VC Series

AC Servo Controller

NCR-CA*6

Instruction Manual

Ver.2.0

Nikki Denso Co., Ltd.

Manual No. TIE-12890J

Preface

We thank you for buying a **<VC-C6 Series>** NC Servo Controller having dedicated functions.

[Points to be confirmed]

1. Inward inspection
   Please verify the following points on delivery of the product.
   (1) Whether the product matches the one you have ordered? (Model, Rated output, Accessories)
   (2) Whether any damages have occurred during transportation? (Damages on the packing, Damages on the product exterior)
   (3) Whether accessories have been included?
   (If any damage is observed on the corrugated packing, please call our sales in-charge, without unpacking.
   Please call our sales in-charge immediately in case you observe any discrepancies or damages as given above.
2. Points to note before installation (Transport)
   (Please transport the controller, motor carefully such that no damages occur.)
   Note:
   Please do not pile up the controllers nor place anything on the cover.
   Please see to it that no impact shock is caused on the motor shaft.
   (This may cause damage to the encoder fitted on the motor.
   When transporting, please do not hold the motor with its cables.
   → This may cause the cables to break.
3. Points to note when storing
   On delivery of the product, if you do not wish to use it immediately, then in order to prevent the insulation from deterioration and rusting, please store the product as given below. However, on receipt of delivery, please unpack and verify that there are no discrepancies or damages occurred during transportation.

Items		Description
Ambient Conditions	Temperature	-20°C - +60°C
	Humidity	Less than 85% (No Condensation)
	Storage Place	Please store in a clean place that is free of thrash and dust. Please do not store in hazardous environment containing corrosive gasses, grinding coolant, metal powder or oil.
Vibrations		Please store in a place free of vibrations.
Miscellaneous		When storing for a long time, always apply rust prevention treatment on the screws of the terminal blocks and check periodically. The rust prevention treatment applied on the motors is effective for about 3 months from the time it was shipped from the factory, if stored in the above conditions. If storing for a period longer than 3 months, then rust prevention treatment should be applied on the motor shaft, flange faces and check periodically.

Conditions to store controller, motor

4. Precautions when transporting

After the delivery of the product, if you wish to transport the same from one place to another, please do so in the conditions given below.

Items		Description
Ambient Conditions	Temperature	-20°C - +60°C
	Humidity	Less than 85% (No Condensation)
	Storage Place	Please do not transport in hazardous environment containing corrosive gasses, grinding coolant, metal powder or oil.
Vibrations		Less than 0.5G (Controller, Motor)

Conditions when transporting controller, motor

⚠ Caution

- Humid conditions affect the life of the LCD module on the front panel and the optional SDI device in particular. We recommend that the humidity should be less than 65% RH when storing or transporting. In case the humidity is to exceed 65% RH, please contact our sales in-charge for information.

[Information about this instruction manual]

This manual describes the installation, wiring, usage instructions, maintenance inspection, fault diagnosis and the counter measures for NC Servo controller VC-C6 and AC Servo motor.
It is advisable to read and understand this manual in order to use the products in a correct and a proper manner.
Please follow the conditions and instructions in this manual when installing, wiring, operations and maintenance inspection.

If you are using this product along with a device having customized specifications, then please refer to both, this manual and the manual of the customized device.
However, the contents of the specifications supersede any duplication of described content or items in this manual.

- This manual is applicable for NC Servo controller VC-C6
  - Software version 2.02 or higher
  - Hardware version 0.03 or higher
- When using a Linear motor, use “Thrust” instead of “Torque”.
- Use “Magnetic pole sensor” on a Linear / Disc motor, if “Automatic magnetic pole sensing (Amplitude of the motor)” cannot be implemented when the power is supplied to the machine (Reasons like interference of the work).

[The warranty period]

The warranty period for the product is 1 year from the time it is shipped from the factory.
Please note that the warranty will not be applicable in case of damages or faults arising out of conditions given below.

(1) Any defects arising out of modifications carried out at your end.
(2) In case when this product is used for some other applications than the ones mentioned in this manual.
(3) In case of natural disasters.
(4) In case if this product has been connected to a third party product other than the ones mentioned by us.

Not withstanding to the warranty period, it is advisable to contact our sales and service in-charge, in case of any defects or faults.

※Nikki Denso Co., Ltd holds the express rights on the revision of this manual and changes may be made without any notice whatsoever. Though Nikki Denso Co., Ltd guarantees the correctness and reliability of the information provided, they will not be responsible in case of usage other than the one recommended.

Safety Precautions

Before installation, running, maintenance inspection, fault diagnosis and its countermeasures, please read the manual and all associated manuals comprehensively.
It is advisable to have knowledge and information of this controller for the safety purpose, before using it.

In this manual, the safety precautions are ranked as [Danger] and [Caution]. The precautions for handling are divided into [Prohibition] and [Compulsion], which are defined respectively as, (Actions not to be performed) and (Action to be performed).

Danger : In case of improper handling, dangerous situations such as, death or serious injury that may lead to death could occur.

Caution : In case of improper handling, dangerous situations such as, medium or light injury or mechanical damage could occur.

Further, **Caution** items described under this if not followed may result in serious consequences depending on the situation.
Please strictly follow all of them.

Compulsion : Prohibited action.
If this precaution is ignored, the unit will not work properly.

Compulsion : Compulsory action
If this precaution is ignored, the unit will not work properly.

[Precautions when using unit]

Danger

★ Please comply with the following suggestions, as there is a possibility of electric shock and injury.

(1) Never touch the inside of this controller or the terminal blocks.
[Otherwise may lead to an electric shock.]

(2) Proper grounding of the grounding terminals or wires of this machine and motor should be done. Use larger Class 3 grounding cables or better grounding.
[Otherwise may lead to an electric shock.]

(3) Transportation, wiring, maintenance, and inspection should be carried out after disconnecting the power supply and confirming with a tester that no current is remaining in the DC main circuit (Internal DC bus) or, after 3 minutes have passed since disconnecting the power supply.
[Otherwise may lead to an electric shock.]

(4) Do not damage or nip the cables, apply excessive force or keep heavy things on the cables.
[Otherwise may lead to an electric shock.]

(5) Do not touch the rotating part of the motor when running.
[Otherwise may lead to an injury.]

Caution

(1) Use motor and this controller in the specified combination.
[Otherwise may lead to fire or failure.]

(2) Do not use in places that are near to water, corrosive materials/inflammable gas or combustibles.
[Otherwise may lead to fire or failure.]

(3) As the temperature around the motor and the controller is high, do not touch them.
[Otherwise may lead to burns.]

(3) The radiator, regenerative unit, or the motor could be very hot when the power is ON or for a short while after it is switched OFF and hence, never touch them.
[Otherwise may lead to burns.]

Prohibition

(1) Do not carryout a “Pressure test” or a “Mega test” on this controller.
[Otherwise may lead to an accident.]

[Receiving and checking the packages]

Caution

(1) Please verify the contents on delivery of the product. Please call our sales in-charge immediately in case you observe any discrepancies or damages.
[Otherwise may lead to an electrical shock, injury, damage, fire, accident.]

(2) If any damage is observed on the corrugated packing, please call our sales in-charge, without unpacking
[Otherwise may lead to an electrical shock, injury, damage, fire, accident.]

[Storage]

Prohibition

(1) Do not store the controller in a place where it may be affected by rain or water dripping, and harmful gases or liquids.
[Otherwise may lead to a failure.]

Compulsion

(1) Store the controller in a place where it is not affected by direct sun rays but, a place where temperature and humidity is controlled within the specified range.
[Otherwise may lead to accidents.]

(2) If the storage period is to exceed 3 years from the date of purchase, please contact our sales in-charge.
[Otherwise may lead to a failure.]

[Transportation]

Caution

(1) Do not hold the cables or the motor shaft when transporting from one place to other.
[Otherwise may lead to an injury or a failure.]

Compulsion

(1) Piling the controllers on top of each other may lead to collapsing of the pile. Hence follow the instructions.
[Otherwise may lead to an injury or a failure.]

[Installation]

⚠ Caution

(1) Do not climb or keep heavy things on this controller.
[Otherwise may lead to an injury or a failure.]
(2) Please see that the air inlet or outlet does not get blocked, or no foreign body enters into it.
[Otherwise may lead to fire.]
(3) Follow the instructions for installation.
[Otherwise may lead to fire or accidents.]
(4) Keep the stipulated gaps between the controller and internal walls of the control panel or other equipment.
[Otherwise may lead to fire or accidents.]
(5) Never apply heavy impact to the controller.
[Otherwise may lead to damaging of the controller.]
(6) See that the fixing is done in a proper way to suit the output or weight of this controller.
[Otherwise may lead to damaging of the controller.]
(7) Use non-flammable metal brackets to fix the controller.
[Otherwise may lead to fire.]

[Wiring]

⚠ Caution

(1) Ensure that the wiring is correct.
[Otherwise may lead to the motor running out of control / burning out, injury or fire.]
(2) To prevent from noise, use the specified length and special (shielded/twisted, etc.) wires. For the controlled I/O signal cable of this machine, the wiring should different when compared to the other power cables and power (transmission) lines.
[Otherwise may lead to the motor running out of control, injury, machine damage.]
(3) For preventing shocks and noise suppression, proper grounding should be ensured.
[Otherwise may lead to the motor running out of control, electrical shocks, injury or damage to the controller.]

[Operation/Run]

⚠ Caution

(1) The motor should be protected by installing an emergency stop circuit having an inbuilt thermostat. Or use a special protection device for motors without thermostat.
[Otherwise may lead to an injury or a fire.]

(2) Ensure that power supply is normal.
[Otherwise may lead to an injury, fire or damage to the machine.]

(3) Test run and confirm the motions of the machine by installing the motor and de-linking it and then re-link the machine.
[Otherwise may lead to an injury or damage to the machine.]

(4) Avoid sudden changes to the settings as they destabilize the machine movements.
[Otherwise may lead to an injury or damage to the machine.]

(5) When the alarm is given, reset it and restart the machine only after the cause has been eliminated.
[Otherwise may lead to an injury or damage to the machine.]

(6) The machine may restart without any warning after the power is instantly restored. Therefore, one should not go too close to the machine.
(It is recommended to design the Machine in such a way, which ensures the safety of people even after restart.)
[Otherwise may lead to an injury.]

⃠ Prohibition

(1) Do not switch ON the power when the motor shaft is rotating or pulsating.
[Otherwise may lead to the motor running out of control, injury or damage to the machine.]

(2) The brakes of the motor with inbuilt brakes are used to maintain the position of machine. They should not be used as a braking device to ensure safety of machine and braking.
[Otherwise may lead to an injury or damage to the machine.]

❗ Compulsion

(1) Install an emergency stop circuit to switch OFF the power and stop the operations immediately.
[Otherwise may lead to an injury or damage to the machine.]

[Maintenance/ Inspection]

⚠ Caution

(1) The capacity of electrolytic condenser on the main circuit inside the machine gets lowered due to wear and tear.
To prevent secondary accidents due to the break down, we recommend that the condensers should be replaced every 5 years, and our sales in-charge should be consulted.
[Otherwise may lead to an accident.]

(2) Cooling effect of the inbuilt fan motor of the controller reduces due to wear and tear.
To prevent secondary accidents due to the break down, replacement every 2 to 3 years is recommended, and our sales in-charge should be consulted.
[Otherwise may lead to an accident.]

⃠ Prohibited

(1) Overhauling of the machine should be done by us or our recommended agencies.
[Otherwise may lead to an accident.]

Table of Contents

Chapter 1 Outline

1-1 Features

In control cycle of industrial machines, there are main motions which form the base of the operations such as drive shaft for transportation of case-making material for case-making machine, drive shaft for transportation of printing material for printing machine. Sometimes, synchronous or proportionately synchronous operations are performed for main drive shaft due to complicated operations performed by the drive shaft in accordance with the main operations and there are cases in which material that is driven by main drive shaft is processed in terms of position and time

Pasting operation of cardboard case making machine, wire forming, striking operation of machines to manufacture springs etc. are the examples of above mentioned movements. As regards to rotational angle of the master axis, for salve axis free curve motion is performed in relation with time and position as per the coordinates. Moreover, if this product is used, universal operations of slave axis by entering the prescribed parameters can be set and work-piece can be changed easily in short time.

This product is generically called **<VC-C6 type>** and positioned as dedicated model of "Free curve motion control".

This controller is Axis NC Servo Controller, performing external or internal master axis pulse simultaneously implementing free curve operation as per servo motor (Slave axis).

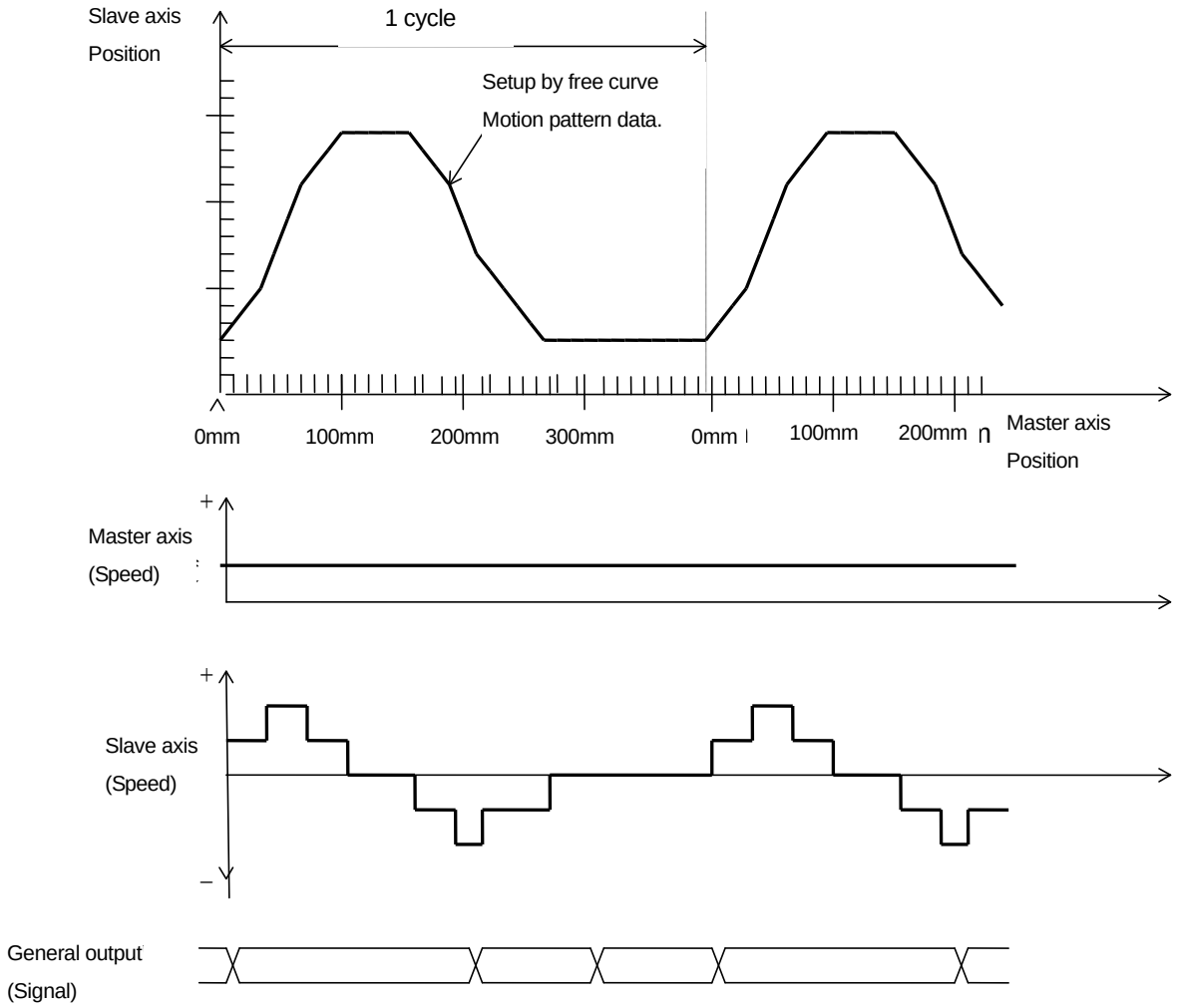
(1) By integrating 1 axis-positioning unit with AC servo driver, system can be made with less wiring and compact size.
(2) With full digital control it is possible to have a less drift, more fine adjustment, a better man-machine interface etc., seeking for better reliability and easier operation.
(3) The custom made LCD module (optional for machines less than 1.5 KW) supports every kind of monitor, alarm history, self-diagnostic function, etc. leading to reliability and improvement in maintenance methods.
(4) Multi use of customized LSIs and less wiring structure leads to improved reliability and compact size of this controller.
(5) Adoption of IPM (IGBT) in the power switching section, improves servo performance and noise dampening.
(6) Drive programming is possible with internal standard data of 280 points.
(7) External trigger positioning is possible.
(8) Position data and speed data can be set by Index data.
(9) Control such as Linear / S shape curve Accel./ Decel., feed-forward, torque command filter, gain change during stop or deceleration, etc. can be performed by standard software servo suitable for machine rigidity.
(10) By setting a parameter, one unit can be made available for various AC servo motor types (Linear motor, disk motor, induction motor, synchronous motor)
(11) Through serial communication, interaction with peripheral equipment of touch panel, high-level controller is possible.
(12) Zero return is not necessary by using an optional absolute encoder.
(13) Auto tuning function.
(14) As free curve data, part analysis is done for total 50000 point and high precision is achieved.
(15) Free curve data can be set for filling machine, on part program using functions in which decimal point and various patterns are used.
(16) Free curve motion of 8 axes which is synchronized with internal master axis by servo control communication can be set.

1-2 Outline of free curve motion

In this explanation, description is given assuming that 1 cycle is of 400 mm.

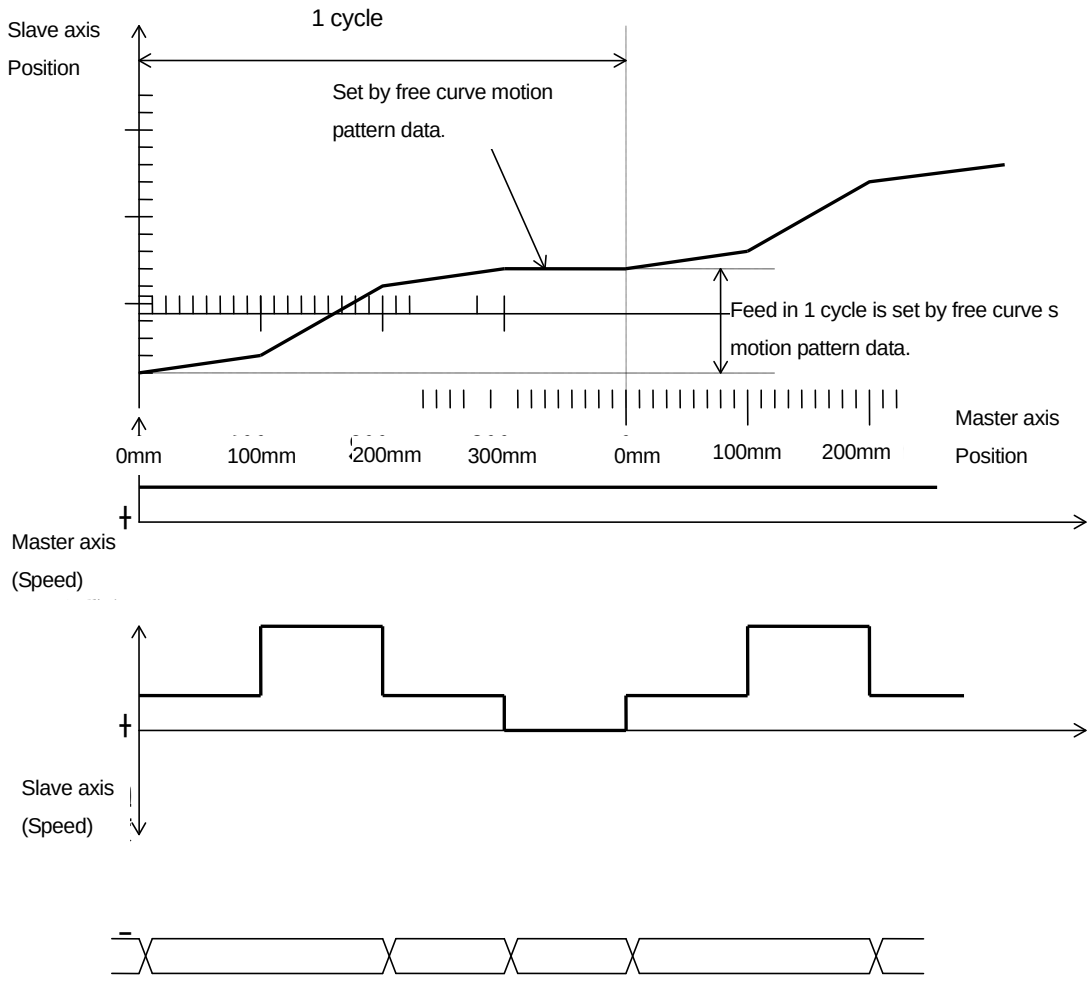
(1) When slave axis is straight-line motion (When free curve motion is returned)

[Figure1 – 1] Slave axis straight-line motion



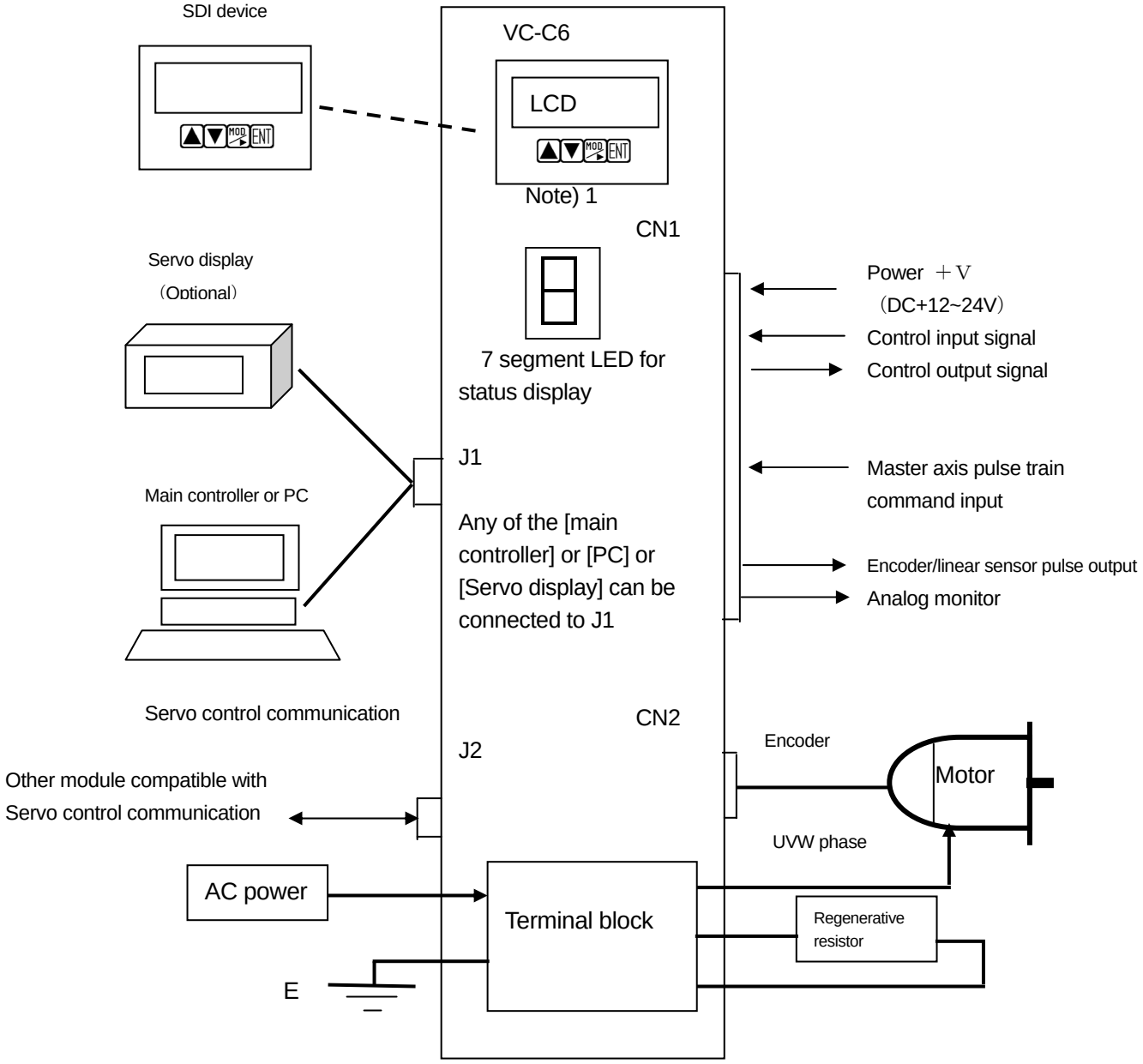
(2) In case of rotations of slave axis (Movement of free curve motion in 1 direction.)

[Figure 1–2] Slave axis rotational motion



1-3 System configuration

Peripheral system configuration of VC-C6 type is shown in figure 1-1 below.



Note1) LCD designed for machine capacity above 1.5 KW

[Figure 1-3] VC-C6 type system configuration

Details of each part

(1) VC

This controller is used for controlling AC servo motor/ Linear motor/ Disk motor.
However, various types of AC servo motors and encoders can be controlled by single controller as per parameters.

(2) LCD module

Sets the status of VC, display of input/output signal and parameters by cursor keys.
This module is set for machines with capacity above 1.5 KW.

(3) SDI device (Optional)

Set VC status with capacity less than 1.5 KW, display of input/output signal and parameter.

(4) Servo display (Optional) or host controller (PC etc.)

By control software developed by our company or by client,
・Display of status data (no. of revolutions, deviation etc.),
・Control of VC control signal,
・Settings of parameter and backup etc. is possible
However, these features are not included in commercial PCs. So kindly consult before investigation.

(5) Motor

As per standards, this is connected to our AC servo motor (Linear motor, disk motor, induction motor, synchronous motor)

(6) Servo control communication

It is connected to the machine with servo control communication compatible system and can control free curve motion up to 8 axes simultaneously.

Settings like parameter, command and index data can be done by LCD module on front side of the controller or by optional SDI device (device for creating data) and also by the serial communication from main controller or PC.

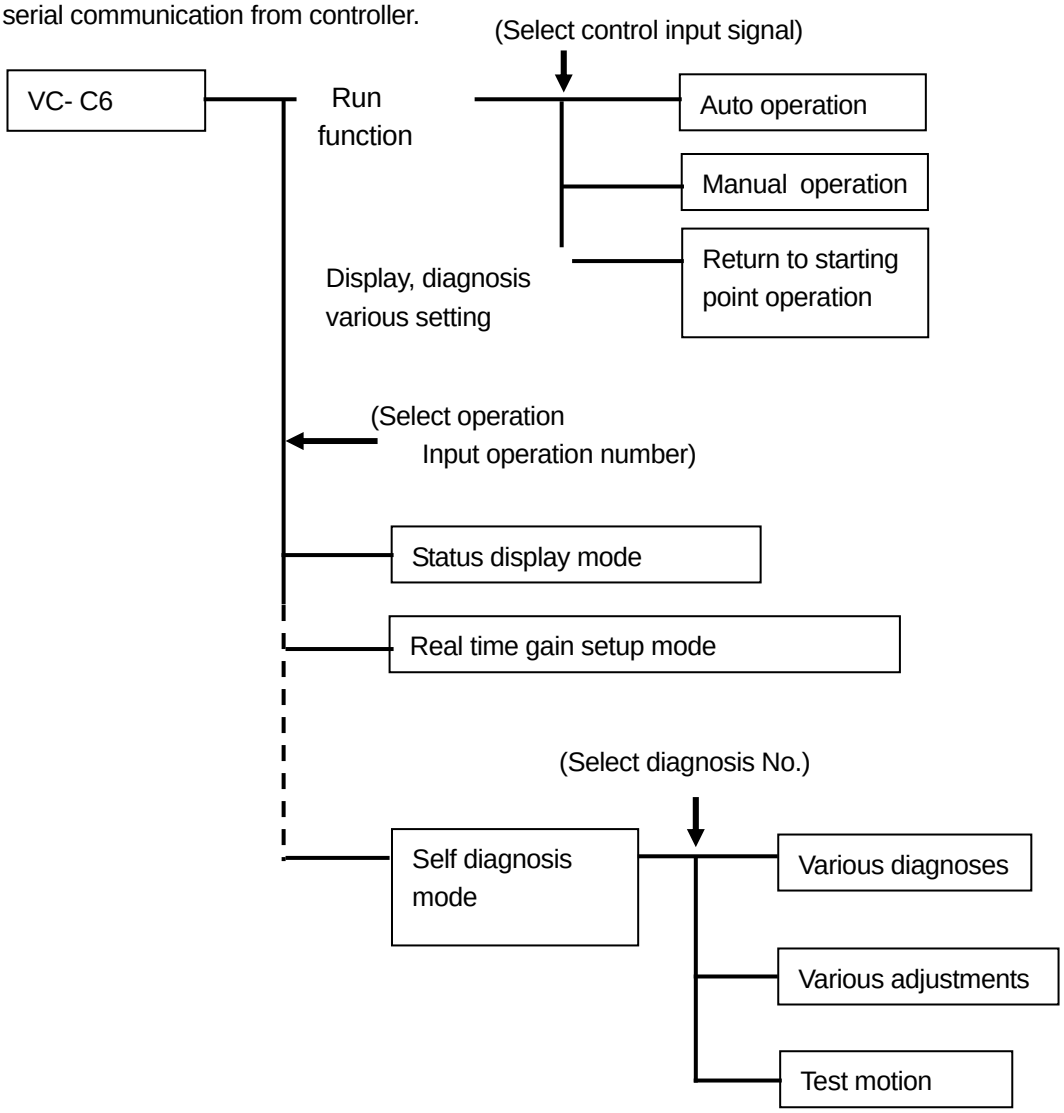
Use serial communication to set [Free curve motion pattern data], by using separately sold [VC series Edit software (compatible to Windows 95)].
(Direct editing by LCD module and SDI device is not possible).
However, patterns specified in program commands [PSET], [POUT], [PCLR] and [PCNV] and [Slave position] and [General output] for master position can be set.
(For details, refer to separate instruction manual [Volume: Command].)
However, when [Free curve motion data Edit software (compatible to Windows 95)] is not used, set by referring to [14-5 Free curve motion data] in serial communication.

1-4 Mode configurations

[1] Run mode

Each run mode can be selected by parameter and control input signal as given below.

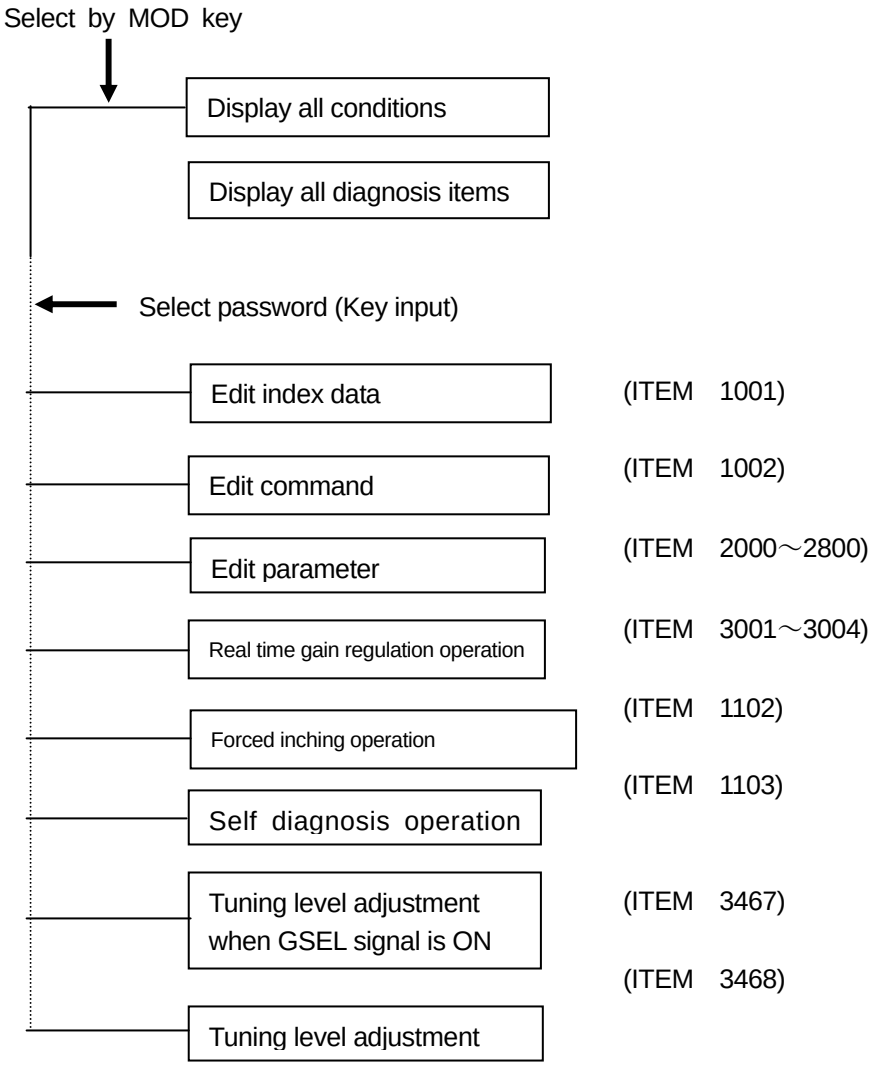
Each parameter can be set by LCD module on front side of the device or optional SDI device or for serial communication from controller.



[Figure 1-4] Mode block diagram

[2] Operation mode

Block diagram for operation of LCD, SDI (Optional)



Chapter 2 Specifications

2-1 Types

Types of NCR-CA*6 series are as follows.

NCR - (1) (2) (3) (4) (5) (6) – (7) (8) – (9)

Example: NCR - C A B 6 A2 A - 201 A

No.	Item	Display	Contents
		NCR	Nikki AC Servo controller series
(1)	Product classification	D	Driver
		C	Controller
(2)	Type name	A	VC series
(3)	Machine type	B	High efficiency version
		C	Multi-function version
		D	High efficiency version (With dynamic brake, below 800W)
		E	Multi-function version （(With dynamic brake, below 800W)
(4)	Function type	0	Driver
		1	Controller
		3	Flying cutter control
		6	Free curve control
(5)	Input power specifications	A1	AC100V system
		A2	AC200V system
		A3	AC400V system
(6)	Design order	A, B,….	Start from A
(7)	Output capacity	E.g.) 201	20 1 = 20 × 10^1 = 200W | └ 10 to power of specified number └── Effective numbers
(8)	Motor-wise classification	A	None: Multi-functions version (Synchronous/ induction motor) A: Linear coreless A/B type motor B: Linear core M/N type/ Disc motor C: Linear coreless S type motor
(9)	Special specification	S1	None: Standard specification S1:Special specification

[Table 2-1] Type display

2-2 General Specification

Item		Contents
Outline		Refer to chapter 3 “Outline diagram”.
Environt	Temperature	0 - 55^0 (Unit circumference) / Stored temp. -20～60℃
	Humidity	85% or less, non-condensing
	Altitude	1000 m or less
	Location	Do not install it in harmful atmosphere, such as corrosive gas, grinding oil, metal powder, oil etc.
Cooling method		Natural air cooling
Mounting method		Panel mounting type
Vibration resistance		0.5G (10 - 50Hz)
Shock resistance		5G
Noise resistance		Line noise: 2000V (50ns, 1μs), 1 minute Radiation noise: 1000V (50ns, 10cm), 1 minute Electro-static noise: 10kV (between earth and case)

[Table 2-2] General specifications

2-3 Function specification

Item	Contents · Specification	
Number of axes	1 axis	
Max. speed	16Mpps (4 times of encoder pulse frequency)	
Control factor	Position (Position control data / free curve control)	
Control method	Position control ┬ Auto. Run Positioning └ Free curve control (implemented by program command)	
Command input types	Auto. run	(1) Internal stored data 280 points (Address 0 - 255 set by control signal) (2) Serial communication
	Master position command	(1)90° different phase pulse (2)Directional pulse (3)Directional signal + feed pulse (Either line driver method or open collector method output can be used. However in the point of noise resistance, Line driver method is recommended.) (4)Servo control communication
Major function	Zero return run, Manual (Jog) run, Serial communication run Program run (Positioning, simple continuous positioning, external trigger positioning, four rules of arithmetic/ Logic computing, Timer, Un-conditional/ conditional jump, Sub-routine, Spinner control, free curve control) self-diagnosis Torque limit, Backlash compensation, Feed-forward ratio set, Electric gear ratio set, Electric thermal	
Accel. / Decel. pattern	Linear accel. /decel., S shape accel. / decal	
Input Signal	[8 Basic input signals (Initial value)] Backlash alignment progress (D11), Backlash delay (D12), Electronic clutch (D14), Master axis selection (D18), Cycle end (D21), Pattern selection (D22/D24/D28) < Following signals can be allocated by Remote control or output signal allocation and used.> Servo ON (SON(*)), Emergency stop (EMG*), Reset (RST), Proportion control (PC), Mode selection (MD1,MD2), Auto start (PST), Address specify (PS1 - PS8), Forward JOG (FJOG), Reverse JOG (RJOG), Hold (HLD), Speed override (OR1 - 4), Deviation clear (CLR), Command pulse input history (CIH(*)), External trigger (TRG), Zero point decal. (ZLS), Forward over travel (FOT*), Reverse over travel (ROT*), M complete (MFIN), Block stop (BSTP), Program cancel (PCAN), Speed gain selection (GSEL), Forced brake ON (BRON), Torque limit (TL), External auto stop history (EPIH), JOG speed change (JOSP), Internal master axis selection (MSSP)	
Output signal	[4 Basic output signals (But, only 3 have initial values)] Electronic clutch stopping (FCRP), In free curve motion (FC), Master axis speed zero (MSZ), Invalid (---) <Following signals can be allocated by Remote control or output signal allocation and used.> Servo ready (RDY), alarm (ALM(*)), warning (WNG(*)), positioning complete (PN) in torque limit (LIM), speed zero (SZ), brake release (BRK), rough matching (PRF), program end (PEND), auto run ready (PRDY), in manual run (MMOD), in auto run (AMOD), in Zero return run (HMOD), in servo lock (PMOD), M strobe (MSTB), Software limit switch (SLSA,SLSB), General output (OUT1 - 8), M output (M01 - M80)	
Operation/ display function	Individual data input and status can be displayed on the front panel LCD module and optional SDI device.	
Monitor function	(1) Signal status is displayed on the signal display section of the front panel LCD module and optional SDI device. (2) Individual motion status, setting status (data) and detected abnormal cause history is displayed on the data display section of the front panel LCD module and optional SDI device (3) Analog monitor: 2 kinds (2 out of several motion states can be selected and monitored.)	
Data memory function	The following data is stored in the non-volatile memory Parameter, command, Index data (Partial), free curve data, alarm history (Last 5 cause history is retained) (Non-volatile memory can be re-written up to 10000 times)	

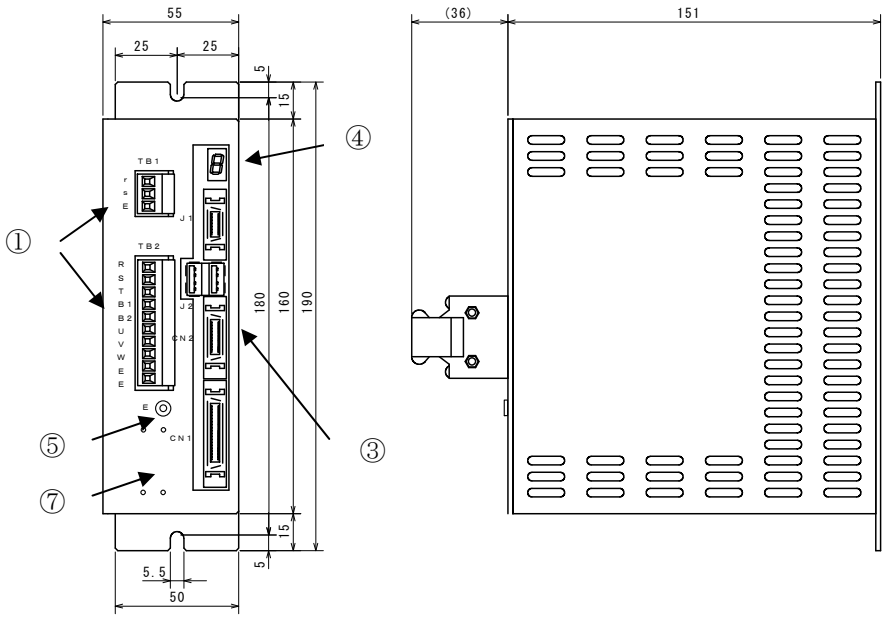
Item	Contents · Specification
Protection function	IPM fault, Over voltage, Under voltage, Over speed, Over load (Electric thermal), Regeneration resistance over load, deviation overflow, communication error, Data error, CPU fault, encoder fault, Absolute encoder fault etc
Communication function	Various data can be transmitted and received by Serial communication (RS-422A)
Option	SDI device, device net interface, cable, regeneration resistor etc

[Table 2-3] Function specification

Chapter 3 Outline

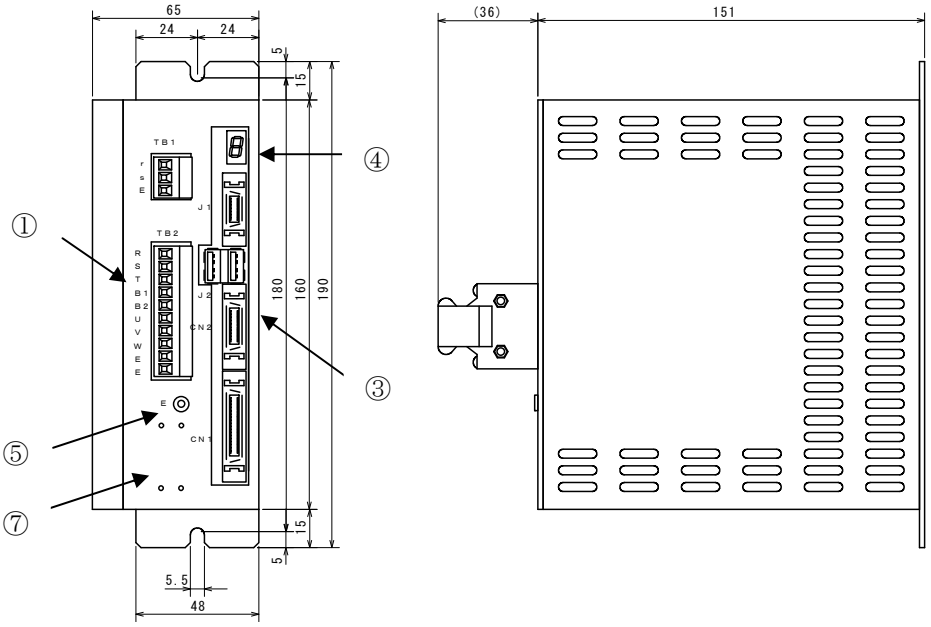
3-1 Outline Drawing

3-1-1 NCR-*A*-051/101/201※



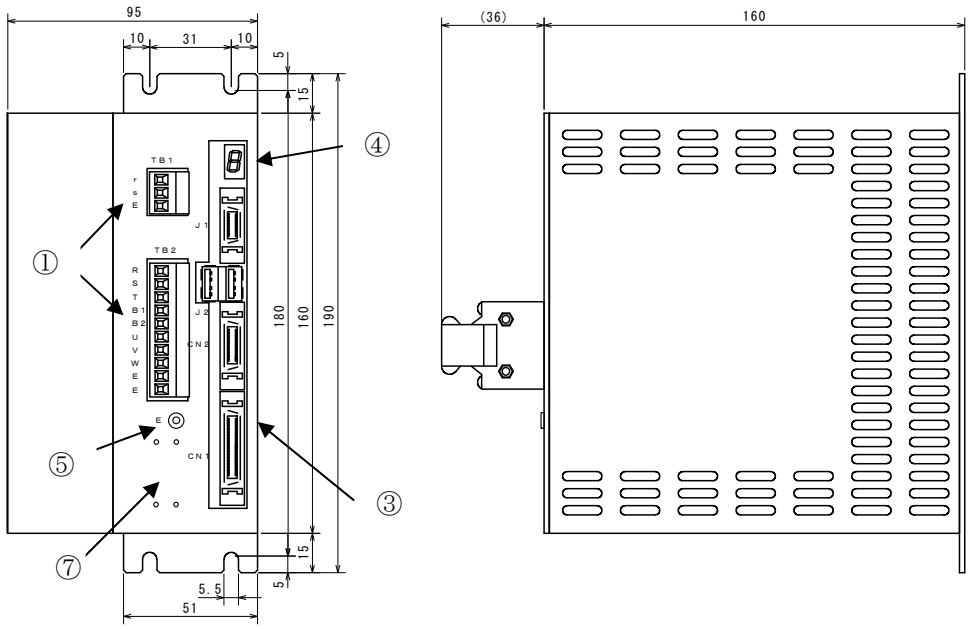
Note）※ marked product is a 200V input type.

3-1-2 NCR-*A*-201※/401

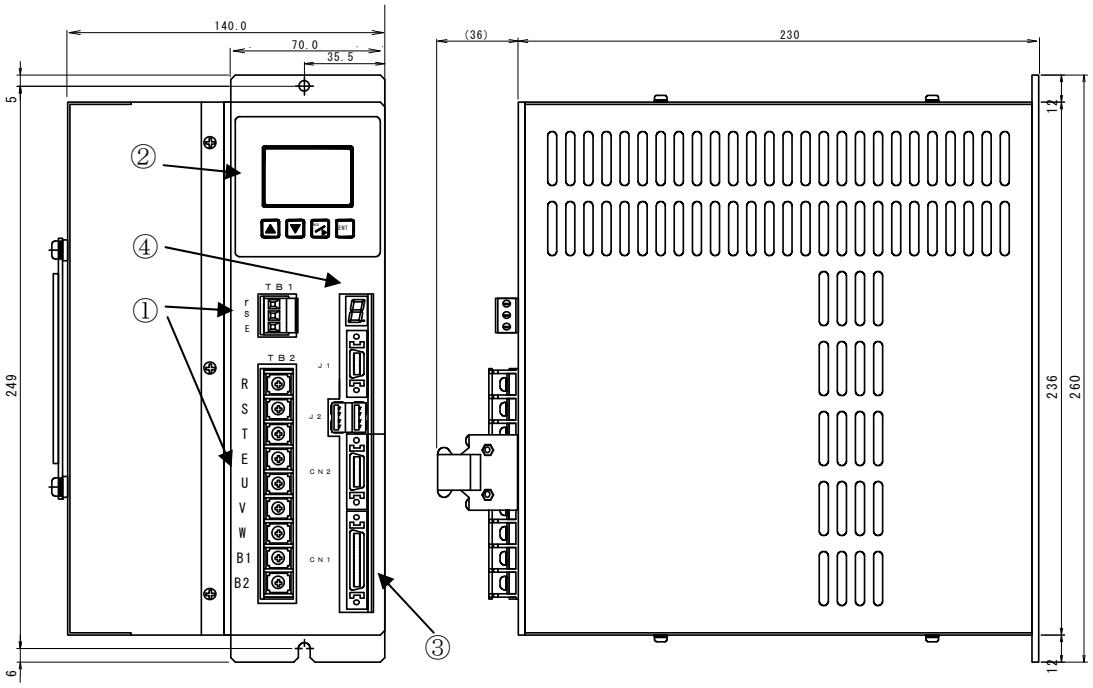


Note）※ Marked product is a 100V input type.

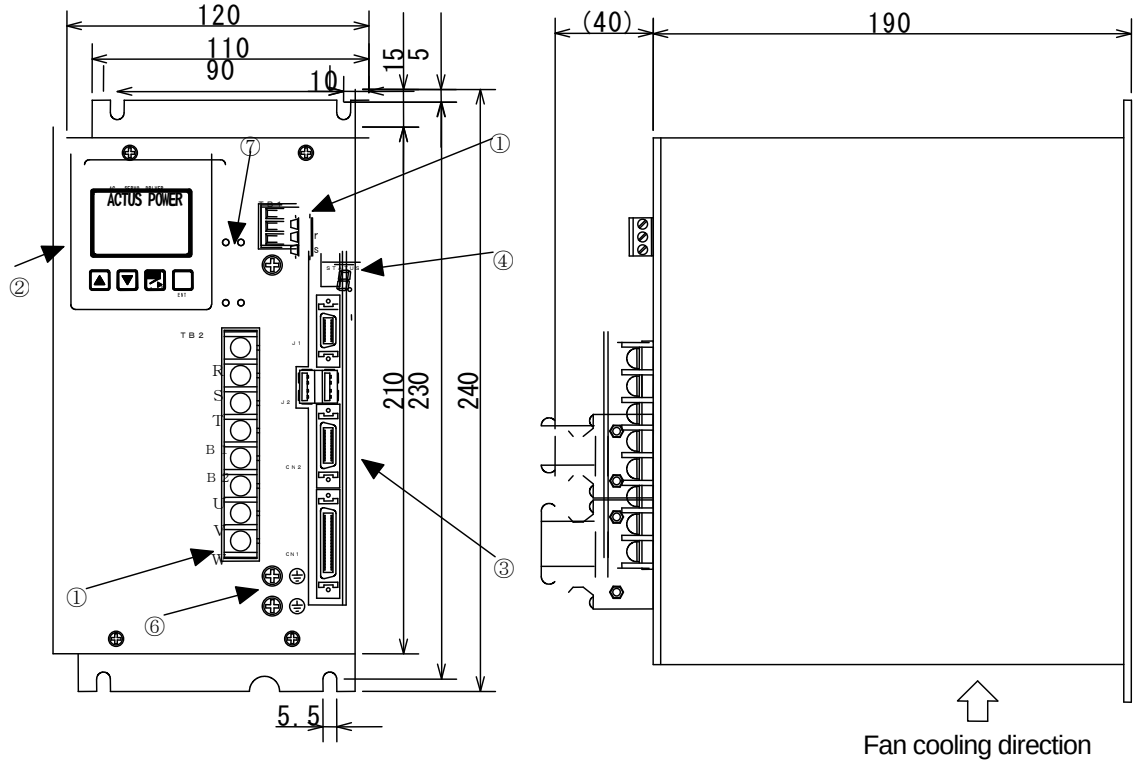
3-1-3 NCR-*A*-801



3-1-4 NCR-*A*-152/222

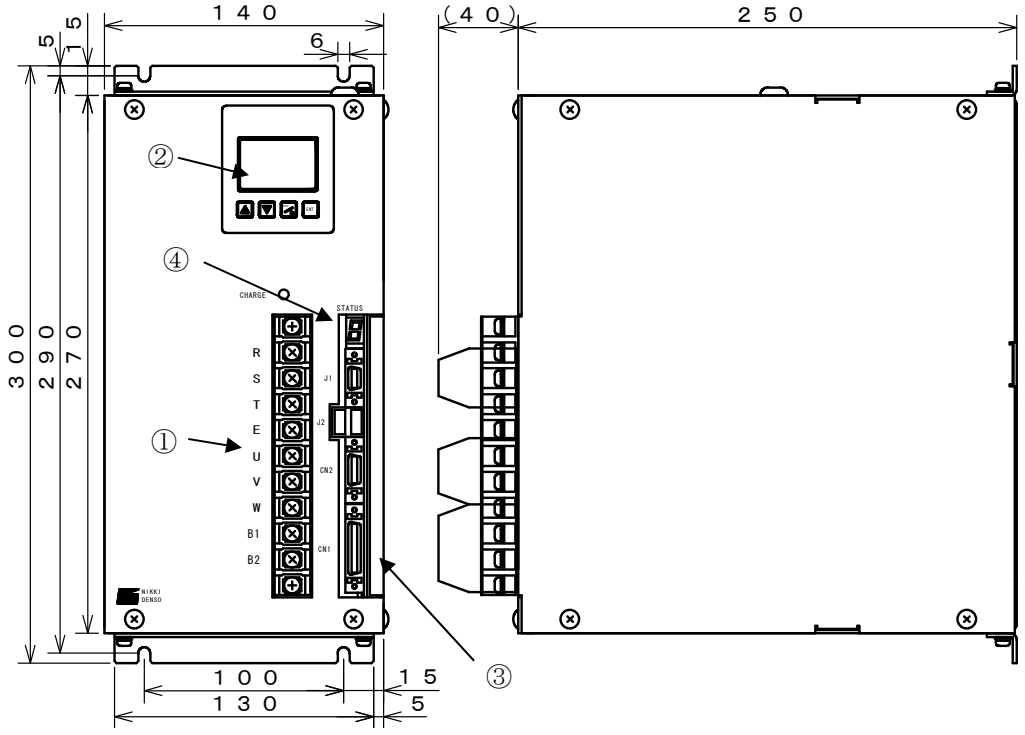


[**Design sequence B/C** (NCR-CA*6*B-XXX /NCR-CA*6*C-XXX) or before]

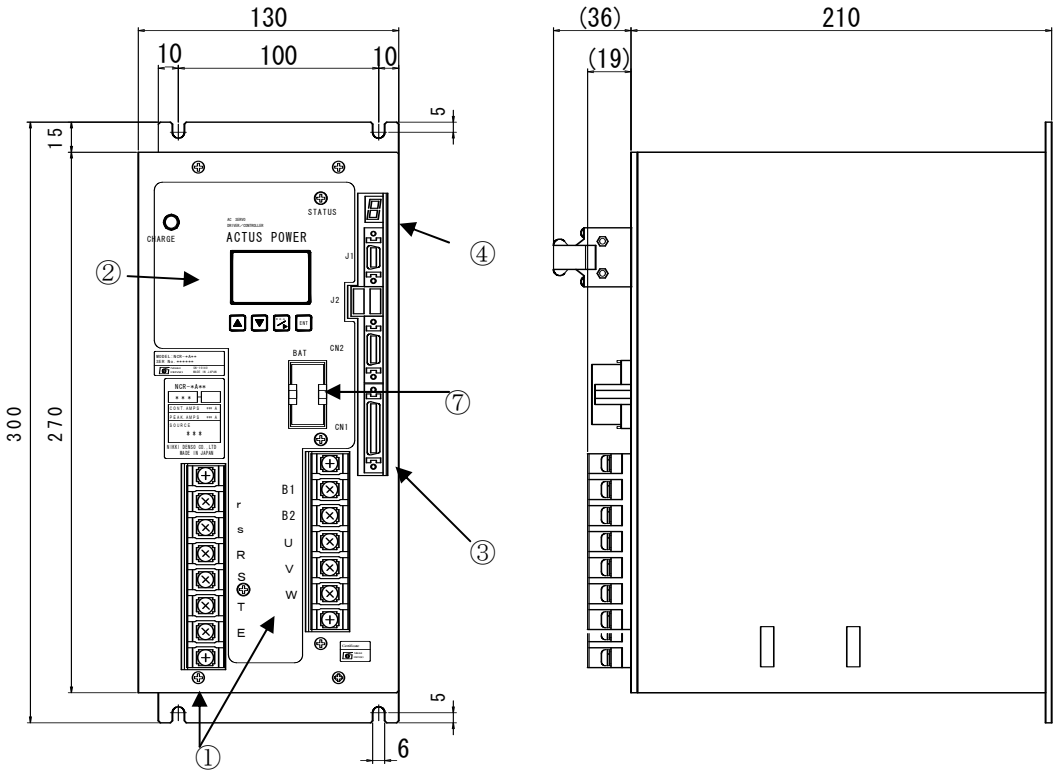


[**Design sequence D** (NCR-CA*6*D-XXX) or higher]

3-1-5 NCR-*A*-302 / 402

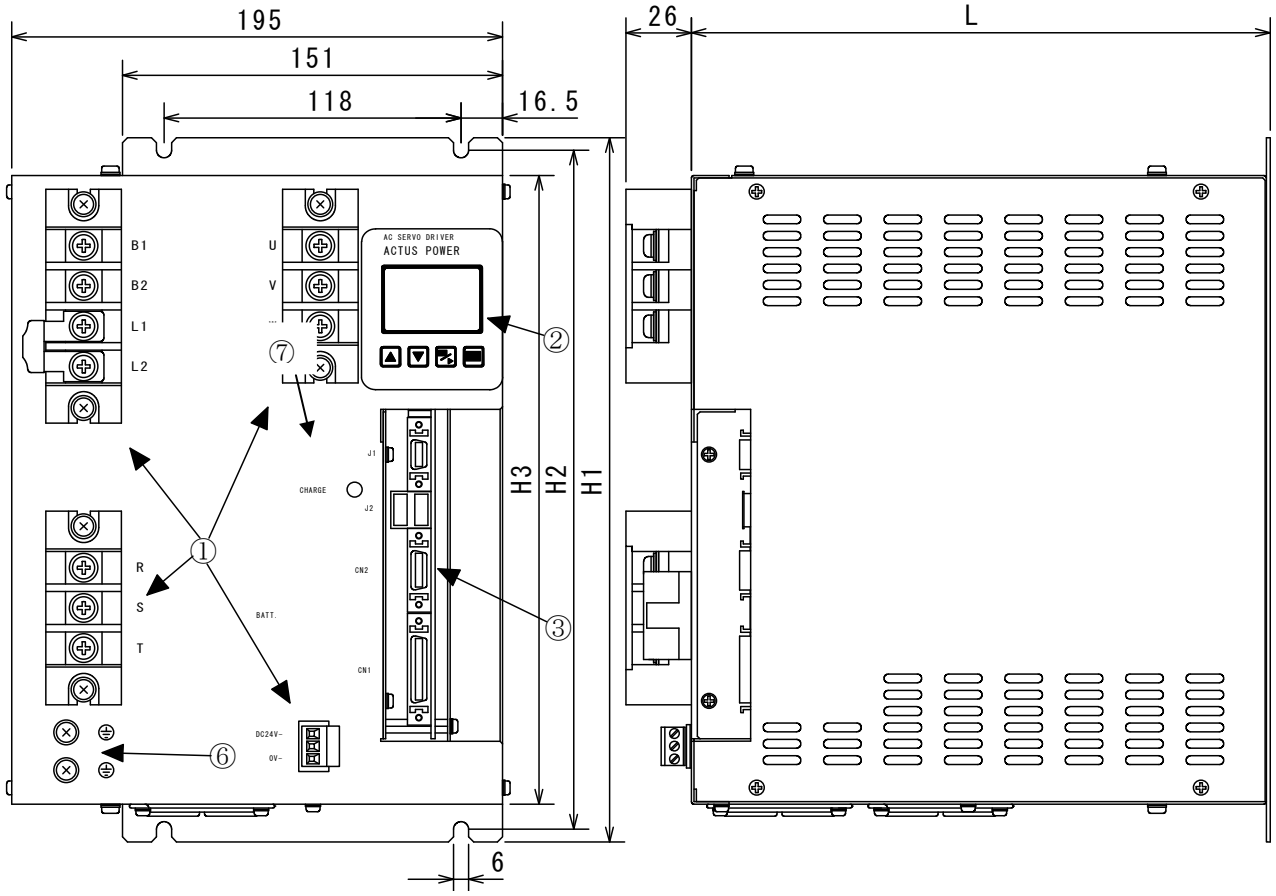


[**Design sequence A/B**(NCR-CA*6*A-XXX／NCR-CA*6*B-XXX)]



[Subsequent design sequence C (NCR-CA*6*C-XXX) or higher]

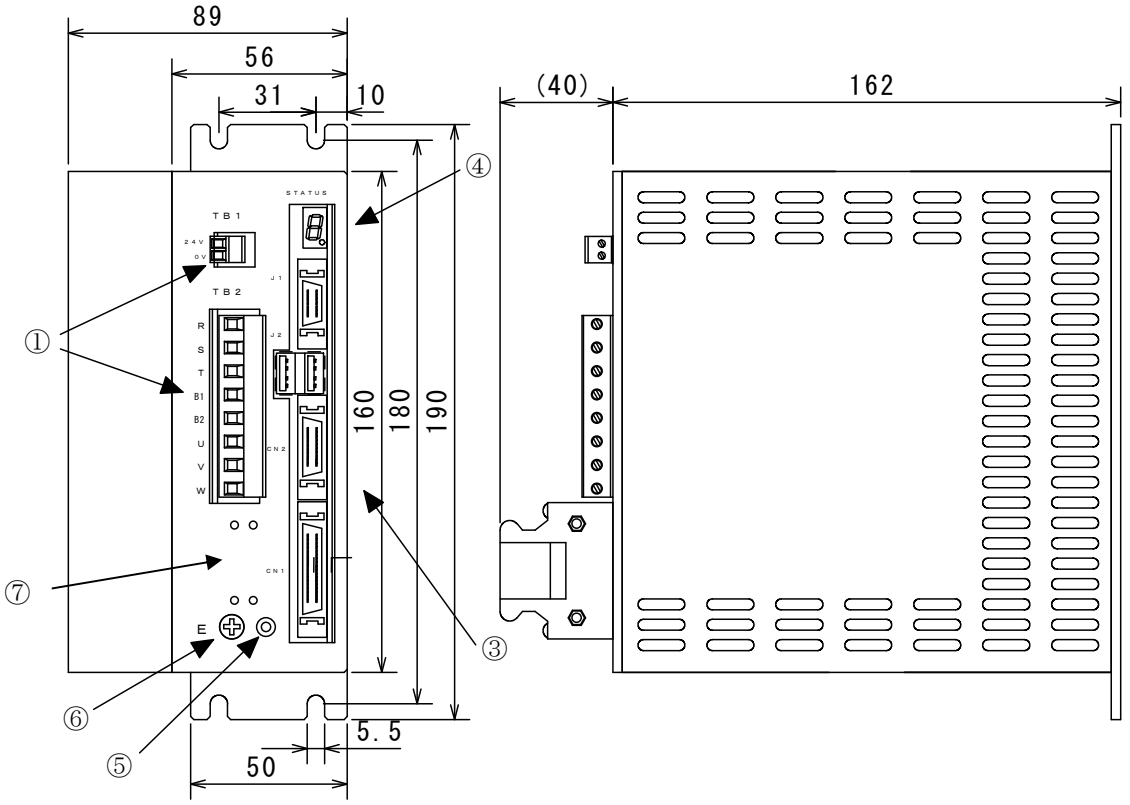
3－1－6　NCR－*A2（A3）*－752／113／153



[AC 200/400V Specifications]

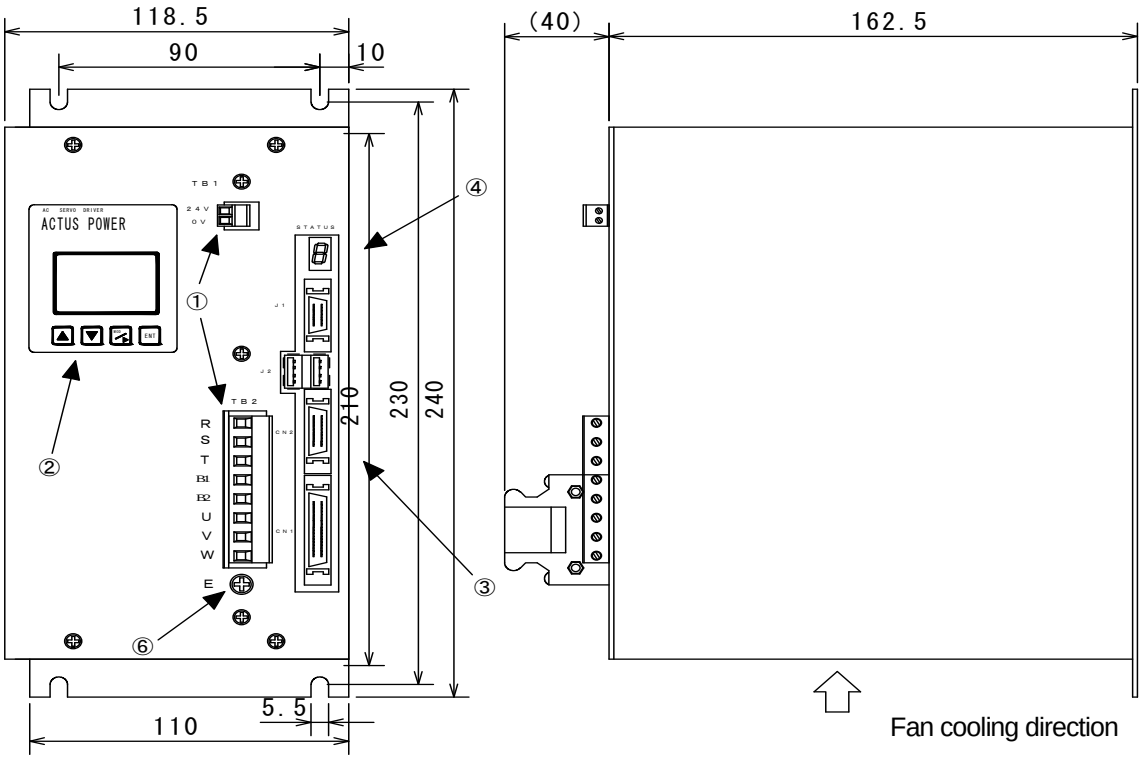
Controller type	L	H1	H2	H3
NCR - * A2 (A3) - 752 NCR - * A2 (A3) - 113	220	255	245	225
NCR - * A2 (A3) - 153	230	280	270	250

３－１－７　ＮＣＲ－＊Ａ３－７５１



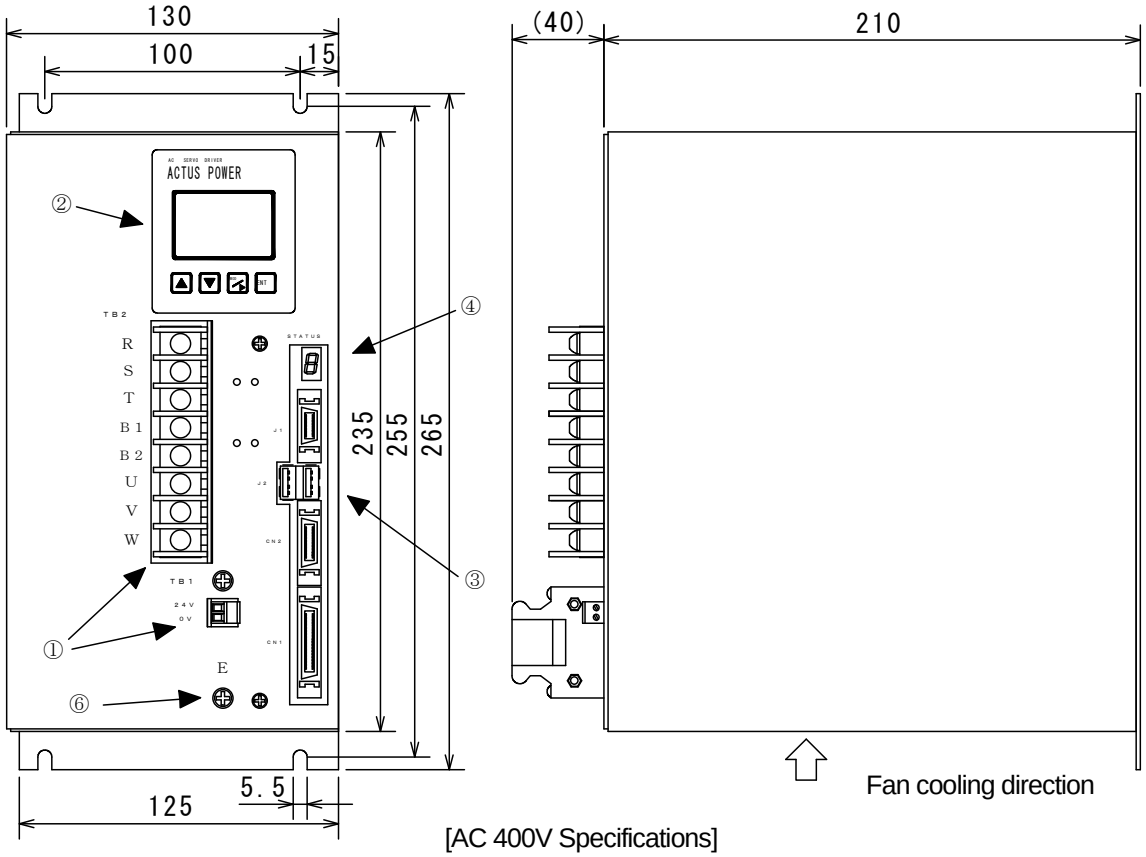
[AC 400V Specifications]

3－1－8　NCR－＊A3－262



[AC 400V Specifications]

3－1－9　NCR－＊A3－402



[AC 400V Specifications]

3－2 Each Component Name and Function

No.	Name	Function
①	TB1 (other than below)	● Terminal block for control power connection(r,s) or (24V, 0V)
	TB2(other than below)	● Terminal block for AC input power(R, S, T) ● Terminal block for motor connection(U, V, W) ● Terminal block for Regenerative resistor connection(B1, B2) ● Terminal block for DC reactor resistor connection(L1, L2) (*3)
	Terminal block (NCR-*A*-302/402)	● Terminal block for AC input power ● Terminal block for motor connection ● Terminal block for Regenerative resistor connection
②	LCD module(*1)	● LCD and key switch in one module Confirmation of data and parameter input and for various monitors and alarms
③	CN1	● Connector for control I/O signals
	CN2	● Connector for encoder feedback pulse input This inputs encoder feedback pulse signals from an encoder on a motor.
	J1	● Serial communication connector It is interfaced with an external unit or an optional unit and conducts Serial communication.
	J2	● Servo control communication connector It is interfaced with other VC series units and used for Synchronous run.
④	SDY	● Motion status display LED It displays a code corresponding to a motion status.
⑤	E	● Earth jack for SDI device (option) It connects an earth terminal of SDI device
⑥	E (*2)	● A screw that fixes power earthing and motor earthing wire.
⑦	BAT	● Battery installation position.

(*1)is applied to a type which capacity is 1.5kW or larger.

(*2) The device with AC400 specifications or the device with such instructions outside.

(*3) Device with the capacity of 752 or above or a device with such instructions outside.

[Tab. 3-1] Controller Name List

Chapter 4 Installation

4-1 Receiving Check of Our Products

Please confirm following points when you receive our products.

① If products are exactly ones what you ordered. (type, rated output, etc.)

② If any damage was made during transportation. (package damage, abnormal outlook of units)

③ If accessories are packed, together.

If above points are unclear or damage is found, please immediately inform our sales man.

And accessories change depending on a controller type as follows.

【200V system controller and accessory list】

Controller type	Accessory	
	Type	Q'ty
NCR-*2*-101 Capacity : 0.1kW	Control power connector［XW4B-03C1-H1］ Main power input/ power line output connector ［XW4B-10C1-H1］	1 1
NCR-*2*-201 Capacity : 0.2kW	Control power connector［XW4B-03C1-H1］ Main power input/ power line output connector ［XW4B-10C1-H1］	1 1
NCR-*2*-401 Capacity : 0.4kW	Control power connector［XW4B-03C1-H1］ Main power input/ power line output connector ［XW4B-10C1-H1］	1 1
NCR-*2*-801 Capacity : 0.8kW	Cement resistor［CAN60UT 82 OHM J］ Thermostat［1NT01L0857L90-10］ Thermostat attachment plate Control power connector［XW4B-03C1-H1］ Main power input/ power line output connector ［XW4B-10C1-H1］	1 1 1 1 1
NCR-*2*-152 Capacity : 1.5kW	Cement resistor［CAN200UT 39 OHM J］ Thermostat［1NT01L0857L90-10］ Thermostat attachment plate Control power connector［XW4B-03C1-H1］	1 1 1 1
NCR-*2*-222 Capacity : 2.2kW	Cement resistor［［CAN200UT 39(24)OHM J］*1 Thermostat［1NT01L0857L90-10］ Thermostat attachment plate Control power connector［XW4B-03C1-H1］	1 1 1 1
NCR-*2*-302 Capacity : 3.0kW	Cement resistor［CAN400UR 20 OHM J］ Thermostat［1NT01L0857L90-10］ Thermostat attachment plate	1 1 1
NCR-*2*-402 Capacity : 4.0kW	Cement resistor［CAN400UR 20 OHM J］ Thermostat［1NT01L0857L90-10］ Thermostat attachment plate	1 1 1

［Tab. 4-1-(a)］ 200V System Controller and Accessory List 1/2

*1: 24ohm J to be used for design sequence D (NCR-CA*6*D-222) or higher.

【200V system controller and accessory list】

Controller type	Accessory	
	Type	Q'ty
NCR-*2*-752 Capacity : 7.5kW	Enamel resistor［RGH-300G-OS30J］ Thermostat［5003-L-130℃B-1］ Thermostat attachment band Control power connector［XW4B-03C1-H1］	3 1 1 1
NCR-*2*-113 Capacity : 11kW	Enamel resistor［RGH-500G-OS22J］ Thermostat［5003-L-130℃B-1］ Thermostat attachment band Control power connector［XW4B-03C1-H1］	3 1 1 1
NCR-*2*-153 Capacity : 15kW	Enamel resistor［RGH-500G-OS22J］ Thermostat［5003-L-130℃B-1］ Thermostat attachment band Control power connector［XW4B-03C1-H1］	4 1 1 1

［Tab. 4-1-(b)］ 200V System Controller and Accessory List 2/2

【100V system controller and accessory list】

Controller type	Accessory	
	Type	Q'ty
NCR-*1*-051 Capacity : 0.05kW	Control power connector［XW4B-03C1-H1］ Main power input/ power line output connector ［XW4B-10C1-H1］	1 1
NCR-*1*-101 Capacity : 0.1kW	Control power connector［XW4B-03C1-H1］ Main power input/ power line output connector ［XW4B-10C1-H1］	1 1
NCR-*1*-201 Capacity : 0.2kW	Control power connector［XW4B-03C1-H1］ Main power input/ power line output connector ［XW4B-10C1-H1］	1 1

［Tab. 4-1-2］ 100V System Controller and Accessory List

【400V system controller and accessory list】

Controller type	Accessory	
	Type	Q'ty
NCR-*3*-751 Capacity: 0.75kW	Cement resistor [CAN60UT 200 Ohm J] Thermostat [1NT01L0857L90-10] Thermostat attachment plate Control power connector [XW4B-02B1-H1] Main power input / Power line output connector [GMSTB2.5/8-ST]	1 1 1 1 1
NCR-*3*-262 Capacity: 2.6kW	Cement resistor [CAN200UT 100 Ohm J] Thermostat［1NT01L0857L90-10］ Thermostat attachment plate Control power connector [XW4B-02B1-H1] Main power input / Power line output connector [GMSTB2.5/8-ST］	1 1 1 1 1
NCR-*3*-402 Capacity: 4.0kW	Cement resistor [CAN400UR 51 Ohm J] Thermostat [1NT01L0857L90-10] Thermostat attachment plate Control power connector [XW4B-02B1-H1]	1 1 1 1

NCR-*3*-752 Capacity: 7.5kW	Enamel resistor [RGH-300-0S120J] Thermostat [5003-L-130℃B-1] Thermostat attachment band Control power connector [XW4B-03C1-H1]	3 1 1 1
NCR-*3*-113 Capacity: 11kW	Enamel resistor [RGH-500-0S82J] Thermostat [5003-L-130℃B-1] Thermostat attachment band Control power connector [XW4B-03C1-H1]	3 1 1 1
NCR-*3*-153 Capacity: 15kW	Enamel resistor [RGH-500-0S82J] Thermostat [5003-L-130℃B-1] Thermostat attachment band Control power connector [XW4B-03C1-H1]	4 1 1 1

［Tab. 4-1-3］ 400V System Controller and Accessory List

⚠ Caution

- If packages as cartons are broken, please do not unpack the package and inform our salesman.

4-2 Installation Conditions

(1) Ambient conditions of a controller can be referred to (2-2 General Specification).

(2) Considering temperature raise by generation loss of equipment and a controller in the control cabinet, keep the temperature around the controller lower than specified allowable range.
And heat energy loss of a controller is about 7%＋50W of a motor capacity.

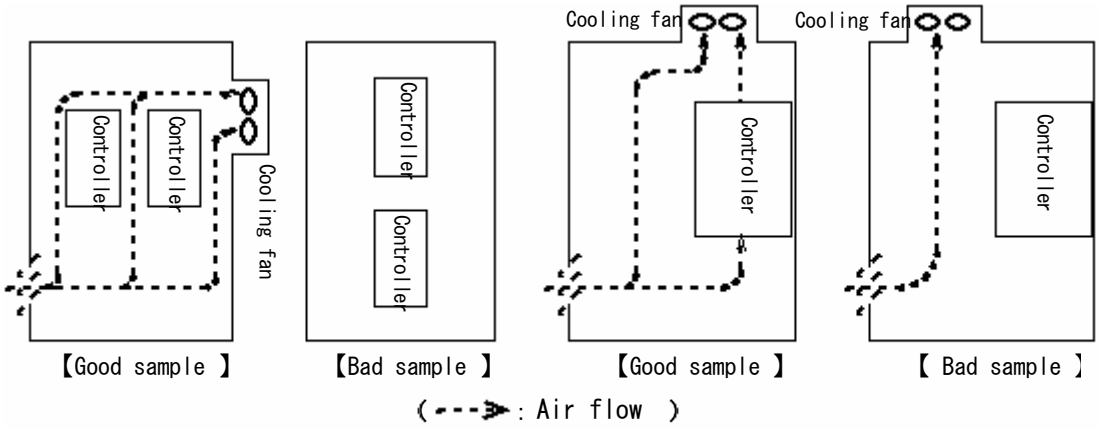
⚠ Caution

- Please be sure to use a controller in the allowable ambient temperature and humidity range. If it is used in the out of range, an error or a failure may occur.

(3) Since a cabinet has a cooling fan for a radiator, keep space for sufficient ventilation. And if plural controllers are installed in a same cabinet, please avoid mutual influence by exhaust air. (Refer to (［Figure 4-1］)

(4) If there is a heat source, vibration source, etc., please design the structure to avoid the influence.

(5) Please avoid installing a controller in a place of high temperature, high humidity, large amount of dirt/ dust, metal powder, lamp soot, etc. and corrosive gas.

