VC series

AC Servo Controller

NCR－CA*3

Instruction Manual

Ver.1.2

NIKKI DENSO CO., LTD.

Manual No. TIE-13260B

Preface

Thank you for adopting our dedicated function type AC servo controller <NCR-CA*3 series>.

[Check items]

1. Receiving check of our products

Please check the following points when you receive our products.

(1) If the products are exactly the ones you ordered.（Type, Rated output, Accessories, etc.）
(2) If baggage are not damaged during transporting.（Package damage, Abnormal out look）
(3) If accessories are packed together with the main products.

* If packages as carton boxes are broken, please do not unpack them and inform our sales man.

And if above points are unclear or damage, etc. is found, please immediately contact our sales man.

2. Precautions before installations（in handling）

* When transporting a controller and a motor, please handle with care so as not to damage them.

* Cautions

Be careful not only to pile controllers but also putting anything on the controller cover.
Be careful not to add shock to a motor shaft which may damage an encoder on the motor shaft.
Do not move a motor with having a motor cable which may cut the cable.

3. Cautions of storage

If our products are not used immediately after receiving, store them under the following conditions
in order to prevent deterioration of insulation and rust formation. However, unpack the packages, soon after receiving and check any damage and other non-conformances incurred during transportation.

Item		Description
Ambient Condition	Temp.	-20℃～+60℃
	Humidity	85% or less（non-condensing）
	Storage Location	Store in a clean place free from dust and dirt. Do not store in harmful atmosphere such as corrosive gas, grinding powder, metal powder, oil, etc..
Vibration		Store in a place free from vibration.
Others		If storage period is planned for long time, please make rust prevention to screws of terminal blocks and then inspect them periodically. Rust prevention effective period is within 3 months after the shipment from our factory under the above described environmental conditions. If storage period is planned for long time, please make rust prevention to a motor shaft and flange face and then inspect them periodically.

Storage conditions of a controller and a motor

4. Precaution of transportation

If you transport our product after receiving, please satisfy following conditions.

Item		Description
Ambient Condition	Temp.	-20℃～+60℃
	Humidity	85% or less（non-condensing）
	Storage Location	Do not store in harmful atmosphere such as corrosive gas, grinding powder, metal powder, oil, etc..
Vibration		0.5G or less（Controller, motor）

Transporting conditions of a controller and a motor

⚠ Caution

- Depending on humidity condition, specially, life of the front LCD module and an optional unit SDI device varies, largely.
  We recommend transportation in the humidity 65%RH or less.
  If the humidity is supposed more than above value, please consult our sales man.

[Notice of this manual]

This manual explains installation, wiring, operation, maintenance, trouble diagnosis, trouble shooting, etc. of AC servo controller NCR-CA*3 types and AC servomotors.
In order to use these units properly, please deeply understand the contents of this manual.
At the time of installation, wiring, operation, maintenance, etc, please comply with the conditions and procedures of this manual.

If special version unit is applied, please use both of this manual and materials of the special version specification. If same name description and items exist in both materials, description in the special version materials is prior to it in this manual.

- This instruction manual supports
  Software version 2.21or higher
  Hardware version 0.04or higher
  of AC sub-controller NCR-CA*3 type.
- In case of using a τ linear motor, replace the description (torque) with (thrust).
- If your machine can not conduct automatic magnetic pole sensing (motor fluctuating motion) due to work interaction, etc. by the τ Linear/ τ Disc motor when power is turned ON, please use a magnetic pole sensor.

[Warranty period]

Warranty period of our products is 1 year after shipment from our factory.
However, please note that any failure or abnormality resulting from the following causes is not covered by the warranty.

1) Modification by parties other than NIKKI DENSO.
2) None standard operation different from the description in our manuals.
3) Natural disaster or act of gods.
4) Connection with an other maker's unit which is not approved by us.

Regardless to the warranty period, please inform our sales man whenever you find any failure or abnormality.

* **NIKKI DENSO retains the right to revise this publication on matter how it is altered. Although the information from NIKKI DENSO is reliable, NIKKI DENSO will not assume responsibility whatever results may arise from the use of this information unless specially guaranteed by NIKKI DENDO.**

Cautions for Safety

Before conducting installation, wiring, running, maintenance, error diagnosis, trouble shooting, and etc., please deeply understand this manual and associated manuals/ materials as well as the knowledge of all the applied equipment for safety and then, use this unit, properly.

In this manual cautions for safety are ranked as “Danger” and”Caution”. And cautions for handling are divided into “Prohibition” , ”Compulsion” witch are defined (action not to be done) and (action to be done).

Danger : If mis-handing is made, dangerous situation as death or serious injury of a worker could occur.

Caution : If mis-handing is made, dangerous situation as medium or light injury of a worker and damage of goods could occur.

However, since a ⚠ Caution marked item could also cause serious results depending on the actual condition; please comply with the important instruction.

Prohibition : Action not to be done
If this caution is ignored, the unit does not perform, properly.

Compulsion : Action to be done
If this caution is ignored, the unit does not perform, properly.

[Cautions when using unit]

Danger

☆ Since electric shock and injury may occur, please be sure to comply with the following suggestions.

1) Never touch inside of this unit and terminal blocks.
   "Electric shock may occur"
2) Be sure to make grounding of an earth terminal or earth cable of this unit and a motor. Use larger earth cables than suggested size in this manual for JIS Class 3 or better grounding.
   "Electric shock may occur"
3) Transportation, wiring, maintenance, and inspection shall be conducted after confirming no residual voltage among DC main circuits (internal DC bus of this unit) by a tester or 3 minutes or longer after power is off.
   When a separated control power type is used, please be sure to shut down the control power after cutting off main power.
   "Electric shock may occur"
4) Do not damage, force cables excessively, put any heavy thing on cables and nip cables.
   "Electric shock may occur"
5) Never touch the rotating section of a running motor.
   "Injury may occur"

Caution

1) Use a specified motor and this unit.
   "Fire or failure may occur"
2) Never use in the atmosphere such as water splash, corrosive or low plashing point gas nor place close to flammable goods.
   "Fire or failure may occur"
3) Since temperature of a motor, this unit and peripherals raises quite high, do not touch them.
   "Burn may occur"
4) In supplying power or for a while after shutting power off, since a radiator of this unit, a motor, regenerative resistor, etc. could be very hot, do not touch them.
   "Burn may occur"
   When the motor is to be driven by the device of AC400V specification, the surge voltage more than the withstand voltage of the motor is required and the insulation of motor is deteriorated depending on the length of wiring between the device and motor, wiring status, wire diameter, which may lead to dielectric breakdown.
   Since measures are necessary to be followed, please contact our sales in-charge.

Prohibition

1) Never conduct voltage withstanding test and megger test of this unit.
   "Failure may occur"

[Receiving and checking of packages]

⚠ Caution

1) When you receive ordered units, please check the contents. If wrong thing is found or quantity is wrong, please do not use them and inform the status to our sales man.
   "Electric shock, injury, damage, fire or failure may occur"
2) If packages of our products are broken, do not unpack them and inform the fact to our sales man.
   "Electric shock, injury, damage, fire or failure may occur"

[Storage]

⃠ Prohibition

1) Do not store units in a place of raining, water dripping, and harmful gas/ liquid.
   "Failure may occur"

❗ Compulsion

1) Store units in a place of no sun-shine but controlled temperature/ humidity within the specified range.
   "Electric shock, injury, damage, fire or failure may occur"
2) If storage term has passed more than 3 years, be sure to consult our sales man.
   "Electric shock, injury, damage, fire or failure may occur"

[Transportation]

⚠ Caution

1) Do not hold a cable and a motor shaft during transporting units.
   "Injury or failure may occur"

❗ Compulsion

1) Complying with the suggestion, do not transport excessive amount break whole packages.
   "Electric shock, injury, damage, fire or failure may occur"

[Installation]

⚠ Caution

1) Do not climb or put any heavy thing on this unit.
   "Injury or failure may occur"
2) Prevent foreign things from entering in holes and choking intake/ outlet air holes.
   "Fire may occur"
3) Be sure to install this unit to the specified direction.
   "Fire or failure may occur"
4) Keep the specified distance between this unit and inside face of a control console or other equipment.
   "Fire may occur"
5) Never apply heavy shock to this unit.
   "This unit may be damaged"
6) Conduct proper attachment suitable for output or weight of this unit.
   "This unit may be damaged"
7) Attach this unit to a non-flammable thing as metal.
   "Fire may occur"

[Wiring]

⚠ Caution

1) Be sure to conduct correct wiring.
   “Running away, burning of a motor, injury or fire may occur”
2) To prevent this unit from noise influence, use specified length and treated (shielded, twisted, etc.) cables in this manual. And use separate control I/O cables of this unit from other power supply cables, and power line.
   “Running away of a motor, injury or machine damage may occur”
3) To avoid electric shock and noise influence, be sure to make proper grounding (earth).
   “Running away of a motor, injury or machine damage may occur”

[Operation and Run]

⚠ Caution

1) Attach emergency stop circuit with internal thermostat, etc. to a motor for the motor protection.
   When a motor without thermostat type is used, add separate protection to the motor.
   “Injury or fire may occur”
2) Confirm that power source is correct.
   “Injury , fire or machine damage may occur”
3) Before conduct test run, separate a motor from its machine system and fix it to a adequate place and confirm the motion, then connect the motor to the machine.
   “Injury or machine damage may occur”
4) Since excess adjustment may cause this unit unstable, avoid this situation.
   “Injury or machine damage may occur”
5) When an alarm occurs, be sure to eliminate the cause, reset the alarm and resume this unit.
   “Injury or machine damage may occur”
6) When power recovers from black out status, since sudden re-start may occur, do not approach the machine.
   “Injury or fire may occur”

⃠ Prohibition

1) Do not supply power in motor turning or vibrating status.
   “Running away of a motor, injury or machine damage may occur”
2) Since the brake on a motor is only for holding, do not use it as an actual braking device.
   “Injury or machine damage may occur”

❗ Compulsion

1) Provide external shut down circuit in order to stop running and shut the power off, immediately.
   “Injury or machine damage may occur”

[Maintenance and inspection]

Caution

1) Capacity of electrolytic capacitors in the main circuit of this unit will deteriorate.
   To prevent secondary damage caused by the capacitors, we recommend to replace them about every
   5 years. Consult our sales man about the replacement.
   “Failure may occur”
2) Cooling efficiency of an internal cooling fan motor of this unit will deteriorate as time going.
   To prevent secondary damage caused by the capacitors, we recommend to replace them about every
   2 to 3 years. Consult our sales man about the replacement.
   “Failure may occur”

Prohibition

1) Overhaul/ repair shall be conducted only by us or suggested shop by us.
   “Failure may occur”

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Chapter 1 Outline

1-1 Features

NCR-CA*3 type (hereinafter, this unit or controller is used.) is a controller for an AC servomotor, τ linear motor, and τ Disk motor control, which realizes the running positioning control by a servomotor (slave axis) synchronizing with the external or internal master-axis pulses.

The running positioning control is a control which allows the processing on a running (or under-conveying) objective item not stopping it, by chasing (synchronizing) it with a tool.
In other words, by using this machine, it is possible to realize any processing machine on which the objective item runs constantly as in the following examples.

1) Standard-size or fixed position cutting (or drilling) in the extrusion molding processing line for such as aluminum and copper pipes.
2) Standard-size or fixed position cutting (or drilling) for heavy articles that is difficult to stop in the line.
3) Standard-size or fixed position cutting (or drilling) for timbers and cardboards that are running in the line.

NCR-CA*3 type features

1) By combining 1 axis positioning unit with AC servo driver, less wiring system and compact size is realized.
2) Digital control achieves less drift/ fine adjustment, strengthens man-machine interface, etc. For better reliability and easier operation.
3) The custom made LCD module (option for 1.5kW or smaller unit) enhances each monitor, Alarm history record, Self-diagnostic functions, etc. And a reliability and maintenance method is improved.
4) Many custom made LSI and less wiring structure improved reliability and realized compact size of this unit.
5) IPM (IGBT) in the power switching section, improved servo performance and lowered noise.
6) Program run by internal stored data 280 points can be conducted.
7) External trigger positioning can be conducted. *1
8) Position data, speed data, etc. can be set by Index data.
9) Control such as Linear/ S shape curve accel./ decel., Feed forward, Torque command filter, Gain change at stop status or low speed, Noise compensation control, etc. can be conducted by advanced software servo suitable for individual machine rigidity.
10) By setting parameters, one unit can be available for several kinds of servomotors.
11) Through serial communication, peripherals as a touch panel, a master controller, servo display, etc. can be interfaced.
12) Zero return is not required by using an absolute encoder.
13) Automatic tuning function
14) In the rotation run mechanism, the cosine compensation control is possible synchronizing at a fixed distance.
15) Run of max. 8 axes (When Servo control communication or Pulse train communication is used.) can be synchronized to a command.
16) Any of τ linear/ τ Disc/ Rotating motors can be conducted by the identical operation.
17) SQB (Sequence control unit) can not be connected. *2

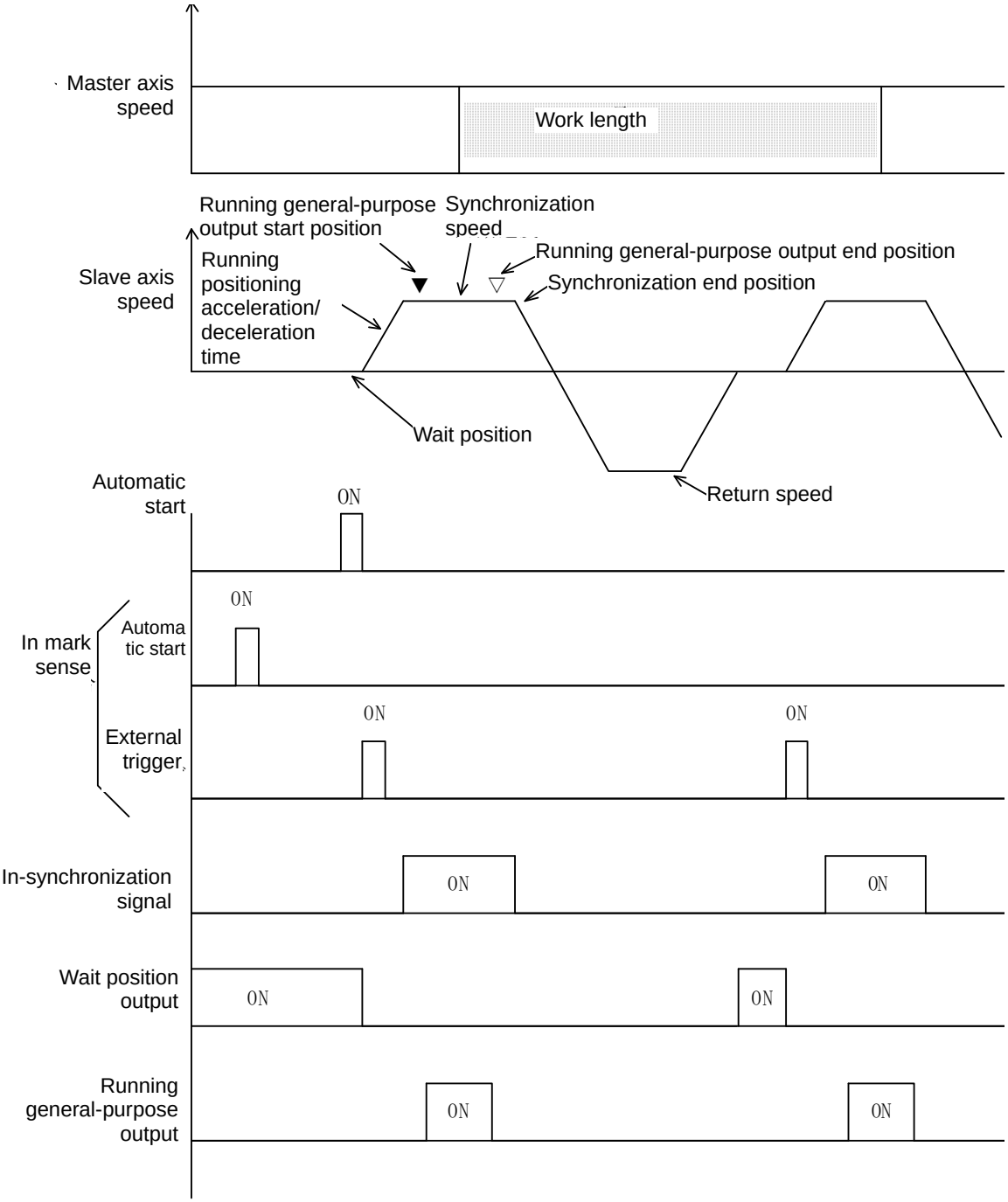
*1: The external trigger signal is used only for the [Mark sense start] signal in the running positioning operation.
*2: This manual describes SQB (Sequence control unit); however, the SQB can not be connected. Thus, all related portions are invalid or not indicated.

1-2 Outline of running positioning operation

The running positioning operation synchronizes with the command pulse (command pulse is internally generated with the simulation at the startup) from the master axis and conducts the running positioning operation depending on the optional work length.

(1) Returning system running positioning

The returning system running positioning operation corresponds to a flying shear.

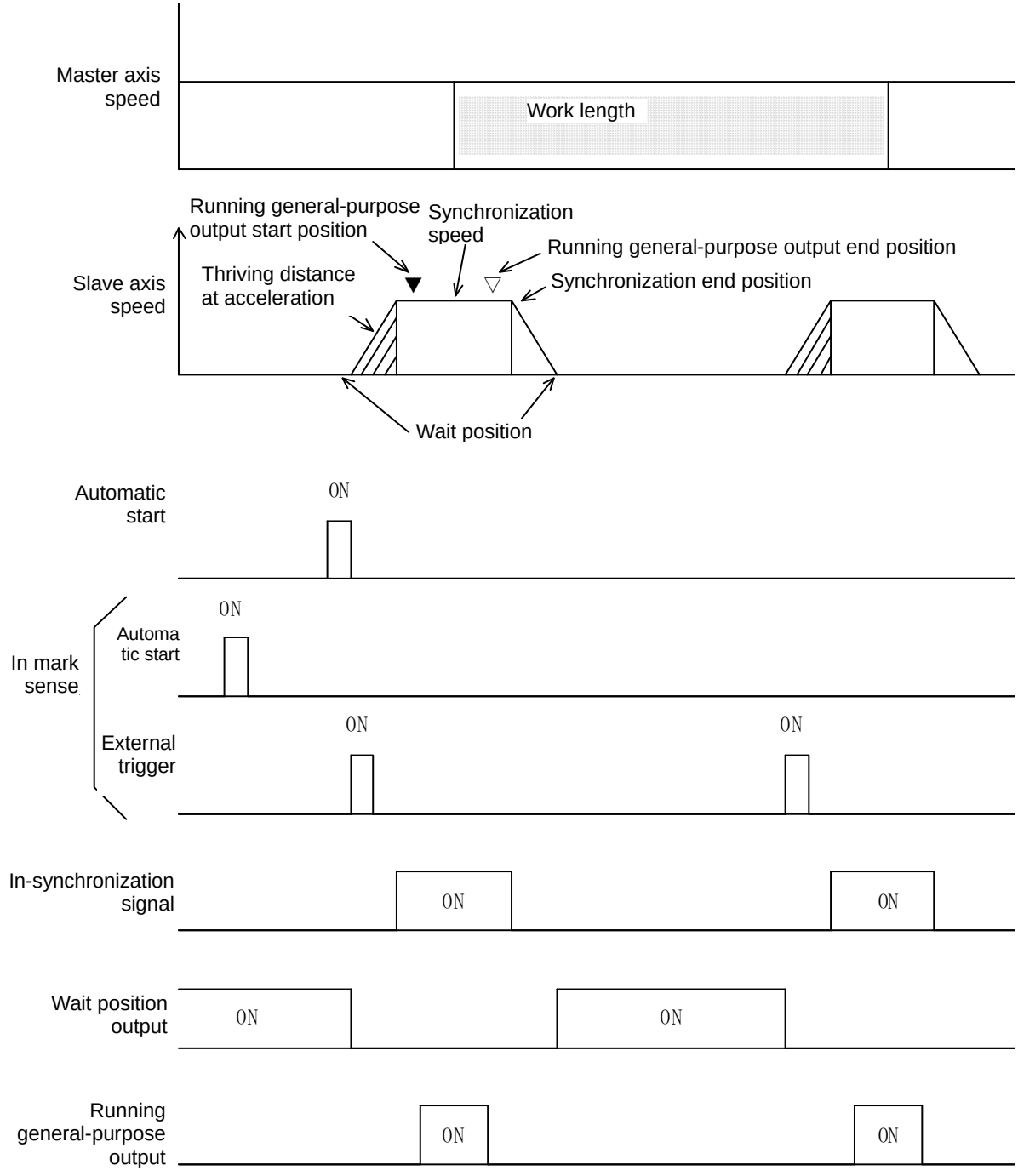


[Fig. 1-1] Returning system running positioning

(2) Rotating system running positioning

The rotating system running positioning operation corresponds to a rotary shear or a rotating flying cutter.

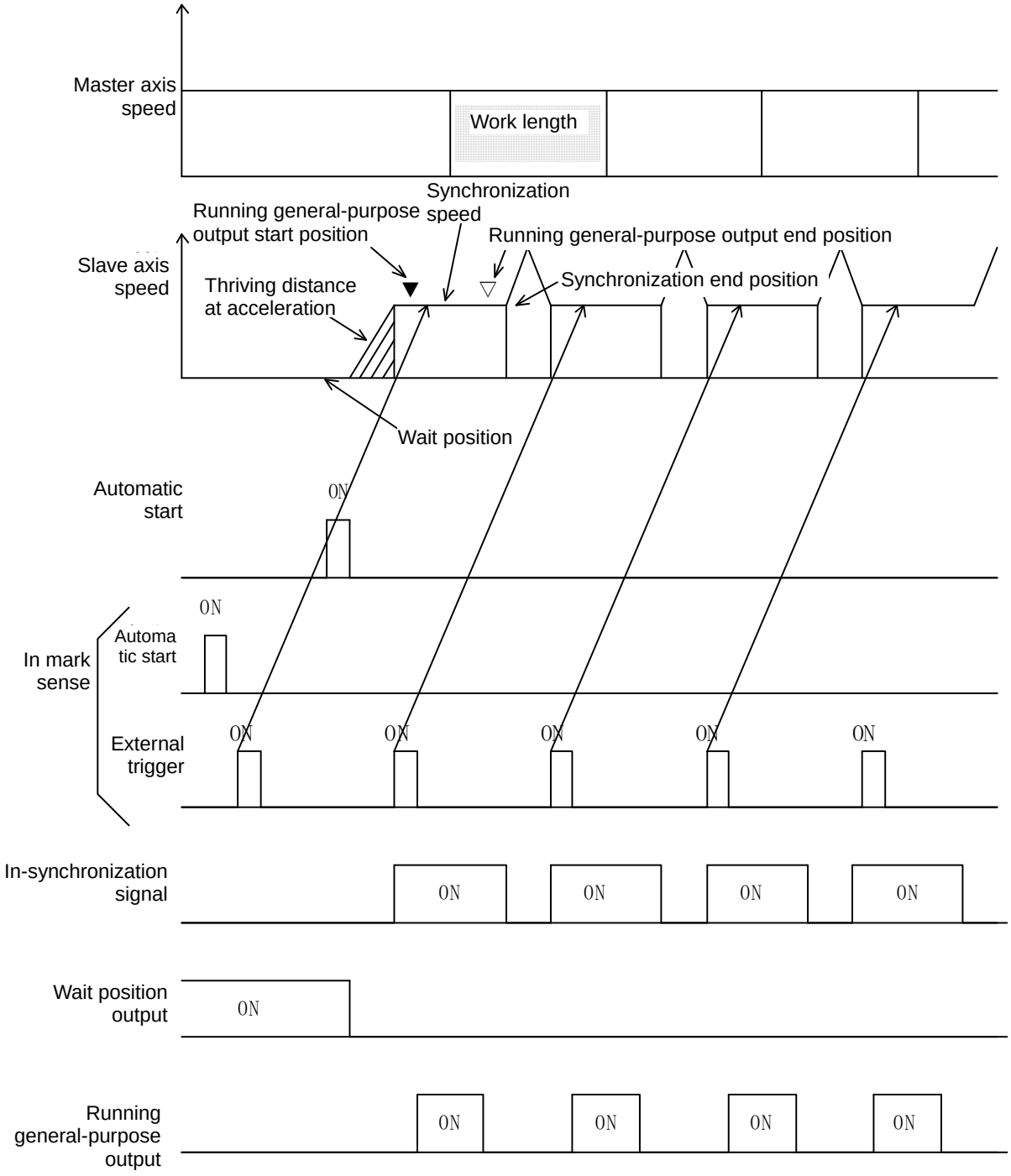
1) In the long-size operation



* The synchronization speed refers to the synchronization ratio speed by the setting of parameter synchronization angle.

[Fig. 1-2] Rotating system running positioning (Long-size)

2) In the short-size operation

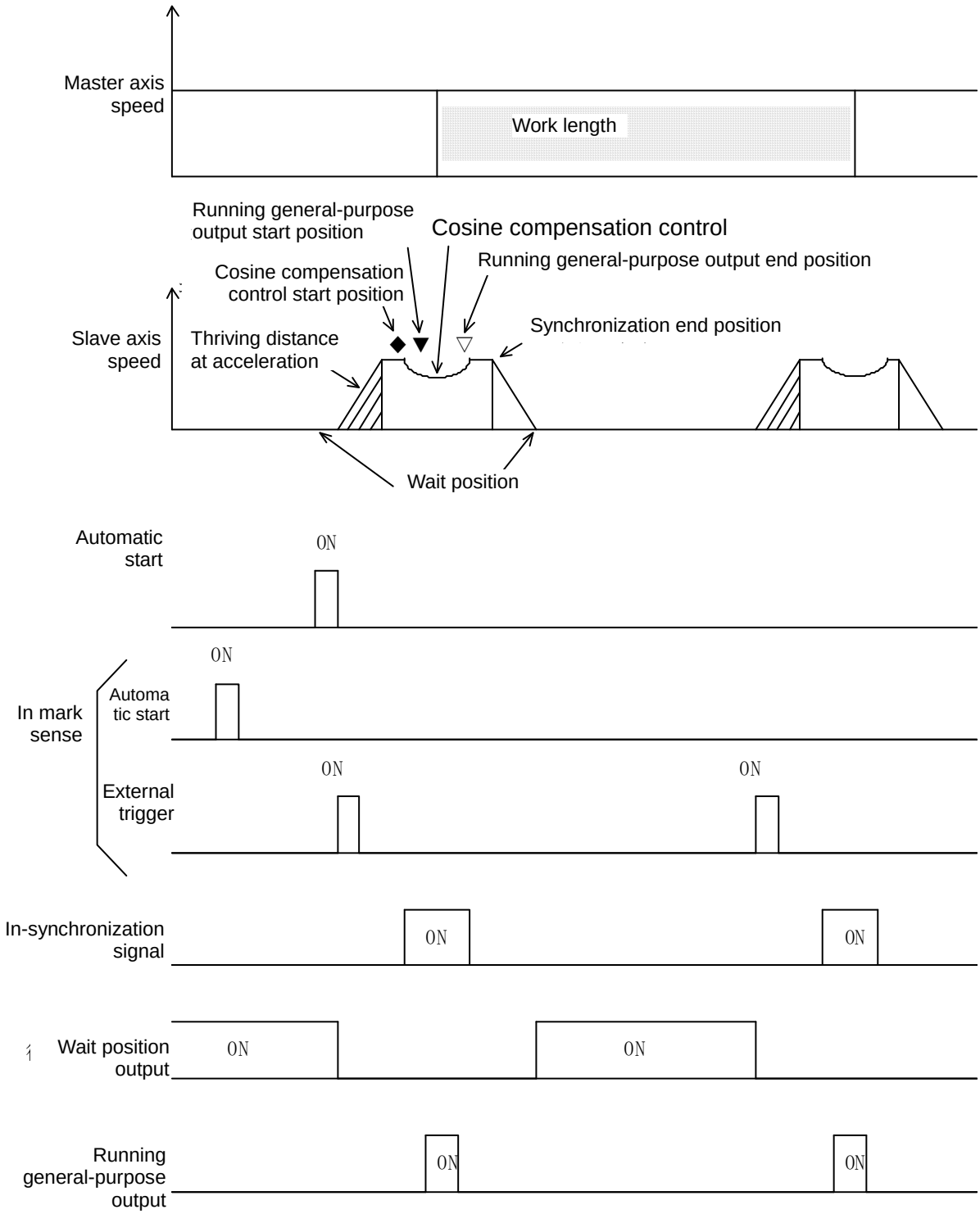


* The synchronization speed refers to the synchronization ratio speed by the setting of parameter synchronization angle.

[Fig. 1-3] Rotating system running positioning (Short-size)

(3) In the long-size cosine compensation operation

In the cosine compensation control operation, running operation in the fixed portion is executed with the rotating running mechanism.

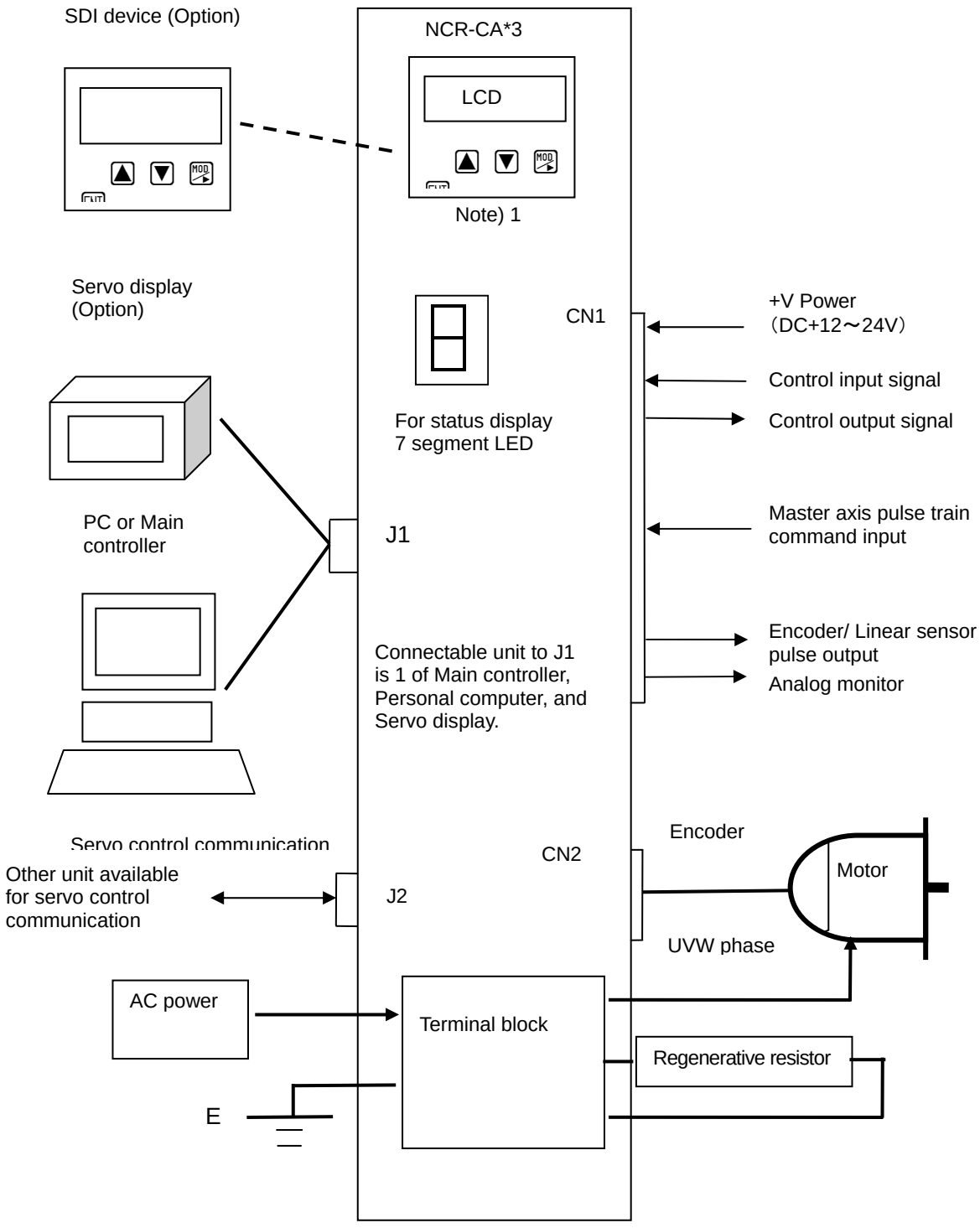


* The synchronization speed refers to the synchronization ratio speed by the setting of parameter synchronization angle.

[Fig. 1-4] Rotating system running positioning (Long-size cosine compensation)

1-3 System Configurations

Peripheral system configuration of NCR-CA*3 type is as figure 1-5.



Note1) LCD is a standard device of an unit which capacity is 1.5kW or larger as standard.

[Figure 1-5] NCR-CA*3 Type System Configuration

Description of each section

(1) NCR-CA*3 body
This unit controls AC servomotors, τ Linear motors, and τ Disc motors.
By a parameter, 1 unit can be used for several kinds of AC servomotors and encoders.

(2) LCD module
This sets display of VC body and I/O signal status, and parameters by the cursor key.
This module is installed on a 1.5kW or larger unit as standard.

(3) SDI device (option)
This sets display of VC body and I/O signal status, and parameters of a 1.5kW or smaller unit.

(4) Servo display (option) or main controller (personal computer, etc.)
By a software developed by customer side or us,
- Data display of status data (speed, deviation, etc.) can be made.
- Control signal of VC body can be controlled.
- Setting and backing up of parameters, etc. can be conducted.

Since some computers on the market can not be interfaced, please consult us when you plan the adoption.

(5) Motor
As standard use, our AC servomotor will be connected.

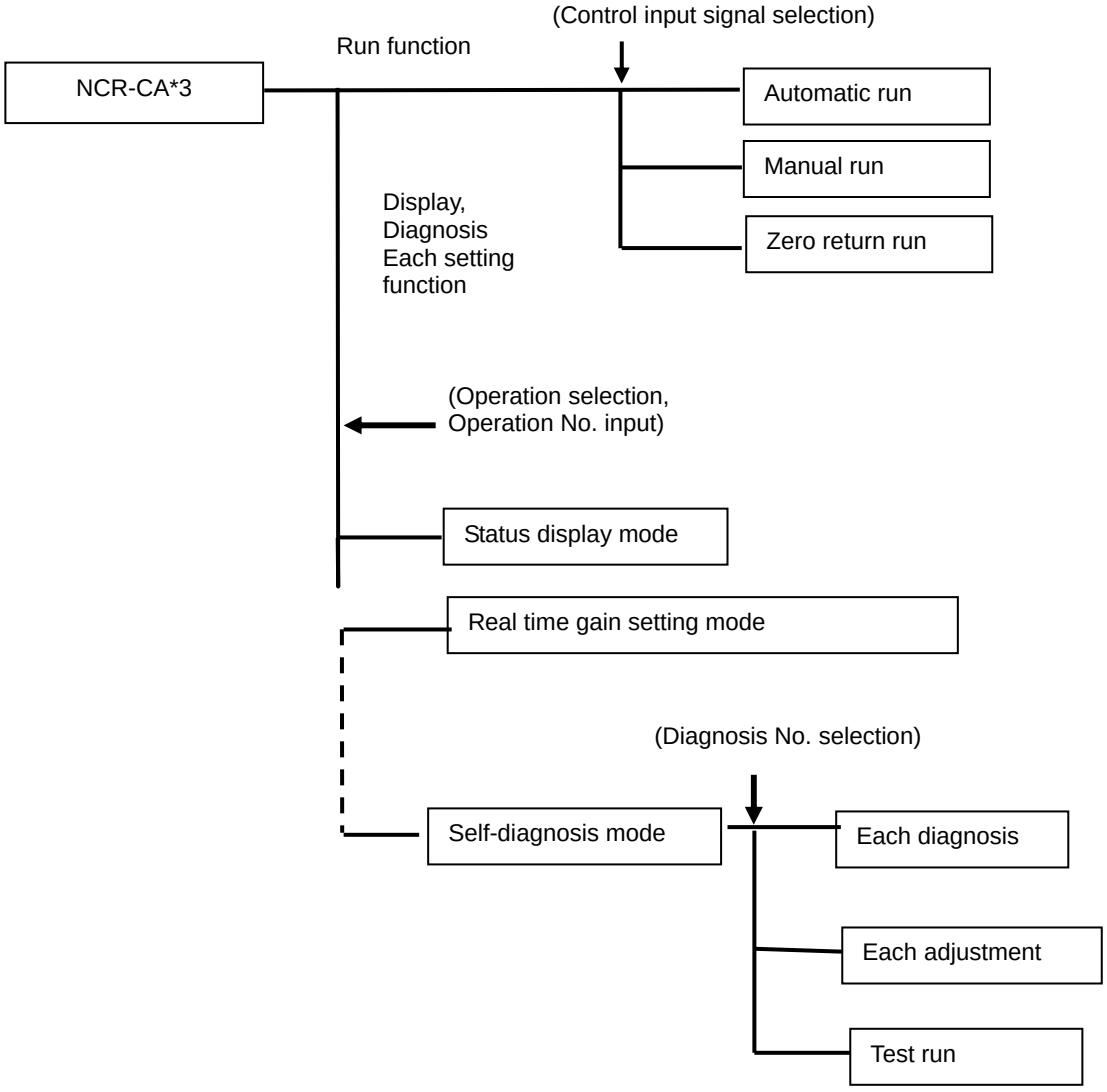
(6) Servo control Communication
Synchronizing control up to 4 axes can be achieved by one unit which has Servo control communication.
(When Pulse train communication is used max. 8 axes can be controlled.)

Though setting of parameters, etc. is normally conducted by the front panel LCD module or an optional SDI device (data creating unit), it can be also conducted by a main controller or a personal computer through Serial communication.

1-4 Mode Configurations

(1) Run mode

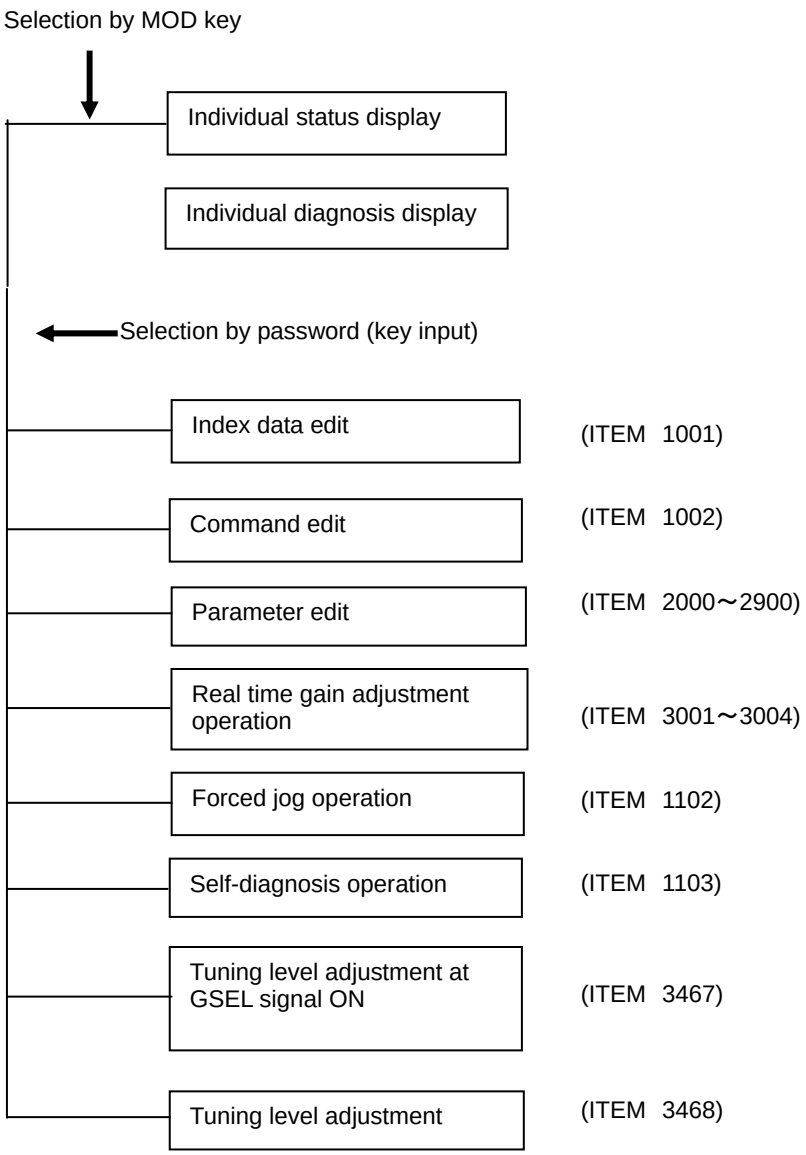
Each run mode is selected by a parameter and a control input signal as follows.
Each parameter can be set by the front panel LCD, an optional SDI device, or a main controller through Serial communication.



［Figure 1-6］Mode Configuration

(2) Operation mode

Operation block diagram of LCD section, SDI device (option)



Chapter 2 Specification

2-1 Type

Types of NCR-CA*3 series are described as follows.

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

Sample: NCR － C A B 3 A1 C － 201 B

No.	Item	Display	Contents
		NCR	Nikki AC servo controller series
(1)	Product type	D	Driver
		C	Controller
(2)	Type name	A	VC series
(3)	Version	B	High performance version
		C	Multi-function version
		D	High performance version (with dynamic brake)*1
		E	Multi-function version (with dynamic brake)*1
(4)	Function	0	Driver
		1	Controller
		3	Flying cut-off control
		6	Free curve control
(5)	Input power specification	A1	AC100V system
		A2	AC200V system
		A3	AC400V system
(6)	Design sequence	C,D,・・・	Starts from C
(7)	Output capacity	Sample) 201	20 1 = 20 × 10^1 = 200W | └ n of 10^n └── Effective No.
(8)	Motor kind	B	τ linear NLA-A/B/M/N type / τ DISC motor
		C	τ linear NLA-S type motor
		D	τ linear NVA type motor
		E	NA70 / NA80 / NA800 type motor
		F	NA20 / NA30 / NA100 type motor
(9)	Special specification	S1	None: Standard・S1: Special specification

*1 A 1.5KW or larger unit requires a separate-type dynamic brake unit.

[Tab.2-1] Type description

2-2 General Specification

Item		Contents
Outline		Refer to Chapter 3 (Outline).
Ambient condition	Temperature	In control 0 ～ 55℃(unit circumference)/ in storage -20～60℃
	Humidity	85% or less, non-condensing
	Altitude	1000m or lower
	Location	Do not install it in harmful atmosphere such as corrosive gas, grinding oil, metal powder, oil, etc..
Cooling method		Natural convection cooling (Less than 801), Forced air cooling (More than 152)
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）

[Tab. 2-2] General Specification

2-3 Function Specification

Item	Contents and specification	
No. of axes	1 axis	
Max.speed	16Mpps(4 times of encoder pulse frequency)	
Control factor	Position (Position control data/ Pulse train)	
Control method	Position control ┬ Automatic run (Positioning) └ Pulse train run	
Command input style	Automatic run	1) Internal stored data 280 points (Address 0～255 set by control signal) 2) Serial communication
	Pulse train command	1) 90° difference phase pulse 2) Directional pulse 3) Direction signal + Feed pulse 《Either Line driver or Open collector output can be used. However, in the point of noise resistance, Line driver method is recommended.》 《Max. input frequency of standard unit is 1Mpps by photo coupler input, and 4Mpps in case of selecting an optional high speed pulse train command receipt unit.》 《When a high speed pulse train command receipt unit is used, Line driver input is chosen. And since GND becomes common, be sure to eliminate noise.》 4) Servo control communication
Major function	Zero return run, Manual (jog) run, Serial communication run, Program run (Positioning, Simple continuous positioning , External trigger positioning ,Timer, Non-conditional/ Conditional jump, Sub-routine, Spinner control, Running positioning control), Self-diagnosis, Torque limit, Backlash compensation, Feed forward ratio set, Electric gear ratio set, Electric thermal	
Acceleration/ deceleration pattern	Linear Acceleration/deceleration., S shape Acceleration./ deceleration.	
Input signal	[Basic input signals: 8 points (initial value)] Cut-off control input (D11), Forced synchronization end (D12), Forced start (D14), Master axis selection (D18), Cycle end (D21), Mark inhibit (D22), Cutting length measurement (D24), Internal master axis speed selection (MSSP) <Next signals are allocated by Remote control or input signal allocation.> Servo ON (SON(*)), Emergency stop (EMG*), Reset (RST), Proportional control (PC), Mode selection (MD1, MD2), Automatic start (PST), Address specification (PS1 - PS8), Forward jog (FJOG), Reverse jog (RJOG), Hold(HLD), Speed override(OR1～4), Deviation clear(CLR), Command pulse input inhibit(CIH(*)), External trigger(TRG), Zero point deceleration (ZLS),Forward over travel(FOT*), Reverse over travel(ROT*), M complete(MFIN), Block stop(BSTP), Program cancel(PCAN), Speed gain select.(GSEL), Compulsory brake ON(BRON), Torque limit(TL), External auto. start inhibit(EPIH), Jog speed change(JOSP)	
Output signal	(Basic output signals, 4 points (initial value)) Servo ready(RDY), Alarm(ALM(*)), N), 1-cycle end (ROUT6), In-synchronization output (ROUT7) <Next signals are allocated by Remote control or output signal allocation.> 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 mode (PMOD),In Pulse train run(PMOD), M strobe(MSTB), Software limit switch(SLSA, SLSB), General output(OUT1～8), M output(M01～M80) Master axis speed zero (MSZ), Running general-purpose output (ROUT1-4), Wait position output (ROUT8), In automatic operation (PRUN), Automatic operation ready 1 (PRDY1), Automatic operation ready 2 (PRDY2), Zero return complete (HCMP), Cutting point end edge (MLS)	
Operation, display function	Various data input and status display can be made by a front panel LCD module or an optional SDI device.	

