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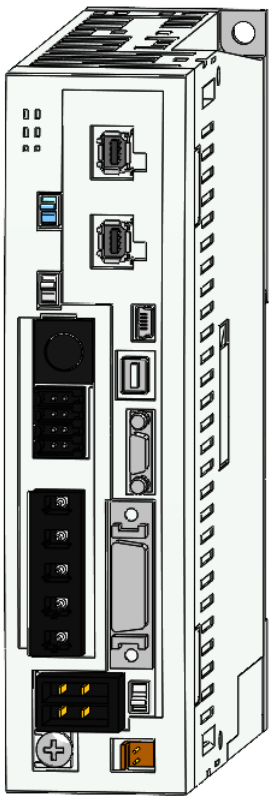
SCON2 Motion Network

MECHATROLINK

MECHATROLINK-III Edition

Instruction Manual First Edition *ME0471-1C*



This instruction manual describes contents SCON2 Motion field network of about. For those not described in this manual should refer to SCON2 Instruction Manual (ME0458).

IAI Corporation

Please Read Before Use

Thank you for purchasing our product.

This instruction manual explains the handling methods, structure and maintenance of this product, providing the information you need in order to use the product safely.

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.

Please downloaded the user's manual from our website.
You can download it free of charge. User registration is required for the first time downloading.
URL : www.iai-robot.co.jp/data_dl/CAD_MANUAL/

When using the product, print out of the necessary portions of the relevant manual, or please display it on your computer, tablet terminal, etc. so that you can check it immediately.

After reading the instruction manual, keep it in a convenient place so that whoever is handling the product can refer to it quickly when necessary.

[Important]

- This instruction manual is an original document dedicated for this product.
- This product cannot be used in ways not shown in this instruction manual. IAI shall not be liable for any result whatsoever arising from the use of the product in any other way than what is noted in the manual.
- The information contained in this instruction manual is subject to change without notice for the purpose of product improvement.
- If any issues arise regarding the information contained in this instruction manual, contact our customer center or the nearest sales office.
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SCON2 Motion Network Manual Configuration

Product name	Manual name	Control number
SCON2 Motion network MECHATROLINK-III Edition	Instruction Manual (this manual)	ME0471
SCON2 Controller	SCON2 Instruction Manual	ME0458
SCON2 Controller	SCON2 First Step Guide	ME0468
PC Software	IA-OS First Step Guide *For how to operate, refer to the guide feature stored in IA-OS	ME0391
Touch Panel Teaching Pendant	TB-02/02D Instruction Manual	ME0355
Touch Panel Teaching Pendant	TB-03 Instruction Manual	ME0376
24V Power Supply Unit	PSA-24 Instruction Manual	ME0379

Instruction Manual is available for download from our website.
URL: www.iai-robot.co.jp/data_dl/CAD_MANUAL/

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Chapter 4 Command

Chapter 5 Operation

Chapter 6 Parameters

Chapter 7 Troubleshooting

Chapter 8 Warranty

Workflow

Shown below is the flow of the work.

1	Prepare a teaching tool necessary to set up SCON2. Refer to [Instruction Manual of Each Teaching Tools Described in [1.4 Used Tools]]
2	Install SCON2 and do wiring on it. Refer to [2.3 Wiring] and [SCON2 Instruction Manual (ME0458)]
3	Set up the parameters for the SCON2. Refer to [2.4 Parameter Settings]
4	Establish the communication setting for the MECHATROLINK-III master and the SCON2. Refer to [instruction manual of MECHATROLINK-III Master]
5	Create a program for basic operation confirmation. (It is not mandatory.) Confirm the basic operations such as servo-on, home-return, moving forward and backward. Refer to [instruction manual of MECHATROLINK-III Master]
6	Create a program for control and confirm the operation in step feeding. Refer to [instruction manual of MECHATROLINK-III Master]
7	Confirm the operation of the created program in continuous operation. Refer to [instruction manual of MECHATROLINK-III Master]
8	Save the project data. Refer to [instruction manual of MECHATROLINK-III Master]

Safety Guide

“Safety Guide” has been written to use the machine safely and so prevent personal injury or property damage beforehand. Make sure to read it before the operation of this product.

Safety Precautions for Our Products

The common safety precautions for the use of any of our robots in each operation.

No.	Operation Description	Description
1	Model Selection	● This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible. Accordingly, do not use it in any of the following applications. 1) Medical equipment used to maintain, control or otherwise affect human life or physical health. 2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility) 3) Important safety parts of machinery (Safety device, etc.) ● Do not use the product outside the specifications. Failure to do so may considerably shorten the life of the product. ● Do not use it in any of the following environments. 1) Location where there is any inflammable gas, inflammable object or explosive 2) Place with potential exposure to radiation 3) Location with the ambient temperature or relative humidity exceeding the specification range 4) Location where radiant heat is added from direct sunlight or other large heat source 5) Location where condensation occurs due to abrupt temperature changes 6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid) 7) Location exposed to significant amount of dust, salt or iron powder 8) Location subject to direct vibration or impact ● For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece.

No.	Operation Description	Description
2	Transportation	● When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane. ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● When in transportation, consider well about the positions to hold, weight and weight balance and pay special attention to the carried object so it would not get hit or dropped. ● Transport it using an appropriate transportation measure. The actuators available for transportation with a crane have eyebolts attached or there are tapped holes to attach bolts. Follow the instructions in the instruction manual for each model. ● Do not step or sit on the package. ● Do not put any heavy thing that can deform the package, on it. ● When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work. ● When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment’s capability limit. ● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. ● Do not get on the load that is hung on a crane. ● Do not leave a load hung up with a crane. ● Do not stand under the load that is hung up with a crane.
3	Storage and Preservation	● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation. ● Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake.
4	Installation and Start	(1) Installation of Robot Main Body and Controller, etc. ● Make sure to securely hold and fix the product (including the work part). A fall, drop or abnormal motion of the product may cause a damage or injury. Also, be equipped for a fall-over or drop due to an act of God such as earthquake. ● Do not get on or put anything on the product. Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life. ● When using the product in any of the places specified below, provide a sufficient shield. 1) Location where electric noise is generated 2) Location where high electrical or magnetic field is present 3) Location with the mains or power lines passing nearby 4) Location where the product may come in contact with water, oil or chemical droplets

No.	Operation Description	Description
4	Installation and Start	(2) Cable Wiring ● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool. ● Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it. Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error. ● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error. ● When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction. ● Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product. ● Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire.
		(3) Grounding ● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation. ● For the ground terminal (PE) on the AC power cable of the controller and the grounding plate in the control panel, make sure for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment standards and criteria). For detail, follow the description in [an instruction manual of each controller or controller built-in actuator]. ● Conduct functional grounding on the FG terminal for a controller supplying 24V DC or a controller built-in type actuator. In order to minimize influence to mechanical operation given by electromagnetic interference (noise) to an electrical device or insulation failure, conduct grounding on a terminal or a conductor that is electrically stable. The reference impedance should be Type D (Former Class 3, ground resistance 100Ω or less).

No.	Operation Description	Description
4	Installation and Start	(4) Safety Measures ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protection fence) so that nobody can enter the area within the robot’s movable range. When the robot under operation is touched, it may result in death or serious injury. ● Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation. ● Take the safety measure not to start up the unit only with the power turning ON. Failure to do so may start up the machine suddenly and cause an injury or damage to the product. ● Take the safety measure not to start up the machine only with the emergency stop cancellation or recovery after the power failure. Failure to do so may result in an electric shock or injury due to unexpected power input. ● When the installation or adjustment operation is to be performed, give clear warnings such as “Under Operation; Do not turn ON the power!” etc. Sudden power input may cause an electric shock or injury. ● Take the measure so that the work part is not dropped in power failure or emergency stop. ● Wear protection gloves, goggle or safety shoes, as necessary, to secure safety. ● Do not insert a finger or object in the openings in the product. Failure to do so may cause an injury, electric shock, damage to the product or fire. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.
5	Teaching	● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● Perform the teaching operation from outside the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign “Under Operation” at the position easy to see. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.

No.	Operation Description	Description
6	Trial Operation	● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation. ● When the check operation is to be performed inside the safety protection fence, perform the check operation using the previously specified work procedure like the teaching operation. ● Make sure to perform the programmed operation check at the safety speed. Failure to do so may result in an accident due to unexpected motion caused by a program error, etc. ● Do not touch the terminal block or any of the various setting switches in the power ON mode. Failure to do so may result in an electric shock or malfunction.
7	Automatic Operation	● Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence. ● Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication. ● Make sure to operate automatic operation start from outside of the safety protection fence. ● In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product. ● When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure.

No.	Operation Description	Description
8	Maintenance and Inspection	● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● Perform the work out of the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. ● When the work is to be performed inside the safety protection fence, basically turn OFF the power switch. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign “Under Operation” at the position easy to see. ● For the grease for the guide or ball screw, use appropriate grease according to the instruction manual for each model. ● Do not perform the dielectric strength test. Failure to do so may result in a damage to the product. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. ● The slider or rod may get misaligned OFF the stop position if the servo is turned OFF. Be careful not to get injured or damaged due to an unnecessary operation. ● Pay attention not to lose the removed cover or screws, and make sure to put the product back to the original condition after maintenance and inspection works. Use in incomplete condition may cause damage to the product or an injury. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.
9	Modification and Dismantle	● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.
10	Disposal	● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste. ● When removing the actuator for disposal, pay attention to drop of components when detaching screws. ● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.
11	Other	● Do not come close to the product or the harnesses if you are a person who requires a support of medical devices such as a pacemaker. Doing so may affect the performance of your medical device. ● See Overseas Specifications Compliance Manual to check whether complies if necessary. ● For the handling of actuators and controllers, follow the dedicated instruction manual of each unit to ensure the safety.

Alert Indication

The safety precautions are divided into “Danger”, “Warning”, “Caution” and “Notice” according to the warning level, as follows, and described in the instruction manual for each model.

Level	Degree of Danger and Damage	Symbol
Danger	This indicates an imminently hazardous situation which, if the product is not handled correctly, will result in death or serious injury.	 Danger
Warning	This indicates a potentially hazardous situation which, if the product is not handled correctly, could result in death or serious injury.	 Warning
Caution	This indicates a potentially hazardous situation which, if the product is not handled correctly, may result in minor injury or property damage.	 Caution
Notice	This indicates lower possibility for the injury, but should be kept to use this product properly.	 Notice

Description

Unless otherwise specified, descriptions are expressed as shown below.

1. The SCON2 controller applicable for MECHATROLINK-III motion should be described as “**SCON2**”.

2. The host program controller (PLC) should be described as “MECHATROLINK-III master” or “master”.

3. Regarding how to describe numbers (integral number), there should be “b” put at the end of an integral number for binary numbers. Also, for hexadecimal numbers, there should be “H” put at the end of an integral number and capital alphabet.

Examples for Descriptions of Binary Numbers and Hexadecimal Numbers

Decimal Number	Binary Number	Hexadecimal Number
238	11101110b	EE_H or 0xEE

Precautions for Handling

1. Make sure to follow the usage condition, environment and use range of the product.
   In case it is not secured, it may cause a drop in performance or malfunction of the product.

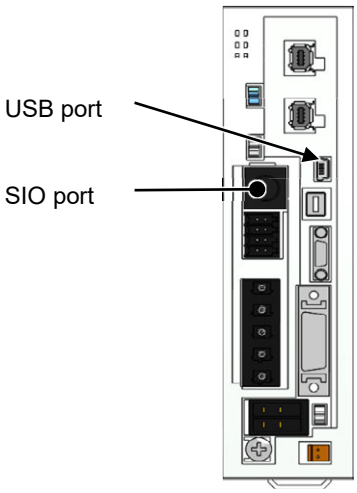
2. Use the correct teaching tool.
   Refer to the following item and use compatible tools for PC software and teaching pendant usable for this controller.
   Refer to [1.4 Used Tools]

3. Back up data in order to be prepared for a breakdown.
   Non-volatile memory is used for backup memory of this controller. Registered parameters are written in this memory and backed up. Therefore, these data will normally not be lost even if the power is turned off. However, be sure to save the latest data to enable a quick recovery process in case this controller needs to be replaced with a substitute due to breakdown, etc.

   How to save
   (1) Save to an external memory or a hard disk using Teaching Tool
   (2) Record position table and parameters in writing

4. External communication ports
   There are two types of communication ports including an option in the SCON2.
   · SIO port (RS-485 round connector)
   · USB port (USB mini-B connector)

   Do not connect multiple ports and perform communication simultaneously.
   This may result in following errors:
   · Occurrence of communication error
   · Occurrence of unpredictable operation



5. Attempt not to exceed the actuator specifications.
   In the MECHATROLINK-III motion control, the velocity and acceleration/deceleration can be controlled with commands from a host programable controller (hereinafter described as master). Do not attempt to make operation above the maximum velocity or maximum acceleration/deceleration of an actuator as it may cause malfunction.

6. About Index Mode in Rotary Type Actuator and DD Motor
   The rotary type actuators and DD motors are not available for use in the index mode.

7. Pressing Operation

   Pressing operation is not available in the control of MECHATROLINK-III. However, as it is now applicable for the torque limit fe11ature, it is capable of operation equivalent to pressing.

8. Other Remarks

   Make sure to read also the caution notes in SCON2 Instruction Manual (Control number : ME0458).

   Operation in wrong manner could cause injury or damage on the product or equipment.

International Standard Compliance

This product complies with the following overseas standards.
Refer to the [Overseas Standard Compliance Manual (ME0287)] for more detailed information.

○: Applicable, ×: Not applicable

RoHS3 Directive	CE Marking	UL Certification
○	○	○*1

*1 It is applicable only for those with UL/cUL mark shown in the rating label.

SCON2 - Motion

Chapter 1

Overview of Field Network Type

1.1 Overview

In this manual, describes the specifications of SCON2-CG controller applicable for the MECHATROLINK-III standard servo profile.

For details not described in this manual regarding the command specifications in the ML3 standard profile, refer to each document issued by MECHATROLINK Members Association.

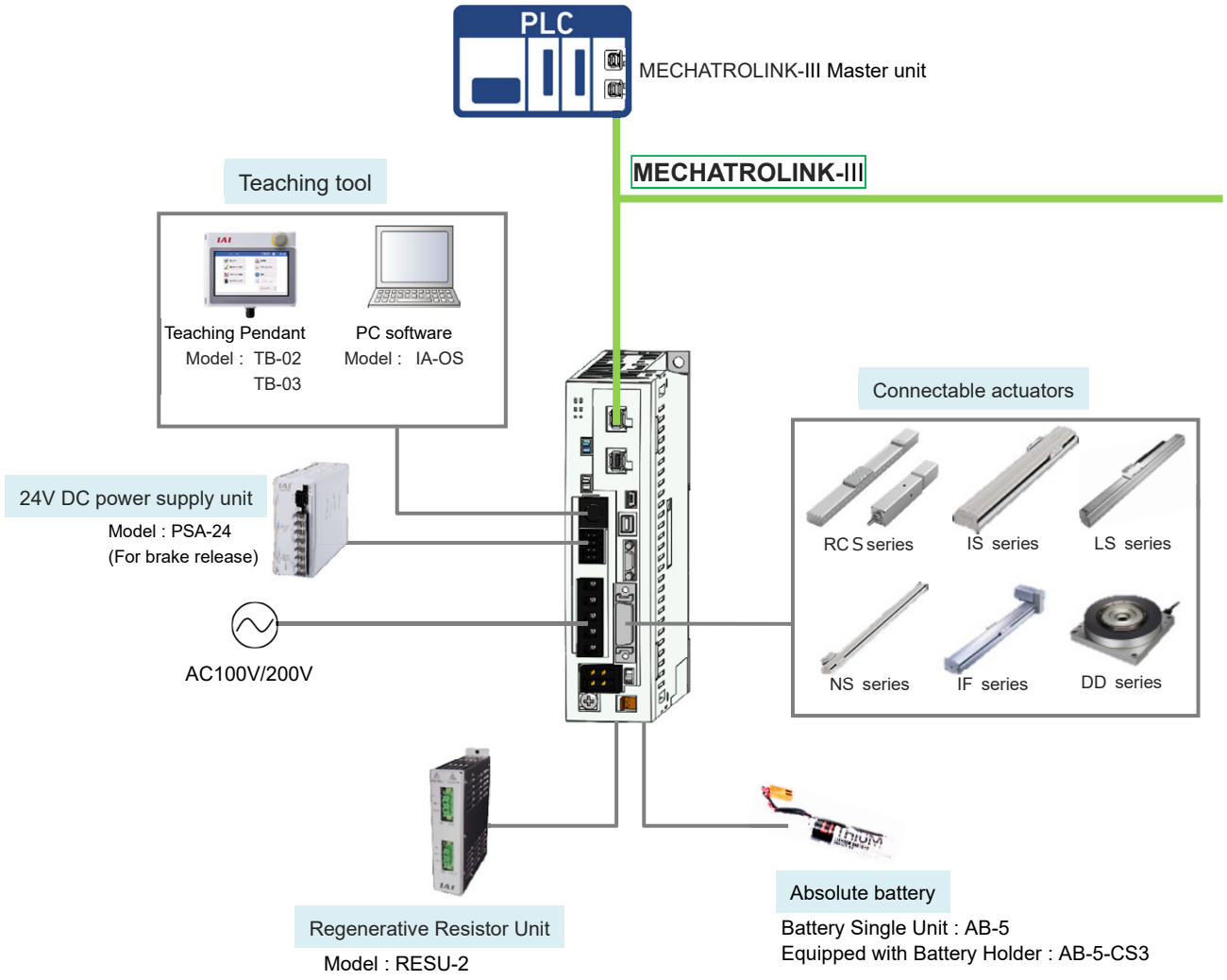
* The profile types of ML3 supported in SCON2-CG should be the standard servo profile and the standard I/O profile. In this manual, explains the standard servo profile application only.
* For SCON2 applicable of the MECHATROLINK-III standard I/O profile, refer to [SCON2 Field Network Instruction Manual (ME0469)] provided separately.

This instruction manual should be used in parallel with an instruction manual for each controller.

Also, any way of use other than those shown possible in this manual should not be available.

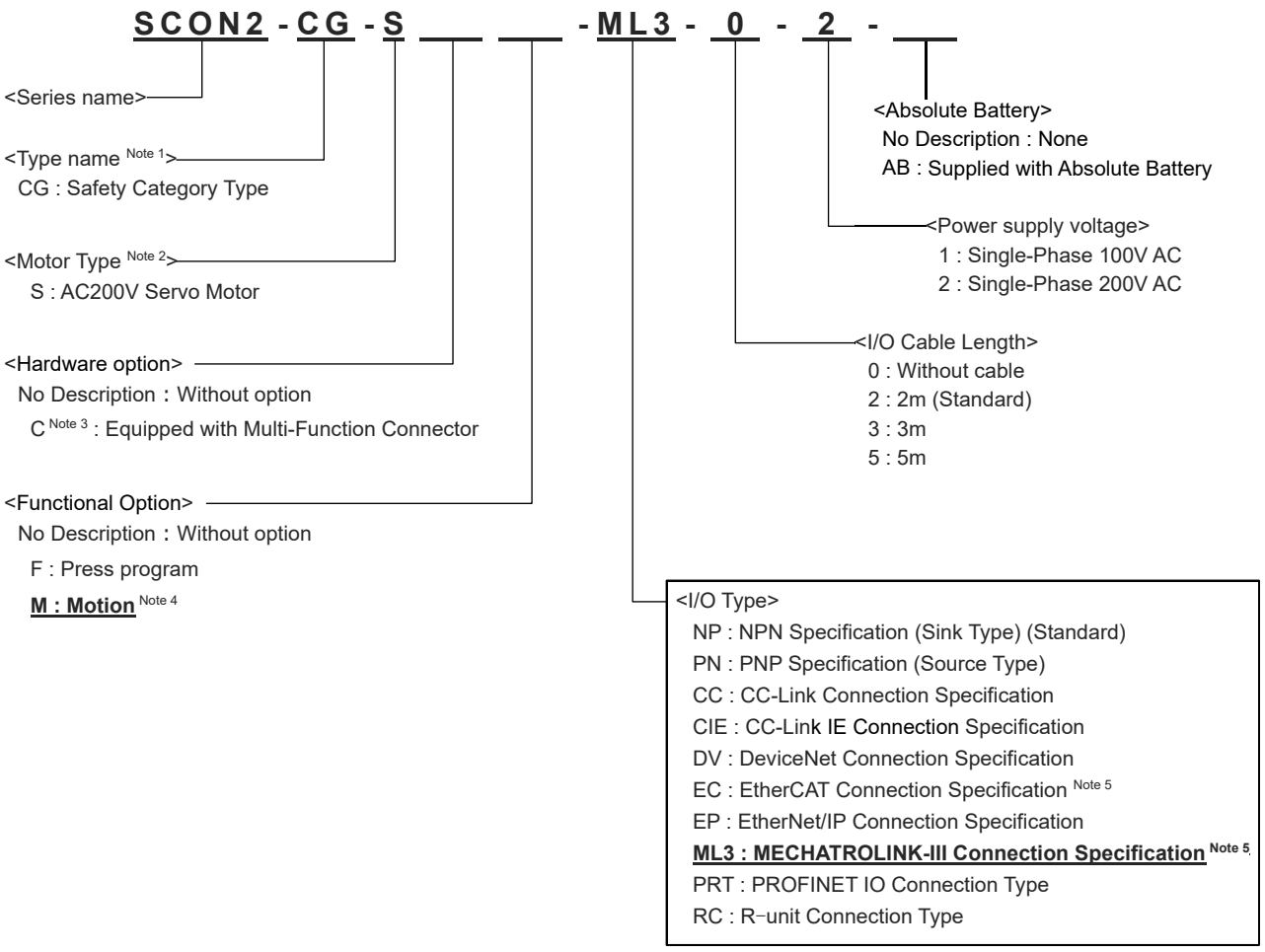
1.2 System Configuration

The following shows the system configuration.



1.3 Model Code

Shown below is how to read the model codes.



Note 1 Only for Safety Category applicable types.

Note 2 The applicable motor wattage is from 60W to 750W.

Note 3 Select this when the pulse train control is to be conducted.
Also, when it is necessary to acquire a feedback pulse, this option should be added.
Note that this option cannot be used when the motion specification or R-unit connection specification is used.

Note 4 It is available to select when the I/O type is “EC” or “ML3”.

Note 5 It should be the remote I/O type when “No Description” or the pressing program “F” is selected in the functional option column and should be the motion type when the motion “M” is selected.
Also, in the remote I/O type, or motion type, the instruction manual should differ.
・SCON2 Field network instruction manual (ME0469)

1.4 Used Tools

Shown below are the versions applicable for the tools available for startup and operation of the field network for SCON2.

Refer to the following instruction manuals for how to operate the PC software and teaching pendants. The instruction (first step guide) manual for IA-OS introduces only the installation procedures and how to start up the software. For how to operate the software, follow the instruction or a help in windows.

Product Name	Model Code	Version Applied from	Instruction Manual
PC software	IA-OS-*	V13.00.00.00	ME0391
Teaching Pendant	TB-02-*	V4.10	ME0355
	TB-03-*	V4.10	ME0376

Instruction Manual is available for download in our website.
The latest version of IA-OS (update) is available to download in our website.

SCON2 - Motion

Chapter 2

Specifications and Settings for MECHATROLINK-III

2.1 MECHATROLINK-III Interface Specifications

The specifications for the MECHATROLINK-III interface are as shown below.

