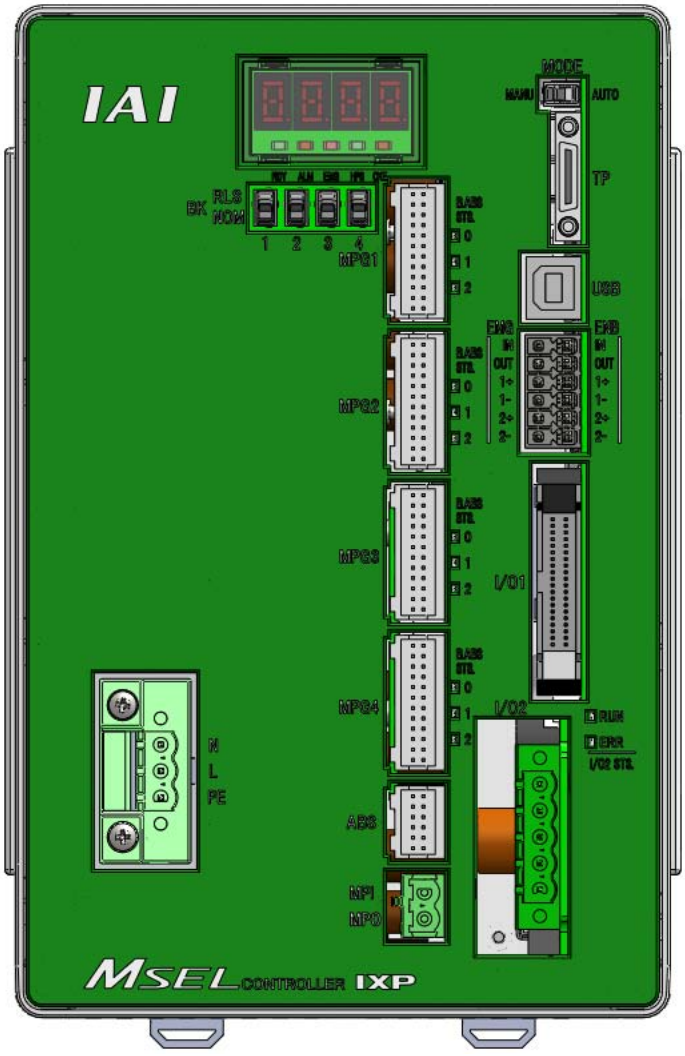
MSEL

MSEL Controller

Instruction Manual　Fifth Edition



IAI Corporation

Please Read Before Use

Thank you for purchasing our product.

This Instruction Manual describes all necessary information items to operate this product safely such as the operation procedure, structure and maintenance procedure.

To ensure the safe operation of this product, please read and fully understand this manual.
The enclosed DVD in this product package includes the Instruction Manual for this product.
For the operation of this product, print out the necessary sections in the Instruction Manual or display them using the personal computer.

After reading through this manual, keep this Instruction Manual at hand so that the operator of this product can read it whenever necessary.

[Important]

- This Instruction Manual is original.
- The product cannot be operated in any way unless expressly specified in this Instruction Manual. IAI shall assume no responsibility for the outcome of any operation not specified herein.
- Information contained in this Instruction Manual is subject to change without notice for the purpose of product improvement.
- If you have any question or comment regarding the content of this manual, please contact the IAI sales office near you.
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- The company names, names of products and trademarks of each company shown in the sentences are registered trademarks.

Table of Contents

Starting Procedures

When using this product for the first time, make sure to check the safety guide in the next section, and then start working with care to avoid mistakes and incorrect wiring by referring to the procedure below.

> ⚠ *Warning :*
> - *Make sure to put the brake release switch on the bottom side (NOM) before turning ON the power. If on the top side (RLS : Compulsory Release), the actuator may drop with its weight and pinch yourself or damage the work piece.*
> - *Make sure to connect the robot with the manufacturing number indicated on the controller.*
>
> *Connecting other than not indicated may cause a wrong operation.*

Check of Packed Items
Are there all the delivered items?
No → Contact us or our distributor.

↓ Yes

Installation and Wiring [Refer to Chapter 1 and 2.1]
Perform the installation of and wiring for the actuator and controller.

↓

Point Check Item
• Is frame ground (FG) and protection earthing (PE) connected? • Has the noise countermeasure been taken?

↓

Power Supply and Alarm Check
Connect a teaching tool such as PC, turn the operation mode setting switch to “MANU” side and turn the power ON for unit.

↓

Check Item
Is the panel window showing “rdy”?
No → Connect the teaching tool such as PC to confirm the content of alarm and have an appropriate treatment.
- It is necessary to supply I/O power for PIO type. When I/O is not to be used, set I/O Parameter No. 10 = 0
- Connect to the upper master for fieldbus type (Set I/O parameter No. 18 = 0 when not connecting to master)

↓ Yes

Servo ON
Turn the servo ON with the operation on the teaching tool such as PC.

> ⚠ *Caution*
> *Please perform this process with the actuator away from the mechanical end or interfering subjects as much as possible. Put the actuator away if it interferes with surroundings. It may generate an alarm if the actuator hit the mechanical end or interfering subjects when the servo is turned ON.*
> *The slider may get slightly dropped by self-weight if servo ON and OFF is repeatedly performed at the same position. Be careful not to pinch the hand or damage the work.*

↓

Check Item
Confirm that “Servo-ON: SV” is turned on in a teaching tool such as PC.
No → If an alarm is generated, connect the PC or teaching pendant and check the content of the alarm to have the right treatment.

↓ Yes

Safety Circuit Check
Does the emergency stop circuit (drive cutoff circuit) work properly and turn the servo OFF?
No → Check the emergency stop circuit.

↓ Yes

Operation check on actuator
Check by JOG operation that operation of the full stroke can be performed with no abnormality.

> ⚠ *Caution*
> - *To ensure safety, it is recommended that safety speed be enabled during initial movements.*
> - *When putting the brake release switch to “RLS” side on a robot installed vertically, pay attention not to pinch fingers or damage a hand by the actuator dropped by its own weight.*

Now, preparation for operation is complete.
[Refer to Section 3 for how to operate]

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 on the AC power cable of the controller and the grounding plate in the control panel, make sure to use a twisted pair cable with wire thickness 0.5mm^2 (AWG20 or equivalent) or more 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 technical standards). ● Perform Class D Grounding (former Class 3 Grounding with ground resistance 100Ω or below).

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 cover or untightened 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

Controller Model Codes and Applicable Actuators

The controllable actuator differs depending on the model code for this controller.

No.	Model	Type	Controllable Actuator
1	MSEL-PCX3	Standard specification	Power-con SCARA robot
2	MSEL-PGX3	Safety category compliant specification*2	
3	MSEL-PCX4	Standard specification	Power-con SCARA robot + additional axis within 1 axis
4	MSEL-PGX4	Safety category compliant specification*2	
5	MSEL-PC	Standard specification	Multi-Axis 4 axes or less*1 (With no connection of high-thrust axis)
6	MSEL-PG	Safety category compliant specification*2	
7	MSEL-PCF	High-thrust specification	Multi-Axis 4 axes or less*1 (With high-thrust axis connected to 1st axis or 1st and 2nd axes)
8	MSEL-PGF	High-thrust safety category compliant specification*2	

*1 Robo cylinder RCP2/RCP3/RCP4/RCP5/RCP6
*2 Category B to 3

Precautions in Operation

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

2. Wait for 5 seconds or more before rebooting the power.
   For the reason of controller circuit structure, startup may not be conducted in normal condition if the time to turn the power ON after turning it OFF (rebooting) is too short.

3. Use a dedicated teaching tool.
   Check in 1.1.2 Teaching Tool for the PC software and the teaching pendant applicable for this controller.

4. Backup the data to secure for breakdown.
   Such data as the position data, programs, parameters and so on registered to this controller is maintained by being written to the non-volatile memory. Therefore, you will not usually lose the data even if the power is shut down. However, make sure to save the latest data so a quick recovery action can be taken in case when the controller is broken and needs to be replaced with another one.

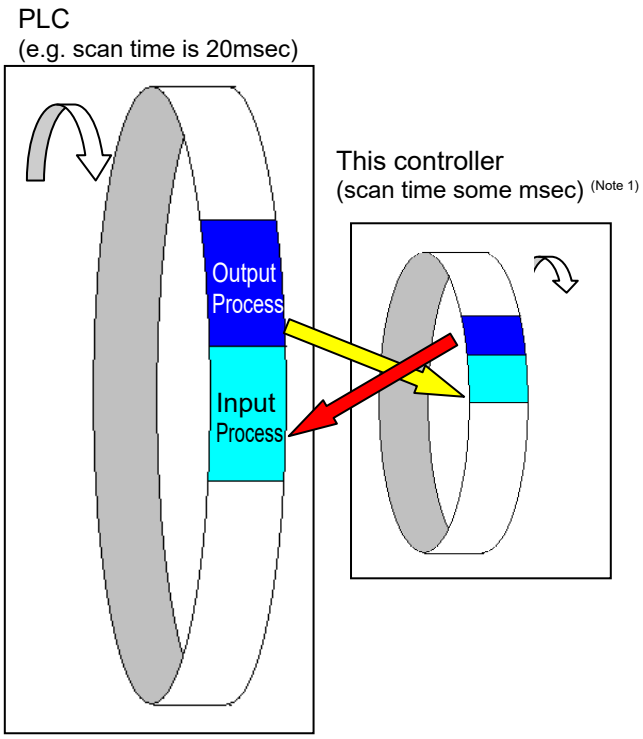
   How to Save Data
   (1) Save the data to external memory or hard disk with using the PC software
   (2) Hard-copy the information of position tables and parameters on paper

5. Clock Setting in Calendar Function
   There may be a case that “Error Code 228 Calendar Data Lost Error (RTC Vibration Generated Stop Detected)” occurs at the first startup after delivery. In the case this happens, set the current time with a teaching tool. [Refer to Teaching Tool Instruction Manual described in 1.1.2 Teaching Tool (Option)]
   If the battery is fully charged, the clock data is retained for approximately 10 days after the power is turned off. Even though the time setting is conducted before the product is shipped out, the battery is not fully charged. Therefore, there may be a case that the clock data is lost even with fewer days than described above passed since the product is shipped out.

6. Transference of PIO Signal between Controllers

Please note the following when conducting transference of PIO signal between controllers.
To certainly transfer the signal between controllers with different scan time, it is necessary to have longer scan time than the one longer than the other controller. To ensure to end the process safely, it is recommended to have the timer setting more than twice as long as the longer scan time at least.

● Operation Image



As shown in the diagram, the input and output timings of two devices that have different scan time do not match, of course, when transferring a signal.
There is no guarantee that PLC would read the signal as soon as this controller signal turns on.
In such a case, make the setting to read the signal after a certain time that is longer than the longer scan time to ensure the reading process to succeed on the PLC side.
It is the same in the case this controller side reads the signal.
In such a case, it is recommended to ensure 2 to 4 times of the scan time for the timer setting margin.
It is risky to have the setting below the scan time since the timer is also processed in the scan process.
In the diagram, PLC can only read the input once in 20msec even though this controller output once in some msec.
Because PLC only conducts output process once in 20msec, this controller identifies the same output status for that while.

Also, if one tries to read the signal that is being re-written by the other, the signal may be read wrongly.
Make sure to read the signal after the rewriting is complete. (It is recommended to have more than 2 scan periods to wait.) Make sure not to have the output side to change the output until the other side completes the reading. Also, a setting is made on the input area not to receive the signal less than a certain time to prevent a wrong reading of noise. This duration also needs to be considered.

Note 1 Because this controller performs two or more processing works including program execution and error processing, in addition to I/O processing, the scan time in not fixed.

7. PLC Timer Setting (Reference)

Do not have the PLC timer setting to be done with the minimum setting.
Setting to “1” for 100msec timer turns ON at the timing from 0 to 100msec while 10msec timer from 0 to 10msec for some PLC.
Therefore, the same process as when the timer is not set is held and may cause a failure.
Set “2” as the minimum value for the setting of 10msec timer and when setting to 100msec, use 10msec timer and set to “10”.

8. Regarding Battery-less Absolute Type Actuator at the Excluding of the SCARA Axis

The battery-less absolute type actuator can have the setting switched over between the absolute type and incremental type with the parameters.

- Parameter No.38 Encoder ABS/INC Type
  Set to 0 = Incremental Type
  Set to 2 = Absolute Type

9. Regarding Battery-less Absolute Type Actuator

1) For the first time to turn the servo on after turning on the power, it will have slight position adjustment due to the characteristics of the stepping motor.
   At that time, the current position displayed on the teaching tool before turning the servo on is the coordinates before adjustment operation. Shown below is the maximum amount of movement.

Linear Drive Axis	:	Actuator Lead Length × 0.025 [mm]	
SCARA Axis	:	J1, J2 Axis	4.9[mm] · · Arm Length 350mm Type
			4.3[mm] · · Arm Length 450mm Type
		Vertical Axis	0.2[mm]
		Rotary Axis	2.7deg

2) After the first time the servo is tuned on after the power has been supplied, the home-return complete signal and the limit switch output signal (LS) are output.

3) When the first servo-on is conducted out of the soft limit range, an error would not be output.
   Soft limit monitoring starts after it is moved into the range.

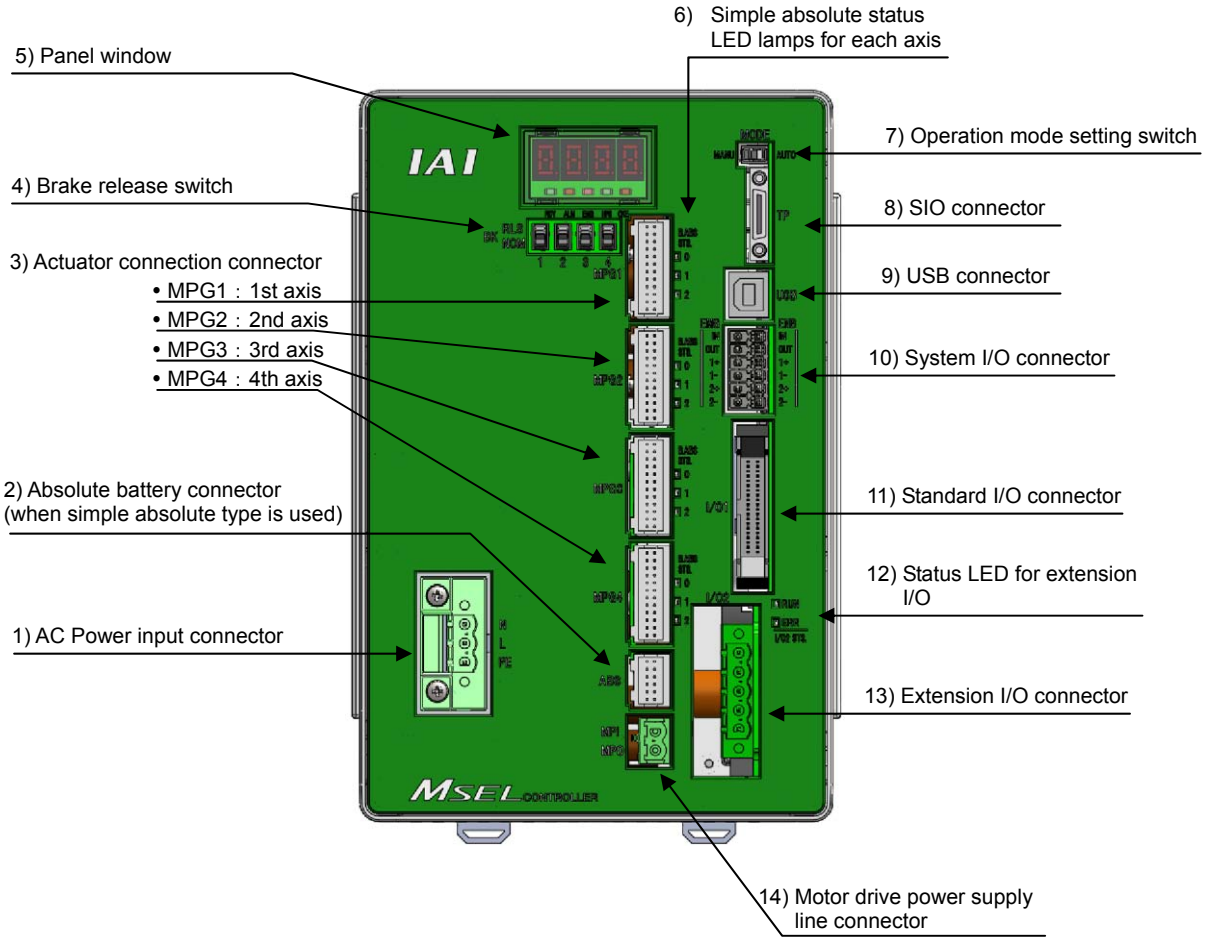
International Standards Compliances

MSEL comply with the following international standards:
Refer to Overseas Standard Compliance Manual (ME0287) for more detailed information.

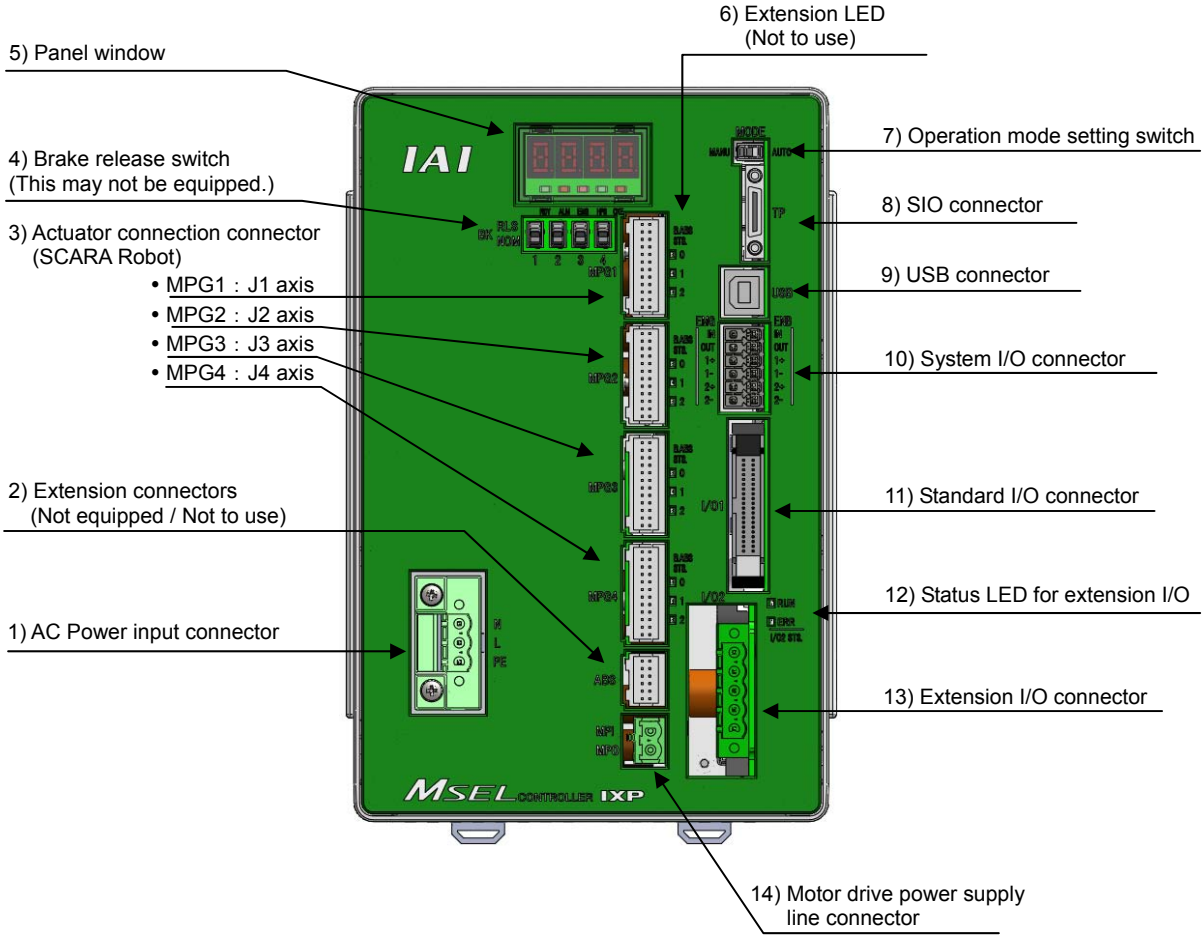
RoHS Directive	CE Marking	UL
○	○ (except for PCX)	To be scheduled

Name for Each Parts and Their Functions

[1] PC/PG/PCF/PGF Type (Cartesian, Single-Axis Robot Control Type)



[2] PCX/PGX Type (IXP Series SCARA Robot Control Type)



1) AC power input connector
Supply the main power source, single-phase 100V to 230V AC.

> ⚠ *Warning : Do not attempt to touch this connector or wires while the power is on as it may cause electric shock.*
> *Make sure to ground the protection earthing "PE" terminal to prevent electric shock.*

2) Absolute battery connector (PC/PG/PCF/PGF type dedicated)
It is mounted for Simple Absolute Type. A battery box placed separately is to be connected with one cable for four axes. It is not to be mounted for Incremental Type and Battery-less Absolute Type.

3) Actuator connection connector [MPG1 to MPG4]
Connect the motor encoder cable of the actuator.
Connect the 1st axis (J1) to "MPG1", and connection made up to "MPG4" = 4th axis (J4) in order.

4) Brake release switch (each axis of 1 to 4)
It is the switch to release the brake compulsorily (excitation release) for the actuator equipped with a brake. When it is desired to move an actuator manually in such cases as to set up the equipment, in teaching and in an error, the brake can be compulsorily released by putting the switch to RLS side after turning the power on.
Keep the switch set on NOM side unless necessary.

Switch position		Function
RLS (Brake release)	Top side	Brake is released compulsorily.
NOM (Automatic mode)	Bottom side	Brake gets controlled automatically by controller. Servo ON : Brake release Servo OFF : Brake effective

⚠ *Warning : After conducting the brake compulsory release, make sure to set the switch back to NOM (automatic mode) so the controller can perform the automatic control on the brake. In RLS (brake release), it is very dangerous as the brake would not work when emergency stop is occurred or servo is turned OFF. For vertically mounted actuators, the slider or rod can drop and it may cause a critical accident.*

5) Panel window
It shows the controller status with the 4-digit 7-segment display and 5 LED lamps.

6) Simple Absolute Status LED Lamps for Each Axis (PC/PG type dedicated)
This displays the status of simple absolute. This status display is not equipped for Incremental Type and Battery-less Absolute Type. [Refer to 3.3.3 Status LED]

7) Operation mode setting switch
It is a switch to indicate the operation mode of the controller.

Switch position		Function
MANU (Operation mode)	Left side	Teaching tool is activated.
AUTO (Automatic mode)	Right side	Teaching tool is inactivated. (Note) Apply the enclosed dummy plug (DP-4S) to SIO connector for PG / PGX types. Emergency stop cannot be cancelled if it is not plugged.

8) SIO connector
It is the connector dedicated for the connection of a teaching tool.

9) USB connector
It is a connector to plug in a USB. It is used to connect a teaching tool by USB connection.

⚠ *Caution :*
- *USB connector and SIO connector cannot be used at the same time. USB connection is prioritized.*
- *When using the USB ports, connect the controllers to use one by one, and install the USB driver stored in the XSEL PC software CD-ROM. See the instruction manual of XSEL PC software for how to install.*
- *Apply the enclosed dummy plug (DP-4S) to SIO connector when using the USB ports.*

10) System I/O connector
It is the input and output connectors to manage the safety control on the controller. For PG / PGX types (safety category complied), it is available to comply with up to category 3 by connecting an external safety circuit to this controller.

11) Standard I/O connector
It is the connector to apply PIO signals of 16 points each of general-purposed input and output.

12) Status LED for extension I/O
It shows the status of PIO or fieldbus plugged to the extension I/O connector.
[Refer to Status LED in Section 3.3.3]

13) Extension I/O connector
It is equipped when PIO or fieldbus is selected as the extension I/O. It is a connector for the general-purposed I/O signal for PIO type and for connection of each fieldbus for fieldbus type.

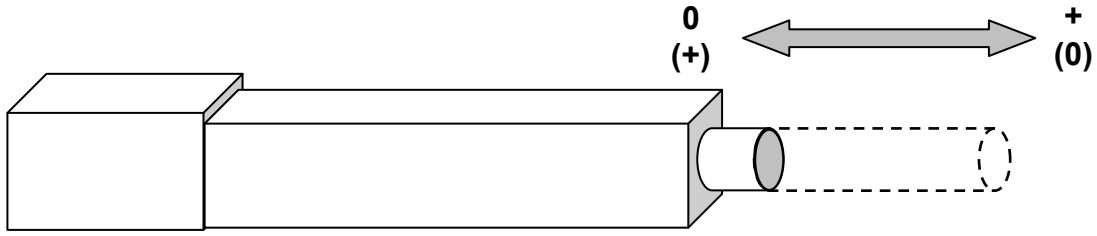
14) Motor drive power supply line connector
It is generally used by short-circuiting MPI and MPO. When supply / cut off the motor driving power externally to construct the safety circuit, connect a contact point between MPI and MPO.

Actuator Axes

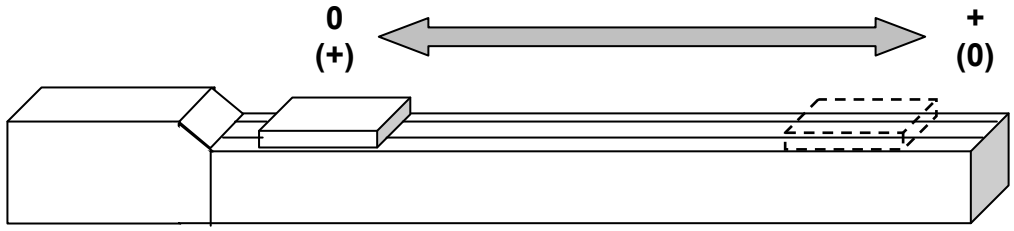
Refer to the pictures below for the actuator axes that can be controlled
0 defines the home position, and items in ( ) are for the home-reversed type (option).

> ⚠ *Caution: There are some actuators that are not applicable to the origin reversed type. Check further on the catalog or the Instruction Manual of the actuator.*

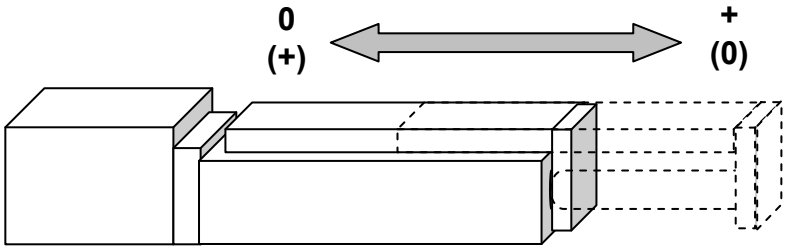
(1) Rod Type



(2) Slider Type

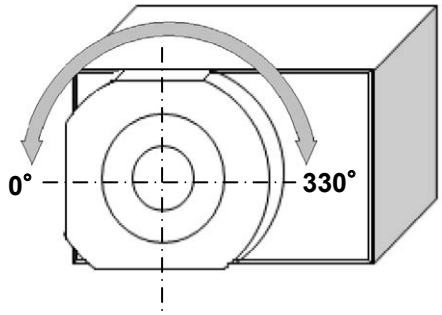


(3) Table Type

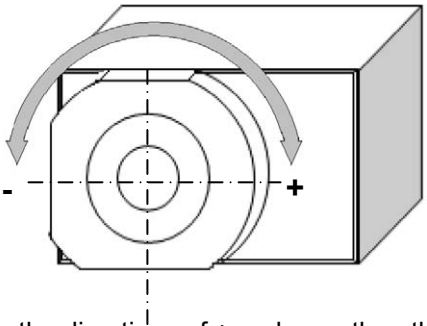


(4) Rotary Type

(330° rotation specification)

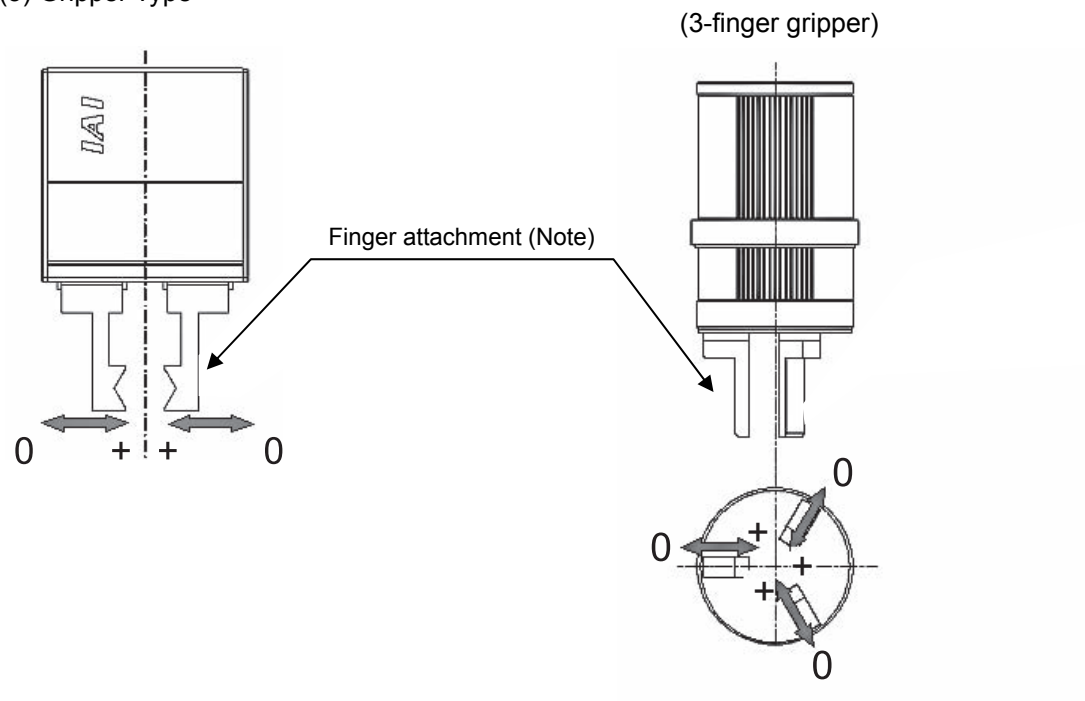


(Multi rotation specification)



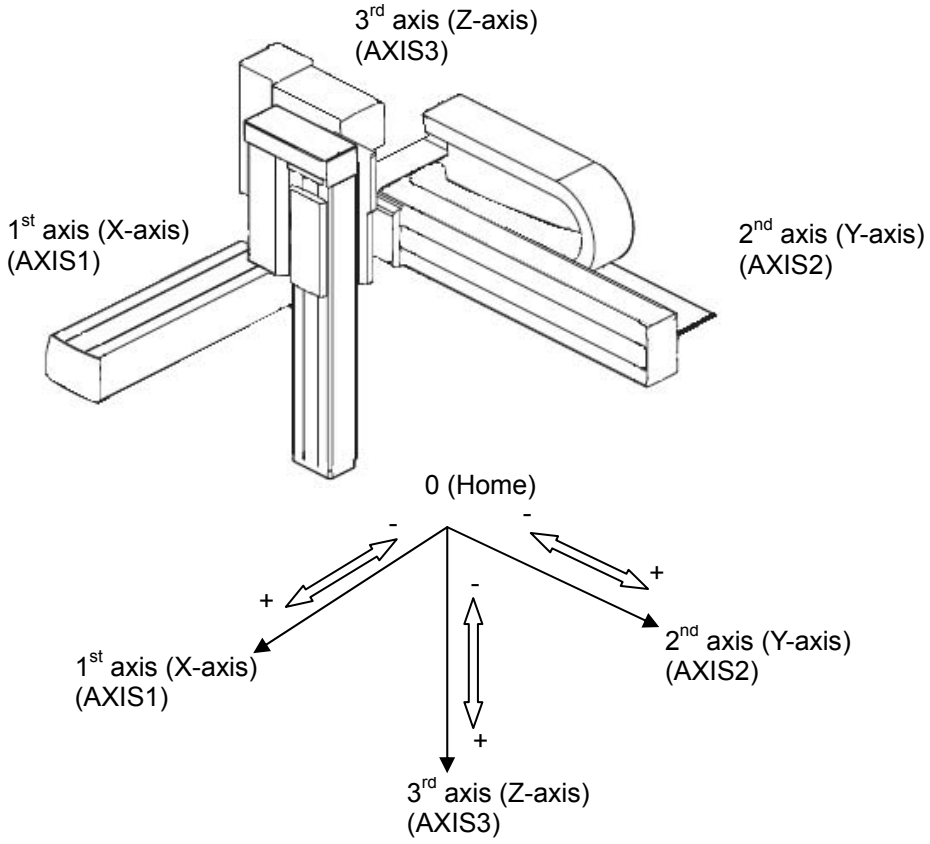
For multiple rotation type with the origin reversed type, the directions of + and - are the other way around.

(5) Gripper Type



Note Finger attachment is not included in the actuator package. Please prepare separately.

(6) Cartesian Robot (dedicated for combination with indicated controller P1 in IK2/IK3 Series)
There are three types of coordinate systems, base coordinate system, work coordinate system and tool coordinate system.
[Refer to 7.4 Cartesian Axis Coordinate Systems for detail]



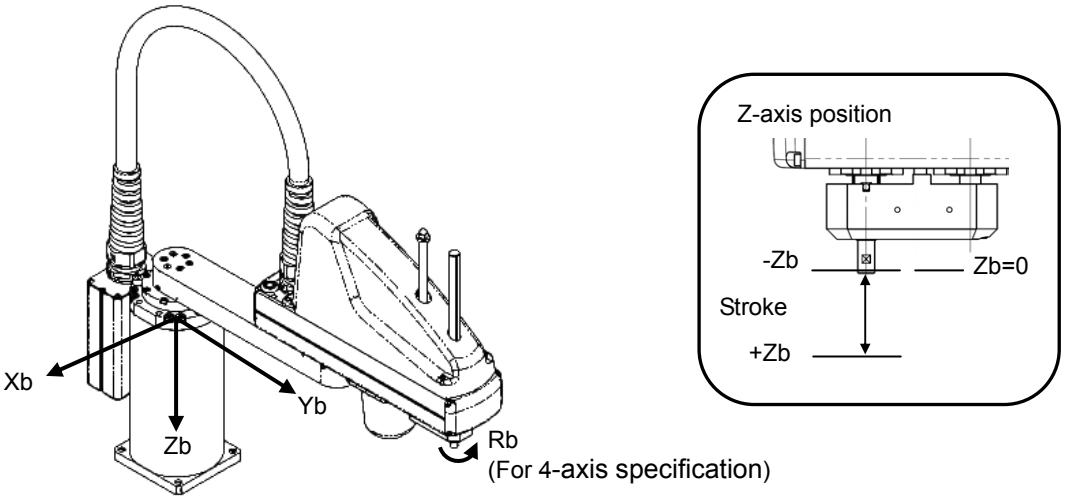
(7) Horizontal Articulated (SCARA) Robot · · IXP Type Dedicated

There are three types of coordinate systems, base coordinate system, work coordinate system and tool coordinate system.

[Base Coordinate System (= Work Coordinate System No. 0)]

It is the 3-dimensional orthogonal coordinates + rotation axis coordinate (dedicated for 4-axis type) defined in the robot at delivery.

Work coordinate system No. 0 (work coordinate system offset 0) = Base coordinate system.

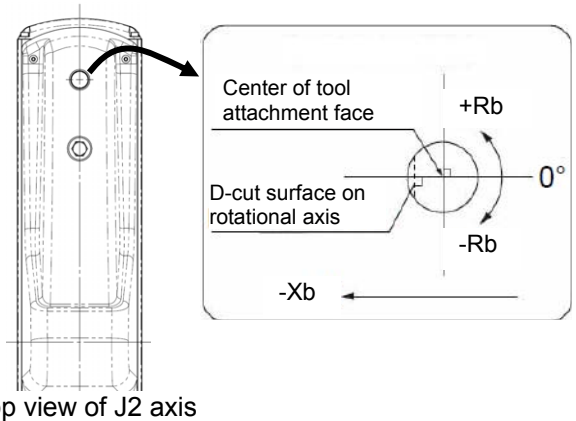


The origin of X and Y axes is the center of the base (rotation center of the 1st arm).

The origin of Z axis is the upper end of the effective stroke on the Z axis.

The origin of R axis is the position that the D-cut surface faces –Xb direction.

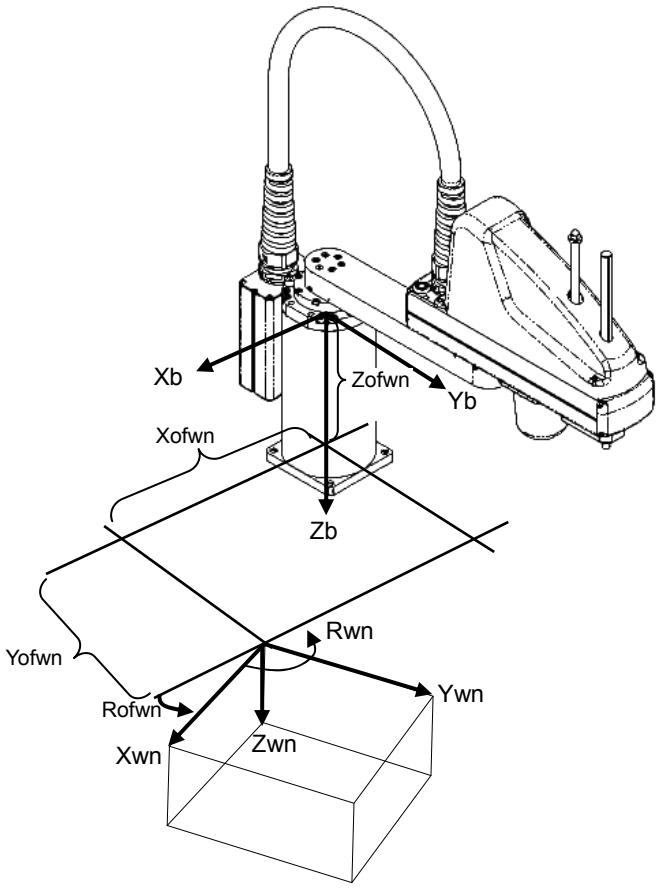
X axis of base coordinate system is described as Xb, Y axis as Yb, Z axis as Zb and R axis as Rb.



Top view of J2 axis

[Work Coordinate System]

It is 32 types of the 3-dimensional orthogonal coordinates + rotation axis coordinate defined by the offset to base coordinate system. Work coordinate system No. 0 is reserved as base coordinates (= work coordinate system offset = 0) by the system.



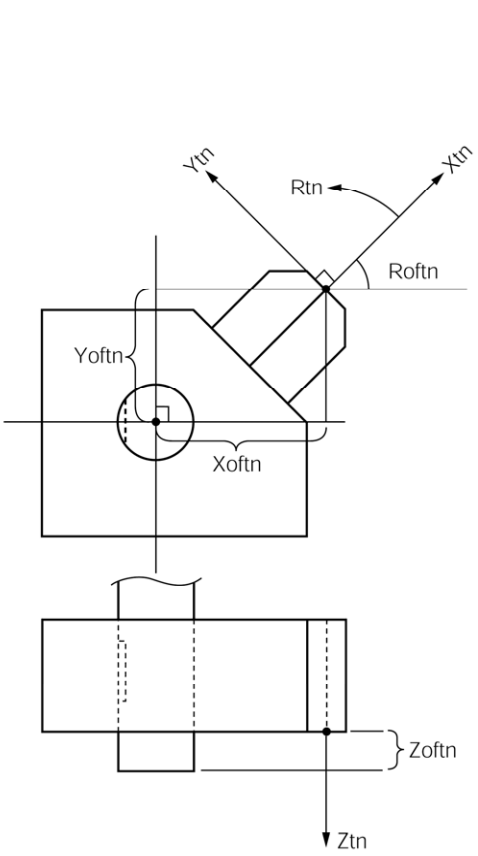
Xofwn : X Work coordinate system offset
Yofwn : Y Work coordinate system offset
Zofwn : Z Work coordinate system offset
Rofwn : R Work coordinate system offset

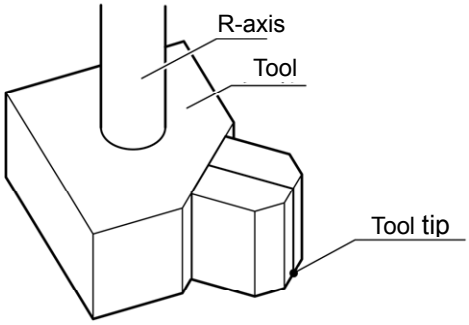
Xwn : Work coordinate system X axis
Ywn : Work coordinate system Y axis
Zwn : Work coordinate system Z axis
Rwn : Work coordinate system R axis

(n is the work coordinate system number)

[Tool Coordinate System]

It is 128 types of the 3-dimensional orthogonal coordinates + rotation axis coordinate defined by the tool (such as hand) dimension (offset) attached to the tool attachment surface. Work coordinate system No. 0 is reserved as offset 0 of tool coordinates by the system.
If the defined tool coordinate system number is selected, the tool tip is used as the reach point at the positioning, not the center of the tool attachment surface.



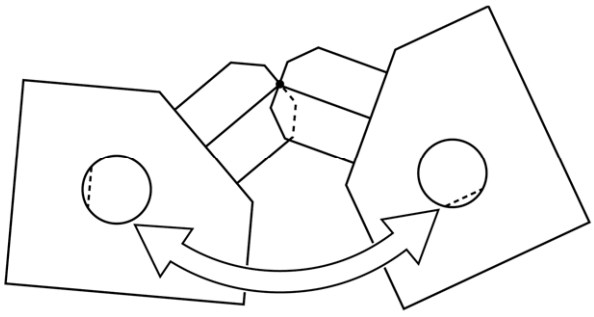


Xoftn : X Tool coordinate system offset
Yoftn : Y Tool coordinate system offset
Zoftn : Z Tool coordinate system offset
Roftn : R Tool coordinate system offset

Xtn : Tool coordinate system X axis
Ytn : Tool coordinate system Y axis
Ztn : Tool coordinate system Z axis
Rtn : Tool coordinate system R axis

(n is the toof coordinate system number)

Select the defined tool coordinate system and operate the R axis with JOG operation, and such movement as shown in the figure below can be performed.



Chapter 1 Specifications Check

1.1 Product Check

The standard configuration of this product is comprised of the following parts.
If you find any faulty or missing parts, contact your local IAI distributor.

1.1.1 Parts (Excluding Options)

No.	Part Name	Model	Quantity
1	Controller Main Body	Refer to “How to read the model plate”, “How to read the model”. [Refer to 1.1.4 or 1.1.5.]	1
Accessories			
2	System I/O Plug	DFMC1.5/6-ST-3.5 (Supplier: PHOENIX CONTACT)	1
3	AC Power Plug	MSTB2.5/3-STF-5.08 (SK: N-PE) (Supplier: PHOENIX CONTACT)	1
4	Motor Drive Power Line Connector	FKIC2.5HC/2-ST-5.08 (Supplier: PHOENIX CONTACT)	1
5	Dummy Plug	DP-4S (Enclosed in PG, PGF or PGX)	1
6	I/O Flat Cable	CB-PAC-PIO□□□ □□□ shows the cable length (Example) □□□ : 020 = 2m (In common for both standard I/O and extension I/O (PIO type))	1 or 2 (for number of mounted PIO)
7	CC-Link Connector	Model CC: MSTB2.5/5-STF-5.08AU (Supplier: PHOENIX CONTACT)	1
		Model CC2: TMSTBP2.5/5-STF-5.08 AUBD-FG (Supplier: PHOENIX CONTACT)	
8	DeviceNet Connector	Model DV: MSTB2.5/5-STF-5.08AUM (Supplier: PHOENIX CONTACT)	1
		Model DV2: TMSTBP2.5/5-STF-5.08 AUM (Supplier: PHOENIX CONTACT)	
9	First Step Guide		1
10	Instruction Manual (DVD)		1
11	Safety Guide		1

1.1.2 Teaching Tool (Optional)

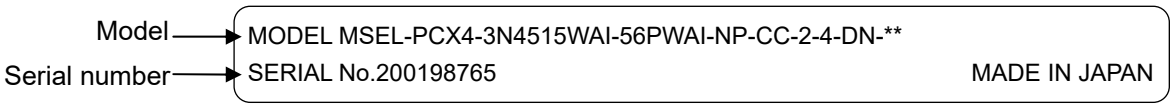
A teaching tool such as PC software is necessary when performing the setup for creating a program, position setting and parameter setting, etc. that can only be done on the teaching tool. Please prepare either of the following teaching tools.

No.	Part Name	Model
1	PC Software (with RS232C Cable + Connector Conversion Cable ・ with Emergency Stop Box)	IA-101-X-MW-JS
2	PC Software (with USB Cable (CB-SEL-USB030) + Dummy Plug (DP-4S))	IA-101-X-USBS
3	Teaching Pendant	TB-02
4	Teaching Pendant	TB-01

1.1.3 Instruction Manuals Related to this Product, which are Contained in the Instruction Manual (DVD).

No.	Name	Manual No.
1	SEL Language Programming Manual	ME0224
2	PC Software IA-101-X-MW-JS/IA-101-X-USBS Instruction Manual	ME0154
3	Touch Panel Teaching TB-01/TB-01D Instruction Manual	ME0325
4	Touch Panel Teaching TB-02 Instruction Manual	ME0356
5	DeviceNet Instruction Manual	ME0124
6	CC-Link Instruction Manual	ME0123
7	PROFIBUS-DP Instruction Manual	ME0153
8	Ethernet Instruction Manual	ME0140
9	EtherNet/IP Instruction Manual	ME0308
10	EtherCAT Instruction Manual	ME0309
11	PROFINET IO Instruction Manual	ME0361

1.1.4 How to Read the Model Plate



1.1.5 How to Read the Model

[1-1] Single-Axis and Cartesian Type Controllers

① Series	② Controller type	③ Axis No.	④ Connected Axis Content: Pulse motor type	④ Connected Axis Content: Encoder type (Note 3)	④ Connected Axis Content: Optional	⑤ Standard I/O content	⑥ Extension I/O content	⑦ I/O cable length	⑧ Power supply voltage	⑨ Absolute Battery (Note 2)	⑩ Mount specification
MSEL	PC (standard type) PG*1 (safety category compliant type)	1 (1 axis) 2 (2 axes) 3 (3 axes) 4 (4 axes)	20P (20 frame) 20SP (20 frame) 28P (28 frame) 28SP (28 frame) 35P (35 frame) 42P (42 frame) 42SP (42 frame) 56P (56 frame)	WAI (Note 3) (battery-less absolute/ incremental)	Not specified HS (Note 1) (home-position check sensor) B (brake)	NP (NPN PIO connect) PN (PNP PIO connect)	E : Not for use DV : (DeviceNet connect) CC : (CC-Link connect) PR : (PROFIBUS-DP connect) EP : (EtherNet/IP connect) NP : (NPN PIO connect) EC : (EtherCAT connect) PRT : (PROFINET IO connect) DV2 : (DeviceNet connect Connector for multidrop enclosed) CC2 : (CC-Link connect Connector for multidrop enclosed) SE1 : (RS232C connect) SE2 : (RS485 connect) IA : (IA net connect)	0 (no cable) 2 (2m: standard) 3 (3m) 5 (5m)	4 (100 AC to 230V input)	Not specified (battery-less absolute/ incremental)	Not specified (screw mounting) DN (DIN rail mounting)
				SA (Note 2, Note 3) (simple absolute)	B (brake)					ABB (Note 2) Simple absolute (with battery box) ABBN (Note2) Simple absolute (without battery box)	
			WUS (Note 4) WUM								

*1 Safety Category Complied Type: This is a type that enables to construct a safety protection circuit

Note 1 It is available to select when the actuator is “Incremental Type”.

Note 2 When “Simple Absolute Type” has been selected, select “ABB” or “ABBN”.

Note 3 “Battery-less Absolute / Incremental Type” and “Simple Absolute Type” cannot be used together.

Note 4 WUS and WUM occupy two axes. It is not necessary to describe an encoder type or option.

[1-2] Single-Axis and Cartesian Type Controllers (High-Thrust Specification)

① Series	② Controller type	③ Axis No.	④ Connected Axis Content: Pulse motor type	④ Connected Axis Content: Encoder type (Note 3)	④ Connected Axis Content: Optional	⑤ Standard I/O content	⑥ Extension I/O content	⑦ I/O cable length	⑧ Power supply voltage	⑨ Absolute Battery (Note 2)	⑩ Mount specification
MSEL	PCF (high-thrust type) PGF*1 (high-thrust safety category compliant type)	1 (1 axis) 2 (2 axis) 3 (3 axis) 4 (4 axis)	1st and 2nd axes 56SP (56 frame) 60P (60 frame) 86P (86 frame) 2nd to 4th axes 20P (20 frame) 20SP (20 frame) 28P (28 frame) 28SP (28 frame) 35P (35 frame) 42P (42 frame) 42SP (42 frame) 56P (56 frame) (Note 3, Note 5)	WAI (Note 4) (battery-less absolute/ incremental)	Not specified HS (Note1) (home-position check sensor) B (brake)	NP (NPN PIO connect) PN (PNP PIO connect)	E : Not for use DV : (DeviceNet connect) CC : (CC-Link connect) PR : (PROFIBUS-DP connect) EP : (EtherNet/IP connect) NP : (NPN PIO connect) EC : (EtherCAT connect) PRT : (PROFINET-IO connect) DV2 : (DeviceNet connect Connector for multidrop enclosed) CC2 : (CC-Link connect Connector for multidrop enclosed) SE1 : (RS232C connect) SE2 : (RS485 connect) IA : (IA net connect)	0 (no cable) 2 (2m: standard) 3 (3m) 5 (5m)	4 (AC100 to 230V input)	Not specified (battery-less absolute/ incremental)	Not specified (screw mounting) DN (DIN rail mounting)
				SA (Note2 to Note 4) (simple absolute)	B (brake)					ABB (Note 2) Simple absolute (with battery box) ABBN (Note 2) Simple absolute (without battery box)	

*1 Safety Category Complied Type: This is a type that enables to construct a safety protection circuit

Note 1 It is available to select when the actuator is “Incremental Type”.

Note 2 When “Simple Absolute Type” has been selected, select “ABB” or “ABBN”.

Note 3 Simple Absolute cannot be selected in the high-thrust type (56SP, 60P and 86P motors).

Note 4 “Battery-less Absolute/Incremental Type” and “Simple Absolute Type” cannot be used together on the 3rd and 4th axes. 2nd, 3rd and 4th axes can be existed together.

Note 5 For the 2nd axis, the type can be selected at the order from the standard type (20P to 56P motor) and the high-thrust type (56SP, 60P or 86P motor).
(Driver board is different.)

[2] SCARA Robot Controller

① Series	② Controller type	③ Power-con SCARA model: Following type symbols come in □ N: Standard C: Cleanroom W: Dust Proof/Splash Proof	③ Power-con SCARA model: Optional	④ Added axis content: Pulse motor type	④ Added axis content: Encoder type	④ Added axis content: Optional	⑤ Standard I/O content	⑥ Extension I/O content	⑦ I/O cable length	⑧ Power supply voltage	⑨ Mount specification
MSEL	PCX3 (3 axes standard type) PGX3 *1 (3 axes safety category compliant type)	(3 axes type) 3N1808WAI 3N2508WAI 3□3515WAI 3□4515WAI 3□5520WAI 3□6520WAI	B (Note2) (Brake)				NP (NPN PIO connect) PN (PNP PIO connect)	E : (not for use) DV : (DeviceNet connect) CC : (CC-Link connect) PR : (PROFIBUS-DP connect) EP : (EtherNet/IP connect) NP : (NPN PIO connect) EC : (EtherCAT connect) PRT : (PROFINET IO connect) DV2 : (DeviceNet connect Connector for multidrop enclosed) CC2 : (CC-Link connect Connector for multidrop enclosed) SE1 : (RS232C connect) SE2 : (RS485 connect) IA : (IA net connect)	0 (No cable) 2 (2m: standard) 3 (3m) 5 (5m)	4 (100 AC to 230V input)	Not specified (Screw mounting) DN (DIN Rail mounting)
	PCX4 (4 axes standard type) PGX4 *1 (4 axes safety category compliant type)	(3 axes type) 3N1808WAI 3N2508WAI 3□3515WAI 3□4515WAI 3□5520WAI 3□6520WAI	B (Note2) (Brake)	20P (20 frame) 20SP (20 frame) 28P (28 frame) 28SP (28 frame) 35P (35 frame) 42P (42 frame) 42SP (42 frame) 56P (56 frame)	WAI (Battery-less absolute/ Incremental)	Not specified HS (Note 1) (home-position check sensor) B (brake)					
		(4 axes type) 4N1808WAI 4N2508WAI 4□3515WAI 4□4515WAI 4□5520WAI 4□6520WAI (3 axes type + Gripper mounted) 3N1808GMWAI 3N2508GMWAI 3N3515GMWAI 3N4515GMWAI 3N3510GLWAI 3N4510GLWAI 3N5515GLWAI 3N6515GLWAI 3N5515GWWAI 3N6515GWWAI	B (Note2) (Brake)								

*1 Safety Category Complied Type: This is a type that enables to construct a safety protection circuit

Note 1 It is available to select when the actuator is “Incremental Type”.

Note 2 When SCARA Robot is with the arm length 550mm or 650mm, it can be selected for Z-axis.

1.2 Basic Specifications

Specification Item		
Number of Controlled Axes		1 axis to 4 axes (Total of RC axis or SCARA axis + RC axis is four axes max.)
Power Supply Voltage		Single-phase 100V AC to 230V±10%
Power Current (typ value)		2.9A (100V AC), 1.4A (200V AC), 1.2A (230V)
Power Supply Frequency		50Hz/60Hz±5%
Rush Current (typ value) (Note 1)		15A(100V AC), 30A(200V AC) (Ambient Temp. 25degC, Measurement in one time of turn-ON: when no repeating of ON/OFF)
Leakage Current (Note 2)		0.75mA or less
Transient Power Cutoff Durability		20ms or more
Heat Generation		40W (100V AC), 35.2W (200V AC), 30.4W (230V AC)
PIO Power Supply (Note 3)		DC24V±10% (Supplied from external equipment)
Motor Control System		Weak field-magnet vector control
Applicable Encoder (The resolution differs depending on the actuator type)		Battery-less absolute encoder or Incremental encoder resolution 800pulse/rev or 8192pulse/rev
Actuator Cable Length		MAX. 20m (when simple absolute type is used Max.10m)
Serial Communication Interface (SIO port or USB port)		Teaching tool dedicated connector (SIO ports and USB ports excluded) (XSEL serial communication protocol (Format B))
External Interface	(Standard / extension) PIO	24V DC general-purposed signal I/O (NPN / PNP selection) Input 32 points max., output 32 points max. (Total of standard and extension) Cable length MAX.10m
	(Extension dedicated) Fieldbus	DeviceNet, CC-Link, PROFIBUS-DP, EtherNet/IP (Note 4), EtherCAT, PROFINET IO, RS232C, RS485
Data Setting and Input		PC software or teaching pendant
Program Specification		SEL Language
Max. Number of Program Steps		9999 steps
Max. Number of Positions		30000 position
Max. Number of Programs		255 program
Max. Number of Multitask Programs		16 program
Data Retention Memory		Flash ROM and FeRAM
Clock Function		Retaining time after power turned OFF: approximately 10 days Time for battery charge after the clock data is lost: approximately 100 hours
System I/O		Emergency stop input, safety gate input
Safety Circuit Configuration	Drive-source cutoff method	Contact point for semiconductor (connect externally such as driving source cutoff relay when required to comply with safety categories for PG/PGF/PGX types)
	Emergency-stop input	b contact (normally closed) Input (internal power supply)
	Enable input	b contact (normally closed) Input (internal power supply)
Protective Functions		Motor over current, overload, encoder open circuit detection, soft limit over, system abnormality, battery abnormality
Absolute Battery (when simple absolute type is used)		AB-7
Protection Function Against Electric Shock		Class I In case grounding conducted on ground terminal in addition to basic insulation for electric shock proof.
Overvoltage Category		Category II Voltage durability 2500V at less than 300V AC for input rating
Insulation Resistance		10MΩ or more (between power terminal and I/O terminal and also all external terminals and case at the power supply of DC500V)
Insulation Strength		1500V AC for 1 min (between primary and PE) 3000V AC for 1 min (between primary and secondary)
Protection Conduction		10A 1.0V or less (for 10sec)
Cooling Method		Forced air-cooling
Environment	Surrounding air temperature	0 to +40°C
	Surrounding humidity	85% RH or less (non-condensing)
	Surrounding environment	(Refer to the Item for the 1.6 Installation Environment).
	Surrounding storage temperature	-20 to 70°C (Note) 0 to 40°C for absolute battery
	Surrounding storage humidity	85% RH or less (non-condensing)
	Maximum operation height	1000m
	Vibration resistance	10 to 57 Hz in XYZ directions Swing width: 0.075mm 57 to 150Hz Acceleration: 9.8m/s^2
	Protection class	IP20
	Pollution degree	Pollution degree 2
External Dimensions		[Refer to the 1.3 External Dimensions]
Mass		Approx. 1.4kg

Note 1 Rush current at the power connection continues for 5 msec. Note that the value of in-rush current differs depending on the impedance of the power supply line.

Note 2 Leak current varies depending on the capacity of connected motor, cable length and the surrounding environment. Measure the leak current at the point where a ground fault circuit interrupter is to be installed when leakage protection is conducted.
Regarding the leakage breaker, it is necessary to have a clear purpose for selection such as a fire protection or protection of human body.

Note 3 Power supply is not necessary if PIO is not to be used.

Note 4 EtherNet/IP can also communicate (teletype procedure communication) with EtherNet.

1.2.1 Selection of the Circuit Breaker

For the selection of the circuit breaker, perform it according to the following items.

- Select the breaker that does not trip with the rush current. (Refer to the Operation Characteristic Curve described in the catalogue of each manufacturer.)
- For the rated breaking current, select the current value which can break the current even when a short circuit occurs.
  Rated Interrupting Current > Short Circuit Current = Power Source Current [Refer to 1.2 Basic Specifications]
- Consider margin for the rated current on the circuit breaker.

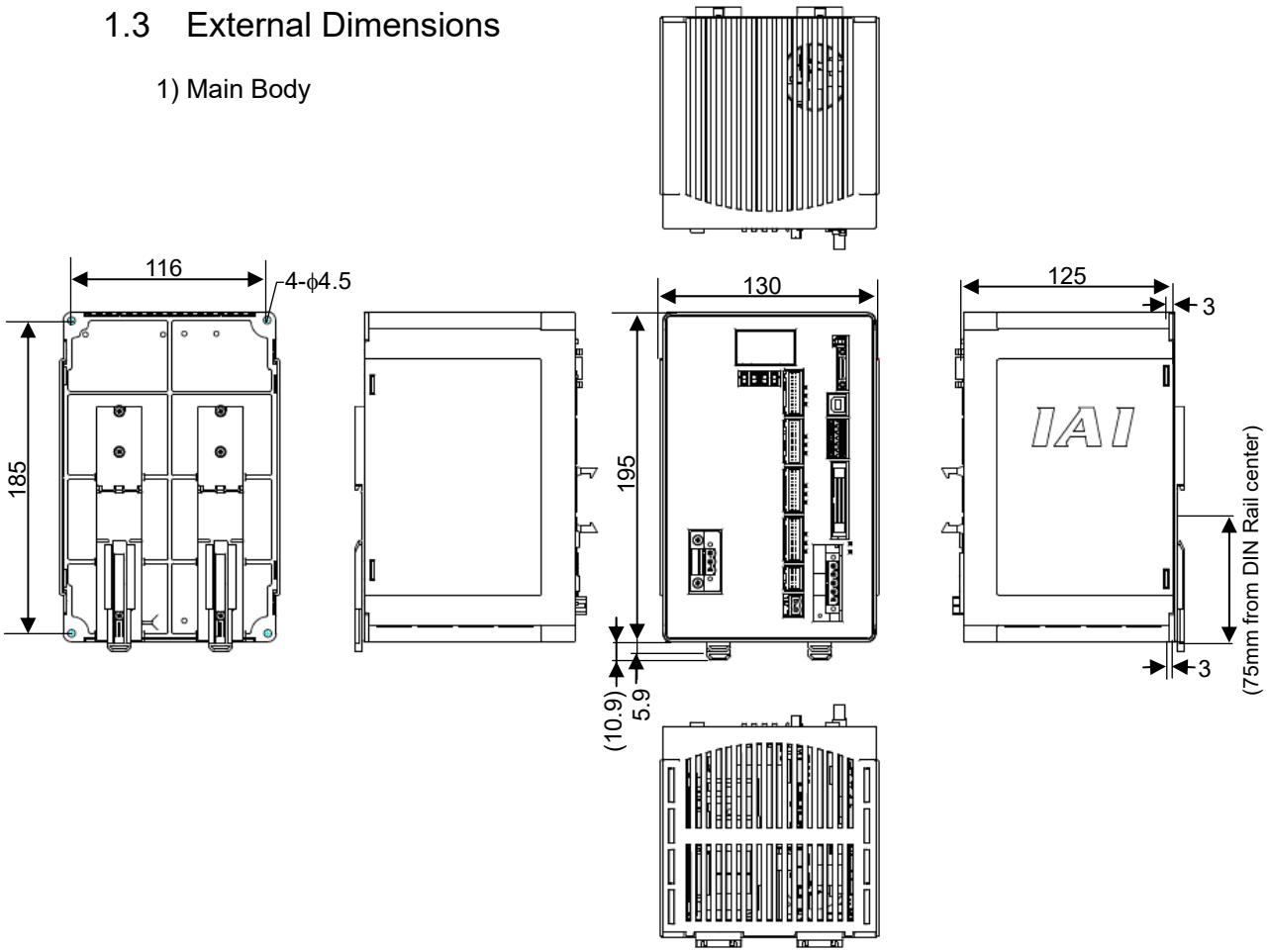
Circuit Breaker Rated Current > Power Source Current [A] × Safety Margin (Reference 1.2 to 1.4)

1.2.2 Selection of the Leakage Breaker

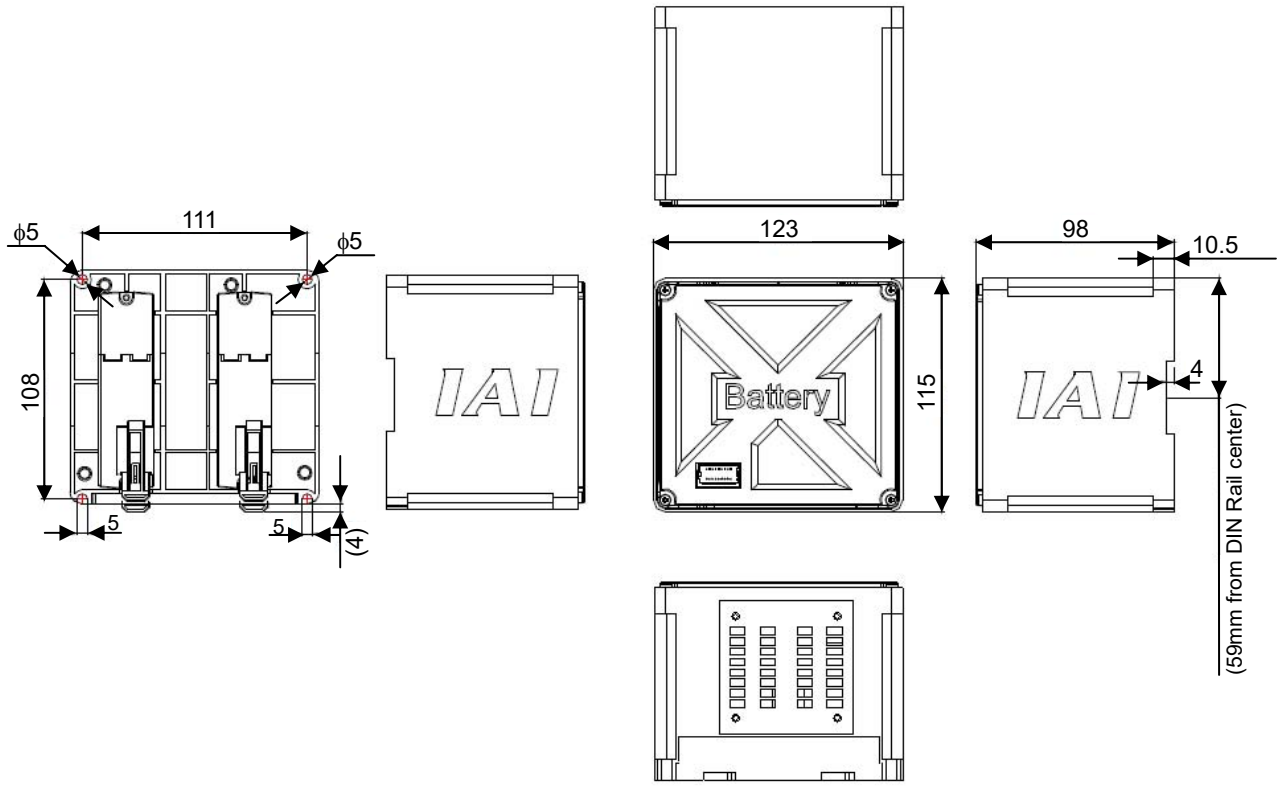
- Regarding the leakage breaker, it is necessary to have a clear purpose for selection such as a fire protection or protection of human body.
- Leak current varies depending on the capacity of connected motor, cable length and the surrounding environment. Measure the leak current at the point where a ground fault circuit interrupter is to be installed when leakage protection is conducted.

1.3 External Dimensions

1) Main Body



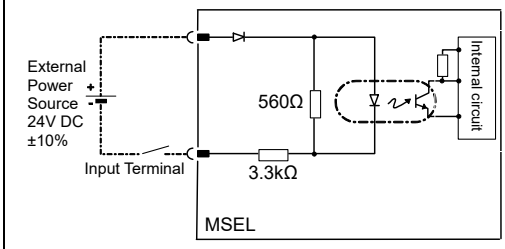
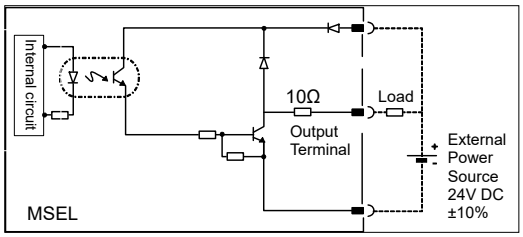
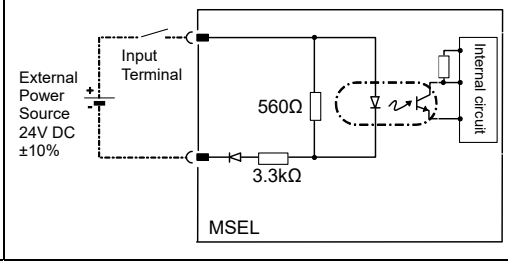
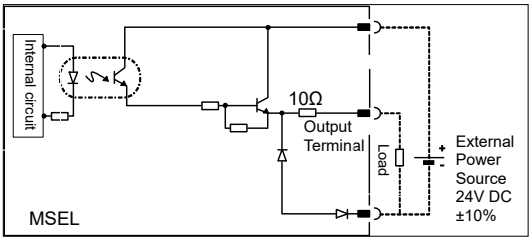
2) Absolute Battery Box (Simple Absolute Type)



1.4 Interfaces

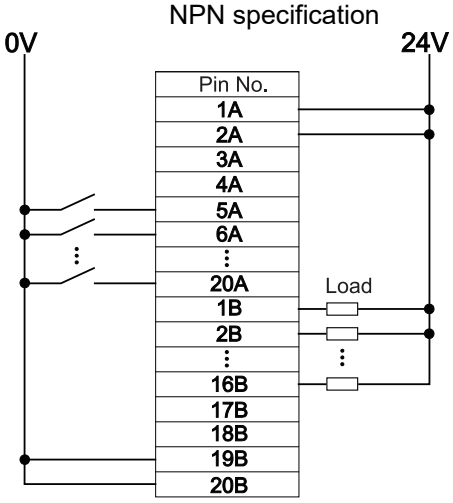
Standard I/O can be equipped with PIO (NPN or PNP).

1.4.1 Standard I/O

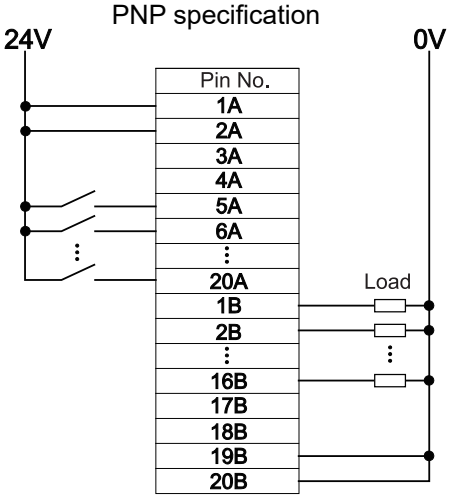
	Input			Output		
Specification	Input Voltage		24V DC ±10%	Load Voltage	24V DC ±10%	
	Input Current		7mA / 1 Circuit	Load Current	100mA / 1 Circuit, 400mA / 8 Port *1	
	ON/OFF Voltage	ON	Min. 16V DC			
		OFF	Max. 5V DC			
	Insulation Type		Photocoupler Insulation	Insulation Type	Photocoupler Insulation	
NPN						
PNP						

Note 1 The total of lead current reaches max. 400mA every 8 ports from output port No. 300.