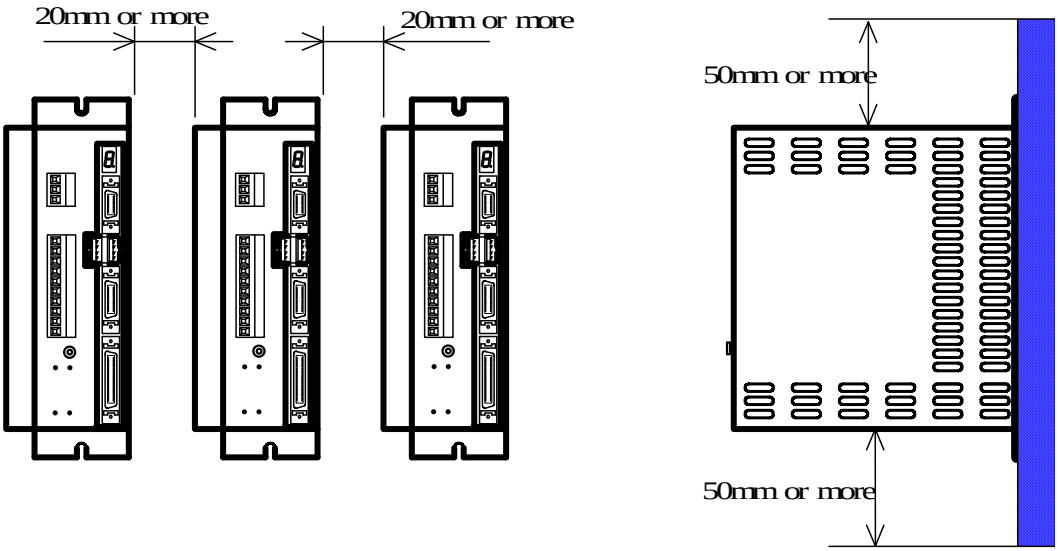


［Figure 4-1］ Fan location sample to install plural controllers

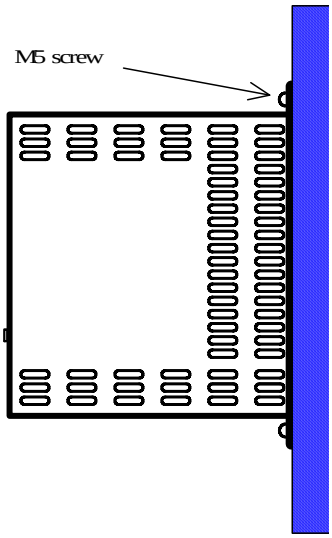
4-3 Installation Method

(1) In order to get sufficient radiation, be sure to install a controller, vertically.
(Refer to［Figure 4-3］and［Figure 4-5］)

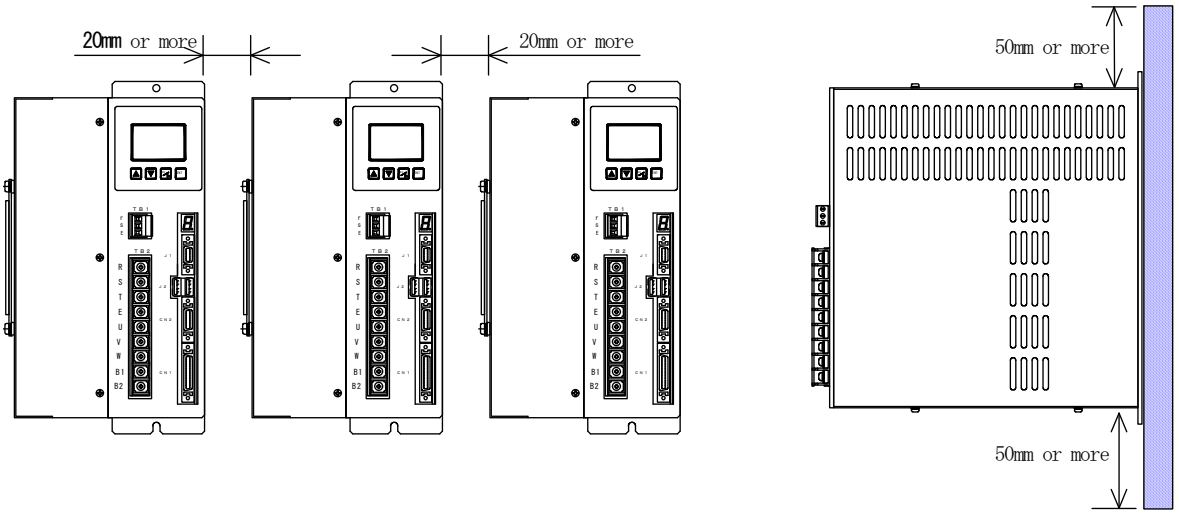
(2) In the points of radiation and maintenance, keep a specified vertical and horizontal distance (distance to other units, parts, and control console walls) to a controller, referring to［Figure 4-2］and［Figure 4-4］.



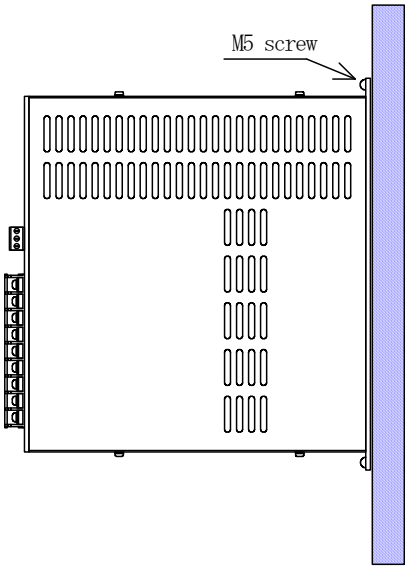
［Figure 4-2］ Installation and Ventilation of VC controller 800W or less



［Figure 4-3］ Installation of VC controller 800W or less



［Figure 4-4］ Installation and Ventilation of VC controller 1.5kW or more



［Figure 4-5］ Installation of VC controller 1.5kW or more

Chapter 5 Wiring

5-1 Power connection

1. AC power supply wiring

(1) The AC power supply is as given below.

NCR-*A*A1*	Main power supply	AC90 - 121V, 50/60Hz	Single phase supply
	Controlled source	AC90 - 121V, 50/60Hz	Single phase supply
NCR-*A*A2*	Main power supply	AC180 - 242V, 50/60Hz	Three phase supply
	Controlled source	AC180 - 242V, 50/60Hz	Single phase supply
NCR-*A*A3*	Main power supply	AC360 - 484V, 50/60Hz	Three phase supply
	Controlled source	AC360 - 484V, 50/60Hz	Single phase supply

Connect the controlled source and main power supply in different places.
Even if there is power fluctuation due to use in the factory, see that it does not exceed the specified range.

(2) Always use adequate shielding capacity No fuse shield or a fuse on the line to prevent accidents and fire. If using an earth leakage breaker, then select a model that can resist the high frequency waves for an inverter.

(3) The main circuit of the controller is condenser input type and hence, a big input current surge flows when power is supplied. Therefore, there is a possibility of drop in the voltage due to power capacitance and impedance. Keep sufficient buffer when selecting the wiring and the capacitance.

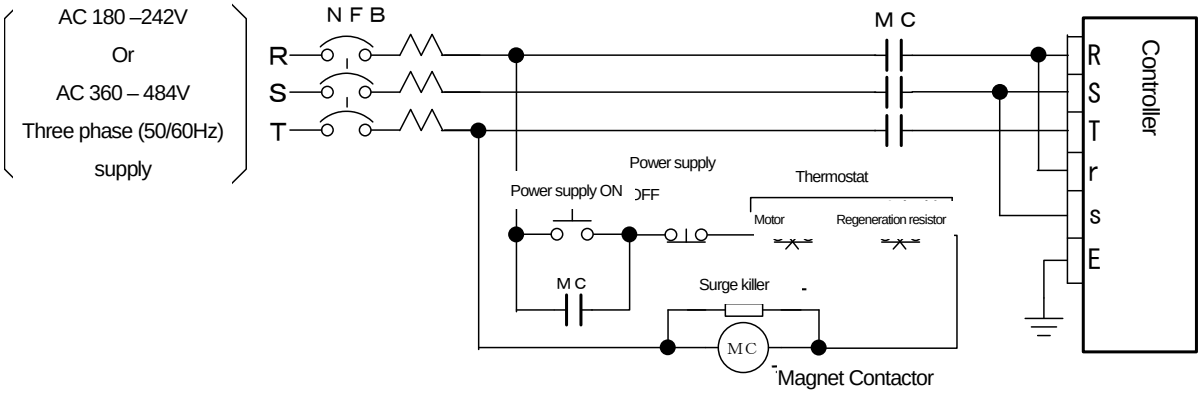
(4) Ensure that the AC power supply (R, S, T, E) is not connected by mistake to the controllers motor connection terminals (U, V, W, E).

⚠ Caution

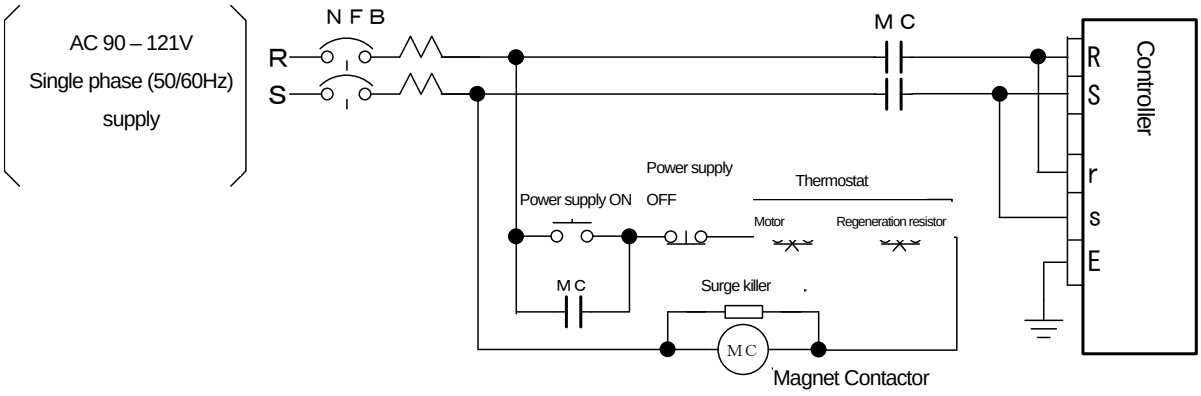
- Ensure that the AC power supply (R, S, T, E) is not connected by mistake to the controllers motor connection terminals (U, V, W, E). The controller will be damaged if connected by mistake.

2. Power circuit

"Figure 5-1" shows the representative power circuit.



[Fig 5-1(a)] Representative power circuit in case of a three phase supply



[Fig 5-1(b)] Representative power circuit in case of a single phase supply

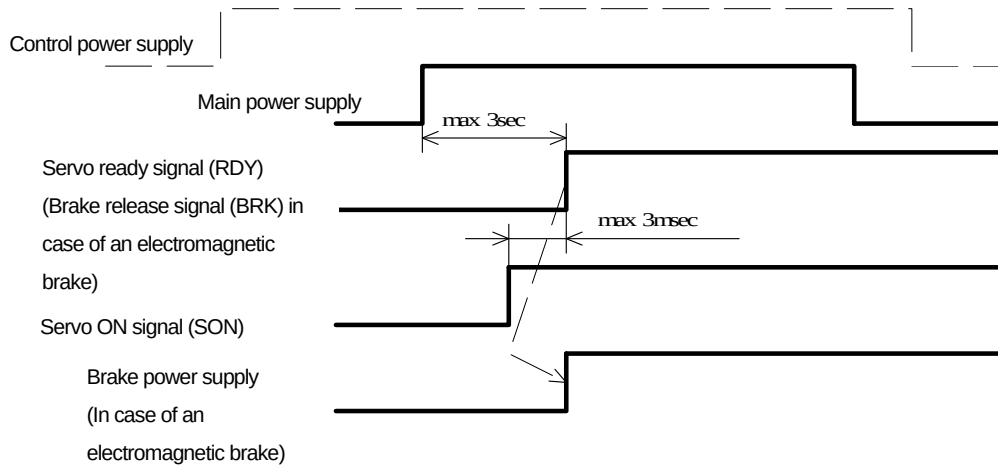
⚠ Caution

- Ensure that the power supply is maintained within the specified range. Otherwise, the controller may incur damages.
- Ensure that no fuse breaker is installed in order to protect power supply line and avoid accidents such as fire.
  Refer "Chapter 14 (Material)" for the capacity of the breaker.
- Always install a surge killer when using magnet contacts.
- As far a possible, it is better to have a power supply circuit for the controller that is different than the bigger electrical equipment.

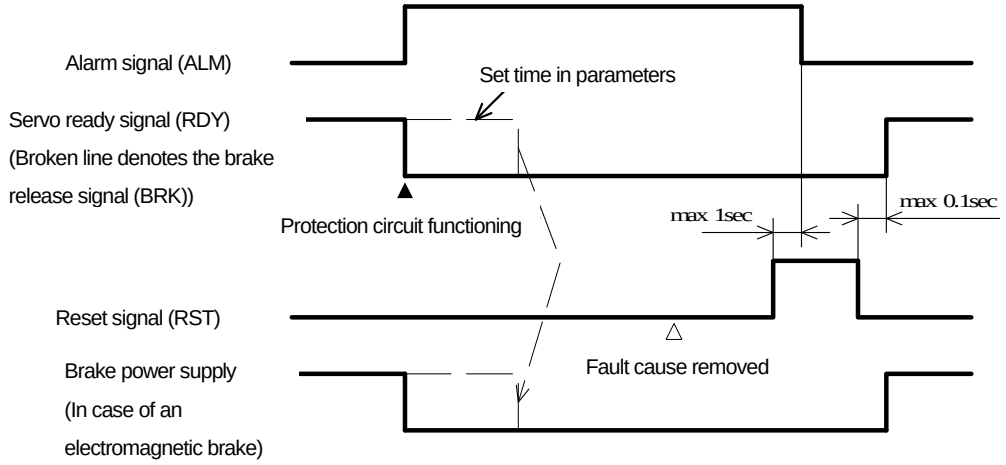
3. Power Supply Sequence

(1) Since the main power source circuit is a condenser input type, if the power is switched ON/OFF of frequently, then the main power circuit elements will wear out. On disconnection of power, if it is re-supplied within 1 minute, then the operations are possible again but the frequency of switching ON/OFF the power has to be restricted to “2 times/ 3 minutes”.

(2) The timing of supplying the control power is either before supplying the main power or the same timing and the timing for disconnection is to be either before the main power is disconnected or the same timing.



[Figure 5-2] Timing chart when power is ON



[Figure 5-3] Timing chart in case of a fault.

⚠ Caution

- If power is re-switched ON within a minute after it was disconnected, then the controller may not function properly.
- In case of over-current and over-load protection, remove the cause for that phenomenon, cool the controller for about 30 minutes and then resume the operations. If repeatedly reset in a short period, the temperature of the controller will increased enormously and there may be a damage caused to the controller.
- When the protection function is activated and an alarm is given, set an external sequence that will switch OFF the run signal and stop the command. When restoring the power after a power failure (including fusing off), if the run signal and command (speed command voltage or pulse line) are already given as an input, then there is a danger of motor starting.

4. Selection of no-fuse breaker and earth leakage breaker

To prevent the controller from short-circuit that may be caused due to some failure, select a breaker suitable to the power source and having the necessary capacitance. Refer to “14-1 Electrical specifications of controller” for the capacitance of the breaker needed for every unit. When the line capacitance (power capacitance) is more as compared to the controller capacitance, add a reactor and perform electrical concordance. (Contact our sales in-charge for the reactor). When using an earth leakage breaker, since the control inverter is a PWM control, its output contains high frequency waves. A current leak is generated due to the grounding electrostatic capacitance of the cable between the controller and the motor, and the floating capacitance between motor coil and iron core.
Since a current leak of this high frequency waves could activate an earth leakage breaker, select an inverter type (50/60hz) earth leakage breaker for the controller’s main power circuit.

5-2 Motor Connection

1. Motor wiring

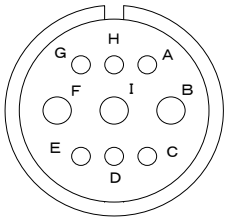
(1) Connect motor terminals (U, V, W, E) and controller terminals (U, V, W, E) in the correct phase sequence. (Connect U-U, V-V, and W-W respectively.) If the phase sequence is wrong, normal operations are not possible and a motor could pulsate, start to run without command input or does other action which is very dangerous.

(2) Motor connection terminals (V, V, M) of synchronous motor types, NA720-122/182/242/402 are cannon types (male). The wiring side cannon plug shall be provided by customer side or our optional ones. The wiring side cannon plug (female) types are shown in the below tabulation and motor connector No. and connector connection list are in [Figure 5-4].

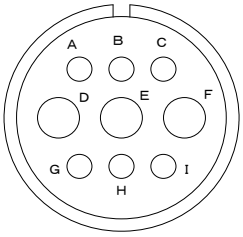
		NA720-122/182/242 NA830-162/332	NA720-402 NA820-402/602/752	NA820-113/153	NA820-113/153 For Brake
Motor side cannon plug		MS3102A20-18P	MS3102A24-11P	MS3102A32-17P	MS3102A10SL-4P
Option	Wiring side	MS3106B20-18S	MS3106B24-11S	MS3106B32-17S	MS3106B10SL-4P
	Cable clamp	MS3057-12A	MS3057-16A	MS3057-20A	MS3057-4A

[Table 5-1] Wiring side (female) cannon plug

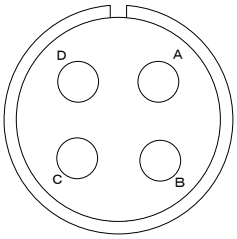
NA720-122/182/242
NA830-162/332



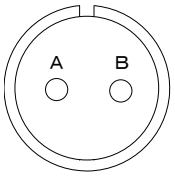
NA720-402
NA820-402/602/752



NA820-113/153



NA820-113/153
For Brake



[Fig. 5-4] Motor cable connector No. location

Pin NO.	NA720-122/182/242(BAMKS) NA830-162/332	NA720-402(BAMKS) NA820-402/602/752	NA820-113/153	NA820-113/153 For Brake
A		(Brake)	U Phase	(Brake)
B	W Phase	(Brake)	V Phase	(Brake)
C			W Phase	
D		U Phase	Frame ground (E)	
E	Frame ground (E)	V Phase		
F	U Phase	W Phase		
G	(Brake)	Frame ground (E)		
H	(Brake)			
I	V Phase			

※ Brake power has no polarity.

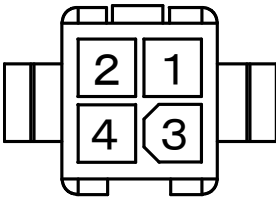
[Table 5-2] Table for connector connections

The specifications of the power supply for brakes are listed in the table below. Please ensure to use a power source that is higher than the required capacitance.

[Table 5-3] Power supply specifications for brake

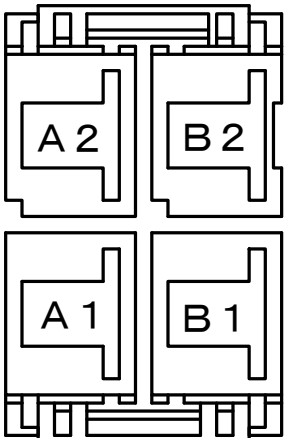
Motor type	NA720-122/182/242 NA830-162	NA830-332	NA720-402	NA820-402	NA820-602/752	NA820-113/153
Rated voltage[V]	DC 24	DC 24	DC 24	DC 24	DC 24	DC 24
Electricity consumption[W]	20	30	33	34.7	25	45

(3) The Linear/Disc/NA70 motor has motor connection terminals (U, V, W, E) that are meiten lock connecters (aimed at equipment of less than 800W) or the D5200 series connecter (aimed at equipment of 1.5KW) (Both AMP type / 4 pin). The connecters at the wiring site could be provided by the customer or they are available with is as an option. [Table 5-4] and [Table 5-5] show the model on the wiring site, motor connecter no., and connection chart for connecters.

Connecter used	Amplifier mini-universal meiten lock connecter (4pin / AMP type)	
	Motor connecter	Wiring cable connecter
Connecter	Plug housing 172167-1	Cap housing 172159-1
Terminals	Pin 170360-1 or 170364-1	Socket 170362-1 or 170366-1
Pin positioning		Pin No. / Signal 1 – U 2 – V 3 – W 4 – E

[Table 5-4] Type of connecters for wiring of less than 800 W

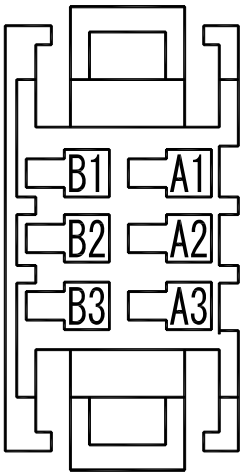
Connecter used	D5200 series Connecter (4 pin) / AMP type	
	Motor connecter	Wiring cable connecter
Connecter	Tag housing 1-917808-2	Relay housing 1-917807-2
Terminals	Tag contacts 917804-2	Relay contact 316040-2

Pin positioning		

Pin No.	Signal
B1	U
B2	V
A1	W
A2	E

[Table 5-5] Type of connecters for wiring of more than 1.5 KW

(4) For NA80 motor, its connection terminal (U,V,W,E) is the D2000 series connector.
Whether the wiring side connector is ready for the customer to be received or whether it is ready as an option for the company.
In the [Tab.5 - 6] it shows the wiring side format, motor connector No. and connector connection table.

Connector used	D5200 series / connector (6 pin) / Manufactured by AMP	
	Motor side connector	Wiring cable side connector
Connector body	Tab / Housing 178964 - 3	Rise / Housing 178289 - 3
Contactor	Tab / Contact 175289-2, 175288-2(B2,B3)	Rise / Contact 175218 - 2
Pin location		

Pin No.	Signal name
A1	U
A2	V
A3	W
B1	E
B2	Brake
B3	Brake

[Table 5 – 6] Wiring side connector type below 800W

The power specifications for brake are shown in the following table. Make arrangements for the power above the corresponding capacity.

Motor type	NA80-05/10	NA80-20/40	NA80-60/75
Rated voltage [V]	DC 24	DC 24	DC 24
Power consumption [W]	5	9	9.5

[Table 5 – 7] Power specifications for brake

(5) Do not connect a magnet switch or a no-fuse breaker between a controller and a motor.

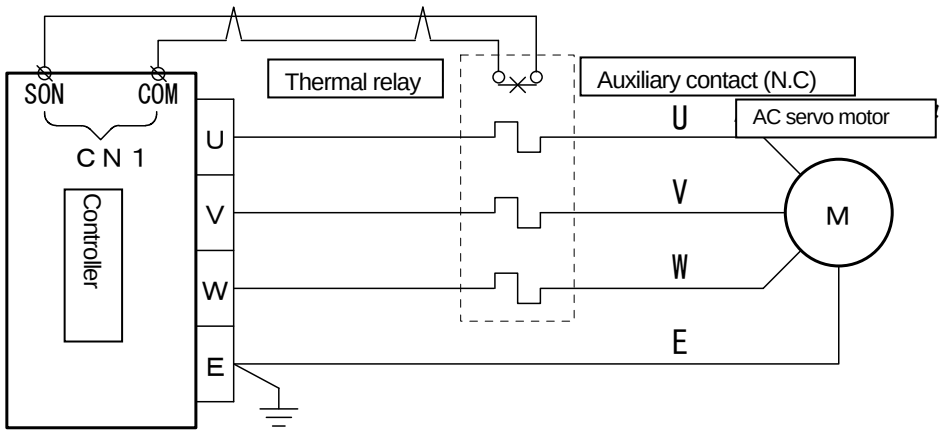
(6) When a motor equipped with a break is used, be sure to release it before starting a motor. Otherwise, the motor may burn out. Refer to [Figure 5-2] and note the timing.

(7) Though the electric thermal is installed on a controller, if a thermal relay is added externally, set the motor rated current to the relay current value.
By using an auxiliary contact of the thermal relay, make a sequence to turn Servo ON signal (SON) OFF to stop motor motion. (Refer to [Figure 5-5])

(8) For motor over heat protection, a B contact (normal close) type thermostat is assembled in NA100 series, NA720-552 - 223 type motors.
Refer to [Figure 5-1] and conduct wiring to shut main power OFF when this relay is activated. Thermostat contact specification is as follows.

Contact V	Contact A (Max. / Min.)
DC 24V	2A／0.05A
AC240V	1A／0.05A

[Table 5-8] Thermostat contact specifications



[Figure 5-5] Motor wiring

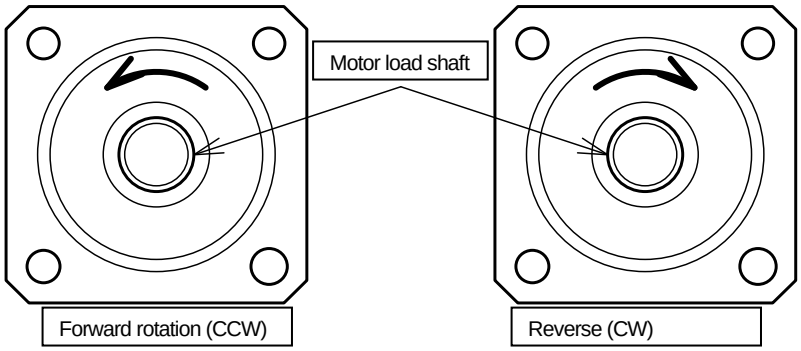
⚠ Caution

● Ensure that the motor grounding terminal (E) is connected to the controller grounding terminal (E).

2. Setting the motor rotating direction

Relation of each command and motor rotating direction in case of connecting standard motor and encoder is shown below.

(1) Motor rotating direction

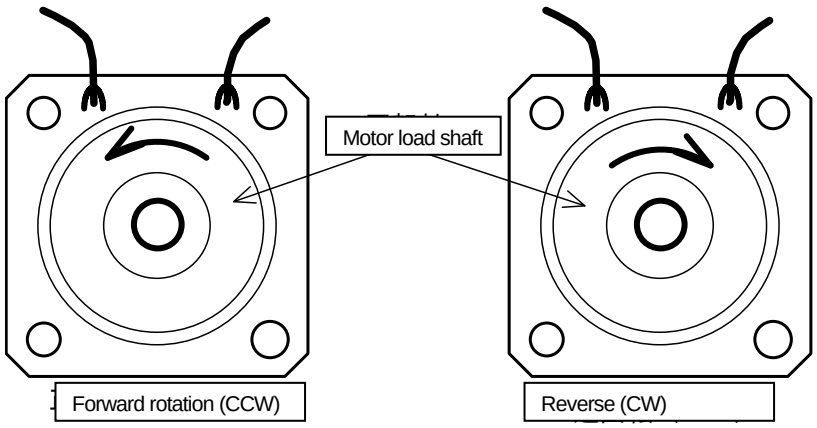


[Figure 5-6] Motor rotating direction

Command input type	Polarity	Motor direction
Positioning command	Forward	Shaft rotates CCW, viewing to motor load shaft : Forward
	Reverse	Shaft rotates CW, viewing to motor load shaft : Reverse
Directional pulse command	Forward	Shaft rotates CCW, viewing to motor load shaft : Forward
	Reverse	Shaft rotates CW, viewing to motor load shaft : Reverse
90°different phase pulse train command	B Phase ahead	Shaft rotates CCW, viewing to motor load shaft : Forward
	A Phase ahead	Shaft rotates CW, viewing to motor load shaft : Reverse

[Table 5-9] Each command input and motor rotating direction (In case of rotating motor)

(2) Rotating direction of disc motor

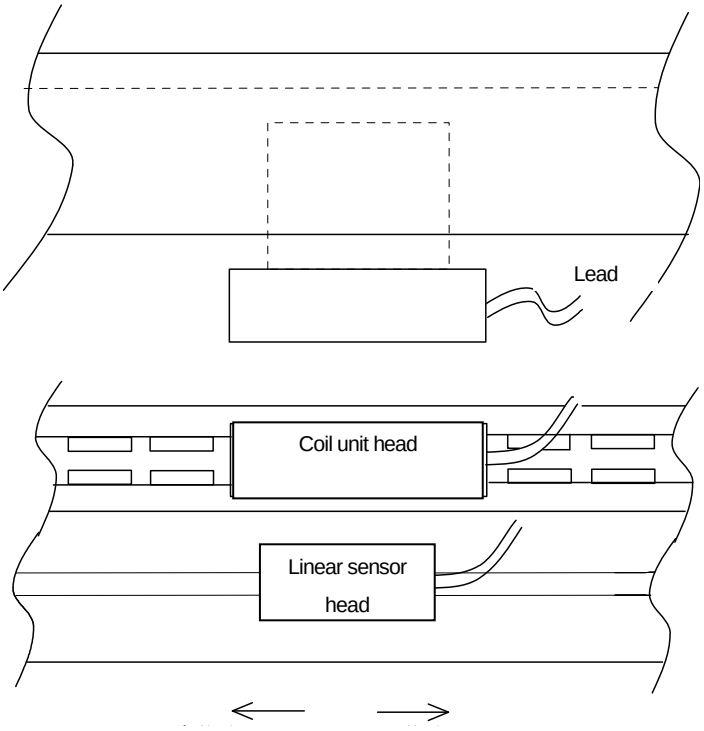


[Figure 5-7] Rotating direction of disc motor

Command input type	Polarity	Motor direction
Positioning command	Forward	Shaft rotates CCW, viewing to motor load shaft : Forward
	Reverse	Shaft rotates CW, viewing to motor load shaft : Reverse
Directional pulse command	Forward	Shaft rotates CCW, viewing to motor load shaft : Forward
	Reverse	Shaft rotates CW, viewing to motor load shaft : Reverse
90°different phase pulse train command	B Phase ahead	Shaft rotates CCW, viewing to motor load shaft : Forward
	A Phase ahead	Shaft rotates CW, viewing to motor load shaft : Reverse

[Table 5-10] Each command input and motor rotating direction (In case of disc motor)

(3) Rotating direction of linear motor



[Figure 5-8] Rotating direction of a linear motor

Coil unit:

Forward movement: Direction in which the lead wires have come out from the coil unit

Reverse movement: Direction in which the lead wires have come out from the coil unit head.

Linear sensor:

Forward movement (B phase advance): While rotating in the direction in which lead wires have come out from the linear sensor

Reverse direction (B phase retard): While rotating in the reverse direction in which the lead wires have come out from the linear sensor

Note) The setting should be such that relation of coil unit and linear sensor is in same direction.

Command input type	Polarity	Motor travel direction
Positioning command	Forward	Forward travel (FD)
	Reverse	Reverse travel (RD)
Directional pulse command	Forward	Forward travel (FD)
	Reverse	Reverse travel (RD)
90°different phase pulse train command	B Phase ahead	Forward travel (FD)
	A Phase ahead	Reverse travel (RD)

[Table 5-11] All command inputs and the motor rotating direction (In case of linear motor)

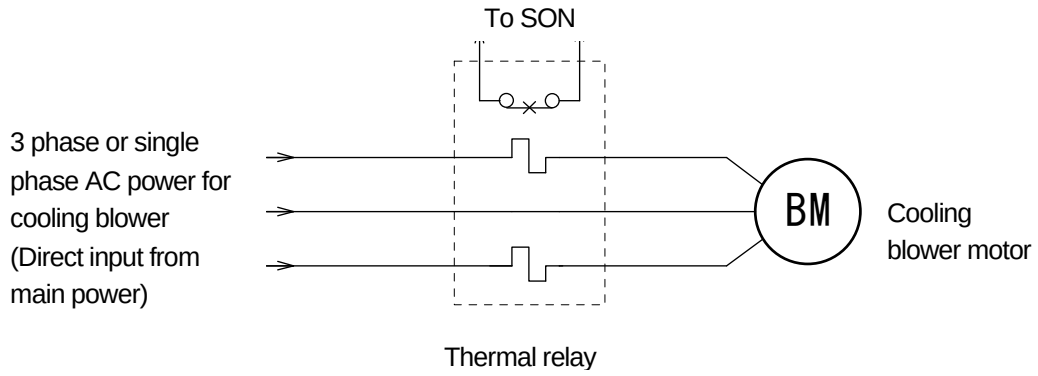
In this manual here onwards, the “motor forward direction” means that the input command is “forward direction” and “motor reverse direction” means that the input command is “reverse direction”.

In case of moving the motor in the reverse direction when the command is “positive current command” or “forward direction command” (Pulse line), then set the parameter in the standard connection settings [P300: Rotation direction selection] to “REVERSE”.
The factory setting is “FORWARD”.

3. Cooling blower wiring

(1) A cooling blower is installed to un-load shaft side of a motor.
Please attach a thermal relay to a cooling blower. Our relay is available optionally.
Please set rated current value of a cooling blower to the thermal relay.
Refer to “14-3 Electric specifications of a cooling blower” for the rated current value of a cooling blower.

(2) Run the cooling blower and check that the rotation direction and wind direction is coincided with the arrow.
Check the wiring carefully if it is in the order of phase in case of 3-phase motor and if it is coincided with the arrow same as above.



[Figure 5-9] Cooling blower wiring

⚠ Caution

- Since, power is not supplied to a cooling blower from a controller, provide a power source for the same. Be sure not to connect cooling blower terminal to U, V, and W of a controller.

4. Electromagnetic brake wiring

(1) Some of our motors are equipped with a brake to hold when power is failed. Brakes are de-energized type.

(2) The brake is activated about 0.5 sec. after voltage is supplied.

(3) Optional brake power connection is as shown in [Figure 5-10].

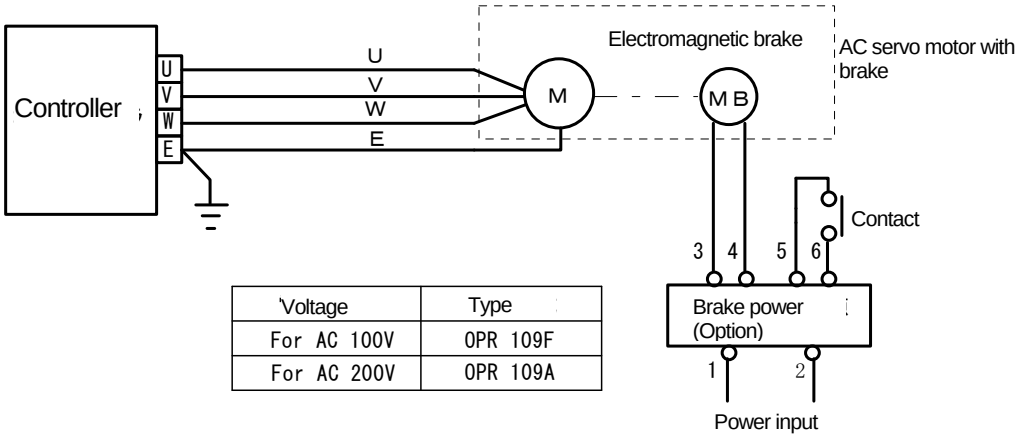
※ Option brake power is for induction motor. The customer needs to arrange for other types of motor if they want.

(4) When the brake terminal P is connected to output terminal 3, connect the brake terminal N to the output terminal 4.

※ Do not short-circuit the output terminal 3 and 4.

(5) Capacity of a contract between the output terminal 5 and 6 is recommended 5 to 6 times of a whole applied brake capacity.

[Fig.5-10] Brake power connection



Voltage	Type
For AC 100V	OPR 109F
For AC 200V	OPR 109A

⚠ Caution

- Since an electro-magnetic brake is released about 0.5 sec. After voltage is supplied consider it and set timing to motor motion commands.
  Be sure to turn OFF motor motion command before activating the electro-magnetic brake.
- Since the electro-magnetic brake is holding purpose only, never activate the brake during a motor is running.

5-3 Grounding

(1) Be sure to conduct grounding to prevent electric shock and noise influence.
(2) As mentioned in [Table 5-12], use a specified area cable for the grounding satisfying JIS Class 3 or better (Grounding resistance 100 Ω or less).
Connect ground cable to the terminal (E) of the controller.
(3) Dedicated ground is recommended if possible. If shared ground is used, be sure to ground cables to 1 point.
(4) To ground a motor, be sure to connect motor body ground terminal (E) to controller ground terminal (E).

⚠ Caution

- To reduce common mode noise and prevent malfunction of units, use dedicated ground and satisfy JIS Class 3 or better (Grounding resistance 100 Ω or less).
- When dedicated grounding cannot be used, connect cables only at 1 common point.
- Never use common ground with large power line or connect to iron structure, etc,.
- Install the wiring carefully in order to avoid the looping of earthing wires. The leakage current of the device may increase depending on its status and it operates Earth leakage circuit-breaker.

5-4 Installation of Regenerative Resistor

(1) Please use auxiliary regenerative resistor.

(2) Since regenerative resistor radiates heat, when you install it, do not leave flammable or materials weak to near the resistor.

Regenerative resistor assists to exhaust generative energy over-floating the regenerative condenser capacity, caused by large loading inertial (GD^2) during motor braking.

(3) Regenerative resistor is equipped with thermostat. When regenerative resistor is heated too much, a thermostat is activated and outputs a contact signal, therefore design the circuit to cut electric power supply OFF, in this situation.

（Refer to Figure 5-1） Contact specifications of servo motor is as follows.

Contact voltage	Contact current
AC200V	1A

Refer to [Table 5-11] for the installation of thermostat.

(4) When many regenerative resistors are installed, please follow the description given in “14-2-1 Regenerative resistor Combination”.

(5) Cable length of regenerative resistor and controller shall be 3m or less and shall be as short as possible.

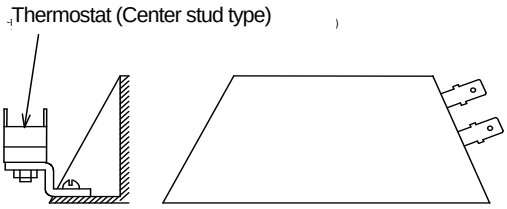
If cable is long, surge voltage generated by switching of power element all increases that causes damage to the controller.

⚠ Caution

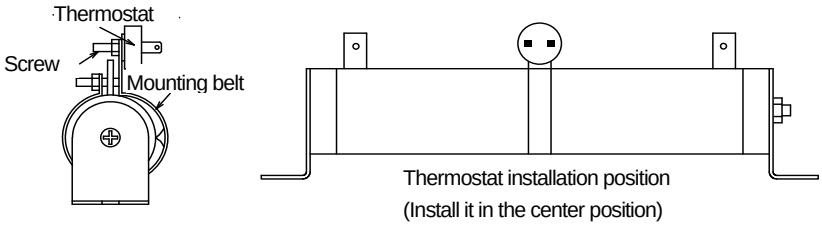
● If abnormal current flows in Regenerative resistor, it becomes hot in very short time and it is very dangerous.

Please be sure to design circuit in such a way that main power supply is turned OFF by the contact of thermostat.

Install thermostat in cement resistor



Install thermostat in hollow resistor



[Figure 5-11] Installation position of thermostat

5-5 Control circuit cable

1. Analog monitor (Speed, torque)
   (1) Since analog signal is a micro-current type, use twisted pair of a shielded cable and connect the shield properly to shield grounding FG terminal on connector CN1.
   (2) Cable length shall be 3m or less.

2. Pulse train input/output
   (1) Pulse train command and encoder pulse output are high speed pulse train signals, so please apply twisted pair of shielded cables and surely connect the shield to shield ground FG pin of Connector CN1.
   (2) Cable length shall be 3m or less. (In case of open connector output it shall be 1.5 m or less)

3. Encoder feedback pulse signal
   (1) Please use twisted pair of shielded cable and surely connect the shield to FG pin of Connector.
   (2) If a mobile motor is required, make the cable-bending radius as large as possible to avoid excess stress.
   (3) Cable length shall be maximum 50m. Dedicated encode cable sets are optionally available. Please contact our sales and service in-charge for the details.

4. Control I/O signals
   (1) When relays and switches are used for control input and output signal, please provide micro-current types.
   (2) To suppress noise generation, always install surge killer or diode on each relay, magnet contract, solenoid, electromagnetic brake, etc. used near the controller.
   (3) Power +V（+12V,2.5mA - +24V,5mA / 1 point）for control input signal shall be provided by customer.
   (4) Cable length shall be 3m or less.

5-6 Noise Protection

1. External noise may enter via the “Power supply” and “Signal cables”. The external noise may cause malfunction and troubles. To prevent trouble by noise, it is important to suppress noise occurrence and not to induce occurred noise.
   Therefore always implement protection and preventive measures given below.

⚠ Caution
● For control I/O signal wiring, select specified type and diameter cable and comply with wiring precautions without fail. Unexpected malfunction could occur and it is very dangerous. ● Be sure to separate control I/O signal cables from the power line (power source, motor, etc.), and never place them in a same duct and bundle.

2. Installation of surge absorber and noise filter

   (1) To suppress noise generation, install surge killer (for AC power source) or a diode (for DC power source) on each relay, magnet switch, electro magnetic brake, solenoid etc. used near the controller.
   (2) In very noisy power line, for example when noise source such as welders and electric discharge machines etc. are nearby, install a noise filter or noise cut transformer etc. in the main power source of the controller for noise protection of the power line.
   When a noise filter is used, be sure to separate input from output cables of the filter, and never bind them to a same bundle. Also, do not bind the filter ground cable to the same bundle of filter output cables but ground it in the shortest distance.
   (3) Since switching power supply is used to the controller, switching noise is generated. If it is supposed that this noise influence other equipment, insert a noise filter or common mode choke coil in main power line of the controller to prevent noise. In addition, conduct noise measures such as passing the power and motor lines through a metal tube.

5-7 Cables

Use the cables described in [Table 5-12].

※ Please use our optional cable for control circuits.

⚠ Caution

- Cable type and size can be changed depending on actual conditions and environment. Please contact our sales and service in-charge
- If control signal cable is longer, the unit is likely to be influenced, keep the specified length. And be sure to use specified cable type.

	Item	Terminal	VC series
Control circuit	Analog control voltage input Analog monitor output (Speed, torque)	INH,TQH TL+,TL-,GND MON1,2	AWG28 or more twisted pair of shielded cable, length 3m or less
	Pulse train command	FC/FC*, RC/RC*	Line driver system: AWG28 or more twisted pair of shielded cable, length 3m or less Open collector system: AWG28 or more twisted pair of shielded cable, length 1.5m or less
	Encoder pulse output	EA/EA*,EB/EB* EM/EM*,GND	AWG28 or more twisted pair of shielded cable Length 3m or less (GND: 0.5mm^2 or more)
	Encoder feedback pulse input	A/A*,B/B* Z/Z* (EP5,GND)	0.2mm^2 or more twisted pair of shielded cable EP5,GND: 0.5mm^2 or more Length: 50m or less
	Other control input/output		AWG28 or more shield cable length 3m or less (+24VC OM: 0.5mm^2 or more)

[Table 5-12 (a)] Cables used in the main circuit 1/3

AC100V Specifications Unit:mm^2

	Item	Terminal	NCR-*A*A1*-051	NCR-*A*A1*-101	NCR-*A*A1*-201			
Main circuit	AC input power, ground	R,S,E	1.25(2)	1.25(2)	1.25(2)			
	Control AC input power	r,s	0.75	0.75	0.75			
	Motor	U,V,W	0.75 (1.25)	0.75 (1.25)	0.75 (1.25)			
	Regenerative resistor	B1,B2	0.75	0.75	0.75			

AC200V Specifications Unit:mm^2

	Item	Terminal	NCR-*A*A2*-101	NCR-*A*A2*-201	NCR-*A*A2*-401	NCR-*A*A2*-801		
Main circuit	AC input power, ground	R,S,T,E	1.25(2)	1.25(2)	1.25(2)	1.25(2)		
	Control AC input power	r,s	0.75	0.75	0.75	0.75		
	Motor	U,V,W	0.75 (1.25)	0.75 (1.25)	0.75 (1.25)	0.75 (1.25)		
	Regenerative resistor	B1,B2	0.75	0.75	0.75	0.75		

AC200V Specifications Unit:mm^2

	Item	Terminal	NCR-*A*A2*-152	NCR-*A*A2*-222	NCR-*A*A2*-302	NCR-*A*A2*-402		
Main circuit	AC input power, ground	R,S,T,E	2	2	2	3.5		
	Control AC input power	r,s	0.75	0.75	0.75	0.75		
	Motor	U,V,W	1.25(2)	1.25(2)	2	2(3.5)		
	Cooling blower motor	u,v,w	0.75	0.75	0.75	0.75		
	Regenerative resistor	B1,B2	2	2	2	3.5		

AC200V Specifications Unit:mm^2

	Item	Terminal	NCR-*A*A2*-752	NCR-*A*A2*-113	NCR-*A*A2*-153	NCR-*A*A2*-223	NCR-*A*A2*-303	NCR-*A*A2*-373
Main circuit	AC input power, ground	R,S,T,E	8	14	14	38	50	60
	Control DC input power	24V,0V *1	0.75	0.75	0.75	0.75	0.75	0.75
	Motor	U,V,W	8	14	14	38	50	60
	Cooling blower motor	u,v,w	0.75	0.75	0.75	0.75	1.25	1.25
	Regenerative resistor	B1,B2	3.5	5.5	8	14	14	22

[Table 5-12 (b)] Applicable cable for main circuit 2/3

Wire diameter is described in ( ) of "Motor" when the induction motor is used.
(It is common if there is no ( ).)
※ The controller of output capacity 22Kw or more can be changed in future.
*1 Please note that there is also a device with the AC200V input power supply specifications.

AC400V Specifications Unit:mm^2

	Item	Terminal		NCR-*A*A3*-751	NCR-*A*A3*-262	NCR-*A*A3*-402	NCR-*A*A3*-752	
Main circuit	AC input power, ground	R,S,T,E		1.25	2.0	2.0	5.5	
	Control DC input power	24V,0V		0.75	0.75	0.75	0.75	
	Motor	U,V,W		0.75	1.25	2.0	5.5	
	Cooling blower motor	-						
	Regenerative resistor	B1,B2		0.75	0.75	0.75	3.5	

AC400V Specifications Unit:mm^2

	Item	Terminal	NCR-*A*A3*-113	NCR-*A*A3*-153	NCR-*A*A3*-223	NCR-*A*A3*-303	NCR-*A*A3*-373	NCR-*A*A3*-553
Main circuit	AC input power, ground	R,S,T,E	5.5	5.5	14	14	22	50
	Control DC input power	24V,0V	0.75	0.75	0.75	0.75	0.75	0.75
	Motor	U,V,W	5.5	8	22	22	30	60
	Cooling blower motor	u,v,w	0.75	0.75	0.75	1.25	1.25	1.25
	Regenerative resistor	B1,B2	3.5	3.5	5.5	8	8	14

AC400V Specifications Unit:mm^2

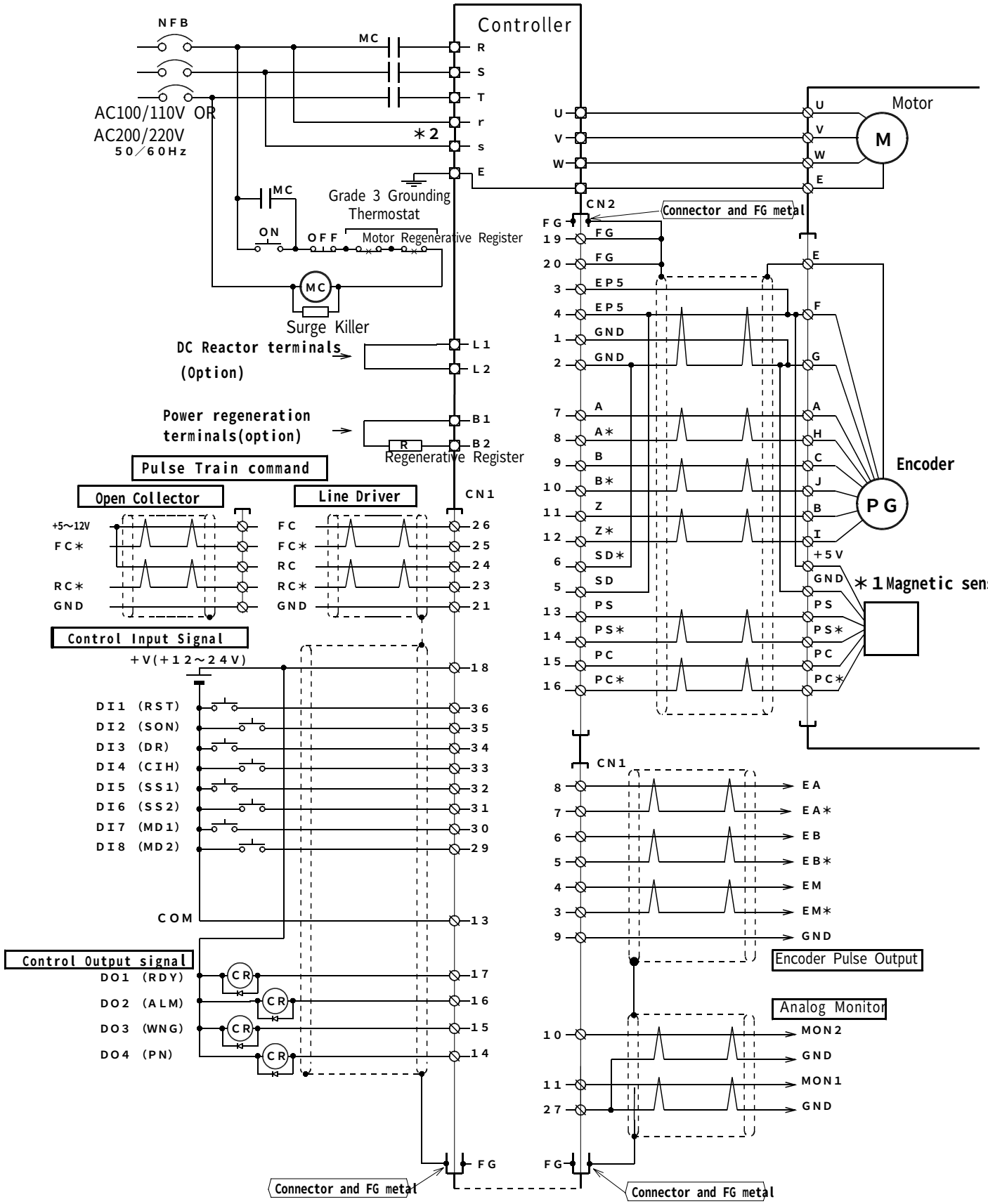
	Item	Terminal	NCR-*A*A3*-753	NCR-*A*A3*-114				
Main circuit	AC input power, ground	R,S,T,E	80	100				
	Control AC input power	r,s	0.75	0.75				
	Motor	U,V,W	100	150				
	Cooling blower motor	u,v,w	1.25	1.25				
	Regenerative resistor	B1,B2	22	38				

[Table 5-12 (c)] Cables used in the main circuit 3/3

Wire diameter is described in ( ) of "Motor" when the induction motor is used.
(It is common if there is no ( ).)
※ The controller of output capacity 22Kw or more can be changed in future.

6－1 External Wiring Diagram

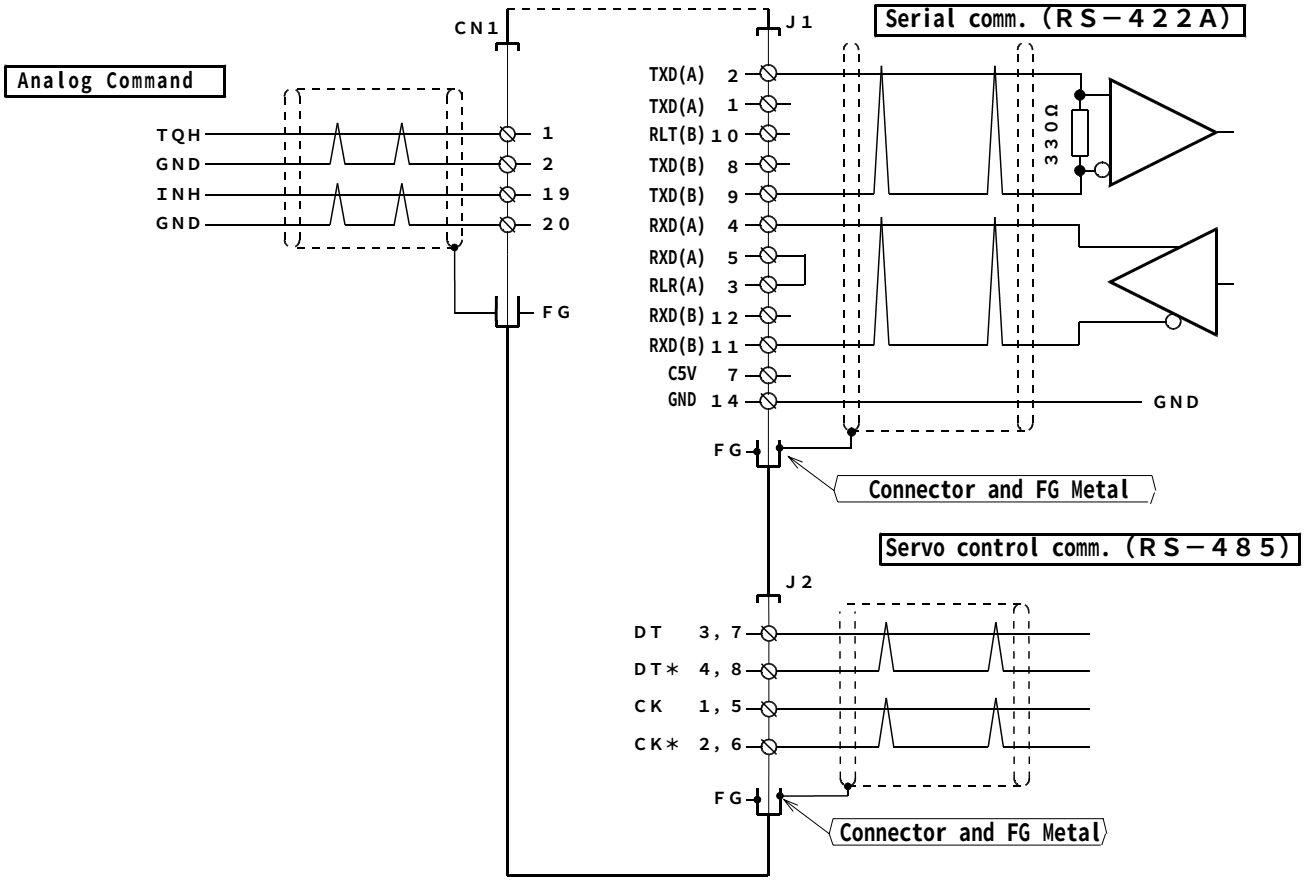
(1) AC100V/200V



[Figure 6-1(a)] External Wiring Diagram(AC100V/200V) 1/3

＊1 : To be used for connecting the magnetic sensor applicable encoder cable.

＊2 : For 752/113/153, it will be DC 24V. (Refer to page 6-4)



Note 1: Provide a power supply with specified voltage and current for control input signals by your side.

Note 2: COM of CN1 connector is common to control I/O signals. And GND is common to the internal control power of the controller (+5V).

Note 3: Since COM of CN1 and GND are isolated, do not make common wiring but alsobind them in a same bundle.

Note 4: Switch status connected with control input signals indicates OFF of individual signal.

Note 5: Motor and encoder wiring can be referred to the individual motor manual.

Note 6: The pins without description in this diagram is NC.

Note 7: Analog input command input is set at our factory optionally.

Note 8: In case of using an extension board, refer to other manual「Volume: Option」.

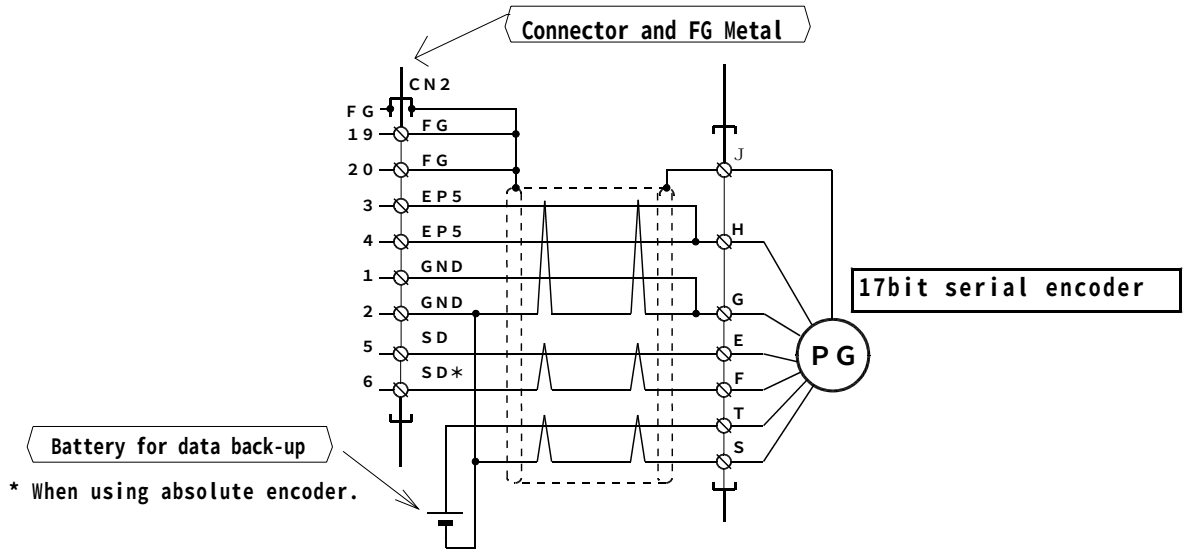
Note 9: () in a signal I/O name,is initial setting value of parameter.

Note 10: Connect GND of pulse train command when an optional line receiver input is used.

Note 11: DC reactor connection terminal is available for the device capacity 752 or higher
(DC reactor is option)

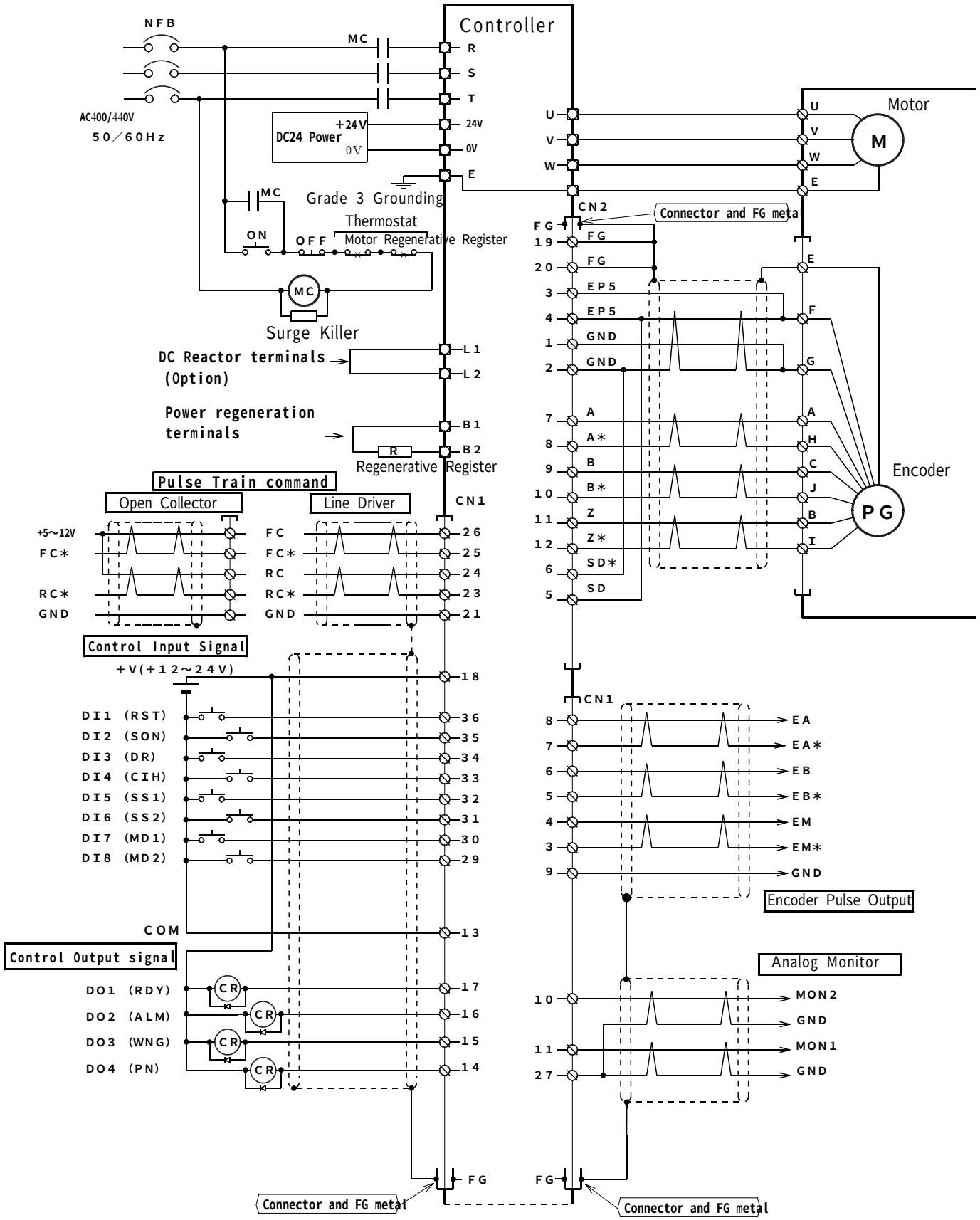
[Figure 6-1(b-1)] External Wiring Diagram(AC100V/200V) 2/3

Note 12: Connection of 17 bit serial encoder is as follows:

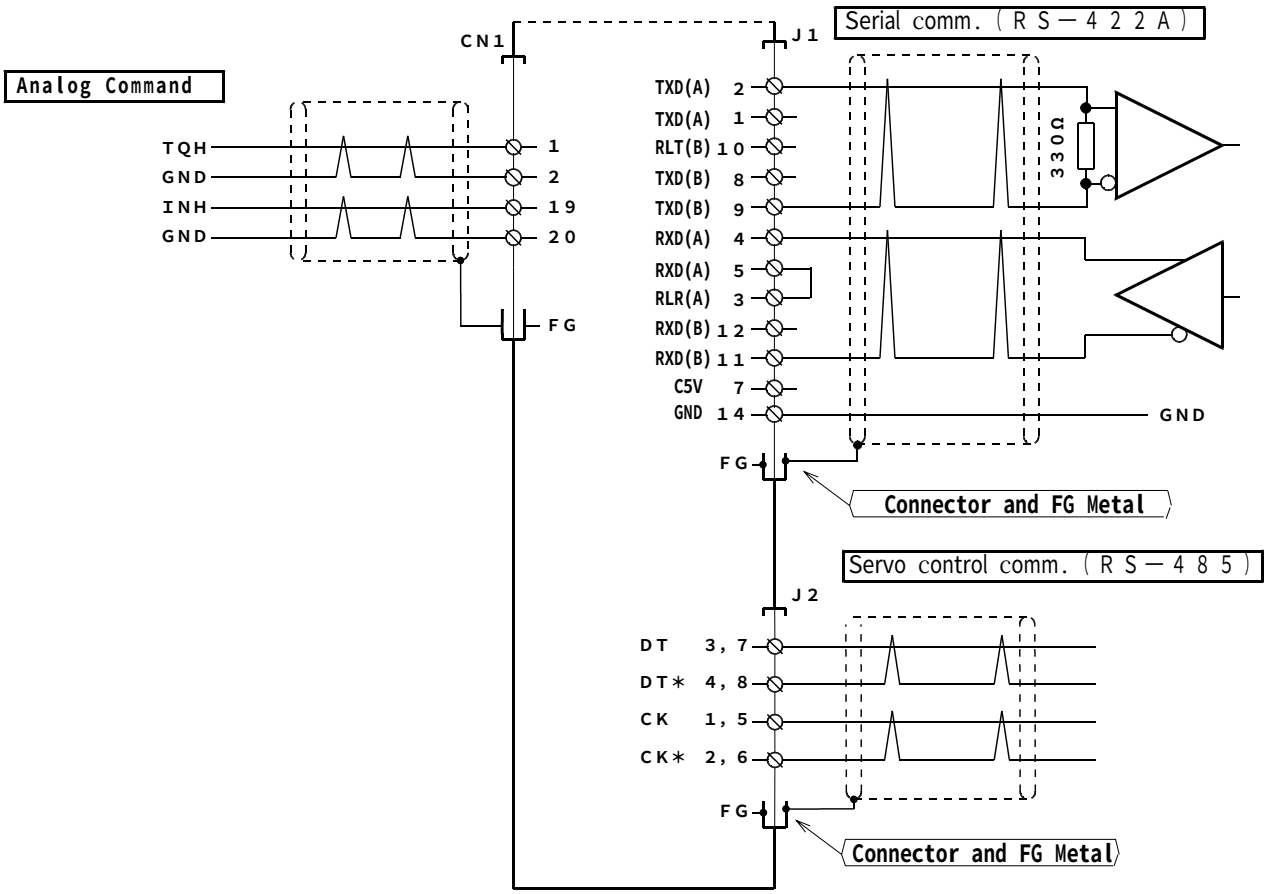


[Figure 6-1(b-2)] External Wiring Diagram(AC100V/200V) 3/3

(2) AC400V



[Figure 6-1(c)] External Wiring Diagram(AC400V) 1/3



Note 1: Provide a power supply with specified voltage and current for control input signals by your side.

Note 2: COM of CN1 connector is common to control I/O signals. And GND is common to the internal control power of the controller (+5V).

Note 3: Since COM of CN1 and GND are isolated, do not make common wiring but alsobind them in a same bundle.

Note 4: Switch status connected with control input signals indicates OFF of individual signal.

Note 5: Motor and encoder wiring can be referred to the individual motor manual.

Note 6: The pins without description in this diagram is NC.

Note 7: Analog input command input is set at our factory optionally.

Note 8: In case of using an extension board, refer to other manual 「Volume: Option」 .

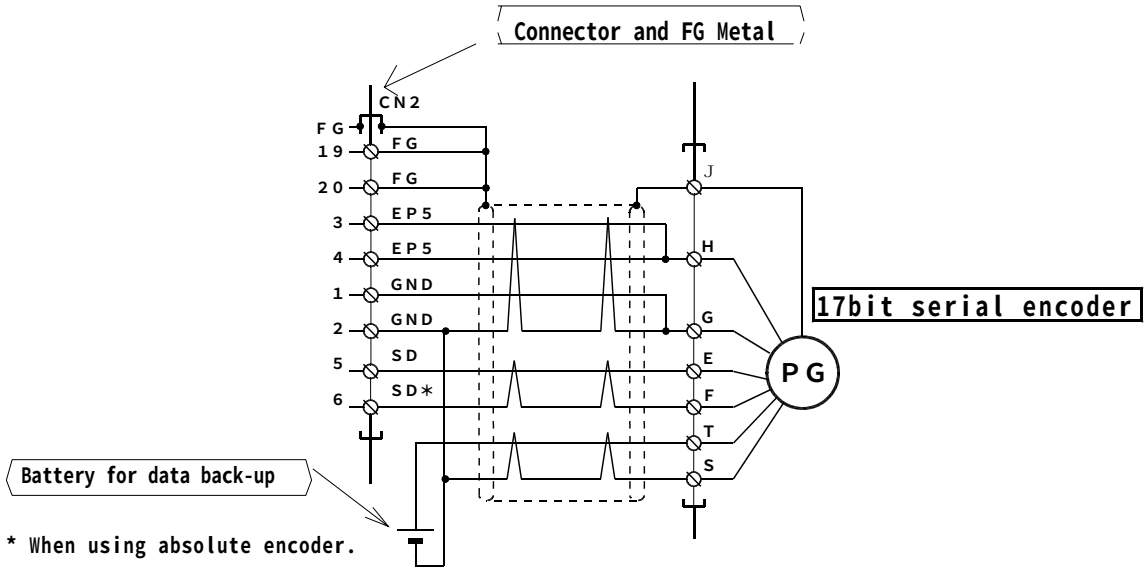
Note 9: () in a signal I/O name,is initial setting value of parameter.

Note 10: Connect GND of pulse train command when an optional line receiver input is used.

Note 11: DC reactor connection terminal is available for the device capacity 752 or higher
(DC reactor is option)

[Figure 6-1(d-1)] External Wiring Diagram(AC400V) 2/3

Note 12: Connection of 17 bit serial encoder is as follows:



[Figure 6-1(d-2)] External Wiring Diagram(AC400V) 3/3

6-2 Input output signals

6-2-1 List of input output signals

⚠ Caution

- COM (Power common for control input output signal) and GND (common for internal control Power+ 5V) are isolated from each other. So do not use common wiring for these.
- This explanation also contains signals which cannot be used as standard specifications. So take care while using.

* As per customer specifications, power for control input output signal is +V (+24V, 0.5A).

Signal name	Signal	Terminal No.	I/O	Function
Clear deviation	CLR	---	---	• On short circuit between COM terminals (Signal is ON), counter for position deviation is cleared and motor is stopped with speed command as in zero state. • If this signal is input during motor operation, motor stopped immediately. • In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738]. • [CLR] of LCD module glows at the time of signal input.
Stop command pulse input Relative parameter (P600)	CIH (*)	---	---	• On short circuit between COM terminals (Signal is ON), master axis pulse train command becomes invalid and updation of master axis position is stopped. • This signal becomes valid on auto run [Free curve motion operation] • Valid logic of this signal can be changed by parameter. • In such a case, above mentioned short circuit / open state between COM terminals becomes completely reverse. • In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738]. • [CIH] of LCD module glows at the time of signal input.
Reset	RST	---	---	• On short circuit between COM terminals (Signal is ON), alarm during detection is reset and alarm output signal is set OFF. • Torque free condition occurs during input of this signal. Brake release signal (BRK) and Servo ready signal (RDY) cannot be output. When signal is set OFF again, Brake release signal and Servo ready signal are output and Machine returns to Normal operation state. • This signal is valid in all modes. • This signal can be used for pulse signal above 3msec. • This signal is used even as release signal in emergency stop. • Alarm can be reset even for 'reconnection' of input Power for connector. • In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738]. • [RST] of LCD module glows at the time of signal input.

				[Note] Reset the alarm only when 'clear' is required.

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initital condition of the parameter.

Signal name	Signal	Terminal No.	I/O	Function
Emergency stop Related parameters (P710) (P711) (P712)	EMG*	---	---	• On opening of COM terminals (signal ON), Motor is stopped by stop method specified by parameter or by deceleration time. This time Servo ready signal (RDY) is set OFF. • After motor is stopped, on passage of time specified by parameter, motor goes in torque free state and brake release signal (BRK) is set OFF. • Emergency stop is carried out by short circuit between COM terminals and can be released by input of Reset signal (RST). • Normal operation is possible during short circuit of COM terminals. • This signal is valid in all modes. • This signal can be used for pulse signal above 3 msec. • In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738]. • On opening COM terminals, [EMG] of LCD module glows and turns OFF on escape from emergency stop state.
Servo ON Related parameters (P704)	SON (*)	---	---	• On short circuit between COM terminals (Signal is ON), Power transistor is activated and motor power ON state. • On opening COM terminals, motor goes in torque free state. • When COM terminals become ‘open’ during motor operation, free run of motor is stopped. • On opening COM terminals, brake release signal (BRK) and Servo ready signal (RDY) cannot be output. • This signal is valid in all modes. • Valid logic of this signal can be changed by parameter. • In such a case, above mentioned short circuit / open condition between COM terminals becomes completely reverse. • In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738]. • On input of signal as per valid logic, [SON] of LCD module glows.

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

<table>
<tr><th>Signal name</th><th>Signal</th><th>Terminal No.</th><th>I/O</th><th>Function</th></tr>
<tr><td>Select Mode 1,2

Related parameters
(P706)</td><td>MD1

MD2</td><td>---

---</td><td>---

---</td><td>• On short circuit between COM terminals (Signal is ON), each operation mode can be selected as per combinations of MD1, MD2 as shown in the chart below.
<table>
<tr><th>MD2</th><th>MD1</th><th>Running Mode</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Manual</td></tr>
<tr><td>OFF</td><td>ON</td><td>Return to original position motion</td></tr>
<tr><td>ON</td><td>OFF</td><td>Auto</td></tr>
<tr><td>ON</td><td>ON</td><td>Servo lock</td></tr>
</table>
• Time between switching of both signal to change of mode can be set by parameter in the range of 0~9.99 sec. (resolution 10 ms). (Initial value: 0.01 sec)
However, actual time of mode change is to be corrected by addition of 0.01sec.
• In initial status, external input signal is not assigned.
• As per necessity, please assign as per [P737/P738].
• At the time of signal input, both [MD1] and [MD2] of LCD module glows.</td></tr>
<tr><td>Select Proportion control</td><td>PC</td><td>---</td><td>---</td><td>• On short circuit between COM terminals (Signal is ON), speed loop is switched from proportional integral control to proportional control.
• This signal is valid in all modes.
• In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738].
• At the time of signal input, [PC] of LCD module glows.</td></tr>
<tr><td>Torque limit

Related parameters
(P125)
(P126)
(P127)
(P128)</td><td>TL</td><td>---</td><td>---</td><td>• On short circuit between COM terminals (Signal is ON), output torque of motor is limited by value (300%Torque /+10V) of external torque limit command voltage (TL+, TL-), when –1 is set in torque limit value 2 (+/-) of parameter (P127, P128) and torque is limited by set value when 0~799 is set.
• In open state of COM terminals, only torque limit value 1 (+/-) of parameter is valid.
• At the time of short circuit between COM terminals, when set torque limit value 1 (+/-) of parameter is smaller than (TL+, TL-) or torque limit value2; preference is given to torque limit value 1 and motion is carried out.
• In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738].
• At the time of signal input, [TL/RJ] of LCD module glows.</td></tr>
</table>

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

Signal name	Signal	Terminal No.	I/O	Function
Forward direction Over travel Related parameters (P705)	FOT*	---	---	※This signal indicates the movment limit (Stroke end) in Forward direction. • On opening COM terminal (signal ON), motor is stopped urgently when it reaches the stroke end point. And Servo lock condition occurs. • In 'Open' state of COM terminals, motion is possible only in reverse direction. • In short circuit state of COM terminals, common operation is possible when motor is in the range of normal motion. • This signal is valid in all modes. • Validity / invalidity of this signal can be selected by parameter. • In initial status, external input signal is not assigned. • As per necessity, please assign as per [P737/P738]. • When COM terminals are open, [FOT] of LCD module glows.
Reverse direction Over travel Related parameters (P705)	ROT*	---	---	※This signal indicates the movment limit (Stroke end) in reverse direction. • On opening COM terminal (signal ON), motor is stopped immediately when it reaches the stroke end point. And servo lock condition occurs. . • In 'Open' state of COM terminals, motion is possible only in forward direction. • In short circuit state of COM terminals, common operation is possible when motor is in the range of normal motion. • This signal is valid in all modes. • Validity / invalidity of this signal can be selected by parameter. • In initial status, external input signal is not assigned. • As per necessity, please assign as per [P737/P738]. • When COM terminals are open, [ROT] of LCD module glows.
Speed override	OR1 OR2 OR3 OR4	--- --- --- ---	--- --- --- ---	• This signal can be set by 15 levels from 10%~150% (Resolution is 10%). • OR4~OR1 can be treated as binary data (4 bit) and corresponds to each and every 3~0 bit. • For all OR4~OR1, override is invalid (100%) when COM terminals are open. • Signal turns ON when there is short circuit between COM terminals and override data is read as 4 bit data and motion speed changed to real time. • Motion speed can be calculated by following formula. Motion speed＝Command speed×Override ratio • However, if speed after override becomes greater than rated speed of motor, it is clampled at 120% of the rated speed. • In initial status, external input signal is not assigned.

				• As per necessity, please assign as per [P737/P738]. • Presently selected override ratio (10~150%) by LCD module [Diagnosis display mode] is displayed.

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

Signal name	Signal	Terminal No.	I/O	Function
Forward direction inching Related parameters (P400) (P401) (P402) (P403) (P404) (P405) (P406) (P407) (P408)	FJOG	---	---	∗Manual running mode • If short circuit between COM terminals (signal ON) continues for more than 3 ms, one shot inching operation (motion by lowest set unit) is carried out in forward direction. When ON condition exceeds 100 ms, inching operation is carried out in forward direction. • In OFF state, forward direction inching operation is stopped. When this signal is ON and reverse direction inching signal (RJOG) turns ON, forward direction inching operation is stopped. ※ Retrun to zero position operation mode • On short circuit between COM terminals (Signal is ON), returned to zero position of forward direction. • In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738]. • When there is short circuit between COM terminals, [DR/FJ] of LCD module glows.
Reverse direction inching Related parameters (P400) (P401) (P402) (P403) (P404) (P405) (P406) (P407) (P408)	RJOG	---	---	※ In Manual running mode • If short circuit between COM terminals (signal ON) continues for more than 3 ms, one shot inching operation (motion by lowest set unit) is carried out in reverse direction. When ON condition exceeds 100 ms, inching operation is carried out in reverse direction. • In OFF state, reverse direction inching operation is stopped. When this signal is ON and forward direction inching signal (FJOG) turns ON, reverse direction inching operation is stopped. ※In zero position returning mode • On short circuit between COM terminals (Signal is ON), returned to zero position of reverse direction. • In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738]. • When there is short circuit between COM terminals, [TL/RJ] of LCD module glows.
Select inching speed Related parameters (P400) (P401)	JOSP	---	---	• On short circuit between COM terminals (Signal is ON), inching speed becomes as per the set value of parameter [P401]. • On short circuit between COM terminals (Signal is OFF), inching speed becomes as per set value of parameter [P400]. • Signal state is not related with inching direction but directly influences the operation. • In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738]. • Presently selected inching speed by LCD module [Diagnosis display mode] is displayed.

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

<table>
<tr><th>Signal name</th><th>Signal</th><th>Terminal No.</th><th>I/O</th><th>Function</th></tr>
<tr><td>Deceleration towards zero position

Related parameters
(P402)
(P403)
(P404)
(P405)
(P406)
(P407)
(P408)
(P610)</td><td>ZLS</td><td>---</td><td>---</td><td>• Deceleration towards zero position starts when there is short circuit between COM terminals (Signal is ON) during Return to zero position operation. In Standard zero position return operation, this signal must be ON from start of deceleration towards zero position till the completion. (ON condition is retained at zero position also).
• In ON condition, when ‘return to zero position’ operation started, once moved to ‘return to zero position’ and once in reverse direction. After recognizing OFF of this signal, return to zero position operation is carried out.
• In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738].
• When there is short circuit between COM terminals, [ZLS] of LCD module glows.</td></tr>
<tr><td>Select address</td><td>PS1
PS2
PS3
PS4
PS5
PS6
PS7
PS8</td><td>---

---</td><td>---

---</td><td>• Select address for start of auto run.
<table><tr><th>Selection signal</th><th>Address to be selected</th></tr><tr><td>PS1</td><td>Bit 0</td></tr><tr><td>PS2</td><td>Bit 1</td></tr><tr><td>PS3</td><td>Bit 2</td></tr><tr><td>PS4</td><td>Bit 3</td></tr><tr><td>PS5</td><td>Bit 4</td></tr><tr><td>PS6</td><td>Bit 5</td></tr><tr><td>PS7</td><td>Bit 6</td></tr><tr><td>PS8</td><td>Bit 7</td></tr></table>• At the time of input of ruto start signal (PST), read as data of execution address.
• Address can be specified in the range of 0~255 for this signal.
• PS8~PS1can handle 8 bit binary data.
• When there is short circuit between COM terminals (signal ON), corresponding bit becomes ‘1’
• Relation between signal and corresponding bit are specified in chart above.
• In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738].
• Presently selected address by LCD module [Diagnosis display mode] and, command of its address are confirmed.</td></tr>
</table>

Auto start	PST	---	---	• On short circuit between COM terminals (Signal is ON), command of address specified by address selection (PS1~PS8) is excluded. • This function serves as a restart signal at the time of temporary hold of auto run and block stop. • Auto start signal input through external input signal can be prohibited by External auto start prohibition signal (EPIH). • In initial status, external input signal is not assigned. • As per necessity, please assign as per [P737/P738]. • At the time of signal input and during Auto run, [PST] of LCD module glows.