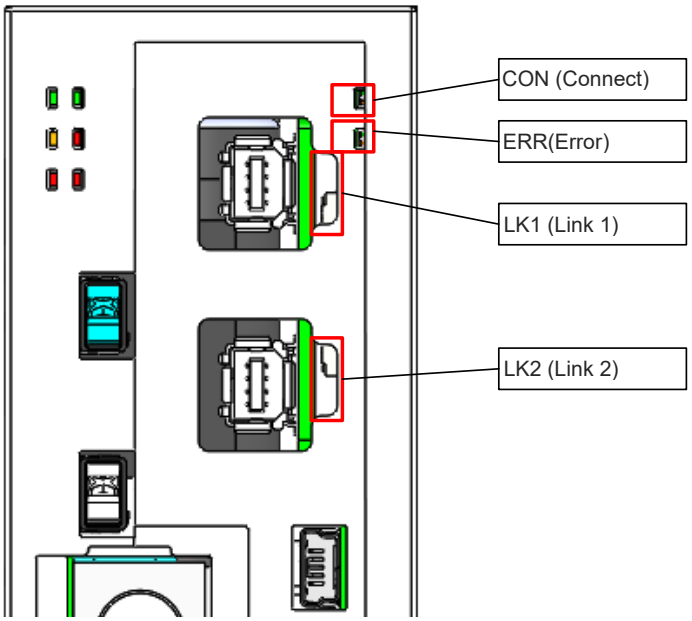
Item		Specification
Physical Layer		Ethernet
Transmission Speed		100Mbps
Max. Data Transmission Distance (Between Nodes)		100m
Minimum Distance Between Stations		0.2m
Connection Form		Cascade Topology / Star Topology / Point-to-Point Topology
Number of Connectable Stations (Max. Number of Slaves)		62 stations
Transmission Cycle		0.125, 0.250, 0.5 to 4ms (0.5ms from 0.5 to 4)
Transmittable Distance		0.125 to 32ms (1ms unit)
Data Length		32, 48 bytes
Node Address		03_H to EF_H
Cable		MECHATROLINK-III dedicated cable
Connector	Controller Side	Industrial Mini I/O Connector
	Cable Side	Industrial Mini I/O Connector

Refer to [SCON2 Instruction Manual (ME0458)] for details of SCON2 main unit.

2.2 Part names/Functions

2.2.1 Part Names

Here shows names of each part related to the MECHATROLINK-III.



2.2.2 Function of Each Parts

[1] Status LED

With the LED lamps allocated on the front of the controller, condition of communication board and network status can be notified.

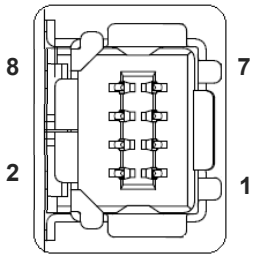
○ : Illuminating, × : Off

LED	Color	Display status	Description
CON	Green	○	It turns on when receiving CONNECT (connected status with master (P2 *1 or more)), and turns off when receiving DISCONNECT or the controller is in reboot.
	-	×	The board is not connected to the master unit. * This lamp turns off when reach P1 *1 or less.
ERR	Orange	○	Turns on when communication alarm (warning excepted) or command alarm (warning excepted) is generated. Turns off when alarm condition is cleared.
	-	×	In normal condition (command alarm not generated on all axes)
LK1 (Link 1)	Green	○	Turns on when physically connected to another device applicable for MECHATROLINK-III. (Check such as cable breakage)
LK2 (Link 2)	Green	○	

*1 Communication Phase: There are three types of status, P1 to P3.
Refer to [section 3.1.1 State Transition]

[2] MECHATROLINK-III Communication connector

The connector mounted on the communication module for the MECHATROLINK-III is as shown below.



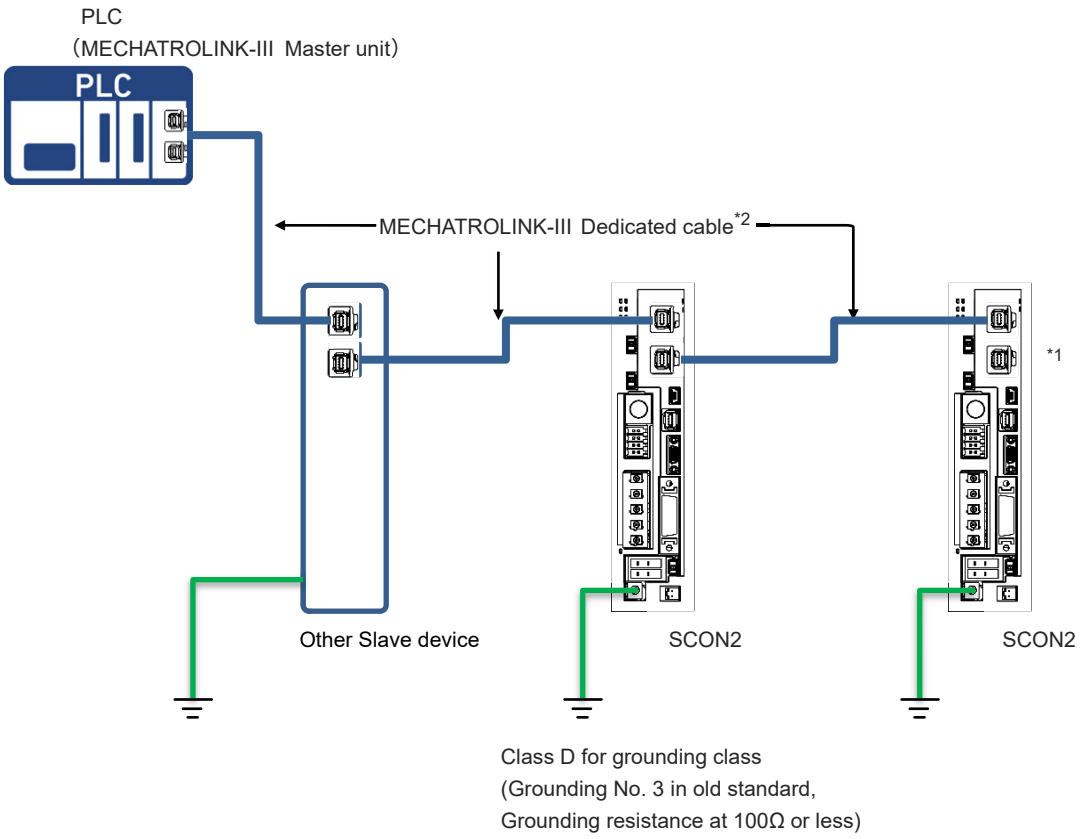
Industrial Mini I/O Connector
(Controller side)

Pin No.	Signal name	Signal abbreviation
1	Transmit data + side	TXD+
2	Transmit data - side	TXD-
3	Receive data + side	RXD+
4	-	Not connected
5	-	Not connected
6	Receive data - side	RXD-
7	-	Not connected
8	-	Not connected

2.3 Wiring

2.3.1 Example for Wiring of MECHATROLINK-III

Shown below is an example f22-5or wiring of MECHATROLINK-III.



*1 There should be nothing connected on the terminal connector on the slave side (no need of terminal resistor).
For details, refer to the [instruction manual for the MECHATROLINK-III master unit].

*2 Reference Cable Model Code: JEPMC-W6012-□□-E
(manufactured by YASKAWA CONTROLS Co., Ltd.)

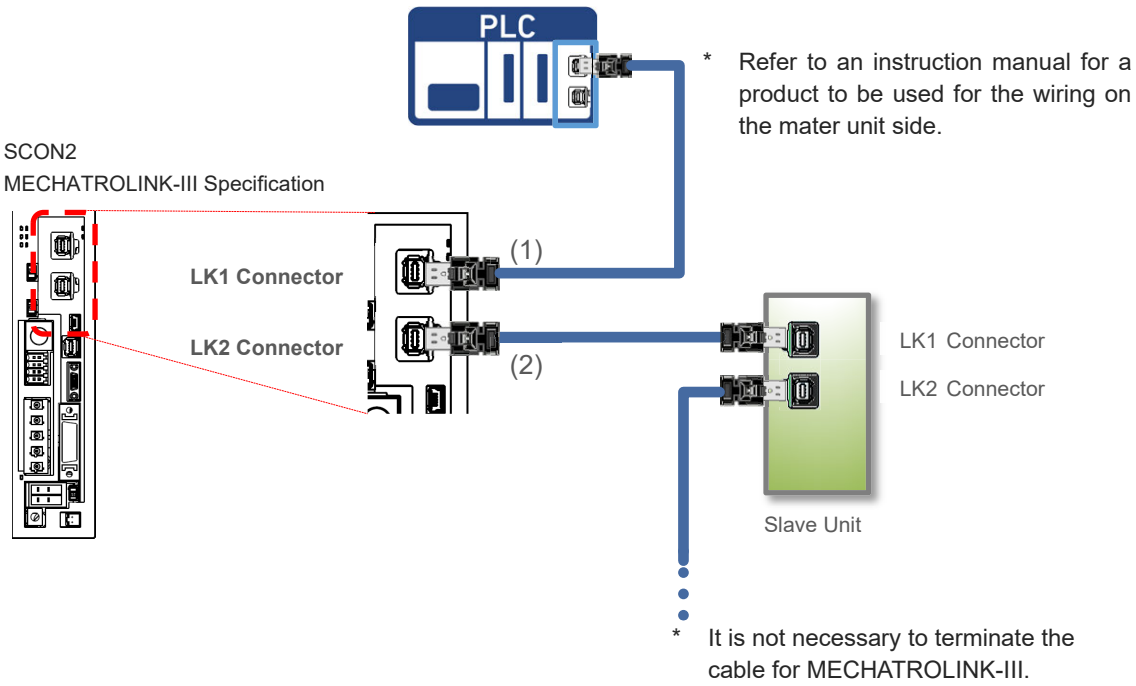
2.3.2 Wiring Method

Shown below is how to conduct wiring.

(1) Connect the MECHATROLINK-III cable to the master unit and join the connector on the other side to the LK1 connector on SCON2.

(2) Join the connector on the MECHATROLINK-III to the LK2 connector on SCON2.

* Join the connector on the other side to the connector on a slave unit connected next.



Point !

- Use dedicated cables for the connection to MECHATROLINK-III.
  Reference Cable Model Code: JEPMC-W6012-□□-E
  (manufactured by YASKAWA CONTROLS Co., Ltd.)
- There should be nothing connected on the terminal connector on the slave side (no need of terminal resistor).
  For the master side, refer to the [instruction manual for the MECHATROLINK-III master unit].

2.4 Parameter Setting

2.4.1 Setup Parameter List

The parameters related to MECHATROLINK-III are as follows.

No	Name	Default factory setting
85	Fieldbus node address	3
86	Fieldbus baud rate	1
87	Network type	9
62	Pulse count direction	In accordance with actuator
65	Electronic gear numerator	1
66	Electronic gear denominator	1

Caution

- When setting up the parameters, put the mode toggle switch on the controller front panel to the MANU side and use a teaching tool.
- After setting up the parameters, reboot the power to the controller and put the mode toggle switch on the controller front panel back to the AUTO side.
  Keeping it to the MANU side and PLC would not be operated.

2.4.2 Details of Setup Parameters

[1] Fieldbus node address (Parameter No.85)

Set the node address number.

The range for setting is from 3 (3_H) to 239 (EF_H). It is set at 3 on delivery.

Caution

- Pay attention not to have the node address duplicated to another device.
  When the node address is duplicated, there should be a communication error occurred on the master unit side.
  Refer to [instruction manuals of PLC and master unit] for details.

[2] Fieldbus baud rate (Parameter No.86)

The data length can be changed. Set it up aligned with the used data length.

32 and 48 bytes should be supported for the transmission byte count. As the sub commands are not available for use in “32-byte Mode”, it is necessary to set it to “48-byte Mode” when the sub commands are to be used.

Setting	Mode
0	32 bytes
1 (Default factory setting)	48 bytes

* Inputting any value other than them should generate a parameter error.

[3] Network type (Parameter No.87)

The type of the network module mounted on a controller should be indicated. Do not attempt to change it from the initial setting.

[4] Checking pulse count direction (Parameter No.62)

The direction of pulse count should be set in the parameter.

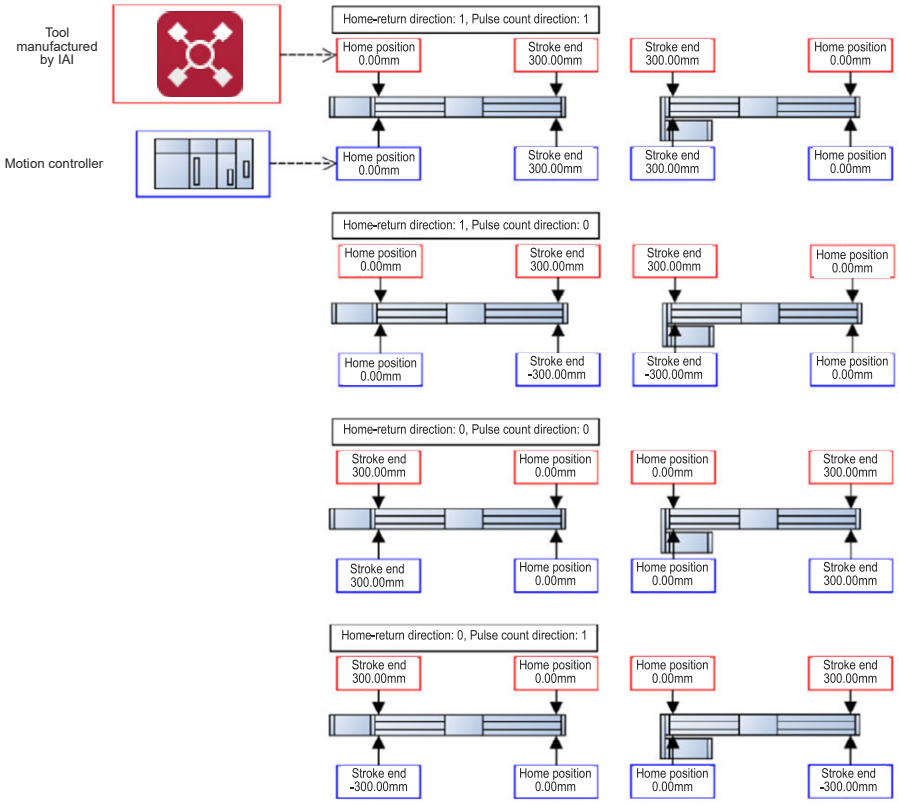
Check that the setting value in Parameter No. 62 “Pulse Count Direction” is the same as that in Parameter No. 5 “Home-return Direction” in the teaching tool, and make it the same in case the different setting is made.

Setting on Delivery: Dependent to Actuator (same value as home-return direction)

Caution

- The pulse count direction should be set to the same value as the home-return direction (Parameter No. 5). The setting on delivery is the same as the home-return direction. When the home-return direction is changed, this parameter also needs to be changed aligned with the home-return direction. Setting it to a different value from the home-return direction, and the symbols in the command coordinate system and the mechanical coordinate system from the MECHATROLINK-III master should revert.

Note The relation between the home-return direction and the pulse count direction should be as shown below.



[5] Electronic gear ratio setting [Parameter No.65, 66]

The electronic gear ratio is set with Parameter No.65 “Electronic Gear Numerator” and No.66 “Electronic Gear Denominator”.

The value set in these parameters controls the actuator by doing multiplication to the command from the master.

Therefore, it is necessary to establish the setting that matches to the unit of master commands. In case the unit of commands is unclear, change the value little by little from the initial (1/1).

Also, it is recommended, if there is a function to convert the unit or set up the gear ratio on the master, to have the parameters set to 1/1 and make an adjustment on the master side.

Setting at Delivery : Electronic Gear Numerator = 1, Electronic Gear Denominator = 1

* Make sure the conditions stated below can be satisfied, and establish the setting.

$$\frac{\text{Stroke [mm]}}{\text{Ball screw lead length [mm]}} \times \text{Encoder pulse number [pulse]} \times \frac{\text{Electronic gear denominator}}{\text{Electronic gear numerator}} \leq 2^{31}$$

SCON2 - Motion

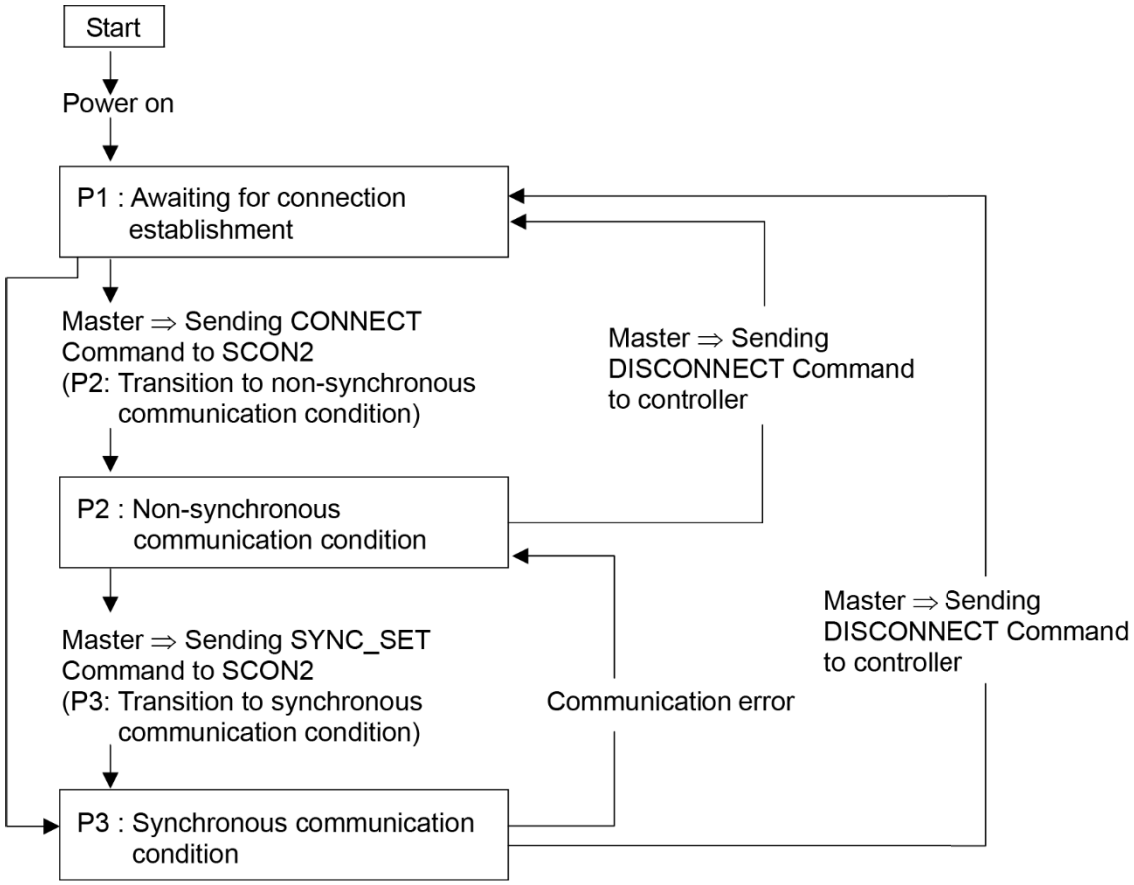
Chapter 3

Communication with Master and Assignment

3.1 MECHATROLINK-III Basic Communication Flow

3.1.1 State Transition

Shown below is the state transition diagram.



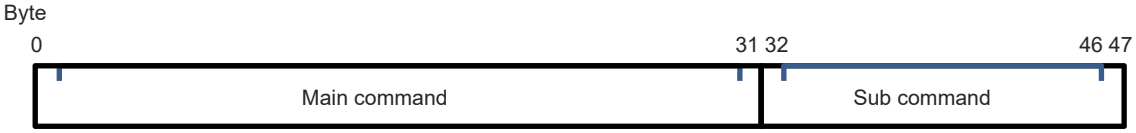
* P1 to P3: Communication Phase (P1: Phase 1, P2: Phase 2, P3: Phase 3)

Communication Phase	Contents
1	Standby for establishment of connection.
2	Asynchronous communication is available. Only the asynchronous commands are available for use.
3	Synchronous communication is available. Both the synchronous commands and the asynchronous commands are available for use.

* For details, refer to [the instruction manual for the MECHATROLINK-III master unit].

3.1.2 Command Frame Construction and Number of Transmission Bytes

The command frame consists of the combination of the main command and the sub command.
Match the number of the transmission bytes to the setting on the host (master) side.
32 bytes mode is available only in the main command.
48 bytes mode is available not only in the main command, but also in the sub command. Also, it is available not to have the sub command used with 48 bytes mode.

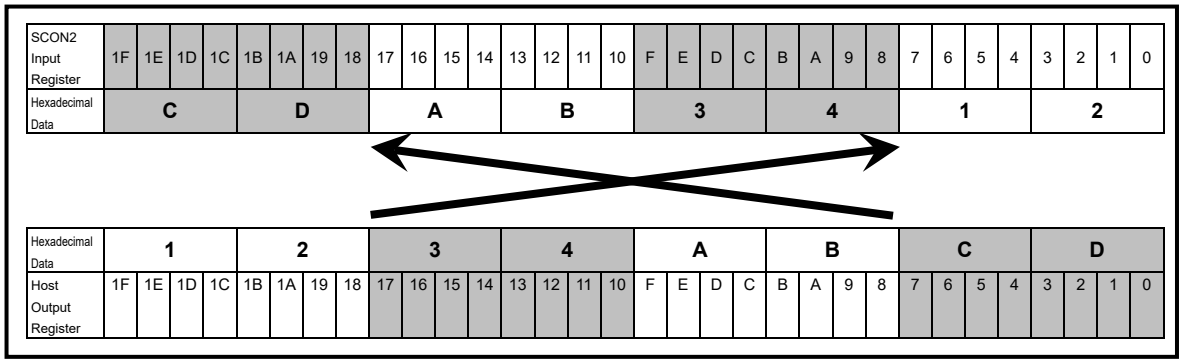


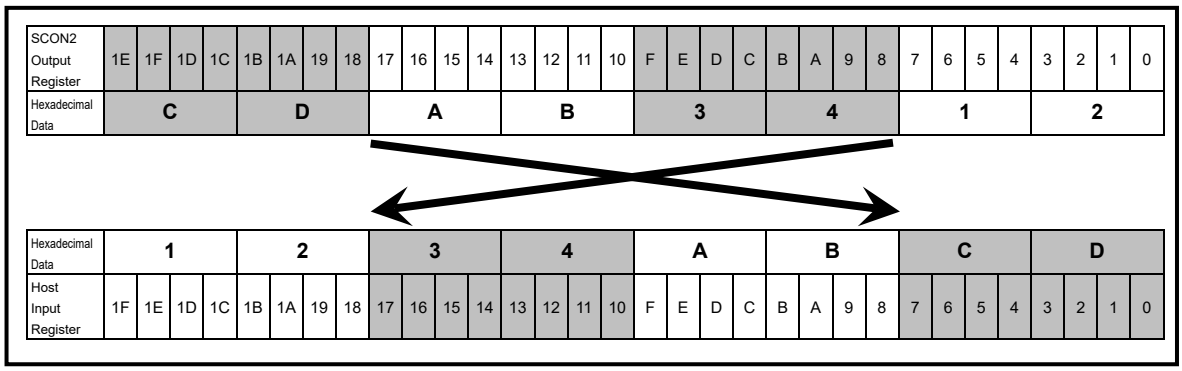
Byte	Command	Response
0 to 31	They are the domains used in the main commands.	
32 to 47	They are the domains used in the sub commands. Combination with the sub commands is available / unavailable depending on the commands.	

3.1.3 Data Row

The data row of the command frame should be the little endian.
If there is the setting of endian on the upper side, set to little endian on the upper side.

(Little Endian)





3.1.4 System of Units

Shown below is the system of units for the data used in the standard servo profile command.

Data	Available Unit
Velocity	Command unit/s : Set a value that does not exceed the maximum velocity of the actuator.
Position	Command unit : Set a value within 3-4the software stroke range (0 to effective stroke length) of the actuator.
Acceleration / deceleration	Command unit/s^2 : Set a value that does not exceed the maximum acceleration or maximum deceleration of the actuator.
Torque	Rated torque in % : The unit for torque is 1%.The input range should be set with 1% as the lower limit and the rating torque of the actuator as the upper limit. Setting to a small value Note1 may make the operation unstable.

Note 1 Take the minimum value of the pressing current limit of the applicable actuator as a reference.

3.2 Standard Command Format

The command format consists of the combination of main command (32 bytes) and the sub command (16 bytes). The sub command is to be used when adding another command to the main command.
When using the sub command, set to 48 bytes for the number of the transmission bytes on the upper side. When the transmission byte count is 32 bytes, the sub command domain should not be used.

Each of the main command domain and the sub command domain is to be divided into the command header part and the command data part.