NPN specification



PNP specification



⚠ *Caution:*
- *If a non-contact circuit is connected externally, malfunction may result from leakage current. Use a circuit in which leakage current in a OFF state does not exceed 1mA.*
- *At the default settings, the system recognizes the ON/OFF durations of input signals if they are continuous approx. 4 msec or longer. The ON/OFF duration settings can also be changed using I/O parameter No. 20 (input filtering frequency).*

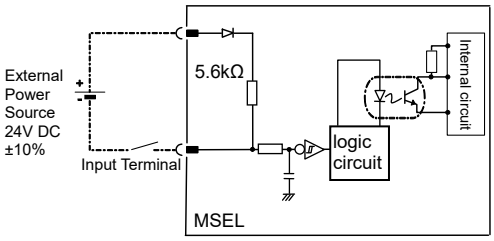
1.4.2 Extension I/O

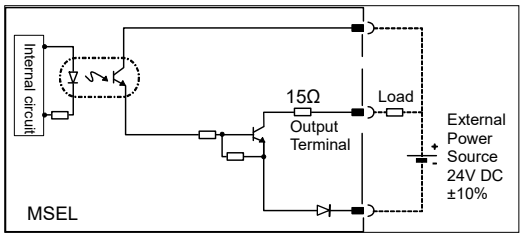
For extension I/O, selection can be made from PIO (NPN or PNP) and six types of fieldbus (CC-Link, DeviceNet, FROFIBUS-DP, EtherNet/IP, EtherCAT or PROFINET-IO) to be equipped with.

[1] PIO Interfaces

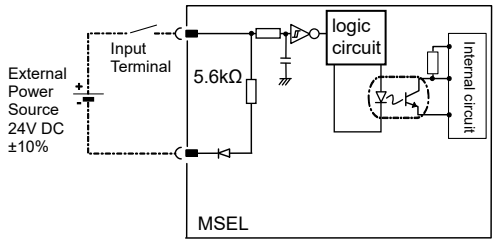
	Input			Output	
Specificatio	Input Voltage		24V DC ±10%	Load Voltage	24V DC ±10%
	Input Current		4mA / 1 Circuit	Load Current	50mA / 1 Circuit
	ON/OFF Voltage	ON	Min. 18V DC		
		OFF	Max. 6V DC		
	Insulation Type		Photocoupler Insulation	Insulation Type	Photocoupler Insulation

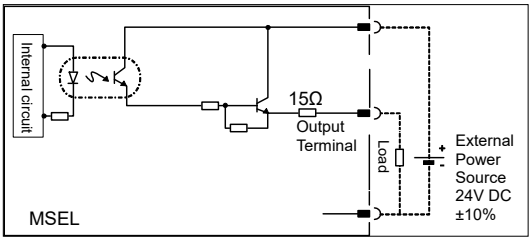
NPN

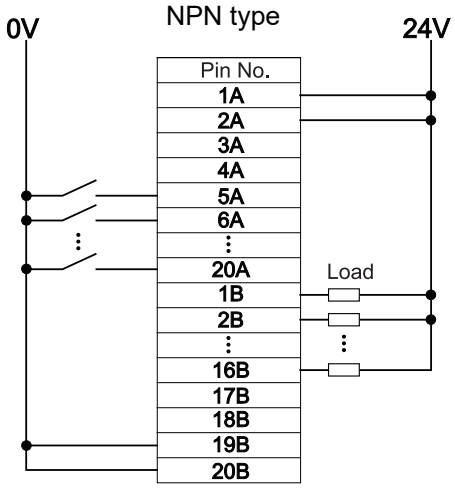


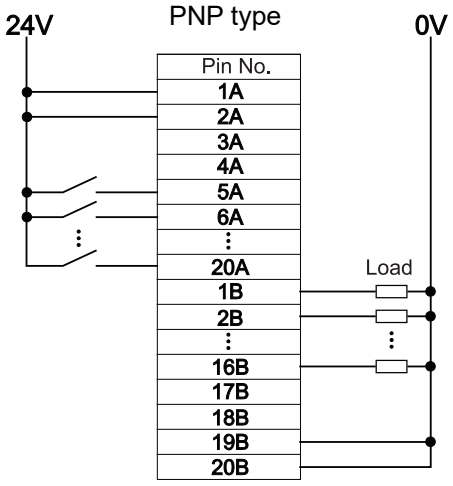


PNP









⚠ *Caution:*
- *If a non-contact circuit is connected externally, malfunction may result from leakage current. Use a circuit in which leakage current in a OFF state does not exceed 1mA.*
- *At the default settings, the system recognizes the ON/OFF durations of input signals if they are continuous approx. 4 msec or longer. The ON/OFF duration settings can also be changed using I/O parameter No. 20 (input filtering frequency).*

[2] Fieldbus

Following fieldbus can be selected. For details, refer to each instruction manual provided separately.

Type	Overview	Details
DeviceNet	DeviceNet Field Network Board This board communicates the I/O data as the remote I/O terminal.	Refer to the separate. (ME0124)
CC-Link	CC-Link Field Network Board This board communicates the I/O data as the Ver1.10 remote device station.	Refer to the separate. (ME0123)
PROFIBUS-DP	PROFIBUS-DP Field Network Board This board communicates the I/O data as the slave station.	Refer to the separate. (ME0153)
PROFINET-IO	PROFINET-IO Field Network Board This board communicates the I/O data as the slave station.	Refer to the separate. (ME0361)
EtherCAT	EtherCAT Field Network Board This board communicates the I/O data as the slave station.	Refer to the separate. (ME0309)
EtherNet/IP	EtherNet/IP Network Connecting Communication Board I/O data communication also can be executed.	Refer to the separate. (ME0308)
	Communication is established with Ethernet Communication (teletype procedure communication).	Refer to the separate. (ME0140)

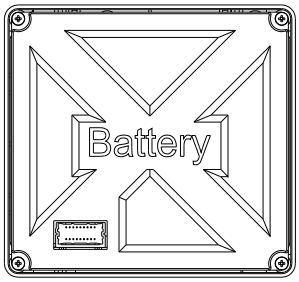
1.5 Absolute Battery Box (to be Connected for Simple Absolute Type)

The dedicated absolute battery box is to be used for simple absolute type.

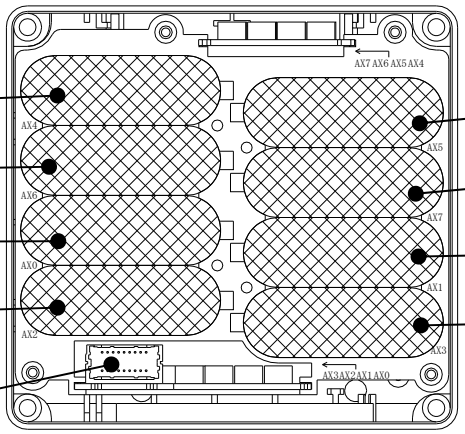
The battery is to be mounted only to the absolute type axes in the places for 1st to 4th axes in the figure below.

Connection to MSEL controller is to be conducted with a dedicated cable (CB-MSEL-AB005).

(Note) Cable length 0.5m



Front View with Cover on



Front View after Cover Removed

Not to use

Not to use

1st battery (Axis No.0)

3rd battery (Axis No.2)

Connector for connection to MSEL

(Note) Do not attempt to plug in or take off the cable with force in the tilted direction to the connector.

Not to use

Not to use

2nd battery (Axis No.1)

4th battery (Axis No.3)

1.6 Installation and Storage Environment

This product is capable for use in the environment of pollution degree 2[*1] or equivalent.

*1 Pollution Degree 2: Environment that may cause non-conductive pollution or transient conductive pollution by frost (IEC60664-1).

[1] Installation Environment

Do not use this product in the following environment:

- Location where the surrounding air temperature exceeds the range of 0 to 40°C
- Location where condensation occurs due to abrupt temperature changes
- Location where relative humidity exceeds 85%RH
- Location exposed to corrosive gases or combustible gases
- Location exposed to significant amount of dust, salt or iron powder
- Location subject to direct vibration or impact
- Location exposed to direct sunlight
- Location where the product may come in contact with water, oil or chemical droplets
- Environment that blocks the air vent [1.7 Noise Prevention and the Installation]

When using the product in any of the locations specified below, provide a sufficient shield.

- Location subject to electrostatic noise
- Location where high electrical or magnetic field is present
- Location with the mains or power lines passing nearby

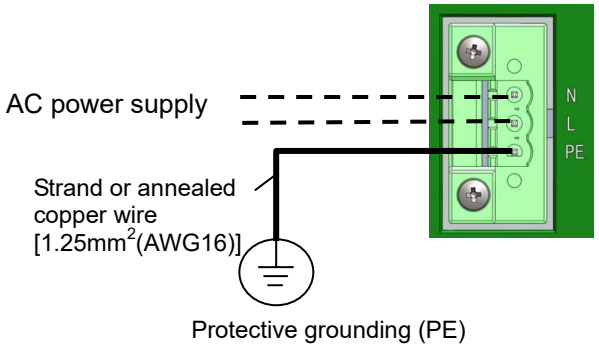
[2] Storage and Preservation Environment

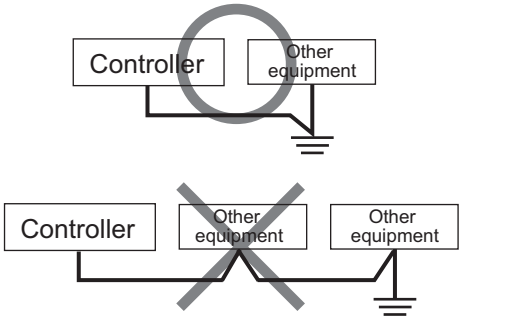
- Storage and preservation environment follows the installation environment. However, the ambient temperature should be from -20 to 70°C (0 to 40°C for absolute battery) and the relative humidity to be 85%RH at maximum. Especially in a long-term storage, consider to avoid condensation of surrounding air.
  Unless specially specified, moisture absorbency protection is not included in the package when the machine is delivered. In the case that the machine is to be stored and preserved in an environment where dew condensation is anticipated, take the condensation preventive measures from outside of the entire package, or directly after opening the package.

1.7 Noise Prevention and the Installation

(1) Protective Grounding

For grounding, conduct a protective grounding using a strand or annealed copper wire with the diameter 1.25mm^2 (AWG16) or more.





Do not share the ground wire with or connect to other equipment. Ground each controller.

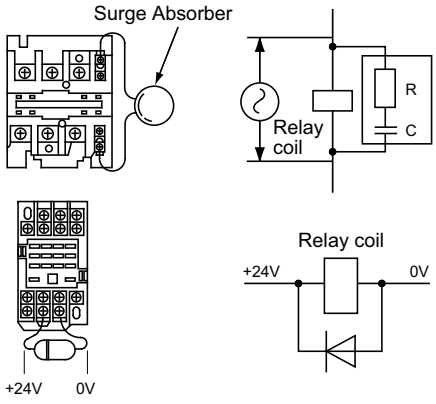
(2) Precautions Regarding Wiring Method

1) Use a twisted cable for connection to the power supply.
2) To reduce the interference to each other, have the I/O line, communication and encoder lines, power and driving supply lines separate from each other.

(3) Noise Sources and Elimination

Carry out noise elimination measures for power devices on the same power path and in the same equipment. The following are examples of measures to eliminate noise sources:

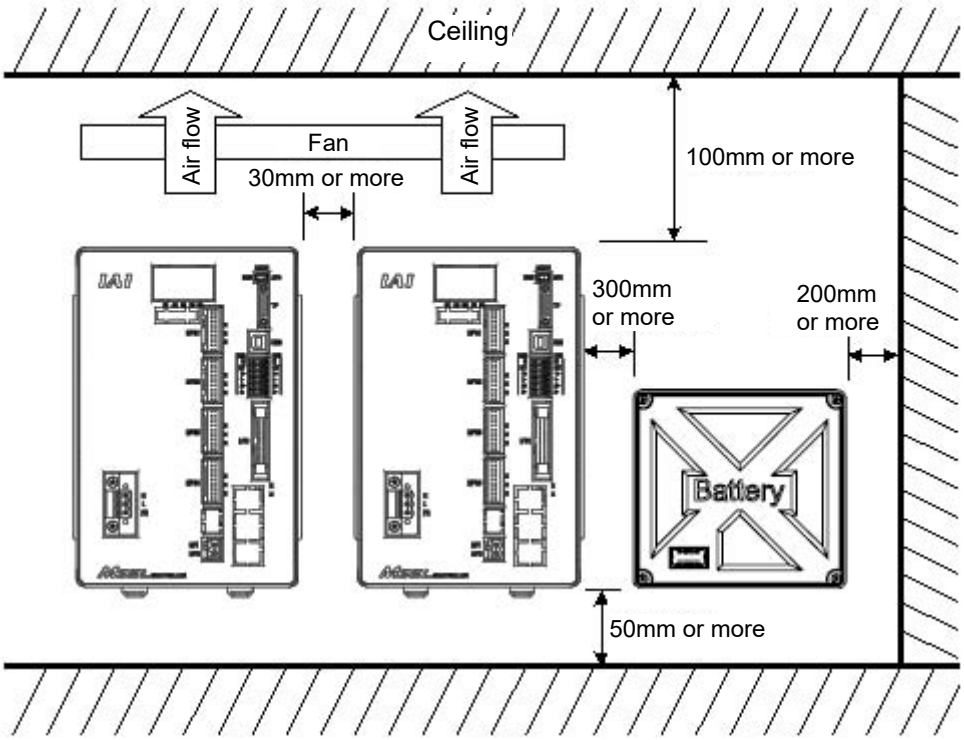
1) AC solenoid valves, magnet switches and relays
   [Measure] Install a Surge Absorber parallel with the coil.
2) DC solenoid valves, magnet switches and relays
   [Measure] Install a diode parallel with the coil. Use a DC relay with a built-in diode.

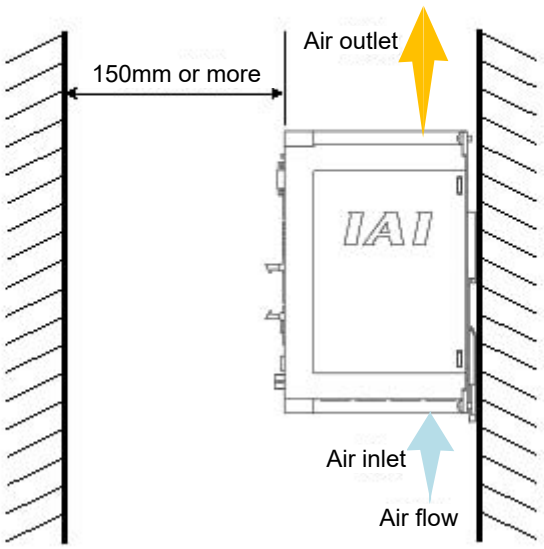


(4) Heat Radiation and Installation

Conuct design and manufacture in consideration of the control box size, controller layout and cooling in such a way that the temperature around the controller will be 40°C or less.
In case of layout with multiple controllers aligned vertically, consider not to have exhaust of bottom side controllers flow directly to the inlet of the upper controllers.
Especially around the battery, the performance may drop in both low and high temperature. Keep it in ambient temperature as much as possible. (Approximately 20°C is the recommended temperature.)

Installation	Direction	Vertical installation (Exhaust on top)
	Method	Screw attachment or DIN rail attachment

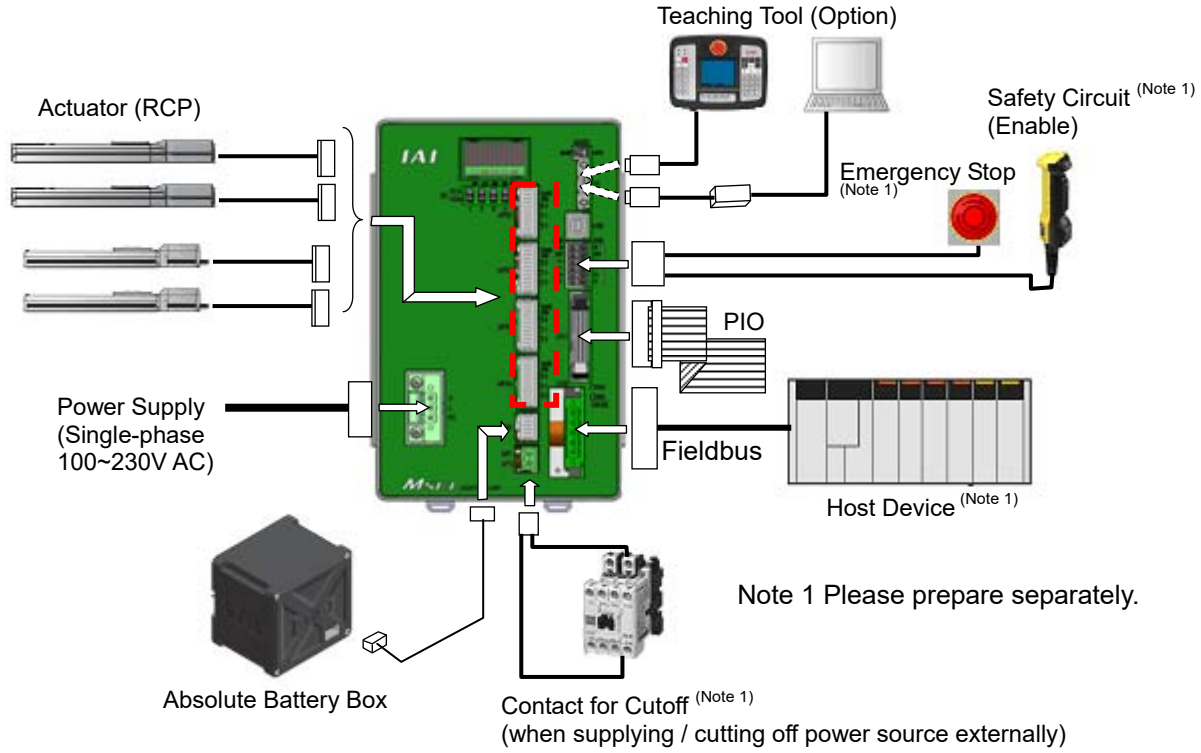




Chapter 2 Wiring

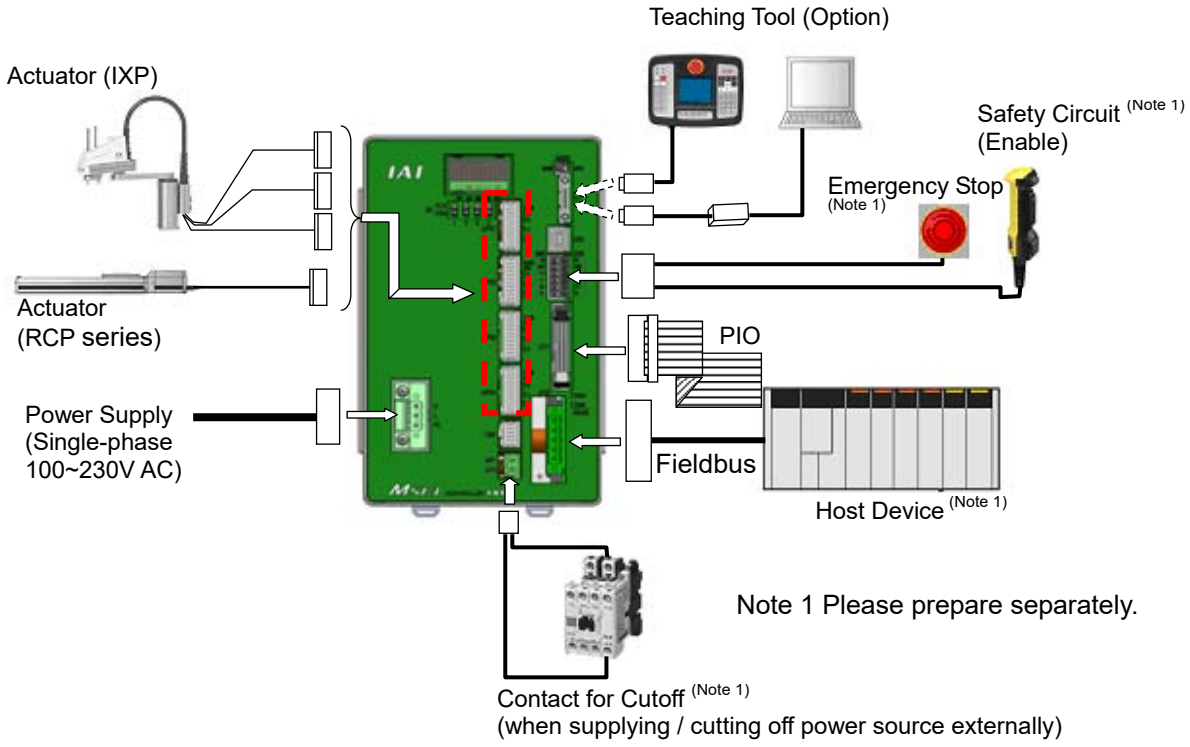
2.1 Wiring (Example connection of devices) Diagram

[1] PC/PG/PCF/PGF Controller (Single and Cartesian Axes Type)



Note 1 Please prepare separately.

[2] PCX/PGX Controller (IXP Series SCARA Robot Control Type)



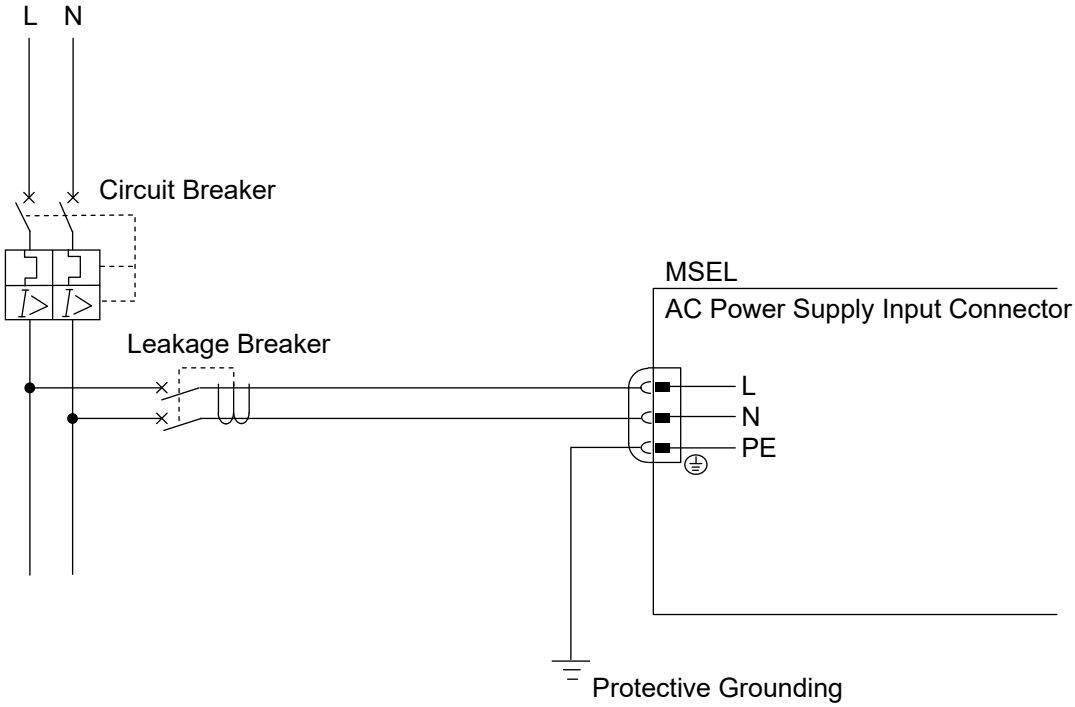
Note 1 Please prepare separately.

⚠ *Caution: Make sure to turn the power to the controller OFF when inserting or removing the connector that connects the PC software or teaching pendant to the controller.*
Inserting or removing the connector while the power is turned ON causes a controller failure.

⚠ *Caution: A number is shown on the cable for SCARA Robot.*
Connect it according to the controller connector number.
For the actuator regarded as that for single-axis robot, the connector Nos. are not indicated.
In such case, give a number to each connector to avoid any mistake.
If the cable is not correctly connected, it might cause a damage to or malfunction of the motor or PCB board.

2.2 Circuit Diagram (Example)

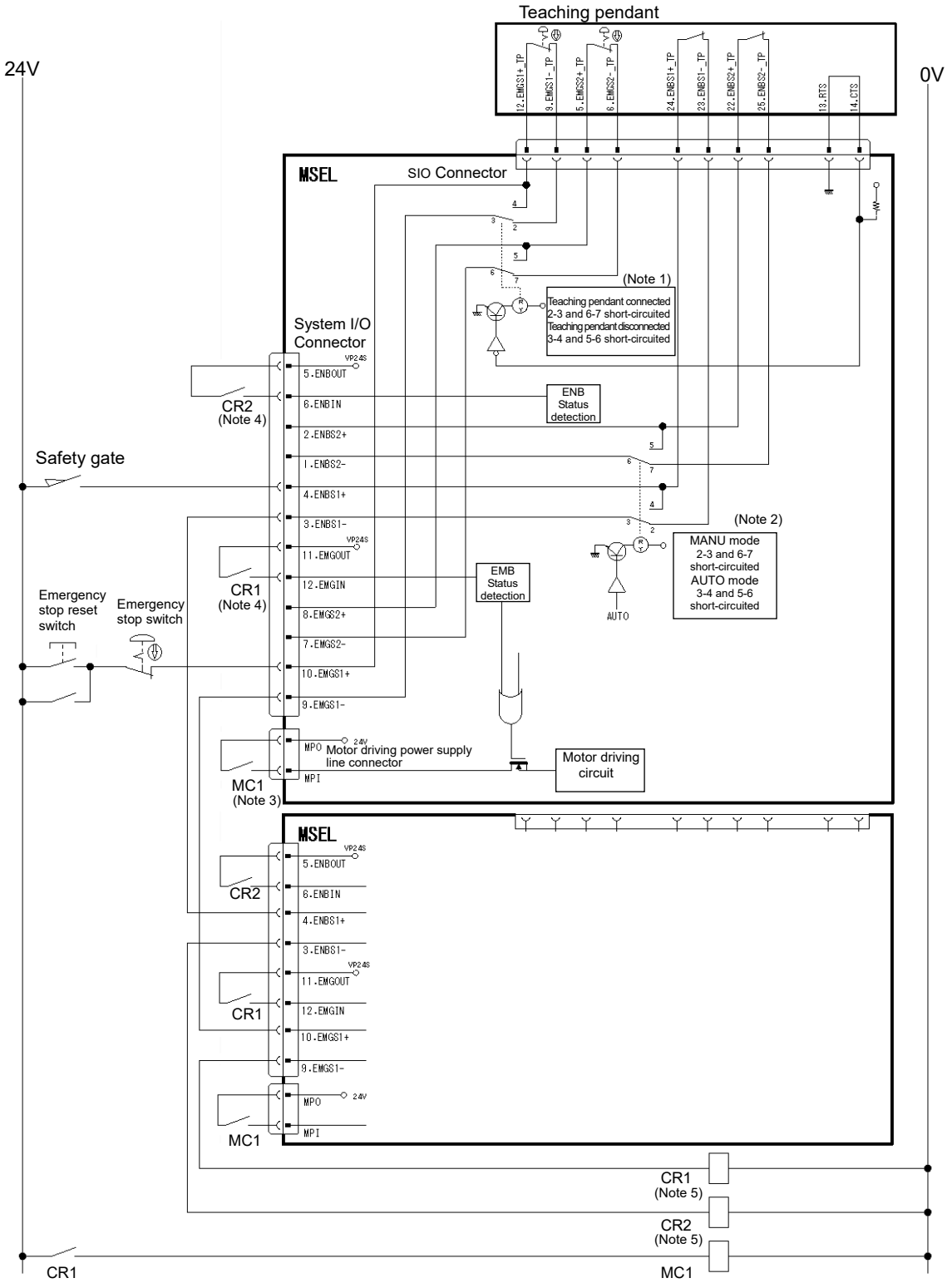
2.2.1 Power Supply Circuit



⚠ *Caution:*	*Leakage current varies depending on the capacity of the motor to be connected, cable length and surrounding environment. Therefore, when protective measures from the leakage are taken, measure the leakage current at the locations where the leakage breaker is installed.* *Regarding the leakage breaker, it is necessary to have a clear purpose for selection such as a fire protection or protection of human body.*

2.2.2 Emergency Stop and Enable Circuit (PC/PCF/PCX Type)

The following diagram shows the case when the teaching pendants emergency stop switch is reflected on the machine's emergency stop circuit design.



> ⚠ *Caution: For PC/PCF/PCX type, the dead man's switch on the teaching pendant is valid in MANU Mode. The Emergency Stop Switch is always enabled regardless of MANU/AUTO mode.*

Note 1: EMGS1+ and EMGS1- make short-circuit inside the controller if a teaching pendant is not connected.
Note 2: In AUTO mode, short-circuit is made between ENBS1+ and ENBS1- inside the controller.
Note 3: When it is necessary to cut off the motor power source externally for such reason as to comply with safety category, connect a contact such as a connector on the wire between MPO and MPI terminals on the motor driving power line connector.

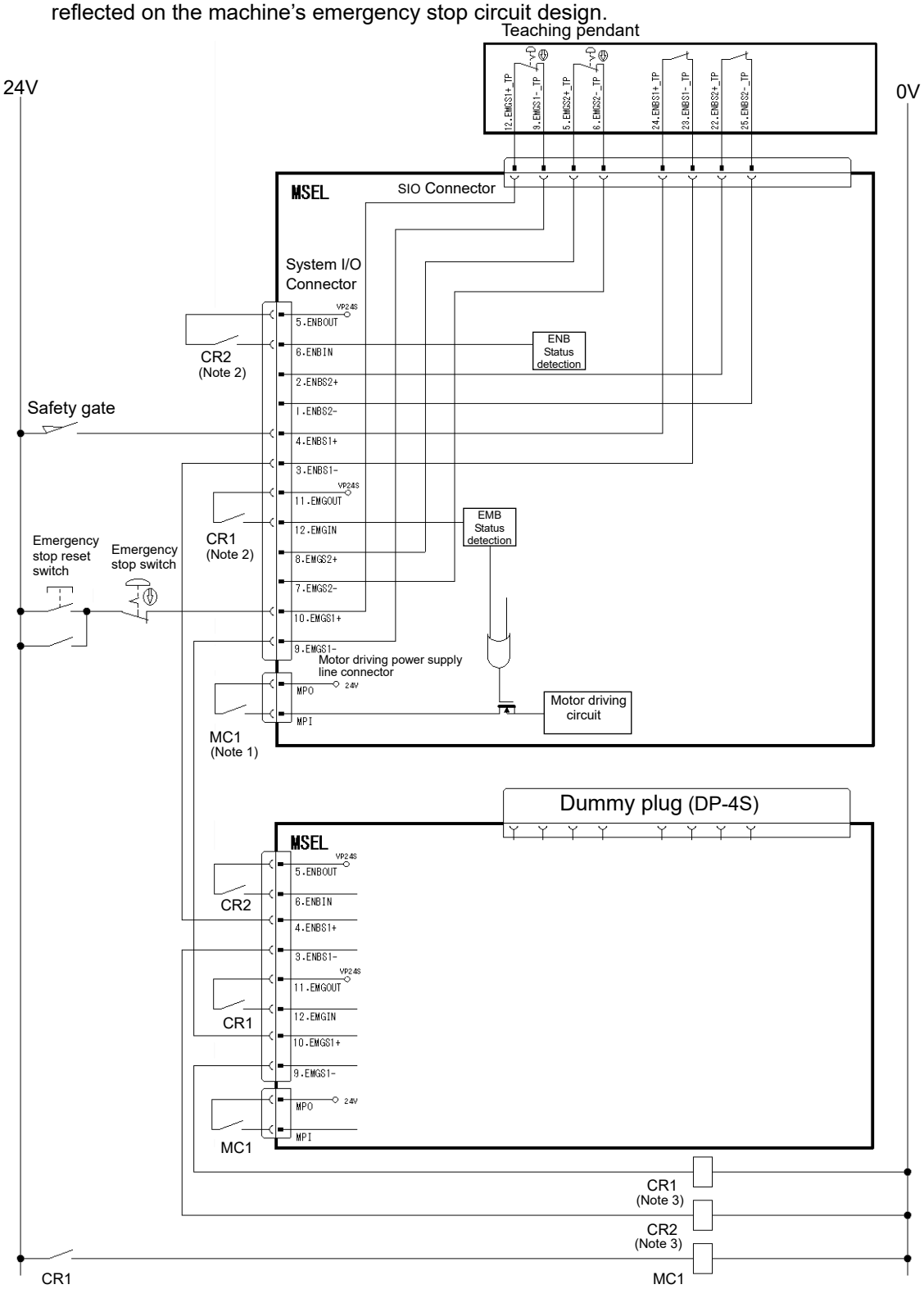
Shown below is table for the power specifications between MPO and MPI terminals.

	Specifications		
Voltage	24V DC (Built-in power supply)		
	Type	PC/PCX	PCF Numbers in brackets ( ) are in case of high-thrust axis
Rated current	1-axis type	2A	1.5A
	2-axis type	4A	3.5A (3.0A)
	3-axis type	6A	5.5A (5.0A)
	4-axis type	8A	7.5A (7.0A)
Maximum current	1-axis type	4A	6A
	2-axis type	8A	10A (12A)
	3-axis type	12A	14A (16A)
	4-axis type	16A	18A (20A)

Note 4: The ratings for the emergency stop signal (EMGIN) that turns ON/OFF at the contact CR1 and the enable signal (ENBIN) that turns on/off at the contact CR2 are 24V DC and 10mA or less.
The emergency stop output (EMGOUT) and the enable output (ENBOUT) are available for connection to 30V DC and 0.5A or less.
Note 5: For CR1 and CR2, select the one with coil current 0.1A or less.

2.2.3 Emergency Stop and Enable Circuit (PG/PGF/PGX Type)

The following diagram shows the case when the teaching pendants emergency stop switch is reflected on the machine's emergency stop circuit design.



> ⚠ *Caution: For PG/PGF/PGX type, the emergency stop switch and the dead man's switch on the teaching pendant are always valid. Apply the dummy plug (DP-4S) if the teaching pendant is not connected.*

Note 1: When it is necessary to cut off the motor power source externally for such reason as to comply with safety category, connect a contact such as a connector on the wire between MPO and MPI terminals on the motor driving power line connector.

Shown below is table for the power specifications between MPO and MPI terminals.

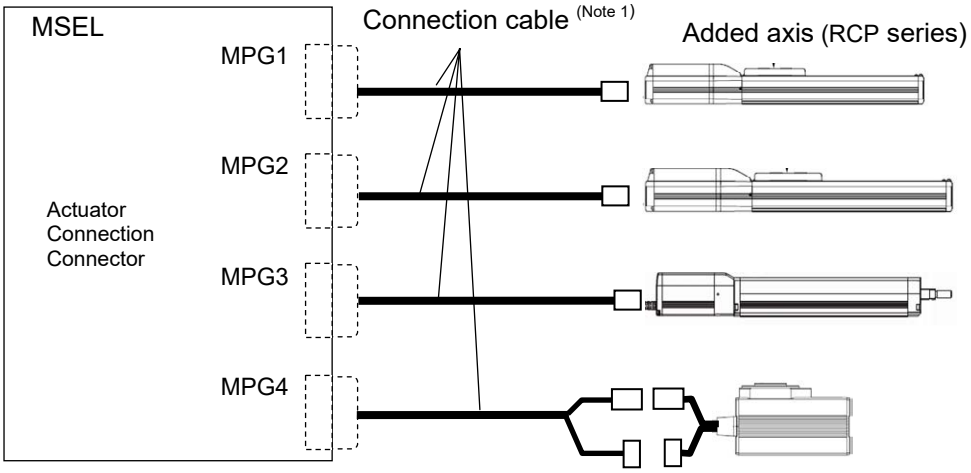
	Specifications		
Voltage	24V DC (Built-in power supply)		
	Type	PG/PGX	PGF Numbers in brackets ( ) are in case of high-thrust axis
Rated current	1-axis type	2A	1.5A
	2-axis type	4A	3.5A (3.0A)
	3-axis type	6A	5.5A (5.0A)
	4-axis type	8A	7.5A (7.0A)
Maximum current	1-axis type	4A	6A
	2-axis type	8A	10A (12A)
	3-axis type	12A	14A (16A)
	4-axis type	16A	18A (20A)

Note 2: The ratings for the emergency stop signal (EMGIN) that turns on/off at the contact CR1 and the enable signal (ENBIN) that turns ON/OFF at the contact CR2 are 24V DC and 10mA or less.
The emergency stop output (EMGOUT) and the enable output (ENBOUT) are available for connection to 30V DC and 0.5A or less.

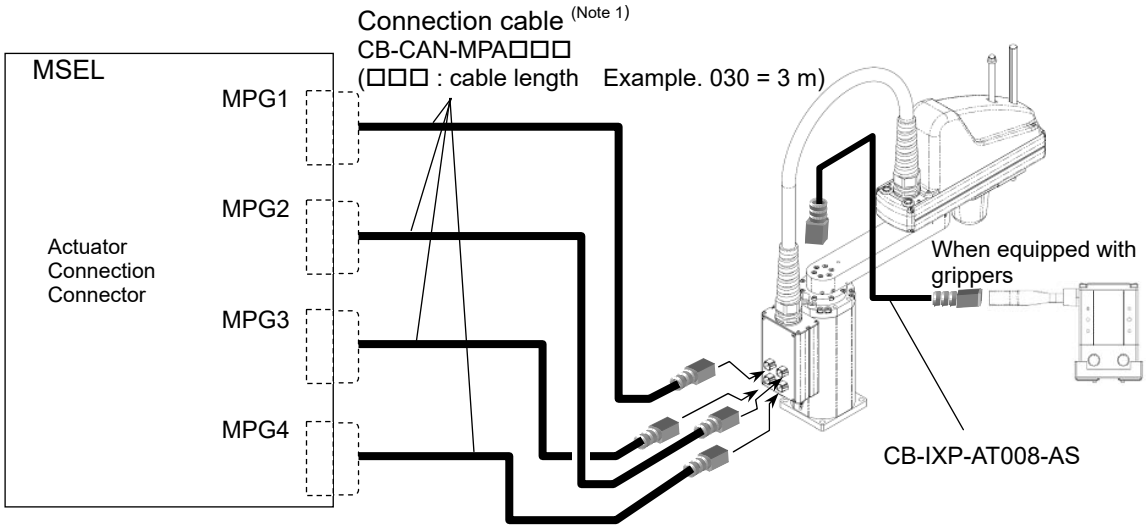
Note 3: For CR1 and CR2, select the one with coil current 0.1A or less.

2.2.4 Motor Encoder Circuit

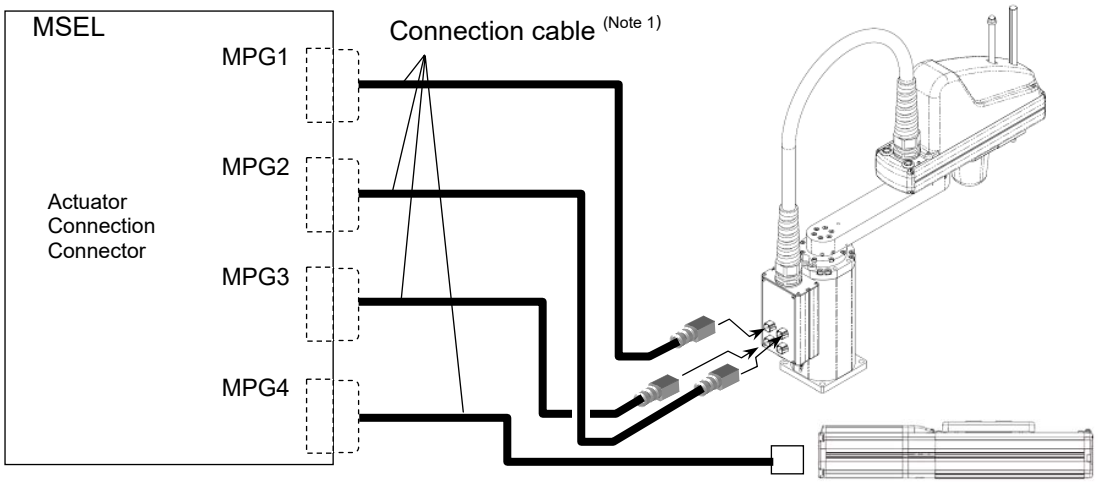
(1) Connection of Linear Axes



(2) Connection to IXP-4N3515, 4515 and IXP-3N3515, 4515 Equipped with Grippers.



(3) Connection to IXP-3N3515, 4515 and Additional Axes



Note 1 Applicable Connection Cable Model No. □□□ : cable length Example. 030 = 3 m

Model	Cable	Remarks
RCP2	CB-PSEP-MPA□□□	Robot cable from 0.5 to 20m
RCP3	CB-APSEP-MPA□□□	Robot cable from 0.5 to 20m
	CB-APSEP-MPA□□□-LC	Standard cable from 0.5 to 20m
RCP4 (except for GR* type)	CB-CA-MPA□□□-RB	Robot cable from 0.5 to 20m
	CB-CA-MPA□□□	Standard cable from 0.5 to 20m
RCP4 (GR* type), RCP5, RCP6, IXP	CB-CAN-MPA□□□-RB	Robot cable from 0.5 to 20m
	CB-CAN-MPA□□□	Standard cable from 0.5 to 20m
RCP2 High-thrust type	CB-CFA-MPA□□□-RB	Robot cable from 0.5 to 20m
	CB-CFA-MPA□□□	Standard cable from 0.5 to 20m
RCP4 High-thrust type	CB-CFA2-MPA□□□-RB	Robot cable from 0.5 to 20m
	CB-CFA2-MPA□□□	Standard cable from 0.5 to 20m
RCP5/6 High-thrust type	CB-CFA3-MPA□□□-RB	Robot cable from 0.5 to 20m
	CB-CFA3-MPA□□□	Standard cable from 0.5 to 20m

⚠ *Caution: In such case, give a number to each connector to avoid any mistake. If the cable is not correctly connected, it might cause a damage to or malfunction of the motor or PCB board.*

2.2.5 PIO Circuit

On MSEL Controller, Standard (I/O1) and Extension (I/O2) are available to mount.
The setting of the I/O parameters is required to use this PIO board.

[1] I/O Port Function Assignment
[2] Port Number Assignment for I/O Ports

[1] I/O Port Function Allocation

To Input Function Select No. 000 to 015 and Output Function Select No. 300 to 315, it is available to set the dedicated functions and is available to assign to any input and output port. For the other I/O port Nos., they can be used freely as the universal I/O port.

(1) Input Port Function Allocation

Input Function Select No.	Parameter No.		Set Value	Function of an Input Signal	At the delivery
000	No.30		0	Universal input	
			1	Program start (When indicated input port = 007 to 014 BCD, start of indicated program number … ON-edge)	○
			2	Program start (When indicated input port = 007 to 014, start of binary indicated program number … ON-edge)	
001	No.31		0	Universal input	○
			1	Software reset signal (1sec continuous ON)	
002	No.32		0	Universal input	○
			1	Servo ON signal (edge input)	
003	No.33		0	Universal input	
			1	Program automatically started when the power ON is reset in AUTO mode and software is reset	○
			2	Automatic starting program start (100sec continuous ON)	
004	No.34		0	Universal input	○
			1	All servo-axes soft interlock (Level signal of regular ON)	
005	No.35		0	Universal input	○
			1	Pause release (ON edge processing signal)	
006	No.36		0	Universal input	○
			1	Pause signal (level signal of regular ON)	
007	No.37	No Consideration of Value in Input Function Select 000	0	Universal input	
		Input Function Select 000=Setting 1	1	Program No. select 0 bit	○
		Input Function Select 000=Setting 2			
008	No.38	No Consideration of Value in Input Function Select 000	0	Universal input	
		Input Function Select 000=Setting 1	1	Program No. select 1 bit	○
		Input Function Select 000=Setting 2			
009	No.39	No Consideration of Value in Input Function Select 000	0	Universal input	
		Input Function Select 000=Setting 1	1	Program No. select 2 bit	○
		Input Function Select 000=Setting 2			
010	No.40	No Consideration of Value in Input Function Select 000	0	Universal input	
		Input Function Select 000=Setting 1	1	Program No. select 3 bit	○
		Input Function Select 000=Setting 2			
011	No.41	No Consideration of Value in Input Function Select 000	0	Universal Input	
		Input Function Select 000=Setting 1	1	Program No. select 4 bit	○
		Input Function Select 000=Setting 2			
012	No.42	No Consideration of Value in Input Function Select 000	0	Universal input	
		Input Function Select 000=Setting 1	1	Program No. select 5 bit	○
		Input Function Select 000=Setting 2			
013	No.43	No Consideration of Value in Input Function Select 000	0	Universal Input	
		Input Function Select 000=Setting 1	1	Program No. select 6 bit	○
		Input Function Select 000=Setting 2			
		No Consideration of Value in Input Function Select 000	2	Error reset (ON-edge)	

Input Function Select No.	Parameter No.		Set Value	Function of an Input Signal	At the delivery
014	No.44	No Consideration of Value in Input Function Select 000	0	Universal input	○
		No Consideration of Value in Input Function Select 000	1	Driving source cut-off cancellation input (ON-edge) (Effective when cancelling the cause of driving source cutoff)	
		Input Function Select 000=Setting 1	2	Program No. select 7 bit	
		Input Function Select 000=Setting 2			
015	No.45		0	Universal input	○
			1	Home-return operation on all the linear axes (ON-edge)	
			2	Home-return operation on all the incremental effective axes (ON-edge)	

(2) Output Port Function Allocation

Output Function Select No.	Parameter No.	Set Value	Function of an Input Signal	At the delivery
300	No.46	0	Universal output	
		1	Error output at the operation cancellation level or more (ON)	
		2	Error output at the operation cancellation level or more (OFF)	○
		3	Error output at the operation cancellation level or more + emergency-stop output (ON)	
		4	Error output at the operation cancellation level or more + emergency-stop output (OFF)	
		7	Output of an error of maintenance information alert function related message level (Error No. 231 or 232) (ON)	
		8	Output of an error of maintenance information alert function related message level (Error No. 231 or 232) (OFF)	
301	No.47	0	Universal output	
		1	READY output (PIO trigger program operation available)	
		2	READY output (PIO trigger program operation available) and without occurrence of any error at the operation cancellation level or more	
		3	READY output (PIO trigger program operation available, and without occurrence of any error at the cold start level or more)	○
302	No.48	0	Universal output	
		1	Emergency-stop output (ON)	
		2	Emergency-stop output (OFF)	○
303	No.49	0	Universal output	○
		1	AUTO mode	
		2	Output during automatic operation (Other parameter No. 12)	
304	No.50	0	Universal output	○
		1	Output when all the effective axes at home position (= 0)	
		2	Output when home-return operation on all the effective axes in complete condition (coordinates confirmed)	
		3	Output when all the effective axes in home preset coordinates	
305	No.51	0	Universal output	○
		1	1st axis in-position output (OFF when miss-pressing)	
		2	Output while the 1st axis servo is ON (system monitoring task output)	
306	No.52	0	Universal output	○
		1	2nd axis in-position output (OFF when miss-pressing)	
		2	Output while the 2nd axis servo is ON (system monitoring task output)	
307	No.53	0	Universal output	○
		1	3rd axis in-position output (OFF when miss-pressing)	
		2	Output while the 3rd axis servo is ON (system monitoring task output)	
308	No.54	0	Universal output	○
		1	4th axis in-position output (OFF when miss-pressing)	
		2	Output while the 4th axis servo is ON (system monitoring task output)	
309	No.55	0	Universal output	○
310	No.56	0	Universal output	○
311	No.57	0	Universal output	○
312	No.58	0	Universal output	○
313	No.59	0	Universal output	○
314	No.60	0	Universal output	○
315	No.61	0	Universal output	○

[2] Port Number Assignment for I/O Ports

With the following I/O parameters, assign the ranges and numbers of the ports used on PIO board.

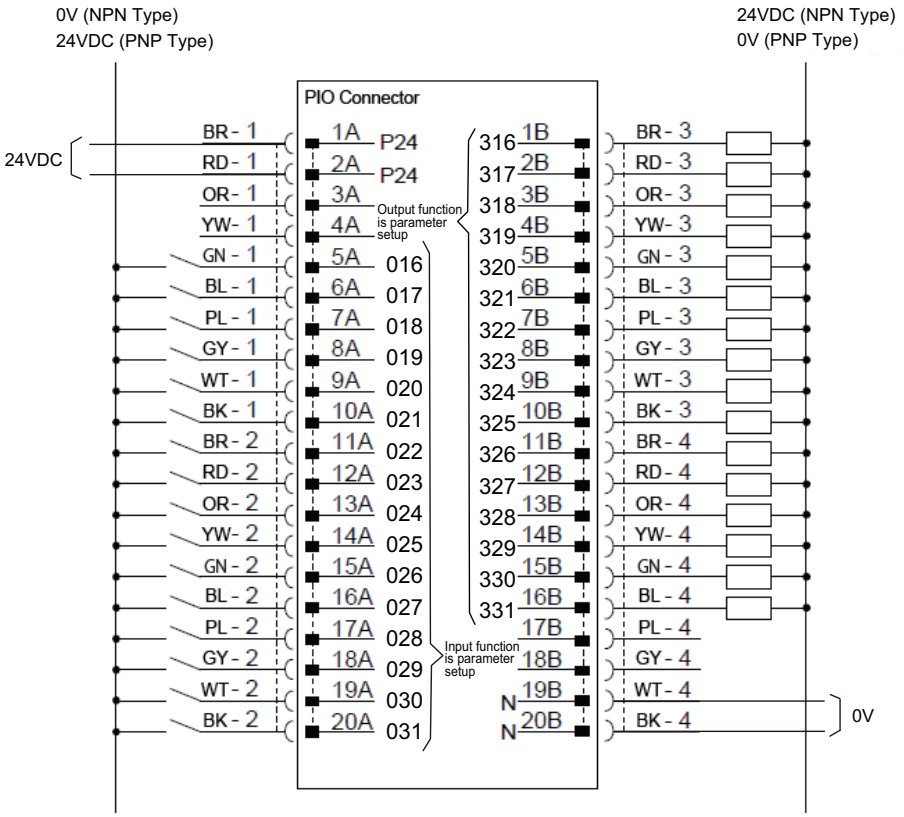
No.	Parameter Name		Default (Reference)	Input Range	Remarks
1	I/O Port Assignment Type		0 (Reference value)	0 to 20	0: Fixed assignment (No other than 0 can be set)
2	Standard	Input Port Start Number at I/O1 Affixed Assignment	000	-1, 0 to 248	0+(multiple of 8)(Unavailable when it is negative figure)
3		Output Port Start Number at I/O1 Affixed Assignment	300	-1, 300 to 548	300+(multiple of 8)(Unavailable when it is negative figure)
16	Extension	Input Port Start Number at I/O2 Affixed Assignment	-1	-1, 0 to 288	0+(multiple of 8)(Unavailable when it is negative figure)
17		Output Port Start Number at I/O2 Affixed Assignment	-1	-1, 300 to 588	300+(multiple of 8)(Unavailable when it is negative figure)
18		I/O2 Error Monitoring	1	0 to 1	0: Not to Monitor (The extension not applicable) 1: Monitor (Use the extension)
225		Extension I/O Controller	9 (Reference value)	0 to 9	0 to 8:Extension not installed or other than PIO installed 9:PIO (Extension installed)
283	Input Function Select 000 Physical Input Port No.		16	-1, 16 to 31, 48 to 299	Indicate port number to assign function set in I/O Parameter No. 30 (Input port 000 when negative)
284	Input Function Select 001 Physical Input Port No.		17	-1, 16 to 31, 48 to 299	Indicate port number to assign function set in I/O Parameter No. 31 (Input port 001 when negative)
285	Input Function Select 002 Physical Input Port No.		18	-1, 16 to 31, 48 to 299	Indicate port number to assign function set in I/O Parameter No. 32 (Input port 002 when negative)
286	Input Function Select 003 Physical Input Port No.		19	-1, 16 to 31, 48 to 299	Indicate port number to assign function set in I/O Parameter No. 33 (Input port 003 when negative)
287	Input Function Select 004 Physical Input Port No.		20	-1, 16 to 31, 48 to 299	Indicate port number to assign function set in I/O Parameter No. 34 (Input port 004 when negative)
288	Input Function Select 005 Physical Input Port No.		21	-1, 16 to 31, 48 to 299	Indicate port number to assign function set in I/O Parameter No. 35 (Input port 005 when negative)
289	Input Function Select 006 Physical Input Port No.		22	-1, 16 to 31, 48 to 299	Indicate port number to assign function set in I/O Parameter No. 36 (Input port 006 when negative)
290	Input Function Select 007 Physical Input Port No.		23	-1, 16 to 31, 48 to 299	Indicate port number to assign function set in I/O Parameter No. 37 (Input port 007 when negative)
291	Input Function Select 008 Physical Input Port No.		24	-1, 16 to 31, 48 to 299	Indicate port number to assign function set in I/O Parameter No. 38 (Input port 008 when negative)
292	Input Function Select 009 Physical Input Port No.		25	-1, 16 to 31, 48 to 299	Indicate port number to assign function set in I/O Parameter No. 39 (Input port 009 when negative)
293	Input Function Select 010 Physical Input Port No.		26	-1, 16 to 31, 48 to 299	Indicate port number to assign function set in I/O Parameter No. 40 (Input port 010 when negative)
294	Input Function Select 011 Physical Input Port No.		27	-1, 16 to 31, 48 to 299	Indicate port number to assign function set in I/O Parameter No. 41 (Input port 011 when negative)
295	Input Function Select 012 Physical Input Port No.		28	-1, 16 to 31, 48 to 299	Indicate port number to assign function set in I/O Parameter No. 42 (Input port 012 when negative)
296	Input Function Select 013 Physical Input Port No.		29	-1, 16 to 31, 48 to 299	Indicate port number to assign function set in I/O Parameter No. 43 (Input port 013 when negative)
297	Input Function Select 014 Physical Input Port No.		30	-1, 16 to 31, 48 to 299	Indicate port number to assign function set in I/O Parameter No. 44 (Input port 014 when negative)
298	Input Function Select 015 Physical Input Port No.		31	-1, 16 to 31, 48 to 299	Indicate port number to assign function set in I/O Parameter No. 45 (Input port 015 when negative)
299	Output Function Select 300 Physical Input Port No.		316	0, 316 to 331, 348 to 599	Indicate port number to assign function set in I/O Parameter No. 46 (Output port 301 when 0)
300	Output Function Select 301 Physical Input Port No.		317	0, 316 to 331, 348 to 599	Indicate port number to assign function set in I/O Parameter No. 47 (Output port 302 when 0)
301	Output Function Select 302 Physical Input Port No.		318	0, 316 to 331, 348 to 599	Indicate port number to assign function set in I/O Parameter No. 48 (Output port 303 when 0)
302	Output Function Select 303 Physical Input Port No.		319	0, 316 to 331, 348 to 599	Indicate port number to assign function set in I/O Parameter No. 49 (Output port 304 when 0)
303	Output Function Select 304 Physical Input Port No.		320	0, 316 to 331, 348 to 599	Indicate port number to assign function set in I/O Parameter No. 50 (Output port 305 when 0)
304	Output Function Select 305 Physical Input Port No.		321	0, 316 to 331, 348 to 599	Indicate port number to assign function set in I/O Parameter No. 51 (Output port 306 when 0)

No.	Parameter Name	Default (Reference)	Input Range	Remarks
305	Output Function Select 306 Physical Input Port No.	322	0, 316 to 331, 348 to 599	Indicate port number to assign function set in I/O Parameter No. 52 (Output port 307 when 0)
306	Output Function Select 307 Physical Input Port No.	323	0, 316 to 331, 348 to 599	Indicate port number to assign function set in I/O Parameter No. 53 (Output port 308 when 0)
307	Output Function Select 308 Physical Input Port No.	324	0, 316 to 331, 348 to 599	Indicate port number to assign function set in I/O Parameter No. 54 Output port 309 when 0)
308	Output Function Select 309 Physical Input Port No.	325	0, 316 to 331, 348 to 599	Indicate port number to assign function set in I/O Parameter No. 55 (Output port 310 when 0)
309	Output Function Select 310 Physical Input Port No.	326	0, 316 to 331, 348 to 599	Indicate port number to assign function set in I/O Parameter No. 56 (Output port 311 when 0)
310	Output Function Select 311 Physical Input Port No.	327	0, 316 to 331, 348 to 599	Indicate port number to assign function set in I/O Parameter No. 57 (Output port 312 when 0)
311	Output Function Select 312 Physical Input Port No.	328	0, 316 to 331, 348 to 599	Indicate port number to assign function set in I/O Parameter No. 58 (Output port 313 when 0)
312	Output Function Select 313 Physical Input Port No.	329	0, 316 to 331, 348 to 599	Indicate port number to assign function set in I/O Parameter No. 59 (Output port 314 when 0)
313	Output Function Select 314 Physical Input Port No.	330	0, 316 to 331, 348 to 599	Indicate port number to assign function set in I/O Parameter No. 60 (Output port 315 when 0)
314	Output Function Select 315 Physical Input Port No.	331	0, 316 to 331, 348 to 599	Indicate port number to assign function set in I/O Parameter No. 61 (Output port 316 when 0)

(Note) The parameter settings at delivery may differ depending on the type of the extension I/O slot (I/O2).
[Refer to 3.2 Receiving and Forwarding of I/O Signals Necessary for Operation]

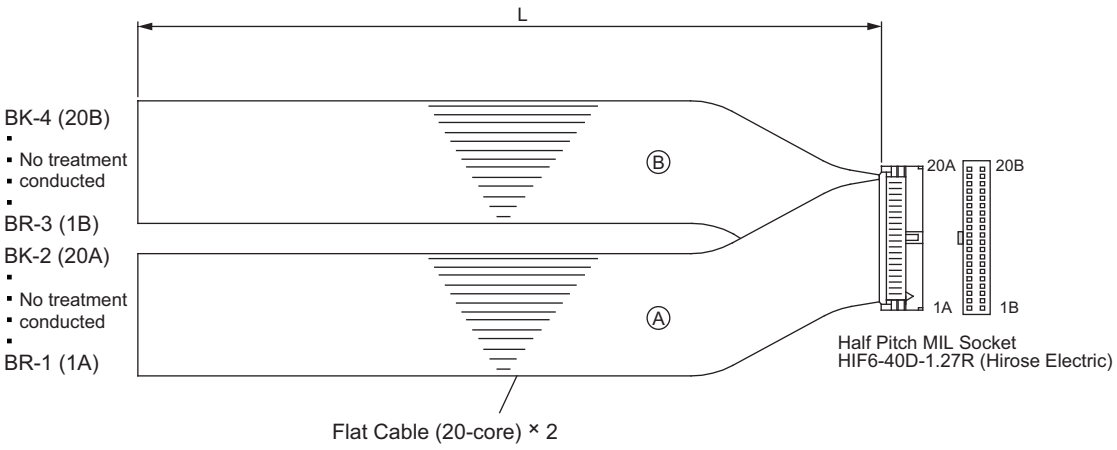
[3] Wiring

1) Standard type (I/O1)

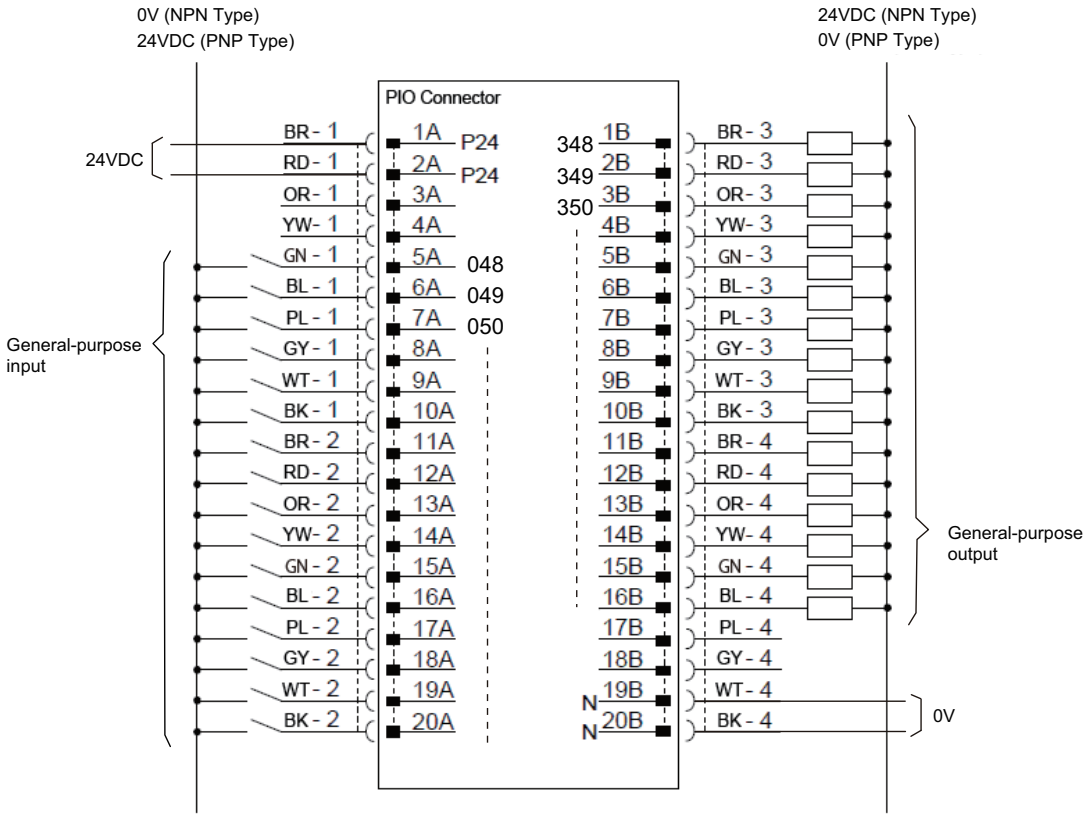


● Use the attached cable for the I/O connection.

Model : CB-PAC-PIO□□□ (□□□ indicates the cable length L. Example. 020 = 2m)

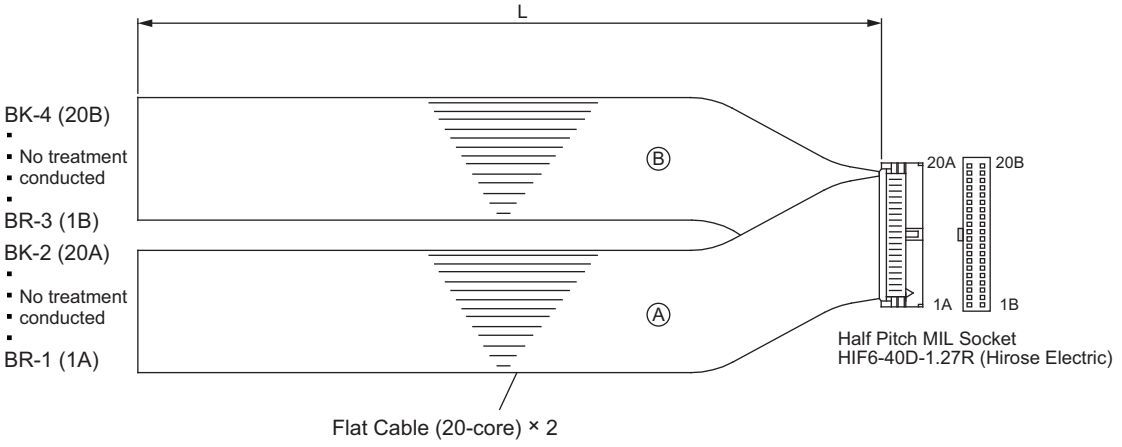


2) ExtensionI/O (I/O2)

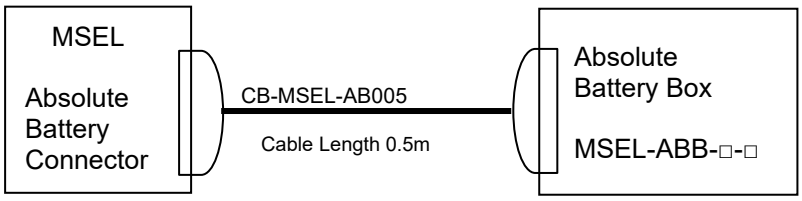


- Use the attached cable for the I/O connection.

Model : CB-PAC-PIO□□□ (□□□ indicates the cable length L. Example. 020 = 2m)



2.2.6 Connection to Absolute Battery Box (only for PC/PG/PCF/PGF Type Simple Absolute)

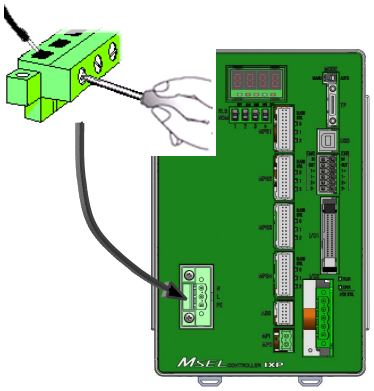


(Note) Do not attempt to plug in or take off the cable with force in the tilted direction to the connector.

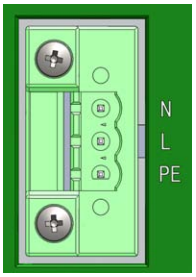
2.3 Wiring Method

2.3.1 Connection to AC Power Input Connector

The wire of the power supply is to be connected to the enclosed connector (plug).
Strip the sheath of the applicable wires for 7mm and insert them to the connector.
When inserting, turn the screw on the side of the inlet to the left with a slotted screwdriver to open the inlet. After inserting the wires, turn the screw to the right with a slotted slotted screwdriver to fix the wires.



Drive Power Supply Input Connector	Model	Remarks
Cable side	MSTB2,5/3-STF-5,08 (SK: N-PE) (PHOENIX CONTACT)	Enclosed in standard package
Controller side	DFK-MSTB2,5/3-GF-5,08 (PHOENIX CONTACT)	



Front view of connector on controller side

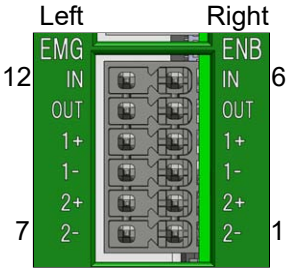
Pin No.	Signal Name	Description	Applicable Cable Diameter
3	N	Power supply input (100 AC to 230V)	1.25 to 0.5mm^2 (AWG16 to 20) Select the cable thickness allowable for the current figured out in the power capacity.
2	L		
1	PE	Protective grounding wire	

2.3.2 Wiring the Emergency Stop Circuit (System I/O)

Construction is made with the emergency stop input and the input terminal of the enable signal.
The wires are to be connected to the enclosed connectors (plugs). Peel the sheath on the applicable cable for 10mm, and insert to a connector.

Item	PC/PCF/PCX Type	PG/PGF/PGX Type
Drive-source cutoff circuit	Built-in (Hard-wired configuration)	
Conforming category	B	B, 1 to 3
Redundancy in safety circuit	-	Achieved by an external circuit.
Operation upon emergency stop	Decelerate the actuator at the emergency deceleration (All axes parameter No. 24, No. 205, each axis parameter No. 136) to a stop, turn OFF the servo, and then cut off the drive source.	
Recovery from emergency stop	Recover by cancelling emergency stop by system I/O	
External output of emergency stop status	Possible. (Set by I/O parameter No. 48.)	

[Refer to 2.2.2 and 2.2.3 for the basic circuit configuration.]



Front view of connector on controller side

System I/O Connector	Model	Remarks
Cable side	DFMC1,5/6-ST-3,5 (PHOENIX CONTACT)	Enclosed in standard package
Controller side	DMC1,5/6-G1-3,5P20THR (PHOENIX CONTACT)	

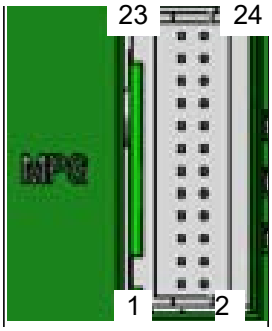
	Pin No.	Signal Name	Class	Description	Applicable cable diameter
Left side	12	EMGIN	IN	Emergency stop detection input	1.25 to 0.3mm^2 (AWG16 to 22)
	11	EMGOUT	+24V	24-V power output for emergency stop detection input (30V DC, Max0.5A)	
	10	EMGS1+	line+	They are the cables to connect to the emergency stop circuit on the teaching pendant when a teaching pendant is to be connected. When no teaching pendant is to be connected, 1+ and 1- are short-circuited the PC/PCF/PCX type.	
	9	EMGS1-	line-		
	8	EMGS2+	line+	(Used in PG/PGF type, Not used in PC/PCF type) They are the cables to connect to the emergency stop circuit on the teaching pendant when a teaching pendant is to be connected. When no teaching pendant is to be connected, 2+ and 2- are short-circuited.	
	7	EMGS2-	line-		
Right side	6	ENBIN	IN	Enable detection input	
	5	ENBOUT	+24V	24-V power output for enable detection input (30V DC, Max0.5A)	
	4	ENBS1+	line+	They are the cables to connect to the enable circuit on the teaching pendant when a teaching pendant is to be connected. When no teaching pendant is to be connected, 1+ and 1- are short-circuited the PC/PCF/PCX type.	
	3	ENBS1-	line-		
	2	ENBS2+	line+	(Used in PG/PGF type, Not used in PC/PCF type) They are the cables to connect to the emergency stop circuit on the teaching pendant when a teaching pendant is to be connected. When no teaching pendant is to be connected, 2+ and 2- are short-circuited.	
	1	ENBS2-	line-		

The following pin numbers are connected with a short-circuiting cable at the delivery.

