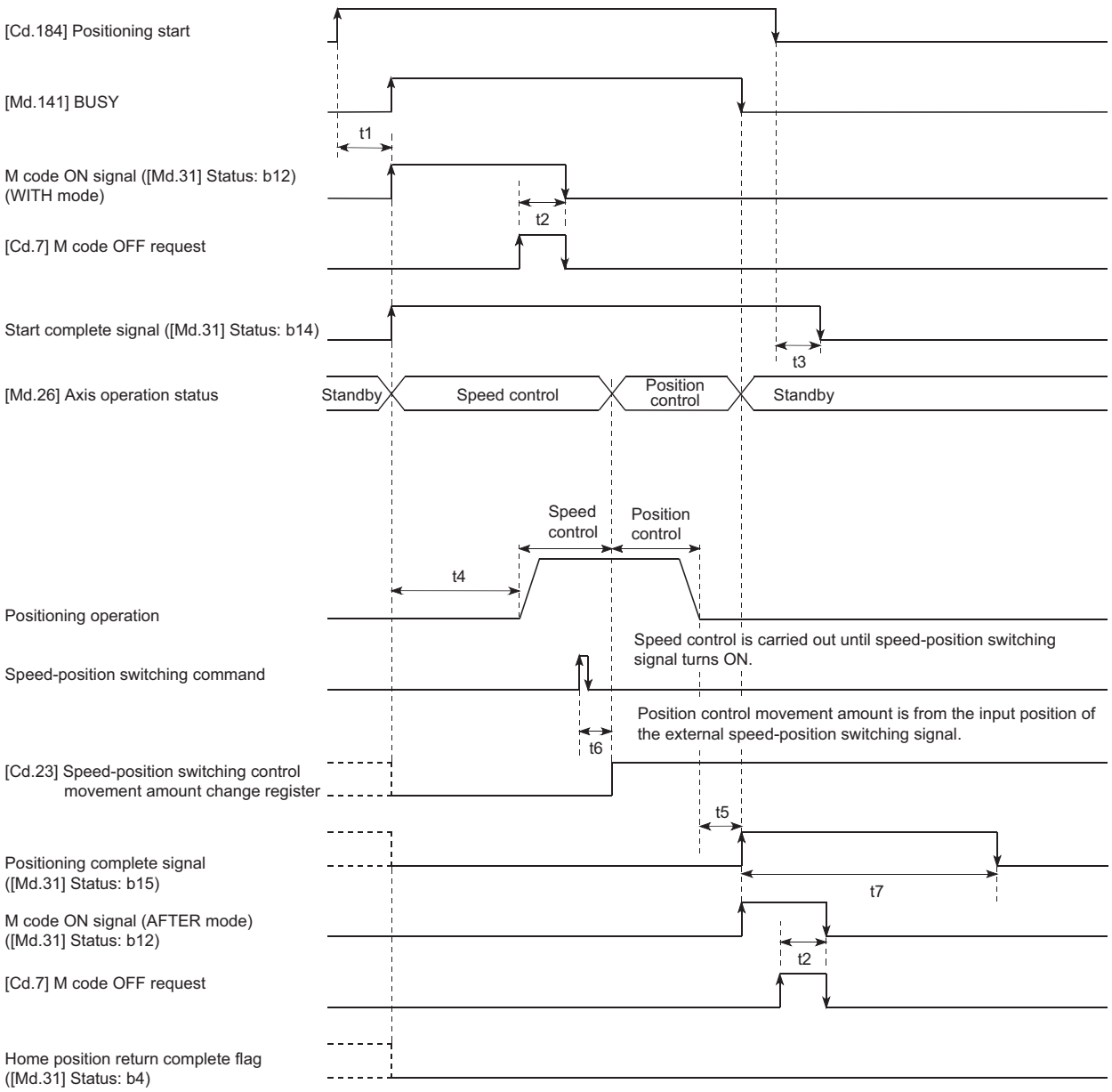


The following operation assumes that the speed-position switching signal is input at the position of the command position value of 90.00000 [degree] during execution of "[Da.2] Control method" "Forward run: speed/position" at "[Pr.1] Unit setting" of "2: degree" and "[Pr.21] Command position value during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

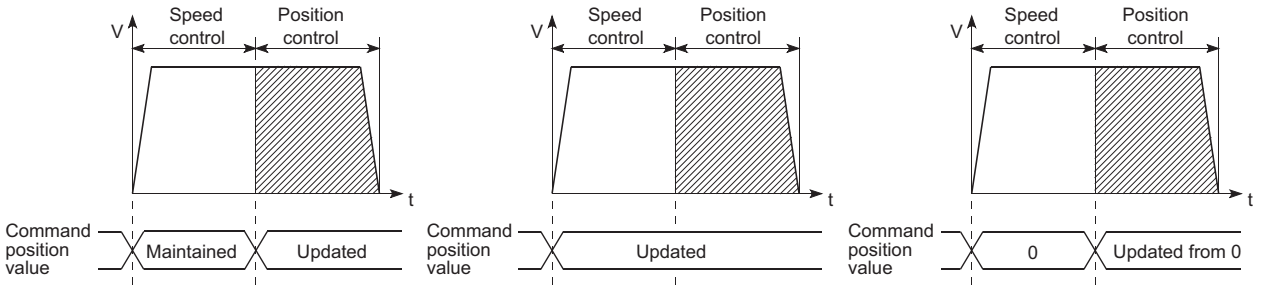
Operation cycle		t1[*1]	t2	t3	t4[*2]	t5	t6[*3]	t7
FX5-SSC-S	0.888	0.3 to 1.4	0 to 0.9	0 to 0.9	3.96 to 4.45	0 to 0.9	0 to 0.9	Follows parameters
	1.777	0.3 to 1.4	0 to 1.8	0 to 1.8	4.85 to 6.49	0 to 1.8	0 to 0.9	Follows parameters
FX5-SSC-G	0.500	0.4 to 1.0	0 to 0.5	0 to 0.5	1.9 to 2.3	0 to 0.5	5.9 to 6.1[*4]	Follows parameters
	1.000	0.4 to 1.5	0 to 1.0	0 to 1.0	3.2 to 3.7	0 to 1.0	7.5 to 7.7[*4]	Follows parameters
	2.000	0.4 to 2.8	0 to 2.0	0 to 2.0	6.0 to 6.4	0 to 2.0	10.5 to 10.7[*4]	Follows parameters
	4.000	0.4 to 4.5	0 to 4.0	0 to 4.0	12.0 to 13.5	0 to 4.0	16.5 to 17.0[*4]	Follows parameters

*1 The t1 timing time could be delayed by the operation state of other axes.
*2 The t4 timing time depends on the setting of the acceleration time, servo parameter, etc.
*3 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.
*4 When the servo parameter of the servo amplifier "Input filter setting (PD11)" is set to "0: No filter", the time fluctuates depending on the setting value of the servo parameter "Input filter setting (PD11)".

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.

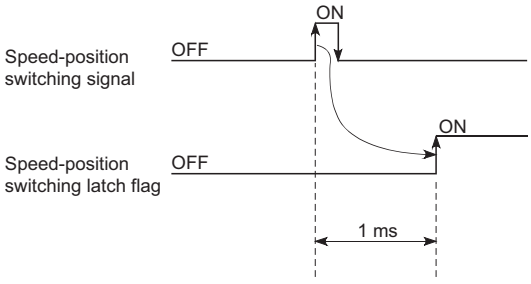
"[Pr.21] Command position value during speed control" setting	[Md.20] Command position value
0: Do not update command position value	The command position value at control start is maintained during speed control, and updated from the switching to position control.
1: Update command position value	The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

■External command signals (DI)

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

Setting item		Setting value	Setting details	Buffer memory address
[Pr.42]	External command function selection	2	Speed-position, position-speed switching request	62+150n
[Cd.8]	External command valid	1	Validates an external command	4305+100n
[Cd.45]	Speed-position switching device selection	0	Use the external command signal for switching from speed control to position control	4366+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 444 Basic Setting, ☞ Page 559 Control Data

■Proximity dog signal (DOG)

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

Setting item		Setting value	Setting details	Buffer memory address
[Cd.45]	Speed-position switching device selection	1	Use the proximity dog signal for switching from speed control to position control	4366+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 559 Control Data

[FX5-SSC-G]

If "3: Link device" is selected in "[Pr.118] DOG signal selection", specify the link device to be used by the link device external signal assignment function. The detection accuracy is the operation cycle considering the communication delay.

■[Cd.46] Speed-position switching command

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

Setting item		Setting value	Setting details	Buffer memory address
[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

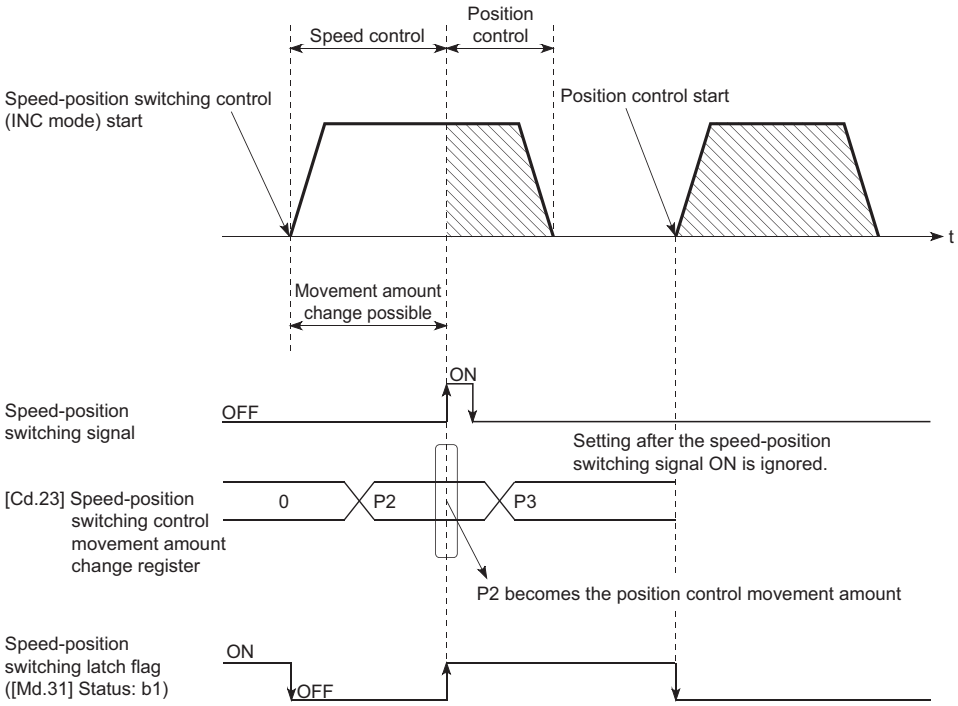
This setting is not required for "[Pr.42] External command function selection" and "[Cd.8] External command valid". Refer to the following for information on the setting details.

☞ Page 559 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 [FX5-SSC-S], or error code 1B1EH [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B1EH [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B12H [FX5-SSC-G]) 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 are 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 [FX5-SSC-S], or error code 1A93H [FX5-SSC-G]) or "Software stroke limit -" (error code: 1995H [FX5-SSC-S], or error code 1A95H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B30H [FX5-SSC-G]) 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	○
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—

Refer to the following for information on the setting details.

☞ Page 497 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 [FX5-SSC-S], or error code 1BAEH [FX5-SSC-G]) will occur when the "[Cd.190] PLC READY" 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

Setting item		Setting value	Setting details	Buffer memory address
[Pr.81]	Speed-position function selection	2	Speed-position switching control (ABS mode)	34+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 444 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

Setting item		Setting value	Setting details	Buffer memory address
[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 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	4366+100n

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

n: Axis No. - 1

Setting item		Setting value	Setting details	Buffer memory address
[Cd.46]	Speed-position switching command	1	Speed control will be taken over by position control.	4367+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

Setting item		Setting value	Setting details	Buffer memory address
[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

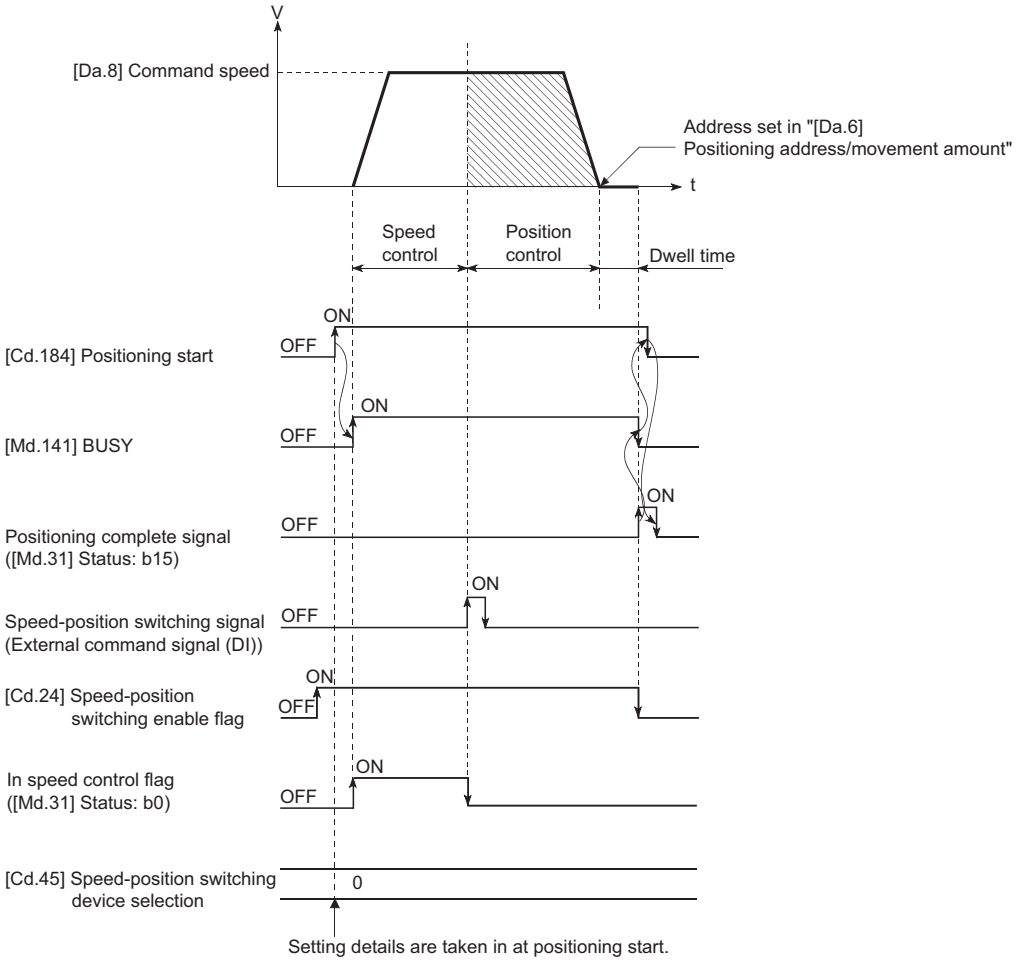
Operation chart

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).

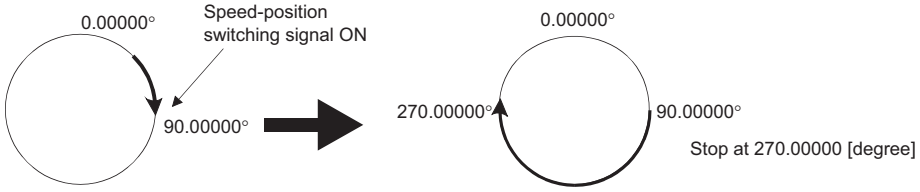
■Operation example

• When using the external command signal (DI) as speed-position switching signal



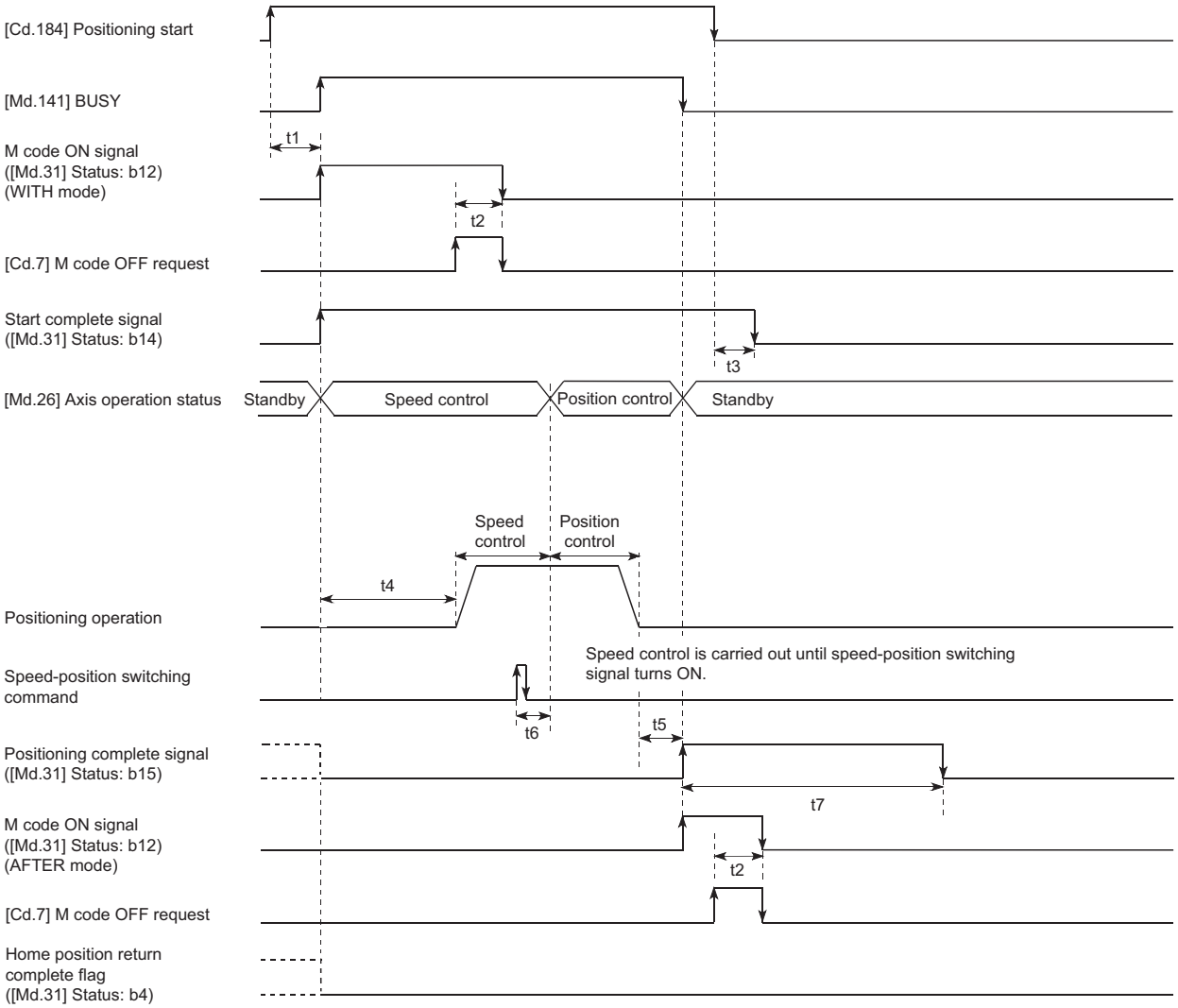
The following operation assumes that the speed-position switching signal is input at the position of the command position value of 90.00000 [degree] during execution of "[Da.2] Control method" "Forward run: speed/position" at "[Pr.1] Unit setting" of "2: degree" and "[Pr.21] Command position value during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

Operation cycle		t1*1	t2	t3	t4*2	t5	t6*3	t7
FX5-SSC-S	0.888	0.3 to 1.4	0 to 0.9	0 to 0.9	3.62 to 4.62	0 to 0.9	0 to 0.9	Follows parameters
	1.777	0.3 to 1.4	0 to 1.8	0 to 1.8	4.54 to 6.38	0 to 1.8	0 to 0.9	Follows parameters
FX5-SSC-G	0.500	0.4 to 1.0	0 to 0.5	0 to 0.5	1.8 to 2.0	0 to 0.5	5.9 to 6.1*4	Follows parameters
	1.000	0.4 to 1.5	0 to 1.0	0 to 1.0	3.0 to 3.5	0 to 1.0	7.5 to 7.7*4	Follows parameters
	2.000	0.4 to 2.8	0 to 2.0	0 to 2.0	6.0 to 6.6	0 to 2.0	10.5 to 10.7*4	Follows parameters
	4.000	0.4 to 4.5	0 to 4.0	0 to 4.0	12.0 to 12.5	0 to 4.0	16.5 to 17.0*4	Follows parameters

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

*2 The t4 timing time depends on the setting of the acceleration time, servo parameter, etc.

*3 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.

*4 When the servo parameter of the servo amplifier "Input filter setting (PD11)" is set to "0: No filter", the time fluctuates depending on the setting value of the servo parameter "Input filter setting (PD11)".

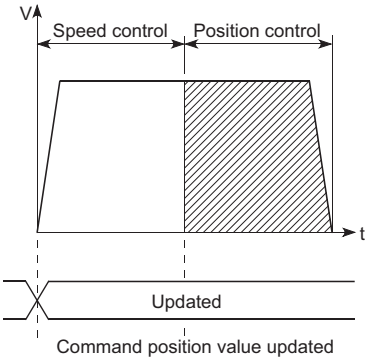
Command position value

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.

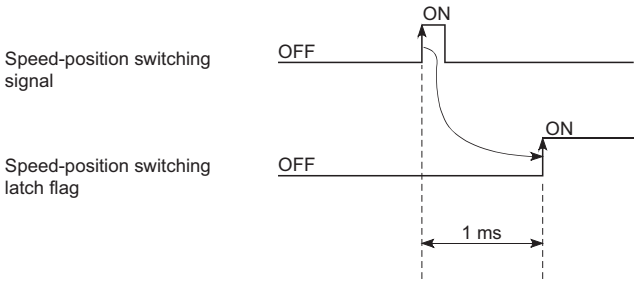
Only "1: Update command position value" is valid for the setting of "[Pr.21] Command position value during speed control" in speed-position switching control (ABS mode).

The error "Speed-position function selection error" (error code: 1AAEH [FX5-SSC-S], or error code 1BAEH [FX5-SSC-G]) 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

■External command signals (DI)

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

Setting item		Setting value	Setting details	Buffer memory address
[Pr.42]	External command function selection	2	Speed-position, position-speed switching request	62+150n
[Cd.8]	External command valid	1	Validates an external command	4305+100n
[Cd.45]	Speed-position switching device selection	0	Use the external command signal for switching from speed control to position control	4366+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 444 Basic Setting, ☞ Page 559 Control Data

■Proximity dog signal (DOG)

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

Setting item		Setting value	Setting details	Buffer memory address
[Cd.45]	Speed-position switching device selection	1	Use the proximity dog signal for switching from speed control to position control	4366+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 559 Control Data

[FX5-SSC-G]

If "3: Link device" is selected in "[Pr.118] DOG signal selection", specify the link device to be used by the link device external signal assignment function. The detection accuracy is the operation cycle.

■[Cd.46] Speed-position switching command

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

Setting item		Setting value	Setting details	Buffer memory address
[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

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.

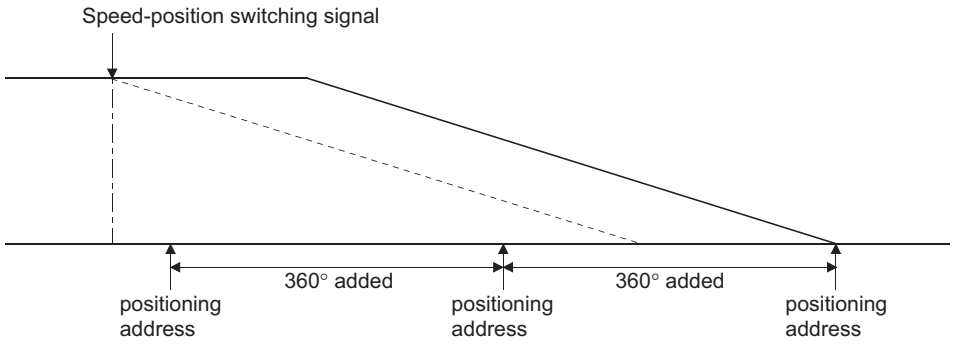
☞ Page 559 Control Data

Restrictions

- The error "Continuous path control not possible" (error code: 1A1EH [FX5-SSC-S], or error code 1B1EH [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B1EH [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B12H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B30H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B30H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1BAEH [FX5-SSC-G]) will occur when the "[Cd.190] PLC READY" 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	○
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—

Refer to the following for information on the setting details.

☞ Page 497 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

Setting item		Setting value	Setting details	Buffer memory address
[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 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	4366+100n

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

n: Axis No. - 1

Setting item		Setting value	Setting details	Buffer memory address
[Cd.46]	Speed-position switching command	1	Position control will be taken over by speed control.	4367+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

Setting item		Setting value	Setting details	Buffer memory address
[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

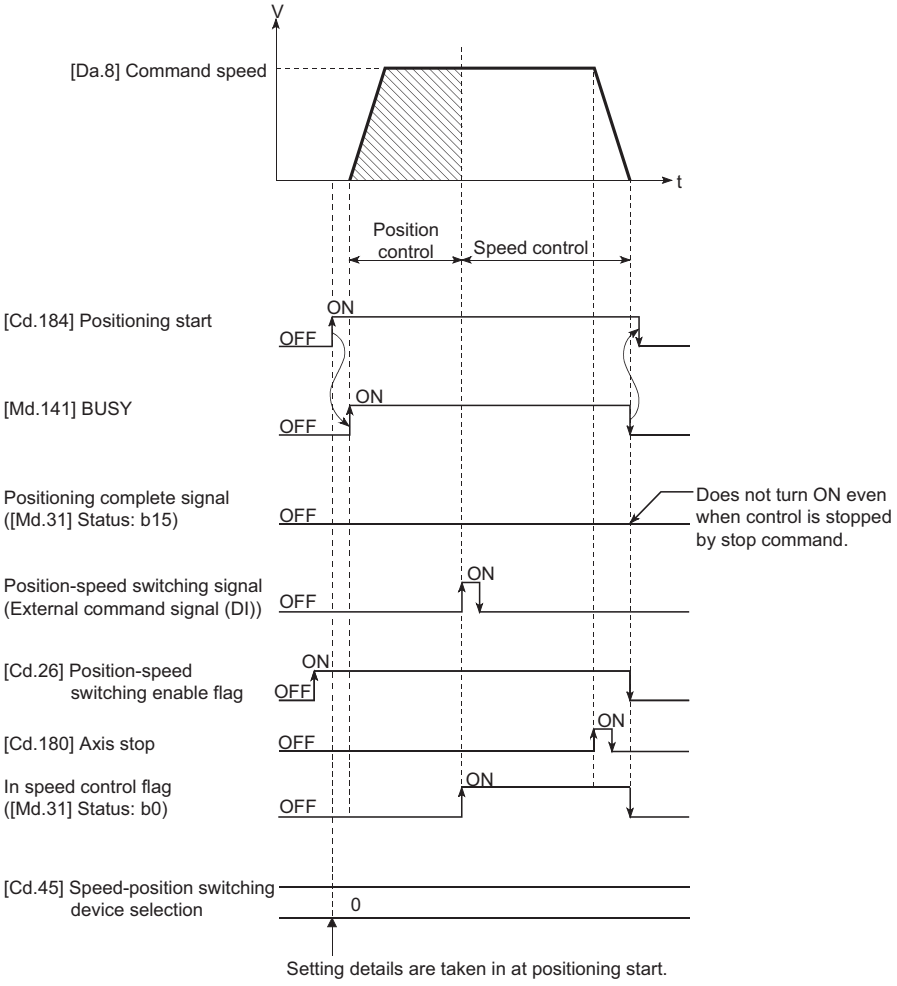
Operation chart

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

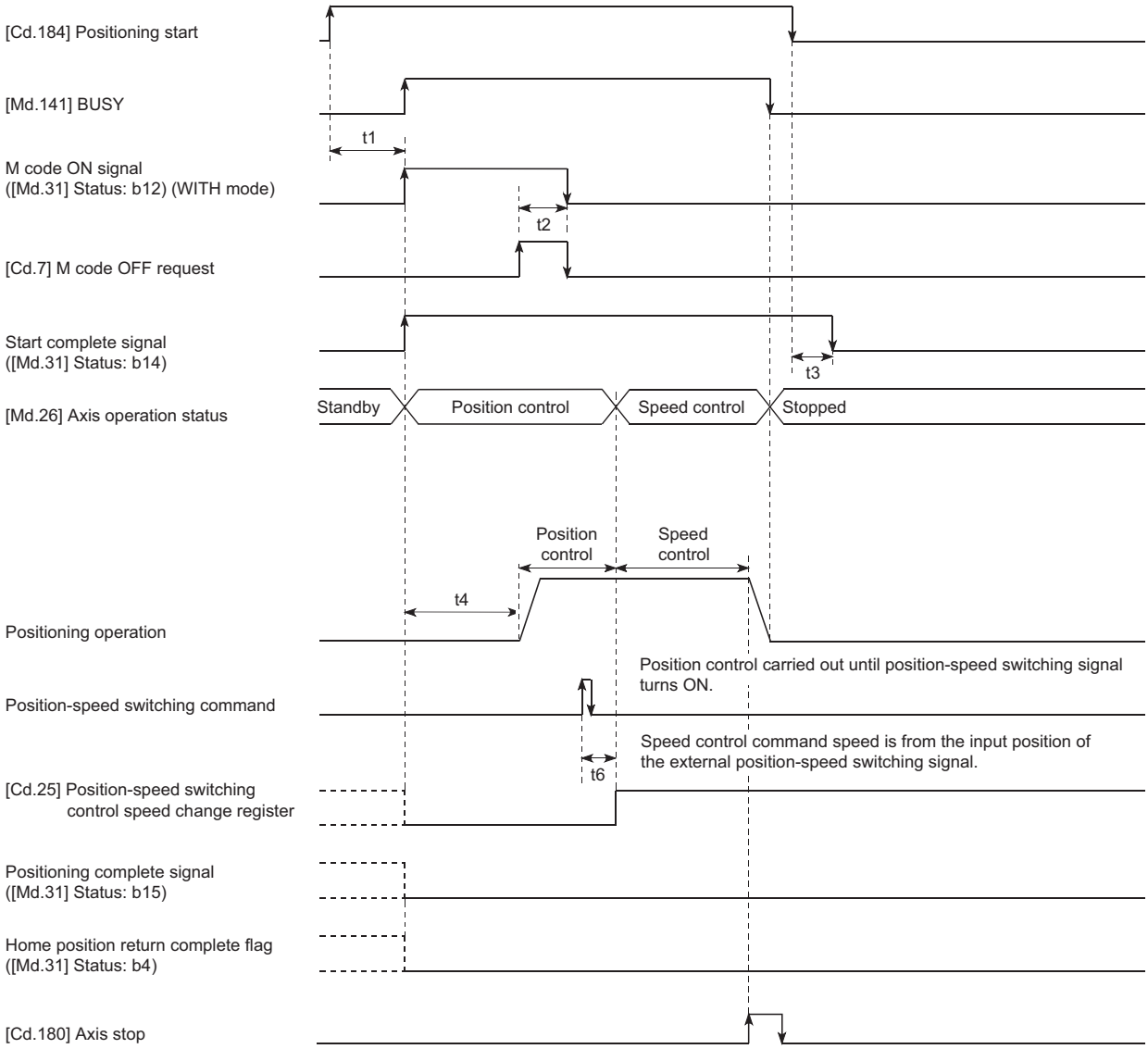
The "in speed control" flag ([Md.31] Status: b0) is turned ON during speed control of position-speed switching control.

■Operation example

• When using the external command signal (DI) as position-speed switching signal



Operation timing and processing time



- Normal timing time (Unit: [ms])

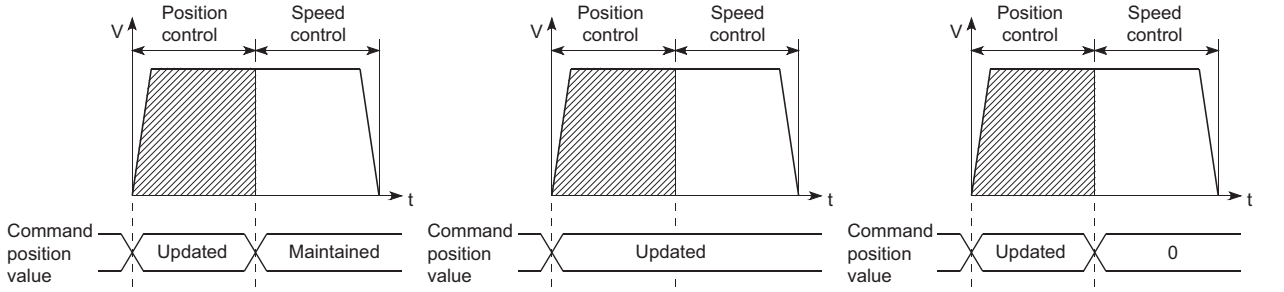
Operation cycle		t1*1	t2	t3	t4*2	t5	t6*3
FX5-SSC-S	0.888	0.3 to 1.4	0 to 0.9	0 to 0.9	3.75 to 4.40	—	0 to 0.9
	1.777	0.3 to 1.4	0 to 1.8	0 to 1.8	4.80 to 6.24	—	0 to 0.9
FX5-SSC-G	0.500	0.4 to 1.0	0 to 0.5	0 to 0.5	1.80 to 2.0	—	5.9 to 6.1*4
	1.000	0.4 to 1.5	0 to 1.0	0 to 1.0	3.2 to 3.5	—	7.5 to 7.7*4
	2.000	0.4 to 2.8	0 to 2.0	0 to 2.0	6.4 to 6.9	—	10.5 to 10.7*4
	4.000	0.4 to 4.5	0 to 4.0	0 to 4.0	12.0 to 12.5	—	16.5 to 17.0*4

*1 The t1 timing time could be delayed by the operation state of other axes.
*2 The t4 timing time depends on the setting of the acceleration time, servo parameter, etc.
*3 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.
*4 When the servo parameter of the servo amplifier "Input filter setting (PD11)" is set to "0: No filter", the time fluctuates depending on the setting value of the servo parameter "Input filter setting (PD11)".

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.

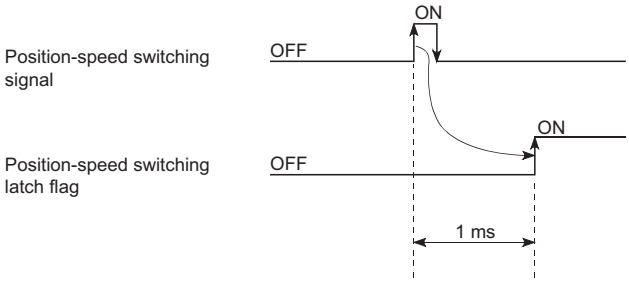
"[Pr.21] Command position value during speed control" setting	[Md.20] Command position value
0: Do not update command position value	The command position value is updated during position control, and the command position value at the time of switching is maintained as soon as position control is switched 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

■External command signals (DI)

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

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

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

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■Proximity dog signal (DOG)

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

Setting item		Setting value	Setting details	Buffer memory address
[Cd.45]	Speed-position switching device selection	1	Use the proximity dog signal for switching from position control to speed control.	4366+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.

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[FX5-SSC-G]

If "3: Link device" is selected in "[Pr.118] DOG signal selection", specify the link device to be used by the link device external signal assignment function. The detection accuracy is the operation cycle.

■[Cd.46] Speed-position switching command

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

Setting item		Setting value	Setting details	Buffer memory address
[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

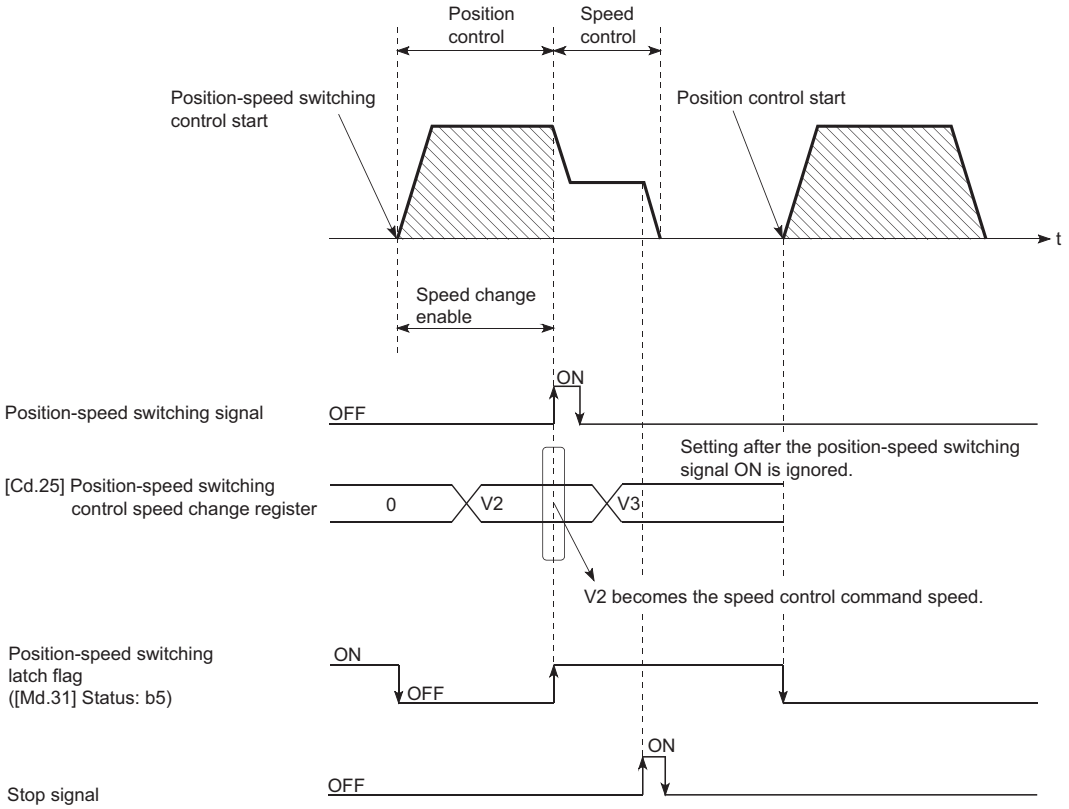
The setting is not required for "[Pr.42] External command function selection" and "[Cd.8] External command valid". Refer to the following for information on the setting details.

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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 [FX5-SSC-S], or error code 1B1EH [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B1EH [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1A93H [FX5-SSC-G]) or "Software stroke limit -" (error code: 1995H [FX5-SSC-S], or error code 1A95H [FX5-SSC-G]) 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 [FX5-SSC-S], or warning code 0D51H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B30H [FX5-SSC-G]) 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	○
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—

Refer to the following for information on the setting details.

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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

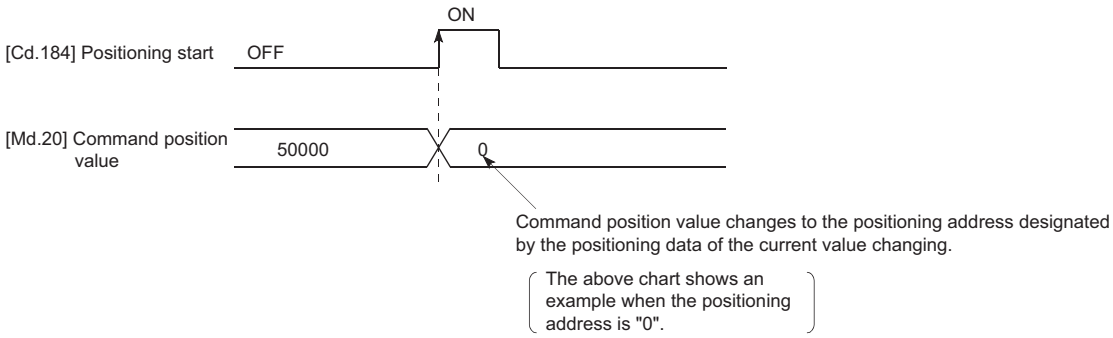
The current value changing using method [1] is used during continuous positioning of multiple blocks, etc.

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.



■Restrictions

- The error "New current value not possible" (error code: 1A1CH [FX5-SSC-S], or error code 1B1CH [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B1CH [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1A97H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1B18H [FX5-SSC-G]) or "Software stroke limit -" (error code: 1A1AH [FX5-SSC-S], or error code 1B1AH [FX5-SSC-G]) will occur at the positioning start, and the operation will not start.
- The error "Software stroke limit +" (error code: 1993H [FX5-SSC-S], or error code 1A93H [FX5-SSC-G]) or "Software stroke limit -" (error code: 1995H [FX5-SSC-S], or error code 1A95H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1AA6H [FX5-SSC-G]) 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	○
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—

Refer to the following for information on the setting details.

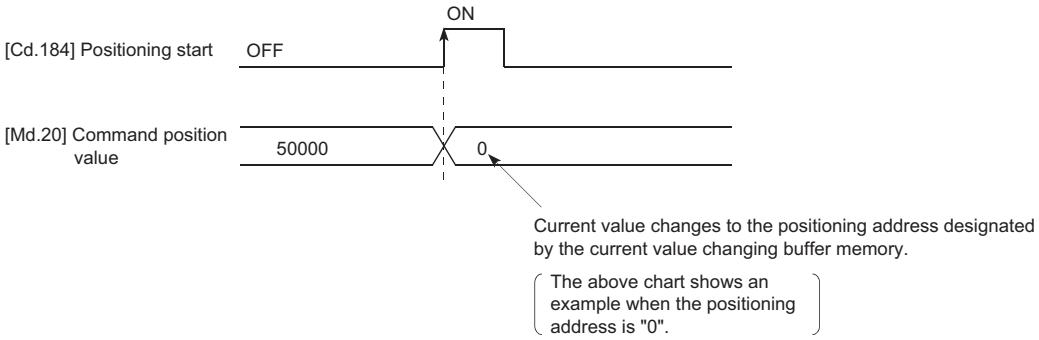
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Changing to a new current value using the current value changing start No. (No.9003)

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 [FX5-SSC-S], or error code 1A97H [FX5-SSC-G]) 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: 1993H [FX5-SSC-S], or error code 1A93H [FX5-SSC-G]) or "Software stroke limit -" (error code: 1995H [FX5-SSC-S], or error code 1A95H [FX5-SSC-G]) 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 an absolute position system is used, "[Md.20] Command position value" returns to the same value as "[Md.21] Machine feed value" at the start of communication with the servo amplifier after the power supply ON or the CPU module reset.

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

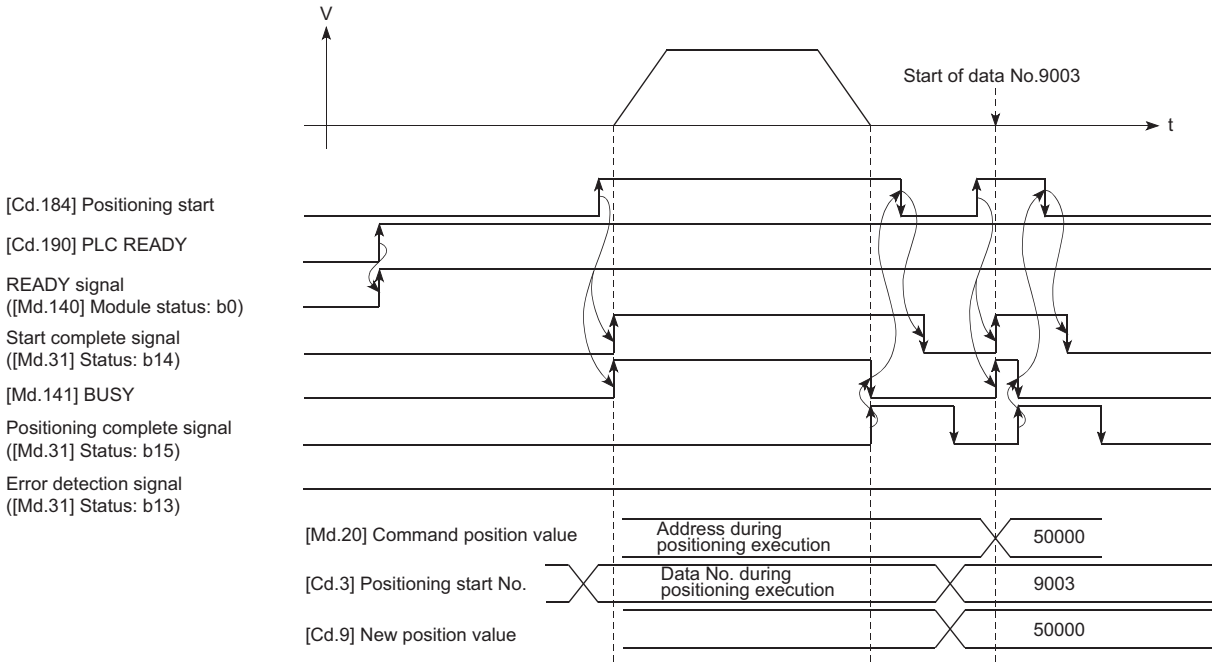
Setting item		Setting value	Setting details	Buffer memory address
[Cd.3]	Positioning start No.	9003	Set the start No. "9003" for the new current value.	4300+100n
[Cd.9]	New position value	50000	Set the new "[Md.20] Command position value".	4306+100n 4307+100n

Refer to the following for details on the setting details.

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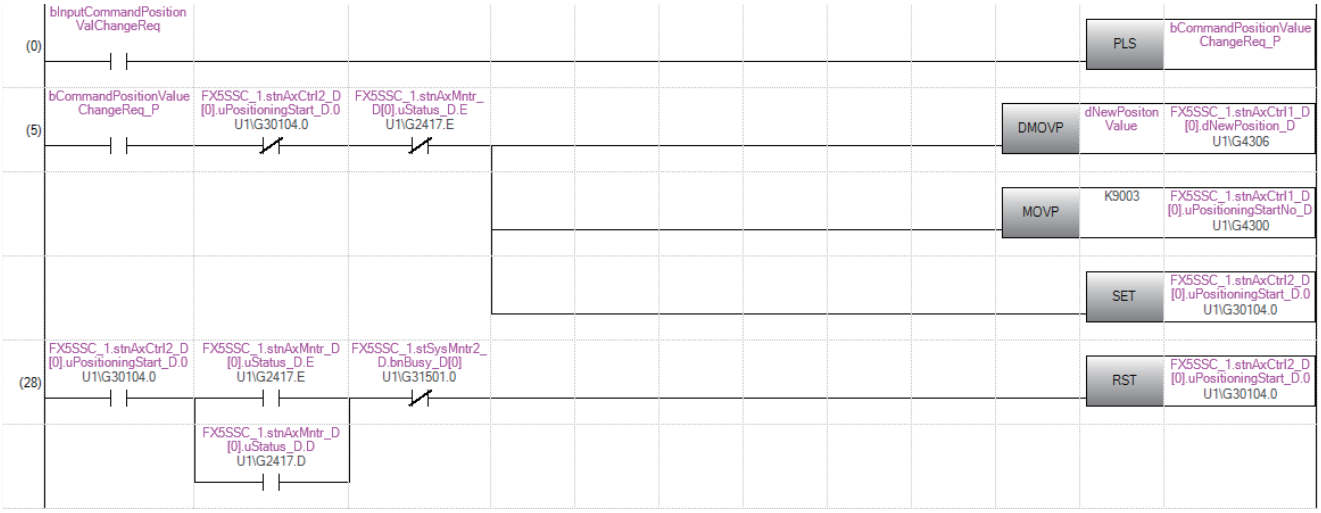
• The following shows a start time chart.

■Operation example



Program example

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



Classification	Label name	Description
Module label	FX5SSC_1.stnAxCtrl2_D[0].uPositioningStart_D.0	Axis 1 Positioning start signal
	FX5SSC_1.stnAxMntr_D[0].uStatus_D.E	Axis 1 Start complete
	FX5SSC_1.stnAxCtrl1_D[0].dNewPosition_D	Axis 1 New position value
	FX5SSC_1.stnAxCtrl1_D[0].uPositioningStartNo_D	Axis 1 Positioning start No.
	FX5SSC_1.stnAxMntr_D[0].uStatus_D.D	Axis 1 Error detection
	FX5SSC_1.stSysMntr2_D.bnBusy_D[0]	Axis 1 BUSY 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 are for local labels.	

	Label Name	Data Type		Class
1	dNewPositonValue	Double Word [Signed]	...	VAR
2	bCommandPositionValueChangeReq_P	Bit	...	VAR
3	bInputCommandPositionValChangeReq	Bit	...	VAR

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	—
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—

Refer to the following for information on the setting details.

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Restrictions

The error "Control method setting error" (error code: 1A24H [FX5-SSC-S], or error code 1B24H [FX5-SSC-G]) 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" 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" 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/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	◎ (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	—

Refer to the following for information on the setting details.

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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	◎ (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	—

Refer to the following for information on the setting details.

☞ Page 497 Positioning Data

Restrictions

- The error "Control method LOOP setting error" (error code: 1A33H [FX5-SSC-S], or error code 1B33H [FX5-SSC-G]) 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 147 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 137 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	—
[Da.20]	Axis to be interpolated No.1	—
[Da.21]	Axis to be interpolated No.2	—
[Da.22]	Axis to be interpolated No.3	—

Refer to the following for information on the setting details.
☞ Page 497 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 28 Multiple axes simultaneous start

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-F FX5 Motion Module/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

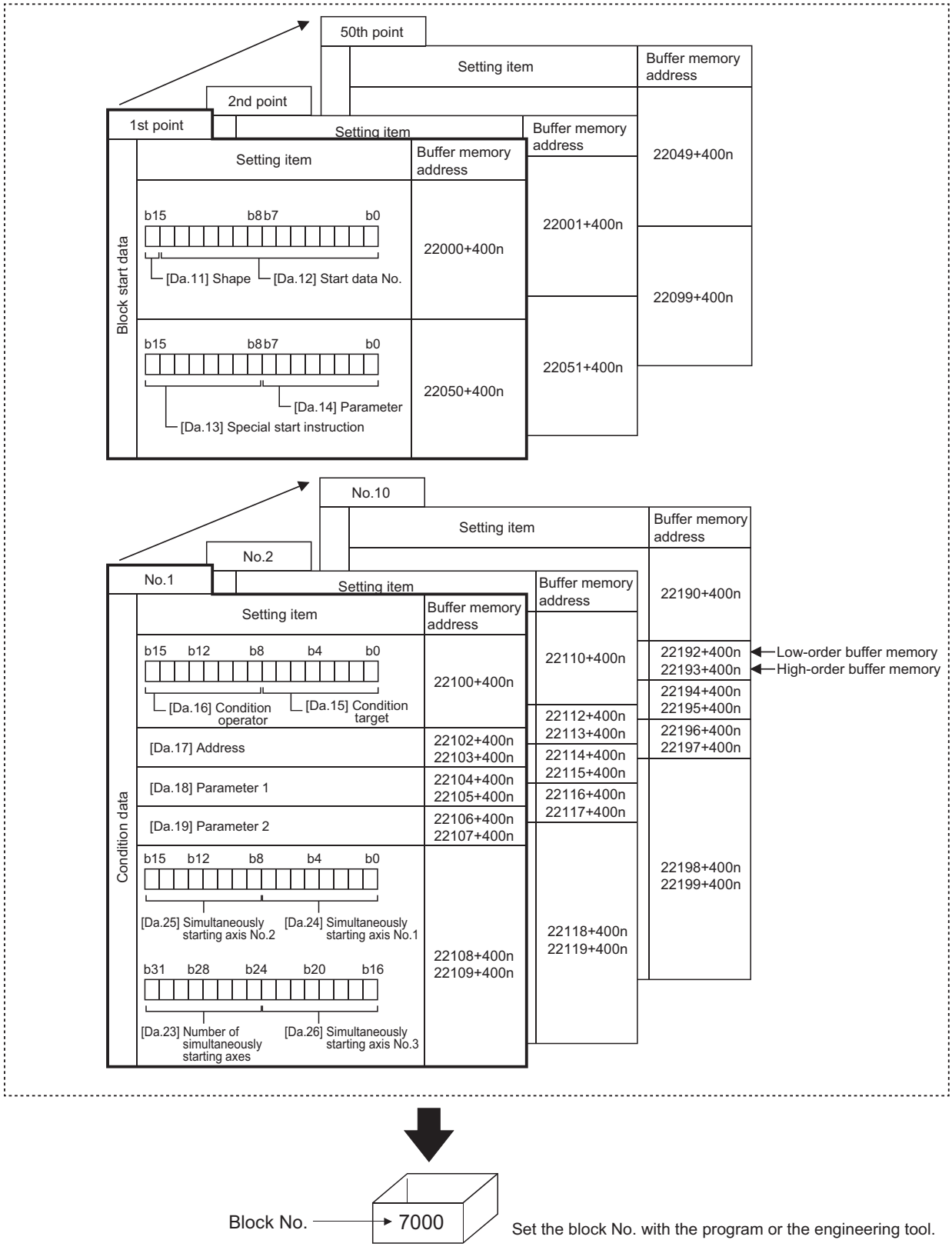
"High-level positioning control" is executed by setting the required items in the "block start data" and "condition data", then starting that "block start data". Judgment about whether execution is possible, etc., is carried out at execution using the "condition data" designated in the "block start data".
"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/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", and "positioning data No." 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 simultaneously starting axes	Set the number of axes to be started simultaneously in the simultaneously start.
	[Da.24]	Simultaneously starting axis No.1	Set the simultaneously starting axis in the simultaneously start.
	[Da.25]	Simultaneously starting axis No.2	
	[Da.26]	Simultaneously 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.



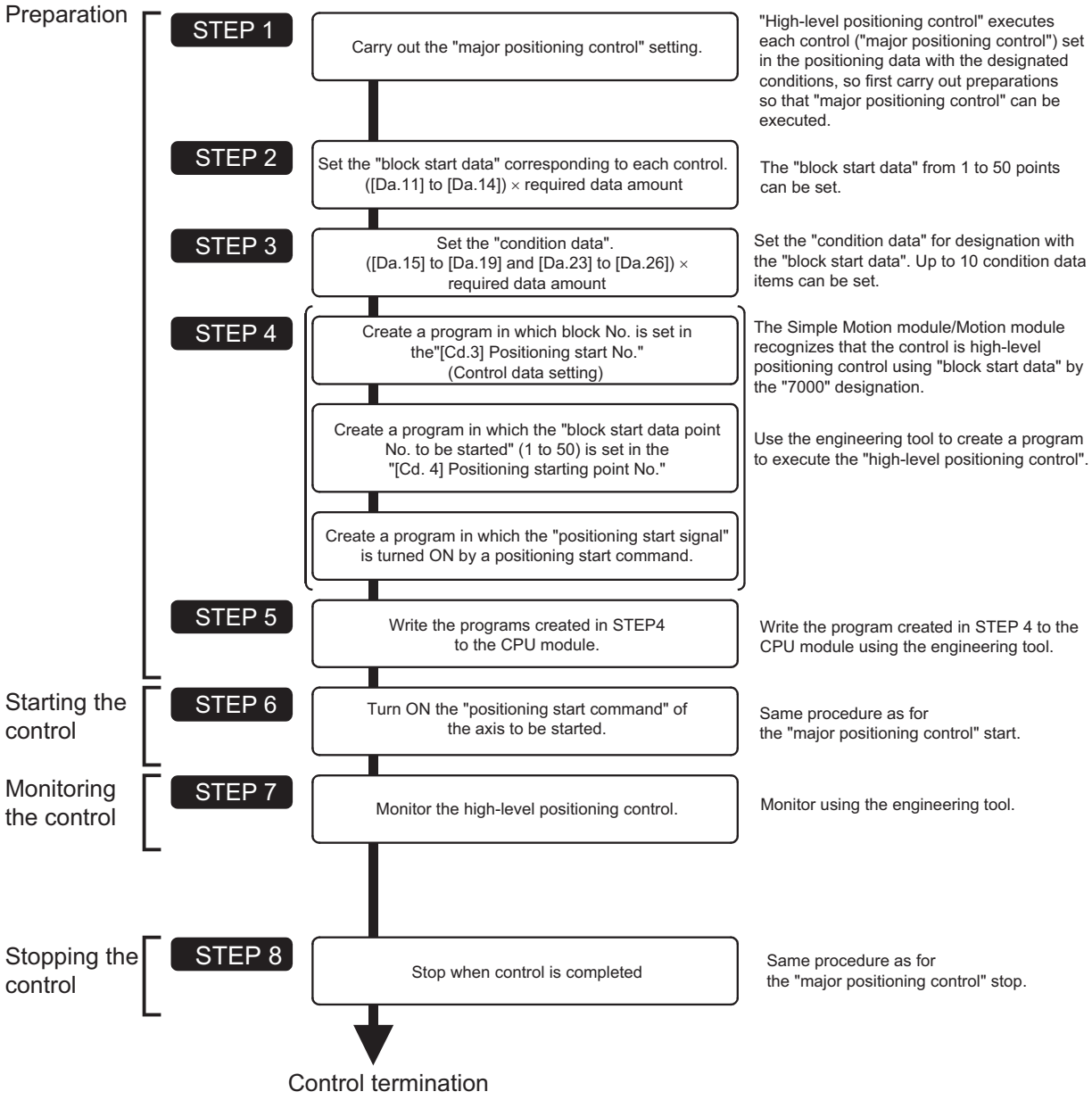
Set the block No. with the program or the engineering tool.

Set the "block start data" and "condition data" corresponding to the following "block No.7001" using the program or the engineering tool to Simple Motion module/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.

4.2 High-level Positioning Control Execution Procedure

High-level positioning control is carried out using the following procedure.



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/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 150 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	
⋮		

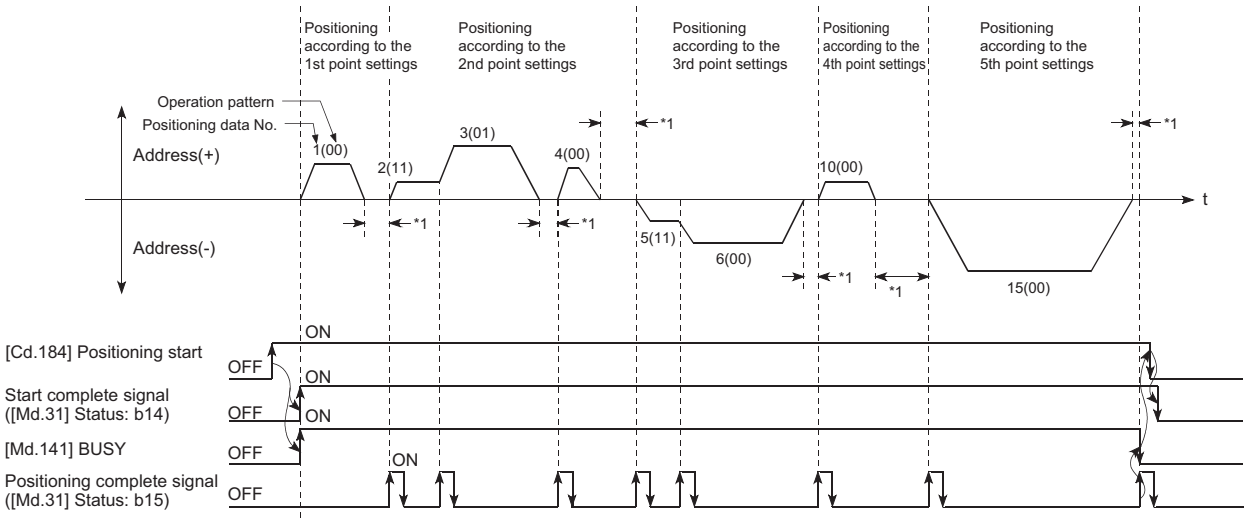
*1 "1 block" is defined as all the data continuing from the positioning data in which "continuous positioning control" or "continuous path control" is set in the "[Da.1] Operation pattern" to the positioning data in which "independent positioning control (Positioning complete)" is set.

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 simultaneously started 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 simultaneously started 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 512 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 147 Repeated start (FOR loop), ☞ Page 148 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 [FX5-SSSC-S], or warning code 0DB1H [FX5-SSC-G]) 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: Monitor data ([Md.140], [Md.141])	◎	◎	×	◎	◎
02H: Control data ([Cd.184], [Cd.190], [Cd.191])	◎	◎	×	◎	◎
03H: Buffer memory (1 word)	◎	◎	×	◎	◎
04H: Buffer memory (2 words)	◎	◎	×	◎	◎
05H: Positioning data No.	×	×	◎	×	×

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]

[Da.15] Condition target	[Da.16] Condition operator	[Da.23] Number of simultaneously starting axes	[Da.17] Address	[Da.18] Parameter 1	[Da.19] Parameter 2
01H: Monitor data ([Md.140], [Md.141])	07H: SIG = ON 08H: SIG = OFF	—	—	Monitor data: 0H (READY ([Md.140] Module status: b0)), 1H (Synchronization flag ([Md.140] Module status: b1)), 10H to 17H (BUSY axis-1 to axis-8 ([Md.141] BUSY)) Control data: 0H (PLC READY ([Cd.190] PLC READY)), 1H (All axis servo ON ([Cd.191] All axis servo ON)), 10H to 17H (Positioning start axis axis-1 to axis-8 ([Cd.184] Positioning start))	—
02H: Control data ([Cd.184], [Cd.190], [Cd.191])					
03H: Buffer memory (1 word)*1	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)*1					
05H: Positioning data No.	Setting not possible	2	—	Low-order 16 bits: "[Da.24] Simultaneously starting axis No.1" positioning data No. High-order 16 bits: "[Da.25] Simultaneously starting axis No.2" positioning data No.	—
		3			Low-order 16 bits: "[Da.26] Simultaneously starting axis No.3" positioning data No. High-order 16 bits: Unusable (Set "0".)
		4			

*1 Comparison of ≤ and ≥ is judged as signed values. (☞ Page 515 [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/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 monitor data ON/OFF as a condition

[Condition]

The monitor data "[Md.141] BUSY" (Axis 1) 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 simultaneously starting axes	[Da.24] Simultaneously starting axis No.1	[Da.25] Simultaneously starting axis No.2	[Da.26] Simultaneously starting axis No.3
01H: Monitor data ([Md.140], [Md.141])	08H: SIG = 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 simultaneously starting axes	[Da.24] Simultaneously starting axis No.1	[Da.25] Simultaneously starting axis No.2	[Da.26] Simultaneously 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]

Simultaneously starting "axis 2 positioning data No.3"

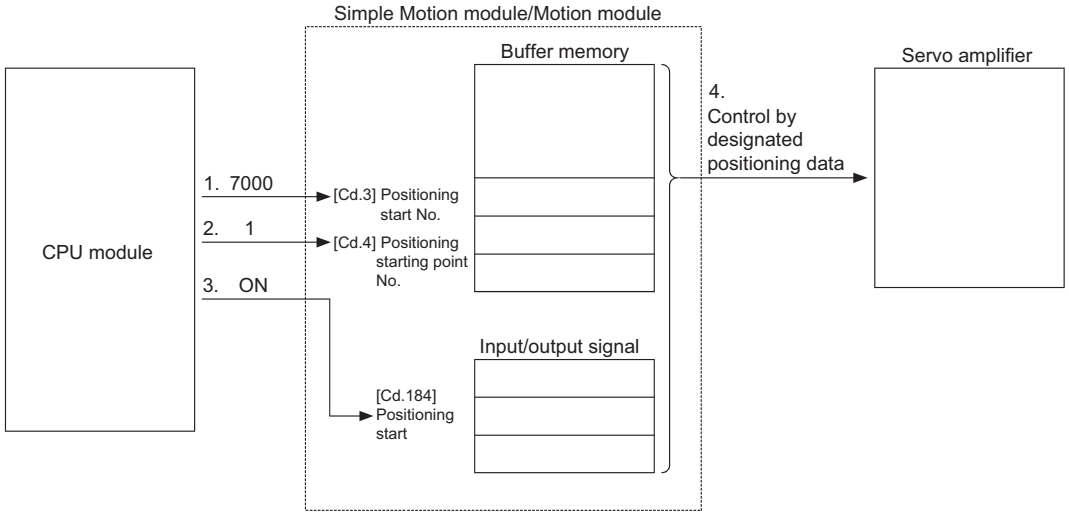
[Da.15] Condition target	[Da.16] Condition operator	[Da.17] Address	[Da.18] Parameter 1	[Da.19] Parameter 2	[Da.23] Number of simultaneously starting axes	[Da.24] Simultaneously starting axis No.1	[Da.25] Simultaneously starting axis No.2	[Da.26] Simultaneously starting axis No.3
05H: Positioning data 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 "[Cd.184] Positioning start" 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

Setting item		Setting value	Setting details	Buffer memory address
[Cd.3]	Positioning start No.	7000	Set "7000" to indicate control using "block start data".	4300+100n
[Cd.4]	Positioning starting point No.	1	Set the point No. of the "block start data" to be started.	4301+100n

Refer to the following for details on the setting details.
☞ Page 559 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	[Cd.190] PLC READY
	READY signal	ON	Preparation completed	[Md.140] Module status: b0
	All axis servo ON	ON	All axis servo ON	[Cd.191] All axis servo ON
	Synchronization flag	ON	The buffer memory can be accessed.	[Md.140] Module status: b1
	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	[Md.141] BUSY
	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	—

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

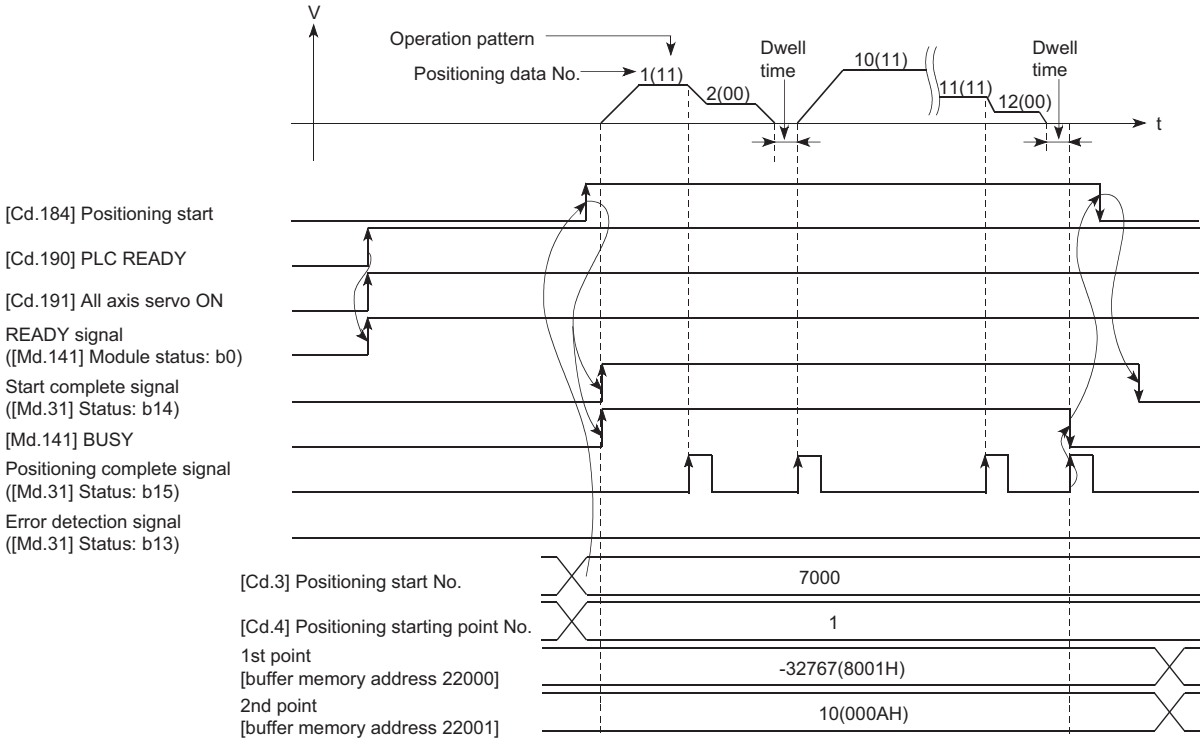
Axis 1 block start data	[Da.11] Shape	[Da.12] Start data No.	[Da.13] Special start instruction	[Da.14] Parameter
1st point	1: Continue	1	0: Block start	—
2nd point	0: End	10	0: Block start	—
⋮				

■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
⋮	

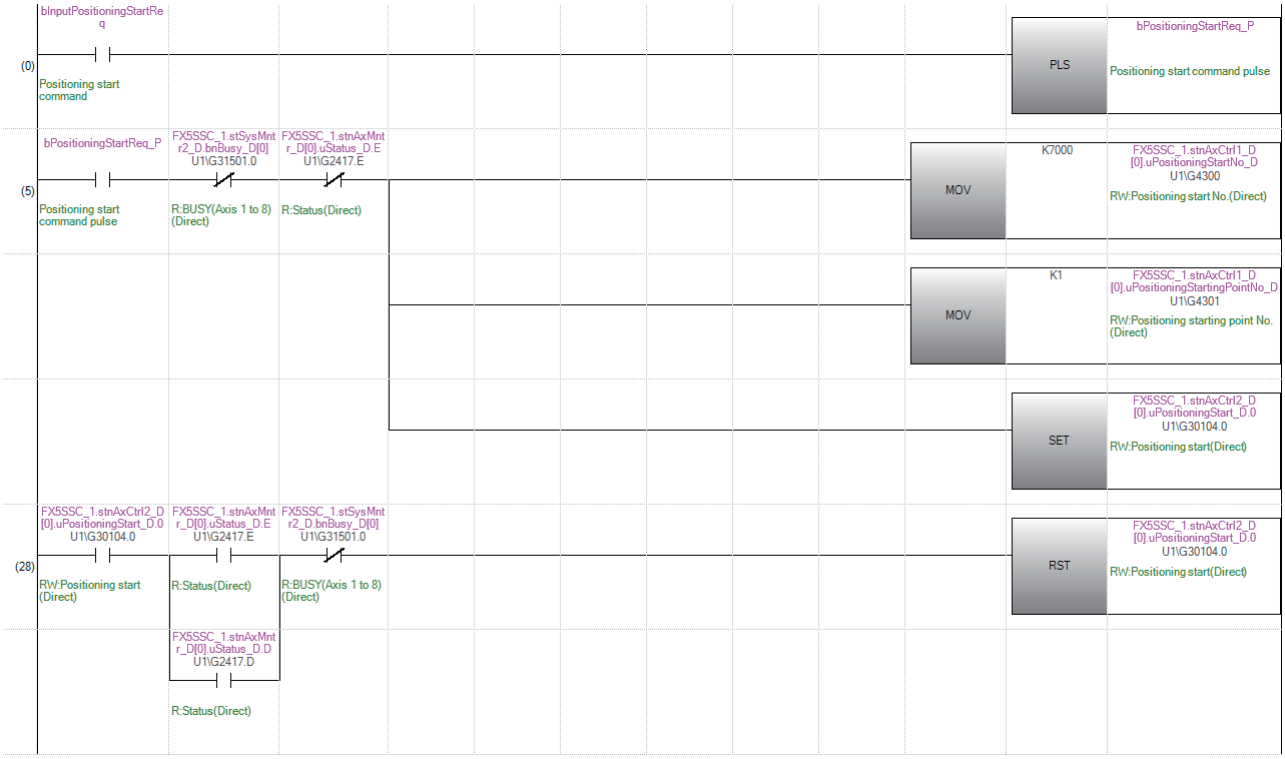
■Start time chart

[Operation example]



Program example

Set the block start data beforehand.



Classification	Label name	Description
Module label	FX5SSC_1.stSysMntr2_D.bnBusy_D[0]	Axis 1 BUSY signal
	FX5SSC_1.stnAxMntr_D[0].uStatus_D.E	Axis 1 Start complete
	FX5SSC_1.stnAxCtrl1_D[0].uPositioningStartNo_D	Axis 1 Positioning start No.
	FX5SSC_1.stnAxCtrl1_D[0].uPositioningStartingPointNo_D	Axis 1 Positioning starting point No.
	FX5SSC_1.stnAxCtrl2_D[0].uPositioningStart_D.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 are for local labels.	

	Label Name	Data Type		Class
1	bInputPositioningStartReq	Bit	...	VAR
2	bPositioningStartReq_P	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/Motion module.
Manual control using a program from the CPU module is explained in this chapter.

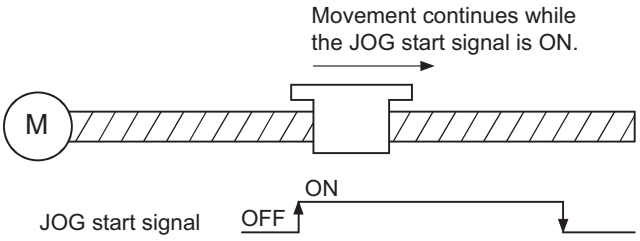
5.1 Outline of Manual Control

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.

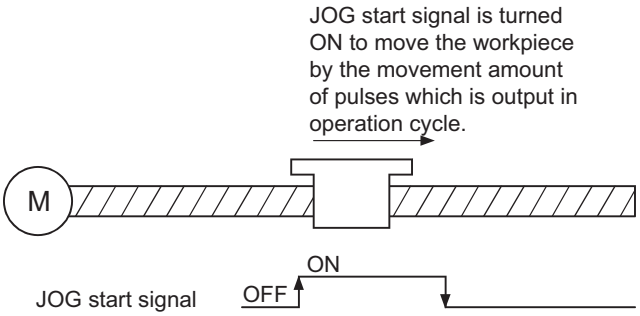
[JOG operation]

"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 297 Teaching function).



[Inching operation]

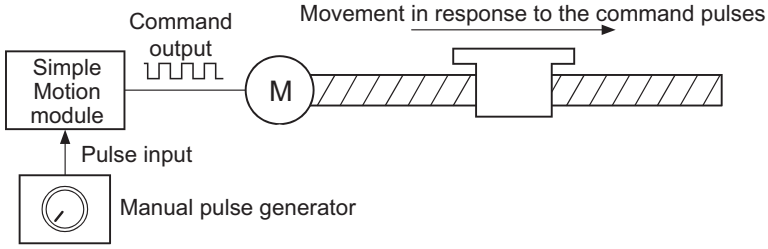
"Inching operation" is a control method in which a minute movement amount of command is output manually in operation cycle. When the "inching movement amount" of the axis control data is set by JOG operation, the workpiece is moved by a set movement amount. (When the "inching movement amount" is set to "0", the machine operates as JOG operation.)



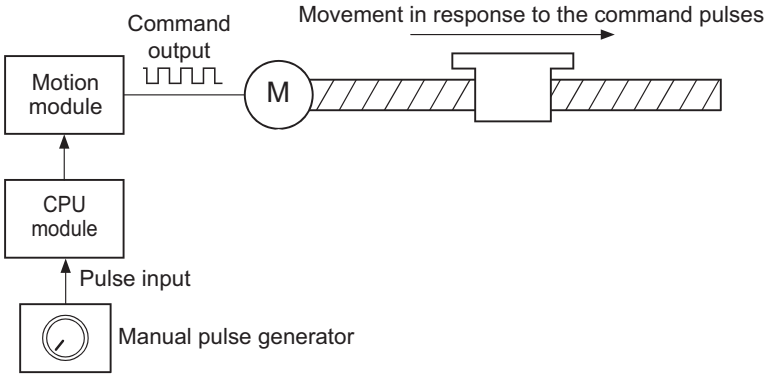
[Manual pulse generator operation]

"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.

[FX5-SSC-S]



[FX5-SSC-G]



■Manual control sub functions

Refer to the "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-F FX5 Motion Module/Simple Motion Module User's Manual (Startup)

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

☞ Page 218 CONTROL SUB FUNCTIONS

■Monitoring manual control

Refer to the following for directly monitoring the buffer memory using an engineering tool.

☞ Page 518 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

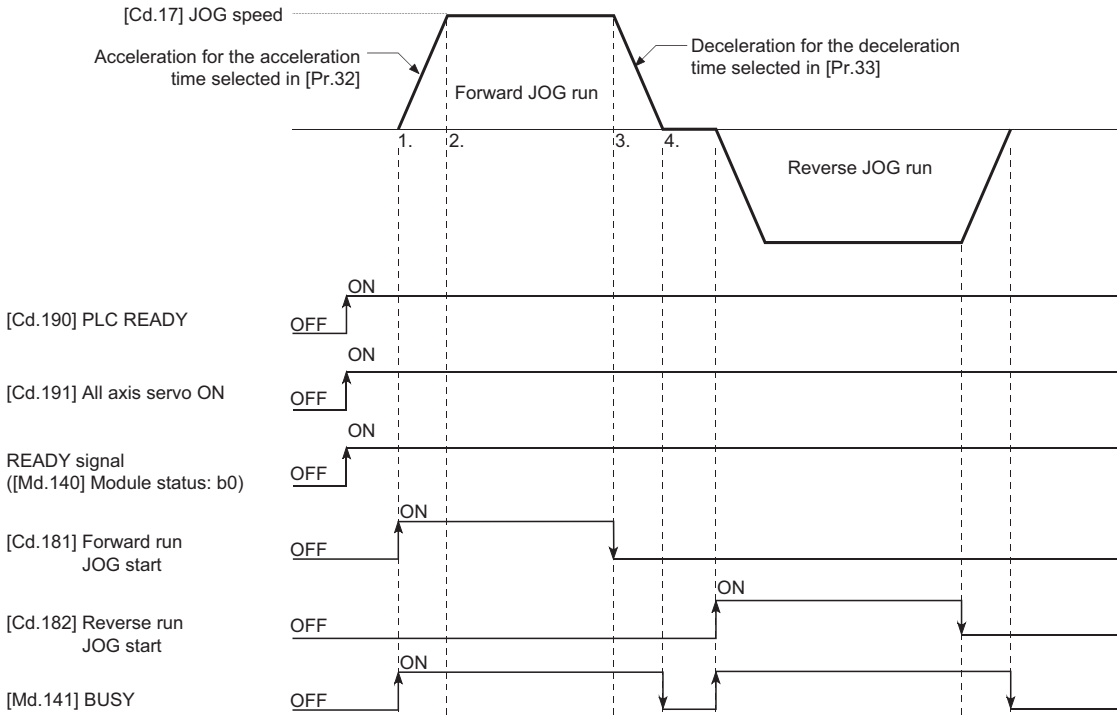
Outline of JOG operation

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/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 250 Hardware stroke limit function)
If the hardware stroke limit function is not used, the workpiece may exceed the moving range, causing an accident.

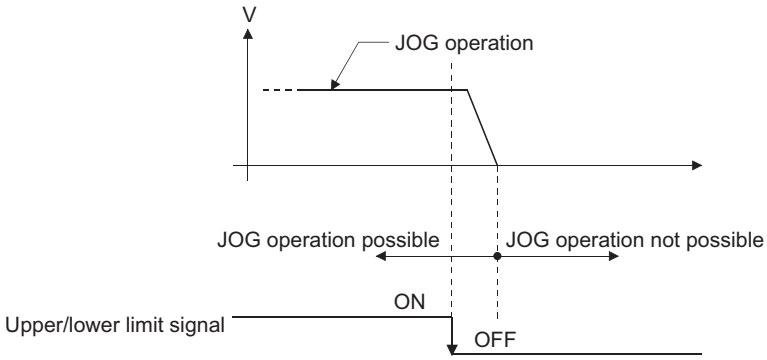
Precautions during operation

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 [FX5-SSC-S], or error code 1A80H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code 1BB7H [FX5-SSC-G]) 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 [FX5-SSC-S], or warning code 0D41H [FX5-SSC-G]) will occur in the Simple Motion module/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 168 Inching Operation)

Operations when stroke limit error occurs

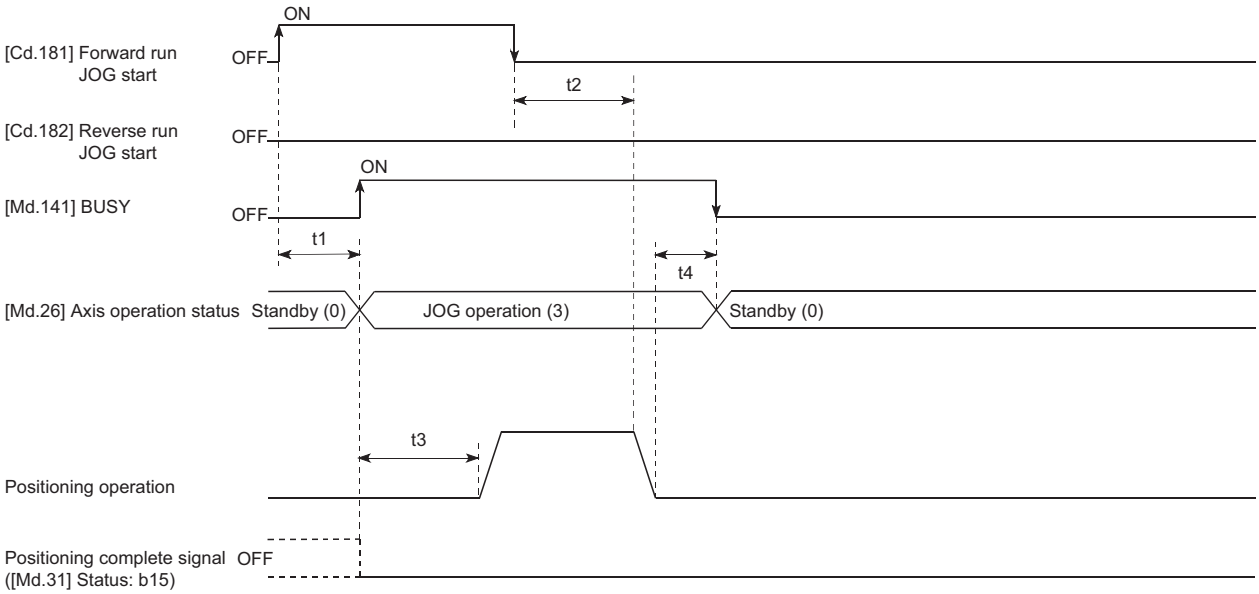
When the operation is stopped by hardware stroke limit error or software stroke limit error, the JOG operation can execute in an opposite way (direction within normal limits) after an error reset. (An error will occur again if JOG start signal is turned ON in a direction to outside the stroke limit.)



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])

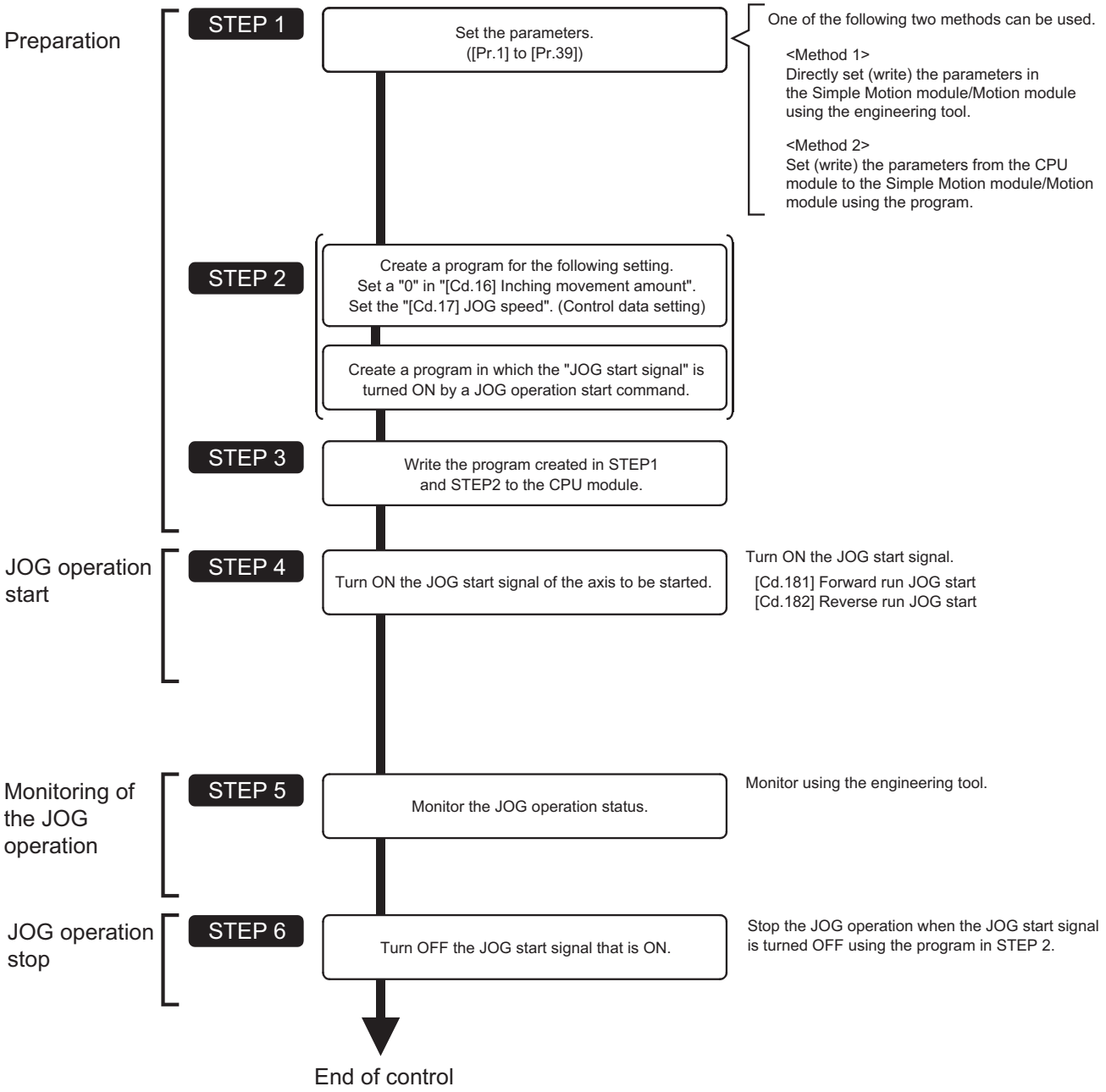
Operation cycle		t1*1	t2	t3*2	t4
FX5-SSC-S	0.888	0.1 to 1.1	0 to 0.9	3.78 to 4.45	0 to 0.9
	1.777	0.1 to 2.1	0 to 1.8	5.58 to 7.13	0 to 1.8
FX5-SSC-G	0.500	0.4 to 1.0	0 to 0.5	1.8 to 2.0	0 to 0.5
	1.000	0.4 to 1.5	0 to 1.0	3.4 to 3.8	0 to 1.0
	2.000	0.4 to 2.8	0 to 2.0	6.4 to 6.6	0 to 2.0
	4.000	0.4 to 4.5	0 to 4.0	12.0 to 12.5	0 to 4.0

*1 Delays may occur in the t1 timing time due to the operation status of other axes.

*2 The t3 timing time depends on the setting of the acceleration time, servo parameter, etc.

JOG operation execution procedure

The JOG operation is carried out by the following procedure.



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/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 values 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]	Sudden stop deceleration time (Unit: ms)	○
	[Pr.37]	Stop group 1 sudden stop selection	○
	[Pr.38]	Stop group 2 sudden stop selection	○
	[Pr.39]	Stop group 3 sudden stop selection	○

Refer to the following for the setting details.

☞ Page 444 Basic Setting

Point

- Parameter settings work in common for all controls using the Simple Motion module/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

Setting item		Setting value	Setting details	Buffer memory address
[Cd.16]	Inching movement amount	0	Set "0".	4317+100n
[Cd.17]	JOG speed	10000	Set a value equal to or below the "[Pr.31] JOG speed limit value".	4318+100n 4319+100n

Refer to the following for the setting details.
☞ Page 559 Control Data

Start conditions

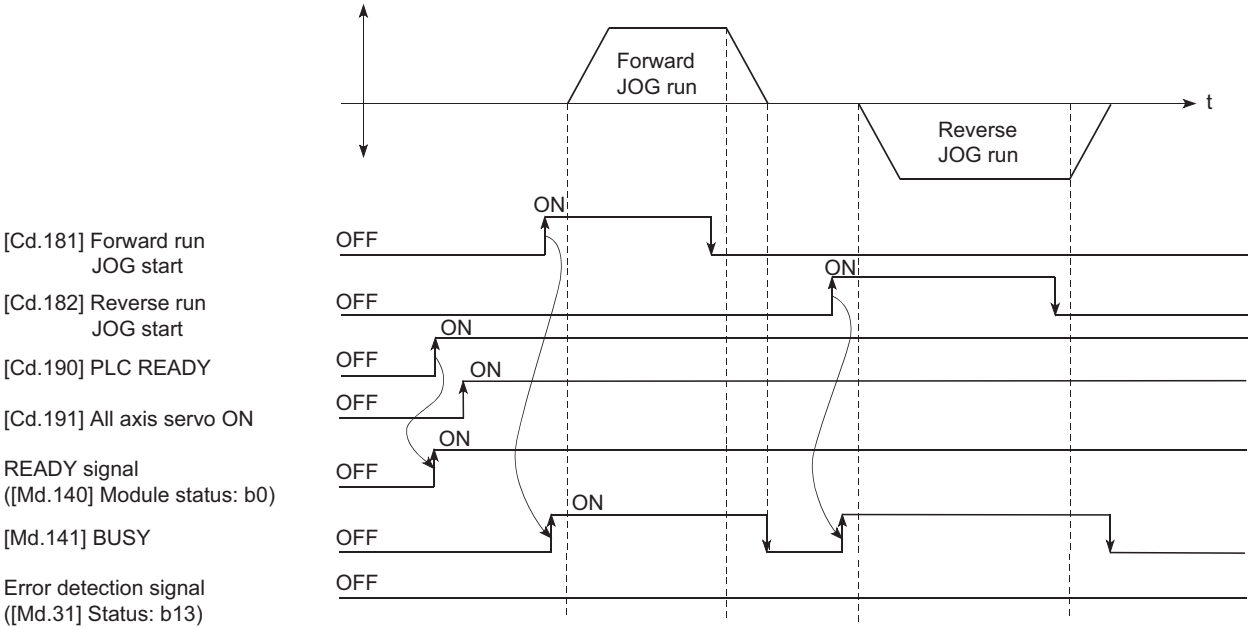
The following conditions must be fulfilled when starting. The required conditions must also be assembled in the program, and the program must be configured so the operation will not start if the conditions are not fulfilled.

Signal name		Signal state		Device
Interface signal	PLC READY signal	ON	CPU module preparation completed	[Cd.190] PLC READY
	READY signal	ON	Preparation completed	[Md.140] Module status: b0
	All axis servo ON	ON	All axis servo ON	[Cd.191] All axis servo ON
	Synchronization flag*1	ON	The buffer memory can be accessed.	[Md.140] Module status: b1
	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 in operation	[Md.141] BUSY
	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 When the CPU module is set to the asynchronous mode in the synchronization setting, the synchronization flag must be inserted in the program as an interlock condition. When it is set to the synchronous mode, the synchronization flag is turned ON when the CPU module executes calculation. Therefore, the interlock condition is not required to be inserted in the program.

Start time chart

■Operation example



Program example

Refer to the following for the program example of the JOG operation.

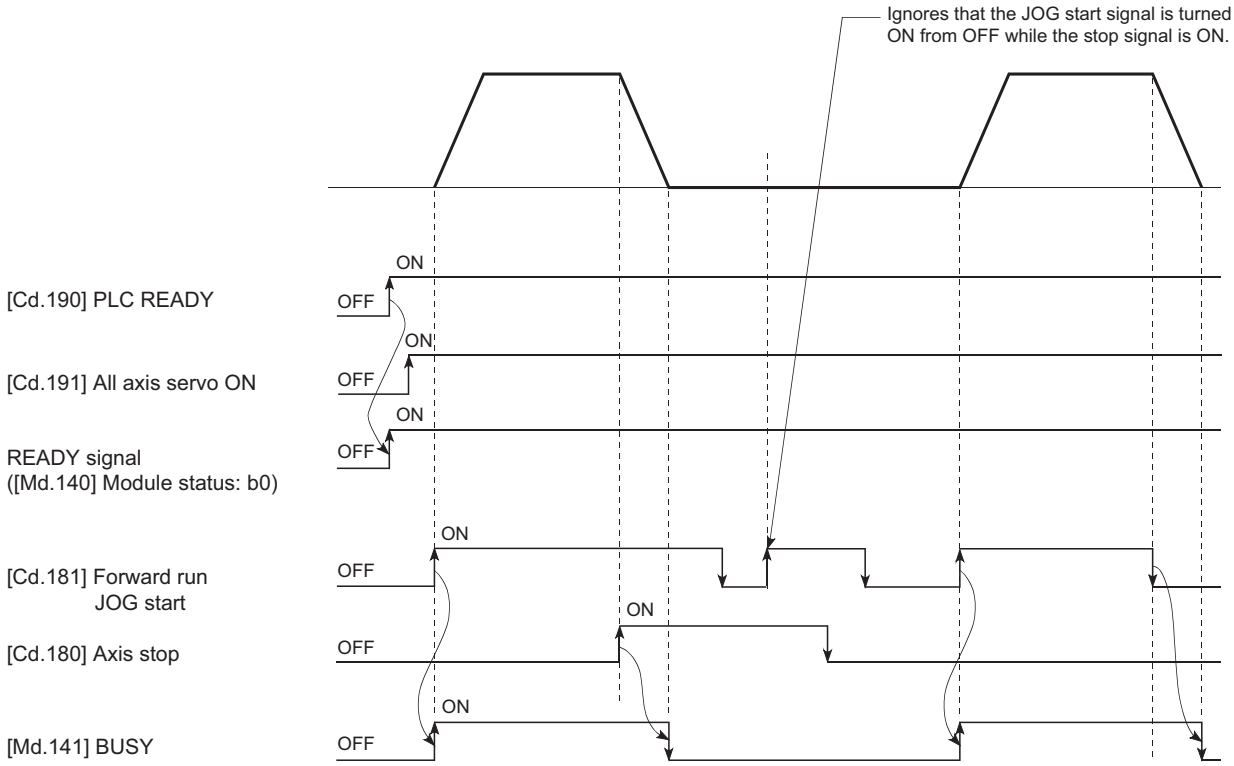
☞ Page 631 JOG operation setting program [FX5-SSC-S]
☞ Page 704 JOG operation setting program [FX5-SSC-G]
☞ Page 632 JOG operation/inching operation execution program [FX5-SSC-S]
☞ Page 705 JOG operation/inching operation execution program [FX5-SSC-G]

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 [FX5-SSC-S], or error code 1A08H [FX5-SSC-G]) 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.

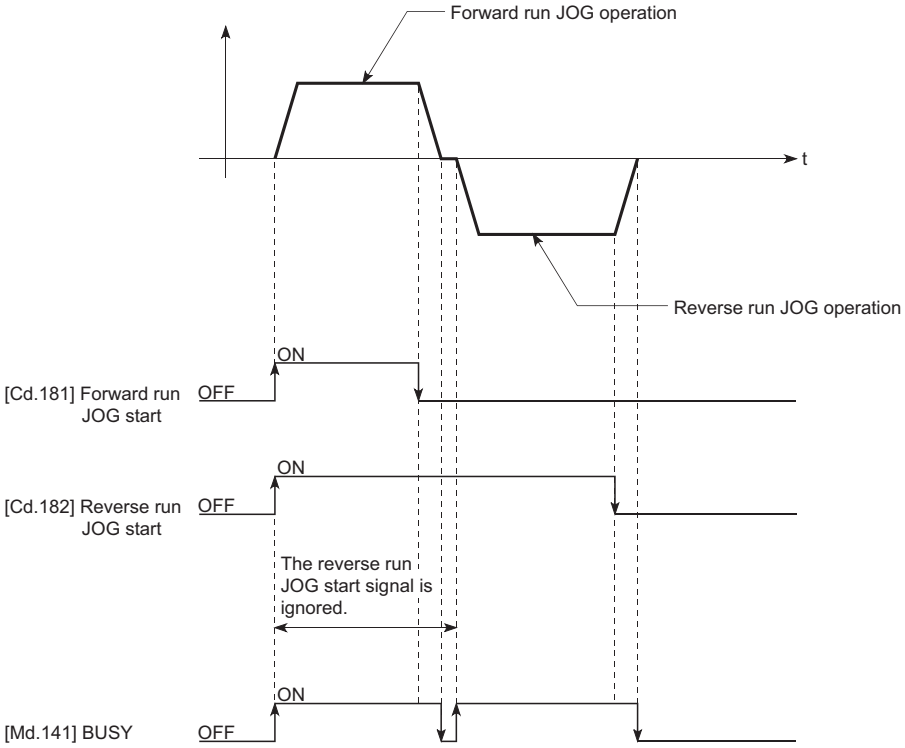
■Operation example



Example 2

When both the forward run JOG start signal and the 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/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.

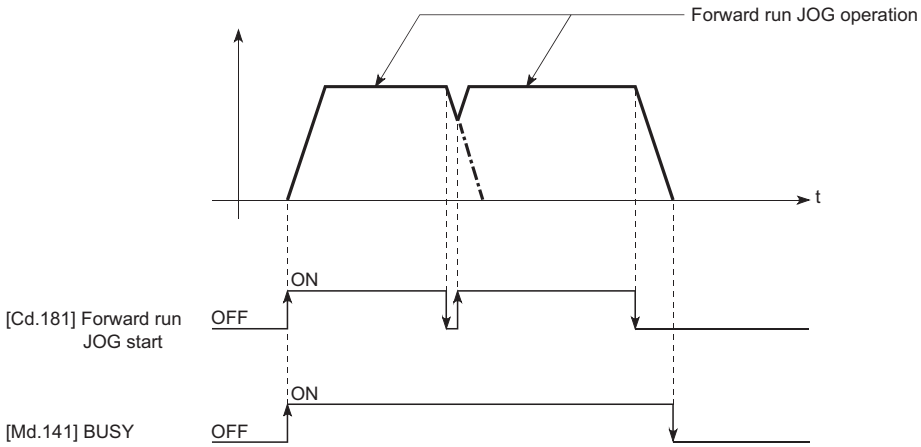
■Operation example



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

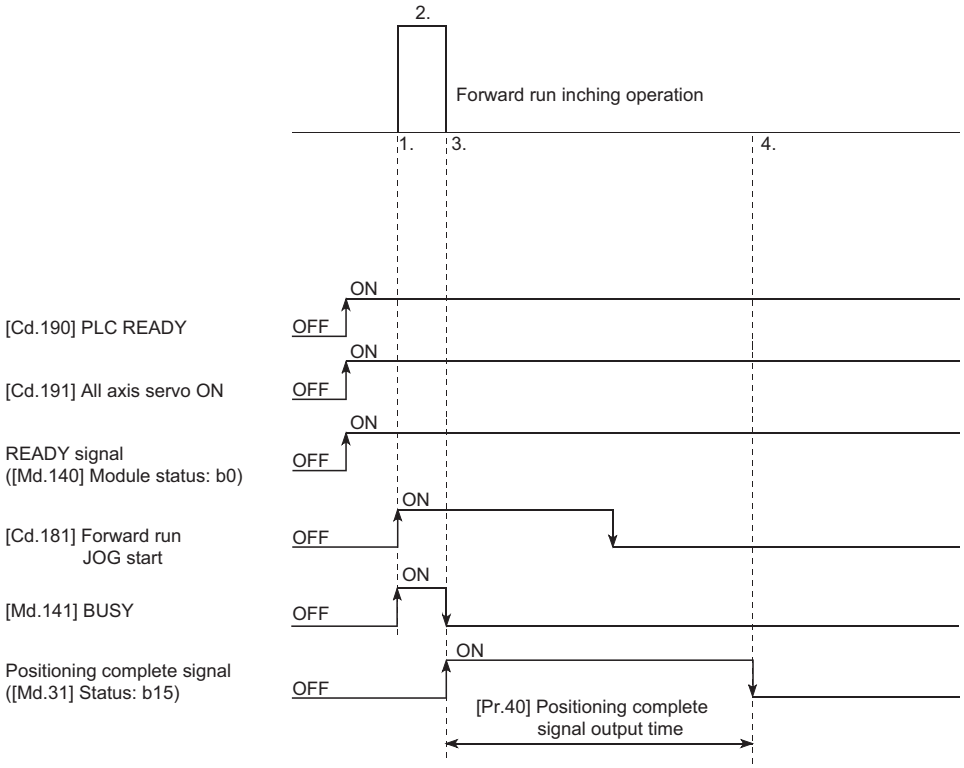
Outline of inching operation

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 250 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 [FX5-SSC-S], or error code 1A81H [FX5-SSC-G]) will occur in the following case.

([Cd.16] Inching movement amount) × (A) > ([Pr.31] JOG speed limit value)

However, (A) is as follows.

[FX5-SSC-S]

Unit setting	Operation cycle	
	0.888 ms	1.777 ms
When the unit setting is pulse	1125	562.5
When the unit setting is degree and the "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid	67.5	33.75
When the unit setting is other than the above	675	337.5

[FX5-SSC-G]

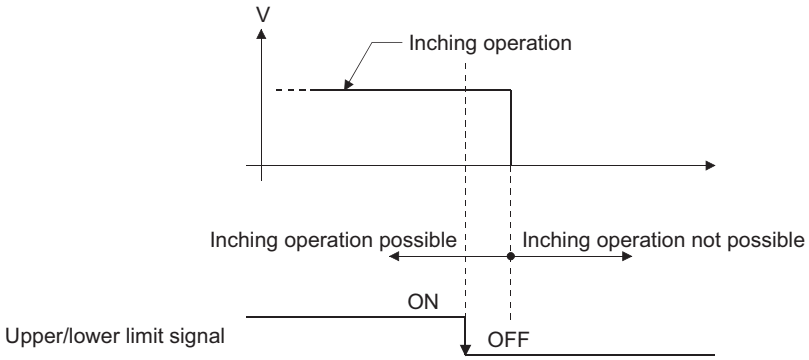
Unit setting	Operation cycle			
	0.50 ms	1.00 ms	2.00 ms	4.00 ms
When the unit setting is pulse	2000	1000	500	250
When the unit setting is degree and the "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid	120	60	30	15
When the unit setting is other than the above	1200	600	300	150

• 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 159 JOG Operation)

Operations when stroke limit error occurs

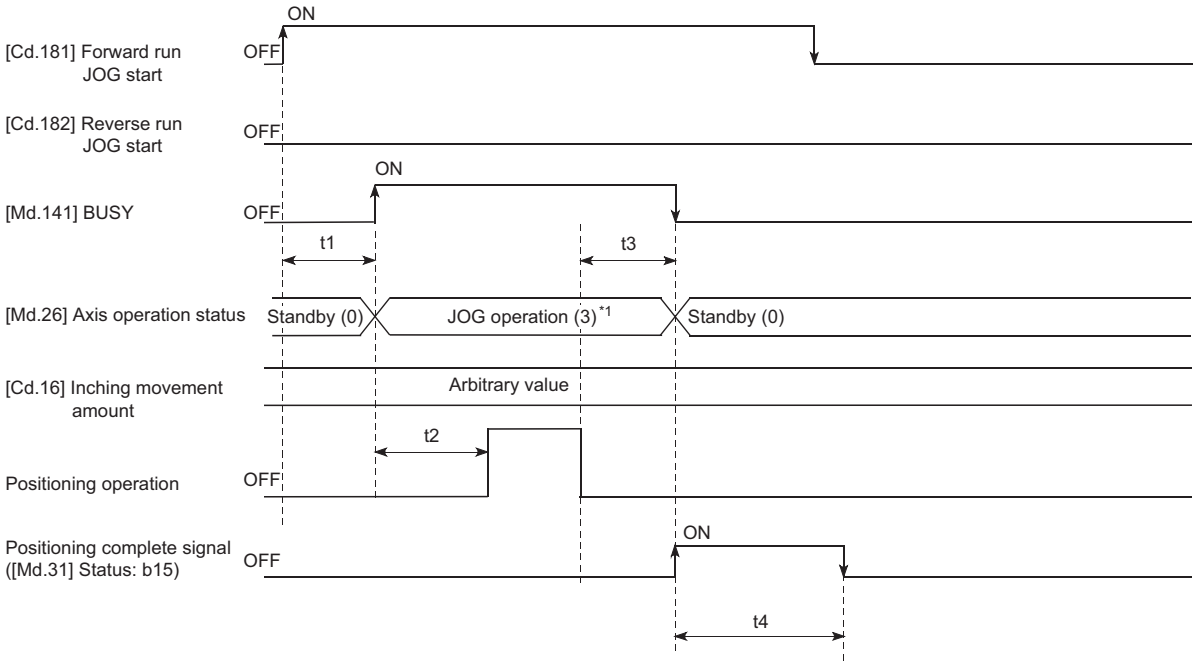
When the operation is stopped by hardware stroke limit error or software stroke limit error, the inching operation can be performed in an opposite way (direction within normal limits) after an error reset. (An error will occur again if JOG start signal is turned ON in a direction to outside the stroke 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])

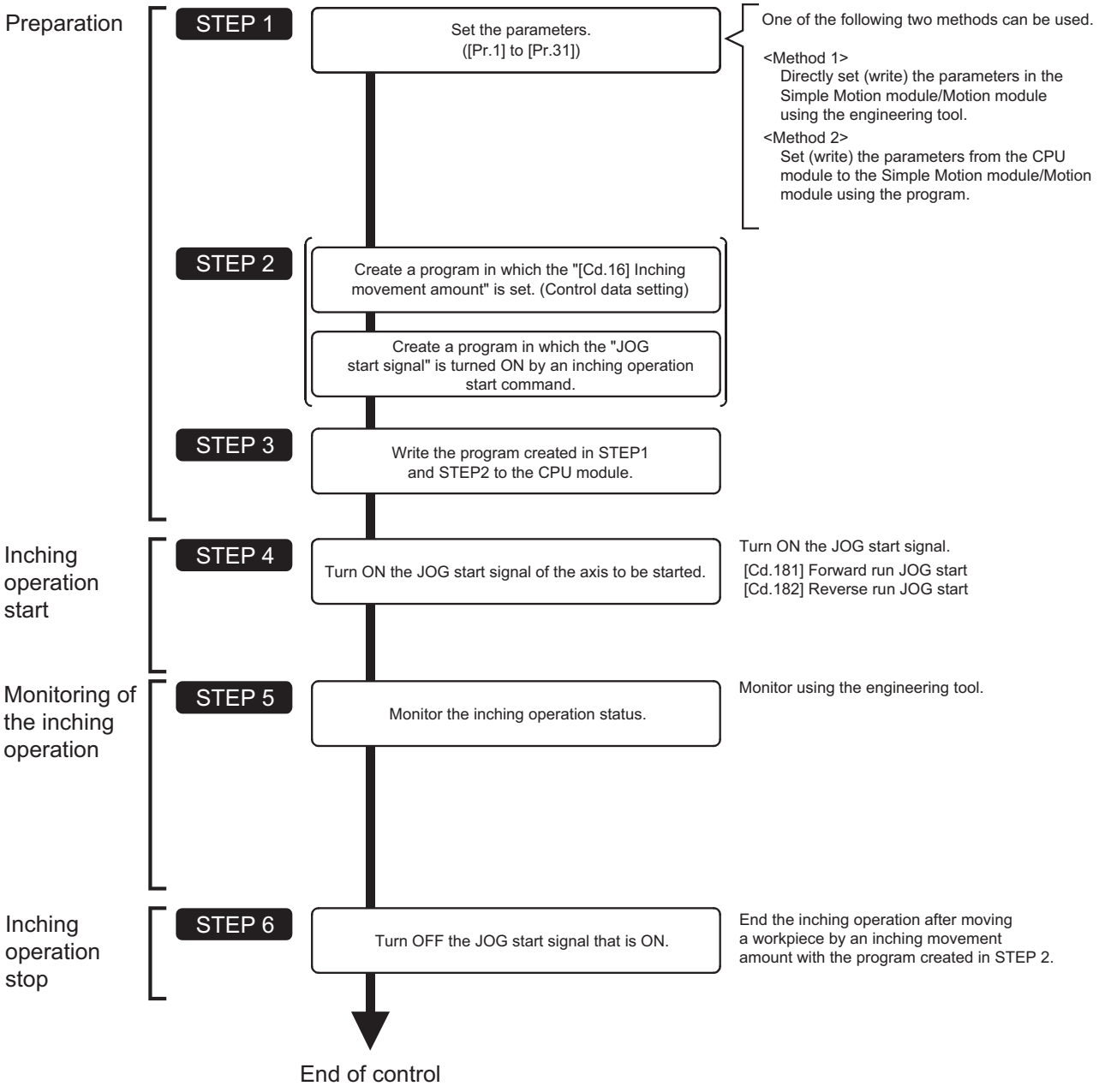
Operation cycle		t1*1	t2*2	t3	t4
FX5-SSC-S	0.888	0.1 to 1.4	3.57 to 4.45	0 to 0.9	Follows parameters
	1.777	0.1 to 2.1	5.96 to 7.11	0 to 1.8	Follows parameters
FX5-SSC-G	0.500	0.4 to 1.0	1.8 to 2.2	0 to 0.5	Follows parameters
	1.000	0.4 to 1.5	3.3 to 3.5	0 to 1.0	Follows parameters
	2.000	0.4 to 2.8	6.2 to 6.4	0 to 2.0	Follows parameters
	4.000	0.4 to 4.5	12.5 to 13.0	0 to 4.0	Follows parameters

*1 Depending on the operating statuses of the other axes, delay may occur in the t1 timing time.

*2 The t2 timing time depends on the setting of the acceleration time, servo parameter, etc.

Inching operation execution procedure

The inching operation is carried out by the following procedure.



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/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 values 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 444 Basic Setting

Point

- Positioning parameter settings work in common for all controls using the Simple Motion module/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

Setting item		Setting value	Setting details	Buffer memory address
[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

Refer to the following for the setting details.

☞ Page 559 Control Data

Start conditions

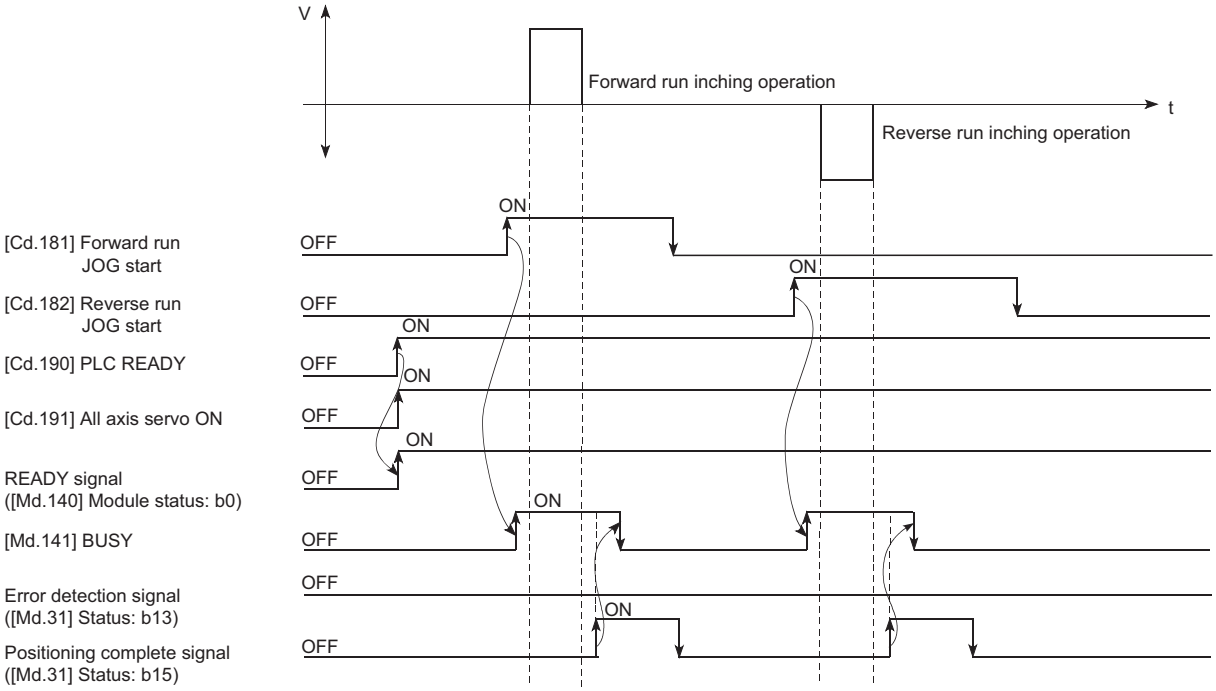
The following conditions must be fulfilled when starting. The required conditions must also be assembled in the program, and the program must be configured so the operation will not start if the conditions are not fulfilled.

Signal name		Signal state		Device
Interface signal	PLC READY signal	ON	CPU module preparation completed	[Cd.190] PLC READY
	READY signal	ON	Preparation completed	[Md.140] Module status: b0
	All axis servo ON	ON	All axis servo ON	[Cd.191] All axis servo ON
	Synchronization flag*1	ON	The buffer memory can be accessed.	[Md.140] Module status: b1
	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 in operation	[Md.141] BUSY
	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 When the CPU module is set to the asynchronous mode in the synchronization setting, the synchronization flag must be inserted in the program as an interlock condition. When it is set to the synchronous mode, the synchronization flag is turned ON when the CPU module executes calculation. Therefore, the interlock condition is not required to be inserted in the program.

Start time chart

■Operation example



Program example

Refer to the following for the program example of the inching operation.

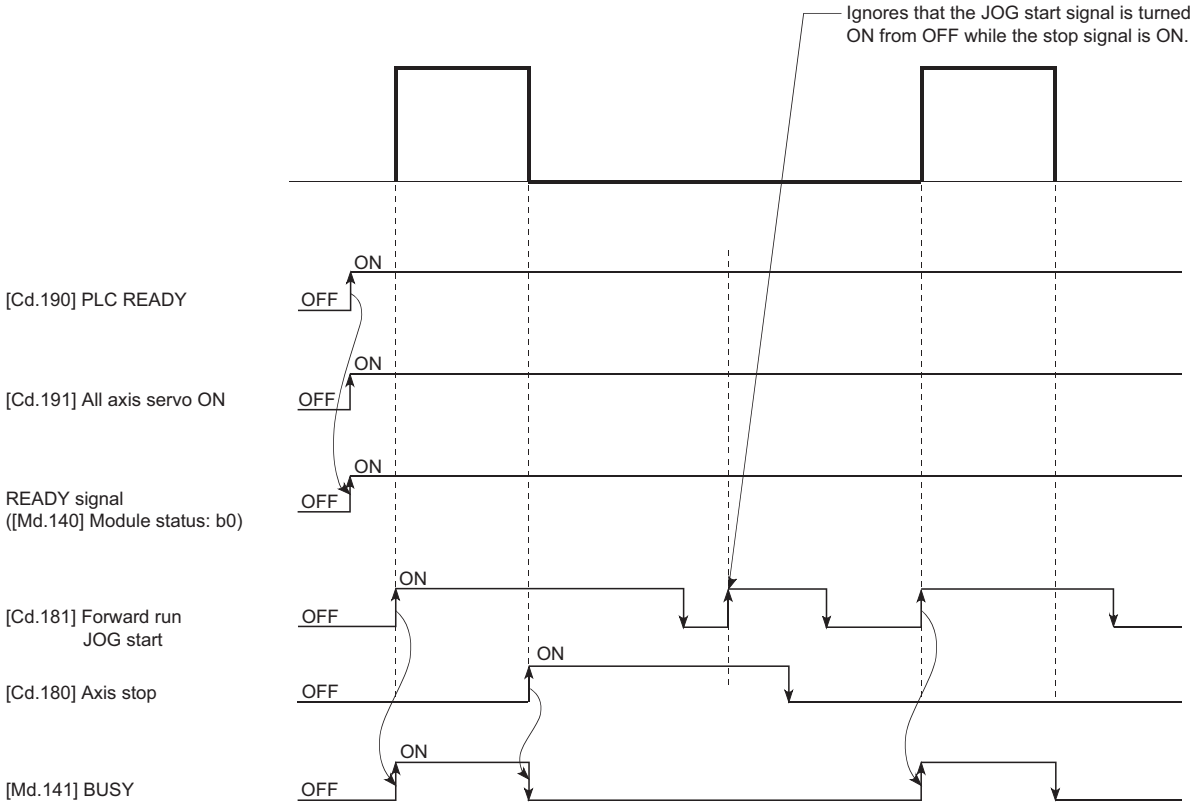
☞ Page 632 Inching operation setting program [FX5-SSC-S]
☞ Page 704 JOG operation setting program [FX5-SSC-G]
☞ Page 632 JOG operation/inching operation execution program [FX5-SSC-S]
☞ Page 705 JOG operation/inching operation execution program [FX5-SSC-G]

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 [FX5-SSC-S], or error code 1A08H [FX5-SSC-G]) 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



5.4 Manual Pulse Generator Operation

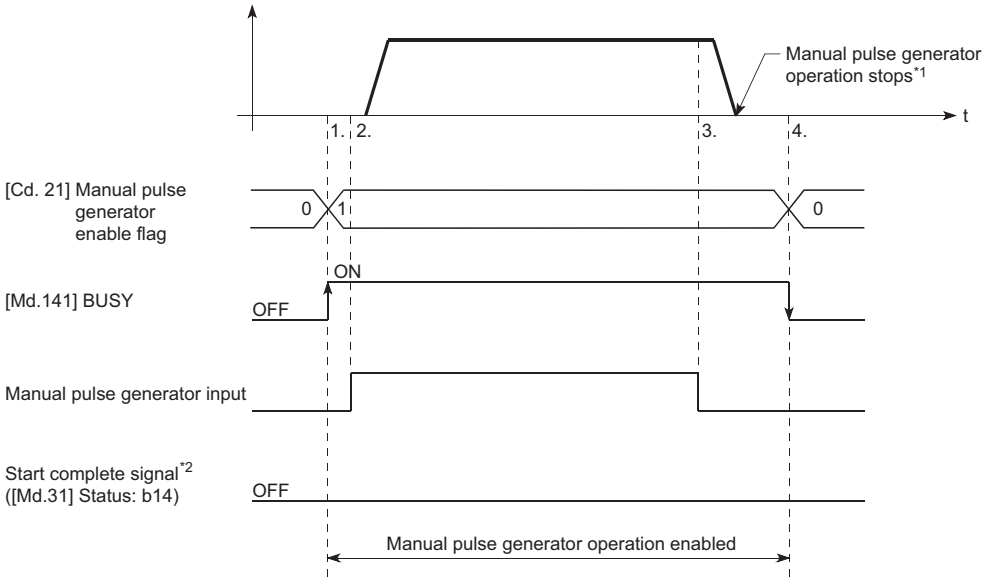
Outline of manual pulse generator operation

Operation

In manual pulse generator operations, pulses are input to the Simple Motion module/Motion module from the manual pulse generator. This causes the same number of input command to be output from the Simple Motion module/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 "[Cd.21] Manual pulse generator enable flag" is turned ON while the Simple Motion module/Motion module is BUSY (BUSY signal ON), the warning "Start during operation" (warning code: 0900H [FX5-SSC-S], or warning code 0D00H [FX5-SSC-G]) 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.

$$\text{(Speed command)} = \text{Number of input pulses for one second} \times \text{Manual pulse generator 1 pulse input magnification} \times \text{Manual pulse generator 1 pulse movement amount} \times \frac{\text{Number of pulses per rotation}}{\text{Movement amount per rotation}}$$

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 will not occur.

Point

- The Simple Motion module/Motion module can simultaneously command to multiple servo amplifiers by one manual pulse generator. (Axis 1 to the number of maximum control axes)

[FX5-SSC-S]

- Only one manual pulse generator can be connected to one Simple Motion module.

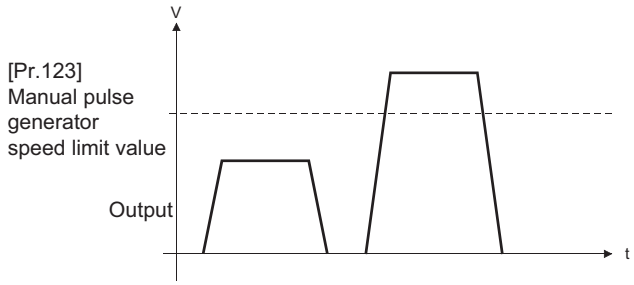
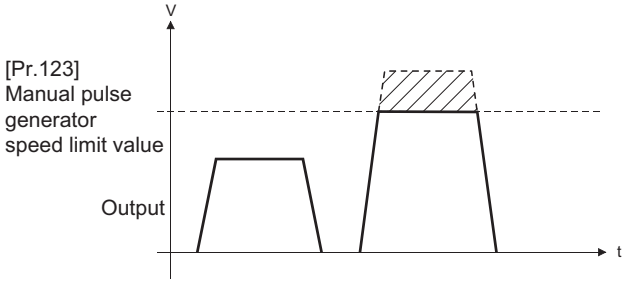
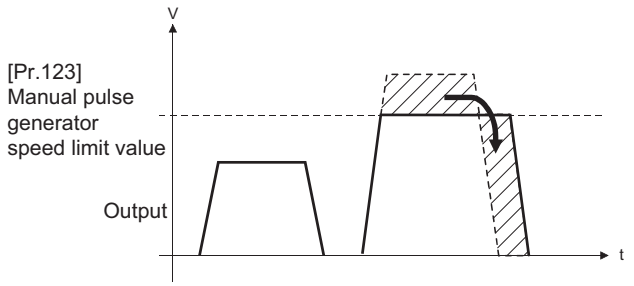
[FX5-SSC-G]

- The manual pulse generator is connected to a CPU module, high-speed pulse input/output module, etc. One Motion module can be connected to one manual pulse generator.

Manual pulse generator speed limit mode [FX5-SSC-G]

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 "Manual pulse generator carry-over movement amount overflow" (error code: 1A82H) occurs and a deceleration stop is executed.*2 

*1 When "[Pr.123] Manual pulse generator speed limit value" is exceeded, the input from the manual pulse generator is not the same as the output from the Motion module.

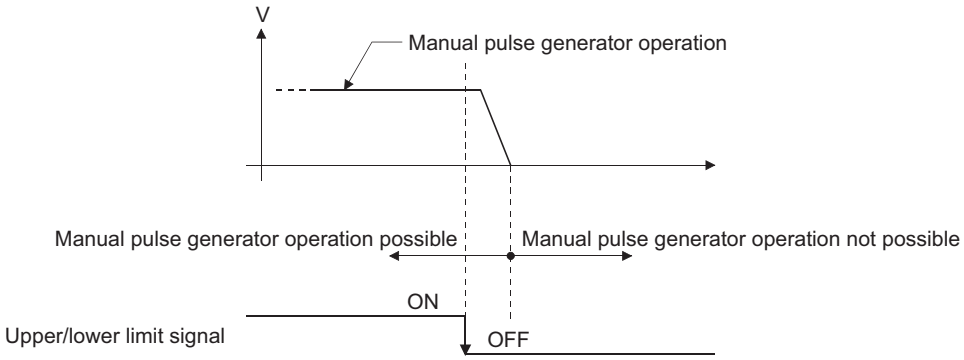
*2 When the pulses which exceed "[Pr.123] Manual pulse generator speed limit value" are large, it takes time between when the input from the manual pulse generator stops and when the output from the Motion module stops.

- 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 "Manual pulse generator speed limit value over" (warning code: 0D49H) is output at exceeding "[Pr.123] Manual pulse generator speed limit value".
- The warning "Manual pulse generator speed limit value over" (warning code: 0D49H) 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 "Manual pulse generator speed limit value over" (warning code: 0D49H) 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.

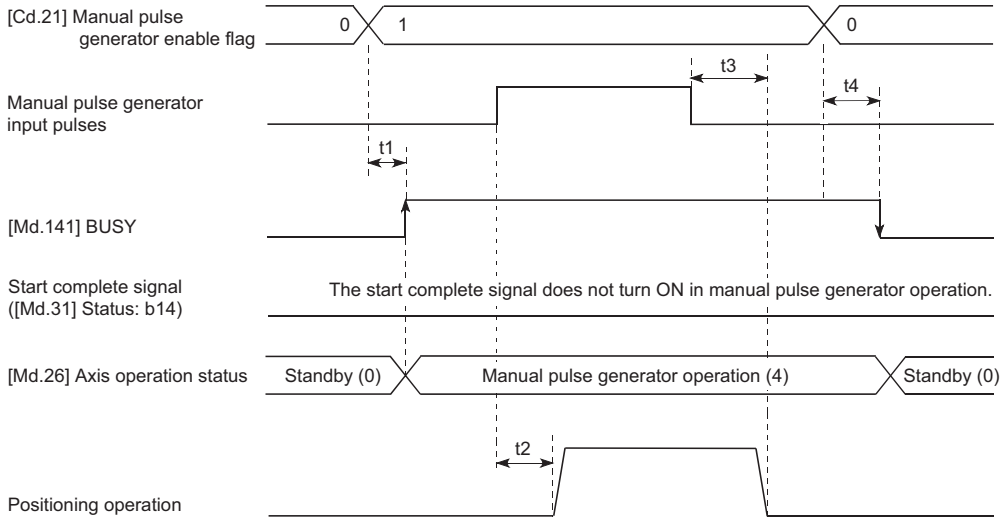
*1 Only when the command position value or the machine feed value overflows or underflows during deceleration, the manual pulse generator operation will terminate as "error occurring". To carry out manual pulse generator operation again, "[Cd.21] Manual pulse generator enable flag" must be turned OFF 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])

Operation cycle		t1[*1]	t2[*2*3]	t3[*2*3]	t4
FX5-SSC-S	0.888	0.6 to 0.9	10 to 15	18 to 25	7.1 to 14.3
	1.777	0.3 to 1.8	10 to 15	18 to 25	7.1 to 14.3
FX5-SSC-G	0.500	0.4 to 1.0	10 to 18	16 to 24	8 to 16
	1.000	0.4 to 1.5	10 to 18	16 to 24	8 to 16
	2.000	0.4 to 2.8	10 to 18	16 to 24	8 to 16
	4.000	0.4 to 4.5	10 to 18	16 to 24	8 to 16

*1 Delays may occur in the t1 timing time due to the operation status of other axes.
*2 The t2 and t3 timing time depend on the setting of the acceleration time, servo parameter, etc.
*3 For when "[Pr.156] Manual pulse generator smoothing time constant" is set to "0 ms". The time fluctuates depending on the setting value of "[Pr.156] Manual pulse generator smoothing time constant".

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/Motion module outputs 1 pulse to the servo amplifier after receiving 10 pulses from the manual pulse generator.

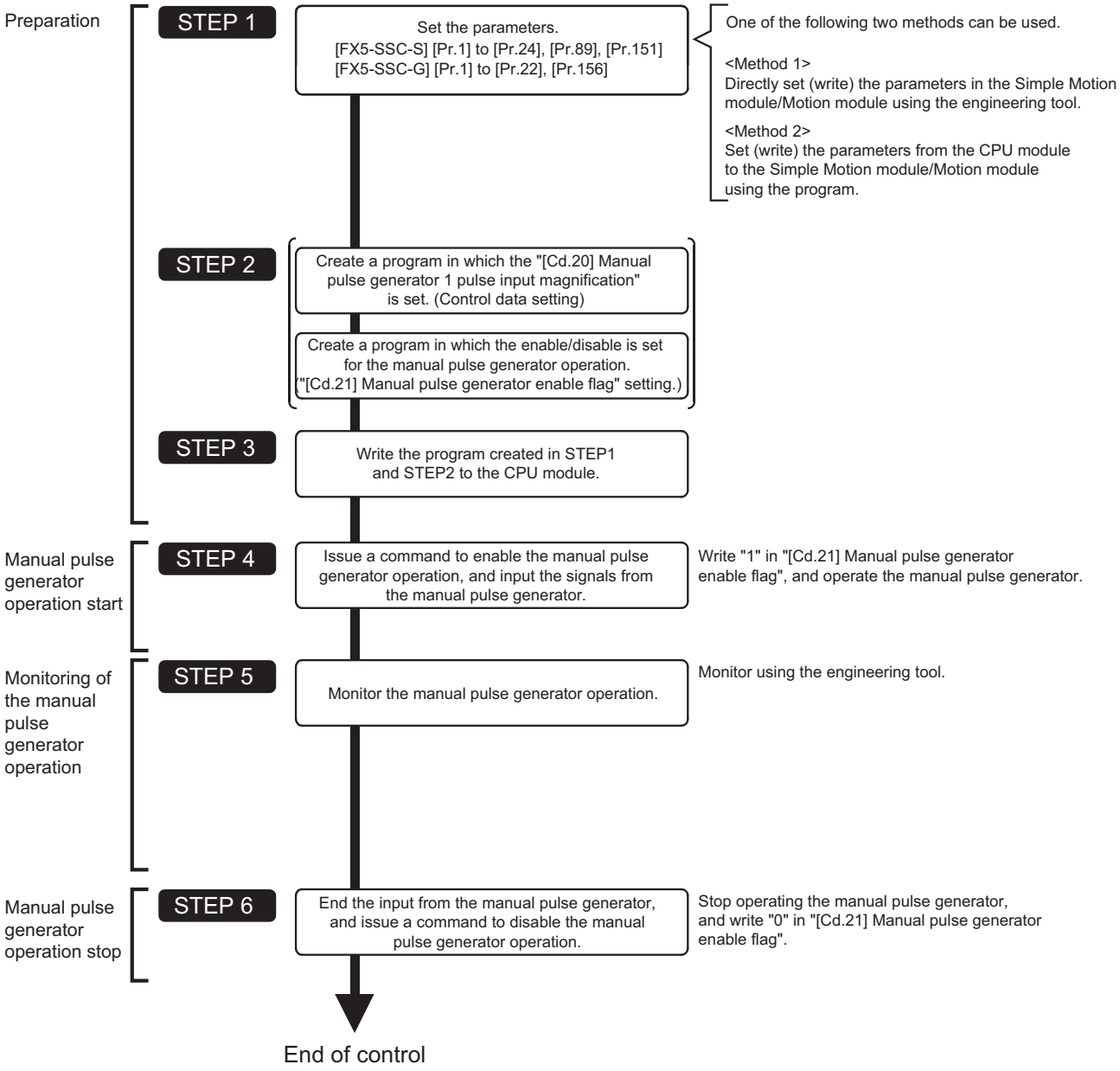
Speed control by manual pulse generation operation

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.



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/Motion module.

Setting the required parameters for manual pulse generator operation

The "Positioning parameters" and "Common 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 values 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 [FX5-SSC-S]	○
	[Pr.89]	Manual pulse generator/Incremental synchronous encoder input type selection [FX5-SSC-S]	◎
	[Pr.151]	Manual pulse generator/Incremental synchronous encoder input logic selection [FX5-SSC-S]	○
	[Pr.156]	Manual pulse generator smoothing time constant [FX5-SSC-G]	○

Refer to the following for the setting details.

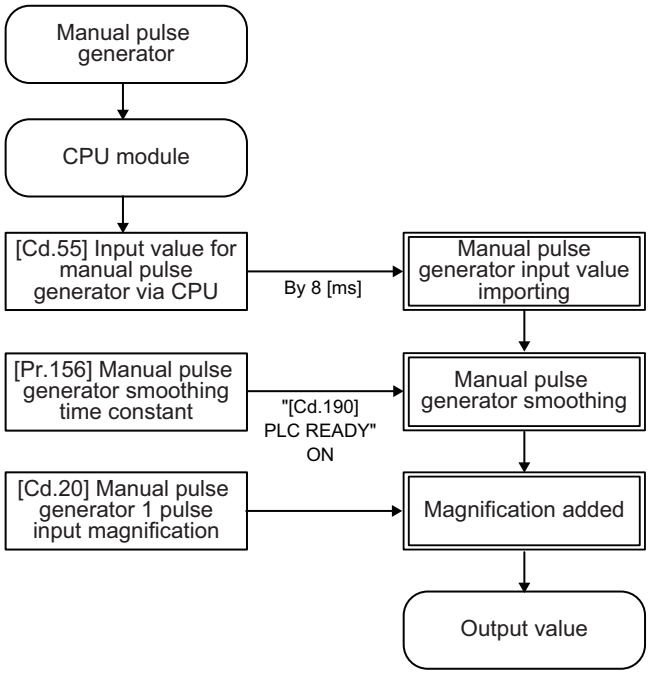
☞ Page 444 Basic Setting

Point

- Positioning parameter settings and common parameters settings work in common for all controls using the Simple Motion module/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.

Block diagram of the manual pulse generator operation [FX5-SSC-G]

The flow of the manual pulse generator operation is shown below.



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

Setting item		Setting value	Setting details	Buffer memory address
[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
[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
[Cd.55]	Input value for manual pulse generator via CPU [FX5-SSC-G]	→	Set the values used for the input values of the manual pulse generator via CPU in order. Setting range: -2147483648 to 2147483647 [pulse]	5946 5947

Refer to the following for the setting details.
☞ Page 559 Control Data

Restriction

[FX5-SSC-G]
Set the movement amount per capture cycle in "[Cd.55] Input value for manual pulse generator via CPU" within the range of -2147483648 to 2147483647. When set to a value outside of the range, the movement amount of the manual pulse generator and the movement amount of the output value may not match.

Start conditions

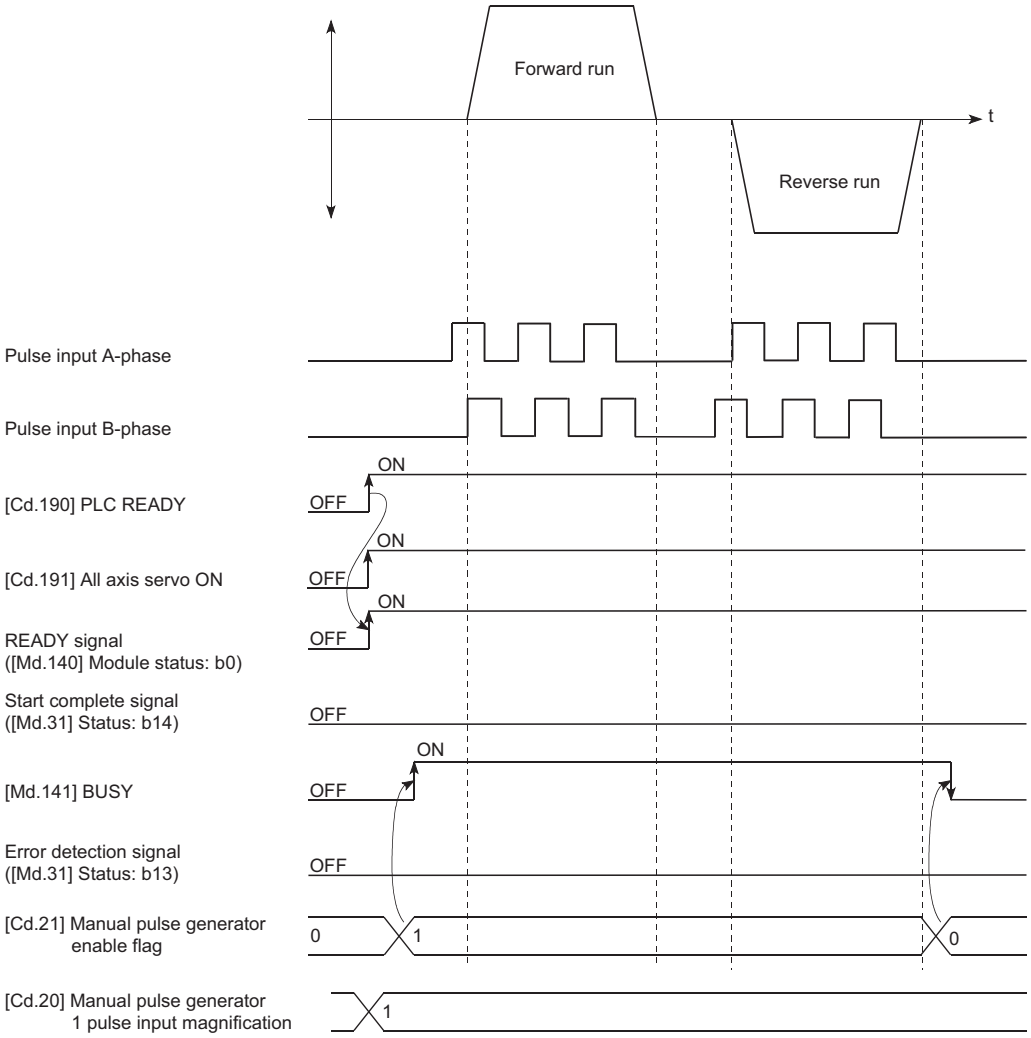
The following conditions must be fulfilled when starting. The required conditions must also be assembled in the program, and the program must be configured so the operation will not start if the conditions are not fulfilled.

Signal name		Signal state		Device
Interface signal	PLC READY signal	ON	CPU module preparation completed	[Cd.190] PLC READY
	READY signal	ON	Preparation completed	[Md.140] Module status: b0
	All axis servo ON	ON	All axis servo ON	[Cd.191] All axis servo ON
	Synchronization flag*1	ON	The buffer memory can be accessed.	[Md.140] Module status: b1
	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 in operation	[Md.141] BUSY
	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 When the CPU module is set to the asynchronous mode in the synchronization setting, the synchronization flag must be inserted in the program as an interlock condition. When it is set to the synchronous mode, the synchronization flag is turned ON when the CPU module executes calculation. Therefore, the interlock condition is not required to be inserted in the program.

Start time chart

■Operation example



Program example

Refer to the following for the program example of the manual pulse generator operation.

☞ Page 632 Manual pulse generator operation program [FX5-SSC-S]
☞ Page 706 Manual pulse generator operation program [FX5-SSC-G]

6 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.

6.1 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.
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		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".
[FX5-SSC-G]
If the servo amplifier is not compatible with each control mode, the error "Driver control mode unsupported" (error code: 1AE7) will occur.

Compatible software version

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 manual or instruction 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-J4-_B_/MR-JE-B(F)	FX5-SSC-S	—	—	—
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-J5-_G_/MR-JET	FX5-SSC-G			B2 or later
MR-J5-_G_-RJ				
MR-J5W_-_G				
MR-J5D_-_G_				—

*1 [FX5-SSC-S]
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 192 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)".
Note that virtual servo amplifiers are not compatible with the continuous operation to torque control mode.
[FX5-SSC-G]
The torque generation direction of servo motor can be changed by setting the servo parameter "Function selection C-B Torque POL reflection selection (PC29.3)" for the servo amplifier that is compatible with the continuous operation to torque control. (☞ Page 192 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 Torque POL reflection selection (PC29.3)".

⚠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.

Point

[FX5-SSC-G]

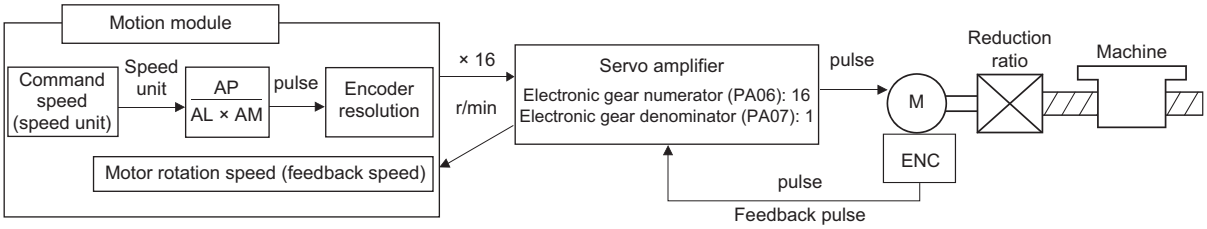
When controlling motor HK-KT (67108864 pulse/rev), set the servo parameters of the MR-J5(W)-G as follows.

PA06 (Electronic gear numerator): 16

PA07 (Electronic gear denominator): 1

PT01.1 (Speed/acceleration/deceleration unit selection): 0 (r/min, mm/s)

In speed control, torque control, and continuous operation to torque control mode, the Motion module multiplies the electronic gear ratio of the servo amplifier at the command speed set in the control data and sends the result to the servo amplifier.



Operation example for speed control mode

• Condition

[Pr.1] Unit setting: 0 [mm]

[Pr.2] Number of pulses per rotation: 67108864 [pulse] × 1/16 = 4194304 [pulse]

[Pr.3] Movement amount per rotation: 20000.0 [mm]

[Pr.4] Unit magnification: 1 (x 1)

[Cd.140] Command speed at speed control mode: 4000000 [$\times 10^{-2}$ mm/min]

• Control details

[Md.103] Motor rotation speed: 200000 [0.01 r/min]

Servo motor speed: 2000 [r/min]

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 values 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	○
Common parameters	[Pr.82]	Forced stop valid/invalid selection	○

Refer to the following for the setting details.

☞ Page 444 Basic Setting

Point

- Positioning parameter settings and common parameters settings work in common for all controls using the Simple Motion module/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

Setting item		Setting value	Setting details	Buffer memory address
[Cd.138]	Control mode switching request	1	Set "1: Switching request" after setting "[Cd.139] Control mode setting".	4374+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	4375+100n

Refer to the following for the setting details.

☞ Page 559 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	→	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	→	Set the condition value when setting the control mode switching condition.	4394+100n 4395+100n

Refer to the following for the setting details.

☞ Page 559 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

Setting item		Setting value	Setting details	Buffer memory address
[Cd.140]	Command speed at speed control mode	→	Set the command speed at speed control mode.	4376+100n 4377+100n
[Cd.141]	Acceleration time at speed control mode	→	Set the acceleration time at speed control mode.	4378+100n
[Cd.142]	Deceleration time at speed control mode	→	Set the deceleration time at speed control mode.	4379+100n

Refer to the following for the setting details.

☞ Page 559 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

Setting item		Setting value	Setting details	Buffer memory address
[Cd.143]	Command torque at torque control mode	→	Set the command torque at torque control mode.	4380+100n
[Cd.144]	Torque time constant at torque control mode (Forward direction)	→	Set the time constant at driving during torque control mode.	4381+100n
[Cd.145]	Torque time constant at torque control mode (Negative direction)	→	Set the time constant at regeneration during torque control mode.	4382+100n
[Cd.146]	Speed limit value at torque control mode	→	Set the speed limit value at torque control mode.	4384+100n 4385+100n

Refer to the following for the setting details.

☞ Page 559 Control Data

Required control data setting for the continuous operation to torque control mode

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 559 Control Data

Operation of speed-torque control

Switching of control mode (Speed control/Torque control)

■Switching method of control mode

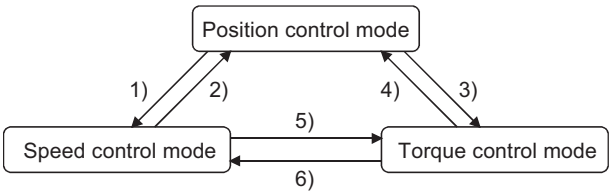
To switch the control mode to the speed control or the torque control, set "1" in "[Cd.138] Control mode switching request" after setting the control mode in "[Cd.139] Control mode setting".

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/Motion module after completion of switching.

The warning "Control mode switching during BUSY" (warning code: 09E6H [FX5-SSC-S], or warning code 0DA6H [FX5-SSC-G]) or "Control mode switching during zero speed OFF" (warning code: 09E7H [FX5-SSC-S], or warning code 0DA7H [FX5-SSC-G]) 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

Monitor item	Buffer memory address
[Md.119] Servo status2: b3	2476+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 480 [Pr.90] Operation setting for speed-torque control mode)

The history of control mode switching is stored to the starting history at request of control mode switching. (☞ Page 518 System monitor data)

Confirm the control mode with "control mode ([Md.108] Servo status1: b2, b3)" of "[Md.108] Servo status". (☞ Page 527 Axis monitor data)

n: Axis No. - 1

Monitor item	Buffer memory address
[Md.108] Servo status1: b2, b3	2477+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 a usage such as pressing a workpiece. When using the continuous operation during speed control mode for a usage such as pressing a workpiece, set servo parameter "Function selection B-1 Model adaptive control selection/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.

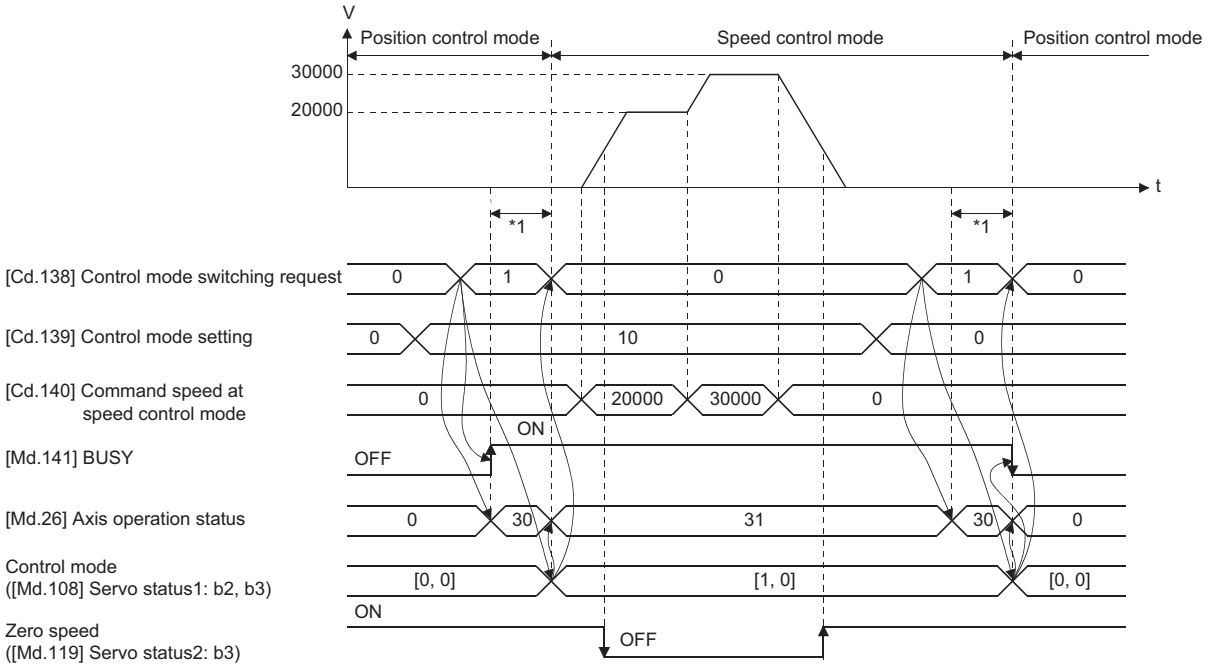
■Operation for "Position control mode ⇔ Speed control mode switching"

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 [FX5-SSC-S]
6 to 11 ms
[FX5-SSC-G]
The switching time varies depending on the specifications of the servo amplifier. When using MR-J5(W)-G and setting "ZSP disabled selection at control switching" of servo parameter "(Function selection C-E (PC76)" to "0: Enabled", the control mode switches after reaching Zero speed.
When the control mode of the servo amplifier does not change within 1 second, the error "Control mode switching error" (error code: 1F04H) occurs.

■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.

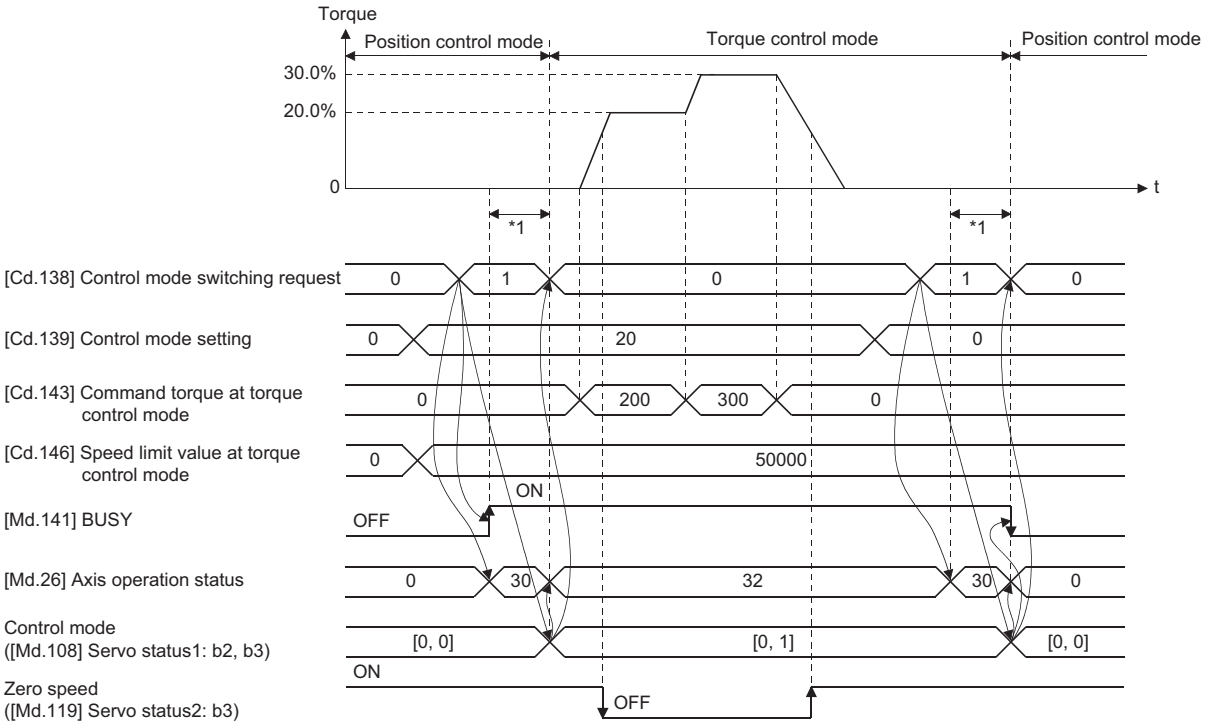
Point

[FX5-SSC-S]

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 [FX5-SSC-S]
6 to 11 ms
[FX5-SSC-G]
The switching time varies depending on the specifications of the servo amplifier. When using MR-J5(W)-G and setting "ZSP disabled selection at control switching" of servo parameter "(Function selection C-E (PC76)" to "0: Enabled", the control mode switches after reaching Zero speed.
When the control mode of the servo amplifier does not change within 1 second, the error "Control mode switching error" (error code: 1F04H) occurs.

■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.

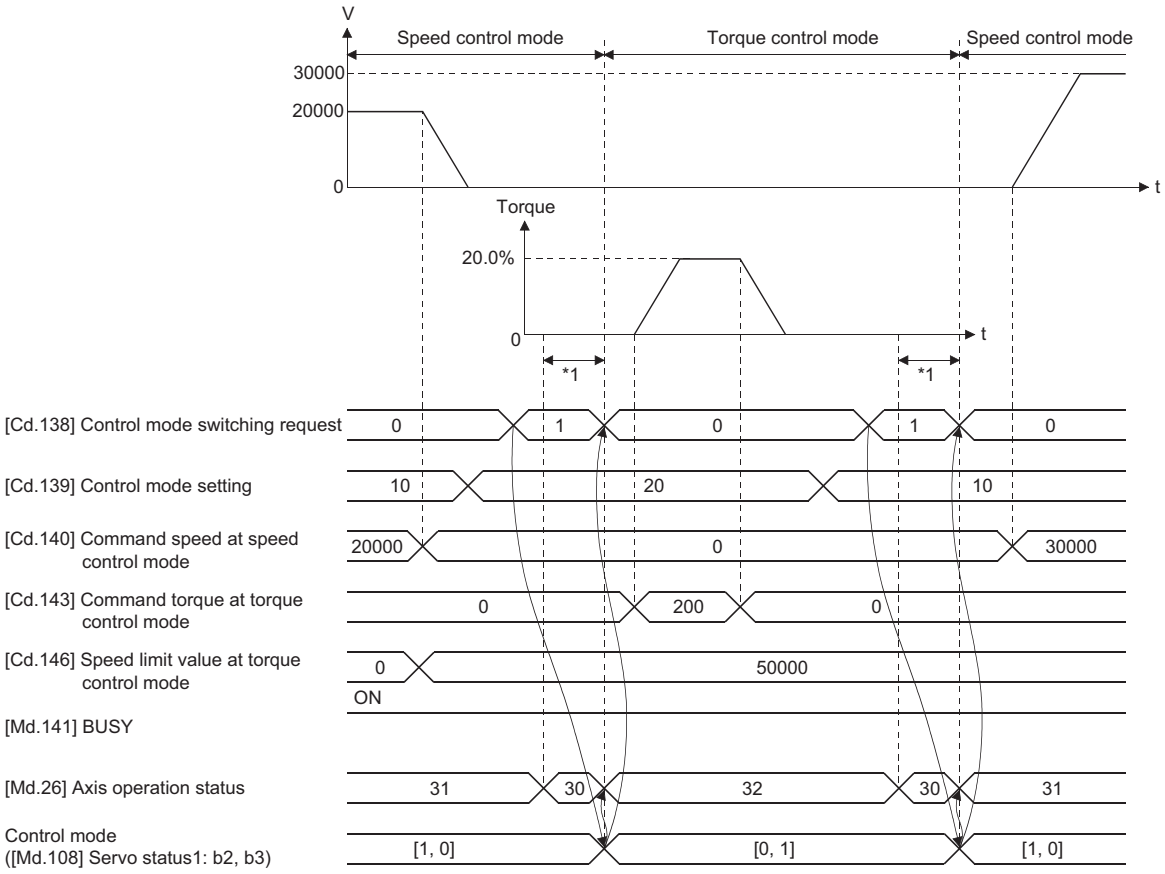
Point

[FX5-SSC-S]

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 [FX5-SSC-S]
6 to 11 ms
[FX5-SSC-G]
The switching time varies depending on the specifications of the servo amplifier. When using MR-J5(W)-G and setting "ZSP disabled selection at control switching" of servo parameter "(Function selection C-E (PC76)" to "0: Enabled", the control mode switches after reaching Zero speed.
When the control mode of the servo amplifier does not change within 1 second, the error "Control mode switching error" (error code: 1F04H) occurs.

Switching of control mode (Continuous operation to torque control)

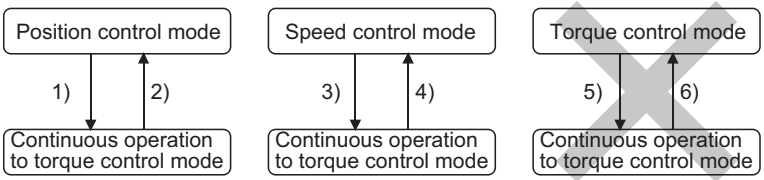
■Switching method of control mode

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]
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.

n: Axis No. - 1

Monitor item	Buffer memory address
[Md.119] Servo status2: b3	2476+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 480 [Pr.90] Operation setting for speed-torque control mode)

The history of control mode switching is stored to the starting history at request of control mode switching. (☞ Page 518 System monitor data)

Confirm the status of the continuous operation to torque control mode with "b14: Continuous operation to torque control mode" 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 527 Axis monitor data)

n: Axis No. - 1

Monitor item	Buffer memory address
[Md.108] Servo status1: b2, b3	2477+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 [FX5-SSC-S], or warning code 0DABH [FX5-SSC-G]) 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 [FX5-SSC-S], or warning code 0DABH [FX5-SSC-G]) 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) [FX5-SSC-S], or "Driver control mode unsupported" (error code: 1AE7H) [FX5-SSC-G]) 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 sudden 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".

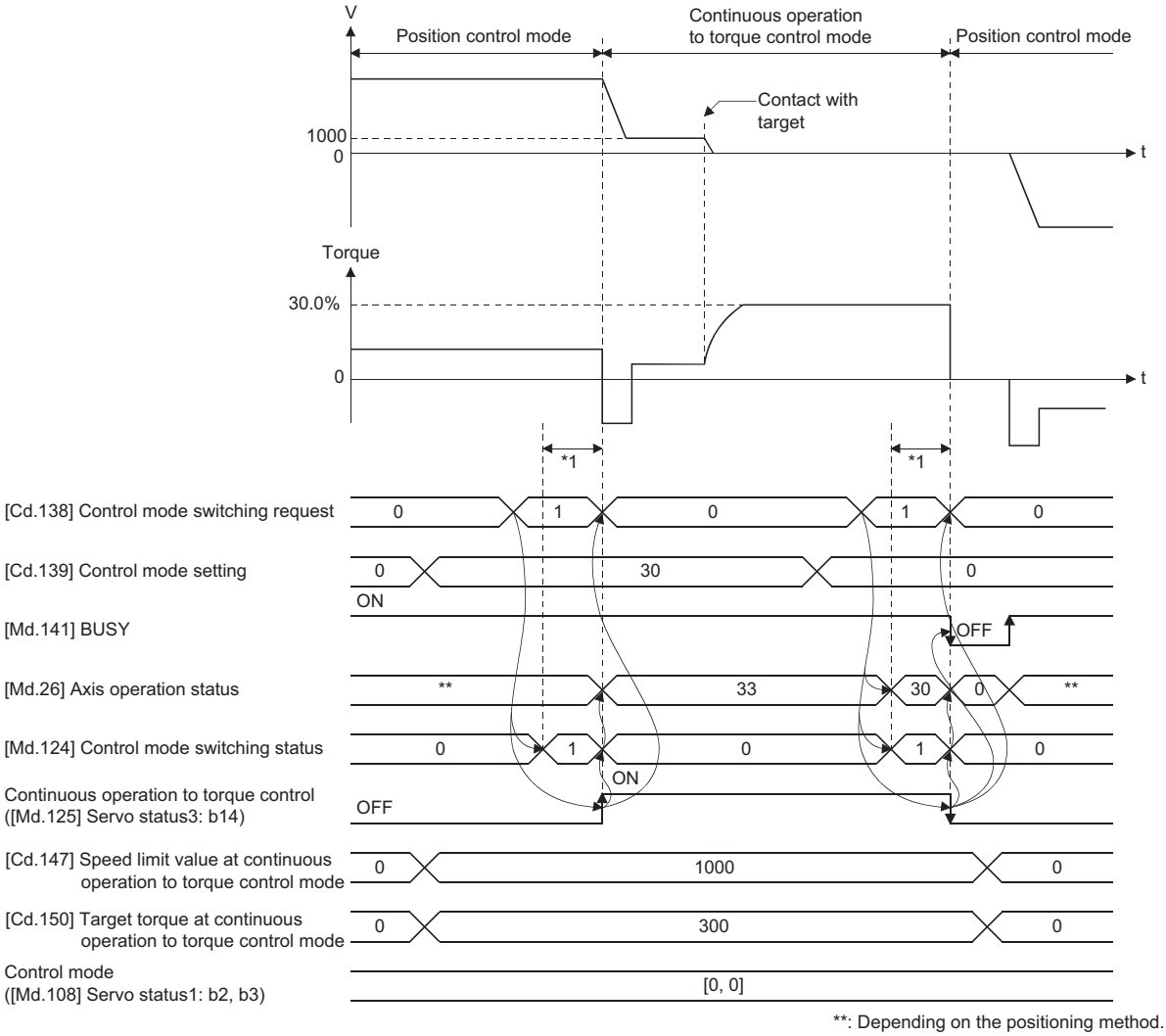
Torque initial value selection ([Pr.90]: b4 to b7)	Command torque to servo amplifier immediately after switching from position control mode to continuous operation to torque control mode
0: Command torque	The value of "[Cd.150] Target torque at continuous operation to torque control mode" at switching.
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.



*1 [FX5-SSC-S]
6 to 11 ms
[FX5-SSC-G]
The switching time varies depending on the specifications of the servo amplifier. When setting "ZSP disabled selection at control switching" of servo parameter "(Function selection C-E (PC76)" to "0: Enabled", the control mode switches after reaching Zero speed. When the control mode of the servo amplifier does not change within 1 second, the error "Control mode switching error" (error code: 1F04H) occurs.

■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.)

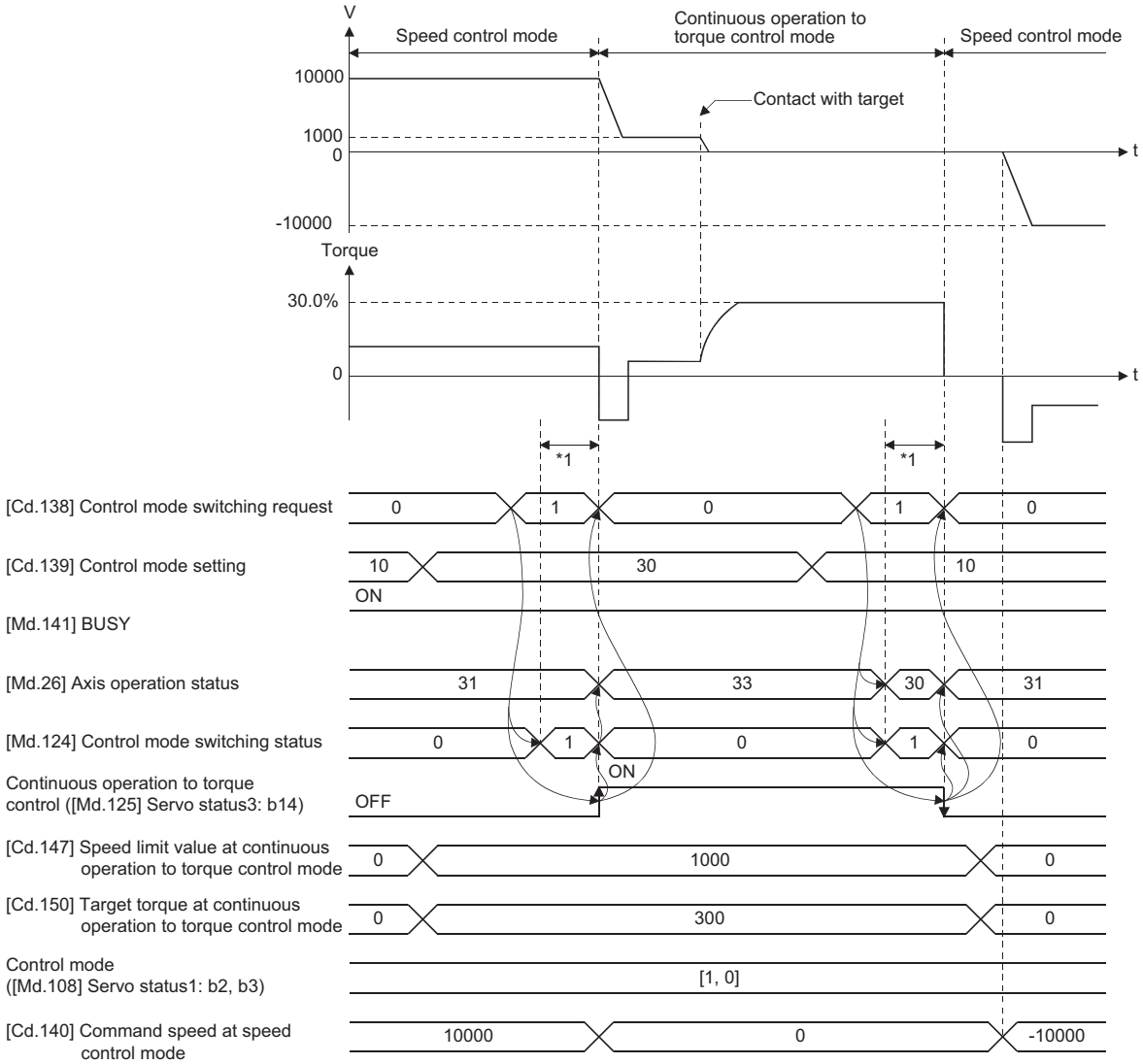
"0" is automatically stored in "[Cd.138] Control mode switching request" and "[Md.124] Control mode switching status" after completion of switching.

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 is the value 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.



*1 [FX5-SSC-S]
6 to 11 ms
[FX5-SSC-G]
The switching time varies depending on the specifications of the servo amplifier. When setting "ZSP disabled selection at control switching" of servo parameter "(Function selection C-E (PC76)" to "0: Enabled", the control mode switches after reaching Zero speed. When the control mode of the servo amplifier does not change within 1 second, the error "Control mode switching error" (error code: 1F04H) occurs.

■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".

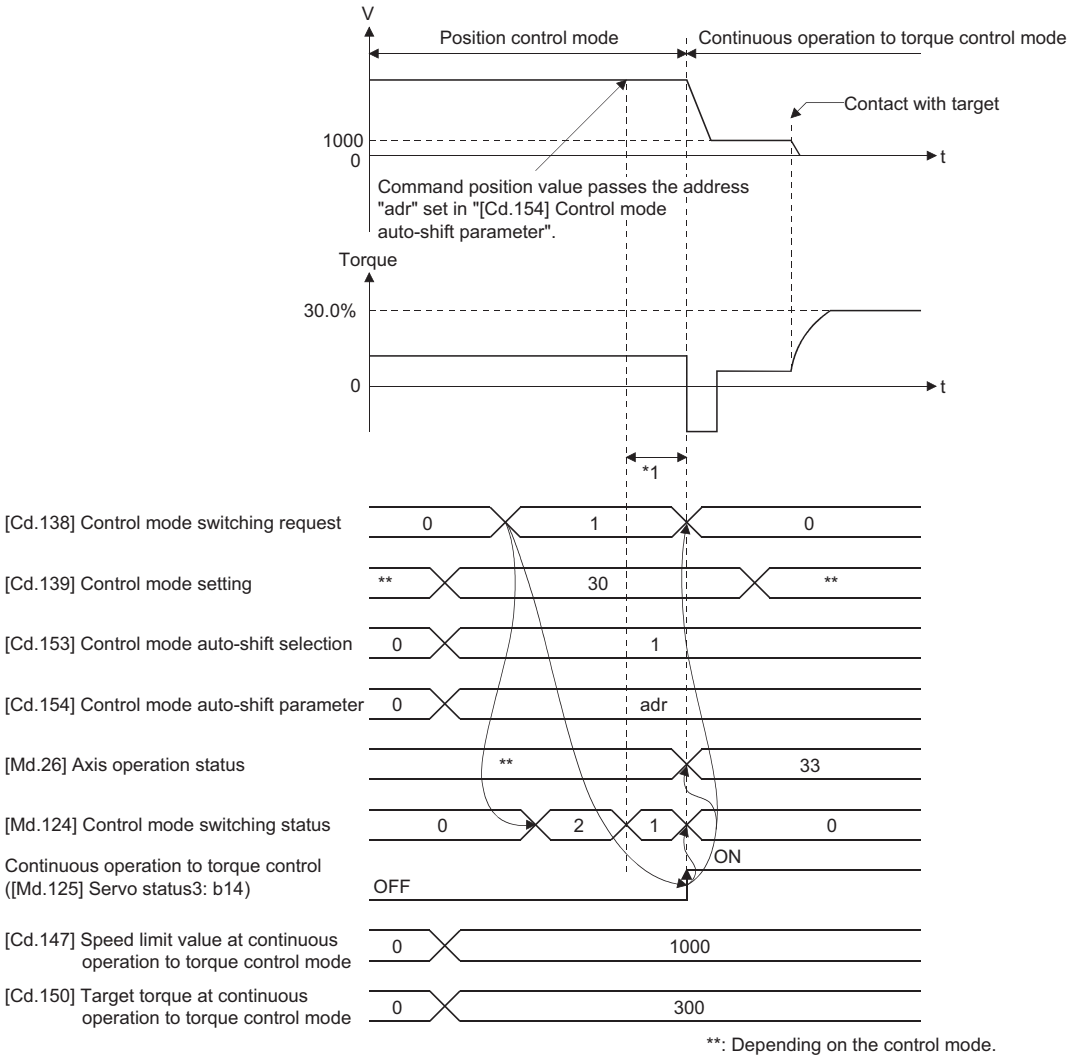
"0" is stored in "[Cd.138] Control mode switching request" and "[Md.124] Control mode switching status" after completion of switching.

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 [FX5-SSC-S], or error code 1AE4H [FX5-SSC-G]) 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 sudden 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 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".



**: Depending on the control mode.

*1 [FX5-SSC-S]
6 to 11 ms
[FX5-SSC-G]
The switching time varies depending on the specifications of the servo amplifier. When setting "ZSP disabled selection at control switching" of servo parameter "(Function selection C-E (PC76)" to "0: Enabled", the control mode switches after reaching Zero speed. When the control mode of the servo amplifier does not change within 1 second, the error "Control mode switching error" (error code: 1F04H) occurs.

Speed control mode

■Operation for speed control mode

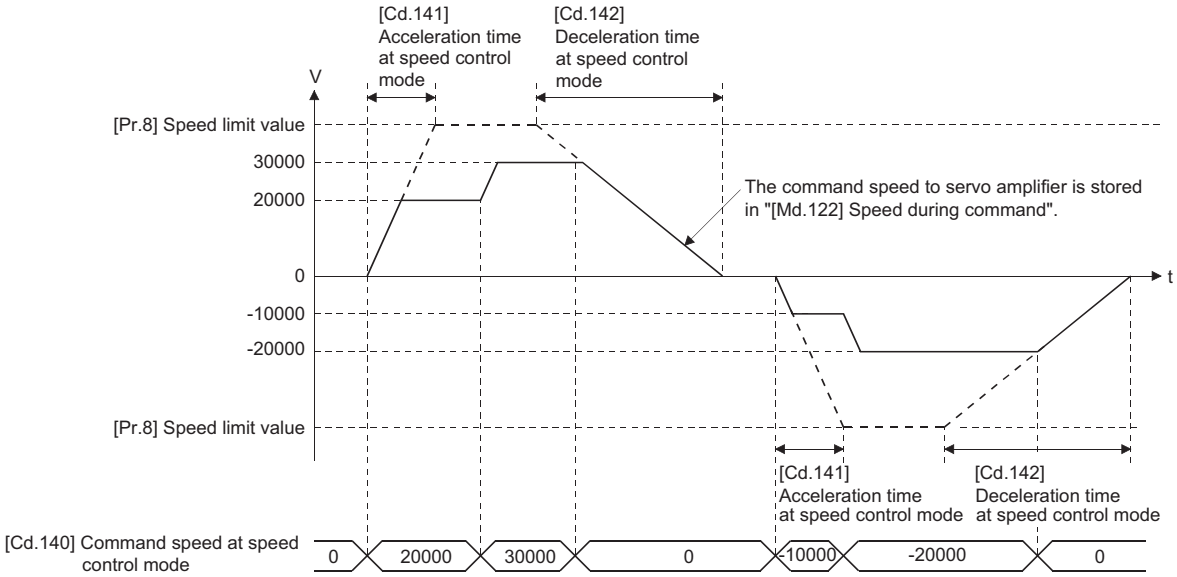
The speed control is executed at the speed set in "[Cd.140] Command speed at speed control mode" in the speed control mode.

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 [FX5-SSC-S], or warning code 0D51H [FX5-SSC-G]) occurs, and the operation is controlled with the speed limit value.

Confirm the command speed to servo amplifier with "[Md.122] Speed during command".



■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 [FX5-SSC-S], or error code 1A93H [FX5-SSC-G]) or "Software stroke limit -" (error code: 1995H [FX5-SSC-S], or error code 1A95H [FX5-SSC-G]) 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 (Axis 1 to 8)" turned ON.	
"[Cd.191] All axis servo ON" 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.	One of the following errors occurs. The mode switches to the position control mode at the current position, and the operation immediately stops. (Deceleration processing is not executed.) [FX5-SSC-S] Error code: 1900H, 1904H, 1906H, 1993H, 1995H [FX5-SSC-G] Error code: 1A00H, 1A04H, 1A06H, 1A93H, 1A95H
The position of the motor reached the hardware stroke limit.	
"[Cd.190] PLC READY" turned OFF.	
Command discard was detected on the servo amplifier. [FX5-SSC-G]	An error (error code: 1BE6H) occurs. The mode switches to the position control mode at the current position, and the operation immediately stops. (Deceleration processing is not executed.)
The forced stop input to Simple Motion module/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.