●Command Header Part for Main Command Domain
Command : CMD, WDT, CMD_CTRL
Response : RCMD, RWDT, CMD_STAT

●Command Header Part for Sub Command Domain
Command : SUBCMD, SUB_CTRL
Response : RSUBCMD, SUB_STAT

[Main Command Domain and Sub Command Domain]

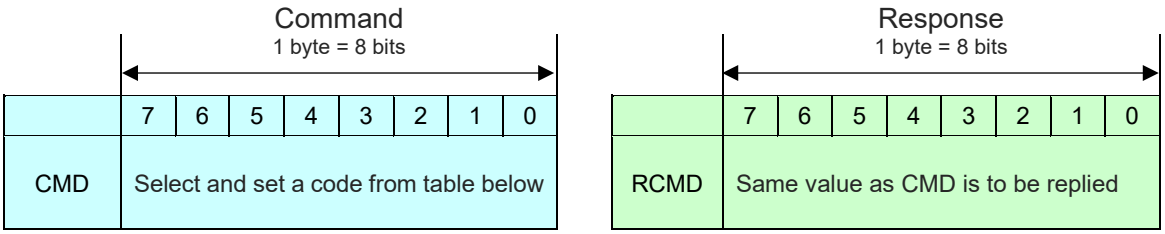
	Command	Byte	Response	Byte
Main Command	Command Code (CMD)	0	Command Code Response (RCMD)	0
	Watchdog Data (WDT)	1	Watchdog Status (RWDT)	1
	Command Control (CMD_CTRL)	2	Command Status (CMD_STAT)	2
		3		3
	Command Data (CMD_DATA)	4	Response Data (RSP_DATA)	4
		5		5
		6		6
		7		7
		8		8
		9		9
		10		10
		11		11
		12		12
		13		13
		14		14
		15		15
		16		16
		17		17
		18		18
		19		19
		20		20
		21		21
		22		22
		23		23
		24		24
		25		25
		26		26
		27		27
		28		28
		29		29
		30		30
		31		31
Sub Command	Sub Command Code (SUB_CMD)	32	Sub Command Code Response (SUB_RCMD)	32
	Sub Command Control (SUB_CTRL)	33	Sub Command Status (SUB_STAT)	33
		34		34
		35		35
	Sub Command Data (SUB_CMD_DATA)	36	Sub Response Data (SUB_RSP_DATA)	36
		37		37
		38		38
		39		39
		40		40
		41		41
		42		42
		43		43
		44		44
		45		45
		46		46
		47		47

3.3 Command / Response Frame of Main Commands

3.3.1 Command Code / Command Code Response (CMD/RCMD)

It shows the command codes that give a meaning to a message.
The 0th byte of the command format should be defined as CMD/RCMD Domain.
The response is a copy of the command code of a command. Select a command available to conduct from the table below by following the communication flow.

Command Format 0th Byte



Example : For SV_ON Code 31_H → Set value 0011 0001_b

Main Command List

○ : Available to conduct, △Ignored, × : Unavailable to conduct

	Code	Command	Functions	Communication Phase *1			Reference
				P1	P2	P3	
Common Commands	00_H	NOP	Disabled	○	○	○	4.1.1
	01_H	PRM_RD	Parameter Readout	×	×	×	
	02_H	PRM_WR	Parameter Write-in	×	×	×	
	03_H	ID_RD	ID Reading	×	○	○	4.1.2
	04_H	CONFIG	Device Setup Request	×	○	○	4.1.3
	05_H	ALM_RD	Warning Reading	×	○	○	4.1.4
	06_H	ALM_CLR	Warning Cleared	×	○	○	4.1.5
	$0D_H$	SYNC_SET	Synchronization Establishment Request	×	○	△	4.1.6
	$0E_H$	CONNECT	Connection Establishment Request	○	△	△	4.1.7
	$0F_H$	DISCONNECT	Connection Release Request	○	○	○	4.1.8
	$1B_H$	PPRM_RD	Non-Volatile Parameter Readout	×	×	×	
	$1C_H$	PPRM_WR	Non-Volatile Parameter Write-in	×	×	×	
	$1D_H$	MEM_RD	Memory Readout	×	○	○	
	$1E_H$	MEM_WR	Memory Write-in	×	○	○	
Standard Servo Profile Commands	20_H	POS_SET	Coordinate System Setting	×	○	○	
	21_H	BRK_ON	Brake Activation Request	×	○	○	
	22_H	BRK_OFF33-8	Brake Activation Release	×	○	○	
	23_H	SENS_ON	Sensor ON Request	×	○	○	4.2.2
	24_H	SENS_OFF	Sensor OFF Request	×	○	○	4.2.3
	30_H	SMON	Servo Status Monitor	×	○	○	4.2.1
	31_H	SV_ON	Servo ON Request	×	○	○	4.2.4
	32_H	SV_OFF	Servo OFF Request	×	○	○	4.2.5
	34_H	INTERPOLATE	Interpolation Feeding	×	×	○	4.2.6
	35_H	POSING	Positioning	×	○	○	4.2.7
	36_H	FEED	Constant Speed Feeding	×	○	○	4.2.8
	37_H	EX_FEED	External Input Positioning Constant Velocity Feeding	×	○	○	
	39_H	EX_POSING	External Input Positioning	×	○	○	
	$3A_H$	ZRET	Home-Return Operation	×	○	○	
	$3C_H$	VELCTRL	Velocity Control	×	○	○	
	$3D_H$	TRQCTRL	Torque (Thrust) Control	×	○	○	
	40_H	SVPRM_RD	Parameter Reading	×	○	○	4.2.9
	41_H	SVPRM_WR	Parameter Writing	×	○	○	4.2.10

*1 Communication Phase:
This shows the current status of communication. There are three types of status, P1 to P3. Refer to [3.1.1 State Transition]

Note 1 The unit is not applicable for the commands shaded in gray.
It will generate an alarm [CMD_ALM = 8] when a command other than those listed in the table above is received.

Note 2 There should be an alarm [CMD_ALM=C] generated when data is received in a communication phase not to be used (marked with x).

3.3.2 Watchdog Data (WDT/RWDT)

Set the timer to monitor the communication is conducted periodically.
Define Byte 1 in the main command as WDT/RWDT Fields.
Monitoring starts after the communication phase P3 is established.

Command Format 1st Byte

Command

1 byte = 8 bits

	7	6	5	4	3	2	1	0
WDT	Copy the values in Bit 7 to 4 in RWDT				Add 1 for every communication frequency			

Response

1 byte = 8 bits

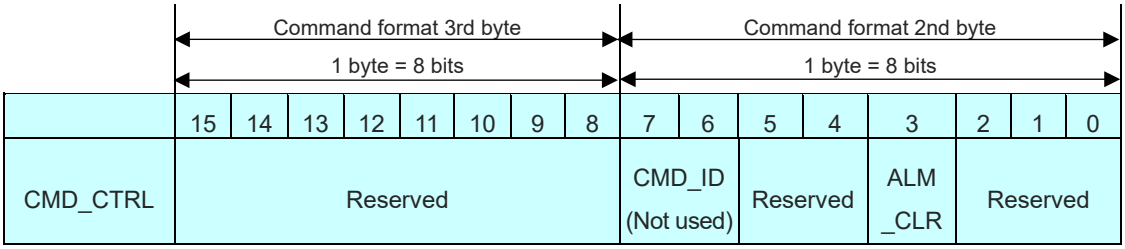
	7	6	5	4	3	2	1	0
RWDT	1 is added for every communication frequency				Values in Bit 3 to 0 in WDT are to be replied			

3.3.3 Command Control / Command Status (CMD_CTRL/CMD_STAT)

Clearing of alarm / warning is commanded, and the current status of the controller is monitored.
Define Byte 2 and 3 in command domain in the main command as CMD_CTRL Field.
Data in CMD_CTRL Field should be effective even when CMD_ALM is generated.

[1] Command Control (CMD_CTRL)

Command Format 2nd and 3rd Bytes

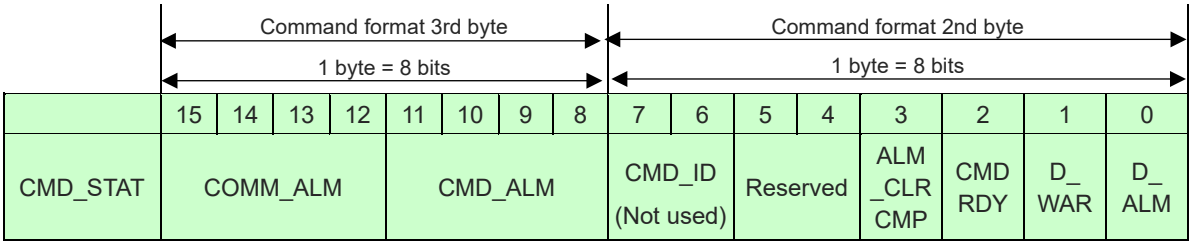


- ALM_CLR: Alarm and Warning Clear
  Generates an alarm when startup edge is detected, or clearing of warning is commanded.
  If the operation mode on the controller is set to AUTO, command to clear the alarm / warning occurred to the controller including the communication. For MANU, the command is subject to clear the alarm / warning related only to the communication.

- CMD_ID: command ID
  Not to be used

[2] Command Control (CMD_STAT)

Command Format 2nd and 3rd Bytes



Bits	Abbreviations	Names	Contents
0	D_ALM	Device Alarm	It shows the controller is in alarm condition. The servo is off when this bit is “1”.
1	D_WAR	Device Warning	It shows the controller is in warning condition. The servo control is available even when this bit is 1.
2	CMDRDY	Command Ready	When “0”, it shows the command process is being executed. All the command inputs are ignored except for DISCONNECT Command. The master can issue a new command only after confirmed this bit is “1”.
3	ALM_CLR_CMP	Alarm / Warning Clearing Completed	This shows the execution of ALM_CLR in CMD_CTRL is completed. It shows the process is completed when this bit is 1. However, it does not show if the alarm is actually cleard. Check in D_ALM (Bit 0), D_WAR (Bit 1) or COMM_ALM (Bit 12 to 15) to see if the alarm is actually cleared.
4, 5	-	Reserved	
6, 7	CMD_ID	Not Used	
8 to 11	CMD_ALM	Command Alarm	It shows an abnormality in a command. It is cleared automatically once a normal command is received.

Code (bit 8 to 11)	Condition	Contents	Remarks
0_H	In normal condition	In normal condition	
1_H	Warning	Out of data range	Notifies a warning, and have an operation with the command value replaced to the maximum value that is available for operation.
8_H	Alarm	Unsupported command received	It notifies an alarm. No command is to be executed.
9_H		Out of data range	
A_H		Command execution condition error	
B_H		Sub command combination error	
C_H		Phase error	

<table>
<tr><th>Bits</th><th>Abbreviations</th><th>Names</th><th colspan="4">Contents</th></tr>
<tr><td rowspan="11">12 to 15</td><td rowspan="11">COMM_ALM</td><td rowspan="11">Communication Alarm</td><td colspan="4">It shows an abnormality in communication.
It can be cleared with ALM_CLR Bit or ALM_CLR Command in CMD_CTRL.</td></tr>
<tr><td>Code (bit 8 to 11)</td><td>Condition</td><td>Contents</td><td>Remarks</td></tr>
<tr><td>0H</td><td>In normal condition</td><td>In normal condition</td><td></td></tr>
<tr><td>1H</td><td rowspan="3">Warning</td><td>FCS error</td><td rowspan="3">It occurs when a communication error in spot is detected. Communication phase and servo status are continued.</td></tr>
<tr><td>2H</td><td>Command data not received</td></tr>
<tr><td>3H</td><td>Synchronizing frame not received</td></tr>
<tr><td>8H</td><td rowspan="5">Alarm</td><td>FCS error</td><td rowspan="5">It occurs when communication error is detected for the indicated times in a row. It will be transited to Communication Phase P2 if it is Communication Phase P3.
An alarm is generated when the warning of 1 to 3 above is detected for two times in a row for Alarm Code 8 to A.
An alarm is generated with one time of detection for Alarm Code B and C.
When the controller is in AUTO Mode, the brake is activated with the servo being turned off.</td></tr>
<tr><td>9H</td><td>Command data not received</td></tr>
<tr><td>AH</td><td>Synchronizing frame not received</td></tr>
<tr><td>BH</td><td>Synchronizing frequency error</td></tr>
<tr><td>CH</td><td>WDT error</td></tr>
</table>

3.3.4 Command Data / Response Data (CMD_DATA/RSP_DATA)

Establish the necessary command settings considering the operation.
(Refer to [5.1 Restrictions in Operation])

(1) Command Data (CMD_DATA)
Command format 4th to 31st bytes

(2) Response Data (RSP_DATA)
Command format 4th to 31st bytes

3.4 Command / Response Frame of Sub Commands

3.4.1 Sub Command Code / Sub Command Code Response (SUB_CMD/SUB_RCMD)

It shows the sub code command that give a meaning to a message in the sub command. The 32nd byte of the command format is to be defined as SUBCMD/SUBRCMD Fields. The response is a copy of the command code of a command.

Select a sub command available to conduct from the table below by following the communication flow. At that time, check on the combination table of the main commands and sub commands that the selected sub command is available for combination with the main command.

Command format 32nd Byte

Command

	1 byte = 8 bits							
	7	6	5	4	3	2	1	0
SUB_ CMD	Select and set a code from table below							

Response

	1 byte = 8 bits							
	7	6	5	4	3	2	1	0
SUB_ RCMD	Same value as SUB_CMD is to be replied							

[1] Command Data (SMD_DATA)

○ : Available to conduct, × : Unavailable to conduct

	Code	Command	Functions	Communication Phase		
				P1	P2	P3
Sub Commands for Standard Servo Profile	00_H	NOP	Disabled		○	○
	01_H	PRM_RD	Parameter Readout		×	×
	02_H	PRM_WR	Parameter Write-in		×	×
	05_H	ALM_RD	Alarm / Warning Reading		○	○
	06_H	ALM_CLR	Warning Cleared		○	○
	$1B_H$	PPRM_RD	Non-Volatile Parameter Readout		×	×
	$1C_H$	PPRM_WR	Non-Volatile Parameter Write-in		×	×
	$1D_H$	MEM_RD	Memory Readout		○	○
	$1E_H$	MEM_WR	Memory Write-in		○	○
	30_H	SMON	Servo Status Monitor		○	○
	40_H	SVPRM_RD	Servo Parameter Reading		○	○
	41_H	SVPRM_WR	Servo Parameter Writing		○	○

Note 1 It is not applicable for the sub commands shaded in gray.
An alarm [SUBCMD_ALM = 8] is generated when combination is not available with the sub command or main command listed in the table above.

Note 2 When receiving is conducted on the communication phase (P1), the sub command cannot be accepted. There will be no alarm generated in that case.

[2] Combination of Main Command and Sub Command

Shown in the table below is combinations of the main commands and sub commands.
There should be an alarm [SUB_STAT.SUBCMD_ALM=B] generated when combination is not available.
(CMD_STAT.CMD_ALM in the main command part will not become B.)

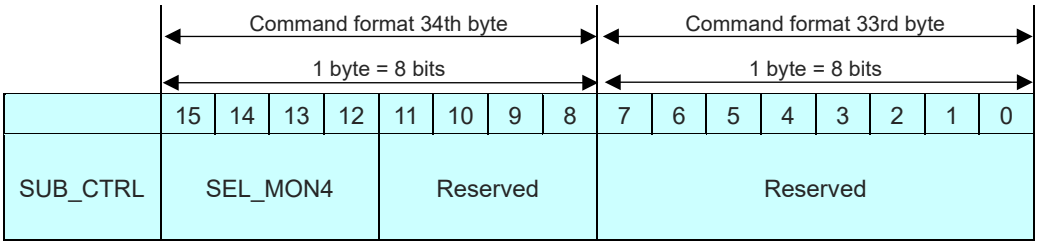
○ : Combination available, × : Combination Unavailable

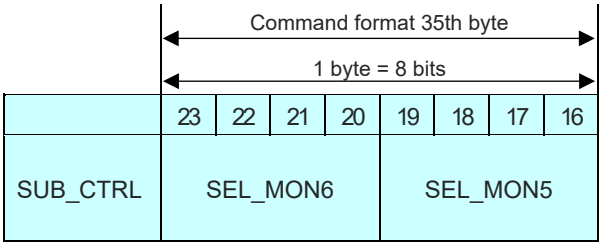
Main Command	Sub Command			
	NOP (00_H)	ALM_RD (05_H)	SMON (30_H)	SVPRM_RD (40_H)
NOP (00_H)	○	○	○	○
ID_RD (03_H)	○	○	○	○
CONFIG (04_H)	○	○	○	×
ALM_RD (05_H)	○	○	○	×
ALM_CLR (06_H)	○	○	○	×
SYNC_SET ($0D_H$)	○	○	○	×
CONNECT ($0E_H$)	○	×	×	×
DISCONNECT ($0F_H$)	○			
SENS_ON (23_H)	○	○	○	×
SENS_OFF (24_H)	○	○	○	×
SMON (30_H)	○	○	○	○
SV_ON (31_H)	○	○	○	○
SV_OFF (32_H)	○	○	○	○
INTERPOLATE (34_H)	○	○	○	○
POSING (35_H)	○	○	○	○
FEED (36_H)	○	○	○	○
SVPRM_RD (40_H)	○	○	○	×
SVPRM_WR (41_H)	○	○	○	×

3.4.2 Sub Command Control / Sub Command Status (SUB_CTRL/SUB_STAT)

The 33rd to 35th bytes in the command format should be defined as SUB_CTRL Domain.
Follow the communication flow to select the sub commands available for execution from the table below. Check that combination with the main command is available at that time from the table of combination of main commands and sub commands.

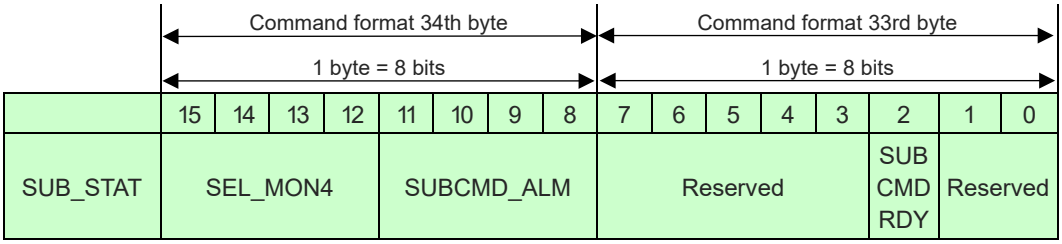
[1] Command Control

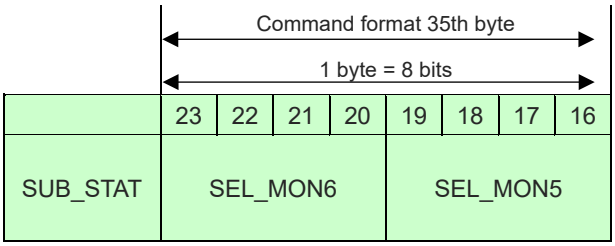




Code	Monitor Name	Contents	Remarks
0_H	APOS	Feedback position	
1_H	CPOS	Command position	
2_H	PERR	Position deviation	
3, 4_H	-	Reserved	
5_H	FSPD	Feedback velocity	
6_H	CSPD	Command velocity	
7_H	TRQ	Command torque (Thrust)	
8_H	ALARM	Detailed information for alarm currently generated	It shows the warning on controller or alarm code
9_H	MPOS	Command position	It should be the same value as CPOS (Code 1)
A, B_H	-	Reserved	
C_H	CMN1	Common monitor 1	It is to be indicated in Common Parameter No. 89h (Refer to [6.1.2])
D_H	CMN2	Common monitor 2	It is to be indicated in Common Parameter No. 8Ah (Refer to [6.1.2])
E, F_H	-	Reserved	

[2] Sub Command Status





Bits	Abbreviations	Names	Contents
0, 1	-	Reserved	
2	SUBCMDRDY	Sub Command Ready	It shows this bit is 1 and the sub command can be accepted. In 48 bytes mode, this is always one no matter if the sub command is enabled or disabled after the connection is established with CONNECT Command.
3 to 7	-	Reserved	
8 to 11	SUBCMD_ALM	Sub Command Alarm	It shows an abnormality in a command. It is cleared automatically once a normal command is received. Refer to [3.3.3 [2] Command Control (CMD_STAT)] for detail of the alarm code
12 to 15	SEL_MON4	Monitor Select 4	The value set in SEL_MON4 in SUB_CTRL is to be replied.
16 to 19	SEL_MON5	Monitor Select 5	The value set in SEL_MON5 in SUB_CTRL is to be replied.
20 to 23	SEL_MON6	Monitor Select 6	The value set in SEL_MON6 in SUB_CTRL is to be replied.

SCON2 - Motion

Chapter 4

Command

4.1 Specifications of Common Commands

4.1.1 Disabled (NOP Code: 00_H)

It is an disabled command.
Current condition is replied as a response.
The response from the power turned on till the completion of the initializing process is NOP, it generates CMDRDY in CMD_STAT bit is 0.
No command but DISCONNECT can be received.

[NOP]

Bytes of Command Format	Command	Response	Remarks
0	00_H	00_H	
1	WDT	RWDT	Refer to [3.3.2].
2	CMD_CTRL	CMD_STAT	Refer to [3.3.3].
3			
4-31	Reserved	Reserved	

4.1.2 ID Reading (ID_RD Code: 03_H)

Readout is held on each ID of the controller.
Set the ID code to be read out in ID_CODE.

An alarm will be generated and will not accept any command in the following cases:

(1) Indicated value in ID_CODE is out of the range in ID Code Table.
(It generates CMD_ALM = 9)

(2) The range shown in OFFSET and SIZE exceeds the range of ID data for readout.
(It generates CMD_ALM = 9)

(3) SIZE exceeds 24 bytes.
(It generates CMD_ALM = 9)

(4) The range of OFFSET exceeds the range of ID data for readout.
(It generates CMD_ALM = 9)

[ID_RD]

Bytes of Command Format	Command	Response	Remarks
0	03_H	03_H	
1	WDT	RWDT	Refer to [3.3.2].
2	CMD_CTRL	CMD_STAT	Refer to [3.3.3].
3			
4	ID_CODE	ID_CODE	
5	OFFSET	OFFSET	If OFFSET is set, only the indicated size can be read out on the way of ID data
6	SIZE	SIZE	
7			
8-31	Reserved	ID	

[Details of ID code]

ID CODE	Description	Data Size [bytes]	Data Type	Data
01_H	Vendor ID Code	4	Binary	$000000CA_H$
02_H	Device Code (Model Code)	4	Binary	SCON2-CG = $0000AA1Ah_H$
03_H	Device Version (Version Code on Application)	4	Binary	SCON2-CG = $0000****_H$ * **** section: Application part version
04_H	Device Information File Version	4	Binary	00001000_H
05_H	Extension Address Setting (Number of Used Extension Addresses)	4	Binary	00000001_H (1 axis)
06_H	Serial Number	32	ASCII Code (Delimiter = 00_H)	Serial number on controller
10_H	Profile Type 1 (Primary)	4	Binary	00000010_H (Standard servo)
11_H	Profile Version 1 (Primary)	4	Binary	00000100_H (V1.00)
12_H	Profile Type 2	4	Binary	$000000FF_H$ (Not applicable)
13_H	Profile Version 2	4	Binary	00000000_H
14_H	Profile Type 3	4	Binary	$000000FF_H$ (Not applicable)
15_H	Profile Version 3	4	Binary	00000000_H
16_H	Min. Transmission Frequency (0.01µs)	4	Binary	$000030D4_H$（0.125ms）
17_H	Max. Transmission Frequency (0.01µs)	4	Binary	$00061A80_H$（4ms）
18_H	Transmission Frequency Intervals (GRANULARITY)	4	Binary	00000002_H（0.5ms）
19_H	Min. Communication Frequency (0.01µs)	4	Binary	$000030D4_H$（0.125ms）
$1A_H$	Max. Communication Frequency (0.01µs)	4	Binary	$0030D400_H$（32ms）
$1B_H$	Number of Transmission Bytes (Applicable Bit Patterns)	4	Binary	$0000000C_H$ (32 or 48 bytes)
$1C_H$	Number of Transmission Bytes (Current Settings)	4	Binary	Number of bytes set in parameter
$1D_H$	Profile Type (Current Selections)	4	Binary	
20_H	Communication Mode Correspondence	4	Binary	00000003_H (Cyclic communication Event-driven communication)
21_H	Reserved	–		
30_H	Main Command Correspondence List	32	Array[32]	[0]=79_H [1]=$E0_H$ [2]=00_H [3]=00_H [4]=18_H [5]=00_H [6]=77_H [7]=00_H [8]=03_H [9] to [31]=00_H
38_H	Sub Command Correspondence List	32	Array[32]	[0]=21_H [1]=00_H [2]=00_H [3]=00_H [4]=00_H [5]=00_H [6]=01_H [7]=00_H [8]=01_H [9] to [31]=00_H

ID CODE	Description	Data Size [bytes]	Data Type	Data
40_H	Common Parameter Correspondence List	32	Array[32]	[0]=FE_H [1]=$1F_H$ [2]=00_H [3]=00_H [4]=66_H [5]=01_H [6]=00_H [7]=00_H [8]=FE_H [9]=03_H [10]=00_H [11]=00_H [12]=$C0_H$ [13]=00_H [14]=00_H [15]=00_H [16]=80_H [17]=$7F_H$ [18]=$0F_H$ [19] to [31]=00_H
80_H	Main Device Name (Controller Product Name)	32	ASCII Code (Delimiter = 00_H)	“SCON2-CG-M”
81_H to	Reserved	–		

4.1.3 Device Setup Request (CONFIG Code: 04_H)

It is the recalculation of common parameters and setup request command.
CONFIG_MOD in SCON2 is applicable only for “0”.
At this time, CMDRDY=1 should be responded.