- Pins 4 and 5
- Pins 3 and 6
- Pins 10 and 11
- Pins 9 and 12

2.3.3 Wiring for Actuator

Connect the relay cables to the actuator connectors.
Check in the instruction manual of each actuator for the details of the relay cables.



Front view of connector on controller side

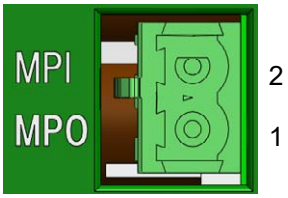
Actuator Connection Connector	Model	Remarks
Cable side	PADP-24V-1-S	
Controller side	S24B-PADSS-1	

Pin No.	Signal Name	Description	Applicable Wire Diameter
1	ϕA	Motor driving A-phase	Cable dedicated for IAI products
2	VMM	Motor power	
3	ϕB	Motor driving B-phase	
4	VMM	Motor power	
5	ϕ/A	Motor driving /A-phase	
6	ϕ/B	Motor driving /B-phase	
7	LS +	Limit switch positive side	
8	LS -	Limit switch negative side	
9	BK +	Brake release positive side	
10	BK -	Brake release negative side	
11	ABS_SA	Absolute encoder differential + input	
12	ABS_SB	Absolute encoder differential - input	
13	A +	Encoder A-phase differential + input	
14	A -	Encoder A-phase differential - input	
15	B +	Encoder B-phase differential + input	
16	B -	Encoder B-phase differential - input	
17 (Note 1)	5V	Encoder power supply (except for high-thrust axis)	
	NC	Disconnected (High-thrust axis)	
18	/PS	Encoder line driver enable output	
19	GND	Ground	
20	LSGND	Ground for limit switch	
21 (Note 1)	NC	Disconnected (except for high-thrust axis)	
	5V	Encoder power supply (High-thrust axis)	
22	NC	Disconnected	
23	NC	Disconnected	
24	FG	Grounding	

Note 1 The pin assignment of the connector that the high-thrust type axis can be connected and that of the connector that all the other types of axis can be connected are different from each other.

2.3.4 Wiring for Motor Driving Power Line Connector

This wiring is to be constructed when it is required to have the driving power source shut externally. In case of using the driving source cutoff circuit inside the controller, use the controller under the condition of the enclosed short-circuiting cable being connected.
The wires are to be connected to the enclosed connectors (plugs). Peel the sheath on the applicable cable for 10mm, and insert to a connector.



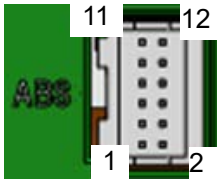
Front view of connector on controller side

Motor Driving Power Supply Line Connector	Model	Remarks
Cable side	FKIC2,5HC/2-ST-5,08 (PHOENIX CONTACT)	Enclosed in standard package
Controller side	IC2,5HC/2-G-5,08	

Pin No.	Signal Name	Description	Applicable Wire Diameter
2	MPI	Motor power supply external input	KIV1.25 to 0.75mm^2 (AWG16 to 18) Select the cable thickness allowable for the current figured out in the power capacity.
1	MPO	Motor power supply external output	

2.3.5 Wiring to Single Absolute Battery Unit

Connect the absolute battery unit and controller for simple absolute type.



Front view of connector on controller side

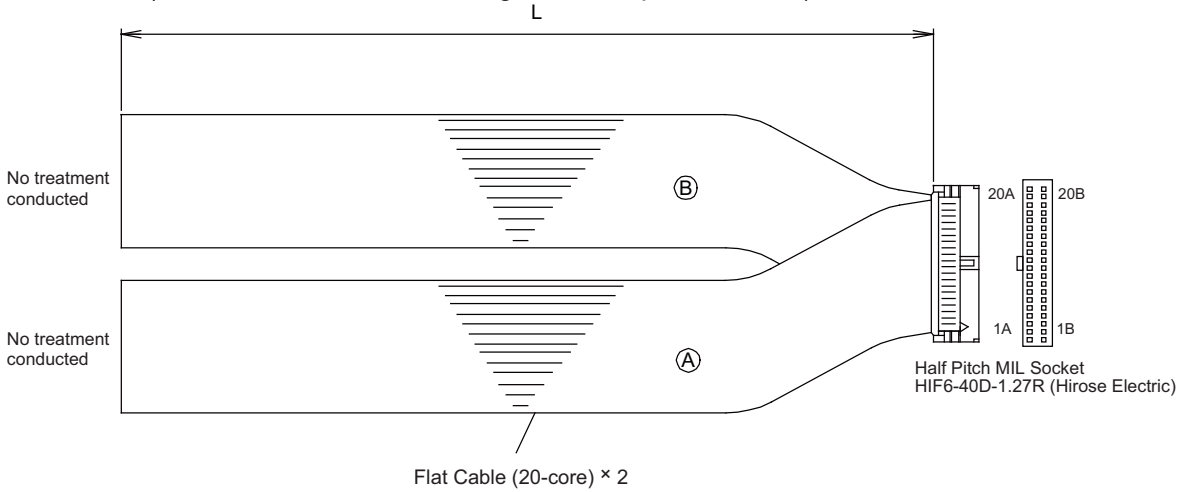
Absolute Battery Connector	Model	Remarks
Cable side	CZHR-12V-S	
Controller side	S12B-PADSS-1	

Pin No.	Signal Name	Description	Applicable Wire Diameter
1	GND	0V	Cable dedicated for IAI products
2	1BAT	Axis No. 1 Absolute battery	
3	1BAT_TMP	Axis No. 1 Absolute battery temperature sensor	
4	2BAT	Axis No. 2 Absolute battery	
5	2BAT_TMP	Axis No. 2 Absolute battery temperature sensor	
6	3BAT	Axis No. 3 Absolute battery	
7	3BAT_TMP	Axis No. 3 Absolute battery temperature sensor	
8	4BAT	Axis No. 4 Absolute battery	
9	4BAT_TMP	Axis No. 4 Absolute battery temperature sensor	
10	GND	0V	
11	NC	Disconnected	
12	NC	Disconnected	

2.3.6 Wiring for PIO

The connection of I/O to the controller is to be carried out using the dedicated I/O cable. The cable length is shown in the model code of the controller. Please check the controller model code. There are 2m for standard, 3m and 5m as an option. Up to 10m can be enabled sold separately. [Refer to “1.1.5 How to Read the Model”]
Also, the end of the cable harness to be connected to the host controller (PLC, etc.) is just cut and no treatment is conducted so the wiring layout can be performed freely.

Model : CB-PAC-PIO□□□
(□□□ indicates the cable length L. Example. 020 = 2m)



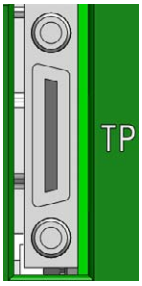
No.	Cable Color	Wiring	No.	Cable Color	Wiring
1A	BR-1	Flat Cable Ⓐ (Press Welding) AWG28	1B	BR-3	Flat Cable Ⓑ (Press Welding) AWG28
2A	RD-1		2B	RD-3	
3A	OR-1		3B	OR-3	
4A	YW-1		4B	YW-3	
5A	GN-1		5B	GN-3	
6A	BL-1		6B	BL-3	
7A	PL-1		7B	PL-3	
8A	GY-1		8B	GY-3	
9A	WT-1		9B	WT-3	
10A	BK-1		10B	BK-3	
11A	BR-2		11B	BR-4	
12A	RD-2		12B	RD-4	
13A	OR-2		13B	OR-4	
14A	YW-2		14B	YW-4	
15A	GN-2		15B	GN-4	
16A	BL-2		16B	BL-4	
17A	PL-2		17B	PL-4	
18A	GY-2		18B	GY-4	
19A	WT-2		19B	WT-4	
20A	BK-2		20B	BK-4	

[Refer to 2.2.5 PIO Circuit for the signal assignment for each cable]

2.3.7 Wiring for the Teaching Tool (SIO Connector, USB Connector)

Connect a teaching tool such as the PC software.
Connection of either RS232C or USB is available. (USB is prioritized when both are connected at the same time.)
Apply the enclosed dummy plug (DP-4S) to the teaching connector when operation mode setting switch is set to AUTO in PG/PGF/PGX type.

[1] SIO Connector



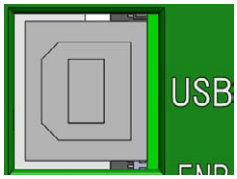
Front view of connector on controller side

SIO Connector	Model	Remarks
Controller side	HDR-EC26LFDT1-SLD+	

Pin No.	Signal Name	Description	Applicable Wire Diameter
1	GND	0V	Cable dedicated for IAI products
2	EMGS	Emergency stop status output	
3	VCC	6.5V power input connector	
4	DTR	Terminal ready (Connected to DSR inside)	
5	EMGS2 +	Emergency stop contact output 2+	
6	EMGS2 -	Emergency stop contact output 2-	
7	NC	Unconnected	
8	RSVVCC	24V power input connector	
9	EMGS1 -	Emergency stop contact output 1-	
10	NC	Unconnected	
11	NC	Unconnected	
12	EMGS1 +	Emergency stop contact output 1+	
13	RTS	Connected to DSR externally	
14	CTS	Connected to RTS externally, connector connection detection input.	
15	TXD	Transmit data	
16	RXD	Receive data	
17	DSR	Equipment ready (Connected to DSR inside)	
18	NC	Unconnected	
19	NC	Unconnected	
20	NC	Unconnected	
21	NC	Unconnected	
22	ENBS2 +	Enable contact output 2 +	
23	ENBS1 -	Enable contact output 1 -	
24	ENBS1 +	Enable contact output 1 +	
25	ENBS2 -	Enable contact output 2 -	
26	GND	0V	

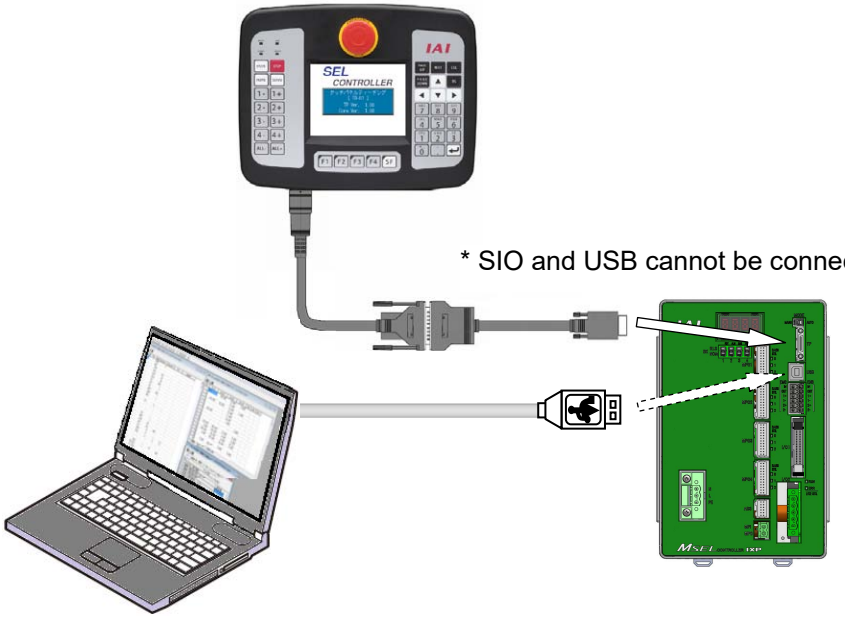
[2] USB Connector

USB Connector	Model	Remarks
Controller side	UBBS-4R-D14-4D	B type



Front view of connector on controller side

Pin No.	Signal Name	Description	Applicable Wire Diameter
1	V_{BUS}	5V	USB cable
2	D-	Communication data -	
3	D+	Communication data +	
4	GND	0V	



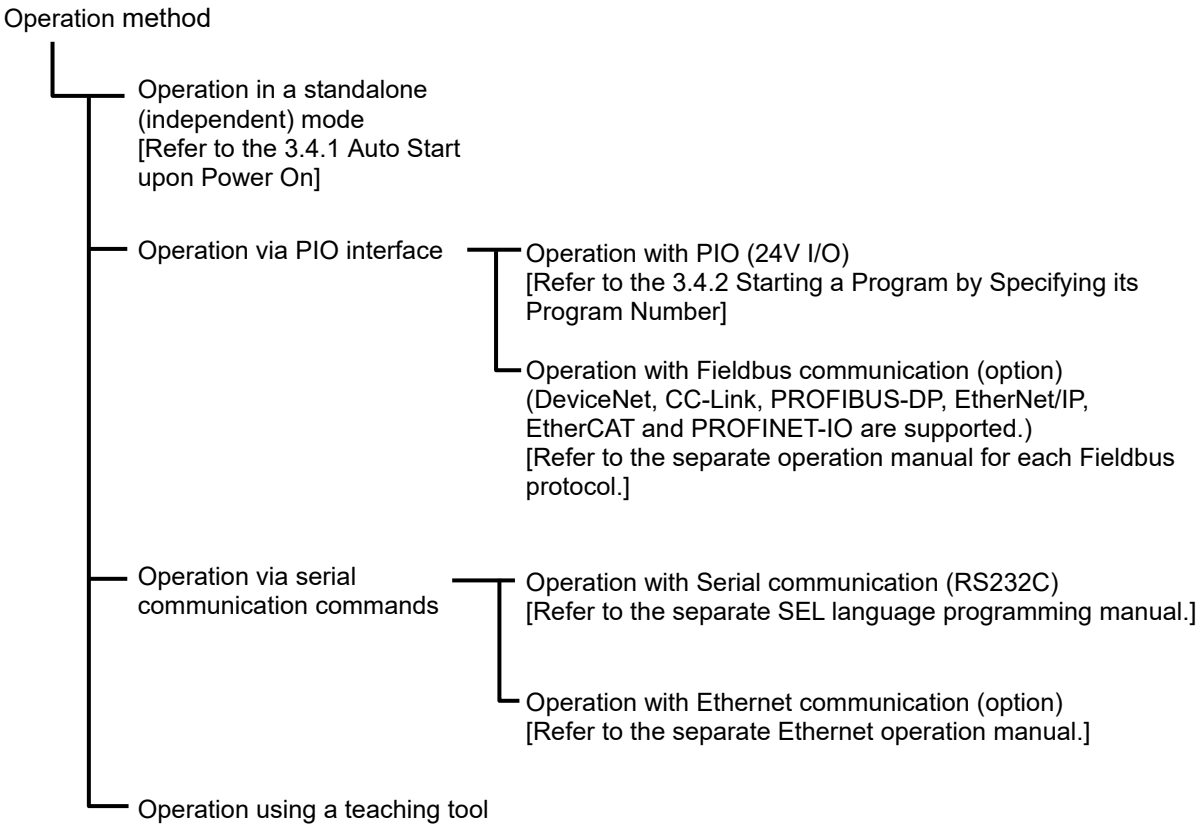
* SIO and USB cannot be connected at the same time.

Caution: 1) Set "Operation Mode Setting Switch" to "MANU" side when a teaching device is connected.
2) Turn the power OFF before disconnecting a teaching pendant.
3 USB connector and SIO connector cannot be used at the same time. USB connector is prioritized.
4) When using a USB connector in MANU Mode, apply the dummy plug (DP-4S) or connect the cable enclosed to the PC software to the SIO connector as the enable signal detection activates.

Chapter 3 Operation

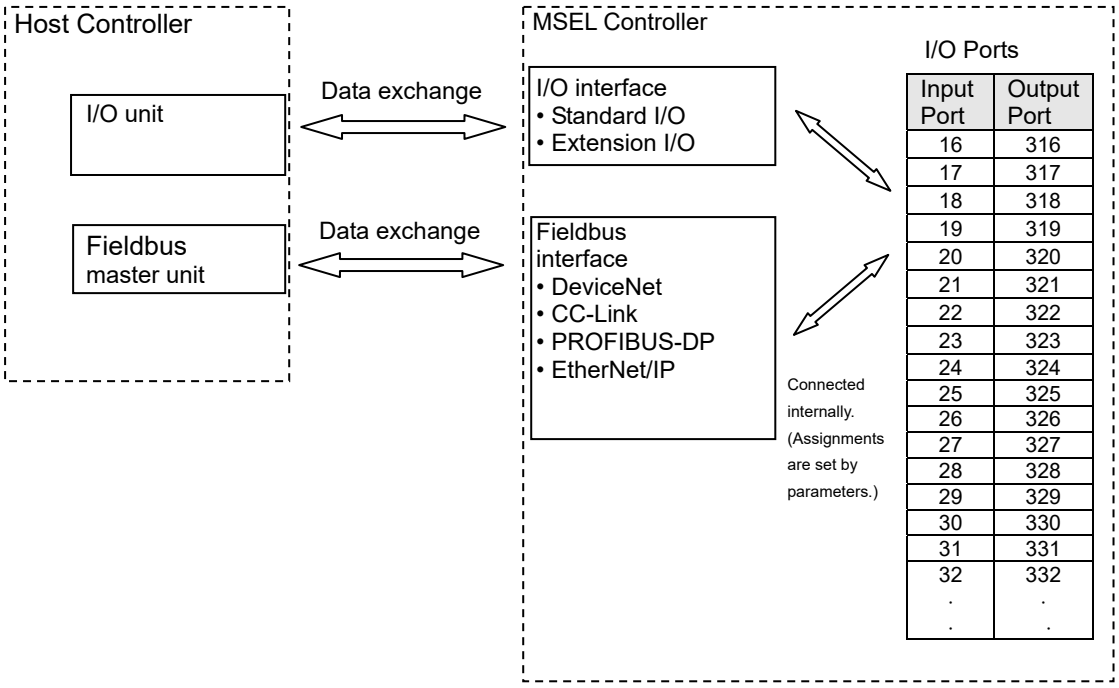
3.1 Types of Operations

The MSEL controller is a programming controller that can operate without a host controller. Programming for this controller uses IAI's dedicated programming language (SEL language). [Refer to the separate SEL Language Programming Manual.]



3.2 Receiving and Forwarding of I/O Signals Necessary for Operation

The I/O port can deliver the data with the MSEL controller and external signals through interface.
One port can exchange data for one contact (1 bit).
Data is exchanged via PIOs (24V I/Os) or over a fieldbus.
Either a PIO or fieldbus can connect to each port at a time.
Whether to use PIO or fieldbus is set by a parameter.



⟺ indicates flow of data.

Refer to Section 2.2.5 for the PIO interface.
For the each fieldbus, refer to each instruction manual.

(1) I/O Map

The factory-set I/O port numbers and functions of the MSEL controller are shown below. The functions of the I/O port can be changed using the I/O parameter setting. [Refer to 2.2.5 PIO Circuit and Chapter 6. I/O Parameter]

1) When I/O2 is Not Fieldbus type (Type of extension I/O is either of E/NP/PN/SE1/SE2/IA)

Type	Port No.	Function	Type	Port No.	Function
Internal DI (I/O1)	000	System reservation	Internal DO (I/O1)	300	ALM (LED on the front panel)
	001			301	RDY (LED on the front panel)
	002			302	EMG (LED on the front panel)
	003			303	System reservation
	004			304	HPS (LED on the front panel)
	005			305	System reservation
	006			306	
	007			307	
	008			308	
	009			309	
	010			310	
	011			311	
	012			312	
	013			313	
	014			314	
	015			315	
External DI (I/O1)	016	Program start	External DO (I/O1)	316	Alarm output
	017	General-purpose input		317	READY output
	018			318	Emergency-stop output
	019			319	General-purpose output
	020			320	
	021			321	
	022			322	
	023	Program number indication (BCD:1・BIN:1) *		323	
	024	Program number indication (BCD:2・BIN:2) *		324	
	025	Program number indication (BCD:4・BIN:4) *		325	
	026	Program number indication (BCD:81・BIN:8) *		326	
	027	Program number indication (BCD:10・BIN:16) *		327	
	028	Program number indication (BCD:20・BIN:32) *		328	
	029	Program number indication (BCD:40・BIN:64) *		329	
	030	General-purpose input		330	
	031			331	
Internal DI (I/O1)	032	System reservation	Internal DO (I/O1)	332	7-segment user display digit
	033			333	7-segment user display digit
	034			334	System reservation
	035			335	System reservation
	036			336	System reservation
	037			337	7-segment display refresh
	038			338	7-segment user/system alternate
	039			339	7-segment user display specification
	040			340	DT0 (7-segment user display bit)
	041			341	DT1 (7-segment user display bit)
	042			342	DT2 (7-segment user display bit)
	043			343	DT3 (7-segment user display bit)
	044			344	DT4 (7-segment user display bit)
	045			345	DT5 (7-segment user display bit)
	046			346	DT6 (7-segment user display bit)
	047			347	System reservation
External DI (I/O2)	048 to 295	General-purpose input	External DO (I/O2)	348 to 595	General-purpose output

* Switching over between BCD and BID in Program Number Indication should be conducted in IO Parameter No. 30 Input Function Select 000.
(1:Program start BCD, 2:Program start binary(BIN))

2) When I/O2 is Fieldbus type (Type of extension I/O is either of CC/CC2/DV/DV2/PR/EP/EC/PRT)

Type	Port No.	Function	Type	Port No.	Function
Internal DI (I/O1)	000	System reservation	Internal DO (I/O1)	300	ALM (LED on the front panel)
	001			301	RDY (LED on the front panel)
	002			302	EMG (LED on the front panel)
	003			303	System reservation
	004			304	HPS (LED on the front panel)
	005			305	System reservation
	006			306	
	007			307	
	008			308	
	009			309	
	010			310	
	011			311	
	012			312	
	013			313	
	014			314	
	015			315	
External DI (I/O1)	016 to 031	General-purpose input	External DO (I/O1)	316 to 331	General-purpose output
Internal DI (I/O1)	032	System reservation	Internal DO (I/O1)	332	7-segment user display digit
	033			333	7-segment user display digit
	034			334	System reservation
	035			335	System reservation
	036			336	System reservation
	037			337	7-segment display refresh
	038			338	7-segment user/system alternate
	039			339	7-segment user display specification
	040			340	DT0 (7-segment user display bit)
	041			341	DT1 (7-segment user display bit)
	042			342	DT2 (7-segment user display bit)
	043			343	DT3 (7-segment user display bit)
	044			344	DT4 (7-segment user display bit)
	045			345	DT5 (7-segment user display bit)
	046			346	DT6 (7-segment user display bit)
	047			347	System reservation
External DI (I/O2)	048	Program start	External DO (I/O2)	348	Alarm output
	049	General-purpose input		349	READY output
	050			350	Emergency-stop output
	051			351	General-purpose output
	052			352	
	053			353	
	054			354	
	055	Program number indication (BCD:1・BIN:1) *		355	
	056	Program number indication (BCD:2・BIN:2) *		356	
	057	Program number indication (BCD:4・BIN:4) *		357	
	058	Program number indication (BCD:81・BIN:8) *		358	
	059	Program number indication (BCD:10・BIN:16) *		359	
	060	Program number indication (BCD:20・BIN:32) *		360	
	061	Program number indication (BCD:40・BIN:64) *		361	
	062	General-purpose input		362	
	063			363	
	064 to 295	General-purpose input		364 to 595	General-purpose output

* Switching over between BCD and BID in Program Number Indication should be conducted in IO Parameter No. 30 Input Function Select 000.
(1:Program start BCD, 2:Program start binary(BIN))

3.3 Starting the Controller

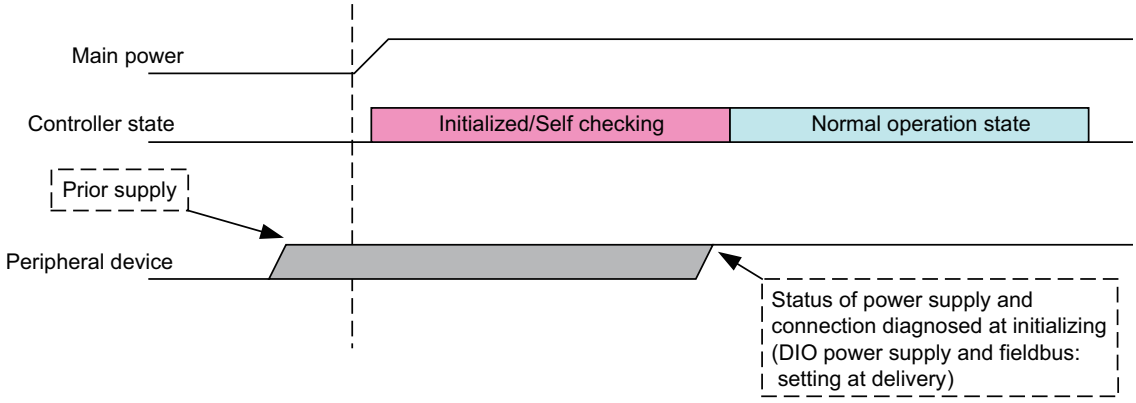
3.3.1 Turning on the Power and Cutoff

(1) Power on Procedure

The following procedure is applied for cases where the parameters are the same as those at delivery, and the unit is not in the error occurrence mode or emergency stop mode.
Also, the number allocation for the I/O ports is shown as the same as the delivery in this description.

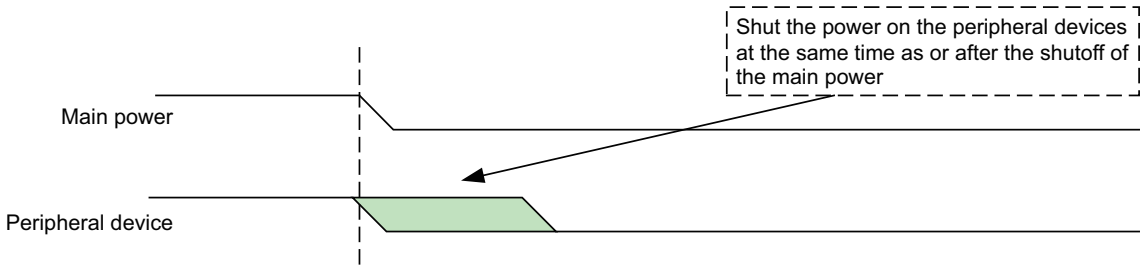
1) After confirming that the wirings are performed properly, supply power to the peripheral devices. If PIO is in use, supply 24V DC for PIO. In the case that it is not used, the power supply is not required, but, set I/O Parameter No. 10 and No. 18 to “0: Unmonitored”.
2) Supply the main power.
3) Once the startup of the controller (CPU startup) is held in normal condition, I/O Port No. 317 turns ON.

A timing chart of the above operation is shown below.



(2) Power Cutoff on Procedure

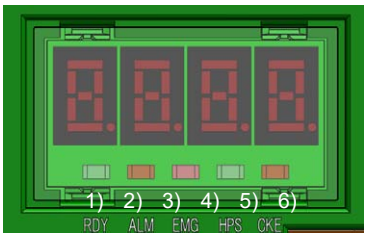
Shut the power on the peripheral devices at the same time as or after the shutoff of the main power.



⚠ *Caution: Leave it for 5 seconds or more after shutting the power off when you turn it back on.*

3.3.2 Panel Window Display

The 4-digit, 7-segment LED shows the controller status.
When the unit is started up normally, " r- 01 13 " is displayed after the initial processing display.
If an indication "E***" is displayed, check "Trouble Shooting" in Chapter 7. For others shown on 7-segment LED display, refer to the display list of the panel window stated below.



Displayed Contents of LED Lamps on Controller

No.	Name	Status when LED is on
1)	RDY	CPU Ready (Program operation available)
2)	ALM	CPU Alarm CPU Alarm (error in operation cancel level or higher) generated
3)	EMG	Emergency stop, error in CPU hardware or power-related hardware error
4)	HPS	All axes have completed home-return operation state
5)	CKE	Error in system lock or power-related hardware error

Panel Window Display List (1/2) Control Codes for Application

Display				Priority (Note)	Description
[Control Codes for Application]					
	A	C	F	1	The AC power is cut off. (Momentary power failure or power-supply power cutoff)
E	F	*	*	1	A system-shutdown level error is present
8	8	8	8	2	Operation test on all 7-seg LED lamps (Initialization sequence)
I	n	*	*	2	Initialization sequence number display
I	n	n	*	2	Field network board initialization sequence number display
	P	r	d	3	Data written to flash ROM
	E	r	G	4 (Display switches in turn)	In emergency stop condition
	e	n	b	4 (Display switches in turn)	The enable switch (deadman's switch/safety gate) is OFF
E	E	*	*	4 (Display switches in turn)	A cold-start level error is present. (Most critical level system error)
E	d	*	*		
E	6	*	*		
E	5	*	*		
E	C	*	*	4 (Display switches in turn)	An operation-cancellation level error is present (Most critical level system error)
E	b	*	*		
E	4	*	*		
-		r	P	5	Waiting for a drive-source cutoff reset signal to be input
-		r	S	5	Operation is paused (waiting for restart)
-	I	L	C	6	All axis servos are interlocked
E	A	*	*	7	A message level error is present (Most critical level system error)
E	9	*	*		
E	2	*	*		
P	*	*	*	8	A program is running (last started program). (The applicable program number is ***.)
A	r	d	y	8	Ready status (Startup complete in AUTO mode)
	r	d	y	8	Ready status (Startup complete in MANU mode)

Note 1 The smaller the value to be displayed, the higher the priority.

Panel Window Display List (2/2) Control Codes for Core

Display				Priority (Note)	Description
[Control Codes for Core]					
E	E	*	*	1	A cold-start level error is present.
E	C	*	*	1	An operation-cancellation level error is present.
E	A	*	*	2	A message level error is present.
	J	P	A	2	Jump to the application
C	H	F	C	2	Flash ROM check process (core)
C	H	F	A	2	Flash ROM check process (application)
C	H	S	d	2	SDRAM check process

Note 1 The smaller the value to be displayed, the higher the priority.

3.3.3 Status LED

It shows the status of PIO or Fieldbus plugged to the extension I/O connector.

(1) PIO Type Status LED

○ : Illuminating × : OFF

Name	Lamp condition	Color	Description
RUN	○	Green	In the normal operation (Flashes when initialization completes)
ERR	○	Orange	PIO power voltage (24V DC) drop error

(2) DeviceNet Type Status LED

○ : Illuminating × : OFF ☆ : Flashing

Name	Lamp condition	Color	Description
MS	○	Green	In the normal operation
	☆		Configuration not established or setting incomplete
	○	Orange	Error impossible to recover
	☆		Error possible to recover
	○	Green / Orange	Self-checking test
NS	○	Green	In the normal communication
	☆		Online status (no connection)
	○	Orange	Critical link error
	☆		Connection timeout
	○	Green / Orange	Self-checking test

(3) CC-Link Type Status LED

○ : Illuminating × : OFF ☆ : Flashing

Name	Lamp condition	Color	Description
RUN	○	Green	In the normal operation
ERR	○	Orange	Error occurrence (CRC, station setting, baud rate setting)
	☆		Change made to station number and baud rate setting at reset cancel

(4) PROFIBUS-DP Type Status LED

○ : Illuminating × : OFF ☆ : Flashing

Name	Lamp condition	Color	Description
MS	○	Green	Initialization complete
	☆		Initialization complete (with diagnosis event)
	○	Orange	Exception error generated
NS	○	Green	In the normal communication
	☆		Online status (in clearance condition)
	○	Orange	Error occurrence (parameter, configuration)

(5) EtherNet/IP Type Status LED

○ : Illuminating × : OFF ☆ : Flashing

Name	Lamp condition	Color	Description
MS	○	Green	In operation condition and under control of scanner (master)
	☆		Setting of construction information incomplete, or scanner (master) in idling condition
	○	Orange	Fatal malfunction (exception condition or critical error)
	☆		Light malfunction possible to recover
NS	○	Green	Online status (Connection established on one or more)
	☆		Online status (connection not being established)
	○	Orange	Critical error such as IP address duplication
	☆		Timeout in connection on one or more

(6) Simple Absolute Status LED Lamps (PC/PG/PCF/PGF type)

○ : Illuminating × : OFF ☆ : Flashing

Name	Lamp condition	Color	Description
0	○	Green	Battery fully charged
	○	Orange	Battery in charge
	○	Red	Battery not connected

Name	Lamp Condition of 1 (Color)	Lamp Condition of 2 (Color)	Description
1, 2	○ (Green)	○ (Green)	Absolute reset complete
	○ (Red)	○ (Green)	Absolute reset incomplete
	-	○ (Red)	Alarm

3.3.4 Position Table and Program Creation and Writing

Create a position table and create a program using the SEL language.
Perform the teaching, etc., and register the required coordinates in the position table. Also, create the program using the SEL language.
[Refer to the separate SEL language programming manual.]
Write the position table and program data in the controller.
[Refer to the separate instruction manual for your PC software.]

⚠ *Caution:*	*A margin of error could accumulate between each pitch if the incremental (relative position indication) movement commands* * *are repeated continuously. To avoid accumulation of errors, utilize the absolute position indication commands such as MOVP and MOVL.*
	* *MVPI, MVLI, TMPI, TMLI*

3.4 Program Operation

For the operation there are two ways of start-up. One is the automatic start-up of the set program No. and the other is to start up with the program No. selected externally.

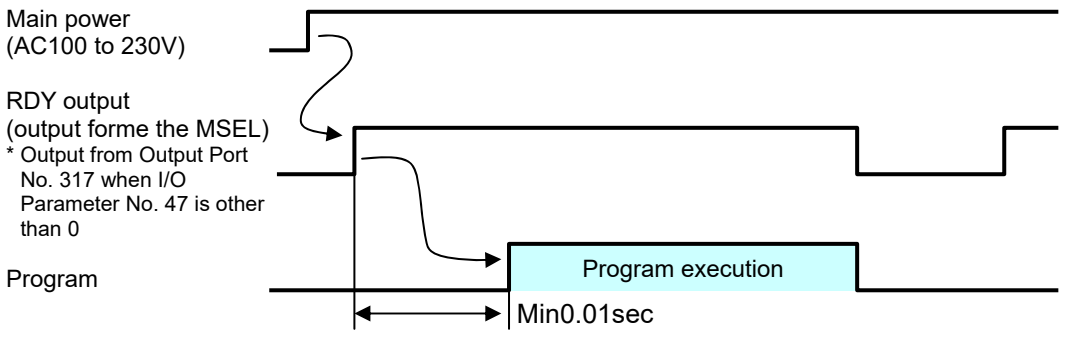
3.4.1 Auto Start upon Power On

After the power is turned ON, the program with its No. registered in the MSEL controller, can be automatically started up.

1) Connect the PC software and set the I/O parameter No. 33 to “1” and set the program No. to be started up in the parameter No. 1 (for others)

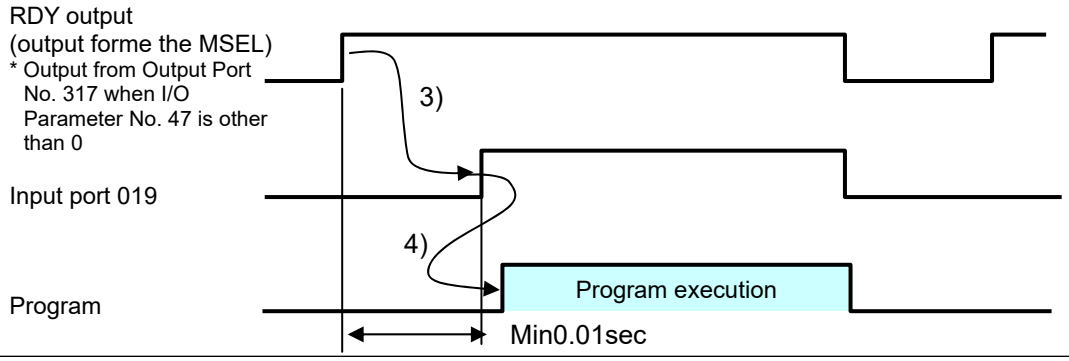
Parameter type and No.	Set Value	Description
I/O parameter No. 33	0	Input port 019 is designated as a general-purpose input.
	1 (factory default)	In the AUTO mode, when the power is turned ON or the software reset is performed, the program No. set in parameter No. 1 (for others) is executed. The input port 019 can be used as a universal input port.
	2	When input port 019 is turned ON, the program whose number is set in other parameter No. 1 is executed. When this port is turned OFF, all currently running programs stop.
I/O parameter No. 286	19	Indicate the port number to assign the feature in I/O Parameter No. 33 “Input Function Select 003”
Other parameter No. 1	1 to 255	Set the program number of the program you want to start automatically.

2) Set the operation mode setting switch on the MSEL controller to the AUTO position.
3) Turn off the power and then turn it back on.
4) The MSEL controller is restarted (the RDY signal turns ON to indicate a successful start), after which the specified program starts.



Caution: After the power is turned on, unexpected movements of the robot may create dangerous situations.
For safety, provide an interlock whereby the program is started only after a start confirmation signal has been input from a pushbutton switch, etc.
An example of operation is given below.

1) Set the parameter No. 33 to “2”.
   The program starts when input port 019 is turned ON, and stops when the port is turned OFF.
2) Set the operation mode setting switch on the MSEL controller to the AUTO position.
3) Turn off the power and then turn it back on.
4) Make sure input port 019 is turned ON after a wait time of 0.01 sec following the start of the MSEL controller (the RDY signal turns ON to indicate a successful start).
5) The specified program starts.



3.4.2 Starting a Program by Specifying its Program Number

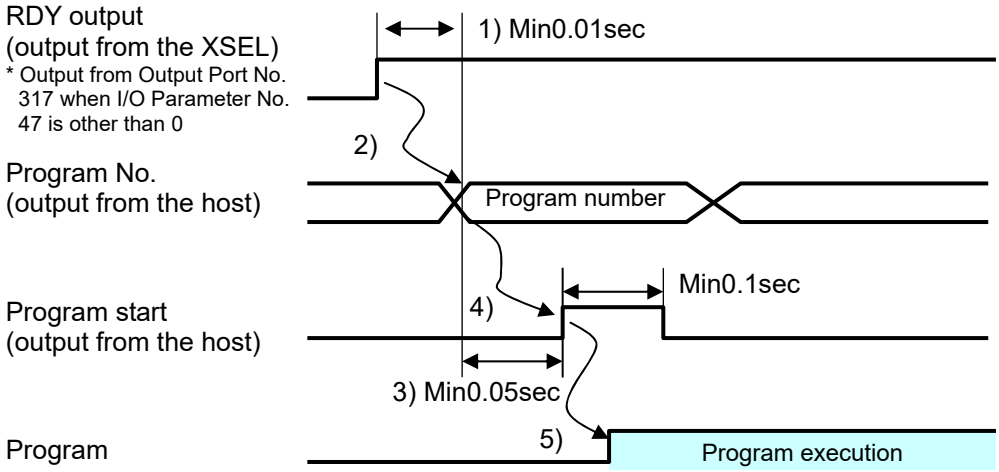
The program to be started up, can be started with its number specified externally and start-up signal input.

1) Connect the PC software and perform the setting, referring to the set values in the following table.

Parameter type and No.		Set Value	Description	Setting
I/O parameter No. 30		0	Input port 016 is designated as a general-purpose input.	1 or 2
		1 (factory default)	After the program number to be started up, is set in the input port 023 (LSB) to 030 (MSB) with BCD, turning ON the input port 016 starts up the program. Turning ON the input port 016 for 0.1 sec or more.	
		2	After the program number to be started up, is set in the input port 023 (LSB) to 030 (MSB) with BCD, turning ON the input port 016 starts up the program. Turning ON the input port 016 for 0.1 sec or more.	
No. 30 = 1 or 2	I/O parameters No. 37 to 44	0	Input ports 023 to 030 are set as general-purpose inputs.	1 (No.44= "2")
		1 (No.44="2")	Input ports 023 to 030 are set as start program number specification ports.	

> ⚠ *Caution: The maximum number of programs is 255. However, the programs able to start up with the BCD Code indication are from No. 1 to No.99. To start up No. 100 to No. 255 when using BCD Code, start them up with using the automatic start program startup or the program startup command "EXPG".*

2) Input the program No. 0.01sec or more after the MSEL controller is started up (after normal start-up = RDY signal ON).
3) Set in the input ports set by I/O parameter No. 30, the program number of the program you want to start.
4) Set the program No. and 0.05 sec. or more later, turn ON the input port 016 (program start).
5) Turn ON input port 016 (program start) and keep it ON for 0.1 sec.
6) The specified program starts.



3.4.3 7-Segment Display SEL Program

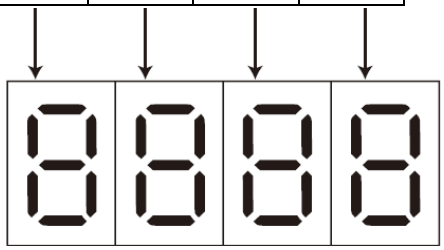
The 7-segment LED in the panel window on the normally displays the information from the system, but it is able to change the display of the 7-segment LED by the SEL program created. (SEL program and system are displayed in turn.)
For control of 7-segment LED, port No. 332, 333 and 337 to 346 are used.

Port No.	Function
332	Indication of digits to show on 7-seg display
333	Indication of digits to show on 7-seg display
334	Cannot be used
335	
336	
337	7-segment display refresh
338	7-segment SEL/system alternate
339	7-segment display specification
340	DT0 (7-segment user display bit)
341	DT1 (7-segment user display bit)
342	DT2 (7-segment user display bit)
343	DT3 (7-segment user display bit)
344	DT4 (7-segment user display bit)
345	DT5 (7-segment user display bit)
346	DT6 (7-segment user display bit)
347	Cannot be used

1) In port No. 332 and 333, indicate the digit number for the segment to be operated.

On/Off of port and indicated digit number 0 : OFF 1 : ON

No.332	0	1	0	1
No.333	0	0	1	1
Digit to be operated	1	2	3	4



⚠ *Caution: In the parameter setting at the delivery, the port numbers are as shown above.*

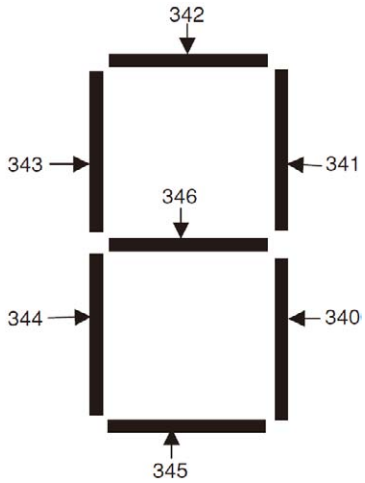
2) In port No. 339, establish the setting for the switchover of SEL program display and system display.

	Setting Value	Function
Port No. 339	0	Display of system is conducted
	1	Display of SEL program is conducted

3) When setting is established No. 339 = 1, and Port No. 338 gets set to 1, SEL Program Display and System Display should be conducted one after another.

> ⚠ *Caution:* *When DO No. 338 is set to 0 and DO No. 339 is set to 1;*
> - *User display is shown and no switchover in every one second.*
> - *System display (error display) should be conducted when it occurs an operation cancel level error, cold start level error or system shutdown level error.*
> - *System display (error display) would not be conducted when it occurs a message level error or is in a condition other than an error occurrence (data flash ROM under writing, etc.).*
>
> *When it is required to display the condition in a message level error or in a condition other than an error occurrence, set DO No. 338 to 1 to make it mutual display.*

4) Pote No. 340 to 346 correspond to the 7-segment LED each display bits.



5) Display is shown no the 7-segment LED by on-edge (0 → 1 → 0) of port No. 337.
(The 7-segment pattern set in port No. 340 to 346 is shown on the digit set in port No. 332 and 333.)

> ⚠ *Caution:* *Parameter setting in normal delivery should be the port number above.*

How to Use

1) Establish the display mode setting in port No. 338 and 339.
2) Set the digit to display (update) in port No. 332 and 333.
3) Establish the display pattern setting of the 7-segment display in port No. 340 to 346.
4) Have port No. 337 (Refresh) turned OFF → ON → OFF. (Update conducted with ON-edge)

To display other digits, repeat the steps 2) to 4).
After the SEL program for display is finished, the display lasts until Port No. 339 is turned OFF.

Reference Program : To show 1234

No	E	N	Cnd	Cmnd	Operand 1	Operand 2	Pst	Comment
1				LET	99	3		
2				OUT	338	339		Display of User and System by Turns
3				BTOF	337			
4	* 1st digit data set							
5				LET	99	0		
6				OUT	332	333		Indicate 1st Digit
7				LET	99	3		3 = Display Data ‘1’
8				OUT	340	346		7-segment Pattern 1
9				BTON	337			Refresh ON
10				BTOF	337			Refresh OFF
11	* 2nd digit data set							
12				LET	99	1		
13				OUT	332	333		Indicate 2nd Digit
14				LET	99	118		118 = Display Data ‘2’
15				OUT	340	346		7-segment Pattern 2
16				BTON	337			Refresh ON
17				BTOF	337			Refresh OFF
18	* 3rd digit data set							
19				LET	99	2		
20				OUT	332	333		Indicate 3rd Digit
21				LET	99	103		118 03Display Data ‘3’
22				OUT	340	346		7-segment Pattern 3
23				BTON	337			Refresh ON
24				BTOF	337			Refresh OFF
25	* 4th digit data set							
26				LET	99	3		
27				OUT	332	333		Indicate 4th Digit
28				LET	99	75		75 = Display Data ‘4’
29				OUT	340	346		7-segment Pattern 4
30				BTON	337			Refresh ON
31				BTOF	337			Refresh OFF
32								
33				EXIT				

Chapter 4 Home-Return / Absolute Reset

There are three types for the encoder to measure the current position of the actuator.

1) For Incremental Type, it is necessary to conduct home-return operation when the power is turned on.
2) For Battery-less Absolute Type, it is necessary to absolute reset only when in motor replacement and in an occurrence of an absolute error.
3) The coordinate data is retained in the battery backup for Simple Absolute Type. Even though it is not necessary to performance a home-return operation each time, it is necessary to have an absolute reset conducted in the first time to start up the system or after replacing the battery.

Encoder Type	Mounted Actuator Series	Timing to Have Home-Return and Absolute Reset		Setting in Each Axis No. 38	Section to Pick up
		Home-Return	Absolute Reset		
Incremental	RCP4 to 2 (Linear, rotary axis and grippers)	When power is turned on		0	4.1
Battery-less Absolute	RCP5, RCP6 (Linear, rotary axis and grippers)		• At motor replacement • When absolute error generated	2	4.2
	IXP (SCARA Robot)			2	4.3
Simple Absolute	RCP4 to 2 (Linear, rotary axis and grippers)		• At initial startup • When the power to the controller is turned OFF and battery is replaced • When the encoder cable is taken off the controller	2	4.4

Described below is the procedure for each. (In this manual, states the procedure for the PC software. For how to treat and process on a teaching pendant, refer to an instruction manual for each product)

4.1 Home-Return Preparation (Incremental Type)

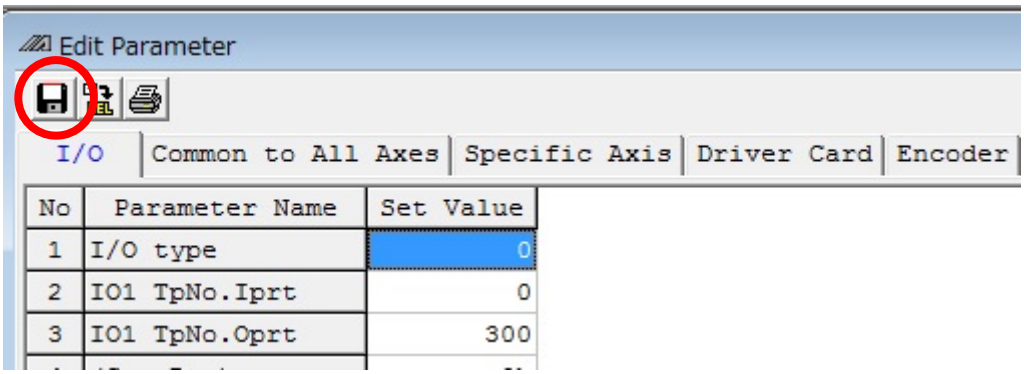
1) Turn OFF the power to the controller.
2) Connect the controller and PC to a teaching tool with a dedicated cable.
3) Turn ON the power to the controller, and connect a teaching tool such as the PC software.
4) Confirm that there is no error generated (and “rdy” is displayed on the 7-seg LED panel window).
5) After pressing the servo-ON button, press the home-return button. Once the home-return operation is complete, the home position gets established.

4.2 Absolute Reset Preparation (for Battery-less Absolute Type except for SCARA Robot)

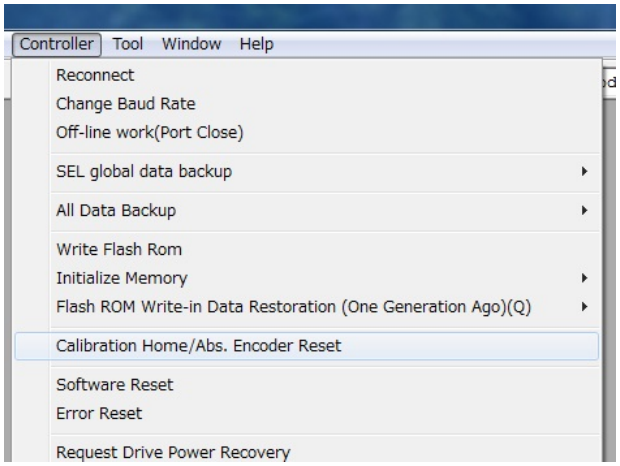
> ⚠ *Caution : It is not necessary to have an absolute reset in ordinary case, however, make sure to have the absolute reset conducted when an absolute error is occurred or after dismantlement of the robot for a reason such as motor replacement. Otherwise, it may cause a malfunction or critical operation error on the robot.*

1) Turn ON the power to the controller, and connect the PC software.

2) Make sure to have a backup of the parameters before conducting.
Select [Parameter] → [Edit] from the menu in the PC software to show the parameter edit window. Press “Save As” button in the parameter edit window to save the parameters to file data.

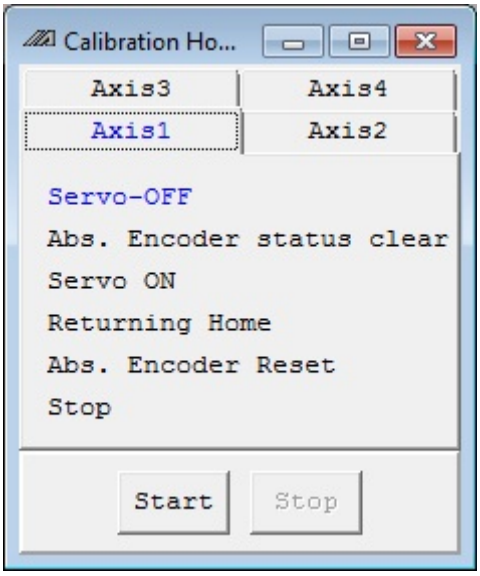


3) Select [Controller] → [Calibration Home/Abs. Encoder Reset] from the menu in the PC software.

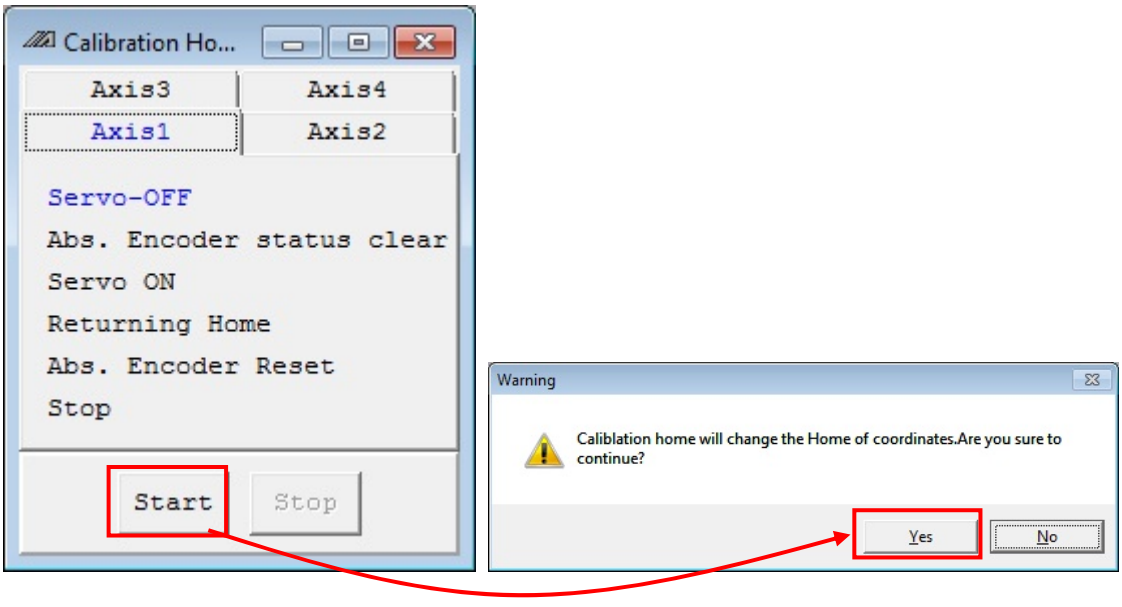


4) A warning window shows up. Check the content and click “OK”.

5) “Calibration Home / Abs. Encoder Reset” window appears.
Select the tab for the Axis 4 (O1).

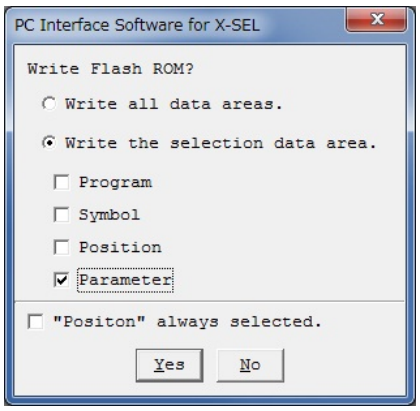


6) Click on “Start” button while the [Axis 4 (O1)] tab is selected, and a warning window shows up. Release the emergency stop, check the content and click “Yes” to start the home-return operation on the axis subject to home-position adjustment.



⚠ *Caution : As soon as clicking “Yes”, the home-return operation starts.*
In case there is any interference to peripheral equipment during the home-return operation, the home-return operation completes at the position of interference, and the proper home position cannot be acquired. Make sure not to have interference to peripheral equipment.

7) Close “Calibration Home / Abs. Encoder Reset” window after the home-return operation is complete. After that, the window switches to “Flash ROM Writing” window.
Put a check mark on “Parameter” and click “Yes” to start writing. After it is finished, conduct a software reset.



4.3 Absolute Reset for SCARA Robot (Battery-less Absolute Type)

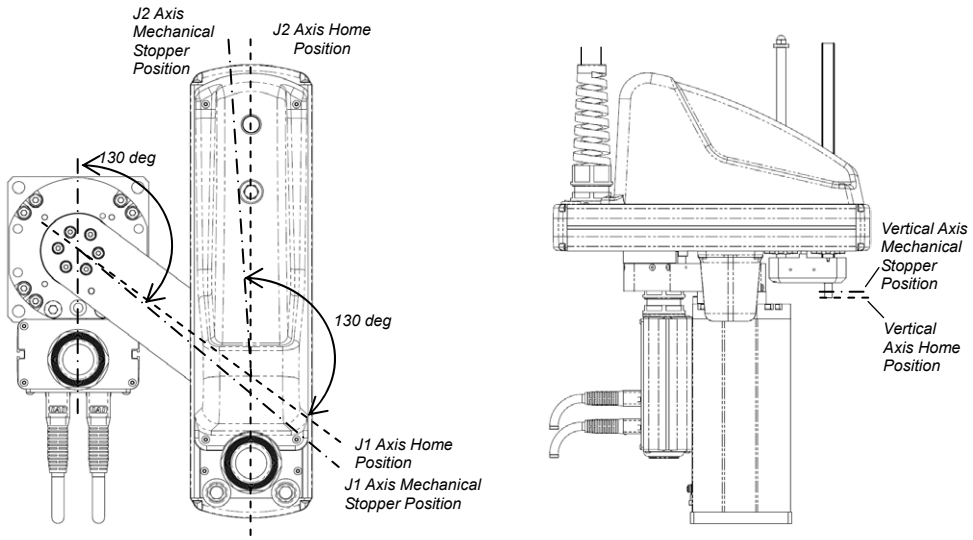
It is available to perform operation on SCARA Robot without having anything special as an absolute reset has already been conducted before delivered out from our factory. It is necessary to have an absolute reset when an absolute error generates or the robot is dismantled for such a reason as motor replacement work.

Model of the Robot	3N3515-WA /3N4515-WA (3-axis Absolute Type)	4N3515-WA /4N4515-WA (4-axis Absolute Type)
J1 axis	(Absolute reset (Note 1)) ↓ Operation	(Absolute reset (Note 1)) ↓ Operation
J2 axis	(Absolute reset (Note 1)) ↓ Operation	(Absolute reset (Note 1)) ↓ Operation
Z axis	(Absolute reset (Note 1)) ↓ Operation	(Absolute reset (Note 1)) ↓ Operation
R axis		(Absolute reset (Note 1)) ↓ Operation

Note 1 It is necessary to perform when the absolute error is occurred or after dismantled the robot for a reason such as to replace motor

Described below is how to conduct an absolute reset.
(In this manual, states the procedure for the PC software. For how to treat and process on a teaching pendant, refer to an instruction manual for each product)

⚠ *Caution: Home-return operation is an action to press towards the mechanical stopper. Make sure to secure enough space for home-return posture and also there is no interference to the peripherals during the home-return operation.*

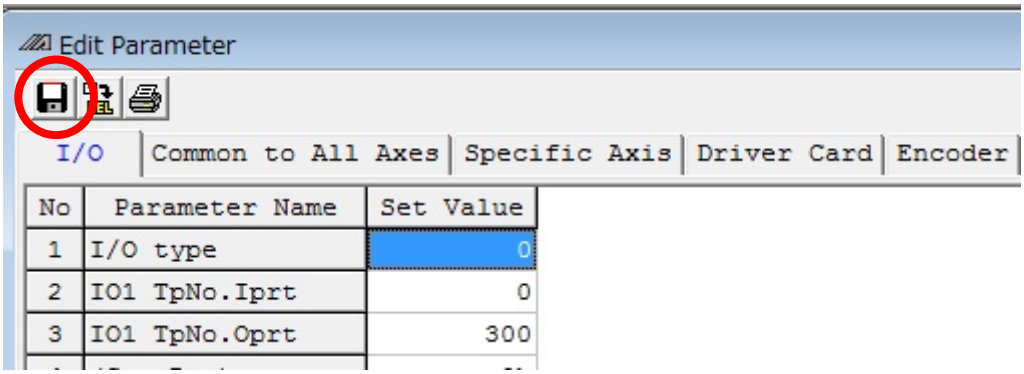


4.3.1 Absolute Reset Preparation

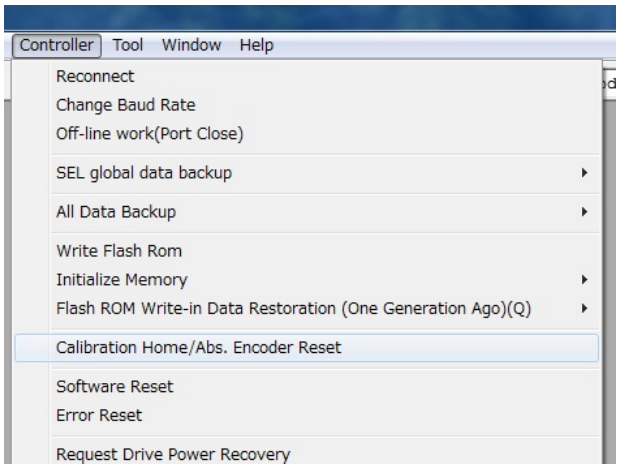
> ⚠ Caution:
> - It is not necessary to have an absolute reset in ordinary case, however, make sure to have the absolute reset conducted when an absolute error is occurred or after dismantlement of the robot for a reason such as motor replacement. Otherwise, it may cause a malfunction or critical operation error on the robot.
> - There may be a case that the indicated coordinates for *positioning* point cannot be achieved before and after the absolute reset is conducted. [Refer to “Scattered Positioning Points” in IXP SCARA Robot instruction]

1) Turn ON the power to the controller, and connect the PC software.

2) Make sure to have a backup of the parameters before conducting.
Select [Parameter] → [Edit] from the menu in the PC software to show the parameter edit window. Press “Save As” button in the parameter edit window to save the parameters to file data.

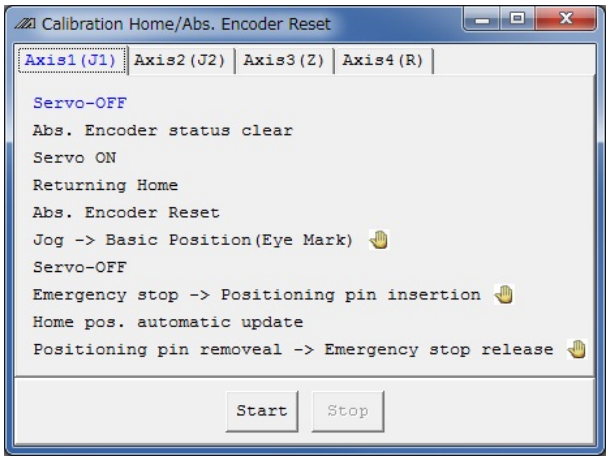


3) Select [Controller] → [Calibration Home/Abs. Encoder Reset] from the menu in the PC software.

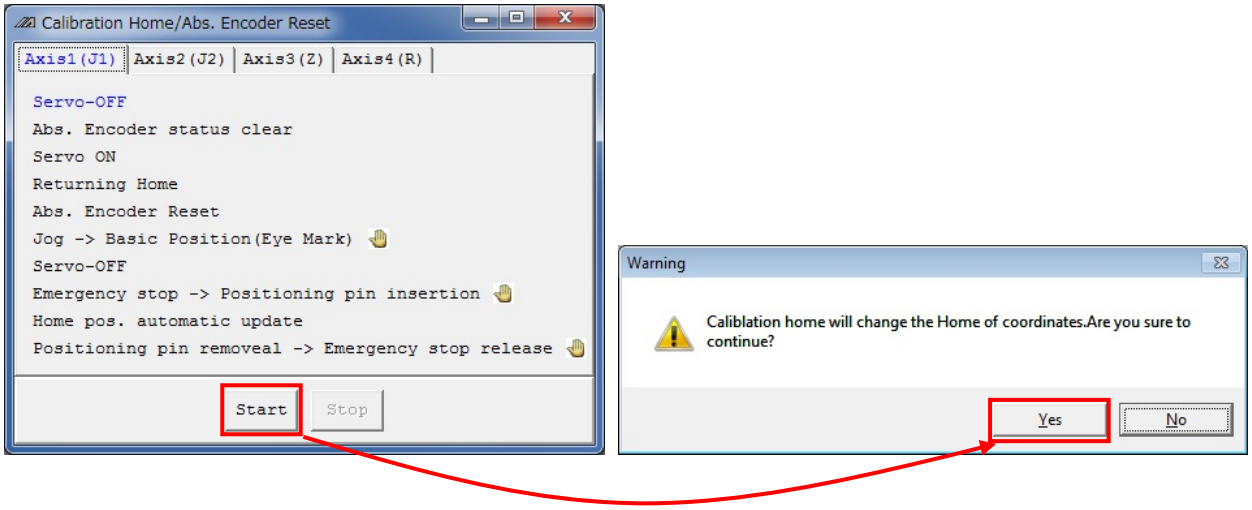


4) A warning window shows up. Check the content and click “OK”.

5) “Calibration Home/Abs. Encoder Reset” appears. Select the tab for the axis that requires the absolute reset.
Select a tab for the axis to have home position adjustment from J1 (Axis 1) Axis or J2 (Axis 2) Axis.
Process for Z (Axis 3) Axis and R (Axis 4) Axis are to be conducted after J1 and J2.

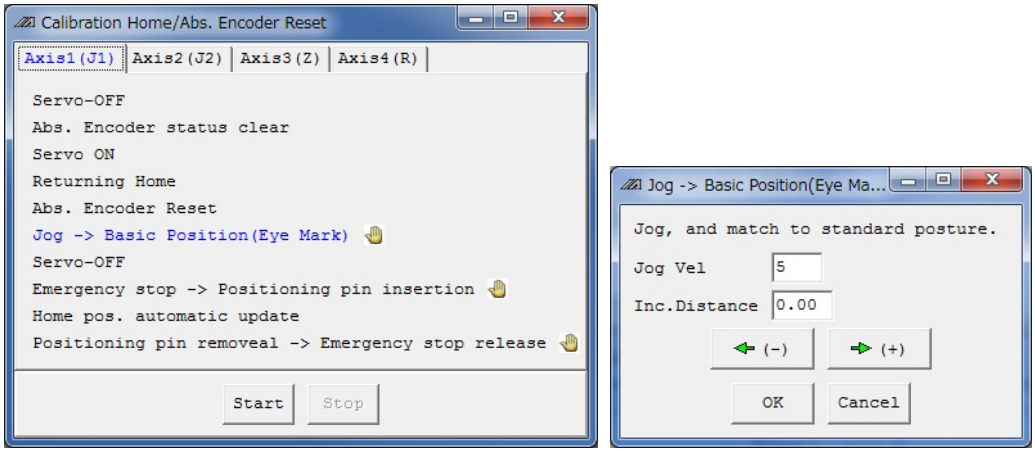


6) Click on “Start” button while the [Axis 1 (J1)] or [Axis 2 (J2)] tab is selected, and a warning window shows up. Release the emergency stop, check the content and click “Yes”. Home-return operation starts on the axis subject to absolute reset.

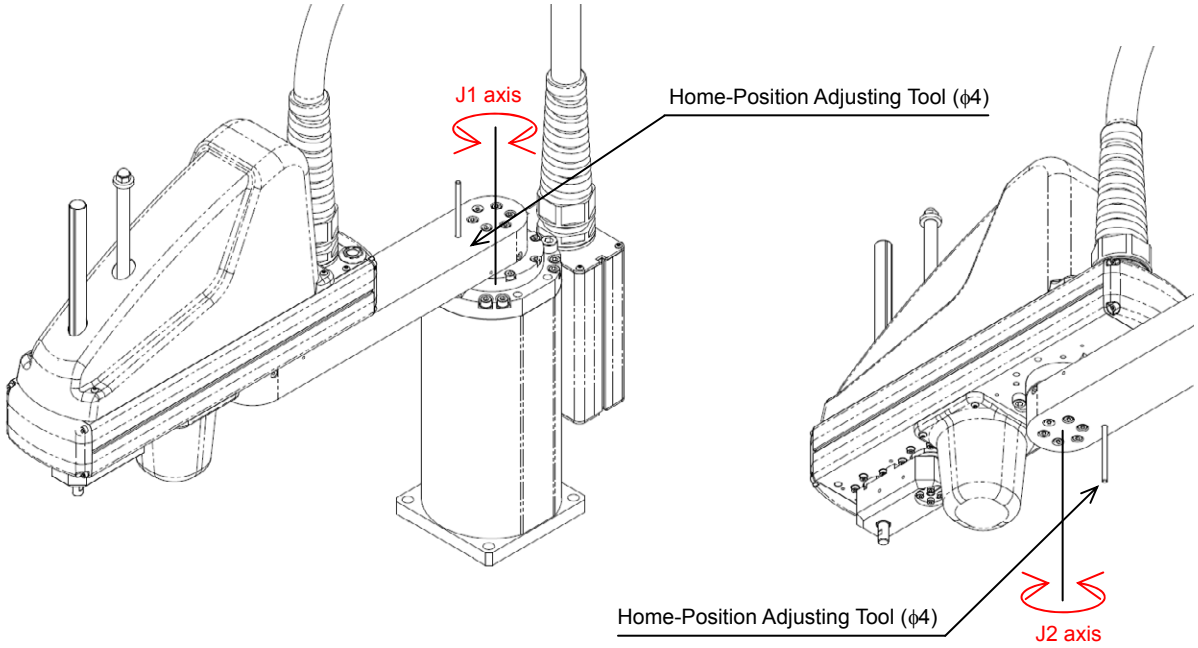


> ⚠ *Caution: As soon as clicking “Yes”, the home-return operation starts. The standard home position is the posture stated in the beginning of this section. In case there is any interference to peripheral equipment during the home-return operation, the home-return operation completes at the position of interference, and the proper home position cannot be acquired. In such cases, it may cause a crash or unexpected operation, which could cause malfunction or critical operation error to the robot or the peripherals. Make sure to secure enough space for home-return posture to avoid any interference to the peripherals during the home-return operation.*

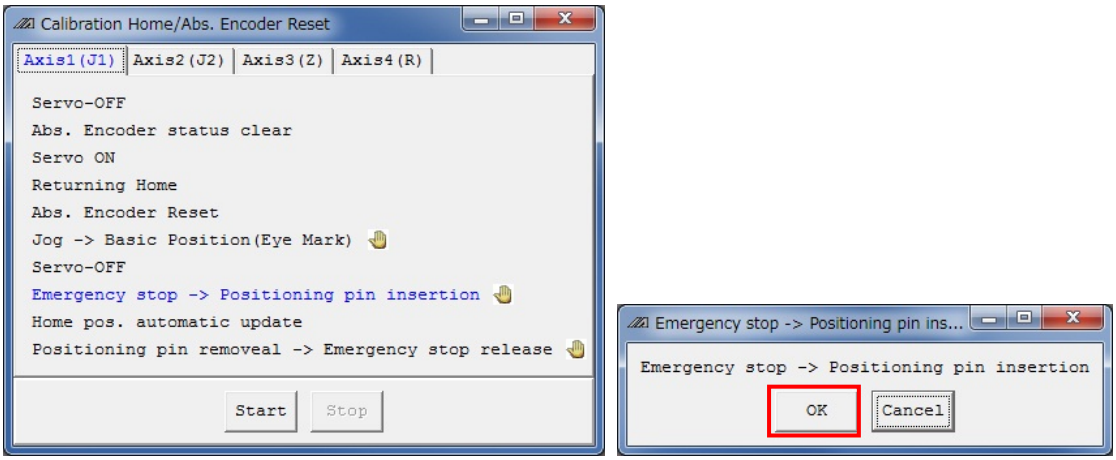
7) “Jog -> Basic position” window appears once the home-return operation is complete. Press “← (-)” and “→ (+)” buttons to move the arm to a place near the datum position. [Refer to the figure in Step (8) for the datum position] Also, change “Jog Vel (JOG speed)” and “Inc. Distance (inching distance)” if necessary. Click “OK” once the arm gets near the datum position. Click “OK” when moving the arm new the datum position manually by hand.