[Tab. 2-3(a)] Standard Specification 1/2

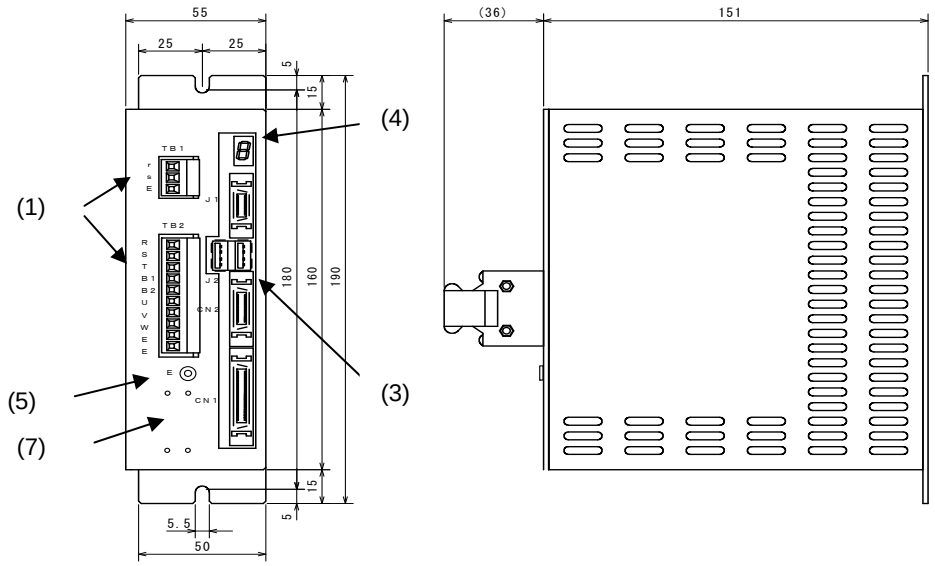
Item	Contents and specification
Monitor function	1) Displays the status of control signal either at the LCD module of the device front panel or at the signal display block of an optional SDI device. 2) Displays various operation status, setting status (data), and alarm detection history either at the LCD module of the device front panel or at the signal display block of the optional SDI device. 3) Analog monitor: 2 points (Possible to monitor two points by the parameter selection among the various operation status.)
Data store function	Stores next date in a none-voluntary memory. Parameters, Command, Index data(partial), and Alarm history (last history: max.5) (Rewrite of the none-voluntary memory: max. 10000 times)
Protective function	IPM fault, Over voltage, Under voltage, Over speed, Over load (electric thermal), Regenerative resistor over load, Deviation over flow, Communication error, Data error, CPU fault, Encoder fault, Absolute encoder fault, etc.
Communication function	Transmission/ Receipt of various data by. serial communication(RS-422A)
Option	SDI device, Edition software, Device net interface, Cables, Regenerative resistor, etc.

[Tab. 2-3(b)] Standard Specification 2/2

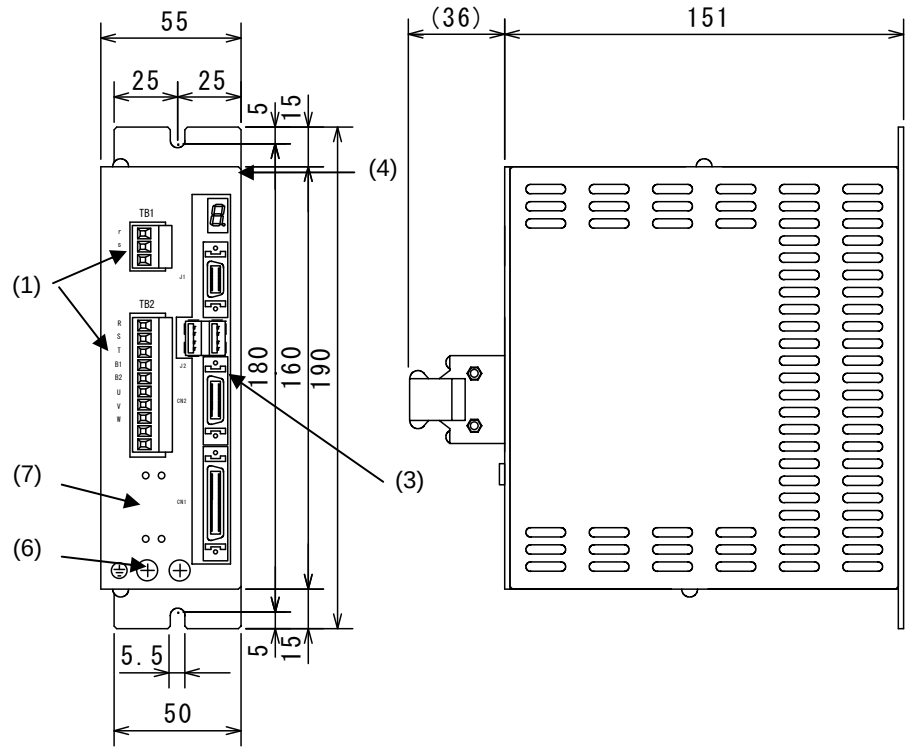
Chapter 3 Outline

3-1 Outline Drawing

3-1-1 NCR-*A*-051/101/201[Note1)]



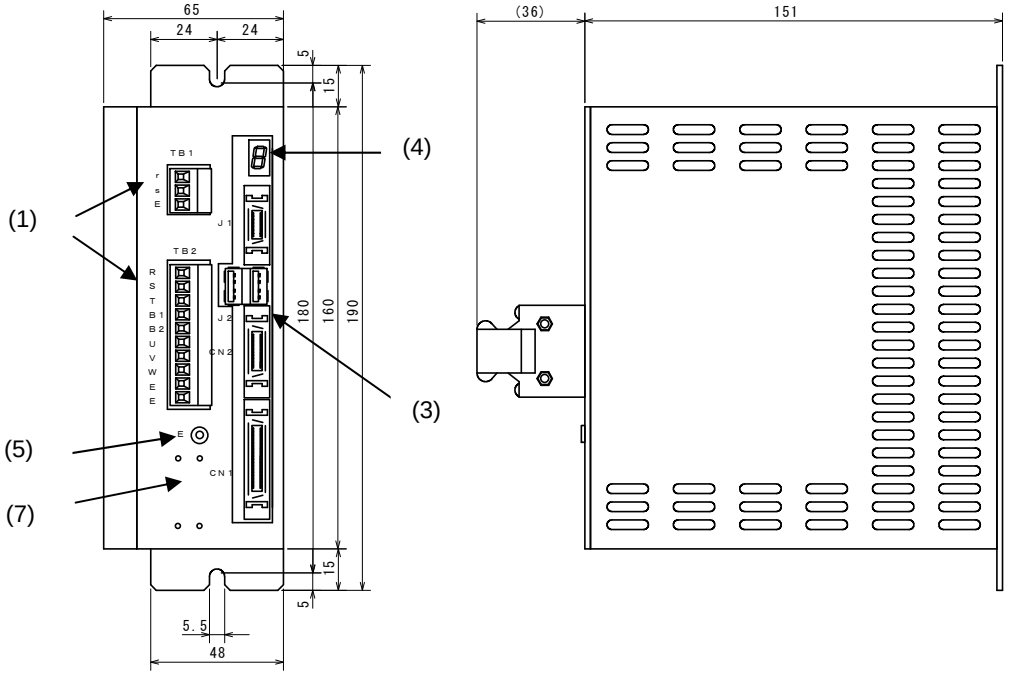
[Design sequence B/C (NCR-CA*3*B-XXX /NCR-CA*3*C-XXX) or before]



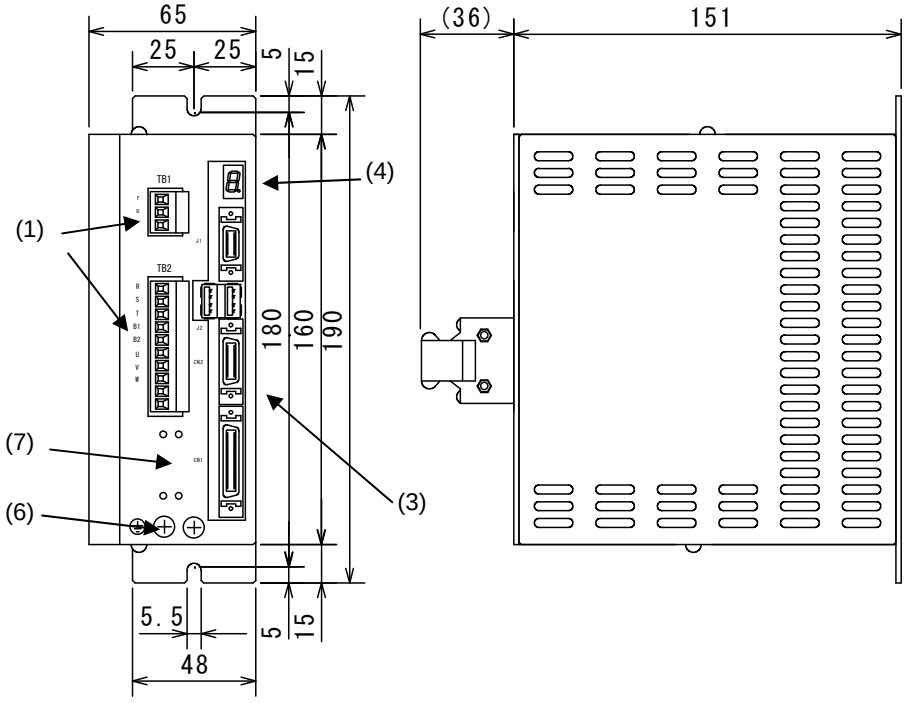
[Design sequence D (NCR-CA*3*D-XXX) or higher]

[Note1)] marked product is a 200V input type.

3-1-2 NCR-*A*-201[Note1)]/401



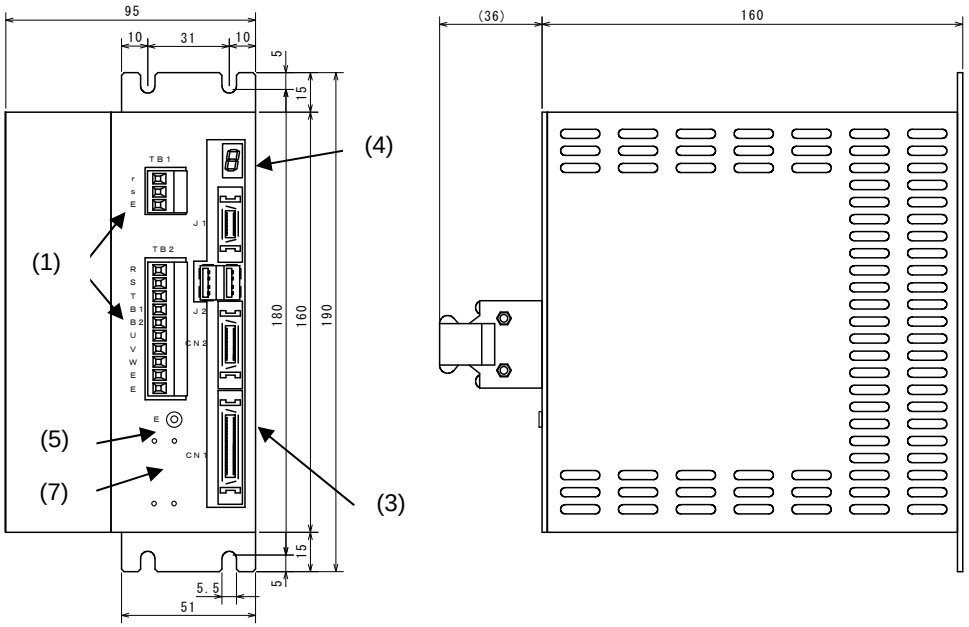
[Design sequence B/C (NCR-CA*3*B-XXX /NCR-CA*3*C-XXX) or before]



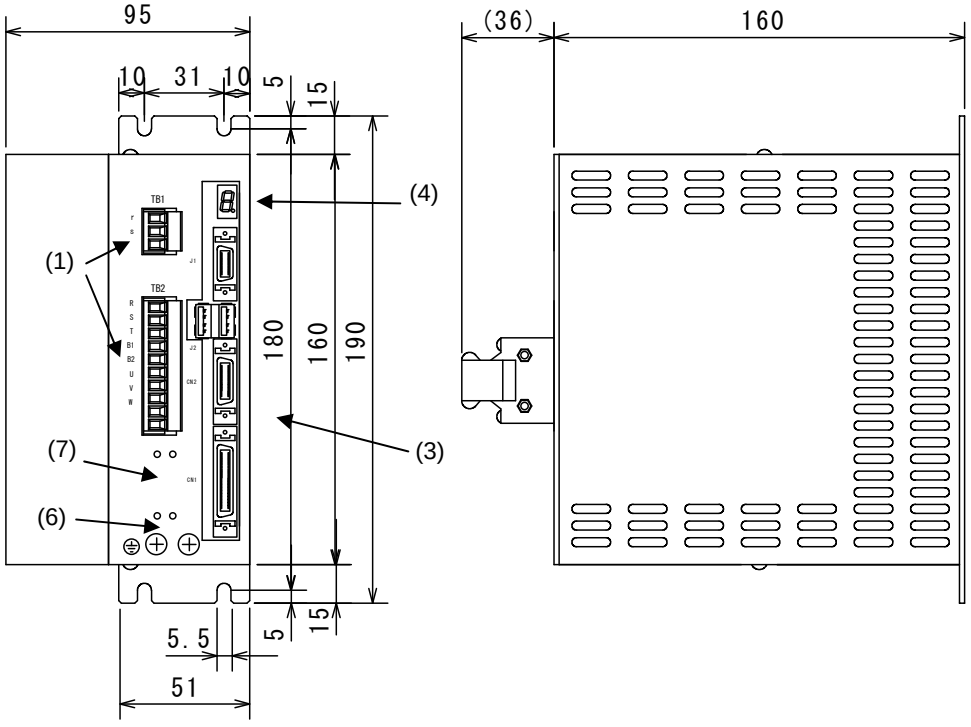
[Design sequence D (NCR-CA*3*D-XXX) or higher]

[Note1)] marked product is a 200V input type.

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

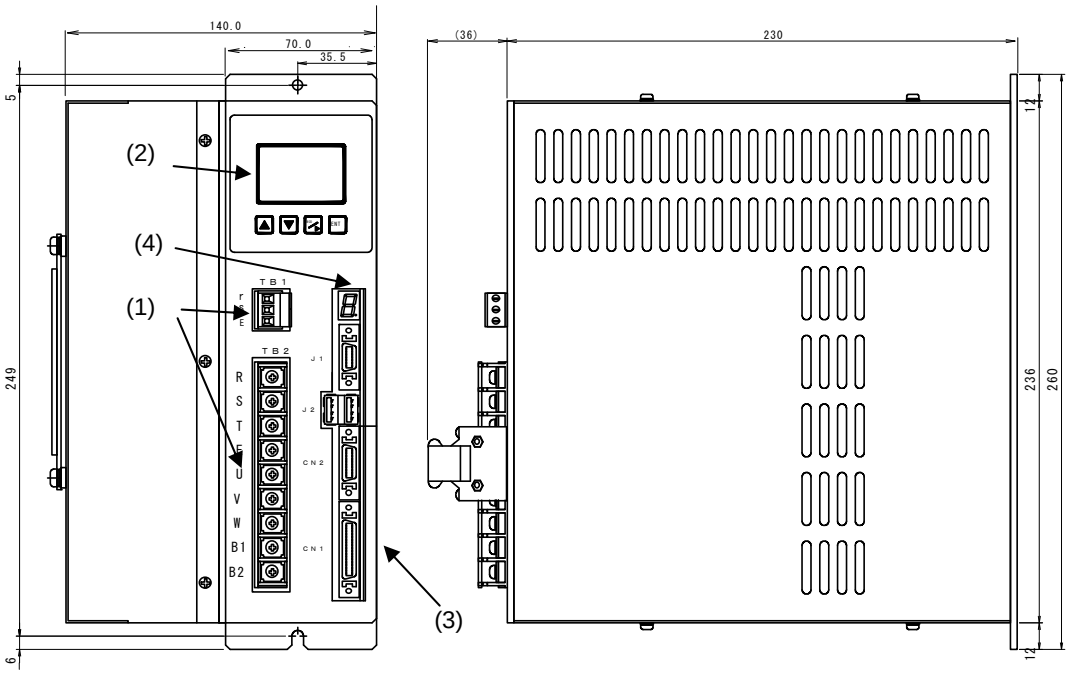


[Design sequence B/C (NCR-CA*3*B-XXX /NCR-CA*3*C-XXX) or before]

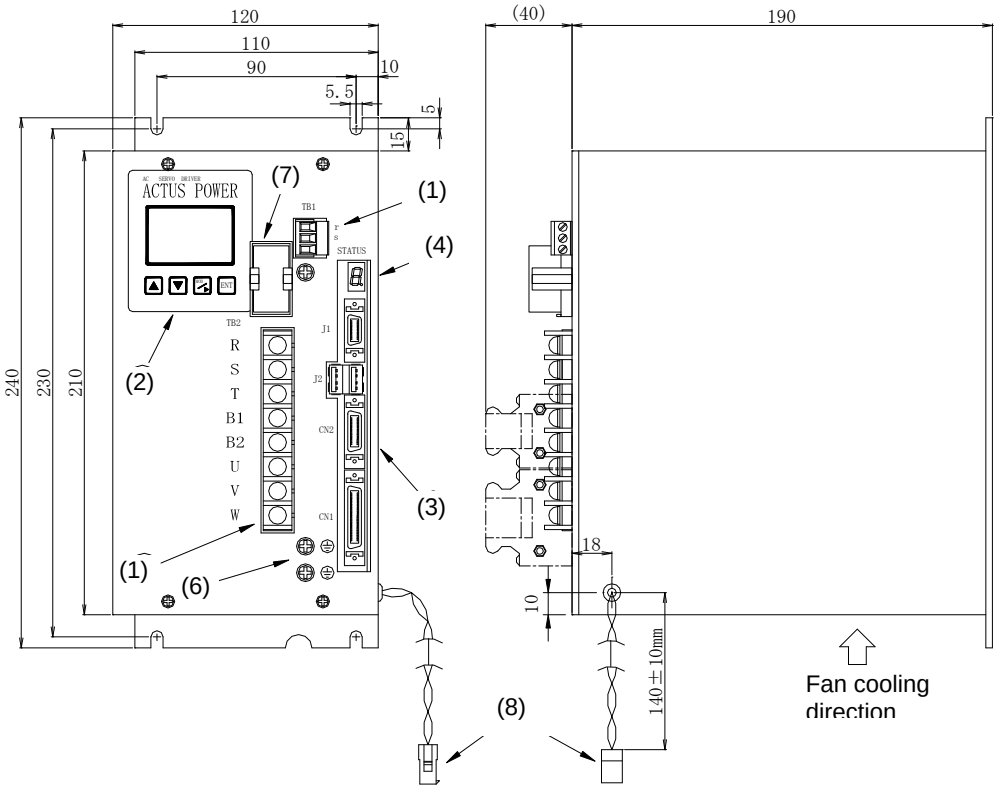


[Design sequence D (NCR-CA*3*D-XXX) or higher]

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

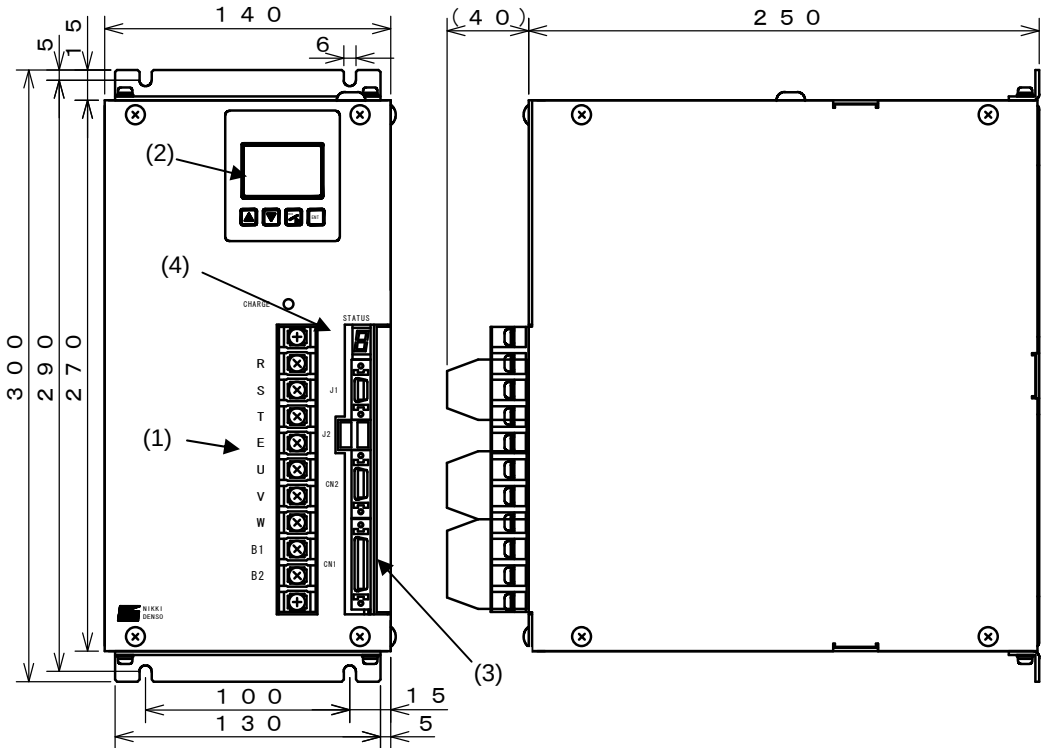


[Design sequence B/C (NCR-CA*3*B-XXX /NCR-CA*3*C-XXX) or before]

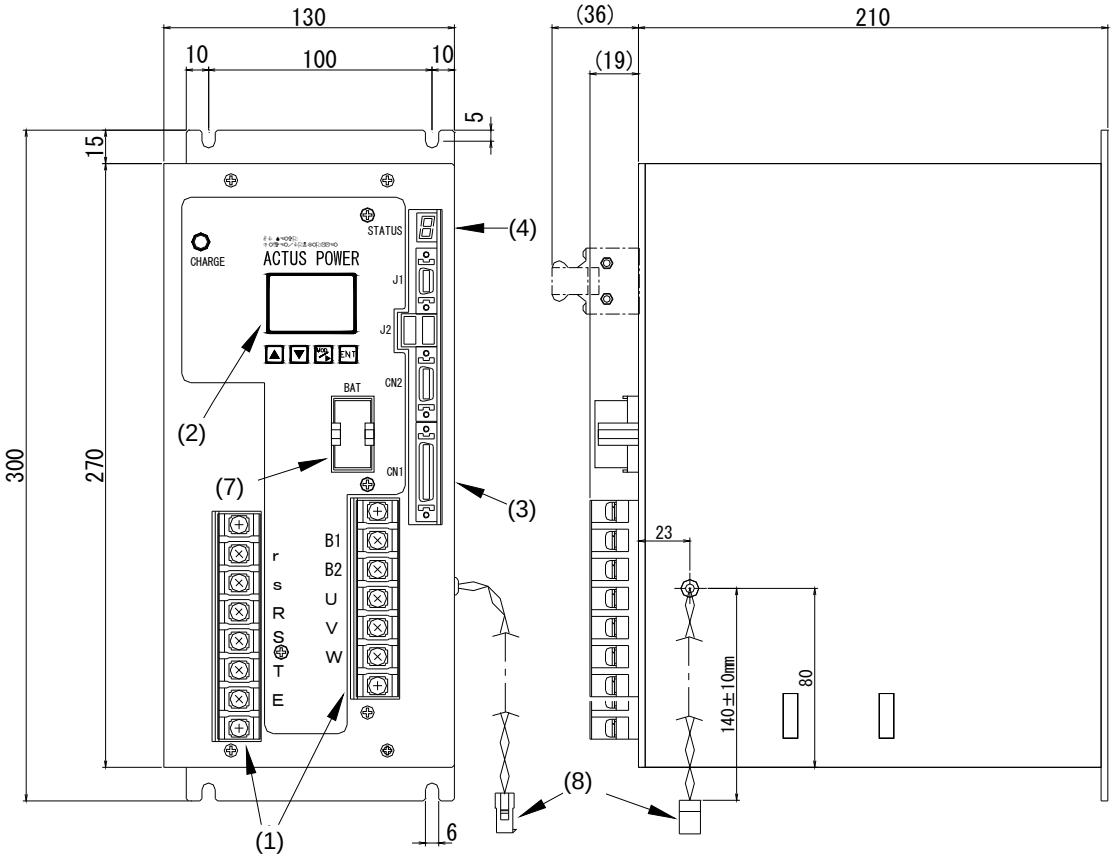


[Design sequence D (NCR-CA*3*D-XXX) or higher]

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

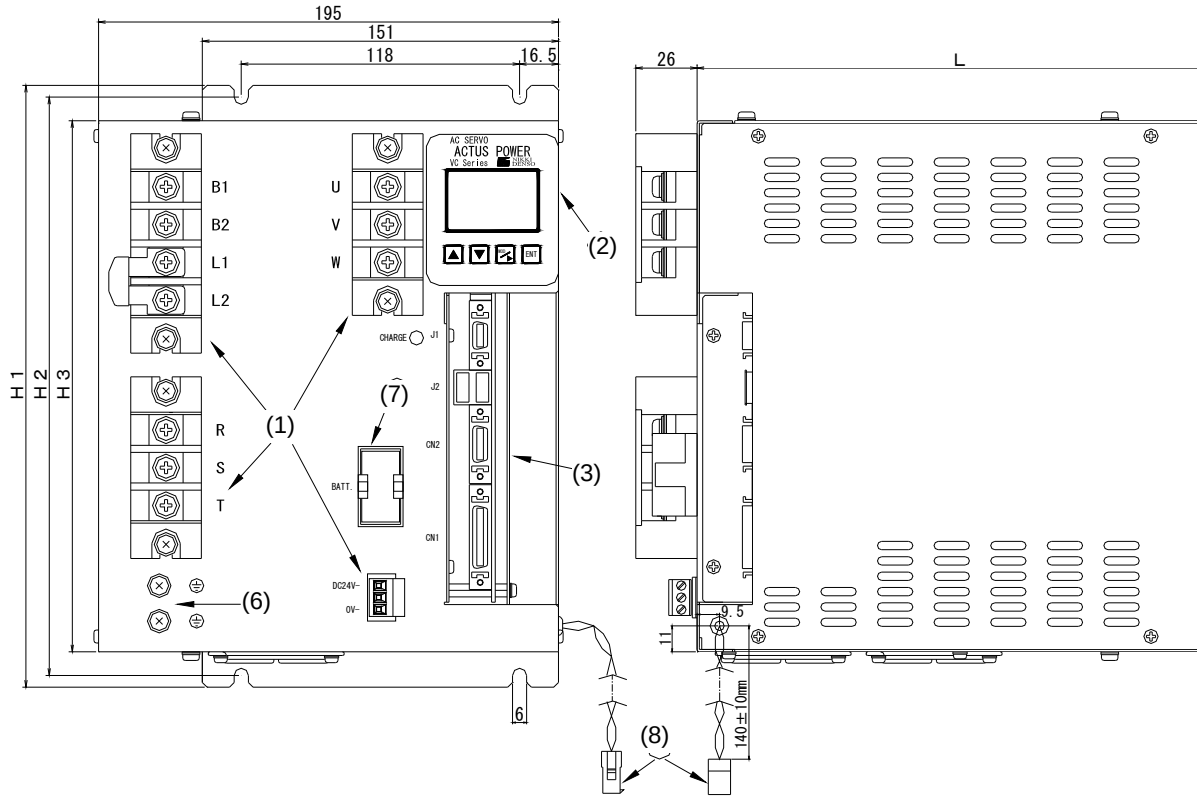


[Design sequence A/B(NCR-CA*3*A-XXX／NCR-CA*3*B-XXX)]



[Design sequence C (NCR-CA*3*C-XXX) or higher]

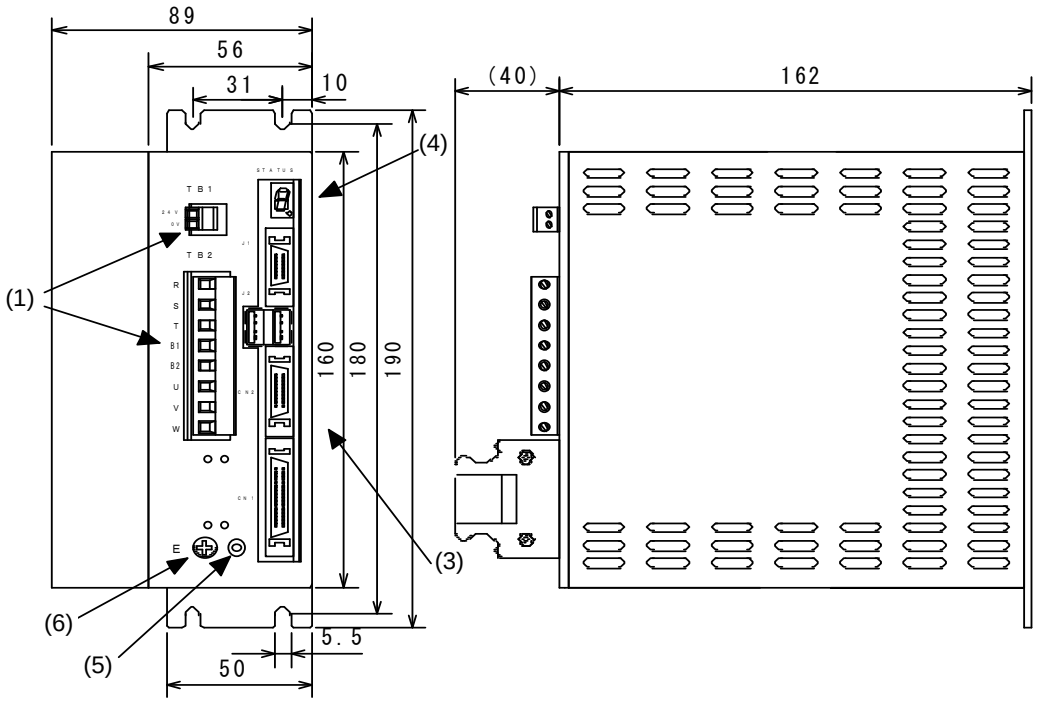
3-1-6 NCR-*A2 (A3)*-752/113/153



[AC 200/400 Specifications]

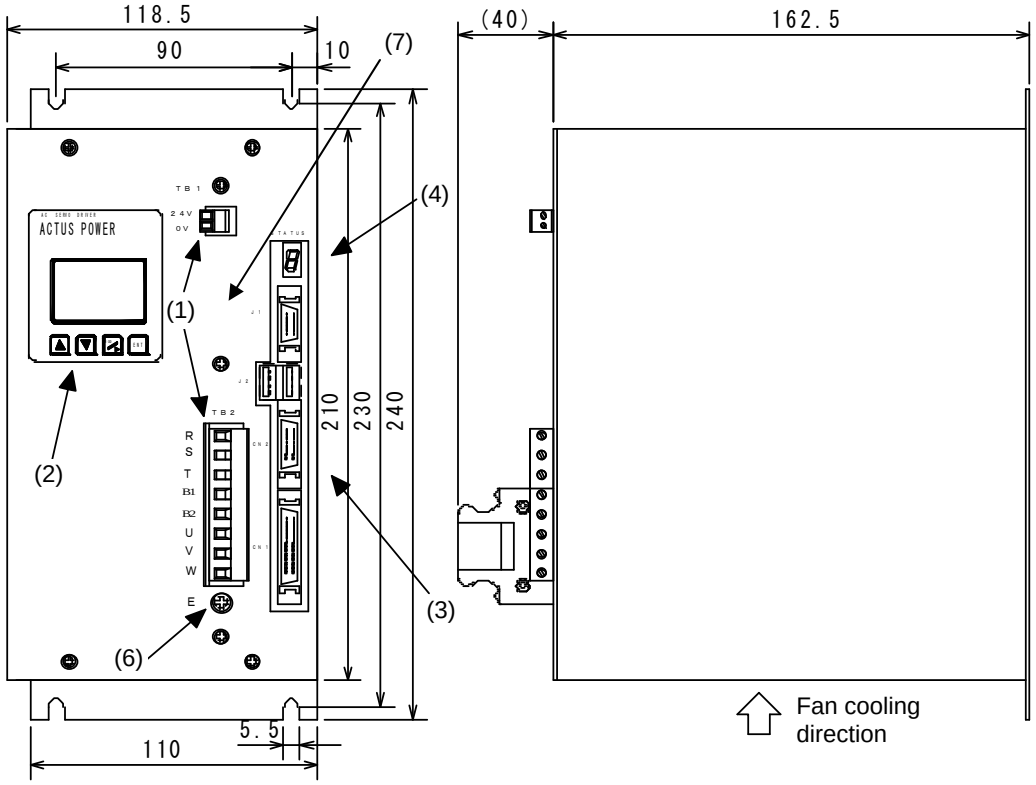
Controller type	L	H1	H2	H3
NCR - * A2 (A3) - 752 NCR - * A2 (A3) - 113	220	255	245	225
NCR - * A2 (A3) - 153	230	280	270	250

3-1-7 NCR-*A3*-751



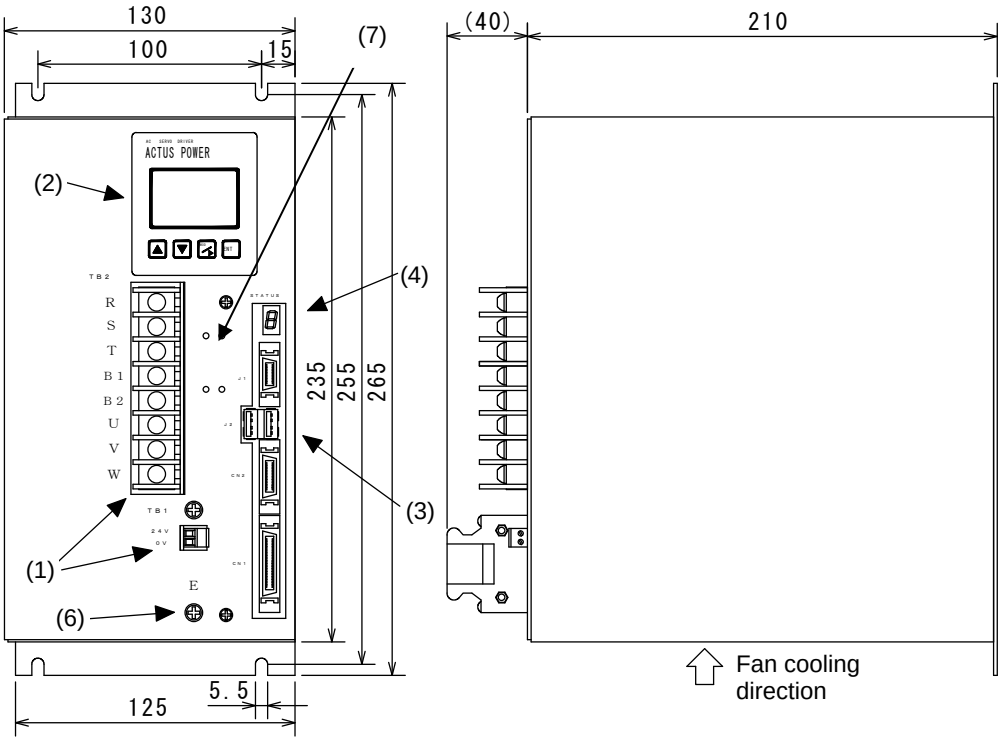
[AC 400V Specifications]

3-1-8 NCR-*A3*-262



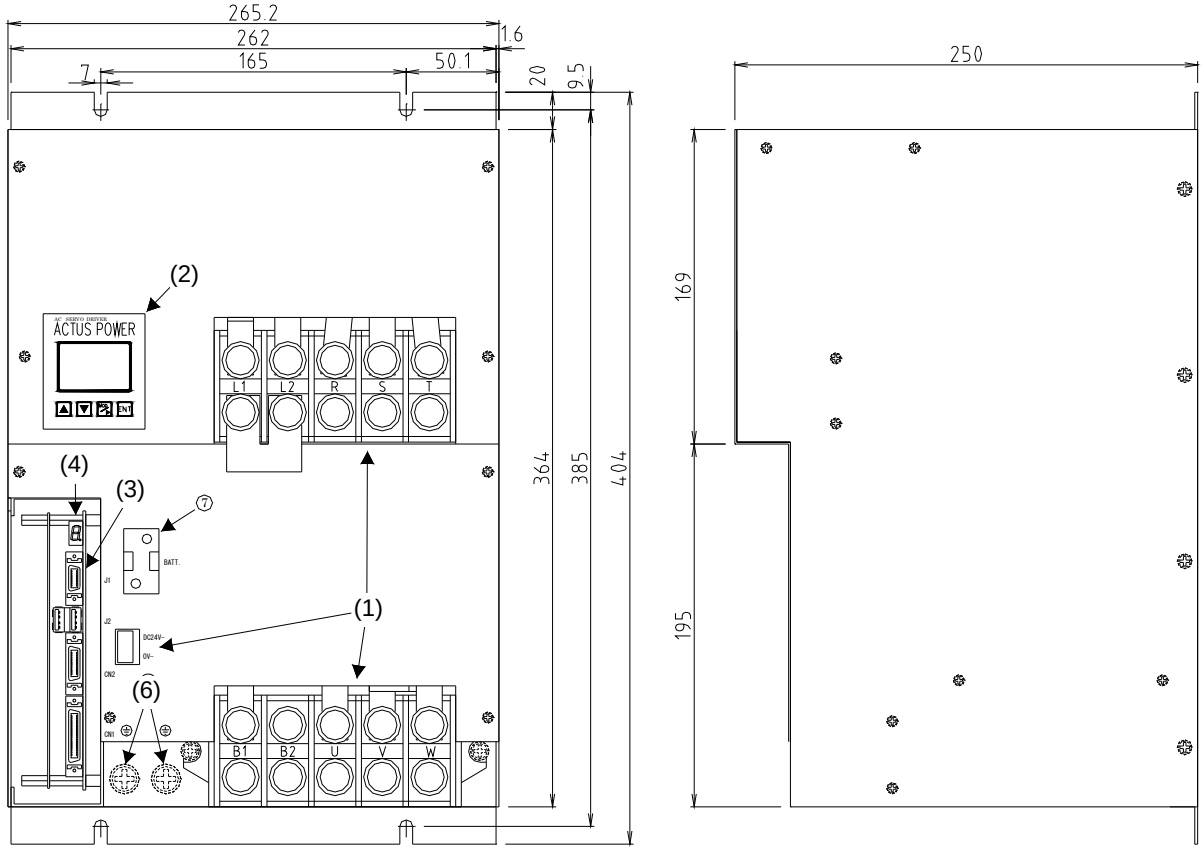
[AC 400V Specifications]

3-1-9 NCR-*A3*-402



[AC 400V Specifications]

3-1-10 NCR-*A2*(A3)*-203



[AC 200/400V 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(R, S, T) Terminal block for motor connection(U, V, W) Terminal block for Regenerative resistor connection(B1, B2)
(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.
(8)	(*1)	● Separate-type dynamic brake unit connecting cable. Not included in a unit that does not have a dynamic brake unit.

(*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.
(*4) Design order D (NCR-*A*D-xxx) or later does not bring it.

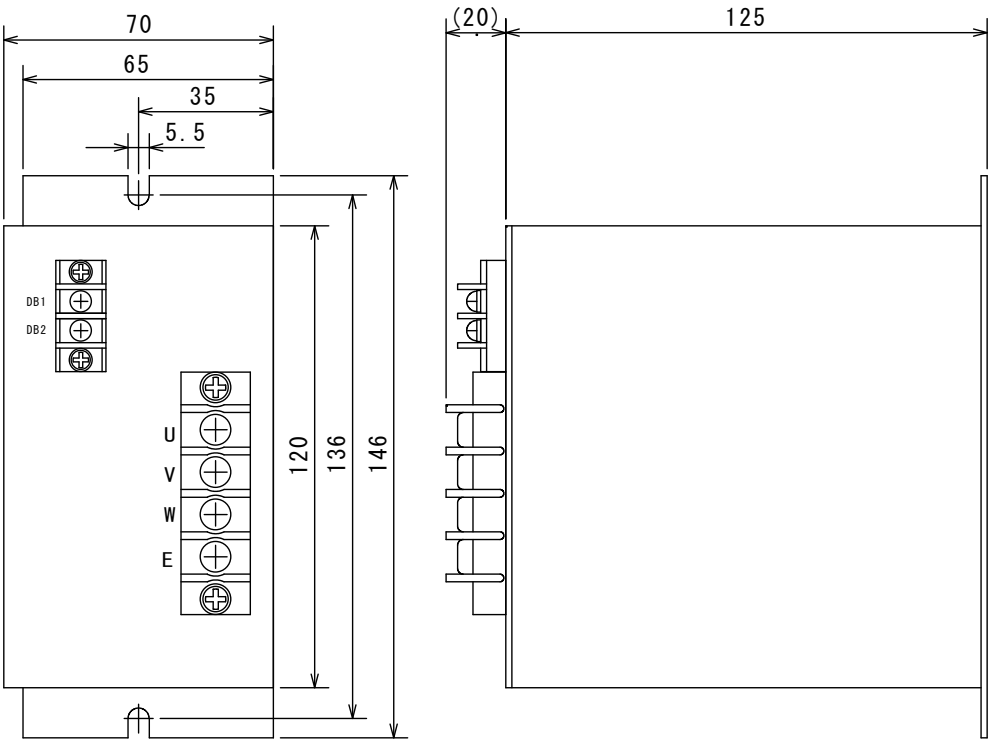
[Tab. 3-1] Controller Name List

3-3 Screw size

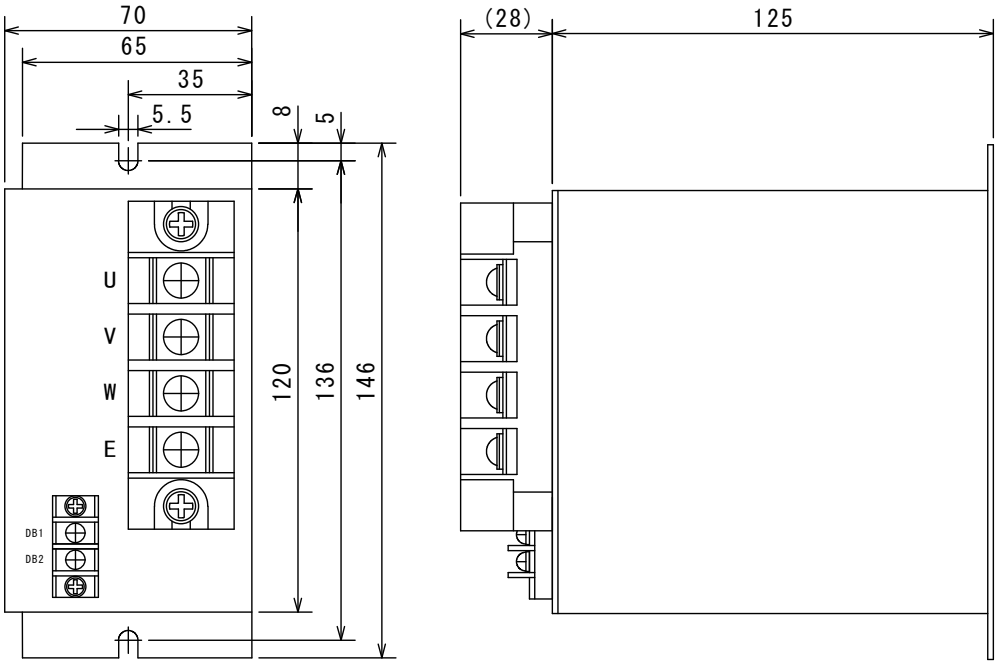
Type		Terminal bar screw size	Grounding screw size
NCR-*A*-051/101/201	Design order D or later		M4
NCR-*A*-201/401	Design order D or later		M4
NCR-*A*-801	Design order D or later		M4
NCR-*A*-152/222	Design order B/C	M4	
NCR-*A*-152/222	Design order D or later	M4	M4
NCR-*A*-302/402	Design order A/B	M4	
NCR-*A*302/402	Design order C or later	M4	
NCR-*A2(A3)*-752/113/153		M5	M5
NCR-*A3*-751			M4
NCR-*A3*-262			M4
NCR-*A3*-402		M4	M4
NCR-*A2(A3)*-203		M8	M6

3-4 Dynamic brake unit outline drawing

NCR-XABCA2B-222/402



NCR-XABCA2B-113/153



* A 800KW or smaller unit of VC series is equipped with the dynamic brake unit.

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	Qty
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
NCR-*2*-752 Capacity: 7.5kW	Hollow 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[RGH500G-OS22J] Thermostat[5003-L-130℃B-1] Thermostat attachment band Control power connector[XW4B-03C1-H1]	3 1 1 1

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

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

[200V system controller and accessory list]

Controller type	Accessory	
	Type	Qty
NCR-*2*-153 Capacity : 15kW	Enamel resistor[RGH500G-OS22J] Thermostat[5003-L-130℃B-1] Thermostat attachment band Control power connector[XW4B-03C1-H1]	4 1 1 1
NCR-*2*-203 Capacity : 20kW	Enamel resistor[RGH500G-OS22J] Thermostat[5003-L-130℃B-1] Thermostat attachment band Control power connector[XW4B-03C1-H1]	6 1 1 1

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

[100V system controller and accessory list]

Controller type	Accessory	
	Type	Qty
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	Qty
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	Hollow 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	Hollow resistor [RGH-500-0S82J] Thermostat [5003-L-130℃B-1] Thermostat attachment band Control power connector [XW4B-03C1-H1]	3 1 1 1

[Tab. 4-1-3(a)] 400V System Controller and Accessory List 1/2

[400V system controller and accessory list]

Controller type	Accessory	
	Type	Qty
NCR-*2*-153 Capacity：15kW	Enamel resistor[RGH500G-OS82J] Thermostat[5003-L-130℃B-1] Thermostat attachment band Control power connector[XW4B-03C1-H1]	4 1 1 1
NCR-*3*-203 Capacity: 20kW	Enamel resistor[RGH500G-OS82J] Thermostat[5003-L-130℃B-1] Thermostat attachment band Control power connector[XW4B-03C1-H1]	5 1 1 1

[Tab. 4-1-3(b)] 400V System Controller and Accessory List 2/2

⚠ Caution

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

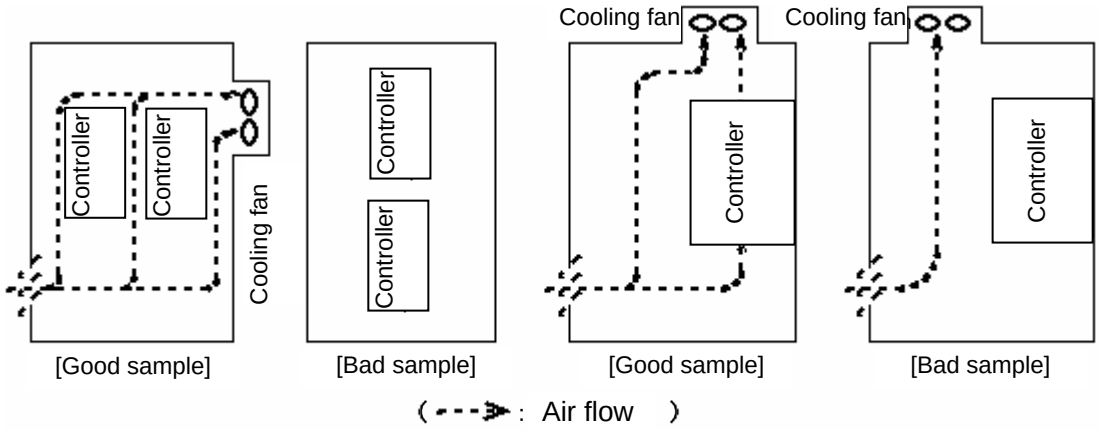
4-2 Installation Conditions

(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.