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

Signal name	Signal	Terminal No.	I/O	Function
External auto start prohibition	EPIH	---	---	• On short circuit between COM terminals (Signal is ON), auto start signal from external input is prohibited. (Cannot restrict Auto start signal from Serial communication, Sequence control, Remote sequence controller) • Auto start signal is received when auto start signal from external input is ON and external auto start prohibition signal (EPIH) is OFF. • In initial status, external input signal is not assigned. • As per necessity, please assign as per [P737/P738]. • At the time of signal input, corresponding signal assigned by [STIN] of [Diagnosis display mode] becomes “1”.
Hold	HLD	---	---	• Run operation is put on hold on short circuit between COM terminals (Signal is ON). • On Return from hold state and after this signal is OFF, At the time of return to zero position operation: Forward direction inching signal (FJOG) or Reverse direction inching signal (RJOG) is set ON. On auto run: Auto start signal (PST) is set ON. • In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738]. • At the time of Hold, [HLD] of LCD module glows.
External trigger Related parameters (P610)	TRG	---	---	• While validating auto runexternal trigger positioning, external trigger positioning is carried out on short circuit between COM terminals (Signal is ON). • At the time of [synchronous start standby condition], when Free curve motion [Synchronous start position adjustment function] is valid, Free curve motion operation starts, on short circuit between COM terminals (Signal is ON). • This signal is valid in valid section of Auto run TRG signal and free curve motion [Synchronous start position adjustment function, start standby condition]. • In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738]. • At the time of signal input, [TRG] of LCD module glows.
M Finish	MFIN	---	---	• On short circuit between COM terminals (Signal is ON), M strobe output signal (MSTB) is set OFF and switches over to execution of next command. • This signal is valid in Auto run. • In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738]. • At the time of signal input, corresponding signal assigned by [STIN] of [Diagnosis display mode] becomes “1”.

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

Signal name	Signal	Terminal No.	I/O	Function
Block stop	BSTP	---	---	• On short circuit between COM terminals (Signal is ON) during execution of auto run command, auto run is stopped by block unit and standby occurs till restart (Block stop). • When start occurs in ON state, it is stopped after execution of 1 block and standby occurs till restart. • Whether to detect this signal or not and processing at the time of detection differs as per command. • In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738]. • At the time of signal input, corresponding signal assigned by [STIN] of [Diagnosis display mode] becomes “1”.
Program cancel	PCAN	---	---	• During execution of auto run command, on short circuit between COM terminals (Signal is ON), auto run is cancelled (Interruption in auto run operation/ release of Hold condition/ release Block stop condition). If switched ON during motor operation, deceleration is stopped as per deceleration time of each command. • During motor stop or after stop, startup is put on hold as per address specification. • In initial status, external input signal is not assigned. • As per necessity, please assign as per [P737/P738]. • At the time of signal input, corresponding signal assigned by [STIN] of [Diagnosis display mode] becomes “1”.
Select speed gain Related parameters (P111~P115)	GSEL	---	---	• On short circuit between COM terminals (Signal is ON), speed loop gain is controlled as per settings of P111~P115. • In ‘Open’ state of COM terminals, (signal OFF), speed loop gain is controlled as per settings of P101~P105 or P106~P110. (In this document, OFF state of this signal is explained in prerequisite. So consider this signal as OFF as long as [GSEL signal] is ON) • This signal is valid in all modes. • In initial status, external input signal is not assigned. • As per necessity, please assign as per [P737/P738]. • At the time of signal input, corresponding signal assigned by [STIN] of [Diagnosis display mode] becomes “1”.
Mandatory brake ON	BRON	---	---	• On short circuit between COM terminals (Signal is ON), Brake release signal (BRK) is switched compulsorily to brake state. (In this document, OFF state of this signal is explained in prerequisite.) • This signal is assigned to external input signal as per parameter. • This signal is valid in all modes. • In initial status, external input signal is not assigned. • As per necessity, please assign as per [P737/P738]. • At the time of signal input, corresponding signal assigned by [STIN] of [Diagnosis display mode] becomes “1”.

Encoder feedback Pulse Related parameters (P001) (P002)	A,A* B,B* Z,Z*	CN2	I-3	• Feedback pulse signal is input from encoder and from linear sensor installed in motor. • Input 2 signals with 90 deg phase difference (A phase, B phase) for the line driver output (suitable to 26LS31) and Marker signal (Z phase).

Note 1) Signals marked with * sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

Signal name	Signal	Terminal No.	I/O	Function
Insert magnetic sensor Related parameter (P010) (P011)	PS, PS*, PC, PC*	CN2	---	• Inputs the feedback signal from the magnetic sensor installed in the motor.
Torque limit Command+, - Related parameters (P127) (P128)	TL+ TL-	--- ---	I-4 I-4 Analog	• This signal is optional. • On input of Torque limit signal (TL), output torque is limited to the lowest of torque limit command value or torque limit value of parameter. • Driving Torque in forward direction is limited by TL+ command. • Driving Torque in reverse direction is limited by TL - command. • For both TL+, TL-, GND terminal is base, and positive voltage is input. Input range is from DC 0~+10V, so on input of each and every DC+10V, limit value becomes 300% Torque.
Phase advance Related parameters (P806)	D11	CN1-36	I – 1	• During Auto run operation, when [Signal during Free curve motion] (FC) is ON, if short circuit between COM terminals (signal ON) exceeds for more than 3 ms. Phase control (Advance direction) is enforced for one time. • Phase adjusted for once by parameter [P806]. • In initial state, assigned to external input signal [DI1]. • At the time of signal input, corresponding signal assigned by [STIN] of [Diagnosis display mode] becomes “1”.
Phase delay Related parameters (P806)	D12	CN1-35	I - 1	• During auto run operation, when [Signal during Free curve motion] (FC) is ON, if short circuit between COM terminals (signal ON) exceeds for more than 3 ms., phase control (Delay direction) is enforced for one time. • One time phase adjustment quantity is set by parameter [P806]. • In initial state, assigned to external input signal [DI2]. • At the time of signal input, corresponding signal assigned by [STIN] of [Diagnosis display mode] becomes “1”.

Electronic clutch	D14	CN1-34	I – 1	• During free curve motion, electronic clutch condition occurs when master axis command passes the standard position, and when there is short circuit between COM terminals (Signal is ON). • In electronic clutch state, [Electronic clutch stopping signal] (FCRP) turns ON. • In initial state, assigned to external input signal [DI3]. • At the time of signal input, corresponding signal assigned by [STIN] of [Diagnosis display mode] becomes “1”.
Select Master axis Related parameters (P808) (P809)	D18	CN1-33	I - 1	• On short circuit between COM terminals (Signal is ON), and on selection of internal Master axis; frequency is generated as set by parameter [P808] or [P809], as per condition of Internal master axis speed selection signal (MSSP). • If COM terminals are open (signal is OFF), master axis command becomes valid for external input. • In initial state, assigned to external input signal [DI4]. At the time of signal input, corresponding signal assigned by [STIN] of [Diagnosis display mode] becomes “1”.

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

<table>
<tr><th>Signal name</th><th>Signal</th><th>Terminal No.</th><th>I/O</th><th>Function</th></tr>
<tr><td>Cycle end</td><td>D21</td><td>CN1-32</td><td>I - 1</td><td>• During free curve motion, when master axis command passes standard position, and when there is short circuit between COM terminals (Signal is ON), free curve motion ends.
• At end of free curve motion, [Signal during free curve motion] (FC) turns OFF.
• In initial state, can be assigned to external input signal [DI5].
• At the time of signal input, corresponding signal assigned by [STIN] of [Diagnosis display mode] becomes “1”.</td></tr>
<tr><td>Selection pattern1~3</td><td>D22
D24
D28</td><td>CN1-31
CN1-30
CN1-29</td><td>I-1
I-1
I-1</td><td>• On short circuit (Signal is ON) /opening (signal is OFF) of COM terminals, operation pattern for Free curve motion can be selected as per following chart by joining D22, D24,D28.
<table>
<tr><th>Pattern selection1 (D22)</th><th>Pattern selection 2 (D24)</th><th>Pattern selection 3 (D28)</th><th>Select pattern</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>1</td></tr>
<tr><td>ON</td><td>OFF</td><td>OFF</td><td>2</td></tr>
<tr><td>OFF</td><td>ON</td><td>OFF</td><td>3</td></tr>
<tr><td>ON</td><td>ON</td><td>OFF</td><td>4</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ON</td><td>5</td></tr>
<tr><td>ON</td><td>OFF</td><td>ON</td><td>6</td></tr>
<tr><td>OFF</td><td>ON</td><td>ON</td><td>7</td></tr>
<tr><td>ON</td><td>ON</td><td>ON</td><td>8</td></tr>
</table>
• In initial conditions, can be assigned as given below
D22: External input signal [DI6]
D24: External input signal [DI7]
D28: External input signal [DI8]
• At the time of signal input, corresponding signal assigned by [STIN] of [Diagnosis display mode] becomes “1”.

[Options]
Related data other than this signal can be specified in IX68 pattern.
For this, optional pattern from 1~500 can be selected.
When set value of IX68 is [0] or [Minus], Signals for pattern selection 1~3(D22, D24, D28) becomes valid</td></tr>
</table>

Select internal Master axis speed Related parameters (P808) (P809)	 MSSP	 ---	 ---	• Master axis speed is to be selected at the time of internal master axis selection (D18 ON). • On short circuit between COM terminals (Signal is ON), internal master axis speed becomes as per set value of parameter [P809]. • If COM terminals are open (signal is OFF), internal master axis speed becomes as per set value of parameter [P808]. • In initial status, external input signal is not assigned. As per necessity, please assign as per [P737/P738]. • At the time of signal input, corresponding signal assigned by [STIN] of [Diagnosis display mode] becomes “1”.

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

<table>
<tr><th>Signal name</th><th>Signal</th><th>Terminal No.</th><th>I/O</th><th>Function</th></tr>
<tr>
<td>Master axis pulse train command</td>
<td>FC
FC*

RC
RC*</td>
<td>CN1-26
CN1-25

CN1-24
CN1-23</td>
<td>For 1 – 2 option, 1-3 can be selected.

For 1 – 2 option, 1-3 can be selected</td>
<td>

This signal is input when master axis is input with external pulse train for free curve motion.
Input is as per pulse train direction or with 90° phase difference. Output may correspond to Line driver and Open collector method.
In case of line driver method, output of each and every line driver between FC-FC* and RC-RC* is connected.
In case of Open collector method, +V (External power for Open collector circuit) is connected to FC and RC and output of each and every Open collector is connected to FC* and RC*.
When pulse train command has 90° phase difference, between FC-FC* or pulse train of FC* (B phase) advances between RC-RC* or pulse train of RC* (A phase) by 90° phase, motor rotates in forward direction and if there is delay of 90°phase, motor rotates in reverse direction
If pulse train command is as per direction, if pulse train is input between FC-FC* or to FC*, motor rotates in forward direction and if pulse train is input between RC-RC* or to RC*, motor rotates in reverse direction.
In case of direction signal + feed pulse command, direction signal is input between RC-RC* or to RC* and feed pulse is input between FC-FC* or to FC*.
Logic of Direction signal.

<table>
<tr><th>Connection method</th><th>Signal name</th><th>Forward rotation command</th><th>Reverse rotation command</th></tr>
<tr><td>Line driver</td><td>RC-RC*</td><td>"L"-"H"</td><td>"H"-"L"</td></tr>
<tr><td>Open collector</td><td>RC*</td><td>0V release</td><td>0V short circuit</td></tr>
</table>
</td>
</tr>
</table>

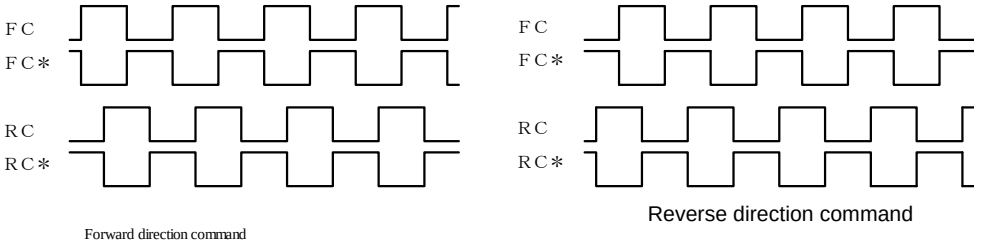
Related parameters (P601) (P602)				• Motion direction logic of master axis can be changed as per Parameter [Switch over the Pulse train command phase order]. • Maximum input frequency of master axis command in case of standard specifications is as below. In case of Line driver output o 90° phase difference pulse:1Mpps （4 times: 4Mpps） o Direction wise pulse :1Mpps o Smallest pulse width :above 500ns At the time of open collector (used voltage is 5~12V) output o 90° phase difference pulse:250kpps （4 times: 1Mpps） o Direction wise pulse :250kpps o Smallest pulse width :above 2μs • Highest frequency when high speed pulse train receiving unit (Line receiver) by option, then highest frequency is as below. For Line driver output In case of Line driver output o 90° phase difference pulse:4Mpps （4 times: 16Mpps） o Direction wise pulse :4Mpps o Smallest pulse width:above 125ns • Refer to next page for signal used for every pulse command while using Line driver. • Refer to next to next page for signal used for every pulse command while using open collector.

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

● Input pulse form while using Line driver

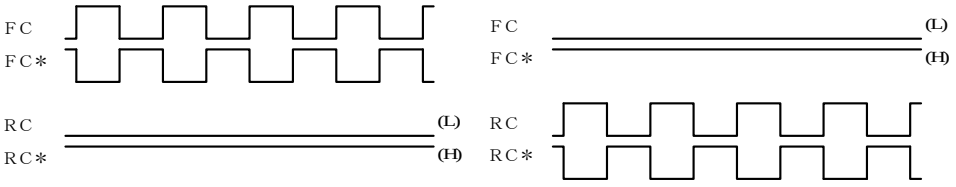
90 degree phase difference



Forward direction command

Reverse direction command

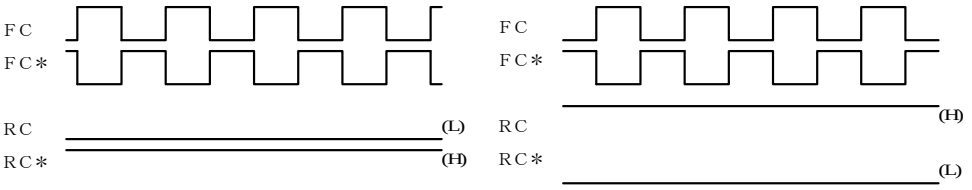
Pulse train direction



Forward direction command

Reverse direction command

Direction signal + feed pulse

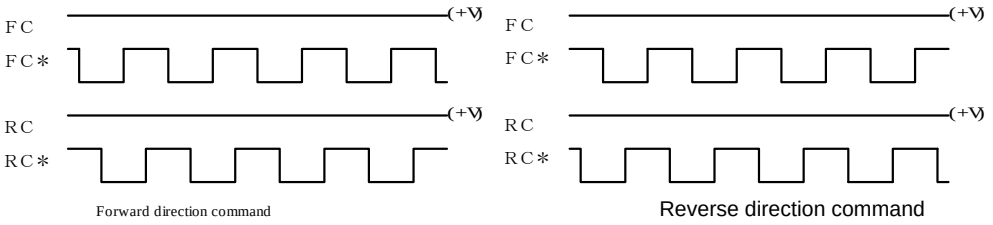


Forward direction command

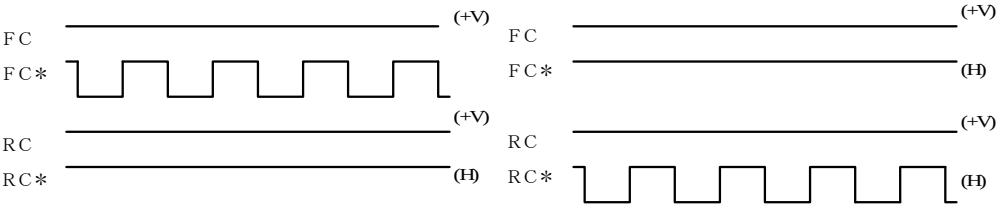
Reverse direction command

●Input pulse form while using Open collector

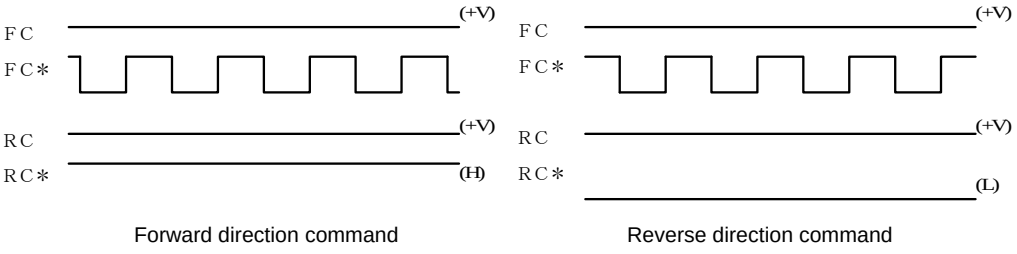
90 degree phase difference



Pulse train direction



Direction signal + feed pulse



Note) +V is power supply with +5V ~ 12V

Signal name	Signal	Terminal No.	I/O	Function
Alarm Related parameters (P142) (P715)	ALM (*)	---	---	• When alarm is produced, motor is stopped immediately and torque free stop occurs. (as per alarm contents) • On generation of alarm, this signal is set ON (COM terminals are Open) and at the same time servo ready signal (RDY) is set OFF. Brake release signal (BRK) is set OFF when motor goes in torque free state. • This signal is OFF in normal conditions. (COM terminals are short circuited) • Alarm is reset by input of reset signal (RST) or by reconnection of power. This signal is set OFF on input of reset signal. • This signal is open collector output and isolated from internal control Power. • In initial conditions, external output signal is not assigned. In case of necessity, please assign as per [P742]. • At the time of signal output, [ALM] of LCD module glows, and alarm contents are displayed in 7 segments LED for condition display.
Servo ready Related parameters (P716)	RDY	---	---	• This signal is set ON when motion preparation of motor control is completed. (COM terminals are short circuited) • When alarm is produced, servo ON signal (SON) is OFF and motor goes in torque free state and this signal is set OFF. (COM terminals are open) • On generation of alarm, this signal is returned when alarm is reset by input of reset signal (RST) or by reconnection of Power. • If this signal and reset signal are OFF during reset signal (RST) input, this signal turns ON. • While connecting the Power; for power reset time inside the equipment, this signal is output after max. 3.0sec. However, if servo ON signal (SON) is input, after max. 3 msec, when reset signal (RST) is input, after release of reset, output is carried out after max. 1.0 sec. for internal operation processing. • For external power connection and for abnormal processing sequence, above mentioned timing needs reconsideration. • This signal is open collector output, isolated from internal control Power. • In initial conditions, external output signal is not assigned. In case of necessity, please assign as per [P742]. • At the time of signal output, [RDY] of LCD module glows.

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

Signal name	Signal	Terminal No.	I/O	Function
Warning Related parameters (P715)	WNG (*)	---	---	• If error is detected during normal motion and if there is possibility of stoppage, this signal turns ON as a warning signal. (COM terminals are short circuited) • Motion is not stopped even on output of this signal,. • This signal is OFF except when there is possibility of occurrence of error. (COM terminals are open) • This signal is output in following conditions. (1) Excess load (2) Abnormal deviation signal (3) Main power shortage detection signal For contents refer to Chart 12- 4 [Warning list]. • This signal is Open collector output and is isolated from internal control Power. • In initial conditions, external output signal is not assigned. In case of necessity, please assign as per [P742]. • At the time of signal output, [WNG] of LCD module glows, and warning contents are displayed in 7 segment LED for condition display.
Positioning completion Related parameters (P202)	PN	---	---	• At the time of return to zero position motion, this signal is set ON on completion of completion of Return to zero position operation. (COM terminals are connected COM terminal are connected) • In auto run state, after completion of positioning command, if difference between present position and positioning data is in the range set by parameter [P202], signal is set ON. • This signal turns OFF in [Auto run start], [While changing motion mode] [Servo is OFF] [When Alarm is produced] [In Emergency stop, Reset, deviation clear, program cancel signal is ON]. • In initial conditions, external output signal is not assigned. In case of necessity, please assign as per [P742] . • At the time of signal output, [PN] of LCD module glows.
Speed /Torque limiting Related parameters (P125) (P126) (P127) (P128)	LIM	---	---	• For all modes, on entering in torque limit zone, this signal is set ON (COM terminals are connected), and set OFF on leaving torque limit zone (COM terminals are open). • In initial conditions, external output signal is not assigned. In case of necessity, please assign as per [P742] . • At the time of signal output, [LIM] of LCD module glows.

Zero speed Related parameters (P702)	SZ	---	---	• For all modes, when motor speed falls below the speed set by parameter (P702) [zero speed range], this signal turns ON (COM terminals are connected) and turns OFF when escapes from this range (COM terminals are Open). • In initial conditions, external output signal is not assigned. In case of necessity, please assign as per [P742] . • At the time of signal output, [SZ] of LCD module glows.

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

<table>
<tr><th>Signal name</th><th>Signal</th><th>Terminal No.</th><th>I/O</th><th>Function</th></tr>
<tr><td>Brake release

Related parameters (P734)</td><td>BRK</td><td>---</td><td>---</td><td>• When this signal is ON (COM terminals are connected), associate the motor brake release sequence externally.
• This signal turns OFF when alarm is produced, on emergency stop, on servo off and when motor goes in torque free on reset signal input. (COM terminals are open)
• This signal is set compulsorily OFF when mandatory brake ON signal (BRON) is ON.
• Time from motor falls in torque free state till this signal turns OFF can be set as per parameter.
• In initial conditions, external output signal is not assigned.
In case of necessity, please assign as per [P742] .
• At the time of signal output, [BRK] of LCD module glows.</td></tr>
<tr><td>Soft limit switch

Related parameters
(P707)
(P708)
(P709)</td><td>SLSA

SLSB</td><td>---

---</td><td>---

---</td><td>• Signal is output corresponding to present position area by following area set by parameter [P707] ~ [P709].
• Parameter and output of each signal is as below.
<table>
<tr><th>SLSB</th><th>SLSA</th><th>Output conditions</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Before completion of return to zero position</td></tr>
<tr><td>OFF</td><td>OFF</td><td>Present position < [P707] set value</td></tr>
<tr><td>OFF</td><td>ON</td><td>[P707] set value ≤ Present position < [P708] settings</td></tr>
<tr><td>ON</td><td>ON</td><td>[P708] set value ≤ Present position <[P709] settings</td></tr>
<tr><td>ON</td><td>OFF</td><td>[P709] set value ≤ Present position</td></tr>
</table>
• To control the output of soft limit switch signal from present command position, this output generates error for part deviated from position as per actual position.
• This signal become always OFF when machine position cannot be recognized in incompletion of return to zero position state etc.
• In initial conditions, external output signal is not assigned.
In case of necessity, please assign as per [P742].
• At the time of signal output, corresponding signal assigned by [SOUT] of [Diagnosis display mode] becomes “1”.</td></tr>
<tr><td>Encoder Pulse output</td><td>EA
EA*

EB
EB*

EM
EM*</td><td>CN1-8
CN1-7

CN1-6
CN1-5

CN1-4
CN1-3</td><td>O – 2

O – 2

O – 2</td><td>• Outputs Encoder feedback pulse input (CN2).
• Output of EA/EA* and EB/EB* is 90° phase difference 2 signal of line driver output (26LS31 compatible) and must be in interface with line receiver (26LS32 compatible).
• Marker output of EM/EM* is line driver output (26LS31 compatible). In factory option, interface of Open collector output (0-4) isolated from internal control power can be selected.</td></tr>
</table>

Note 1) Signals marked with ＊ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

Signal name	Signal	Terminal No.	I/O	Function
In manual motion Mode	MMOD	---	---	• This signal turns ON during manual control motion mode. (COM terminals are connected) • In initial conditions, external output signal is not assigned. In case of necessity, please assign as per [P742] . • At the time of signal output, [JOG] is displayed in condition display [Mode display screen] of LCD module.
Returning to zero position motion mode	HMOD	---	---	• This signal become ON during return to zero position motion mode. (COM terminals are connected) • In initial conditions, external output signal is not assigned. In case of necessity, please assign as per [P742]. • At the time of signal output, [ORG] is displayed in condition display [Mode display screen] of LCD module.
Auto running mode	AMOD	---	---	• This signal become ON during auto run mode. (COM terminals are connected) • In initial conditions, external output signal is not assigned. In case of necessity, please assign as per [P742] • At the time of signal output, [AUTO] is displayed in condition display [Mode display screen] of LCD module.
Servo locking mode	PMOD	---	---	• This signal become ON during servo lock mode. (COM terminals are connected) • In initial conditions, external output signal is not assigned. In case of necessity, please assign as per [P742]. • At the time of signal output, [INVALID] is displayed in condition display [Mode display screen] of LCD module.

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

Signal name	Signal	Terminal No.	I/O	Function
Flaw match Related parameters (P703)	PRF	---	---	• At the time of return to zero position motion, turns ON on completion of return to zero position operation. (COM terminals are connected) • On start of positioning operation, this signal turns ON when difference between present position and positioning data becomes below value set by parameter [P703]. • This signal turns OFF in [Auto run start] [Change in motion mode] [Servo is OFF] [When alarm is produced] [Emergency stop, Reset, Deviation Clear, Program cancel signal is ON]. • In initial conditions, external output signal is not assigned. In case of necessity, please assign as per [P742] . • At the time of signal output, [PRF] of LCD module glows.
Program end	PEND	---	---	• In Auto run, this signal turns ON when PEND command is excluded, or any of the P0S/H0ME/INDX command is excluded and completed. (COM terminals are connected) • This signal turns OFF in [Auto run start] [Change in motion mode] [Servo is OFF] [When alarm is produced] [Emergency stop, Reset, Deviation Clear, Program cancel signal is ON]. • In initial conditions, external output signal is not assigned. In case of necessity, please assign as per [P742] . • At the time of Signal output, corresponding signal assigned by [SOUT] of [Diagnosis display mode] becomes “1”.
Auto run ready Related parameters (P409)	PRDY	---	---	• This signal turns ON when auto start signal (PST) becomes [Receiving possible state] (Auto run start standby condition, Hold, Restart standby condition, Block stop restart standby condition). (COM terminals are connected) • This signal turns OFF in [Auto run start] [Change in motion mode] [Servo is OFF] [When alarm is produced] [Emergency stop, Reset, Deviation clear, Hold, Program cancel signal is ON] [In Auto run permission condition (P409), Return to zero position is not achieved even after completion of return to zero position operation]. • In initial conditions, external output signal is not assigned. In case of necessity, please assign as per [P742]. • At the time of signal output, corresponding signal assigned by [SOUT] of [Diagnosis display mode] becomes “1”.

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

Signal name	Signal	Terminal No.	I/O	Function
General output	OUT1 OUT2 OUT3 OUT4 OUT5 OUT6 OUT7 OUT8	--- --- --- --- --- --- --- ---	--- --- --- --- --- --- --- ---	• In auto run, it is the output, when command which validates general output is executed. (COM terminals are connected) • Signal is retained, till command, which makes next general output as valid. • OUT8~OUT1 is treated as binary data (8bit) and corresponds to each of 7~0 bits. ON state is set when corresponding bit is “1” and OFF when “0”. • This signal turns OFF in [Auto run start] [Change in motion mode] [Servo is OFF] [When alarm is produced] [Emergency stop, Reset, Deviation clear, Program cancel signal is ON]. • In initial conditions, external output signal is not assigned. In case of necessity, please assign as per [P742]. • At the time of signal output, corresponding signal assigned by [SOUT] of [Diagnosis display mode] becomes “1”.
M output	M01 M02 M04 M08 M10 M20 M40 M80	--- --- --- --- --- --- --- ---	--- --- --- --- --- --- --- ---	• In Auto run, it is the output, when command, which validates the M output. (COM terminals are connected) • Signal is retained, till command, which makes next M output as valid. • M80~M01 is treated as as binary data (8bit), and corresponds to each of 7~0 bits. ON state is set when corresponding bit is “1” and OFF when “0”. • This signal turns OFF in [Auto run start] [Change in motion mode] [Servo is OFF] [When alarm is produced] [Emergency stop, Reset, Deviation clear, Program cancel signal is ON]. • In initial conditions, external output signal is not assigned. In case of necessity, please assign as per [P742] . • At the time of Signal output, corresponding signal assigned by [SOUT] of [Diagnosis display mode] becomes “1”.
M strobe Related parameters (P409)	MSTB	---	---	• In Auto run, strobe signal turns ON on completion of execution of command which validates M output. (COM terminals are connected) • This signal turns OFF in [Auto run start] [Change in motion ode] [Servo is OFF] [When alarm is produced] [Emergency stop, Reset, Deviation clear, Hold, Program cancel signal is ON] [In auto run permissible condition (P409), When return to zero position is not achieved even after completion return to zero position]. • In initial conditions, external output signal is not assigned. • In case of necessity, please assign as per [P742]. • At the time of signal output, corresponding signal assigned by [SOUT] of [Diagnosis display mode] becomes “1”.

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be

changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

Signal name	Signal	Terminal No.	I/O	Function
Stopping Electronic clutch	FCRP	CN1-17	0-1	• Turns ON at the time of stoppage as per electronic clutch condition. (COM terminals are connected) • In electronic clutch condition, electronic clutch signal (D14) is set OFF and remains OFF till master axis position does not pass the standard position. • (COM terminals are Open) • In initial conditions, can be assigned to external output signal [DO1]. • At the time of signal output, corresponding signal assigned by [SOUT] of [Diagnosis display mode] becomes “1”.
In Free curve motion	FC	CN1-16	0-1	• Set ON when free curve motion control starts (COM terminals are connected) and set OFF when free curve motion ends. (COM terminals are open). • In initial conditions, it can be assigned to external output signal [DO2]. • At the time of signal output, corresponding signal assigned by [SOUT] of [Diagnosis display mode] becomes “1”.
Master axis Speed zero Related parameters (P812)	MSZ	CN1-15	0-1	• Set ON when master axis speed is below the set value of parameter [P812]. (COM terminals are connected). Set OFF when master axis speed crosses set value of parameter [P812] (COM terminals are open). • In initial conditions, can be assigned to external output signal [DO3]. • At the time of signal output, corresponding signal assigned by [SOUT] of [Diagnosis display mode] becomes “1”.

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

Signal name	Signal	Terminal No.	I/O	Function
Analog Monitor Related parameters (P700) (P701)	MON1 MON2 GND	CN1-11 CN1-10 CN1-27	0-4	• It is the output of Analog monitor for confirming controller and motor operation conditions. • Monitor output can be selected from followings by parameter (P700, P701) [Select Monitor 1, 2]. (1)Speed command, (2) Speed feedback, (3) Torque command, (4) External+ torque limit, (5) External-torque limit, (6) Position deviation 1 (Range:± 255 pulse) (7) Position deviation 2 (Range:± 4080 pulse) (8)NC speed output Further, output of monitor is as below. MON1: Selected by P700 MON2: Selected by P701 • For monitor voltage value, refer to [10-3 Analog monitor]. • Output impedance is 1KΩ.
Serial communication Related parameters (P500 block)		J1	I0-1	• Serial communication (RS-422A) is carried out by connecting external machine or optional unit. • Communication conditions can be selected by parameter.
Servo control communication Related parameters (P521 ~528) (P602)		J2	I0-2	• Servo control data can be sent or received by connecting with other Servo control communication machine. • When ‘receiving’ is selected by parameter, free curve motion operation is possible by received master axis position data.

Note 1) Signals marked with ∗ sign are of negative logic. Logic of signals marked with (*) can be changed by parameter.

Note 2) Terminal No. is a number assigned to initial condition of the parameter.

6-2-2 Remote signal list

Signal name	Code	Input/ Output	Controller No.		
			Serial signal communication	Sequence control	Remote sequence control
Reset	RST	Input	X0000	M9144	Ymn00
Emergency stop	EMG*		X0001	M9145	Ymn01
Servo on	SON(*)		X0002	M9146	Ymn02
Speed gain selection	GSEL		X0004	M9148	Ymn04
Deviation clear	CLR		X0005	M9149	Ymn05
Forward direction over travel	FOT*		X0006	M9150	Ymn06
Opposite direction over travel	ROT*		X0007	M9151	Ymn07
Mode selection 1	MD1		X000B	M9155	Ymn13
Mode selection 2	MD2		X000C	M9156	Ymn14
Torque control	TL		X000D	M9157	Ymn15
Command pulse input prohibition	CIH (*)		X000E	M9158	Ymn16
Mandatory brake ON	BRON		X000F	M9159	Ymn17
Proportionate control	PC		X0010	M9160	Ymn20
Address specification 1	PS1		X0018	M9168	Ymn30
Address specification 2	PS2		X0019	M9169	Ymn31
Address specification 3	PS3		X001A	M9170	Ymn32
Address specification 4	PS4		X001B	M9171	Ymn33
Address specification 5	PS5		X001C	M9172	Ymn34
Address specification 6	PS6		X001D	M9173	Ymn35
Address specification 7	PS7		X001E	M9174	Ymn36
Address specification 8	PS8		X001F	M9175	Ymn37
Auto start	PST		X0020	M9176	Ymn40
Forward direction inching	FJOG		X0021	M9177	Ymn41
Reverse direction inching	RJOG		X0022	M9178	Ymn42
Select inching speed	JOSP		X0023	M9179	Ymn43
M finish	MFIN		X0024	M9180	Ymn44
Block stop	BSTP		X0025	M9181	Ymn45
Program cancel	PCAN		X0026	M9182	Ymn46
External auto start stop	EPIH		X0027	M9183	Ymn47
Speed override 1	OR1		X0028	M9184	Ymn50
Speed override 2	OR2		X0029	M9185	Ymn51
Speed override 3	OR3		X002A	M9186	Ymn52
Speed override 4	OR4		X002B	M9187	Ymn53
Hold	HLD		X002C	M9188	Ymn54
(External trigger)	(TRG)		X002D	M9189	Ymn55

※1 Controller No.column displays controller number of remote control data area corresponding to each signal.

※2 Remote control signal is not related with positive/negative logic.
Data “1” is corresponding to “ON” signal and data”0” is corresponding to “OFF” signal.

※ 3 mn of Ymn controller is 2 digit number which displays ID number of node connected with octal number.

[Table6-1 (A)] Remote control compatible signal list 1/3 (Input signals)

Signl name	Code	Input / Output	Controller No.		
			Serial communication	Sequence control	Remote sequence control
Internal master speed selection	MSSP	Input	X0030	M9192	Ymn60
Phase progress	D11		X0038	M9200	Ymn70
Phase delay	D12		X0039	M9201	Ymn71
Electronic clutch	D14		X003A	M9202	Ymn72
Master axis selection	D18		X003B	M9203	Ymn73
Cycle end	D21		X003C	M9204	Ymn74
Pattern selection1	D22		X003D	M9205	Ymn75
Pattern selection2	D24		X003E	M9206	Ymn76
Pattern selection3	D28		X003F	M9207	Ymn77

※1 Controller No. column displays controller number of remote control data area corresponding to each signal.

※2 Remote control signal is not related with positive / negative logic.
Data “1” is compatible with “ON” signal.
Data “0” is compatible with “OFF” signal.

※3 mn of Ymn controller is a 2 digit number which displays ID number of node connected with octal number.

[Table6-1(b)] Remote control compatible signal list 2/3 (Input signals)

Signal name	Code	Input / Output	ControllerNo.		
			Serial communication	Sequence control	Remote sequence control
Alarm	ALM(*)	Output	X0060	M9208	Xmn00
Warning	WNG(*)		X0061	M9209	Xmn01
Servo ready	RDY		X0062	M9210	Xmn02
Speed zero	SZ		X0063	M9211	Xmn03
Positioning completion	PN		X0064	M9212	Xmn04
Rough matching	PRF		X0065	M9213	Xmn05
Brake cancellation	BRK		X0066	M9214	Xmn06
Torque limiting	LIM		X0067	M9215	Xmn07
Program end	PEND		X0068	M9216	Xmn10
Auto run ready	PRDY		X0069	M9217	Xmn11
In manual operation mode	MMOD		X006A	M9218	Xmn12
In 'return to zero position' operation mode	HMOD		X006B	M9219	Xmn13
Auto running mode	AMOD		X006C	M9220	Xmn14
In servo lock mode	PMOD		X006D	M9221	Xmn15
General output1	OUT1		X0070	M9224	Xmn20
General output2	OUT2		X0071	M9225	Xmn21
General output3	OUT3		X0072	M9226	Xmn22
General output4	OUT4		X0073	M9227	Xmn23
General output5	OUT5		X0074	M9228	Xmn24
General output6	OUT6		X0075	M9229	Xmn25
General output7	OUT7		X0076	M9230	Xmn26
General output8	OUT8		X0077	M9231	Xmn27
Electronic clutch stopping	FCRP		X0078	M9232	Xmn30
In free curve motion	FC		X0079	M9233	Xmn31
Soft limit switch A	SLSA		X007E	M9238	Xmn36
Soft limit switchB	SLSB		X007F	M9239	Xmn37
M output 01	M01		X0080	M9240	Xmn40
M output 02	M02		X0081	M9241	Xmn41
M output 04	M04		X0082	M9242	Xmn42
M output 08	M08		X0083	M9243	Xmn43
M output 10	M10		X0084	M9244	Xmn44
M output 20	M20		X0085	M9245	Xmn45
M output 40	M40		X0086	M9246	Xmn46
M output 80	M80		X0087	M9247	Xmn47
Master axis speed zero	MSZ		X0088	M9248	Xmn50
M strobe	MSTB		X0089	M9249	Xmn51

※1 Controller No.column displays controller number of remote control data area corresponding to each signal.

※2 Remote control signal is not related with positive / negative logic.
Data "1" is compatible with "ON" signal.
Data "0" is compatible with "OFF" signal.

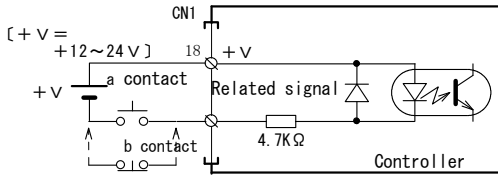
※3 mn for Xmn controller is two digital number which displays ID number of node connected by octal number (8)

[Table6-1(c)] Remote control compatible output 3/3 (Output signal)

6-2-3 Input output interface

Table displays the types of input output signal and equivalent circuits.

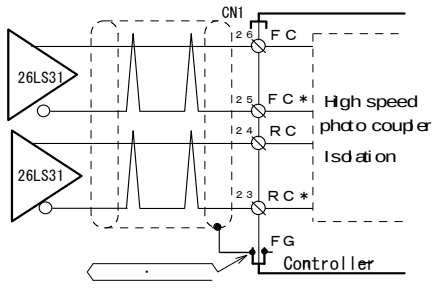
Every type input output signal is mentioned in input output terminal of [Table 6-2-1 Input output signal list] / circuit number column.

Circuit No.	Electric specification		Circuit.
I-1	Isolation method	Photo coupler isolation	
Related signal	Voltage range	DC10.2～26.4V	
DI1～8	Ripple ratio	Within 5%	
	Rated input current (/1 point)	About 2.5mA/DC12V	
		About 5.0mA/DC24V	
	Input resistor	About 4.7kΩ	
	Input filter time constant	About 120μs	

・Use a micro-current relay or an Open collector output transistor for the contact.
・A signal which right end of the signal Mark is not"*", is a positive logic signal. When the contact is closed, this signal is defined ON and when opened it is OFF.
・A signal which right end of the signal Mark is "*", is a negative logic signal. When the contact is opened, this signal is defined ON and when closed it is OFF.

Circuit No.		Input method	Photo coupler		Line receiver ※High speed Pulse train command In case of an option, Receipt unit
I-2	Electric specification	Pulse train output	Line driver	Open collector	Line driver
Related signal		Min. input pulse width	500ns	2μs	125ns
Master axis Pulse train. command		Max. input frequency	1Mpps	250Kpps	4Mpps
		Line driver	26LS31or equiv.	————————	26LS31 or equivalent
		Trans. saturation volt.	————————	0.9V or less	————————
FC,FC* RC,RC*		Applied voltage range	————————	DC5.0～12.0V	————————
		Rated input current	————————	About 10mA/ 1point	————————

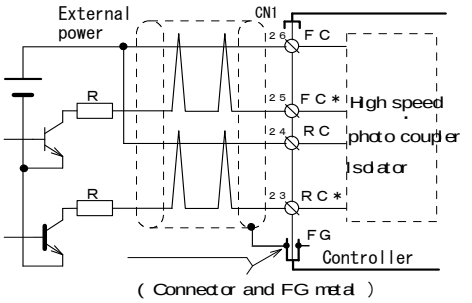
Circuit



(Connector and FG metal)

(Cable length 3m or less)

(Line driver method)



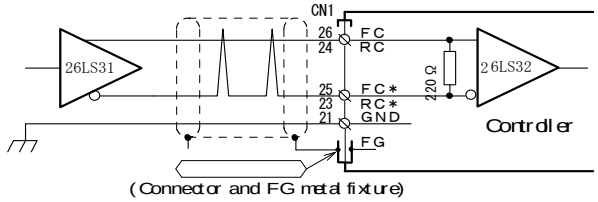
(Connector and FG metal)

(Cable length 1.5m or less)

(Open collector method)

Ext. power	Rvalue
5 V	0
12V	1 kΩ (1/4W)

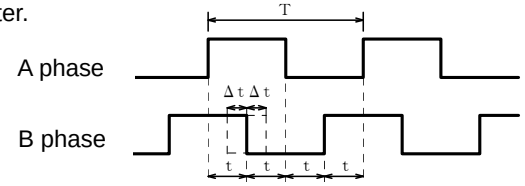
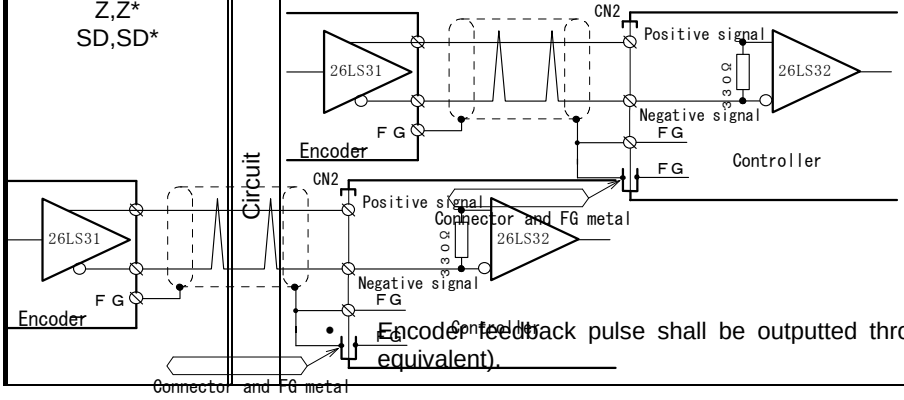
In some cases, it is better to connect Pulse train command output to each controller GND.



(Connector and FG metal fixture)

(Line receiver input method) (Factory option)

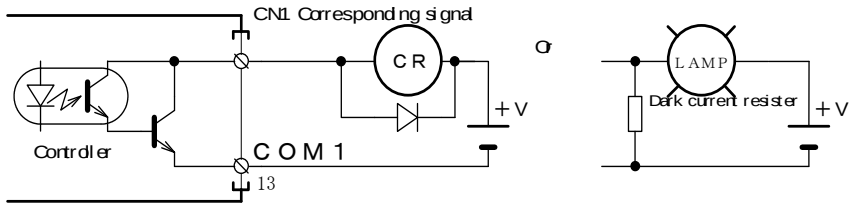
*1 Apply counter measure for noise for supply voltage from external power supply machine.

Circuit No.	Electric specification	
I-3		
Related signal		
Encoder feedback pulse input A,A* B,B* Z,Z* SD,SD*	Circuit	• In forward run of a motor, B phase is ahead to A phase. • t (Phase difference between A-phase and B-phase) requires 62.5 ns or greater.  t = T／4 Δ t =±T／8  • Encoder feedback pulse shall be outputted through Line drive (26LS31 or equivalent).

	+ signal	- signal
A phase	A	A*
B phase	B	B*
Z phase	Z	Z*
	SD	SD*

Circuit number	Electrical Specification		
O-1	Insulation method	Photocoupler insulation	Set to ON when when COM terminals are connected.
Corresponding signal	Maximum load voltage	DC30V	
DO1~4	Maximum load current	50mA/point	
	Leakage Current	Less than 0.1mA	
	Satured voltage	Less than 1.0V	

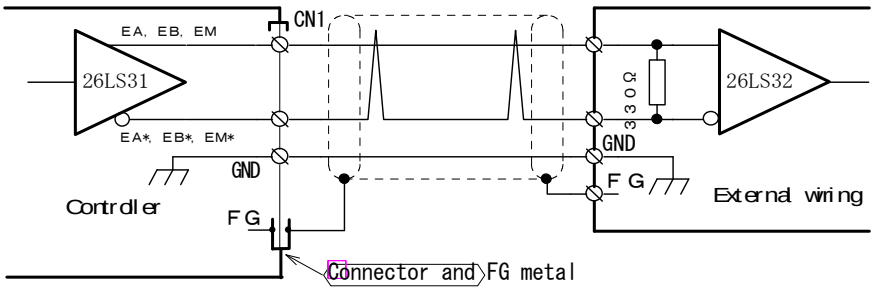
Circuit



・Diode should be connected in parallel when connecting inductive load of relay etc.,.
・In case of lamp load, resistance for dark current should be inserted and it should be used below rated current by including inrush current.

Circuit number	
O-2	
Corresponding signal	
Encoder pulse output EA EA* EB EB* EM EM*	

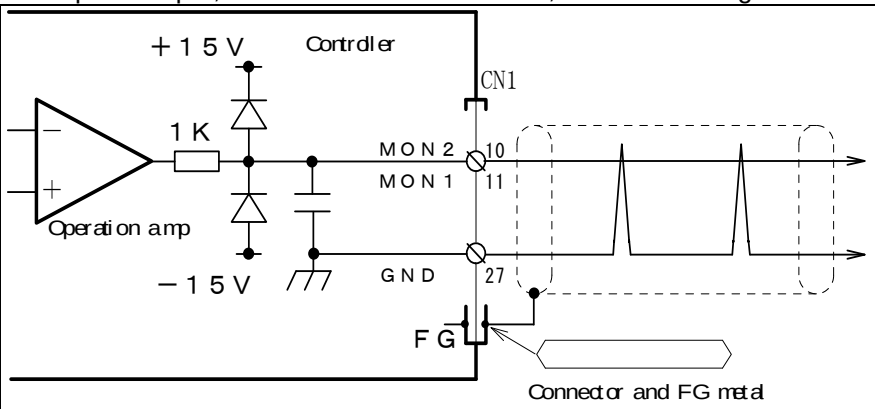
Circuit



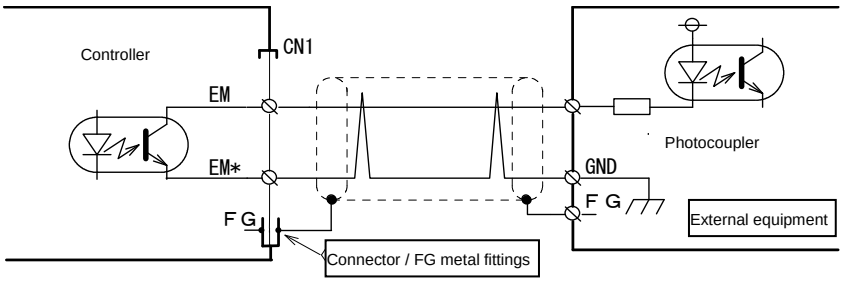
- As output uses line driver (suitable for 26LS31), interface with the line driver (26LS31 compatible).
- When motor operates in forward direction, output is carried out by preceeding B phase than A phase.
- A phase and B phase are in phase with motion direction of motor and is not influenced by motion direction set by the parameter.
- After power input, within maximum 2 seconds, it becomes irregular.

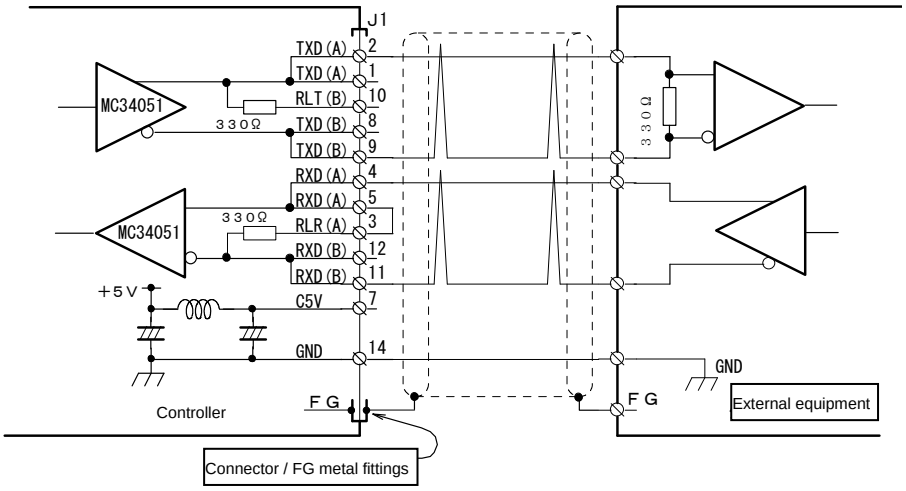
Circuit number	
O-3	
Corresponding signal	
Analog monitor MON1 MON2	

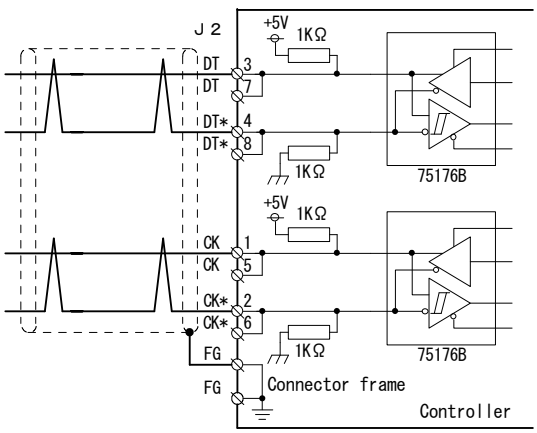
Circuit



- When cable length is more than 1m, twisted pair shield line is used and shield should be connected to the metallic part for FG connector.

Circuit number	Electric specification		
O-4	Insulation method	Photocoupler insulation	Output is set to ON at the time of H level mark signal.
Corresponding signal	Maximum load voltage	DC50V	
	Maximum load current	50mA	
Encoder Pulse output EM EM*	Leakage current	Less than 0.05mA	
	Satured voltage	Less than 0.4V	
	Transmission minimum pulse width	10μs	
Option (Encoder mark / Open collector output unit)	Circuit		

Circuit number		
IO-1	Circuit	
Corresponding signal		
Serial communication TXD(A) TXD(B) RXD(A) RXD(B) RLR(A)	o Communication method is RS-422A. o Connects the controller, which is the communication end terminal for, RLR (A) terminal and RXD (A) terminal. After connection, connect inbuilt end terminal resistance. Also connect terminal resistance on the same end for external machine.	

Circuit number		
IO-2	Circuit	
Corresponding signal		
Servo control communication DT DT* CK CK*		

	o Communication method is RS-485. o Controller which is communication end terminal should be connected to end terminal resistance connector.

6-3 Connector-pin arrangement

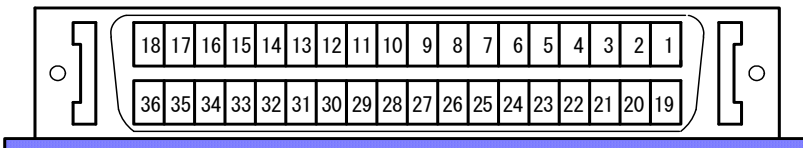
6-3-1 Connector for control input output (CN1)

No.	Mark	Signal name	No.	Mark.	Signal name
1		(Not used/ Reserved)	19		(Not used/ Reserved)
2	GND	Internal control power common	20	GND	Internal control power common
3	EM*	Encoder marker output (-)	21	GND	Internal control power common
4	EM	Encoder marker output (+)	22	+5V	Internal control power+5V
5	EB*	Encoder pulse B phase output (-)	23	RC*	Reverse Pulse train Command (-)
6	EB	Encoder pulse B phase output (+)	24	RC	Reverse Pulse train command (+)
7	EA*	Encoder pulse A phase output (-)	25	FC*	Forward Pulse train command(-)
8	EA	Encoder pulse A phase output (+)	26	FC	Forward Pulse train command(+)
9	GND	Internal control power common	27	GND	Internal control power common
10	MON2	Monitor output2	28		(Not used/ Reserved)
11	MON1	Monitor output1	29	DI8	External input8 (MSSP)
12		(Not used/ Reserved)	30	DI7	〃 7(D24)
13	COM	External power－common	31	DI6	〃 6(D22)
14	DO4	External output4 (ROUT7)	32	DI5	〃 5(D21)
15	DO3	〃 3(ROUT6)	33	DI4	〃 4(D18)
16	DO2	〃 2(ALM)	34	DI3	〃 3(D14)
17	DO1	〃 1(RDY)	35	DI2	〃 2(D12)
18	+24V	External power＋common	36	DI1	〃 1(D11)

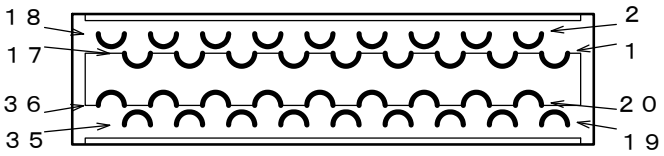
Applied connector　:Receptacle / 10236-52A2JL（3M product）
Applicable cable side　connector　:Soldered plug / 10136-3000VE
:Case (shell) / 10336-52AO-008

1　A signal which right end of the signal Mark is not“”is a positive logic signal. A signal which right end of the signal Mark is “*”is a negative logic signal. And (　) of External output1～4 and External input 1～8 is initial value of the parameters.

*2　Below figure is the layout viewed from connection side to the unit connector.



*3　Below figure is the layout viewed from soldered terminal side to cable connector side.



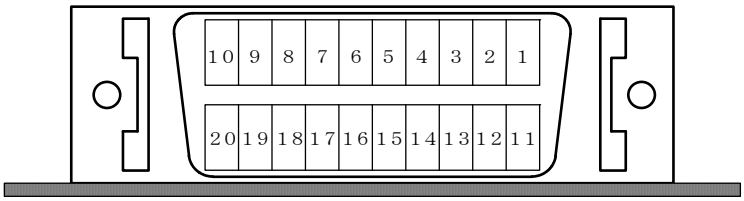
[Tab. 6-2] Connector CN1 Terminal Layout

6-3-2 Connector for encoder feedback pulse input (CN2)

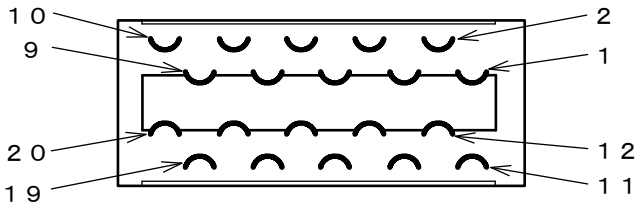
No.	Mark.	Signal name	No.	Mark.	Signal name
1	GND	Encoder power common	11	Z	Encoder marker signal input(+)
2	GND	〃	12	Z*	〃 (-)
3	EP5	Encoder power （+5V）	13	PS	Magnetic sensor input *3
4	EP5	〃	14	PS*	Magnetic sensor input *3
5	SD	ABS position data (+)	15	PC	Magnetic sensor input *3
6	SD*	〃 (-)	16	PC*	Magnetic sensor input *3
7	A	Encoder pulse A phase input (+)	17		(Not used/ Reserved)
8	A*	〃 (-)	18		(Not used/ Reserved)
9	B	Encoder pulse B phase input (+)	19	FG	shield earth
10	B*	〃 (-)	20	FG	shield earth

Applied connector :Receptacle / 10220-52A2JL（3M product）
Applicable cable side connector :Soldered plug / 10120-3000VE
:Case (shell) / 10320-52AO-008

*1 Below figure is the layout viewed from connection side to the unit connector.



*2 Below figure is the layout viewed from soldered terminal side to cable connector side.



*3 It is the input signal to be used by the encoder corresponding to the magnetic sensor.

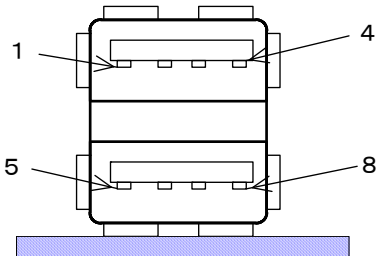
[Tab. 6-3] Connector CN2 Terminal Layout

6-3-3 Connector for servo control communication (J2)

No.	Mark.	Signal name	No.	Mark.	Signal name
1	CK	Clock signal （+）	5	CK	Clock signal （+）
2	CK*	〃 （-）	6	CK*	〃 （-）
3	DT	Data signal （+）	7	DT	Data signal （+）
4	DT*	〃 （-）	8	DT*	〃 （-）

Applied connector ：Receptacle / DUSB-ARB82-T11A(D2)（DDK product）
Applicable cable side connector ：Plug harness / DUSB-HAN21-FBm（DDK product）
(m = 05,10,30)

*1 Below figure is the layout viewed from connection side to the unit connector.



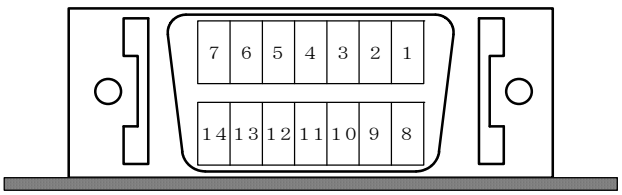
[Tab. 6-4] Connector J2 Terminal Layout

6-3-4 Connector for serial communication (J1)

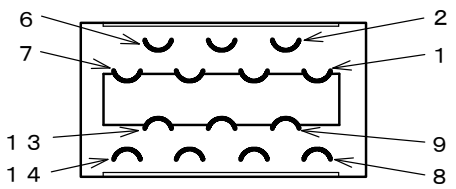
No.	Mark.	Signal name	No.	Mark.	Signal name
1	TXD(A)	Transmission data (Pair with TXD(B))	8	TXD(B)	Transmission data (Pair with TXD(A))
2	TXD(A)	〃	9	TXD(B)	〃
3	RLR(A)	Receipt line terminating resistor	10	RLT(B)	Transmission line terminating resistor
4	RXD(A)	Receipt data (Pair with RXD(B))	11	RXD(B)	Receipt data (Pair with RXD(A))
5	RXD(A)	〃	12	RXD(B)	〃
6		(Not used/ Reserved)	13		(Not used/ Reserved)
7	C5V	Internal control power＋5V	14	GND	Internal control power common

Applied connector ：Receptacle / 10214-52A2JL (3M product）
Applicable cable side connector ：Soldered plug ／10114-3000VE
：Case (shell) / 10314-52AO-008

*1 Below figure is the layout viewed from connection side to the unit connector.



*2 Below figure is the layout viewed from soldered terminal side to cable connector side.



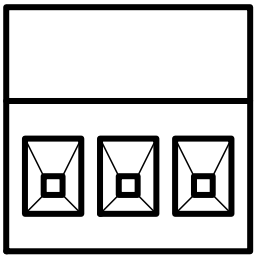
[Tab. 6-5] Connector J1 Terminal Layout

6-3-5 Control power input connector (TB1)

No.	Mark.	Signal name
1	r	AC input power for control R phase（100/200V)
2	s	AC input power for control S phase（100/200V)
3	E	Earth *2

Applied connector XW4B-03C1-H1 Wire tightening recommendable torque 0.5-0.6 Nm
（OMRON-product, attached to the capacity 2.2 KW or smaller unit ）

*1 Below figure is the layout viewed from cable insert section to the connector.



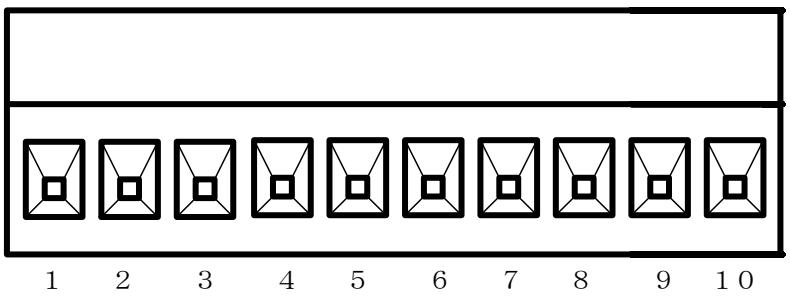
[Tab. 6-6] Connector TB1 terminal configurations

6-3-6 Main source input/Power cable output connector (TB2)

No.	Mark.	Signal name	No.	Mark.	Signal name
1	R	AC input power R phase（100/200V）	6	U	Motor power U phase
2	S	AC input power S phase（100/200V）	7	V	Motor power V phase
3	T	AC input power T phase（200V）	8	W	Motor power W phase
4	B1	Regenerative resistor	9	E	Earth
5	B2	Regenerative resistor	10	E	Earth

Applied connector XW4B-10C1-H1 Wire tightening recommendable torque 0.5-0.6 Nm
（OMRON-product, attached to the capacity 0.8 KW or smaller unit ）

*1 Below figure is the layout viewed from cable insert section to the connector.



[Tab. 6-6] Connector TB2 terminal configurations

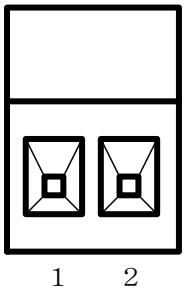
6-3-7 Control Power Input Connector (TB1) [AC400C Specifications]

AV 400 V Use below 4.0 KW.

No.	Mark.	Signal name
1	24V	DC input power for control + 24 V
2	0V	DC input power for control 0V

Connector used XW4B-02B1-H1 Wire tightening recommendable torque 0.22-0.25Nm
(Manufactured by OMRON Attached to a capacity 4.0KW or smaller unit)

*1 Following figure shows the layout of the connector viewed from the cable insertion section.



[Tab. 6 – 6] Connector TB1 Terminal Layout

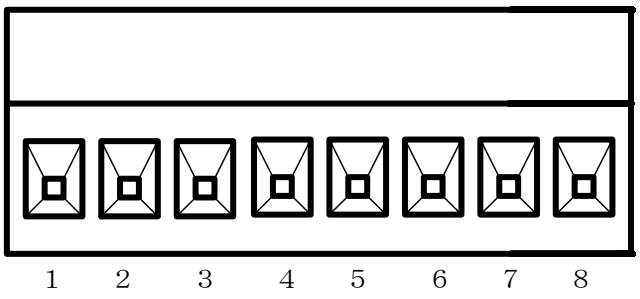
6-3-8 Main power input / Power line output connector (TB2) [AC400V specifications]

AC 400 V Use below 2.6KW

No.	Mark.	Signal name	No.	Mark.	Signal name
1	R	AC Input power R Phase (400V)	6	U	Motor power U phase
2	S	AC Input power S Phase (400V)	7	V	Motor power V phase
3	T	AC Input power T Phase (400V)	8	W	Motor power W phase
4	B1	Regenerative resistor			
5	B2	Regenerative resistor			

Connector used GMSTB2.5/8-ST Wire tightening recommendable torque 0.5-0.6 Nm
(Manufactured by Phoenix Contact. Attached to a capacity 2.6KW or smaller unit)

*1 Following figure shows the layout of the connector viewed from the cable insertion section.



[Tab. 6–7] Connector TB2 Terminal Layout

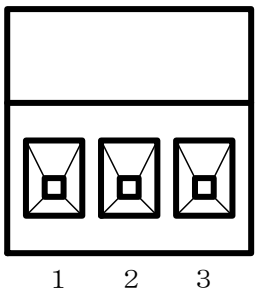
6-3-9 Control Power Input Connector (TB1)

AC200V/400V Specifications Use in the device of 7.5 KW / 11 KW / 15 KW

No.	Mark.	Signal name
1	24V	DC input power for control + 24 V
2	Empty	
3	0V	DC input power for control 0 V

Connector used XW4B-03C1-H1 Wire tightening recommendable torque 0.5-0.6 Nm
(Manufactured by OMRON Attached to the main unit)

*1 Following figure shows the layout of the connector viewed from the cable insertion section.



[Tab. 6 − 8] Connector TB1 Terminal Layout

Chapter 7 Parameters

7-1 List of Parameters

No.	Name
P000	Motor type
P001	Encoder type selection
P002	Rotary motor encoder pulse selection
P003	Linear motor linear sensor resolution
P004	Disc motor encoder pulse
P005	Rotary/Disc motor-Maximum usage speed
P006	Linear motor-Maximum usage speed
P007	Linear motor rated speed
P009	Carrier fequency selection
P010	Magnetic pole sensor type for linear/disc motors
P011	Magnetic pole sensor offset for linear/disc motors
P012	Reserved
P013	Reserved
P014	Reserved
P015	Reserved
P016	Reserved
P017	Reserved
P018	ABS reference data
P019	ABS reference machine position
P020	Motor type/No. of poles
P021	Rated torque current
P022	Rated speed
P023	Max. transit torque ratio
P024	Exciting current
P025	Rated output
P026	Current loop coefficient
P030	Phase compensation angle
P031	Machine's rated torque current
P032	Machine's max. transit torque ratio
P033	Machine's power capacity
P037	Torque cmmnd.change limiter value
P040	Primary resistor
P041	Secondary resistor
P042	Primary self inductance
P043	Secondary self inductance
P044	Mutual inductance
P045	Leakage coefficient
P046	Dead time compensation time
P047	Current loop cut of frequency
P048	Current loop derivative time const.
P049	Torque constant
P050	Magnetic pole sensor sin gain
P051	Magnetic pole sensor sin offset
P052	Magnetic pole sensor cos gain
P053	Magnetic pole sensor cos offset

No.	Name
P054	Disc motor encoder compensation
P058	Linear motor pole to pole distance
P059	Special encoder pulse number
P100	Low speed gain range
P101	Speed loop gain
P102	Speed loop integral time constant
P103	Speed loop derivative time constant
P104	Speed loop proportionate gain distribution factor
P105	Speed loop derivative gain distribution factor
P106	Speed loop gain／Low speed gain range
P107	Speed loop integral time constant／Low speed gain range
P108	Speed loop derivative time constant／Low speed gain range
P109	Speed loop proportionate gain distribution factor／Low speed gain range
P110	Speed loop derivative gain distribution factor／Low speed gain range
P111	Speed loop gain／at GSEL signal ON
P112	Speed loop integral time constant／at GSEL signal ON
P113	Speed loop derivative time constant／at GSEL signal ON
P114	Speed loop proportionate gain distribution factor／at GSEL signal ON
P115	Speed loop derivative gain distribution factor／at GSEL signal ON
P116	Torque limit value at magnetic detection
P117	Magnetic detection gain 1
P118	Magnetic detection integral time constant
P119	Magnetic detection gain 2
P120	Torque command filter frequency
P121	Notch filter center frequency 1
P122	Notch filter band width 1
P123	Notch filter center frequency 2
P124	Notch filter band width 2
P125	Torque limit value 1+
P126	Torque limit value 1-
P127	Torque limit value 2+
P128	Torque limit value 2-
P140	Auto.tuning trial run direct.selec.
P141	Auto.tuning trial run speed ratio
P142	Torque limit select.at Alarm stop
P143	R2 compensation selection
P144	Elect. thermal detection selection
P145	Magnetic pole sensor auto tuning run
P146	Mass/inertia
P147	Viscocity friction
P148	Disturbance compensation filter frequency

No.	Name
P149	Disc motor auto adjustment
P150	Disturbance compensation invalid range
P151	Notch filter center frequency 3
P152	Notch filter band width 3
P153	Notch filter center frequency 4
P154	Notch filter band width 4
P155	Notch filter center frequency 5
P156	Notch filter band width 5
P157	Reserved
P158	Rated voltage of regenerative resistor
P200	Position loop gain
P201	Servo lock gain
P202	Positioning complete range
P203	Positioning time over
P204	Backlash compensation value
P205	Feed forward ratio
P206	Feed forward shift ratio
P207	Over-flow detection pulse
P208	Deviation error detection pulse
P209	Motion selection at Deviation error
P210	S shape accel./decel. time
P211	Acceleration time 1
P212	Acceleration time 2
P213	Acceleration time 3
P214	Deceleration time 1
P215	Deceleration time 2
P216	Deceleration time 3
P217	Position complete feed forward derivative added ratio
P220	Position loop derivative time constant
P221	Servo lock derivative time constant
P222	Reserved
P223	Reserved
P300	Rotating direction selection
P301	Setting unit selection
P302	Command unit
P303	Electronic gear ratio numerator
P304	Electronic gear ratio denominator
P305	Index positioning range
P306	Forward software OT limit
P307	Reverse software OT limit
P308	Max. Forward positioning amount
P309	Max. Reverse positioning amount
P310	Machine travel amount
P400	Jog speed 1
P401	Jog speed 2

No.	Name
P402	Zero return method selection
P403	Zero point marker selection
P404	Zero return Speed
P405	Zero return creep speed
P406	Zero point constant
P407	Zero point set distance
P408	Position data reference point
P409	Auto.run permit condition selection
P410	Decel. time of zero return from OT
P411	External trigger level selection
P500	Reserved
P501	Reserved
P502	LCD current posi. display selection
P505	Communication function selection
P506	Communication ID No.
P507	Data length select.(Ser.communi.)
P508	Parity select.(Ser.communi.)
P509	Baud rate select.(Ser.communi.)
P510	Reserved(DMOV selection)
P511	Communication group ID set 1
P512	Communicat.group response yes/no 1
P513	Communication group ID set 2
P514	Communicat.group response yes/no 2
P515	Communication group ID set 3
P516	Communicat.group response yes/no 3
P517	Communication group ID set 4
P518	Communicat.group response yes/no 4
P519	Communication group ID set 5
P520	Communicat.group response yes/no 5
P521	Servo control communication ID No.
P522	Servo control communication control mode
P523	Alarm stop selection at servo control communication
P524	Servo control communication realtime data 1 device no
P525	Servo control communication realtime data 2 device no
P526	Servo control communication realtime data 3 device no
P527	Servo control communication realtime data 4 device no
P528	Servo control communication realtime data 5 device no
P529	Reserved
P530	Reserved
P531	Reserved
P532	Reserved
P600	CIH signal spec. selection
P601	Pls.train cmmnd. sequence change
P602	Pulse train command classification selection
P610	Pulse train command input selection when extn board

No.	Name
P700	Monitor 1 selection
P701	Monitor 2 selection
P702	Speed zero range
P703	Rough matching range
P704	SON signal logic selection
P705	Hard.OT Enable/ Disable selection
P706	Delay time of Mode change confirm
P707	Software limit switch position 1
P708	Software limit switch position 2
P709	Software limit switch position 3
P710	Stop method of Emergency stop
P711	Decel.time at Emergency stop
P712	Servo OFF delay time after Emergency stop
P713	Stop method at AC power cut
P714	ALM output selection at AC power cut
P715	ALM／WNG signal logic selection
P716	RDY signal spec. selection
P719	PN signal spec. selection
P720	SQB Write data 1
P721	SQB Write data 2
P722	SQB Write data 3
P723	SQB Write data 4
P724	SQB Read data 1
P725	SQB Read data 2
P726	SQB Read data 3
P727	SQB Read data 4
P728	SQB Read data 5
P729	SQB Read data 6
P730	Reserved
P731	Reserved
P732	Reserved
P733	Reserved
P734	Brake output delay time
P735	External input disable selection 1
P736	External input disable selection 2
P737	Basic extnl. input signal input allocation 1
P738	Basic extnl. input signal input allocation 2
P739	Extnd. extnl. input signal input allocation 1
P740	Extnd. extnl. input signal input allocation 2
P741	Extnd. extnl. input signal input allocation 3
P742	Basic extnl. output signal output allocation
P743	Extnd. extnl. output signal output allocation 1
P744	Extnd. extnl. output signal output allocation 2
P745	Dynamic brake spec. selection
P746	Servo ON delay time at dynamic braking
P747	Servo control error detection tuning value

No.	Name
P800	Master axis setting unit selection
P801	Master axis command unit selection
P802	1 cycle resolution
P803	Master axis 1 cycle change transfer amount
P804	Master axis 1 cycle change pulse
P805	Master axis 1 cycle transfer amount
P806	Phase tuning amount
P808	Internal master axis speed 1
P809	Internal master axis speed 2
P810	Internal master axis accl. time
P811	Internal master axis decel. time
P812	Master axis speed zero range
P813	Waiting position designation Index data No.
P814	Waiting position returning speed designation Index data No.
P820	Slave axis synchronous delay compensation time
P821	Slave axis synchronous delay compensation filter time constant
P830	Master axis reference position 1 (For SEL1)
P831	Master axis delay length 1 when running (For SEL1)
P832	Pattern magnification denominator 1 (For SEL1)
P833	Pattern magnification numerator 1 (For SEL1)
P834	Electric clutch position 1 (SEL. 1)
P835	Master axis reference position 2 (For SEL2)
P836	Master axis delay length 2 when running (For SEL2)
P837	Pattern magnification denominator 2 (For SEL2)
P838	Pattern magnification numerator 2 (For SEL2)
P839	Electric clutch position 2 (SEL. 2)
P840	Master axis reference position 3 (For SEL3)
P841	Master axis delay length 3 when running (For SEL3)
P842	Pattern magnification denominator 3 (For SEL3)
P843	Pattern magnification numerator 3 (For SEL3)
P844	Electric clutch position 3 (SEL. 3)
P900	Mater postponed length 1 when Free curve movement is cleared(SEL. 1)
P901	Mater postponed length Index data No. 1 when Free curve movement is cleared.(SEL. 1)
P902	Mater postponed length Index data No. 2 when Free curve movement is cleared.(SEL. 2)
P903	Mater postponed length Index data No. 2 when Free curve movement is cleared.(SEL. 2)
P904	Mater postponed length Index data No. 3 when Free curve movement is cleared.(SEL. 3)
P905	Mater postponed length Index data No. 3 when Free curve movement is cleared.(SEL. 3)

7－2 Parameter Specification

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
《Group 0》 [Motor, Encoder Parameter]										
P000	Motor type	P	A M Z P				S	None	000 ～ 999	000
								It sets an applied motor type. Referring to [14-4 applicable motor list], correctly set it. To select a dedicated motor, input [999] to this No.. Referring to [Setting option specification], input dedicated motor parameter to P020～P059. [Caution] ・If wrong value is set, running away or fire could occur. Since it is very dangerous, be sure to set it, correctly.		
P001	Encoder type selection	P	A M Z P				S	None	INC1/ INC2/ INC3/ L-SEN/ S-INC/ S-ABS/ C-SEN1/ C-SEN2	INC3
								It sets an applied encoder type. Referring to [14-4 applicable motor list], correctly set it. Set: Encoder type INC1: For Induction motor・Incremental INC2: For Synchronous motor ・Not less wiring type ・Incremental INC3: For Synchronous motor ・Less wiring type ・Incremental L-SEN: Linear ・sensor S-INC: Serial・Incremental (Option) S-ABS: Serial・Absolute (Option) C-SEN1: For Disc motor・Without a marker C-SEN2: For Disc motor・With a marker		
P002	Rotating motor Encoder pulse selection	P	A M Z P				S	PPR	1000/ 2000/ 6000/ 17bit	6000
								It sets number of pulses per one revolution of an applied encoder. [Caution]・When [INC1/ INC2/ INC3] is selected by P001, pulse number is this parameter set value×4 (4times). ・When [S-INC/ S-ABS] is selected by P001, set[17bit]. In this case, pulse number is 17bit＝131072 pulse. ・If wrong value is set, running away or fire could occur. Since it is very dangerous, be sure to set it, correctly.		
P003	Linear motor Linear sensor Resolution	P	A M Z P				S	μm	0.00001 - 100.00000	001.00000
								It sets resolution (4times) per 1 pulse of an applied linear sensor.		
P004	Disc motor Encoder pulse number	P	A M Z P				S	PPR	00000001 ～ 99999999	00000001
								It sets encoder pulse number (4times) per 1 turn of a motor when Disc motor is applied.		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
《Group 0》 [Motor, Encoder Parameter]										
P005	Rotating/ Disc motor applicable max. speed	P	A	M	Z	P	S	rpm	00000 ～ 20000	00000
								It sets applicable max. speed of Rotating/ Disc motor. Rated speed is selected when [0] is set. Complying with the next notice, set this parameter. Synchronous motor : Set lower speed than rated speed. Disc motor: Referring to [14-4 Applicable motor list], set the parameter lower speed than a value in the list.		
P006	Linear motor applicable max. speed	P	A	M	Z	P	S	mm/ sec	0.00 ～ 100000.00	000000.00
								It sets applicable max. speed of Linear motor. Rated speed is selected when [0.00] is set. Referring to [14-4 Applicable motor list], set this parameter, correctly. The value shall be lower speed than the list.		
P007	Linear motor rated speed	P	A	M	Z	P	S	mm/ sec	0.01 ～ 100000.00	000000.01
								It sets rated speed of Linear motor. Referring to [14-4 Applicable motor list], set this parameter, correctly.		
P009	Carrier frequency selection	P	A	M	Z	P	S	Hz	10K/ 16K/ 20K/ 24K	16K
								It selects carrier frequency of PWM. [Caution] ・ Since this function is not used for high performance version, do not change the parameter set. ・ As carrier frequency is higher, frequency characteristics become better. On the other hand, heat loss of a unit becomes large which may cause a trouble of the unit. For reference: 2.2kW or smaller 16K/ 20K/ 24KHz 3kW or larger 10KHz		
P010	Linear Disc motor Magnetic pole sensor type	P	A	M	Z	P	F	None	0～9	0
								It sets a Magnetic pole sensor used for a Linear/ Disc motor. Referring to [14-4 Applicable motor list], set this parameter, correctly.		
P011	Linear/ Disc motor Magnetic poles sensor offset	P	A	M	Z	P	F	mm	0.00 ～ 100.00	028.50
								It sets offset value of a Magnetic pole sensor used for Linear/ Disc motor. Referring to [14-4 Applicable motor list], set this parameter, correctly.		
P012	Only for maker	—	・	・	・	・	F			00000000
								Be sure to set [0] to this Parameter.		
P013	Only for maker	—	・	・	・	・	F			00000000
								Be sure to set [0] to this Parameter.		
P014	Only for maker	—	・	・	・	・	F			050
								Be sure to set [0] to this Parameter.		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
《Group 0》 [Motor, Encoder Parameter]										
P015	Only for maker	—	·	·	·	·	F			00000000
			Be sure to set [0] to this Parameter.							
P016	Only for maker	—	·	·	·	·	F			0.0
			Be sure to set [0] to this Parameter.							
P017	Only for maker	—	·	·	·	·	F			00.0
			Be sure to set [0] to this Parameter.							
P018	ABS reference data	P	A	M	Z	P	F	Pulse	-99999999 ～ 99999999	00000000
			It sets absolute data at machine reference position.							
P019	ABS reference machine position	P	A	M	Z	P	F	mm/ ° / in	-99999999 ～ 99999999	00000000
			It sets machine position against machine reference position. (A decimal point position depends on [P302 : command unit].)							
P020	Motor type, Number of poles	P	A	M	Z	P	S	None	00000000～99999999	00000000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P021	Rated torque current	P	A	M	Z	P	S	10mA	00000～65535	00000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P022	Rated speed (Field control base speed)	P	A	M	Z	P	S	rpm	00001～20000	02000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P023	Momentary max. torque ratio	P	A	M	Z	P	S	%	100～799	100
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P024	Excitation current	P	A	M	Z	P	S	10mA	00000～65535	00000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P025	Rated output	P	A	M	Z	P	S	KW	000.000～999.999	000.000
			It sets motor rated output value when [999]is set to[P000 : Motor type]. When 0 is set, unit power capacity is identical to motor rated output value.							
P026	Current loop coefficient	P	A	M	Z	P	S	None	000～300	000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P030	Phase compensation angle	P	A	M	Z	P	S	deg	-100～100	000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop
※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved
※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
《Group 0》 [Motor, Encoder Parameter]										
P031	Unit rated torque current	P	A	M	Z	P	S	10mA	00000～65535	00000
			Referring to Setting option specification, input it when [999]is set to【P000 : Motor type】.							
P032	Unit momentary max. torque ratio	P	A	M	Z	P	S	%	100～799	100
			Referring to Setting option specification, input it when [999]is set to【P000 : Motor type】.							
P033	Unit power capacity	P	A	M	Z	P	S	KW	000.000～999.999	000.000
			It sets unit rated power capacity when [999]is set to[P000 : Motor type].							
P037	Torque command value change amount limit value	P	A	M	Z	P	S	None	00000～65535	00000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P040	Primary resistor	P	A	M	Z	P	S	μΩ	00000000～99999999	00000000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P041	Secondary resistor	P	A	M	Z	P	S	μΩ	00000000～99999999	00000000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P042	Primary self inductance	P	A	M	Z	P	S	μH	00000000～99999999	00000000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P043	Secondary self inductance	P	A	M	Z	P	S	μH	00000000～99999999	00000000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P044	Mutual inductance	P	A	M	Z	P	S	μH	00000000～99999999	00000000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P045	Leakage coefficient	P	A	M	Z	P	S	10^{-6}	00000000～99999999	00000000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P046	Dead time compensation time	P	A	M	Z	P	S	10^{-7}sec	00000～65535	00000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P047	Current loop cut off frequency	P	A	M	Z	P	S	rad/ s	00000～65535	04000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P048	Current loop Derivative time constant	P	A	M	Z	P	S	μsec	00000～65535	00000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop
※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved
※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
《Group 0》 [Motor, Encoder Parameter]										
P049	Torque constant	P	A	M	Z	P	S	10^{-4}Nm/ A	00000000～99999999	00000000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type]. In case of a Linear motor, setting unit is10^{-4}N/ A.							
P050	Magnetic pole sensor sine gain	P	A	M	Z	P	S	None	0～4096	0512
			[This is automatically set by Self-diagnosis [Magnetic pole sensor adjustment].]							
P051	Magnetic pole sensor sine offset	P	A	M	Z	P	S	None	-999～999	000
			[This is automatically set by Self-diagnosis [Magnetic pole sensor adjustment].]							
P052	Magnetic pole sensor Cosine gain	P	A	M	Z	P	S	None	0～4096	0512
			[This is automatically set by Self-diagnosis [Magnetic pole sensor adjustment].]							
P053	Magnetic pole sensor cosine offset	P	A	M	Z	P	S	None	-999～999	000
			[This is automatically set by Self-diagnosis [Magnetic pole sensor adjustment].]							
P054	Disc motor encoder compensation	P	A	M	Z	P	S	pulse	-99999999～99999999	00000000
			[This is automatically set by Self-diagnosis [Dick motor adjustment].]							
P058	Linear motor Distance between poles	P	A	M	Z	P	S	mm	0.01 ～ 1000.00	0032.00
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type]							
P059	Special encoder pulse number	P	A	M	Z	P	S	PPR	00000000～99999999	00000000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type]. When [0] is set, either [P002 : Rotating motor encoder pulse selection] or [P004: Disc motor encoder pulse] setting value is effective.							