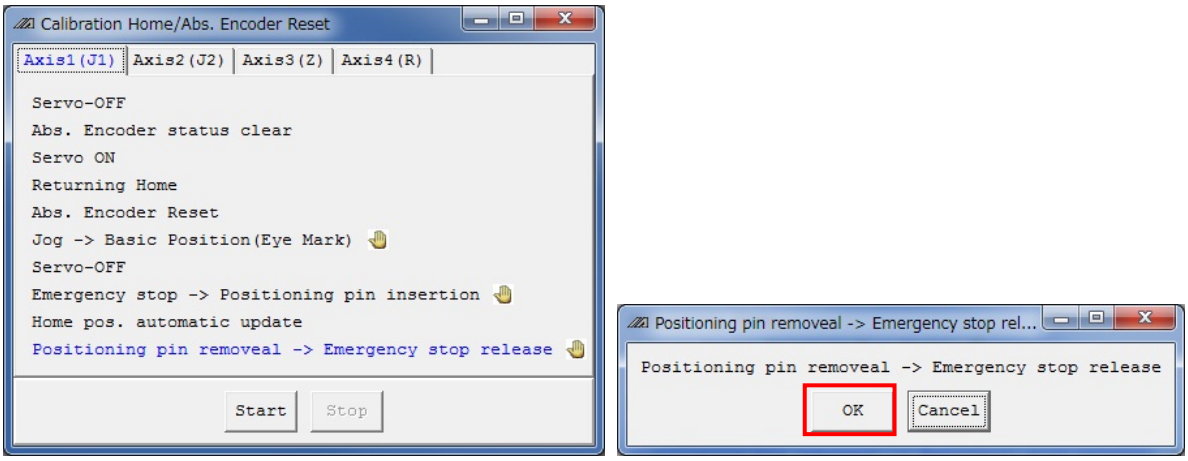
8) Have the emergency stop conducted, and insert the home-position adjustment tool (ϕ4) at the datum position of J1 axis or J2 axis.



9) With the home-position adjustment tool (ϕ4) being inserted, click “OK” in “Emergency stop -> Positioning pin insertion” window.

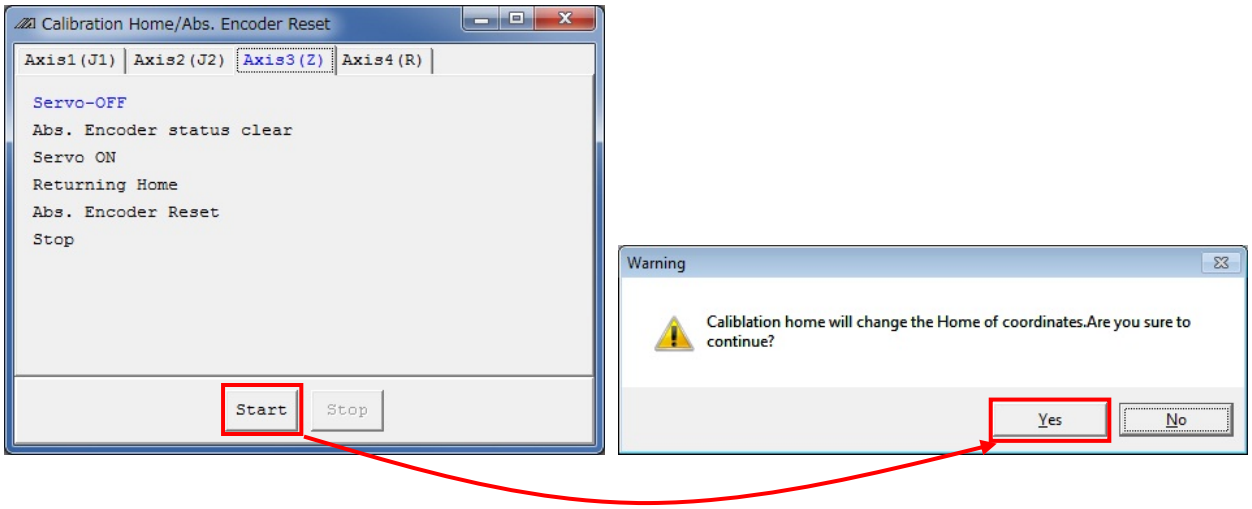


10) Remove the home-position adjustment tool (ϕ4), and release the emergency stop. Click "OK" in "Positioning Pin Ejection, Emergency Stop Release" window.



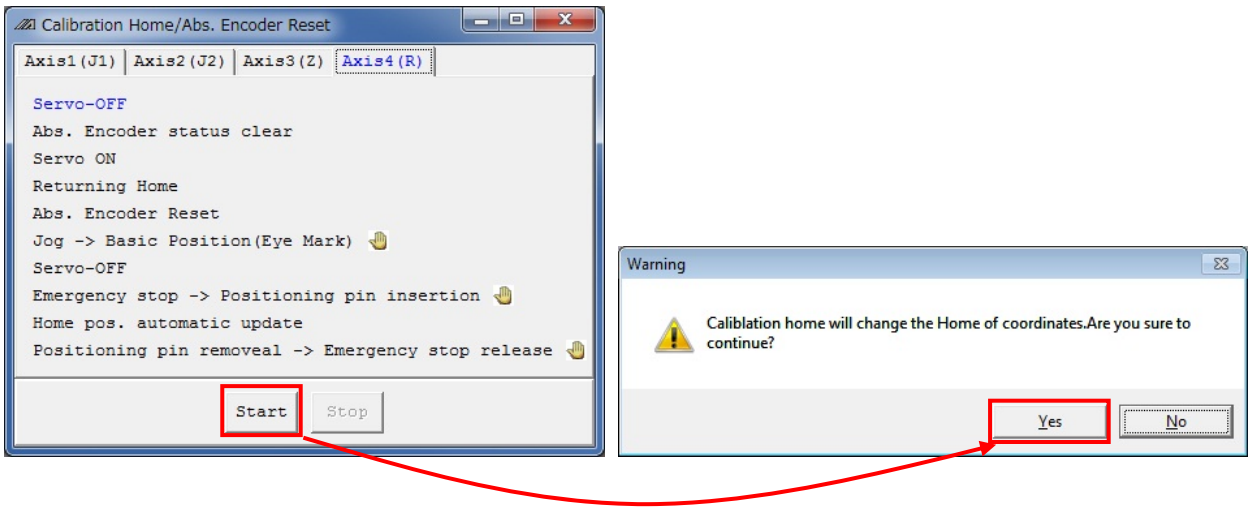
11) If absolute reset on both J1 and J2 Axes is not finished, go back to Step 5) to complete the absolute reset on the remaining axes.

12) Conduct absolute reset on [Axis 3 (Z)].
Click on "Start" button while the [Axis 3 (Z)] tab is selected, and a warning window shows up. Release the emergency stop, check the content and click "Yes". Home-return operation starts on the Z-axis.
Absolute reset completes after home return.

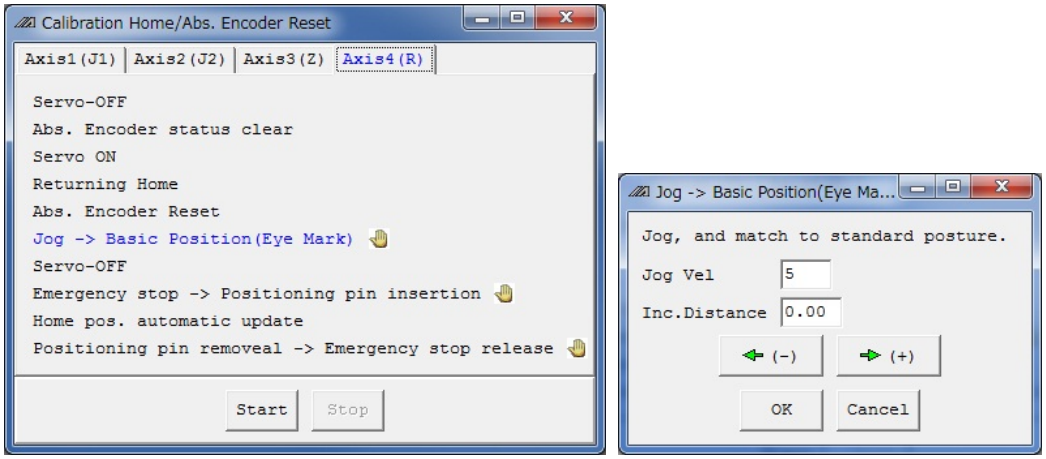


⚠ *Caution: As soon as clicking "Yes", the home-return operation starts. The standard home position is the posture stated in the beginning of this section.*
In case there is any interference to peripheral equipment during the home-return operation, the home-return operation completes at the position of interference, and the proper home position cannot be acquired. In such cases, it may cause a crash or unexpected operation, which could cause malfunction or critical operation error to the robot or the peripherals. Make sure to secure enough space for home-return posture to avoid any interference to the peripherals during the home-return operation.

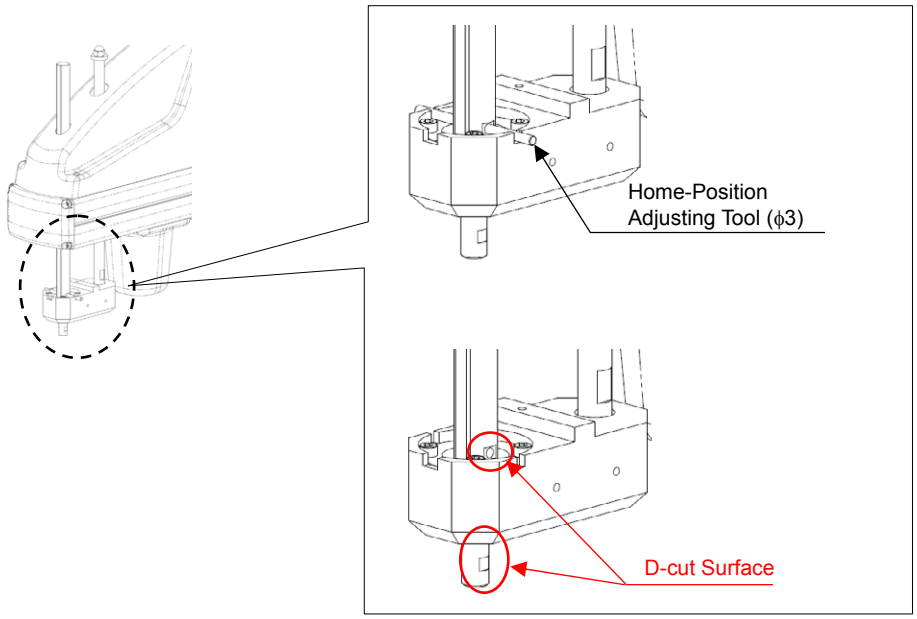
13) Conduct absolute reset on [Axis 4 (R)].
Click on “Start” button while the [Axis 4 (R)] tab is selected, and a warning window shows up.
Cancel the emergency stop and click “Yes”, and the home-return operation on the selected axes starts.



14) “JOG -> Basic Position” window appears. Press “← (-)” and “→ (+)” buttons to move the arm to a place near the datum position. [Refer to the figure in Step 15) for the datum position]
Also, change “Jog Vel (JOG speed)” and “Inc. Distance (inching distance)” if necessary.
Click “OK” once the arm gets near the datum position.
Click “OK” when moving the arm new the datum position manually by hand.

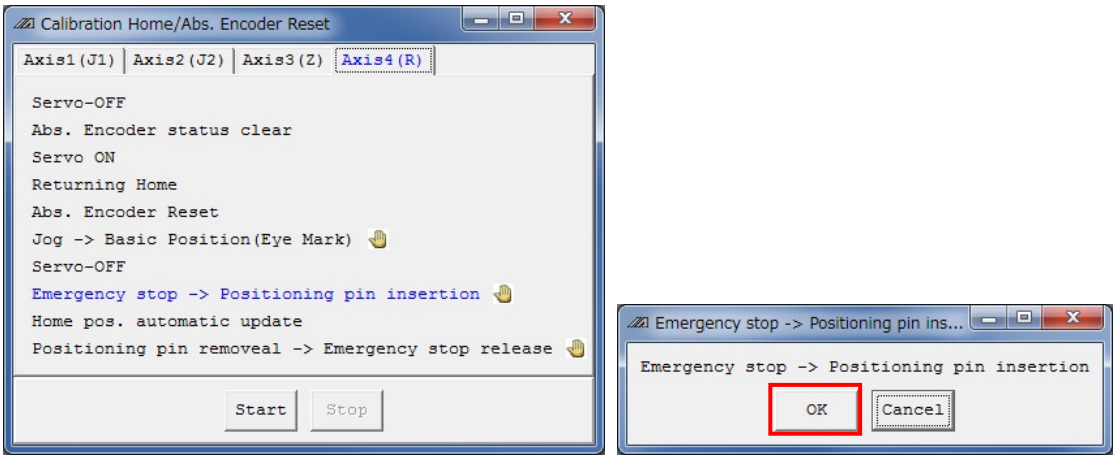


15) Input the emergency stop, adjust it manually so it becomes the datum position for R Axis, and insert the home-position adjusting tool (ϕ3). As shown in the figure below align the position of either the D-cut surface on the R-axis tip or the D-cut surface on the hole for insertion of the home-position adjustment tool (ϕ3).

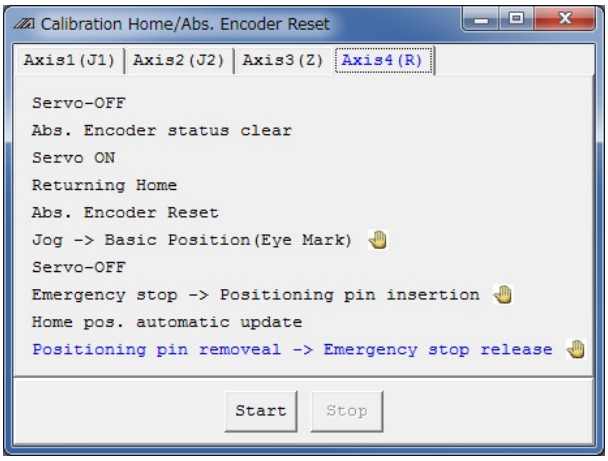


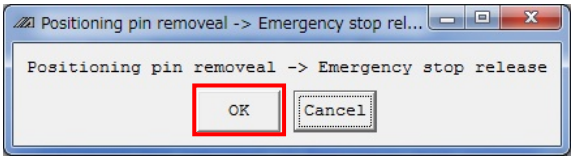
⚠ *Caution: Pay attention not to get the cables and pipes on the tool twisted.*

16) With the home-position adjustment tool (ϕ4) being inserted, click “OK” in “Emergency stop -> Positioning pin insertion” window.

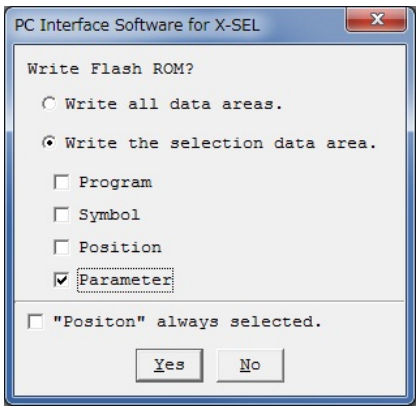


17) Remove the home-position adjustment tool (ϕ3), and release the emergency stop. Click “OK” in “Positioning pin removeal -> Emergency stop release” window.





18) After the adjustment on all the axes necessary to have an absolute reset is finished, close “Calibration Home / Abs. Encoder Reset” window. After that, the window switches to “Flash ROM Writing” window. Put a check mark on “Parameter” and click “Yes” to start writing. After it is finished, conduct a software reset.
(Reference) After the absolute reset on each axis is finished, it is available to have the flash ROM writing at once.



4.4 Simple Absolute Type (PC/PG/PCF/PGF Type Dedicated)

A Simple Absolute Type controller retains the position data of an encoder in battery backup. It is not necessary to perform a home-return operation every time you turn it on.
To retain the encoder position data, it is necessary to register (absolute reset) the home position.
It is available to check in the illuminating patterns on the status LED lamps for the drivers for each axis whether it is necessary to conduct an absolute reset or not. Have an absolute reset conducted when the status LED lamp for driver shows absolute reset is incomplete.

4.4.1 Status LED

It displays the status (condition) for absolute for each connected axis.

○: Illuminating, ×: OFF, ☆: Flashing

Name	Lamp condition	Color	Description
0	○	Green	Battery fully charged
	○	Orange	Battery in charge
	○	Red	Battery not connected

Name	Lamp Condition of 1 (Color)	Lamp Condition of 2 (Color)	Description
1,2	○ (Green)	○ (Green)	Absolute Reset Complete
	○ (Red)	○ (Green)	Absolute Reset Incomplete
	-	○ (Red)	Alarm

4.4.2 Absolute Reset Preparation

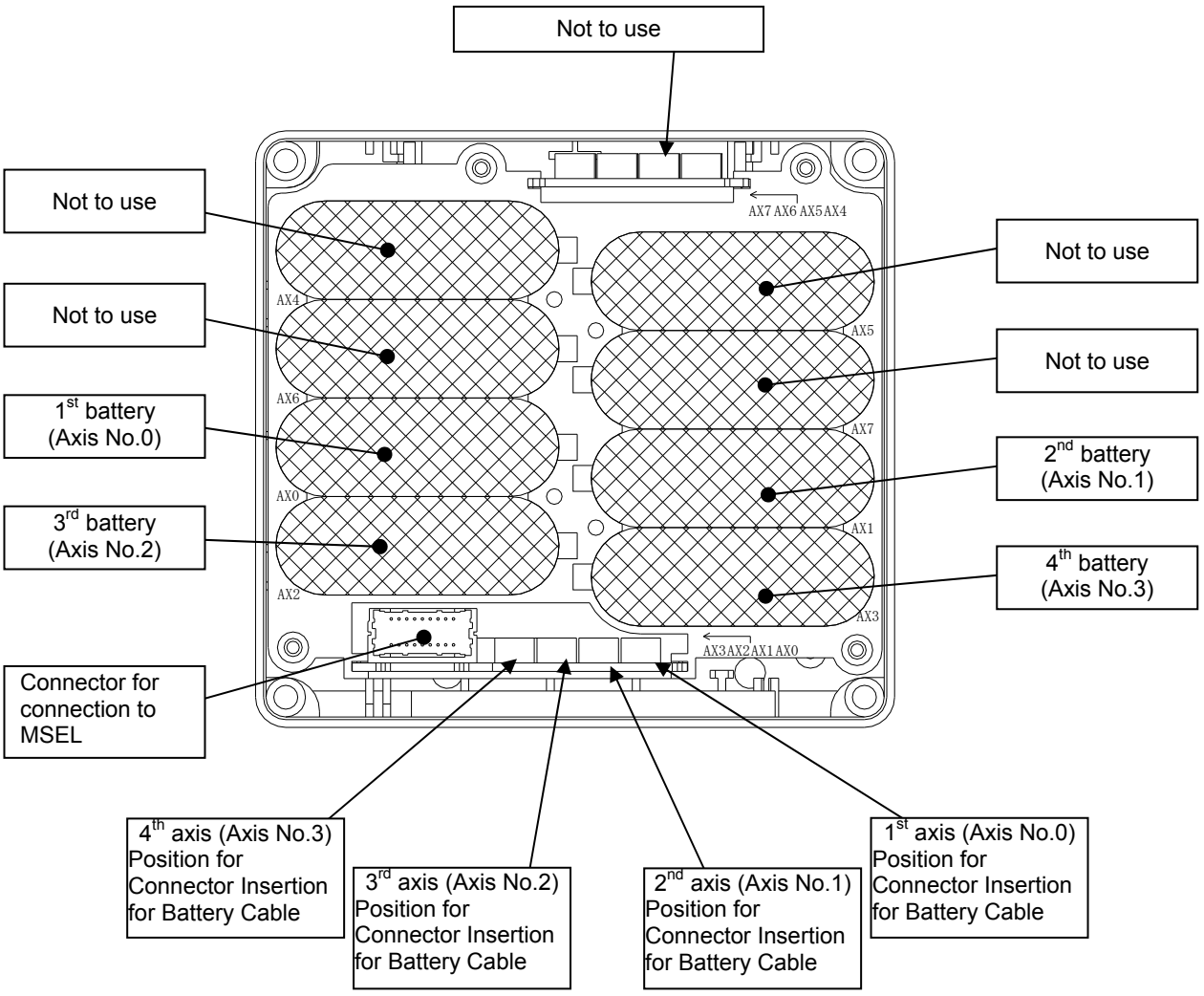
Stated below is the procedure to conduct an absolute reset.
(In this manual, shows the procedure using the PC software. For handling and procedure on a teaching pendant, refer to each instruction manual.)

1) For handling and procedure on a teaching pendant, refer to each instruction manual. [Refer to Chapter 1 or Chapter 2]
2) Turn ON the power to the controller and connect the PC software.
3) Follow the section of the procedure for absolute to perform a reset.

4.4.3 Simple Absolute Type

Absolute batteries and absolute battery box are enclosed in a simple absolute type controller. For an absolute battery, there is a specific position for each axis number. Refer to the figure below to insert the batteries to the absolute battery box. There is also a position for connector insertion specified for battery cables. Refer to the figure below to establish the connections.

- Front View after Absolute Battery Unit Cover Removed



4.4.4 Absolute Encoder Backup Type

Item	Specification
Battery model	AB-7
Number of Units	1 unit/axis (4 units/4 axes max.)
Battery Voltage	3.6V
Current Capacity	3300mAH
Reference for battery replacing timing(Note 1)	Approx. 3 years (It may differ depending on condition of use)

Note 1 Replace the battery regularly.

4.4.5 Charging Absolute Battery

Have the battery charged continuously for 72 hours or more for the first time to use or after replacing the battery. While 24V is being supplied to a controller, battery is being charged.

Data Retaining Duration (Reference assuming a battery is new)

Setting in Each Axis Parameter No. 49	Upper Boundary for Number of Encoder Rotation When Power is off [rpm]	Reference for Duration of Battery Remaining [days]	Retaining Duration as of 1 Hour of Battery Charging (Reference) [hrs]
0	100	20	6.6
1	200	15	5.0
2 (factory default)	400	10	3.3
3	800	5	1.6

The data will be lost if the controller is off for more than the capable duration to retain the data. Charge the battery as early as possible.
A battery has its life, and the capable duration to retain data decreases gradually. Replace the battery if the retaining duration is remarkably dropped even after charging it properly.

e.g.) Conditions of Use;
Monday to Friday = Charged for 8 hours per day, discharged for 16 hours
Saturday and Sunday = Discharge

1) If setting is Parameter No. 19 = 3;
Total Charging: Operation time 8 [hrs] per day * Retaining time 1.6 [hrs] per hour of charging * Weekdays 5 [days] = 64 [hrs]
Total Discharging: Stopped time during night 16 [hrs] * Weekdays 5 [days] + Stopped time in weekend 48 [hours] = 128 [hrs]
Assuming to start on Monday with the battery fully charged, the total discharging exceeds the total charging by 64 [hrs], thus the amount of fully charged keeps decreasing by 64 [hrs].

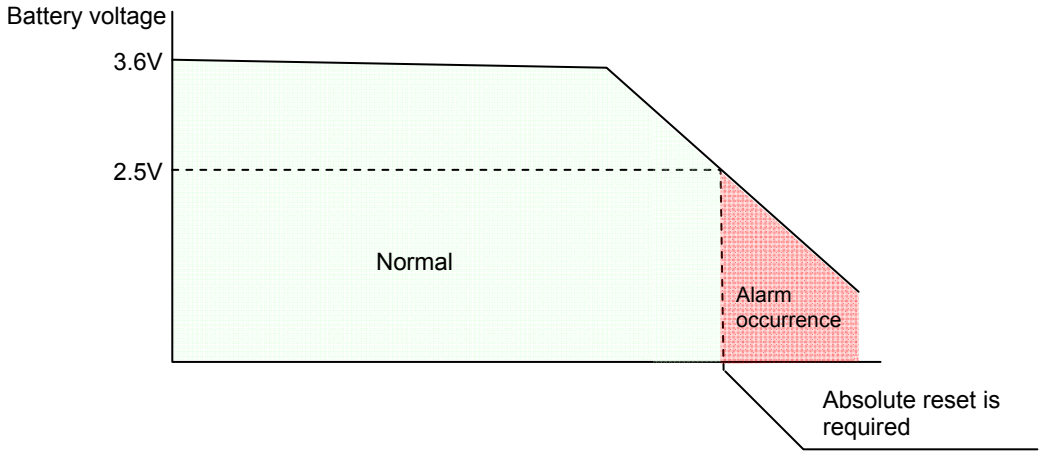
2) If setting is Parameter No. 19 = 2;
Total Charging: Operation time 8 [hrs] per day * Retaining time 3.3 [hrs] per hour of charging * Weekdays 5 [days] = 132 [hrs]
Total Discharging: Stopped time during night 16 [hrs] * Weekdays 5 [days] + Stopped time in weekend 48 [hours] = 128 [hrs]
Assuming to start on Monday, the total charging exceeds the total discharging, thus there is no need of continuous full charging. The battery is charged for 4 hours in one week.

4.4.6 Detection of Absolute Battery Voltage Drop

An error will be detected corresponding to the voltage when the absolute battery voltage starts to drop.

Voltage	Alarm
2.5V ±8% or less	41C ABS Unit Encoder Error (2)

An absolute reset is necessary after battery replacement when an alarm gets generated. (The controller checks the battery voltage when the power is turned on. It would not be detected when the battery voltage drops to the alarm level during the power conducted to the controller.



Chapter 5 I/O Parameter

Parameter data should be set appropriately according to the applicaiton requirements. 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.
For a teaching pendant applicable for memory card (TB-01/TB-02/TB-03), back up the data to a memory card. Make notes in case there is no memory card available.
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.
The change to the parameters will be activated after they are edited, written to the flash ROM, then either software reset or reboot of the power. It will not be active only with writing on the teaching tool.
The initial settings (reference) described in the tables in the sections from 5.1 I/O Parameters to 5.7 Other Parameters may differ depending on the connected actuators and control systems.
The range for input is the range that a teaching tool can apply. In the actual setting, input a value in the remark column which activates the functions. (Do not attempt to input the values other than those defined in the remarks.)

> ⚠ *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. Understand very well about the control logic of controller if making a change or performing a setting suitable to the system. Please contact us if you have anything unclear.*
> *Do not turn OFF the power to the controller during the parameter writing.*

◎Parameters Set in Bits

• How to Use Bits
Refer below for how to turn on the bits (in case the last digit of the set value is H).
Set the value of hexadecimal number transformed from the binary number.

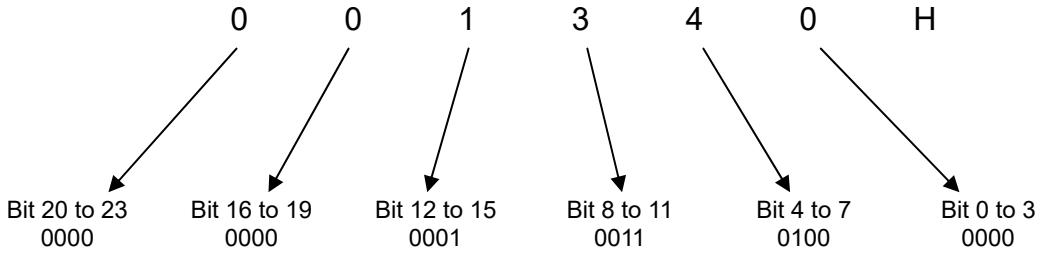
■ Binary number
In the Binary number system, the figure is expressed using two (0 and 1) numerical characters. The figure increases from “0”, and then “1” and moves on to the next digit to “10”, “11”, etc.

Decimal number	0	1	2	3	4	5	6	7	8	9	10
Binary number	0	1	10	11	100	101	110	111	1000	1001	1010

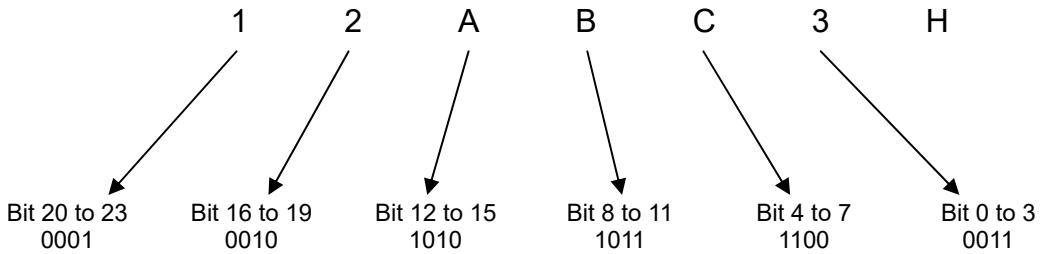
■ Hexadecimal number
In the Hexadecimal number system, the figure is expressed using nine numerical characters (from 0 to 9) and alphabetical characters (from A to F). The figure is gradually increased from “0” to “1”, “2”, “3”, “4”, “5”, “6”, “7”, “8”, “9”, “A”, “B”, “C”, “D”, “E”, “F” and then moves on to the next digit to “10”, “11”, etc.

Decimal number	0～9 (Same expression in the decimal number system and the hexadecimal number system)	10	11	12	13	14	15	16
Hexadecimal number		A	B	C	D	E	F	10

Example 1: 001340H



Example 2: 12ABC3H



5.1 I/O Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
1	I/O port assignment type	0	0 ~ 20		0: Fixed assignment
2	Input port start number at I/O1 affixed assignment	000	-1 ~ 599		0 + (Multiple of 8) (Invalid if a negative value is set)
3	Output port start number at I/O1 affixed assignment	300	-1 ~ 599		300 + (Multiple of 8) (Invalid if a negative value is set)
4	System reservation	0H	0H ~ FFFFFFFFH		
5	System reservation	0H	0H ~ FFFFFFFFH		
6	System reservation	0H	0H ~ FFFFFFFFH		
7	System reservation	0H	0H ~ FFFFFFFFH		
8	System reservation	0H	0H ~ FFFFFFFFH		
9	System reservation	0H	0H ~ FFFFFFFFH		
10	I/O error monitor	1	0 ~ 5		0: Do not monitor 1: Monitor 2: Monitor (Do not monitor errors relating to 24-V I/O power source) 3: Monitor (Monitor only errors relating to 24-V I/O power source) * Some exceptions apply. * If 0 (= Do not monitor) or 2 (= Monitor (Monitor only errors relating to 24-V I/O power sours)) is selected, a system error wlii not generate even when an abnomallity relating to the 24-V I/O power source occurs. However, allsubsequent actual outputs from the digital I/O board will be cut off by a circuit to protect the controller.
11	System reservation	0H	0H ~ FFFFFFFFH		
12	System reservation	0H	0H ~ FFFFFFFFH		
13	System reservation	0H	0H ~ FFFFFFFFH		
14	Number of I/O2 fieldbus remote input used ports	0	0 ~ 240		Multiple of 8
15	Number of I/O2 fieldbus remote output used ports	0	0 ~ 240		Multiple of 8
16	Input port start number at I/O2 affixed assignment	48	-1 ~ 299		0 + (Multiple of 8) (Invalid if a negative value is set)
17	Output port start number at I/O2 affixed assignment	348	-1 ~ 599		300 + (Multiple of 8) (Invalid if a negative value is set)
18	I/O2 error monitor	1	0 ~ 5		0: Do not monitor 1: Monitor * Some exceptions apply.
19	(For extension)	0			
20	Input filtering periods	2	1 ~ 9	msec	Input signal is recognized when the status is held for twice the period set by this parameter.
21	Register input filtering periods	2	1 ~ 9	msec	Input signal is recognized when the status is held for twice the period set by this parameter.
22	System reservation	2000	0 ~ 99999	msec	
23	System reservation	0H	0H ~ FFFFFFFFH		
24	System reservation	0	0H ~ FFFFFFFFH		
25	(For extension)	0			
26	(For extension)	0			
27	(For extension)	0			
28	(For extension)	0			
29	(For extension)	0			
30	Input function selection 000	1	0 ~ 5		0: General-purpose input 1: Program start signal (ON edge) (007 to 014, BCD-specified program number) 2: Program start signal (ON edge) (007 to 014, Binary-specified program number) * When using this signal to start a program, make sure the signal remains ON to 100 msec or longer so that the program will start without fail. Note: The port number assigned to this function can be changed using I/O Parameter No. 283, “Physical input port number for input function selection 000”.
31	Input function selection 001	0	0 ~ 5		0: General-purpose input 1: Software reset signal (1 second ON) * If continued operation is specified as the action upon emergency stop, enable the software reset signal (to provide a means of canceling the operation). Note: The port number assigned to this function can be changed using I/O Parameter No. 284, “Physical input port number for input function selection 001.”

I/O Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
32	Input function selection 002	0	0 ~ 5		0: General-purpose input 1: Servo ON * ON edge: Equivalent to the all-valid-axis servo ON command, OFF edge: Equivalent to the all-valid-axis servo OFF command (A minimum interval of 1.5 seconds is required) (Must be executed in non-operating condition) Note: The port number assigned to this function can be changed using I/O Parameter No. 285, “Physical input port number for input function selection 002.”
33	Input function selection 003	1	0 ~ 5		0: General-purpose input 1: General-purpose input (Start the auto-start program upon power-ON reset/software reset in the AUTO mode) 2: Auto-start program start signal (ON edge: Start, OFF edge: Abort all operations/programs (excluding the I/O processing program at operation/program abort)) * If this parameter is used as an auto-start program start signal, turn ON the signal for at least 100 msec so that the program will start without fail. Note: The port number assigned to this function can be changed using I/O Parameter No. 286, “Physical input port number for input function selection 003.”
34	Input function selection 004	0	0 ~ 5		0: General-purpose input 1: All servo axis soft interlock (OFF level) (Valid for all commands other than the servo OFF command) (Operation is held upon interlock actuation during automatic operation; operation is terminated upon interlock in non-AUTO mode) Note: The port number assigned to this function can be changed using I/O Parameter No. 287, “Physical input port number for input function selection 004.”
35	Input function selection 005	0	0 ~ 5		0: General-purpose input 1: Operation-pause reset signal (ON edge) Note: The port number assigned to this function can be changed using I/O Parameter No. 288, “Physical input port number for input function selection 005.”
36	Input function selection 006	0	0 ~ 5		0: General-purpose input 1: Operation-pause reset signal (OFF level) (Valid only during automatic operation) * Cancel pause when an operation-pause reset signal is received. Note: The port number assigned to this function can be changed using I/O Parameter No. 289, “Physical input port number for input function selection 006.”
37	Input function selection 007	1	0 ~ 5		0: General-purpose input 1: Program number specified for program start (least significant bit) Note: The port number assigned to this function can be changed using I/O Parameter No. 290, “Physical input port number for input function selection 007.”
38	Input function selection 008	1	0 ~ 5		0: General-purpose input 1: Program number specified for program start Note: The port number assigned to this function can be changed using I/O Parameter No. 291, “Physical input port number for input function selection 008.”
39	Input function selection 009	1	0 ~ 5		0: General-purpose input 1: Program number specified for program start Note: The port number assigned to this function can be changed using I/O Parameter No. 292, “Physical input port number for input function selection 009.”
40	Input function selection 010	1	0 ~ 5		0: General-purpose input 1: Program number specified for program start Note: The port number assigned to this function can be changed using I/O Parameter No. 293, “Physical input port number for input function selection 010.”
41	Input function selection 011	1	0 ~ 5		0: General-purpose input 1: Program number specified for program start Note: The port number assigned to this function can be changed using I/O Parameter No. 294, “Physical input port number for input function selection 011.”
42	Input function selection 012	1	0 ~ 5		0: General-purpose input 1: Program number specified for program start Note: The port number assigned to this function can be changed using I/O Parameter No. 295, “Physical input port number for input function selection 012.”

I/O Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
43	Input function selection 013	1	0 ~ 5		0: General-purpose input 1: Program number specified for program start 2: Error reset (ON edge) Note: The port number assigned to this function can be changed using I/O Parameter No. 296, “Physical input port number for input function selection 013.”
44	Input function selection 014	0	0 ~ 5		0: General-purpose input 1: Driving source cut-off cancellation input (ON edge) (effective when cancelling cause) * Cutoff to be cancelled with driving source cutoff cancellation for cases except for 1 * An axis with no motor drive power part built in this controller or that with the drive source cutoff circuit not under the control of this controller cannot make a drive source cutoff. 2: Program number specified for program start Note: The port number assigned to this function can be changed using I/O Parameter No. 297, “Physical input port number for input function selection 014.”
45	Input function selection 015	0	0 ~ 5		0: General-purpose input 1: Home-return operation (ON edge) in all incremental axes (PCX/PGX Types) on SCARA Robot and all Linear Robot 2: Home return of all valid incremental axes (ON edge) * It is necessary to turn the servo ON before home-return operation (I/O Parameter No. 32, Axis-Specific Parameter No. 13) Note: The port number assigned to this function can be changed using I/O Parameter No. 298, “Physical input port number for input function selection 015.”
46	Output function selection 300	2	0 ~ 20		0: General-purpose output 1: Output error of operation-cancellation level or higher (ON) 2: Output error of operation-cancellation level or higher (OFF) 3: Output error of operation-cancellation level or higher + emergency stop (ON) 4: Output error of operation-cancellation level or higher + emergency stop (OFF) 7: Output error of maintenance information alert related message level (Error No. 231 to 232) (ON) 8: Output error of maintenance information alert related message level (Error No. 231 to 232) (OFF) Note: The port number assigned to this function can be changed using I/O Parameter No. 299, “Physical input port number for input function selection 300.”
47	Output function selection 301	3	0 ~ 20		0: General-purpose output 1: READY output (PIO trigger program can be run) 2: READY output (PIO trigger program can be run and error of operation-cancellation level or higher is not present) 3: READY output (PIO trigger program can be run and error of cold-start level or higher is not present) Note: The port number assigned to this function can be changed using I/O Parameter No. 300, “Physical input port number for input function selection 301.”
48	Output function selection 302	2	0 ~ 20		0: General-purpose output 1: Emergency-stop output (ON) 2: Emergency-stop output (OFF) Note: The port number assigned to this function can be changed using I/O Parameter No. 301, “Physical input port number for input function selection 302.”
49	Output function selection 303	0	0 ~ 5		0: General-purpose output 1: AUTO mode output 2: Output during automatic operation (Other parameter No. 12) Note: The port number assigned to this function can be changed using I/O Parameter No. 302, “Physical input port number for input function selection 303.”
50	Output function selection 304	0	0 ~ 5		0: General-purpose output 1: Output if all valid axes are at home (= 0) 2: Output if all valid axes completed home return (coordinates confirmed) 3: Output if all valid axes are at preset home coordinates * Do not use HOME command, but use MOVP command to move the axes to the home coordinate in the battery-less absolute type Note: The port number assigned to this function can be changed using I/O Parameter No. 303, “Physical input port number for input function selection 304.”

I/O Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
51	Output function selection 305	0	0 ~ 5		0: General-purpose output 1: Axis 1 in-position output (OFF if the work part is missed during push-motion operation) 2: Output when axis-1 servo is ON (systemmonitored task output) 3: System reservation Note: The port number assigned to this function can be changed using I/O Parameter No. 304, “Physical input port number for input function selection 305.”
52	Output function selection 306	0	0 ~ 5		0: General-purpose output 1: Axis 2 in-position output (OFF if the work part is missed during push-motion operation) 2: Output when axis-2 servo is ON (Systemmonitored task output) 3: System reservation Note: The port number assigned to this function can be changed using I/O Parameter No. 305, “Physical input port number for input function selection 306.”
53	Output function selection 307	0	0 ~ 5		0: General-purpose output 1: Axis 3 in-position output (OFF if the work part is missed during push-motion operation) 2: Output when axis-3 servo is ON (systemmonitored task output) 3: System reservation Note: The port number assigned to this function can be changed using I/O Parameter No. 306, “Physical input port number for input function selection 307.”
54	Output function selection 308	0	0 ~ 5		0: General-purpose output 1: Axis 4 in-position output (OFF if the work part is missed during push-motion operation) 2: Output when axis-4 servo is ON (systemmonitored task output) 3: System reservation Note: The port number assigned to this function can be changed using I/O Parameter No. 307, “Physical input port number for input function selection 308.”
55	Output function selection 309	0	0 ~ 5		0: General-purpose output Note: The port number assigned to this function can be changed using I/O Parameter No. 308, “Physical input port number for input function selection 309.”
56	Output function selection 310	0	0 ~ 5		0: General-purpose output Note: The port number assigned to this function can be changed using I/O Parameter No. 309, “Physical input port number for input function selection 310.”
57	Output function selection 311	0	0 ~ 5		0: General-purpose output Note: The port number assigned to this function can be changed using I/O Parameter No. 310, “Physical input port number for input function selection 311.”
58	Output function selection 312	0	0 ~ 5		0: General-purpose output Note: The port number assigned to this function can be changed using I/O Parameter No. 311, “Physical input port number for input function selection 312.”
59	Output function selection 313	0	0 ~ 5		0: General-purpose output Note: The port number assigned to this function can be changed using I/O Parameter No. 312, “Physical input port number for input function selection 313.”
60	Output function selection 314	0	0 ~ 5		0: General-purpose output Note: The port number assigned to this function can be changed using I/O Parameter No. 313, “Physical input port number for input function selection 314.”
61	Output function selection 315	0	0 ~ 5		0: General-purpose output Note: The port number assigned to this function can be changed using I/O Parameter No. 314, “Physical input port number for input function selection 315.”
62	Physical input port number for axis-1 brake forced release (For PC/PG/PCF/PGF type)	0	0 ~ 299		Forcibly unlock the brake when the applicable port is ON (Be aware of a falling load). * Invalid if “0” is set (Invalid if input port No. 0 is specified) * PCX/PGX type is system reservation
63	Physical input port number for axis-2 brake forced release (For PC/PG/PCF/PGF type)	0	0 ~ 299		Forcibly unlock the brake when the applicable port is ON (Be aware of a falling load). * Invalid if “0” is set (Invalid if input port No. 0 is specified) * PCX/PGX type is system reservation
64	Physical input port number for axis-3 brake forced release (For PC/PG/PCF/PGF type)	0	0 ~ 299		Forcibly unlock the brake when the applicable port is ON (Be aware of a falling load). * Invalid if “0” is set (Invalid if input port No. 0 is specified) * PCX/PGX type is system reservation

I/O Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
65	Physical input port number for axis-4 brake forced release	0	0 ~ 299		Forcibly unlock the brake when the applicable port is ON (Be aware of a falling load). * Invalid if “0” is set (Invalid if input port No. 0 is specified)
66	(For extension)	0			
67	(For extension)	0			
68	(For extension)	0			
69	(For extension)	0			
70	Unaffected general purpose output area number (Min.) when all operations/programs are aborted	300	0 ~ 599		* Caution: Outputs in this area must be operated under the responsibility of user programs including the “I/O processing program at operation/program abort.” Outputs outside this area will be forcibly turned OFF. (Invalid if “0” is set)
71	Unaffected general purpose output area number (maximum) when all operations/programs are aborted	315	0 ~ 599		
72	Unaffected general purpose output area number (MIN.) when all operations are paused (servo-axis soft interlock + output-port soft interlock)	300	0 ~ 599		* Caution: Outputs in this area must be operated (including recovery) under the responsibility of user programs including the “I/O processing program at all operations pause.” Outputs outside this area will be forcibly turned OFF, reflecting /holding the results of operations performed while all operation pause is effective (only during automatic operation). (Invalid if “0” is set)
73	Unaffected general purpose output area number (maximum) when all operations are paused (servo-axis soft interlock + output-port soft interlock)	599	0 ~ 599		
74	Number of TP user output ports used (hand, etc.)	0	0~ 8		Referenced by TP. (Invalid if “0” is set)
75	TP user output-port start number (hand, etc.)	0	0 ~ 599		Referenced by TP.
76	AUTO-mode physical output port number	0	0 ~ 599		(Invalid if “0” is set)
77	Input port number for acceptance permission of PC/TP servo movement command	0	0 ~ 299		* Caution: Invalid once operation is started. (Invalid if “0” is set)
78	Input target axis pattern for acceptance permission of PC/TP servo movement command	0	0B ~ 11111111B		
79	Remote mode control input-port number	0	0 ~ 299		System Mode = MANU when Indicated DI = ON or AUTO/MANU-SW = on MANU side. (Invalid if “0” is set) * Necessary to combine with feature applicable hardware * Debug filter invalid to remote mode control input port (Main application Ver. 2.00 or later)
80	(PC/TP SIO usage)	1	1 ~ 1		Switching of DIP switches
81	(PC/TP SIO station code)	153	153 ~ 153		Fixed to 153 (99H).
82	(PC/TP SIO reservation)	0			
83	(PC/TP SIO reservation)	0			
84	(PC/TP SIO reservation)	0			
85	(PC/TP SIO reservation)	0			
86	(PC/TP SIO reservation)	0			
87	(PC/TP SIO reservation)	0			
88	(PC/TP SIO reservation)	0			
89	(PC/TP SIO reservation)	0			
90	Usage of SIO channel 1 opened to user (AUTO mode)	1	0 ~ 9		0: Open SEL program 1: Open SEL program (Connect PC/TP when both devices are CLOSED) 2: IAI protocol B (Slave)
91	Station code of SIO channel 1 opened to user	153	0 ~ 255		Valid only with IAI protocol.
92	Baud rate type of SIO channel 1 opened to user	0	0 ~ 5		0: 9.6, 1: 19.2, 2: 38.4, 3: 57.6, 4: 76.8, 5: 115.2kbps
93	Data length of SIO channel 1 opened to user	8	7 ~ 8		
94	Stop bit length of SIO channel 1 opened to user	1	1 ~ 2		

I/O Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
95	Parity type of SIO channel 1 opened to use	0	0 ~ 2		0: None 1: Odd 2: Even
96	Receive operation type of SIO channel 1 opened to user	0	0 ~ 1		0: Forcibly enable receive after send 1: Do not forcibly enable receive at send
97	IAI-protocol minimum response delay for SIO channel 1 opened to user	0	0 ~ 999	msec	Valid only with IAI protocol.
98	(Reservation of SIO channel 1 opened to user)	0			
99	(Reservation of SIO channel 1 opened to user)	0			
100	SIO system reservation	0	0H ~ FFFFFFFFH		
101	SIO system reservation	0	0H ~ FFFFFFFFH		
102	SIO system reservation	0	0H ~ FFFFFFFFH		
103	SIO system reservation	0	0H ~ FFFFFFFFH		
104	SIO system reservation	0	0H ~ FFFFFFFFH		
105	SIO system reservation	0	0H ~ FFFFFFFFH		
106	SIO system reservation	0	0H ~ FFFFFFFFH		
107	SIO system reservation	0	0H ~ FFFFFFFFH		
108	SIO system reservation	0	0H ~ FFFFFFFFH		
109	SIO system reservation	0	0H ~ FFFFFFFFH		
110	SIO system reservation	0	0H ~ FFFFFFFFH		
111	SIO system reservation	0	0H ~ FFFFFFFFH		
112	SIO system reservation	0	0H ~ FFFFFFFFH		
113	SIO system reservation	0	0H ~ FFFFFFFFH		
114	SIO system reservation	0	0H ~ FFFFFFFFH		
115	SIO system reservation	0	0H ~ FFFFFFFFH		
116	IAI protocol communication attribute	10H	0H ~FFFFFFFFH		Bits 0 to 3: IAI protocol multiple channel communication permission select (0: Unpermitted * Communication exclusively in priority of Teaching port > Ethernet 1: Permitted) Bits 4 to 11: IAI protocol execution command communication valid channel select at AUTO Mode (01H: Teaching Port 02H: Extension SIO (Attribute 2 of SIO channel 2 opened to user) 26H: Ethernet) * Valid when IAI protocol multiple channel communication permission select = 1 (Permitted) * Communication available exclusively in priority of Teaching port > Ethernet at MANU Mode * Reference commands and stop commands (execution commands) are available to communicate with all the channels. (Main application Ver. 2.00 or later)
117	(For extension)	0			
118	(For extension)	0			
119	(For extension)	0			
120	Network attribute 1	640001H	0H ~ FFFFFFFFH		Bits 0 to 3: System reservation Bits 4 to 11: I/O2 fieldbus link error check timer value (10ms) Bits 12 to 15: For future extension Bits 16 to 27: System reservation Bits 28 to 31: I/O2 fieldbus link error and input port data select at PIO power error (0: Clear, 1: Hold)
121	Network attribute 2	C80000H	0H ~ FFFFFFFFH		Bits 0 to 7: System reservation Bits 8 to 11: System reservation Bits 12 to 15: For future extension Bits 16 to 27: Link timeout value at fieldbus initialization (100msec)
122	Network attribute 3	0	0H ~ FFFFFFFFH		

I/O Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
123	Network attribute 4	0H	0H ~ FFFFFFFFH		Bits 0 to 3: Selection for permission of 0.0.0.0 (IP address of connection destination ignored) for IP address of connection destination during Ethernet TCP/IP message communication (Server) (0: Do not permit 1: Permit (Not recommended.)) * Note: Number of clients that can be connected simultaneously per server port channel = 1 Bits 4 to 7: Ethernet IAI protocol B/TCP (MANU mode) existence check function select (0: Not used, 1: Use KeepAlive) Bits 8 to 11: Ethernet IAI protocol B/TCP (AUTO mode) existence check function select (0: Not used, 1: Use KeepAlive) Bits 12 to 15: Ethernet free-for-user channel 31 existence check function select (0: Not used, 1: Use KeepAlive) Bits 16 to 19: Ethernet free-for-user channel 32 existence check function select (0: Not used, 1: Use KeepAlive) Bits 20 to 23: Ethernet free-for-user channel 33 existence check function select (0: Not used, 1: Use KeepAlive) Bits 24 to 27: Ethernet free-for-user channel 34 existence check function select (0: Not used, 1: Use KeepAlive) Bits 28 to 31: System reservation * The connection may get cut in case the mating device is not applicable for TCP KeepAlive function.
124	Network attribute 5	0H	0H ~ FFFFFFFFH		Ethernet TCP/IP message communication attribute: Ethernet client-server type (0: Not used 1: Client (Automatic assignment of own port number) 2: System reservation 3: Server (Specification of own port number)) * Note: Number of clients that can be connected simultaneously per server port channel = 1 Bits 0 to 3: IAI protocol B/TCP (MANU mode) * Can be connected to the PC software only if clients Bits 4 to 7: IAI protocol B/TCP (AUTO mode) * Can be connected to the PC software only if clients Bits 8 to 11: User-open channel 31 Bits 12 to 15: User-open channel 32 Bits 16 to 19: User-open channel 33 Bits 20 to 23: User-open channel 34 * If the parameter settings for own port number, client/server type, IP address of connection destination and port number of connection destination do no match completely between the IAI protocol B/TCP MANU and AUTO modes, the connection will be cut off when the MANU/AUTO mode is switched.
125	Network attribute 6	1E32H	0H ~ FFFFFFFFH		Bits 0 to 7: System reservation Bits 8 to 15: System reservation Bits 16 to 23: System reservation
126	Network attribute 7	7D007D0H	0H ~ FFFFFFFFH		Ethernet TCP/IP message communication attribute Bits 0 to 15: System reservation Bits 16 to 31: System reservation
127	Network attribute 8	5050214H	0H ~ FFFFFFFFH		Ethernet TCP/IP message communication attribute Bits 0 to 7: CONNECT_TIMEOUT (Change prohibited) (0 prohibited) (sec) Bits 8 to 15: Connection retry interval (IAI protocol B/TCP) (sec) Bits 16 to 23: Send timeout value (sec) Bits 24 to 31: IAI protocol B- SIO noncommunication confirmation timer value (sec) (IAI protocol B/TCP connection trigger)
128	Network attribute 9	0H	0H ~ FFFFFFFFH		Ethernet TCP/IP message communication attribute Bits 0 to 15: SEL server open timeout value (sec) (No timeout check, if 0) Bits 16 to 23: System reservation
129	Network attribute 10	0H	0H ~ FFFFFFFFH		Ethernet operation specification Bits 0 to 3: System reservation Bits 4 to 7: TCP/IP message communication (0: Not use, 1: Use) Bits 8 to 31: Reserved (operation specification)

I/O Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
130	Own MAC address (H)	0H	Referency only (HEX)		Only lower two bytes are valid.
131	Own MAC address (L)	0H	Referency only (HEX)		
132	Own IP address (H)	192	1 ~ 255		* Setting of 0 and 127 is prohibited.
133	Own IP address (MH)	168	0 ~ 255		
134	Own IP address (ML)	0	0 ~ 255		
135	Own IP address (L)	1	1 ~ 254		* 0 and 255 are available to set only in main application V2.00 and later.
136	Subnet mask (H)	255	0 ~ 255		
137	Subnet mask (MH)	255	0 ~ 255		
138	Subnet mask (ML)	255	0 ~ 255		
139	Subnet mask (L)	0	0 ~ 255		
140	Default gateway (H)	0	0 ~ 255		
141	Default gateway (MH)	0	0 ~ 255		
142	Default gateway (ML)	0	0 ~ 255		
143	Default gateway (L)	0	0 ~ 255		
144	IAI protocol B/TCP: Own port number (MANU mode)	64511	1025 ~ 65535		* Important: Be sure to set a different number for each own port number. (Duplication is permitted only for own port numbers under IAI protocol B/TCP in the MANU/AUTO modes.)
145	User-open channel 31 (TCP/IP): Own port number	64512	1025 ~ 65535		
146	User-open channel 32 (TCP/IP): Own port number	64513	1025 ~ 65535		
147	User-open channel 33 (TCP/IP): Own port number	64514	1025 ~ 65535		
148	User-open channel 34 (TCP/IP): Own port number	64515	1025 ~ 65535		
149	IAI protocol B/TCP: IP address of connection destination (MANU mode) (H)	192	0 ~ 255		* Setting of 0 and 127 is prohibited.
150	IAI protocol B/TCP: IP address of connection destination (MANU mode) (MH)	168	0 ~ 255		
151	IAI protocol B/TCP: IP address of connection destination (MANU mode) (ML)	0	0 ~ 255		
152	IAI protocol B/TCP: IP address of connection destination (MANU mode) (L)	100	0 ~ 254		* Setting of 0 and 255 is prohibited.
153	IAI protocol B/TCP: Port number of connection destination (MANU mode)	64611	0 ~ 65535		* 0 can be set, if server. 0 = Port number of connection destination ignored (Only IP address is checked) * 0 cannot be set, if client.
154	IAI protocol B/TCP: IP address of connection destination (AUTO mode) (H)	192	0 ~ 255		* Setting of 0 and 127 is prohibited.
155	IAI protocol B/TCP: IP address of connection destination (AUTO mode) (MH)	168	0 ~ 255		
156	IAI protocol B/TCP: IP address of connection destination (AUTO mode) (ML)	0	0 ~ 255		
157	IAI protocol B/TCP: IP address of connection destination (AUTO mode) (L)	100	0 ~ 254		* Setting of 0 and 255 is prohibited.
158	IAI protocol B/TCP: Port number of connection destination (AUTO mode)	64611	0 ~ 65535		* 0 can be set, if server. 0 = Port number of connection destination ignored (Only IP address is checked) * 0 cannot be set, if client.
159	IAI protocol B/TCP: Own port number (AUTO mode)	64516	1025 ~ 65535		* Important: Be sure to set a different number for each own port number. (Duplication is permitted only for own port numbers under IAI protocol B/TCP in the MANU/AUTO modes.)
160	Vision system I/F connected IP address (H) (For PC/PG/PCF/PGF type)	192	0 ~ 255		* Setting of 0 and 127 is prohibited. * PCX/PGX type is system reservation
161	Vision system I/F connected IP address (MH) (For PC/PG/PCF/PGF type)	168	0 ~ 255		* PCX/PGX type is system reservation
162	Vision system I/F connected IP address (ML) (For PC/PG/PCF/PGF type)	0	0 ~ 255		* PCX/PGX type is system reservation

I/O Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
163	Vision system I/F connected IP address (L) (For PC/PG/PCF/PGF type)	102	0 ~ 254		* Setting of 0 and 255 is prohibited. * PCX/PGX type is system reservation
164	Vision system I/F connected port number (For PC/PG/PCF/PGF type)	64613	0 ~ 65535		* Vision System I/F is dedicated for the specifications of the client on IAI controller side (Self-Port Number Automatic Assignment) * Setting of 0 is prohibited. * PCX/PGX type is system reservation
165	(For network extention)	0			
166	(For network extention)	0			
167	(For network extention)	0			
168	(For network extention)	0			
169	(For network extention)	0			
170	(For extention)	0			
171	(For extention)	0			
172	(For extention)	0			
173	(For extention)	0			
174	(For extention)	0			
175	(For extention)	0			
176	(For extention)	0			
177	(For extention)	0			
178	(For extention)	0			
179	(For extention)	0			
180	(For extention)	0			
181	(For extention)	0			
182	(For extention)	0			
183	(For extention)	0			
184	(For extention)	0			
185	(For extention)	0			
186	(For extention)	0			
187	(For extention)	0			
188	(For extention)	0			
189	(For extention)	0			
190	(For extention)	0			
191	(For extention)	0			
192	(For extention)	0			
193	(For extention)	0			
194	(For extention)	0			
195	(For extention)	0			
196	(For extention)	0			
197	(For extention)	0			
198	(For extention)	0			
199	(For extention)	0			
200	(For extention)	0			
201	(For extention)	0			
202	(For extention)	0			
203	(For extention)	0			
204	(For extention)	0			
205	(For extention)	0			
206	(For extention)	0			
207	(For extention)	0			
208	(For extention)	0			
209	(For extention)	0			
210	(For extention)	0			
211	(For extention)	0			
212	(For extention)	0			
213	(For extention)	0			
214	(For extention)	0			
215	(For extention)	0			
216	(For extention)	0			
217	(For extention)	0			
218	(For extention)	0			
219	(For extention)	0			
220	(For extention)	0			
221	(For extention)	0			
222	(For extention)	0			
223	(For extention)	0			
224	(For extention)	0			

I/O Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
225	Extension I/O control	0H	0H ~ FFFFFFFFH		Bits 0 to 3: I/O2 Module Type (0: Not mounted 1: CC-Link, 2: DeviceNet, 3: PROFIBUS, 4: IA-NET 5 to 6: System reservation 7: EtherNet/IP, 8: System reservation 9: PIO) Bits 4 to 7: System reservation
226	I/O2 fieldbus node address	0	0 ~ 99999999		· When CC-Link: 1 to 64 · When DeviceNet: 0 to 63 · When PROFIBUS: 0 to 125
227	I/O2 fieldbus communication speed	0	0 ~ 9		· When CC-Link: (0: 156kbps, 1: 625kbps, 2: 2.5Mbps, 3: 5Mbps, 4: 10Mbps) · When DeviceNet: (0: 125kbps, 1: 250kbps, 2: 500kbps, 3: Auto) · When EtherNet/IP: (0: Auto negotiation, 1: 10Mbps (Half-duplex), 2: 10Mbps (Full-duplux), 3: 100Mbps (Half-duplex), 4: 100Mbps (Full-duplux)) * Setting unnecessary when PROFIBUS
228	(For extention)	0			
229	(For extention)	0			
230	(For extention)	0			
231	System reservation	0	0 ~ 240		
232	System reservation	0	0 ~ 240		
233	System reservation	-1	-1 ~ 299		
234	System reservation	-1	-1 ~ 599		
235	System reservation	0	0 ~ 5		
236	(For extention)	0			
237	System reservation	0	0 ~ 99999999		
238	System reservation	0	0 ~ 9		
239	(For extention)	0			
240	(For extention)	0			
241	(For extention)	0			
242	(For extention)	0			
243	(For extention)	0			
244	(For extention)	0			
245	(For extention)	0			
246	(For extention)	0			
247	(For extention)	0			
248	(For extention)	0			
249	(For extention)	0			
250	(For extention)	0			
251	(For extention)	0			
252	(For extention)	0			
253	(For extention)	0			
254	(For extention)	0			
255	(For extention)	0			
256	(For extention)	0			
257	(For extention)	0			
258	(For extention)	0			
259	(For extention)	0			
260	(For extention)	0			
261	(For extention)	0			
262	(For extention)	0			
263	(For extention)	0			
264	(For extention)	0			
265	(For extention)	0			
266	(For extention)	0			
267	(For extention)	0			
268	(For extention)	0			
269	(For extention)	0			
270	(For extention)	0			
271	(For extention)	0			
272	(For extention)	0			
273	(For extention)	0			

I/O Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
274	(For extention)	0			
275	(For extention)	0			
276	(For extention)	0			
277	(For extention)	0			
278	(For extention)	0			
279	(For extention)	0			
280	(For extention)	0			
281	(For extention)	0			
282	(For extention)	0			
283	Physical input port number to input function selection 000	16	-1 ~ 299		Specify the port number to be assigned to the function of I/O Parameter No. 30, “Input function selection 000”. * If a negative value is set, the function will be assigned to input port No. 0.
284	Physical input port number to input function selection 001	17	-1 ~ 299		Specify the port number to be assigned to the function of I/O Parameter No. 31, “Input function selection 001”. * If a negative value is set, the function will be assigned to input port No. 1.
285	Physical input port number to input function selection 002	18	-1 ~ 299		Specify the port number to be assigned to the function of I/O Parameter No. 32, “Input function selection 002”. * If a negative value is set, the function will be assigned to input port No. 2.
286	Physical input port number to input function selection 003	19	-1 ~ 299		Specify the port number to be assigned to the function of I/O Parameter No. 33, “Input function selection 003”. * If a negative value is set, the function will be assigned to input port No. 3.
287	Physical input port number to input function selection 004	20	-1 ~ 299		Specify the port number to be assigned to the function of I/O Parameter No. 34, “Input function selection 004”. * If a negative value is set, the function will be assigned to input port No. 4.
288	Physical input port number to input function selection 005	21	-1 ~ 299		Specify the port number to be assigned to the function of I/O Parameter No. 35, “Input function selection 005”. * If a negative value is set, the function will be assigned to input port No. 5.
289	Physical input port number to input function selection 006	22	-1 ~ 299		Specify the port number to be assigned to the function of I/O Parameter No. 36, “Input function selection 006”. * If a negative value is set, the function will be assigned to input port No. 6.
290	Physical input port number to input function selection 007	23	-1 ~ 299		Specify the port number to be assigned to the function of I/O Parameter No. 37, “Input function selection 007”. * If a negative value is set, the function will be assigned to input port No. 7. * If “Program number specified for program start” has been specified for input function selection 007, specify in this parameter an input port number whose LSB contains the program number specified for program start.
291	Physical input port number to input function selection 008	24	-1 ~ 299		Specify the port number to be assigned to the function of I/O Parameter No. 38, “Input function selection 008”. * If a negative value is set, the function will be assigned to input port No. 8. * If “Program number specified for program start” has been specified for input function selection 008, specify in this parameter an input port number whose LSB contains the program number specified for program start.
292	Physical input port number to input function selection 009	25	-1 ~ 299		Specify the port number to be assigned to the function of I/O Parameter No. 39, “Input function selection 009”. * If a negative value is set, the function will be assigned to input port No. 9. * If “Program number specified for program start” has been specified for input function selection 009, specify in this parameter an input port number whose LSB contains the program number specified for program start.
293	Physical input port number to input function selection 010	26	-1 ~ 299		Specify the port number to be assigned to the function of I/O Parameter No. 40, “Input function selection 010”. * If a negative value is set, the function will be assigned to input port No. 10. * If “Program number specified for program start” has been specified for input function selection 010, specify in this parameter an input port number whose LSB contains the program number specified for program start.

I/O Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
294	Physical input port number to input function selection 011	27	-1 ~ 299		Specify the port number to be assigned to the function of I/O Parameter No. 41, “Input function selection 011”. * If a negative value is set, the function will be assigned to input port No. 11. * If “Program number specified for program start” has been specified for input function selection 011, specify in this parameter an input port number whose LSB contains the program number specified for program start.
295	Physical input port number to input function selection 012	28	-1 ~ 299		Specify the port number to be assigned to the function of I/O Parameter No. 42, “Input function selection 012”. * If a negative value is set, the function will be assigned to input port No. 12. * If “Program number specified for program start” has been specified for input function selection 012, specify in this parameter an input port number whose LSB contains the program number specified for program start.
296	Physical input port number to input function selection 013	29	-1 ~ 299		Specify the port number to be assigned to the function of I/O Parameter No. 43, “Input function selection 013”. * If a negative value is set, the function will be assigned to input port No. 13. * If “Program number specified for program start” has been specified for input function selection 013, specify in this parameter an input port number whose LSB contains the program number specified for program start.
297	Physical input port number to input function selection 014	30	-1 ~ 299		Specify the port number to be assigned to the function of I/O Parameter No. 44, “Input function selection 014”. * If a negative value is set, the function will be assigned to input port No. 14. * If “Program number specified for program start” has been specified for input function selection 014, specify in this parameter an input port number whose LSB contains the program number specified for program start.
298	Physical input port number to input function selection 015	31	-1 ~ 299		Specify the port number to be assigned to the function of I/O Parameter No. 45, “Input function selection 015”. * If a negative value is set, the function will be assigned to input port No. 15.
299	Physical output port number to output function selection 300	316	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 46, “Output function selection 300”. * If 0 is set, the function will be assigned to output port No. 300.
300	Physical output port number to output function selection 301	317	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 47, “Output function selection 301”. * If 0 is set, the function will be assigned to output port No. 301.
301	Physical output port number to output function selection 302	318	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 48, “Output function selection 302”. * If 0 is set, the function will be assigned to output port No. 302.
302	Physical output port number to output function selection 303	319	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 49, “Output function selection 303”. * If 0 is set, the function will be assigned to output port No. 303.
303	Physical output port number to output function selection 304	320	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 50, “Output function selection 304”. * If 0 is set, the function will be assigned to output port No. 304.
304	Physical output port number to output function selection 305	321	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 51, “Output function selection 305”. * If 0 is set, the function will be assigned to output port No. 305.
305	Physical output port number to output function selection 306	322	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 52, “Output function selection 306”. * If 0 is set, the function will be assigned to output port No. 306.
306	Physical output port number to output function selection 307	323	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 53, “Output function selection 307”. * If 0 is set, the function will be assigned to output port No. 307.
307	Physical output port number to output function selection 308	324	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 54, “Output function selection 308”. * If 0 is set, the function will be assigned to output port No. 308.
308	Physical output port number to output function selection 309	325	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 55, “Output function selection 309”. * If 0 is set, the function will be assigned to output port No. 309.