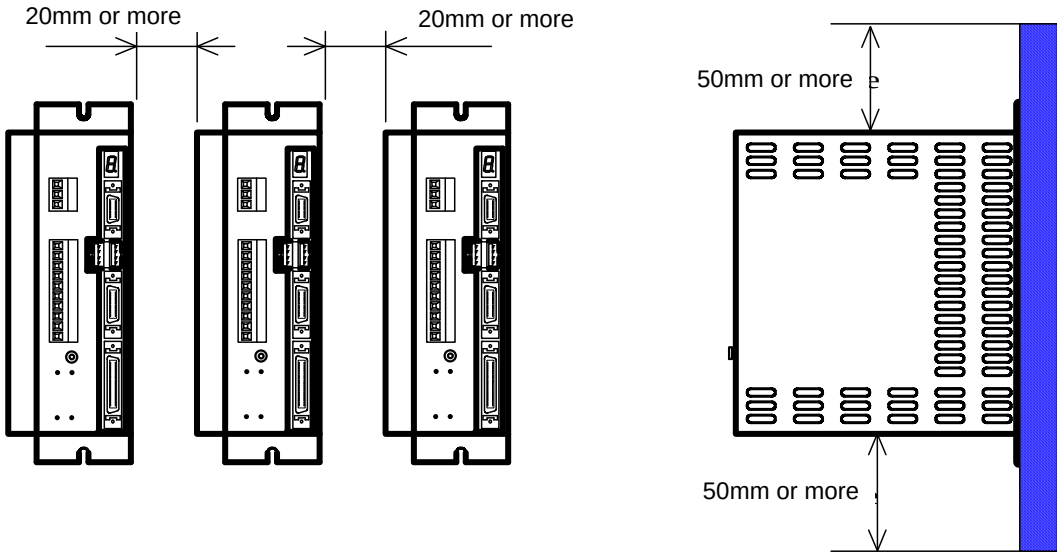


[Figure 4-1]Fan location sample to install plural controllers

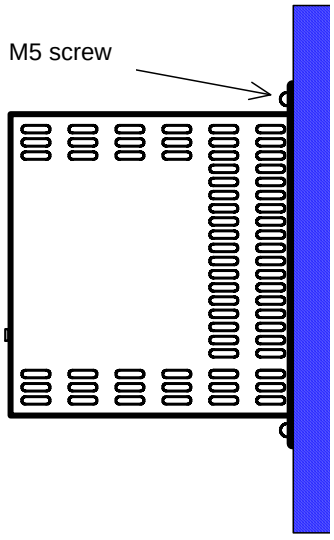
4-3 Installation Method

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

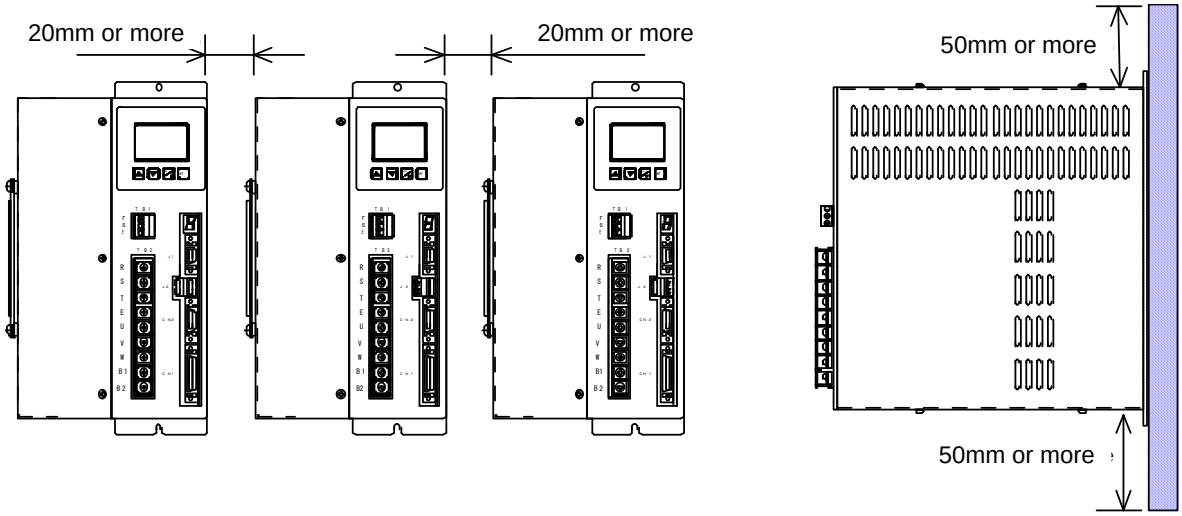
(2) In the points of radiation and maintenance, keep a specified vertical and horizontal distance (distance to other units, parts, and control console walls) to a controller, referring to[Figure 4-2]and[Figure 4-4].



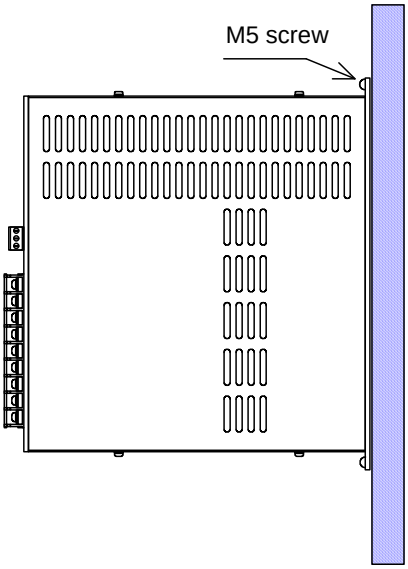
[Figure 4-2] Installation and Ventilation of VC controller 800W or less



[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 Source Wiring

1. AC input power source wiring

(1) AC input power source is as follows.

NCR-*A*A1*	Main power	AC100～115V,50/60Hz	Single Phase power
	Control power	AC100～115V,50/60Hz	Single Phase power
NCR-*A*A2*	Main power	AC200～230V,50/60Hz	3Phase power
	Control power	AC200～230V,50/60Hz	Single Phase power
	Control power	DC24	Direct current power (Only the type of 752/113/153/203)
NCR-*A*A3*	Main power	AC400～460V,50/60Hz	3Phase power
	Control power	DC24	Direct current power

Connect control power and main power cables, separately.
Please keep this range regardless to power source fluctuation due to factory load change.

(2) In order to protect accident and fire, be sure to install a no-fuse breaker or a fuse suitable for breaking capacity of the line. In case of using an earth leakage breaker, select an anti-high frequency noise type for an inverter.

(3) Since main circuits are a capacitor input type, rush current will flow when power is turned on.
Depending on power source capacity or impedance, large voltage drop may occur, therefore, apply a sufficiently large capacity power source, and cables.

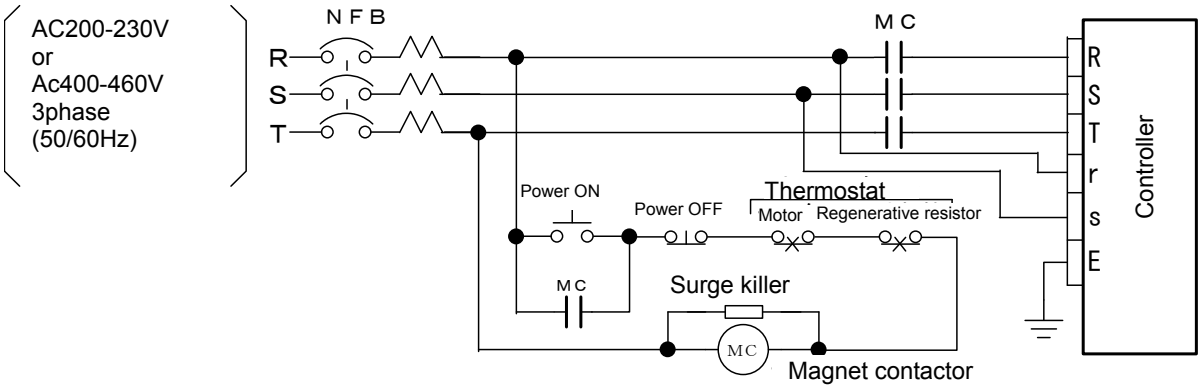
(4) Do not make wrong connection of AC power source（R,S,T,E）to motor connection terminals（U,V,W,E）of the controller.

⚠ Caution

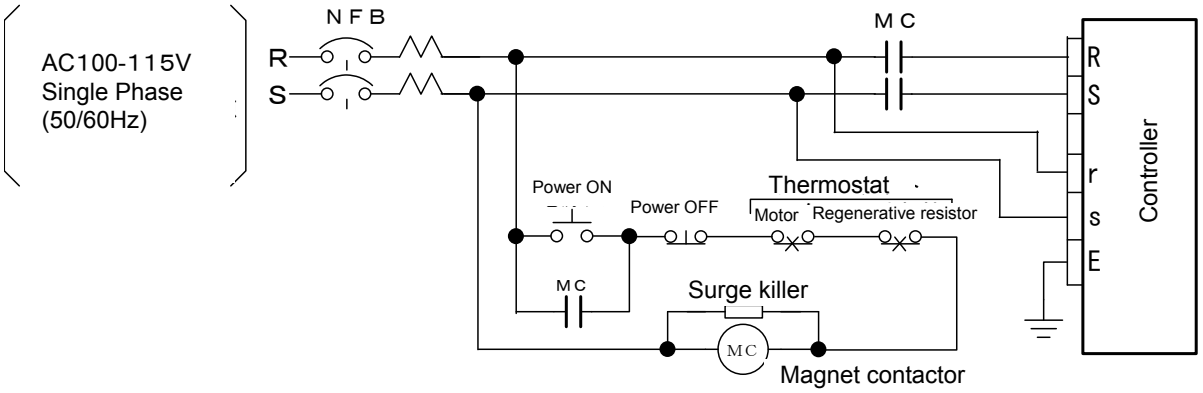
- Do not make wrong connection of AC power source（R,S,T,E）to motor connection terminals（U,V,W,E）of the controller. If wrong wiring is made, the controller will be damaged.

2. Power circuit

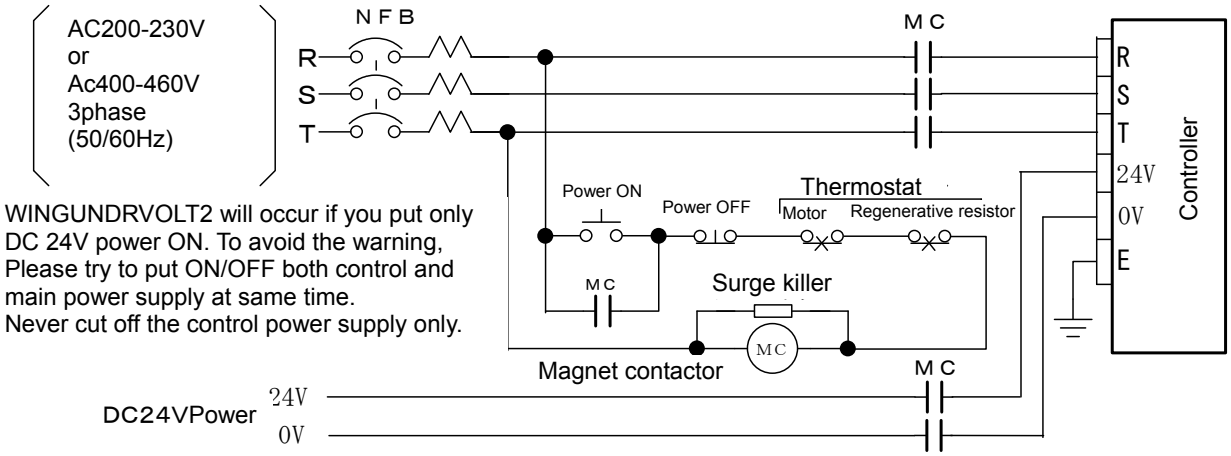
Typical power circuit is described in [Figure 5-1].



[Figure 5-1(a)] Typical power circuit of 3 Phase power



[Figure 5-1(b)] Typical power circuit of single phase



WINGUNDRVOLT2 will occur if you put only DC 24V power ON. To avoid the warning, Please try to put ON/OFF both control and main power supply at same time.
Never cut off the control power supply only.

[Figure 5 - 1(C)] Typical power circuit of control power DC24V

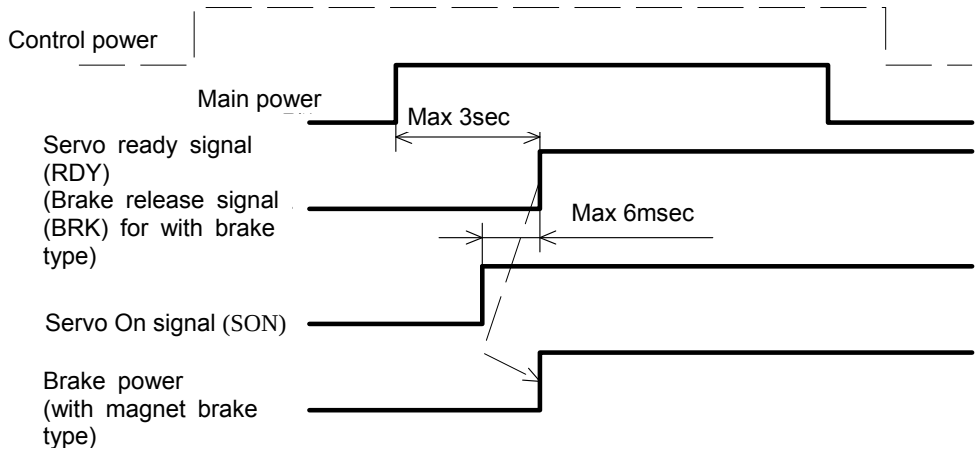
⚠ Caution

- Be sure to keep specified range of power source. If not, a controller could be damaged.
- In order to protect power source line, and avoid accident as fire, be sure to install a no-fuse breaker. Capacity of a breaker can be referred to Chapter 14 (Materials).
- When a magnet contact is used, be sure to install a surge killer.
- If possible, separate the controller power source from other large power consumption units.

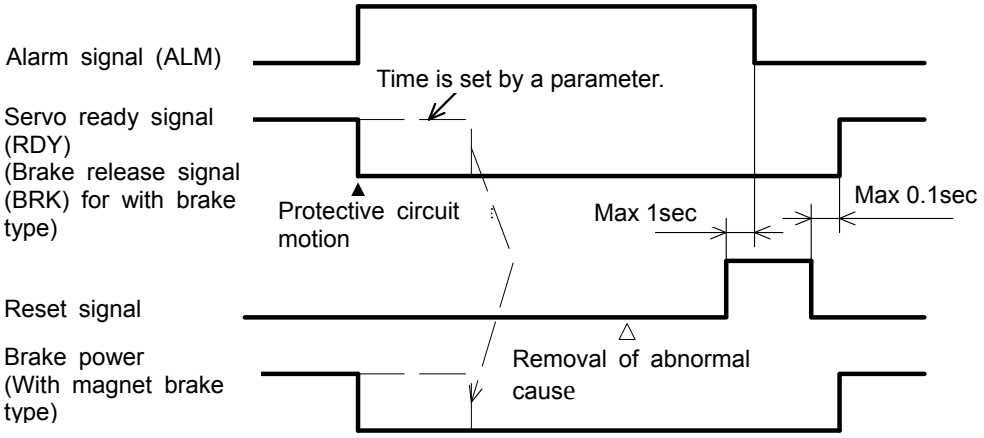
3. Power supply sequence

(1) Since the main circuit of the controller is a capacitor input type, if frequent switching (ON/OFF) of the power source is conducted, the main power circuit elements will deteriorate. Though, power re-input after shutting off the power can be made within one minute, please keep the switching frequency twice/ 3 minutes or less.

(2) The control power shall be turned on before or same timing when the main power is turned on, and shall be turned off after or same timing when the main power is turned off.



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



[Figure 5-3] Timing chart when a trouble occurs

⚠ Caution

- If power is re-inputted within 1 minute after the power is turned off, this unit may not work, properly.
- If over current or over load protection works, remove the cause, cool this unit about 30 minutes and resume it. If reset is repeatedly conducted in a short period, a controller temperature will be extremely increased and it could be damaged.
- Please design sequence, externally to turn off Start signal and stop the command when a protective function works and the alarm occurs(outputted). If Start signal and its command (Speed command voltage, Pulse train, etc.) are inputted when power source recovers after shut down occurred (includes black out), a motor will start and the situation is quite dangerous.

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

In order to prevent this unit from short-circuit; select a suitable break down capacity breaker to meet the power source capacity. As for breaker capacity of one unit, please refer to (14-1 Electric Specification of Controller)
When line capacity (power source capacity) is quite large to a unit capacity, insert a reactor and conduct electric coordination. (As for reactor specification, please ask our sales man.) And in case of using an earth leakage breaker, since controller inverter section is PWM control, output contains high harmonic. And leakage current is generated by earth electrostatic capacity of cable route from a controller to a motor and floating capacity between a motor coil and an iron core.
Since leakage current of this high harmonic components could activate an earth leakage breaker, select an inverter type earth leakage breaker for the controller power supply circuit.

5-2 Motor Wiring

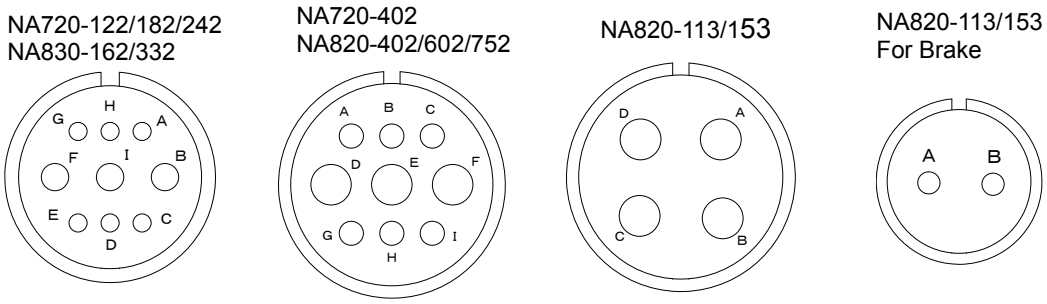
1. Motor wiring

(1) Connect motor terminals（U,V,W,E）and controller terminals （U,V,W,E）in the correct sequence.(Connect U-U, V-V, and W-W , respectively.) If the phase sequence is wrong, normal control can not be conducted and a motor could vibrate or start without a command input which is very dangerous.

(2) Motor connecting terminals（U,V,W,E）of synchronous type NA720-122/182/242/402 are cannon plug type (male).The wiring side cannon plug shall be provided by customer side or our optional unit.
The wiring side cannon plug types (female) are shown in the below tabulation. And motor connector No. and connector wiring 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 Brakes
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

[Tab. 5-1] Wiring Side (female) Cannon Type



[Figure 5-4] Motor Cable Connector No. Location Figure

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			

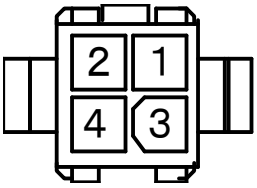
*There is no polarity of brake terminals.

[Tab.5-2] Connector Wiring Tab.

Specification of brake power is as shown in the next tabulation. Please provide a larger capacity power source than the specified value.

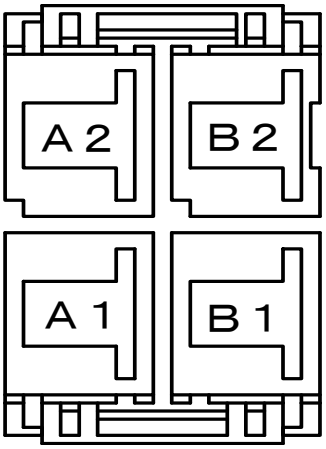
Motor type	NA720-122/182/242 NA830-162	NA830-332	NA720-402	NA820-402	NA820-602/752	NA820-113/153
Rated voltage [V]	DC 24	DC 24	DC 24	DC 24	DC 24	DC 24
power consumption [W]	20	30	33	34.7	25	45

(3) Motor connecting terminals（U,V,W,E）of Linear/ Disc/ NA70 motors（U,V,W,E）are MATE-N-LOK connector types (product 800W or less) or D5200 connector types (product 1.5kW) (Both are AMP products/ 4pin). Wiring side connectors shall be provided by customer side or our option[Tab. 5-4]and[Tab.5-5]show wiring side types, motor connector numbers, and connector wiring tabulation.

Used connector	Amp・Mini-universal・MATE-N-LOK・connector (4 pin)/ AMP product	
	Motor side connector	Wiring cable side connector
Connector body	Plug・Housing 172167-1	Cap・Housing 172159-1
Contactor	Pin 170360-1 or 170364-1	Socket 170362-1 or 170366-1
Pin location		

Pin No.	Signal name
1	U
2	V
3	W
4	E

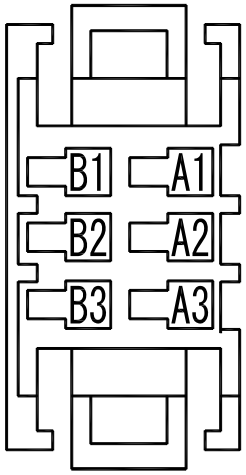
[Tab. 5-4] Wiring side connector type of 800W or less product

Used connector	D5200 series・ connector (4 pin)/ AMP product	
	Motor side connector	Wiring cable side connector
Connector body	Tab・Housing 1-917808-2	Rise・Housing 1-917807-2
Contactor	Tab・Contact 917804-2	Rise・Housing 316040-2
Pin location		

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

[Tab.5-5] Wiring side connector type of 1.5 kW product

(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.

<table>
<tr><td rowspan="2">Connector used</td><td colspan="2">D2000 series / connector (6 pin) / Manufactured by AMP</td></tr>
<tr><td>Motor side connector</td><td>Wiring cable side connector</td></tr>
<tr><td>Connector body</td><td>Tab / Housing
178964 - 3</td><td>Rise / Housing
178289 - 3</td></tr>
<tr><td>Contactor</td><td>Tab / Contact
175289-2, 175288-2(B2,B3)</td><td>Rise / Contact
175218 - 2</td></tr>
<tr><td>Pin location</td><td colspan="2"> 

<table>
<tr><th>Pin No.</th><th>Signal name</th></tr>
<tr><td>A1</td><td>U</td></tr>
<tr><td>A2</td><td>V</td></tr>
<tr><td>A3</td><td>W</td></tr>
<tr><td>B1</td><td>E</td></tr>
<tr><td>B2</td><td>Brake</td></tr>
<tr><td>B3</td><td>Brake</td></tr>
</table></td></tr>
</table>

[Tab.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

[Tab.5 – 7] Power specifications for brake

(5) In case of wiring between motor controllers, do not connect the magnet switch and no-fuse breaker

(6) When a motor equipped with a brake is used, be sure to release it before starting a motor.
Otherwise, the motor may be burn out. Referring to [Figure 5-2], timing shall be considered.

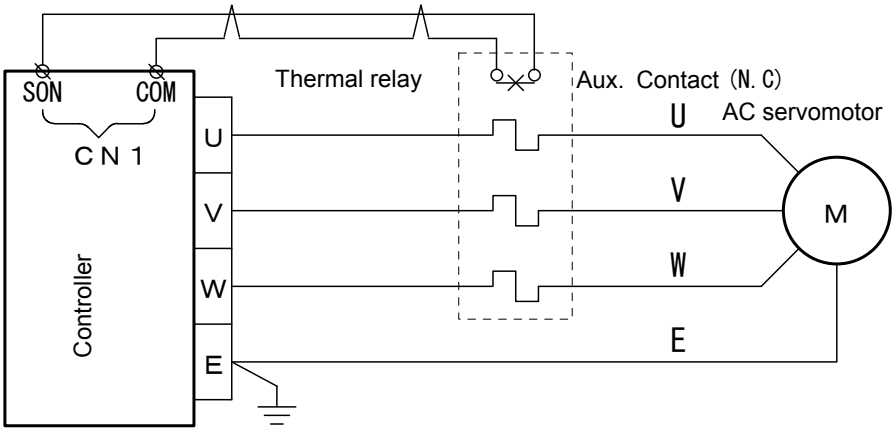
(7) Though an electric thermal is installed on a controller, if a thermal relay will be added,externally, set the motor rated current to the relay current value.
Make a sequence to turn off Servo ON (SON) signal and then stop a motor by an auxiliary contact of the thermal relay when a thermal relay is activated. (Refer to[Figure 5-5].)

(8) For motor over-heat protection, a thermostat (normal close contact) of B contact is installed in NA720-552～223.
Referring to [Figure 5-1], make wiring to shut the main power OFF when the contact opens.

Thermostat contact specification is as follows.

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

[Tab. 5-8] Thermostat contact specification



[Figure 5-5] Motor wiring

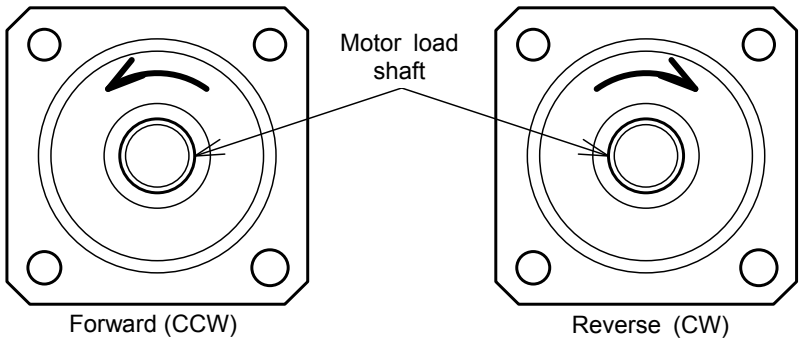
⚠ Caution

- Be sure to connect a motor earth terminal(E)to a controller earth terminal (E).

2. Motor rotating direction set

Relation of each command and motor rotating direction in case of connecting a standard motor to a standard encoder is as follows.

1) Motor running direction

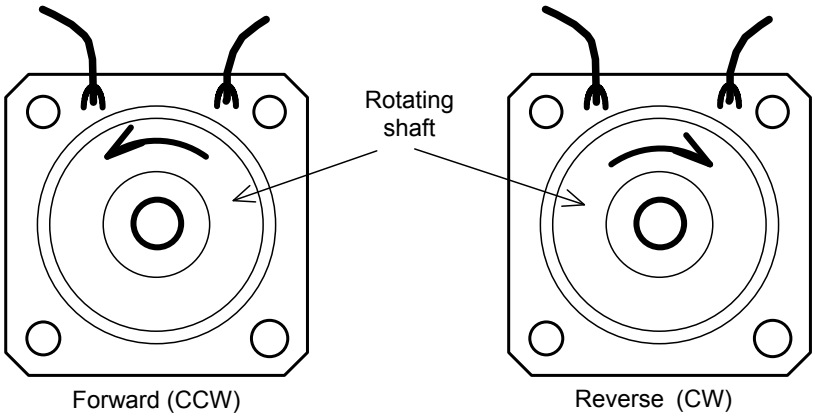


[Figure 5-6] Running motor direction

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

[Tab. 5-9] Each command input and motor rotating direction (in running)

2) Disc motor running direction

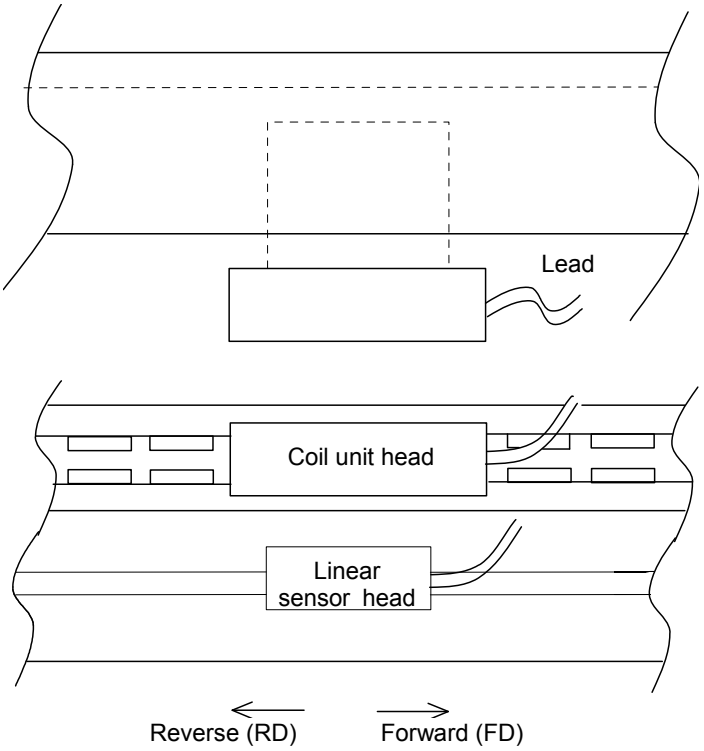


[Figure 5-7] Disc motor running direction

Command input type	Polarity	Motor direction
Positioning command	Forward	Shaft rotates CCW, viewing to rotating shaft : Forward
	Reverse	Shaft rotates CW, viewing to rotating shaft : Reverse

[Tab. 5-10] Each command input and motor rotating direction (Disc motor)

3) Linear motor running direction



[Figure 5-8] Linear motor running direction

Coil unit:

Forward travel: Direction from the coil unit head to the lead wire

Reverse travel: Opposite direction from the coil unit head to the lead wire

Linear sensor:

Forward travel (B Phase ahead): Travel direction from the linear sensor head to the lead wire

Reverse travel (B Phase behind: Travel direction from the lead wire to the linear sensor head.

Note) Please set the coil unit and the linear sensor to the same direction.

Command input type	Polarity	Motor travel direction
Positioning command	Forward	Forward travel (FD)
	Reverse	Reverse travel (RD)

[Tab.5-11] Each command input and motor travel direction (linear motor)

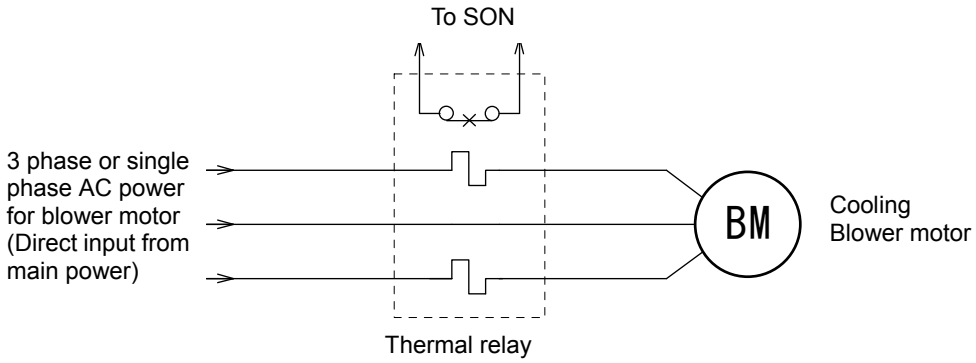
Hereunder, in this manual, motor forward direction is defined that a motor runs forward to a forward command input, and motor reverse direction is defined that a motor runs reverse against a forward command input.

To run a motor opposite direction to positive voltage command or forward command (pulse train), in the standard connection, set 'REVERSE' to the parameter[P300: Rotating direction selection].
Factory set is 'FORWARD'.

3. Wiring of cooling blower motor

(1) A blower motor for cooling a servo motor is installed on an un-loaded shaft side of a motor. Please attach a thermal relay to a cooling blower. Our relay is also available as an option. The thermal relay shall be set to rated current value of a cooling blower motor.
The rated current value of a cooling blower motor can be referred to (14-3 Electric specification of motor cooling blower).

(2) Run the cooling blower motor and confirm whether motor rotating direction is identical to the wind direction or not. In case of a 3 Phase motor, carefully pay attention to phase sequence when wiring is conducted, and confirm if the sequence direction is identical to the arrow, as well.



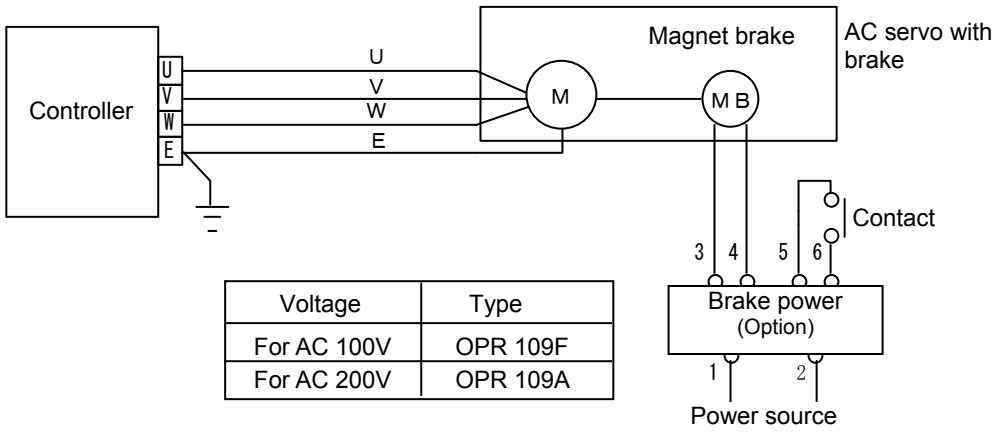
[Figure5-9] Wiring of cooling blower motor

⚠ Caution

- Since power is not supplied to a cooling blower by a controller, please provide the power source. Be sure not to connect cooling blower terminals to U, V, and W of a controller.

4. Wiring of electro magnetic brake

(1) Brakes of our motors are for holding purpose, only. And 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 [Figure 5-10].
    * Our optional brake power supply is only for induction motors. Please provide a power supply for other motor types.
(4) Connect the brake terminal P to the output terminal No.3 and brake terminal N to the output terminal No.4, respectively.
    * Never short-circuit the output terminal No.3 and No.4.
(5) Recommended capacity of a contact between the output terminal 5 and 6 is 5 to 6 times of total capacity of applied brakes.



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

[Figure 5-10] Brake power wiring

⚠ Caution

- Since an electro-magnetic brake is released about 0.5 sec. after voltage is supplied, consider the timing to motor start command.
  Be sure to turn off a motor command before activating the electro-magnetic brake.
- Since the electro-magnetic brake is holding purpose, only, never activate the brake in running condition of a motor.

5. Wiring of dynamic brake

(1) What is the dynamic brake:
  - The dynamic brake is a function to control (or brake) the motor free run (uncontrolled operation) utilizing the motor rotating energy in the case of servo OFF status due to a certain factor (alarm incidence or else) of the unit. It is used to prevent devices and motors from breakages and man from injuries, due to the motor free run.

    [Note] The dynamic brake has no maintaining brake functions.

(2) Absolute maximum rating

- When using the dynamic brake, the operation must fulfill below conditions.

	Speed	Load volume (Activating block)	Brake operation interval
Liner motor	Rating speed or less	VC operative specification ranges or less	Greater than 10 min.

	Rotation number	Load inertia (Motor ratio)	Brake operation interval
NA70	Rating rotation number or less	About 50 times or less or specification ranges or less	Greater than 10 min.

	Rotation number	Load inertia (Motor ratio)	Brake operation interval
Disk motor	Rating rotation number or less	VC operative specification ranges or less	Greater than 10 min.

⚠ Caution

- Activating the dynamic brake under the condition exceeding the absolute maximum rating leads to the breakage of VC series body.
- The absolute maximum rating is a specification where parts are not electrically broken. Time changes until the motor stops depending on the conditions of the using linear motor and slider. Therefore, particular attention is required when using for the high speed and for the big load capacity. As it leads to motor breakages and human body injuries due to a collision to a stopper, consult our sales representatives before accidents.

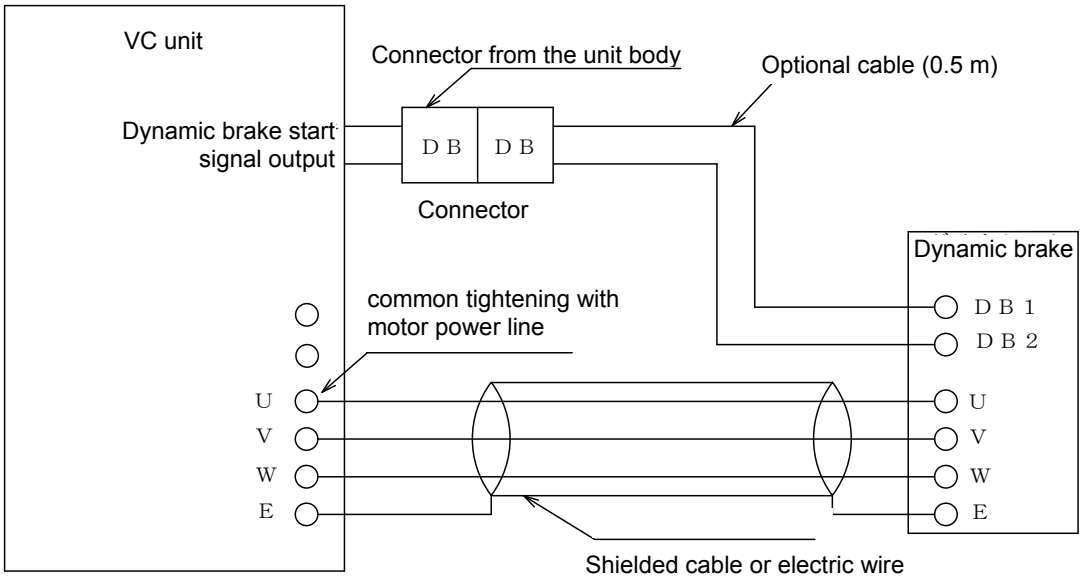
(3) Installation of the unit

Install this unit referring to the connection diagram as shown below.
The maximum wiring length between the motor drive VC unit and this unit must be about 0.5 m or less.
Wire diameter for U, V, W connections must be bigger than the wire diameter listed below.

* VC series 800W or smaller types are equipped with the dynamic brake unit; thus, wire connection is not necessary.

Unit: AWG (mm^2)

Unit type	Wire diameter
NCR-*A2*-152/222	16(1.25)
NCR-*A2*-302/402	14(2.0)
NCR-*A2*-752	12(3.5)
NCR-*A2*-113	10(5.5)
NCR-*A2*-153	8(8.0)



(4) Setting the dynamic brake

- Setting such as operation or no-operation of the dynamic brake is conducted in the parameter setting (P745, P746) of the VC series body.
  * For details of the parameter setting, refer to Chapter 7.

[Note]
The dynamic brake tries to stop the motor by generating the dynamic brake start signal in the incidence where the driver becomes servo OFF during the motor operation (rotation).
In the case of the motor rotation, error incidence, or warning happening, the start signal is generated disregarding the input signal and the dynamic brake is activated.

In the incidence of instantaneous blackout and to activate the dynamic brake in the power-cut, set [FREE RUN] in P713, AC loss stop method. (Initial setting)
When [QUICK] is set, the dynamic brake does not operate.

5-3 Grounding

(1) Be sure to conduct grounding to prevent electric shock and noise influence.
(2) Use a specified area cable in later described [Tab. 5-10 Applicable cables], and conduct JIS Class 3 or better grounding (ground resistance 100 Ω or less).
Connect the ground cable to the ground terminal（E）of a controller.
(3) If possible, dedicated ground is recommended. If shared ground is used, be sure to ground the cables to 1 point.
(4) Be sure to connect a motor ground terminal （E）to a controller ground terminal（E）.

⚠ Caution

- To reduce common mode noise and prevent malfunction of a unit, use dedicated ground and satisfy JIS class 3 or better (ground resistance 100 Ω or less).
- When dedicated ground can not be used, connect cables to other units only at 1 common point.
- Never use common ground with large power line nor connect ground to iron structures, etc.
- Install the wiring carefully in order to avoid the looping of earthling wires. The leakage current of the device may increase depending on its status and it operates Earth leakage circuit-breaker.

5-4 Regenerative Resistor Wiring

(1) Use an attached accessory, Regenerative resistor.
(2) Since heat is generated by regenerative energy, locate a Regenerative resistor not to influence other units. The Regenerative resistor is used to consume excessive energy that the regenerative capacitor can not absorb regenerative energy generated by motor braking when load inertia (GD2) is large.
(3) A thermostat is attached to a Regenerative resistor. Since the thermostat contact opens when a Regenerative resistor is over-heated, make wiring to shut main power down at the time. (Refer to[Figure 5-1]) Thermostat contact specification is as follows.

Contact voltage	Contact current
AC200V	1A

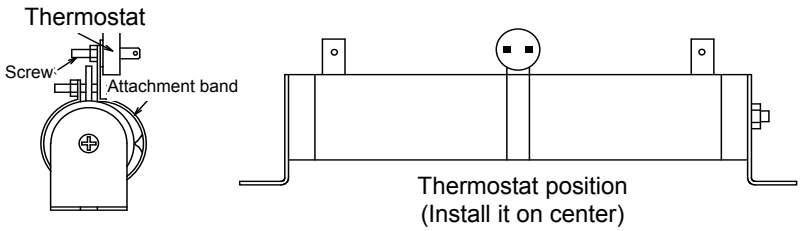
And thermostat attachment can be referred to [Figure 5-11].

(4) In case of using plural Regenerative resistors, comply with description of (14-2-1 Combination of Regenerative resistor).
(5) Cable length between a Regenerative resistor and a controller shall be 3m or as short as possible.
As the cable is longer, surge voltage generated by switching of power elements becomes larger, and in the results a controller could be damaged.

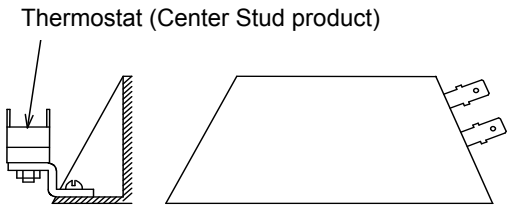
⚠ Caution

- When abnormally high current flows in a Regenerative resistor in a short time, it becomes hot and quite dangerous. Be sure to construct a circuit to shut main power down by a thermostat contact.

Thermostat attachment on enamel resistor



Thermostat attachment on cement resistor



[Figure 5-11] Location of Thermostat Attachment

5-5 Control Circuit Wiring

1. Analog command (speed, torque)

(1) Since each analog signal is micro-current, use twist pair shield cables and be sure to connect those shields to the shield earth FG terminal of connector CN1.
(2) Cable length shall be 3m or shorter.

2. Pulse train input and output

(1) Since Pulse train input and encoder Pulse train output are high speed Pulse train signals, use twist pair shield cables, and be sure to connect those shields to the shield earth FG terminal of connector CN1.
(2) Cable length shall be 3m or shorter. (In case of Open collector output, 1.5m or shorter)

3. Encoder feedback pulse signal

(1) Use twist pair shield cables, and be sure to connect those shields to the shield earth FG terminal of connector CN2.
(2) If a mobile motor is required, make the cable bending radius as large as possible to avoid excessive load.
(3) Max. cable length is 50m. Dedicated encoder cable sets are optionally available. Ask our sales man the details.

4. Control I/O signals

(1) When relays and switches are used for control input and output signals, please use micro-current types.
(2) To prevent mal-function by noise, be sure to install surge killers, diodes, etc. to relays, magnet switches, electro-magnet brakes, solenoids, etc. used around a controller and depress the noise generation.
(3) Control input signal power +V（+12V,2.5mA～+24V,5mA/ 1 point） shall be provided by customer side.
(4) Cable length shall be 3m or shorter.

5-6 Noise Protection

1. External noise intrudes through 2 routes, power lines and signal lines. External noise causes malfunction and a trouble. In order to protect a trouble caused by noise, it is important to depress noise generation or not to induce generated noise to units.
   Therefore, be sure to conduct the next counter measures and protection treatment.

⚠ Caution
● Control I/O signal cables shall be specified type and area, and comply with wiring precaution without fail. If this counter measure is not conducted, un-expected malfunction could occur by noise, etc. which is quite 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 a bundle.

2. Installation of surge killer and noise filter

(1) To depress noise generation, be sure to install a surge killer (for AC power) or a diode (for DC power) on each relay, magnet switch, electro-magnetic brake, solenoid, etc. used near a controller.。

(2) If noise generation source is near a power line such as welders and electric discharge machine, etc., install a noise filter or noise cut transformer, etc. on the man power source and controller power source of the controller for noise protection.
When a noise filter is used, be sure to separate input cables 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 (earth) it in the shortest distance.

(3) Since high speed switching power supply is used in the controller, switching noise is generated. If it is supposed that this noise influences other equipment, insert a noise filter or common mode choke coil in the main power line of the controller and protect the unit from inducing the noise into the power line. And conduct radiation noise measures such as passing the power and motor lines through a metal tube.

5-7 Applicable Cable

Please use cables described in[Tab. 5-12].
*Please use our optional cable for control circuits.

⚠ Caution

- A cable type and size can be changed depending on actual conditions and environment. Please consult our sales man for further information.
- If a control signal cable is long, this unit likely to be influenced by noise. Please keep specified length for wiring. And be sure to use specified cable type.

	Item	Terminal	VC series
Control circuit	Analog voltage command input Analog monitor output (Speed, Torque)	INH,TQH TL+,TL-,GND MON1,2	AWG28 (0.08mm^2) or larger twist pair shield cable, 3 m or less
	Pulse train command	FC/FC*, RC/RC*	Line driver method: AWG28 (0.08mm^2) or larger twist pair shield cable, 3 m or less Open collector method: AWG28 (0.08mm^2) or larger twist pair shield cable, 1.5 m or less
	Encoder pulse output	EA/EA*,EB/EB* EM/EM*,GND	AWG28 (0.08mm^2) or larger twist pair shield cable, 3 m or less （AWG20(0.5mm$^{2)}$ or larger for GND）
	Encoder feedback Pulse input	A/A*,B/B* Z/Z* (EP5,GND)	AWG24(0.2mm^2)or larger twist pair shield cable AWG20(0.5mm^2)or larger for EP5,GND Length: 50m or less
	Other control I/O		AWG28 (0.08mm^2) or larger twist pair shield cable, 3 m or less （AWG20(0.5mm^2) or larger for +24V,COM）

[Tab. 5-12(a)] Applicable Cable 1/3

AC100V Specifications Unit :AWG(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	16(1.25)	16(1.25)	16(1.25)		
	Control AC input power, ground	r,s	18(0.75)	18(0.75)	18(0.75)		
	Motor	U,V,W	16(1.25)	16(1.25)	16(1.25)		
	Regenerative resistor	B1,B2	18(0.75)	18(0.75)	18(0.75)		

AC200V Specifications Unit :AWG(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	16(1.25)	16(1.25)	16(1.25)	16(1.25)	
	Control AC input power, ground	r,s	18(0.75)	18(0.75)	18(0.75)	18(0.75)	
	Motor	U,V,W	16(1.25)	16(1.25)	16(1.25)	16(1.25)	
	Regenerative resistor	B1,B2	18(0.75)	18(0.75)	18(0.75)	18(0.75)	

AC200V Specifications Unit :AWG(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	14(2)	12(3.5)	12(3.5)	10(5.5)	
	Control AC input power, ground	r,s	18(0.75)	18(0.75)	18(0.75)	18(0.75)	
	Motor	U,V,W	14(2)	12(3.5)	12(3.5)	10(5.5)	
	Cooling blower motor	u,v,w	18(0.75)	18(0.75)	18(0.75)	18(0.75)	
	Regenerative resistor	B1,B2	18(0.75)	18(0.75)	18(0.75)	18(0.75)	

AC200V Specifications Unit :AWG(mm^2)

	Item	Terminal	NCR-*A*A2*-752	NCR-*A*A2*-113	NCR-*A*A2*-153	NCR-*A*A2*-203	
Main circuit	AC input power, ground	R,S,T,E	6(14)	6(14)	4(22)	2(30)	
	Control AC input power, ground	24V,0V *1	18(0.75)	18(0.75)	18(0.75)	18(0.75)	
	Motor	U,V,W	6(14)	6(14)	4(22)	2(30)	
	Cooling blower motor	u,v,w	18(0.75)	18(0.75)	18(0.75)	18(0.75)	
	Regenerative resistor	B1,B2	12(3.5)	10(5.5)	8(8)	6(14)	

[Tab. 5-12(b)] Applicable Cable 2/3

*1 Please note that there is also a device with the AC200V input power supply specifications.