• [FX5-SSC-S]

"[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)".

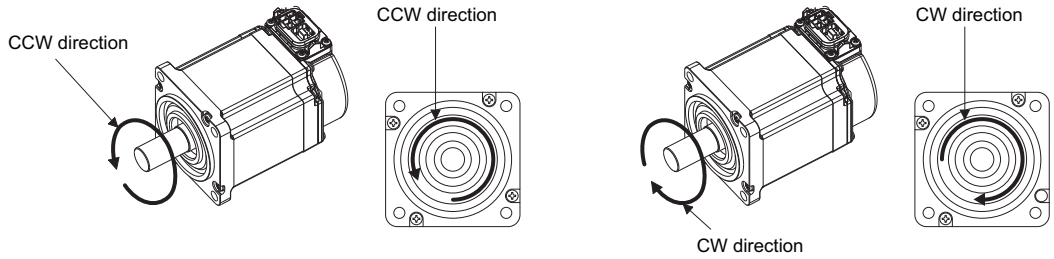
Setting value of "Function selection C-B POL reflection selection at torque control (PC29)"	"Rotation direction selection/travel direction selection (PA14)"	"[Cd.143] Command torque at torque control mode"	Torque generation direction of servo motor*1
0: Enabled	0: Forward rotation (CCW) with the increase 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

• [FX5-SSC-G]

"[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 "Travel direction selection (PA14)" and "Function selection C-B Torque POL reflection selection (PC29.3)".

"Function selection C-B Torque POL reflection selection (PC29.3)"	"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

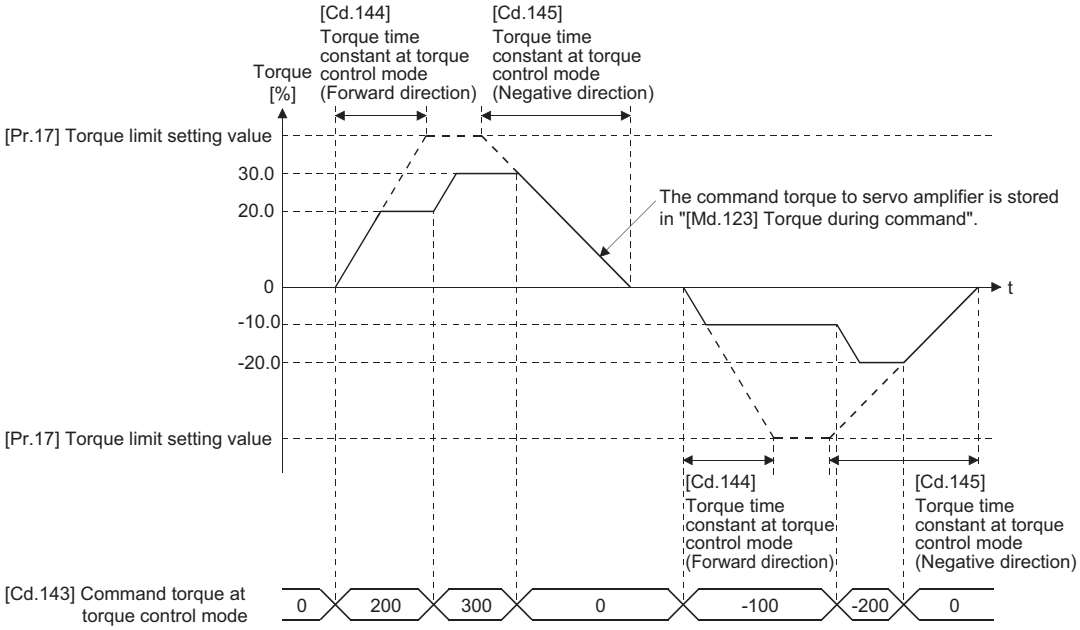
*1 Refer to the following diagram.



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 [FX5-SSC-S], or warning code: 0DA4H [FX5-SSC-G]) 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

Monitor item	Buffer memory address
[Md.119] Servo status2: b4	2476+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 [FX5-SSC-S], or warning code: 0D51H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code: 1A93H [FX5-SSC-G]) or "Software stroke limit -" (error code: 1995H [FX5-SSC-S], or error code: 1A95H [FX5-SSC-G]) 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 (Axis 1 to 8)" turned ON.	
"[Cd.191] All axis servo ON" 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.	One of the following errors occurs. The mode switches to the position control mode at the current position, and the operation immediately stops. (Deceleration processing is not executed.) [FX5-SSC-S] Error code: 1900H, 1904H, 1906H, 1993H, 1995H [FX5-SSC-G] Error code: 1A00H, 1A04H, 1A06H, 1A93H, 1A95H
The position of the motor reached the hardware stroke limit.	
"[Cd.190] PLC READY" turned OFF.	
Command discard was detected on the servo amplifier. [FX5-SSC-G]	An error (error code: 1BE6H) occurs. The mode switches to the position control mode at the current position, and the operation immediately stops. (Deceleration processing is not executed.)
The forced stop input to Simple Motion module/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

■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".

• [FX5-SSC-S]

"[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)".

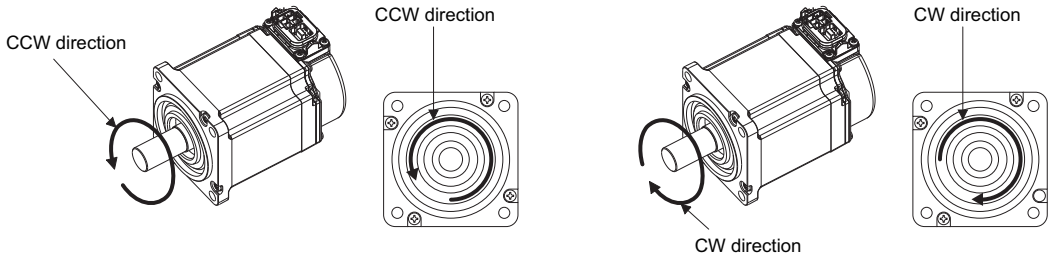
"Rotation direction selection/travel direction selection (PA14)"	"[Cd.150] Target torque at continuous operation to torque control mode"	Torque generation direction of servo motor*1
0: Forward rotation (CCW) with the increase of the positioning address	Positive value (Forward direction)	CCW direction
	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

• [FX5-SSC-G]

The relation between the setting of command torque and the torque generation direction of servo motor varies depending on the setting of servo parameters "Travel direction selection (PA14)" and "Function selection C-B Torque POL reflection selection (PC29.3)".

"Function selection C-B Torque POL reflection selection (PC29.3)"	"Travel direction selection (PA14)"	"[Cd.150] Target torque at continuous operation to 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.



Restriction

[FX5-SSC-S]

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".

[FX5-SSC-S]

- 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 [FX5-SSC-S], or warning code: 0DA4H [FX5-SSC-G]) 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.

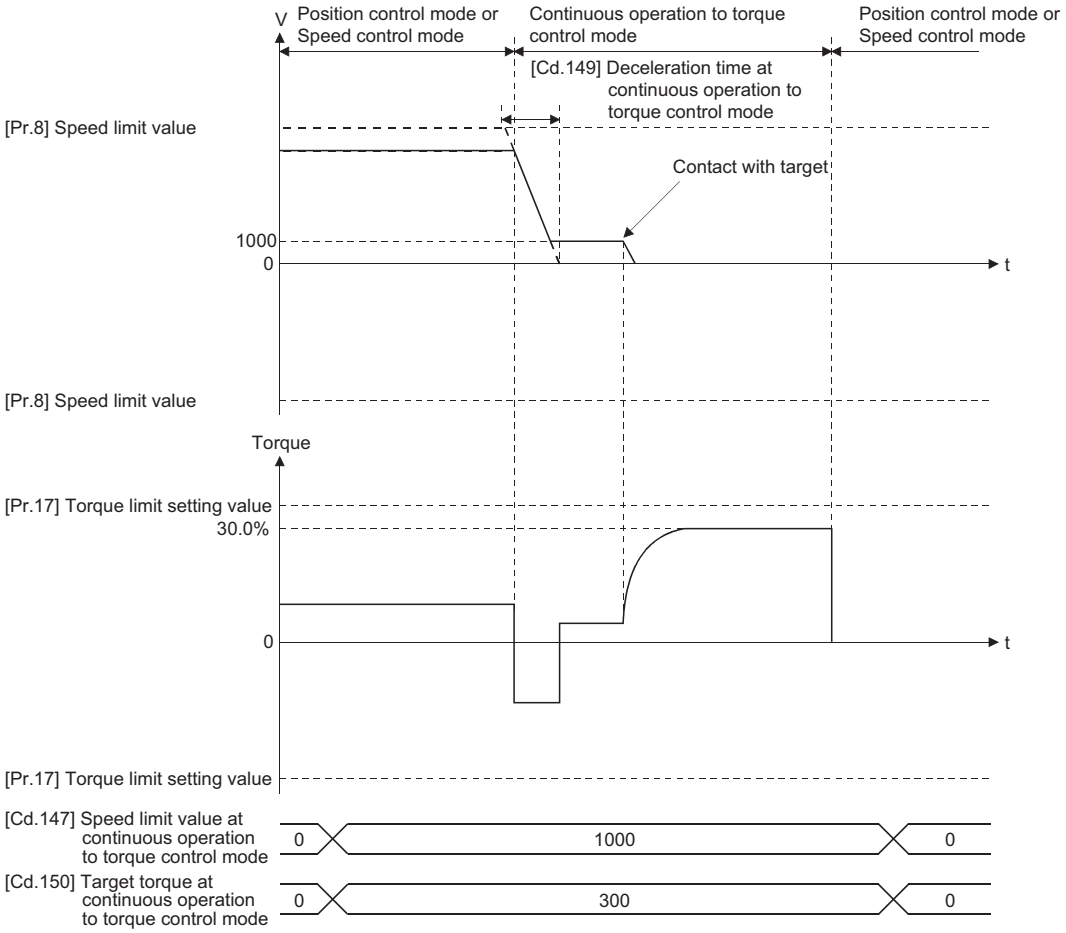
Confirm the current torque value in "[Md.104] Motor current value".

n: Axis No. - 1

Monitor item	Buffer memory address
[Md.108] Servo status1: b13	2477+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 [FX5-SSC-S], or warning code: 0D51H [FX5-SSC-G]) 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/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

Monitor item	Buffer memory address
[Md.119] Servo status2: b4	2476+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 [FX5-SSC-S], or warning code: 0D51H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code: 1A93H [FX5-SSC-G]) or "Software stroke limit -" (error code: 1995H [FX5-SSC-S], or error code: 1A95H [FX5-SSC-G]) 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 (Axis 1 to 8)" turned ON.	
"[Cd.191] All axis servo ON" 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.	One of the following errors occurs. The mode switches to the position control mode at the current position, and the operation immediately stops. (Deceleration processing is not executed.)*1 [FX5-SSC-S] Error code: 1900H, 1904H, 1906H, 1993H, 1995H [FX5-SSC-G] Error code: 1A00H, 1A04H, 1A06H, 1A93H, 1A95H 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 "[Cd.190] PLC READY".
The position of the motor reached the hardware stroke limit.	
"[Cd.190] PLC READY" turned OFF.	
Command discard was detected on the servo amplifier. [FX5-SSC-G]	An error (error code: 1BE6H) occurs. The mode switches to the position control mode at the current position, and the operation immediately stops. (Deceleration processing is not executed.) 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 "[Cd.190] PLC READY".
The forced stop input to Simple Motion module/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

Servo OFF command valid function during speed-torque control [FX5-SSC-G]

"Servo OFF command valid function" is the function that enables "[Cd.100] Servo OFF command" and "[Cd.191] All axis servo ON" to be accepted during the speed control mode, the torque control mode, and the continuous operation to torque control mode.
When using this function, servo amplifiers can be set to servo OFF without using dynamic brake.
It is possible to select valid or invalid on "[Cd.100] Servo OFF command" and "[Cd.191] All axis servo ON" during speed/torque/continuous operation to torque control by selecting "[Pr.112] Servo OFF command valid/invalid setting". When "1: Servo OFF command in speed/torque control valid" is set to "[Pr.112] Servo OFF command valid/invalid setting", the servo OFF command will be valid. When "0: Servo OFF Command Invalid" is set to "[Pr.112] Servo OFF command valid/invalid setting", the servo OFF command will be invalid.
The setting value of "[Pr.112] Servo OFF command valid/invalid setting" is to be valid at control mode switching.
At servo OFF command valid, the target axis is set to be servo OFF when "1: Servo OFF" is set to "[Cd.100] Servo OFF command" or "[Cd.191] All axis servo ON" is set to OFF. The control mode during servo OFF carries over the control mode at servo OFF command execution.

Precautions

For a safe operation, execute "[Cd. 100] Servo OFF command" while not braking with the dynamic brake and turning servo OFF will not cause any problems.

Relevant buffer memory

■Detailed parameter 2

n: Axis No. -1

Setting item	Setting value		Buffer memory address
			Axis 1 to axis 8
[Pr.112] Servo OFF command valid/invalid setting*1	bit0	0: Servo OFF command invalid 1: Servo OFF command in speed/torque control valid	112+150n
	bit1 or later	Not used*2	

*1 Saved to the flash ROM by Flash ROM write by the "[Cd.1] Flash ROM write request" or the engineering tool.
*2 When other than bit0 is ON, it operates with the setting "0: Servo OFF Command Invalid".

■Axis control data

n: Axis No. -1

Setting item	Setting detail	Buffer memory address
		Axis 1 to axis 8
[Cd.100] Servo OFF command	0: Servo ON 1: Servo OFF	4351+100n
[Cd.191] All axis servo ON	0: Servo OFF 1: Servo ON	5951

Stop cause

When "1: Servo OFF command in speed/torque control valid" is set to "[Pr.112] Servo OFF command valid/invalid setting", the operation at stop cause occurrence is as follows.

■Stop cause during speed control mode

Setting 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 status 2" turns ON, and the operation stops. During Servo OFF, the stop signal is not accepted even if "[Cd.180] Axis stop" turned ON.
Stop signal of "[Cd.44] External input signal operation device" turned ON.	
"[Cd.191] All axis servo ON" turned OFF.	The servo turned OFF and the speed control mode will continue. It will be braked by the dynamic brake at the stop by the servo OFF. The speed control mode can be continued after servo ON.
"[Cd.100] Servo OFF command" turned OFF.	The servo turned OFF and the speed control mode will continue. It will not be braked by the dynamic brake at the stop by the servo OFF. The speed control mode can be continued after servo ON.
The current value reached the software stroke limit.	An error (error code: 1A00H, 1A04H to 1A07H, 1A93H, 1A95H, 1BE6H) occurs. The mode switches to the position control mode at the current position, and the operation immediately stops. (Deceleration processing is not executed.) While the servo amplifier is servo OFF, an error does not occur even if any operation on the left is performed.
The position of the motor reached the hardware stroke limit.	
"[Cd.190] PLC READY" turned OFF.	
Command discard was detected on the servo amplifier.	
The forced stop input to Motion module.	Stop processing of the controller is immediate stop. (Speed control mode will continue. It can be possible to continue after the cause is removed.)
The emergency stop input to servo amplifier.	
The servo alarm occurred.	The mode switches to the position control mode when the servo OFF (Servo ON of "[Md.108] Servo status 1" 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 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.)

■Stop cause during torque control mode

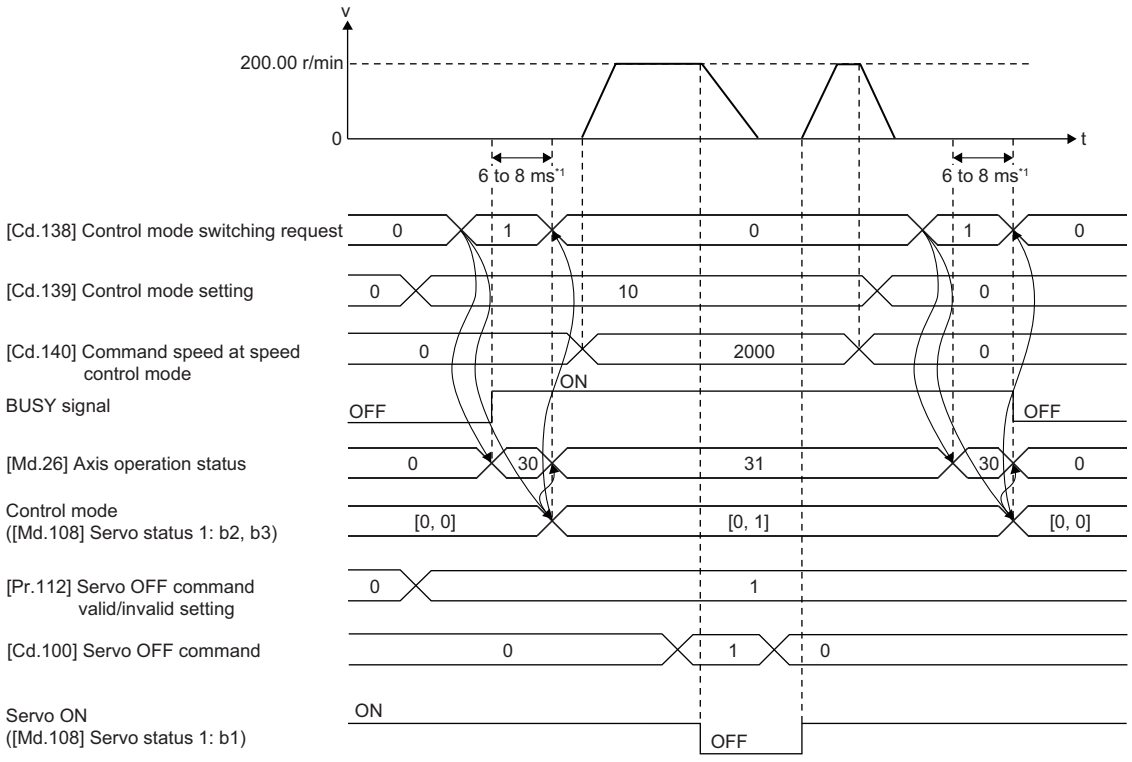
Setting item	Operation during torque mode
"[Cd.180] Axis stop" turned ON.	The speed limit value commanded to servo amplifier is "0" regardless of the setting value of "[Cd.146] Speed limit value at torque control mode". The mode switches to the position control mode when "Zero speed" of "[Md.119] Servo status 2" 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. During Servo OFF, the stop signal is not accepted even if "[Cd.180] Axis stop" turned ON.
Stop signal of "[Cd.44] External input signal operation device" turned ON.	
"[Cd.191] All axis servo ON" turned OFF.	The servo turned OFF and the torque control mode will continue. It will be braked by the dynamic brake at the stop by the servo OFF. The torque control mode can be continued after servo ON.
"[Cd.100] Servo OFF command" turned ON.	The servo turned OFF and the torque control mode will continue. It will not be braked by the dynamic brake at the stop by the servo OFF. The torque control mode can be continued after servo ON.
The current value reached the software stroke limit.	An error (error code: 1A00H, 1A04H to 1A07H, 1A93H, 1A95H, 1BE6H) occurs. The mode switches to the position control mode at the current position, and the operation immediately stops. (Deceleration processing is not executed.) While the servo amplifier is servo OFF, an error does not occur even if any operation on the left is performed.
The position of the motor reached the hardware stroke limit.	
"[Cd.190] PLC READY" turned OFF.	
Command discard was detected on the servo amplifier.	
The forced stop input to Motion module.	Stop processing of the controller is immediate stop. (Torque control mode will continue after the cause is removed.)
The emergency stop input to servo amplifier.	
The servo alarm occurred.	The mode switches to the position control mode when the servo OFF (Servo ON of "[Md.108] Servo status 1" 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 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.)

■Stop cause during continuous operation to torque control mode

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 status 2" 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.	
"[Cd.191] All axis servo ON" turned OFF.	The servo turned OFF and the continuous control to torque control mode will continue. It will be braked by dynamic brake at the stop by the servo OFF. The continuous control to torque control can be continued after servo ON.
"[Cd.100] Servo OFF command" turned ON.	The servo turned OFF and the continuous control to torque control mode will continue. It will not be braked by dynamic brake at the stop by the servo OFF. The continuous operation to torque control can be continued after servo ON.
The current value reached the software stroke limit.	An error (error code: 1A00H, 1A04H to 1A07H, 1A93H, 1A95H, 1BE6H) occurs. The mode switches to the position control mode at the current position, and the operation immediately stops. (Deceleration processing is not executed.) 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 "[Cd.190] PLC READY". While the servo amplifier is servo OFF, an error does not occur even if any operation on the left is performed.
The position of the motor reached the hardware stroke limit.	
"[Cd.190] PLC READY" turned OFF.	
Command discard was detected on the servo amplifier.	
The forced stop input to Motion module.	Stop processing of the controller is immediate stop. (Torque control mode will continue. It can be possible to continue after the cause is removed.)
The emergency stop input to servo amplifier.	
The servo alarm occurred.	The mode switches to the position control mode when the servo OFF (Servo ON of "[Md.108] Servo status 1" 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 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.)

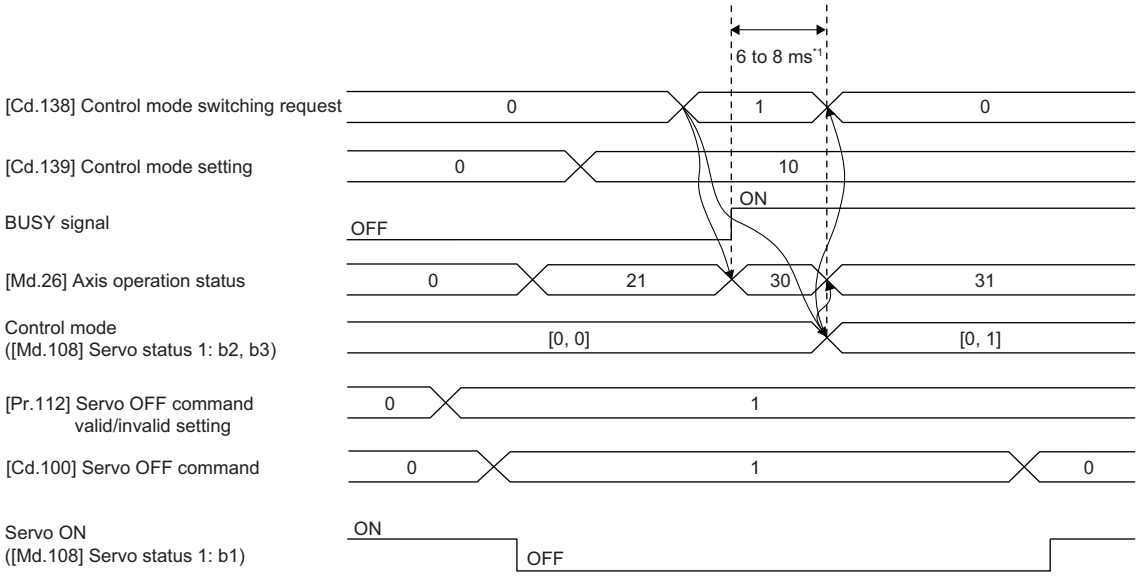
Operation timing

The following shows the operation of the speed torque control mode in case of setting "1: Servo OFF Command in Speed/Torque Control Valid Function" in "[Pr.112] Servo OFF command valid/invalid setting". The operation at torque control mode or continuous operation to torque control mode is the same as that operation.



*1 Switching time differs depending on the specification of the servo amplifier.

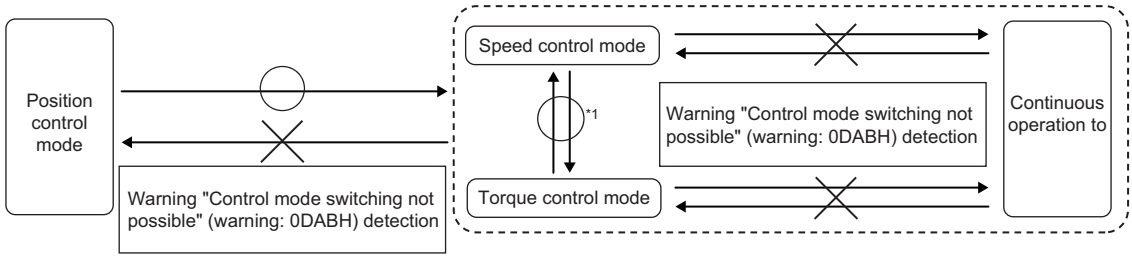
- The following shows the operation in case of switching from the position control mode to speed control mode during servo OFF command. The operation when switching from the position control mode to torque control mode or continuous operation to torque control mode is the same as that operation.



*1 Switching time differs depending on the specification of the servo amplifier.

Control mode switching during servo OFF

The position control mode can be switched to speed-torque-continuous operation to torque control mode, and the speed control mode ⇔ torque control mode switching*1 can be performed during servo OFF in case of setting "1: Servo OFF Command in Speed/Torque Control Valid Function" in "[Pr.112] Servo OFF command valid/invalid setting".
The control mode cannot be switched during continuous operation to torque control mode.



*1 The operation differs depending on the software version.

Software version	Operation
1.003 or later	The speed control mode ⇔ torque control mode switching during servo OFF is possible.
1.002 or earlier	For the speed control mode ⇔ torque control mode switching during servo OFF, the warning "Control mode switching not possible" (warning code: 0DABH) is detected.

Precautions during operation

- When the speed control or torque control, the control mode cannot be switched to during servo OFF. If "1: Switching request" is set in "[Cd.138] Control mode switching request", the warning "Control mode switching not possible" (warning code: 0DABH) will be detected. However, in case of satisfying the following conditions, switching from speed-torque control mode to continuous operation to torque control mode can be possible during servo OFF.

  - "[Md.26] Axis operation status" is standstill or stopping
  - "[Cd.180] Axis stop" is OFF
  - No error occurred
  - Driver communication function is not used [FX5-SSC-S]

- In the continuous operation to torque control mode, the control mode cannot be switched during servo OFF. If "1: Switching request" is set in "[Cd.138] Control mode switching request", the warning "Control mode switching not possible" (warning code: 0DABH) will be detected. However, in case of satisfying the following conditions, switching from continuous operation to torque control mode to speed control mode can be possible.

  - The current control mode is continuous operation to torque control mode and the previous control mode is positioning control mode
  - During zero speed ([Md.119] Servo status 2: b3) is OFF
  - Servo amplifier is connected
  - No immediately stop cause
  - "1: ON conditions invalid during zero speed at mode switching" is set in "Condition selection at mode switching (b12 to b15)" of "[Pr.90] Operation setting for speed-torque control mode". [FX5-SSC-S]
  - "1: According to the Servo Amplifier Specification" is set in "Condition selection at mode switching (b12 to b15)" of "[Pr.90] Operation setting for speed-torque control mode" and also "ZSP disabled selection at control switching" of MR-J5-G servo parameter "Function selection C-E (PC76)" is "1: Disabled". [FX5-SSC-G]

- When the setting is "[Md.26] Axis operation status" is "30: Control mode switch" or "[Md.124] Control mode switching status" is other than "0: Not during control mode switching", the servo OFF command will not be accepted. Request the servo OFF command after completing the control mode switching.
- If the value other than "0: Servo OFF Command Invalid" or "1: Servo OFF Command in Speed/Torque Control Valid" is set in "[Pr.112] Servo OFF command valid/invalid setting", it will be processed as "0: Servo OFF command invalid".
- The immediate stop cannot be accepted after the servo OFF. However, if the stop cause is the cause involved with switching to position control mode, the control mode will be switched to position control mode.
- When the axis is stopped with the servo OFF status during speed-torque-continuous operation to torque control mode, the operation of the each control mode will be restarted at the point of removing the stop causes.
- When "1: Servo OFF Command in Speed/Torque Control Valid" is set in "[Pr.112] Servo OFF command valid/invalid setting" and it becomes servo OFF by "[Cd.100] Servo OFF command", dynamic brake is not performed. Make sure that there is no problem even the servo motor is not braked by the dynamic brake and then execute "[Cd.100] Servo OFF command" because it is dangerous.

6.2 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, command generation axis, or synchronous encoder axis), by setting "the parameters for advanced synchronous control" and starting synchronous control on each output axis.
Refer to the following for details of advanced synchronous control.
MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control)

7 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.

7.1 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	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	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 by a designated percentage 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/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/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.

7.2 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.

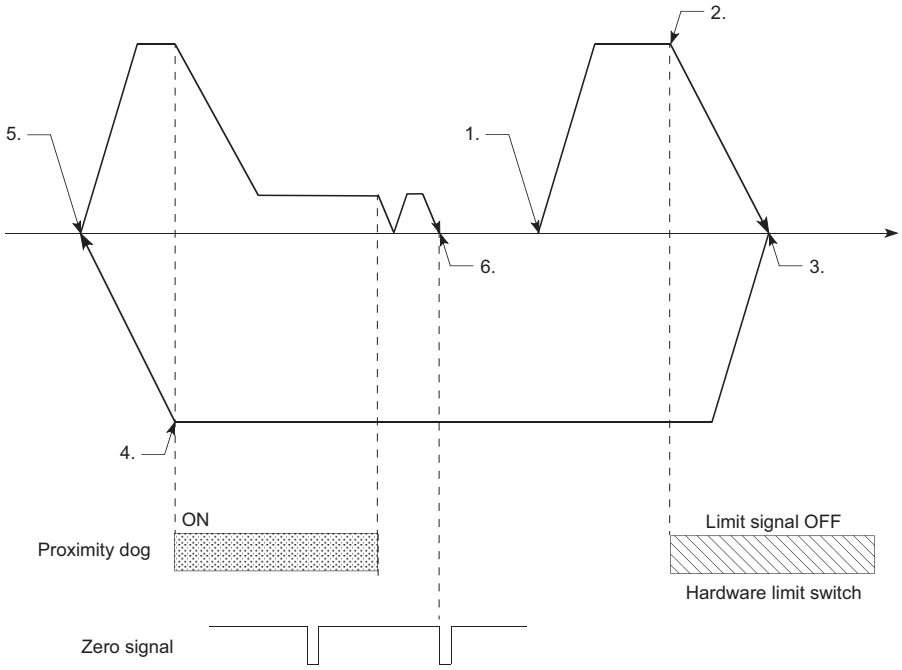
Home position return retry function [FX5-SSC-S]

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".

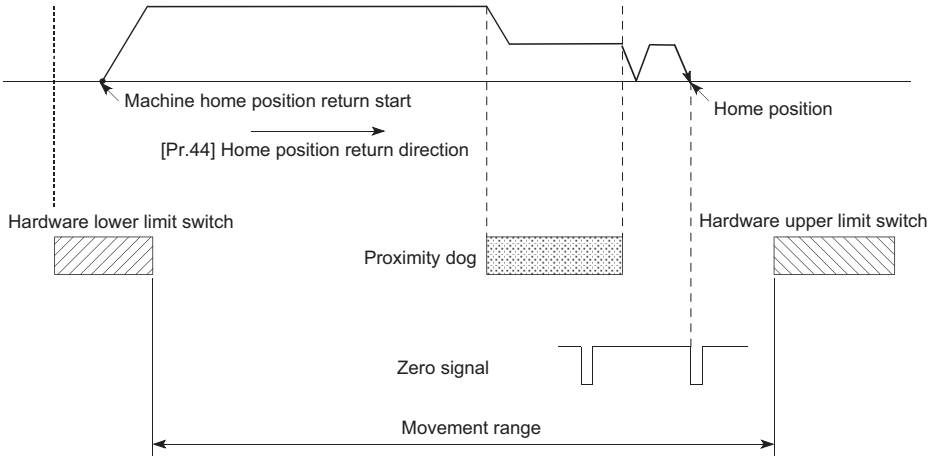
4. The operation decelerates when the proximity dog turns OFF.

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.)

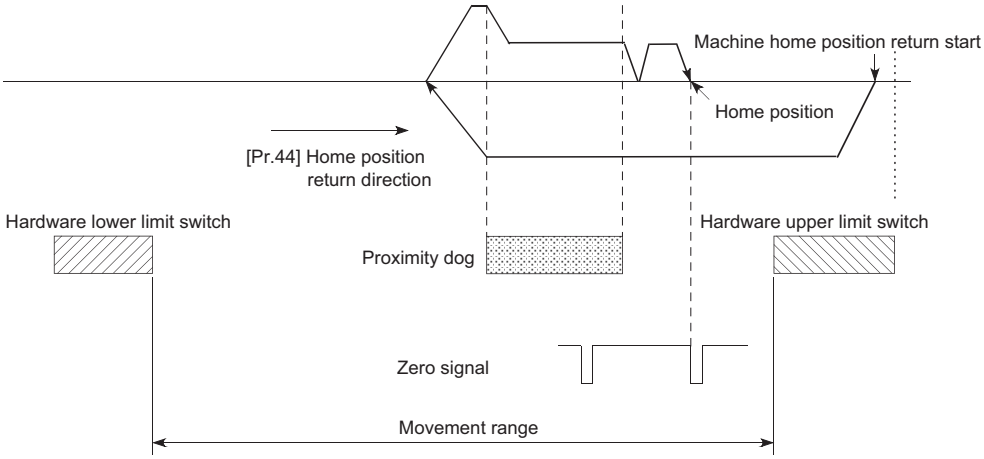
6. Machine home position return completion.

■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".

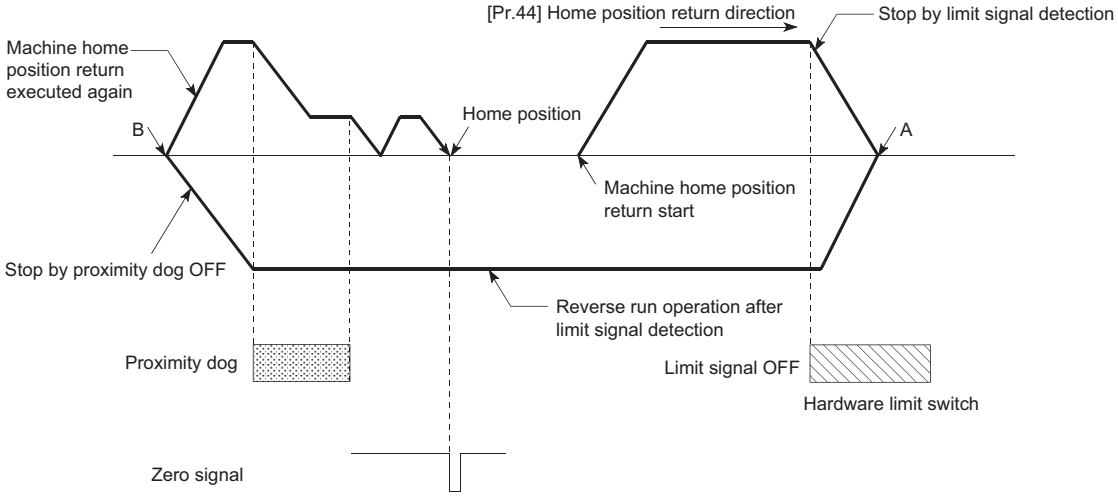


Point

- 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	○: Execution possible
Count method 1	○: Execution possible
Count method 2	○: Execution possible
Data set method	—
Scale origin signal detection method	×: 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. 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 [FX5-SSC-S], or error code: 1A04H [FX5-SSC-G]) or "Hardware stroke limit (-)" (error code: 1906H [FX5-SSC-S], or error code: 1A06H [FX5-SSC-G]) 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 250 Hardware stroke limit function)

- 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 "[Cd.190] PLC READY". 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 444 Basic Setting

Point

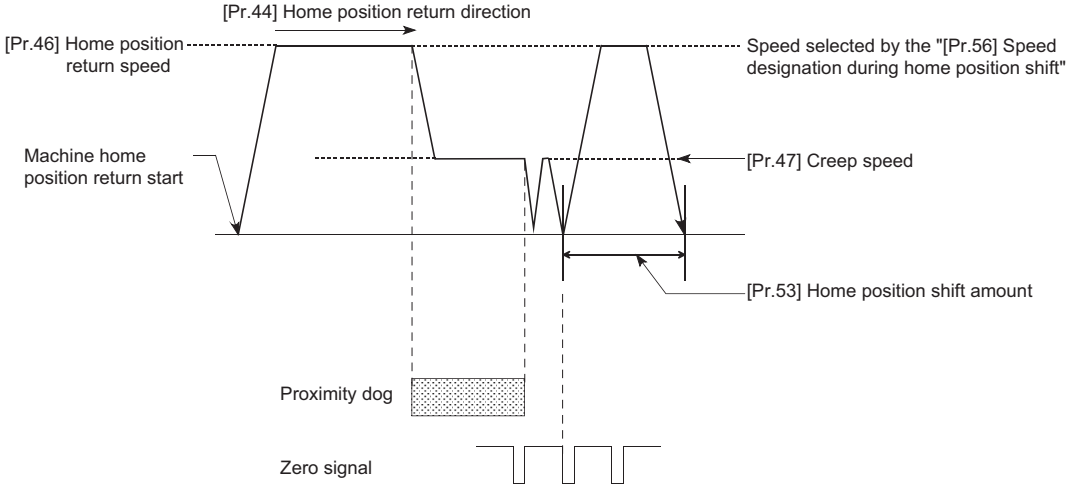
- Parameters are set for each axis.
- It is recommended that the parameters be set whenever possible with the engineering tool. Execution by a program uses many programs and devices. The execution becomes complicated, and the scan times will increase.

Home position shift function [FX5-SSC-S]

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.

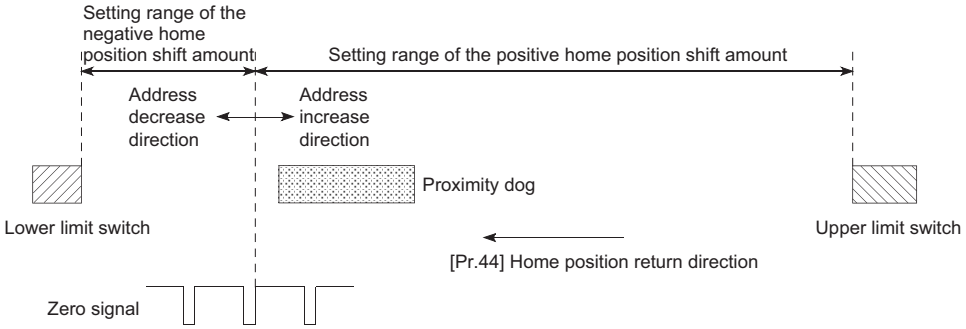
Control details

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.

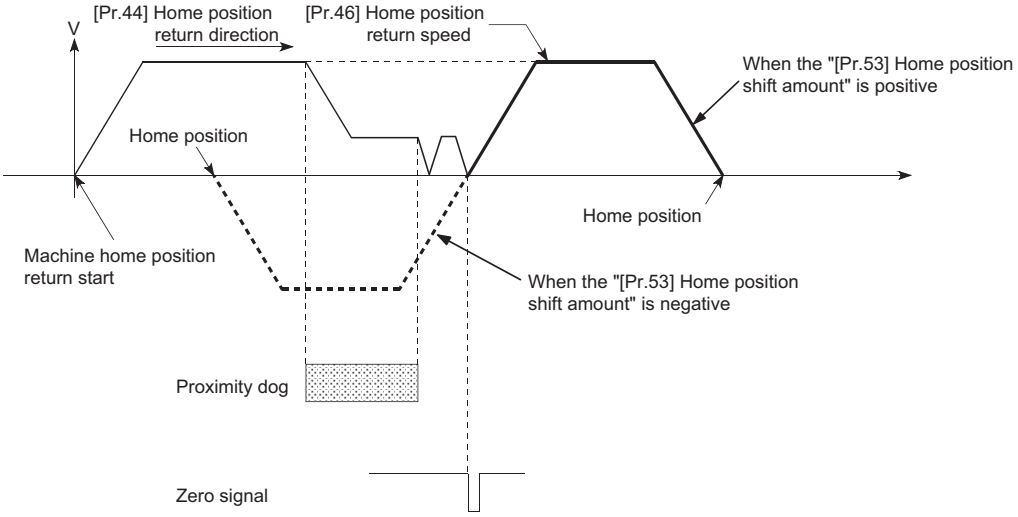


Movement speed during home position shift

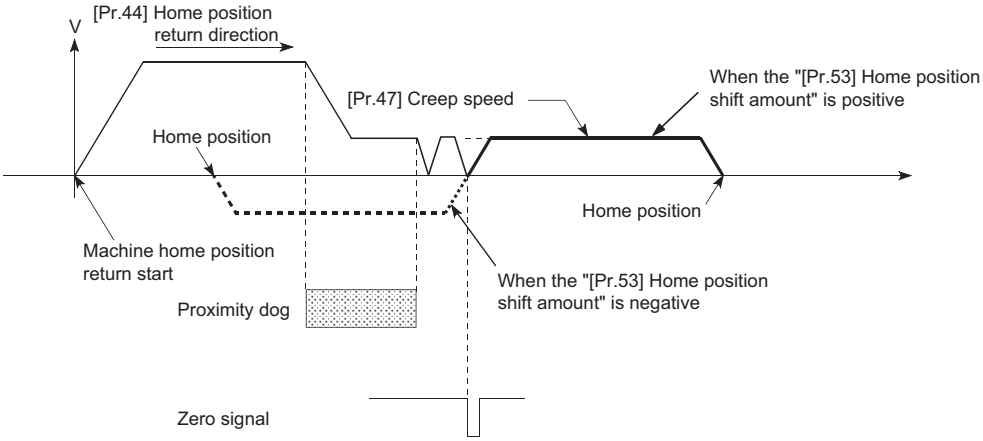
When using the home position shift function, the movement speed during the home position shift is set in "[Pr.56] Speed designation during home position shift". The movement speed during the home position shift is selected from either the "[Pr.46] Home position return speed" or the "[Pr.47] Creep speed". 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 "[Cd.190] PLC READY".

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 444 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.

7.3 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.

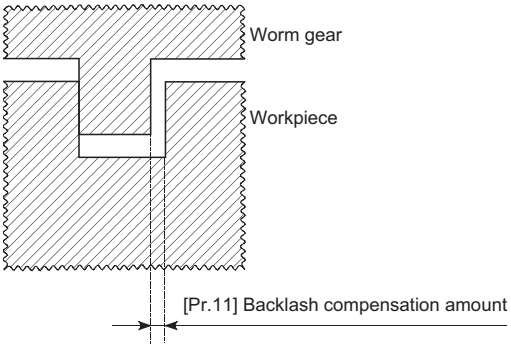
Backlash compensation function

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.
  For details on the setting, refer to the following.
  ☞ Page 462 [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/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/Motion module.

The set details are validated at the rising edge (OFF → ON) of the "[Cd.190] PLC READY".

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 444 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/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/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/Motion module automatically carries out the processing for [A] and [B].
[FX5-SSC-G]
The "Electronic gear function" section in this chapter is different from the "Electronic gear function" of the servo amplifier. For the "Electronic gear function" of the servo amplifier, refer to the manual of the servo amplifier.
For MR-J5(W)-G: 📖MR-J5 User's Manual (Function)

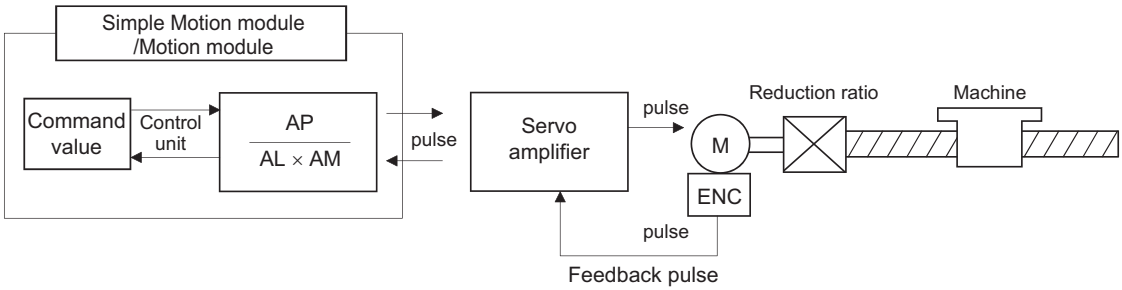
7

Precautions

[FX5-SSC-G]
The setting for the electronic gear of the servo amplifier is limited depending on the resolution of the encoder. For details, refer to the following.
☞ Page 841 Devices Compatible with CC-Link IE TSN [FX5-SSC-G]

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

$$\text{Electronic gear} = \frac{AP}{\Delta S} = \frac{AP}{AL \times AM} \cdots (1)$$

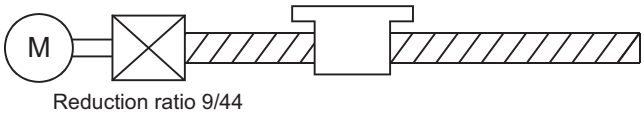
Set values for AP, AL and AM so that this related equation is established.
However, because values to be set for AP, AL and AM have the settable range, values calculated (reduced) from the above related equation must be contained in the setting range for AP, AL and AM.

■For "Ball screw" + "Reduction gear"

Ex.

[FX5-SSC-S]

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

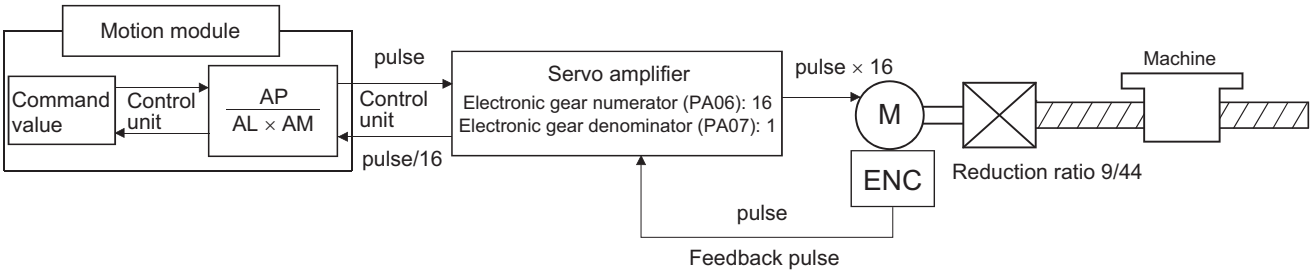
= 10 [mm] × 9/44

= 10000.0 [μm] × 9/44

When the control unit is "mm", the minimum command unit is 0.1 μm.

[FX5-SSC-G]

When the ball screw pitch is 10 mm, the motor is the HK-KT (67108864 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) = 67108864 [pulse] × 1/16

= 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 performing control for an HK-KT motor, set the servo parameters of MR-J5(W)-G as follows.

Electronic gear numerator (PA06): 16

Electronic gear denominator (PA07): 1

Substitute this for the above expression (1).

At this time, make calculation with the reduction ratio 9/44 remaining as a fraction.

$$\frac{AP}{\Delta S} = \frac{4194304\ [pulse]}{10000.0\ [\mu m] \times 9/44}$$

$$= \frac{4194304 \times 44}{10000.0 \times 9}$$

$$= \frac{184549376}{90000.0}$$

$$= \frac{23068672}{11250.0} = \frac{23068672(AP)}{11250.0(AL) \times 1(AM)}$$

$$= \frac{23068672(AP)}{1125.0(AL) \times 10(AM)}$$

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.

[FX5-SSC-S]

When the motor is the HG-KR (4194304 pulses/rev)

[FX5-SSC-G]

When the motor is the HK-KT (67108864 pulses/rev)

Point

When performing control for an HK-KT motor, set the servo parameters of MR-J5(W)-G as follows.

Electronic gear numerator (PA06): 16

Electronic gear denominator (PA07): 1

Setting value	Setting item
AP = 4194304	[Pr.2]
AL = 4194304	[Pr.3]
AM = 1	[Pr.4]

■When "degree" is set as the control unit for a rotary axis

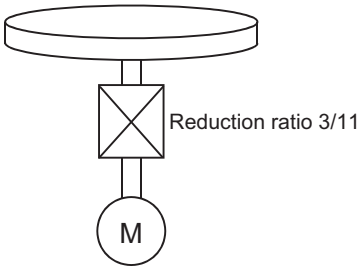
Ex.

[FX5-SSC-S]

When the rotary axis is used, the motor is HG-KR (4194304 pulses/rev) and the reduction ratio is 3/11.

[FX5-SSC-G]

When the motor is HK-KT (67108864 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).

[FX5-SSC-S]

AP (Number of pulses per rotation) = 4194304 [pulse]

[FX5-SSC-G]

AP (Number of pulses per rotation) = 67108864 [pulse] x1/16 = 4194304 [pulse]

Point

When performing control for an HK-KT motor, set the servo parameters of MR-J5(W)-G as follows.
Electronic gear numerator (PA06): 16
Electronic gear denominator (PA07): 1

ΔS (Movement amount per rotation)

= 360.00000 [degree] × Reduction ratio

= 360.00000 × 3/11

Substitute this for the above expression (1).

At this time, make calculation with the reduction ratio 3/11 remaining as a fraction.

$$\frac{AP}{\Delta S} = \frac{4194304\ [pulse]}{360.00000\ [degree] \times 3/11}$$

$$= \frac{4194304\ [pulse] \times 11}{360.00000\ [degree] \times 3}$$

$$= \frac{46137344}{1080.00000}$$

$$= \frac{2883584}{67.50000} = \frac{2883584(AP)}{67.50000(AL) \times 1(AM)}$$

$$= \frac{2883584(AP)}{0.06750(AL) \times 1000(AM)}$$

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)

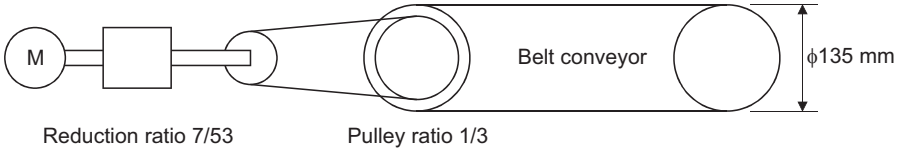
Ex.

[FX5-SSC-S]

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.

[FX5-SSC-G]

When the belt conveyor drive is used, the conveyor diameter is 135 mm, the pulley ratio is 1/3, the motor is HK-KT (67108864 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).

[FX5-SSC-S]

AP (Number of pulses per rotation) = 4194304 [pulse]

[FX5-SSC-G]

AP (Number of pulses per rotation) = 67108864 [pulse] x1/16 = 4194304 [pulse]

Point

When performing control for an HK-KT motor, set the servo parameters of MR-J5(W)-G as follows.

Electronic gear numerator (PA06): 16

Electronic gear denominator (PA07): 1

ΔS (Movement amount per rotation)

= 135000.0 [μm] × π × Reduction ratio

= 135000.0 [μm] × π × 7/53 × 1/3

Substitute this for the above expression (1).

At this time, make calculation with the reduction ratio 7/53 × 1/3 remaining as a fraction.

$$\frac{AP}{\Delta S} = \frac{AP}{AL \times AM} = \frac{4194304\ [pulse]}{135000.0\ [\mu m] \times \pi \times 7/53 \times 1/3}$$

$$= \frac{4194304 \times 53 \times 3}{135000.0 \times \pi \times 7}$$

$$= \frac{166723584}{236250 \times \pi}$$

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]

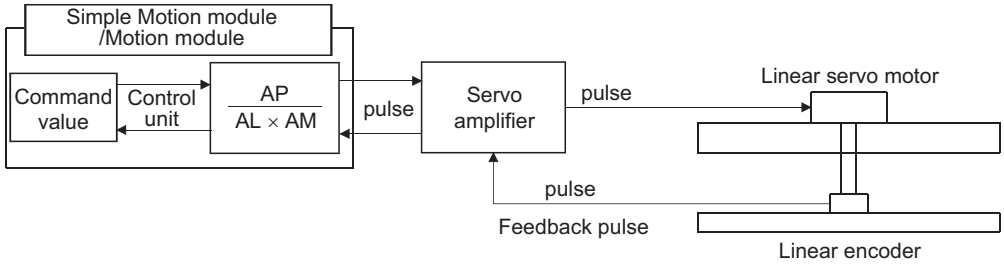
ΔS (Movement amount per rotation)

= 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, AM as shown below.

When using MR-J4(W)-B [FX5-SSC-S]	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-J4(W)-G [FX5-SSC-G]	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]
[FX5-SSC-G] 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

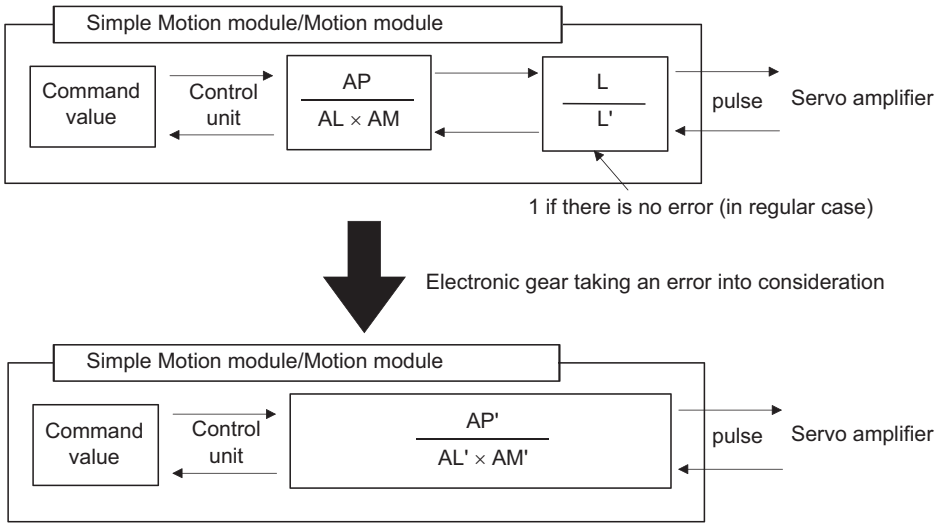
When the position control is carried out using the "Electronic gear" set in a parameter, this may produce an error between the command movement amount (L) and the actual movement amount (L'). With Simple Motion module/Motion module, this error is compensated by adjusting the electronic gear.

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/Motion module. The set details are validated at the rising edge (OFF → ON) of the "[Cd.190] PLC READY".

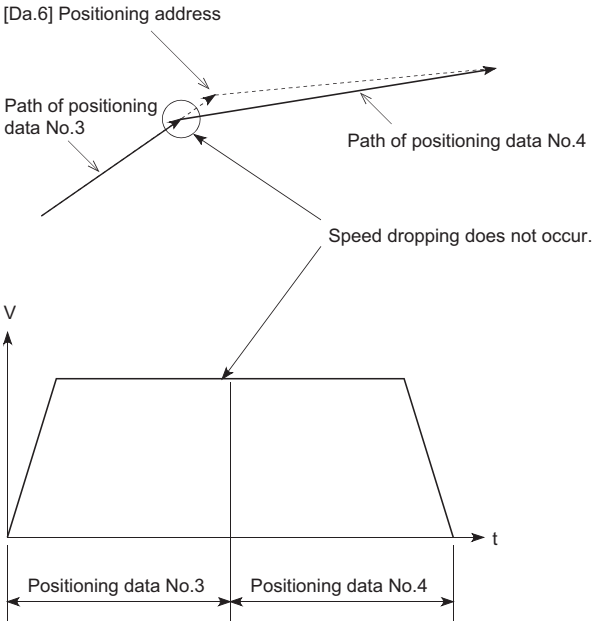
Near pass function

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.

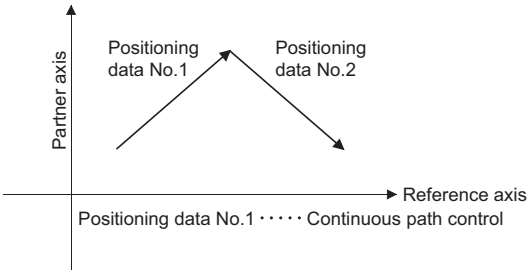
■The path of the near pass



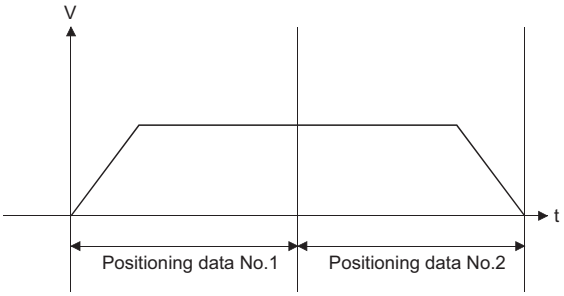
Precautions during control

- 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.

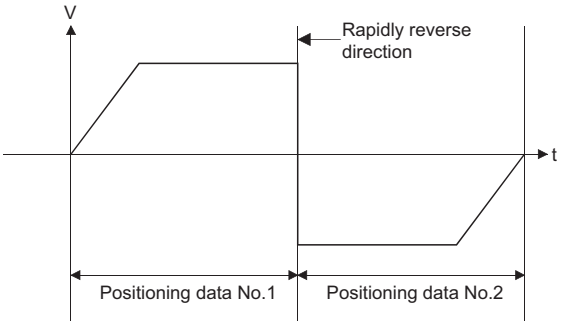
■Positioning by interpolation



■Operation of reference axis



■Operation of partner axis for interpolation



7.4 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	◎	
	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.

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/Motion module.

The set details are validated at the next start after they are written to the Simple Motion module/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 444 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.)

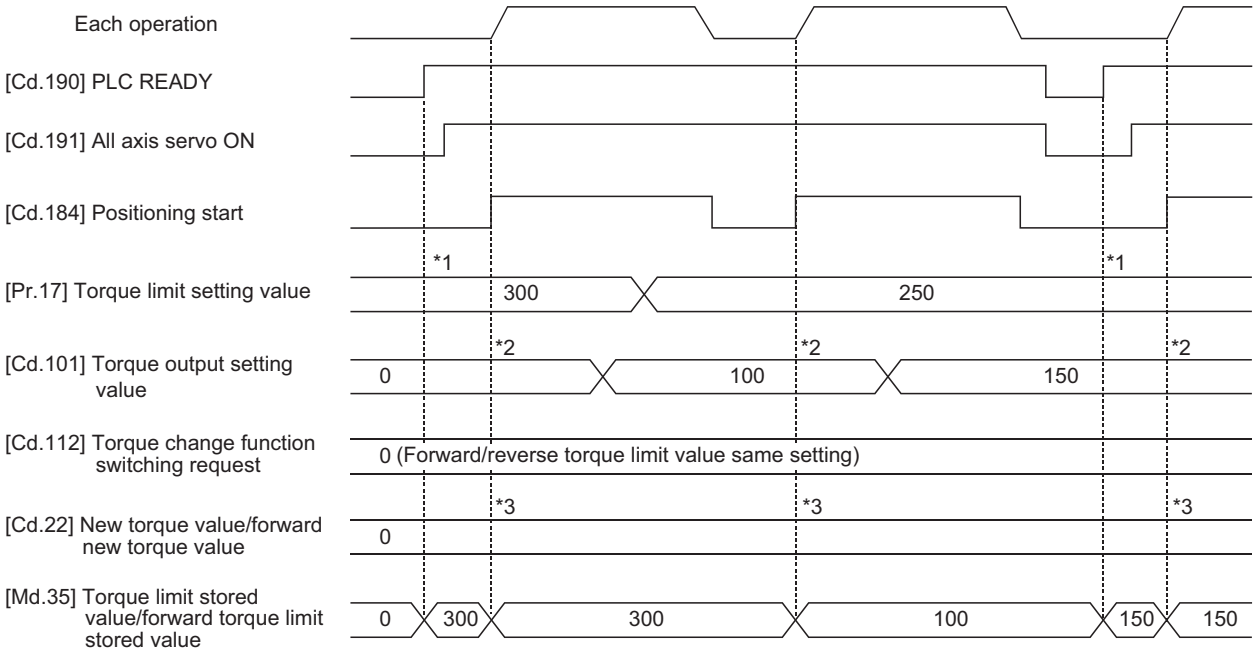
Control type			Torque limit function	Torque limit value *1
Home position return control	Machine home position return control		○	[FX5-SSC-S] "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value". After the "[Pr.47] Creep speed" is reached, this value becomes the "[Pr.54] Home position return torque limit value".
				[FX5-SSC-G] "[Pr.17] Torque limit setting value" or "[Cd.101] Torque output setting value".*2 After the "[Pr.47] Creep speed" is reached, this value becomes the "[Pr.54] Home position return torque limit value".*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	○	
	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 Only the value specified at start is enabled. The value cannot be changed during homing.
*3 For the setting method, refer to the servo amplifier manuals.
For MR-J5(W)-G: MR-J5-G/MR-J5W-G User's Manual (Parameters)

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 "[Cd.190] PLC READY" rising edge (however, after the servo 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 "[Cd.184] Positioning start" 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 "[Cd.184] Positioning start" 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 269 Torque change function for details about the "new torque value".)
- 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.

[FX5-SSC-S]

- 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) occurs.

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/Motion module.

The set details are validated at the rising edge (OFF → ON) of the "[Cd.190] PLC READY".

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 [FX5-SSC-S]	→	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 "[Cd.184] Positioning start".

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

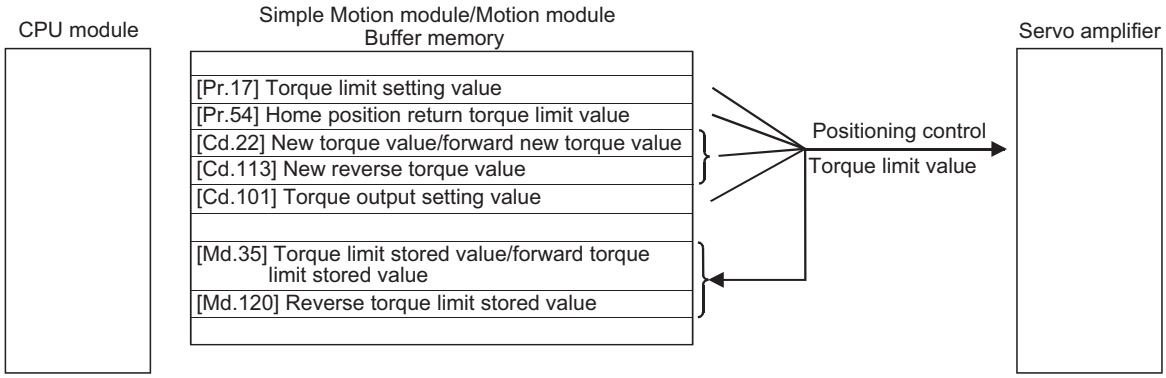
*1 Torque limit value: Will be an upper limit value of the torque change value. If a larger value has been mistakenly input for the torque change value, it is restricted within the torque limit setting values to prevent an erroneous entry. (Even if a value larger than the torque limit setting value has 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 444 Basic Setting, ☞ Page 559 Control Data

- The "torque limit value" set in the Simple Motion module/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

Monitor item		Monitor value	Storage details	Buffer memory address
[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
[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

Refer to the following for information on the storage details.

☞ Page 518 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 269 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.

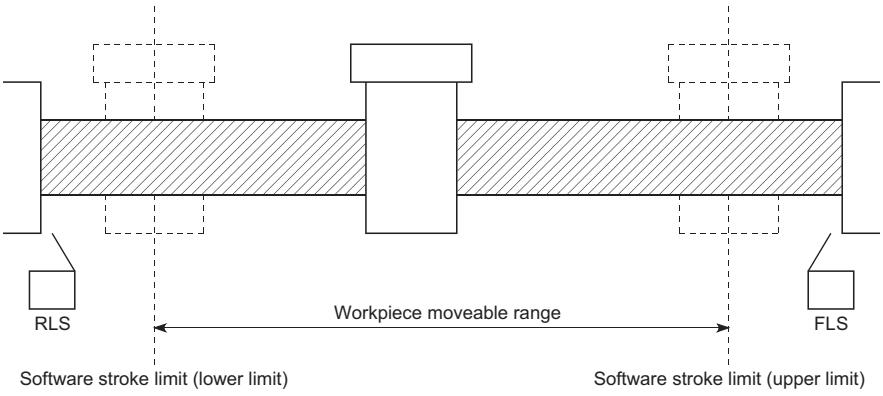
In the Simple Motion module/Motion module, the "command position value" and "machine feed value" are used as the addresses indicating the current position. However, in the "software stroke limit function", the address used to carry out the limit check is designated in the "[Pr.14] Software stroke limit selection". Refer to the following for details on the "command position value" and "machine feed value".

☞ Page 69 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

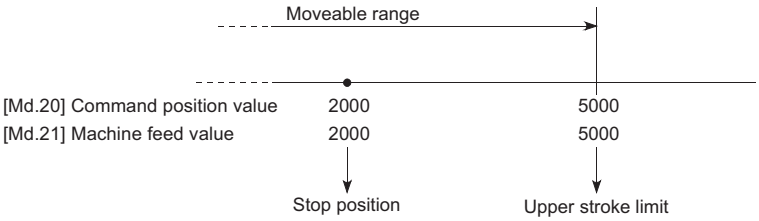
The following drawing shows the moveable range of the workpiece when the software stroke limit function is used.



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.

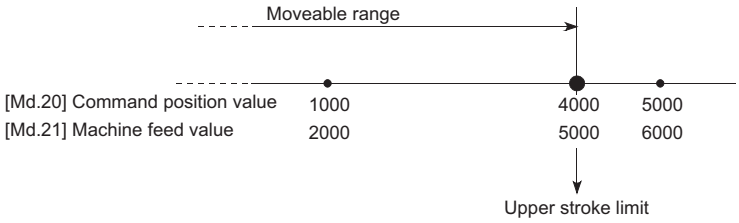


■Current value changing

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.

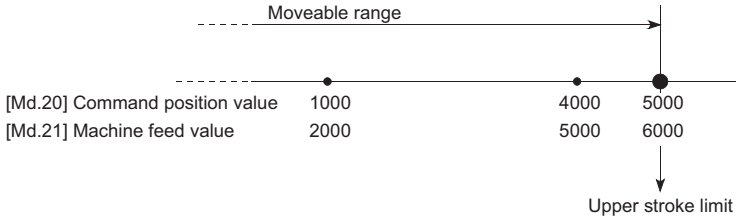
• When the machine feed value is set at the limit

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 following errors will occur. [FX5-SSC-S] Error "Software stroke limit +" (error code: 1993H, 1A18H) and "Software stroke limit -" (error code: 1995H, 1A1AH) [FX5-SSC-G] Error "Software stroke limit +" (error code: 1A93H, 1B18H) and "Software stroke limit -" (error code: 1A95H, 1B1AH)
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 467 [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 carried out 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 245 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	◎	
	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 245 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 245 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.

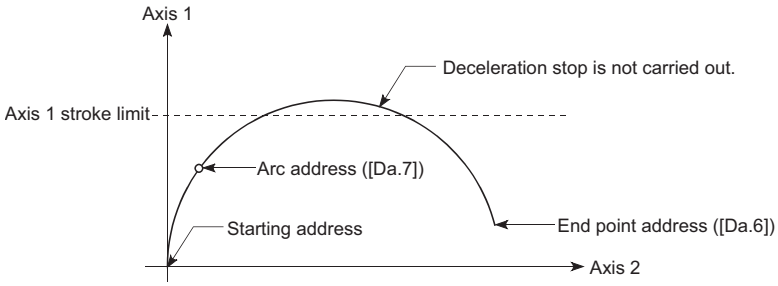
*2 When the unit is "degree", check is not made during speed control.

*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, 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.



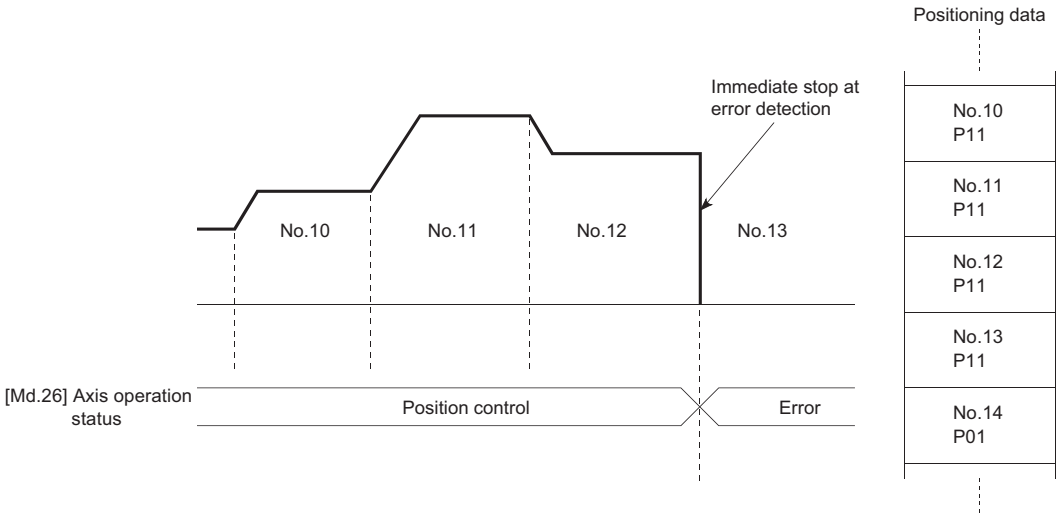
Point

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/Motion module.

The set details are validated at the rising edge (OFF → ON) of the "[Cd.190] PLC READY".

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 444 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/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 "[Cd.190] PLC READY".

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].

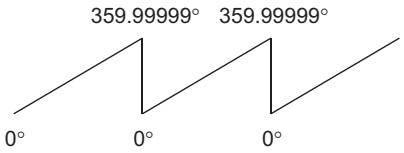
Point

- 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°.

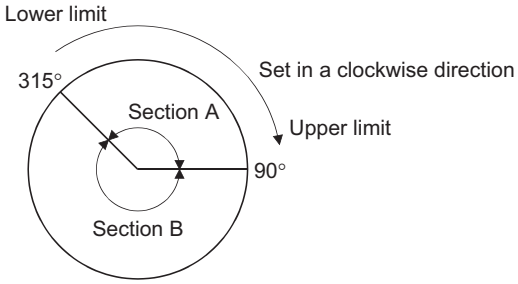


■Setting the software stroke limit

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 469 [Pr.116] to [Pr.119] FLS/RLS/DOG/STOP signal selection)

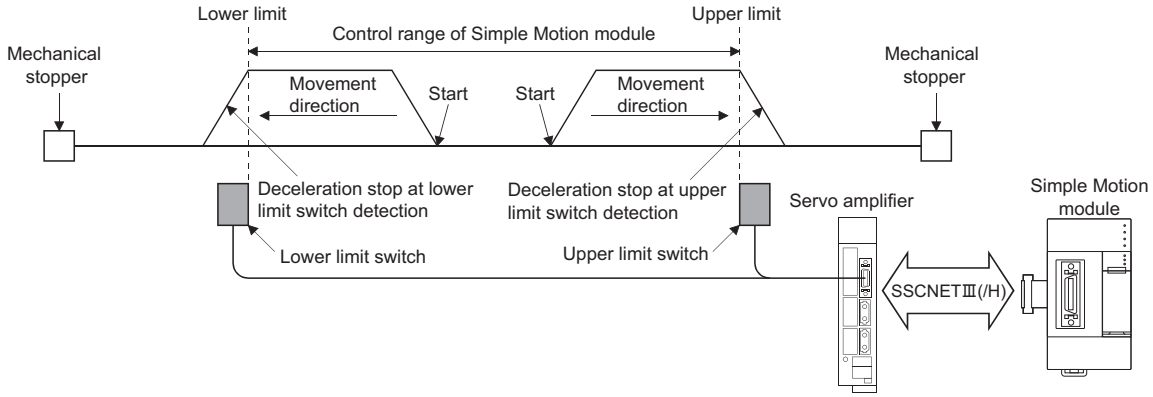
- External input signal of servo amplifier
- External input signal via CPU (buffer memory of Simple Motion module/Motion module)
- Input signal on the CC-Link IE TSN network (link device) [FX5-SSC-G]

Control details

The following drawing shows the operation of the hardware stroke limit function.

■External input signal of servo amplifier

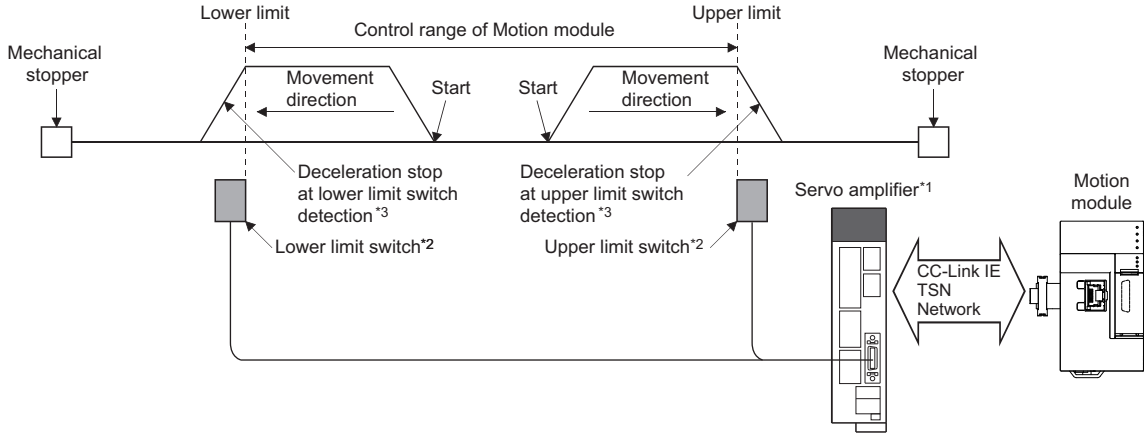
[FX5-SSC-S]



[FX5-SSC-G]

For the operation of the servo amplifier at stroke limit detection, check the specifications of the servo amplifier to use.

The example below uses MR-J5(W)-G.



*1 Be sure to set the following servo parameters correctly.

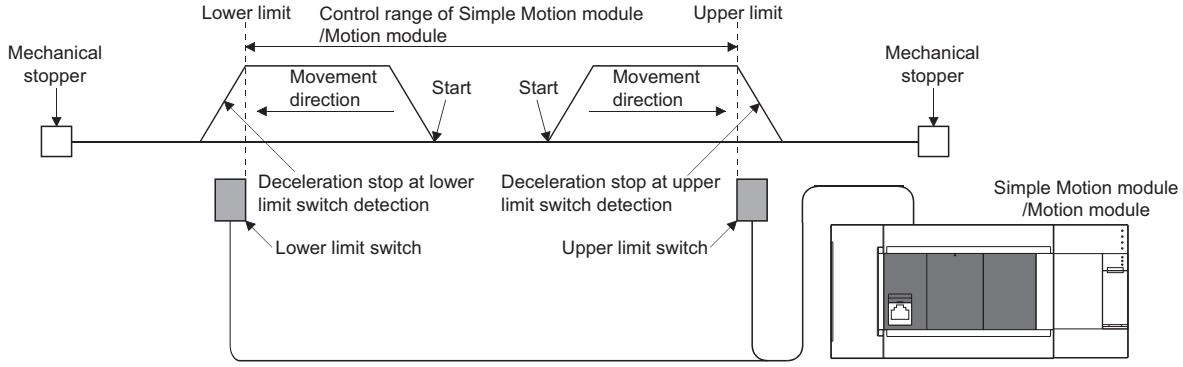
- Set servo parameter "Function selection D-4 Sensor input method selection (PD41.3)" to "1: Input from controller". When set to a different value, the error "Servo parameter invalid" (error code: 1DC8H) occurs and the controller rewrites the value of "Function selection D-4 Sensor input method selection (PD41.3)" to "1: Input from controller". The servo parameter is enabled after the servo amplifier is reset.
- Assign the LSP/LSN signal in servo parameters "Input device selection 1 to 3 (PD03 to PD05)"

*2 The signal to be wired changes depending on the setting of servo parameter "Travel direction selection (PA14)".

"Travel direction selection (PA14)"	Name of servo amplifier signal	
	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 Stop processing is carried out in the Motion module.

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

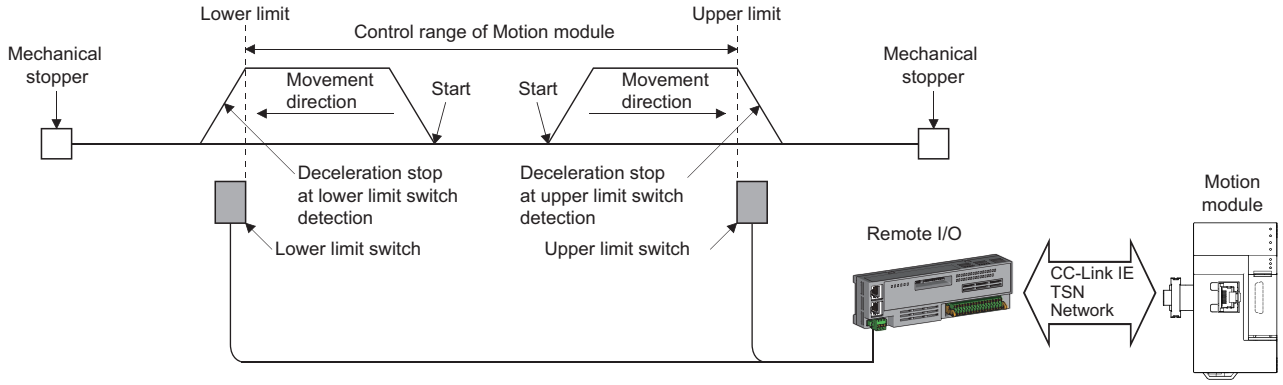


[FX5-SSC-G]

Be sure to set the servo parameters correctly. For details, refer to the following.

☞ Page 841 Devices Compatible with CC-Link IE TSN [FX5-SSC-G]

■Link device [FX5-SSC-G]



Set the servo parameters and the link device external signal assignment parameters appropriately. For details, refer to the following.

☞ Page 841 Devices Compatible with CC-Link IE TSN [FX5-SSC-G]

☞ Page 329 Link Device External Signal Assignment Function [FX5-SSC-G]

Wiring the hardware stroke limit

When using the hardware stroke limit function, wire the terminals corresponding to the upper/lower stroke limit of the device to be used as shown in the following drawing.

[FX5-SSC-G]

For the setting method of the input logic for the upper/lower stroke limit, refer to the following.

☞ Page 323 Input logic setting method for external input signals

■External input signal of the servo amplifier

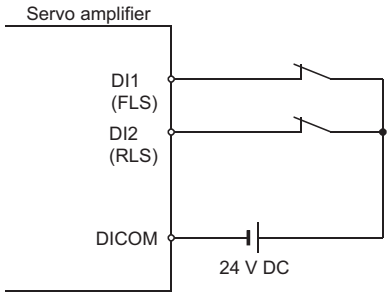
Refer to the manual and instruction manual of the servo amplifier to be used for details on input and wiring of the signal.

[FX5-SSC-S]

Wire the MR-J3/MR-J4 series servo amplifier as shown in the following drawing. As for the 24 V DC power supply, the polarity of current can be switched.

Ex.

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



[FX5-SSC-G]

Check the specifications of the servo amplifier to be connected before performing wiring and setting.

■External input signal via CPU (buffer memory of the Simple Motion module/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 820 Connection with MR-JE-B(F)

■Link device [FX5-SSC-G]

For the wiring, refer to the manual of the device station to be used.

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 manual and instruction manual for details.

When the hardware stroke limit function is not used

When not using the hardware stroke limit function, 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.

Precautions during control

If the machine is stopped outside the Simple Motion module/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/Motion module control range by a "JOG operation", "inching operation" or "manual pulse generator operation".
[FX5-SSC-S]
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).
[FX5-SSC-G]
When "[Pr.22] Input signal logic selection" is set to the initial value, the 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).

Forced stop function

⚠ WARNING

- When the forced stop is required to be wired, ensure to wire it in the negative logic using b-contact. [FX5-SSC-S]
- When the forced stop is required to be wired, take the following measures. [FX5-SSC-G]
  When using other than the link device for the forced stop input:
  Ensure to wire in the negative logic using b-contact.
  When using the link device for the forced stop input:
  Wire according to "[Pr.903] Forced stop signal (EMI): Link device logic setting". It is recommended to set "0: Negative logic" in "[Pr.903] Forced stop signal (EMI): Link device logic setting" and wire in the negative logic using b-contact.
- Provided safety circuit outside the Simple Motion module/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 "0: Valid (External input signal)" [FX5-SSC-S], or "1: Invalid" [FX5-SSC-G].)
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 manual and instruction manual for the operation of the servo amplifier after the forced stop signal is sent.
[FX5-SSC-G]
When "[Pr.82] Forced stop valid/invalid selection" is set to other than "1: Invalid", the "Quick stop" defined in CiA 402 is issued to all servo amplifier axes after the forced stop input is turned on.
Refer to the servo amplifier manual for the operation of the servo amplifier when the "Quick stop" is issued.
For MR-J5(W)-G: 📖MR-J5 User's Manual (Function)

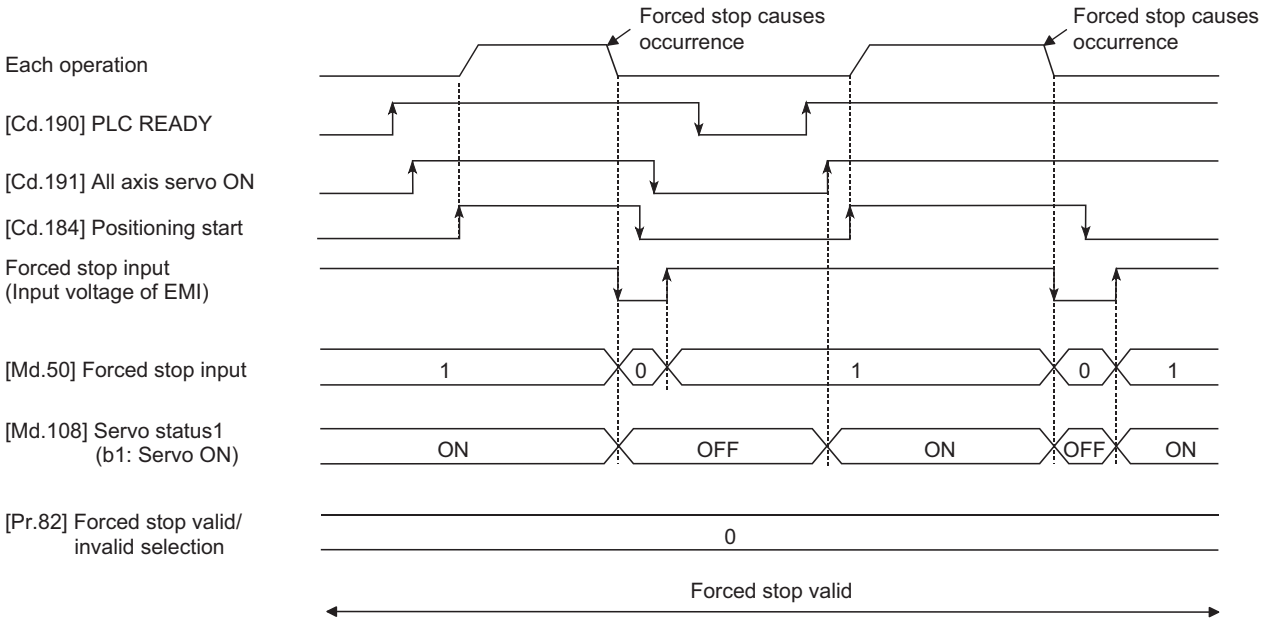
■Forced stop processing

<table>
<tr><th colspan="2" rowspan="3">Stop cause</th><th rowspan="3">Stop axis</th><th rowspan="3">M code ON signal after stop</th><th rowspan="3">Axis operation status ([Md.26]) after stopping</th><th colspan="5">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</th><th>Fast home position return control</th><th>JOG/ Inching operation</th><th>Manual pulse generator operation</th></tr>
<tr><td rowspan="2">Forced stop</td><td>"Forced stop input signal" OFF [FX5-SSC-S]</td><td rowspan="2">All axes</td><td rowspan="2">No change</td><td rowspan="2">Servo OFF</td><td colspan="5" rowspan="2">Immediate stop</td><td rowspan="2">—</td></tr>
<tr><td>"[Cd.158] Forced stop input" OFF [FX5-SSC-G]</td></tr>
</table>

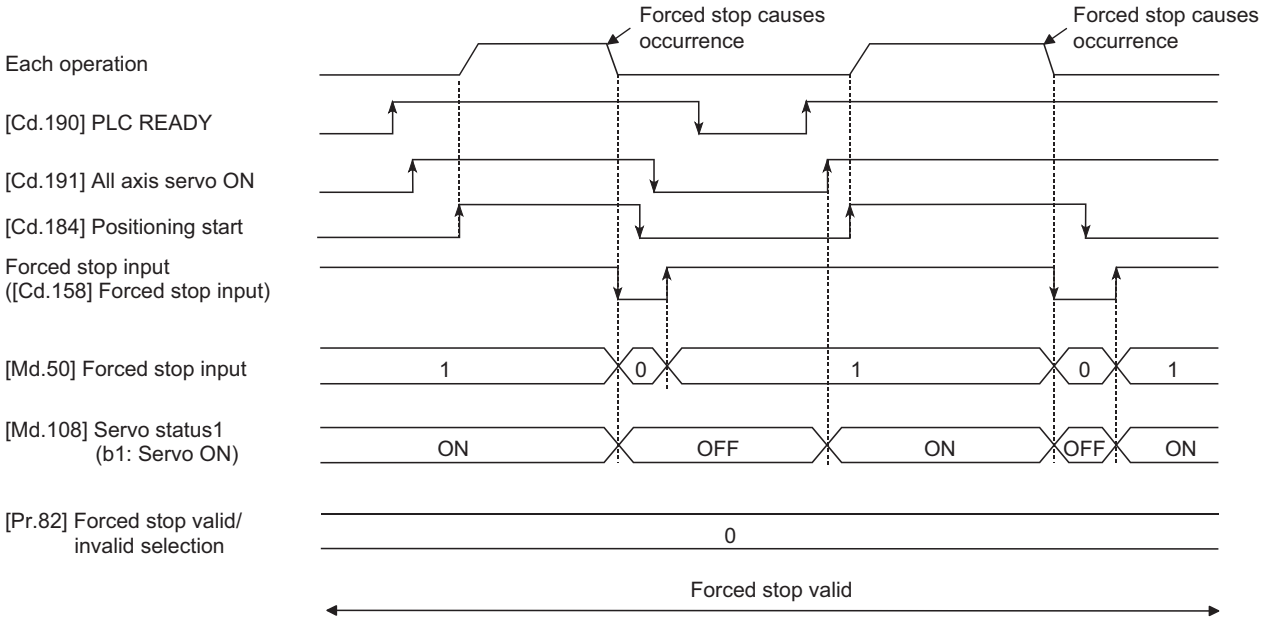
The following drawing shows the operation of the forced stop function.

■Operation example

• [FX5-SSC-S]

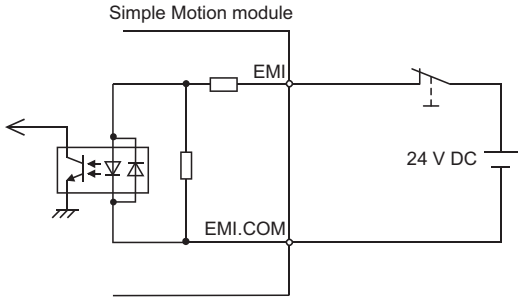


• [FX5-SSC-G]



Wiring the forced stop [FX5-SSC-S]

When using the forced stop function, 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 polarity of current can be switched.



Setting the forced stop

To use the "Forced stop function", set the following data using a program.

The set details are validated at the rising edge (OFF → ON) of the "[Cd.190] PLC READY".

Refer to the following for the setting details.

☞ Page 444 Basic Setting

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) [FX5-SSC-S]	Forced stop from the external input signal is used	
			1: Invalid	Forced stop is not used	
			2: Valid (Buffer memory) [FX5-SSC-G]	Forced stop from the buffer memory is used	
			3: Valid (Link device) [FX5-SSC-G]	Forced stop from the link device is used	
[Cd.158]	Forced stop input [FX5-SSC-G]	→	Set the forced stop information in the buffer memory.		5945
			0: Forced stop ON (Forced stop)*1	Forced stop	
			1: Forced stop OFF (Forced stop release)	Forced stop is released	

*1 When a value other than "1" is set, the value is considered as being "0".

[FX5-SSC-G]

- "[Cd.158] Forced stop input" is valid 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.

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 518 Monitor Data

Precautions during control

- After the "Forced stop input" is released, the servo ON/OFF is valid for the status of "[Cd.191] All axis servo ON".
- 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: IB71H [FX5-SSC-S], or error code: 1DC1H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code: 1A02H [FX5-SSC-G]) does not occur.
- The status of the signal that is not selected in "[Pr.82] Forced stop valid/invalid selection" is ignored.

[FX5-SSC-G]

- Errors cannot be cleared with "[Cd.5] Axis error reset" during a forced stop. Clear the errors after the forced stop is released.
- The error "Driver command discard detection" (error code: 1BE6H) may occur before servo OFF when "[Cd.158] Forced stop input" is set to "0000H: Forced stop ON (Forced stop)" during operation with "[Pr.140] Driver command discard detection setting" set to "1: Detection enabled".

7.5 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 main function.

MELSEC iQ-F FX5 Motion Module/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

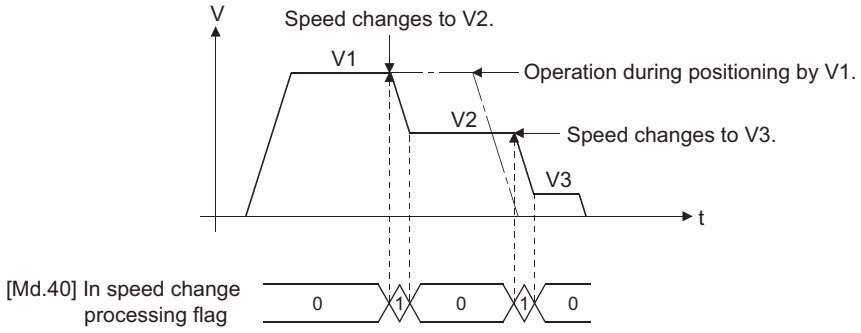
The speed control function is used to change the speed during control to a newly designated speed at any time.

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.

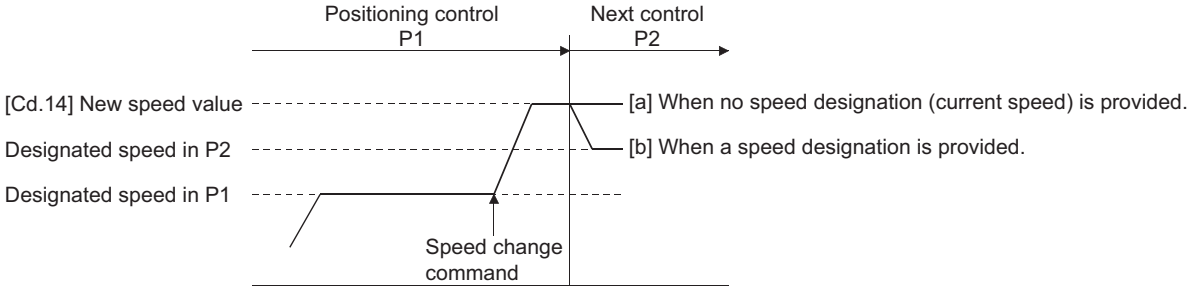
Control details

The following drawing shows the operation during a speed change.

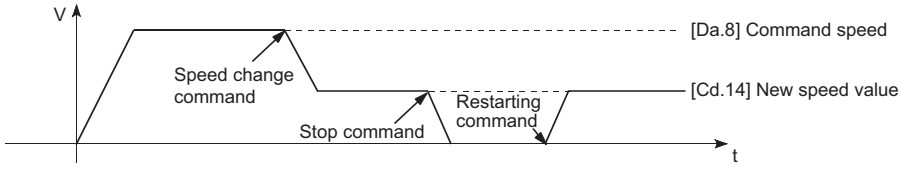


Precautions during control

- 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".

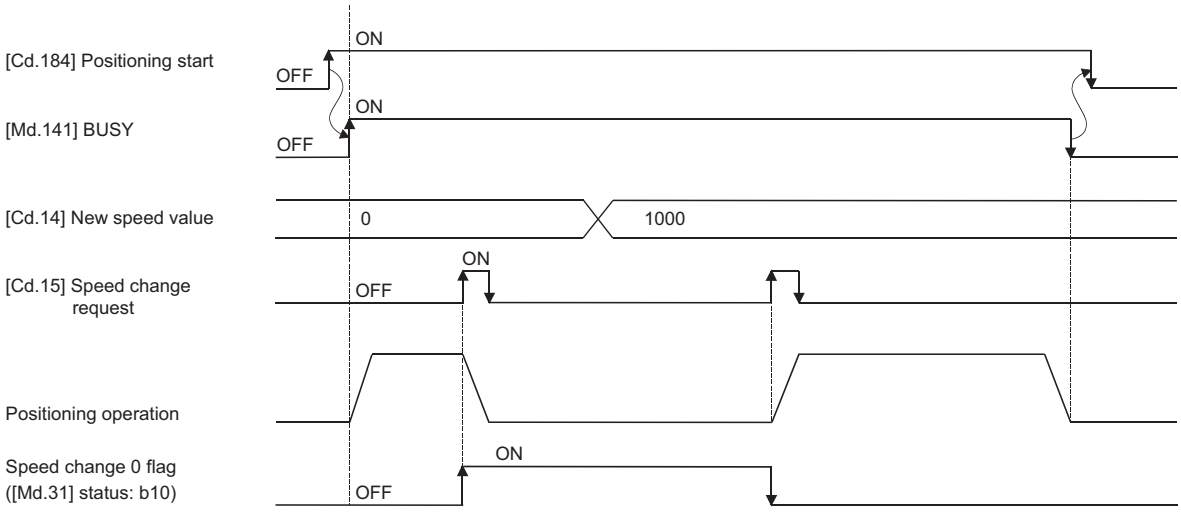


- When changing the speed during continuous path control, the speed change will be ignored if there is not enough distance remaining to carry out the change.
- When the stop command was given to make a stop after a speed change that had been made during position control, the restarting speed depends 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 [FX5-SSC-S], or warning code: 0D50H [FX5-SSC-G]) 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 [FX5-SSC-S], or warning code: 0D51H [FX5-SSC-G]) 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/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 186 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

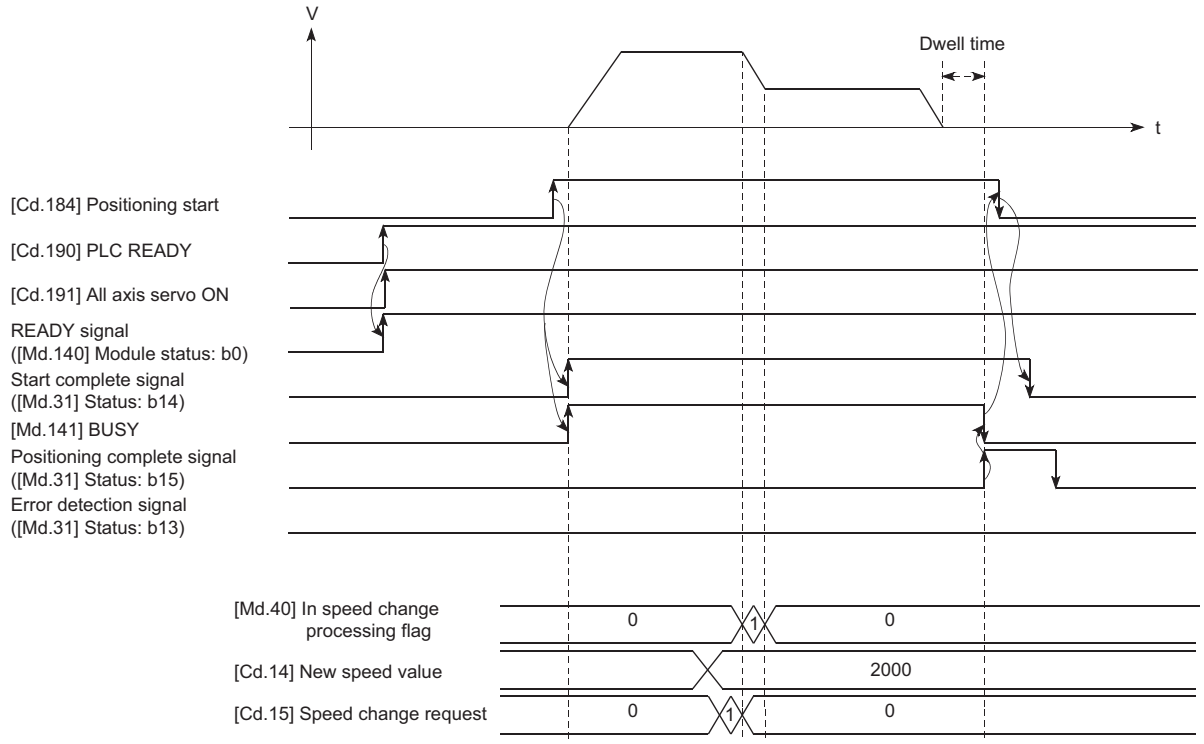
Setting item		Setting value	Setting details	Buffer memory address
[Cd.14]	New speed value	2000	Set the new speed.	4314+100n 4315+100n
[Cd.15]	Speed change request	1	Set "1: Change the speed".	4316+100n

Refer to the following for the setting details.

☞ Page 559 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 633 Speed change program [FX5-SSC-S]

☞ Page 707 Speed change program [FX5-SSC-G]

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

Setting item		Setting value	Setting details	Buffer memory address
[Pr.42]	External command function selection	1	Set "1: External speed change request".	62+150n
[Cd.8]	External command valid	1	Set "1: Validates an external command".	4305+100n
[Cd.14]	New speed value	1000000	Set the new speed.	4314+100n 4315+100n

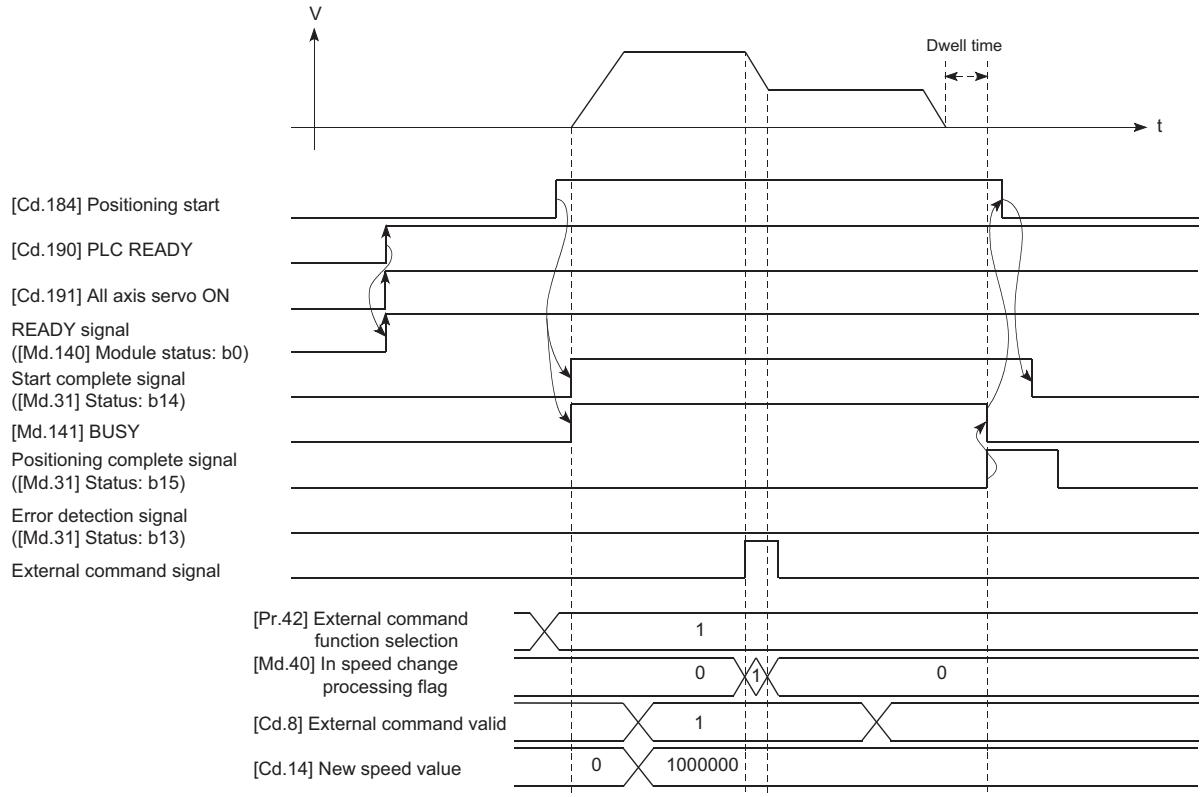
Set the external command signal (D1) in "[Pr.95] External command signal selection".

Refer to the following for the setting details.

☞ Page 444 Basic Setting, ☞ Page 559 Control Data

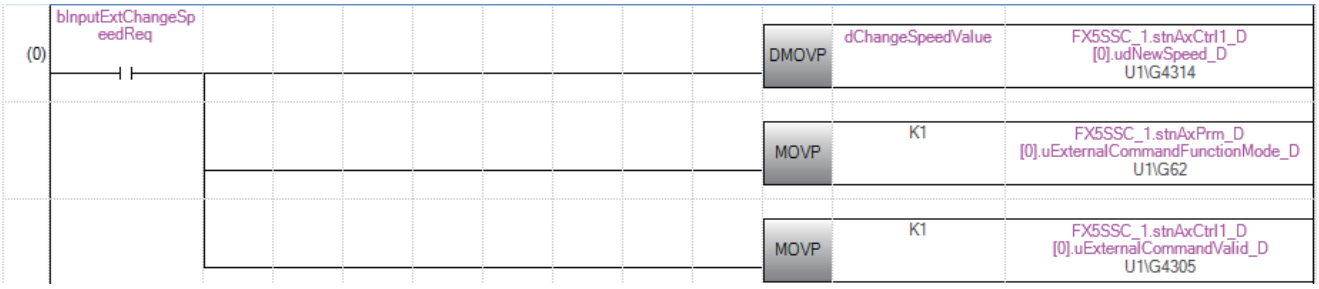
- The following shows the speed change time chart.

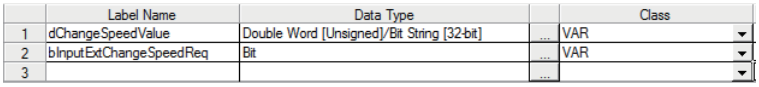
■Operation example



Program example

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



Classification	Label name	Description
Module label	FX5SSC_1.stnAxPrm_D[0].uExternalCommandFunctionMode_D	Axis 1 External command function selection
	FX5SSC_1.stnAxCtrl1_D[0].uExternalCommandValid_D	Axis 1 External command valid
	FX5SSC_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 are for local labels. 	

Override function

The override function changes the command speed by a designated percentage 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".
The setting range of "[Cd.13] Positioning operation speed override" differs depending on the model.

Model	The setting range of "[Cd.13] Positioning operation speed override"
FX5-SSC-S	1 to 300%
FX5-SSC-G	Version 1.001 or earlier: 1 to 300% Version 1.002 or later: 0 to 300%

Control details

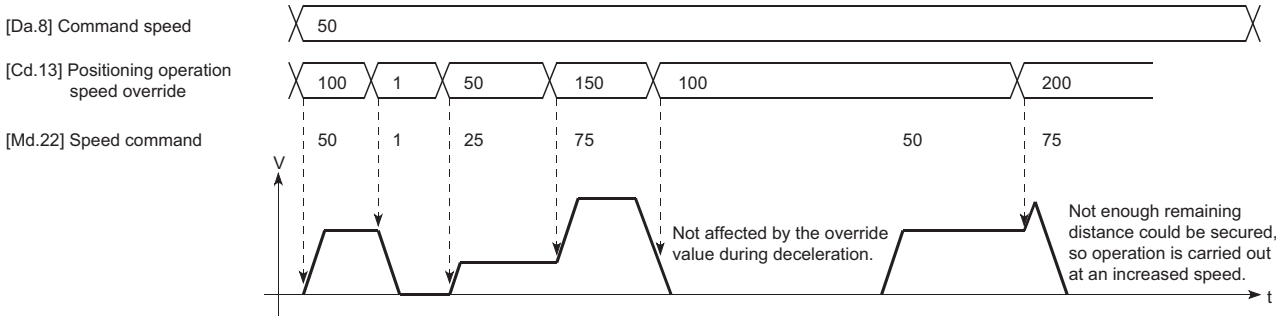
The following shows that operation of the override function.

- 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 [FX5-SSC-S], or warning code: 0D04H [FX5-SSC-G]) occurs and "[Md.22] Speed command" is set with "1" in any speed unit.
- 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 [FX5-SSC-S], or warning code: 0D51H [FX5-SSC-G]) 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.

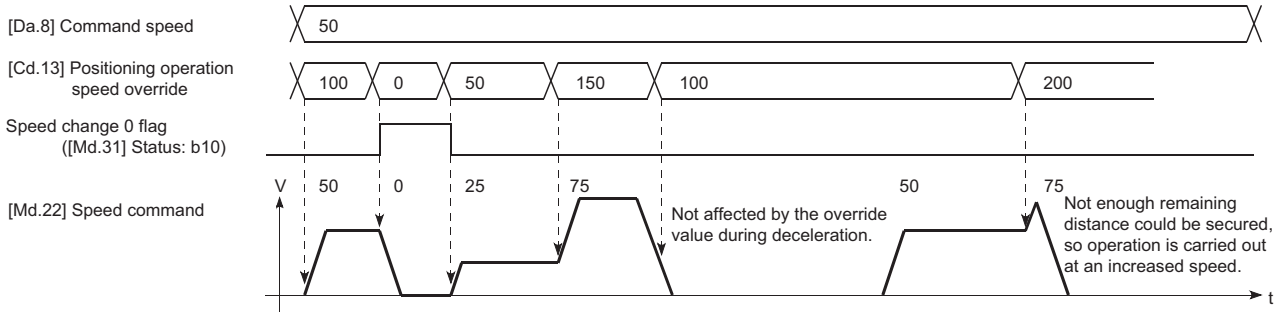
[FX5-SSC-G]

- 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: 0D04H) does not occur.

■Override function operation [FX5-SSC-S]



■Override function operation [FX5-SSC-G]



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 [FX5-SSC-S], or warning code: 0D50H [FX5-SSC-G]) 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/Motion module will not be able to track, and it may become impossible to carry out commands correctly.)
- 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.

[FX5-SSC-S]

- 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.

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

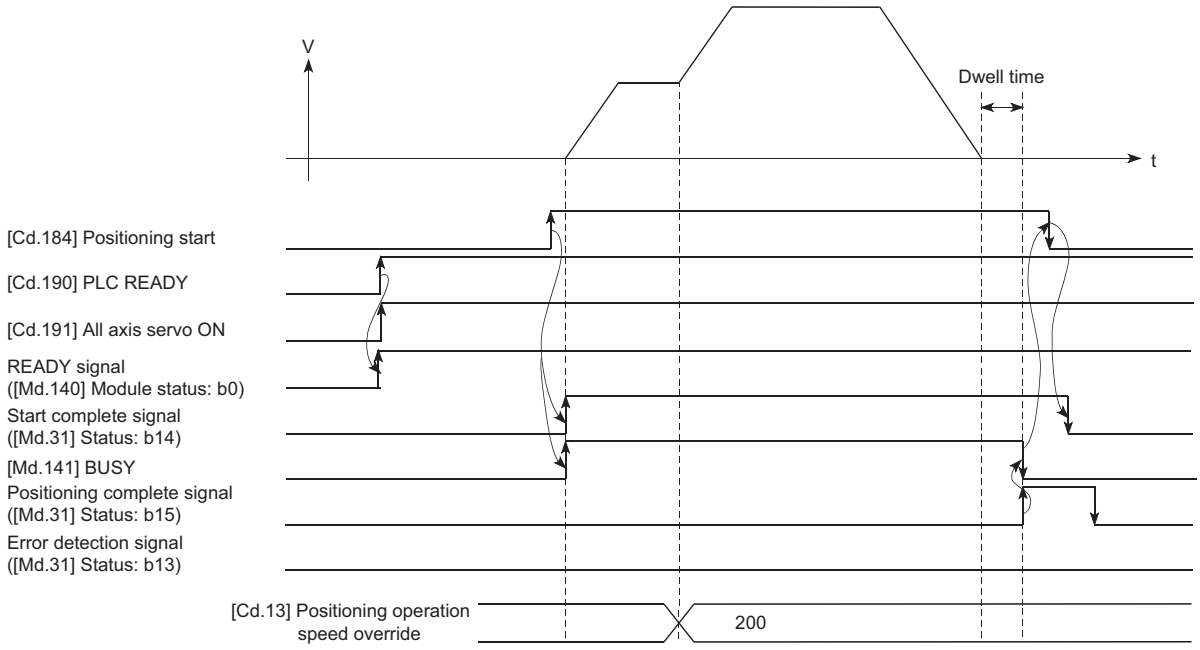
Setting item		Setting value	Setting details	Buffer memory address
[Cd.13]	Positioning operation speed override	200	Set the new speed as a percentage (%).	4313+100n

Refer to the following for the setting details.

☞ Page 559 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 633 Override program [FX5-SSC-S]

☞ Page 707 Override program [FX5-SSC-G]

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]).

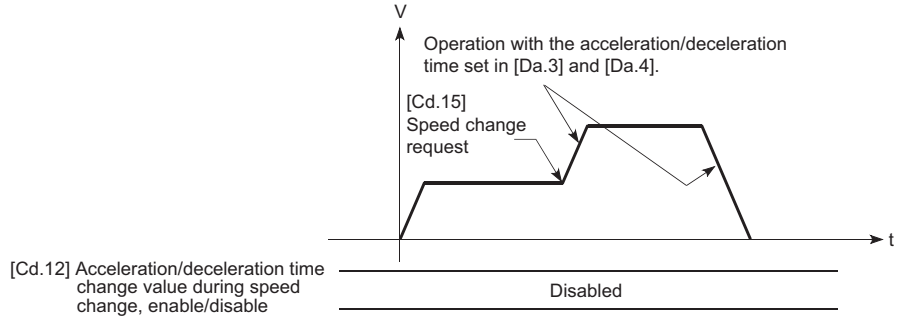
Control details

After setting the following two items, carry out the speed change to change the acceleration/deceleration time during the speed change.

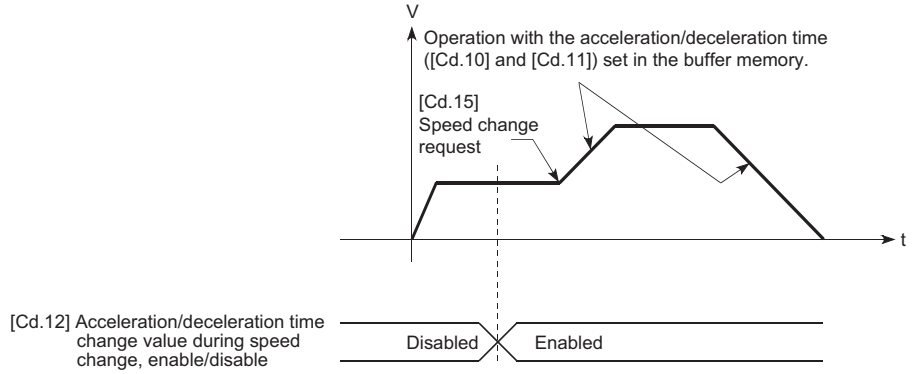
- Set change value of the acceleration/deceleration time ("[Cd.10] New acceleration time value", "[Cd.11] New deceleration time value")
- Setting acceleration/deceleration time change to enable ("[Cd.12] Acceleration/deceleration time change value during speed change, enable/disable")

The following drawing shows the operation during an acceleration/deceleration time change.

[For an acceleration/deceleration time change disable setting]



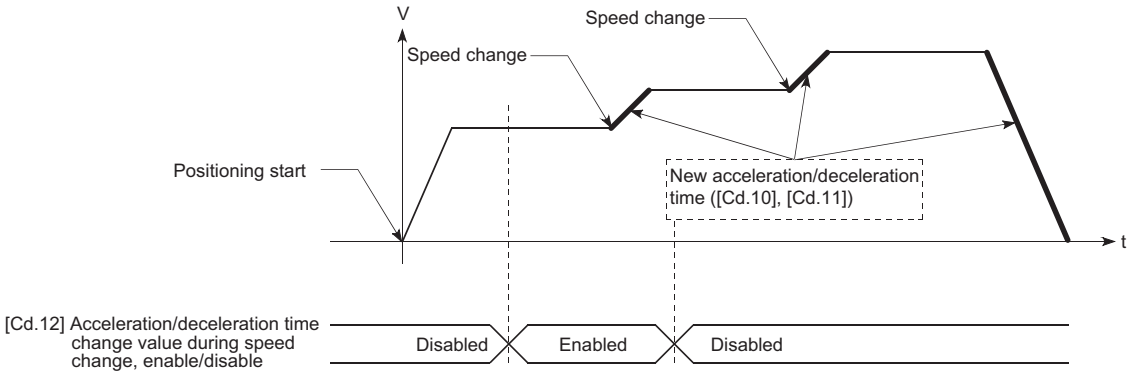
[For an acceleration/deceleration time change enable setting]



Precautions during control

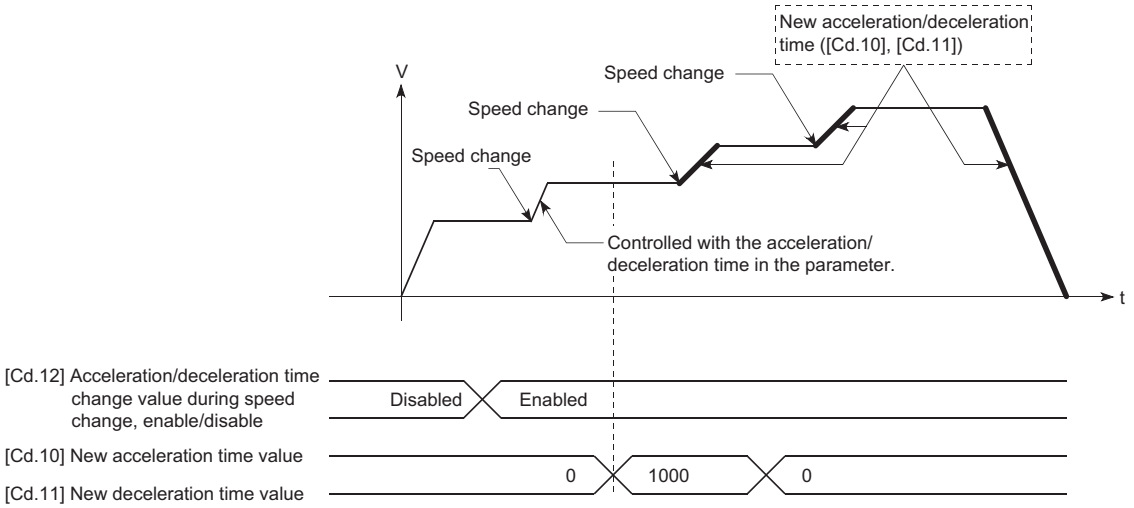
- When "0" is set in "[Cd.10] New acceleration time value" and "[Cd.11] New deceleration time value", the acceleration/deceleration time will not be changed even if the speed is changed. In this case, the operation will be controlled at the acceleration/deceleration time previously set in the parameters.
- 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.

☞ Page 186 Speed-torque Control

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/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/Motion module.

n: Axis No. - 1

Setting item		Setting value	Setting details	Buffer memory address
[Cd.10]	New acceleration time value	→	Set the new acceleration time.	4308+100n 4309+100n
[Cd.11]	New deceleration time value	→	Set the new deceleration time.	4310+100n 4311+100n
[Cd.12]	Acceleration/deceleration time change value during speed change, enable/disable	1	Set "1: Acceleration/deceleration time change enable".	4312+100n

Refer to the following for the setting details.

☞ Page 559 Control Data

Program example

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

☞ Page 633 Acceleration/deceleration time change program [FX5-SSC-S]

☞ Page 708 Acceleration/deceleration time change program [FX5-SSC-G]

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 reverse new 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.

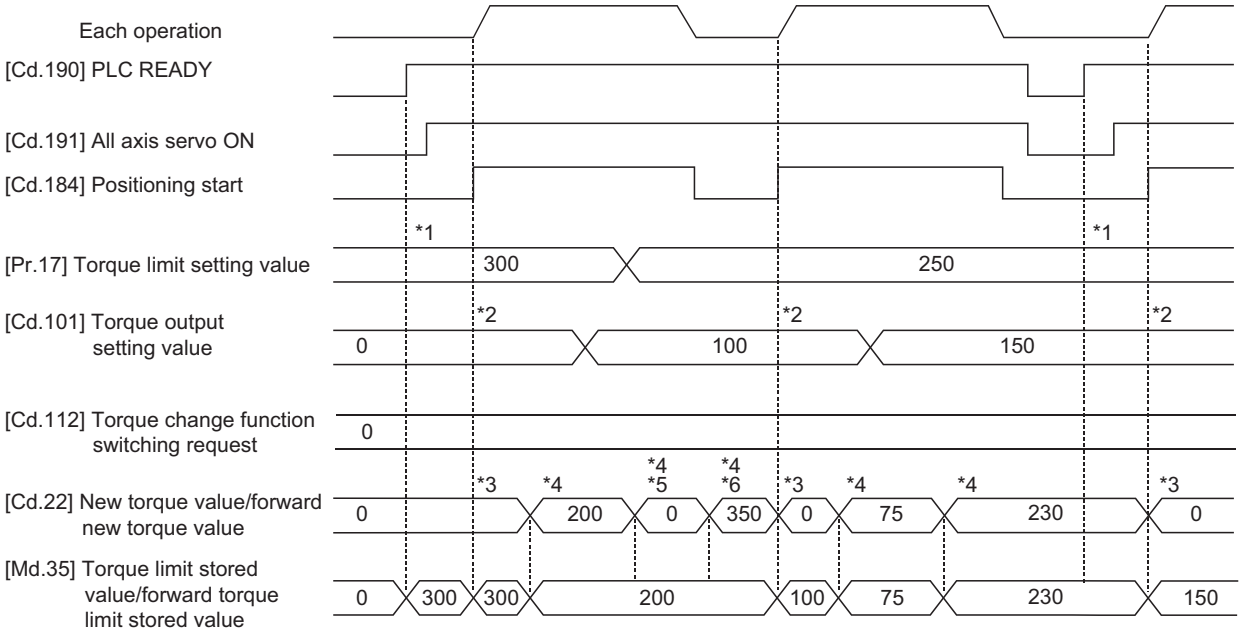
Set previously "same setting" or "individual setting" of the forward/reverse torque limit value in "[Cd.112] Torque change function switching request". Set the new torque value (forward new torque value/reverse new torque value) in the axis control data ([Cd.22] or [Cd.113]) shown below.

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

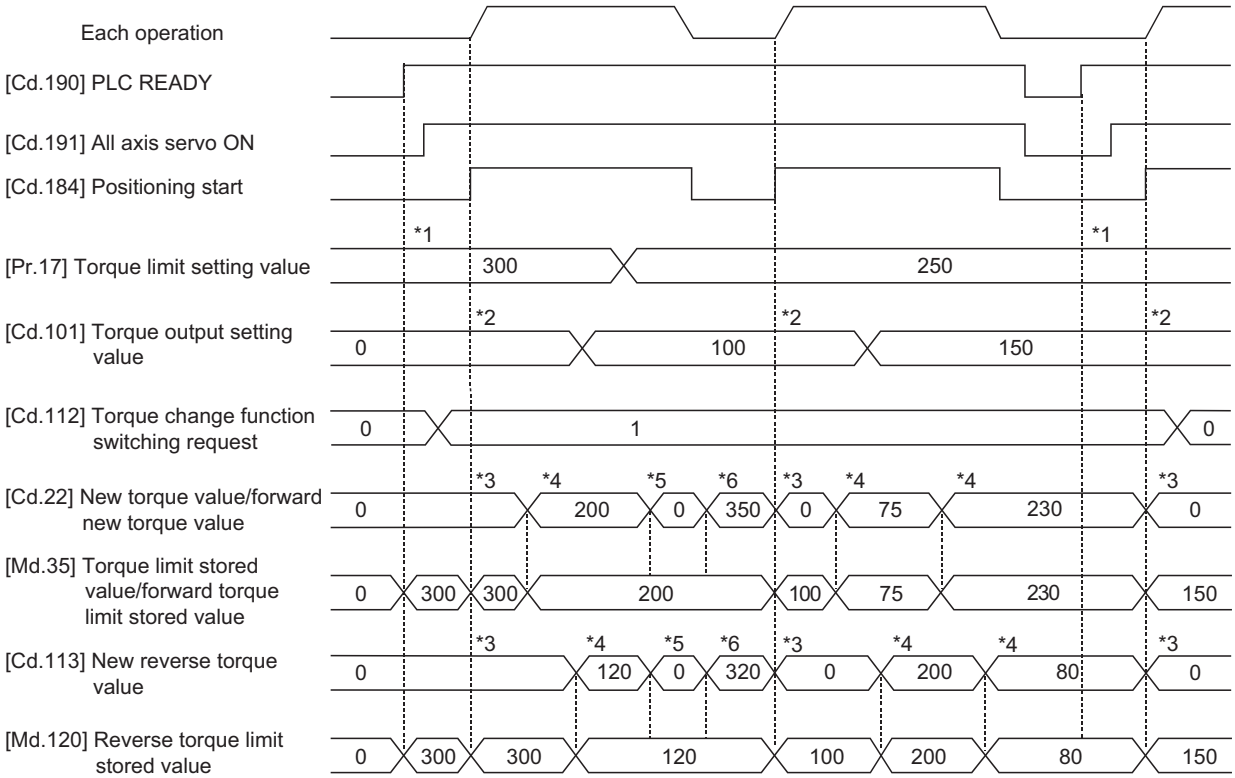
The torque value (forward new torque value/reverse new torque value) of the axis control data can be changed at all times.
The torque can be limited with a new torque value from the time the new torque value has been written to the Simple Motion module.
Note that the delay time until a torque control 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 "[Cd.190] PLC READY" is turned ON.
The new torque value ([Cd.22], [Cd.113]) is cleared to zero at the leading edge (OFF to ON) of the "[Cd.184] Positioning start at the start of JOG operation or 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 reverse new torque value.

■Operation example 1



*1 The torque limit setting value or torque output setting value becomes effective at the rising edge of the "[Cd.190] PLC READY" (however, after the servo 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 rising edge of the "[Cd.184] Positioning start", 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 rising edge of the "[Cd.184] Positioning start".
*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 rising edge of the "[Cd.190] PLC READY" (however, after the servo turned ON.)

*2 The torque limit setting value or torque output setting value becomes effective at the rising edge of the "[Cd.184] Positioning start", and the torque limit value is updated.

*3 The torque change value is cleared to "0" at the rising edge of the "[Cd.184] Positioning start".

*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/Motion module. (Note that it is not validated from the time the power supply is turned ON to the time the "[Cd.190] PLC READY" 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 [FX5-SSC-S], or warning code: 0D07H [FX5-SSC-G]) 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 reverse new torque value range" (warning code: 0932H [FX5-SSC-S], or warning code: 0D32H [FX5-SSC-G]) 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/Motion module using the program.

The set details are validated when written to the Simple Motion module/Motion module.

n: Axis No. - 1

Setting item		Setting value	Setting details	Buffer memory address
[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
[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
[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

Refer to the following for the setting details.

☞ Page 559 Control Data

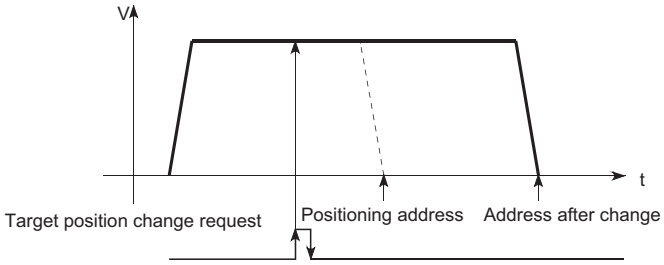
Target position change function

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".

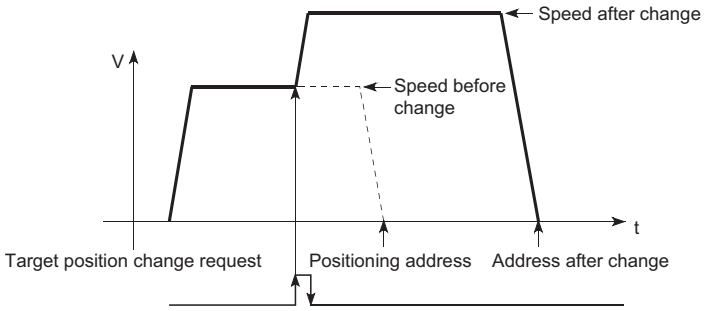
Details of control

The following charts show the details of control of the target position change function.

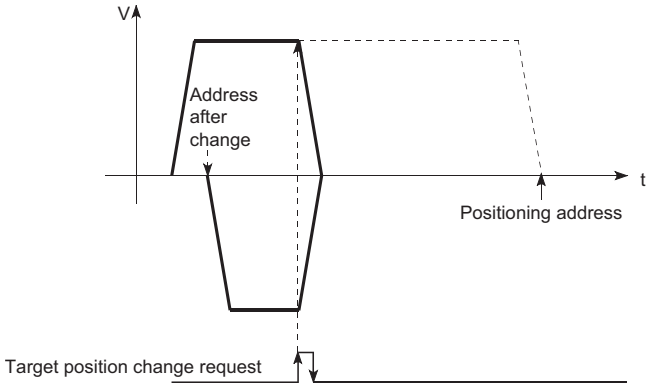
■When the address after change is positioned away from the start point more than the positioning address:



■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 273 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 [FX5-SSC-S], or warning code: 0D51H [FX5-SSC-G]) 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 [FX5-SSC-S], or warning code: 0D54H [FX5-SSC-G]).
- In the following cases, a target position change request given is ignored and the warning "Target position change not possible" (warning code: 099BH [FX5-SSC-S], or warning code: 0D5BH [FX5-SSC-G]) 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 306 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

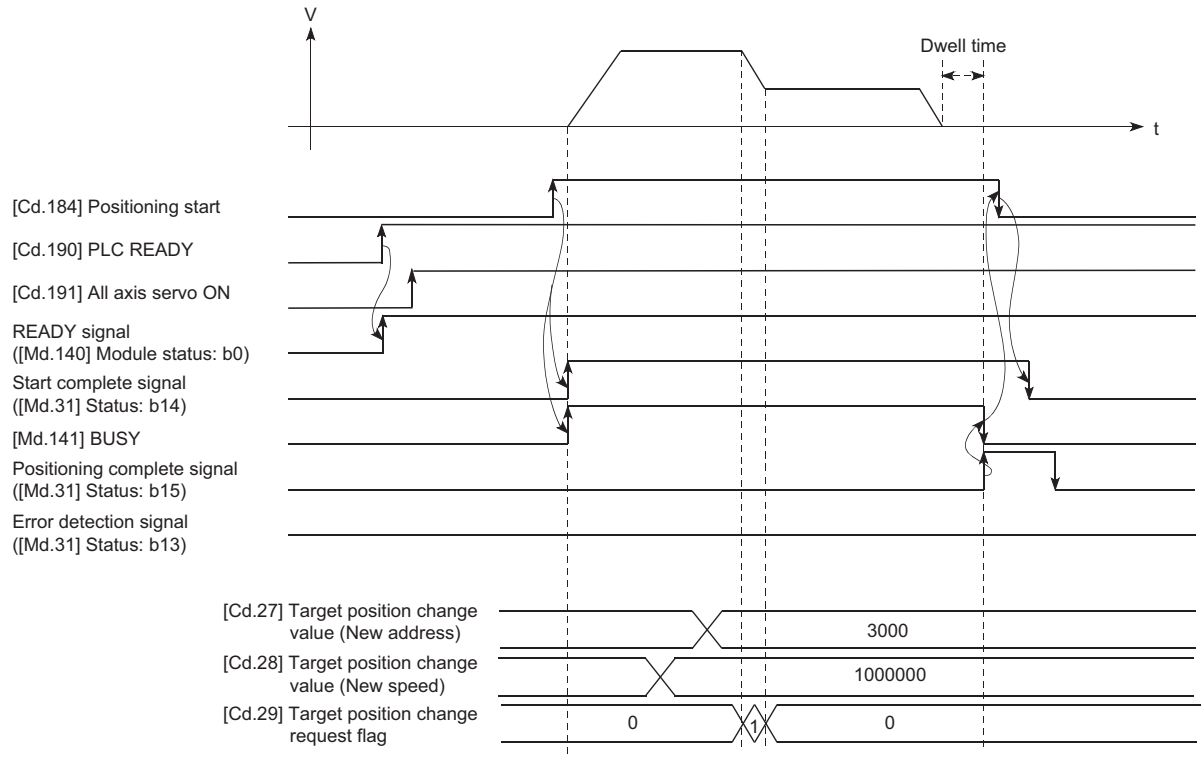
Setting item		Setting value	Setting details	Buffer memory address
[Cd.27]	Target position change value (New address)	3000	Set the new address.	4334+100n 4335+100n
[Cd.28]	Target position change value (New speed)	1000000	Set the new speed.	4336+100n 4337+100n
[Cd.29]	Target position change request flag	1	Set "1: Requests a change in the target position".	4338+100n

Refer to the following for details on the setting details.

☞ Page 559 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 635 Target position change program [FX5-SSC-S]

☞ Page 709 Target position change program [FX5-SSC-G]

7.6 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.

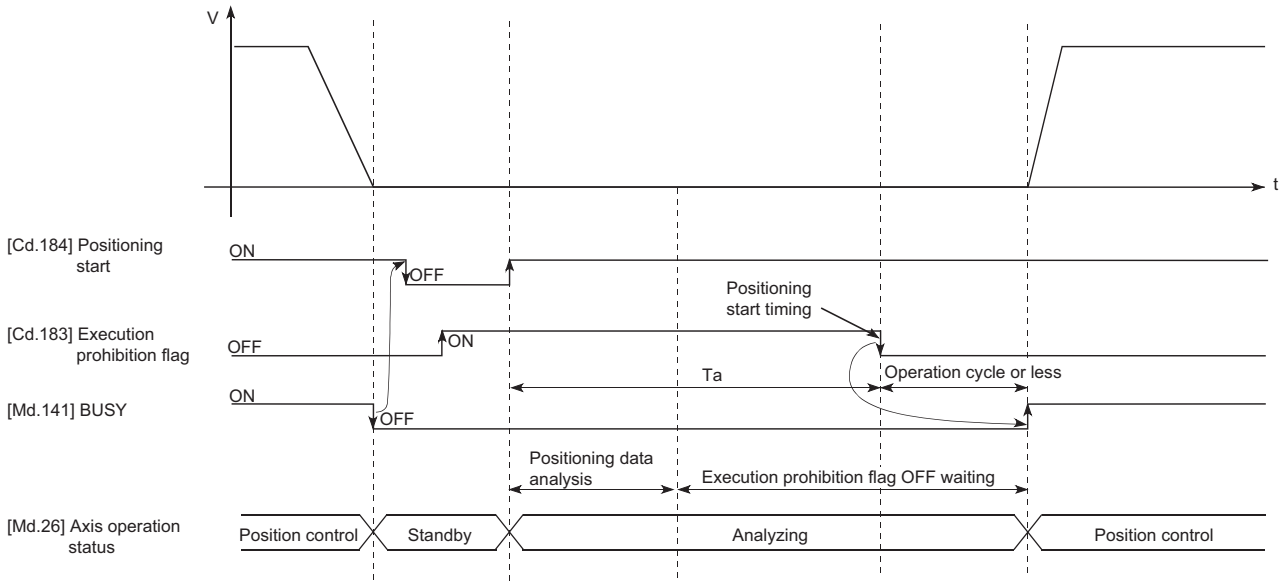
Pre-reading start function

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. (Refer to the following figure.)

■Operation example

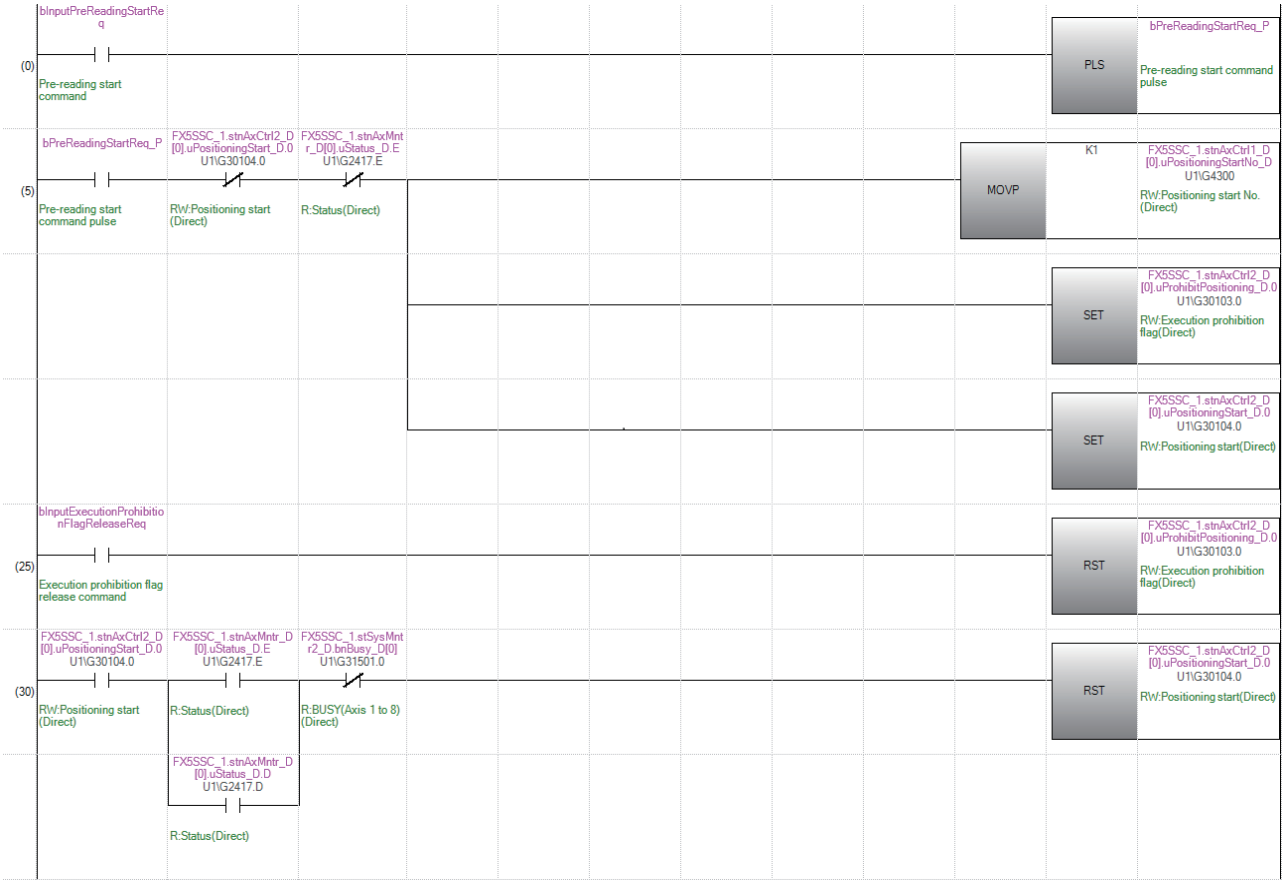


Precautions during control

- The time required to analyze the positioning data is up to an operation cycle.
- 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 [FX5-SSC-S], or error code: 1AA3H [FX5-SSC-G]).
- 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.

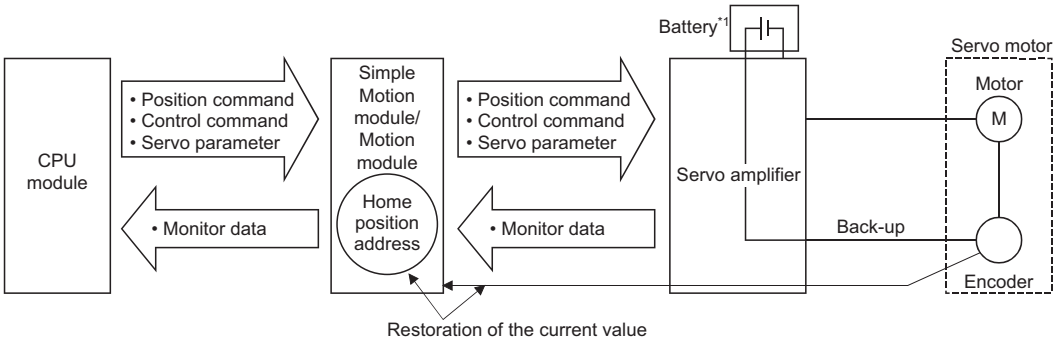


Classification	Label name	Description
Module label	FX5SSC_1.stSysMntr2_D.bnBusy_D[0]	Axis 1 BUSY signal
	FX5SSC_1.stnAxCtrl2_D[0].uPositioningStart_D.0	Axis 1 Positioning start signal
	FX5SSC_1.stnAxMntr_D[0].uStatus_D.D	Axis 1 Error detection
	FX5SSC_1.stnAxMntr_D[0].uStatus_D.E	Axis 1 Start complete
	FX5SSC_1.stnAxCtrl1_D[0].uPositioningStartNo_D	Axis 1 Positioning start No.
	FX5SSC_1.stnAxCtrl2_D[0].uProhibitPositioning_D.0	Axis 1 Execution prohibition flag
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 are for local labels.	

	Label Name	Data Type		Class
1	bPreReadingStartReq_P	Bit	...	VAR
2	bInputPreReadingStartReq	Bit	...	VAR
3	bInputExecutionProhibitionFlagReleaseReq	Bit	...	VAR
4			...	

7.7 Absolute Position System

The Simple Motion module/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.



*1 Depending on the servo amplifier used, it may be necessary to install a battery for retaining the location of the home position return in the servo amplifier.

Setting for absolute positions

For constructing an absolute position system, use a servo amplifier and a servo motor which enable absolute position detection.

• Settings for MR-J4(W)-B [FX5-SSC-S]

It is also 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. Refer to each servo amplifier manual and instruction manual for details of the absolute position system.
n: Axis No. - 1

Item	Buffer memory address
Absolute position detection system (PA03)	28403+100n

• Settings for MR-J5(W)-G [FX5-SSC-G]

Select "1: Enabled (absolute position detection system)" in the servo parameter "Absolute position detection system selection (PA03.0)". In addition, select "0: Disabled" in the servo parameter "[AL.0E3 Absolute position counter warning] selection (29.5)".
When connecting to the encoder with 67108864 pulse resolution, set the servo parameters so that the value of "Electronic gear numerator (PA06)" is 16:1 the value of "Electronic gear denominator (PA07)".

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.

[FX5-SSC-S]

• 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

[FX5-SSC-G]

- When connecting the absolute position system to the servo amplifier for the first time, the warning "Home position return data incorrect" (warning code: 0D3CH) occurs based on one of the following conditions and the home position return request turns ON.

- The backup data for absolute position restoration is corrupted.
- The rotation direction setting of the servo amplifier is different from that in the backup data.
- The backup was performed while the home position return request was ON.
- Absolute position loss occurred on the servo amplifier side.
- HomeOffset is different from that in the backup data.
- The encoder resolution is different from that in the backup data.
- The servo amplifier model is different from that in the backup data.

- The movement amount removed with the electronic gear of the servo amplifier cannot be restored.
- If the absolute position of the servo amplifier cannot be restored, the error "Encoder initial communication error at servo amplifier power supply on" (error code: 1A7EH) occurs and the absolute position cannot be restored. The absolute position may be restored by checking the status of the servo amplifier and reconnecting it. If the home position return request is ON when reconnecting, execute the home position return again.

Restoration by absolute position system [FX5-SSC-G]

■Related buffer memory

- Axis monitor data

n: Axis No. - 1

Monitor item		Monitor value	Storage details	Buffer memory address
[Md.190]	Controller position value restoration complete status	→	This area stores the completion status of controller current value restoration. The status becomes "0: Incomplete restoration" when the device is disconnected. • 0: Incomplete restoration • 1: Complete INC restoration • 2: Complete ABS restoration (64-bit Restoration_Based on Backup Location) • 3: Complete ABS restoration (32-bit Restoration_Based on Backup Location)	59327+100n

■Restoration method

The following current values are restored.

Current value	Details
Command position value	The restored address is stored. If "degree" is selected as the unit, the addresses have a ring structure for values between 0 and 359.99999°.
Feed machine value	The restored address is stored. If "degree" is selected as the unit, the movement amount during the power supply OFF is added to the machine feed value before the power supply OFF (the rounded value within the range of 0 to 359.99999°) for restoration.

There are following types of current value restoration by the absolute position system.

Current value restoration method	Reference position	Details	Condition
64-bit restoration	Backup position	The current value is accurately restored from the backup position within a maximum signed 64-bit integer range [command unit].*1 Restoration is performed based on the motion system backup data, and the encoder multiple revolution counter, encoder position within one revolution and encoder resolution of the driver.	32-bit restoration is performed under either of the following conditions. • The encoder resolution is 0. • The maximum value of the encoder multiple revolution counter is other than 2 to the power of n. <Example> Using HK-KT motor 64-bit restoration is performed for the following conditions. Encoder resolution: 67108864 pulse Maximum value of encoder multiple revolution counter: 65536
32-bit restoration*2	Backup position	The current value is accurately restored from the backup position within a signed 32-bit integer range [command unit]. Restoration is performed based on the motion system backup data and the driver current position (Position Actual Value).	

*1 The actual restoration possible range is - ((Multiple revolution counter maximum value) / 2 × (Encoder resolution)) to ((Multiple revolution counter maximum value) / 2 × (Encoder resolution -1)).

*2 32-bit restoration is available with software version 1.005 or later. Do not use the 32-bit restoration encoder with software version 1.004 or earlier.

Point

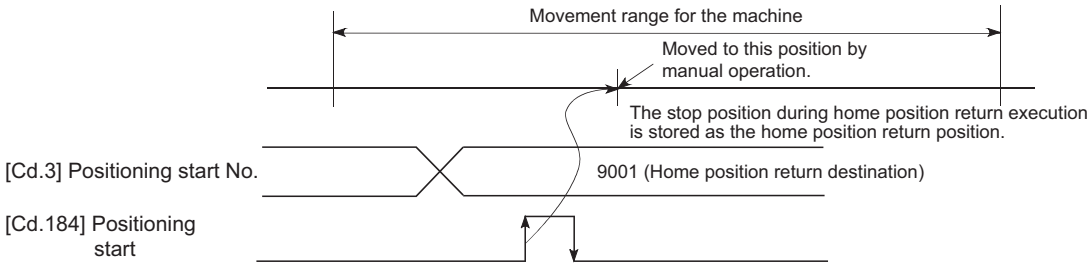
Which restoration method has been used, 64-bit restoration (Based on Backup Location) or 32-bit restoration (Based on Backup Location), can be checked in "[Md.190] Controller position value restoration complete status".

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



7.8 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

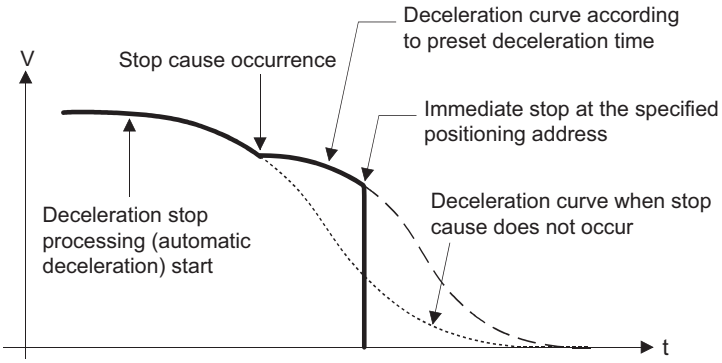
The "stop command processing for deceleration stop function" is provided to set the deceleration curve if a stop cause occurs during deceleration stop processing (including automatic deceleration).
This function is valid for both trapezoidal and S-curve acceleration/deceleration processing methods.
Refer to the following for details of the stop cause.
☞ Page 30 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.

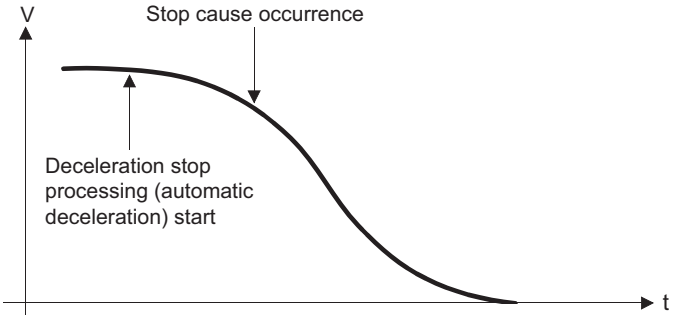
■Deceleration curve re-processing

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.



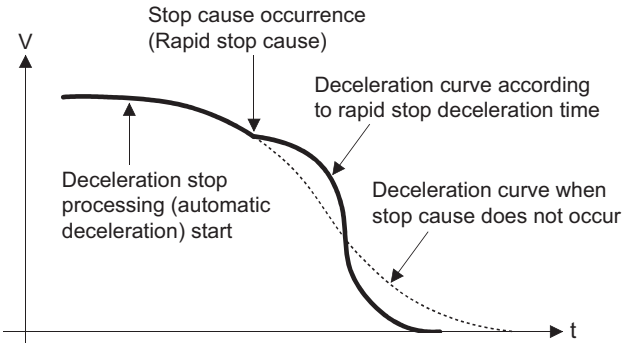
■Deceleration curve continuation

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.

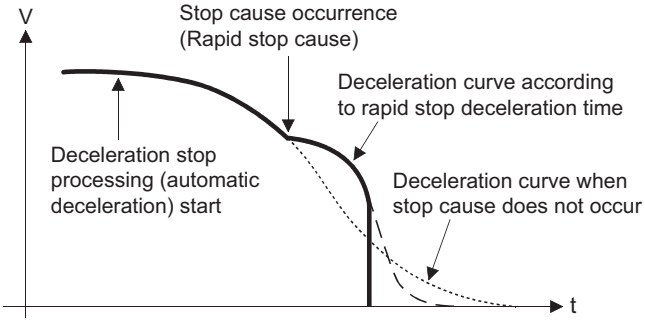


Precautions for control

- 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 sudden stop selection" to "[Pr.39] Stop group 3 sudden 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 sudden stop selection" to "[Pr.39] Stop group 3 sudden 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] Sudden 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] Sudden 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 "[Cd.190] PLC READY" 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.

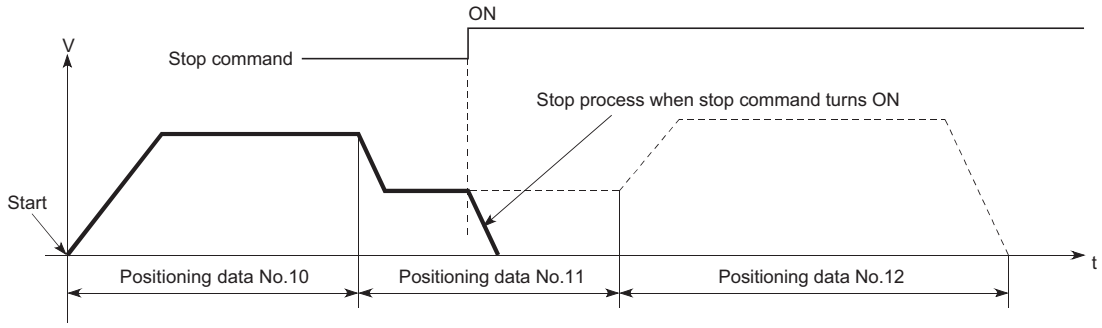
☞ Page 559 Control Data

Continuous operation interrupt function

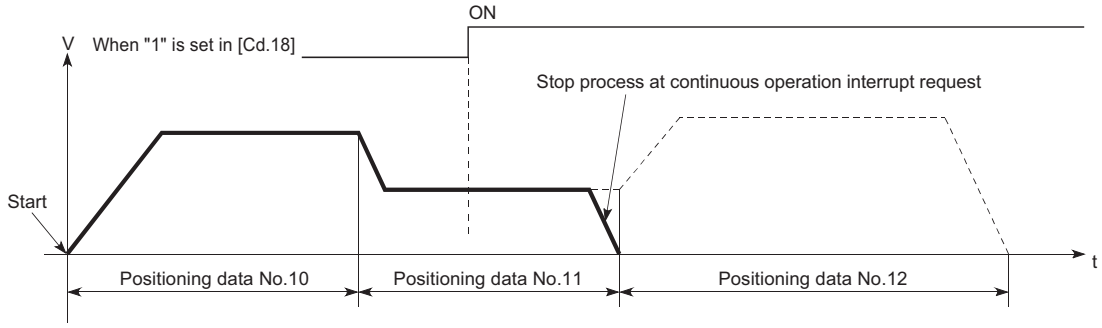
During positioning control, the control can be interrupted during continuous positioning control and continuous path control (continuous operation interrupt function). When "continuous operation interruption" is execution, the control will stop when the operation of the positioning data being executed 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



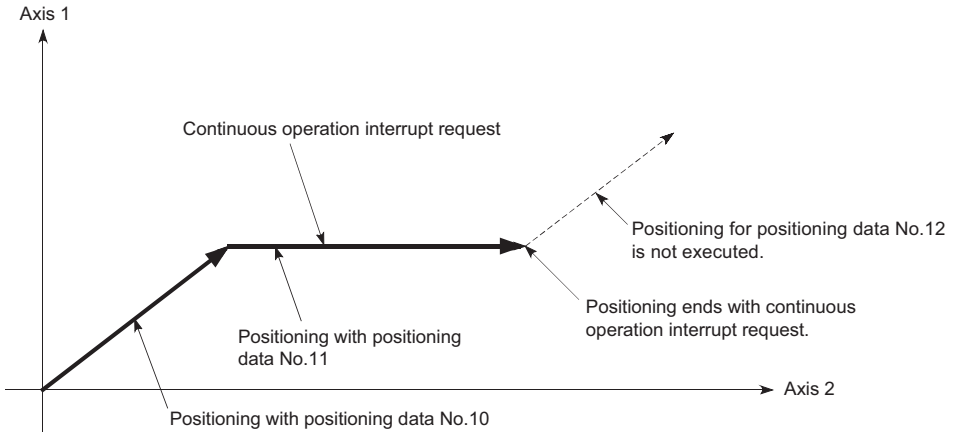
When "1" is set in [Cd.18]



7

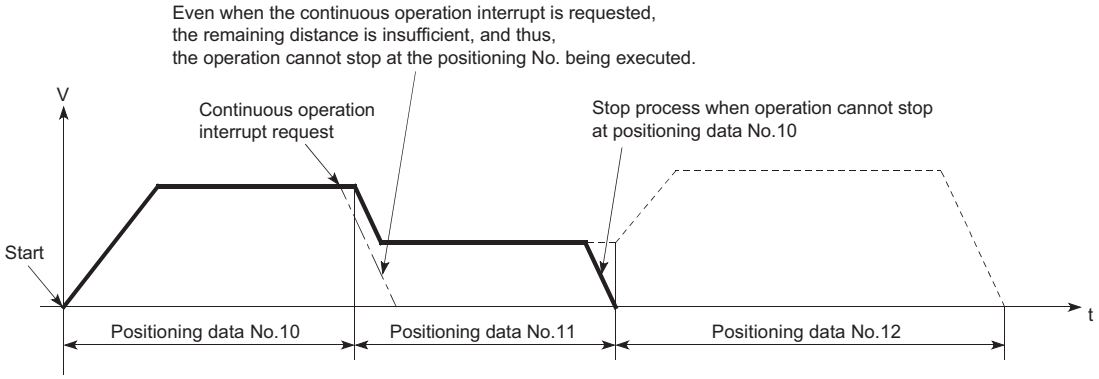
Restrictions

- 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 [FX5-SSC-S], or warning code: 0D02H [FX5-SSC-G]) 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

Setting item		Setting value	Setting details	Buffer memory address
[Cd.18]	Interrupt request during continuous operation	1	Set "1: Interrupts continuous operation control or continuous path control.".	4320+100n

Refer to the following for the setting details.

☞ Page 559 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	○	
	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.

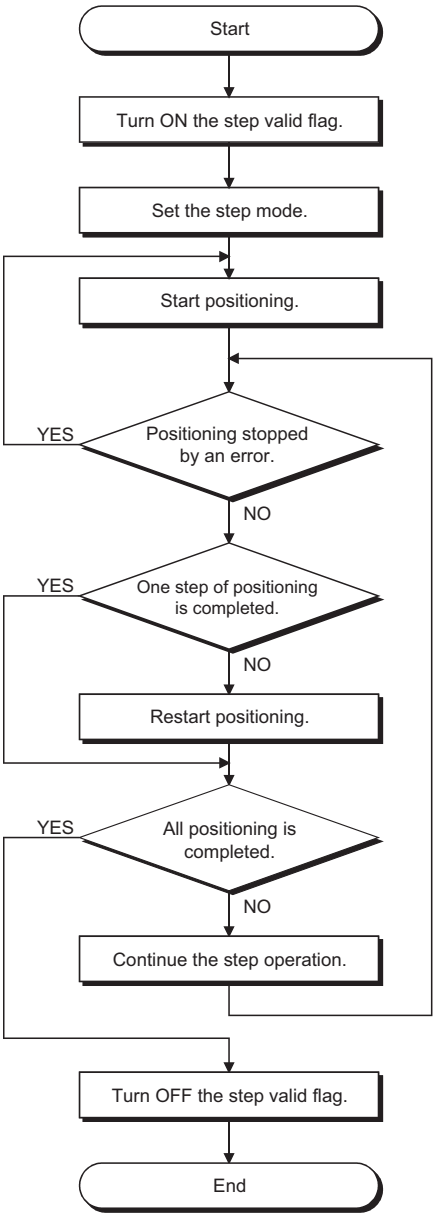
Stop status in the step operation	[Md.26] Axis operation status	[Cd.36] Step start information	Step start results
1 step of positioning stopped normally	Step standby	1: Continues step operation	The next positioning data is executed.

The warning "Step not possible" (warning code: 0996H [FX5-SSC-S], or warning code: 0D56H [FX5-SSC-G]) 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".

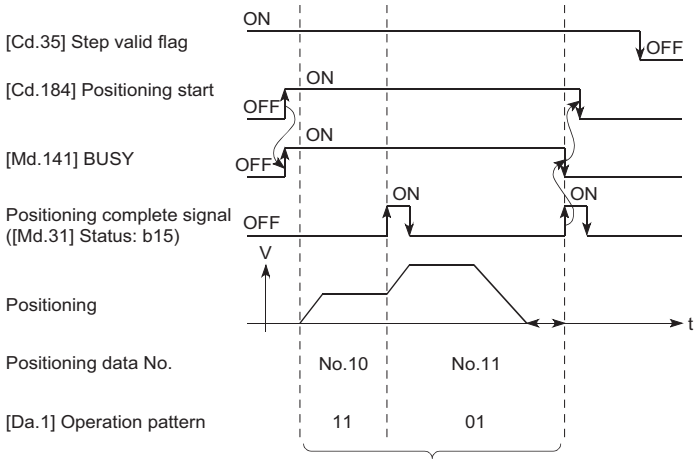
Write "1" (restart) to "[Cd.6] Restart command" and check whether the positioning data operates normally.

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".

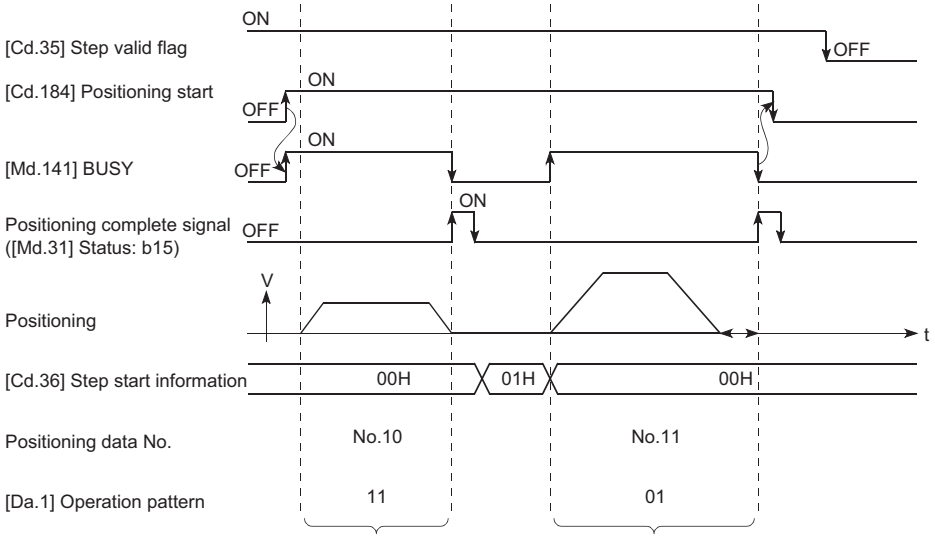
Control details

• 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/Motion module using the program. Refer to the following for the timing of the settings.

☞ Page 287 Using the step operation

The set details are validated after they are written to the Simple Motion module/Motion module.

n: Axis No. - 1

Setting item		Setting value	Setting details	Buffer memory address
[Cd.34]	Step mode	→	Set "0: Stepping by deceleration units" or "1: Stepping by data No. units".	4344+100n
[Cd.35]	Step valid flag	1	Set "1: Validates step operations".	4345+100n
[Cd.36]	Step start information	→	Set "1: Continues step operation", depending on the stop status.	4346+100n

Refer to the following for the setting details.

☞ Page 559 Control Data

7.9 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

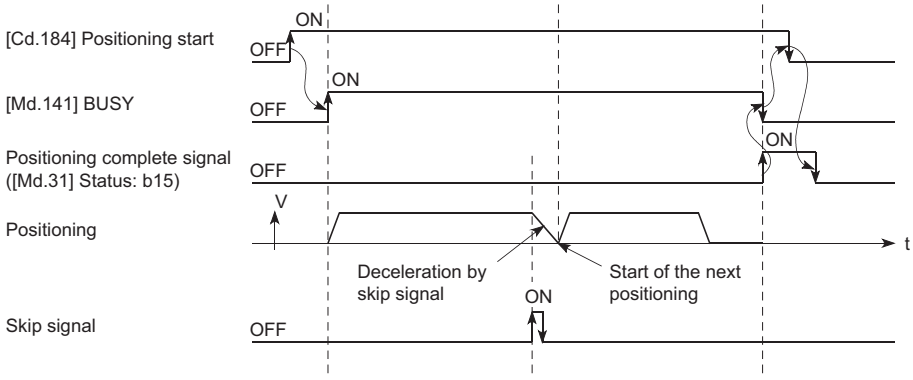
The following table shows the relation between the "skip function" and various controls.
○: Set when required, ×: Setting not possible

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	○	
	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

Setting item		Setting value	Setting details	Buffer memory address
[Cd.37]	Skip command	1	Set "1: Skip request".	4347+100n

Refer to the following for the setting details.

☞ Page 559 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/Motion module.

Program example

Refer to the following for the program example.

☞ Page 634 Skip program [FX5-SSC-S]

☞ Page 712 Skip program [FX5-SSC-G]

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

Setting item		Setting value	Setting details	Buffer memory address
[Pr.42]	External command function selection	3	Set "3: Skip request".	62+150n
[Cd.8]	External command valid	1	Set "1: Validate external command".	4305+100n

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

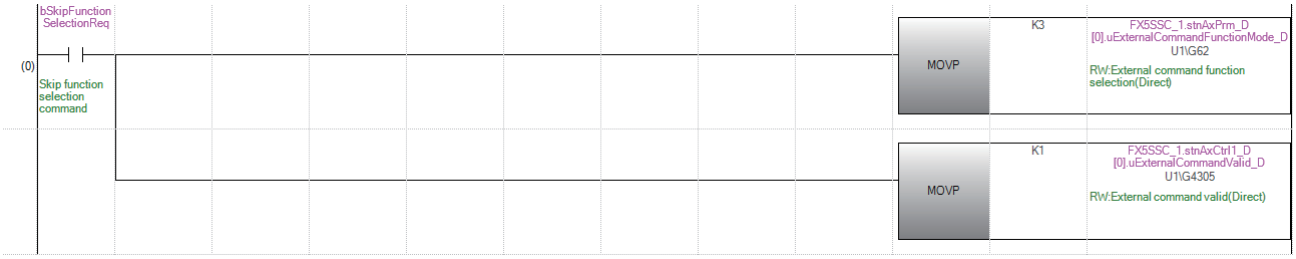
Refer to the following for the setting details.

☞ Page 444 Basic Setting, ☞ Page 559 Control Data

- 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.



Classification	Label name	Description
Module label	FX5SSC_1.stnAxPrm_D[0].uExternalCommandFunctionMode_D	Axis 1 External command function selection
	FX5SSC_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 are for local labels. 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" of the positioning data.)
The timing for outputting (storing) the M codes can also be set in the "M code output function".

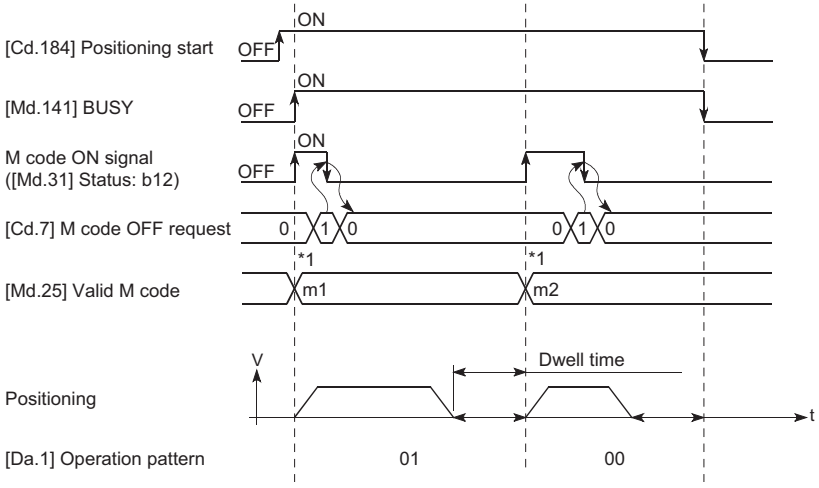
M code ON signal output timing

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.

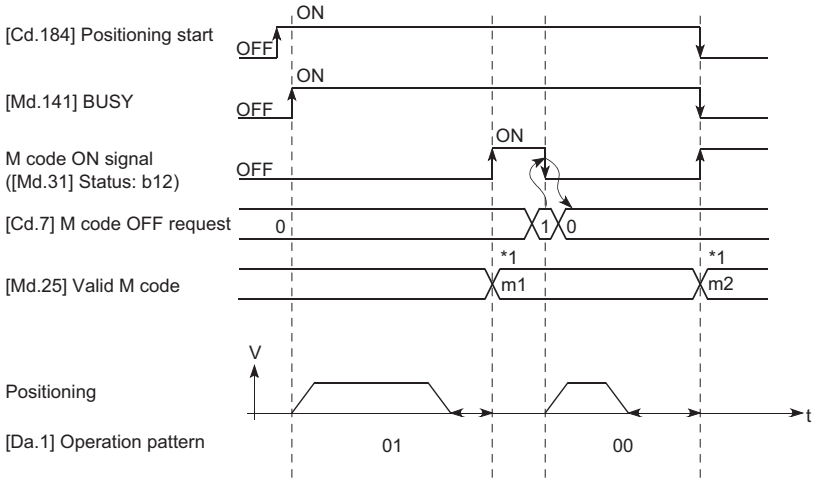


*1 m1 and m2 indicate set M codes.

■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

Setting item		Setting value	Setting details	Buffer memory address
[Cd.7]	M code OFF request	1	Set "1: Turn OFF the M code ON signal".	4304+100n

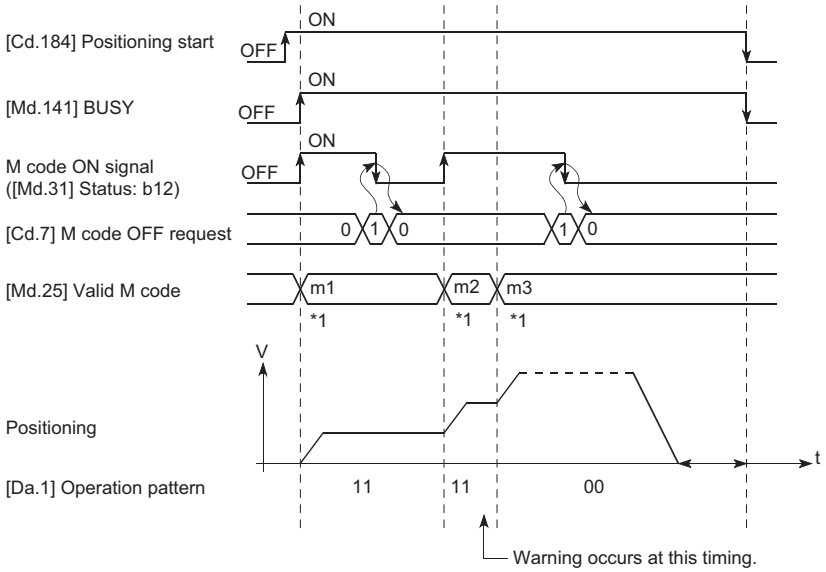
Refer to the following for the setting details.

☞ Page 559 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 [FX5-SSC-S], or warning code: 0D52H [FX5-SSC-G]) 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".

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". (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 [FX5-SSC-S], or error code: 1AA0H [FX5-SSC-G]) will occur, and the positioning will not start.
- If the "[Cd.190] PLC READY" 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 [FX5-SSC-S], or warning code: 0D52H [FX5-SSC-G]) may occur. In this case, set a "0" in the "[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions" 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".
- 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/Motion module. The set details are validated at the rising edge (OFF → ON) of the "[Cd.190] PLC READY".

n: Axis No. - 1

Setting item		Setting value	Setting details	Buffer memory address
[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

Refer to the following for the setting details.

☞ Page 444 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

Monitor item		Monitor value	Storage details	Buffer memory address
[Md.25]	Valid M code	→	The M code No. ([Da.10] M code/Condition data No./Number of LOOP to LEND repetitions) set in the positioning data is stored.	2408+100n

Refer to the following for information on the storage details.

☞ Page 518 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	FX5SSC_1.stnAxMntr_D[0].uStatus_D.C	Axis 1 M code ON
	FX5SSC_1.stnAxMntr_D[0].uM_Code_D	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 are for global labels. 1 | G_uValidMode | Word [Unsigned]/Bit String [16-bit] | VAR_GLOBAL | D110	

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).

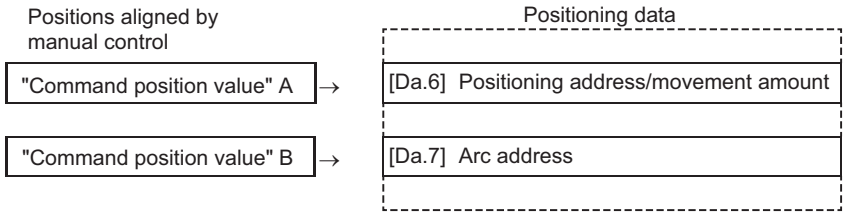
Control details

■Teaching timing

Teaching is executed using the program when the "[Md.141] BUSY" 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

Setting item		Setting value	Setting details	Buffer memory address
[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
[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

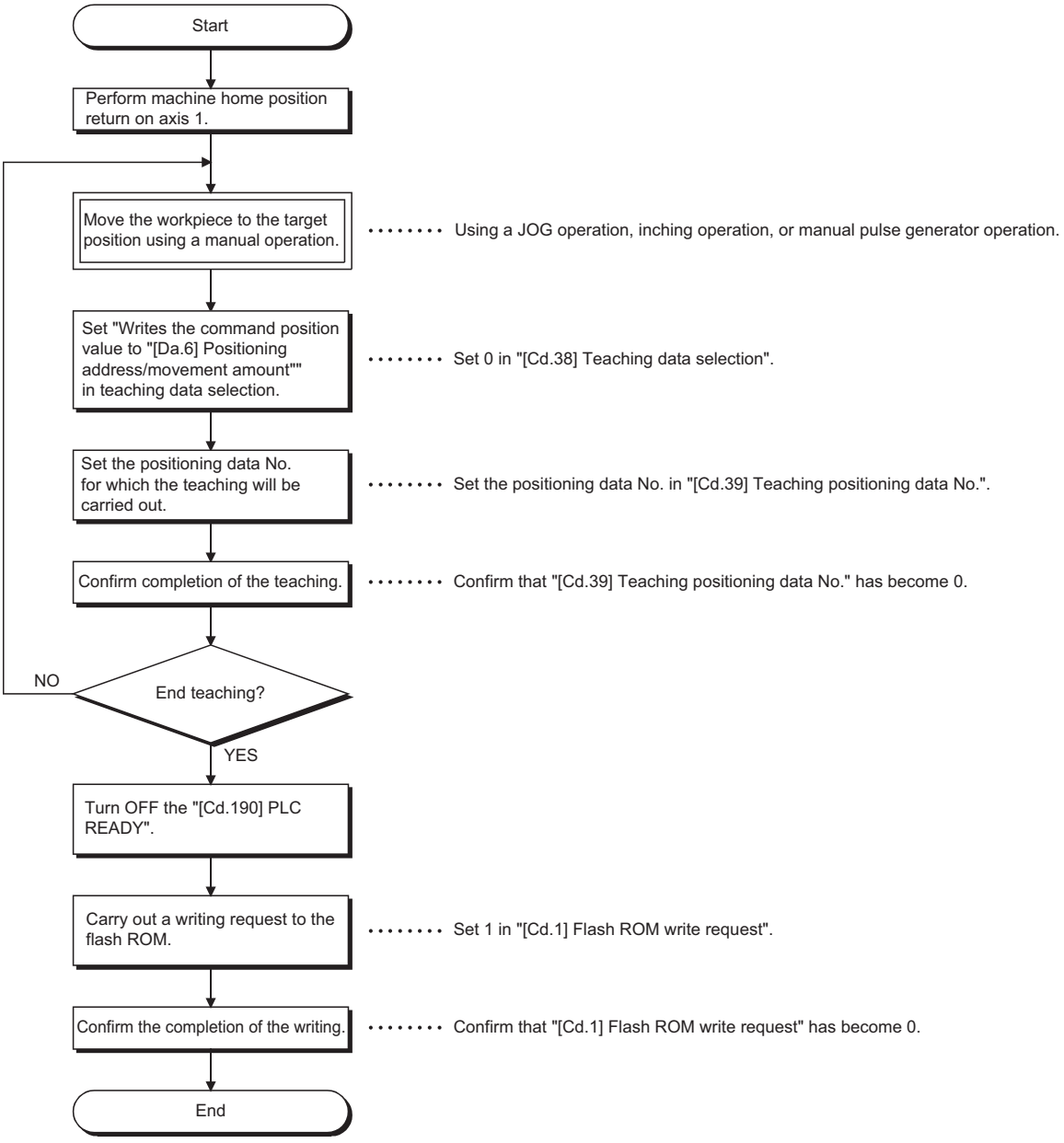
Refer to the following for the setting details.