I/O Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
309	Physical output port number to output function selection 310	326	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 56, “Output function selection 310”. * If 0 is set, the function will be assigned to output port No. 310.
310	Physical output port number to output function selection 311	327	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 57, “Output function selection 311”. * If 0 is set, the function will be assigned to output port No. 311.
311	Physical output port number to output function selection 312	328	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 58, “Output function selection 312”. * If 0 is set, the function will be assigned to output port No. 312.
312	Physical output port number to output function selection 313	329	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 59, “Output function selection 313”. * If 0 is set, the function will be assigned to output port No. 313.
313	Physical output port number to output function selection 314	330	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 60, “Output function selection 314”. * If 0 is set, the function will be assigned to output port No. 314.
314	Physical output port number to output function selection 315	331	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 61, “Output function selection 315”. * If 0 is set, the function will be assigned to output port No. 315.
315	Physical output port number to output function selection 300 (Area 2)	300	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 331, “Output function selection 300 (Area 2)”. * If 0 is set, the function will not be assigned to any port.
316	Physical output port number to output function selection 301 (Area 2)	301	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 332, “Output function selection 301 (Area 2)”. * If 0 is set, the function will not be assigned to any port.
317	Physical output port number to output function selection 302 (Area 2)	302	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 333, “Output function selection 302 (Area 2)”. * If 0 is set, the function will not be assigned to any port.
318	Physical output port number to output function selection 303 (Area 2)	0	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 334, “Output function selection 303 (Area 2)”. * If 0 is set, the function will not be assigned to any port.
319	Physical output port number to output function selection 304 (Area 2)	304	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 335, “Output function selection 304 (Area 2)”. * If 0 is set, the function will not be assigned to any port.
320	Physical output port number to output function selection 305 (Area 2)	0	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 336, “Output function selection 305 (Area 2)”. * If 0 is set, the function will not be assigned to any port.
321	Physical output port number to output function selection 306 (Area 2)	0	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 337, “Output function selection 306 (Area 2)”. * If 0 is set, the function will not be assigned to any port.
322	Physical output port number to output function selection 307 (Area 2)	0	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 338, “Output function selection 307 (Area 2)”. * If 0 is set, the function will not be assigned to any port.
323	Physical output port number to output function selection 308 (Area 2)	0	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 339, “Output function selection 308 (Area 2)”. * If 0 is set, the function will not be assigned to any port.
324	Physical output port number to output function selection 309 (Area 2)	0	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 340, “Output function selection 309 (Area 2)”. * If 0 is set, the function will not be assigned to any port.
325	Physical output port number to output function selection 310 (Area 2)	0	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 341, “Output function selection 310 (Area 2)”. * If 0 is set, the function will not be assigned to any port.
326	Physical output port number to output function selection 311 (Area 2)	0	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 342, “Output function selection 311 (Area 2)”. * If 0 is set, the function will not be assigned to any port.
327	Physical output port number to output function selection 312 (Area 2)	0	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 343 “Output function selection 312 (Area 2)”. * If 0 is set, the function will not be assigned to any port.
328	Physical output port number to output function selection 313 (Area 2)	0	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 344, “Output function selection 313 (Area 2)”. * If 0 is set, the function will not be assigned to any port.
329	Physical output port number to output function selection 314 (Area 2)	0	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 345, “Output function selection 314 (Area 2)”. * If 0 is set, the function will not be assigned to any port.
330	Physical output port number to output function selection 315 (Area 2)	0	0 ~ 599		Specify the port number to be assigned to the function of I/O Parameter No. 346, “Output function selection 315 (Area 2)”. * If 0 is set, the function will not be assigned to any port.

I/O Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
331	Output function selection 300 (Area 2)	1	0 ~ 20		0: General-purpose output 1: Output error of operation-cancellation level or higher (ON) 2: Output error of operation-cancellation level or higher (OFF) 3: Output error of operation-cancellation level or higher + emergency stop (ON) 4: Output error of operation-cancellation level or higher + emergency stop (OFF) 7: Output error of maintenance information alert related message level (error No. 231 to 232) (ON) 8: Output error of maintenance information alert related message level (error No. 231 to 232) (OFF)
332	Output function selection 301 (Area 2)	1	0 ~ 20		0: General-purpose output 1: READY output (PIO trigger program can be run) 2: READY output (PIO trigger program can be run and error of operation-cancellation level or higher is not present) 3: READY output (PIO trigger program can be run and error of cold-start level or higher is not present)
333	Output function selection 302 (Area 2)	1	0 ~ 20		0: General-purpose output 1: Emergency-stop output (ON) 2: Emergency-stop output (OFF)
334	Output function selection 303 (Area 2)	0	0 ~ 5		0: General-purpose output 1: AUTO mode output 2: Output during automatic operation (Other Prameter No. 12)
335	Output function selection 304 (Area 2)	2	0 ~ 5		0: General-purpose output 1: Output if all valid axes are at home (= 0) 2: Output if all valid axes completed home return (Coordinates confirmed) 3: Output if all valid axes are at preset home coordinates
336	Output function selection 305 (Area 2)	0	0 ~ 5		0: General-purpose output 1: Axis 1 in-position output (OFF if the work part is missed during push-motion operation) 2: Output when axis-1 servo is ON (System-monitored task output) 3: System reservation
337	Output function selection 306 (Area 2)	0	0 ~ 5		0: General-purpose output 1: Axis 2 in-position output (OFF if the work part is missed during push-motion operation) 2: Output when axis-2 servo is ON (System-monitored task output) 3: System reservation
338	Output function selection 307 (Area 2)	0	0 ~ 5		0: General-purpose output 1: Axis 3 in-position output (OFF if the work part is missed during push-motion operation) 2: Output when axis-3 servo is ON (System-monitored task output) 3: System reservation
339	Output function selection 308 (Area 2)	0	0 ~ 5		0: General-purpose output 1: Axis 4 in-position output (OFF if the work part is missed during push-motion operation) 2: Output when axis-4 servo is ON (System-monitored task output) 3: System reservation
340	Output function selection 309 (Area 2)	0	0 ~ 5		0: General-purpose output
341	Output function selection 310 (Area 2)	0	0 ~ 5		0: General-purpose output
342	Output function selection 311 (Area 2)	0	0 ~ 5		0: General-purpose output
343	Output function selection 312 (Area 2)	0	0 ~ 5		0: General-purpose output
344	Output function selection 313 (Area 2)	0	0 ~ 5		0: General-purpose output
345	Output function selection 314 (Area 2)	0	0 ~ 5		0: General-purpose output
346	Output function selection 315 (Area 2)	0	0 ~ 5		0: General-purpose output
347	Error reset input port number	0	0 ~ 5		Error reset executed at on-edge (Invalid if “0” is set) (Main application Ver. 2.00 or later)
348	(For extention)	0			
349	(For extention)	0			
350	(For extention)	0			

I/O Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
351	Vision system I/F 1 function selection 1 (For PC/PG/PCF/PGF type)	3105500H	0H ~ FFFFFFFFH		* PCX/PGX is system reservation Bits 0 to 3: Function select (0: Not in use, 1: Use) Bits 4 to 7: Communication device selection (0: System reservation, 1: System reservation, 2: Ethernet Ch31, 3: Ethernet Ch32, 4: Ethernet Ch33, 5: Ethernet Ch34) (Related I/O Parameters No.124,129 to 143,145 to 148) Bits 8 to 11: Vision system I/F 1 response timeout value (sec) Bits 12 to 19: Vision system I/F 1 capturing command disable delay timer value (msec) Bits 20 to 23: Vision system I/F 1 capturing delay prediction timer value (msec) Bits 24 to 31: Number of vision system I/F 1 capturing command retries * No retry if 0
352	Vision system I/F 1 function selection 2 (For PC/PG/PCF/PGF type)	0H	0H ~ FFFFFFFFH		* PCX/PGX is system reservation Bits 0 to 7: Vision system I/F 1 communication format select (0: COGNEX, 1: System reservation, 2: Keyence) (Related I/O Parameter No.353) Bits 8 to 31: System reservation
353	Vision system I/F 1 function selection 3 (For PC/PG/PCF/PGF type)	54313C0DH	0H ~ FFFFFFFFH		* PCX/PGX is system reservation Bits 0 to 7: Vision system I/F 1 communication delimiter Bits 8 to 15: Vision system I/F 1 communication header 1 * No header when 0 Bits 16 to 31: Vision system I/F 1 communication header 2 * No header when 0
354	System reservation	0			
355	System reservation	0			
356	Vision system I/F 1 initializing complete status physical input port number (For PC/PG/PCF/PGF type)	0	0 ~ 299		* PCX/PGX is system reservation * Invalid if “0” is set
357	Vision system I/F 1 Image-capture command physical output number (For PC/PG/PCF/PGF type)	0	0 ~ 599		* PCX/PGX is system reservation
358	(For extention)	0			
359	(For extention)	0			
360	(For extention)	0			
361	(For extention)	0			
362	(For extention)	0			
363	(For extention)	0			
364	(For extention)	0			
365	(For extention)	0			
366	(For extention)	0			
367	(For extention)	0			
368	(For extention)	0			
369	(For extention)	0			
370	(For extention)	0			
371	(For extention)	0			
372	(For extention)	0			
373	(For extention)	0			
374	(For extention)	0			
375	(For extention)	0			
376	(For extention)	0			
378	(For extention)	0			
379	(For extention)	0			
380	(For extention)	0			
381	(For extention)	0			
382	(For extention)	0			
383	(For extention)	0			
384	(For extention)	0			
385	(For extention)	0			
386	(For extention)	0			
387	(For extention)	0			

I/O Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
388	(For extention)	0			
389	(For extention)	0			
390	(For extention)	0			
391	(For extention)	0			
392	(For extention)	0			
393	(For extention)	0			
394	(For extention)	0			
395	(For extention)	0			
396	(For extention)	0			
397	(For extention)	0			
398	(For extention)	0			
399	(For extention)	0			
400	(For extention)	0			
401 ~ 601	(For extention)	0			
602	System reservation	0	0 ~ 63		
603	System reservation	0	0 ~ 63		
604	System reservation	63	1 ~ 63		
605	System reservation	0H	0H		
606	System reservation	0H	0H		
607	System reservation	1	0 ~ 5		
608	System reservation	F000000H	0 ~ FFFFFFFFH		
609	System reservation	F05H	F05H		
610 ~ 690	(For extention)	0	0		
691	System reservation	-1	-1 ~ 299		
692	System reservation	-1	-1 ~ 599		
693	System reservation	0H	0 ~ FFFFFFFFH		
694	System reservation	0H	0 ~ FFFFFFFFH		
695	System reservation	0H	0 ~ FFFFFFFFH		
696	System reservation	0H	0 ~ FFFFFFFFH		
697	System reservation	0H	0 ~ FFFFFFFFH		
698	System reservation	0H	0 ~ FFFFFFFFH		
699	System reservation	0H	0 ~ FFFFFFFFH		
700	System reservation	0H	0 ~ FFFFFFFFH		
701	System reservation	0	0 ~ 240		
702 ~ 704	(For extention)	0	0		
705	Extension I/O unit use select	0H	0 ~ FFFFFFFFH		Bits 0 to 3: Select to use slot 1 Bits 4 to 7: Select to use slot 2 Bits 8 to 11: Select to use slot 3 Bits 12 to 15: Select to use slot 4 (0: Not to use, 1: Use DO, 2: Use DI, 3: Use DO+DI)
706	System reservation	1H	0 ~ FH		
707	System reservation	-1	-1 ~ 299		
708	System reservation	-1	-1 ~ 599		
709	System reservation	-1	-1 ~ 299		
710	System reservation	-1	-1 ~ 599		
711	System reservation	-1	-1 ~ 299		
712	System reservation	-1	-1 ~ 599		
713	System reservation	-1	-1 ~ 299		
714	System reservation	-1	-1 ~ 599		
715	System reservation	1	0 ~ 5		
716	System reservation	0H	0 ~ FFFFFFFFH		
717 ~ 999	(For extention)	0	0		

5.2 All Axes Common Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
			~		
1	Effective axis pattern	0000B	0B ~ 11111111B		
2	Default override	100	1 ~ 100		Used if not specified in program. (Invalid for SIO operation)
3	System reservation	0 (PC/PG/ PCF/PGF), 1111B (PCX/PGX)	~		
4	(For extension)	0	~		
5	(For extension)	0	~		
6	(For extension)	0	~		
7	(For extension)	0	~		
8	(For extension)	0	~		
9	Enable switch (Deadman's switch/Safety gate) effective physical axis pattern (For PC/PG/PCF/PGF type)	11111111B	00B ~ 11111111B		* PC/PG is system reservation Receives no influence from BASE Command For all axes (= basic), make sure to indicate 11111111. The enable switch gets involved in the drive source cutoff factor only when it is set to 11111111, and in cases other than 11111111, drive source cutoff would not be conducted, and only the indicated axis servo will be turned off. ("enb" not displayed on 7-segment display windows) * When "Other Parameter No. 11 Recovery Type at Enable Switch (Dead man's switch and safety gate) Open" = 1 (Reset Recovery Required), the setting will be identified as the indication of all axes.
10	System reservation	0	0H ~ FFFFFFFFH		
11	Default acceleration (PC/PG/PCF/PGF type) SCARA axis CP default acceleration (PCX/PGX type)	20 (PC/PG/ PCF/PGF), 10 (PCX/PGX)	1 ~ 200	0.01G	Used if not specified in position data, program or SIO message, etc.
12	Default deceleration (PC/PG/PCF/PGF type) SCARA axis CP default deceleration (PCX/PGX type)	20 (PC/PG/ PCF/PGF), 10 (PCX/PGX)	1 ~ 200	0.01G	Used if not specified in position data, program or SIO message, etc.
13	Default speed (PC/PG/PCF/PGF type) SCARA axis CP default speed (PCX/PGX type)	30	1 ~ 250	mm/s	Used in such case as SIO message or position data not indicated In PC/PG/PCF/PGF Types, it is used also in continuous recovery move as well as in such cases described above.
14	Operation position data deceleration rate 0 effective select	0	0 ~ 5		0: "Deceleration = Acceleration" when the deceleration in the operation point data is "0" 1: "Deceleration = 0" when the deceleration in the operation point data is "0"
15	Maximum JOG speed at home return incomplete (PC/PG/PCF/PGF type) Linear sliding axis Max. Jog speed at coordinates not determined / Home-Return incomplet (PCX/PGX type)	30	1 ~ 250	mm/s	* Valid only on linear sliding axes
16	System reservation	0	0B ~ 11111111B		
17	System reservation	0	-99999999 ~ 99999999		
18	(For extension)	0	~		
19	(For extension)	0	~		

All Axes Common Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
20	Maximum operation acceleration/deceleration ctheck timing (For PC/PG/PCF/PGF type)	1 (PC/PG/ PCF/PGF), 0 (PCX/PGX)	0 ~ 1		* PC/PG is system reservation 0: Check at input 1: Check at operation * For the check at operation, distribution speed (CP) of the indicated velocity or the specified velocity (PTP) and the maximum operation speed parameter of each axis are to be compared and checked, and get clamped to the available velocity. Therefore, the maximum performance of the system corresponding to the operation command can be obtained, but a complete check cannot be made at the input (because the start position of command or operation is not constant). Also, at CP, the distribution speed changes depending on the operation start point, therefore, in case CP is conducted from an unspecified position (such as the position movement at the first), the speed changes depending on the operation start position.
21	Maximum operation speed for input value check (PC/PG/PCF/PGF type) SCARA axis CP Max. speed (PCX/PGX type)	300 (PC/PG/ PCF/PGF), 270 (PCX/PGX)	1 ~ 9999	mm/s	* Differ depending on structure When the maximum velocity check timing = at input in PC/PG/PCF/PGF Types, check the input error with this parameter.
22	Maximum acceleration (PC/PG/PCF/PGF type) SCARA axis CP Max. acceleration (PCX/PGX type)	100 (PC/PG/ PCF/PGF), 30 (PCX/PGX)	1 ~ 999	0.01G	* Differ depending on structure
23	Maximum deceleration (PC/PG/PCF/PGF type) SCARA axis CP Max. deceleration (PCX/PGX type)	100 (PC/PG/ PCF/PGF), 30 (PCX/PGX)	1 ~ 999	0.01G	* Differ depending on structure
24	Minimum Emergency Deceleration (PC/PG/PCF/PGF type) SCARA axis CP Min. emergency deceleration (PCX/PGX type)	30	1 ~ 300	0.01G	
25	System reservation	0	1 ~ 300	0.01G	
26	System reservation (Change prohibited)	0	0 ~ 5		
27	System reservation (Change prohibited)	0	0 ~ 5		
28	(linear sliding axes) Inching → jog auto-switching prohibition	0	0 ~ 5		0: Execute auto-switching (Continuous button ON timer), 1: Prohibited * Referenced by the PC/TP * Only for linear sliding axes
29	All-axis setting bit pattern 1	0	0H ~ FFFFFFFFH		Bits 0 to 3: Selection of use of last PC/TP inching distance (0: Do not use, 1: Use) * Referenced by the PC/TP (Excluding ANSI-compliant TP) Bits 8 to 11: "Actual-position soft limit over (Servo)" error level (0: Operation-cancellation level, 1: Cold-start level, 2: Operation-cancellation level at reset, thereafter cold-start level)
30	Default division angle	150	0 ~ 1200	0.1 degree	
31	Default division distance	0	0 ~ 10000	mm	
32	Arch-trigger start-point check type	0	0 ~ 5		0: Operated amount and actual position checks * Checks on J1 and J2 in SCARA Axis PTP for PCX/PGX Types 1: Check operation amount only
33	Safety speed in manual mode (PC/PG/PCF/PGF type) SCARA axis CP safety speed in manual mode (PCX/PGX type)	250 (PC/PG/ PCF/PGF), 150 (PCX/PGX)	1 ~ 250	mm/s	* In PC/PG/PCF/PGF Types, this is treated as a value below the minimum in Each Axis Parameter No. 29 "VLMX Velocity" on all the activated axes.

All Axes Common Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
34	SCARA axis PTP safety speed in manual mode (For PCX/PGX type)	5	1 ~ 10	%	* PC/PG/PCF/PGF is system reservation
35	SCARA axis each axis related Max. Jog speed (For PCX/PGX type)	10	1 ~ 10	%	* PC/PG/PCF/PGF is system reservation
36	SCARA axis each axis related Max. Jog speed at coordinate not determined (For PCX/PGX type)	5	1 ~ 10	%	* PC/PG/PCF/PGF is system reservation
37	JxWx command SCARA axis Max. speed (For PCX/PGX type)	150	1 ~ 500	mm/s	* PC/PG/PCF/PGF is system reservation
38	System reservation	0	0 ~ 5		
39	System reservation	0	0 ~ 999999	0.001mm	
40	(For extension)	0	~		
41	(For extension)	0	~		
42	All axes setting bit pattern 2	0H (PC/PG/ PCF/PGF), 11H (PCX/PGX)	0H ~ FFFFFFFFH		Bits 0 to 3: System reservation Bits 4 to 7: System reservation Bits 8 to 31: (Reserved)
43	Stopper pressing type absolute reset setting	0	~		
44	SCARA axis PTP SM control ratio (For PCX/PGX type)	3	0 ~ 50	%	* PC/PG/PCF/PGF is system reservation
45	SCARA axis tool datum point invasion forbidden diameter (For PCX/PGX type)	158500	0 ~ 999999	0.001mm	* PC/PG/PCF/PGF is system reservation For simple checking (Diameter of a circle with 1st arm axis as the center) * Differ depending on structure
46	SCARA axis Cpxy check tolerance (For PCX/PGX type)	2000	100 ~ 9999	0.001mm	* PC/PG/PCF/PGF is system reservation
47	SCARA axis PTP acceleration initial value (For PCX/PGX type)	20	1 ~ 100	%	* PC/PG/PCF/PGF is system reservation Used when not indicated in position data, program and SIO message, in continuous recovery movement, etc.
48	SCARA axis PTP deceleration initial value (For PCX/PGX type)	20	1 ~ 100	%	* PC/PG/PCF/PGF is system reservation Used when not indicated in position data, program and SIO message, in continuous recovery movement, etc.
49	SCARA axis PTP speed initial value (For PCX/PGX type)	2	1 ~ 100	%	* PC/PG/PCF/PGF is system reservation Used when not indicated in position data, program and SIO message, in continuous recovery movement, etc.
50	SCARA axis CP operation restriction band width around arm 1 & arm 2 straight points (For PCX/PGX type)	500	0 ~ 9999	0.001mm	* Change prohibited unless any indication from the supplier * PC/PG/PCF/PGF is system reservation
51	SCARA axis control 1 (For PCX/PGX type)	11111H	0H ~ FFFFFFFFH		* PC/PG/PCF/PGF is system reservation Bits 0 to 3: System reservation Bits 4 to 7: System reservation Bits 8 to 11: SCARA Z position → horizontal movement optimized (PTP) (0: Disable, 1: Enable) Bits 12 to 15: SCARA Z position → horizontal movement optimized (CP) (0: Disable, 1: Enable) * Disable is recommended when velocity constancy, tracking accuracy and reach to setting speed are required in CP operation Bits 16 to 19: Select SCARA axis position gain switchover function (0: Disable, 1: Enable)
52	(For expansion)	0	~		
53	Position gain switchover timeout time (For PCX/PGX type)	2000	100 ~ 9999	msec	* PC/PG/PCF/PGF is system reservation

All Axes Common Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
54	All axes setting bit pattern 3	100H	0H ~ FFFFFFFFH		Bits 0 to 3: System reservation Bits 4 to 7: Select position output operation data valid (0: Disable, 1: Enable) * Caution: Position data initialization necessary when selecting valid / invalid (Error No. 6BD “Position Data Structure Change Error”) Make sure to have a backup of the position data before conducting change. (Main application Ver. 2.00 or later) Bits 8 to 11: Select each axis pressing speed maximum control feature (0: Disable, 1: Enable) (Main application Ver. 2.00 or later)
55	Coordinate system definition 1 Control (PC/PG/PCF/PGF type)	0H	0H ~ FFFFFFFFH		* PCX/PGX type is system reservation Bits 0 to 3: Unit Valid Indication (0: Invalid, 1: Valid) (Main application Ver. 2.00 or later) Bits 4 to 31: Reservation
56	Coordinate system definition 1 Constructing axis setting (PC/PG/PCF/PGF type)	0H	0H ~ FFFFFFFFH		* PCX/PGX type is system reservation Bits 0 to 3: X Indicated Axis Number (0 to 4) Bits 4 to 7: Y Indicated Axis Number (0 to 4) Bits 8 to 11: Z Indicated Axis Number (0 to 4) Bits 12 to 15: R Indicated Axis Number (0 to 4) Bits 16 to 31: Reservation (Bits 0 to 15……Main application Ver. 2.00 or later) (No applicable definition axis when Axis No. = 0)
57	Coordinate system definition 1 R-Axis coordinates direction setting (PC/PG/PCF/PGF type)	0	0 ~ 1		* PCX/PGX type is system reservation Relation between direction of rotation from X-axis to Y-axis and R-axis direction in base coordinate system 0: Same direction 1: Opposite direction (Main application Ver. 2.00 or later)
58	(For extension)	0	~		
59	(For extension)	0	~		
60	(For extension)	0	~		
61	(For extension)	0	~		
62	(For extension)	0	~		
63	(For extension)	0	~		
64	(For extension)	0	~		
65	(For extension)	0	~		
66	(For extension)	0	~		
67	(For extension)	0	~		
68	(For extension)	0	~		
69	(For extension)	0	~		
70	(For extension)	0	~		
71	(For extension)	0	~		
72	(For extension)	0	~		
73	(For extension)	0	~		
74	(For extension)	0	~		
75	(For extension)	0	~		
76	(For extension)	0	~		
77	(For extension)	0	~		
78	(For extension)	0	~		
79	(For extension)	0	~		
80	(For extension)	0	~		
81	(For extension)	0	~		
82	(For extension)	0	~		
83	(For extension)	0	~		
84	(For extension)	0	~		
85	(For extension)	0	~		
86	(For extension)	0	~		
87	(For extension)	0	~		
88	(For extension)	0	~		
89	(For extension)	0	~		
90	(For extension)	0	~		
91	(For extension)	0	~		
92	(For extension)	0	~		
93	(For extension)	0	~		
94	(For extension)	0	~		
95	(For extension)	0	~		
96	(For extension)	0	~		
97	(For extension)	0	~		

All Axes Common Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
98	(For extension)	0	~		
99	(For extension)	0	~		
100	(For extension)	0	~		
101	(For extension)	0	~		
102	(For extension)	0	~		
103	(For extension)	0	~		
104	(For extension)	0	~		
105	(For extension)	0	~		
106	(For extension)	0	~		
107	(For extension)	0	~		
108	(For extension)	0	~		
109	(For extension)	0	~		
110	(For extension)	0	~		
111	(For extension)	0	~		
112	(For extension)	0	~		
113	(For extension)	0	~		
114	(For extension)	0	~		
115	(For extension)	0	~		
116	(For extension)	0	~		
117	(For extension)	0	~		
118	(For extension)	0	~		
119	(For extension)	0	~		
120	(For extension)	0	~		
121	Vision system I/F 1 Coordinate axis definition (For PC/PG/PCF/PGF type)	4321H	0H ~ FFFFFFFFH		* PCX/PGX is system reservation Bits 0 to 3: Axis number in X direction Bits 4 to 7: Axis number in Y direction Bits 8 to 11: Axis number in Z direction Bits 12 to 15: Axis number in R direction Bits 16 to 31: Reserved
122	Vision system I/F 1 Coordinate datum point offset X (For PC/PG/PCF/PGF type)	0	-99999999 ~ 99999999	0.001mm	* PCX/PGX is system reservation Robot coordinate X on vision system I/F 1 coordinate (X = 0, Y = 0) * Setting is to be established at vision system I/F adjustment.
123	Vision system I/F 1 coordinate datum point offset Y (For PC/PG/PCF/PGF type)	0	-99999999 ~ 99999999	0.001mm	* PCX/PGX is system reservation Robot coordinate Y on vision system I/F 1 coordinate (X = 0, Y = 0) * Setting is to be established at vision system I/F adjustment.
124	Vision system I/F 1 coordinate offset angle (For PC/PG/PCF/PGF type)	0	-99999999 ~ 99999999	0.001deg	* PCX/PGX is system reservation Rotation angle of vision system I/F 1 coordinate when robot coordinate is taken as the datum * Setting is to be established at vision system I/F adjustment.
125	Vision system I/F 1 Z-axis direction vision system position judgment datum (For PC/PG/PCF/PGF type)	0	-99999999 ~ 99999999	0.001mm	* PCX/PGX is system reservation (Related Information: All Axes Parameter No. 130) * Setting is to be established at vision system I/F adjustment.
126	Vision system I/F 1 X-axis (GTVD acquirement data) adjustment offset (For PC/PG/PCF/PGF type)	0	-99999 ~ 99999	0.001mm	* PCX/PGX is system reservation
127	Vision system I/F 1 Y-Axis (GTVD acquirement data) adjustment offset (For PC/PG/PCF/PGF type)	0	-999999 ~ 99999	0.001mm	* PCX/PGX is system reservation
128	Vision system I/F 1 R-Axis (GTVD acquirement data) adjustment offset (For PC/PG/PCF/PGF type)	0	-360000 ~ 360000	0.001deg	* PCX/PGX is system reservation
129	Vision System I/F 1 Control 1 (For PC/PG/PCF/PGF type)	0H	0H ~ FFFFFFFFH		* PCX/PGX is system reservation Bits 0 to 3: System reservation (Change prohibited) Bits 4 to 11: System reservation (Change prohibited) Bits 12 to 19: System reservation (Change prohibited) Bits 20 to 23: R-axis adjustment sign reverse (0: Not to reverse code 1: Reverse code) Bits 24 to 31: Reserved

All Axes Common Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
130	Vision system I/F 1 control 2 (For PC/PG/PCF/PGF type)	0H	0H ~ FFFFFFFFH		* PCX/PGX is system reservation Bits 0 to 7: Position judgment datum distance in Z-axis direction [0.1mm] (In installation with robot on top, invalid when set to "0") * Effective only when Bit 8-11 = 1 in All Axes Common No. 130 Bits 8 to 11: Vision installation type (0: Solid installation (not installed on robot)) 1: Installation on robot) * Setting is to be established at vision system I/F adjustment. Bits 12 to 31: Reserved
131	System reservation (Change prohibited)	0	0 ~ 5		
132	SCARA tip load Max. transportable weight (For PCX/PGX type)	3000	1 ~ 99999999	g	* PC/PG/PCF/PGF is system reservation
133	SCARA tip load Max. allowable moment of inertia (For PCX/PGX type)	4000	1 ~ 99999999	$Kgmm^2$	* PC/PG/PCF/PGF is system reservation
134	(For extension)	0	~		
135	(For extension)	0	~		
136	SCARA function information 1 (For PCX/PGX type)	30H	0H ~ FFFFFFFFH		* PC/PG/PCF/PGF is system reservation For adjustment by the manufacturer
137	SCARA tip load rated transportable weight (For PCX/PGX type)	1000	0 ~ 99999999	g	* PC/PG/PCF/PGF is system reservation
138	(For extension)	0	~		
139	System reservation (Change prohibited)	13720	1 ~ 99999999		For adjustment by the manufacturer
140	System reservation (Change prohibited)	97500	1 ~ 99999999		For adjustment by the manufacturer
141	(For extension)	0	~		
142	(For extension)	0	~		
143	(For extension)	0	~		
144	(For extension)	0	~		
145	(For extension)	0	~		
146	(For extension)	0	~		
147	(For extension)	0	~		
148	(For extension)	0	~		
149	(For extension)	0	~		
150	(For extension)	0	~		
151 ~ 199	(For extension)	0	~		
200	Linear sliding axis default acceleration (For PCX/PGX type)	20	1 ~ 200	0.01G	* PC/PG/PCF/PGF is system reservation Used when not indicated in position data, program and SIO message, in continuous recovery movement, etc.
201	Linear sliding axis default deceleration (For PCX/PGX type)	20	1 ~ 200	0.01G	* PC/PG/PCF/PGF is system reservation Used when not indicated in position data, program and SIO message, in continuous recovery movement, etc.
202	Linear sliding axis default speed (For PCX/PGX type)	30	1 ~ 250	mm/s	* PC/PG/PCF/PGF is system reservation Used when not indicated in position data, program and SIO message, in continuous recovery movement, etc.
203	Linear sliding axis maximum acceleration (For PCX/PGX type)	100	1 ~ 999	0.01G	* PC/PG/PCF/PGF is system reservation
204	Linear sliding axis maximum deceleration (For PCX/PGX type)	100	1 ~ 999	0.01G	* PC/PG/PCF/PGF is system reservation
205	Linear sliding axis minimum emergency deceleration (For PCX/PGX type)	30	1 ~ 300	0.01G	* PC/PG/PCF/PGF is system reservation
206	Linear sliding axis safety speed in manual mode (For PCX/PGX type)	250	1 ~ 250	mm/s	* PC/PG/PCF/PGF is system reservation
207	(For extension)	0	~		
208	(For extension)	0	~		
209	(For extension)	0	~		
210 ~ 400	(For extension)	0	~		

5.3 Axis-Specific Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
1	Axis operation type	0 (PC/PG/ PCF/PGF), 1, 1, 0, 1 (PCX/PGX)	0 ~ 1		0: Linear movement axis 1: Rotational movement axis (Angle control)
2	(For extension)	0	~		
3	(For extension)	0	~		
4	(For extension)	0	~		
5	(For extension)	0	~		
6	Coordinate/physical-operation direction selection	1 (PC/PG/ /PCF/PGF), 1, 1, 0, 1 (PCX/PGX)	0 ~ 1		0: Motor CW → Negative direction on the coordinate system 1: Motor CCW → Positive direction on the coordinate system
7	Soft limit +	50000 (PC/PG/ PCF/PGF), 217000, 127000, 150000, 720000 (PCX/PGX)	-99999999 ~ 99999999	0.001mm 0.001deg	(PC/PG/PCF/PGF type) Fixed at 359.999deg inside when index mode Invalid when infinite stroke mode (PCX/PGX type) For SCARA axes, set in coordinates for each axis ([0.001deg] for 1st, 2nd and 4th axes, [0.001mm] for 3rd axis). Fixed at 359.999deg inside when liner axis in index mode Invalid when linear axis in infinite stroke mode * Differ depending on structure
8	Soft limit –	0 (PC/PG/ PCF/PGF), -37000, -127000, 0, -720000 (PCX/PGX)	-99999999 ~ 99999999	0.001mm 0.001deg	(PC/PG/PCF/PGF type) Fixed at 0deg inside when index mode Invalid when infinite stroke mode (PCX/PGX type) For SCARA axes, set in coordinates for each axis. ([0.001deg] for 1st, 2nd and 4th axes, [0.001mm] for 3rd axis) Fixed at 0deg inside when liner axis in index mode Invalid when linear axis in infinite stroke mode * Differ depending on structure
9	Soft-limit actual position margin	2000 (PC/PG/ PCF/PGF), 1000 (PCX/PGX)	0 ~ 9999	0.001mm 0.001deg	Positioning boundary critical zone actual position margin in infinite stroke mode
10	Home-return method	0 (PC/PG/ PCF/PGF), 0, 0, 0, 1 (PCX/PGX)	0 ~ 5		0: Search phase Z after end search (Offset operation after end search for actuator without Z-phase) 1: Current position 0 home (Pay attention to contact. Update not to be applied for battery-less ABS), 2: Current position = Preset home (Pay attention to contact. Update not to be applied for battery-less ABS) 3: System reservation 4: Home position sensor detection range center point calculation method
11	Home-return end-search direction selection	0 (PC/PG/ PCF/PGF), 0, 1, 0, 1 (PCX/PGX)	0 ~ 1		0: Negative end of the coordinate system 1: Positive end of the coordinate system
12	Home preset value	0 (PC/PG/ PCF/PGF), 0, 0, 0, 0 (PCX/PGX)	-99999999 ~ 99999999	0.001mm 0.001deg	
13	SIO/PIO home-return order	0 (PC/PG/ PCF/PGF), 0, 0, 0, 0 (PCX/PGX)	0 ~ 16		Executed from the smallest one.
14	Home-sensor input polarity	0 (PC/PG/ PCF/PGF), 0, 0, 0, 0 (PCX/PGX)	0 ~ 4		0: Do not use 1: Contact a (End detection sensor (End equivalent)) 2: Contact b (End detection sensor (End equivalent)) 3: Contact a (Home check sensor (Mechanical end vicinity check)) 4: Contact b (Home check sensor (Mechanical end vicinity check))
15	System reservation	0	0 ~ 2		
16	System reservation	0	0 ~ 2		

Axis-Specific Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
17	Initial home sensor escape velocity at power recovery	10 (PC/PG/ PCF/PGF), 10, 10, 10, 10 (PCX/PGX)	1 ~ 100	mm/sec	
18	System reservation	100	1 ~ 500	mm/sec	
19	End search speed at home return	20 (PC/PG/ PCF/PGF), 12, 12, 10, 20 (PCX/PGX)	1 ~ 100	mm/sec	
20	Phase-Z search speed at home return	3 (PC/PG/ PCF/PGF), 3, 3, 3, 3 (PCX/PGX)	1 ~ 540	mm/sec	Exercise caution, since limitations apply depending on the read/encoder pulse count.
21	Offset travel distance at home return	1000 (PC/PG/ PCF/PGF), 3000, 3000, 3000, 1000 (PCX/PGX)	-99999999 ~ 99999999	0.001mm	Offset travel distance from the ideal phase-Z position (Positive value = Applied in the direction of moving away from the end)
22	Allowable value for phase Z position error check during home return	0	0 ~ 99999999	0.001mm	Allowable actual minimum distance between the end (Mechanical or LS) and phase Z when a rotary encoder is used.
23	System reservation	1	1 ~ 8		
24	Push stop check time at home return	700 (PC/PG/ PCF/PGF) 1500 (PCX/PGX)	1 ~ 5000	msec	Used to confirm pusing action at the time of home return.
25	Push stop check time at positioning	500	1 ~ 5000	msec	Used to confirm pusing action according to the PUSH command.
26	System reservation	0	0 ~ 99999		
27	System reservation (Change prohibited)	5000	1 ~ 99999		
28	MAX operational velocity of each axis (PC/PG/PCF/PGF type) MAX PTP velocity (SCARA axes) MAX operational velocity of each axis (Linear sliding axes) (PCX/PGX type)	300 (PC/PG/ PCF/PGF) 161, 266, 189, 500 (PCX/PGX)	1 ~ 9999	mm/s deg/s	* (PG/PGX type) Maximum SCARA CP velocity is set in All Axes Parameter No. 21
29	VLMX speed (PC/PG/PCF/PGF type) Linear sliding axis VLMX speed (PCX/PGX type)	300 (PC/PG/ PCF/PGF) 800 (PCX/PGX)	1 ~ 9999	mm/s	During VLMX operation, the maximum operating speed of each axis or VLMX speed, whichever is lower, is used as the maximum speed of the applicable axis. * Linear sliding axes of only
30	Servo ON check time	20	0 ~ 5000	msec	Brake equipped: Time after receiving a servo-ON start response until start of brake unlocking Brake not equipped: Time after receiving a servo ON start response until transition to an operation-enabled status
31	Offset travel speed at home return	3 (PC/PG/ PCF/PGF) 12, 12, 10, 3 (PCX/PGX)	1 ~ 500	mm/sec	
32	Actual distance between phase Z and end	0	-1 ~99999	0.001mm	Absolute distance from the end (Mechanical or LS). Obtained automatically if the distance is a negative value. When multiple actuators are combined, it is recommended to write the flash ROM after automatic acquisition.
33	Ideal distance between phase Z and end	0	0 ~ 99999	0.001mm	Absolute distance from the end (Mechanical or LS).
34	Brake equipment specification	0	0 ~ 1		0: Not equipped 1: Equipped
35	Brake unlock check time	10	0 ~ 3000	msec	Time after receiving a brake-unlock start response until transition to an operation-enabled status
36	Brake lock check time	10	0 ~ 1000	msec	Time after receiving a brake-lock start response until start of servo OFF
37	System reservation	0	0 ~ 1		
38	Encoder ABS / INC type	0	0 ~ 2		0: INC 1: System reservation 2: ABS (Battery-less ABS specification)
39	System reservation	1	0 ~ 1		

Axis-Specific Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
40	System reservation	0	0 ~ 1		
41	System reservation	25	0 ~ 100	DRVVR	
42	System reservation (Change prohibited)	800	0 ~ 99999999		
43	System reservation (Change prohibited)	0	-7 ~ 7		
44	Length measurement correction	0	-99999999~ 99999999	0.001mm/ 1M	Valid only for linear movement axes. (Coordinates other than the encoder reference Z point will change proportionally.)
45	(For extension)	0			
46	(For extension)	0			
47	Screw lead	6000 (PC/PG/ PCF/PGF) 6545 (PCX/PGX)	-1 ~ 99999999	0.001mm	Valid only for linear movement axes.
48	(For extension)	0			
49	Duration of absolute battery remaining (For PC/PG/PCF/PGF type)	2 (PC/PG/ PCF/PGF) 2, 2, 2, 2 (PCX/PGX)	0 ~ 5		* PCX/PGX is system reservation 0: 20 days 1: 15 days 2: 10 days 3: 5 days
50	Gear ratio numerator (For PC/PG/PCF/PGF type)	1 (PC/PG/ PCF/PGF) 1, 1, 1, 1 (PCX/PGX)	1 ~ 99999999		* PCX/PGX is system reservation (Change prohibited)
51	Gear ratio denominator (For PC/PG/PCF/PGF type)	1 (PC/PG/ PCF/PGF) 21, 21, 1, 4 (PCX/PGX)	1 ~ 99999999		* PCX/PGX is system reservation (Change prohibited)
52	(For extension)	0			
53	Setting bit pattern 1 of each axis	0H	0H ~ FFFFFFFFH		Bits 0 to 3: System reservation Bits 4 to 7: Select complete stop position tuning feature (0: Disable, 1: Enable)
54	Travel distance for push stop detection at home return	20	1 ~ 99999	0.001mm	Used to confirm pusing action at the time of home return.
55	Travel distance for push stop detection at positioning	30	1 ~ 99999	0.001mm	Used to confirm pusing action according to the PUSH command.
56	Push-abort deviation ratio at home return	2000 (PC/PG/ PCF/PGF) 5000 (PCX/PGX)	1 ~ 99999		Deviation is compared against “Steady-state deviation of push speed + Push-speed pulse speed × Abort deviation ratio.
57	Push-abort deviation ratio at positioning	5000	1 ~ 99999		Deviation is compared against “Steady-state deviation of push speed + Push-speed pulse speed × Abort deviation ratio.
58	Positioning band	100 (PC/PG/ PCF/PGF) 150, 150, 150, 150 (PCX/PGX)	1 ~ 9999	0.001mm 0.001deg	* (PCX/PGX type) For SCARA axes, set in coordinates for each axis ([0.001deg] for 1st, 2nd and 4th axes, [0.001mm] for 3rd axis).
59	Allowable deviation error ratio (Maximum speed pulse ratio)	138 (PC/PG/ PCF/PGF) 85 (PCX/PGX)	1 ~ 9999		Deviation is compared against “Steady-state deviation of maximum operating speed of each axis + Pulse speed of maximum operating speed of each axis × Allowable deviation error ratio.”
60	Position gain (PC/PG/PCF/PGF type) PSG (PCX/PGX type)	45 (PC/PG/ PCF/PGF) 40 (PCX/PGX)	1 ~ 9999	/s	(PCX/PGX type) * Set to the same value on SCARA axis * Change prohibited on SCARA axis unless any supplier indication
61	System reservation	0	0 ~ 500	%	
62	System reservation (PCX/PGX type) Synchro FB gain (PC/PG/PCF/PGF type)	0 (PCX/PGX) 77 (PC/PG/ PCF/PGF)	0 ~ 1000		* PCX/PGX is system reservation (Main application Ver. 2.00 and “V1” or later of last digits of the manufacturing code)
63	Stop special output range	1	0 ~ 9999	pulse	Invalid if “0” is set.
64	Stop special output value	1	0 ~ 999	DRVVR	

Axis-Specific Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
65	System reservation (PCX/PGX type) Synchro axis number of mating axis (PC/PG/PCF/PGF type)	0	0 ~ 8		* PCX/PGX is system reservation Smaller axis number in a pair is the main axis. It is available to indicate only when satisfying both that it is the same characteristic axis in the resolution related and that axis not necessary to have magnetic pole confirmed operation. It is not available to issue any command to a slave axis. (Ineffective at 0) (Main application Ver. 2.00 and "V1" or later of last digits of the manufacturing code)
66	Rotation movement axis mode select (PC/PG/PCF/PGF type) Linear sliding axis rotation movement axis mode select (PCX/PGX type)	0	0 ~ 5		0: Normal 1: Index mode * Valid only on linear sliding axes
67	Short-cut control selection for rotational movement axis (PC/PG/PCF/PGF type) Short-cut control selection for rotational movement axis (PCX/PGX type)	0	0 ~ 5		0: Do not select 1: Select (effective when the specification is in index mode, INC encode and simple absolute type) * Valid only on linear sliding axes
68	Linear sliding axis mode select (PC/PG/PCF/PGF type) Linear sliding axis linear sliding axis mode select (PCX/PGX type)	0	0 ~ 5		0: Normal 1: Infinite-stroke mode (Note: Positioning boundary applies. This setting can be specified only when an incremental encoder is used.) * Valid only on linear sliding axes
69	(For extension)	0	~		
70	System reservation	32767	0 ~ 32767	DRVVR	(Change prohibited)
71	System reservation	32767	0 ~ 32767	DRVVR	(Change prohibited)
72	System reservation	1	-999 ~ 999	DRVVR	(Change prohibited) To maintain symmetry of the positive and negative sides.
73	System reservation	0	-999 ~ 999	DRVVR	(Change prohibited) To maintain symmetry of the positive and negative sides.
74	System reservation	32436	0 ~ 32767	DRVVR	(Change prohibited)
75	System reservation	-32435	0 ~ -32767	DRVVR	(Change prohibited)
76	System reservation	1	0 ~ 1		(Change prohibited)
77	System reservation (PCX/PGX type) Synchro S pulse (PC/PG/PCF/PGF type)	0 (PCX/PGX) 3 (PC/PG/ PCF/PGF)	0 ~ 99999	pulse	* PCX/PGX is system reservation (Main application Ver. 2.00 and "V1" or later of last digits of the manufacturing code)
78	Maximum takeoff command amount	0	-3000 ~ 3000	0.001mm	Maximum lift command amount before brake unlock (Input with sign) (Suppression of momentary drop upon servo ON when a heavy object is placed) * Important: Input using the same sign as the rising coordinate direction. (0.100 mm to 0.500 mm in absolute value as a guideline) * The servo-ON check time (Axis-Specific Parameter No. 30) must also be extended (Approx. 1000 to 1500 msec) to provide a sufficient time for rise-direction torque to follow. (Valid only when installation of brake is specified.)
79	Actual takeoff check distance	5	0 ~ 3000	0.001mm	Absolute value input
80	Maximum compulsory feed range (PC/PG/PCF/PGF type) Linear sliding axis Max. compulsory feed range (PCX/PGX type)	0	0 ~ 9999	0.001mm	For reduction of settling time. (Invalid range if "0" is set) (Approx. 1.000 mm as a guideline) * Valid only on linear sliding axes
81	Min. compulsory feed range (PC/PG/PCF/PGF type) Linear sliding axis Min. compulsory feed range (PCX/PGX type)	200	0 ~ 9999	0.001mm	* Valid only on linear sliding axes
82	Mid. compulsory feed range (PC/PG/PCF/PGF type) Linear sliding axis Mid. compulsory feed range (PCX/PGX type)	600	0 ~ 9999	0.001mm	* Valid only on linear sliding axes

Axis-Specific Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
83	System reservation (PCX/PGX type) ABS synchro slave axes same coordinates reset cancel (PC/PG/PCF/PGF type)	0	0 ~ 5		* PCX/PGX is system reservation It is available only for synchronized axes. 0: It gets initialized to the same coordinates as the synchronized master axis with the relation of the physical positions at the power-on reset / soft reset. 1: It does not get initialized to the same coordinates as the synchronized master axis (synchronized slave axes ABS coordinate valid) with the relation of the physical positions at the power-on reset / soft reset only when both the synchronized master axis and the synchronized slave axes are valid as an ABS encoder. * It is necessary to set to 0 once at the ABS reset. (Main application Ver. 2.00 and “V1” or later of last digits of the manufacturing code)
84	System reservation (PCX/PGX type) Synchro slave axes synchronizing adjustment speed at maximum (PC/PG/PCF/PGF type)	0 (PCX/PGX) 5 (PC/PG/ PCF/PGF)	0 ~ 100	mm/sec (PC/PG/ PCF/PGF)	* PCX/PGX is system reservation Slave axes synchronizing position adjustment movement speed at maximum It is available only for synchronized axes. * Caution: It will not be limited at the safety speed. (Main application Ver. 2.00 and “V1” or later of last digits of the manufacturing code)
85	Home-return acceleration/deceleration	15 (PC/PG/ PCF/PGF) 5, 5, 5, 15 (PCX/PGX)	1 ~ 300	0.01G deg/sec^2	* (PCX/PGX type) SCARA J1, J2 and R-axes are in unit of [deg/sec^2].
86	Zone 1 MAX. (PC/PG/PCF/PGF type) Linear sliding axis zone 1 MAX. (PCX/PGX type)	0	-99999999 ~ 99999999	0.001mm 0.001 deg	Valid only when maximum > minimum * Must be inside the range for at least 3 msec. * Valid only on linear sliding axes
87	Zone 1 MIN. (PC/PG/PCF/PGF type) Linear sliding axis zone 1 MIN. (PCX/PGX type)	0	-99999999 ~ 99999999	0.001mm 0.001 deg	Valid only when maximum > minimum * Must be inside the range for at least 3 msec. * Valid only on linear sliding axes
88	Zone 1 output No. (PC/PG/PCF/PGF type) Linear sliding axis zone 1 output No. (PCX/PGX type)	0	0 ~ 899		Physical output port or global flag (Output is invalid if “0” is set; multiple specification is invalid) * Valid only on linear sliding axes
89	Zone 2 MAX. (PC/PG/PCF/PGF type) Linear sliding axis zone 2 MAX. (PCX/PGX type)	0	-99999999 ~ 99999999	0.001mm 0.001 deg	Valid only when maximum > minimum * Must be inside the range for at least 3 msec. * Valid only on linear sliding axes
90	Zone 2 MIN. (PC/PG/PCF/PGF type) Linear sliding axis zone 2 MIN. (PCX/PGX type)	0	-99999999 ~ 99999999	0.001mm 0.001 deg	Valid only when maximum > minimum * Must be inside the range for at least 3 msec. * Valid only on linear sliding axes
91	Zone 2 output No. (PC/PG/PCF/PGF type) Linear sliding axis zone 2 output No. (PCX/PGX type)	0	0 ~ 899		Physical output port or global flag (Output is invalid if “0” is set; multiple specification is invalid) * Valid only on linear sliding axes
92	Zone 3 MAX. (PC/PG/PCF/PGF type) Linear sliding axis zone 3 MAX. (PCX/PGX type)	0	-99999999 ~ 99999999	0.001mm 0.001 deg	Valid only when maximum > minimum. * Must be inside the range for at least 3 msec. * Valid only on linear sliding axes
93	Zone 3 MIN. (PC/PG/PCF/PGF type) Linear sliding axis zone 3 MIN. (PCX/PGX type)	0	-99999999 ~ 99999999	0.001mm 0.001 deg	Valid only when maximum > minimum * Must be inside the range for at least 3 msec. * Valid only on linear sliding axes
94	Zone 3 output No. (PC/PG/PCF/PGF type) Linear sliding axis zone 3 output No. (PCX/PGX type)	0	0 ~ 899		Physical output port or global flag (Output is invalid if “0” is set ; multiple specification is invalid) * Valid only on linear sliding axes

Axis-Specific Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
95	Zone 4 MAX. (PC/PG/PCF/PGF type) Linear sliding axis zone 4 MAX. (PCX/PGX type)	0	-99999999 ~ 99999999	0.001mm 0.001 deg	Valid only when maximum. > minimum * Must be inside the range for at least 3 msec. * Valid only on linear sliding axes
96	Zone 4 MIN (PC/PG/PCF/PGF type) Linear sliding axis zone 4 MIN. (PCX/PGX type)	0	-99999999 ~ 99999999	0.001mm 0.001 deg	Valid only when maximum > minimum * Must be inside the range for at least 3 msec. * Valid only on linear sliding axes
97	Zone 4 output No. (PC/PG/PCF/PGF type) Linear sliding axis zone 4 output No. (PCX/PGX type)	0	0 ~ 899		Physical output port or global flag (Output is invalid if “0” is set; multiple specification is invalid) * Valid only on linear sliding axes
98	Complete stop mode transition stop band	1 (PCX/PGX) 4 (PC/PG/ PCF/PGF)	0 ~ 5	pulse	(For pulse motor)
99	Deviation buffer number designation for complete stop mode transition judgment	2 (PC/PG/ PCF/PGF) 4 (PCX/PGX)	0 ~ 4		(For pulse motor)
100	(For extension)	0	~		
101	(For extension)	0	~		
102	(For extension)	0	~		
103	(For extension)	0	~		
104	(For extension)	0	~		
105	(For extension)	0	~		
106	(For extension)	0	~		
107	(For extension)	0	~		
108	(For extension)	0	~		
109	(For extension)	0	~		
110	(For extension)	0	~		
111	(For extension)	0	~		
112	(For extension)	0	~		
113	(For extension)	0	~		
114	(For extension)	0	~		
115	(For extension)	0	~		
116	(For extension)	0	~		
117	(For extension)	0	~		
118	(For extension)	0	~		
119	FSG	0	0 ~ 100		
120	FFF	10	0 ~ 100		* Change is prohibited unless instructed by the manufacturer.
121 ~ 130	(For extension)	0	~		
131	Setting bit pattern 2 of each axis	0H	0H ~ FFFFFFFFH		
132	(For extension)	0	~		
133	(For extension)	0	~		
134	Max. PTP acceleration (SCARA axis) (For PCX/PGX type)	100 (PC/PG/ PCF/PGF) 400, 1000, 20, 2000 (PCX/PGX)	1 ~ 99999999	0.01G deg/sec^2	* PC/PG/PCF/PGF is system reservation Unit in 0.01G only on the 3rd axis (Zb), unit in deg/sec^2 on other axes
135	Max. PTP deceleration (SCARA axis) (For PCX/PGX type)	100 (PC/PG/ PCF/PGF) 400, 1000, 20, 2000 (PCX/PGX)	1 ~ 99999999	0.01G deg/sec^2	* PC/PG/PCF/PGF is system reservation Unit in 0.01G only on the 3rd axis (Zb), unit in deg/sec^2 on other axes
136	Min. PTP emergency deceleration (SCARA axis) (For PCX/PGX type)	0 (PC/PG/ PCF/PGF) 400, 1000, 20, 2000 (PCX/PGX)	1 ~ 99999999	0.01G deg/sec^2	* PC/PG/PCF/PGF is system reservation Unit in 0.01G only on the 3rd axis (Zb), unit in deg/sec^2 on other axes

Axis-Specific Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
137	System reservation (Change prohibited)	0			
138	Arm length (For PCX/PGX type)	0 (PC/PG/ PCF/PGF) 160000, 190000, 0, 0 (PCX/PGX)	1 ~ 99999999	0.001mm	* PC/PG/PCF/PGF is system reservation * Used only for arm 1 axis (J1) and arm 2 axis (J2) * Differ depending on structure
139	Intrusion forbidden area behind SCARA axis MAX (Xb) (For PCX/PGX type)	0 (PC/PG/ PCF/PGF) 60000, 0, 0, 0 (PCX/PGX)	-99999999 ~ 99999999	0.001mm	* PC/PG/PCF/PGF is system reservation For simple checking * Used only for arm 1 axis (Xb) * Differ depending on structure
140	Intrusion forbidden area behind SCARA axis MIN (Xb) (For PCX/PGX type)	0 (PC/PG/ PCF/PGF) -60000, 0, 0, 0 (PCX/PGX)	-99999999 ~ 99999999	0.001mm	* PC/PG/PCF/PGF is system reservation For simple checking * Used only for arm 1 axis (Xb) * Differ depending on structure
141	Home preset automatic update datum coordinate (For PCX/PGX type)	0 (PC/PG/ PCF/PGF) 90000, 0, 0, 0 (PCX/PGX)	-99999999 ~ 99999999	0.001mm 0.001deg	* PC/PG/PCF/PGF is system reservation * Differ depending on structure
142	System reservation (For Change prohibited)	2	0 ~ 2		
143	SCARA axis CP operation limit band actual position intrusion boundary angle (J2) (For PCX/PGX type)	0	0 ~ 9999	0.001deg	* PC/PG/PCF/PGF is system reservation Input an absolute value (Used only for 2nd axis (J2)) * Change prohibited unless any indication from the supplier
144	System reservation (Change prohibited)	0	-99999999 ~ 99999999	0.001mm	
145	SIO current arm system changed velocity initial value (J2) (For PCX/PGX type)	0 (PC/PG/ PCF/PGF) 0, 3, 0, 0 (PCX/PGX)	0 ~ 10	%	* PC/PG/PCF/PGF is system reservation * Used only for 2nd axis (J2)
146	System reservation (Change prohibited)	0 (PC/PG/ PCF/PGF) 5000 (PCX/PGX)	1 ~ 99999		
147	(For extension)	0			
148	(For extension)	0			
149	(For extension)	0			
150	Number of repeated times for home sensor detection	0	0 ~ 4	time	* 0 setting is same as 1
151 ~ 165	(For extension)	0			
166	(For extension)	0			
167	(For extension)	0			
168	(For extension)	0			
169	(For extension)	0			
170	(For extension)	0			
171	System reservation (Change prohibited)	0	0 ~ 99999999		For adjustment by the manufacturer
172	System reservation (Change prohibited)	0	-99999999 ~ 99999999		For adjustment by the manufacturer
173	System reservation (Change prohibited)	0	-99999999 ~ 99999999		For adjustment by the manufacturer
174	System reservation (Change prohibited)	0	0 ~ 99999999		For adjustment by the manufacturer
175	System reservation (Change prohibited)	0	0 ~ 99999999		For adjustment by the manufacturer
176	System reservation (Change prohibited)	0	0 ~ 99999999		For adjustment by the manufacturer
177	System reservation (Change prohibited)	0	0 ~ 99999999		For adjustment by the manufacturer
178	System reservation (Change prohibited)	0	0 ~ 99999999		For adjustment by the manufacturer
179	System reservation (Change prohibited)	0	0 ~ 99999999		For adjustment by the manufacturer

Axis-Specific Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
180	System reservation (Change prohibited)	0	0 ~ 100		For adjustment by the manufacturer
181	System reservation (Change prohibited)	0	0 ~ 400		For adjustment by the manufacturer
182	(For extension)	0			
183	System reservation (Change prohibited)	0	0 ~ 99999999		For adjustment by the manufacturer
184	System reservation (Change prohibited)	0	0 ~ 99999999		For adjustment by the manufacturer
185	System reservation (Change prohibited)	0	0 ~ 99999999		For adjustment by the manufacturer
186	System reservation (Change prohibited)	0	0 ~ 99999999		For adjustment by the manufacturer
187	System reservation (Change prohibited)	0	0 ~ 100		For adjustment by the manufacturer
188 ~ 190	(For extension)	0			
191	System reservation (Change prohibited)	0	1 ~ 99999999		For adjustment by the manufacturer
192 ~ 197	(For extension)	0			
198	Max. PTP velocity 2 (SCARA axis) (For PCX/PGX type)	0 (PC/PG/ PCF/PGF) 230, 380, 270, 1000 (PCX/PGX)	0 ~ 9999	mm/s deg/s	* PC/PG/PCF/PGF is system reservation
199	Max. PTP acceleration 2 (SCARA axis) (For PCX/PGX type)	0 (PC/PG/ PCF/PGF) 800, 2500, 40, 4000 (PCX/PGX)	0 ~ 99999999	0.01G deg/sec^2	* PC/PG/PCF/PGF is system reservation
200	Max. PTP ceceleration 2 (SCARA axis) (For PCX/PGX type)	0 (PC/PG/ PCF/PGF) 800, 2500, 40, 4000 (PCX/PGX)	0 ~ 99999999	0.01G deg/sec^2	* PC/PG/PCF/PGF is system reservation
201 ~ 212	(For extension)	0			
213	System reservation (Change prohibited)	-99999999	-99999999 ~ 99999999		
214	System reservation (Change prohibited)	99999999	0 ~ 99999999		
215	PSG2 (For PCX/PGX type)	0 (PC/PG/ PCF/PGF) 50 (PCX/PGX)	0 ~ 9999	/s	* PC/PG/PCF/PGF is system reservation * Change prohibited on SCARA axis unless any supplier indication * Same value as PSG (Each Axis No. 60) when set to 0
216	(For extension)	0			
217	FSG2 (For PCX/PGX type)	0	0 ~ 100		* PC/PG/PCF/PGF is system reservation
218	Offset added value in ABS encoder account range	10000	0 ~ 99999999		* Effective only on linear axes
219	System reservation	70	1 ~ 300		
220	System reservation	30	0 ~ 200		
221	Threshold for total number of movements	0	0 ~ 99999999	time	Alert function is invalid when maintenance information alert function setting is 0. 231: "Total number of movements" will be generated if "Total movement counts" in the maintenance information exceeds the setting of this parameter.
222	Threshold for total travelled distance	0	0 ~ 99999999	m 1000deg	Alert function is invalid when maintenance information alert function setting is 0. 232: "Total travelled distance" will be generated if "Total operated distance" in the maintenance information exceeds the setting of this parameter.
223 ~ 250	(For extension)	0	~		

5.4 Driver Card Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
1	Type (upper) (Manufacturing information)	Space	4 digits ’ ’ ~ ’ z’		
2	Type (middle) (Manufacturing information)	Space	4 digits ’ ’ ~ ’ z’		
3	Type (lower) (Manufacturing information)	Space	4 digits ’ ’ ~ ’ z’		
4	Manufacturing data 4 (Manufacturing information)	Space	4 digits ’ ’ ~ ’ z’		
5	Manufacturing data 5 (Manufacturing information)	Space	4 digits ’ ’ ~ ’ z’		
6	Manufacturing data 6 (Manufacturing information)	Space	4 digits ’ ’ ~ ’ z’		
7	Manufacturing data 7 (Manufacturing information)	Space	4 digits ’ ’ ~ ’ z’		
8	Board type (Function information)	30	0 ~ 255		
9	Function information 01 (Hard): Encoder support information (upper word)	0000H	0000H ~ FFFFH	Encoder ID bit pattern	
10	Function information 02 (Hard): Encoder support information (lower word)	003H	0000H ~ FFFFH	Encoder ID bit pattern	
11	Function information 03 (Hard): PCB type	0000H	0000H ~ FFFFH		
12	Function information 04 (Hard): System reservation	0000H	0000H ~ FFFFH		
13	Function information 05 (Hard): System reservation	0000H	0000H ~ FFFFH		
14	Function information 06 (Hard): System reservation	0000H	0000H ~ FFFFH		
15	Function information 07 (Soft): Motor support information (upper word)	0000H	0000H ~ FFFFH	Motor ID bit pattern	
16	Function information 08 (Soft): Motor support information (lower word)	003FH	0000H ~ FFFFH	Motor ID bit pattern	
17	Function information 09 (Soft): Encoder support information (upper word)	0000H	0000H ~ FFFFH	Encoder ID bit pattern	
18	Function information 10 (Soft): Encoder support information (lower word)	0003H	0000H ~ FFFFH	Encoder ID bit pattern	
19	Function information 11 (Soft): Software support information word 0	0000H	0000H ~ FFFFH		
20	Function information 12 (Soft): Software version information	0001H	0000H ~ FFFFH		
21	Function information 13 (Soft): System reservation	0000H	0000H ~ FFFFH		
22	Function information 14 (Soft): System log control word	0000H	0000H ~ FFFFH		
23	Configuration information 01: System reservation	0011H	0000H ~ FFFFH	W	
24	Configuration information 02: Configured voltage (Motor voltage)	0018H	0000H ~ FFFFH	V	
25	Configuration information 03: Motor/encoder configuration information	1500H	0000H ~ FFFFH	Motor/ encoder ID bit number	
26	Configuration information 04: Designed output (at high-output setting)	001BH	0000H ~ FFFFH	W	
27	Configuration information 05: Encoder resolution (upper word)	0000H	0000H ~ FFFFH		
28	Configuration information 06: Encoder resolution (lower word)	0320H	0000H ~ FFFFH		
29	Configuration information 07: Motor/encoder characteristics word	0004H	0000H ~ FFFFH		Bits 0 to 2: System reservation (Change prohibited) Bit 3: Brake equipment bit (1: Equipped, 0: Not equipped)

Driver Card Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
30	Configuration information 08: System reservation	0000H	0000H ~ FFFFH		
31	Configuration information 09: Control characteristics word	1400H	0000H ~ FFFFH		
32	Configuration information 10: Push torque limit at home return	40	0 ~ 100	%	
33	Configuration information 11: Push torque limit at positioning	70	0 ~ 70	%	
34	Configuration information 12: Control characteristic word 2	B00H	0000H ~ FFFFH		Bits 0 to 7: System reservation Bit 8: Initial moving direction in excitation-phase signal detection operation (0: CW, 1: CCW) Bit 9: Stop mode selection (0: Full servo mode, 1: Complete stop mode) * In the case of coating or other application where operation focus is given to the locus, select “0” (Full servo mode). (In this case, the complete stop function is disabled.) In all other applications, “1” (complete stop mode) is normally selected. Bit 10: System reservation Bit 11: System reservation Bit 12: System reservation
35	Configuration information 13: System reservation	0H	0000H ~ FFFFH		
36	Configuration information 14: Rated load level adjustment	0	-32768 ~ 32767	0.1 K (Kelvin = temperature)	
37	Configuration information 15: Current limitation at positioning stop	70	0 ~ 100	%	
38	System reservation	0H	0000H ~ FFFFH		
39	System reservation	0H	0000H ~ FFFFH		
40	System reservation	0H	0000H ~ FFFFH		
41	High-output pattern table select	0	0 ~ 1		
42	Torque filter constant	0	0 ~ 2500		
43	System reservation Complete stop characteristics of the word (High resolution)	0H 8001H (High resolution)	0000H ~ FFFFH		(Note) Following is for high resolution encoder Bit 15: Fine Current Response Realizing Feature (0: Disable, 1: Enable) Bit 14 to 8: Damped Frequency Unit: 100 [ms] Bit 7 to 0: Electrical Angle Feed Unit: 1/4096 [eAgl]
44	Speed loop proportional gain (upper word)	0H	0000H ~ 0000H		
45	Speed loop proportional gain (lower word)	12CH	0000H ~ 7350H		
46	Speed loop integral gain (upper word)	0H	0000H ~ 0004H		
47	Speed loop integral gain (lower word)	11F9H	0000H ~ FFFFH		
48	System reservation	0H	0000H ~ FFFFH		
49	Sine wave drive design output multiplying factor	0	0 ~ 1000	%	
50	Drive transition judgment time	0	0 ~ 2000	0.05ms	
51	Discretization error compensation ratio	2000	0 ~ 65535	0.1%	
52	High-Output discretization error compensation ratio	2000	0 ~ 65535	0.1%	
53	System reservation	0H	0000H ~ FFFFH		
54	System reservation	0H	0000H ~ FFFFH		
55	System reservation	0H	0000H ~ FFFFH		
56	System reservation	0H	0000H ~ FFFFH		
57	System reservation	0H	0000H ~ FFFFH		
58	System reservation	0H	0000H ~ FFFFH		
59	System reservation	0H	0000H ~ FFFFH		
60	System reservation	0H	0000H ~ FFFFH		
61	System reservation	0H	0000H ~ FFFFH		
62	System reservation	0H	0000H ~ FFFFH		
63	System reservation	0H	0000H ~ FFFFH		
64	System reservation	0H	0000H ~ FFFFH		

Driver Card Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
65	System reservation	0H	0000H ~ FFFFH		
66	System reservation	0H	0000H ~ FFFFH		
67	System reservation	0H	0000H ~ FFFFH		
68	System reservation	0H	0000H ~ FFFFH		
69	System reservation	0H	0000H ~ FFFFH		
70	System reservation	0H	0000H ~ FFFFH		
71	System reservation	0H	0000H ~ FFFFH		
72	System reservation	0H	0000H ~ FFFFH		
73	System reservation	0H	0000H ~ FFFFH		
74	System reservation	0H	0000H ~ FFFFH		
75	System reservation	0H	0000H ~ FFFFH		
76	System reservation	0H	0000H ~ FFFFH		
77	System reservation	0H	0000H ~ FFFFH		
78	System reservation	0H	0000H ~ FFFFH		
79	System reservation	0H	0000H ~ FFFFH		
80	System reservation	0H	0000H ~ FFFFH		
81	System reservation	0H	0000H ~ FFFFH		
82	System reservation	0H	0000H ~ FFFFH		
83	System reservation	0H	0000H ~ FFFFH		
84	System reservation	0H	0000H ~ FFFFH		
85	System reservation	0H	0000H ~ FFFFH		
86	System reservation	0H	0000H ~ FFFFH		
87	System reservation	0H	0000H ~ FFFFH		
88	System reservation	0H	0000H ~ FFFFH		
89	System reservation	0H	0000H ~ FFFFH		
90	System reservation	0H	0000H ~ FFFFH		
91	System reservation	0H	0000H ~ FFFFH		
92	System reservation	0H	0000H ~ FFFFH		
93	System reservation	0H	0000H ~ FFFFH		
94	System reservation	0H	0000H ~ FFFFH		
95	System reservation	0H	0000H ~ FFFFH		
96	System reservation	0H	0000H ~ FFFFH		
97	System reservation	0H	0000H ~ FFFFH		
98	System reservation (Query information)	0H	0000H ~ FFFFH		
99	System reservation (Query information)	0H	0000H ~ FFFFH		
100	System reservation (Query information)	0H	0000H ~ FFFFH		
101	System reservation (Query information)	0H	0000H ~ FFFFH		
102	System reservation (Query information)	0H	0000H ~ FFFFH		
103	System reservation (Query information)	0H	0000H ~ FFFFH		
104	System reservation (Query information)	0H	0000H ~ FFFFH		
105	System reservation (Query information)	0H	0000H ~ FFFFH		
106	System reservation (Query information)	0H	0000H ~ FFFFH		
107	System reservation (Query information)	0H	0000H ~ FFFFH		
108	System reservation (Query information)	0H	0000H ~ FFFFH		
109	System reservation (Query information)	0H	0000H ~ FFFFH		
110	System reservation (Query information)	0H	0000H ~ FFFFH		
111	System reservation (Query information)	0H	0000H ~ FFFFH		
112	System reservation (Query information)	0H	0000H ~ FFFFH		