AC400V Specifications Unit :AWG(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		16(1.25)	16(1.25)	12(3.5)	12(3.5)
	Control AC input power, ground	24V,0V		18(0.75)	18(0.75)	18(0.75)	18(0.75)
	Motor	U,V,W		16(1.25)	16(1.25)	12(3.5)	12(3.5)
	Cooling blower motor	None					
	Regenerative resistor	B1,B2		18(0.75)	18(0.75)	18(0.75)	18(0.75)

AC400V Specifications Unit :AWG(mm^2)

	Item	Terminal	NCR-*A*A3*-113	NCR-*A*A3*-153	NCR-*A*A3*-203		
Main circuit	AC input power, ground	R,S,T,E	10(5.5)	8(8)	6(14)		
	Control AC input power, ground	24V,0V	18(0.75)	18(0.75)	18(0.75)		
	Motor	U,V,W	10(5.5)	8(8)	6(14)		
	Cooling blower motor	U,V,W	18(0.75)	18(0.75)	18(0.75)		
	Regenerative resistor	B1,B2	14(2)	12(3.5)	12(3.5)		

[Tab. 5-12(c)] Applicable Cable 3/3

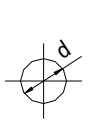
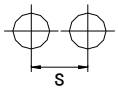
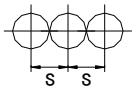
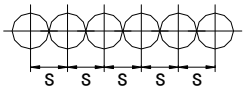
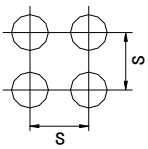
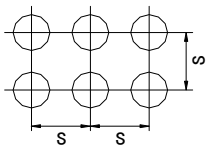
* Wire diameters in [Table 5-12] are decided in the following conditions based on the vinyl insulation electric wires for electric appliances (KIV electric wires).
  - KIV electric wire: Rating 600 V, 60℃Operating temperature: 40℃ Installation conditions: Air, 3-line (Interval s = d) wiring

* Permissible current of a wire differs each other depending on the operating conditions (applicable temperature, installation conditions), coating, insulation, and maker.
  Chose the most appropriate wire diameter considering the operating environments and conditions.

* When calculating the permissible current changing the operating temperature and installation conditions, multiply the permissible current decrease coefficient and permissible current compensation coefficient, complying with the conditions.
  Permissible current decrease coefficient when exceeding the operating temperature of 30℃ (when the permissible maximum temperature of the cable is 60℃)

$$\text{Permissibl e current decrease coefficien t} = \sqrt{\frac{(60-\theta)}{30}} \quad (\theta = \text{applicable temperatur e } \theta < 60)$$

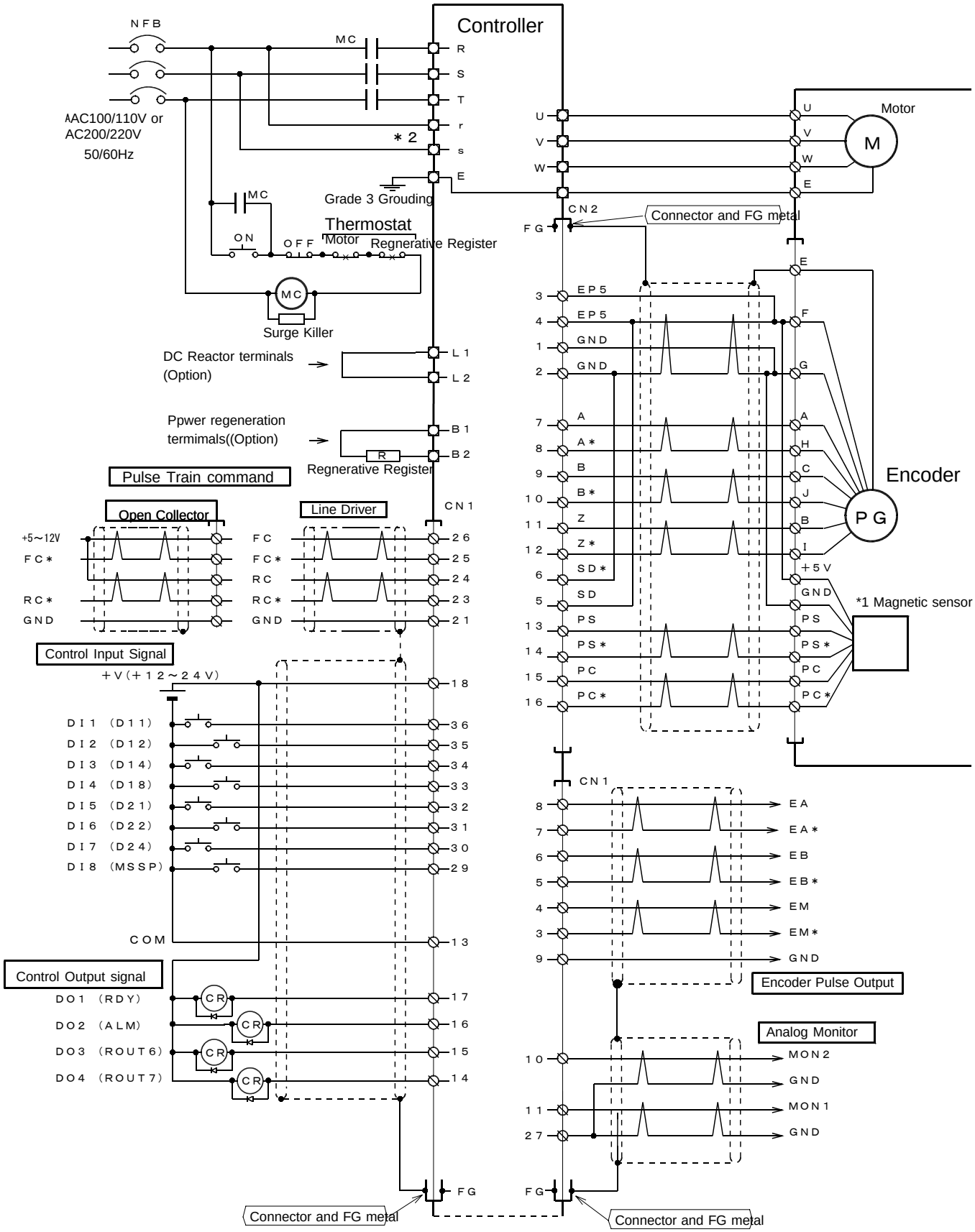
Permissible current compensation coefficient when installing multiple cables in the air

Line	1	2	3	6	4	6
Center interval / Alignment						
s=d	1.00	0.85	0.80	0.70	0.70	0.60
s=2d		0.95	0.95	0.90	0.90	0.90
s=3d		1.00	1.00	0.95	0.95	0.95

Chapter 6: Signal Connection

6-1 External Wiring Diagram

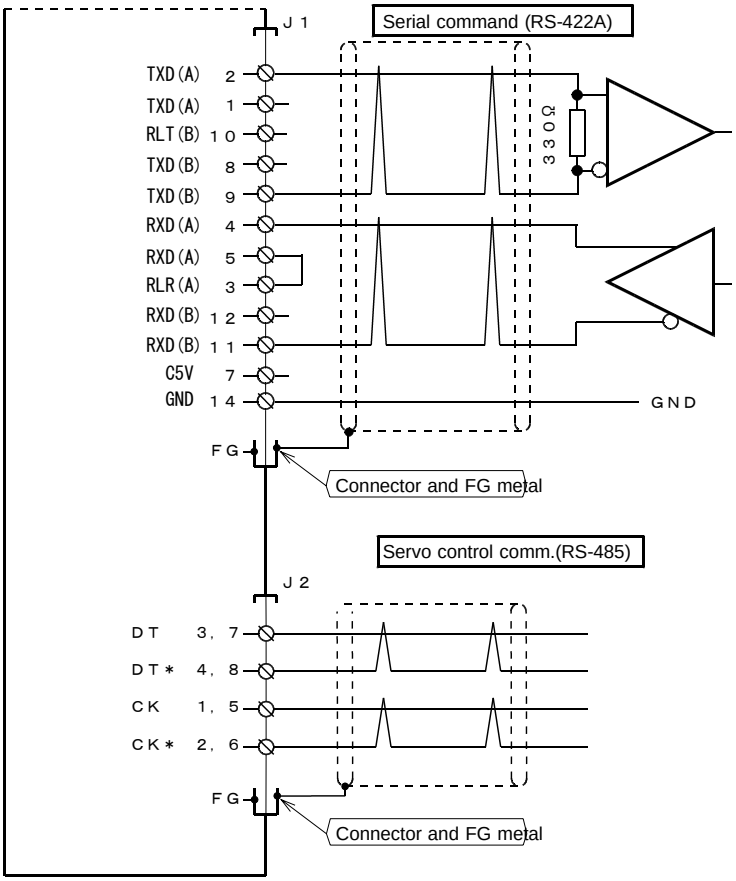
(1) AC100V/200V



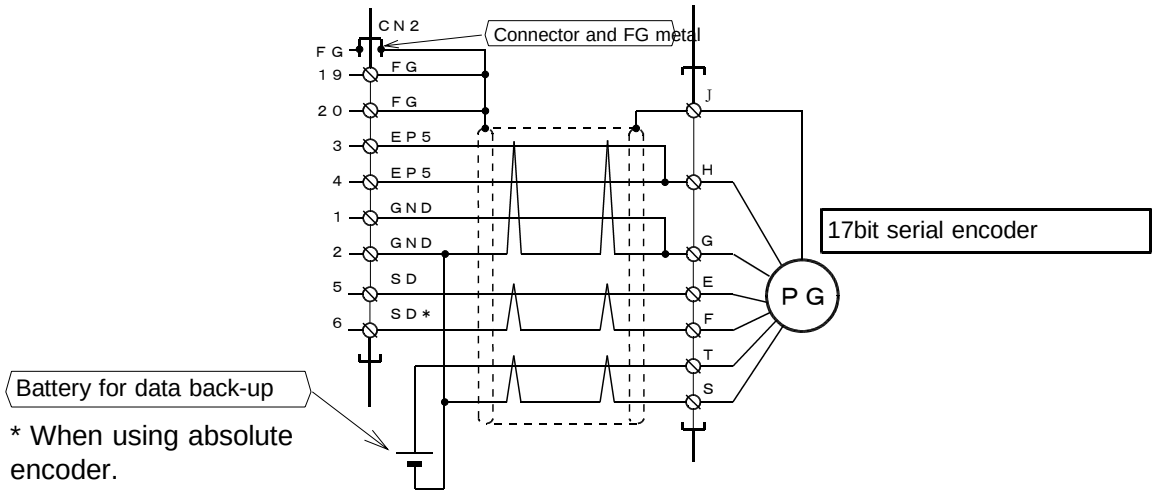
[Fig.6-1(a)] External Wiring Diagram(AC100V/200V) 1/2

*1 : To be used for connecting the magnetic sensor

*2 : For 752/113/153/203, it will be DC 24V. (Refer to page 6-3)

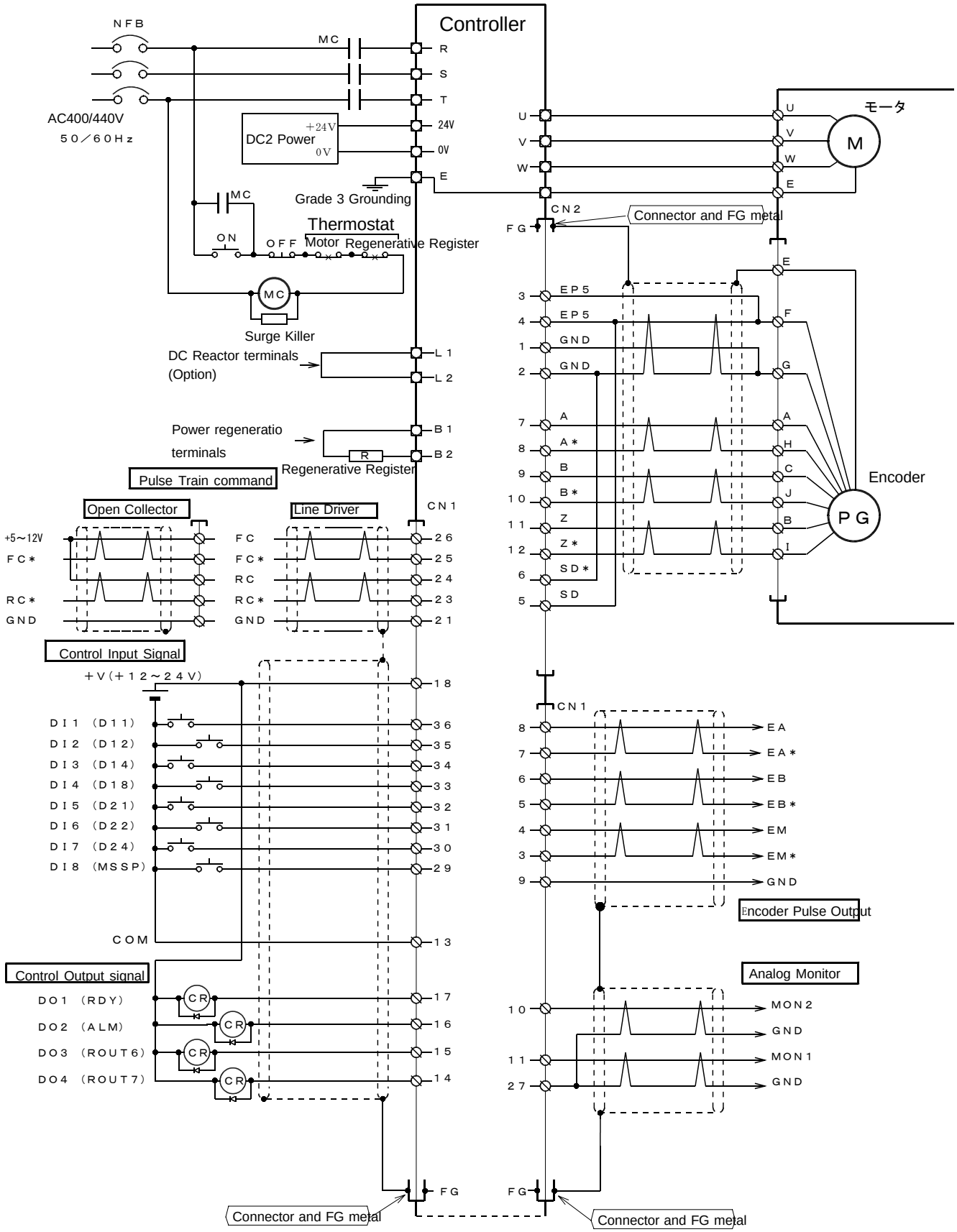


Note 1: Provide a power supply with specified voltage and current for control input signals by your side.
Note 2: COM of CN1 connector is common to control I/O signals. And GND is common to the internal control power of the controller (+5V).
Note 3: Since COM of CN1 and GND are isolated, do not make 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: In case of using an extension board, refer to other manual「Volume: Option」.
Note 8: ( ) in a signal I/O name,is initial setting value of parameter.
Note 9: DC reactor connection terminal is available for the device capacity 752 or higher (DC reactor is option)
Note 10: Connect GND of pulse train command when an optional line receiver input is used.
Note 11: Connection of the 17-bit serial encoder is as follows.

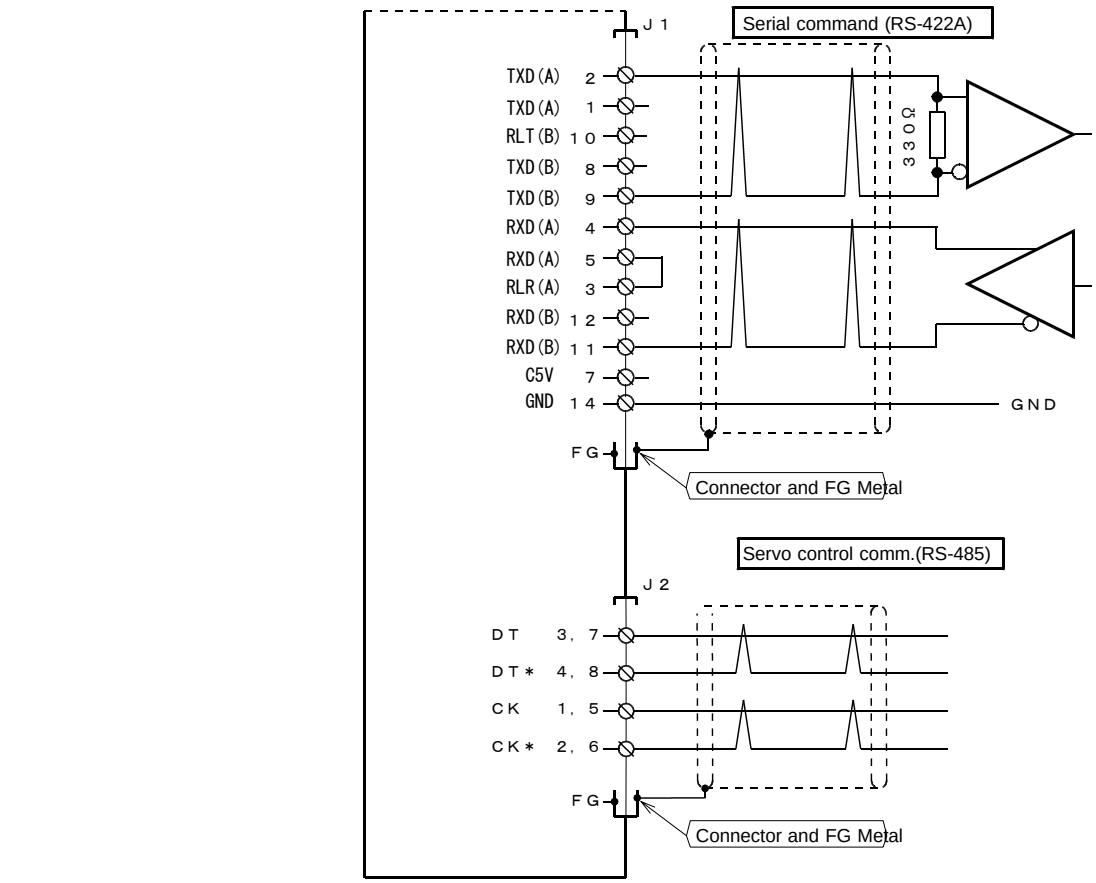


[Figure 6-1(b)] External Wiring Diagram(AC100V/200V) 2/2

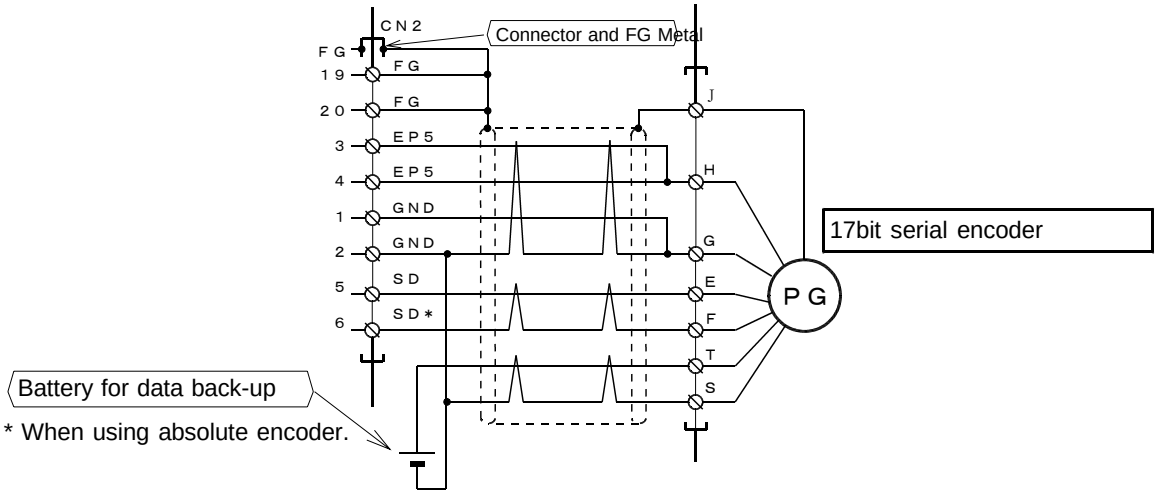
(2) AC400V



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



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: In case of using an extension board, refer to other manual「Volume: Option」.
Note 8: ( ) in a signal I/O name,is initial setting value of parameter.
Note 9: DC reactor connection terminal is available for the device capacity 752 or higher (DC reactor is option)
Note 10: Connect GND of pulse train command when an optional line receiver input is used.
Note 11: Connection of the 17-bit serial encoder is as follows.



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

6-2 Input and Output Signals

6-2-1 Input and Output Signal List

⚠ Caution
Since COM (common of control I/O signal power) and GND (common of internal control power +5V) are isolated, do not use common wiring but also put them in a same bundle.) Since some signals which can not be used in standard specification are also described in this manual, please note it.

* Please provide power source +V（+24V,0.5A）for control I/O signals, by your side.

Signal name	Mark	Terminal №	I/O	Function
Deviation clear	CLR	———	———	● When this and COM terminals are short-circuited (signal ON), the deviation counter is cleared and a motor stops by zero speed command. ● If this signal is inputted in running of a motor, the motor stops, immediately. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● When it is inputted, [CLR] is lit in the LCD module display.
Command pulse input inhibit Related parameter (P600)	CIH (*)	———	———	● If the COM terminals are shortened (Signal ON), the master axis pulse train command becomes invalid and goes into the master axis position renewal stopping conditions. ● This signal becomes valid in the automatic operation [running positioning operation]. ● This signal is valid in Pulse train run. Effective logic of this signal can be changed by a parameter. In the case, all the above described conditions of short-circuit/ release between COM terminal become opposite. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● When it is inputted, [CIH] is lit in the LCD module display.
Reset	RST	———	———	● When this and COM terminals are short-circuited (signal ON),the detecting alarm is reset and the alarm signal is turned OFF. ● During this signal is inputted, a motor is in torque free status and Brake release signal (BRK) and Servo ready signal (RDY) are not outputted. When the signal is again turned OFF, Brake release signal and Servo ready signal (RDY) are outputted and the controller returns to normal operation. ● This signal is valid in all modes. ● This signal is activated by a 3msec. or longer pulse signal. ● This signal is also used as a release signal of Emergency stop. ● Alarm can be reset by re-inputting power to the controller. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● When it is inputted, [RST] is lit in the LCD module display. [Note] Alarm reset shall be made after removing the cause

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

Signal name	Mark	Terminal No.	I/O	Function
Emergency stop Related parameter (P710) (P711) (P712)	EMG*	———	———	● When this and COM terminals are opened (signal ON), a motor stops in accordance with the stop method, and decal. time specified by a parameter. In the case, Servo ready (RDY) is OFF. ● After the motor stops and time set by a parameter passes, the motor becomes in torque free, and Brake release signal (BRK) is turned OFF. ● Emergency stop status can be released by short-circuiting this signal and COM terminal and inputting Reset (RST) signal. ● In short-circuit status between this signal and COM terminal, normal operation can be conducted. ● This signal is valid in all modes. ● This signal is activated by a 6msec. or longer pulse signal. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● When this and COM terminals are opened, [EMG] is lit in the LCD module display and when Emergency stop status is released, [EMG] is lit off.
Servo ON Related parameter (P704)	SON (*)	———	———	● When this and COM terminals are short-circuited (signal ON), power transistors are driven and power is supplied to a motor. ● When this and COM terminals are opened, the motor becomes in torque free. ● When this and COM terminals are opened in running of a motor, the motor conducts free run stop. ● When this and COM terminals are opened, Brake release signal (BRK) and Servo ready signal (RDY) are not outputted. ● This signal is valid in all modes. ● Effective logic of this signal can be changed by a parameter. In the case, all the above described conditions of short-circuit/ release between COM terminal become opposite. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● When this signal is inputted by effective logic, [SON] is lit in the LCD module display.

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

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

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

MD2</td><td>———

———</td><td>———

———</td><td>● When this and COM terminals are short-circuited (signal ON), by the combination of MD1,MD2, each Run mode can be selected.
<table>
<tr><th>MD2</th><th>MD1</th><th>Run mode</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Manual run</td></tr>
<tr><td>OFF</td><td>ON</td><td>Zero return run</td></tr>
<tr><td>ON</td><td>OFF</td><td>Auto. run</td></tr>
<tr><td>ON</td><td>ON</td><td>Servo Lock</td></tr>
</table>
● Shifting time to a new mode after switching the both signals can be set in the range of 0～9.99sec. (Resolution 10ms). (Initial value: 0.01sec.) However, actual time is 0.01 sec. longer than the set value.
● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738.
● When it is inputted, [MD1] or [MD2] is lit in the LCD module display, respectively.</td></tr>
<tr><td>Proportional control selection</td><td>PC</td><td>———</td><td>———</td><td>● When this and COM terminals are short-circuited (signal ON), Speed loop control changes from proportional plus integral (PI) control to proportional control.
● This signal is valid in all modes.
● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738.
● When it is inputted, [PC] is lit in the LCD module display.</td></tr>
<tr><td>Torque limit

Related parameter
(P125)
(P126)
(P127)
(P128)</td><td>TL</td><td>———</td><td>———</td><td>● When this and COM terminals are short-circuited (signal ON), motor output torque is restricted to External torque limit command voltage (TL+, TL-) value (300% torque/ +10V), if -1 is set to Torque limit value2(+/-) of parameters (P127, P128), and restricted to set value of the parameters if 0～799 is set to them.
● When this and COM terminals are opened, only torque limit value 1(+/-) of the parameter is effective.
● When this and COM terminals are short-circuited, if setting of Torque limit value 1(+/-) of the parameter is lower than (TL+, TL-) or Torque limit value 2, Torque limit value 1 is applied.
● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738.
● When it is inputted, [TL/RJ] is lit in the LCD module display.</td></tr>
</table>

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

Signal name	Mark	Terminal No.	I/O	Function
Forward over travel Related parameter (P705)	FOT*	———	———	*This signal is forward travel (stroke end) signal. ● When this and COM terminals are opened(signal ON), travel limit point is recognized and a motor suddenly stops and becomes in servo lock. ● When this and COM terminals are opened, a motor can move only to reverse direction. ● When this and COM terminals are short-circuited, a motor is recognized that it stays in normal travel range and can move normally. ● This signal is valid in all modes. ● (Enable/ Disable) of this signal can be selected by a parameter. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● When this and COM terminals are opened, [FOT] is lit in the LCD module display.
Reverse over travel Related parameter (P705)	ROT*	———	———	*This signal is reverse travel (stroke end) signal. ● When this and COM terminals are opened(signal ON), travel limit point is recognized and a motor suddenly stops and becomes in servo lock. ● When this and COM terminals are opened, a motor can move only to forward direction. ● When this and COM terminals are short-circuited, a motor is recognized that it stays in normal travel range and can move normally. ● This signal is valid in all modes. ● (Enable/ Disable) of this signal can be selected by a parameter. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● When this and COM terminals are opened, [ROT] is lit in the LCD module display.
Speed override	OR1 OR2 OR3 OR4	——— ——— ——— ———	——— ——— ——— ———	● This signal can be set 10%～150%（Resolution 10%）,15 step ratios. ● OR4～OR1 are handled as binary data (4bits) and correspond to bit 3～0, respectively. ● When all OR4～OR1 and COM terminals are opened, Override function is invalid (100%). ● When this and COM terminals are short-circuited, this signal is turned ON and override data are read by 4 bit data. And motor speed changes in real time. ● Motor speed is determined by next expression. Travel speed＝Command speed×Override ratio However if speed after override works becomes higher than motor rated speed, it is clamped at 120% speed. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● Currently applied override ratio（10～150%）selected by Diagnosis display mode in the LCD module is displayed.

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

Signal name	Mark	Terminal No.	I/O	Function
Forward jog Related parameter (P400) (P401) (P402) (P403) (P404) (P405) (P406) (P407) (P408)	FJOG	———	———	* In Manual run mode ● When this and COM terminals are short-circuited (signal ON) for more than 6[ms], one shot of Forward jog (min. setting unit of travel) is conducted. And when it is longer than 100[ms], Reverse jog is conducted. ● When it is OFF, Forward jog stops. And if Reverse jog signal (RJOG) is turned ON when this signal is ON, Forward jog stops. *In Zero return run mode ● When this and COM terminals are short-circuited (signal ON), Forward zero return is conducted. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● When this and COM terminals are short-circuited, [DR/FJ] is lit in the LCD module display.
Reverse jog Related parameter (P400) (P401) (P402) (P403) (P404) (P405) (P406) (P407) (P408)	RJOG	———	———	* In Manual run mode ● When this and COM terminals are short-circuited (signal ON) for more than 6[ms], one shot of Reverse jog (min. setting unit of travel) is conducted. And when it is longer than 100[ms], Reverse jog is conducted. ● When it is OFF, Reverse jog stops. And if Forward jog signal (FJOG) is turned ON when this signal is ON, Reverse jog stops. *In Zero return run mode ● When this and COM terminals are short-circuited (signal ON), Reverse zero return is conducted. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● When this and COM terminals are short-circuited, [TL/RJ] is lit in the LCD module display.
Jog speed selection Related parameter (P400) (P401)	JOSP	———	———	● When this and COM terminals are short-circuited (signal ON), Jog speed is set by the parameter [P401]. ● When this and COM terminals are opened (signal OFF), Jog speed is set by the parameter [P400]. ● Signal status immediately changes regardless to Jog direction. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● Currently applied jog speed selected by Diagnosis display mode in the LCD module is displayed.
Zero point decel. Related parameter (P402) (P403) (P404) (P405) (P406) (P407) P408) (P610)	ZLS	———	———	● When this and COM terminals are short-circuited (signal ON) in Zero return run, Zero point decal. starts. In case of standard Zero return, ON status of this signal shall be continued from start to completion of Zero point decal. (Keep ON status at zero point.) ● If it is already ON when Zero return run starts, a motor once moves to opposite direction to Zero return direction, and after confirming this signal, conducts Zero return run. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● When this and COM terminals are short-circuited, [ZLS] is lit in the LCD module display.

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

<table>
<tr><th>Signal name</th><th>Mark</th><th>Terminal No.</th><th>I/O</th><th>Function</th></tr>
<tr><td>Address selection</td><td>PS1
PS2
PS3
PS4
PS5
PS6
PS7
PS8</td><td>———
———
———
———
———
———
———
———</td><td>———
———
———
———
———
———
———
———</td><td>● This selects start address of Auto. run.
<table><tr><th>Select. signal</th><th>Selected address</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>● When Auto. start signal (PST) is inputted, it is read as an executing address data.
● This signal can select address 0～255.
● PS8～PS1 are handled as 8 bit binary data, ‘1’is applied when this and COM terminals are short-circuited (signal ON).
● Relation of signals and corresponding bits are in the above tabulation.
● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738.
● Currently selected address and address command Diagnosis display mode in the LCD module can be confirmed.</td></tr>
<tr><td>Auto.
start</td><td>PST</td><td>———</td><td>———</td><td>● When this and COM terminals are short-circuited (signal ON), the address command selected by parameters Address selection（PS1～PS8）is executed.
● It works as re-starting signal for Auto. run hold and Block stop.
● Auto. start signal inputted by an external signal can be prohibited by External auto start prohibit signal (EPIH).
● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738.
● When this signal is inputted and in Auto. run, [PST] is lit in the LCD module display.</td></tr>
<tr><td>Extern al auto.
start
inhibit</td><td>EPIH</td><td>———</td><td>———</td><td>● When this and COM terminals are short-circuited (signal ON), this prohibits Auto. start signal. (But Auto. start by signals of Serial communication, Sequence control, and remote sequence can not be prohibited.)
● If External Auto. start inhibit signal (EPIH) is turned OFF when Auto. start signal by an external input is ON status, Auto. start signal is accepted.
● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738.
● When this signal is inputted, the signal allocated to [STIN] of Diagnosis display mode becomes "1".</td></tr>
</table>

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

Signal name	Mark	Terminal No.	I/O	Function
Hold	HLD	———	———	● When this and COM terminals are short-circuited (signal ON), Run motion is held. ● To return from Hold status after turning OFF this signal, In Zero return run : Turn ON Forward jog signal (FJOG) or Reverse jog signal (RJOG). In Auto. run : Turn ON Auto. start signal (PST). ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● In Hold status, [HLD] is lit in the LCD module display.
External trigger Related parameter (P610)	TRG	———	———	● When activating the mark sense start in the running positioning operation, and if the COM terminals are shortened (Signal ON), the running positioning operation is started. ● This signal is valid in the [Mark signal wait conditions] of the running positioning mark sense start. ● In this unit, the external trigger positioning is not conducted at the positioning command (POS, SPOS, CONT, REPT). Note here that the external trigger positioning operation is not conducted even when this signal is applied by effecting the external trigger positioning with these commands. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● When it is inputted, [TRG] is lit in the LCD module display.
M complete	MFIN	———	———	● When this and COM terminals are short-circuited (signal ON), M strobe output signal (MSTB) is turned OFF and next command will be executed. ● This signal is valid in Auto. run. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● When this signal is inputted, the signal allocated to [STIN] of Diagnosis display mode becomes "1".
Block stop	BSTP	———	———	● If this and COM terminals are short-circuited (signal ON) during Auto. run command is executed, Auto. run stops block by block and waits for re-start (Block stop). ● When this units starts in Block stop ON status, after the unit executes one block, it stops and waits for a restart command. ● Detection and treatment of this signal is determined by corresponding different commands. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● When this signal is inputted, the signal allocated to [STIN] of Diagnosis display mode becomes "1".
Program cancel	PCAN	———	———	● If this and COM terminals are short-circuited (signal ON) during Auto. run command is executed, Auto. run will be cancelled (It releases Stops/ Hold of Auto. run / Block stop status.) ● If it is turned ON in running of a motor, the motor conducts decal. Stop in accordance with decel. time selected by each command. ● In motor stop condition or after a motor stops, the unit waits for a re-start signal by Address set. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● When this signal is inputted, the signal allocated to [STIN] of Diagnosis display mode becomes "1".

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

Signal name	Mark	Terminal No.	I/O	Function
Speed gain selection Related parameter (P111～P115)	GSEL	———	———	● When this and COM terminals are short-circuited (signal ON), Speed loop gain is controlled by setting of P111～ P115. ● When this and COM terminals are opened (signal OFF), Speed loop gain is controlled by setting of P101～P105 orP106～P110. (Since in this manual, unless specified that GSEL signal is ON, this signal is handled as OFF status.) ● This signal is valid in all modes. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● When this signal is inputted, the signal allocated to [STIN] of Diagnosis display mode becomes "1".
Forced brake ON	BRON	———	———	● When this and COM terminals are short-circuited (signal ON), Brake release signal（BRK）is compulsory turned to brake status. (In this manual, unless specified, this signal is handled as OFF status.) ● This signal is allocated to the external input signal by the parameter. ● This signal is valid in all modes. ● In initial status, external input signals are not allocated. If necessary, allocate them by P737/738. ● When this signal is inputted, the signal allocated to [STIN] of Diagnosis display mode becomes "1".
Encoder feedback Pulse related parameter (P001) (P002)	A,A* B,B* Z,Z*	CN2	I-3	● Inputs the feedback pulse signal from the encoder and linear sensor installed in the motor. ● Inputs 90^{O} phase difference 2 signal (A-phase, B-phase) and marker signal (Z-phase) of the line driver output (26LS31 compatible).
Insert magnetic sensor Related parameter (P010) (P011)	PS, PS*, PC, PC*	CN2	I-4	● Inputs the feedback signal from the magnetic sensor installed in the motor.
Torque limit command ＋, － Related parameter (P127) (P128)	TL＋ TL－	——— ———	——— ——— Analog	● This is a dedicated signal when our option unit (Extension unit 1 of control I/O) is selected at shipment of our factory. ● When Torque limit signal (TL) is inputted, output torque is restricted to lower value of Torque limit command value or Torque limit value of a parameter. ● By TL+ command, forward drive torque is limited. ● By TL- command, reverse drive torque is limited. ● Referring to GND terminal voltage, input positive voltage to both of TL+ and TL-. Input range is DC 0～+10V and when DC+10V is inputted in both cases, limit value becomes 300 % torque.

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

Signal name	Mark	Terminal No.	I/O	Function
Cut-off control Related parameter (P812) (P813) (P814)	D11	CN1-36	I-1	● In the operation of returning system running positioning control, and this signal is kept ON for more than 6 ms when the slave axis speed is synchronizing with the master axis speed, the cut-off control is conducted. ● Distance of the cut-off control is set with the parameter [P812]. ● Acceleration ratio of the cut-off control is set with the parameter [P813] and [P814]. ● In the initial setting, it is allocated to the external input signal [DI1]. ● At the signal input, a signal corresponding to [STIN] allocated, in [Diagnosis display mode], becomes "1".
Forced synchronization end Related parameter (P805)	D12	CN1-35	I-1	● In the operation of returning system running positioning control, and this signal is kept ON for more than 6 ms when the slave axis speed is synchronizing with the master axis speed, the returning operation to the wait position is conducted switching OFF the 1-cycle output and in-the-synchronization output. ● Yes/No of the forced synchronization end is set with the parameter [P805]. ● If there is no input of this signal when the parameter [P805] is valid, it stops with an alarm at the synchronization end position. ● In the initial setting, it is allocated to the external input signal [DI2]. ● At the signal input, a signal corresponding to [STIN] allocated, in [Diagnosis display mode], becomes "1".
Forced start	D14	CN1-34	I-1	● In the state of the wait position return end of the running positioning control operation, and this signal is kept ON for more than 6 ms, the start operation is conducted forcefully. When the cycle end and this signal are input, the cycle end has a priority. ● In the initial setting, it is allocated to the external input signal [DI3]. ● At the signal input, a signal corresponding to [STIN] allocated, in [Diagnosis display mode], becomes "1".
Master axis selection Related parameter (P830) (P831)	D18	CN1-33	I-1	● If the COM terminals are shortened (Signal ON), the internal master axis selection becomes effective and the frequency being set with the parameter [P830] or [P831] is generated based on the status of the internal master axis speed selection signal (MSSP). ● By opening the COM terminals (Signal OFF), the input from the outside becomes effective for the master axis command. ● In the initial setting, it is allocated to the external input signal [DI4]. ● At the signal input, a signal corresponding to [STIN] allocated, in [Diagnosis display mode], becomes "1".

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

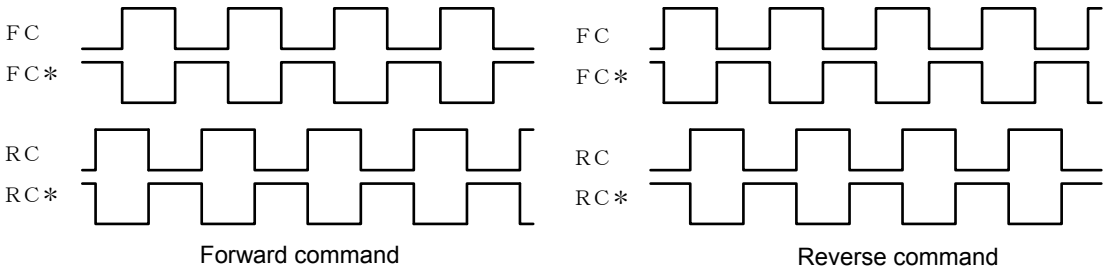
Signal name	Mark	Terminal No.	I/O	Function
Cycle end	D21	CN1-32	I-1	● f this signal is kept ON for more than 6 ms during the operation of the running positioning control, it becomes the command end when the slave axis reaches the wait position. ● After the cycle end, the next command is conducted. ● In the initial setting, it is allocated to the external input signal [DI5]. ● At the signal input, a signal corresponding to [STIN] allocated, in [Diagnosis display mode], becomes "1".
Mark inhibit	D22	CN1-31	I-1	● It conducts the mark signal Valid/Invalid selection in the running positioning operation by the mark signal. ● At the ON status, the mark signal input becomes invalid (Inhibit). ● At the OFF status, the mark signal input becomes valid. ● In the initial setting, it is allocated to the external input signal [DI6]. ● At the signal input, a signal corresponding to [STIN] allocated, in [Diagnosis display mode], becomes "1".
Cut-off length measurement	D24	CN1-30	I-1	● When this signal is kept ON for more than 6 ms, the cutting length, at the time where this signal is ON, is displayed at the [ST21] of [Motion status display mode]. ● In the initial setting, it is allocated to the external input signal [DI7]. ● At the signal input, a signal corresponding to [STIN] allocated, in [Diagnosis display mode], becomes "1".
Internal master axis speed selection Related parameter (P830) (P831)	MSSP	CN1-29	I-1	● It selects the internal master axis speed at the time of the internal master axis selection (D18 ON). ● If the COM terminals are shortened (Signal ON), the internal master axis speed becomes a set value of the parameter [P831]. ● If the COM terminals are opened (Signal OFF), the internal master axis speed becomes a set value of the parameter [P830]. ● In the initial setting, it is allocated to the external input signal [DI8]. ● At the signal input, a signal corresponding to [STIN] allocated, in [Diagnosis display mode], becomes "1".

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

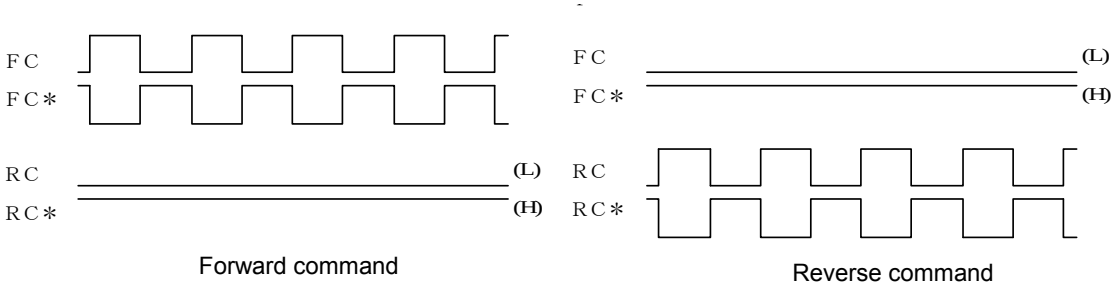
<table>
<tr><th>Signal name</th><th>Mark</th><th>Terminal No.</th><th>I/O</th><th>Function</th></tr>
<tr><td>Pulse train command

- Input pulse style when Line driver is used

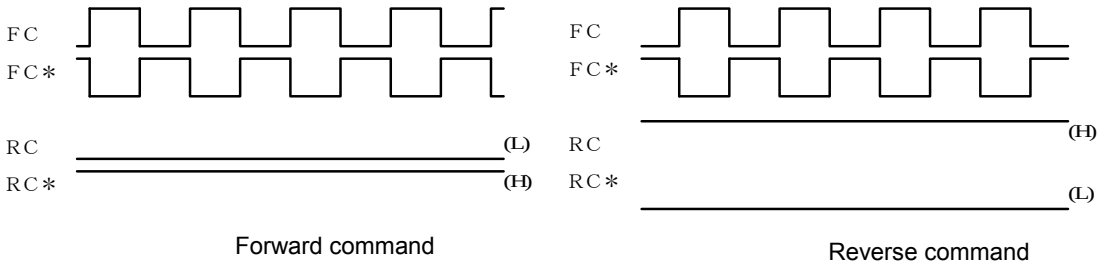
90° different phase



Directional pulse

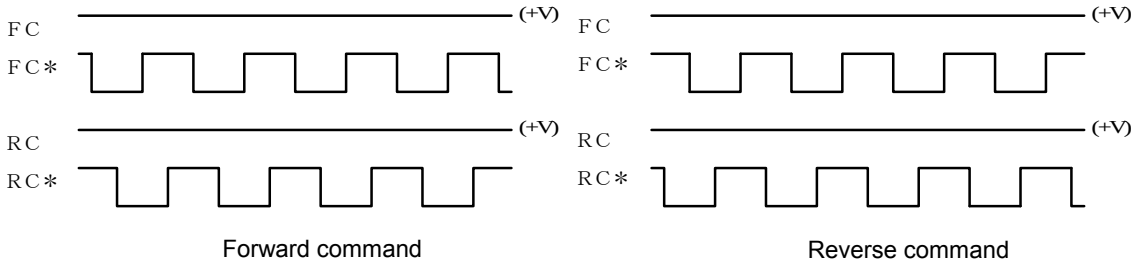


Direction + Feed pulse



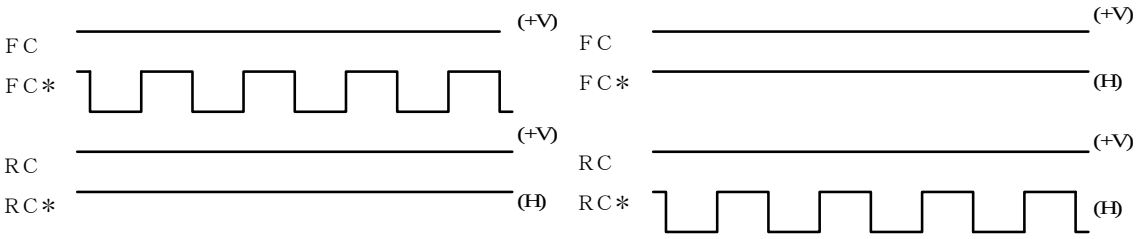
- Input pulse style when Open collector is used

90°different phase



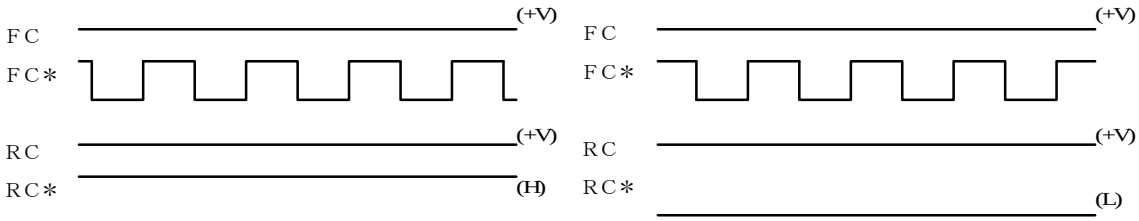
Forward command　　Reverse command

Directional pulse



Forward command　　Reverse command

Direction + Feed pulse



Forward command　　Reverse command

Note)＋V is ＋5～12V power source

Signal name	Mark	Terminal No.	I/O	Function
Alarm Related parameter (P142) (P715)	ALM (*)	CN1-16	O - 1	● When Alarm occurs, a motor suddenly stops or conducts torque free stop.（It depends on Alarm contents.） ● When Alarm occurs, this signal is ON (This and COM terminals are opened.）, and simultaneously Servo ready signal (RDY) is OFF. When a motor is in torque free, Brake release signal (BRK) is OFF. ● Normally, this signal is OFF status.(This and COM terminals are closed.) ● Alarm is reset by Reset signal (RST) input or power re-input, and at the time when Reset signal (RST) is inputted, this signal is OFF. ● This signal is an open collector output isolated to the internal power supply. ● In initial status, it is allocated to the external output signal[D02]. ● When this signal is outputted, [ALM] is lit in the LCD module display, and Alarm contents are displayed in the status display 7 segment LEDs.
Servo ready Related parameter (P716)	RDY	CN1-17	O - 1	● When motor control becomes ready to work, this signal is ON.（This and COM terminals are closed.） ● If Servo ON signal (SON) OFF or a motor is in Torque free, when Alarm occurs, this signal is OFF. (This and COM terminals are opened.） ● When Alarm is reset by inputting Reset signal (RST) or power after the Alarm occurs, this signal recovers. ● During Reset signal (RST) is inputted, this signal is OFF and after Reset signal is OFF again, this signal is turned ON. ● When power is supplied, this signal output will be delayed max.3.0sec due to internal power reset time of the control. And this signal output is delayed max. 3msec when Servo ON (SON) signal is inputted and max. 1.0sec when Reset signal (RST) is inputted due to internal computing time of the controller. ● Consider above described timing to External power input and trouble treatment sequence. ● This signal is an open collector output isolated to the internal power supply. ● In initial status, it is allocated to the external output signal[D01]. ● When it is outputted, [RDY] is lit in the LCD module display.