Secure at least 3 seconds or more when setting the timeout on the master side while executing writing. It ordinary finishes in 0.6 to 0.8 seconds. Also, CMDRDY=0 during writing. The condition gets to CMDRDY = 1 when writing is completed, however it gets to CMD_ALM = 1 at the same time when an error has occurred.
To apply the parameters after writing has been executed, it is necessary to have the power turned on to controller.

An alarm will be generated and will not accept any command in the following cases:
(1) A value other than 0 is set in CONFIG_MOD (It generates CMD_ALM = 9)

[CONFIG]

Bytes of Command Format	Command	Response	Remarks
0	04_H	04_H	
1	WDT	RWDT	Refer to [3.3.2].
2	CMD_CTRL	CMD_STAT	Refer to [3.3.3].
3			
4	CONFIG_MOD	CONFIG_MOD	Depends on controller
5-31	Reserved	Reserved	

4.1.4 Alarm / Warning Readout (ALM_RD Code: 05_H)

It is the readout command for the alarms and warnings on the controller.
ALM_RD_MOD of SCON2 should be applicable only for “0”.
If ALM_RD_MOD is set to 0, the readout of the alarm code currently generated is conducted. The read out alarm code is stored in Bytes 8 and 9 in the response. When the read out alarm data is 0, it shows that there is no alarm generated.

An alarm will be generated and will not accept any command in the following cases:

(1) ALM_RD_MOD is 3 and ALM_INDEX is set out of range
(It generates CMD_ALM = 9)

(2) A value other than 0 or 3 is set in ALM_RD_MOD
(It generates CMD_ALM = 9)

[ALM_RD]

Bytes of Command Format	Command	Response	Remarks
0	05_H	05_H	
1	WDT	RWDT	Refer to [3.3.2].
2	CMD_CTRL	CMD_STAT	Refer to [3.3.3].
3			
4	ALM_RD_MOD	ALM_RD_MOD	Refer to table next page
5			
6	ALM_INDEX	ALM_INDEX	0 to 15 (0=Latest)
7			
8-31	Reserved	ALM_DATA	

[ALM_DATA Details (When ALM_RD_MOD = 3)]

Bytes	Contents	Remarks
8	Alarm code	For detail of the alarm code, refer to [SCON2 Instruction Manual (ME0458)] provided separately.
9		
10, 11	Reserved	
12	Alarm Occurred Address	The address should be the register address in the controller. (Address disabled when $FFFF_H$)
13		
14	Alarm Detail Code	The contents of the detail code may differ for each alarm code.
15		
16	Alarm Generated Time	When clock setting is conducted with the calendar feature enabled in Controller Parameter No. 111 “Select Calendar Feature Specification”, the date and time when an alarm is generated should get output. When the calendar feature is not used in Controller Parameter No. 111 “Select Calendar Feature Specification”, or the clock setting is not conducted even though the calendar feature is used, the time when the controller power is turned on should be 00/01/01 00:00:00.
17		
18		
19		

4.1.5 Alarm / Warning Clear (ALM_CLR Code: 06_H)

It executes the alarm / warning clearing command.
An alarm currently being generated is available to clear. (Applicable only for ALM_CLR_MOD = 0).
When the operation mode of the controller is set to AUTO, a command is executed to clear alarm / warning being generated on the controller including the communication. When MANU, a command is executed to clear alarm / warning related the communication.

ALM_CLR_MOD is applicable only to 0. It generates an alarm for others and command will not be accepted. (It generates CMD_ALM = 9)

[ALM_CLR]

Bytes of Command Format	Command	Response	Remarks
0	06_H	06_H	
1	WDT	RWDT	Refer to [3.3.2].
2	CMD_CTRL	CMD_STAT	Refer to [3.3.3].
3			
4	ALM_CLR_MOD	ALM_CLR_MOD	Applicable only for 0
5			
6-31	Reserved	Reserved	

4.1.6 Synchronization Establishment Request (SYNC_SET Code: $0D_H$)

It is a command to start the synchronizing communication and request a transition to the communication phase P3.
This command will be ignored if it is executed in a condition that it is already in the communication phase P3. (There is no alarm or warning to be generated.)

[SYNC_SET]

Bytes of Command Format	Command	Response	Remarks
0	$0D_H$	$0D_H$	
1	WDT	RWDT	Refer to [3.3.2].
2	CMD_CTRL	CMD_STAT	Refer to [3.3.3].
3			
4-31	Reserved	Reserved	

4.1.7 Connection Establishment Request (CONNECT Code: $0E_H$)

It is a command to request the establishment of the communication (connection).
This command will be ignored if it is executed in a condition of being in the communication phase P2 or P3.
* There is no alarm or warning to be generated.

An alarm will be generated and will not accept any command in the following cases:
(1) A value other than 30_H is set to VER (It generates CMD_ALM = 9)
(2) A value other than 0 is set to DTMODE in COM_MODE (It generates CMD_ALM = 9)
(3) When in setting of 32 bytes mode, 1 is set to SUBCMD in COM _MODE
(It generates CMD_ALM = 9)
(4) Communication Frequency (Transmission frequency × COM_TIME) is set to a number other than 0.125, 0.25 and 0.5 to 4ms
(It generates CMD_ALM = 9)
(5) A value other than 10_H is set in PROFILE_TYPE (It generates CMD_ALM = 9)

[CONNECT]

Bytes of Command Format	Command	Response	Remarks
0	$0E_H$	$0E_H$	
1	WDT	RWDT	Refer to [3.3.2].
2	CMD_CTRL	CMD_STAT	Refer to [3.3.3].
3			
4	VER	VER	Fixed at 30_H
5	COM_MODE	COM_MODE	Refer to table next page
6	COM_TIME	COM_TIME	Establish setting to determine how many times of transmission frequency is to be the communication frequency
7	PROFILE_TYPE	PROFILE_TYPE	Fixed at 10_H
8-31	Reserved	Reserved	

Details of COM_MODE Field

Bits	Abbreviations	Names	Contents
0	-	Reserved	
1	SYNCMODE	Synchronizing Setting	0: Non-synchronizing communication (Transited to communication phase P2) 1: Synchronizing communication (Transited to communication phase P3)
2	DTMODE	Communication System	0: Single transmission communication 1: Continuous transmission communication (Not supported)
3			
4 to 6	-	Reserved	
7	SUBCMD	Sub Command Setting	0: Sub command disabled 1: Sub command enabled

4.1.8 Connection Release Request (DISCONNECT Code: $0F_H$)

It is a command to request the transition to the communication phase P1 by releasing the communication (connection).
This command is available in any condition.
When the operation mode of the controller is in AUTO, the brake is activated with the servo being turned off once this command is executed.

[DISCONNECT]

Bytes of Command Format	Command	Response	Remarks
0	$0F_H$	$0F_H$	
1-31	Reserved	Reserved	

4.2 Specifications of Standard Servo Profile Commands

4.2.1 Servo Status Monitor (SMON Code: 30_H)

It is a command to read out the home-return command and monitor information.

[SMON]

Bytes of Command Format	Command	Response	Remarks
0	30_H	30_H	
1	WDT	RWDT	Refer to [3.3.2].
2	CMD_CTRL	CMD_STAT	Refer to [3.3.3].
3			
4	SVCMD_CTRL Refer to [4.2.1 [1] Details of SVCMD_CTRL Field]	SVCMD_STAT Refer to [4.2.1 [2] Details of SVCMD_STAT Field]	
5			
6			
7			
8	SVCMD_IO Refer to [4.2.1 [3] Details of SVCMD_IO Command Field]	SVCMD_IO Refer to [4.2.1 [4] Details of SVCMD_IO Response Field]	
9			
10			
11			
12	Reserved	CPRM_SEL_MON1	Selected in Common Parameter No. 87h Refer to [6.1.2].
13			
14			
15			
16		CPRM_SEL_MON2	Selected in Common Parameter No. 88h Refer to [6.1.2].
17			
18			
19			
20		MONITOR1	Refer to section [4.2.1 [1] Details of SVCMD_CTRL Field] and [4.2.1 [5] Monitor Information]
21			
22			
23			
24		MONITOR2	
25			
26			
27			
28		MONITOR3	
29			
30			
31			

[1] Details of SVCMD_CTRL Field

Bits	Abbreviations	Names	Contents
0	CMD_PAUSE	Movement Command Pause	0: None 1: Pause It is available only during POSING, FEED Command or home-return operation. The previous condition is continued in other cases. Because the target position is not changed, a pause during an operation does not complete the discharge (DEN = 1). Refer to [section 4.2.1 [4] Details of SVCMD_IO Response Field]. When issued at the same time as CMD_CANCEL, CMD_CANCEL will be prioritized. It will be ignored when the operation mode of the controller is in MANU.
1	CMD_CANCEL	Movement Command Cancel	0: None 1: Movement is cancelled It is available only during POSING, FEED Command or home-return operation. The previous condition is continued in other cases. Because the target position is changed, Completion of the movement cancel completes the discharge (DEN = 1). Refer to [section 4.2.1 [4] Details of SVCMD_IO Response Field]. It will be ignored when the operation mode of the controller is in MANU.
2, 3	STOP_MODE	Stop Mode Selection	0: Deceleration and stop (recommended) 1: Sudden stop This indicates the stop mode for CMD_PAUSE and CMD_CANCEL above. Do not attempt to set a number above 2. It will be ignored when the operation mode of the controller is in MANU. ⚠ Caution The target position should be replaced with the current command value to make a stop for the sudden stop. However, in CMD_CANCEL during the home-return operation, stop will be made at the spot regardless of the stop mode.
4 to 15	-	Reserved	
16 to 19	SEL_MON1	Monitor Select 1	Monitor code to be set in MONITOR1 Refer to [section 4.2.1 [5] Monitor Information]
20 to 23	SEL_MON2	Monitor Select 2	Monitor code to be set in MONITOR1 Refer to [section 4.2.1 [5] Monitor Information]
24 to 27	SEL_MOM3	Monitor Select 3	Monitor code to be set in MONITOR1 Refer to [section 4.2.1 [5] Monitor Information]
28 to 31	-	Reserved	

[2] Details of SVCMD_STAT Field

Bits	Abbreviations	Names	Contents
0	CMD_PAUSE_CMP	Movement Command Pause Complete	0: None 1: Pause Completed It shows the completion of pause commanded by CMD_PAUSE (Refer to [4.2.1 [1] Details of SVCMD_CTRL Field].) It turns to 1 when CMD_PAUSE = 1 and zero speed (ZSPD = 1) during POSING, FEED Command or the home-return operation. (Refer to [4.2.1 [4], “Details of SVCMD_IO Response Field]
1	CMD_CANCEL_CMP	Movement Command Cancel Complete	0: None 1: Movement cancel completed It shows the completion of movement cancel commanded by CMD_CANCEL. (Refer to [4.2.1 [1] Details of SVCMD_CTRL Field]) It turns to 1 if CMD_CANCEL = 1 and also the disposal complete (DEN = 1) when in POSING and FEED Commands. (Refer to [4.1.2 [4] SVCMD_IO Response Field Detail]) It remains 0 when CMD_CANCEL = 1 during home-return operation.
2 to 9	-	Reserved	
10	POS_RDY	Position Information Enabled	[For Absolute Encoder Type] 0: Home-return incomplete 1: Home-return completed It turns to 1 when absolute reset is complete (home-return is complete). [For Incremental Encoder Type] 0: Condition of connection not being established 1: Condition of connection being established It turns to 1 when CONNECT Command process completes.
11	PON	Main Power ON	Always 1 is read out
12	M_RDY	Motor Conductivity Ready	0: Driving source OFF 1: Driving source ON
13	SV_ON	Servo ON	0: Servo OFF 1: Servo ON The torque limit value is the limit control value during movement of the controller parameter when the servo is off.
14, 15	-	Reserved	
16 to 19	SEL_MON1	Monitor Select 1	The value set in SEL_MON1 of SVCMD_CTRL is replied.
20 to 23	SEL_MON2	Monitor Select 2	The value set in SEL_MON2 of SVCMD_CTRL is replied.
24 to 27	SEL_MON3	Monitor Select 3	The value set in SEL_MON3 of SVCMD_CTRL is replied.
28	-	Reserved	
29	BALM (For SCON2 Serial Encoder Type Only)	Battery Alarm	0: Battery voltage in normal condition 1: ABS Battery voltage drop alarm
30	DALM	Driver Alarm	0: No alarm 1: Alarm being generated (warnings excluded)
31	-	Reserved	

* As bits from 28 to 31 (shaded portions) in this command field are defined as the vendor specific domain in the MECHATROLINK-III specifications, check how to operate in the master PLC manual when the applicable domain is to be operated.

[3] Details of SVCMD_IO Command Field (Master ⇒ Slave)

Bits	Abbreviations	Names	Contents
0 to 5	-	Reserved	
6	P_CL	Torque Limit in Normal Rotation	0: With no torque limit 1: With torque limit The command torque in the normal rotation is to be limited in Common Parameter 8C “Normal Rotation Torque Control Value” (refer to [Section 6.1.2]). Comparing with TLIM set with the command, the smaller becomes the upper limit of the command torque. While in the torque limit by this bit, the deviation error monitoring should not be performed. *This bit should not be effective when the home-return operation is incomplete.
7	N_CL	Torque Limit in Reversed Rotation	0: With no torque limit 1: With torque limit The command torque in the normal rotation is to be limited in Common Parameter 8D “Reversed Rotation Torque Control Value” (refer to [Section 6.1.2]). Comparing with TLIM set with the command, the smaller becomes the upper limit of the command torque. While in the torque limit by this bit, the deviation error monitoring should not be performed. *This bit should not be effective when the home-return operation is incomplete.
8 to 11	G_SEL (ACON, SCON only)	Gain Switchover	0 to 3: Servo gain set select Select the servo gain set 0 to 3 in the controller parameter. Do not attempt to set to 4 or higher. It is available only for INTERPOLATE, POSING and FEED Commands, and is reflected immediately if a command is being executed. Home-return operation activates with the setting of servo gain set 0. It will be ignored when the operation mode of the controller is in MANU.
12 to 15	-	Reserved	
16	BKRL	Brake Compulsory Release	0: Not to have the brake compulsorily released when the servo is off 1: To have the brake compulsorily released when the servo is off It will be ignored when the operation mode of the controller is in MANU. ⚠Caution This bit is accepted even when the servo is on. In case of the axis installed in vertical orientation, the transported object or fixture may drop once the servo is turned off in the condition of the brake release command.

Bits	Abbreviations	Names	Contents
17	HOME	Home-Return	Home-return operation starts when the startup edge is detected. The current control value at home-return and the current control value at a movement after the home-return operation are the controller parameter value. It will be ignored when the operation mode of the controller is in MANU or the command is INTERPOLATE, POSING or FEED.
18 to 31	-	Reserved	

* As bits from 16 to 31 (shaded portions) in this command field are defined as the vendor specific domain in the MECHATROLINK-III specifications, check how to operate in the master PLC manual when the applicable domain is to be operated.

[4] Details of SVCMD_IO Response Field (Slave ⇒ Master)

Bits	Abbreviations	Names	Contents
0, 1	-	Reserved	
2	P_OT	Input of Drive in Positive Direction Forbidden	Always 0 is read out.
3	N_OT	Input of Drive in Negative Direction Forbidden	
4 to 6	-	Reserved	
7	ESTP	Emergency Stop	0: Emergency stop released 1: In emergency stop condition
8	-	Reserved	
9	BRK_ON	Brake Output	0: Brake release 1: Brake lock It shows the condition of Brake Release/Lock. Command. However, the condition of hardware switches (such as the brake release switch on the front of the controller) cannot be reflected.
10	P_SOT	Positive Side Soft Limit	0: Current position is in positive side software limit 1: Current position exceeds positive side software limit
11	N_SOT	Negative Side Soft Limit	0: Current position is in negative side software limit 1: Current position exceeds negative side software limit
12	DEN	Discharge Complete (Position Control Mode)	0: Position command output incomplete 1: Position command output completed
13	NEAR	Near Positioning (Position Control Mode)	0: Current position out of near positioning band 1: Current position in near positioning band * “Near positioning band initial setting” = “Positioning band initial setting in parameter”
14	PSET	Positioning Complete (Position Control Mode)	0: DEN = 0 (Bit 12) or current position out of positioning complete band 1: DEN = 1 and current position in positioning complete band * “Positioning complete band initial setting” = “Positioning band initial setting in parameter”
15	ZPOINT	Home Position	0: Home-return incomplete or current position out of home position detection band 1: Home-return completed and current position in home position detection band * “Home position detection band initial setting” = “Positioning band initial setting in parameter”
16	T_LIM	Torque Limit	0: Not in torque limit 1: In torque limit It is a status to judge if clamped in the normal rotation torque limit value or in the reversed rotation torque limit value. * When TLIM set with the command is smaller than the limit value by the torque limit command, this bit would not become 1 as it should be clamped with TLIM.
17 to 18	-	Reserved	
19	ZSPD	Zero Velocity *1	0: Current speed out of zero speed detection band 1: Current speed in zero speed detection band
20 to 23	-	Reserved	
24	OVLW	Overload Warning	0: Operation in normal condition 1: Driver overload warning generated

Bits	Abbreviations	Names	Contents
25	HEND	Home-return Completed	0: Home-return incomplete 1: Home-return completed
26	ZONE1	Zone 1	0: Current position out of ZONE1 range 1: Current position in ZONE1 range * Because ZONE1 updates the status in the control frequency of the controller, it may not synchronize with the APOS of the monitor (Refer to [4.2.1 [5] Monitor Information]).
27	ZONE2	Zone 2	0: Current position out of ZONE2 range 1: Current position in ZONE2 range * Because ZONE2 updates the status in the control frequency of the controller, it may not synchronize with the APOS of the monitor (Refer to [4.2.1 [5] Monitor Information]).
28	RMDS	Operation Mode	0: AUTO 1: MANU
29 to 31	-	Reserved	

*1 It may cause chattering when “ZSPD” bit stops an axis if the battery-less absolute encoder actuator is combined. In such a case, it can be solved by increasing the value in Common Parameter “8Eh: Zero Velocity Detection Band Width” (recommended value: 1000).

Note As bits from 24 to 31 (shaded portions) in this command field are defined as the vendor specific domain in the MECHATROLINK-III specifications, check how to operate in the master PLC manual when the applicable domain is to be operated.

[5] Monitor Information

Code	Monitor Name	Contents	Unit	Symbol	Remarks
0	APOS	Feedback Position	Command unit	Exist	
1	CPOS	Command Position	Command unit	Exist	
2	PERR	Position Deviation	Command unit	Exist	
3, 4	-	Reserved			
5	FSPD	Feedback Speed	Command unit /s	Exist	
6	CSPD	Command Speed	Command unit /s	Exist	
7	TRQ	Command Torque (Thrust)	%	Exist	
8	ALARM	Detailed Information for Alarm Currently Generated		None	It shows the warning or alarm code
9	MPOS	Command Position	Command unit	Exist	It should be the same value as CPOS “Command Position” (Code 1)
A, B	-	Reserved			
C	CMN1	Common Monitor 1 Refer to [the next table]			It is to be indicated in Common Parameter No. 89h “Monitor Select 1 of SEL_MON”. Refer to [6.1.2]
D	CMN2	Common Monitor 2 Refer to [the next table]			It is to be indicated in Common Parameter No. 8Ah “Monitor Select 2 of SEL_MON”. Refer to [6.1.2]
E, F	-	Reserved			

[6] Common Monitor Data List

Code	Name	Contents	Unit	Symbol	Remarks
0	TPOS	Target Position	Command unit	Exist	
1	IPOS	Command Position	Command unit	Exist	It is the same value as CPOS “Command Position” ([[5]Code 1 in Monitor Information])
2	-	Reserved			
3	TSPD	Target Speed	Command unit /s	None	
4	-	Reserved			
5	TRQ_LIM	Torque Limit	%	None	Current torque limit value by TLIM set with command
6	SV_STAT	Servo Actual Operational Status	-	None	[0]: Communication Phase [1]: Current control mode (0: fixed to position control) [2]: Reserve (fixed to 0) [3]: Extension input signal monitor (Always all bits 0)
7 to 9	-	Reserved			

4.2.2 Sensor-on Request (SENS_ON Code: 23_H)

It is the command to request the sensor (encoder) to turn ON. Since it is unable to turn on and off the encoder power with a command, this just replies a normal response.

Note The data except for Response Command [23_H] is the same as [4.2.1 Servo Status Monitor (SMON: 30_H)].

It generates an alarm for the operation mode of the controller is MANU mode and command will not be accepted. (It generates CMD_ALM = A).

[SENS_ON]

Bytes of Command Format	Command	Response	Remarks
0	23_H	23_H	
1	WDT	RWDT	Refer to [3.3.2].
2	CMD_CTRL	CMD_STAT	Refer to [3.3.3].
3			
4	SVCMD_CTRL Refer to [4.2.1 [1] Details of SVCMD_CTRL Field]	SVCMD_STAT Refer to [4.2.1 [2] Details of SVCMD_STAT Field]	
5			
6			
7			
8	SVCMD_IO Refer to [4.2.1 [3] Details of SVCMD_IO Command Field]	SVCMD_IO Refer to [4.2.1 [4] Details of SVCMD_IO Response Field]	
9			
10			
11			
12	Reserved	CPRM_SEL_MON1	Selected in Common Parameter No. 87h Refer to [6.1.2].
13			
14			
15			
16		CPRM_SEL_MON2	Selected in Common Parameter No. 88h Refer to [6.1.2].
17			
18			
19			
20		MONITOR1	Refer to the tables in [4.2.1 [1] Details of SVCMD_CTRL Field] and [4.2.1 [5] Monitor Information]
21			
22			
23			
24		MONITOR2	
25			
26			
27			
28		MONITOR3	
29			
30			
31			

4.2.3 Sensor-off Request (SENS_OFF Code: 24H)

It is the command to request the sensor (encoder) to turn OFF. Since it is unable to turn on and off the encoder power with a command, this just replies a normal response.

Note The data except for Response Command [24H] is the same as [4.2.1 Servo Status Monitor (SMON: 30H)].

It generates an alarm for the operation mode of the controller is MANU mode and command will not be accepted. (It generates CMD_ALM = A).