☞ Page 559 Control Data

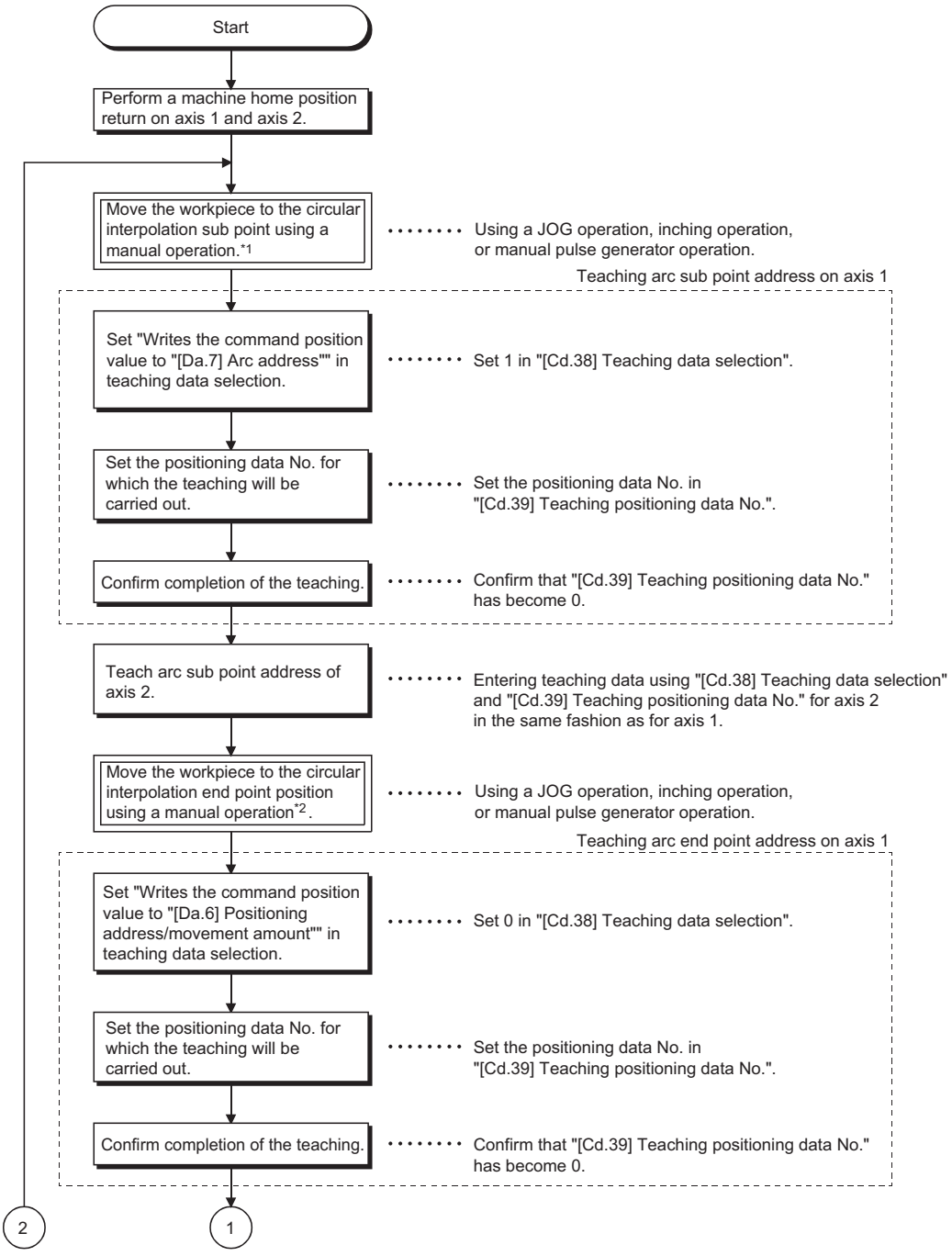
Teaching procedure

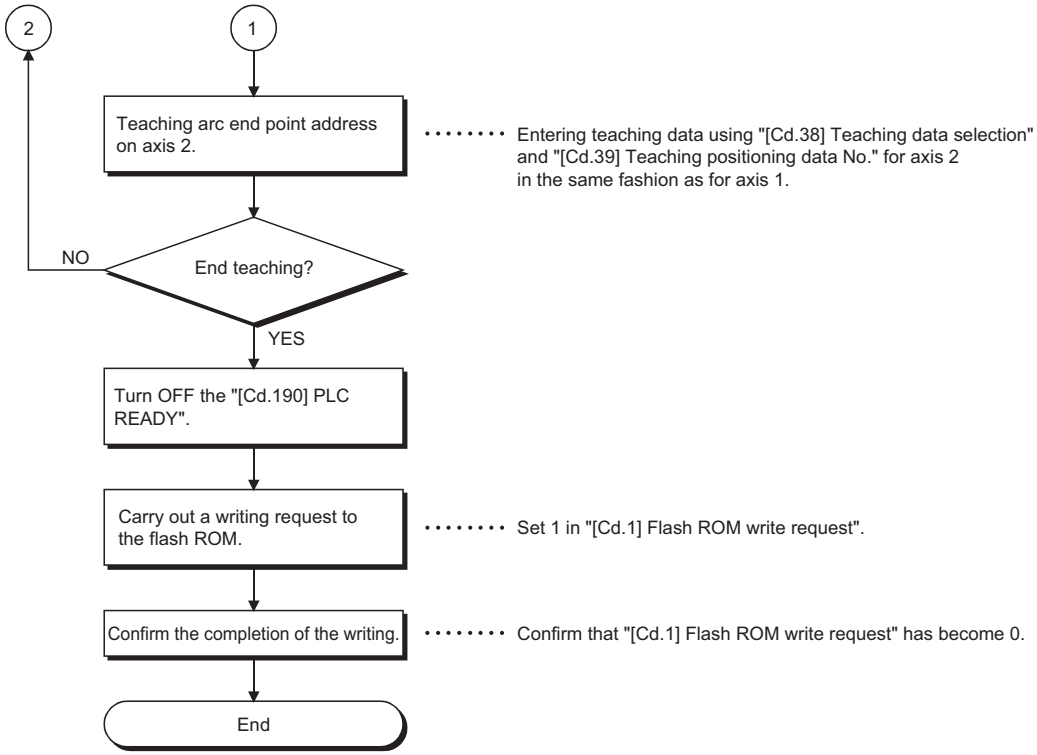
The following shows the procedure for a teaching operation.

- When teaching to the "[Da.6] Positioning address/movement amount" (Teaching example on axis 1)

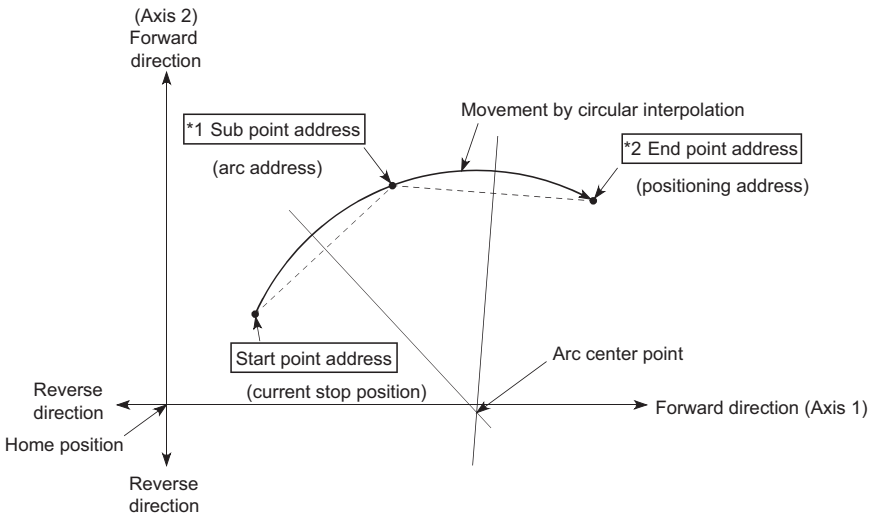


- When teaching to the "[Da.7] Arc address", then teaching to the "[Da.6] Positioning address/movement amount" (Teaching example for 2-axis circular interpolation control with sub point designation on axis 1 and axis 2)





■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/Motion module.

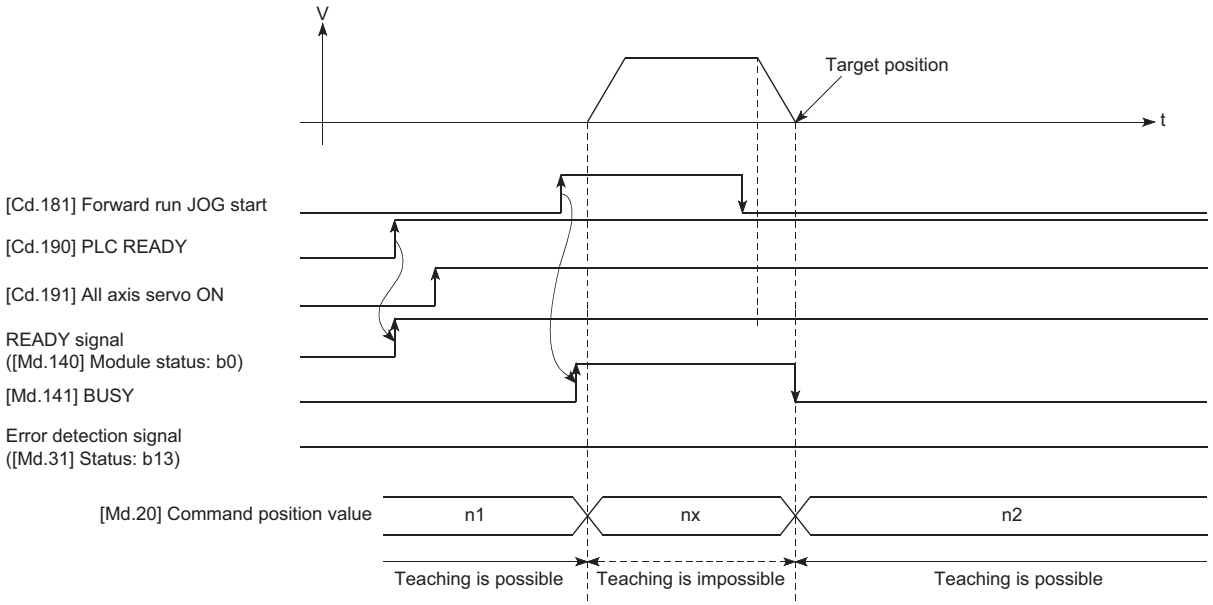
■Setting conditions

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 634 Teaching program [FX5-SSC-S]
☞ Page 712 Teaching program [FX5-SSC-G]

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.

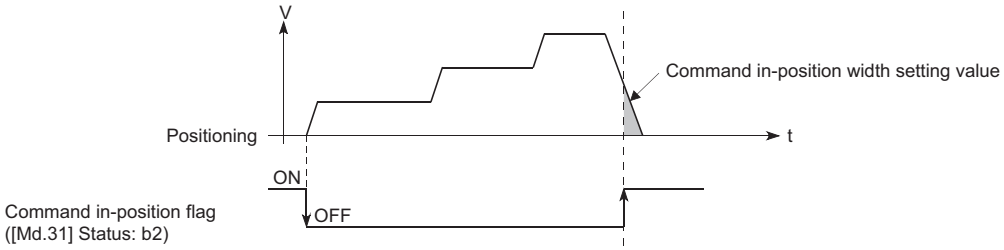
Control details

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

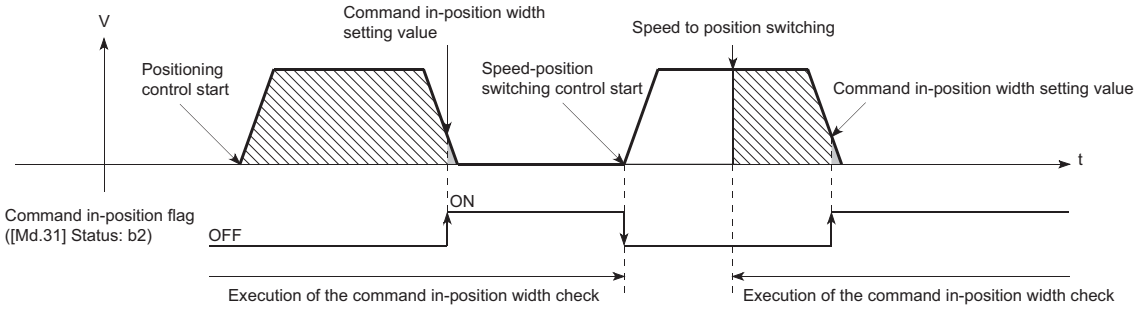


- A command in-position width check is carried out every operation cycle.

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/Motion module.

The set details are validated at the rising edge (OFF → ON) of the "[Cd.190] PLC READY".

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 444 Basic Setting

Confirming the command in-position flag

The "command in-position flag" is stored in the following buffer memory.

n: Axis No. - 1

Monitor item		Monitor value	Storage details	Buffer memory address
[Md.31]	Status	→	The command in-position flag is stored in the "b2" position.	2417+100n

Refer to the following for information on the storage details.

☞ Page 518 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 186 Speed-torque Control

"Acceleration/deceleration time 0 to 3" control details and setting

In the Simple Motion module/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/Motion module.

The set details are validated when written to the Simple Motion module/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 444 Basic Setting

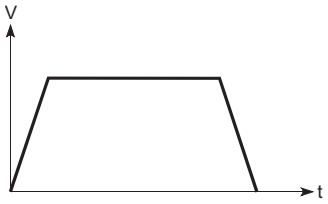
"Acceleration/deceleration method setting" control details and setting

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

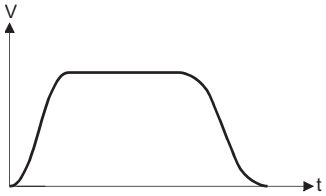
This is a method in which linear acceleration/deceleration is carried out based on the acceleration time, deceleration time, and speed limit value set by the user.



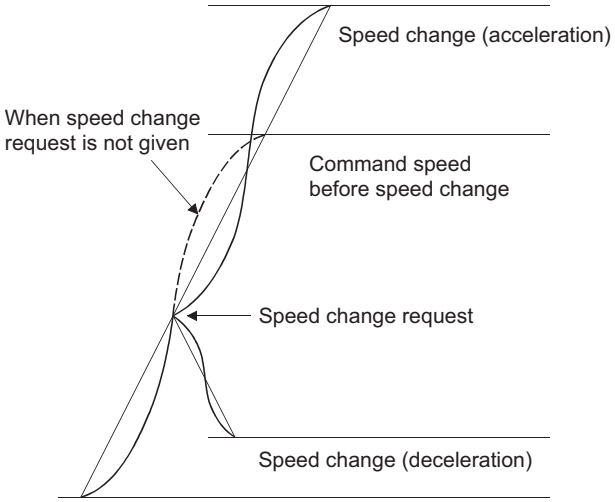
■S-curve acceleration/deceleration processing method

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/Motion module.

The set details are validated when written to the Simple Motion module/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 444 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.

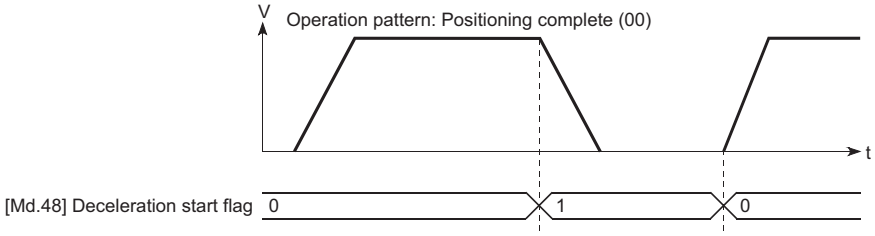
Deceleration start flag function

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



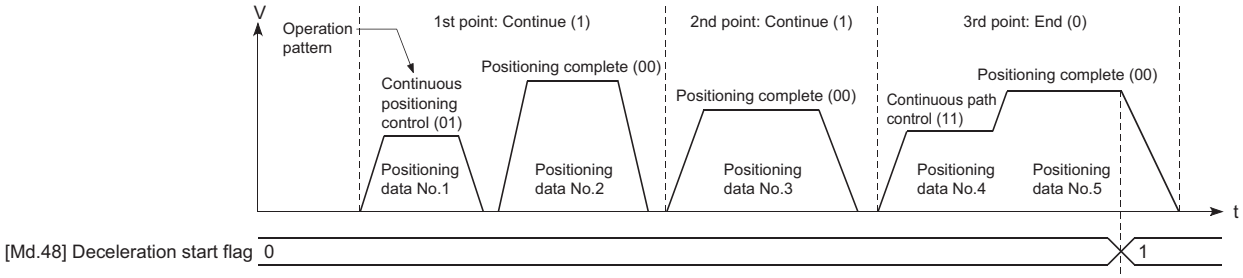
■Block start

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.

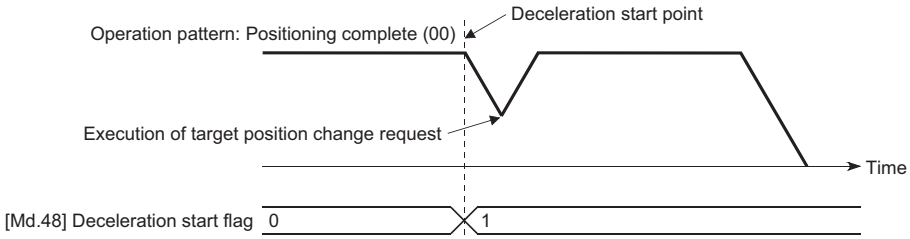
Block start data	[Da.11] Shape	[Da.12] Start data No.	[Da.13] Special start instruction
1st point	1: Continue	1	0: Block start
2nd point	1: Continue	3	0: Block start
3rd point	0: End	4	0: Block start
⋮			

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
⋮	

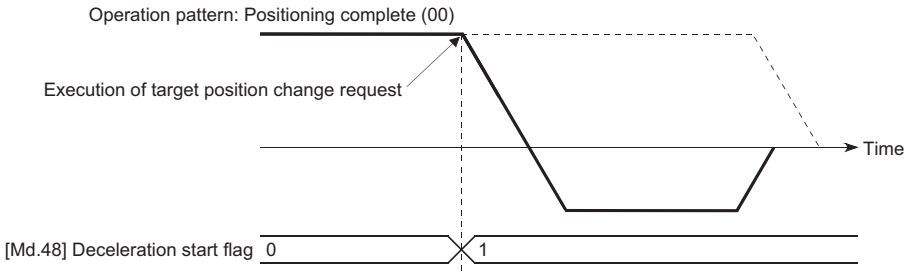


Precautions during control

- 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-F FX5 Motion Module/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 "[Cd.190] PLC READY".

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 559 Control Data

Checking of deceleration start flag

The "deceleration start flag" is stored into the following buffer memory addresses.

n: Axis No. - 1

Monitor item		Monitor value	Storage details	Buffer memory address
[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

Refer to the following for information on the storage details.

☞ Page 518 Monitor Data

Speed control 10 times 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" [FX5-SSC-S]
- "[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"

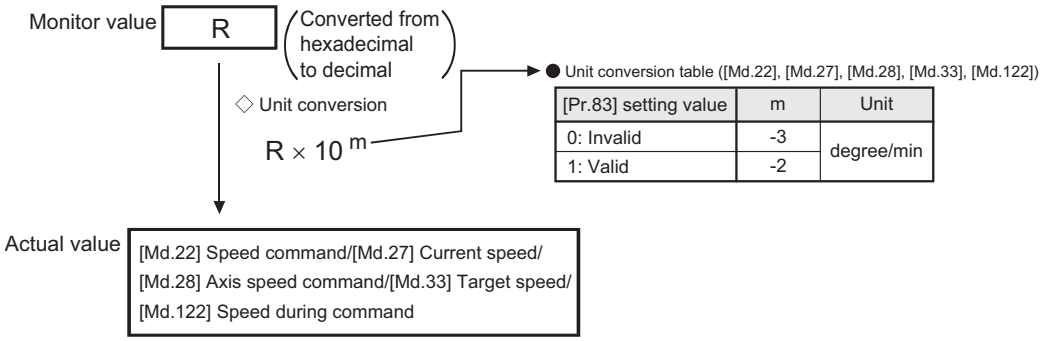
- Major positioning control

- 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.



■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 decouple 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

Setting item		Setting value	Setting details	Buffer memory address
[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

Refer to the following for the setting details.

☞ Page 444 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) • 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 manual and instruction manual for details.

Precautions during control

- The error "Start at home position return incomplete" (error code: 19A6H [FX5-SSC-S], or error code: 1AA6H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code: 1A45H [FX5-SSC-G]) 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

Setting item		Setting value	Setting details	Buffer memory address
[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

Refer to the following for the setting details.

☞ Page 444 Basic Setting

7.10 Servo ON/OFF

Servo ON/OFF

This function executes servo ON/OFF of the servo amplifiers connected to the Simple Motion module/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.

- [Cd.191] All axis servo ON
- [Cd.100] Servo OFF command

n: Axis No. - 1

Setting item	Buffer memory address
[Cd.191] All axis servo ON	5951
[Cd.100] Servo OFF command	4351+100n

A list of the "[Cd.191] All axis servo ON" 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
[Cd.191] All axis servo ON	Other than 1	×	Servo ON command: OFF Ready ON command: OFF	×	Servo ON command: OFF Ready ON command: OFF
	1	○	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 "[Cd.191] All axis servo ON" is turned ON to OFF, set "1" in "[Cd.100] Servo OFF command" and execute the servo OFF. Then, turn off the "[Cd.191] All axis servo ON" after delay time passes.)
Refer to each servo amplifier manual and instruction manual for details of servo ON command OFF and ready ON command OFF from Simple Motion module/Motion module.

[FX5-SSC-G]
After the initial communication with the servo amplifier completes, the status will not change to servo ON in the following cases.

- When the error "Servo parameter invalid" (error code: 1DC8H) is occurring.*1
- When the current value restoration is not complete.*2

*1 For details, refer to the following.
☞ Page 841 Setting methods
*2 After the initial communication with the servo amplifier completes, restoration of the current value is performed on the Motion module. The status of the current value restoration can be checked using the following monitor data.

n: Axis No. -1

Monitor item		Monitor value	Stored contents	Buffer memory address
[Md.190]	Controller position value restoration complete status	→	This area stores the completion status of controller current value restoration. The status becomes "0: Incomplete restoration" when the device is disconnected. • 0: Incomplete restoration • 1: Complete INC restoration • 2: Complete ABS restoration (64-bit Restoration_Based on Backup Location) • 3: Complete ABS restoration (32-bit Restoration_Based on Backup Location)	59327+100n

Servo ON (Servo operation enabled)

The following shows the procedure for servo ON.

1. Make sure that the servo amplifier LED indicates "b_" (for the MR-J4 series), or "r_" (for the MR-J5 series).
(The initial value for "[Cd.191] All axis servo ON" is "OFF".)

2. Set "0" for "[Cd.100] Servo OFF command".

3. Turn ON "[Cd.191] All axis servo ON".

Now the servo amplifier turns ON the servo (servo operation enabled state). (The servo amplifier LED indicates "d_" (for the MR-J4 series), or "r._" (for the MR-J5 series.))

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_" (for the MR-J4 series), or "r_" (for the MR-J5 series.))

(If the "[Cd.100] Servo OFF command" set "0" again, after the servo operation enabled.)

2. Turn OFF "[Cd.191] All axis servo ON".

(The servo amplifier LED indicates "b_" (for the MR-J4 series), or "r_" (for the MR-J5 series.))

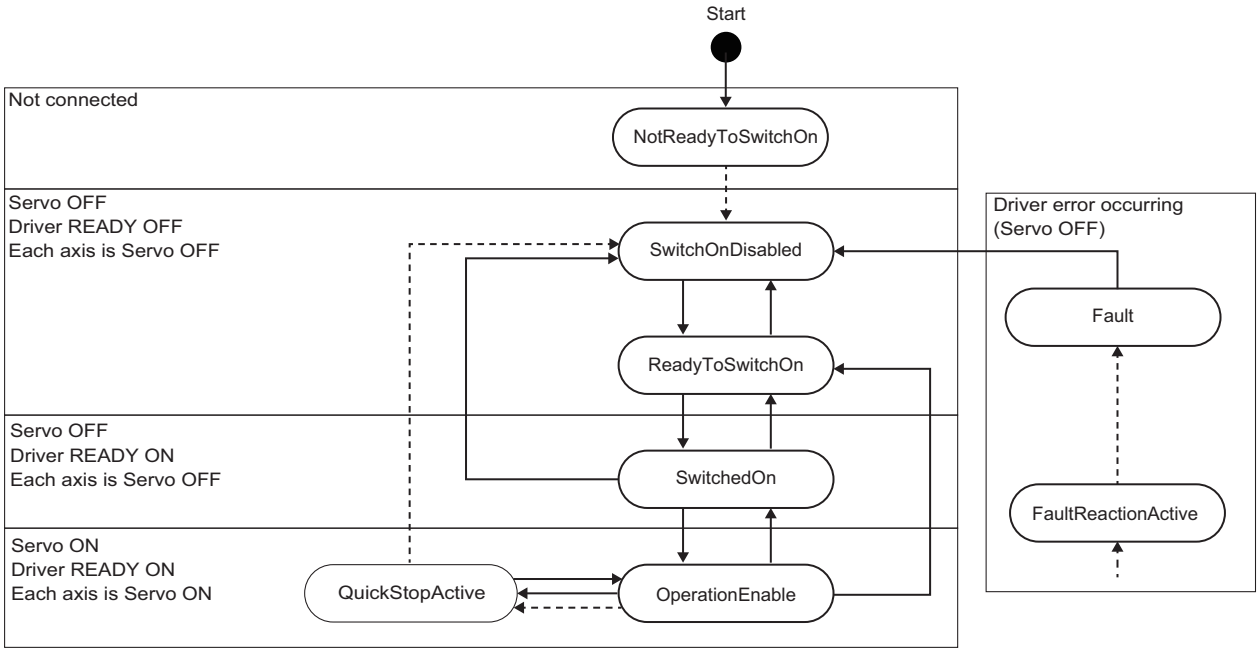
Point

- 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, "[Cd.191] All axis servo ON" is applied even if all axis servo ON command is turned ON to OFF with "[Cd.100] Servo OFF command" set "0".

PDS state transition [FX5-SSC-G]

The drive unit connected as an axis performs operation according to the state transition defined by the CiA402 drive profile as shown below. The Motion module determines whether the drive unit is in servo ON or OFF status based on the current drive unit status.

For details on operation in each status, refer to the specifications of the connected drive unit.



Follow up function

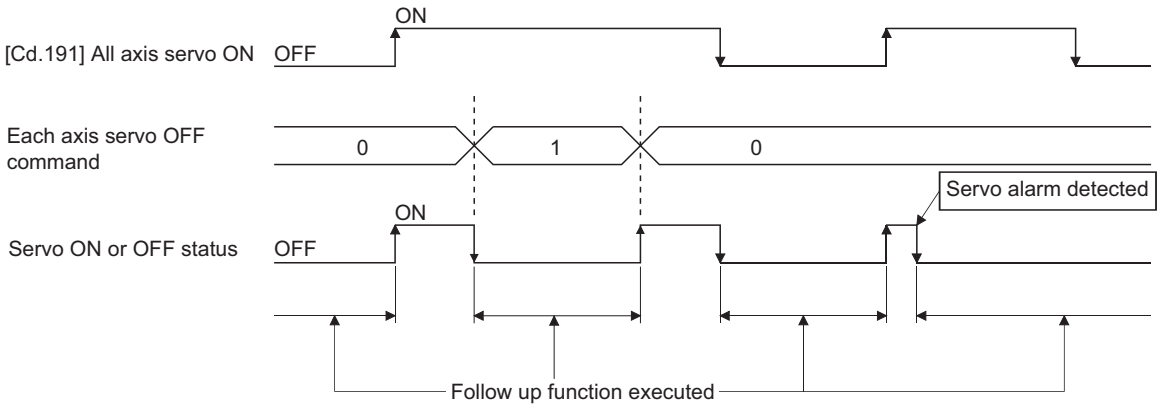
Follow up function

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/Motion module and the servo amplifier is turned ON" and "servo OFF" regardless of the presence of the absolute position system. [FX5-SSC-G]

However, in the following case, follow up function is executed even during the servo ON.

- When the control mode of the servo amplifier is other than the control mode that the Motion module supports*1

*1 The control mode that the Motion module supports
- Position control mode
- Speed control mode
- Torque control mode
- Continuous operation to torque control mode
- Home position return mode

8 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/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.

8.1 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/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	This function is used to select from the following signals when using each external input signal of each axis (upper/lower stroke limit signal (FLS/RLS), proximity dog signal (DOG), and stop signal (STOP)). • External input signal of servo amplifier • External input signal via CPU (buffer memory) • Link device input signal [FX5-SSC-G]	○	○
Link device external signal assignment function [FX5-SSC-G]	This function assigns link devices to the external signals of the Motion module.	○	○
History monitor function	This function monitors start history and current value history of all axes.	—	○
Amplifier-less operation function [FX5-SSC-S]	This function executes the positioning control of Simple Motion module without connecting to the servo amplifiers. It is used to debug the program at the start-up of the device or simulate the positioning operation.	○	—
Virtual servo amplifier function	This function executes the operation as the axis (virtual servo amplifier axis) that operates only command (instruction) virtually without servo amplifiers.	○	○
Driver communication function [FX5-SSC-S]	This function uses the "Master-slave operation function" of servo amplifier. The Simple Motion module controls the master axis and the slave axis is controlled by data communication between servo amplifiers (driver communication) without Simple Motion module.	○	○
Mark detection function	This function is used to latch any data at the input timing of the mark detection signal (DI).	○	○
Optional data monitor function	This function is used to store the data selected by user up to 4 data per axis to buffer memory and monitor them.	○	○
Event history function [FX5-SSC-G]	This function takes errors that occur on the Motion module and event information and collects them in the CPU module or saves them to the SD memory card. Storing the errors in the CPU allows the error history to be checked even after turning OFF the power or resetting.	—	○
Connect/disconnect function of SSCNET communication [FX5-SSC-S]	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 transient transmission function [FX5-SSC-G]	This function reads and writes objects of the device via transient transmission.	○	—
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).	○	○
F/W update function [FX5-SSC-G]	This function is used to update F/W of the Motion module.	—	○

8.2 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/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 configuration parameters [FX5-SSC-G]
	Common parameters
	Basic parameters
	Detailed parameters
	Home position return basic parameters
	Home position return detailed parameters
	Extended parameters
	Link device external signal assignment parameters [FX5-SSC-G]
Servo parameters	Servo amplifier parameters [FX5-SSC-S]
Mark detection	Mark detection setting parameters
Synchronous control parameters	Servo input axis parameters
	Synchronous encoder axis parameters
	Synchronous encoder axis parameters via link device [FX5-SSC-G]
	Command generation axis parameters
	Command generation axis positioning data
	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 "[Cd.190] PLC READY" is OFF). The warning "In PLC READY" (warning code: 0905H [FX5-SSC-S], or warning code: 0D05H [FX5-SSC-G]) will occur if executed when the "[Cd.190] PLC READY" 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 [FX5-SSC-S], or error code: 1A31H [FX5-SSC-G]) 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/Motion module when the "[Cd.190] PLC READY" is turned ON, the READY signal ([Md.140] Module status: b0) will not be turned ON and the control cannot be carried out.

Restriction

Parameter initialization takes approximately 30 seconds. When a short time is assigned to the main cycle*1, initialization may take more than 30 seconds.
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 Cycle of processing executed at free time except for the positioning control. It changes by status of axis start.

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/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/Motion module.

Setting item		Setting value	Setting details	Buffer memory address
[Cd.2]	Parameter initialization request	1	Set "1" (parameter initialization request).	5901

Refer to the following for the setting details.
☞ Page 559 Control Data
When the initialization is complete, "0" will be set in "[Cd.2] Parameter initialization request" by the Simple Motion module/Motion module automatically.

8.3 Execution Data Backup Function

When the buffer memory data of Simple Motion module/Motion module is rewritten from the CPU module, "the data backed up in the flash ROM/internal memory (nonvolatile)" of Simple Motion module/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/Motion module is replaced, all the data in the Simple Motion module/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/Motion module again by using the backup/restore function of an engineering tool. Refer to "Help" in the "Simple Motion Module Setting Function" of the engineering tool 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 configuration parameters [FX5-SSC-G]
	Common parameters
	Basic parameters
	Detailed parameters
	Home position return basic parameters
	Home position return detailed parameters
	Extended parameters
	Link device external signal assignment parameters [FX5-SSC-G]
Servo parameters	Servo amplifier parameters [FX5-SSC-S]
Mark detection	Mark detection setting parameters
Synchronous control parameters	Servo input axis parameters
	Synchronous encoder axis parameters
	Synchronous encoder axis parameters via link device [FX5-SSC-G]
	Command generation axis parameters
	Command generation axis positioning data
	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/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 "[Cd.190] PLC READY" is OFF). The warning "In PLC READY" (warning code: 0905H [FX5-SSC-S], or warning code: 0D05H [FX5-SSC-G]) will occur if executed when the "[Cd.190] PLC READY" is ON.
- 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.

[FX5-SSC-S]

- 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.

[FX5-SSC-G]

- Writing to the flash ROM can be executed up to 100,000 times. If writing to the flash ROM exceeds 100,000 times, the error "Flash ROM write number error" (error code: 1080H) will occur. In addition, sometimes writing to the flash ROM may become impossible, in which case the error "Flash ROM write error" (error code: 1A31H) will occur.

Restriction

The writing time to the flash ROM is approximately 10 seconds. When a short time is assigned to the main cycle[*1], writing may take more than 10 seconds.
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.

*1 Cycle of processing executed at free time except for the positioning control. It changes by status of axis start.

Execution data backup method

- Refer to the following for the data transmission processing at the backup of the execution data.
  ☞ Page 605 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/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/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 559 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/Motion module automatically.

8.4 External Input Signal Select Function

The "external input signal select function" is used to select from the following signals when using each external input signal of each axis (upper/lower stroke limit signal (FLS/RLS), proximity dog signal (DOG), and stop signal (STOP)).

- External input signal of servo amplifier
- External input signal via CPU (buffer memory)
- Link device input signal [FX5-SSC-G]

Setting details

The setting details of the "external input signal select function" are shown below.

Setting item		Initial value	Setting details
[Pr.116]	FLS signal selection	0001H	■Set with a hexadecimal. H _ _ _ _ └►Input type Set the input type used as the external input signal. 1(0001H): Servo amplifier*1 2(0002H): Buffer memory 3(0003H): Link device [FX5-SSC-G]*2
[Pr.117]	RLS signal selection	0001H	
[Pr.118]	DOG signal selection	0001H	
[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 [FX5-SSC-S], or error code: 1BD3H [FX5-SSC-G]) occurs and the "[Cd.190] PLC READY" is not turned ON.

*2 For details, refer to the following.

☞ Page 329 Link Device External Signal Assignment Function [FX5-SSC-G]

Point

[FX5-SSC-G]

- When using the MR-J5(W)-G, set the servo parameters as follows.

- Set "Function selection C-G DI status read selection (PC79.0)" to "Eh".
- Set "Function selection D-4 Sensor input method selection (PD41.3)" to "1: Input from controller".
- Set "Function selection D-4 Limit switch enabled status selection (PD41.2)" to "1: Enabled only for homing mode"
- Set "DI pin polarity selection (PD60)" to "00000000h".
- Set "Function selection T-3 Device input polarity 1 (PT29.0)" to "1: Dog detection with ON"

If the above servo parameters are set to different values, the error "Servo parameter invalid" (error code: 1DC8H) occurs, and the Motion module rewrites the value of said servo parameters to the above values. The servo parameters are enabled after the Motion module or servo amplifier is reset.

- When parameter automatic setting is enabled, the saved parameters are automatically updated. Check the execution result of automatically updating the saved parameters in the event history.
- When "[Pr.95] External command signal selection" is set to use the DOG signal of the axis, the DOG signal of the servo amplifier is used regardless of the setting value of "[Pr.118] DOG signal selection". For details of the logic selection for the signal, refer to the following.

☞ Page 841 Devices Compatible with CC-Link IE TSN [FX5-SSC-G]

- A virtual servo amplifier cannot be used in an external command. When the axis selected in "[Pr.95] External command signal selection" is a virtual servo amplifier, the setting is invalid.

■When "1: Servo amplifier" is set

The following table shows the pin No. of the external input signal of the servo amplifier to be used.

At MR-JE-B(F) use, refer to the following.

☞ Page 820 Connection with MR-JE-B(F)

[FX5-SSC-S]

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). For details, refer to the instruction manual of the servo amplifier to be used.

*2 The stop signal cannot be input from the external input signal of the servo amplifier. When inputting a stop signal, set "[Cd.44] External input signal operation device". Refer to the following for the setting details.

☞ Page 559 System control data

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

[FX5-SSC-G]

Pin No. of servo amplifier*1	Signal name
CN3-2	LSP
CN3-12	LSN
CN3-19	DOG
CN3-20	EM2

*1 This servo amplifier means about MR-J5_G_(-RJ). For details, refer to the manual of the servo amplifier to be used.

■When "2: Buffer memory" is set

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
[Cd.44]	External input signal operation device (Axis 1 to 8)	→	Set the status of the upper/lower limit signal, the proximity dog signal and the stop signal.	5928 5929

Refer to the following for the setting details.

☞ Page 562 [Cd.44] External input signal operation device (Axis 1 to 8)

■ When "3: Link device" is set [FX5-SSC-G]

Refer to the following for the setting details.

☞ Page 329 Link Device External Signal Assignment Function [FX5-SSC-G]

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 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 changing to "Positive logic" in 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
1: Servo amplifier	FLS/RLS/DOG	[Pr.22] Input signal logic selection
2: Buffer memory	FLS/RLS/DOG/STOP	
3: Link device	FLS	[Pr.913] Upper limit signal (FLS): Link device logic setting
	RLS	[Pr.923] Lower limit signal (RLS): Link device logic setting
	DOG	[Pr.933] Proximity dog signal (DOG): Link device logic setting
	STOP	[Pr.943] Stop signal (STOP): Link device logic setting

■Upper/lower stroke limit signal, stop signal, and proximity dog signal [FX5-SSC-S]

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 454 Basic parameters1

■Upper/lower stroke limit signal, stop signal, proximity dog signal, and external command/switching signal [FX5-SSC-G]

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), stop signal (STOP), and external command/switching signal (DI)).

Setting item		Initial value	Setting details
[Pr.22]	Input signal logic selection	0	Select the logic of the signal which is input to the 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 460 Detailed parameters1

When using the signals on the servo amplifier side, match the setting with the input logic setting on the servo amplifier. If the input logic settings do not match, the limit signal may be erroneously detected during home position return. For the input logic specifications of the servo amplifier, refer to the manual of the servo amplifier used.

■External command signal/switching signal [FX5-SSC-S]

Use the following parameter to switch the logic of the external input signals for the 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] b0 to b3

Refer to the following for the setting details.

☞ Page 446 Common parameters

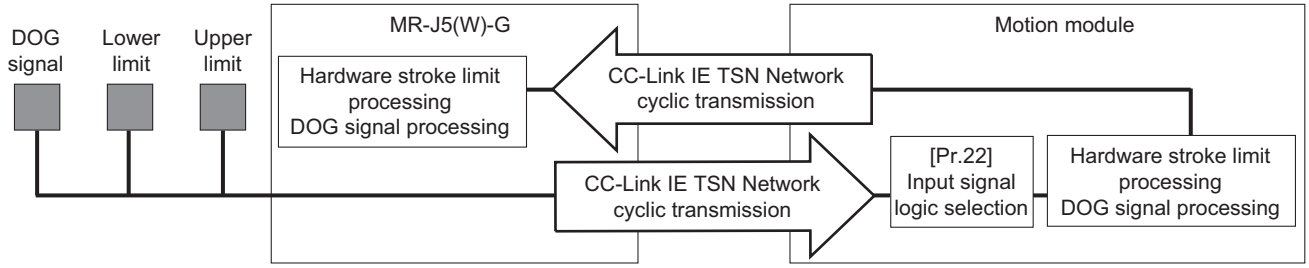
■External input signal when connecting to the MR-J5(W)-G [FX5-SSC-G]

The data sent and received with the external input signal when connecting the Motion module to the MR-J5(W)-G is shown below.

[Flow of upper/lower stroke limit signal (FLS/RLS) and proximity dog signal (DOG)]

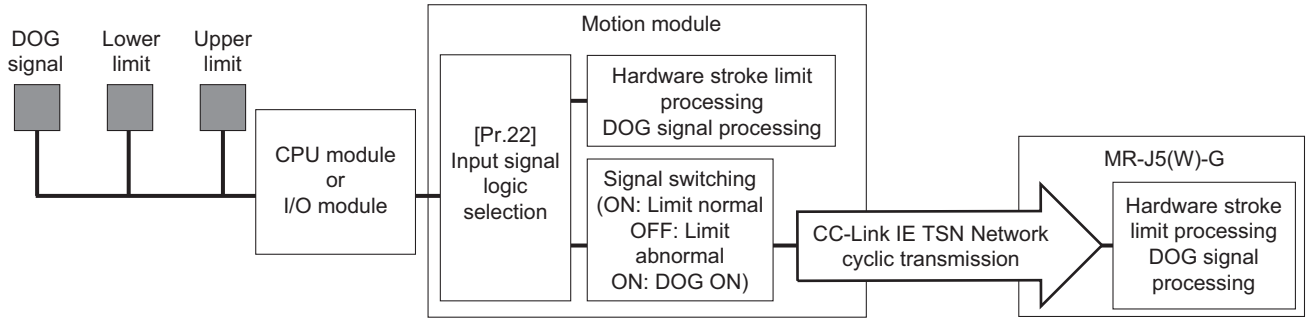
• When using the external input signal of the servo amplifier

The inputted command signal is sent from the servo amplifier to the Motion module, following which the stop command or DOG signal is sent to the servo amplifier after the input signal logic selection processing completes in the Motion module.



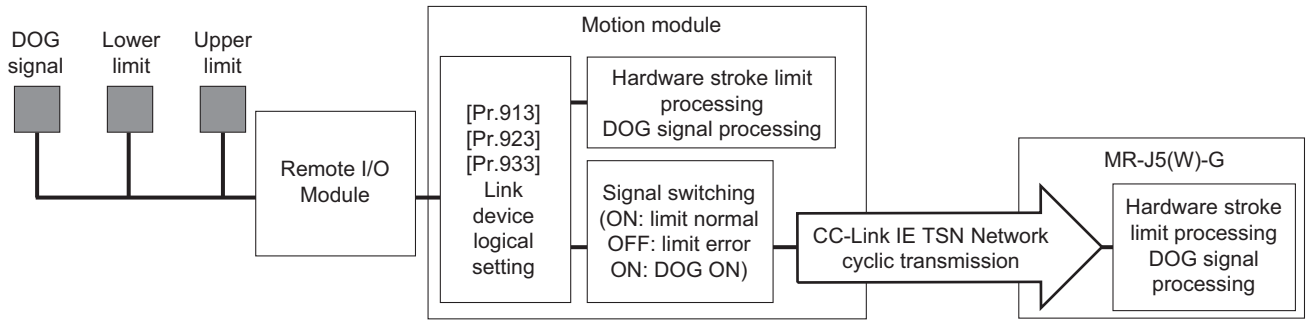
• When not using the external input signal of the servo amplifier

The stop command or DOG signal is sent to the servo amplifier after the input signal logic selection processing completes in the Motion module.



• When using the link device

The upper/lower limit switch signal or the DOG signal is sent to the servo amplifier after the input signal logic selection processing completes in the Motion module.



Remote I/O	→	Motion module				→	MR-J5(W)-G
Upper/lower limit signal bit		**[Pr.913]Upper limit signal (FLS): Link device logic setting [Pr.923]Lower limit signal (RLS): Link device logic setting**	**Hardware stroke limit error detection**	→	**Lower limit signal (RLS)(b0)" and "Upper limit signal(FLS)(b1)" of "[Md.30] External input signal"**	→	**Hardware stroke limit error detection**
0	→	0: Negative logic	Detect	→	OFF	→	Detect
		1: Positive logic	Not detect		ON		Not detect
1		0: Negative logic	Not detect		ON		Not detect
		1: Positive logic	Detect		OFF		Detect

Remote I/O	→	Motion module				→	MR-J5(W)-G	
DOG signal bit		**[Pr.933] Proximity dog signal (DOG): Link device logic setting**	**Processing with proximity dog signal detection**	→	**"Proximity dog signal (DOG)(b6)" of "[Md.30] External input signal"**	→	**External input signal logic (Function selection T-3 Device input polarity 1 (PT29.0))**	**Processing with proximity dog signal detection**
0	→	0: Detection at ON	Not proceed	→	OFF	→	1: Dog detection with on	Not proceed
		1: Detection at OFF	Proceed		ON		1: Dog detection with on	Proceed
1		0: Detection at ON	Proceed		ON		1: Dog detection with on	Proceed
		1: Detection at OFF	Not proceed		OFF		1: Dog detection with on	Not proceed

Point

The signal status of the servo amplifier is read by the object Digital inputs [Obj. 60FDh], following which the hardware stroke limit processing or DOG signal processing is executed by sending Control DI 5 (Obj. 2D05h) on the controller side.

■External input signal via link device, external command signal [FX5-SSC-G]

The following parameters are used for logic switching when various external input signals and external command signals are input from the link device of the CC-Link IE TSN network.

Signal type		Setting item		Initial value	Setting details[*1]
External input signals[*2]	Forced stop signal (EMI)	[Pr.903]	Forced stop signal (EMI): Link device logic setting	0	0: Negative logic 1: Positive logic
	Upper limit signal (FLS)	[Pr.913]	Upper limit signal (FLS): Link device logic setting	0	
	Lower limit signal (RLS)	[Pr.923]	Lower limit signal (RLS): Link device logic setting	0	
	Proximity dog signal (DOG)	[Pr.933]	Proximity dog signal (DOG): Link device logic setting	0	0: Detection at ON 1: Detection at OFF
	Stop signal (STOP)	[Pr.943]	Stop signal (STOP): Link device logic setting	0	
External command signals	Synchronous encoder axis start request	[Pr.1013]	Synchronous encoder axis start request: Link device logic setting	0	0: Negative logic 1: Positive logic 2: Falling detection 3: Rising detection
	Mark detection input signal	[Pr.811]	Mark detection signal detection direction setting	0	0: Rising detection 1: Falling detection

Setting item		Initial value	Setting details[*3]
[Pr.22]	Input signal logic selection	0	Select the logic of the signal to be input to the Motion module from the outside. 0: Negative logic 1: Positive logic • b0: Lower limit • b1: Upper limit • b3: Stop signal • b6: Proximity dog signal

*1 For the setting details, refer to the following.
☞ Page 329 Link Device External Signal Assignment Function [FX5-SSC-G]

*2 For the logic setting of the external input signals, refer to the following.
☞ Page 841 Devices Compatible with CC-Link IE TSN [FX5-SSC-G]

*3 For the setting details, refer to the following.
☞ Page 460 Detailed parameters1

■Manual pulse generator/Incremental synchronous encoder input [FX5-SSC-S]

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 444 Basic Setting

■Precautions on parameter setting

- The external I/O signal logic switching parameters are validated when the "[Cd.190] PLC READY" 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
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 [FX5-SSC-G]	Set at the device station.

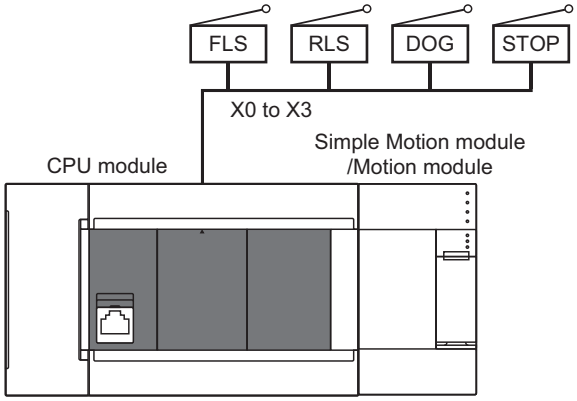
*1 Refer to the instruction manual or manual of the servo amplifier to be used.
For MR-J5(W)-G, Set with the servo parameter "Input filter setting (PD11)".
MR-J5-G/MR-J5W-G User's Manual (Parameters)

Program

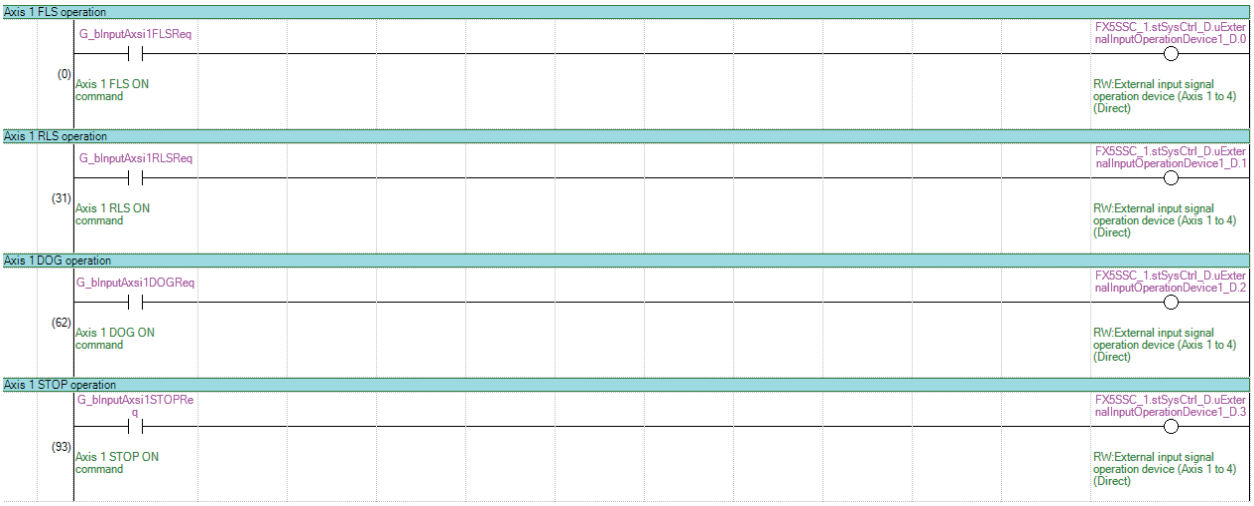
The following shows the program example to operate "[Cd.44] External input signal operation device (Axis 1 to 8)" of axis 1 using the limit switch connected to the CPU module when "2: Buffer memory" is set in "[Pr.116] FLS signal selection" to "[Pr.119] STOP signal selection".

■System configuration

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



Program example



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

Classification	Label name	Description
Module label	FX5SSC_1.stSysCtrl_D.uExternalInputOperationDevice_D[0].0	Axis 1 FLS
	FX5SSC_1.stSysCtrl_D.uExternalInputOperationDevice_D[0].1	Axis 1 RLS
	FX5SSC_1.stSysCtrl_D.uExternalInputOperationDevice_D[0].2	Axis 1 DOG
	FX5SSC_1.stSysCtrl_D.uExternalInputOperationDevice_D[0].3	Axis 1 STOP
Global label	Defines the global labels to set the assignment device as follows.	

	Label Name	Data Type		Class	Assign (Device/Label)
1	G_bInputAxsi1FLSReq	Bit	...	VAR_GLOBAL	X0
2	G_bInputAxsi1RLSReq	Bit	...	VAR_GLOBAL	X1
3	G_bInputAxsi1DOGReq	Bit	...	VAR_GLOBAL	X2
4	G_bInputAxsi1STOPReq	Bit	...	VAR_GLOBAL	X3

8.5 Link Device External Signal Assignment Function [FX5-SSC-G]

This function assigns link devices to the external signals of the Motion module.
Signals such as the upper/lower limit signal and proximity dog signal can be assigned to link devices.

Point

The following are available in the software version 1.004 or later.
- Synchronous encoder via link device
- Mark detection (link device input)

The following are available in the software version 1.005 or later.
- Forced stop signal (EMI)
- Upper limit signal (FLS)
- Lower limit signal (RLS)
- Proximity dog signal (DOG)
- Stop signal (STOP)

Signals that can be assigned

The following signals used in the Motion module can be assigned to the link devices of the CC-Link IE TSN Network. The same link device can be assigned to multiple external signals.

■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	
Synchronous encoder axis start request*1*2	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 axis
Input signal for mark detection*1*3	○	×	×	○	×	×	○	×	×	○	×	×	1 point/1 mark detection setting

*1 This is the accuracy of the operation cycle.
*2 Set by synchronous encoder axis parameters via link device. For details, refer to "Synchronous Encoder Axis" in the following manual.
MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control)
*3 Set by mark detection setting parameters. Refer to the following for details.
Page 355 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	
Synchronous encoder input*1*2	×	○	○	×	○	○	×	○	○	×	○	○	1 point/1 axis

*1 When assigning RX/RY, the setting is made in units of 16 points.

*2 Set by synchronous encoder axis parameters via link device. For details, refer to "Synchronous Encoder Axis" in the following manual.
MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control)

Operation in case of data link error during communication

■Bit device

Signals are as follows regardless of the logical setting.

External signal	Operation details
Forced stop signal	Forced stop of all axes of the servo amplifier.
Upper/lower limit signal	Outside the upper/lower limit range.
Proximity dog signal	The proximity dog signal becomes invalid.
Stop signal	The control of the axis is stopped.
Other signals	No request is made.

■Word device

Synchronous encoder axis: When the connection is in progress, the connection is disabled.

Setting method

Set this function with link device external signal assignment parameters. Refer to the following for details on each setting.

☞ Page 333 Related buffer memory

☞ Page 422 List of Buffer Memory Addresses

For the setting method of the mark detection input signal, refer to the following.

☞ Page 355 Mark Detection Function

For the setting method of the synchronous encoder axis start request and the synchronous encoder input, refer to "Synchronous Encoder Axis" in the following manual.

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

■Forced stop signal

Set the following for the forced stop signal.

• Set to use the link device for the forced stop signal.

Item		Details	Buffer memory address
[Pr.82]	Forced stop valid/invalid selection	Set "3: Valid (Link device)".*1	35

*1 If "3: Valid (Link device)" is set in "[Pr.82] Forced stop valid/invalid selection", and the link device external signal assignment parameter is not set, the error "Forced stop signal link device incorrect configuration" (error code: 1F13H) occurs and the READY signal ([Md.140] Module status: b0) does not turn ON.

• Set the link device external signal assignment parameter to be used as the forced stop signal.

Item		Details	Buffer memory address
[Pr.900]	Forced stop signal (EMI): Link device type	Set the link device type for use.	58014
[Pr.901]	Forced stop signal (EMI): Link device start No.	Set the link device No. for use.	58015
[Pr.902]	Forced stop signal (EMI): Link device bit specification	Set the bit No. that is used when "13H: RWr" and "14H: RWw" are set to the link device type.	58016
[Pr.903]	Forced stop signal (EMI): Link device logic setting	Set the logic for assignment signal. • 0: Negative logic • 1: Positive logic	58017

■FLS signal, RLS signal

Set the FLS signal and the RLS signal of the corresponding axis as follows.

• Set the corresponding signal to use the link device and set the corresponding signal logic.

n: Axis No. - 1

Item		Details	Buffer memory address
[Pr.116]	FLS signal selection	Set "3: Link device".*1	116+150n
[Pr.117]	RLS signal selection		117+150n

*1 If "3: Link device" is set in "[Pr. 116] FLS signal selection" and "[Pr. 117] RLS signal selection", and the link device external signal assignment parameter is not set, the error "FLS signal link device incorrect configuration" (error code: 1F14H) or the error "RLS signal link device incorrect configuration" (error code: 1F15H) occurs, and the READY signal ([Md.140] Module status: b0) does not turn ON.

• Set the link device external signal assignment parameter to be used as the corresponding signal.

n: Axis No. - 1

Item		Details	Buffer memory address
[Pr.910]	Upper limit signal (FLS): Link device type	Set the link device type for use.	36000+20n
[Pr.920]	Lower limit signal (RLS): Link device type		36005+20n
[Pr.911]	Upper limit signal (FLS): Link device start No.	Set the link device No. for use.	36001+20n
[Pr.921]	Lower limit signal (RLS): Link device start No.		36006+20n
[Pr.912]	Upper limit signal (FLS): Link device bit specification	Set the bit No. that is used when "13H: RWr" and "14H: RWw" are set to the link device type.	36002+20n
[Pr.922]	Lower limit signal (RLS): Link device bit specification		36007+20n
[Pr.913]	Upper limit signal (FLS): Link device logic setting	Set the logic for assignment signal. • 0: Negative logic • 1: Positive logic	36003+20n
[Pr.923]	Lower limit signal (RLS): Link device logic setting		36008+20n

■DOG signal, STOP signal

Set the DOG signal and the STOP signal of the corresponding axis as follows.

• Set the corresponding signal to use the link device and set the corresponding signal logic.

n: Axis No. - 1

Item		Details	Buffer memory address
[Pr.118]	DOG signal selection	Set "3: Link device".*1	118+150n
[Pr.119]	STOP signal selection		119+150n

*1 If "3: Link device" is set in "[Pr. 118] DOG signal selection" and "[Pr. 119] STOP signal selection", and the link device external signal assignment parameter is not set, the error "DOG signal link device incorrect configuration" (error code: 1F16H) or the error "STOP signal link device incorrect configuration" (error code: 1F17H) occurs, and the READY signal ([Md.140] Module status: b0) does not turn ON.

• Set the link device external signal assignment parameter to be used as the corresponding signal.

n: Axis No. - 1

Item		Details	Buffer memory address
[Pr.930]	Proximity dog signal (DOG): Link device type	Set the link device type for use.	36010+20n
[Pr.940]	Stop signal (STOP): Link device type		36015+20n
[Pr.931]	Proximity dog signal (DOG): Link device start No.	Set the link device No. for use.	36011+20n
[Pr.941]	Stop signal (STOP): Link device start No.		36016+20n
[Pr.932]	Proximity dog signal (DOG): Link device bit specification	Set the bit No. that is used when "13H: RWr" and "14H: RWw" are set to the link device type.	36012+20n
[Pr.942]	Stop signal (STOP): Link device bit specification		36017+20n
[Pr.933]	Proximity dog signal (DOG): Link device logic setting	Set the logic for assignment signal. • 0: Detection at ON • 1: Detection at OFF	36013+20n
[Pr.943]	Stop signal (STOP): Link device logic setting		36018+20n

Point

Using a link device No. that is not assigned in the network configuration settings does not result in an error/warning. The signal is detected when the link device or the corresponding buffer memory is operated.
If the link device No. exceeds the setting range of the start No., an error/warning occurs.

Monitoring method

The input status of each bit device signal can be monitored by the following signal.

• External command signal

n: Axis No. - 1

Monitor item		Storage details	Buffer memory address
[Md.50]	Forced stop input	Forced stop signal (EMI)	4231
[Md.30]	External input signal	• b0: Lower limit signal (RLS) • b1: Upper limit signal (FLS) • b3: Stop signal (STOP) • b6: Proximity dog signal (DOG)	2416+100n

• External command signal

j: Synchronous encoder axis No. - 1

Monitor item		Storage details	Buffer memory address
[Md.325]	Synchronous encoder axis status	b6: Start command flag	35210+20j

Related buffer memory

Each external signal can be assigned by setting the following buffer memories.

Point

- Refer to the following for mark detection setting parameters.
  ☞ Page 355 Mark Detection Function
- For the synchronous encoder axis parameters via link device, refer to "Synchronous Encoder Axes" in the following manual.
  📖MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control)

■For bit device setting

n: Axis No. - 1

Setting item		Setting details, setting value	Buffer memory address
[Pr.900]	Forced stop signal (EMI): Link device type	Set the link device type for use. • Others: Invalid • 11H: RX • 12H: RY • 13H: RWr • 14H: RWw Fetch cycle: At power supply ON/the CPU module reset	58014
[Pr.910]	Upper limit signal (FLS): Link device type		36000+20n
[Pr.920]	Lower limit signal (RLS): Link device type		36005+20n
[Pr.930]	Proximity dog signal (DOG): Link device type		36010+20n
[Pr.940]	Stop signal (STOP): Link device type		36015+20n
[Pr.901]	Forced stop signal (EMI): Link device start No.	Set the link device type for use.*1 • RX/RY: 0 to 1FFFH • RWr/RWw: 0 to 3FFH Fetch cycle: At power supply ON/the CPU module reset	58015
[Pr.911]	Upper limit signal (FLS): Link device start No.		36001+20n
[Pr.921]	Lower limit signal (RLS): Link device start No.		36006+20n
[Pr.931]	Proximity dog signal (DOG): Link device start No.		36011+20n
[Pr.941]	Stop signal (STOP): Link device start No.		36016+20n
[Pr.902]	Forced stop signal (EMI): Link device bit specification	Set the bit No. that is used when "13H: RWr" and "14H: RWw" are set to the link device type.*2 • 00H to 0FH Fetch cycle: At power supply ON/the CPU module reset	58016
[Pr.912]	Upper limit signal (FLS): Link device bit specification		36002+20n
[Pr.922]	Lower limit signal (RLS): Link device bit specification		36007+20n
[Pr.932]	Proximity dog signal (DOG): Link device bit specification		36012+20n
[Pr.942]	Stop signal (STOP): Link device bit specification		36017+20n
[Pr.903]	Forced stop signal (EMI): Link device logic setting	Set the logic for assignment signal. (Only the 0th bit is valid.) • 0: Negative logic When link device relevant bit = 0 EMI: Forced stop input ON (Forced stop) FLS, RLS: Limit signal is OFF (Limit over) • 1: Positive logic Opposite of the negative logic Fetch cycle: At power supply ON/the CPU module reset	58017
[Pr.913]	Upper limit signal (FLS): Link device logic setting		36003+20n
[Pr.923]	Lower limit signal (RLS): Link device logic setting		36008+20n
[Pr.933]	Proximity dog signal (DOG): Link device logic setting	Set the logic for assignment signal. (Only the 0th bit is valid.) • 0: Detection at ON The link device status and the signal status are not inverted. When the link device is set to 0, the corresponding signal is set to OFF. When the link device is set to 1, the corresponding signal is set to ON. • 1: Detection at OFF The link device status and the signal status are inverted. When the link device is set to 0, the corresponding signal is set to ON. When the link device is set to 0, the corresponding signal is set to OFF. Fetch cycle: At power supply ON/the CPU module reset	36013+20n
[Pr.943]	Stop signal (STOP): Link device logic setting		36018+20n

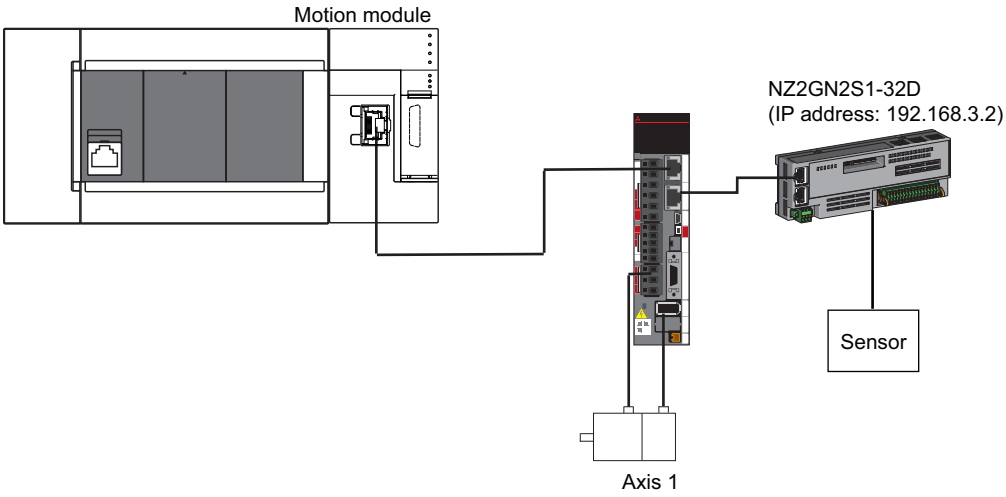
*1 If the setting value is outside the setting range, the error "Outside the link device start No. range" (error code: 1F10H) occurs and the corresponding external signal becomes invalid.

*2 If the setting value is outside the setting range, the error "Outside the link device bit specification range" (error code: 1F11H) occurs and the corresponding external signal becomes invalid.

Setting example of link device external signal assignment

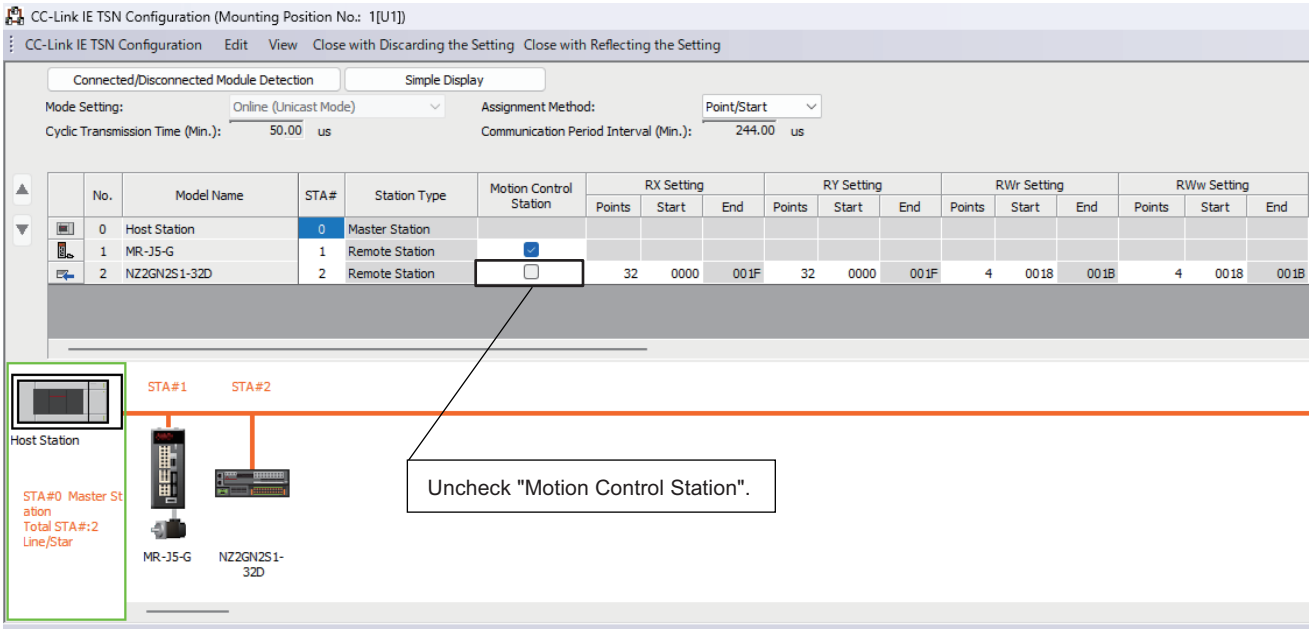
Ex.

When using link device as upper/lower limit signal (FLS/RLS)



In this example, the signal used as the upper limit signal (FLS) is assigned to RX0 and the signal used as the lower limit signal (RLS) is assigned to RX1.

■Network configuration setting



In this example, the following link devices are used.

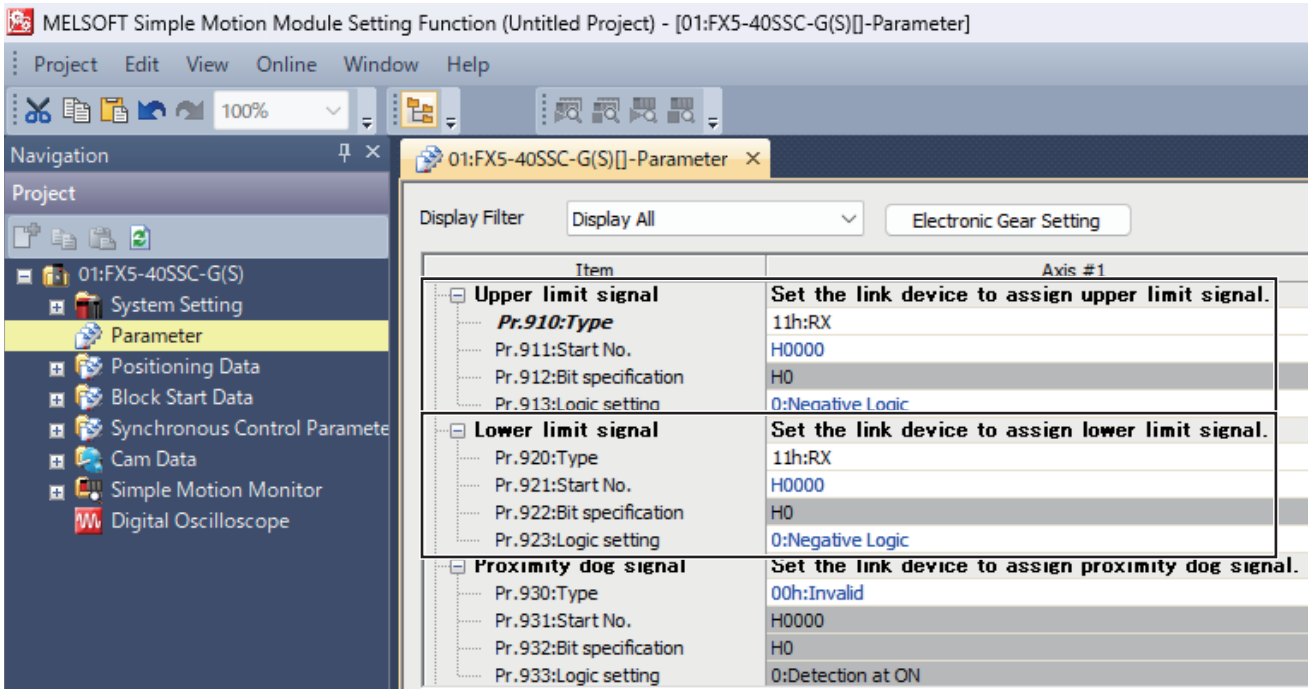
- Remote input (RX)

Device No.	Application
RX0	Used as the upper limit signal (FLS).
RX1	Used as the lower limit signal (RLS).

■Link device external input signal assignment parameter

Set the link device to be used as the upper/lower limit signal (FLS/RLS).

Parameter	Setting value
[Pr.910] Upper limit signal (FLS): Link device type	11h: RX
[Pr.911] Upper limit signal (FLS): Link device start No.	H0000
[Pr.912] Upper limit signal (FLS): Link device bit specification	Not necessary when "11h: RX" or "12h: RY" is selected for link device type.
[Pr.913] Upper limit signal (FLS): Link device logic setting	0: Negative logic
[Pr.920] Lower limit signal (RLS): Link device type	11h: RX
[Pr.921] Lower limit signal (RLS): Link device start No.	H0001
[Pr.922] Lower limit signal (RLS): Link device bit specification	Not necessary when "11h: RX" or "12h: RY" is selected for link device type.
[Pr.923] Lower limit signal (RLS): Link device logic setting	0: Negative logic



Restrictions

- Use the communication cycle setting of the network configuration settings in the basic cycle. If not used in the basic cycle, the signal detection accuracy will be poor.
- The fetch timing of the link device fluctuates by 1 operation cycle.

8.6 History Monitor Function

This function monitors starting history and current value history stored in the buffer memory of the Simple Motion module/ Motion module on the operation monitor of an engineering tool.

Starting history

The starting history logs of operations such as positioning operation, JOG operation, and manual pulse generator operation can be monitored. The latest 64 logs 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 starting history check method, refer to "Help" in the "Simple Motion Module Setting Function" of an engineering tool.

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/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: 4 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: 4 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
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 The value equal to the multiplied inverse number of the electronic gear ratio of the servo amplifier (the command unit) is displayed. [FX5-SSC-G]

*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 The value equal to the multiplied inverse number of the electronic gear ratio of the servo amplifier (the command unit) is displayed. [FX5-SSC-G]

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.

[FX5-SSC-S]

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.

[Pr.97] SSCNET setting	Servo amplifier type	Motor type
1: SSCNETⅢ/H	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 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.
- The warning "Home position return data incorrect" (warning code: 093CH [FX5-SSC-S], or warning code: 0D3CH [FX5-SSC-G]) is set in the error/warning code at current value restoration.
- When the incremental system is set, the detail of the backup data at power supply 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.

[FX5-SSC-S]

- If the current value cannot be restored in the absolute system, "0" is set to the command position value and servo command value.

[FX5-SSC-G]

- When current value restoration could not be performed in the absolute position system, "0" is set to the command position value, the encoder position within one revolution, the encoder multiple revolution counter and the feedback value from the servo amplifier is set to the servo command value.
- When 32-bit restoration is performed in the absolute position system, "0" is set to the encoder position within one revolution and the encoder multiple revolution counter at power supply on.

■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 The value equal to the multiplied inverse number of the electronic gear ratio of the servo amplifier (the command unit) is displayed. [FX5-SSC-G]

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.

8.7 Amplifier-less Operation Function [FX5-SSC-S]

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.

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)"	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.

■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 of the following before switching to the amplifier-less operation mode becomes the connection status during amplifier-less operation.

  • "[Pr.100] Servo series" 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] Servo series" is set, and then the "[Cd.190] PLC READY" 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	Servo amplifier type	Motor type
1: SSCNETⅢ/H	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 pulses/rev)

Restrictions

• Some monitor data differ from the actual servo amplifier during amplifier-less operation mode.

n: Axis No. - 1

Storage item		Storage details	Buffer memory address
[Md.102]	Deviation counter value	Always "0".	2452+100n 2453+100n
[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 "[Cd.191] All axis servo ON" and "[Cd.100] Servo OFF command". • Control mode (b2, b3): Indicates control mode. • Gain switching (b4): Always OFF • Fully closed 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 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 following monitor data differs from the normal operation mode during amplifier-less operation mode.

n: Axis No. - 1

Storage item		Storage details	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.
- Even if the "[Cd.190] PLC READY" is turned ON by changing "[Pr.100] Servo series" from "0: 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

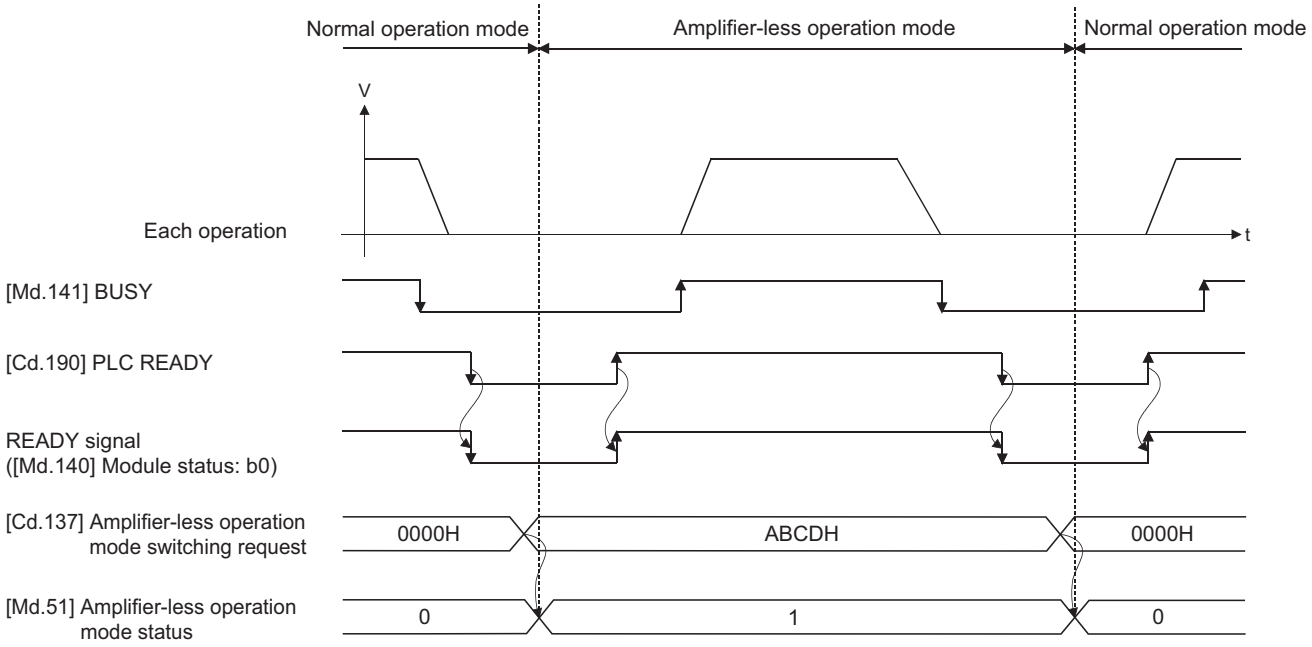
1. Stop all operating axes, and then confirm that the "[Md.141] BUSY" for all axes turned OFF.
2. Turn OFF the "[Cd.190] PLC READY".
3. Confirm that the READY signal ([Md.140] Module status: b0) turned OFF.
4. Set "ABCDH" in "[Cd.137] Amplifier-less operation mode switching request".
5. Confirm that "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 "[Md.141] BUSY" for all axes turned OFF.
2. Turn OFF the "[Cd.190] PLC READY".
3. Confirm that the READY signal ([Md.140] Module status: b0) 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 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 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 the "[Cd.137] Amplifier-less operation mode switching request". The switching to amplifier-less operation mode can be accepted only when "[Cd.137] Amplifier-less operation mode switching request" is switched from "0000H" to "ABCDH". The switching to normal operation mode can be accepted only when "[Cd.137] Amplifier-less operation mode switching request" is switched from "ABCDH" to "0000H".

8.8 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 [FX5-SSC-S]

Control details

- When "4097, 4128" is set in "[Pr.100] Servo series" set in the flash ROM, it operates as virtual servo amplifier immediately after power supply ON.
- When "0" is set in "[Pr.100] Servo series" set in the flash ROM, it operates as virtual servo amplifier by setting "4097, 4128" in "[Pr.100] Servo series" of buffer memory and by turning the "[Cd.190] PLC READY" OFF to ON after power supply ON.
- Do not connect the actual servo amplifier to axis set as virtual servo amplifier. If the servo amplifier is connected, 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 "Absolute position detection system (PA03)". Set "1: Enabled (used in absolute position detection system)" to the buffer memory to use as absolute position system.

Point

Do not make to operate by switching between the actual servo amplifier and virtual servo amplifier. When a value except "0" is set in "[Pr.100] Servo series" set in the flash ROM, the connected device is not changed even if the "[Pr.100] Servo series" of buffer memory is changed after power supply ON and then the "[Cd.190] PLC READY" 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

Storage item		Storage details	Buffer memory address
[Md.102]	Deviation counter value	Always "0".	2452+100n 2453+100n
[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 "[Cd.191] All axis servo ON" and "[Cd.100] Servo OFF command" • Control mode (b2, b3): Indicates control mode. • Gain switching (b4): Always OFF • Fully closed 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 the signal status in "[Md.30] External input signal". (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

Storage item		Storage details	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] Servo series"
0: SSCNETⅢ	4097: Virtual servo amplifier (MR-J3)
1: SSCNETⅢ/H	4128: Virtual servo amplifier (MR-J4)

Virtual servo amplifier function [FX5-SSC-G]

Control details

- The servo amplifier is operated as a virtual servo amplifier when the value of "[Pr.101] Virtual servo amplifier setting" is "1: Use for the virtual servo amplifier" immediately after power cycling.
- When the value of "[Pr.101] Virtual servo amplifier setting" is other than "1: Use for the virtual servo amplifier" immediately after power cycling, the servo amplifier is not operated as a virtual servo amplifier even if "[Pr.101] Virtual servo amplifier setting" in the buffer memory is set to "1: Use for the virtual servo amplifier" and "[Cd.190] PLC READY" is turned OFF → ON after power cycling.
- Virtual servo amplifiers are connected with the absolute position detection system enabled. The command position value and machine feed value are as follows.

• When the servo amplifier is turned on for the first time as a virtual servo amplifier, the warning "Homing data incorrect" (warning code: 0D3CH) occurs, the home position return request turns ON, and the command position value and feed machine value both become "0". Following this, establishing the home position and then turning the power OFF → ON causes the address to become the address from the last time that the module power was disconnected.

Restrictions

- The following monitor data of virtual servo amplifier differ from the actual servo amplifier.

n: Axis No. - 1

Storage item		Storage details	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": • Lower limit signal (b0): Always ON • Upper limit signal (b1): Always ON • Proximity dog signal (b6): Always OFF	2416+100n
[Md.102]	Deviation counter value	Always "0".	2452+100n 2453+100n
[Md.104]	Motor current value	Outputs the command torque during torque control and continuous operation to torque control mode.	2456+100n
[Md.108]	Servo status1	• READY ON (b0), Servo ON (b1): Changed depending on the "[Cd.191] All axis servo ON" and "[Cd.100] Servo OFF command" • Control mode (b2, b3): Indicates control mode. • Gain switching (b4): Always OFF • Fully closed control switching (b5): Always OFF • Servo alarm (b7): Always OFF • In-position (b12): Always ON during Servo ON, always OFF during Servo OFF • Torque limit (b13): Changed depending on the command torque value • Absolute position lost (b14): Turns ON when the connected device is not the MR-J5-G at establishment of the home position when connected to a virtual servo amplifier axis, and turns OFF when home position return is performed. • 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): Turns ON when the speed exceeds the limit value at torque control mode. • PID control (b8): Always OFF	2476+100n
[Md.514]	HPR operating status	Changed depending on the HPR (home position return) status	2457+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", this function cannot be used to emulate the upper/lower limit signal (FLS, RLS) and proximity dog signal (DOG). 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 Motion module even with a virtual servo amplifier.
External command function selection	This function cannot be used to emulate "[Pr.95] External command signal selection".
Torque limit function	Turns ON/OFF torque limit ("[Md.108] Servo status1": b13) depending on the command torque value.

• When a device is connected to an axis or station that is operating as a virtual servo amplifier, the relevant device is connected to the CC-Link IE TSN network, but does not enter the in synchronous communication status.

• An axis being operated as a virtual servo amplifier emulate the following servo amplifier types.

• Servo amplifier type: MR-J5-G

The specification of the emulated MR-J5(W)-G is as follows.

Function		Support	Description
Reception check	WDC check	×	Check of reception WDC (the master station → the device station) is not carried out.
PDO-related	Emulation of feedback	○	Simulates feedback of MR-J5(W)-G.
	Variable mapping	×	When the emulate function is valid, the default mapping of MR-J5(W)-G is used. For the default mapping, refer to MR-J5(W)-G manuals. The following functions cannot be used with the virtual servo amplifier function. • External input signal • Synchronous encoder via servo amplifier • Optional data monitor
SLMP-related	Response data simulation	×	SLMP communication simulation is not supported.
Servo alarm-related		×	Servo alarms cannot be detected.
Motor type	Standard rotary type	○	Operates as a rotary servo motor (resolution: 4194304). A speed unit of the servo amplifier is fixed to 0.01 r/min.
Operation mode	csp	○	Position control operation by csp is available.
	csv	○	Velocity control operation by csv is available.
	cst	○	Torque control operation by cst is available.
	hm	○	Homing by hm is available. The homing method supports the driver homing method (data set method) only.
	ct	○	Continuous operation to torque control by ct is available. (The operation is the same as cst.)
External signal-related	FLS	○	• Only input via the controller is available. Stop operation of the device station when the FLS is OFF is not simulated. The command from the master station stops by FLS detection, following which the servo motor stops as well. • In the case of input via the servo amplifier, the input value is always OFF.
	RLS	○	• Only input via the controller is available. Stop operation of the device station when the RLS is OFF is not simulated. The command from the master station stops by RLS detection, following which the servo motor stops as well. • In the case of input via the servo amplifier, the input value is always OFF.

[Servo parameter specification]

No.	Servo parameter	Description
PA03.0	Absolute position detection system selection	Fixed to "1: Enabled (absolute position detection system)"
PA14	Travel direction selection	Fixed to "0".
PC07	Zero speed	50 r/min
PC29	Function selection C-B	1000H X_ _ _: Torque POL reflection selection 1: Disabled
PC76	Function selection C-E	0011H _ _ X _: ZSP disabled selection at control switching 1: Disabled (control switching is performed regardless of the range of ZSP)
PT07	Home position shift distance	0
PT45	Homing method	37 (data set type)

Setting method

Set "[Pr.101] Virtual servo amplifier setting" as follows.

n: Axis No. - 1

Storage item		Storage details	Buffer memory address
[Pr.101]	Virtual servo amplifier setting	Sets whether or not to use the axis as a virtual servo amplifier axis. The value is imported when the power is turned ON. 0: Use for the actual servo amplifier 1: Use for the virtual servo amplifier*1	58022+32n

*1 When set to a value other than "1: Use for the virtual servo amplifier", the axis is used as an actual axis.

8.9 Driver Communication Function [FX5-SSC-S]

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 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*1		Remark
			Master axis	Slave axis	
SSCNETⅢ	MR-J3-_B_ MR-J3-_BS_	FX5-40SSC-S	1 axis to 2 axes	1 axis or more per master axis	The axes other than the master axis and slave axis can be used as normal axis.
		FX5-80SSC-S	1 axis to 4 axes		
SSCNETⅢ/H	MR-J4-_B_ MR-J4-_B_-RJ	FX5-40SSC-S	1 axis to 2 axes	1 axis or more per master axis	
		FX5-80SSC-S	1 axis to 4 axes		

*1 When the slave axis is not allocated for the master axis, only the master axis operates independently.

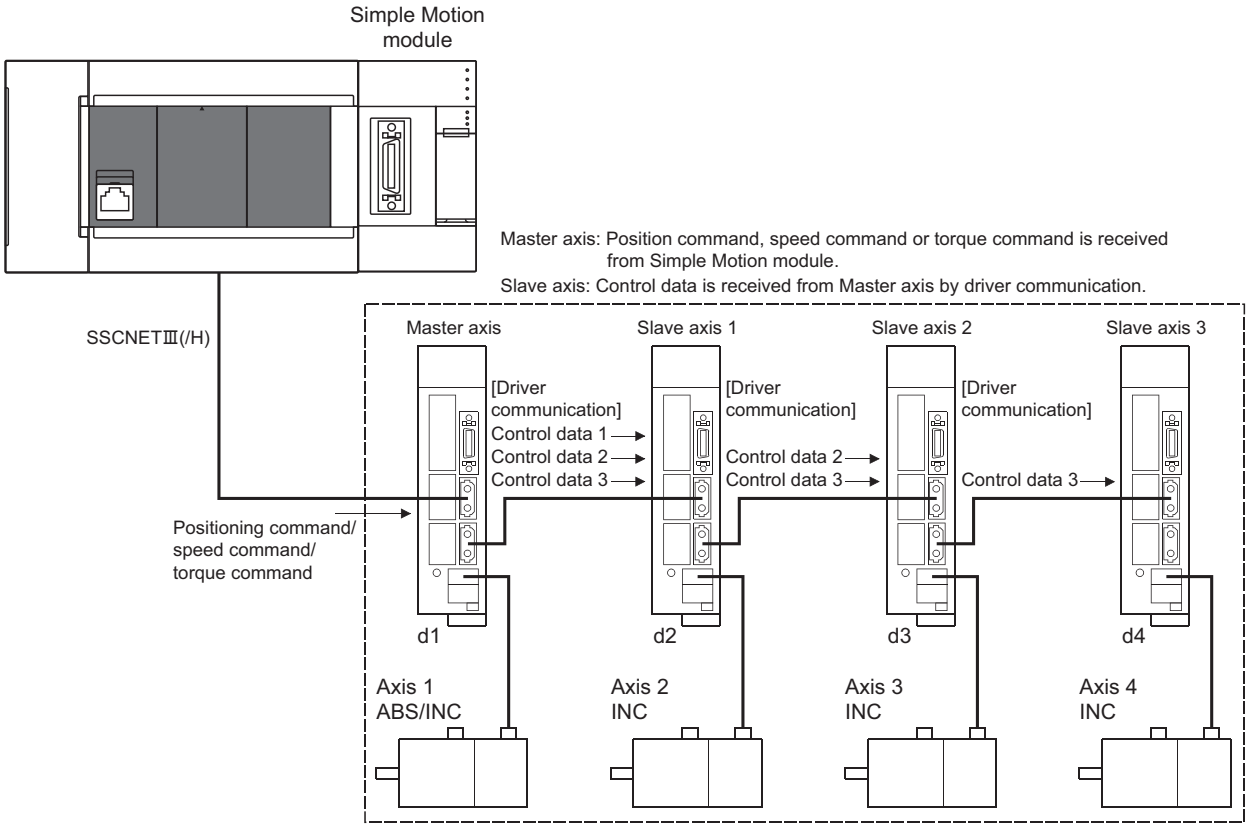
Control details

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 352 I/O signals of slave axis and ☞ Page 352 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 (used in incremental system)" in "Absolute position detection system (PA03)" 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.

■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	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 for details.)

[MR-J3-_B_/MR-J3-_BS_ 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_ 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 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.

Point

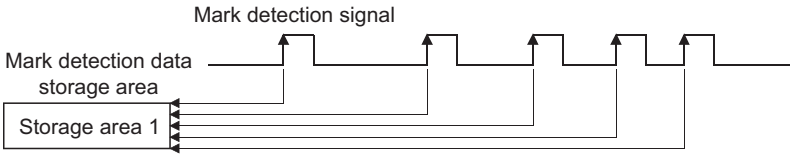
- The servo parameters are transmitted from Simple Motion module to servo amplifier after power supply ON or reset of the CPU module. Execute flash ROM writing of Simple Motion module after writing the servo parameter to buffer memory, and then turn the power supply ON or reset the CPU module.
- The 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)".

8.10 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

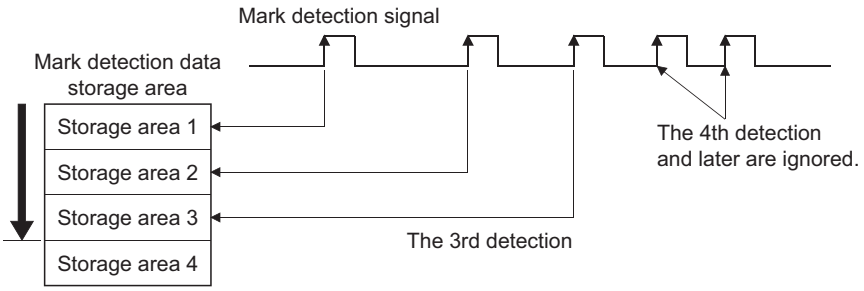
The latched data is always stored to the first of mark detection data storage area at mark detection.



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.

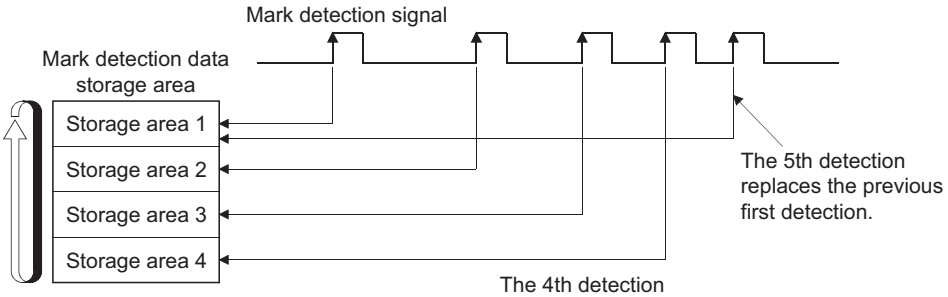
Ex.
Number of detections: 3



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



Point

[FX5-SSC-G]
For the software version 1.004 or later, a link device can be used for the mark detection signal.

Performance specifications

■Performance specifications [FX5-SSC-S]

Item	FX5-40SSC-S	FX5-80SSC-S
Number of mark detection settings	Up to 16	
Input signal	Axis 1 to Axis 4 External input signal (DI1 to DI4)	Axis 1 to Axis 8 External input signal (DI1 to DI4)
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	13 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), Command position value of command generation axis, Position value per cycle of command generation axis)	
Number of continuous latch data storage	Up to 32	
Latched data range	Settable in the range of -2147483648 to 2147483647	

■Performance specifications [FX5-SSC-G]

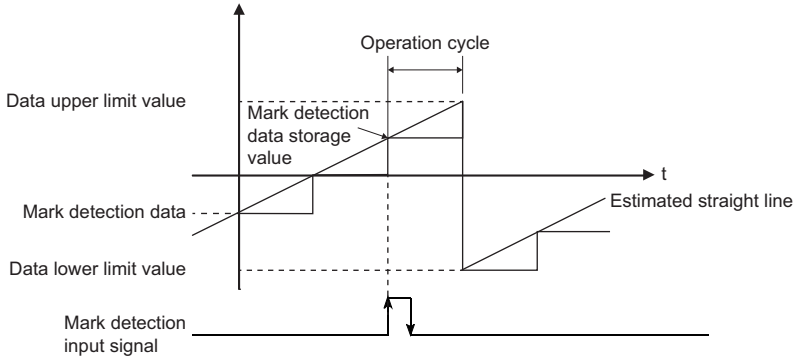
Item	FX5-40SSC-G	FX5-80SSC-G
Number of mark detection settings	Up to 16	
Input signal	External input signal DOG of the servo amplifier, TPR1 (Touch probe1), Link device	
Input signal detection direction	When using the DOG signal of the servo amplifier: Detection at leading edge/detection at trailing edge are selectable in "b4: External command/switching signal" of "[Pr.22] Input signal logic selection" When using the TPR1 signal of the servo amplifier and link device: Detection at leading edge/detection at trailing edge are selectable in "[Pr.811] Mark detection signal detection direction setting"	
Input signal compensation time	Correctable within the range of -32768 to 32767 μs	
Detection accuracy	When using the DOG signal: operation cycle When using the TPR1 signal: high-accuracy When using the link device: operation cycle	
Latch data	13 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), Command position value of command generation axis, Position value per cycle of command generation axis)	
Number of continuous latch data storage	Up to 32	
Latched data range	Settable in the range of -2147483648 to 2147483647	

■Calculation by estimation [FX5-SSC-G]

The mark detection value during operation cycle interval is calculated by estimation. The value calculated by estimation when the mark detection input signal is inputted is stored in the buffer memory as the mark detection data. The value is calculated as shown in the figure below.

• When using the DOG signal of the servo amplifier

The detection timing is the operation cycle.



• When using the TPR1 signal of the servo amplifier

High-accurately estimated calculation using signal detection time is performed by using the following signals for touch probe function of MR-J5(W)-G series.

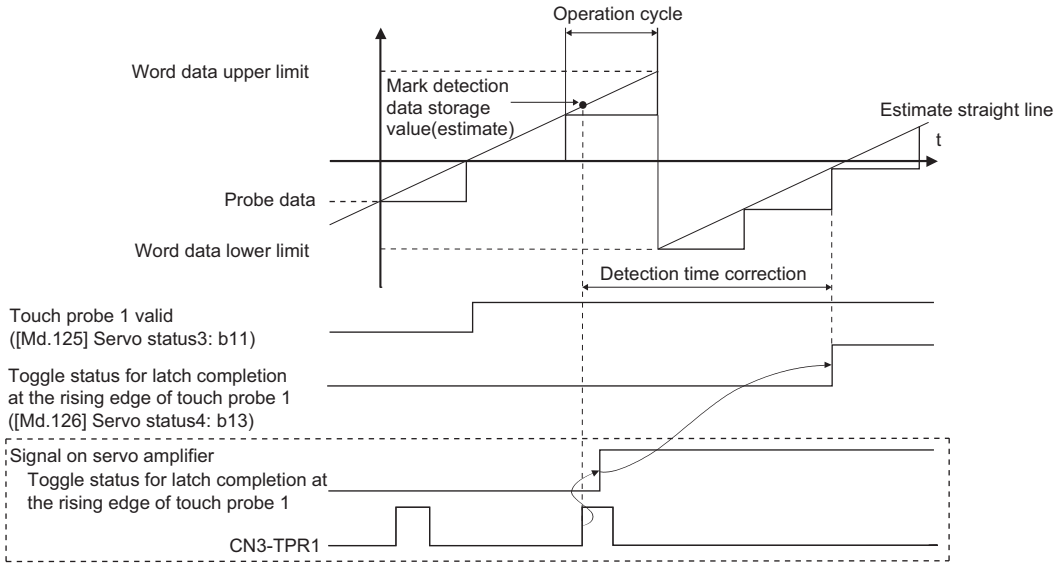
For the signal details and the accuracy of signal detection time, refer to the manual of the servo amplifier.

For MR-J5(W)-G: 📖MR-J5 User's Manual (Function)

[Touch probe status (Obj. 60B9h)]

Bit6: Toggle status for latch completion at the rising edge of touch probe 1

Bit7: Toggle status for latch completion at the falling edge of touch probe 1



8

Point

- Confirm that TPR1 is assigned to CN3 on the servo parameter of the MR-J5(W)-G series before it is connected.[*1]
  And also, in case of using multi-axis servo amplifier, confirm that the axis using TPR1 is selected. If TPR1 is not assigned to CN3, the status is to be touch probe 1 enabled but the signal cannot be detected.
  For the details of the servo parameter setting, refer to "4.4 Touch probe [G]" in the following manual.
  For MR-J5(W)-G: MR-J5 User's Manual (Function)
- There are restrictions to use the touch probe function of the MR-J5(W)-G series on the model and its version. One example of supported version is shown below. For details and the other servo amplifier models not shown below, refer to the manual of the servo amplifier to be used.
  MR-J5-_G[*2]: C0 or later and the servo amplifier manufactured in June, 2021 or later[*3]
  MR-J5-_G_-RJ[*2]: B6 or later
  MR-J5W2-_G/MR-J5W3-_G[*4]: B6 or later
  When using TPR1 as the signal, if the servo amplifier that the function is unsupported is connected, the error "PDO mapping setting error" (error code: 1C48H) will occur and the servo amplifier cannot be connected.
- To detect TPR1 on the Motion module, the touch probe function on the servo amplifier side is needed to be enabled after the connection. Even if operating the cycle for enabling function and the TPR1 input before enabling function, as the signal for mark detection input signal is ignored. Therefore, the Motion module automatically executes enabling by using SLMP after the servo amplifier using TPR1 is connected. If the function cannot be enabled, the warning "Mark detection - Driver touch probe function invalid" (warning: 0D3FH) will occur and the mark detection setting specifying TPR1 of the axis which has error is disabled.
  Whether the servo amplifier is in touch probe enabled function or not can be checked with the following monitor.
  "[Md.125] Servo status 3", "b11: Touch probe 1 enabled"
- About two communication cycles of delay will occur until "[Md.800] Number of mark detection" or "[Md.801] Mark detection data storage area (1 to 32)" is updated from the servo amplifier TPR1 input.
- The status of TPR1 for the servo amplifier can be checked by one of these methods below.
  - Specify "Touch probe status" by optional data monitor[*5]
  - Check Toggle status for latch completion at the rising/falling edge of touch probe 1 received from the servo amplifier[*6]
- If TPR1 is used for the axis that is not set in the axis setting or the axis set as virtual servo amplifier, the warning "Outside mark detection signal setting range" (warning code: 0D36H) will occur and the mark detection will be invalid.

*1 Set the related servo parameter in TPR1. Even if the related parameter is set in TPR2 or later, the Motion module does not detect the signal.

*2 When the single axis is connected to the Motion module, the following CiA402 object will be automatically set to the PDO mapping to use the touch probe function. For the details of the each object, refer to the manual of the servo amplifier.
For MR-J5(W)-G: MR-J5-G/MR-J5W-G User's Manual (Object Dictionary)
- Touch probe status (Obj. 60B9H)
- Touch probe time stamp 1 positive value (Obj. 60D1H)
- Touch probe time stamp 1 negative value (Obj. 60D2H)

*3 For the manufactured date of the MR-J5-_G, refer to the following manual.
MR-J5-G/MR-J5W-G User's Manual (Introduction)

*4 When connecting the multi-axis servo amplifier such as MR-J5W_-_G/MR-J5W3-_G, the CiA402 object of the touch probe function is not automatically set in the PDO mapping. When using TPR1 of the multi-axis servo amplifier as the input signal for mark detection, it is necessary to assign TPR1 in CN3 before it is connected and to select if TPR1 is used in axis A, B or C. After that, it can be used by specifying CiA402 object for the touch probe optional data monitor function of the axis selecting TPR1 in the Motion module. However, if Touch probe time stamp 1 positive value (Obj. 60D1H) or Touch probe time stamp 1 negative value (Obj. 60D2H) is not set in the optional data monitor, the detection accuracy is operation cycle.

Parameter name	Setting value
[Pr.91] Optional data monitor: Data type setting 1	Touch probe status (Obj. 60B9H)
[Pr.93] Optional data monitor: Data type setting 3	When "0: Rising detection" is set in "[Pr.811] Mark detection signal detection direction setting": Touch probe time stamp 1 positive value (Obj. 60D1H) When "1: Falling detection" is set in "[Pr.811] Mark detection signal detection direction setting": Touch probe time stamp 1 negative value (Obj. 60D2H)
[Pr.591] Optional data monitor: Data type expansion setting 1	0010H
[Pr.593] Optional data monitor: Data type expansion setting 3	0020H

*5 When specifying optional data monitor1

Parameter name	Setting value
[Pr.91] Optional data monitor: Data type setting 1	Touch probe status (Obj. 60B9H)
[Pr.591] Optional data monitor: Data type expansion setting 1	0010H

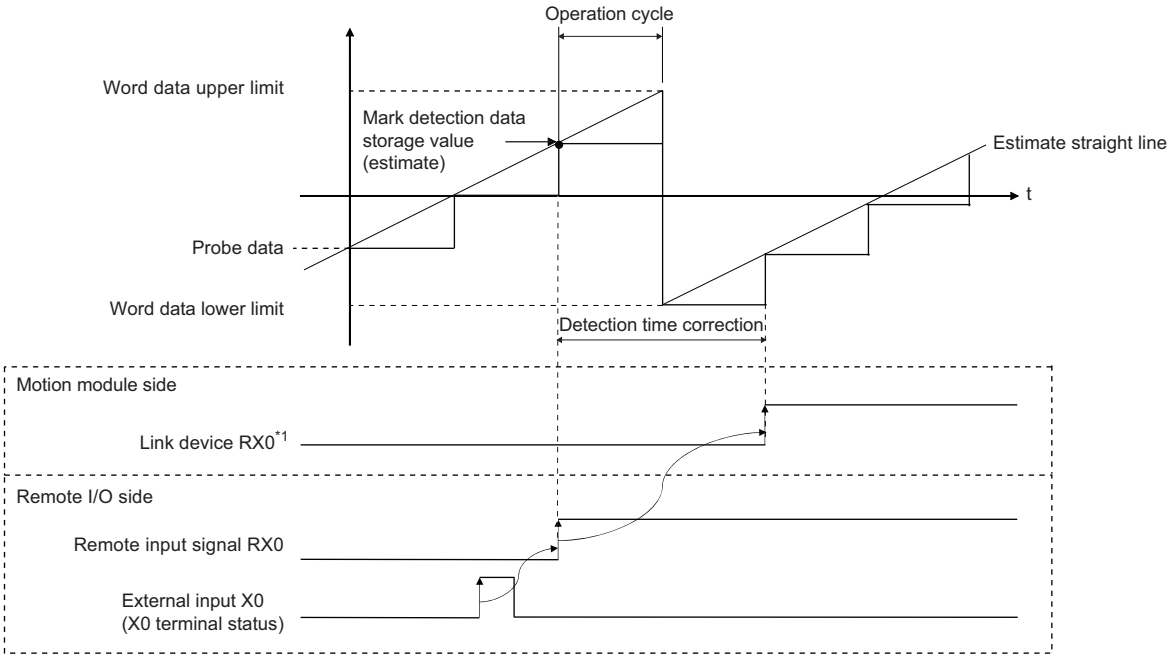
*6 Can be checked by referring to the corresponding bit of "[Md.126] Servo status4".
- b13: Toggle status for latch completion at the rising edge of touch probe 1
- b14: Toggle status for latch completion at the falling edge of touch probe 1

• When using a link device

Point

The signal response time varies depending on the input response time setting value of the remote I/O. Therefore, the signal delay caused by the input response time setting value should be corrected by "[Pr.801] Mark detection signal compensation time".

The detection timing is the operation cycle.



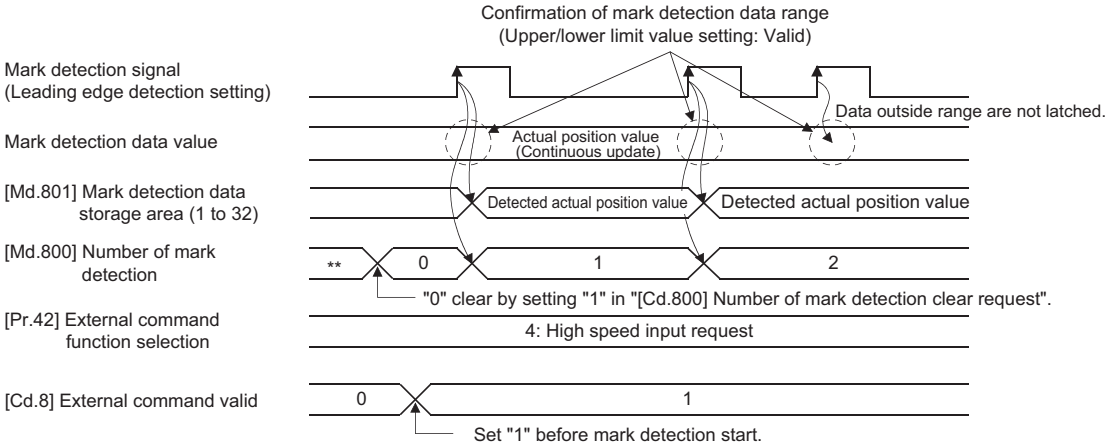
*1 When using RX0 as the link device.

Operation for mark detection function

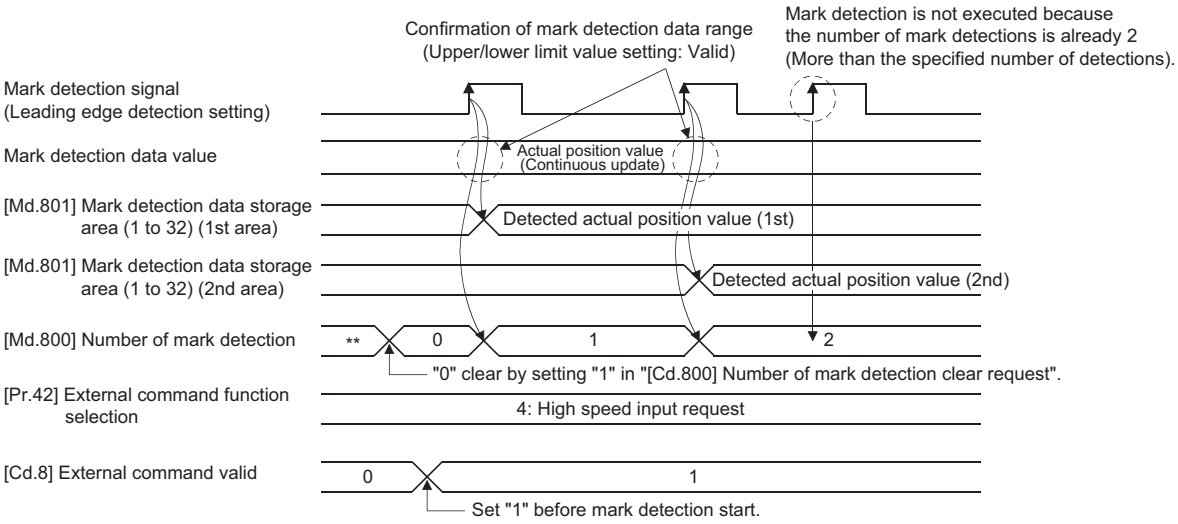
Operations done at mark detection are shown below.

- 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)



8

How to use mark detection function

The following shows an example for mark detection using the signals shown below.

- External command signal (DI2) of axis 2 [FX5-SSC-S]
- DOG signal of MR-J5(W)-G [FX5-SSC-G]

The mark detection target is axis 1 actual position value, and the all range is detected in continuous detection mode.

1. [FX5-SSC-S]

Allocate the input signal (DI2) to the external command signal of axis 2, and set the "high speed input request" for mark detection.

[FX5-SSC-G]

Allocate the input signal to the external command signal of axis 2, and set the "high speed input request" for mark detection.

n: Axis No. - 1

Setting item		Setting value	Setting details/setting value	Buffer memory address
[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)
[Pr.95]	External command signal selection	→	Set the following to the external command signal of axis 2. • 2: D12 [FX5-SSC-S] • 102: DOG signal of axis 2 [FX5-SSC-G]	219 (69+150n)

2. 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	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

3. Turn the power supply OFF or reset of the CPU module to validate the setting parameters.

4. 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
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
54960 to 55039	Mark detection monitor data [Md.800], [Md.801]	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

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	Set the external input signal (high speed input request) for mark detection. 0: Invalid 1 to 4: External command signal on axis 1 to axis 4 (4-axis module) 1 to 8: External command signal on axis 1 to axis 8 (8-axis module) 301 to 304: TPR1 of servo amplifiers on axis 1 to axis 4 (4-axis module) [FX5-SSC-G] 301 to 308: TPR1 of servo amplifiers on axis 1 to axis 8 (8-axis module) [FX5-SSC-G] 901: Link device [FX5-SSC-G] 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 "[Cd.190] PLC READY" OFF to ON	0	54001+20k
[Pr.802]	Mark detection data type	Set the target data for mark detection. 0 to 14: 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 4: Axis 1 to axis 4 (4-axis module) 1 to 8: Axis 1 to axis 8 (8-axis module) 201 to 204: Command generation axis 1 to axis 4 (4-axis module) 201 to 208: Command generation axis 1 to axis 8 (8-axis module) 801 to 804: Synchronous encoder axis 1 to axis 4 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 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, "[Cd.190] PLC READY" 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, "[Cd.190] PLC READY" 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 "[Cd.190] PLC READY" OFF to ON	0	54010+20k
[Pr.808]	Mark detection signal link device type [FX5-SSC-G]	Set the link device for use. Others: Invalid 11H: RX 12H: RY 13H: RWr 14H: RWw Fetch cycle: At power supply ON	0	54011+20k
[Pr.809]	Mark detection signal link device start No. [FX5-SSC-G]	Set the link device No. for use. Fetch cycle: At power supply ON	0	54012+20k
[Pr.810]	Mark detection signal link device bit specification [FX5-SSC-G]	Set the bit No. to be used when setting "13H: RWr", "14H: RWw" to "[Pr.808] Mark detection signal link device type". Fetch cycle: At power supply ON	0	54013+20k
[Pr.811]	Mark detection signal detection direction setting [FX5-SSC-G]	Set signal detection direction in case of specifying TPR1 of the servo amplifier and the link device in "[Pr.800] Mark detection signal setting". Only bit0 setting is enabled. 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/Motion module when the power ON or the CPU module reset. Except for a part, the value is not fetched by turning the "[Cd.190] PLC READY" 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

Set the input signal for mark detection.

Setting value	Setting details
0	Invalid
1 to 4	External command signal (DI) on axis 1 to axis 4 (4-axis module)
1 to 8	External command signal (DI) on axis 1 to axis 8 (8-axis module)
301 to 304 [FX5-SSC-G]	TPR1 of servo amplifiers on axis 1 to axis 4 (4-axis module)
301 to 308 [FX5-SSC-G]	TPR1 of servo amplifiers on axis 1 to axis 8 (8-axis module)
901 [FX5-SSC-G]	Link device

If a value other than the above is set, the warning "Outside mark detection signal setting range" (warning code: 0936H [FX5-SSC-S], or warning code: 0D36H [FX5-SSC-G]) occurs and the target mark detection is not available.

[FX5-SSC-S]

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".

[FX5-SSC-G]

- When executing mark detection by the external signal command, Set "[Pr.42] External command function selection" to "4: High speed input request", "[Cd.8] External command valid" to "1: Validates an external command".
- When executing mark detection by TPR1 of the servo amplifier, assign TPR1 to CN3 of the corresponding servo amplifier.
- When using a link device, specify the target link device in [Pr.808] to [Pr.811].

Point

[FX5-SSC-G]

When setting this parameter and executing mark detection by the external command, also set "[Pr.95] External command signal selection".

- Setting example

  When "101: DOG signal of axis 1" is set in "[Pr.95] External command signal selection" and "8: External command signal of axis 8 (DI)" is set in "[Pr.800] Mark detection signal setting" of axis 8, mark detection is performed with the DOG signal of the servo amplifier connected to axis 1.

When the DOG signal is selected for use as the external command signal in "[Pr.95] External command signal selection", the accuracy of the mark detection changes to the accuracy of the operation cycle.

When setting this parameter and executing mark detection by TPR1 of the servo amplifier, also set "[Pr.811] Mark detection signal detection direction setting". For the accuracy when using TPR1 of the servo amplifier, refer to the manual for servo amplifier.

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

[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 14". 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)
13	Command position value of command generation axis
14	Position value per cycle of command generation axis
-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 [FX5-SSC-S], or warning code: 0D37H [FX5-SSC-G]) 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	4-axis module	8-axis module
0	Command position value	10^{-1} [μm], 10^{-5} [inch], 10^{-5} [degree], [pulse]	1 to 4	1 to 8
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	801 to 804
7	Synchronous encoder axis position value per cycle			
8	Position value after composite main shaft gear	Main input axis position unit	1 to 4	1 to 8
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			
13	Command position value of command generation axis	Command generation axis position unit	201 to 204	201 to 208
14	Position value per cycle of command generation axis			

*1 The same value as "11: Cam axis position value per cycle".

If a value other than the above is set, the warning "Outside mark detection data axis No. setting range" (warning code: 0938H [FX5-SSC-S], or warning code: 0D38H [FX5-SSC-G]) 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 [FX5-SSC-S], or warning code: 0D39H [FX5-SSC-G]) occurs and the target mark detection is not available.

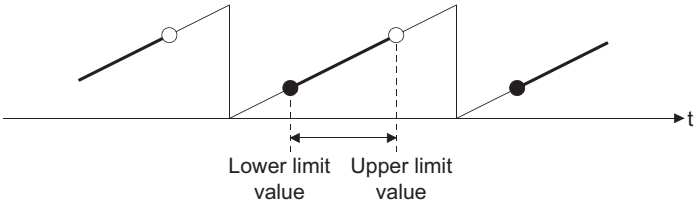
[Pr.805] Latch data range upper limit value, [Pr.806] Latch data range lower limit value

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.

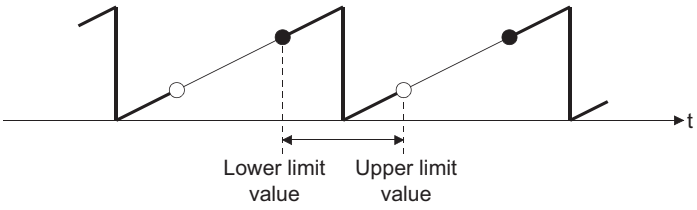
• Upper limit value > Lower limit value

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 [FX5-SSC-G]

Set the link device type for use.

Setting value	Setting details
11H	RX
12H	RY
13H	RWr
14H	RWw

Values other than the above are invalid.

[Pr.809] Mark detection signal link device start No. [FX5-SSC-G]

Set the link device No. for use.
RX/RY: 0 to 1FFFH
RWr/RWw: 0 to 3FFH
When a link device No. outside the range is set, the warning "Mark detection link device start No. specification" (warning code: 0D2EH) occurs and the target mark detection cannot be used.

[Pr.810] Mark detection signal link device bit specification [FX5-SSC-G]

Set the link device No. to be used when setting "13H: RWr" and "14H: RWw" for "[Pr.808] Mark detection signal link device type".
When a value outside the range is set, the warning "Mark detection link device bit specification" (warning code: 0D2FH) occurs and the target mark detection cannot be used.

[Pr.811] Mark detection signal detection direction setting [FX5-SSC-G]

Set signal detection direction in case of specifying TPR1 of the servo amplifier and the link device in "[Pr.811] Mark detection signal detection direction setting". Only bit0 setting is enabled.
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.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.

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 mark detection is performed when not in synchronous control and "8: Position value after composite main shaft gear" to "12: Cam axis position value per cycle (Real position)" is selected in "[Pr.802] Mark detection data type", the latched value may be different from the actual outputted monitor data.
- 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.

[FX5-SSC-G]

- If the operation cycle over occurs before or after signal input at the mark detection, the accuracy of estimate calculation may be lowered.
- When using TPR1 of the servo amplifier as mark detection input, do not turn ON and Off multiple times in one communication cycle to the signal input in the servo amplifier. By doing so, the signal cannot be detected correctly.

8.11 Optional Data Monitor Function

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 [FX5-SSC-S]

○: 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)
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]		—	○	
16	Settling time	[ms]		—	○	
17	Overshoot amount	[pulse]		—	○	
18	Internal temperature of encoder	[℃]		—	○	
20	Position feedback	[pulse]	2 words	○	○	
21	Encoder position within one revolution	[pulse]		○	○	
22	Selected droop pulse	[pulse]		○	○	
23	Unit total power consumption	[Wh]		—	○	
24	Load-side encoder information 1	[pulse]		—	○*2	
25	Load-side encoder information 2	—		—	○*2	
26	Z-phase counter	[pulse]		—	○*3	
27	Servo motor side/load-side position deviation	[pulse]		—	○*4	
28	Servo motor side/load-side speed deviation	[× 0.01 r/min]		—	○*4	
30	Unit power consumption (2 words)	[Wh]		—	○	
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 It can be monitored when using the synchronous encoder via servo amplifier.

*3 It can be monitored when using the linear servo motors.

*4 It can be monitored when using the fully closed loop control.

Refer to each servo amplifier instruction manual for details of the data monitored.

■Specifiable data [FX5-SSC-G]

Set the index of the CiA402 object of the device.

Ex.

When monitoring the effective load ratio, set "2B09H".

■List of parameters and data

The parameters and data used in the optional data monitor function is shown below.

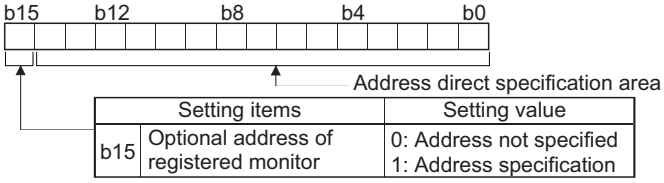
• Extended parameter

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 371 Data that can be set [FX5-SSC-S]) • 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
[Pr.591]	Optional data monitor: Data type expansion setting 1 [FX5-SSC-G]	Set the data type monitored in optional data monitor function.	92+150n
[Pr.592]	Optional data monitor: Data type expansion setting 2 [FX5-SSC-G]		93+150n
[Pr.593]	Optional data monitor: Data type expansion setting 3 [FX5-SSC-G]		94+150n
[Pr.594]	Optional data monitor: Data type expansion setting 4 [FX5-SSC-G]		95+150n

[When specifying the optional address of registered monitor] [FX5-SSC-S]

Switches to direct specification of the registered monitor address for each optional data monitor data type.



Setting items		Setting value
b15	Optional address of registered monitor	0: Address not specified 1: Address specification

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

[FX5-SSC-S]

- 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 371 Data that can be set [FX5-SSC-S] 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 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".

Point

[FX5-SSC-G]

- Registered monitor addresses for the optional data monitor are imported after the power is turned ON or the CPU module is reset.
- Set data types that use 2 points in either "[Pr.91] Optional data monitor: Data type setting 1" and "[Pr.591] Optional data monitor: Data type expansion setting 1" or "[Pr.93] Optional data monitor: Data type setting 3" and "[Pr.593] Optional data monitor: Data type expansion setting 3". The setting values of both "[Pr.92] Optional data monitor: Data type setting 2" and "[Pr.592] Optional data monitor: Data type expansion setting 2" and [Pr.94] Optional data monitor: Data type setting 4" and "[Pr.594] Optional data monitor: Data type expansion setting 4"are ignored.
- Confirming the correctness of the object size cannot be performed on the Motion module. As such, the monitor output value will not be stored correctly when the set object size and the actual object size are different. Exercise caution when directly specifying from the engineering tool or setting the optional data monitor from the buffer memory.

(1) Effective load ratio (2B09H, size 16 bit)
(2) Servo motor speed (2B02H, size 32 bit)
(3) Regenerative load ratio (2B08H, size 16 bit)

When the items above are incorrectly set to the following:
(1) Effective load ratio (2B09H, size 32 bit)
(2) Servo motor speed (2B02H, size 16 bit)
(3) Regenerative load ratio (2B08H, size 16 bit)

The actual object size is 16 bit, so the monitor is only output to "[Md.109] Regenerative load ratio/Optional data monitor output 1".

Pr.91	2B09H	Pr.591	0020H	Md.109	The actual load ratio (2B09H) is output to the monitor
Pr.92	2B09H	Pr.592	0020H	Md.110	The servo motor speed (2B02H) is output to the monitor
Pr.93	2B02H	Pr.593	0010H	Md.111	The servo motor speed (2B02H) is output to the monitor
Pr.94	2B08H	Pr.594	0010H	Md.112	The regenerative load ratio (2B08H) is output to the monitor

The actual object size is 32 bit, so the monitor is only output to "[Md.110] Effective load torque/Optional data monitor output 2" and "[Md.111] Peak torque ratio/Optional data monitor output 3".

- When a value other than 08H, 10H, 20H, or 40H is set in "[Pr.591] Optional data monitor: Data type expansion setting 1" to "[Pr.594] Optional data monitor: Data type expansion setting 4", the value is treated as being 20H.
- When a CiA402 object that cannot be monitored is set, the error "PDO mapping setting error" (error code: 1C48H) occurs and communication with that axis is not performed.

• Axis monitor data

n: Axis No. - 1

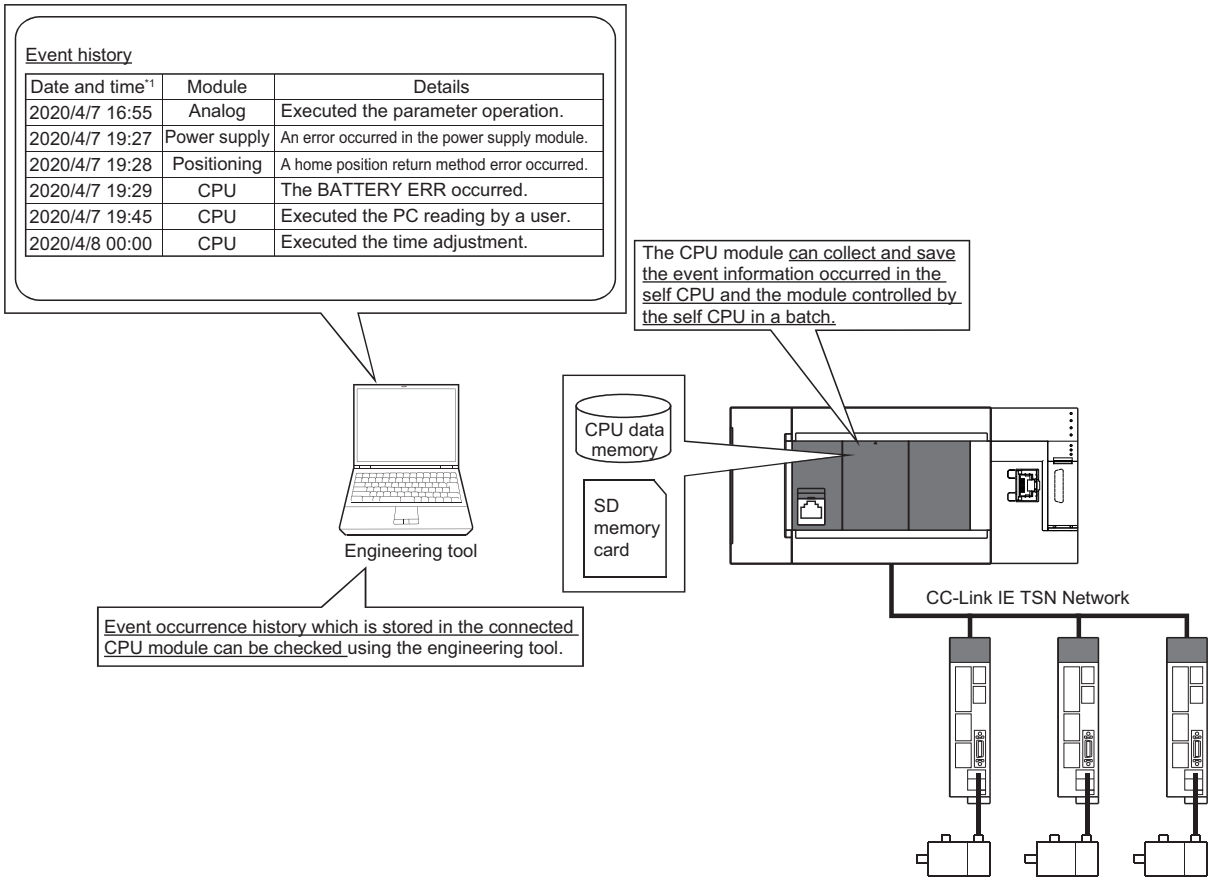
Storage item		Storage details/storage value		Buffer memory address
		FX5-SSC-S	FX5-SSC-G	
[Md.109]	Regenerative load ratio/ Optional data monitor output 1	• The content set in "[Pr.91] Optional data monitor: Data type setting 1" is stored at optional data monitor data type setting. • The regenerative load ratio is stored when nothing is set.	• The content set in "[Pr.91] Optional data monitor: Data type setting 1" and "[Pr.591] Optional data monitor: Data type expansion 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.	• The content set in "[Pr.92] Optional data monitor: Data type setting 2" and "[Pr.592] Optional data monitor: Data type expansion 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.	• The content set in "[Pr.93] Optional data monitor: Data type setting 3" and "[Pr.593] Optional data monitor: Data type expansion 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.	• The content set in "[Pr.94] Optional data monitor: Data type setting 4" and "[Pr.594] Optional data monitor: Data type expansion 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].

8.12 Event History Function [FX5-SSC-G]

The "Event History Function" is a function that saves error information and operations performed to the module as events on the CPU module or SD memory card. The saved event information can be displayed in the engineering tool, allowing the occurrence history to be checked in chronological order.
In addition, error detail information can be checked by referencing "Added Information" in the event history.



*1 Displays a value set by the clock function of the CPU module.

Events that occur on the Motion module

The items saved in the event history are shown below.
For events related to the CC-Link IE TSN network, refer to "Event List" in the following manual.
MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN)

Event type	Event category	Details	Event item	Event code
System	Error	An error was detected on the Motion module.	Major error	03C00 to 03FFF
			Moderate error	02000 to 03BFF
			Minor error	01000 to 01FFF
	Warning	A warning was detected on the Motion module.	Warning	00800 to 00FFF

8.13 Connect/Disconnect Function of SSCNET Communication [FX5-SSC-S]

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

Monitor 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

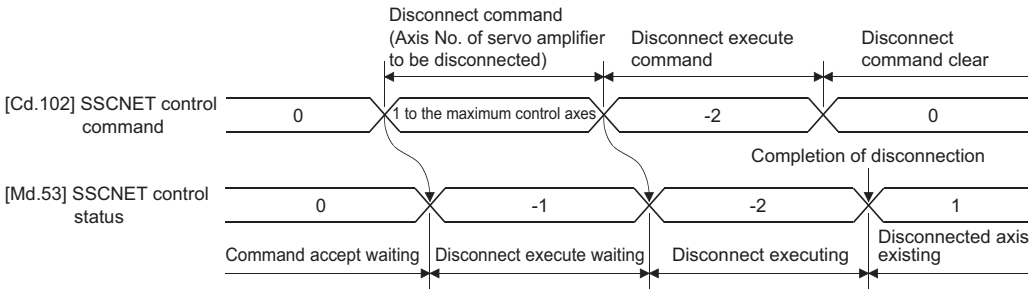
Monitor item		Monitor value	Storage details	Buffer memory address
[Md.53]	SSCNET control status	→	The connect/disconnect status of SSCNET communication is stored. 1: Disconnected axis existing 0: Command accept waiting -1: Execute waiting -2: Executing	4233

Procedure to connect/disconnect

Procedure to connect/disconnect at the exchange of servo amplifiers or SSCNETⅢ cables is shown below.

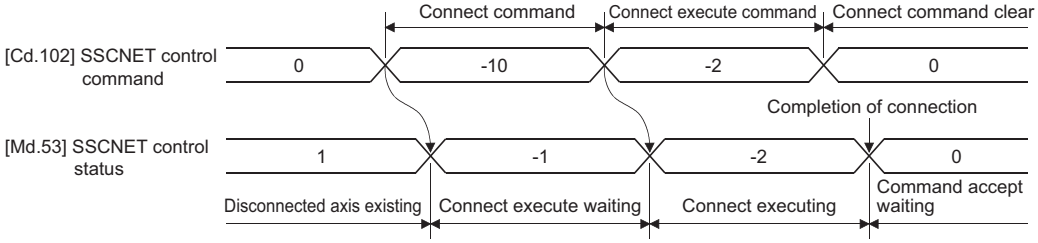
■Procedure to disconnect

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

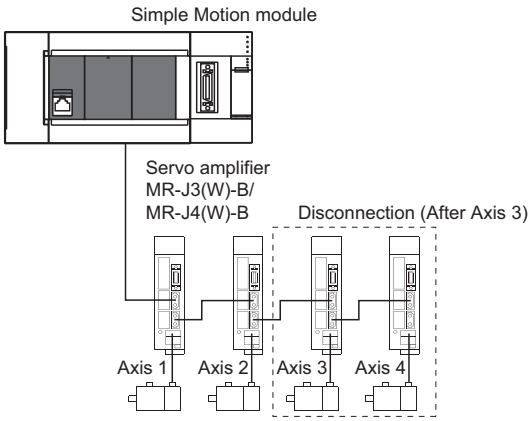
When "-1: Execute waiting" is set in "[Md.53] SSCNET control status", the command of execute waiting can be canceled if "0: No command" is set in "[Cd.102] SSCNET control command".

Program

The following shows the program example to connect/disconnect the servo amplifiers connected after Axis 3.

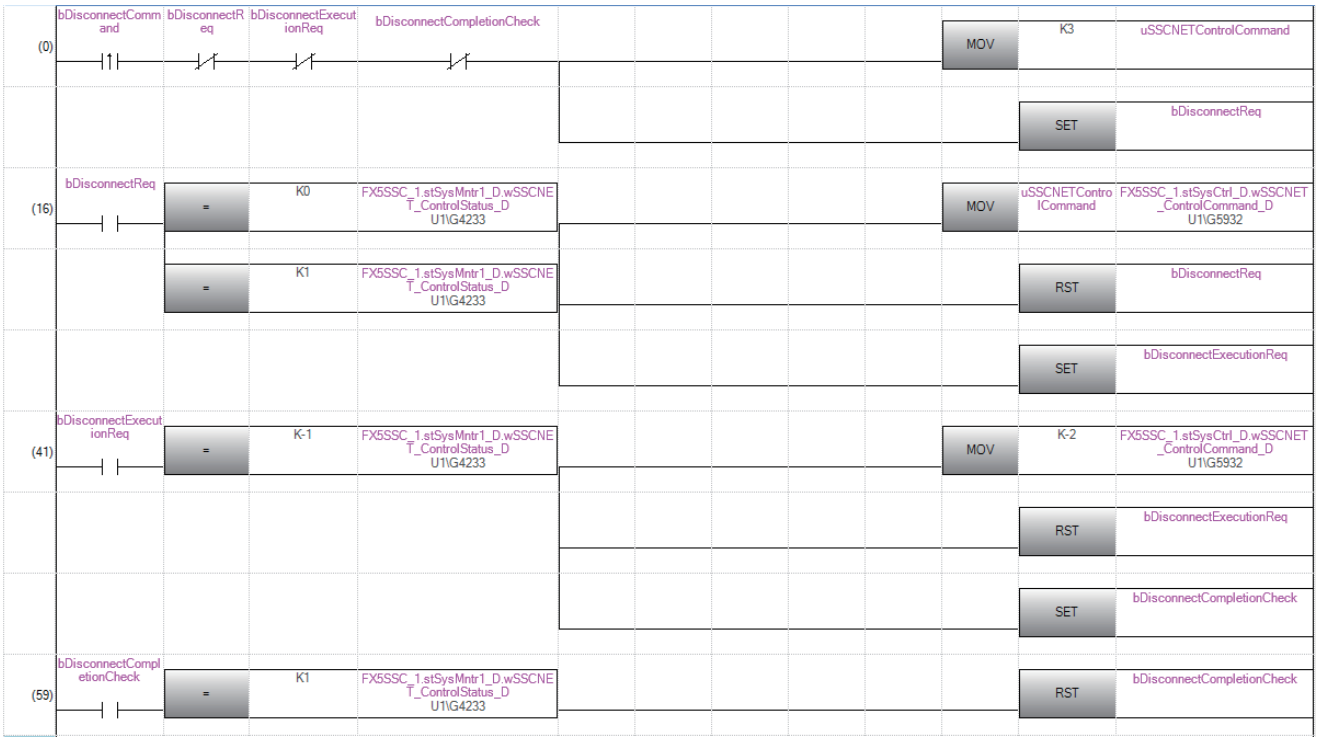
Disconnect procedure	Connect procedure
Turn OFF the servo amplifier's power supply after checking the LED display "AA" of servo amplifier by turning bDisconnectCommand OFF to ON.	Resume operation of servo amplifier after checking the "[Md.26] Axis operation status" of the connected servo amplifier by turning bConnectCommand from OFF to ON.

■System configuration

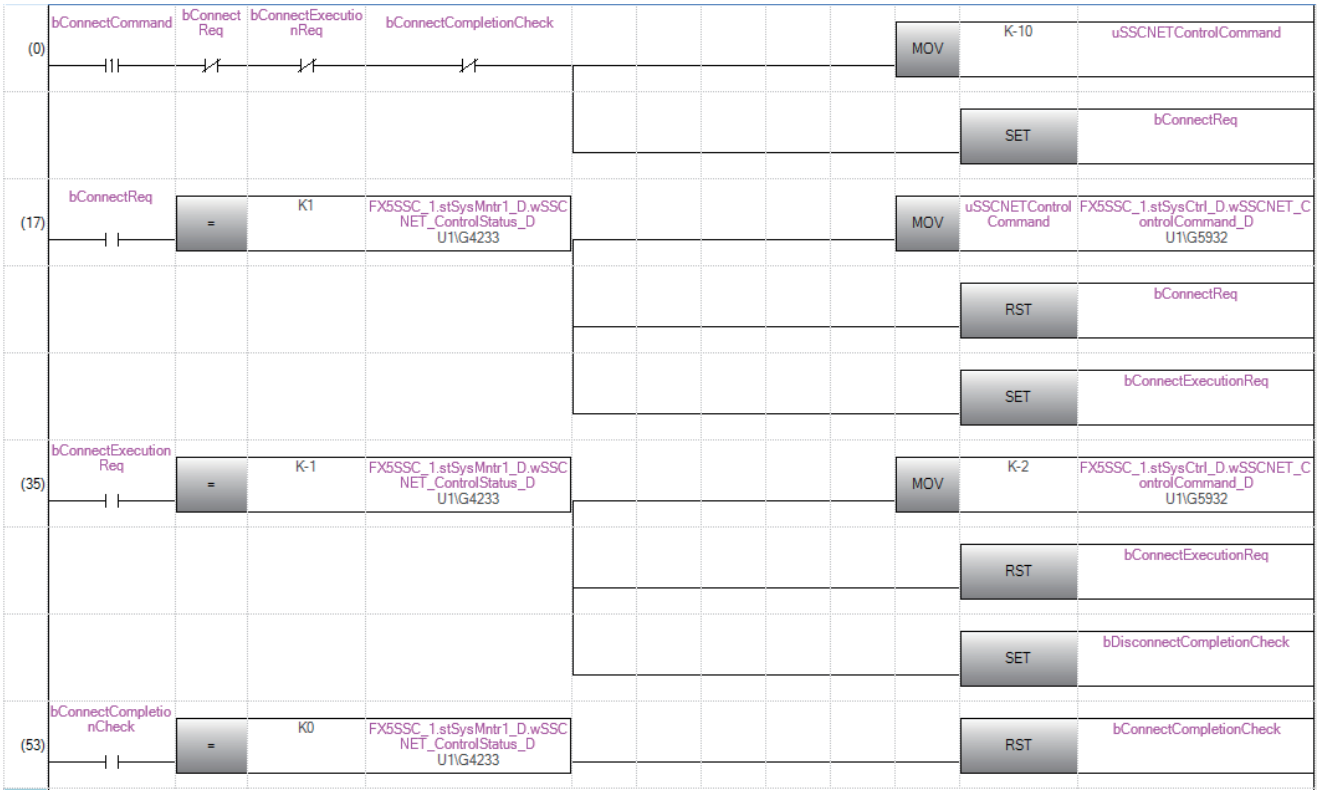


Program example

- Disconnect operation



• Connect operation



Classification	Label name	Description
Module label	FX5SSC_1.stSysMntr1_D.wSSCNET_ControlStatus_D	Axis 1 SSCNET control status
	FX5SSC_1.stSysCtrl_D.wSSCNET_ControlCommand_D	Axis 1 SSCNET control command
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 are for local labels.	

	Label Name	Data Type		Class
1	bDisconnectCommand	Bit	...	VAR
2	bDisconnectReq	Bit	...	VAR
3	bDisconnectExecutionReq	Bit	...	VAR
4	bDisconnectCompletionCheck	Bit	...	VAR
5	bConnectCommand	Bit	...	VAR
6	bConnectReq	Bit	...	VAR
7	bConnectExecutionReq	Bit	...	VAR
8	bConnectCompletionCheck	Bit	...	VAR
9	uSSCNETControlCommand	Word [Signed]	...	VAR
10			...	

8.14 Servo Transient Transmission Function [FX5-SSC-G]

The "Servo Transient Transmission Function" is a function that reads and writes objects of the device using transient transmission. Transient transmission is suitable for data that does not require reading and writing in a fixed cycle and data with a large size.

For objects that can be read and written using transient transmission, refer to the manual of the device.

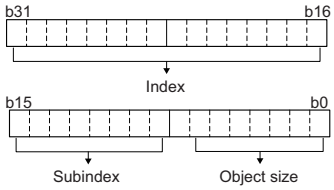
In the servo transient transmission function, one point can be set per axis, and changes can be made at any time.

Control details

The following parameters and data are used in the "Servo Transient Transmission Function".

■Extension parameters

n: Axis No. -1

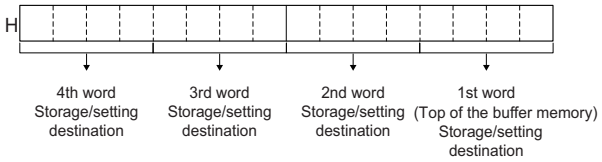
Setting item		Setting details/setting value	Default value	Buffer memory address
[Pr.512]	Optional SDO 1	Specifies the object that will perform servo transient transmission.  At reading: Reads the object using SDO Upload of the SLMP. The writing object size [byte] is ignored. And the size of the object that is read will be stored to the request object of optional SDO transfer status. At writing: Writes the object using Download command of the SLMP. The writing object size [byte] can be set to "0x01, 0x02, 0x04, or 0x08" along with the object being written. When the object size is outside the range, the size is considered to be "0x04". Example) When specifying an UNSIGNED32 object with the object index "6099H" and the sub-index "02H", specify as shown below. Reading: "60990200H" (default size) Writing: "6099204H" (size: 4 bytes) Fetch cycle: At request (Servo transient request)	0	128+150n 129+150n

Point

- Servo transient processing operates in the series of request sent → response received which is performed in order of the setting numbers.
- For the specifiable indexes, sub-indexes, and object sizes, refer to the manual of the device. When an object not supported by the device is specified, error completion occurs.

■Axis control data (transient function)

n: Axis No. -1

Setting item		Setting details/setting value	Default value	Buffer memory address
[Cd.160]	Optional SDO transfer request 1	Requests the servo transient transmission. • Changes to values are not accepted during processing. • Automatically 0 cleared when processing completes. 1: Individual read request 11: Individual write request Other than above: No request Fetch cycle: Main cycle	0	57520+30n
[Cd.164]	Optional SDO transfer data 1	Stores data up to 8 bytes (4 words) from the top of the buffer memory as follows in accordance with the specified object.  Example) To write "1234H" and "5678H" from the top of the buffer memory to "Optional SDO transfer result 1", set "H56781234" in G57522. • When reading the object, the read value is stored at normal completion of communication. Values are not updated when an error occurs. • When writing the object, specify the data being written. Do not change the written contents until the processing completes. Fetch cycle: At request (Command request)	0	57522+30n 57523+30n 57524+30n 57525+30n

■Axis monitor data

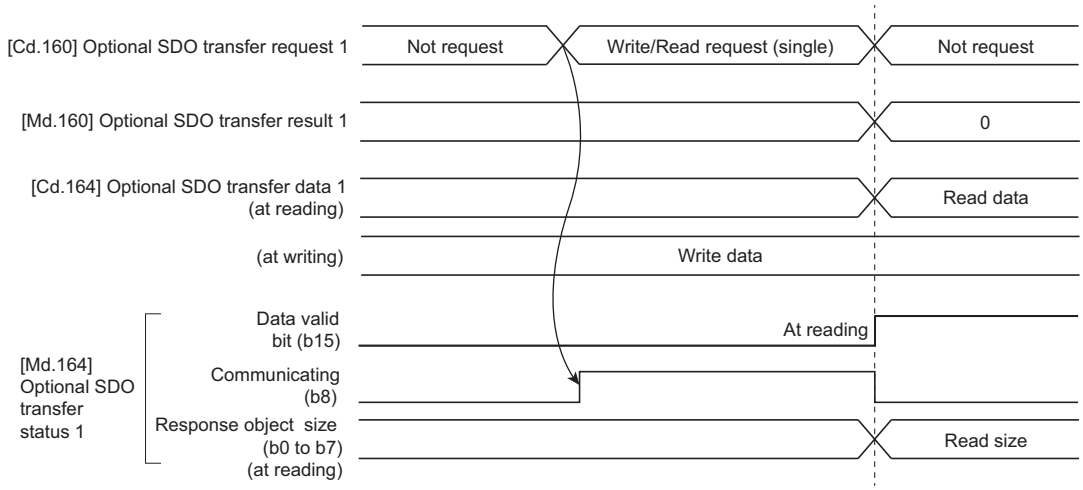
n: Axis No. -1

Setting item		Setting details/setting value	Default value	Buffer memory address
[Md.160]	Optional SDO transfer result 1	Stores the response code (SDO Abort code) received from the device in response to the transient request. For details of the code, refer to "Response Code (SDO Abort Code)" in the following manual. MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN) "0" is stored when a response code cannot be retrieved because of a communication error, etc. Refresh cycle: At request (Command request)	0	59308+100n 59309+100n
[Md.164]	Optional SDO transfer status 1	Stores the processing status of the transient request. • b7 to 0: Response object size (byte) The object size received from the device is stored when the processing completes. • b8: Communicating Turns ON during transient communication. • b9: Communication error detection Turns ON when an error is detected in transient transmission, and remains ON until the transient transmission completes normally. Error causes are shown below. - Standard errors - Error response (SDO Abort code) received from device (Example: When the index, sub-index, or size specified in "[Pr.512] Optional SDO 1" is incorrect. • b10: Not used • b15: Data enabled bit Turns ON at normal completion of the read request. Turns OFF when a read error is detected. Refresh cycle: At request (Command request)	0	59312+100n

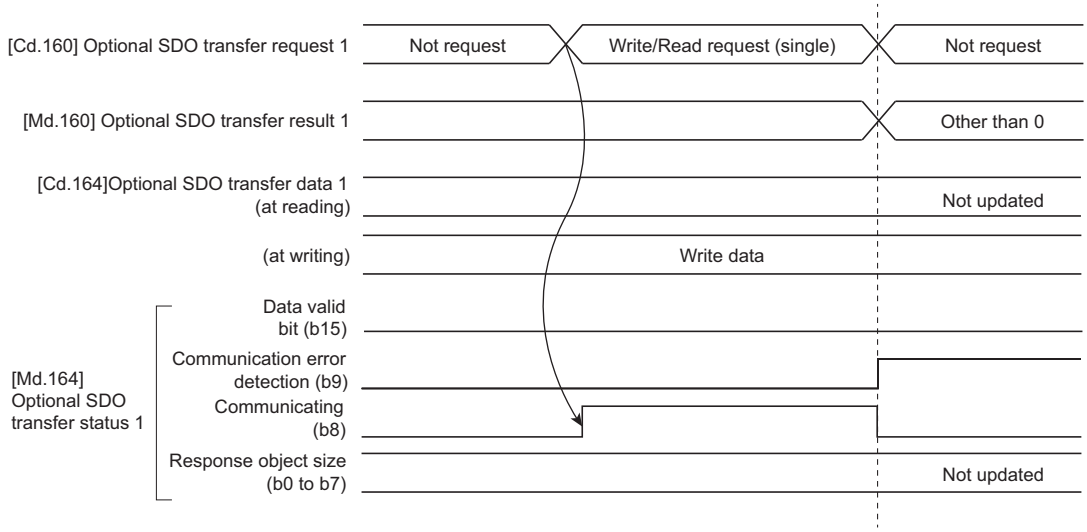
■Send/receive timing

The send/receive timing for the servo transient transmission is shown below.

- Send/receive timing for individual read/write (at normal operation)



- Send/receive timing for individual read/write (when an error occurs)



Precautions

Obtains home position data of the driver by the transient transmission function in a driver homing method. Therefore, if reading/writing objects of the device is executed with transient transmission while driver homing is being carried out, the error "ABS Reference Point Read Error" (error code: 1A75H) may occur.

8.15 Firmware update function [FX5-SSC-G]

This function is used to update firmware of the Motion module.

Procedure to update firmware

Firmware update when using GX Works3

For the method to update firmware of the Motion module, refer to "update instruction using engineering tool" in the following manual.

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

LED display at firmware version update

☐: OFF, ■: ON, ●: Fast flashing (200 ms interval), ▲: Slow flashing (1000 ms interval)

LED	Description	Remedy
POWER ■ RUN ▲ ERROR ▲	Firmware version updating	Turn ON→ OFF or reset the CPU module and then execute firmware version update.
	Firmware version update executing	—
POWER ■ RUN ☐ ERROR ☐	Firmware version update complete successfully	Reset the system and then check if the CPU module can be RUN/STOP correctly and BFM can be monitored on the intelligent function modules correctly.
POWER ■ RUN ☐ ERROR ●	Firmware version update error complete	Turn ON → OFF the power supply of the CPU module or reset the system and then execute firmware version update again.

8.16 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).

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(F) Servo Amplifier Instruction Manual

This function is enabled at the MR-JE-B(F) 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(F) and MR-J4(W)-B, this function can execute deceleration stop for MR-J4(W)-B at the servo alarm occurrence in MR-JE-B(F). To execute deceleration stop for MR-J4(W)-B, set "2: Enabled" in the servo parameter of MR-J4(W)-B "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(F)]

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]

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.

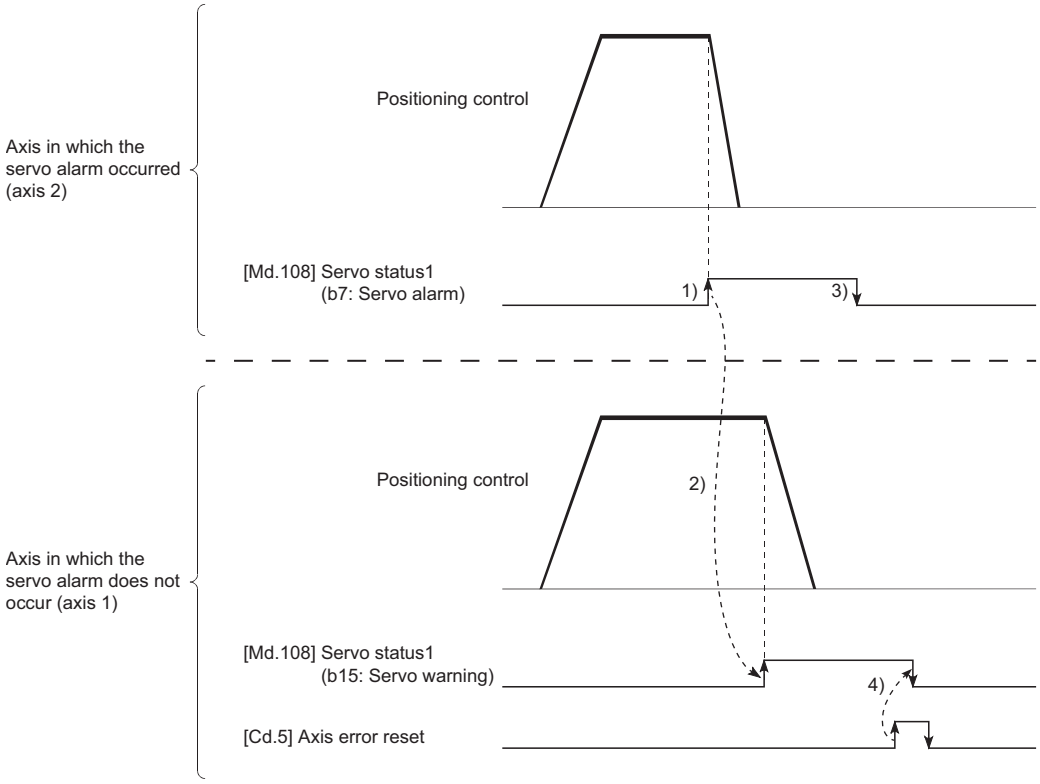
Servo amplifier type	Software version
MR-J4(W)-B	B7 or later
MR-JE-B(F)	B6 or later

*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.

9 SPECIFICATIONS OF I/O SIGNALS WITH CPU MODULES

9.1 List of Input/Output Signals with CPU Modules

The Simple Motion module/Motion module uses 10 input points and 10 output points for exchanging data with the CPU module.

The input/output signals of the Simple Motion module/Motion module are shown below.

• 4-axis/8-axis module

Signal direction: Simple Motion module/Motion module → CPU module		
Buffer memory address	**Signal name**	
31500.b0	READY	
31500.b1	Synchronization flag	
31501.b0	Axis 1	BUSY*1
31501.b1	Axis 2	
31501.b2	Axis 3	
31501.b3	Axis 4	
31501.b4	Axis 5	
31501.b5	Axis 6	
31501.b6	Axis 7	
31501.b7	Axis 8	

Signal direction: CPU module → Simple Motion module/Motion module		
Buffer memory address	**Signal name**	
5950	PLC READY	
5951	All axis servo ON	
30104	Axis 1	Positioning start*1
30114	Axis 2	
30124	Axis 3	
30134	Axis 4	
30144	Axis 5	
30154	Axis 6	
30164	Axis 7	
30174	Axis 8	

*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].

MEMO

10 PARAMETER SETTINGS

This chapter describes the parameter setting of the Simple Motion module/Motion module. By setting parameters, the parameter setting by program is not needed.
The module parameter and Simple Motion module setting are included in the parameter settings.

10.1 Parameter Setting Procedure

1. Add the Simple Motion module/Motion module in the engineering tool.

Navigation window ⇨ "Parameter" ⇨ "Module Information" ⇨ Right-click ⇨ [Add New Module]

2. The module parameter and Simple Motion module setting are included in the parameter settings. Select one of the settings from the tree on the following window.

Navigation window ⇨ "Parameter" ⇨ "Module Information" ⇨ Target module

3. Write the settings to the CPU module using 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.

[FX5-SSC-S]

- Refresh settings

[FX5-SSC-G]

Module parameter (Motion)

- Refresh settings

Module Parameter (Network)*1

- Required settings
- Basic settings
- Application settings

*1 For details, refer to the following.
MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN)

Select the module parameter from the tree on the following window.

Navigation window ⇨ "Parameter" ⇨ "Module Information" ⇨ Target module ⇨ "Module Parameter"

Refresh setting

Set the setting to transfer the values of the Simple Motion module/Motion module to devices or module labels of 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 390 Module Label)
- Specify Device (☞ Page 390 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".

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.

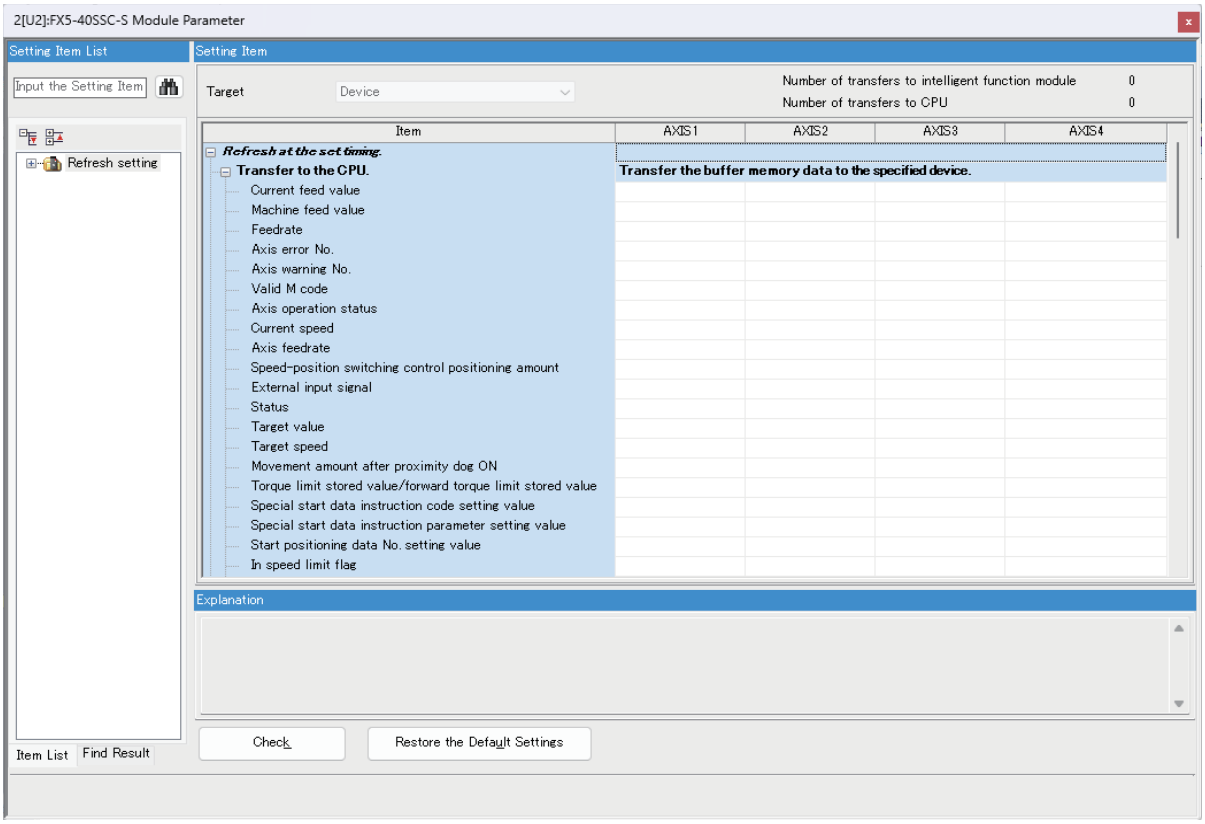
Ex.

When X10 is set, data is stored in X10 to X1F.

Setting item

The refresh setting has the following items.

[FX5-SSC-S]



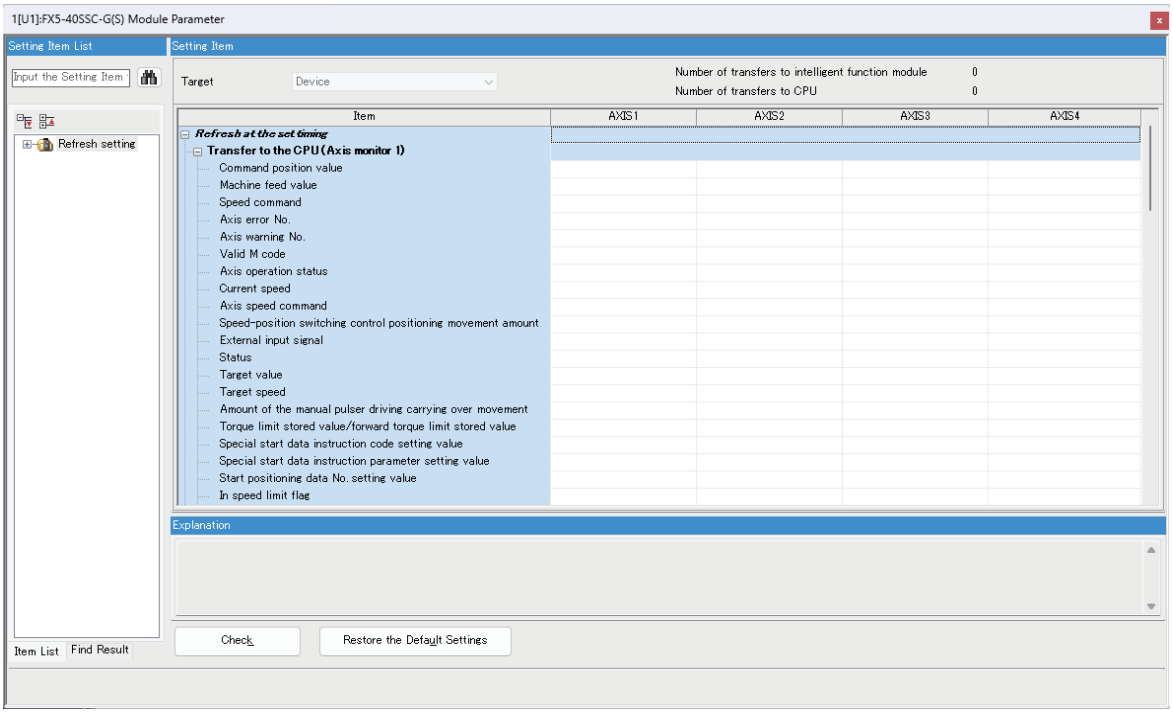
Item			Reference
Refresh at the set timing	Transfer to the CPU	Command position value	Page 527 [Md.20] Command position value
		Machine feed value	Page 528 [Md.21] Machine feed value
		Speed command	Page 529 [Md.22] Speed command
		Axis error No.	Page 529 [Md.23] Axis error No.
		Axis warning No.	Page 530 [Md.24] Axis warning No.
		Valid M code	Page 530 [Md.25] Valid M code
		Axis operation status	Page 530 [Md.26] Axis operation status
		Current speed	Page 531 [Md.27] Current speed
		Axis peed command	Page 532 [Md.28] Axis speed command
		Speed-position switching control positioning movement amount	Page 533 [Md.29] Speed-position switching control positioning movement amount
		External input signal	Page 534 [Md.30] External input signal
		Status	Page 535 [Md.31] Status
		Target value	Page 536 [Md.32] Target value
		Target speed	Page 537 [Md.33] Target speed
		Movement amount after proximity dog ON	Page 538 [Md.34] Movement amount after proximity dog ON [FX5-SSC-S]
		Torque limit stored value/forward torque limit stored value	Page 539 [Md.35] Torque limit stored value/forward torque limit stored value
		Special start data instruction code setting value	Page 539 [Md.36] Special start data instruction code setting value
		Special start data instruction parameter setting value	Page 540 [Md.37] Special start data instruction parameter setting value
		Start positioning data No. setting value	Page 540 [Md.38] Start positioning data No. setting value
		In speed limit flag	Page 540 [Md.39] In speed limit flag
		In speed change processing flag	Page 540 [Md.40] In speed change processing flag
		Special start repetition counter	Page 541 [Md.41] Special start repetition counter
		Control system repetition counter	Page 541 [Md.42] Control system repetition counter

Item			Reference
Refresh at the set timing	Transfer to the CPU	Start data pointer being executed	Page 541 [Md.43] Start data pointer being executed
		Positioning data No. being executed	Page 541 [Md.44] Positioning data No. being executed
		Block No. being executed	Page 541 [Md.45] Block No. being executed
		Last executed positioning data No.	Page 542 [Md.46] Last executed positioning data No.
		Positioning data being executed (Positioning identifier)	Page 542 [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 544 [Md.100] Home position return re-travel value [FX5-SSC-S]
		Actual position value	Page 545 [Md.101] Actual position value
		Deviation counter value	Page 546 [Md.102] Deviation counter value
		Motor rotation speed	Page 547 [Md.103] Motor rotation speed
		Motor current value	Page 547 [Md.104] Motor current value
		Servo status3	Page 556 [Md.125] Servo status3
		Servo amplifier software No.1	Page 548 [Md.106] Servo amplifier software No. [FX5-SSC-S]
	Transfer to the CPU (axis monitor)	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 548 [Md.107] Parameter error No. [FX5-SSC-S]
		Servo status2	Page 554 [Md.119] Servo status2
		Servo status1	Page 549 [Md.108] Servo status1
		Regenerative load ratio/Optional data monitor output 1	Page 550 [Md.109] Regenerative load ratio/Optional data monitor output 1
		Effective load torque/Optional data monitor output 2	Page 550 [Md.110] Effective load torque/Optional data monitor output 2
		Peak torque ratio/Optional data monitor output 3	Page 550 [Md.111] Peak torque ratio/Optional data monitor output 3
		Optional data monitor output 4	Page 551 [Md.112] Optional data monitor output 4
		Semi/Fully closed loop status	Page 551 [Md.113] Semi/Fully closed loop status
		Servo alarm	Page 552 [Md.114] Servo alarm
		Encoder option information	Page 553 [Md.116] Encoder option information
		Reverse torque limit stored value	Page 555 [Md.120] Reverse torque limit stored value
		Speed during command	Page 555 [Md.122] Speed during command
		Torque during command	Page 556 [Md.123] Torque during command
		Control mode switching status	Page 556 [Md.124] Control mode switching status
		Positioning data being executed (Axis to be interpolated)	Page 542 [Md.47] Positioning data being executed
		Deceleration start flag	Page 542 [Md.48] Deceleration start flag
	Transfer to the CPU	Command Generation Axis_Command position value	Page 527 [Md.20] Command position value
		Command Generation Axis_speed command	Page 529 [Md.22] Speed command
		Command Generation Axis_Axis error No.	Page 529 [Md.23] Axis error No.
		Command Generation Axis_Axis warning No	Page 530 [Md.24] Axis warning No.
		Command Generation Axis_Valid M code	Page 530 [Md.25] Valid M code
		Command Generation Axis_Axis operation status	Page 530 [Md.26] Axis operation status
		Command Generation Axis_Current speed	Page 531 [Md.27] Current speed
		Command Generation Axis_Axis speed command	Page 532 [Md.28] Axis speed command
		Command Generation Axis_Speed-position switching control positioning movement amount	Page 533 [Md.29] Speed-position switching control positioning movement amount
		Command Generation Axis_Status	Page 535 [Md.31] Status
		Command Generation Axis_Target value	Page 536 [Md.32] Target value
		Command Generation Axis_Target speed	Page 537 [Md.33] Target speed

Item			Reference
Refresh at the set timing	Transfer to the CPU	Command Generation Axis_Start positioning data No. setting value	Page 540 [Md.38] Start positioning data No. setting value
		Command Generation Axis_In speed limit flag	Page 540 [Md.39] In speed limit flag
		Command Generation Axis_In speed change processing flag	Page 540 [Md.40] In speed change processing flag
		Command Generation Axis_Control system repetition counter	Page 541 [Md.42] Control system repetition counter
		Command Generation Axis_Positioning data No. being executed	Page 541 [Md.44] Positioning data No. being executed
		Command Generation Axis_Last executed positioning data No.	Page 542 [Md.46] Last executed positioning data No.
		Command Generation Axis_Positioning data being executed : Positioning identifier	Page 542 [Md.47] Positioning data being executed
		Command Generation Axis_Positioning data being executed : M code	
		Command Generation Axis_Positioning data being executed : Dwell time	
		Command Generation Axis_Positioning data being executed : Command speed	
		Command Generation Axis_Positioning data being executed : Positioning address	
		Command Generation Axis_Speed during command	Page 555 [Md.122] Speed during command
		Command Generation Axis_Deceleration start flag	Page 542 [Md.48] Deceleration start flag
		Command Generation Axis Accumulative Position Value	For details, refer to the following manual, command generation axis. MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control)
		Command Generation Axis Position Value per Cycle	
		Command Generation Axis Busy	
Refresh Timing		Refresh Timing	Page 396 Refresh group
		Refresh Group [n] (n: 1-64)	
Refresh Timing (I/O)*1		Refresh Timing	—

*1 The setting cannot be changed from the default in the Motion module.

[FX5-SSC-G]



Item			Reference
Refresh at the set timing	Transfer to the CPU (axis monitor 1)	Command position value	Page 527 [Md.20] Command position value
		Machine feed value	Page 528 [Md.21] Machine feed value
		Speed command	Page 529 [Md.22] Speed command
		Axis error No.	Page 529 [Md.23] Axis error No.
		Axis warning No.	Page 530 [Md.24] Axis warning No.
		Valid M code	Page 530 [Md.25] Valid M code
		Axis operation status	Page 530 [Md.26] Axis operation status
		Current speed	Page 531 [Md.27] Current speed
		Axis speed command	Page 532 [Md.28] Axis speed command
		Speed-position switching control positioning movement amount	Page 533 [Md.29] Speed-position switching control positioning movement amount
		External input signal	Page 534 [Md.30] External input signal
		Status	Page 535 [Md.31] Status
		Target value	Page 536 [Md.32] Target value
		Target speed	Page 537 [Md.33] Target speed
		Amount of the manual pulser driving carrying over movement	Page 543 [Md.62] Amount of the manual pulser driving carrying over movement [FX5-SSC-G]
		Torque limit stored value/forward torque limit stored value	Page 539 [Md.35] Torque limit stored value/forward torque limit stored value
		Special start data instruction code setting value	Page 539 [Md.36] Special start data instruction code setting value
		Special start data instruction parameter setting value	Page 540 [Md.37] Special start data instruction parameter setting value
		Start positioning data No. setting value	Page 540 [Md.38] Start positioning data No. setting value
		In speed limit flag	Page 540 [Md.39] In speed limit flag
		In speed change processing flag	Page 540 [Md.40] In speed change processing flag
		Special start repetition counter	Page 541 [Md.41] Special start repetition counter
		Control system repetition counter	Page 541 [Md.42] Control system repetition counter
		Start data pointer being executed	Page 541 [Md.43] Start data pointer being executed
		Positioning data No. being executed	Page 541 [Md.44] Positioning data No. being executed
		Block No. being executed	Page 541 [Md.45] Block No. being executed
		Last executed positioning data No.	Page 542 [Md.46] Last executed positioning data No.

Item			Reference
Refresh at the set timing	Transfer to the CPU (axis monitor 1)	Positioning data being executed (Positioning identifier)	Page 542 [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)	
		Actual position value	Page 545 [Md.101] Actual position value
		Deviation counter value	Page 546 [Md.102] Deviation counter value
		Motor rotation speed	Page 547 [Md.103] Motor rotation speed
		Motor current value	Page 547 [Md.104] Motor current value
		Home position return operating status	Page 558 [Md.514] HPR operating status [FX5-SSC-G]
		Servo status3	Page 556 [Md.125] Servo status3
		Servo status4	Page 557 [Md.126] Servo status4 [FX5-SSC-G]
	Transfer to the CPU (axis monitor 2)	Statusword	Page 554 [Md.117] Statusword [FX5-SSC-G]
		Servo status2	Page 554 [Md.119] Servo status2
		Servo status1	Page 549 [Md.108] Servo status1
		Regenerative load ratio/Optional data monitor output 1	Page 550 [Md.109] Regenerative load ratio/Optional data monitor output 1
		Effective load torque/Optional data monitor output 2	Page 550 [Md.110] Effective load torque/Optional data monitor output 2
		Peak torque ratio/Optional data monitor output 3	Page 550 [Md.111] Peak torque ratio/Optional data monitor output 3
		Optional data monitor output 4	Page 551 [Md.112] Optional data monitor output 4
		Semi/Fully closed loop status	Page 551 [Md.113] Semi/Fully closed loop status
		Servo alarm	Page 552 [Md.114] Servo alarm
		Encoder option information	Page 553 [Md.116] Encoder option information
		Reverse torque limit stored value	Page 555 [Md.120] Reverse torque limit stored value
		Speed during command	Page 555 [Md.122] Speed during command
		Torque during command	Page 556 [Md.123] Torque during command
		Control mode switching status	Page 556 [Md.124] Control mode switching status
		Positioning data being executed (Axis to be interpolated)	Page 542 [Md.47] Positioning data being executed
		Deceleration start flag	Page 542 [Md.48] Deceleration start flag
		Optional SDO transfer result 1	Page 557 [Md.160] Optional SDO transfer result 1 [FX5-SSC-G]
		Optional SDO transfer status 1	Page 557 [Md.164] Optional SDO transfer status 1 [FX5-SSC-G]
		Controller position value restoration complete status	Page 557 [Md.190] Controller position value restoration complete status [FX5-SSC-G]
	Transfer to the CPU (command generation axis monitor)	Command Generation Axis_Command position value	Page 527 [Md.20] Command position value
		Command Generation Axis_Speed command	Page 529 [Md.22] Speed command
		Command Generation Axis_Axis error No.	Page 529 [Md.23] Axis error No.
		Command Generation Axis_Axis warning No	Page 530 [Md.24] Axis warning No.
		Command Generation Axis_Valid M code	Page 530 [Md.25] Valid M code
		Command Generation Axis_Axis operation status	Page 530 [Md.26] Axis operation status
		Command Generation Axis_Current speed	Page 531 [Md.27] Current speed
		Command Generation Axis_Axis speed command	Page 532 [Md.28] Axis speed command
		Command Generation Axis_Speed-position switching control positioning movement amount	Page 533 [Md.29] Speed-position switching control positioning movement amount
		Command Generation Axis_Status	Page 535 [Md.31] Status
		Command Generation Axis_Target value	Page 536 [Md.32] Target value
		Command Generation Axis_Target speed	Page 537 [Md.33] Target speed
		Command Generation Axis_Start positioning data No. setting value	Page 540 [Md.38] Start positioning data No. setting value
		Command Generation Axis_In speed limit flag	Page 540 [Md.39] In speed limit flag
		Command Generation Axis_In speed change processing flag	Page 540 [Md.40] In speed change processing flag
		Command Generation Axis_Control system repetition counter	Page 541 [Md.42] Control system repetition counter

Item			Reference
Refresh at the set timing	Transfer to the CPU (command generation axis monitor)	Command Generation Axis_Positioning data No. being executed	Page 541 [Md.44] Positioning data No. being executed
		Command Generation Axis_Last executed positioning data No.	Page 542 [Md.46] Last executed positioning data No.
		Command Generation Axis_Positioning data being executed : Positioning identifier	Page 542 [Md.47] Positioning data being executed
		Command Generation Axis_Positioning data being executed : M code	
		Command Generation Axis_Positioning data being executed : Dwell time	
		Command Generation Axis_Positioning data being executed : Command speed	
		Command Generation Axis_Positioning data being executed : Positioning address	
		Command Generation Axis_Speed during command	Page 555 [Md.122] Speed during command
		Command Generation Axis_Deceleration start flag	Page 542 [Md.48] Deceleration start flag
		Command Generation Axis Accumulative Position Value	For details, refer to the following manual, command generation axis. MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control)
		Command Generation Axis Position Value per Cycle	
		Command Generation Axis Busy signal	
Refresh Timing		Refresh Timing	Page 396 Refresh group
		Refresh Group [n] (n: 1-64)	
Refresh Timing (I/O)*1		Refresh Timing	—

*1 The setting cannot be changed from the default in the 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.