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

Signal name	Mark	Terminal No.	I/O	Function
Warning Related parameter (P715)	WNG (*)	———	———	● In some cases, an error could be sensed and a controller will stop if current Run is continued. In the case, this signal is turned ON as Alarm signal. (This and COM terminals are closed.) ● When this signal is outputted, Run motion does not stop. ● When it is confirmed that an error will not occur, this signal is OFF. (This and COM terminals are opened.) ● This signal is outputted by the following warnings. 1) Over load warning 2) Deviation error warning 3) Under voltage of main power warning Those contents can be referred to tab.12－4 [Warning list]. ● This signal is an open collector output isolated to the internal power supply. ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When this signal is outputted, [WNG] is lit in the LCD module display, and Warning contents are displayed in the status display 7 segment LEDs.
Positioning complete Related parameter (P202)	PN	———	———	● When Zero return run is completed in Zero return run, this signal is ON. (This and COM terminals are closed.) ● In Auto. run, when difference of current position and Positioning data goes in the setting range of the parameter[P202]after Positioning command is completed, this signal is ON. ● This signal is also OFF at [Auto. run start],[Run mode change],[Servo OFF],[Alarm occurrence], and[Emergency stop, Reset, Deviation clear, Program cancel signal ON]. ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When it is outputted, [PN] is lit in the LCD module display.
Torque limit Related parameter (P125) (P126) (P127) (P128)	LIM	———	———	● In all modes, this signal becomes ON (COM terminals are conducted electrically) when entered into the torque limit area. On the contrary, this signal becomes OFF (COM terminals are opened) when deviated from the torque limit area. In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When it is outputted, [LIM] is lit in the LCD module display.
Speed zero Related parameter (P702)	SZ	———	———	● When motor speed is lower than the setting range of the parameter[P702：Speed zero range]in all modes, this signal is turned ON (This and COM terminals are closed.), and when goes out of the range, this signal is turned OFF (This and COM terminals are opened.) ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When it is outputted, [SZ] is lit in the LCD module display.

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

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

Related parameter (P734)</td><td>BRK</td><td>———</td><td>———</td><td>● Design an external sequence to release a motor brake when this signal is ON (This and COM terminals are closed.).
● This signal is OFF when a motor goes into torque free at Alarm occurrence, Emergency stop, Servo OFF and Reset signal input. (This and COM terminals are opened.)
● This signal is compulsory turned OFF when Forced brake signal(BRON)is ON.
● Time from a motor goes into Torque free to this signal is turned OFF can be set by a parameter.
● In initial status, external input signals are not allocated. If necessary, allocate them by P742.
● When it is outputted, [BRK] is lit in the LCD module display.</td></tr>
<tr><td>Software limit switch

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

SLSB</td><td>———

———</td><td>———

———</td><td>● According to areas set by parameters[P707]～[P709],this signal outputs signals corresponding to the current position area.
● Output status of parameters and each signal is as follows.
<table>
<tr><th>SLSB</th><th>SLSA</th><th>Output condition</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Before Zero return completion</td></tr>
<tr><td>OFF</td><td>OFF</td><td>Current position＜[P707] Set value</td></tr>
<tr><td>OFF</td><td>ON</td><td>[P707]Set value ≦ Current position ＜ [P708]Set value</td></tr>
<tr><td>ON</td><td>ON</td><td>[P708]Set value ≦ Current position ＜ [P709]Set value</td></tr>
<tr><td>ON</td><td>OFF</td><td>[P709]Set value≦Current position</td></tr>
</table>
● Since output of Software limit switch is controlled by the current command position, the output has an error of position deviation against the actual position.
● When machine position is not recognized due to un-completion of Zero return, etc., this signal is always OFF.
● In initial status, external input signals are not allocated. If necessary, allocate them by P742.
● When this signal is outputted, the signal allocated to [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>● Encoder feedback pulse input (CN2) is output.
● EA/EA* and EB/EB* output are 90° phase difference two signals of the line driver output (26LS31 equivalent). Absolutely interface with the line receiver (26LS32 equivalent).
● Marker output of the EM/EM* is the line driver output (26LS31 equivalent). As a factory option, the interface of an open collector output (O -4) which is isolated from the internal control power can be selected.</td></tr>
</table>

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

Signal name	Mark	Terminal No.	I/O	Function
In Manual run	MMOD	———	———	● In Manual run, this signal is ON (This and COM terminals are closed.). ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When it is outputted, [JOG] is lit in [Mode display screen] of the LCD module display.
In Zero return run	HMOD	———	———	● In Zero return run, this signal is ON (This and COM terminals are closed.). ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When it is outputted, [ORG] is lit in [Mode display screen] of the LCD module display.
In Auto. run	AMOD	———	———	● In Auto. run, this signal is ON (This and COM terminals are closed.). ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When it is outputted, [AUTO] is lit in [Mode display screen] of the LCD module display.
In Pulse train run	PMOD	———	———	● In Pulse train run, this signal is ON (This and COM terminals are closed.). ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When it is outputted, [INVALID] is lit in [Mode display screen] of the LCD module display.

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

Signal name	Mark	Terminal No.	I/O	Function
Rough matching Related parameter (P703)	PRF	———	———	● When Zero return run is completed in Zero return run, this signal is ON. (This and COM terminals are closed.) ● In Positioning. when difference of current position and Positioning data becomes less than the setting value of the parameter[P703], this signal is ON. ● This signal is also OFF at [Auto. run start],[Run mode change],[Servo OFF],[Alarm occurrence], and[Emergency stop, Reset, Deviation clear, Program cancel signal ON]. ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When it is outputted, [PRF] is lit in the LCD module display.
Program end	PEND	———	———	● When PEND command or one of POS, HOME, and INDX commands is executed and completed in Auto. run, this signal is ON. (This and COM terminals are closed.) ● This signal is also OFF at [Auto. run start],[Run mode change],[Servo OFF],[Alarm occurrence], and[Emergency stop, Reset, Deviation clear, Program cancel signal ON]. ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When this signal is outputted, the signal allocated to [SOUT] of Diagnosis display mode becomes "1"
Auto. run ready Related parameter (P409)	PRDY	———	———	● When Auto. start signal (PST) is ready to receive a command (Waiting for Auto. run start, HOLD re-start, and Block stop re-start), this signal is ON. (This and COM terminals are closed.) ● This signal is OFF at [Auto. run start],[Run mode change],[Servo OFF],[Alarm occurrence], and[Emergency stop, Reset, Deviation clear, Program cancel signal ON], and [Zero return run is not completed, when the condition is required by Auto. run permit condition (P409).]. ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When this signal is outputted, the signal allocated to [SOUT] of Diagnosis display mode becomes "1"

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

Signal name	Mark	Terminal No.	I/O	Function
General output	OUT1 OUT2 OUT3 OUT4 OUT5 OUT6 OUT7 OUT8	——— ——— ——— ——— ——— ——— ——— ———	——— ——— ——— ——— ——— ——— ——— ———	● In Auto. run, when a command to enable General output is executed, this signal is ON. (This and COM terminals are closed.) ● The signal is held until a command to enable next General output is executed. ● OUT8～OUT1 are handled as 2 binary number data(8bits) and corresponding to bit7～0, respectively. When corresponding bit is“1”, it is ON, and when it is“0”, it is OFF. ● This signal is also OFF at [Auto. run start],[Run mode change],[Servo OFF],[Alarm occurrence], and[Emergency stop, Reset, Deviation clear, Program cancel signal ON]. ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When this signal is outputted, the signal allocated to [SOUT] of Diagnosis display mode becomes "1".
M output	M01 M02 M04 M08 M10 M20 M40 M80	——— ——— ——— ——— ——— ——— ——— ———	——— ——— ——— ——— ——— ——— ——— ———	● In Auto. run, when a command to enable M output is executed, this signal is ON. (This and COM terminals are closed.) ● The signal is held until a command to enable next M output is executed. ● M80～M01 are handled as 2 binary number data(8bits)and corresponding to bit7～0, respectively. When corresponding bit is“1”, it is ON, and when it is“0”, it is OFF. ● This signal is also OFF at [Auto. run start],[Run mode change],[Servo OFF],[Alarm occurrence], and[Emergency stop, Reset, Deviation clear, Program cancel signal ON]. ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When this signal is outputted, the signal allocated to [SOUT] of Diagnosis display mode becomes "1".
M strobe Related parameter (P409)	MSTB	———	———	● In Auto. run, when a command to enable M output is executed, this signal will be ON as a strobe signal after the command is completed. (This and COM terminals are closed.) ● This signal is also OFF at [Auto. run start],[Run mode change],[Servo OFF],[Alarm occurrence], and[Emergency stop, Reset, Deviation clear, Program cancel signal ON], and [Zero return run is not completed, when the condition is required by Auto. run permit condition (P409).]. ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When this signal is outputted, the signal allocated to [SOUT] of Diagnosis display mode becomes "1".

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

Signal name	Mark	Terminal No.	I/O	Function
Running general-purpose output 1-4	ROUT1 ROUT2 ROUT3 ROUT4	———	———	● This signal is set with an index data or a prompt value at the time of running positioning command setting. The set data value is output in 4-bit binary data (0-15). ● When the running general-purpose output is set by the prompt value, the output depends on the prompt value being set with each cycle of the combination patterns. When setting a different running general-purpose output to the combination patterns respectively, it follows the order of numbers (IX**) of the index data. ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When this signal is outputted, the signal allocated to [SOUT] of Diagnosis display mode becomes "1".
1-cycle output	ROUT6	CN1-15	O - 1	● When the running positioning operation is continuously performed, this signal becomes ON during the synchronization of the 1-cycle end operation. The 1-cycle end operation refers to the final running positioning operation when running positioning in order of the running positioning continuous commands (BRC, RRAC). In the single performance, this signal is always ON during synchronization. ● In initial status, it is allocated to an external signal [D03]. ● When this signal is outputted, the signal allocated to [SOUT] of Diagnosis display mode becomes "1".
In-the-synchronization output Related parameter (P802)	ROUT7	CN1-14	O - 1	● When the running positioning control is in operation, and after reaching the synchronizing speed, this signal becomes ON providing the internal deviation amount is in the setting range of the parameter [P802]. ● In initial status, it is allocated to an external signal [D04]. ● When this signal is outputted, the signal allocated to [SOUT] of Diagnosis display mode becomes "1".
Wait position output	ROUT8	———	———	● When the running positioning control is in operation, and at the slave axis waits position return complete, this signal becomes ON. If the slave axis moves from the wait position, this signal becomes OFF. ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When this signal is outputted, the signal allocated to [SOUT] of Diagnosis display mode becomes "1".

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

Signal name	Mark	Terminal No.	I/O	Function
In automatic operation	PRUN	———	———	● This signal becomes ON when the automatic operation is in operation. ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When this signal is outputted, the signal allocated to [SOUT] of Diagnosis display mode becomes "1".
Automatic operation ready1	PRDY1	———	———	● It is turned ON/OFF in the same timing with the automatic operation ready signal. ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When this signal is outputted, the signal allocated to [SOUT] of Diagnosis display mode becomes "1".
Automatic operation ready2	PRDY2	———	———	● When the automatic start signal (PST) becomes [Ready to receive status], this signal becomes ON. However, even in the status where the automatic operation mode is not chosen, this signal becomes ON providing the automatic start signal (PST) is in [Ready to receive status) by choosing the automatic operation mode. ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When this signal is outputted, the signal allocated to [SOUT] of Diagnosis display mode becomes "1".
Zero return complete	HCMP	———	———	● After completion of the Zero return, this signal becomes ON provided the machine position is recognized. ● This signal becomes OFF in the following conditions where the machine position can not be recognized. [At the power ON] [At the encoder error incidence] [At the start of zero return] ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When this signal is outputted, the signal allocated to [SOUT] of Diagnosis display mode becomes "1".
Master axis speed zero Related parameter (P834)	MSZ	———	———	● It becomes ON when the master axis speed is less than the parameter [P834] set value. ● It becomes OFF when the master axis speed exceeds the parameter [P834] set value. ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When this signal is outputted, the signal allocated to [SOUT] of Diagnosis display mode becomes "1".

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

Signal name	Mark	Terminal No.	I/O	Function
Cutting position end edge Related parameter (P806)	MLS	———	———	● When the BRS, BRC command is in operation, this signal is turned ON/OFF comparing the position to follow on the master with the cutting position end edge signal output position (P806). ● When the position to follow on the master exceeds the cutting position end edge signal output position (P806), it turns ON the cutting position end edge signal (MLS signal). ● When the position to follow on the master becomes lower than the cutting position end edge signal output position (P806), it turns OFF the cutting position end edge signal (MLS signal). ● In initial status, external input signals are not allocated. If necessary, allocate them by P742. ● When this signal is outputted, the signal allocated to [SOUT] of Diagnosis display mode becomes "1".
Analog Monitor Related parameter (P700) (P701)	MON1 MON2 GND	CN1-11 CN1-10 CN1-27	O - 4	● This is an Analog monitor output to confirm performance status of a controller and a motor. ● Monitor output can be selected one of next items by parameters (P700, P701)[Monitor 1,2 selection]. (1)Speed command, (2)Speed feedback,(3)torque command, (4)External＋ Torque limit, (5)External－ Torque limit,(6)Position deviation 1（Range：±255 pulses）(7)Position deviation 2（Range：±4080 pulses）(8)NC speed output (9)NC target speed (10)Index data 62, (11)Index data 63 (12)External master axis speed, (13)External master axis acceleration And monitor outputs are, MON1：Selection by P700 MON2：Selection by P701 ● Monitor voltage value can be referred to [10－3 Analog monitor]. ● Output impedance is 1kΩ.
Serial communication Related parameter (P500-599)		J1	IO - 1	● Connecting this with an external unit or an option unit, this conducts Serial communication（RS-422A）. ● Communication condition can be selected by a parameter.
Servo control communication Related parameter (P521～528) (P602)		J2	IO - 2	● Connecting this with an communication unit of other servo control, this conducts Transmission/ Receipt of the servo control data. ● When selected the receive with the parameter, the running positioning operation with the received master axis position data is enabled.

Note 1)* Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.
Note 2) Terminal No. is allocated in the initial status of a parameter.

6-2-2 Remote Signal List

Signal name	Mark	Input Output	Device No.		
			Serial 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 over-travel	FOT*		X0006	M9150	Ymn06
Reverse over-travel	ROT*		X0007	M9151	Ymn07
Mode selection 1	MD1		X000B	M9155	Ymn13
Mode selection 2	MD2		X000C	M9156	Ymn14
Torque limit	TL		X000D	M9157	Ymn15
Command pulse input inhibit	CIH(*)		X000E	M9158	Ymn16
Forced brake ON	BRON		X000F	M9159	Ymn17
Proportional control	PC		X0010	M9160	Ymn20
Address set 1	PS1		X0018	M9168	Ymn30
Address set 2	PS2		X0019	M9169	Ymn31
Address set 3	PS3		X001A	M9170	Ymn32
Address set 4	PS4		X001B	M9171	Ymn33
Address set 5	PS5		X001C	M9172	Ymn34
Address set 6	PS6		X001D	M9173	Ymn35
Address set 7	PS7		X001E	M9174	Ymn36
Address set 8	PS8		X001F	M9175	Ymn37
Auto. start	PST		X0020	M9176	Ymn40
Forward jog	FJOG		X0021	M9177	Ymn41
Reverse jog	RJOG		X0022	M9178	Ymn42
Jog speed selection	JOSP		X0023	M9179	Ymn43
M complete	MFIN		X0024	M9180	Ymn44
Block stop	BSTP		X0025	M9181	Ymn45
Program cancel	PCAN		X0026	M9182	Ymn46
External Auto. start inhibit	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 In device No. column, device No. of Remote control data area corresponding to individual signal is shown.
*2 Regardless to positive/ negative logic, Remote control signal is ON to data“1”, and OFF to data“0”.
*3 mn of Ymn device is 2 digit number displaying interfaced node ID number by an octal number .
*4 Remote input of the external trigger signal is possible; however, it does not practically function. When using the external trigger, do it through the external input.

[Tab. 6-1(a)] Remote Control Signal List 1/4 (Input signal)

Signal name	Mark	Input Output	Device No.		
			Serial communication	Sequence control	Remote sequence control
Internal master speed selection	MSSP	Input	X0030	M9192	Ymn60
Cut-off control	D11		X0038	M9200	Ymn70
Forced synchronization end	D12		X0039	M9201	Ymn71
Forced start	D14		X003A	M9202	Ymn72
Master axis selection	D18		X003B	M9203	Ymn73
Cycle end	D21		X003C	M9204	Ymn74
Mark inhibit	D22		X003D	M9205	Ymn75
Cutting length measurement	D24		X003E	M9206	Ymn76

*1 In device No. column, device No. of Remote control data area corresponding to individual signal is shown.
*2 Regardless to positive/ negative logic, Remote control signal is ON to data“1”, and OFF to data“0”.
*3 mn of Ymn device is 2 digit number displaying interfaced node ID number by an octal number .

[Tab. 6-1(b)] Remote Control Signal List 2/4 (Input signal)

Signal name	Mark	Input Output	Device No.		
			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 complete	PN		X0064	M9212	Xmn04
Rough matching	PRF		X0065	M9213	Xmn05
Brake release	BRK		X0066	M9214	Xmn06
In Torque limit	LIM		X0067	M9215	Xmn07
Program end	PEND		X0068	M9216	Xmn10
Auto. run ready	PRDY		X0069	M9217	Xmn11
In manual run	MMOD		X006A	M9218	Xmn12
In Zero return run	HMOD		X006B	M9219	Xmn13
In Auto. run	AMOD		X006C	M9220	Xmn14
In Pulse train run	PMOD		X006D	M9221	Xmn15
General output 1	OUT1		X0070	M9224	Xmn20
General output 2	OUT2		X0071	M9225	Xmn21
General output 3	OUT3		X0072	M9226	Xmn22
General output 4	OUT4		X0073	M9227	Xmn23
General output 5	OUT5		X0074	M9228	Xmn24
General output 6	OUT6		X0075	M9229	Xmn25
General output 7	OUT7		X0076	M9230	Xmn26
General output 8	OUT8		X0077	M9231	Xmn27
Software limit switch A	SLSA		X007E	M9238	Xmn36
Software limit switch B	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 In device No. column, device No. of Remote control data area corresponding to individual signal is shown.
*2 Regardless to positive/ negative logic, Remote control signal is ON to data“1”, and OFF to data“0”.
*3 mn of Ymn device is 2 digit number displaying interfaced node ID number by an octal number .

[Tab. 6-1(c)] Remote Control Signal List 3/4 (Output signal)

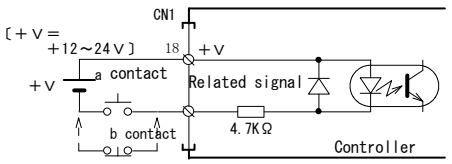
Signal name	Mark	Input Output	Device No.		
			Serial communication	Sequence control	Remote sequence control
In automatic operation	PRUN	Output	X0090	M9256	Xmn60
Automatic operation ready 1	PRDY 1		X0091	M9257	Xmn61
Automatic operation ready 2	PRDY2		X0092	M9258	Xmn62
Zero return complete	HCMP		X0093	M9259	Xmn63
Cutting position end edge	MLS		X0094	M9260	Xmn64
Running general-purpose output 1	ROUT1		X0098	M9264	Xmn70
Running general-purpose output 2	ROUT2		X0099	M9265	Xmn71
Running general-purpose output 3	ROUT3		X009A	M9266	Xmn72
Running general-purpose output 4	ROUT4		X009B	M9267	Xmn73
1-cycle output	ROUT6		X009D	M9269	Xmn75
In synchronization output	ROUT7		X009E	M9270	Xmn76
Wait position output	ROUT8		X009F	M9271	Xmn77

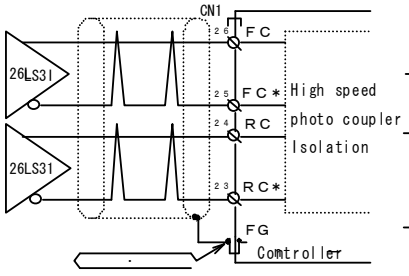
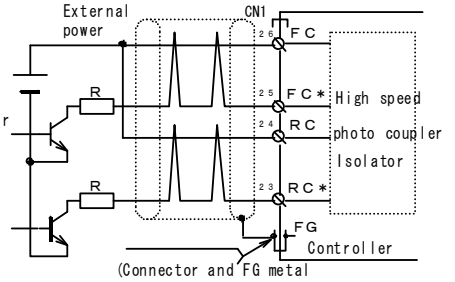
*1 In device No. column, device No. of Remote control data area corresponding to individual signal is shown.
*2 Regardless to positive/ negative logic, Remote control signal is ON to data“1”, and OFF to data“0”.
*3 mn of Ymn device is 2 digit number displaying interfaced node ID number by an octal number .

[Tab. 6-1(d)] Remote Control Signal List 4/4 (Output signal)

6-2-3 Input and Output Interface

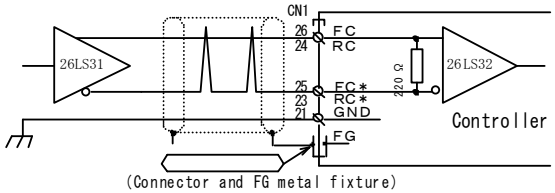
I/O signal type and its equivalent circuit is shown as follows. Individual I/O signal type is described in I/O terminal and circuit number columns of[Tab. 6-2-1 I/O signal list].

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.	Electric specification	Input method	Photo coupler		Line receiver *High speed Pulse train command. In case of an option, Receipt unit
I-2		Pulse train output	Line driver	Open collector	Line driver
Related signal		Min. input pulse width	500ns	2μs	125ns
Pulse train. command		Max. input frequency	1Mpps	250Kpps	4Mpps
FC,FC* RC,RC*		Line driver	26LS31or equiv.	————	26LS31 or equivalent
		Trans. saturation volt.	————	0.9V or less	————
		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	R value
V	0
12V	1kΩ (1/4W)

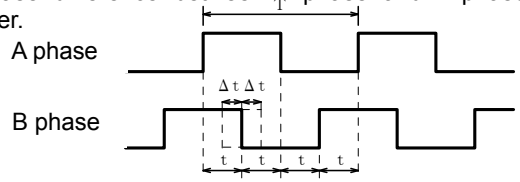
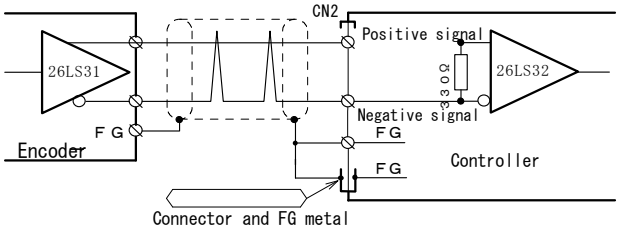
*In some cases, it is better to connect Pulse train command output to each controller GND.



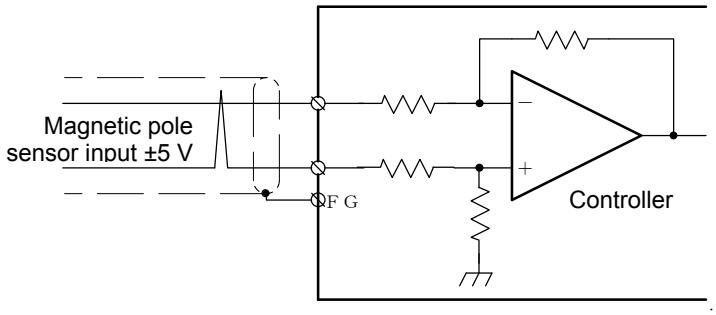
(Connector and FG metal fixture)

(Line receiver input method) (Facttory option)

*1 Please delete noise on supply voltage from an external power supply unit.

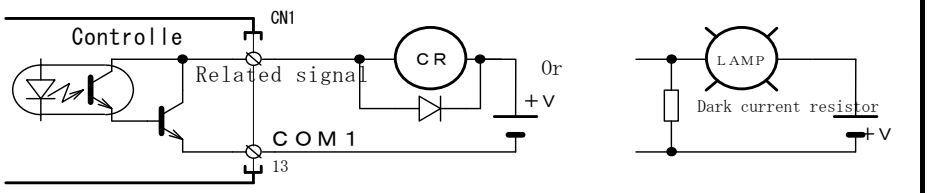
Circuit No. I-3 Related signal Encoder feedback pulse input A,A* B,B* Z,Z* SD,SD*	Electric specification	• In forward run of a motor, B phase is ahead to A phase. • t (Phase difference between A-phase and B-phase) requires 62.5 ns or greater.  t = T／4 Δ t =±T／8
	Circuit	 • Encoder feedback pulse shall 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 No. I-4 Related signal Magnetic pole sensor input PS,PS* PC,PC*	

Circuit No.	Electric specification		
O-1	Isolation method	Photo coupler isolation	ON is defined when this signal and COM terminals are closed.
Related signal	Max.load voltage	DC30V	
	Max.load current	50mA/ 1point	
DO1～4	Leak current	0.1mA or less	
	Saturated current	1.0V or less	

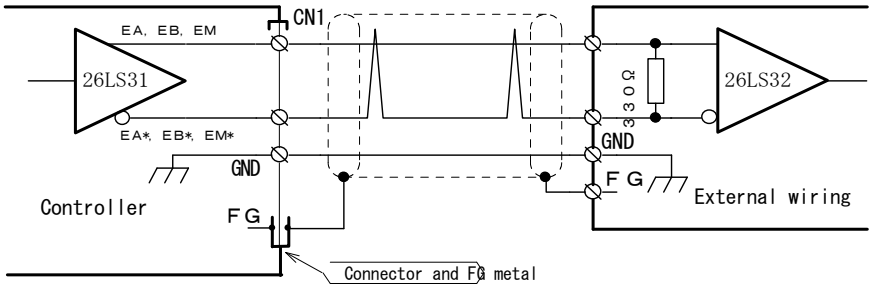
Circuit



- In case of applying an inductive load as a relay, etc., be sure to insert a diode in parallel with the load.
- In case of a lamp lad, insert a dark current resistor to keep current (including rush current) lower than rated value.

Circuit No.
O-2
Related signal
Encoder pulse output EA EA* EB EB* EM EM*

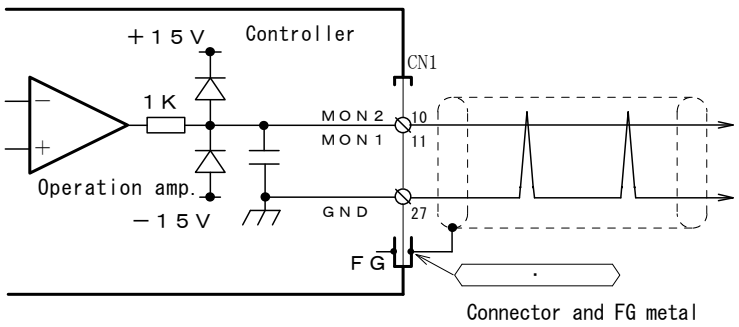
Circuit



- Since outputs use a Line driver(26LS31 or equivalent), interface them with Line receiver(26LS32 or equivalent).
- In forward run of a motor, A phase is outputted ahead of B phase.
- Phase relation of A and B phases is always corresponding to motor running direction and not influenced by motion direction set by a parameter.
- After power is turned ON, a controller is unstable for max. 2 seconds.
- In case of 17 bits serial encoder, there is a delay of 186 μ Sec. in the output. Also, the output width for the marker signal is set to 62 μ Sec.

Circuit No.
O-3
Related signal
Analog Monitor MON1 MON2

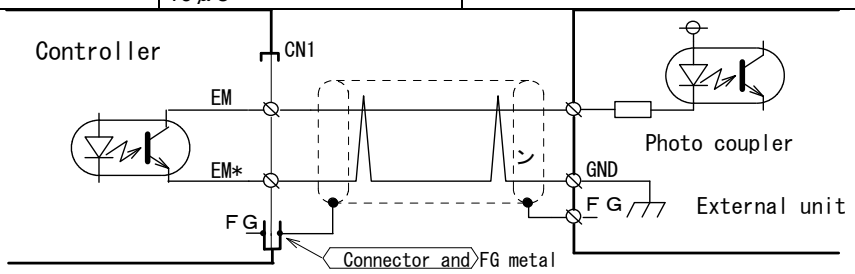
Circuit



- If cable length is longer than 1m, use twist pair shield cables and connect the shields to a connector and FG metal.

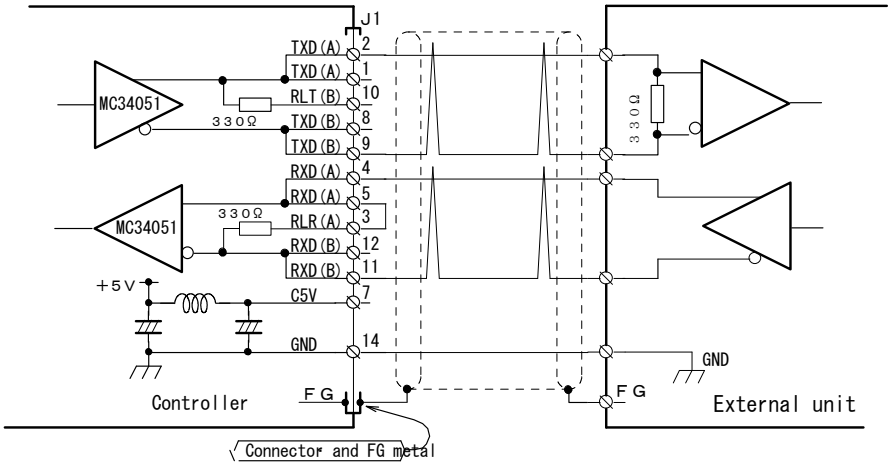
Circuit No.	Electric specification		
O-4	Isolation method	Photo coupler insulation	ON is outputted when Marker signal level is high.
Related signal	Max.load voltag		
Encoder pulse output EM EM* Option (Encoder Marker・Open collector output units)	Max.load current	DC50V	
	Leak current	50mA	
	Saturated current	0.05mA or less	
	Transmission min. pulse width	0.4V or less	
	Width	10 μ s	

Circuit.



Circuit No.
IO-1
Related signal
Serial communication TXD(A) TXD(B) RXD(A) RXD(B) RLR(A)

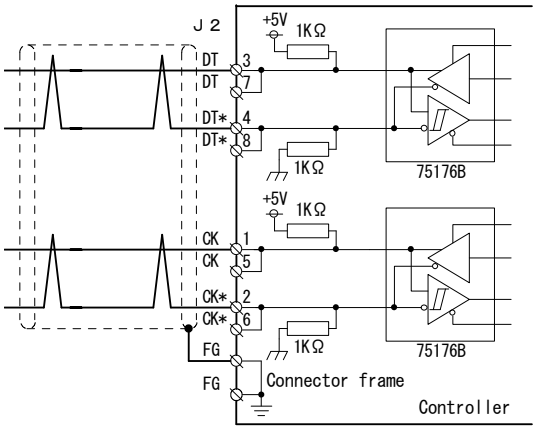
Circuit



- Communication method is RS-422A.
- The communication terminal controller shall be connected an internal terminating resistor by connecting RLR(A) and RXD(A) terminals. And an external unit shall be connected a terminating resistor, as well.

Circuit No.
IO-2
Related signal
Servo control communication DT DT* CK CK*

Circuit



- Communication method is RS-485.
- The communication terminal controller shall be connected a terminating resistor.

6-3 Connector Pin Layout

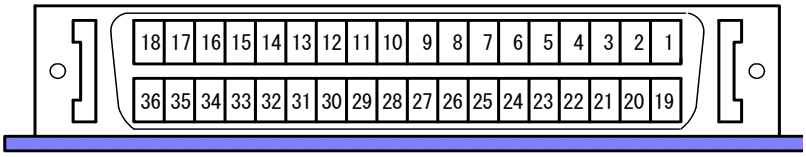
6-3-1 Control I/O Signal Connector (CN1)

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)

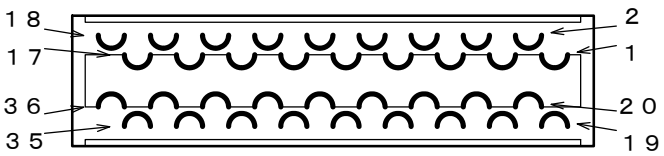
Applied connector　:Receptacle / 10236-52A2JL（3M product）
Applicable cable side　connector　:Soldered plug / 10136-3000VE
:Case (shell) / 10336-52AO-008

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.



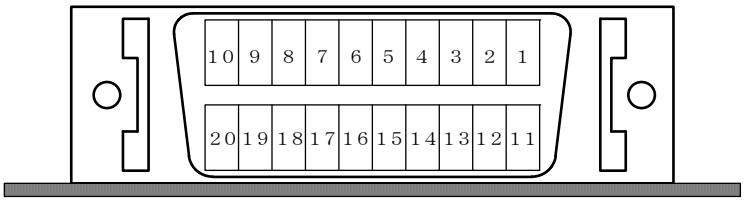
[Tab. 6-2] Connector CN1 Terminal Layout

6-3-2 Encoder Feedback Pulse Input Connector (CN2)

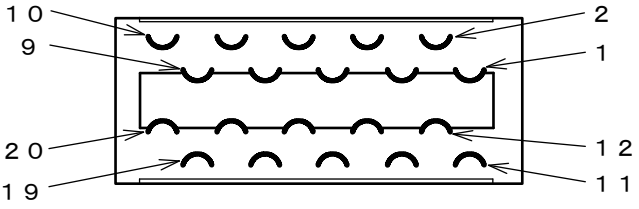
No.	Mark.	Signal name	No.	Mark.	Signal name
1	GND	Encoder power common	11	Z	Encoder marker signal input(+)
2	GND	〃	12	Z*	〃 (-)
3	EP5	Encoder power （+5V）	13	PS	Magnetic sensor input *3
4	EP5	〃	14	PS*	Magnetic sensor input *3
5	SD	ABS position data (+)	15	PC	Magnetic sensor input *3
6	SD*	〃 (-)	16	PC*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

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 si

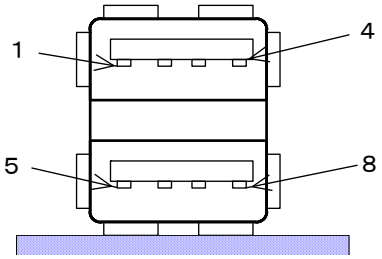
[Tab. 6-3] Connector CN2 Terminal Layout

6-3-3 Servo Control Communication Connector (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.



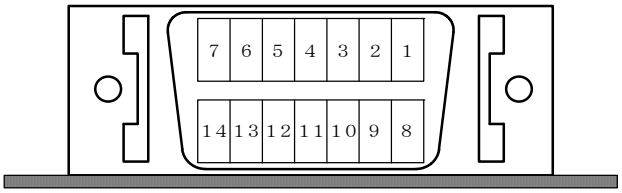
[Tab. 6-4] Connector J2 Terminal Layout

6-3-4 Serial Communication Connector (J1)

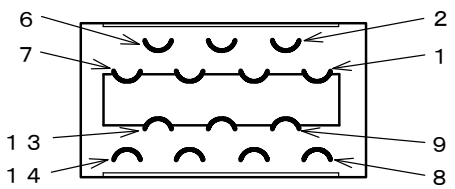
No.	Mark.	Signal name	No.	Mark.	Signal name
1	TXD(A)	Transmission data (Pair with TXD(B))	8	TXD(B)	Transmission data (Pair with TXD(A))
2	TXD(A)	〃	9	TXD(B)	〃
3	RLR(A)	Receipt line terminating resistor	10	RLT(B)	Transmission line terminating resistor
4	RXD(A)	Receipt data (Pair with RXD(B))	11	RXD(B)	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.



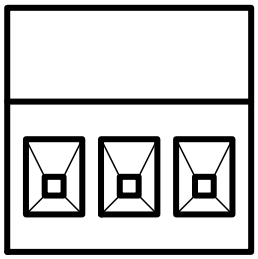
[Tab. 6-5] Connector J1 Terminal Layout

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 device）

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



*2 Grounding signal is not used in the design order D (NCR-*A*D-xxx) or later. Refrain from connection. Connect the grounding to the [E] screw on the unit casing.

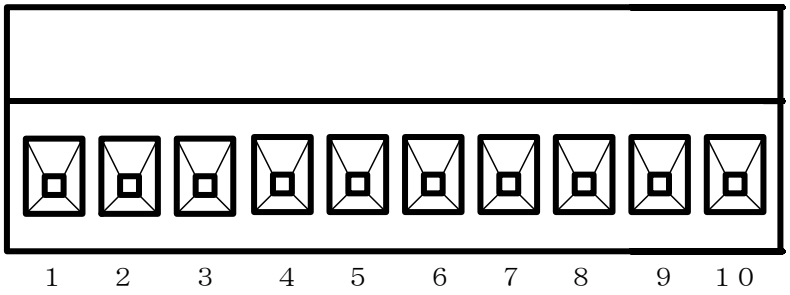
[Tab. 6-6] Connector TB1 terminal configurations

6-3-6 Main Power Input/ Power Line 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 device）

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



*2 Grounding signal is not used in the design order D (NCR-*A*D-xxx) or later. Refrain from connection. Connect the grounding to the [E] screw on the unit casing.

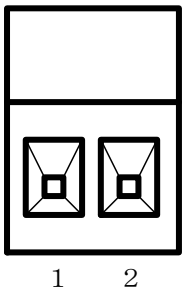
[Tab. 6-6] Connector TB2 terminal configurations

6-3-7 Control Power Input Connector (TB1) [AC400V 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
(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.



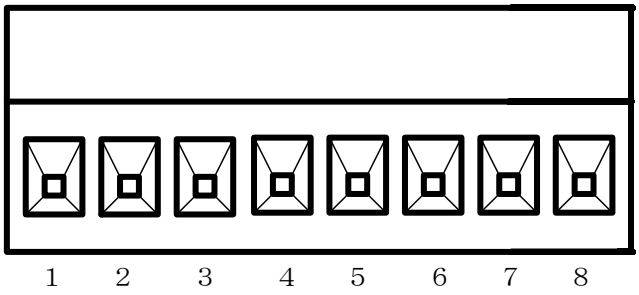
[Tab. 6 – 6] Connector TB1 Terminal Layout

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
(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

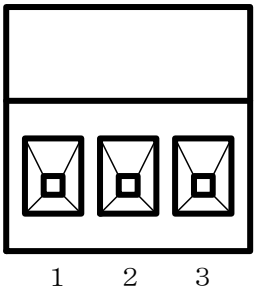
6-3-9 Control Power Input Connector (TB1)

AC200V/400V Specifications Use in the device of 7.5 KW / 11 KW / 15 KW /20KW

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
(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 Parameter

7-1 Parameter List

No.	Name
P000	Motor type
P001	Encoder type selection
P002	Rotating motor Encoder pulse number selection
P003	Linear motor Linear sensor resolution
P004	Disc motor Encoder pulse number
P005	Rotating/Disc motor・Applicable max.speed
P006	Linear motor Applicable max. speed
P007	Linear motor Rated Speed
P009	Carrier frequency selection
P010	Linear/ Disc motor Magnetic pole sensor type
P011	Linear/ Disc motor Magnetic pole sensor offset
P012	Encoder feedback output dividing numerator
P013	Encoder feedback output dividing denominator
P014	Only for maker
P015	Only for maker
P016	Only for maker
P017	Only for maker
P018	ABS reference data
P019	ABS reference machine position
P020	Motor type and number of poles
P021	Rated torque current
P022	Rated speed
P023	Momentary max. torque ratio
P024	Excitation current
P025	Rated output
P026	Current loop coefficient
P030	Phase compensation angle
P031	Unit rated torque current
P032	Unit momentary max. torque ratio
P033	Unit power capacity
P037	Change amount limit of Torque command 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 off frequency
P048	Current loop Derivative time constant
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 Distance between poles
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 Proportional gain division ratio
P105	Speed loop Derivative gain division ratio
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 Proportional. gain division ratio/ Low speed gain range / Low speed gain range
P110	Speed loop Derivat. gain division ratio/ Low speed gain range
P111	Speed loop gain/ GSEL signal ON
P112	Speed loop Integral time constant/ GSEL signal ON
P113	Speed loop Derivativ time constant/GSEL signal ON
P114	Speed loop Prop. gain division ratio/ GSEL signal ON
P115	Speed loop Derivative gain division ratio/ GSEL signal ON
P116	Torque limit value at Magnetic pole detection
P117	Magnetic pole detection gain 1
P118	Magnetic pole detection Integral time constant
P119	Magnetic pole 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	Selection of Auto. tuning test run direction
P141	Auto. tuning test run speed ratio
P142	Torque limit selection at Alarm stop
P143	R2 compensation selection
P144	Selection of Electric thermal detection
P145	Magnetic pole sensor Auto. Adjustment
P146	Mass/ Inertia
P147	Viscosity friction
P148	Noise compensation filter frequency
P149	Disc motor auto. Adjustment
P150	Noise compensation invalid range
P151	Notch filter center frequency 3
P152	Notch filter band width 3

No.	Name
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	Only for maker
P158	Rated power 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. Addition 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	Positioning feed forward Derivative add ratio
P220	Position loop Derivative time constant
P221	Servo lock Derivative time constant
P222	Only for maker
P223	Only for maker
P300	Rotating direction selection
P301	Setting unit selection
P302	Command unit
P303	Electronic gear ratio numerator
P304	Electronic gear ratio denominator
P305	Index data range
P306	Forward software OT limit
P307	Reverse software OT limit
P308	Forward positioning amount max. value
P309	Reverse positioning amount max. value
P310	Machine travel amount
P400	Jog speed 1
P401	Jog speed 2
P402	Zero return method selection
P403	Zero point marker selection
P404	Zero return speed
P405	Zero return creep speed
P406	Zero point position constant
P407	Zero points set distance

No.	Name
P408	Position data reference point
P409	Auto. run permit condition selection
P410	OT back Zero return Decel time at OT
P411	External trigger level selection
P500	Only for maker
P501	Only for maker
P502	Selection of LCD current position display
P505	Communication function selection
P506	Communication ID No.
P507	Data length selection (Serial communication)
P508	Parity selection(Serial communication)
P509	Baud rate selection(Serial communication)
P510	Only for maker (DMOV selection)
P511	Communication group ID set 1
P512	Communication group response Yes/ No 1
P513	Communication group ID set 2
P514	Communication group response Yes/ No 2
P515	Communication group ID set 3
P516	Communication group response Yes/ No 3
P517	Communication group ID set 4
P518	Communication group response Yes/ No 4
P519	Communication group ID set 5
P520	Communication group response Yes/ No 5
P521	Servo control communication ID No.
P522	Servo control communication control mode
P523	Alarm at Servo control communication selection
P524	Servo control communication Real time data 1 device No.
P525	Servo control communication Real time data 2 device No.
P526	Servo control communication Real time data 3 device No.
P527	Servo control communication Real time data 4 device No.
P528	Servo control communication Real time data 5 device No.
P529	Only for maker
P530	Only for maker
P531	Only for maker
P532	Only for maker
P600	Selection of CIH signal specification
P601	Pulse train command sequence change
P602	Pulse train command type selection
P603	Master axis pulse compensation numerator
P604	Master axis compensation denominator
P610	Select pulse train command input in case of extension board connection
P700	Monitor 1 selection
P701	Monitor 2 selection
P702	Speed zero range
P703	Rough matching range
P704	SON signal logic selection
P705	Hardware OT Enable/Disable selection

No.	Name
P706	Mode change verification delay time
P707	Soft limit switch position 1
P708	Soft limit switch position 2
P709	Soft limit switch position 3
P710	In-emergency stop, stopping method
P711	In-emergency stop, deceleration time
P712	Servo OFF delay time at Emergency stop
P713	Stop method at AC power loss
P714	ALM output selection at AC power cut OFF
P715	ALM/ WNG signal logic selection
P716	RDY signal specification selection
P719	PN signal specification 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	Only for maker
P731	Only for maker
P732	Only for maker
P733	Only for maker
P734	Brake output delay time
P735	External input Disable selection 1
P736	External input Disable selection 2
P737	Basic external input signal: Input allocation 1
P738	Basic external input signal: Input allocation 2
P739	Extended external input signal: Input allocation 1
P740	Extended external input signal: Input allocation 2
P741	Extended external input signal: Input allocation 3
P742	Basic external output signal : Output allocation
P743	Extended external output signal: Output allocation 1
P744	Extended external output signal: Output allocation 2
P745	Dynamic brake specification selection
P746	Servo ON delay time at Dynamic brake
P747	Adjustment value of servo control error detection
P748	Only for maker
P800	Short cut function selection
P801	Running S-letter acceleration and deceleration ratio
P802	Synchronization deviation range
P803	Cutting length measurement position
P805	Forced synchronization end Valid/Invalid
P806	Cutting position end edge signal output position
P812	Cut-off control distance

No.	Name
P813	Acceleration control coefficient numerator
P814	Acceleration control coefficient denominator
P822	Master axis smoothening speed error compensation width
P823	Master axis smoothening speed error compensation time constant
P824	Master axis smoothening speed variation width
P825	Master axis smoothening acceleration/deceleration control
P826	Master axis smoothening speed smooth filter time constant
P827	Master axis smoothening variation speed smooth filter time constant
P830	Internal master axis speed 1
P831	Internal master axis speed 2
P832	Internal mater axis acceleration time
P833	Internal master axis deceleration time
P834	Master axis speed zero range
P900	Synchronization angle 1
P901	Return speed 1
P902	In-acceleration travel amount 1
P903	Synchronization end position 1
P904	Running general-purpose output start position 1
P905	Running general-purpose output end position 1
P906	Master axis speed retain start position 1
P907	Master axis speed retain end position 1
P908	Standard-size initial work length 1
P909	Standard-size initial work index data number 1
P910	Mark delay length 1
P911	Mark delay length index data number 1
P912	Mark inhibit distance index data number 1
P913	Running positioning wait position 1
P914	Cosine compensation control range 1
P916	Running positioning acceleration/deceleration time 1
P917	Running positioning in-synchronization acceleration/deceleration time 1
P920	Synchronization angle 2
P921	Return speed 2
P922	In-acceleration travel amount 2
P923	Synchronization end position 2
P924	Running general-purpose output start position 2
P925	Running general-purpose output end position 2
P926	Master axis speed retain start position 2
P927	Master axis speed retain end position 2
P928	Standard-size initial work length 2
P929	Standard-size initial work length index data number 2
P930	Mark delay length 2
P931	Mark delay length index data number 2
P932	Mark inhibit distance index data number 2
P933	Running positioning wait position 2
P934	Cosine compensation control range 2
P936	Running positioning acceleration/deceleration time 2
P937	Running positioning in-synchronization acceleration/deceleration time 2

No.	Name
P940	Synchronization angle 3
P941	Return speed 3
P942	In-acceleration travel amount 3
P943	Synchronization end position 3
P944	Running general-purpose output start position 3
P945	Running general-purpose output end position 3
P946	Master axis speed retain start position 3
P947	Master axis speed retain end position 3
P948	Standard-size initial work length 3
P949	Standard-size initial work length index data number 3
P950	Mark delay length 3
P951	Mark delay length index data number 3
P952	Mark inhibit distance index data number 3
P953	Running positioning wait position 3
P954	Cosine compensation control range 3
P956	Running positioning acceleration/deceleration time 3
P957	Running positioning in-synchronization acceleration/deceleration time 3

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Zero return	Lock		Function		
			A	M	Z	L				
《Group 0》 [Motor, Encoder Parameter]										
P000	Motor type	P	A	M	Z	L	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	L	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.		
P002	Rotating motor Encoder pulse selection	P	A	M	Z	L	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.		