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop
※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved
※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
《Group 1》 [Driver adjustment parameter]										
P100	Low speed gain range	I	A M Z P				F	%	000.00 ~ 100.00	000.00
			It sets speed range ratio of Low speed gain area against rated speed or max. speed when GSEL signal is OFF. When motor speed is less than this setting value, [Speed loop gain], [Speed loop Integral time constant], [Speed loop Derivative time constant], [Speed loop Proportional gain division ratio], [Speed loop Derivative gain division ratio]are switched to the control set by Parameters, ([P101], [P102], [P103], [P104], and [P105]) in Low speed gain range. But if set value is [0], they are not switched. And motor speed is larger than this setting value, control is conducted by parameters, ([P101], [P102], [P103], [P104], and[P105]).								
P101	Speed loop gain	I	A M Z P				F	None	000 ~ 9999	0025
			It sets Speed loop gain. When it is set larger, though response becomes faster, depending on machine system rigidity, vibration may occur. If set value is [0], a motor is in torque free.							
P102	Speed loop Integral time constant	I	A M Z P				F	msec	0000.00 ~ 9999.99	0020.00
			It sets time constant of Speed loop Integral compensation. When it is set smaller, though response becomes faster, if the value is too small, vibration may easily occur. If set value is [0], Integral compensation is not conducted.							
P103	Speed loop Derivative time constant	I	A M Z P				F	μ sec	0000 ~ 9999	0000
			It sets time constant of Speed loop Derivative compensation. When it is set larger, though response becomes faster, if the value is too large, vibration may easily occur. If set value is [0], Derivative compensation is not conducted.							
P104	Speed loop Proportional gain division ratio	I	A M Z P				F	%	-100.0 ~ 100.0	000.0
			It sets Proportional compensation gain division ratio of 2 free degree PID speed control system. When it is set larger, over shoot to a speed command is depressed, response to load change of Speed control system becomes better. If it is too large, response to Speed command becomes worse.							
P105	Speed loop Derivative gain division ratio	I	A M Z P				F	%	-100.0 ~ 100.0	000.0
			It sets Derivative compensation gain division ratio of 2 free degree PID speed control system. When it is set larger, over shoot to a speed command is depressed, response to load change of Speed control system becomes better. If it is too large, response to Speed command becomes worse.							
P106	Speed loop gain / Low speed gain range	I	A M Z P				F	None	0000 ~ 9999	0025
			It sets Speed loop gain in Low speed gain range. (Description can be referred to [P101].)							

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
《Group 1》 [Driver adjustment parameter]										
P107	Speed loop Integral time constant/ Low speed gain range	I	A	M	Z	P	F	msec	0000.00 ～ 9999.99	0020.00
			It sets time constant of Speed loop Integral compensation in Low speed gain range. (Description can be referred to [P102].)							
P108	Speed loop Derivative time constant/ Low speed gain range	I	A	M	Z	P	F	μsec	0000 ～ 9999	0000
			It sets time constant of Speed loop Derivative compensation in Low speed gain range. (Description can be referred to [P103].)							
P109	Speed loop Proportional gain division ratio/ Low speed gain range	I	A	M	Z	P	F	%	-100.0 ～ 100.0	000.0
			It sets Proportional compensation gain division ratio of 2 free degree PID speed control system in Low speed gain range. (Description can be referred to [P104].)							
P110	Speed loop Derivative gain division ratio/ Low speed gain range	I	A	M	Z	P	F	%	-100.0 ～ 100.0	000.0
			It sets Derivative compensation gain division ratio of 2 free degree PID speed control system in Low speed gain range. (Description can be referred to [P105].)							
P111	Speed loop gain/ GSEL signal ON	I	A	M	Z	P	F	None	0000 ～ 9999	0025
			It sets Speed loop gain when GSEL signal ON. (Description can be referred to [P101].)							
P112	Speed loop Integral time constant/ GSEL signal ON	I	A	M	Z	P	F	msec	0000.00 ～ 9999.99	0020.00
			It sets time constant of Speed loop Integral compensation when GSEL signal is ON. (Description can be referred to [P102].)							
P113	Speed loop Derivative time constant/ GSEL signal ON	I	A	M	Z	P	F	μsec	0000 ～ 9999	0000
			It sets time constant of Speed loop Derivative compensation when GSEL signal is ON. (Description can be referred to [P1053.)							
P114	Speed loop Proportional gain division ratio/ GSEL signal ON	I	A	M	Z	P	F	%	-100.0 ～ 100.0	000.0
			It sets Proportional compensation gain division ratio of 2 free degree PID speed control system when GSEL signal is ON. (Description can be referred to [P104].)							
P115	Speed loop Derivative gain division ratio/ GSEL signal ON	I	A	M	Z	P	F	%	-100.0 ～ 100.0	000.0
			It sets Derivative compensation gain division ratio of 2 free degree PID speed control system when GSEL signal is ON. (Description can be referred to [P105].)(							
P116	Torque limit value/ Magnetic pole detection	I	A	M	Z	P	F	%	000.0 ～ 799.9	300.0
			It sets Torque limit value when Magnetic pole is detected But same limit value is applied to both directions (+/-).							
P117	Magnetic pole detection gain 1	I	A	M	Z	P	F	None	0000 ～ 9999	0025
			It sets Proportional compensation gain when Magnetic pole is detected. When it is set larger, though response becomes faster, depending on machine system rigidity, vibration may occur. If set value is [0], a motor is in torque free.							
P118	Magnetic pole detection Integral time constant	I	A	M	Z	P	F	msec	00000 ～ 65535	00200
			It sets Integral compensation gain when Magnetic pole is detected. When it is set smaller, though response becomes faster, if the value is too small, vibration may easily occur. If set value is [0], Integral compensation is not conducted.							

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 1》 [Driver adjustment parameter]										
P119	Magnetic pole detection gain 2	I	A M Z P				F	S^{-1}	0000 ～ 9999	0020
								It sets Position loop gain when Magnetic pole is detected. When it is set larger, though response becomes faster, if the value is too large, vibration may easily occur. If set value is [0], since Position loop opens, Magnetic pole detection can not be conducted.		
P120	Torque command filter frequency	I	A M Z P				F	Hz	0000 ～ 4999 (1Hzunit)	1000
								It sets filter (low pass) frequency of Torque command. If resonance occurs in combination with some machine system, fix it by inserting Torque command filter. (anti-resonance) If set is [0], the filter is disabled.		
P121	Notch filter center frequency 1	I	A M Z P				F	Hz	0000 ～ 4999 (1Hzunit)	0000
								If resonance occurs in combination with some machine system, it sets resonance frequency to stop the resonance. If set is [0], the Notch filter 1 is disabled.		
P122	Notch filter band width 1	I	A M Z P				F	Hz	0000 ～ 4999 (1Hzunit)	0000
								It sets band width of Notch filter 1. If set is [0], the Notch filter 1 is disabled.		
P123	Notch filter center frequency 2	I	A M Z P				F	Hz	0000 ～ 4999 (1Hzunit)	0000
								If resonance occurs in combination with some machine system, it sets resonance frequency to stop the resonance. If set is [0], the Notch filter 2 is disabled.		
P124	Notch filter band width 2	I	A M Z P				F	Hz	0000 ～ 4999 (1Hzunit)	0000
								It sets band width of Notch filter 2. If set is [0], the Notch filter 2 is disabled.		
P125	Torque limit value 1＋	I	A M Z P				F	%	000.0 ～ 799.9 (0.1% unit)	300.0
								It sets limit value of motor forward output torque. If set is larger than peak torque, output is clamped at the peak torque. And if set is [0], forward torque is not generated.		
P126	Torque limit value 1－	I	A M Z P				F	%	000.0 ～ 799.9 (0.1% unit)	300.0
								It sets limit value of motor reverse output torque. If set is larger than peak torque, output is clamped at the peak torque. And if set is [0], reverse torque is not generated.		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

<table>
<tr><td rowspan="2">Parameter No.</td><td rowspan="2">Parameter name</td><td rowspan="2">Activating timing</td><td colspan="4">Run mode method</td><td rowspan="2">Level</td><td>Setting unit</td><td>Setting range</td><td>Standard ship. set (Initial value)</td></tr>
<tr><td>Automatic</td><td>Manual</td><td>Function</td><td>Pulse train</td><td colspan="3">Function</td></tr>
<tr><td></td><td></td><td></td><td>A</td><td>M</td><td>Z</td><td>P</td><td></td><td colspan="4">Function</td></tr>
<tr><td colspan="11">《Group 1》 [Driver adjustment parameter]</td></tr>
<tr><td rowspan="2">P127</td><td rowspan="2">Torque limit value 2+</td><td rowspan="2">I</td><td colspan="4" rowspan="2">A M Z P</td><td rowspan="2">F</td><td>%</td><td>−000.1,000.0 ～799.9 (0.1%unit)</td><td>300.0</td></tr>
<tr><td colspan="3">At TL signal ON or Alarm stop status (but by [P142: Torque limit selection at Alarm stop]), it sets Forward torque limit value. If set is [−000.1], Analog torque limit command +(TL+)is enabled. And if set is [000.0～799.9], torque is limited by setting value. And torque is limited by lower value of this parameter and [P125: Torque limit value 1 +] . And in the above status, if this parameter set is [0.000], forward torque is not generated.</td></tr>
<tr><td rowspan="2">P128</td><td rowspan="2">Torque limit value 2−</td><td rowspan="2">I</td><td colspan="4" rowspan="2">A M Z P</td><td rowspan="2">F</td><td>%</td><td>−000.1,000.0～799.9 (0.1%unit)</td><td>300.0</td></tr>
<tr><td colspan="3">At TL signal ON or Alarm stop status (but by [P142: Torque limit selection at Alarm stop]), it sets Reverse torque limit value. If set is [−000.1], Analog torque limit command −(TL−) is enabled. And if set is [000.0～799.9], torque is limited by setting value. And torque is limited by lower value of this parameter and [P126: Torque limit value 1-] . And in the above status, if this parameter set is [0.000], reverse torque is not generated.</td></tr>
<tr><td rowspan="2">P140</td><td rowspan="2">Auto. tuning trial run direction selection</td><td rowspan="2">R</td><td colspan="4" rowspan="2">・ ・ ・ ・</td><td rowspan="2">F</td><td>None</td><td>BOTH/+ONLY/−ONLY</td><td>BOTH</td></tr>
<tr><td colspan="3">It selects trial run direction in Auto. tuning.
Set | Contents
※Operation method can be referred to [11−4 Auto. tuning].</td></tr>
</table>

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	F	P				
《Group 1》 [Driver adjustment parameter]										
P141	Auto. tuning trial run speed ratio	R	・ ・ ・ ・				F	None	0.00 ～ 1.00	0.30
								It sets ratio to rated speed when trial run of a motor is conducted in Auto. tuning run. When set is [1.00], the motor runs at rated speed. ※ Operation method can be referred to [11－4 Auto. tuning]		
P142	Torque limit selection at Alarm stop	I	A M Z P				F	None	ALM.TL N/ ALM.TL Y	ALM.TL N
								It selects Torque limit function to conduct sudden motor stop when Alarm occurs. ◎ ALM.TL N : It conducts torque limit in accordance with [P125/126 : Torque limit value 1±] . ◎ ALM.TL Y : It conducts torque limit in accordance with [P127/128 : Torque limit value 2±] .		
P143	R2 compensation selection	I	A M Z P				F	None	R2 OFF/ R2 ID	R2 OFF
								It selects a method of R2 compensation (Output torque error compensation caused by motor temperature). ◎ R2 OFF : R2 compensation is not conducted. R2 ID : It identifies R2 by motor current and voltage and R2 compensation is conducted. **※Since this function is not applied now, please do not edit it.**		
P144	Electronic thermal detection selection	R	A M Z P				F	None	STD/ BIG/ 0.L. 110%/ 0.L. 50%/ 0.L. 70%/ 0.L. 90%/ 0.L. 130%/ 0.L. 150%/ 0.L. 170%/ 0.L. 190%	STD
								It selects a method of Electronic thermal detection. ◎ STD : Standard ◎ BIG : Big capacity ◎ 0.L. XXX% : Over load error is detected by motor load ratio (ST15) XXX%. When Over load error is detected by motor load ratio, normally [0.L. 110%] is selected. [Caution] When BIG or 0.L. 130% or more is applied, install a thermostat or a thermal to a motor for the protection.		
P145	Magnetic pole sensor Automatic adjustment	R	A M Z P				F	%	－100 ～ 100 (1%unit)	005
								It sets motion direction and speed when Self-diagnosis [DG84: Magnetic pole sensor automatic adjustment] is executed. Relation of set value and motion is as follows. Plus : Forward motion Minus: Reverse motion Speed : Ratio setting to rated (max.) speed		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	F	P				
《Group 1》 [Driver adjustment parameter]										
P146	Mass/ Inertia	I	A M Z P				F	See refer.	00000000～99999999	00000000
								It sets [Mass] or [Inertia] of a control system. Its unit is as follows. For Linear motor : Mass(10^{-4} Kg) For other than Linear motor : Inertia(10^{-6} Kg·m^2) [Caution]If the value is not clear, do not set it.		
P147	Viscosity friction	I	A M Z P				F	See refer.	00000000～99999999	00000000
								It sets [Viscosity friction of a control system. Its unit is as follows. For Linear motor : 10^{-4} N/m/s For other than Linear motor : 10^{-6} N·m/rad/s [Caution]If the value is not clear, do not set it.		
P148	Noise compensation filter frequency	I	A M Z P				F	Hz	0000 ～ 4999 (1Hzunit)	0000
								It sets filter frequency of Noise compensation. When set is [0], Noise compensation is disabled.		
P149	Disc motor initialization	R	A M Z P				F	%	−100 ～ 100 (1%unit)	005
								It sets motion direction and speed when Self-diagnosis [DG95 : Disc motor auto. adjustment] is executed. Relation and setting value is as follows. Plus : Forward motion Minus: Reverse motion Speed : Ratio setting to rated (max.) speed		
P150	Noise compensation invalid range	I	A M Z P				F	%	000.00 ～ 100.00	005.00
								It sets invalid speed of Noise compensation . Noise compensation is disabled at the speed less than this setting value.		
P151	Notch filter center frequency 3	I	A M Z P				F	Hz	0000 ～ 4999 (1Hzunit)	0000
								If resonance occurs in combination with some machine system, it sets resonance frequency to stop the resonance. If set is [0], the Notch filter 3 is disabled.		
P152	Notch filter band width 3	I	A M Z P				F	Hz	0000 ～ 4999 (1Hzunit)	0000
								It sets band width of Notch filter 3. If set is [0], the Notch filter 3 is disabled.		
P153	Notch filter center frequency 4	I	A M Z P				F	Hz	0000 ～ 4999 (1Hzunit)	0000
								If resonance occurs in combination with some machine system, it sets resonance frequency to stop the resonance. If set is [0], the Notch filter 4 is disabled.		
P154	Notch filter band width 4	I	A M Z P				F	Hz	0000 ～ 4999 (1Hzunit)	0000
								It sets band width of Notch filter 4. If set is [0], the Notch filter 4 is disabled.		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 1》 [Driver adjustment parameter]										
P155	Notch filter center frequency 5	I	A	M	Z	P	F	Hz	0000 ～ 4999 (1Hzunit)	0000
								If resonance occurs in combination with some machine system, it sets resonance frequency to stop the resonance. If set is [0], the Notch filter 5 is disabled.		
P156	Notch filter band width 5	I	A	M	Z	P	F	Hz	0000 ～ 4999 (1Hzunit)	0000
								It sets band width of Notch filter 5. If set is [0], the Notch filter 5 is disabled.		
P157	Only for maker	—	・	・	・	・	F			0
								Set value of this parameter shall be [0].		
P158	Rated power for Regenerative resistor	R	A	M	Z	P	F	KW	−999.999～999.999	000.000
								It sets Rated power value for Regenerative resistor connected with this unit. In accordance with this power value, display of Display status [ST16] (Regenerative load ratio) and detection of Regenerative over load error are conducted. If any Regenerative resistor is not connected, set [0]. When this setting is 0, ・ Display of [ST16] (Regenerative load ratio) indicates regenerative power ratio accumulated in this unit. ・ If this display becomes more than 50%, since Over voltage error could occur, attach Regenerative resistor. ・ Regenerative over load error detection is disabled. When a thermostat is used for Regenerative resistor protection, set negative(−)value to Regenerative resistor power. When this setting is negative, Display of [ST16] (Regenerative load ratio) is indicated based on this value, but Regenerative over load error detection is disabled.		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 2》 [NC adjustment parameter]										
P200	Position loop gain	I	A M Z ·				F	S^{-1}	0000 ～ 9999	0020
			It sets Position loop gain in Auto. / Manual/ Zero return/ Pulse train run. When it is set larger, though response becomes faster, vibration may easily occur. If set value is [0], Position loop opens and Auto. run can not be conducted.							
P201	Servo lock gain	I	A M Z P				F	S^{-1}	0000 ～ 9999	0020
			It sets Position loop gain in Servo lock status, when position deviation is within [P202:Positioning complete range]. When it is set larger, though response becomes faster, vibration may easily occur. If set value is [0], Position loop opens and Servo lock is not conducted.							
P202	Positioning complete range	R	A · Z ·				F	pulse	000 ～ 999	010
			It sets output range of Positioning complete signal (PN). Setting varies depending on an applied encoder type. ◎ Pulse number unit of an applied encoder resolution when Linear sensor and serial encoder[P001L-SEN/S-INC/ S-ABS] are used. ◎ 4 times of an applied encoder pulse number when Incremental type [P001 : INC1/ INC2/NC3] is used. 《Sample》 · When [P001 : L－SEN] is set, if ±10pulse is Positioning complete range, setting value is [010]. · When [P001 : NC3] is set, if ±10pulse is Positioning complete range, setting value is [040].							
P203	Positioning time over	R	A · Z ·				F	sec	0.00 ～ 9.99 (10msecunit)	0.00
			It sets allowable time to actually reach in completion range after command is completed in Positioning or Zero return. If Positioning is not completed within the time, Alarm signal(ALM)is outputted. But if set value is [0.00], Positioning time over is not detected.							
P204	Backlash compensation value	R	A M Z P				F	pulse	－999 ～ 999	000
			It sets Backlash compensation amount in a machine system. When travel direction reverses in Auto. / Manual/ Zero return/ Pulse train, backlash run, compensation amount is added/ subtracted to/ from the motion. [＋] mark is addition (push) and [－] mark is subtraction (pull). Setting is identical to [P202: Positioning complete range]. If set value is [0], Backlash compensation is not conducted.							

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 2》 [NC adjustment parameter]										
P205	Feed forward ratio	R	A M Z ·				F	%	000 ～ 120	080
			It sets Feed forward ratio to Speed command in Auto./ Manual/ Zero return run. When it is set larger, though compliance becomes better, but in some cases due to mismatching with a machine system, vibration may occur. In the case, lower the set a little and give some deviation to get stable motion. If set value is [0], Feed forward control is not conducted.							
P206	Feed forward shift ratio	R	A M Z ·				F	%	000 ～ 100	001
			It sets Feed forward shift ratio to Speed command in Auto./ Manual/ Zero return run.							
P207	Overflow detection pulse	R	A M Z P				F	pulse	00001000 ～ 99999999	00024000
			It sets Overflow detection value of Position deviation. Setting is identical to [P202: Positioning complete range].							
P208	Deviation error detection pulse	R	A M Z P				F	pulse	00000000 ～ 99999999	00000000
			It sets allowable range of Position deviation. Setting is identical to [P202: Positioning complete range]. If set value is [0.00], Deviation error is not detected.							
P209	Motion selection at Deviation error	I	A M Z P				F	None	STOP/ CONTINUE	CONTINUE
			It selects motion when Position deviation exceeds setting value of [P208 : Deviation error detection pulse] and Deviation error occurs. ◎ STOP (Alarm stop) It outputs Alarm signal (ALM) and a motor stops suddenly. ◎ CONTINUE (Motion continues.) It controls to lower Position deviation below a deviation error detection pulse when Deviation error is detected and continues motion. In Auto./ Manual/ Zero return run, from Deviation error detection to completion and in Manual/ Pulse train run from detection to stop of motion, Warning signal (WNG) is outputted. And in case of CONTINUE (Motion continues.), next position shall be noticed. · Positioning time becomes long. · Over load error may easily occur. · When excessive deviation exists at deceleration, set [000] to the parameters [P205: Feed forward ratio] and [P605 : Pulse train feed forward ratio].							

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 2》 [NC adjustment parameter]										
P210	S shape Accel. / Decel. Addition time	R	A M Z ·				F	msec	0000.0～1000.0(0.1msecunit)	0000.0
								It sets addition time when 'S shape' is selected for Accel./ Decel. curve of a motor in Auto./ Manual/ Zero return run. When set value is [0], it is linear Accel./ Decel.. Acceleration time becomes S shape addition time longer than the value set by parameters, [P211], [P212], and [P213]. Deceleration time becomes S shape addition time longer than the value set by parameters [P214], [P215], and [P216]. Actual control time is setting time round upped by 0.5msec unit. For instance when 0.7ms is set, time is 1ms(0.5×2).		
P211	Acceleration time 1	R	A M Z ·				F	sec	00.000 ～ 99.999 (1msec unit)	00.500
								It sets Acceleration time of a motor from zero to rated speed. But a motor is accelerated by this parameter set plus set time (addition time)[P210]. It is valid in Auto./ Manual/ Zero return run.		
P212	Acceleration time 2	R	A · · ·				F	sec	00.000 ～ 99.999 (1msecunit)	00.500
								*Function is identical to [P211]. But this parameter is valid only in Automatic run.		
P213	Acceleration time 3	R	A · · ·				F	sec	00.000 ～ 99.999 (1msecunit)	00.500
								*Function is identical to [P211]. But this parameter is valid only in Automatic run.		
P214	Deceleration time 1	R	A M Z ·				F	sec	00.000 ～ 99.999 (1msecunit)	00.500
								It sets Deceleration time of a motor from rated speed to stop. But a motor is decelerated by this parameter set plus set time (addition time)[P210]. It is valid in Auto./ Manual/ Zero return run.		
P215	Deceleration time 2	R	A · · ·				F	sec	00.000 ～ 99.999 (1msecunit)	00.500
								*Function is identical to [P214]. But this parameter is valid only in Automatic run.		
P216	Deceleration time 3	R	A · · ·				F	sec	00.000 ～ 99.999 (1msecunit)	00.500
								*Function is identical to [P214]. But this parameter is valid only in Automatic run.		
P217	Positioning Feed forward Derivative addition ratio	—	A M Z ·				F	None	−1 ～ 31	00
								It sets addition amount of Derivative to Feed forward data in Auto./ Manual/ Zero return run. When it is set larger, though response becomes faster, vibration may easily occur. If set value is [0], the results are identical to [16]. If set value is [−1], it is disabled.		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 2》 [NC adjustment parameter]										
P220	Position loop Derivative time constant	I	A	M	Z	・	F	μ sec	0000 ～ 9999	0000
								It sets Derivative compensation time constant of Position loop. When it is set smaller, though response becomes faster, if the value is too small, vibration may easily occur. If set value is [0], Derivative compensation is not conducted.		
P221	Derivative time constant at Servo lock	I	A	M	Z	P	F	μ sec	0000 ～ 9999	0000
								It sets Position loop Derivative time constant when Position deviation is in the range of [P202 : Positioning complete range]at Servo lock status.。 When it is set smaller, though response becomes faster, if the value is too small, vibration may easily occur. If set value is [0], Derivative compensation is not conducted.		
P222	Only for maker	—	・	・	・	・	F			00000
								[Caution] Set value of this parameter shall be [0].		
P223	Only for maker	—	・	・	・	・	F			00000
								[Caution] Set value of this parameter shall be [0].		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 3》 [Position adjustment parameter]										
P300	Rotating direction selection	R	A	M	Z	P	F	None	FORWARD/ REVERSE	FORWARD
								It selects motor rotating direction to each command. FORWARD / Forward / Motor forward rotation to Forward or positive data REVERSE / Reverse / Motor reverse rotation to Forward or positive data		
P301	Setting unit selection	R	A	M	Z	P	F	None	[mm]/ [°]/ [in]	[mm]
								It selects basic unit for setting of Positioning data, etc.. All the position and speed setting use this unit. ([mm]: mm/[°]: degree/ [in]: inch)		
P302	Command unit	R	A	M	Z	P	F	mm/ °/ in	1/ 0.1/0.01/ 0.001/0.0001/ 0.00001	0.01
								It selects minimal setting unit of Positioning data. By this parameter, decimal point position of each position data and speed data is determined and used in individual data display.		
P303	Electronic gear ratio numerator	R	A	M	Z	P	F	None	00000001 ～ 99999999	00000001
								It sets gear ratio between a machine system drive shaft and a motor shaft together with [P304 : Electronic gear ratio denominator]. If a load shaft rotates n turns when a motor rotates m turns in a machine system, it sets n to this parameter. Setting sample and cautions of Electronic gear ratio can be referred to [P310 : Machine travel amount].		
P304	Electronic gear ratio denominator	R	A	M	Z	P	F	None	00000001 ～ 99999999	00000001
								It sets gear ratio between a machine system drive shaft and a motor shaft together with [P303 : Electronic gear ratio numerator]. If a load shaft rotates n turns when a motor rotates m turns in a machine system, it sets n to this parameter. Setting sample and cautions of Electronic gear ratio can be referred to [P310 : Machine travel amount].		
P305	Index data range	R	A	M	Z	P	F	mm/° / in	00000000 ～ 99999999	00000000
								It sets 1 turn data amount to a rotating machine. (A decimal point position depends on [P302 : command unit].) By the set, absolute position (Absolute) data range becomes 0～([this setting value]－1). Except [Index positioning] or [Spinner] applications, set 00000000. When 00000000 is set, Index positioning commands(INDX, SIND)and Spin commands(SPNS, SPNT, SPNP)can not be used.		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 3》 [Position adjustment parameter]										
P306	Forward software OT limit	I	A M Z P				F	mm/˚/ in	−99999999 ～ 99999999	00000000
								It sets Forward travel limit point [P408 : Position data reference point. When power is ON and after Zero return is completed, this signal is always valid.(A decimal point position depends on [P302 : command unit].) But if set value is [0], limit is not detected. [Caution]After power is turned ON, be sure to execute Zero return. Since [P408 : Position data reference point] is reset after Zero return is completed, Software OT limit is not detected until the completion. Since Software OT limit is detected at command position, if delay deviation is large, a motor could stop at front of the Software OT limit position.		
P307	Reverse software OT limit	I	A M Z P				F	mm/˚/in	−99999999 ～ 99999999	00000000
								It sets Reverse travel limit point [P408 : Position data reference point. When power is ON and after Zero return is completed, this signal is always valid.(A decimal point position depends on [P302 : command unit].) But if set value is [0], limit is not detected. [Caution]After power is turned ON, be sure to execute Zero return. Since [P408:Position data reference point] is reset after Zero return is completed Software OT limit is not detected until the completion. Since Software OT limit is detected at command position, if delay deviation is large, a motor may stop at front of the Software OT limit position.		
P308	Forward Positioning amount max. value	I	A・・・				F	mm/ ˚/in	00000000 ～ 99999999	00000000
								It sets max. value of Forward positioning amount to applicable commands by incremental amount.(A decimal point position depends on [P302 : command unit].) If executed Positioning amount of a command is larger than this setting value, the command is aborted by Alarm. But if set value is [0], Forward positioning amount is not checked. Applicable commands : POS, INDX, SPOS, CONT, REPT, SIND		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 3》 [Position adjustment parameter]										
P309	Reverse Positioning amount max. value	I	A・・・				F	mm/゜/in	−99999999 ～ 00000000	00000000
								It sets Max. value of Reverse positioning amount to applicable commands by incremental amount.(A decimal point position depends on [P302 : command unit].) If executed Positioning amount of a command is larger than this setting value, the command is aborted by Alarm. But if set value is [0], Reverse positioning amount is not checked. Applicable commands : POS, INDX, SPOS, CONT, REPT, SIND		
P310	Machine travel amount	R	A M Z P				F	mm/゜/ in	00000000 ～ 99999999	00000000
								It sets load travel amount per 1 turn of a machine system drive shaft (load shaft). (A decimal point position depends on [P302 : command unit].) But if set value is [0], [Applied Encoder pulse number×4] is used as this parameter value in the travel. [Caution]When motor rated speed set by Electronic gear ratio and Machine travel amount set is out of 100～20M(setting unit/ sec)range, Alarm occurs and motion stops. (Setting unit depends on [P301] and [P302].		
P303 P304 P310	《Example of Electronic gear ratio and Machine travel amount parameter set 》 <In case of ball screw> 《ボールネジの場合》 Ball screw, pitch =10.00mm ボールネジ・ピッチ＝１０ｍｍ Gear (pulley) ratio =1/2 ギア（プーリ）比＝１／２ M PG Ｐ３０２：指令単位＝０．０１ｍｍ Ｐ３０３：電子ギア比分子＝１ Ｐ３０４：電子ギア比分母＝２ Ｐ３１０：機械移動量＝１０．００ｍｍ P:302: Command unit = 0.01mm P303: Electronic gear numerator=1 P304: Electronic gear denominator=2 P310: Machine travel amount=10.00mm <In case of round table> 《円テーブルの場合》 Gear ギア Round table 円テーブル M PG ギア比＝１／２ Gear ratio= 1/2 Ｐ３０２：指令単位＝０．１° Ｐ３０３：電子ギア比分子＝１ Ｐ３０４：電子ギア比分母＝２ Ｐ３１０：機械移動量＝３６０．０° P302: Command unit=0.1° P303: Electronic gear numerator=1 P304: Electronic gear denominator= 2 P310: Machine travel amount= 360.0° <In case of conveyer> 《コンベアの場合》 コンベア Conveyer D Gear ギア Gear ratio=1/25 ギア比＝１／２５ M PG Ｐ３０２：指令単位＝０．００１ｍｍ Ｐ３０３：電子ギア比分子＝１ Ｐ３０４：電子ギア比分母＝２５ Ｐ３１０：機械移動量＝πＤ ｍｍ P:302: Command unit = 0.001mm P303: Electronic gear numerator=1 P304: Electronic gear denominator=25 P310: Machine travel amount= πDmm									

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 4 》[Run motion parameter]										
P400	Jog speed 1	S	· M · ·				F	mm/sec°/sec in/sec	00000001 ～ 99999999	00001000
								It sets Jog speed when Jog speed selection signal is (JOSP signal) OFF. (A decimal point position depends on [P302 : command unit].)		
P401	Jog speed 2	S	· M · ·				F	mm/sec°/sec in/sec	00000001 ～ 99999999	00002000
								It sets Jog speed when Jog speed selection signal is (JOSP signal) ON. (A decimal point position depends on [P302 : command unit].)		
P402	Zero return method selection	S	A · Z ·				F	None	STD.HOME/LS LESS/STOP HOME/ OT HOME	STD.HOME
								It selects Zero return method. ◎ STD.HOME (Standard Zero return) When Marker is detected after Zero point decel. LS is detected, positioned point by the Marker becomes new Zero point. ◎ LS LESS (No LS Zero return) When Marker is detected without Zero point decel. LS in Decel. speed control, positioned point by the Marker becomes new Zero point. ◎ STOP HOME (On the spot Zero return) Current place becomes new Zero point without any motion. ◎ OT HOME (OT back Zero return) When Marker is detected after Zero point decel. LS is detected, positioned point by the Marker becomes new Zero point. If OT for motion direction is detected before Zero point decel. LS is detected, motion changes to reverse direction. And when P403 is set to [NON.MARK], motion is conducted based on Zero point decel. LS without any Marker signal. Description can be referred to [10—2—2 Zero return mode].		
P403	Zero point marker selection	R	A · Z ·				F	None	ENC.MARK/ NON.MARK	ENC.MARK
								It selects a signal used for Zero point marker. ◎ ENC.MARK : Encoder marker ◎ NON.MARK : Marker is not used.		
P404	Zero return speed	S	A · Z ·				F	mm/sec°/secin/sec	00000001 ～ 99999999	00001000
								It sets initial speed in Zero return. (A decimal point position depends on [P302 : command unit].) Both of FJ and RJ signals are valid in Zero return start. HOME command motion speed is conducted by this setting value. Max. motion speed is applied motor rated speed.		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 4 》[Run motion parameter]										
P405	Zero return creep speed	R	A · Z ·				F	mm/sec˚/ sec in/ sec	00000001 ～ 99999999	00000100
								It sets Creep speed in Zero return run after Zero point decel LS is detected. (A decimal point position depends on [P302 : command unit].) Normally, set is 1/100 or less of motor rated speed. In case of No LS Zero return, a motor runs at this setting value from the beginning.		
P406	Zero point position constant	R	A · Z ·				F	mm/˚/ in	00000000 ～ 99999999	00010000
								It sets distance to start Marker signal detection after Zero point decel LS is detected in Zero return. (A decimal point position depends on [P302 : command unit].) It sets longer value than min. distance to decelerate speed from Zero return speed to Zero return creep speed. And if [NON.MARK] is set to P403, motion is conducted based on Zero point decel. LS without any Marker signal. Description can be referred to [10—2—2 Zero return mode]. [Caution]If this setting value is small when Zero return speed is high, a motor suddenly decelerates or stops. Therefore, set adequate value to decelerate a motor to Creep speed.		
P407	Zero point set distance	R	A · Z ·				F	mm/˚/in	—99999999 ～ 99999999	00000000
								It sets travel distance＋α from Marker signal detection point in Zero return. This is used for fine adjustment of Marker signal position and machine zero point position. (A decimal point position depends on [P302 : command unit].) ◎ In case of standard and OT back Zero return Positioning is executed for same direction of Zero return when a mark is [＋] and opposite direction when a mark is [—]. ◎ In case of no LS Zero return, Positioning is executed for same direction of Zero return. If set value is [0], Zero return will be completed when Marker signal is detected. When setting value is smaller than distance from Zero return creep speed to stop, over shoot will occur when Zero return is completed. And if [NON.MARK] is set to P403, motion is conducted based on Zero point decel. LS without any Marker signal. Description can be referred to [10—2—2 Zero return mode].		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 4 》[Run motion parameter]										
P408	Position data reference point	R	A · Z ·				F	mm/° / in	−99999999 ~ 99999999	00000000
								It sets Absolute position data reference point by distance from Machine zero point.(A decimal point position depends on [P302 : command unit].) Setting value is entered when Zero return is completed. If Positioning is conducted after power is turned ON without executing Zero return, the position where power is ON becomes Absolute position data reference position. Software OT limit value of parameters [P306] and [P307] refer to this position data reference position.		
P409	Automatic run permit condition selection	S	A · · ·				F	None	AUTO.N/ AUTO.Y	AUTO.N
								It selects Automatic run start permit condition. ◎ AUTO.N(After Zero return completion) Auto. run start can be conducted after Zero return is completed. But if an external not-permit factor exists, this is not permitted. ◎ AUTO.Y(No condition) At anytime, Auto. run start can be conducted. But if an external not-permit factor exists, this is not permitted.		
P410	Deceleration time at OT back Zero return	R	A · Z ·				F	sec	00.00 ~ 99.99 (10msecunit)	00.50
								It sets Decel. time from rated speed to stop of a motor. When S shape Accel./Decel. curve is selected by [P210], this set value is added to the motor Decel. time. This set is valid only for reverse motion of OT in OT back Zero return.		
P411	External trigger level selection	R	A · · ·				F	None	TRG.EDGE/ TRG.LEVEL	TRG.EDGE
								It selects whether [ON edge] or [ON level] shall be received when External trigger is inputted. ◎ TRG.EDGE : ON edge receipt at External trigger input. ◎ TRG.LEVEL: ON level receipt at External trigger input. (At Auto. run start and re-start from Hold or Block stop, when this signal is ON, External trigger is received.)		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 5》 [Display, Edit, Communication parameter]										
P500	Only for maker	—	·	·	·	·	F			00000
								[Caution]Set value of this parameter shall be [0].		
P501	Only for maker	—	·	·	·	·	F			00000
								[Caution]Set value of this parameter shall be [0].		
P502	LCD current position display selection	I	A	M	Z	P	F	None	ABSOLUTE/ MACHINE/ INCREMENT/ ABS.ENC.	ABSOLUTE
								It selects contents of current position displayed in LCD status display mode『ST01』. ◎ ABSOLUTE(Absolute position) It displays distance (position)from position data reference point. And if a value other than 0 is set to Index position range (P305), position or angle in rotating work is displayed. ◎ MACHINE(Machine position) Same as absolute position is displayed. But if a value other than 0 is set to Index position range (P305), total travel distance is displayed. ◎ INCREMENT(Relative position) Distance (position) from Positioning start position is displayed. ◎ ABS.ENC.(ABS encoder data) Position managed by ABS encoder is displayed.		
P505	Communication function selection	R	A	M	Z	P	F	None	0 ～ 9	5
								It sets an external unit (protocol) interfaced through Serial communication.		
								Set No. / External unit / Set No. / External unit 0 / Reserved(MDI) / 5 / Dedicated PC software 1 / Reserved / 6 / Reserved 2 / Computer / 7 / Reserved 3 / Touch panel / 8 / Reserved 4 / Reserved / 9 / Reserved		
P506	Communication ID No.	R	A	M	Z	P	F	None	00 ～ 16	01
								It sets ID No.(Office code) when digital chain is used for connection in Serial Communication.(When only 1 unit is connected, set [01].) If setting value is [00], MDI can not be used.		
P507	Data length selection (Serial communication)	R	A	M	Z	P	F	BITS	7 BITS/ 8 BITS	8 BITS
								It selects Transmission/ receipt data length of Serial communication.		
P508	Parity selection (Serial communication)	R	A	M	Z	P	F	None	NONE/ ODD/ EVEN	ODD
								It selects Parity of Serial communication. ◎ NONE : No parity ◎ ODD : Odd parity ◎ EVEN : Even parity		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 5》 [Display, Edit, Communication parameter]										
P509	Baud rate selection (Serial communication)	R	A M Z P				F	BPS	4.8K/9.6K/19.2K/56K/115.2K	9.6K
								It selects baud rate of Serial communication. **※ At present, it is not compatible to "115.2KBPS". Hence, do not select it.**		
P510	Only for maker	—	· · · ·				F			00000000
								Set value of this parameter shall be [0].		
P511	Communication group ID set 1	R	A M Z P				F	None	000 ～ 255	000
								When this unit is connected with plural units and broadcast communication is executed, it sets ID No. allocated to a same group. ◎ 0 : Communication group is not set. ◎ 1～255 : A unit attends to set No. group. When ID is set area of 1～5, a unit attends to same group No. group. In the case, set area No. (1～5) is neglected.		
P512	Communication group response yes/no 1	R	A M Z P				F	None	RESP. OFF/ RESP. ON	RESP. OFF
								Using this and Communication group ID set 1, it sets yes/no response to a parent office when Broadcast communication is conducted to an attended group. ◎ RESP. OFF : Response is not made to a parent office. ◎ RSEP. ON : Response is returned to a parent office in Broadcast communication.		
P513	Communication group ID set 2	R	A M Z P				F	None	000 ～ 255	000
								It is a second area to set Communication group ID No. Setting method is same as Communication group ID set 1.		
P514	Communication group response yes/no 2	R	A M Z P				F	None	RESP. OFF/ RESP. ON	RESP. OFF
								Set this together with Communication group ID set 2. Setting method is same as Communication group response yes/ no 1.		
P515	Communication group ID set 3	R	A M Z P				F	None	000 ～ 255	000
								It is a third area to set Communication group ID No.. Setting method is same as Communication group ID set 1.		
P516	Communication group response yes/no 3	R	A M Z P				F	None	RESP. OFF/ RESP. ON	RESP. OFF
								Set this together with Communication group ID set 3. Setting method is same as Communication group response yes/ no 1.		
P517	Communication group ID set 4	R	A M Z P				F	None	000 ～ 255	000
								It is a fourth area to set Communication group ID No. Setting method is same as Communication group ID set 1.		
P518	Communication group response yes/no 4	R	A M Z P				F	None	RESP. OFF/ RESP. ON	RESP. OFF
								Set this together with Communication group ID set 4. Setting method is same as Communication group response yes/ no 1.		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 5》 [Display, Edit, Communication parameter]										
P519	Communication group ID set 5	R	A	M	Z	P	F	None	000 ~ 255	000
			It is a fifth area to set Communication group ID No. Setting method is same as Communication group ID set 1.							
P520	Communication group response yes/no 5	R	A	M	Z	P	F	None	RESP. OFF/ RESP. ON	RESP. OFF
			Set this together with Communication group ID set 5. Setting method is same as Communication group response yes/ no 1.							
P521	Servo control communication ID No.	P	A	M	Z	P	F	None	0 ~ 8	8
			It sets a master and a slave offices in Servo control Communication. When [0] is set, it sets a master office. In case of Pulse train communication, ID No. of all the slave offices is set [8]. ***This function is currently applicable only for Pulse train communication.**							
P522	Servo control communication control mode	P	A	M	Z	P	F	None	PULSE/ CNTRL	PULSE
			It selects control mode in Servo control communication. ◎ PULSE : Pulse train communication ◎ CNTRL : Control block construction If a set mode is not coincided with a received text, Alarm occurs. ***This function is currently applicable only for Pulse train communication. Set [PULSE] before using a unit.**							
P523	Alarm stop selection at Servo control communication stop	P	A	M	Z	P	F	None	NON ALM/ ALM	ALM
			It selects motion when communication of connected controller is stopped in Servo control communication. ◎ NON ALM (Motion continues.) : A motor does not stop and continues rotation. ◎ ALM (Alarm stops.) : Alarm signal (ALM) is outputted and a motor suddenly stops.							
P524	Servo control communication real time data 1 device No.	R	A	M	Z	P	F	None	0 ~ 29999	00064
			It sets a device No. of data set to Real time data 1 in Servo control communication. **※Since this function is not applied now, please do not edit it.**							
P525	Servo control communication real time data 2 device No.	R	A	M	Z	P	F	None	0 ~ 29999	00054
			It sets a device No. of data set to Real time data 2 in Servo control communication. *** Since this function is not applied now, please do not edit it.**							
P526	Servo control communication real time data 3 device No.	R	A	M	Z	P	F	None	0 ~ 29999	00042
			It sets a device No. of data set to Real time data 3 in Servo control communication. *** Since this function is not applied now, please do not edit it.**							

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 5》 [Display, Edit, Communication parameter]										
P527	Servo control communication real time data 4 device No.	R	A M Z P				F	None	0 ～ 29999	00040
			It sets a device No. of data set to Real time data 4 in Servo control communication. **＊ Since this function is not applied now, please do not edit it.**							
P528	Servo control communication real time data 5 device No.	R	A M Z P				F	None	0 ～ 29999	00036
			It sets a device No. of data set to Real time data 5 in Servo control communication. **＊ Since this function is not appliednow, please do not edit it.**							
P529	Only for maker	—	・ ・ ・ ・				F			7.0 MBPS
			Be sure to set [7.0 MBPS] to this parameter.							
P530	Only for maker	—	・ ・ ・ ・				F			21000
			Be sure to set [21000] to this parameter.							
P531	Only for maker	—	・ ・ ・ ・				F			21000
			Be sure to set [21000] to this parameter.							
P532	Only for maker	—	・ ・ ・ ・				F			00
			Be sure to set [00] to this parameter.							

※ Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 6》 [Pulse train input parameter]										
P600	CIH signal specification selection	R	A ・・・				F	None	CIH CLOSE/ CIH OPEN/ PFB CLOSE/ PFB OPEN	CIH CLOSE
								It selects effective logic of control input signals (CIH). CIH : It prohibits command pulse input. PFB : It exchanges a measuring encoder with a motor encoder. Selection items(Combination of CIH or PFB and effective logic)are as follows. (CIH-COM terminals are short-circuited. : ON, opened: OFF) ◎ CIH CLOSE Pulse train command signal ON: Disable/ OFF: Enable ◎ CIH OPEN Pulse train command signal ON: Enable/ OFF: Disable ◎ PFB CLOSE position For position feedback, Signal ON :A motor Encoder is used. / OFF :A measuring encoder (Pulse train input)is used. ◎ PFB OPEN position For position feedback, Signal OFF :A motor Encoder is used. / ON :A measuring encoder (Pulse train input)is used.			
P601	Pulse train command sequence change	R	A ・・・				F	None	FORWARD/ REVERSE	FORWARD
								It selects motor rotating direction by Pulse train command input. ◎ FORWARD (Forward selection) A motor runs forward by Forward or lead B phase Pulse train command. ◎ REVERSE (Reverse selection)A motor runs reverse by Forward or lead B phase Pulse train command. But when [REVERSE] is selected by [P300 : Rotating direction selection], rotating direction is reversed to the above direction.			

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 6》 [Pulse train input parameter]										
P602	Pulse train command type selection	P	A・・・				F	None	X1/X2/X4/F/RPULSE/P+F/ R/ID0.FCRC/D0.CMNDP/ ID0.MTENC	X1

It selects signal input style and multiplication ratio of Pulse train command. And next [ID0.XXX] selects a command pulse of a parent office (ID0) in Servo control communication.

◎ X1 : By 90° phase different pulse 1 time
◎ X2 : By 90° phase different pulse 2 times
◎ X4 : By 90° phase different pulse 4 times
◎ F/ R PULSE : Directional pulse (1 time only)
◎ P + F/ R : Direction signal +feed pulse (1 time only)
◎ ID0.FCRC : This unit receives Pulse train command by Servo control communication and external Pulse train (Pulse train input by FC/ RC of CN1).(In case of 90° phase different pulse, 4 times of Pulse train are received.)
◎ ID0.CMNDP : This unit receives position command internally created by Pulse train command in Servo control communication.(It receives Pulse train which [302 : Minimum command unit]is 1 pulse.)
◎ ID0.MTENC : This unit receives 4 times of a motor encoder pulse trains by Pulse train command in Servo control communication

What is Servo control communication?

① Servo control communication receives/ transmits motion data between this unit and other units (Hereafter, other VC is used.) equipped with Servo control communication.
This unit only supports **[Pulse train communication]** which handles only Transmission/ Receipt of Pulse train data out of all the Servo control communication functions.

② Following functions can be achieved by [Pulse train communication].
・Received pulse data from other VC can be used as Pulse train command of this unit to conduct Pulse train run. And since max. 8 axes can receive one transmitted data simultaneously, plural axis control following to 1 pulse data can be achieved.
・This unit can conducts Pulse train run by external Pulse train commands and transmits the Pulse train commands to other VC, simultaneously. By this method, this unit and other VCs can follow 1 master axis command and in the other word, plural pulse train run can be achieved.
・ This unit can transmit motor motion pulse data of this unit to drive other VC which can conduct highly accurate twin drive motion. In the case, select [ID0.CMND.P]for [P602 : Pulse train command type selection]of this unit. Synchronous accuracy is improved better than when [ID0.MTENC] is selected.

③ Transmission of Pulse train communication means to transmit pulse data.
Transmission unit can be selected by setting [0] to [P521: Servo control communication ID No.].

④ Receipt of Pulse train communication means to receive pulse data from other VC. In the case, select [8] (Receipt) for[P521:Servo control communication ID No.] and Receipt data [ID0.FCRC/ ID0.CMNDP/ ID0.TENC] for [P602 : Pulse train command type selection].

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop
※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved
※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

<table>
<tr><td rowspan="2">Parameter No.</td><td rowspan="2">Parameter name</td><td rowspan="2">Activating timing</td><td colspan="4">Run mode method</td><td rowspan="2">Level</td><td>Setting unit</td><td>Setting range</td><td>Standard ship. set (Initial value)</td></tr>
<tr><td>Automatic</td><td>Manual</td><td>Function</td><td>Pulse train</td><td colspan="3">Function</td></tr>
<tr><td></td><td></td><td></td><td>A</td><td>M</td><td>Z</td><td>P</td><td></td><td colspan="3"></td></tr>
<tr><td colspan="11">《Group 6》 [Pulse train input parameter]</td></tr>
<tr><td rowspan="2">P610</td><td rowspan="2">Pulse train command input selection when extension board is connected</td><td rowspan="2">P</td><td colspan="4" rowspan="2">・ ・ P ・</td><td rowspan="2">F</td><td>None</td><td>EXT/STD</td><td>EXT</td></tr>
<tr><td colspan="3">Select where to enter the pulse train command through the extension board connector CN3 or main connector CN1 while the extension board of the option is connected.
◎ EXT
Though the extension board connector CN3 of the option
◎ STD
Through the main connector CN1
[Note]
For ZLS and the TRG signals, the commands entered through the connector selected here, are valid.</td></tr>
</table>

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 7》 [I/O signal parameter]										
P700	Monitor 1 selection	I	A M Z P				F	None	SPD. REF. /SPD. FB. /TRQ. REF. / TRQ. LIM. +/TRQ. LIM. -/P. RANGE. L /P. RANGE. H/SPD. OUT/SCL. OUT/ IX62/IX63/OPT. W/OPT. L	SPD. FB.
								It selects output data of Analog monitor [MON1]. ◎ SPD. REF : Speed command ◎ SPD. FB. : Speed feedback ◎ TRQ. REF. : Torque command ◎ TRQ. LIM. ＋ : External torque limit ＋command ◎ TRQ. LIM. － : External torque limit －command ◎ P. RANGE. L : Position deviation 1 ◎ P. RANGE. H : Position deviation 2 ◎ SPD. OUT : ＮＣ speed command ◎ SCL. OUT : ＮＣ target speed ◎ IX62 : Output in accordance with data of index data No. 62 ◎ IX63 : Output in accordance with data of index data No. 63 ◎ OPT. W : Only for maker (Do not set this.) ◎ OPT. L : Only for maker (Do not set this.)			
P701	Monitor 2selection	I	A M Z P				F	None	SPD. REF. /SPD. FB. /TRQ. REF . / TRQ. LIM. ＋/TRQ. LIM. －/ P. RANGE. L/P. RANGE. H/SPD. OUT/ SCL. OUT/ IX62/ IX63/ OPT. W/OPT. L	TRQ. REF.
								It selects output data of Analog monitor [MON2]. ※Selection items are same as[P700 : Monitor 1 selection].		
P702	Speed zero range	R	A M Z P				F	%	000.00 ～ 100.00	000.10
								It sets output range of Speed zero signal (SZ).		
P703	Rough matching range	R	A・Z・				F	pulse	00000001 ～ 99999999	00000100
								It sets output range of Rough matching signal(PRF). Setting is same as [202 : Positioning complete range]. 《Sample》 If Rough matching signal shall be outputted by a 6000P/R encoder at 1000 pulses before target position, set 04000.		
P704	SON signal logic selection	R	A M Z P				F	None	SERVO ON/ SHUT OFF	SERVO ON
								It selects effective logic of Servo ON signal (SON). (SON-COM terminals are short-circuitted: ON, opned: OFF) ◎ SERVO ON: Signal ON status is Servo ON(A motor is in control.) ◎ SHUT OFF: Signal ON status is Servo signal OFF(A motor is in torque free.)		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 7》 [I/O signal parameter]										
P705	Hardware OT Enable/ Disable selection	R	A M Z P				F	None	OT.CHK.Y/ OT.CHK.N	OT.CHK.Y
								It selects Enable/ Disable of Over travel signal (FOT,ROT). ◎ OT.CHK.Y : Enable ◎ OT.CHK.N : Disable		
P706	Mode change confirmation delay time	R	A M Z P				F	sec	0.00 ~ 9.99 (10msecunit)	0.01
								It sets confirmation delay time from change of mode selection signal(MD1,MD2)to completion of the mode change. This parameter function is not to recognize unclear status as a signal at Mode change. [Caution] Actual changing time is this set value plus about 20msec (internal processing time).		
P707	Software limit switch position 1	I	A M Z P				F	mm/ ° / in	-99999999 ~ 99999999	00000000
								It sets output change position of Software limit switch signal(SLSA,SLSB)(A decimal point position depends on [P302 : command unit].). ＊Relation with [P708,P709] can be referred to below description.		
P708	Software limit switch position 2	I	A M Z P				F	mm/°/in	-99999999 ~ 99999999	00000001
								This function is same as [P707]. ＊Relation with [P708,P709] can be referred to below description.		
P709	Software limit switch position 3	I	A M Z P				F	mm/ ° / in	-99999999 ~ 99999999	00000002
								This function is same as [P707]. ＊Relation with [P708,P709] can be referred to below description.		
P707 P708 P709	＜Software limit switch position 1~3＞ It sets Area change position of current position by distance from [P408 : position data reference position]. It is enabled after power is turned ON and Zero return is completed.(If Zero return is not completed, it is not outputted.) 《 Setting conditions》 [P707 : Software limit switch position 1]＜[P708 : Software limit switch position 2] ＜[P709 : Software limit switch position 3] If this condition is not satisfied, correct motion can not be conducted. [Caution1]Software limit switch signal can be referred to [Chapter 6 Signal connection]. [Caution2]Since Software limit switch signal is controlled at current command position, Position deviation error occurs and the deviation is added to actual position output.									
P710	Stop method at Emergency stop	I	A M Z P				F	None	QUICK/ FREE RUN	QUICK
								It selects motor stop method at Emergency stop, ◎ QUICK (Brake stop) A motor stops by a brake for decel. time set by[P711 : Deceleration time at Emergency stop]and after setting time[P712 : Servo OFF delay time after Emergency stop]passes Servo is OFF (torque free). ◎ FREE RUN(Free run stop) A motor conducts Torque free run stop.		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 7》 [I/O signal parameter]										
P711	Deceleration time at Emergency stop	R	A	M	Z	P	F	sec	00.00 ～ 50.00 (10msecunit)	00.00
			It sets motor decel. time when brake stop is selected by [P710 : Stop method at Emergency stop]. When set value is [0], a motor suddenly stops with max. torque(Torque limit value). When Free run stop is selected by[P710 : Stop method at Emergency stop], this parameter is invalid.							
P712	Servo OFF delay time after Emergency stop	R	A	M	Z	P	F	sec	0.00 ～ 9.99 (10msecunit)	0.00
			It sets time from motor stop to Servo OFF (torque free)when Brake stop is selected by[P710 : Stop method at Emergency stop]. When set value is [0], a motor stops and at the same time Servo is OFF(torque free). When Free run stop is selected by[P710 : Stop method at Emergency stop], this parameter is invalid.							
P713	Stop method at AC power loss (Refer to *1)	I	A	M	Z	P	F	None	QUICK/ FREE RUN	FREE RUN
			It selects motor stop method when AC power is lost.(at power OFF). ◎ QUICK (Brake stop) A motor stops by a brake. ◎ FREE RUN (Free run stop) A motor conducts Torque free run stop. [Caution] ① When AC power is OFF, to output Alarm signal(ALM), set [ALM.ON] to [P714 : ALM output selection at AC power loss]. (Alarm signal is not outputted by ([ALM.OFF] set). ② In case of brake stop, brake stop torque varies depending on controller status and load conditions. Specially, if AC power loss is detected in acceleration, Free run stop may occur.							
P714	ALM output selection at AC power loss (Refer to *1)	I	A	M	Z	P	F	None	ALM.OFF/ ALM.ON	ALM.OFF
			It selects whether Alarm signal (ALM)shall be outputted or not when AC power loss is detected (at power OFF). ◎ ALM.OFF : Alarm signal(ALM)is not outputted. ◎ ALM.ON : Alarm signal(ALM)is outputted. * Motor stop method at AC power loss detection is set by [P713 : Stop method at AC power loss].							

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

*1: AC power OFF is detected by control power (r, s). It functions in case of AC power OFF of the terminal. The device of DC24V input of control power operates, depending on the voltage drop of control power. It does not operate in case of AC power OFF.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 7》 [I/O signal parameter]										
P715	ALM/ WNG signal logic selection	R	A M Z P				F	None	ALM/ WNG1 ～ ALM/ WNG4	ALM/ WNG1
								It selects output logic of Control output signals (ALM, WNG). ◎ ALM/WNG1 Open ALM—COM1 : ON/Close WNG—OM : ON ◎ ALM/WNG2 Close ALM—COM1 : ON/ Close WNG—COM : ON ◎ ALM/WNG3 Open ALM—COM1 : ON/ Open WNG—COM : ON ◎ ALM/WNG4 Close ALM—COM1 : ON/ Open WNG—COM : ON		
P716	RDY signal specification selection	R	A M Z P				F	None	RDY1/RDY2/RDY3/RDY4	RDY1
								It selects output spec. of Control output signal (RDY). ① : Hardware OT alarm, Software OT alarm ② : Alarm which motion at error detection is Servo lock and requires Reset signal (RST) for release it. ◎ RDY1 At motor drive(includes ①②) : Close RDY—COM1. At motor free : Open RDY—COM1. ◎ RDY2 At motor drive(includes ①)and not ② : Close RDY-COM1 At motor free or ② : Open RDY-COM1. ◎ RDY3 At motor drive(includes ②)and not ① : Close RDY-COM1 At motor free or ① : Open RDY-COM1. ◎ RDY4 At motor drive and not ①② : Close RDY—COM1. At motor free or ①② : Open RDY—COM1		
P719	PN signal specification selection	R	A · · ·				F	None	PN1/ PN2	PN1
								It selects output spec. of Control output signal (PN) in Auto. run. ◎ PN1 It is not related with PN2 output condition (invalid). Therefore, when Positioning goes into completion range, PN is outputted even though PST is OFF. ◎ PN2 When Auto. start signal (PST) is OFF, Positioning completion signal (PN) is always OFF. Therefore, even though Positioning goes into completion range, PN is not outputted when PST is OFF.		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

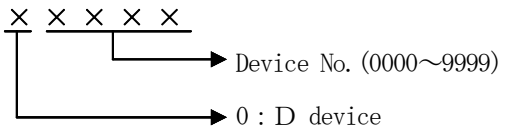
※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 7》 [I/O signal parameter]										
P720	SQB write data 1	R	A M Z P				F	None	00000 ～ 29999	13700
			It sets Data No. to write in NC by SQB sequence program. This parameter is valid when SQB is connected. **[Caution])If this parameter is carelessly set, malfunction of this unit may occurs. Since applicable setting data are described is the separate manual 『Volume: SQB』, do not set other data No..**							
P721	SQB write data 2	R	A M Z P				F	None	00000 ～ 29999	13702
			Function is same as [P720].							
P722	SQB write data 3	R	A M Z P				F	None	00000 ～ 29999	13704
			Function is same as [P720].							
P723	SQB write data 4	R	A M Z P				F	None	00000 ～ 29999	13706
			Function is same as [P720].							
P720 P721 P722 P723	《SQB write data 1～4 : Setting range》 × × × × × → Device No. (0000～9999) → 0 : D device。 1 : R device 2 : System reserves. (Do not use it.)									

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 7》 [I/O signal parameter]										
P724	SQB read data 1	R	A M Z P				F	None	00000 ～ 29999	13708
			It sets Data No. to read from NC by SQB sequence program. This parameter is valid when SQB is connected. **[Caution]) Since applicable setting data are described is the separate manual 『Volume: SQB』, do not set other data No..**							
P725	SQB read data 2	R	A M Z P				F	None	00000 ～ 29999	13710
			Function is same as [P724].							
P726	SQB read data 3	R	A M Z P				F	None	00000 ～ 29999	13712
			Function is same as [P724].							
P727	SQB read data 4	R	A M Z P				F	None	00000 ～ 29999	13714
			Function is same as [P724].							
P728	SQB read data 5	R	A M Z P				F	None	00000 ～ 29999	09302
			Function is same as [P724].							
P729	SQB read data 6	R	A M Z P				F	None	00000 ～ 29999	09100
			Function is same as [P724].							
P724 P725 P726 P727 P728 P729	《SQB read data 1～6 : Setting range 》  									
P730	Only for maker	—	・ ・ ・ ・				F			00000
			Set value of this parameter shall be [0].							
P731	Only for maker	—	・ ・ ・ ・				F			00000000
			Set value of this parameter shall be [0].							
P732	Only for maker	—	・ ・ ・ ・				F			00000
			Set value of this parameter shall be [0].							
P733	Only for maker	—	・ ・ ・ ・				F			00000000
			Set value of this parameter shall be [0].							
P734	Brake output delay time	R	A M Z P				F	sec	0.00 ～ 9.99(10msecunit)	0.00
			When Alarm, Emergency stop, Servo OFF or Reset occurs, it sets delay time from the time when a motor becomes in torque free to the time Control output signal (BRK) is OFF.							

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 7》 [I/O signal parameter]										
P735	External input disable selection 1	R	A M Z P				F	None	000000000 ～ 268435455	000000194
								It sets External input signal to be disabled. Enable/ Disable setting of each signal is indicated by 1 bit, 0/1 and the value is converted to a decimal number and set(1 : Enable/0 : Disable). ＊ As initial value, signals other than [FOT,ROT,EMG] are valid [External input is enabled.]. ＊ Relation of a signal name and a setting bit can be referred as below. [Setting sample] To disable [FOT, ROT, EMG], set [1] to bit 7, 6, 1. → In hexadecimal No.: 000000C2 → In decimal No.: 194		
P736	External input disable selection 2	R	A M Z P				F	None	000000000 ～ 268435455	000000000
								It sets External input signal to be disabled. Enable/ Disable setting of each signal is indicated by 1 bit, 1/0 and the value is converted to a decimal number and set(0 : Enable/1 : Disable). ＊ Relation of a signal name and a setting bit can be referred as below. [Setting sample] To disable [EPIH, PCAN, BSTP, MFIN], set [1] to bit 7, 6, 5, 4. → In hexadecimal No.: 000000f0 → In decimal No.: 240(Parameter set value)		

P735 ＜Relation of a signal name and a setting bit＞

Bit

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
—	—	—	—	PS8	PS7	PS6	PS5	PS4	PS3	PS2	PS1	—	—	—	PC
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
BRON	CIH	TL	MD2	MD1	—	—	—	ROT	FOT	CLR	GSEL	—	SON	EMG	RST

P736 ＜Relation of a signal name and a setting bit＞

Bit

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
—	—	—	—	D28	D24	D22	D21	D18	D14	D12	D11	—	—	—	MSSP
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
—	ZLS	TRG	HLD	OR4	OR3	OR2	OR1	EPIH	PCAN	BSTP	MFIN	JOSP	RJOG	FJOG	PST

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 7》 [I/O signal parameter]										
P737	Basic external input signal input allocation 1	R	A M Z P				F	None	00000000 ～ 99999999	34330301
								It allocates External input signals, DI1～DI4 of a basic connector CN1. This allocation setting is as a below sample which divides a signal by 2 digits, and allocation No. in input signal allocation list (page 7-42) is set to the 2 digits. When [00] is set, a set input signal is disabled. (Initial value: All are disabled.) Sample) 34 33 03 01 DI1: Allocates to RST signal DI2: Allocates to SON signal DI3: Allocates to PST signal DI4: Allocates to FJOG signal		
P738	Basic external input signal input allocation 2	R	A M Z P				F	None	00000000 ～ 99999999	13124735
								It allocates External input signals, DI5～DI8 of a basic connector CN1. This allocation setting is as a below sample which divides a signal by 2 digits, and allocation No. in input signal allocation list (page 7-42) is set to the 2 digits. When [00] is set, a set input signal is disabled. (Initial value: All are disabled.) Sample) 13 12 47 35 DI5: Allocates to RJOG signal DI6: Allocates to ZLS signal DI7: Allocates to MD1 signal DI8: Allocates to MD2 signal		
P739	Extended external input signal input allocation 1	R	A M Z P				F	None	00000000 ～ 99999999	00000000
								It allocates External input signals, EI9～EI12 of an optional extension board connector CN1. This allocation setting is as a below sample which divides a signal by 2 digits, and allocation No. in input signal allocation list (page 7-42) is set to the 2 digits. When [00] is set, a set input signal is disabled. (Initial value: All are disabled.) Sample) 28 27 26 25 EI9 : Allocates to PS1 signal EI10: Allocates to PS2 signal EI11: Allocates to PS3 signal EI12: Allocates to PS4 signal		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method: Automatic (A)	Manual (M)	Function (Z)	Pulse train (P)	Level	Setting unit	Setting range	Standard ship. set (Initial value)
								Function		
《Group 7》 [I/O signal parameter]										
P740	Extended external input signal input allocation 2	R	A	M	Z	P	F	None	00000000 ~ 99999999	00000000
								It allocates External input signals, EI3~EI16 of an optional extension board connector CN3. This allocation setting is as a below sample which divides a signal by 2 digits, and allocation No. in input signal allocation list (page 7-42) is set to the 2 digits. When [00] is set, a set input signal is disabled. (Initial value: All are disabled.) Sample) 32 31 30 29 → EI13: Allocates to PS5 signal → EI14: Allocates to PS6 signal → EI15: Allocates to PS7 signal → EI16: Allocates to PS8 signal		
P741	Extended external input signal input allocation 3	R	A	M	Z	P	F	None	00000000 ~ 99999999	00000000
								It allocates External input signals, EI7~EI20 of an optional extension board connector CN3. This allocation setting is as a below sample which divides a signal by 2 digits, and allocation No. in input signal allocation list (page 7-42) is set to the 2 digits. When [00] is set, a set input signal is disabled. (Initial value: All are disabled.) Sample) 44 43 42 41 → EI17: Allocates to OR1signal → EI18: Allocates to OR2 signal → EI19: Allocates to OR3 signal → EI20: Allocates to OR4 signal		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				

《Group 7》 [I/O signal parameter]

P737
P738
P739
P740
P741

Input signal allocation list

Allocat. No.	Code	Signal name	Allocat. No.	Code	Signal name
00	----	Disable	33	PST	Automatic start
01	RST	Reset	34	FJOG	Forward jog
02	EMG	Emergency stop	35	RJOG	Reverse jog
03	SON	Servo ON	36	JOSP	Jog speed selection
04		Reserved	37	MFIN	M complete
05	GSEL	Speed gain selection	38	BSTP	Block stop
06	CLR	Deviation clear	39	PCAN	Program cancel
07	FOT	Forward over travel	40	EPIH	External automatic start inhibit.
08	ROT	Reverse over travel	41	OR1	Speed override 1
09		Reserved	42	OR2	Speed override 2
10		Reserved	43	OR3	Speed override 3
11	SSD	Command direction selection	44	OR4	Speed override 4
12	MD1	Mode selection 1	45	HLD	Hold
13	MD2	Mode selection 2	46	TRG	External trigger
14	TL	Torque limit	47	ZLS	Zero point LS
15	CIH	Command pulse input inhibit	48		Reserved
16	BRON	Forced brake ON	49	MSSP	Internal master axis speed selection
17	PC	Proportional control	50		Reserved
18		Reserved	51		〃
19		〃	52		〃
20		〃	53		〃
21		〃	54		〃
22		〃	55		〃
23		〃	56		〃
24		〃	57	D11	Phase advance
25	PS1	Address set 1	58	D12	Phase delay
26	PS2	Address set 2	59	D14	Electric clutch
27	PS3	Address set 3	60	D18	Master axis selection
28	PS4	Address set 4	61	D21	Cycle complete
29	PS5	Address set 5	62	D22	Pattern selection 1
30	PS6	Address set 6	63	D24	Pattern selection 1
31	PS7	Address set 7	64	D28	Pattern selection 1
32	PS8	Address set 8	65		Reserved

Supplement) If above allocation No. is doubly set to P737～P741, the duplicated signal is controlled by OR.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 7》 [I/O signal parameter]										
P742	Basic external output signal output allocation	R	A M Z P				F	None	00000000 ~ 99999999	00412625
								It allocates External output signals, DO1~DO4 of a basic connector CN1. This allocation setting is as a below sample which divides a signal by 2 digits, and allocation No. in output signal allocation list (page 7-44) is set to the 2 digits. When [00] is set, a set output signal is disabled. (Initial value: All are disabled.) 05 02 01 03 Sample) DO1: Allocates to RDY signal DO2: Allocates to ALM signal DO3: Allocates to WNG signal DO4: Allocates to PN signal		
P743	Extended external output signal output allocation 1	R	A M Z P				F	None	00000000 ~ 99999999	00000000
								It allocates External output signals, E01~E04 of an optional extension board connector CN3. This allocation setting is as a below sample which divides a signal by 2 digits, and allocation No. in output signal allocation list (page 7-44) is set to the 2 digits. When [00] is set, a set output signal is disabled. (Initial value: All are disabled.) Sample) 04 03 02 01 E01: Allocates to ALM signal E02: Allocates to WNG signal E03: Allocates to RDY signal E04: Allocates to SZ signal		
P744	Extended external output signal output allocation 2	R	A M Z P				F	None	00000000 ~ 99999999	00000000
								It allocates External output signals, E05~E08 of an optional extension board connector CN3. This allocation setting is as a below sample which divides a signal by 2 digits, and allocation No. in output signal allocation list (page 7-44) is set to the 2 digits. When [00] is set, a set output signal is disabled. (Initial value: All are disabled.) Sample) 08 07 06 05 E05: Allocates to PN signal E06: Allocates to PRF signal E07: Allocates to BRK signal E08: Allocates to LIM signal		

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				

《Group 7》 [I/O signal parameter]

P742
P743
P744

Output signal allocation list

Allocat. No.	Code	Signal name	Allocat. No.	Code	Signal name
00	----	Disable	25		Reserved
01	ALM	Alarm	26		〃
02	WNG	Warning	27		〃
03	RDY	Servo ready	28		〃
04	SZ	Speed zero	29		〃
05	PN	Positioning complete	30		〃
06	PRF	Rough matching	31	SLSA	Software limit switch A
07	BRK	Brake release	32	SLSB	Software limit switch B
08	LIM	In Torque limit	33	M01	ML OUTPUT 01
09	PEND	Program end	34	M02	ML OUTPUT 02
10	PRDY	Automatic run ready	35	M04	ML OUTPUT 04
11	MMOD	In Manual run	36	M08	ML OUTPUT 08
12	HMOD	In Zero return run	37	M10	ML OUTPUT 10
13	AMOD	In Automatic run	38	M20	ML OUTPUT 20
14	PMOD	In Pulse train run	39	M40	ML OUTPUT 40
15		Reserved	40	M80	ML OUTPUT 80
16		〃	41		Reserved
17	OUT1	General output 1	42	MSTB	M strobe
18	OUT2	General output 2	43		Reserved
19	OUT3	General output 3	44		〃
20	OUT4	General output 4	45		〃
21	OUT5	General output 5	46		〃
22	OUT6	General output 6	47		〃
23	OUT7	General output 7	48		〃
24	OUT8	General output 8	49		〃

※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 7》 [I/O signal parameter]										
P745	Dynamic brake specification selection	R	A M Z P				F	Msec	INVALID/ DMB ON/ DMB OFF	INVALID
								It selects specification of Dynamic brake. ◎ INVALID(No connection) Dynamic brake is not conducted. ◎ DMB ON(Dynamic brake) Normal Dynamic brake is conducted. ◎ DMB OFF(Motion invalid) After power is turned ON, Dynamic brake keeps ON until first Servo ON is conducted and then always keeps OFF.		
P746	Servo ON ready delay time at Dynamic brake	R	A M Z P				F	msec	0 ~ 10	01
								It sets time from confirming motor stop status by Dynamic brake to releasing the brake.		

P745
P746

《Dynamic brake motion》

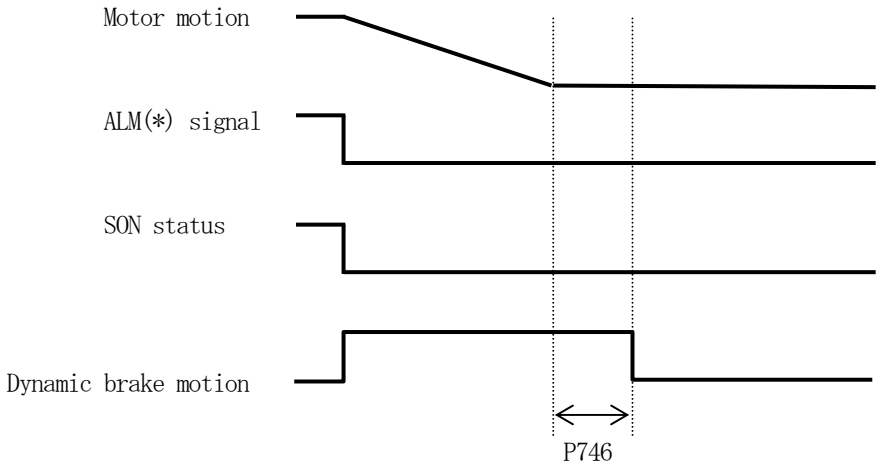
① This function is set by [P745 : Dynamic brake specification selection].

② Dynamic brake is enabled in Servo OFF status when a motor is running, and disabled when the time[P746 Servo ON ready delay time at Dynamic brake] passes after confirming motor stop.

③ This brake is an emergency brake for emergency stop. In motor stop status, this brake does not work.

④ This function is a factory option.

● Basic motion of Dynamic brake(When a motor runs and Torque free alarm occurs.)



※ item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 7》 [I/O signal parameter]										
P747	Adjustment value for servo control error detection	I	A M Z P				F	None	-1000~1000	0000
								The setting value for eliminating the servo control error or invalid servo control error detection is set. Normally, 0 is set. If the servo system is applying external forces to operate the motor, servo control error may get detected irrespective of normal operation. In that case, set this adjustment value in such a way that 50% of ST17 is displayed. Further, if this value is greater, the error is eliminated. ①When this setting is a "-" (Minus) value. In this case, ST17 is displayed with the adjustment value corresponding to the set numeric value. ②When the induction motor is connected with the setting "0". In this case, ST17 is displayed.		

※ Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 8 》 [Free curve motion parameter 1]										
P800	Master axis setting value selection	R	A · · ·				F	None	[mm]/[°]/[in]	[mm]
								Select the basic unit for setting the master axis data. ([mm]:Millimeter / [°]: Degree / [in]: Inch)		
P801	Master axis Command unit selection	R	A · · ·				F	mm/inch/°	0.00001/0.0001/0.001/0.01 /0.1/1/0.000001/0.0000001	0.01
								Select the min setting unit for the master axis data. The decimal point position of master axis data is determined by this parameter and is displayed in that position when the master axis data is displayed. (E.g.) If 0.01 is selected and when master axis position is 6000, then the actual master axis position becomes 6000x0.01=60.00.		
P802	1 cycle resolution	R	A · · ·				S	None	00100 - 50000	06250
								Set resolution for each pattern. The no. of patterns that can be used can be determined by this parameter.		
P803	Master axis 1 cycle change transfer amount	R	A · · ·				S	Master axis setting value	00000001 - 99999999	00000001
								Set the master axis transfer amount for each cycle. Refer to remarks for the setting method		
P804	Master axis 1 cycle change pulse	R	A · · ·				S	Pulse	00000001 - 99999999	00000001
								. Set the master axis motion pulse for each cycle. Refer to remarks for the setting method		
P805	Master axis 1 cycle transfer amount	R	A · · ·				S	Master axis setting value	00000001 - 99999999	00000001
								Set the master axis transfer amount for each cycle. However, if factorized as given in the remarks for [P803:Master axis 1 cycle change transfer amount], then it is different than [P803:Master axis 1 cycle change transfer amount].		

※ Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train				
			A	M	Z	P		Function		
《Group 8 》 [Free curve motion parameter 1]										
P806	Phase tuning amount	I	A · · ·				F	Master axis setting value	0 - 65535	00000
								Set the phase tuning amount for 1 cycle in the phase tuning. However, this data is set in the unit of master axis settings.		
<<Remarks>> The conversion to master axis position from the master axis command pulse is done using the formula given below. Master axis position = master axis input pulse x conversion coefficient Conversion coefficient = [P803:Master axis 1 cycle change transfer amount] / [P804: Master axis 1 cycle change pulse] *If 1 cycle converting pulse is out of the specified range or cannot be set in integers, then set by factorizing it.										
P808	Internal master axis speed 1	I	A · · ·				F	Pulse/S	0000000 - 5000000	0000000
								Set the data for internal master axis speed 1(When MSSP signal is OFF). [Caution] This setting value is a value when [P602:Pulse train command magnification] is set as "x1".		
P809	Internal master axis speed 2	I	A · · ·				F	Pulse/S	0000000 - 5000000	0000000
								Set the data for the internal master axis speed 2 (When MSSP signal is ON). [Caution] This setting value is a value when [P602:Pulse train command magnification] is set as "x1".		
P810	Internal master axis accl. time	R	A · · ·				F	Sec	00.00 - 99.999	00.000
								Set the accel time required by the internal master axis to achieve the speed of 100kpps from stop position. [Caution] The above value of 100Kpps is a value when [P602:Pulse train command magnification] is set as "x1".		
P811	Internal master axis decel. time	R	A · · ·				F	Sec	00.00 - 99.999	00.000
								Set the decel time required by the internal master axis to stop from a speed of 100kpps. [Caution] The above value of 100Kpps is a value when [P602:Pulse train command magnification] is set as "x1".		

※ Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 8 》 [Free curve motion parameter 1]										
P812	Master axis Speed zero range	R	A · · ·				F	Pulse/S	0000000 - 5000000	0000000
								Set the output range for the Master axis speed zero (MSZ).		
P813	Waiting position designation Index data No.	R	A · · ·				F	None	00 - 99	00
								It is used for setting the index data NO. to designate the waiting position after Free curve movement is completed		
P814	Waiting position returning speed designation Index data No.	R	A · · ·				F	None	00 - 99	00
								It is used for setting the index data NO. to designate the returning speed to the waiting position after Free curve movement is completed. When speed data is either [0] or [Minus],waiting position return movement will not be done.		
P820	Slave axis synchronous delay compensation time	I	A · · ·				F	msec	00.0 - 99.9	00.5
								Set synchronous delay compensation time of the slave axis for master axis. This data compensates the setting time pulse as a compensation value for the master command. Generally, it is set in terms of the following calculations. Setting value = (S SHAPE ACCEL./DECEL. TIME [P210:S SHAPE ACCEL./DECEL. TIME]/2)+ 0.5 However, using pulse train communication receive, when [P602:] of this machine is "ID0.CMNDP" Setting value = (S SHAPE ACCEL./DECEL. TIME[P210:S SHAPE ACCEL./DECEL. TIME]/2)		
P821	Slave axis synchronous delay compensation filter time constant	I	A · · ·				F	Sec	0.000 - 0.100	0.020
								Set the filter time constant for response adjustment for delay compensation time.		
P830	Master axis reference position 1 (SEL.1)	R	A · · ·				F	Master axis setting value	00000000 - 99999999	00000000
								Sets the reference position of the master that starts the free curve motion. This parameter is used when SEL.1 is selected.		

※ Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 8》 [Free curve motion parameter 1]										
P831	Master axis delay length 1 when running (SEL.1)	R	A · · ·				F	Master axis setting value	-99999999 - 99999999	00000000
			Sets the master axis position that starts the count of the master axis after the free curve motion is started. However, the "±" settings are carried out according to the direction of master axis motion. This parameter is used when SEL.1 is selected.							
P832	Pattern magnification denominator 1(SEL.1)	R	A · · ·				F	None	-99999999 - 99999999	00000000
			Sets the pattern magnification / reduction denominator. The pattern is not magnified / reduced when this data is 0. This parameter is used when SEL.1 is selected.							
P833	Pattern magnification numerator 1(SEL.1)	R	A · · ·				F	None	00 - 99	00
			Sets the Index data no. of the Pattern magnification / reduction numerator. This parameter is used when SEL.1 is selected.							
P834	Electric clutch position 1 (SEL. 1)	I	A · · ·				F	Master axis setting value	00000000 - 99999999	00000000
			It is used for setting the master axis position where the electric clutch stops. This parameter is effective when SEL. 1 is selected							
P835	Master axis reference position 2(SEL.2)	R	A · · ·				F	Master axis setting value	00000000 - 99999999	00000000
			The function is similar to [P830: Master axis reference position 1 (SEL.1)]. * But, this parameter is used when SEL.2 is selected.							

※ Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 8 》 [Free curve motion parameter 1]										
P836	Master axis delay length 2 when running(SEL.2)	R	A · · ·				F	Master axis setting value	00000000 - 99999999	00000000
								The function is similar to [P831: Master axis delay length 1 when running (SEL.1)]. * But, this parameter is used when SEL.2 is selected.		
P837	Pattern magnification denominator 2(SEL.2)	R	A · · ·				F	Master axis setting value	-99999999 - 99999999	00000000
								The function is similar to [P832: Pattern magnification denominator 1 (SEL.1)]. * But, this parameter is used when SEL.2 is selected.		
P838	Pattern magnification numerator 2(SEL.2)	R	A · · ·				F	None	00 - 99	00
								The function is similar to [P833: Pattern magnification numerator 1 (SEL.1)]. * But, this parameter is used when SEL.2 is selected.		
P839	Electric clutch position 2 (SEL. 2)	I	A · · ·				F	Master axis setting value	00000000 - 99999999	00000000
								The function is same as 〔P834: Electric clutch position 1〕 This parameter is effective when SEL. 2 is selected		
P840	Master axis reference position 3(SEL.3)	R	A · · ·				F	Master axis setting value	00000000 - 99999999	00000000
								The function is similar to [P830: Master axis reference position 1 (SEL.1)] * But, this parameter is used when SEL.3 is selected.		

※ Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 8 》 [Free curve motion parameter 1]										
P841	Master axis delay length 3 when running(SEL.3)	R	A · · ·				F	Master axis setting value	-99999999 - 99999999	00000000
			The function is similar to [P831: Master axis delay length 1 when running (SEL.1)]. * But, this parameter is used when SEL.3 is selected.							
P842	Pattern magnification denominator 3(SEL.3)	R	A · · ·				F	Master axis setting value	-99999999 - 99999999	00000000
			The function is similar to [P832: Pattern magnification denominator 1 (SEL.1)]. * But, this parameter is used when SEL.3 is selected.							
P843	Pattern magnification numerator 3(SEL.3)	R	A · · ·				F	None	00 - 99	00
			This function is similar to [P833: Pattern magnification numerator 1 (SEL.1)]. * But, this parameter is used when SEL.3 is selected.							
P844	Electric clutch position 3 (SEL. 3)	I	A · · ·				F	Master axis setting value	00000000 - 99999999	00000000
			It is used for same as (P834: Electric clutch position 1). This parameter is effective when SEL. 3 is selected.							

※ Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 9 》[Free curve motion parameter 2]										
P900	Master postponed length 1 when free curve movement is cleared (SEL. 1)	R	A · · ·				F	Master axis setting value	00000000 – 99999999	00000000
								It is used for setting the postponed length of master axis from the time of Free curve movement clear signal (TRG) is input to the time of Movement clear is done. (Relationship to the master postponed Index data No. 1 (P901)) It is postponed even longer based on the value of Index data designated by master postponed Index data 2. In this way, Free curve movement is possible according to the standard position that is based on the Free curve movement clear signal (TRG) position.		
P901	Master postponed length Index data No. 1 when Free curve movement is cleared. (SEL. 1)	R	A · · ·				F	None	00 – 99	00
								It is used for setting the postponed length of master axis from the time of Free curve movement clear signal (TRG) is input to the time of Movement clear is done. (Relationship to the master postponed Index data No. 1 (P900)) Please refer to Master postponed 1 (P900)		
P902	Master postponed length Index data No. 2 when Free curve movement is cleared. (SEL. 2)	R	A · · ·				F	Master axis setting value	00000000 – 99999999	00000000
								It is used for setting the postponed length of master axis from the time of Free curve movement clear signal (TRG) is input to the time of Movement clear is done. 〔Relationship to the master postponed Index data No. 2 (P903)〕 It is postponed even longer based on the value of Index data designated by master postponed Index data 2. In this way, Free curve movement is possible according to the standard position that is based on the Free curve movement clear signal (TRG) position		
P903	Master postponed length Index data No. 2 when Free curve movement is cleared. (SEL. 2)	R	A · · ·				F	None	00 – 99	00
								It is used for setting the postponed length of master axis from the time of Free curve movement clear signal (TRG) is input to the time of Movement clear is done. 〔Relationship to the master postponed Index data No. 2 (P902)〕 Please refer to Master postponed 2 (P902)		

※ Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON/ S:Motor stop

※ item description [Level] S:Setting is required./ F:Run can be done by initial value./ M:Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 8 》[Free curve motion parameter 2]										
P904	Master postponed length Index data No. 3 when Free curve movement is cleared. (SEL. 3)	R	A・・・				F	Master axis setting value	00000000 - 99999999	00000000
								It is used for setting the postponed length of master axis from the time of Free curve movement clear signal (TRG) is input to the time of Movement clear is done. 〔Relationship to the master postponed Index data No. 3 (P905)〕 It is postponed even longer based on the value of Index data designated by master postponed Index data 3. In this way, Free curve movement is possible according to the standard position that is based on the Free curve movement clear signal (TRG) position		
P905	Master postponed length Index data No. 3 when Free curve movement is cleared. (SEL. 3)	R	A・・・				F	None	00 - 99	00
								It is used for setting the postponed length of master axis from the time of Free curve movement clear signal (TRG) is input to the time of Movement clear is done. 〔Relationship to the master postponed Index data No. 3 (P904)〕 Please refer to Master postponed 3 (P904)		

※ Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop

※ item description [Level] S : Setting is required. / F : Run can be done by initial value. / M : Reserved

※ When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Chapter 8 Index data

8-1 List of index data

Index data No.	Index data name	Type	Function
IX00 - IX49	Index data 00 - Index data 49	Hold	Index data, which retains data even when the power is OFF. But, it can be re-written only 10,000 times maximum.
IX50 - IX61	Index data 50 - Index data 61	0 Clear	Voluntary index data, which does not retain data when the power is OFF. It is “0” at power ON.
IX62	Index data 62	0 Clear	Index data for data of output voltage to the analog monitor. Data value: Output voltage relation -499:-10V, 0:0V, 499:+10V
IX63	Index data 63	0 Clear	Index data for data of output voltage to the analog monitor. Data value: Output voltage relation -499:-10V, 0:0V, 499:+10V
IX64 - IX65	Index data 64 - Index data 65	0 Clear	Voluntary index data, which does not retain data when the power is OFF. It is “0” at power ON.
IX66	Index data 66		Index data for current position.
IX67	Index data 67	0 Clear	Index data which counts down numbers, every 10msec when a numeric value entered is other than 0.
IX68	Index data 68	0 Clear	Sets the operation pattern for free curve motion and when returning to the reference position. But when this area is set as “0” or “minus”, then “pattern selection 1-3” are enabled.
IX69	Index data 69	0 Clear	Index data for data to be output for General output signal.
IX70 - IX99	Index data 70 - Index data 99	0 Clear	Voluntary index data, which does not retain data when the power is OFF. It is “0” at power ON.

Note: ”0 Clear” in the Type column
“0 Clear” data in the Type column does not retain the Index data contents and performs “0 Clear” when power is switched OFF.
It is suitable for data that can be cleared when power is switched OFF or varying data like the current position, etc.

8-2 Index data specifications (Handling on each command)

Setting Item	Index data handling (Example: (P302:Command unit) is 0.1)
Positioning position (Data with mark)	• Data is the setting value. [Example] Index data setting -125.6 → Position -125.6mm
Positioning position (Data without mark)	• When data is +, data is the setting value. [Example] Index data setting 125.6 → Position 125.6° • When data is -, data is the setting value without -mark. [Example] Index data setting -325.6 → Position 325.6°
External trigger position (Data without mark)	• When data is +, data is the setting value. [Example] Index data setting 125.6 → Position 125.6mm • When data is -, data is the setting value without -mark. [Example] Index data setting -325.6 → Position 325.6mm
Speed (Data without mark)	• When data is +, data is the setting value. [Example] Index data setting 125.6 → Speed 125.6mm/s • When data is -, data is the setting value without -mark. [Example] Index data setting -325.6 → Speed 325.6mm/s • When data is 0, data is the min. setting unit speed. [Example] Index data setting 0.0 → Speed 0.1mm/s • When data exceeds the rated speed, data is the rated speed.
Speed (rpm) (Data with mark)	• Data is the setting value without a decimal point. [Example] Index data setting -125.6 → Speed(rpm) -1256rpm • When the data exceeds the rated speed, the data becomes rated speed (rpm).
Time (Data without mark / Data with mark)	[Other than Spin speed command, Spin timer command] • Data is the setting value without ± mark and the unit is 10msec. [Example] Index data setting -125.6 → Time 12.56sec • When the data exceeds the setting range, data is the max value. [In case of Spin speed command, Spin timer command] • When the data is +, the data is in the units of 10msec. [Example] Index data setting 125.6 → Time 12.56sec • When data is -, the Spin speed and Spin timer command there onwards is cancelled. • When the data exceeds the setting range, data is the max value.
General output (Data without mark)	• Data is the setting value without a decimal point and ±, and is lower 8 bit binary number converted from a decimal number. [Example] Index data setting -52.7 → General output ~~10~~00001111 (binary)
M output (Data without mark)	• Data is the setting value without a decimal point and ±, and is lower 2 bit binary number [Example] Index data setting -162.5 → M output 25
Address (Data without mark)	• Data is the setting value without a decimal point. [Example] Index data setting 1.2 → Address 12 • When data exceeds the setting range or is "－", alarm stop occurs.
Looping frequency (Data without mark)	• Data is the setting value without a decimal point and ±. [Example] Index data setting -1.2 → Looping frequency 12 • When data exceeds the setting range, data is the max value.
Processing data (Data with mark)	• Data is the setting value without a decimal point. [Example] Index data setting -1.2 → Processing data –12 • When processing data exceeds the setting range, data is the max value of the range.
Operations pattern data (Data with mark)	• Data is the setting value without a decimal point. • When the data setting is “0” and “-“, the “Pattern selection 1-3” signal is enabled. • When a pattern outside the valid range is selected and free curve motion is executed, an alarm occurs.

Chapter 9 Commands

9-1 List of commands

Group	Title	Command name	Function
6 Free Curve Motion Command	FCM	Free curve motion [Free Curve Motion]	Executes a selected free curve pattern motion by synchronizing the slave axis to the master axis.
	FRR	Free curve reference return [Free curve Reference Return]	Positions the slave axis in position corresponding to the master axis reference position on a selected free curve pattern.
	FMR	Free curve master return [Free curve Master Return]	Positions the slave axis in position corresponding to the specified master axis position on a selected free curve pattern.
	PCLR	Free curve pattern clear [free curve Pattern CleaR]	Clears the selected free curve pattern data.
	PSET	Free curve point set [free curve Point SET]	Registers the slave axis position and general output at a suitable point on the specified master axis position of the selected free curve pattern.
	POUT	Free curve point out set [free curve Point OUT set]	Registers the general output at a suitable point on the specified master axis position of the selected free curve pattern.
	PCNV	Free curve pattern convert [free curve Pattern CoNVert]	Converts the selected free curve pattern into executable data.
0 Motion Command	NOP	No Function [No OPeration]	No motion.
	POS	Positioning [POSitioning]	Executes positioning.
	HOME	Zero return [HOME positioning]	Executes zero return.
	INDX	Index positioning [INDeX positioning]	Executes Positioning of the rotating work to a shortest rotating direction.
1 No Motion Command	M	M output [M out]	Waits for M to complete after sending M output and M strobe signals.
	TIME	Timer [TIMEr]	Waits for specified time.
	PEND	Program end [Program END]	Finishes executing Program.
	CALL	Subroutine call [sub-routine CALL]	Repeats Subroutine for specified no. of times.
	RET	Subroutine return [sub-routine RETurn]	Indicates the completion of a specified Subroutine and returns to the caller address.
	GSEL	Gain select [Gain SELect]	Changes over to a selected motion gain (excluding the positioning loop gain) after the specified time has elapsed.

Group	Title	Command name	Function
2 Processing Command	IMOV	Transfer [Indirect MOVe]	Transfers the specified data to Index data.
	ADD	Addition [ADDition]	Executes Addition and transfers the result to Index data.
	SUB	Subtraction [SUBtraction]	Executes Subtraction and transfers the result to Index data.
	MUL	Multiplication [MULtiplcation]	Executes Multiplication and transfers the result to Index data.
	DIV	Division [DIVision]	Executes Division and transfers the result to Index data.
	AND	Logical AND [AND]	Executes Logical AND, and transfers the result to Index data.
	OR	Logical OR [OR]	Executes Logical OR, and transfers the result to Index data.
	XOR	Exclusive logical OR [eXclusive OR]	Executes Exclusive logical OR, and transfers the result to Index data.
3 Jump Command	JMP	Unconditional jump [JuMP]	Jumps to a specified address without any condition.
	JZ	0 jump [Jump if Zero]	Jumps to a specified address, if the branch decision (Index data) is 0.
	JNZ	Not 0 jump [Jump if Not Zero]	Jumps to a specified address, if the branch decision (Index data) is not 0.
	JG	Greater than 1 jump [Jump if Greater than zero]	Jumps to a specified address, if the branch decision (Index data) is 1 or greater.
	JL	Less than -1 jump [Jump if Less than zero]	Jumps to a specified address, if the branch decision (Index data) is -1 or less.
5 Continuous Motion Command	SPNS	Spin speed [SPiN Speed]	Achieves the specified speed (rpm) for set Accel / Decel time.
	SPNT	Spin timer [SPiN Timer]	Retains rotations achieved by the Spin speed command for the specified time.
	SPNP	Spin positioning [SPiN POSitioning]	Executes Positioning from rotations at Spin speed to a specified position for the set time.
	SPOS	Positioning [Sequential POSitioning]	Function is same as the [POS] command and the Program continues even after the motion is completed.
	CONT	Simple continuous positioning [CONTinue POSitioning]	Here, this command continues and so does the motion without stopping. And if this is last or single command, function is same as SPOS.
	REPT	Repeat positioning [REPeaT POSitioning]	Repeats specified Positioning for set no. of times.
	SHOM	Zero return [Sequential HOME positioning]	Function is same as the [HOME] command and the Program continues even after the motion is completed.
	SIND	Index positioning [Sequential INDeX positioning]	Function is same as the [INDX] command and the Program continues even after the motion is completed.

9-2 Command name specifications

The various commands supported in this device are described below.

Refer to the separate “VC series Instructions manual [Commands]” for further information on the working of commands.

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (Direct data) Setting range (Index data)
			Function		
<Group 6> [Free curve motion command]					
FCM	Free curve motion [Free Curve Motion]	Yes (1)	TRG [Synchronous start position adjustment selection]	None	00000000~99999999 IX00~IX99 (0:Disabled, Other than 0:Enabled)
			PSEL [Motion parameter selection]	None	SEL.1/SEL.2/SEL.3
			· Executes a free curve motion in the pattern and parameters specified in the “Pattern selection” and “PSEL”. · The motion is stopped when the “Cycle end signal” is ON. · On enabling TRG [Synchronous start position adjustment selection], high precision operations are started based on the TRG signal input position.		
FRR	Free curve reference return [Free curve Reference Return]	Yes (1)	F [Positioning speed]	mm,°,in /sec	-00000001~99999999 IX00~IX99
			PSEL [Motion parameter selection]	None	SEL.1/SEL.2/SEL.3
			・ Executes the slave axis positioning in correspondence with the parameters of the master axis reference position as specified in the” Pattern selection” and “PSEL”. ・ When “0” is set in F [Positioning speed], positions the slave axis in correspondence with the master axis reference position, at that instance without any motion. (Here, the current position of the slave axis is updated.) ・ When “-1” is set in F [Positioning speed], positions the slave axis in correspondence with the master axis reference position, at that instance without any motion. (Here, the current position of the slave axis is not updated, but only the slave axis position used in the free curve motion is updated.)		

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (Direct data) Setting range (Index data)
			Function		
<Group 6> [Free curve motion command]					
FMR	Free curve master return [Free curve Master Return]	Yes (1)	MPOS [Master positioning]	mm/°/in	00000000~99999999 IX00~IX99
			F [Positioning speed]	mm,°,in /sec	-00000001~99999999 IX00~IX99
			PSEL [Motion parameter selection]	None	SEL.1/SEL.2/SEL.3
			・ Executes the slave axis positioning as calculated in correspondence with the pattern as specified in the ”Master positioning”, ” Pattern selection” and “PSEL”. ・ When “0” is set in F[Positioning speed], positions the slave axis in correspondence with the master axis reference position, at that instance without any motion. (Here, the current position of the slave axis is updated.) ・ When “-1” is set in F[Positioning speed], positions the slave axis in correspondence with the master axis reference position, at that instance without any motion. (Here, the current position of the slave axis is not updated, but only the slave axis position used in the free curve motion is updated.)		

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (Direct data) Setting range (Index data)
			Function		
<Group 6>[Free curve motion command]					
PCLR	Free curve pattern clear [free curve Pattern CLeaR]	Yes (1)	PATN [Pattern selection]	None	000~500 IX00~IX99
			· Clears the free curve data of the selected pattern. (Clear means, disregards all data and sets it to "0") · Clears all patterns when "0" is set in pattern.		
PSET	Free curve point set [free curve Point SET]	Yes (1)	MPOS [Master positioning]	mm/°/in	00000000~99999999 IX00~IX99
			POS [Slave positioning]	mm/°/in	-99999999~99999999 IX00~IX99
			OUT [General output]	Binary number	00000000~11111111 IX00~IX99
			PATN [Pattern selection]	None	000~500 IX00~IX99
			· Registers the slave position and the general output at a suitable point on the specified master axis position of the selected pattern. · The fractions are discarded when converting the master axis position to points.		
POUT	Free curve point out set [free curve Point OUT set]	Yes (1)	MPOS [Master positioning]	mm/°/in	00000000~99999999 IX00~IX99
			OUT [General output]	Binary number	00000000~11111111 IX00~IX99
			PATN [Pattern selection]	None	000~500 IX00~IX99
			· Registers the general output at a suitable point on the specified master axis position of the selected pattern. · The fractions are discarded when converting the master axis position to points.		
PCNV	Free curve pattern convert [free curve Pattern CoNVert]		PATN [Pattern selection]	None	000~500 IX00~IX99
			· Converts the free curve data of the selected pattern to an executable format. · Data for all patterns is converted when "0" is set in the pattern.		

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (Direct data) Setting range (Index data)
			Function		
<Group 0>[Motion command]					
NOP	No function [No OPeration]	No (1)	None	None	None
			· No motion.		
POS	Positioning [POSitioning]	No (2)	POS [Positioning position / direction]	mm/°/in	-99999999~99999999 IX00~IX99
			A/I [Absolute position / Relative position]	None	ABSOLUTE/INCREMENT
			F [Positioning speed]	mm,°,in /sec	00000000~99999999 IX00~IX99
			UPDN [Accel. Time / Decel. Time]	None	SEL.1/SEL.2/SEL.3
			TRG [External trigger position]	mm/°/in	00000000~99999999 IX00~IX99
			OUT [General output]	Binary number	00000000~11111111 IX00~IX99
			· Executes positioning. · External trigger positioning is possible. External trigger position sets travel amount from TRG signal input. · General output is possible when motion starts. · Finishes the program after motion is completed.		
HOME	Zero return [HOME positioning]	No (2)	TYPE [Zero return method]	None	STD.HOME/LS LESS/ STOP HOME/OT HOME
			DIR [Motion direction]	None	FORWARD/REVERSE
			OUT [General output]	Binary number	00000000~11111111 IX00~IX99
			· Executes Zero return. · Setting Zero return method and direction is possible. · Except the command setting data, the associated parameters for the Zero return are followed. · General output is possible when motion starts. · Finishes the program after motion is completed.		
INDX	Index positioning [INDeX positioning]	No (2)	POS [Positioning position / direction]	mm/°/in	00000000~99999999 IX00~IX99
			F [Positioning speed]	mm,°,in /sec	00000000~99999999 IX00~IX99
			UPDN [Accel. Time / Decel. Time]	None	SEL.1/SEL.2/SEL.3
			OUT [General output]	Binary number	00000000~11111111 IX00~IX99
			· Executes positioning of the rotating work to a shorter rotating direction. · General output is possible when motion starts. · Finishes the program after motion is completed.		

<table>
<tr><td rowspan="3">Title</td><td rowspan="3">Command name</td><td rowspan="3">BS</td><td colspan="3">Setting data</td></tr>
<tr><td rowspan="2">Data</td><td rowspan="2">Setting unit</td><td>Setting range (Direct data)</td></tr>
<tr><td>Setting range (Index data)</td></tr>
<tr><td colspan="6">Function</td></tr>
<tr><td colspan="6"><Group 1>[No motion command]</td></tr>
<tr><td rowspan="3">M</td><td rowspan="3">M output

[M out]</td><td rowspan="3">Yes
(1)</td><td rowspan="2">M
[M output]</td><td rowspan="2">None</td><td>00~99</td></tr>
<tr><td>IX00~IX99</td></tr>
<tr><td colspan="3">· Waits for M complete signal, after sending M output and M strobe signal.
· The sent M output retains data until a command in the effective setting status for the next M output is executed.
· If this command is executed with the input as M complete, then M strobe is not sent until the input signal is OFF.</td></tr>
<tr><td rowspan="5">TIME</td><td rowspan="5">Timer

[TIMEr]</td><td rowspan="5">Yes
(1)</td><td rowspan="2">TIME
[Timer time]</td><td rowspan="2">0.01sec</td><td>000000.00~999999.99</td></tr>
<tr><td>IX00~IX99</td></tr>
<tr><td rowspan="2">OUT
[General output]</td><td rowspan="2">Binary number</td><td>00000000~11111111</td></tr>
<tr><td>IX00~IX99</td></tr>
<tr><td colspan="3">· Waits for the specified time.
· General output is possible when motion starts.</td></tr>
<tr><td rowspan="2">PEND</td><td rowspan="2">Program end

[Program END]</td><td rowspan="2">No
(2)</td><td>None</td><td>None</td><td>None</td></tr>
<tr><td colspan="3">· Finishes executing the program.
· When this command is completed, Program end signal (PEND) and Auto run ready signal (PRDY) is sent.
· General output and M output are retained.</td></tr>
<tr><td rowspan="5">CALL</td><td rowspan="5">Subroutine call

[sub-routine CALL]</td><td rowspan="5">Yes
(4)</td><td rowspan="2">CADR
[Called address]</td><td rowspan="2">None</td><td>000~279</td></tr>
<tr><td>IX00~IX99</td></tr>
<tr><td rowspan="2">REPT
[Looping frequency]</td><td rowspan="2">None</td><td>00000~65535</td></tr>
<tr><td>IX00~IX99</td></tr>
<tr><td colspan="3">· Repeats subroutine specified by CADR (REPT frequency).
· Nesting (Looping frequency for executing this command without returning) is possible max 8 times.
· When the Looping frequency is “0”, this command is ignored and the next command is executed.</td></tr>
<tr><td rowspan="2">RET</td><td rowspan="2">Subroutine return
[sub-routine RETurn]</td><td rowspan="2">Yes
(1)</td><td>None</td><td>None</td><td>None</td></tr>
<tr><td colspan="3">· Finishes called Subroutine and returns to the caller address.
· When the subroutine is executed for the specified number of times, the executing address is changed to the next caller address.</td></tr>
<tr><td rowspan="5">GSEL</td><td rowspan="5">Gain select

[Gain SELect]</td><td rowspan="5">No
(1)</td><td rowspan="2">SEL
[Gain selection]</td><td rowspan="2">None</td><td>SEL/ON/OFF</td></tr>
<tr><td></td></tr>
<tr><td rowspan="2">TIME
[Timer time]</td><td rowspan="2">0.001sec</td><td>00000.000~99999.999</td></tr>
<tr><td>IX00~IX99</td></tr>
<tr><td colspan="3">· Changes to selected motion gain (excluding the position loop gain) after the set time has elapsed.
· The motion gain specified by this command is invalid during, “Program end (PEN)”, “RST/PCA”, “Alarm occurrence”, “other than auto transfer mode” and follows the GSEL input signal.
· The Gain selection is as given below.
SEL : Follows the GSEL input signal.
ON : Works as if the GSEL input signal is ON.
OFF : Works as if the GSEL input signal is OFF.</td></tr>
</table>

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (Direct data) Setting range (Index data)
			Function		
<Group 2>[Processing command]					
IMOV	Transfer [Indirect MOVe]	No (1)	DST [Transfer destination]	None	None IX00~IX99
			SOC [Transfer source data]	None	-99999999~99999999 IX00~IX99
			Transfers specified data to the Index data. Expression: DST (Index) ← SOC		
ADD	Addition [ADDition]	No (1)	DST [Addition results transfer destination]	None	None IX00~IX99
			SOC1 [Addition factor 1]	None	-99999999~99999999 IX00~IX99
			SOC2 [Addition factor 2]	None	-99999999~99999999 IX00~IX99
			· Executes Addition and transfers the results to the Index data. · In case of Index data, a decimal point is ignored and the numeric value is treated as an integer for processing. (E.g.: 1.25 is treated as 125 for processing.) · The processing results are clumped at ±99999999. Expression: DST (Index) ← SOC1 + SOC2		
SUB	Subtraction [SUBtraction]	No (1)	DST [Process results transfer destination]	None	None IX00~IX99
			SOC1 [Subtraction factor 1]	None	-99999999~99999999 IX00~IX99
			SOC2 [Subtraction factor 2]	None	-99999999~99999999 IX00~IX99
			· Executes Subtraction and transfers the results to Index data. · In case of Index data, a decimal point is ignored and the numeric value is treated as an integer for processing. (E.g.: 1.25 is treated as 125 for processing.) · The processing results are clumped at ±99999999. Expression: DST (Index) ← SOC1 - SOC2		

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (Direct data) Setting range (Index data)
			Function		
<Group 2>[Processing command]					
MUL	Multiplication [MULtiplcation]	No (1)	DST [Process results transfer destination]	None	None IX00~IX99
			SOC1 [Multiplication factor 1]	None	-99999999~99999999 IX00~IX99
			SOC2 [Multiplication factor 2]	None	-99999999~99999999 IX00~IX99
			· Executes Multiplication and transfers the results to Index data. · In case of Index data, a decimal point is ignored and the numeric value is treated as an integer for processing. (E.g.: 1.25 is treated as 125 for processing.) · The processing results are clumped at ±99999999. Expression: DST (Index) ← SOC1 x SOC2		
DIV	Division [DIVision]	No (1)	DST1 [Division remainder transfer destination]	None	None IX00~IX99
			DST2 [Division quotient transfer destination]	None	None IX00~IX99
			SOC1 [Dividend]	None	-99999999~99999999 IX00~IX99
			SOC2 [Divisor]	None	-99999999~99999999 IX00~IX99
			· Executes Division and transfers the results to Index data. · In case of Index data, a decimal point is ignored and the numeric value is treated as an integer for processing. (E.g.: 1.25 is treated as 125 for processing.) Expression: DST2 (Index) ← SOC1 ÷ SOC2 DST1 (Index) ← Remainder		
AND	Logical AND [AND]	No (1)	DST [Process results transfer destination]	None	None IX00~IX99
			SOC1 [Logical AND factor 1]	None	-99999999~99999999 IX00~IX99
			SOC2 [Logical AND factor 1]	None	-99999999~99999999 IX00~IX99
			· Executes AND and transfers the results to Index data. · In case of Index data, a decimal point is ignored and the numeric value is treated as an integer for processing. (E.g.: 1.25 is treated as 125 for processing.) Expression: DST(Index) ← SOC1 AND SOC2		

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (Direct data) Setting range (Index data)
			Function		
<Group 2>[Processing command]					
OR	Logical OR [OR]	No (1)	DST [Process results transfer destination]	None	None IX00~IX99
			SOC1 [Logical OR factor 1]	None	-99999999~99999999 IX00~IX99
			SOC2 [Logical OR factor 2]	None	-99999999~99999999 IX00~IX99
			・ Executes OR and transfers the results to Index data. ・ In case of Index data, a decimal point is ignored and the numeric value is treated as an integer for processing. (E.g.: 1.25 is treated as 125 for processing.) Expression: DST (Index) ← SOC1 OR SOC2		
XOR	Exclusive logical OR [eXclusive OR]	No (1)	DST [Process results transfer destination]	None	None IX00~IX99
			SOC1 [Exclusive logical OR factor 1]	None	-99999999~99999999 IX00~IX99
			SOC2 [Exclusive logical OR factor 2]	None	-99999999~99999999 IX00~IX99
			・ Executes Exclusive OR and transfers the results to Index data. ・ In case of Index data, a decimal point is ignored and the numeric value is treated as an integer for processing. (E.g.: 1.25 is treated as 125 for processing.) Expression: DST (Index) ← SOC1 XOR SOC2		

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (Direct data) Setting range (Index data)
			Function		
<Group 3>[Jump command]					
JMP	Un-conditional jump [JuMP]	Yes (1)	JADR [Jump destination address]	None	000~279 IX00~IX99
			· Jumps to specified address without any condition.		
JZ	0 Jump [Jump if Zero]	Yes (1)	JADR [Jump destination address]	None	000~279 IX00~IX99
			SOC [Branch condition decision data]	None	None IX00~IX99
			· Jumps to specified address when Branch decision is 0.		
JNZ	Not 0 jump [Jump if Not Zero]	Yes (1)	JADR [Jump destination address]	None	000~279 IX00~IX99
			SOC [Branch condition decision data]	None	None IX00~IX99
			· Jumps to specified address when Branch decision is not 0.		
JG	Greater than 1 jump [Jump if Greater than zero]	Yes (1)	JADR [Jump destination address]	None	000~279 IX00~IX99
			SOC [Branch condition decision data]	None	None IX00~IX99
			· Jumps to specified address when Branch decision is 1 or more.		
JL	Less than -1 jump [Jump if Less than zero]	Yes (1)	JADR [Jump destination address]	None	000~279 IX00~IX99
			SOC [Branch condition decision data]	None	None IX00~IX99
			· Jumps to specified address when Branch decision is -1 or less.		

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (Direct data) Setting range (Index data)
			Function		
<Group 5>[Continuous motion command]					
SPNS	Spin speed [SpiN Speed]	No (1)	RPM [Speed]	rpm	-9999~9999 IX00~IX99
			TIME [Accel./ Decel.time]	0.01sec	000.00~655.35 IX00~IX99
			M [M output]	None	00~99 IX00~IX99
			· Achieves specified speed (rpm) for the set Accel./Decel.time. But if Accel./ Decel.time setting exceeds the stipulated max. value as given below, the Accel./ Decel.is performed at the max. value, and the reached speed is constantly retained during excess time. Stipulated time : Max.Accel.time from 0 rpm to rated speed : 300.00 sec. Max.Decel.time from rated speed to 0 rpm.: 300.00 sec. · Can send M output at Motion start and wait for M completion. · When Hold (HLD) is given as an input when executing this command, a motor decelerates and stops for [P214:Decel.time 1] and on restarting, the M strobe signal output is put to OFF. · If the data specified in the Accel./ Decel.time is negative (Only Index data specified), the spin speeds and the spin timer command set there onwards are cancelled.		
SPNT	Spin timer [SpiN Timer]	No (1)	TIME [Retaining time]	0.01sec	000000.00~999999.99 IX00~IX99
			M [M output]	None	00~99 IX00~IX99
			· Retains speed status at Spin speed for specified time. · Can send M output at Motion start and wait for M completion. · When Hold (HLD) is given as an input when executing this command, a motor decelerates and stops for [P214:Decel.time 1] and on restarting, the M strobe signal output is put to OFF. · If the data specified in the retaining time is negative (Only Index data specified), the spin speeds and the spin timer command set there onwards are cancelled.		
SPNP	Spin positioning [SpiN Positioning]	Yes (1)	POS [Positioning position]	mm/°/in	00000000~99999999 IX00~IX99
			DOWN [Decel. time selection]	None	SEL.1/SEL.2/SEL.3
			M [M output]	None	00~99 IX00~IX99
			· Executes Positioning from the state of rotations at Spin speed to a specified position for the set time. · Can send M output at Motion start and wait for M completion. · When Hold (HLD) is given as an input when executing this command, a motor decelerates and stops for DOWN setting.		

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (Direct data) Setting range (Index data)
			Function		
<Group 5>[Continuous motion command]					
SPOS	Positioning [Sequential POSitioning]	Yes (1)	POS [Positioning position・direction]	mm/°/in	-99999999~99999999 IX00~IX99
			A/I [Absolute position /Relative position]	None	ABSOLUTE/INCREMENT
			F [Positioning speed]	mm,°,in /sec	00000000~99999999 IX00~IX99
			UPDN [Accel./Decel.time]	None	SEL.1/SEL.2/SEL.3
			TRG [External trigger position]	mm/°/in	00000000~99999999 IX00~IX99
			OUT [General output]	Binary number	00000000~11111111 IX00~IX99
			・ Motion is identical to POS (Positioning) command. But, the next address is executed only after the motion is completed.		
CONT	Simple continuous positioning [CONTinue positioning]	Yes (2)	POS [Positioning position・direction]	mm/°/in	-99999999~99999999 IX00~IX99
			A/I [Absolute position /Relative position]	None	ABSOLUTE/INCREMENT
			F [Positioning speed]	mm,°,in /sec	00000000~99999999 IX00~IX99
			UPDN [Accel./Decel.time]	None	SEL.1/SEL.2/SEL.3
			TRG [External trigger position]	mm/°/in	00000000~99999999 IX00~IX99
			OUT [General output]	Binary number	00000000~11111111 IX00~IX99
			・ When this command continues and the motion direction is unchanged, Positioning is continued without stopping. ・ When this command is independent, the function is same as SPOS. ・ External trigger positioning is possible. And, External trigger positioning sets the travel amount from TRG input. ・ General output can be sent when motion starts. ・ The Accel./Decel.time and External trigger positioning in Continuous motion follows the starting block of this motion 'UPDN' and 'TRG'.		

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range (Direct data) Setting range (Index data)
			Function		
<Group 5>[Continuous motion command]					
REPT	Repeat positioning [REPeaT positioning]	Yes (3)	POS [Positioning position・direction]	mm/°/in	-99999999~99999999 IX00~IX99
			A/I [Absolute position/Relative position]	None	ABSOLUTE/INCREMENT
			F [Positioning speed]	mm,°,in /sec	00000000~99999999 IX00~IX99
			UPDN [Accel./Decel.time]	None	SEL.1/SEL.2/SEL.3
			TRG [External trigger position]	mm/°/in	00000000~99999999 IX00~IX99
			M [M output]	None	00~99 IX00~IX99
			REPT [Looping frequency]	None	00000~65535 IX00~IX99
			・ Repeats the specified Positioning for the set number of times. ・ External trigger positioning is possible. And, External trigger positioning sets the travel amount from TRG signal input. ・ Can send M output at Motion start and wait for M completion. ・ If the looping frequency is"0", then the Repeat positioning is not carried out.		
SHOM	Zero return [Sequential HOMe positioning]	Yes (1)	TYPE [Zero return method]	None	STD.HOME/LS LESS/ STOP HOME/OT HOME
			DIR [Motion direction]	None	FORWARD/REVERSE
			OUT [General output]	Binary number	00000000~11111111 IX00~IX99
			・ Motion is identical to "0 HOME" (Zero return) command. But, the next address is executed only after the motion is completed.		
SIND	Index positioning [Sequential IND-ex positioning]	Yes (1)	POS [Positioning position・direction]	mm/°/in	00000000~99999999 IX00~IX99
			F [Positioning speed]	mm,°,in /sec	00000000~99999999 IX00~IX99
			UPDN [Accel./Decel.time]	None	SEL.1/SEL.2/SEL.3
			OUT [General output]	Binary number	00000000~11111111 IX00~IX99
			・ Motion is identical to INDX (Index Positioning) command. Program is finished after motion is completed.		

Supplement for the Command specification description

The BS column indicates a Block stop function at each command end.
A Block stop function executes stop motion at end of the command with a Block stop signal (BTSP) during Auto run.

“No (1)” neglects the Block stop signal and executes the next address command.

“No (2)” neglects the Block stop signal and executes commands till the Program end.

“Yes (1)” creates a wait condition for restarting when a command is completed.
The next address command is executed on restart.

“Yes (2)” creates a wait condition for restarting when a Continuous motion is completed and the motor stops.
The next address command for Block stop completion is executed on restart.

“Yes (3)” creates a wait condition for restarting when all Repeat positioning is completed.
The next address command is executed on restart.

“Yes (4)” creates a wait condition for restarting after calling a specified address.
The specified address command is executed on restarting and this command is continued or restarted.

Chapter 10 Run

10-1 Inspection before operation

After installation and wiring is complete, check the following points before startup.

1) Whether there is any faulty wiring.
   Especially whether the power is not supplied to motor connection terminals U, V, W.
2) Whether there is any place where short-circuit may occur due to cable chips, etc.
3) Whether there is any part of cable where abnormal force is added.
4) Whether there are any loosely fitted screws, terminals etc.
   Ensure that connector is inserted properly.
5) Whether the power source is proper.
6) Whether there is any short-circuit or line-to-ground fault in the external sequence circuit.
7) Whether the grounding method is correct. Whether the earth ground grade is JIS Class 3 or higher.

⚠ Caution

- Never conduct insulation test as withstanding voltage, mega test, etc. and noise test by a simulator, etc. for controller.
  "These tests may damage the controller."

Confirm the following settings before executing operation

- As per " 10-4 Run operation ", in setting parameter P000 of standard motor, motor type data is set in P000. When motor for exclusive purpose is set, set "999" in P000 data and as per the specifications of [Setting option] specifications, input motor related parameter in P020-P059.
- Input signal Check of negative logic input of emergency stop (EMG*), forward, reverse over travel (FOT*,ROT*) (At usage)
- Input signal Parameter setting compatible to positive or negative logical operation of servo on (SON(*))

10-2 Run Mode

On the basis of Mode selection signal 1, 2 following operation modes are supported.

Operation Mode	Mode selection signal 2 (MD 2)	Mode selection signal 1 (MD 1)
Manual operation mode	○	○
Zero return operation mode	○	●
Auto run mode	●	○
Servo lock mode	●	●

Note) ○: Signal OFF ●: Signal ON

[Table 10-1] Mode selection list

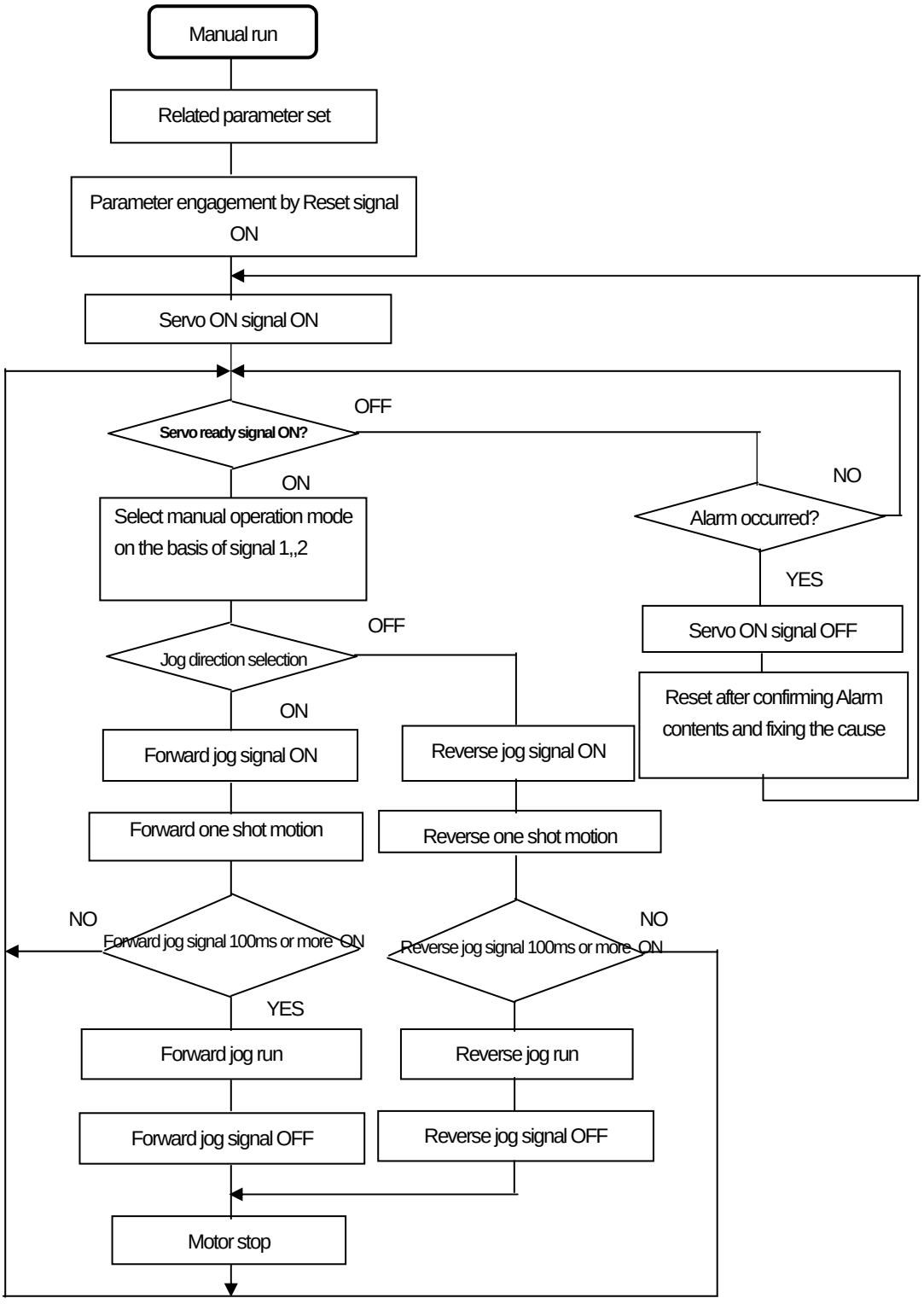
10-2-1 Manual operation mode

In manual operation mode, if any of forward jog signal (FJOG) or reverse jog signal (RJOG) remains in ON status for more than 3 ms, one-shot jog is performed in forward/reverse direction. Therefore, if ON status of Signal remains connected for more than 100 ms, inch operation is performed in forward/reverse direction.

One-shot jog means the amount transferred (One shot operation) in minimum set unit.

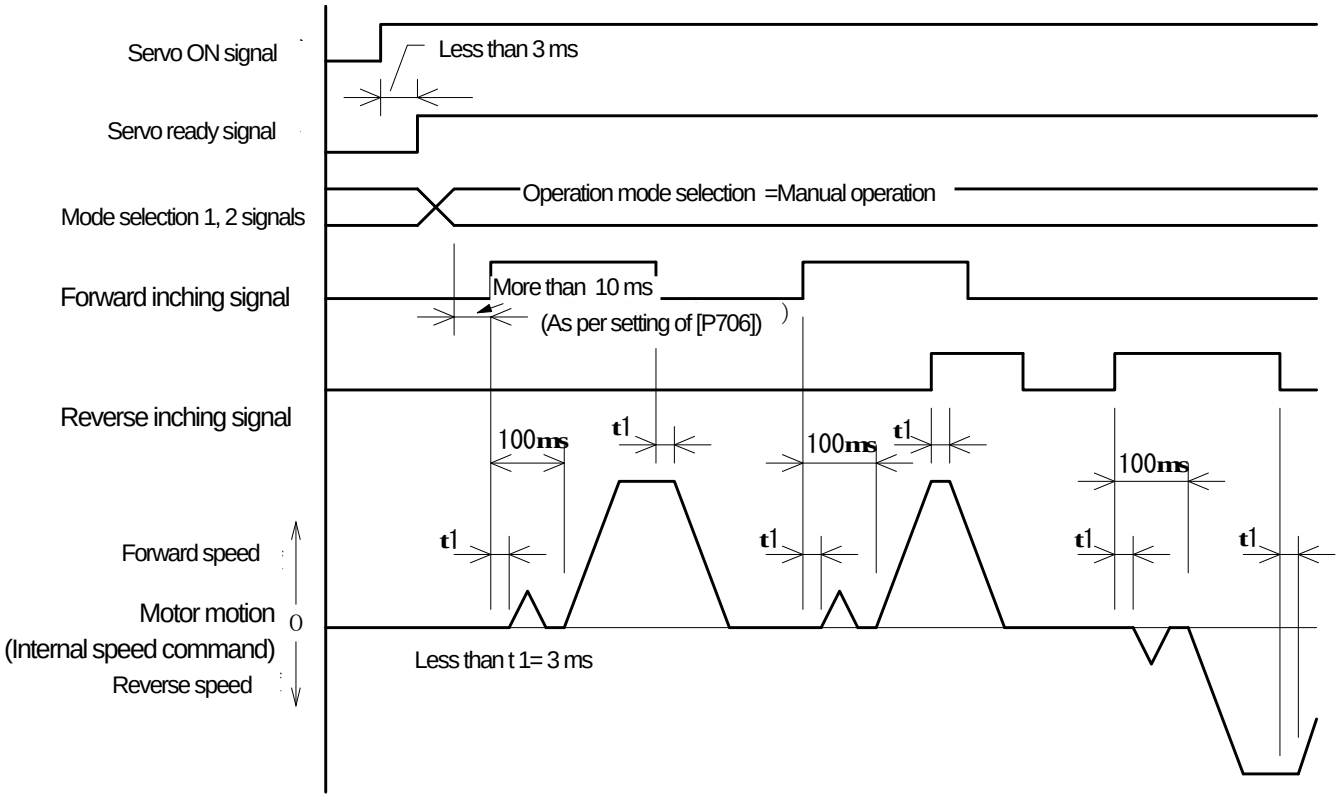
For inch operation speed, setting value of parameter [P400] [P401] is selected by switch over signal (JOSP) of inch speed.

1) Operation Procedure



[Figure 10-1] Manual operation procedure

2) Time chart



Note : When Forward jog signal (FJOG) and Reverse jog signal (RJOG) are simultaneously inputted, a motor conducts deceleration stop. After both signals are OFF, and forward / reverse jog signals are again inputted, one shot jog is executed again. One shot travel amount is fixed to minimum setting unit.

[Figure 10-2] Manual operation time chart

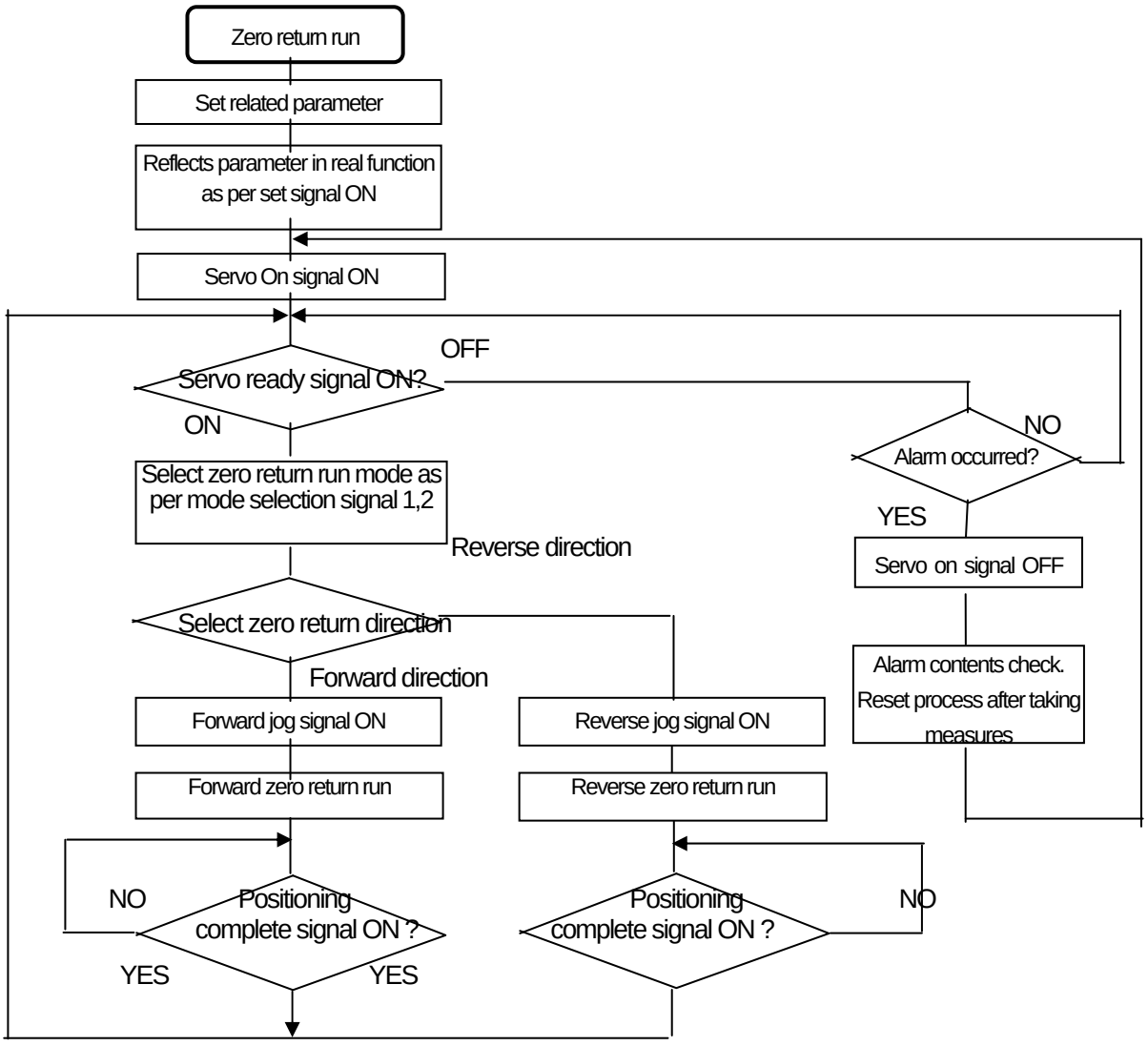
10-2-2 Zero return run mode

In Zero return run mode, Zero return is performed by the speed command set by the parameters [P404: Zero return speed] and [P405: Zero return creep speed] .
By 10ms or longer Forward signal (FJ), Forward zero return is executed.
By 1oms or longer Reverse jog signal (RJ), Reverse zero return is executed.
Zero return methods are of the following types.

Zero return method name	Setting of [P402: Zero return method selection]	Operation Specifications
Standard zero return	STD.HOME	Zero return that uses zero return deceleration LS. For details, refer to time chart (a) - (d).
LS less zero return	LS LESS	Zero return by marker or **ZLS** without zero deceleration. For details, refer to the time chart. (e)
Stop zero return	STOP HOME	Zero return without any operation
OT zero return	OT HOME	When OT is complete in Zero return, return to reverse direction. For details, refer to time chart (f)-(g)

[Table 10-2] Zero return Mode setting operation

1) Operation procedure



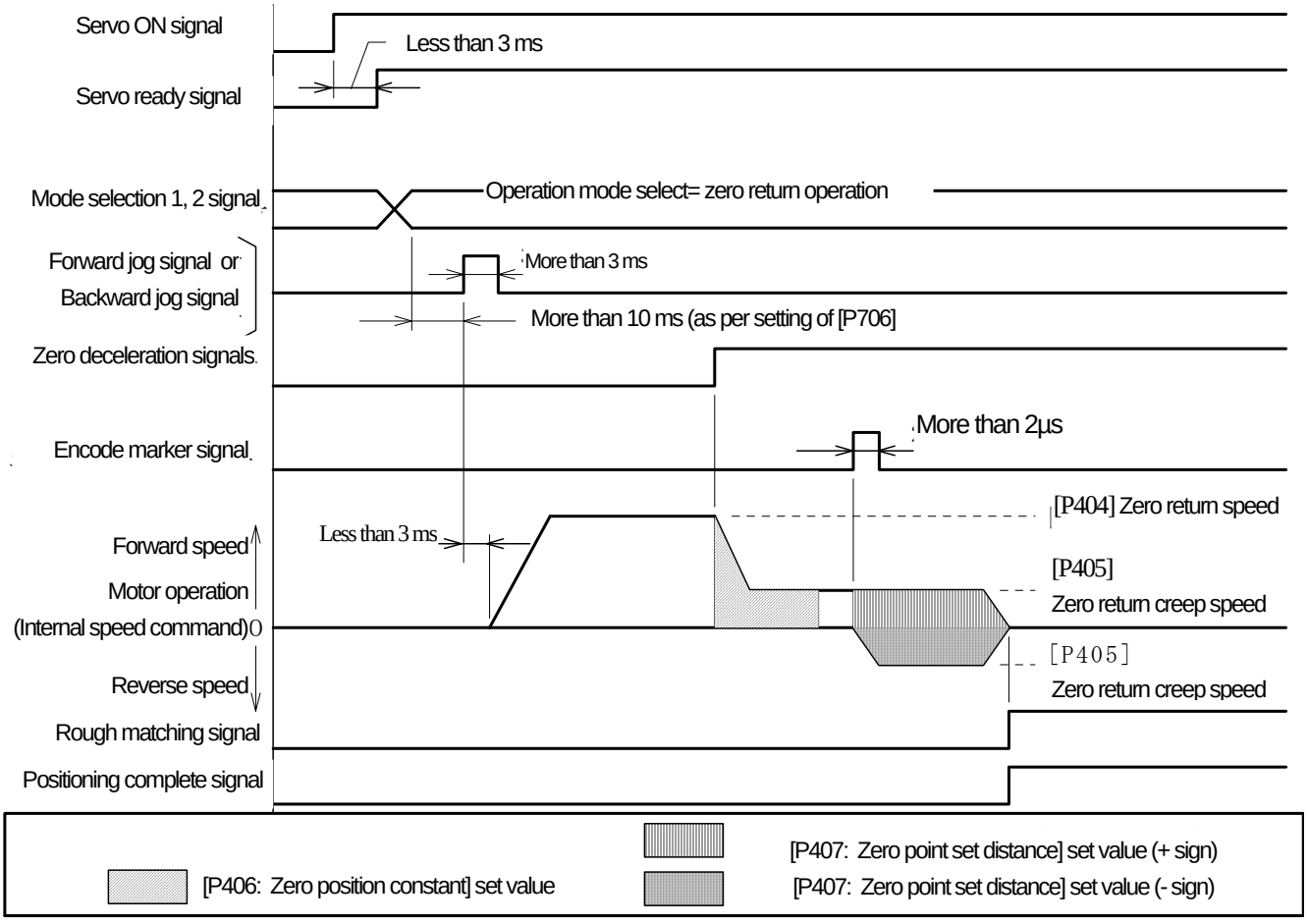
[Figure 10-3] Zero return operation procedure

2) Time chart

Note 1: At the time of Zero return startup, if zero return deceleration limit signal is already ON, operates in reverse direction on zero return startup and after the zero return deceleration limit signal is set to OFF, starts operating in regular direction.
Note 2: In Zero return operation, operation stops if stop signal is input and at the time of restart, if zero return deceleration limit signal is turned ON, operates in reverse direction. After the zero return deceleration limit signal is turned OFF, starts zero return operation in normal direction.
Note 3: Selects whether to use select maker signal or encoder maker signal as per the parameter.
Note 4: During zero return operation, soft limit is not detected.
Note 5: In zero return creep speed, speed override is not required.
Note 6: If zero return operation is stopped midway, previously set forward/reverse direction soft limit remains valid in the exiting state.

(a) [Standard Zero return] (Encoder marker usage)

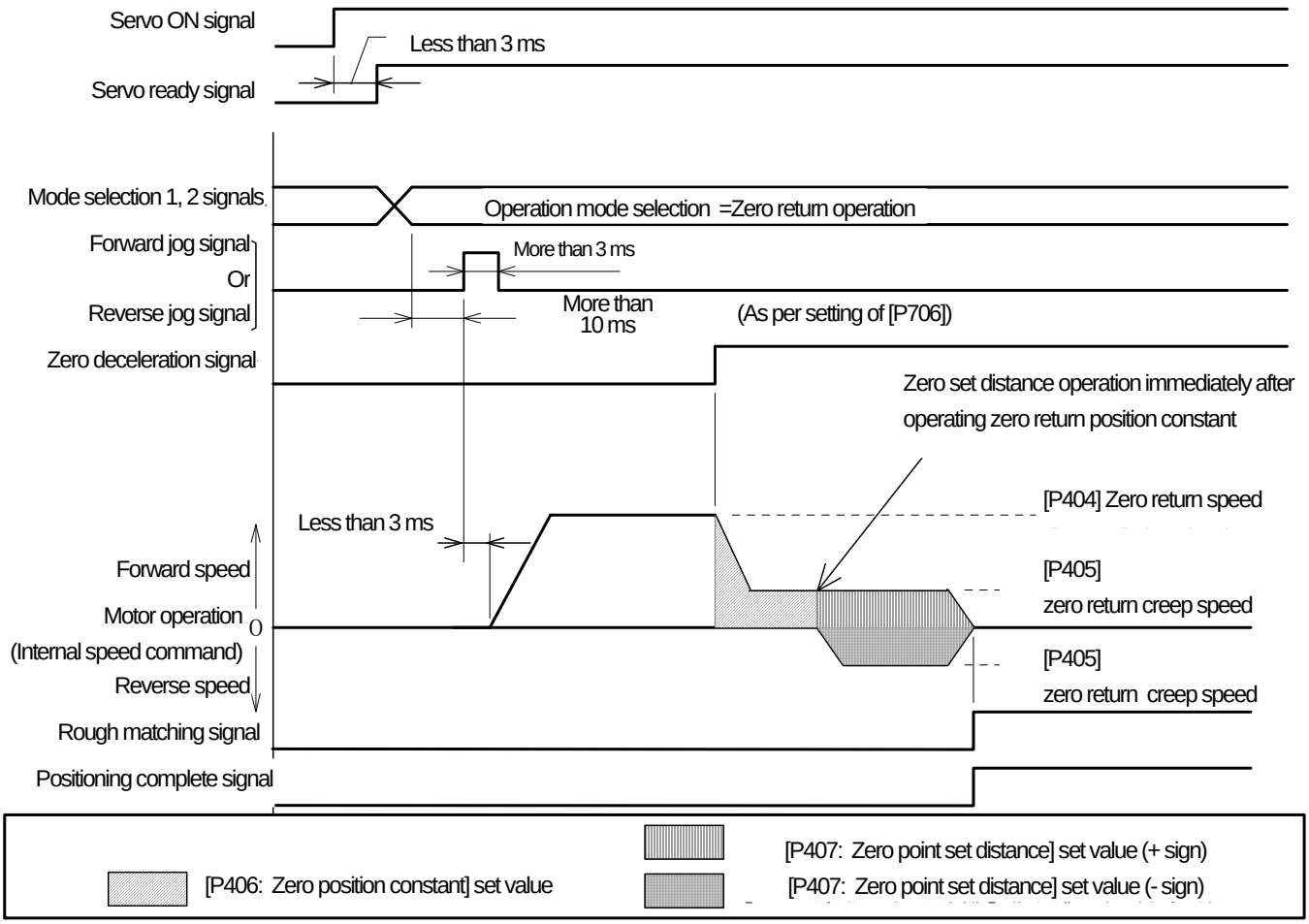
(At the time of zero return startup, when zero return deceleration limit is OFF)



[Figure 10-4] Standard zero return operation time chart 1

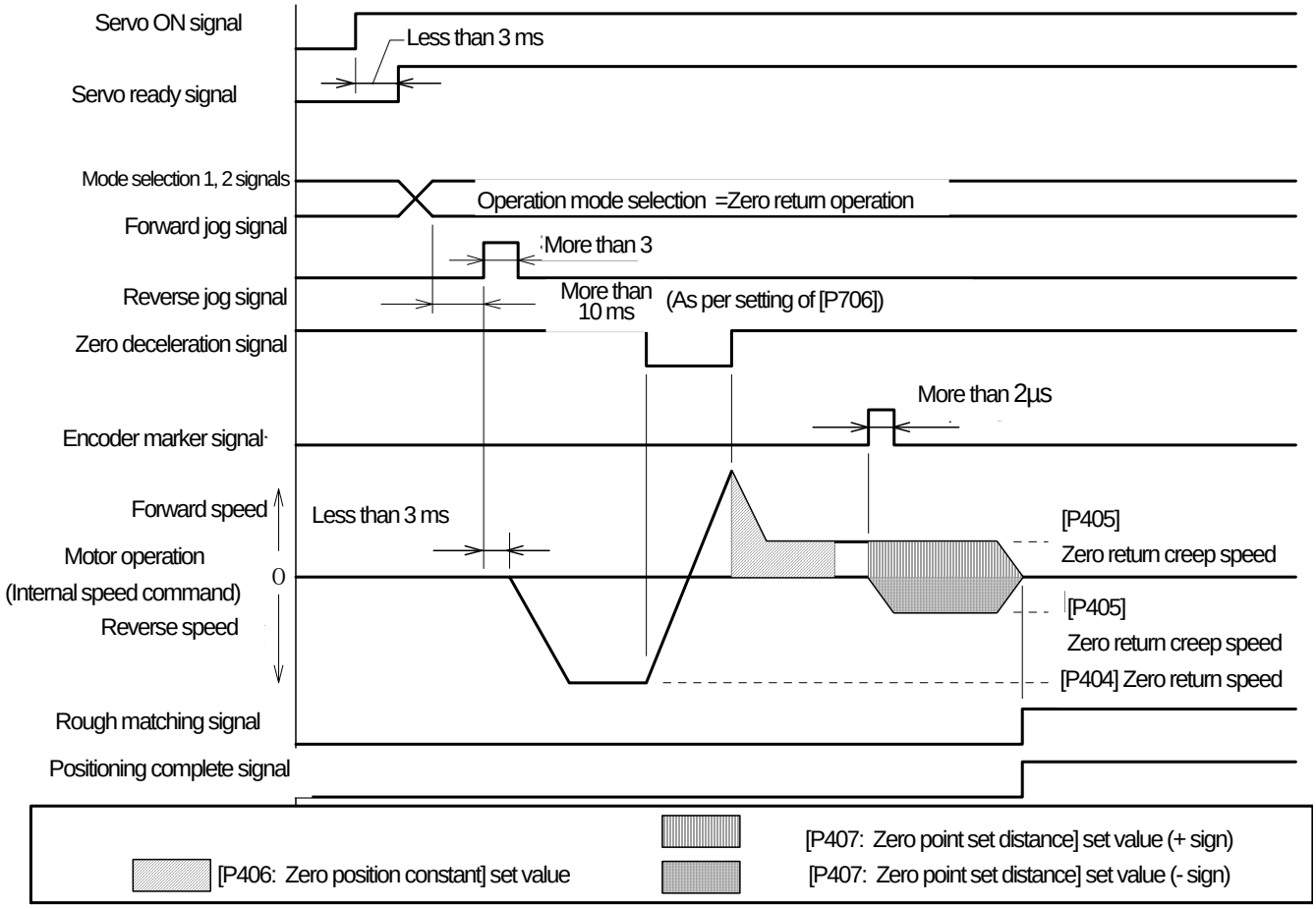
(b) [Standard Zero return] (Encoder marker not used)

(At zero return startup, when zero deceleration limit is set to OFF)



[Figure 10-5] Standard zero return operation time chart 2 (Encoder marker not used)

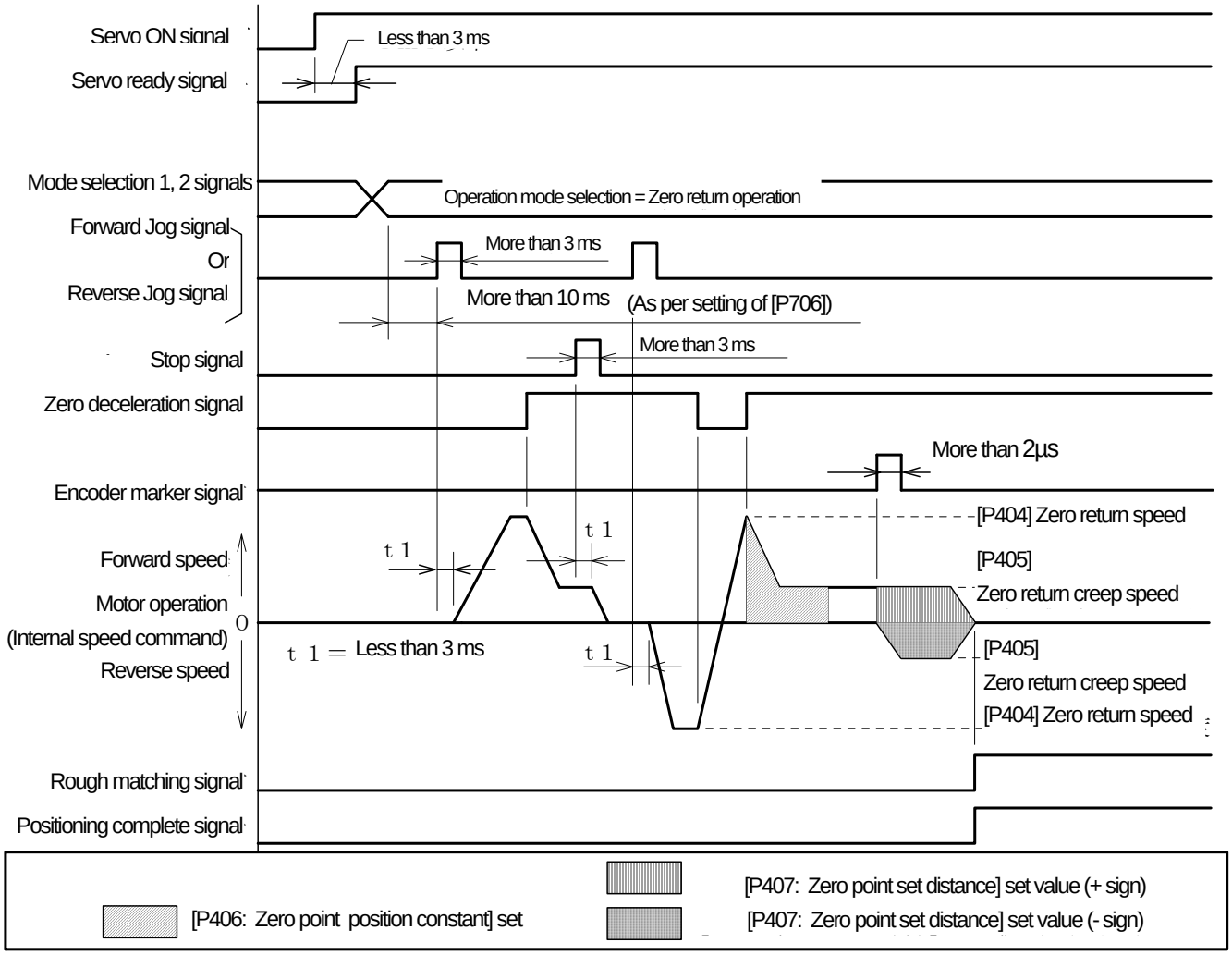
(c) [Standard zero return]
(At the start of zero return, when sero return deceleration limit is ON.)



[Figure 10-6] Standard zero return operation time chart 3

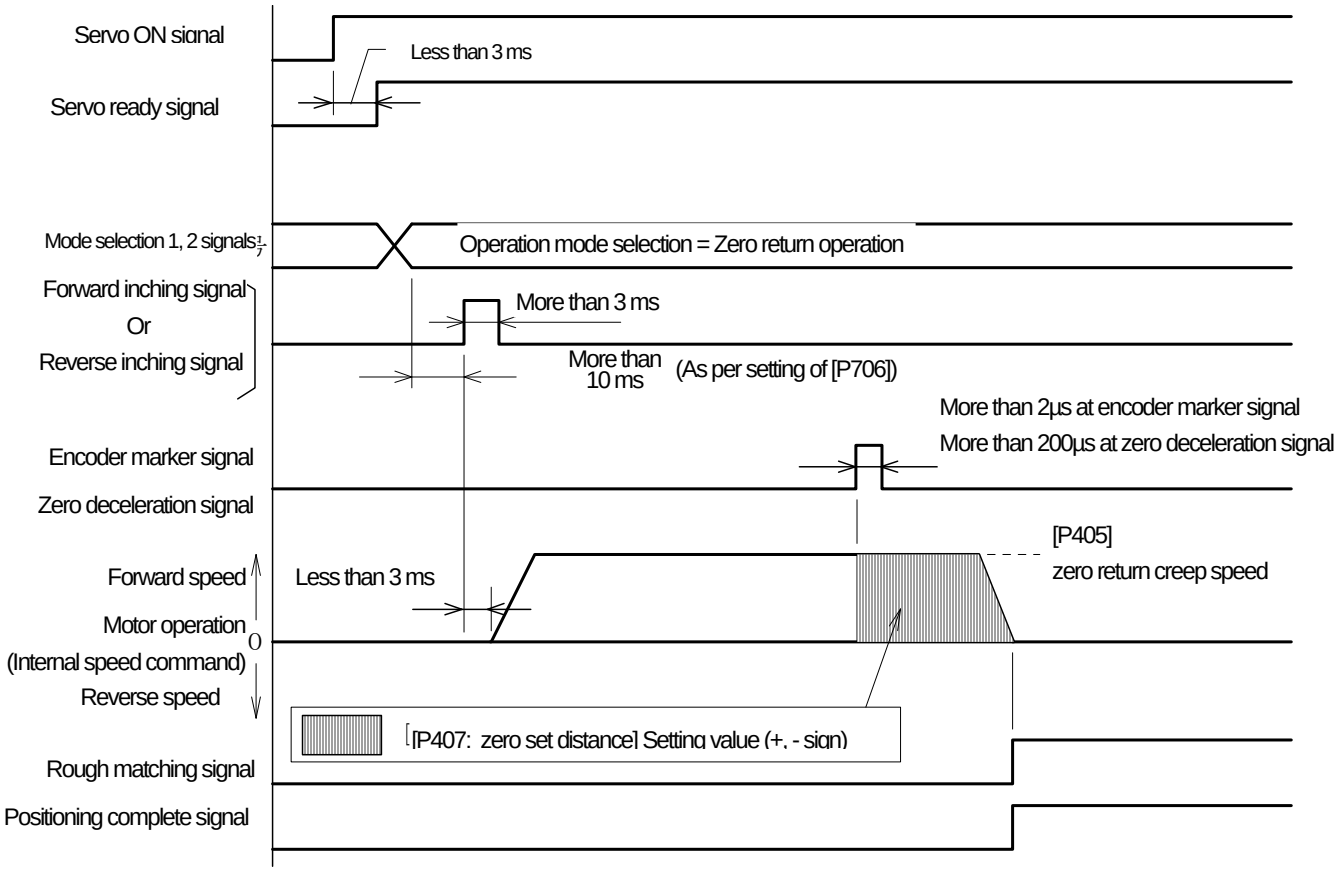
(d) [Standard zero return]

(When stop signal is input after detecting zero return deceleration limit)



[Figure 10-7] Standard zero return operation time chart 4

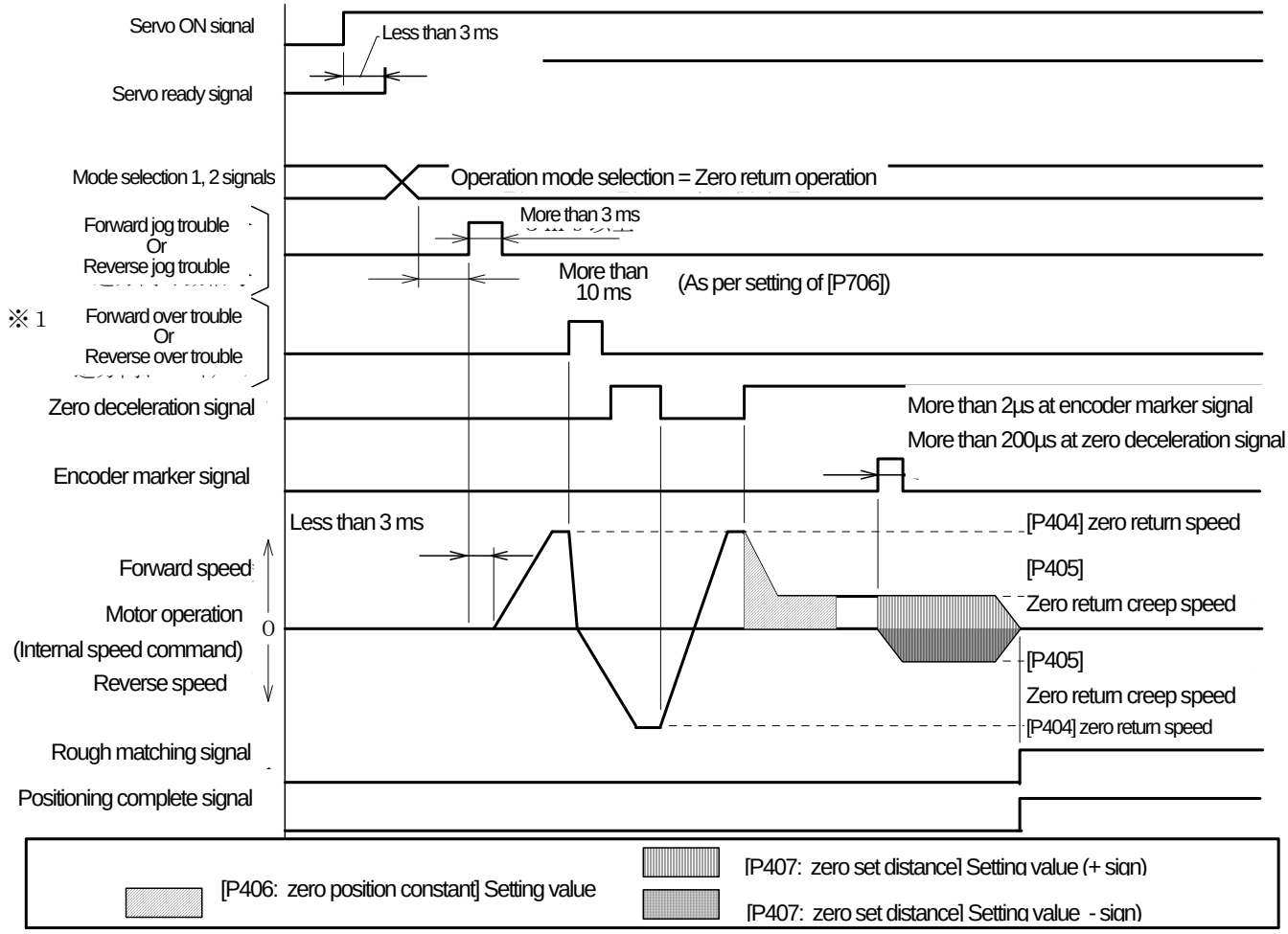
(e) [LS less zero return]



[Figure 10-8] LS less zero return operation time chart 5

(f) [OT return zero return]

(At zero return startup, with zero point deceleration limit on OFF, before turning ON the zero return deceleration limit, forward (reverse) direction over travel should be ON)

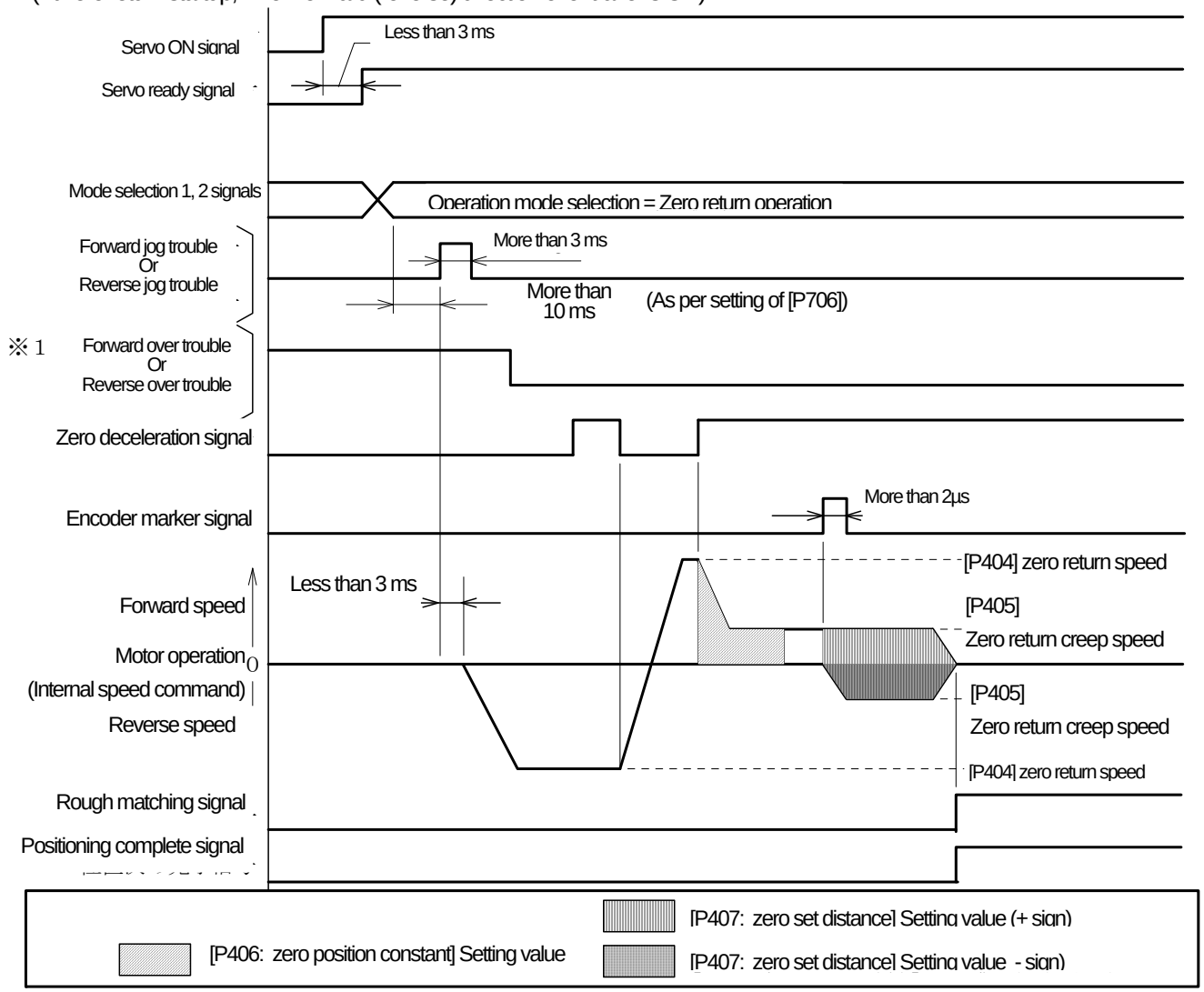


* 1: When Zero return direction is +: Forward over travel
when -: Reverse over travel

[Figure 10-9] OT zero return operation time chart 6

(g) [OT zero return]

(At zero return startup, when forward (reverse) direction over travel is ON)



* 1 : When Zero return direction is +: Forward direction over travel
when -: Reverse direction over travel

[Figure 10-10] OT zero return operation time chart

(h) [OT zero return]

(At zero return startup, with zero point deceleration limit on OFF, before turning the forward (reverse) direction over travel ON, if zero point deceleration limit is turned ON, (Encoder marker usage))
It is similar to [Figure 10-4] standard zero return operation time chart 1.