10.3 Simple Motion Module Setting

Set the required setting for the Simple Motion module/Motion module. Refer to "Help" in the "Simple Motion Module Setting Function" of the engineering tool for details.

Select the Simple Motion module setting from the tree on the following window.

Navigation window ⇨ "Parameter" ⇨ "Module Information" ⇨ Target module ⇨ "Simple Motion module setting"

11 DATA USED FOR POSITIONING CONTROL

The parameters and data used to carry out positioning control with the Simple Motion module/Motion module are explained in this chapter.
With the positioning system using the Simple Motion module/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.

11.1 Types of Data

Parameters and data required for control

The parameters and data required to carry out control with the Simple Motion module/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/Motion module.

Restriction

The setting data can be backed up only in the flash ROM/internal memory (nonvolatile) of the Simple Motion module/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
Parameters	Servo network configuration parameters [FX5-SSC-G]		Parameters for the network. Perform settings for the devices 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		Set according to the system configuration when the system is started up.
	Link device external signal assignment parameters [FX5-SSC-G]		Set according to the network configuration when the system is started up.
Servo parameters [FX5-SSC-S]	Servo amplifier parameters ([Pr.100], PA, PB, PC, PD, PE, PS, PF, Po)		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".

Classification	Item	Description
Synchronous control parameters	Servo input axis parameters	Set the parameters for synchronous control.
	Synchronous encoder axis parameters	
	Synchronous encoder axis parameters via link device [FX5-SSC-G]	
	Command generation axis parameters	
	Command generation axis positioning data	
	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/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.

- 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.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", "[Pr.127] Speed limit value input selection at control mode switching" and common parameters (excluding "[Pr.97] SSCNET setting") become valid when the "[Cd.190] PLC READY" 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 "[Cd.190] PLC READY".
- Even when the "[Cd.190] PLC READY" 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/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/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/Motion module.
Axis monitor data	Monitors the data related to the operating axis, such as the current position and speed.
Synchronous control data	Monitors the data for synchronous control.
Mark detection monitor data	Monitors the data for mark detection.

- 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, execution prohibition flag, and axis start) from the CPU module to the Simple Motion module/Motion module.
Synchronous control data	Sets the data for synchronous control.
Mark detection control data	Sets the data for mark detection control.

- 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 "[Cd.190] PLC READY" turns from OFF to ON.

Setting items for servo network configuration parameters [FX5-SSC-G]

The setting items for the "servo network configuration parameters" are shown below.

Servo network configuration parameter		Remark
[Pr.101]	Virtual servo amplifier setting	Set whether or not to use the axis as a virtual servo amplifier axis. The value is imported when the power is turned ON.
[Pr.140]	Driver command discard detection setting	When bit 12 in "[Md.117] Statusword" of the drive unit turns ON → OFF while operating an actual axis, the error "Driver command discard detection" (error code: 1BE6H) is outputted before the motor stops to stop the command.
[Pr.141]	IP address	Specify the IP address.
[Pr.142]	Multidrop number	When one station includes multiple logic axes, specify the No. in order to distinguish logic axes.

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.

◎: 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		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
[Pr.24]	Manual pulse generator/Incremental synchronous encoder input selection [FX5-SSC-S]	—	—	—	—
[Pr.82]	Forced stop valid/invalid selection	○	○	○	○
[Pr.89]	Manual pulse generator/Incremental synchronous encoder input type selection [FX5-SSC-S]	—	—	—	—
[Pr.96]	Operation cycle setting [FX5-SSC-S]	—	—	—	—
[Pr.97]	SSCNET setting [FX5-SSC-S]	—	—	—	—
[Pr.150]	Input terminal logic selection [FX5-SSC-S]	○	○	○	○
[Pr.151]	Manual pulse generator/Incremental synchronous encoder input logic selection [FX5-SSC-S]	—	—	—	—
[Pr.152]	Maximum number of control axes [FX5-SSC-G]	○	○	○	○
[Pr.156]	Manual pulse generator smoothing time constant [FX5-SSC-G]	—	—	—	—

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 [FX5-SSC-S]	—	—	—	—
[Pr.82]	Forced stop valid/invalid selection	○	○	○	○
[Pr.89]	Manual pulse generator/Incremental synchronous encoder input type selection [FX5-SSC-S]	—	—	—	—
[Pr.96]	Operation cycle setting [FX5-SSC-S]	—	—	—	—
[Pr.97]	SSCNET setting [FX5-SSC-S]	—	—	—	—
[Pr.150]	Input terminal logic selection [FX5-SSC-S]	○	○	○	○
[Pr.151]	Manual pulse generator/Incremental synchronous encoder input logic selection [FX5-SSC-S]	—	—	—	—
[Pr.152]	Maximum number of control axes [FX5-SSC-G]	○	○	○	○
[Pr.156]	Manual pulse generator smoothing time constant [FX5-SSC-G]	—	—	—	—

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 [FX5-SSC-S]	◎	—	—	—	—
[Pr.82]	Forced stop valid/invalid selection	○	○	○	○	☞ Page 254 Forced stop function
[Pr.89]	Manual pulse generator/Incremental synchronous encoder input type selection [FX5-SSC-S]	◎	—	—	—	—
[Pr.96]	Operation cycle setting [FX5-SSC-S]	—	—	—	—	—
[Pr.97]	SSCNET setting [FX5-SSC-S]	—	—	—	—	—
[Pr.150]	Input terminal logic selection [FX5-SSC-S]	○	○	○	○	—
[Pr.151]	Manual pulse generator/Incremental synchronous encoder input logic selection [FX5-SSC-S]	◎	—	—	—	—
[Pr.152]	Maximum number of control axes [FX5-SSC-G]	○	○	○	○	—
[Pr.156]	Manual pulse generator smoothing time constant [FX5-SSC-G]	○	—	—	—	—

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/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] Sudden stop deceleration time	○
	[Pr.37] Stop group 1 sudden stop selection	○
	[Pr.38] Stop group 2 sudden stop selection	○
	[Pr.39] Stop group 3 sudden stop selection	○
	[Pr.40] Positioning complete signal output time	—
	[Pr.41] Allowable circular interpolation error width	—
	[Pr.42] External command function selection	○
	[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	○
	[Pr.112] Servo OFF command valid/invalid setting [FX5-SSC-G]	—
	[Pr.122] Manual pulse generator speed limit mode [FX5-SSC-G]	—
	[Pr.123] Manual pulse generator speed limit value [FX5-SSC-G]	—
	[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-axis fixed-feed control 2/3/4-axis fixed-feed control	2-axis circular 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	◎	◎	◎	◎	◎	—	—
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-axis fixed-feed control 2/3/4-axis fixed-feed control	2-axis circular 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] Sudden stop deceleration time	○	○	○	○	○	—	—
	[Pr.37] Stop group 1 sudden stop selection	○	○	○	○	○	—	—
	[Pr.38] Stop group 2 sudden stop selection	○	○	○	○	○	—	—
	[Pr.39] Stop group 3 sudden stop selection	○	○	○	○	○	—	—
	[Pr.40] Positioning complete signal output time	○	○	○	○	○	○	—
	[Pr.41] Allowable circular interpolation error width	—	—	○	—	—	—	—
	[Pr.42] External command function selection	○	○	○	○	◎	○	—
	[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	○	○	○	○	◎	○	—
	[Pr.112] Servo OFF command valid/invalid setting [FX5-SSC-G]	—	—	—	—	—	—	—
	[Pr.122] Manual pulse generator speed limit mode [FX5-SSC-G]	—	—	—	—	—	—	—
	[Pr.123] Manual pulse generator speed limit value [FX5-SSC-G]	—	—	—	—	—	—	—
	[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] Sudden stop deceleration time	—	—	○
	[Pr.37] Stop group 1 sudden stop selection	—	—	○
	[Pr.38] Stop group 2 sudden stop selection	—	—	○
	[Pr.39] Stop group 3 sudden stop selection	—	—	○
	[Pr.40] Positioning complete signal output time	—	—	—
	[Pr.41] Allowable circular interpolation error width	—	—	—
	[Pr.42] External command function selection	—	—	○
	[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	—	—	○
	[Pr.112] Servo OFF command valid/invalid setting [FX5-SSC-G]	—	—	—
	[Pr.122] Manual pulse generator speed limit mode [FX5-SSC-G]	○	—	—
	[Pr.123] Manual pulse generator speed limit value [FX5-SSC-G]	○	—	—
	[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] Suddenstop deceleration time	—
	[Pr.37] Stop group 1 suddenstop selection	—
	[Pr.38] Stop group 2 sudden stop selection	—
	[Pr.39] Stop group 3 sudden stop selection	—
	[Pr.40] Positioning complete signal output time	—
	[Pr.41] Allowable circular interpolation error width	—
	[Pr.42] External command function selection	—
	[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	—
	[Pr.112] Servo OFF command valid/invalid setting [FX5-SSC-G]	○
	[Pr.122] Manual pulse generator speed limit mode [FX5-SSC-G]	—
	[Pr.123] Manual pulse generator speed limit value [FX5-SSC-G]	—
	[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] to [Pr.123], and [Pr.127] are checked with the following timing.

- When the "[Cd.190] PLC READY" changes from OFF to ON

[Pr.112] is checked at the control mode switching.

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 [FX5-SSC-S]	Count method 1 [FX5-SSC-S]	Count method 2 [FX5-SSC-S]	Data set method [FX5-SSC-S]	Scale origin signal detection method [FX5-SSC-S]	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 [FX5-SSC-S]	◎	◎	◎	—	◎	—	—
	[Pr.48]	Home position return retry [FX5-SSC-S]	R	R	R	—	—	—	—
Home position return detailed parameters	[Pr.50]	Setting for the movement amount after proximity dog ON [FX5-SSC-S]	—	◎	◎	—	—	—	—
	[Pr.51]	Home position return acceleration time selection	◎	◎	◎	—	◎	—	◎
	[Pr.52]	Home position return deceleration time selection	◎	◎	◎	—	◎	—	◎
	[Pr.53]	Home position shift amount [FX5-SSC-S]	S	S	S	—	S	—	—
	[Pr.54]	Home position return torque limit value [FX5-SSC-S]	○	○	○	—	○	—	◎
	[Pr.55]	Operation setting for incompletion of home position return	○	○	○	○	○	○	—
	[Pr.56]	Speed designation during home position shift [FX5-SSC-S]	S	S	S	—	S	—	—
	[Pr.57]	Dwell time during home position return retry [FX5-SSC-S]	R	R	R	—	—	—	—

*1 For details, refer to the following.
☞ Page 483 [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/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 "[Cd.190] PLC READY" changes from OFF to ON

Setting items for extended parameters

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 371 Optional Data Monitor Function
[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.512]	Optional SDO 1 [FX5-SSC-G]	☞ Page 381 Virtual servo amplifier function [FX5-SSC-G]
[Pr.591]	Optional data monitor: Data type expansion setting 1 [FX5-SSC-G]	☞ Page 371 Optional Data Monitor Function
[Pr.592]	Optional data monitor: Data type expansion setting 2 [FX5-SSC-G]	
[Pr.593]	Optional data monitor: Data type expansion setting 3 [FX5-SSC-G]	
[Pr.594]	Optional data monitor: Data type expansion setting 4 [FX5-SSC-G]	

Setting items for servo parameters [FX5-SSC-S]

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
[Pr.100]	Servo series	Set the servo amplifier series connected to the Simple Motion module.
PA01 to PA32	PA group	Setting items are different according to the servo series.
PB01 to PB64	PB group	
PC01 to PC64	PC group	
PD01 to PD48	PD group	
PE01 to PE64	PE group	
PS01 to PS32	PS group	
PF01 to PF48	PF group	
Po01 to Po32	Po group	
PL01 to PL48	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 [FX5-SSC-S], or error code: 1B1EH [FX5-SSC-G]) 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			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	
[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	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		○	○	○	○
[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			

*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 [FX5-SSC-S], or error code: 1B1EH [FX5-SSC-G]) 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		○	○
[Da.20]	Axis to be interpolated 1		—	—
[Da.21]	Axis to be interpolated 2		—	—
[Da.22]	Axis to be interpolated 3		—	—

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		—	○	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		—	—	—	—	—

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

Checking the positioning data

[Da.1] to [Da.10], [Da.20] to [Da.22] 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 simultaneously starting axes	—	—	—	—	—	○	—	—
[Da.24]	Simultaneously starting axis No.1	—	—	—	—	—	○	—	—
[Da.25]	Simultaneously starting axis No.2	—	—	—	—	—	○	—	—
[Da.26]	Simultaneously 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/Motion module (system monitor data [Md.3] to [Md.8], [Md.19], [Md.50] to [Md.54], [Md.59], [Md.60], [Md.130] to [Md.135], [Md.140], [Md.141])
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.126], [Md.160], [Md.164], [Md.190], [Md.500], [Md.502], [Md.514])

Monitoring the system

■Monitoring the positioning system operation history

Monitoring details			Corresponding item
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 [FX5-SSC-S]			[Md.51] Amplifier-less operation mode status
Monitor the detection status of axis that set communication between amplifiers [FX5-SSC-S]			[Md.52] Communication between amplifiers axes searching flag
Monitor the connect/disconnect status of SSCNET communication [FX5-SSC-S]			[Md.53] SSCNET control status
Store the module information			[Md.59] Module information
Monitor the firmware version 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
Store the module status information.			[Md.140] Module status
Monitor the BUSY state.			[Md.141] BUSY

*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 - deviation counter value". [FX5-SSC-S]	[Md.101] Actual position value
Monitor the real current value "command position value - (command pulse - feedback pulse)". [FX5-SSC-G]	
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 software No. of servo amplifier. [FX5-SSC-S]	[Md.106] Servo amplifier software No.
Monitor the parameter No. that an error occurred. [FX5-SSC-S]	[Md.107] Parameter error No.
Monitor the status (servo status) of servo amplifier.	[Md.108] Servo status1
	[Md.119] Servo status2
	[Md.125] Servo status3
Monitor the status (servo status) of servo amplifier. [FX5-SSC-G]	[Md.126] Servo status4
Monitor the status (servo status) of servo amplifier. [FX5-SSC-S]	[Md.500] Servo status7
• Monitor the percentage of regenerative power to permissible regenerative value. [FX5-SSC-S] • Monitor the content of "[Pr.91] Optional data monitor: Data type setting 1" at optional data monitor data type setting. [FX5-SSC-G] • Monitor the content of "[Pr.91] Optional data monitor: Data type setting 1" and "[Pr.591] Optional data monitor: Data type expansion setting 1" at optional data monitor data type setting.	[Md.109] Regenerative load ratio/Optional data monitor output 1
• Monitor the continuous effective load torque. [FX5-SSC-S] • Monitor the content of "[Pr.92] Optional data monitor: Data type setting 2" at optional data monitor data type setting. [FX5-SSC-G] • Monitor the content of "[Pr.92] Optional data monitor: Data type setting 2" and "[Pr.592] Optional data monitor: Data type expansion setting 2" at optional data monitor data type setting.	[Md.110] Effective load torque/Optional data monitor output 2
• Monitor the maximum generated torque. [FX5-SSC-S] • Monitor the content of "[Pr.93] Optional data monitor: Data type setting 3" at optional data monitor data type setting. [FX5-SSC-G] • Monitor the content of "[Pr.93] Optional data monitor: Data type setting 3" and "[Pr.593] Optional data monitor: Data type expansion setting 3" at optional data monitor data type setting.	[Md.111] Peak torque ratio/Optional data monitor output 3

Monitor details	Corresponding item
[FX5-SSC-S] • Monitor the content of "[Pr.94] Optional data monitor: Data type setting 4" at optional data monitor data type setting. [FX5-SSC-G] • Monitor the content of "[Pr.94] Optional data monitor: Data type setting 4" and "[Pr.594] Optional data monitor: Data type expansion setting 4" at optional data monitor data type setting.	[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 alarm detail No. of the servo amplifier. [FX5-SSC-G]	[Md.115] Servo alarm detail number
Monitor the option information of encoder.	[Md.116] Encoder option information
Monitor the CiA402 Statusword of the servo amplifier. [FX5-SSC-G]	[Md.117] Statusword
Monitor the driver operation alarm No. [FX5-SSC-S]	[Md.502] Driver operation alarm No.
Monitor the status of the servo amplifier during home position return. [FX5-SSC-G]	[Md.514] HPR operating status

■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. [FX5-SSC-S]	[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" [FX5-SSC-G]	[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. [FX5-SSC-S]	[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 response code (SDO Abort code) received from the device in response to the transient request. [FX5-SSC-G]	[Md.160] Optional SDO transfer result 1
Monitor the processing status of the transient request. [FX5-SSC-G]	[Md.164] Optional SDO transfer status 1
Monitor the completion status of the controller current value restoration. [FX5-SSC-G]	[Md.190] Controller position value restoration complete status

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/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.55], [Cd.102], [Cd.137], [Cd.158], [Cd.190], [Cd.191], 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.184])

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 (Axis 1 to 8)
Set the forced stop information to the buffer memory. [FX5-SSC-G]	[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
Start the home position return or positioning operation.	[Cd.184] Positioning start

■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 within the set 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. [FX5-SSC-S]	[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
Set the values to use as the input values of the manual pulse generator via CPU in order.	[Cd.55] Input value for manual pulse generator via CPU
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. [FX5-SSC-S]	[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

Control details		Corresponding item
Set the semi closed loop control/fully closed loop control.		[Cd.133] Semi/Fully closed loop switching request
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
Notify the Simple Motion module/Motion module that the CPU module is normal.		[Cd.190] PLC READY
Turn ON/OFF the servo for all the servo amplifiers connected to the Simple Motion module/Motion module.		[Cd.191] All axis servo ON

11.2 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 the "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-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control)
Buffer memory addresses used for the CC-Link IE TSN network [FX5-SSC-G]	Refer to "Buffer Memory" in the following manual. MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN)

*1 Simple Motion Module Setting Function ⇨ "Help" ⇨ "Buffer Memory Address List"

[Basic setting]

■Servo network configuration parameters [FX5-SSC-G]

n: Axis No. -1

Item		Fetch cycle	Buffer memory address
[Pr.101]	Virtual servo amplifier setting	At power supply ON/the CPU module reset	58022+32n
[Pr.140]	Driver command discard detection setting		58023+32n
[Pr.141]	IP address		58024+32n 58025+32n
[Pr.142]	Multidrop number		58028+32n

■Common parameters

Item		Fetch cycle	Buffer memory address
[Pr.24]	Manual pulse generator/Incremental synchronous encoder input selection [FX5-SSC-S]	"[Cd.190] PLC READY" OFF to ON	33
[Pr.82]	Forced stop valid/invalid selection		35
[Pr.89]	Manual pulse generator/Incremental synchronous encoder input type selection [FX5-SSC-S]		67
[Pr.96]	Operation cycle setting [FX5-SSC-S]	At power supply ON/the CPU module reset	105
[Pr.97]	SSCNET setting [FX5-SSC-S]		106
[Pr.150]	Input terminal logic selection [FX5-SSC-S]	At power supply ON/the CPU module reset/"[Cd.190] PLC READY" OFF to ON	58000 58001
[Pr.151]	Manual pulse generator/Incremental synchronous encoder input logic selection [FX5-SSC-S]		58002
[Pr.152]	Maximum number of control axes [FX5-SSC-G]	At power supply ON/the CPU module reset	58003
[Pr.156]	Manual pulse generator smoothing time constant [FX5-SSC-G]	"[Cd.190] PLC READY" OFF to ON	58011
[Pr.900]	Forced stop signal (EMI): Link device type [FX5-SSC-G]	At power supply ON/the CPU module reset	58014
[Pr.901]	Forced stop signal (EMI): Link device start No. [FX5-SSC-G]		58015
[Pr.902]	Forced stop signal (EMI): Link device bit specification [FX5-SSC-G]		58016
[Pr.903]	Forced stop signal (EMI): Link device logic setting [FX5-SSC-G]		58017

■Positioning parameters: Basic parameters 1

n: Axis No. - 1

Item		Fetch cycle	Buffer memory address
[Pr.1]	Unit setting	"[Cd.190] PLC READY" OFF to ON	0+150n
[Pr.2]	Number of pulses per rotation (AP)		2+150n 3+150n
[Pr.3]	Movement amount per rotation (AL)		4+150n 5+150n
[Pr.4]	Unit magnification (AM)		1+150n
[Pr.7]	Bias speed at start		6+150n 7+150n

■Positioning parameters: Basic parameters 2

n: Axis No. - 1

Item		Fetch cycle	Buffer memory address
[Pr.8]	Speed limit value	When the next each control starts	10+150n 11+150n
[Pr.9]	Acceleration time 0		12+150n 13+150n
[Pr.10]	Deceleration time 0		14+150n 15+150n

■Positioning parameters: Detailed parameters 1

n: Axis No. - 1

Item		Fetch cycle	Buffer memory address
[Pr.11]	Backlash compensation amount	"[Cd.190] PLC READY" OFF to ON	17+150n
[Pr.12]	Software stroke limit upper limit value		18+150n 19+150n
[Pr.13]	Software stroke limit lower limit value		20+150n 21+150n
[Pr.14]	Software stroke limit selection		22+150n
[Pr.15]	Software stroke limit valid/invalid setting		23+150n
[Pr.16]	Command in-position width		24+150n 25+150n
[Pr.17]	Torque limit setting value		26+150n
[Pr.18]	M code ON signal output timing		27+150n
[Pr.19]	Speed switching mode		28+150n
[Pr.20]	Interpolation speed designation method		29+150n
[Pr.21]	Command position value during speed control		30+150n
[Pr.22]	Input signal logic selection		31+150n
[Pr.81]	Speed-position function selection		34+150n
[Pr.116]	FLS signal selection	At power supply ON/the CPU module reset/"[Cd.190] PLC READY" OFF to ON	116+150n
[Pr.117]	RLS signal selection		117+150n
[Pr.118]	DOG signal selection		118+150n
[Pr.119]	STOP signal selection		119+150n

■Positioning parameters: Detailed parameters 2

n: Axis No. - 1

Item		Fetch cycle	Buffer memory address
[Pr.25]	Acceleration time 1	When the next each control starts	36+150n 37+150n
[Pr.26]	Acceleration time 2		38+150n 39+150n
[Pr.27]	Acceleration time 3		40+150n 41+150n
[Pr.28]	Deceleration time 1		42+150n 43+150n
[Pr.29]	Deceleration time 2		44+150n 45+150n
[Pr.30]	Deceleration time 3		46+150n 47+150n
[Pr.31]	JOG speed limit value		48+150n 49+150n
[Pr.32]	JOG operation acceleration time selection		50+150n
[Pr.33]	JOG operation deceleration time selection		51+150n
[Pr.34]	Acceleration/deceleration process selection		52+150n
[Pr.35]	S-curve ratio		53+150n
[Pr.36]	Sudden stop deceleration time		54+150n 55+150n
[Pr.37]	Stop group 1 sudden stop selection		56+150n
[Pr.38]	Stop group 2 sudden stop selection		57+150n
[Pr.39]	Stop group 3 sudden stop selection		58+150n
[Pr.40]	Positioning complete signal output time		59+150n
[Pr.41]	Allowable circular interpolation error width		60+150n 61+150n
[Pr.42]	External command function selection	At conditions established (DI input)	62+150n
[Pr.83]	Speed control 10 × multiplier setting for degree axis	"[Cd.190] PLC READY" OFF to ON	63+150n
[Pr.84]	Restart allowable range when servo OFF to ON	At start	64+150n 65+150n
[Pr.90]	Operation setting for speed-torque control mode	"[Cd.190] PLC READY" OFF to ON	68+150n
[Pr.95]	External command signal selection		69+150n
[Pr.112]	Servo OFF command valid/invalid setting [FX5-SSC-G]	At conditions established (Control mode switching)	112+150n
[Pr.122]	Manual pulse generator speed limit mode [FX5-SSC-G]	"[Cd.190] PLC READY" OFF to ON	121+150n
[Pr.123]	Manual pulse generator speed limit value [FX5-SSC-G]		122+150n 123+150n
[Pr.127]	Speed limit value input selection at control mode switching		125+150n

■Home position return parameters: Home position return basic parameters

n: Axis No. - 1

Item		Fetch cycle	Buffer memory address
[Pr.43]	Home position return method	"[Cd.190] PLC READY" OFF to ON	70+150n
[Pr.44]	Home position return direction		71+150n
[Pr.45]	Home position address		72+150n 73+150n
[Pr.46]	Home position return speed		74+150n 75+150n
[Pr.47]	Creep speed [FX5-SSC-S]		76+150n 77+150n
[Pr.48]	Home position return retry [FX5-SSC-S]		78+150n

■Home position return parameters: Home position return detailed parameters

n: Axis No. - 1

Item		Fetch cycle	Buffer memory address
[Pr.50]	Setting for the movement amount after proximity dog ON [FX5-SSC-S]	"[Cd.190] PLC READY" OFF to ON	80+150n 81+150n
[Pr.51]	Home position return acceleration time selection		82+150n
[Pr.52]	Home position return deceleration time selection		83+150n
[Pr.53]	Home position shift amount [FX5-SSC-S]		84+150n 85+150n
[Pr.54]	Home position return torque limit value [FX5-SSC-S]		86+150n
[Pr.55]	Operation setting for incompletion of home position return		87+150n
[Pr.56]	Speed designation during home position shift [FX5-SSC-S]		88+150n
[Pr.57]	Dwell time during home position return retry [FX5-SSC-S]		89+150n

■Extended parameters

n: Axis No. - 1

Item		Fetch cycle	Buffer memory address
[Pr.91]	Optional data monitor: Data type setting 1	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		101+150n
[Pr.93]	Optional data monitor: Data type setting 3		102+150n
[Pr.94]	Optional data monitor: Data type setting 4		103+150n
[Pr.512]	Optional SDO 1 [FX5-SSC-G]	At request (Servo transient request)	128+150n 129+150n
[Pr.591]	Optional data monitor: Data type expansion setting 1 [FX5-SSC-G]	Power supply ON	92+150n
[Pr.592]	Optional data monitor: Data type expansion setting 2 [FX5-SSC-G]		93+150n
[Pr.593]	Optional data monitor: Data type expansion setting 3 [FX5-SSC-G]		94+150n
[Pr.594]	Optional data monitor: Data type expansion setting 4 [FX5-SSC-G]		95+150n

[Monitor data]

■System monitor data

p: Pointer No. - 1

Item			Refresh cycle	Buffer memory address[*1]
[Md.3]	Start information	Start history[*2]	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 [FX5-SSC-S]		Immediate	4232
[Md.52]	Communication between amplifiers axes searching flag [FX5-SSC-S]			4234
[Md.53]	SSCNET control status [FX5-SSC-S]			4233
[Md.59]	Module information		At power supply ON	31332
[Md.130]	F/W version			4006 4007
[Md.131]	Digital oscilloscope running flag		Main cycle	4011
[Md.132]	Operation cycle setting		At power supply ON	4238
[Md.133]	Operation cycle over flag		Immediate	4239

Item		Refresh cycle	Buffer memory address*1
[Md.134]	Operation time	Operation cycle	4008
[Md.135]	Maximum operation time	Immediate	4009
[Md.140]	Module status	b0: "[Cd.190] PLC READY" OFF to ON b1: At power supply ON/the CPU module reset	31500
[Md.141]	BUSY	At start	31501

*1 Some buffer memory addresses differ from the addresses used on the command generation axis side in synchronous control. For specifications of the command generation axis, refer to "Command Generation Axis" in the following manual.
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*2 Displays a value set by the clock function of the CPU module.

■Axis monitor data

n: Axis No. - 1

Item		Refresh cycle	Buffer memory address*1
[Md.20]	Command position value	Operation cycle	2400+100n 2401+100n
[Md.21]	Machine feed value		2402+100n 2403+100n
[Md.22]	Speed command		2404+100n 2405+100n
[Md.23]	Axis error No.	Immediate	2406+100n
[Md.24]	Axis warning No.		2407+100n
[Md.25]	Valid M code		2408+100n
[Md.26]	Axis operation status		2409+100n
[Md.27]	Current speed		2410+100n 2411+100n
[Md.28]	Axis speed command	Operation cycle	2412+100n 2413+100n
[Md.29]	Speed-position switching control positioning movement amount	Immediate	2414+100n 2415+100n
[Md.30]	External input signal	Operation cycle	2416+100n
[Md.31]	Status	Immediate	2417+100n
[Md.32]	Target value		2418+100n 2419+100n
[Md.33]	Target speed		2420+100n 2421+100n
[Md.34]	Movement amount after proximity dog ON [FX5-SSC-S]		2424+100n 2425+100n
[Md.35]	Torque limit stored value/forward torque limit stored value		2426+100n
[Md.36]	Special start data instruction code setting value		2427+100n
[Md.37]	Special start data instruction parameter setting value		2428+100n
[Md.38]	Start positioning data No. setting value		2429+100n
[Md.39]	In speed limit flag		2430+100n
[Md.40]	In speed change processing flag		2431+100n
[Md.41]	Special start repetition counter		2432+100n
[Md.42]	Control system repetition counter		2433+100n
[Md.43]	Start data pointer being executed		2434+100n
[Md.44]	Positioning data No. being executed		2435+100n
[Md.45]	Block No. being executed	At start	2436+100n

Item			Refresh cycle	Buffer memory address*1
[Md.46]	Last executed positioning data No.		Immediate	2437+100n
[Md.47]	Positioning data being executed	Positioning identifier		2438+100n
		M code		2439+100n
		Dwell time		2440+100n
		Command speed		2442+100n 2443+100n
		Positioning address		2444+100n 2445+100n
		Arc address		2446+100n 2447+100n
		Axis to be interpolated		2496+100n 2497+100n
[Md.48]	Deceleration start flag			2499+100n
[Md.62]	Amount of the manual pulser driving carrying over movement [FX5-SSC-G]			2422+100n 2423+100n
[Md.100]	Home position return re-travel value [FX5-SSC-S]		At conditions established (At home position return re-travel)	2448+100n 2449+100n
[Md.101]	Actual position value		Operation cycle	2450+100n 2451+100n
[Md.102]	Deviation counter value			2452+100n 2453+100n
[Md.103]	Motor rotation speed			2454+100n 2455+100n
[Md.104]	Motor current value			2456+100n
[Md.106]	Servo amplifier software No. [FX5-SSC-S]		At servo amplifier's power supply ON	2464+100n 2465+100n 2466+100n 2467+100n 2468+100n 2469+100n
[Md.107]	Parameter error No. [FX5-SSC-S]		Immediate	2470+100n
[Md.108]	Servo status1		Operation cycle	2477+100n
[Md.109]	Regenerative load ratio/Optional data monitor output 1			2478+100n
[Md.110]	Effective load torque/Optional data monitor output 2			2479+100n
[Md.111]	Peak torque ratio/Optional data monitor output 3			2480+100n
[Md.112]	Optional data monitor output 4			2481+100n
[Md.113]	Semi/Fully closed loop status			2487+100n
[Md.114]	Servo alarm		Immediate	2488+100n
[Md.115]	Servo alarm detail number [FX5-SSC-G]			2489+100n
[Md.116]	Encoder option information		At servo amplifier's power supply ON	2490+100n
[Md.117]	Statusword [FX5-SSC-G]		Operation cycle	2472+100n
[Md.119]	Servo status2			2476+100n
[Md.120]	Reverse torque limit stored value		Immediate	2491+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
[Md.123]	Torque during command		Operation cycle (Only at the torque control mode/the continuous operation to torque control mode)	2494+100n
[Md.124]	Control mode switching status		Operation cycle (Only at the continuous operation to torque control mode)	2495+100n
[Md.125]	Servo status3		Operation cycle	2458+100n
[Md.126]	Servo status4 [FX5-SSC-G]			2459+100n

Item		Refresh cycle	Buffer memory address*1
[Md.160]	Optional SDO transfer result 1 [FX5-SSC-G]	At request (Command request)	59308+100n 59309+100n
[Md.164]	Optional SDO transfer status 1 [FX5-SSC-G]		59312+100n
[Md.190]	Controller position value restoration complete status [FX5-SSC-G]	16.0 ms	59327+100n
[Md.500]	Servo status7 [FX5-SSC-S]	Operation cycle	59300+100n
[Md.502]	Driver operation alarm No. [FX5-SSC-S]	Immediate	59302+100n
[Md.514]	HPR operating status [FX5-SSC-G]	Operation cycle	2457+100n

*1 Some buffer memory addresses differ from the addresses used on the command generation axis side in synchronous control. For specifications of the command generation axis, refer to "Command Generation Axis" in the following manual.
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[Control data]

■System control data

Item		Fetch cycle	Buffer memory address
[Cd.1]	Flash ROM write request	103 ms [FX5-SSC-S] 116 ms [FX5-SSC-G]	5900
[Cd.2]	Parameter initialization request		5901
[Cd.41]	Deceleration start flag valid	"[Cd.190] PLC READY" 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 (Axis 1 to 8)	Operation cycle	5928 (Axis 1 to 4) 5929 (Axis 5 to 8)
[Cd.55]	Input value for manual pulse generator via CPU [FX5-SSC-G]	8.0 ms	5946 5947
[Cd.102]	SSCNET control command [FX5-SSC-S]	3.5 ms	5932
[Cd.137]	Amplifier-less operation mode switching request [FX5-SSC-S]		5926
[Cd.158]	Forced stop input [FX5-SSC-G]	Operation cycle	5945
[Cd.190]	PLC READY		5950
[Cd.191]	All axis servo ON		5951

■Axis control data

n: Axis No. - 1

Item		Fetch cycle	Buffer memory address
[Cd.3]	Positioning start No.	At start	4300+100n
[Cd.4]	Positioning starting point No.		4301+100n
[Cd.5]	Axis error reset	14.2 ms [FX5-SSC-S] 16.0 ms [FX5-SSC-G]	4302+100n
[Cd.6]	Restart command		4303+100n
[Cd.7]	M code OFF request	Operation cycle	4304+100n
[Cd.8]	External command valid	At request	4305+100n
[Cd.9]	New position value		4306+100n 4307+100n
[Cd.10]	New acceleration time value		4308+100n 4309+100n
[Cd.11]	New deceleration time value		4310+100n 4311+100n
[Cd.12]	Acceleration/deceleration time change value during speed change, enable/disable		4312+100n
[Cd.13]	Positioning operation speed override	Operation cycle	4313+100n
[Cd.14]	New speed value	At request	4314+100n 4315+100n
[Cd.15]	Speed change request	Operation cycle	4316+100n

Item		Fetch cycle	Buffer memory address
[Cd.16]	Inching movement amount	At start	4317+100n
[Cd.17]	JOG speed		4318+100n 4319+100n
[Cd.18]	Interrupt request during continuous operation	Operation cycle	4320+100n
[Cd.19]	Home position return request flag OFF request	14.2 ms [FX5-SSC-S] 16.0 ms [FX5-SSC-G]	4321+100n
[Cd.20]	Manual pulse generator 1 pulse input magnification	Operation cycle (At manual pulse generator enabled)	4322+100n 4323+100n
[Cd.21]	Manual pulse generator enable flag	Operation cycle	4324+100n
[Cd.22]	New torque value/forward new torque value		4325+100n
[Cd.23]	Speed-position switching control movement amount change register	At request	4326+100n 4327+100n
[Cd.24]	Speed-position switching enable flag		4328+100n
[Cd.25]	Position-speed switching control speed change register		4330+100n 4331+100n
[Cd.26]	Position-speed switching enable flag		4332+100n
[Cd.27]	Target position change value (New address)		4334+100n 4335+100n
[Cd.28]	Target position change value (New speed)		4336+100n 4337+100n
[Cd.29]	Target position change request flag	Operation cycle	4338+100n
[Cd.30]	Simultaneous starting own axis start data No.	At start	4340+100n
[Cd.31]	Simultaneous starting axis start data No.1		4341+100n
[Cd.32]	Simultaneous starting axis start data No.2		4342+100n
[Cd.33]	Simultaneous starting axis start data No.3		4343+100n
[Cd.34]	Step mode		4344+100n
[Cd.35]	Step valid flag		4345+100n
[Cd.36]	Step start information	14.2 ms [FX5-SSC-S] 16.0 ms [FX5-SSC-G]	4346+100n
[Cd.37]	Skip command	Operation cycle (During positioning operation)	4347+100n
[Cd.38]	Teaching data selection	At request	4348+100n
[Cd.39]	Teaching positioning data No.	103 ms [FX5-SSC-S] 116 ms [FX5-SSC-G]	4349+100n
[Cd.40]	ABS direction in degrees	At start	4350+100n
[Cd.43]	Simultaneous starting axis		4368+100n 4369+100n
[Cd.45]	Speed-position switching device selection		4366+100n
[Cd.46]	Speed-position switching command	0.888 ms [FX5-SSC-S] Operation cycle [FX5-SSC-G]	4367+100n
[Cd.100]	Servo OFF command	Operation cycle	4351+100n
[Cd.101]	Torque output setting value	At start	4352+100n
[Cd.108]	Gain switching command flag	Operation cycle	4359+100n
[Cd.112]	Torque change function switching request		4363+100n
[Cd.113]	New reverse torque value		4364+100n
[Cd.130]	Servo parameter write request [FX5-SSC-S]	Main cycle	4354+100n
[Cd.131]	Parameter No. (Setting for servo parameters to be changed) [FX5-SSC-S]	At request	4355+100n
[Cd.132]	Change data [FX5-SSC-S]		4356+100n 4357+100n
[Cd.133]	Semi/Fully closed loop switching request	Operation cycle (The servo amplifiers for fully closed loop control only)	4358+100n
[Cd.136]	PI-PID switching request	Operation cycle	4365+100n
[Cd.138]	Control mode switching request		4374+100n
[Cd.139]	Control mode setting	At request (Mode switching)	4375+100n

Item		Fetch cycle	Buffer memory address
[Cd.140]	Command speed at speed control mode	Operation cycle (At speed control mode)	4376+100n 4377+100n
[Cd.141]	Acceleration time at speed control mode	At request (Mode switching)	4378+100n
[Cd.142]	Deceleration time at speed control mode		4379+100n
[Cd.143]	Command torque at torque control mode	Operation cycle (At torque control mode)	4380+100n
[Cd.144]	Torque time constant at torque control mode (Forward direction)	At request (Mode switching)	4381+100n
[Cd.145]	Torque time constant at torque control mode (Negative direction)		4382+100n
[Cd.146]	Speed limit value at torque control mode	Operation cycle (At torque control mode)	4384+100n 4385+100n
[Cd.147]	Speed limit value at continuous operation to torque control mode	Operation cycle (At continuous operation to torque control mode)	4386+100n 4387+100n
[Cd.148]	Acceleration time at continuous operation to torque control mode	At request (Mode switching)	4388+100n
[Cd.149]	Deceleration time at continuous operation to torque control mode		4389+100n
[Cd.150]	Target torque at continuous operation to torque control mode	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)	At request (Mode switching)	4391+100n
[Cd.152]	Torque time constant at continuous operation to torque control mode (Negative direction)		4392+100n
[Cd.153]	Control mode auto-shift selection		4393+100n
[Cd.154]	Control mode auto-shift parameter		4394+100n 4395+100n
[Cd.180]	Axis stop	Operation cycle	30100+10n
[Cd.181]	Forward run JOG start		30101+10n
[Cd.182]	Reverse run JOG start		30102+10n
[Cd.183]	Execution prohibition flag	At start	30103+10n
[Cd.184]	Positioning start	Operation cycle	30104+10n

■Axis control data (transient function) [FX5-SSC-G]

n: Axis No. -1

Item		Fetch cycle	Buffer memory address
[Cd.160]	Optional SDO transfer request 1	Main cycle	57520+30n
[Cd.164]	Optional SDO transfer data 1	At request (Command request)	57522+30n 57523+30n 57524+30n 57525+30n

[Positioning data]

■Positioning data

n: Axis No. - 1

Memory area	Item			Buffer memory address
Positioning data No.1	[Da.1]	Operation pattern	Positioning identifier	6000+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
	[Da.7]	Arc address		6008+1000n 6009+1000n
	[Da.8]	Command speed		6004+1000n 6005+1000n
	[Da.9]	Dwell time/JUMP destination positioning data No.		6002+1000n
	[Da.10]	M code/Condition data No./Number of LOOP to LEND repetitions		6001+1000n
	[Da.20]	Axis to be interpolated No.1	Axis to be interpolated	71000+1000n 71001+1000n
	[Da.21]	Axis to be interpolated No.2		
	[Da.22]	Axis to be interpolated No.3		
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 [Da.20] Axis to be interpolated No.1 [Da.21] Axis to be interpolated No.2 [Da.22] Axis to be interpolated No.3			6010+1000n ⋮ 6019+1000n 71010+1000n 71011+1000n
No.3				6020+1000n ⋮ 6029+1000n 71020+1000n 71021+1000n
⋮				⋮
No.100				6990+1000n ⋮ 6999+1000n 71990+1000n 71991+1000n
No.101 ⋮ No.600				Set with the engineering tool.

[Block start data]

■Positioning data (Block start data)

n: Axis No. - 1

Memory area	Item				Buffer memory address	
Starting block 0	Block start data 1st point	[Da.11] [Da.12]	Shape Start data No.		22000+400n	—
		[Da.13] [Da.14]	Special start instruction Parameter		—	22050+400n
	Block start data 2nd point				22001+400n	22051+400n
	Block start data 3rd point				22002+400n	22052+400n
	⋮				⋮	
	Block start data 50th point				22049+400n	22099+400n
	Condition data No.1	[Da.15]	Condition target		22100+400n	
		[Da.16]	Condition operator			
		[Da.17]	Address		22102+400n 22103+400n	
		[Da.18]	Parameter 1		22104+400n 22105+400n	
		[Da.19]	Parameter 2		22106+400n 22107+400n	
		[Da.23]	Number of simultaneously starting axes	Simultaneously starting axis	22108+400n 22109+400n	
		[Da.24]	Simultaneously starting axis No.1			
		[Da.25]	Simultaneously starting axis No.2			
		[Da.26]	Simultaneously starting axis No.3			
	Condition data No.2				22110+400n ⋮ 22119+400n	
	Condition data No.3				22120+400n ⋮ 22129+400n	
	⋮				⋮	
	Condition data No.10				22190+400n ⋮ 22199+400n	
Starting block 1	Block start data				22200+400n ⋮ 22299+400n	
	Condition data				22300+400n ⋮ 22399+400n	
Starting block 2	Block start data				Set with the engineering tool.	
	Condition data					
Starting block 3	Block start data					
	Condition data					
Starting block 4	Block start data					
	Condition data					

Servo parameters

The following shows the relation between the buffer memory addresses of servo parameters and the various items.
The setting range is different depending on the servo amplifier model. Refer to each servo amplifier instruction manual for details.

■Servo parameters [FX5-SSC-S]

n: Axis No. - 1

Item	Servo amplifier parameter No.	Buffer memory address
[Pr.100] Servo series	—	28400+100n
—	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
—	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

Item	Servo amplifier parameter No.	Buffer memory address
—	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
—	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

Item	Servo amplifier parameter No.	Buffer memory address
—	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
—	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

Item	Servo amplifier parameter No.	Buffer memory address
—	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
—	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

Item	Servo amplifier parameter No.	Buffer memory address
—	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
—	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

Item	Servo amplifier parameter No.	Buffer memory address
—	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
—	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

Item	Servo amplifier parameter No.	Buffer memory address
—	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
—	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

Item	Servo amplifier parameter No.	Buffer memory address
—	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
—	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

Item	Servo amplifier parameter No.	Buffer memory address
—	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 setting parameters

k: Mark detection setting No. - 1

Item		Fetch cycle	Buffer memory address
[Pr.800]	Mark detection signal setting	At power supply ON	54000+20k
[Pr.801]	Mark detection signal compensation time	At power supply ON/"[Cd.190] PLC READY" 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/"[Cd.190] PLC READY" 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	At power supply ON/"[Cd.190] PLC READY" OFF to ON	54010+20k
[Pr.808]	Mark detection signal link device type [FX5-SSC-G]	At power supply ON	54011+20k
[Pr.809]	Mark detection signal link device No. [FX5-SSC-G]	At power supply ON	54012+20k
[Pr.810]	Mark detection signal link device bit specification [FX5-SSC-G]	At power supply ON	54013+20k
[Pr.811]	Mark detection signal detection direction setting [FX5-SSC-G]	At power supply ON	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

Link device external signal assignment [FX5-SSC-G]

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

n: Axis No. - 1

Item		Fetch cycle	Buffer memory address
[Pr.910]	Upper limit signal (FLS): Link device type	At power supply ON/the CPU module reset	36000+20n
[Pr.911]	Upper limit signal (FLS): Link device start No.		36001+20n
[Pr.912]	Upper limit signal (FLS): Link device bit specification		36002+20n
[Pr.913]	Upper limit signal (FLS): Link device logic setting		36003+20n
[Pr.920]	Lower limit signal (RLS): Link device type		36005+20n
[Pr.921]	Lower limit signal (RLS): Link device start No.		36006+20n
[Pr.922]	Lower limit signal (RLS): Link device bit specification		36007+20n
[Pr.923]	Lower limit signal (RLS): Link device logic setting		36008+20n
[Pr.930]	Proximity dog signal (DOG): Link device type		36010+20n
[Pr.931]	Proximity dog signal (DOG): Link device start No.		36011+20n
[Pr.932]	Proximity dog signal (DOG): Link device bit specification		36012+20n
[Pr.933]	Proximity dog signal (DOG): Link device logic setting		36013+20n
[Pr.940]	Stop signal (STOP): Link device type		36015+20n
[Pr.941]	Stop signal (STOP): Link device start No.		36016+20n
[Pr.942]	Stop signal (STOP): Link device bit specification		36017+20n
[Pr.943]	Stop signal (STOP): Link device logic setting		36018+20n

11.3 Basic Setting

The setting items of the setting data are explained in this section.

Servo network configuration parameters [FX5-SSC-G]

n: Axis No. -1

Item	Setting value, setting range	Default value	Buffer memory address
[Pr.101] Virtual servo amplifier setting	0: Use for the actual servo amplifier 1: Use for the virtual servo amplifier	0	58022+32n
[Pr.140] Driver command discard detection setting	0: Detection invalid 1: Detection valid	0	58023+32n
[Pr.141] IP address	Set the IP address. Assign 1 [byte] each to octets 1 to 4.	0	58024+32n 58025+32n
[Pr.142] Multidrop number	0 to 65535	0	58028+32n

[Pr.101] Virtual servo amplifier setting

Set whether or not to use the axis as a virtual servo amplifier axis.

0: Use for the actual servo amplifier

1: Use for the virtual servo amplifier

■Buffer memory address

For the buffer memory addresses in this area, refer to the following.

☞ Page 422 Servo network configuration parameters [FX5-SSC-G]

[Pr.140] Driver command discard detection setting

By setting the driver command discard detection setting, when bit 12 in "[Md.117] Statusword" of the drive unit turns ON → OFF while operating an actual axis, the error "Driver command discard detection" (error code: 1BE6H) can be outputted before the motor stops to stop the command.

0: Detection invalid

1: Detection valid

The contents of bit 12 in "[Md.117] Statusword" changes depending on the control mode of the connected drive unit. Refer to the specifications for the drive unit being connected for the change conditions of "[Md.117] Statusword", etc.

Driver control mode	Abbreviation for bit 12 of "[Md.117] Statusword"	Details
Cyclic synchronous position mode (csp)	Target position ignored	0: Discarding Target position [Obj. 607Ah]
Cyclic synchronous velocity mode (csv)	Target velocity ignored	0: Discarding Target velocity [Obj. 60FFh]
Cyclic synchronous torque mode (cst)	Target torque ignored	0: Discarding Target torque [Obj. 6071h]
Continuous operation to torque control mode (ct)	Target torque ignored	0: Discarding Target torque [Obj. 6071h]
Other than the above	—	Not checked

■Buffer memory address

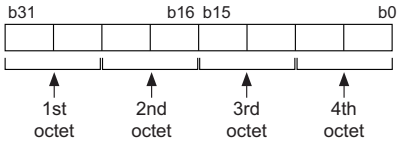
For the buffer memory addresses in this area, refer to the following.

☞ Page 422 Servo network configuration parameters [FX5-SSC-G]

[Pr.141] IP address

Set the IP address.

Assign 1 [byte] each to octets 1 to 4.



Ex.

For 192.168.3.1

Setting value: HC0A80301

Point

- When using the amplifier as an actual servo amplifier, be sure to set an IP address. Axis control cannot be performed when set to the default value of "0".
- For this parameter, the value set in the flash ROM of the Motion module becomes valid when the power is turned ON or the CPU module is reset. Inputting is not performed by turning "[Cd.190] PLC READY", so perform writing to the flash ROM after setting the value to the buffer memory when changing this parameter. (The value must be fixed when turning ON the power or resetting the CPU module.)

■ Buffer memory address

For the buffer memory addresses in this area, refer to the following.

☞ Page 422 Servo network configuration parameters [FX5-SSC-G]

[Pr.142] Multidrop number

When one station includes multiple logic axes, such as for a multi-axis drive unit, specify the No. in order to distinguish logic axes. Specify 0 when using a single axis servo amplifier.

Point

For this parameter, the value set in the flash ROM of the Motion module becomes valid when the power is turned ON or the CPU module is reset. Inputting is not performed by turning "[Cd.190] PLC READY", so perform writing to the flash ROM after setting the value to the buffer memory when changing this parameter. (The value must be fixed when turning ON the power or resetting the CPU module.)

■Buffer memory address

For the buffer memory addresses in this area, refer to the following.

☞ Page 422 Servo network configuration parameters [FX5-SSC-G]

Common parameters

Item	Setting value, setting range		Default value	Buffer memory address
	Value set with the engineering tool	Value set with a program		
[Pr.24] Manual pulse generator/ Incremental synchronous encoder input selection [FX5-SSC-S]	0: A-phase/B-phase multiplied by 4	0	0	33
	1: A-phase/B-phase multiplied by 2	1		
	2: A-phase/B-phase multiplied by 1	2		
	3: pulse/SIGN	3		
[Pr.82] Forced stop valid/invalid selection	0: Valid (External input signal) [FX5-SSC-S]	0	0 [FX5-SSC-S] 1 [FX5-SSC-G]	35
	1: Invalid	1		
	2: Valid (buffer memory) [FX5-SSC-G]	2		
	3: Valid (Link device) [FX5-SSC-G]	3		
[Pr.89] Manual pulse generator/ Incremental synchronous encoder input type selection [FX5-SSC-S]	0: Differential output type	0	1	67
	1: Voltage output/open collector type	1		
[Pr.96] Operation cycle setting [FX5-SSC-S]	0000H: 0.888 ms	0000H	1	105
	0001H: 1.777 ms	0001H		
[Pr.97] SSCNET setting [FX5-SSC-S]	0: SSCNETⅢ	0	1	106
	1: SSCNETⅢ/H	1		
[Pr.150] Input terminal logic selection [FX5-SSC-S]	b0: DI1 to b3: DI4 (0: ON at leading edge, 1: ON at trailing edge)	0 1	0	58000, 58001
[Pr.151] Manual pulse generator/ Incremental synchronous encoder input logic selection [FX5-SSC-S]	0: Negative logic	0	0	58002
	1: Positive logic	1		
[Pr.152] Maximum number of control axes [FX5-SSC-G]	0: No setting	0	0	58003
	1 to maximum No. of control axes	1 to maximum No. of control axes		
[Pr.156] Manual pulse generator smoothing time constant [FX5-SSC-G]	0 to 5000 (ms)	0 to 5000	0	58011
[Pr.900] Forced stop signal (EMI): Link device type [FX5-SSC-G]	Others: Invalid	—	0	58014
	11H: RX	11H		
	12H: RY	12H		
	13H: RWr	13H		
	14H: RWw	14H		
[Pr.901] Forced stop signal (EMI): Link device start No.	RX/RY: 0 to 1FFFH	0 to 1FFFH	0	58015
	RWr/RWw: 0 to 3FFH	0 to 3FFH		
[Pr.902] Forced stop signal (EMI): Link device bit specification	00H to 1FH	00H to 1FH	0	58016
[Pr.903] Forced stop signal (EMI): Link device logic setting	0: Negative logic	0	0	58017
	1: Positive logic	1		

[Pr.24] Manual pulse generator/Incremental synchronous encoder input selection [FX5-SSC-S]

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".

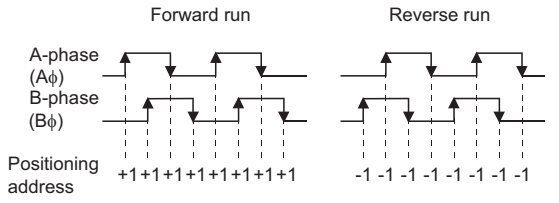
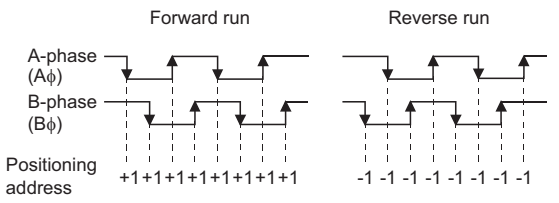
■A-phase/B-phase mode

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.

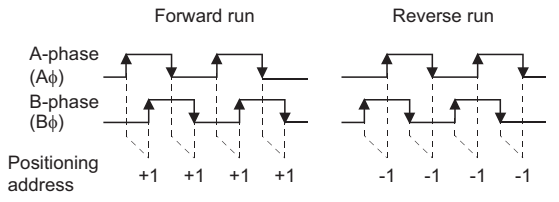
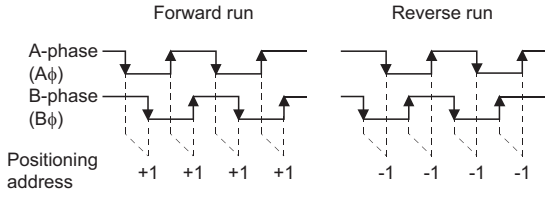
• A-phase/B-phase multiplied by 4

The positioning address increases or decreases at rising or falling edges of A-phase/B-phase.

[Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection	
Positive logic	**Negative logic**
	

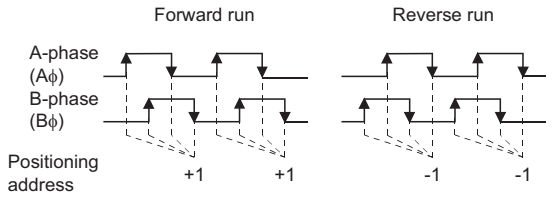
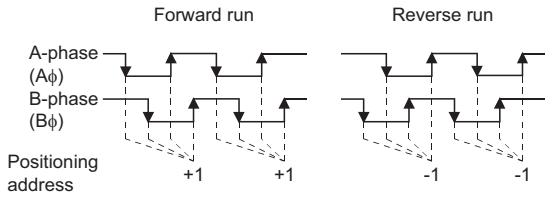
• A-phase/B-phase multiplied by 2

The positioning address increases or decreases at twice rising or twice falling edges of A-phase/B-phase.

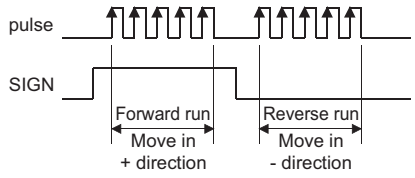
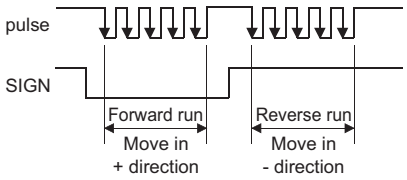
[Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection	
Positive logic	**Negative logic**
	

• 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.

[Pr.151] Manual pulse generator/Incremental synchronous encoder input logic selection	
Positive logic	**Negative logic**
	

■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 422 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 after this is set to "0: Valid (External input signal)" or "2: Valid (Buffer memory)".

The error "Servo READY signal OFF during operation" (error code: 1902H [FX5-SSC-S], or error code 1A02H [FX5-SSC-G]) 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 is used.) [FX5-SSC-S]	0
Invalid (Forced stop is not used.)	1
Valid (Buffer memory) (Uses the forced stop from the buffer memory) [FX5-SSC-G]	2
Valid (Link device) (Uses the forced stop from the link device) [FX5-SSC-G]	3

Point

- If the setting is other than 0 to 3, the error "Forced stop valid/invalid setting error" (error code: 1B71H [FX5-SSC-S], or error code 1DC1H [FX5-SSC-G]) occurs.
- The "[Md.50] Forced stop input" is stored "1" by setting "Forced stop valid/invalid selection" to invalid. [FX5-SSC-G]
- If "3: Valid (Link device)" is selected, specify the link device to be used for the forced stop signal by using the following parameters.
  - · [Pr.900] Forced stop signal (EMI): Link device type
  - · [Pr.901] Forced stop signal (EMI): Link device start No.
  - · [Pr.902] Forced stop signal (EMI): Link device bit specification
  - · [Pr.903] Forced stop signal (EMI): Link device logic setting

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 422 Common parameters

[Pr.89] Manual pulse generator/Incremental synchronous encoder input type selection [FX5-SSC-S]

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 [FX5-SSC-S]" in the following manual for details.
MELSEC iQ-F FX5 Motion Module/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 "[Cd.190] PLC READY".

■Buffer memory address

Refer to the following for the buffer memory address in this area.
☞ Page 422 Common parameters

[Pr.96] Operation cycle setting [FX5-SSC-S]

Set the operation cycle.

Operation cycle setting	Setting value
0.888 ms	0000H
1.777 ms	0001H

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 "[Cd.190] PLC READY" 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. If the flag is ON, the operation cycle over has been generated. Correct the positioning content or increase the operation cycle.

■Buffer memory address

Refer to the following for the buffer memory address in this area.
☞ Page 422 Common parameters

[Pr.97] SSCNET setting [FX5-SSC-S]

Set the servo network.

SSCNET setting	Setting value
SSCNETⅢ	0
SSCNETⅢ/H	1

The connectable servo amplifier differs by this parameter. When an unconnectable servo amplifier is set in "[Pr.100] Servo series", the error "SSCNET setting error" (error code: 1B74H) occurs and the communication with the servo amplifier is not executed.

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 "[Cd.190] PLC READY" 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 422 Common parameters

[Pr.150] Input terminal logic selection [FX5-SSC-S]

Set the external input signal logic (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

Bit	Input terminal
b0	DI1
b1	DI2
b2	DI3
b3	DI4

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 422 Common parameters

[Pr.151] Manual pulse generator/INC synchronous encoder input logic selection [FX5-SSC-S]

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 447 [Pr.24] Manual pulse generator/Incremental synchronous encoder input selection [FX5-SSC-S]

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 422 Common parameters

[Pr.152] Maximum number of control axes [FX5-SSC-G]

Set the upper limit for the number of control axes.

This is used to reduce the operation cycle when the actual number of axes used is lower than the maximum number of control axes of the relevant model.

Maximum number of control axes	Setting value
No setting (Control is performed using the maximum number of control axes for the relevant model.)	0
Maximum number of control axes (Axes up to the set axis No. are used as the target for control.)*1	1 to maximum No. of control axes*2

*1 Example) When "4" is set, the control axes are Axis 1 to 4. Control cannot be performed for Axis 5 and later.

*2 The maximum No. of control axes for each model is shown below.
FX5-40SSC-G: 4
FX5-80SSC-G: 8

- When the maximum number of control axes exceeds the maximum No. of control axes for the Motion module (for example, "5" is set for a model with a maximum of 4 axes), the warning "Outside Maximum number of control axes" (warning code: 0D3AH) occurs, and control is performed as though the set value is "0: No setting". (The warning occurs on Axis 1.)
- When subsequent axes are set to a value other than "0: No setting" in "[Pr.141] IP address" or a value other than "0: Use for the actual servo amplifier" in "[Pr.101] Virtual servo amplifier setting" via the setting of the maximum number of control axes the warning "Outside control axis setting" (warning code: 0D3BH) occurs on the axes and the servo amplifier does not start the RUN time. (The LED display of the servo amplifier continues displaying "B.".)

Point

- For this parameter, the value set in the flash ROM of the Motion module becomes valid when the power is turned ON or the CPU module is reset. Inputting is not performed by turning "[Cd.190] PLC READY" OFF→ON, so perform writing to the flash ROM after setting the value to the buffer memory when changing this parameter. (The value must be fixed when turning ON the power or resetting the CPU module.)
- Subsequent axes set as a servo input axis (synchronous control) or a virtual servo amplifier via the setting of the maximum number of control axes are also not eligible to be targets of control.

■ Buffer memory address

For the buffer memory addresses in this area, refer to the following.

☞ Page 422 Common parameters

[Pr.156] Manual pulse generator smoothing time constant [FX5-SSC-G]

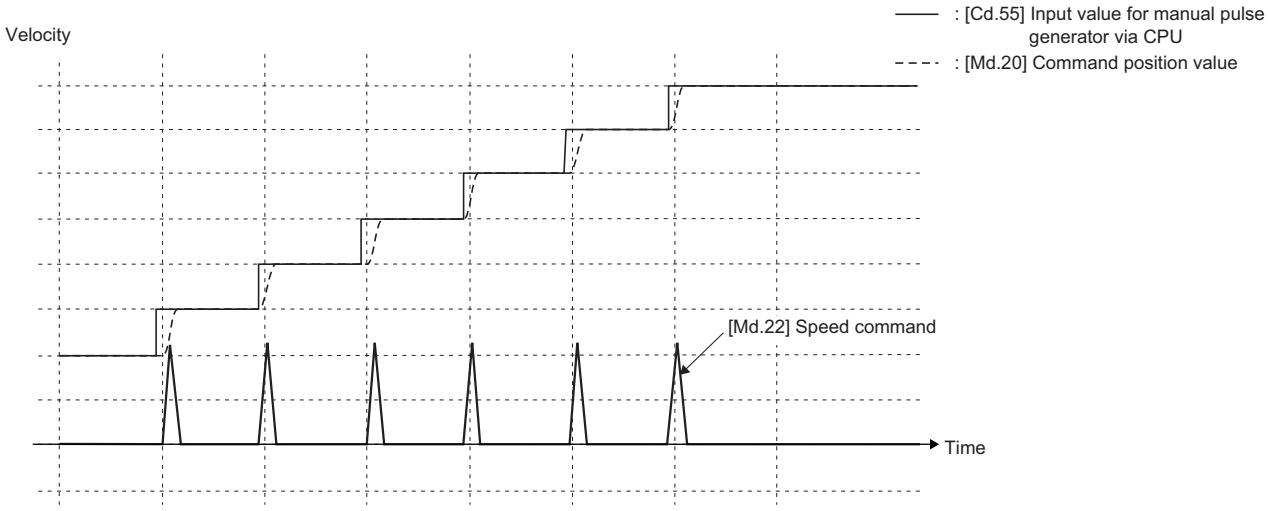
- Smoothing processing smooths the speed change in manual pulse generator operation. Note that the input response is delayed by the time set for the smoothing processing.
- When a value outside the range is set, the error "Outside manual pulse generator smoothing time constant range error" (error code: 1DC6H) occurs when "[Cd.190] PLC READY" turns ON, preventing the READY signal ([Md.140] Module status: b0) from turning ON.
- The input cycle of "[Cd.55] Input value for manual pulse generator via CPU" has an interval of 8.0 ms, so the smoothing time constant is truncated in multiples of 8. (Example: a setting value of 8 to 15 ms is operated at a time constant of 8 ms.
- The smoothing time constant is not reflected at a stop cause occurrence or at a deceleration stop via the "0" setting of "[Cd.21] Manual pulse generator enable flag".

■Basic concept of speed change

Speed change occurs because of a discrepancy between the scan time of the CPU module and the input cycle in "[Cd.55] Input value for manual pulse generator via CPU". As shown in the diagram below, the speed change can be suppressed by setting "[Pr.156] Manual pulse generator smoothing time constant" to a value larger than the maximum scan time.

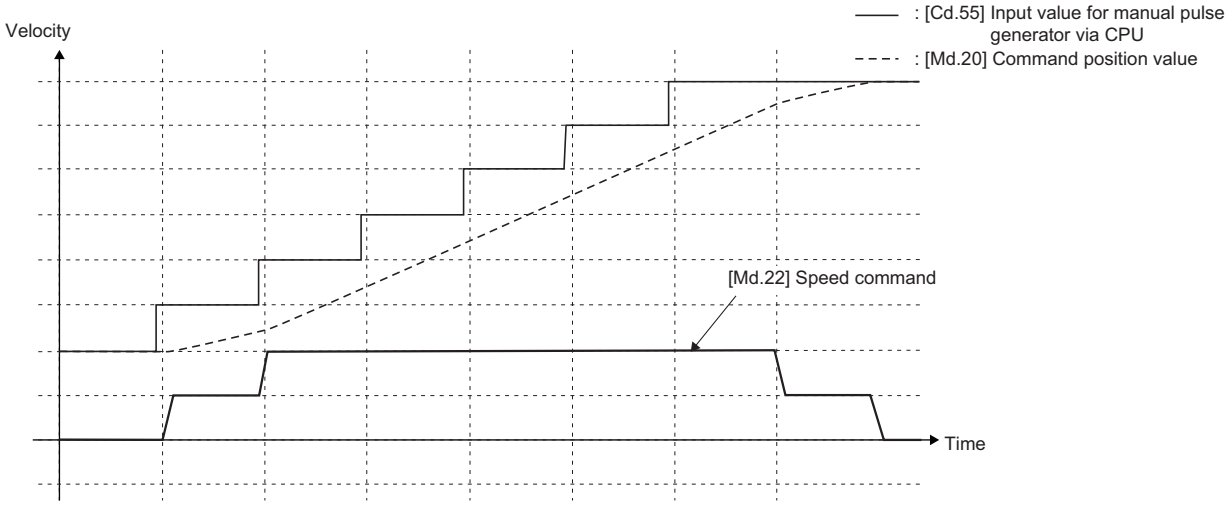
- When speed change occurs

As shown in the diagram below, speed change occurs when the scan time is larger than the input cycle of "[Cd.55] Input value for manual pulse generator via CPU".



- When speed change is suppressed

  Example: When "[Pr.156] Manual pulse generator smoothing time constant" is set to a value equal to double the scan time



■Buffer memory address

For the buffer memory addresses in this area, refer to the following.

☞ Page 422 Common parameters

[Pr.900] Forced stop signal (EMI): Link device type [FX5-SSC-G]

Set the link device type for use. For details, refer to the following.

☞ Page 329 Link Device External Signal Assignment Function [FX5-SSC-G]

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 422 Common parameters

[Pr.901] Forced stop signal (EMI): Link device start No. [FX5-SSC-G]

Set the link device No. for use. For details, refer to the following.

☞ Page 329 Link Device External Signal Assignment Function [FX5-SSC-G]

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 422 Common parameters

[Pr.902] Forced stop signal (EMI): Link device bit specification [FX5-SSC-G]

Set the bit No. that is used when "13H: RWr" and "14H: RWw" are set to "[Pr.900] Forced stop signal (EMI): Link device type". For details, refer to the following.

☞ Page 329 Link Device External Signal Assignment Function [FX5-SSC-G]

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 422 Common parameters

[Pr.903] Forced stop signal (EMI): Link device logic setting [FX5-SSC-G]

Set the logic for assignment signal. For details, refer to the following.

☞ Page 329 Link Device External Signal Assignment Function [FX5-SSC-G]

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 422 Common parameters

Basic parameters1

This section describes the details on the basic parameter 1.

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.1] Unit setting		0: mm	0	3	0+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
	[Pr.3] Movement amount per rotation (AL)	The setting value range differs according to the "[Pr.1] Unit setting".		20000	4+150n 5+150n
	[Pr.4] Unit magnification (AM)	1: 1 times	1	1	1+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

[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 position system.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 423 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/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 229 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 [FX5-SSC-S], or error code: 1B68H [FX5-SSC-G]) will occur.

[FX5-SSC-S]/[FX5-SSC-G] Ver.1.001 or earlier

$$0.001 \leq \text{Electronic gear} \left(\frac{AP}{AL \times AM} \right) \leq 320000$$

[FX5-SSC-G] Ver.1.002 or later
The range is not checked

- 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 315 Follow up function

■Buffer memory address

Refer to the following for the buffer memory address in this area.
☞ Page 423 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.

[FX5-SSC-S]

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

[FX5-SSC-G]

When using the MR-J5(W)-G/MR-JET-G, add the electronic gear of the servo amplifier when setting.

Number of pulses per rotation (AP) = Servo motor resolution per rotation × Electronic gear denominator (PA07) / Electronic gear numerator (PA06)

Point

[FX5-SSC-G]

When using the MR-J5(W)-G rotary servo motor, the servo motor resolution per rotation is 26 bits (67108864). However, set the number of pulses per rotation (AP) to 22 bits (4194304) to account for Electronic gear numerator (PA06)/Electronic gear denominator (PA07) of the servo amplifier being overwritten from the controller to 1/16 of their values.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 423 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 229 Electronic gear function

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 423 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

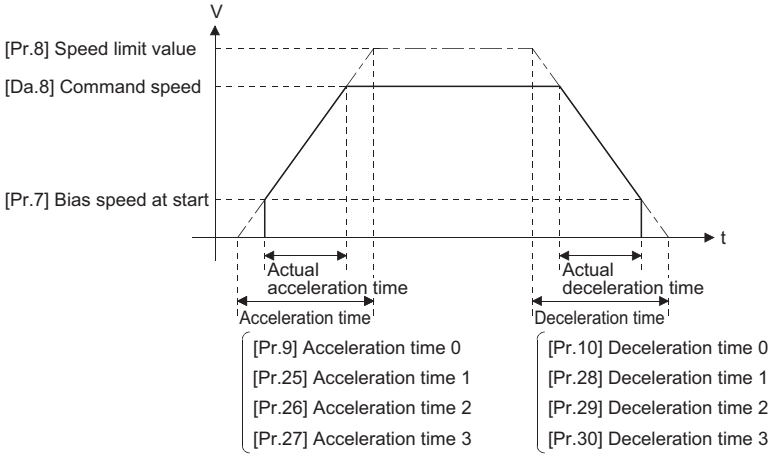
Set the value that the bias speed should not exceed "[Pr.8] Speed limit value".

[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)

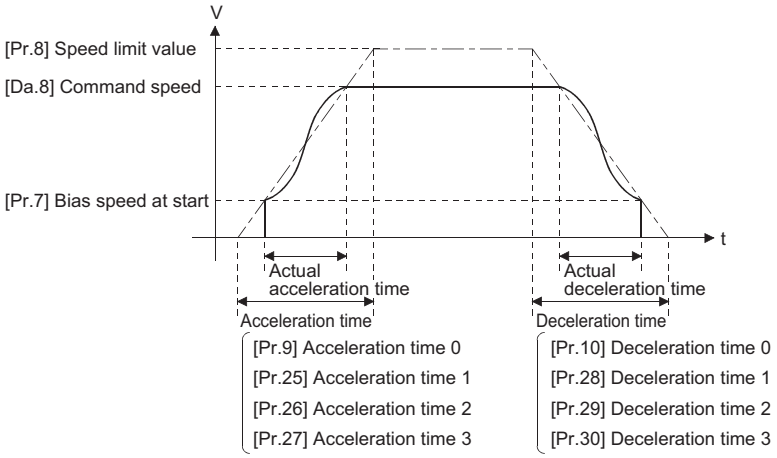
*1 Range of speed limit value when "[Pr.83] Speed control 10 × multiplier setting for degree axis" is set to valid: 0.00 to 20000000.00 (degree/min)

*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)

Trapezoidal acceleration/deceleration (S-curve ratio is 0%)



S-curve acceleration/deceleration (S-curve ratio is other than 0%)



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

- Set "0" because "[Pr.7] Bias speed at start" is valid regardless of motor type. 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 [FX5-SSC-S], or warning code: 0D08H [FX5-SSC-G]) 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 423 Positioning parameters: Basic parameters 1

Basic parameters2

This section describes the details on the basic parameter 2.

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.8] Speed limit value	The setting range differs depending on the "[Pr.1] Unit setting".		200000	10+150n 11+150n
[Pr.9] Acceleration time 0	1 to 8388608 (ms)	1 to 8388608 (ms)	1000	12+150n 13+150n
[Pr.10] Deceleration time 0	1 to 8388608 (ms)	1 to 8388608 (ms)	1000	14+150n 15+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 ($\times 10^{-2}$ mm/min)
1: inch	0.001 to 2000000.000 (inch/min)	1 to 2000000000 ($\times 10^{-3}$ inch/min)
2: degree	0.001 to 2000000.000 (degree/min)*1	1 to 2000000000 ($\times 10^{-3}$ 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 ($\times 10^{-2}$ degree/min)

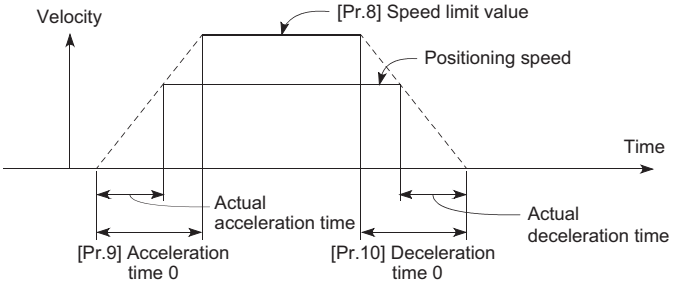
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 423 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.

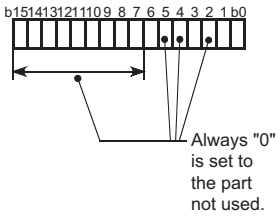
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 423 Positioning parameters: Basic parameters 2

Detailed parameters1

n: Axis No. - 1

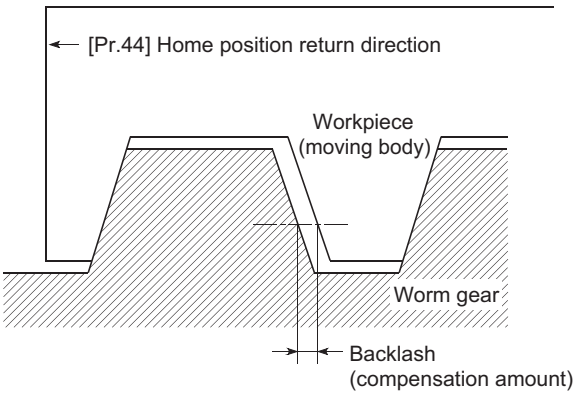
Item	Setting value, setting range				Default value	Buffer memory address
	Value set with the engineering tool			Value set with a program		
[Pr.11] Backlash compensation amount	The setting value range differs according to the "[Pr.1] Unit setting".				0	17+150n
[Pr.12] Software stroke limit upper limit value					2147483647	18+150n 19+150n
[Pr.13] Software stroke limit lower limit value					-2147483648	20+150n 21+150n
[Pr.14] Software stroke limit selection	0: Apply software stroke limit on command position value			0	0	22+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
	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
[Pr.17] Torque limit setting value	0.1 to 1000.0 (%)			1 to 10000 (× 0.1%)	3000	26+150n
[Pr.18] M code ON signal output timing	0: WITH mode			0	0	27+150n
	1: AFTER mode			1		
[Pr.19] Speed switching mode	0: Standard speed switching mode			0	0	28+150n
	1: Front-loading speed switching mode			1		
[Pr.20] Interpolation speed designation method	0: Composite speed			0	0	29+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
	1: Update command position value			1		
	2: Clear command position value to zero			2		
[Pr.22] Input signal logic selection	b0	Lower limit	0: Negative logic 1: Positive logic		0	31+150n
	b1	Upper limit				
	b2	Not used				
	b3	Stop signal				
	b4	Not used [FX5-SSC-S]				
		External command/ switching signal [FX5-SSC-G]				
	b5	Not used				
	b6	Proximity dog signal				
	b7 to b15	Not used				
[Pr.81] Speed-position function selection	0: Speed-position switching control (INC mode)			0	0	34+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		
[Pr.116] FLS signal selection	1 (0001H): Servo amplifier*1 2 (0002H): Buffer memory 3 (0003H): Link device [FX5-SSC-G]	1*1 2 3	0001H	116+150n
[Pr.117] RLS signal selection			0001H	117+150n
[Pr.118] DOG signal selection			0001H	118+150n
[Pr.119] STOP signal selection			0002H	119+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.

$$0 \leq \frac{\text{([Pr.11] Backlash compensation amount)} \times \text{([Pr.2] Number of pulses per rotation (AP))}}{\text{([Pr.3] Movement amount per rotation (AL))} \times \text{([Pr.4] Unit magnification (AM))}} (= A) \leq 4194303 \text{ (pulse)}: (1)$$

(round down after decimal point)

The error "Backlash compensation amount error" (error code: 1AA0H [FX5-SSC-S], or error code 1BA0H [FX5-SSC-G]) 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/Motion module) even if the setting is within the calculation result of (1).
Reduce the setting value of "[Pr.11] Backlash compensation amount" if a servo alarm occurs. Use the value of the following (2) as a measure that a servo alarm does not occur.

$$A \leq \frac{\text{(Maximum motor speed (r/min))} \times 1.2 \times \text{(Encoder resolution (pulse/rev))} \times \text{(Operation cycle (ms))}}{60 \text{ (s)} \times 1000 \text{ (ms)}} \text{ (pulse)}: (2)$$

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 (× 10^{-1} μm)
1: inch	0 to 0.65535 (inch)	0 to 65535 (× 10^{-5} inch)
2: degree	0 to 0.65535 (degree)	0 to 65535 (× 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 423 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)

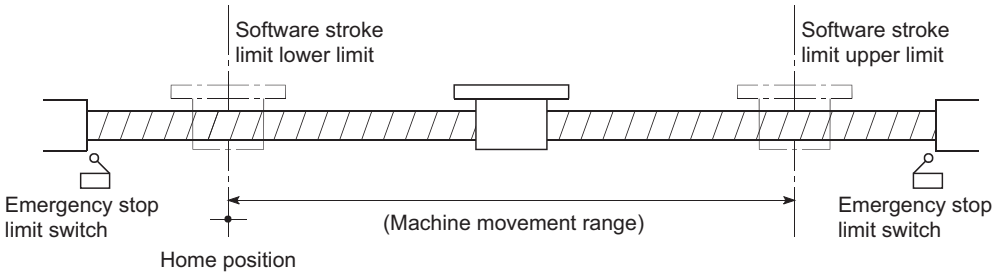
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 423 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 423 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 [FX5-SSC-S], or error code: 1BA5H [FX5-SSC-G]) will occur if "machine feed value" is set.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 423 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.

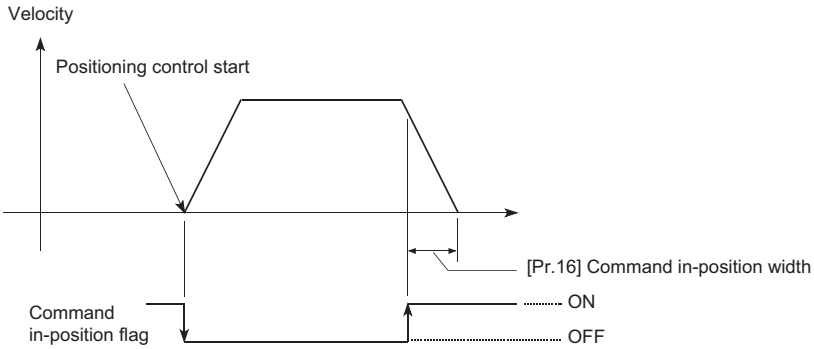
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 423 Positioning parameters: Detailed parameters 1

[Pr.16] Command in-position width

Set the remaining distance that turns the command in-position flag ON. The command in-position signal is used as a front-loading signal of the positioning complete signal. 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 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 423 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 241 Torque limit function

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 423 Positioning parameters: Detailed parameters 1

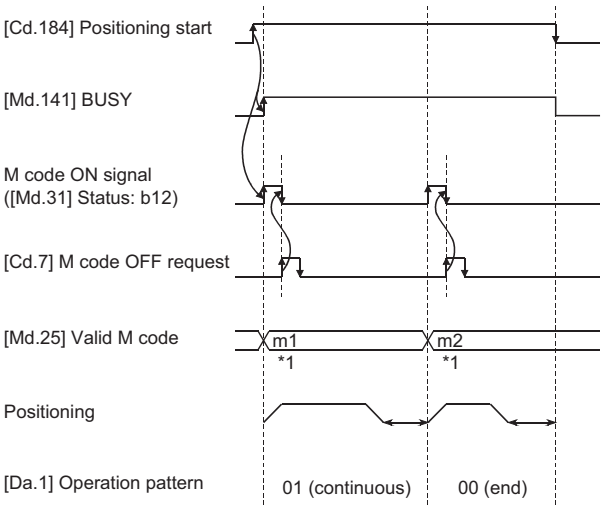
[Pr.18] M code ON signal output timing

This parameter sets the M code ON signal output timing.

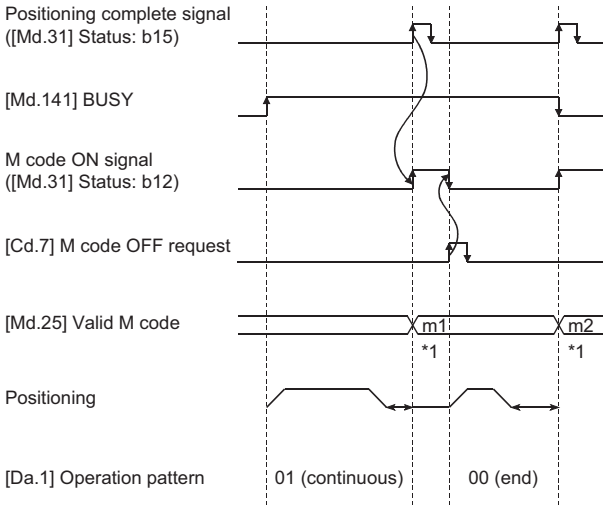
Choose either WITH mode or AFTER mode as the M code ON signal output timing.

■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] M code/Condition data No./Number of LOOP to LEND repetitions).

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.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

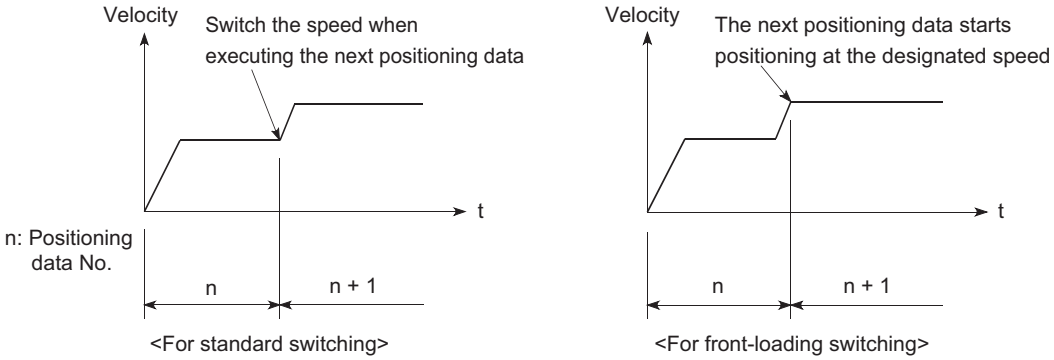
☞ Page 423 Positioning parameters: Detailed parameters 1

[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
  Decelerates at deceleration time No. of Positioning data No.n + 1
- Speed of positioning data No.n < Speed of positioning data No.n + 1
  Accelerates at 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.



■Buffer memory address

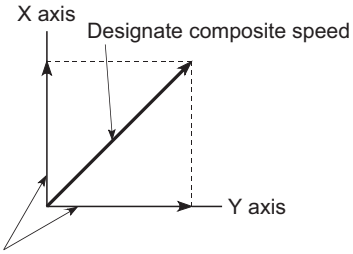
Refer to the following for the buffer memory address in this area.

☞ Page 423 Positioning parameters: Detailed parameters 1

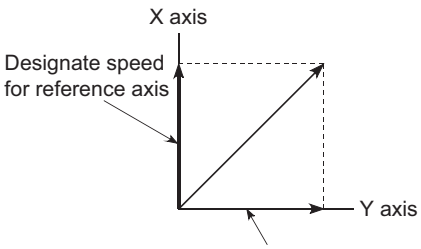
[Pr.20] Interpolation speed designation method

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/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/Motion module.



<When composite speed is designated>



<When reference axis speed is designated>

Point

Always specify the reference axis speed if the 4-axis linear interpolation or 2 to 4 axis speed control has to be performed.

If you specify the composite speed for a positioning operation that involves the 4-axis linear interpolation or 2 to 4 axis speed control, the error "Interpolation mode error" (error code: 199AH [FX5-SSC-S], or error code: 1A9AH [FX5-SSC-G]) will occur when the positioning operation is attempted.

For a positioning operation that involves the 2-axis circular interpolation, specify the composite speed always.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 423 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 423 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/Motion module or "[Cd.44] External input signal operation device (Axis 1 to 8)".

■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.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 423 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 423 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.

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/Motion module.)

3 (0003H): Link device (Uses the link device.) [FX5-SSC-G]

*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 [FX5-SSC-S], or error code: 1BD3H [FX5-SSC-G]) occurs and the "[Cd.190] PLC READY" is not turned ON.

*2 At MR-JE-B(F) use, refer to the following.

☞ Page 820 Connection with MR-JE-B(F)

Point

[FX5-SSC-G]

If "3: Link device" is selected, specify the link device to be used for the external input signals (upper/lower limit signal (FLS/RLS), proximity dog signal (DOG), stop signal (STOP)) by using the following parameters.

- [Pr.910], [Pr.920], [Pr.930], [Pr.940] Link device type
- [Pr.911], [Pr.921], [Pr.931], [Pr.941] Link device start No.
- [Pr.912], [Pr.922], [Pr.932], [Pr.942] Link device bit specification
- [Pr.913], [Pr.923], [Pr.933], [Pr.943] Link device logic setting

■Buffer memory address

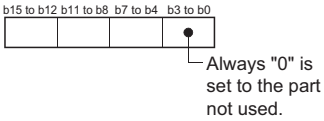
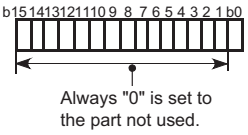
Refer to the following for the buffer memory address in this area.

☞ Page 423 Positioning parameters: Detailed parameters 1

Detailed parameters2

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.25] Acceleration time 1	1 to 8388608 (ms)	1 to 8388608 (ms)	1000	36+150n 37+150n
[Pr.26] Acceleration time 2				38+150n 39+150n
[Pr.27] Acceleration time 3				40+150n 41+150n
[Pr.28] Deceleration time 1				42+150n 43+150n
[Pr.29] Deceleration time 2				44+150n 45+150n
[Pr.30] Deceleration time 3				46+150n 47+150n
[Pr.31] JOG speed limit value	The setting range differs depending on the "[Pr.1] Unit setting".		20000	48+150n 49+150n
[Pr.32] JOG operation acceleration time selection	0: [Pr.9] Acceleration time 0	0	0	50+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
	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
	1: S-curve acceleration/deceleration process	1		
[Pr.35] S-curve ratio	1 to 100 (%)	1 to 100 (%)	100	53+150n
[Pr.36] Sudden stop deceleration time	1 to 8388608 (ms)	1 to 8388608 (ms)	1000	54+150n 55+150n
[Pr.37] Stop group 1 sudden stop selection	0: Normal deceleration stop	0	0	56+150n
	1: Rapid stop	1		
[Pr.38] Stop group 2 sudden stop selection	0: Normal deceleration stop	0		57+150n
	1: Rapid stop	1		
[Pr.39] Stop group 3 sudden stop selection	0: Normal deceleration stop	0		58+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
[Pr.41] Allowable circular interpolation error width	The setting value range differs depending on the "[Pr.1] Unit setting".		100	60+150n 61+150n
[Pr.42] External command function selection	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		
[Pr.83] Speed control 10 times multiplier setting for degree axis	0: Invalid		0	0	63+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
[Pr.90] Operation setting for speed-torque control mode	b0 to b3	Not used		0000H	68+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 [FX5-SSC-S] 0: Switching conditions valid at mode switching 1: ON conditions invalid during zero speed at mode switching [FX5-SSC-G] 0: Check the switching condition on the Motion module 1: Follow the specifications of the servo amplifier			
[Pr.95] External command signal selection	0: Not used		0	0	69+150n
	1 to 4: DI1 to DI4 [FX5-SSC-S]		1 to 4		
	101 to 108: DOG signal of Axis 1 to Axis 8 [FX5-SSC-G]		101 to 108		
[Pr.112] Servo OFF command valid/invalid setting [FX5-SSC-G]	b0	0: Servo OFF Command Invalid 1: Servo OFF Command in Speed/Torque Control Valid		0000H	112+150n
	b1 to b15	Not used			
[Pr.122] Manual pulse generator speed limit mode [FX5-SSC-G]	0: Do not execute speed limit		0	0	121+150n
	1: Do not output the exceeding speed limit value		1		
	2: Output the exceeding speed limit value delay		2		
[Pr.123] Manual pulse generator speed limit value [FX5-SSC-G]	The setting range differs depending on the "[Pr.1] Unit setting".			20000	122+150n 123+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 424 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 424 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 [FX5-SSC-S], or error code: 1BB7H [FX5-SSC-G]) will occur.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 424 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 424 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.

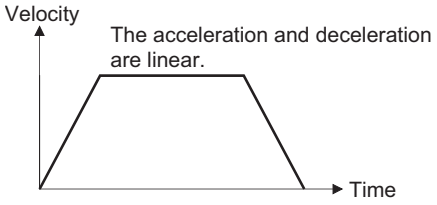
☞ Page 424 Positioning parameters: Detailed parameters 2

[Pr.34] Acceleration/deceleration process selection

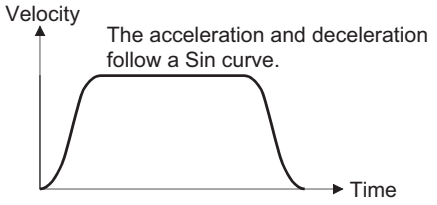
Set whether to use trapezoid acceleration/deceleration or S-curve acceleration/deceleration for the acceleration/deceleration process.

Refer to the following for details.

☞ Page 304 Acceleration/deceleration processing function



<Trapezoid acceleration/deceleration>



<S-curve acceleration/deceleration>

■Buffer memory address

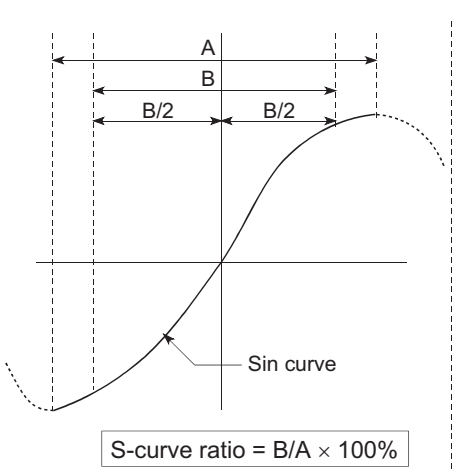
Refer to the following for the buffer memory address in this area.

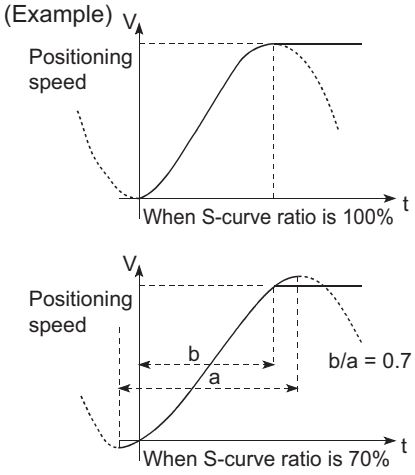
☞ Page 424 Positioning parameters: Detailed parameters 2

[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.





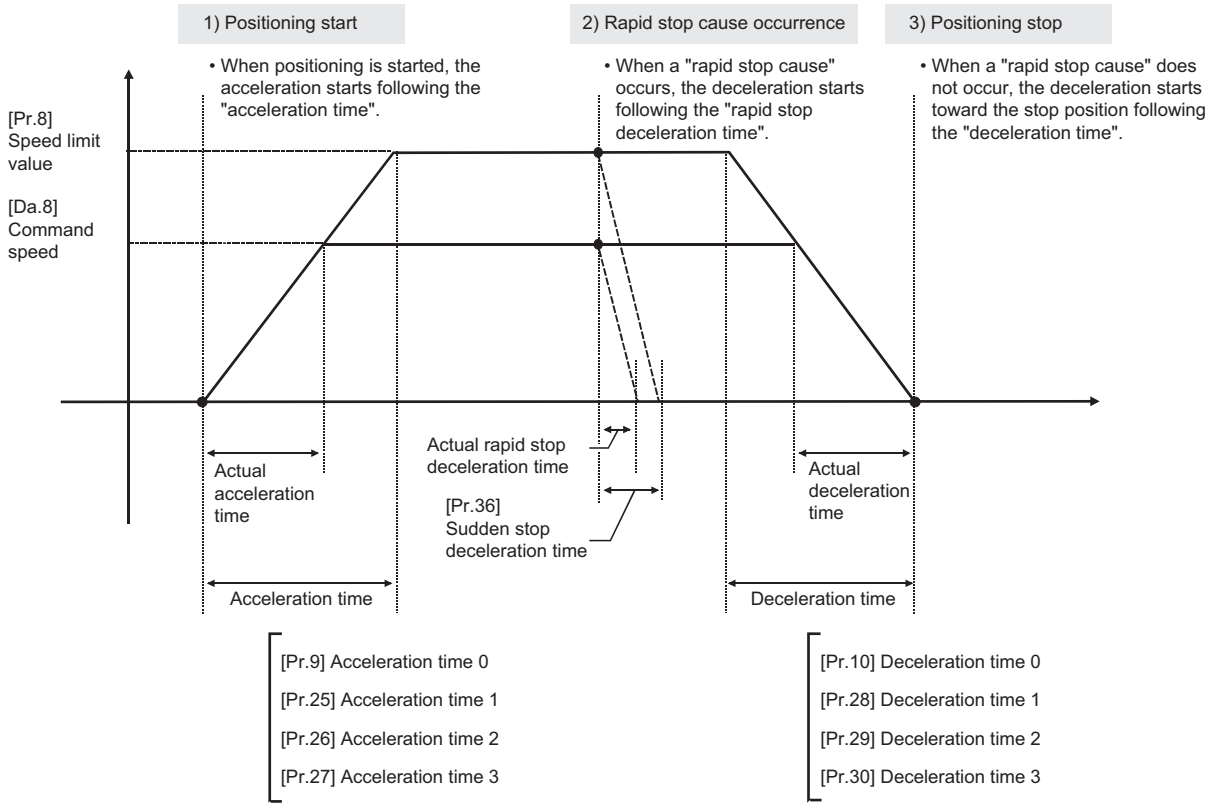
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 424 Positioning parameters: Detailed parameters 2

[Pr.36] Sudden 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 424 Positioning parameters: Detailed parameters 2

[Pr.37] to [Pr.39] Stop group 1/2/3 sudden 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, "[Cd.190] PLC READY" 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 424 Positioning parameters: Detailed parameters 2

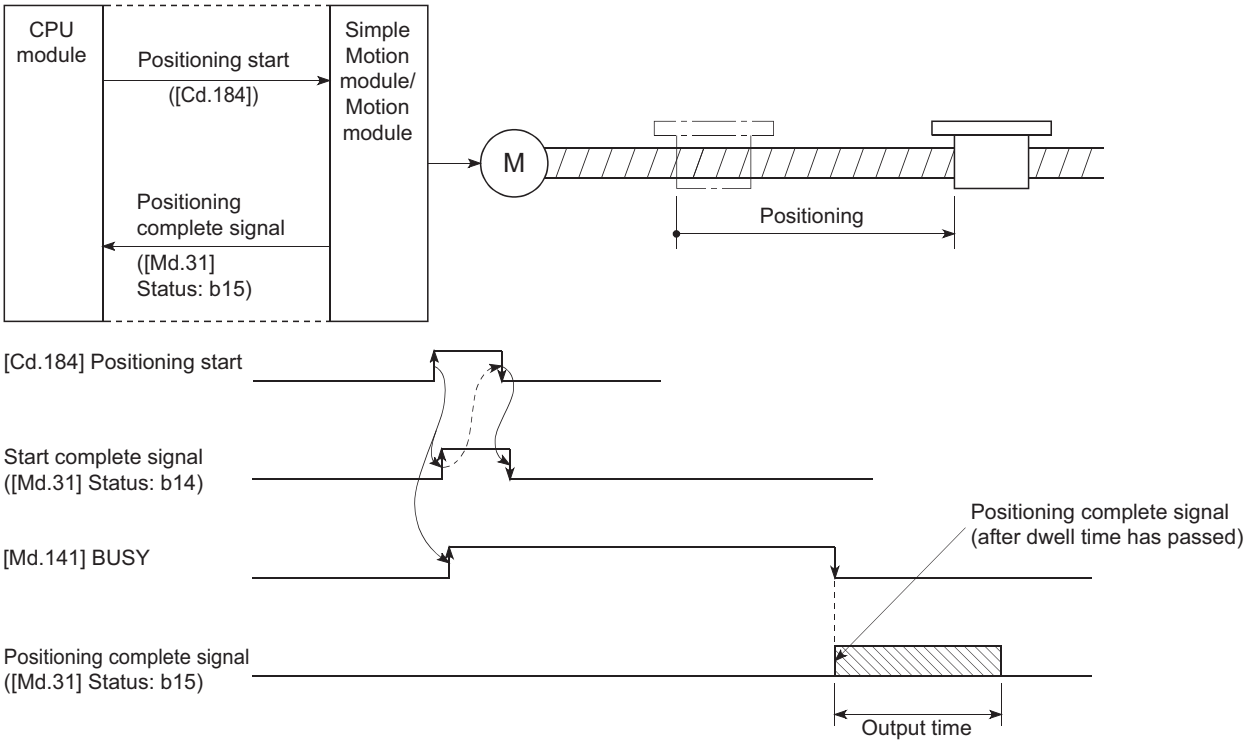
[Pr.40] Positioning complete signal output time

Set the output time of the positioning complete signal output from the Simple Motion module/Motion module.

A positioning completes when the specified dwell time has passed after the Simple Motion module/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 424 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

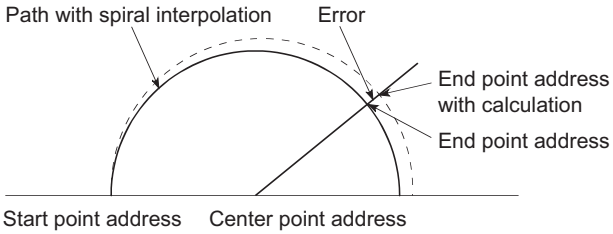
If the error of the calculated arc path and end point address is within the set range, circular interpolation will be carried out to the set end point address while compensating the error with spiral interpolation.

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].



*1 In 2-axis circular interpolation control with the 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 424 Positioning parameters: Detailed parameters 2

[Pr.42] External command function selection

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 424 Positioning parameters: Detailed parameters 2

[Pr.83] Speed control 10 times 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 309 Speed control 10 times 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 (× 10^{-3} degree/min)
1: Valid	0.01 to 20000000.00 (degree/min)	1 to 2000000000 (× 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 "[Cd.190] PLC READY".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 424 Positioning parameters: Detailed parameters 2

[Pr.84] Restart allowable range when servo OFF to ON

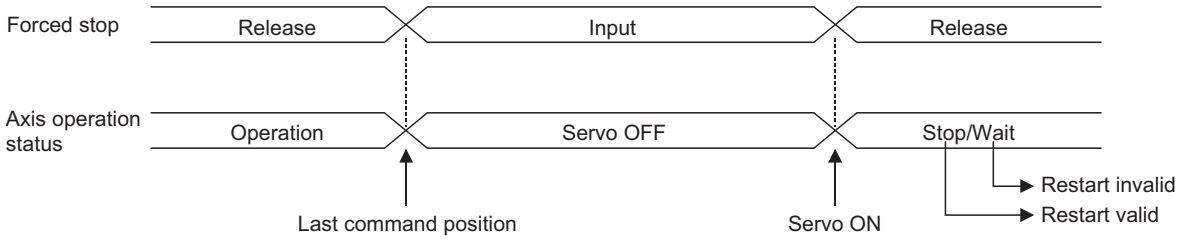
■Restart function at switching servo OFF to ON

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/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/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.

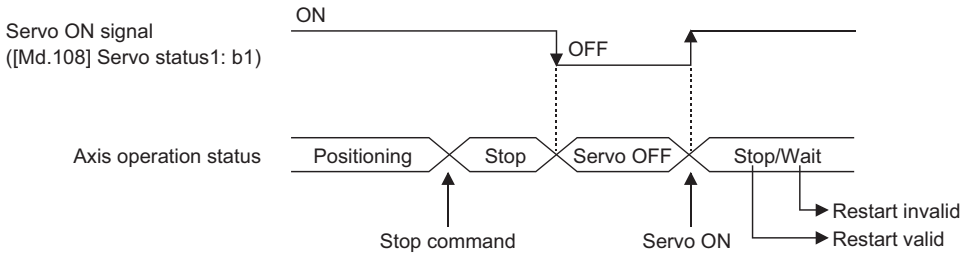
• Servo emergency stop processing

- When the difference between the last command position of Simple Motion module/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/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/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/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

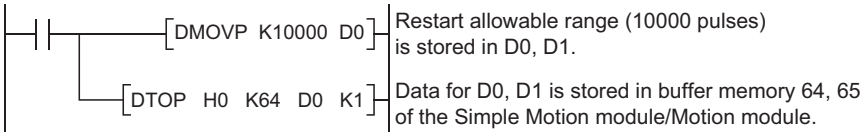
For performing restart at switching servo OFF to ON, set the restart allowable range in the following buffer memory.

n: Axis No. - 1

Item	Setting range	Default value	Buffer memory address
[Pr.84] Restart allowable range when servo OFF to ON	0, 1 to 327680 [pulse] 0: restart not allowed	0	64+150n 65+150n

• Setting example

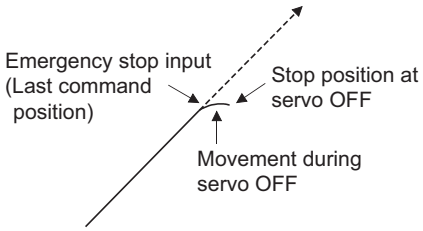
A program to set the restart allowable range for axis 1 to 10000 pulses is shown below.



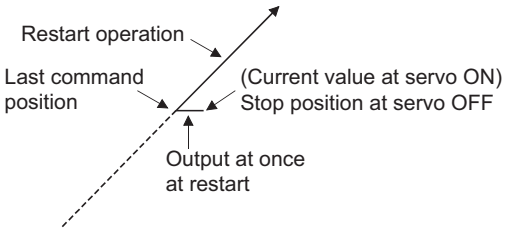
Point

- 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 "[Cd.190] PLC READY" 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 [FX5-SSC-S], or warning code: 0D02H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code: 1A08H [FX5-SSC-G]) 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 [FX5-SSC-S], or warning code: 0D02H [FX5-SSC-G]) 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 424 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.

[FX5-SSC-S]

0: Switching conditions valid at mode switching

1: ON conditions invalid during zero speed at mode switching

[FX5-SSC-G]

0: Check the switching conditions on the Motion module

1: Follow the specifications of the servo amplifier

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 "[Cd.190] PLC READY".
- Set the following settings to switch the control mode without waiting for the servo motor to stop. Note that it may cause vibration or impact at control switching.

[FX5-SSC-S]

Set "Condition selection at mode switching (b12 to b15)" to "1: ON conditions invalid during zero speed at mode switching"

[FX5-SSC-G]

Set "Condition selection at mode switching (b12 to b15)" to "1: Follow the specifications of the servo amplifier". When using MR-J5(W)-G, set "ZSP disabled selection at control switching" in 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 424 Positioning parameters: Detailed parameters 2

[Pr.95] External command signal selection

Set the external command signal.

DOG signal of the servo amplifier is used regardless of the values of "[Pr.118] DOG signal selection". [FX5-SSC-G]

■FX5-SSC-S

Setting value	Details
0: Not used	External command signal is not used.
1: DI1	DI1 is used as external command signal.
⋮	⋮
4: DI4	DI4 is used as external command signal.

■FX5-SSC-G

Setting value	Details
0: Not used	External command signal is not used.
101: DOG signal of Axis 1	DOG signal of Axis 1 is used as external command signal.
⋮	⋮
108: DOG signal of Axis 8	DOG signal of Axis 8 is used as external command signal.

The logic selection of the DOG signal assigned as the external command signal follows the setting of "[Pr.22] Input signal logic selection" "b4: External command/switching signal".

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 "[Cd.190] PLC READY".
- 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 424 Positioning parameters: Detailed parameters 2

[Pr.112] Servo OFF command valid/invalid setting [FX5-SSC-G]

Set whether accept "[Cd.100] Servo OFF command" and "[Cd.191] All axis servo ON" or not during the speed control mode, torque control mode, or continuous operation to torque control mode of each axis. The setting value is reflected at the control mode switching. Only the setting of bit0 is enabled.

0: Servo OFF Command Invalid

1: Servo OFF Command in Speed/Torque Control Valid

Point

When the value is "1" other than bit0, the setting is ignored and as the same behavior occurs as when the bit0 is set to "0: Servo OFF Command Invalid".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 424 Positioning parameters: Detailed parameters 2

[Pr.122] Manual pulse generator speed limit mode [FX5-SSC-G]

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→ON) of "[Cd.190] PLC READY".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 424 Positioning parameters: Detailed parameters 2

[Pr.123] Manual pulse generator speed limit value [FX5-SSC-G]

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→ON) of "[Cd.190] PLC READY".
- 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: 1BBAH) will occur.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 424 Positioning parameters: Detailed parameters 2

[Pr.127] Speed limit value input selection at control mode switching

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 "[Cd.190] PLC READY".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 424 Positioning parameters: Detailed parameters 2

Home position return basic 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.43] Home position return method	0: Proximity dog method [FX5-SSC-S]	0	0 [FX5-SSC-S] 8 [FX5-SSC-G]	70+150n
	4: Count method 1 [FX5-SSC-S]	4		
	5: Count method 2 [FX5-SSC-S]	5		
	6: Data set method [FX5-SSC-S]	6		
	7: Scale origin signal detection method [FX5-SSC-S]	7		
	8: Driver home position return method	8		
[Pr.44] Home position return direction	0: Positive direction (address increment direction)	0	0	71+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
[Pr.46] Home position return speed			1	74+150n 75+150n
[Pr.47] Creep speed [FX5-SSC-S]			1	76+150n 77+150n
[Pr.48] Home position return retry [FX5-SSC-S]	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 [FX5-SSC-S]	After decelerating at the proximity dog ON, stop at the zero signal and complete the machine home position return.	Page 42 Proximity dog method [FX5-SSC-S]
4: Count method 1 [FX5-SSC-S]	After decelerating at the proximity dog ON, move the designated distance, and complete the machine home position return with the zero signal.	Page 44 Count method1 [FX5-SSC-S]
5: Count method 2 [FX5-SSC-S]	After decelerating at the proximity dog ON, move the designated distance, and complete the machine home position return.	Page 46 Count method2 [FX5-SSC-S]
6: Data set method [FX5-SSC-S]	The position where the machine home position return has been made will be the home position.	Page 48 Data set method [FX5-SSC-S]
7: Scale origin signal detection method [FX5-SSC-S]	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 49 Scale origin signal detection method [FX5-SSC-S]
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.	[FX5-SSC-S] Page 825 AlphaStep/5-phase stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd. Page 836 IAI electric actuator controller manufactured by IAI Corporation [FX5-SSC-G] Page 52 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 [FX5-SSC-S], or error code: 1A79H [FX5-SSC-G]) occurs and the home position return is not executed.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

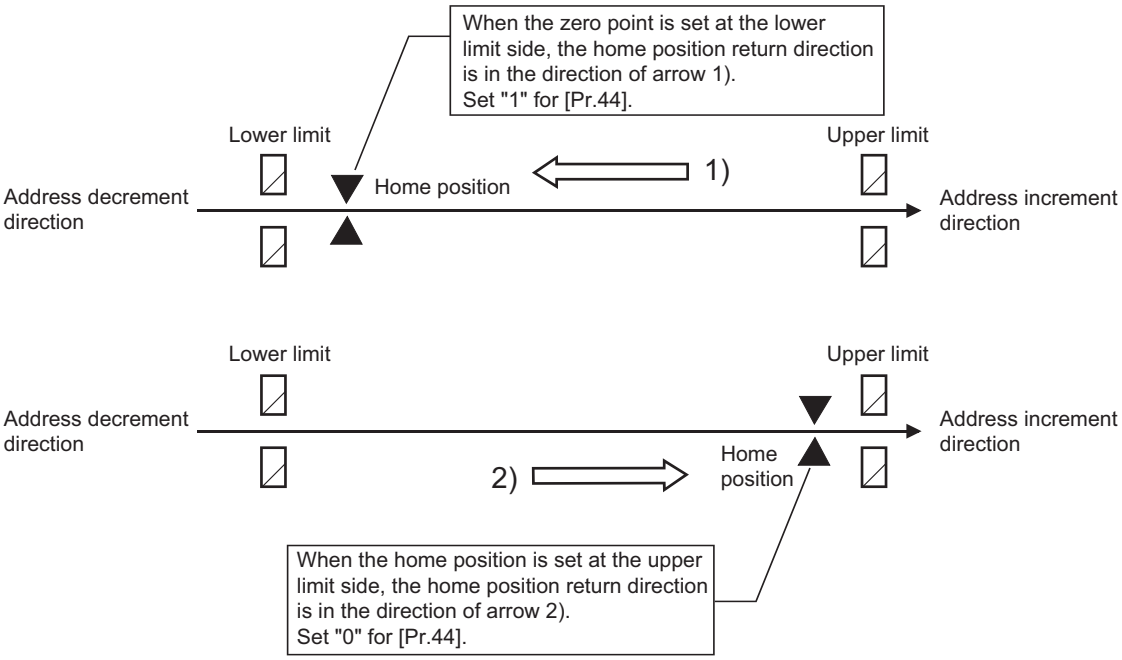
☞ Page 424 Home position return parameters: Home position return basic parameters

[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 424 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 (× 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 424 Home position return parameters: Home position return basic parameters

[Pr.46] Home position return speed

Set the speed for home position return.

Performs high-speed home position return with the home position return speed. [FX5-SSC-G]

[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 ($\times 10^{-2}$ mm/min)
1: inch	0.001 to 2000000.000 (inch/min)	1 to 2000000000 ($\times 10^{-3}$ inch/min)
2: degree	0.001 to 2000000.000 (degree/min)*1	1 to 2000000000 ($\times 10^{-3}$ 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 ($\times 10^{-2}$ degree/min)

Point

[FX5-SSC-S]

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".

[FX5-SSC-G]

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: 1B69H) will occur, and home position return will not be executed.

■Buffer memory address

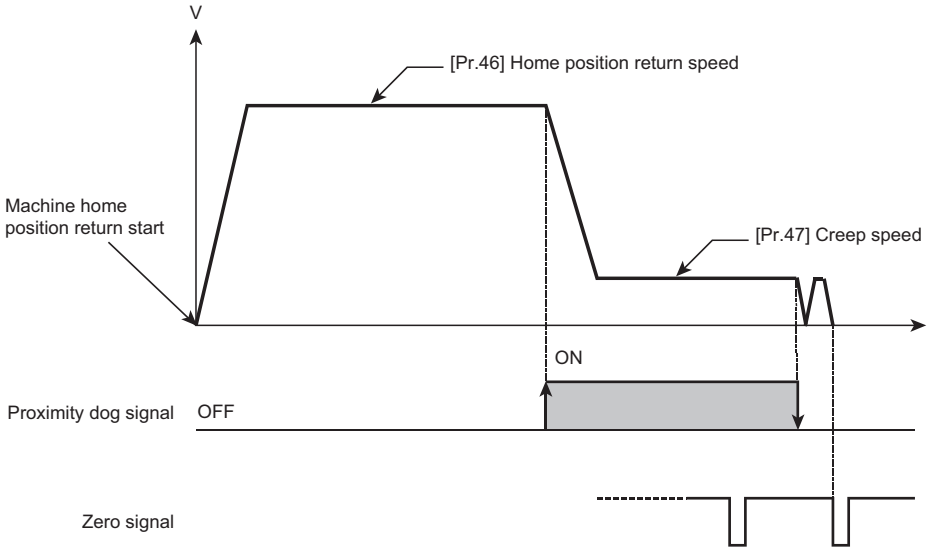
Refer to the following for the buffer memory address in this area.

☞ Page 424 Home position return parameters: Home position return basic parameters

[Pr.47] Creep speed [FX5-SSC-S]

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 424 Home position return parameters: Home position return basic parameters

[Pr.48] Home position return retry [FX5-SSC-S]

Set whether to carry out home position return retry.

Refer to the following for the operation of home position return retry.

☞ Page 220 Home position return retry function [FX5-SSC-S]

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 424 Home position return parameters: Home position return basic parameters

Home position return detailed 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.50] Setting for the movement amount after proximity dog ON [FX5-SSC-S]	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
	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
	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 [FX5-SSC-S]	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 [FX5-SSC-S]	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
	1: Positioning control is executed.	1		
[Pr.56] Speed designation during home position shift [FX5-SSC-S]	0: Home position return speed	0	0	88+150n
	1: Creep speed	1		
[Pr.57] Dwell time during home position return retry [FX5-SSC-S]	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

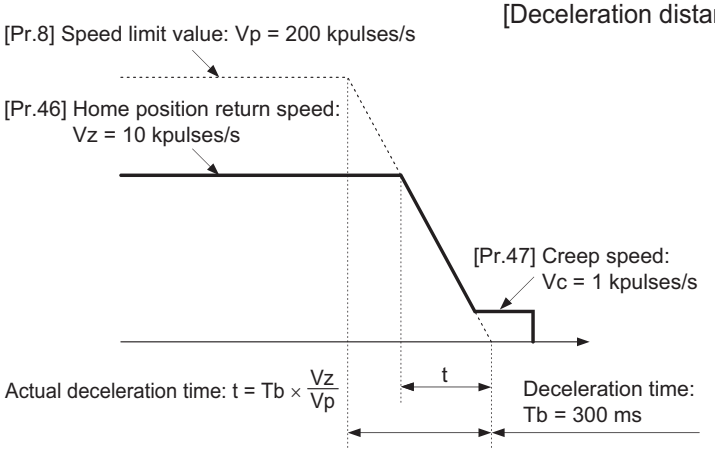
[Pr.50] Setting for the movement amount after proximity dog ON [FX5-SSC-S]

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:

[Home position return operation]



$$[\text{Deceleration distance}] = \frac{1}{2} \times \frac{Vz}{1000} \times t + \underbrace{0.01 \times Vz}_{\text{Movement amount for 10 ms at home position return speed.}}$$

$$= \frac{Vz}{2000} \times \frac{Tb \times Vz}{Vp} + 0.01 \times Vz$$

$$= \frac{10 \times 10^3}{2000} \times \frac{300 \times 10 \times 10^3}{200 \times 10^3} + 0.01 \times 10 \times 10^3$$

$$= 75 + 100$$

$$= 175$$

"[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 (× 10^{-1} μm)
1: inch	0 to 21474.83647 (inch)	0 to 2147483647 (× 10^{-5} inch)
2: degree	0 to 21474.83647 (degree)	0 to 2147483647 (× 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.

To calculate the movement amount, the deviation counter value is used to compensate the movement amount after the proximity dog is turned ON. If the deviation counter value is large, the corrected movement amount becomes small, and the error "Count method movement amount fault" (error code: 1944H) may occur. Adjust the gain to reduce the deviation counter value or to increase the movement amount.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 425 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".

Only valid at high-speed home position return. [FX5-SSC-G]

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 425 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".

Only valid at high-speed home position return. [FX5-SSC-G]

■Buffer memory address

Refer to the following for the buffer memory address in this area.

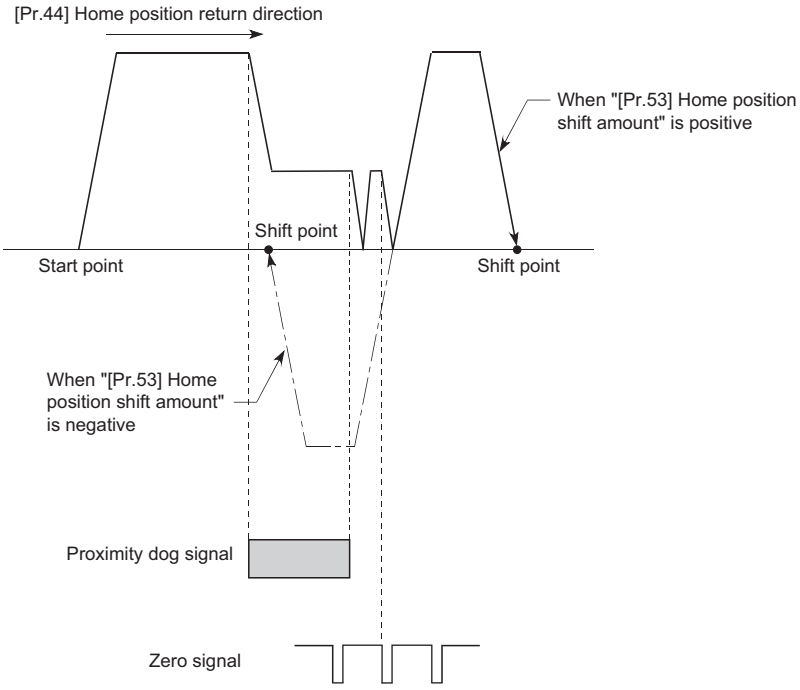
☞ Page 425 Home position return parameters: Home position return detailed parameters

[Pr.53] Home position shift amount [FX5-SSC-S]

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 (× 10^{-1} μm)
1: inch	-21474.83648 to 21474.83647 (inch)	-2147483648 to 2147483647 (× 10^{-5} inch)
2: degree	-21474.83648 to 21474.83647 (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 425 Home position return parameters: Home position return detailed parameters

[Pr.54] Home position return torque limit value [FX5-SSC-S]

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 241 Torque limit function

■Buffer memory address

Refer to the following for the buffer memory address in this area.
☞ Page 425 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 [FX5-SSC-S], or error code: 1AA6H [FX5-SSC-G]), 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, 2-axis circular interpolation control with 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 [FX5-SSC-S], or error code: 1A45H [FX5-SSC-G]) 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 425 Home position return parameters: Home position return detailed parameters

[Pr.56] Speed designation during home position shift [FX5-SSC-S]

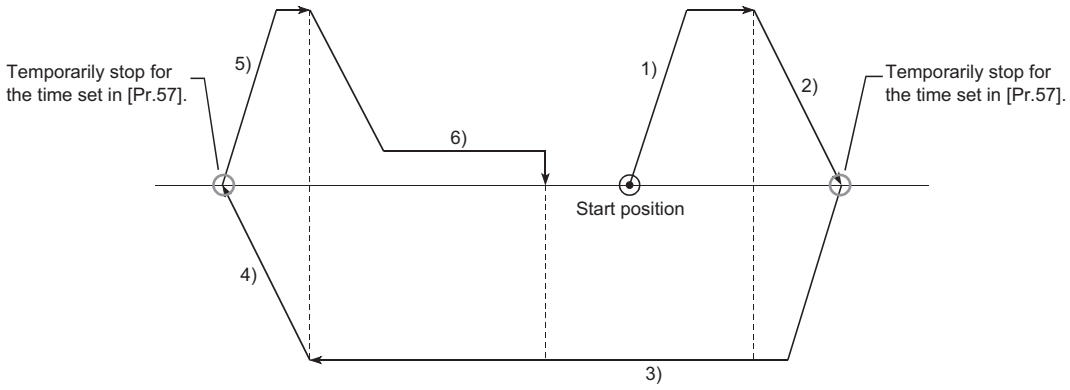
Set the operation speed for when a value other than "0" is set for "[Pr.53] Home position shift amount". Select the setting from "[Pr.46] Home position return speed" or "[Pr.47] Creep speed".
0: Designate "[Pr.46] Home position return speed" as the setting value.
1: Designate "[Pr.47] Creep speed" as the setting value.

■Buffer memory address

Refer to the following for the buffer memory address in this area.
☞ Page 425 Home position return parameters: Home position return detailed parameters

[Pr.57] Dwell time during home position return retry [FX5-SSC-S]

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.



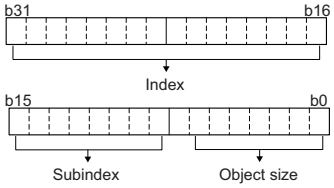
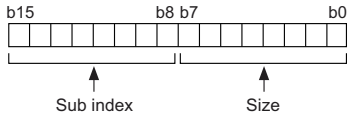
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 425 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	[FX5-SSC-S] 0: No setting 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	[FX5-SSC-S] 0 1 2 3 4 5 6 7	0	100+150n
[Pr.92] Optional data monitor: Data type setting 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	8 9 10 12 13 14 15 16 17	0	101+150n
[Pr.93] Optional data monitor: Data type setting 3	18: Internal temperature of encoder 20: Position feedback*1 21: Encoder position within one revolution*1 22: Selected droop pulse*1 23: Unit total power consumption*1 24: Load-side encoder information 1*1 25: Load-side encoder information 2*1 26: Z-phase counter*1 27: Servo motor side/load-side position deviation*1	18 20 21 22 23 24 25 26 27	0	102+150n
[Pr.94] Optional data monitor: Data type setting 4	28: Servo motor side/load-side speed deviation*1 29: External encoder counter value*1 30: Unit power consumption (2 words)*1 Most significant bit1 + address value: Optional address of registered monitor [FX5-SSC-G] Set the index of the CiA402 object of the device.	28 29 30 Most significant bit1 + address value [FX5-SSC-G] Example) When monitoring the effective load ratio, set "2B09H".	0	103+150n
[Pr.512] Optional SDO 1 [FX5-SSC-G]	Specify the object that will perform servo transient transmission.  	Example) When specifying an UNSIGNED32 object with the object index "6099H" and the sub-index "02H", specify as shown below. Reading: "60990200H" (default size) Writing: "6099204H" (size: 4 bytes)	0	128+150n 129+150n
[Pr.591] Optional data monitor: Data type expansion setting 1 [FX5-SSC-G]	Set the sub-index and size of the CiA402 object of the device. Specify the size in bit lengths.  	Example) When monitoring the effective load ratio (sub-index: 00h, size 1 [Word]), set "0010H".	0	92+150n
[Pr.592] Optional data monitor: Data type expansion setting 2 [FX5-SSC-G]			0	93+150n
[Pr.593] Optional data monitor: Data type expansion setting 3 [FX5-SSC-G]			0	94+150n
[Pr.594] Optional data monitor: Data type expansion setting 4 [FX5-SSC-G]			0	95+150n

*1 Used point: 2 words

*2 The name differs depending on the connected device.

[Pr.91] to [Pr.94] Optional data monitor: Data type setting

Set the data type monitored by the optional data monitor function.

■Setting values [FX5-SSC-S]

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	
29	External encoder counter value	
30	Unit power consumption (2 words)	
Most significant bit1 + address value	Optional address of registered monitor	—

*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 527 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 371 Optional Data Monitor Function 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 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".

■Setting values [FX5-SSC-G]

Set the index for the CiA402 object of the device.

Point

- Registered monitor addresses for the optional data monitor are imported after the power is turned ON or the CPU module is reset.
- Set data types that use 2 points in either "[Pr.91] Optional data monitor: Data type setting 1" and "[Pr.591] Optional data monitor: Data type expansion setting 1" or "[Pr.93] Optional data monitor: Data type setting 3" and "[Pr.593] Optional data monitor: Data type expansion setting 3". The setting values of both "[Pr.92] Optional data monitor: Data type setting 2" and "[Pr.592] Optional data monitor: Data type expansion setting 2" and [Pr.94] Optional data monitor: Data type setting 4" and "[Pr.594] Optional data monitor: Data type expansion setting 4"are ignored.
- When a value other than 08H, 10H, 20H, or 40H is set as the size in "[Pr.591] Optional data monitor: Data type expansion setting 1" to "[Pr.594] Optional data monitor: Data type expansion setting 4", the value is treated as being 20H.
- When a CiA402 object that cannot be monitored is set, the error "PDO mapping setting error" (error code: 1C48H) occurs and communication with that axis is not performed.

■Buffer memory address

For the buffer memory addresses in this area, refer to the following.

☞ Page 425 Extended parameters

[Pr.512] Optional SDO 1 [FX5-SSC-G]

Specify the object that will perform servo transient transmission. For details, refer to the following.

☞ Page 381 Servo Transient Transmission Function [FX5-SSC-G]

■Buffer memory address

For the buffer memory addresses in this area, refer to the following.

☞ Page 425 Extended parameters

[Pr.591] to [Pr.594] Optional data monitor: Data type expansion setting [FX5-SSC-G]

Set the data type to monitor with the optional data monitor function. For details of the data, refer to the manual of the servo amplifier.

For MR-J5(W)-G: 📖MR-J5-G/MR-J5W-G User's Manual (Object Dictionary)

Set the sub-index and size of the CiA402 object of the device.

Specify the size in bit lengths.

■Buffer memory address

For the buffer memory addresses in this area, refer to the following.

☞ Page 425 Extended parameters

Servo parameters [FX5-SSC-S]

Servo series

n: Axis No. -1

Item	Setting details	Set range	Default value	Buffer memory address
[Pr.100] Servo series	Used to select the servo amplifier series to connect to the Simple Motion module.	0: Not set 1: MR-J3-_B_, MR-J3W-_B (2-axis type) 3: MR-J3-_BS (For safety servo) 32: MR-J4-_B_(-RJ), MR-J4W_-_B (2-axis type, 3-axis type) 48: MR-JE-_B(F) 68: FR-A800-1 69: FR-A800-2 96: VCⅡ series (manufactured by CKD NIKKI DENSO CO., LTD.) 97: AlphaStep/5-phase (manufactured by ORIENTAL MOTOR Co., Ltd.) 98: IAI electric actuator controller (manufactured by IAI Corporation) 99: VPH series (manufactured by CKD NIKKI DENSO CO., LTD.) 4097: Virtual servo amplifier (MR-J3) 4128: Virtual servo amplifier (MR-J4)	0	28400+100n

Point

- Be sure to set up servo series. Communication with servo amplifier is not started by the initial value "0" in default value. (The LED indication of servo amplifier indicates "Ab".)
- The connectable servo amplifier differs by the setting of "[Pr.97] SSCNET setting".

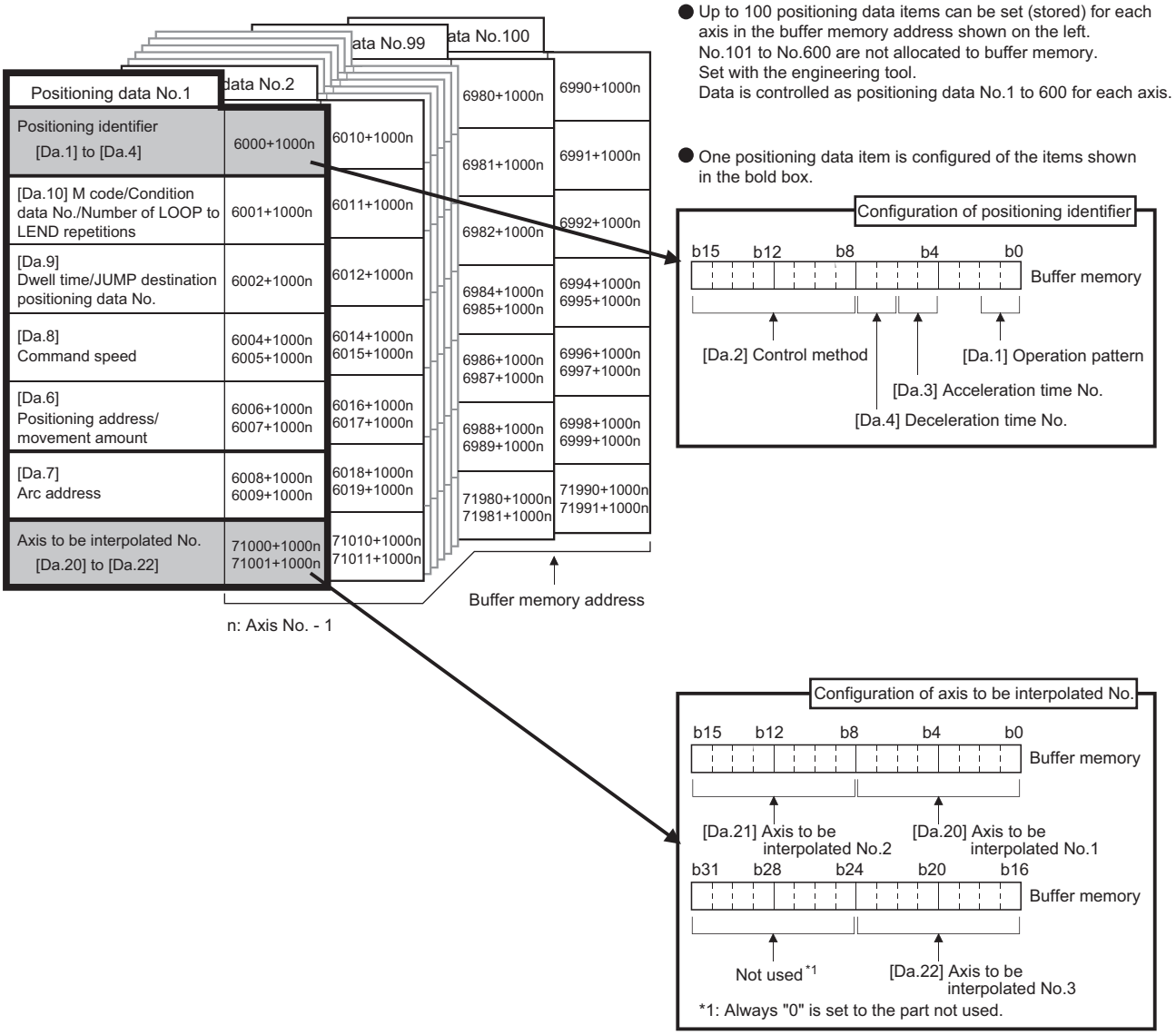
Parameters of MR-J4(W)-B/MR-JE-B(F)/MR-J3(W)-B

Refer to each servo amplifier instruction manual for details of the parameter list and setting items for MR-J4(W)-B/MR-JE-B(F)/MR-J3(W)-B. Do not change other than the buffer memory addresses of the parameters described in each servo amplifier instruction manual.

11.4 Positioning Data

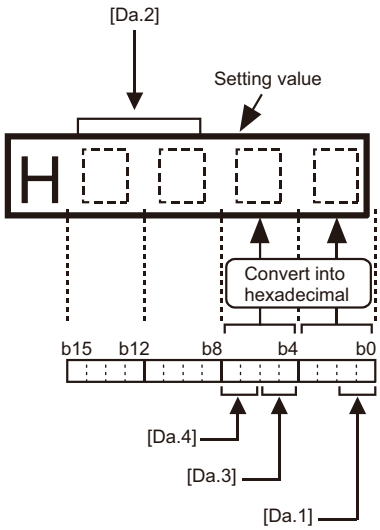
Before explaining the positioning data setting items [Da.1] to [Da.10], [Da.20] to [Da.22], the configuration of the positioning data is shown below.

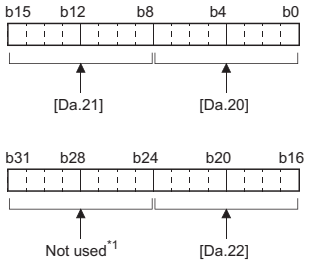
The positioning data stored in the buffer memory of the Simple Motion module/Motion module is the following configuration.



The following explains the positioning data setting items [Da.1] to [Da.10] and [Da.20] to [Da.22]. (The buffer memory addresses shown are those of the "positioning data No.1".)

n: Axis No. - 1

Item		Setting value			Default value	Buffer memory address
		Value set with the engineering tool	Value set with a program			
Positioning identifier	[Da.1] Operation pattern	00: Positioning complete	00		0000H	6000+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			
		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			

Item		Setting value			Default value	Buffer memory address
		Value set with the engineering tool	Value set with a program			
[Da.6] Positioning address/ movement amount		The setting value range differs according to the "[Da.2] Control method".			0	6006+1000n 6007+1000n
[Da.7] Arc address					0	6008+1000n 6009+1000n
[Da.8] Command speed		The setting value range differs depending on the "[Pr.1] Unit setting".			0	6004+1000n 6005+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
	JUMP destination positioning data No.					
[Da.10] M code/ Condition data No./ Number of LOOP to LEND repetitions	M code				0	6001+1000n
	Condition data No.					
	Number of LOOP to LEND repetitions					
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	0H 1H 2H 3H 4H 5H 6H 7H	 *1: Always "0" is set to the part not used.	0000H	71000+1000n 71001+1000n
	[Da.21] Axis to be interpolated No.2					
	[Da.22] Axis to be interpolated No.3					

[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 431 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" 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" should be set differently from other cases.
- Refer to the following for details on the control methods.

☞ Page 58 MAJOR POSITIONING CONTROL

- If "degree" is set for "[Pr.1] Unit setting", 2-axis circular interpolation control cannot be carried out. (The error "Circular interpolation not possible" (error code: 199FH [FX5-SSC-S], or error code: 1A9FH [FX5-SSC-G]) will occur when executed.)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 431 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 431 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 431 Positioning data

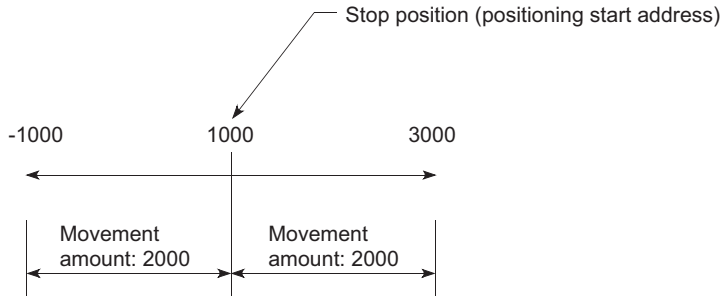
[Da.6] Positioning address/movement amount

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).

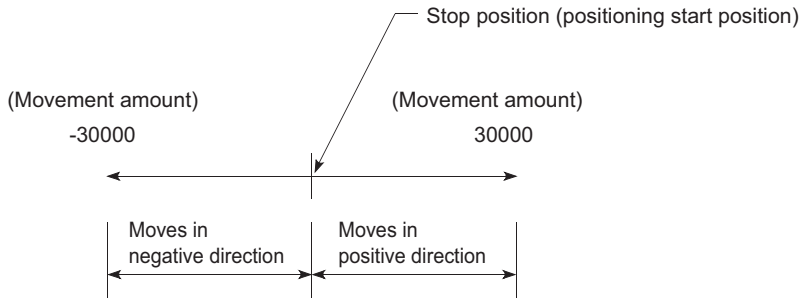


■Incremental (INC) system, fixed-feed 1, fixed-feed 2, fixed-feed 3, fixed-feed 4

- The setting value (movement amount) for the INC system is set as a movement amount with sign.

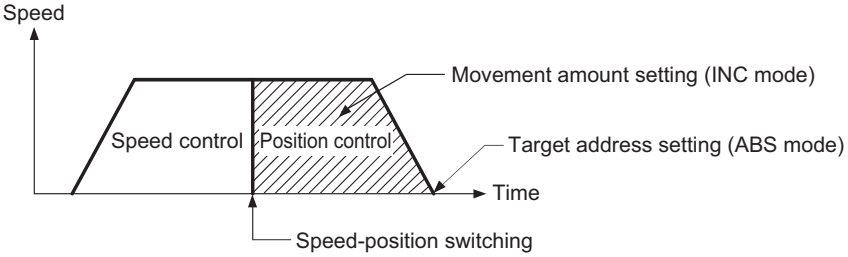
When movement amount is positive: Moves in the positive direction (address increment direction)

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

*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

*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.

● 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

● 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

*1 Set an integer because the program cannot handle fractions.
(The value will be converted properly within the system.)

■Buffer memory address

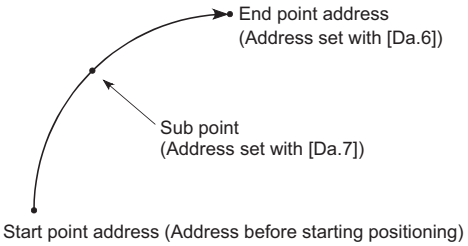
Refer to the following for the buffer memory address in this area.

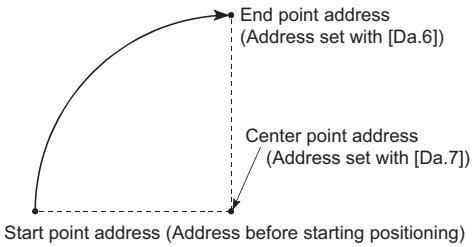
☞ Page 431 Positioning data

[Da.7] Arc address

The arc address is data required only when carrying out 2-axis circular 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, 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] (× 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]

*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^{-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]

*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]

*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 431 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 [FX5-SSC-S], or error code: 1B12H [FX5-SSC-G]) will occur, and the positioning will not start.

Refer to the following for details on the errors.

☞ Page 751 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 431 Positioning data

[Da.9] Dwell time/JUMP destination positioning data No.

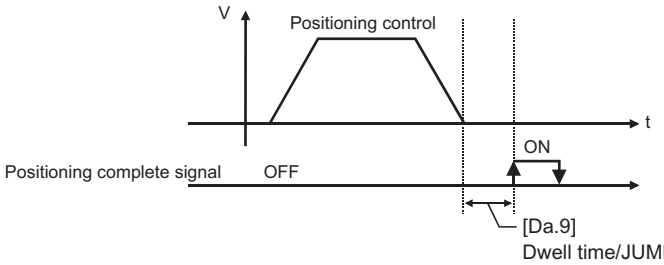
Set the "dwell time" or "positioning data No." corresponding to the "[Da.2] Control method".

- 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".

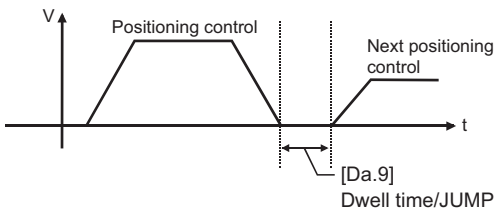
■When "[Da.1] Operation pattern" in "00: Positioning complete"

- Set the time from when the positioning ends to when the "positioning complete signal" turns ON as the "dwell time".



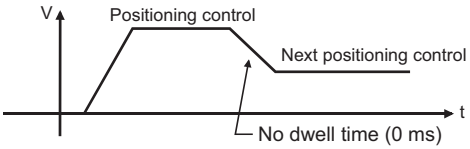
■When "[Da.1] Operation pattern" is "01: Continuous positioning control"

- 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 431 Positioning data

[Da.10] M code/Condition data No./Number of LOOP to LEND repetitions

Set an "M code", a "condition data No.", or the "Number of LOOP to LEND repetitions" 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" and "LOOP" 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 [FX5-SSC-S], or error code: 1B33H [FX5-SSC-G]) will occur if you specify "0".

[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
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 431 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.

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".

Set the axis set as axis to be interpolated.

Setting value	Axis to be interpolated	Setting value	Axis to be interpolated
0	Axis 1	4	Axis 5
1	Axis 2	5	Axis 6
2	Axis 3	6	Axis 7
3	Axis 4	7	Axis 8

Point

- Do not specify the own axis No. or the value outside the range. Otherwise, the error "Illegal interpolation description command" (error code: 1A22H [FX5-SSC-S], or error code: 1B22H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code: 1B22H [FX5-SSC-G]) 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.

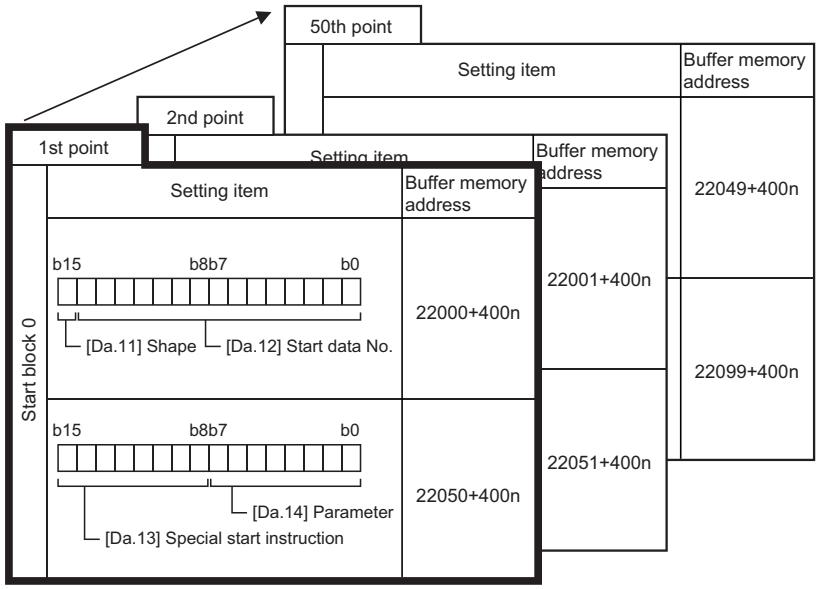
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 431 Positioning data

11.5 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/Motion module is the following configuration.



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.

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)".)

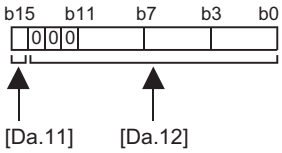
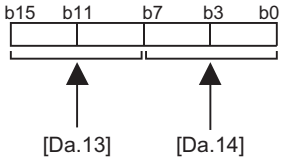
Point

- 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 number 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/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)	—	
	⋮		⋮		
	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 [FX5-SSC-S], or error code: 1AA3H [FX5-SSC-G])" will occur.
Refer to the following for details.
☞ Page 276 Pre-reading start function

n: Axis No. - 1

Item	Setting value			Default value	Buffer memory address
	Value set with the engineering tool	Value set with a program			
[Da.11] Shape	0: End	0		0000H	22000+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
	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 432 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 432 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 137 HIGH-LEVEL POSITIONING CONTROL

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 432 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 512 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

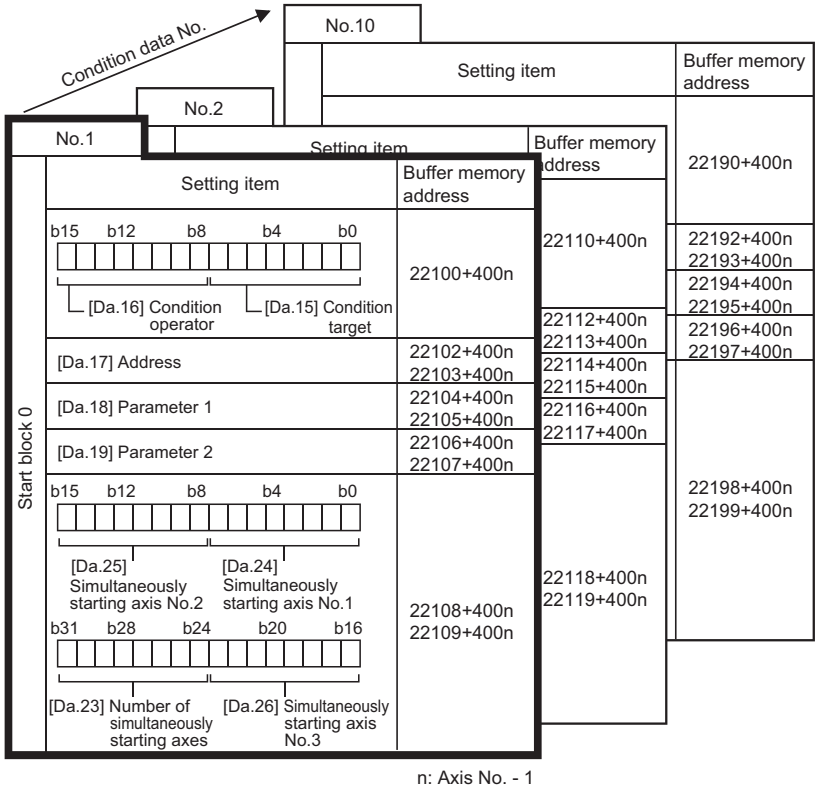
Refer to the following for the buffer memory address in this area.

☞ Page 432 Positioning data (Block start data)

11.6 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/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.

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)".)

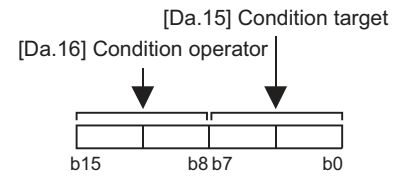
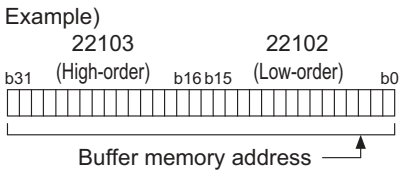
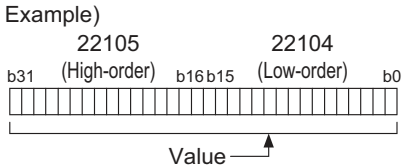
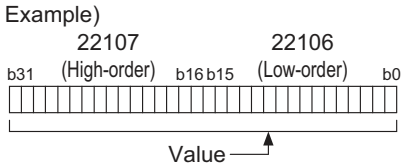
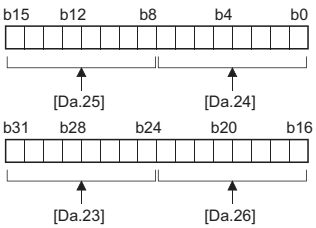
Point

- 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/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)	—	
	⋮		⋮		
	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 [FX5-SSC-S], or error code: 1AA3H [FX5-SSC-G]) will occur. Refer to the following for details.
☞ Page 276 Pre-reading start function

n: Axis No. - 1

Item		Setting value			Default value	Buffer memory address
		Value set with the engineering tool	Value set with a program			
Condition identifier	[Da.15] Condition target	01: Monitor data ([Md.140], [Md.141])	01H		0000H	22100+400n
		02: Control data ([Cd.184], [Cd.190], [Cd.191])	02H			
		03: Buffer memory (1-word)	03H			
		04: Buffer memory (2-word)	04H			
		05: Positioning data No.	05H			
	[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: SIG = ON	07H			
		08: SIG = OFF	08H			
[Da.17] Address		Buffer memory address			0000H	22102+400n 22103+400n
[Da.18] Parameter 1		Value			0000H	22104+400n 22105+400n
[Da.19] Parameter 2		Value			0000H	22106+400n 22107+400n
Simultaneously starting axis	[Da.23] Number of simultaneously starting axes	2: 2 axes	2H		0000H	22108+400n 22109+400n
		3: 3 axes	3H			
		4: 4 axes	4H			
	[Da.24] Simultaneously 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	0H 1H 2H 3H 4H 5H 6H 7H			
	[Da.25] Simultaneously starting axis No.2					
	[Da.26] Simultaneously starting axis No.3					

[Da.15] Condition target

Set the condition target as required for each control.

Setting value	Setting details
01H: Monitor data ([Md.140], [Md.141])	Set the state (ON/OFF) of each signal as a condition.
02H: Control data ([Cd.184], [Cd.190], [Cd.191])	
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".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 432 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: Monitor data ([Md.140], [Md.141]) 02H: Control data ([Cd.184], [Cd.190], [Cd.191])	07H: SIG= ON	When the state (ON/OFF) of each signal is set as a condition, select ON or OFF as the trigger.
	08H: SIG = OFF	
03H: Buffer memory (1-word) 04H: Buffer memory (2-word)	01H: ** = P1	Select how to use the value (**) in the buffer memory 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 432 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: Monitor data ([Md.140], [Md.141])	—	Not used. (There is no need to set.)
02H: Control data ([Cd.184], [Cd.190], [Cd.191])		
03H: Buffer memory (1-word)	Value (Buffer memory address)*1	Set the target "buffer memory address". (For 2 words, set the low-order buffer memory address.)
04H: Buffer memory (2-word)		
05H: Positioning data No.	—	Not used. (There is no need to set.)

*1 The setting range of the buffer memory address at specifying buffer memory is as follows.

[Da.15] Condition target	Buffer memory address range
03H: Buffer memory (1-word)	0 to 98303
04H: Buffer memory (2-word)	0 to 98302

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 432 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 simultaneously starting axes".

[Da.16] Condition operator	[Da.23] Number of simultaneously 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 [FX5-SSC-S], or error code: 1B00H to 1B0FH [FX5-SSC-G]) will occur.
02H: ** ≠ P1			
03H: ** ≤ P1			
04H: ** ≥ P1			
05H: P1 ≤ ** ≤ P2			
06H: ** ≤ P1, P2 ≤ **			
07H: SIG = ON		Value (bit No.)	Set the bit No. of each signal. Monitor data: 0H (READY ([Md.140] Module status: b0)), 1H (Synchronization flag ([Md.140] Module status: b1)), 10H to 17H (BUSY axis-1 to axis-8 ([Md.141] BUSY)) Control data: 0H (PLC READY ([Cd.190] PLC READY)), 1H (All axis servo ON ([Cd.191] All axis servo ON)), 10H to 17H (Positioning start axis axis-1 to axis-8 ([Cd.184] Positioning start))
08H: SIG = OFF			
—	2 to 4	Value (positioning data No.)	Set the positioning data No. for starting axis set in "[Da.24] Simultaneously starting axis No.1" and/or "[Da.25] Simultaneously starting axis No.2". Low-order 16-bit: Simultaneously starting axis No.1 positioning data No.1 to 600 (01H to 258H) High-order 16-bit: Simultaneously starting axis No.2 positioning data No.1 to 600 (01H to 258H)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 432 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 simultaneously starting axes".

[Da.16] Condition operator	[Da.23] Number of simultaneously 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 [FX5-SSC-S], or error code: 1B00H to 1B0FH [FX5-SSC-G]) will occur.
06H: ** ≤ P1, P2 ≤ **			
07H: SIG = ON		—	Not used. (No need to be set.)
08H: SIG = OFF			
—	2 to 3		
	4	Value (positioning data No.)	Set the positioning data No. for starting axis set in "[Da.26] Simultaneously starting axis No.3" Low-order 16-bit: Simultaneously 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 432 Positioning data (Block start data)

[Da.23] Number of simultaneously starting axes

Set the number of simultaneously 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] Simultaneously starting axis No.1".
3	Simultaneous start by 3 axes of the starting axis and axis set in "[Da.24] Simultaneously starting axis No.1" and "[Da.25] Simultaneously starting axis No.2".
4	Simultaneous start by 4 axes of the starting axis and axis set in "[Da.24] Simultaneously starting axis No.1" to "[Da.26] Simultaneously starting axis No.3".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 432 Positioning data (Block start data)

[Da.24] Simultaneously starting axis No.1 to [Da.26] Simultaneously starting axis No.3

Set the simultaneously starting axis to execute the 2 to 4-axis simultaneous start.

Simultaneously starting axis	Details
2-axis interpolation	Set the target axis No. in "[Da.24] Simultaneously starting axis No.1".
3-axis interpolation	Set the target axis No. in "[Da.24] Simultaneously starting axis No.1" and "[Da.25] Simultaneously starting axis No.2".
4-axis interpolation	Set the target axis No. in "[Da.24] Simultaneously starting axis No.1" to "[Da.26] Simultaneously starting axis No.3".

Set the axis set as simultaneously starting axis.

Setting value	Simultaneously starting axis	Setting value	Simultaneously starting axis
0	Axis 1	4	Axis 5
1	Axis 2	5	Axis 6
2	Axis 3	6	Axis 7
3	Axis 4	7	Axis 8

Point

- Do not specify the own axis No. or the value outside the range. Otherwise, the error "Condition data error" (error code: 1A00H [FX5-SSC-S], or error code: 1B00H to 1B0FH [FX5-SSC-G]) will occur during the program execution.
- When the same axis No. is set to multiple simultaneously starting axis Nos. or the value outside the range is set to the number of simultaneously starting axes, the error "Condition data error" (error code: 1A00H [FX5-SSC-S], or error code: 1B00H to 1B0FH [FX5-SSC-G]) will occur during the program execution.
- Do not specify the simultaneously starting axis No.2 and simultaneously starting axis No.3 for 2-axis simultaneously start, and not specify the simultaneously 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 432 Positioning data (Block start data)

11.7 Monitor Data

The setting items of the monitor data are explained in this section.

System monitor data

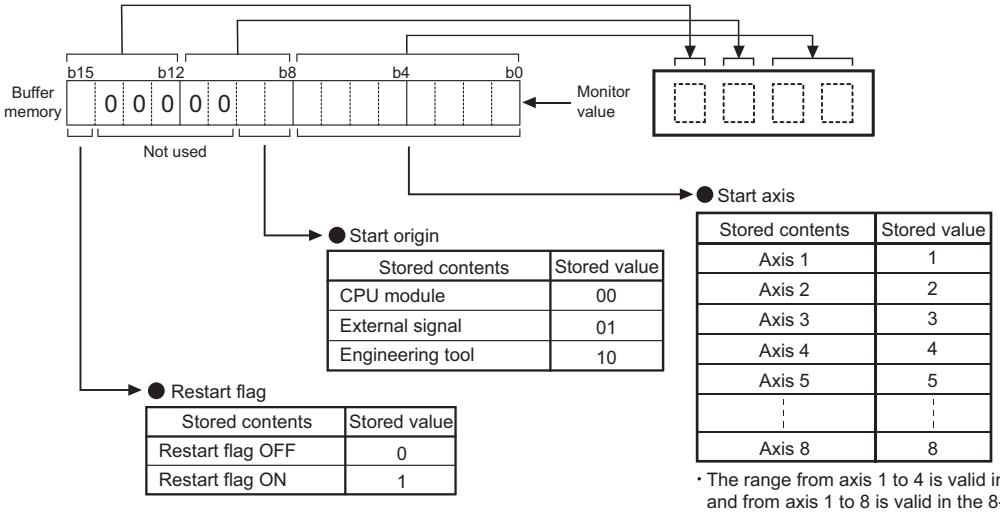
Unless noted in particular, the monitor value is saved as binary data.

[Md.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 axis

Stored contents	Stored value
Axis 1	1
Axis 2	2
Axis 3	3
Axis 4	4
Axis 5	5
⋮	⋮
Axis 8	8

・The range from axis 1 to 4 is valid in the 4-axis module and from axis 1 to 8 is valid in the 8-axis module.

● 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

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 425 System monitor data

[Md.4] Start No.

The start No. is stored.

Stored 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 home position return
9002(232AH)	Fast home position return
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

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.

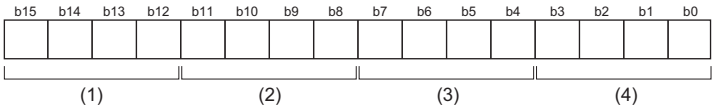
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 425 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.

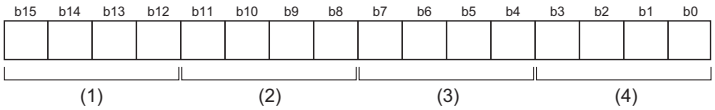
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 425 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.

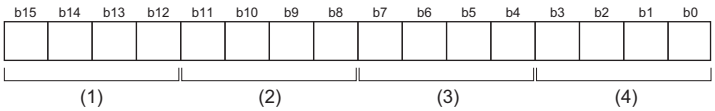
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 425 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

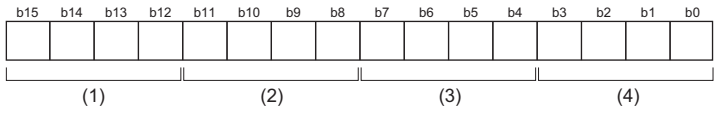
Refer to the following for the buffer memory address in this area.

☞ Page 425 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 425 System monitor data

[Md.7] Error judgment

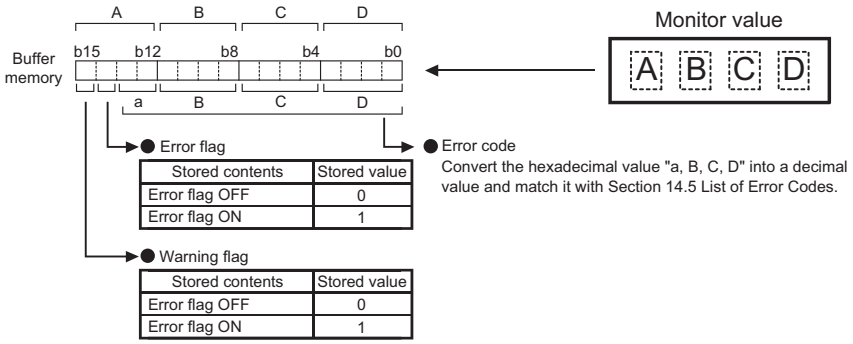
This area stores the following results of the error judgment performed upon starting:

- 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.



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 425 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 starting 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 425 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 425 System monitor data

[Md.50] Forced stop input

This area stores the forced stop input 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 425 System monitor data

[Md.51] Amplifier-less operation mode status [FX5-SSC-S]

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 425 System monitor data

[Md.52] Communication between amplifiers axes searching flag [FX5-SSC-S]

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 425 System monitor data

[Md.53] SSCNET control status [FX5-SSC-S]

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 425 System monitor data

[Md.59] Module information

Stores the model code of the module.

Storage value	Module information
63C0H	FX5-40SSC-S
63C1H	FX5-80SSC-S
6959H	FX5-40SSC-G
695AH	FX5-80SSC-G

Refresh cycle: At power supply ON

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 425 System monitor data

[Md.130] F/W version

Stores the F/W version of the module.

- Monitoring is carried out with a decimal display.

Ex.

When the F/W version is "1.000", "1000" is stored.

Refresh cycle: At power supply ON

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 425 System monitor data

[Md.131] Digital oscilloscope running flag

Stores the RUN status of the digital oscilloscope.

Storage value	Digital oscilloscope RUN status
0	Stop
1	Run
-1	Stop by error

Refresh cycle: Main cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 425 System monitor data

[Md.132] Operation cycle setting

Stores the current operation cycle.

Storage value		Operation cycle
FX5-SSC-S	0000H	0.888 ms
	0001H	1.777 ms
FX5-SSC-G	1005H	0.500 ms
	1006H	1.000 ms
	1007H	2.000 ms
	1008H	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 425 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.

[FX5-SSC-G]

- The operation cycle time only includes the time spent on the positioning processing cycle and does not include the time spent on communication with the servo amplifier, etc. As such, errors such as "Operation cycle time over error" (error code: 1A3FH), "Driver error" (error code: 1ED0H), and "WDT error" (error code: 1ED2H) may occur even if the operation cycle time does not reach the set operation cycle.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 425 System monitor data

[Md.134] Operation time

Stores the time (Unit: μs) that took for operation every operation cycle.

Refresh cycle: Operation cycle

Point

[FX5-SSC-G]

- The stored time only includes the time spent on the positioning processing cycle and does not include the time spent on communication with the servo amplifier, etc. As such, errors such as "Operation cycle time over error" (error code: 1A3FH), "Driver error" (error code: 1ED0H), and "WDT error" (error code: 1ED2H) may occur even if the operation cycle time does not reach the set operation cycle.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 425 System monitor data

[Md.135] Maximum operation time

Stores the maximum value (Unit: μs) of operation time after each module's power supply ON.

Refresh cycle: Immediate

Point

[FX5-SSC-G]

- The stored time only includes the time spent on the positioning processing cycle and does not include the time spent on communication with the servo amplifier, etc. As such, errors such as "Operation cycle time over error" (error code: 1A3FH), "Driver error" (error code: 1ED0H), and "WDT error" (error code: 1ED2H) may occur even if the operation cycle time does not reach the set operation cycle.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 425 System monitor data

[Md.140] Module status

Stores the status (ON/OFF) of various flags.

Storage details are shown below.

Flag	Details
READY	• When the "[Cd.190] PLC READY" turns from OFF→ON, the parameter setting range is checked. If no error is found, this signal turns ON. • When the "[Cd.190] PLC READY" 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.
Synchronization flag	• After the CPC module is turned ON/reset, this signal turns ON if the access from the CPU module to the Simple Motion module/Motion module is possible. • It is used for interlock when accessing the Simple Motion module/Motion module from the program.

Buffer memory configuration	Stored items		Storage value
b15 b14 b13 b12 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 (2) (1) Not used	(1)	READY	0: OFF (Not READY/Watch dog timer error) 1: ON (READY)
	(2)	Synchronization flag	

Refresh cycle of READY(b0): At "[Cd.190] PLC READY" OFF → ON

Refresh cycle of Synchronization flag (b1): At power supply ON/the CPU module reset

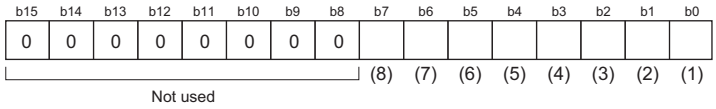
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 425 System monitor data

[Md.141] BUSY

- This signal turns ON at the start of positioning, home position return or JOG operation. It turns OFF during the stop by the step operation that turns OFF (This signal remains ON during positioning) after the "[Da.9] Dwell time/JUMP destination positioning data No." has passed after positioning stops.
- 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.

Buffer memory configuration	Stored items		Storage value
	(1)	Axis 1 BUSY	0: OFF (Not BUSY) 1: ON (BUSY)
	(2)	Axis 2 BUSY	
	(3)	Axis 3 BUSY	
	(4)	Axis 4 BUSY	
	(5)	Axis 5 BUSY	
	(6)	Axis 6 BUSY	
	(7)	Axis 7 BUSY	
	(8)	Axis 8 BUSY	

Refresh cycle: At start

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 425 System monitor data

Axis monitor data

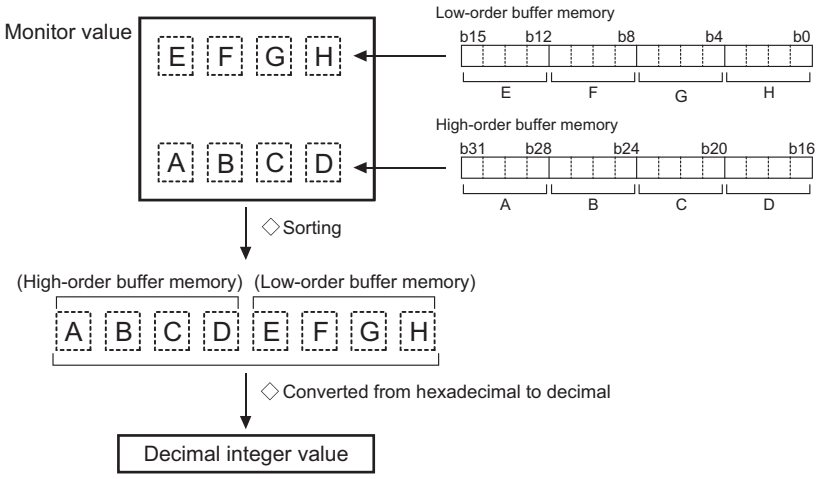
[Md.20] Command position value

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 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	Conversion value
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 426 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)

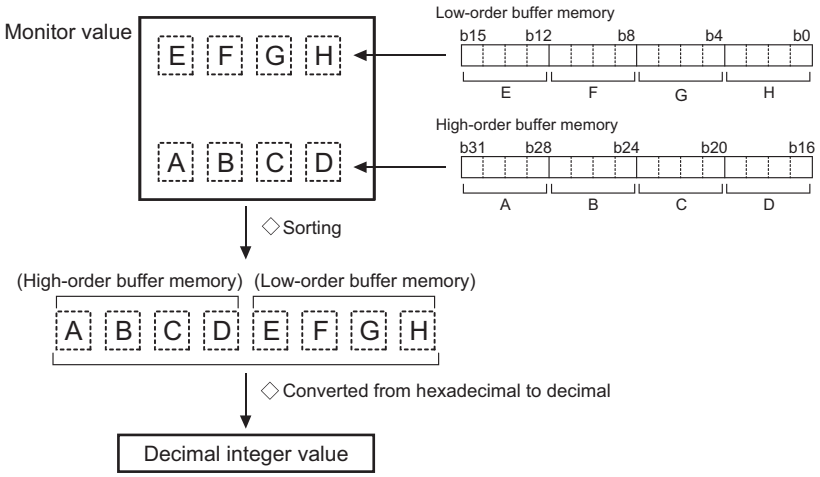
Note that the current value changing function will not change the machine feed value.

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 become a cumulative value. (They do not have a ring structure for values between 0 and 359.99999°). However, the movement amount during the power supply OFF is added to the machine feed value before the power supply OFF (the rounded value within the range of 0 to 359.99999°) for restoration 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	Conversion value
μm	$\times 10^{-1}$
inch	$\times 10^{-5}$
degree	$\times 10^{-5}$
pulse	$\times 10^{0}$

• Machine coordinates: Characteristic coordinates determined with machine

Refresh cycle: Operation cycle

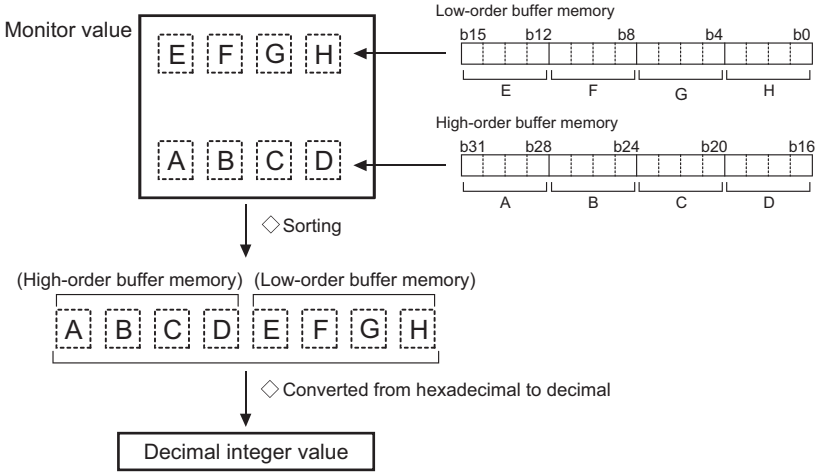
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 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	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}".

- 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 426 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.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.
☞ Page 426 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 "[Cd.5] Axis error reset" is set to "1", the axis warning No. is cleared to "0".
- Monitoring is carried out with a hexadecimal.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 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 "[Cd.190] PLC READY" goes 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 426 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
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

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 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 257 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

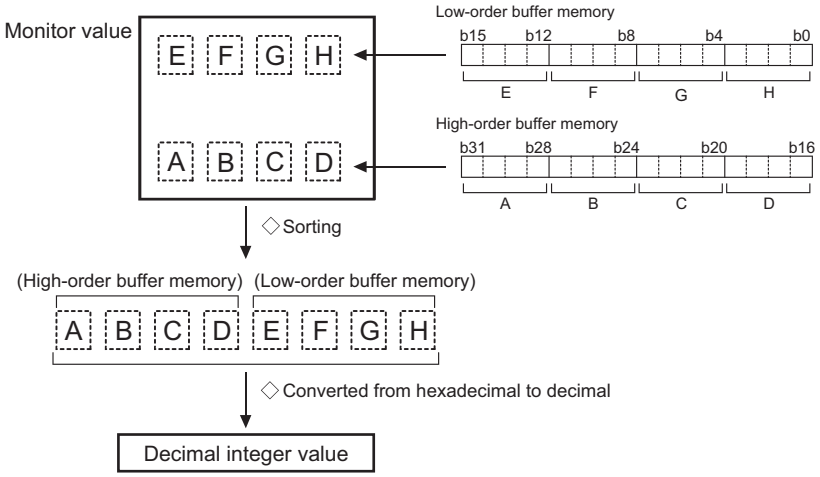
Refer to the following for the buffer memory address in this area.

☞ Page 426 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 529 [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}

*1 When "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid, becomes "× 10^{-2}".

Refresh cycle: Operation cycle

Point

The absolute value is displayed in "[Md.28] Axis speed command". The operation direction can be checked in "[Md.20] Command position value".

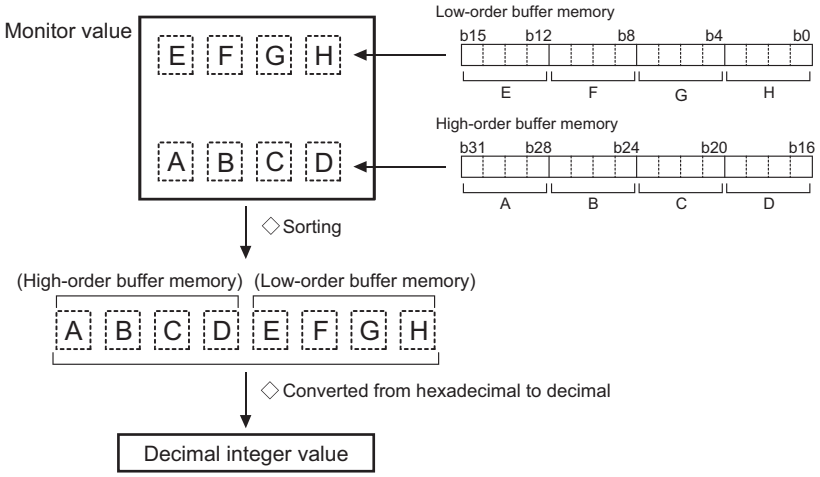
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 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	× 10^{-1}
inch	× 10^{-5}
degree	× 10^{-5}
pulse	× 10^{0}

Refresh cycle: Immediate

■Buffer memory address

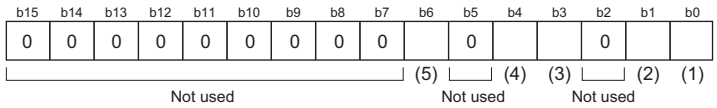
Refer to the following for the buffer memory address in this area.

☞ Page 426 Axis monitor data

[Md.30] External input signal

[FX5-SSC-S]

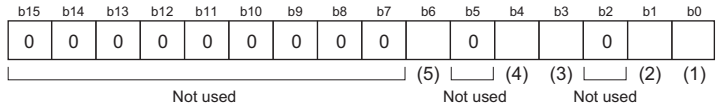
The ON/OFF state of the external input signal is stored.

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 (servo amplifier) or buffer memory of Simple Motion module/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".

[FX5-SSC-G]

The state of the external input signal is stored.

Buffer memory configuration	Stored items		Storage value
	(1)	Lower limit signal	0: Limit signal ON 1: Limit signal OFF
	(2)	Upper limit signal	
	(3)	Stop signal	0: Stop signal is OFF 1: Stop signal is ON
	(4)	External command signal/switching signal	0: External command signal/ switching signal is OFF 1: External command signal/ switching signal is ON
	(5)	Proximity dog signal	0: Proximity dog signal is OFF 1: Proximity dog signal is ON

The signal state is stored according to the logic set by the following parameters.