Set	Encoder type
INC1	For Induction motor・Incremental
INC2	For Synchronous motor ・Not less wiring type ・Incremental
INC3	For Synchronous motor ・Not 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

*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	Lock		Function		
			A	M	Z	L				
《Group 0》[Motor, Encoder Parameter]										
P003	Linear motor Linear sensor Resolution	P	A	M	Z	L	S	μm	0.00001 - 100.00000	001.00000
			It sets resolution (4times) per 1 pulse of an applied linear sensor. * Resolution of our τ Linear motor sensor is a four times value. Directly set the specification value.							
P004	Disc motor Encoder pulse number	P	A	M	Z	L	S	PPR	00000001 ～ 99999999	00000001
			It sets encoder pulse number (4times) per 1 turn of a motor when Disc motor is applied. *The number of pulses per a rotation mentioned on our τ DISC motor name plate is a four times value. Directly set the mentioned value.							
P005	Rotating/ Disc motor Applicable max. speed	P	A	M	Z	L	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	L	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	L	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	L	S	Hz	10K/ 16K/ 20K/ 24K	10K
			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							

*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	Lock		Function		
			A	M	Z	L				
《Group 0》[Motor, Encoder Parameter]										
P010	Linear Disc motor Magnetic pole sensor type	P	A	M	Z	L	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	L	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	Encoder feedback output dividing numerator	P	A	M	Z	L	F	None	0 ～16777216	0
								Set the numerator value of the encoder feedback output dividing.		
P013	Encoder feedback output dividing denominator	P	A	M	Z	L	F	None	0 ～16777216	0
								Set the denominator value of the encoder feedback output dividing.		
	<<Setting the encoder feedback output dividing ratio>> The encoder feedback output dividing ratio is set as follows. Dividing ratio = P012 set value / P013 set value Note 1) The encoder feedback output has a delay in output as shown below. Serial encoder: 186μs output delay Others, excluding the serial encoder: 124μs output delay Others, excluding the serial encoder, and when P012 is set to "0": No output delay Note 2) Others, excluding the serial encoder, and when P012 is set to "0", it becomes a through (1/1 equivalent) output. Note 3) When P012 is set to "0" with the serial encoder, it gives no output. Note 4) When P013 is set to "0", the denominator value becomes 16777216. Note.5) Even when this dividing ratio is used, keep the output feedback frequency at 16Mpps or less. If exceeds this frequency, normal output is not achieved. <<Setting example of the encoder feedback output dividing ratio>> When, the output feedback pulse: 10000000 (pulses) against the input encoder pulse: 20000000 (pulses) [P012] = [The number of output feedback pulses] = 10000000 [P013] = [The number of input encoder pulses] = 20000000 Dividing ratio in this case = P012 / P013 = 10000000 / 20000000 As they are outside the parameter setting ranges, following values are set after reduction. [P012] = [The number of output feedback pulses] = 1 [P013] = [The number of input encoder pulses] = 2									

*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	Lock		Function		
			A	M	Z	L				
《Group 0》 [Motor, Encoder Parameter]										
P014	Only for maker	-	·	·	·	·	F			050
			Be sure to set [50] to this 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	L	F	Pulse	-99999999 ～ 99999999	00000000
			It sets absolute data at machine reference position.							
P019	ABS reference machine position	P	A	M	Z	L	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	L	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	L	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	L	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	L	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	L	S	10mA	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	Lock		Function		
			A	M	Z	L				
《Group 0》[Motor, Encoder Parameter]										
P025	Rated output	P	A	M	Z	L	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	L	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	L	S	deg	-100～100	000
								Referring to Setting option specification, input it when [999]is set to[P000：Motor type].		
P031	Unit rated torque current	P	A	M	Z	L	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	L	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	L	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	L	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	L	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	L	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	L	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	L	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	L	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	L	S	10^{-6}	00000000～99999999	00000000
								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	Lock		Function		
			A	M	Z	L				
《Group 0》[Motor, Encoder Parameter]										
P046	Dead time compensation time	P	A	M	Z	L	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	L	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	L	S	μ sec	00000～65535	00000
								Referring to Setting option specification, input it when [999]is set to[P000：Motor type].		
P049	Torque constant	P	A	M	Z	L	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	L	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	L	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	L	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	L	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	L	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	L	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	L	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	Lock		Function		
			A	M	Z	L				
《Group 1》 [Driver adjustment parameter]										
P100	Low speed gain range	I	A	M	Z	L	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	L	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	L	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	L	F	μsec	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	L	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	L	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	L	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	Lock		Function		
			A	M	Z	L				
《Group 1》 [Driver adjustment parameter]										
P107	Speed loop Integral time constant/ Low speed gain range	I	A	M	Z	L	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	L	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	L	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	L	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	L	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	L	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	L	F	μsec	0000 ～ 9999	0000
								It sets time constant of Speed loop Derivative compensation when GSEL signal is ON. (Description can be referred to [P103].)		

*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	Lock		Function		
			A	M	Z	L				
《Group 1》 [Driver adjustment parameter]										
P114	Speed loop Proportional gain division ratio/ GSEL signal ON	I	A	M	Z	L	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	L	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	L	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	L	F	None	0000 ～ 9999	0080
								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	L	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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 1》 [Driver adjustment parameter]										
P119	Magnetic pole detection gain 2	I	A	M	Z	L	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	L	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	L	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	L	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	L	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	L	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	L	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	L	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><th rowspan="3">Parameter No.</th><th rowspan="3">Parameter name</th><th rowspan="3">Activating Timing</th><th colspan="4">Run mode method</th><th rowspan="3">Level</th><th>Setting unit</th><th>Setting range</th><th>Standard ship. set (Initial value)</th></tr>
<tr><th>Automatic</th><th>Manual</th><th>Zero return</th><th>Lock</th><th colspan="3" rowspan="2">Function</th></tr>
<tr><th>A</th><th>M</th><th>Z</th><th>L</th></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 rowspan="2">A</td><td rowspan="2">M</td><td rowspan="2">Z</td><td rowspan="2">L</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 rowspan="2">A</td><td rowspan="2">M</td><td rowspan="2">Z</td><td rowspan="2">L</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 rowspan="2">・</td><td rowspan="2">・</td><td rowspan="2">・</td><td 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.
<table><tr><th>Set</th><th>Contents</th></tr><tr><td>BOTH</td><td>Both</td></tr><tr><td>＋ONLY</td><td>Forward</td></tr><tr><td>-ONLY</td><td>Reverse</td></tr></table>*Operation method can be referred to [11-4 Auto. tuning].</td></tr>
<tr><td rowspan="2">P141</td><td rowspan="2">Auto. tuning trial run speed ratio</td><td rowspan="2">R</td><td rowspan="2">・</td><td rowspan="2">・</td><td rowspan="2">・</td><td rowspan="2">・</td><td rowspan="2">F</td><td>None</td><td>0.00 ～ 1.00</td><td>0.30</td></tr>
<tr><td colspan="3">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]</td></tr>
<tr><td rowspan="2">P142</td><td rowspan="2">Torque limit selection at Alarm stop</td><td rowspan="2">I</td><td rowspan="2">A</td><td rowspan="2">M</td><td rowspan="2">Z</td><td rowspan="2">L</td><td rowspan="2">F</td><td>None</td><td>ALM.TL N/ ALM.TL Y</td><td>ALM.TL N</td></tr>
<tr><td colspan="3">It selects Torque limit function to conduct sudden motor stop when Alarm occurs.
• ALM.TL N：Performs the torque limitation according to the ON/OFF status of the torque limitation signal (TL).
• ALM.TL Y：Performs the torque limitation disregarding the ON/OFF status of the torque limitation signal (TL).</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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 1》 [Driver adjustment parameter]										
P143	R2 compensation selection	I	A	M	Z	L	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	L	F	None	STD/ BIG/ O.L. 110%/ O.L. 50%/ O.L. 70%/ O.L. 90%/ O.L. 130%/ O.L. 150%/ O.L. 170%/ O.L. 190%	STD
			It selects a method of Electronic thermal detection. • STD : Standard • BIG : Big capacity • O.L. XXX% : Over load error is detected by motor load ratio (ST15)XXX%. When Over load error is detected by motor load ratio, normally [O.L. 110%] is selected. [Caution] When BIG or O.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	L	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							
P146	Mass/ Inertia	I	A	M	Z	L	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	L	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	L	F	Hz	0000 ～ 4999 (1Hzunit)	0000
			It sets filter frequency of Noise compensation. When set is [0], Noise compensation 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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 1》 [Driver adjustment parameter]										
P149	Disc motor initialization	R	A	M	Z	L	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	L	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	L	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	L	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	L	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	L	F	Hz	0000 ～ 4999 (1Hzunit)	0000
								It sets band width of Notch filter 4. If set is [0], the Notch filter 4 is disabled.		
P155	Notch filter center frequency 5	I	A	M	Z	L	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	L	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].		

*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="3">Parameter No.</td><td rowspan="3">Parameter name</td><td rowspan="3">Activating Timing</td><td colspan="4">Run mode method</td><td rowspan="3">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>Zero return</td><td>Lock</td><td colspan="3" rowspan="2">Function</td></tr>
<tr><td>A</td><td>M</td><td>Z</td><td>L</td></tr>
<tr><td colspan="11">《Group 1》[Driver adjustment parameter]</td></tr>
<tr><td rowspan="2">P158</td><td rowspan="2">Rated power for Regenerative resistor</td><td rowspan="2">R</td><td rowspan="2">A</td><td rowspan="2">M</td><td rowspan="2">Z</td><td rowspan="2">L</td><td rowspan="2">F</td><td>KW</td><td>-999.999～999.999</td><td>000.000</td></tr>
<tr><td colspan="3">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.</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	Zero return	Lock		Function		
			A	M	Z	L				
《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	L	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	L	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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 2》 [NC adjustment parameter]										
P205	Feed forward ratio	R	A	M	Z	・	F	%	000 ～ 120	100
								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	000
								It sets Feed forward shift ratio to Speed command in Auto./ Manual/ Zero return run.		
P207	Overflow detection pulse	R	A	M	Z	L	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	L	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	L	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	Zero return	Lock		Function		
			A	M	Z	L				
《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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 2》 [NC adjustment parameter]										
P220	Position loop Derivative time constant	I	A	M	Z	·	F	μsec	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	L	F	μsec	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.

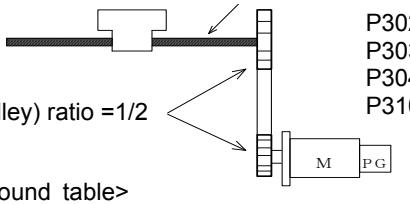
Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Zero return	Lock		Function		
			A	M	Z	L				
《Group 3》 [Position adjustment parameter]										
P300	Rotating direction selection	R	A	M	Z	L	F	None	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	L	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	L	F	mm/ °/ in	0.00001/0.0001/0.001/ 0.01/0.1/1/0.000001/ 0.0000001	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	L	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	L	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	L	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 Except [Index positioning], [Spinner], or [Rotation system running positioning] applications, set 00000000. When 00000000 is set, Index positioning commands(INDX,SIND), Spin commands (SPNS, SPNT, SPNP), Rotation system running positioning commands (RRAS, RRAC), and Rotation system wait position return command (WRR) can not be used.		

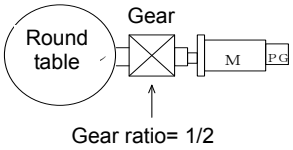
*Item description [Activating timing] I：Real time/ R：Reset or Power ON/ P：Power ON/ S：Motor stop.
*Item description [Level] S：Setting is required./ F：Run can be done by initial value./ M：Reserved.
*When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

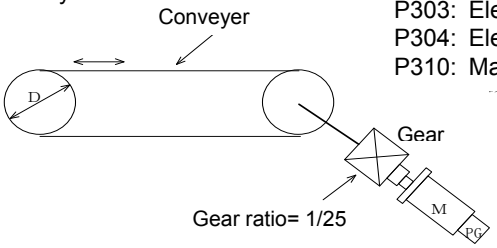
Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Zero return	Lock		Function		
			A	M	Z	L				
《Group 3》 [Position adjustment parameter]										
P306	Forward software OT limit	I	A	M	Z	L	F	mm/˚/ in	-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	L	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. Applicablecommands: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.

<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>Zero return</td><td>Lock</td><td colspan="3" rowspan="2">Function</td></tr>
<tr><td>A</td><td>M</td><td>Z</td><td>L</td></tr>
<tr><td colspan="11">《Group 3》 [Position adjustment parameter]</td></tr>
<tr><td>P309</td><td>Reverse Positioning amount max. value</td><td>I</td><td>A ・ ・ ・</td><td>F</td><td colspan="3">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</td></tr>
<tr><td>P310</td><td>Machine travel amount</td><td>R</td><td>A M Z L</td><td>F</td><td colspan="3">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]</td></tr>
<tr><td>P303
P304
P310</td><td colspan="10">《Example of Electronic gear ratio and Machine travel amount parameter set 》
<In case of ball screw>
Ball screw, pitch =10.00mm
 

P302: 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>
 

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>
 

P302: Command unit = 0.001mm
P303: Electronic gear numerator=1
P304: Electronic gear denominator=25
P310: Machine travel amount= πDmm</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	Zero return	Lock		Function		
			A	M	Z	L				
《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 °/ sec in/sec	00000001 ～ 99999999	00001000
								It sets initial speed in Zero return. (A decimal point position depends on [P302：command unit].) Both of FJOG and RJOG 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	Zero return	Lock		Function		
			A	M	Z	L				
《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	Zero return	Lock		Function		
			A	M	Z	L				
《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.) Note) In this unit, the external trigger signal is used only for [Mark sense start] signal in the running positioning operation. In this case, it becomes a receipt at [ON edge] disregarding this setting.		

*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><th rowspan="3">Parameter No.</th><th rowspan="3">Parameter name</th><th rowspan="3">Activating Timing</th><th colspan="4">Run mode method</th><th rowspan="3">Level</th><th>Setting unit</th><th>Setting range</th><th>Standard ship. set (Initial value)</th></tr>
<tr><th>Automatic</th><th>Manual</th><th>Zero return</th><th>Lock</th><th colspan="3" rowspan="2">Function</th></tr>
<tr><th>A</th><th>M</th><th>Z</th><th>L</th></tr>
<tr><td colspan="11">《Group 5》 [Display, Edit, Communication parameter]</td></tr>
<tr><td>P500</td><td>Only for maker</td><td>-</td><td>▪</td><td>▪</td><td>▪</td><td>▪</td><td>F</td><td></td><td></td><td>00000</td></tr>
<tr><td colspan="11">Set value of this parameter shall be [0].</td></tr>
<tr><td>P501</td><td>Only for maker</td><td>-</td><td>▪</td><td>▪</td><td>▪</td><td>▪</td><td>F</td><td></td><td></td><td>00000</td></tr>
<tr><td colspan="11">Set value of this parameter shall be [0].</td></tr>
<tr><td rowspan="2">P502</td><td rowspan="2">LCD current position display selection</td><td rowspan="2">I</td><td rowspan="2">A</td><td rowspan="2">M</td><td rowspan="2">Z</td><td rowspan="2">L</td><td rowspan="2">F</td><td>None</td><td>ABSOLUTE/ MACHINE/ INCREMENT/ ABS.ENC.</td><td>ABSOLUTE</td></tr>
<tr><td colspan="3">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.
• NCREMENT(Relative position) Distance (position) from Positioning start position is displayed.
• ABS.ENC.(ABS encoder data) Position managed by ABS encoder is displayed.</td></tr>
<tr><td rowspan="2">P505</td><td rowspan="2">Communication function selection</td><td rowspan="2">R</td><td rowspan="2">A</td><td rowspan="2">M</td><td rowspan="2">Z</td><td rowspan="2">L</td><td rowspan="2">F</td><td>None</td><td>0 ～ 9</td><td>5</td></tr>
<tr><td colspan="3">It sets an external unit (protocol) interfaced through Serial communication.
<table>
<tr><th>Set No.</th><th>External unit</th><th>Set No.</th><th>External unit</th></tr>
<tr><td>0</td><td>Reserved(MDI)</td><td>5</td><td>Dedicated PC software</td></tr>
<tr><td>1</td><td>Reserved</td><td>6</td><td>Reserved</td></tr>
<tr><td>2</td><td>Computer</td><td>7</td><td>Reserved</td></tr>
<tr><td>3</td><td>Touch panel</td><td>8</td><td>Reserved</td></tr>
<tr><td>4</td><td>Reserved</td><td>9</td><td>Reserved</td></tr>
</table></td></tr>
<tr><td rowspan="2">P506</td><td rowspan="2">Communication ID No.</td><td rowspan="2">R</td><td rowspan="2">A</td><td rowspan="2">M</td><td rowspan="2">Z</td><td rowspan="2">L</td><td rowspan="2">F</td><td>None</td><td>00 ～ 16</td><td>01</td></tr>
<tr><td colspan="3">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.</td></tr>
<tr><td rowspan="2">P507</td><td rowspan="2">Data length selection (Serial communication)</td><td rowspan="2">R</td><td rowspan="2">A</td><td rowspan="2">M</td><td rowspan="2">Z</td><td rowspan="2">L</td><td rowspan="2">F</td><td>BITS</td><td>7 BITS/ 8 BITS</td><td>8 BITS</td></tr>
<tr><td colspan="3">It selects Transmission/ receipt data length of Serial communication.</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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 5》 [Display, Edit, Communication parameter]										
P508	Parity selection (Serial communication)	R	A	M	Z	L	F	None	NONE/ ODD/ EVEN	ODD
								It selects Parity of Serial communication. • NONE : No parity • ODD : Odd parity • EVEN : Even parity		
P509	Baud rate selection (Serial communication)	R	A	M	Z	L	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	L	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	L	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	L	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	L	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	L	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	L	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.		

*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	Lock		Function		
			A	M	Z	L				
《Group 5》 [Display, Edit, Communication parameter]										
P517	Communication group ID set 4	R	A	M	Z	L	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	L	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.		
P519	Communication group ID set 5	R	A	M	Z	L	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	L	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	L	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	L	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	L	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	L	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.		

*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	Lock		Function		
			A	M	Z	L				
《Group 5》 [Display, Edit, Communication parameter]										
P525	Servo control communication real time data 2 device No.	R	A	M	Z	L	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	L	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.		
P527	Servo control communication real time data 4 device No.	R	A	M	Z	L	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	L	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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 6》 [Pulse train input parameter]										
P600	CIH signal specification selection	R	A	·	·	·	F	None	CIH CLOSE/ CIH OPEN	CIH CLOSE
								It selects effective logic of control input signals (CIH). CIH: It prohibits command pulse input. Selection items 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 *When using under [CIH OPEN] and only with the remote such as CC-Link/DeviceNet, it becomes the external input signal is fixed status and that the signal ON status (CIH ON) is also fixed. In this case, make the CIH signal invalid with the parameter P735: External input invalid selection 1.		
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.		

*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>Zero return</td><td>Lock</td><td colspan="3" rowspan="2">Function</td></tr>
<tr><td>A</td><td>M</td><td>Z</td><td>L</td></tr>
<tr><td colspan="11">《Group 6》 [Pulse train input parameter]</td></tr>
<tr><td rowspan="2">P602</td><td>Pulse train command type selection</td><td>P</td><td>A ・ ・ ・</td><td>F</td><td colspan="4">None</td><td>X1/X2/X4/F/RPULSE/P+F/R/ID0.FCRC/ID0.CMNDP/ ID0.MTENC</td><td>X1</td></tr>
<tr><td colspan="9">It selects signal input style and multiplication ratio of Pulse train command. And next [ID0.XXX] selects a command pulse of a parent office (IDO) 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 : Pulse train command by the servo control communication
Receives the external pulse train (pulse train input by FC/RC).
(Receives four times pulse trains, in the case of 90°phase difference pulse.
• 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</td></tr>
<tr><td colspan="10">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 [IDO.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.MTENC] for [P602 : Pulse train command type selection].</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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 6》 [Pulse train input parameter]										
P603	Master axis pulse compensation numerator	I	A	·	·	·	F	None	00000001 ～ 99999999	00000001
								In combination with [P604: Master axis pulse compensation denominator], it sets the master axis command input pulse number per a unit of operation command. (Operation command unit is determined by parameters [P301] and [P302].) When operation command amount is 'm' and the master axis command input pulse number is 'n', the 'n' value is set by this parameter.		
P604	Master axis compensation denominator	I	A	·	·	·	F	None	00000001 ～ 99999999	00000001
								In combination with [P603: Master axis pulse compensation numerator], it sets the master axis operation command amount per a unit of operation command. (Operation command unit is determined by parameters [P301] and [P302].) When the operation command amount is 'm' and the master axis command input pulse number is 'n', the 'm' value is set by this parameter.		

《Setting sample of Pulse train compensation ratio 》

In order to coincide to motion command amount (Work travel amount)10.00 mm(A decimal point position

depends on [P302：command unit].) with Pulse train command input 1500 pulses, setting is

Setting value
- [P603]＝[Pulse train command input pulse number]＝ 1500
- [P604]＝ [Motion command amount] / [P302：command unit] ＝ 1000

[Motion command amount] / [P302：Command unit] × [P603：Pulse train command compensation numerator] / [P604：Pulse train command compensation denominator]

＝ [Pulse train command input pulse number]

*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	Lock		Function		
			A	M	Z	L				
《Group 6》 [Pulse train input parameter]										
P610	Pulse train command input selection when extension board is connected	P	A	·	·	·	F	None	EXT/STD	EXT
								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.		

*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	Lock		Function		
			A	M	Z	L				
《Group 7》 [I/O signal parameter]										
P700	Monitor 1 selection	I	A	M	Z	L	F	None	SPD.REF./SPD.FB./TRQ.REF./ TRQ.LIM.＋/TRQ.LIM.－/ P.RANGE.L/P.RANGE.H/SPD.OUT /SCL.OUT/IX62/IX63/EMST.SPD/ EMST.ACCL/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 • EMST.SPD : External master axis command speed • EMST.ACCL : External master axis command acceleration • 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	L	F	None	SPD.REF./SPD.FB./TRQ.REF./ TRQ.LIM.＋/TRQ.LIM.－/ P.RANGE.L/P.RANGE.H/SPD.OUT /SCL.OUT/IX62/IX63/EMST.SPD/ EMST.ACCL/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	L	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.		

*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	Lock		Function		
			A	M	Z	L				
《Group 7》 [I/O signal parameter]										
P704	SON signal logic selection	R	A	M	Z	L	F	None	SERVO ON/ SHUT OFF	SERVO ON
								It selects effective logic of Servo ON signal (SON). (SON-COM terminals are short-circuited: ON, opened: 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.) *When using under [SHUT OFF] and only with the remote such as CC-Link/DeviceNet, it becomes the external input signal is fixed status and that the signal ON status (SON ON) is also fixed. In this case, make the SON signal invalid with the parameter P735: External input invalid selection 1.		
P705	Hardware OT Enable/ Disable selection	R	A	M	Z	L	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	L	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	L	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	L	F	mm/˚/in	-99999999 ～ 99999999	00000001
								This function is same as [P707]. *Relation with ［P707,P709］can be referred to below description.		
P709	Software limit switch position 3	I	A	M	Z	L	F	mm/ ˚/ in	-99999999 ～ 99999999	00000002
								This function is same as [P707]. *Relation with ［P707,P708］can be referred to below description.		

*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="3">Parameter No.</td><td rowspan="3">Parameter name</td><td rowspan="3">Activating Timing</td><td colspan="4">Run mode method</td><td rowspan="3">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>Zero return</td><td>Lock</td><td colspan="3" rowspan="2">Function</td></tr>
<tr><td>A</td><td>M</td><td>Z</td><td>L</td></tr>
<tr><td colspan="11">《Group 7》 [I/O signal parameter]</td></tr>
<tr><td>P707
P708
P709</td><td colspan="10">＜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.</td></tr>
<tr><td>P710</td><td>In-emergency stop, stopping method</td><td>I</td><td>A</td><td>M</td><td>Z</td><td>L</td><td>F</td><td>None</td><td>QUICK/ FREE RUN</td><td>QUICK</td></tr>
<tr><td colspan="11">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.</td></tr>
</table>

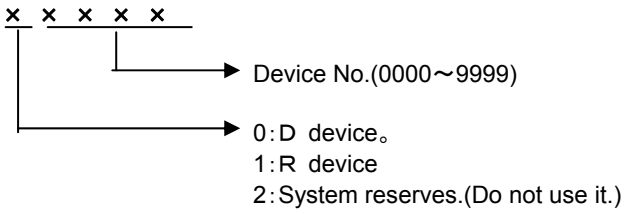
*Item description [Activating timing] I：Real time/ R：Reset or Power ON/ P：Power ON/ S：Motor stop.
*Item description [Level] S：Setting is required./ F：Run can be done by initial value./ M：Reserved.
*When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Zero return	Lock		Function		
			A	M	Z	L				
《Group 7》 [I/O signal parameter]										
P711	In-emergency stop, deceleration time	R	A	M	Z	L	F	sec	00.00 ～ 50.00 (10msecunit)	0.00
								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	L	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	L	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	L	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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 7》 [I/O signal parameter]										
P715	ALM/ WNG signal logic selection	R	A	M	Z	L	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	L	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 1)2)) : 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 1)2) : Close RDY-COM1. At motor free or 1)2) : 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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 7》 [I/O signal parameter]										
P720	SQB write data 1	R	A	M	Z	L	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	L	F	None	00000 ～ 29999	13702
			Function is same as [P720].							
P722	SQB write data 3	R	A	M	Z	L	F	None	00000 ～ 29999	13704
			Function is same as [P720].							
P723	SQB write data 4	R	A	M	Z	L	F	None	00000 ～ 29999	13706
			Function is same as [P720].							
P720 P721 P722 P723	《SQB write data 1～4：Setting range》  									

*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	Lock		Function		
			A	M	Z	L				
《Group 7》 [I/O signal parameter]										
P724	SQB read data 1	R	A	M	Z	L	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	L	F	None	00000 ～ 29999	13710
								Function is same as [P724].		
P726	SQB read data 3	R	A	M	Z	L	F	None	00000 ～ 29999	13712
								Function is same as [P724].		
P727	SQB read data 4	R	A	M	Z	L	F	None	00000 ～ 29999	13714
								Function is same as [P724].		
P728	SQB read data 5	R	A	M	Z	L	F	None	00000 ～ 29999	09302
								Function is same as [P724].		
P729	SQB read data 6	R	A	M	Z	L	F	None	00000 ～ 29999	09100
								Function is same as [P724].		
P724 P725 P726 P727 P728 P729	《SQB read data 1～6：Setting range 》 × × × × × Device No.(0000～9999) 0：D device 1：R device 2：System reserves.(Do not use it.)									
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	L	F	sec	0.00 ～ 9.99(10msec unit)	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.

<table>
<tr><td rowspan="3">Parameter No.</td><td rowspan="3">Parameter name</td><td rowspan="3">Activating Timing</td><td colspan="4">Run mode method</td><td rowspan="3">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>Zero return</td><td>Lock</td><td colspan="3" rowspan="2">Function</td></tr>
<tr><td>A</td><td>M</td><td>Z</td><td>L</td></tr>
<tr><td colspan="11">《Group 7》 [I/O signal parameter]</td></tr>
<tr><td>P735</td><td>External input disable selection 1</td><td>R</td><td>A</td><td>M</td><td>Z</td><td>L</td><td>F</td><td>None</td><td>000000000～268435455</td><td>000000194</td></tr>
<tr><td colspan="10">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</td></tr>
<tr><td>P736</td><td>External input disable selection 2</td><td>R</td><td>A</td><td>M</td><td>Z</td><td>L</td><td>F</td><td>None</td><td>000000000～268435455</td><td>000000000</td></tr>
<tr><td colspan="10">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)</td></tr>
<tr><td>P735</td><td colspan="10">＜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</td></tr>
<tr><td>P736</td><td colspan="10">＜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
- - - - - 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</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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 7》 [I/O signal parameter]										
P737	Basic external input signal input allocation 1	R	A	M	Z	L	F	None	00000000 ～ 99999999	60595857
								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 7-47) is set to the 2 digits. When [00] is set, a set input signal is disabled. (Initial value: All are disabled.) Sample) 60 59 58 57 DI1: Allocates to D11 signal DI2: Allocates to D12 signal DI3: Allocates to D14 signal DI4: Allocates to D18 signal		
P738	Basic external input signal input allocation 2	R	A	M	Z	L	F	None	00000000 ～ 99999999	49636261
								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 7-47) is set to the 2 digits. When [00] is set, a set input signal is disabled. (Initial value: All are disabled.) Sample) 49 63 62 61 DI5: Allocates to D21 signal DI6: Allocates to D22 signal DI7: Allocates to D24 signal DI8: Allocates to MSSP signal		
P739	Extended external input signal input allocation 1	R	A	M	Z	L	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 7-41) 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				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Zero return	Lock		Function		
			A	M	Z	L				
《Group 7》 [I/O signal parameter]										
P740	Extended external input signal input allocation 2	R	A	M	Z	L	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 7-47) 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	L	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 7-47) 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	Zero return	Lock		Function		
			A	M	Z	L				

《Group 7》 [I/O signal parameter]

P737
P738
P739
P740
P741

Input signal allocation list

Allocated. No.	Code	Signal name	Allocated. 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 inhibits.
08	ROT	Reverse over travel	41	OR1	Speed override 1
09		Reserved	42	OR2	Speed override 2
10		〃	43	OR3	Speed override 3
11		〃	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	Cut-off control input
25	PS1	Address set 1	58	D12	Forced synchronization end
26	PS2	Address set 2	59	D14	Forced start
27	PS3	Address set 3	60	D18	Master axis selection
28	PS4	Address set 4	61	D21	Cycle end
29	PS5	Address set 5	62	D22	Mark inhibit
30	PS6	Address set 6	63	D24	Cutting length measurement
31	PS7	Address set 7	64		Reserved
32	PS8	Address set 8	65		〃

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

*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	Lock		Function		
			A	M	Z	L				
《Group 7》 [I/O signal parameter]										
P742	Basic external output signal output allocation	R	A	M	Z	L	F	None	00000000～99999999	05020103
								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 7-49) is set to the 2 digits. When [00] is set, a set output signal is disabled. (Initial value: All are disabled.) Sample) 50 49 01 03 DO1: Allocates to RDY signal DO2: Allocates to ALM signal DO3: Allocates to ROUT6 signal DO4: Allocates to ROUT7 signal		
P743	Extended external output signal output allocation 1	R	A	M	Z	L	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 7-49) 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 EO1: Allocates to ALM signal EO2: Allocates to WNG signal EO3: Allocates to RDY signal EO4: Allocates to SZ signal		
P744	Extended external output signal output allocation 2	R	A	M	Z	L	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 7-49) 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 EO5: Allocates to PN signal EO6: 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	Zero return	Lock		Function		
			A	M	Z	L				

《Group 7》 [I/O signal parameter]

P742
P743
P744

Output signal allocation list

Allocated. No.	Code	Signal name	Allocated. No.	Code	Signal name
00	----	Disable	31	SLSA	Software limit switch A
01	ALM	Alarm	32	SLSB	Software limit switch B
02	WNG	Warning	33	M01	ML OUTPUT 01
03	RDY	Servo ready	34	M02	ML OUTPUT 02
04	SZ	Speed zero	35	M04	ML OUTPUT 04
05	PN	Positioning complete	36	M08	ML OUTPUT 08
06	PRF	Rough matching	37	M10	ML OUTPUT 10
07	BRK	Brake release	38	M20	ML OUTPUT 20
08	LIM	In Torque limit	39	M40	ML OUTPUT 40
09	PEND	Program end	40	M80	ML OUTPUT 80
10	PRDY	Automatic run ready	41	MSZ	Master axis speed zero
11	MMOD	In Manual run	42	MSTB	M strobe
12	HMOD	In Zero return run	43		Reserved
13	AMOD	In Automatic run	44	ROUT1	Running general-purpose output 1
14	PMOD	In Pulse train run	45	ROUT2	Running general-purpose output 2
15		Reserved	46	ROUT3	Running general-purpose output 3
16		〃	47	ROUT4	Running general-purpose output 4
17	OUT1	General output 1	48	ROUT5	Reserved
18	OUT2	General output 2	49	ROUT6	1-cycle end
19	OUT3	General output 3	50	ROUT7	In-synchronization output
20	OUT4	General output 4	51	ROUT8	Wait position output
21	OUT5	General output 5	52	PRUN	In-automatic operation
22	OUT6	General output 6	53	PRDY1	Automatic operation ready 1
23	OUT7	General output 7	54	PRDY2	Automatic operation ready 2
24	OUT8	General output 8	55	HCMP	Zero return complete
25		Reserved	56	MLS	Cutting position end edge
26		〃	57		Reserved
27		〃	58		〃
28		〃	59		〃
29		〃	60		〃
30		〃			

*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.

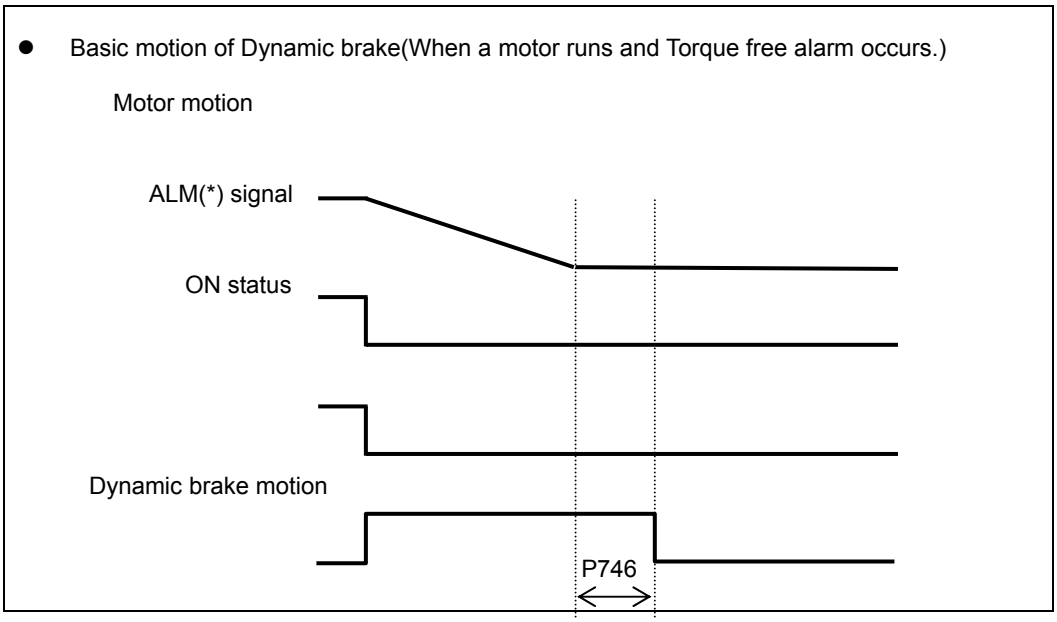
Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Zero return	Lock		Function		
			A	M	Z	L				
《Group 7》 [I/O signal parameter]										
P745	Dynamic brake specification selection	R	A	M	Z	L	F	Msec	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 the power on, the dynamic brake is kept ON until the first servo on. After that, it is always OFF.		
P746	Servo ON ready delay time at Dynamic brake	R	A	M	Z	L	F	msec	0 ~ 10	02
								It sets the time from a point of motor stop status confirmation by the dynamic brake to a point of releasing the brake. Control is made with a cut-back time in the unit of 2 msec. against the set time. For example, in the case of 3 msec. setting, its actual delay time becomes 2 msec.		

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.)



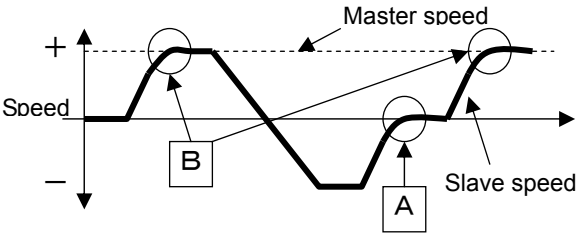
*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.
*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.
*When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

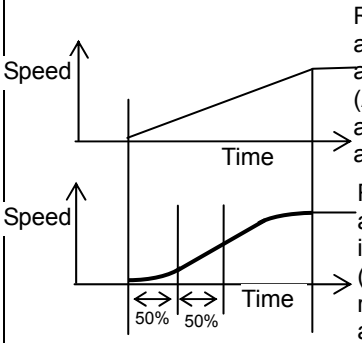
<table>
<tr><td rowspan="3">Parameter No.</td><td rowspan="3">Parameter name</td><td rowspan="3">Activating Timing</td><td colspan="4">Run mode method</td><td rowspan="3">Level</td><td>Setting unit</td><td>Setting range</td><td>Standard ship. set (Initial value)</td></tr>
<tr><td>Automatic</td><td>Manual</td><td>Zero return</td><td>Lock</td><td colspan="3" rowspan="2">Function</td></tr>
<tr><td>A</td><td>M</td><td>Z</td><td>L</td></tr>
<tr><td colspan="11">《Group 7》 [I/O signal parameter]</td></tr>
<tr><td rowspan="2">P747</td><td rowspan="2">Adjustment value for servo control error detection</td><td rowspan="2">I</td><td rowspan="2">A</td><td rowspan="2">M</td><td rowspan="2">Z</td><td rowspan="2">L</td><td rowspan="2">F</td><td>None</td><td>-1000~1000</td><td>0000</td></tr>
<tr><td colspan="3">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.</td></tr>
<tr><td rowspan="2">P748</td><td rowspan="2">Only for maker</td><td rowspan="2">-</td><td rowspan="2">▪</td><td rowspan="2">▪</td><td rowspan="2">▪</td><td rowspan="2">▪</td><td rowspan="2">F</td><td></td><td></td><td>00000000</td></tr>
<tr><td colspan="3">Set value of this parameter shall be [00000000].</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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 8》 [Running positioning parameter 1]										
P800	Short cut function selection	R	A ・ ・ ・				F	None	1～3	1
								<In BRS command> It selects specifications at the cycle end of the short cut function with the BRS command. Individual specification for each setting is as follows.		
								Set value	Cycle end specification	
								1	Receiving at the synchronization end, then ends returning to the wait position.	
								2	Receiving at the synchronization end and at the wait position, then ends returning to the wait position.	
								3	Receiving at the synchronization end and at the wait position, then ends decelerating and stopping at the received position. When being stopped, it ends at that position.	
								<In BRC, RRAS, RRAC command> Receiving at the synchronization end, then ends returning to the wait position, disregarding this setting.		

*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><th rowspan="2">Parameter No.</th><th rowspan="2">Parameter name</th><th rowspan="2">Activating Timing</th><th colspan="4">Run mode method</th><th rowspan="2">Level</th><th>Setting unit</th><th>Setting range</th><th>Standard ship. set (Initial value)</th></tr>
<tr><th>Automatic</th><th>Manual</th><th>Zero return</th><th>Lock</th><th colspan="3" rowspan="2">Function</th></tr>
<tr><td>A</td><td>M</td><td>Z</td><td>L</td></tr>
<tr><td colspan="11">《Group 8》 [Running positioning parameter 1]</td></tr>
<tr><td rowspan="2">P801</td><td rowspan="2">Running S-letter acceleration and deceleration ratio</td><td rowspan="2">R</td><td rowspan="2">A ・ ・ ・</td><td rowspan="2">F</td><td>%</td><td>000 ～ 101</td><td>10</td></tr>
<tr><td colspan="3">
<In BRS, BRC command>
It sets the S-letter acceleration/deceleration ratio in the running positioning operation command.
<u>In the return running cutting operation, this S-letter acceleration/deceleration performs at the below A and B positioning ends.</u>


A: At the end of positioning to the wait position
B: At the end of running positioning
Note) This parameter accepts an entry in the unit of 1%; however, the control is made in the unit of 10%.
Note) This parameter accepts an entry of up to 101%; however, in the case of setting over 50%, the control is made at 50%.
<In RRAS, RRAC command>
It sets the S-letter ratio in the acceleration/deceleration control by the in-acceleration/deceleration travel amount (P902, P922, P942) in the running positioning command.
When this set value is 101%, it conducts the acceleration/deceleration control in the sine curve.


Running S-letter acceleration/deceleration ratio 0% (All in the linear acceleration/deceleration)
Running S-letter acceleration/deceleration ratio 50% (For a half time of the running S-letter acceleration/deceleration ratio, 50% is the S-letter and remaining 50% is the linear acceleration/deceleration.
Note) This parameter accepts an entry in the unit of 1%; however, the control is made in the unit of 20%.
</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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 8》 [Running positioning parameter 1]										
P802	Synchronization deviation range	R	A	·	·	·	F	mm/° / in	00000 ～ 30000	00100
								<In BRS, BRC, RRAS, RRAC command> In the running positioning operation command, and in the synchronization operation, the in-synchronization output signal becomes ON when the internal deviation amount is within this set value. (Decimal point position depends on [P302:Command unit].) When this setting value is set to "0", the in-synchronization output signal becomes ON disregarding the internal deviation amount.		
P803	Cutting length measurement position	R	A	·	·	·	F	mm/° / in	00000000 ～ 10000000	00000000
								<In BRS, BRC, RRAS, RRAC command> It sets the slave position when measuring the cutting length (work length) (status display mode ST18) in the running positioning cutting. (Decimal point position depends on [P302: Command unit].) This setting value is a distance from the synchronization speed start point.		
P805	Forced synchronization end Valid/Invalid	R	A	·	·	·	F	None	OFF/ON	OFF
								<In BRS, BRC command> It selects the forced synchronization end Valid/Invalid. • When OFF, the forced synchronization end function becomes invalid and the synchronization continues until the synchronization end point. • When ON, the forced synchronization end function becomes valid and the synchronization ends according to the forced synchronization end input signal. [Note] In the forced synchronization end Valid, and if there is no input of the forced synchronization end input signal, it gives an alarm when reached the synchronization end point.		
								<In RRAS, RRAC command> This function is invalid.		
P806	Cutting position end edge signal output position	R	A	·	·	·	F	mm/° / in	00000000 ～ 99999999	00000000
								<In BRS, BRC command> It sets the output point of the cutting point end edge signal in the running positioning operation command. Its position is set with the slave axis position. When the running positioning target position on the master exceeds this position, it outputs the cutting position end edge signal.		
								<In RRAS, RRAC command> This function is invalid.		

*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	Lock		Function		
			A	M	Z	L				
《Group 8》 [Running positioning parameter 1]										
P812	Cut-off control distance	P	A	·	·	·	F	mm/˚/ in	00000 ～ 10000	00000
								<In BRS, BRC command> In the synchronization speed, and if the cut-off control input signal comes in, the slave axis additionally moves by this set value. (Decimal point position depends on [P302: Command unit].) <In RRAS, RRAC command> This function is invalid.		
P813	Acceleration control coefficient numerator	R	A	·	·	·	F	None	00000 ～ 65535	00000
								<In BRS, BRC command> In the synchronization speed, it sets the accelerating coefficient numerator when the cut-off control input signal is applied. <In RRAS, RRAC command> This function is invalid.		
P814	Acceleration control coefficient denominator	R	A	·	·	·	F	None	00000 ～ 65535	00000
								<In BRS, BRC command> In the synchronization speed, it sets the accelerating coefficient denominator when the cut-off control input signal is applied. <In RRAS, RRAC command> This function is invalid.		

P813
P814

In the synchronization speed, and when the cut-off control input signal is applied, the acceleration coefficient is set as below.

$$\text{The acceleration ratio is set by } \frac{\text{Acceleration control coefficient numerator (P813)}}{\text{Acceleration control coefficient denominator (P814).}}$$

In the case where the acceleration ratio is multiplied by 1.5, the setting is as follows.

1.5times ⇒ $\frac{1.5}{1}$ ⇒ $\frac{15}{10}$ → P813 setting / P814 setting

Fraction conversion

Plus number conversion from decimal fraction.

"0" setting in both or either variable results in no acceleration.
The set value must be P813 > P814.