5.5 Encoder Parameters

No	Parameter name	Default value (Reference)	Input range	Unit	Remarks
1	Manufacturing information 01 (System reservation)	Space	4 digits ’ ’ ~ ’ z’		
2	Manufacturing information 02 (System reservation)	Space	4 digits ’ ’ ~ ’ z’		
3	Manufacturing information 03 (System reservation)	Space	4 digits ’ ’ ~ ’ z’		
4	Manufacturing information 04 (System reservation)	Space	4 digits ’ ’ ~ ’ z’		
5	Manufacturing information 05 (System reservation)	Space	4 digits ’ ’ ~ ’ z’		
6	Manufacturing information 06 (System reservation)	Space	4 digits ’ ’ ~ ’ z’		
7	Manufacturing information 07 (System reservation)	Space	4 digits ’ ’ ~ ’ z’		
8	Manufacturing information 08 (System reservation)	0	0 ~ 255		
9	Function information 01 (System reservation)	0000H	0000H ~ FFFFH		
10	Function information 02 (System reservation)	0000H	0000H ~ FFFFH		
11	Function information 03 (System reservation)	0000H	0000H ~ FFFFH		
12	Function information 04 (System reservation)	0000H	0000H ~ FFFFH		
13	Function information 05 (System reservation)	0000H	0000H ~ FFFFH		
14	Function information 06 (System reservation)	0000H	0000H ~ FFFFH		
15	Function information 07 (System reservation)	0000H	0000H ~ FFFFH		
16	Function information 08 (System reservation)	0000H	0000H ~ FFFFH		
17	Function information 09 (System reservation)	0000H	0000H ~ FFFFH		
18	Function information 10 (System reservation)	0000H	0000H ~ FFFFH		
19	Function information 11 (System reservation)	0000H	0000H ~ FFFFH		
20	Function information 12 (System reservation)	0000H	0000H ~ FFFFH		
21	Function information 13 (System reservation)	0000H	0000H ~ FFFFH		
22	Function information 14 (System reservation)	0000H	0000H ~ FFFFH		
23	Card parameter (By board type)	0000H	0000H ~ FFFFH		
24	Card parameter (By board type)	0000H	0000H ~ FFFFH		
25	Card parameter (By board type)	0000H	0000H ~ FFFFH		
26	Card parameter (By board type)	0000H	0000H ~ FFFFH		
27	Card parameter (By board type)	0000H	0000H ~ FFFFH		
28	Card parameter (By board type)	0000H	0000H ~ FFFFH		
29	Card parameter (By board type)	0000H	0000H ~ FFFFH		
30	Card parameter (By board type)	0000H	0000H ~ FFFFH		

5.6 I/O-Slot Card Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
1	Type (upper) (Manufacturing information)	Space	Four-digit ASCII code		
2	Type (middle) (Manufacturing information)	Space	Four-digit ASCII code		
3	Type (lower) (Manufacturing information)	Space	Four-digit ASCII code		
4	Manufacturing data 4 (Manufacturing information)	Space	4 digits ' ' ~ ' z'		
5	Manufacturing data 5 (Manufacturing information)	Space	4 digits ' ' ~ ' z'		
6	Manufacturing data 6 (Manufacturing information)	Space	4 digits ' ' ~ ' z'		
7	Manufacturing data 7 (Manufacturing information)	Space	4 digits ' ' ~ ' z'		
8	Board type (Function information)	0	0 ~ 255		
9	Function information 01 (By board type)	0000H	0000H ~ FFFFH		
10	Function information 02 (By board type)	0003H	0000H ~ FFFFH		
11	Function information 03 (By board type)	0000H	0000H ~ FFFFH		
12	Function information 04 (By board type)	0000H	0000H ~ FFFFH		
13	Function information 05 (By board type)	0000H	0000H ~ FFFFH		
14	Function information 06 (By board type)	0000H	0000H ~ FFFFH		
15	Function information 07 (By board type)	0000H	0000H ~ FFFFH		
16	Function information 08 (By board type)	0000H	0000H ~ FFFFH		
17	Function information 09 (By board type)	0000H	0000H ~ FFFFH		
18	Function information 10 (By board type)	0000H	0000H ~ FFFFH		
19	Function information 11 (By board type)	0000H	0000H ~ FFFFH		
20	Function information 12 (By board type)	0000H	0000H ~ FFFFH		
21	Function information 13 (By board type)	0000H	0000H ~ FFFFH		
22	Function information 14 (By board type)	0000H	0000H ~ FFFFH		
23	Card parameter (By board type)	0000H	0000H ~ FFFFH		
24	Card parameter (By board type)	0000H	0000H ~ FFFFH		
25	Card parameter (By board type)	0000H	0000H ~ FFFFH		
26	Card parameter (By board type)	0000H	0000H ~ FFFFH		
27	Card parameter (By board type)	0000H	0000H ~ FFFFH		
28	Card parameter (By board type)	0000H	0000H ~ FFFFH		
29	Card parameter (By board type)	0000H	0000H ~ FFFFH		
30	Card parameter (By board type)	0000H	0000H ~ FFFFH		
31	Card parameter (By board type)	0000H	0000H ~ FFFFH		
32	Card parameter (By board type)	0000H	0000H ~ FFFFH		
33	Card parameter (By board type)	0000H	0000H ~ FFFFH		
34	Card parameter (By board type)	0000H	0000H ~ FFFFH		
35	Card parameter (By board type)	0000H	0000H ~ FFFFH		

I/O-Slot Card Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
36	Card parameter (By board type)	0000H	0000H ~ FFFFH		
37	Card parameter (By board type)	0000H	0000H ~ FFFFH		
38	Card parameter (By board type)	0000H	0000H ~ FFFFH		
39	Card parameter (By board type)	0000H	0000H ~ FFFFH		
40	Card parameter (By board type)	0000H	0000H ~ FFFFH		
41	Card parameter (By board type)	0000H	0000H ~ FFFFH		
42	Card parameter (By board type)	0000H	0000H ~ FFFFH		
43	Card parameter (By board type)	0000H	0000H ~ FFFFH		
44	Card parameter (By board type)	0000H	0000H ~ FFFFH		
45	Card parameter (By board type)	0000H	0000H ~ FFFFH		
46	Card parameter (By board type)	0000H	0000H ~ FFFFH		
47	Card parameter (By board type)	0000H	0000H ~ FFFFH		
48	Card parameter (By board type)	0000H	0000H ~ FFFFH		
49	Card parameter (By board type)	0000H	0000H ~ FFFFH		
50	Card parameter (By board type)	0000H	0000H ~ FFFFH		
51	Card parameter (By board type)	0000H	0000H ~ FFFFH		
52	Card parameter (By board type)	0000H	0000H ~ FFFFH		
53	Card parameter (By board type)	0000H	0000H ~ FFFFH		
54	Card parameter (By board type)	0000H	0000H ~ FFFFH		
55	Card parameter (By board type)	0000H	0000H ~ FFFFH		
56	Card parameter (By board type)	0000H	0000H ~ FFFFH		
57	Card parameter (By board type)	0000H	0000H ~ FFFFH		
58	Card parameter (By board type)	0000H	0000H ~ FFFFH		
59	Card parameter (By board type)	0000H	0000H ~ FFFFH		
60	Card parameter (By board type)	0000H	0000H ~ FFFFH		
61	Card parameter (By board type)	0000H	0000H ~ FFFFH		
62	Card parameter (By board type)	0000H	0000H ~ FFFFH		
63	Card parameter (By board type)	0000H	0000H ~ FFFFH		
64	Card parameter (By board type)	0000H	0000H ~ FFFFH		
65	Card parameter (By board type)	0000H	0000H ~ FFFFH		
66	Card parameter (By board type)	0000H	0000H ~ FFFFH		
67	Card parameter (By board type)	0000H	0000H ~ FFFFH		
68	Card parameter (By board type)	0000H	0000H ~ FFFFH		
69	Card parameter (By board type)	0000H	0000H ~ FFFFH		
70	Card parameter (By board type)	0000H	0000H ~ FFFFH		
71	Card parameter (By board type)	0000H	0000H ~ FFFFH		

I/O-Slot Card Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
72	Card parameter (By board type)	0000H	0000H ~ FFFFH		
73	Card parameter (By board type)	0000H	0000H ~ FFFFH		
74	Card parameter (By board type)	0000H	0000H ~ FFFFH		
75	Card parameter (By board type)	0000H	0000H ~ FFFFH		
76	Card parameter (By board type)	0000H	0000H ~ FFFFH		
77	Card parameter (By board type)	0000H	0000H ~ FFFFH		
78	Card parameter (By board type)	0000H	0000H ~ FFFFH		
79	Card parameter (By board type)	0000H	0000H ~ FFFFH		
80	Card parameter (By board type)	0000H	0000H ~ FFFFH		
81	Card parameter (By board type)	0000H	0000H ~ FFFFH		
82	Card parameter (By board type)	0000H	0000H ~ FFFFH		
83	Card parameter (By board type)	0000H	0000H ~ FFFFH		
84	Card parameter (By board type)	0000H	0000H ~ FFFFH		
85	Card parameter (By board type)	0000H	0000H ~ FFFFH		
86	Card parameter (By board type)	0000H	0000H ~ FFFFH		
87	Card parameter (By board type)	0000H	0000H ~ FFFFH		
88	Card parameter (By board type)	0000H	0000H ~ FFFFH		
89	Card parameter (By board type)	0000H	0000H ~ FFFFH		
90	Card parameter (By board type)	0000H	0000H ~ FFFFH		
91	Card parameter (By board type)	0000H	0000H ~ FFFFH		
92	Card parameter (By board type)	0000H	0000H ~ FFFFH		
93	Card parameter (By board type)	0000H	0000H ~ FFFFH		
94	Card parameter (By board type)	0000H	0000H ~ FFFFH		
95	Card parameter (By board type)	0000H	0000H ~ FFFFH		
96	Card parameter (By board type)	0000H	0000H ~ FFFFH		
97	Card parameter (By board type)	0000H	0000H ~ FFFFH		
98	Card parameter (By board type)	0000H	0000H ~ FFFFH		
99	Card parameter (By board type)	0000H	0000H ~ FFFFH		
100	Card parameter (By board type)	0000H	0000H ~ FFFFH		
101	Card parameter (By board type)	0000H	0000H ~ FFFFH		
102	Card parameter (By board type)	0000H	0000H ~ FFFFH		
103	Card parameter (By board type)	0000H	0000H ~ FFFFH		
104	Card parameter (By board type)	0000H	0000H ~ FFFFH		
105	Card parameter (By board type)	0000H	0000H ~ FFFFH		
106	Card parameter (By board type)	0000H	0000H ~ FFFFH		
107	Card parameter (By board type)	0000H	0000H ~ FFFFH		

I/O-Slot Card Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
108	Card parameter (By board type)	0000H	0000H ~ FFFFH		
109	Card parameter (By board type)	0000H	0000H ~ FFFFH		
110	Card parameter (By board type)	0000H	0000H ~ FFFFH		
111	Card parameter (By board type)	0000H	0000H ~ FFFFH		
112	Card parameter (By board type)	0000H	0000H ~ FFFFH		

5.7 Other Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
1	Auto-start program number	0	0 ~ 255		(Invalid if “0” is set)
2	I/O processing program number at operation/program abort	0	0 ~ 255		The start trigger is determined from the “I/O processing program start type at operation/program abort.” (Note: This program will be started before confirming an abort of other programs.) (Invalid if “0” is set) * If the setting is valid, the number of user program tasks that can be used will decrease by 1.
3	I/O processing program number at all operation pause	0	0 ~ 255		This program will be started when an alloperation-pause command is issued due to an all-operation-pause factor. (Only when a program is running) (Invalid if “0” is set) * If the setting is valid, the number of user program tasks that can be used will decrease by 1.
4	Program abort type at error	0	0 ~ 5		0: Cancel only the program in which an error of operation-cancellation level or higher has generated. (If the error requiring drive-source cutoff, error requiring servo OFF or error requiring all-axis servo OFF, etc., all programs other than the “I/O processing program at operation/program abort” will be cancelled.) 1: Cancel all programs other than the “I/O processing program at operation/program abort” when an error of operationcancellation level or higher has generated.
5	I/O processing program start type at operation/program abort	0	0 ~ 5		0: When all-operation-cancellation factor has generated (Only when a program is running) 1: When all-operation-cancellation factor has generated (Always) 2: All-operation-cancellation factor + Error of operation-cancellation level or higher (“Other Parameter No. 4 = 0” is considered) (Only when a program is running) 3: All-operation-cancellation factor + Error of operation-cancellation level or higher (“Other Parameter No. 4 = 0” is considered) (Always)
6	PC/TP reconnection delay at software reset	11000	1 ~ 99999	msec	* Effective after the controller, PC software or TP is restarted.
7	(For extension)	0			
8	(For extension)	0			
9	System reservation	0	0 ~ 2		
10	Emergency-stop recovery type	0	0 ~ 4		0: Abort operations/programs 1: Recovery after reset 2: Operation continued (Only during automatic operation. * Operation commands from the PC software/TP will be aborted from the PC software/TP side.) 3: Abort operations/programs (Software reset when the emergency stop is reset. The home-return completion status of incremental-encoder axes will be reset (EG approximation swap). 4: Abort operations/programs (Error reset (Only with an error of operation-cancellation level or lower) and auto-start program start (Only if AUTO mode and I/O Parameter No. 33 = 1 and I/O Parameter No. 44 ≠ 1 and all-operation-cancellation factor is not present) when the emergency stop is reset). There must be a minimum interval of 1 second after an emergency stop is actuated before it is reset. The home-return completion status of incremental-encoder axes will be retained.)
11	Enable switch (Dead man’s switch, enable switch) recovery class	0	0 ~ 2		0: Abort operations/programs 1: Recovery after reset 2: Operation continued (Only during automatic operation*) * Operation commands from the PC/TP will be aborted on the PC/TP side.
12	Automatic operation recognition type	0	0 ~ 3		0: Program is running and all-operation-cancellation factor is not present 1: [Program is running OR in AUTO mode] and all-operation-cancellation factor is not present
13	(For extension)	0			
14	(For extension)	0			
15	(For extension)	0			
16	(For extension)	0			
17	(For extension)	0			
18	(For extension)	0			
19	(For extension)	0			
20	System reservation	0	0 ~ 2		

Other Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
21	Manual operation type	0	0 ~ 5		0: Always enable edit and SIO/PIO start (Initial condition after connection = With safety speed) 1: Select edit and start (with password) (EU, etc.) 2: Always enable edit and SIO/PIO start (Initial condition after connection = Without safety speed (Cancellation)) * Referenced by the PC/TP.
22	Control use region	0	0 ~ 99		0: J, 1: E, 2: EU
23	PSIZ command function type	0	0 ~ 5		0: Maximum position data area number 1: Number of position data use
24	Local variable number for storing SEL communication command return code	99	1 ~ 99, 1001 ~ 1099		
25	(For extension)	0			
26	(For extension)	0			
27	(For extension)	0			
28	(For extension)	0			
29	(For extension)	0			
30	Option password 00	0H	0H ~ FFFFFFFFH		* Change is prohibited unless instructed by the manufacturer.
31	Option password 01	0H	0H ~ FFFFFFFFH		Reserved (Change prohibited) * Change is prohibited unless instructed by the manufacturer.
32	Option password 02	0H	0H ~ FFFFFFFFH		Reserved (Change prohibited) * Change is prohibited unless instructed by the manufacturer.
33	(For extension)	0H	0H ~ FFFFFFFFH		
34	(For extension)	0H	0H ~ FFFFFFFFH		
35	(For extension)	0H	0H ~ FFFFFFFFH		
36	(For extension)	0H	0H ~ FFFFFFFFH		
37	(For extension)	0H	0H ~ FFFFFFFFH		
38	(For extension)	0H	0H ~ FFFFFFFFH		
39	(System reservation)	0H	0H ~ FFFFFFFFH		
40	System reservation	3H	0H ~ FFFFFFFFH		For adjustment by the manufacture
41	System reservation	80H	0H ~ FFFFFFFFH		For adjustment by the manufacture
42	System reservation	7H	0H ~ FFFFFFFFH		For adjustment by the manufacture
43	Special monitor type	0H	0H ~ FFFFFFFFH		* Change is prohibited unless instructed by the manufacturer.
44	(For extension)	0H	0H ~ FFFFFFFFH		
45	Special start condition setting	0H	0H ~ FFFFFFFFH		Bits 0 to 3: Enable start from PC/TP in AUTO mode = Used exclusively by the manufacturer (0: Do not permit, 1: Permit) Bits 4 to 7: PIO program start (Input port 000) Single start selection (0: Normal, 1: Single start) * When single start is selected, the next PIO program start (input port 000) will not be accepted as long as a program with the same program number as the one started by the last PIO program start (Input port 000) is running. Bits 8 to 11: Permission of auto program start when all-operation-cancellation factor is present (0: Do not permit, 1: Permit) Bits 12 to 15: Permission of ON edge of PIO program start (input port 000) when all-operation-cancellation factor is present (0: Do not permit, 1: Permit) * This parameter specifies an ON edge acceptance condition and if the start condition is not satisfied, “Error No. A1E, start condition nonsatisfaction error” will generate.
46	Other setting bit pattern 1	2001H	0H ~ FFFFFFFFH		Bits 0 to 3: System reservation (Change prohibited) Bits 4 to 7: When substituting integer variable in LET / TRAN Command real number, selection of round-off of decimal fraction (0: Not to round off, 1: Round off) Bits 8 to 11: System reservation Bits 12 to 15: When indicating TPCD Command = 1, Selection of process of Sub-routine 1st Step Input Condition Unindicated Command (0: Not executed, 1: Executed, 2: Error)

Other Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
47	Other setting bit pattern 2	1H	0H ~ FFFFFFFFH		Bits 0 to 3: Calendar function use selection (0: Not in use 1: Use 2: Not in use (Use the elapsed time after the reset) 3: System reservation) * Clear all data in error list when making change Bits 4 to 7: 7-segment display factor switchover (0: Valid, 1: Invalid) * Display is switched among emergency stop / ENB / cold-start, operation cancel level error. Bits 8 to 11: Use servo monitor IO monitoring function (0: Not in use, 1: Use) Bits 12 to 15: Program 7SEG display class during execution (0: Displays final program number, 1: Displays the program number booted the first) Bits 16 to 19: (PCX/PGX) System reservation (PC/PG/PCF/PGF) Select PARG acquiring angle coordinate direction (0: CW 1: CCW) (Main application V2.00 or later) Bits 20 to 31: For future extension
48	(For extension)	0			
49	(For extension)	0			
50	(For extension)	0			
51	(For extension)	0			
52	(For extension)	0			
53	Fan status monitoring setting 1	1H	0H ~ FFFFFFFFH		Bit 0 : Monitoring status of fan 1 (0: Invalid, 1: Valid) Bits 1 to 31: System reservation
54	Fan status monitoring setting 2	0H	0H ~ FFFFFFFFH		Bits 0 to 15: System reservation Bits 16 to 19: Fan status monitoring error level (0: Message level, 1: Cold-start level) Bits 20 to 31: System reservation
55	PC/TP data protect setting 1	0H	0H ~ FFFFFFFFH		Bits 0 to 3: Protect type (Program) (0: Read/write 1: Read only 2: No read/write) Bits 4 to 7: Protect release method (Program) (0: Special operation) Bits 8 to 11: Protect type (Position) (0: Read/write 1: Read only 2: No read/write) Bits 12 to 15: Protect release method (Position) (0: Special operation) Bits 16 to 19: Protect type (Symbol) (0: Read/write 1: Read only 2: No read/write) Bits 20 to 23: Protect release method (Symbol) (0: Special operation) Bits 24 to 27: Protect type (Parameter) (0: Read/write 1: Read only 2: No read/write) Bits 28 to 31: Protect release method (Parameter) (0: Special operation) * Referenced by the PC/TP
56	PC/TP data protect setting 2	0H	0H ~ FFFFFFFFH		Bits 0 to 3: Protect range maximum number (Program) (1's place, BCD) Bits 4 to 7: Protect range maximum number (Program) (10's place, BCD) Bits 8 to 11: Protect range maximum number (Program) (100's place, BCD) Bits 12 to 15: Protect range minimum number. (Program) (1's place, BCD) Bits 16 to 19: Protect range minimum number. (Program) (10's place, BCD) Bits 20 to 23: Protect range minimum number. (Program) (100's place, BCD) Bits 24 to 31: System reservation * Referenced by the PC/TP

Other Parameters

No.	Parameter name	Default value (Reference)	Input range	Unit	Remarks
57	PC/TP data protect setting 3	0H	0H ~ FFFFFFFFH		Bits 0 to 3: Protect range maximum number (Position) (10's place, BCD) Bits 4 to 7: Protect range maximum number (Position) (100's place, BCD) Bits 8 to 11: Protect range maximum number (Position) (1000's place, BCD) Bits 12 to 15: Protect range maximum number (Position) (10000's place, BCD) Bits 16 to 19: Protect range minimum number. (Position) (10's place, BCD) Bits 20 to 23: Protect range minimum number. (Position) (100's place, BCD) Bits 24 to 27: Protect range minimum number. (Position) (1000's place, BCD) Bits 28 to 31: Protect range minimum number. (Position) (10000's place, BCD) * The value in the 1's place is considered "0" for both the protect range maximum/minimum numbers. * Referenced by the PC/TP
58	PC/TP data protect setting 4 (For PCX/PGX type)	0H	0H ~ FFFFFFFFH		* PC/PG/PCF/PGF is system reservation Bits 0 to 3: Type (Tool coordinate system offset) (0: Read/write 1: Read only 2: No read/write) Bits 4 to 7: Protect release method (Tool coordinate system offset) (0: Special operation) Bits 8 to 11: Protect type (Tool coordinate system offset) (0: Read/write 1: Read only 2: No read/write) Bits 12 to 15: Protect release method (Tool coordinate system offset) (0: Special operation) Bits 16 to 19: Protect type (Simple interference check zone definition coordinates) (0: Read/write 1: Read only 2: No read/write) Bits 20 to 23: Protect release method (Symbol) (Simple interference check zone definition coordinates) (0: Special operation) * Referenced by the PC/TP
59	Monitoring status of fan 3	11H	0H ~ FFFFFFFFH		For adjustment by the manufacturer
60	System reservation	0H	0H ~ FFFFFFFFH		
61 ~ 200	(For extension)	0			

5.8 Parameters for Linear / Rotation Controls

Shown in the list below are the combinations of parameters for linear and rotation controls:

Each Axis Parameter No.1 Axis operation type	Each Axis Parameter No.68 Linear Sliding Axis Mode Select	Each Axis Parameter No.66 Rotation Movement Axis Mode Select	Each Axis Parameter No.67 Short-cut Control Selection for Rotational Movement Axis	Encoder Process Type Accepted/Unaccepted			Current Position Expression (Approximately)	Each Axis Parameter No.7 Soft limit+	Each Axis Parameter No.8 Soft limit-	Each Axis Parameter No.44 Measurement Adjustment	Each Axis Parameter No.47 Screw Lead	Each Axis Parameter No.50 Gear Ratio Numerator	Each Axis Parameter No.51 Gear Ratio Numerator	Input Unit
				Battery-less ABS	Simple ABS	Incremental								
0 (linear movement axis)	0 (Normal mode)	Disable		○	○	○	Counter range	Enable	Enable	Enable	Enable	Enable	Enable	• Distance mm • Speed mm/sec • Acceleration/ Deceleration G
	1 (Infinite stroke mode)			×	×	○	-10000 to 9999.999 (Rotary)	Disable (Note 1)						
1 (rotation movement axis)	Disable	0 (Normal mode)	0 (No shortcut)	○	○	○	Counter range	Enable	Enable	Disable	Enable	Enable	Enable	• angle mm → deg • Angular velocity mm/sec → deg/sec • Angular acceleration and deceleration G = 9807mm/sec^2 → 9807deg/sec^2 = 9807×2π/360 rad/sec^2 * "deg" shows the angle of a solid of revolution on the tip
		1 (Index mode)	0 (No shortcut)	○	○	○	Counter range	Disable (Fixed at 359.999 inside)	Disable (Fixed at 0 inside)					
			1 (Shortcut control)	×	○	○	00 to 359.999 (Rotary)							

(Note 1): "Error No. CBE Target Tracking Data Boundary Violation Error" will be issued if having a positioning command except for 'JxWx' exceeding the coordinate range approximately from -9990 to 9990.
: "Error No. CC5 Positioning Boundary Excess Error" will be issued if executing a positioning command except for 'JxWx' out of the coordinate range approximately from -9990 to 9990.

[Parameters Related to Rotary Axis Movement]

- Rotation Movement Axis Mode Select (Axis-specific parameter No.66)

  Set the rotation axis mode.
  The current value expression gets fixed at 0 to 359.99 by selecting Index Mode when the setting of the axis operation type (Each Axis Parameter No. 1) is set to Rotary Axis: 1 on the rotary axis.
  The shortcut control is available when Index Mode is selected.

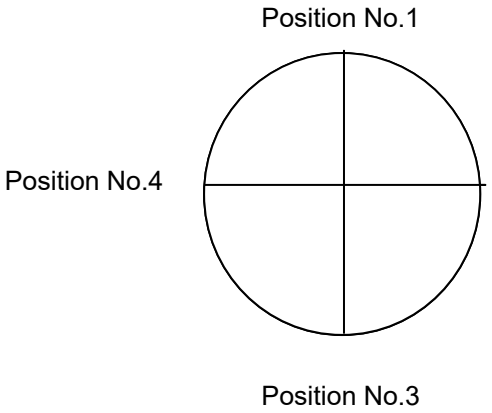
Set Value	Description
0	Normal Mode
1	Index Mode

- Short-Cut Control Selection for Rotational Movement Axis (Axis-specific parameter No.67)
  Make a setting whether to valid or invalid the shortcut at positioning except for the relative position movement for the multi-rotary type rotary actuator.
  Shortcut defines a movement in rotational direction with smaller movement amount to the next positioning operation.

Set Value	Description
0	Disable
1	Enable

[Shortcut Control for Multi-Rotation Type Rotary Actuator]
The shortcut control select can be set enable/disable in each axis parameter No. 67 “Rotary Movement Axis Shortcut Control Select”. Movement can be performed in one way when the shortcut select is set enable.

[Example for Operation]

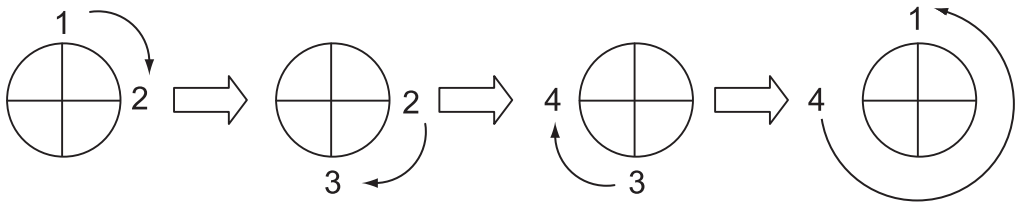


Position No.	Position
1	0
2	90
3	180
4	270

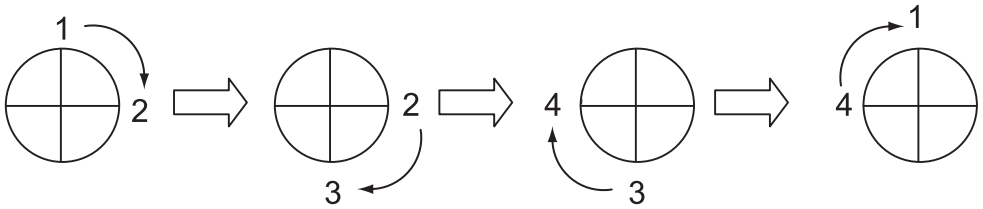
Position data is to be input as 1deg = 1mm. e.g.) 1.2 is treated as 1.2deg.

The operation will differ when shortcut select is disabled from when it is enabled if movement is made in the order of positions 1 → 2 → 3 → 4 → 1.

・When Disabled



・When Enabled



5.9 Permission of SIO/PIO Program Startup with Password

By setting to Parameter “Manual Operation Type” (Other Parameter No. 21), the parameter can be changed so SIO program startup and PIO program startup cannot be conducted without inputting a password.

(1) PC software

1) Setting = 0 (Always enable edit and SIO/PIO start)

Operation type	Password	Functions				
		Edit	Safety speed	Jog, move, continuous move	SIO program start	PIO program start
With safety speed	Not required	○	○	○	○	○
Without safety speed	Not required	○		○	○	○

2) Setting = 1 (Select edit and start (with password))

Operation type	Password	Functions				
		Edit	Safety speed	Jog, move, continuous move	SIO program start	PIO program start
Edit and jog	Not required	○	○	○		
SIO start and jog (safety speed)	1817		○	○	○	
SIO start and jog	1818			○	○	
SIO/PIO start and jog	1819			○	○	○

(2) Teaching pendant

1) Setting = 0 (Always enable edit and SIO/PIO start)

Safety-speed enable selection	Password	Functions				
		Edit	Safety speed	Jog, move, continuous move	SIO program start	PIO program start
Enable	Not required	○	○	○	○	○
Disable	Not required	○		○	○	○

2) Setting = 1 (Select edit and start (with password))

Safety-speed enable selection	Password	Functions				
		Edit	Safety speed	Jog, move, continuous move	SIO program start	PIO program start (Note 1)
Enable	Not required	○	○	○	○	Note 2
Disable	1818	○		○	○	Note 2

PIO start prohibition selection	Password	Functions				
		Edit	Safety speed	Jog, move, continuous move	SIO program start	PIO program start (Note 1)
Prohibit	Not required	○	Note 3	○	○	
Enable	1819	○	Note 3	○	○	○

Note 1 PIO program start is enabled only in modes other than the edit mode.
Note 2 In accordance with the “PIO start prohibition selection” setting.
Note 3 In accordance with the “Safety-speed enable” setting.

5.10 Parameter Setting (Applied)

You can add functions or set dedicated functions to I/O ports by changing parameter values.
Setting examples under different operating conditions are explained below.
When executing the desired operation, change the parameter settings in the table on the describing section.
Before changing each parameter, be sure to read the applicable section in the parameter list.

Desired Operation		Section to Pick up
1	Want to Operate the System Tentatively Without Using I/Os	5.10.1
2	Want to Output an Auto Operation Determination Signal from the XSEL Controller	5.10.2
3	Want to Retain Current Output Statuses Even during Emergency Stop	5.10.3
4	Want to Start an Emergency Program	5.10.4
5	Want to Enable Auto Recovery (Restart) upon Cancellation of Emergency Stop	5.10.5
6	Want to Enable Auto Recovery (Error Reset) upon Cancellation of Emergency Stop	5.10.6
7	Want to Return to the Condition Immediately before Emergency Stop	5.10.7
8	Want to Restart the Controller Externally	5.10.8
9	Want to Turn ON the Servo Externally	5.10.9
10	Want to Make a Home-return on Actuators Externally	5.10.10
11	Want to Execute the Program Externally	5.10.11
12	Want to Execute a Program Externally by Making an Indication of a Program Number in Binary	5.10.12
13	Want to Pause Controller Externally during Automatic Operation	5.10.13
14	Want to Reset Errors Externally	5.10.14
15	Want to Change Input Port Assignments	5.10.15
16	Want to Change Output Port Assignments	5.10.16
17	Want to Output that Home-return (Home Position) Operation is Complete on all Actuators	5.10.17
18	Want to Output the Error Level	5.10.18
19	Want to Output the Emergency Stop Status	5.10.19
20	Want to Know the Current Operation Mode	5.10.20

(Note) The following explanation is described with parameter settings in case I/O2 is not the fieldbus type. Replace setting values when I/O2 is the fieldbus type or a change has made to the parameter settings.

5.10.1 Want to Operate the System Tentatively Without Using I/Os

If you want to perform a test operation before wiring the I/Os and fieldbus, disable the error monitor functions for I/Os and fieldbus. (The I/Os and fieldbus whose error monitor function was disabled cannot be used.)

Parameter No.	Set Value	Description
I/O parameter No.10	0	I/O slot 1 error monitor (I/O 1 disabled)
I/O parameter No.18	0	I/O slot 2 error monitor (I/O 2 disabled)

5.10.2 Want to Output an Auto Operation Determination Signal from the Controller

A signal output to determine auto operation can be set using output port 319.
Classification during an automatic operation is changed by the setting in Other Parameter No. 12.

Parameter No.	Set Value	Description
I/O parameter No.49	2	Turn output port 319 ON during auto operation (When I/O Parameter No. 302 = 319)
Other parameter No.12	0	Auto operation if a program is running

5.10.3 Want to Retain Current Output Statuses Even during Emergency Stop

To retain the current statuses of output ports even when an emergency stop is actuated or the safety gate becomes open, set a range of output ports whose status you want to retain.

Parameter No.	Set Value	Description
I/O parameter No.70	Lower-limit output port number	Set the lower limit of output ports whose status is retained
I/O parameter No.71	Upper-limit output port number	Set the upper limit of output ports whose status is retained

5.10.4 Want to Start an Emergency Program

To operate an emergency program when an emergency stop signal is input or the safety gate becomes open, set an emergency program number and range of output ports to be used.

* Programs which do not involve actuator operations are the only program that can be operated.

Parameter No.	Set Value	Description
Other parameter No.2	Emergency program number	
I/O parameter No.70	Lower-limit output port number	Set the lower limit of output ports to be used
I/O parameter No.71	Upper-limit output port number	Set the upper limit of output ports to be used

Also, for emergency program, the startup is determined by Other Parameter No. 5 “I/O Processing Program Start Type at Operation/Program Abort” below.

Parameter No.	Description
Other Parameter No.5	0: When a program is running or When all-operation-cancellation factor has generated 1: When all-operation-cancellation factor has generated (Starts in no relation to program executed or not) 2: When an error over operation level is generated, and cause to release all operation is generated during program execution 3: When an error over operation level is generated, and cause to release all operation is generated (Starts in no relation to program executed or not)

5.10.5 Want to Enable Auto Recovery (Restart) upon Cancellation of Emergency Stop

You can automatically restart the system (via software reset) when the emergency stop is cancelled, and execute the program.

Parameter No.	Set Value	Description
Other parameter No.1	Execution program number	
Other parameter No.10	3	Restart (via software reset) upon cancellation of emergency stop
I/O parameter No.33	1	Execute the program after restart if in the AUTO mode

5.10.6 Want to Enable Auto Recovery (Error Reset) upon Cancellation of Emergency Stop

You can automatically reset the error when the emergency stop is cancelled, and execute the program.

Parameter No.	Set Value	Description
Other parameter No.1	Execution program number	
Other parameter No.10	4	Reset the error upon cancellation of emergency stop
I/O parameter No.33	1	Execute the program after error reset if in the AUTO mode
I/O parameter No.44	0	Restore the cutoff drive source upon removal of the cause of cutoff (emergency stop)

5.10.7 Want to Return to the Condition Immediately before Emergency Stop

Only duringauto operation [refer to other parameter No. 12], operation can be resumed upon cancellation of emergency stop from the condition immediately before the emergency stop signal was input.

Cancel the emergency stop switch and then turn ON input port 021 (to produce an OFF → ON edge).

Parameter No.	Set Value	Description
Other parameter No.10	2	Continue operation upon cancellation of emergency stop
I/O parameter No.35	1	Set input port 021 as operation pause cancellation signal input port (When I/O Parameter No. 288 = 21)

5.10.8 Want to Restart the Controller Externally

You can restart the controller (via software reset) by inputting an ON signal to input port 017 for at least 1 second.

Parameter No.	Set Value	Description
I/O parameter No.31	1	Set input port 017 as the soft reset signal input port (When I/O Parameter No. 284 = 17)

5.10.9 Want to Turn ON the Servo Externally

The servo turns on when input port 018 turns ON (at the OFF → ON edge), and turns off when the port turns OFF (at the ON → OFF edge).

Parameter No.	Set Value	Description
I/O parameter No.32	1	Set input port 018 as the servo ON signal input port (When I/O Parameter No. 285 = 18)

5.10.10 Want to Make a Home-Return on Actuators Externally

Actuator of incremental type will make home-return operation once on-edge OFF → ON) is input to Input Port 031*.

Parameter No.	Set Value	Description
I/O parameter No.45	1	Home-return operation of incremental type SCARA robot and linear axis (necessary to turn the servo on before home return)
	2	Home-return operation of all the Incremental Type axes set valid (necessary to turn the servo on before home return)

* When I/O Parameter No. 298 is set to 31

5.10.11 Want to Execute the Controller Program Externally

The program is executed when input port 019 turns ON (at the OFF→ON edge), and stops when the port turns OFF (at the ON→OFF edge).
The ON status must be retained for at least 100 ms to ensure reliable operation.

Parameter No.	Set Value	Description
Other parameter No.1	Execution program number	
I/O parameter No.33	2	Set input port 019 as the servo ON signal input port (When I/O Parameter No. 286 = 19)

5.10.12 Want to Execute a Program Externally by Making an Indication of a Program Number in Binary

By setting I/O Parameter No. 30 to 2, an indication of program number can be conducted in binary to execute a program. The program number is to be indicated in Input Port No. 023 to 030*.
BCD is indicated as a program number at delivery.

Parameter No.	Set Value	Description
I/O parameter No.30	2	Set input port 016* as the program start signal
I/O parameters No.37 to 43	1	Set input ports 023 to 030* as the signal specified for program No.
I/O parameter No.44	2	

* When I/O Parameter No. 283 is set to 16 and also No. 290 to 297 are set to 23 to 30

5.10.13 Want to Pause Controller Externally during Automatic Operation

The controller pauses when input port 022* is turned OFF. To cancel the pause, turn ON input port 022* and also 021* (the pause is cancelled at the OFF→ON edge).

Parameter No.	Set Value	Description
I/O parameter No.35	1	Set input port 021* as the pause cancellation signal input port
I/O parameter No.36	1	Set input port 022* as the pause signal input port

* When I/O Parameter No. 288 is set to 21 and also No. 289 are set to 22

5.10.14 Want to Reset Errors Externally

Errors other than cold-start level errors are reset when input port 029 is turned ON (errors are reset at the OFF→ON edge).

Parameter No.	Set Value	Description
I/O parameter No.43	2	Set input port 013 as the error reset signal input port (When I/O Parameter No. 296 = 29)

5.10.15 Want to Change Input Port Assignments

You can select input functions by I/O parameter Nos. 30 to 45 and assign them to desired input ports.

Parameter No.	Set Value	Description
I/O parameter No.283	Input port number to assign input function selection 000 to	
I/O parameter No.284	Input port number to assign input function selection 001 to	
	≦	
I/O parameter No.297	Input port number to assign input function selection 014 to	
I/O parameter No.298	Input port number to assign input function selection 015 to	

Explanation below shows how to assign Input Function Select 000 “Start” set in “Input Function Select 000” to another input port.
Set the physical input port number of Input Function Select 000 (Start) in I/O Parameter No. 283 “Input Function Select 000 Physical Input Port Number”. For instance, when “016” is set, the function of Input Function Select 000 (Start) is assigned to “Input Port No. 016”.
The signal input port of Input Function Select 000 (Start) becomes Input Port 016.
“Input Port No. 000” after the assignment becomes an input port for general purpose.

(Note) Even though the input port numbers can be set individually, Error No. 685 “Input and Output Function Select Physical Port Number Error” will be generated in case a duplicated setting is made or port number setting is made not in a continuous order.

5.10.16 Want to Change Output Port Assignments

You can select output functions by I/O parameter Nos. 46 to 61 and assign them to desired output ports.

Parameter No.	Set Value	Description
I/O parameter No.299	Output port number to assign output function selection 300 to	
I/O parameter No.300	Output port number to assign output function selection 301 to	
	≀	
I/O parameter No.313	Output port number to assign output function selection 314 to	
I/O parameter No.314	Output port number to assign output function selection 315 to	

Explanation below shows how to assign Output Function Select 300 (ALM) set in “Output Function Select 300” to another output port.
Set the physical output port number of Output Function Select 300 (ALM) in I/O Parameter No. 299 “Output Function Select 300 Physical Output Port Number”. For instance, when “316” is set, the function of Output Function Select 300 (ALM) is assigned to “Output Port No. 316”.
The signal output port of Output Function Select 300 (ALM) becomes Output Port 316.
“Output Port No. 300” after the assignment becomes an output port for general purpose.

(Note) Even though the output port numbers can be set individually, Error No. 685 “Input and Output Function Select Physical Port Number Error” will be generated in case a duplicated setting is made.

5.10.17 Want to Output that Home-Return (Home Position) Operation is Complete on All Actuators

It can be confirmed that all actuators are at the home position.

Status	Output port 320*
Home return completion	ON
Home-return incomplete	OFF

Parameter No.	Set Value	Description
I/O parameter No.50	2	Set to output when all actuators completed home-return operation

* When I/O Parameter No. 303 is set to 320

5.10.18 Want to Output the Error Level

The level of each error can be indicated using output ports 316* and 317*.

Error level	Output port 316*	Output port 317*
Message level or lower	ON	ON
Operation-cancellation level	OFF	ON
Cold-start level	OFF	OFF

Parameter No.	Set Value	Description
I/O parameter No.46	2	Turn ON output port 316* only for message level errors
I/O parameter No.47	3	Turn ON output port 317* for message level and operation-cancellation level errors

* When I/O Parameter No. 299 is set to 316 and also No. 300 are set to 317

5.10.19 Want to Output the Emergency Stop Status

Whether or not an emergency stop status is currently actuated can be checked from the status of output port 318*.

Current status	Output port 318*
Emergency stop not actuated	ON
Emergency stop actuated	OFF

Parameter No.	Set Value	Description
I/O parameter No.48	2	Turn OFF output port 318* if an emergency stop is actuated

* When I/O Parameter No. 301 is set to 318

5.10.20 Want to Know the Current Operation Mode

The current operation mode can be checked from the status of output port 319*.

Current operation mode	Output port 319*
AUTO	ON
MANU	OFF

Parameter No.	Set Value	Description
I/O parameter No.49	1	Turn ON output port setting in the AUTO mode

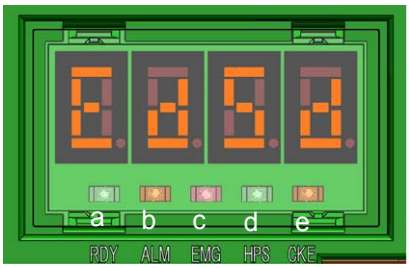
* When I/O Parameter No. 302 is set to 319

Chapter 6 Troubleshooting

6.1 Action to Be Taken upon Occurrence of Problem

When a trouble is occurred, take an action following the steps described below in order to have a rapid recovery and to avoid the recurrence of the same trouble.

1) Check on 7-Segment LED Display and LED Displays on Controller
   - Check the 7-segment display windows on the controller.
     [Refer to the "3.3.2 Panel Window Display" for the displayed contents.]
   - Check the LED on the controller (a to e) in the figure below).



Displayed Contents of LED Lamps on Controller

No.	Name	Status when LED is ON
a	RDY	CPU Ready (Program operation available)
b	ALM	CPU Alarm (Operation cancelled level or higher error) occurs
c	EMG	Emergency stop, error in CPU hardware or power-related hardware error
d	HPS	Home-return complete on all axes
e	CKE	Error in system lock or power-related hardware error

2) Check for alarm on the host controller (such as PLC)
3) Check the voltage of the main power supply.
4) Check the voltage of the PIO power supply (24V DC).
5) Check for the details of the alarm. (Note 1)
   For the alarm codes, check on a teaching tool such as the PC software.
6) Check on connectors for being disconnected or incomplete connection
7) Check on the connection, wire breakage and pinch of cables
   When checking the electrical conductivity, cut off the main power of the devices mounted to this controller (to prevent electric shock) and remove the cables on the measured part (to avoid conductivity due to sneak circuit) prior to the check.
8) Check the I/O signals.
   Check with using a teaching tool such as the host controller or PC software that there is no inconsistency in the conditions of the input and output signals.
9) Check on noise preventing actions (e.g. connection of ground line, connection of noise killer, etc.)
10) Review the events leading to the occurrence of a problem, as well as the operating condition at the time of occurrence. (Note 1)
11) Cause analysis
12) Treatment

> Notice: To handle a trouble, the cause is to be narrowed down by getting rid of the things that can certainly be considered as normal. Please check all the items mentioned in 1) to 10) before making a contact with us.

Note 1: Time when an alarm has issued can be checked.
Establish the clock setting using a teaching tool such as the PC software at the first time the power is supplied to the controller.
[Refer to an instruction manual of a teaching tool such as the PC software for how to establish the clock setting.]
Once the clock setting is established, the data can be retained for approximately ten days with the power to the controller being off. Without the setting conducted or when clock data is lost, the system starts with the time at 00h00m January 1, 2000 at the power being turned on. Even if the time data is lost, a generated error code can be retained.
The alarms applicable for this function are those stated in Section 6.3 Alarm. Any error which may occur in a teaching tool such as the PC software is not included.

6.2 Error Level Control

Error level	System error assignment source	Error No. (HEX)	Display (7-segment display, etc.)	Error list (Application only)	Error LED output (MAIN only)	Program run (Application only)		Error reset (Application only)	Remarks
						Other parameter No. 4 = 0	Other parameter No. 4 = 1		
Secret level	MAIN application	800 to 88F		○					Special error level provided for maintenance purposes
	MAIN core	890 to 8AF							
	PC	8B0 to 8DF							
	TP	8E0 to 8FF							
Message level	MAIN application		○	△ (Battery and fieldbus errors will be registered in an error list.)				Enabled.	Status display, input error, etc.
	MAIN core	-							
	PC								
	PC (Update tool)								
	TP								
	MAIN application	200 to 24F							
	MAIN core	-							
	PC	250 to 29F							
	PC (Update tool)	2A0 to 2CF							
	TP	2D0 to 2FF							
	MAIN application	900 to 93F							
	MAIN core	940 to 97F							
	PC	980 to 9AF							
	PC (Update tool)	9B0 to 9BF							
	TP	9C0 to 9FF							
	MAIN application	A00 to A6F							
	MAIN core	A70 to A9F							
	PC	AA0 to ACF							
	TP	AD0 to AFF							
Operation-cancellation level	MAIN application		○	○		The program in which the error generated will be cancelled. (Except for axis errors, a cancellation factor is present only for the moment the error occurs.) * However, in the case of an error requiring servo OFF or error requiring all-axis servo OFF, all programs other than the “I/O processing program at operation/program abort” will be cancelled.	All programs other than the “I/O processing program at operation/program abort” will be cancelled. (Except for axis errors, a cancellation factor is present only for the moment the error occurs.)	Enabled.	Errors affecting operation. The system will attempt to reset minor errors below this level using an auto-reset function via external active command (SIO/PIO) (application only).
	MAIN core	-							
	PC								
	PC (Update tool)								
	TP								
	MAIN application	400 to 4CF							
	MAIN core	-							
	PC	4D0 to 4DF							
	PC (Update tool)	4E0 to 4EF							
	TP	4F0 to 4FF							

PC: PC software, TP: Teaching pendant

* Secret-level errors are not actual errors. Internal statuses are registered in an error list as secret-level errors, when deemed necessary, in order to facilitate error analysis.

Error level	System error assignment source	Error No. (HEX)	Display (7-segment display, etc.)	Error list (Application only)	Error LED output (MAIN only)	Program run (Application only)		Error reset (Application only)	Remarks
						Other parameter No. 4 = 0	Other parameter No. 4 = 1		
Operation-cancellation level	MAIN application	B00 to B9F	○	○		The program in which the error generated will be cancelled. (Except for axis errors, a cancellation factor is present only for the moment the error occurs.) * However, in the case of an error requiring servo OFF or error requiring all-axis servo OFF, all programs other than the "I/O processing program at operation/program abort" will be cancelled.	All programs other than the "I/O processing program at operation/program abort" will be cancelled. (Except for axis errors, a cancellation factor is present only for the moment the error occurs.)	Enabled.	Errors affecting operation. The system will attempt to reset minor errors below this level using an auto-reset function via external active command (SIO/PIO) (application only).
	MAIN core	BA0 to BBF							
	PC	BC0 to BDF							
	TP	BE0 to BFF							
	MAIN application	C00 to CCF							
	MAIN core	CD0 to CDF							
	PC	CE0 to CEF							
	TP	CF0 to CFF							
Cold-start level	MAIN application		○	○	○ (Core only)	The program in which the error generated will be cancelled. * However, in the case of an error requiring drive-source cutoff, error requiring servo OFF or error requiring all-axis servo OFF (initialization error, power error, etc.), all programs other than the "I/O processing program at operation/program abort" will be cancelled.	All programs other than the "I/O processing program at operation/program abort" will be cancelled.	Not enabled.	The controller power must be reconnected (MAIN only). (The CPU and OS will run properly.)
	MAIN core	-							
	PC								
	PC (Update tool)								
	TP								
	MAIN application	600 to 6CF							
	MAIN core	-							
	PC	6D0 to 6DF							
	PC (Update tool)	6E0 to 6EF							
	TP	6F0 to 6FF							
	MAIN application	D00 to D8F							
	MAIN core	D90 to DAF							
	PC	DB0 to DCF							
	PC (Update tool)	DD0 to DDF							
	TP	DE0 to DFF							
	MAIN application	E00 to E8F							
	MAIN core	E90 to EBF							
	PC	EC0 to EDF							
	TP	EE0 to EFF							
System-down level	MAIN application		○	○	○	All programs will be cancelled.		Not enabled.	The controller power must be reconnected (MAIN only). (The CPU and OS will not run.)
	MAIN core	-							
	PC								
	PC (Update tool)								
	TP								
	MAIN application	FF0 to FBF							
	MAIN core	FC0 to FCF							
	PC	FD0 to FDF							
	TP	FE0 to FEF							

PC: PC software, TP: Teaching pendant

6.3 Error List (MAIN Application)

In the panel window, the error numbers follow E in the display.

	Error No.	Error name	Description, action, etc.
Message level errors	205	Update system software version error (IAI protocol)	An update was tried to an old version of system software that has no compatibility. Check such information as the compatibility of the system software and the hardware, and try the steps for updating again from the start.
	207	Update file name error (IAI protocol)	The name of the update program file selected in the update mode is invalid. Select the correct file and repeat the update procedure from the beginning.
	208	Time data error	[Detail & Cause] An error is occurred on clock data to be indicated in such as communication. [Countermeasure] Check the communication message and so on.
	20D	Flash busy reset timeout error	Error erasing/writing the flash ROM
	20E	Motorola S-byte count error	The update program file is invalid. Check the file.
	20F	Updating target specification error (Received by the application)	The system application received an updating target specification command. To update the program, restart the controller and repeat the updating procedure from the beginning.
	211	IA Net link error	IA Net link error was detected. Check if the stations indicated in I/O parameters No. 605 and 606 are connected to IA Net properly, or if the station numbers are duplicated in the IA Net network.
	212	IA Net break station detection error	A station that cannot be joined in the IA Net communication cycle was detected. Check if there is a controller or unit with the station number greater than what is set in I/O parameter No. 604 “IA Net Final Station Number”
	213	IA Net mail undefined error code receive error	Undefined IA Net mail error code was received. There is a concern that there is a function that is available in other controllers and units in the IA Net network, but is not available on this controller. Update the application in the main CPU board.
	214	IA Net stop detection error	IA Net stop detection error was detected. Check if there is an IA Net related error being occurred.
	228	Calendar clock lost error (RTC oscillation stop detection)	[Detail & Cause] Clock data is lost due to power voltage drop in calendar IC. [Countermeasure] Establish the clock setting again.
	229	RTC device access error	[Detail & Cause] It is a data access error to the RTC device. [Countermeasure] In case the same error occurs even after power reboot, there is a concern of noise disturbance or component malfunction.
	22A	RTC device access error	[Detail & Cause] It is a clock data error off the calendar function. It also occurs when the power voltage in calendar IC is dropped. [Countermeasure] Establish the clock setting again. In case the same error occurs even after clock setting is established, there is a concern of noise disturbance or component malfunction.

In the panel window, the error numbers follow E in the display.

	Error No.	Error name	Description, action, etc.
Message level errors	22D	Error in number of maintenance information change	[Detail & Cause] There is an error in the number of maintenance information change to be indicated in such as communication. [Countermeasure] Check the communication message and so on.
	22E	Maintenance information type error	[Detail & Cause] There is an error in the maintenance information type to be indicated in such as communication. [Countermeasure] Check the communication message and so on.
	22F	Maintenance information number error	[Detail & Cause] There is an error in the maintenance information number to be indicated in such as communication. [Countermeasure] Check the communication message and so on.
	231	Movements threshold exceeded	[Detail & Cause] The total times of axis operation has exceeded the times set in Each Axis Parameter No. 221 “Threshold for total number of movements”. [Countermeasure] Have maintenance conducted on each axis.
	232	Travelled distance threshold exceeded	[Detail & Cause] The total distance of axis operation has exceeded the distance set in Each Axis Parameter No. 222 “Threshold for total travelled distance”. [Countermeasure] Have maintenance conducted on each axis.
	233	Fan error	[Detail & Cause] Drop or stop in fan revolution has been detected. [Countermeasure] Contact IAI as there is a risk of generating heat due to the stop of the fan on the controller.
	235	Fan revolution drop alarm	[Detail & Cause] Drop in fan revolution has been detected. [Countermeasure] Contact IAI as there is a risk of generating heat due to the stop of the fan on the controller.
	236	Position data record format class error	There is an error in the position data record format class.
	237	Password error	There is a failure in the password error.
	23C	Invalid coordinate system definition error	[Detail & Cause] It was attempted to execute an operation related to the coordinate system definition when the coordinate system definition is ineffective. [Countermeasure] Have an operation related to the coordinate system definition when the coordinate system definition is effective.

In the panel window, the error numbers follow E in the display.

	Error No.	Error name	Description, action, etc.
Operation-cancellation level errors	406	Flash busy reset timeout	It is an error in deleting or writing of flash ROM.
	40D	Vision System Response Timeout Error	Communication response from the vision system cannot be confirmed. Check in the settings in I/O Parameter No. 129 Bit 4 to 7 and No. 160 to 164, if data transportation is working for the capturing command in the vision system and so on. * This is an error generated only on MSEL-PC/PG/PCF/PGF
	414	Excessive Number of Piled-up Word Piece Detection Error	The number of work pieces exceeded the allowable number to be piled up. Have an action to reduce the number of piled up work pieces. * This is an error generated only on MSEL-PC/PG/PCF/PGF
	415	Unsupported Identification Code Reception Error (Tracking Vision System I/F Data Communication)	Unsupported identification code was received from the vision system. Check in the sent data. * This is an error generated only on MSEL-PC/PG/PCF/PGF
	416	Received Message Error (Tracking Vision System I/F Data Communication)	Inappropriate data was received from the vision system. Check if data different from the format has been sent. * This is an error generated only on MSEL-PC/PG/PCF/PGF
	417	Received Work Piece Number Error (Tracking Vision System I/F Data Communication)	The number of work pieces received from the vision system exceeds the upper limit of the number or work pieces available for capturing in one time. Establish the setting not to exceed the upper limit. * This is an error generated only on MSEL-PC/PG/PCF/PGF
	418	Work Piece Information Handling Busy Error	It is an error in internal process of the vision system I/F. The process cannot be continued due to the work piece information handling process in busy condition. There is a concern that Error No. 419 is also generated. * This is an error generated only on MSEL-PC/PG/PCF/PGF
	419	Work Piece Information Handling Timeout Error	It is an error in internal process of the vision system I/F. Timeout has occurred in work piece information handling process. * This is an error generated only on MSEL-PC/PG/PCF/PGF
	41B	ABS unit encoder error (1)	[Detail & Cause] It is detected the axis has moved for an external reason during an absolute reset. It can be considered an actuator or robot is moved by an external force of such as a reaction of the stand-alone cable. [Countermeasure] Remove the cause of axis movement and conduct an absolute reset again.
	41C	ABS unit encoder error (2)	[Detail & Cause] 1) Turning the power on for the first time after connection of simple absolute battery or battery-less ABS 2) Voltage drop of simple absolute battery or battery unconnected (Info.1 = 1 in Error List) 3) Breakage on actuator connection cable for Simple ABS Type or cable enclosed in actuator, connection error of connector, or cable being disconnected. (Info.1 = 2 in Error List) 4) Power is turned off during data writing to ROM in Battery-less ABS Type (Info.1 = 6 in Error List) [Countermeasure] 1), 2), 4) : Conduct an absolute reset. 3) : Supply power, charge the battery enough, and then conduct an absolute reset. * It requires approximately 72 hours to have the flat battery fully charged.

In the panel window, the error numbers follow E in the display.

	Error No.	Error name	Description, action, etc.
Operation-cancellation level errors	41D	ABS unit encoder error (3)	[Detail & Cause] It is detected the axis has moved with speed more than the set rotation speed for an external reason during power cutoff in Simple Absolute Type. [Countermeasure] 1) Remove the cause of axis movement and conduct an absolute reset. 2) Set the rotation speed allowable setting to applicable setting for higher rotation speed than current.
	421	SCARA / linear axis simultaneous indication error	SCARA and linear movement axes were specified simultaneously. SCARA and linear movement axes cannot be specified or operated at the same time. Check the axis pattern, position data, etc. * SCARA only.
	424	Size over error of position number data in response message	[Detail & Cause] The expanded point number in the received command is not supported, so a response cannot be sent successfully. [Countermeasure] Check the communication message and so on.
	42F	Positioning timeout error when home position determined	Positioning did not finish at home-return operation. It can be concerned that there was an error in servo-motor gain adjustment or interference of the actuator at the home-return operation.
	491	IA Net stop detection error at IAI protocol transfer	IA Net is not working properly during the IAI protocol transfer in IA Net. Confirm that the IA Net board is mounted in the appropriate way or the IA Net is working properly.
	492	IA Net IAI protocol mail sending error	IAI protocol communication failed in IA Net. Check the condition of IA Net connection, communication station number, I/O parameters No. 602 to 605, etc.
	49B	SEL program source symbol management domain sum check error	[Detail & Cause] An error was detected in SEL program data stored in the flash ROM. [Countermeasure] SEL program will be initialized. Contact IAI in case the same error occurs even after flash ROM writing is conducted.
	49C	SEL program source symbol management domain ID error	[Detail & Cause] An error was detected in SEL program data stored in the flash ROM. [Countermeasure] SEL program will be initialized. Contact IAI in case the same error occurs even after flash ROM writing is conducted
	49D	Symbol definition table management domain sum check error	[Detail & Cause] An error was detected in the symbol definition table data stored in the flash ROM. [Countermeasure] The symbol definition table data will be initialized. Contact IAI in case the same error occurs even after flash ROM writing is conducted
	49E	Symbol definition table management domain ID error	[Detail & Cause] An error was detected in the symbol definition table data stored in the flash ROM. [Countermeasure] The symbol definition table data will be initialized. Contact IAI in case the same error occurs even after flash ROM writing is conducted

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	Error No.	Error name	Description, action, etc.
Operation-cancellation level errors	4A4	Maintenance information data control domain sum check error	[Detail & Cause] An error was detected in maintenance information data stored in the retention memory. This may occur also when the power is accidently turned off during the initialization of the maintenance information. [Countermeasure] The maintenance information data will not be initialized even if an error is detected. To cancel the error, have the data initialized. Contact IAI in case the same error occurs even after initializing.
	4A5	Maintenance information data control domain ID error	[Detail & Cause] An error was detected in maintenance information data stored in the retention memory. [Countermeasure] The maintenance information data will not be initialized even if an error is detected. To cancel the error, have the data initialized. Contact IAI in case the same error occurs even after initializing.
	4A6	Maintenance information data sum check error	[Detail & Cause] An error was detected in maintenance information data stored in the retention memory. [Countermeasure] The maintenance information data will not be initialized even if an error is detected. To cancel the error, have the data initialized. Contact IAI in case the same error occurs even after initializing.
	4A8	Virtual input and output port operation error	[Detail & Cause] The virtual input and output port of input attribute was tried to change. Change cannot be made to the virtual input and output port of input attribute. [Countermeasure] Check on the virtual input and output port that the change was tried on.
	4A9	Absolute reset information inconsistency error	[Detail & Cause] This occurs when an actuator or robot with absolute reset being conducted with not connected on this controller. [Countermeasure] 1) Check the combination of the controller and the actuator or robot. 2) Conduct an absolute reset.

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	Error No.	Error name	Description, action, etc.
Cold-start level errors	548	IA Net resizing overlapping error	Several stations executed the resizing. There is a concern multiple stations are subject to resizing execution. Check the conformity of I/O parameter No. 603 with the controller on the same network.
	54C	IA Network communication parameter error	There is an error in the communication parameter of IA Network. Check in I/O Parameter No. 601 to 606.
	552	IA Net link error	IA Net link error was detected. Confirm that all the controllers occupying the stations indicated in I/O parameters No. 603 and 604 are connected properly to IA Net. This error also occurs when the occupied stations indicated in I/O parameters No. 601 and 602 are duplicating with other controllers connected to IA Net.
	553	IA Net message command sending busy error	Message command could not be sent due to the busy condition at the process of IA Net message command sending.
	554	IA Net message command sending timeout error	IA Net message command could not be completed to be sent in the specified time. There is a concern of message commands not being able to be sent properly.
	556	IA Net message command domain access right acquirement timeout error	Access right to IA Net message command domain could not be gained in the specified time.
	560	Number of IA Net occupied station exceeded error	The number of IA Net occupied stations has exceeded the number allowed in the system.
	561	IA Net I/O assignment number overflow error	The number of IA Net I/O assignments has exceeded the specified range.
	562	Extension I/O unit parameter error	There is a failure in the extension I/O unit parameters. 1) The station numbers for a controller and an extension I/O unit are duplicated. 2) Eextension I/O unit with a station number greater than the value set in I/O parameter No. 604 “IA Net final station number” is attempted to be used.
	563	Extension I/O unit DO duplication error	Multiple controllers attempted to use DO in one I/O board on the extension I/O unit.
	564	Extension I/O unit initial Communication timeout error	Initial communication with the extension remote I/O unit was not established correctly. It could be considered that; 1) Extension remote I/O unit is not connected. 2) Power is not supplied to extension remote I/O unit. 3) Wrong unit number is set in I/O parameters.
	565	Extension I/O unit board undetected error	I/O board in an extension I/O unit was not detected.
	566	Extension I/O unit undefined error code detection	Undefined extension I/O unit error code was detected. This error occurs when the main CPU board software is not applicable for the error code of the extension I/O unit. Updating is required on the application in the main CPU board.
	567	IA Net communication cycle time error	There is an error in the communication cycle time of IA Net.
	568	Extension I/O unit self checking error	There is a failure in the CPU program of extension I/O unit.
	569	Extension I/O unit initial communication parameter error	There is a failure in the extension I/O unit parameters. Make sure that the I/O parameters No. 20 and 716, etc., are identical to those of the other extension I/O unit controller.

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	Error No.	Error name	Description, action, etc.
Cold-start level errors	56A	CC-Link system domain use error	CC-Link system domain cannot be used as the system input and output port of X-SEL. It can be considered as the cause that CC-Link system domain is used as a system output as shown below. Check the I/O parameter settings. 1) Input and output function select port number 2) Zone output port number 3) Simple interference check zone output port number 4) Vision system I/F capturing command physical output port number Etc.
	572	Motor power overcurrent error	[Detail & Cause] Overcurrent has occurred due to an error in motor cable area or malfunction on motor drive circuit. [Countermeasure] Replacement of motor cable or PCB is necessary.
	573	ABS encoder error detection	[Detail & Cause] There is an error on the absolute encoder. 1) Abrasion on gear is large. (Info.1 = 1 in Error List) 2) Internal communication error has occurred due to such as noise. (Info.1 = 2 in Error List) 3) The motor started to move during gear angle detection. (Info.1 = 3 in Error List) 4) Error in ABS data. (Info.1 = 4 in Error List) [Countermeasure] Reboot the power. In case the error occurs even after power reboot for several times, contact IAI.
	574	System construction definition ROM data error	[Detail & Cause] There is an error in the flash ROM data. 1) Data is not written in normal condition to the flash ROM. 2) The power was turned off during data writing to the flash ROM. 3) There is wrong information in the flash ROM data. 4) Malfunction of flash ROM. [Countermeasure] In case the error occurs even after power reboot, contact IAI.
	575	System construction definition error	[Detail & Cause] It is a system construction not supported. [Countermeasure] In case the error occurs even after power reboot, contact IAI.
	5C0	Coordinate system definition setting error	[Detail & Cause] There is an error in the setting of the coordinate system definition. The following can be concerned. 1) There is an error in the setting of All Axes Parameter No. 56 (Indication of invalid axis or axis forbidden to indicate, duplication of indicated axis number, XYZ axes are not a linear drive axis, R-axis is not rotary drive axis, etc.) [Countermeasure] Revise the parameter settings related to the coordinate system definition.

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	Error No.	Error name	Description, action, etc.
Cold-start level errors	614	Driver synchronizing communication LRC error	[Detail & Cause] An error was detected in the communication between the driver CPU and main board FPGA. [Countermeasure] Reboot the power supply. Contact IAI in case the same error occurs even after power reboot.
	616	ABS unit encoder command busy error	[Detail & Cause] A command could not be executed due to the busy status when an absolute unit encoder command was issued. [Countermeasure] Reboot the power. In case the error occurs even after power reboot, contact IAI.
	617	ABS unit encoder command timeout error	[Detail & Cause] Timeout occurred with no complete confirmation when an absolute unit encoder command was executed. [Countermeasure] Reboot the power. In case the error occurs even after power reboot, contact IAI.
	618	ABS unit encoder command data error	[Detail & Cause] A command could not be executed due to a data error of an absolute unit encoder command. [Countermeasure] Reboot the power. In case the error occurs even after power reboot, contact IAI.
	619	ABS unit encoder reception error	[Detail & Cause] A response could not be received in a normal condition when an absolute unit encoder command was issued. [Countermeasure] • Turn on the power to the simple absolute unit before (or at the same time as) turning on the controller. • Check if any noise influence or cable breakage.
	630	Update system code error (Detected by the application)	The update system code is invalid.
	631	Update unit code error (Detected by the application)	The update unit code is invalid.
	632	Update device number error (Detected by the application)	The update device number is invalid.
	635	Deadman/enable switch requiring reset recovery open	Reset the deadman/enable switch, and then reconnect the power.
	636	Serial encoder command busy error	The system was busy when the serial encoder command was issued.
	637	Serial encoder command timeout error	Completion of the serial encoder command cannot be confirmed after the specified time.
	643	Encoder resolution division error	Check “Axis-specific parameter No. 43: Encoder division ratio.”
	646	Encoder EEPROM read busy error	The encoder is faulty or an encoder communication failure occurred.
	647	Encoder EEPROM write address mismatch error	The encoder is faulty or an encoder communication failure occurred.
	648	Encoder EEPROM read address mismatch error	The encoder is faulty or an encoder communication failure occurred.
	649	Undefined serial encoder installation error	Installation of serial encoder is not defined.
	64A	Undefined serial encoder command error	The serial encoder command is not defined.

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	Error No.	Error name	Description, action, etc.
Cold-start level errors	650	Encoder receive timeout error (during initialization communication)	An encoder communication failure.
	66D	Slave communication target ID error	The target ID of slave communication is invalid.
	66E	Slave communication block number error	The block number of slave communication is invalid.
	671	Encoder control data error	[Detail & Cause] The encoder control data is invalid or cannot be acquired. [Countermeasure] Reboot the power. In case the error occurs even after power reboot for several times, contact IAI.
	672	Motor control relevance data error	[Detail & Cause] There is an error in the motor control related data. This error can occur when the controller main CPU firmware is not applicable for the data related to the motor control indicated in the driver card parameters. [Countermeasure] Check the settings in the driver card parameters.
	683	Axis Operation Error during System Semi-Closing (Encoder Stop)	[Detail & Cause] It was attempted to make an operation such as servo-ON, absolute reset and so on during the system semi-closing (encoder stop). [Countermeasure] Reboot the power or execute the software reset.
	685	I/O function selection port number error	The I/O port number setting specified for a given I/O function selection is invalid. Check the settings of I/O parameter Nos. 62 to 65, 76, 77, 283 to 330, etc. e.g. • A value out of the range of input and output port numbers is set. • Input and output port number is duplicated.
	690	Motor overcurrent error	[Detail & Cause] The output current on power supply circuit rose extremely high. [Countermeasure] It would not ordinary happen. Insulation degradation on the motor coil or malfunction of the controller can be concerned. Contact IAI.
	69C	Parameter control domain sum check error	[Detail & Cause] An error was detected in the parameter data stored in the flash ROM. [Countermeasure] The parameter data will be initialized. Contact IAI in case the same error occurs even after flash ROM writing is conducted.
	69D	Parameter control domain ID error	[Detail & Cause] An error was detected in the parameter data stored in the flash ROM. [Countermeasure] The parameter data will be initialized. Contact IAI in case the same error occurs even after flash ROM writing is conducted.

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	Error No.	Error name	Description, action, etc.
Cold-start level errors	69E	Position data control domain sum check error	[Detail & Cause] An error was detected in the position data. Contents in Info.1 in the error list show the data domain the error was detected. Info.1 = 1: Data stored in the flash ROM (from No. 10001) Info.1 = 2: Data stored in the retention memory (from No. 1 to 10000) In this case, the error will also occur when the power is accidently turned off during memory initialization. [Countermeasure] The position data will not be initialized even if an error is detected. To cancel the error, have the data initialized. Also conduct the flash ROM writing if the error was detected in the flash ROM domain. Contact IAI in case the same error occurs even after initializing (flash ROM writing).
	69F	Position data control domain ID error	[Detail & Cause] An error was detected in the position data. Contents in Info.1 in the error list show the data domain the error was detected. Info.1 = 1: Data stored in the flash ROM (from No. 10001) Info.1 = 2: Data stored in the retention memory (from No. 1 to 10000) [Countermeasure] The position data will not be initialized even if an error is detected. To cancel the error, have the data initialized. Also conduct the flash ROM writing if the error was detected in the flash ROM domain. Contact IAI in case the same error occurs even after initializing (flash ROM writing).
	6BB	Deviation overflow error (when home return is not yet completed)	[Detail & Cause] The command cannot be performed. The electrical angle may be inconsistent. [Countermeasure] Check for operational interference, locking, wiring, encoder, motor, etc.
	6BC	Stop deviation overflow error (when home return is not yet completed)	[Detail & Cause] The actuator may have moved while stationary due to an external force or its operation may have been locked during deceleration. This error may also occur when the operation is locked while jogging (due to contact with an obstacle, contact with the mechanical end while jogging before home return, etc.) or as a result of wiring error, encoder failure or motor failure occurring during deceleration. The electrical angle may be inconsistent. [Countermeasure] Check for operational interference, locking, wiring, encoder, motor, etc.