- [Pr.22] Input signal logic selection
- [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

Refresh cycle: Operation cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

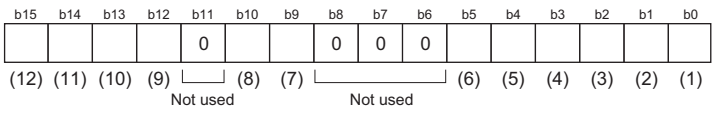
☞ Page 426 Axis monitor data

[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 speed-position 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 36 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 the "[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 [FX5-SSC-S], or warning code: 0D52H [FX5-SSC-G]) will occur. When the "[Cd.190] PLC READY" 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 [FX5-SSC-S], or error code: 1AA0H [FX5-SSC-G]) will occur.
Error detection	This signal turns ON when an error (☞ Page 751 List of Error Codes) occurs, and turns OFF when the error is reset on "[Cd.5] Axis error reset".
Start complete	This signal turns ON when the positioning start signal turns ON and the Simple Motion module/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 426 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

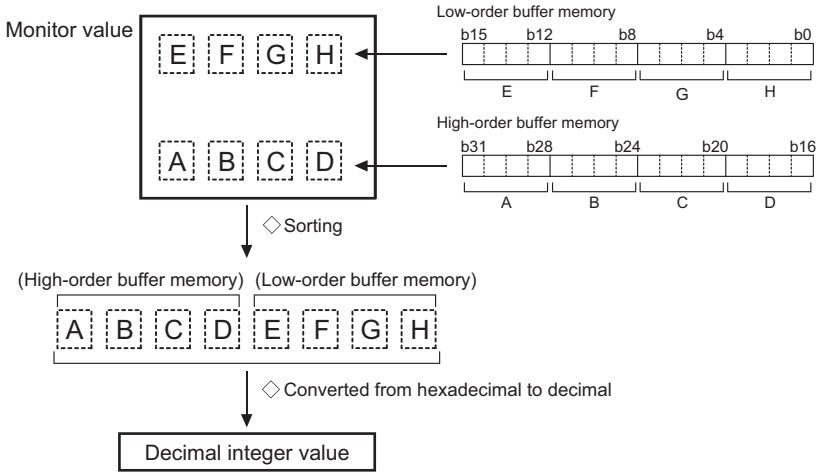
Refer to the following for the buffer memory address in this area.

☞ Page 426 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

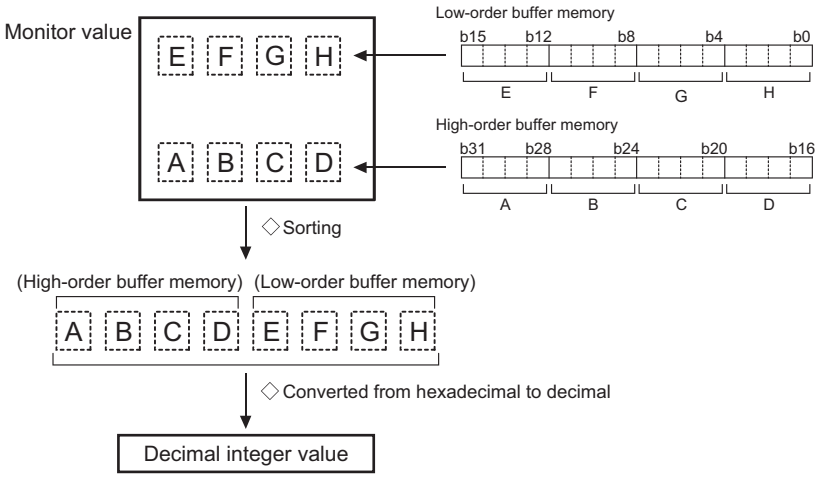
Refer to the following for the buffer memory address in this area.

☞ Page 426 Axis monitor data

[Md.34] Movement amount after proximity dog ON [FX5-SSC-S]

- "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 426 Axis monitor data

[Md.35] Torque limit stored value/forward torque limit stored value

[FX5-SSC-S]

"[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 value stored 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".

[FX5-SSC-G]

"[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 value stored 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 426 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 426 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 426 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 value stored 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 426 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 426 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 change processing flag
0	Not in speed change (OFF)
1	In speed change (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 426 Axis monitor data

[Md.41] Special start repetition counter

- This area stores the remaining number of repetitions during "repetitions" specific to special starting.
- The value stored 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 426 Axis monitor data

[Md.42] Control system repetition counter

- This area stores the remaining number of repetitions during "repetitions" specific to control system.
- The value stored 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 426 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 426 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 value stored is 1 to 600, and 9001 to 9003.
- This area stores "0" when the JOG/inching operation is executed.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 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 426 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 value stored 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.

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 Axis monitor data

[Md.47] Positioning data being executed

The details of the positioning data currently being executed (positioning data No. given by "[Md.44] Positioning data No. being executed") are stored in the buffer memory addresses.

n: Axis No. - 1

Buffer memory address	Stored items	Reference
6000+1000n	Positioning identifier	Page 499 [Da.1] Operation pattern to Page 500 [Da.4] Deceleration time No.
6006+1000n 6007+1000n	Positioning address/movement amount	Page 501 [Da.6] Positioning address/movement amount
6008+1000n 6009+1000n	Arc address	Page 504 [Da.7] Arc address
6004+1000n 6005+1000n	Command speed	Page 506 [Da.8] Command speed
6002+1000n	Dwell time/JUMP destination positioning data No.	Page 506 [Da.9] Dwell time/JUMP destination positioning data No.
6001+1000n	M code/Condition data No./Number of LOOP to LEND repetitions	Page 507 [Da.10] M code/Condition data No./Number of LOOP to LEND repetitions
71000+1000n 71001+1000n	Axis to be interpolated	Page 508 [Da.20] Axis to be interpolated No.1 to [Da.22] Axis to be interpolated No.3

Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 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.

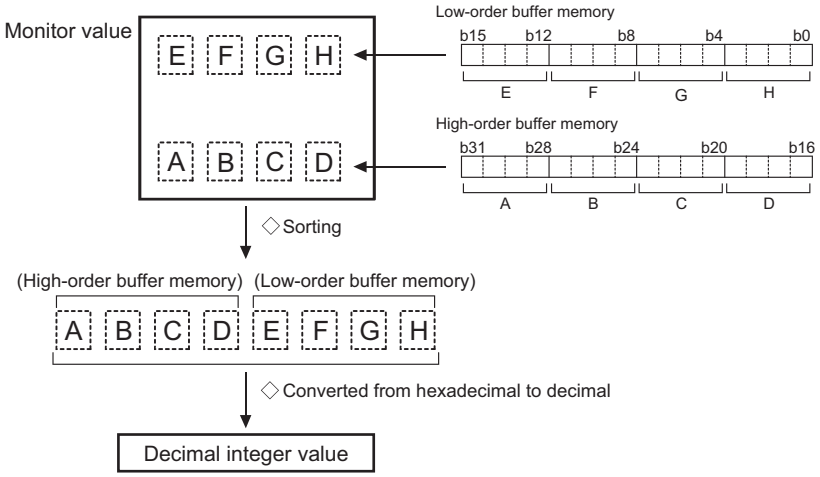
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 Axis monitor data

[Md.62] Amount of the manual pulser driving carrying over movement [FX5-SSC-G]

When "2: Output the exceeding speed limit value delay" 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

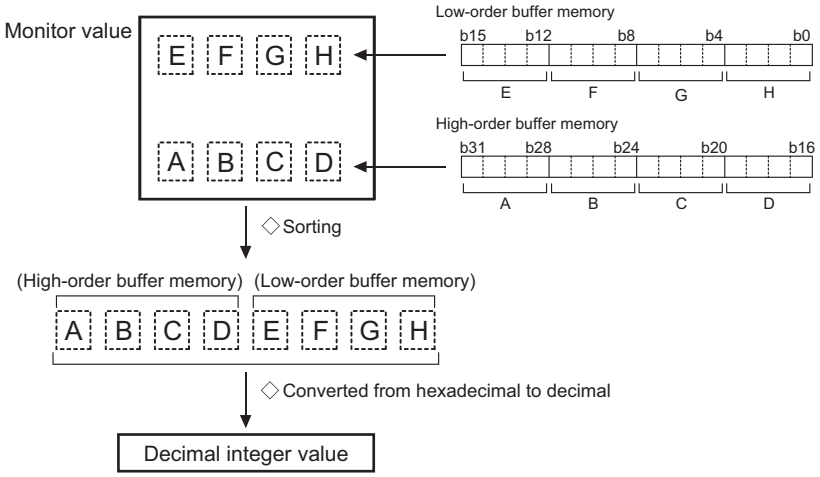
Refer to the following for the buffer memory address in this area.

☞ Page 426 Axis monitor data

[Md.100] Home position return re-travel value [FX5-SSC-S]

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 426 Axis monitor data

[Md.101] Actual position value

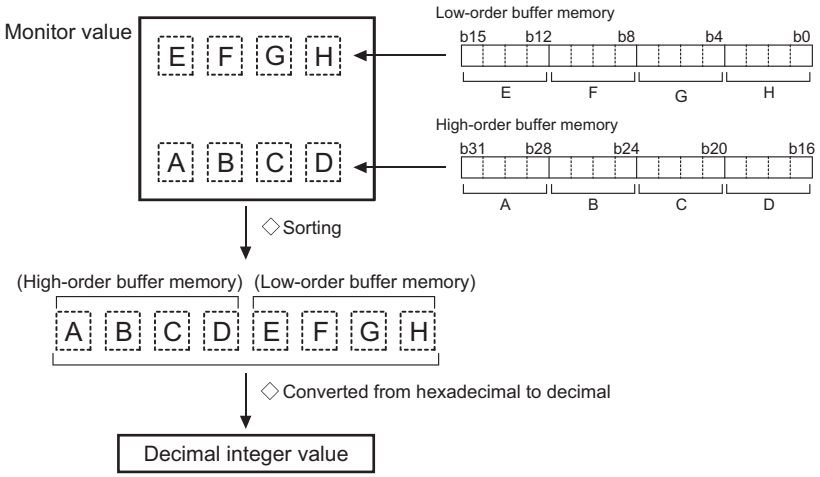
[FX5-SSC-S]

• This area stores the current value (command position value - deviation counter value). (Depends on the setting unit.)

[FX5-SSC-G]

• This area stores the current value (command position value - deviation counter value). (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

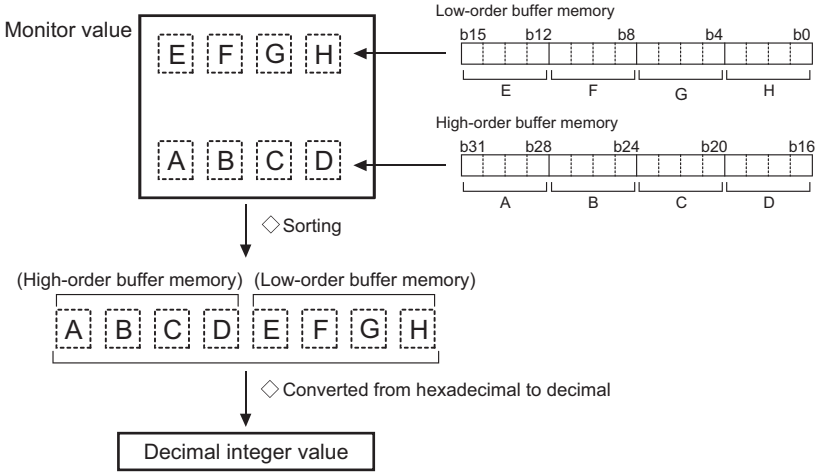
Refer to the following for the buffer memory address in this area.

☞ Page 426 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	$\times 10^0$

(Buffer memory details) × 1) pulse

Refresh cycle: Operation cycle

■Buffer memory address

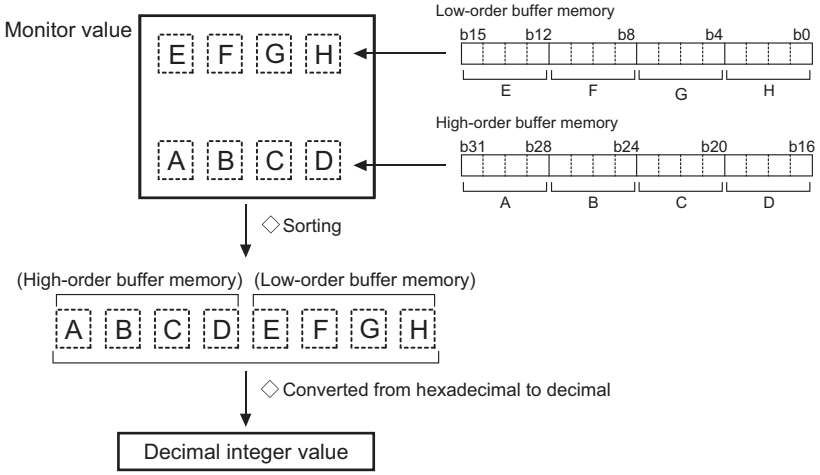
Refer to the following for the buffer memory address in this area.

☞ Page 426 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 When using a linear servo, the unit is mm/s.

(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 426 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 426 Axis monitor data

[Md.106] Servo amplifier software No. [FX5-SSC-S]

- 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.

Ex.

For software No. "-B35W200_A0_"

Buffer memory address	Monitor value*1	Stored 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).

Refresh cycle: At servo amplifier's power supply ON

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 Axis monitor data

[Md.107] Parameter error No. [FX5-SSC-S]

- 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	Stored value	Parameter No.
When SSCNETIII/H	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
When SSCNETIII	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

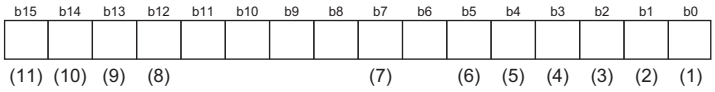
Refer to the following for the buffer memory address in this area.

☞ Page 426 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 The control modes are shown below.

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".

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 Axis monitor data

[Md.109] Regenerative load ratio/Optional data monitor output 1

- 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) %

[FX5-SSC-S]

- This area stores the content set in "[Pr.91] Optional data monitor: Data type setting 1" at optional data monitor data type setting.

[FX5-SSC-G]

- This area stores the content set in "[Pr.91] Optional data monitor: Data type setting 1" and "[Pr.591] Optional data monitor: Data type expansion 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 426 Axis monitor data

[Md.110] Effective load torque/Optional data monitor output 2

- The continuous effective load current is indicated.
- The effective value for the past 15 seconds is displayed, with the rated current being 100%.

(Buffer memory) %

[FX5-SSC-S]

- This area stores the content set in "[Pr.92] Optional data monitor: Data type setting 2" at optional data monitor data type setting.

[FX5-SSC-G]

- This area stores the content set in "[Pr.92] Optional data monitor: Data type setting 2" and "[Pr.592] Optional data monitor: Data type expansion 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 426 Axis monitor data

[Md.111] Peak torque ratio/Optional data monitor output 3

- The maximum torque is indicated. (Holding value)
- The peak values for the past 15 seconds are indicated, rated torque being 100%.

(Buffer memory) %

[FX5-SSC-S]

- This area stores the content set in "[Pr.93] Optional data monitor: Data type setting 3" at optional data monitor data type setting.

[FX5-SSC-G]

- This area stores the content set in "[Pr.93] Optional data monitor: Data type setting 3" and "[Pr.593] Optional data monitor: Data type expansion 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 426 Axis monitor data

[Md.112] Optional data monitor output 4

- 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.)

[FX5-SSC-G]

- This area stores the content set in "[Pr.94] Optional data monitor: Data type setting 4" and "[Pr.594] Optional data monitor: Data type expansion setting 4" 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 426 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 426 Axis monitor data

[Md.114] Servo alarm

[FX5-SSC-S]

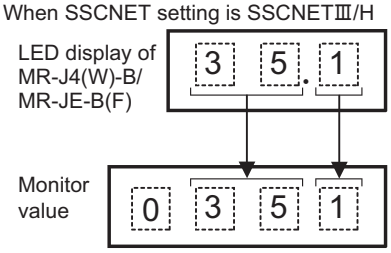
- This area stores the servo alarm code and servo warning code displayed in LED of servo amplifier.
- When the "[Cd.5] Axis error reset" is set to "1" after removing the cause of an error on the servo amplifier side, the servo alarm is cleared (set to "0").

Ex.

For MR-J4(W)-B

When the servo alarm "AL35.1 Command frequency error" occurs on the servo amplifier, "0351H" is stored.

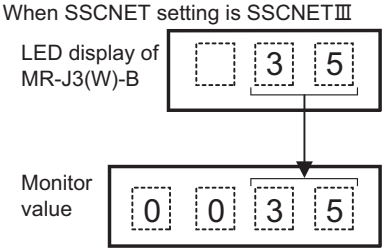
• When SSCNET setting is SSCNETⅢ/H



For MR-J3(W)-B

When the servo alarm "AL35 Command frequency error" occurs on the servo amplifier, "0035H" is stored.

• When SSCNET setting is SSCNETⅢ



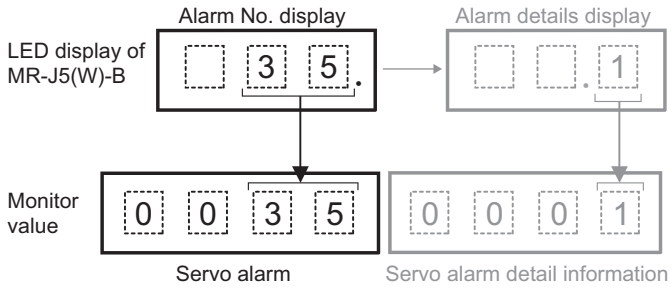
[FX5-SSC-G]

- When a servo amplifier alarm/warning occurs, the alarm/warning No. is stored.
- When the "[Cd.5] Axis error reset" is set to "1" after removing the cause of an alarm/warning on the servo amplifier side, the servo alarm is cleared (set to 0).

Ex.

For MR-J5(W)-G

When the servo alarm [AL35.1 Command frequency error] occurs on the drive unit, "0035H" is stored.



Refresh cycle: Immediate

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 Axis monitor data

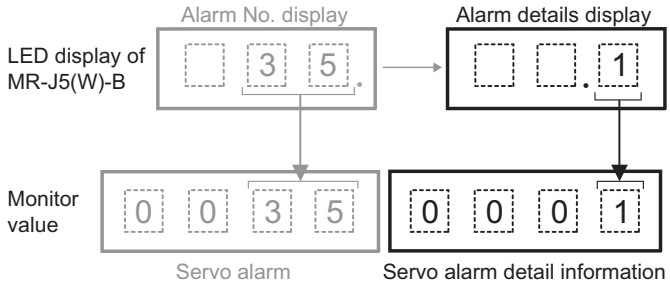
[Md.115] Servo alarm detail number [FX5-SSC-G]

- When a servo amplifier alarm/warning occurs, the alarm/warning No. is stored.
- When the "[Cd.5] Axis error reset" is set to "1" after removing the cause of an alarm/warning on the servo amplifier side, the servo alarm detail number is cleared (set to 0).

Ex.

For MR-J5(W)-G

When the servo alarm [AL35.1 Command frequency error] occurs on the drive unit, "0001H" is stored.



Refresh cycle: Immediate

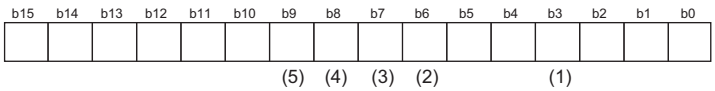
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 Axis monitor data

[Md.116] Encoder option information

The option information of encoder is indicated.

Buffer memory configuration	Stored items		Storage value
	(1)	ABS/INC mode distinction for magnetism type encoder [FX5-SSC-S]	0: INC mode 1: ABS mode
	(2)	Connecting to single-revolution ABS encoder [FX5-SSC-S]	0: Multi-revolution ABS/INC 1: Single-revolution ABS
	(3)	Connecting to magnetism type encoder [FX5-SSC-S]	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	

Refresh cycle: At servo amplifier's power supply ON

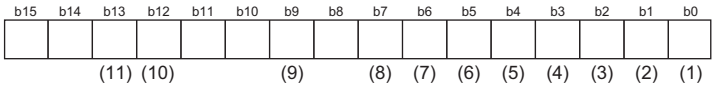
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 Axis monitor data

[Md.117] Statusword [FX5-SSC-G]

Statusword is stored.

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

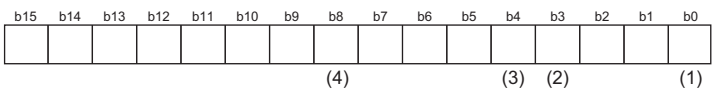
Refer to the following for the buffer memory address in this area.

☞ Page 426 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 426 Axis monitor data

[Md.120] Reverse torque limit stored value

[FX5-SSC-S]

"[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 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".

[FX5-SSC-G]

"[Pr.17] Torque limit setting value", "[Cd.101] Torque output setting value", or "[Cd.113] New reverse torque value" is stored.

- The stored value 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 426 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	$\times 10^{-2}$
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: Operation cycle (Only at the speed control mode and the continuous operation to torque control mode)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 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 (Only at the torque control mode and the continuous operation to torque control mode)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 Axis monitor data

[Md.124] Control mode switching status

This area stores the switching status of control mode.

Unit	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 the continuous operation to torque control mode)

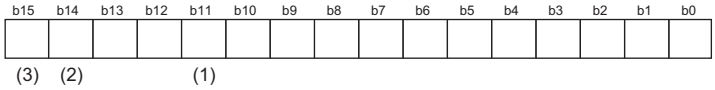
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 Axis monitor data

[Md.125] Servo status3

- This area stores the servo status3.
- Touch probe1 valid: Turn ON when the touch probe function using TPR1 signal of the servo amplifier is enabled. [FX5-SSC-G]
- Continuous operation to torque control mode: Turn ON when the continuous operation to torque control mode.
- Unsupported control mode: Turn ON when the unsupported control mode. [FX5-SSC-G]

Buffer memory configuration	Servo status3		Storage value
	(1)	Touch probe1 valid [FX5-SSC-G]	0: OFF 1: ON
	(2)	Continuous operation to torque control mode	
	(3)	Unsupported control mode [FX5-SSC-G]	

Refresh cycle: Operation cycle

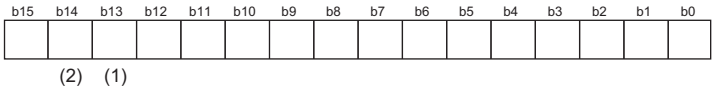
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 Axis monitor data

[Md.126] Servo status4 [FX5-SSC-G]

- Servo status4 is stored.
- Toggle status for latch completion at the rising edge of touch probe 1/Toggle status for latch completion at the falling edge of touch probe 1: When TPR1 of the servo amplifier side is enabled, the status will change every time stamp is stored by the signal detection.

Buffer memory configuration	Servo status4		Storage value
	(1)	Toggle status for latch completion at the rising edge of touch probe 1	0: OFF 1: ON
	(2)	Toggle status for latch completion at the falling edge of touch probe 1	

Refresh cycle: Operation cycle

■Buffer memory address

For buffer memory in this area, refer to the following.

☞ Page 426 Axis monitor data

[Md.160] Optional SDO transfer result 1 [FX5-SSC-G]

Used in the servo transient transmission function. For details, refer to the following.

☞ Page 381 Servo Transient Transmission Function [FX5-SSC-G]

Refresh cycle: At request (Command request)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 Axis monitor data

[Md.164] Optional SDO transfer status 1 [FX5-SSC-G]

Used in the servo transient transmission function. For details, refer to the following.

☞ Page 381 Servo Transient Transmission Function [FX5-SSC-G]

Refresh cycle: At request (Command request)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 Axis monitor data

[Md.190] Controller position value restoration complete status [FX5-SSC-G]

The completion status of the controller current value restoration is stored.

The status becomes "0: Incomplete restoration" when the device is disconnected.

Storage value	Controller position value restoration complete status
0	Incomplete restoration
1	Complete INC restoration
2	Complete ABS restoration (64-bit Restoration_Based on Backup Location)
3	Complete ABS restoration (32-bit Restoration_Based on Backup Location)

Refresh cycle: 16.0 [ms]

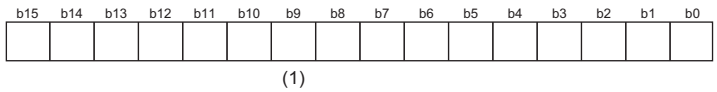
■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 426 Axis monitor data

[Md.500] Servo status7 [FX5-SSC-S]

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 426 Axis monitor data

[Md.502] Driver operation alarm No. [FX5-SSC-S]

- 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 426 Axis monitor data

[Md.514] HPR operating status [FX5-SSC-G]

The HPR (home position return) operating status is stored

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 426 Axis monitor data

11.8 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/Motion module resets the value to "0" automatically when the write access completes. (This indicates the completion of write operation.)

Fetch cycle: 103 [ms] [FX5-SSC-S]
Fetch cycle: 116 [ms] [FX5-SSC-G]

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 751 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 428 System control data

■Default value

Set to "0".

[Cd.2] Parameter initialization request

- Requests initialization of setting data.
- The Simple Motion module/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 317 Parameter Initialization Function

Initialization: Resetting of setting data to default values

Fetch cycle: 103 [ms] [FX5-SSC-S]

Fetch cycle: 116 [ms] [FX5-SSC-G]

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 428 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: At "[Cd.190] PLC READY" OFF to ON

Point

The "[Cd.41] Deceleration start flag valid" become valid when the "[Cd.190] PLC READY" 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 428 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 428 System control data

■Default value

Set to "0".

[Cd.44] External input signal operation device (Axis 1 to 8)

Operates the external input signal status (Upper/lower limit signal, proximity dog signal, stop signal) of the Simple Motion module/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		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	Axis 2 Upper limit signal (FLS)	
	b5	Axis 2 Lower limit signal (RLS)	
	b6	Axis 2 Proximity dog signal (DOG)	
	b7	Axis 2 STOP signal (STOP)	
	b8	Axis 3 Upper limit signal (FLS)	
	b9	Axis 3 Lower limit signal (RLS)	
	b10	Axis 3 Proximity dog signal (DOG)	
	b11	Axis 3 STOP signal (STOP)	
	b12	Axis 4 Upper limit signal (FLS)	
	b13	Axis 4 Lower limit signal (RLS)	
	b14	Axis 4 Proximity dog signal (DOG)	
	b15	Axis 4 STOP signal (STOP)	
5929	b0	Axis 5 Upper limit signal (FLS)	
	b1	Axis 5 Lower limit signal (RLS)	
	b2	Axis 5 Proximity dog signal (DOG)	
	b3	Axis 5 STOP signal (STOP)	
	b4	Axis 6 Upper limit signal (FLS)	
	b5	Axis 6 Lower limit signal (RLS)	
	b6	Axis 6 Proximity dog signal (DOG)	
	b7	Axis 6 STOP signal (STOP)	
	b8	Axis 7 Upper limit signal (FLS)	
	b9	Axis 7 Lower limit signal (RLS)	
	b10	Axis 7 Proximity dog signal (DOG)	
	b11	Axis 7 STOP signal (STOP)	
	b12	Axis 8 Upper limit signal (FLS)	
	b13	Axis 8 Lower limit signal (RLS)	
	b14	Axis 8 Proximity dog signal (DOG)	
	b15	Axis 8 STOP signal (STOP)	

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 428 System control data

■Default value

Set to "0000H".

[Cd.55] Input value for manual pulse generator via CPU [FX5-SSC-G]

- Set the values used as the input values for the manual pulse generator via CPU in order.
- Set the input values with the high speed counter function of the CPU module.

Fetch cycle: 8.0 [ms]

- Although "[Cd.55] Input value for manual pulse generator via CPU" is imported every 8.0 ms, synchronization with the scan time of the CPU module is not performed, so the speed change of the axis may become large if the refresh cycle of "[Cd.55] Input value for manual pulse generator via CPU" is slow. Use the following methods to smooth the speed change.

  - Refresh "[Cd.55] Input value for manual pulse generator via CPU" in a cycle that is 8.0 ms or less.
  - Smooth the speed change by using the smoothing function of "[Pr.156] Manual pulse generator smoothing time constant".

- When executing manual pulser operation using "[Cd.55] Input value for manual pulse generator via CPU", set the following items as shown below in [Module Parameter] → [High Speed I/O] → [Input Function] → [High Speed Counter] → [Detail Setting] of the CPU module.

Setting items		Setting value
Use/do not use counter		Enable
Operation mode		Normal mode
Pulse input mode		Set according to the system.
Preset input	Preset input enable/disable	Disable
Preset value		0
Enable input	Enable input enable/disable	Disable
Ring length setting	Ring length enable/disable	Disable

Restriction

Set the movement amount per fetch cycle of "[Cd.55] Input value for manual pulse generator via CPU" within the range of -2147483648 to 2147483647 pulse. When set to a value outside the range, the movement amount of the manual pulse generator and the movement amount of the outputted value may not match.

■Setting range

- Set with a decimal.

Setting range of [Cd.55] (Unit)
-2147483648 to 2147483647 (pulse)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 428 System control data

■Default value

Set to "0".

[Cd.102] SSCNET control command [FX5-SSC-S]

Sets the connect/disconnect command of SSCNET communication.

Fetch cycle: 3.5 [ms]

■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 428 System control data

■Default value

Set to "0".

[Cd.137] Amplifier-less operation mode switching request [FX5-SSC-S]

Sets the switching request of the normal operation mode and amplifier-less operation mode.

Fetch cycle: 3.5 [ms]

■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 428 System control data

■Default value

Set to "0000H".

[Cd.158] Forced stop input [FX5-SSC-G]

Set the forced stop input 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 428 System control data

■Default value

Set to "0000H".

[Cd.190] PLC READY

• This signal notifies the Simple Motion module/Motion module that the CPU module is normal.

• It is turned ON/OFF with the program.

• When the data (parameter) are changed, the "[Cd.190] PLC READY" is turned OFF depending on the parameter.

• The following processes are carried out when the "[Cd.190] PLC READY" turns from OFF → ON.

• The parameter setting range is checked.
• The READY signal ([Md.140] Module status: b0) turns ON.

• The following processes are carried out when the "[Cd.190] PLC READY" turns from ON → OFF. In these cases, the OFF time should be set to 100 ms or more.

• The READY signal ([Md.140] Module status: b0) 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".

• When parameters or positioning data (No.1 to 600) are written from the engineering tool or CPU module to the flash ROM, the "[Cd.190] PLC READY" will turn OFF.

Fetch cycle: Operation cycle

■Setting value

• Set with a decimal.

Setting value	Details
1	PLC READY ON
Other than 1	PLC READY OFF

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 428 System control data

■Default value

Set to "0".

[Cd.191] All axis servo ON

Sets all the servo amplifiers connected to the Simple Motion module/Motion module.

Fetch cycle: Operation cycle

■Setting value

• Set with a decimal.

Setting value	Details
1	Servo ON
Other than 1	Servo OFF

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 428 System control data

■Default value

Set to "0".

[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 276 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 428 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/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 428 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/Motion module is "in error occurrence", the error is cleared and the Simple Motion module/Motion module is returned to the "waiting" state.
- The Simple Motion module/Motion module resets the value to "0" automatically after the axis error reset is completed. (Indicates that the axis error reset is completed.)

[FX5-SSC-S]

- Clears both Simple Motion module/Motion module errors and servo amplifier errors 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] Axis error reset" by the 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 details, refer to each servo amplifier instruction manual.)

[FX5-SSC-G]

- Clears both Motion module errors and servo amplifier errors 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] Axis error reset" by the 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 details, refer to each servo amplifier instruction manual.)
- Errors cannot be reset during the forced stop. Execute the axis error reset while the forced stop is in released status.

Fetch cycle: 14.2 [ms] [FX5-SSC-S]

Fetch cycle: 16.0 [ms] [FX5-SSC-G]

■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 428 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/Motion module resets the value to "0" automatically after restart acceptance is completed. (Indicates that the restart acceptance is completed.)

Fetch cycle: 14.2 [ms] [FX5-SSC-S]

Fetch cycle: 16.0 [ms] [FX5-SSC-G]

■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 428 Axis control data

■Default value

Set to "0".

[Cd.7] M code OFF request

- The M code ON signal turns OFF.
- The Simple Motion module/Motion module resets the value to "0" automatically after the M code signal turns OFF. (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 428 Axis control data

■Default value

Set to "0".

[Cd.8] External command valid

Validates or invalidates external command signals.

Fetch cycle: At request

■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 428 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 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($\times 10^{-1}$ mm)
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 428 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 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 428 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 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 428 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 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 428 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 [FX5-SSC-S], or warning code: 0D04H [FX5-SSC-G]) occurs.

For details of the override function, refer to the following.

☞ Page 263 Override function

Fetch cycle: Operation cycle

■Setting range

- Set with a decimal

Model	Setting range of [Cd.13] (unit)
FX5-SSC-S	1 to 300%
FX5-SSC-G	Version 1.001 or earlier: 1 to 300% Version 1.002 or later: 0 to 300%

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 428 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 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($\times 10^{-2}$ mm/min)
1: inch	0 to 2000000000 ($\times 10^{-3}$ inch/min)
2: degree*1	0 to 2000000000 ($\times 10^{-3}$ 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 ($\times 10^{-2}$ degree/min).

Ex.

When the "[Cd.14] New speed degree axis" is valid: "2" value" 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 428 Axis control data

■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/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 428 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 ($\times 10^{-1}$ μm)
1: inch	0 to 65535 ($\times 10^{-5}$ inch)
2: degree*1	0 to 65535 ($\times 10^{-5}$ 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 428 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 value range differs according to the "[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 428 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 428 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/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] [FX5-SSC-S]
Fetch cycle: 16.0 [ms] [FX5-SSC-G]

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 428 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 428 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 428 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 (unit) of [Cd.22]
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 428 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 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 428 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 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 428 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 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 428 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 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 428 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 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 ($\times 10^{-1}$ μm)	-2147483648 to 2147483647 ($\times 10^{-1}$ μm)
1: inch	-2147483648 to 2147483647 ($\times 10^{-5}$ inch)	-2147483648 to 2147483647 ($\times 10^{-5}$ inch)
2: degree	0 to 35999999 ($\times 10^{-5}$ 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 428 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 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.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 428 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/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 428 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 428 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 428 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 428 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 428 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 428 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 428 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/Motion module resets the value to "0" automatically when processing of the step start request completes.

Fetch cycle: 14.2 [ms] [FX5-SSC-S]
Fetch cycle: 16.0 [ms] [FX5-SSC-G]

■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 428 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/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 428 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 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 428 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/Motion module is initialized, when a teaching operation completes, and when an illegal value (601 or higher) is entered.

Fetch cycle: 103 [ms] [FX5-SSC-S]

Fetch cycle: 116 [ms] [FX5-SSC-G]

■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 428 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 428 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 [FX5-SSC-S], or error code: 1A90H [FX5-SSC-G]) 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		Details	Setting value	
Low-order	b0 to b7	Simultaneous starting axis No.1	00H to 07H	Axis 1 to Axis 8
	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

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 428 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".

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	Use the external command signal for switching from position control to speed control
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

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 428 Axis control data

■Default value

Set to "0".

[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: 0.888 ms [FX5-SSC-S]
Fetch cycle: Operation cycle [FX5-SSC-G]

■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 428 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 "[Cd.191] All axis servo ON".

■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 428 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 "[Cd.190] PLC READY" OFF → ON.
- 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 269 Torque change function)

■Setting range

- Set with a decimal.

Setting range (unit) of [Cd.101]
0 to 10000 (× 0.1%)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 428 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/Motion module.

Fetch cycle: Operation cycle

Point

If the setting is other than "0" and "1", operation is performed in the "gain switching" with the setting regard as "0".

Refer to each servo amplifier manual and instruction manual.

■Setting value

- Set with a decimal.

Setting value	Details
0	Gain switching command OFF
1	Gain switching command ON

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 428 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 428 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 (unit) 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 428 Axis control data

■Default value

Set to "0".

[Cd.130] Servo parameter write request [FX5-SSC-S]

- Set the write request of servo parameter. Set "1" or "2" after setting "[Cd.131] Parameter No. (Setting for servo parameters to be changed)" and "[Cd.132] Change data".
- The Simple Motion module/Motion module resets the value to "0" automatically when the parameter write access completes. (The Simple Motion module resets the value to "3" at writing 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.

■Setting value

- Set with a decimal.

Set "1" for MR-J4(W)-B, MR-JE-B(F), and MR-J3(W)-B, and set "2" for VCⅡ series/VPH series.

Writing failure occurs when a value except "1" or "2" is set.

Setting value	Details
1	1 word write request
2	2 words write request
Other than 1 and 2	Not request

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 428 Axis control data

■Default value

Set to "0".

[Cd.131] Parameter No. (Setting for servo parameters to be changed) [FX5-SSC-S]

Set the servo parameter to be changed.

Fetch cycle: At request

■Setting value

- Set with a hexadecimal.

Buffer memory	Details	Setting value			
		For MR-J4(W)-B		For VCII series/VPH series	
b0 to b7	Parameter No. setting	01H to 40H		01H to 99H	
b8 to b11	Parameter group	0H	PA group	0H	Group 0
		1H	PB group	1H	Group 1
		2H	PC group	2H	Group 2
		3H	PD group	3H	Group 3
		4H	PE group	4H	Group 4
		5H	PF group	5H	Group 5
		9H	Po group	6H	Group 6
		AH	PS group	7H	Group 7
		—		8H	Group 8
		—		9H	Group 9
b12 to b15	Writing mode	0H	Write to RAM	0H	Write to RAM

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 428 Axis control data

■Default value

Set to "0000H".

[Cd.132] Change data [FX5-SSC-S]

Set the change value of servo parameter set in "[Cd.131] Parameter No. (Setting for servo parameters to be changed)".

Fetch cycle: At request

■Setting value

- Set with a decimal or hexadecimal.

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 428 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 (The servo amplifiers for fully closed loop control 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 428 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 428 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/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 428 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

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 428 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 428 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 (unit) 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 428 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 (unit) 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 428 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.

Fetch cycle: Operation cycle (At torque control mode)

■Setting range

- Set with a decimal.

Setting range (unit) of [Cd.143]
-10000 to 10000 (× 0.1%)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 428 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 (unit) 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 428 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 (unit) 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 428 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 2147483647 (× 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 428 Axis control data

■Default value

Set to "1".

[Cd.147] Speed limit value at continuous operation to torque control mode

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 [FX5-SSC-S] (unit)	Setting value depending on program [FX5-SSC-G] (unit)
0: mm	-2000000000 to 2000000000 (× 10^{-2} mm/min)	0 to 2000000000 (× 10^{-2} mm/min)
1: inch	-2000000000 to 2000000000 (× 10^{-3} inch/min)	0 to 2000000000 (× 10^{-3} inch/min)
2: degree*1	-2000000000 to 2000000000 (× 10^{-3} degree/min)	0 to 2000000000 (× 10^{-3} degree/min)
3: pulse	-1000000000 to 1000000000 (pulse/s)	0 to 1000000000 (pulse/s)

*1 [FX5-SSC-S]
When "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid, the setting range is -2000000000 to 2000000000 (× 10^{-2} degree/min).
[FX5-SSC-G]
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 428 Axis control data

■Default value

Set to "0".

[Cd.148] Acceleration time at continuous operation to torque control mode

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 (unit) 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 428 Axis control data

■Default value

Set to "1000".

[Cd.149] Deceleration time at continuous operation to torque control mode

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 (unit) 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 428 Axis control data

■Default value

Set to "1000".

[Cd.150] Target torque at continuous operation to torque control mode

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 (unit) of [Cd.150]
-10000 to 10000 (× 0.1%)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 428 Axis control data

■Default value

Set to "0".

[Cd.151] Torque time constant at continuous operation to torque control mode (+*1)

*1 "+" is an abbreviation for "Forward direction".

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 (unit) 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 428 Axis control data

■Default value

Set to "1000".

[Cd.152] Torque time constant at continuous operation to torque control mode (-*1)

*1 "-" is an abbreviation for "Negative direction".

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 (unit) 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 428 Axis control data

■Default value

Set to "1000".

[Cd.153] Control mode auto-shift selection

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 428 Axis control data

■Default value

Set to "0".

[Cd.154] Control mode auto-shift parameter

- 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 428 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 sudden 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 428 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 428 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 276 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 428 Axis control data

■Default value

Set to "0".

[Cd.184] Positioning start

- Home position return operation or positioning operation is started.
- The positioning start signal is valid at the leading edge, and the operation is started.
- When the positioning start signal turns ON during BUSY, the warning "Start during operation" (warning code: 0900H [FX5-SSC-S], or warning code: 0D00H [FX5-SSC-G]) will occur.

Fetch cycle: Operation cycle

■Setting value

- Set with a decimal

Setting value	Details
1	Positioning start signal requested
Other than 1	Positioning start signal not requested

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 428 Axis control data

■Default value

Set to "0".

Axis control data (transient function) [FX5-SSC-G]

[Cd.160] Optional SDO transfer request 1

Used in the servo transient transmission function. Refer to the following for details.

☞ Page 381 Servo Transient Transmission Function [FX5-SSC-G]

Fetch cycle: Main cycle

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 430 Axis control data (transient function) [FX5-SSC-G]

■Default value

Set to "0".

[Cd.164] Optional SDO transfer data 1

Used in the servo transient transmission function. Refer to the following for details.

☞ Page 381 Servo Transient Transmission Function [FX5-SSC-G]

Fetch cycle: At request (Command request)

■Buffer memory address

Refer to the following for the buffer memory address in this area.

☞ Page 430 Axis control data (transient function) [FX5-SSC-G]

■Default value

Set to "0".

11.9 Memory Configuration and Data Process

The memory configuration and data transmission of Simple Motion module/Motion module are explained in this section.
The Simple Motion module/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/Motion module, such as "when the power is turned ON" or "when the "[Cd.190] PLC READY" 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/Motion module is configured of the following four memories.
○: Setting and storage area provided, —: Setting and storage area not provided.
Not possible: Data is lost when power is turned OFF, Possible: Data is held even when power is turned OFF.

Memory configuration	Role	Area configuration						
		Parameter area	Monitor data area	Control data area	Positioning data area		Block start data area	
					(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	○	○	○	○	—	○	—
Internal memory	Area that can be set only with the engineering tool	—	—	—	—	○	—	○
	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	Synchronous control area	Cam area	
Buffer memory	Area that can be directly accessed with a program with a CPU module	○ [FX5-SSC-S] — [FX5-SSC-G]	○	—	Not possible
Internal memory	Area that can be set only with the engineering tool	—	—	—	Not possible
	Area that can be set only using buffer memory	—	—	○	Not possible
Flash ROM	Area for backing up data required for positioning	—	○*1	—	Possible
Internal memory (nonvolatile)	Area for backing up servo parameter or cam data	○ [FX5-SSC-S] — [FX5-SSC-G]	—	○	Possible

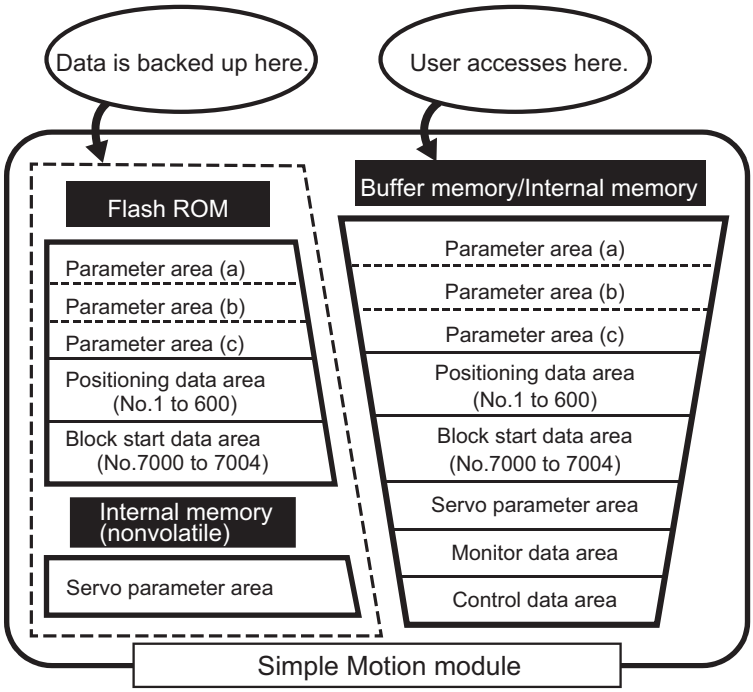
*1 Parameter only

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.

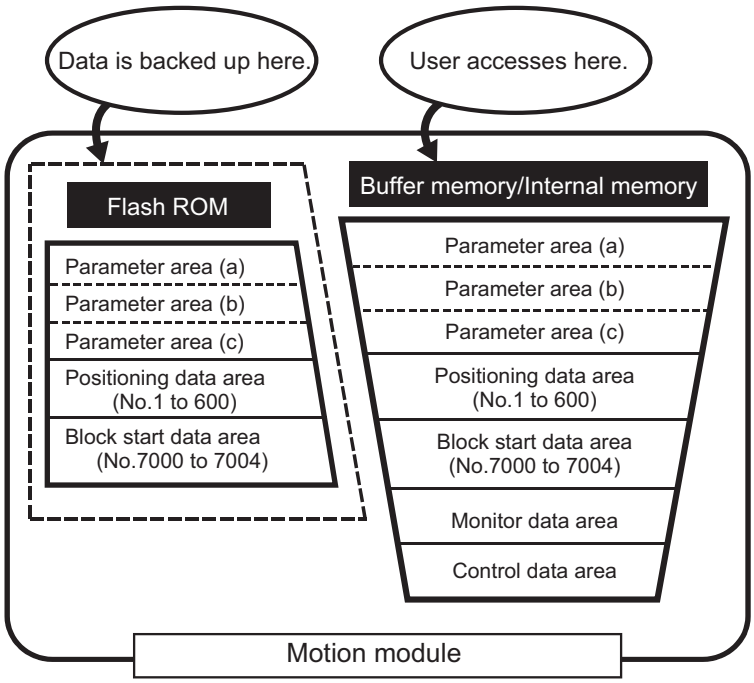
*1 Refer to the following manual for details of synchronous control area and cam area.
MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control)

■Area of FX5-SSC-S



Area name	Description	
Parameter area (a)	Parameters validated when "[Cd.190] PLC READY" 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], [Pr.90], [Pr.95], [Pr.116] to [Pr.119], [Pr.127], [Pr.150], [Pr.151], [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/the CPU module reset	[Pr.91] to [Pr.94], [Pr.96], [Pr.97], [Pr.116] to [Pr.119], [Pr.150], [Pr.151], [Pr.800] to [Pr.807]

■Area of FX5-SSC-G



Area name	Description	
Parameter area (a)	Parameters validated when "[Cd.190] PLC READY" 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.95], [Pr.116] to [Pr.119], [Pr.122], [Pr.123], [Pr.127], [Pr.156], [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], [Pr.112]
Parameter area (c)	Parameters validated with power supply ON/the CPU module reset	[Pr.91] to [Pr.94], [Pr.101], [Pr.116] to [Pr.119], [Pr.140] to [Pr.142] [Pr.152], [Pr.591] to [Pr.594], [Pr.800] to [Pr.811], [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]

Buffer memory area configuration

The buffer memory of Simple Motion module/Motion module is configured of the following types of areas.

n: Axis No. - 1

k: Mark detection setting No. - 1

j: Synchronous encoder axis No. - 1

Buffer memory area configuration		Buffer memory address[*1]	Writing possibility
Parameter area	Servo network configuration parameter [FX5-SSC-G]	58022+32n to 58028+32n	Possible
	Common parameter	33, 35, 67, 105, 106, 58000 to 58003, 58011, 58014 to 58017	
	Basic parameter	0+150n to 15+150n	
	Detailed parameter	17+150n to 69+150n, 116+150n to 119+150n, 125+150n	
	Home position return basic parameter	70+150n to 78+150n	
	Home position return detailed parameter	80+150n to 91+150n	
	Extended parameter	92+150n to 95+150n, 100+150n to 103+150n, 128+150n, 129+150n	
	Link device external signal assignment parameter [FX5-SSC-G]	36000+20n to 36019+20n	
	Mark detection setting parameter	54000+20k to 54019+20k	
Monitor data area	System monitor data	4000 to 4299, 31300 to 31549, 87000 to 87649	Not possible
	Axis monitor data	2400+100n to 2499+100n, 59300+100n to 60899+100n	
	Mark detection monitor data	54960+80k to 55039+80k	
Control data area	System control data	5900 to 5999	Possible
	Axis control data	4300+100n to 4399+100n 30100+10n to 30109+10n 57520+30n, 57522+30n	
	Mark detection control data	54640+10k to 54649+10k	
Positioning data area (No.1 to 100)	Positioning data	6000+1000n to 6999+1000n 71000+1000n, 71001+1000n	Possible
Positioning data area (No.101 to 600)		Set with the engineering tool.	
Block start data area (No.7000)	Block start data	22000+400n to 22049+400n	
		22050+400n to 22099+400n	
	Condition data	22100+400n to 22199+400n	
Block start data area (No.7001)	Block start data	22200+400n to 22249+400n	
		22250+400n to 22299+400n	
	Condition data	22300+400n to 22399+400n	
Block start data area (No.7002)	Block start data	Set with the engineering tool.	
	Condition data		
Block start data area (No.7003)	Block start data		
	Condition data		
Block start data area (No.7004)	Block start data		
	Condition data		

Buffer memory area configuration			Buffer memory address[*1]	Writing possibility
Servo parameter area [FX5-SSC-S]	Servo series		28400+100n	Possible
	PA group	PA01 to PA18	28401+100n to 28418+100n	
		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[*2]	Servo input axis parameter		32800+10n to 32805+10n	Possible
	Servo input axis monitor data		33120+10n to 33127+10n	Not possible
	Synchronous encoder axis parameter		34720+20j to 34735+20j	Possible
	Synchronous encoder axis control data		35040+10j to 35048+10j	Possible
	Synchronous encoder axis monitor data		35200+20j to 35212+20j	Not possible
	Synchronous encoder axis parameters via link device		35520+20j to 35534+20j	Possible
	Synchronous control system control data		36320, 36322	Possible
	Synchronous parameter		36400+200n to 36513+200n	Possible
	Synchronous control monitor data		42800+40n to 42835+40n	Not possible
	Control data for synchronous control		44080+20n to 44090+20n	Possible
	Cam operation control data		45000 to 53791	Possible
	Cam operation monitor data		53800 to 53801	Not possible
	Command generation axis parameter		Set with the engineering tool.	Possible
	Command generation axis control data		61860 to 62883	Possible
	Command generation axis monitor data		60900 to 61859	Not possible
	Command generation axis positioning data		Set with the engineering tool.	Possible
CC-Link IE TSN network area [FX5-SSC-G][*3]	Link device (RX) area		63140 to 64163	Not possible
	Link device (RY) area		64164 to 65187	Possible
	Link device (RWw) area		65188 to 66211	Possible
	Link device (RWr) area		66212 to 67235	Not possible
	Device station offset/size data		68900 to 70995	Not possible

*1 Use of skipped address Nos. is prohibited. If used, the system may not operate correctly.

*2 For details, refer to "List of Buffer Memory Addresses (for Synchronous Control)" in the following manual.
MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control)

*3 For details, refer to "Buffer memory" in the following manual.
MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN)

Point

[FX5-SSC-S]

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.

Timing for data transfers

Parameters of the Simple Motion module/Motion module are categorized as being either module parameters or Simple Motion module settings. Each parameter is reflected to the buffer memory of the Simple Motion module/Motion module at the following timing.

Parameter reflection timing	Operation	Parameter setting value reflected to buffer memory	
		Module parameter*1	Simple Motion module setting*2
Power ON	Power ON	Parameters set from the engineering tool*3	Parameters stored within the Simple Motion module
Module initialization	[Cd.2] Parameter initialization request	Default setting (Initial setting)	

*1 Certain module parameters are reflected within the Simple Motion module/Motion module by turning "[Cd.190] PLC READY" OFF → ON.

*2 When the reflection source does not exist at the reflection timing, refer to the following.
☞ Page 605 (1) Transmitting data when power is turned ON or CPU module is reset

*3 When not set from the engineering tool, the default value is used.

Data transmission process

The data is transmitted between the memories of Simple Motion module/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.

Data transmission pattern		Referential drawing	
		FX5-SSC-S	FX5-SSC-G
(1)	Transmitting data when power is turned ON or CPU module is reset	Page 613 Pattern (1) to (5)	Page 617 Pattern (1) to (4)
(2)	Transmitting data with TO command from CPU module		
(3)	Validate parameters when "[Cd.190] PLC READY" changes from OFF to ON		
(4)	Accessing with FROM command from CPU module		
(5)	Reading the servo parameter from the servo amplifier [FX5-SSC-S]		—
(6)	Writing the flash ROM by a CPU module request	Page 614 Pattern (6) and (7)	Page 618 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 615 Pattern (8) and (9)	Page 619 Pattern (8) and (9)
(9)	Writing data from the engineering tool to buffer memory/internal memory		
(10)	Transmitting servo parameter [FX5-SSC-S]	Page 616 Pattern (10)	—
	Transmitting servo parameter [FX5-SSC-G]	—	—

(1) Transmitting data when power is turned ON or CPU module is reset

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 600 Details of areas

(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 Positioning data No.101 to 600 and Block start data No.7002 to 7004 can be set with only the engineering tool.
*2 For details, refer to the following.
☞ Page 600 Details of areas

Point

[FX5-SSC-S]
When a value other than "0" has been set to the servo parameter "[Pr.100] Servo series" 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 instruction 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 "[Cd.190] PLC READY" is turned OFF then ON. Change the servo parameter with the above method, after setting the servo parameter "[Pr.100] Servo series" inside the internal memory (nonvolatile), to "0".

(3) Validate parameters when "[Cd.190] PLC READY" changes from OFF to ON

When the "[Cd.190] PLC READY" 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 600 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 "[Cd.190] PLC READY" 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 Positioning data No.101 to 600 and Block start data No.7002 to 7004 can be read with only the engineering tool.

(5) Reading the servo parameter from the servo amplifier [FX5-SSC-S]

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

Parameters of the servo amplifier can be changed individually from the Simple Motion module by using 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 [FX5-SSC-S]" in the buffer memory/internal memory area are transmitted to the flash ROM/internal memory (nonvolatile).

(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 Transferring of a servo parameter is possible only when using FX5-SSC-S.

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 751 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 Transferring of a servo parameter is possible only when using FX5-SSC-S.

(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 Transferring of a servo parameter is possible only when using FX5-SSC-S.

(10) Transmitting servo parameter [FX5-SSC-S]

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 "extended parameter" and "servo parameter" in the buffer memory/internal memory area are transmitted to the servo amplifier.
- The following servo parameters in the buffer memory area are transmitted to the internal memory (nonvolatile) and servo amplifier when the "[Cd.190] PLC READY" turns from OFF to ON.

- Auto tuning mode (PA08)
- Auto tuning response (PA09)
- Feed forward gain (PB04)
- Load to motor inertia 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 "[Cd.190] PLC READY" 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.

■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 parameter "[Pr.100] Servo series" 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 parameter "[Pr.100] Servo series" 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 parameter "[Pr.100] Servo series" inside the internal memory (nonvolatile) set to "0". (Initial value: "0")

The setting value of the parameters that correspond to the servo parameter "[Pr.100] Servo series" 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 "[Cd.190] PLC READY" is changed from OFF to ON after setting the servo parameters ("[Pr.100] Servo series": 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

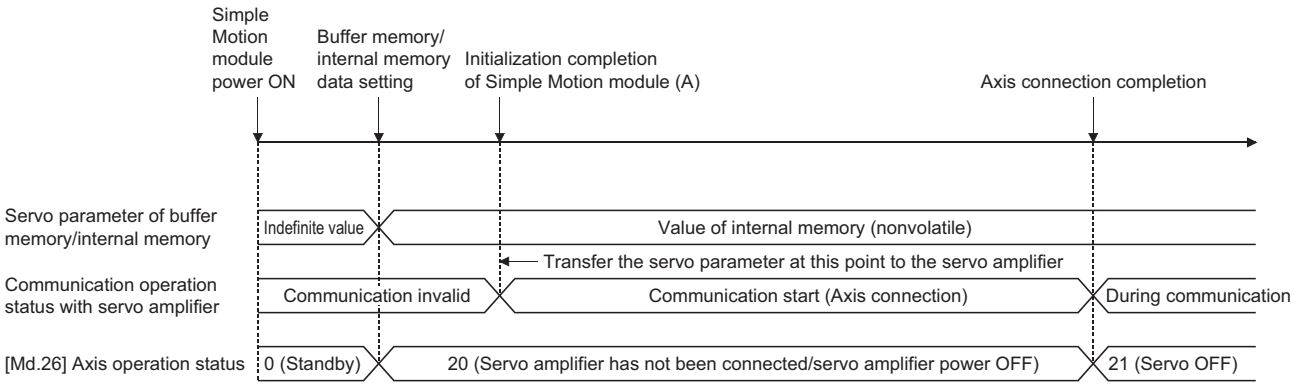
The following shows details about the operation timing and details at transmitting the servo parameter of the buffer memory/internal memory.

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.

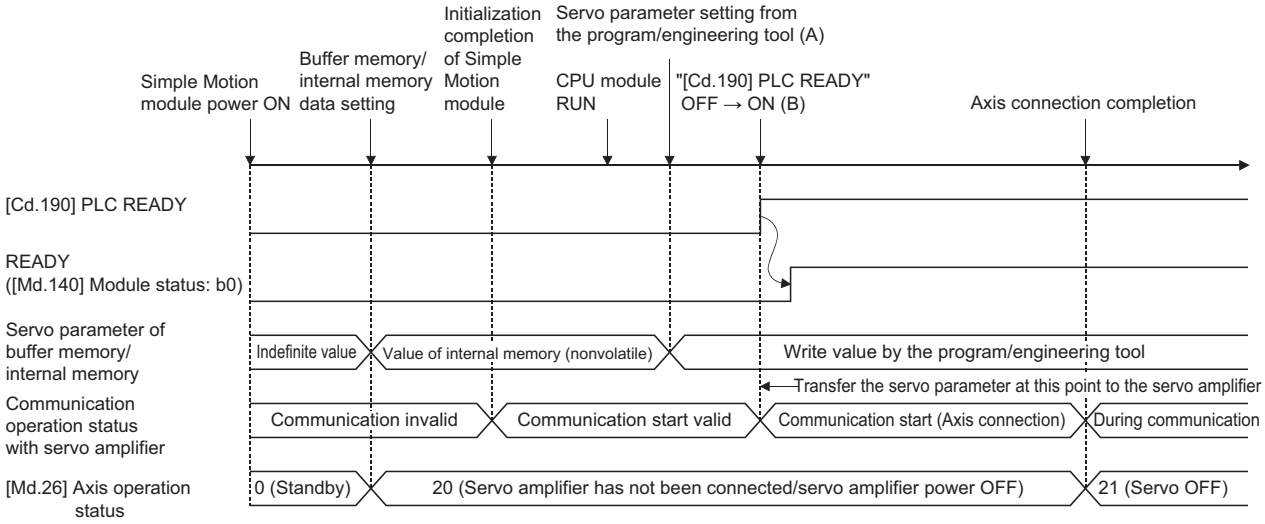
- When the servo amplifier's power supply is turned ON before the system's power supply ON and the servo parameter "[Pr.100] Servo series" ≠ "0" is stored in the internal memory (nonvolatile)

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).



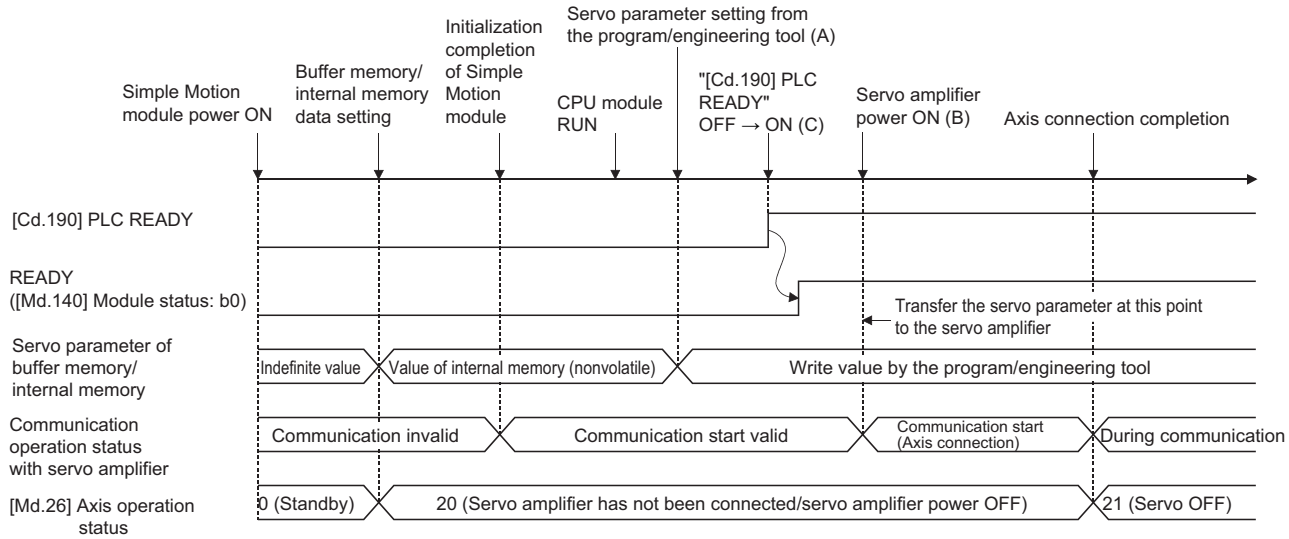
- When the servo amplifier's power supply is turned ON before the system's power supply ON and the servo parameter "[Pr.100] Servo series" = "0" is stored in the internal memory (nonvolatile)

Communication start timing with the servo amplifier	The "[Cd.190] PLC READY" 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 "[Cd.190] PLC READY" ON. ((A) in the following figure)



- When the servo amplifier's power supply is turned ON after the "[Cd.190] PLC READY" 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 "[Cd.190] PLC READY" 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 write request	Set the write request of servo parameter. Set "1" after setting "[Cd.131] Parameter No. (Setting for servo parameters to be changed)" and "[Cd.132] Change data". 1: 1 word write request Other than 1 : Not 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.)

(10) Transmitting servo parameter [FX5-SSC-G]

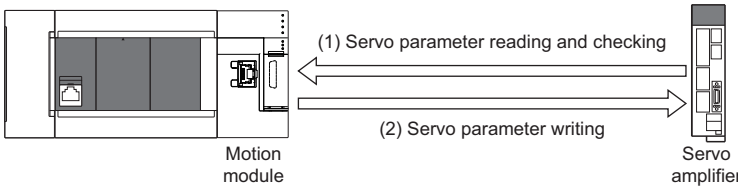
On the CC-Link IE TSN network, when the device station parameter automatic setting is set to "Enabled", servo parameters controlled by the CPU module are transmitted when communications with the servo amplifier start.
When the device station parameter automatic setting is set to "Enabled", servo parameters controlled by the servo amplifier are enabled.
For the device station parameter automatic setting, refer to "Others" in the following manual.
MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN)
The Motion module checks whether the servo parameters transmitted from the CPU module and the servo parameters controlled by the servo amplifier are in the recommended setting when communications with the servo amplifier start.
When the parameters are not in the recommended setting, the error "Servo parameter invalid" (error code: 1DC8H) occurs and the setting values of the servo parameters are overwritten from the Motion module.
For details of the recommended setting of servo parameters, refer to the following.
Page 841 Devices Compatible with CC-Link IE TSN [FX5-SSC-G]

Point

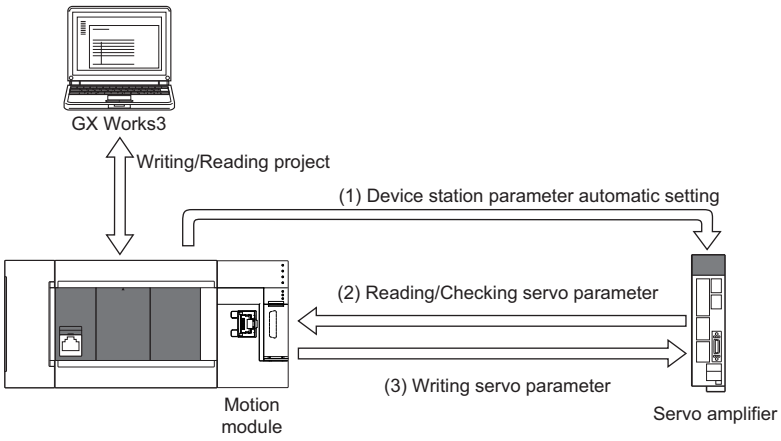
When the error "Servo parameter invalid" (error code: 1DC8H), "[Md.190] Controller position value restoration complete status" becomes "0: Incomplete restoration" and servo ON cannot be performed.
After resetting the error, cycle the power of the servo amplifier.

■Control details

- When the device station parameter automatic setting is set to "Disabled"



- When the device station parameter automatic setting is set to "Enabled"



Point

- Transient communication (SLMP) is used for the reading and writing of servo parameters. For writing, servo parameters are saved by using the Store parameters request. For details of the Store parameters request, refer to the manual of the servo amplifier.
- The timing of reading and checking servo parameter of the Motion module depends on the device station parameter automatic setting as follows.
  When the device station automatic setting is "Valid": After the servo parameter is transferred from the CPU module.
  When the device station parameter automatic setting is "Invalid": At the start of communication with the servo amplifier.
- When the device station is used with the parameter automatic setting, the servo parameter "Parameter automatic backup update interval (PN20)"*1 is required to be set to perform "Automatic update of saved parameters" (automatic update when parameters are updated on the device station side). After the power is turned on, backup is performed every set time when the parameters that have been distributed and the current parameters are different. To reflect changes made to parameters in a project, reopen the servo parameter setting window and apply the servo parameters to the project by directly reading said parameters from the servo amplifier via "Read".

[FX5-SSC-G]

- In case of executing "Automatic update of saved parameters" with the device station parameter automatic setting, CPU module and the Motion module are needed to be updated to the following version.
  CPU module: Ver. 1.250 or later, Motion module: Ver. 1.001 or later.
  When using the earlier version of the above of CPU module and the Motion module the error "Servo parameter invalid" (error code: 1DC8H) occurs when the device station parameter automatic setting is set to "Enabled", be aware that rewritten servo parameters are not reflected to the CPU module. When updating servo parameters that are saved to the CPU module without using "Automatic update of saved parameters", execute the changes after performing reading from the servo amplifier.*2

*1 The number of times for writing data from the CPU module to the data memory is limited. For detail, refer to the following manual.
For MR-J5(W)-G: MR-J5-G/MR-J5W-G User's Manual(Parameter)

*2 The operation of "automatic update of saved parameters" is as follows depending on the combination of each version of the CPU module and the Motion module.

Version of CPU module	Version of Motion module	Operation of Automatic update of saved parameters
1.245 or before	1.000	Even if other than "0" is set to the servo parameter "Parameter automatic backup update interval (PN20)", it will not be backed up to the CPU module.
1.250 or later		
1.245 or before	1.001 or later	When other than "0" is set to the servo parameter "Parameter automatic backup update interval (PN20)", Servo alarm [AL. 19E.1_Parameter automatic backup setting warning] will occur on the servo amplifier. Also, the servo parameter will not be backed up to the CPU module.
1.250 or later		The servo parameter will be backed up to the CPU module in accordance with the setting of "Parameter automatic backup update interval (PN20)".

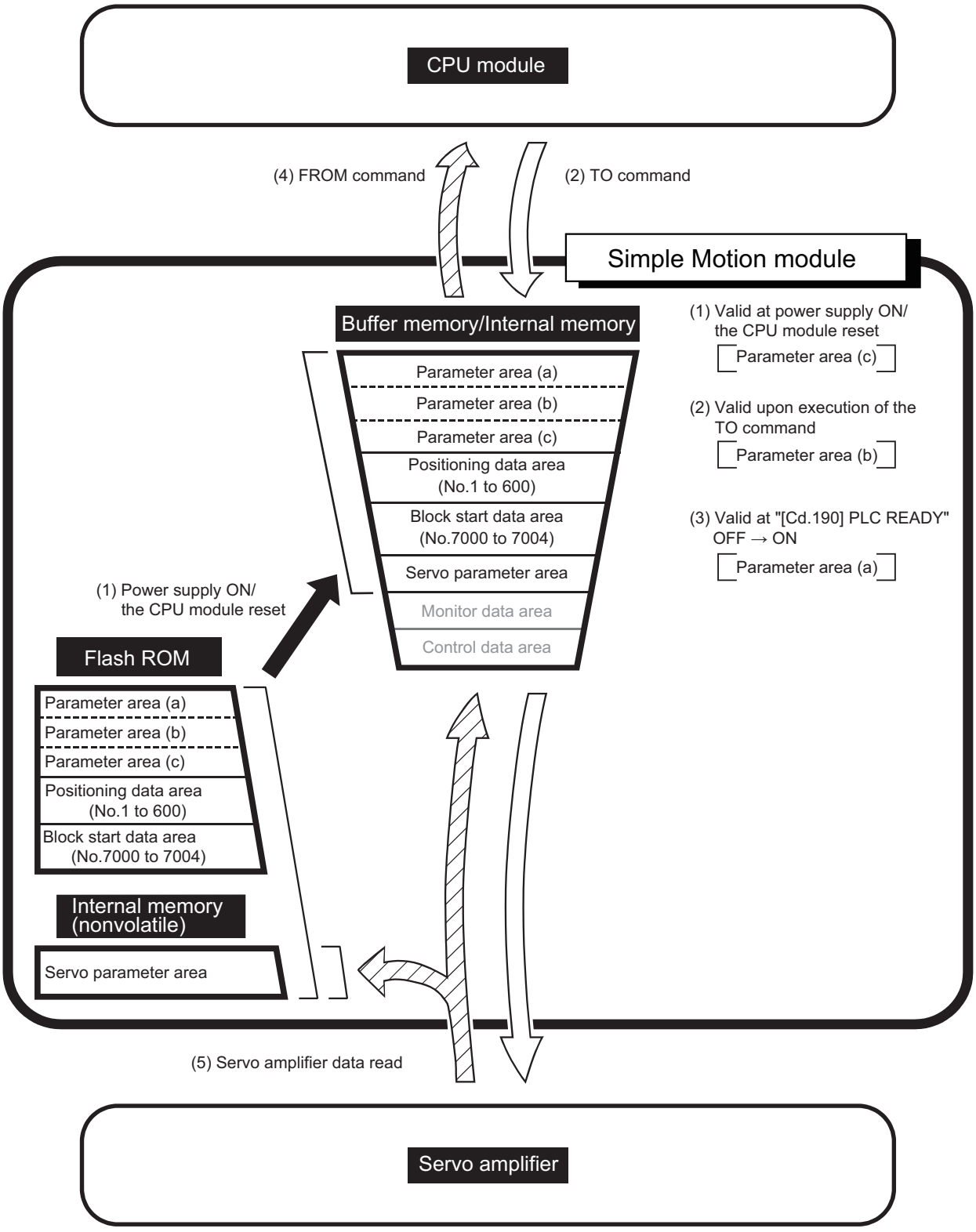
■Restrictions

Turning OFF the power of the servo amplifier while servo parameters are being changed to the recommended setting may cause the servo parameters to become corrupt. Turn OFF the power of the servo amplifier after checking that the Motion module is in one of the two following statuses.

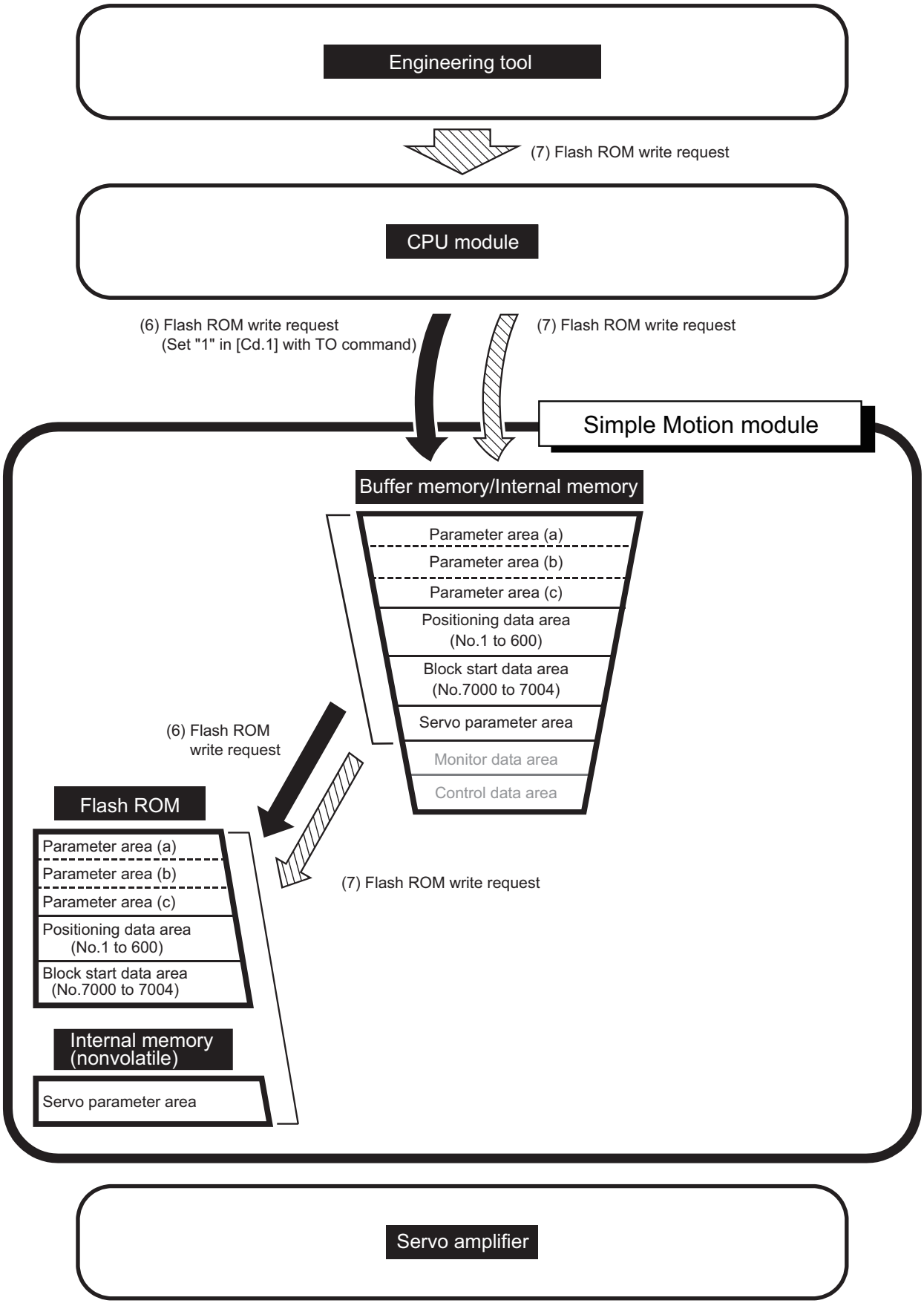
- The error "Servo parameter invalid" (error code: 1DC8H) has occurred.
- "[Md.190] Controller position value restoration complete status" is complete (other than "0: Incomplete restoration").

Data transmission patterns [FX5-SSC-S]

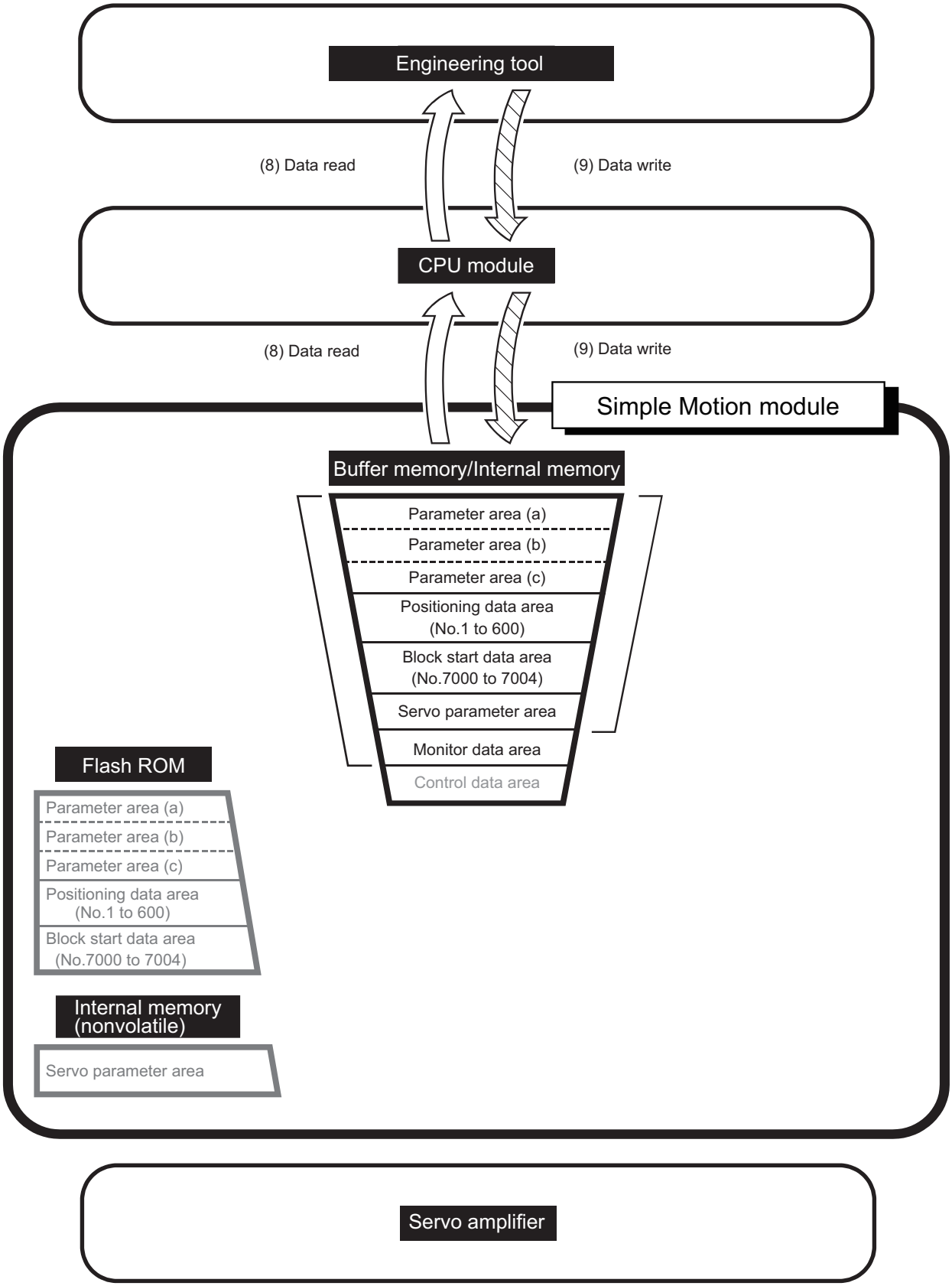
■Pattern (1) to (5)



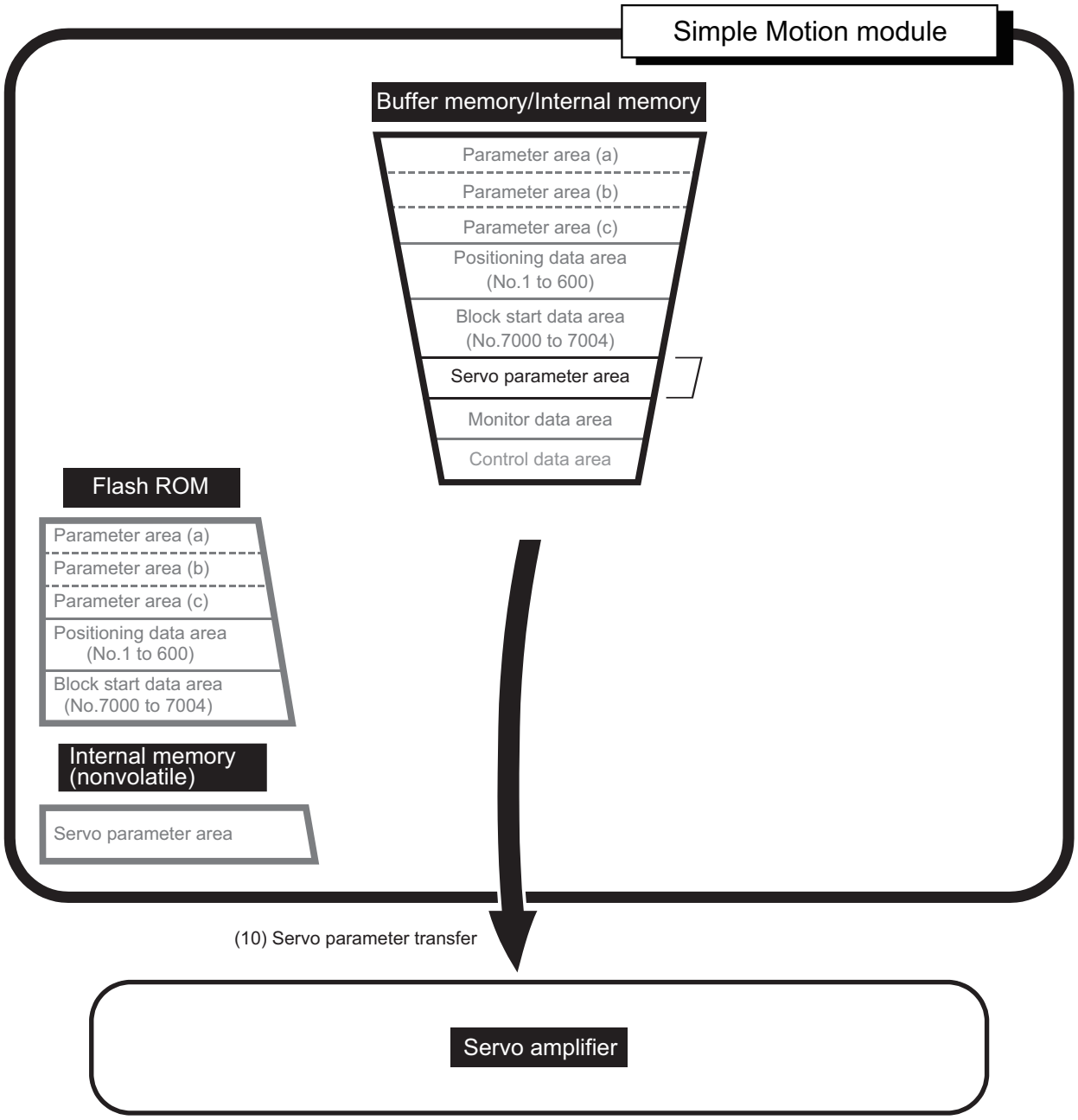
■**Pattern (6) and (7)**



■Pattern (8) and (9)

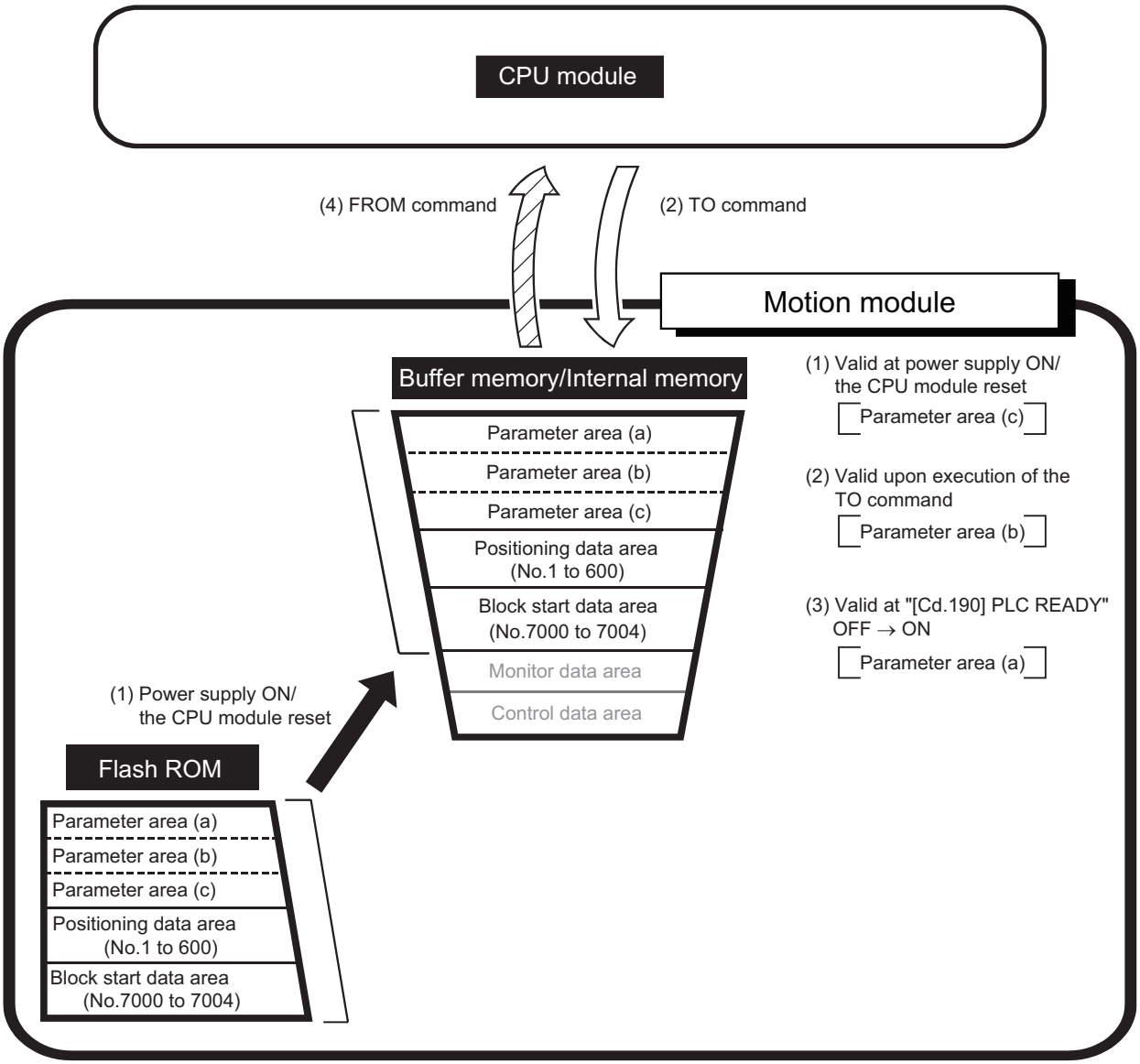


■**Pattern (10)**

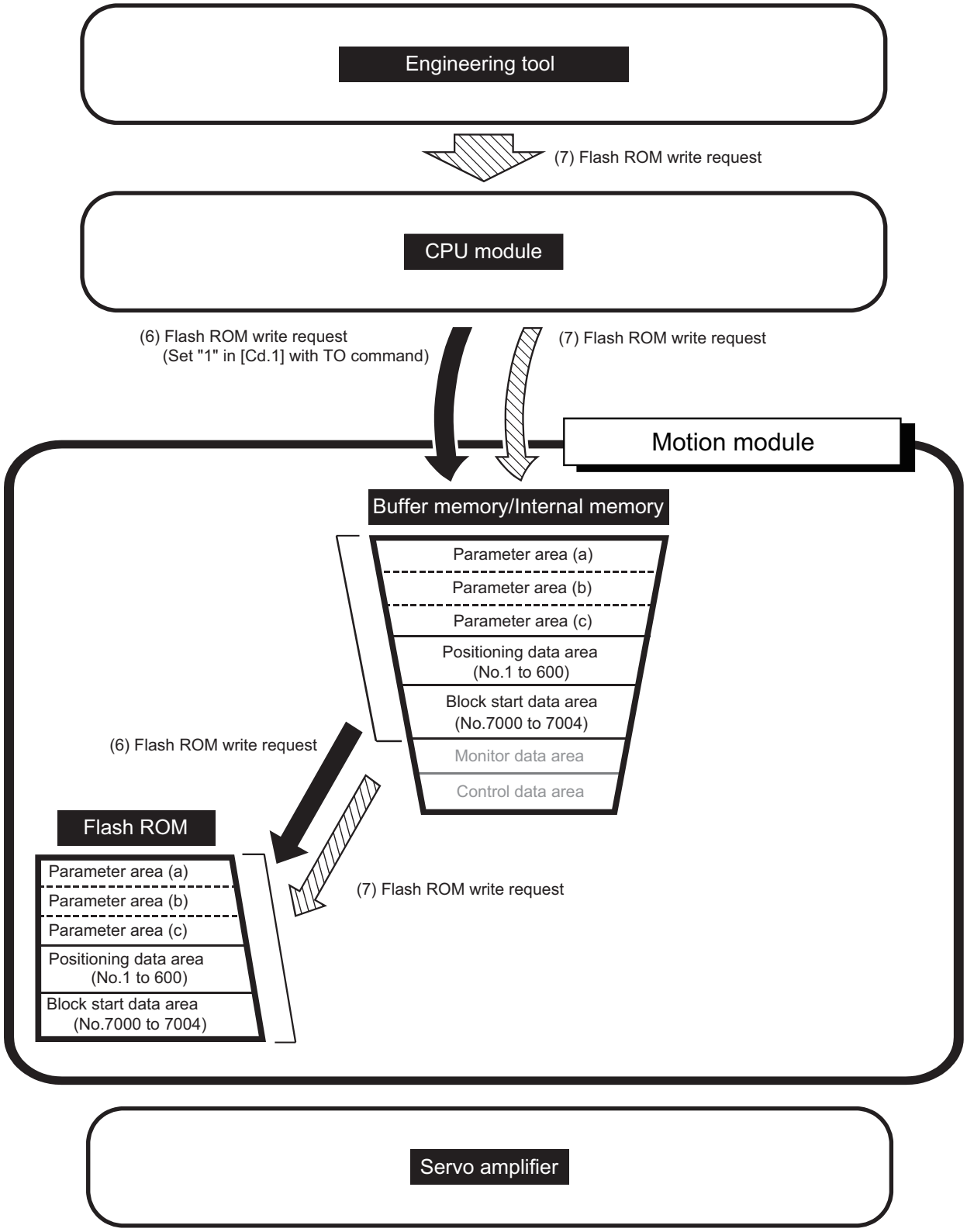

Simple Motion module
Buffer memory/Internal memory
Parameter area (a)
Parameter area (b)
Parameter area (c)
Positioning data area
(No.1 to 600)
Block start data area
(No.7000 to 7004)
Servo parameter area
Monitor data area
Control data area
Flash ROM
Parameter area (a)
Parameter area (b)
Parameter area (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 [FX5-SSC-G]

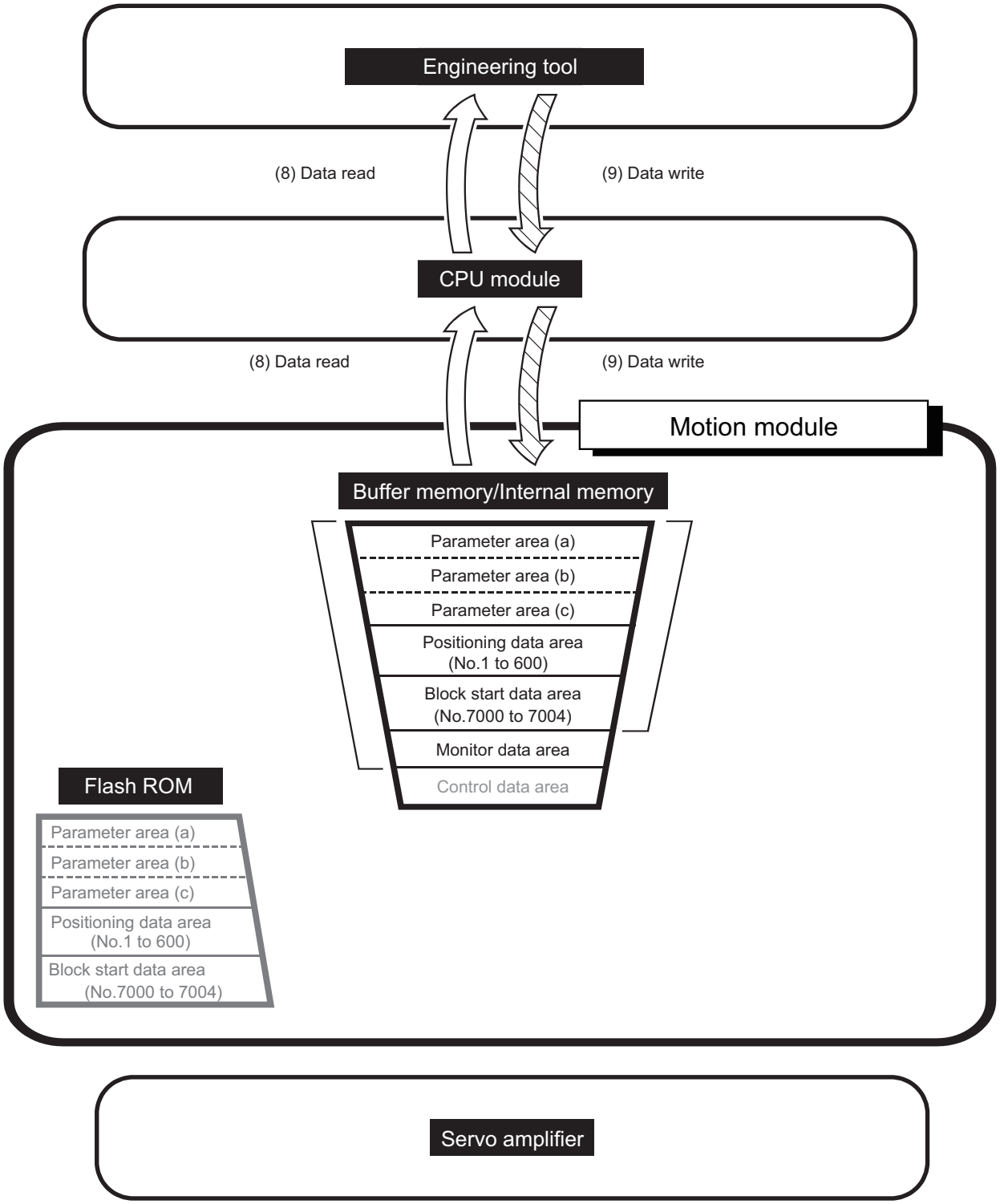
■Pattern (1) to (4)



■**Pattern (6) and (7)**



■Pattern (8) and (9)



12 PROGRAMMING [FX5-SSC-S]

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.)

12.1 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

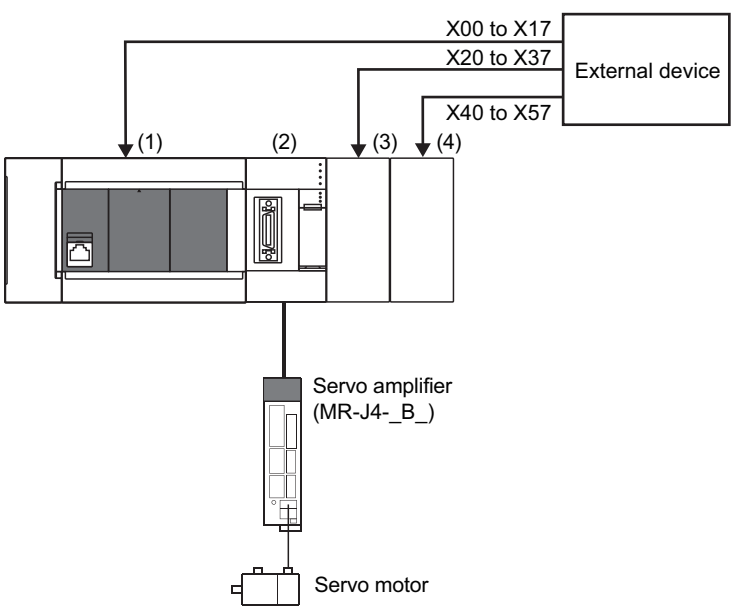
Be sure there is an interval between the speed changes of 10 ms or more when carrying out consecutive speed changes by the speed change function or override function with the Simple Motion module.

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) FX5U-32MR/ES
(2) FX5-40SSC-S
(3) FX5-16EX/ES
(4) FX5-16EX/ES

12.2 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
1	Parameter setting program	• 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.
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 ON program	
8	All axis servo ON 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	—

12.3 Positioning Program Examples (For Using Labels)

List of labels used

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

Module label

Classification	Label name	Description
Start I/O No.	FX5SSC_1.uIO	Start I/O No.
Input signal	FX5SSC_1.stSysCtrl_D.bAllAxisServoOn_D	All axis servo ON
	FX5SSC_1.stSysMntr2_D.bReady_D	READY
	FX5SSC_1.bSynchronizationFlag	Synchronization flag
	FX5SSC_1.stSysMntr2_D.bSynchronizationFlag_D	
	FX5SSC_1.stSysMntr2_D.bnBusy_D[0]	Axis 1 BUSY signal
Output signal	FX5SSC_1.stSysCtrl_D.bPLC_Ready_D	PLC READY signal
	FX5SSC_1.stnAxCtrl2_D[0].uPositioningStart_D.0	Axis 1 Positioning start signal
Parameter	FX5SSC_1.stnAxPrm_D[0].dHomePosition_D	Axis 1 Home position address
	FX5SSC_1.stnAxPrm_D[0].dSoftwareStrokeLowerLimit_D	Axis 1 Software stroke limit lower limit value
	FX5SSC_1.stnAxPrm_D[0].dSoftwareStrokeUpperLimit_D	Axis 1 Software stroke limit upper limit value
	FX5SSC_1.stnAxPrm_D[0].uExternalCommandFunctionMode_D	Axis 1 External command function selection
	FX5SSC_1.stnAxPrm_D[0].uHomingDirection_D	Axis 1 Home position return direction
	FX5SSC_1.stnAxPrm_D[0].uHomingMethod_D	Axis 1 Home position return method
	FX5SSC_1.stnAxPrm_D[0].uHomingRetry_D	Axis 1 Home position return retry
	FX5SSC_1.stnAxPrm_D[0].uUnitMagnification_D	Axis 1 Unit magnification (AM)
	FX5SSC_1.stnAxPrm_D[0].uUnit_D	Axis 1 Unit setting
	FX5SSC_1.stnAxPrm_D[0].uVP_Mode_D	Axis 1 Speed-position function selection
	FX5SSC_1.stnAxPrm_D[0].uV_CommandPosition_D	Axis 1 Command position value during speed control
	FX5SSC_1.stnAxPrm_D[0].udCreepSpeed_D	Axis 1 Creep speed
	FX5SSC_1.stnAxPrm_D[0].udHomingSpeed_D	Axis 1 Home position return speed
	FX5SSC_1.stnAxPrm_D[0].udMovementAmountPerRotation_D	Axis 1 Movement amount per rotation (AL)
	FX5SSC_1.stnAxPrm_D[0].udPulsesPerRotation_D	Axis 1 Number of pulses per rotation (AP)
Axis monitor data	FX5SSC_1.stnAxMntr_D[0].uM_Code_D	Axis 1 Valid M code
	FX5SSC_1.stnAxMntr_D[0].uStatus_D.3	Axis 1 Home position return request flag
	FX5SSC_1.stnAxMntr_D[0].uStatus_D.9	Axis 1 Axis warning detection
	FX5SSC_1.stnAxMntr_D[0].uStatus_D.C	Axis 1 M code ON
	FX5SSC_1.stnAxMntr[0].uStatus.D	Axis 1 Error detection
	FX5SSC_1.stnAxMntr_D[0].uStatus_D.D	
	FX5SSC_1.stnAxMntr[0].uStatus.E	Axis 1 Start complete
	FX5SSC_1.stnAxMntr_D[0].uStatus_D.E	
	FX5SSC_1.stnAxMntr_D[0].uStatus_D.F	Axis 1 Positioning complete
	FX5SSC_1.stnAxMntr_D[0].dCommandPosition_D	Axis 1 Command position value
System monitor data	FX5SSC_1.stSysMntr1_D.wSSCNET_ControlStatus_D	SSCNET control status

Classification	Label name	Description
Axis control data 1	FX5SSC_1.stnAxCtrl1_D[0].dNewPosition_D	Axis 1 New position value
	FX5SSC_1.stnAxCtrl1_D[0].uClearHomingRequestFlag_D	Axis 1 Home position return request flag OFF request
	FX5SSC_1.stnAxCtrl1_D[0].uClear_M_Code_D	Axis 1 M code OFF request
	FX5SSC_1.stnAxCtrl1_D[0].uEnablePV_Switching_D	Axis 1 Position-speed switching enable flag
	FX5SSC_1.stnAxCtrl1_D[0].uEnableVP_Switching_D	Axis 1 Speed-position switching enable flag
	FX5SSC_1.stnAxCtrl1_D[0].uExternalCommandValid_D	Axis 1 External command valid
	FX5SSC_1.stnAxCtrl1_D[0].uForwardNewTorque_D	Axis 1 New torque value/forward new torque value
	FX5SSC_1.stnAxCtrl1_D[0].uInterruptOperation_D	Axis 1 Interrupt request during continuous operation
	FX5SSC_1.stnAxCtrl1_D[0].uOverride_D	Axis 1 Positioning operation speed override
	FX5SSC_1.stnAxCtrl1_D[0].uPositioningStartNo_D	Axis 1 Positioning start No.
	FX5SSC_1.stnAxCtrl1_D[0].uPositioningStartingPointNo_D	Axis 1 Positioning starting point No.
	FX5SSC_1.stnAxCtrl1_D[0].uSkip_D	Axis 1 Skip command
Axis control data 1	FX5SSC_1.stnAxCtrl1_D[0].uStepMode_D	Axis 1 Step mode
	FX5SSC_1.stnAxCtrl1_D[0].uStepStartInformation_D	Axis 1 Step start information
	FX5SSC_1.stnAxCtrl1_D[0].uStepValid_D	Axis 1 Step valid flag
	FX5SSC_1.stnAxCtrl1_D[0].uTeachingDataSelection_D	Axis 1 Teaching data selection
	FX5SSC_1.stnAxCtrl1_D[0].uTeachingPositioningDataNo_D	Axis 1 Teaching positioning data No.
	FX5SSC_1.stnAxCtrl1_D[0].udNewSpeed_D	Axis 1 New speed value
	FX5SSC_1.stnAxCtrl1_D[0].udPV_NewSpeed_D	Axis 1 Position-speed switching control speed change register
	FX5SSC_1.stnAxCtrl1_D[0].udVP_NewMovementAmount_D	Axis 1 Speed-position switching control movement amount change register
System control data	FX5SSC_1.stSysCtrl_D.wSSCNET_ControlCommand_D	SSCNET control command
Axis control data 2	FX5SSC_1.stnAxCtrl2_D[0].uProhibitPositioning_D	Axis 1 Execution prohibition flag
	FX5SSC_1.stnAxCtrl2_D[0].uProhibitPositioning_D.0	
	FX5SSC_1.stnAxCtrl2_D[0].uStopAxis_D	Axis 1 Axis stop
	FX5SSC_1.stnAxCtrl2_D[0].uStopAxis_D.0	

Global label

The following describes the global labels used in the program examples. Set the global labels as follows.

- 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)
1	bSetPositioningData_bEN	Bit	...	VAR_GLOBAL	
2	bSetPositioningData_bENO	Bit	...	VAR_GLOBAL	
3	bSetPositioningData_bOK	Bit	...	VAR_GLOBAL	
4	bSetPositioningData_bErr	Bit	...	VAR_GLOBAL	
5	uSetPositioningData_bErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
6	bJOG_bENO	Bit	...	VAR_GLOBAL	
7	bJOG_bOK	Bit	...	VAR_GLOBAL	
8	bJOG_bErr	Bit	...	VAR_GLOBAL	
9	uJOG_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
10	bMPG_bENO	Bit	...	VAR_GLOBAL	
11	bMPG_bOK	Bit	...	VAR_GLOBAL	
12	bMPG_bErr	Bit	...	VAR_GLOBAL	
13	uMPG_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
14	bChangeSpeed_bENO	Bit	...	VAR_GLOBAL	
15	bChangeSpeed_bOK	Bit	...	VAR_GLOBAL	
16	bChangeSpeed_bErr	Bit	...	VAR_GLOBAL	
17	uChangeSpeed_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
18	bChangeAccDecTime_bENO	Bit	...	VAR_GLOBAL	
19	bChangeAccDecTime_bOK	Bit	...	VAR_GLOBAL	
20	bChangeAccDecTime_bErr	Bit	...	VAR_GLOBAL	
21	uChangeAccDecTime_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
22	bChangePosition_bENO	Bit	...	VAR_GLOBAL	
23	bChangePosition_bOK	Bit	...	VAR_GLOBAL	
24	bChangePosition_bErr	Bit	...	VAR_GLOBAL	
25	uChangePosition_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
26	bRestart_bENO	Bit	...	VAR_GLOBAL	
27	bRestart_bOK	Bit	...	VAR_GLOBAL	
28	bRestart_bErr	Bit	...	VAR_GLOBAL	
29	uRestart_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
30	bInitializeParameter_bENO	Bit	...	VAR_GLOBAL	
31	bInitializeParameter_bOK	Bit	...	VAR_GLOBAL	
32	bInitializeParameter_bErr	Bit	...	VAR_GLOBAL	
33	uInitializeParameter_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
34	bOperateError_bENO	Bit	...	VAR_GLOBAL	
35	bOperateError_bOK	Bit	...	VAR_GLOBAL	
36	bOperateError_bModuleErr	Bit	...	VAR_GLOBAL	
37	uOperateError_uModuleErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
38	bOperateError_bModuleWarn	Bit	...	VAR_GLOBAL	
39	uOperateError_bModuleWarnId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
40	bOperateError_bErr	Bit	...	VAR_GLOBAL	
41	uOperateError_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
42	bWriteFlash_bENO	Bit	...	VAR_GLOBAL	
43	bWriteFlash_bOK	Bit	...	VAR_GLOBAL	
44	bWriteFlash_bErr	Bit	...	VAR_GLOBAL	
45	uWriteFlash_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
46	bBasicParamSetComp	Bit	...	VAR_GLOBAL	
47	bSetElectronicGear16bit	Bit	...	VAR_GLOBAL	
48	bOPRParamSetComp	Bit	...	VAR_GLOBAL	
49	uBlockData	Word [Unsigned]/Bit String [16-bit](0..4)	...	VAR_GLOBAL	
50	uBlockInstData	Word [Unsigned]/Bit String [16-bit](0..4)	...	VAR_GLOBAL	
51	bOPRReqFlagOffReq_P	Bit	...	VAR_GLOBAL	
52	bOPRReqFlagOffReq_H	Bit	...	VAR_GLOBAL	
53	bOPRReqFlagOffReq	Bit	...	VAR_GLOBAL	
54	udMovementAmount	Double Word [Unsigned]/Bit String [32-bit]	...	VAR_GLOBAL	
55	udSpeed	Double Word [Signed]	...	VAR_GLOBAL	
56	bStartPositioning_bENO	Bit	...	VAR_GLOBAL	
57	bStartPositioning_bOK	Bit	...	VAR_GLOBAL	
58	bStartPositioning_bErr	Bit	...	VAR_GLOBAL	
59	uStartPositioning_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
60	bDuringMPGOperation	Bit	...	VAR_GLOBAL	
61	bFastStartPreparationComp	Bit	...	VAR_GLOBAL	
62	bFastOPRStartReq	Bit	...	VAR_GLOBAL	
63	bFastOPRStartReq_H	Bit	...	VAR_GLOBAL	
64	bDuringJogInchingOperation	Bit	...	VAR_GLOBAL	
65	udJogOperationSpeed	Double Word [Unsigned]/Bit String [32-bit]	...	VAR_GLOBAL	
66	uInchingMovementAmount	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
67	bChangeSpeedReq	Bit	...	VAR_GLOBAL	
68	bOverrideReq_P	Bit	...	VAR_GLOBAL	
69	bAccDecTimeChangeReq	Bit	...	VAR_GLOBAL	
70	bChangeAccDecTime_jEnable	Bit	...	VAR_GLOBAL	
71	bStepOperationReq_P	Bit	...	VAR_GLOBAL	
72	bChangeTorqueReq	Bit	...	VAR_GLOBAL	
73	bSkipReq_P	Bit	...	VAR_GLOBAL	
74	bSkipReq	Bit	...	VAR_GLOBAL	
75	bTeachingReq_P	Bit	...	VAR_GLOBAL	
76	bTeachingReq	Bit	...	VAR_GLOBAL	
77	uTeachingData	Word [Unsigned]/Bit String [16-bit](0..3)	...	VAR_GLOBAL	
78	uTeachingDevice	Bit(0..1)	...	VAR_GLOBAL	
79	uIO	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
80	bStopContinuousOperationReq_P	Bit	...	VAR_GLOBAL	
81	bTargetPositionChangeReq	Bit	...	VAR_GLOBAL	
82	bRestartReq	Bit	...	VAR_GLOBAL	
83	bInitializeParameterReq	Bit	...	VAR_GLOBAL	
84	bWriteFlashReq	Bit	...	VAR_GLOBAL	
85	bErrResetReq	Bit	...	VAR_GLOBAL	

	Label Name	Data Type		Class	Assign (Device/Label)
86	bStopReq_P	Bit	...	VAR_GLOBAL	
87	bABRSTReq	Bit	...	VAR_GLOBAL	
88	uOperateError_bModuleErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
89	bErrReadReq	Bit	...	VAR_GLOBAL	
90	bPositioningStartReq	Bit	...	VAR_GLOBAL	
91	bABRSTReq_P	Bit	...	VAR_GLOBAL	
92	bABRST_bENO	Bit	...	VAR_GLOBAL	
93	bABRST_bOK	Bit	...	VAR_GLOBAL	
94	bABRST_bAbsNG	Bit	...	VAR_GLOBAL	
95	uABRST_uAbsErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
96	bABRST_bErr	Bit	...	VAR_GLOBAL	
97	uABRST_uErrId	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	
98	bPosiStart10	Bit	...	VAR_GLOBAL	
99	uPositioningStartNo	Word [Unsigned]/Bit String [16-bit]	...	VAR_GLOBAL	

- Global label that the assignment device is to be set

	Label Name	Data Type		Class	Assign (Device/Label)
100	bInputOPRReqFlagOffReq	Bit	...	VAR_GLOBAL	X0
101	bInputExternalCommandValidReq	Bit	...	VAR_GLOBAL	X1
102	bInputExternalCommandInvalidReq	Bit	...	VAR_GLOBAL	X2
103	bInputOPRStartReq	Bit	...	VAR_GLOBAL	X3
104	bInputFastOPRStartReq	Bit	...	VAR_GLOBAL	X4
105	bInputStartPositioningNoReq	Bit	...	VAR_GLOBAL	X5
106	bInputSpeedPositionSwitchingReq	Bit	...	VAR_GLOBAL	X6
107	bInputSpeedPositionSwitchingEnableReq	Bit	...	VAR_GLOBAL	X7
108	bInputSpeedPositionSwitchingDisableReq	Bit	...	VAR_GLOBAL	X10
109	bInputChangeSpeedPositionSwitchingMovementAmount	Bit	...	VAR_GLOBAL	X11
110	bInputStartAdvancedPositioningReq	Bit	...	VAR_GLOBAL	X12
111	bInputMcodeOffReq	Bit	...	VAR_GLOBAL	X14
112	bInputSetJogSpeedReq	Bit	...	VAR_GLOBAL	X15
113	bInputForwardJogStartReq	Bit	...	VAR_GLOBAL	X16
114	bInputReverseJogStartReq	Bit	...	VAR_GLOBAL	X17
115	bInputStartMPGReq	Bit	...	VAR_GLOBAL	X20
116	bInputChangeSpeedReq	Bit	...	VAR_GLOBAL	X22
117	bInputOverrideReq	Bit	...	VAR_GLOBAL	X23
118	bInputChangeAccDecTimeReq	Bit	...	VAR_GLOBAL	X24
119	bInputChangeAccDecTimeDisable	Bit	...	VAR_GLOBAL	X25
120	bInputChangeTorqueReq	Bit	...	VAR_GLOBAL	X26
121	bInputStepOperationReq	Bit	...	VAR_GLOBAL	X27
122	bInputSkipReq	Bit	...	VAR_GLOBAL	X30
123	bInputTeachingReq	Bit	...	VAR_GLOBAL	X31
124	bInputStopContinuousOperationReq	Bit	...	VAR_GLOBAL	X32
125	bInputRestartReq	Bit	...	VAR_GLOBAL	X33
126	bInputInitializeParameterReq	Bit	...	VAR_GLOBAL	X34
127	bInputWriteFlashReq	Bit	...	VAR_GLOBAL	X35
128	bInputErrResetReq	Bit	...	VAR_GLOBAL	X36
129	bInputStopReq	Bit	...	VAR_GLOBAL	X37
130	bInputPositionSpeedSwitchingReq	Bit	...	VAR_GLOBAL	X40
131	bInputPositionSpeedSwitchingEnableReq	Bit	...	VAR_GLOBAL	X41
132	bInputPositionSpeedSwitchingDisableReq	Bit	...	VAR_GLOBAL	X42
133	bInputChangePositionSpeedSwitchingSpeedReq	Bit	...	VAR_GLOBAL	X43
134	bInputSetInchingMovementAmountReq	Bit	...	VAR_GLOBAL	X44
135	bInputTargetPositionChangeReq	Bit	...	VAR_GLOBAL	X45
136	bInputStepStartInformationReq	Bit	...	VAR_GLOBAL	X46
137	bInputSpeedPositionSwitchingAbsSetReq	Bit	...	VAR_GLOBAL	X56
138	bAllAxisServoOnReq	Bit	...	VAR_GLOBAL	X57

Program examples (for using labels)

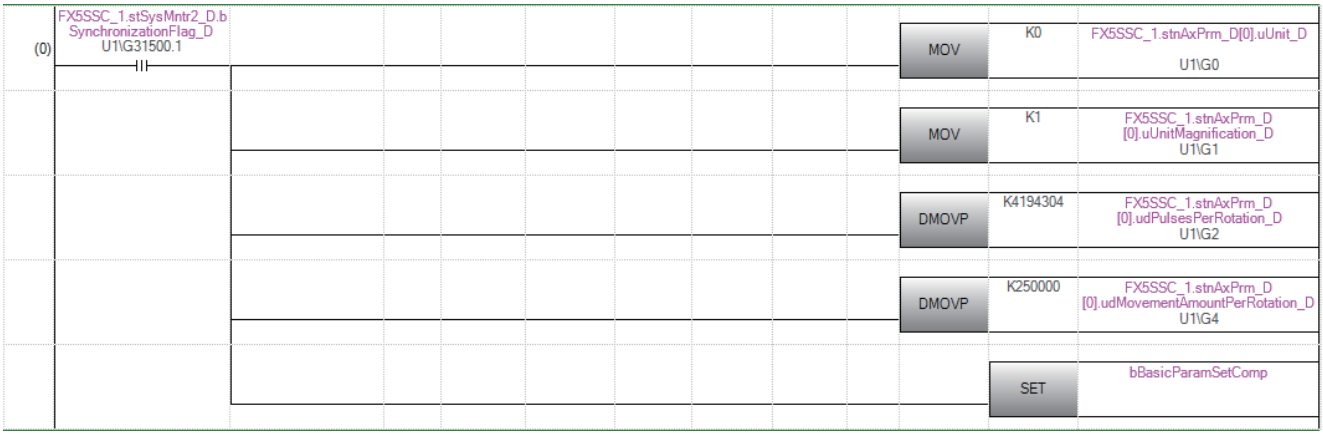
For details of the module function blocks (FBs), refer to "Simple Motion Module FB/Motion Module FB" in the following manual.

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

Parameter setting program

This program is not required when the parameter is set by "Module Parameter" using an engineering tool.

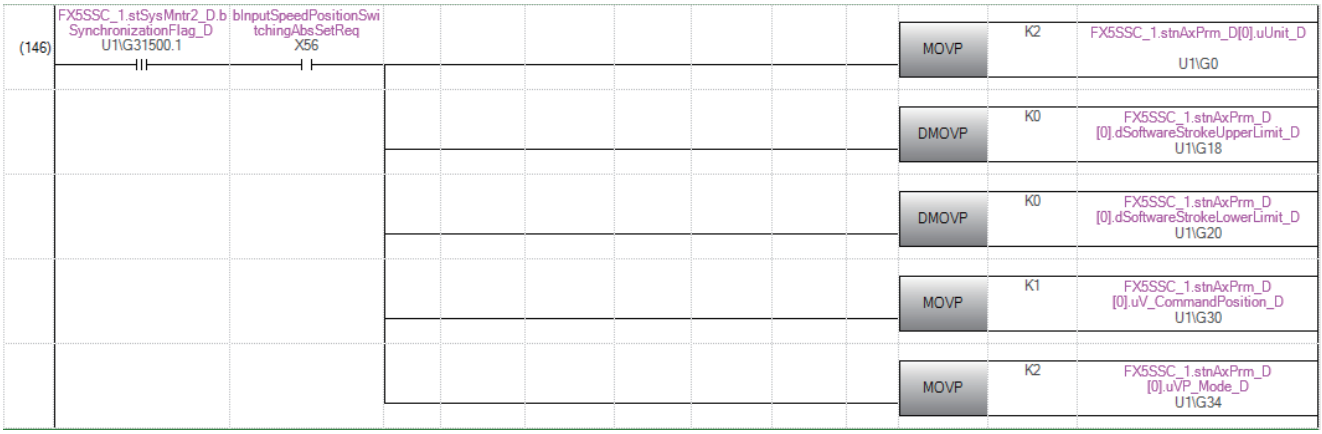
■Setting for basic parameter 1 (axis 1)



■Setting for home position return basic parameter (axis 1)

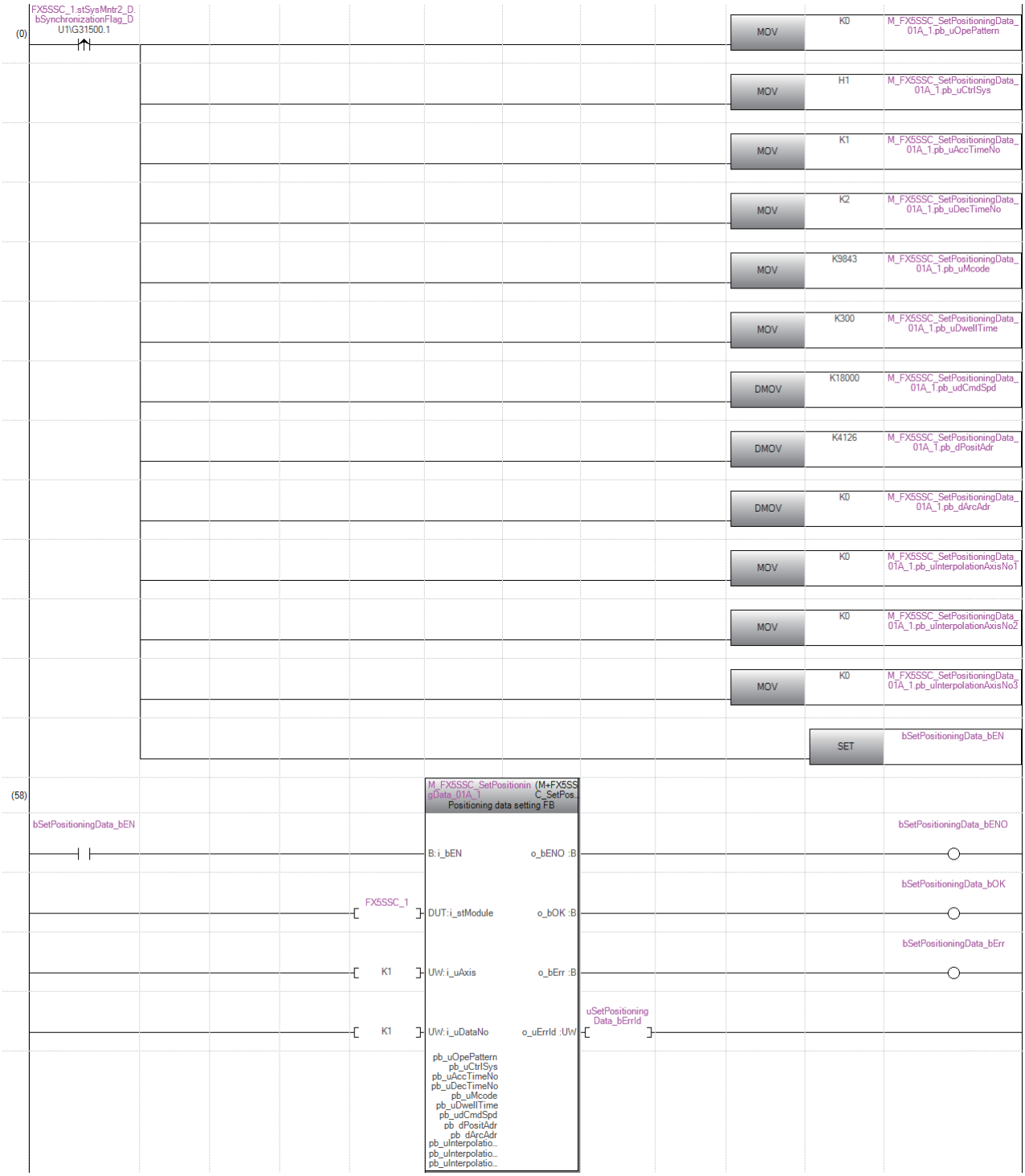


■Unit "degree" setting (axis 1) program



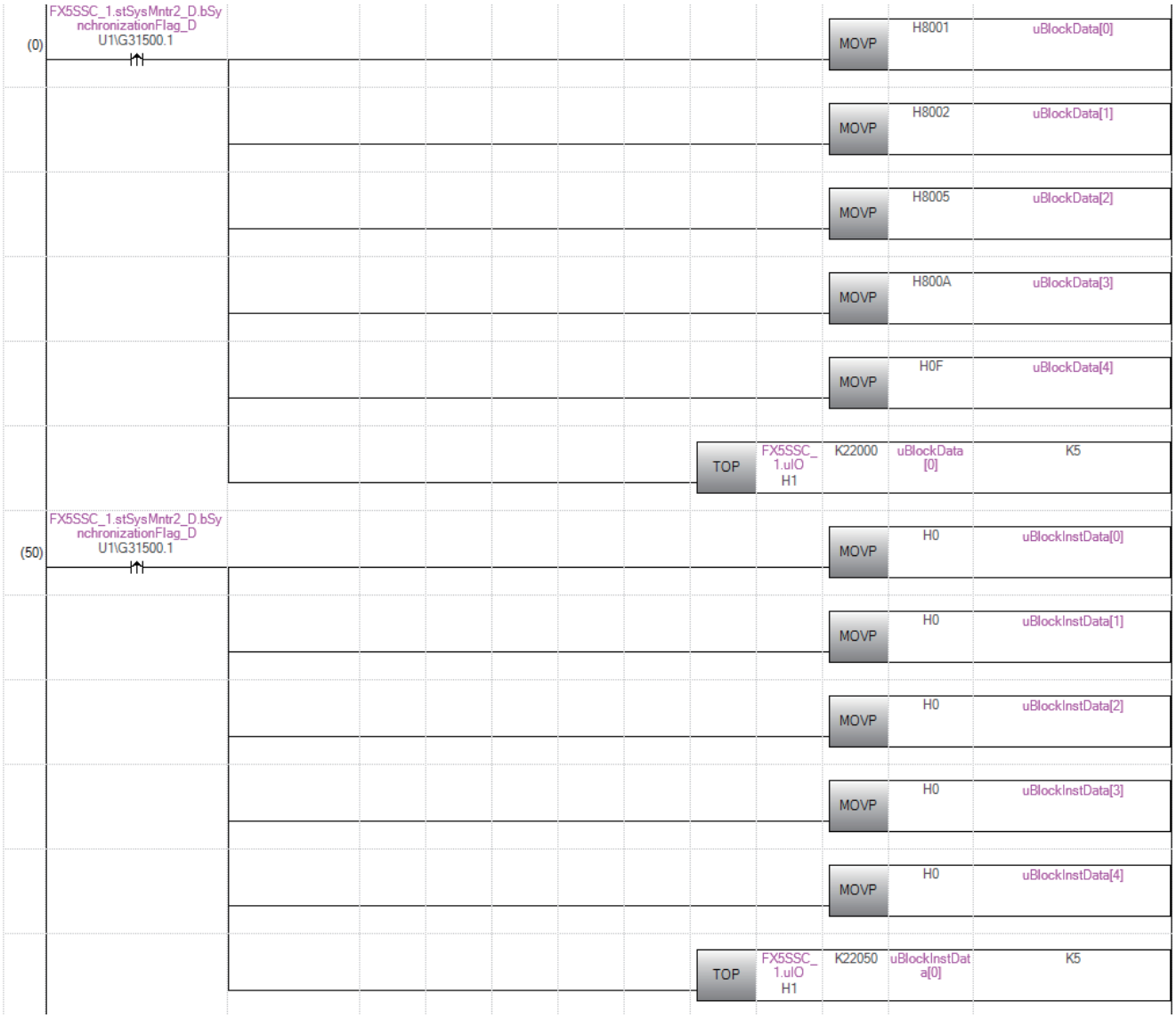
Positioning data setting program

This program is not required when the data is set by "Positioning Data" using an engineering tool.



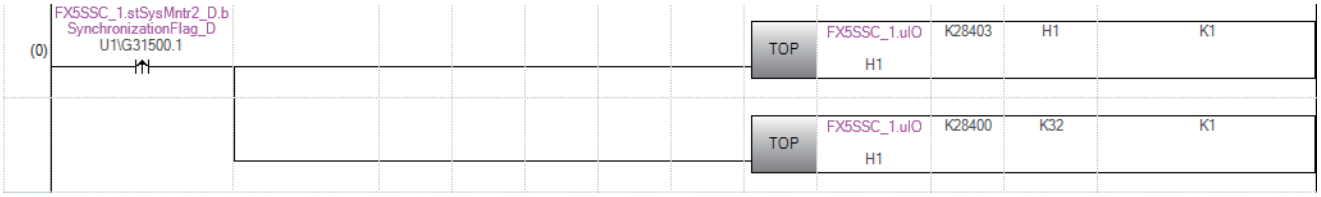
Block start data setting program

This program is not required when the data is set by "Block Start Data" using an engineering tool.



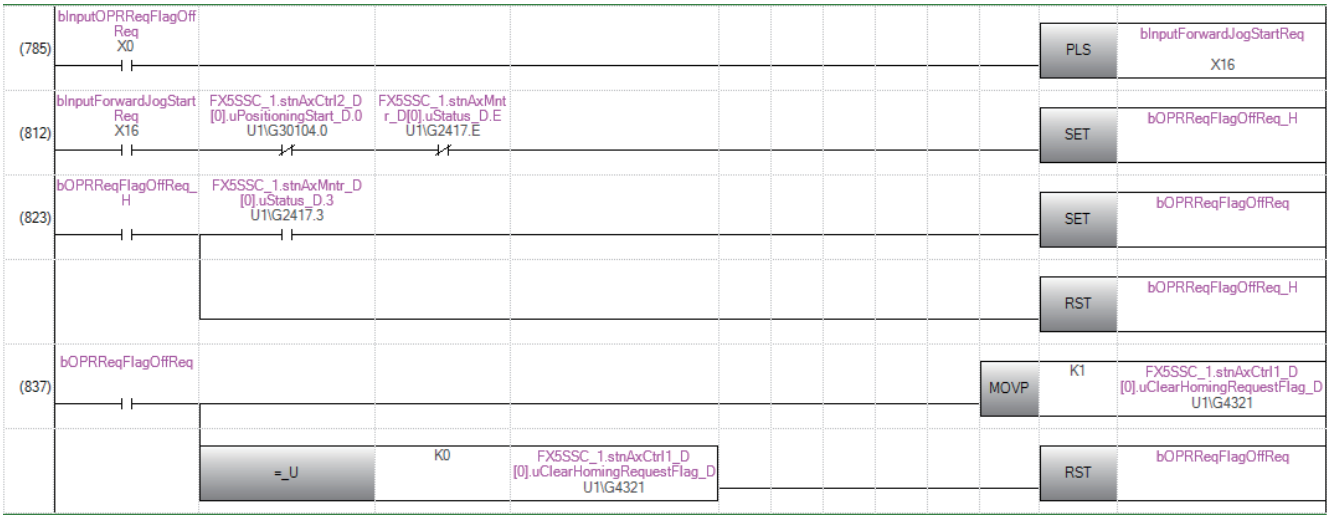
Servo parameter setting program

This program is not required when the parameter is set by "Servo Parameter" using an engineering tool.

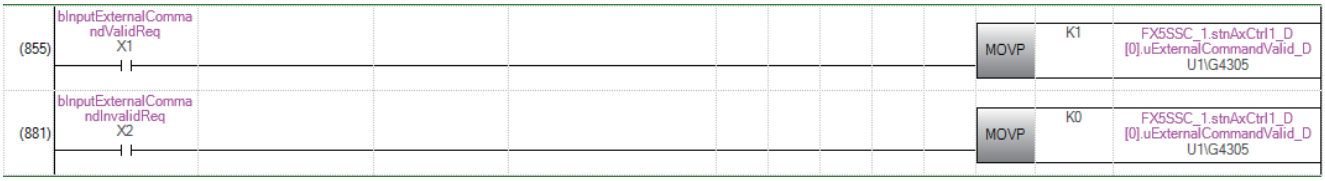


Home position return request OFF program

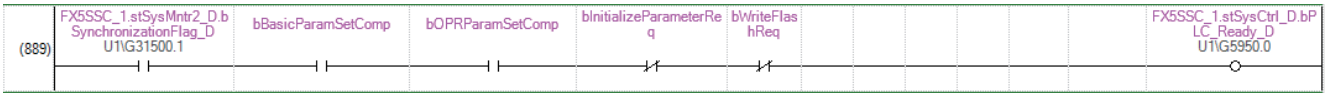
This program is not required when "1: Positioning control is executed." is set in "[Pr.55] Operation setting for incompletion of home position return" by "Home Position Return Detailed Parameters" using an engineering tool.



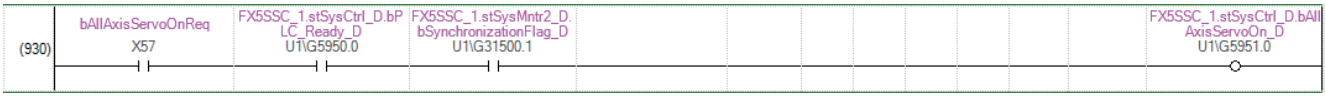
External command function valid setting program



PLC READY signal ON program

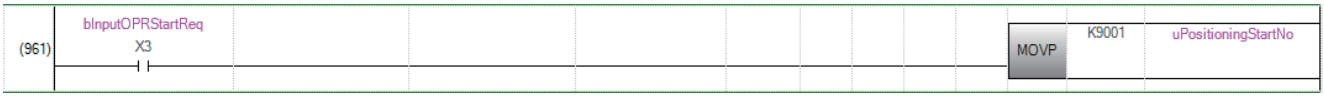


All axis servo ON program

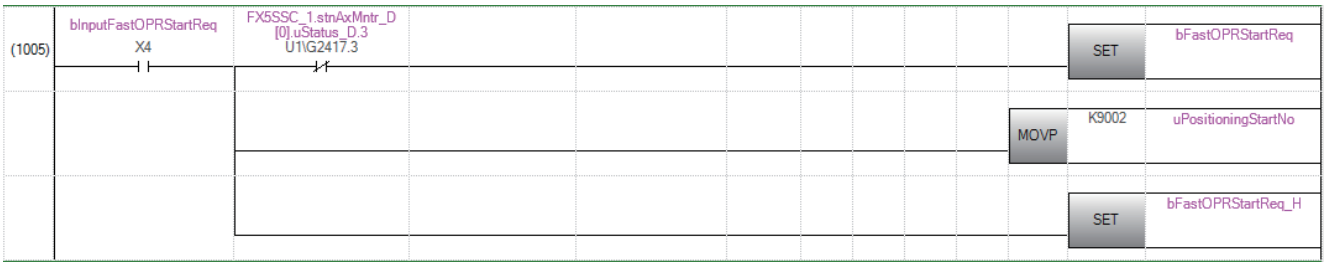


Positioning start No. setting program

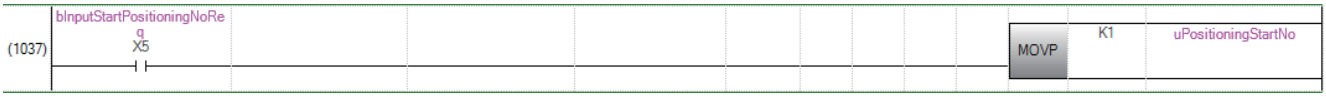
■Machine home position return



■Fast home position return

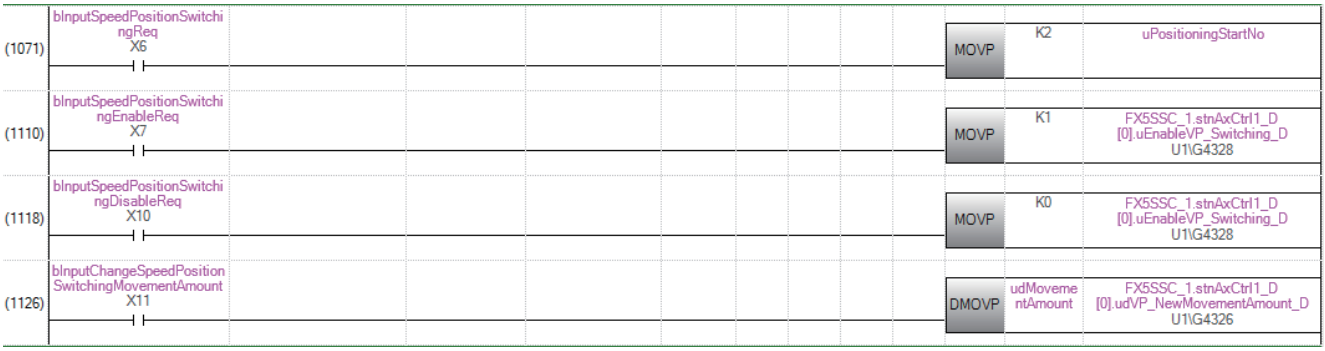


■Positioning with positioning data No.1

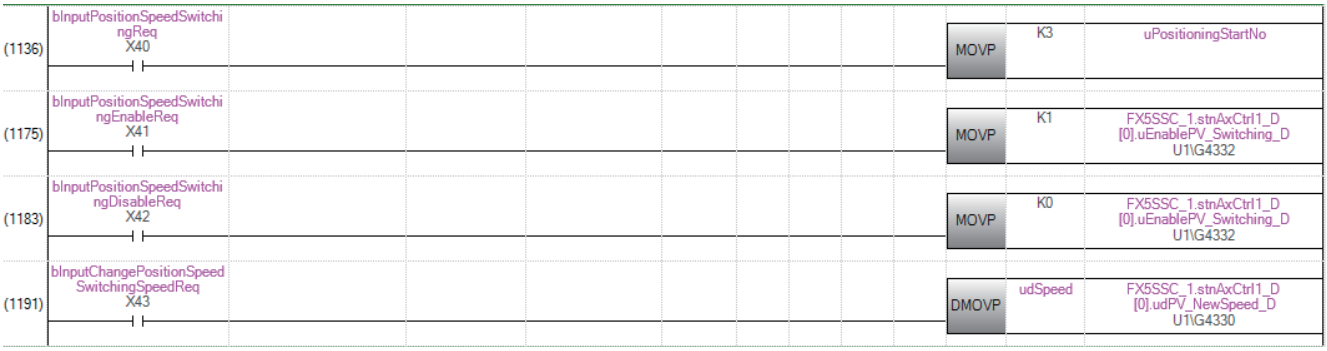


■Speed-position switching operation (Positioning data No.2)

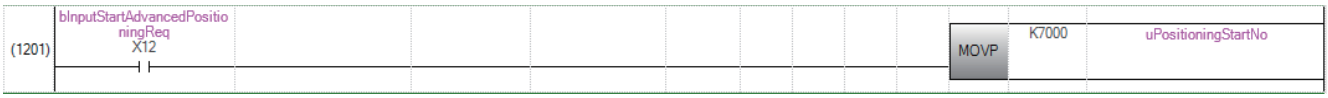
In the ABS mode, new movement amount is not needed to be written.



■Position-speed switching operation (Positioning data No.3)



■High-level positioning control

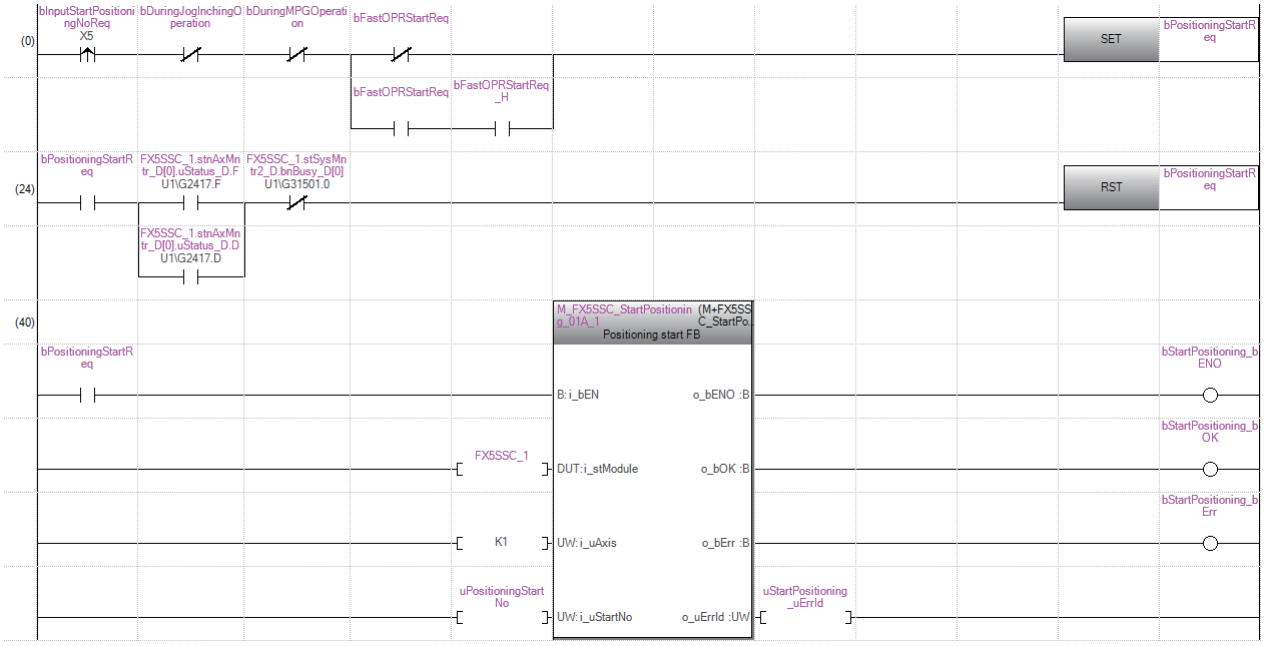


■Fast home position return command and fast home position return command storage OFF

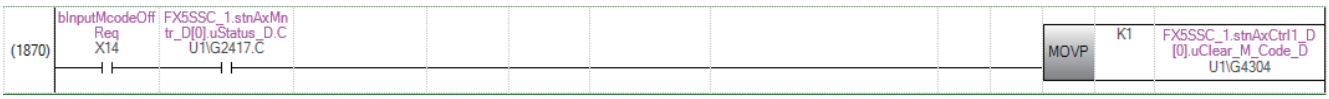
Not required when fast home position return is not used.



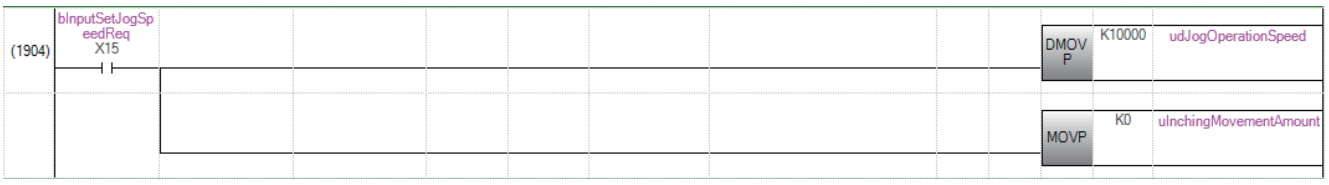
Positioning start program



M code OFF program



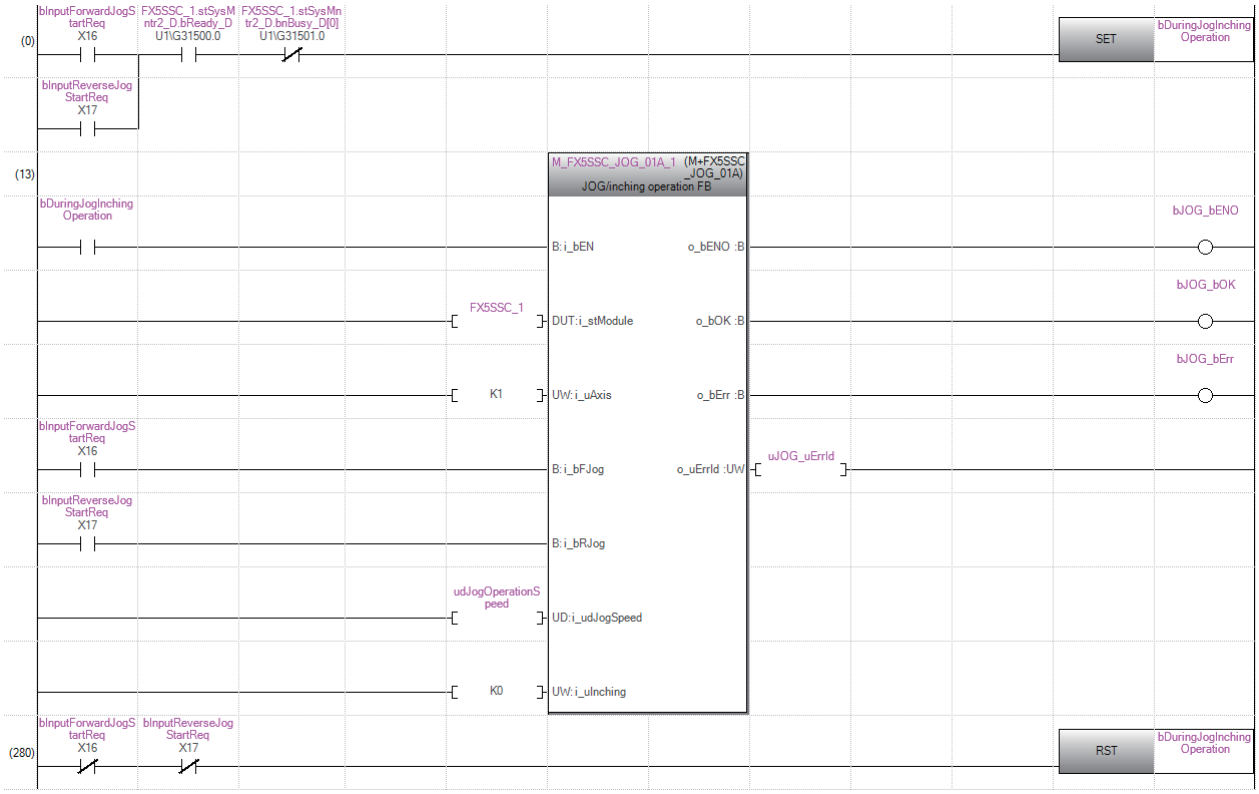
JOG operation setting program



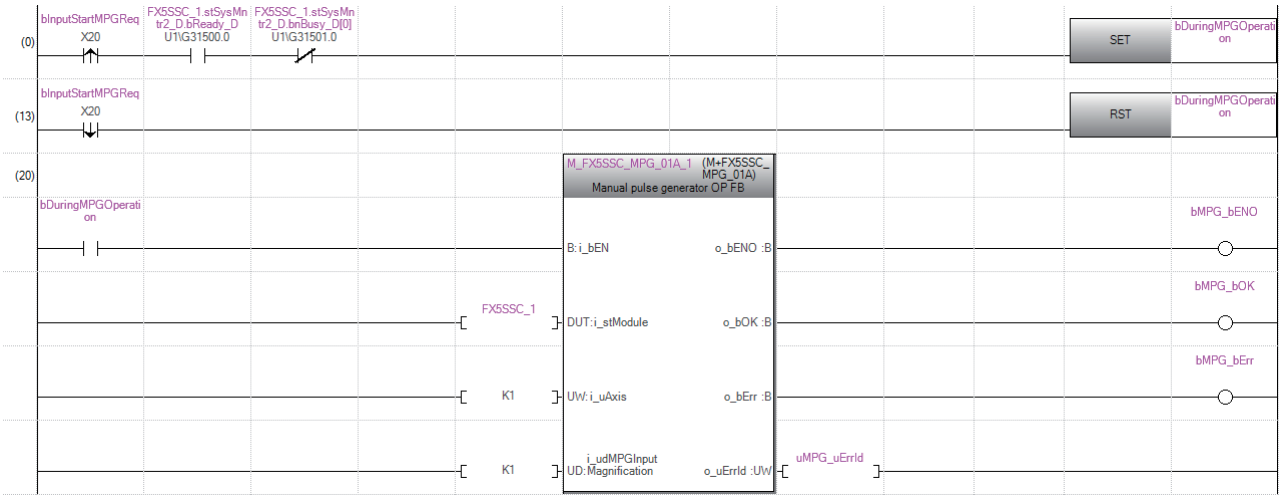
Inching operation setting program



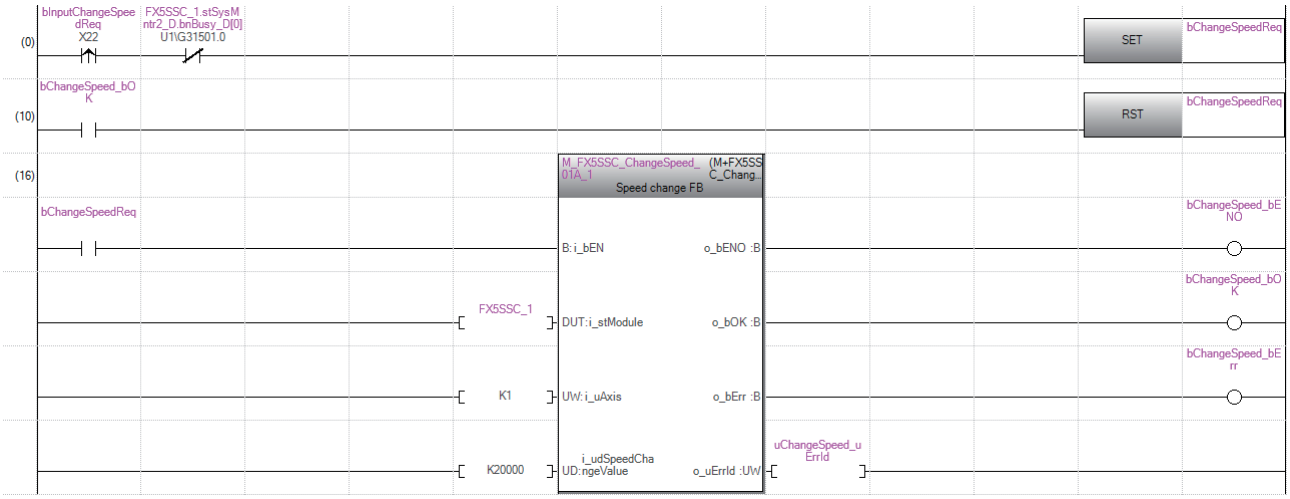
JOG operation/inching operation execution program



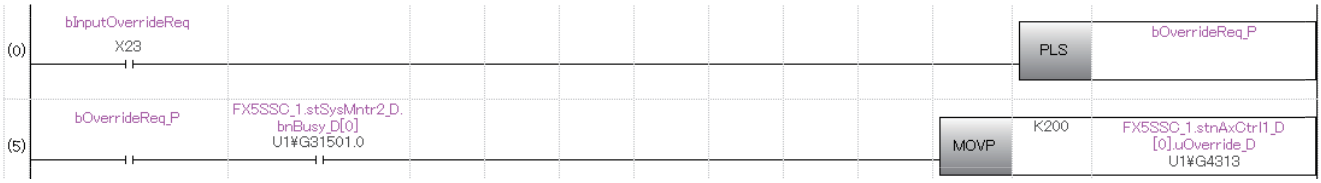
Manual pulse generator operation program



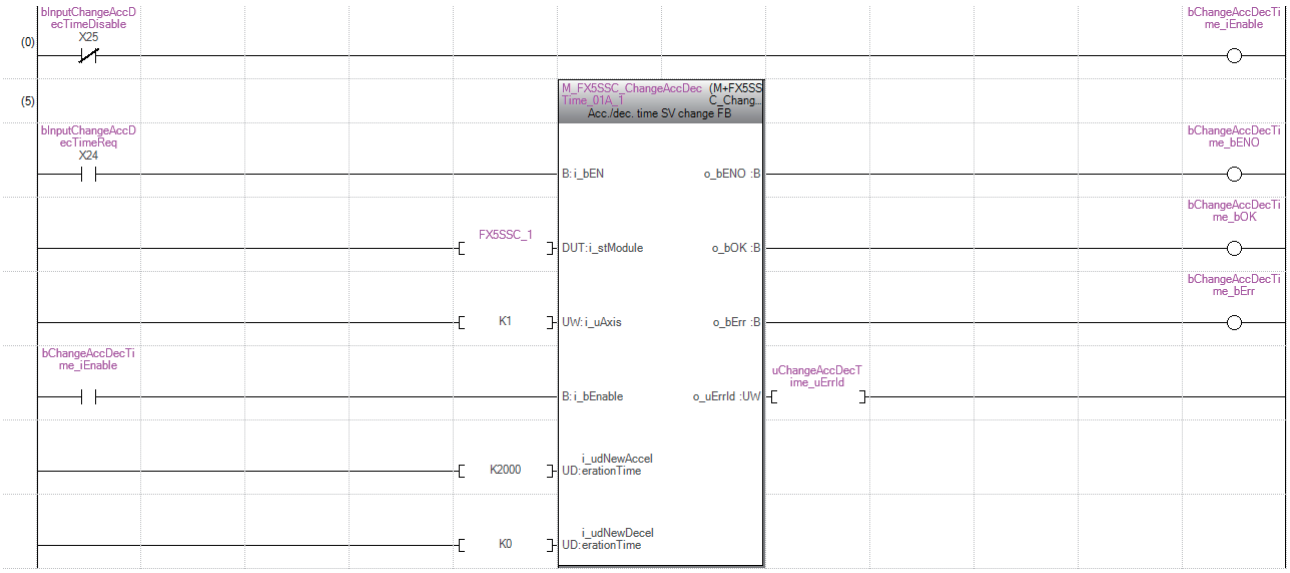
Speed change program



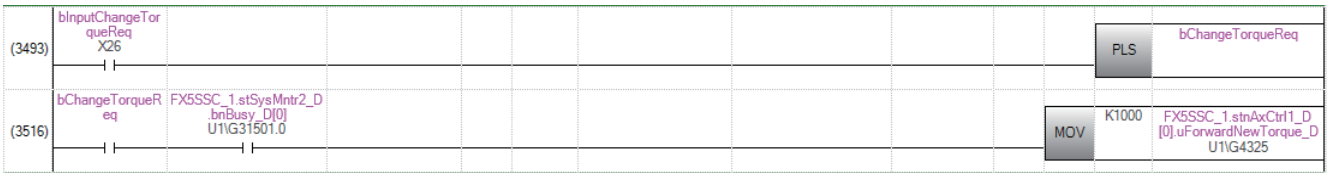
Override program



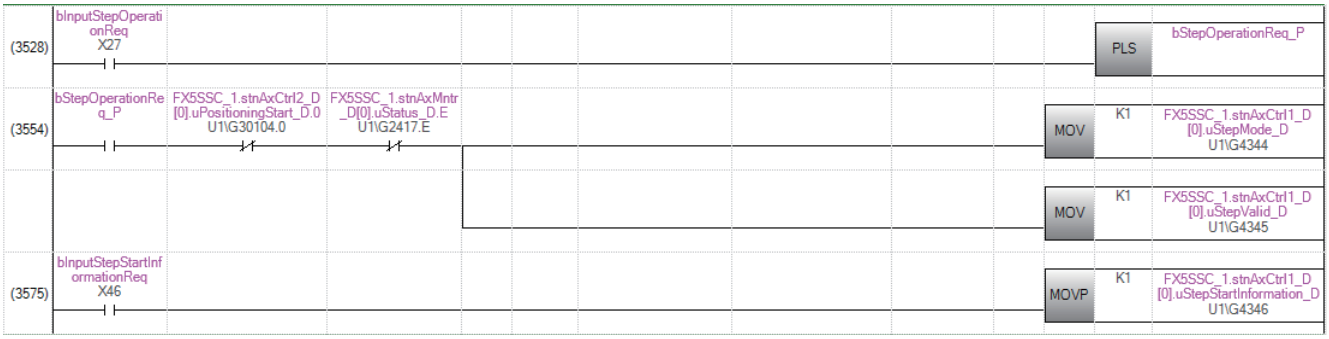
Acceleration/deceleration time change program



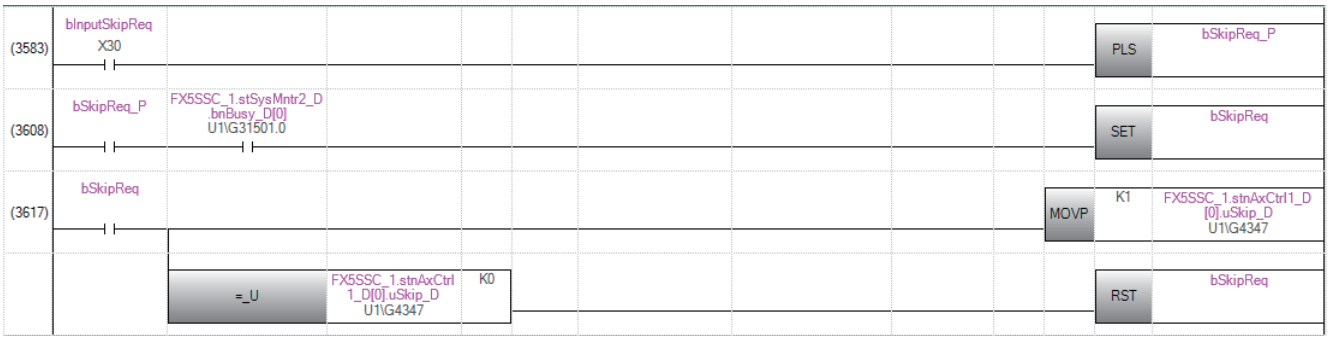
Torque change program



Step operation program



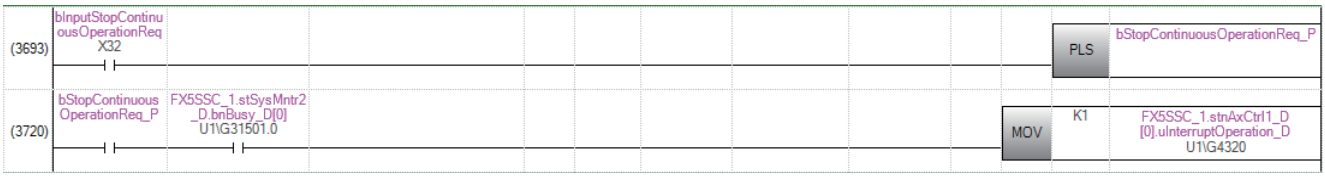
Skip program



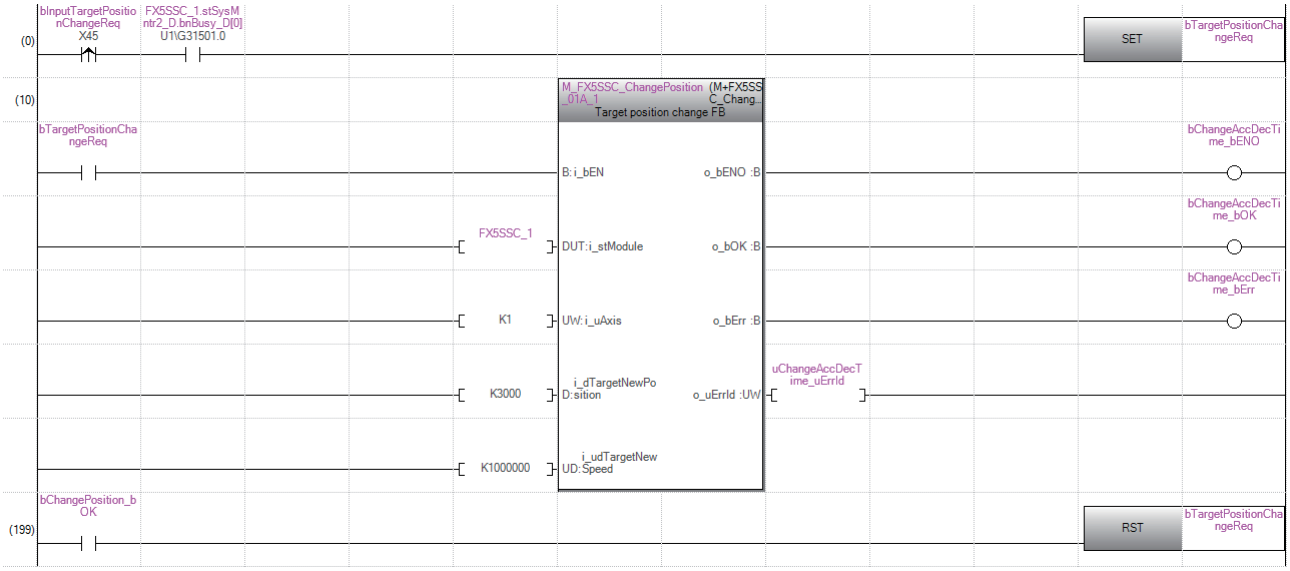
Teaching program



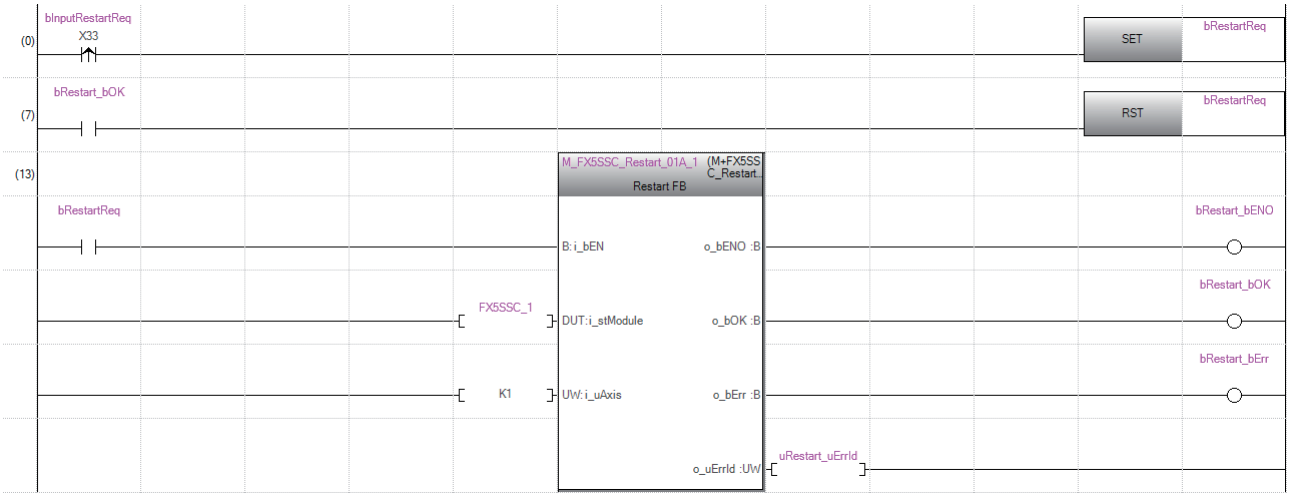
Continuous operation interrupt program



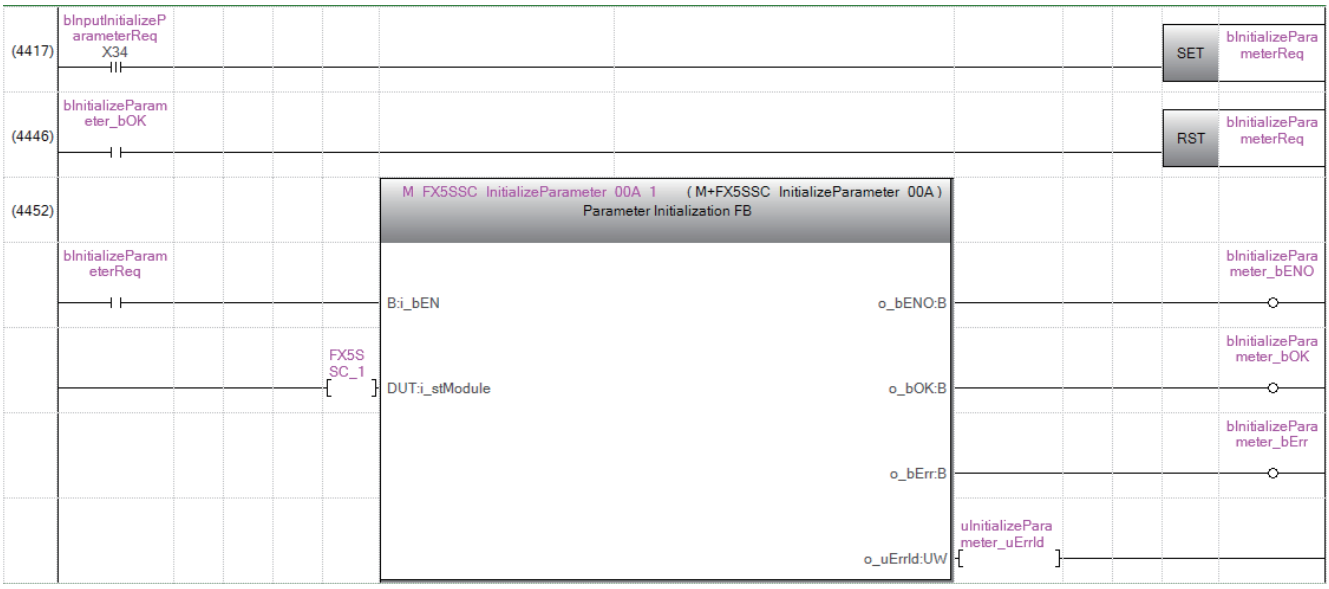
Target position change program



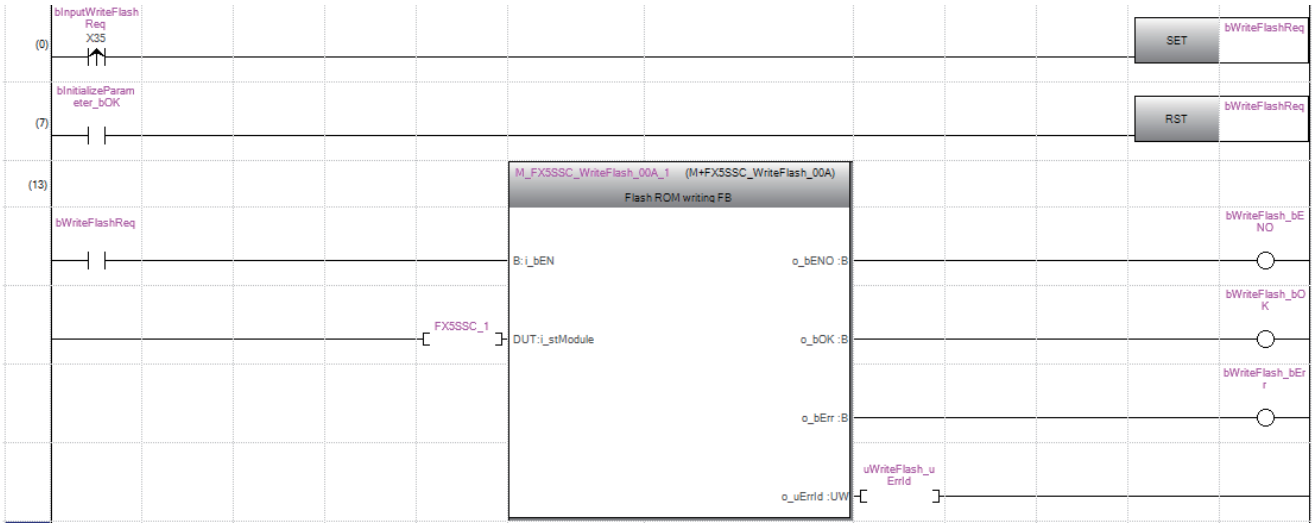
Restart program



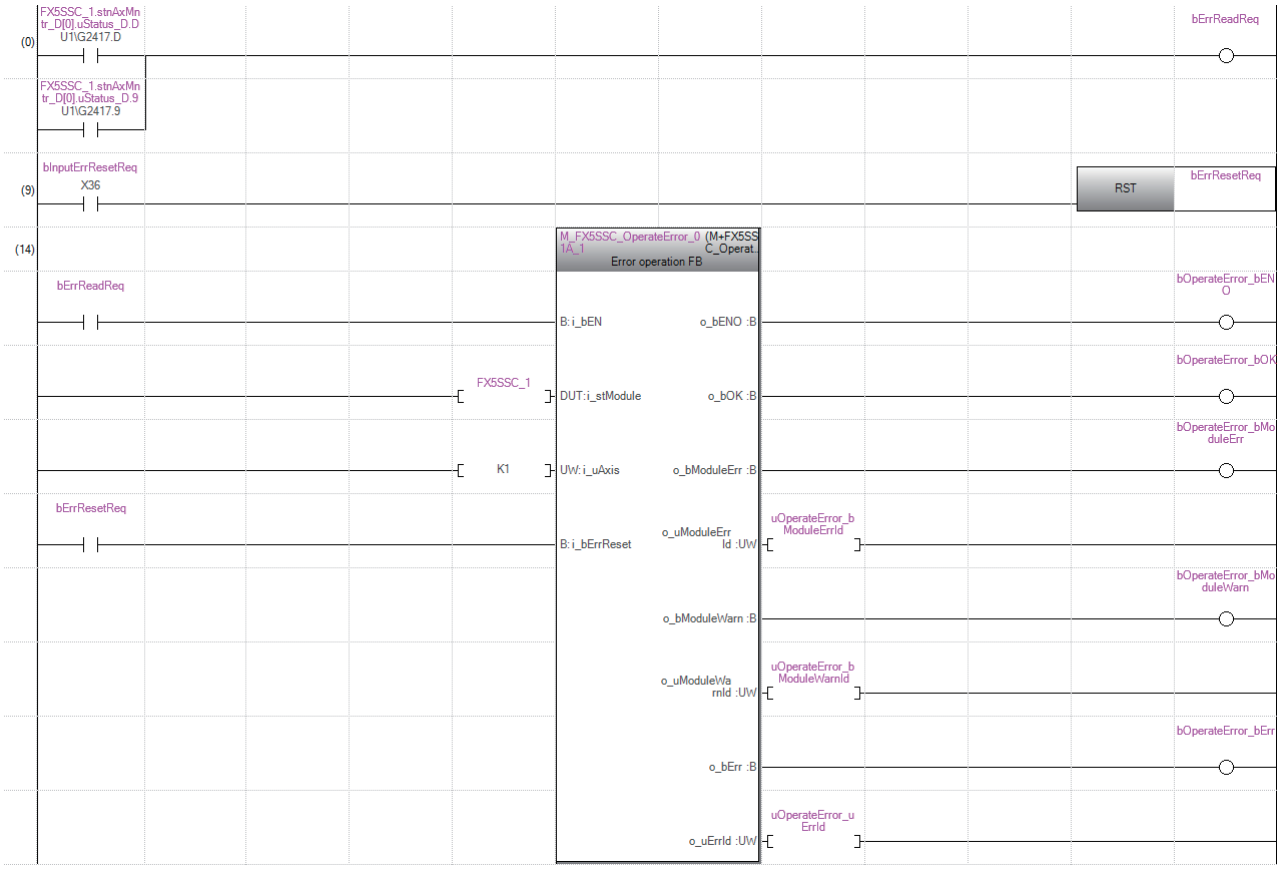
Parameter initialization program



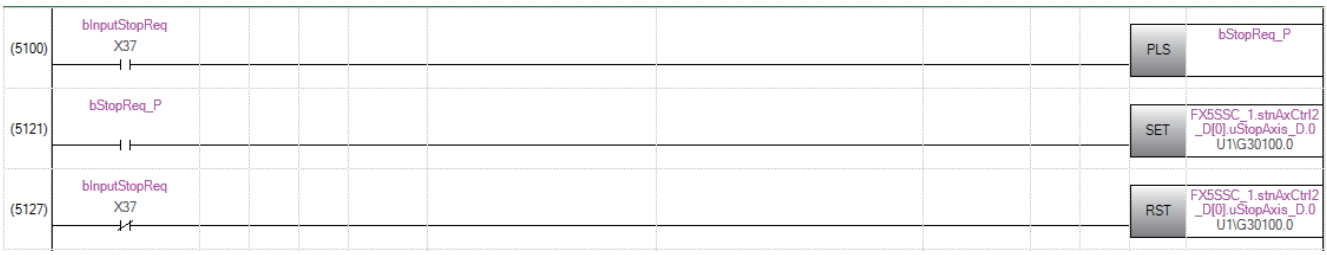
Flash ROM write program



Error reset program



Axis stop program



12.4 Positioning Program Examples (For Using Buffer Memory)

List of devices used

In the program examples, the devices to be used are assigned as follows.
In addition, change the module access device, external inputs, internal relays, data resisters, and timers according to the system used.