[SENS_OFF]

<table>
<tr><th>Bytes of Command Format</th><th>Command</th><th>Response</th><th>Remarks</th></tr>
<tr><td>0</td><td>24H</td><td>24H</td><td></td></tr>
<tr><td>1</td><td>WDT</td><td>RWDT</td><td>Refer to [3.3.2].</td></tr>
<tr><td>2</td><td rowspan="2">CMD_CTRL</td><td rowspan="2">CMD_STAT</td><td rowspan="2">Refer to [3.3.3].</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td><td rowspan="4">SVCMD_CTRL
Refer to [4.2.1 [1] Details of SVCMD_CTRL Field]</td><td rowspan="4">SVCMD_STAT
Refer to [4.2.1 [2] Details of SVCMD_STAT Field]</td><td rowspan="4"></td></tr>
<tr><td>5</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td><td rowspan="4">SVCMD_IO
Refer to [4.2.1 [3] Details of SVCMD_IO Command Field]</td><td rowspan="4">SVCMD_IO
Refer to [4.2.1 [4] Details of SVCMD_IO Response Field]</td><td rowspan="4"></td></tr>
<tr><td>9</td></tr>
<tr><td>10</td></tr>
<tr><td>11</td></tr>
<tr><td>12</td><td rowspan="20">Reserved</td><td rowspan="4">CPRM_SEL_MON1</td><td rowspan="4">Selected in Common Parameter No. 87h
Refer to [6.1.2]</td></tr>
<tr><td>13</td></tr>
<tr><td>14</td></tr>
<tr><td>15</td></tr>
<tr><td>16</td><td rowspan="4">CPRM_SEL_MON2</td><td rowspan="4">Selected in Common Parameter No. 88h
Refer to [6.1.2]</td></tr>
<tr><td>17</td></tr>
<tr><td>18</td></tr>
<tr><td>19</td></tr>
<tr><td>20</td><td rowspan="4">MONITOR1</td><td rowspan="12">Refer to the tables in [4.2.1 [1] Details of SVCMD_CTRL Field] and [4.2.1 [5] Monitor Information]</td></tr>
<tr><td>21</td></tr>
<tr><td>22</td></tr>
<tr><td>23</td></tr>
<tr><td>24</td><td rowspan="4">MONITOR2</td></tr>
<tr><td>25</td></tr>
<tr><td>26</td></tr>
<tr><td>27</td></tr>
<tr><td>28</td><td rowspan="4">MONITOR3</td></tr>
<tr><td>29</td></tr>
<tr><td>30</td></tr>
<tr><td>31</td></tr>
</table>

4.2.4 Servo ON Request (SV_ON Code: 31H)

It is the command to request the servo to turn ON.

For the servo status, check SV_ON in SVCMD_STAT.

Note The data except for Response Command [31H] is the same as [4.2.1 Servo Status Monitor (SMON: 30H)].

An alarm will be generated and will not accept any command in the following cases:

(1) Alarm is generated on the controller (It generates CMD_ALM = A)

(2) In emergency stop condition (It generates CMD_ALM = A)

(3) Communication alarm is generated (COMM_ALM ≥ 8) (It generates CMD_ALM = A)

(4) The operation mode of the controller is MANU mode (It generates CMD_ALM = A)

[SV_ON]

Bytes of Command Format	Command	Response	Remarks
0	31H	31H	
1	WDT	RWDT	Refer to [3.3.2].
2	CMD_CTRL	CMD_STAT	Refer to [3.3.3].
3			
4	SVCMD_CTRL Refer to [4.2.1 [1] Details of SVCMD_CTRL Field]	SVCMD_STAT Refer to [4.2.1 [2] Details of SVCMD_STAT Field]	
5			
6			
7			
8	SVCMD_IO Refer to [4.2.1 [3] Details of SVCMD_IO Command Field]	SVCMD_IO Refer to [4.2.1 [4] Details of SVCMD_IO Response Field]	
9			
10			
11			
12	Reserved	CPRM_SEL_MON1	Selected in Common Parameter No. 87h Refer to [6.1.2].
13			
14			
15			
16		CPRM_SEL_MON2	Selected in Common Parameter No. 88h Refer to [6.1.2].
17			
18			
19			
20		MONITOR1	Refer to the tables in [4.2.1 [1] Details of SVCMD_CTRL Field] and [4.2.1 [5] Monitor Information]
21			
22			
23			
24		MONITOR2	
25			
26			
27			
28		MONITOR3	
29			
30			
31			

4.2.5 Servo OFF Request (SV_OFF Code: 32_H)

It is the command to request the servo to turn OFF.

For the servo status, check SV_ON in SVCMD_STAT.

Note The data except for Response Command [32_H] is the same as [4.2.1 Servo Status Monitor (SMON: 30_H)].

It generates an alarm for the operation mode of the controller is MANU mode and command will not be accepted. (It generates CMD_ALM = A)

[SV_OFF]

Bytes of Command Format	Command	Response	Remarks
0	32_H	32_H	
1	WDT	RWDT	Refer to [3.3.2].
2	CMD_CTRL	CMD_STAT	Refer to [3.3.3].
3			
4	SVCMD_CTRL Refer to [4.2.1 [1] Details of SVCMD_CTRL Field]	SVCMD_STAT Refer to [4.2.1 [2] Details of SVCMD_STAT Field]	
5			
6			
7			
8	SVCMD_IO Refer to [4.2.1 [3] Details of SVCMD_IO Command Field]	SVCMD_IO Refer to [4.2.1 [4] Details of SVCMD_IO Response Field]	
9			
10			
11			
12	Reserved	CPRM_SEL_MON1	Selected in Common Parameter No. 87h Refer to [6.1.2].
13			
14			
15			
16		CPRM_SEL_MON2	Selected in Common Parameter No. 88h Refer to [6.1.2].
17			
18			
19			
20		MONITOR1	Refer to the tables in [4.2.1 [1] Details of SVCMD_CTRL Field] and [4.2.1 [5] Monitor Information]
21			
22			
23			
24		MONITOR2	
25			
26			
27			
28		MONITOR3	
29			
30			
31			

4.2.6 Interpolation Feeding (INTERPOLATE Code: 34H)

It is a command to request the interpolation feeding.
For the output complete of the movement command data, check DEN = 1 in SVCMD_IO.
For the positioning complete, check PSET = 1 in SVCMD_IO.
When the target position (TPOS) is out of the soft limit range, the target position makes the soft limit.
In the condition of the home-return operation incomplete, an operation is made with the position at the controller being booted as the datum point. Also, the soft limit is disabled.

An alarm will be generated and will not accept any command in the following cases:

(1) The operation mode of the controller is MANU mode
(It generates CMD_ALM = A)
(2) The controller is in a condition of the servo being off
(It generates CMD_ALM = A)
(3) In home-return operation
(It generates CMD_ALM = A)

[INTERPOLATE]

Bytes of Command Format	Command	Response	Remarks
0	34H	34H	
1	WDT	RWDT	Refer to [3.3.2].
2	CMD_CTRL	CMD_STAT	Refer to [3.3.3].
3			
4	SVCMD_CTRL Refer to [4.2.1 [1] Details of SVCMD_CTRL Field]	SVCMD_STAT Refer to [4.2.1 [2] Details of SVCMD_STAT Field]	
5			
6			
7			
8	SVCMD_IO Refer to [4.2.1 [3] Details of SVCMD_IO Command Field]	SVCMD_IO Refer to [4.2.1 [4] Details of SVCMD_IO Response Field]	
9			
10			
11			
12	TPOS (with symbol)	CPRM_SEL_MON1	• Set target position with symbol for TPOS • CPRM_SEL_MON1 to be selected in Common Parameter No. 87h Refer to [6.1.2].
13			
14			
15			
16	VFF (Not used: Specify 0)	CPRM_SEL_MON2	Selected in Common Parameter No. 88h Refer to [6.1.2].
17			
18			
19			

Bytes of Command Format	Command	Response	Remarks
20	TFF (Not used: Specify 0)	MONITOR1	• Torque limit [% x 10^0] to be set in TLIM (Operation made with max. value when TLIM = $FFFFFFFF_H$) Alarm (CMD_ARM = 1) to be generated and operation made with maximum value when the value exceeds the maximum value. • For MONITOR*, refer to the tables in [4.2.1 [1] Details of SVCMD_CTRL Field] and [4.2.1 [5] Monitor Information]
21			
22			
23			
24	Reserved	MONITOR2	
25			
26			
27			
28	TLIM (with no symbol)	MONITOR3	
29			
30			
31			

4.2.7 Positioning (POSING Code: 35H)

It is a command to request positioning to the indicated point.
For the output complete of the movement command data, check DEN = 1 in SVCMD_IO.
When the positioning operation is to be cancelled, set CMD_CANCEL in SVCMD_CTRL to 1.
When the positioning operation is to be paused, set CMD_PAUSE in SVCMD_CTRL to 1.
For the positioning complete, check “PSET = 1” in SVCMD_IO.
When the target position (TPOS) is out of the soft limit range, the target position makes the soft limit.
In the condition of the home-return operation incomplete, an operation is made with the position at the controller being booted as the datum point. Also, the soft limit is disabled.

An alarm will be generated and will not accept any command in the following cases:

1) The operation mode of the controller is MANU mode (It generates CMD_ALM = A)
2) The controller is in a condition of the servo being off (It generates CMD_ALM = A)
3) In home-return operation (It generates CMD_ALM = A)
4) Either of ACCR or DECR is set 0 (It generates CMD_ALM = 9)

[POSING]

Bytes of Command Format	Command	Response	Remarks
0	35H	35H	
1	WDT	RWDT	Refer to [3.3.2].
2	CMD_CTRL	CMD_STAT	Refer to [3.3.3].
3			
4	SVCMD_CTRL Refer to [4.2.1 [1] Details of SVCMD_CTRL Field]	SVCMD_STAT Refer to [4.2.1 [2] Details of SVCMD_STAT Field]	
5			
6			
7			
8	SVCMD_IO Refer to [4.2.1 [3] Details of SVCMD_IO Command Field]	SVCMD_IO Refer to [4.2.1 [4] Details of SVCMD_IO Response Field]	
9			
10			
11			
12	TPOS (with symbol)	CPRM_SEL_MON1	• Set target position with symbol for TPOS • CPRM_SEL_MON1 to be selected in Common Parameter No. 87h Refer to [6.1.2].
13			
14			
15			
16	TSPD (with no symbol)	CPRM_SEL_MON2	• Target speed to be set in TSPD (When exceeds max. value, operation made with max. value and warning to be issued) • CPRM_SEL_MON2 to be selected in Common Parameter No. 88h Refer to [6.1.2].
17			
18			
19			

Bytes of Command Format	Command	Response	Remarks
20	ACCR (with no symbol)	MONITOR1	• ACCR (acceleration) and DECR (deceleration) to be set (Operation made with max. value when ACCR, DECR = $FFFFFFFF_H$)
21			
22			
23			
24	DECR (with no symbol)	MONITOR2	• Alarm (CMD_ALM = 1) to be generated and operation made with maximum value when the value exceeds the maximum value. (when ACCR and DECR = 0h, operation is to be made with maximum acceleration / deceleration initial value of the controller parameter)
25			
26			
27			
28	TLIM (with no symbol)	MONITOR3	• Torque limit [% x 10^0] to be set in TLIM (Operation made with max. value when TLIM = $FFFFFFFF_H$) • Alarm (CMD_ALM = 1) to be generated and operation made with maximum value when the value exceeds the maximum value. • For MONITOR*, refer to the tables in [4.2.1 [1] Details of SVCMD_CTRL Field] and [4.2.1 [5] Monitor Information]
29			
30			
31			

4.2.8 Constant Speed Feeding (FEED Code: 36_H)

It is a command to request the constant speed feeding with the indicated speed.
For the output complete of the movement command data, check DEN = 1 in SVCMD_IO.
When having the constant speed feeding cancelled, make CMD_CANCEL to 1 in SVCMD_CTRL.
When having the constant speed feeding paused, make CMD_PAUSE to 1 in SVCMD_CTRL.
For the positioning complete, check PSET = 1 in SVCMD_IO.
For the direction of movement, when the value in the target speed (TSPD) is the positive number, it is the direction opposite the home position, while negative is towards the home position.
In the condition of home-return being complete, the target position is made the soft limit.

An alarm will be generated and will not accept any command in the following cases:

(1) The operation mode of the controller is MANU mode
(It generates CMD_ALM = A)
(2) The controller is in a condition of the servo being off
(It generates CMD_ALM = A)
(3) In home-return operation
(It generates CMD_ALM = A)
(4) Either of ACCR or DECR is set 0
(It generates CMD_ALM = 9)

[FEED]

Bytes of Command Format	Command	Response	Remarks
0	36_H	36_H	
1	WDT	RWDT	Refer to [3.3.2].
2 3	CMD_CTRL	CMD_STAT	Refer to [3.3.3].
4 5 6 7	SVCMD_CTRL Refer to [4.2.1 [1] Details of SVCMD_CTRL Field]	SVCMD_STAT Refer to [4.2.1 [2] Details of SVCMD_STAT Field]	
8 9 10 11	SVCMD_IO Refer to [4.2.1 [3] Details of SVCMD_IO Command Field]	SVCMD_IO Refer to [4.2.1 [4] Details of SVCMD_IO Response Field]	
12 13 14 15	Reserved	CPRM_SEL_MON1	Selected in Common Parameter No. 87h Refer to [6.1.2].

Bytes of Command Format	Command	Response	Remarks
16	TSPD (with symbol)	CPRM_SEL_MON2	• Set the target speed with sign to TSPD (When exceeds max. value, operation made with max. value and warning to be issued) • CPRM_SEL_MON2 to be selected in Common Parameter No. 88h Refer to [6.1.2].
17			
18			
19			
20	ACCR (with no symbol)	MONITOR1	• ACCR (acceleration) and DECR (deceleration) to be set (Operation made with max. value when ACCR, DECR = $FFFFFFFF_H$) • Alarm (CMD_ALM = 1) to be generated and operation made with maximum value when the value exceeds the maximum value. (when ACCR and DECR = 0h, operation is to be made with maximum acceleration / deceleration initial value of the controller parameter) • Torque limit [% x 10^0] to be set in TLIM (Operation made with max. value when TLIM = $FFFFFFFF_H$) • Alarm (CMD_ALM = 1) to be generated and operation made with maximum value when the value exceeds the maximum value. • For MONITOR*, refer to the tables in [4.2.1 [1] Details of SVCMD_CTRL Field] and [4.2.1 [5] Monitor Information]
21			
22			
23			
24	DECR (with no symbol)	MONITOR2	
25			
26			
27			
28	TLIM (with no symbol)	MONITOR3	
29			
30			
31			

4.2.9 Servo Parameter Readout (SVPRM_RD Code: 40_H)

It is a command to request the readout of the servo parameter.

An alarm will be generated and will not accept any command in the following cases:

(1) Readout Parameter No. (No) indicates a value out of the range
(It generates CMD_ALM = 9)

(2) Readout Parameter No. does not match with the data size (SIZE)
(It generates CMD_ALM = 9)

(3) A value other than 00H or 10H is set in MODE
(It generates CMD_ALM = 9)

[SVPRM_RD]

Bytes of Command Format	Command	Response	Remarks
0	40_H	40_H	
1	WDT	RWDT	Refer to [3.3.2].
2	CMD_CTRL	CMD_STAT	Refer to [3.3.3].
3			
4	SVCMD_CTRL Refer to [4.2.1 [1] Details of SVCMD_CTRL Field]	SVCMD_STAT Refer to [4.2.1 [2] Details of SVCMD_STAT Field]	
5			
6			
7			
8	SVCMD_IO Refer to [4.2.1 [3] Details of SVCMD_IO Command Field]	SVCMD_IO Refer to [4.2.1 [4] Details of SVCMD_IO Response Field]	
9			
10			
11			
12	NO	NO	Refer to Common Parameter List and Device Parameter List Refer to [6.1].
13			
14	SIZE	SIZE	04_H:All data 4 bytes
15	MODE	MODE	00_H:Common parameter domain 10_H:Device parameter domain
16	Reserved	PARAMETER	PARAMETER is the common or device parameter that is read out.
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			

4.2.10 Servo Parameter Writing (SVPRM_WR Code: 41_H)

It is a command to request the writing of the servo parameter. However, writing into the non-volatile memory is not available.

An alarm will be generated and will not accept any command in the following cases:

(1) Writing Parameter No. (No) indicates a value out of the range
(It generates CMD_ALM = 9)

(2) Writing Parameter No. does not match with the data size (SIZE)
(It generates CMD_ALM = 9)

(3) A value other than 00h is set in MODE
(It generates CMD_ALM = 9)

[SVPRM_WR]

Bytes of Command Format	Command	Response	Remarks
0	41_H	41_H	
1	WDT	RWDT	Refer to [3.3.2].
2	CMD_CTRL	CMD_STAT	Refer to [3.3.3].
3			
4	SVCMD_CTRL Refer to [4.2.1 [1] Details of SVCMD_CTRL Field]	SVCMD_STAT Refer to [4.2.1 [2] Details of SVCMD_STAT Field]	
5			
6			
7			
8	SVCMD_IO Refer to [4.2.1 [3] Details of SVCMD_IO Command Field]	SVCMD_IO Refer to [4.2.1 [4] Details of SVCMD_IO Response Field]	
9			
10			
11			
12	NO	NO	Parameter List Refer to [6.1.2].
13			
14	SIZE	SIZE	04_H:All data 4 bytes
15	MODE	MODE	00_H:Common parameter domain
16	PARAMETER	PARAMETER	PARAMETER is the common parameter
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			

4.3 Specifications of Sub Commands

4.3.1 Invalid (NOP Code: 00_H)

It is an disabled command.
Current condition is replied as a response.
The response from the power turned on till the completion of the initializing process is NOP, and no command but DISCONNECT can be received.

[NOP]

Bytes of Command Format	Command	Response	Remarks
32	00_H	00_H	
33	SUB_CTRL Refer to [4.3.1 [1] Details of SUB_CTRL Field]	SUB_STAT Refer to [4.3.1 [2] Details of SUB_STAT Field]	
34			
35			
36-47	Reserved	Reserved	

[1] Details of SUB_CTRL Field

Bits	Abbreviations	Names	Contents
0 to 11	-	Reserved	
12 to 15	SEL_MON4	Monitor Select 4	Monitor code set to MONITOR4 in SMON Command of sub command Refer to [4.2.1 [5] Monitor Information]
16 to 19	SEL_MON5	Monitor Select 5	Monitor code set to MONITOR5 in SMON Command of sub command Refer to [4.2.1 [5] Monitor Information]
20 to 23	SEL_MON6	Monitor Select 6	Monitor code set to MONITOR6 in SMON Command of sub command Refer to [4.2.1 [5] Monitor Information]

[2] Details of SUB_STAT Field

Bits	Abbreviations	Names	Contents
0, 1	-	Reserved	
2	SUBCMDRDY	Sub Command Ready	It shows the status that sub command reception is available. This always shows “1” no matter of sub command enabled/disabled after the connection is established in the main command (CONNECT) during 48 bytes mode.
4 to 7	-	Reserved	
8 to 11	SUBCMD_ALM	Sub Command Alarm	It shows an abnormality in a command. A normal command should automatically be cleared when it is received after the command error has been occurred. It uses the same alarm code as for CMD_ALM in CMD_STAT in the main command.
12 to 15	SEL_MON4	Monitor Select 4	The value set in SEL_MON4 in SUB_CTRL is to be replied.
16 to 19	SEL_MON5	Monitor Select 5	The value set in SEL_MON5 in SUB_CTRL is to be replied.
20 to 23	SEL_MON6	Monitor Select 6	The value set in SEL_MON6 in SUB_CTRL is to be replied.

4.3.2 Alarm / Warning Readout (ALM_RD Code: 05_H)

It is the readout command for the alarms and warnings on the controller.
ALM_RD_MOD is applicable only to 0 that reads out the alarm code currently being generated.
The read out alarm code is stored in Bytes 40 and 41 in the response. When the read out alarm data is 0, it shows that there is no alarm generated.
An alarm will be generated and will not accept any command in the following cases:

(1) A value other than 0 or 3 is set to ALM_RD_MOD.
(It generates SUBCMD_ALM = 9)

[ALM_RD]

Bytes of Command Format	Command	Response	Remarks
32	00_H	00_H	
33	SUB_CTRL Refer to [4.3.1 [1] Details of SUB_CTRL Field]	SUB_STAT Refer to [4.3.1 [2] Details of SUB_STAT Field]	
34			
35			
36	ALM_RD_MOD	ALM_RD_MOD	Fixed to 0
37			
38	Reserved	Reserved	
39			
40-47	Reserved	ALM_DATA	

4.3.3 Servo Status Monitor (SMON Code: 30_H)

It is a command to read out the monitor information.

[SMON]

Bytes of Command Format	Command	Response	Remarks
32	30_H	30_H	
33	SUB_CTRL Refer to [4.3.1 [1] Details of SUB_CTRL Field]	SUB_STAT Refer to [4.3.1 [2] Details of SUB_STAT Field]	
34			
35			
36	Reserved	MONITOR4	Refer to [4.3.1 [1] Details of SUB_CTRL Field]
37			
38			
39			
40		MONITOR5	
41			
42			
43			
44		MONITOR6	
45			
46			
47			

4.3.4 Servo Parameter Readout (SVPRM_RD Code: 40_H)

It is a command to request the readout of the servo parameter.

An alarm will be generated and will not accept any command in the following cases:

(1) Readout Parameter No. (No) indicates a value out of the range
(It generates SUBCMD_ALM = 9)

(2) Readout Parameter No. does not match with the data size (SIZE)
(It generates SUBCMD_ALM = 9)

(3) A value other than 00h or 10h is set in MODE
(It generates SUBCMD_ALM = 9)

[SVPRM_RD]

Bytes of Command Format	Command	Response	Remarks
32	40_H	40_H	
33	SUB_CTRL Refer to [4.3.1 [1] Details of SUB_CTRL Field]	SUB_STAT Refer to [4.3.1 [2] Details of SUB_STAT Field]	
34			
35			
36	NO	NO	Common parameter list, and Device parameter list
37			
38	SIZE	SIZE	
39	MODE	MODE	00_H : Common parameter domain 10_H : Device parameter domain 11_H : Device parameter non-volatile memory domain indication Refer to [6.1].
40	Reserved	PARAMETER	PARAMETER is the common or device parameter data that is read out.
41			
42			
43			
44			
45			
46			
47			

SCON2 - Motion

Chapter 5

Operation

5.1 Restrictions in Operation

Make sure to check the restrictions below and the cautions described in [section 5.2] before creating the operation sequence.

Caution

- Position number indication operation cannot be performed. (It performs the direct position indicating operation by commands.)
- Incremental (relative) operation cannot be performed. (It performs the direct position indicating operation by commands.)
- Pressing operation cannot be performed.
- Acceleration/deceleration mode (primary filter acceleration/deceleration and S-shaped acceleration/deceleration) cannot be used.
- Automatic servo-off function cannot be used.
- Anti-vibration control function cannot be used.
- Individual zone (PZONE) function cannot be used. For zone function, use the zones (ZONE 1 and ZONE 2) determined by the boundary setting in the parameter.
- Index mode cannot be used on the rotary axis.
- Switchover of the operation mode (AUTO ⇔ MANU) cannot be performed by the host (master).
- The settings of the electronic gear ratio and the feedback gear ratio cannot be established separately.
- Force control (SCON only: load cell interface) cannot be used.

Common Parameters Note 1 are those of numbers in common defined by the standard servo profile of MECHATROLINK-III that is independent from the connected devices. The parameter dependent on the devices is treated as the device parameter Note 1, and another domain is secured for it.
For setting and reference, select Common Parameter Domain or Device Parameter Domain in [section 4.2.9] or [section 4.3.4] SVPRM_RD Command and section [4.2.10] SVPRM_WR Command.

Note 1 The items relying on the actuator are to be set by the initial values registered in an IAI controller being ready out at the startup.

Operation is performed after the readout and writing of the common parameters are complete when the power is turned on.

Procedure	Item	Command to Use	Contents	Communication Phase
1	Power on	NOP	Check on each controller initialization	1
2	Release communication (disconnect)	DISCONNECT	Send this command for more than 2 communication frequency	1
3	Establish connection	CONNECT	Start establishing communication and counting up WDT	2 or 3
4	Check on such as device (Each controller) ID	ID_RD/SVPRM_RD	Read out such as device ID	2 or 3
5	Establish device settings	SVPRM_WR	Transfer parameters necessary for device (Each controller)	2 or 3
6	Servo ON	SV_ON		2 or 3
7	Home-Return	Indicate with HOME (bits17) in SVCMD_IO, and check with HEND (bits25)	Available only in incremental type Note ZRET Command cannot be used	2 or 3
8	Operation	Each operation command		2 or 3
9	Servo OFF	SV_OFF		2 or 3
10	Release communication (disconnect)	DISCONNECT	Release the communication	1
11	Power OFF			1

Caution

- It should be immediately reflected when there is a change made to the positioning band in the common parameters. But, the value in the user parameter of a controller will not be changed.

5.2 Cautions in Actuator Operation

5.2.1 Home Return

The home-return operation is a dedicated method. Therefore, Home-Return “ZRET” Command cannot be used. The home-return operation starts when SVCMD_IO.HOME bit is turned on to (1) while the servo is turned on.
SVCMD_IO.HEND bit turns on to (1) once the home-return operation is completed.