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	Error No.	Error name	Description, action, etc.
Cold-start level errors	6BF	Position data sum check error	[Detail & Cause] An error was detected in the position data. Contents in Info.1 in the error list show the data domain the error was detected. Info.1 = 1: Data stored in the flash ROM (from No. 10001) Info.1 = 2: Data stored in the retention memory (from No. 1 to 10000) [Countermeasure] The position data will not be initialized even if an error is detected. To cancel the error, have the data initialized. Also conduct the flash ROM writing if the error was detected in the flash ROM domain. Contact IAI in case the same error occurs even after initializing (flash ROM writing).
	6C7	SEL global data control domain sum check error	[Detail & Cause] An error was detected in SEL global data stored in the retention memory. This may occur also when the power is accidently turned off during the initialization of SEL global data. [Countermeasure] SEL global data will not be initialized even if an error is detected. To cancel the error, have the data initialized. Contact IAI in case the same error occurs even after initializing.
	6C8	SEL global data control domain ID error	[Detail & Cause] An error was detected in SEL global data stored in the retention memory. [Countermeasure] SEL global data will not be initialized even if an error is detected. To cancel the error, have the data initialized. Contact IAI in case the same error occurs even after initializing.
	6C9	SEL global data sum check error	[Detail & Cause] An error was detected in SEL global data stored in the retention memory. [Countermeasure] SEL global data will not be initialized even if an error is detected. To cancel the error, have the data initialized. Contact IAI in case the same error occurs even after initializing.

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	Error No.	Error name	Description, action, etc.
Secret level errors	801	SCIF overrun status (IAI protocol reception)	Communication failure. Check for noise, connected equipment and communication setting.
	802	SCIF receive ER status (IAI protocol reception)	Communication failure. Check for noise, shorted/disconnected communication cable, connected equipment and communication setting. This error will also occur when establishing communication with the PC/TP wrongly connected to SIO-CH1 being opened to the user.
	803	Receive timeout status (IAI protocol reception)	The transfer interval after the first received byte is too long. Possible causes include disconnected communication cable and error in the connected equipment.
	804	SCIF overrun status (SEL reception)	Communication failure. Check for noise, connected equipment and communication setting.
	805	SCIF receive ER status (SEL reception)	Communication failure. Check for noise, shorted/disconnected communication cable, connected equipment and communication setting.
	806	SCIF receive ER status due to other factor (SEL reception)	Communication failure. Take the same action specified for error No. 804 or 805.
	807	Drive-source cutoff relay ER status	The motor-drive power ON status remains ON even when the drive source is cut off. The drive-source cut-off relay contacts may have been melted.
	808	Power OFF status during slave parameter write	The power was turned off while writing slave parameters.
	809	Power OFF status during data write to flash ROM	The power was turned off while writing data to the flash ROM.
	80F	Ethernet control status 1	Ethernet control information (For analysis)
	810	Ethernet control status 2	Ethernet control information (For analysis)
	811	Maintenance information 1	Maintenance information (For analysis)
	812	Maintenance information 2	Maintenance information (For analysis)
	813	Maintenance information 3	Maintenance information (For analysis)
	814	Maintenance information 4	Maintenance information (For analysis)
	815	Maintenance information 5	Maintenance information (For analysis)
	821	Tracking System Adjustment Type Indication Error	Indication of tracking system adjustment type is not appropriate. Indicate only the acceptable type. * This is an error generated only on MSEL-PC/PG/PCF/PGF
	824	Controller power-on log	It is the log for time when the controller power is turned on. (not error)
	825	Controller software reset log	It is the log for time of controller software reset. (not error)
	826	Power OFF status during memory initializing	[Detail & Cause] It was detected the power was turned off while in the operation to initialize the memory. As the initializing process was interrupted, there may be a risk the memory data error has been occurred. [Countermeasure] Conduct the memory initialization again.

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	Error No.	Error name	Description, action, etc.
Message level errors	900	Blank step shortage error	There are not enough blank steps to save step data. Provide enough blank steps needed to save step data.
	901	Step number error	The step number is invalid.
	902	Symbol-definition table number error	The symbol-definition table number is invalid.
	903	Position number error	The position number is invalid.
	904	Variable number error	The variable number is invalid.
	905	Flag number error	The flag number is invalid.
	906	I/O port/flag number error	The I/O port/flag number is invalid.
	90A	Rejection error during servo-ON	[Detail & Cause] Process unacceptable while the servo is turned ON was held. [Countermeasure] Conduct it after the servo is turned OFF.
	90B	Rejection error when motor magnetic pole not detected	[Detail & Cause] • The motor magnetic pole was not detected. [Countermeasure] • Check for interference or restriction in operation, wires, encoders or motor.
	910	Command error (IAI protocol HT reception)	The command ID is not supported or invalid. (For future expansion)
	911	Message conversion error (IAI protocol HT reception)	The transmitted message does not match the message format or contains invalid data. (For future expansion)
	912	PC/TP servo-movement command acceptance-enable input OFF error	Any axis movement command issued to the axis specified in I/O parameter No. 78 from the PC/TP will not be accepted while the input port specified in I/O parameter No. 77 is OFF. (Important: The acceptance-enable input port will become invalid once the operation is started.)
	913	Multiple-program simultaneous start prohibition error	Starting of multiple programs is prohibited.
	916	Non-mounted device indication error	The indicated device is not mounted.
	930	Coordinate system number error	The coordinate system number is invalid.
	931	Coordinate system type error	The coordinate system type is invalid.
	932	Coordinate system definition data count-specification error	The specified number of coordinate system definition data is invalid.
	933	Axis number error	The axis number is invalid.
	935	Positioning operation type error	There is an error in the SCARA ABS reset special movement operation type.
	936	Simple interference check zone number error	The positioning operation type is invalid. * It is an error only for SCARA
	938	Simple interference check zone data count-specification error	The simple contact check zone number is invalid. * It is an error only for SCARA
	939	Detection of entry into simple interference check zone (Message level specification)	The specified number of simple contact check zone data is invalid. * It is an error only for SCARA
	93A	R- axis CP Job forbidden error out of operation range (When tool XY offset is valid)	Move each axis into the operation range with JOG operation. * It is an error only for SCARA

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	Error No.	Error name	Description, action, etc.
Message level errors	A04	System mode error at core update	[Detail & Cause] An update command was received when the system was not in the core update mode. [Countermeasure] Establish the setting in the update mode for core part. (For maintenance)
	A05	Motorola S record format error	The update program file is invalid. Check the file.
	A06	Motorola S checksum error	The update program file is invalid. Check the file.
	A07	Motorola S load address error	The update program file is invalid. Check the file.
	A08	Motorola S write address over error	The update program file is invalid. Check the file.
	A09	Flash-ROM timing limit over error (Write)	Error writing the flash ROM
	A0A	Flash-ROM timing limit over error (Erase)	Error erasing the flash ROM
	A0B	Flash-ROM verify error	Error erasing/writing the flash ROM
	A0C	Flash-ROM ACK timeout	Error erasing/writing the flash ROM
	A0D	Head sector number specification error	Error erasing the flash ROM
	A0E	Sector count specification error	Error erasing the flash ROM
	A0F	Write-destination offset address error (Odd-numbered address)	Error writing the flash ROM
	A10	Write-source data buffer address error (Odd-numbered address)	Error writing the flash ROM
	A11	Invalid core-code sector block ID error	The core program already written to the flash ROM is invalid.
	A12	Core-code sector block ID erase count over	The number of times the flash ROM can be erased was exceeded.
	A13	Flash-ROM write request error when erase is incomplete	When updating, a flash-ROM write command was received before a flash-ROM erase command. Check the update program file and perform update again.
	A14	Busy-status reset timeout error at EEPROM write	A busy-status reset timeout occurred after executing EEPROM write.
	A15	EEPROM write request error due to no-EEPROM in target	An EEPROM write request was received for a driver or other unit with CPU not equipped with EEPROM.
	A16	EEPROM read request error due to no-EEPROM in target	An EEPROM read request was received for a driver or other unit with CPU not equipped with EEPROM.
	A17	Message checksum error (IAI protocol reception)	The checksum in the received message is invalid.
	A18	Message header error (IAI protocol reception)	The header in the received message is invalid. Invalid header position (message is 9 bytes or less) is suspected, among other reasons.
	A19	Message station number error (IAI protocol reception)	The station number in the received message is invalid.
	A1A	Message ID error (IAI protocol reception)	The ID in the received message is invalid.
	A1C	Message conversion error	The transmitted message does not match the message format or contains invalid data. Check the transmitted message.
	A1D	Start mode error	A start not permitted in the current mode (MANU/AUTO) was attempted.

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	Error No.	Error name	Description, action, etc.
Message level errors	A1E	Start condition non-satisfaction error	Start was attempted when the start condition was not satisfied, such as when an all-operation-cancellation factor (see the 7-segment display: Drive-source cutoff, mode switching, error, auto-start switch OFF edge, deadman switch, safety gate, emergency stop, etc.) was present or the flash ROM was being written.
	A1F	Axis duplication error (SIO • PIO)	The applicable axis is currently in use.
	A20	Servo-control-right acquisition error (SIO • PIO)	The servo control right is not available.
	A21	Servo-control-right duplicate-acquisition error (SIO • PIO)	The servo control right has already been acquired.
	A22	Servo-control-right non-acquisition error (SIO • PIO)	An attempt to retain the servo control right has failed.
	A25	Step count specification error	The specified number of steps is invalid.
	A26	Program count specification error	The specified number of programs is invalid.
	A27	Program non-registration error	The applicable program is not registered.
	A28	Reorganization disable error during program run	A program-area reorganization operation was attempted while a program was running. End all active programs first.
	A29	Active-program edit disable error	An edit operation was attempted to a program currently not running. End the applicable program first.
	A2A	Program inactive error	The specified program is not running.
	A2B	Program-run command refusal error in AUTO mode	Programs cannot be run from the TP/PC software connector in the AUTO mode.
	A2C	Program number error	The program number is invalid.
	A2D	Inactive program resumption error	A resumption request was received for a program currently not running.
	A2E	Inactive program pause error	A pause request was received for a program currently not running.
	A2F	Breakpoint error	The step number specified as a breakpoint is invalid.
	A30	Breakpoint setting-count specification error	The number of breakpoints to be set exceeds the limit value.
	A31	Parameter change value error	The value of parameter changed is invalid.
	A32	Parameter type error	The parameter type is invalid.
	A33	Parameter number error	The parameter number is invalid.
	A34	Card-parameter buffer read error	Error reading the card-parameter buffer
	A35	Card-parameter buffer write error	Error writing the card-parameter buffer
	A36	Parameter change refusal error during operation	Parameters cannot be changed during operation (Program is running, servo is in use, etc.).
	A37	Card manufacturing/function information change refusal error	The card manufacturing/function information cannot be changed.
	A38	Parameter change refusal error during servo ON	An attempt was made to change a parameter whose change is not permitted while the servo is ON.
	A39	Non-acquired card parameter change error	An attempt was made to change a parameter for a card not recognized at reset.
	A3A	Device number error	The device number is invalid.
	A3C	Memory initialization type specification error	The specified memory initialization type is invalid.
	A3D	Unit type error	The unit type is invalid.
	A3E	SEL write data type specification error	The specified SEL write data type is invalid.
	A3F	Flash-ROM write refusal error during program run	The flash ROM cannot be written while a program is running.

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	Error No.	Error name	Description, action, etc.
Message level errors	A40	Data change refusal error during flash ROM write	Data cannot be changed while the flash ROM is being written.
	A41	Duplicate flash-ROM write commands refusal error	Another flash-ROM write command was received while the flash ROM was being written.
	A42	Direct monitor prohibition error during flash ROM write	Direct monitor is prohibited while the flash ROM is being written.
	A43	P0/P3-area direct monitor prohibition error	Direct monitor in the P0/P3 areas is prohibited.
	A44	Position-data count specification error	The specified number of position data is invalid.
	A45	Symbol-record count specification error	The specified number of symbol records is invalid.
	A46	Variable-data count specification error	The specified number of variable data is invalid.
	A48	Error-detail query type 1 error	Error-detail query type 1 is invalid.
	A49	Error-detail query type 2 error	Error-detail query type 2 is invalid.
	A4B	Monitoring-record count specification error	The specified number of records for monitoring data query is invalid.
	A4E	Parameter register busy error at issuance of slave command	The driver special command ACK generated a timeout at issuance of a slave command.
	A4F	Software reset refusal error during operation	Software reset (SIO) is prohibited during operation (program is running, servo is in use, etc.).
	A50	Drive-source recovery request refusal error	The drive-source cutoff factor (error, deadman switch, safety gate, emergency stop, etc.) has not been removed.
	A51	Operation-pause reset request refusal error	The all-operation-pause factor (drive-source cutoff, operation-pause signal, deadman switch, safety gate, emergency stop, etc.) has not been removed.
	A53	Refusal error due to servo ON	A processing not permitted during servo ON was attempted.
	A54	Refusal error due to unsupported function	The function is not supported.
	A55	Refusal error due to exclusive manufacturer function	A processing not opened to users other than the manufacturer was attempted.
	A56	Refusal error due to invalid data	The data is invalid.
	A57	Program start duplication error	An attempt was made to start a program currently running.
	A58	BCD error warning	The BCD value being read may be invalid, or the value being written (variable 99) may be a negative value, among other reasons.
	A59	IN/OUT command port flag error warning	The number of I/O ports (flags) may have exceeded 32, among other reasons. Check the I/O port (flag) specifications.
	A5B	Character-string → value conversion error warning	The specified number of converting characters is invalid or characters that cannot be converted to value are included.
	A5C	Copying-character count error warning with SCPY command	The specified number of copying characters is invalid.
	A5D	SCIF open error in non-AUTO mode	The channel was opened in a non-AUTO mode. In the MANU mode, the PC/TP connection must be forcibly disconnected before opening the serial channel opened to the user. Exercise caution.
	A5E	I/O-port/flag count specification error	The specified number of I/O ports/flags is invalid.
	A5F	Fieldbus error (LERROR-ON)	A LERROR-ON was detected.
	A60	Fieldbus error (LERROR-BLINK)	A LERROR-BLINK was detected.
	A61	Fieldbus error (HERROR-ON)	A HERROR-ON was detected.

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	Error No.	Error name	Description, action, etc.
Message level errors	A62	Fieldbus error (HERROR-BLINK)	A HERROR-BLINK was detected.
	A64	SCIF overrun error (SIO bridge)	Communication failure. Check for noise, connected equipment and communication setting.
	A65	SCIF receive error (SIO bridge)	Communication failure. Check for noise, shorted/disconnected communication cable, connected equipment and communication setting.
	A66	SCI overrun error (SIO bridge)	Communication failure. Check for noise, circuit failure and slave card.
	A67	SCI framing error (SIO bridge)	Communication failure. Check for noise, shorting, circuit failure and slave card.
	A68	SCI parity error (SIO bridge)	Communication failure. Check for noise, shorting, circuit failure and slave card.
	A69	Data change refusal error during operation	An attempt was made to change data whose change is prohibited during operation (program is running, servo is in use, etc.).
	A6A	Software reset refusal error during write	Software reset is prohibited while data is being written to the flash ROM or slave parameters are being written.
	A6B	Fieldbus error (FBRS link error)	A FBRS link error was detected.
	A6C	PC/TP start command refusal error in AUTO mode	Starting from the PC software/TP connector is prohibited in the AUTO mode.
	A6D	P0/P3/FROM-area direct write prohibition error	Direct write to the P0/P3/FROM areas is prohibited.
	A6E	Refusal error during write	A processing not permitted while data is being written to the flash ROM or slave parameters are being written was attempted.

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	Error No.	Error name	Description, action, etc.
Operation-cancellation level errors	B00	SCHA setting error	The setting of SCHA command is invalid.
	B01	TPCD setting error	The setting of TPCD command is invalid
	B02	SLEN setting error	The setting of SLEN command is invalid.
	B03	Home-return method error	The setting of “Axis-specific parameter No. 10, Home-return method” is invalid. (Not incremental encoder AND current position 0 home is specified, etc.)
	B04	1-shot-pulse output excessive simultaneous use error	The number of BTPN and BTPF timers operating in one program simultaneously exceeds the upper limit (16).
	B05	Estimate-stroke over error at home return	The operation at home return exceeded the estimate stroke.
	B0E	ABS encoder multi-rotation error	[Detail & Cause] The multi-rotation of the encoder is inconstant. There is a concern that the absolute reset has not been conducted or the absolute data has been lost. [Countermeasure] Conduct the absolute reset.
	B0F	ABS encoder counter overflow error	[Detail & Cause] The multi-rotation counter on the encoder has exceeded the upper limit. [Countermeasure] Check such a thing as if the soft limit of Axis Specific Parameter No. 7 and 8 are set to encoder and the multiple rotation count is in the available range.
	B10	Z-phase search timeout error	Z-phase cannot be detected. Check in restriction on operation, wiring, motor, and so on.
	B11	Home position sensor escape timeout error	Escape from the home position sensor cannot be confirmed. Check in restriction on operation, wiring, motor, home position and so on.
	B12	Storage variable number error for SEL command return code	Storage variable number error for SEL command return code
	B15	Input-port debug filter type error	The setting of input-port debug filter type is invalid.
	B16	SEL operand specification error	The operand specification of SEL command is invalid
	B17	Parameter register busy error at issuance of slave command	The driver special command ACK generated a timeout at issuance of a slave command.
	B18	Device number error	The device number is invalid.
	B19	Unit type error	The unit type is invalid
	B1A	ABS reset indication error	There is an error in the selection in the ABS reset. (Ex: Simultaneous selection of two or more axes, or selection of the axis except for that of the ABS encoder, the version of the PC software or teaching pendant is old, etc.)
	B1B	Ethernet non-closed socket open error	An attempt was made to open a socket without closing it first.
	B1C	Ethernet in-use-by-other-task error	An attempt was made to open a channel already opened by other task.
	B1D	Ethernet non-open error	An attempt was made to use a channel not opened by own task.
	B1E	Ethernet multiple WRIT execution error	WRIT commands were executed simultaneously in multiple tasks for the same channel, or a WRIT command had failed (due to a communication error, etc.) and then was retried without executing a CLOS command → OPEN command first.
	B1F	Ethernet job busy error	An attempt was made to start a new process when the Ethernet mailbox control job was busy.

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	Error No.	Error name	Description, action, etc.
Operation-cancellation level errors	B20	Ethernet non-initialization device use error	An attempt was made to use the Ethernet system when Ethernet device initialization was not yet complete. Check I/O parameter Nos. 123 to 159, 14, 15, etc., depending on the purpose of use.
	B21	Ethernet IP address error	An error will generate under the following conditions during normal use. When IP address (H) (first octet) through IP address (L) (fourth octet) are given as IP_H, IP_MH, IP_ML and IP_L, the error conditions are described as follows: IP_H ≤ 0 or IP_H = 127 or IP_H > 255 or IP_MH < 0 or IP_MH > 255 or IP_ML < 0 or IP_ML > 255 or IP_L ≤ 0 or IP_L ≥ 255 Check I/O parameter Nos. 132 to 135, 149 to 152, and 154 to 157, the IP address of connection destination specified by an IPCN command in an integer variable, or the like.
	B22	Ethernet port number error	An error will generate if own port number < 1025, or own port number > 65535, or own port number duplication, or connection-destination port number for client ≤ 0, or connection-destination port number for client > 65535, or connection-destination port number for server < 0, or connection-destination port number for server > 65535 is satisfied. Check I/O parameter Nos. 144 to 148, 159, 153, and 158, the port number of connection destination specified by an IPCN command in an integer variable, or the like.
	B25	Driver unsupported function error	It is a function the driver part does not support. Check the driver applicable version.
	B26	Ethernet communication mode error	A communication mode error.
	B27	Vision System Indication Error	The vision system I/F intended to be used is different from the vision system I/F in use. Cancel (SLVS Command Operation 1 [0]) the vision system I/F in use and then indicate the vision system I/F to be used. * This is an error generated only on MSEL-PC/PG/PCF/PGF
	B28	Vision System I/F Initialization Incomplete Error	Initialization of the vision system I/F is incomplete. Check in I/O Parameter No. 160 to 164, 351 to 357, All Axes Parameter No. 121, etc. * This is an error generated only on MSEL-PC/PG/PCF/PGF
	B29	Vision System I/F Other Task in Use Error	The indicated vision system I/F is in use in another task. * This is an error generated only on MSEL-PC/PG/PCF/PGF
	B2A	Vision System I/F Capturing Position Error	The position of Z-axis in calibration and the position when capturing are different. When the camera is fixed on the robot, it is necessary that the position of Z-axis in calibration and when capturing are the same. Check the positions at calibration and in capturing, All Axes Common Parameter No. 130 Bit 0 to 7 Judgment Distance and so on. * This is an error generated only on MSEL-PC/PG/PCF/PGF
	B44	Load mass setting error	The load mass exceeds the maximum loading capacity of the robot. Check the set mass. * It is an error only for SCARA
	B4B	“Load mass change prohibited while servo is in use” error	The load mass currently used by the servo system cannot be changed. * It is an error only for SCARA

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	Error No.	Error name	Description, action, etc.
Operation-cancellation level errors	B4D	Arm system setting error	There is an error in the setting of the arm system. When the target arm system data is set to the position to make SCARA CP operation (such as linear support and arc support operations), the current arm system and the target arm system of position will differ from each other. In such a case, make the current arm system and the target arm system of position the same. * It is an error only for SCARA
	B4E	Position gain switchover error	The position gain could not get switched. The followings are concerned as the cause; • Position gain switchover was tried on such axis as in operation or in pressing. • Program was terminated during position gain switchover. • The actuator cannot be remained in the positioning band due to the generation of vibration. etc.
	B70	Coordinate system definition data sum check error	The coordinate system definition data is destroyed.
	B71	Coordinate system number error	The coordinate system number is invalid.
	B72	Coordinate system type error	The coordinate system type is invalid.
	B73	Coordinate system data change forbidden error during servo use	The coordinate system data the servo is currently using is forbidden to change.
	B74	CP operation limit band violation error (PTP, jog available for each axis)	There was an invasion detected in the CP operation limit band. PTP operation and job operation of each axis are available. * It is an error only for SCARA
	B75	Singularity calculation error	CP calculation cannot be conducted as it is the singularity. Check if there is any problem to the coordinates due to such as the 2nd arm home position. * It is an error only for SCARA
	B77	Current arm system setting error	The arm system to be set and the 2nd arm actual angle do not match with each other, or coordinates are not defined. * It is an error only for SCARA
	B78	Current arm system undefined error	Current arm system is not defined yet. * It is an error only for SCARA
	B79	R- axis servo-OFF detection error during posture control adjustment	It was detected that the servo has been turned OFF on the R-axis during the posture control adjustment. * It is an error only for SCARA
	B7B	Target track error in keep-out area at back	The target position or the track of the movement is in the keep-out area at the back side. * It is an error only for SCARA
	B7C	Target track error in CP operation limit band (PTP, jog available for each axis)	The target position or the track of the movement is in CP operation limit band. PTP operation and job operation of each axis are available. * It is an error only for SCARA
	B7D	Physically unfeasible target error	Unrealistic target considering the construction of the lengths of the 1st and 2nd arms was indicated. Check “Each Axis Parameter No. 138 Arm Length” and the target value. * It is an error only for SCARA
	B7F	Servo use purpose error	The purpose of the servo use is not ordinary.
	B80	Indication prohibited axes error	It is an axis forbidden to indicate. Set an axis that is available to indicate.

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	Error No.	Error name	Description, action, etc.
Operation-cancellation level errors	B81	Each axis PTP multiple axes indication error	Each axis PTP operation on multiple axes was indicated. Each axis PTP operation is available to indicate only one axis. * It is an error only for SCARA
	B82	Jog multiple axes indication error	Jog and inching operations are indicated on several axes. Jog and inching operations are available only on one axis.
	B84	Arm length error	There is an error in the arm length. Check in “Each Axis Parameter No. 138 Arm Length”. * It is an error only for SCARA
	B85	Operation start position acquirement error in application servo use work area	The operation start position in the application servo use work area cannot be acquired.
	B86	SEL PTRQ command preprocessing error	The PTRQ command setting is abnormal. Check the setting for abnormality, such as deviation from the allowable range.
	B87	Target tracking in tool datum point keep-out circle error	The target position or the track of the movement is in the tool datum point keep-out circle. * It is an error only for SCARA
	B88	Logic error in effective target data calculation	Internal logic error has been issued during effective target data calculation.
	B89	SCARA CP logic error	Internal logic error was detected during SCARA CP process. * It is an error only for SCARA
	B8C	Simple interference check zone violation detection (Operation cancel level indication)	There was an invasion detected in the simple interference check zone. (Operation cancel level indication) * It is an error only for SCARA
	B8F	Positioning time calculation error	Positioning time calculation error was occurred. * It is an error only for SCARA
	B90	Transmit distance calculation error	Transmit distance calculation error was occurred. * It is an error only for SCARA
	B91	Main excessive speed demand error	Excessive speed is demanded. It may also occur when passing near the singularity in CP Operation. In CP Operation, avoid passing near the singularity when in programming. It may also be avoided by decreasing the indicated speed. * It is an error only for SCARA

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	Error No.	Error name	Description, action, etc.
Operation-cancellation level errors	C02	Executable program count over error	Execution requests were received for programs exceeding the number that can be executed simultaneously.
	C03	Non-registered program specification error	The specified program is not registered.
	C04	Program entry point non-detection error	A request was made to execute a program number for which no program steps are registered.
	C05	Program first-step BGSR error	The program specified for execution starts with BGSR.
	C06	Executable step non-detection error	The program specified for execution does not contain executable program steps.
	C07	Subroutine non-definition error	The subroutine specified for call is not defined.
	C08	Subroutine duplicate-definition error	The same subroutine number is defined at multiple locations.
	C0A	Tag duplicate-definition error	The same tag number is defined at multiple locations.
	C0B	Tag non-definition error	The tag specified as the jump destination of a GOTO statement is not defined.
	C0C	DW/IF/IS/SL pair-end mismatch error	The branching command syntax is invalid. Correspondence with the last appearing branching command is invalid when EDIF, EDDO or EDSL is used. Check the correspondence between IF/IS command and EDIF, DO command and EDDO or SLCT command and EDSL
	C0D	DW/IF/IS/SL no pair-end error	EDIF, EDDO or EDSL is not found. Check the correspondence between IF/IS command and EDIF, DO command and EDDO or SLCT command and EDSL.
	C0E	BGSR no pair-end error	There is no EDSR for BGSR, or no BGSR for EDSR. Check the correspondence between BGSR and EDSR.
	C0F	DO/IF/IS over-nesting error	The number of nests in a DO or IF/IS command exceeds the limit value. Check for excessive nesting or branching out of or into the syntax using a GOTO command.
	C10	SLCT over-nesting error	The number of nests in a SLCT command exceeds the limit value. Check for excessive nesting or branching out of or into the syntax using a GOTO command.
	C11	Subroutine over-nesting error	The number of nests in a subroutine exceeds the limit value. Check for excessive nesting or branching out of or into the syntax using a GOTO command.
	C12	DO/IF/IS under-nesting error	The EDIF or EDDO position is invalid. Check the correspondence between IF/IS command and EDIF or DO command and EDDO, or branching out of or into the syntax using a GOTO command.
	C13	SLCT under-nesting error	The EDSL position is invalid. Check the correspondence between SLCT and EDSR, or branching out of or into the syntax using a GOTO command.
	C14	Subroutine under-nesting error	The EDSR position is invalid. Check the correspondence between BGSR and EDSR, or branching out of or into the syntax using a GOTO command.
	C15	SLCT next-step command code error	The program step next to SLCT must be WHEQ, WHNE, WHGT, WHGE, WHLT, WHLE, WSEQ, WSNE, OTHE or EDSL.
	C16	Create stack failed	Initialization of the input-condition-status storage stuck has failed.
	C17	Expansion-condition code error	Input program step error. The expansion condition code is invalid.
	C18	Expansion-condition LD simultaneous processing over error	The number of LDs processed simultaneously exceeds the limit value.

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	Error No.	Error name	Description, action, etc.
Operation-cancellation level errors	C19	Expansion-condition LD shortage error 1	There is not enough LD when expansion condition A or O is used.
	C1A	Expansion-condition LD shortage error 2	There is not enough LD when expansion condition AB or OB is used.
	C1C	Unused-LD detection error	An attempt was made to execute a command based on multiple LD condition that has been saved, without using it in expansion condition AB or OB.
	C1F	Input-condition CND shortage error	The necessary input condition is not found when an expansion condition is used.
	C21	Input-condition use error with input-condition prohibited command	Input-condition prohibited commands prohibit the use of input conditions.
	C22	Invalid command position error with input-condition prohibited command	A command for which input condition is prohibited cannot be included in an input condition nest.
	C23	Invalid operand error	Program step error. The necessary operand data is invalid.
	C24	Operand type error	Program step error. The operand data type is invalid.
	C25	Actuator control declaration error	The setting of actuator control declaration command is invalid.
	C26	Timer setting-range over error	The timer setting is invalid.
	C27	Timeout setting-range over error during wait	The timeout setting is invalid.
	C28	Tick count setting-range error	The Tick count setting is invalid.
	C29	DIV command divisor 0 error	“0” was specified as the divisor in the DIV command.
	C2A	SQR command range error	The operand value in the SQR command is invalid. Input a value larger than “0” as data in a SQR command.
	C2B	BCD display digit range error	The specified number of BCD display digits is invalid. Specify a value between 1 and 8.
	C2C	Program number error	The program number is invalid.
	C2D	Step number error	The step number is invalid.
	C2E	Blank step shortage error	There are not enough blank steps to save step data. Provide enough blank steps needed to save step data.
	C2F	Axis number error	The axis number is invalid.
	C30	Axis pattern error	The axis pattern is invalid.
	C32	Operating-axis addition error during command execution	An operating axis for position data was added during continuous position movement or push-motion movement calculation.
	C33	Base axis number error	The base axis number is invalid.
	C34	Zone number error	The zone number is invalid. * Cartesian axis only.
	C35	Position number error	The position number is invalid.
	C36	I/O port/flag number error	The I/O port/flag number is invalid.
	C37	Flag number error	The flag number is invalid.
	C38	Tag number error	The tag number is invalid.
	C39	Subroutine number error	The subroutine number is invalid.
	C3A	User-open communication channel number error	The channel number of the communication channel opened to the user is invalid.
	C3B	Parameter number error	The parameter number is invalid.
	C3C	Variable number error	The variable number is invalid.
	C3D	String number error	The string number is invalid.
	C3E	String-variable data count specification error	The specified number of string variables exceeds the area, etc.

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	Error No.	Error name	Description, action, etc.
Operation-cancellation level errors	C40	String-variable delimiter non-detection error	Delimiter cannot be detected in the string variable.
	C41	String-variable copy size over error	The copy size of string variable is too large.
	C42	Character count non-detection error during string processing	The character-string length is not defined in string processing. Execute a string processing command after defining the length with a SLEN command.
	C43	Character-string length error during string processing	The character-string length used in string processing is invalid. Check the value of character-string length defined by a SLEN command.
	C45	Symbol definition table number error	The symbol definition table number is invalid.
	C46	Blank area shortage error with source-symbol storage table	There is not enough area to store the source symbols. Check the number of times source symbol can be used.
	C47	Symbol search error	Definitions are not found for the symbols used in the program steps.
	C48	SIO-message continuous conversion error	The transmitted SIO message does not match the message format or contains invalid data. Check the transmitted message.
	C49	SEL-SIO in-use error	The SIO is being used by other interpreter task.
	C4A	SCIF unopen error	Serial channel 1 opened to the user is not opened in the target task. Open the channel using an OPEN command first.
	C4B	Delimiter non-definition error	An end character is not defined. Set an end character using a SCHA command first.
	C4E	SIO1 invalid usage OPEN error	The usage of serial channel opened to the user does not match the parameter. Check “I/O parameter No. 90, Usage of SIO channel opened to user.”
	C4F	SEL program/source symbol checksum error	The flash ROM data has been destroyed.
	C50	Symbol definition table checksum error	The flash ROM data has been destroyed.
	C55	Flash-ROM erase count over error for SEL global data/error lists	The number of time the flash ROM containing SEL global data/error lists can be erased was exceeded.
	C56	Timing limit over error (Flash ROM erase)	Error erasing the flash ROM
	C57	Flash-ROM verify error (Flash ROM erase)	Error erasing the flash ROM
	C58	Flash-ROM ACK timeout error (Flash ROM erase)	Error erasing the flash ROM
	C59	Head sector number specification error (Flash ROM erase)	Error erasing the flash ROM
	C5A	Sector count specification error (Flash ROM erase)	Error erasing the flash ROM
	C5B	Timing limit over error (Flash ROM write)	Error writing the flash ROM
	C5C	Flash-ROM verify error (Flash ROM write)	Error writing the flash ROM
	C5D	Flash-ROM ACK timeout error (Flash ROM write)	Error writing the flash ROM
	C5E	Flash-ROM ACK timeout error (Flash ROM write)	Error writing the flash ROM
	C5F	Write-source data buffer address error (Flash ROM write)	Error writing the flash ROM

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	Error No.	Error name	Description, action, etc.
Operation-cancellation level errors	C61	SEL-data flash-ROM erase count over error	The number of times the flash ROM containing SEL data can be erased was exceeded.
	C62	Operation command error at servo OFF	An attempt was made to execute an operation command when the servo was OFF.
	C63	Servo operation condition error	The servo is not in an operation-enabled condition.
	C64	Invalid servo acceleration/deceleration error	The internal servo acceleration/deceleration is invalid.
	C65	Servo ON/OFF logic error	The servo ON/OFF logic between the main and driver is invalid.
	C66	Axis duplication error	An attempt was made to acquire the control right to an axis already in use.
	C67	Servo-control-right acquisition error	There is no space in the servo user management area.
	C68	Servo-control-right duplicate-acquisition error	The servo control right has already been acquired.
	C69	Servo-control-right non-acquisition error	A user who doesn't have the servo control right attempted to retain the control right.
	C6A	Push-motion flag logic error	The internal logic for push-motion processing is invalid.
	C6B	Deviation overflow error	The command cannot be followed. Check for operation restriction, wiring, encoder, motor, etc.
	C6C	Movement error during absolute data acquisition	Axis movement was detected while acquiring absolute encoder data after the power was turned on. The power may have been turned or a software reset executed while the actuator was moving due to external force such as reactive force of a self-supported cable or while the installation location was vibrating. Or, a software reset may have been executed. Absolute coordinates cannot be confirmed in this condition.
	C6D	Maximum installable axes over error	The specified number of axes exceeded the number of installable axes as a result of axis shift with a base command.
	C6E	Servo-OFF axis use error	An attempt was made to use an axis whose servo is OFF.
	C6F	Home-return incomplete error	Home return has not completed yet.
	C70	Absolute coordinate non-confirmation error	[Detail & Cause] Absolute coordinates have not been confirmed. 1) The servo is not turned ON at the battery-less ABS axis for the pulse motor. 2) Operation was performed after the absolute reset without conducting the software reset or power reboot. 3) Absolute reset has not been conducted. [Countermeasure] 1) The battery-less ABS axis for the pulse motor confirms the coordinates in the first servo-ON. Turn the servo ON. 2) Execute the software reset and reboot the power. 3) Execute the software reset and reboot the power after executing the absolute reset.
	C71	Synchro slave-axis command error	A command was issued to the synchro slave axis. * Only for MSEL-PC/PG/PCF/PGF
	C73	Target-locus soft limit over error	The target position or movement locus exceeds a soft limit. * If this error occurred on a SCARA axis, the axis may not have position data.
	C74	Actual-position soft limit over error	The actual position exceeds a soft limit by the "soft limit/actual position margin" or more.

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	Error No.	Error name	Description, action, etc.
Operation-cancellation level errors	C75	Motion-data-packet generation logic error	The motion-data-packet generation logic is invalid.
	C76	Movement-position count over error	Too many packets are generated simultaneously.
	C77	Handling-packet overflow error	The servo handling packets overflowed.
	C78	Motion-data-packet overflow error	The servo motion data packets overflowed.
	C79	Pole sense operation error	Operation is disabled in the pole sense mode.
	C7A	Servo unsupported function error	An attempt was made to use an unsupported function.
	C7B	Odd-pulse slide error	Internal servo calculation error
	C7C	Odd-pulse processing logic error	Internal servo calculation error
	C7D	Packet pulse shortage error	Internal servo calculation error
	C7E	Quadratic equation solution error	An error was detected while calculating a quadratic equation solution.
	C7F	No valid specified axis error	No valid axes are specified.
	C80	Servo-packet calculation logic error	Internal servo calculation error If the controller is of absolute-encoder specification and an “Error No. C74, Actual-position soft limit over error” is also present, an absolute reset may not have been executed correctly and consequently a servo packet calculation overflow occurred due to a current position error. If this is the case, perform an absolute reset again by following the procedure specified in the operation manual. (Performing an “encoder error reset” operation in the absolute reset window alone does not allow the controller to recognize the current position correctly. Always perform an absolute reset by strictly following the specified procedure.)
	C81	Operation-amount logic during servo ON	Servo processing logic error
	C82	Servo direct command type error	Servo processing logic error
	C83	Servo calculation method type error	The servo calculation method type is invalid.
	C84	In-use axis servo OFF error	The servo of an axis currently in use (being processed) was turned off.
	C85	Non-installed driver error	Driver is not installed for the applicable axis.
	C86	Driver servo ready OFF error	The ready signal for the driver of the applicable axis is OFF.
	C87	SEL unsupported function error	An attempt was made to use a function not supported by SEL.
	C88	Speed specification error	The specified speed is invalid.
	C89	Acceleration/deceleration specification error	The specified acceleration/deceleration is invalid.
	C8B	Circle/arc calculation logic error	The arc calculation logic is invalid.
	C8D	Circle/arc calculation error	Position data that cannot be used in arc movement was specified. Check the position data.
	C8E	Position deletion error during command execution	The final position data was deleted while continuous position movement was being calculated.
	C8F	Axis operation type error	The axis operation type is invalid. Check “Axis-specific parameter No. 1, Axis operation type” and perform operation appropriate for the operation type specified.
	C90	Spline calculation logic error	The spline processing logic is invalid.
	C91	Push-motion axis multiple specification error	Two or more push-motion axes were specified.

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	Error No.	Error name	Description, action, etc.
Operation-cancellation level errors	C92	Push-motion approach distance/speed specification error	The specified push-motion approach distance/speed is invalid.
	C93	System output operation error	The user attempted a system output operation (through the port specified by I/O parameter for output function selection or the zone output port specified by axis-specific parameter).
	C94	PIO program number error	The PIO-specified program number is invalid.
	C95	AUTO program number error	The setting of “Other parameter No. 1, Auto-start program number” is invalid.
	C96	Program number error for I/O processing program at operation/program abort	The setting of “Other parameter No. 2, I/O processing program number at operation/program abort” is invalid.
	C97	Program number error for I/O processing program at operation pause	The setting of “Other parameter No. 3, I/O processing program number at all operation pause” is invalid.
	C98	PIO program number error	The PIO-specified program number is invalid.
	C99	Home position undetected error	Home position sensor cannot be detected. Check in wiring and sensors.
	C9B	Phase Z non-detection error	Phase Z cannot be detected. Check the wiring and encoder.
	C9C	Defective phase-Z position error	The phase-Z position is defective. Normal wear and tear of the mechanical ends and home sensor may also be a reason. Readjustment is necessary.
	C9D	Card parameter write error	Error writing card parameters
	C9E	Servo calculation overflow error	Internal servo calculation error
	CA3	Slave setting data out-of-range error	The data set to the slave is outside the allowable range.
	CA4	Slave error response	An error response was returned from the slave.
	CA5	Stop deviation overflow error	Movement may have occurred during stopping due to external force or operation may have been restricted during deceleration. This error may also generate when jog operation is restricted (due to contact with an obstacle, contact with a mechanical end before home return, etc.) or when wiring error, faulty encoder or faulty motor is detected during deceleration.
	CA6	Palletizing number error	The specified palletizing number is invalid.
	CA7	Setting error of even-numbered row count for palletizing zigzag	The set even-numbered row count for palletizing zigzag is invalid.
	CA8	Setting error of palletizing pitches	The set palletizing pitches are abnormal.
	CA9	Setting error of placement points in palletizing-axis directions	The set X/Y-axis direction counts for palletizing are invalid.
	CAA	Palletizing PASE/PAPS non-declaration error	Neither PASE or PAPS palletizing-setting command is set. Set either command.
	CAB	Palletizing position number error	The specified palletizing position number is invalid.
	CAC	Palletizing position number setting over	The specified palletizing position number exceeds the position number range calculated for the current palletizing setting.
	CAD	Palletizing PX/PY/PZ-axis duplication error	Any two of the specified PX, PY and PZ-axes for palletizing are the same axis.
	CAE	Insufficient valid axes for palletizing 3-point teaching position data	The number of valid axes is insufficient in the position data for palletizing 3-point teaching. Axes to comprise the palletizing PX/PY planes cannot be specified.
	CAF	Excessive valid axes for palletizing 3-point teaching position data	The number of valid axes is excessive in the position data for palletizing 3-point teaching. Axes to comprise the palletizing PX/PY planes cannot be specified.

In the panel window, the error numbers follow E in the display.

	Error No.	Error name	Description, action, etc.
Operation-cancellation level errors	CB0	Mismatched valid axes for palletizing 3-point teaching position data	The valid axis patterns do not match in the position data for palletizing 3-point teaching.
	CB1	Offset setting error at palletizing 3-point teaching	Zigzag offset (not zero) cannot be set in palletizing 3-point teaching, if the reference point is the same as the end point of the PX-axis.
	CB2	BGPA/EDPA pair-end mismatch error	The BGPA/EDPA syntax is invalid. EDPA was declared before BGPA, or another BGPA was declared after BGPA without first declaring EDPA.
	CB4	Arch-motion Z-axis non-declaration error	Z-axis has not been declared by PCHZ or ACHZ.
	CB5	BGPA non-declaration error during palletizing setting	Palletizing setting cannot be performed without first declaring BGPA. Declare BGPA.
	CB6	Palletizing point error	The palletizing points are invalid (non-Z-axis components are absent, etc.).
	CB7	Arch-trigger non-declaration error	Declare arch triggers using PTRG or ATRG.
	CB8	No 3-point teaching setting error at palletizing angle acquisition	The palletizing angle cannot be acquired until setting by palletizing 3-point teaching is complete.
	CB9	PX/PY-axis indeterminable error at palletizing angle acquisition	Angle cannot be calculated because there are too many valid axes in the 3-point teaching data and thus PX/PY-axes cannot be specified.
	CBA	Reference-axis/PY/PY-axis mismatch error at palletizing angle acquisition	Angle cannot be calculated because the reference axis for angle calculation is neither of the axes comprising the PX/PY-axes as set by 3-point teaching.
	CBB	Reference-point/PX-axis end-point duplication error at palletizing angle acquisition	Angle cannot be calculated because the reference point of 3-point teaching is the same as the PX-axis end-point data other than the PZ-axis component and thus arc tangent cannot be calculated.
	CBC	Palletizing motion calculation error	Trapezoid control calculation error for palletizing motion
	CBD	MOD command divisor 0 error	“0” was specified as the divisor in the MOD command.
	CBE	Target-locus boundary over error	The target position or movement locus exceeded the positioning boundary in the infinite-stroke mode. * Cartesian axis only.
	CBF	Positioning distance overflow error	The positioning distance is too large.
	CC0	Axis mode error	The axis mode is invalid.
	CC1	Speed change condition error	An attempt was made to change the speed of an axis whose speed cannot be changed (axis operating in S-motion, etc.).
	CC2	Driver parameter list number error	The driver parameter list number is invalid.
	CC3	Angle error	The angle is invalid.
	CC4	SEL data error	The SEL data is invalid.
	CC5	Positioning boundary pull-out error	An attempt was made to execute a command not permitted outside the positioning boundary
	CC6	Driver error primary detection	A driver error was found by primary detection.
	CC7	Palletizing movement PZ-axis pattern non-detection error	PZ-axis component is not found in the axis pattern during palletizing movement.
	CC8	Arch top Z-axis pattern non-detection error	Z-axis component relating to the highest point of arch motion is not found in the axis pattern during arch motion operation.
	CC9	Arch trigger Z-axis pattern non-detection error	Z-axis component relating to arch motion is not found in the axis pattern of the arch-trigger declaration point data.

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	Error No.	Error name	Description, action, etc.
Operation-cancellation level errors	CCA	Arch top/end-point reversing error	The coordinates of highest point and end point are reversed during arch motion operation.
	CCB	Arch start-point/trigger reversing error	The coordinates of start point and start-point arch trigger are reversed during arch motion operation.
	CCC	Arch end-point/trigger reversing error	The coordinates of end point and end-point arch trigger are reversed during arch motion operation.
	CCD	Drive-source cutoff axis use error	An attempt was made to use an axis whose drive source is cut off.
	CCE	Error axis use error	An attempt was made to use an axis currently generating an error.
	CCF	Palletizing reference-point/ valid-axis mismatch error	The PX/PY (/PZ)-axes set by PASE/PCHZ are not valid in the axis pattern of the reference-point data set by PAST.

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	Error No.	Error name	Description, action, etc.
Cold-start level errors	D03	Encoder count error	Faulty encoder or defective encoder assembly condition is suspected.
	D05	Encoder-EEPROM write acceptance error	The encoder is faulty or failure occurred in the encoder communication.
	D07	Driver logic error	The encoder is faulty or failure occurred in the encoder communication.
	D09	Driver overspeed error	The motor speed exceeded the upper limit.
	D0A	Driver overload error	The power input to the motor exceeded the upper limit.
	D0B	Driver EEPROM data error	Failure during write or EEPROM failure
	D0E	Failure during write or EEPROM failure	An error occurred in the axis sensor.
	D0F	Power stage temperature error	The power stage board exceeded the upper temperature limit.
	D10	IPM error	A failure occurred in the motor drive circuit.
	D11	Driver abnormal interruption error	The driver CPU board is in a condition where it cannot operate normally.
	D12	Encoder disconnection error	The encoder cable is disconnected. The power must be reconnected.
	D13	FPGA watchdog timer error	Failure in the interface with the main CPU
	D14	Current loop underrun error	Failure in the interface with the main CPU
	D15	Driver-CPU down status error	An error occurred in the driver CPU board.
	D17	Main-CPU alarm status error	Failure in the interface with the main CPU
	D18	Speed loop underrun error	Failure in the interface with the main CPU
	D19	Encoder receive timeout error	The encoder is faulty or failure occurred in the encoder communication.
	D1A	Driver command error	An error occurred in the CPU bus command.
	D1B	Serial bus receive error	Failure in the interface with the main CPU
	D1D	Encoder full-absolute status error	The motor ran at the specified speed or above when the power was turned on.
	D22	Encoder rotation reset error	The encoder is faulty or has turned.
	D24	Encoder ID error	The encoder is faulty or failure occurred in the encoder communication.
	D25	Encoder configuration mismatch error	The encoder configuration information is outside the function information range.
	D26	Motor configuration mismatch error	The motor configuration information is outside the function information range.
	D29	Excitation detection error	An error was detected during excitation communication.
	D2C	Drive-power overvoltage error	An overvoltage error was detected in the motor drive power.
	D2D	Drive-power voltage drop error	A voltage drop was detected in the motor drive power.
	D2E	Synchronous communication error	A communication failure occurred between the driver board and FPGA (main).
	D2F	Driver non-volatile memory error	[Detail & Cause] Error data was detected in the non-volatile memory check during the driver CPU startup. There is a concern of the driver CPU non-volatile memory. [Countermeasure] Contact IAI in case the same error occurs even after power reboot.

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	Error No.	Error name	Description, action, etc.
Cold-start level errors	D35	ABS encoder error detection 2	[Detail & Cause] Initialization of the absolute encoder could not be completed. [Countermeasure] Reboot the power. In case the error occurs even after power reboot for several times, contact IAI.
	D40	Coordinate system data control domain sum check error	The coordinate system data is destroyed. Initialize the coordinate system data. * It is an error only for SCARA
	D41	Coordinate system data control domain ID error	The coordinate system data is destroyed. Initialize the coordinate system data. * It is an error only for SCARA
	D42	Coordinate system data Sum check error	The coordinate system data is destroyed. Initialize the coordinate system data. * It is an error only for SCARA
	D43	Fan error	[Detail & Cause] Drop or stop in fan revolution has been detected. [Countermeasure] Contact IAI as there is a risk of generating heat due to the stop of the fan on the controller.
	D46	SCI sending check timeout error	[Detail & Cause] Completion of sending could not be confirmed in the controller internal communication process. [Countermeasure] Repair of the main CPU mounting board.
	D50	Fieldbus error (FBMIRQ timeout)	A FBMIRQ timeout was detected. Check the status of the monitor LED on the front face of the board by referring to the operation manual for your field network.
	D51	Fieldbus error (FBMIRQ reset)	A FBMIRQ reset error was detected. Check the status of the monitor LED on the front face of the board by referring to the operation manual for your field network.
	D52	Fieldbus error (FBMBSY)	A FBMBSY was detected. Check the status of the monitor LED on the front face of the board by referring to the operation manual for your field network.
	D53	Fieldbus error (BSYERR)	A BSYERR was detected. Check the status of the monitor LED on the front face of the board by referring to the operation manual for your field network.
	D54	Window lock error (LERR)	A LERR was detected. Check the status of the monitor LED on the front face of the board by referring to the operation manual for your field network.
	D55	Fieldbus error (Min busy)	A Min busy error was detected. Check the status of the monitor LED on the front face of the board by referring to the operation manual for your field network.
	D56	Fieldbus error (MinACK timeout)	A Min ACK timeout was detected. Check the status of the monitor LED on the front face of the board by referring to the operation manual for your field network.
	D57	Fieldbus error (MoutSTB timeout)	A Mout STB timeout was detected Check the status of the monitor LED on the front face of the board by referring to the operation manual for your field network.

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	Error No.	Error name	Description, action, etc.
Cold-start level errors	D58	Fieldbus error (INIT timeout)	An INIT timeout was detected. Check the status of the monitor LED on the front face of the board by referring to the operation manual for your field network.
	D59	Fieldbus error (DPRAM write/read)	A DPRAM write/read error was detected. Check the status of the monitor LED on the front face of the board by referring to the operation manual for your field network.
	D5A	Fieldbus error (TOGGLE timeout)	A TOGGLE timeout was detected. Check the status of the monitor LED on the front face of the board by referring to the operation manual for your field network.
	D5B	Fieldbus error (Access-privilege retry over)	An access-privilege retry over error was detected. Check the status of the monitor LED on the front face of the board by referring to the operation manual for your field network.
	D5C	Fieldbus error (Access-privilege open error)	An access-privilege open error was detected. Check the status of the monitor LED on the front face of the board by referring to the operation manual for your field network.
	D5D	Fieldbus error (FBRS link error)	A FBRS link error was detected. Check the status of the monitor LED on the front face of the board by referring to the operation manual for your field network.
	D5E	Fieldbus error (Mailbox response)	A mailbox response error was detected. Check the status of the monitor LED on the front face of the board by referring to the operation manual for your field network.
	D5F	Network I/F module class unmatched error	The network I/F module class in I/O Parameter No. 225 and the actual mounted network module class do not match with each other. →Check on such settings as the combination of the setting in I/O Parameter No. 225 and the network module actually mounted.
	D67	Motor/encoder configuration information mismatch error	Driver parameter No. 26 “Motor/encoder configuration information” (motor identification number, encoder identification number) does not match encoder parameter No. 11 “Motor/encoder configuration information” (motor identification number, encoder identification number). Check the parameter values, connection of the encoder cable, etc.
	D68	No remote-mode control support board error	[Detail & Cause] It is a PC board not supporting the remote mode control. [Countermeasure] Set I/O Parameter No. 79 to 0 and make the remote mode control invalid.
	D69	External terminal block overcurrent or power-supply error	Overcurrent or power-supply error in the external terminal block
	D6A	Hardware unsupported function error	An attempt was made to use a function not supported by the hardware.
	D6C	Actual-position soft limit over error	The actual position exceeded a soft limit by the “soft limit/actual position margin” or more.
	D6D	Logic error	A logic error occurred.
	D6E	Motor drive-source OFF error (MPONSTR-OFF)	An OFF status of the drive source (MPONSTR-OFF) was detected in a non-shutdown (SHDWNSTR-OFF) state.

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	Error No.	Error name	Description, action, etc.
Cold-start level errors	D6F	Optional password error	The optional function specified for use requires an optional password. Check other parameter Nos. 30 to 32, etc., depending on the function to be used.
	D70	Option use permission error	Check, among others, if an option is specified with a system program that does not permit use of options.
	D75	Fieldbus parameter error	There is an error in the fieldbus parameter. Check in IO Parameter No 226 to 227, 237 to 238 and 132 to 135. Followings can be considered as a cause: • A node address out of the specified range was identified. • A baud rate out of the specified range was identified. • Self IP address was set in the system reservation.etc.
	D76	Fieldbus module unmounted error	Fieldbus module is not mounted.
	D77	Fieldbus error (exception)	Exception error was detected. Refer to the instruction manual of the field network board, and check the LED status for the fieldbus monitoring.
	D78	Encoder initialization error	[Detail & Cause] Encoder initialization has not been completed in the normal condition. [Countermeasure] In case the error occurs even after power reboot, contact IAI.
	D80	SCARA unsupported function error	An attempt was made to use a function not supported by SCARA.
	D81	Parameter error during calculation of valid target data	An invalid parameter value was detected during calculation of valid target data. Check axis-specific parameter Nos. 7, 8, 138, etc.
	D82	Simple interference check zone output-number specification error	A value other than an output port/global flag number (0 is allowed) may have been input, or the specified number may be already used as a system output number via the I/O parameter for output function selection.
	D83	Simple interference check zone number error	The simple interference check zone number is invalid.
	D88	Encoder information abnormality error	[Detail & Cause] There is an error in the information acquired from the encoder. 1) The value set in the encoder classification bit number in Driver Card Parameter No. 25 is different from the actual connected encoder. [Countermeasure] 1) Check the value set in the encoder classification bit number in Driver Card Parameter No. 25.
	D89	Pulse calculation error for one turn of motor output axis	[Detail & Cause] It is an error during calculation of number of pulse for one turn of the output axis when the absolute encoder is used in Rotation Axis Mode with Shortcut Control selected. The shortcut control cannot be conducted when there is a fraction in the result of the calculation. [Countermeasure] Check in Each Axis Parameter No. 42, No. 50 or No. 51.
	D8A	Optimal acceleration/deceleration, Horizontal move optimization function based on Z position internal parameter error	The value set in the internal parameter for optimal acceleration/deceleration function or Horizontal move optimization function based on Z position for SCARA is abnormal. The optimal acceleration/deceleration function or Horizontal move optimization function based on Z position for SCARA cannot be used. * It is an error only for SCARA

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	Error No.	Error name	Description, action, etc.
Cold-start level errors	E01	DMA address error	DMA transfer error
	E02	SCIF send-buffer overflow error	The SCIF send buffer overflowed.
	E03	SCI send-buffer overflow error	The SCI send buffer overflowed.
	E04	SCIF receive-buffer overflow error	The SCIF receive buffer overflowed. Excessive data was received from outside.
	E05	SCI receive-buffer overflow error	The SCI receive buffer overflowed. Excessive data was received from the slave.
	E06	Receive timeout error (Slave communication)	Response from the slave cannot be recognized.
	E07	SCI overrun error (Slave communication)	Communication failure. Check for noise, circuit failure and slave card.
	E08	SCI framing error (Slave communication)	Communication failure. Check for noise, shorting, circuit failure and slave card.
	E09	SCI parity error (Slave communication)	Communication failure. Check for noise, shorting, circuit failure and slave card.
	E0A	SCI CRC error (Slave communication)	The CRC in the message is invalid.
	E10	SCIF communication mode error	The communication mode is invalid.
	E11	SCI communication mode error	The communication mode is invalid.
	E12	SIO-bridge SCIF send-queue overflow error	The send queue overflowed
	E13	SIO-bridge SCI send-queue overflow error	The send queue overflowed
	E14	SCI receive-data-register full wait timeout error	Communication failure. Check for noise, shorting, circuit failure and slave card.
	E15	SCI overrun error	Communication failure. Check for noise, shorting, circuit failure and slave card.
	E16	Program end confirmation timeout error	The program cannot be ended.
	E17	I/O-processing-program start logic error	The I/O-processing-program start logic is invalid.
	E18	Task ID error	The task ID is invalid.
	E19	WAIT factor error	The WAIT factor is invalid.
	E1A	WAIT logic error	The WAIT logic is invalid.
	E1B	Position-data valid address error	Position-data valid address is not set.
	E1C	Source data error	The source data is invalid.
	E1D	Unaffected output number error	The unaffected output number is invalid. A value other than an output port number (“0” is acceptable) may be input in I/O parameter Nos. 70 to 73.
	E1E	Zone parameter error	A value other than an output port/global flag number (“0” is acceptable) or duplicate numbers may be input in axis-specific parameter Nos. 88, 91, 94 and 97, or the output number specified as system output in the I/O parameter for output function selection may be duplicated, among other reasons. * Cartesian axis only.
	E1F	I/O assignment parameter error	A value other than an I/O port number (“-1” is acceptable) or other than an I/O head port number + [multiple of 8] may be input in I/O parameter Nos. 2 to 9, or a value other than a [multiple of 8] may be input in I/O parameter Nos. 14 to 17.
	E20	I/O assignment duplication error	I/O assignments are duplicated. Check I/O parameter Nos. 2 to 9 and 14 to 17 and the I/O slot card type (number of I/Os), etc.

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	Error No.	Error name	Description, action, etc.
Cold-start level errors	E21	I/O assignment count over error	The I/O assignments exceed the specified range. Check I/O parameter Nos. 2 to 9 and 14 to 17 and the I/O slot card type (number of I/Os).
	E22	Header error (Slave communication)	The header in the message received from the slave card is invalid.
	E23	Card ID error (Slave communication)	The card ID in the message received from the slave card is invalid.
	E24	Response type error (Slave communication)	The response type in the message received from the slave card is invalid.
	E25	Command type error (Slave communication)	The command type of the transmitting command is invalid.
	E26	Target type error	The target type is invalid.
	E27	No target error	Target (Driver card, I/O card, encoder or other slave card) is not installed.
	E29	EEPROM error (EWEN/EWDS not permitted)	EEPROM access error (When writing)
	E2A	Read compare mismatch error during EEPROM write	EEPROM access error (When writing)
	E2B	Abnormal response error when sending EEPROM information acquisition command	An abnormal response was received when a slave-EEPROM information acquisition command was sent.
	E2C	Maximum receive size over error when sending EEPROM information acquisition command	The maximum receive size exceeds the limit value when a slave-EEPROM information acquisition command is sent.
	E2D	Receive-data checksum error when sending EEPROM information acquisition command	The checksum of receive data is invalid when a slave-EEPROM information acquisition command is sent.
	E2E	No required power stage error	The required power stage is not installed for the valid axes.
	E2F	No required regenerative resistance error	The required regenerative resistance is not installed for the valid axes.
	E30	No required motor-drive power error	The required motor-drive power is not installed for the valid axes.
	E31	No standard I/O slot error	Standard I/O unit is not installed.
	E32	No control power error	Control power unit is not installed.
	E33	Slave response logic error	The slave response logic is invalid.
	E34	Slave block number out of range	The slave block number is out of range.
	E35	Slave EEPROM sum check error	It is the sum check error of slave EEPROM.
	E37	Slave data setting prohibited	Setting of slave data is prohibited.
	E38	Faulty slave EEPROM	The slave EEPROM is faulty.
	E3C	Undefined slave-command error code detected	An undefined slave-command error code was detected.
	E3D	SEL program/position/parameter flash ROM status error	Data is not written to the flash ROM correctly or written in an old, incompatible application version.
	E3E	Parameter checksum error	The flash ROM data has been destroyed.
	E3F	Gain parameter error	The setting of “Axis-specific parameter No. 60, Position gain,” etc., is invalid.
	E40	Rotational-movement axis parameter error	Check axis-specific parameter Nos. 67, 66, 38, 37, 1, etc.
	E41	Servo-motion data packet shortage error	There are not enough servo-motion data packets.
	E42	Servo job error	The servo job is invalid.
	E45	Servo undefined command detection error	An undefined command was detected during servo processing.

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	Error No.	Error name	Description, action, etc.
Cold-start level errors	E46	Maximum receive size over error at absolute-data acquisition	The receive size is too large when acquiring absolute data.
	E47	No normal response error at absolute-data acquisition	Normal response is not received when acquiring absolute data.
	E4B	Encoder count error	An encoder count error was detected.
	E4E	Phase-Z count parameter error	Check axis-specific parameter Nos. 23, 38, 37, etc.
	E4F	Synchronizing parameter error	Check each axis parameters No. 65 and 39 and all axes parameter No. 1 and so on. * Only for MSEL-PC/PG/PCF/PGF
	E50	Driver special command ACK-timeout error	ACK cannot be detected for the driver special command.
	E51	Drive unit error (DRVESR)	Error notification from the driver
	E52	Encoder error (DRVESR)	Error notification from the driver
	E53	Driver CPU error (DRVESR)	Error notification from the driver
	E54	Servo control error (DRVESR)	Error notification from the driver
	E55	Command error (DRVESR)	Error notification from the driver
	E56	Motor temperature error (DRVESR)	Error notification from the driver
	E58	Servo ON/OFF timeout error	Servo ON/OFF cannot be confirmed.
	E59	Brake ON/OFF timeout error	Brake ON/OFF cannot be confirmed.
	E5A	Pole sense non-detection error	Motor magnetic pole cannot be detected.
	E5B	Detection OFF error upon pole sense completion	The motor-magnetic-pole detection status bit (Psenex) is turned OFF after completion of pole sense.
	E5C	Hold-at-stop servo job error	The servo job is invalid.
	E5D	Servo packet error	The servo packets are invalid.
	E5E	Servo-control-right management array number error	The servo-control-right management array number is invalid.
	E5F	Length conversion parameter error	Check axis-specific parameter Nos. 47, 50, 51, 42, 1, etc.
	E60	Slave maximum receive size over error	The slave receive size is too large.
	E61	Slave no normal response reception error	Normal response cannot be received from the slave.
	E62	Sending-slave CPU type error	The CPU type of the sending slave is invalid.
	E63	Message-buffer information type error	The message-buffer information type is invalid.
	E68	Emergency-stop status requiring reset recovery (Not error)	Reset the emergency stop and then reconnect the power.
	E69	Abnormal 24-V I/O power source	The 24-V I/O power source is abnormal.
	E6B	Shutdown factor indeterminable error	Shutdown factor cannot be determined.
	E6C	DO output current error	The DO output current is abnormal. The power must be reconnected.
	E6D	Drive-source cutoff relay error	The drive-source cutoff relay may have been melted.
	E6E	Power-stage rating (W) mismatch error	A power stage with inappropriate rated capacity (W) is installed.
	E6F	Power-stage rating (V) mismatch error	A power stage with inappropriate rated voltage (V) is installed.
	E70	Motor-drive power rating (V) mismatch error	A motor-drive power source with inappropriate rated voltage (V) is installed.
	E71	Encoder configuration information outside supported function information range	An encoder whose configuration information is outside the range supported by the driver unit is installed.

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	Error No.	Error name	Description, action, etc.
Cold-start level errors	E72	Motor configuration information outside supported function information range	A motor whose configuration information is outside the range supported by the driver unit is installed.
	E73	Encoder resolution mismatch error	The encoder resolution in the system's axis-specific parameter and that of the installed encoder do not match.
	E74	Encoder division ratio mismatch error	The encoder division ratio in the system's axis-specific parameter and that of the installed encoder do not match.
	E75	Encoder linear/rotary type mismatch error	The encoder linear/rotary type in the system's axis-specific parameter and that of the installed encoder do not match.
	E76	Encoder ABS/INC type mismatch error	The encoder ABS/INC type in the system's axis-specific parameter and that of the installed encoder do not match.
	E77	Magnetic-pole sensor installation specification mismatch error	The magnetic-sensor installation specification in the system's axis-specific parameter and that of the installed encoder do not match.
	E78	Brake installation specification mismatch error	The brake installation specification in the system's axis-specific parameter and that of the installed encoder do not match.
	E79	Abnormal response error when sending EEPROM-data setting slave command	An abnormal response was received when an EEPROM-data setting slave command was sent.
	E7A	Maximum receive size over error when sending EEPROM-data setting slave command	The receive size exceeded the limit value when an EEPROM-data setting slave command was sent.
	E7B	Motor-drive power ON timeout error	Abnormal current flow from the motor-drive power source
	E7C	Register read/write test error	Error reading/writing the register
	E7D	Linear axis parameter error	Check in each axis parameter No. 38, No. 68 or No. 1.
	E7E	Linear-movement axis parameter error	Check axis-specific parameter Nos. 38, 68, 1, etc.
	E7F	Parameter error	The parameter is invalid.
	E80	Unsupported card error	An unsupported card is installed in an I/O slot.
	E81	Priority auto-assignment card non-detection error	Priority auto-assignment card cannot be detected.
	E82	Card mismatch error	The combination or positioning of I/O slot cards has a problem.
	E83	I/O slot card error	The I/O slot card is invalid.
	E84	Resolution parameter error	Check axis-specific parameter Nos. 47, 50, 51, 44, 42, 43, 1, 37, etc.
	E85	Driver ready OFF factor indeterminable error	Driver ready OFF factor cannot be determined.
	E86	Fieldbus error (FBVCCER)	A fieldbus error (FBVCCER) was detected.
	E87	Fieldbus error (FBPOWER)	A fieldbus error (FBPOWER) was detected.
	E88	Power error (Other)	A power error (Other) was detected. This error also generates when the power OFF → ON interval is short. After the power has been turned off, be sure to wait for at least 5 seconds before turning it back on. Abnormal regenerative resistance temperature is also suspected.
	E89	SCIF open error in non-AUTO mode (Servo in use)	In a mode other than AUTO, opening of the serial 1 channel (also used by the PC software/TP port) from a SEL program is prohibited while the servo is in use (to ensure safety).

In the panel window, the error numbers follow E in the display.

	Error No.	Error name	Description, action, etc.
Cold-start level errors	E8A	SEL program flash-ROM status error	Data is not written to the flash ROM correctly or written in an old, incompatible application version.
	E8B	Symbol definition table flash-ROM status error	Data is not written to the flash ROM correctly or written in an old, incompatible application version.
	E8C	Position data flash-ROM status error	Data is not written to the flash ROM correctly or written in an old, incompatible application version.
	E8D	Parameter flash-ROM status error	Data is not written to the flash ROM correctly or written in an old, incompatible application version.
	E8F	Fieldbus logic error	It is a logic error in fieldbus initializing.

In the panel window, the error numbers follow E in the display.

	Error No.	Error name	Description, action, etc.
System-down level error	F00	Shutdown error (hi_sysdwn ( ) definition)	A shutdown error (hi_sysdwn ( ) definition) was detected.
	F03 ~ F58	Shutdown error (OS call error)	A shutdown error (OS call error) was detected.
	F60	System-down level error-call procedure error	A system-down level error-call procedure error was detected.
	F61	Interpreter-task end task ID error	An interpreter-task end task ID error was detected.
	F66	Servo control underrun error	Servo control underrun error or communication error between the driver board and main CPU board (FPGA) has been detected.
	F6A ~ FA0	Undefined exception/interruption error	An undefined exception/interruption occurred.
	FB0	TMU0 interruption error	A TMU0 interruption error was detected.
	FB1	Application code SDRAM copy error (Checksum)	The sum of 4 bytes does not match between the corresponding sections after FROM → SDRAM program copy.
	FB2	Installed flash ROM type mismatch (Application)	The flash ROM type anticipated in the software does not match the flash ROM type actually installed. Check the combination of software and hardware.
	FB8	Undefined NMI error	An undefined NMI interruption occurred.
	FF0 ~ FFF	Shutdown error (hi_sysdwn ( ) definition)	A shutdown error (hi_sysdwn ( ) definition) was detected.

◎Error List (MAIN core)

In the panel window, the error numbers follow the three digits after the E in the display.