*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	Lock		Function		
			A	M	Z	L				
《Group 8》 [Running positioning parameter 1]										
P822	Master axis smoothening speed error compensation width	R	A	·	·	·		mm/sec ° /sec in/sec	0000000 ～ 9999999	00000000
								<In BRS, BRC, RRAS, RRAC command> It sets the speed range to compensate the speed error (errors generated in the control range of P824-P827) generated in the master axis smoothing control. (Decimal point position depends on [P302: Command unit].) In general, initial value is set. When the set value is "0", control of the compensation speed range is not conducted. When the cutting error fluctuates in the master axis acceleration/deceleration, set about 1.2 times value of the P824 set value.		
P823	Master axis smoothening speed error compensation time constant	R	A	·	·	·	F	sec	0.000 ～ 0.999	0.050
								<In BRS, BRC, RRAS, RRAC command> It sets the time constant to compensate the speed error (errors generated in the control range of P824-P827) generated in the master axis smoothing control. When this set value is small, the slave axis swings heavily and it becomes the cutting error. In general, initial value is set. When the set value is "0", control of the compensation speed range is not conducted. When the cutting error fluctuates in the master axis acceleration/deceleration, increase the set value.		
P824	Master axis smoothening speed variation width	R	A	·	·	·	F	mm/sec ° /sec in/sec	0000000 ～ 9999999	0001000
								<In BRS, BRC, RRAS, RRAC command> It sets the speed variation width in the master axis constant speed. For the speed variation of this setting, the time constant of P827 makes the speed smooth. (Decimal point position depends on [P302: Command unit].) In general, initial value is set. When the cutting error is happened due to the big speed variation width in the master axis constant speed operation, set about 1.2 times value of that speed variation.		

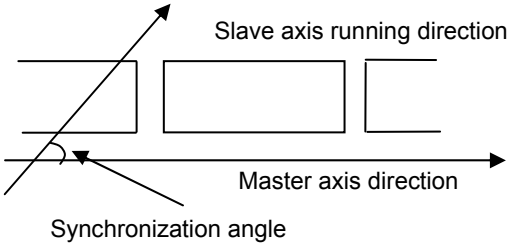
*Item description [Activating timing] I : Real time/ R : Reset or Power ON/ P : Power ON/ S : Motor stop.
*Item description [Level] S : Setting is required./ F : Run can be done by initial value./ M : Reserved.
*When [xxx/ xxx/ xxx] is indicated in the setting range, one of the menu shall be selected.

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Zero return	Lock		Function		
			A	M	Z	L				
《Group 8》 [Running positioning parameter 1]										
P825	Master axis smoothening acceleration/deceleration control	R	A ・ ・ ・				F	mm/sec^2 ° /sec^2 in/sec^2	0000000 ～ 9999999	0000000
								<In BRS, BRC, RRAS, RRAC command> It sets the limit value of the master axis acceleration/deceleration speed. When the acceleration/deceleration speed is applied exceeding this set value, the time constant of P827 makes the acceleration/deceleration speed smooth as the abnormal vibration for the portion that exceeded the acceleration/deceleration speed made by this setting. (Decimal point position depends on [P302: Command unit].) When the set value is "0", control of the acceleration/deceleration is not conducted. In general, initial value is set. When the abnormal vibration is big, set about 1.2 times value of the maximum acceleration or deceleration of the master axis.		
P826	Master axis smoothening speed smooth filter time constant	R	A ・ ・ ・				F	Sec	0.000 ～ 0.200	0.020
								<In BRS, BRC, RRAS, RRAC command> It sets the smoothing filter time constant for the fundamental master speed, excluding the speed variation width which is set with P824. In general, initial value is set.		

*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	Lock		Function		
			A	M	Z	L				
《Group 8》 [Running positioning parameter 1]										
P827	Master axis smoothening variation speed smooth filter time constant	R	A	・	・	・	F	sec	0.000 ～ 0.200	0.050
								<In BRS, BRC, RRAS, RRAC command> It sets the smoothing filter time constant for the speed of the speed variation width being set with P824. In general, initial value is set.		
P830	Internal master axis speed 1	I	A	・	・	・	F	pulse	0000000 ～ 5000000	0000000
								<In BRS, BRC, RRAS, RRAC command> It sets the internal mask axis speed (at OFF of MSSP signal) data. [Note] This setting value is a value where [P602: Pulse train command multiplication ratio selection] is set to [x1].		
P831	Internal master axis speed 2	I	A	・	・	・	F	pulse	0000000 ～ 5000000	0000000
								<In BRS, BRC, RRAS, RRAC command> It sets the internal master axis speed 2 (at ON of MSSP signal) data. [Note] This setting value is a value where [P602: Pulse train command multiplication ratio selection] is set to [x1].		
P832	Internal mater axis acceleration time	R	A	・	・	・	F	sec	00.000 ～ 99.999	00.000
								<In BRS, BRC, RRAS, RRAC command> It sets the acceleration time of the internal master axis speed from stop to 100Kpps. [Note] The above 100Kpps is a value where [P602: Pulse train command multiplication ratio selection] is set to [x1].		
P833	Internal master axis deceleration time	R	A	・	・	・	F	sec	00.000 ～ 99.999	00.000
								<In BRS, BRC, RRAS, RRAC command> It sets the deceleration time of the internal master axis speed from 100Kpps to stop. [Note] This setting value is a value where [P602: Pulse train command multiplication ratio selection] is set to [x1].		
P834	Master axis speed zero range	R	A	・	・	・	F	pulse	0000000 ～ 5000000	0000000
								<In BRS, BRC, RRAS, RRAC command> It sets the output range of the master axis speed zero (MSZ).		

*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	Lock		Function		
			A	M	Z	L				
《Group 9》 [Running positioning parameter 2]										
P900	Synchronization angle 1	R	A	·	·	·	F	°	00.0 ～ 80.0	00.0
								<In RRAS, BRC command> This function is invalid. <In RRAS, RRAC command> It sets the slave axis running angle against the master axis.  		
P901	Return speed 1	R	A	·	·	·	F	mm/sec °/sec in/sec	0000001 ～ 9999999	0010000
								<In BRS, BRC command> In the running positioning operation, it sets the traveling speed to the wait position. (Decimal point position depends on [P302: Command unit].) <In RRAS, RRAC command> This function is invalid.		
P902	In-acceleration travel amount 1	R	A	·	·	·	F	mm/°/in	00000001 ～ 99999999	00000001
								<In RRAS, BRC command> This function is invalid. <In RRAS, RRAC command> In the running positioning operation, it sets the slave axis travel amount until the slave axis follows the master axis feeding speed. (Decimal point position depends on [P302: Command unit].)		
P903	Synchronization end position 1	R	A	·	·	·	F	mm/°/in	00000000 ～ 99999999	00000000
								<In BRS, BRC command> In the running positioning operation, it sets the position to start the returning operation to the wait position for the slave axis. (Decimal point position depends on [P302: Command unit].) This set value is the distance from the synchronization start position. <In RRAS, RRAC command> In the running positioning operation, it sets the position to start the returning operation to the wait position for the slave axis. (Decimal point position depends on [P302: Command unit].) This set value is the distance from the wait position.		

*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	Lock		Function		
			A	M	Z	L				
《Group 9》 [Running positioning parameter 2]										
P904	Running general-purpose output start position 1	R	A	・	・	・	F	mm/ ゜/in	00000000 ～ 99999999	00000000
								<In BRS, BRC command> It sets the position to ON the running general-purpose output signal. (Decimal point position depends on [P302: Command unit].) This set value is a distance from the synchronization start position. <In RRAS, RRAC command> It sets the position to ON the running general-purpose output signal. (Decimal point position depends on [P302: Command unit].) This set value is a distance from the wait position.		
P905	Running general-purpose output end position 1	R	A	・	・	・	F	mm/ ゜/in	00000000 ～ 99999999	00000000
								<In BRS, BRC command> It sets the position to OFF the running general-purpose output signal. (Decimal point position depends on [P302: Command unit].) This set value is a distance from the synchronization start position. <In RRAS, RRAC command> It sets the position to OFF the running general-purpose output signal. (Decimal point position depends on [P302: Command unit].) This set value is a distance from the wait position.		
P906	Master axis speed retain start position 1	R	A	・	・	・	F	mm/ ゜/in	00000000 ～ 99999999	00000000
								<In BRS, BRC command> It sets the retain start position of the master axis speed, in the master axis speed smoothing control. (Decimal point position depends on [P302: Command unit].) This set value is the distance from the synchronization start position. In general, initial value is set. Related parameters: P824～6 <In RRAS, RRAC command> It sets the retain start position of the master axis speed, in the master axis speed smoothing control. (Decimal point position depends on [P302: Command unit].) This set value is the distance from the wait position. In general, initial value is set. Related parameters: P824～6		

*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	Lock		Function		
			A	M	Z	L				
《Group 9》 [Running positioning parameter 2]										
P907	Master axis speed retain end position 1	R	A	・	・	・	F	mm/ ゜/in	00000000 ～ 99999999	00000000
			<In BRS, BRC command> It sets the retain end position of the master axis speed, in the master axis speed smoothing control. (Decimal point position depends on [P302: Command unit].) This set value is the distance from the synchronization start position. In general, initial value is set. Related parameters: P824～6							
			<In RRAS, RRAC command> It sets the retain end position of the master axis speed, in the master axis speed smoothing control. (Decimal point position depends on [P302: Command unit].) This set value is the distance from the wait position. In general, initial value is set. Related parameters: P824～6							

*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	Lock		Function		
			A	M	Z	L				
《Group 9》 [Running positioning parameter 2]										
P908	Standard-size initial work length 1	R	A	・	・	・	F	mm/ ゜/in	00000000 ～ 99999999	00000000

<In BRS, BRC, RRAS, RRAC command>
It sets the work length in the running positioning command standard-size start.
(Decimal point position depends on [P302: Command unit].)
When "0" is set to this set value, it runs on the work length specified by the command from the running positioning command standard-size start. When another value than "0" is set to this set value, it runs on this set length in the running positioning command standard-size start.
When cutting the end edge of the work, set a distance between the master axis position sensor and the "0" position. With this, the running positioning position becomes the work end edge position.

[Relations with the standard-size initial work length index data 1 (P909)]
(1) When this set value is "0":
Adding to the work length specified by the command, another work length is added according to the index data value specified by the standard-size initial work length index data 1.
(2) When this set value is another value than "0":
Adding to this set value, another work length is added according to the index data value specified by the standard-size initial work length index data 1.
With this, a setting of the running positioning position is enabled, setting the work end edge position to "0".
[Control range]
<In BRS, BRC command>
For the standard-size initial work full-length, set a greater value than the travel amount which is required in the synchronization acceleration.
<In RRAS, RRAC command>
The standard-size initial work full-length can be controlled in the range below.
Standard-size initial work length ≧ In-acceleration travel amount 1 (P902)

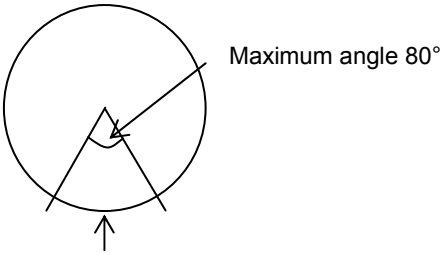
The standard-size work full-length is [this set value + index data value indicated by the standard-size initial work length index data 1].

*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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 9》 [Running positioning parameter 2]										
P909	Standard-size initial work index data number 1	R	A	・	・	・	F	None	00 ～ 99	99
								<BRS, BRC, RRAS, RRAC command> For the standard-size initial work length 1 (P908), it sets the index data number which includes a further additional amount. Data indicated in the index data is in the unit of mm/°/in, and it reflects in real-time as a standard-size initial work length. [Relations with the standard-size initial work length 1 (P908)] Refer to the standard-size initial work length 1.		
P910	Mark delay length 1	R	A	・	・	・	F	mm/ ゜/in	00000000～ 99999999	00000000
								<In BRS, BRC, RRAS, RRAC command> It sets the running positioning command, mark delay length amount in the mark start. (Decimal point position depends on [P302: Command unit].) In general, set a distance between the absolute "0" position of the slave axis and the mark sensor. With this, the running positioning position becomes the mark position. [Relations with the mark delay length index data 1 (P911)] It further delays according to the index data value specified by the mark delay length index data number 1. With this, it is possible to set the running positioning position making the mark position to "0".		
P911	Mark delay length index data number 1	R	A	・	・	・	F	None	00 ～ 99	99
								<In BRS, BRC, RRAS, RRAC command> For the mark delay length 1 (P910), it sets the index data number which includes a further additional mark delay amount. Data indicated in the index data is in the unit of mm/°/in, and it reflects in real-time as a mark delay length. [Relations with the mark delay length 1 (P910)] Refer to the mark delay length 1.		
P912	Mark inhibit distance index data number 1	R	A	・	・	・	F	None	00 ～ 99	98
								<In BRS, BRC, RRAS, RRAC command> In the mark signal input, it sets the index data number which includes the distance (mm/°/in) where the next mark signal input is rejected from the previous mark signal input.		
P913	Running positioning wait position 1	R	A	・	・	・	F	mm/ ゜/in	00000000 ～ 99999999	00000000
								<In BRS, BRC command> It sets the wait position. (Decimal point position depends on [P302: Command unit].) <In RRAS, RRAC command> It sets the distance from the bottom limit to the wait position. (Decimal point position depends on [P302: Command unit].)		

*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><th rowspan="3">Parameter No.</th><th rowspan="3">Parameter name</th><th rowspan="3">Activating Timing</th><th colspan="4">Run mode method</th><th rowspan="3">Level</th><th>Setting unit</th><th>Setting range</th><th>Standard ship. set (Initial value)</th></tr>
<tr><th rowspan="2">Automatic</th><th rowspan="2">Manual</th><th rowspan="2">Zero return</th><th rowspan="2">Lock</th><th colspan="3" rowspan="2">Function</th></tr>
<tr></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="11">《Group 9》 [Running positioning parameter 2]</td></tr>
<tr><td rowspan="2">P914</td><td rowspan="2">Cosine compensation control range 1</td><td rowspan="2">R</td><td rowspan="2">A ・ ・ ・</td><td rowspan="2">F</td><td>°</td><td>00.0 ～ 80.0</td><td>00.0</td></tr>
<tr><td colspan="3"><In BRS, BRC command>
This function is invalid.

<In RRAS, RRAC command>
In the rotation system running positioning, it sets the range of the cosine compensation control.
When this set value is "0", the cosine compensation control is not conducted.
 

[Note 1] When the acceleration automatic amount (P902) superimposes this setting, this control range is decreased while retaining the acceleration travel amount.

[Note 2] When the synchronization end position (P903) superimposes this setting, this control range is decreased while retaining the synchronization end position.

[Note 3] When this setting is set at more than 80°in the slave axis machine angle, the 80°equivalent becomes the rang of this control.</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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 9》 [Running positioning parameter 2]										
P916	Running positioning acceleration/deceleration time 1	R	A	·	·	·	F	sec	0.000 ～ 9.999	0.500
								<In BRS, BRC command> In the running positioning operation, it sets the acceleration/deceleration time. The acceleration/deceleration time is set by the time from the motor stop to the time where the rated speed is achieved. <In RRAS, RRAC command> This function is invalid.		
P917	Running positioning in-synchronization acceleration/deceleration time 1	R	A	·	·	·	F	sec	0.000 ～ 9.999	0.000
								<In BRS, BRC command> In the running positioning operation, it sets the acceleration/deceleration time from the return speed to the synchronization speed. The acceleration/deceleration time is set by the time from the motor stop to the time where the rated speed is achieved. When this set value is "0", the acceleration/deceleration time from the return time to the synchronization speed becomes the set value of P916. In general, set "0". <In RRAS, RRAC command> This function is invalid.		

*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	Lock		Function		
			A	M	Z	L				
《Group 9》 [Running positioning parameter 2]										
P920	Synchronization angle 2	R	A	・	・	・	F	°	00.0 ～ 80.0	00.0
			Function is identical to [P900: Synchronization angle 1].							
P921	Return speed 2	R	A	・	・	・	F	mm/sec °/sec in/sec	0000001 ～ 9999999	0010000
			Function is identical to [P901: Return speed 1].							
P922	In-acceleration travel amount 2	R	A	・	・	・	F	mm/ °/in	00000001～ 99999999	00000001
			Function is identical to [P902: In-acceleration travel amount 1].							
P923	Synchronization end position 2	R	A	・	・	・	F	mm/ °/in	00000000～ 99999999	00000000
			Function is identical to [P903: Synchronization end position 1].							
P924	Running general-purpose output start position 2	R	A	・	・	・	F	mm/ °/in	00000000～ 99999999	00000000
			Function is identical to [P904: Running general-purpose output start position 1].							
P925	Running general-purpose output end position 2	R	A	・	・	・	F	mm/ °/in	00000000～ 99999999	00000000
			Function is identical to [P905: Running general-purpose output end position 1].							
P926	Master axis speed retain start position 2	R	A	・	・	・	F	mm/ °/in	00000000～ 99999999	00000000
			Function is identical to [P906: Master axis speeds retain start position 1].							
P927	Master axis speed retain end position 2	R	A	・	・	・	F	mm/ °/in	00000000～ 99999999	00000000
			Function is identical to [P907: Master axis speed retain end position 1].							
P928	Standard-size initial work length 2	R	A	・	・	・	F	mm/ °/in	00000000～ 99999999	00000000
			Function is identical to [P908: Standard-size initial work length 1].							
P929	Standard-size initial work length index data number 2	R	A	・	・	・	F	None	00 ～ 99	99
			Function is identical to [P909: Standard-size initial work index data number 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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 9》 [Running positioning parameter 2]										
P930	Mark delay length 2	R	A	・	・	・	F	mm/ ゜/in	00000000～ 99999999	00000000
			Function is identical to [P910: Mark delay length 1].							
P931	Mark delay length index data number 2	R	A	・	・	・	F	None	00 ～ 99	99
			Function is identical to [P911: Mark delay length index data number 1].							
P932	Mark inhibit distance index data number 2	R	A	・	・	・	F	None	00 ～ 99	98
			Function is identical to [P912: Mark inhibits distance index data number 1].							
P933	Running positioning wait position 2	R	A	・	・	・	F	mm/ ゜/in	00000000～ 99999999	00000000
			Function is identical to [P913: Running positioning wait position 1].							
P934	Cosine compensation control range 2	R	A	・	・	・	F	゜	00.0 ～ 80.0	00.0
			Function is identical to [P914: Cosine compensation control range 1].							
P936	Running positioning acceleration/deceleration time 2	R	A	・	・	・	F	Sec	0.000 ～ 9.999	0.500
			Function is identical to [P916: Running positioning acceleration/deceleration time 1].							
P937	Running positioning in-synchronization acceleration/deceleration time 2	R	A	・	・	・	F	sec	0.000 ～ 9.999	0.000
			Function is identical to [P917: Running positioning in-synchronization acceleration/deceleration time 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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 9》 [Running positioning parameter 2]										
P940	Synchronization angle 3	R	A	・	・	・	F	°	00.0 ～ 80.0	00.0
			Function is identical to [P900: Synchronization angle 1].							
P941	Return speed 3	R	A	・	・	・	F	mm/sec °/sec in/sec	0000001 ～ 9999999	0010000
			Function is identical to [P901: Return speed 1].							
P942	In-acceleration travel amount 3	R	A	・	・	・	F	mm/ °/in	00000001～ 99999999	00000001
			Function is identical to [P902: In-acceleration travel amount 1].							
P943	Synchronization end position 3	R	A	・	・	・	F	mm/ °/in	00000000～ 99999999	00000000
			Function is identical to [P903: Synchronization end position 1].							
P944	Running general-purpose output start position 3	R	A	・	・	・	F	mm/ °/in	00000000～ 99999999	00000000
			Function is identical to [P904: Running general-purpose output start position 1].							
P945	Running general-purpose output end position 3	R	A	・	・	・	F	mm/ °/in	00000000～ 99999999	00000000
			Function is identical to [P905: Running general-purpose output end position 1].							
P946	Master axis speed retain start position 3	R	A	・	・	・	F	mm/ °/in	00000000～ 99999999	00000000
			Function is identical to [P906: Master axis speeds retain start position 1].							
P947	Master axis speed retain end position 3	R	A	・	・	・	F	mm/ °/in	00000000～ 99999999	00000000
			Function is identical to [P907: Master axis speed retain end position 1].							
P948	Standard-size initial work length 3	R	A	・	・	・	F	mm/ °/in	00000000～ 99999999	00000000
			Function is identical to [P908: Standard-size initial work length 1].							
P949	Standard-size initial work length index data number 3	R	A	・	・	・	F	None	00 ～ 99	99
			Function is identical to [P909: Standard-size initial work index data number 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	Zero return	Lock		Function		
			A	M	Z	L				
《Group 9》 [Running positioning parameter 2]										
P950	Mark delay length 3	R	A	・	・	・	F	mm/ ゜/in	00000000～ 99999999	00000000
			Function is identical to [P910: Mark delay length 1].							
P951	Mark delay length index data number 3	R	A	・	・	・	F	None	00 ～ 99	99
			Function is identical to [P911: Mark delay length index data number 1].							
P952	Mark inhibit distance index data number 3	R	A	・	・	・	F	None	00 ～ 99	98
			Function is identical to [P912: Mark inhibits distance index data number 1].							
P953	Running positioning wait position 3	R	A	・	・	・	F	mm/ ゜/in	00000000～ 99999999	00000000
			Function is identical to [P913: Running positioning wait position 1].							
P954	Cosine compensation control range 3	R	A	・	・	・	F	゜	00.0 ～ 80.0	00.0
			Function is identical to [P914: Cosine compensation control range 1].							
P956	Running positioning acceleration/deceleration time 3	R	A	・	・	・	F	Sec	0.000 ～ 9.999	0.500
			Function is identical to [P916: Running positioning acceleration/deceleration time 1].							
P957	Running positioning in-synchronization acceleration/deceleration time 3	R	A	・	・	・	F	sec	0.000 ～ 9.999	0.000
			Function is identical to [P917: Running positioning in-synchronization acceleration/deceleration time 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.

Chapter 8 Index data

8-1 Index Data List

Index data №.	Index data name	Type	Function
IX00 ～ IX49	Index data 00 ～ Index data 49	Retain	Index data which retains data contents when power is OFF. But re-writing can be made max. 10000 times.
IX50 ～ IX60	Index data 50 ～ Index data 60	0 clear	Voluntary Index data which do not retain data when power is OFF. It is [0] at power ON.
IX61	Index data 61	0 clear	Index data to set the operation of the continuous running positioning.
IX62	Index data 62	0 clear	Index data for data to output voltage to Analog monitor Data value : Output voltage relation -499:-10V, 0:0V, 499:+10V
IX63	Index data 63	0 clear	Index data for data to output voltage to 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 do not retain data when power is OFF. It is [0] at power ON.
IX66	Index data 66		Index data which contains current position.
IX67	Index data 67	0 clear	Index data which count down every 10msec when numeric value other than [0] is inputted.
IX68	Index data 68	0 clear	Voluntary Index data which do not retain data when power is OFF. It is [0] at power ON.
IX69	Index data 69	0 clear	Index data for data to output General output signal.
IX70 ～ IX99	Index data 70 ～ Index data 99	0 clear	Voluntary Index data which do not retain data when power is OFF. It is [0] at power ON.

Note) [0 clear] in Type column

[0 clear] data in Type column means that Index data contents are not retained but cleared when power is turned OFF. It is suitable for data which can be cleared when power is OFF or varying data as current position, etc.

8-2 Index Data Specification (Handling on each command)

Setting item	Index data handling (Sample:〔P302：Command unit〕is 0.1.)
Positioning position （data with mark）	• ． Data are as setting data. [Sample] Index data set -125.6 → Position, -125.6mm
Positioning position （data without mark）	• When data are ＋, data are as setting data [Sample] Index data setting 125.6 → Position, 125.6° • When data are －, data are setting data without － mark. [Sample] Index data setting -325.6 → Position, 325.6°
External trigger position, （data without mark）	• When data are ＋, data are as setting data. [Sample] Index data setting 125.6 → Position, 125.6mm • When data are －, data are setting data without － mark. [Sample] Index data setting -325.6 → Position, 325.6mm
Speed (mm) （data without mark）	• When data are ＋, data are as setting data. [Sample] Index data setting 125.6 → Speed 125.6mm/s • When data are －, data are setting data without － mark. [Sample] Index data setting -325.6 → Speed 325.6mm/s • When data is 0, speed is minimum setting unit. [Sample] Index data setting 0.0 → Speed 0.1mm/s • When data exceeds rated speed, rated speed is applied.
Speed (rpm) （data with mark）	• Data are setting data without a decimal point. [Sample] Index data setting -125.6 → Rotating speed -1256rpm • When data exceeds rated speed, rated speed is applied.
Time （data without mark / data with mark）	[Commands other than Spin speed command and Spin timer command] • Data are setting data without ± mark and setting unit of the data is 10msec. [Sample] Index data setting -125.6 → time 12.56sec • When data exceeds setting range, maximum value in the range is applied. [Spin speed command, Spin timer command] • When data are ＋, data are as setting data without ± mark and setting unit of the data is 10msec. [Sample] Index data setting 125.6 → time 12.56sec • When data are －, following Spin speed command and Spin timer command are cancelled. • When data exceeds setting range, maximum value in the range is applied.
General output （data without mark）	• Data are setting data without a decimal point and ± mark but which decimal number is converted to lower 8 bit binary number. [Sample] Index data setting -52.7 → General output ~~10~~00001111(binary number)
M output （data without mark）	• Data are setting data without a decimal point and ± mark and lower 2 bit data. [Sample] Index data setting -162.5 → Moutput 25
Address （data without mark）	• Data are setting data without a decimal point. [Sample] Index data setting 1.2 → Address 12 • When data exceeds setting range or [－], Alarm stop occurs.
Looping time （data without mark）	• Data are setting data without a decimal point and ± mark. [Sample] Index data setting -1.2 → looping time 12 • When data exceeds setting range, maximum value in the range is applied.
Processing data （data with mark）	• Data are setting data without a decimal point. [Sample] Index data setting -1.2 → processing data -12 • When processing results exceed setting range, maximum value in the range is applied.

Setting item	Index data handling (Sample:〔P302：Command unit〕is 0.1.)
Wait position (Data without code)	• When data is +, it is the data as being set. [Sample] Index data set 125.6 → Wait position 125.6 mm • When data is -, it is the data ignoring the code. [Sample] Index data set -325.6 → Wait position 325.6 mm
Work length (Data with code)	• When data is +, it is the data as being set. [Sample] Index data set 125.6 → Work length (Standard-size start) 125.6 mm • When data is "0", the mark start functions. [Sample] Index data set 0.0 → Work length (Mark start) • When data is -, the single and continue command in the running positioning operation gives different meanings. ・ In the single command: It is the data ignoring the code. [Sample] Index data set -325.6 → Work length (Standard-size start) 325.6 mm ・ In the continuous command: It means the end code of the combination pattern. [Sample] Index data set -325.6 → End code
Running general-purpose output (Data without code)	• Ignoring the decimal point and code of the set data, it takes the lower 4-bit data after converting the decimal number to the binary number. [Sample] Index data set -52.7 → Running general-purpose output ~~100000~~1111 (Binary number)
Continuous running positioning operation (Data without code)	• It sets the operation of the continuous running positioning. For setting descriptions, refer to [9-4 Continuous running positioning].

Chapter 9 Command

9-1 Command List

Group	Title	Command name	Function
0 Motion command	NOP	No function [No OPeration]	No motion
	POS	Positioning [POSitioning]	This unit executes Positioning.
	HOME	Zero return [HOME positioning]	This unit executes Zero return.
	INDX	Index Positioning [INDeX positioning]	This unit executes Positioning of a rotating work to shorter travel distance direction.
1 No motion command	M	M output [M out]	This unit waits for M complete after sending M output and M strobe signals.
	TIME	Timer [TIMEr]	This unit waits for specified time.
	PEND	Program end [Program END]	This unit finishes executing program.
	CALL	Sub-routine call [sub-routine CALL]	This unit repeats Sub-routine specified times.
	RET	Sub-routine return [sub-routine RETurn]	This unit indicates completion of specified called Sub-routine and returns to the caller address.
	GSEL	Gain selection [Gain SELect]	This unit changes to selected motion gain (Excludes position loop gain.) after set time passes.
2 Processing command	IMOV	Transfer [Indirect MOVe]	This unit transfers specified data to Index data.
	ADD	Addition [ADDition]	It executes Addition and transfers the processing results to Index data.
	SUB	Subtraction [SUBtraction]	It executes Subtraction and transfers the processing results to Index data.
	MUL	Multiplication [MULtiplcation]	It executes Multiplication and transfers the processing results to Index data.
	DIV	Division [DIVision]	It executes Division and transfers the processing results to Index data.
	AND	Logical AND [AND]	It executes Logical AND and transfers the processing results to Index data.
	OR	Logical OR [OR]	It executes Logical OR and transfers the processing results to Index data.
	XOR	Exclusive logical [eXclusive OR]	It executes Exclusive logic OR and transfers the processing results to Index data.
3 Jump command	JMP	Un-conditional jump [JuMP]	Address jumps to a specified address without any condition.
	JZ	0 jump [Jump if Zero]	Address jumps to a specified address if branch decision (Index data) is 0.
	JNZ	Not 0 jump [Jump if Not Zero]	Address jumps to a specified address if branch decision (Index data) is other than 0.
	JG	1 or greater jump [Jump if Greater than zero]	Address jumps to a specified address if branch decision (Index data) is 1 or larger.
	JL	-1 or smaller jump [Jump if Less than zero]	Address jumps to a specified address if branch decision (Index data) is -1 or smaller.

Group	Title	Command name	Function
5 Continuous motion command	SPNS	Spin Speed [SPiN Speed]	This unit achieves specified speed for set Accel. / Decel. time
	SPNT	Spin Timer [SPiN Timer]	This unit retains rotating status at reached S pin speed for specified time.
	SPNP	Spin Positioning [SPiN POSitioning]	This unit executes Positioning from rotating status at Spin speed to specified position for set time.
	SPOS	Positioning [Sequential POSitioning]	Function is same as［POS］command and program continues even after a motion is completed.
	CONT	Simple continuous Positioning [CONTinue POSitioning]	When this command continues, this unit does not stop but conducts continuous motion, And if last or single command is executed, function is same as SPOS.
	REPT	Looping Positioning [REPeaT POSitioning]	This unit repeats specified Positioning specified times.
	SHOM	Zero return [Sequential HOME positioning]	Function is same as［HOME］command and program continues even after a motion is completed.
	SIND	Index Positioning [Sequential INDeX positioning]	Function is same as［INDX］command and program continues even after a motion is completed.
6 Running positioning command	BRS	Returning system running positioning (Single) [Between Run Single]	It conducts the running positioning operation of the returning system and repeats the operation.
	BRC	Returning system running positioning (Continue) [Between Run Continue]	It conducts the running positioning operation of the returning system and repeats the operation. In this process, it runs in order of the index data number.
	RRAS	Rotating system running positioning (Single) [Rotary Run All-sync Single]	It conducts the running positioning operation of the rotating system and repeats the operation.
	RRAC	Rotating system running positioning (Continue) [Rotary Run All-sync Continue]	It conducts the running positioning operation of the rotating system and repeats the operation. In this process, it runs in order of the index data number.
	WBR	Returning system wait position return [Wait position Between Return]	It moves the slave axis to the wait position at the retuning speed. This command is used in the returning operation.
	WRR	Rotating system wait position return [Wait position Rotary Return]	It moves the slaves axis to the wait position at the running speed. This command is used in the rotating operation.

9-2 Command Specification

Command outline supported by this type is described hereunder.
And if concrete motion specification of a command is necessary, please refer to the separate VC series manual [Volume: Command].

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./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
			• Positioning is executed. • External trigger Positioning can be conducted. And External trigger position sets travel amount from TRG signal input. • General output can be sent when motion starts. • Program is finished 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
			• Zero return is executed. • Zero return method and direction can be set. • Except command setting data, this units complies with Zero return associated parameters. • General output can be sent when motion starts. • Program is finished 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./Decel.time］	None	SEL.1/ SEL.2/ SEL.3
			OUT ［General output］	binary number	00000000～11111111 IX00～IX99
			• This unit executes Positioning of rotating work to shorter rotating travel distance direction. • General output can be sent when motion starts. • Program is finished after motion is completed.		

*BS can be referred to end of this chapter.

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range（Direct data） Setting range（Index data）
			Function		
《Group 1》 [No motion command]					
M	M output [M out]	Yes (1)	M [M output]	None	00～99 IX00～IX99
			• This units waits for M complete signal after sending M output and M strobe signals. • M output which is once outputted retains data until next M output executes a valid command. • If this command is executed with M complete input, M strobe is not outputted until the M complete input signal is OFF.		
TIME	Timer [TIMEr]	Yes (1)	TIME [Timer time]	0.01sec	000000.00～999999.99 IX00～IX99
			OUT [General output]	Binary number	00000000～11111111 IX00～IX99
			• This unit waits for specified times. • General output can be sent when motion starts.		
PEND	Program end [Program END]	No (2)	None	None	None
			• Executing program is finished. • When this command is completed, Program end signal（PEND）and Auto. run ready signal（PRDY）are outputted. • General output and M output are retained.		
CALL	Sub-routine call [sub-routine CALL]	Yes (4)	CADR [Called address]	None	000～279 IX00～IX99
			REPT [Looping times]	None	00000～65535 IX00～IX99
			• This unit repeats Sub-routine specified times by CADR, REPT. • Nesting (Looping time of executing this command without conducting return.) can be conducted max. 8 times. • When Looping time is [0], this command is neglected and next command is executed.		
RET	Sub-routine return [sub-routine RETurn]	Yes (1)	None	None	None
			• This unit finishes called Sub-routine and returns to caller address. • When Sub-routine is executed specified times, executing address is changed to the next address of the caller.		
GSEL	Gain selection [Gain SELect]	No (1)	SEL [Gain selection]	None	SEL / ON / OFF
			TIME [Timer time]	0.001sec	00000.000～99999.999 IX00～IX99
			• Gain is changed to selected gain (Except Position loop gain) after set time passes. • Motion gain specified by a command is disabled [At Program end (PEND)], [At RST/ PCAN], [AT Alarm occurrence], and [In mode other than Automatic run] and complies with GSEL input signal. • Gain selection motion is, SEL：Motion complies with GSEL input signal. ON ：Motion is done when GSEL input signal is ON status. OFF：Motion is done when GSEL input signal is OFF status.		

*BS can be referred to end of this chapter.

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	 IX00～IX99
			SOC ［Transfer origin data］	None	-99999999～99999999 IX00～IX99
			• This unit transfers specified data to Index data. Expression：DST（Index） ← SOC		
ADD	Addition [ADDition]	No (1)	DST［Addition results transfer destination］	None	 IX00～IX99
			SOC1 ［Addition factor1］	None	-99999999～99999999 IX00～IX99
			SOC2 ［Addition factor2］	None	-99999999～99999999 IX00～IX99
			• This unit executes Addition and transfers the processing results to Index data • In case of Index data, a decimal point is neglected and numeric value is handled as integer for processing. （Sample：1.25, 125 is used for processing.） • Processing results are clamped at ±99999999. Expression：DST（Index） ← SOC1 ＋ SOC2		
SUB	Subtraction [SUBtraction]	No (1)	DST［Processing results transfer destination］	None	 IX00～IX99
			SOC 1 ［Subtraction factor 1］	None	-99999999～99999999 IX00～IX99
			SOC 2 ［Subtraction factor 2］	None	-99999999～99999999 IX00～IX99
			• This unit executes Subtraction and transfers the processing results to Index data • In case of Index data, a decimal point is neglected and numeric value is handled as integer for processing. （Sample：1.25, 125 is used for processing.） • Processing results are clamped at ±99999999. Expression：DST（Index） ← SOC1 - SOC2		
MUL	Multiplication [MULtiplcation]	No (1)	DST［Processing results transfer destination］	None	 IX00～IX99
			SOC 1［Multiplication factor 1］	None	-99999999～99999999 IX00～IX99
			SOC 2［Multiplication factor 2］	None	-99999999～99999999 IX00～IX99
			• This unit executes Multiplication and transfers the processing results to Index data • In case of Index data, a decimal point is neglected and numeric value is handled as integer for processing. （Sample：1.25, 125 is used for processing.） • Processing results are clamped at ±99999999. Expression：DST（Index） ← SOC1 × SOC2		

*BS can be referred to end of this chapter.

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range（Direct data） Setting range（Index data）
			Function		
《Group 2》 [Processing command]					
DIV	Division [DIVision]	No (1)	DST 1[Division remainder transfer destination]	None	IX00～IX99
			DST 2[Division quotient transfer destination]	None	IX00～IX99
			SOC1[Dividend]	None	-99999999～99999999 IX00～IX99
			SOC2[Divisor]	None	-99999999～99999999 IX00～IX99
			• This unit executes Division and transfers the processing results to Index data • In case of Index data, a decimal point is neglected and numeric value is handled as integer for processing. （Sample：1.25, 125 is used for processing.） • Processing results are clamped at ±99999999. Expression： DST（Index） ← SOC1 ÷ SOC2 DST1（Index） ← Remainder		
AND	Logical AND [AND]	No (1)	DST[Processing results transfer destination]	None	IX00～IX99
			SOC1 [Logical AND factor 1]	None	-99999999～99999999 IX00～IX99
			SOC2 [Logical AND factor 2]	None	-99999999～99999999 IX00～IX99
			• This unit executes Logical AND and transfers the processing results to Index data • In case of Index data, a decimal point is neglected and numeric value is handled as integer for processing. （Sample：1.25, 125 is used for processing.） • Processing results are clamped at ±99999999. Expression：DST（Index）← SOC1 AND SOC2		
OR	Logical OR [OR]	No (1)	DST[Processing results transfer destination]	None	IX00～IX99
			SOC 1[Logical OR factor 1]	None	-99999999～99999999 IX00～IX99
			SOC 2[Logical OR factor 2]	None	-99999999～99999999 IX00～IX99
			• This unit executes Logical OR and transfers the processing results to Index data • In case of Index data, a decimal point is neglected and numeric value is handled as integer for processing. （Sample：1.25, 125 is used for processing.） • Processing results are clamped at ±99999999. Expression：DST（Index）← SOC1 OR SOC2		

*BS can be referred to end of this chapter.

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range（Direct data） Setting range（Index data）
			Function		
《Group 2》 [Processing command]					
XOR	Exclusive logical OR [eXclusive OR]	No (1)	DST［Processing results transfer destination］	None	 IX00～IX99
			SOC1 ［Exclusive logical OR factor 1］ Function	None	-99999999～99999999 IX00～IX99
			SOC2 ［Exclusive logical OR factor 2］ Function	None	-99999999～99999999 IX00～IX99
			• It executes exclusive logical OR and transfers the processing results to Index data. • In the case of index data, a decimal point is neglected and numeric value is handled as integer for processing. (Sample: When 1.25, 125 is used for processing.) Expression: DST (Index) ← SOC1 XOR SOC2		
《Group 3》［Jump command］					
JMP	Un-conditional jump [JuMP]	Yes (1)	JADR［Jump destination address］	None	000～279 IX00～IX99
			• An address jumps to a 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	 IX00～IX99
			• When Branch decision is 0, an address jumps to a specified address.		
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	 IX00～IX99
			• When Branch decision is not 0, an address jumps to a specified address.		
JG	Grater 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	 IX00～IX99
			• When Branch decision is 1 or larger, an address jumps to a specified address.		
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	 IX00～IX99
			• When Branch decision is -1 or less, an address jumps to a specified address.		

*BS can be referred to end of this chapter.

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］	0.01 sec	000.00～655.35 IX00～IX99
			M［M output］	None	00～99 IX00～IX99
			• This units achieves specified speed for Accel./ Decel. time. But if Accel./ Decel. time setting exceeds the following stipulated max.value, Accel./ Decel. is conducted at the max.value, and the reached speed is retained constantly for excess time. Stipulation：Max.accel. time from 0 rpm to rated speed：300.00sec. Max.decel.time from rated speed to 0 rpm：300.00sec. • This unit sends M output when motion starts and can wait for M completion. • When Hold (HLD) is inputted in executing this command, a motor decelerates for setting of［P214: Decel. time1］and stops, and then M strobe signal output is turned OFF by restart. • When setting of Accel./ Decel. time is negative data (only Index data set), following Spin speed and Spin timer command are cancelled.		
SPNT	Spin Timer [SPiN Timer]	No (1)	TIME ［Retaining time］	0.01 sec	000000.00～999999.99 IX00～IX99
			M ［M output］	None	00～99 IX00～IX99
			• This unit retains rotating status at Spin speed for specified time. • This unit sends M output when motion starts and can wait for M completion. • When Hold (HLD) is inputted in executing this command, a motor decelerates for setting of［P214: Decel. time1］and stops, and then M strobe signal output is turned OFF by restart. • When setting of Accel./ Decel. time is negative data (only Index data set), following Spin speed and Spin timer command 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
			• This unit conducts Positioning from rotating status at Spin speed to specified position for specified time . • This unit sends M output when motion starts and can wait for M completion. • When Hold (HLD) is inputted in executing this command, a motor decelerates for setting of DOWN.		

*BS can be referred to end of this chapter.

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 same as POS（Positioning ）command. But next address will be executed after motion is completed.		
CONT	Simple continuous Positioning [CONTinue 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
			• When this command continues and motion direction unchanged, Positioning is continued without stop motion. • When this signal is single, function is same as SPOS. • External trigger positioning can be conducted. And External trigger position sets travel amount from the time of TRG input. • General output can be sent when motion starts. • Accel./Decel. time and External trigger positioning in Continuous run complies with start blocks of Continuous run ‘UPDN’ and ‘TRG’.		

*BS can be referred to end of this chapter.

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range（Direct data） Setting range（Index data）
			Function		
《Group 5》 [Continuous motion command]					
REPT	Looping 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 time］	None	00000～65535 IX00～IX99
			• This unit repeats specified Positioning set times. • External trigger positioning can be conducted. And External trigger position sets travel amount from the time of TRG input. • General output can be sent when motion starts. • If looping time is [0], Positioning is not repeated.		
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 same as HOME（Zero return）command. But next address will be executed after 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 same as INDX（Index Positioning）command. But program is finished after motion is completed.		

*BS can be referred to end of this chapter.

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range（Direct data）
					Setting range（Index data）
			Function		
《Group 6》 []					
BRS	Returning system running positioning (Single) [Between Run Single]	No (1)	LENG [Work length]	mm/ ° / in	00000000～99999999 IX00～IX99
			ROUT [Running general-purpose output]	None	0000～1111 IX00～IX99
			PATN [Parameter selection]	None	SEL.1/ SEL.2/ SEL.3
			• It conducts the running positioning operation of the returning system and repeats the operation. • The work length is specified by [LENG] If "0" is set to LENG, it starts with the mark sense. • During the synchronization, the in-synchronization output signal becomes ON with the setting of synchronization deviation range (P802). • Parameter relating to the operation is selected using [PATN]. • With the running general-purpose output start position (P904, P924, P944) and with the running general-purpose output end position (P905, P925, P945), the running general-purpose output signal set to [ROUT] becomes ON/OFF. • This command allows to use the short cut function by the parameter setting.		
BRC	Returning system running positioning (Continue) [Between Run Continue]	No (1)	LENG [Work length]	mm/ ° / in	IX00～IX99
			ROUT [Running general-purpose output]	None	0000～1111 IX00～IX99
			PATN [Parameter selection]	None	SEL.1/ SEL.2/ SEL.3
			• It basically conducts the returning system running positioning operation same as the BRS command; however, it enables the plural pattern setting for the work length in one command. • The index data can set plural work lengths and it runs in order of the set index number. In the end of the operation pattern, a minus value is set to the index data. • The short cut function can not be used in this command.		

*BS can be referred to end of this chapter.

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range（Direct data） Setting range（Index data）
			Function		
《Group 6》 []					
RRAS	Rotating system running positioning (Single) [Rotary Run All-sync Single]	No (1)	LENG [Work length]	mm/ ° / in	00000000～99999999 IX00～IX99
			ROUT [Running general-purpose output]	None	0000～1111 IX00～IX99
			PATN [Parameter selection]	None	SEL.1/ SEL.2/ SEL.3
			• It conducts the rotating positioning operation of the returning system and repeats the operation. • The work length is specified by [LENG] If "0" is set to LENG, it starts with the mark sense. • During the synchronization, the in-synchronization output signal becomes ON with the setting of synchronization deviation range (P802). • Parameter relating to the operation is selected using [PATN]. • The cosine compensation control is possible by setting the parameter. • With the running general-purpose output start position (P904, P924, P944) and with the running general-purpose output end position (P905, P925, P945), the running general-purpose output signal set to [ROUT] becomes ON/OFF.		
RRAC	Rotating system running positioning (Continue) [Rotary Run All-sync Continue]	No (1)	LENG [Work length]	mm/ ° / in	IX00～IX99
			ROUT [Running general-purpose output]	None	0000～1111 IX00～IX99
			PATN [Parameter selection]	None	SEL.1/ SEL.2/ SEL.3
			• It basically conducts the rotating system running positioning operation same as the BRS command; however, it enables the plural pattern setting for the work length in one command. • The index data can set plural work lengths and it runs in order of the set index number. In the end of the operation pattern, a minus value is set to the index data.		

*BS can be referred to end of this chapter.

Title	Command name	BS	Setting data		
			Data	Setting unit	Setting range（Direct data） Setting range（Index data）
			Function		
《Group 6》 []					
WBR	Returning system wait position return [Wait position Between Return]	No (1)	F [Retuning speed]	mm/ ° / in	00000000～99999999 IX00～IX99
			PATN [Parameter selection]	None	SEL.1/ SEL.2/ SEL.3
			• It moves the slave axis to the wait position at the return speed. This command is used in the retuning operation. • - Parameters such as the acceleration/deceleration time and the wait position are set with [PATN].		
WRR	Rotating system wait position return [Wait position Rotary Return]	No (1)	F [Retuning speed]	mm/ ° / in	00000000～99999999 IX00～IX99
			PATN [Running direction selection]	None	SEL.1/ SEL.2/ SEL.3
			DIR[Operation direction selection]	None	FORWARD/ REVERSE SHORT DST
			• It moves the slave axis to the parameter wait position at the return speed. This command is used in the rotating system operation. • The operation direction is set with [DIR]. • Parameters such as the acceleration/deceleration time and the wait position are specified with [PATN].		

*BS can be referred to end of this chapter.

Supplement of command specification description

BS column indicates block stop function at each command end.
Block stop function executes stop at a command end by Block stop signal (BSTP) in Automatic run.

[No (1)] neglects Block stop signal and executes next address command.

[No (2)] neglects Block stop signal and executes commands to program end.

[Yes (1)] makes wait condition for restart when a command is completed.
Next address command is executed by restart.

[Yes (2)] makes wait condition for restart when continuous motion is completed and a motor stops.
Next address command to a completed block stop address command is executed by restart.

[Yes (3)] makes wait condition for restart when all the Looping positioning is completed.
Next address command is executed by restart.

[Yes (4)] makes wait condition for restart when a specified address is called.
A specified address command is executed by restart and this command is continued or restarted.

9-3 Details of running positioning commands

[BRS] Returning system running positioning (Single)

[Function]

- This command conducts the returning system running positioning control which has following functions.
  (After the completion of this command, the next address command is conducted.)

(1) In this command, the slave axis follows the master axis speed from the running positioning wait position (P913, P933, P953 *1). In this operation, the slave axis acceleration/deceleration depends on the setting of the running positioning acceleration/deceleration time (P916, P936, P956 *1).
The in-acceleration S-letter ratio is specified with the running S-letter acceleration/deceleration ratio (P801).