Caution

- In some cases, depending on the actuator to use, the coordinate is not 0mm for the home-return complete position. Therefore, confirm that SVCMD_IO.HEND bit is on when making a judgment of the home-return complete. Also, home-return operation is ignored during execution of each command of interpolation feeding “INTERPOLATE”, positioning “POSING” and Constant Speed Feeding “FEED”.
- When INTERPOLATE or POSING Command gets executed while the home-return operation is incomplete, the position where the power was turned on should become the position 0. Also, the soft limit feature should get disabled.
  FEED Command should operate with the target position as the soft limit.

5.2.2 Soft Limit

It activates once the home-return complete (SVCMD_IO.HEND) bit turns on to (1). For the absolute type actuators, it is effective from the controller startup as long as the absolute reset is finished.

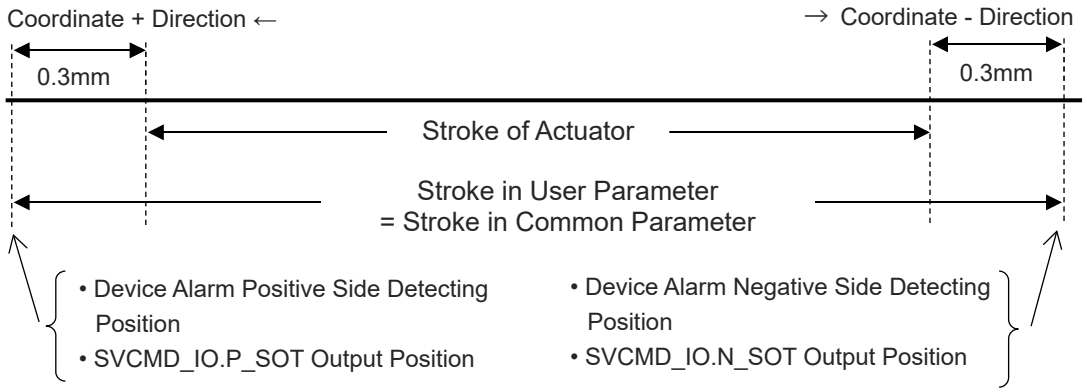
The soft limit value in the common parameter at the controller startup is a value that the soft limit positive and negative in each controller User Parameter No.3 “Soft Limit on Positive Side” and No.4 “Soft Limit on Negative Side” are converted into the unit of command.

* Setting will be applied immediately if the soft limit value is changed in the common parameter. However, the user parameter in the controller will not be changed.

When the soft limit is enabled, the target position “TPOS” is limited to the soft limit value in the common parameter, and the value gets replaced.

The following things occur when the soft limit setting is exceeded.

Condition	Alarm Output	
When setting in User Parameter No.3 “Soft Limit on Positive Side” is exceeded	SVCMD_IO.P_SOT (Positive Side) = 1	Software stroke limit violation in device alarm to be issued
When setting in User Parameter No.4 “Soft Limit on Negative Side” is exceeded	SVCMD_IO.N_SOT (Negative Side) = 1	Software stroke limit violation in device alarm to be issued
When exceeded setting in Common Parameter No.26 “Positive Side Soft Limit”	SVCMD_IO.P_SOT (Positive Side) = 1	
When exceeded setting in Common Parameter No.28 “Negative Side Soft Limit”	SVCMD_IO.N_SOT (Negative Side) = 1	



5.2.3 Positioning Complete Band, Positioning Vicinity Band and Home Position Detection Band

The positioning complete band, positioning vicinity band and home position detection band in the common parameters at the controller startup are a value that the initial value in controller User Parameter No.10 “Positioning band” is converted into the unit of command.
Each value in the common parameter above can be changed individually with the servo parameter writing “SVPRM_WR” command.

Caution

- Setting will be applied immediately if the positioning band is changed in the common parameter.
  However, the user parameter in the controller will not be changed.

SCON2 - Motion

Chapter 6

Parameters

6.1 Parameters of Standard Servo Profile

6.1.1 Overview

Common Parameters [Note 1] are those of numbers in common defined by the standard servo profile of MECHATROLINK-III that is independent from the connected devices. The parameter dependent on the devices is treated as the device parameter [Note 1], and another domain is secured for it.

For setting and reference, select Common Parameter Domain or Device Parameter Domain in [section 4.2.9] or [section 4.3.4] SVPRM_RD Command and [section 4.2.10] SVPRM_WR Command.

Note 1 The items relying on the actuator are to be set by the initial values registered in an IAI controller being ready out at the startup.

6.1.2 Common Parameter

Shown below are the common parameters available to be read out / written in by MODE = 00h.

Enable Timing ⊙ : Enable Immediately, Δ : Enable by Executing CONFIG Command, -: Readout Only

Genre	No.	Item	Unit	Setting Range	Setting at Delivery	Enable Timing
Device Information Related	01h	Selected from Encoder Type	-	0 to 1	In accordance with actuator	-
	02h	Motor Type	-	0 to 1	In accordance with actuator	-
	03h	Selection of Semiclosed/ Full-closed	-	0 to 1 1 for Linear	In accordance with actuator	-
	04h	Rated Rotary Speed	Rotary : min^{-1} Linear : mm/s	1 to $FFFFFFFF_H$	In accordance with actuator	-
	05h	Max. Output Available Speed	Rotary : min^{-1} Linear : mm/s	1 to $FFFFFFFF_H$	In accordance with actuator	-
	06h	Speed Multiplier	-	0	0	-
	07h	Rated Torque	Rotary : N•m Linear : N	1 to $FFFFFFFF_H$	In accordance with actuator	-
	08h	Max. Output Available Torque	Rotary : N•m Linear : N	1 to $FFFFFFFF_H$	In accordance with actuator	-
	09h	Torque Multiplier	-	-3	-3	-
	0Ah	Resolution (Rotary Encoder)	pulse/rev	1 to $FFFFFFFF_H$	In accordance with actuator	-
	0Bh	Linear Scale Pitch (Linear)	nm	0 to $FFFFFFFF_H$	In accordance with actuator	-
	0Ch	Number of Pulse per Scale Pitch (Linear)	pulse/pitch	0 to $FFFFFFFF_H$	In accordance with actuator	-
Mechanical Element Related	21h	Electronic gear ratio (Numerator)	-	1 to 99999999	1	-
	22h	Electronic gear ratio (Denominator)	-	1 to 99999999	1	-
	25h	Limit Setting	-	0 to FF_H	30_H	-
	26h	Soft Limit on Positive Side	Command unit	* 1	In accordance with actuator	⊙
	28h	Soft Limit on Negative Side	Command unit	* 1	In accordance with actuator	⊙

Enable Timing ⊙ : Enable Immediately, Δ : Enable by Executing CONFIG Command, -: Readout Only

Genre	No.	Item	Unit	Setting Range	Setting at Delivery	Enable Timing
Unit System Related	41h	Selection of Speed Unit	-	0	0	Δ
	42h	Selection of Speed Basic Unit	-	0	0	Δ
	43h	Selection of Position Unit	-	0	0	Δ
	44h	Selection of Position Basic Unit	-	0	0	Δ
	45h	Selection of Acceleration Unit	-	0	0	Δ
	46h	Selection of Acceleration Basic Unit	-	0	0	Δ
	47h	Selection of Torque Unit	-	1	1	Δ
	48h	Selection of Torque Basic Unit	-	0	0	Δ
	49h	Applicable Unit System	-	bits0 to 7 = 01h Unit of velocity : Command unit /s bits8 to 15 = 01h Unit of position : Command unit bits16 to 23 = 01h Unit of acceleration : /sec^2 bits24 to 31 = 02h Unit of torque: Rated torque in %	02010101_H	-
Adjustment Related	66h	Positioning Complete Band	Command unit	* 2	In accordance with actuator	⊙
	67h	Positioning Vicinity Band	Command unit	0 to $7FFFFFFF_H$	In accordance with actuator	⊙
Command Related	87h	Selection of Fixed Monitor 1	-	0 to Fh	1	⊙
	88h	Selection of Fixed Monitor 2	-	0 to Fh	0	⊙
	89h	Monitor Select 1 in SEL_MON	-	0 to 9h	0	⊙
	8Ah	Monitor Select 2 in SEL_MON	-	0 to 9h	0	⊙
	8Bh	Home Position Detection Band	Command unit	0 to $7FFFFFFF_H$	In accordance with actuator	⊙
	8Ch	Normal Rotation Torque Limit Value	%	*3	In accordance with actuator	⊙
	8Dh	Reversed Rotation Torque Limit Value	%	*3	In accordance with actuator	⊙
	8Eh	Zero Speed Detection Band	Rotary : 10^{-3} min^{-1} Linear : 10^{-3}mm/s	0 to $7FFFFFFF_H$	0	⊙
	90h	Selection of Enabled/Disabled for Servo Command Control Field	-	0 to $FFFFFFFF_H$	$0FFF000F_H$	-
	91h	Selection of Enabled/Disabled for Servo Status Field	-	0 to $FFFFFFFF_H$	$6FFF3C03_H$	-
	92h	Selection of Enabled/Disabled for I/O Bit Definition (on Output Side)	-	0 to $FFFFFFFF_H$	$00030F00_H$	-
	93h	Selection of Enabled/Disabled for I/O Bit Definition (on Input Side)	-	0 to $FFFFFFFF_H$	$1F08FE8C_H$	-

*1 The soft limit value is available for setting if the value figured out by the formula below is in the range in the table below.

Setting x Electronic Gear Denominator / Electronic Gear Numerator

(Setting Range: -134217728 to 134217727 (-2^{27} to $2^{27}-1$))

*2 The value related to the positioning band should also not to be available for setting when the value figured out by the formula same as the soft limit exceeds the range from 0 to $7FFFFFFF_H$.

*3 The maximum settable value should be the maximum pressing current of an actuator.

6.1.3 Device Parameter

Shown below are the device parameters available to be read out by MODE = 10h. Writing of device parameters is not available.

No.	Symbol	Names	Unit	Size [byte]	Code
0	LIMM	Soft limit +	0.01mm	4	Exist
1	LIML	Soft limit -	0.01mm	4	Exist
2	MAXV	Max. velocity	0.01mm/s	4	None
3	MAXA	Max. acceleration	0.01G	4	None
4	MAXD	Max. deceleration	0.01G	4	None
5	LEAD	Lead length	0.01mm	4	None
6	EPLS	Encoder pulse number	pulse	4	None
7	RACC	Rated acceleration/deceleration	0.01G	4	None
8	CNUM	Electronic gear numerator	-	4	None
9	CDEN	Electronic gear denominator	-	4	None

6.2 Controller Parameters

6.2.1 Controller Parameters Overview

It is the data to operate a controller applicable for MECHATROLINK-III.

Parameters are the data to set up considering the system and application.
When a change is required to the parameters, make sure to back up the data before the change so the settings can be returned anytime.
With using “PC software”, it is able to store the backup to the PC. Teaching pendant is capable for backup to a memory card.
Also, for the purpose of rapid recovery after the investigation of failure unit or replacing the controller, keep data backup or memo also after the parameter change.
After an edit is made on the parameters, it is written in FeRAM. The content of edit can be enabled after the software reset or reboot of the power. Note that the change will not be enable only by writing it in a teaching tool.

Warning

- Establishment of parameter setting gives a great influence to operation. Wrongly established setting could cause not only an operation error or malfunction, but also it is very dangerous.
- Settings at the delivery enable the product to operate standardly. When having a change or setting considering suitability to the system, make sure to understand well about how to control the controller. Please contact us if you have anything unclear.
- Do not turn off the power to the controller during the parameter writing.

6.2.2 Controller Parameter List

The parameter list related to SCON2 Motion Network specification are as follows.

No.	Name	Unit	Input range	Default initial value setting	Relevant sections
1	Zone boundary 1 + side	mm (deg)	-9,999.99 to 9,999.99	In accordance with actuator	6.2.3 [1]
2	Zone boundary 1 - side	mm (deg)	-9,999.99 to 9,999.99	In accordance with actuator	6.2.3 [1]
3	Soft limit - side	mm (deg)	-9,999.99 to 9,999.99	In accordance with actuator	6.2.3 [2]
4	Soft limit - side	mm (deg)	-9,999.99 to 9,999.99	In accordance with actuator	6.2.3 [2]
5	Homing direction	-	0: Reverse, 1: Forward	In accordance with actuator	6.2.3 [3]
7	Servo gain number	-	0 to 31	In accordance with actuator	6.2.3 [4]
9	Acc/Dec initial value	G	0.01 to Actuator max. acceleration/deceleration	Actuator rated acceleration/ deceleration	6.2.3 [5]
10	Positioning band initial value	mm (deg)	0.01 to 9,999.99	In accordance with actuator	6.2.3 [6]
13	Current limit during homing	%	0 to 300	In accordance with actuator	6.2.3 [7]
14	Dynamic brake	-	0: Disabled, 1: Enabled	1	6.2.3 [8]
16	SIO communication speed	bps	9,600 to 230,400	38,400	6.2.3 [9]
17	Minimum delay time for slave transmitter activation	ms	0 to 255	5	6.2.3 [10]
18	Home sensor input polarity	-	0 : Not in use 1 : a-contact 2 : b-contact	In accordance with actuator	6.2.3 [11]
19	Overrun sensor input polarity	-	0 : Not in use 1 : a-contact 2 : b-contact	In accordance with actuator	6.2.3 [12]
20	Creep sensor input polarity	-	0 : Not in use 1 : a-contact 2 : b-contact	In accordance with actuator	6.2.3 [13]
22	Homing offset	mm (deg)	0 to 9,999.99	In accordance with actuator	6.2.3 [14]
23	Zone boundary 2 + side	mm (deg)	-9,999.99 to 9,999.99	In accordance with actuator	6.2.3 [1]
24	Zone boundary 2 - side	mm (deg)	-9,999.99 to 9,999.99	In accordance with actuator	6.2.3 [1]
31	Velocity loop proportional gain	-	1 to 9,999.99	In accordance with actuator	6.2.3 [15]
32	Velocity loop integral gain	-	1 to 9,999.99	In accordance with actuator	6.2.3 [16]
33	Torque filter constant	-	0 to 2,500	In accordance with actuator	6.2.3 [17]
35	Safety velocity	mm/s (deg/s)	1 to 250 (max. for actuator of 250 or less)	100	6.2.3 [18]
42	Enable function	-	0: Enabled, 1: Disabled	1	6.2.3 [19]

No.	Name	Unit	Input range	Default initial value setting	Relevant sections
45	Silent interval magnification	-	0 to 10	0	6.2.3 [20]
54	Current control width number	-	0 to 15	In accordance with actuator	6.2.3 [21]
62	Pulse count direction	-	0: Forward, 1: Reverse	In accordance with actuator	6.2.3 [22]
65	Electronic gear numerator	-	1 to 99,999,999	1	6.2.3 [23]
66	Electronic gear denominator	-	1 to 99,999,999	1	6.2.3 [24]
71	Position feedforward gain	-	0 to 100	In accordance with actuator	6.2.3 [25]
72	Drive cutoff relay sticking monitoring timer	ms	0 to 60,000	3,000	6.2.3 [26]
73	Encoder voltage level	-	0 to 3	In accordance with actuator	6.2.3 [27]
76	Belt breaking sensor input polarity	-	0 : Not in use 1 : a-contact 2 : b-contact	In accordance with actuator	6.2.3 [28]
77	Ball screw lead length	mm (deg)	0.01 to 999.99	In accordance with actuator	6.2.3 [29]
85	Fieldbus node address	-	Dependent to network	3	6.2.3 [30]
86	Fieldbus baud rate	-	Dependent to network	1	6.2.3 [31]
87	Network type	-	Dependent to network	9	6.2.3 [32]
88	Software limit margin	mm (deg)	0 to 9,999.99	In accordance with actuator	6.2.3 [33]
110	Stop method during SrvOFF	-	0 : Sudden stop 1 : Decelerating stop	0	6.2.3 [34]
111	Calendar function	-	0 : Not in use 1 : Used	1	6.2.3 [35]
112	Monitoring mode select	-	0: Not in use 1: Monitor function 1 2: Monitor function 2 3: Monitor function 3	1	6.2.3 [36]
113	Monitoring cycle	ms	1 to 60,000	1	6.2.3 [37]
120	Servo gain number 1	-	0 to 31	In accordance with actuator	6.2.3 [4]
121	Position feed forward gain 1	-	0 to 100	In accordance with actuator	6.2.3 [25]
122	Velocity loop proportional gain 1	-	1 to 99,999,999	In accordance with actuator	6.2.3 [15]
123	Velocity loop integral gain 1	-	1 to 99,999,999	In accordance with actuator	6.2.3 [16]
124	Torque filter constant 1	-	0 to 2,500	In accordance with actuator	6.2.3 [17]
125	Current control width number 1	-	0 to 15	In accordance with actuator	6.2.3 [21]
126	Servo gain number 2	-	0 to 31	In accordance with actuator	6.2.3 [4]
127	Position feed forward gain 2	-	0 to 100	In accordance with actuator	6.2.3 [25]
128	Velocity loop proportional gain 2	-	1 to 99,999,999	In accordance with actuator	6.2.3 [15]

No.	Name	Unit	Input range	Default initial value setting	Relevant sections
129	Velocity loop integral gain 2	-	1 to 99,999,999	In accordance with actuator	6.2.3 [16]
130	Torque filter constant 2	-	0 to 2,500	In accordance with actuator	6.2.3 [17]
131	Current control width number 2	-	0 to 15	In accordance with actuator	6.2.3 [21]
132	Servo gain number 3	-	0 to 31	In accordance with actuator	6.2.3 [4]
133	Position feed forward gain 3	-	0 to 100	In accordance with actuator	6.2.3 [25]
134	Velocity loop proportional gain 3	-	1 to 99,999,999	In accordance with actuator	6.2.3 [15]
135	Velocity loop integral gain 3	-	1 to 99,999,999	In accordance with actuator	6.2.3 [16]
136	Torque filter constant 3	-	0 to 2,500	In accordance with actuator	6.2.3 [17]
137	Current control width number 3	-	0 to 15	In accordance with actuator	6.2.3 [21]
138	Servo gain switch time constant	ms	10 to 2,000	10	6.2.3 [38]
139	Home preset value	mm (deg)	-9,999.99 to 9,999.99	In accordance with actuator	6.2.3 [39]
143	Overload level ratio	%	50 to 100	100	6.2.3 [40]
147	Total travel count threshold	times	0 to 999,999,999	0	6.2.3 [41]
148	Total travel distance threshold	m	0 to 999,999,999	0	6.2.3 [42]
150	Linear absolute home preset value	mm	-9,999.99 to 9,999.99	In accordance with actuator	6.2.3 [43]
165	Delay time after shutdown release	ms	0 to 10,000	0	6.2.3 [44]
192	Actuator identification feature	-	0: Not for use, 1: Used	In accordance with actuator	6.2.3 [45]
194	JOG switch	-	0: Enabled, 1: Disabled	0	6.2.3 [46]
195	Virtual axis	-	0: Disabled, 1: Enabled	0	6.2.3 [47]
196	Virtual axis absolute initial position	mm (deg)	-9,999.99 to 9,999.99	0	6.2.3 [48]
199	Safety unit enable/disable select	-	0: Disabled, 1: Enabled	0	6.2.3 [49]
207	Position data unit	-	0: 0.01mm, 1: 0.001mm	In accordance with actuator	6.2.3 [50]
209	System I/O enable feature	-	0: Always Enabled, 1: Disabled	0	6.2.3 [51]
210	Drive recorder mode select	-	0: Disabled,1: 4CH, 2: 8CH, 3: 2CH	2	6.2.3 [52]
211	Drive recorder save history select	-	0: 3 History, 1: 6 History, 2: 12 History	0	6.2.3 [53]
212	Drive recorder sampling frequency	ms	1 to 1,000	10	6.2.3 [54]

*
- The unit (deg) is applicable to the rotary actuator or lever-type gripper. It will be displayed as [mm] on the teaching tool.
- The setting values vary in accordance with the specification of the actuator. At shipping, the parameters are set in accordance with the specification.
- Conduct the absolute reset before use when a product in the battery absolute type is to be used.

6.2.3 Details of Parameters

Caution

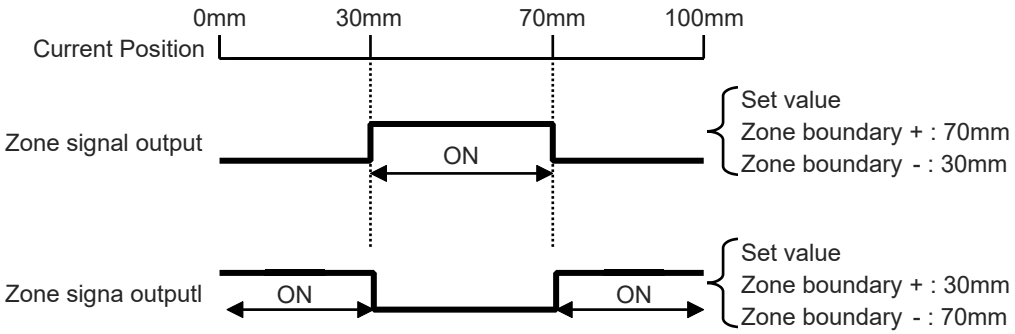
- After changing (writing) parameters, perform a software reset or power reboot so that the set values can be reflected.
- The unit (deg) is for rotary actuator. Note that it will be displayed as millimeter [mm] on the teaching tool.

[1] Zone boundary 1 + side, Zone boundary 1 - side (Parameter No. 1, No. 2)
Zone boundary 2 + side, Zone boundary 2 - side (Parameter No. 23, No. 24)

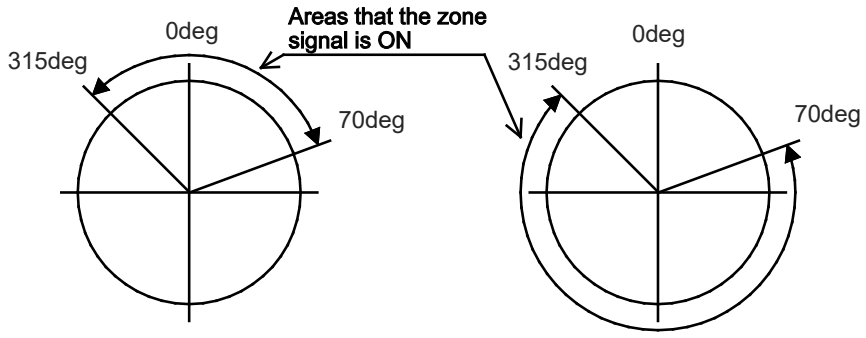
No.	Name	Unit	Input range	Default initial value setting
1	Zone boundary 1 + side	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on + side
2	Zone boundary 1 - side	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on - side
23	Zone boundary 2 + side	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on + side
24	Zone boundary 2 - side	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on - side

Set the range to turn zone signals (ZONE1, ZONE2) ON.
The minimum setting unit is 0.01mm (deg).
If a specific value is set to both zone boundary + and zone boundary -, the zone signal is not output.
A setting sample is shown next page.

[Example of when line axis]



[Example of Rotary Actuator Index Mode]



Caution

- Unless the zone signal detection range is set at a value above minimum resolution, a signal will not be output.
- The minimum resolution can be calculated with the equation below.
  Minimum resolution [mm/pulse] = Actuator lead [mm/r] / Encoder resolution [pulse/r]

[2] Soft limit + side, Soft limit - side (Parameter No. 3, No. 4)

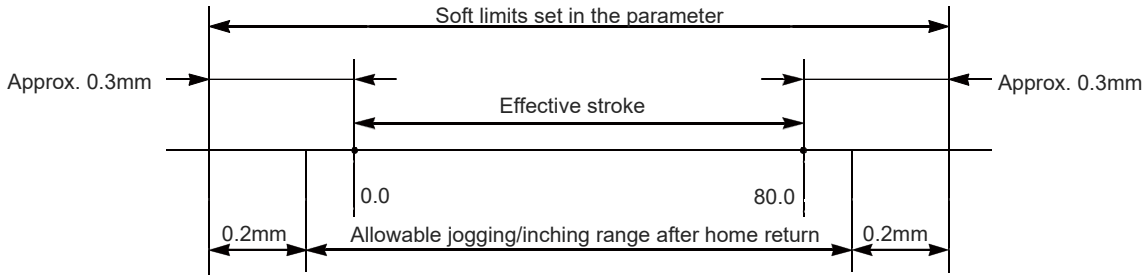
No.	Name	Unit	Input range	Default initial value setting
3	Soft limit + side	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on + side
4	Soft limit - side	mm (deg)	-9,999.99 to 9,999.99	Actual stroke on - side

0.3mm (deg) is added to the outside of the effective actuator stroke for the setting at the delivery). Change the setting if required for the cases such as when there is interference or to prevent a crash, or when using the actuator with slightly exceeding effective stroke in the operational range. The minimum setting unit is 0.01mm.