	Error No.	Error name	Description, action, etc.
Message level errors	950	Update File Error	[Detail & Cause] 1) It was attempted to update to an old system software version which is not compatible. 2) Update file name is not correct. [Countermeasure] Select the correct file and have an update again from the beginning.
	A70	SCIF overrun error	Communication error. Check for noise, connected equipment and communication setting. (When updating the application, connect to a PC and use IAI's update tool.)
	A71	SCIF framing error	Communication error. Check for noise, shorted/disconnected communication cable, connected equipment and communication setting. (When updating the application, connect to a PC and use IAI's update tool.)
	A72	SCIF parity error	Communication error. Check for noise, shorted/disconnected communication cable, connected equipment and communication setting. (When updating the application, connect to a PC and use IAI's update tool.)
	A73	IAI protocol header error	Communication protocol error. Check for noise and connected equipment. (When updating the application, connect to a PC and use IAI's update tool.)
	A74	IAI protocol terminal ID error	Communication protocol error. Check for noise and connected equipment. (When updating the application, connect to a PC and use IAI's update tool.)
	A75	IAI protocol command ID error	Communication protocol error. Check for noise and connected equipment. (When updating the application, connect to a PC and use IAI's update tool.)
	A76	IAI protocol checksum error	Communication protocol error. Check for noise and connected equipment. (When updating the application, connect to a PC and use IAI's update tool.)
	A77	Motorola S record type error	The update program file is invalid. Check the file.
	A78	Motorola S checksum error	The update program file is invalid. Check the file.
	A79	Motorola S load address error	The update program file is invalid. Check the file.
	A7A	Motorola S write address over error	The update program file is invalid. Check the file.
	A7B	Flash timing limit over error (Write)	Error writing the flash ROM (When updating)
	A7C	Flash timing limit over error (Erase)	Error erasing the flash ROM (When updating)
	A7D	Flash verify error	Error erasing/writing the flash ROM (When updating)
	A7E	Flash ACK timeout	Error erasing/writing the flash ROM (When updating)
	A7F	Head sector number specification error	Error erasing the flash ROM (When updating)
	A80	Sector count specification error	Error erasing the flash ROM (When updating)
	A81	Write-destination offset address error (Odd-numbered address)	The address written during flash ROM write (when updating) is invalid. Check the update program file.

In the panel window, the error numbers follow the three digits after the E in the display.

	Error No.	Error name	Description, action, etc.
Message level errors	A82	Write-source data buffer address error (Odd-numbered address)	Error writing the flash ROM (When updating)
	A83	Invalid code sector block ID error	The flash ROM is new, or the program currently written to the flash ROM is invalid because the last update was aborted. The ROM can be updated without problem.
	A84	Code sector block ID erase count over	The number of times the flash ROM was erased exceeded the allowable count.
	A85	FROM write request error before erase is complete	When updating, a flash-ROM write command was received before a flash-ROM erase command. Confirm that the update program file is valid and then perform update again.
	A87	Motorola S byte count error (Detected by the core)	The update program file is invalid. Check the file.
	A88	Message conversion error (Detected by the core)	The received message does not match the message format or contains invalid data. Check the message sent from the host communication device.
	A89	Update target non-specification error (Detected by the core)	An update command was received before the update target was correctly specified during update processing. Check if an appropriate update PC tool is used and if the target specification and other settings of the update PC tool are correct.
	A8A	Update system code error (Detected by the core)	The system code in the message of the received update target specification command does not match the controller system. Check the target specification and other settings of the update PC tool.
	A8B	Update unit code error (Detected by the core)	The unit code in the message of the received update target specification command does not match the controller unit that can be updated. Check the target specification and other settings of the update PC tool.
	A8C	Update device number error (Detected by the core)	The device number specified in the message of the received update target specification command is not appropriate. Check the target specification, device number and other settings of the update PC tool.
	A8D	Flash busy reset timeout (Detected by the core)	Error erasing/writing the flash ROM
	A8E	Unit type error (Detected by the core)	The unit type in the received command message is invalid or not supported.
	A90	SCIF receiving buffer overflow error	SCIF receiving buffer has overflown. Excess data has been received from outside.
	A91	DMA address error	It is the DMA transfer error.
	A9E	Password error (Core detection)	There is an error in the password.

In the panel window, the error numbers follow the three digits after the E in the display.

	Error No.	Error name	Description, action, etc.
Cold-start level errors	E90	Core code flash-ROM status error	The core program is invalid. Contact the manufacturer.
	E91	Application code flash-ROM status error	The application program is invalid. Contact the manufacturer.
	E92	Core code sum error	The core program is invalid. Contact the manufacturer.
	E93	Application code sum error	The application program is invalid. Contact the manufacturer.
	E94	Timing limit over error (Flash erase)	Error erasing the flash ROM
	E95	Flash verify error (Flash erase)	Error erasing the flash ROM
	E96	Flash ACK timeout (Flash erase)	Error erasing the flash ROM
	E97	Head sector number specification error (Flash erase)	Error erasing the flash ROM
	E98	Sector count specification error (Flash erase)	Error erasing the flash ROM
	E99	Timing limit over error (Flash write)	Error writing the flash ROM
	E9A	Flash verify error (Flash write)	Error writing the flash ROM
	E9B	Flash ACK timeout (Flash write)	Error writing the flash ROM
	E9C	Write-destination offset address error (Flash write)	Error writing the flash ROM
	E9D	Write-source data buffer address error (Flash write)	Error writing the flash ROM
	E9E	Watchdog reset occurrence error	A WDT (watchdog timer) was manually reset (error detection).
	E9F	Exception occurrence error while BL = 1 (NMI)	An exception occurred while the block bit in the CPU status register was “1.” (NMI)
	EA0	Exception occurrence error while BL = 1 (Other than NMI)	An exception occurred while the block bit in the CPU status register was “1.” (Other than NMI)
	EA1	Bit exception reset due to command/data TLB duplication	This reset occurs when there are multiple TLB entries corresponding to the virtual address.
	EA2	Undefined exception/interruption error	An undefined exception/interruption occurred.
	EA3	AC-power cutoff detection error	An AC-power cutoff was detected.
	EAA	SDRAM write/read test error	The SDRAM is faulty. Contact the manufacturer.
	EAB	Application-update SCIF send-queue overflow error	An overflow occurred in the send queue.
	EAC	Servo control underrun error	A servo control underrun error was detected.
	EAE	Application-update SCIF receive-queue overflow error	Excessive data is received from outside. (Confirm that a PC and IAI’s update tool are used to update the application.)
	EAF	Installed flash ROM type mismatch (Core)	The flash ROM type anticipated in the software does not match the flash ROM type actually installed. Check the combination of software and hardware.
	EB0	Undefined NMI error (Core)	An undefined NMI interruption occurred.
	EB2	Flash busy reset timeout (Detected by the core)	Malfunction of the flash ROM. The flash ROM is not reset from the busy mode.

In the panel window, the error numbers follow the three digits after the E in the display.

	Error No.	Error name	Description, action, etc.
Cold-start level errors	EB3	CPU clock operation mode error	[Detail & Cause] It has been detected the operation is made in an unsupported or inappropriate CPU clock operation mode. There is a concern of an error operation caused by malfunction of the hardware, noise and so on. [Countermeasure] Contact IAI.
	EB4	FROM writing and reading test error	It is the FROM access error. It is a logic error occurred. It is necessary to repair the PC board.
	EBC	Logic error	It is a logic error occurred.

Chapter 7 Appendix

7.1 Example of Safety Circuit for PG/PGF/PGX Type (Conforming to Safety Category)

PG/PGF/PGX types are the controllers applicable for the safety categories (B to 3).
In this section, describes an example of a circuit using the dedicated teaching pendant. Please note that the conformity to your system cannot be confirmed. Therefore, it is necessary to construct yourself the circuit that conforms to your condition of use and the applicable category.
[Refer to 2.3.2 Wiring of Emergency Stop Circuit (System I/O) for the names of the signals]

[1] System configuration
When it is necessary to construct a system that complies with Safety Category, use a teaching pendant.

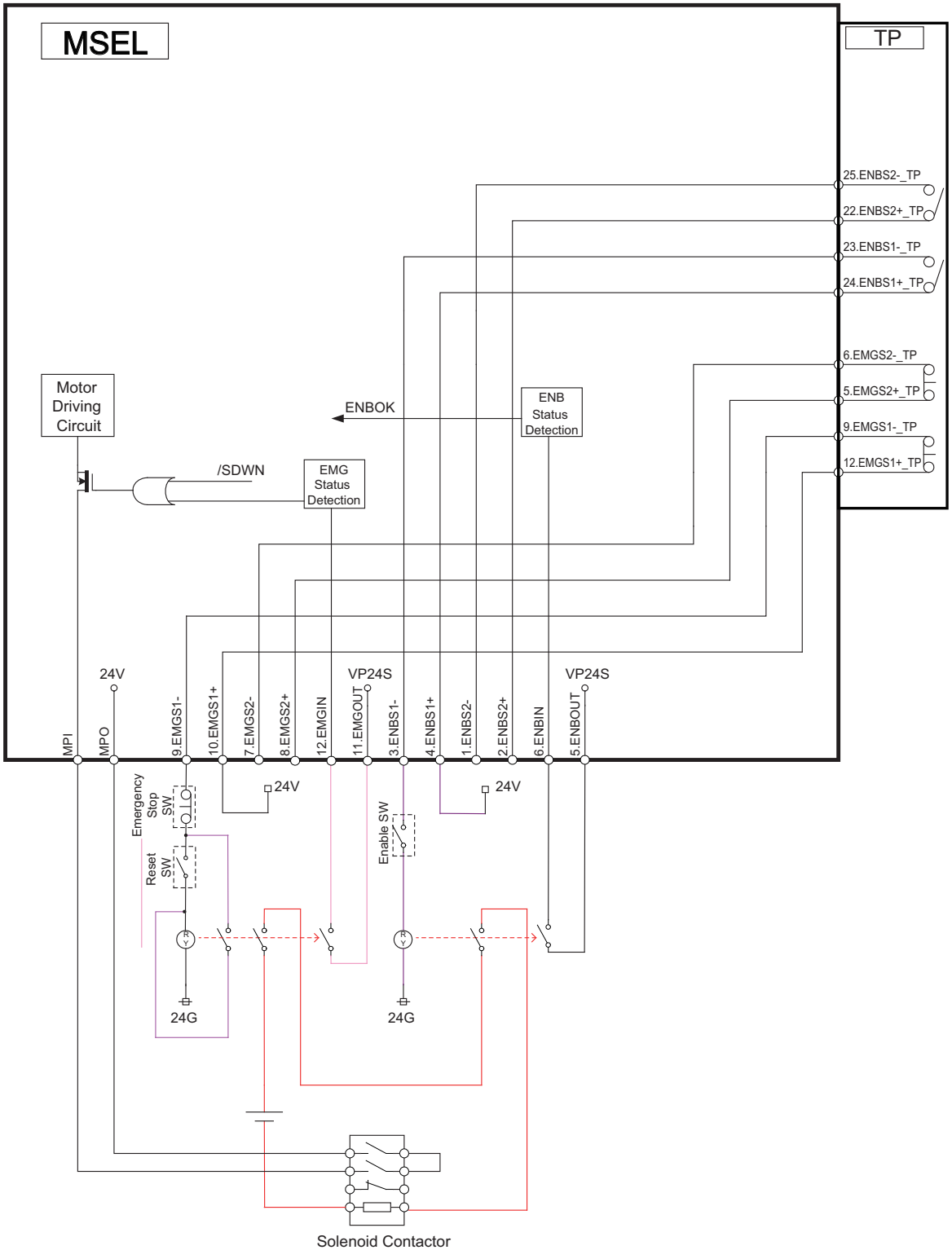
- TB-01D(R), TB-02D

By changing the connection of the system I/O connector, it can conform up to Safety Categories B to 3 (ISO12100-1).

[2] Power supply of safety circuit
When using a safety relay or contactor of 24V DC type in the safety circuit, make the power source for it dedicated as much as possible.

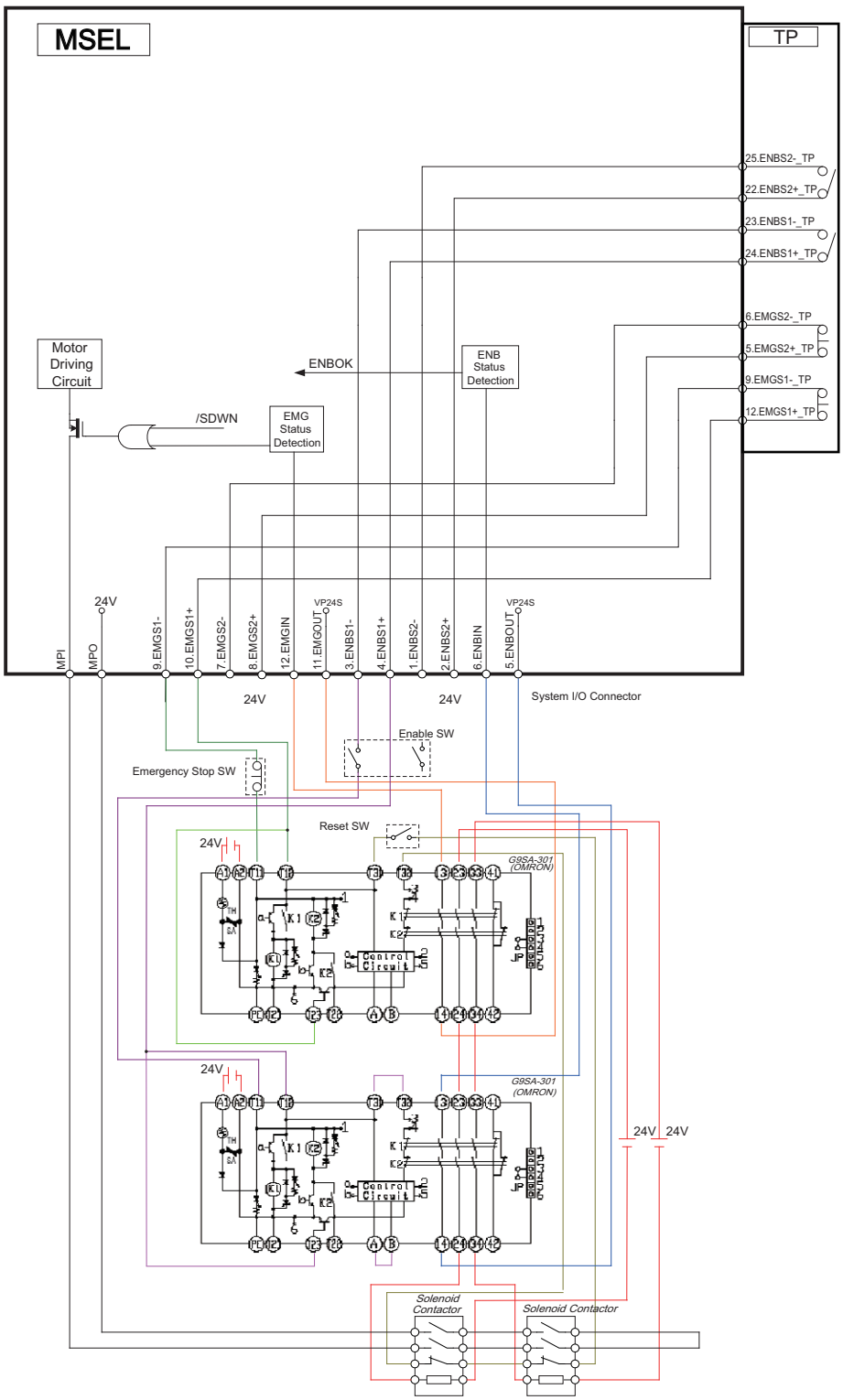
[3] Examples of safety circuits

1) In case of category 1



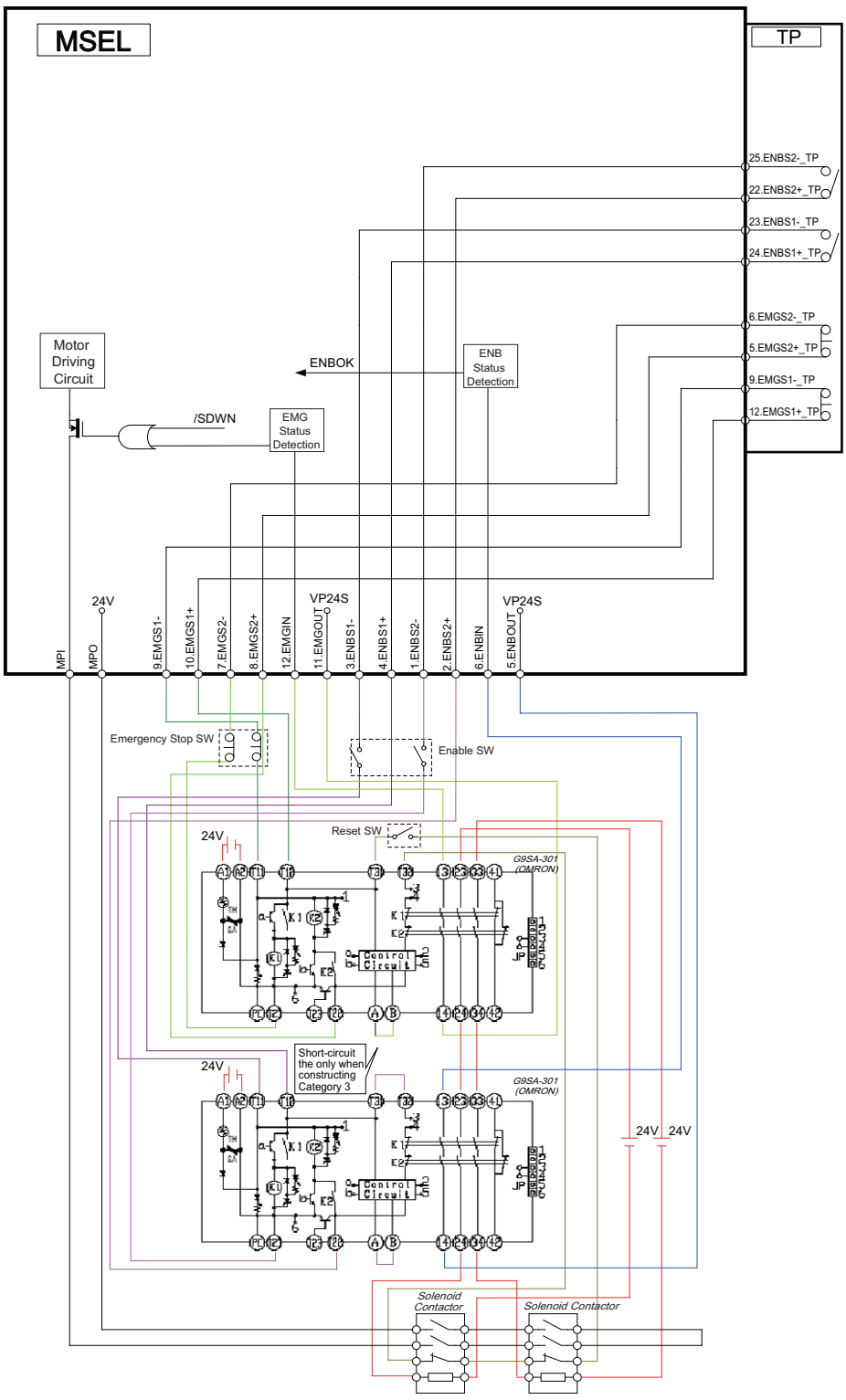
* Put the dummy plug (DP-4S) when a connection of the teaching pendant such as PC software is not necessary.

2) In case of category 2



* Put the dummy plug (DP-4S) when a connection of the teaching pendant such as PC software is not necessary.

3) In case of category 3



* Put the dummy plug (DP-4S) when a connection of the teaching pendant such as PC software is not necessary.

7.2 Stopping method and Recovery

7.2.1 Stopping method

Actuator operation can be stopped in two methods: normal operation stop and emergency stop.

1) Normal operation stop
   Normal position control is active: Set a deceleration operation plan and cause the actuator to decelerate to a stop, according to the plan, under normal position control
2) Emergency stop (stop with immediate servo-OFF)
   Cancel the operation plan and immediately turn OFF the servo (power supply to the motor is cut off).

How operation is stopped in each condition is explained below.

Stop command, Condition	Stopping method	Remarks
Pause	1)	
Servo OFF	1)	
Emergency stop	1)	Since the motor drive source is cut off by hardware means, the deceleration operation plan may have to be forcibly stopped beforehand.
SEL program command	1)	Stop is made when the following four commands are issued. HOLD, CANC, STOP, ABPG
Errors not described in list	1)	
Errors in list	2)	

Error of stop with immediate servo OFF in 2)

Error No.	Error name
614	Driver synchronizing communication LRC error
6BB	Deviation overflow error (home return not yet complete)
6BC	Stop deviation overflow error (home return not yet complete)
B05	Estimate stroke exceeded during home return
B11	Home position sensor escape timeout error
C6B	Deviation overflow error
C99	Home position undetected error
CA5	Stop deviation overflow error
CC6	Driver error initial detection
D0A	Driver overload error
D10	IPM error (POE0)
D15	Driver CPU down status error
D17	Main CPU alarm status error
F00 to FBF	All system-down level errors

7.2.2 Recovery

[1] Drive-source recovery request

(1) Method of drive-source recovery request

Recovery of drive source can be requested by one of the following methods:

- Set I/O parameter No. 44 to “1” (input selection function 014 = drive-source cutoff reset input), and then turn ON input port No. 14 (a request is issued at the ON edge).
- Click Controller (C) from the menu of the PC software and then select Drive-source Recovery Request (P).

(2) Situation where recovery of drive source must be requested

Recovery of drive source must be requested only in the following situation:

- A cause that cut off the drive source occurred when I/O parameter No. 44 was set to “1,” after which you have removed the cause and now want the restore the drive source.

[2] Operation-pause reset request

(1) Method of operation-pause reset request

Reset of operation pause can be requested by one of the following methods:

- Set I/O parameter No. 35 to “1” (input selection function 005 = operation-pause reset signal), and then turn ON input port No. 5 (a request is issued at the ON edge).
- Click Controller (C) from the menu of the PC software and then select Operation-pause Reset Request (L).

(2) Situation where reset of operation pause must be requested

Reset of operation pause must be requested only in the following situations:

- When other parameter No. 10 was set to “2 (emergency stop recovery type = recovery with continued operation (only during auto operation)),” after which you have cancelled the emergency stop and now want to restore the operation (reset the operation pause).
- Was stopped with the deadman switch or enable switch when other parameter No. 11 was set to “2 (deadman/enable switch recovery type = recovery with continued operation (only during auto operation)),” after which you have cancelled the stop and now want to restore the operation (reset the operation pause).
- A signal to turn OFF input port No. 6 was input (operation was paused) during auto operation when I/O parameter No. 36 was wet to “1 (input selection function 006 = operation pause signal),” after which a signal to turn ON input port No. 6 was input and now you want to restore the operation (reset the operation pause).

* When the driving source cancel demand and the pause cancel demand are issued at the same time, it is necessary to have the driving source recovery demand first, and then make the operation pause cancel demand.

7.3 Extension SIO

It can be applicable to SEL program communication and IAI protocol communication features if serial communication type (model code SE1: RS232C, SE2: RS485) is mounted to the extension I/O.

7.3.1 Specification

Item	Contents	
Interface standards	RS-232C	Interface standards
Communication system	Start-Stop Synchronous Full / Half Duplex Communication	Communication system
Connector	D-sub9 pin	
Baud rate (bps)	9.6k,19.2k,38.4k,57.6k,76.8k,115.2k,230.4k	
Data length	7 or 8 bit	
Start bit	1 bit	
Stop bit	1 or 2 bit	
Binary classification	None, Odd or even	
Connector on Controller Side	D-sub, 9-pin (Male)	

7.3.2 Functions

(1) SEL Program Communication

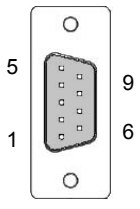
It is the communication mode to send and receive data by writing and reading the data of each SIO channel using the communication SEL commands (OPEN, READ, WRIT, CLOS, TMRW and SCHA). (Refer to SEL Language Programing Manual for more details.)
The number of maximum available channels is one channels, user release channels 2.

(2) IAI Protocol Communication

It is the communication mode for the host system to refer to the data inside the controller or to indicate the command execution by using the serial communication protocol dedicated for IAI.
IAI protocol communication makes only one channel, User Release Channel 2, valid. (Valid in priority in MANU Mode, valid in I/O parameter setting channel in AUTO Mode)
Be careful to the connection as it may get disconnected when execution commands are received at the same time from multiple connections in MANU mode.

7.3.3 Wiring

Prepare a D-sub 9-pin connector and solder wires to each signal.



Pin No.	RS232C Signal name	RS485 Signal name	Contents
1	NC	NC	Not connected
2	RXD	NC	Received Data (RS232C)
3	TXD	SGA	Sent Data (RS232C) / Communication line A (RS485)
4	NC	NC	Not connected
5	GND	GND	Signal Ground (Insulation)
6	NC	NC	Not connected
7	NC	SGB	Communication line B (RS485)
8	NC	NC	Not connected
9	NC	NC	Not connected

7.3.4 Status Display

There are LED lamps equipped on the front panel of the controller to display the communication status.

○ : Illuminating × : OFF ☆ : Flashing

LED	Color	Lamp condition	Description
RUN	Green	○	In the normal communication

7.3.5 Parameter Settings

In below, shows the parameter settings necessary in order to use the extension SIO features.

(1) Set the receiving operation classification and communication specification in I/O Parameter No. 100 “User Release SIO Channel 2 Attribute (Extended)”.

No.	Parameter name	Initial value (Reference)	Input range	Remarks
100	Attribute 1 of SIO channel 2 opened to user (Extension)	68100010_H	0 ~ $FFFFFFFF_H$	Bits 28-31: Baud rate type (0: 9.6, 1: 19.2, 2: 38.4, 3: 57.6, 4: 76.8, 5: 115.2k, 6: 230.4kbps) Bits 24-27: Data length (7 to 8) Bits 20-23: Stop bit length (1 to 2) Bits 16-19: Binary Classification (0: None, 1: Odd, 2: Even) Bits 12-15: System reservation Bits 8-11: Reception Operation Classification (0:RS485= Reception compulsorily enabled straight after sending process. RS232C= Reception compulsorily enabled right before sending process 1: Not to have reception compulsorily enabled at sending process Bits 4-7: In-board channel assignment number (1: 1ch, 2: 2ch) Bits 0-3: Extension I/O slot assignment number * Not to be used when set to 0

(2) Set parameters such as the communication channel using method in I/O Parameter No. 101 "User Release SIO Channel 2 Attribute 2 (Extended)".

No.	Parameter name	Initial value (Reference)	Input range	Remarks
101	Attribute 2 of SIO channel 2 opened to user (Extension)	0	0 ~ $FFFFFFFF_H$	Bits 0-3: Way to use channels (0: SEL program release 1: System reservation 2: IAI protocol B * I/O Parameter No. 116 "IAI Protocol Communication Attribute" Bit 0 to 3: Available to set when IAI protocol multiple channel communication permission select = 1 (permitted) * Settable only Attribute 2 of SIO channel 2 opened to user) Bits 4-11: IAI protocol response minimum latency (ms) (Valid only in IAI protocol) (Main application part V2.00 or later)

(3) Set parameters such as the IAI protocol multiple channel communication permission select in I/O Parameter No. 116 "IAI Protocol Communication Attribute". In order to perform the IAI protocol communication on User Release SIO Channel 2, it is necessary to set IAI Protocol Multiple Channel Communication Permission Select = 1 (Permitted).

No.	Parameter name	Initial value (Reference)	Input range	Remarks
116	IAI protocol communication attribute	0	0 ~ $FFFFFFFF_H$	Bits 0-3: IAI protocol multiple channel communication permission select (0: Unpermitted * Communication exclusively in priority of Teaching port > Ethernet 1: Permitted) Bits 4-11:IAI protocol execution command communication valid channel select at AUTO Mode (01H: Teaching Port 02H: Extension SIO (Attribute 2 of SIO channel 2 opened to user) 26H: Ethernet) * Valid when IAI protocol multiple channel communication permission select = 1 (Permitted) * Communication available exclusively in priority of Teaching port > Ethernet at MANU Mode * Reference commands and stop commands (execution commands) are available to communicate with all the channels. (Main application part V2.00 or later)

(3) How to Set Parameters

1) Settings in Common for SEL Program Communication / IAI Protocol Communication

・Set the communication specifications for the extension SIO user release channel number to be used. (I/O Parameter No. 100, 102, 104 and 106 “User Release Channel n Attribute 1”) (The extension I/O slot assignment and in-board channel number assignment are already set up at the delivery.)

(Example) When indicating User Release Channel No. 3 as the in-board channel 1 for the extension SIO module (RS-232C) connected to Extension I/O Slot 2, and setting to the communication specification as follows;

Baud rate : 115.2k ⇨ I/O Parameter 102 bit28-31=5
Data length : 8 Bits ⇨ I/O Parameter 102 bit24-27=8
Stop bit length : 1 Bit ⇨ I/O Parameter 102 bit20-23=1
Binary Classification : None ⇨ I/O Parameter 102 bit16-19=0
Reception Operation Classification : Reception compulsorily enabled right before sending process ⇨ I/O Parameter 102 bit 8 to 11 = 0

Establish the setting as;
I/O Parameter 102 “User Release Channel 3 Attribute 1” = 58100012h

2) IAI Protocol Communication Individual Setting

A : SEL Program Communication

・Set the way to use for the extension SIO user release channel number to be used. (I/O Parameter 101,103,105,107 [SIO Channel 2 Opened to User] bit0-3)

(Example) When having the SEL program communication in User Release Channel No. 2, set as I/O Parameter 101 “User Release Channel 2 Attribute 2” bit 0 to 3 = 0.

B : IAI Protocol Communication

・Establish the setting to permit multiple channel communication for IAI protocol. (I/O Parameter 116 [IAI Protocol Communication Attribute] bit0-3)

・Set the way to use for the extension SIO user release channel number to be used. (I/O Parameter 101,103,105,107 [SIO Channel 2 Opened to User] bit0-3)

・Set the minimum response latency in IAI protocol communication. (I/O Parameter 101, 103, 105, 107 [IAI Protocol Communication Attribute] bit4-11)

・Set the station code for the extension SIO user release channel number to be used. (I/O Parameter 91 “User Release SIO Channel 1 Station Code”)
(* Although it is determined as User Release SIO Channel 1, this parameter is in common for Ethernet and extension SIO.)

・Indicate the channel available for communication with execution commands in AUTO Mode. I/O Parameter 116 [IAI Protocol Communication Attribute] bit4-11)

7.4 Cartesian Axis Coordinate Systems

It can be applicable to SEL program communication and IAI protocol communication features if serial communication type (model code SE1: RS232C, SE2: RS485) is mounted to the extension I/O.

7.4.1 Coordinates for Coordinate System Definition Unit

The coordinate system for the coordinate system definition unit consists of four coordinate axes at the maximum (X-axis, Y-axis, Z-axis and R-axis).
At this time, it should be premised that the physical axes applicable for each coordinate axis satisfy the following conditions.

- X-axis, Y-axis and Z-axis are laid orthogonally to each other.
- The center axis of rotary for the R-axis is laid orthogonally to XY plane. (It is parallel to Z-axis if there is Z-axis.)
- A tool is attached on the R-axis if there is R-axis. (It should be premised that the tool attachment datum point is on the R rotation axis.)

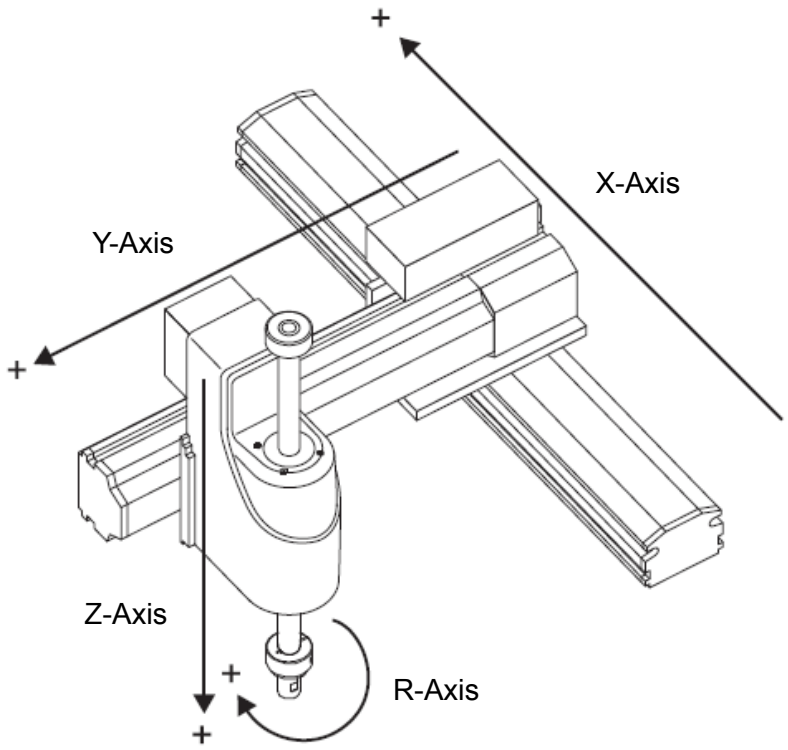
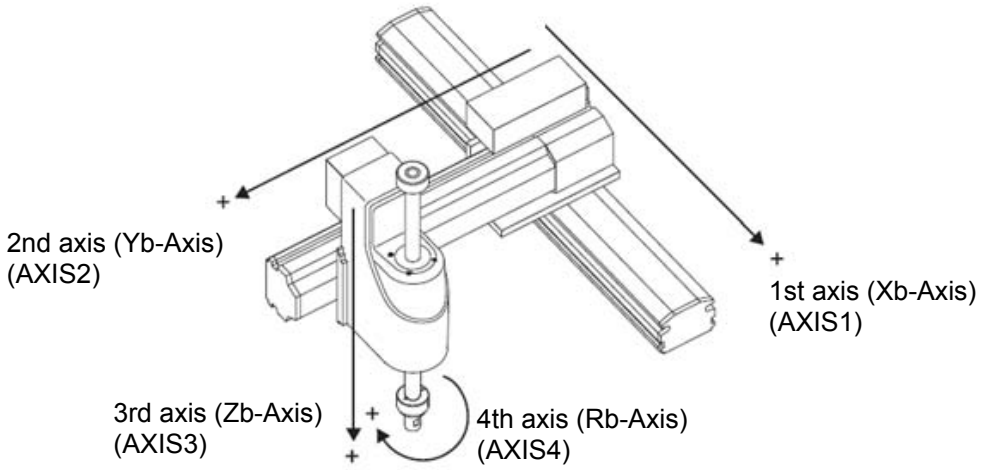
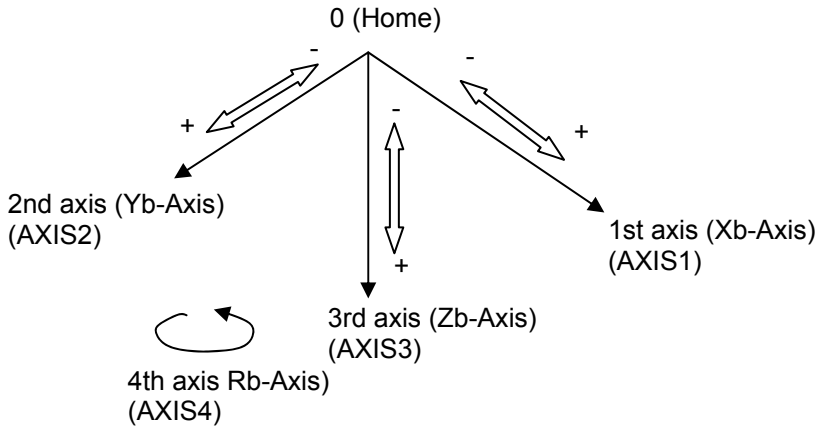


Figure : Example for orthogonal unit satisfying conditions above

7.4.2 Base Coordinate System

It is the coordinate system to indicate the position of the datum point for tool installation against the work piece mount face. Work Coordinate System No. 0 (work coordinate system offset 0) = Base Coordinate System. X axis of Base Coordinate System is described as Xb, Y axis as Yb, Z axis as Zb and R axis as Rb.



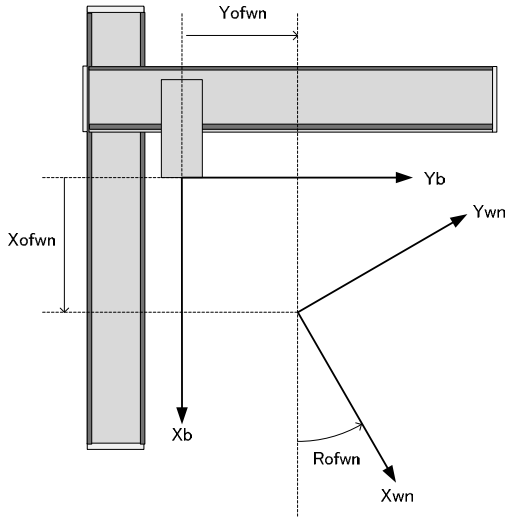


7.4.3 Work Coordinate System

It is the 32 kinds of coordinate systems defined by the offset of each axis against the base coordinate system.
Work Coordinate System No. 0 is reserved as Base Coordinate System (= Work Coordinate System Offset = 0) by the system.

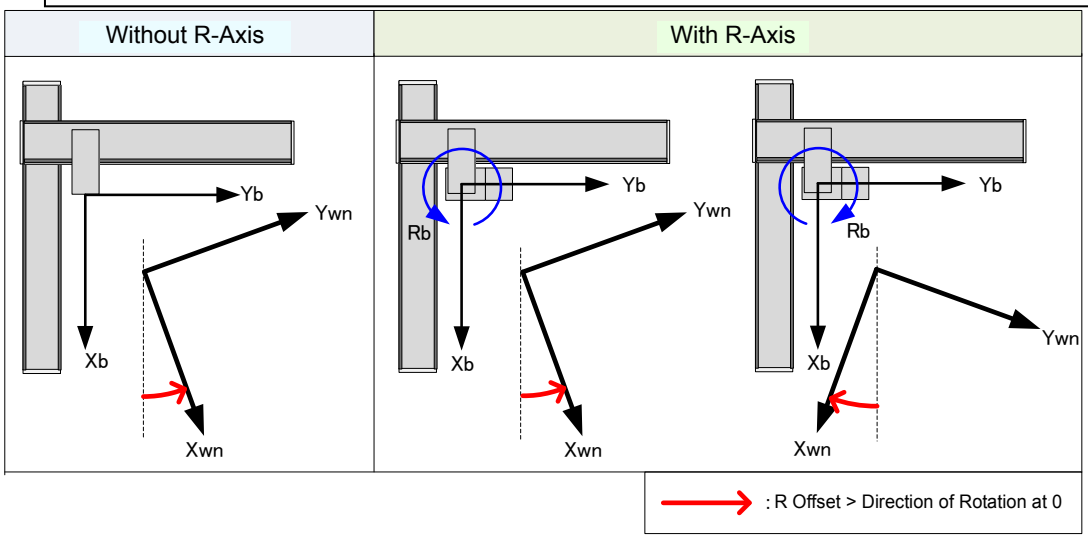
Set the offset of each axis as described below.

- X, Y, Z Offset
  Distance from the base coordinate system home to the work coordinate system home along Xb, Yb and Zb directions
- R Offset
  Amount of work coordinate system rotation when base coordinate system taken as the datum



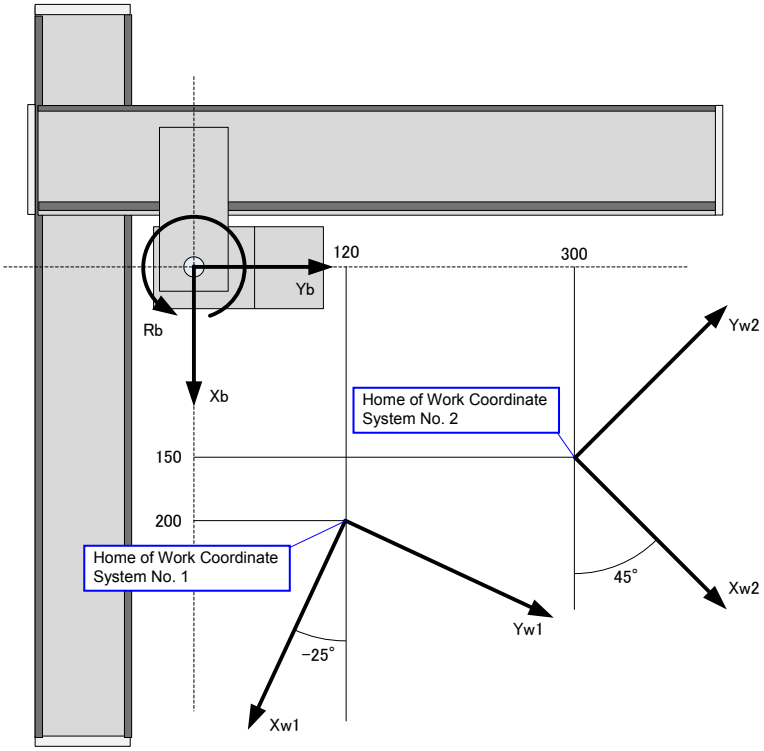
The direction of the coordinate system rotation (positive direction of R offset) is defined as described below by the axis structure of the coordinate system definition unit.

- When no R-axis in constructing axes · · · · · · · Rotating Direction from Xb positive direction to Yb positive direction
- When there is R-axis in constructing axes · · · Rb + Direction



(1) Setting of Work Coordinate System

When required to define Work Coordinate System No. 1 and No. 2 as shown in the figure below;



The offset of Work Coordinate System No. 1 and No. 2 are to be set as shown in the table below.

Work Coordinate System No.	Offset			
	X [mm]	Y [mm]	Z [mm]	R [deg]
1	200.000	120.000	0.000	-25.000
2	150.000	300.000	0.000	45.000

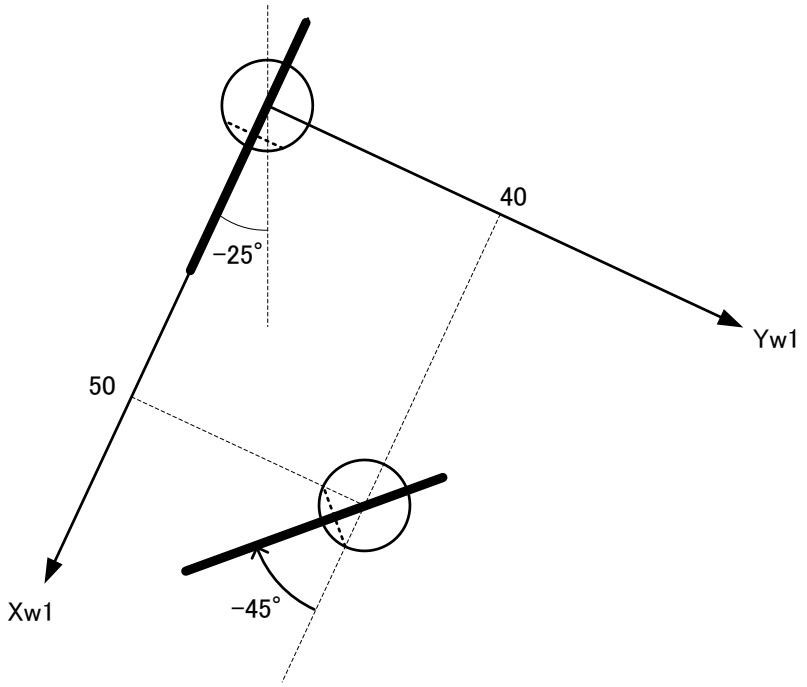
(2) Positioning on Work Coordinate System

Select the work coordinate system to be used and perform positioning.
When selecting the work coordinate system number in SEL program, use SLWK Command.
Also, the selected work coordinate system number is valid after program complete and after rebooting.

1) When having PTP positioning to Position No. 5 and No. 6 on Work Coordinate System No. 1.

Work Coordinate System No.	Offset			
	X [mm]	Y [mm]	Z [mm]	R [deg]
1	200.000	120.000	0.000	-25.000

Position No.	Coordinate Data			
	Axis1(X)	Axis2(Y)	Axis3(Z)	Axis4(R)
5	0.000	0.000	0.000	0.000
6	50.000	40.000	0.000	-45.000

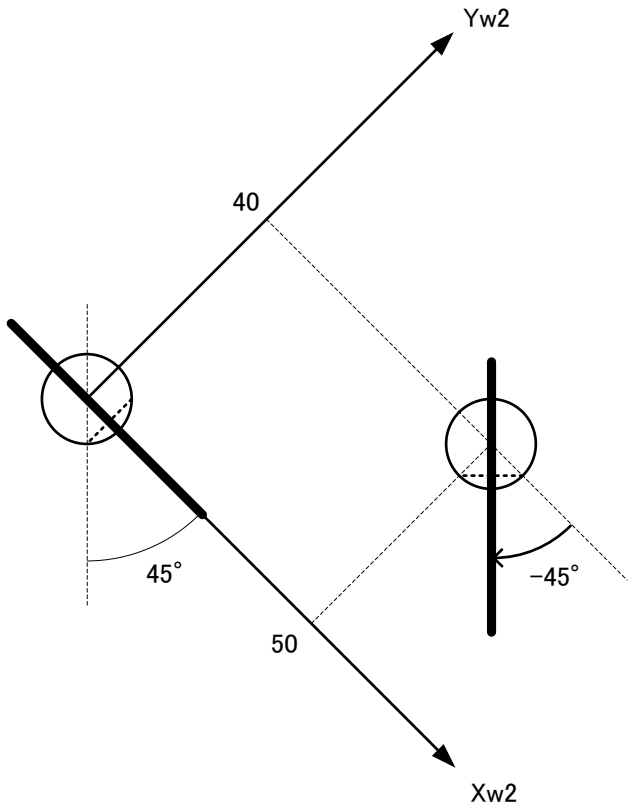


(* Example for when the datum surface on the R-axis orients Xb positive direction when each axis system coordinate on all the unit axes = 0)

2) When having PTP positioning to Position No. 5 and No. 6 on Work Coordinate System No. 2.

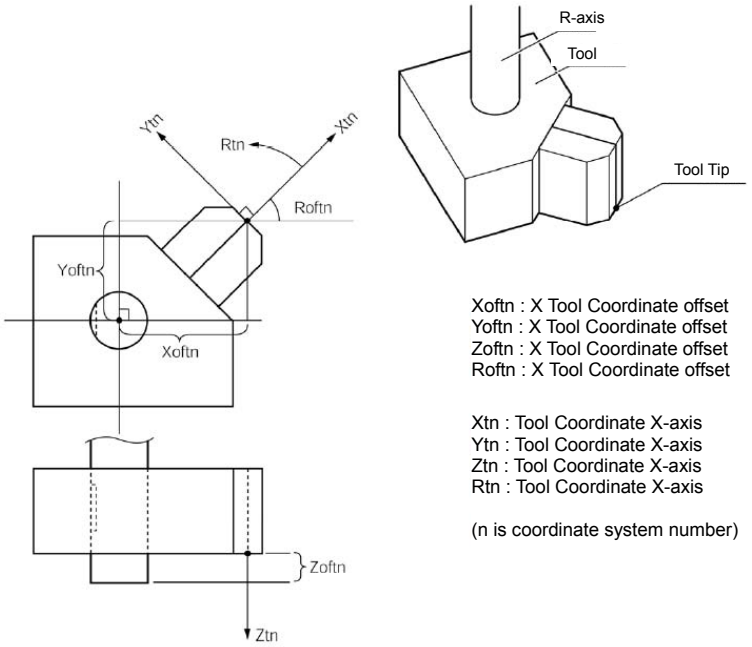
Work Coordinate System No.	Offset			
	X [mm]	Y [mm]	Z [mm]	R [deg]
2	150.000	300.000	0.000	45.000

Position No.	Coordinate Data			
	Axis1(X)	Axis2(Y)	Axis3(Z)	Axis4(R)
5	0.000	0.000	0.000	0.000
6	50.000	40.000	0.000	-45.000



7.4.4 Tool Coordinate System

It is the 128 kinds of coordinate systems defined by the too (such as hand) dimensions (offset) of that attached on the tool attached position.
(Note) Work Coordinate System No. 0 is reserved as offset = 0 of Tool Coordinates by the system.
Select the defined tool coordinate system number, and it is used as the destination point at positioning of the tool tip as well as the tool attached position.

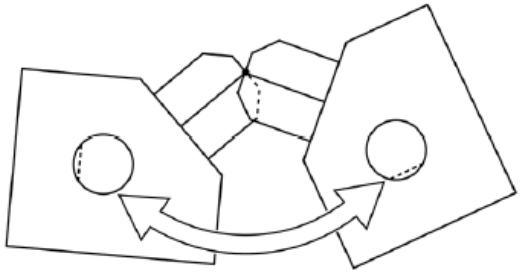


Xoftn : X Tool Coordinate offset
Yoftn : X Tool Coordinate offset
Zoftn : X Tool Coordinate offset
Roftn : X Tool Coordinate offset

Xtn : Tool Coordinate X-axis
Ytn : Tool Coordinate X-axis
Ztn : Tool Coordinate X-axis
Rtn : Tool Coordinate X-axis

(n is coordinate system number)

Select the defined Tool Coordinate System and operate the R axis with JOG operation, and such movement as shown in the figure below can be performed.

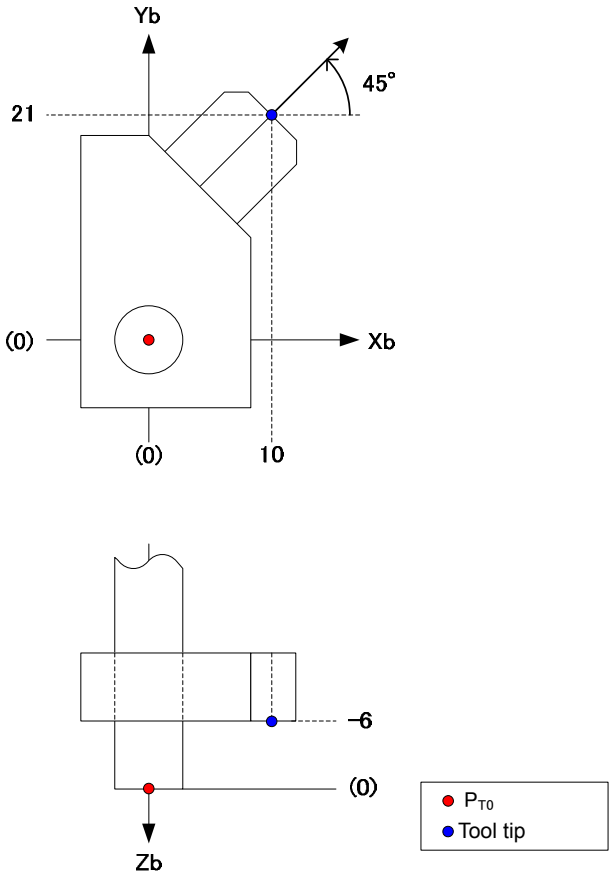


● Regarding directions of X and Y axes (Xtn and Ytn) in tool coordinate system
With R-Axis : Varies relying on coordinates of R-axis
Without R-Axis : Always fixed, the directions depends on R offset of tool coordinate system

(1) Setting the tool coordinate system
Set the offset amount from the tool attached position to the tool tip.
Set the tool offset as explained below under condition that **each axis system coordinates for all the unit constructing axes is 0 is taken as the datum.**

- X, Y, Z offset
  Distance from the tool attached position to the tool tip along Xb, Yb and Zb directions of the base coordinate system
- R offset
  Angle of the working direction with Xb positive direction as the datum
  (Definition for direction of angle is the same as work coordinate system R offset)

- Example for Tool Coordinate System Setting
  When required to set Tool Coordinate System No. 1 as shown in the figure below;
  (The figure below is assumed to show that each axis system coordinates for all the unit constructing axes is 0)



The offset of Tool Coordinate System No. 1 are to be set as shown in the table below.

Tool Coordinate System No.	Offset			
	X [mm]	Y [mm]	Z [mm]	R [deg]
1	10.000	21.000	-6.000	45.000

(2) Positioning using Tool Coordinate System Offset

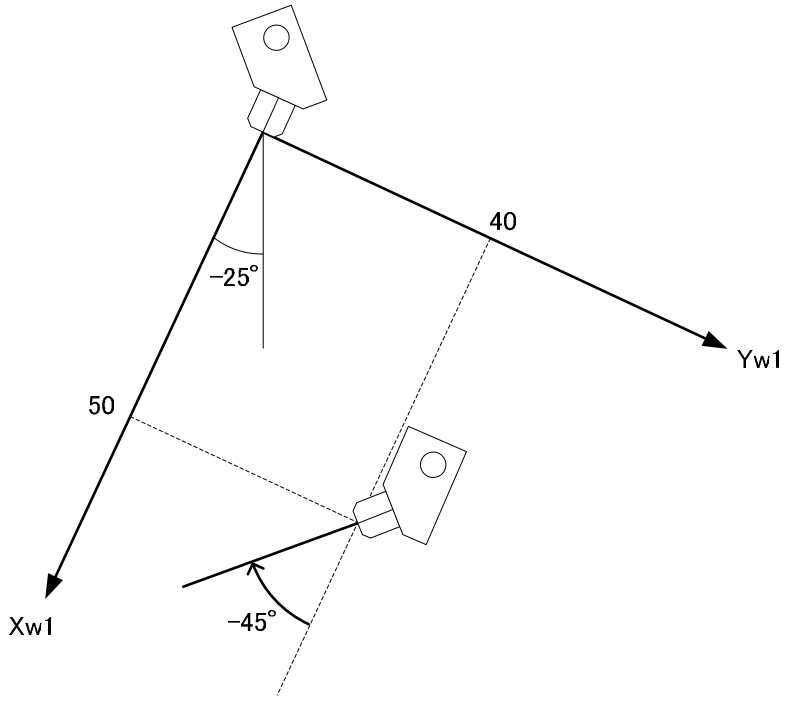
Select the work coordinate system to be used and perform positioning.
When selecting the work coordinate system number in SEL program, use SLTL Command.
Also, the selected work coordinate system number is valid after program complete and after rebooting.

1) When having the tool tip on Tool Coordinate System No. 1 to perform PTP positioning from Position No. 5 to No. 6 in Work Coordinate System No. 1;

Work Coordinate System No.	Offset			
	X [mm]	Y [mm]	Z [mm]	R [deg]
1	200.000	120.000	0.000	-25.000

Tool Coordinate System No.	Offset			
	X [mm]	Y [mm]	Z [mm]	R [deg]
1	10.000	21.000	-6.000	45.000

Position No.	Coordinate Data			
	Axis1(X)	Axis2(Y)	Axis3(Z)	Axis4(R)
5	0.000	0.000	0.000	0.000
6	50.000	40.000	0.000	-45.000

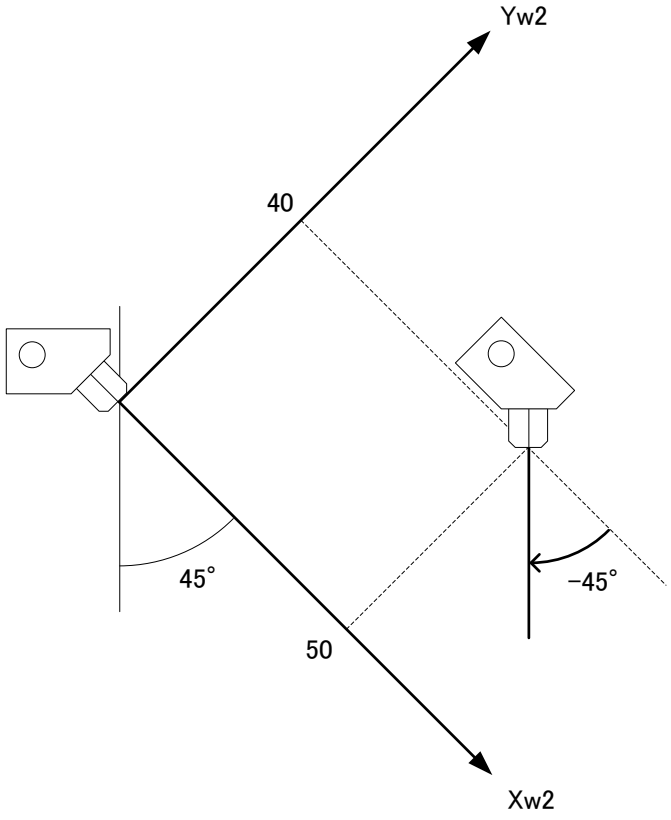


2) When having the tool tip on Tool Coordinate System No. 1 to perform PTP positioning from Position No. 5 to No. 6 in Work Coordinate System No. 2;

Work Coordinate System No.	Offset			
	X [mm]	Y [mm]	Z [mm]	R [deg]
2	150.000	300.000	0.000	45.000

Tool Coordinate System No.	Offset			
	X [mm]	Y [mm]	Z [mm]	R [deg]
1	10.000	21.000	-6.000	45.000

Position No.	Coordinate Data			
	Axis1(X)	Axis2(Y)	Axis3(Z)	Axis4(R)
5	0.000	0.000	0.000	0.000
6	50.000	40.000	0.000	-45.000



7.4.5 Setting of Parameters

Shown below, describes how to set the parameters necessary for using the work and tool coordinate system features on the linear axis.

• By setting All Axes Parameter No. 55 “Coordinate System Definition 1 Control” to “1h”, the coordinate system definition unit becomes effective.

No.	Parameter name	Initial value (Reference)	Input range	Unit	Access right	Remarks
55	Coordinate System Definition 1 Control	0H	0 ~ FFFFFFFFH		F	Bits 0-3 : Unit Valid Indication (0: Invalid, 1: Valid) Bits 4-31 : Reservation

• Indicate the physical axis applicable for the coordinate axes (X-axis, Y-axis, Z-axis and R-axis) in the coordinate system in All Axes Parameter No. 56 “Coordinate System Definition 1 Constructing Axis Setting”.

No.	Parameter name	Initial value (Reference)	Input range	Unit	Access right	Remarks
56	Coordinate System Definition 1 Constructing Axis Setting	0H	0 ~ FFFFFFFFH		F	Bits 0 to 3: X Indicated Axis Number Bits 4 to 7: Y Indicated Axis Number Bits 8 to 11: Z Indicated Axis Number Bits 12 to 15: R Indicated Axis Number Bits 16 to 31: Reservation (No applicable definition axis when Axis No. = 0)

Stated below are the caution items regarding the setting of All Axes Parameter No. 56. “5C0 Coordinate System Setting Error” will occur when there is an error in setting related to these caution items described below.

- The patterns of constructing axes that are available to indicate should be either of “XY”, “XYZ”, “XYZR” and “XYR”.
- Duplicated indication of one physical axis is not allowed.
- It is necessary that the axes indicated as the X, Y and Z-axes are linear driving axes (Each Axis Parameter No. 1 = “0”), and that the axis indicated as R-axis should be rotary driving axis (Each Axis Parameter No. 1 = “1”).
- The following axes cannot be indicated.
  [Synchronized Slave Axes, Infinite Stroke Axes, Shortcut Control Valid Axes]

- There may be a case that an error such as “D41 Coordinate System Data Management Domain ID Error” occurs after conducting parameter writing → reboot when the coordinate system definition unit gets activated by setting All Axes Parameter No. 55 for the first time.
  In such a case, initialize the memory for the “coordinate system definition data” using the PC software or a teaching pendant and then reboot the controller.
- There will be limitation in some part of operation if indicated to the coordinate system definition unit axis. (Refer to 3.1 for details.)

- In case there is an axis indicated as the R-axis in All Axes Parameter No. 56, establish the setting in All Axes Parameter No. 57 “Coordinate System Definition 1 R-Axis Coordinates Direction Setting”.

No.	Parameter name	Initial value (Reference)	Input range	Unit	Access right	Remarks
57	Coordinate System Definition 1 R-Axis Coordinates Direction Setting	0	0 ~ 1		F	Relation between direction of rotation from X-axis to Y-axis and R-axis direction in base coordinate system 0: Same direction 1: Opposite direction

(All Axes Parameter No. 57 is the parameter to define the relations of X-axis, Y-axis and R-axis in the base coordinate system.
In case this parameter is not established correctly, the axes will not operate as expected. Pay attention when establish the setting for this parameter as the controller cannot judge right or wrong for the contents of the setting.)

Establish the setting as described below for the value in All Axes Parameter No. 57.

・When “Rb Positive Direction” is the same as “Rotating Direction from Xb Positive Direction to Yb Positive Direction” → “0”
・When “Rb Positive Direction” is opposite “Rotating Direction from Xb Positive Direction to Yb Positive Direction” → “1”

(Example) In the construction below, Rb positive direction (clockwise) is opposite the rotating direction from Xb positive direction to Yb positive direction R’ (counterclockwise), thus All Axes Parameter No. 56 should be set to “1”.

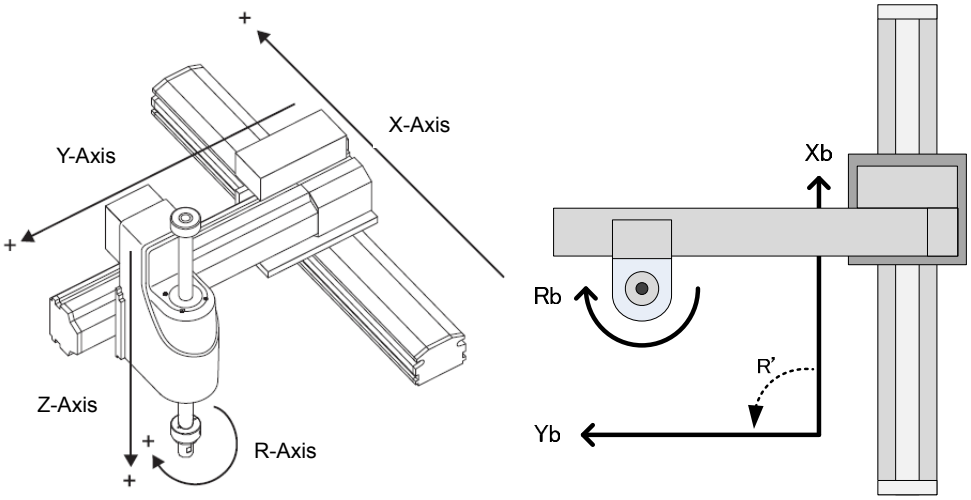


Figure : Example for unit (Left : Each axis system / Right : Base coordinate system)

7.4.6 Caution Note

(1) Limitation in Coordinate System Constructing Axes

Shown below are the cases when limitation is applied to indication for operation of X, Y and R-axes in the coordinate system definition unit.

Operations Subject for Limitation		Indicated Axis			
		X	Y	Z	R
Pressing Movement	(PUSH)	Δ*1	Δ*1	○	Δ*1
Arch motion Z-axis	(ACHZ/PCHZ)	Δ*1	Δ*1	○	×
palletize XY-axis	(PASE/PAPS)	○	○	○	×
Circular / Arc Movement 3-Dimensional Circular / Arc Movement	(CIRS/ARCS) (CIR/ARC)	○	○	○	×
Circular / Arc Movement 2 Arc Movement with Center Indication	(CIR2/ARC2) (ARCC/ARCD)	○	○	Δ*2	×

○ : Available for Indication Δ : Available for Indication with Conditions × : Unavailable for Indication

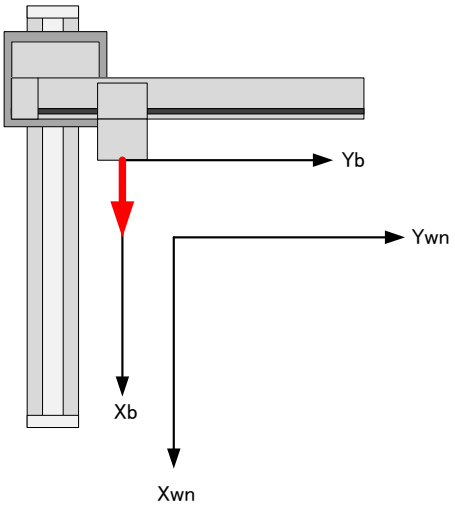
(*1) Permitted only when operated physical axis is one axis to the indicated axis

(*2) Permitted only when operated axes are two axes in total

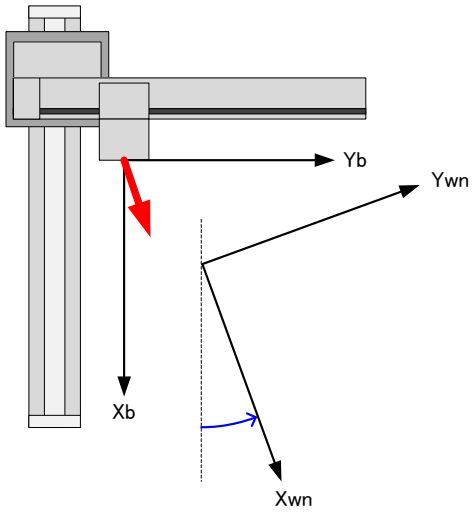
Example : To indicate X-axis in PUSH Command

1) Work coordinate system R offset is 0 (in such case as Work Coordinate System No. 0)
→ Available to indicate (Only X-axis operates)

2) Work coordinate system R offset is not 0
→ Unavailable to indicate (Operation necessary on X and Y-axes)



○ : Available for Indication



× : Unavailable for Indication

(2) While in operation of either X-axis or Y-axis (or R-axis) in a SEL program, or with operation of PC software or TP, X-axis and Y-axis (and R-axis) cannot be operated in another SEL program.

(3) When operating either X-axis or Y-axis (or R-axis), it is basically necessary that servo is turned on and home return operation is completed on all of X-axis and Y-axis (and R-axis). It could cause an error if operation is attempted with those conditions above unsatisfied.

(4) In the position edit window for the PC software and teaching tools applicable for the feature, when operation is made to turn on/off the servo to the coordinate system definition unit axes, servo turns on/off on all the axes in the applicable units.

(5) When performing CP operation on the R-axis by setting the tool coordinate system offset, the operation speed and acceleration / deceleration on the X-axis and Y-axis will be limited so they do not exceed the indicated velocity and acceleration / deceleration. Therefore, even if the indicated velocity and acceleration / deceleration are the same, the actual operation speed may tend to be slower as the tool length (distance from the tool attachment datum point to the tool tip) gets longer.

(6) When attempted to perform CP operation or JOG operation on the work coordinate system or tool coordinate system while the coordinate system definition unit axis is out of the soft limit, “Error No. C73 Target Track Soft Limit Exceeding Error” could occur. In such a case, use the PC software or a teaching pendant and have JOG operation on each axis system to have the axis moved inside the soft limit from outside.

(7) When a velocity change command is issued to CP operation including the R-axis, the specification could be limited depending on the condition. Refer in the section for CHVL Command for details. [Refer to the separate SEL Language Programming Manual.]

(8) When a synchronized master axis is indicated as the coordinate system definition unit axis, the applicable synchronized slave axes are to be treated as the axes outside the unit (* Operation will be synchronized to the synchronized master axis as it does in ordinary use). Therefore, the work coordinate system and the tool coordinate system are not considered in the current

Chapter 8 Warranty

8.1 Warranty Period

One of the following periods, whichever is shorter:
- 18 months after shipment from our company
- 12 months after delivery to the specified location

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 problem in question pertains to our product as delivered by us or our authorized dealer.

(2) The breakdown or problem in question occurred during the warranty period.

(3) The breakdown or problem in question occurred while the product was in use for an appropriate purpose under the conditions and environment of use specified in the operation manual and catalog.

(4) The breakdown of problem in question was caused by a specification defect or problem, or by a quality issue with our product.

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

[1] Anything other than our product
[2] Modification or repair performed by a party other than us (unless we have approved such modification or repair)
[3] Anything that could not be easily predicted with the level of science and technology available at the time of shipment from our company
[4] A natural disaster, man-made disaster, incident or accident for which we are not liable
[5] Natural fading of paint or other symptoms of aging
[6] Wear, depletion or other expected result of use
[7] Operation noise, vibration or other subjective sensation 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 brought to us for repair under warranty.

8.4 Limited Liability

(1) We shall 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 shall not be liable for any program or control method created by the customer to operate our product or for the result of such program or control method.

8.5 Conditions of Conformance with Applicable Standards/Regulations, Etc., and Applications

(1) If our product is combined with another product or any system, device, 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 will not be liable 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 us if you must use our product for any of these applications:

[1] Medical equipment pertaining to maintenance or management of human life or health
[2] A mechanism or mechanical equipment intended to move or transport people (such as a vehicle, railway facility or aviation facility)
[3] Important safety parts of mechanical equipment (such as safety devices)
[4] Equipment used to handle cultural assets, art or other irreplaceable items

(3) Contact us at the earliest opportunity if our product is to be used in any condition or environment that differs from what is specified in the catalog or operation 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:

[1] Guidance for installation/adjustment and witnessing of test operation
[2] Maintenance and inspection
[3] Technical guidance and education on operating/wiring methods, etc.
[4] Technical guidance and education on programming and other items related to programs

Change History

Revision Date	Revision Description
2014.07	First Edition
2014.08	Second Edition PC/PG type added
2015.04	Edition 2C Pg. 23: Correction made to model code of PC Software. Pg. 25: SCARA model codes added. Pg. 27: Selection of Breaker added.
2016.01	Third Edition Note added for High resolution Battery-less Absolute (Chapter 5 Parameter, Chapter 6 Troubleshooting and Pg. 26, 43, 75)
2016.02	Fourth Edition Applicable for cleanroom, dust-proof and drip-proof, and for new coordinate systems and serial communication board
2016.04	Edition 4B Pg. 23 to 26: New fieldbus added
2017.05	Fifth Edition PCF/PGF type added
2018.05	Edition 5B Values changed for parameter settings at delivery for field network type 1.2, 2.2.1 Descriptions revised for leakage breaker 1.1.5 Model code added for wrist unit 1.4.2 Correction made for resistance value in PIO interface circuit diagram 3.4.3 Description revised for 7-Segment Display SEL Program 5.1 I/O Prameter No.116, 135 and 347 added 5.2 All Axes Common Parameters No.55 to 57 added

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