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

Device name	Device				Application	Description at device ON
	Axis 1	Axis 2	Axis 3	Axis 4		
Buffer memory address of Simple Motion module	U1\G31500.0				READY signal	READY
	U1\G31500.1				Synchronization flag	Buffer memory accessible
	U1\G2417.C	—			M code ON signal	M code outputting
	U1\G2417.D				Error detection signal	Error detection
	U1\G31501.0				BUSY signal	BUSY (operating)
	U1\G2417.E				Start complete signal	Start completed
	U1\G2417.F				Positioning complete signal	Positioning completed
	U1\G5950				PLC READY signal	CPU module preparation completed
	U1\G5951				All axis servo ON signal	All axis servo ON
	U1\G30100	—			Axis stop signal	Requesting stop
	U1\G30101				Forward run JOG start signal	Starting forward run JOG
	U1\G30102				Reverse run JOG start signal	Starting reverse run JOG
	U1\G30103				Execution prohibition request	Execution prohibition
	U1\G30104				Positioning start signal	Requesting start
External input (command)	X0	—			Home position return request OFF command	Commanding home position return request OFF
	X1				External command valid command	Commanding external command valid setting
	X2				External command invalid command	Commanding external command invalid
	X3				Machine home position return command	Commanding machine home position return
	X4				Fast home position return command	Commanding fast home position return
	X5				Positioning start command	Commanding positioning start
	X6				Speed-position switching operation command	Commanding speed-position switching operation
	X7				Speed-position switching enable command	Commanding speed-position switching enable
	X10				Speed-position switching prohibit command	Commanding speed-position switching prohibit
	X11				Movement amount change command	Commanding movement amount change
	X12				High-level positioning control start command	Commanding high-level positioning control start
	X14				M code OFF command	Commanding M code OFF
	X15				JOG operation speed setting command	Commanding JOG operation speed setting
	X16				Forward run JOG/inching command	Commanding forward run JOG/inching operation
	X17				Reverse run JOG/inching command	Commanding reverse run JOG/inching operation
	X20				Manual pulse generator operation enable command	Commanding manual pulse generator operation enable
	X21				Manual pulse generator operation disable command	Commanding manual pulse generator operation disable
	X22				Speed change command	Commanding speed change

Device name	Device				Application	Description at device ON
	Axis 1	Axis 2	Axis 3	Axis 4		
External input (command)	X23	—			Override command	Commanding override
	X24				Acceleration/deceleration time change command	Commanding acceleration/deceleration time change
	X25				Acceleration/deceleration time change disable command	Commanding acceleration/deceleration time change disable
	X26				Torque change command	Commanding torque change
	X27				Step operation command	Commanding step operation
	X30				Skip command	Commanding skip
	X31				Teaching command	Commanding teaching
	X32				Continuous operation interrupt command	Commanding continuous operation interrupt
	X33				Restart command	Commanding restart
	X34				Parameter initialization command	Commanding parameter initialization
	X35				Flash ROM write command	Commanding flash ROM write
	X36	—			Error reset command	Commanding error reset
	X37				Stop command	Commanding stop
	X40				Position-speed switching operation command	Position-speed switching operation command
	X41				Position-speed switching enable command	Position-speed switching enable command
	X42				Position-speed switching prohibit command	Position-speed switching prohibit command
	X43				Speed change command	Speed change command
	X44				Inching movement amount setting command	Inching movement amount setting command
	X45				Target position change command	Target position change command
	X46				Step start information command	Step start information command
	X47				Positioning start command K10	Positioning start command K10
	X50				Override initialization value command	Override initialization value command
	X53				PLC READY signal ON	PLC READY signal ON
	X54				Error reset clear command	Error reset clear command
	X55				For Unit (degree)	For Unit (degree)
	X56				Positioning start signal command	Commanding positioning start
	X57				All axis servo ON command	All axis servo ON command
Internal relay	M0	—			Home position return request OFF command	Commanding home position return request OFF
	M1				Home position return request OFF command pulse	Home position return request OFF commanded
	M2				Home position return request OFF command storage	Home position return request OFF command held
	M3				Fast home position return command	Commanding fast home position return
	M4				Fast home position return command storage	Fast home position return command held
	M5				Positioning start command pulse	Positioning start commanded
	M6				Positioning start command storage	Positioning start command held
	M7				JOG/inching operation termination	JOG/inching operation termination
	M8				Manual pulse generator operation enable command	Commanding manual pulse generator operation enable
	M9				Manual pulse generator operating flag	Manual pulse generator operating flag
	M10				Manual pulse generator operation disable command	Commanding manual pulse generator operation disable
	M11				Speed change command pulse	Speed change commanded
	M12				Speed change command storage	Speed change command held
	M13				Override command	Requesting override
	M14				Acceleration/deceleration time change command	Requesting acceleration/deceleration time change

Device name	Device				Application	Description at device ON
	Axis 1	Axis 2	Axis 3	Axis 4		
Internal relay	M15	—			Torque change command	Requesting torque change
	M16				Step operation command pulse	Step operation commanded
	M17				Skip command pulse	Skip commanded
	M18				Skip command storage	Skip command held
	M19				Teaching command pulse	Teaching commanded
	M20				Teaching command storage	Teaching command held
	M21				Continuous operation interrupt command	Requesting continuous operation interrupt
	M22				Restart command	Requesting restart
	M23				Restart command storage	Restart command held
	M24				Parameter initialization command pulse	Parameter initialization commanded
	M25				Parameter initialization command storage	Parameter initialization command held
	M26				Flash ROM write command pulse	Flash ROM write commanded
	M27				Flash ROM write command storage	Flash ROM write command held
	M28	—			Error reset	Error reset completed
	M29				Stop command pulse	Stop commanded
	M30				Target position change command pulse	Target position change commanded
	M31				Target position change command storage	Target position change command held
	M40				Override initialization value command	Override initialization value
	M50				Parameter setting complete device	Parameter setting completed

Data registers and timers

Device name	Device				Application	Storage details
	Axis 1	Axis 2	Axis 3	Axis 4		
Data register	D0	—			Home position return request flag	[Md.31] Status: b3
	D1				Speed (low-order 16 bits)	[Cd.25] Position-speed switching control speed change register
	D2				Speed (high-order 16 bits)	
	D3				Movement amount (low-order 16 bits)	[Cd.23] Speed-position switching control movement amount change register
	D4				Movement amount (high-order 16 bits)	
	D5				Inching movement amount	[Cd.16] Inching movement amount
	D6				JOG operation speed (low-order 16 bits)	[Cd.17] JOG speed
	D7				JOG operation speed (high-order 16 bits)	
	D8				Manual pulse generator 1 pulse input magnification (low-order)	[Cd.20] Manual pulse generator 1 pulse input magnification
	D9				Manual pulse generator 1 pulse input magnification (high-order)	
	D10				Manual pulse generator operation enable	[Cd.21] Manual pulse generator enable flag
	D11				Speed change value (low-order 16 bits)	[Cd.14] New speed value
	D12				Speed change value (high-order 16 bits)	
	D13				Speed change request	[Cd.15] Speed change request
	D14				Override value	[Cd.13] Positioning operation speed override
	D15				Acceleration time setting (low-order 16 bits)	[Cd.10] New acceleration time value
	D16				Acceleration time setting (high-order 16 bits)	
	D17				Deceleration time setting (low-order 16 bits)	[Cd.11] New deceleration time value
	D18				Deceleration time setting (high-order 16 bits)	
	D19				Acceleration/deceleration time change enable	[Cd.12] Acceleration/deceleration time change during speed change, enable/disable selection
	D20				Step mode	[Cd.34] Step mode
	D21				Step valid flag	[Cd.35] Step valid flag
	D22				Step start information	—
	D23				Target position (low-order 16 bits)	[Cd.27] Target position change value (New address)
	D24				Target position (high-order 16 bits)	
	D25				Target speed (low-order 16 bits)	[Cd.28] Target position change value (New speed)
	D26				Target speed (high-order 16 bits)	
	D27				Target position change request	[Cd.29] Target position change request flag
	D31				Completion status	—
	D32				Start No.	—
	D34				Completion status	—
	D35				Teaching data	—
	D36				Positioning data No.	—
	D38				Completion status	—
	D40				Completion status	—
	D50				Unit setting	[Pr.1] Unit setting
	D51				Unit magnification	[Pr.4] Unit magnification (AM)

Device name	Device				Application		Storage details
	Axis 1	Axis 2	Axis 3	Axis 4			
Data register	D52	—			Number of pulses per rotation (low-order 16 bits)		[Pr.2] Number of pulses per rotation (AP)
	D53				Number of pulses per rotation (high-order 16 bits)		
	D54				Movement amount per rotation (low-order 16 bits)		[Pr.3] Movement amount per rotation (AL)
	D55				Movement amount per rotation (high-order 16 bits)		
	D56				Bias speed at start (low-order 16 bits)		[Pr.7] Bias speed at start
	D57				Bias speed at start (high-order 16 bits)		
	D68				Block start data (Block 0)	Point 1 (shape, start No.)	[Da.11] Shape [Da.12] Start data No. [Da.13] Special start instruction [Da.14] Parameter
	D69					Point 2 (shape, start No.)	
	D70					Point 3 (shape, start No.)	
	D71					Point 4 (shape, start No.)	
	D72					Point 5 (shape, start No.)	
	D73					Point 1 (special start instruction)	
	D74					Point 2 (special start instruction)	
	D75					Point 3 (special start instruction)	
	D76					Point 4 (special start instruction)	
	D77					Point 5 (special start instruction)	
	D78				Torque change value		—
	D79				Error		[Md.23] Axis error No.
	D80				Servo series		[Pr.100] Servo series
	D81				Absolute position system valid/invalid		Absolute position detection system (PA03)
	D85				Home position return method		[Pr.43] Home position return method
	D100				Positioning identifier		Data No.1 [Da.1] Operation pattern [Da.2] Control method [Da.3] Acceleration time No. [Da.4] Deceleration time No. [Da.20] to [Da.22] Axis to be interpolated [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
	D101				M code		
	D102				Dwell time		
	D103				Dummy		
	D104				Command speed (low-order 16 bits)		
	D105				Command speed (high-order 16 bits)		
	D106				Positioning address (low-order 16 bits)		
	D107				Positioning address (high-order 16 bits)		
	D108				Arc address (low-order 16 bits)		
	D109				Arc address (high-order 16 bits)		
	D110				Positioning identifier		Data No.2 [Da.1] Operation pattern [Da.2] Control method [Da.3] Acceleration time No. [Da.4] Deceleration time No. [Da.20] to [Da.22] Axis to be interpolated [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
	D111				M code		
	D112				Dwell time		
	D113				Dummy		
	D114				Command speed (low-order 16 bits)		
	D115				Command speed (high-order 16 bits)		
	D116				Positioning address (low-order 16 bits)		
	D117				Positioning address (high-order 16 bits)		
	D118				Arc address (low-order 16 bits)		
	D119				Arc address (high-order 16 bits)		

Device name	Device				Application	Storage details
	Axis 1	Axis 2	Axis 3	Axis 4		
Data register	D120	—			Positioning identifier	Data No.3 [Da.1] Operation pattern [Da.2] Control method [Da.3] Acceleration time No. [Da.4] Deceleration time No. [Da.20] to [Da.22] Axis to be interpolated [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
	D121				M code	
	D122				Dwell time	
	D123				Dummy	
	D124				Command speed (low-order 16 bits)	
	D125				Command speed (high-order 16 bits)	
	D126				Positioning address (low-order 16 bits)	
	D127				Positioning address (high-order 16 bits)	
	D128				Arc address (low-order 16 bits)	
	D129				Arc address (high-order 16 bits)	
	D130				Positioning identifier	Data No.4 [Da.1] Operation pattern [Da.2] Control method [Da.3] Acceleration time No. [Da.4] Deceleration time No. [Da.20] to [Da.22] Axis to be interpolated [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
	D131				M code	
	D132				Dwell time	
	D133				Dummy	
	D134				Command speed (low-order 16 bits)	
	D135				Command speed (high-order 16 bits)	
	D136				Positioning address (low-order 16 bits)	
	D137				Positioning address (high-order 16 bits)	
	D138				Arc address (low-order 16 bits)	
	D139				Arc address (high-order 16 bits)	
	D140				Positioning identifier	Data No.5 [Da.1] Operation pattern [Da.2] Control method [Da.3] Acceleration time No. [Da.4] Deceleration time No. [Da.20] to [Da.22] Axis to be interpolated [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
	D141				M code	
	D142				Dwell time	
	D143				Dummy	
	D144				Command speed (low-order 16 bits)	
	D145				Command speed (high-order 16 bits)	
	D146				Positioning address (low-order 16 bits)	
	D147				Positioning address (high-order 16 bits)	
	D148				Arc address (low-order 16 bits)	
	D149				Arc address (high-order 16 bits)	
	D150				Positioning identifier	Data No.6 [Da.1] Operation pattern [Da.2] Control method [Da.3] Acceleration time No. [Da.4] Deceleration time No. [Da.20] to [Da.22] Axis to be interpolated [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
	D151				M code	
	D152				Dwell time	
	D153				Dummy	
	D154				Command speed (low-order 16 bits)	
	D155				Command speed (high-order 16 bits)	
	D156				Positioning address (low-order 16 bits)	
	D157				Positioning address (high-order 16 bits)	
	D158				Arc address (low-order 16 bits)	
	D159				Arc address (high-order 16 bits)	

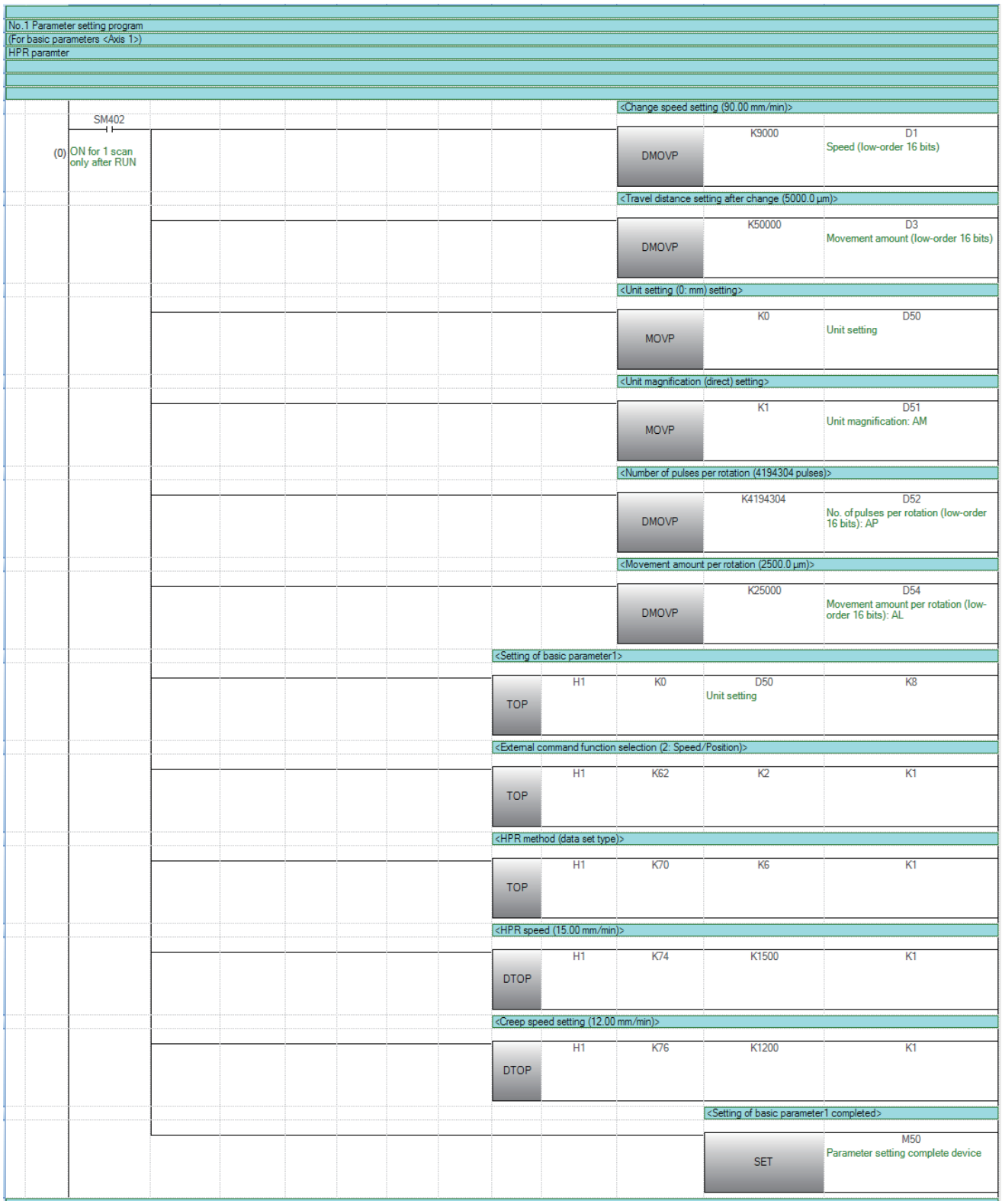
Device name	Device				Application	Storage details
	Axis 1	Axis 2	Axis 3	Axis 4		
Data register	D190	—			Positioning identifier	Data No.10 [Da.1] Operation pattern [Da.2] Control method [Da.3] Acceleration time No. [Da.4] Deceleration time No. [Da.20] to [Da.22] Axis to be interpolated [Da.6] Positioning 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
	D191				M code	
	D192				Dwell time	
	D193				Dummy	
	D194				Command speed (low-order 16 bits)	
	D195				Command speed (high-order 16 bits)	
	D196				Positioning address (low-order 16 bits)	
	D197				Positioning address (high-order 16 bits)	
	D198				Arc address (low-order 16 bits)	
	D199				Arc address (high-order 16 bits)	
	D200				Positioning identifier	Data No.11 [Da.1] Operation pattern [Da.2] Control method [Da.3] Acceleration time No. [Da.4] Deceleration time No. [Da.20] to [Da.22] Axis to be interpolated [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
	D201				M code	
	D202				Dwell time	
	D203				Dummy	
	D204				Command speed (low-order 16 bits)	
	D205				Command speed (high-order 16 bits)	
	D206				Positioning address (low-order 16 bits)	
	D207				Positioning address (high-order 16 bits)	
	D208				Arc address (low-order 16 bits)	
	D209				Arc address (high-order 16 bits)	
	D240				Positioning identifier	Data No.15 [Da.1] Operation pattern [Da.2] Control method [Da.3] Acceleration time No. [Da.4] Deceleration time No. [Da.20] to [Da.22] Axis to be interpolated [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
	D241				M code	
	D242				Dwell time	
	D243				Dummy	
	D244				Command speed (low-order 16 bits)	
	D245				Command speed (high-order 16 bits)	
	D246				Positioning address (low-order 16 bits)	
	D247				Positioning address (high-order 16 bits)	
	D248				Arc address (low-order 16 bits)	
	D249				Arc address (high-order 16 bits)	
Timer	T0				PLC READY signal OFF confirmation	PLC READY signal OFF
	T1				PLC READY signal OFF confirmation	

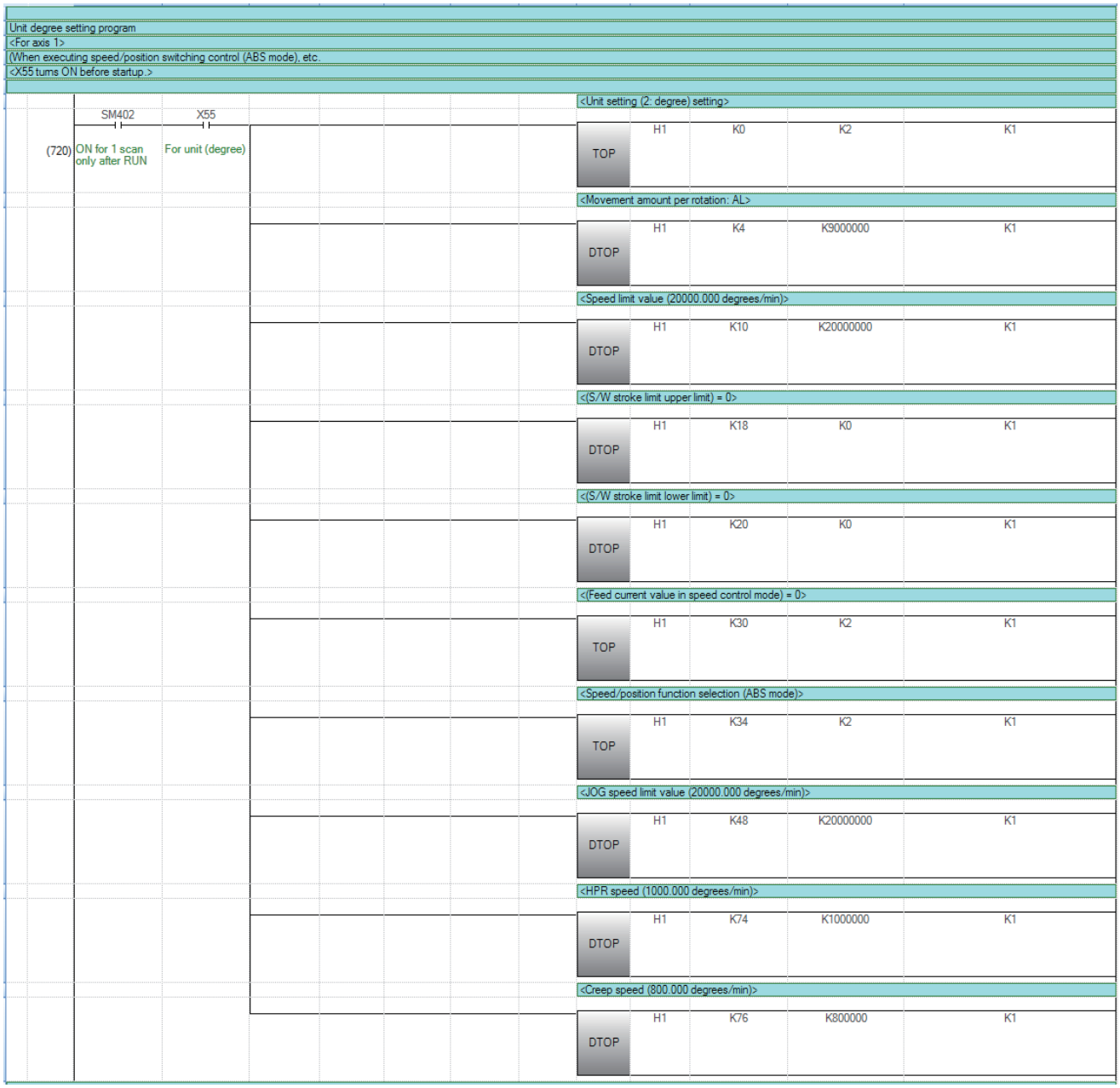
Device name	Device				Application	Storage details
	Axis 1	Axis 2	Axis 3	Axis 4		
Code	U1\G2406				Error code	[Md.23] Axis error No.
	U1\G2409				Axis operation status	[Md.26] Axis operation status
	U1\G2417				Status	[Md.31] Status
	U1\G4300				Positioning start No.	[Cd.3] Positioning start No.
	U1\G4301				Positioning starting point No.	[Cd.4] Positioning starting point No.
	U1\G4302				Error reset	[Cd.5] Axis error reset
	U1\G4303				Restart command	[Cd.6] Restart command
	U1\G4304				M code OFF request (Buffer memory)	[Cd.7] M code OFF request
	U1\G4305				External command valid	[Cd.8] External command valid
	U1\G4313				Override request	[Cd.13] Positioning operation speed override
	U1\G4316				Speed change request	[Cd.15] Speed change request
	U1\G4317				Inching movement amount	[Cd.16] Inching movement amount
	U1\G4320				Interrupt request during continuous operation	[Cd.18] Interrupt request during continuous operation
	U1\G4321				Home position return request flag OFF request	[Cd.19] Home position return request flag OFF request
	U1\G4324				Manual pulse generator enable flag	[Cd.21] Manual pulse generator enable flag
	U1\G4326				Speed-position switching control movement amount	[Cd.23] Speed-position switching control movement amount change register
	U1\G4328				Speed-position switching enable flag	[Cd.24] Speed-position switching enable flag
	U1\G4330				Position-speed switching control speed change	[Cd.25] Position-speed switching control speed change register
	U1\G4332				Position-speed switching enable flag	[Cd.26] Position-speed switching enable flag
	U1\G4338				Target position change request flag	[Cd.29] Target position change request flag
	U1\G4344				Step mode	[Cd.34] Step mode
	U1\G4347				Skip command	[Cd.37] Skip command

Program examples (for using buffer memory)

Parameter setting program

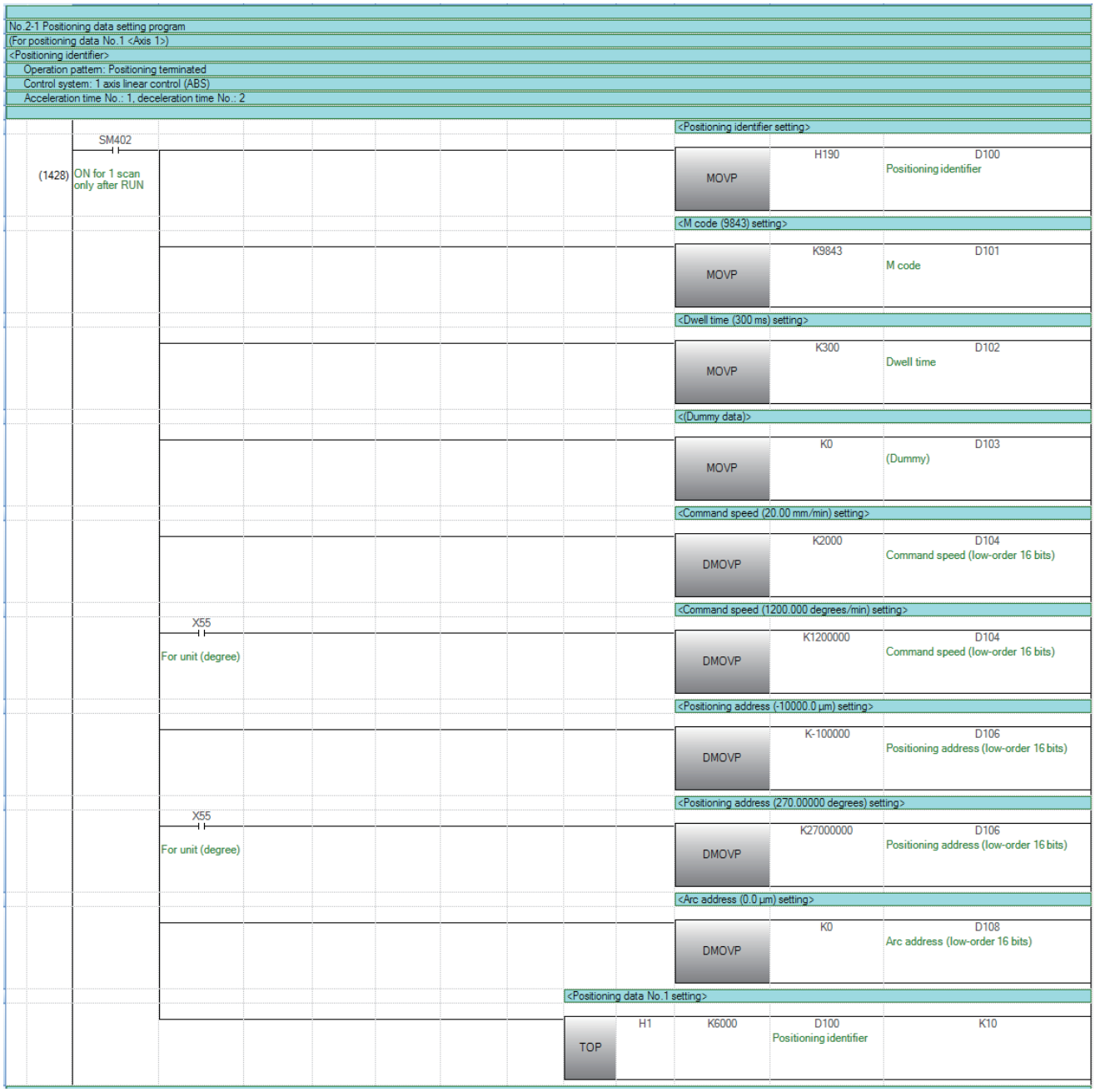
This program is not required when the parameter is set by "Module Parameter" using an engineering tool.

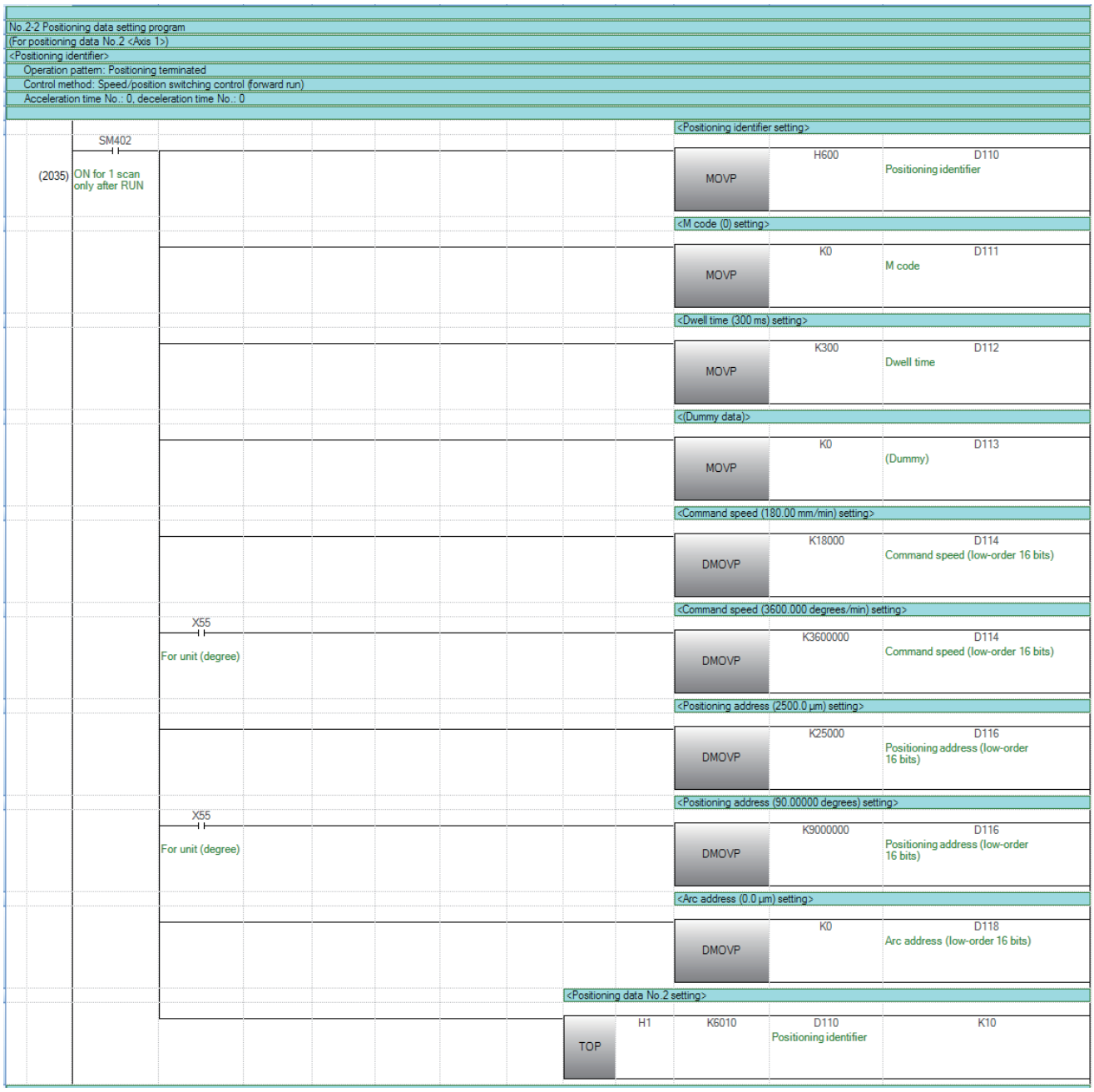


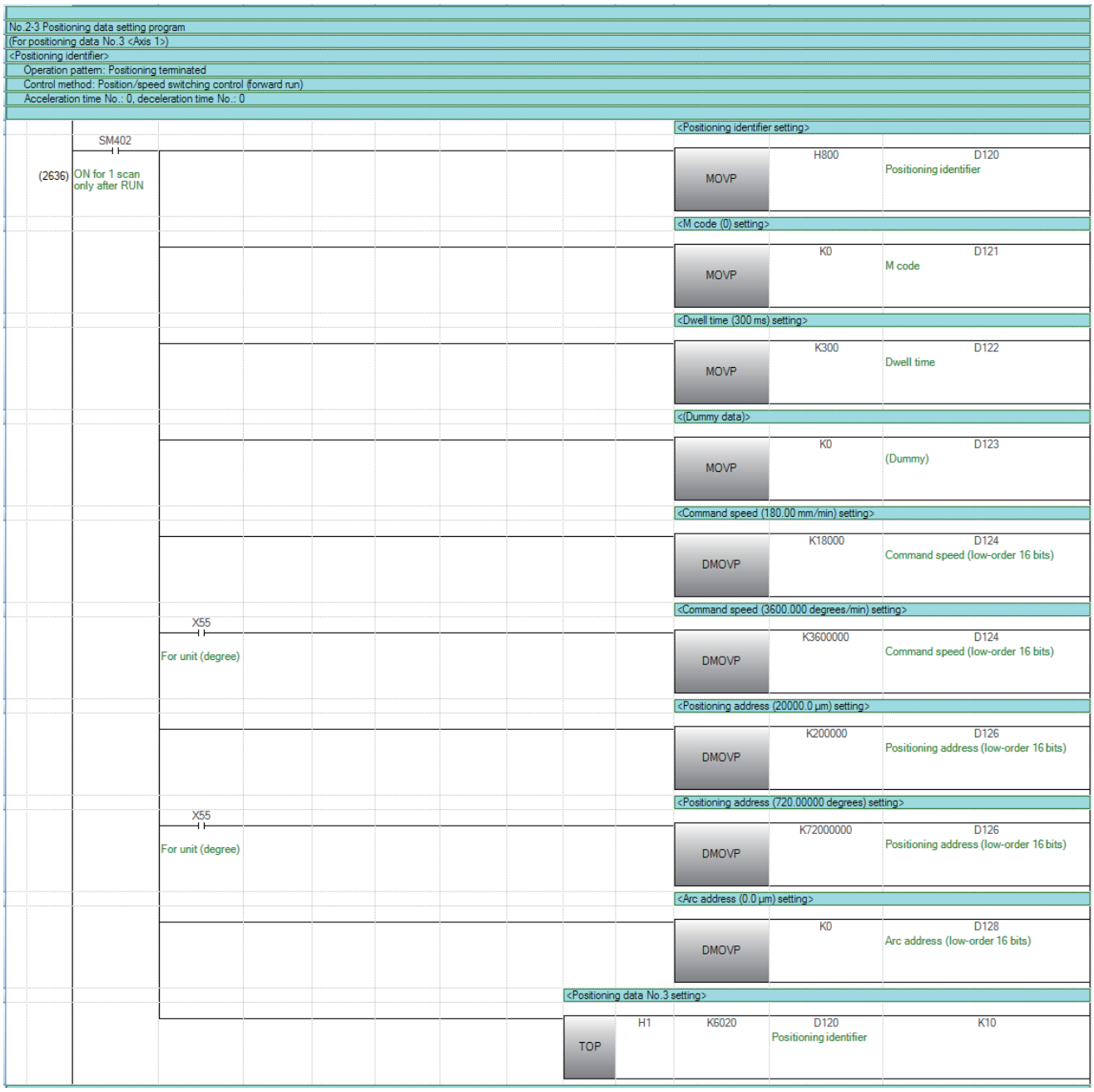

Unit degree setting program
<For axis 1>
(When executing speed/position switching control (ABS mode), etc.
<X55 turns ON before startup.>
SM402
X55
(720)
ON for 1 scan only after RUN
For unit (degree)
<Unit setting (2: degree) setting>
TOP H1 K0 K2 K1
<Movement amount per rotation: AL>
DTOP H1 K4 K9000000 K1
<Speed limit value (20000.000 degrees/min)>
DTOP H1 K10 K20000000 K1
<(S/W stroke limit upper limit) = 0>
DTOP H1 K18 K0 K1
<(S/W stroke limit lower limit) = 0>
DTOP H1 K20 K0 K1
<(Feed current value in speed control mode) = 0>
TOP H1 K30 K2 K1
<Speed/position function selection (ABS mode)>
TOP H1 K34 K2 K1
<JOG speed limit value (20000.000 degrees/min)>
DTOP H1 K48 K20000000 K1
<HPR speed (1000.000 degrees/min)>
DTOP H1 K74 K1000000 K1
<Creep speed (800.000 degrees/min)>
DTOP H1 K76 K800000 K1

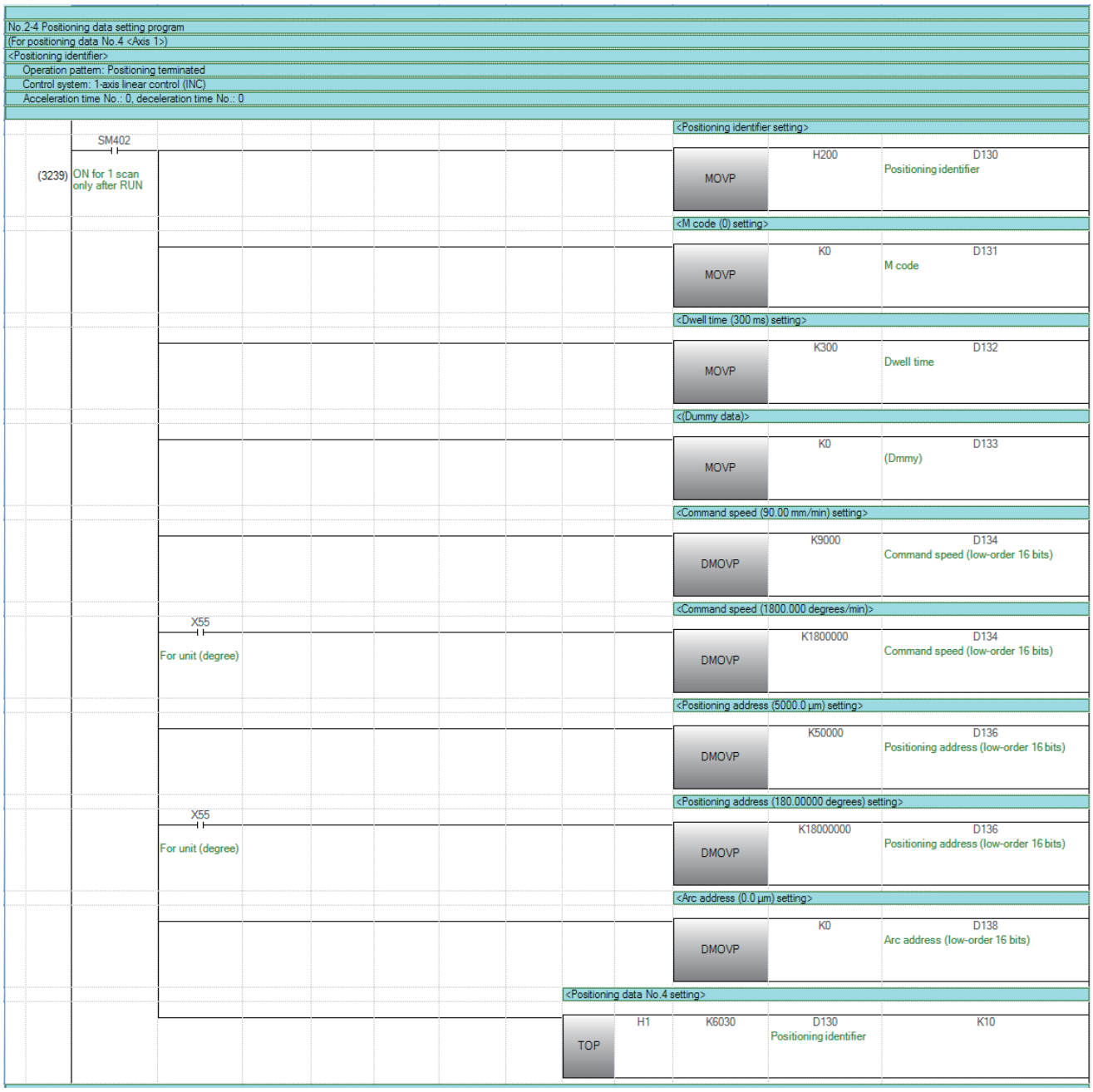
Positioning data setting program

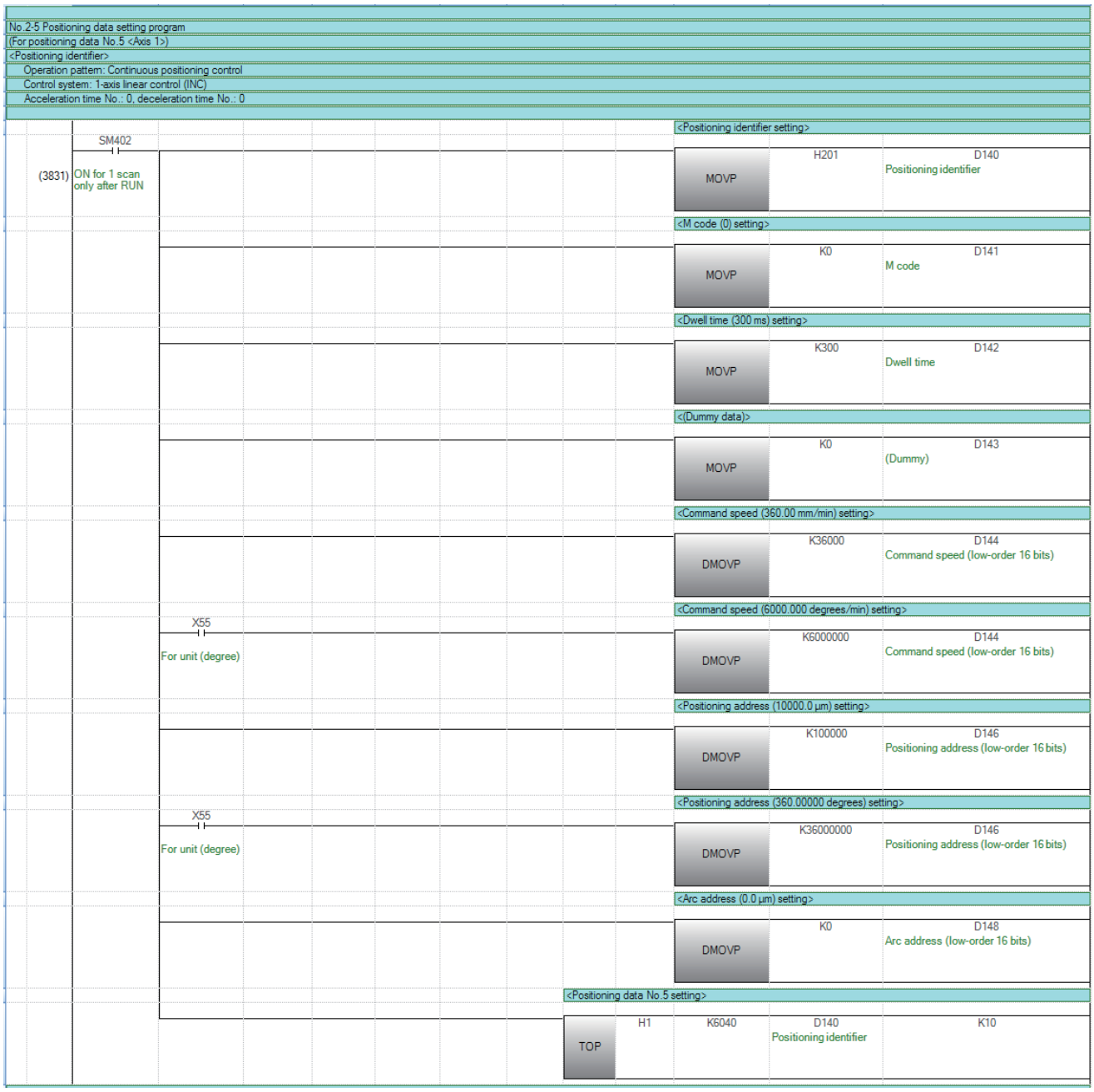
This program is not required when the data is set by "Positioning Data" using an engineering tool.

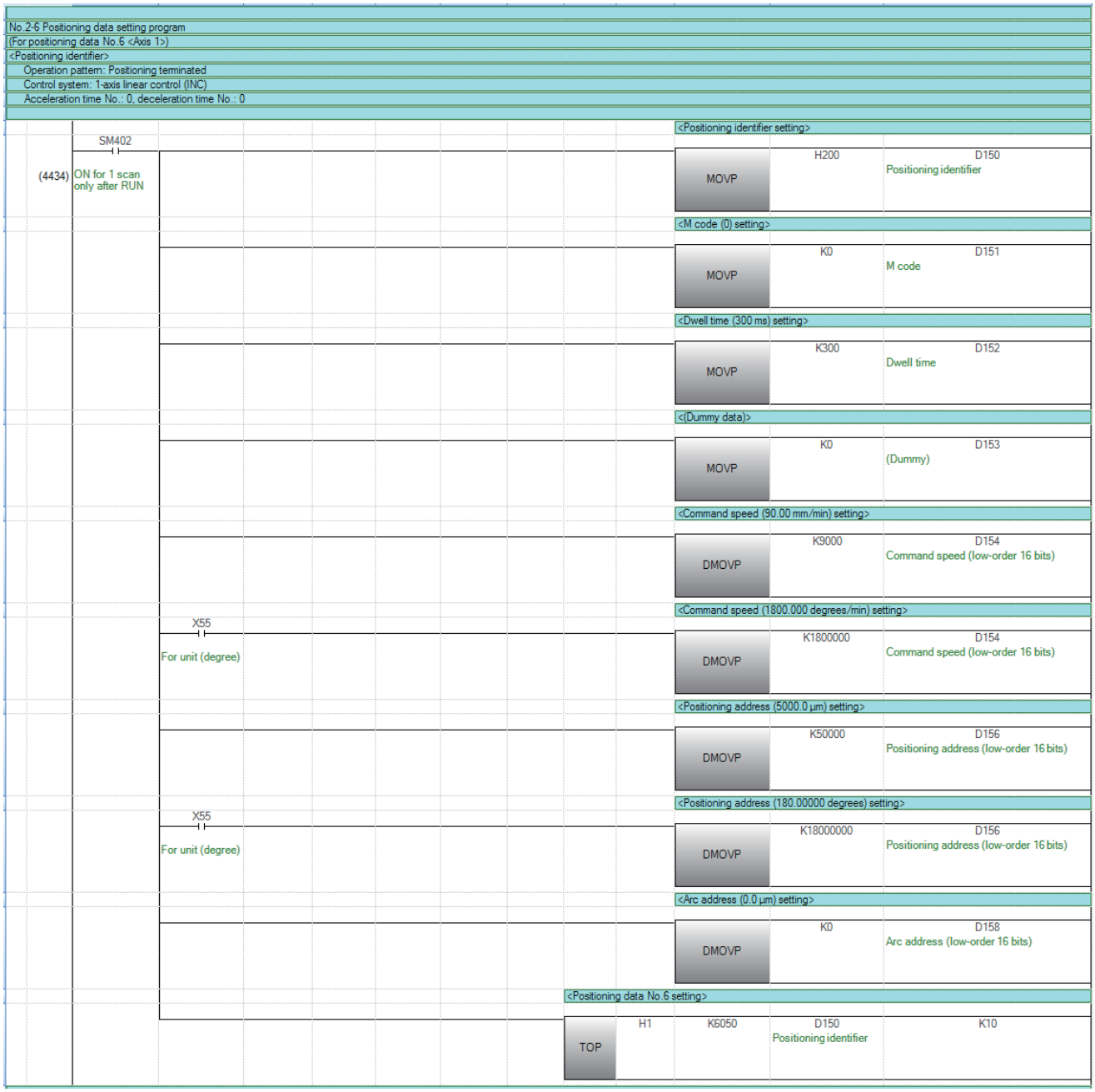


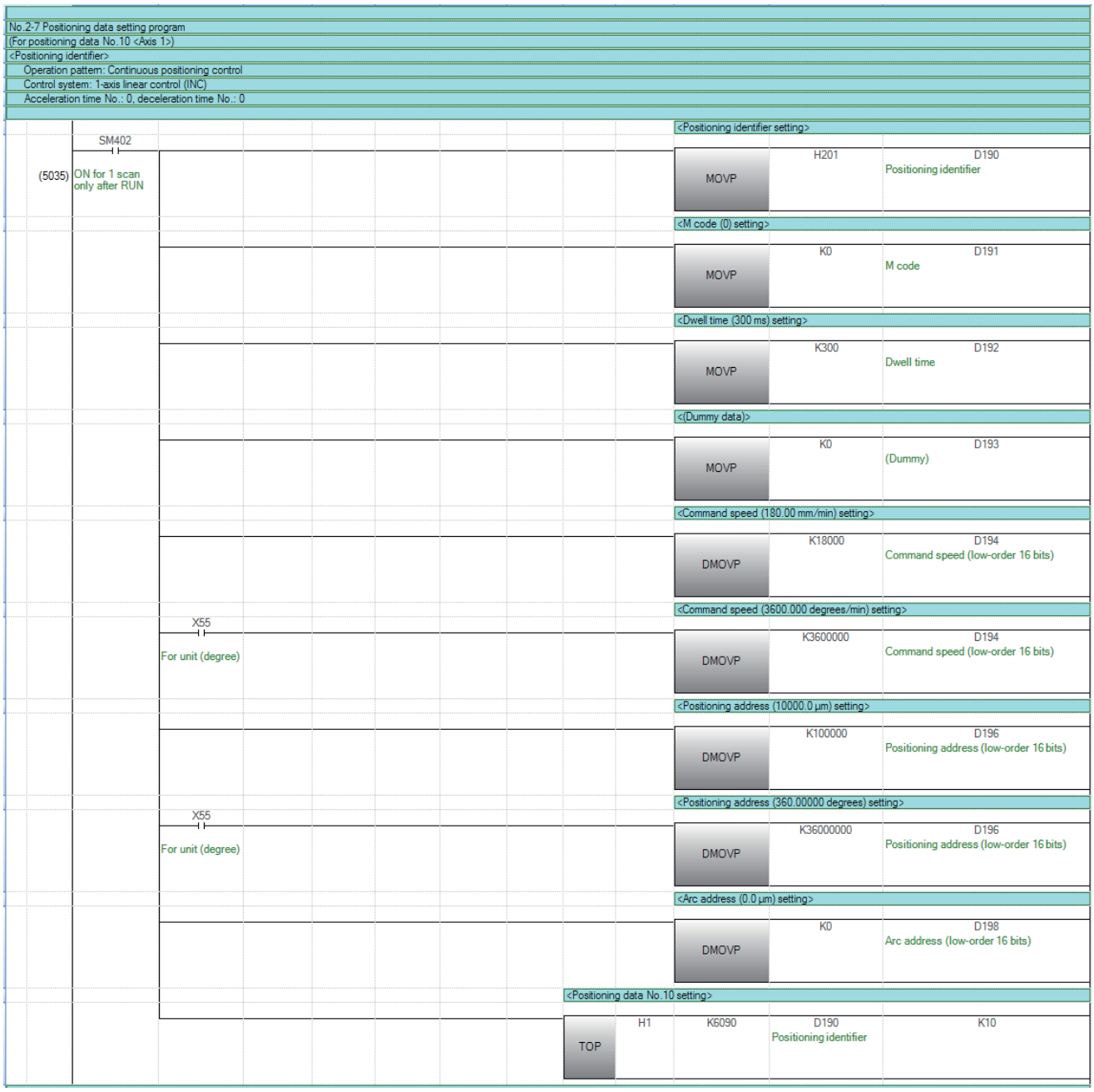

No.2-2 Positioning data setting program
(For positioning data No.2 <Axis 1>)
<Positioning identifier>
Operation pattern: Positioning terminated
Control method: Speed/position switching control (forward run)
Acceleration time No.: 0, deceleration time No.: 0
SM402
(2035)
ON for 1 scan only after RUN
<Positioning identifier setting>
MOVP
H600
D110
Positioning identifier
<M code (0) setting>
MOVP
K0
D111
M code
<Dwell time (300 ms) setting>
MOVP
K300
D112
Dwell time
<(Dummy data)>
MOVP
K0
D113
(Dummy)
<Command speed (180.00 mm/min) setting>
DMOVP
K18000
D114
Command speed (low-order 16 bits)
<Command speed (3600.000 degrees/min) setting>
X55
For unit (degree)
DMOVP
K3600000
D114
Command speed (low-order 16 bits)
<Positioning address (2500.0 µm) setting>
DMOVP
K25000
D116
Positioning address (low-order 16 bits)
<Positioning address (90.00000 degrees) setting>
X55
For unit (degree)
DMOVP
K9000000
D116
Positioning address (low-order 16 bits)
<Arc address (0.0 µm) setting>
DMOVP
K0
D118
Arc address (low-order 16 bits)
<Positioning data No.2 setting>
TOP
H1
K6010
D110
Positioning identifier
K10

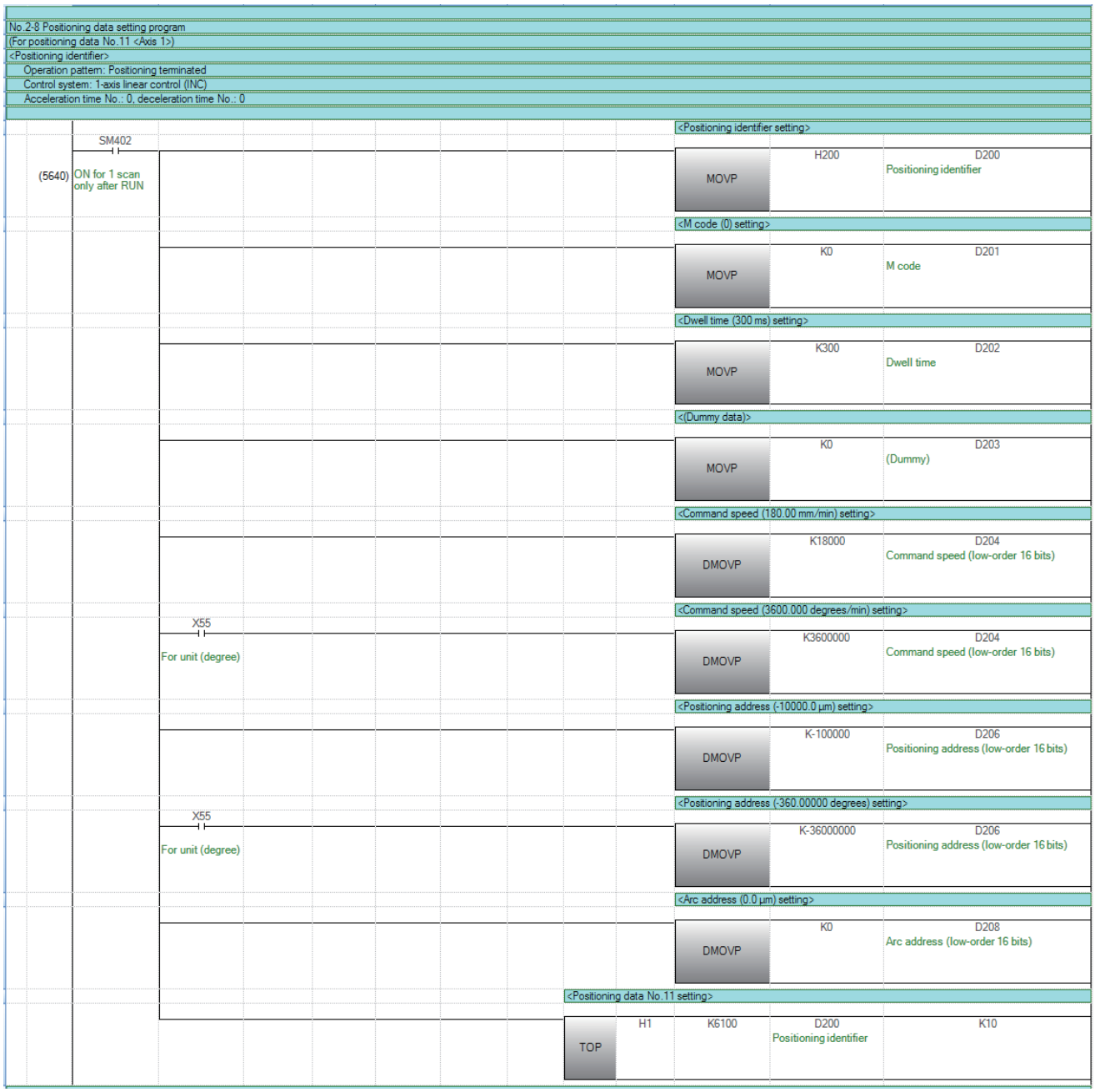

No.2-3 Positioning data setting program
(For positioning data No.3 <Axis 1>)
<Positioning identifier>
Operation pattern: Positioning terminated
Control method: Position/speed switching control (forward run)
Acceleration time No.: 0, deceleration time No.: 0
<Positioning identifier setting>
SM402
(2636)
ON for 1 scan only after RUN
MOVP
H800
D120
Positioning identifier
<M code (0) setting>
MOVP
K0
D121
M code
<Dwell time (300 ms) setting>
MOVP
K300
D122
Dwell time
<(Dummy data)>
MOVP
K0
D123
(Dummy)
<Command speed (180.00 mm/min) setting>
DMOVP
K18000
D124
Command speed (low-order 16 bits)
<Command speed (3600.000 degrees/min) setting>
X55
For unit (degree)
DMOVP
K3600000
D124
Command speed (low-order 16 bits)
<Positioning address (20000.0 µm) setting>
DMOVP
K200000
D126
Positioning address (low-order 16 bits)
<Positioning address (720.00000 degrees) setting>
X55
For unit (degree)
DMOVP
K72000000
D126
Positioning address (low-order 16 bits)
<Arc address (0.0 µm) setting>
DMOVP
K0
D128
Arc address (low-order 16 bits)
<Positioning data No.3 setting>
TOP
H1
K6020
D120
Positioning identifier
K10

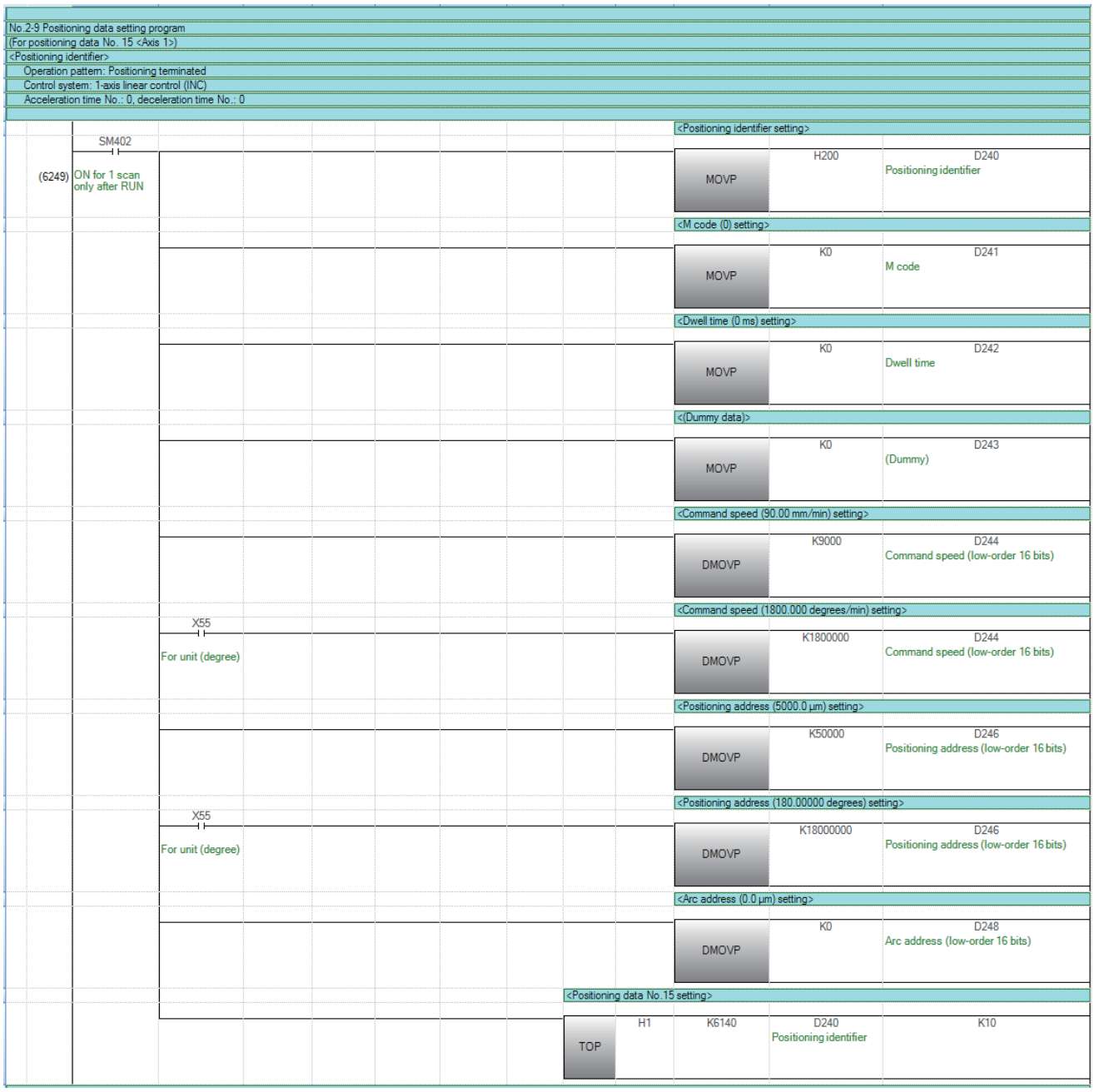

No.2-4 Positioning data setting program
(For positioning data No.4 <Axis 1>)
<Positioning identifier>
Operation pattern: Positioning terminated
Control system: 1-axis linear control (INC)
Acceleration time No.: 0, deceleration time No.: 0
<Positioning identifier setting>
SM402
(3239) ON for 1 scan only after RUN
MOVP H200 D130 Positioning identifier
<M code (0) setting>
MOVP K0 D131 M code
<Dwell time (300 ms) setting>
MOVP K300 D132 Dwell time
<(Dummy data)>
MOVP K0 D133 (Dmmy)
<Command speed (90.00 mm/min) setting>
DMOVP K9000 D134 Command speed (low-order 16 bits)
<Command speed (1800.000 degrees/min)>
X55
For unit (degree)
DMOVP K1800000 D134 Command speed (low-order 16 bits)
<Positioning address (5000.0 µm) setting>
DMOVP K50000 D136 Positioning address (low-order 16 bits)
<Positioning address (180.00000 degrees) setting>
X55
For unit (degree)
DMOVP K18000000 D136 Positioning address (low-order 16 bits)
<Arc address (0.0 µm) setting>
DMOVP K0 D138 Arc address (low-order 16 bits)
<Positioning data No.4 setting>
TOP H1 K6030 D130 Positioning identifier K10


No.2-5 Positioning data setting program
(For positioning data No.5 <Axis 1>)
<Positioning identifier>
Operation pattern: Continuous positioning control
Control system: 1-axis linear control (INC)
Acceleration time No.: 0, deceleration time No.: 0
SM402
(3831) ON for 1 scan only after RUN
<Positioning identifier setting>
MOVP H201 D140 Positioning identifier
<M code (0) setting>
MOVP K0 D141 M code
<Dwell time (300 ms) setting>
MOVP K300 D142 Dwell time
<(Dummy data)>
MOVP K0 D143 (Dummy)
<Command speed (360.00 mm/min) setting>
DMOVP K36000 D144 Command speed (low-order 16 bits)
<Command speed (6000.000 degrees/min) setting>
X55
For unit (degree)
DMOVP K6000000 D144 Command speed (low-order 16 bits)
<Positioning address (10000.0 µm) setting>
DMOVP K100000 D146 Positioning address (low-order 16 bits)
<Positioning address (360.00000 degrees) setting>
X55
For unit (degree)
DMOVP K36000000 D146 Positioning address (low-order 16 bits)
<Arc address (0.0 µm) setting>
DMOVP K0 D148 Arc address (low-order 16 bits)
<Positioning data No.5 setting>
TOP H1 K6040 D140 Positioning identifier K10


No.2-6 Positioning data setting program
(For positioning data No.6 <Axis 1>)
<Positioning identifier>
Operation pattern: Positioning terminated
Control system: 1-axis linear control (INC)
Acceleration time No.: 0, deceleration time No.: 0
SM402
(4434) ON for 1 scan only after RUN
<Positioning identifier setting>
MOVP H200 D150 Positioning identifier
<M code (0) setting>
MOVP K0 D151 M code
<Dwell time (300 ms) setting>
MOVP K300 D152 Dwell time
<(Dummy data)>
MOVP K0 D153 (Dummy)
<Command speed (90.00 mm/min) setting>
DMOVP K9000 D154 Command speed (low-order 16 bits)
<Command speed (1800.000 degrees/min) setting>
X55
For unit (degree)
DMOVP K1800000 D154 Command speed (low-order 16 bits)
<Positioning address (5000.0 µm) setting>
DMOVP K50000 D156 Positioning address (low-order 16 bits)
<Positioning address (180.00000 degrees) setting>
X55
For unit (degree)
DMOVP K18000000 D156 Positioning address (low-order 16 bits)
<Arc address (0.0 µm) setting>
DMOVP K0 D158 Arc address (low-order 16 bits)
<Positioning data No.6 setting>
TOP H1 K6050 D150 Positioning identifier K10

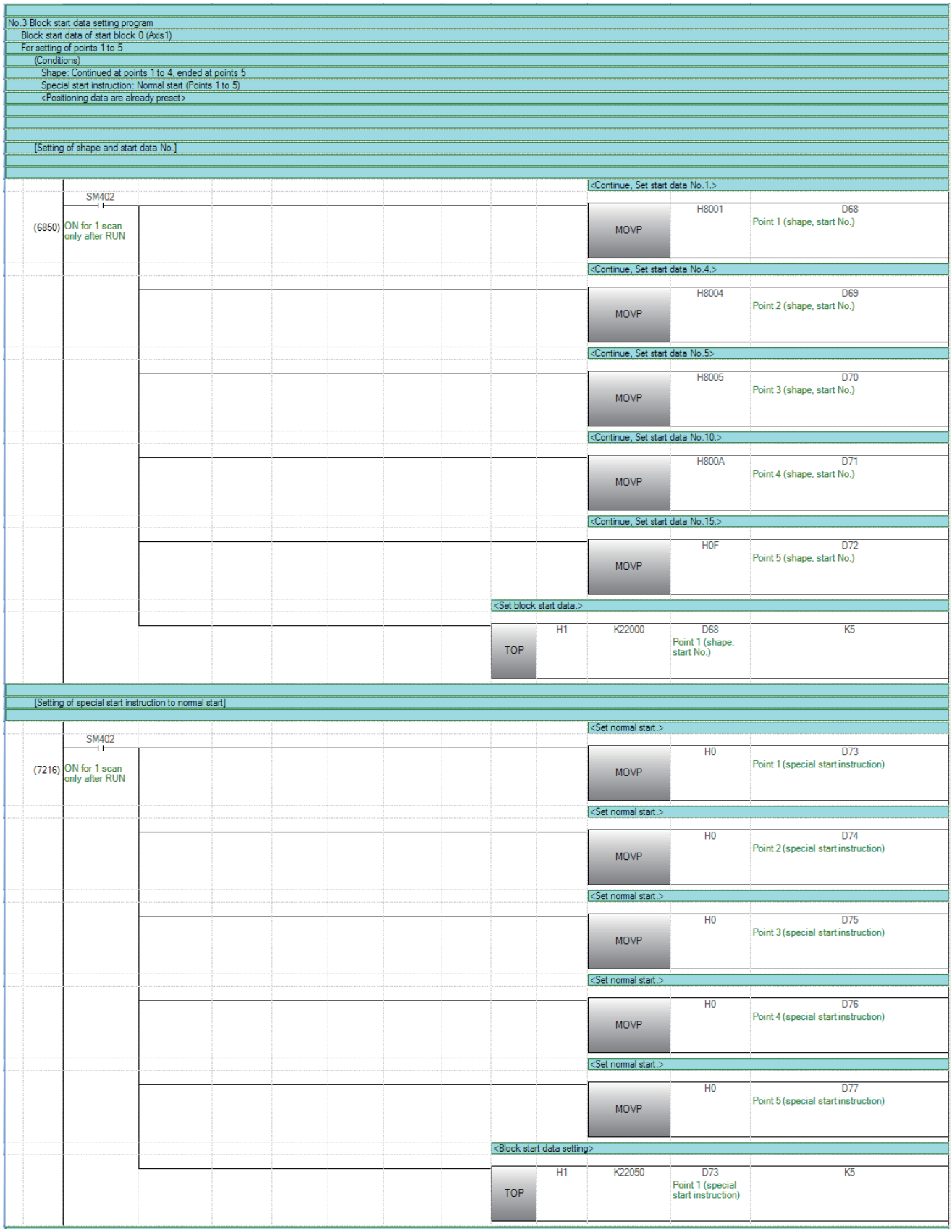

No.2-7 Positioning data setting program
(For positioning data No.10 <Axis 1>)
<Positioning identifier>
Operation pattern: Continuous positioning control
Control system: 1-axis linear control (INC)
Acceleration time No.: 0, deceleration time No.: 0
SM402
(5035)
ON for 1 scan only after RUN
<Positioning identifier setting>
MOVP
H201
D190
Positioning identifier
<M code (0) setting>
MOVP
K0
D191
M code
<Dwell time (300 ms) setting>
MOVP
K300
D192
Dwell time
<(Dummy data)>
MOVP
K0
D193
(Dummy)
<Command speed (180.00 mm/min) setting>
DMOVP
K18000
D194
Command speed (low-order 16 bits)
<Command speed (3600.000 degrees/min) setting>
X55
For unit (degree)
DMOVP
K3600000
D194
Command speed (low-order 16 bits)
<Positioning address (10000.0 µm) setting>
DMOVP
K100000
D196
Positioning address (low-order 16 bits)
<Positioning address (360.00000 degrees) setting>
X55
For unit (degree)
DMOVP
K36000000
D196
Positioning address (low-order 16 bits)
<Arc address (0.0 µm) setting>
DMOVP
K0
D198
Arc address (low-order 16 bits)
<Positioning data No.10 setting>
TOP
H1
K6090
D190
Positioning identifier
K10


No.2-8 Positioning data setting program
(For positioning data No.11 <Axis 1>)
<Positioning identifier>
Operation pattern: Positioning terminated
Control system: 1-axis linear control (INC)
Acceleration time No.: 0, deceleration time No.: 0
SM402
(5640)
ON for 1 scan only after RUN
<Positioning identifier setting>
MOVP
H200
D200
Positioning identifier
<M code (0) setting>
MOVP
K0
D201
M code
<Dwell time (300 ms) setting>
MOVP
K300
D202
Dwell time
<(Dummy data)>
MOVP
K0
D203
(Dummy)
<Command speed (180.00 mm/min) setting>
DMOVP
K18000
D204
Command speed (low-order 16 bits)
<Command speed (3600.000 degrees/min) setting>
X55
For unit (degree)
DMOVP
K3600000
D204
Command speed (low-order 16 bits)
<Positioning address (-10000.0 µm) setting>
DMOVP
K-100000
D206
Positioning address (low-order 16 bits)
<Positioning address (-360.00000 degrees) setting>
X55
For unit (degree)
DMOVP
K-36000000
D206
Positioning address (low-order 16 bits)
<Arc address (0.0 µm) setting>
DMOVP
K0
D208
Arc address (low-order 16 bits)
<Positioning data No.11 setting>
TOP
H1
K6100
D200
Positioning identifier
K10


No.2-9 Positioning data setting program
(For positioning data No. 15 <Axis 1>)
<Positioning identifier>
Operation pattern: Positioning terminated
Control system: 1-axis linear control (INC)
Acceleration time No.: 0, deceleration time No.: 0
<Positioning identifier setting>
SM402
(6249) ON for 1 scan only after RUN
MOVP
H200
D240
Positioning identifier
<M code (0) setting>
MOVP
K0
D241
M code
<Dwell time (0 ms) setting>
MOVP
K0
D242
Dwell time
<(Dummy data)>
MOVP
K0
D243
(Dummy)
<Command speed (90.00 mm/min) setting>
DMOVP
K9000
D244
Command speed (low-order 16 bits)
<Command speed (1800.000 degrees/min) setting>
X55
For unit (degree)
DMOVP
K1800000
D244
Command speed (low-order 16 bits)
<Positioning address (5000.0 µm) setting>
DMOVP
K50000
D246
Positioning address (low-order 16 bits)
<Positioning address (180.00000 degrees) setting>
X55
For unit (degree)
DMOVP
K18000000
D246
Positioning address (low-order 16 bits)
<Arc address (0.0 µm) setting>
DMOVP
K0
D248
Arc address (low-order 16 bits)
<Positioning data No.15 setting>
TOP
H1
K6140
D240
Positioning identifier
K10

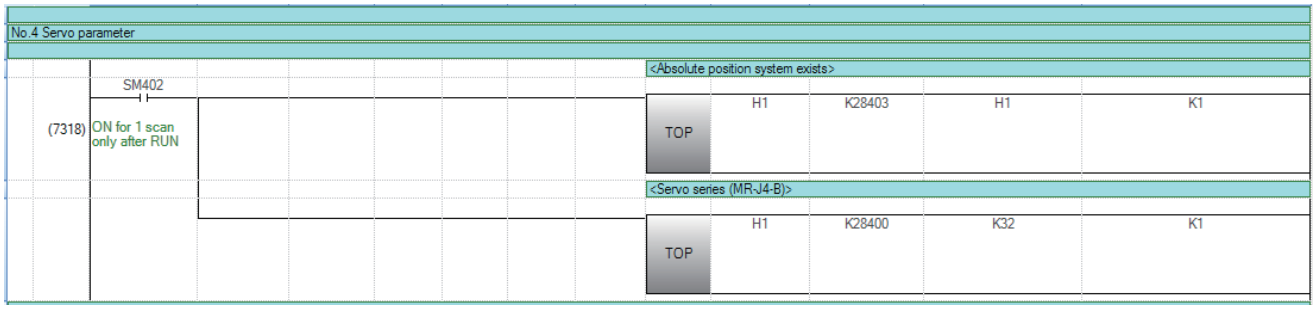
Block start data setting program

This program is not required when the data is set by "Block Start Data" using an engineering tool.



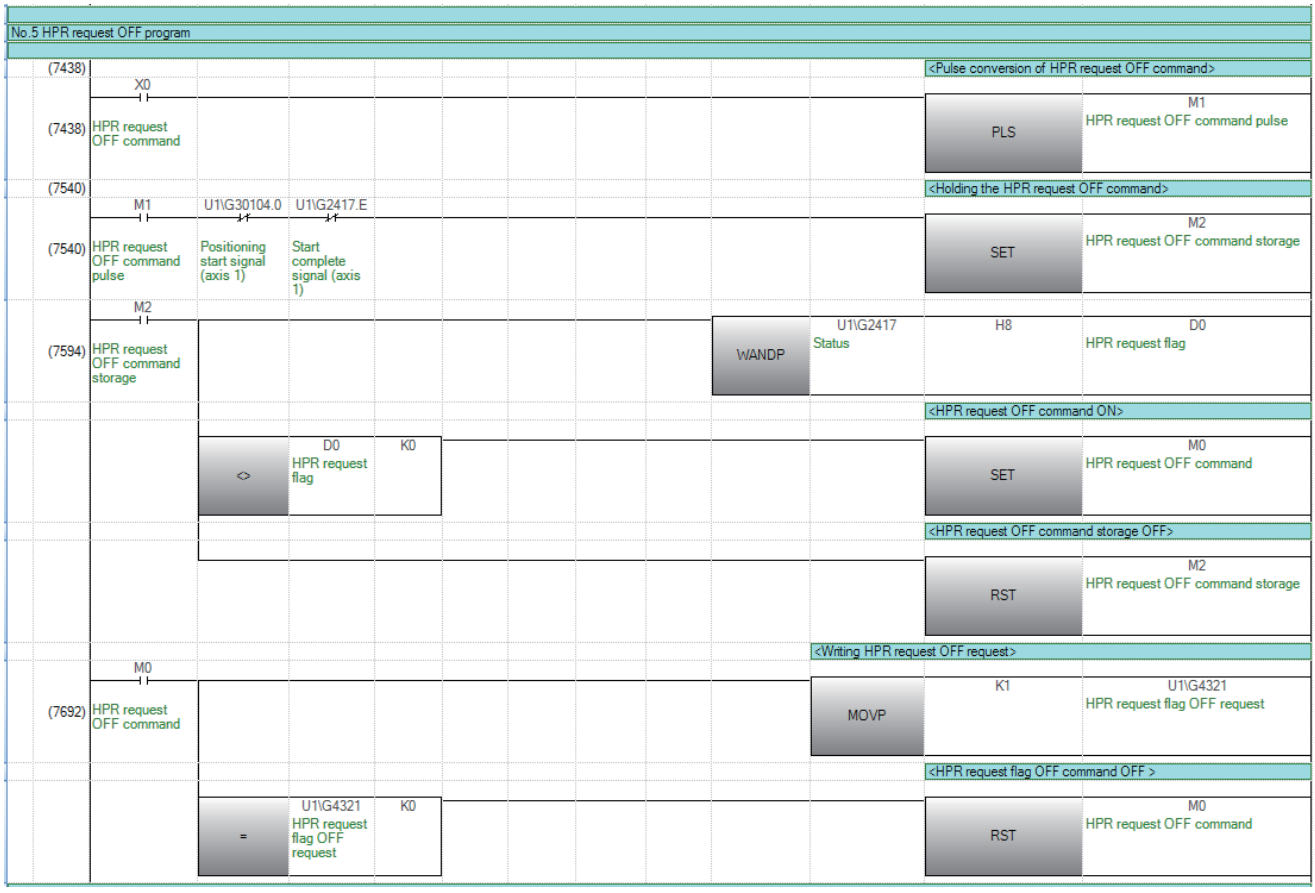
Servo parameter setting program

This program is not required when the parameter is set by "Servo Parameter" using an engineering tool.

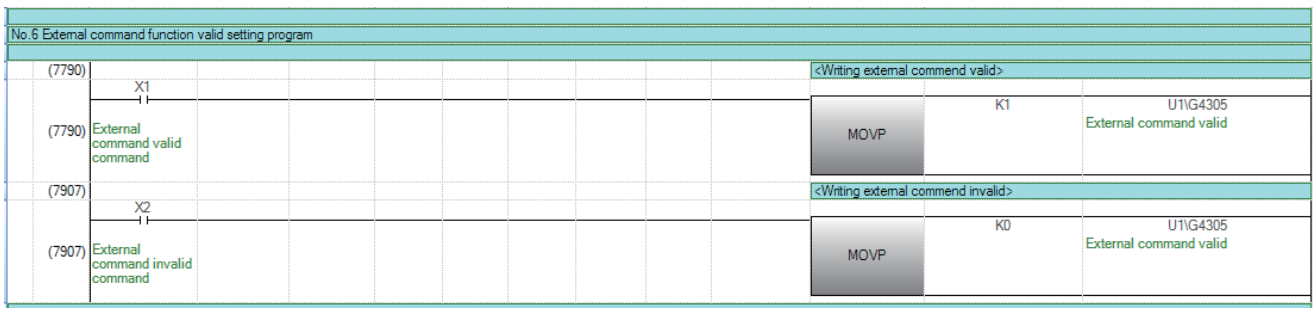


Home position return request OFF program

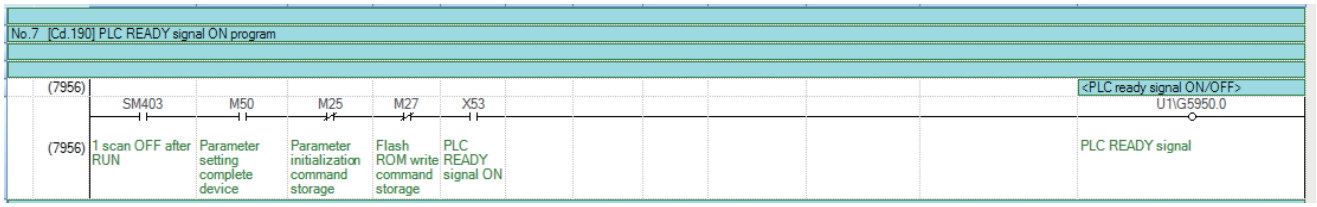
This program is not required when "1: Positioning control is executed." is set in "[Pr.55] Operation setting for incompletion of home position return" by "Home Position Return Detailed Parameters" using an engineering tool.



External command function valid setting program



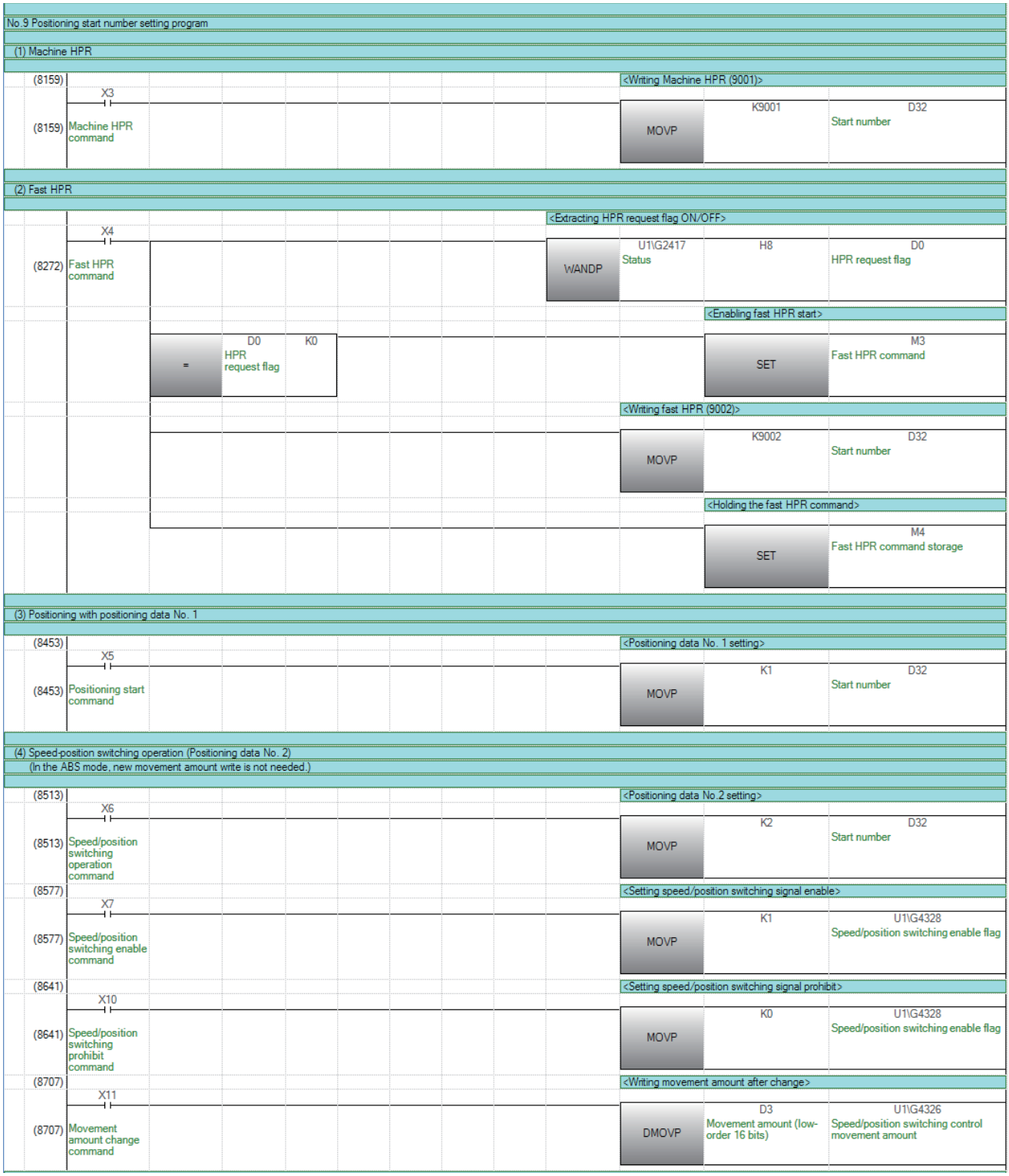
PLC READY signal ON program

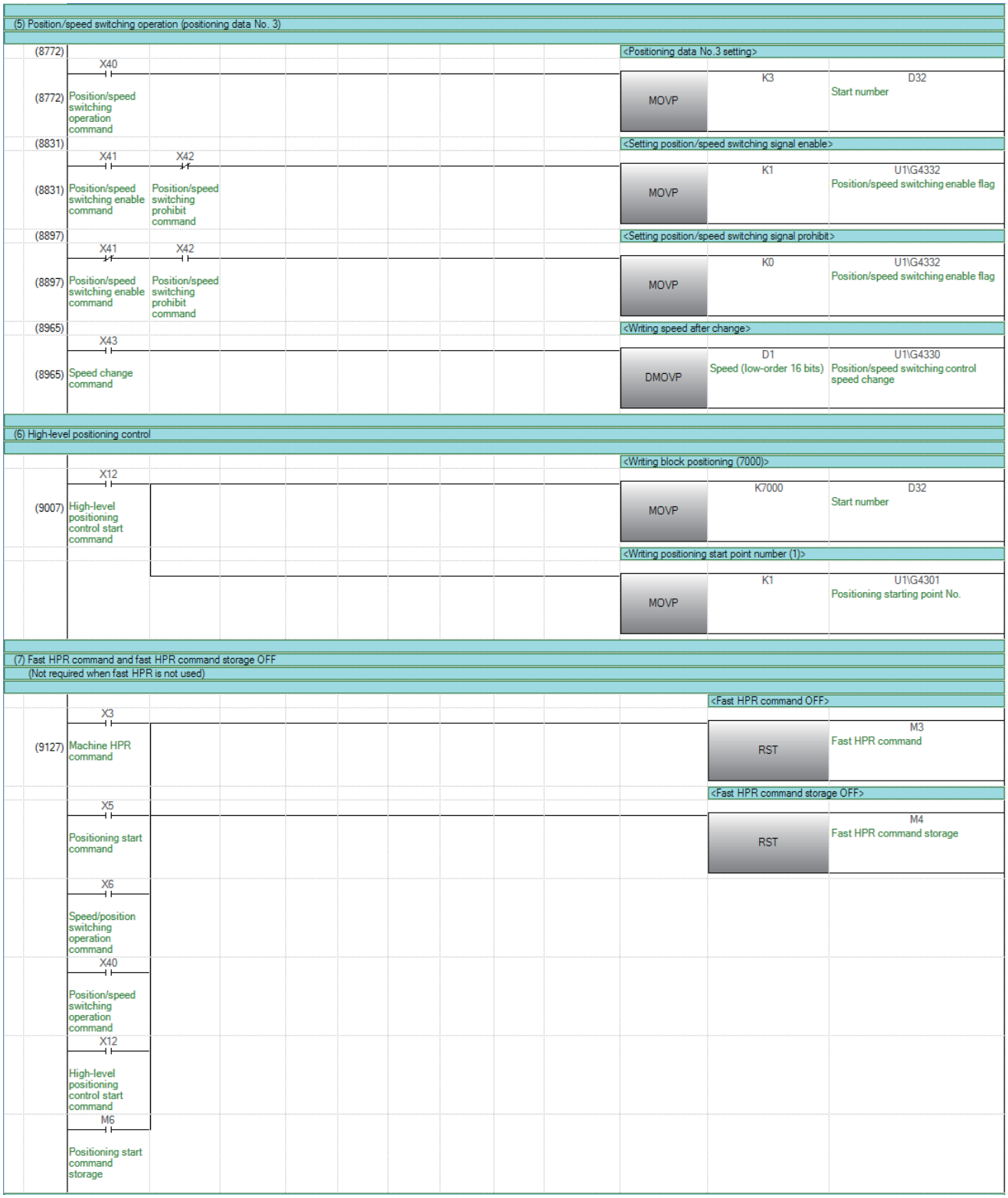


All axis servo ON program

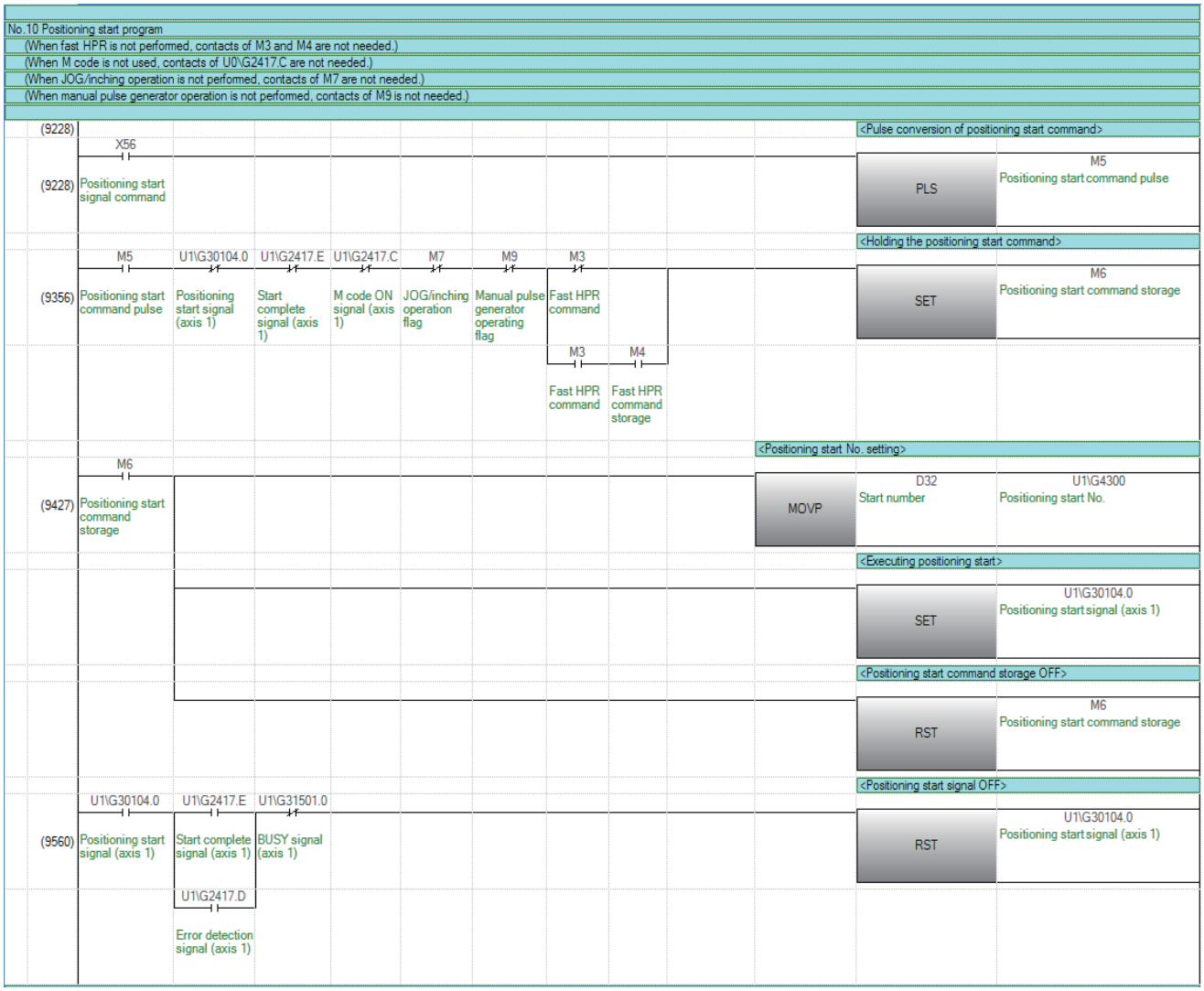


Positioning start No. setting program

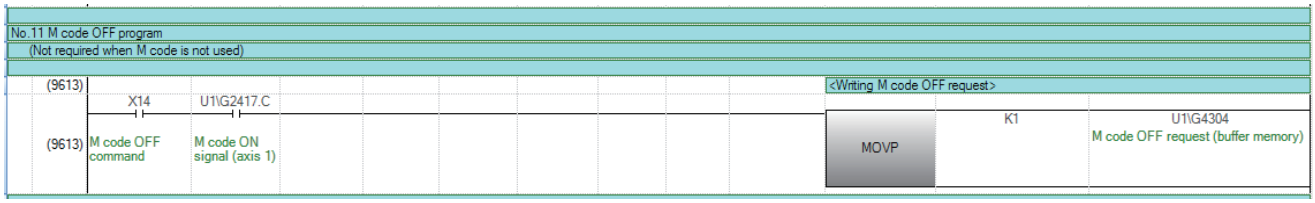



(5) Position/speed switching operation (positioning data No. 3)
(8772)
X40
(8772) Position/speed switching operation command
<Positioning data No.3 setting>
MOVP
K3
D32
Start number
(8831)
X41
X42
(8831) Position/speed switching enable command
Position/speed switching prohibit command
<Setting position/speed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

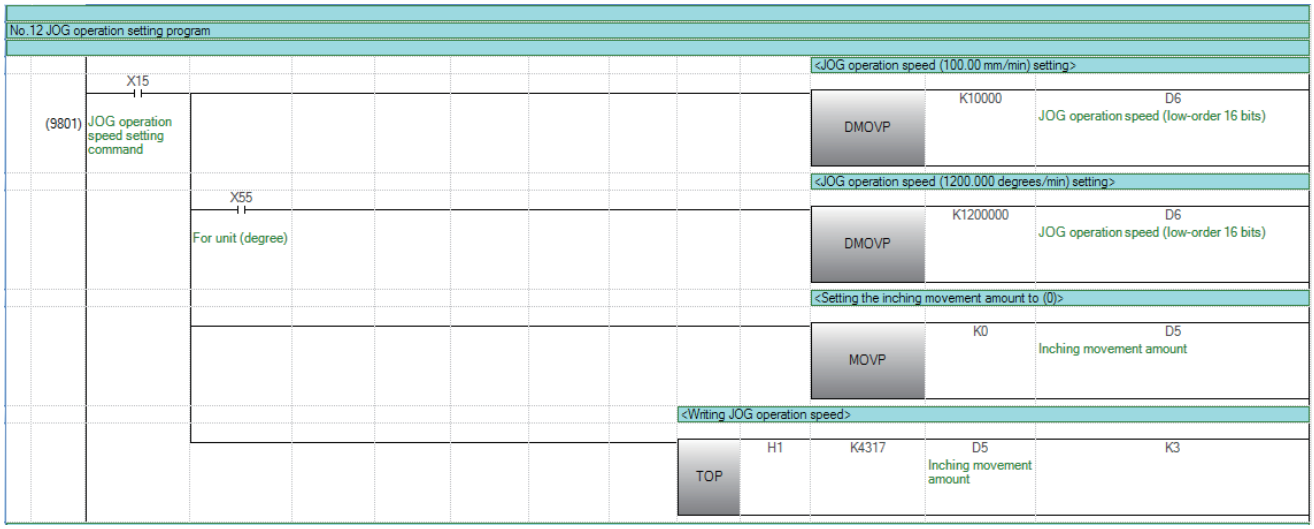
Positioning start program



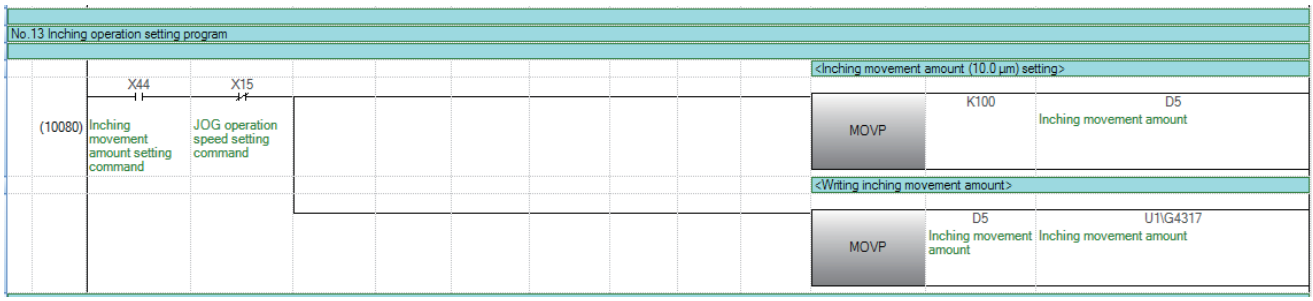
M code OFF program



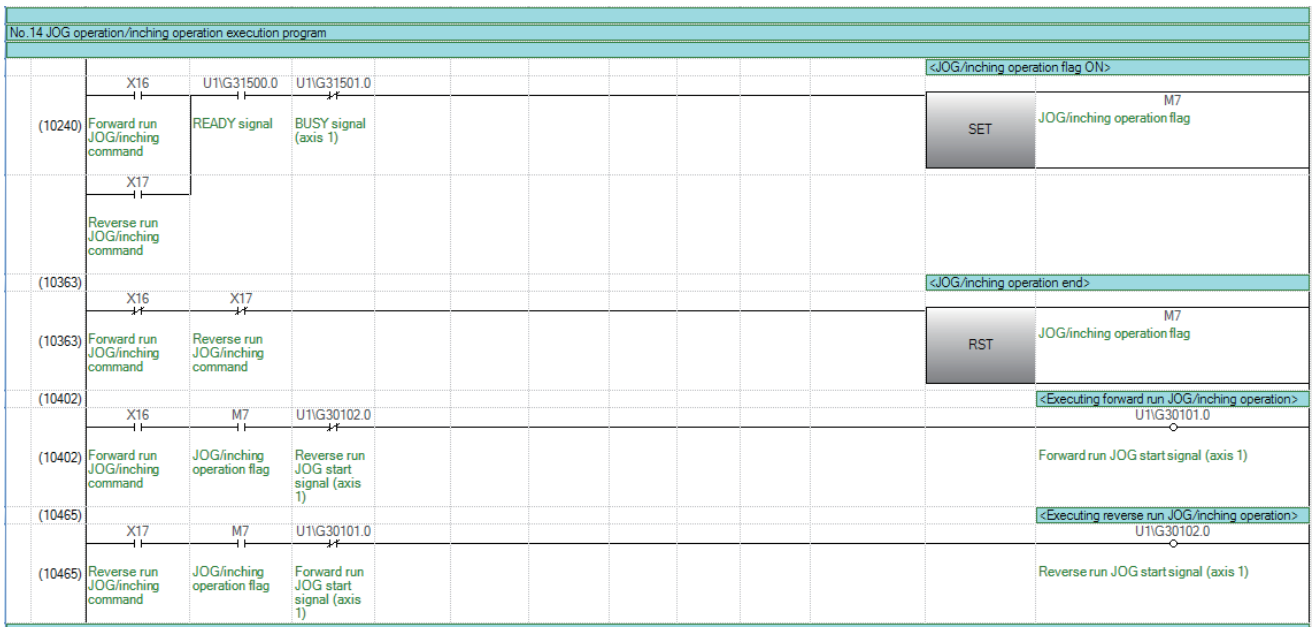
JOG operation setting program



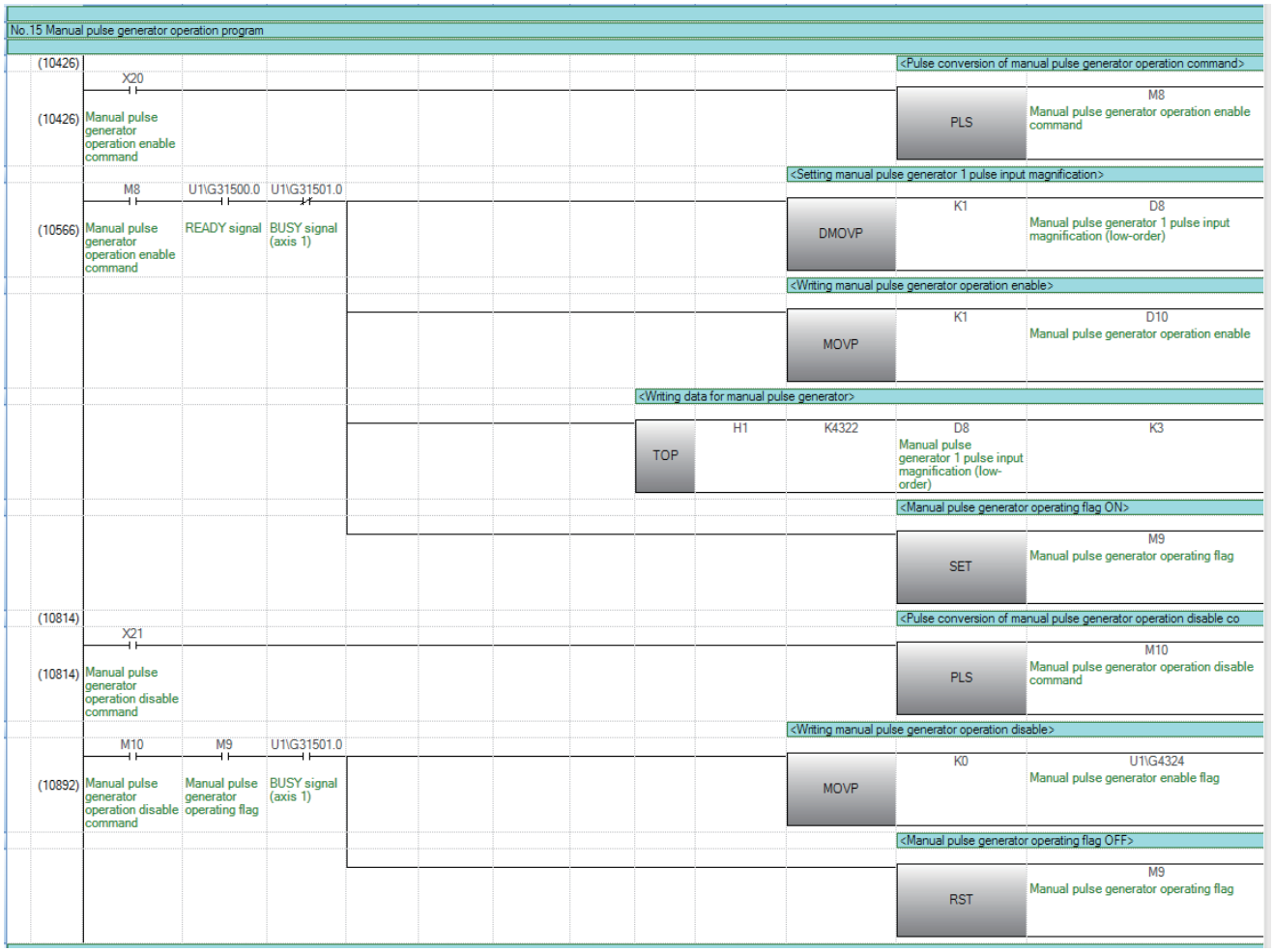
Inching operation setting program



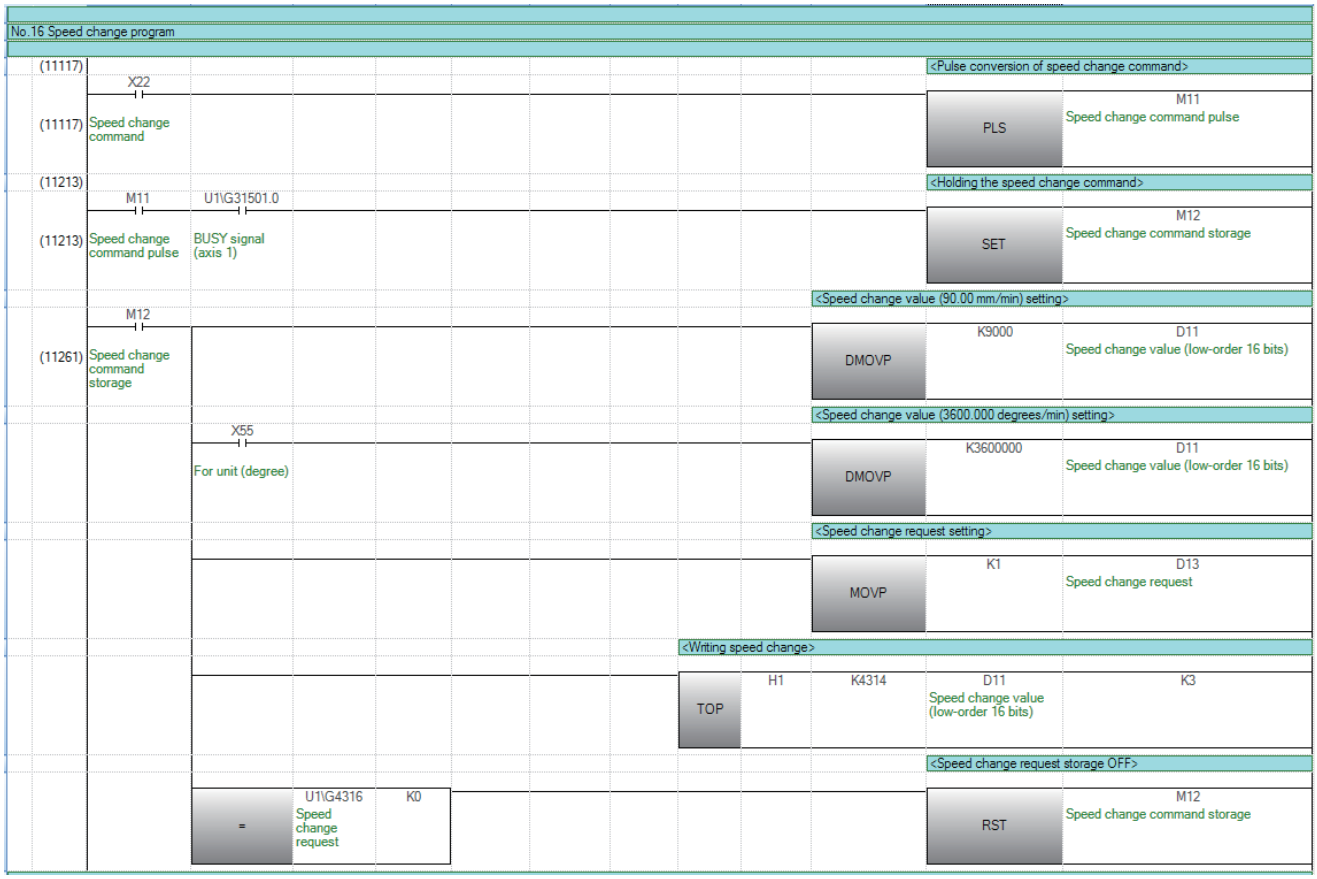
JOG operation/inching operation execution program



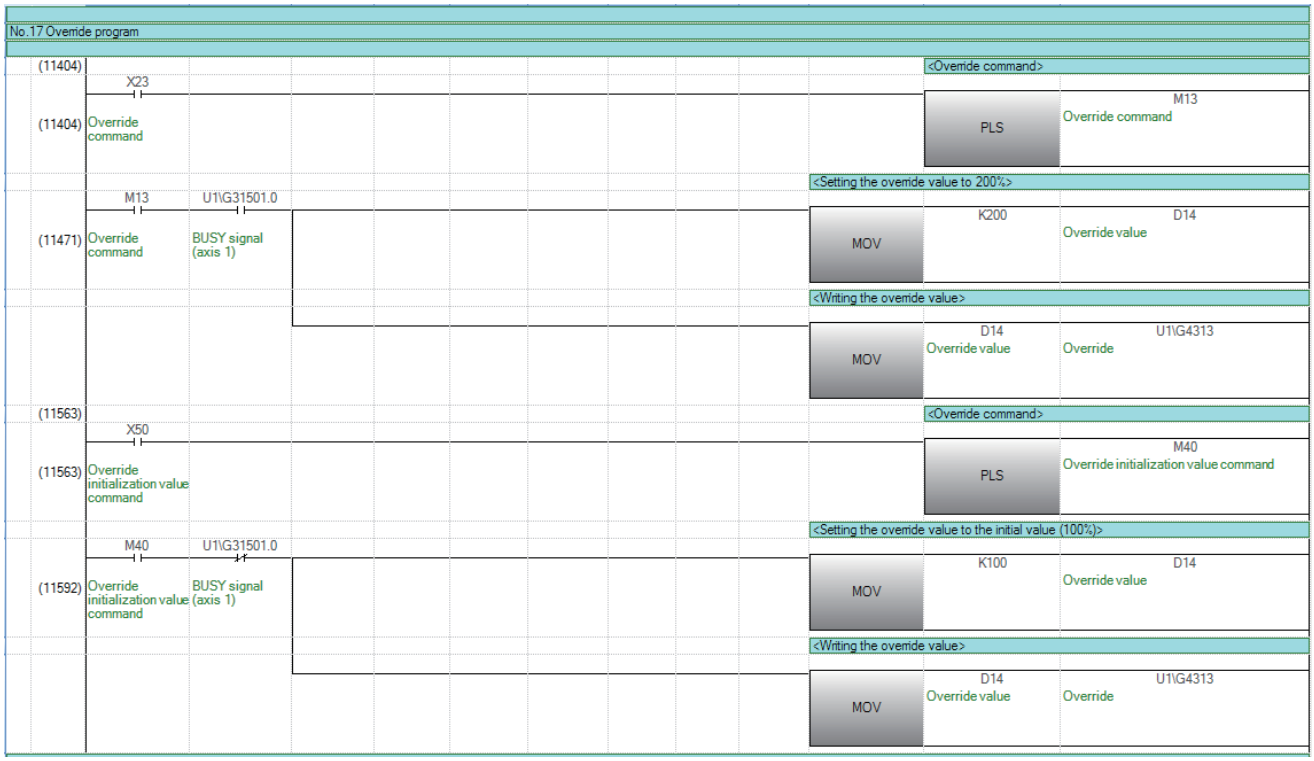
Manual pulse generator operation program



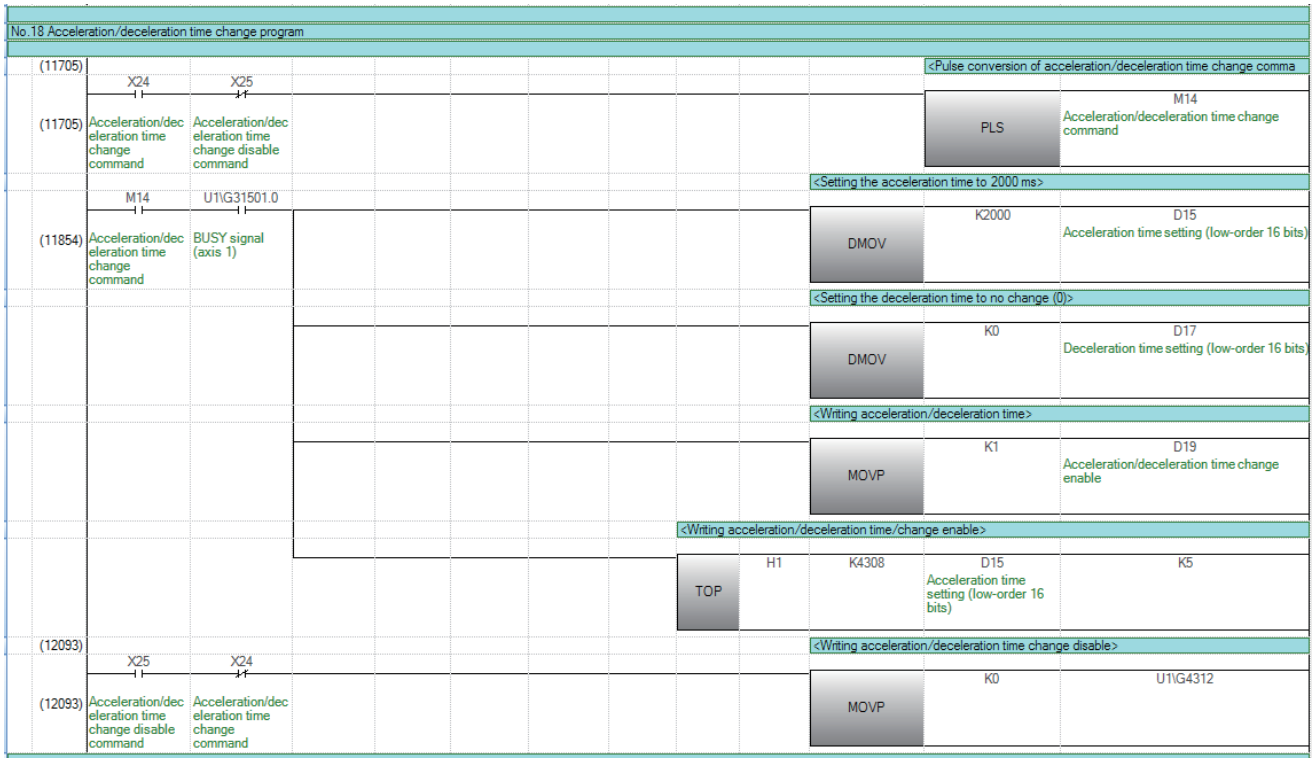
Speed change program



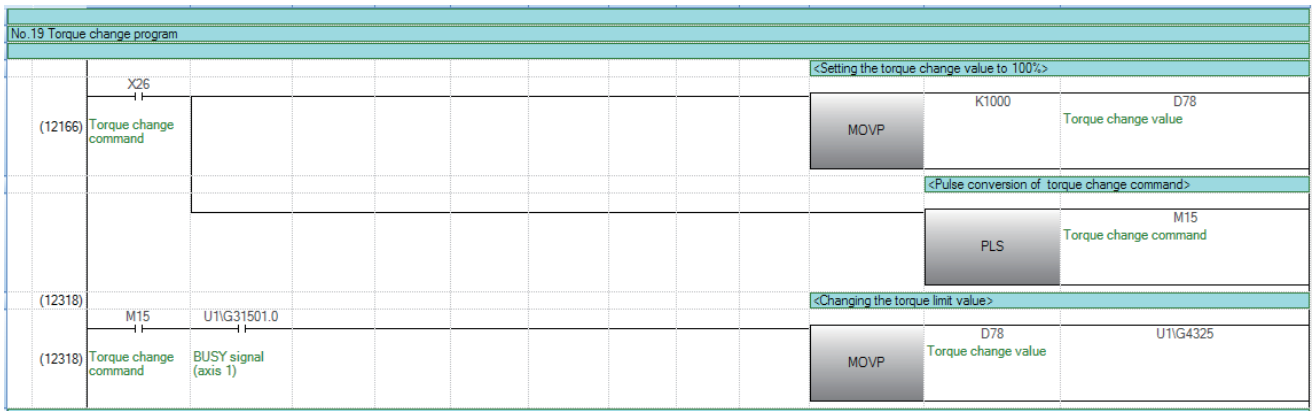
Override program



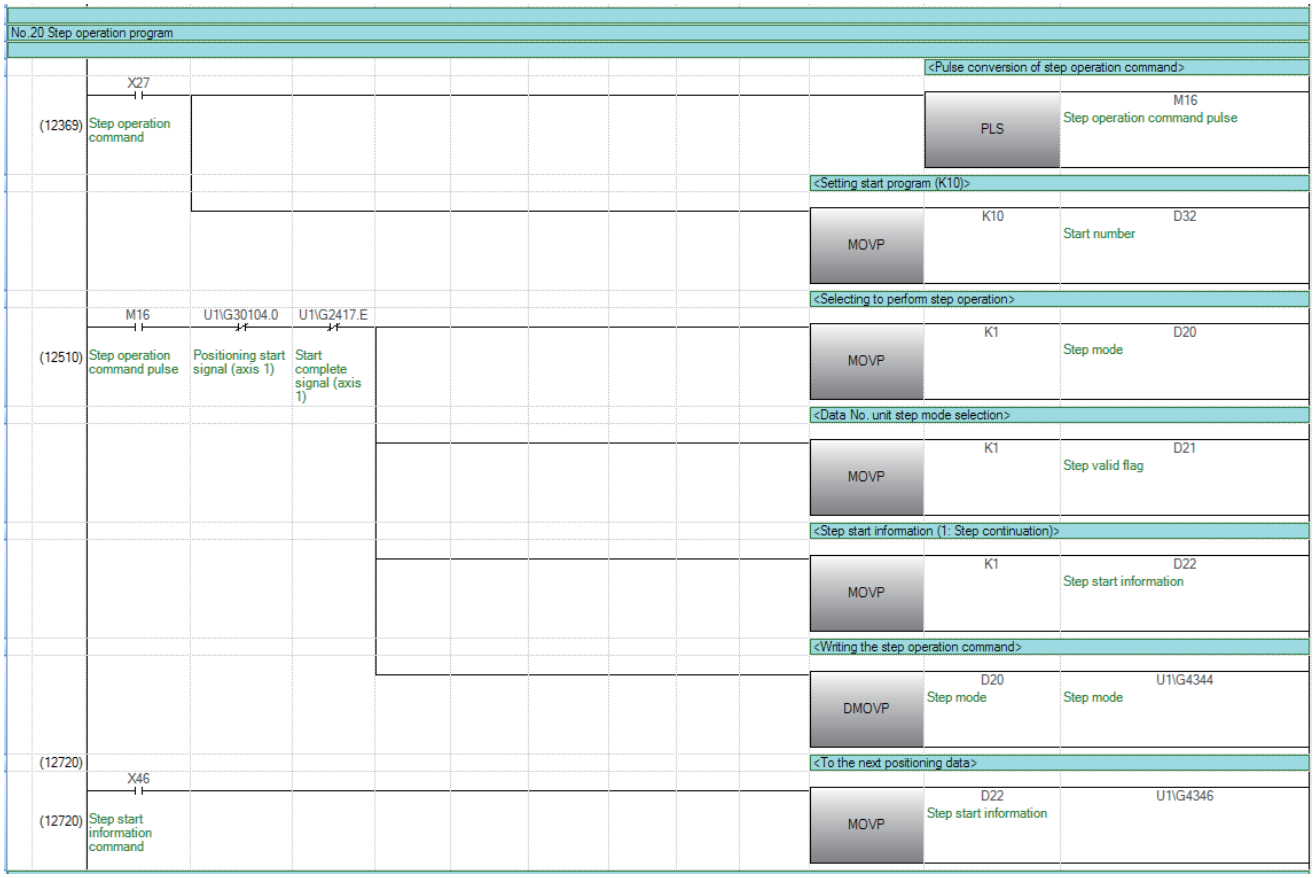
Acceleration/deceleration time change program



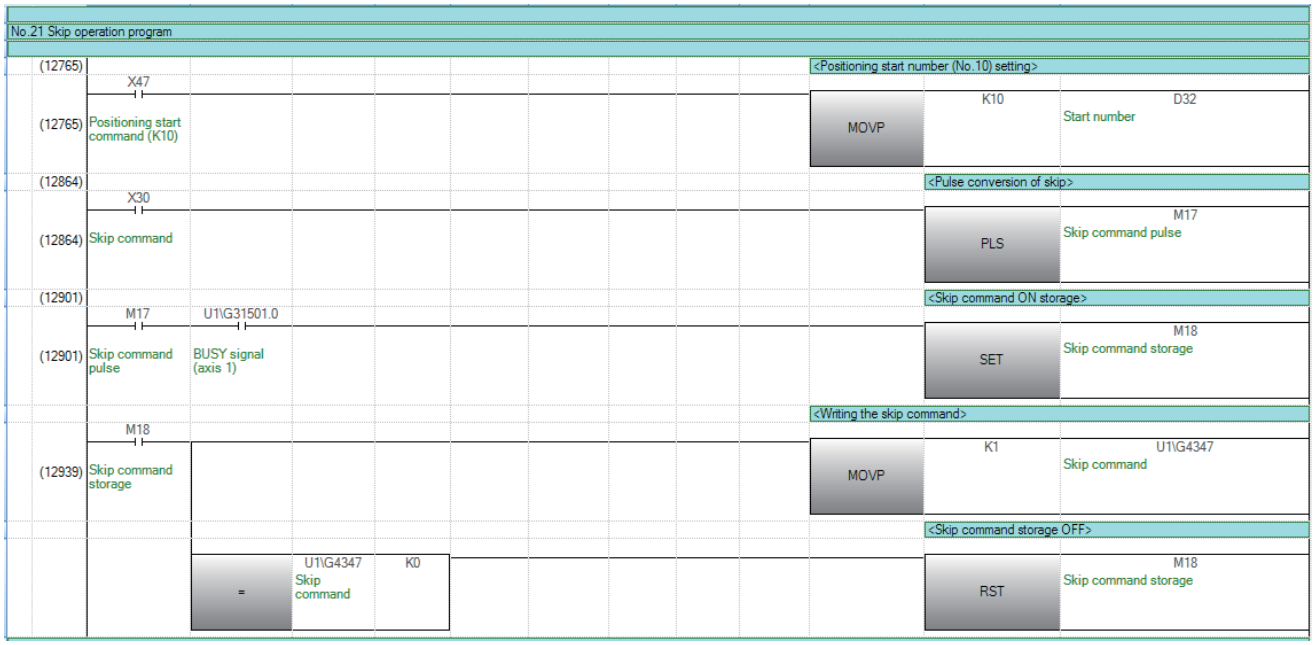
Torque change program



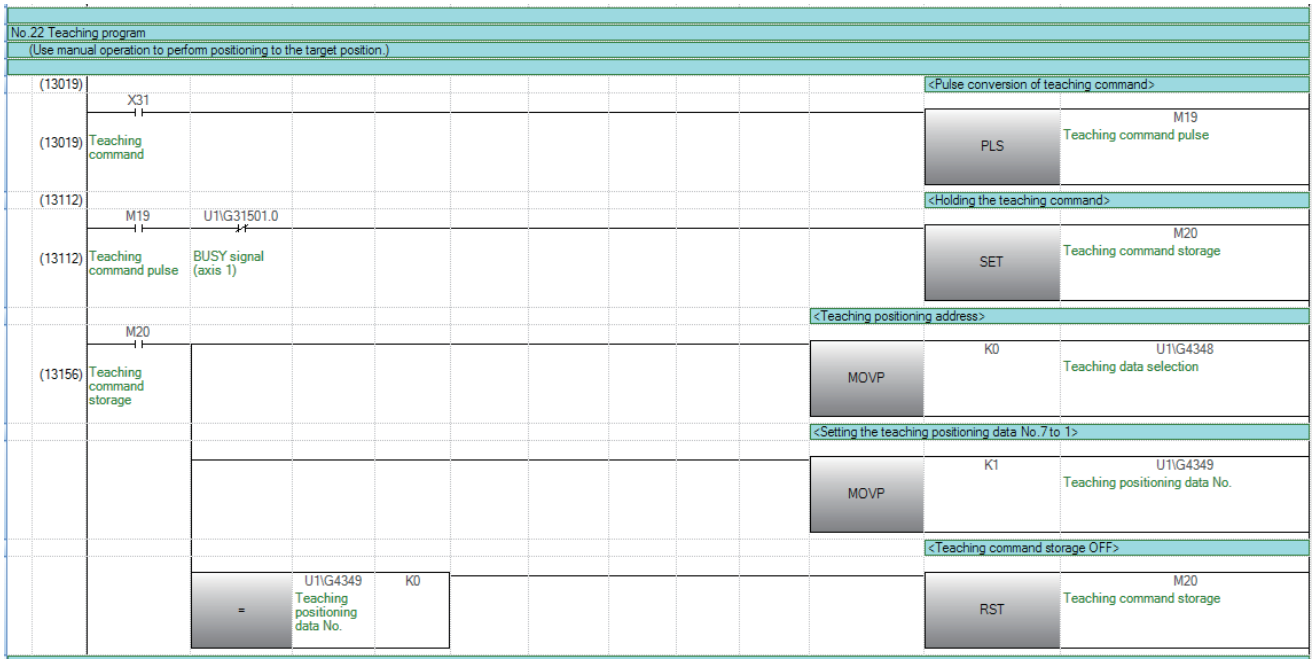
Step operation program



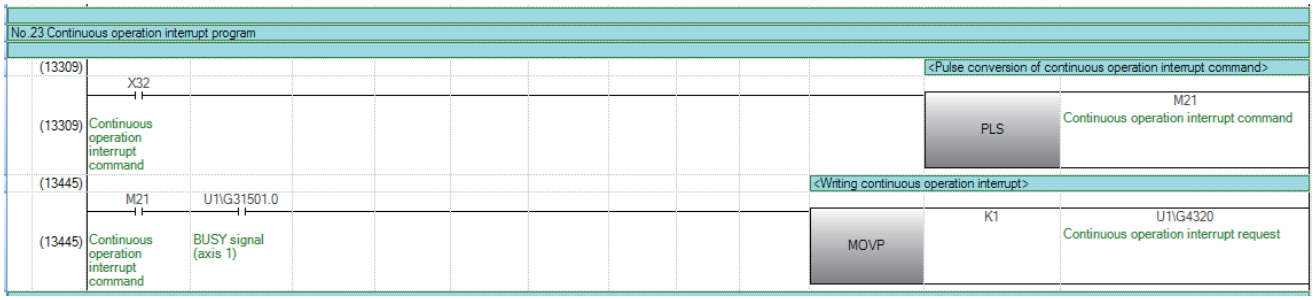
Skip program



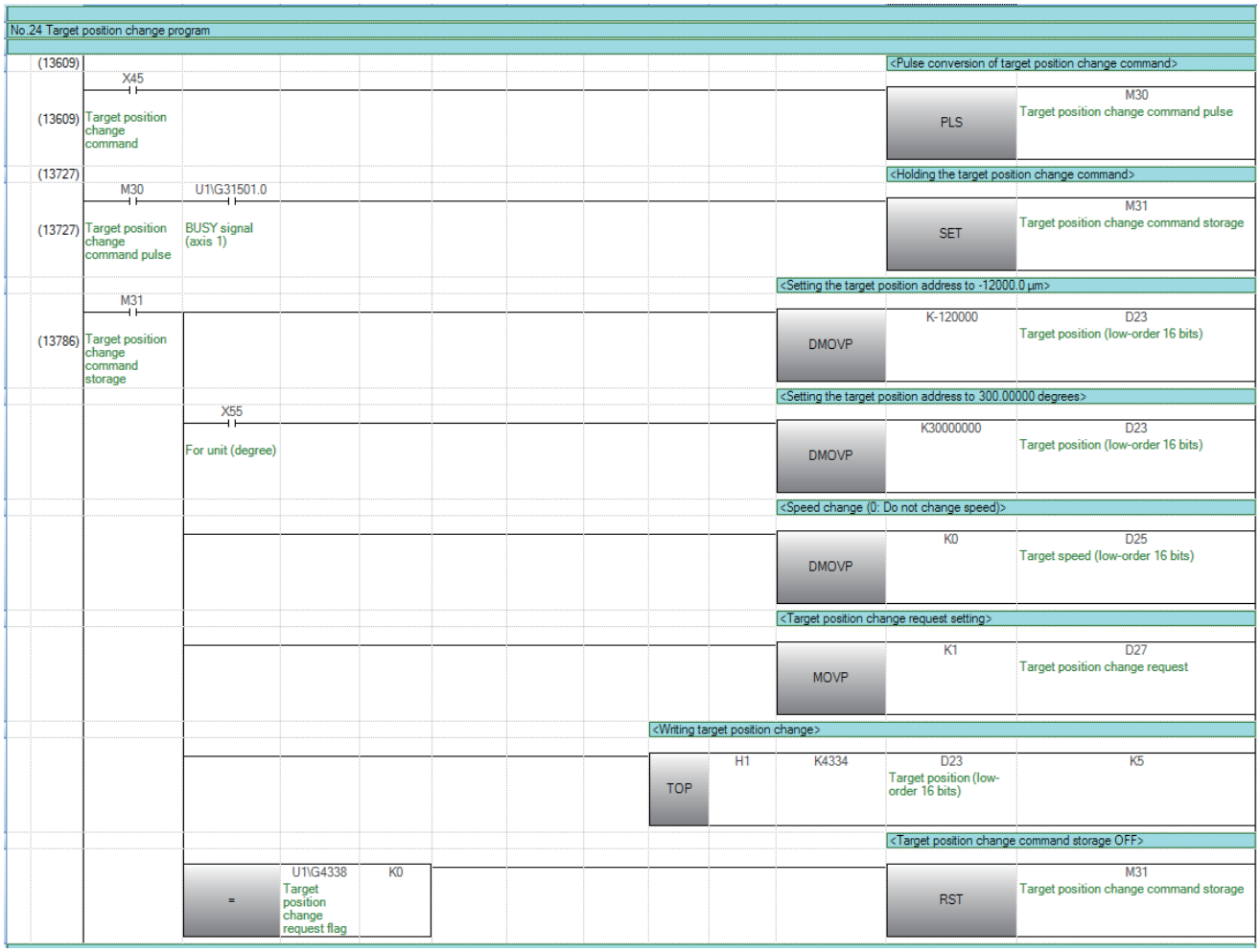
Teaching program



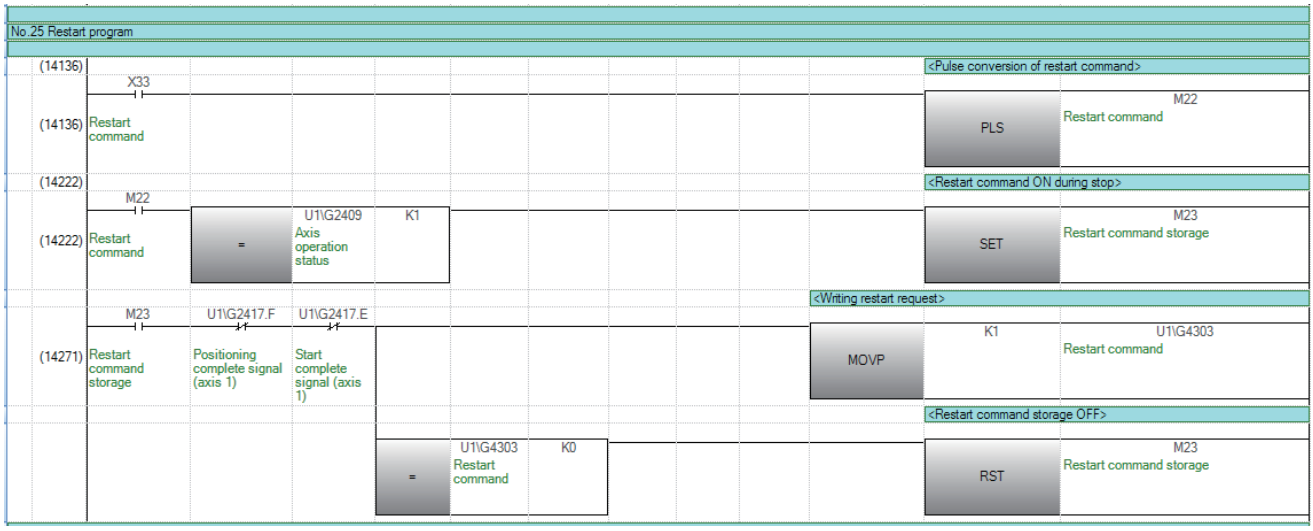
Continuous operation interrupt program



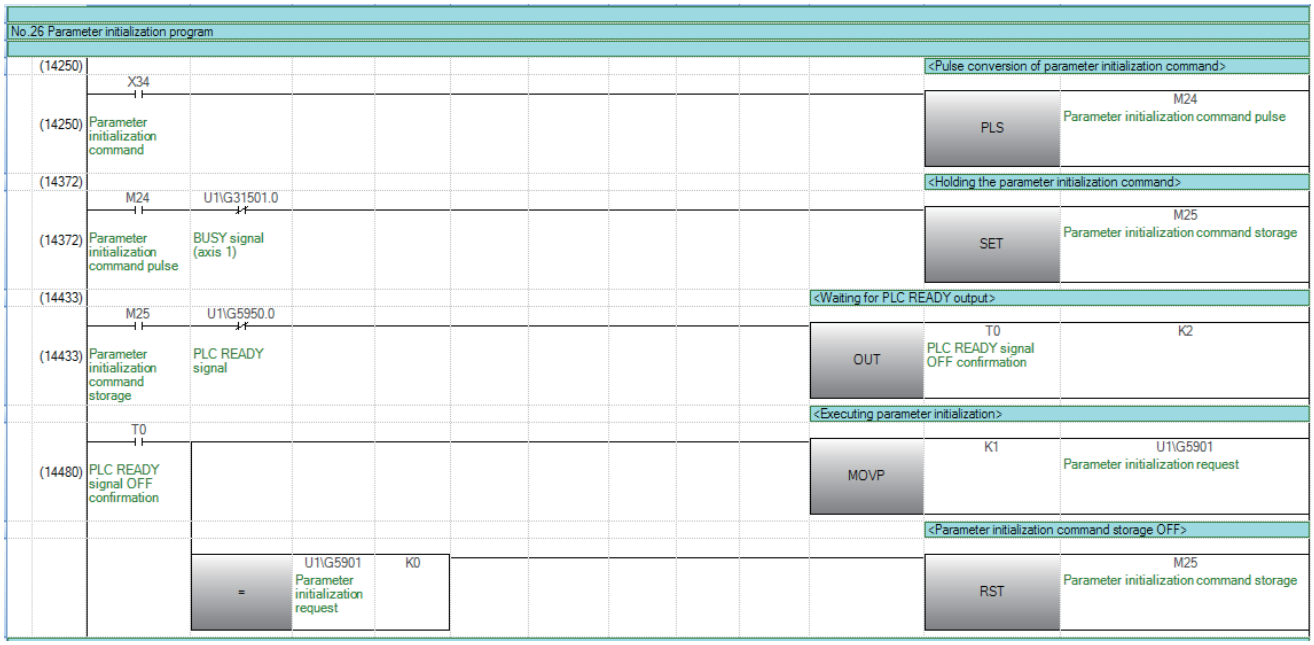
Target position change program



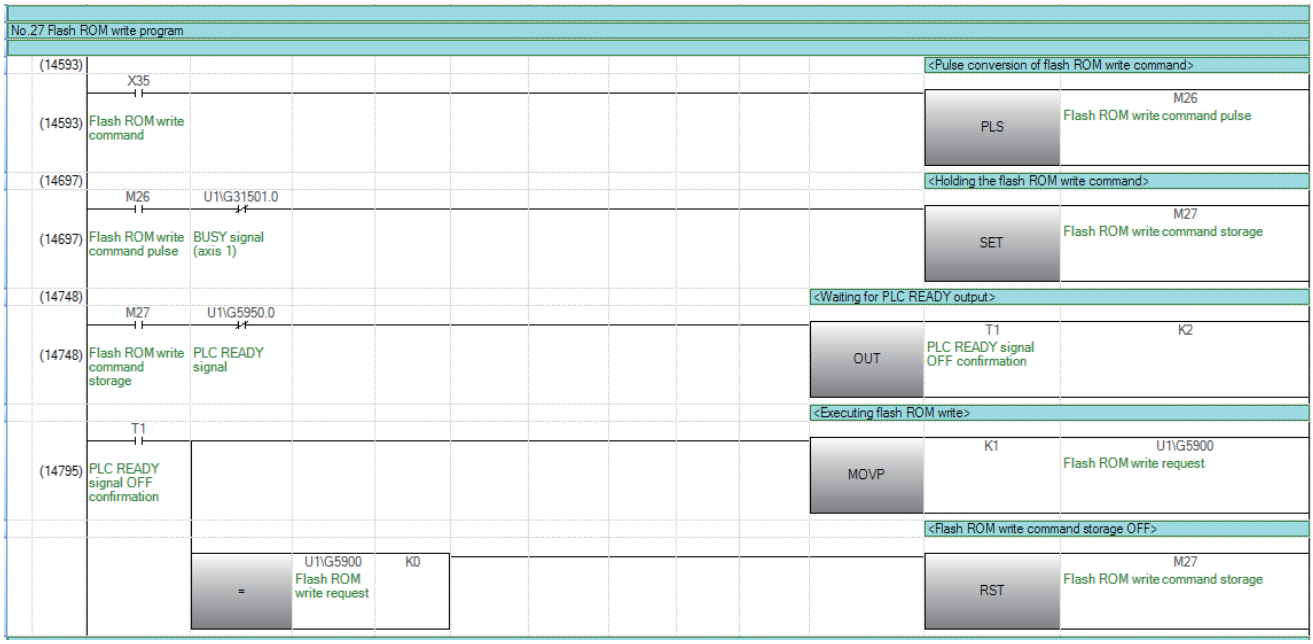
Restart program



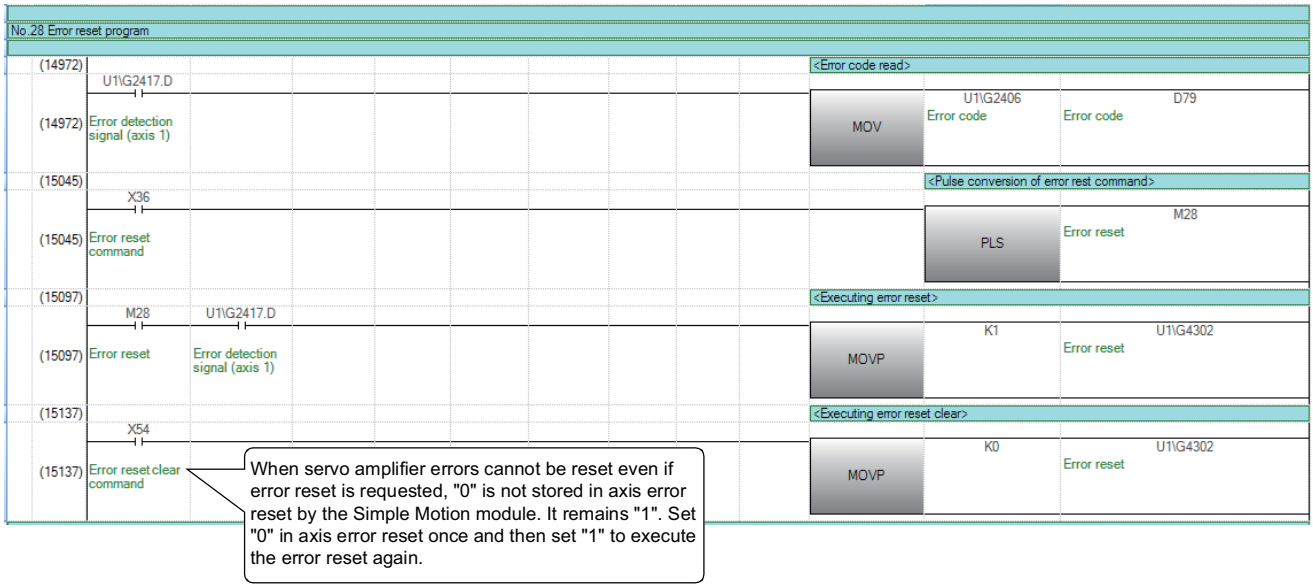
Parameter initialization program



Flash ROM write program



Error reset program

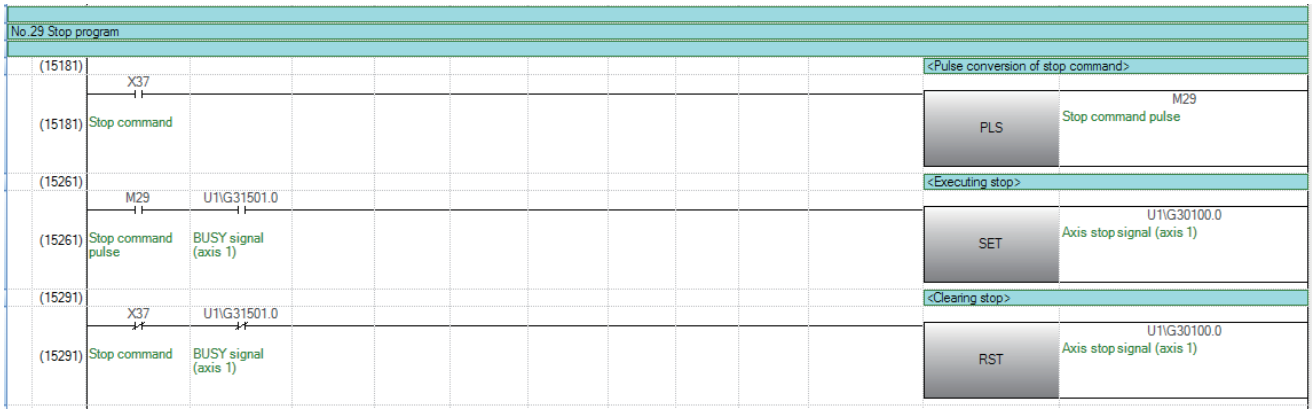


This program only stores and resets the error codes.

To also reset warnings, create an OR circuit on step 15097 for Error detection signal (axis 1)G2417.D and Warning detection signal (axis 1)G2417.9.

When necessary, reference step 14972 and create a similar program to store the warning codes.

Axis stop program



13 PROGRAMMING [FX5-SSC-G]

This chapter describes the programs required to carry out positioning control with the 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 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 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

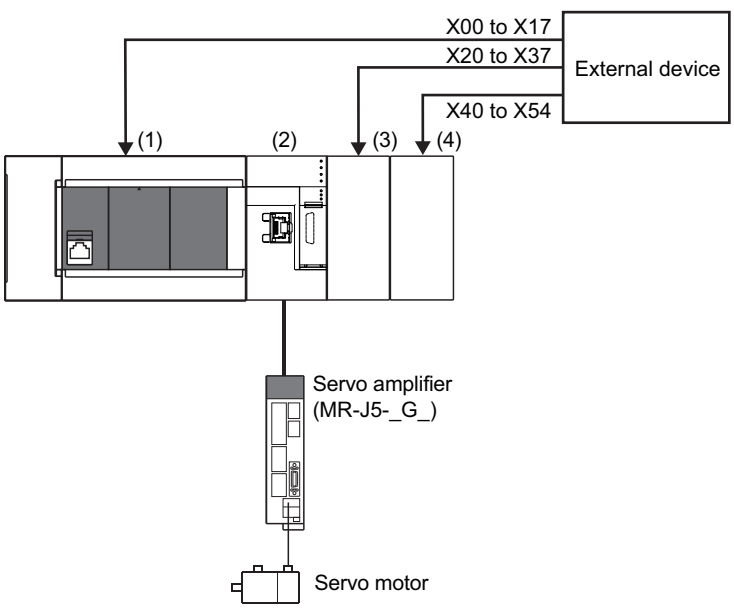
Be sure there is an interval between the speed changes of 10 ms or more when carrying out consecutive speed changes by the speed change function or override function with the Motion module.

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 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) FX5U-32MR/ES
(2) FX5-80SSC-G
(3) FX5-16EX/ES
(4) FX5-16EX/ES

13.2 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
1	Parameter setting program	• 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.
2	Positioning data setting program	
3	Block start data setting program	
4	Home position return request OFF program	Not required when the fast home position return is executed.
5	External command function valid setting program	—
6	PLC READY signal ON program	
7	All axis servo ON program	
8	Positioning start No. setting program	
9	Positioning start program	—
10	M code OFF program	Not required when the M code output function is not used.
11	JOG operation setting program	Not required when the JOG operation is not used.
12	Inching operation setting program	Not required when the inching operation is not used.
13	JOG operation/inching operation execution program	Not required when the JOG operation or the inching operation is not used.
14	Manual pulse generator operation program	Not required when the manual pulse generator operation is not used.
15	Speed change program	Add the program as necessary.
16	Override program	
17	Acceleration/deceleration time change program	
18	Torque change program	
19	Target position change program	
20	Servo parameter reading/writing program	
21	Step operation program	
22	Skip program	
23	Teaching program	
24	Continuous operation interrupt program	
25	Restart program	
26	Parameter initialization program	
27	Flash ROM write program	
28	Error reset program	
29	Axis stop program	—

13.3 Positioning Program Examples (For Using Labels)

List of labels used

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

Module label

Classification	Label name	Description
Input signal	FX5SSC_1.stSysCtrl_D.bAllAxisServoOn_D	All axis servo ON
	FX5SSC_1.stSysMntr2_D.bReady_D	READY
	FX5SSC_1.stSysMntr2_D.bSynchronizationFlag_D	Synchronization flag
	FX5SSC_1.stSysMntr2_D.bnBusy_D[0]	Axis 1 BUSY signal
Output signal	FX5SSC_1.stSysCtrl_D.bPLC_Ready_D	PLC READY signal
	FX5SSC_1.stnAxCtrl2_D[0].uPositioningStart_D.0	Axis 1 Positioning start signal
Parameter	FX5SSC_1.stnAxPrm_D[0].dHomePosition_D	Axis 1 Home position address
	FX5SSC_1.stnAxPrm_D[0].dSoftwareStrokeLowerLimit_D	Axis 1 Software stroke limit lower limit value
	FX5SSC_1.stnAxPrm_D[0].dSoftwareStrokeUpperLimit_D	Axis 1 Software stroke limit upper limit value
	FX5SSC_1.stnAxPrm_D[0].uExternalCommandFunctionMode_D	Axis 1 External command function selection
	FX5SSC_1.stnAxPrm_D[0].uExternalCommandSignalMode_D	Axis 1 External command signal selection
	FX5SSC_1.stnAxPrm_D[0].uUnitMagnification_D	Axis 1 Unit magnification (AM)
	FX5SSC_1.stnAxPrm_D[0].uUnit_D	Axis 1 Unit setting
	FX5SSC_1.stnAxPrm_D[0].uVP_Mode_D	Axis 1 Speed-position function selection
	FX5SSC_1.stnAxPrm_D[0].uV_CommandPosition_D	Axis 1 Command position value during speed control
	FX5SSC_1.stnAxPrm_D[0].udHomingSpeed_D	Axis 1 Home position return speed
	FX5SSC_1.stnAXPrm_D[0].udJogSpeedLimit_D	Axis 1 JOG speed limit value
	FX5SSC_1.stnAxPrm_D[0].udMovementAmountPerRotation_D	Axis 1 Movement amount per rotation (AL)
	FX5SSC_1.stnAxPrm_D[0].udPulsesPerRotation_D	Axis 1 Number of pulses per rotation (AP)
	FX5SSC_1.stnAXPrm_D[0].udSpeedLimitValue_D	Axis 1 Speed limit value
Axis monitor data	FX5SSC_1.stnAxMntr_D[0].uStatus_D.3	Axis 1 Home position return request flag
	FX5SSC_1.stnAxMntr_D[0].uStatus_D.9	Axis 1 Axis warning detection
	FX5SSC_1.stnAxMntr_D[0].uStatus_D.C	Axis 1 M code ON
	FX5SSC_1.stnAxMntr_D[0].uStatus_D.D	Axis 1 Error detection
	FX5SSC_1.stnAxMntr_D[0].uStatus_D.E	Axis 1 Start complete
Axis control data 1	FX5SSC_1.stnAxCtrl1_D[0].uClearHomingRequestFlag_D	Axis 1 Home position return request flag OFF request
	FX5SSC_1.stnAxCtrl1_D[0].uClear_M_Code_D	Axis 1 M code OFF request
	FX5SSC_1.stnAxCtrl1_D[0].uEnablePV_Switching_D	Axis 1 Position-speed switching enable flag
	FX5SSC_1.stnAxCtrl1_D[0].uEnableVP_Switching_D	Axis 1 Speed-position switching enable flag
	FX5SSC_1.stnAxCtrl1_D[0].uExternalCommandValid_D	Axis 1 External command valid
	FX5SSC_1.stnAxCtrl1_D[0].uForwardNewTorque_D	Axis 1 New torque value/forward new torque value
	FX5SSC_1.stnAxCtrl1_D[0].uInchingMovementAmount_D	Axis 1 Inching movement amount
	FX5SSC_1.stnAxCtrl1_D[0].uInterruptOperation_D	Axis 1 Interrupt request during continuous operation
	FX5SSC_1.stnAxCtrl1_D[0].uOverride_D	Axis 1 Positioning operation speed override
	FX5SSC_1.stnAxCtrl1_D[0].uSkip_D	Axis 1 Skip command
	FX5SSC_1.stnAxCtrl1_D[0].uStepMode_D	Axis 1 Step mode
	FX5SSC_1.stnAxCtrl1_D[0].uStepStartInformation_D	Axis 1 Step start information
	FX5SSC_1.stnAxCtrl1_D[0].uStepValid_D	Axis 1 Step valid flag
	FX5SSC_1.stnAxCtrl1_D[0].uTeachingDataSelection_D	Axis 1 Teaching data selection
	FX5SSC_1.stnAxCtrl1_D[0].uTeachingPositioningDataNo_D	Axis 1 Teaching positioning data No.
	FX5SSC_1.stnAxCtrl1_D[0].udJOG_Speed_D	Axis 1 JOG speed
	FX5SSC_1.stnAxCtrl1_D[0].udPV_NewSpeed_D	Axis 1 Position-speed switching control speed change register
	FX5SSC_1.stnAxCtrl1_D[0].udVP_NewMovementAmount_D	Axis 1 Speed-position switching control movement amount change register

Classification	Label name	Description
System control data	FX5SSC_1.stSysCtrl_D.dInputValueForManualPulseGeneratorViaCPU_D	Axis 1 Input value for manual pulse generator via CPU
Axis control data 2	FX5SSC_1.stnAxCtrl2_D[0].uStopAxis_D.0	Axis 1 Axis stop

Global label

The following describes the global labels used in the program examples. Set the global labels as follows.

- 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
1	G_bInitializeParameterReq	Bit	...	VAR_GLOBAL	
2	G_bWriteFlashReq	Bit	...	VAR_GLOBAL	
3	G_bDuringJogInchingOperation	Bit	...	VAR_GLOBAL	
4	G_bDuringMPGOperation	Bit	...	VAR_GLOBAL	

- Global label that the assignment device is to be set

	Label Name	Data Type		Class	Assign
5	G_bInputOPRReqFlagOffReq	Bit	...	VAR_GLOBAL	X2
6	G_bInputExternalCommandValidReq	Bit	...	VAR_GLOBAL	X3
7	G_bInputExternalCommandInvalidReq	Bit	...	VAR_GLOBAL	X4
8	G_bInputOPRStartReq	Bit	...	VAR_GLOBAL	X5
9	G_bInputFastOPRStartReq	Bit	...	VAR_GLOBAL	X6
10	G_bInputSetStartPositioningNoReq	Bit	...	VAR_GLOBAL	X7
11	G_bInputSpeedPositionSwitchingReq	Bit	...	VAR_GLOBAL	X10
12	G_bInputSpeedPositionSwitchingEnableReq	Bit	...	VAR_GLOBAL	X11
13	G_bInputSpeedPositionSwitchingDisableReq	Bit	...	VAR_GLOBAL	X12
14	G_bInputChangeSpeedPositionSwitchingMovementAmount	Bit	...	VAR_GLOBAL	X13
15	G_bInputStartAdvancedPositioningReq	Bit	...	VAR_GLOBAL	X14
16	G_bInputStartPositioningReq	Bit	...	VAR_GLOBAL	X15
17	G_bInputMcodeOffReq	Bit	...	VAR_GLOBAL	X16
18	G_bInputSetJogSpeedReq	Bit	...	VAR_GLOBAL	X17
19	G_bInputForwardJogStartReq	Bit	...	VAR_GLOBAL	X20
20	G_bInputReverseJogStartReq	Bit	...	VAR_GLOBAL	X22
21	G_bInputStartMPGReq	Bit	...	VAR_GLOBAL	X23
22	G_bInputChangeSpeedReq	Bit	...	VAR_GLOBAL	X24
23	G_bInputOverrideReq	Bit	...	VAR_GLOBAL	X25
24	G_bInputChangeAccDecTimeReq	Bit	...	VAR_GLOBAL	X26
25	G_bInputChangeAccDecTimeDisable	Bit	...	VAR_GLOBAL	X27
26	G_bInputChangeTorqueReq	Bit	...	VAR_GLOBAL	X30
27	G_bInputStepOperationReq	Bit	...	VAR_GLOBAL	X31
28	G_bInputSkipReq	Bit	...	VAR_GLOBAL	X32
29	G_bInputTeachingReq	Bit	...	VAR_GLOBAL	X33
30	G_bInputStopContinuousOperationReq	Bit	...	VAR_GLOBAL	X34
31	G_bInputRestartReq	Bit	...	VAR_GLOBAL	X35
32	G_bInputInitializeParameterReq	Bit	...	VAR_GLOBAL	X36
33	G_bInputWriteFlashReq	Bit	...	VAR_GLOBAL	X37
34	G_bInputErrResetReq	Bit	...	VAR_GLOBAL	X40
35	G_bInputStopReq	Bit	...	VAR_GLOBAL	X41
36	G_bInputPositionSpeedSwitchingReq	Bit	...	VAR_GLOBAL	X42
37	G_bInputPositionSpeedSwitchingEnableReq	Bit	...	VAR_GLOBAL	X43
38	G_bInputPositionSpeedSwitchingDisableReq	Bit	...	VAR_GLOBAL	X44
39	G_bInputChangePositionSpeedSwitchingSpeedReq	Bit	...	VAR_GLOBAL	X45
40	G_bInputSetInchingMovementAmountReq	Bit	...	VAR_GLOBAL	X46
41	G_bInputTargetPositionChangeReq	Bit	...	VAR_GLOBAL	X47
42	G_bInputStepStartInformationReq	Bit	...	VAR_GLOBAL	X50
43	G_bInputG_bInputSpeedPositionSwitchingAbsSetReq	Bit	...	VAR_GLOBAL	X51
44	G_bAllAxisServoOnReq	Bit	...	VAR_GLOBAL	X52
45	G_bInputServoParamChange	Bit	...	VAR_GLOBAL	X53
46	G_bInputServoParamRead	Bit	...	VAR_GLOBAL	X54

Program examples (for using labels)

For details of the module function blocks (FBs), refer to "Simple Motion Module FB/Motion Module FB" in the following manual.

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

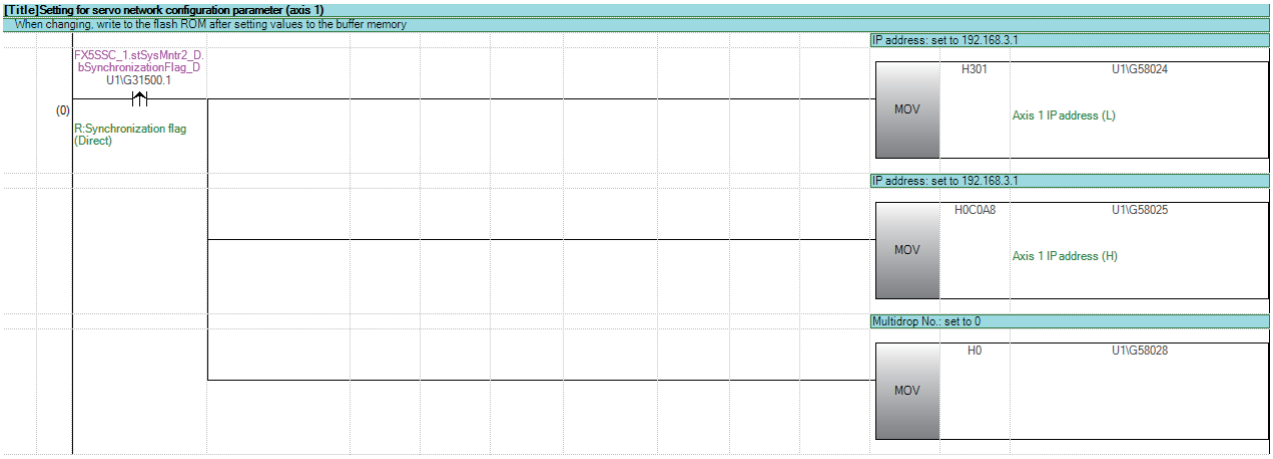
Parameter setting program

The program is not required when the parameter is set by "Module Parameter" using an engineering tool.

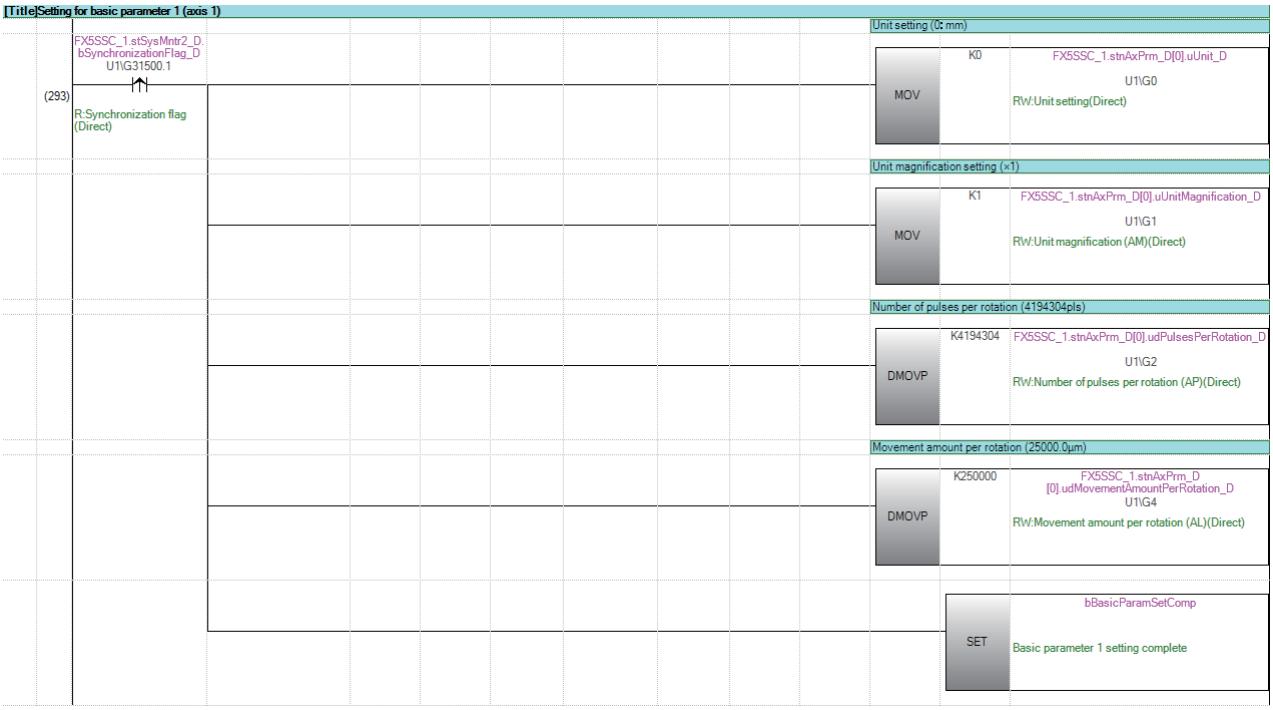
Set the local labels as follows.

	Label Name	Data Type		Class
1	bServoNetworkCompositionParam	Bit	...	VAR
2	bBasicParamSetComp	Bit	...	VAR
3	bDetailedParamSetComp	Bit	...	VAR
4	bOPRParamSetComp	Bit	...	VAR

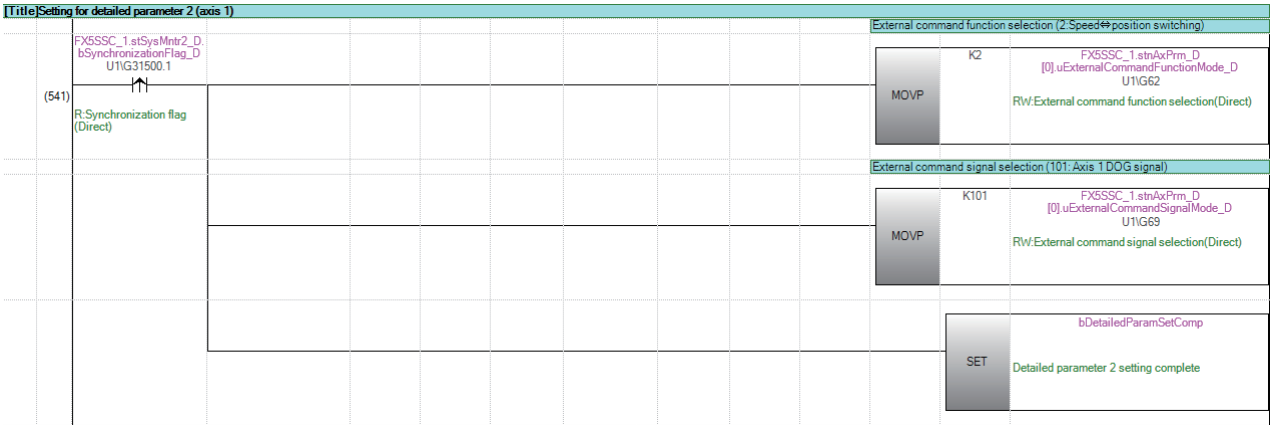
■Setting for servo network configuration parameter (axis 1)



■Setting for basic parameter 1 (axis 1)

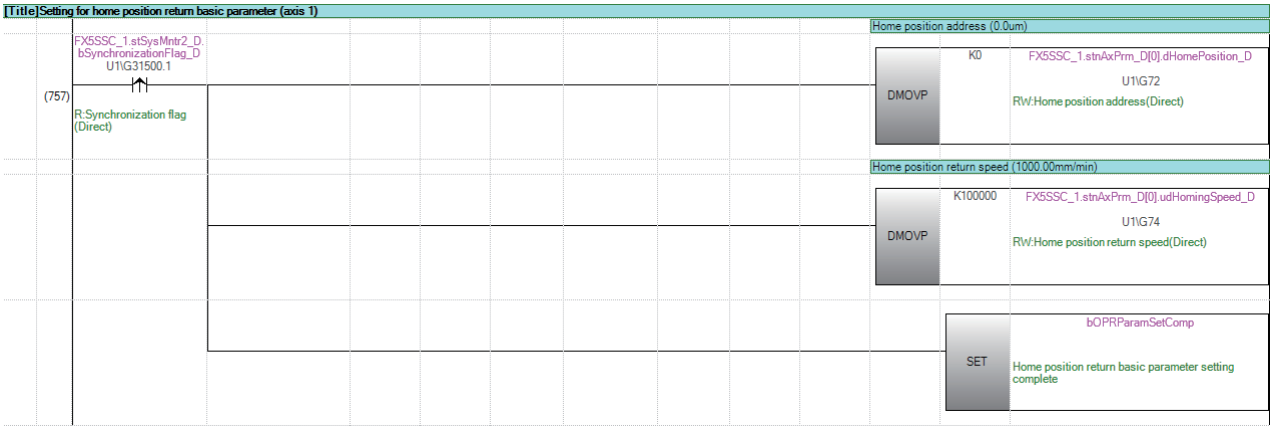


■Setting for detailed parameter 2 (axis 1)



■Setting for home position return basic parameter (axis 1)

For the home position return method and home position return data, set the parameters of the driver to be used.



■Unit "degree" setting (axis 1) program



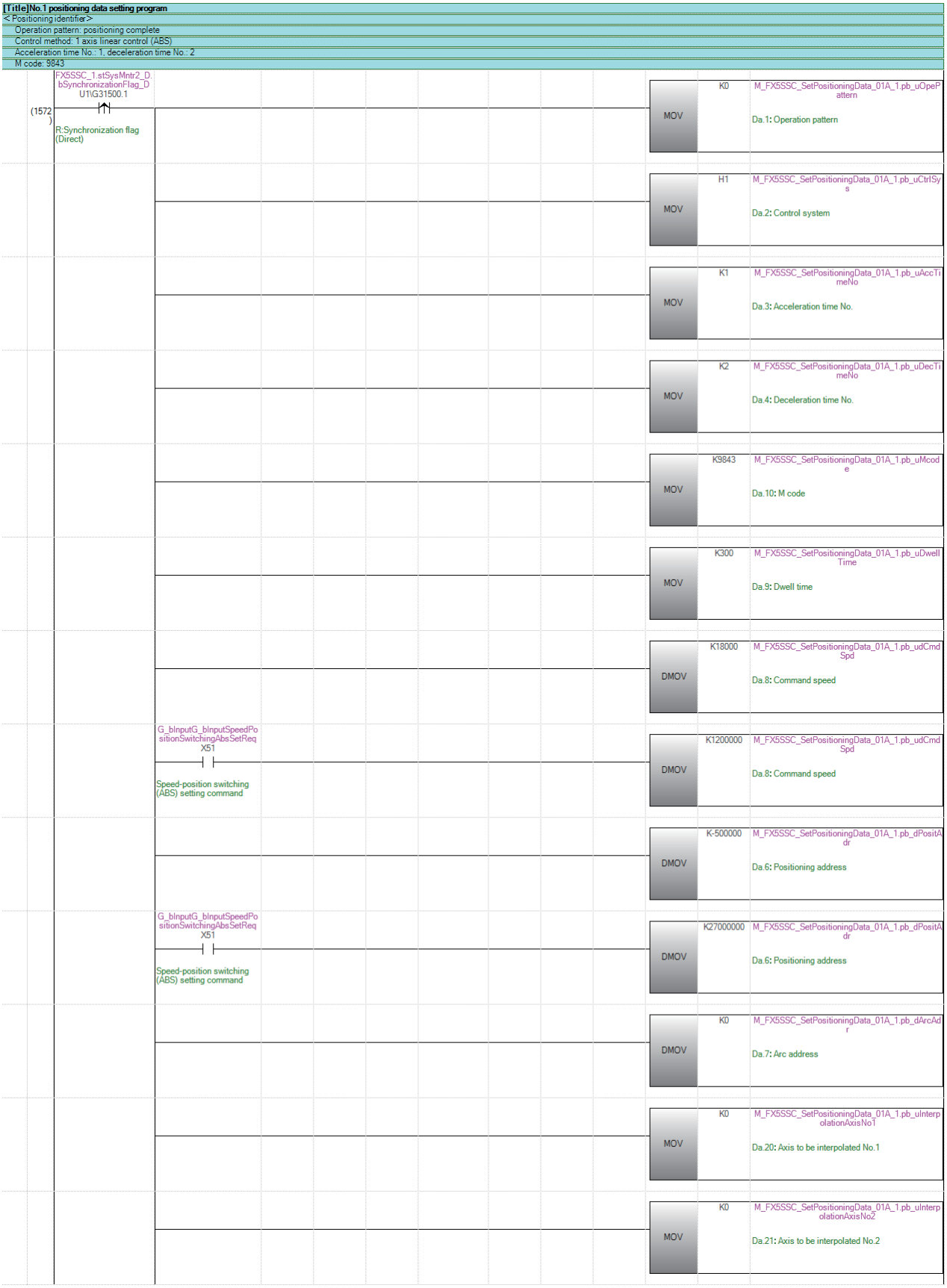
Positioning data setting program

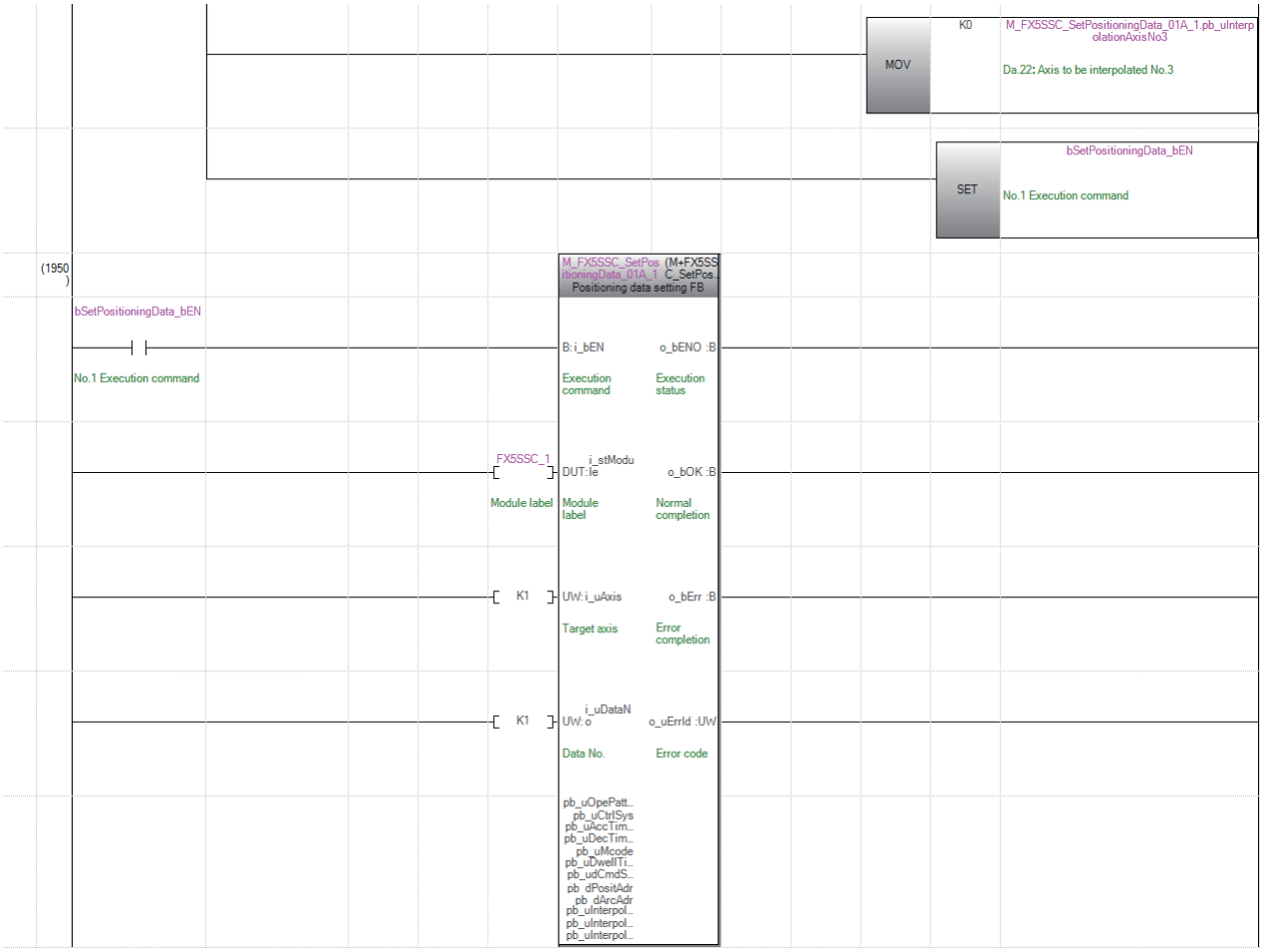
This program is not required when the data is set by "Positioning Data" using an engineering tool.

Set the local labels as follows.