(At zero return startup, with zero point deceleration limit on OFF, before turning the forward (reverse) direction over travel ON, if zero point deceleration limit is set to ON, (Encoder marker not used))
it is similar to [Figure 10-5] standard zero return operation time chart.

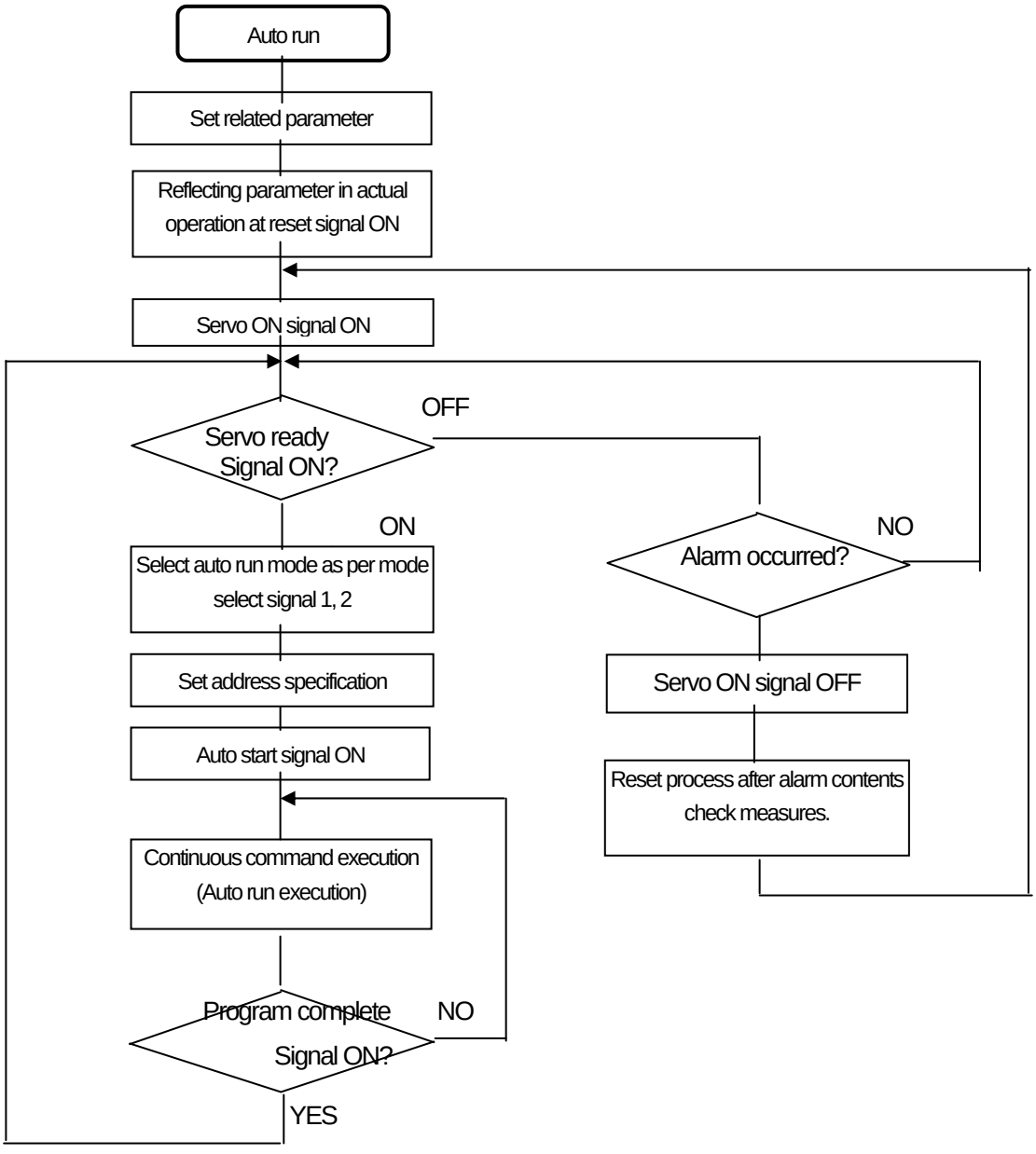
(At zero return startup, when zero point deceleration limit is ON))
It is similar to [Figure 10-6] standard zero return operation time chart 3

Note 7: At auto run " HOME" command execution, shows error when over travel is ON

10-2-3 Auto run mode

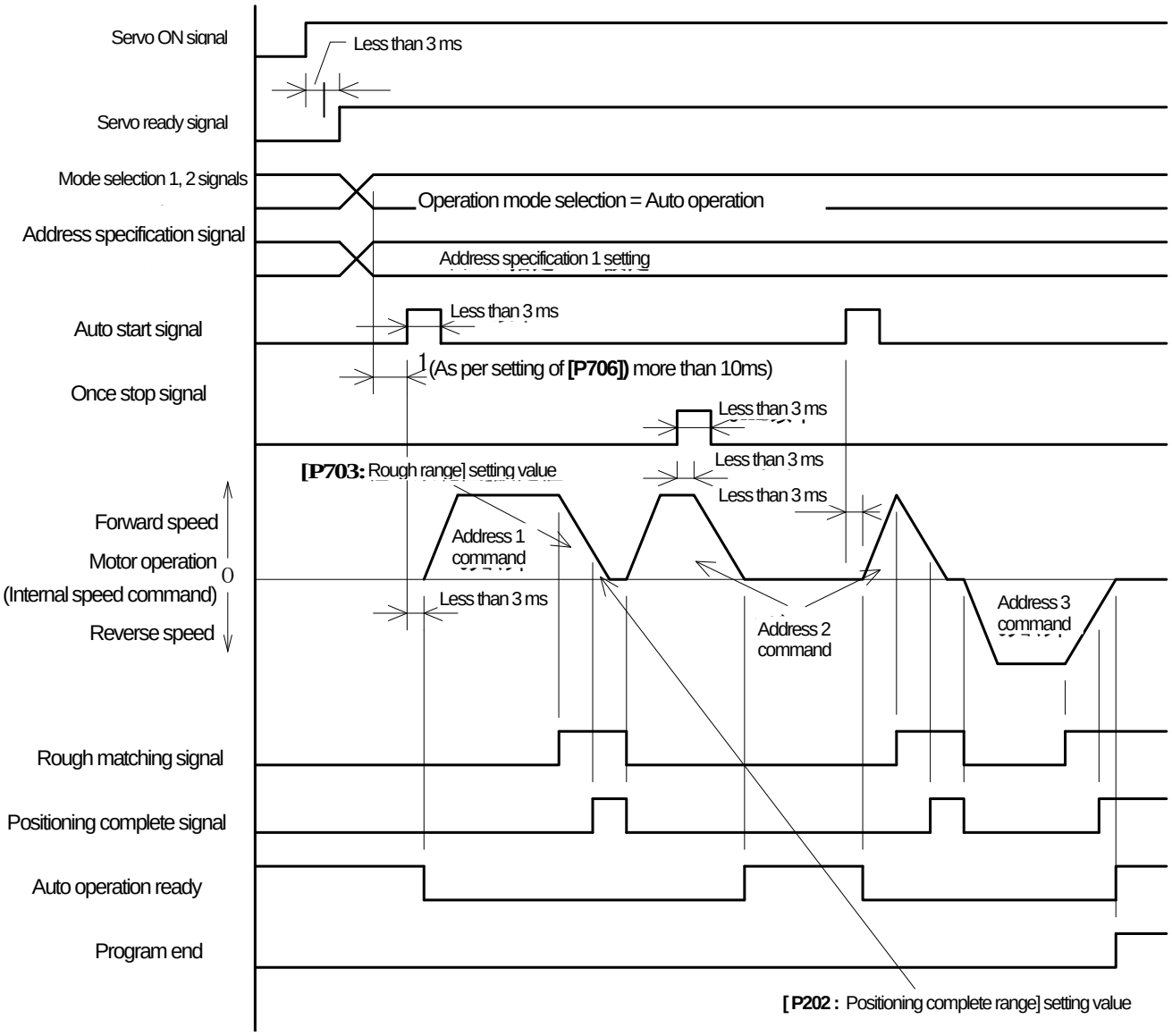
By the parameter [P409: Auto. run permit condition selection] , Auto. run can be disabled before zero return is completed.
Auto. run executes commands continuously by internally stored commands or external set data. By turning Auto. start signal (PST) ON, a command of address set is executed.

1) Operation procedure



[Figure10-11] Auto run operation procedure

2) Time chart



[Figure 10-12] Auto run time chart

Note 1: If motor is stopped during auto run and zero return operation, changes in running mode are possible during stop but, if speed override signal is input, actual operation speed becomes the speed of override ratio as per the speed command value.

10-2-4 Servo lock mode

In servo lock mode, run operation is not performed.
Normally in servo lock status.

10-3 Analog monitor

At the analog monitor connector (P1) terminals MON1, and MON 2, contents selected by the parameters [P700: Monitor 1 selection] and [P701: monitor 2 selection] is outputted by DC voltage.
Motor motion status (transit, steady state) can be confirmed by an oscilloscope.
Monitor item contents are as follows.

Sign	Monitor items	Monitor contents
MON1 and MON2	Speed command [SPD.REF.]	Outputs speed command value of motor. Polarity: Positive voltage at Forward rotation and negative voltage at reverse rotation Range: 0-±10V ±10% At rated speed operation: Full range
	Speed feedback [SPD.FB.]	Outputs actual operation speed of motor. Polarity: Positive voltage at Forward rotation and negative voltage at reverse rotation Range: 0-±10V ±10% 125% of rated speed: Full range (Rated speed: ±8V)
	Torque command [TRQ.REF.]	Outputs output torque value of motor Polarity: Positive voltage at forward torque, negative voltage at reverse torque Range: 0-±10V ±10% At rated torque occurrence: ±3.3V
	External+ torque limit [TRQ.LIM.+] External-torque limit [TRQ.LIM.-]	Outputs external +/-torque limiting value. Polarity: Positive voltage Positive voltage at forward torque limit, reverse torque limit Range: 0-+10V ±10% At rated torque limit: +3.3V
	Position deviation 1 [P.RANGE.L] Position deviation 2 [P.RANGE.H]	Outputs Position deviation volume Polarity: Positive voltage at + deviation, negative voltage at - deviation Range: 0-±10V ±10% At position deviation 1: 255 pulse (4 multiply) , Full range At position deviation 2: 4080 pulse (4 multiply) , Full range
	NC speed command [SPD.OUT]	Outputs speed command value at positioning operation and pulse array operation Polarity: Positive voltage at forward command, negative voltage at reverse voltage Range: 0-±10V ±10% Rated speed: Full range
	NC target speed [SCL.OUT]	Outputs the target speed generated as per the internal operation (mathematical) at positioning, inching, zero return operation. Polarity: Positive voltage at forward command, negative voltage at reverse voltage Range: 0-±10V ±10% Rated speed: Full range
	Indirect data 62 [IX62]	Output as per the data entered in indirect data 62. Polarity: Positive voltage at positive data, negative voltage at negative data Range: 0-±10V ±10% At 499: Full range
	Indirect data 63 [IX63]	Output as per the data entered in indirect data 63. Polarity: Positive voltage at positive data, negative voltage at negative data Range: 0-±10V ±10% A t499: Full range
	Reserve[OPT.W]	For in-house adjustment. Do **Not set**
	Reserve[OPT.L]	For in-house adjustment. Do **Not set**

[Table 10-3] Contents of analog monitor

Caution 1 : Since Analog monitor resolution is 1000 within ±10V, transit wave could be like steps.
And ripple is generated by ratio 1/ 1000 (1000 resolution case) on the output.

10-4 Operation procedure

Operation of device is as per the following procedure.

1) Perform trial operation without fail.
2) For avoiding the troubles at the time of trial operation, initially operate in no load status and after confirming that there is no error, connect with machine and see to it that accidents will not occur.
3) When magnetic pole sensor is not used in Linear /disk motor, at the time of applying power supply or after encoder abnormality returns and perform "Automatic magnetic pole detection operation" as per initial servo ON.
   In this operation, note that motor performs vibration.
   Amplitude or operation at the time of this operation is as per the value of parameter P116-119 (magnetic pole detection operation related parameters) .
   But, when this operation does not end normally, alarm stops due to " Encoder Abnormality"
   In this operation, " RDY Signal" is not output. Output is done after normal completion.
4) The machine positioning is necessary in the system where the absolute encoder is used.
   For details, refer to "10-7 Specifications of absolute encoder and Machine positioning".

⚠ Caution

1) Do not touch the terminals of controller carelessly.
   "Since there is high voltage, it is very dangerous."
2) Do not use terminal with cover removed.
   "Possibility of electric shock"
3) Since some residual voltage is left after power is turned OFF, do no touch terminals and main circuits for 2 to 3 minutes.
4) Turn the Power source ON/OFF after confirming sufficient safety.
5) In Linear /disk motor, at the time of applying power source, use "magnetic pole sensor" in case of machine (reason of interference with work) that does not execute
   (" Automatic magnetic pole detection operation (motor vibration) "
6) In Automatic magnetic pole detection operation, note that motor does not perform vibration

10-4-1 Confirmation of power source

Confirm that power source of controller fulfills the specifications.
For specifications of power source, refer to [14-1 Electrical specifications of controller]

10-4-2 Trial run

Note 1: **[LCD module]** in following description, is loaded as per standard of product capacity more than 1.5 Kw
Again, for the products less than a capacity of 1.5Kw, **[SDI device]** is provided as a option.

1) Isolation of motor and load
   1) No load status by removing link between motor and machine system.

2) Servo on Signal (SON(*)) turned OFF
   1) Before introducing power supply, Servo On Signal (SON(*)) should be in OFF status.

3) Power ON
   1) After power ON, initial status display is displayed in LCD module.

4) Parameter setting

1) Set [P000: Motor type] and other parameters and Positioning data to meet with your application.
(Refer to chapter 7 " parameter")

*** Required parameters for setting at the time of trial operation are as follows.**

Parameter No.	name	Used motor		
		Linear motor	Disk motor	Rotation motor
P000	Motor type	●	●	●
P001	Encoder type selection	●	●	●
P002	Selection of Rotation motor / no. of encoder pluses			●
P003	Linear motor /linear sensor resolution	●		
P004	Disk motor no. of encoder pluses		●	
P005	Rotation/no. of max rotations used for disk motor		●	●
P006	Max speed used for Linear motor	●		
P007	Rates speed for Linear motor	●		
P010	Magnetic pole sensor type for Linear/disk motor	▲	▲	
P011	Magnetic pole sensor offset for linear/disk motor	▲	▲	

Note) ●: Always set ▲: Set only for magnetic pole sensor usage

[Table 10-4] Parameter set compulsorily at trial operation

5) Power on

(In order to reflect parameter values on actual motion, turn the power on.

6) Confirmation of control input signal

(Turn ON/OFF all the control inputs except Servo ON (SON(*)) signal, and by ON/OFF status of individual input display in the front panel LCD module (I/O signal display section), confirm if connection and logic of control inputs are correct.

(As for Speed override signals (OR1-OR4) and Address set signals (SS1-SS3,PS4-PS8), confirm them by Diagnosis display mode.

7) Servo ON signal (SON(*)) ON

(After setting parameters, and confirming control input signals, turn OFF over travel signals (FOT*, ROT*),

1)Emergency stop signal (EMG*) , turn On and then OFF Reset signal (RST) . (LCD module [FOT] , [ROT] Then turn ON Servo ON signal (SON(*)) . At the time all other control signals shall be OFF.

2) When Servo ON signal (SON(*)) is ON, a motor is ready to generate driving torque and resisting torque to external force.

3) If alarm is displayed or a motor runs at the time when Servo ON signal (SON (*)) is ON, investigate and delete the cause.

8) Selecting operation mode

1) By mode selection 1,2 Signal (MD1,MD2) , select operation mode.

9) Run motion check

1) Run a motor by low speed command (as Jog motion, etc.), and confirm if speed is correct, abnormal vibration does not occur and abnormal sound does not exist, etc. .
2) Change command speed and confirm that motor speed is proportional to changed command. (It is recommended to measure the speed with a load axel for rotation motor.)
3) If motor speed can not be increased or is not proportional to the speed command and motor vibration or if an abnormal sound occurs, investigate and delete the cause.
4) In case of Positioning run, confirm if the motor rotating amount is correct to Positioning data. (It is recommended to mark on the motor load shaft to confirm position.)
5) If the motor rotating amount is multiplied by constant ratio or if it fluctuates, investigate and delete the cause.
6) Running motion confirmation shall be conducted for both forward and reverse directions.

10) Load run

1) After trial run in no load is over, connect the motor to the machine and conduct Trial run, again.
2) Before executing load run, confirm that Emergency stop, Over travel, etc. work properly.
3) Please inspect if abnormal sound, abnormal vibration, or abnormal heat, etc., do not occur.
4) If above abnormality occurs, or Alarm is displayed, investigate and delete the cause.
5) Motor motion and load status can be confirmed by LCD module (Status and Diagnosis display mode). (Refer to the separate manual " Volume: Function", " 2-2 Display mode".
6) If machine system travel amount and NC position command is not equal, confirm the next parameters.

*** For matching the machine system, operation and NC position command , parameters necessary for setting are as follows.**

Parameter No.	Name	Remarks
P301	Setting unit selection	
P302	Command unit	
P303	Electronic gear numerator	*As per this parameter, match the actual machine system transfer volume and NC position command.
P304	Electronic gear denominator	
P310	Machine transfer volume	

[Table 10-5] Required parameters for position matching

10-5 Adjustment

10-5-1 Adjustment status at shipment

Adjustment of controller is set as per all parameters.
For standard shipment setting (initial value) at factory shipment, refer to [7-2 Parameter specifications]
Though a controller has standard adjustment values (initial value set) at our factory shipment, it may be necessary to readjust the controller when a machine system is connected to actual load condition and application.

.

*1 Auto tuning is possible as per auto tuning
Further, for auto tuning, refer to " 11-4 Auto tuning"

*2 In some case, due to actual load status, mechanical play, etc. , Auto tuning could not be conducted. In this case, referring to the following description, set individual parameter, manually.

10-5-2 Phenomenon wise adjustment locations (Parameter)

For details and setting method of each parameter, refer to " 7-2 Parameter specifications", " 13-3 Operation Mode"

Phenomenon	Adjustment position (Parameter)
Motor vibrates during stop	[P106: Speed loop gain/deceleration gain range] [P107: Speed loop integral time constant/ deceleration gain Range] [P108: Speed loop differential time constant /deceleration gain Range] Effective in above mentioned deceleration gain Range as per P100 settings [P120: Torque command filter no. of cycles] [P201: Servo lock gain] Valid in P202 Positioning Complete Range as per P202 settings
Motor vibrates during operation	[P101: Speed loop gain] [P102: Speed loop constant of integration] [P103: Speed loop differential constant] [P120: Torque command filter no. of cycles] [P200: Position loop gain] [P605: Pulse train Feed forward rate]
Motor vibrates when GSEL Signal is ON	[P111: Speed loop gain /GSEL Signal ON] [P112: Speed loop constant of integration /GSEL Signal ON] [P113: Speed loop derivative time constant /GSEL Signal ON] [P120: Torque command filter no. of cycles]
Overshoots, undershoot on motor startup, stop are many.	[P101: Speed loop gain] [P102: Speed loop integral time constant] [P103: Speed loop differential time constant] [P200: Position loop gain] [P205: Feed forward rate] [P211-213: Accelerating time] [P214-216: Decelerating time]
Excess speed abnormality occurs	
Deviation overflow occurs.	[P200: Position loop gain] [P207: Overflow detection pulse] [P205: Feed forward rate] [P211-213: Accelerating time] [P214-216: Decelerating time]
Positioning time is long	[P200: Position loop gain] [P202: Positioning Complete Range] [P205: Feed forward rate]

[Table 10-6] Phenomenon wise adjustment location (parameter)

10-5-3 Individual adjustment method

1) (Speed loop gain)
   1) Speed loop gain [P101] / Low speed gain range [P106] / GSEL signal ON [P111]
      •Larger the setting value, faster is the response.
      •If the set value is exceedingly larger, vibration occurs.
      • Lower the set value, response is slower and motion unstable.
   2) Speed loop integral time constant [P102] / Low speed gain range [P107] / GSEL signal ON [P112]
      •Smaller the setting value, faster is the response.
      •If the set value is exceedingly smaller, vibration occurs
      •Higher the set value , slower the response and motion unstable.
   3) Speed loop derivative time constant [P103] / Low speed gain range [P108] / GSEL signal ON [P113]
      •When this is set, response becomes quick.
      •The smaller, the setting value, the earlier time it works in motion characteristics. Too large set value works all the motion range and causes vibration.
2) (Torque command filter)
   1) Torque command filter freq. [P120]
      •If machine resonance occurs, insert a filter to Torque command to fix it.
      •The larger, the setting value, the faster is the response.
      • Lower the set value, response is slower and motion unstable.
3) (Position loop gain)
   1) Position loop gain [P200]
      •The larger the setting value, quicker is the response.
      •Too large set value causes Over-shoot, Under-shoot and vibration.
      • Lower the set value, positioning time longer and Positioning accuracy worse.
   2) Servo lock gain [P201]
      • The larger the setting value, faster is the response in Servo lock.
      • If the set value is larger, vibration occurs.
      • Lower the set value makes Servo lock weaker and shifts stop position by external force.
4) (Feed forward ratio)
   1) Feed forward ratio [P205]
      • The larger, the setting value is, the higher compliance to Pulse train command is.
      • If setting value is too large, it causes over-shoot, undershoot, vibration, etc.
      • If setting value is too small, it makes positioning time longer.
      •To reduce the synchronization deviation with the master in the running positioning control, set this value to [100] and [P206: Feed forward shift ratio] to [0].

5)[Gain adjustment method]

Gain can be adjusted by using Analog monitor (connector P1) and by observing the wave of Speed feedback in an oscilloscope.

Adjust Position loop and Speed loop gain parameters until over-shoot, under-shoot and vibration does not occur.

● Conduct below adjustment in running status

1) Set a low value to [P200: Position loop gain] and [P201: Servo lock gain] and adjust [P101: Speed loop gain] as high as possible unless a motor vibrates.
2) Adjust and set the optimum value to [P102: Speed loop integral time const.] and re-adjust [P101: Speed loop gain] , again to find motor optimum motion.
3) Set [P103: Speed loop derivative time const.] to decrease over-shoot and under-shoot. Large set value causes vibration.
4) When machine resonance occurs, adjust [P104: Torque command filter] as high as possible to avoid the resonance.
5) Adjust and set [P200: Position loop gain] as high as possible within the range where motor vibration, over-shoot and under-shoot does not occur.

● Conduct below adjustment in stop status

1) Copy parameter settings in above running status to the parameters in stop status.
   P201 ← P200 [Position loop gain]
   P106 ← P101 [Speed loop gain]
   P107 ← P102 [Speed loop integral time const.]
   P108 ← P103 [Speed loop derivative time const.]
2) If a motor vibrates after setting the above, adjust next parameters as the adjustment methods in running status.
   [P201: Servo lock gain] ,
   [P106: Speed loop gain/ Low speed gain range]
   [P107: Speed loop integral time const. / Low speed gain range]
   [P108: Speed loop derivative time const. / Low speed gain range]
3) When machine resonance occurs, adjust [P120: Torque command filter] as high as possible to avoid the resonance.

● Conduct below adjustment in GSEL signal ON status.

(Adjustment is not required when Speed gain selection signal (GSEL signal) is not used.)

1) Adjust and set [P111: Speed loop gain / GSEL signal ON] as high as possible within the range where a motor does not vibrate.
2) Adjust and set the optimum value to [P112: Speed loop integral time const. /GSEL signal ON] and re-adjust [P111 : Speed loop gain / GSEL signal ON] ,again to find motor optimum motion.
3) Set [P113: Speed loop derivative time const. / GSEL signal ON] to reduce over-shoot and under-shoot further more. Large value set causes vibration.
4) When machine resonance occurs, adjust [P120: Torque command filter / GSEL signal ON] as high as possible to avoid the resonance.

* Refer to " 13-3-4 Real-time• gain settings"

10-6 Automatic magnetic pole detection operation

1) In Linear /disk motor, when magnetic sensor is not used, "Automatic magnetic pole detection operation" is executed at the time of the following operations for confirming the magnetic pole position of motor by using a device.
   - Upon initial servo ON operation after applying power source.
   - Upon initial servo ON operation after returns from encoder abnormality

2) In this operation, note the following points since motor vibration is performed.
   Further, amplitude and operation at the time of this operation are as per the value of parameter P116 –119 (Magnetic pole detection operation related parameter).

3) When this operation does not end normally, alarm rings and stops due to [Encoder Abnormality]
   In such case, following factors should be considered
   - Uneven load
   - Large friction
   - Load inertia is large
   - Load inertia is large and fluctuates
   - Load machine stiffness is extremely low
   - Play or Backlash of load machine are large
   - Machine hits the stopper etc. at the time of automatic magnetic pole detection operation (vibration)
   - Error in parameter " (Group 0) " motor, encoder parameter"
   - Magnetic pole detection operation related parameter (P116-119) is not set appropriately

4) In this operation, " RDY Signal " is not output. Output after ends normally.

5) Automatic Magnetic pole detection operation coordination
   (P116: Torque limit value at Magnetic pole detection)
   - •By matching with the used motor, torque limit value is set.
   - •Larger the set numerical value, larger the torque output by motor and faster is the response.
   - •If the set value decreases, reply is delayed and magnetic pole detection becomes difficult.

   (P117: Gain 1 at the time of Magnetic pole detection)
   - •Larger the set numerical value, faster is the response.
   - •Vibrates if the set value increases.
   - •If the set value decreases, reply is delayed and magnetic pole detection becomes difficult.

   (P118: constant of integration)
   - •Larger the set numerical value, faster is the response.
   - •If the set value decreases, oscillations occur
   - • If the set value increases, reply is delayed and magnetic pole detection becomes difficult.

   (P119: Gain 2 at magnetic pole detection)
   - •Larger the set numerical value, faster is the response.
   - •If the Set value increases, overshoots, undershoots or vibrates
   - •If the set value decreases, reply is delayed and magnetic pole detection becomes difficult.

⚠ Caution
(In Linear /disk motor, after applying power supply, " Automatic magnetic pole detection operation (motor vibration) "is not performed. In case of machine (due to reason that work interferes) , use " magnetic sensor" (During automatic magnetic pole detection operation, note that motor does not perform amplitude operation.

10-7 Specifications of absolute encoder and Machine positioning

10-7-1 Specifications of absolute encoder

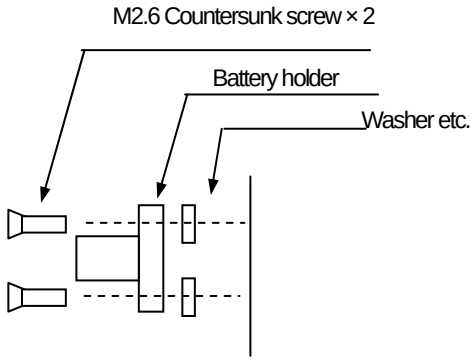
Item	Description
One rotational resolution	2^{17} (131072 Pulse)
Number of multiple rotations	2^{15} (±16383 rev than the initialization position)
Backup system	Battery backup
Battery used	Lithium battery (Primary battery, Nominal 3.6 V)
Battery backup time	Around 2.5 years. * 1
Battery shelf life	5 years from the date of manufacturing.

* 1 When it is operated 10 h / day, 300 day / year

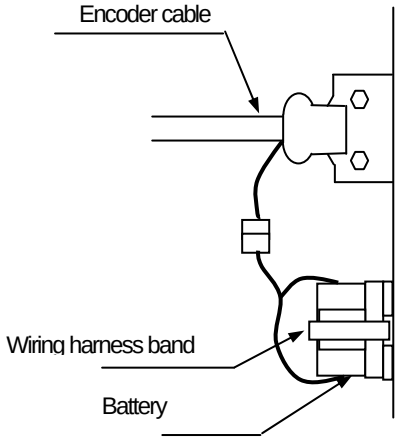
10-7-2 Installation and replacement of battery

(1) Battery installation

1) Install the battery holder at a specific position on the front side of the main device.



2) Install the battery in the battery holder and fix it using Wiring harness band etc. After that, connect it with the encoder cable.



(2) Battery replacement

Replace the battery in case of absolute encoder battery error warning (WNG/ABS/BATT.) or when absolute encoder battery error (ALM/ABS/BATT) occurs.

Replace the battery when the control power supply is ON.

Be careful since the backup data in the encoder may get lost if the battery is replaced while the control power supply is set to OFF status.

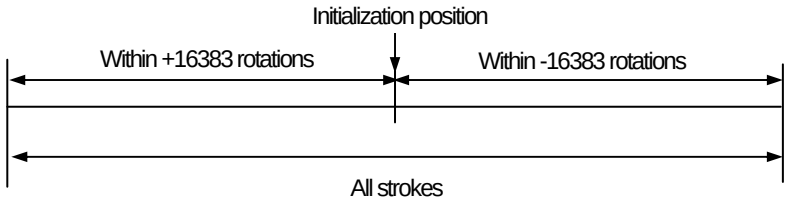
Moreover, even though the above-mentioned errors do not occur, it is recommended to replace the battery regularly.

10-7-3 Parameter setting

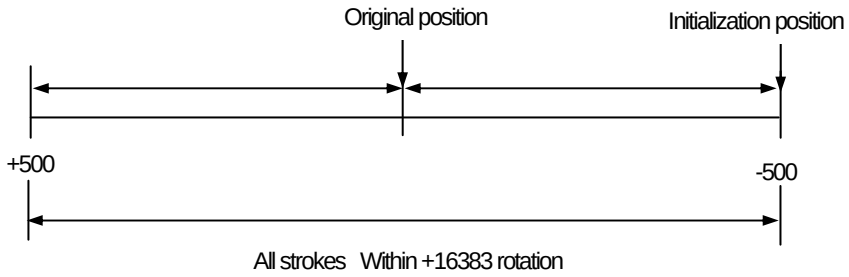
(1) Select the encoder type (P001)
Select “S – ABS”.

(2) Select the motor rotations encoder pulse (P002)
Select “17 bit”.

(3) ABS standard machine position (P019)
Enter the position where the initialization of absolute encoder takes place.
Set the initialization position in such a way that it will be within the number of multiple rotations of the absolute encoder.



- Setting value becomes “0”, when initialization takes place in the original position.
- Setting value becomes “-500” when initialization takes place by one side stroke when the original position is at the central stroke and all strokes are ±500 mm.



10-7-4 Absolute encoder initialization

Initialize the absolute encoder in the following cases.

- When starting the machine for the 1st time.
- When the motor is replaced.
- When the following errors occurred
  Absolute encoder backup error (ALM.ABS.BAKUP)
  Absolute encoder overflow error (ALM.ABS.OVER)
  Absolute encoder count error (ALM.ABS.COUNT)

Following operations are carried out to support the absolute encoder and the machine position.

(1) Move to the initialization position. (The position set with the parameter P019)
Cancel the alarm by executing the operations in 2) when it is moved to the initialization position by inching operation or ‘Return to origin’ operation.

(2) Execute DG97 (S-INC/CLR) of self-diagnostic mode. If “OK !!” is displayed, it is considered as completed.
During self-diagnostic mode, the motor works as free torque. Therefore, set such that the machine position is not moved by any external force etc.
*For the operation procedure of self-diagnostic mode, refer to “Chapter 11 Self-diagnostic”.

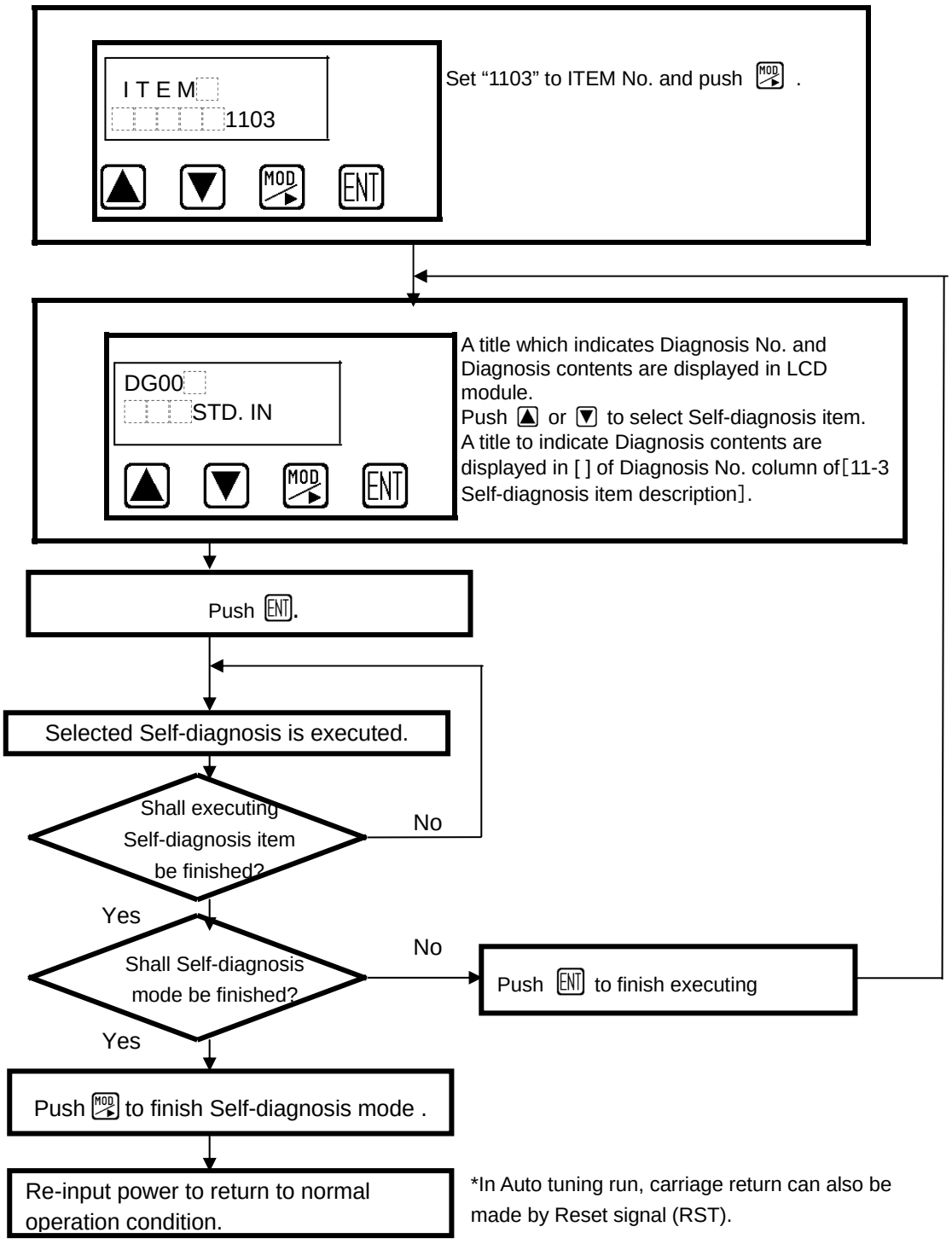
(3) Restart the power supply.

Chapter 11 Self-diagnosis

11-1 Diagnosis Procedure

Self-diagnosis mode is executed by LCD module, SDI device, or our dedicated software. Execution procedure of Self-diagnosis mode by LCD module and SDI device is described below.

（As for Self-diagnosis by our dedicated software, please refer to Help of the dedicated software.）



［Fig. 11-1］ Self-diagnosis Mode Execution Procedure

11-2 Diagnosis items

DG No.	Name	Functions
DG 00	Basic input signal check	Displays status of basic input port (CN1-29-36:DI8-DI1) in LCD module.
DG 01	Extended input signal check1	Displays status of optional extended input port (CN3:EI8-EI1) in LCD module.
DG 02	Extended input signal check2	Displays status of optional extended input port (CN3:EI16-EI9) in LCD module.
DG 03	Extended input signal check3	Displays status of optional extended input port (CN3:EI24-EI17) in LCD module.
DG 04	Extended input signal check4	Displays status of optional extended input port (CN3:EI32-EI25) in LCD module.
DG 05	DIP SW check	Displays status of DIPSW for power ID in LCD module.
DG 06	Expansion interruption ZLS signal check	Displays optional control input output expansion unit, receipt status of ZLS signal in LCD module.
DG 07	Expansion interruption TRG signal check	Displays optional control input output expansion unit, receipt status of TRG signal in LCD module.
DG 10	Pulse train command check	Displays motion status of internal command counter (value of command counter) by pulse train command input in LCD module.
DG 11	Encoder FB check	Value of internal feedback pulse counter) is displayed in LCD module in encoder feedback pulse.
DG 12	Encoder speed detection check	Displays motion status of internal speed detection counter (frequency of encoder feedback pulse) according to encoder feedback pulse in LCD module.
DG 13	Serial encoder FB check	Displays position of serial encoder 1 turn in LCD module.
DG 14	Marker capture check	Displays receipt status of encoder marker signal in LCD module.
DG 20	Analog input speed command check	Displays input voltage of optional external speed command (INH) in LCD module.
DG 21	Analog input torque command check	Displays input voltage of optional external torque command (TQH) in LCD module.
DG 22	Analog input magnetic pole sensor SIN check	Displays input voltage of optional magnetic sensor SIN in LCD module.
DG 23	Analog input magnetic pole sensor COS check	Displays input voltage of optional magnetic sensor COS in LCD module.
DG 24	Expanded analog input check 1	Displays optional Expanded analog input voltage of in LCD module.
DG 25	Expanded analog input check 2	Displays optional expanded analog input voltage of in LCD module.
DG 26	Expanded analog input check 3	Displays optional expanded analog input voltage of in LCD module.
DG 27	Expanded analog input check 4	Displays optional expanded analog input voltage of in LCD module.

[Table 11-1 (a)] Self diagnosis items (1/3)

DG No.	Name	Functions
DG 30	Basic output signal check	Displays status of basic output port (CN1-14 -17:004-D01) in LCD module.
DG 31	Expansion output signal check	Displays status of optional expansion output port (CN3:EO8-EO1) in LCD module.
DG 32	7 segment LED check	Displays 0-9 numbers in 7 segment LED in order.
DG 33	LCD signal display check	All signal display parts of LCD module blink
DG 40	Analog Monitor 0V check	Outputs 0V to Analog Monitor terminal (MON1, MON2).
DG 41	Analog Monitor +5V check	Outputs +5V to Analog Monitor terminal (MON1, MON2).
DG 42	Analog Monitor –5V check	Outputs -5V to Analog Monitor terminal (MON1, MON2) .
DG 43	Analog Monitor +10V check	Outputs +10V to Analog Monitor terminal (MON1, MON2).
DG 44	Analog Monitor -10V check	Outputs -10V to Analog Monitor terminal (MON1, MON2).
DG 50	RAM check	Performs read/write for RAM of internal device and checks that there is no error. Displays result in LCD module.
DG 51	Expansion RAM check	Performs read/write for option RAM and checks that there is no error. Displays result in LCD module.
DG 52	EEPROM check	Performs read/write for EEPROM of internal device (non-volatility memory) and checks that there is no error. Displays result in LCD module.
DG 53	Memory initialization	This item is to adjust at the time of shipment from our factory. **Do not execute at all.** **If executed, contents of parameter are transferred to initial status.**
DG 60	SIO check	Performs short circuit for TXD(A)-RXD(A), TXD(B)-RXD(B), RXD(A)-RLR(A) of Connector J1 and checks that transmission and reception are being performed properly. Displays result in LCD module.
DG 61	Servo control communication transmission check	Performs transmission check of data by servo control communication of connector J2. Check by combining with DG 62.
DG 62	Servo control communication receipt check	Performs receipt check of data by servo control communication of connector J2. Check by combining with DG 61.

[Table 11-1(b)] Self diagnosis items (2/3)

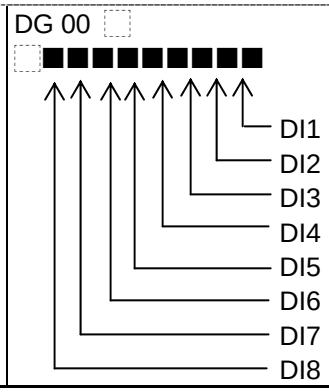
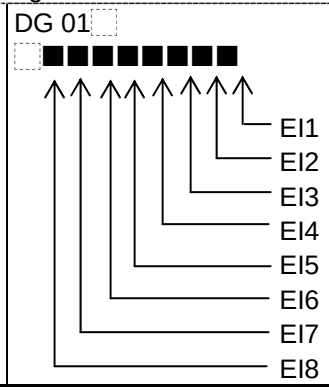
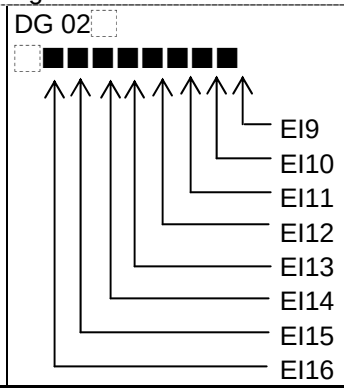
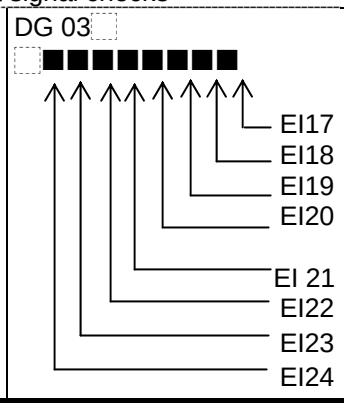
DG No.	Name	Functions
DG 80	Test run	This item is to adjust at the time of shipment from our factory. **Do not execute at all.**
DG 81	DCCT U phase check	This item is adjusted at the time of shipment in our factory **Do not change the settings at all.** (DCCT U phase offset check)
DG 82	DCCT V phase check	This item is adjusted at the time of shipment in our factory **Do not change the settings at all.** (DCCT V phase offset check)
DG 83	DCCT adjustment	This item is adjusted at the time of shipment in our factory **Do not change the settings at all.** (DCCT offset adjustment value)
DG 84	Magnetic pole sensor auto adjustment	While using magnetic pole sensor in Linear/disc motor, gain and offset value are measured automatically and following parameters are set. [P050:Magnetic pole sensor sin gain] [P051:Magnetic pole sensor sin offset] [P052:Magnetic pole sensor cos gain] [P053:Magnetic pole sensor cos offset]
DG 85	Current amplifier adjustment 10V output	This item is to adjust at the time of shipment from our factory. **Do not execute at all.**
DG 86	Current amplifier adjustment 0V output	”
DG 87	Current amplifier adjustment 0.5V output	”
DG 88	Direct current excitation	”
DG 95	Disc motor auto-adjustment	Sensor pulse per 1 rotation of disc motor are measured and difference of setting value of [P004: disc motor encoder pulses] is set to [P054: disc motor encoder revision] as compensation value.
DG 96	Serial encoder 1 rotation data initialization	This item is to adjust at the time of shipment from our factory. **Do not execute at all.**
DG 97	Initialization of data of many serial encoder rotations	Performs initialization of many serial encoder rotations data.
DG 98	Auto tuning in case of GSEL	Perform gain setting of speed loop automatically at the time of GSEL signal is ON.
DG 99	Auto tuning	Performs gain setting of speed loop automatically. (When GSEL signal is OFF)

[Table 11-1(c)] Self diagnosis items (3/3)

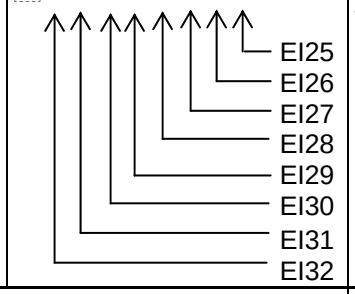
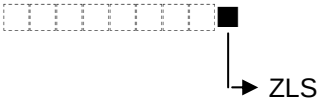
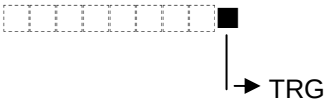
⚠ Caution

① DG 53, DG 80 - 88 (excluding DG 84), DG 96 of self diagnosis items are used for adjustment at the time of shipment in our factory.
Do not execute at all.

11-3 Details of Self diagnosis items

Diagnosis No.	LCD display at the time of execution	Diagnosis contents
Basic input signal check DG 00 [_STD.IN]		If basic input signal of connector CN1 is turned ON, bits are displayed in data display area for each signal of [DI8]-[DI1]. The bits are displayed as 1 when there is a short-circuit (ON) between the COM terminal and 0 when released (OFF).
Extended input signal check1 DG 01 [_EXT.IN1]		If control input signal of optional expanded board connector CN 3 is turned ON, bits are displayed in data display area for each signal from [EI8] to [EI1]. The bits are displayed as 1 when there is a short-circuit (ON) between the COM terminal and 0 when released (OFF).
Extended input signal check2 DG 02 [_EXT.IN2]		If control input signal of optional expanded board connector CN 3 is ON, bits are displayed in data display part for each signal of [EI16]-[EI9]. The bits are displayed as 1 when there is a short-circuit (ON) between the COM terminal and 0 when released (OFF)...
Extended input signal check3 DG 03 [_EXT.IN3]		If control input signal of optional expanded board connector CN 3 is ON, bits are displayed in data display part for each signal of [EI24]-[EI17]. The bits are displayed as 1 when there is a short-circuit (ON) between the COM terminal and 0 when released (OFF).

[Table 11-2(a)] Self diagnosis item details (1/10)]

Diagnosis No.	LCD display at the time of execution	Diagnosis contents
Extended input signal check4 DG 04 [_EXT.IN4]	DG 04 	If control input signal of optional expanded board connector CN 3 is turned ON, bits are displayed in data display part for each signal of [EI32]-[EI25]. The bits are displayed as 1 when there is a short-circuit (ON) between the COM terminal and 0 when released (OFF).
DIP SW check DG 05 [_POWER.ID]	DG 05 	Performs bit display for setting status of DIPSW for power ID on control panel.
Expansion interruption ZLS signal check DG 06 [_ZLS.CAP]	DG 06 	Checks operation status of interruption signal (ZLS) of optional expanded board connector CN3. It is set to “1” when signal ON edge (short circuit (ON) between COM terminals) is received. Once it becomes “1” it cannot be “0” in this test.
Expansion interruption TRG signal check DG 07 [_TRG.CAP]	DG 07 	Checks operation status of interruption signal (TRG) of optional expanded board connector CN3. It becomes “1” when signal ON edge (short circuit (ON) between COM terminals) is received. Once it becomes “1” it cannot be “0” in this test.

[Table 11-2(b) Self diagnosis item details (2/10)]

Diagnosis No.	LCD display at the time of execution	Diagnosis contents
Pulse Train Command counter check		Displays internal counter value of Pulse Train Command. If 90° phase difference pulse is input, value of 4 times of input pulse is displayed. Display range 0-65535, added at the time of forward rotation command.
DG 10 [_PLS.REF.]	DG 10 ■■■■■	
Feedback pulse position counter check		Displays value of internal position counter of encoder feedback pulse. For counter value, value of 4 times of input pulse is displayed. Display range 0-65535, added at the time of forward rotation command.
DG 11 [_ENC.FB.]	DG 11 ■■■■■	
Feed back pulse speed detection counter check		Value of internal speed detection counter of encoder feedback pulse. For counter value, value of 4 times of input pulse is displayed. "★"given in the diagram on left, code ("-") at the time of reverse) is displayed.
DG 12 [SPD.COUNT]	DG 12★ ■■■■■■■■	
Serial encoder feedback check		Displays position of 1 rotation of serial encoder.
DG 13 [_S-ENC.FB]	DG 13★ ■■■■■■■■	
Encoder marker check		Checks input status of encoder mark signal. It becomes "1" when signal ON edge (short circuit (ON) between COM terminals) is received. Once it becomes "1" it cannot be "0" in this test.
DG 14 [_ENC.MK]	DG 14 ■ MK	

[Table 11-2(c)] Self diagnosis item details (3/10)]

Diagnosis No.	LCD display at the time of execution	Diagnosis contents
Speed command input voltage check		Displays optional external speed command input voltage. Code ("-" at the time of negative voltage) is displayed in "★"given in left.
DG 20 [_SPD.REF.]	DG 20★ □□□□■■.■■	
Torque command input voltage check		Displays optional external torque command input voltage. Code ("-" at the time of negative voltage) is displayed in "★"given in left.
DG 21 [_TRQ.REF.]	DG 21★ □□□□■■.■■	
Analog input magnetic pole sensor SIN check		Displays analog input magnetic pole sensor SIN value at the time of optional magnetic pole sensor connection.
DG 22 [M-SEN.SIN]	DG 22★ □□□□■■.■■	
Analog input magnetic pole sensor COS check		Displays analog input magnetic pole sensor COS value time of optional magnetic pole sensor connection.
DG 23 [M-SEN.COS]	DG 23★ □□□□■■.■■	
Extension analog input check1		Displays value of analog input terminal of optional extended board (INH).
DG 24 [EXT.A-IN1]	DG 24★ □□□□■■.■■	
Extension analog input check2		Displays value of analog input terminal of optional extended board (TQH).
DG 25 [EXT.A-IN2]	DG 25★ □□□□■■.■■	
Extension analog input check3		Displays value of analog input terminal of optional extended board (TL+).
DG 26 [EXT.A-IN3]	DG 26★ □□□□■■.■■	
Extension analog input check4		Displays value of analog input terminal of optional extended board (TL-).
DG 27 [EXT.A-IN4]	DG 27★ □□□□■■.■■	

[Table 11-2(d) Self diagnosis item details(4/10)]

Diagnosis No.	LCD display at the time of execution	Diagnosis contents
Base output signal check DG 30 [_I/O_OUT]	DG 30 S.OUT■ ON	Control output signal of connector CN1 is set ON for each second in the order shown below. When output signal is ON, output signal No. is displayed in "■"given in the diagram to left.
Start → S. OUT1 → S. OUT2 → S. OUT3 → S. OUT4 ↑		
Expansion output signal check DG 31 [EXI/O OUT]	DG 31 E.OUT■!!	Control output signal of option expanded board connector CN3 is set to ON for each second in the order shown below. When output signal is ON, output signal No. is displayed in "■"given in the diagram to left. Model of expanded basal plate un-equipped shows "NO I/F".
Start → E. OUT1 → E. OUT2 → E. OUT3 → E. OUT4 → E. OUT5 ↑ ← ← E. OUT8 ← E. OUT7 ← E. OUT6		
7 seg LED check DG 32 [_SEG.DSP]	DG 32 ■	Front model 7 seg LED are displayed in the order shown below. Again, display is done by following data displayed in "■" in the diagram given to left. Start → 0 → 1 → 2 → 3 → 4 ↑ 9 ← 8 ← 7 ← 6 ← 5
LCD signal display check DG 33 [_LCD.IO]	DG 33 RUNNING	Signal display part of LCD module is switched on and off.

[Table 11-2(e) Self diagnosis item details(5/10)]

Diagnosis No.	LCD display at the time of execution	Diagnosis contents
Analog Monitor OV output check DG 40 [A.MON. 0V]	DG 40 0.00	Outputs 0[V] in Analog Monitor output terminal (MON1, MON2).
Analog Monitor +5V output check DG 41 [A.MON.+5V]	DG 41 5.00	Outputs ＋5[V] in Analog Monitor output terminal (MON1, MON2).
Analog Monitor -5V output check DG 42 [A.MON.-5V]	DG 13- 5.00	Outputs -5[V] in Analog Monitor output terminal (MON1, MON2).

Analog Monitor ＋10V output check		Outputs ＋10[V] in Analog Monitor output terminal (MON1, MON2).
DG 43 [A.MON+10V]	DG 43 10.00	
Analog Monitor -10Ⅴ output check		Outputs -10[V] in Analog Monitor output terminal (MON1, MON2).
DG 44 [A.MON-10V]	DG 44- 10.00	

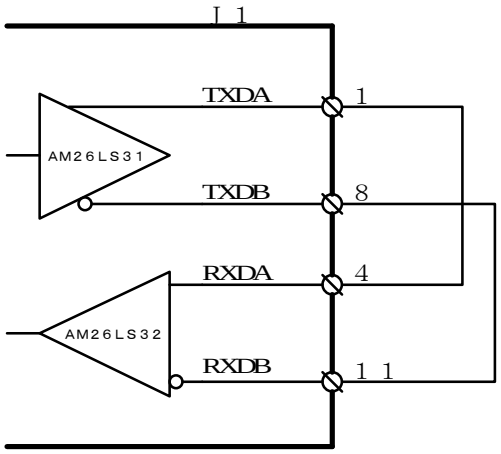
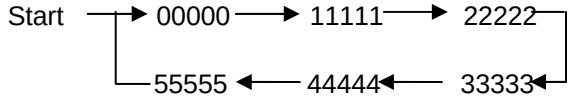
[Table 11-2(f) Self diagnosis item details(6/10)]

<table>
<tr><th>Diagnosis No.</th><th>LCD display at the time of execution</th><th>Diagnosis contents</th></tr>
<tr><td>RAM check
DG 50
[_RAM]</td><td>DG 50
RUNNING</td><td>Checks RAM of internal model and displays diagnosis result shown in the table.
<table>
<tr><th>Display</th><th>Diagnosis result</th><th>Error contents</th></tr>
<tr><td>[__OK!!]</td><td>Normal end</td><td></td></tr>
<tr><td>[_ERROR1!!]</td><td>Error No.1</td><td>Data “0000”
Read/write Error</td></tr>
<tr><td>[_ERROR2!!]</td><td>Error No.2</td><td>Data “5555”
Read/write Error</td></tr>
<tr><td>[_ERROR3!!]</td><td>Error No.3</td><td>Data “AAAA”
Read/write Error</td></tr>
<tr><td>[_ERROR4!!]</td><td>Error No.4</td><td>Data “FFFF”
Read/write Error</td></tr>
</table></td></tr>
<tr><td>Expanded RAM check
DG 51
[_EXT RAM]</td><td>DG 51
RUNNING</td><td>Checks expanded RAM of internal model and displays diagnosis result shown in the table.
<table>
<tr><th>Display</th><th>Diagnosis result</th><th>Error contents</th></tr>
<tr><td>[__OK!!]</td><td>Normal end</td><td></td></tr>
<tr><td>[_ERROR1!!]</td><td>Error No.1</td><td>Data “0000”
Read/write error</td></tr>
<tr><td>[_ERROR2!!]</td><td>Error No.2</td><td>Data “5555”
Read/write error</td></tr>
<tr><td>[_ERROR3!!]</td><td>Error No.3</td><td>Data “AAAA”
Read/write Error</td></tr>
<tr><td>[_ERROR4!!]</td><td>Error No.4</td><td>Data “FFFF”
Read/write error</td></tr>
<tr><td>[_ERROR5!!]</td><td>Error No.5</td><td>Source data
restoration error</td></tr>
</table></td></tr>
<tr><td>EEPROM check
DG 52
[_EEPROM]</td><td>DG 52
RUNNING</td><td>Checks EEPROM of internal model and displays diagnosis result shown in the table.
<table>
<tr><th>Display</th><th>Diagnosis result</th><th>Error contents</th></tr>
<tr><td>[__OK!!]</td><td>Normal end</td><td></td></tr>
<tr><td>[_ERROR1!!]</td><td>Error No.1</td><td>Data “0000”
Read/write error</td></tr>
<tr><td>[_ERROR2!!]</td><td>Error No.2</td><td>Data “5555”
Read/write error</td></tr>
<tr><td>[_ERROR3!!]</td><td>Error No.3</td><td>Data “AAAA”
Read/write error</td></tr>
<tr><td>[_ERROR4!!]</td><td>Error No.4</td><td>Data “FFFF”
Read/write error</td></tr>
<tr><td>[_ERROR5!!]</td><td>Error No.5</td><td>Source data
restoration error</td></tr>
</table></td></tr>
</table>

<table>
<tr><td colspan="2">Memory initialization</td><td rowspan="2">This item is to adjust at the time of shipment from our factory.
Do not execute at all.
If this operation is performed, take care as the status becomes same as at the time of factory shipment.
<table><tr><th>Display</th><th>Adjustment result</th><th>Error contents</th></tr><tr><td>[__OK!!]</td><td>Normal end</td><td></td></tr><tr><td>[_ERROR1!!]</td><td>Abnormal end</td><td>Initialization not permitted</td></tr><tr><td>[_ERROR2!!]</td><td>Abnormal end</td><td>Initialization not possible</td></tr></table></td></tr>
<tr><td>DG 53
[_MEM.INI]</td><td>DG 53

RUNNING</td></tr>
</table>

[Table 11-2(g) Self diagnosis item details(7/10)]

<table>
<tr><th>Diagnosis No.</th><th>LCD display at the time of execution</th><th>Diagnosis contents</th></tr>
<tr><td colspan="2">Serial communication I/F check</td><td rowspan="2">“ OK!!” in case of normal end,
“ ERROR!!” in case of abnormal end is displayed.
Short circuit for TXD (A)-RXD (A), TXD (B), and RXD (A)-RLR (A) of connector J1 is done before execution.
Connection diagram is shown below.
 
</td></tr>
<tr><td>DG 60
[_S.COMM.]</td><td>DG 60
RUNNING</td></tr>
<tr><td colspan="2">Servo control communication transmission check</td><td rowspan="2">Data is transmitted in the order given below for every 0.5 second from servo control communication of connector J2.
Again, display is performed by following transmission data in “■■■■■“given in the diagram to left.
 
</td></tr>
<tr><td>DG 61
[_PLS.TRS.]</td><td>DG 61
■■■■■</td></tr>
<tr><td colspan="2">Servo control communication receipt check</td><td rowspan="2">Data is received in the servo control communication of connector J2.
This check is required for VC series model and connection in DG61.
Data to be received is the data transmitted from VC series by executing DG61.
Diagnosis result of received data is as follows.
<table>
<tr><th>Display</th><th>Diagnosis result</th><th>Error contents</th></tr>
<tr><td>[__OK!!]</td><td>Normal end</td><td></td></tr>
<tr><td>[SUM.ERROR]</td><td>Abnormal end</td><td>Sum check of communication data is abnormal</td></tr>
<tr><td>[_TIME.OUT]</td><td>Abnormal end</td><td>Entire communication data is not received.</td></tr>
</table></td></tr>
<tr><td>DG 62
[_PLS.RCV.]</td><td>DG 62
RUNNING</td></tr>
</table>

[Table 11-2(h) Self diagnosis item details(8/10)]

<table>
<tr><th>Diagnosis No.</th><th>LCD display at the time of execution</th><th>Diagnosis contents</th></tr>
<tr><td>Test run
DG 80
[TST.DRIVE]</td><td>DG 80
■■■■■■■■</td><td>This item is to adjust at the time of shipment from our factory.
Do not execute at all.
If executed, motor might get turned.</td></tr>
<tr><td>For DCCT offset adjustment
DG81 - DG83</td><td></td><td>This item is adjusted at the time of shipment in our factory
Do not change the settings at all.</td></tr>
<tr><td>Magnetic pole sensor auto-adjustment
DG 84
[M-SEN.ADJ]</td><td>DG 84
RUNNING</td><td>Gain and offset of Magnetic pole sensor are measured and set to “P050-P053”.
⚠ Caution
At the time of adjustment, Motor operates in the speed and motion direction set in “P145: Magnetic pole sensor auto-adjustment motion” and operates maximum 30 times of “P058: Distance between poles for linear/disc motor”.
<table>
<tr><th>Display</th><th>Adjustment result</th><th>Error contents</th></tr>
<tr><td>[__OK!!]</td><td>Normal end</td><td></td></tr>
<tr><td>[_ERROR1!!]</td><td>Abnormal end</td><td>• Not linear/disc motor
• No Magnetic pole sensor</td></tr>
<tr><td>[_ERROR2!!]</td><td>Abnormal end</td><td>• Abnormality occurred</td></tr>
</table></td></tr>
<tr><td>Current amplifier adjustment 10V output
DG 85
[CURCK. 10]</td><td>DG 85
10. 00</td><td>This item is to adjust at the time of shipment from our factory.
Do not execute at all.
If executed, there is danger of motor starting.</td></tr>
<tr><td>Current amplifier adjustment 0V output
DG 86
[CURCK. 0]</td><td>DG 86
0. 00</td><td>This item is to adjust at the time of shipment from our factory.
Do not execute at all.
If executed, there is danger of motor starting.</td></tr>
<tr><td>Current amplifier adjustment 0.5 V output
DG 87
[CURCK.0.5]</td><td>DG 87
0.50</td><td>This item is to adjust at the time of shipment from our factory.
Do not execute at all.
If executed, there is danger of motor starting.</td></tr>
<tr><td>Direct current excitation
DG 88
[DC.EXCT]</td><td>DG 88
RUNNING</td><td>This item is to adjust at the time of shipment from our factory.
Do not execute at all.
If executed, there is danger of motor starting.</td></tr>
</table>

[Table 11-2(i) Self diagnosis item details(9/10)]

<table>
<tr><th>Diagnosis No.</th><th>LCD display at the time of execution</th><th>Diagnosis contents</th></tr>
<tr><td colspan="2">Disc motor automatic adjustment
DG95
[DISC.INI]</td><td>DG95
RUNNING</td><td>It measures sensor pulse number per 1 turn of Disc motor and set difference between the setting value of [P004: Disc motor ・Encoder pulse number] and [P054: Disc motor ・Encoder compensation] as compensation value.
⚠ Caution
1) When this adjustment is conducted, a motor runs max. 9 turns by the speed and for travel direction set by [P149: Disc motor automatic adjustment].
2) Start this adjustment from OFF position of a reference marker.(If adjustments starts from the ON position, correct adjustment value can not be detected.)
3) If a reference marker is not connected, a motor continuously runs.(Alarm does not occur.)
<table>
<tr><th>Display</th><th>adjustment results</th><th>Contents</th></tr>
<tr><td>[Pulse number]</td><td>Normal end</td><td>Display of 1 turn pulse number</td></tr>
<tr><td>[_ERROR1!!]</td><td>Abnormal end</td><td>Disc motor is not used.</td></tr>
<tr><td>[_ERROR2!!]</td><td>Abnormal end</td><td>Data are out of range.</td></tr>
<tr><td>[_ERROR3!!]</td><td>Abnormal end</td><td>Duplicate read error</td></tr>
</table></td></tr>
<tr><td colspan="2">Serial encoder 1 turn data initialization
G96
[S-INC.INI]</td><td>DG96
RUNNING</td><td>This item is only for adjustment at our factory shipment. Never conduct it.</td></tr>
<tr><td colspan="2">Serial encoder plural turn data initialization
DG97
[S-INC.CLR]</td><td>DG97
RUNNING</td><td>Counter for Serial encoder plural data are initialized.
<table>
<tr><th>Display</th><th>Adjustment results</th><th>Abnormal contents</th></tr>
<tr><td>[____OK!!]</td><td>Normal end</td><td></td></tr>
<tr><td>[__ERROR!!]</td><td>Abnormal end</td><td>Serial encoder is not used</td></tr>
</table></td></tr>
<tr><td colspan="2">Automatic tuning at GSEL
DG98
[_GSELTUNE]</td><td>DG98
RUNNING
Display in Trial run
↓
DG98
CALCULATE
Display in calculating</td><td>This item measures load characteristics (machine system) for GSEL signal ON status and sets a proper parameter for Servo control automatically.
Operate this item referring to 11-4 Automatic tuning].</td></tr>
<tr><td colspan="2">Automatic tuning
DG99
[_AUTOTUNE]</td><td>DG99
RUNNING
Display in Trial run
↓
DG99
CALCULATE
Display in calculating</td><td>This item measures load characteristics (machine system) and sets a proper parameter for Servo control automatically.
Operate this item referring to 11-4 Automatic tuning].</td></tr>
</table>

[Table 11-2(j) Self diagnosis item details(10/10)]

11-4 Auto tuning

Auto tuning is the function that performs adequate servo control parameter setting or servo control parameter setting support to the machine (motor load) in model itself.

Auto tuning is constructed by 2 functions such as “Auto-tuning function” and “Tuning level adjustment function”.

In Auto tuning function, motor rotates in test run (internal run pattern motion) and adequate servo control parameter value in accordance with machine action.

Tuning level adjustment function supports the setting of servo control parameter by increasing or decreasing gain in accordance with the characteristics of machine measured in auto tuning function.

Again, this model has switch over function (selection by GSEL signal) of servo control parameter and auto tuning in motor load status of 2 types is assigned to the change command.

⚠ Caution

① As motor shaft rotates in accordance with the setting of parameter [P140], [P141] at the time of auto tuning function execution, check that the load machine is in valid range. Again, if over travel signal (FOT*/ROT*) is not connected, this function gives error (FOT*, ROT* in setting of parameter [P705] can be invalidated.).

② Input signal other than FOT*, ROT* are invalid in auto tuning function execution.
Cannot be interrupted by Reset signal (RST), emergency stop signal (EMG*) etc.

③ If abnormality like vibrator etc occurred in auto tuning function execution, process cannot be stopped immediately with ENT key. Again, if stopped, it operates in motor free inertia.

④ Auto-tuning function cannot calculate the correct gain in following cases and it may get in to oscillation/out of control status. In that case, set gain manually.
(1) big unequal load
(2) big friction
(3) when load inertia changes
(4) when stiffness of load machine is low
(5) play or backlash in load machine
(6) Load inertia is 3 times less of motor inertia.

❗ Compulsion

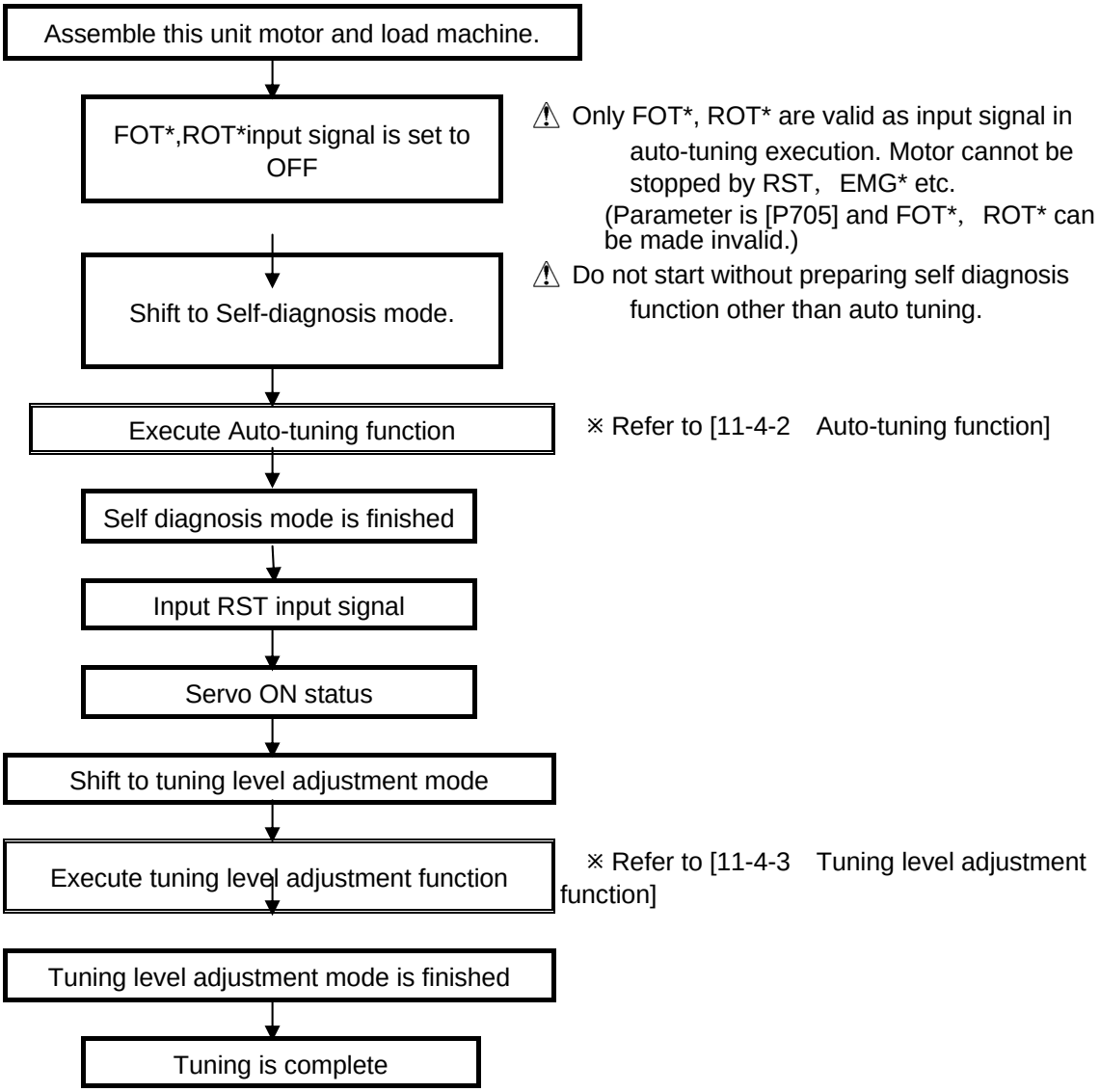
① Auto-tuning function and tuning level adjustment function calculate gain of appropriate speed loop based on the measured load characteristics.
In case of changes in load by fine control of load machine after Auto tuning function and tuning level adjustment function execution, execute auto-tuning function must again and measure the load characteristics.
If auto tuning function is not executed again after the load is changed, load machine may get in to oscillation/out of control status.

⃠ Prohibition

① Do not perform auto tuning, to the motor with vertical shaft etc when external torque is loaded.
When Self diagnosis is selected to perform auto tuning function, a motor becomes torque free and moved by external torque.

11-4-1 Auto-tuning execution process

Auto-tuning execution process is shown below.



[Diagram 11-2] Auto-tuning execution process

11-4-2 Auto-tuning function

Auto-tuning function operates in Diagnosis No. DG 98 and DG 99 of Self-diagnosis mode.

- DG 99 measures machine characteristics in trial run and sets adequate value in parameter for following servo control.
  Consequently, **you must load motor and execute DG 99.**

No.	Parameter name	Remarks
P101	Speed loop gain	Set appropriate value.
P102	Speed loop integral time constant	Set appropriate value.
P104	Speed loop proportion gain division ratio	Set 0. (Normally, 0 is the appropriate value)
P105	Speed loop differential gain division ratio	Set 0. (Normally, 0 is the appropriate value)
P106	Speed loop gain/low speed gain range	Setting value similar to P101
P107	Speed loop integral time constant/low speed gain range	Setting value similar to P102
P109	Speed loop proportional gain division ratio/low speed gain range	Set 0. (Normally, 0 is the appropriate value)
P110	Speed loop differential gain division ratio /low speed gain range	Set 0. (Normally, 0 is the appropriate value)
P146	Mass inertia	Set appropriate value.
P147	Viscosity friction	Set appropriate value.

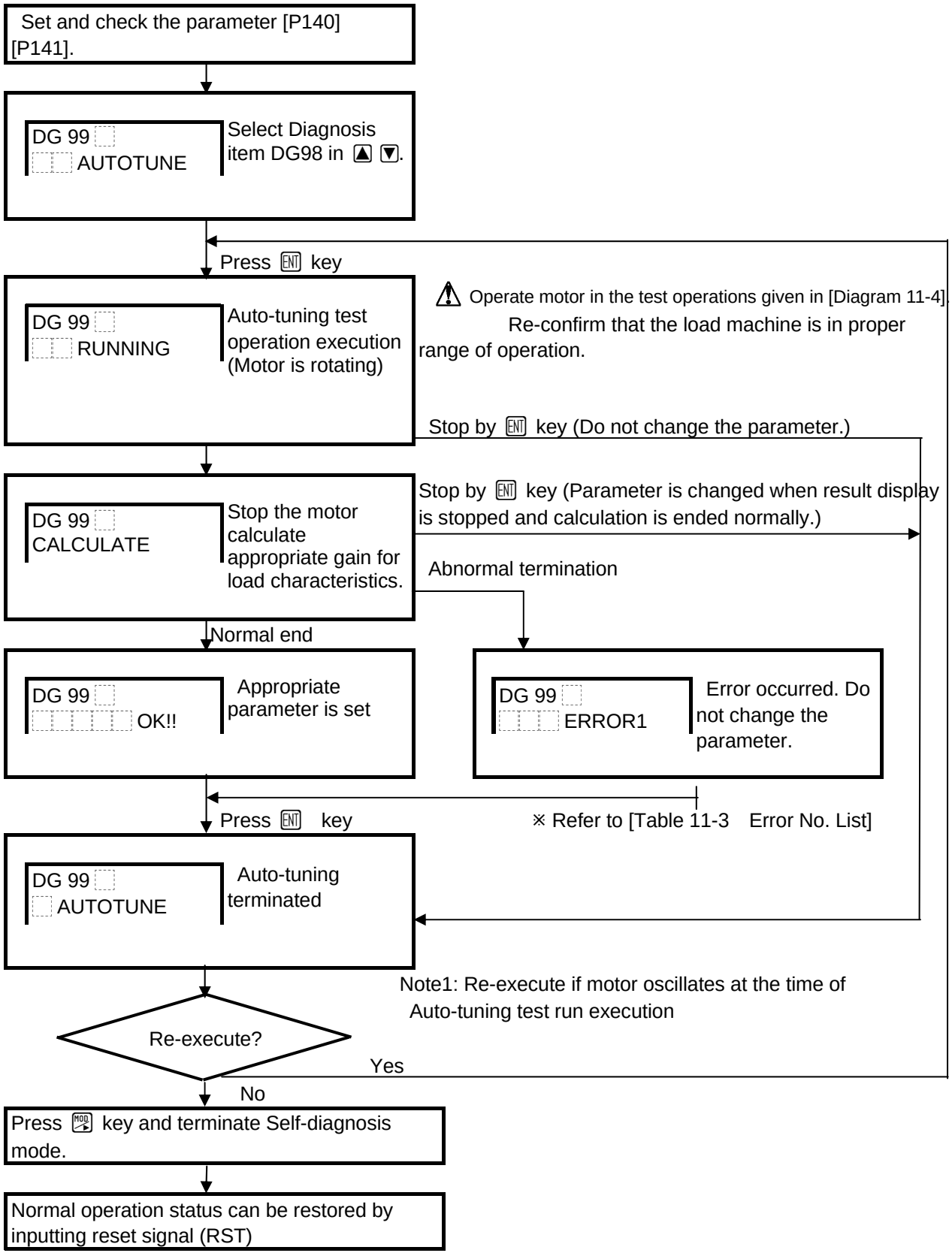
- DG 98 sets parameter for following servo control when GSEL signal is ON.
  Consequently, as it measures machine characteristics by trial run, **you must connect the motor and load for GSEL signal ON and execute DG 98.**

No.	Parameter name	Remarks
P111	Speed loop gain/GSEL signal ON	Set appropriate value.
P112	Speed loop integral time constant/GSEL signal ON	Set appropriate value.
P114	Speed loop proportional gain division ratio /GSEL signal ON	Set 0. (Normally, 0 is the appropriate value)
P115	Speed loop differential gain division ratio /GSEL signal ON	Set 0. (Normally, 0 is the appropriate value)

Again when machine load is changed or other load characteristics are changed, **measure the load characteristics by auto tuning function.**
Auto-tuning function sets adequate gain when load inertia is in range of 3 - 30 times of motor inertia. If load inertia exceeds 30 times, since gain is a little bit low, confirm the safety and adjust by Tuning level adjustment function.