Caution

- Take extra care not to set incorrect values as this will lead to a collision with the mechanical end.
- If changing, set a value extended by 0.3mm to the outside of the effective stroke.

Example) Set the effective stroke to between 0.0mm and 80mm
Parameter No.3 (positive side) 80.3
Parameter No.4 (negative side) -0.3



The operational range for jog and inching after the home return is 0.2mm less than the set value. Alarm Code 0D9 “Software Stroke Limit Over Error” will be generated when the set value exceeded the value (0 when shipped out) set in Parameter No.88 “Software Limit Margin”.
If the setting is not done in Parameter No.88, the value set in this parameter become the detection value for Alarm Code 0D9 “Software Stroke Limit Over Error”.

[3] Homing direction (Parameter No.5)

No.	Name	Unit	Input range	Default initial value setting
5	Homing direction	-	0: Reverse, 1: Forward	In accordance with actuator

Unless there is a request of Home Reversed Type (option), the homing direction is on the motor side for the line axis, counterclockwise side for the rotary axis and outer (open) side for the gripper. If it becomes necessary to reverse the home direction after the actuator is installed on the machine, change the setting. Refer to [Actuator Coordinate System].

Refer to [SCON2 instruction manual (ME0458) Prelims Actuator Coordinate System].

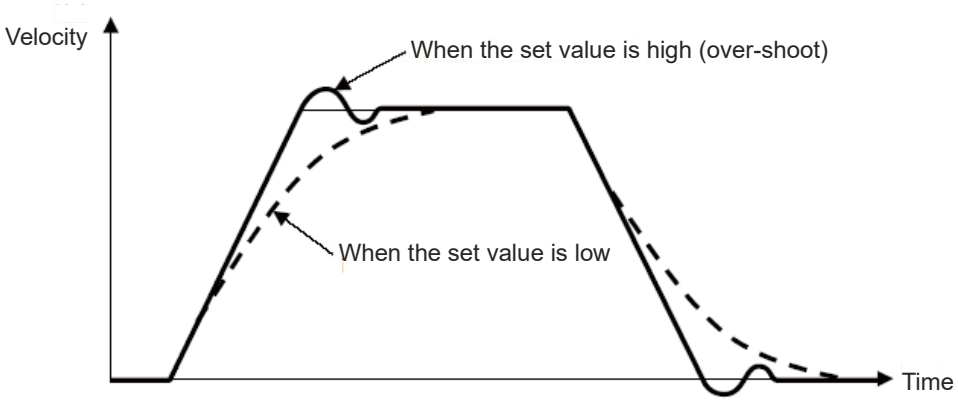
Caution

- Homing direction cannot be changed with some models.
- If it becomes necessary to reverse the homing direction after assembly to equipment, check the model of the applicable actuator to ensure that the homing direction is changeable.
- For models with which change is not possible, the actuator must be replaced. Contact IAI if anything is unclear.

[4] Servo gain number (Parameter No.7, 120, 126, 132)

No.	Name	Unit	Input range	Default initial value setting
7	Servo gain number	-	0 to 31	In accordance with actuator
120	Servo gain number 1	-	0 to 31	In accordance with actuator
126	Servo gain number 2	-	0 to 31	In accordance with actuator
132	Servo gain number 3	-	0 to 31	In accordance with actuator

The servo gain is also called position loop gain or position control system proportion gain. The parameter defines the response when a position control loop is used. Increasing the set value improves the tracking performance with respect to the position command. However, increasing the parameter value excessively increases the changes of overshooting.
When the set value is too low, the follow-up ability to the position command is degraded and it takes longer time to complete the positioning.
For a system of low mechanical rigidity or low natural frequency, setting a large servo gain number may generate mechanical resonance, which then cause not only vibrations and/or noises but also overload error to occur.



[5] Acc/Dec initial value (Parameter No.9)

No.	Name	Unit	Input range	Default initial value setting
9	Acc/Dec initial value	G	0.01 to Actuator max. acceleration/deceleration	Actuator rated acceleration/deceleration

The actuator rated acceleration/deceleration is set at shipment.
This setting value should be automatically written to the acceleration/deceleration in the applicable position numbers when the target position gets written to the unregistered position table. This setting also gets reflected to the jog/inching operations with a teaching tool.
Enter frequently used values for convenience.

[6] Positioning band initial value (Parameter No.10)

No.	Name	Unit	Input range	Default initial value setting
10	Positioning band initial value	mm (deg)	0.01 to 9,999.99	In accordance with actuator

When a target position is set in an unregistered position table, the setting in this parameter is automatically written in the applicable position number. When the remaining moving distance enters into this width, the positioning complete signal is output.
It is convenient to set the positioning width often used.

Caution

- For the initial positioning band width, set a value of or higher than the minimum positioning band width.

[7] Current limit during homing (Parameter No.13)

No.	Name	Unit	Input range	Default initial value setting
13	Current limit during homing	%	0 to 300	In accordance with actuator

The factory setting conforms to the standard specification of the actuator.
Increasing this setting will increase the home return torque.
Normally this parameter need not be changed. If the home return should be completed before the correct position depending on the affixing method, load condition or other factors when the actuator is used in a vertical application, the setting value must be increased.

[8] Dynamic brake (Parameter No.14)

No.	Name	Unit	Input range	Default initial value setting
14	Dynamic brake	-	0: Disabled, 1: Enabled	1

This parameter defines whether the dynamic brake is enabled or disabled while the actuator is at standstill.
Normally it need not be changed.

[9] SIO communication speed (Parameter No.16)

No.	Name	Unit	Input range	Default initial value setting
16	SIO communication speed	bps	9,600 to 230,400	38,400

Set the SIO baud rate for the startup.
Set an appropriate value in accordance with the communication speed of the host.
One of 9,600, 14,400, 19,200, 28,800, 38,400, 76,800, 115,200 and 230,400 bps can be selected as the communication speed.

Caution

- After the PC software is connected, the baud rate setting is changed to that of the PC software. To make effective the value set in the parameter, cycle controller power.

[10] Minimum delay time for slave transmitter activation (Parameter No.17)

No.	Name	Unit	Input range	Default initial value setting
17	Minimum delay time for slave transmitter activation	ms	0 to 255	5

In this setting, set the time from receiving the command (received data) during the SIO communication till the response (sent data) is returned to the host side.

[11] Home sensor input polarity (Parameter No.18)

No.	Name	Unit	Input range	Default initial value setting
18	Home sensor input polarity	-	0 to 2	In accordance with actuator

A parameter to select input polarity of the home sensor.
The home sensor is an option.

Set value	Content
0	Standard specification (home sensor not in use)
1	Input is a-contact
2	Input is b-contact

[12] Overrun sensor input polarity (Parameter No.19)

No.	Name	Unit	Input range	Default initial value setting
19	Overrun sensor input polarity	-	0 to 2	In accordance with actuator

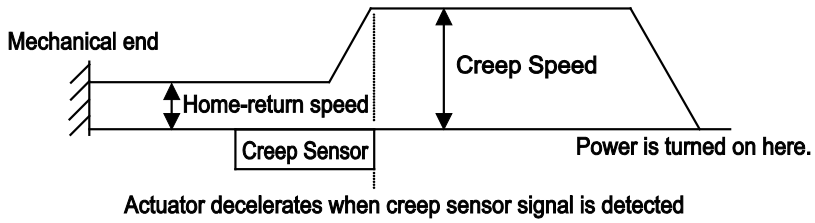
A parameter to select input polarity of the overrun sensor.
This parameter is set properly prior to the shipment according to the specification of the actuator.

Set value	Content
0	Standard specification (Overrun sensor not in use)
1	Input is a-contact
2	Input is b-contact

[13] Creep sensor input polarity (Parameter No.20)

No.	Name	Unit	Input range	Default initial value setting
20	Creep sensor input polarity	-	0 to 2	In accordance with actuator

Even though the actuator with long stroke requires time to home-return if the power is shut at a point far from the home position, the required time can be improved with using the creep sensor. The actuator moves at the creep speed (100mm/s or less) until a creep sensor signal is detected, upon which the actuator will decelerate to the home return speed.
Creep sensor is an option for the line axis type.
This parameter is set properly prior to the shipment according to the specification of the actuator.



Set value	Content
0	Standard specification (Creep sensor not in use)
1	Input is a-contact
2	Input is b-contact

[14] Homing offset (Parameter No.22)

No.	Name	Unit	Input range	Default initial value setting
22	Homing offset	mm (deg)	0.00 to 9,999.99	In accordance with actuator

The distance from the encoder datum point (Z-phase) to the home position is set up.
In this setting can set the distance from the mechanical end to the home position.
An adjustment is available for the following cases.

- Want to match the actuator home position and the mechanical origin of the system.
- Want to set a new home after reversing the factory-set home direction.
- Want to eliminate a slight deviation from the previous home position generated after replacing the actuator.

Adjustment process

1) Homing execution
2) Offset check
3) Parameter setting change

If setting a number close to a multiple of the lead length (including home-return offset value = 0) to the home offset value, there is a possibility to servo lock on Z-phase at absolute reset, thus the coordinates may get shifted for the lead length.
For Absolute Type, do not attempt to set a value near a number that the lead length is multiplied by an integral number.
Have enough margin.
After the setting, repeat home return several times to confirm that the actuator always returns to the same home position.

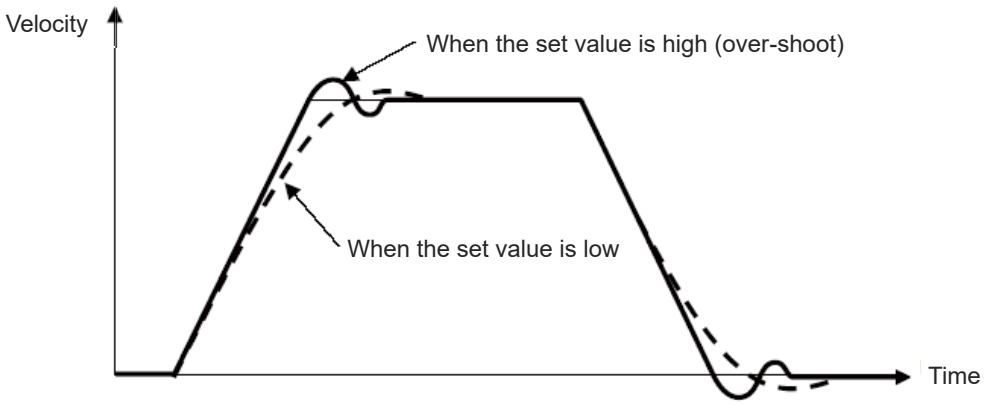
Caution

- If the homing offset has been changed, the software limit parameter also needs to be reviewed.
  If the value must be set above the default setting, contact IAI.

[15] Velocity loop proportional gain (Parameter No.31, 122, 128, 134)

No.	Name	Unit	Input range	Default initial value setting
31	Velocity loop proportional gain	-	1 to 99,999,999	In accordance with actuator
122	Velocity loop proportional gain 1	-	1 to 99,999,999	In accordance with actuator
128	Velocity loop proportional gain 2	-	1 to 99,999,999	In accordance with actuator
134	Velocity loop proportional gain 3	-	1 to 99,999,999	In accordance with actuator

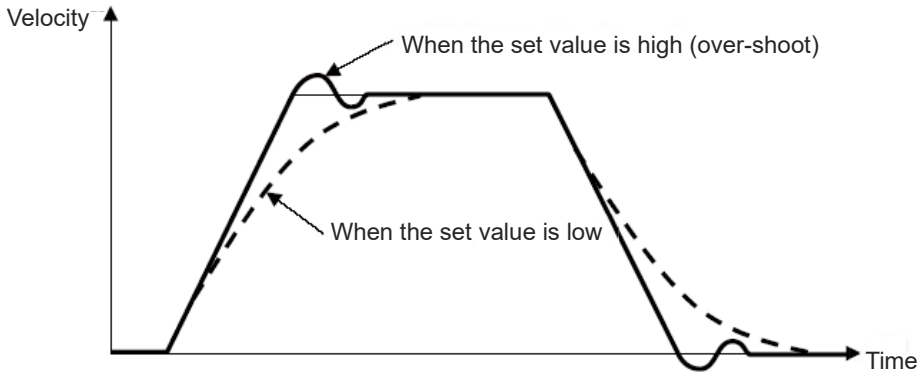
This parameter determines the response of the speed control loop. When the set value is increased, the follow-up ability to the velocity command becomes better (the servo-motor rigidity is enhanced). The higher the load inertia becomes, the larger the value should be set. However, excessively increasing the setting will cause overshooting or oscillation, which facilitates producing the vibrations of the mechanical system.



[16] Velocity loop integral gain (Parameter No.32, 123,129, 135)

No.	Name	Unit	Input range	Default initial value setting
32	Velocity loop integral gain	-	1 to 99,999,999	In accordance with actuator
123	Velocity loop integral gain 1	-	1 to 99,999,999	In accordance with actuator
129	Velocity loop integral gain 2	-	1 to 99,999,999	In accordance with actuator
135	Velocity loop integral gain 3	-	1 to 99,999,999	In accordance with actuator

The parameter which corresponds to deviation caused by external factors, such as friction.
The increased set value improves the repulsive force against load fluctuation.
If it is too high, overshoot and oscillation, as well as vibration in the mechanical system may occur.
Adjust appropriately while observing the response.



[17] Torque filter time constant (Parameter No.33, 124, 130, 136)

No.	Name	Unit	Input range	Default initial value setting
33	Torque filter constant	-	0 to 2,500	In accordance with actuator
124	Torque filter constant 1	-	0 to 2,500	In accordance with actuator
130	Torque filter constant 2	-	0 to 2,500	In accordance with actuator
136	Torque filter constant 3	-	0 to 2,500	In accordance with actuator

This parameter decides the filter time constant for the torque command. When vibration and/or noises occur due to mechanical resonance during operation, this parameter may be able to suppress the mechanical resonance. This function is effective for torsion resonance of ball screws (several hundreds Hz).

[18] Safety velocity (Parameter No. 35)

No.	Name	Unit	Input range	Default initial value setting
35	Safety velocity	mm/s (deg/s)	1 to 250 Note 1	100

This is the parameter to set the maximum speed of manual operation while the safety velocity selected in the teaching tool. Do not have the setting more than necessary.

Note 1 The maximum velocity should be the upper limit for actuators with the maximum velocity less than 250.

[19] Enable function (Parameter No.42)

No.	Name	Unit	Input range	Default initial value setting
42	Enable function	-	0 : Enabling 1 : Disabling	1

Set valid/invalid the deadman switch function if the teaching pendant is equipped with a deadman switch.

[20] Silent interval magnification (Parameter No.45)

No.	Name	Unit	Input range	Default initial value setting
45	Silent interval magnification	-	1 to 10	0

Use this parameter to set the silent interval (no communication) time by the time taken for communication of 3.5 characters or longer before command data transmission when the controller is operated via serial communication (RTU).
This parameter need not be changed when a teaching tool such as PC software is used.
If “0” is set, no multiplier is applied.

[21] Current control width number (Parameter No.54, 125, 131, 137)

No.	Name	Unit	Input range	Default initial value setting
54	Current control width number	-	0 to 15	In accordance with actuator
125	Current control width number 1	-	0 to 15	In accordance with actuator
131	Current control width number 2	-	0 to 15	In accordance with actuator
137	Current control width number 3	-	0 to 15	In accordance with actuator

This parameter is for the manufacturer's use only to determine the response capability of the current loop control. Therefore, do not change the settings in this parameter. If the parameter is changed carelessly, control safety may be adversely affected and a very dangerous situation may result.

[22] Pulse count direction (Parameter No.62)

No.	Name	Unit	Input range	Default initial value setting
62	Pulse count direction	-	0: Forward, 1: Reverse	In accordance with actuator

This parameter is exclusively used for the pulse-train control mode and motion field network control.
Refer to [2.4.2 [4] Checking Pulse Count Direction].

[23] Electronic gear numerator (Parameter No.65)

No.	Name	Unit	Input range	Default initial value setting
65	Electronic gear numerator	-	1 to 99,999,999	1

This parameter is exclusively used for the pulse-train control mode and motion field network control.
Refer to [2.4.2 [5] Electronic gear ratio setting].

[24] Electronic gear denominator (Parameter No.66)

No.	Name	Unit	Input range	Default initial value setting
66	Electronic gear denominator	-	1 to 99,999,999	1

This parameter is exclusively used for the pulse-train control mode and motion field network control.
Refer to [2.4.2 [5] Electronic gear ratio setting].

[25] Positional feedforward gain (Parameter No.71)

No.	Name	Unit	Input range	Default initial value setting
71	Positional feedforward gain	-	0 to 100	In accordance with actuator
121	Positional feedforward gain 1	-	0 to 100	In accordance with actuator
127	Positional feedforward gain 2	-	0 to 100	In accordance with actuator
133	Positional feedforward gain 3	-	0 to 100	In accordance with actuator

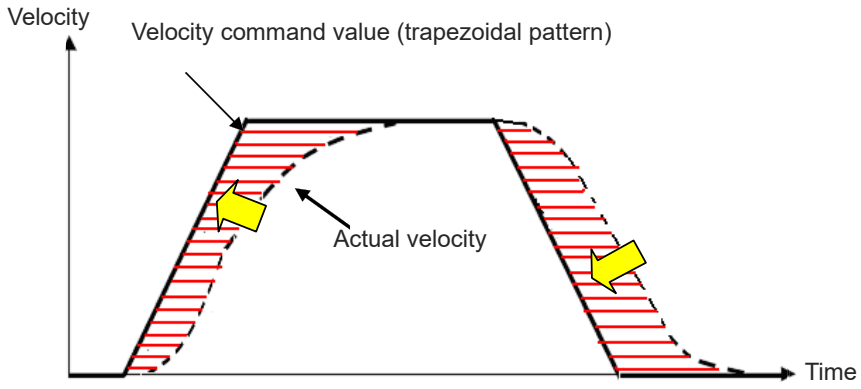
Sets the feed forward gain amount of the position control system.

Performing this setting increases the servo gain and improves responsiveness of the position control loop.
Properly adjust Parameter No. 7 “Servo Gain Number” and Parameter No. 31 “Velocity Loop Proportional Gain”, etc., to further improve the tact time and following performance. As a result, positioning time can be shortened.

Gain adjustment of position, speed, and current loop in the feedback control directly changes the response of the servo control system, so affecting the stability of the control system due to inappropriate setting may cause vibration and abnormal noise. However, this parameter only changes the speed command value, so it is irrelevant to the servo loop, and it would not generate persistent vibration and noise. However, if the setting is excessive, every time it operates, vibration and noise may be generated until the machine follows the command value.

In the trapezoidal pattern, adding the value resulting from multiplying the speed command by the feed forward gain to the speed command can reduce the delay of speed follow-up and the position deviation.

The feedback control providing control in accordance with the result causes control delay to occur. This conducts the supportive control independent from the control delay.



[26] Drive cutoff relay sticking monitoring timer (Parameter No. 72)

No.	Name	Unit	Input range	Default initial value setting
72	Drive cutoff relay sticking monitoring timer	ms	0 to 60,000	3,000

This parameter defines the timer period in which fusing of the emergency stop relay for cutting off the motor drive power is detected.
If the motor AC power is not cut off after elapse of the timer period set by this parameter following the cutoff of the driver power, the control will recognize that the relay has been fused and generate an alarm.
Normally this parameter need not be changed. When a value between 0 and 9 is set, no fusing is detected.

[27] Encoder voltage level (Parameter No.73)

No.	Name	Unit	Input range	Default initial value setting
73	Encoder voltage level	-	0 to 3	Depending on encoder cable length

To stabilize encoder detection signals, this parameter defines the voltage supplied to the encoder circuit to one of four levels in accordance with the encoder type and the length of the encoder relay cable.
Normally this parameter need not be changed. If you have changed the length of the encoder relay cable after the shipment, the value of the parameter may be changed.

[28] Belt breaking sensor input polarity (Parameter No.76)

No.	Name	Unit	Input range	Default initial value setting
76	Belt breaking sensor input polarity	-	0 to 2	In accordance with actuator

Set the sensor input polarity for Alarm Code 0D7 “Belt Break Detection” for Ultra-High Thrust Type RCS2-RA13R.

Set Value	Description
0	not used
1	Input is a contact
2	Input is b contact

Caution

- Changing the setting of this parameter disables the alarm to be detected.

[29] Ball screw lead length (Parameter No.77)

No.	Name	Unit	Input range	Default initial value setting
77	Ball screw lead length	mm (deg)	0.01 to 999.99	In accordance with actuator

This parameter set the ball screw lead length.
The factory setting is the value in accordance with the actuator characteristics.

Caution

- If the setting is changed, not only the normal operation with indicated speed, acceleration or amount to move is disabled, but also it may cause a generation of alarm, or malfunction of the unit.

[30] Fieldbus node address (Parameter No.85)

No.	Name	Unit	Input range	Default initial value setting
85	Fieldbus node address	-	Dependent to network	3

The node address of the slave is to be indicated. The setting range and the settings on delivery should differ depending on the network module to be connected.
Refer to [2.4.2 [1] Fieldbus Node Address (Parameter No. 85)] for how to set up MECHATROLINK-III.

Caution

- Pay attention not to have the node address duplicated to another device.
  The node address being duplicated and there will be a communication error occurred on the master unit side. For details, refer to [Instruction manual for PLC and Muster unit].

[31] Fieldbus baud rate (Parameter No.86)

No.	Name	Unit	Input range	Default initial value setting
86	Fieldbus baud rate	-	Dependent to network	1

This parameter is exclusively used for the controller of field network specification.
Refer to [2.4.2 [2] Fieldbus baud rate (Parameter No.86)] for how to set up MECHATROLINK-III.

[32] Network type (Parameter No.87)

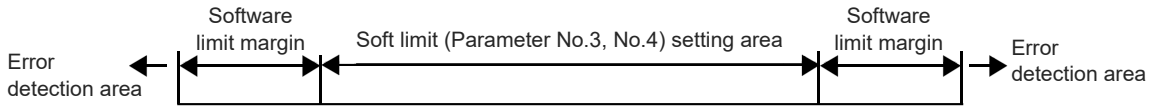
No.	Name	Unit	Input range	Default initial value setting
87	Network type	-	Dependent to network	9

This parameter is exclusively used for the controller of field network specification.
Refer to [2.4.2 [3] Network type (Parameter No.87)] for how to set up MECHATROLINK-III.

[33] Software limit margin (Parameter No.88)

No.	Name	Unit	Input range	Default initial value setting
88	Software limit margin	mm (deg)	0.00 to 9,999.99	In accordance with actuator

This is the parameter to set the position of over error detection against the software limit errors set in Parameters No. 3 and No. 4.
It is not necessary to change the setting in normal use.



[34] Stop method during SrvOFF (Parameter No.110)

No.	Name	Unit	Input range	Default initial value setting
110	Stop method during SrvOFF	-	0: Sudden stop 1: Decelerating stop	0

Selects Servo OFF command, drive source cutoff, and stop mode of actuator during alarm generation (operation cancel level).

Stop command	Set value	
	0: Sudden stop	1: Decelerating stop
	In Normal Position Control Process	In Normal Position Control Process
Pausing	Normal decelerating stop	Normal decelerating Stop
Servo OFF	Sudden stop with emergency stop torque	
Drive-source cutoff		
Alarm (Operation cancel level)		
Alarm (Cold start)	Sudden stop with emergency stop torque	

[35] Calendar function (Parameter No.111)

No.	Name	Unit	Input range	Default initial value setting
111	Calendar function	-	0: Not in use 1: Used	1

This parameter defines whether the calendar function (RTC) is used or not.
Set the current time with using a teaching tool when the calendar function is used.
For details, please refer to the [instruction manual of each teaching tool].

In use of RTC, the alarm occurrence time in the alarm list is the time at which an alarm has occurred.
If RTC is not used, the time of alarm issuance shown in the alarm list counts the time passed since the power is supplied to the controller counted as 0/1/1 00:00:00.
The time data retainable duration with no power supply to the controller is approximately 10 days.

[36] Monitoring mode select (Parameter No.112)

No.	Name	Unit	Input range	Default initial value setting
112	Monitoring mode select	-	0: Not in use 1: Monitor function 1 2: Monitor function 2 3: Monitor function 3	1

The controller can be connected with PC software to monitor the servo.
This parameter allows you to select a monitoring mode function (servo monitor).
Refer to [Help: Servo Monitoring] in IA-OS or [PC Software Instruction Manual (ME0155)] or detail.