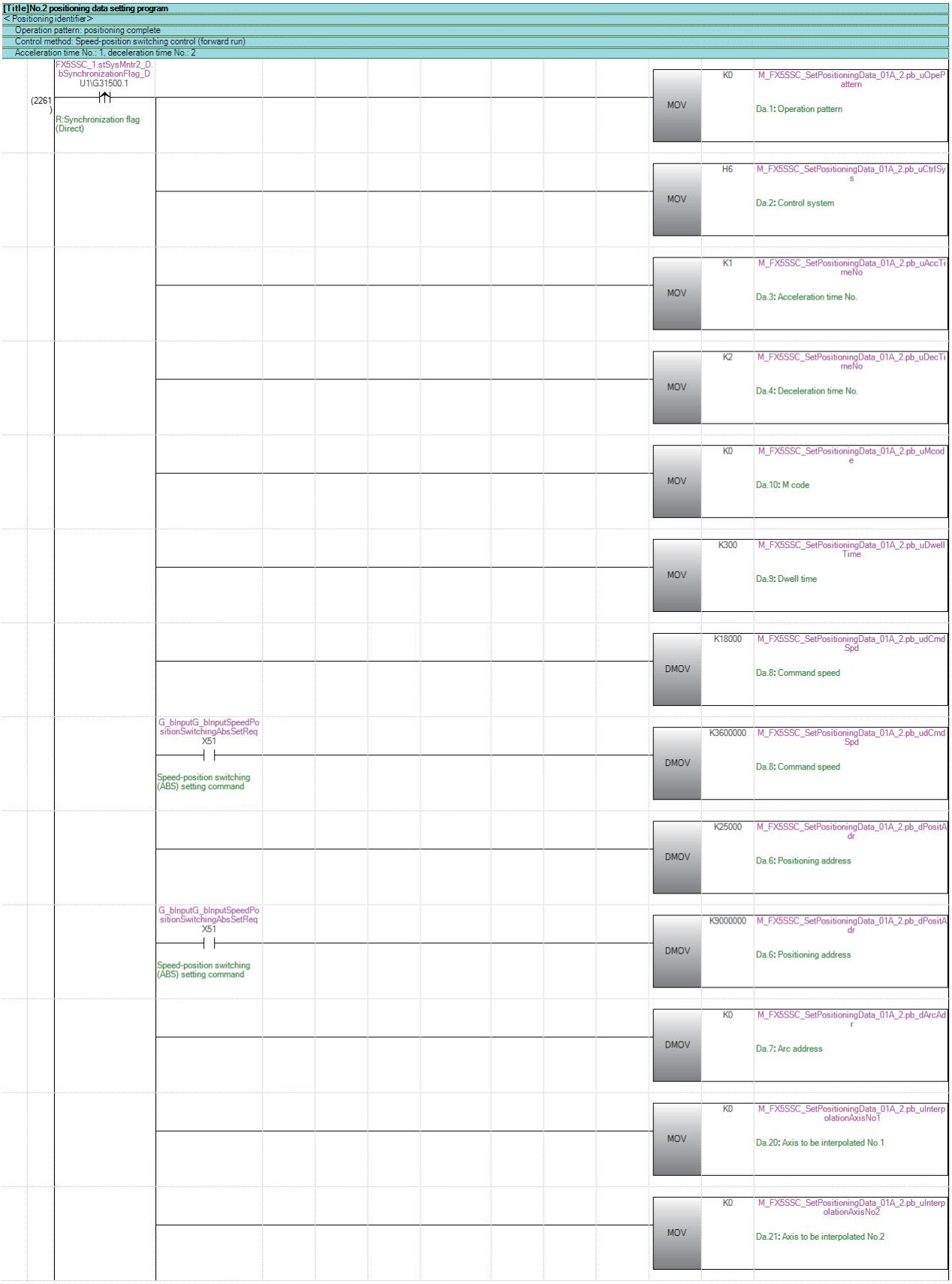
	Label Name	Data Type		Class
1	bSetPositioningData_bEN	Bit	...	VAR
2	bSetPositioningData2_bEN	Bit	...	VAR
3	bSetPositioningData3_bEN	Bit	...	VAR
4	bSetPositioningData4_bEN	Bit	...	VAR
5	bSetPositioningData5_bEN	Bit	...	VAR
6	bSetPositioningData6_bEN	Bit	...	VAR
7	bSetPositioningData10_bEN	Bit	...	VAR
8	bSetPositioningData11_bEN	Bit	...	VAR
9	bSetPositioningData15_bEN	Bit	...	VAR

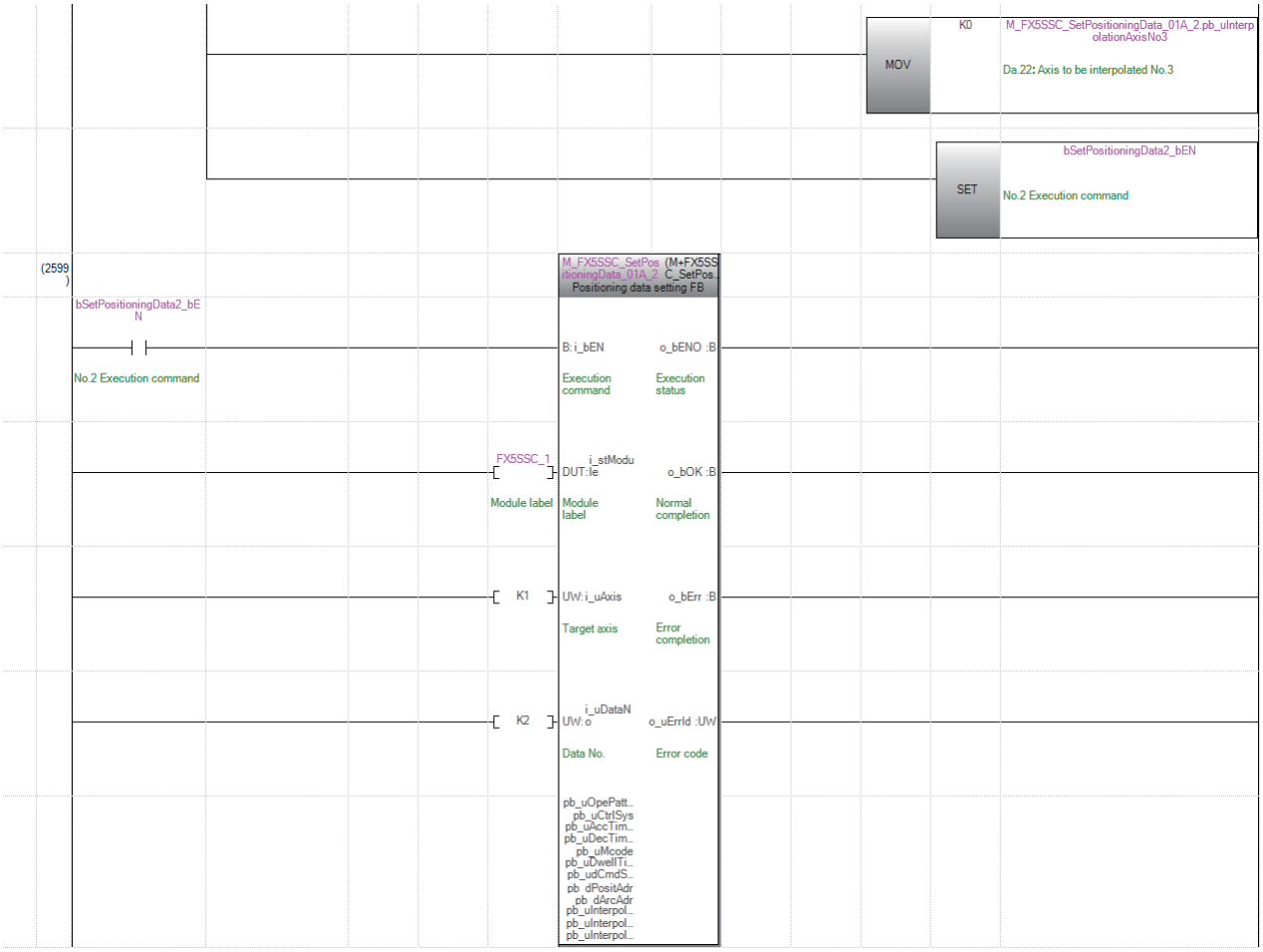
■No.1 positioning data setting program



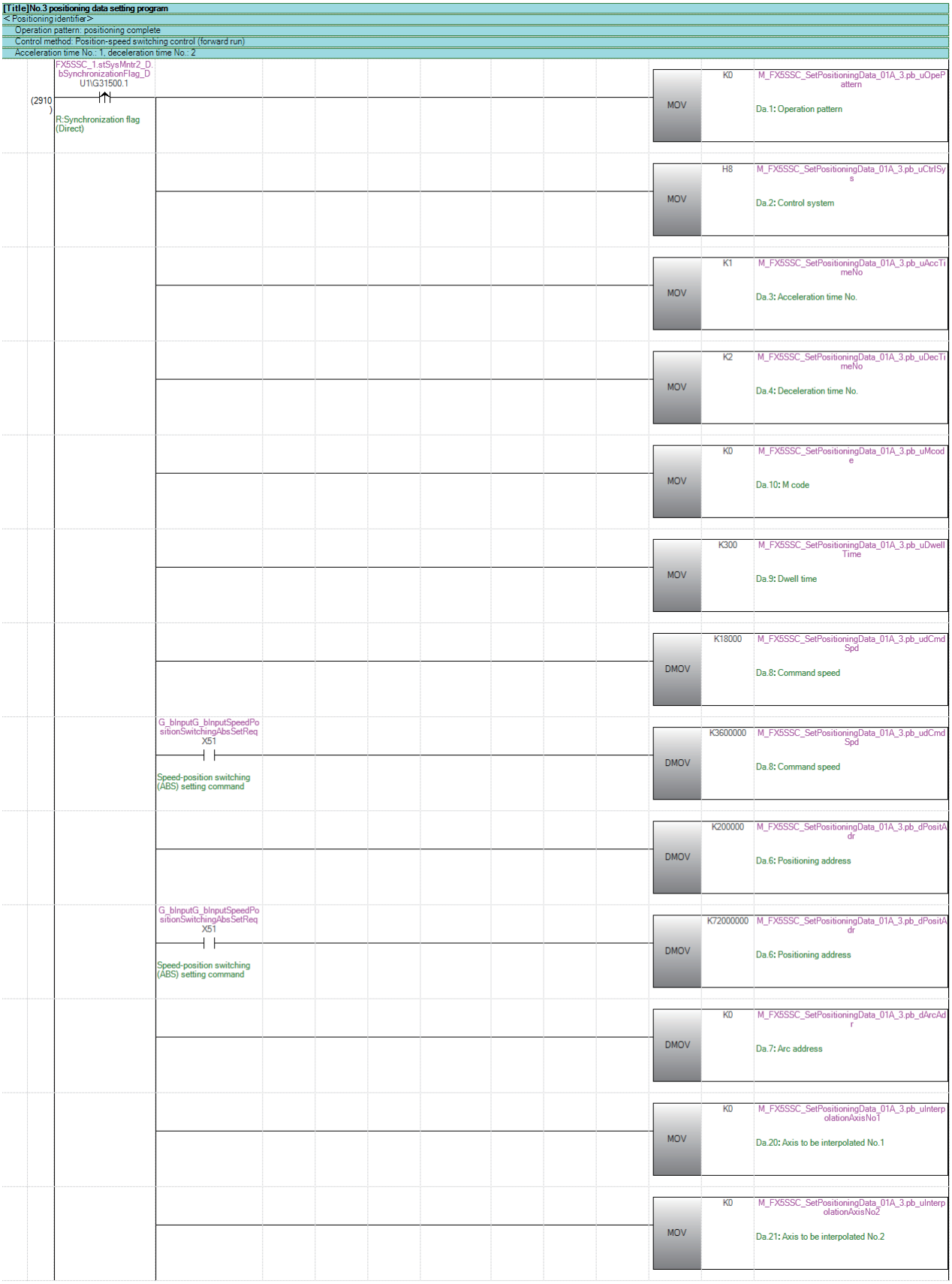

MOV
K0
M_FX5SSC_SetPositioningData_01A_1.pb_uInterpolationAxisNo3
Da.22: Axis to be interpolated No.3
SET
bSetPositioningData_bEN
No.1 Execution command
(1950)
bSetPositioningData_bEN
No.1 Execution command
M_FX5SSC_SetPositioningData_01A_1
(M+FX5SSC_SetPos...
Positioning data setting FB
B: i_bEN
Execution command
o_bENO :B
Execution status
FX5SSC_1
i_stModule
DUT:le
o_bOK :B
Module label
Module label
Normal completion
K1
UW: i_uAxis
o_bErr :B
Target axis
Error completion
K1
i_uDataNo
UW: o
o_uErrId :UW
Data No.
Error code
pb_uOpePatt...
pb_uCtrlSys
pb_uAccTim...
pb_uDecTim...
pb_uMcode
pb_uDwellTi...
pb_udCmdS...
pb_dPositAdr
pb_dArcAdr
pb_uInterpol...
pb_uInterpol...
pb_uInterpol...

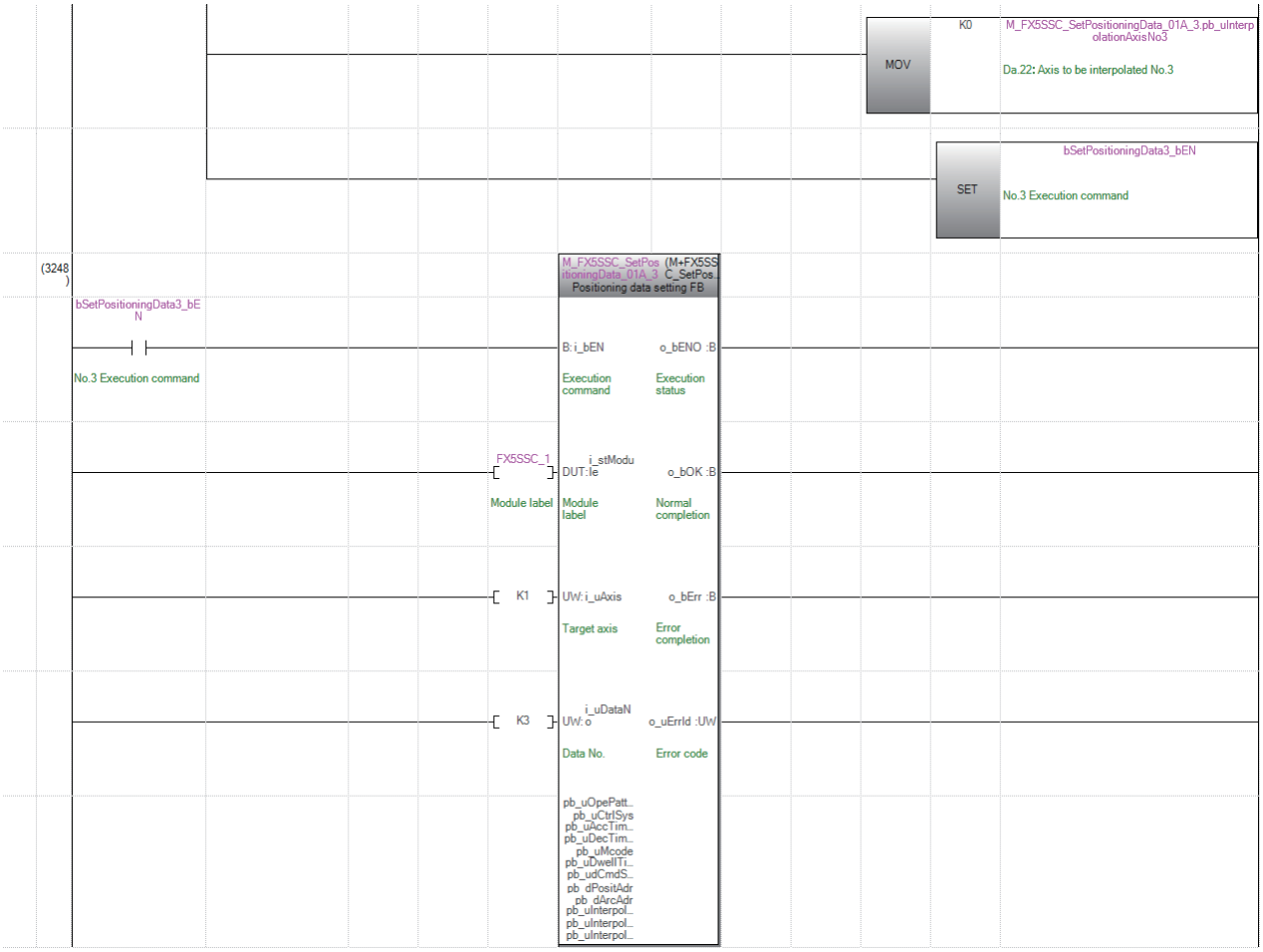
■No.2 positioning data setting program



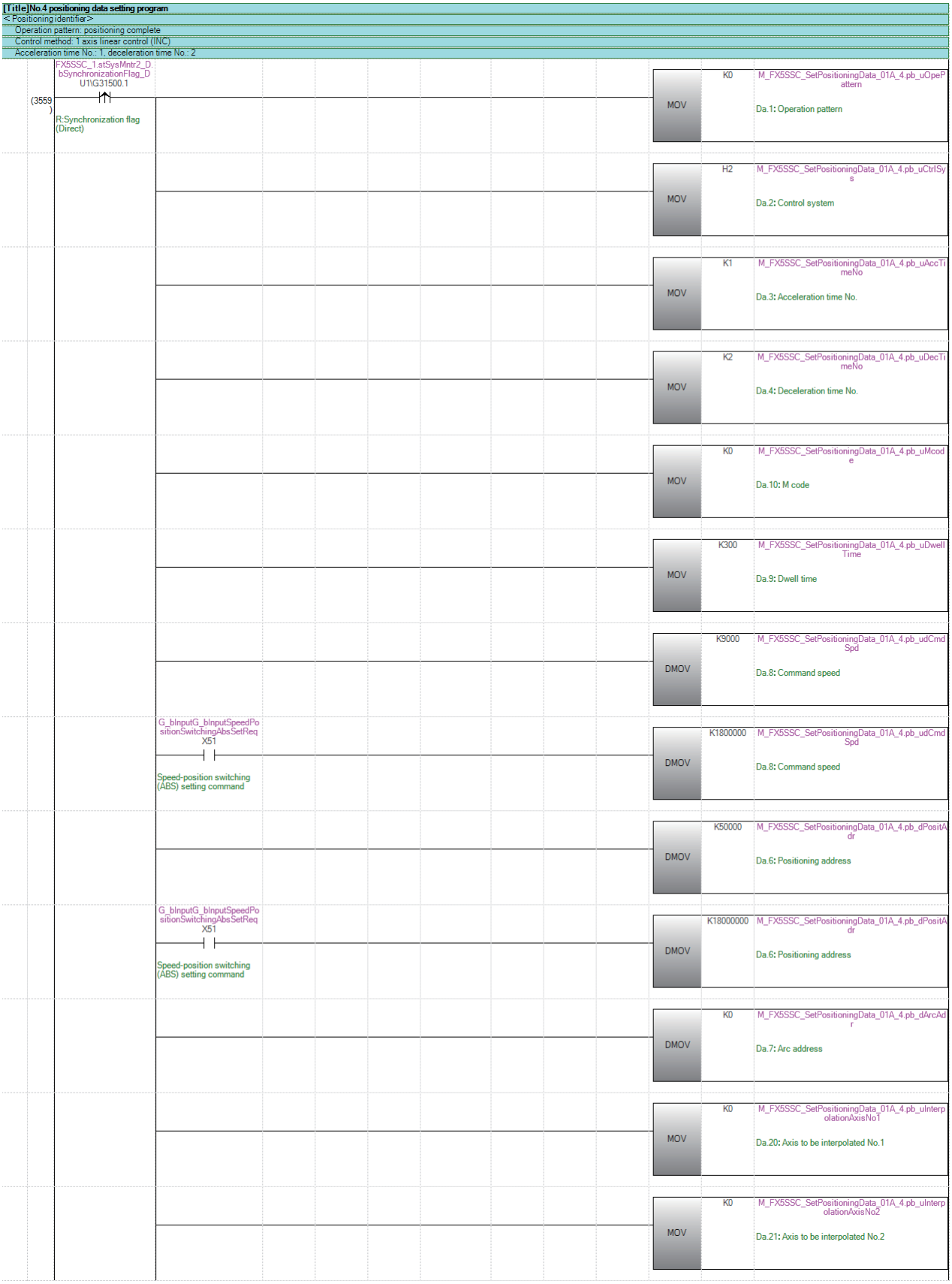

MOV
K0
M_FX5SSC_SetPositioningData_01A_2.pb_uInterpolationAxisNo3
Da.22: Axis to be interpolated No.3
SET
bSetPositioningData2_bEN
No.2 Execution command
(2599)
bSetPositioningData2_bEN
No.2 Execution command
M_FX5SSC_SetPositioningData_01A_2
(M+FX5SSC_SetPos...
Positioning data setting FB
B: i_bEN
Execution command
o_bENO :B
Execution status
FX5SSC_1
i_stModuleDUT: le
Module label
Module label
o_bOK :B
Normal completion
K1
UW: i_uAxis
Target axis
o_bErr :B
Error completion
K2
i_uDataNoUW: o
Data No.
o_uErrId :UW
Error code
pb_uOpePatt...
pb_uCtrlSys
pb_uAccTim...
pb_uDecTim...
pb_uMcode
pb_uDwellTi...
pb_udCmdS...
pb_dPositAdr
pb_dArcAdr
pb_uInterpol...
pb_uInterpol...
pb_uInterpol...

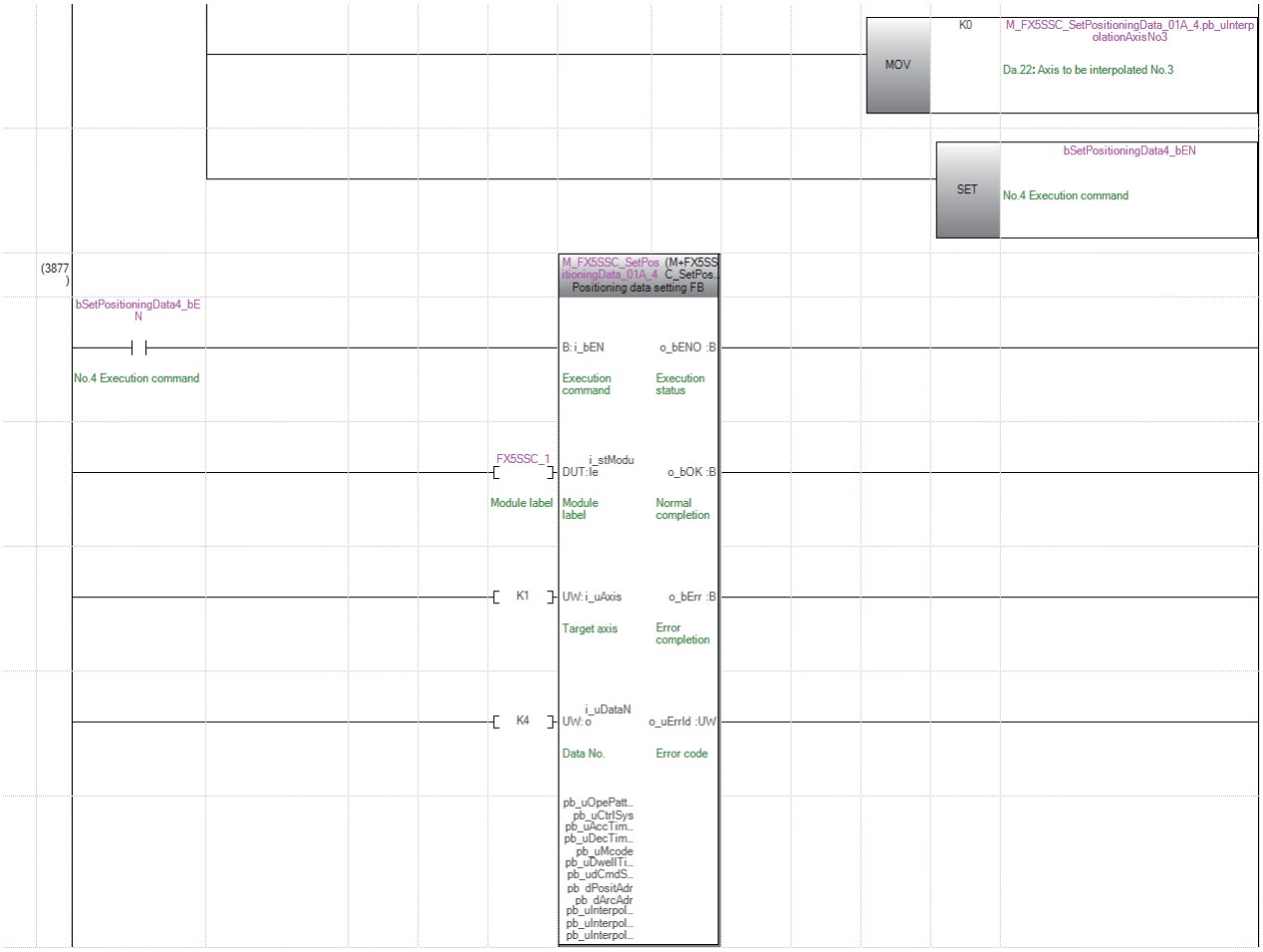
■No.3 positioning data setting program



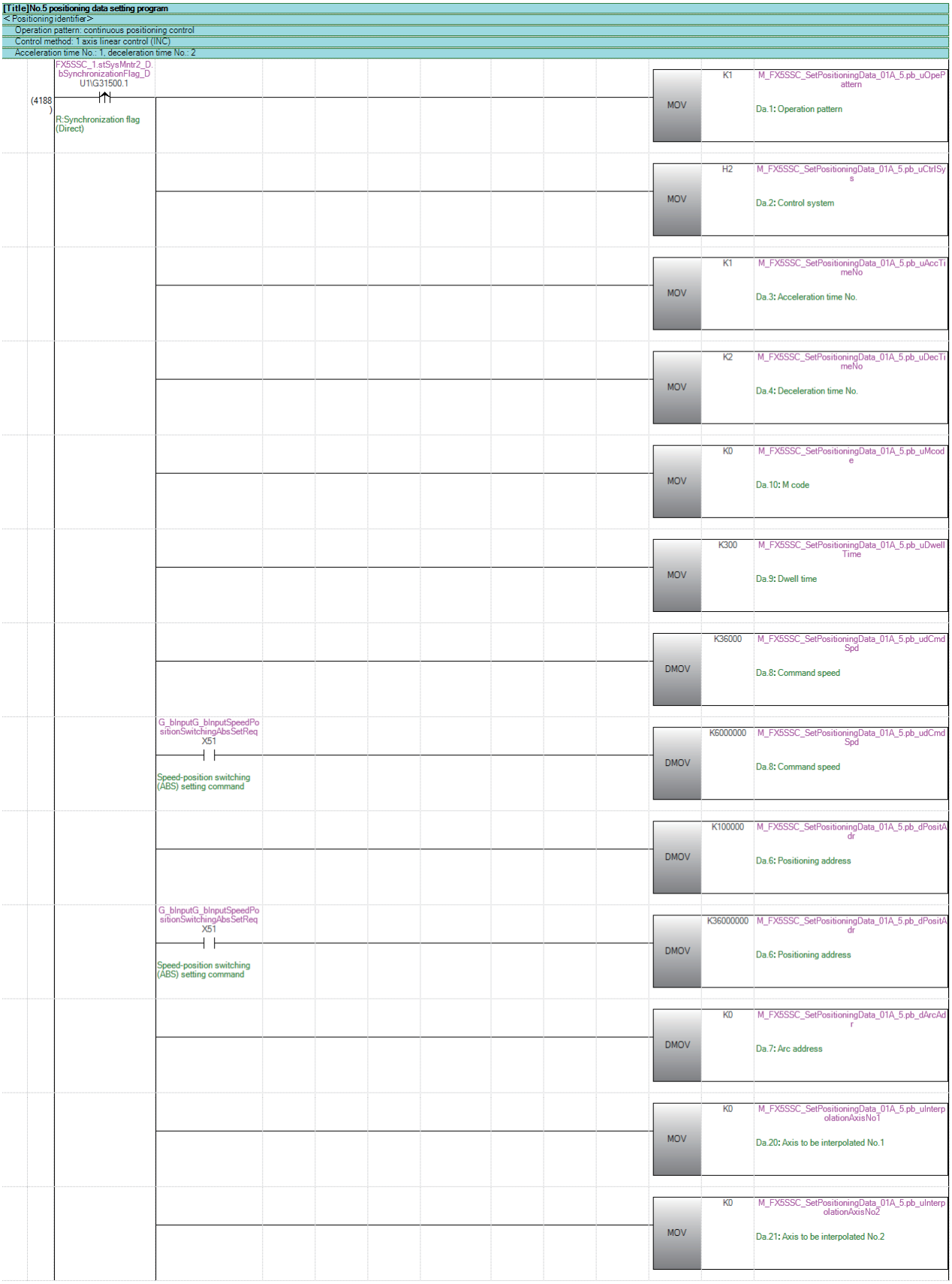

MOV
K0
M_FX5SSC_SetPositioningData_01A_3.pb_uInterpolationAxisNo3
Da.22: Axis to be interpolated No.3
SET
bSetPositioningData3_bEN
No.3 Execution command
(3248)
bSetPositioningData3_bEN
No.3 Execution command
M_FX5SSC_SetPositioningData_01A_3
(M+FX5SSC_SetPos...
Positioning data setting FB
B: i_bEN
Execution command
o_bENO :B
Execution status
FX5SSC_1
i_stModuleDUT: le
Module label
Module label
o_bOK :B
Normal completion
K1
UW: i_uAxis
Target axis
o_bErr :B
Error completion
K3
i_uDataNoUW: o
Data No.
o_uErrId :UW
Error code
pb_uOpePatt...
pb_uCtrlSys
pb_uAccTim...
pb_uDecTim...
pb_uMcode
pb_uDwellTi...
pb_udCmdS...
pb_dPositAdr
pb_dArcAdr
pb_uInterpol...
pb_uInterpol...
pb_uInterpol...

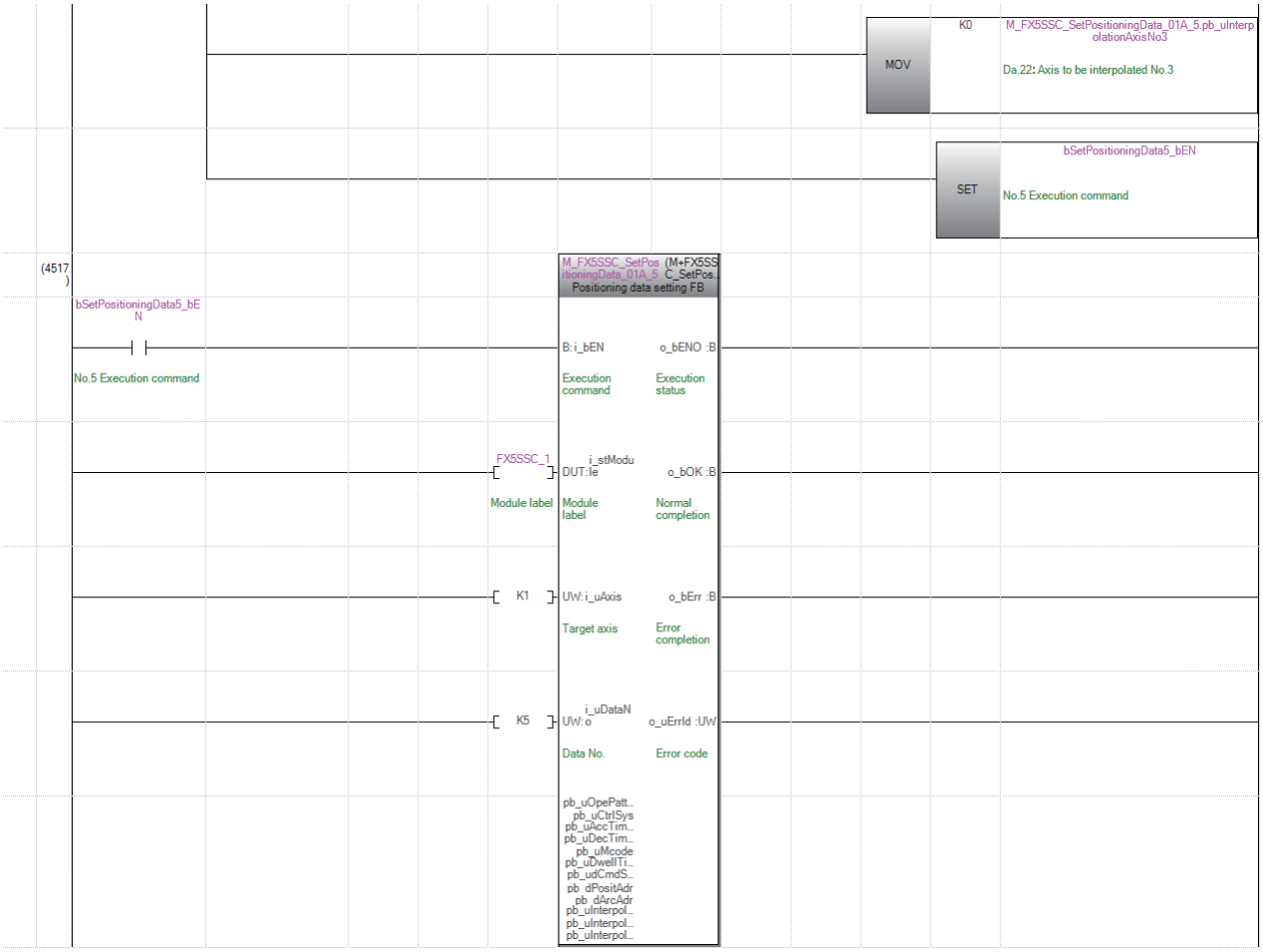
■No.4 positioning data setting program



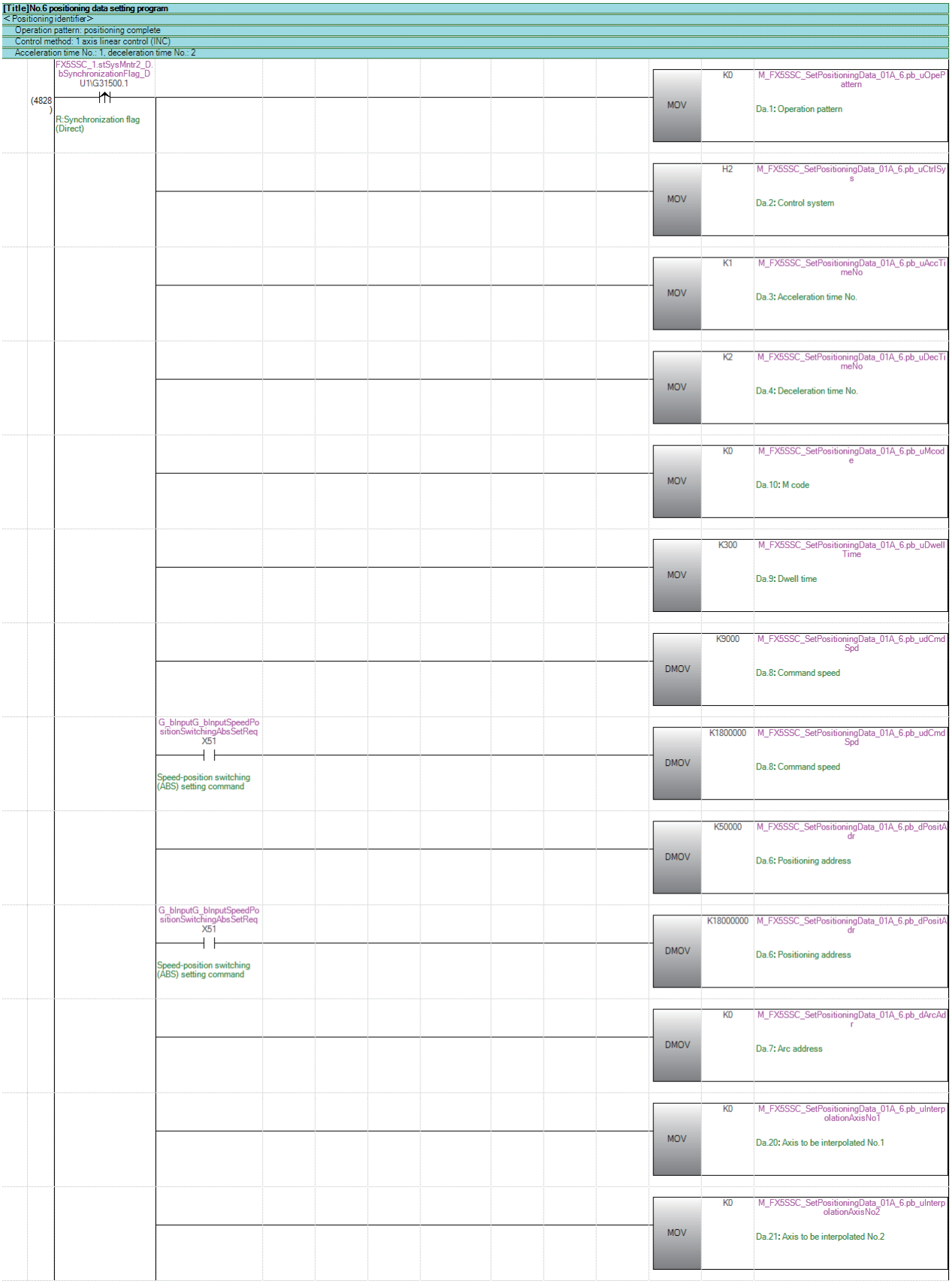

MOV
K0
M_FX5SSC_SetPositioningData_01A_4.pb_uInterpolationAxisNo3
Da.22: Axis to be interpolated No.3
SET
bSetPositioningData4_bEN
No.4 Execution command
(3877)
bSetPositioningData4_bEN
No.4 Execution command
M_FX5SSC_SetPositioningData_01A_4
(M+FX5SSC_SetPos...
Positioning data setting FB
B: i_bEN
Execution command
o_bENO :B
Execution status
FX5SSC_1
Module label
i_stModuleDUT: le
Module label
o_bOK :B
Normal completion
K1
UW: i_uAxis
Target axis
o_bErr :B
Error completion
K4
i_uDataNoUW: o
Data No.
o_uErrId :UW
Error code
pb_uOpePatt...
pb_uCtrlSys
pb_uAccTim...
pb_uDecTim...
pb_uMcode
pb_uDwellTi...
pb_udCmdS...
pb_dPositAdr
pb_dArcAdr
pb_uInterpol...
pb_uInterpol...
pb_uInterpol...

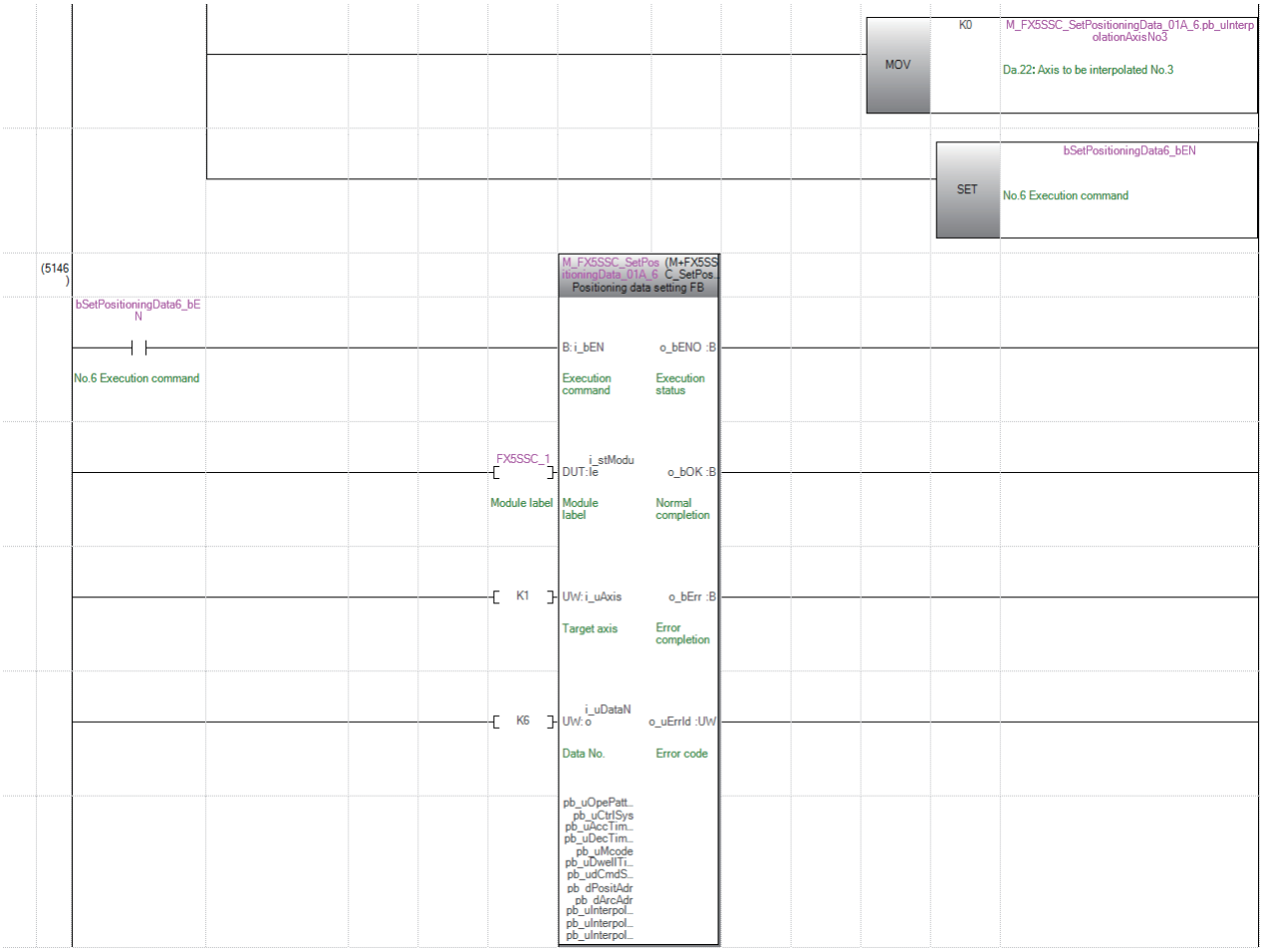
■No.5 positioning data setting program




MOV
K0
M_FX5SSC_SetPositioningData_01A_5.pb_uInterpolationAxisNo3
Da.22: Axis to be interpolated No.3
SET
bSetPositioningData5_bEN
No.5 Execution command
(4517)
bSetPositioningData5_bEN
No.5 Execution command
M_FX5SSC_SetPos (M+FX5SSC_SetPos_
itioningData_01A_5
Positioning data setting FB
B: i_bEN
Execution command
o_bENO :B
Execution status
FX5SSC_1
Module label
i_stModuleDUT: le
Module label
o_bOK :B
Normal completion
K1
UW: i_uAxis
Target axis
o_bErr :B
Error completion
K5
i_uDataNoUW: o
Data No.
o_uErrId :UW
Error code
pb_uOpePatt...
pb_uCtrlSys
pb_uAccTim...
pb_uDecTim...
pb_uMcode
pb_uDwellTi...
pb_udCmdS...
pb_dPositAdr
pb_dArcAdr
pb_uInterpol...
pb_uInterpol...
pb_uInterpol...

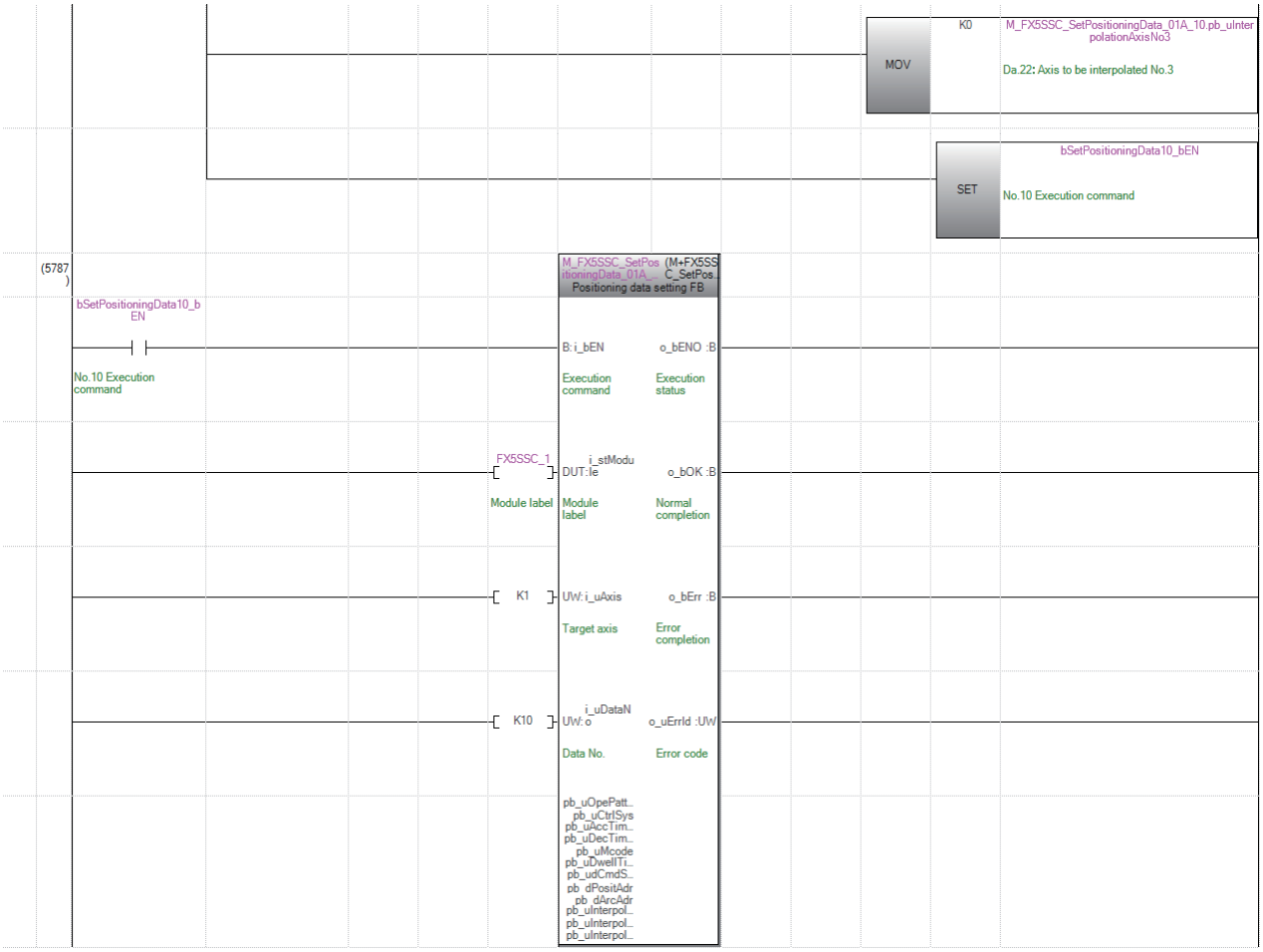
■No.6 positioning data setting program



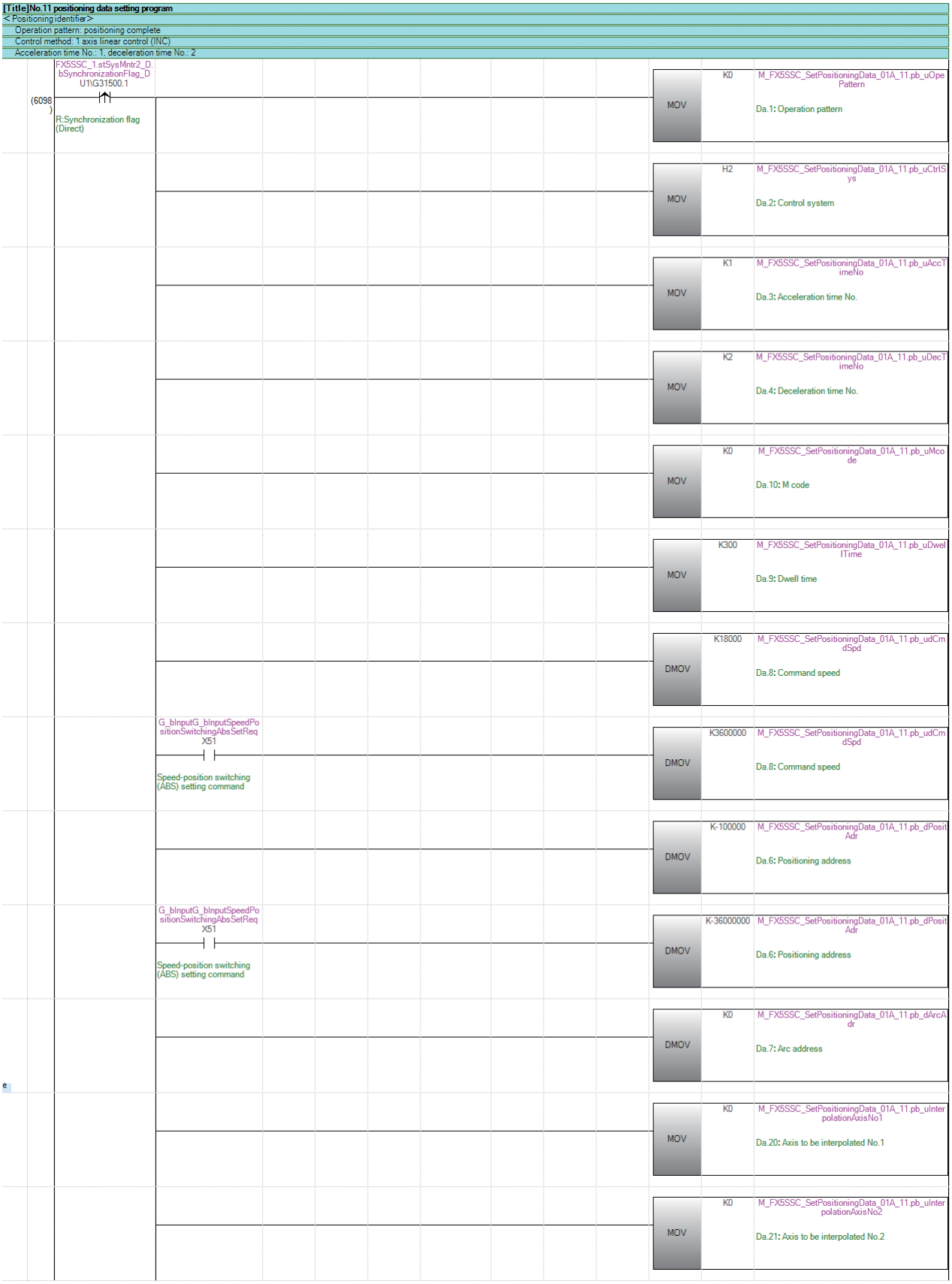

MOV
K0
M_FX5SSC_SetPositioningData_01A_6.pb_uInterpolationAxisNo3
Da.22: Axis to be interpolated No.3
SET
bSetPositioningData6_bEN
No.6 Execution command
(5146)
bSetPositioningData6_bEN
No.6 Execution command
M_FX5SSC_SetPositioningData_01A_6
(M+FX5SSC_SetPos...
Positioning data setting FB
B: i_bEN
Execution command
o_bENO :B
Execution status
FX5SSC_1
i_stModuleDUT: le
Module label
Module label
o_bOK :B
Normal completion
K1
UW: i_uAxis
Target axis
o_bErr :B
Error completion
K6
i_uDataNoUW: o
Data No.
o_uErrId :UW
Error code
pb_uOpePatt...
pb_uCtrlSys
pb_uAccTim...
pb_uDecTim...
pb_uMcode
pb_uDwellTi...
pb_udCmdS...
pb_dPositAdr
pb_dArcAdr
pb_uInterpol...
pb_uInterpol...
pb_uInterpol...

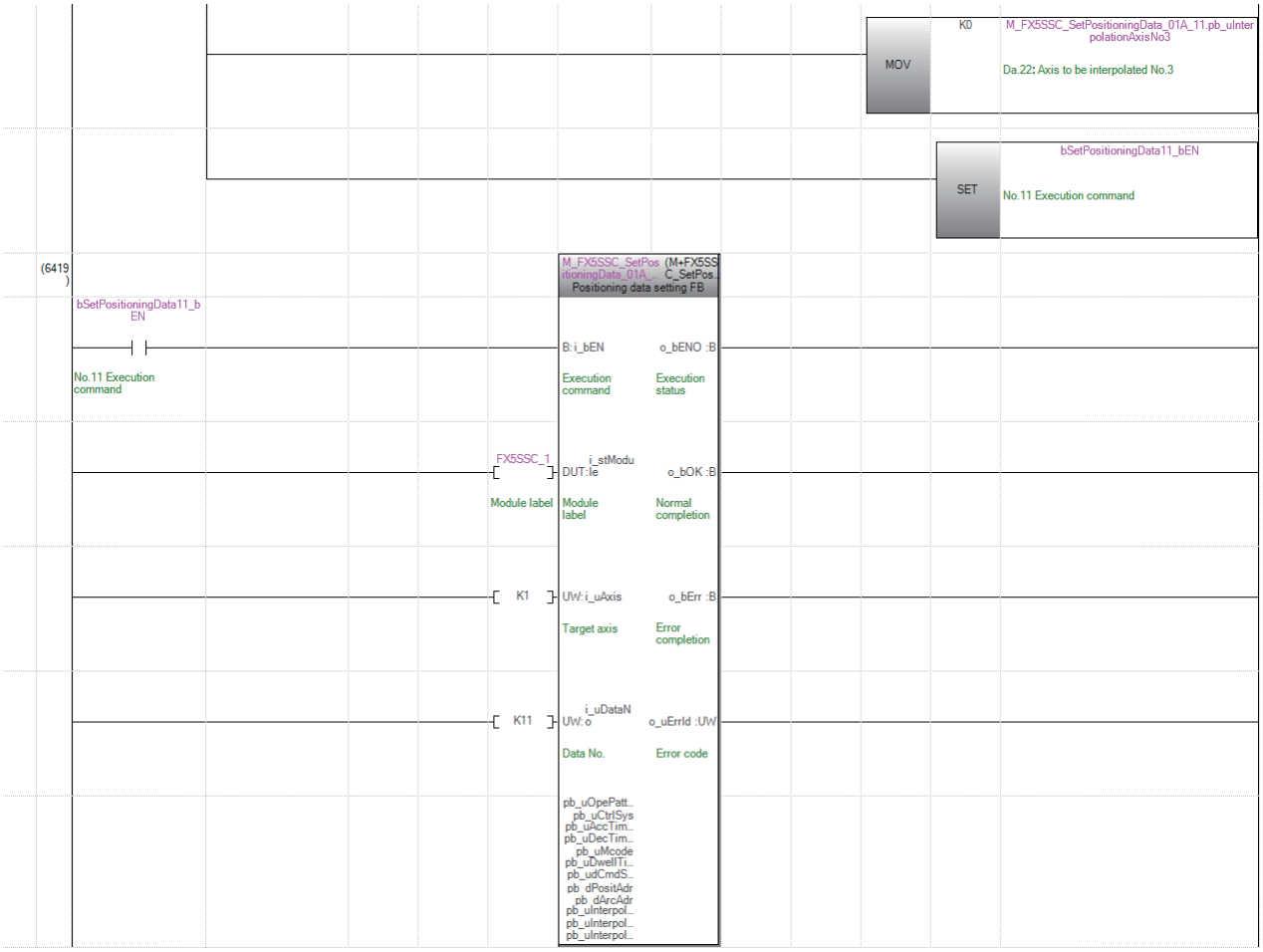
■No.10 positioning data setting program




MOV
K0
M_FX5SSC_SetPositioningData_01A_10.pb_uInterpolationAxisNo3
Da.22: Axis to be interpolated No.3
SET
bSetPositioningData10_bEN
No.10 Execution command
(5787)
bSetPositioningData10_bEN
No.10 Execution command
M_FX5SSC_SetPositioningData_01A_... (M+FX5SSC_SetPos...
Positioning data setting FB
B: i_bEN
Execution command
o_bENO :B
Execution status
FX5SSC_1
Module label
i_stModuleDUT: le
Module label
o_bOK :B
Normal completion
K1
UW: i_uAxis
Target axis
o_bErr :B
Error completion
K10
i_uDataNoUW: o
Data No.
o_uErrId :UW
Error code
pb_uOpePatt...
pb_uCtrlSys
pb_uAccTim...
pb_uDecTim...
pb_uMcode
pb_uDwellTi...
pb_udCmdS...
pb_dPositAdr
pb_dArcAdr
pb_uInterpol...
pb_uInterpol...
pb_uInterpol...

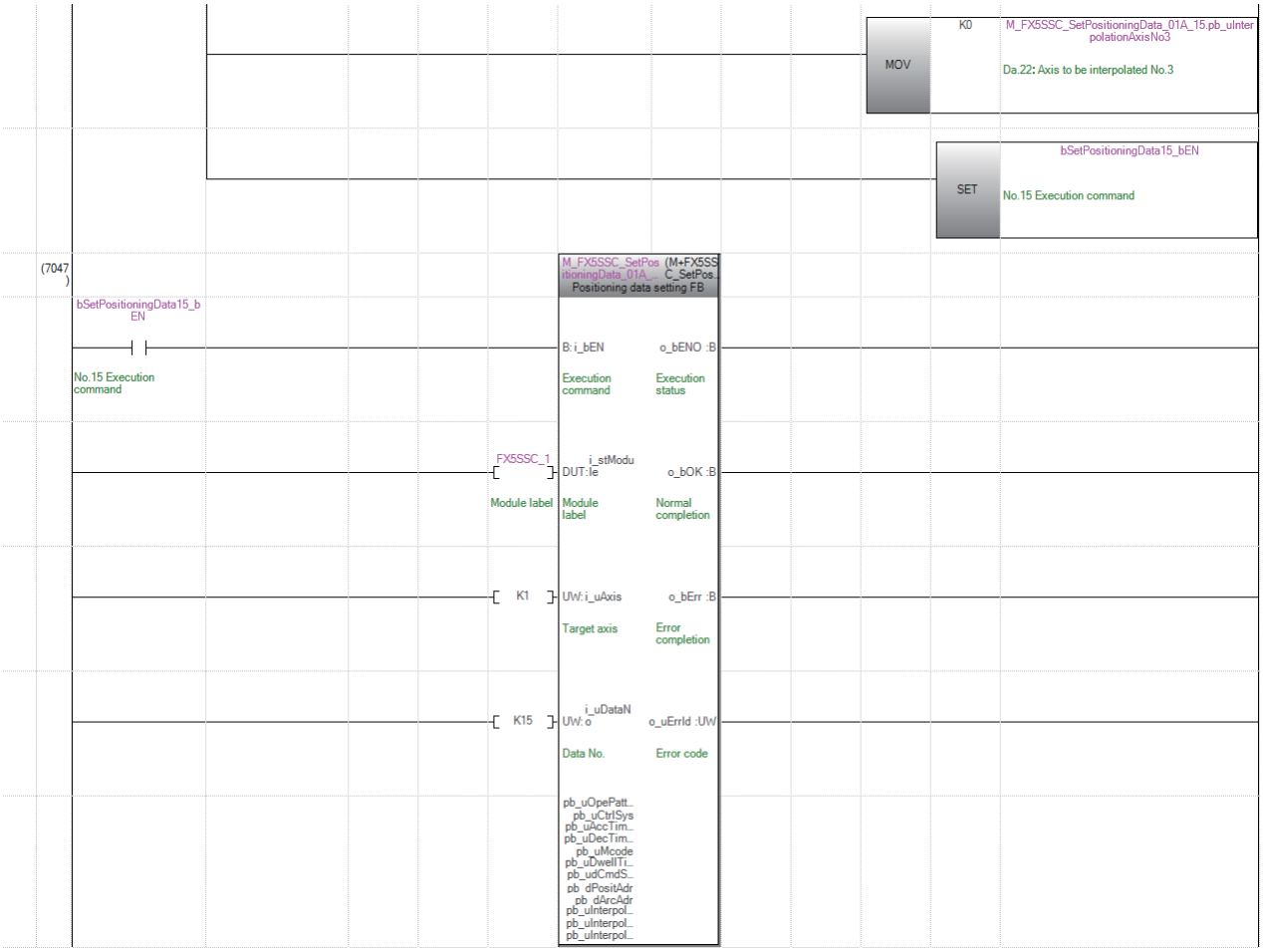
■No.11 positioning data setting program




MOV
K0
M_FX5SSC_SetPositioningData_01A_11.pb_uInterpolationAxisNo3
Da.22: Axis to be interpolated No.3
SET
bSetPositioningData11_bEN
No.11 Execution command
(6419)
bSetPositioningData11_bEN
No.11 Execution command
M_FX5SSC_SetPositioningData_01A_... (M+FX5SSC_SetPos...
Positioning data setting FB
B: i_bEN
Execution command
o_bENO :B
Execution status
FX5SSC_1
Module label
i_stModuleDUT: le
Module label
o_bOK :B
Normal completion
K1
UW: i_uAxis
Target axis
o_bErr :B
Error completion
K11
i_uDataNoUW: o
Data No.
o_uErrId :UW
Error code
pb_uOpePatt...
pb_uCtrlSys
pb_uAccTim...
pb_uDecTim...
pb_uMcode
pb_uDwellTi...
pb_udCmdS...
pb_dPositAdr
pb_dArcAdr
pb_uInterpol...
pb_uInterpol...
pb_uInterpol...

■No.15 positioning data setting program



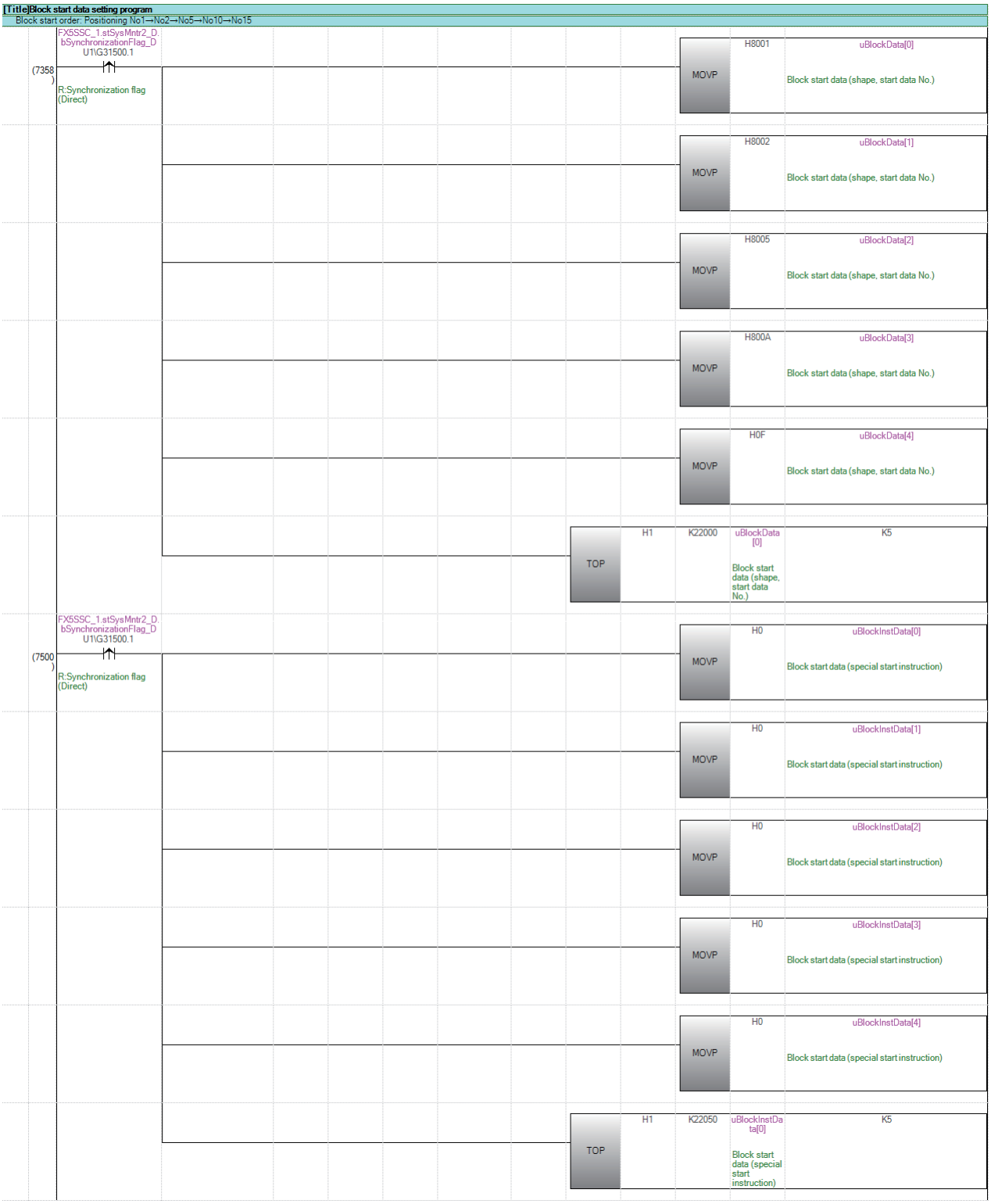

MOV
K0
M_FX5SSC_SetPositioningData_01A_15.pb_uInterpolationAxisNo3
Da.22: Axis to be interpolated No.3
SET
bSetPositioningData15_bEN
No.15 Execution command
(7047)
bSetPositioningData15_bEN
No.15 Execution command
M_FX5SSC_SetPositioningData_01A_... (M+FX5SSC_SetPos...
Positioning data setting FB
B: i_bEN
Execution command
o_bENO :B
Execution status
FX5SSC_1
Module label
i_stModuDUT: le
Module label
o_bOK :B
Normal completion
K1
UW: i_uAxis
Target axis
o_bErr :B
Error completion
K15
i_uDataNUW: o
Data No.
o_uErrId :UW
Error code
pb_uOpePatt...
pb_uCtrlSys
pb_uAccTim...
pb_uDecTim...
pb_uMcode
pb_uDwellTi...
pb_udCmdS...
pb_dPositAdr
pb_dArcAdr
pb_uInterpol...
pb_uInterpol...
pb_uInterpol...

Block start data setting program

This program is not required when the data is set by "Block Start Data" using an engineering tool.

Set the local labels as follows.

	Label Name	Data Type		Class
1	uBlockData	Word [Unsigned]/Bit String [16-bit](0..4)	...	VAR
2	uBlockInstData	Word [Unsigned]/Bit String [16-bit](0..4)	...	VAR

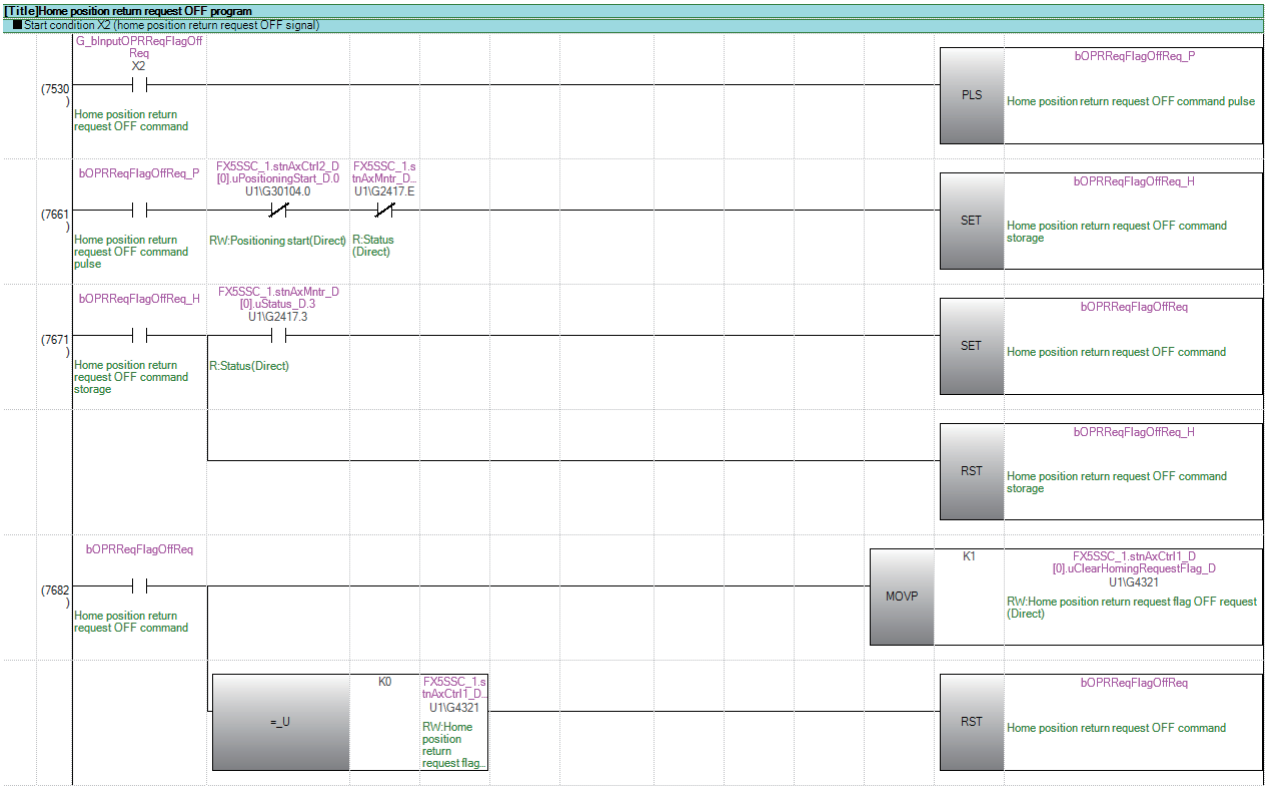


Home position return request OFF program

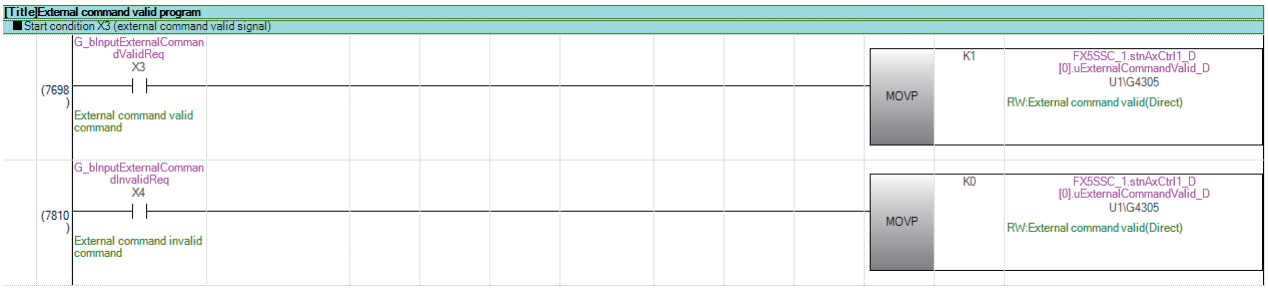
This program is not required when "1: Positioning control is executed." is set in "[Pr.55] Operation setting for incompletion of home position return" by "Home Position Return Detailed Parameters" using an engineering tool.

Set the local labels as follows.

	Label Name	Data Type		Class
1	bOPRReqFlagOffReq_P	Bit	...	VAR
2	bOPRReqFlagOffReq_H	Bit	...	VAR
3	bOPRReqFlagOffReq	Bit	...	VAR



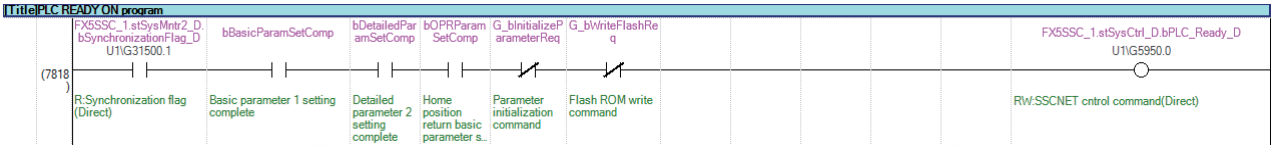
External command function valid setting program



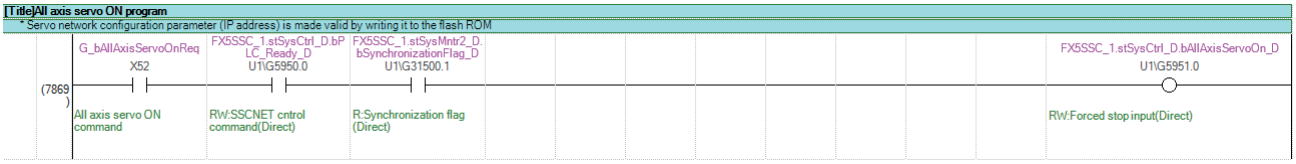
PLC READY signal ON program

Set the local labels as follows.

	Label Name	Data Type		Class
1	bBasicParamSetComp	Bit	...	VAR
2	bDetailedParamSetComp	Bit	...	VAR
3	bOPRParamSetComp	Bit	...	VAR



All axis servo ON program

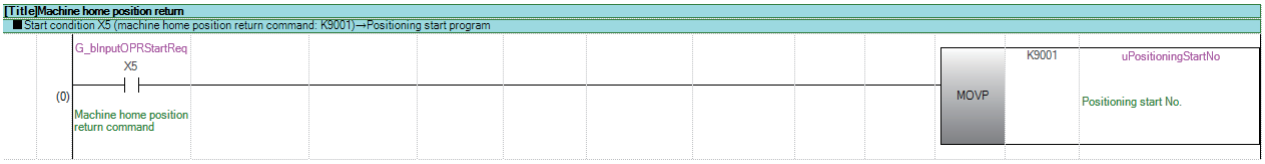


Positioning start No. setting program

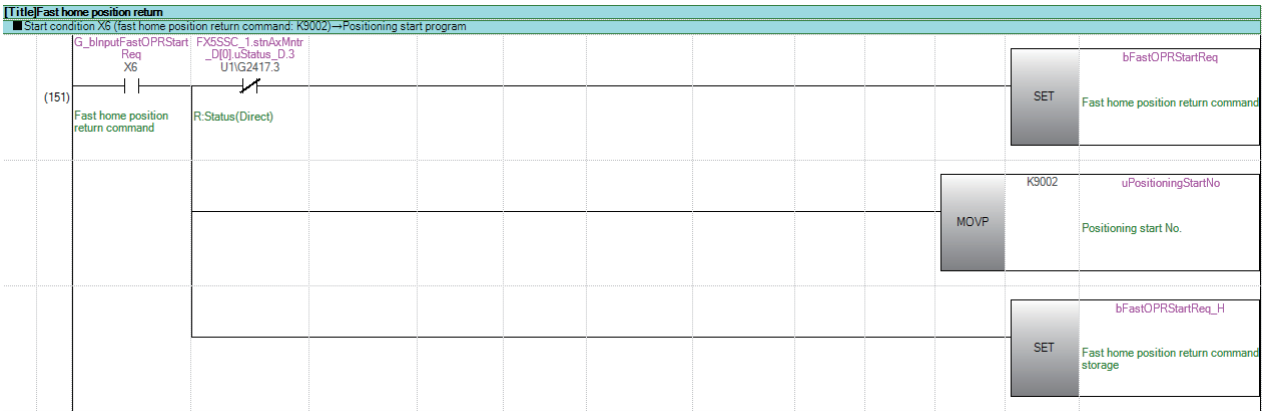
Set the local labels as follows.

	Label Name	Data Type		Class
1	uPositioningStartNo	Word [Signed]	...	VAR
2	bFastOPRStartReq	Bit	...	VAR
3	bFastOPRStartReq_H	Bit	...	VAR
4	bPositioningStartReq	Bit	...	VAR
5	udMovementAmount	Double Word [Unsigned]/Bit String [32-bit]	...	VAR
6	udSpeed	Double Word [Signed]	...	VAR
7	bInputSpeedPositionSwitching	Bit	...	VAR

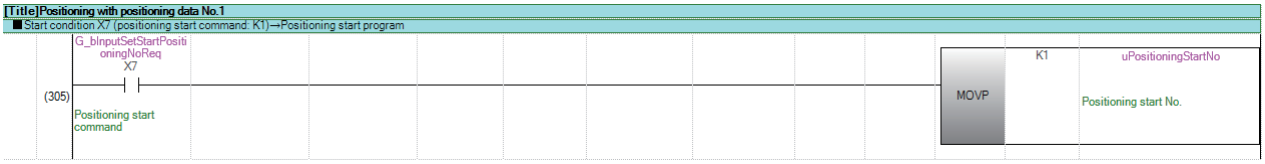
■Machine home position return



■Fast home position return

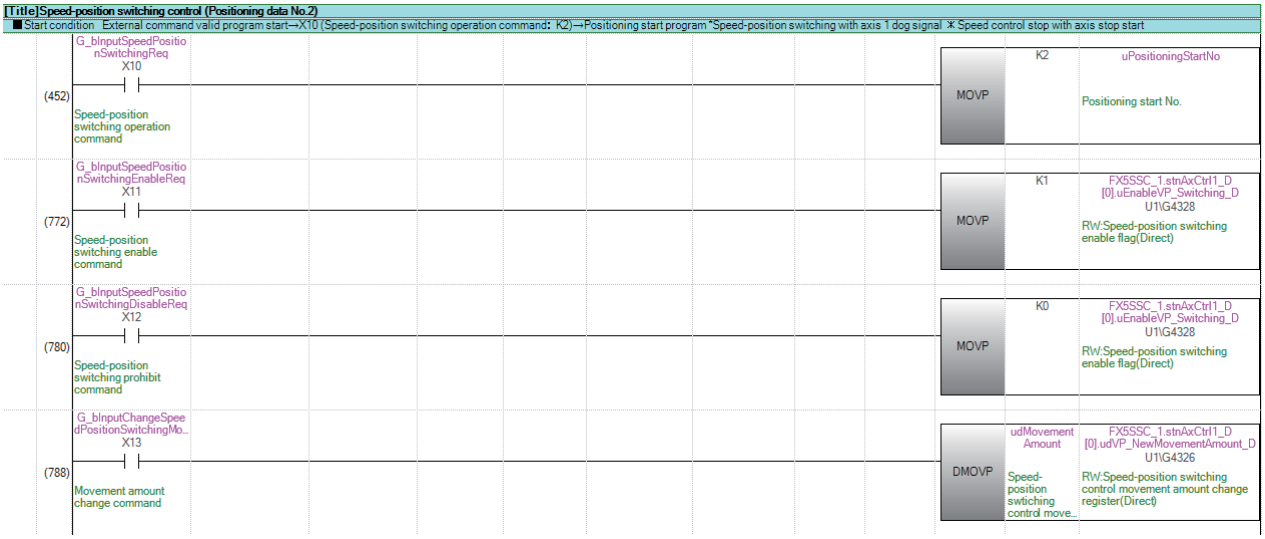


■Positioning with positioning data No.1

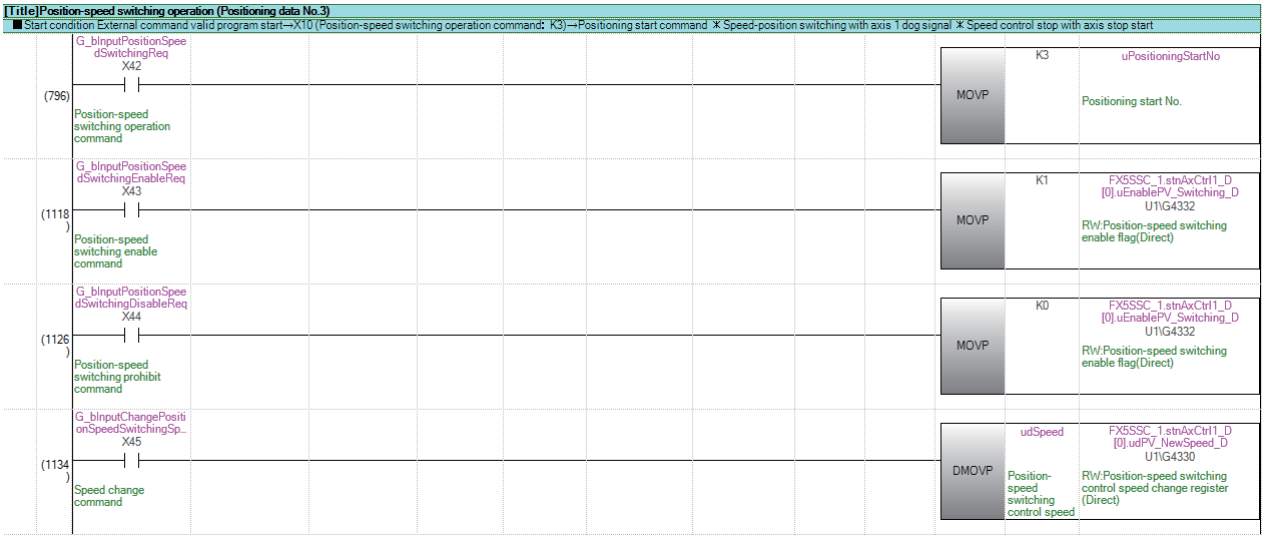


■Speed-position switching operation (Positioning data No.2)

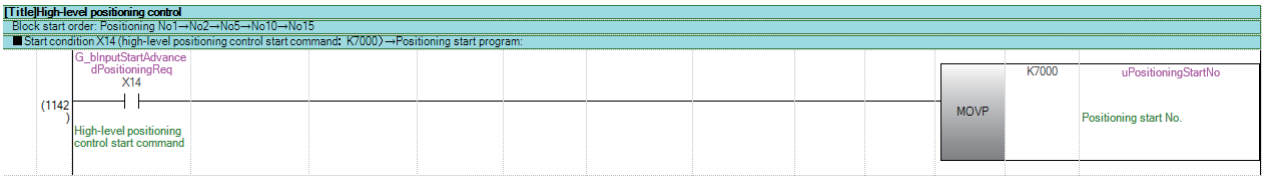
In the ABS mode, new movement amount is not needed to be written.



■Position-speed switching operation (Positioning data No.3)

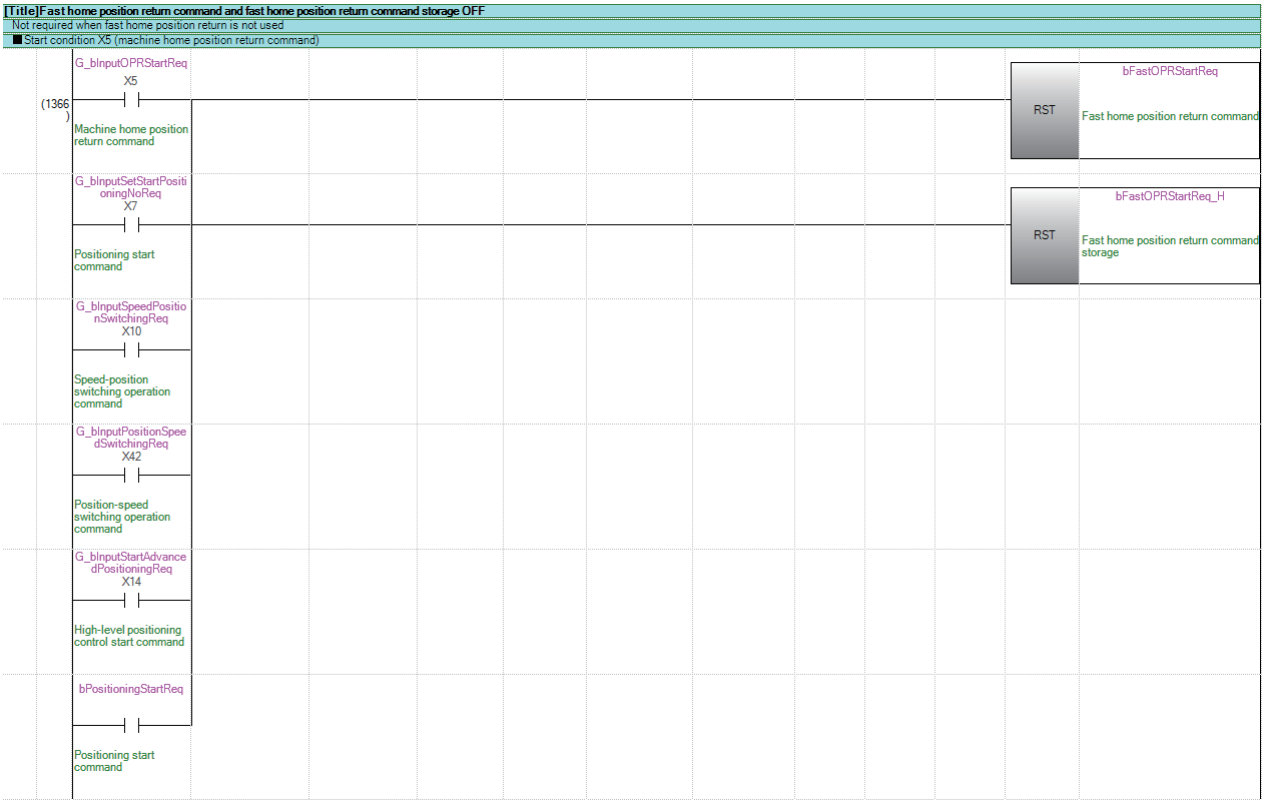


■High-level positioning control



■Fast home position return command and fast home position return command storage OFF

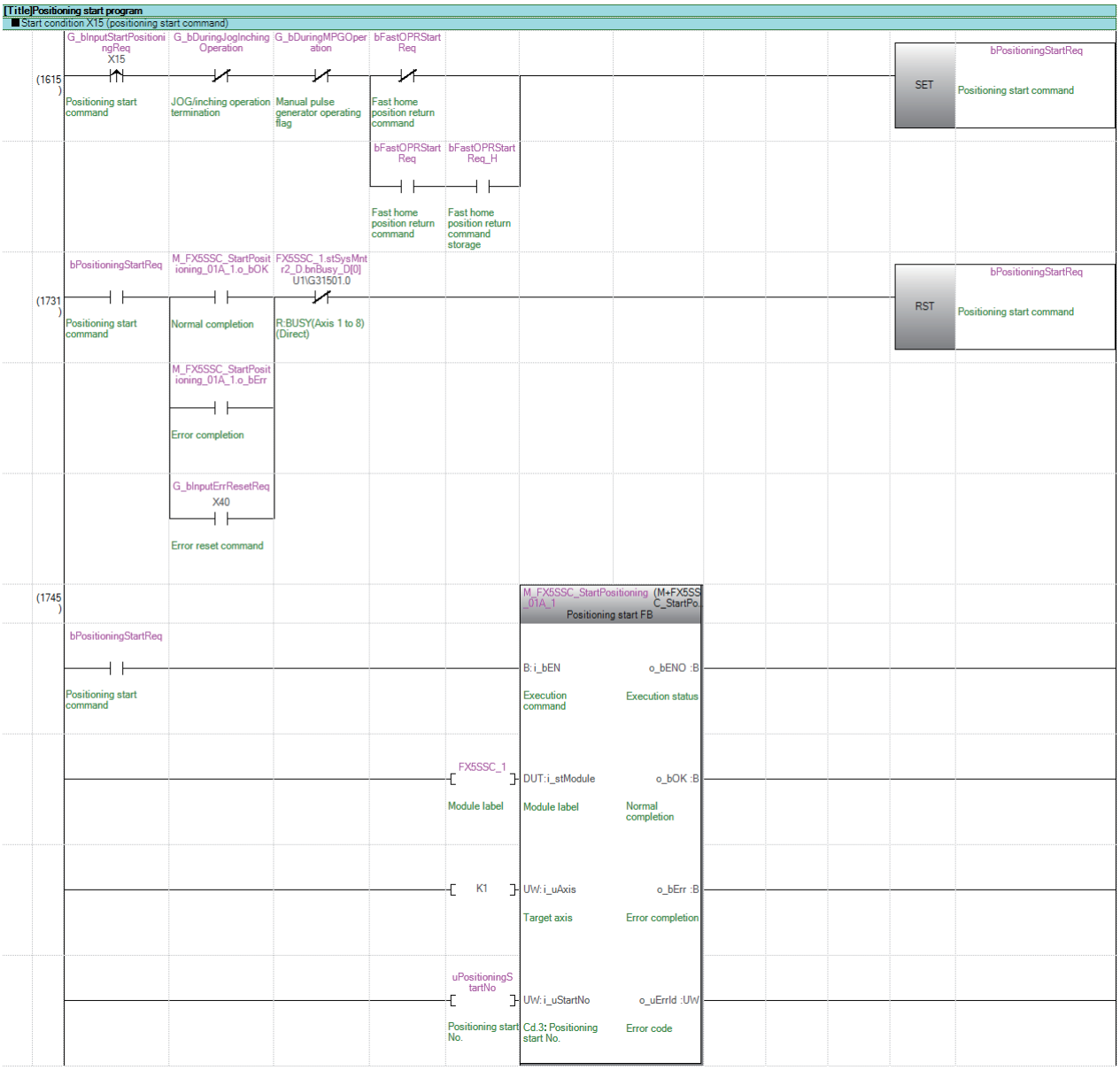
Not required when fast home position return is not used.



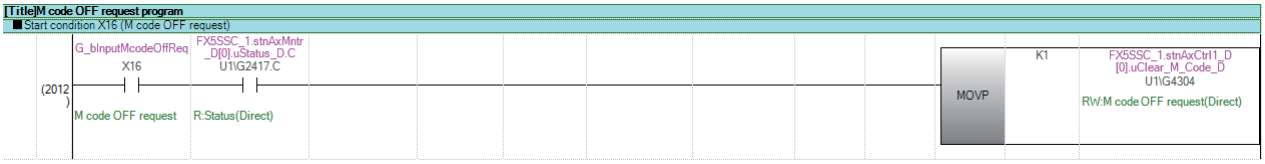
Positioning start program

Set the local labels as follows.

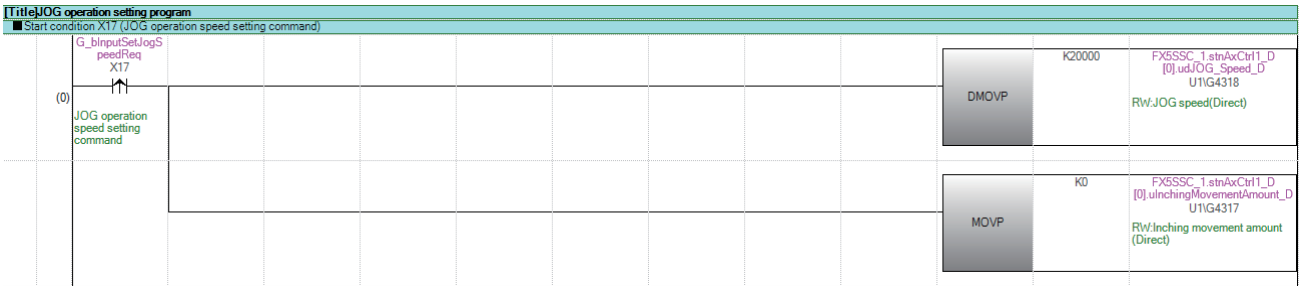
	Label Name	Data Type		Class
1	uPositioningStartNo	Word [Signed]	...	VAR
2	bFastOPRStartReq	Bit	...	VAR
3	bFastOPRStartReq_H	Bit	...	VAR
4	bPositioningStartReq	Bit	...	VAR



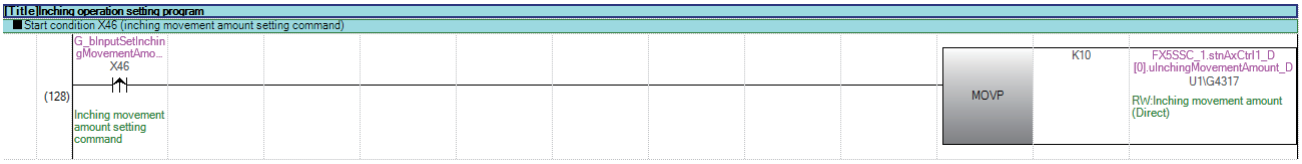
M code OFF program



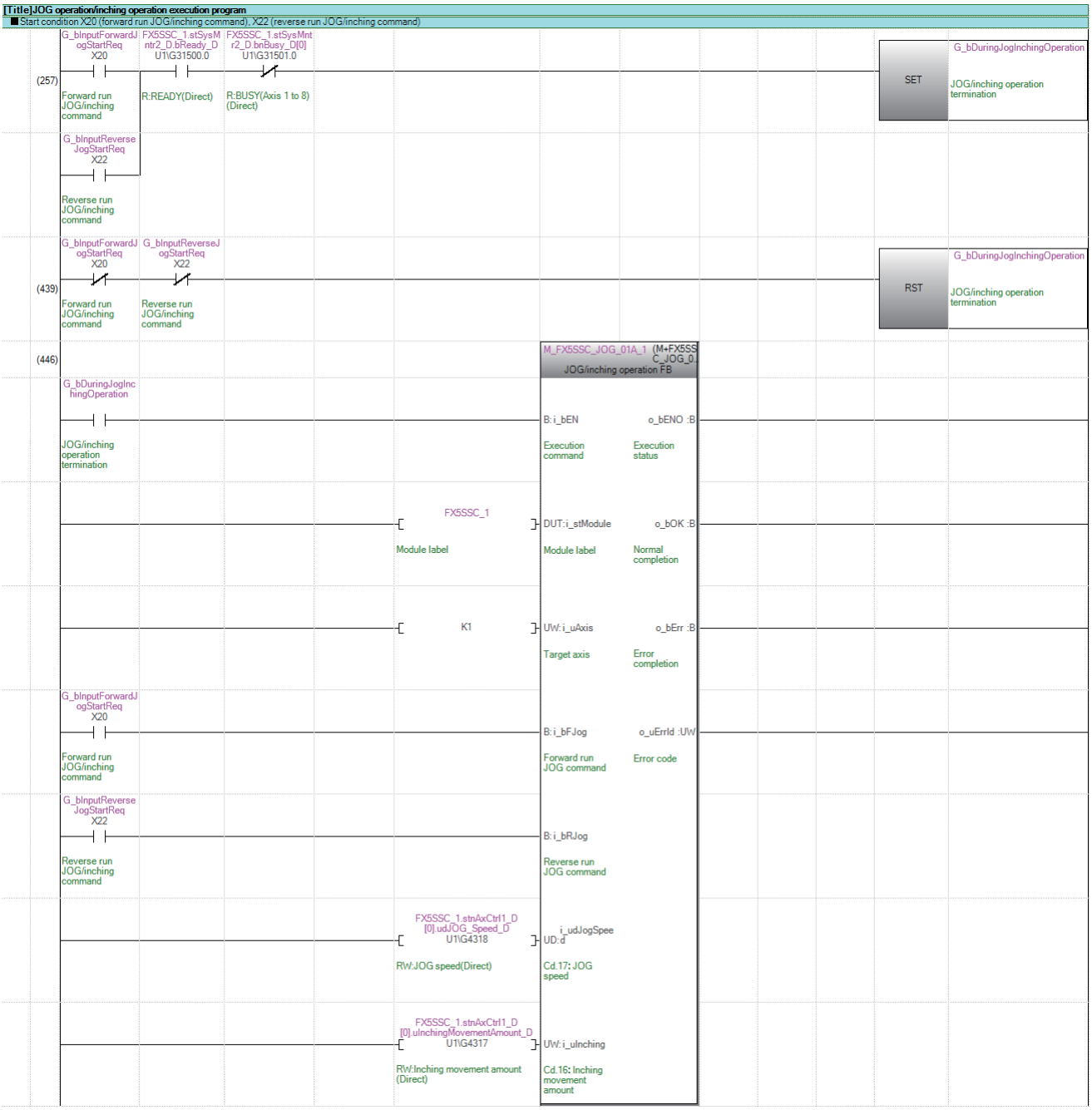
JOG operation setting program



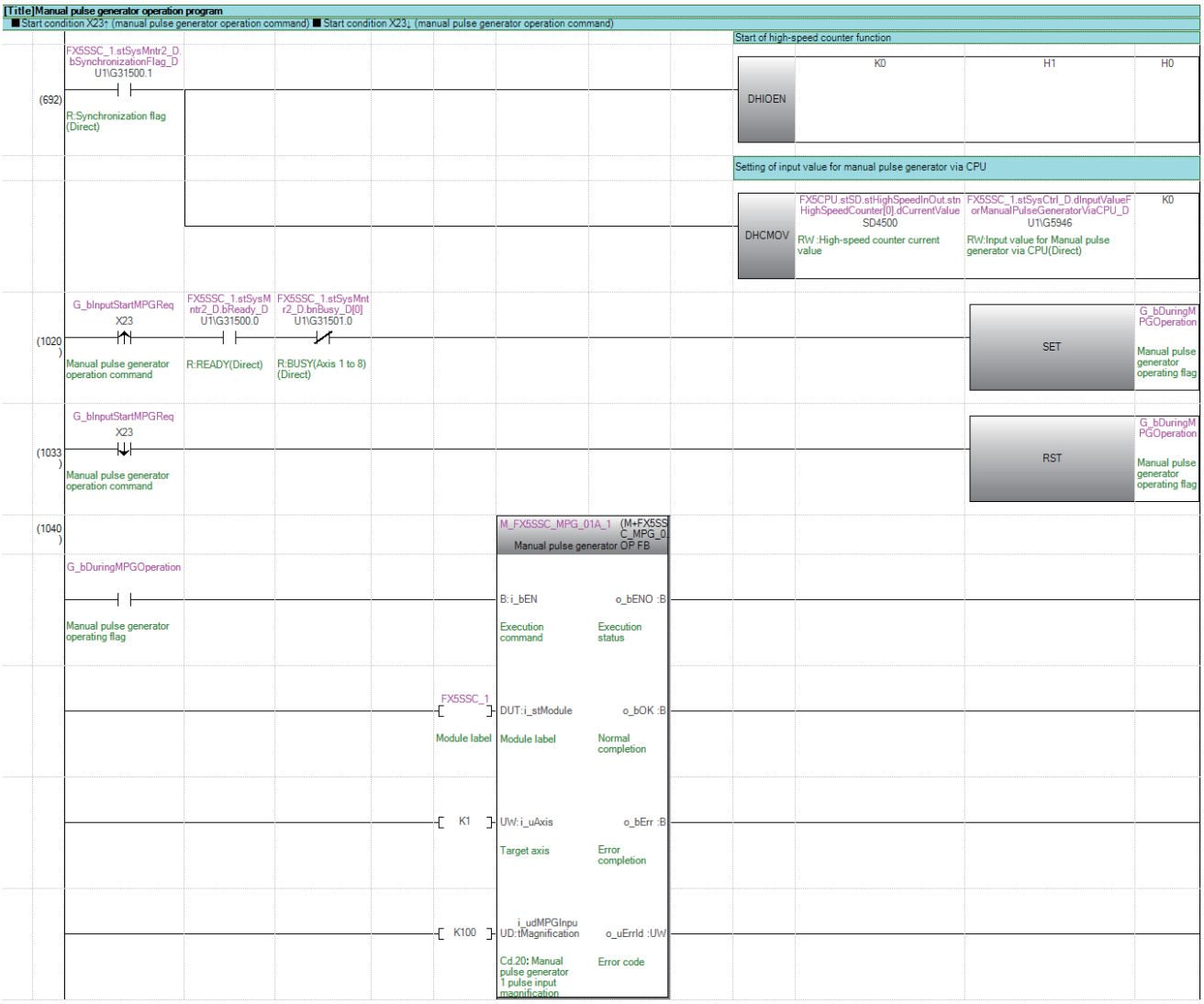
Inching operation setting program



JOG operation/inching operation execution program



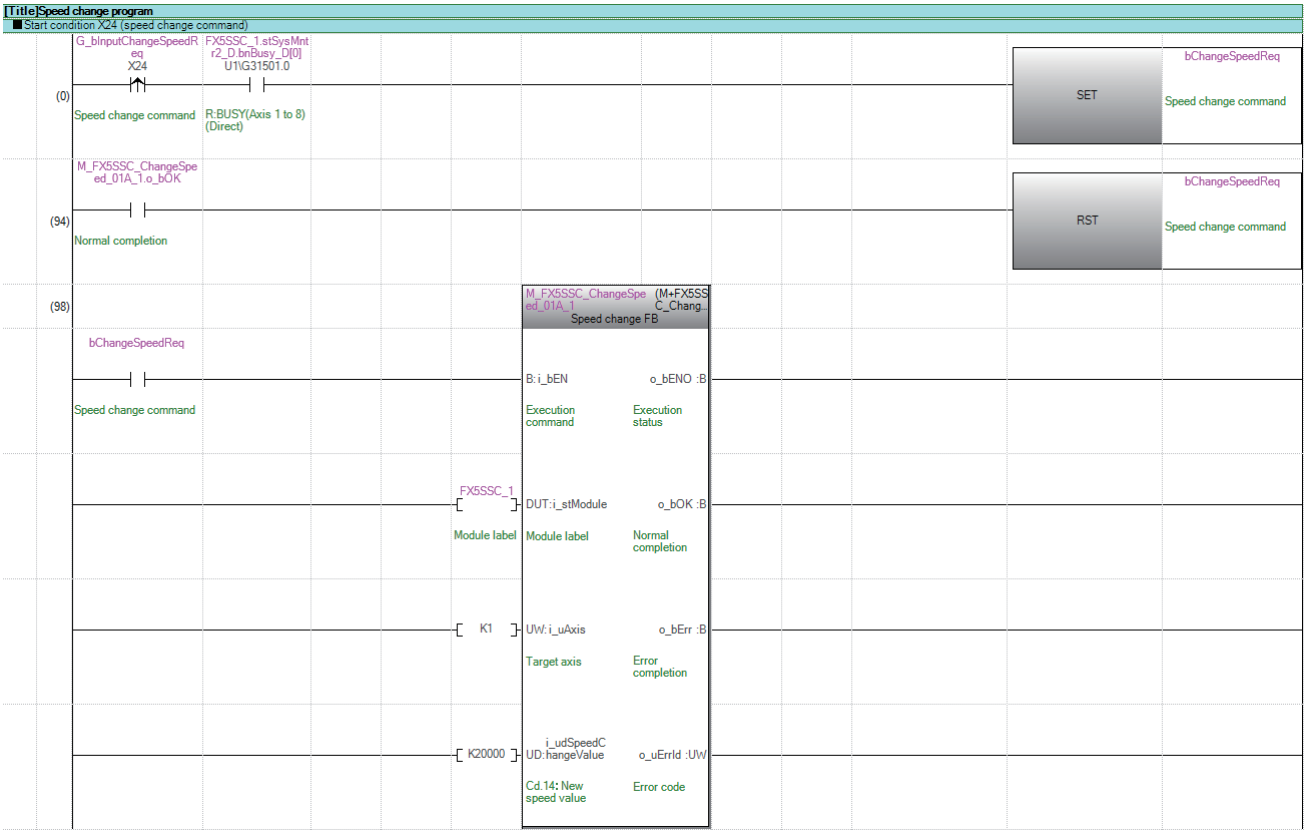
Manual pulse generator operation program



Speed change program

Set the local labels as follows.

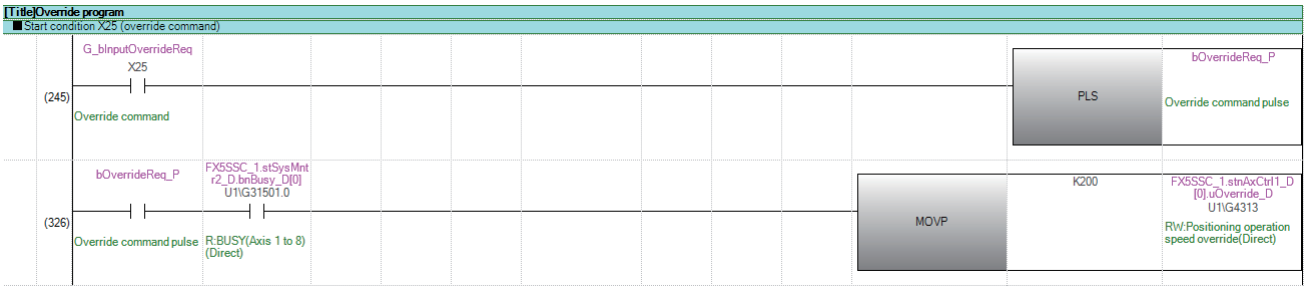
	Label Name	Data Type		Class
1	bChangeSpeedReq	Bit	...	VAR



Override program

Set the local labels as follows.

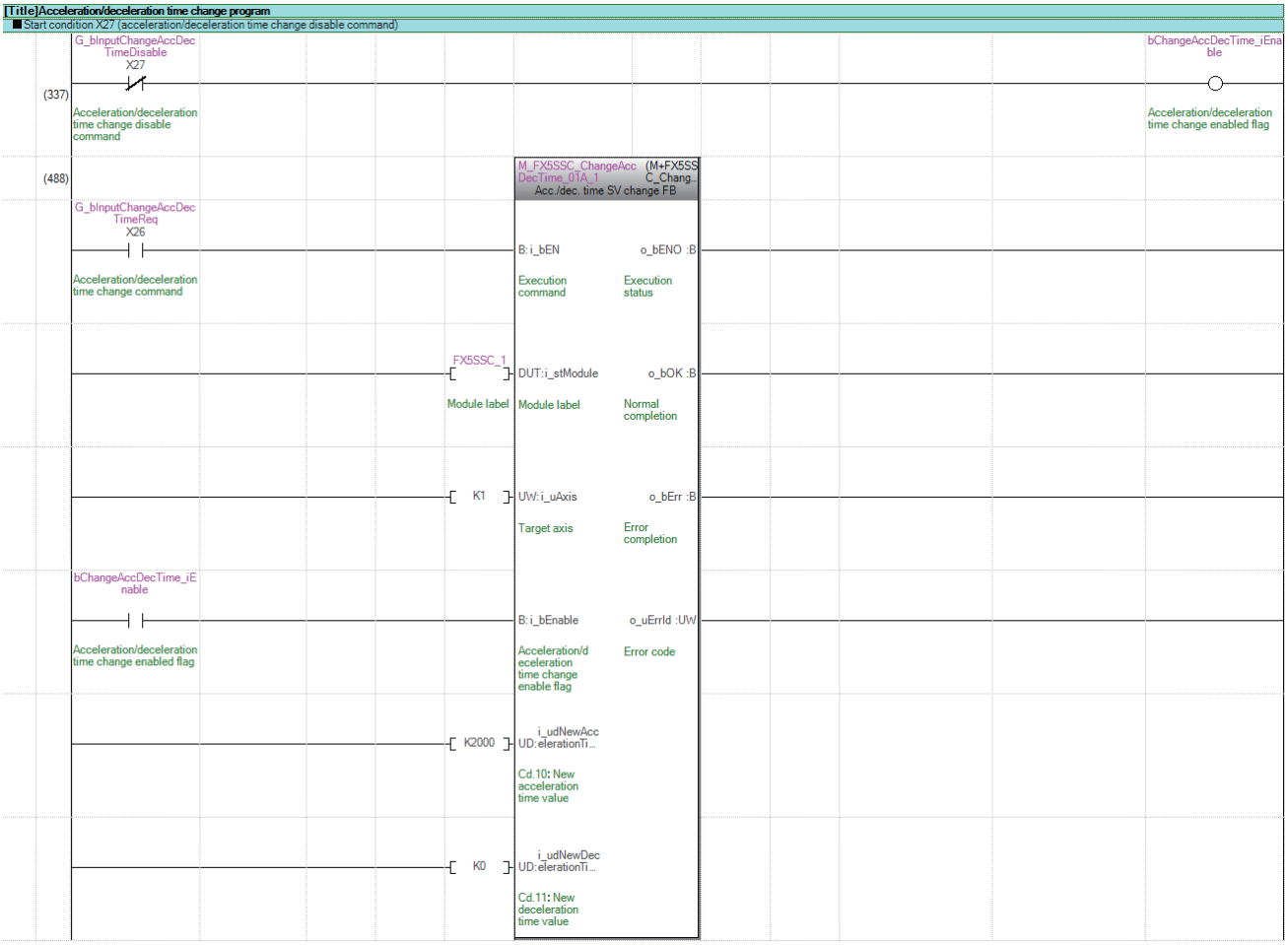
	Label Name	Data Type		Class
1	bOverrideReq_P	Bit	...	VAR



Acceleration/deceleration time change program

Set the local labels as follows.

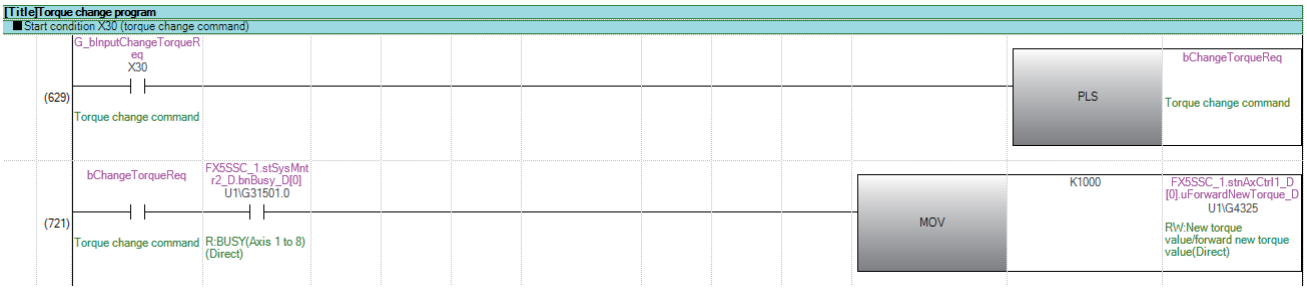
	Label Name	Data Type		Class
1	bChangeAccDecTime_iEnable	Bit	...	VAR



Torque change program

Set the local labels as follows.

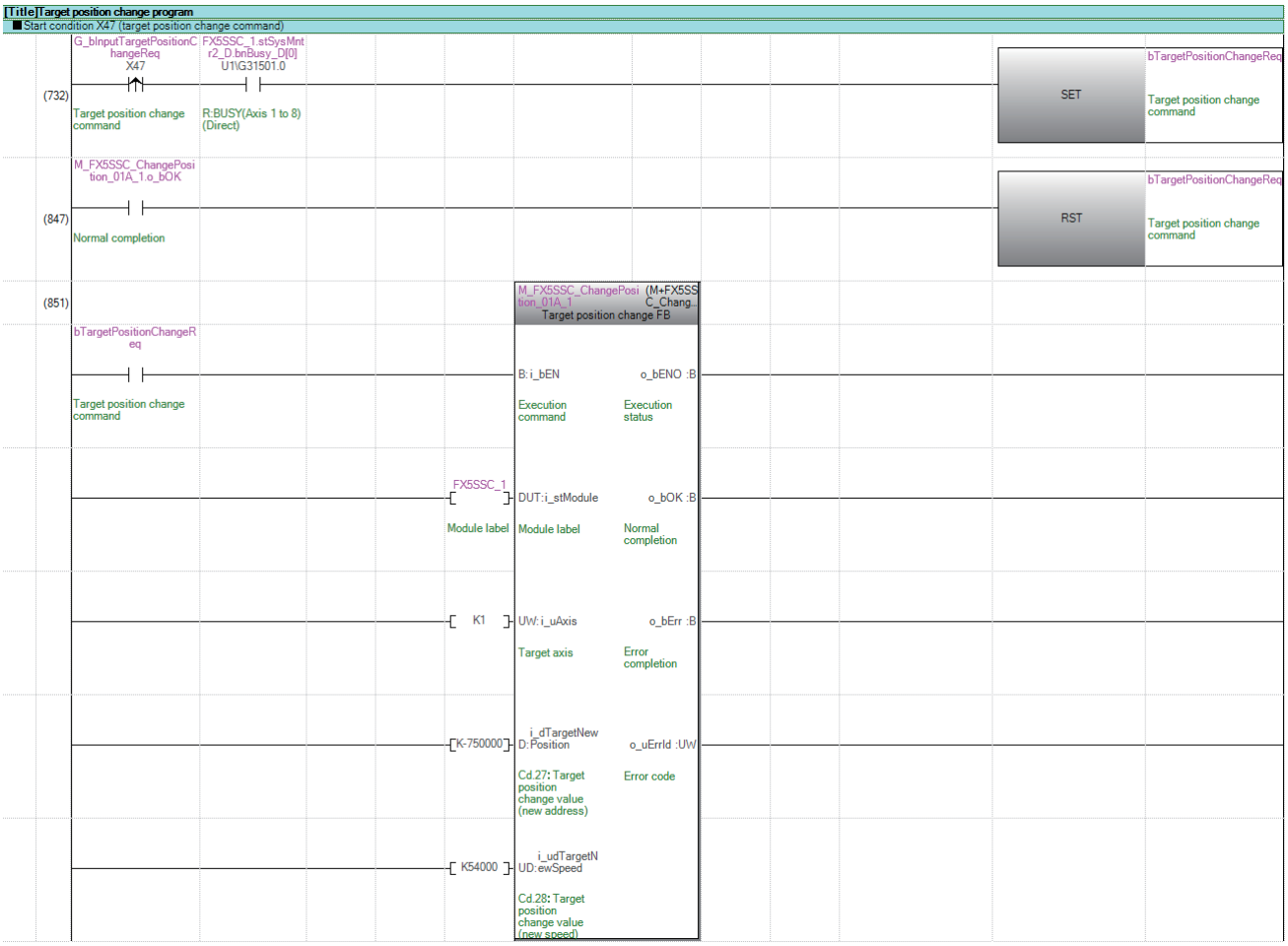
	Label Name	Data Type		Class
1	bChangeTorqueReq	Bit	...	VAR



Target position change program

Set the local labels as follows.

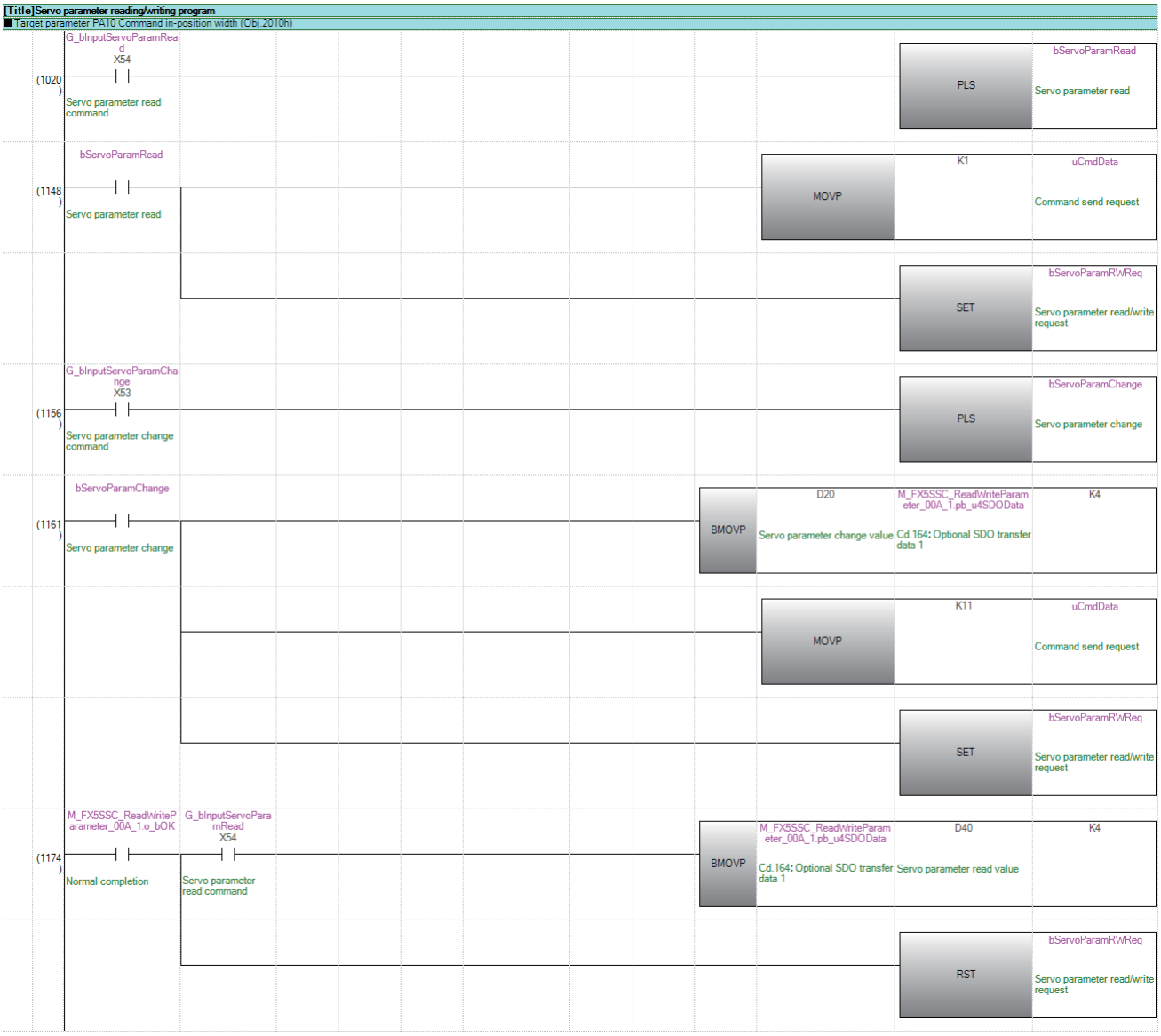
	Label Name	Data Type		Class
1	bTargetPositionChangeReq	Bit	...	VAR

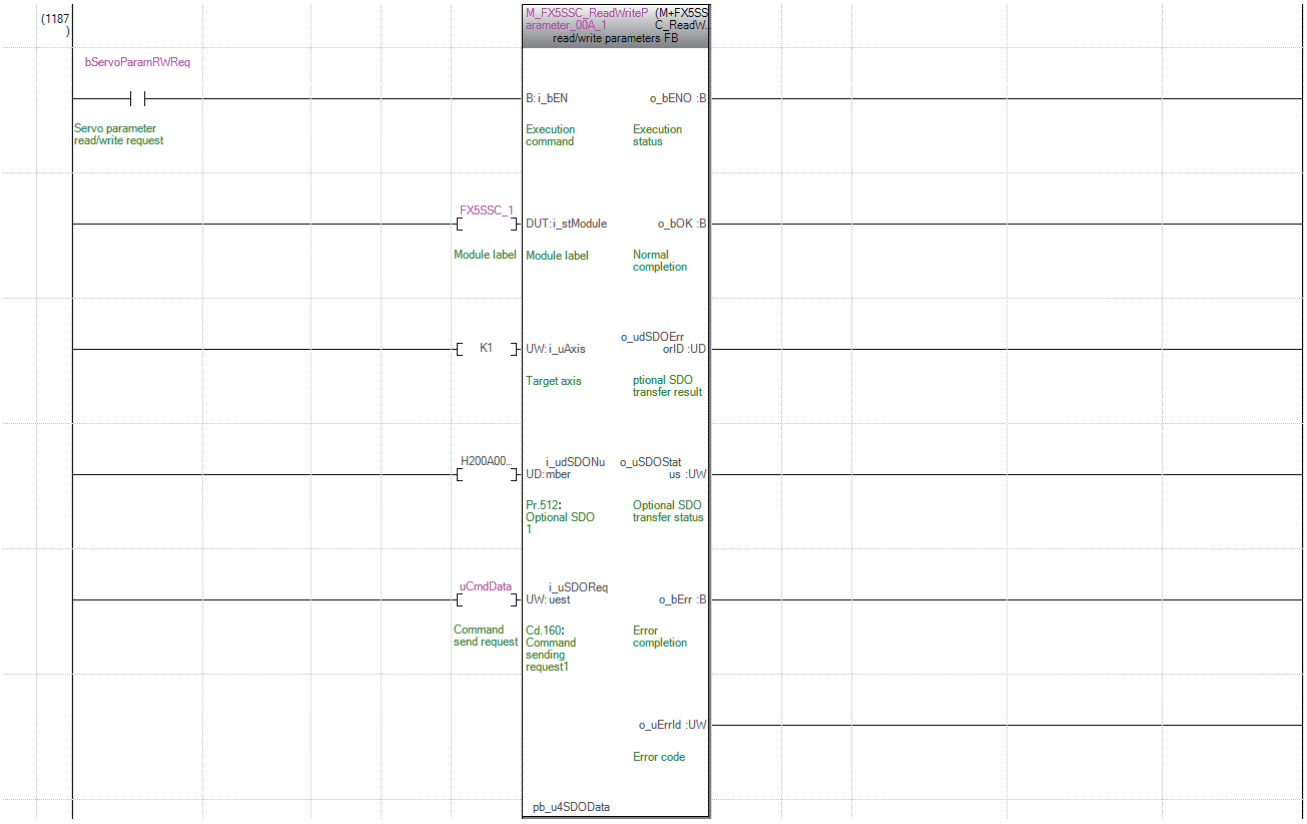


Servo parameter reading/writing program

Set the local labels as follows.

	Label Name	Data Type		Class
1	bServoParamRWReq	Bit	...	VAR
2	uCmdData	Word [Unsigned]/Bit String [16-bit]	...	VAR
3	bServoParamChange	Bit	...	VAR
4	bServoParamRead	Bit	...	VAR

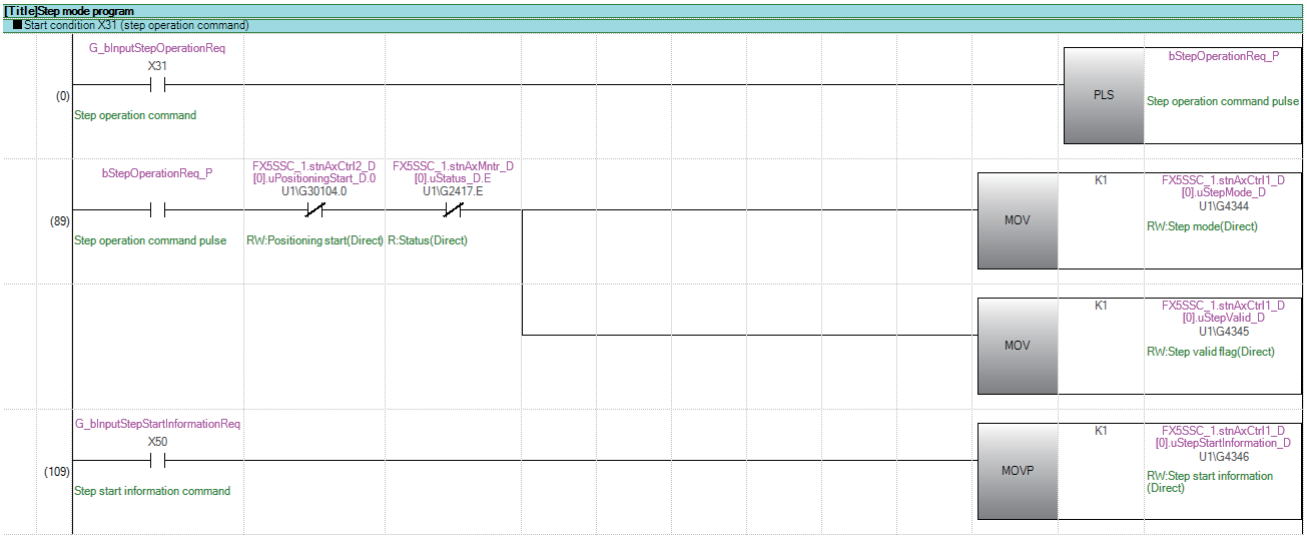




Step operation program

Set the local labels as follows.

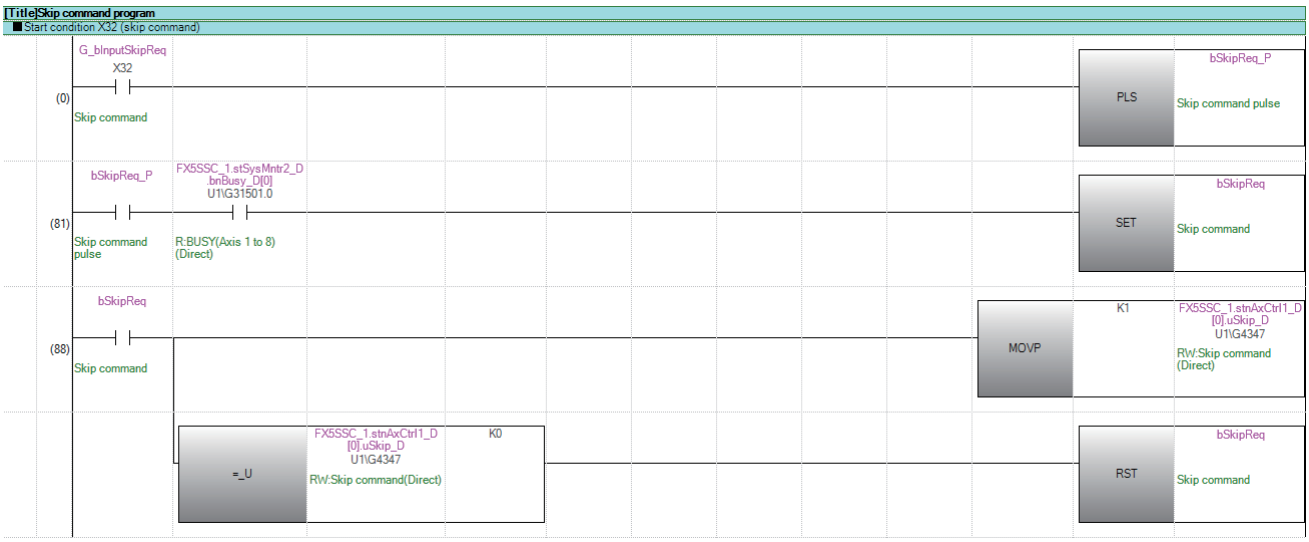
	Label Name	Data Type		Class
1	bStepOperationReq_P	Bit	...	VAR



Skip program

Set the local labels as follows.

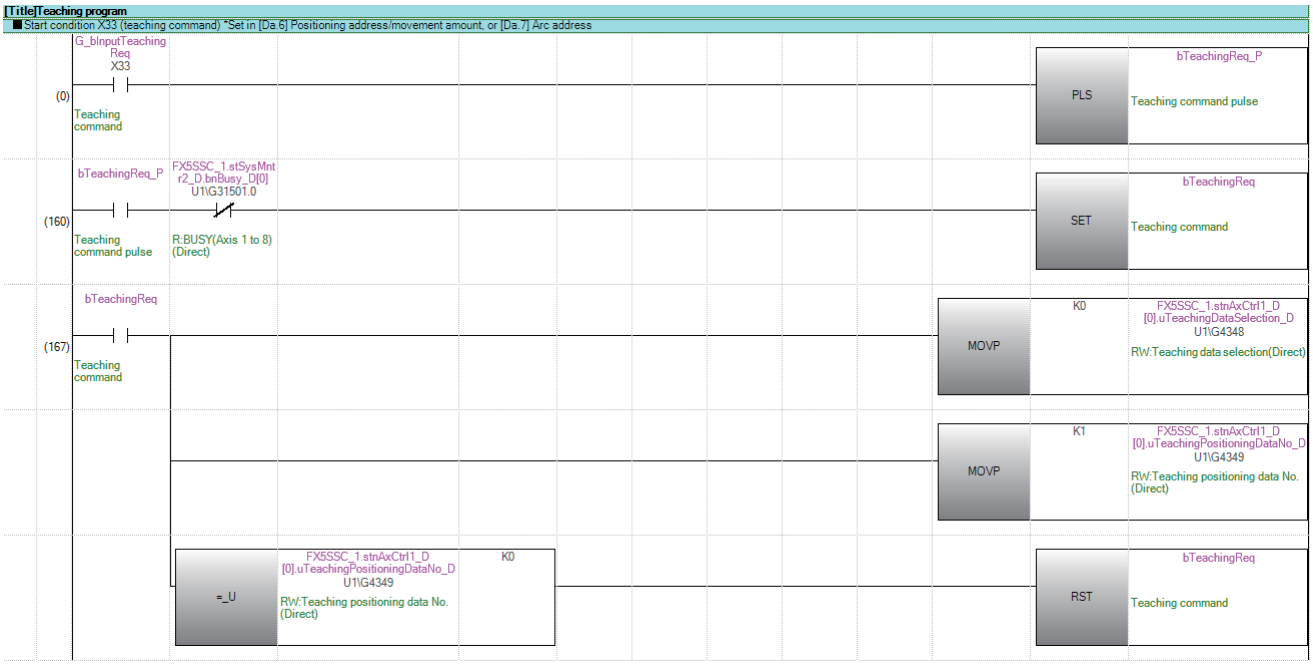
	Label Name	Data Type		Class
1	bSkipReq_P	Bit	...	VAR
2	bSkipReq	Bit	...	VAR



Teaching program

Set the local labels as follows.

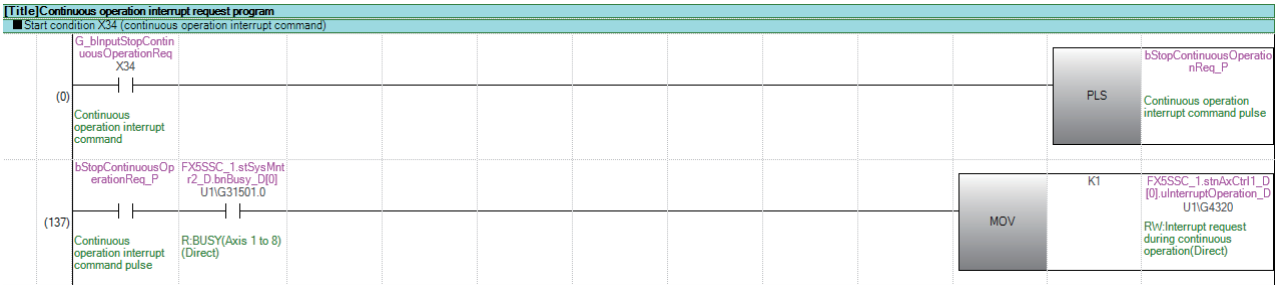
	Label Name	Data Type		Class
1	bTeachingReq_P	Bit	...	VAR
2	bTeachingReq	Bit	...	VAR



Continuous operation interrupt program

Set the local labels as follows.

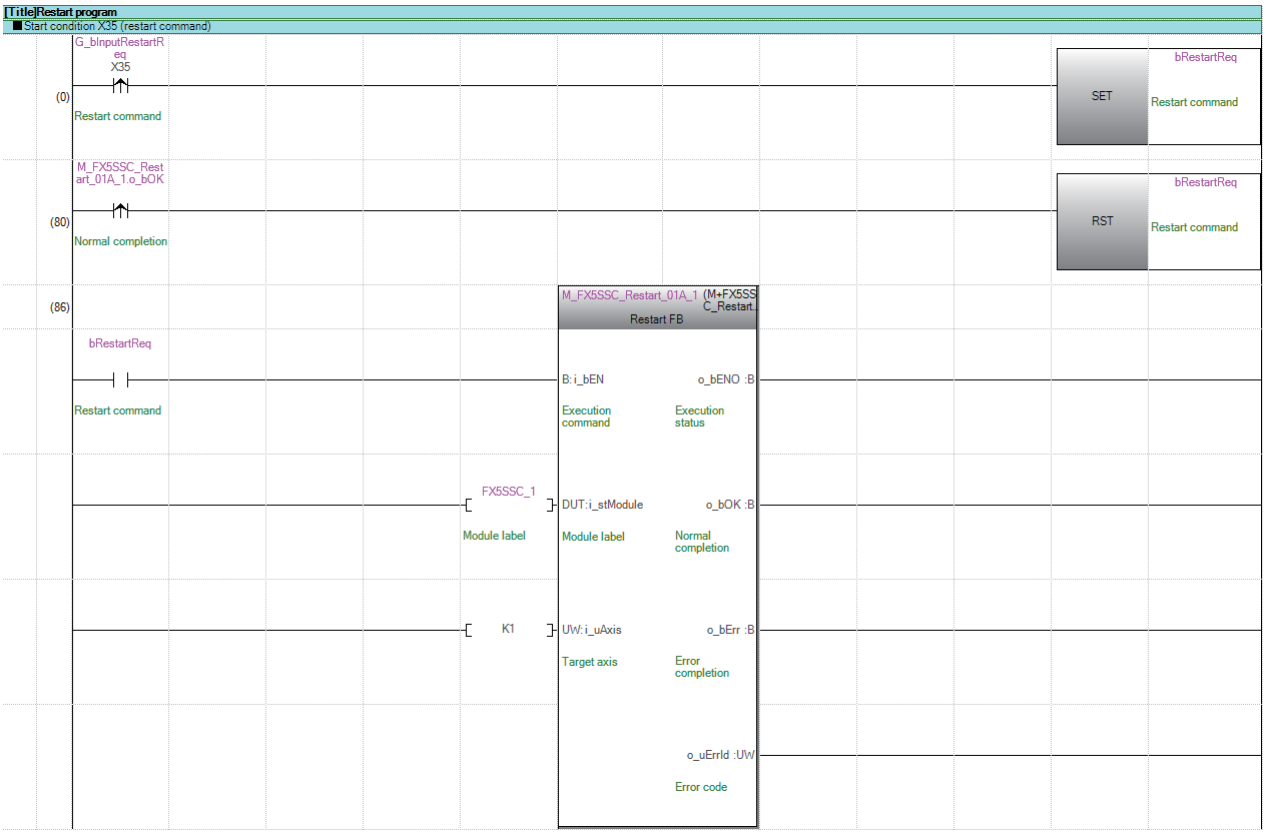
	Label Name	Data Type		Class
1	bStopContinuousOperationReq_P	Bit	...	VAR



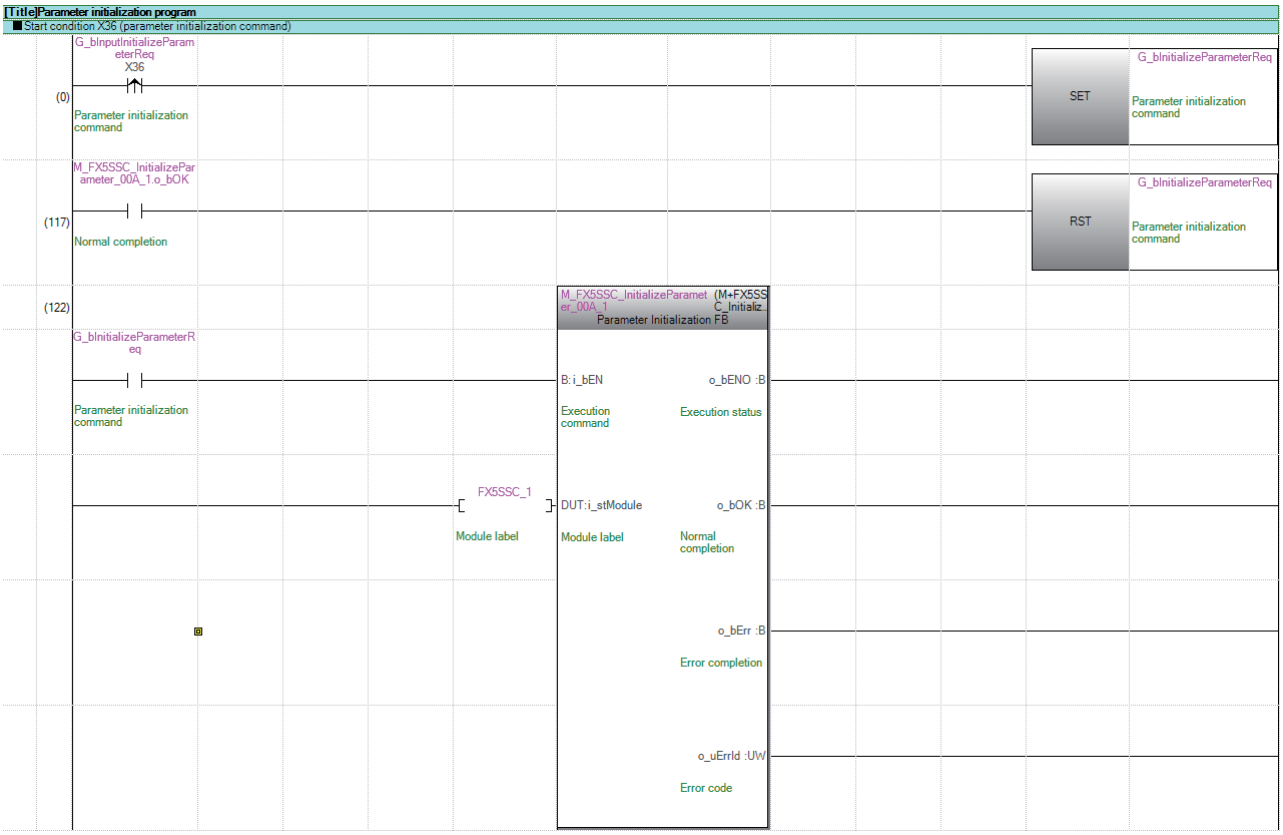
Restart program

Set the local labels as follows.

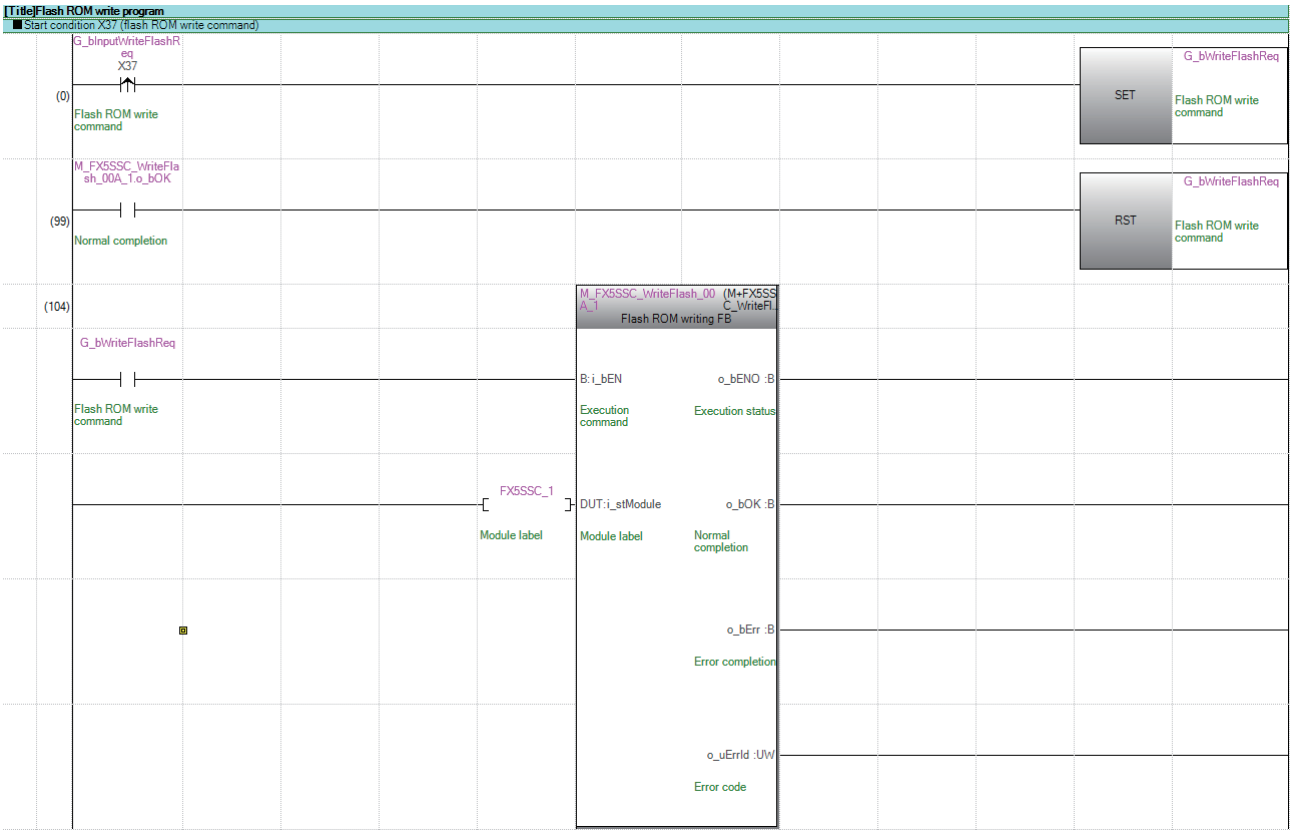
	Label Name	Data Type		Class
1	bRestartReq	Bit	...	VAR



Parameter initialization program



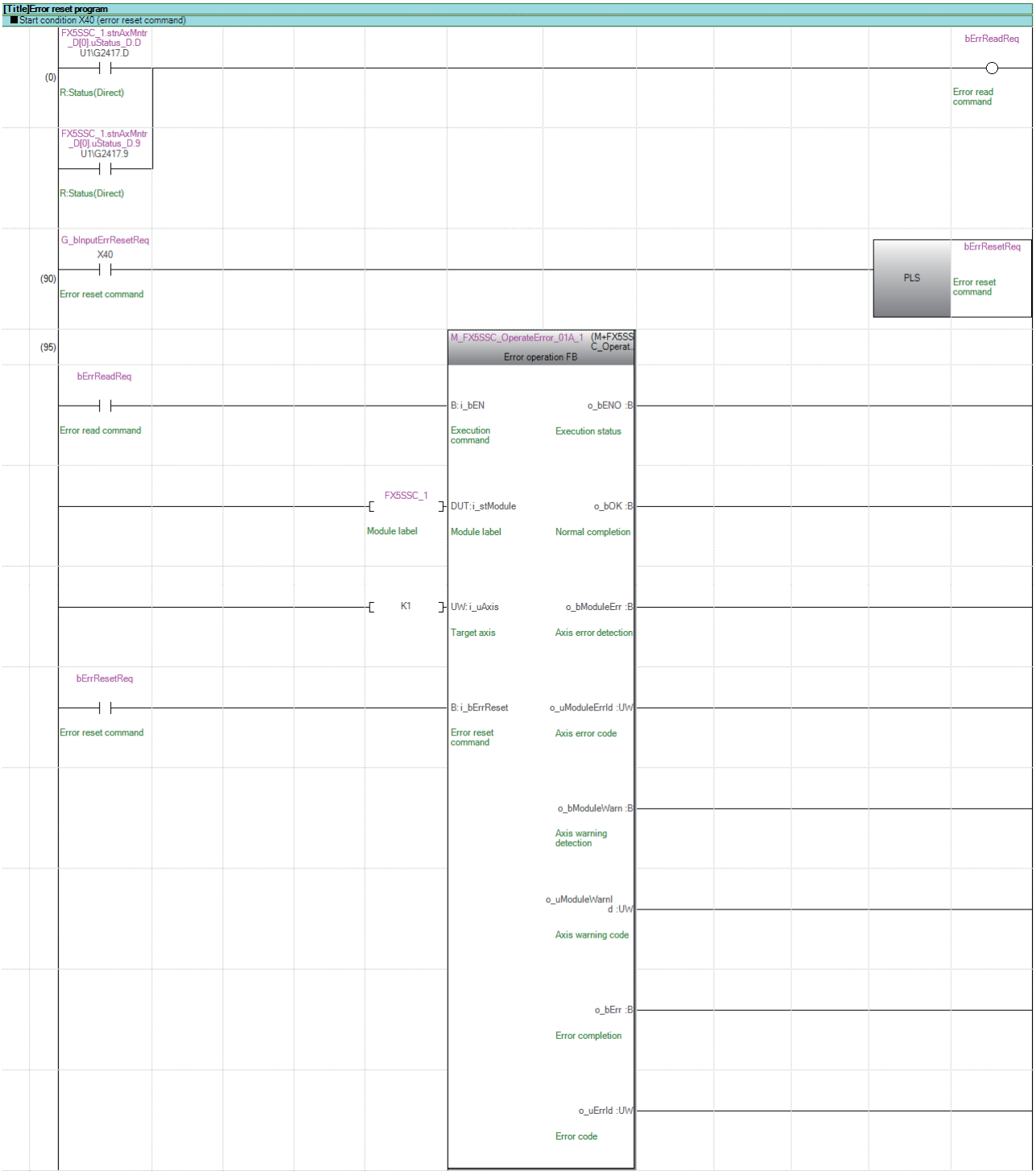
Flash ROM write program



Error reset program

Set the local labels as follows.

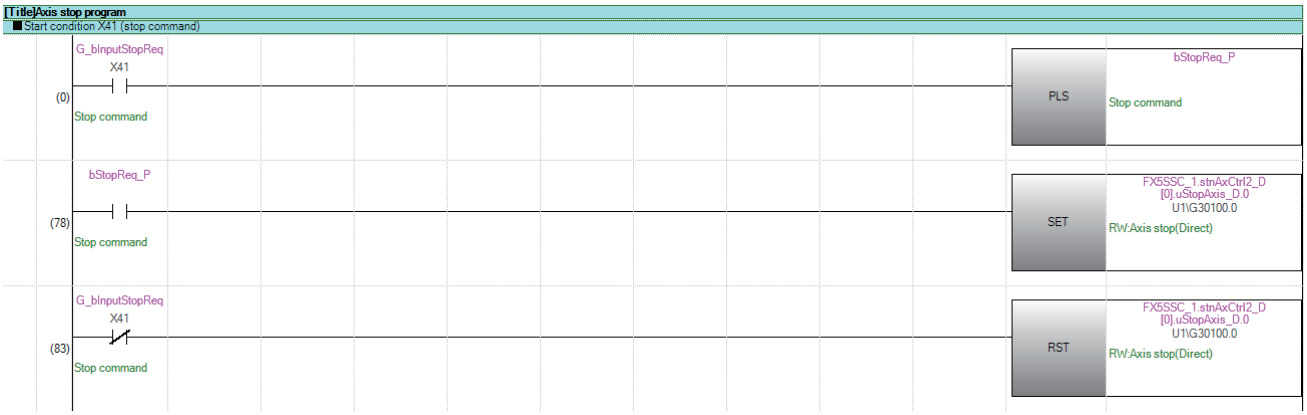
	Label Name	Data Type		Class
1	bErrReadReq	Bit	...	VAR
2	bErrResetReq	Bit	...	VAR



Axis stop program

Set the local labels as follows.

	Label Name	Data Type		Class
1	bStopReq_P	Bit	...	VAR



14 TROUBLESHOOTING

This chapter describes details of error occurred by using the Simple Motion module/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-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware))
2. Check the LEDs of the CPU module.
(MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware))
3. Check the LED status of each module to confirm whether an error does not occur in a module. (Page 718 Troubleshooting using the LEDs)

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/Motion module.

LED display [FX5-SSC-S]

☐: OFF, ■: ON, ●: Flashing

Simple Motion module status	LED display		Description	Remedy
	4-axis module	8-axis module		
Normal operation	AX1 ☐ AX2 ☐ AX3 ☐ AX4 ☐	AX1-8 ☐*3	The axes stopped The axes on standby	—
	POWER ■*1 RUN ■ ERROR ☐	POWER ■*1 RUN ■ ERROR ☐		
	AX1 ■ AX2 ☐ AX3 ☐ AX4 ☐	AX1-8 ■*4	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.)
	POWER ■*1 RUN ■ ERROR ☐	POWER ■*1 RUN ■ ERROR ☐		
Operation failure	AX1 ●*2 AX2 ☐ AX3 ☐ AX4 ☐	AX1-8 ●*2*5	Minor error	Check the error code occurred in "[Md.23] Axis error No.", and take a measure against the error described in the list of error codes.
	POWER ■*1 RUN ■ ERROR ■	POWER ■*1 RUN ■ ERROR ■		
	AX1 ☐ AX2 ☐ AX3 ☐ AX4 ☐	AX1-8 ☐	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.
	POWER ■*1 RUN ■ ERROR ●	POWER ■*1 RUN ■ ERROR ●		

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

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

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

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

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

LED display specifications [FX5-SSC-G]

☐: OFF, ■: ON, ●: Flashing

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

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

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

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

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

When the POWER LED turns off

Check item	Action
Is the power supplied?	Check that the voltage supplied to the Simple Motion module/Motion module is within the rated range.
Is it equipped with the power connector correctly?	Check that the power connector is inserted exactly.
Is the power cable wired correctly?	Check that there are any errors in wiring with external power supply.

When the RUN LED turns off

Check item	Action
Is the power supplied?	Check that the voltage supplied to the CPU module is within the rated range.
Is the power supply capacity of the CPU module sufficient?	Calculate the total current consumption of the connected modules (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 CPU module 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 ERROR LED flashes

Check item	Action
Is there a moderate error?	Check the error code and take a corrective action. • 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 ERROR LED turns on and AX LED flashes [FX5-SSC-S]

Check item	Action
Is there a minor error?	Check the error code and take a corrective action.

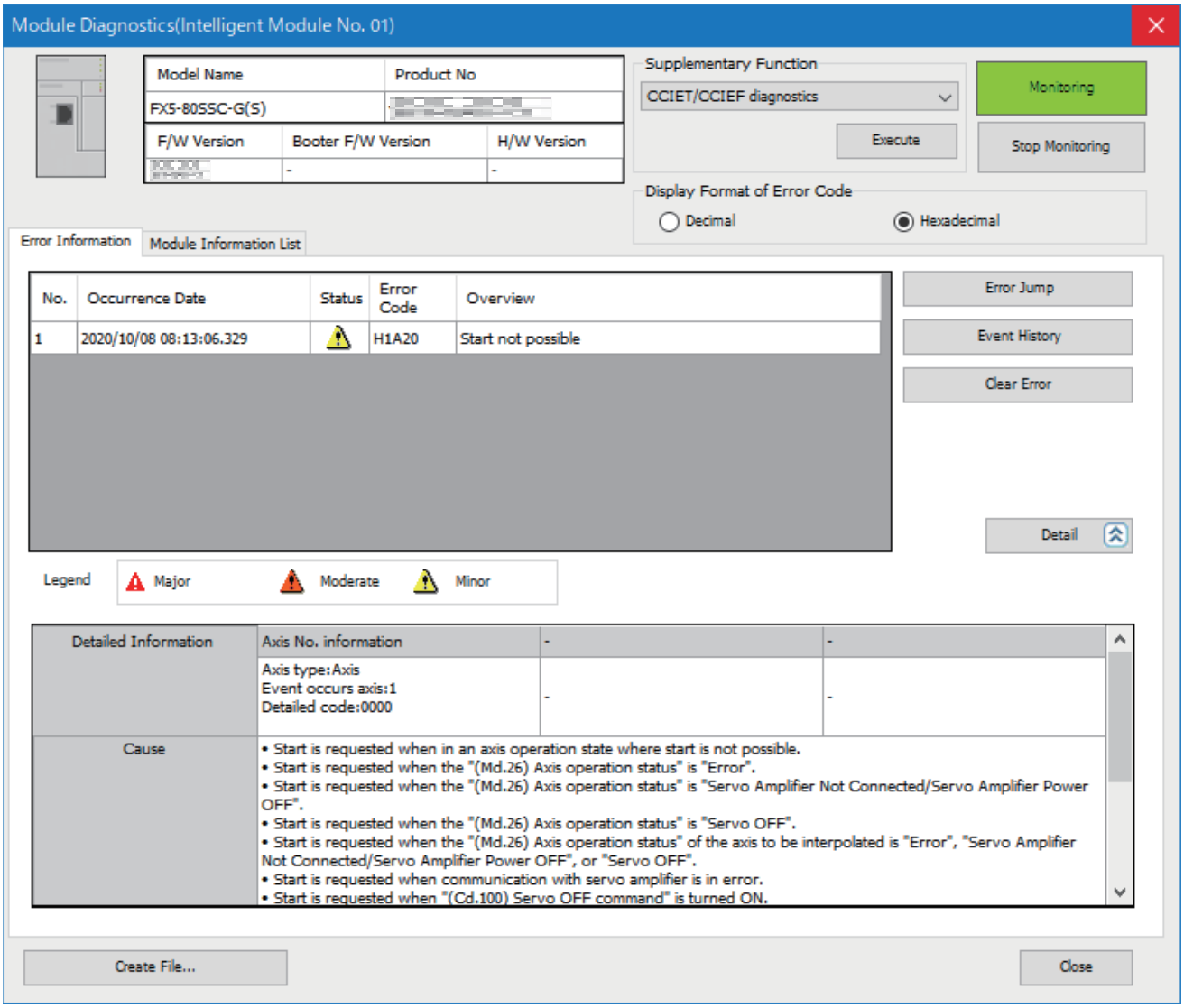
When the ERROR LED turns on

Check item	Action
Is there a synchronous encoder axis error?	Check the error code and take a corrective action.
Is there a minor error? [FX5-SSC-G]	Check the error code and take a corrective action.
Is there a command generation axis error? [FX5-SSC-G]	Check the error code and take a corrective action.

The ERROR LED and the operation status of the axis may not match in some cases. To check the most recent operation status, refer to the error detection signal ([Md.31] Status: b13).

Check of module status [FX5-SSC-G]

Error codes (warning codes) and the error history of the Motion module can be checked with the module diagnostics window of the engineering tool.



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 "[Cd.190] PLC READY" turned ON?	Review the program to turn ON the "[Cd.190] PLC READY".
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/Motion module and servo amplifier correct?	Check the wiring between the Simple Motion module/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 upper/lower 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/Motion module? (ERROR 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 manual and instruction 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 to 0 by the speed change function, review the value of the speed to be changed. • When "[Cd.13] Positioning operation speed override" is set to "0 (%)", review the set value. [FX5-SSC-G]

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
[FX5-SSC-S] 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.
[FX5-SSC-G] Is the value in "Travel direction selection (PA14)" correct?	Check that the value in "Travel direction selection (PA14)" matches the settings of servo amplifier. When "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 items and corrective actions for when a communication time-out occurs on the engineering tool are described below.

[FX5-SSC-S]

Check item	Action
Is the operation cycle set for the operation cycle time sufficiently long?	Check the positioning details, or change the setting of "[P.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.

[FX5-SSC-G]

Check item	Action
Is the operation cycle set for the operation cycle time sufficiently long?	Check the positioning details, or change the setting of the network parameter "Communication cycle interval setting"*1 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.

*1 For the communication cycle interval, refer to "Processing Time" in the following manual.
MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN)

When the parameter is not reflected

Check the fetch timing of each parameter. For details, check each function description or the following.

☞ Page 600 Details of areas

When the parameter is not reflected after restarting the module, check that execution data is backed up.

For details of the execution data back up, refer to the following.

☞ Page 319 Execution Data Backup Function

14.3 Error and Warning Details

Error type

Errors detected by the Simple Motion module/Motion module include parameter setting range errors, errors at operation start or during operation and errors detected by servo amplifier.

Simple Motion module/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 "[Cd.190] PLC READY". 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 ([Md.140] Module status: b0) 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 "[Cd.190] PLC READY".

Simple Motion module/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 [FX5-SSC-S], or error code: 1A90H [FX5-SSC-G]) 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 [FX5-SSC-S], or error code: 1A9EH [FX5-SSC-G]) 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
	FX5-SSC-S	FX5-SSC-G	
Minor errors	1080H, 18B0H, 18B1H	1080H	IF (Interface) errors
	18C0H to 18FFH	—	inter-module synchronization error
	1900H to 193FH	1A00H to 1A3FH	Positioning control common errors
	1940H to 197FH	1A40H to 1A7FH	Home position return errors
	1980H to 198FH	1A80H to 1A8FH	JOG, inching and manual pulse generator operation errors
	1990H to 19EFH	1A90H to 1AEFH	Positioning operation errors
	19F0H to 19FFH	1AF0H to 1AFFH	Block start data errors
	1A00H to 1A0FH	1B00H to 1B0FH	Condition data errors
	1A10H to 1A5FH	1B10H to 1B5FH	Positioning data errors
	1A60H to 1A9FH	1B60H to 1B9FH	Basic parameter errors
	1AA0H to 1AFFH	1BA0H to 1BFFH	Detailed parameter errors
	1B00H to 1B3FH	1C10H to 1C2	Home position return parameter errors
	1B40H to 1B9FH	1D90H to 1DEFH	Extended/Common parameter errors
	1BA0H to 1BDFH	1DF0H to 1E2FH	Synchronous control input axis errors
	1BE0H to 1C3FH	1E30H to 1E8FH	Synchronous control output axis errors
	1C80H to 1CBFH	1ED0H to 1F0FH	Errors for servo amplifier, inverter, amplifier manufactured by other companies, and head module
	—	1F10H to 1F1FH	Link device external signal assignment error
Moderate errors	3000H to 30FFH	3300H to 33FFH	Initial process errors
Major errors	—	3C00H to 3DFFH	Hardware failures (common)

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" and "[Md.115] Servo alarm detail number". Check the error details and remedies with "[Md.114] Servo alarm" and "[Md.115] Servo alarm detail number".

Error detection signal	Error code	Servo alarm
[Md.31] Status: b13	[Md.23] Axis error No.*1	[Md.114] Servo alarm [Md.115] Servo alarm detail number [FX5-SSC-G]

*1 A new error code is stored in "[Md.23] Axis error No." every time an error occurs.

When an alarm occurs on a drive unit, the specification is as follows.

[Md.23] Axis error No.	[Md.108] Servo status1	[Md.114] Servo alarm [Md.115] Servo alarm detail number [FX5-SSC-G]
1C80H [FX5-SSC-S] 1ED0H [FX5-SSC-G]	"b7: Servo alarm" turns ON.	The error code read from a drive unit is stored.

When the Simple Motion module/Motion module detects the communication error status of a drive unit, the specification is as follows.

Error status	[Md.23] Axis error No.	[Md.108] Servo status1	[Md.114] Servo alarm [Md.115] Servo alarm detail number [FX5-SSC-G]
Communication retry counter error	1C81H [FX5-SSC-S]	"b7: Servo alarm" remains OFF.	Not updated.
Watchdog timer error	1C82H [FX5-SSC-S] 1ED2H [FX5-SSC-G]	"b7: Servo alarm" remains OFF.	Not updated.

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/Motion module include system warnings, axis warnings and warnings detected by servo amplifier.

Simple Motion module/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/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/Motion module.

Reset it as necessary.

Warning classification

Item	Warning code		Classification of warnings
	FX5-SSC-S	FX5-SSC-G	
Warnings	0900H to 093FH	0D00H to 0D3FH	Positioning control common warnings
	0980H to 098FH	0D40H to 0D4FH	JOG, inching and manual pulse generator operation warnings
	0990H to 09EFH	0D50H to 0DAFH	Positioning operation warnings
	09F0H to 09FFH	0DB0H to 0DBFH	Block start data warnings
	0A10H to 0A5FH	0DC0H to 0E0FH	Positioning data warnings
	0BA0H to 0BDFH	0E40H to 0E4FH	Synchronous control input axis warnings
	0BE0H to 0C3FH	0E50H to 0E8FH	Synchronous control output axis warnings
	0C40H to 0C7FH	0E90H to 0EBFH	Cam data operation warnings
	0C80H to 0CBFH	0EC0H to 0EDFH	Warnings for servo amplifier, inverter, amplifier manufactured by other companies, and head module

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" and "[Md.115] Servo alarm detail number". Check the warning details and remedies with "[Md.114] Servo alarm" and "[Md.115] Servo alarm detail number".

Warning detection signal	Warning code	Servo alarm
[Md.31] Status: b9	[Md.24] Axis warning No.*1	[Md.114] Servo alarm [Md.115] Servo alarm detail number [FX5-SSC-G]

*1 A new warning code is stored in "[Md.24] Axis warning No." every time a warning occurs.

When a warning occurs on a drive unit, the specification is as follows.

[Md.23] Axis error No.	[Md.108] Servo status1	[Md.114] Servo alarm [Md.115] Servo alarm detail number [FX5-SSC-G]
0C80H [FX5-SSC-S] 1EC0H [FX5-SSC-G]	"b9: Servo warning" turns ON.	The warning code read from a drive unit is stored.

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 729 List of Warning Codes, ☞ Page 751 List of Error Codes

How to clear errors or warnings

■When clearing errors for an individual axis

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/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.

■When clearing errors for all axes [FX5-SSC-G]

The error/warning state of the network and all axes can be cleared in a batch by setting "Intelligent module latest error clear request" of the CPU module to "1" or clicking the "Clear Error" button from the "Module Diagnostics" window in GX Works3. The processing details are the same as when clearing errors for an individual axis.

14.4 List of Warning Codes

Simple Motion module detection warning [FX5-SSC-S]

Warning code (Hexadecimal) [FX5-SSC-S]	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 "[Md.26] Axis operation status" is not "1: Stopped". [Operation status at warning occurrence] Continues the operation.	Normalize the start request ON timing. (Do not issue the restart command when "[Md.26] Axis operation status" is not "1: 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 "[Cd.190] PLC READY" is turned ON. [Operation status at warning occurrence] The warning for axis 1 is issued.	Request to write when the "[Cd.190] PLC READY" is OFF.
0906H	Illegal override value	A value other than 1 to 300 is set for the override value. [Operation status at warning occurrence] When a setting value is 0: Controlled at 100. 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	"[Cd.22] New torque value/forward new torque value" exceeds "[Pr.17] Torque limit setting value".*1 [Operation status at warning occurrence] The torque change is not carried out.	Set "[Cd.22] New torque value/forward new torque value" equal to or less than "[Pr.17] Torque limit setting value".
0908H	Below bias speed	The command speed is below "[Pr.7] Bias speed at start". [Operation status at warning occurrence] Operates by "[Pr.7] Bias speed at start".	Re-set the command speed/bias speed at start so that the command speed is equal to or larger than "[Pr.7] Bias speed at start".
0932H	Outside new reverse torque value range	"[Cd.113] New reverse torque value" exceeds "[Pr.17] Torque limit setting value". [Operation status at warning occurrence] The torque change is not carried out.	Set a value which does not exceed "[Pr.17] Torque limit setting value" as "[Cd.113] New reverse torque value".
0933H	Optional data monitor data type setting error	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".
0935H	VCⅡ series parameter setting error	The servo parameter 'Absolute position detection system (PA03)' is different from VCⅡ series. [Operation status at warning occurrence] Operates using the setting of the VCⅡ series.	Match the setting of the servo parameter 'Absolute position detection system (PA03)' to the setting of VCⅡ series, and turn "[Cd.190] PLC READY" from OFF to ON.

Warning code (Hexadecimal) [FX5-SSC-S]	Warning name	Error details and causes	Remedy
0936H	Outside mark detection signal setting range	• "[Pr.800] Mark detection signal setting" is outside the range. • The axis for which TPR1 is specified with the "[Pr.800] Mark detection signal setting" is not set, or the axis is set as a virtual servo amplifier axis. [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. • Set the axis specified with the "[Pr.800] Mark detection signal setting".
0937H	Outside mark detection data type setting range	"[Pr.802] 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 "[Pr.802] Mark detection data type" setting is not "Optional 2 word buffer memory", "[Pr.802] 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 "[Pr.802] Mark detection data type" setting is "Optional 2 word buffer memory", "[Pr.804] 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.
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. • The servo parameter "Rotation direction selection (PA14)" is changed. [Operation status at warning occurrence] The operation continues.	Execute home position return.
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 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	• "[Cd.17] JOG speed"*2 exceeds "[Pr.31] JOG speed limit value" at start. • The new speed value*2 exceeds "[Pr.31] JOG speed limit value" when the speed is changed during operation. [Operation status at warning occurrence] • When the speed exceeds "[Pr.31] JOG speed limit value", the JOG operation is carried out with "[Pr.31] 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	"[Cd.20] 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 "[Cd.20] Manual pulse generator 1 pulse input magnification" to within the setting range.

Warning code (Hexadecimal) [FX5-SSC-S]	Warning name	Error details and causes	Remedy
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.
0991H	Speed limit value over	• Setting speeds*2 exceed "[Pr.8] Speed limit value" when starting/restarting the positioning or when changing the speed at the positioning*3. (At the interpolation control, either of reference axes or interpolation axes exceeds "[Pr.8] Speed limit value".) • "[Cd.140] Command speed at speed control mode" exceeds the "[Pr.8] Speed limit value" during the speed control mode. • "[Cd.146] Speed limit value at torque control mode" exceeds the "[Pr.8] Speed limit value" during the torque control mode. • "[Cd.147] Speed limit value at continuous operation to torque control mode" exceeds the "[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 "[Pr.8] 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 "[Pr.8] Speed limit value". (The "[Md.39] In speed limit flag" is not turned ON.)	Review each speed so that setting speeds do not exceed "[Pr.8] Speed limit value".
0992H	M code ON signal ON	The M code ON signal ([Md.31] Status: b12) 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 "[Cd.7] 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. • 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 "[Cd.14] New speed value" as possible. • When a target position is changed: Adjust the speed to a value as near "[Da.18] Command speed" as possible, and then change to a target position. (When "[Da.1] 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 "[Cd.36] 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 "[Cd.36] Step start information" when the step is not in standby state.
0997H	Illegal external command function	The detailed parameter 2 "[Pr.42] 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 "[Pr.42] External command function selection" to within the setting range.

Warning code (Hexadecimal) [FX5-SSC-S]	Warning name	Error details and causes	Remedy
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.
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	"[Cd.38] Teaching data selection" set value is outside the setting range. [Operation status at warning occurrence] Teaching is not carried out.	Set "[Cd.38] 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 "[Da.2] Control method" other than ABS1 and INC1. • A target position change request is turned ON during continuous path control. • A new target position address is outside the software stroke limit range. • A target position change request was given during deceleration to a stop. • A target position change request was issued when speed change 0 flag ([Md.31] Status: b10) was ON. • A target position change request was given during speed control mode, torque control mode or continuous operation to torque control mode. • "[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.	• Do not turn ON the target position change request in the following cases. An operating pattern "continuous path control" is used. A control method other than ABS1 and INC1 is used. During deceleration stop When the speed change 0 flag ([Md.31] Status: b10) ON During speed control mode During torque control mode During continuous operation to torque control mode • When the target position change address is outside the software stroke limit range, correct the target position change address.
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 "[Pr.17] Torque limit setting value".	Review the setting value so that the setting torque is not exceeded "[Pr.17] Torque limit setting value".
09E5H	Torque initial value selection invalid	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". • Set the torque initial value selection for control mode switching 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.
09E7H	Control mode switching during zero speed OFF	Control mode was changed when "Zero speed" ([Md.119] Servo status2: b3) 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: b3) ON.

Warning code (Hexadecimal) [FX5-SSC-S]	Warning name	Error details and causes	Remedy
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	The control mode was switched as follows during servo ON. • 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*4 • "[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	The value set "[Pr.8] Speed limit value" is outside the range when switching the control mode. [Operation status at warning occurrence] The speed limit value before the change is continued.	Set the speed limit value within the range.
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 manual of each driver.)

Warning code (Hexadecimal) [FX5-SSC-S]	Warning name	Error details and causes	Remedy
0CC0H	Inter-module synchronization cycle time over	The calculation process time of the inter-module synchronization (I44) etc. exceeds the inter-module synchronization cycle of the Simple Motion module. [Operation status at warning occurrence] The operation continues.	• Lengthen the operation cycle setting. • Review the content of the calculation process time of the inter-module synchronization (I44) and reduce the number of steps.

*1 When the torque change function is used with the individual setting for new torque value and reverse new torque value, it indicates outside forward new torque value.

*2 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 [%].)

*3 The speed change by position-speed switching control, target position change function, or override function is contained.

*4 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) [FX5-SSC-S]	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 changed 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 changed 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	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.	Set a value within the range of 0 to 256.
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) [FX5-SSC-S]	Warning name	Error details and causes	Remedy
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.
0C40H	Outside operation cam No. range	"[Cd.601] Operation cam No." is other than 1 to 256. [Operation status at warning occurrence] Cam data writing/reading is not executed.	Set a value within the range of 1 to 256.
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.	• Specify the cam No. of an existing cam data. • When writing the cam data from a programming tool, turn the power or the "[Cd.190] PLC READY" from OFF to ON and open the cam data on the cam open area.
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.
0C43H	Outside number of cam data operation points range	• "[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.	• 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.
0C44H	Outside cam data format range	"[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.	Set 1 or 2.
0C45H	Outside cam resolution/ coordinate number range	• "[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.	• 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.
0C46H	Outside cam data starting position range	"[Cd.606] Cam data starting point" is outside the range of "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)".
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.

Warning code (Hexadecimal) [FX5-SSC-S]	Warning name	Error details and causes	Remedy
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.	Delete the cam data read password with a programming tool.
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.	Delete the cam data write password with a programming tool.
0C50H	Outside cam auto-generation cam No. range	"[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.	Set a value within the range of 1 to 256.
0C51H	Outside cam auto-generation type range	"[Cd.610] Cam auto-generation type" is other than 1. [Operation status at warning occurrence] Cam auto-generation is not executed.	Set 1.
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.
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.	Delete the cam data write password with a programming tool.
0C60H	Outside cam position calculation cam No. range	"[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.	Set a value within the range of 0 to 256.
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.	• Specify the cam No. of an existing cam data. • When writing the cam data from a programming tool, turn the power or "[Cd.190] PLC READY" from OFF to ON and open the cam data on the cam open area.
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.

Warning code (Hexadecimal) [FX5-SSC-S]	Warning name	Error details and causes	Remedy
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" as to fit within the range of reciprocated cam pattern stroke.

Motion module detection warning [FX5-SSC-G]

Warning code (Hexadecimal) [FX5-SSC-G]	Warning name	Error details and causes	Remedy
0D00H	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.
0D02H	Restart not possible	The restart command is issued when "[Md.26] Axis operation status" is not "1: Stopped". [Operation status at warning occurrence] Continues the operation.	Normalize the start request ON timing. (Do not issue the restart command when "[Md.26] Axis operation status" is not "1: stopped".)
0D03H	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.
0D04H	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.
0D05H	In PLC READY	The request for writing to the flash ROM is issued when the "[Cd.190] PLC READY" is turned ON. [Operation status at warning occurrence] The warning for axis 1 is issued.	Request to write when the "[Cd.190] PLC READY" is OFF.
0D06H	Illegal override value	[Version 1.002 or later] A value other than 0 to 300 was set for the override value. [Version 1.001 or earlier] A value other than 1 to 300 was set for the override value. [Operation status at warning occurrence] [Version 1.002 or later] When a setting value is 301 or more: Controlled at 300. [Version 1.001 or earlier] When a setting value is 0: Controlled at 100. When a setting value is 301 or more: Controlled at 300.	Set a value within the setting range.
0D07H	Outside new torque value range/outside forward new torque value range	"[Cd.22] New torque value/forward new torque value" exceeds "[Pr.17] Torque limit setting value".*1 [Operation status at warning occurrence] The torque change is not carried out.	Set "[Cd.22] New torque value/forward new torque value" equal to or less than "[Pr.17] Torque limit setting value".
0D08H	Below bias speed	The command speed is below "[Pr.7] Bias speed at start". [Operation status at warning occurrence] Operates by "[Pr.7] Bias speed at start".	Re-set the command speed/bias speed at start so that the command speed is equal to or larger than "[Pr.7] Bias speed at start".
0D2EH	Mark detection link device No. specification	The mark detection signal link device No. is outside the range. [Operation status at warning occurrence] The setting No. of which the mark detection setting parameter is outside the setting range is invalid.	Review the setting of mark detection link device No.
0D2FH	Mark detection link device bit specification	Bits other than 0 to F has been specified in mark detection signal link device bit specification. [Operation status at warning occurrence] The setting No. of which the mark detection setting parameter is out of the setting range is invalid.	Review the setting of mark detection link device bit No.
0D32H	Outside new reverse torque value range	"[Cd.113] New reverse torque value" exceeds "[Pr.17] Torque limit setting value". [Operation status at warning occurrence] The torque change is not carried out.	Set a value which does not exceed "[Pr.17] Torque limit setting value" as "[Cd.113] New reverse torque value".

Warning code (Hexadecimal) [FX5-SSC-G]	Warning name	Error details and causes	Remedy
0D36H	Outside mark detection signal setting range	• "[Pr.800] Mark detection signal setting" is outside the range. • The axis for which TPR1 is specified with the "[Pr.800] Mark detection signal setting" is not set, or the axis is set as a virtual servo amplifier axis. [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. • Set the axis specified with the "[Pr.800] Mark detection signal setting", or change the "[Pr.101] Virtual servo amplifier setting" to "0: Use Real Servo Amplifier".
0D37H	Outside mark detection data type setting range	"[Pr.802] 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.
0D38H	Outside mark detection data axis No. setting range	When "[Pr.802] Mark detection data type" setting is not "Optional 2 word buffer memory", "[Pr.802] 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.
0D39H	Outside mark detection data buffer memory No. setting range	When "[Pr.802] Mark detection data type" setting is "Optional 2 word buffer memory", "[Pr.804] 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.
0D3AH	Outside Maximum number of control axes	The common parameter "[Pr.152] Maximum number of control axes" exceeds the maximum number of control axes of the Motion module. [Operation status at warning occurrence] Controlled as if set to "0: No setting".	Set the maximum number of control axes to the maximum number of control axes for the Motion module or less.
0D3BH	Outside control axis setting	"[Pr.141] IP address" or "[Pr.101] Virtual servo amplifier setting" is set for an axis that exceeds "[Pr.152] Maximum number of control axes". [Operation status at warning occurrence] Communication is not performed with the connected device.	For an axis exceeding the maximum number of control axes, set the servo network composition parameter "[Pr.141] IP address" to "0: No Setting" and the "[Pr.101] Virtual servo amplifier setting" to "0: Use Real Servo Amplifier".
0D3CH	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. • The servo parameter "Rotation direction selection (PA14)" is changed. • The electronic gear of the Motion module or drive module is changed. [Operation status at warning occurrence] The operation continues.	Execute home position return.
0D3FH	Mark detection - Driver touch probe function invalid	When using TPR1 with the "[Pr.800] Mark detection signal setting", either of the following factors was met on the set axis. • The specified axis does not support the servo amplifier touch probe function. • When using a multi-axis servo amplifier, objects for touch probes are not set to the optional data monitor. [Operation status at warning occurrence] The setting No. specified in "[Pr.800] Mark detection signal setting" will be invalid.	• Check the model and version of the connected servo amplifier to confirm that the touch probe function is supported. • When using a multi-axis servo amplifier, set objects for touch probes to the optional data monitor.
0D40H	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.