1) Auto-tuning function execution process

Operation upon Auto-tuning function execution is shown. (Operation is similar to DG 98.)



[Diagram 11-3] Auto-tuning function execution process

2) Parameter setting

Set and confirm parameter [P140] [P141] to execute Auto-tuning function.

[P140] Auto-tuning test run direction selection

1. Function

Set direction in which motor is to be run for test at the time of executing Auto-tuning function.

- BOTH: Motor operates to reverse direction after operating in Forward direction.
- +ONLY: Motor operates only in forward direction.
- –ONLY: Motor operates only in reverse direction.

Normally, select “BOTH”. Change for the load machine that can be operated only in forward direction or reverse direction.

Again, Note that operation direction may get reversed by setting parameter [P300 Rotation direction selection].

2. Unit, Setting range

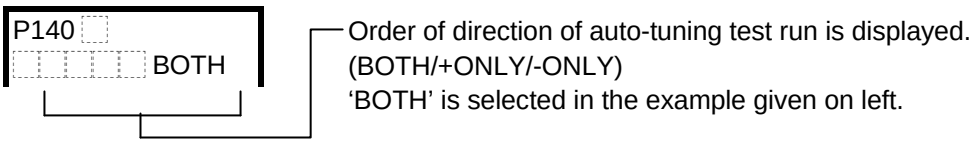
(1) Unit: Menu selection

(2) Setting range: BOTH/+ONLY/-ONLY

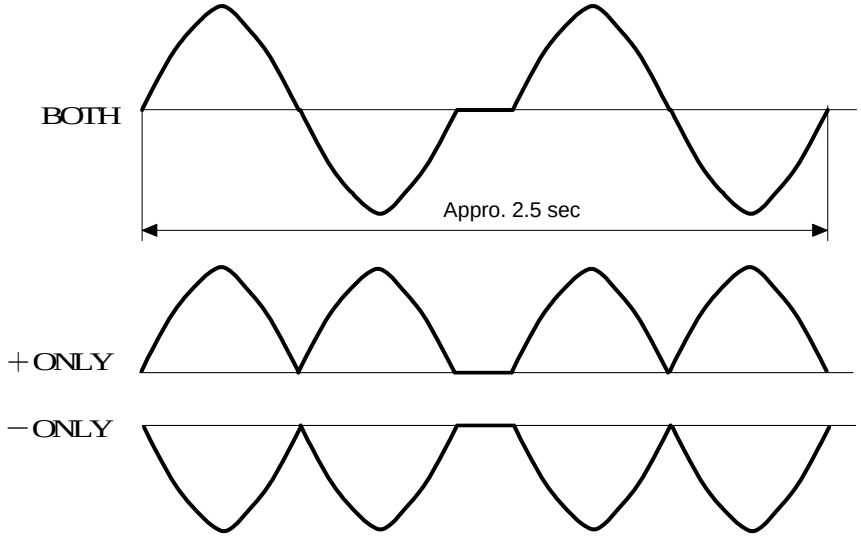
(3) Initial value: BOTH

3. Display

[Auto-tuning test run direction selection]



Motor operation pattern at the time of executing auto-tuning test run is shown.



[Diagram 11-4] Auto-tuning test run

[P141] Auto-tuning test run speed ratio

1. Function

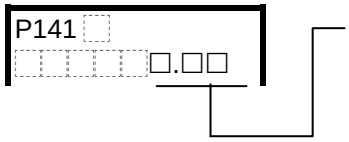
At the time of Auto-tuning function execution, motor is set by some ratio of rated speed.
When 0. 00 set, error occurs and motor doesn't run.
When 1. 00 set, motor runs at rated speed.
Set initial value. Again, please note that motor operation changes according to the value of this parameter.

2. Unit, setting range

(1) Unit: none
(2) Set range: 0. 00 - 1. 00
(3) Initial value: 0. 30

3. Display

[Auto-tuning test operation speed ratio]



Auto-tuning test operation speed ratio is displayed.

⚠ Caution

By parameter［P140］and［P141］values, motor speed is determined as below.
Before executing Auto tuning function, be sure to confirm if a load machine is in the movable range.

(1) If [P140] is "BOTH"

At the time of rotating motor: (Motor shaft rotating amount[Turns])=(Ｐ141setting value) X (rated speed) X 0.005

At the time of straight drive motor: (motor operation quantity [Set unit])=(Ｐ141setting value) X (Rated speed) X 0.3

[Sample 1]If [P141] is "0. 30" in rotating motor and rated speed is 3000rpm,
(Motor shaft rotating amount[turns])=0.30 X 3000 X 0.005=4.5[Turns]
Rotates approximately for 4.5 in forward direction and then rotates approximately for 4.5 in reverse direction.

[Sample 2] If [P141] in straight drive motor is "0.30" and rated speed is 1000mm/sec,
(motor operation quantity[Set unit])=0.30 X 1000 X 0.3=90[mm]
Rotates approximately for 90mm in forward direction and then rotates approximately for 90mm in reverse direction.

(2) If [P140] is "+ONLY" or "-ONLY",

At the time of rotating motor: (Motor shaft rotating amount [turns])=(P141 setting value)X(rated speed) X 0.020

At the time of straight drive motor: (motor operation quantity [Set unit])=(P141 setting value) X(rated speed) X 1.2

[Sample 1]If [P141] is "0.30" and rated speed is 3000rpm,
(Motor shaft rotating amount [turns])=0.30 X 3000 X 0.020=18[turns]
Rotates approximately for 18 times in forward or reverse direction.

[Sample 2] If [P141] is "0.30" in straight drive motor and rated speed is 1000mm/sec,
(motor operation quantity[Set unit])=0.30 X 1000 X 1.2=360[mm]
Operates for approximate 360 mm in forward or reverse direction.

(3) Reference sample

As a reference sample at the time of rotating motor, sample for [P141] is "0.30 (initial value) "is shown.

Rated speed	Setting of P140		
	BOTH	+ONLY	-ONLY
2000	3 rotations in each forward and reverse direction	Forward direction 12 rotations	Reverse direction 12 rotations
3000	4.5 rotations in each forward and reverse direction	Forward direction 18 rotations	Reverse direction 18 rotations
4000	6 rotations in each forward and reverse direction	Forward direction 24 rotations	Reverse direction 24 rotations

3) Auto-tuning error

Error upon Auto-tuning function execution is shown.

Error No.	Contents
ERROR1	Measurement data is “0”. Re-execute after confirming that [P141] is not “0.00”.
ERROR2	Speed loop integral time constant [P102] or [P112] is out of range. Auto tuning not possible. Set the parameter manually.
ERROR3	Abnormal measurement data. Check that no play etc exists in load machine.
ERROR4	Interrupted due to FOT* or ROT*.

[Table 11-3] Error No. list

11-4-3 Tuning level adjustment function

Tuning level adjustment function is executed in <Tuning level adjustment mode>.
<Tuning level adjustment mode> can be executed after Auto-tuning function execution.
Again, in case of load changed even after Auto-tuning function execution, re-execute auto tuning function.
Tuning level adjustment mode is selected by following ITEM.

- By ITEM No. “3468”, to adjust lower or higher gain, set adequate value to Servo control parameters. At the time, adjust gain by watching machine action.

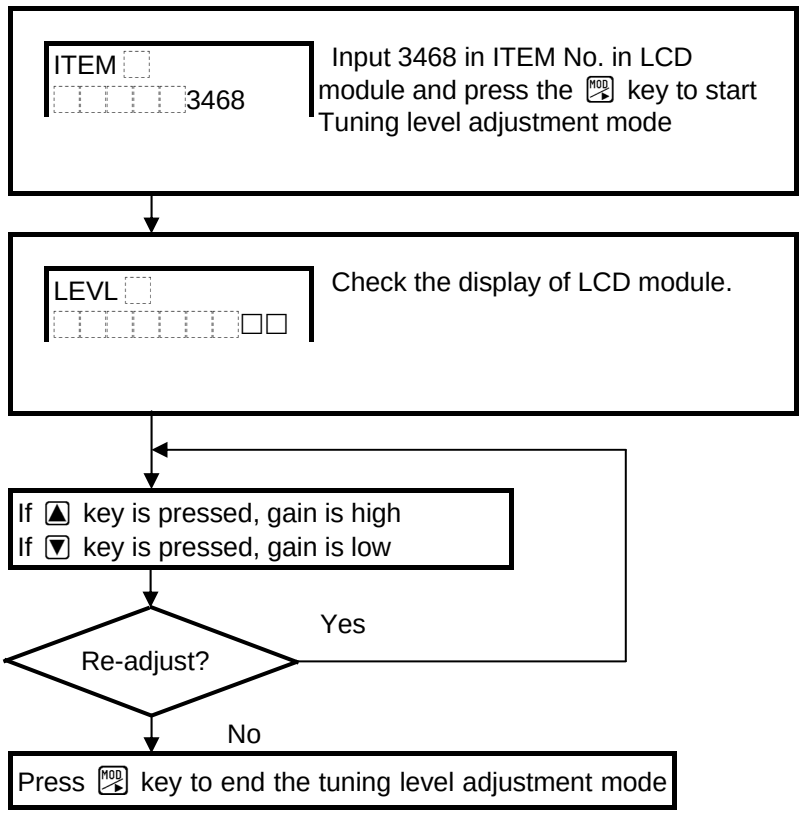
No.	Parameter name	Remarks
P101	Speed loop gain	Set appropriate value.
P102	Speed loop integral time constant	Set appropriate value.
P106	Speed loop gain/Low speed gain range	Setting value similar to P101
P107	Speed loop integral time constant/low speed gain range	Setting value similar to P102

- By ITEM No. “3467”, to adjust lower or higher gain when GSEL is ON, set adequate value to Servo control parameters. At that time, turn GSEL signal ON and adjust gain by watching machine action.

No.	Parameter name	Remarks
P111	Speed loop gain/GSEL signal ON	Set appropriate value.
P112	Speed loop integral time constant/GSEL signal ON	Set appropriate value.

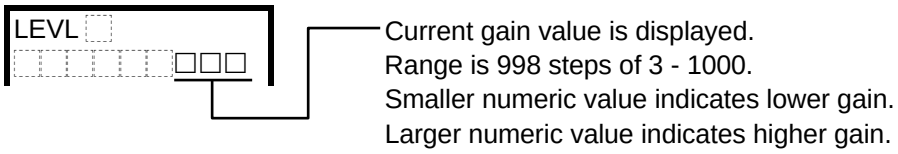
1) Tuning level adjustment function execution procedure

Operation upon tuning level adjustment function execution is shown below. (ITEM"3467" is also similar.)



[Diagram 11-5] Tuning level adjustment function execution procedure

2) Display of tuning level adjustment mode



By pressing ▲ key level numeric value becomes large, i.e. high gain.
By pressing ▼ key level numeric value becomes small, i.e. low gain.

11-5 Forced jog mode

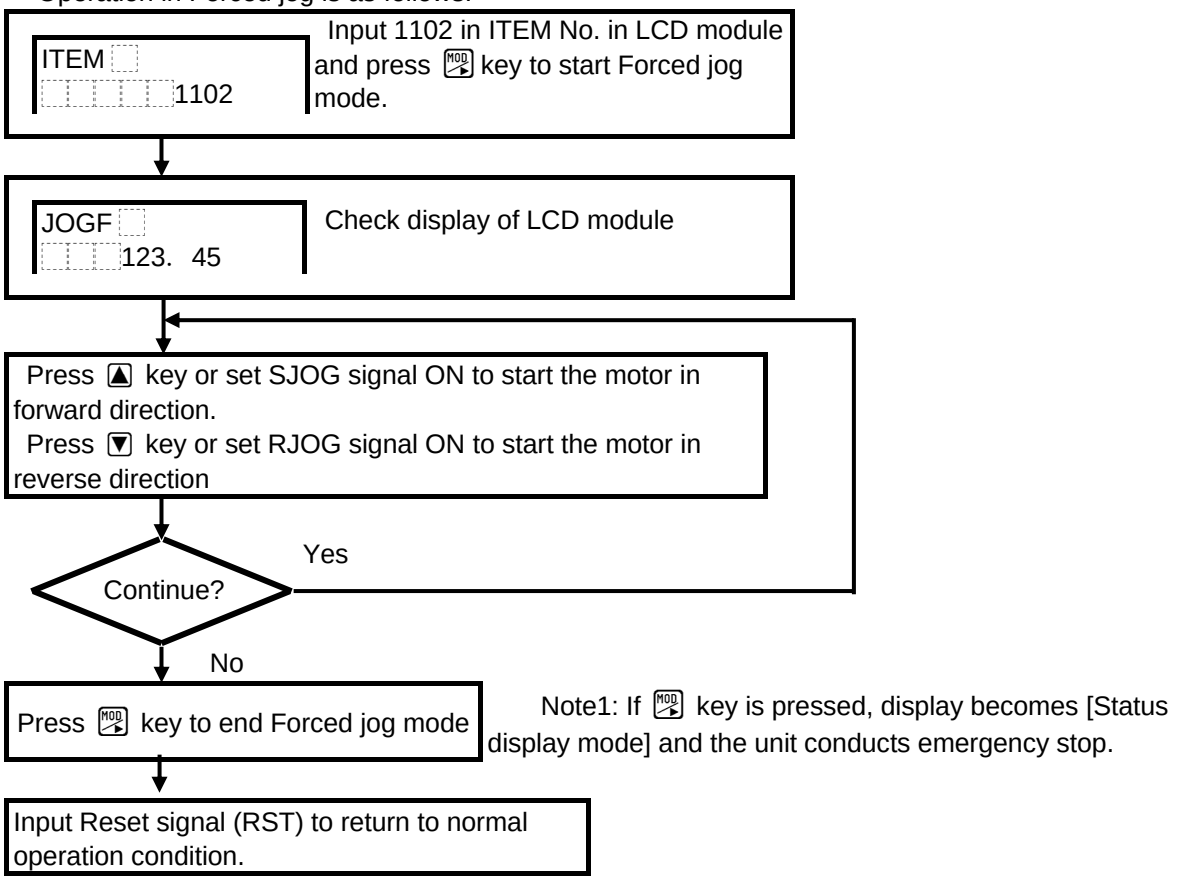
Forced jog mode is the mode that performs forced operation for test run and to recover from errors etc.

Operation speed of motor is setting value of parameter [P400: Jog speed 1].

Signals other than FJOG, RJOG, FOT, RJOG, FOT*, ROT* are ignored in Forced jog mode.

1) Forced jog execution procedure

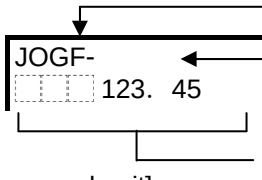
Operation in Forced jog is as follows.



Note1: If MOD key is pressed, display becomes [Status display mode] and the unit conducts emergency stop.

[Fig. 11-6] Forced jog execution procedure

2) Display of Forced jog mode



Motor operation direction F: forward direction/R: Reverse direction

Current position code (•/-)

Current display position is machine position and decimal point depends on [P302: command unit]

Motor can be started with ▲/▼ key.

If ▲ key is pressed or FJOG signal is ON, motor runs in forward direction and if ▼ key is pressed or ROJG signal is ON, motor runs in reverse direction.

To start the motor by FJOG, RJOG instead of pressing only ▲/▼ key, display is the same.

⚠ Caution

① In case of changing motor speed, once Forced jog mode is finished and change the value of [P400:Jog speed1].

② Please note that if forced jog mode starts when FJOG or RJOG is ON, a motor immediately starts.

Chapter 12 Protective Function

12-1 Protective Function and Error Treatment

The controller has various Protective function to prevent a controller or a motor from damage and Error treatment function to inform operation error, etc..
Protective function consists of [Alarm treatment] and [Warning treatment], and Error treatment function has [Error display].

1) Alarm treatment
When an error is detected, a motor stops (Sudden stop or torque free based on the error contents), Alarm signal output and Alarm message display are conducted, simultaneously.

2) Warning treatment
When it is supposed it may probably occur an error if current status is continued, Warning of error notice will be made.
The controller outputs Warning signal and displays Warning message but does not stop motor motion.

3) Error display
When an operation error, input data error, etc. occurs, Error message is displayed on the spot.

	Treatment contents when an error occurs (detected).		
	Motor motion status	Control output signal	LCD display
Alarm treatment	Sudden stop or torque free	Alarm signal ON	Alarm message
Warning treatment	Current motion continues.	Warning signal ON	Warning message
Error display	Current motion continues.	Un-changed	Error message

［Tab. 12-1］ Error Occurrence and Treatment

***[LCD display]**
When LCD module is equipped or SDI device is connected, Alarm/ Warning/ Error message is displayed in [Data display section]. As for LCD module, please refer to [Chapter 13 LCD module].

12-2 7 Segment Display

Next status is displayed by 2 digits in 7 segment LED of the front panel.
And the display is lower order 2 bits with [－] in the middle of 2 digits.

Display sample

1 digit (high order bit) sample: 0 display　　2 digits　sample: 12 display

[0]　　[1] → [－] → [2] → [ ] → [1] …

7 segment display when Alarm occurs is as follows.

High order Display	status	Lower order display	Error contents
None	Normal	None	
0	RDY OFF	None	Alarm / Warning does not occur when RDY is OFF.
1	Servo error	0	IPM error
		1	Control power low capacity error
		2	Main power low capacity error
		3	Over voltage error
		4	Over speed error
		5	Over load error
		6	IPM over load error
		7	Regenerative resistor over load error
		8	AC disconnected (*1)
			Overheat
		8	Servo control error
2	Motor error	0	Motor type is not set yet.
		1	Motor type is not proper.
3	Encoder error	0	Encoder error
		1	Motor shaft error at power ON
		2	Serial encoder count error
		3	Serial encoder communication error
4	NC error	0	Deviation overflow
		1	Deviation error
5	OT detection	0	Forward over-travel
		1	Reverse over-travel
		2	Forward software over-travel
		3	Reverse software over-travel

(*1) When the control power is DC24V, it is detected as control voltage error when 24V voltage of the control power is less than 18V.

[Tab. 12-2 (a)] 7 Segment Display 1/2

High order Display	status	Lower order display	Error contents
6	Error in Automatic run	0	Address setting error
		1	Positioning time over
		2	Positioning data overflow
		3	1 rotational data is not set
		4	Program end command is not set
		5	Sub-routine call nesting over
		6	Sub-routine return error
		7	Jump address error
		8	Spin command error
		9	Division error
		A	Positioning amount error
		b	Error command
		C	Index data No. error
		d	Continuous control command error
7	Data hold error	None	Back up data error
8	System error (failure)	None	DSP error or RAM fault
9	Sequence error	0	SQB Alarm
		1	Remote sequence control IC fault
		2	Remote sequence control communication OFF
		3	DevineNet communication OFF
A	Other error	0	Extension memory battery low voltage error
		1	EEPROM (Non-voluntary memory) Write error
		2	Rated speed command error 1
		3	Rated speed command error 2
		4	Servo control communication OFF error
		5	Servo control communication error
		6	S.COMM.ER
b	Free curve motion operation error	0	Free curve motion data error
		1	Standard position return data error
		2	Slave axis movement error
		3	Uninstalling extension memory
C	Un-defined	None	
d	Un-defined	None	
E	Absolute related error	0	Absolute encoder battery error
		1	Absolute encoder back up error
		2	Absolute encoder overflow error
		3	Absolute encoder count error
F	Warning	0	Over load warning
		1	Deviation error warning
		2	Main power under voltage detection warning
		3	Zero return incomplete at Automatic start warning
		4	Absolute encoder battery error warning
		5	Waiting warning for Remote sequence control communication
		5	SW change warning for remote sequence control

[Tab. 12-2 (b)] 7 segment Display 2/2

12-3 Protective Function List

12-3-1 Alarm List

Name Display	Contents	Motion and output signal status	Way to release
IPM error ALM. I P M ERR.	Due to the motor grounding, the wiring between controller and motor, or the short circuit and the grounding of B1 and B2 wiring between resistor and U.V.W. of controller, over-current flew into the transistor in main circuit. Or the cooling heat sink for power element was overheated.	Motor torque free 7 segment display [10] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1) Re-input power. (2) Reset signal (RST) input
Control power under voltage error ALM. UNDRVOLT 1	Control power (+5V, +15V) voltage dropped. DC+5V：About +4.75V or less DC+15V：About +13.5V or less	Motor torque free 7 segment display [11] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1) Re-input power. (2) Reset signal (RST) input
Main power under voltage error ALM. UNDRVOLT 2	Main circuit DEC bus voltage dropped less than 180[90](360) V. A value of 100V type is in [ ]. A value of 400V type is in( ). (In case of a controller combined with main power type detect this Alarm.)	Motortorque free 7 segment display [12] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1)Re-input power. (2)Reset signal (RST) input
Over voltage error ALM. OVER VOLT	Due to excessive load inertia, etc., regenerative energy at motor stop or decel. is beyond the treatment capacity and DC power voltage of main circuits exceeded about 400[200](800)V or more. A value of 100V type is in [ ]. A value of 400V type is in( ).	Motor torque free 7 segment display [13] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1)Re-input power. (2) Reset signal (RST) input

Name Display	Contents	Motion and output signal status	Way to release
Encoder fault 	(1) Encoder fault (2) Break or disconnection of an encoder cable or loose fitting of a connector (3) Wrong encoder selection by the parameter, etc. occurred. (4) First magnetic pole detection is not completed, correctly when a linear sensor is used.	Motor torque free 7 segment display [30] Alarm ON Motor torque free 7 segment display [30] Alarm ON Warning OFF Servo ready OFF Brake release OFF	Confirm the encoder, encoder cables and the parameter [P001], or [P010] (If Confirm the encoder, encoder cables and the parameter [P001], or [P010] (If a linear sensor is used), (1) Re-input power. (2) When [P001] is other than [INC3] setting, input Reset signal (RST) .

［Tab. 12-3 (a)］Alarm List 1/11

Name Display	Contents	Motion and output signal status	Way to release
Motor shaft fault at power ON ALM. PW. ON ENC	Motor shaft has been rotated or vibrated when power is turned ON. In the case, an encoder can not be initialized.	Motor torque free 7 segment display [31] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1)Re-input power. (2)When [P001] is other than [INC3] setting, input Reset (RST) signal.
Over speed error ALM. OVERSPEED	Motor speed is more than about 130% of the rated speed.	Motor torque free 7 segment display [14] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1) Re-input power. (2) Reset signal (RST) input
Over load error ALM. OVER LOAD	Due to over load or too frequent ON/OFF than allowable times, an internal electronic thermal is activated. Detection method can be selected by [P144 : Electronic thermal detection selection].	Motor torque free 7 segment display [15] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1) Re-input power. (2) Reset signal (RST) input
ＩＰＭ over load error ALM. IIPM O. L.	Load exceeds capacity of power elements of a unit. 180% or more current of motor or unit rated current was flown for more than specified time.	Motor torque free 7 segment display [16] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1) Re-input power. (2) Reset signal (RST) input
Regenerative resistor over load error ALM. RG. O. L.	Regenerative electric power generated at deceleration of load inertia, etc. exceeds allowable range of Regenerative resistor power capacity. This error is detected referring to [P158 : Regenerative resistor power].	Motor torque free 7 segment display [17] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1) Re-input power. (2) Reset signal (RST) input
AC loss detection error ALM. AC DOWN	AC power voltage dropped less than about 60[30]V.(Black out occurred.) But it is available when ［ALM.ON:Alarm signal output］ is selected by ［P714 : AC loss ALM output selection ］. A value of 100V type is in［ ］.	Motor stops and is in torque free after by [P713 : AC loss stop method]. 7 segment display [18] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1) Re-input power. (2) Reset signal (RST) input

(*1) : When the control power is DC24V, it is detected as control voltage error when 24V voltage of the control power is less than 18V.

［Tab. 12-3 (b)］Alarm List 2/11

Name Display	Contents	Motion and output signal status	Way to release
Deviation overflow ALM. OVERFLOW	Position deviation exceeds setting of [P207 : Overflow detection pulse].	Suddenly a motor stops and is in torque free. 7 segment display [40] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1) Re-input power. (2)Reset signal (RST) input
Deviation error ALM. VARI. OVER	Position deviation exceeds setting of [P208 : Deviation error detection pulse]. But it is applied when [STOP: Alarm stop] is selected by [P209 : Motion selection at Deviation error].	Suddenly a motor stops and is in Servo lock. 7 segment display [41] Alarm ON Warning OFF Servo ready ON *1 Brake release ON	(1) Re-input power. (2) Reset signal (RST) input
Forward over travel ALM. +HARD OT.	Forward over travel signal (FOT) is detected.	Suddenly a motor stops and is in Servo lock. 7 segment display [50] Alarm ON Warning OFF Servo ready ON *1 Brake release ON	(1) A motor moves reverse by Jog motion and release Forward over travel.
Reverse over travel ALM. - HARD OT.	Reverse over travel signal (ROT) is detected.	Suddenly a motor stops and is in Servo lock. 7 segment display [51] Alarm ON Warning OFF Servo ready ON *1 Brake release ON	(1) A motor moves forward by Jog motion and release Reverse over travel.
Forward software Over travel ALM. +SOFT OT.	Current position exceeds setting value of [P306 : Forward software OT limit].	Suddenly a motor stops and is in Servo lock. 7 segment display [52] Alarm ON Warning OFF Servo ready ON *1 Brake release ON	(1) A motor moves reverse into movable range by Jog motion.
Reverse software Over travel ALM. - SOFT OT.	Current position exceeds setting value of [P307 : Reverse software OT limit].	Suddenly a motor stops and is in Servo lock. 7 segment display [53] Alarm ON Warning OFF Servo ready ON *1 Brake release ON	(1) A motor moves forward into movable range by Jog motion.

*1 : Status when [RDY1] is selected by ［P716: RDY signal specification selection ］.
If other is selected, status could be different.

［Tab. 12-3 (c)］Alarm List 3/11

Name Display	Contents	Motion and output signal status	Way to release
No set of motor type ALM. MOTORTYPE1	[P000 : Motor type] setting is [000].	Motor torque free 7 segment display [21] Alarm ON Warning OFF Servo ready OFF Brake release OFF	Set motor type, then, (1) Re-input power.
Motor type error ALM. MOTORTYPE2	Combination of a motor and a controller selected by [P000 : Motor type] is wrong.	Motor torque free 7 segment display [22] Alarm ON Warning OFF Servo ready OFF Brake release OFF	Set correct motor type, then, (1) Re-input power.
Extension memory battery under voltage error ALM. RAM BATT.	Voltage of a data hold battery for an extended memory (option) dropped. (Only one time, Alarm is detected in power ON status.)	Motor torque free 7 segment display [A0] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1) Reset signal (RST) input Immediate replacement of the extended memory is required by us.
EEPROM (Non-voluntary memory) Write error ALM. WR. EEPROM	Write of data to EEPROM in a controller was failed.	Suddenly a motor stops and is in Servo lock. 7 segment display [A1] Alarm ON Warning OFF Servo ready ON *1 Brake release ON	(1) Re-input power. (2) Reset signal (RST) input
Rated speed command error 1 ALM. STD. SPD. 1	Speed at motor rated speed set by [P303,P304: Electronic gear ratio] and [P310 : Machine travel amount] exceeded 40M (Setting unit/ sec).	Motor torque free 7 segment display STD.SPD.1:[A2] STD.SPD.2:[A3] Alarm ON Warning OFF Servo ready OFF Brake release OFF	Correct [P303, P304 : Electronic gear ratio] and [P310 : Machine travel amount] and then, (1) Re-input power. (2) Reset signal (RST) input
Rated speed command error 2 ALM. STD. SPD. 2	Speed at motor rated speed set by [P303,P304: electronic gear ratio] and [P310 : Machine travel amount] is less than 40M (Setting unit/ sec).		
Address setting error ALM. ADDR ERR.	Command of an address out of 0～279 range was specified and executed.	Motor Servo lock 7 segment display [60] Alarm ON Warning OFF Servo ready ON*1 Brake release ON	Correct to a right address, and then, (1) Re-input power. (2) Reset signal (RST) input

*1 : Status when [RDY1] is selected by ［P716: RDY signal specification selection ］.
If other is selected, status could be different.

［Tab. 12-3 (d)］Alarm List 4/11

Name Display	Contents	Motion and output signal status	Way to release
Positioning time over ALM. TIME OUT	Positioning is not completed after setting time [P203 : Positioning time over] passes.	Suddenly a motor stops and is in Servo lock. 7 segment display [61] Alarm ON Warning OFF Servo ready ON *1 Brake release ON	(1) Re-input power. (2) Reset signal (RST) input
Positioning data overflow ALM. DATA OVER	Continuous travel distance of Simple Continuous positioning was executed out of 2147483647～-2147483647 range.	Motor Servo lock 7 segment display [62] Alarm ON Warning OFF Servo ready ON*1 Brake release ON	Correct Continuous travel distance in the range, then (1) Re-input power. (2) Reset signal (RST) input
No 1 turn data setting ALM. P305 ERR.	Index positioning command or Spin command was executed without [P305 : Index position range] setting, i.e. it was [0] status.	Motor Servo lock 7 segment display [63] Alarm ON Warning OFF Servo ready ON*1 Brake release ON	Set [P305 : Index position range] correctly, then, (1) Re-input power. (2) Reset signal (RST) input
No Program end command setting ALM. PEND. ERR.	In executing a command other than group 0, an address becomes 280 due to no PEND command setting.	Suddenly a motor stops and is in Servo lock. 7 segment display [64] Alarm ON Warning OFF Servo ready ON *1 Brake release ON	Input a correct program, then, (1) Re-input power. (2) Reset signal (RST) input
Sub-routine call nesting over ALM. CALL OVER	Sub-routine call was executed 9 times without executing Sub-routine return.	Motor Servo lock 7 segment display [65] Alarm ON Warning OFF Servo ready ON*1 Brake release ON	Input a correct program, then, (1) Re-input power. (2) Reset signal (RST) input
Sub-routine return error ALM. RET ERR.	Sub-routine return was executed without executing Sub-routine call.	Motor Servo lock 7 segment display [66] Alarm ON Warning OFF Servo ready ON*1 Brake release ON	Input a correct program, then, (1) Re-input power. (2) Reset signal (RST) input

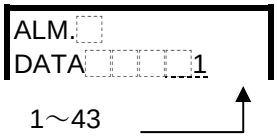
*1 : Status when [RDY1] is selected by ［P716: RDY signal specification selection ］.
If other is selected, status could be different.

［Tab. 12-3 (e)］Alarm List 5/11

Name Display	Contents	Motion and output signal status	Way to release
Jump address error ALM. JUMP ERR.	Jump destination or Sub-routine call destination was set out of 0 ～279 range and the command was executed.	Motor Servo lock 7 segment display [67] Alarm ON Warning OFF Servo ready ON*1 Brake release ON	Input a correct address, then, (1) Re-input power. (2) Reset signal (RST) input
Spin command error ALM. SPN. ERR.	Without executing SPNS command, SPNT or SPNP command was executed. Or in Spin run, a command other than SPNS, SPNT, and SPNP was tried to execute. Or SPNS or SPNT command was executed by Address 279.	Suddenly a motor stops and is in Servo lock. 7 segment display [68] Alarm ON Warning OFF Servo ready ON *1 Brake release ON	Input a correct program, then, (1) Re-input power. (2) Reset signal (RST) input
Division error ALM. 0DIV. ERR.	Divisor [0] was used to execute Division.	Motor Servo lock 7 segment display [69] Alarm ON Warning OFF Servo ready ON*1 Brake release ON	Input a correct Divisor, then, (1) Re-input power. (2) Reset signal (RST) input
Positioning amount error ALM. POS OVER	Positioning command was executed by Positioning amount more than the setting value of the parameter [P308：Forward positioning amount max. value] or [P309：Reverse positioning amount max. value].	Motor Servo lock 7 segment display [6A] Alarm ON Warning OFF Servo ready ON*1 Brake release ON	Input a correct data, then, (1) Re-input power. (2) Reset signal (RST) input
Error command ALM. CMND. ERR.	Un-recognized command was executed. (It occurs when an error command is registered by communication.)	Motor Servo lock 7 segment display [6B] Alarm ON Warning OFF Servo ready ON*1 Brake release ON	Input a correct data, then, (1) Re-input power. (2) Reset signal (RST) input
Index data No. error ALM. IXNO. ERR.	Command specified out of Index data №0～99 range was executed. (This error occurs when Offset No. of Index data No. is used or wrong Index data №. is registered by communication.) Also, Index data № for internal condition comparison value in Continuous control command run was specified out of 0～99 range.	Motor Servo lock 7 segment display [6C] Alarm ON Warning OFF Servo ready ON*1 Brake release ON	Input a correct data, then, (1) Re-input power. (2) Reset signal (RST) input

*1：Status when [RDY1] is selected by［P716: RDY signal specification selection ］.
If other is selected, status could be different.

［Tab. 12-3 (f)］Alarm List 6/11

Name Display	Contents	Motion and output signal status	Way to release
Stored data error 1～43 	Stored data were broken.	Motor Torque free 7 segment display [7] Alarm ON Warning OFF Servo ready OFF Brake release OFF	Reset data, then (1) Re-input power. (2) Reset signal (RST) input But since DATA39 and DATA 43 error is unable to resolve, please contact with our service.

display	Description
DATA 1	Parameter(Group0/ P000～99)contents were broken.
DATA 2	Parameter(Group1/ P100～199)contents were broken.
DATA 3	Parameter(Group2/ P200～299)contents were broken.
DATA 4	Parameter(Group3/ P300～399)contents were broken.
DATA 5	Parameter(Group4/ P400～499)contents were broken.
DATA 6	Parameter(Group5/ P500～599)contents were broken.
DATA 7	Parameter(Group6/ P600～699)contents were broken.
DATA 8	Parameter(Group7/ P700～799)contents were broken.
DATA 9	Command (Address 000～009)contents were broken.
DATA 10	Command (Address 010～019)contents were broken.
DATA 11	Command (Address 020～029)contents were broken.
DATA 12	Command (Address 030～039)contents were broken.
DATA 13	Command (Address 040～049)contents were broken.
DATA 14	Command (Address 050～059)contents were broken.
DATA 15	Command (Address 060～069)contents were broken.
DATA 16	Command (Address 070～079)contents were broken.
DATA 17	Command (Address 080～089)contents were broken.
DATA 18	Command (Address 090～099)contents were broken.
DATA 19	Command (Address 100～109)contents were broken.
DATA 20	Command (Address 110～119)contents were broken.
DATA 21	Command (Address 120～129)contents were broken.
DATA 22	Command (Address 130～139)contents were broken.
DATA 23	Command (Address 140～149)contents were broken.
DATA 24	Command (Address 150～159)contents were broken.
DATA 25	Command (Address 160～169)contents were broken.
DATA 26	Command (Address 170～179)contents were broken.
DATA 27	Command (Address 180～189)contents were broken.
DATA 28	Command (Address 190～199)contents were broken.
DATA 29	Command (Address 200～209)contents were broken.
DATA 30	Command (Address 210～219)contents were broken.
DATA 31	Command (Address 220～229)contents were broken.
DATA 32	Command (Address 230～239)contents were broken.
DATA 33	Command (Address 240～249)contents were broken.
DATA 34	Command (Address 250～259)contents were broken.
DATA 35	Command (Address 260～269)contents were broken.
DATA 36	Command (Address 270～279)contents were broken.
DATA 37	Index data (IX00～IX49) contents were broken.

display	Description
DATA 39	Adjustment data contents for factory shipment of this unit were broken.
DATA 40	Parameter(Group8/ P800～899)contents were broken.
DATA 41	Free curve motion pattern data contents were broken.
DATA 42	Parameter(Group9/ P900～999)contents were broken.
DATA 43	Adjustment data contents for factory shipment of this unit were broken.

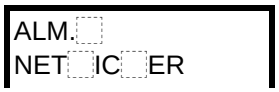
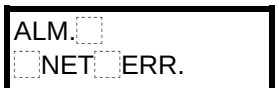
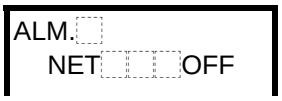
［Tab. 12-3 (g)］Alarm List　7/11

Name Display	Contents	Motion and output signal status	Way to release
Serial encoder count error ALM. SER. COUNT	Serial encoder count error occurred. ※ It is applied when Serial encoder is set. ([P001] setting is [S-INC] or [S-ABS].)	Motor Torque free 7 segment display [32] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1) Re-input power. (2) Reset signal (RST) input
Serial encoder communication error ALM. SER. COMM.	Data from Serial encoder cannot be received. ※ It is applied when Serial encoder is set. ([P001] setting is [S-INC] or [S-ABS].)	Motor Torque free 7 segment display [33] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1) Re-input power. (2) Reset signal (RST) input
Absolute encoder battery error ALM. ABS. BATT.	External battery voltage for Absolute encoder data back up dropped. 『It is detected only once when power is turned ON.』 ※ It is applied when Absolute encoder is set. ([P001] setting is [S-ABS].)	Motor Torque free 7 segment display [E0] Alarm ON Warning OFF Servo ready OFF Brake release OFF	Replace the external battery, then, (1) Re-input power. (2) Reset signal (RST) input
Absolute encoder back up error ALM. ABS. BAKUP.	Plural turn data back upped by Absolute encoder are gone. ※ It is applied when Absolute encoder is set. ([P001] setting is [S-ABS].)	Motor Torque free 7 segment display [E1] Alarm ON Warning OFF Servo ready OFF Brake release OFF	Replace the external battery, then, (1) Initialize Absolute encoder setting, then reinput power.

Absolute encoder overflow error 	Turning amount of Absolute encoder is more than±16383 turns. ※ It is applied when Absolute encoder is set. ([P001] setting is [S-ABS].)	Motor Torque free 7 segment display [E2] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1) Initialize Absolute encoder setting, then reinput power.
Absolute encoder count error 	Absolute encoder count error occurred. ※ It is applied when Absolute encoder is set. ([P001] setting is [S-ABS].)	Motor Torque free 7 segment display [E3] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1) Initialize Absolute encoder setting, then reinput power.
Liniar sensor resolutions error 	While using the linier motor, the calculation result of the “Distance between linier motor pole [P058]” ÷ “Linear sensor resolution[P003]” exceeded 32 bits ※ It is applied when the linear sensor (P001 is set as "L-SEN") is set.	Motor Torque free 7 segment display [34] Alarm ON Warning OFF Ready servo OFF Brake release OFF	(1) Reinspection of the linier sensor to be used. (2) Restart the power supply after checking the parameters [P003]

*1：Status when [RDY1] is selected by［P716: RDY signal specification selection ］.
If other is selected, status could be different.

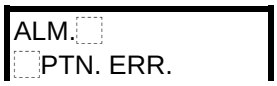
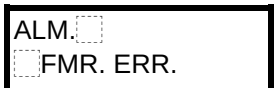
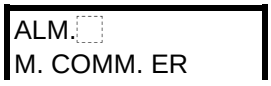
［Tab. 12-3 (h)］Alarm List 8/11

Name Display	Contents	Motion and output signal status	Way to release
SQB (Sequence control section) Alarm 	(1) Access from SQB has been lost for 10 sec. at power ON, and 1 sec. or more in normal condition. (2) Self-diagnosis, or Forced jog mode escaped.	Motor Torque free 7 segment display [90] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1) Reinput power.
Remote sequence control IC fault 	IC part to control communication of Remote sequence control is broken.	Motor Torque free 7 segment display [91] Alarm ON Warning OFF Servo ready OFF Brake release OFF	Repair it by our service section.
Remote sequence control communication loss 	Communication of Remote sequence control can not be used. It also occurs when power of a controller for Sequence control is turned OFF first.	Motor Torque free 7 segment display [92] Alarm ON Warning OFF Servo ready OFF Brake release OFF	Reinput power to whole system where Sequence control is remotely connected.
Reception timeout for remote sequence control 	An error occurred in the transmission status of the remote sequence control resulting into the reception timeout.	Motor Torque free 7 segment display [93] Alarm ON Warning OFF Servo ready OFF Brake release OFF	After the Causes is resolved, (1) Restart the power supply (2) Reset signal (RST) input

［Tab. 12-3 (i)］Alarm List 9/11

Name Display	Contents	Motion and output signal status	Way to release
Servo control error 	The motor operated in the opposite direction of the torque output by the device. When this error is deteced in the normal operation adjust “P747: Servo control error detection adjustment value”.	Motor torque free 7 segment display “1A” Alarm ON Warning OFF Ready servo OFF Brake release OFF	(1) Restart the power supply (2) Input reset (RST) signal
CPU fault     	A unit is out of order.	Motor Torque free 7 segment display [8] Alarm flickering Warning OFF Servo ready OFF Brake release OFF	(1) Reinput power. (2) Replace the unit or repair the unit by us.
CPU fault	Due to fault of CPU, memory (ROM, RAM), etc., Watch dog timer is activated.	Motor Torque free 7 segment display [Uncertain] Alarm ON Warning OFF Servo ready OFF Brake release OFF	(1) Reinput power. (2) Replace the unit or repair the unit by us.

［Tab. 12-3 (i)］Alarm List　10/11

Name Display	Contents	Operation and output signal status	Cancellation method
Free curve motion data error 	There is inconsistency in set free curve motion pattern data. (Outside set data range etc.) When group 6 command is executed (Free curve motion connection) invalid pattern is selected.	Motor servolock 7segment display [b0] Alarm ON Warning OFF Servo ready ON *1 Brake release ON	Enter correct data, (1) Power ON (2) Reset signal (RST)input
Standard position return data error 	When Master axis return [FMR],standard position return [FRR]and each command of [PCNV] is executed and set master axis position and standard position at the time of auto run selection are larger than [P805 Master axis 1 cycle movement.]	Motor servolock 7segment display[b1] Alarm ON Warning OFF Servo ready ON *1 Brake release ON	Enter correct data (1) Power ON (2) Reset signal (RST) input
Slave axis movement error 	When group 6 command is executed (free curve motion connection) ,as per pattern diameter, slave axis movement per 1 interval goes beyond ±99999999.	Motor servolock 7segment display[b2] Alarm ON Warning OFF Servo ready ON *1 Brake release ON	Enter correct data, (1) Power ON (2) Reset signal (RST) input
Not equipped with Extended memory 	Extended memory that stores free curve pattern data is not installed.	Motor servo free 7segment display[b3] Alarm ON Warning OFF Servo ready OFF Brake releaseOFF	Repaired by our company service.
Servo control communication disconnection error 	During servo control Communication , Interruption (Communication disconnection has occurred) Note. This Alarm occurs, when, [ALM] is selected as per [P523:At the time of servo control Communication disconnection, Alarm stop selection]	Motor suddenly stops and after stop, Torque free. 7segment display[A4] Alarm ON Warning OFF Servo ready OFF Brake releaseOFF	After eliminating the Causess of interruption, (1)Power ON (2)Reset signal (RST) input

Name Display	Contents	Operation and output signal status	Cancellation method
Servo control communication error ALM. □ □□BCC. ERR	During servo control communication error (Data error etc.) has occurred. Note. This Alarm occurs, when,[ALM]is selected as per [P523:At the time of servo control communication disconnection, Alarm stop selection]	Motor suddenly stops and torque free after stop, 7segment display[A5] Alarm ON Warning OFF Servo ready OFF Brake releaseOFF	After eliminating the Causess of communication error (1)Power ON (2)Reset signal (RST) input

[Table12-3 (k)] Alarm list 11/11

12-3-2 Warning List

Name Display	Contents	Motion and output signal status	Way to release
Over load warning WNG. □ OVER. LOAD	If current running condition is continued, Over load error will occur.	Current motion is continued. 7 segment display [F0] Alarm OFF Warning ON Servo ready ON Brake release ON	(1) Delete Causes of Over load.
Deviation error warning WNG. □ VARI. OVER	Position deviation exceeded setting of [P208：Deviation error detection pulse]. It is applied when 『Continuous motion』 is selected by [P209：Motion selection at Deviation error] .	Current motion is continued. 7 segment display [F1] Alarm OFF Warning ON Servo ready ON Brake release ON	(1)Delete Causes of Deviation error (Load crease, wrong setting of Gain or Accel./ decel. time, etc.)
Main power under voltage detection warning WNG. □ UNDRVOLT2	Main circuit DC bus voltage dropped lower than about 180[90] (360)V. A value of 100V type is in［ ］. 400V is in ( ). (In case of a controller type not combined with main power source, this Warning is detected.)	Motor Torque free 7 segment display [F2] Alarm OFF Warning ON Servo ready OFF Brake release OFF	Return Main power source voltage to normal range.
Zero return incomplete Automatic start warning WNG. □ HOME. ERR.	Since Automatic run started in Zero return incomplete status, Start signal is ignored. ※ When setting of[P409：Automatic run permit condition selection] is no condition, this is not detected.	Automatic start signal is ignored. 7 segment display [F3] Alarm OFF Warning ON Servo ready ON Brake release ON	(1) Execute Zero return. (When a mode other than Automatic mode is selected, Warning is OFF)
Absolute encoder battery error warning WNG. □ ABS. BATT.	External battery voltage for Absolute encoder data back up dropped. 『Consistent detection』 ※ It is applied when Absolute encoder is used.	Current motion is continued. 7 segment display [F4] Alarm OFF Warning ON Servo ready ON Brake release ON	(1) Replace the external battery.
Remote sequence control communication waiting warning WNG. □ NET□NORDY	Communication for Remote sequence control is not started. This occurs when a controller for Remote sequence control is not functioning.	Current motion is continued. 7 segment display [F5] Alarm OFF Warning ON Servo ready ON Brake release ON	Turn ON power of a controller for Remote sequence control.

SW change warning for remote sequence control 	For the remote sequence control, the setting status of the office number SW or baud rate SW of the controller is changed from the status when the power is ON.	Current motion is continued. 7 segment display [F6] Alarm OFF Warning ON Servo ready ON Brake release ON	The office number SW or baud rate SW setting of the controller that controls the remote sequence, returns to the status when the power supply is ON.

［Tab. 12-4］ Warning list

12-3-3 Error List

Name Display	Contents	Motion and output signal status	Way to release
Data input range error 	Input parameter and data value is out of setting range.	A motor continues current motion in Edit mode. Output signal is not changed.	(1) Release error by input of any key and reset correct data.
Data setting value error 	Computed results by plural associated parameter values are out of setting range.	A motor continues current motion in Edit mode. Output signal is not changed.	(1) Release error by input of any key and reset correct data.

［Tab. 12-5］ Error list

12-4 Confirmation of Motion when Protective Function Works

When Protective function works, it indicates some error occurred.
Before releasing Alarm, be sure to investigate the error Causes and delete it.
As for error inspection and corrective measures, referring to [12-5 Error diagnosis and corrective measures] conduct proper treatment.

(1) IPM fault (IPM ERR.)

When IPM fault occurs, over current in transistors of main circuits of a unit (power section) can be assumed. If this fault is repeated by resetting before completely deleting the Causes, the unit will be damaged. Therefore be sure to delete the Causes and resume Run.

And when function of radiating heat which is generated by power elements is failed, Over-heat error of the unit is also activated as Protective function.

Assumed Causess of the fault are,

1) Larger load than rated value or Over load by too frequent ON/OFF than allowable times is continued.
2) Ambient temperature of a unit becomes high.
3) A radiator is choked.
4) A radiator fan is damaged or its capacity is lowered.

Therefore, when this fault occurs, please confirm that ambient temperature is in 0～55℃ range, ventilation is proper, any radiator is not choked, fans are normally turning, etc..

And if Over-heat error occurs, delete the Causes of the error, wait until radiator temperature drops(About 30 minutes cooling time)and then resume Run.

(2) Control power/ Main power under voltage error(UNDER VOLTAGE)

When AC power voltage dropped and Under voltage error occurs, voltage drop due to power capacity deterioration or black out(About 10ms or more power loss)is assumed. If power loss status continues after Protective function works against black out, control power is lost and protective circuits are reset. Then, if start signal, various commands (Speed command, Pulse train command, etc.)is inputted when power recovers, a motor starts. Since it is dangerous, please make sequence to turn OFF individual signal and command at the time Protective function works and Alarm is outputted.).

(3) Over voltage error(OVER VOLTAGE)

When Over voltage error occurs in motor stop status or decelerating, excessive regenerative energy due to large inertia can be assumed.

In the case, attach Regenerative resistor, increase deceleration time, or lower running speed to fix it.

And confirm that applied power voltage (AC100/120V±10%, AC200/220V±10％, AC400/440V±10％)is not too high.

(4) Encoder fault(ENCODER)

When Encoder fault occurs, disconnection or break of an encoder cable, loose fit of a connector, noise on an encoder signal, wrong setting of a parameter [P000～P002: Encoder selection], etc. are assumed.

And if an encoder itself is failed, Encoder fault may not be detected in some cases.

In the case, Over load error will occur in running shaft of a motor.

It is assumed that first magnetic pole detection is not correctly completed when a linear sensor is used.

Also, it is assumed when a magnetic pole is used for Linear and Disc motor, magnetic pole decision is not correctly completed due to too high speed.

(5) Over speed error (OVER SPEED)

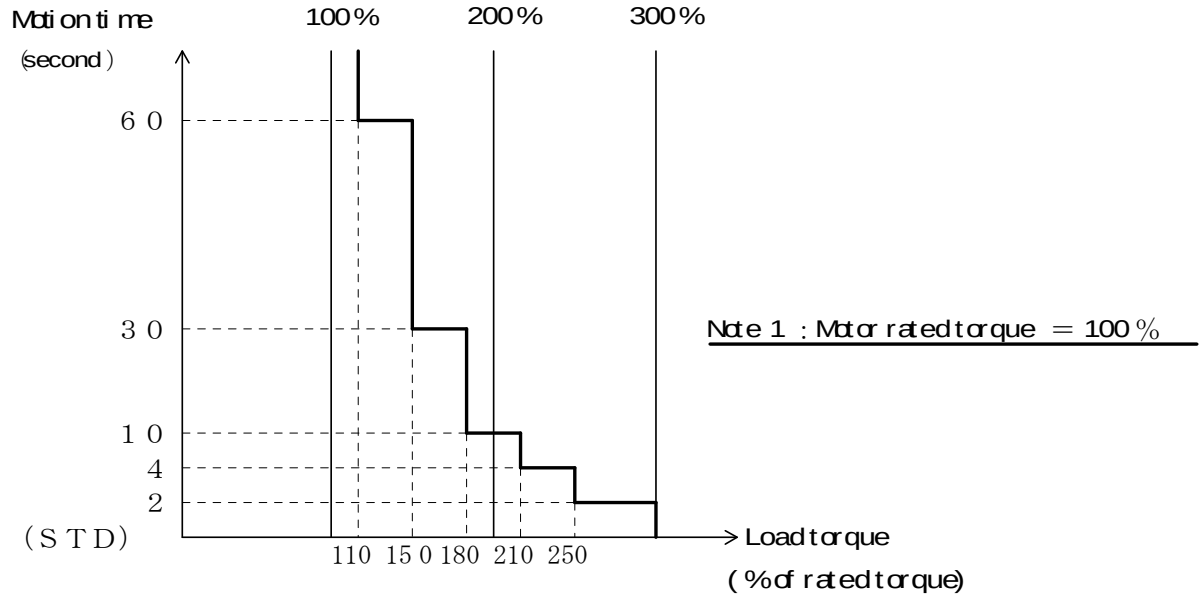
When Over speed error occurs, it is assumed that over-shoot of speed at starting of a motor is excessive due to large load inertia, etc. In the case, adjust Gain of Speed loop or Position loop or increase acceleration time.

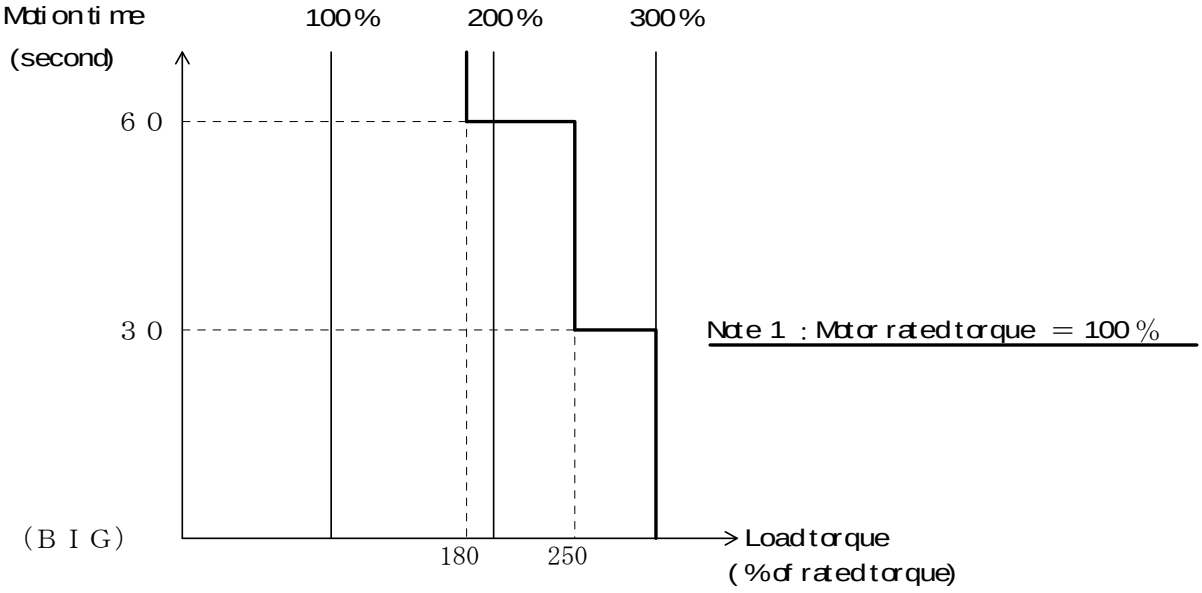
As for individual Gain adjustment, please refer to [10-5 Adjustment].

(6) Over load error(OVER LOAD/ IPM Over load error (IPM O.L.)

When this error occurs, it is assumed that an internal electronic thermal worked due to Over load or too frequent ON/OFF than allowable times. If Alarm reset and Run is repeated in a short time, power element of a unit or motor temperature is raised abnormally, and in the results they are damaged. Be sure to delete the Causes and cool them for about 30 minutes and then, resume run. Next internal electronic thermal can be selected for Over load error detection by the parameter [P144]

- [STD] ,[BIG] : It is detected by the relation of load and time at 100% motor rated torque as [Fig. 12-1].
- [O.L. XXX%] : It is detected by actual load value XXX% or more when a motor torque is defined 100%.





Notice) In order to protect a unit, above electronic thermal can not be used when BIG is selected.

[Fig. 12-1] Internal Electronic Thermal Working Time

12-5 Error Diagnosis and Corrective Measures

When any error occurs, conduct the following inspections and error diagnosis in order to investigate the Causes and properly take corrective measures. When it is supposed that a part or a unit is failed or damaged, immediately inform the fact to our sales man.

When Corrective measures are conducted, a worker in charge should check power ON/OFF by himself.

Since residual voltage remains in the main circuits, after power is turned OFF, start corrective measures 2 to 3 minutes after the power OFF.

And when it is necessary to touch inside of a unit, be careful not to damage it by static electricity.

Never conduct insulation test by a meggar tester as it may damage a controller. In case of measuring motor insulation, disconnect cables (U,V,W) between a motor and a controller, completely and measure it.

12-5-1 Inspection and Confirmation Items

When an error occurred, inspect and confirm next items.

If a controller or a motor is available at the same time, replace suspicious one and run it to judge whether the controller or the motor is damaged or any external factor exists.

[Inspection and Confirmation Items**]**

(1) Inspect what Alarm display is.
(2) Inspect if any error is found by visual check.
(3) Inspect if the error is reproducible or occurs only in a particular motion.
(4) Inspect how often the error occurs.
(5) Inspect how long the unit has been used.
(6) Inspect if power voltage is normal or fluctuates largely in a particular time band.
(7) Inspect if black out occurred.
(8) Inspect if motor, controller and ambient temperature is normal.
(9) Inspect if installation environment of a motor and a controller is normal. (water, oil, metal powder, paper fragment, corrosive gas, etc.)
(10) Inspect when an error occurs during acceleration, deceleration or running at constant speed of a motor.
(11) Inspect if an error occurs at load fluctuation. (at load increase or decrease)
(12) Inspect if there is difference between forward and reverse motion of a motor.
(13) Inspect if there is any error in no load run.

⚠ Caution

- If Reset is repeatedly conducted when IPM fault or Over load error occurs, since it may damage a controller and a motor, be sure to delete the error Causes and resume Run.

12-5-2 Inspection Method and Corrective Measures When Alarm Occurs.

When any error occurs, confirm the error contents by Alarm display and conduct proper measures.
Be sure to delete an error Causes before releasing Alarm.
If an error repeatedly occurs, a unit may be damaged.

Error contents	Causes	Corrective measures
[IPM fault**]** ・Due to grounding or same trouble and short-circuit of U,V,W cables between a controller and a motor, over current flew in the main circuit power elements. ・AC power source voltage is out of specification range and over current flew in the main circuit power elements. ・Radiating function of generated heat by the main circuit power elements is failed and over heat occurred.	・Motor grounding.	・Replace the motor.
	・Grounding or short-circuit of wiring (U,V,W) between controller and a motor.	・Correct the wiring.
	・Grounding or short-circuit of wiring (B1,B2) between controller and the regenerative resistor.	・Correct the wiring.
	・Current fluctuation due to unstable motor motion and vibration.	・Adjust stability.(Gain adjustment, play of a machine system improvement, etc.)
	・Power source voltage is out of spec. range or fluctuate, largely,	・Supply correct power.
	・Malfunction due to noise	・Delete the noise source and take corrective measures.
	・High ambient temperature or bad ventilation	・Lower ambient temperature or improve the cooling method.
	・Choke of a radiator	・Clean air blow section, etc. of the radiator.
[Over load error**]** **[**IPM Over load error**]** ・Due to over load or too frequent ON/OFF than allowable times, an internal electronic thermal is activated. ・A motor value different from the applied type is set to the parameter [P000～P011].	・Excessive load	・Decrease load.
	・Too frequent start/stop of a motor	・ Decrease the frequency of ON/OFF of a motor.
	・Incorrect wiring(U,V,W) between a controller and a motor.	・Correct the wiring.
	・Encoder feedback signal is influenced by noise.	・Delete the noise source and take corrective measures.
	・Encoder failure	・Replace the encoder.
	・Mechanical locking by a brake, etc.	・Release the brake. ・If there is a fault in the machine, fix it.
	・Current fluctuation due to unstable motor motion and vibration.	・Adjust stability.(Gain adjustment and improvement of play in a machine system, looseness of connecting section, weak machine rigidity, etc.)
	・High ambient temperature or bad ventilation	・Lower ambient temperature. ・Improve the cooling method.
	・Wrong setting of [P000～P011]	・Set correct values to [P000～P011].
[Regenerative resistor Over load error**]** ・Regenerative power generated by excessive load inertia, etc. is larger than allowable power of Regenerative resistor. ・Regenerative resistor different from the applied type is set to the parameter [P158].	・Excessive regenerative energy due to too large load inertia.	・Replace Regenerative resistor with a large capacity one. ・Lower the load inertia. ・Decrease speed or increase Deceleration time.
	・Wrong setting of [P158]	・Set a correct values to [P158].

［Tab. 12-6 (a)］ Inspection Method and Corrective Measures When Alarm Occurs.

Error contents	Causes	Corrective measures
[Under voltage error] ・Power source voltage or control power voltage dropped. Main circuit DC bus voltage: 180[90](360)V or less DC+5V ：About +4.75V or less DC+15V：About +13.5V or less A value of 100V type is in［ ］. A value of 400V type is in ( ).	・A fuse of power section is broken. ・Power source voltage is low(Includes insufficient capacity.) ・10ms or more black out occurred. ・Power cables are thin. ・Power terminal screws are loose.	・Supply correct power source or reconsider the power supply system, capacity, and cable diameter.
	・Malfunction due to noise	・Delete the noise source and take corrective measures.
[Over voltage error] ・Due to excessive load inertia, etc., regenerative energy at motor stop or decel. is beyond the treatment capacity and DC power voltage of main circuits exceeded about 400[200](800)V or more. A value of 100V type is in [ ]. A value of 400V type is in ( ).	・Power source voltage is high.	・Supply correct power source.
	・Excessive regenerative energy due to too large load inertia.	・Attach Regenerative resistor. ・Lower the load inertia. ・Decrease speed or increase deceleration time.
	・Malfunction due to noise	・Delete the noise source and take corrective measures.
[Over speed error] ・Motor speed exceeds 130% of rated speed.	・Incorrect wiring(U,V,W) between a controller and a motor. ・Incorrect wiring of encoder feedback cables	・Correct the wiring.
	・Encoder failure	・Replace the encoder.
	・Due to excessive load inertia or gain setting error, over-shoot is large.	・Lower the load inertia or increase acceleration time. ・Adjust stability.(gain adjustment and improvement of play in a machine system, looseness of connecting section, weak machine rigidity, etc.)
	・Encoder feedback signal is influenced by noise.	・Delete the noise source and take corrective measures.
[Encoder fault] ・Encoder fault, break or disconnection of an encoder cable or loose fitting of a connector, noise on an encoder signal, wrong parameter setting, etc. occurred. ・First magnetic pole detection is not completed, correctly when a linear sensor is used. ・Magnetic pole detection is not completed, correctly when a linear sensor is used for Linear/ Disc motor.	・Break, disconnection or incorrect wiring of encoder cables	・Correct the wiring.
	・A connector is inserted, incorrectly.	・Insert the connector, tightly.
	・Encoder failure	・Replace the encoder.
	・Wrong parameter setting of encoder selection	・Set correct data to the parameter [P000～P004].
	・Magnetic pole sensor failure	・Replace the magnetic pole.
	・Wrong parameter setting of magnetic pole sensor type selection	・Set correct data to the parameter [P010].
	・Motion speed to determine a magnetic pole is too fast.	・Run the motor within speed where this error does not occur.

［Tab. 12-6 (b)］ Inspection Method and Corrective Measures When Alarm Occurs.

Error contents	Causes	Corrective measures
[Deviation overflow] [Deviation error] ・Position deviation exceeds set value of the parameter [P207: Overflow detection pulse]. ・Position deviation exceeds set value of the parameter [P208: Deviation error detection pulse].	・Excessive load	・ Decrease the load.
	・Due to excessive load inertia or Gain setting error, Over-shoot is large.	・Lower the load inertia or increase Acceleration time. ・Adjust stability.(Gain adjustment and improvement of play in a machine system, looseness of connecting section, weak machine rigidity, etc.)
	・Incorrect wiring(U,V,W) between a controller and a motor. ・Incorrect wiring of encoder feedback cables	・Correct the wiring.
	・Encoder failure	・Replace the encoder.
	・An encoder feedback signal or a pulse is influenced by noise.	・Delete the noise source and take corrective measures.
	・Mechanical locking by a brake, etc.	・Release the brake. ・If there is a fault in the machine, fix it.
	・Parameter setting error	・Check an associated parameter and reset a correct value.
[Positioning time over] ・Positioning is not completed after set time of the parameter [P203: Positioning time over] has passed.	・Excessive load	・Decrease the load.
	・Sticking in a machine system	・Fix the trouble in the system.
	・Gain setting is too low.	・Increase Gain setting.
	・Parameter setting fault	・Check an associated parameter and reset correct value.
[Forward over travel] [Reverse over travel] ・Forward over travel was detected. ・Reverse over travel was detected.	・Loose contact, break, disconnection or incorrect wiring of signal cables	・Correct the wiring.
	・A connector is inserted, incorrectly.	・Insert the connector, tightly.
	・Positioning data setting error	・Reset a correct value.
	・External sequence error	・Correct the external sequence.
[Forward software limit] [Reverse software limit] ・ Current position exceeds set time of the parameter [P306: Forward software limit] ・ Current position exceeds set time of the parameter [P307: Reverse software limit]	・Positioning data setting error	・Reset a correct value.

［Tab. 12-6 (c)］ Inspection Method and Corrective Measures When Alarm Occurs.

Error contents	Causes	Corrective measures
[EEPROM Write error] ・Write can not be conducted to data of Non-voluntary memory (EEPROM) .	・Write can not be conducted to data of Non-voluntary memory (EEPROM) due to noise.	・Delete the noise source and take corrective measures.
	・Unit failure	・Replace the unit.
[Positioning amount error] ・In associated Positioning command, Positioning amount exceeds the value of [P308: Forward positioning amount max.value] or [P309: Reverse positioning amount max.value].	・Positioning data setting error	・Reset a correct value.
	・Parameter setting error	・Check an associated parameter and reset correct value.
	・Malfunction due to noise	・Delete the noise source and take corrective measures.
[Servo control error] ・The motor operated in the opposite direction of the torque output by the device.	・Faulty wiring (U,V,W) between the controller and motor. ・Faulty wiring of encoder feedback signal cables.	・Change the wiring
	・Encoder failure ・Incorrect parameter setting related to the encoder.	・Replace the encoder ・Set data of parameter [P001-P004,P059] correctly.
	・Incorrect parameter setting related to the motor.	・Set data of parameter [P000,P020,P058] correctly.
	・Magnetic sensor failure ・Incorrect parameter setting related to the magnetic sensor (When using magnetic sensor)	・Replace the magnetic sensor ・Set data of parameter [P010-P011] [P050-P053] correctly.
	・The setting of automatic magnetic detection operation parameter is not correct. (When automatic magnetic detection is valid)	・Set the correct parameter [P116-P119].
	・Irregular motor operations or abnormal vibrations	・Adjust the stability. (Gain adjustment and improvement in machine structure)
	・The motor is operated due to external force. (Example of external force) Load, tension etc.	・Eliminate the servo control error using the parameter [P747].
[CPU fault] ・Due to fault of CPU, memory (ROM, RAM), etc., Watch dog timer is activated.	・Malfunction due to noise	・Delete the noise source and take corrective measures.
	・Unit failure	・Replace the unit.
[Stored data error] ・ Error occurred in data contents.	・Data was broken by noise.	・Delete the noise source and take corrective measures.

［Tab. 12-6 (d)］ Inspection Method and Corrective Measures When Alarm Occurs.

⚠ Caution

- If Reset is repeatedly conducted when IPM fault or Over load error occurs, since it may damage a controller and a motor, be sure to delete the error Causes and resume Run.

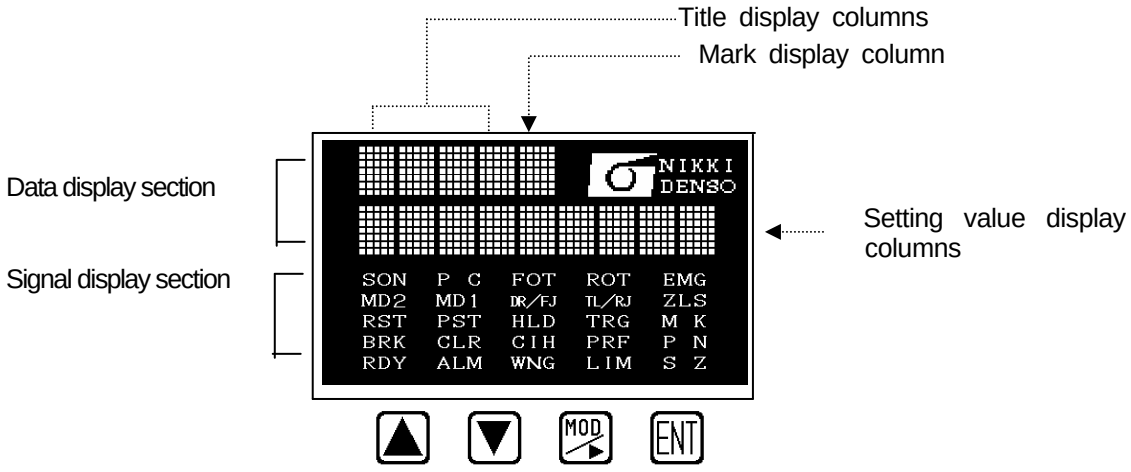
Chapter 13 Setting and display

13-1 LCD module operation

13-1-1 LCD module each component and function

Various parameters and data are set by key input of LCD module in the controller front panel. Since parameters deeply influence motion of machine system and whole system, pay special attention to set.

[1] External appearance of LCD module



[Fig. 13-1] External appearance of LCD module

[2] Display contents of each display section

Display section		Display contents
Data display section	Title display columns	Target item title (name, No.), or message (ALM. / WNG. /ERR) etc. when protective function works are displayed.
	Mark display column	Contents like mark, etc. of target item data are displayed. [ ] : indicates positive direct data. [-] : indicates negative direct data. [*] : indicates index data set. [/] : indicates setting data are invalid.
	Setting value display column	Target item data (setting value/status/Diagnosis results/Alarm name, etc.) are displayed.
Signal display section		Input/Output signal is displayed. When a signal is input or output, corresponding letter is lit.

[Table 13-1] Display contents of each display section

[3] Each operation key function

Key	Function	
▲	Item select.	Displays next item.
	Data setting	Next menu is displayed while increasing the setting numbers(0-9) or exchanging the marks (□, -, *, /)
▼	Item select	Displays previous item.
	Data setting	Previous menu is displayed while decreasing the setting numbers (0-9) or exchanging the marks (□, -, *, /)
MOD	Item select	Displays first item of next target mode.
	Data setting	Selects data setting columns.
ENT	At Power ON	Deletes alarm history
	Item select	Moves to data setting status of target items.
	Data setting	Enters display data (all columns) as new data.
▲▼	At Power ON	Initializes all the memory data. ※Refer to the following cautions.
	Data setting	Forced termination of data settings (Maintain the data prior to any change in it)

[Table 13-2] Each operation key function

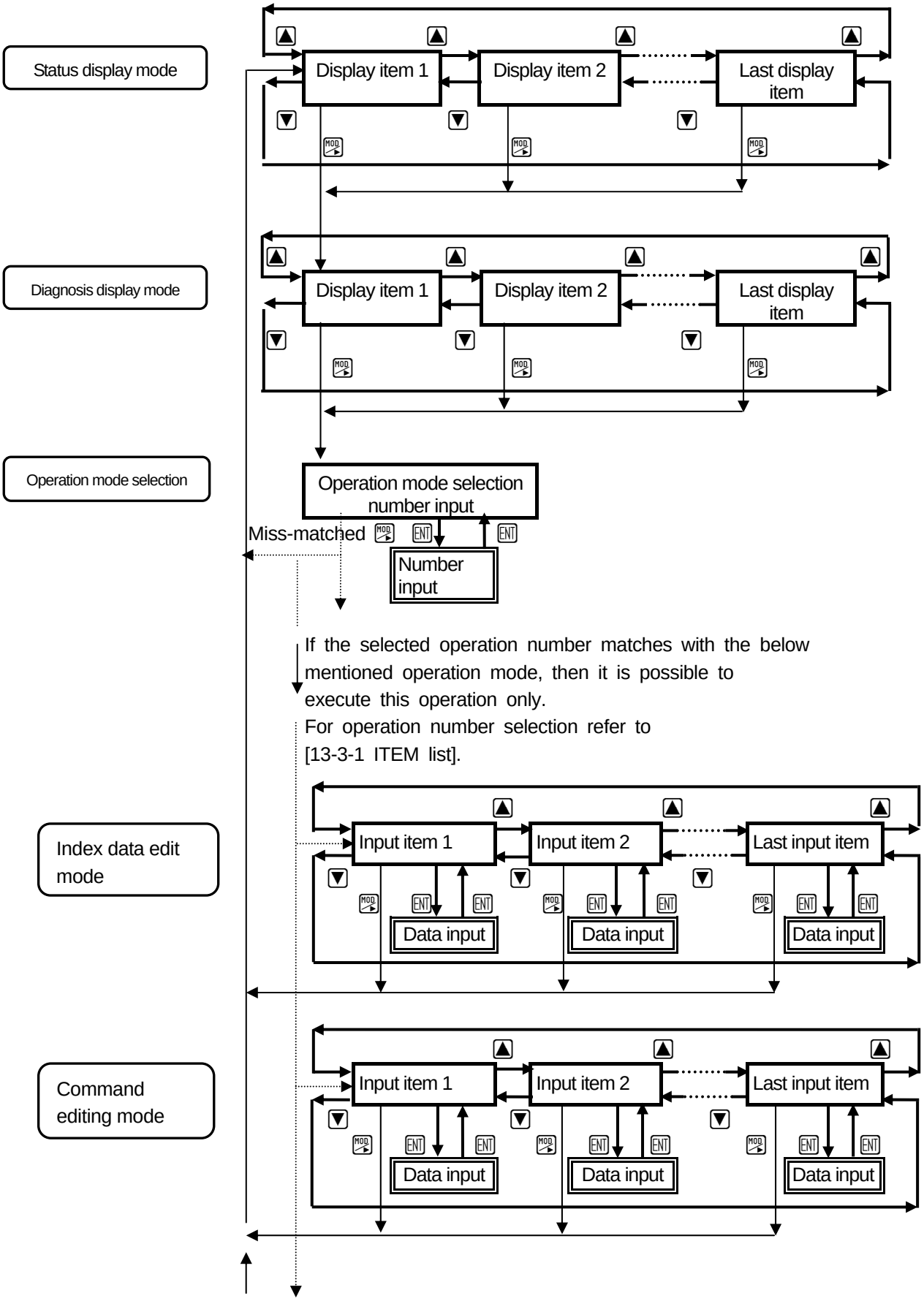
[Caution]

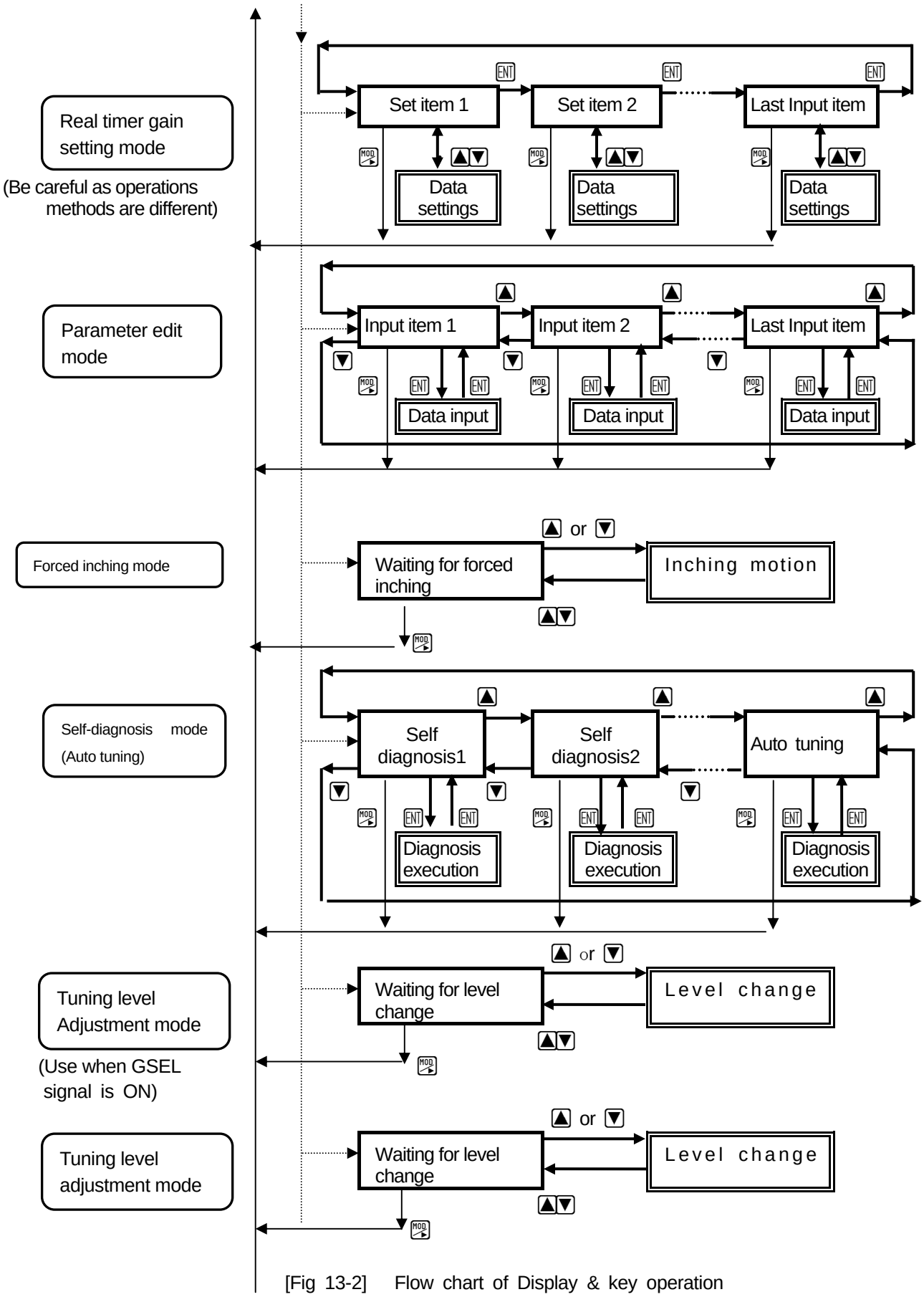
When unit power is ON on pressing ▲ and ▼ keys simultaneously, all the memory data (parameter etc.) are initialized.
And then, following figure is displayed in LCD data display section.