Set Value	Description
0	Does not use
1	Sets the 4CH-30000 record mode.
2	Sets the 8CH-15000 record mode.
3	Sets the 2CH-60000 record mode.

[37] Monitoring cycle (Parameter No.113)

No.	Name	Unit	Input range	Default initial value setting
113	Monitoring cycle	ms	1 to 60,000	1

Sets initial value Note 1 of time cycle (sampling cycle) to obtain data when monitoring mode is selected.
Data obtaining interval can be extended by increasing the value of this parameter.
It is set to 1ms in the initial setting. Up to 60,000ms can be set.

Record mode	1ms frequency setting	1000ms frequency setting
2CH-60000	Max. Obtainable Time 60s	Max. Obtainable Time 3,600,000s (60,000 minutes)
4CH-30000	Max. Obtainable Time 30s	Max. Obtainable Time 1,800,000s (30,000 minutes)
8CH-15000	Max. Obtainable Time 15s	Max. Obtainable Time 900,000s (15,000 minutes)

Note 1 Sampling cycle can be changed by using PC software.

[38] Servo gain switch time constant (Parameter No.138)

No.	Name	Unit	Input range	Default initial value setting
138	Servo gain switch time constant	ms	10 to 2,000	10

The switchover of the servo gain should be commanded by G_SEL in SVCMD_IO Field.

Caution

- A time constant being rather short may cause the servo gain to change rapidly to have the operation of the actuator unstable.

[39] Home preset value (Parameter No.139)

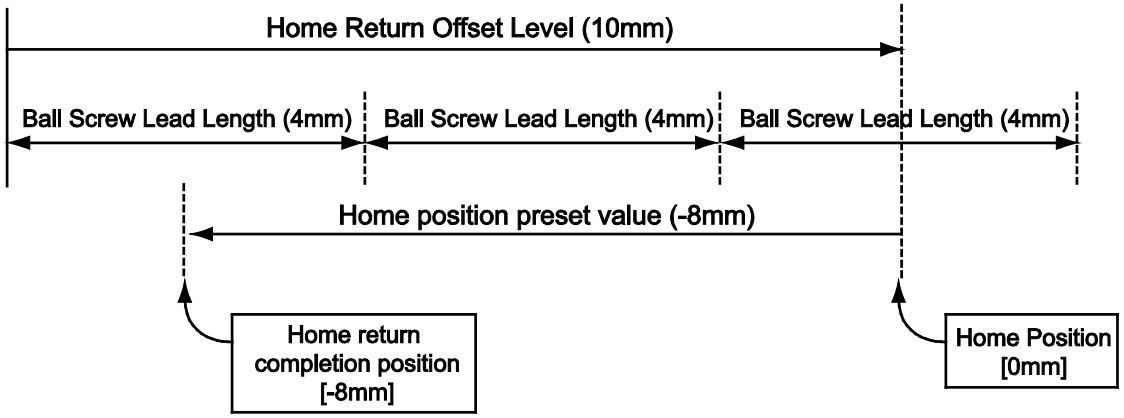
No.	Name	Unit	Input range	Default initial value setting
139	Home preset value	mm (deg)	-9,999.99 to 9,999.99	In accordance with actuator

For the actuator of absolute specification, set this parameter so that “home return offset + value of this parameter” is within the range between “0 and the ball screw lead”. (as it is necessary to register the Z-phase nearest to the mechanical end as the datum)
The value should be an integer multiple of ±ball screw lead length including 0.00.
(If the home return offset is within the range between 0 and ball screw lead length, the value of this parameter is 0.00.)
Also, when a value other than 0.00 is set in this parameter, home-return complete position cannot be 0.00, and it gets to the positon of home position + this parameter.

Caution

- If the above condition is not satisfied, the home position at restart after home return may shift by an integer multiple of the ball screw lead.

<Setting example >
With ball screw lead length 4mm and home return offset level 10mm, set this parameter to -8mm.

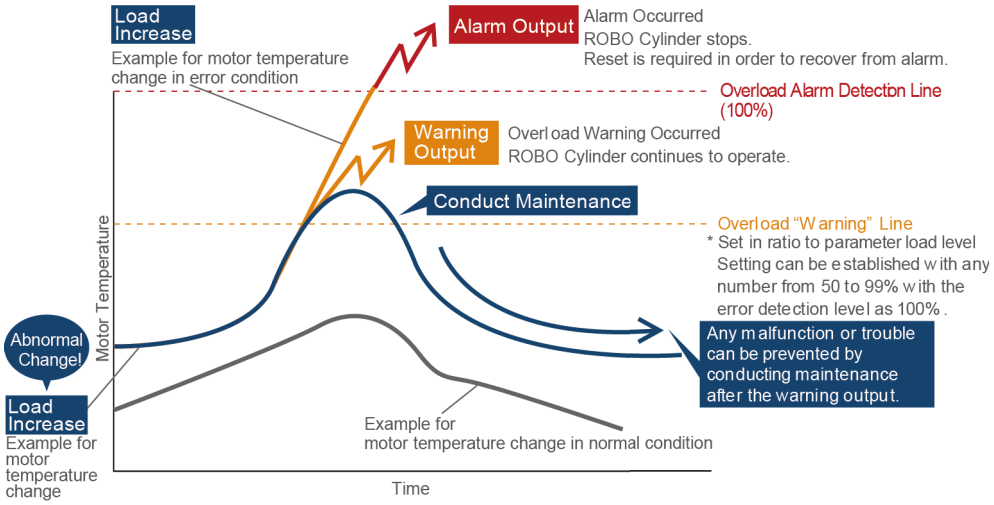


[40] Overload level ratio (Parameter No.143)

No.	Name	Unit	Input range	Default initial value setting
143	Overload level ratio	%	50 to 100	100

With the motor thrust increase temperature of when an overload alarm gets generated being set as 100%, alarm 048 “Overload warning” (message level) is output when the motor temperature exceeds the rate set in this parameter.
The judgment would not be made if the value is set to 100%.

[Applied: prevention function]
By setting this parameter, warning output (*BALM/*OVLW/*ALML Signal) notifies you before the equipment stops by error in case that the motor temperature rises due to load condition change caused by dry-up of grease or wear-out of components.



Warning output enables detection of items such as those below.
- Time to supply grease
- Time to replace components
- Time to implement mechanical tuning

[41] Total travel count threshold (Parameter No.147)

No.	Name	Unit	Input range	Default initial value setting
147	Total travel count threshold	times	0 to 999,999,999	0 (Disabled)

When total travel count exceeds the set value of this parameter, alarm 04E “Travel Count Threshold Over” will send a notification.
No judgment will be made when set as “0”.

[42] Total travel distance threshold (Parameter No.148)

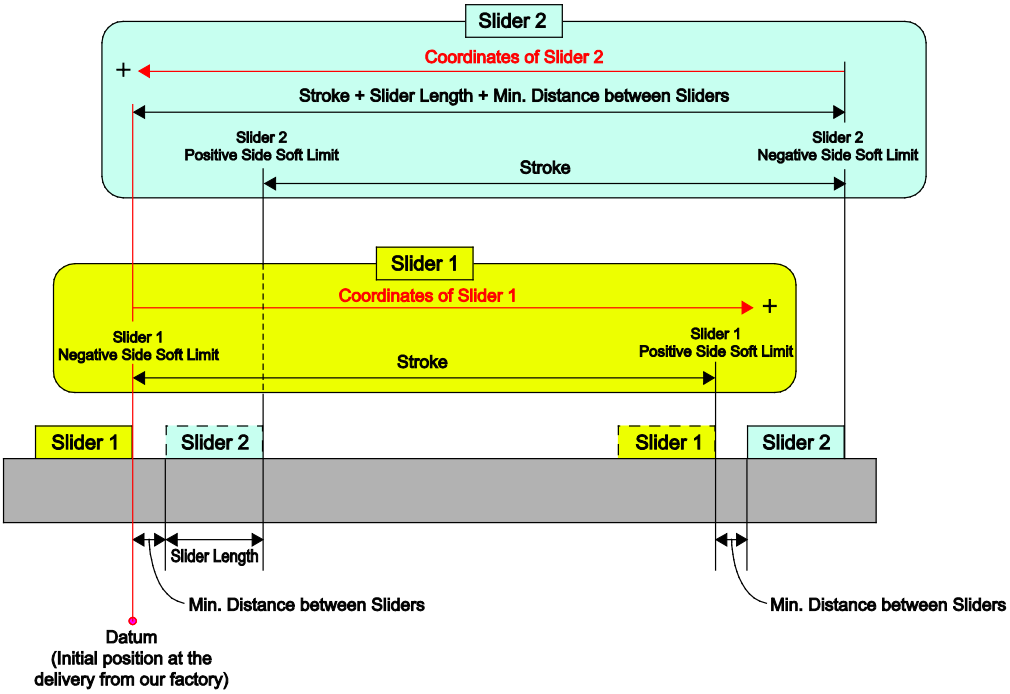
No.	Name	Unit	Input range	Default initial value setting
148	Total travel distance threshold	m	0 to 999,999,999	0 (Disabled)

When total travel distance exceeds the set value of this parameter, alarm 04F “Travel Distance Threshold Over” will send a notification.
No judgment will be made when set as “0”.

[43] Linear absolute home preset value (Parameter No.150)

No.	Name	Unit	Input range	Default initial value setting
150	Linear absolute home preset value	mm	-9,999.99 to 9,999.99	In accordance with actuator

This can set the home position of the actuator for Spurious Absolute Type.
This can set the home position of the actuator for Spurious Absolute Type.The diagram below shows the position of each part related to the datum (the initial position at the delivery from our factory):



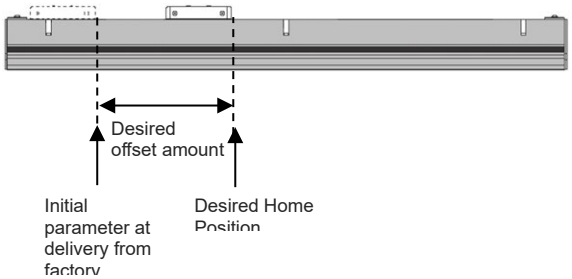
Caution

- Note the initial parameter at the delivery from our factory in a memo before changing the settings.
- Take the initial parameter at the delivery from our factory as the datum when giving a change to the settings.
- After having a change to the settings, make sure to have an operation check with low speed.
- For the spurious absolute type actuator, No.22: Home-return Offset Value and No.139: Home Preset Value are invalid.

When a change is required to the home position, do a calculation following the formula below and input the calculated value to the parameter.

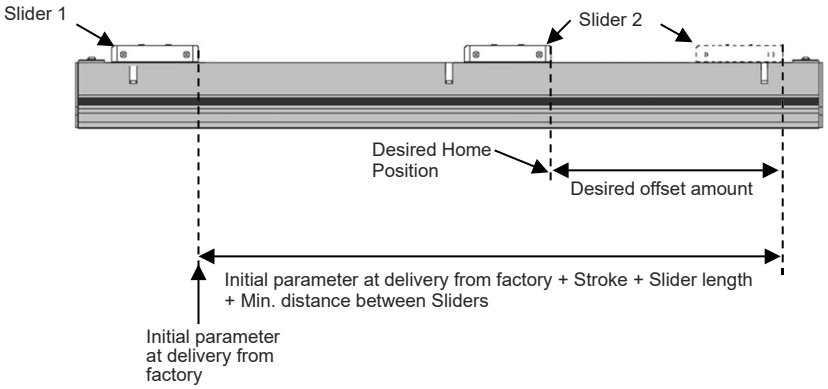
1. Setting for Single Slider Type:

   Parameter setting value = Initial parameter at delivery from factory (Parameter No.150) + Desired offset amount



2. Setting on Slider 2 for Double Slider Type (Refer to 1) for Slider 1):

   Parameter setting value = [Initial parameter at delivery from factory (Parameter No.150) + Stroke (value indicated when purchased) + Slider length (value shown in catalog) + Min. distance between Sliders (value shown in catalog)] – Desired offset amount

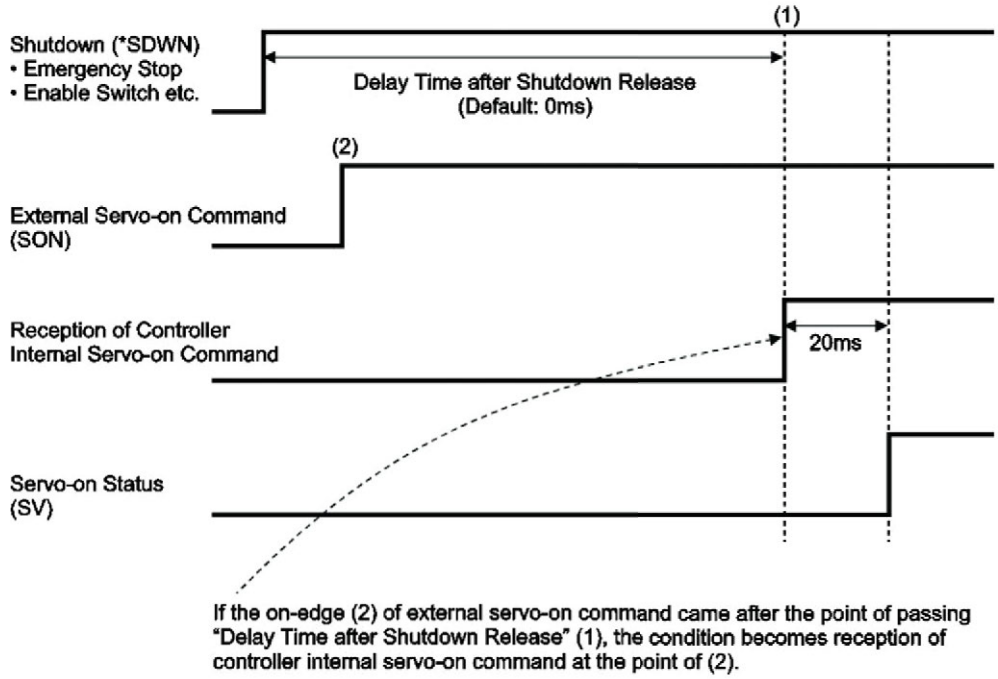


[44] Delay time after shutdown release (Parameter No.165)

No.	Name	Unit	Input range	Default initial value setting
165	Delay time after shutdown release	ms	0 to 10,000	0

Time setting before getting available to turn the servo ON when the startup of the drive source is slow due to a reason e.g. an external drive cutoff circuit after the emergency stop canceled should be established. There is no need to change the setting if the drive source is to be cut off only with the drive cutoff relay inside the controller.

Example of use) When drive cutoff is constructed externally



[45] Actuator Identification feature (Parameter No.192)

No.	Name	Unit	Input range	Default initial value setting
192	Actuator Identification feature	-	0: Not for use 1: Used	In accordance with actuator

The following information saved in the actuator side should be read out.
It can also be checked in the PC teaching software and a teaching pendant.

1. Manufacturing Number / Model Code
2. User Memo (Domain available for User to Write)
3. Maintenance Data (Drive Distance, Movement Count, etc.)

[46] JOG switch (Parameter No.194)

No.	Name	Unit	Input range	Default initial value setting
194	JOG switch	-	0 : Enabled, 1 : Disabled	0

Enable/disable can be selected with the job switch on the front of the controller.
Either Enabled or Disabled can be selected for the JOG switch on the front of the driver unit.

[47] Virtual axis (Parameter No.195)

No.	Name	Unit	Input range	Default initial value setting
195	Virtual axis	-	0 : Disabled, 1 : Enabled	0

The feature capable of operation simulation without connecting an actuator should established. Status data such as the current position and the current velocity should be generated “as if there was an actuator connected”.

[48] Virtual axis absolute initial position (Parameter No.196)

No.	Name	Unit	Input range	Default initial value setting
196	Virtual axis absolute initial position	mm (deg)	-9,999.99 to 9,999.99	0

The initial position of the simulation feature should be set up.

[49] Safety unit enable/disable select (Parameter No.199)

No.	Name	Unit	Input range	Default initial value setting
199	Safety unit enable/disable select	-	0 : Disabled, 1 : Enabled	0

Setting whether to use / not to use the functional safety unit. Alarm 08B “Safety Unit Initializing Error” should occur if the setting in this parameter and the status of hardware would not match.

[50] Position data unit (Parameter No.207)

No.	Name	Unit	Input range	Default initial value setting
207	Position data unit	-	0: 0.01mm 1: 0.001mm	In accordance with actuator

In the motion type, the display unit at the current position displayed in IA-OS and TP should be switched over.

[51] System I/O enable feature (Parameter No.209)

No.	Name	Unit	Input range	Default initial value setting
209	System I/O enable feature	-	0: Always Enabled, 1: Disabled	0

[52] Drive recorder mode select (Parameter No.210)

No.	Name	Unit	Input range	Default initial value setting
210	Drive recorder mode select	-	0: Disabled, 1: 4CH, 2: 8CH, 3: 2CH	2

The number of data to be acquired in the drive recorder feature should be selected.
For details, refer to [SCON2 Instruction Manual (ME0458) Drive Recorder Feature]

[53] Drive recorder save history select (Parameter No.211)

No.	Name	Unit	Input range	Default initial value setting
211	Drive recorder save history select	-	0: 3 History, 1: 6 History, 2: 12 History	0

The number of data available for display in the drive recorder feature should be selected.
For details, refer to [SCON2 Instruction Manual (ME0458) Drive Recorder Feature]

[54] Drive recorder sampling frequency (Parameter No.212)

No.	Name	Unit	Input range	Default initial value setting
212	Drive recorder sampling frequency	ms	1 to 1,000	10

The cycle to acquire data in the drive recorder feature should be changed.

For details, refer to [SCON2 Instruction Manual (ME0458) Drive Recorder Feature]

SCON2 - Motion

Chapter 7

Troubleshooting

7.1 Action to Be Taken upon Occurrence of Problem

If a problem occurs, check the following points first in order to ensure quick recovery and prevent recurrence of the problem.

(1) Status Display LED on Controller and Network Status LED

LED	Display	Status
PWR	Green Light ON	System ready (normal CPU operation)
	Light OFF	Power OFF
SV	Green Light ON	Servo ON (operation available)
	Light on Green Blinking	During AUTO servo OFF
	Light OFF	Servo OFF
ALM	Orange Light ON	Alarm being generated (operation release or cold start level alarm)
STOP	Red Light ON	Emergency stop (regardless of alarms)
WRG	Light on Orange Blinking	Message level alarm being generated
SAFE	Red Light ON	SS1-t In process for input

(2) Check whether an alarm occurs on the host controller (PLC, etc.).
(3) Check the voltage of the main power supply.
(4) Check the voltage of power supply for the PIO.
(5) Check the voltage of the power supply for brake (For the actuator with the brake).
(6) Confirm the generated alarm Note 1
Check the alarm code on the teaching tool such as PC software.
(7) Check the connectors for disconnection or incomplete connection
(8) Check the cables for connection error, disconnection or snagging.
Before performing a continuity check, turn off the power (to prevent electric shocks) and disconnect the cables of measuring instruments (to prevent accidental power connection due to sneak current path).
(9) Check the I/O signals
Using the host controller (PLC, etc.) or a teaching tool such as PC software, check the presence of inconsistency in I/O signal conditions.
(10) Check the noise elimination measures (grounding, connection of noise suppressor, etc.)
(11) Check the events leading to the occurrence of the problem Note1, as well as the operating conditions at the time of occurrence
(12) Analyze the cause
(13) Countermeasures

Note 1 As SCON2 is equipped with the calendar function, it is available to check the date and time of an alarm occurrence.
Set the date and time such from teaching tool as a IA-OS or Gateway Parameter Setting Tool at the first time when the controller power is turned on.
Once the setting is established, the clock data will be retained for approximately ten days even if the controller power is turned off.
Without establish setting or if the clock data is lost, the display shows 00Year00Month01Day01Hour00Minute00Second. Even if the clock data is lost, the error code occurred in the past will be remained.
The alarms explained in this chapter will not include errors that can occur on the PC software or teaching tool.

Notice

- When proceeding with troubleshooting, exclude normally functioning parts from the targets to narrow down the causes.
- First, check (1) to (11) so that countermeasures can be taken swiftly.

7.2 About Alarms

Check in [SCON2 Instruction Manual (ME0458) Chapter 8 Troubleshooting] for the details of alarms generated in the SCON2.

* When an alarm is generated, it is basically required to stop the operation of an actuator and turn the servo off.

Caution

- Reset each alarm after identifying and removing the cause.
  If the cause of the alarm cannot be removed or when the alarm cannot be reset after removing the cause, please contact IAI.
- If the same error occurs again after resetting the alarm, it means that the cause of the alarm has not been removed.
- If a controller or actuator is found malfunctioned, consider to repair or replace it.

SCON2 - Motion

Chapter 8

Warranty

8.1 Warranty period

Whichever of the following periods is shorter:

- 18 months after shipment from IAI
- 12 months after delivery to a specified location
- 2,500 operational hours

8.2 Scope of the warranty

Our products are covered by warranty when all of the following conditions are met.
Faulty products covered by warranty will be replaced or repaired free of charge:

(1) The breakdown or malfunction in question pertains to our product as delivered by IAI or our authorized dealer.
(2) The breakdown or malfunction in question occurred during the warranty period.
(3) The breakdown or malfunction in question occurred while the product was in use for an appropriate purpose under the operating conditions and operating environment specified in the instruction manual and catalog.
(4) The breakdown or malfunction in question was caused by a specification defect, malfunction, or poor product quality.

Note that breakdowns due to any of the following reasons are excluded from the scope of warranty:

- Anything other than our product
- Modification or repair performed by a party other than IAI (unless approved by IAI)
- Anything that could not be easily predicted with the level of science and technology available at the time of shipment from IAI
- Natural disaster, unnatural disaster, incident or accident for which we are not liable
- Natural fading of paint or other symptoms of aging
- Wear, depletion or other expected results of use
- Operation noise, vibration or other subjective sensations not affecting function or maintenance

Note that the warranty only covers our product as delivered and that any secondary loss arising from a breakdown of our product is excluded from the scope of warranty.

8.3 Honoring the warranty

As a rule, the product must be consigned to IAI for repair under warranty.

8.4 Limited liability

(1) We assume no liability for any special damage, consequential loss or passive loss such as a loss of expected profit arising from or in connection with our product.
(2) We assume no liability for any program or control method created by the customer to operate our product or for the results of any such program or control method.

8.5 Conformance with applicable standards/regulations, etc., and application conditions

(1) If our product is combined with another product or any system, equipment, etc., used by the customer, the customer must first check the applicable standards, regulations and/or rules. The customer is also responsible for confirming that such combination with our product conforms to the applicable standards, etc.
In such a case we assume no liability for the conformance of our product with the applicable standards, etc.
(2) Our product is for general industrial use. It is not intended or designed for the applications specified below, which require a high level of safety. Accordingly, as a rule our product cannot be used in these applications.
Contact IAI if you must use our product for any of these applications:
- Medical equipment used to maintain, control or otherwise affect human life or physical health
- Mechanisms and machinery designed for the purpose of moving or transporting people (vehicles, railway facilities, aviation facilities etc.)
- Machinery components essential for safety (safety devices etc.)
- Equipment used to handle cultural assets, art or other irreplaceable items

(3) Contact IAI in advance if our product is to be used in any condition or environment that differs from that specified in the catalog or instruction manual.

8.6 Other items excluded from warranty

The price of the product delivered to you does not include expenses associated with programming, the dispatch of engineers, etc. Accordingly, a separate fee will be charged in the following cases even during the warranty period:

- Guidance for mounting/adjustment and witnessing of test operation
- Maintenance and inspection
- Technical guidance and education on operating/wiring methods, etc.
- Technical guidance and education on programming and other items related to programs

Revision History

Revision date	Revised content
2023.6	First Edition
2023.11	1B Edition Reference Wiring Cable Model Code: JEPC → JEPMC Delete Parameter No.75 “Electromagnetic brake power supply monitoring”
2024.04	1C Edition Preliminaries - International Standard Compliance updated (SCON2-CG applicable for UL) 1.2 Correction made to absolute battery holder 1.3 Supplementary explanation added and period corrected in models (equipped with multiple function connector)

Manual No.: ME0471-1C (April 2024)

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24.04.000