Warning code (Hexadecimal) [FX5-SSC-G]	Warning name	Error details and causes	Remedy
0D41H	JOG speed limit value	[Version 1.001 or later] "[Cd.17] JOG speed"*2exceeds "[Pr.31] JOG speed limit value" at start. [Version 1.000] • "[Cd.17] JOG speed"*2 exceeds "[Pr.31] JOG speed limit value" at start. • The new speed value*2 exceeds "[Pr.31] JOG speed limit value" when the speed is changed during operation. [Operation status at warning occurrence] • When the speed exceeds "[Pr.31] JOG speed limit value", the JOG operation is carried out with "[Pr.31] 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.
0D42H	JOG speed limit value	The new speed value exceeds "[Pr.31] JOG speed limit value" when the speed is changed during JOG operation. New speed value: 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 [%].) [Operation status at warning occurrence] • When the speed exceeds "[Pr.31] JOG speed limit value", the JOG operation is carried out with "[Pr.31] 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.
0D48H	Outside manual pulse generator input magnification range	"[Cd.20] 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 "[Cd.20] Manual pulse generator 1 pulse input magnification" to within the setting range.
0D49H	Manual pulse generator speed limit value over	The manual pulse generator speed exceeds the "[Pr.123] Manual pulse generator speed limit value" during manual pulse generator operation. [Operation status at warning occurrence] • When the detailed parameter 2 "[Pr.123] Manual pulse generator speed limit value" is exceeded, the manual pulse generator operation is performed in accordance with the detailed parameter 2 "[Pr.122] Manual pulse generator speed limit mode". • While the speed is limited by the detailed parameter 2 "[Pr.123] Manual pulse generator speed limit value", the "[Md.39] In speed limit flag" is turned ON.	Adjust the manual pulse generator speed or the "[Cd.20] Manual pulse generator 1 pulse input magnification" to avoid exceeding the speed limit value.
0D50H	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) [FX5-SSC-G]	Warning name	Error details and causes	Remedy
0D51H	Speed limit value over	• Setting speeds[*2] exceed "[Pr.8] Speed limit value" when starting/restarting the positioning or when changing the speed at the positioning[*3]. (At the interpolation control, either of reference axes or interpolation axes exceeds "[Pr.8] Speed limit value".) • "[Cd.140] Command speed at speed control mode" exceeds the "[Pr.8] Speed limit value" during the speed control mode. • "[Cd.146] Speed limit value at torque control mode" exceeds the "[Pr.8] Speed limit value" during the torque control mode. • "[Cd.147] Speed limit value at continuous operation to torque control mode" exceeds the "[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 "[Pr.8] 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 "[Pr.8] Speed limit value". (The "[Md.39] In speed limit flag" is not turned ON.)	Review each speed so that setting speeds do not exceed "[Pr.8] Speed limit value".
0D52H	M code ON signal ON	The M code ON signal ([Md.31] Status: b12) 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 "[Cd.7] M code OFF request".
0D53H	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).
0D54H	Insufficient remaining distance	[Version 1.001 or later] At a continuous operation interrupt request, the distance to decelerate is not long enough. [Version 1.000] • At a continuous operation interrupt request, the distance to decelerate is not long enough. • 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 "[Cd.14] New speed value" as possible. • When a target position is changed: Adjust the speed to a value as near "[Da.8] Command speed" as possible, and then change to a target position. (When "[Da.1] 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.
0D55H	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 "[Cd.14] New speed value" as possible. • When a target position is changed: Adjust the speed to a value as near "[Da.8] Command speed" as possible, and then change to a target position. (When "[Da.1] 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.
0D56H	Step not possible	Code 1 is set for "[Cd.36] 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 "[Cd.36] Step start information" when the step is not in standby state.

Warning code (Hexadecimal) [FX5-SSC-G]	Warning name	Error details and causes	Remedy
0D57H	Illegal external command function	The detailed parameter 2 "[Pr.42] 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 "[Pr.42] External command function selection" to within the setting range.
0D58H	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.
0D59H	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 Motion module even when a "0" or "601" or more is set.)	Set the positioning data No. to within the setting range.
0D5AH	Illegal teaching data selection	"[Cd.38] Teaching data selection" set value is outside the setting range. [Operation status at warning occurrence] Teaching is not carried out.	Set "[Cd.38] Teaching data selection" set value to within the setting range.
0D5BH	Target position change not possible	[Version 1.001 or later] • A target position change request was given for the "[Da.2] 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. [Version 1.000] • A target position change request was given for a control method other than ABS1 and INC1. • A target position change request is turned ON during continuous trajectory control. • Target position change value (New address) is outside the software stroke limit range. • A target position change request was given during deceleration to a stop. • A target position change request was given when speed change 0 flag ([Md.31] Status: b10) was ON. • A target position change request was given during speed control mode, torque control mode, or continuous operation to torque control mode. • "[Cd.27] Target position change value (New address)" is outside the range of 0 to 359.99999 [degree]. [Operation status at warning occurrence] The target position change is not carried out.	[Version 1.001 or later] 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 [Version 1.000] • Do not turn ON the target position change request in the following cases. An operating pattern "continuous trajectory control" is used. A control method other than ABS1 and INC1 is used. During deceleration stop When the speed change 0 flag ([Md.31] Status: b10) is ON During speed control mode During torque control mode During continuous operation to torque control mode • When the target position change address is outside the software stroke limit range, correct the target position change address.
0D5CH	Target position change not possible	A target position change request is turned ON during continuous trajectory 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 trajectory control" is used.
0D5DH	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.
0D5EH	Target position change not possible	A target position change request was given when the 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 the speed change 0 flag ([Md.31] Status: b10) is ON.
0D5FH	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.

Warning code (Hexadecimal) [FX5-SSC-G]	Warning name	Error details and causes	Remedy
0D60H	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.
0D61H	Target position change not possible	"[Cd.27] Target position change value (New address)" is outside the range of 0 to 359.99999 [degree]. [Operation status at warning occurrence] The target position change is not carried out.	Correct the setting value.
0DA4H	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 "[Pr.17] Torque limit setting value".	Review the setting value so that the setting torque is not exceeded "[Pr.17] Torque limit setting value".
0DA5H	Torque initial value selection invalid	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". • Set the torque initial value selection for control mode switching to command torque.
0DA6H	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.
0DA7H	Control mode switching during zero speed OFF	Control mode was changed when "Zero speed" ([Md.119] Servo status2: b3) 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: b3) ON.
0DA8H	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".
0DA9H	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.
0DAAH	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.

Warning code (Hexadecimal) [FX5-SSC-G]	Warning name	Error details and causes	Remedy
0DABH	Control mode switching not possible	[Version 1.001 or later] The control mode was switched as follows during servo ON. • 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 • 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 • Between the torque control mode and continuous operation to torque control mode The control mode was switched as follows when the "[Pr.112] Servo OFF command valid/invalid setting" was set to "1:Servo OFF Command in Speed/Torque Control Valid" during servo OFF. • From a mode other than the position control mode to the position control mode • Between the speed control mode and torque control mode • Between the speed control mode and continuous operation to torque control mode • Between the torque control mode and continuous operation to torque control mode [Version 1.000] The control mode was switched as follows during servo ON. • 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 • 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 • 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.)	[Version 1.001 or later] • Review the setting so that during servo ON, the 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. • Review the setting so that when the setting value of the "[Pr.112] Servo OFF command valid/invalid setting" is "1: Servo OFF Command in Speed/Torque Control Valid" during servo OFF, the control mode switching is performed from the position control mode to the speed control mode, from the position control mode to the torque control mode, or from the position control mode to the continuous operation to torque control mode. [Version 1.000] Review the setting so that during servo ON, the 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.
0DB0H	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.
0DB1H	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.
0DC0H	Outside command speed range	• The speed change value is outside the setting range when changing the speed during operation*4 • "[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.
0E06H	Speed limit value outside range at switching control mode	The value set "[Pr.8] Speed limit value" is outside the range when switching the control mode. [Operation status at warning occurrence] The speed limit value before the change is continued.	Set the speed limit value within the range.

Warning code (Hexadecimal) [FX5-SSC-G]	Warning name	Error details and causes	Remedy
0EC0H	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" and "[Md.115] Servo alarm detail number". (For the details of "[Md.114] Servo alarm" and "[Md.115] Servo alarm detail number", refer to the manual of each driver.)

*1 When the torque change function is used with the individual setting for new torque value and reverse new torque value, it indicates outside forward new torque value.

*2 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 [%].)

*3 The speed change by position-speed switching control, target position change function, or override function is contained.

*4 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) [FX5-SSC-G]	Warning name	Error details and causes	Remedy
0E40H	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.
0E41H	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.
0E42H	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.
0E43H	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.
0E54H	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 changed 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".
0E64H	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 changed 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".
0E71H	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.
0E80H	Outside cam No. range	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.	Set a value within the range of 0 to 256.
0E81H	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) [FX5-SSC-G]	Warning name	Error details and causes	Remedy
0E82H	Outside cam axis length per cycle range	Set the value of synchronous parameter "[Pr.439] Cam axis length per cycle" 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.
0E84H	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.
0E85H	Cam axis length per cycle change not possible	"[Pr.439] Cam axis length per cycle" was 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.
0E90H	Outside operation cam No. range	"[Cd.601] Operation cam No." is other than 1 to 256. [Operation status at warning occurrence] Cam data writing/reading is not executed.	Set a value within the range of 1 to 256.
0E91H	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.	• Specify the cam No. of an existing cam data. • When writing the cam data from a programming tool, turn the power or the "[Cd.190] PLC READY" from OFF to ON and open the cam data on the cam open area.
0E92H	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.
0E93H	Outside number of cam data operation points range	• "[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.	• 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.
0E94H	Outside cam data format range	"[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.	Set 1 or 2.
0E95H	Outside cam resolution/ coordinate number range	• "[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.	• 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.
0E96H	Outside cam data starting position range	"[Cd.606] Cam data starting point" is outside the range of "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) [FX5-SSC-G]	Warning name	Error details and causes	Remedy
0E97H	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.
0E98H	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.
0E99H	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 "$X_n < X_{n+1}$".
0E9AH	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.	Delete the cam data read password with a programming tool.
0E9BH	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.	Delete the cam data write password with a programming tool.
0EA0H	Outside cam auto-generation cam No. range	"[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.	Set a value within the range of 1 to 256.
0EA1H	Outside cam auto-generation type range	"[Cd.610] Cam auto-generation type" is other than 1. [Operation status at warning occurrence] Cam auto-generation is not executed.	Set 1.
0EA2H	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.
0EA3H	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.
0EA4H	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.
0EA5H	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.
0EA6H	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.	Delete the cam data write password with a programming tool.
0EB0H	Outside cam position calculation cam No. range	"[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.	Set a value within the range of 0 to 256.

Warning code (Hexadecimal) [FX5-SSC-G]	Warning name	Error details and causes	Remedy
0EB1H	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.	• Specify the cam No. of an existing cam data. • When writing the cam data from a programming tool, turn the power or "[Cd.190] PLC READY" from OFF to ON and open the cam data on the cam open area.
0EB2H	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.
0EB3H	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".
0EB4H	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" as to fit within the range of reciprocated cam pattern stroke.

Servo amplifier detection warning

For details of servo amplifier detection warnings, refer to each servo amplifier manual and instruction manual.

14.5 List of Error Codes

Simple Motion module detection error [FX5-SSC-S]

Error code (Hexadecimal) [FX5-SSC-S]	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. Or the accumulative number of write accesses to flash ROM exceeds 100,000. [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.) If the same error occurs repeatedly, please consult your local Mitsubishi representative.
18B0H	Error when switching from normal operation mode to amplifier-less operation mode	Input signals other than synchronization flag ([Md.140] Module status: b1) are ON when switching from the normal operation mode to the amplifier-less operation mode. [Operation status at error occurrence] At start: The system does not operate.	Switch the operation mode after confirming that all input signals other than synchronization flag ([Md.140] Module status: b1) are OFF.
18B1H	Error when switching from amplifier-less operation mode to normal operation mode	Input signals other than synchronization flag ([Md.140] Module status: b1) 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 ([Md.140] Module status: b1) are OFF.
18C0H	Unit synchronization cycle setting unsupported	The setting value of unit synchronization cycle is unsupported. [Operation status at error occurrence] READY signal ([Md.140] Module status: b0) will not turn ON.	With the setting brought into the supported range, switch the power on again or reset the PLC.
1900H	PLC READY OFF during operation	The "[Cd.190] PLC READY" 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 "[Pr.38] Stop group 2 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Review the program which turns ON/OFF "[Cd.190] PLC READY".
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 "[Pr.38] Stop group 2 sudden stop selection". (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.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1904H	Hardware stroke limit (+)	• Start is requested when the hardware stroke limit (upper limit signal FLS) is turned OFF. • The hardware stroke limit (upper limit signal FLS) is turned OFF during operation. [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 to be installed for the system, wire to always turn ON the upper limit signal (FLS) input of the Simple Motion module. • 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.
1906H	Hardware stroke limit (-)	• Start is requested when the hardware stroke limit (lower limit signal RLS) is turned OFF. • The hardware stroke limit (lower limit signal RLS) is turned OFF during operation. [Operation status at error occurrence] At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 "[Pr.37] Stop group 1 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	• 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. • 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. • Start is requested when an external 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.
190AH	READY OFF → ON during BUSY	"[Cd.190] PLC READY" is turned from OFF to ON when BUSY signal is turned ON. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	Turn ON the "[Cd.190] PLC READY" with the BUSY signals of all axes OFF.
190CH	Unit replacement during the operation	The online module is replaced during operation. [Operation status at error occurrence] The operation is stopped.	Replace the online module after confirming that the machine has stopped.
1920H	Start not possible	• Start is requested when start is not possible in the axis operation status. • The start request is issued during the "[Md.26] Axis operation status" into "-1: Error occurred". • The start request is issued during the "[Md.26] Axis operation status" into "20: Servo amplifier has not been connected/Servo amplifier power OFF". • The start request is issued during the "[Md.26] Axis operation status" into "21: Servo OFF". • The start request is issued during the "[Md.26] Axis operation status" of axis to be interpolated into "-1: Error occurred", "20: Servo amplifier has not been connected/Servo amplifier power OFF" or "21: Servo OFF". • The start request is issued during the communication error to servo amplifier. • The start request is issued during the "[Cd.100] Servo OFF command" into "1: Servo OFF". • The start request is issued during the servo alarm. • The start request is issued during the forced stop of controller. • The start request is issued during the servo READY OFF. [Operation status at error occurrence] The system does not start positioning.	• Do not request the start when "[Md.26] Axis operation status" is other than "0: Standby", "1: Stopped", and "-2: Step standby". • Check the wiring with the servo amplifier and connection of connectors. • Set "0: Servo ON" in the "[Cd.100] Servo OFF command". • Reset the error after removing the servo alarm referring to the servo amplifier manual. • Remove the cause of forced stop. • Do not request the start when the servo READY signal is turned OFF.
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.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
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 in the synchronous control area was being written to the flash ROM, the power was turned OFF. • The backup data is corrupted. [Operation status at error occurrence] At start: The system does not operate.	Reset the parameter and write it to the flash ROM again.
193EH	Servo amplifier series error	The set series of the "[Pr.100] Servo series" and the series of connected servo amplifier are mismatch. [Operation status at error occurrence] The communication between servo amplifiers or later of target axis is not executed.	Match the set series of the "[Pr.100] Servo series" to the series of connected servo amplifier.
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.	Review the content of the positioning or "[Pr.96] Operation cycle setting" 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 ([Md.31] Status: b4) turned ON. • Scale origin signal detection method machine home position return is started with the home position return complete flag ([Md.31] Status: b4) 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 "[Pr.39] Stop group 3 sudden stop selection". (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 "[Pr.50] 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 "[Pr.39] Stop group 3 sudden stop selection".	• 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 ([Md.31] Status: b3) 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).
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.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
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.
1976H	Pulse conversion unit clear output OFF wait error	The clear output was not turned OFF upon the home position return in the pulse conversion unit connection axis. [Operation status at error occurrence] The home position return does not complete.	Execute home position return again. If the same error is displayed again, the hardware of the Simple Motion module or the pulse conversion unit is faulty. Please consult your sales representative.
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 a home position return method unsupported 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.
1980H	Outside JOG speed range	At the time of JOG starting, "[Cd.17] 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 "[Cd.17] JOG speed" into the setting range.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1981H	Inching movement amount error	"[Cd.16] 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 "[Cd.16] Inching movement amount" so that the setting condition is satisfied.
1990H	Error before simultaneous start	<When blocks are started simultaneously> • The partner axis for simultaneous start is BUSY. • The partner axis for simultaneous start is not present. <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. • "[Da.23] Number of simultaneous starting axes" is outside the setting range of 2 to 4. • The "Simultaneous starting axis start data No." of a starting 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 system stops immediately.	• Normalize the simultaneous start axis. • Normalize the simultaneous starting own axis start data No. and the simultaneous starting axis (1 to 3) start data No.
1993H	Software stroke limit +	• The command position exceeds the upper limit of the software stroke limit. • The positioning address and "[Cd.9] New position value" exceed the upper limit of the software stroke limit. • In the circular interpolation with sub points designated, the sub point exceeds the upper limit of the software stroke limit. • During the speed control mode/the torque control mode/the continuous operation to torque control mode, the command position value exceeded the upper limit of the software stroke limit. [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 the detailed parameter 2 "[Pr.39] Stop group 3 sudden stop selection" 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 control operation. • Correct the positioning address. (At circular interpolation with sub points designated, also check "[Da.7] Arc address".) New current value: Set "[Cd.9] New position value" within the software stroke limit. During operation: Correct the positioning address. 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.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1995H	Software stroke limit -	• The command position exceeds the lower limit of the software stroke limit. • The positioning address and "[Cd.9] New position value" exceed the lower limit of the software stroke limit. • In the circular interpolation with sub points designated, the sub point exceeds the lower limit of the software stroke limit. • During the speed control mode/the torque control mode/the continuous operation to torque control mode, the command position value exceeded the lower limit of the software stroke limit. [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 the detailed parameter 2 "[Pr.39] Stop group 3 sudden stop selection" 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 control operation. • Correct the positioning address. (At circular interpolation with sub points designated, also check "[Da.7] Arc address".) New current value: Set "[Cd.9] New position value" within the software stroke limit. During operation: Correct the positioning address. 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.
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 "[Cd.9] New position value" into the setting range.
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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct "[Da.2] Control method".
1999H	Unit group mismatch	The reference and interpolation axis units are different at the parameter "[Pr.20] 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the positioning data or change the parameter "[Pr.1] Unit setting" of the axis to be interpolated.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
199AH	Interpolation mode error	• For starting, a composite speed is designated in the reference axis parameter "[Pr.20] Interpolation speed designation method" using the speed interpolation control or 4-axis linear interpolation control. • For starting, a reference axis speed is designated in the reference axis parameter "[Pr.20] Interpolation speed designation method" using the circular 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Set the "[Pr.20] Interpolation speed designation method" correctly.
199CH	Control method setting error	• "[Da.2] 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 "[Pr.39] Stop group 3 sudden stop selection". (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 "[Pr.39] Stop group 3 sudden stop selection". (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.
199FH	Circular interpolation not possible	Circular interpolation is carried out on an axis in the unit of degree. [Operation status at error occurrence] The operation is terminated.	Correct "[Da.2] Control method".
19A0H	M code ON signal start	The positioning start is carried out when an M code ON signal ([Md.31] Status: b12) is turned ON. [Operation status at error occurrence] The system does not operate at start.	After turning OFF the M code ON signal ([Md.31] Status: b12), start the system.
19A1H	PLC READY OFF start	The positioning start is carried out when the "[Cd.190] PLC READY" is turned OFF. [Operation status at error occurrence] The system does not operate at start.	Check the program which turns ON/OFF the "[Cd.190] PLC READY", and turn ON "[Cd.190] PLC READY". Then start the system.
19A2H	READY OFF start	The positioning start is carried out when the READY signal ([Md.140] Module status: b0) is turned OFF. [Operation status at error occurrence] The system does not operate at start.	Check the READY ON signal ([Md.140] Module status: b0), and then start the system.
19A3H	Outside start No. range	• At the start of positioning, the setting value of the "[Cd.3] 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 "[Cd.3] 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 [Cd.3] Positioning start No."

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
19A4H	Illegal setting of ABS direction in unit of degree	The setting value of ABS direction in the unit of degree is as follows. • Set outside the setting range when the software stroke limit is invalid. • A figure other than "0" is set 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 limits. (To invalidate, set "[Pr.12] Software stroke limit upper limit value" the same as "[Pr.13] 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 "[Pr.55] Setting value of the operation setting at home position return incomplete".
19E4H	Outside control mode auto-shift switching parameter range	When setting "[Cd.153] Control mode auto-shift selection", "[Cd.154] Control mode auto-shift parameter" is outside the range. [Operation status at error occurrence] During positioning control: The system stops with the setting of the detailed parameter 2 "[Pr.39] Stop group 3 sudden stop selection". During speed control mode: The mode is switched to position control mode, and the system stops immediately.	Set "[Cd.154] Control mode auto-shift parameter" within the range and switch to the continuous operation to torque control mode.
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 "[Pr.39] Stop group 3 sudden stop selection". 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.
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.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1A00H	Condition data error	• "[Da.15] Condition target" setting values are not set or outside the setting range. • "[Da.16] Condition operator" setting values are not set or outside the setting range. • "[Da.16] Condition operator" is a bit operator, and "[Da.18] Parameter 1" is 32 or more. • An unusable "[Da.16] Condition operator" is set for the set "[Da.15] Condition target". • "[Da.16] Condition operator" is ["[Da.18] Parameter 1" is greater than to "[Da.19] Parameter 2"] with 05H (P1 ≤ ** ≤ P2). • "[Da.16] Condition operator" is ["[Da.18] Parameter 1" is greater than to "[Da.19] Parameter 2"] with 06H (** ≤ P1, P2≤**). • The setting value of "[Da.17] Address" is outside the setting range when "[Da.15] Condition target" is set to "Buffer memory (1-word/2-word)". (1-word: 0 to 98303, 2-word: 0 to 98302) • The same axis was designated in "[Da.24] Simultaneously starting axis No.1", "[Da.25] Simultaneously starting axis No.2", or "[Da.26] Simultaneously starting axis No.3". • The axis larger than shared parameter "[Pr.152] Maximum number of control axes" was set as "[Da.24] Simultaneously starting axis No.1", "[Da.25] Simultaneously starting axis No.2", and "[Da.26] Simultaneously starting axis No.3". • Self-axis was set as "[Da.24] Simultaneously starting axis No.1", "[Da.25] Simultaneously starting axis No.2", or "[Da.26] Simultaneously starting axis No.3". • Values outside ranges are set in "[Da.23] Number of simultaneous starting axes", "[Da.24] Simultaneous starting axis No.1", "[Da.25] Simultaneous starting axis No.2", and/or "[Da.26] Simultaneous starting axis No.3". [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1A10H	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 executed currently. • 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. • The current speed is set by speed control. • 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 the "[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}). • 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 the "[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) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1A17H	Large arc error deviation	When an arc 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 "[Pr.41] Allowable circular interpolation error width". [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 "[Pr.41] Allowable circular interpolation error width".
1A18H	Software stroke limit +	• The setting value of the "[Da.6] Positioning address/movement amount" exceeds "[Pr.12] Software stroke limit upper limit value". • In the circular 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 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 the detailed parameter 2 "[Pr.39] Stop group 3 sudden stop selection" 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". (In the circular interpolation with sub points designated, correct the "[Da.7] Arc address" too.) At operation start: Set the command position value within the software stroke limit by the manual control operation.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1A1AH	Software stroke limit -	• The setting value of the "[Da.6] Positioning address/movement amount" exceeds the "[Pr.13] Software stroke limit lower limit value". • In the circular interpolation with sub points designated, the sub point exceeds the "[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 the detailed parameter 2 "[Pr.39] Stop group 3 sudden stop selection" 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". (In the circular interpolation with sub points designated, correct the "[Da.7] Arc address" too.) At operation start: Set the command position value within the software stroke limit by the manual control operation.
1A1CH	New current value not possible	• "[Da.2] Control method" sets "[Da.1] Operation pattern" "continuous path control" using new current positioning data. • "[Da.1] Operation pattern" sets a "new current value" in "[Da.2] 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	• The continuous path control is designated using a control method which is not allowed to use for continuous path control such as speed control, speed-position switching control, position-speed switching control, fixed-feed, and current value changing. • The previous data such as those on speed control, speed-position switching control, position-speed switching control, fixed-feed, and current value changing shows a continuous path control. • The continuous positioning control is designated for speed control or position-speed switching control. [Operation status at error occurrence] The system does not operate at start.	• Do not designate a speed control, fixed-feed, speed-position switching control, position-speed switching control, and current value changing using the positioning data following the continuous path control data. • Do not carry out the fixed-feed, speed control, speed-position switching control, position-speed switching control, and current value changing using the continuous path control operation pattern. • Do not carry out the speed control and position-speed switching control using the continuous path control operation pattern.
1A21H	Outside operation pattern range	"[Da.1] 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct "[Da.1] Operation pattern".

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	• Correct "[Da.2] Control method". • Correct the axis to be interpolated. • Correct the maximum number of control axes.
1A23H	Command speed setting error	• The command speed is outside the setting range. • Linear interpolation, circular 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the command speed.
1A24H	Control method setting error	• "[Da.2] 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct "[Da.2] Control method", axis to be interpolated or parameter.
1A27H	Sub point setting error	Either of the following applies in the circular interpolation with sub points designated. • Start point = sub point • End point = sub point • Start point, end point, and sub point are in line with each other. • Sub point address is outside the range of -2147483648 to 2147483647. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops immediately.	Correct the sub address (arc address).
1A2BH	End point setting error	• Start point is equal to end point in the circular interpolation with sub points designated. • End point address is outside the range of -2147483648 to 2147483647 in the circular 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).

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1A2DH	Center point setting error	Either of the following applies in the circular interpolation with center point designated. • Start point = Center point • End point = Center point • Center point address is outside the range of -2147483648 to 2147483647. [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. • 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 "[Pr.39] Stop group 3 sudden stop selection" (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 "[Da.2] control method" "LOOP". [Operation status at error occurrence] The operation is terminated.	Set 1 to 65535 in the repeating time of LOOP.
1A60H	Outside unit setting range	The setting value of the basic parameter 1 "[Pr.1] Unit setting" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1A61H	Outside pulse number per rotation range	The setting value of the basic parameter 1 "[Pr.2] Number of pulses per rotation (AP)" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1A62H	Outside movement amount per rotation range	The setting value of the basic parameter 1 "[Pr.3] Movement amount per rotation (AL)" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1A63H	Outside unit magnification range	• The setting value of the basic parameter 1 "[Pr.4] Unit magnification (AM)" is outside the setting range. • "[Pr.3] Movement amount per rotation (AL)" × "[Pr.4] Unit magnification (AM)" exceeds 2147483648. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	• Set AL and AM values which make "[Pr.3] Movement amount per rotation (AL)" × "[Pr.4] Unit magnification (AM)" within 2147483647, and then turn the "[Cd.190] PLC READY" from OFF to ON. • With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1A66H	Outside bias speed range	• The setting value of the basic parameter 1 "[Pr.7] Bias speed at start" is outside the setting range. • The bias speed exceeds "[Pr.8] Speed limit value". [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not ON.	• With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON. • Set the bias speed equal to or less than "[Pr.8] Speed limit value" and turn the "[Cd.190] PLC READY" from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1A68H	Outside electronic gear setting range	The setting 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 ([Md.140] Module status: b0) is not ON.	"[Pr.2] Number of pulses per rotation (AP)", "[Pr.3] Movement amount per rotation (AL)", "[Pr.4] Unit magnification (AM)" Review these parameters.
1A69H	Outside speed limit value range	• The setting value of the basic parameter 2 "[Pr.8] Speed limit value" is outside the setting range. • The value which carried out frequency conversion of the basic parameter 2 "[Pr.8] Speed limit value" is over maximum output frequency of the CPU module. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) is not turned ON. At start: The system does not operate.	• When the "[Cd.190] PLC READY" is not turned ON after the setting is set within the setting range, turn the "[Cd.190] PLC READY" from OFF to ON. • After keeping the value which carried out frequency conversion from exceeding maximum output frequency of the CPU module, "[Cd.190] PLC READY" will be set to OFF to ON if "[Cd.190] PLC READY" is not ON.
1A6BH	Outside acceleration time 0 range	The setting value of the basic parameter 2 "[Pr.9] Acceleration time 0" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) is not turned ON. At start: The system does not operate.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1A6CH	Outside deceleration time 0 range	The setting value of the basic parameter 2 "[Pr.10] Deceleration time 0" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) is not turned ON. At start: The system does not operate.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" 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 ([Md.140] Module status: b0) 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 "[Pr.12] Software stroke limit upper limit value" is outside the setting range. • In a unit other than "degree", "[Pr.12] Software stroke limit upper limit value" is smaller than the setting value of "[Pr.13] Software stroke limit lower limit value". [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	• Correct the setting value and turn the "[Cd.190] PLC READY" from OFF to 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" and turn the "[Cd.190] PLC READY" from OFF to ON.
1AA3H	Software stroke limit lower limit	• In the unit of "degree", the setting value of the detailed parameter 1 "[Pr.13] Software stroke limit lower limit value" is outside the setting range. • In a unit other than "degree", "[Pr.12] Software stroke limit upper limit value" is smaller than "[Pr.13] Software stroke limit lower limit value". [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	• Correct the setting value and turn the "[Cd.190] PLC READY" from OFF to 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 "[Cd.190] PLC READY" from OFF to ON.
1AA5H	Software stroke limit selection	• The setting value of the detailed parameter 1 "[Pr.14] 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 ([Md.140] Module status: b0) 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".

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1AA6H	Software stroke limit valid/ invalid setting	The setting value of the detailed parameter 1 "[Pr.15] Software stroke limit valid/invalid setting" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1AA7H	Command in-position width	The setting value of the detailed parameter 1 "[Pr.16] Command in-position width" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1AA8H	Illegal torque limit setting value	The setting value of the detailed parameter 1 "[Pr.17] Torque limit setting value" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1AA9H	M code ON timing error	The setting value of the detailed parameter 1 "[Pr.18] M code ON signal output timing" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1AAAH	Speed switching mode error	The setting value of the detailed parameter 1 "[Pr.19] Speed switching mode" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1AABH	Interpolation speed designation method error	The setting value of the detailed parameter 1 "[Pr.20] Interpolation speed designation method" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1AACH	Current value update request error	The setting value of the detailed parameter 1 "[Pr.21] Command position value during speed control" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1AAEH	Speed-position function selection error	The detailed parameter 1 "[Pr.81] 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 ([Md.140] Module status: b0) 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 "[Pr.81] Speed-position function selection" and turn the "[Cd.190] PLC READY" from OFF to ON.
1AB1H	Acceleration time 1 setting error	The setting value of the detailed parameter 2 "[Pr.25] Acceleration time 1" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1AB2H	Acceleration time 2 setting error	The setting value of the detailed parameter 2 "[Pr.26] Acceleration time 2" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY " from OFF to ON.
1AB3H	Acceleration time 3 setting error	The setting value of the detailed parameter 2 "[Pr.27] Acceleration time 3" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1AB4H	Deceleration time 1 setting error	The setting value of the detailed parameter 2 "[Pr.28] Deceleration time 1" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1AB5H	Deceleration time 2 setting error	The setting value of the detailed parameter 2 "[Pr.29] Deceleration time 2" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1AB6H	Deceleration time 3 setting error	The setting value of the detailed parameter 2 "[Pr.30] Deceleration time 3" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
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. • The setting value of the detailed parameter 2 "[Pr.31] JOG speed limit value" exceeds the "[Pr.8] Speed limit value". • 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 "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	• When the "[Cd.190] PLC READY" is not turned ON after the setting value is corrected, turn the "[Cd.190] PLC READY" from OFF to ON. • When the "[Cd.190] PLC READY" is not turned ON after the setting value is set to equal to or less than the "[Pr.8] Speed limit value", turn the "[Cd.190] PLC READY" from OFF to ON. • When the "[Cd.190] PLC READY" 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 "[Cd.190] PLC READY" from OFF to ON.
1ABCH	JOG acceleration time selection setting error	The setting value of the detailed parameter 2 "[Pr.32] JOG operation acceleration time selection" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1ABDH	JOG deceleration time selection setting error	The setting value of the detailed parameter 2 "[Pr.33] JOG operation deceleration time selection" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1ABEH	Acceleration/deceleration process selection setting error	The setting value of the detailed parameter 2 "[Pr.34] Acceleration/deceleration process selection" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1ABFH	S-curve ratio setting error	The setting value of the detailed parameter 2 "[Pr.35] S-curve ratio" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1AC0H	Illegal sudden stop deceleration time	The setting value of the detailed parameter 2 "[Pr.36] Sudden stop deceleration time" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 suddenstop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1AC1H	Stop group 1 sudden stop selection error	The setting value of the detailed parameter 2 "[Pr.37] Stop group 1 sudden stop selection" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1AC2H	Stop group 2 sudden stop selection error	The setting value of the detailed parameter 2 "[Pr.38] Stop group 2 sudden stop selection" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1AC3H	Stop group 3 sudden stop selection error	The setting value of the detailed parameter 2 "[Pr.39] Stop group 3 sudden stop selection" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1AC4H	Outside allowance circular interpolation error width	The setting value of the detailed parameter 2 "[Pr.41] Allowance circular interpolation error width" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1AC5H	External command function selection error	The setting value of the detailed parameter 2 "[Pr.42] External command function selection" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1ACCH	Restart allowable range error	The setting value of the detailed parameter 2 "[Pr.84] Restart allowable range when servo OFF to ON" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1ACDH	Speed control 10 × multiplier setting for degree axis error	The setting value of the detailed parameter 2 "[Pr.83] Speed control 10 × multiplier setting for degree axis" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1ACEH	Operation setting for speed-torque control mode error	The setting value of the detailed parameter 2 "[Pr.90] Operation setting for speed-torque control mode" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1ACFH	External command signal selection error	The setting value of the detailed parameter 2 "[Pr.95] External command signal selection" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1AD0H	FLS signal selection error	The setting value of the detailed parameter 1 "[Pr.116] FLS signal selection" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	Correct the setting value and turn the "[Cd.190] PLC READY" from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1AD1H	RLS signal selection error	The setting value of the detailed parameter 1 "[Pr.117] RLS signal selection" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	Correct the setting value and turn the "[Cd.190] PLC READY" from OFF to ON.
1AD2H	DOG signal selection error	The setting value of the detailed parameter 1 "[Pr.118] DOG signal selection" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	Correct the setting value and turn the "[Cd.190] PLC READY" from OFF to ON.
1AD3H	STOP signal selection error	The setting value of the detailed parameter 1 "[Pr.119] STOP signal selection" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	Correct the setting value and turn the "[Cd.190] PLC READY" from OFF to ON.
1B00H	Home position return method error	The setting value of the home position return basic parameter "[Pr.43] Home position return method" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1B01H	Home position return direction error	The setting value of the home position return basic parameter "[Pr.44] Home position return direction" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1B02H	Home position address setting error	The setting value of the home position return basic parameter "[Pr.45] Home position address" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" 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. • The setting value of the home position return basic parameter "[Pr.46] Home position return speed" exceeds the "[Pr.8] Speed limit value". • 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 ([Md.140] Module status: b0) is not turned ON.	• Correct the setting value and turn the "[Cd.190] PLC READY" from OFF to ON. • After the setting value is equal to or less than the "[Pr.8] Speed limit value", turn the "[Cd.190] PLC READY" from OFF to ON. • After the setting value is set to equal to or more than "[Pr.7] Bias speed at start", turn the "[Cd.190] PLC READY" 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 ([Md.140] Module status: b0) is not turned ON.	• Correct the setting value and turn the "[Cd.190] PLC READY" 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 ([Md.140] Module status: b0) 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"[Cd.190] PLC READY" 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 ([Md.140] Module status: b0) 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 "[Cd.190] PLC READY" from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1B09H	Home position return retry error	The setting value of the home position return basic parameter "[Pr.48] Home position return retry" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" 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 "[Pr.50] Setting for the movement amount after proximity dog ON" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1B0BH	Home position return acceleration time selection error	The setting value of the home position return detailed parameter "[Pr.51] Home position return acceleration time selection" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1B0CH	Home position return deceleration time selection error	The setting value of the home position return detailed parameter "[Pr.52] Home position return deceleration time selection" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1B0DH	Home position return torque limit value error	The setting value of the home position return detailed parameter "[Pr.54] Home position return torque limit value" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1B0EH	Home position return torque limit value error	The home position return detailed parameter "[Pr.54] Home position return torque limit value" has exceeded the detailed parameter 1 "[Pr.17] Torque limit setting value". [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the"[Cd.190] PLC READY" from OFF to ON.
1B10H	Speed designation during home position shift error	The setting value of the home position return detailed parameter "[Pr.56] Speed designation during home position shift" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1B11H	Operation setting for incompletion of home position return error	The setting value of the home position return detailed parameter "[Pr.55] Operation setting for incompletion of home position return" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1B70H	Manual pulse generator/ Incremental synchronous encoder input selection error	The setting value of the common parameter 1 "[Pr.24] Manual pulse generator/Incremental synchronous encoder input selection" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1B71H	Forced stop valid/invalid setting error	The setting value of the common parameter 1 "[Pr.82] Forced stop valid/invalid setting" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1B72H	Manual pulse generator/ Incremental synchronous encoder input type selection error	The setting value of the common parameter 2 "[Pr.89] 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".)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1B73H	Operation cycle setting error	The set value of the common parameter "[Pr.96] Operation cycle setting" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) 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.
1B74H	SSCNET setting error	The set values of the common parameter "[Pr.97] SSCNET setting" and the servo parameter "[Pr.100] Servo series" do not match. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not ON.	With "[Pr.97] SSCNET setting" and "[Pr.100] Servo series" set by a correct combination, 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 ([Md.140] Module status: b0) is not turned ON.	Correct the setting value and turn the "[Cd.190] PLC READY" from OFF to ON.
1B9FH	Pulse conversion unit parameter error	'Absolute position detection system (PA03)' of the servo parameter is set to '1: Valid (used in absolute position detection system)' for the pulse conversion unit axis. Or, 'Communication setting between drivers (PD15)' of the servo parameter is other than '0: Invalid'. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) will not turn ON.	With the setting brought into '0: Invalid (used in Incremental system)' or, '0: Invalid', turn the "[Cd.190] PLC READY" from OFF to ON.
1C80H	Driver error	Errors occur in the driver. [Operation status at error occurrence] The motor stops. (For stop methods, follow the specification of the driver.)	Check the contents of the error and take actions according to "[Md.114] Servo alarm". (For the details of "[Md.114] Servo alarm", refer to the manual of each driver.)
1C81H	Communication retry counter error	The Simple Motion module detects the communication retry counter errors with the driver. [Operation status at error occurrence] At start: The system does not start. During operation: 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] At start: The system does not start. During operation: 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 servo amplifier does not correspond is set up. [Operation status at error occurrence] The operation is stopped.	With the setting brought into the supported range, switch the power on again or reset the PLC.
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 ([Md.140] Module status: b0) is not turned ON.	Set the number of master axis not more than the number can be set in servo parameter "PD15".

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
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 ([Md.140] Module status: b0) 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 ([Md.140] Module status: b0) 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 ([Md.140] Module status: b0) 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.
1CBEH	The optical hub unit connection error	• Connection number of the optical hub unit exceeds connectable number per system. • The optical hub unit connected to connection route which accessing OUT2 or OUT3. [Operation status at error occurrence] Communication is not performed between the servo amplifier and the sub path or with units over the maximum connectable number.	• Set a number of optical hub units that can be connected per system. • When connect the optical hub unit to back part of the optical hub, please connect to diverge path from OUT1.
1CBFH	The optical hub unit communication error	Communication with the optical hub unit is error. [Operation status at error occurrence] Depending on the error that occurred on the relevant unit, the operation is continued or communication with the servo amplifier is disconnected.	• Check if there exist any error in SSCNET III cable. • Check if there exist any problem in power supply. • Replace the optical hub unit.
2610H	Inter-module synchronization signal fault	Inter-module synchronization fault is detected. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) will not turn 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 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 ([Md.140] Module status: b0) will not turn 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 CPU module, base unit, extension cable or Simple Motion module. Please consult your sales representative.
3001H	Faults	Hardware failure. [Operation status at error occurrence] The system stops.	Check that there is no influence from noise.
3002H	Internal circuit fault	Hardware failure. [Operation status at error occurrence] The system stops.	Check that there is no influence from noise.
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 was 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 "[Pr.38] Stop group 2 sudden stop selection". (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.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
3022H	System bus error	Communication with CPU module did not complete properly. [Operation status at error occurrence] System halt	• Check that there is no influence from noise. • Check the connection of the extension cable. • If the above problems are not found, the possible cause is a failure inside the module or an extension cable failure. Replace them as required.

*1 Setting condition: "[Cd.16] Inching movement amount × (A) ≤ [Pr.31] JOG speed limit value"
Use the following values for (A).

Unit setting	Operation cycle [FX5-SSC-S]	
	0.888 ms	1.777 ms
When unit is set to pulse	1125	562.5
When unit is set to degree and "[Pr.83] Speed control 10 × multiplier setting for degree axis" is valid	67.5	33.75
When unit setting is other than the above	675	337.5

Errors related to synchronous control are described below.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1928H	Start not possible	Start is requested when the forced stop of controller input ON. [Operation status at error occurrence] Positioning does not start.	Remove the cause of forced stop.
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	The 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 actual position 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) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1BAAH	Synchronous encoder via servo amplifier invalid error	• 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 ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, switch the power on again or reset the PLC.
1BACH	Command generation axis speed-position error	Start of forward run speed/position or reverse run speed/position is requested when "[Pr.346] Command generation axis length per cycle" set value is 0. [Operation status at error occurrence] The command generation axis does not start.	Set a value within the range of 1 to 2147483647 for "[Pr.346] Command generation axis length per cycle".
1BADH	Outside command generation axis length per cycle setting error	"[Pr.346] Command generation axis length per cycle" is outside the setting range of 0 to 2147483647. [Operation status at error occurrence] "[Pr.346] Command generation axis length per cycle" operates regarded as the setting value "0".	Set a value within the range of 1 to 2147483647 for "[Pr.346] Command generation axis length per cycle".
1BE0H	Outside main input axis No. range	• The 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	• The 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	The 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	The 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) [FX5-SSC-S]	Error name	Error details and causes	Remedy
1BE6H	Outside main shaft clutch smoothing method range	The 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	The 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 axis No. range	• The 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	The 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	The 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	The 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	The 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	The 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.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
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.
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	Outside cam axis length per cycle range	The synchronous parameter "[Pr.439] Cam axis length per cycle" 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.
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.

Error code (Hexadecimal) [FX5-SSC-S]	Error name	Error details and causes	Remedy
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.
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).

Motion module detection error [FX5-SSC-G]

Error code (Hexadecimal) [FX5-SSC-G]	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. Or the accumulative number of write accesses to flash ROM exceeds 100,000. [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.) If the same error occurs repeatedly, please consult your local Mitsubishi representative.
1800H	SDO communication error	• An error occurred in the SDO communication. • Issued a large quantity of SLMP requests at a time. • Issued an SLMP request for a virtual servo amplifier axis. [Operation status at error occurrence] FB Error is ON, and SDO error code is output to SDOErrorID.	• Remove the error factor according to SDO error code. • Correct the program to decrease the number of issued SLMPs or issue the next request after a response is returned. • Correct the program so that an SLMP request is not issued for a virtual servo amplifier axis.
1A00H	PLC READY OFF during operation	The "[Cd.190] PLC READY" 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 "[Pr.38] Stop group 2 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Review the program which turns ON/OFF "[Cd.190] PLC READY".
1A02H	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.
1A04H	Hardware stroke limit (+)	[Version 1.001 or later] • Start is requested when the hardware stroke limit (upper limit signal FLS) is turned OFF. [Version 1.000] • Start is requested when the hardware stroke limit (upper limit signal FLS) is turned OFF. • The hardware stroke limit (upper limit signal FLS) is turned OFF during operation. [Operation status at error occurrence] The system does not start.	[Version 1.001 or later] • 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 to be installed for the system, wire to always turn ON the upper limit signal (FLS) input of the Motion module. [Version 1.000] • 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 to be installed for the system, wire to always turn ON the upper limit signal (FLS) input of the Motion module. • 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.
1A05H	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 "[Pr.37] Stop group 1 sudden stop selection". (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) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1A06H	Hardware stroke limit (-)	[Version 1.001 or later] Start is requested when the hardware stroke limit (lower limit signal RLS) is turned OFF. [Version 1.000] • Start is requested when the hardware stroke limit (lower limit signal (RLS)) is turned OFF. • The hardware stroke limit (lower limit signal (RLS)) is turned OFF during operation. [Operation status at error occurrence] The system does not start. At start: The system does not start. During operation: The system stops with the setting (deceleration stop/rapid stop) of the detailed parameter 2 "[Pr.37] Stop group 1 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	[Version 1.001 or later] • 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 to be installed for the system, wire to always turn ON the lower limit signal (RLS) input of the Motion module. [Version 1.000] • 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 to be installed for the system, wire to always turn ON the lower limit signal (RLS) input of the Motion module. • 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.
1A07H	Hardware stroke limit(-)	The hardware stroke limit (lower limit signal (RLS)) is turned OFF during operation. [Operation status at error occurrence] —	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.
1A08H	Stop signal ON at start	[Version 1.001 or later] Start is requested when a STOP signal is turned ON. [Version 1.000] • Start is requested when a STOP signal is turned ON. • Start is requested when an external 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.
1A09H	Stop signal ON at start	Start is requested when an external stop signal is turned ON. [Operation status at error occurrence] —	After clearing the external stop signal, then review the timing of start.
1A0AH	READY OFF → ON during BUSY	"[Cd.190] PLC READY" is turned from OFF to ON when BUSY signal is turned ON. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	Turn ON the "[Cd.190] PLC READY" with the BUSY signals of all axes OFF.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1A20H	Start not possible	[Version 1.001 or later] Start is requested when start is not possible in the axis operation state. [Version 1.000] • Start is requested when start is not possible in the axis operation state. • Start is requested when the "[Md.26] Axis operation status" is "-1: Error" • Start is requested when the "[Md.26] Axis operation status" is "20: Servo Amplifier Not Connected/ Servo Amplifier Power OFF". • Start is requested when the "[Md.26] Axis operation status" is "21: Servo OFF". • Start is requested when the "[Md.26] Axis operation status" of the axis to be interpolated is "-1: Error", "20: Servo Amplifier Not Connected/Servo Amplifier Power OFF", or "21: Servo OFF". • Start is requested when communication with the servo amplifier is in error. • Start is requested when the "[Cd.100] Servo OFF command" is "1: Servo OFF". • Start is requested during a servo alarm. • Start is requested when the forced stop of controller input is ON. • Start is requested when the servo READY signal is turned OFF. [Operation status at error occurrence] The system does not start positioning.	[Version 1.001 or later] Do not request the "[Md.26] Axis operation status" is other than "0: Standby", "1: Stop", and "-2: Step Standby". [Version 1.000] • Do not request the start when the "[Md.26] Axis operation status" is other than "0: Standby", "1: Stop", and "-2: Step Standby". • Check the wiring with the servo amplifier, and connection of connectors. • Set "0: Servo ON" to the "[Cd.100] Servo OFF command". • Reset the error after removing the servo alarm referring to the manual of the servo amplifier. • Remove the cause of forced stop. • Do not request the start when the servo READY signal is turned OFF.
1A21H	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 "[Md.26] Axis operation status" is other than "0: Standby", "1: Stop", and "-2: Step Standby".
1A22H	Start not possible	Start is requested when the "[Md.26] Axis operation status" is "20: Servo Amplifier Not Connected/Servo Amplifier Power OFF". [Operation status at error occurrence] The system does not start positioning.	Do not request the start when the "[Md.26] Axis operation status" is other than "0: Standby", "1: Stop", and "-2: Step Standby".
1A23H	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 "[Md.26] Axis operation status" is other than "0: Standby", "1: Stop", and "-2: Step Standby".
1A24H	Start not possible	Start is requested when communication with the servo amplifier is in error. [Operation status at error occurrence] The system does not start positioning.	Check the wiring with the servo amplifier and connection of connectors.
1A25H	Start not possible	Start is requested when the "[Md.26] Axis operation status" of the axis to be interpolated is "-1: Error occurred", "20: Servo Amplifier Not Connected/Servo Amplifier Power OFF" or "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" of the axis to be interpolated is other than "0: Standby", "1: Stop", and "-2: Step Standby".
1A26H	Start not possible	Start is requested when the "[Cd.100] Servo OFF command" is "1: Servo OFF". [Operation status at error occurrence] The system does not start positioning.	Set "0: Servo ON" to the "[Cd.100] Servo OFF command".
1A27H	Start not possible	Start is requested during a servo alarm. [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".
1A29H	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.
1A31H	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.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1A32H	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.
1A33H	Flash ROM sum check error	• While data in the synchronous control area was being written to the flash ROM, the power was turned OFF. • The backup data is corrupted. [Operation status at error occurrence] At start: The system does not operate.	Reset the parameter and write it to the flash ROM again.
1A34H	Synchronous restoration data sum check error	Failed to load synchronous restoration data. [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. Replace the module.
1A3FH	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.	Review the content of the positioning or operation cycle setting longer than the current setting.
1A45H	Home position return request ON	The home position return request flag ([Md.31] Status: b3) 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).
1A46H	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.
1A74H	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.
1A75H	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.
1A79H	Home position return method invalid	Home position return is started with a home position return method unsupported by the connected device. [Operation status at error occurrence] The home position return does not start.	Correct to the available home position return method.
1A7EH	Encoder initial communication error at servo amplifier power supply on	Error occurred to the communication between servo amplifier and encoder at turning on the servo amplifier power supply. [Operation status at error occurrence] Current value restoration is not performed.	Check the motor and encoder cables.
1A80H	Outside JOG speed range	At the time of JOG starting, "[Cd.17] 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 "[Cd.17] JOG speed" into the setting range.
1A81H	Inching movement amount error	"[Cd.16] 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 "[Cd.16] Inching movement amount" so that the setting condition is satisfied.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1A82H	Manual pulse generator carry-over movement amount overflow	The movement amount which exceeds the detailed parameter 2 "[Pr.123] Manual pulse generator speed limit value" is generated continuously and the "[Md.62] Amount of the manual pulser driving carrying over movement" exceeds tolerance (-2147483648 to 2147483647).	• Adjust input pulses so as not to occur the movement amount, which exceeds the detailed parameter 2 "[Pr.123] Manual pulse generator speed limit value", continuously. • Change the detailed parameter 2 "[Pr.122] Manual pulse generator speed limit mode" to a value other than "2: Output over value of speed limit later".
1A90H	Error before simultaneous start	[Version 1.001 or later] <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. [Version 1.000] <When it is the block start control> • The partner axis for simultaneous start is BUSY. • The partner axis for simultaneous start is not present. <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. • "[Da.23] Number of simultaneous starting axes" is outside the setting range of 2 to 4. • The "Simultaneous starting axis start data No." of a starting 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 system stops immediately.	[Version 1.001 or later] • Normalize the simultaneous starting axes. [Version 1.000] • Normalize the simultaneous starting axes. • Normalize the simultaneous starting own axis start data No. and the simultaneous starting axis (1 to 3) start data No.
1A91H	Error before simultaneous start	<When multiple axes are started and controlled simultaneously> • The same axis number is set to multiple simultaneous starting axes. • The own axis number is set to a simultaneous starting axes. • "[Da.23] Number of simultaneous starting axes" is out of range (2 to 4). • The "Simultaneous starting axis start data No." of a starting axis is 0 or is outside the setting range. • The "Simultaneous starting axis start data No." of a starting axis or 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 system stops immediately.	Normalize the simultaneous starting own axis start data No. and the simultaneous starting axis (1 to 3) start data No.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1A93H	Software stroke limit +	[Version 1.001 or later] The command position exceeds the upper limit of the software stroke limit. [Version 1.000] • The command position exceeds the upper limit of the software stroke limit. • The positioning address and "[Cd.9] New position value" exceed the upper limit of the software stroke limit. • In the circular interpolation with auxiliary point designated, the auxiliary point exceeds the upper limit of the software stroke limit. • The command position value exceeds the upper limit of the software stroke limit during speed control mode, torque control mode, or continuous operation to torque control mode. [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 the detailed parameter 2 "[Pr.39] Stop group 3 sudden stop selection" 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.	[Version 1.001 or later] 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. [Version 1.000] At operation start: • Set the command position value within the software stroke limit by the manual control operation. • Correct the positioning address. (Also check "[Da.7] Arc address" for the circular interpolation with auxiliary point designated.) Current value change: • Set "[Cd.9] New position value" within the software stroke limit. During operation: • Correct the positioning address. 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.
1A94H	Software stroke limit +	"[Cd.9] 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 "[Cd.9] New position value" within the software stroke limit.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1A95H	Software stroke limit -	[Version 1.001 or later] The command position exceeds the lower limit of the software stroke limit. [Version 1.000] • The command position exceeds the lower limit of the software stroke limit. • The positioning address or "[Cd.9] New position value" exceed the lower limit of the software stroke limit. • In the circular interpolation with auxiliary point designated, the auxiliary point exceeds the lower limit of the software stroke limit. • The command position value exceeds the lower limit of the software stroke limit during speed control mode, torque control mode, or continuous operation to torque control mode. [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 the detailed parameter 2 "[Pr.39] Stop group 3 sudden stop selection" 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.	[Version 1.001 or later] 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. [Version 1.000] At operation start: • Set the command position value within the software stroke limit by the manual control operation. • Correct the positioning address. (Also check "[Da.7] Arc address" for the circular interpolation with auxiliary point designated.) Current value change: • Set "[Cd.9] New position value" within the software stroke limit. During operation: • Correct the positioning address. 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.
1A96H	Software stroke limit -	"[Cd.9] 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 "[Cd.9] New position value" within the software stroke limit.
1A97H	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 "[Cd.9] New position value" into the setting range.
1A98H	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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct "[Da.2] Control method".
1A99H	Unit group mismatch	The reference and interpolation axis units are different at the parameter "[Pr.20] 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the positioning data or change the parameter "[Pr.1] Unit setting" of the axis to be interpolated.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1A9AH	Interpolation mode error	[Version 1.001 or later] For starting, a vector speed is designated in the reference axis parameter "[Pr.20] Interpolation speed designation method" using the speed interpolation control or 4-axis linear interpolation control. [Version 1.000] • For starting, a vector speed is designated in the reference axis parameter "[Pr.20] Interpolation speed designation method" using the speed interpolation control or 4-axis linear interpolation control. • For starting, a reference-axis speed is designated in the reference axis parameter "[Pr.20] Interpolation speed designation method" using the circular 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Set the "[Pr.20] Interpolation speed designation method" correctly.
1A9BH	Interpolation mode error	For starting, a reference-axis speed is designated in the "[Pr.20] Interpolation speed designation method" of the reference axis using the circular 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Set the "[Pr.20] Interpolation speed designation method" correctly.
1A9CH	Control method setting error	• "[Da.2] 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the control method, axis to be interpolated or parameter.
1A9EH	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 "[Pr.39] Stop group 3 sudden stop selection". (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.
1A9FH	Circular interpolation not possible	Circular interpolation is carried out on an axis in the unit of degree. [Operation status at error occurrence] The operation is terminated.	Correct "[Da.2] Control method".
1AA0H	M code ON signal start	The positioning start is carried out when an M code ON signal ([Md.31] Status: b12) is turned ON. [Operation status at error occurrence] The system does not operate at start.	After turning OFF the M code ON signal ([Md.31] Status: b12), start the system.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1AA1H	PLC READY OFF start	The positioning start is carried out when the "[Cd.190] PLC READY" is turned OFF. [Operation status at error occurrence] The system does not operate at start.	Check the program which turns ON/OFF the "[Cd.190] PLC READY", and turn ON "[Cd.190] PLC READY". Then start the system.
1AA2H	READY OFF start	The positioning start is carried out when the READY signal ([Md.140] Module status: b0) is turned OFF. [Operation status at error occurrence] The system does not operate at start.	Check the READY ON signal ([Md.140] Module status: b0), and then start the system.
1AA3H	Outside start No. range	• At the start of positioning, the setting value of the "[Cd.3] 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 "[Cd.3] 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 [Cd.3] Positioning start No."
1AA4H	Illegal setting of ABS direction in unit of degree	[Version 1.001 or later] The setting value of the "[Cd.40] ABS direction in degrees" is outside the setting range when the software stroke limit is invalid. [Version 1.000] The setting value of ABS direction in the unit of degree is as follows. • Set outside the setting range when the software stroke limit is invalid. • A figure other than "0" is set 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.)	[Version 1.001 or later] Correct the "[Cd.40] ABS direction in degrees". [Version 1.000] • Set "0" when the software stroke limits are valid. • Invalidate the software stroke limits. (To invalidate, set "[Pr.12] Software stroke limit upper limit value" the same as "[Pr.13] Software stroke limit lower limit value".)
1AA5H	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 limits. (To invalidate, set "[Pr.12] Software stroke limit upper limit value" the same as "[Pr.13] Software stroke limit lower limit value".)
1AA6H	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 "[Pr.55] Setting value of the operation setting at home position return incomplete".
1AE4H	Outside control mode auto-shift switching parameter range	When setting "[Cd.153] Control mode auto-shift selection", "[Cd.154] Control mode auto-shift parameter" is outside the range. [Operation status at error occurrence] During positioning control: The system stops with the setting of the detailed parameter 2 "[Pr.39] Stop group 3 sudden stop selection". During speed control mode: The mode is switched to position control mode, and the system stops immediately.	Set "[Cd.154] Control mode auto-shift parameter" within the range and switch to the continuous operation to torque control mode.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1AE7H	Driver control mode unsupported	The driver was switched to an unsupported driver control mode. [Operation status at error occurrence] During positioning control: The system stops with the setting of the detailed parameter 2 "[Pr.39] Stop group 3 sudden stop selection". During speed control mode: The mode is switched to position control mode, and the system stops immediately.	Connect a driver that supports the driver control mode to be switched to.
1AF0H	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.
1AF1H	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 system stops immediately.	Normalize the simultaneous starting axis.
1AF2H	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.
1B00H	Condition data error	[Version 1.001 or later] "[Da.15] Condition target" setting values are not set or outside the setting range. [Version 1.000] • "[Da.15] Condition target" setting values are not set or outside the setting range. • "[Da.16] Condition operator" setting values are not set or are outside the setting range. • "[Da.16] Condition operator" is a Bit operator, and "[Da.18] Parameter 1" is 32 or more. • An unusable "[Da.16] Condition operator" is set for the set "[Da.15] Condition target". • "[Da.18] Parameter 1" is greater than "[Da.19] Parameter 2" while "[Da.16] Condition operator" is 05H (P1 <= ** <= P2). • "[Da.18] Parameter 1" is greater than "[Da.19] Parameter 2" while "[Da.16] Condition operator" is 06H (** <= P1, P2 <= **). • The setting value of "[Da.17] Address" is outside the setting range when "[Da.15] Condition target" is set to "Buffer memory (1-word/2-word)". (1-word: 0 to 98303, 2-word: 0 to 98302) • The same axis is set in "[Da.24] Simultaneous starting axis No.1", "[Da.25] Simultaneous starting axis No.2", and/or "[Da.26] Simultaneous starting axis No.3". • The self-axis is set in "[Da.24] Simultaneous starting axis No.1", "[Da.25] Simultaneous starting axis No.2", and/or "[Da.26] Simultaneous starting axis No.3". • Values outside ranges are set in "[Da.23] Number of simultaneous starting axes", "[Da.24] Simultaneous starting axis No.1", "[Da.25] Simultaneous starting axis No.2", and/or "[Da.26] Simultaneous starting axis No.3". [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1B01H	Condition data error	"[Da.16] Condition operator" setting values are not set or are outside the setting range. [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1B02H	Condition data error	"[Da.16] Condition operator" is a Bit operator, and "[Da.18] Parameter 1" is out of range. [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1B03H	Condition data error	An unusable "[Da.16] Condition operator" is set for the set "[Da.15] condition target". [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1B04H	Condition data error	• "[Da.18] Parameter 1" is greater than "[Da.19] Parameter 2" while "[Da.16] Condition operator" is 05H (P1 <= ** <= P2). • "[Da.18] Parameter 1" is greater than "[Da.19] Parameter 2" while "[Da.16] Condition operator" is 06H (** <= P1, P2 <= **). [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1B05H	Condition data error	The setting value of "[Da.17] Address" is outside the setting range when "[Da.15] 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.
1B0CH	Condition data error	The same axis is set in "[Da.24] Simultaneous starting axis No.1", "[Da.25] Simultaneous starting axis No.2", and/or "[Da.26] Simultaneous starting axis No.3". [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1B0DH	Condition data error	Axis number larger than the "[Pr.152] Maximum number of control axes" is set in "[Da.24] Simultaneous starting axis No.1", "[Da.25] Simultaneous starting axis No.2", and/or "[Da.26] Simultaneous starting axis No.3". [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1B0EH	Condition data error	The self axis is set in "[Da.24] Simultaneous starting axis No.1", "[Da.25] Simultaneous starting axis No.2", and/or "[Da.26] Simultaneous starting axis No.3". [Operation status at error occurrence] The operation is terminated.	Normalize the block start data.
1B0FH	Condition data error	• The "[Da.23] Number of simultaneously starting axes" is out of range. • The "[Da.23] Number of simultaneously 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.
1B10H	Illegal data No.	[Version 1.001 or later] The JUMP destination is being executed. [Version 1.000] • The positioning data No. to be executed is outside the ranges of 1 to 600, 7000 to 7004, and 9001 to 9004. • The JUMP destination is being executed. • The JUMP destination is outside the range of 1 to 600. [Operation status at error occurrence] The positioning data is not executed.	Normalize the positioning data.
1B11H	Illegal data No	• The positioning data No. to be executed is outside the ranges of 1 to 600, 7000 to 7004, and 9001 to 9004. • The JUMP destination is outside the range of 1 to 600. [Operation status at error occurrence] The positioning data is not executed.	Normalize the positioning data.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1B12H	No command speed	[Version 1.001 or later] At the start of positioning, a current speed (-1) is set for the command speed of the positioning data to be initially executed. [Version 1.000] • At the start of positioning, a current speed (-1) is set for the command speed of the positioning data to be initially executed. • The current speed is set by speed control. • 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.
1B13H	No command speed	The current speed is set for speed control. [Operation status at error occurrence] The operation does not start at positioning start.	Normalize the positioning data.
1B14H	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.
1B15H	Outside linear movement amount range	[Version 1.001 or later] In a linear interpolation where the parameter "[Pr.20] Interpolation speed designation method" is set to "vector speed", the axis movement amount for each positioning data exceeds 1073741824 (2^{30}). [Version 1.000] • In a linear interpolation where the parameter "[Pr.20] Interpolation speed designation method" is set to "vector speed", the axis movement amount for each positioning data exceeds 1073741824 (2^30). • The positioning address in INC instruction is -360.00000 or less, or 360.00000 or more, when the control unit is set to "degree" and the "[Pr.12] Software stroke limit upper limit value" is not equal to the "[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.
1B16H	Outside linear movement amount range	The positioning address in INC instruction is -360.00000 or less, or 360.00000 or more, when the control unit is set to "degree" and the "[Pr.12] Software stroke limit upper limit value" is not equal to the "[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.
1B17H	Large arc error deviation	When an arc 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 "[Pr.41] Allowable circular interpolation error width". [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 "[Pr.41] Allowable circular interpolation error width".

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1B18H	Software stroke limit +	[Version 1.001 or later] The setting value of the "[Da.6] Positioning address/movement amount" exceeds the "[Pr.12] Software stroke limit upper limit value". [Version 1.000] • The setting value of the "[Da.6] Positioning address/movement amount" exceeds the "[Pr.12] Software stroke limit upper limit value". • In the circular interpolation with auxiliary point designated, the auxiliary point exceeds the "[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 the detailed parameter 2 "[Pr.39] Stop group 3 sudden stop selection" 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.	[Version 1.001 or later] 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. [Version 1.000] At operation start/during operation: Correct the "[Da.6] Positioning address/movement amount". (Also correct the "[Da.7] Arc address" for the circular interpolation with auxiliary point designated.) At operation start: Set the command position value within the software stroke limit by the manual control operation.
1B19H	Software stroke limit +	In the circular interpolation with auxiliary point designated, the auxiliary point exceeds the upper limit of the software stroke limit.	At operation start/during operation: Correct the "[Da.6] Positioning address/movement amount" and "[Da.7] Arc address". At operation start: Set the command position value within the software stroke limit by the manual control operation.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1B1AH	Software stroke limit -	[Version 1.001 or later] The setting value of the "[Da.6] Positioning address/movement amount" exceeds the"[Pr.13] Software stroke limit lower limit value". [Version 1.000] • The setting value of the "[Da.6] Positioning address/movement amount" exceeds the "[Pr.13] Software stroke limit lower limit value". • In the circular interpolation with auxiliary point designated, the auxiliary point exceeds the "[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 the detailed parameter 2 "[Pr.39] Stop group 3 sudden stop selection" 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.	[Version 1.001 or later] 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. [Version 1.000] At operation start, during operation: Correct the "[Da.6] Positioning address/movement amount". (Also correct the "[Da.7] Arc address" for the circular interpolation with auxiliary point designated.) At operation start: Set the command position value within the software stroke limit by the manual control operation.
1B1BH	Software stroke limit -	In the circular interpolation with auxiliary point designated, the auxiliary point exceeds the lower limit of the software stroke limit.	At operation start/during operation: Correct the "[Da.6] Positioning address/movement amount" and "[Da.7] Arc address". At operation start: Set the command position value within the software stroke limit by the manual control operation.
1B1CH	New current value not possible	[Version 1.001 or later] "[Da.1] Operation pattern" "continuous trajectory control" is set for positioning data whose "[Da.2] Control method" is current value change. [Version 1.000] • "[Da.1] Operation pattern" "continuous trajectory control" is set for positioning data whose "[Da.2] Control method" is current value change. • "[Da.2] Control method" of the positioning data following the one whose "[Da.1] Operation pattern" is "continuous trajectory control" is set to "current value change". [Operation status at error occurrence] Current value is not changed.	• Do not designate continuous trajectory control using a "current value change". • Do not designate a current value change using the positioning data following the continuous trajectory control.
1B1DH	New current value not possible	"[Da.2] Control method" of the positioning data following the one whose "[Da.1] Operation pattern" is "continuous trajectory control" is set to "current value change". [Operation status at error occurrence] Current value is not changed.	• Do not designate continuous trajectory control using a "current value change". • Do not designate a current value change using the positioning data following the continuous trajectory control.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1B1EH	Continuous control or continuous trajectory control not possible	[Version 1.001 or later] "[Da.1] Operation pattern" is "continuous positioning control" or "continuous trajectory control" when "[Da.2] Control method" is "speed control" or "position-speed switching control". [Version 1.000] • Continuous trajectory control is designated for a control method for which continuous trajectory control is not available, e.g. speed control, speed-position switching control, position-speed switching control, fixed-pitch feed, and current value change. • The data before the one whose control method is speed control, speed-position switching control, position-speed switching control, fixed-pitch feed, or current value change, is set to continuous trajectory control. • Continuous positioning control is designated for speed control or position-speed switching control. [Operation status at error occurrence] The system does not operate at start.	[Version 1.001 or later] Correct the "[Da.1] Operation pattern" or "[Da.2] Control method". [Version 1.000] • Do not designate speed control, fixed-pitch feed, speed-position switching control, position-speed switching control, or current value change for the positioning data following a continuous trajectory control. • Do not execute fixed-pitch feed, speed control, speed-position switching control, position-speed switching control, or current value change in an operation pattern of continuous trajectory control. • Do not execute speed control or position-speed switching control in an operation pattern of continuous positioning control.
1B1FH	Continuous control or continuous trajectory control not possible	"[Da.1] Operation pattern" is "continuous trajectory control" when "[Da.2] Control method" is "fixed-pitch feed" or "speed-position switching control". [Operation status at error occurrence] The system does not operate at start.	Correct "[Da.1] Operation pattern" or "[Da.2] Control method".
1B20H	Continuous control or continuous trajectory control not possible	"[Da.1] Operation pattern" is "continuous trajectory control" when "[Da.2] Control method" of the next data is "speed control", "fixed-pitch feed", "position-speed switching control", or "speed-position switching control". [Operation status at error occurrence] The system does not operate at start.	Correct "[Da.1] Operation pattern" or "[Da.2] Control method".
1B21H	Outside operation pattern range	"[Da.1] 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct "[Da.1] Operation pattern".
1B22H	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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	• Correct "[Da.2] Control method". • Correct the axis to be interpolated. • Correct the maximum number of control axes.
1B23H	Command speed setting error	• The command speed is outside the setting range. • Linear interpolation, circular 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the command speed.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1B24H	Control method setting error	[Version 1.001 or later] "[Da.2] Control method" setting value is outside the setting range. [Version 1.000] • "[Da.2] 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 trajectory control is to be exercised 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct "[Da.2] Control method", axis to be interpolated or parameter.
1B25H	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 trajectory control is to be exercised 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct "[Da.2] Control method" axis to be interpolated or parameter.
1B26H	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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct "[Da.2] Control method", axis to be interpolated or parameter.
1B27H	Sub point setting error	[Version 1.001 or later] Start point in the circular interpolation with sub points designated is equal to sub point. [Version 1.000] Either of the following applies in the circular interpolation with sub points designated. • Start point = sub point • End point = sub point • Start point, end point, and sub point are in line with each other. • Sub point address is outside the range of -2147483648 to 2147483647. [Operation status at error occurrence] At start: The system does not operate. During operation: The system stops immediately.	Correct the sub address (arc address).
1B28H	Sub point setting error	End point is equal to auxiliary point in the circular interpolation with auxiliary point 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).
1B29H	Sub point setting error	Start point, end point, and auxiliary point are in line with each other in the circular interpolation with auxiliary point 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) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1B2AH	Sub point setting error	Auxiliary point address is outside the range of -2147483648 to 2147483647 in the circular interpolation with auxiliary point 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).
1B2BH	End point setting error	[Version 1.001 or later] Start point is equal to end point in the circular interpolation with auxiliary points designated. [Version 1.000] • Start point is equal to end point in the circular interpolation with auxiliary points designated. • End point address is outside the range of -2147483648 to 2147483647 in the circular interpolation with auxiliary point or center point 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).
1B2CH	End point setting error	End point address is outside the range of -2147483648 to 2147483647 in the circular interpolation with auxiliary point or center point 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).
1B2DH	Center point setting error	[Version 1.001 or later] Start point is equal to center point in the circular interpolation with center point designated. [Version 1.000] Either of the following applies in the circular interpolation with center point designated. • Start point = Center point • End point = Center point • Center point address is outside the range of -2147483648 to 2147483647. [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).
1B2EH	Center point setting error	End point is equal to center point in the circular interpolation with center point designated. At start: The system does not operate. During operation: The system stops immediately.	Correct the center point address (arc address).
1B2FH	Center point setting error	Center point address is outside the range of -2147483648 to 2147483647 in the circular interpolation with center point designated. [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).
1B30H	Outside address range	[Version 1.001 or later] In the speed-position switching control or the position-speed switching control, the setting value of a positioning address is negative. [Version 1.000] • In the speed-position switching control or the position-speed switching control, the setting value of a positioning address is negative. • In ABS1, ABS2, ABS3 or 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1B31H	Outside address range	In ABS1, ABS2, ABS3, ABS4, or speed-position switching control (ABS), 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	Correct the setting value.
1B32H	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.
1B33H	Control method LOOP setting error	A "0" is set in the repeating times of "[Da.2] control method" "LOOP". [Operation status at error occurrence] The operation is terminated.	Set 1 to 65535 in the repeating time of LOOP.
1B37H	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 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).
1B60H	Outside unit setting range	The setting value of the basic parameter 1 "[Pr.1] Unit setting" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1B61H	Outside pulse number per rotation range	The setting value of the basic parameter 1 "[Pr.2] Number of pulses per rotation (AP)" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1B62H	Outside movement amount per rotation range	The setting value of the basic parameter 1 "[Pr.3] Movement amount per rotation (AL)" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1B63H	Outside unit magnification range	• The setting value of the basic parameter 1 "[Pr.4] Unit magnification (AM)" is outside the setting range. • "[Pr.3] Movement amount per rotation (AL)" × "[Pr.4] Unit magnification (AM)" exceeds 2147483648. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	• Set AL and AM values which make "[Pr.3] Movement amount per rotation (AL)" × "[Pr.4] Unit magnification (AM)" within 2147483647, and then turn the "[Cd.190] PLC READY" from OFF to ON. • With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1B66H	Outside bias speed range	[Version 1.001 or later] The setting value of the basic parameter 1 "[Pr.7] Bias speed at start" is outside the setting range. [Version 1.000] • The setting value of the basic parameter 1 "[Pr.7] Bias speed at start" is outside the setting range. • The bias speed exceeds "[Pr.8] Speed limit value". [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not ON.	[Version 1.001 or later] With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON. [Version 1.000] • With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON. • Set the bias speed equal to or less than "[Pr.8] Speed limit value" and turn the "[Cd.190] PLC READY" from OFF to ON.
1B67H	Outside bias speed range	The bias speed exceeds "[Pr.8] Speed limit value". [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not ON.	Set the bias speed equal to or less than "[Pr.8] Speed limit value" and turn the "[Cd.190] PLC READY" from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1B68H	Outside electronic gear setting range	The setting 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 ([Md.140] Module status: b0) is not ON.	"[Pr.2] Number of pulses per rotation (AP)", "[Pr.3] Movement amount per rotation (AL)", "[Pr.4] Unit magnification (AM)" Review these parameters.
1B69H	Outside speed limit value range	[Version 1.001 or later] The setting value of the basic parameter 2 "[Pr.8] Speed limit value" is outside the setting range. [Version 1.000] • The setting value of the basic parameter 2 "[Pr.8] Speed limit value" is outside the setting range. • The frequency converted from the basic parameter 2 "[Pr.8] Speed limit value" exceeds the maximum output frequency of the module. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) is not turned ON. At start: The system does not operate.	[Version 1.001 or later] With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON. [Version 1.000] • With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON. • Make sure the converted frequency does not exceed the maximum output frequency of the module, and then turn the "[Cd.190] PLC READY" from OFF to ON.
1B6AH	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 "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) is not turned ON. At start: The system does not operate.	Make sure "[Pr.8] Speed limit value" does not exceed the command speed limit value, and then turn the "[Cd.190] PLC READY" from OFF to ON.
1B6BH	Outside acceleration time 0 range	The setting value of the basic parameter 2 "[Pr.9] Acceleration time 0" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) is not turned ON. At start: The system does not operate.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1B6CH	Outside deceleration time 0 range	The setting value of the basic parameter 2 "[Pr.10] Deceleration time 0" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) is not turned ON. At start: The system does not operate.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1B94H	Station address duplication error	"[Pr.141] IP address" and "[Pr.142] Multidrop number" of an axis overlap with those of another. [Operation status at error occurrence] Communication with the driver is not possible.	Set "[Pr.141] IP address" and "[Pr.142] Multidrop number" for each axis avoiding duplication.
1B95H	Connected setting invalid	• For a real servo amplifier axis that does not use the virtual servo amplifier function, the specified "[Pr.141] IP address" is not set in the Network Configuration Settings or connected device does not exist. • The electronic gear is 0. • A moderate error occurred in the motion module. [Operation status at error occurrence] Communication with the driver is not possible.]	• If the virtual servo amplifier function is not used, specify the IP address set in the Network Configuration Settings for "[Pr.141] IP address" and "[Pr.142] Multidrop number". • Review "[Pr.2] Number of pulses per rotation (AP)", "[Pr.3] Movement amount per rotation (AL)" and "[Pr.4] Unit magnification (AM)". • Refer to the remedy for the moderate error occurred in the motion module.
1BA0H	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 ([Md.140] Module status: b0) 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.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1BA1H	Software stroke limit upper limit	[Version 1.001 or later] In the unit of "degree", the setting value of the detailed parameter 1 "[Pr.12] Software stroke limit upper limit value" is outside the setting range. [Version 1.000] • In the unit of "degree", the setting value of the detailed parameter 1 "[Pr.12] Software stroke limit upper limit value" is outside the setting range. • In a unit other than "degree", "[Pr.12] Software stroke limit upper limit value" is smaller than "[Pr.13] Software stroke limit lower limit value". [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	[Version 1.001 or later] With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON. [Version 1.000] • With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON. • In a unit other than "degree", make sure the "[Pr.13] Software stroke limit lower limit value" is smaller than the "[Pr.12] Software stroke limit upper limit value", and then turn the "[Cd.190] PLC READY" from OFF to ON.
1BA2H	Software stroke limit upper limit	In a unit other than "degree", "[Pr.12] Software stroke limit upper limit value is smaller than "[Pr.13] Software stroke limit lower limit value.	In a unit other than "degree", make sure the "[Pr.13] Software stroke limit lower limit value" is smaller than the "[Pr.12] Software stroke limit upper limit value", and then turn the "[Cd.190] PLC READY" from OFF to ON.
1BA3H	Software stroke limit lower limit	[Version 1.001 or later] In the unit of "degree", the setting value of the detailed parameter 1 "[Pr.13] Software stroke limit lower limit value" is outside the setting range. [Version 1.000] • In the unit of "degree", the setting value of the detailed parameter 1 "[Pr.13] Software stroke limit lower limit value" is outside the setting range. • In a unit other than "degree", "[Pr.12] Software stroke limit upper limit value" is smaller than "[Pr.13] Software stroke limit lower limit value". [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	[Version 1.001 or later] With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON. [Version 1.000] • With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON. • In a unit other than "degree", make sure the "[Pr.13] Software stroke limit lower limit value" is smaller than the "[Pr.12] Software stroke limit upper limit value", and then turn the "[Cd.190] PLC READY" from OFF to ON.
1BA4H	Software stroke limit lower limit	In a unit other than "degree", "[Pr.12] Software stroke limit upper limit value" is smaller than "[Pr.13] Software stroke limit lower limit value". [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) 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" and turn the "[Cd.190] PLC READY" from OFF to ON.
1BA5H	Software stroke limit selection	• The setting value of the detailed parameter 1 "[Pr.14] 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 ([Md.140] Module status: b0) 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".
1BA6H	Software stroke limit valid/invalid setting	The setting value of the detailed parameter 1 "[Pr.15] Software stroke limit valid/invalid setting" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BA7H	Command in-position width	The setting value of the detailed parameter 1 "[Pr.16] Command in-position width" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BA8H	Illegal torque limit setting value	The setting value of the detailed parameter 1 "[Pr.17] Torque limit setting value" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1BA9H	M code ON timing error	The setting value of the detailed parameter 1 "[Pr.18] M code ON signal output timing" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BAAH	Speed switching mode error	The setting value of the detailed parameter 1 "[Pr.19] Speed switching mode" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BABH	Interpolation speed designation method error	The setting value of the detailed parameter 1 "[Pr.20] Interpolation speed designation method" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BACH	Current value update request error	The setting value of the detailed parameter 1 "[Pr.21] Command position value during speed control" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BAEH	Speed-position function selection error	The detailed parameter 1 "[Pr.81] 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 ([Md.140] Module status: b0) 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 "[Pr.81] Speed-position function selection" and turn the "[Cd.190] PLC READY" from OFF to ON.
1BB1H	Acceleration time 1 setting error	The setting value of the detailed parameter 2 "[Pr.25] Acceleration time 1" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BB2H	Acceleration time 2 setting error	The setting value of the detailed parameter 2 "[Pr.26] Acceleration time 2" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY " from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1BB3H	Acceleration time 3 setting error	The setting value of the detailed parameter 2 "[Pr.27] Acceleration time 3" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BB4H	Deceleration time 1 setting error	The setting value of the detailed parameter 2 "[Pr.28] Deceleration time 1" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BB5H	Deceleration time 2 setting error	The setting value of the detailed parameter 2 "[Pr.29] Deceleration time 2" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BB6H	Deceleration time 3 setting error	The setting value of the detailed parameter 2 "[Pr.30] Deceleration time 3" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1BB7H	JOG speed limit value error	The setting value of the detailed parameter 2 "[Pr.31] JOG speed limit value" is outside the setting range. [Version 1.000] • The setting value of the detailed parameter 2 "[Pr.31] JOG speed limit value" is outside the setting range. • The setting value of the detailed parameter 2 "[Pr.31] JOG speed limit value" exceeds the "[Pr.8] Speed limit value". • 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 "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON. [Version 1.000] • With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON. • When the "[Cd.190] PLC READY" is not turned ON after the setting value is set to equal to or less than the "[Pr.8] Speed limit value", turn the "[Cd.190] PLC READY" from OFF to ON. • When the "[Cd.190] PLC READY" 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 "[Cd.190] PLC READY" from OFF to ON.
1BB8H	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 "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) is not turned ON. At start: The system does not start.	When the "[Cd.190] PLC READY" is not turned ON after the setting value is set to equal to or less than the "[Pr.8] Speed limit value", turn the "[Cd.190] PLC READY" from OFF to ON.
1BB9H	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 "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) is not turned ON. At start: The system does not start.	When the "[Cd.190] PLC READY" 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 "[Cd.190] PLC READY" from OFF to ON.
1BBAH	Manual pulse generator speed limit value error	The setting value of the detailed parameter 2 "[Pr.123] Manual pulse generator speed limit value" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) is not turned ON. At start: The system does not start.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BBBH	Manual pulse generator speed limit value error	The setting value of the detailed parameter 2 "[Pr.123] Manual pulse generator speed limit value" exceeds the "[Pr.8] Speed limit value". [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) is not turned ON. At start: The system does not start.	Correct the setting value to "[Pr.8] Speed limit value" or less.
1BBCH	JOG acceleration time selection setting error	The setting value of the detailed parameter 2 "[Pr.32] JOG operation acceleration time selection" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1BBDH	JOG deceleration time selection setting error	The setting value of the detailed parameter 2 "[Pr.33] JOG operation deceleration time selection" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BBEH	Acceleration/deceleration process selection setting error	The setting value of the detailed parameter 2 "[Pr.34] Acceleration/deceleration process selection" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BBFH	S-curve ratio setting error	The setting value of the detailed parameter 2 "[Pr.35] S-curve ratio" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BC0H	Illegal rapid stop deceleration time	The setting value of the detailed parameter 2 "[Pr.36] Sudden stop deceleration time" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BC1H	Stop group 1 rapid stop selection error	The setting value of the detailed parameter 2 "[Pr.37] Stop group 1 sudden stop selection" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1BC2H	Stop group 2 rapid stop selection error	The setting value of the detailed parameter 2 "[Pr.38] Stop group 2 sudden stop selection" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BC3H	Stop group 3 rapid stop selection error	The setting value of the detailed parameter 2 "[Pr.39] Stop group 3 sudden stop selection" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BC4H	Outside allowance circular interpolation error width	The setting value of the detailed parameter 2 "[Pr.41] Allowance circular interpolation error width" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BC5H	External command function selection error	The setting value of the detailed parameter 2 "[Pr.42] External command function selection" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BC6H	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] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1BCCH	Restart allowable range error	The setting value of the detailed parameter 2 "[Pr.84] Restart allowable range when servo OFF to ON" is outside the setting range. [Operation status at error occurrence] When the "[Cd.190] PLC READY" is turned from OFF to ON: The READY signal ([Md.140] Module status: b0) 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 "[Pr.39] Stop group 3 sudden stop selection". (Note that the deceleration stop only occurs during the manual pulse generator operation.)	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BCDH	Speed control 10 × multiplier setting for degree axis error	The setting value of the detailed parameter 2 "[Pr.83] Speed control 10 × multiplier setting for degree axis" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BCEH	Operation setting for speed-torque control mode error	The setting value of the detailed parameter 2 "[Pr.90] Operation setting for speed-torque control mode" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BCFH	External command signal selection error	The setting value of the detailed parameter 2 "[Pr.95] External command signal selection" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1BD0H	FLS signal selection error	The setting value of the detailed parameter 1 "[Pr.116] FLS signal selection" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	Correct the setting value and turn the "[Cd.190] PLC READY" from OFF to ON.
1BD1H	RLS signal selection error	The setting value of the detailed parameter 1 "[Pr.117] RLS signal selection" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	Correct the setting value and turn the "[Cd.190] PLC READY" from OFF to ON.
1BD2H	DOG signal selection error	The setting value of the detailed parameter 1 "[Pr.118] DOG signal selection" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	Correct the setting value and turn the "[Cd.190] PLC READY" from OFF to ON.
1BD3H	STOP signal selection error	The setting value of the detailed parameter 1 "[Pr.119] STOP signal selection" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	Correct the setting value and turn the "[Cd.190] PLC READY" from OFF to ON.
1BE6H	Driver command discard detection	The command discard (Statusword bit12 OFF) of the servo amplifier was detected during operation. [Operation status at error occurrence] The operation is stopped.	Clear forced stop input or emergency stop input of servo amplifier. Move the command by JOG instruction etc. to the position where the limit signal was detected when using limit signal for servo amplifier. (Check the servo amplifier manual for details of Statusword)
1BE7H	Driver execution control mode invalid	The control mode of the connected driver device switched to an unsupported mode by the Motion module during operation. [Operation status at error occurrence] The system stops immediately.	Switch the driver control mode to a control mode that is supported by the Motion module.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1C10H	Home position return method error	The setting value of the home position return basic parameter "[Pr.43] Home position return method" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1C11H	Home position return direction error	The setting value of the home position return basic parameter "[Pr.44] Home position return direction" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1C12H	Home position address setting error	The setting value of the home position return basic parameter "[Pr.45] Home position address" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1C13H	Home position return speed error	[Version 1.001 or later] The setting value of the HPR basic parameter "[Pr.46] HPR speed" is outside the setting range. [Version 1.000] • The setting value of the HPR basic parameter "[Pr.46] HPR speed" is outside the setting range. • The setting value of the HPR basic parameter "[Pr.46] HPR speed" is larger than the "[Pr.8] Speed limit value". • The setting value of the HPR basic parameter "[Pr.46] HPR speed" is smaller than the "[Pr.7] Bias speed at start". [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	[Version 1.001 or later] With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON. [Version 1.000] • With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON. • Set to equal to or less than the "[Pr.8] Speed limit value", and then turn the "[Cd.190] PLC READY" from OFF to ON. • Set to equal to or larger than the "[Pr.7] Bias speed at start", and then turn the "[Cd.190] PLC READY" from OFF to ON.
1C14H	Home position return speed error	The setting value of the HPR basic parameter "[Pr.46] HPR speed" is larger than the "[Pr.8] Speed limit value". [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	Set to equal to or less than the "[Pr.8] Speed limit value", and then turn the "[Cd.190] PLC READY" from OFF to ON.
1C15H	Home position return speed error	The setting value of the HPR basic parameter "[Pr.46] HPR speed" is smaller than the "[Pr.7] Bias speed at start". [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	Set to equal to or larger than the "[Pr.7] Bias speed at start", and then turn the "[Cd.190] PLC READY" from OFF to ON.
1C1BH	Home position return acceleration time selection error	The setting value of the home position return detailed parameter "[Pr.51] Home position return acceleration time selection" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1C1CH	Home position return deceleration time selection error	The setting value of the home position return detailed parameter "[Pr.52] Home position return deceleration time selection" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1C21H	Operation setting for incompletion of home position return error	The setting value of the home position return detailed parameter "[Pr.55] Operation setting for incompletion of home position return" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1C40H	Network parameter error (total number of stations < station No.)	The station No. of a device station to connect to the network in "Network Configuration Settings" exceeds the total number of device stations configured. [Operation status at error occurrence] The station in question cannot be connected to the drive unit.	Set the station No. of the device station to connect to the network to be less than or equal to the total number of device stations.
1C41H	Driver WTD error	A WDT error of the driver was detected. [Operation status at error occurrence] Stop immediately.	• When a stop error of the CPU module is detected, check the error of the CPU module and take corrective action. • Review the communication period. • Check for errors in surrounding environment, e.g. noise, and remove the error factor. • After the above procedure, switch the power off and then on, or reset the CPU module.
1C42H	Unsupported driver connection	An unsupported driver was connected. [Operation status at error occurrence] Instance generation of the drive unit is not possible.	Connect a supported driver.
1C43H	SLMP communication error	An error occurred in SLMP communication. [Operation status at error occurrence] During communication initial. • Communication with the drive unit is not possible.	• Review slave object settings. • Check the manual of driver. corrective action.
1C45H	SLMP communication error (timeout)	Response timeout was detected in SLMP communication. [Operation status at error occurrence] SLMP communication is not possible.	Review the transient transmission time. it is derived by the following formula. (Transient Transmission Time = Communication Period Interval Setting - Cyclic Transmission Time - System Reserved Time)
1C48H	PDO mapping setting error	Abnormal response for PDO mapping setting was received from a device station. [Operation status at error occurrence] The station in question cannot be connected to the drive unit.	• Check the error according to the error code (SDO Abort Code) and review the PDO mapping setting. • Check that CiA402 objects that are set for "[Pr.91] Optional data monitor: Data type setting 1" to "[Pr.94] Optional data monitor: Data type setting 4" and "[Pr.591] Optional data monitor: Data type expansion setting 1" to "[Pr.594] Optional data monitor: Data type expansion setting 4" can be monitored.
1C49H	Configuration mismatch on reconnection	A model name mismatch was detected on reconnection of device station. [Operation status at error occurrence] The station in question cannot be connected to the drive unit.	Connect the device station with the same model name as the disconnected device station.
1C4AH	Unsupported device station connection	Connection with a device station that does not support motion control station was detected. [Operation status at error occurrence] The station in question cannot be connected to the drive unit.	Connect a device station that supports the motion control station. For connectable device stations, refer to the following: ☞ Devices Compatible with CC-Link IE TSN [FX5-SSC-G]
1C4BH	Motion control station setting error	A motion control station setting error was detected. [Operation status at error occurrence] The station in question cannot be connected to the drive unit.	• Check that a motion control station is set for "[Pr.141] IP address". • Check if "[Pr.141] IP address" is set for an axis that exceeds "[Pr.152] Maximum number of control axes".
1DC1H	Forced stop valid/invalid setting error	The setting value of the common parameter 1 "[Pr.82] Forced stop valid/invalid setting" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.
1DC6H	Outside manual pulse generator smoothing time constant range error	The set value of the common parameter "[Pr.156] Manual pulse generator smoothing time constant" is outside the setting range. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) will not turn ON.	With the setting brought into the setting range, turn the "[Cd.190] PLC READY" from OFF to ON.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1DC8H	Servo parameter invalid	Servo parameters are not set as the following. • PA06 (Electronic gear - Numerator): For 26-bit resolution servo motor (rotary servo motor HK series, etc.): 16 For others: 1 • PA07 (Electronic gear - Denominator): 1 • PC79.0 (DI status read selection): Eh • PD41.2 (Limit switch enabled status selection): 1h • PD41.3 (Sensor input method selection): 1h (Input from controller (FLS/RLS/DOG)) • PD60 (DI pin polarity selection): 00000000h • PT01.1 (Speed/acceleration/deceleration unit selection): 0h • PT08 (Homing position data): 0 • PT15 (Software position limit +): 0 • PT17 (Software position limit -): 0 • PT29.0 (Device input polarity 1): 1h: Dog detection with on [Operation status at error occurrence] Current value restoration is not performed for the relevant servo amplifier.	Servo parameters are automatically rewritten from the Motion module. After powering OFF and ON the servo amplifier, check that this error no longer occurs.
1ED0H	Driver error	Errors occur in the driver. [Operation status at error occurrence] The motor stops. (For stop methods, follow the specification of the driver.)	Check the contents of the error and take actions according to "[Md.114] Servo alarm" and "[Md.115] Servo alarm detail number". (For the details of "[Md.114] Servo alarm" and "[Md.115] Servo alarm detail number", refer to the manual of each driver.)
1ED2H	WDT error	The Motion module detects the WDT error of the driver. [Operation status at error occurrence] At start: The system does not start. During operation: The system stops immediately.	Replace the driver in which the WDT occurred.
1F04H	Control mode switching error	Driver control mode switching did not complete within 1 second after control mode switching command had been issued. [Operation status at error occurrence] Communication with the driver is not possible.	• Check whether an error occurred in the driver or whether the setting is incorrect, and take necessary actions. • When MR-J5(W)-G series is connected: When you switch the driver control mode while the motor is operating, set the servo parameter "ZSP disabled selection at control switching (PC76.1)" to "1: Disabled". • When using "[Cd.153] Control mode auto-shift selection" to switch from current value change, fixed-feed control, or speed control to continuous operation to torque control, set "[Cd.138] Control mode switching request" to "1: Switching request" after the positioning starts so that the switching condition of "[Md.26] Axis operation status" to switch to "5: Analyzing" is not met.
1F05H	Servo parameter communication error	A communication error was detected when connecting to the servo amplifier. [Operation status at error occurrence] The operation is stopped. Communication with the driver is not possible.	After checking the cable connecting the amplifier, switch the power off and then on, or reset the PLC.
1F10H	Outside the link device start No. range	• The link device start No. is outside the setting range. • When specifying 1-word/2-word size of the bit device, the start No. which is not a specified using a multiple of 16 is set. [Operation status at error occurrence] The relevant link device external signal cannot be used.	Review the link device start No. setting.
1F11H	Outside the link device bit specification range	Bit other than 0 to F is specified. [Operation status at error occurrence] The relevant link device external signal cannot be used.	Review the setting of the link device bit specification.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1F12H	Outside the link device maximum/minimum value specification range	The maximum value in the ring counter range is set smaller than the minimum value. [Operation status at error occurrence] The relevant link device external signal cannot be used.	Review the maximum/minimum value of the ring counter.
1F13H	Forced stop signal link device incorrect configuration	When the set value of the common parameter "[Pr.82] Forced stop valid/invalid selection" is "3: Enable (link device)", link device of forced stop signal is not set in link device external signal allocation parameter. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	• When using link device as forced stop signal, set "[Pr.900] Forced stop signal (EMI): Link device type" within the range. • If you do not use link device as forced stop signal, do not set 3: Enable (link device) for "[Pr.82] Forced stop valid/invalid selection".
1F14H	FLS signal link device incorrect configuration	When the detailed parameter 1 "[Pr. 116] FLS signal selection: Input type" set to "3: Link device", link device of upper limit signal is not set in link device external signal allocation parameter. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	• When using link device as upper limit signal, set "[Pr.910] Upper limit signal: Link device type" within the range. • If you do not use link device as upper limit signal, do not set "3: Link device" for "[Pr. 116] FLS signal selection: Input type".
1F15H	RLS signal link device incorrect configuration	When the detailed parameter 1 "[Pr. 117] RLS signal selection: Input type" set to "3: Link device", link device of lower limit signal is not set in link device external signal allocation parameter. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	• When using link device as lower limit signal, set "[Pr.920] Lower limit signal: Link device type" within the range. • If you do not use link device as lower limit signal, do not set "3: Link device" for "[Pr. 117] RLS signal selection: Input type".
1F16H	DOG signal link device incorrect configuration	When the detailed parameter 1 "[Pr. 118] DOG signal selection: Input type" set to "3: Link device", link device of proximity dog signal is not set in link device external signal allocation parameter. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	• When using link device as proximity dog signal, set "[Pr.930] Proximity dog signal: Link device type" within the range. • If you do not use link device as proximity dog signal, do not set "3: Link device" for "[Pr. 118] DOG signal selection: Input type".
1F17H	STOP signal link device incorrect configuration	When the detailed parameter 1 "[Pr. 119] STOP signal selection: Input type" set to "3: Link device", link device of stop signal is not set in link device external signal allocation parameter. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	• When using link device as stop signal, set "[Pr.940] Stop signal: Link device type" within the range. • If you do not use link device as stop signal, do not set "3: Link device" for "[Pr. 119] STOP signal selection: Input type".
3301H	Faults	Hardware failure. [Operation status at error occurrence] The system stops.	Check that there is no influence from noise.
3302H	Internal circuit fault	Hardware failure. [Operation status at error occurrence] The system stops.	• Take measures to reduce noise. • Reset the Motion module, and run it again. If the same error occurs again even after taking the above, the possible cause is a hardware failure of the CPU module, extension cable, or module. Please consult your local Mitsubishi representative.
3320H	CPU module error	An error was 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 "[Pr.38] Stop group 2 sudden stop selection". (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.
3322H	System bus error	Communication with CPU module did not complete properly. [Operation status at error occurrence] System halt	• Check that there is no influence from noise. • Check the connection of the extension cable. • If the above problems are not found, the possible cause is a failure inside the module or an extension cable failure. Replace them as required.

*1 Setting condition: "[Cd.16] Inching movement amount × (A) ≤ [Pr.31] JOG speed limit value"
Use the following values for (A).

Unit setting	Operation cycle [FX5-SSC-G]			
	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) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1A28H	Start not possible	Start is requested when the forced stop of controller input ON. [Operation status at error occurrence] Positioning does not start.	Remove the cause of forced stop.
1DF0H	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.
1DF1H	Outside input axis unit setting range	The 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.
1DF2H	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.
1DF3H	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.
1DF4H	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.
1DF5H	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.
1DF6H	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.
1DF7H	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".
1DF8H	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.
1DF9H	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) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1DFAH	Synchronous encoder via servo amplifier invalid error	• "[Pr.141] IP address" of the axis No. selected as "Synchronous encoder via servo amplifier" in "[Pr.320] Synchronous encoder axis type" is not set or it is set as the virtual servo amplifier axis. • A servo amplifier axis for which scale measurement mode is not enabled is set as the destination servo amplifier axis of "Synchronous Encoder via Servo Amplifier". [Version 1.003 or later] Linear encoder (absolute position type) is connected. [Version 1.002 or earlier] • Linear scale is connected. [Operation status at error occurrence] The READY signal ([Md.140] Module status: b0) is not turned ON.	After you solve the problem, switch the power off and then on, or reset the PLC.
1DFEH	Synchronous encoder via link device communication error	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.
1DFDH	Outside command generation axis length per cycle setting error	"[Pr.346] Command generation axis length per cycle" is outside the setting range of 0 to 2147483647. [Operation status at error occurrence] "[Pr.346] Command generation axis length per cycle" operates regarded as the setting value "0".	Set a value within the range of 1 to 2147483647 for "[Pr.346] Command generation axis length per cycle".
1E30H	Outside main input axis No. range	• The 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.
1E31H	Outside sub input axis No. range	• The 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.
1E32H	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.
1E33H	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.
1E34H	Outside main shaft clutch control setting range	The 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.
1E35H	Outside main shaft clutch reference address setting range	The 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) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1E36H	Outside main shaft clutch smoothing method range	The 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.
1E37H	Outside main shaft clutch smoothing time constant range	The 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.
1E38H	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.
1E40H	Outside auxiliary shaft axis No. range	• The 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.
1E42H	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.
1E43H	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.
1E44H	Outside auxiliary shaft clutch control setting range	The 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.
1E45H	Outside auxiliary shaft clutch reference address setting range	The 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.
1E46H	Outside auxiliary shaft clutch smoothing method range	The 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.
1E47H	Outside auxiliary shaft clutch smoothing time constant range	The 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.
1E48H	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.
1E50H	Outside speed change gear range	The 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.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1E51H	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.
1E52H	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.
1E53H	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.
1E60H	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.
1E61H	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.
1E62H	Outside cam axis length per cycle range	The synchronous parameter "[Pr.439] Cam axis length per cycle" 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.
1E63H	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.
1E70H	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.
1E71H	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).
1E72H	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.
1E73H	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).
1E74H	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.
1E75H	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.

Error code (Hexadecimal) [FX5-SSC-G]	Error name	Error details and causes	Remedy
1E76H	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.
1E77H	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).
1E78H	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.
1E79H	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 and manual.

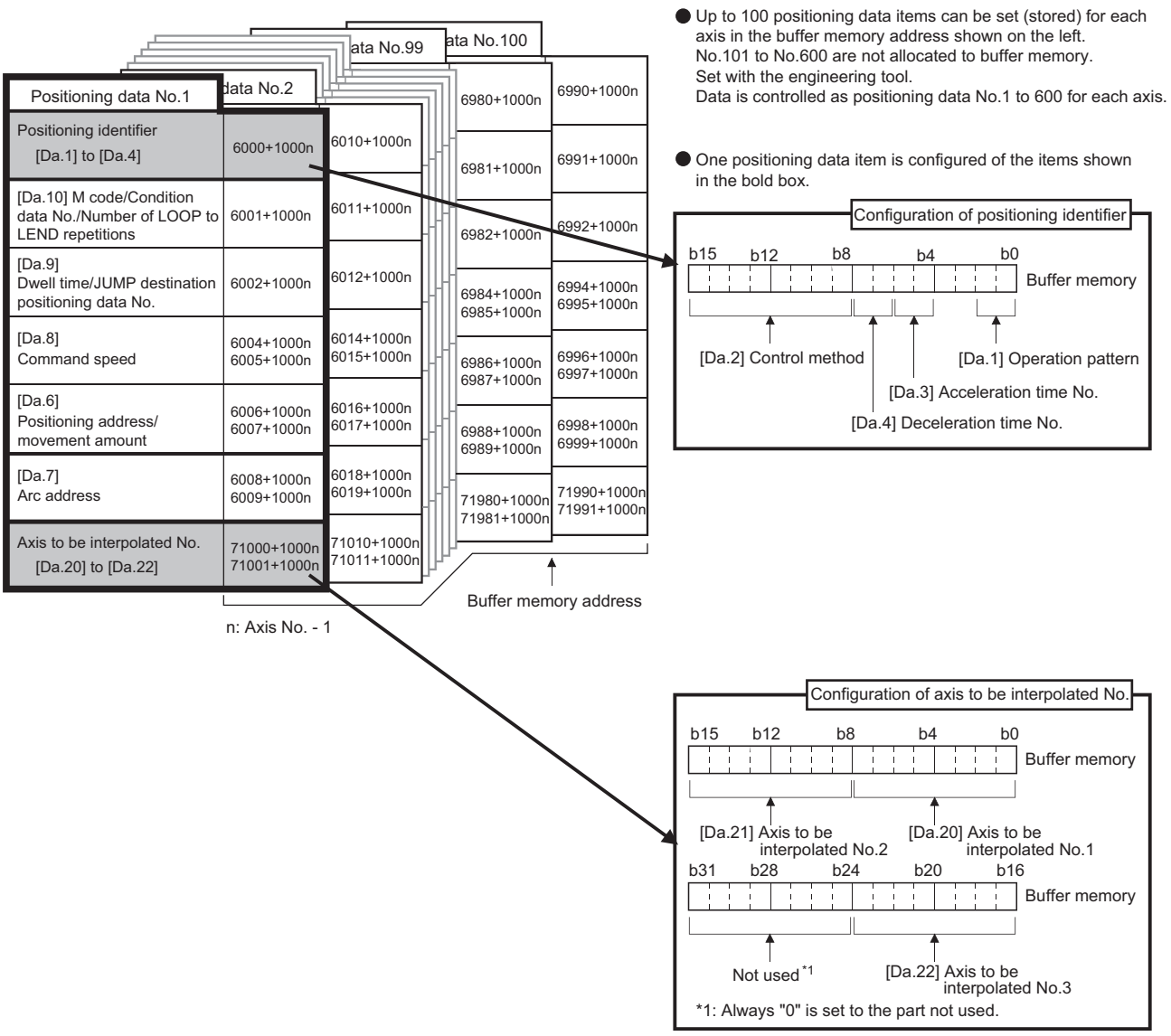
APPENDICES

Appendix 1 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 No.1 to No.100 are assigned to each axis. Positioning data has the following structure.



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 8.
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: 1 • [Da.9] Dwell time/JUMP destination positioning data No.: 2 • [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

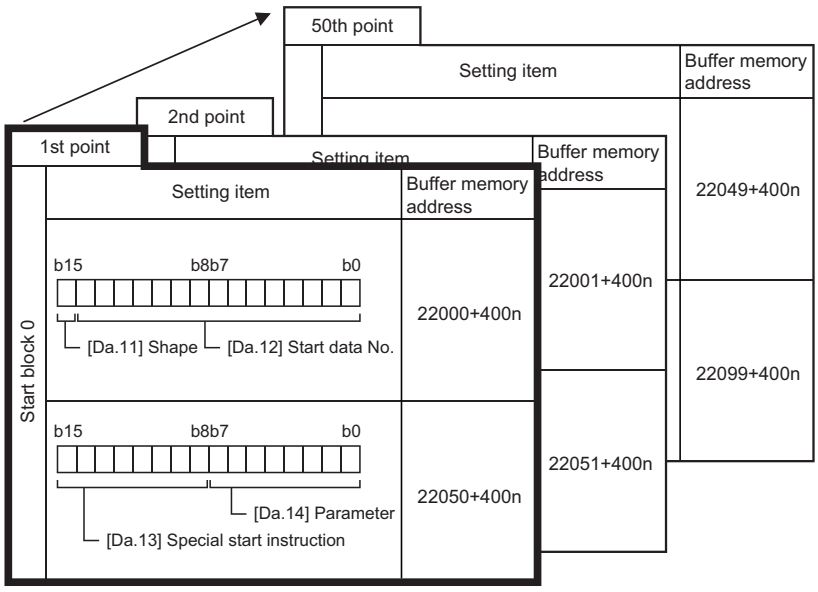
Ex.

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

$6000 + (1000 \times (2 - 1)) + 10 \times (1 - 1) + 2 = 7002$

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.



- 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.

n: Axis No. - 1

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.

- $22000 + (400 \times (Ax - 1)) + (200 \times M) + (P - 1)$

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 8.
M	The start block No. of the buffer memory address to be determined. Substitute a number from 0 to 1.
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.1
- Block start data point: 40

22000 + (400 × (3 - 1)) + (200 × 1) + (40 - 1) = 23039

■[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 8.
M	The start block No. of the buffer memory address to be determined. Substitute a number from 0 to 1.
P	The block start data point of the buffer memory address to be determined. Substitute a number from 1 to 50.

Ex.

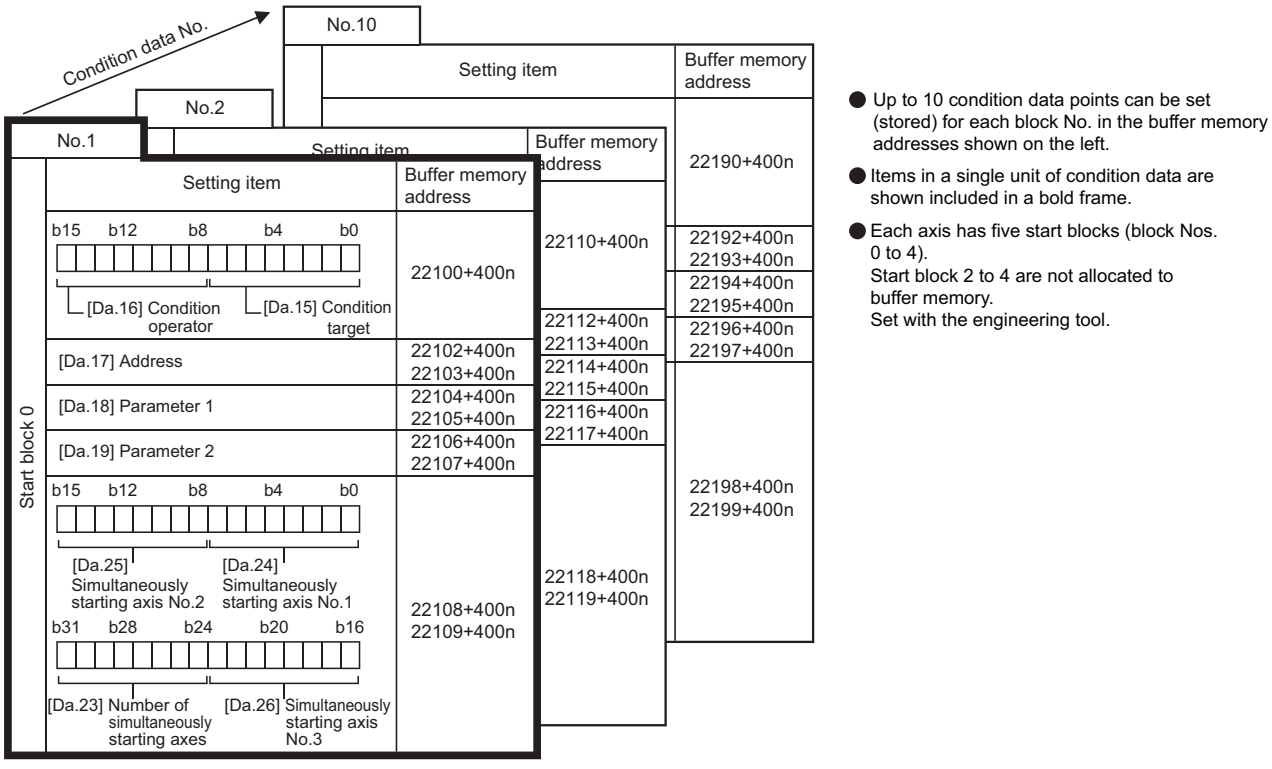
When the buffer memory address that satisfies the following conditions is determined

- 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.

n: Axis No. - 1

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 8.
M	The start block No. of the buffer memory address to be determined. Substitute a number from 0 to 1.
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] Simultaneously starting axis (lower 16 bits): 8 • [Da.23] to [Da.26] Simultaneously starting axis (upper 16 bits): 9

Ex.

When the buffer memory address that satisfies the following conditions is determined

- Axis 4
- Start block No.1
- Condition data No.5
- [Da.19] Parameter 2 (lower 16 bits)

22100 + (400 × (4 - 1)) + (200 × 1) + (10 × (5 - 1)) + 6 = 23546

A

Appendix 2 Compatible Devices with SSCNETIII(/H) [FX5-SSC-S]

Connection with MR-JE-B(F)

The servo amplifier MR-JE-B can be connected using SSCNETⅢ/H.

Comparisons of specifications with MR-J4(W)-B

Item		MR-JE-B(F)	MR-J4(W)-B
[Pr.100] Servo series		48: MR-JE-_B(F)	32: MR-J4-_B_(-RJ), MR-J4W_-_B (2-, 3-axis type)
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		
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 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(F) 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(F) use, set "2: Buffer memory". Refer to the following for the program and the system configuration.
☞ Page 321 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-A800 series

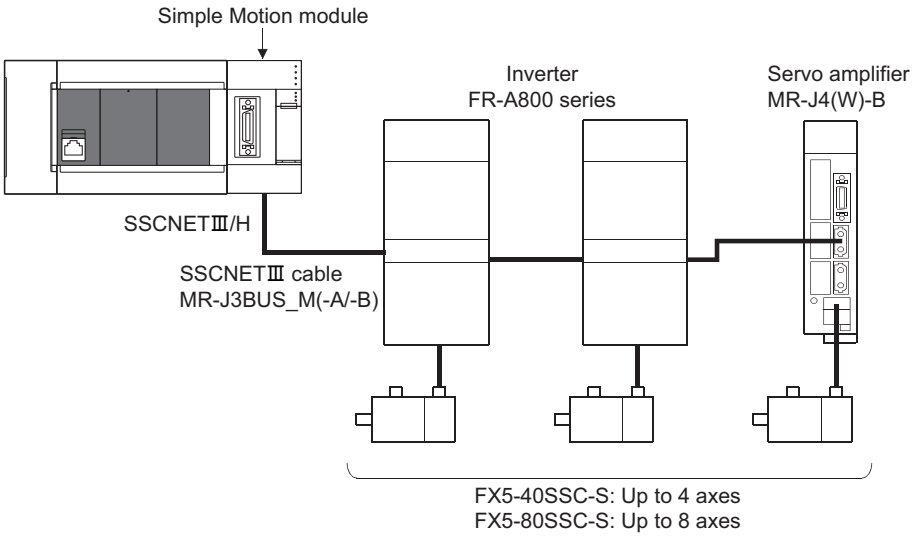
FR-A800 series can be connected via SSCNETⅢ/H by using built-in option FR-A8AP and FR-A8NS.

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] Servo series": "68: FR-A800-1", "69: 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 the following 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-J4(W)-B

Item		FR-A800 series[*1]	MR-J4(W)-B
[Pr.100] Servo series		68: FR-A800-1 69: FR-A800-2	32: MR-J4-_B_(-RJ), MR-J4W_-_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 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		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
Amplifier-less operation function		Possible[*2]	Possible
		(Operates artificially as the following during amplifier-less operation. Servo amplifier type: MR-J4-10B, Motor type: HG-KR053 (resolution per servo motor rotation: 4194304 pulses/rev))	
Driver communication		Not possible	Possible[*3]
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 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

*3 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-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)", 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".

■Servo parameter change request

Change request of servo parameter ("[Cd.130] Servo parameter 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 "3" is stored in "[Cd.130] Servo parameter 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.

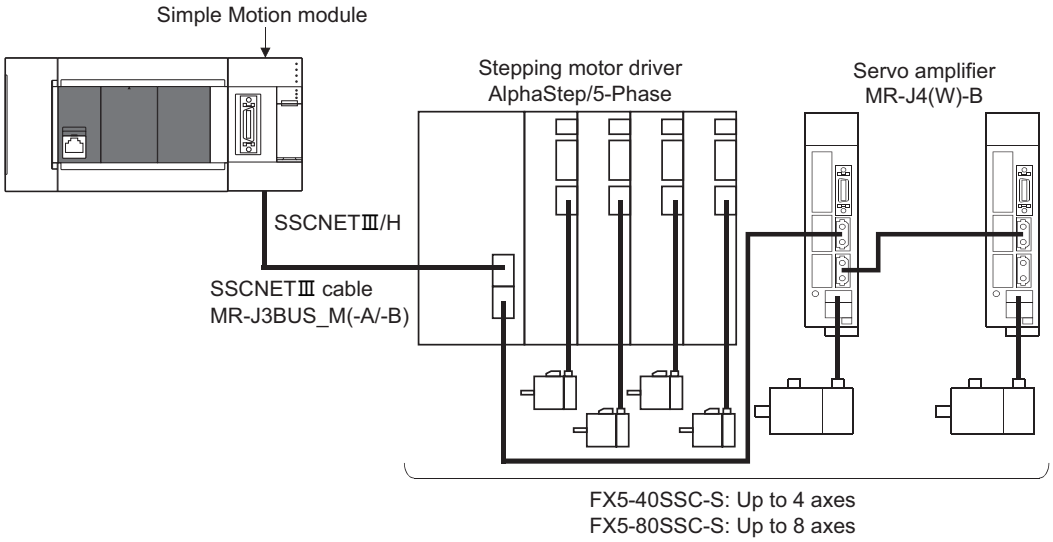
AlphaStep/5-phase stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd.

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]	Servo series	97: αSTEP/5-Phase (manufactured by ORIENTAL MOTOR Co., Ltd.)	0	28400+100n

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-J4(W)-B

Item		AlphaStep	5-phase	MR-J4(W)-B
[Pr.100] Servo series		97: αSTEP/5-Phase (manufactured by ORIENTAL MOTOR Co., Ltd.)	97: αSTEP/5-Phase (manufactured by ORIENTAL MOTOR Co., Ltd.)	32: MR-J4-_B_(-RJ), MR-J4W_-_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. 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 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. 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	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	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

Item	AlphaStep	5-phase	MR-J4(W)-B
Amplifier-less operation	Not possible*1	Not possible*1	Possible (Operates artificially as the following during amplifier-less operation. Servo amplifier type: MR-J4-10B, Motor type: HG-KR053 (resolution per servo motor rotation: 4194304 pulses/rev))
Servo parameter change request	Possible	Possible	Possible (1 word write)
Driver communication	Not possible	Not possible	Possible
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 b7: Servo alarm 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 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	b9: Driver operation alarm	—
Programming tool	MR Configurator2 is not available. Use AlphaStep data editing software.	MR Configurator2 is not available. Use 5-phase data editing software.	MR Configurator2 is available.
Servo input axis type	Setting possible (Restrictions*2)	Setting possible (Restrictions*2)	Setting possible

*1 Set as the unconnected status during amplifier-less operation.

*2 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 position value of the servo input axis might be not restored correctly. Therefore, set "1: Command position value" or "2: Actual current value" before using.

A

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 servo external signal status is checked in the AlphaStep/5-phase during the driver home position return.

The Simple Motion module sends the status of upper/lower limit signals and proximity dog signal to the AlphaStep/5-phase at the set values regardless of the logic setting of Simple Motion module.

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 411 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

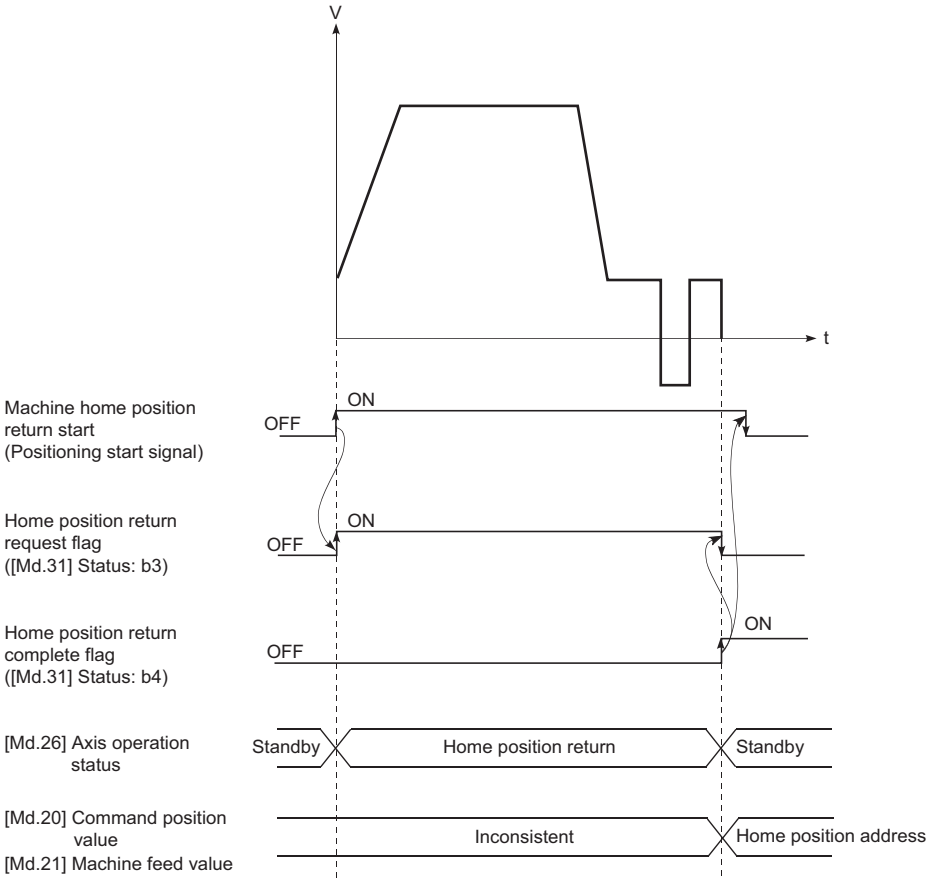
When "[Pr.11] Backlash compensation amount" is set in the Simple Motion module, whether the backlash compensation is necessary or not is judged from "[Pr.44] Home position return direction" of the Simple Motion module in the axis operation such as positioning after the driver home position return. When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

Only position control mode (position control, speed control including position loop, etc.) 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 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, "1" (1 word write request) and "2" (2 words write request) can be set in "[Cd.130] Servo parameter 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
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	—

■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

The torque limit set by the Simple Motion module is ignored. Set the torque limit value with the parameter on the driver side.

■Axis monitor data

- "[Md.104] Motor current value" is always "0".
  "[Md.109] Regenerative load ratio/Optional data monitor output 1", "[Md.110] Effective load torque/Optional data monitor output 2", and "[Md.111] Peak torque ratio/Optional data monitor output 3" become "0" when the optional data monitor is not set.
- "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.

■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.

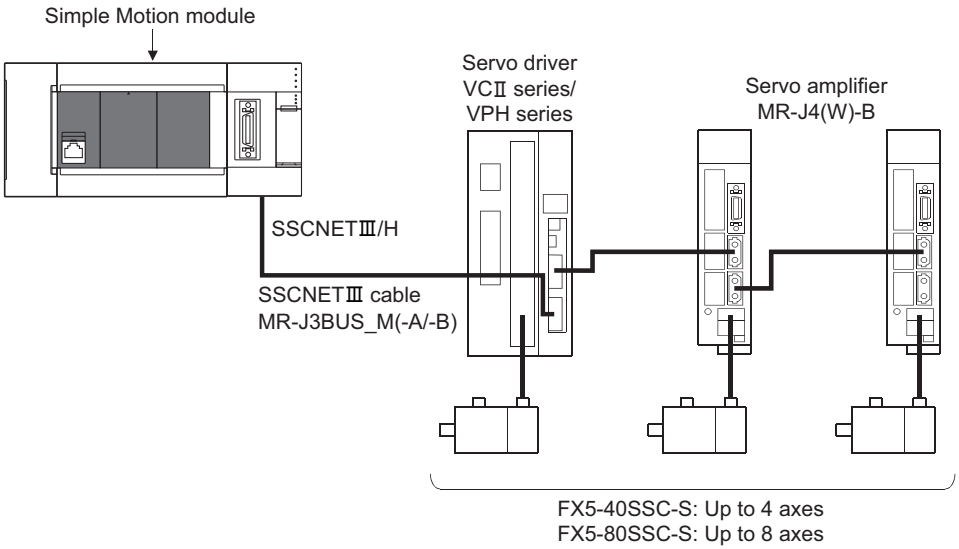
The direct drive τDISC/τiD roll/τServo compass/τLinear stage, etc. manufactured by CKD NIKKI DENSO CO., LTD. can be controlled by connecting with the servo driver VCⅡ series/VPH series manufactured by the same company using SSCNETⅢ/H.

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.



■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]	Servo series	96: VCⅡ series (manufactured by CKD NIKKI DENSO CO., LTD.) 99: VPH series (manufactured by CKD NIKKI DENSO CO., LTD.)	0	28400+100n

Point

Parameters set in VCⅡ series/VPH series are not controlled by the Simple Motion module.

Comparisons of specifications with MR-J4(W)-B

Item		VCII series/VPH series[*1]	MR-J4(W)-B
[Pr.100] Servo series		96: VCⅡ (manufactured by CKD NIKKI DENSO CO., LTD.) 99: VPH (manufactured by CKD NIKKI DENSO CO., LTD.)	32: MR-J4-_B_(-RJ), MR-J4W_-_B (2-, 3-axis type)
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[*6] 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 29: External encoder counter value 30: Unit power consumption (2 words) Most significant bit1 + address value: Optional address of registered monitor
Absolute position system		Possible[*2]	Possible
Unlimited length feed		Possible[*3]	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
Torque limit value change		Possible (Separate setting: Restrictions[*4])	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 (Operates artificially as the following during amplifier-less operation. Servo amplifier type: MR-J4-10B, Motor type: HG-KR053 (resolution per servo motor rotation: 4194304 pulses/rev))	Possible
Servo parameter change request		Possible (2 words write)	Possible (1 word write)

Item	VCII series/VPH series*1	MR-J4(W)-B
Driver communication	Not possible	Possible*5
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	MR Configurator2 is not available. Use VCⅡ/VPH data editing software.	MR Configurator2 is available.

*1 Confirm the specifications of VCⅡ series/VPH series for details.
*2 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.
*3 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.
*4 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.
*5 Refer to each servo amplifier instruction manual for the servo amplifiers that can be used.
*6 It can be monitored when using VPH series.

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 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 "2: 2 words write request" in "[Cd.130] Servo parameter write request" for executing the parameter write. If 1 word write is executed to VCⅡ series/VPH series, the parameter write is failure, and "3" is stored in "[Cd.130] Servo parameter 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]
Optional address of registered monitor	—

*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.

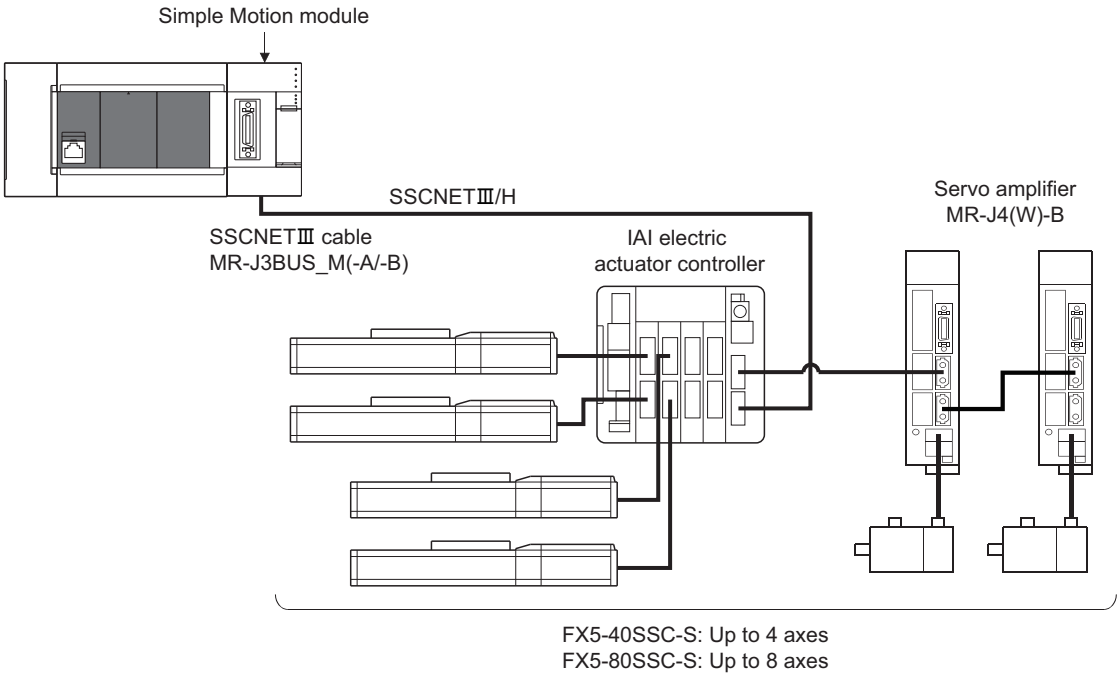
IAI electric actuator controller manufactured by IAI Corporation

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]	Servo series	98: IAI Controller for Electric Actuator (manufactured by IAI Corporation)	0	28400+100n

Point

Parameters set in IAI electric actuator controller are not controlled by the Simple Motion module.

Comparisons of specifications with MR-J4(W)-B

Item		IAI electric actuator controller	MR-J4(W)-B
[Pr.100] Servo series		98: IAI Controller for Electric Actuator (manufactured by IAI Corporation)	32: MR-J4-_B_(-RJ), MR-J4W_-_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 (Operates artificially as the following during amplifier-less operation. Servo amplifier type: MR-J4-10B, Motor type: HG-KR053 (resolution per servo motor rotation: 4194304 pulses/rev))
Servo parameter change request		Not possible	Possible (1 word write)
Driver communication		Not possible	Possible
Monitoring of servo parameter error No.		Not possible	Possible

Item	IAI electric actuator controller	MR-J4(W)-B
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".
[Md.108] Servo status 1	b0: READY ON b1: Servo ON b7: Servo alarm b12: In-position b13: Current cutback	b0: READY ON b1: Servo ON b2 to b3: Control mode b4: Gain switching b5: Fully closed 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	MR Configurator2 is not available. Use IAI electric actuator controller editing software.	MR Configurator2 is available.

*1 Set as the unconnected status during amplifier-less operation.

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 servo external signal status is checked in the IAI electric actuator controller during the driver home position return.

The Simple Motion module sends the status of upper/lower limit signals and proximity dog signal to the IAI electric actuator controller at the set values regardless of the logic setting of Simple Motion module.

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 411 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.

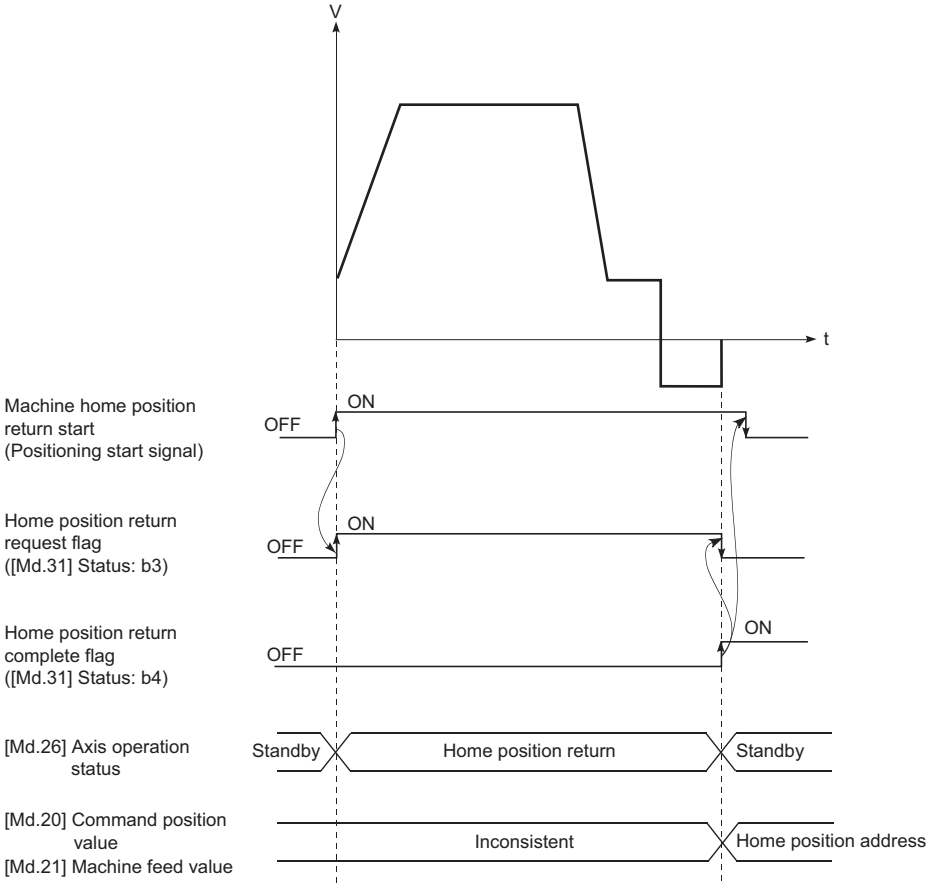
• Backlash compensation after the driver home position return method

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 specifiable data types are shown below.

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.

■Torque limit

The torque limit set by the Simple Motion module is ignored. Set the torque limit value with the parameter on the IAI electric actuator controller side.

■Axis monitor data

- "[Md.104] Motor current value" is always "0". When the optional data monitor is not used, "[Md.109] Regenerative load ratio/Optional data monitor output 1", "[Md.110] Effective load ratio/Optional data monitor output 2", and "[Md.111] Peak load ratio/Optional data monitor output 3" are "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 an unspecifiable data type is set in [Pr.91] Optional data monitor: Data type setting 1" to "[Pr.94] Optional data monitor: Data type setting 4", "0" is stored in "[Md.109] Regenerative load ratio/Optional data monitor output 1" to "[Md.112] Optional data monitor output 4". For the specifiable data, refer to the following. ☞ Page 839 IAI electric actuator controller manufactured by IAI Corporation

■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 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 IAI electric actuator controller, the "In-position range" is checked as 100 [pulse].

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.

Appendix 3 Devices Compatible with CC-Link IE TSN [FX5-SSC-G]

MR-J5(W)-G (Cyclic synchronous mode) connection method

This section describes how to set when connecting MR-J5(W)-G with cyclic synchronous mode (csp, csv, and cst) and use various functions.

For details about wiring and parameters of MR-J5(W)-G, refer to MR-J5(W)-G manuals.

Setting methods

■Parameter setting value for using MR-J5(W)-G

Set the parameters of MR-J5(W)-G as shown below when executing motion control with MR-J5(W)-G.

When the parameters are not set as shown below, the error "Servo parameter invalid" (error code: 1DC8H) occurs and the values will be rewritten from the controller.

No.	Name	Default value	Setting value
PA06	Electronic gear numerator*1	1	• When the resolution of the servo motor is 26 bits: 16 (Such as the rotary servo motor HK-KT series) • Other (when not using the rotary servo motor HK-KT series): 1
PA07	Electronic gear denominator*1	1	1
PC79.0	DI status read selection*1	0h	Eh
PD41.2	Limit switch enabled status selection*1	0h	1h (only enabled in homing mode)
PD41.3	Sensor input method selection*1	0h	1h (Input from controller (FLS/RLS/DOG))
PD60	DI pin polarity selection*1	00000000h	00000000h
PT01.1	Speed/acceleration/deceleration unit selection*2	0h	0h
PT08	Homing position data*1	0	0h
PT15	Software position limit +	0	0
PT17	Software position limit -	0	0
PT29.0	Device input polarity 1*1	0h	1h: Dog detection with on

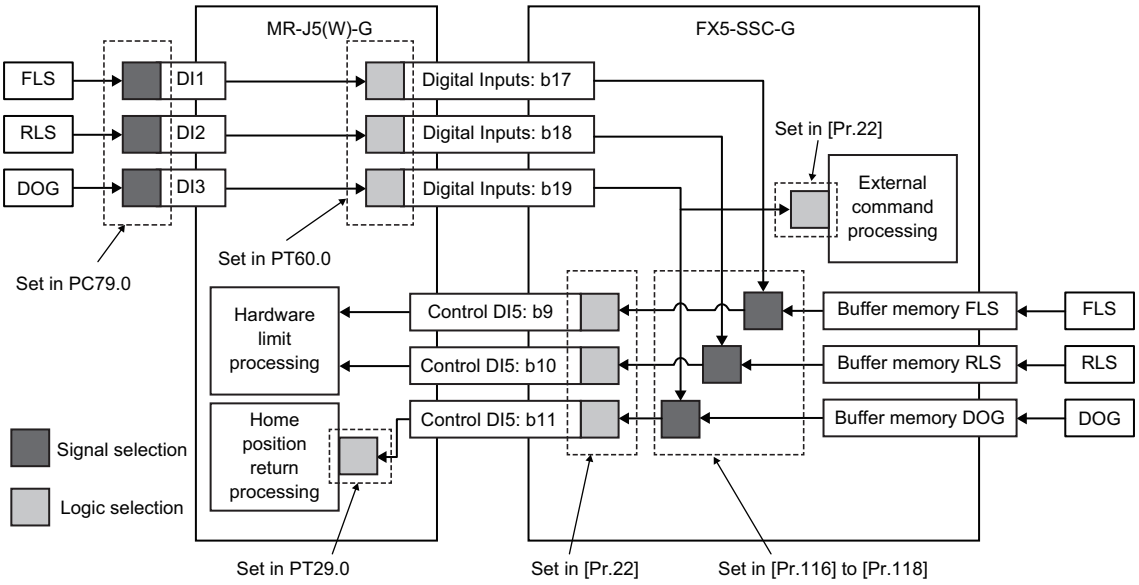
*1 The parameter is enabled after resetting the Motion module or MR-J5(W)-G.

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

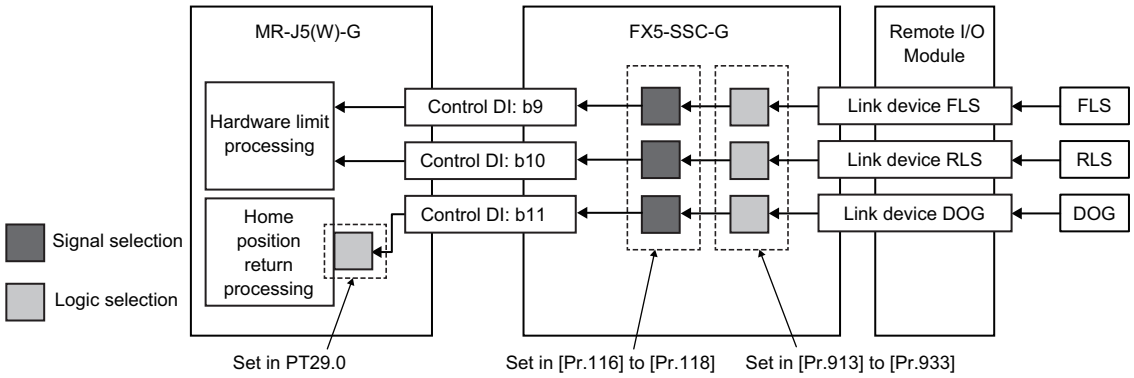
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The setting contents of the servo parameters are shown below.

• External input signal from servo amplifier and buffer memory



• Link device external signal



Set the following values for the signal logic selection of the servo amplifier.

No.	Name	Default value	Setting value
PC79.0	DI status read selection	0h	Eh: The supported pin No. is shown below. bit1: Returns the ON/OFF status of the DI1 pin. bit2: Returns the ON/OFF status of the DI2 pin. bit3: Returns the ON/OFF status of the DI3 pin.
PD60.0	DI pin polarity selection	0h	0h: The supported pin No. is shown below. bit0: DI pin polarity selection 1 (on with V 24 input) bit1: DI pin polarity selection 2 (on with V 24 input) bit2: DI pin polarity selection 3 (on with V 24 input)
PT29.0	Device input polarity 1	0h	1h: Dog detection with on

When "[Pr.118] DOG signal selection" is set to "1: Servo amplifier", the DOG signal at homing is returned and the detection accuracy of the DOG signal may vary because the DOG signal being compared to the DOG signal at detection by the servo amplifier used for communication.

If the detection position accuracy is poor, adjust servo parameters such as "Homing position data (PT08)" and "Travel distance after proximity dog (PT09)" to values that include the communication cycle delay.

In addition, the variety becomes larger when the communication cycle is long.

■Network parameter setting for using MR-J5(W)-G

Select the motion control station in the network configuration settings when connecting MR-J5(W)-G in the cyclic synchronous mode.

■PDO mapping for using MR-J5(W)-G

When MR-J5(W)-G is the motion control station, the Motion module assigns the PDO mapping automatically so that the setting is not needed.

The mapping pattern is as follows.

• TPDO mapping

Entry No.	Index	Sub Index	Size[bit]	Entry name	Remark
1	0x1D02	0x01	16	Watchdog counter UL 1	Basic function area (fixed)
2	0x6061	0x00	8	Modes of operation display	
3	0x0000	0x00	8	GAP	
4	0x6064	0x00	32	Position actual value	
5	0x606C	0x00	32	Velocity actual value	
6	0x60F4	0x00	32	Following error actual value	
7	0x6041	0x00	16	Statusword	
8	0x0000	0x00	16	GAP	
9	0x6077	0x00	16	Torque actual value	
10	0x2D11	0x00	16	Status DO 1	
11	0x2D12	0x00	16	Status DO 2	
12	0x2D13	0x00	16	Status DO 3	
13	0x2D14	0x00	16	Status DO 4	
14	0x2D15	0x00	16	Status DO 5	
15	0x2A41	0x00	32	Current alarm	
16	0x2D21	0x00	32	Reserved	
17	0x2D22	0x00	16	Reserved	
18	0x60FD	0x00	32	Digital inputs	
19	0x2B08	0x00	16	Regenerative load ratio	Optional data monitor area (when optional data monitor is set as default.)*1
20	0x2B09	0x00	16	Effective load ratio	
21	0x2B0A	0x00	16	Peak load ratio	
22	0x0000	0x00	16	GAP	
23	0x2D37	0x00	32	Scale ABS counter	Synchronous encoder area via Servo Amplifier*2
24	0x2D36	0x00	32	Scale cycle counter	
25	0x2D3C	0x00	32	Scale measurement encoder reception status	
26	0x60B9	0x00	16	Touch probe status	High accuracy mark detection area
27	0x60D1	0x00	32	Touch probe time stamp 1 positive value	
28	0x60D2	0x00	32	Touch probe time stamp 1 negative value	

*1 The mapping changes depending on the setting, "[Pr.91] Optional data monitor: Data type setting 1" to "[Pr.94] Optional data monitor: Data type setting 4" and "[Pr.591] Optional data monitor: Data type expansion setting 1" to "[Pr.594] Optional data monitor: Data type expansion setting 4".

*2 If the function in single-axis servo amplifier is not used, it will become GAP. When using multi-axis servo amplifier (except MR-J5W-G, MR-J5D-G(MR-J5D1-G), it will not be assigned.

• RPDO mapping

Entry No.	Index	Sub Index	Size[bit]	Entry name	Remark
1	0x1D01	0x01	16	Watchdog counter DL 1	Basic function area (fixed)
2	0x6060	0x00	8	Modes of operation	
3	0x0000	0x00	8	GAP	
4	0x607A	0x00	32	Target position	
5	0x60FF	0x00	32	Target velocity	
6	0x6040	0x00	16	Controlword	
7	0x60E0	0x00	16	Positive torque limit value	
8	0x60E1	0x00	16	Negative torque limit value	
9	0x6071	0x00	16	Target torque	
10	0x2D20	0x00	32	Velocity limit value	
11	0x2D01	0x00	16	Control DI 1	
12	0x2D02	0x00	16	Control DI 2	
13	0x2D03	0x00	16	Control DI 3	
14	0x2D04	0x00	16	Control DI 4	
15	0x2D05	0x00	16	Control DI 5	

Precautions

- When connecting to the MR-J5(W)-G series, use software version A5 or later for the servo amplifier. If an unsupported software version is used, the error "Unsupported servo amplifier connection" (error code: 1A0BH) occurs.
- Set Network Synchronous Communication to "Synchronous". The setting is ignored when "Asynchronous" is set.
- When parameter automatic setting is enabled in the network configuration settings on GX Works3 and the parameter is changed as the same time for multiple stations using MR Configurator2 communication, the changed parameters may not be reflected to the CPU module depending on the communication load condition. Change one station at a time or write the project to the CPU module after starting MR Configuration2 via GX Works3 and changing parameters.
- Motion control is not performed if the IP address of the Motion control station set in Network Configuration Settings is not also set in "[Pr.141] IP address". In this situation, correct the parameter setting.
- A servo alarm [AL.035_Command frequency error] may be detected in MR-J5(W)-G when an operation cycle over occurs on the Motion module during a motor operation and the command differs greatly before the operation cycle over and after a restoration. Check the program and increase the operation cycle setting or decrease the loading if necessary.
- In the "Encoder position during rotation" displayed when monitoring the current position history, the value equal to the multiplied inverse number of the electronic gear ratio of the servo amplifier (the command unit) is displayed.
- Match the current network configuration setting to the actual system configuration. If there is a difference, the Motion module may not be able to recognize device stations correctly. When disabling any of the axes with the "control axis disable switch function" of a multi-axis servo amplifier, configure the following settings for the disabled axis. Otherwise, the Motion module may not be able to recognize device stations correctly.

  • Set IP address and multidrop number to each "[Pr.141] IP address" and "[Pr.142] Multidrop number".
  • Set "[Pr.101] Virtual servo amplifier setting" to "1: Use as virtual servo amplifier".

- Do not assign MR-J5(W)-G set to CC-Link IE TSN Class A for the axis. If MR-J5(W)-G set to CC-Link IE TSN Class A is assigned for the axis, [AL.19E.2_Control mode setting warning 2] occurs in MR-J5(W)-G when it is connected.

MR-J5(W)-G (other than the cyclic synchronous mode) connection method

This section describes how to set when connecting MR-J5(W)-G with other than the cyclic synchronous mode and use various functions.

For details on wiring and parameters of MR-J5(W)-G, refer to MR-J5(W)-G manuals.

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

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

The firmware of MR-J5(W)-G that can be used for other than the cyclic synchronous mode is as follows.

Device	Mode	Version
MR-J5(W)-G	Profile mode	A4 or later
	Point table mode	B8 or later

Setting method

An example using two stations for MR-J5(W)-G is shown below. In this example, the 1st station (192.168.3.1) uses the cyclic synchronous mode and the 2nd station (192.168.3.2) uses other than the cyclic synchronous mode.

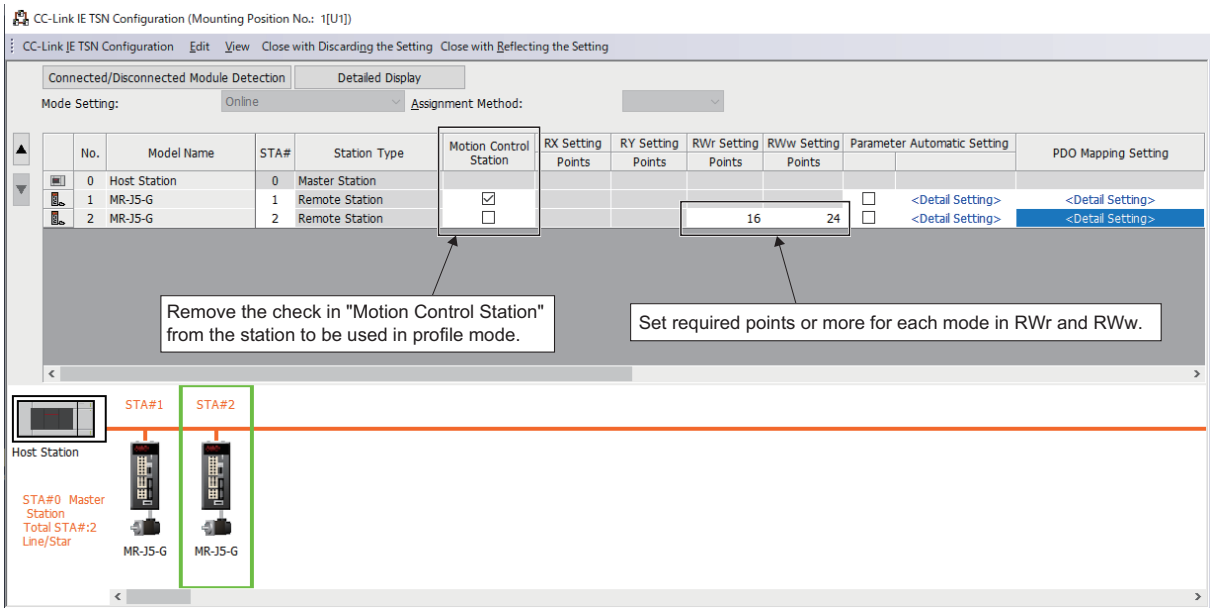
■CPU setting [GX Works3]

1. Set "Motion Control Station", "RWr Setting", and "RWw Setting".

Navigation window ⇨ "Parameter" ⇨ "Module Information" ⇨ Target module ⇨ [Module Parameter (Network)] ⇨ [Basic Settings] ⇨ [Network Configuration Settings]

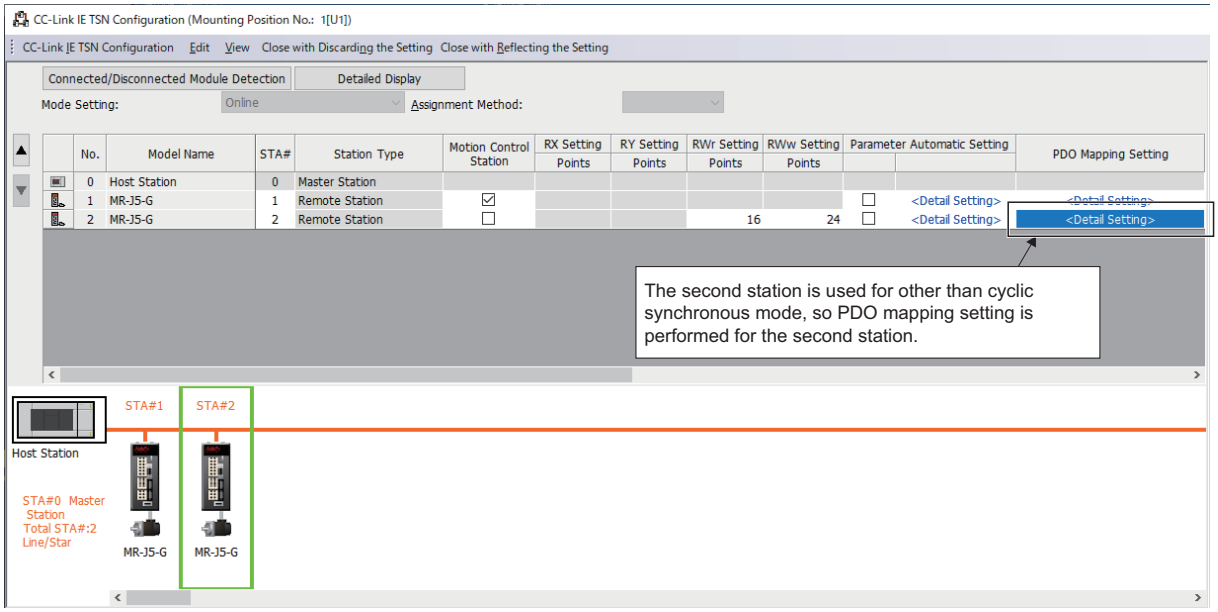
Points of Rwr and RWw that are required for each mode are shown below.

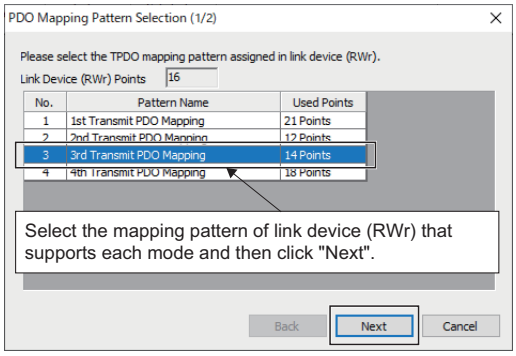
Mode	RWr	RWw
Profile mode	14 points or more	21 points or more
Point table mode	18 points or more	13 points or more

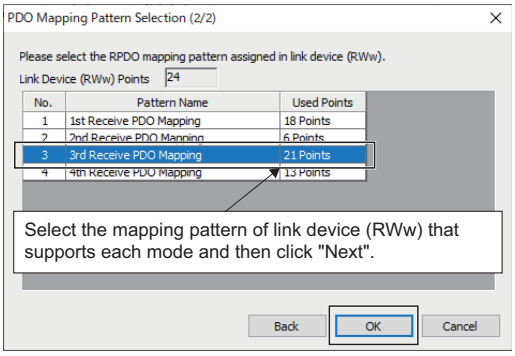


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2. Set the PDO mapping pattern selection for the station to be used in other than the cyclic synchronous mode in Detail Setting of "PDO Mapping Setting".

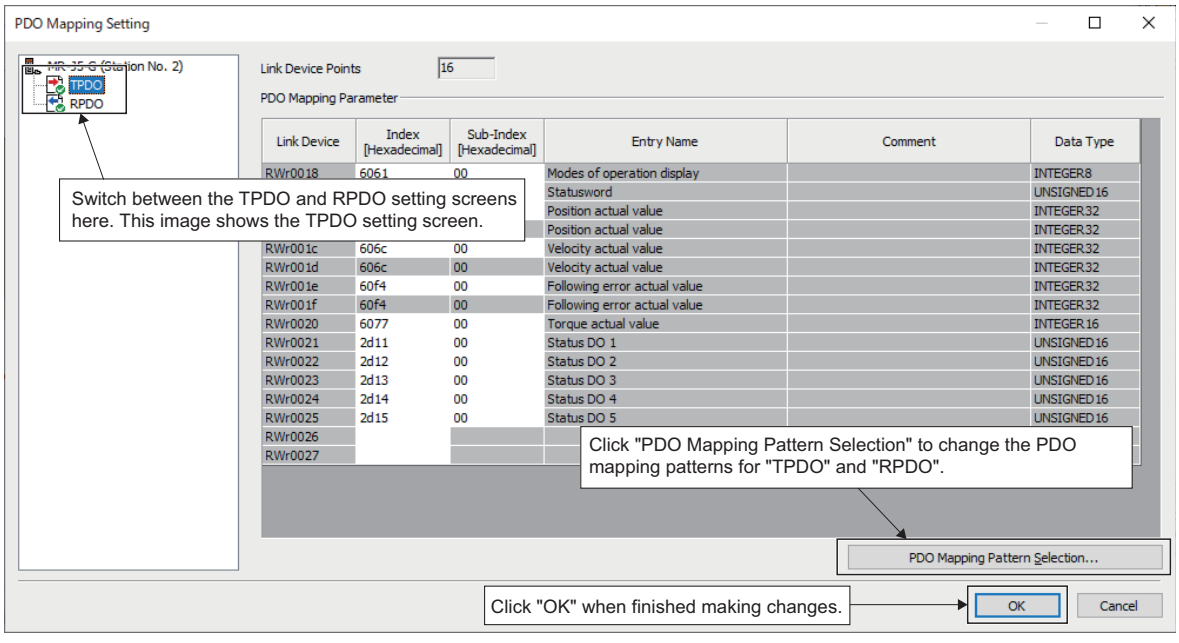






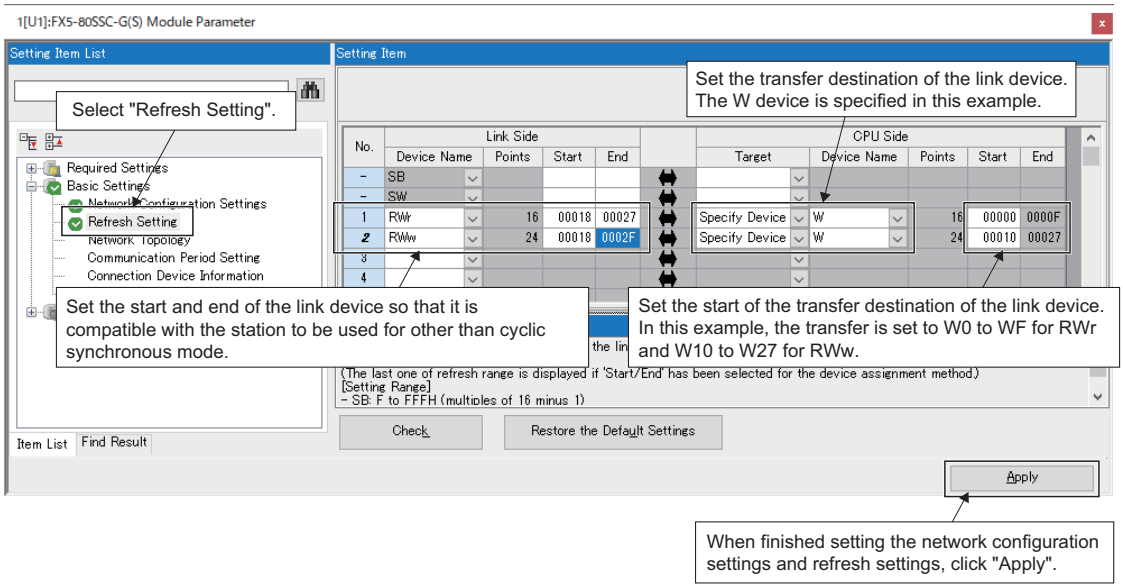
Mapping pattern setting for each mode is as follows.

Mode	RWr	RWw
Profile mode	[No.3] 3rd Transmit PDO Mapping	[No.3] 3rd Receive PDO Mapping
Point table mode	[No.4] 4th Transmit PDO Mapping	[No.4] 4th Receive PDO Mapping



3. Set the transfer ranges for the link device and the CPU module device for the station that was set to other than the cyclic synchronous mode.

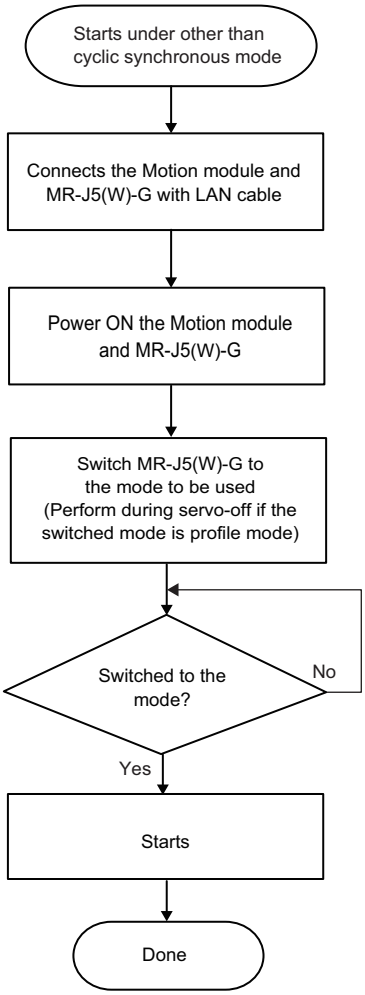
Navigation window → "Parameter"→ "Module Information" → Target module → [Module Parameter (Network)] → [Basic Settings] → [Refresh Settings]



4. When performing control with other than the cyclic synchronous mode, perform operation with the supported link device for each object.

Usage method

The following figure describes the process for driving a motor with other than the cyclic synchronous mode.



Change MR-J5(W)-G to the mode to be used by modifying link device that is assigned Modes of operation from program or watch.
For details of the setting value, refer to the manual for MR-J5(W)-G.
(e.g.: For changing to pp mode, set link device supporting Modes of operation to "1".)

Refer to Modes of operation display and check that the control mode of MR-J5(W)-G is switched.

Precautions

- Do not execute servo-on before switching to the profile mode. An improper operation, such as sudden acceleration of the motors, might occur.
- Do not switch to the cyclic synchronous mode after switching to the profile mode. An improper operation, such as sudden acceleration of the motors, might occur.
- When using with other than the cyclic synchronous mode, the Motion module does not perform the limit check, emergency stop command issue, etc. Carry out safety measures at the user's program or MR-J5(W)-G side.
- If the parameter automatic setting is enabled in the Network configuration setting on GX works3, the changed parameters are not reflected to the CPU module even if the parameters are changed using MR Configuration2 communication. If the parameter of the device station is changed, start MR Configuration2 via GX works3 and read the servo parameter.
- Axes must not be set to profile mode. When an axis is set, an error occurs.

MR-JET-G connection method

This section describes how to set when connecting MR-JET-G and use various functions.
For details about wiring and parameters of MR-JET-G, refer to MR-JET-G manuals.

Parameter setting value when using MR-JET-G

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

No.	Name	Default value	Setting value
PA06	Electronic gear numerator*1	1	• When using the rotary servo motor HK-KT series: 16 • Other (when not using the rotary servo motor HK-KT series): 1
PA07	Electronic gear denominator*1	1	1
PD41.3	Sensor input method selection*1	0h	1h (Input from controller (FLS/RLS/DOG))
PD60	DI pin polarity selection*1	00000000h	00000000h
PT01.1	Speed/acceleration/deceleration unit selection*2	0h	0h
PT15	Software position limit +	0	0
PT17	Software position limit -	0	0
PT29.0	Device input polarity 1*1	0h	1h: Dog detection with on

*1 The parameter is enabled after resetting the Motion module or MR-JET-G.
*2 The parameter is enabled after resetting the MR-JET-G.

PDO mapping when using MR-JET-G

When MR-JET-G is the motion control station, the Motion module assigns the PDO mapping automatically so that the setting is not needed.
Details of the mapping is as same as MR-J5(W)-G (Cyclic synchronous mode).

Precautions

- The following Motion module-related functions of the MR-JET-G are not supported by the MR-JET-G. For details, refer to the servo amplifier manuals.

  • Scale measurement function

- When parameter automatic setting is enabled in the network configuration settings on GX Works3, servo parameters are not automatically refreshed to the CPU module after the error "Servo parameter invalid" (error code: 1DC8H) occurs. Start MR Configuration2 via GX Works3, then read the servo parameters.
- Motion control is not performed if the IP address of the Motion control station set in Network Configuration Settings is not also set in "[Pr.141] IP address". In this situation, correct the parameter setting.
- A servo alarm [AL.035 Command frequency error] may be detected in MR-JET-G when an operation cycle over occurs on the Motion module during a motor operation and the command differs greatly before the operation cycle over and after a restoration. Check the program and increase the operation cycle setting or decrease the loading if necessary.

Appendix 4 Restrictions by the version

The software versions compatible with each Simple Motion module/Motion module are shown below.

Model	Version
	GX Works3
FX5-SSC-S	1.007H or later
FX5-SSC-G	1.072A or later

There are restrictions in the function that can be used by the software of the Simple Motion module/Motion module and the version of the engineering tool. The combination of each version and function is shown below.

[FX5-SSC-S]

Function	Software version	GX Works3	Reference
Command generation axis	1.002 or later	1.015R or later	*1
Advanced synchronous control Slippage smoothing method (Linear: Input value follow up)	1.003 or later	1.025B or later	*2
Monitor of rotation direction using synchronous control monitor			*3
Optional data monitor function data type Internal temperature of encoder, Unit power consumption (Used point: 2 words)			☞ Page 371 Optional Data Monitor Function
[Pr.127] Speed limit value input selection at control mode switching			☞ Page 470 Detailed parameters2
AlphaStep/5-phase stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd.			☞ Page 825 AlphaStep/5-phase stepping motor driver manufactured by ORIENTAL MOTOR Co., Ltd.
Compatible with 8 axes	1.004 or later	1.030G or later	—
Compatible with 0.888 ms of operation cycle			—
Linear servo motor control mode/Direct drive motor control mode/Fully closed loop control mode			—
Inverter (FR-A800 series)			☞ Page 821 Inverter FR-A800 series
Servo driver manufactured by CKD NIKKI DENSO CO., LTD. (VCⅡ series/VPH series)			☞ Page 832 Servo driver VCII series/VPH series manufactured by CKD NIKKI DENSO CO., LTD.
IAI electric actuator controller manufactured by IAI Corporation			☞ Page 836 IAI electric actuator controller manufactured by IAI Corporation

*1 Refer to "Command Generation Axis" in the following manual for details.
📖MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control)

*2 Refer to "Clutch" in the following manual for details.
📖MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control)

*3 Refer to "Outline of Synchronous Control" in the following manual for details.
📖MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control)

[FX5-SSC-G]

Function	Software version	GX Works3	Reference
Supports MR-J5D-G.	1.001 or later	1.075D or later	—
Safety extension module			—
Supports mark detection (servo amplifier TPR1 input).		1.080J or later	☞ Page 355 Mark Detection Function
Automatic update of saved parameter			*1
Supports dedicated instruction, SLMPSND.			*2
Supports override 0%.	1.002 or later	1.075D or later	☞ Page 263 Override function
Supports communication speed 100 Mbps.		1.085P or later	*3
Supports the time managed polling method (CC-Link IE TSN Protocol version 2.0)			*3
Supports manual pulse generator speed limit value.			☞ Page 178 Manual pulse generator speed limit mode [FX5-SSC-G]
Supports cam axis length per cycle change.			*4
Electronic gear setting range extended			☞ Page 455 [Pr.2] to [Pr.4] Electronic gear (Movement amount per pulse)
Supports the speed/torque control mutual switching during servo OFF	1.003 or later		☞ Page 215 Control mode switching during servo OFF
Supports synchronous encoder via servo amplifier • linear encoder (incremental type) • ABZ-phase differential output type encoder			*4
Supports synchronous encoder axis via link device	1.004 or later	1.105K or later	Page 329 Link Device External Signal Assignment Function [FX5-SSC-G]
Supports mark detection (link device input)			Page 329 Page 329 Link Device External Signal Assignment Function [FX5-SSC-G] Page 355 Mark Detection Function
Supports link device external signal	1.005 or later	1.110Q or later	Page 329 Link Device External Signal Assignment Function [FX5-SSC-G]

*1 Refer to "Others" in the following manual for details.
MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN)

*2 Refer to "DEDICATED INSTRUCTION" in the following manual for details.
MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN)

*3 Refer to "SYSTEM CONFIGURATION" in the following manual for details.
MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN)

*4 Refer to "Synchronous Encoder Axis" in the following manual for details.
MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Advanced Synchronous Control)

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REVISIONS

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

Revision date	*Manual number	Description
November 2014	IB(NA)-0300253ENG-A	First edition
January 2015	IB(NA)-0300253ENG-B	■Added or modified parts SAFETY PRECAUTIONS, RELEVANT MANUALS, TERMS, Section 2.1, 3.1, 3.2, 4.1, 5.1, 5.2, 5.3, 5.4, 6.2, 7.4, 7.5, 7.9, 8.9, 10.1, 10.2, 10.3, 10.7, 10.8, 10.9, 12.1
August 2015	IB(NA)-0300253ENG-C	■Added functions Command generation axis ■Added or modified parts Section 1.1, 1.2, 2.1, 3.1, 3.2, 4.1, 4.3, 4.4, 4.5, 5.1, 5.4, 6.1, 7.4, 7.5, 7.6, 7.9, 7.10, 8.1, 8.2, 8.3, 8.4, 8.5, 8.8, 8.9, 8.10, 8.11, 10.1, 10.2, 10.3, 10.4, 10.7, 10.8, 10.9, 11.2, 11.4, 12.1, 12.3, 12.4, 12.5, Appendix 2, 3
October 2016	IB(NA)-0300253ENG-D	■Added models FX5-80SSC-S ■Added functions Linear servo motor control mode/Direct drive motor control mode/Fully closed loop control mode, Inverter FR-A800 series, Stepping motor driver AlphaStep/5-phase manufactured by ORIENTAL MOTOR Co., Ltd., Servo driver VCⅡ series/VPH series manufactured by Nikki Denso Co., Ltd., IAI electric actuator controller manufactured by IAI Corporation ■Added or modified parts SAFETY PRECAUTIONS, INTRODUCTION, TERMS, Section 1.1, Section 2.1, 2.2, 2.3, 2.4, 3.1, 3.2, 4.1, 4.3, 4.4, 4.5, 5.2, 5.3, 5.4, 6.1, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9, 7.10, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, 8.11, 8.12, 9.1, 10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9, 11.1, 11.2, 11.3, 11.4, 12.1, 12.3, 12.4, 12.5, Appendix 2, 3, WARRANTY
March 2021	IB(NA)-0300253ENG-E	■Added models FX5-40SSC-G, FX5-80SSC-G ■Added or modified parts SAFETY PRECAUTIONS, INTRODUCTION, RELEVANT MANUALS, TERMS, Chapter 1, Section 1.1, 1.2, 1.3, Section 2.1, 2.2, 2.3, 2.4, 3.1, 3.2, 4.1, 4.2, 4.3, 4.4, 4.5, Chapter 5, Section 5.1, 5.2, 5.3, 5.4, Chapter 6, Section 6.1, 6.2, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9, 7.10, Chapter 8, Section 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, 8.11, 8.12, 9.1, Chapter 10, Section 10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9, Chapter 11, Section 11.1, 11.3, 11.4, Chapter 12, Section 12.1, 12.2, 12.3, Chapter 13, Section 13.1, 13.2, 13.3, 13.4, 13.5, Appendix 1, 2, 3, 4, WARRANTY, TRADEMARKS
March 2021	IB(NA)-0300253ENG-F	■Added or modified parts Section 11.3
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July 2022	IB(NA)-0300253ENG-H	■Added or modified parts SAFETY PRECAUTIONS, RELEVANT MANUALS, TERMS, GENERIC TERMS AND ABBREVIATIONS, Section 1.1, 1.2, 1.3, 2.2, 3.2, 4.3, 4.4, 4.5, 5.2, 5.3, 5.4, 6.1, 7.1, 7.2, 7.3, 7.4, 7.5, 7.7, 7.8, 7.9, 7.10, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.9, 8.10, 8.13, 10.2, 10.3, 11.1, 11.2, 11.3, 11.6, 11.7, 11.8, 11.9, 12.1, 12.3, 12.4, 13.1, 13.3, 14.1, 14.2, 14.3, 14.4, 14.5, Appendix 2, 3, 4
September 2022	IB(NA)-0300253ENG-J	■Added or modified parts Section 3.2, 4.1, 7.3, 8.7, 8.9, 11.1, 11.2, 11.7, 11.9, 14.4, 14.5, Appendix 1, 2, 3
November 2023	IB(NA)-0300253ENG-K	■Added or modified parts SAFETY PRECAUTIONS, TERMS, Section 1.1, 1.2, 1.3, 2.2, 3.1, 3.2, 4.4, 5.4, 6.1,7.1, 7.2, 7.3, 7.4, 7.5, 7.7, 7.8, 7.9, 7.10, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, Chapter 10, Section 10.1, 10.2, 10.3, 11.1, 11.2, 11.3, 11.4, 11.6, 11.7, 11.8, 11.9, 12.3, 13.3, 14.2, 14.4, 14.5, Appendix 2, 3, 4, INFORMATION AND SERVICES, TRADEMARKS
July 2024	IB(NA)-0300253ENG-L	■Added functions [FX5-SSC-G] Link device external signal assignment function ■Added or modified parts SAFETY PRECAUTIONS, TERMS, GENERIC TERMS AND ABBREVIATIONS, Section 8.2, 8.3, 8.5, 8.10, 11.1, 11.2, 11.3, 11.9, 14.3, 14.4, 14.5, Appendix 4, INDEX
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Revision date	*Manual number	Description
May 2025	IB(NA)-0300253ENG-N	■Added or modified parts TERMS, Section 7.7, 7.10, 8.6, 11.1, 11.7, 11.9, 12.3, 14.5, Appendix 2

Japanese manual number: IB-0300252-L

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WARRANTY

Please confirm the following product warranty details before using this product.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company. However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

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

[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
   1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
   2. Failure caused by unapproved modifications, etc., to the product by the user.
   3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
   4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
   5. Relay failure or output contact failure caused by usage beyond the specified life of contact (cycles).
   6. Failure caused by external irresistible forces such as fires or abnormal voltages, and failure caused by force majeure such as earthquakes, lightning, wind and water damage.
   7. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
   8. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued.
Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.

(2) Product supply (including repair parts) is not available after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

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. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

6. Product application

(1) In using the Mitsubishi MELSEC programmable controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.

(2) The Mitsubishi programmable controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for railway companies or public service purposes shall be excluded from the programmable controller applications.
In addition, applications in which human life or property that could be greatly affected, such as in aircraft, medical applications, incineration and fuel devices, manned transportation, equipment for recreation and amusement, and safety devices, shall also be excluded from the programmable controller range of applications.
However, in certain cases, some applications may be possible, providing the user consults their local Mitsubishi representative outlining the special requirements of the project, and providing that all parties concerned agree to the special circumstances, solely at the user's discretion.

(3) Mitsubishi shall have no responsibility or liability for any problems involving programmable controller trouble and system trouble caused by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.

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
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MODEL: FX5SSC-U-APP-E
MODEL CODE: 1XB020

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