It is recommended to save data before initializing the unit.
Backup of data by a personal computer can be conducted by our optional Data edit software.

13-1-2 LCD module operation procedure

Flow chart of data settings and display & key operation is as shown below.



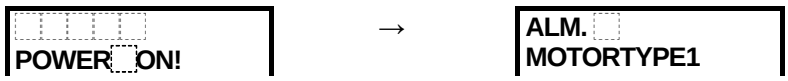


[Fig 13-2] Flow chart of Display & key operation

13-2 Display mode

13-2-1 Initial status display

- When the unit is initialed during Power supply is turned ON, [POWER ON!] is displayed.
- At the time of controller shipment, various parameters and data are set to initial value.
- Since a motor not selected by the parameter P000 can not run, at first [P000:Motor type selection] and other parameter shall be set to meet the applied conditions.
- For the re-settings, confirmation of parameters, when supply is switched on, motor not selected alarm [ALM. MOTORTYPE1] is displayed.
  At the same time alarm signal is also output.
- Initial status display is cleared by any of the ▲ / ▼ / MOD / ENT input keys.
  After display is cleared, contents can be confirmed by Alarm history.



[Fig 13-3] Initial status display

Display example

{{Display of motor torque}}

Actual torque is displayed in Status display (ST10).

1) By MOD , display mode changes from Status display (ST00)→ Diagnosis display (TYPE) → Operation selection (ITEM) →Status display (ST00) →.
   ⊙ Select Status display mode (ST00).
2) By ▲ ▼, Display item change from (ST00) → (ST01) →• • • •
   ⊙ Select display items (ST10).
3) Selected (ST10) data displays running motor torque.

{{Confirming alarm situation}}

When there is generation of alarm, alarm contents are displayed in diagnosis display, (ALM0).

1) By MOD Display mode changes from Status display (ST00) → diagnosis display (TYPE) → operation selection (ITEM) →Status display (ST00) →.
   ⊙Select diagnosis display mode (TYPE).
2) By ▲ ▼, Display items change from (TYPE) → (MODE) → • • •.
   ⊙ Select display items (ALM0).
3) Selected (ALM0) data, displays the contents of alarm being activated.

13-2-2 Status display mode

● The status No. is displayed in the title column, the status data is displayed in the setting value display column, and the mark is displayed in the mark display column.

Display order.	Display example	Unit	Display contents
1	ST00- □□□ 100.00	%	Actual motor speed is displayed. In forward direction: □, Reverse direction:- Display range: -120.00 ~ 120.00
2	ST01- 10000.000	※1	Displays current position. Display range: -99999999 ~ 99999999 ※2
3	ST02- □ 00010000	Pulse	Displays position deviation pulse. At ＋ deviation: □、At -deviation:- Display range:-99999999 ~ 99999999
4	ST05- 000100.00	Kpps	Display of input frequency of master axis command. Display range:-999999.99 ~ 999999.99
5	ST06- □ 10000000	※3	Display of master axis position in a single cycle. Display range: 0 - 99999999 ※4
6	ST07 □ □□□□ 100.0	%	Display of Forward direction external torque limiting command input value as % of rated value. Display range: 0.0 ~ 300.0
7	ST08 □ □□□□ 100.0	%	Display of Reverse direction external torque limiting command input value as % of rated value. Display range: 0.0 ~300.0

[Table 13-3(a)] Display contents of Status display mode 1/3

● In this display mode, when ENT key is pressed only once, then the display data is maintained for a second, and
when ENT key is continued to be pressed, then the display data is maintained over that span.

※1: Unit is set amongst [mm],[°],[in(inch)] by the parameter [P301].
※2: Decimal point position is set by the parameter [P302].
※3: Unit is set amongst [mm],[°],[in(inch)] by the parameter [P800].
※4: Decimal point position is set by the parameter [P801].

Display order	Display example	Unit	Display contents
8	ST09 □ □□□□□□ 080	%	Display of thermal trip ratio in %. This display is as below according to Setting value of [P144: Electron thermal detection selection]. • STD/BIG: Display Excess load ratio by Excess load error or IPM Excess load error. • O.L. XXX%: Display Excess load ratio by IPM Excess load error. Display range: 0 ~100 Excess load alarm rings when display is 100(100%).
9	ST10 □ □□□□ 100.0	%	Display of actual torque command as % of rated torque. Display range: 0.0 ~799.9
10	ST11 □ □□□□ 100.0	%	Display of peak torque command as % of rated torque. (With RST signal it becomes [000]) Display range: 0.0 ~ 799.9
11	ST12 □ □□□□ 01500	rpm	Display of actual rotation speed of rotation body. At rotation in Forward direction: □, At rotation in Reverse direction:- Display range: -99999 ~ 99999
12	ST13- 00001.000	※5	Display actual machine operating speed. At Forward direction: □, At Reverse direction:- Display range: -99999999 ~ 99999999 ※6
13	ST14- □□□□ 02000	rpm	Display of actual motor operating speed in rpm. At Forward direction: □, At Reverse direction:- Display range: -99999 ~ 99999
14	ST15 □□□□□□ 100	%	Display of reverse load ratio of motor (efficiency value). Display 100% at the time of reverse rated motor load. With settings of [O.L. XXX%] by [P144: electron thermal detect selection], then there is overload error by XXX%. Display range : 0 ~ 300

[Table 13-3(b)] Display contents of Status display mode 2/3

- In this display mode, ENT when key is pressed only once, then the display data is maintained for a second, and
  ENT when key is continued to be pressed, then the display data is maintained over that span.

※5: Unit is set amongst [mm],[°],[in(inch)] by the parameter [P301]

※6: Decimal point position is by the parameter [P302].

Display order	Display example	Unit	Display contents
15	ST16 100	%	Display of reverse load ration of regeneration resistance. This display is as below according to settings of [P158: Rated power of regeneration resistance]. • Except 0:display 100% at regeneration resistance rated power. • 0: Display 100 % when the power for regeneration stored in the module internally is full. Moreover, when the display exceeds 50%, as there is possibility of formation of excess voltage error, install the regeneration resistance. Display range: 0 - 999
16	ST17 100	%	Display in % the largest value of ratio of servo control error occurrence. Over 100% there is occurrence of servo control error. It is possible to regulate this error by [P747: Servo control error detection regulation value]. Moreover form this error clear 0 in case of the following. ・When RST signal is ON after occurrence of Servo control error. ・When there is change in setting value of P747 Display range : 0 - 999

[Table 13-3(c)] Display contents of Status display mode 3/3

● In this display mode, ENT when key is pressed only once, and then the display data is maintained for a second, and
When ENT key is continued to be pressed, then the display data is maintained over that span.

13-2-3 Diagnosis display mode

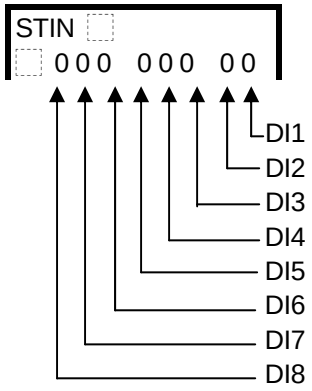
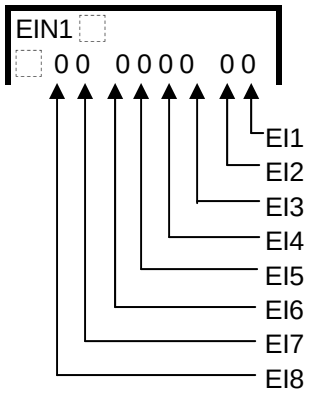
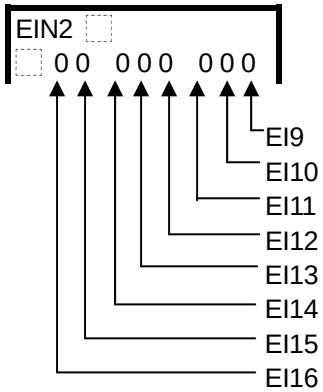
● Display message as well as data in data display section.

Display order	Display example	Unit	Display contents
1	TYPE □ □□ VC－C6－S High efficiency is "-" Many function printing is"＝" display Display of "=" after VC is controller of	-	Display controller type. Controller:VC-C6-x x corresponding motor classification L:Linear motor S :SM motor I :IM motor R :Disc motor Display example:SM motor selection
2	MODE □ □□□□□ AUTO	-	Display run mode. JOG :Manual run mode ORG :Starting point returning mode AUTO : Auto run mode INVALID :Servo lock mode
3	A012 □ □□□□□□ POS	-	At opening of Auto run or the command during execution and its address is displayed. Display example :Command: POS, address:012
4	JSP1 □ □ 000100.00	※1	Display of inching speed selected by inching speed switchover signal. Display range :0 ~ 99999999 ※2
5	O. R. □ □□□□□□ 100	%	Display in % the input status of speed over ride signal as over ride ratio. Display range : 0 ~150

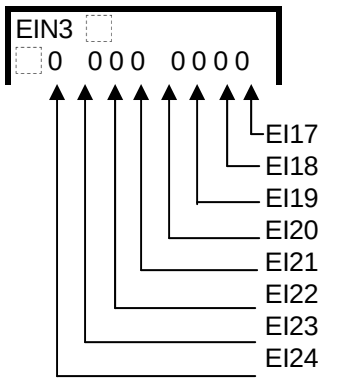
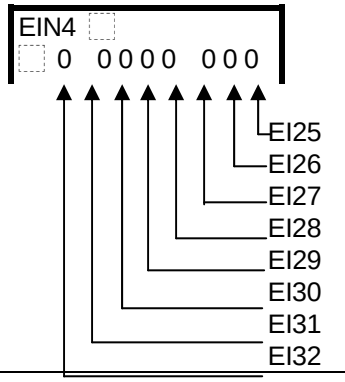
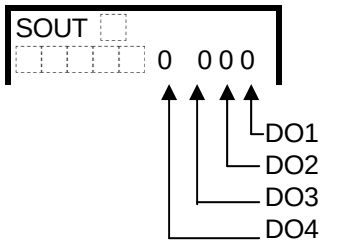
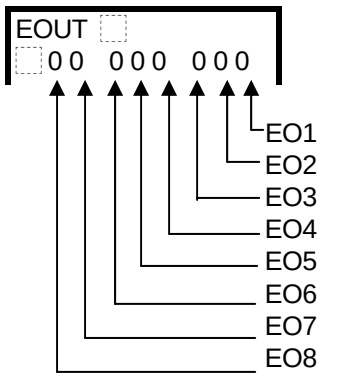
[Table 13-4 (a)] Display contents of diagnosis display mode 1/4

※1: Unit is set amongst [mm],[°],[in(inch)] by the parameter [P301].
※2: Decimal point position is set by the parameter [P302].

※ Display of diagnosis display (TYPExx), module type in Title display columns.

Display order	Display Example	Unit	Display contents
6		-	Display of standard external input signal status set by P737, P738. ※ Input signal set in "○○" 2 digits and display position is interacted as below. When signal is ON: 1, OFF:0 DI1:P737(xxxxxxOO) DI2:P737(xxxxOOxx) DI3:P737(xxOOxxxx) DI4:P737(OOxxxxxx) DI5:P738(xxxxxxOO) DI6:P738(xxxxOOxx) DI7:P738(xxOOxxxx) DI8:P738(OOxxxxxx)
7		-	Display of extended external input signal status. When signal is ON:1, OFF:0 EI1:RST EI2:EMG EI3:SON EI4:PST EI5:HLD EI6:CLR EI7:FOT EI8:ROT
8		-	Display of extended external input signal status set by P739, P740. ※ Input signal set in "○○" 2 digits and display position is interacted as below. When signal is ON: 1, OFF: 0 EI9 :P739(xxxxxxOO) EI10:P739(xxxxOOxx) EI11:P739(xxOOxxxx) EI12:P739(OOxxxxxx) EI13:P740(xxxxxxOO) EI14:P740(xxxxOOxx) EI15:P740(xxOOxxxx) EI16:P740(OOxxxxxx)

[Table 13-4 (b)] Display contents of diagnosis display mode 2/4

Display order	Display example	Unit	Display contents
9		-	Display of extended external input signal status set by P741. ※ Input signal set in "OO"2 digits and display position is interacted as below for EI17-EI20. When signal is ON: 1, OFF: 0 EI17:P741(xxxxxxOO) EI18:P741(xxxxOOxx) EI19:P741(xxOOxxxx) EI20:P741(OOxxxxxx) EI21:CIH EI22:ZLS EI23:TRG EI24: Not used
10		-	Display of extended external input signal status. When signal is ON: 1, OFF:0 EI25:MD1 EI26:MD2 EI27:PC EI28:FJOG EI29:RJOG EI30: Not used EI31: Not used EI32: Not used
11		-	Display of extended external output signal status set by P742. ※Output signal set in "OO"2 digits and display position is interacted as below. When signal is ON: 1, OFF: 0 DO1:P742(xxxxxxOO) DO2:P742(xxxxOOxx) DO3:P742(xxOOxxxx) DO4:P742(OOxxxxxx)
12		-	Displays extended external output signal status set by P743, P744. ※Output signal set in "OO"2 digits and display position is interacted as below. When signal is ON: 1, OFF: 0 EO1:P743(xxxxxxOO) EO2:P743(xxxxOOxx) EO3:P743(xxOOxxxx) EO4:P743(OOxxxxxx) EO5:P744(xxxxxxOO) EO6:P744(xxxxOOxx) EO7:P744(xxOOxxxx) EO8:P744(OOxxxxxx)

[Table 13-4 (c)] Display contents of diagnosis display mode 3/4

Display order	Display example	Unit	Display contents
13	ALM0 □ OVERCURR. _	-	Display of latest Alarm contents. Display example: Overcurrent error.
14	ALM1 □ □□ ENCODER	-	Display of previous alarm contents. Display example: Linear sensor /Encoder error.
15	ALM2 □ OVER □ LOAD	-	Display of alarm contents 2 times before. Display example :Excess load error
16	ALM3 □ OVER □ VOLT	-	Display of alarm contents 3 times before. Display example : Excess voltage error
17	ALM4 □ OVERSPEED	-	Display of alarm contents 4 times previous. Display example :Excess speed error
18	WNG0 □ OVER. LOAD	-	Display of latest warning contents. Display example :Excess load warning
19 ※3	SQB □□ STNo. 6203	-	Display the status information of SQB ※4 Display range : 0 ~ 9999 Display example: [Check sum error] occurrence.
20 ※3	SQB □□ Ver □□ 1.00	-	Display of SQB software version. Display example :Software version 1.00 Maximum display :9.99
21	HARD □ Ver □□ 1.00	-	Display of hardware version. Each displays refers to : < Display of HARD > HARD □: Design class C or before HARD *: Design class D or after < Display of Version > Display example :Hard version 1.00 Max. display :9.99
22	SOFT □ Ver □□ 1.00	-	Display of software version. Display example :Software version 1.00 Maximum display :9.99

[Table 13-4 (d)] Display contents of Diagnosis display mode 4/4

※3: No display when there is no SQB connection.

※4: For SQB status information refer to supplementary Instruction manual [SQB edition].

13-3 Operation mode

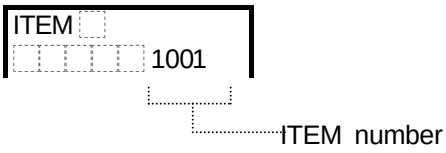
13-3-1 ITEM(Operation mode)list

Selection ITEM (Operation mode) is shown in Table 13-5.

ITEM Selection number	Operation mode		
1001	Index data edit mode(IX00 ~ IX99)		
1002	Command edit mode		
1102	Forced inching mode		
1103	Self diagnosis mode		
2000	Group 0	Motor, encoder parameter	Parameter edit mode
2100	Group 1	Driver adjustment parameter	
2200	Group 2	NC adjustment parameter	
2300	Group 3	Position adjustment parameter	
2400	Group 4	Drive Motion parameter	
2500	Group 5	Display , Editing, Communication parameter	
2600	Group 6	Pulse train input parameter	
2700	Group 7	Input Output signal parameter	
2800	Group 8	Free curve motion parameter 1	
2900	Group 9	Free curve motion parameter 2	
3001	Real time gain settings 1 (Speed loop gain regulation)		Real time Gain settings mode
3002	Real time gain settings 2 (In slow speed range Speed loop gain regulation)		
3003	Real time gain settings 3 (When GSEL is ON Speed loop gain regulation)		
3004	Real time gain settings 4 (Position loop gain regulation)		
3467	Auto tuning level adjustment mode(Used when GSEL signal is ON)		
3468	Auto tuning level adjustment mode		

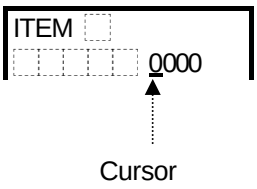
[Table 13-5] ITEM (Operation mode) list

① Display example



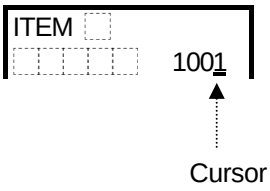
② Settings

・ITEM number input 1



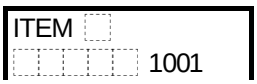
- On pressing ENT key the cursor appears and input is enabled.
- On pressing the ▲ or ▼ key, the numerical value or mark changes.
- On pressing MOD key, a cursor moves.
- For cancellation of input data, press ▲▼ keys together.

・ITEM number input 2



- As mentioned above, input ITEM number [E.g. 1001].

・ITEM number settings



- On pressing ENT key the cursor disappears and ITEM number is set.

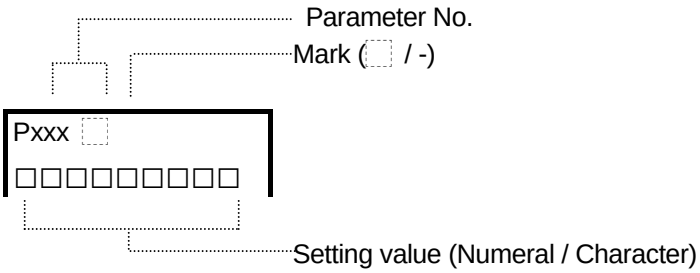
13-3-2 Parameter settings

[1] Parameter composition

Group number	Parameter No.	Group name
0	P000-	Motor, encoder parameter
1	P100-	Driver adjustment parameter
2	P200-	NC adjustment parameter
3	P300-	Position adjustment parameter
4	P400-	Drive Motion parameter
5	P500-	Display, Edit, Communication parameter
6	P600-	Pulse train input parameter
7	P700-	Input/Output signal parameter
8	P800-	Free curve motion parameter

[Table 13-6] Parameter configuration

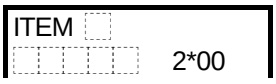
[2] Display



[3] Settings methods

Parameter edition (Numerical input or menu selection) procedure is as given below.

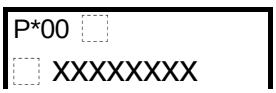
① ITEM number setting



● Set ITEM number [2*00].
* mark is a group No. (Refer to Table 13-6)

● After settings, when MOD key is pressed, it moves to ②.

② Parameter selection

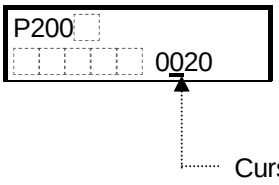


● Select the parameter to edit.
On pressing ▲ key, the parameter No. increases.
On pressing ▼ key, the parameter No. decrease.

● At this time, current setting data are displayed.

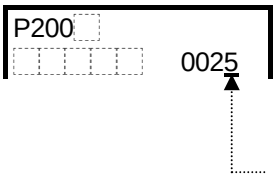
A. [In case of setting by numeric input]

③ Data input 1



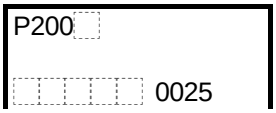
●On pressing [ENT] key the cursor appears and input is enabled.
●On pressing the [▲] or [▼] key, the numerical value or Mark changes.
●On pressing [MOD] key, a cursor moves.
●For cancellation of input data, press [▲][▼] keys together.

④ Data input 2



● As per the above mentioned operation, input the settings data.

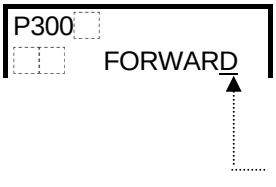
⑤ Data memory



● On pressing [ENT] key, the cursor disappears and the set data are memorized.

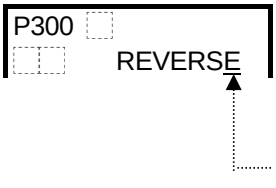
B. [In case of settings by menu selection]

③ Data selection 1



●On pressing [ENT] key the cursor appears and input is enabled.
●On pressing the [▲] or [▲] key, menu items are changed.
●For cancellation of input data, press [▲][▼] keys together.

④ Data selection 2



● As per the above mentioned operation, select the settings data.

⑤ Data memory

● On pressing [ENT] key, the cursor disappears and the settings data are memorized.

13-3-3 Command settings

[1]Common settings items

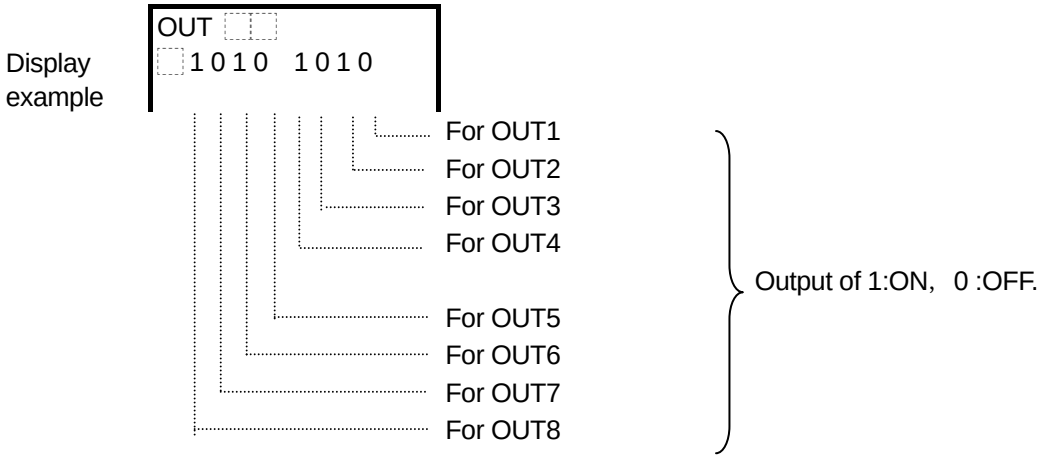
① Accel./ Decel. time selection

Perform the settings of Acceleration time and Deceleration time by parameter and select a combination from the below table.

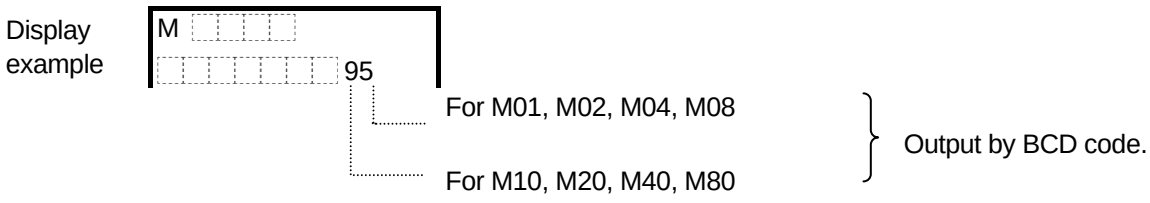
Accel. / Decel. time Selection	Accel. / Decel. time settings(parameter)
SEL.1	Acceleration time is set [P211: Acceleration time 1]. Deceleration time is set [P214: Deceleration time 1].
SEL.2	Acceleration time is set [P212: Acceleration time 2]. Deceleration time is set [P215: Deceleration time 2].
SEL.3	Acceleration time is set [P213: Acceleration time 3]. Deceleration time is set [P216: Deceleration time 3].

[Table 13-7] Combination of Accel./ Decel. Time

② General output



③ M output



[2] Free curve command setting items

① Motion parameter selection

Selection of Motion parameter at the time of free curve drive command group execution is as below.

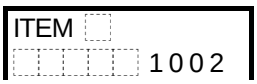
Motion parameter selection	Motion parameter settings(parameter)
SEL.1	Master standard position is [P830: according to Master standard position 1]. Delay/extension length of Master axis during startup is according to [P831: Delay/extension length 1of Master axis]. Pattern magnification denominator is according to [P832: Pattern magnification denominator 1]. Numerator number of pattern magnification is according to [P833: Pattern magnification numerator number 1]. Acceleration time is according to [P211: Acceleration time 1]. Deceleration time is according to [P214: Deceleration time 1].
SEL.2	Master standard position is according to [P835: Master standard position2]. Delay/extension length of Master axis during startup is according to [P836: Delay/extension length 2 of Master axis]. Pattern magnification denominator is according to [P837: Pattern magnification denominator 2]. Numerator number of pattern magnification is according to [P838: Pattern magnification numerator number 2]. Acceleration time is according to [P212: Acceleration time 2]. Deceleration time is according to [P215: Deceleration time 2]
SEL.3	Master standard position is according to [P840: Master standard position3]. Delay/extension length of Master axis during startup is according to [P841: Delay/extension length 3 of Master axis]. Pattern magnification denominator is according to [P842: Pattern magnification denominator 3]. Numerator number of pattern magnification is according to [P843: Pattern magnification numerator number 3]. Acceleration time is according to [P213: Acceleration time 3]. Deceleration time is according to [P216: Deceleration time 3]

[Table 13-8] Combination of free curve drive Motion parameter

[3] Settings methods

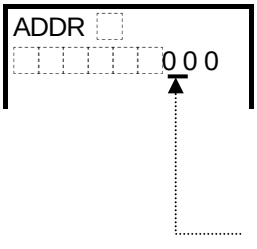
Command editing procedure is as below.

① ITEM number settings



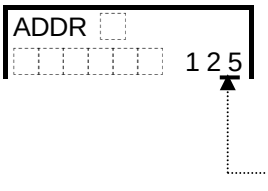
● Set ITEM number [1002].
● After settings, On pressing MOD key, it moves to②.

② Input 1 of editing address



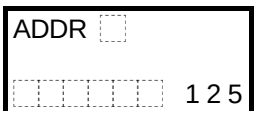
● On pressing ENT key, the cursor appears and input is enabled.
● On pressing ▲ or ▼ key, there is a change in numerical value of cursor digit.
● On pressing MOD key, a cursor moves.
●For cancellation of input data, press ▲▼ keys together at the same time.

③ Input 2 of editing address



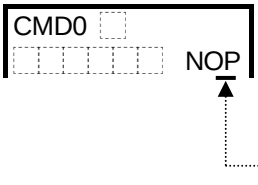
● As per the above mentioned operation, input the edited address.

④ Deciding Edit address



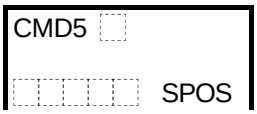
● On pressing ENT key, the cursor disappears and the Edit address is decided.
● After decision, On pressing ▲ key it moves to ⑤ .

⑤ Selection of Edit command



●On pressing ENT key, the cursor appears and input is enabled.
● On pressing MOD key, selection of command group is possible.
● With press of ▲ or ▼ key, select the edit command.

⑥ Deciding Edit command



●On pressing ENT key, the cursor disappears and the Edit address is decided.
●After decision, On pressing ▲ or ▼ key it moves to ⑦.

⑦Editing each setting item of the selected command
→ Refer to Command specification from next page.
Edit (Numerical input or menu selection) procedure of each setting item is of the same type that of parameter editing.

13-3-4 Real time gain setting

[1] Function

Real time gain setting adjusts various unit gains in the dedicated mode in Real time', watching motor motion status. In parameter edit mode, when [ENT] key is pressed, the gain is reflected in actual operation; in the Real time • gain mode, ± single gain is immediately reflected in actual operation with press of [▲] or [▼] key.

[2] Settings methods

Parameters for Real time • gain settings are shown in Table 13-9.

ITEM	Parameter No.	Parameter Name	Initial Value
3001	P101	Speed loop gain	0025
	P102	Speed loop integral time constant	20.00[ms]
	P103	Speed loop differential time constant	0000 [μs]
	P104	Speed loop proportional gain distribution ration	000.0[%]
	P105	Speed loop differential gain distribution ratio	000.0[%]
3002	P106	Speed loop gain /Low speed gain range	0025
	P107	Speed loop integral time constant / low speed gain range	20.00[ms]
	P108	Speed loop differential time constant / low speed gain range	0000[μs]
	P109	Speed loop proportional gain distribution ration / low speed gain range	000.0[%]
	P110	Speed loop differential gain distribution ration /low speed gain range	000.0[%]
3003	P111	Speed loop gain / use when GSEL signal is ON	0025
	P112	Speed loop differential time constant / use when GSEL signal is ON	20.00[ms]
	P113	Speed loop differential time constant / use when GSEL signal is ON	0000[μs]
	P114	Speed loop proportional gain distribution ration /use when GSEL signal is ON	000.0[%]
	P115	Speed loop differential gain distribution ration / use when GSEL signal is ON	000.0[%]
3004	P200	Position loop gain	0020[1/S]
	P201	Servo lock gain	0020[1/S]

[Table 13-9] Real time • Gain settings parameter

① ITEM [ENT] → 3001(Selection of Real time • gain settings mode)→ [ENT] →[MOD]

② P*** [ENT] (Selection of settings parameter)

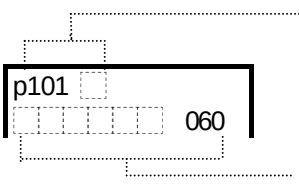
*mark is parameter No.(Refer to Table 13-9)

③ Data settings (gain adjustment) of selected parameter

- When [▲] key is pressed once ＋1 is added On pressing [▼] key -1 is reduced

④ On pressing [MOD] key there is EXIT from this mode. (At that time, display forms to [Status display mode].)

⑤ Display example



※For display, so as to differentiate from the similar items of parameter edit mode, the starting character of parameter No. is ‘p’ in lower case.

[Caution!!]

The value while in gain settings is immediately reflected in actual operation, but it is not overwritten to backup memory.

The overwriting the set data is executed when [ENT] or [MOD] key is pressed.

Chapter 14 Data

14 - 1 Electrical specifications of controller

[100V controller **]**

Items	Contents		
Model	NCR-*A*A1		
	-051	-101	-201
Power supply	AC90~121V, 50/60Hz Single phase		
Output capacity [W]	50	100	200
Driver method	3 phase sine wave PWM		
Power capacity (In case of rated output) [kVA] *2	0.3	0.6	1.1
Continuous output current [Arms]	1.1	2.0	3.4
Instantaneous output current [Arms]	3.3	6.0	9.9
Control method	Semi closed loop by encoder (linear sensor) feedback		
Braking method	Regenerative braking: externally attached regenerative resistor		
Career frequency	High efficiency type:25 kHz/ Multi functional type : parameter selection (10K / 1 6K / 20K / 24K)		
Speed control range	1:5000 *1		
Highest speed frequency	16 Mpps		
No fuse circuit breaker (Rated current) [A]*3	5	5	5
Weight [kg]*4	1.0	1.0	1.4
Method	Refer to Chapter 3 External appearance		
Accessories	Regenerative resistor (Optional below 400W) Refer to 14 - 2 [External regenerative resistor, combination]		
Applicable motor	Refer to 14 – 4 [List of applicable motors]		

* 1: A motor may not run smoothly with 1/5000 speed of rated speed.
Speed control range is the range in which motor runs non-stop when 100% load is applied.
* 2: Changes according to power source impedance.
* 3: Select sufficient shut down capacity type to have protective coordination with power source capacity for no fuse circuit breaker.
* 4: Weight when options are not applied.

[Table 14 - 1(a)] Electrical specifications 1/4

[200V controller]

Items	Contents							
Model	NCR-*A*A2*							
	-101	-201	-401	-801	-152	-222	-302	-402
Power supply	AC 180~242 V, 50/60 Hz, three phase							
Output capacity [W]	100	200	400	800	1.5K	2.2K	3.0K	4.0K
Driver method	3 phase sine wave PWM							
Power source capacity (In case of rated output) [kVA] *2	0.3	0.6	1.1	1.8	3.0	4.7	4.8	6.4 7.8
Continuous output current [Arms] *6	1.1	2.0	3.4	6.8	8.0 10.0	10.2 16.0	14.0 16.0	21.0 26.0
Instantaneous output current [Arms] *7	3.3	6.0	9.9	17.0	24.0 30.0	30.6 48.0	42.0 48.0	63.0 78.0
Control method	Semi closed loop by encoder (Linear sensor) feedback							
Braking method	Regenerative braking: Externally attached regenerative resistor							
Career frequency	High efficiency type : 25kHz/10kHz (Product with output capacity above 3.0KW) Multi functional type : parameter selection (10K/16K/20K/24K) * 5							
Speed control range	1:5000 *1							
Highest speed frequency	16 Mpps							
No fuse circuit breaker (Rated current) [A] *3	5	5	5	10	15	20	20	30
Weight [kg] *4	1.0	1.0	1.4	2.4	5.8 4.0	5.8 4.0	7.7 6.0	7.7 6.0
Method	Refer to Chapter 3 External appearance							
Accessories	Regenerative resistor (Optional below 400W) Refer to 14 - 2 [External regenerative resistor, combination]							
Applicable motors	Refer to 14 – 4 [List if applicable motors]							

* 1: A motor may not run smoothly with 1/5000 speed of rated speed.
Speed control range is the range in which motor runs non-stop when 100% load is applied.

* 2: Changes according to power source impedance.
In product with output capacity of 4.0KW, for power source capacity the upper limit is design class A/B (NCR-CA*6*A-XXX/NCR-CA*6*B-XXX), lower limit is from design class C (NCR-CA-*6*C-XXX).

* 3: Please choose sufficient shut down capacity type to conduct protective coordination with power source capacity for no fuse circuit breaker.

* 4: Weight when option is not installed.
In product with output capacity of 3.0KW and 4.0KW, for weight the upper limit is design class A/B (NCR-CA*6*A-XXX/NCR-CA*6*B-XXX), lower limit is from design class C (NCR-CA-*6*C-XXX).

* 5: Use 10 kHz frequency for machines with output capacity below 3.0KW.

* 6: In product with output capacity of 3.0KW and 4.0KW, for Continuous output current value the upper limit is design order A/B(NCR-CA*6*A-XXX/NCR-CA*6*B-XXX), lower limit is from design class C (NCR-CA-*6*C-XXX).

*7: In product with output capacity of 3.0KW and 4.0KW, for Instantaneous output current value the upper limit is design class A/B(NCR-CA*6*A-XXX/NCR-CA*6*B-XXX), lower limit is from design class C (NCR-CA-*6*C-XXX).

[Table 14 - 1(b)] Electrical specifications 2/4

[200V controller]

Items	Contents							
Model	NCR-*A*A2*							
	-752	-113	-153	-	-	-	-	-
Power supply	AC 180~242 V, 50/60 Hz, three phase							
DC24V control power	DC20.4~27.6 V							
Output capacity [W]	7.5K	11.0K	15.0K					
Driver method	3 phase sine wave PWM							
Power source capacity (at rated output of power Of power section) [kVA] *2	15	20	25					
Control power capacity [W] *5	26	26	26					
Continuous output current [Arms]	41.8	46.6	62.6					
Instantaneous output current [Arms]	83.6	93.2	125.2					
Control method	Semi closed loop by encoder (Linear sensor) feedback							
Braking method	Regenerative braking: Externally attached regenerative resistor							
Career frequency	10kHz							
Speed control range	1:5000 *1							
Highest speed frequency	16 Mpps							
No fuse circuit breaker (Rated current) [A] *3	60	75	100					
Weight [kg] *4	7.4	7.7	10.0					
Method	Refer to Chapter 3 External appearance							
Accessories	Regenerative resistor (Optional below 400W) Refer to 14 - 2 [External regenerative resistor, combination]							
Applicable motors	Refer to 14 – 4 [List if applicable motors]							

* 1: A motor may not run smoothly with 1/5000 speed of rated speed.
Speed control range is the range in which motor runs non-stop when 100% load is applied.
* 2: Changes according to power source impedance.
* 3: Please choose sufficient shut down capacity type to conduct protective coordination with power source capacity for no fuse circuit breaker.
* 4: Weight when option is not installed.
* 5: At the time of inserting the power, above the moment rated capacity flow provides the power supply.

[Table 14 - 1(c)] Electrical specifications 3/4

[400V controller]

Items	Contents							
Model	NCR-*A*A3*							
	-	-751	-262	-402	-752	-113	-153	-
Power supply	AC 360~484 V, 50/60 Hz, three phase							
DC24V control power	DC20.4~27.6 V (Instantaneous 24V±20%)							
Output capacity [W]		750	2.6K	4.0K	7.5K	11.0K	15.0K	
Driver method	3 phase sine wave PWM							
Power source capacity (at rated output of power Of power section) [kVA] *2		1.8	5.2	7.8	15	20	25	
Control power capacity [W] *5		15	20	24	26	26	26	
Continuous output current [Arms]		2.5	8.0	15.0	20.9	23.4	31.3	
Instantaneous output current [Arms]		7.5	24.0	45.0	41.8	46.8	62.6	
Control method	Semi closed loop by encoder (Linear sensor) feedback							
Braking method	Regenerative braking: Externally attached regenerative resistor							
Career frequency	10kHz							
Speed control range	1:5000 *1							
Highest speed frequency	16 Mpps							
No fuse circuit breaker (Rated current) [A] *3		5	15	20	30	40	50	
Weight [kg] *4		1.9	4.0	6.0	7.4	7.7	10.0	
Method	Refer to Chapter 3 External appearance							
Accessories	Regenerative resistor (Optional below 400W) Refer to 14 - 2 [External regenerative resistor, combination]							
Applicable motors	Refer to 14 – 4 [List if applicable motors]							

* 1: A motor may not run smoothly with 1/5000 speed of rated speed.
Speed control range is the range in which motor runs non-stop when 100% load is applied.
* 2: Changes according to power source impedance.
* 3: Please choose sufficient shut down capacity type to conduct protective coordination with power source capacity for no fuse circuit breaker.
* 4: Weight when option is not installed.
* 5: At the time of inserting the power, above the moment rated capacity flow provides the power supply.

[Table 14 - 1(d)] Electrical specifications 4/4

14 - 2 Regenerative resistor combination

14 - 2 – 1 Regenerative resistor combination

[200Vsystem controller regenerative resistor list**]**

Controller model	Auxiliary regenerative resistor type
NCR-*2*-101 Capacity :0.1kw	None. If necessary, consult with the company.
NCR-*2*-201 Capacity: 0.2kw	None. If necessary, consult with the company.
NCR-*2*-401 Capacity :0.4kw	None. If necessary, consult with the company.
NCR-*2*-801 Capacity: 0.8kw	CAN60UT 82 Ohm J 60W, 82Ω – One pc. Cement resistor External appearance 1
NCR-*2*-152 Capacity: 1.5kw	CAN200UT 39 Ohm J 200W, 39Ω - One pc. Cement resistor External appearance 2
NCR-*2*-222 Capacity: 2.2kw	CAN200UT 39(24) Ohm J 200W, 39(24)Ω - One pc. *1 Cement resistor External appearance 2
NCR-*2*-302 Capacity: 3.0kw	CAN400UR 20 Ohm J 400W, 20Ω - One pc. Cement resistor External appearance 3
NCR-*2*-402 Capacity: 4.0kw	CAN400UR 20 Ohm J 400W, 20Ω - One pc. Cement resistor External appearance 3
NCR-*2*-752 Capacity: 7.5kw	RGH-300-0S30J 300W,30Ω - Three (Parallel connections Total 900W 10Ω) Enamel resistor External appearance 4
NCR-*2*-113 Capacity: 11kw	RGH-500-0S22J 500W,22Ω - Three (Parallel connections Total 1.5KW 7.3Ω) Enamel resistor External appearance 5
NCR-*2*-153 Capacity: 15kw	RGH-500-0S22J 500W,22Ω - Four (Parallel connections Total 2.0KW 5.5Ω) Enamel resistor External appearance 5

* 1: Design class D (NCR-CA*6*D-222) or after becomes 24Ω.

[100V system Controller Auxiliary Regenerative resistor list]

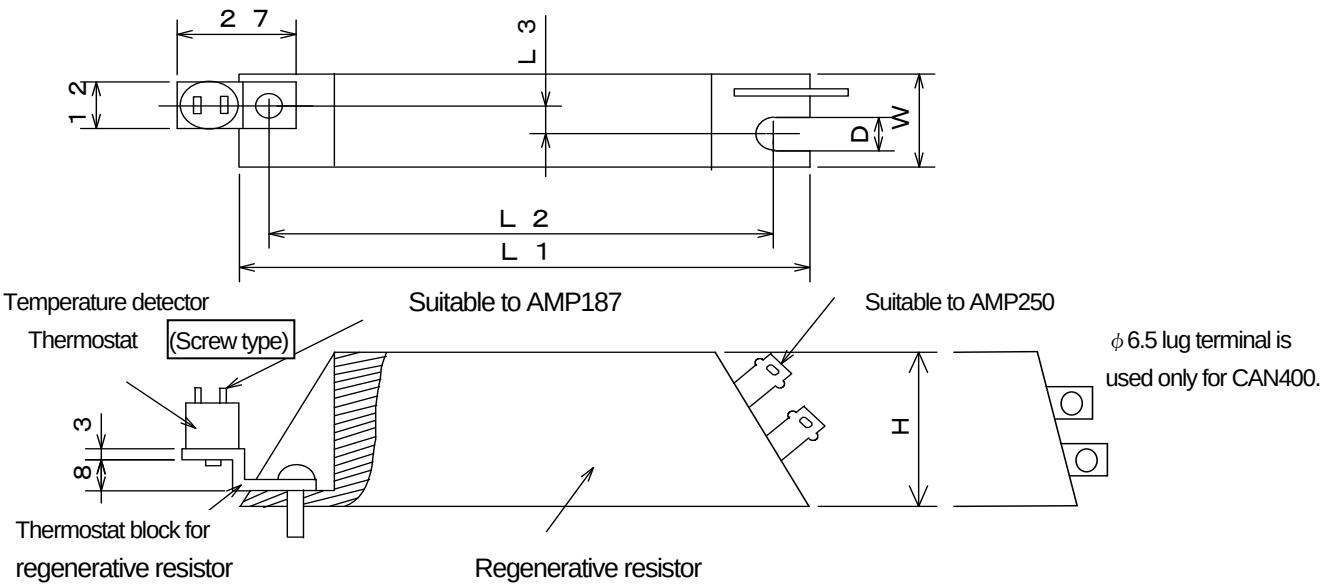
Controller model	Regenerative resistor type
NCR-*1*-051 Capacity: 0. 05kw	None. If necessary, consult with the company.
NCR-*1*-101 Capacity: 0. 1kw	None. If necessary, consult with the company.
NCR-*1*-201 Capacity: 0. 2kw	None. If necessary, consult with the company.

[400V system Controller auxiliary regenerative resistor list]

Controller Model	Regenerative resistor type
NCR-*3*-751 Capacity: 0.75kw	CAN60UT 200 Ohm J 60W, 200Ω – One pc. Cement resistor External appearance 1
NCR-*3*-262 Capacity: 2.6kw	CAN200UT 100 Ohm J 200W, 100Ω – One pc. Cement resistor External appearance 2
NCR-*3*-402 Capacity: 4.0kw	CAN400UR 51 Ohm J 400W, 51Ω – One pc. Cement resistor External appearance 3
NCR-*3*-752 Capacity: 7.5kw	RGH-300-0S120J 300W,120Ω - Three (Parallel connections Total 900W 40Ω) Enamel resistor External appearance 5
NCR-*3*-113 Capacity: 11kw	RGH-500-0S82J 500W,82Ω - Three (Parallel connections Total 1.5KW 27.3Ω) Enamel resistor External appearance 5
NCR-*3*-153 Capacity: 15kw	RGH-500-0S82J 500W,82Ω - Four (Parallel connections Total 2.0KW 20.5Ω) Enamel resistor External appearance 5

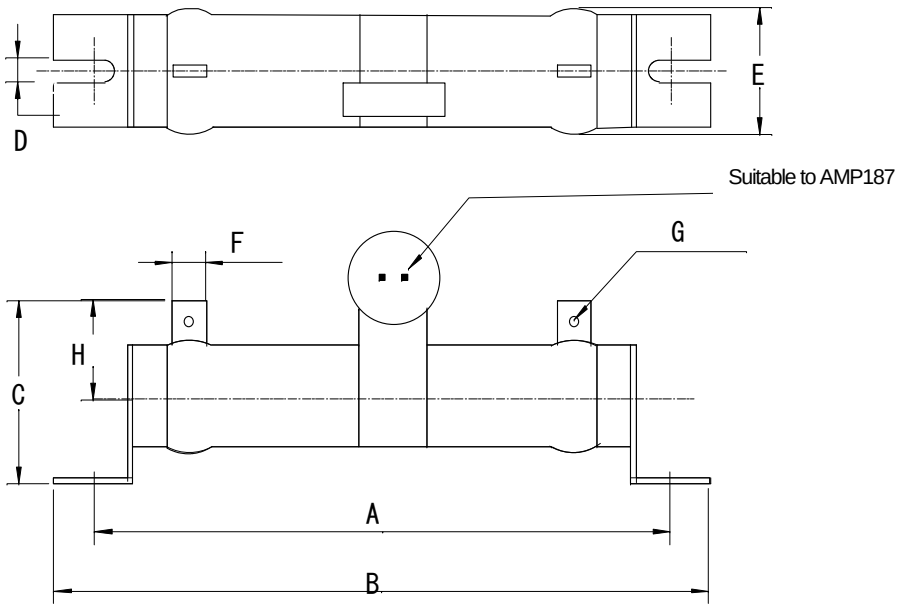
14 - 2 - 2　External appearance of regenerative resistor

External appearance of the regenerative resistor, measurements and installation positions of thermostat are shown below.



Installation base is common to both regenerative resistor and thermostat.

Model	Rated	L1	L2	W	H	L3	D	External appearance
CAN 60	60W	115	100	20	40	5	4.3	External appearance 1
CAN 200	200W	215	200	26	50	8	5.3	External appearance 2
CAN 400	400W	265	250	33	61	13	5.3	External appearance 3



Model	Rated	A	B	C	D	F	F	G	H	External appearance
RGH200	200W	282	304	54	6	32	7	4.2	31	
RGH300	300W	304	334	84	10	46	13	6.0	44	External appearance 4
RGH500	500W	350	380	99	10	57	13	5.2	49	External appearance 5

[Figure 14 - 1] External appearance of regenerative resistor

14 - 3 Electrical specifications of motor cooling blowers

[AC200V system motor cooling blowers]

Motor Model	Power supply						Power source poles
	200V/50Hz		200V/60Hz		220V/60Hz		
	Power consumption (W)	Rated Current (A)	Power Consumption (W)	Rated current (A)	Power consumption (W)	Rated current (A)	
NA100-110F/-10	23	0.14	24	0.13	28	0.14	3Φ 2P
NA100-180F/-10	37	0.22	54	0.29	56	0.28	
NA100-270F/-10	37	0.22	54	0.29	56	0.28	
NA100-370F/-10	37	0.22	54	0.29	56	0.28	
NA100-550F/-10, -550AF	47	0.27	68	0.36	70	0.35	
NA100-750F/-10, -750AF	110	0.55	163	0.75	167	0.75	
NA100-1100F/-10, -1100AF	110	0.55	163	0.75	167	0.75	
NA20-1500/-10	620	2.0	650	2.0	700	2.0	
NA20-1800	620	2.0	650	2.0	700	2.0	
NA20-2200/-10	620	2.0	650	2.0	700	2.0	
NA20-2700/-10	620	2.0	650	2.0	700	2.0	
NA20-3700/-10	620	2.0	650	2.0	700	2.0	
NA720-153, -223	47	0.27	68	0.36	70	0.35	

[AC400V system motor cooling blowers]

Motor Model	Power supply				Power source poles
	100V/50Hz		100V/60Hz		
	Power consumption (W)	Rated current (A)	Power consumption (W)	Rated current (A)	
NA100-270F-20H/-10H	80	1.3	80	1.2	1Φ 2P
NA100-370F-20H/-10H	80	1.3	80	1.2	
NA100-550F-20H/-10H	110	1.6	110	1.4	

Motor Model	Power supply				Power source poles
	400V/50Hz		400V/60Hz		
	Power consumption (W)	Rated current (A)	Power consumption (W)	Rated current (A)	
NA100-750F-20H/-10H	100	0.3	145	0.36	3Φ 2P
NA100-1100F-20H/-10H	100	0.3	145	0.36	
NA20-1500-20H/-10H	620	1.0	650	1.0	
NA20-1800-20H	620	1.0	650	1.0	
NA20-2200-20H/-10H	620	1.0	650	1.0	
NA20-2700-20H/-10H	620	1.0	650	1.0	
NA20-3700-20H/-10H	620	1.0	650	1.0	
NA20-5500-20H/-10H					
NA20-7500-20H/-10H					
NA20-11000-10H/-5H					

14 - 4 Applicable motor list

14 – 4 – 1 τ Linear Applicable Motor List

Note 1) Max. usage speed is the speed when 1.0μm or 5.0μm sensor is used.
Sensor feedback pulse should be used below 16 Mpps if it is using the sensor other than the above mentioned sensors.

Note 2) When magnetic pole sensor is not used, set sensor type to 0 (P010=0).

[The list of applicable parameter selection for τ Linear motor 1/2]

Controller capacity	P000	P001	Applicable motor						
	Setting value		Motor model	Rated thrust	Rated speed	Max. speed	Peak thrust	Magnetic pole sensor	
								Type	Offset
				[N]	[m/s]	[m/s]	[%]		[mm]
NCR-*1*-051	001	L-SEN	NLA-7SL	7	3.0	3.0	300	1	28.50
	021	L-SEN	NLA-25AL	25	3.0	3.0	300	1	28.50
Capacity: 0.05kW									
Input voltage:100V									
NCR-*1*-101	002	L-SEN	NLA-13SL	13	3.0	3.0	300	1	28.50
	022	L-SEN	NLA-50AL	50	3.0	3.0	300	1	28.50
Capacity : 0.1kW									
Input voltage:100V									
NCR-*1*-201	023	L-SEN	NLA-100AL	100	3.0	3.0	290	1	28.50
Capacity: 0.2kW									
Input voltage:100V									
NCR-*2*-101	024	L-SEN	NLA-50AM	50	3.0	3.0	300	1	28.50
	061	L-SEN	NVA-AMA	23	3.0	3.5	300	2	0.00
Capacity: 0.1kW	071	L-SEN	NVA-BMA	50	3.0	3.5	300	2	0.00
Input voltage: 200V	091	L-SEN	NVA-DMA	30	3.0	3.5	300	2	0.00
NCR-*2*-201	025	L-SEN	NLA-100AM	100	3.0	3.0	300	1	28.50
	041	L-SEN	NLA-100BM	100	3.0	3.0	300	1	28.50
Capacity: 0.2kW	062	L-SEN	NVA-AMB	45	3.0	3.5	300	2	0.00
Input voltage:200V	072	L-SEN	NVA-BMB	100	3.0	3.5	300	2	0.00
	092	L-SEN	NVA-DMB	60	3.0	3.5	300	2	0.00
NCR-*2*-401	026	L-SEN	NLA-150AM	150	3.0	3.0	300	1	28.50
	042	L-SEN	NLA-200BM	200	3.0	3.0	290	1	28.50
Capacity: 0.4kW	063	L-SEN	NVA-AMC	68	3.0	3.5	300	2	0.00
Input voltage: 200V	064	L-SEN	NVA-AMD	90	3.0	3.5	290	2	0.00
	073	L-SEN	NVA-BMC	150	3.0	3.5	300	2	0.00
	093	L-SEN	NVA-DMC	90	3.0	3.5	300	2	0.00
	101	L-SEN	NLA-250MM	250	3.0	2.5	290	2	0.00
NCR-*2*-801	043	L-SEN	NLA-300BM	300	3.0	3.0	280	1	28.50
	065	L-SEN	NVA-AME	135	3.0	3.5	300	2	0.00
Capacity: 0.8kW	074	L-SEN	NVA-BMD	200	3.0	3.5	300	2	0.00
Input voltage: 200V	075	L-SEN	NVA-BME	300	3.0	3.5	300	2	0.00
	094	L-SEN	NVA-DMD	120	3.0	3.5	300	2	0.00
	095	L-SEN	NVA-DME	180	3.0	3.5	300	2	0.00
	102	L-SEN	NLA-500MM	500	3.0	2.5	250	2	0.00
	121	L-SEN	NLA-500NM	500	3.0	3.0	250	2	0.00

[The list of applicable parameter selection for τ Linear motor 2/2]

Controller capacity	P000	P001	Applicable motor						
	Setting value		Motor model	Rated thrust	Rated speed	Max. speed	Peak thrust	Magnetic pole sensor	
								Type	Offset
				[N]	[m/s]	[m/s]	[%]		[mm]
NCR-*2*-152									
Capacity: 1.5kW									
Input voltage: 200V									
NCR-*2*-222	103	L-SEN	NLA-750MM	750	3.0	2.5	300	2	0.00
Capacity: 2.2kW									
Input voltage: 200V									
NCR-*2*-302	122	L-SEN	NLA-1000NM	1000	3.0	3.0	300	2	0.00
Capacity: 3.0kW									
Input voltage:200V									
NCR-*2*-402	123	L-SEN	NLA-1500NM	1500	3.0	3.0	300	2	0.00
Capacity: 4.0kW									
Input voltage: 200V									

14 - 4 - 2 Applicable τ DISC servomotor list

Note 1) About magnetic pole sensor

If τ DISC servomotor is the special model which is not listed in the above-mentioned diagram, pleaser consult with our sales dept., and the parameters for sensor type (P010) and sensor offset (P011) should be set.

[The list of applicable parameter selection for τ DISC servomotor]

Controller capacity	P000	P001	Applicable motor						
	Setting value		Motor model	Rated torque	Rated speed	Max. usable no. of rotations	Peak output	Magnetic poles sensor	
								Type	Offset
				[N·m]	[rps]	[rpm]	[%]		[mm]
NCR-*2*-201	261	C-SEN2	NMR-FADBA2*-061 NMR-FPDBA2*-061	2.0	5	300	300	0	0.00
Capacity: 0.2kW									
Input voltage:200V									
NCR-*2*-401	201	C-SEN2	NMR-FDDB	7.5	5	300	300	1	0.00
Capacity: 0.4kW	205	C-SEN2	NMR-FDDBA2*-201 NMR-FSDBA2*-201	7.5	5	300	300	2	0.00
Input voltage: 200V	221	C-SEN2	NMR-FEDB	20.7	3	180	290	1	0.00
	223	C-SEN2	NMR-FEDBA2*-401 NMR-FTDBA2*-401	20.7	3	180	290	2	0.00
	262	C-SEN2	NMR-FAEBA2*-121 NMR-FPEBA2*-121	4.0	5	300	300	0	0.00
NCR-*2*-801	203	C-SEN2	NMR-FDFB	22.5	5	300	300	1	0.00
Capacity: 0.8kW	206	C-SEN2	NMR-FDFBA2*-701 NMR-FSFBA2*-701	22.5	5	300	300	2	0.00
Input voltage: 200V	241	C-SEN2	NMR-FFDB	67	2	120	200	1	0.00
	243	C-SEN2	NMR-FFDBA2*-801 NMR-FUDBA2*-801	67	2	120	200	2	0.00
NCR-*2*-152	222	C-SEN2	NMR-FEFB	62	3	180	300	1	0.00
Capacity: 1.5kW	224	C-SEN2	NMR-FEFBA2*-122 NMR-FTFBA2*-122	62	3	180	300	2	0.00
Input voltage: 200V									
NCR-*2*-222									
Capacity: 2.2kW									
Inputvoltage:200V									
NCR-*2*-302	242	C-SEN2	NMR-FFFB	200	2	120	200	1	0.00
Capacity: 3.0kW	244	C-SEN2	NMR-FFFBA2*-252 NMR-FUFBA2*-252	200	2	120	200	2	0.00
Input voltage:200V									
NCR-*2*-402									
Capacity: 4.0kW									
Input voltage: 200V									

14 - 4 - 3 Applicable synchronous motor list

Note 1) Motor above 22KW is under development..
Note 2) Applicable to the device of design class C (NCR-CA*6*C-XXX) or after.
Note 3) Applicable to the device of design class C (NCR-CA*6*C-XXX) or before.
Note 4) Applicable to the device of design class D (NCR-CA*6*D-XXX) or after.

[The list of applicable parameter selection for synchronous motor 1/3]

Controller capacity	P000	P001	Applicable motor			
	Setting value		Motor model	Rated output	Rated no. of rotations	Peak output
				[kW]	[rpm]	[%]
NCR-*1*-051	701	INC3	NA70-05*Z	0.05	3000	300
	704	S-INC	NA80-05*Z	0.05	3000	300
Capacity: 0.05kW						
Input voltage:100V						
NCR-*1*-101	702	INC3	NA70-10*Z	0.1	3000	300
	705	S-INC	NA80-10*Z	0.1	3000	300
Capacity: 0.1kW						
Input voltage:100V						
NCR-*1*-201	703	INC3	NA70-20*L	0.2	3000	300
	706	S-INC	NA80-20*L	0.2	3000	300
Capacity: 0.2kW						
Input voltage:100V						
NCR-*2*-101						
Capacity: 0.1kW						
Input voltage:200V						
NCR-*2*-201	601	INC3	NA70-10*Z	0.1	3000	300
	602	INC3	NA70-20*M	0.2	3000	300
Capacity: 0.2kW	603	S-INC	NA80-10*M	0.1	3000	300
Input voltage:200V	604	S-INC	NA80-20*M	0.2	3000	300
NCR-*2*-401	611	INC3	NA70-40*M	0.4	3000	300
	614	S-INC	NA80-40*M	0.4	3000	300
Capacity: 0.4kW						
Input voltage:200V						
NCR-*2*-801	612	INC3	NA70-60*M	0.6	3000	300
	613	INC3	NA70-80*M	0.8	3000	300
Capacity: 0.8kW	615	S-INC	NA80-75*Z	0.75	3000	300
Input voltage:200V	616	S-INC	NA80-60*M	0.6	3000	300
NCR-*2*-152	621 * 4)	INC3	NA720-122	1.2	2000	300
	622 *4)	S-INC	NA830-162	1.6	3000	300
Capacity: 1.5kW						
Input voltage:200V						
NCR-*2*-222	631 *3)	INC3	NA720-122	1.2	2000	300
	632 *3)	S-INC	NA830-162	1.6	3000	300
Capacity: 2.2kW	633 *4)	INC3	NA720-182	1.8	2000	300
Input voltage:200V	634 *4)	INC3	NA720-242	2.4	2000	300
NCR-*2*-302	641 *3)	INC3	NA720-182	1.8	2000	300
	642 *2) *3)	INC3	NA720-242	2.4	2000	300
Capacity: 3.0kW						
Input voltage:200V						

[The list of applicable parameter selection for synchronous motor 2/3]

Controller capacity	P000	P001	Applicable motor			
	Setting value		Motor Model	Rated output	Rated no. of rotations	Peak output
				[kW]	[rpm]	[%]
NCR-*2*-402	651	INC3	NA720-242	2.4	2000	300
	652 *2)	INC3	NA720-402	4.0	2000	250
Capacity: 4.0kW	653	S-INC	NA830-332	3.3	3000	300
Input voltage:200V	654	S-INC	NA820-402	4.0	2000	250
NCR-*2*-752	664	S-INC	NA820-602	6.0	2000	250
	665	S-INC	NA820-752	7.5	2000	200
Capacity: 7.5kW						
Input voltage:200V						
NCR-*2*-113	672	S-INC	NA820-113	11.0	2000	200
Capacity: 11kw						
Input voltage:200V						
NCR-*2*-153	682	S-INC	NA820-153	15.0	2000	200
Capacity: 15kw						
Input voltage:200V						

[The list of applicable parameter selection for Synchronous motor 3/3**]**

Controller capacity	P000	P001	Applicable motor			
	Settings value		Motor Model	Rated output	Rated no. of rotations	Peak output
				[kW]	[rpm]	[%]
NCR-*3*-751	711	S-INC	NA80-60*H	0.6	3000	300
	712	S-INC	NA80-75*H	0.75	3000	300
Capacity: 0.75kW						
Input voltage:400V						
NCR-*3*-262	746	S-INC	NA830-162*H	1.6	3000	300
Capacity: 2.6kW						
Input voltage:400V						
NCR-*3*-402	751	S-INC	NA820-402*H	4.0	2000	250
	752	S-INC	NA830-332*H	3.3	3000	300
Capacity: 4.0kw						
Input voltage:400V						
NCR-*3*-752	761	S-INC	NA820-752*H	7.5	2000	200
	762	S-INC	NA820-602*H	6.0	2000	250
Capacity: 7.5kw						
Input voltage:400V						
NCR-*3*-113	771	S-INC	NA820-113*H	11.0	2000	200
Capacity: 11w						
Input voltage :400V						
NCR-*3*-153	781	S-INC	NA820-153*H	15.0	2000	200
Capacity: 15kw						
Input voltage :400V						

14 - 4 - 4 Applicable induction motor list

Note 1) Motor above 7.5 KW is under development. So avoid using it.

[The list of applicable parameter selection for induction motor 1/2]

Controller capacity	P000	P001	Applicable motor			
	Setting value		Motor Model	Rated output	Rated no. of rotations	Peak output
				[kW]	[rpm]	[%]
NCR-*2*-201	401	INC1	NA30-13F-15	0.2	1500	300
Capacity: 0.2kW						
Input voltage:200V						
NCR-*2*-401	411	INC1	NA30-25F-15	0.4	1500	300
Capacity: 0.4kW						
Input voltage:200V						
NCR-*2*-801	412	INC1	NA100-20F	0.6	3000	300
	413	INC1	NA100-40F	0.8	2000	300
Capacity: 0.8kW	414	INC1	NA100-75F-10	0.8	1000	300
Input voltage:200V	415	INC1	NA30-50F-15	0.8	1500	300
NCR-*2*-222	431	INC1	NA100-110F-10	1.2	1000	300
Capacity: 2.2kW						
Input voltage: 200V						
NCR-*2*-302	441	INC1	NA100-180F-10	1.9	1000	300
	442	INC1	NA30-110F-15	1.6	1500	300
Capacity: 3.0kW	443	INC1	NA100-75F	1.5	2000	300
Input voltage:200V						
NCR-*2*-402	451	INC1	NA100-110F	2.2	2000	300
	452	INC1	NA100-270F-10	2.8	1000	300
Capacity: 4.0kW						
Input voltage:200V						

[The list of applicable parameter selection for induction motor 2/2]

Controller capacity	P000	P001	Applicable motor			
	Settings value		Motor Model	Rated output	Rated no. of rotations	Peak output
				[kW]	[rpm]	[%]
NCR-*2*-752 Capacity: 7.5kW Input voltage:200V	461	INC1	NA30-180F-15	2.8	1500	
	462	INC1	NA100-180F	3.7	2000	
	463	INC1	NA100-370AF	7.5	2000	
	464	INC1	NA100-370F-10	3.7	1000	
	465	INC1	NA100-550F-10	5.5	1000	
	466	INC1	NA100-750F-10	7.5	1000	
NCR-*2*-113 Capacity: 11kw Input voltage:200V	471	INC1	NA100-270F	5.5	2000	
	472	INC1	NA100-550F-10	5.5	1000	
	473	INC1	NA100-750F-10	7.5	1000	
	474	INC1	NA100-550AF	11	2000	
	475	INC1	NA100-1100F-10	11	1000	
NCR-*2*-153 Capacity: 15kw Input voltage:200V	481	INC1	NA100-370F	7.5	2000	
	482	INC1	NA100-750AF	15	2000	
	483	INC1	NA20-1500-10	15	1000	
	484	INC1	NA100-550F	11	2000	
NCR-*2*-223 Capacity: 22kw Input voltage:200V	491	INC1	NA100-1100AF	22	2000	
	492	INC1	NA20-2200-10	22	1000	
	493	INC1	NA100-750F	15	2000	
NCR-*3*-113 Capacity: 11kw Input voltage:400V	571	INC1	NA100-550F-20H	11	2000	
	572	INC1	NA100-1100F-10H	11	1000	
	573	INC1	NA100-550F-20H	11	2000	
NCR-*3*-153 Capacity: 15kw Input voltage:400V	581	INC1	NA100-750F-20H	15	2000	
	582	INC1	NA20-1500-10H	15	1000	
NCR-*3*-222 Capacity: 22kw Input voltage:400V	591	INC1	NA100-1100F-20H	22	2000	
	592	INC1	NA20-2200-10H	22	1000	
	593	INC1	NA100-750F-20H	15	2000	

14 - 5 Free curve motion data

14 -5 -1 Data settings

Free curve motion is operated by data changed to [Protected data - > Executable data] as per following timings.

(1) At the time of power source input
(2) At the time of reset execution
(3) At the time of [PCNV] command execution

i.e. During automatic operation mode, even if data contents of free curve motion data are changed, it is not reflected in the operation.

Free curve motion Data is organized to set Slave axis track and General output timing [Operation Pattern Data].

However, this Data cannot be edited directly for LCD unit/SDI device.

With using [VC series editing software (Windows95 compatible)], which is sold separately, settings the Serial communication.
However, In Program command [PSET], [POUT], [PCLR] and [PCNV], [Slave position] and [General output] can be set for specific pattern and master position.
(For details, refer to separate Instruction manual [Command compilation]).

When [Free curve motion Data editing software (Windows95 compatible)] is not used, refer the following contents for settings of Serial communication.

(1) Free curve motion can be performed to set data necessary for internal data area (P device).
(However, parameters related with standard position of Serial communication are necessary to set on Controller side).

(2) Free curve motion Data is organized by 4 devices, 64 bit corresponding to 1Point.
[POS: (Slave axis position (track) Data)]→2 devices
[Validity/ invalidity :(Validity / invalidity settings of POS, OUT)] →1 device
[OUT:(General output)] →1 device

(3) When [COMM.2 (Computer)] is selected in parameter [P510: select communication function], relation between upper position / lower position of 2 device nos. is as below.
Furthermore, when [COMM.3 Touch panel) is selected, (parameter [P510: select communication function] relation between upper position / lower position becomes reverse.

<Example>

Device no.	Data name
P000000	Pattern1 0 Point
P000001	[POS] Data

Setting Data	
Upper position	Lower position
P000000	P000001

[Figure 14 - 2] Data organization

(4) Settings data is a 32 bit data with digits after decimal points being ignored or unsigned hexadecimal data.

<Example>

[Numerical value Settings (motion pattern data example)]

Device No.	Data name	Settings value (Example)
P000000	Pattern1 0Point [POS] Data	Slave axis position: -100.0
P000001		

Slave position -100.0 (Decimal) → Slave position -1000 (Decimal) → Slave position FC18H (Hexadecimal) → FFFFFC18H

Ignore digits after decimal points (Position Data) | Hexadecimal conversion (Position Data) | 32 bit Data length (8 digits for Hexadecimal)

Settings data

Upper position	Lower position
P000000	P000001
FFFFH	FC18H

Device No.	Data name	Settings value (Example)
P000002	Pattern1 0Point [Existence]&[OUT] Data	Existence position and OUT Valid OUT: 255
P000003		

Existence Position: Valid OUT: Valid OUT 255 → Existence C000H (Hexadecimal) OUT 255 → Existence C000H (Hexadecimal) OUT 00FFH → C00000FFH

Converting Valid or Invalid into Numerical value | Hexadecimal conversion | 32 bit Data length (8 digits for Hexadecimal)

Settings Data

Upper position	Lower position
P000002	P000003
C000H	00FFH

For data format details refer to [[Chart 14 - 5] motion pattern data format].

[Figure 14 - 3] Setting data example

14 - 5 - 2 Motion pattern data

Motion Pattern Data maintains total resolution of 50000 Point. Usable pattern number is decided by setting resolution as per Pattern 1 (However maximum 500 Patterns). Motion Pattern Data Example at the time of free curve motion is as follows.

(Example at the time of 6250 1-cycle resolution)

Pattern	Data items	Data number	Contents
1	Slave axis position	6251	Position data of slave axis compatible with 0~6250 master axis resolution.(Absolute position of standard position)
	General output	6251	General output data compatible with 0~6250 Master axis resolution.
2	Slave axis position	6251	Position data of slave axis compatible with 0~6250 master axis resolution (Absolute position of standard position)
	General output	6251	General output data compatible with 0 ~ 6250 master axis resolution.
3	Slave axis position	6251	Position data of slave axis compatible with 0 ~ 6250 master axis resolution. (Absolute position of standard position)
	General output	6251	General output data compatible with 0 ~ 6250 master axis resolution.
4	Slave axis position	6251	Position data of slave axis compatible with 0 ~ 6250 master axis resolution (Absolute position of standard position)
	General output	6251	General output data compatible with 0 ~ 6250 master axis resolution.
5	Slave axis position	6251	Position data of slave axis compatible with 0 ~ 6250 master axis resolution (Absolute position of standard position)
	General output	6251	General output data compatible with 0 ~ 6250 master axis resolution.
6	Slave axis position	6251	Position data of slave axis compatible with 0 ~ 6250 master axis resolution (Absolute position of standard position)
	General output	6251	General output data compatible with 0 ~ 6250 master axis resolution.
7	Slave axis position	6251	Position data of slave axis compatible with 0 ~ 6250 master axis resolution (Absolute position of standard position)
	General output	6251	General output data compatible with 0 ~ 6250 master axis resolution.
8	Slave axis position	6251	Position data of slave axis compatible with 0 ~ 6250 master axis resolution (Absolute position of standard position)
	General output	6251	General output data compatible with 0 ~ 6250 master axis resolution.

[Chart 14 - 2] Motion pattern data list (Example at the time of settings of 6250 resolution)

Internal motion pattern example at the time of free curve motion is as follows.
And model No. shows internal data area of this model. When [Free curve motion data editing software (Windows95 compatible)], which is sold separately, and cannot be used, for settings of motion pattern data refer the below mentioned data area.

Device No.	Signal name		Contents
P000000	Pattern1	POS	-99999999~99999999(Settings unit): Slave axis position
000001			
000002	0 point	Existence	Data valid / invalid Settings
000003		OUT	0~255:General output Data
~			~
~			~
025000	Pattern1	POS	-99999999~99999999(Settings unit): Slave axis position
025001			
025002	6250 point	Existence	Data valid / invalid settings
025003		OUT	0~255:General output data
025004	Pattern2	POS	-99999999~99999999(Settings unit): Slave axis position
025005			
025006	0Point	Existence	Data valid / invalid settings
025007		OUT	0~255:General output data
~			~
~			~
050004	Pattern2	POS	-99999999~99999999(Settings unit): Slave axis position
050005			
050006	6250Point	Existence	Data valid / invalid settings
050007		OUT	0~255:General output data
050008	Pattern3	POS	-99999999~99999999(Settings unit): Slave axis position
050009			
050010	0Point	Existence	Data valid / invalid settings
050011		OUT	0~255:General output data
~			~
~			~
075008	Pattern3	POS	-99999999~99999999(Settings unit): Slave axis position
075009			
075010	6250Point	Existence	Data valid / invalid settings
075011		OUT	0~255:General output Data
075012	Pattern4	POS	-99999999~99999999(Settings unit): Slave axis position
075013			
075014		Existence	Data valid / invalid settings
075015	0Point	OUT	0~255:General output Data
~			~
~			~
100012	Pattern4	POS	-99999999~99999999(Settings unit): Slave axis position
100013			
100014	6250Point	Existence	Data valid / invalid settings
100015		OUT	0~255:General output Data

[Chart 14 - 3(a)] Motion Pattern Data example (Example at the time of settings of 6250 resolution) 1/2

Note 1) For necessary points as per pattern 1, **mentioned in the above table become resolution +1**.
Note 2) In latest data (Above-mentioned 6250Point Data) General output data is invalid.
Slave position of latest data sets sending volume of 1 cycle.

Device NO.	Signal name		Contents
100016	Pattern5	POS	-99999999~99999999(Settings unit): Slave axis position
100017			
100018	0Point	Existence	Data valid / invalid settings
100019		OUT	0~255:General output Data
~			~
~			~
125016	Pattern5	POS	-99999999~99999999(Settings unit): Slave axis position
125017			
120518	6250Point	Existence	Data valid / invalid settings
125019		OUT	0~255:General output data
125020	Pattern6	POS	-99999999~99999999(Settings unit): Slave axis position
125021			
125022	0Point	Existence	Data valid / invalid settings
125023		OUT	0~255:General output data
~			~
~			~
150020	Pattern6	POS	-99999999~99999999(Settings unit): Slave axis position
150021			
150022	6250Point	Existence	Data valid / invalid Settings
150023		OUT	0~255:General output Data
150024	Pattern7	POS	-99999999~99999999(Settings unit): Slave axis position
150025			
150026	0Point	Existence	Data valid / invalid settings
150027		OUT	0~255:General output data
~			~
~			~
175024	Pattern7	POS	-99999999~99999999(Settings unit): Slave axis position
175025			
175026	6250Point	Existence	Data valid / invalid settings
175027		OUT	0~255:General output Data
175028	Pattern8	POS	-99999999~99999999(Settings unit): Slave axis position
175029			
175030	0Point	Existence	Data valid / invalid settings
175031		OUT	0~255:General output Data
~			~
~			~
200028	Pattern8	POS	-99999999~99999999(Settings unit):Slave axis position
200029			
200030	6250Point	Existence	Data valid / invalid settings
200031		OUT	0~255:General output data

[Chart 14 - 3(b)] Motion Pattern Data Example (Example at the time of settings of 6250 resolution) 2/2

Note 1) For necessary points as per pattern 1, **mentioned in above table become resolution +1**.

Note 2) In latest data (Above-mentioned 6250PointData) General output Data is invalid.

Slave position of latest data sets sending volume of 1 cycle.

Relation of 1 cycle resolution (P802) and usable pattern number (Example up to 1~8) is as follows.

Settings resolution	Available patterns
6250	8
6251~7142	7
7143~8333	6
8334~10000	5
10001~12500	4
12501~16666	3
16667~25000	2
25001~50000	1

[Chart 14 - 4] Relation list of settings resolution and available patterns

Data format of 1pattern is as follows.

Data name	Internal size (Byte)	Meaning
POS	4	Slave axis position - 99999999~99999999 [Settings unit]
Existence	2	bit 15 0: Position data invalid, 1:Valid bit 14 0:General output data invalid,1:Valid ∗Bit other than above mentioned considered as invalid.
OUT	2	bit 7~0 General output data (OUT 8~1) ∗Bit other than above mentioned considered as invalid.

[Chart 14 - 5] Motion pattern data format

Note 1) When in data format, **head of every pattern and slave axis position of latest data is invalid**, **slave axis position is considered as [0]**.

Note 2) General output at latest point is invalid.

14 - 6 Maintenance

Though the controller and motor are maintenance free, to prevent them from un-expected troubles caused by unit circumference change, etc. periodic inspection is recommended.

⚠ Caution
(1) During maintenance, confirmation of the power ON/OFF is the responsibility of the worker in charge. (2) Since high voltage remains in the main circuit condensers after power is turned OFF, start maintenance after passing over of 2 to 3 minutes (after front LED display for [CHARGE] is lit OFF.) (3) Never conduct insulation test of the controller with a megger tester. [The controller may be damaged.] And in case of measuring motor insulation, disconnect cables (U,V,W) between the motor and the controller completely and then measure it.

14-6-1 Daily inspections

Conduct daily inspection for the following items.

[Inspection items]

(1) Is the motor running correctly?
(2) Is the installation environment is normal? (Power source, temperature, humidity, dust, etc.)
(3) Whether cooling system working correctly?
(4) Whether terminals and connectors are loose?
(5) Whether there is abnormal sound or vibration?
(6) Whether there is over-heating or discoloration?
(7) Are the regenerative resistors, etc. normal?

14-6-2 Periodic Inspections

Perform periodic inspection after the specified drive period or, or particular term (6 months or 1 year).

[Inspection items]

(1) Inspect if there is no loose load connection, loose belt, shaft key play, or abnormal motor bearing sound.
(2) Is the Installation environment is normal? (Power source, temperature, humidity, dust, etc.)
(3) Whether cooling system working correctly?
(4) Whether terminals and connectors are not loose?
(5) Whether there is abnormal sound or vibration?
(6) Whether there is over-heating or discoloration?
(7) Inspect if there is no foreign body or dust lump in the controller.
(8) Inspect if cables are free from flaws and fatigue.
(9) Inspect if Regenerative resistors, etc. are normal.
(10) Inspect the control cabinet radiation fans, clean air filters, and inspect or replace relays, etc.

14-6-3 Other Inspections

1) Gear

It is necessary to supply and replace lubricating oil for gears parts of geared motors.
Replace lubricating oil every 3,000 hours.
Since lubricating oil has very important role in functioning, use only the specified lubricating oil. (Never use machine oil, engine oil, etc.)
If designated lubricating oil name is not indicated, consult with the concerned person from our company.
In case of supplying or replacing oil to or from lubricating system, be careful to avoid of oil mixing or cause oil leakage.
Please supply oil to the specified level.
Confirm if bolts for gears are not loose.

2) Oil seal

Replace the oil seal every 5,000 hours.
Since any oil seal is not attached to a standard motor, if required, describe [Oil seal attachment] on your order sheet.

3) Motor Bearing

Motor bearings are of special types only for motors.
Bearing life depends on working conditions but is generally about 20,000 hours.
Motor cooling blower life is same as above.

4) Controller

Replacement of each Controller part is indicated as below.
As used parts of the controller are mainly electrical parts, their life varies respectively.

Part replacement guidance is described in the below tabulation

Part name	Std. replacement years	Replacement method, others
Smoothing condenser and other aluminum electrolytic condenser. (On Print board)	5 years	Replace with new PCB (Decide after inspection.)
Breaker, relays, etc.	-	(Decide after inspection.)
Cooling fan	2~3 yrs	Replace with new one.
Fuse	10 yrs	Replace with new one.

Part replacement guidance Table 1

Working Conditions

- Ambient temperature: Mean temperature throughout the year 30°
- Load ratio : 80% or less
- Availability : 20 hours or less / day

Caution 1: They are based on the "Recommendation of periodic inspection of general inverter" issued by the incorporate party JAPAN Electrical Manufacturer's Association.
However, above replacement period is just guidance and in general,
our products were designed with heavy duty parts.

Replacement guidance of other parts, which have life, is described in below table.

Part Name	Std. Replacement years	Replacement method, others	Condition
LCD as well as SDI device	7 yrs	Replace with new.	Below 25±10deg. C, 65%RH
EEPROM	10 yrs	Replace with new PCB (Decide after inspection.)	Change frequency of parameter, index data, command, etc. 3 times / day
lithium battery *1			

Part replacement guidance Table 2

*1 Refer to "10-7-1 Specifications of absolute encoder" for the details of lithium battery.

Since part life largely varies depending on temperature and humidity condition, avoid using our products in high temperature and high humidity.