(2) During the synchronization (next to 1), the in-synchronization output signal becomes ON with the setting of the synchronization deviation range (P802). Further, the running general-purpose output becomes ON with the setting of the running general-purpose output start position (P904, P924, P944 *1).
The running general-purpose output signal comes out in the 4-bit binary number (0000-1111).
The running general-purpose output becomes OFF with the setting of the running general-purpose output end position (P905, P925, P945 *1).
The 1-cycle output becomes ON during the synchronization.

(3) The synchronization end patters consist of two patterns with the forced synchronization end valid/invalid (P805).
When valid: Synchronization ends when detected the ON edge of the forced synchronization end signal. (To 4)
When invalid: Synchronization ends when the slave axis reached the synchronization end position (P903, P923, P943 *1). (To 4)
At the synchronization end, the in-synchronization output signal, the running general-purpose output signal, and the 1-cycle output signal become OFF.

(4) The slave axis returns to the running positioning wait position (P913, P933, P953, *1).
Returning operation to the running positioning wait position follows as below.
  - Return speed (P901, P921, P941 *1)
  - Running positioning acceleration/deceleration time (P916, P936, P956 *1)

(5) After the wait position returning, it waits for the below start timing following the LENG (Work length).
In the mark sense start, LENG is set to "0".
In the standard-size start, set LENG with the plus value.

(6) A series of the 1 to 5 operations is repeated.
If necessary to follow the master axis during the wait position returning, the wait position returning operation is canceled and follows the master axis.

(7) When the cycle end signal becomes ON while this command is in operation, after completing 4, the next address command is conducted. At the cycle end, the positioning complete signal (PN) is output.

(8) If the hold signal (HLD) is input while this command is in operation, it decelerates and stops according to the setting of the deceleration time (P214, P215, P216 *1).
When it becomes the restart wait status, the automatic operation ready signal (PRDY) is output.

(9) The restart after the hold completes this command and it outputs the automatic operation ready signal (PRDY) entering the start waiting mode by the next address.

(10) Each data for the work length and the running general-purpose output can be appointed by the numeric input (Direct data specification) or the index data specification.

(11) In the standard-size operation, the material end edge processing is enabled by the standard-size initial work length (P908&9, P928&9, P948&9 *1).

(12) If put ON the cut-off control input signal during synchronization, the slave axis is accelerated more than the synchronization speed with the cut-off control distance (P812) and acceleration control coefficient (P813, P814).

(13) When the slave axis is on the wait position, the start operation is forcefully conducted by turning ON the force start signal.

(14) When conducting the mark sense start, it is necessary to secure the following distance between the mark sensor position and the wait position.
Distance between the mark sensor position and the wait position $\geqq$ Distance to follow the master speed
Distance to follow the master speed = $((A^2 \times B / D) + (A \times C / 100)) / 2$

A: Master speed (mm/sec)
B: Running positioning acceleration/deceleration time (P916, P936, P956 or P917, P973, P957 *1) (sec)
C: Running S-letter acceleration/deceleration ratio (P801) (%)
D: Slave axis rated speed (mm/sec)

The slave axis rated speed is the operating speed when the slave axis motor rotates at its rating speed. The positioning adjustment between the mark sensor position and the wait position is conducted with the mark delay length (P910&1, P930&1, P950&1 *1).

(15) When the position to follow on the master exceeds the cutting position end edge signal output position (P806), the cutting position end edge signal (MLS signal) becomes ON. When the position to follow on the master becomes lower than the cutting position end edge output position (P806), the cutting position end edge signal (MLS signal) becomes OFF.

(16) Continuous running positioning is possible.
For details, refer to [9-4 Continuous running positioning].

(17) This command does not stop by the block stop signal.

*1: It is selected with the command parameter PATN (Parameter selection).

[Setting]

(1) Title display	Setting content		
↑	Setting unit	Setting range (Direct data) (Index data)	Initial value
Display order	Remarks (Details and annotations for setting)		

<<Group 6: BRS>>

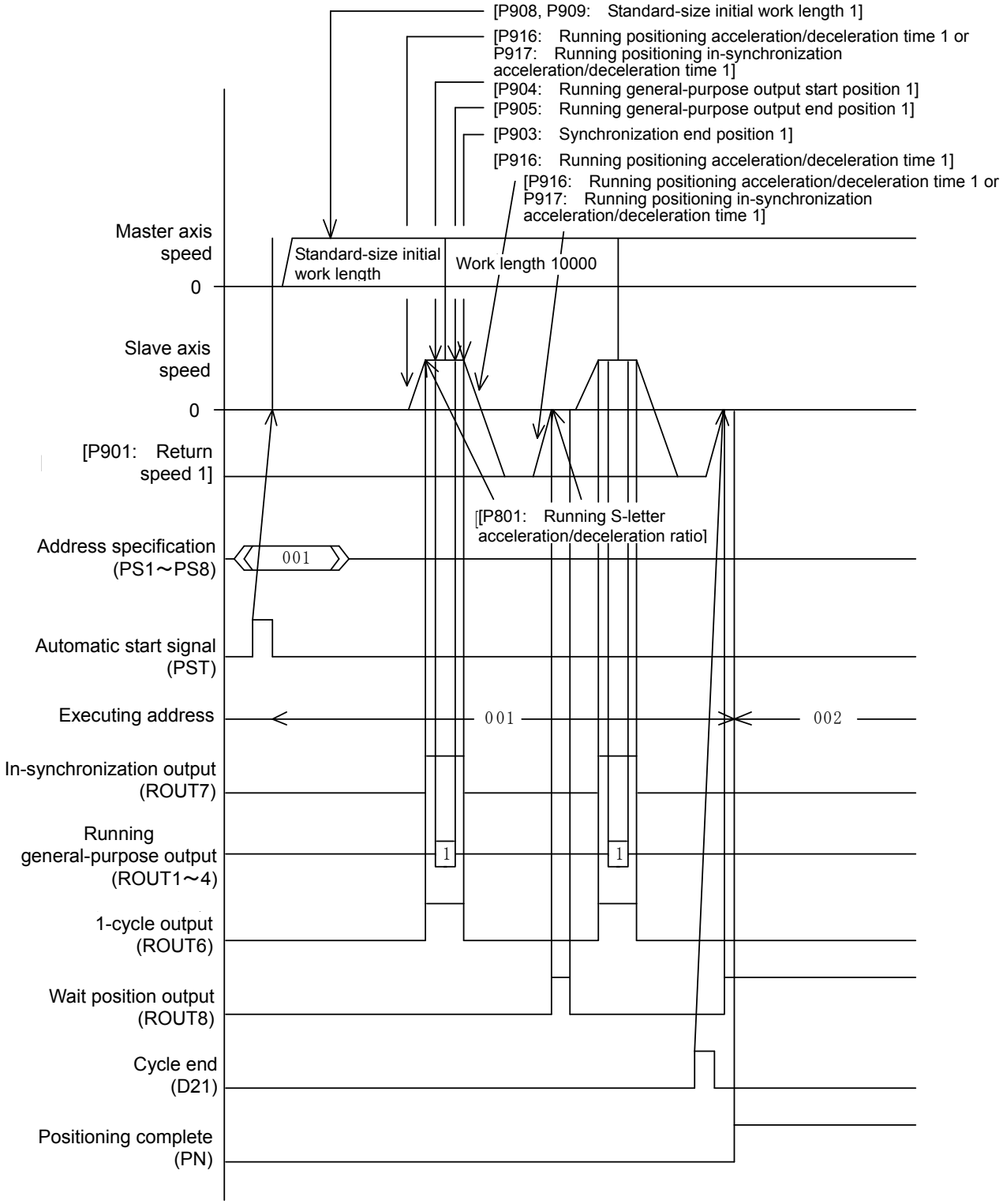
(1) LENG	Work length		
	mm, ˚,inch	00000000～99999999 IX00～IX99	00000000
	It specifies the direct data value "0" or the index data, and if the index data value is "0", the mark sense start is appointed. Readout timing of this command parameter value is as follows. • When the direct data: Readout when this command starts. • When the index data: Readout the index data value when this command starts and when the synchronization ends.		
(2) ROUT	Running general-purpose output		
	Binary	0000～1111 IX00～IX99	/0000
	Readout timing of this command parameter value is as follows. • When the direct data: Readout when this command starts. • When the index data: Readout the index data value when this command starts and when the synchronization ends.		
(3) PATN	Parameter selection		
	None	EL.1/SEL.2/SEL.3	SEL.1
	This command parameter is readout when this command starts. *1, in the BRS command explanation, is selected.		

[Operation example]

<<Running positioning operation example_1>>

In the standard-size & forced synchronization end invalid (P805) (Short cut operation:　Nil)

ADDR	CMD	LENG	ROUT	PATN	Remarks
001	BRS	10000	0001	SEL.1	Standard-size initial work length 1:　Other than "0"
002	PEND	----	----	----	

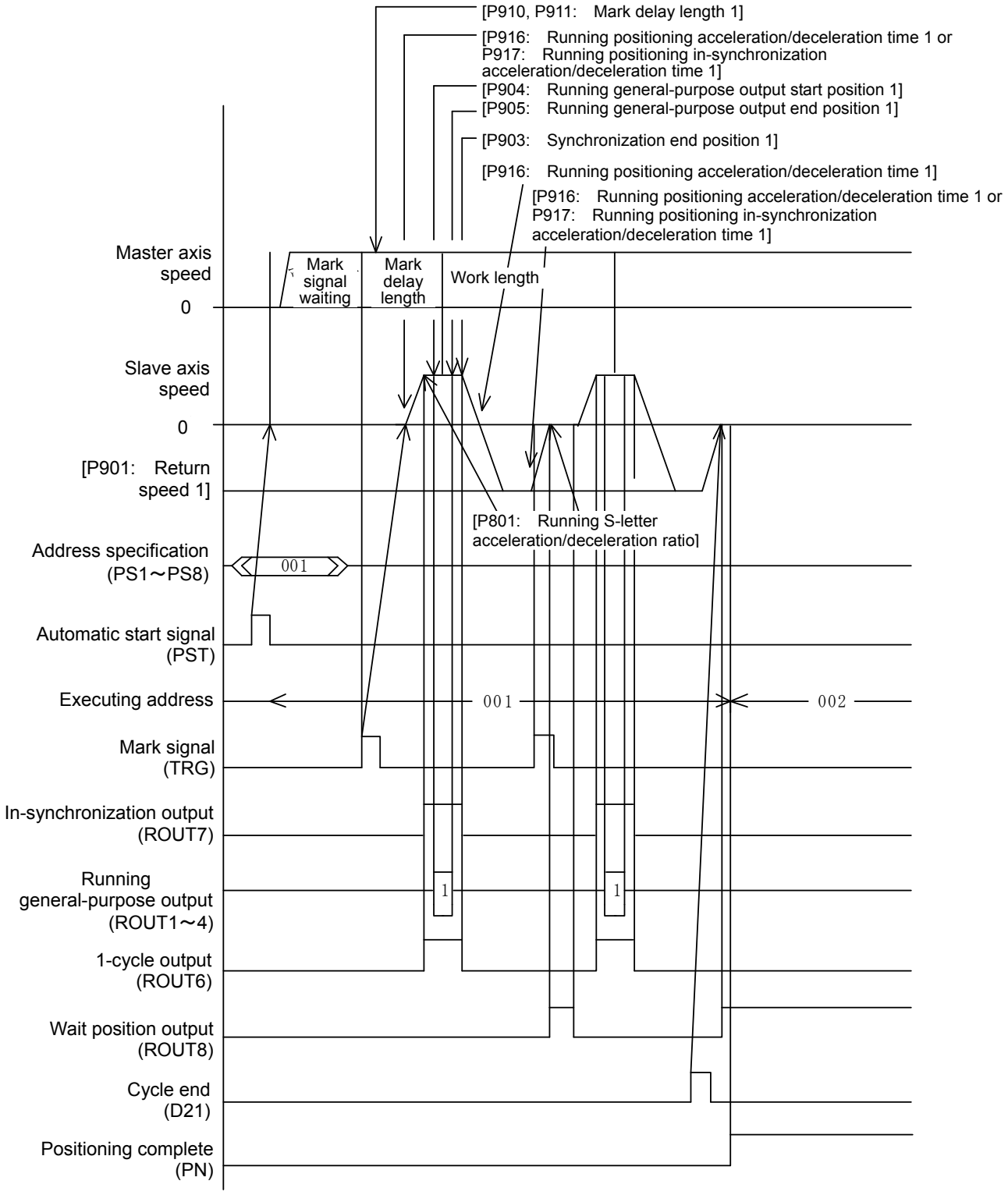


[Operation example]

<<Running positioning operation example_2>>

In the mark sense & forced synchronization end invalid (P805) (Short cut operation: Nil)

ADDR	CMD	LENG	ROUT	PATN	Remarks
001	BRS	0	0001	SEL.1	
002	PEND	----	----	----	

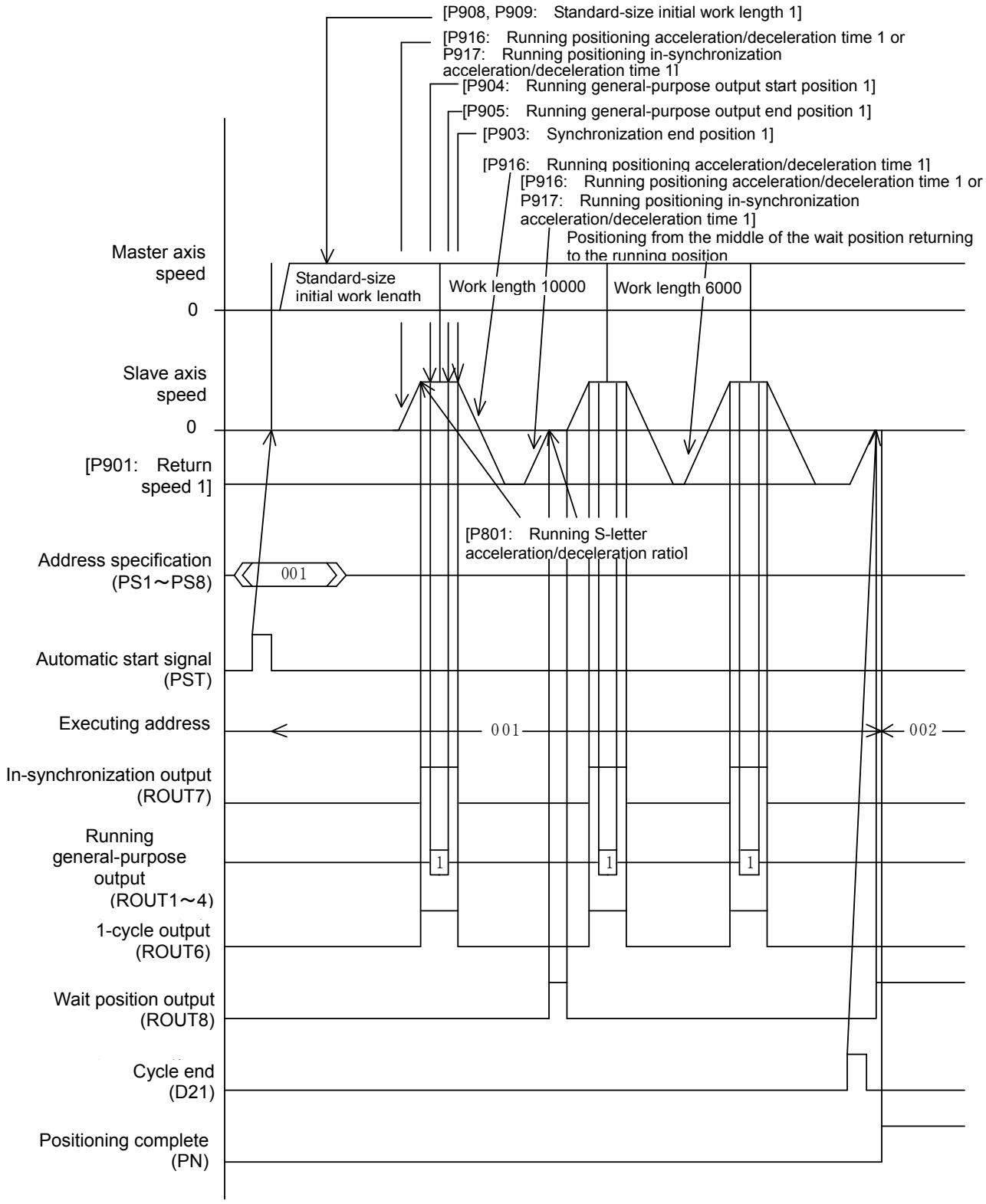


[Operation example]

<<Running positioning operation example_3>>

In the mark sense & forced synchronization end invalid (P805) (Short cut operation:　Yes)

ADDR	CMD	LENG	ROUT	PATN	Remarks
001	BRS	IX54	0001	SEL.1	Standard-size initial work length 1:　Other than "0"
002	PEND	----	----	----	

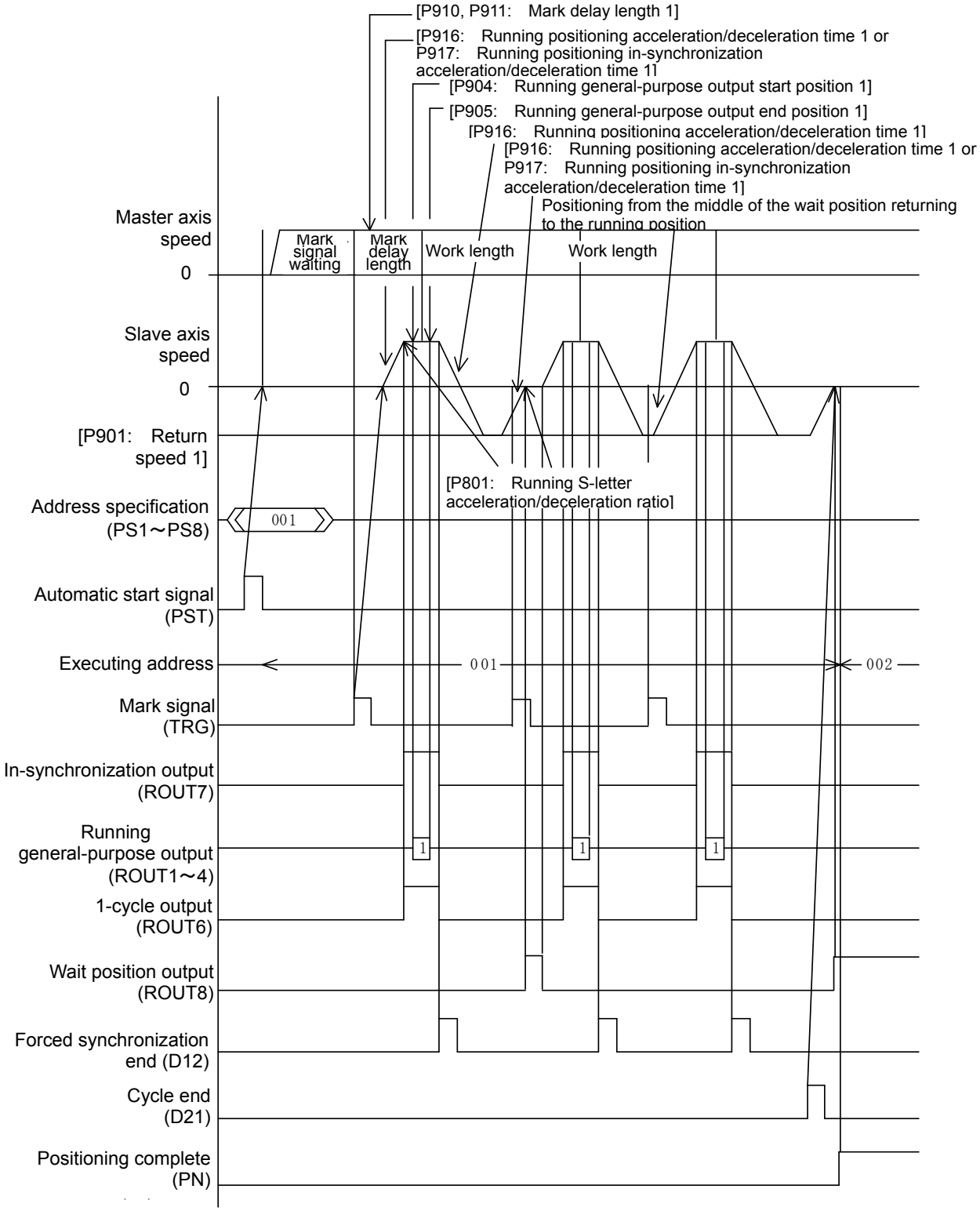


[Operation example]

<<Running positioning operation example_4>>

In the mark sense & forced synchronization end invalid (P805) (Short cut operation:　Yes)

ADDR	CMD	LENG	ROUT	PATN	Remarks
001	BRS	0	0001	SEL.1	
002	PEND	----	----	----	



[BRS] Returning system running positioning (Continuous)

[Function]

- This command conducts the returning system running positioning control which has following functions.
  (After the completion of this command, the next address command is conducted.)

(1) In this command, the slave axis follows the master axis speed from the running positioning wait position (P913, P933, P953 *1). In this operation, the slave axis acceleration/deceleration depends on the setting of the running positioning acceleration/deceleration time (P916, P936, P956 *1).
The in-acceleration S-letter ratio is specified with the running S-letter acceleration/deceleration ratio (P801).

(2) During the synchronization (next to 1), the in-synchronization output signal becomes ON with the setting of the synchronization deviation range (P802). Further, the running general-purpose output becomes ON with the setting of the running general-purpose output start position (P904, P924, P944 *1).
The running general-purpose output signal comes out in the 4-bit binary number (0000-1111).
The running general-purpose output becomes OFF with the setting of the running general-purpose output end position (P905, P925, P945 *1).
The 1-cycle output becomes ON during the synchronization.

(3) The synchronization end patters consist of two patterns with the forced synchronization end valid/invalid (P805).
When valid: Synchronization ends when detected the ON edge of the forced synchronization end signal. (To 4)
When invalid: Synchronization ends when the slave axis reached the synchronization end position (P903, P923, P943 *1). (To 4)
At the synchronization end, the in-synchronization output signal, the running general-purpose output signal, and the 1-cycle output signal become OFF.

(4) The slave axis returns to the running positioning wait position (P913, P933, P953, *1).
Returning operation to the running positioning wait position follows as below.
  - Return speed (P901, P921, P941 *1)
  - Running positioning acceleration/deceleration time (P916, P936, P956 *1)

(5) After the wait position returning, it waits for the below start timing following the LENG (Work length).
To LENG, specify with the index data.
In the mark sense start, set "0" to the index data.
In the standard-size start, set a plus value to the index data.
In the end of the combination patterns, set a minus value to the index data.
The order of operation in the combination patterns follows the index data numbering order (I X * *).
The maximum number of the combination patterns is 50 (including the minus of the combination pattern end).

(6) A series of the (1) to (5) operations is repeated.

(7) When the cycle end signal becomes ON while this command is in operation, after completing (4), the next address command is conducted. At the cycle end, the positioning complete signal (PN) is output.

(8) If the hold signal (HLD) is input while this command is in operation, it decelerates and stops according to the setting of the deceleration time (P214, P215, P216 *1).

(9) The restart after the hold completes this command and it outputs the automatic operation ready signal (PRDY) entering the start waiting mode by the next address.

(10) Data for the running general-purpose output can be appointed by the numeric input (Direct data specification) or the index data specification, in the different meaning.
In the numeric input (Direct data specification), same value is reflected to all operations of the combination patterns.
In the index data specification, each individual value can be set to the combination patterns respectively. The setting in this case copes with the order of the work length.

(11) In the standard-size operation, the material end edge processing is enabled by the standard-size initial work length (P908&9, P928&9, P948&9 *1).
The general-purpose output in the standard-size initial operation runs on the first data of the combination patterns.

(12) If put ON the cut-off control input signal during synchronization, the slave axis is accelerated more than the synchronization speed with the cut-off control distance (P812) and acceleration control coefficient (P813, P814).

(13) When the slave axis is on the wait position, the start operation is forcefully conducted by turning ON the force start signal.

(14) When conducting the mark sense start, it is necessary to secure the following distance between the mark sensor position and the wait position.
Distance between the mark sensor position and the wait position $\geqq$ Distance to follow the master speed
Distance to follow the master speed = $((A^2 \times B / D) + (A \times C / 100)) / 2$
A: Master speed (mm/sec)
B: Running positioning acceleration/deceleration time (P916, P936, P956 or P917, P937, P957 *1) (sec)
C: Running S-letter acceleration/deceleration ratio (P801) (%)
D: Slave axis rated speed (mm/sec)
The slave axis rated speed is the operating speed when the slave axis motor rotates at its rating speed. The positioning adjustment between the mark sensor position and the wait position is conducted with the mark delay length (P910&1, P930&1, P950&1 *1).

(15) When the position to follow on the master exceeds the cutting position end edge signal output position (P806), the cutting position end edge signal (MLS signal) becomes ON. When the position to follow on the master becomes lower than the cutting position end edge output position (P806), the cutting position end edge signal (MLS signal) becomes OFF.

(16) This command does not stop by the block stop signal.

*1: It is selected with the command parameter PATN (Parameter selection).

[Setting]

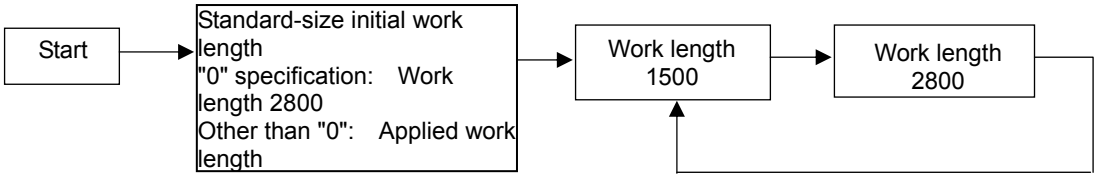
(1) Title display	Setting content		
↑	Setting unit	Setting range (Direct data) (Index data)	Initial value
Display order	Remarks (Details and annotations for setting)		

<<Group 6: BRS>>

(1) LENG	Work length		
	mm, ˚,inch	IX00～IX99	00000000
	In the mark sense start, set "0" to the index data value. In the standard-size start, set the plus value to the index data. In the end of the combination patterns, set the minus value to the index data.		
(2) ROUT	Running general-purpose output		
	Binary	0000～1111 IX00～IX99	/0000
	In the index data specification, the using number is not confirmed. When the index data area is exceeded, with the number of patterns specified by 1, it operates referring to the data area which exceeded the number. Thus, pay attention.		
(3) PATN	Parameter selection		
	None	EL.1/SEL.2/SEL.3	SEL.1
	*1, in the BRS command explanation, is selected.		

[Operation example]

<<Running positioning operation example_1>>
When repeats the below operations:

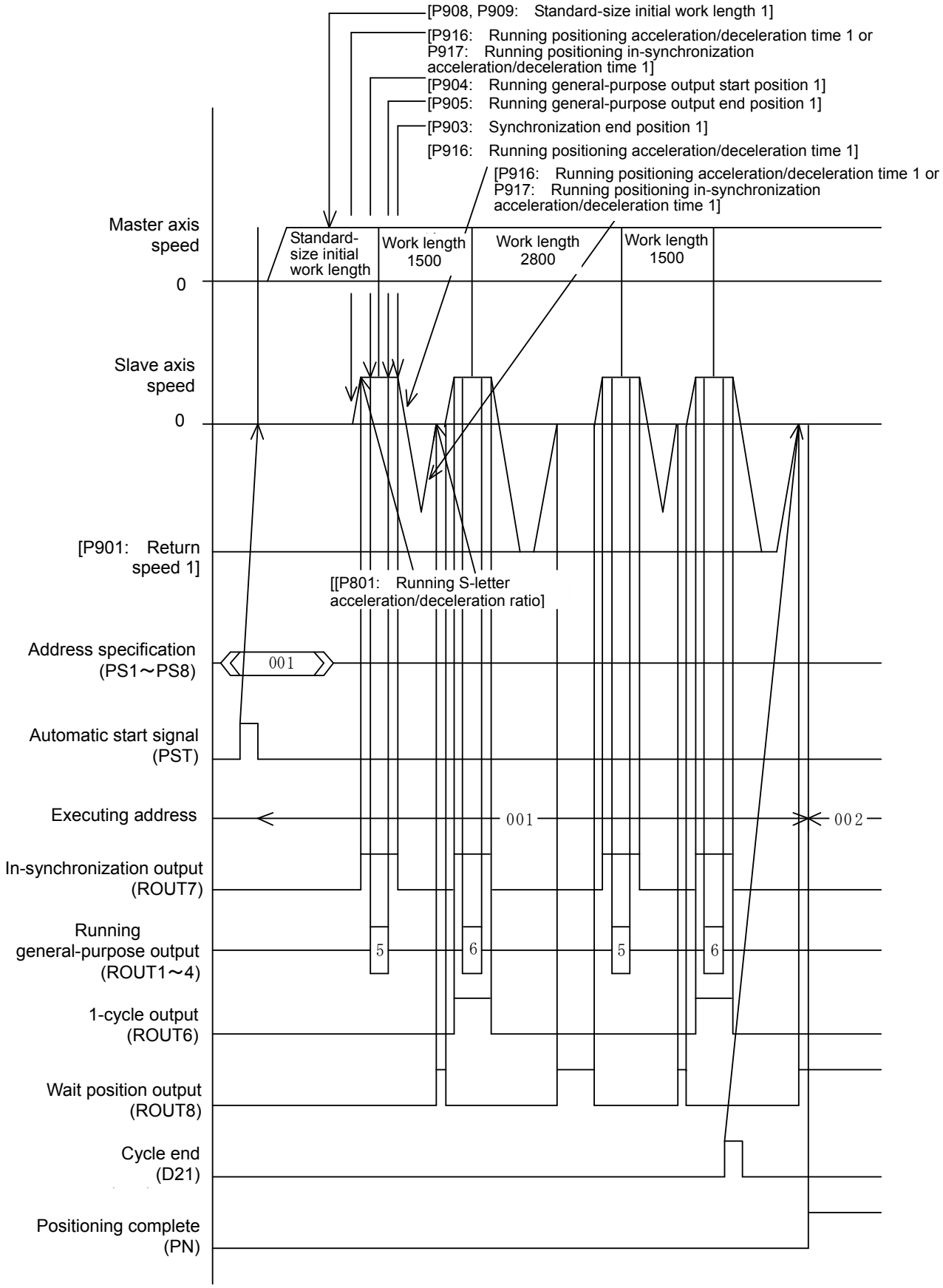


Index data setting

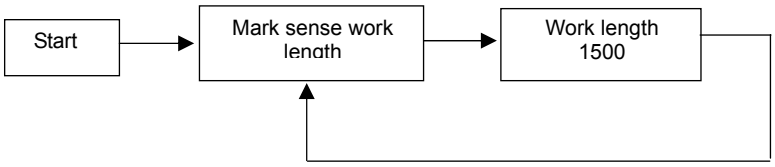
I X * *	Value	Meaning
I X 0 0	2800	Work length with the first pattern standard-size
I X 0 1	1500	Work length with the second pattern standard-size
I X 0 2	-1	Combination pattern end code
I X 1 0	5(0101)	First in-synchronization running general-purpose output
I X 1 1	6(0110)	Second in-synchronization running general-purpose output

Command setting

ADDR	CMD	LENG	ROUT	PATN	Remarks
001	BRC	I X 0 0	I X 1 0	SEL.1	Standard-size initial work length 1: Other than "0"
002	PEND	----	----	----	


[P908, P909: Standard-size initial work length 1]
[P916: Running positioning acceleration/deceleration time 1 or P917: Running positioning in-synchronization acceleration/deceleration time 1]
[P904: Running general-purpose output start position 1]
[P905: Running general-purpose output end position 1]
[P903: Synchronization end position 1]
[P916: Running positioning acceleration/deceleration time 1]
[P916: Running positioning acceleration/deceleration time 1 or P917: Running positioning in-synchronization acceleration/deceleration time 1]
Master axis speed
0
Slave axis speed
0
Standard-size initial work length
Work length 1500
Work length 2800
Work length 1500
[P901: Return speed 1]
[[P801: Running S-letter acceleration/deceleration ratio]
Address specification (PS1～PS8)
001
Automatic start signal (PST)
Executing address
001
002
In-synchronization output (ROUT7)
Running general-purpose output (ROUT1～4)
5
6
5
6
1-cycle output (ROUT6)
Wait position output (ROUT8)
Cycle end (D21)
Positioning complete (PN)

[Operation example]
<<Running positioning operation example_2>>
When repeats the below operations:

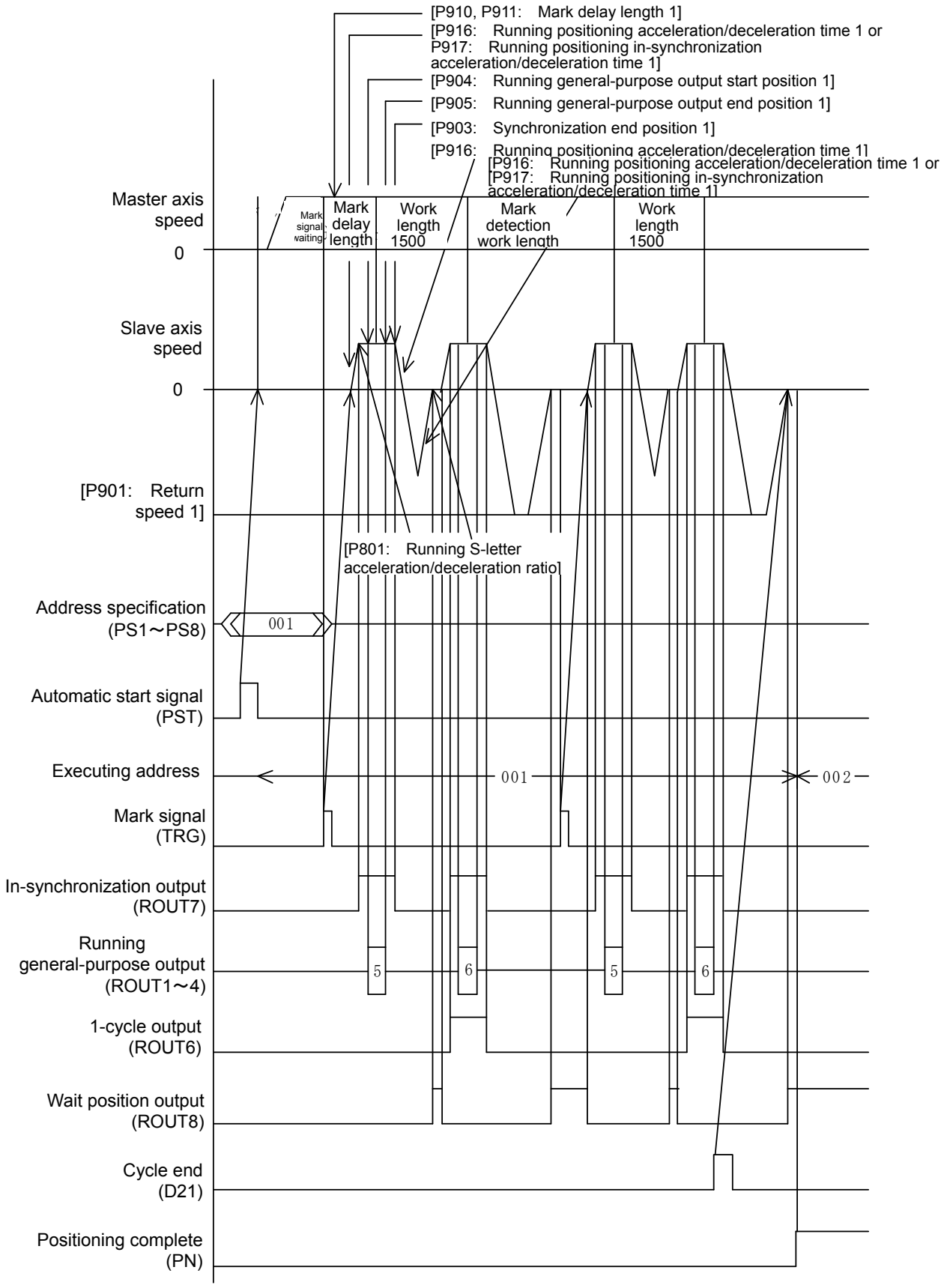


Index data setting

I X * *	Value	Meaning
I X 0 0	0	Work length with the first pattern standard-size
I X 0 1	1500	Work length with the second pattern standard-size
I X 0 2	-1	Combination pattern end code
I X 1 0	5(0101)	First in-synchronization running general-purpose output
I X 1 1	6(0110)	Second in-synchronization running general-purpose output

Command setting

ADDR	CMD	LENG	ROUT	PATN	Remarks
001	BRC	I X 0 0	I X 1 0	SEL.1	
002	PEND	----	----	----	


[P910, P911: Mark delay length 1]
[P916: Running positioning acceleration/deceleration time 1 or
P917: Running positioning in-synchronization
acceleration/deceleration time 1]
[P904: Running general-purpose output start position 1]
[P905: Running general-purpose output end position 1]
[P903: Synchronization end position 1]
[P916: Running positioning acceleration/deceleration time 1]
[P916: Running positioning acceleration/deceleration time 1 or
[P917: Running positioning in-synchronization
acceleration/deceleration time 1]
Master axis speed
0
Slave axis speed
0
[P901: Return speed 1]
Address specification (PS1～PS8)
Automatic start signal (PST)
Executing address
Mark signal (TRG)
In-synchronization output (ROUT7)
Running general-purpose output (ROUT1～4)
1-cycle output (ROUT6)
Wait position output (ROUT8)
Cycle end (D21)
Positioning complete (PN)
Mark signal waiting
Mark delay length
Work length 1500
Mark detection work length
Work length 1500
[P801: Running S-letter acceleration/deceleration ratio]
001
001
002
5
6
5
6

[RRAS] Rotating system running positioning (Single)

[Function]

- This command conducts the rotating system running positioning control which has following functions.
  (After the completion of this command, the next address command is conducted.)

(1) In this command, the slave axis follows the master axis speed from the wait position.
In this operation, the slave axis travel amount to follow the master axis speed is set with the in-acceleration travel amount (P902, P922, P942 *1).
The in-acceleration S-letter ratio is specified with the running S-letter acceleration/deceleration ratio (P801).

(2) During the synchronization (next to 1, including the time of cosine compensation control), the in-synchronization output signal becomes ON depending on the synchronization deviation range (P802).
Further, the running general-purpose output becomes ON with the setting of the running general-purpose output start position (P904, P924, P944 *1).
The running general-purpose output signal comes out in the 4-bit binary number (0000-1111).
The running general-purpose output becomes OFF with the setting of the running general-purpose output end position (P905, P925, P945 *1).
The 1-cycle output becomes ON during the synchronization.

(3) When the slave axis reaches the synchronization end position (P903, P923, P943 *1), synchronization ends. (To 4)
At the synchronization end, the in-synchronization output signal, the running general-purpose output signal, and the 1-cycle output signal become OFF.

(4) The slave axis is adjusted in speed according to LENG (Work length).
When the long-size: It decelerates at the synchronization end position and returns (positioning) to the wait position.
When other than the long-size: It adjusts the speed to align to the running positioning position, not positioning to the wait position.
The S-letter ratio in the deceleration (Speed adjust) is specified with the running S-letter acceleration/deceleration ratio (P801).

(5) Only in the long-size mode, after returning to the wait position, it waits for the next start timing according to LENG (Work length).
In the mark sense start, "0" is set to LENG.
In the standard-size start, a plus value is set to LENG.

(6) A series of the (1) to (5) operations is repeated.

(7) If the cycle end signal becomes ON while this command is in operation (before synchronization end), after returning to the wait position in 4, the next address command is conducted. At the cycle end, the positioning complete signal (PN) is output.

(8) If the hold signal (HLD) is input while this command is in operation, it decelerates and stops according to the setting of the deceleration time (P214, P215, P216 *1).

(9) The restart after the hold completes this command and it outputs the automatic operation ready signal (PRDY) entering the start waiting mode by the next address.

(10) Each data of the work length and running general-purpose output is possible to specify with the numeric input (Direct data specification) or the index data specification.

(11) The wait position is set with the running positioning wait position (P913, P933, P953 *1).

(12) In the standard-size operation, the material end edge processing is possible with the standard-size initial work length (P908&9, P928&9, P948&9 *1).

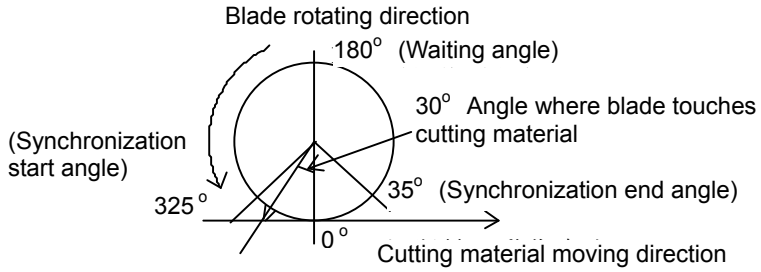
(13) In the mark sense start, it requires the following distance between the mark sensor position and the wait position.
Distance between the mark sensor position and the wait position ≧ Two times of circumference of the slave axis
The positioning adjustment of the mark sensor position and the wait position is made with the mark delay length (P910&1, P930&1, P950&1 *1).

(14) When the cosine compensation control range (P914, P934, P954 *1) is another value than "0", the cosine compensation control is conducted. In the cosine compensation control, the position where the cutter is at the bottom limit refers to the "0" position of the slave position.

(15) This command does not stop with the block stop signal.

(16) When this command is in operation, and if the rotating body position range (P305) is not set, it ends with an alarm.

[Parameter setting example in the rotary shear]



Parameter selection:	SEL1
Rotary shear diameter:	500 mm
Waiting angle:	180°
Synchronization start angle:	325°
Synchronization end angle:	35°
Angle where blade touches cutting material:	30°

P305 (Rotating body position range) = Rotary shear circumference
= 500 * π
= 1570.8 mm

P900 (Synchronization angle) = Angle where blade touches cutting material
= 30°

P902 (In-acceleration travel amount) = Rotary sear circumference distance from the wait angle to the synchronization start angle
= ((325-180)/360) * 500 * π
= 632.7 mm

P903 (Synchronization end position) = Rotary sear circumference distance from the wait angle to the synchronization start angle
= ((180+35)/360) * 500 * π
= 938.1 mm

P913 (Running positioning wait position) = Rotary shear circumference distance from 0°to the wait angle
= (180/360) * 500 * π
= 785.4 mm

* The running general-purpose output position is also set with the rotary shear circumference distance from the wait angle.

*1: It is selected with the command parameter PATN (Parameter selection).

[Setting]

(1) Title display	Setting content		
↑	Setting unit	Setting range (Direct data) (Index data)	Initial value
Display order	Remarks (Details and annotations for setting)		

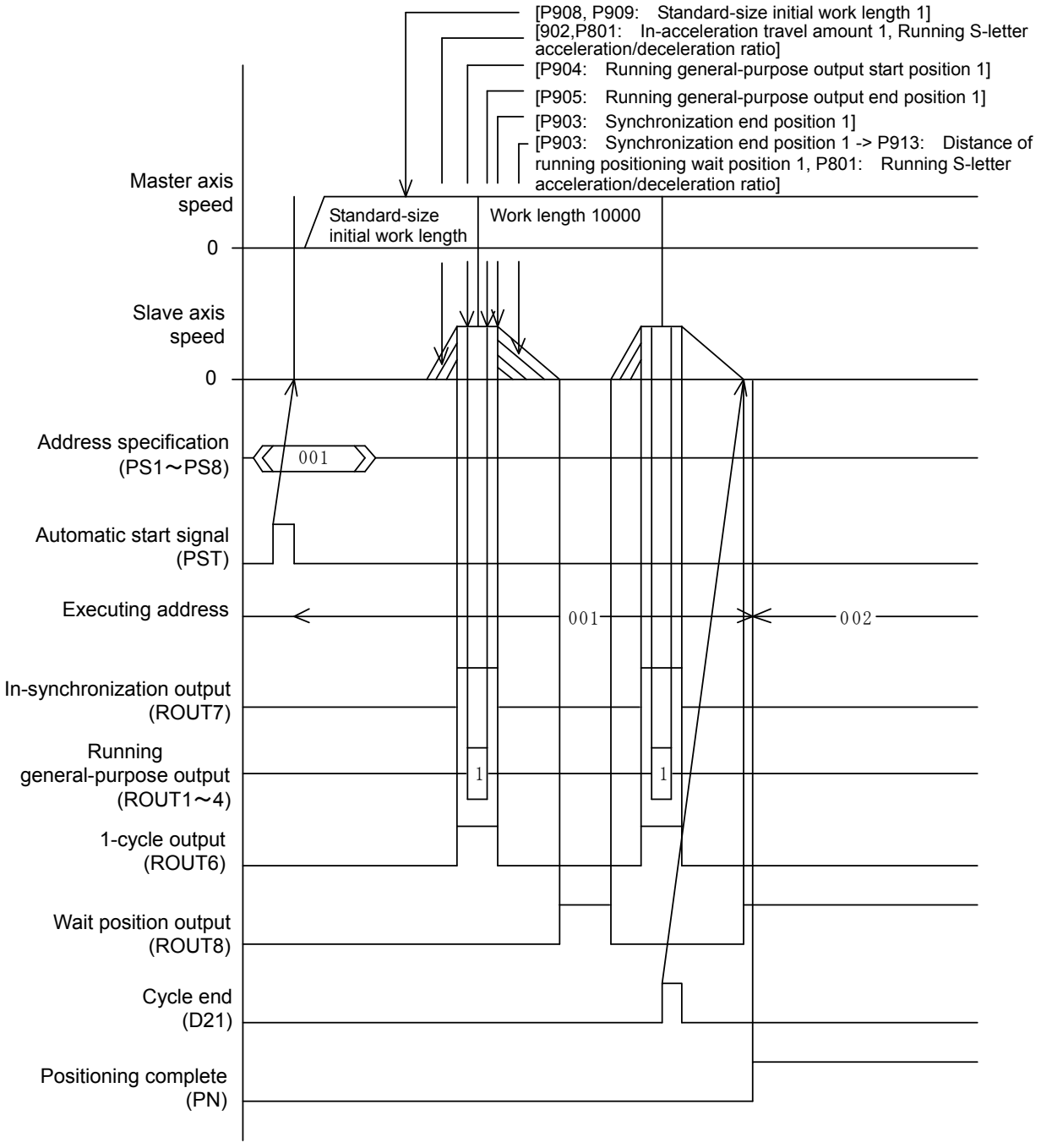
<<Group 6: RRAS>>

(1) LENG	Work length		
	mm, ˚,inch	00000000～99999999 IX00～IX99	00000000
	It specifies the direct data value "0" or the index data, and if the index data value is "0", the mark sense start is appointed. This command parameter is reflected at the synchronization end.		
(2) ROUT	Running general-purpose output		
	Binary	0000～1111 IX00～IX99	/0000
	This command parameter is reflected at the synchronization end.		
(3) PATN	Parameter selection		
	None	EL.1/SEL.2/SEL.3	SEL.1
	*1 in the RRAS command function explanation is selected.		

[Operation example]

<<Running positioning operation example_1>> (When the standard-size in the long-size)

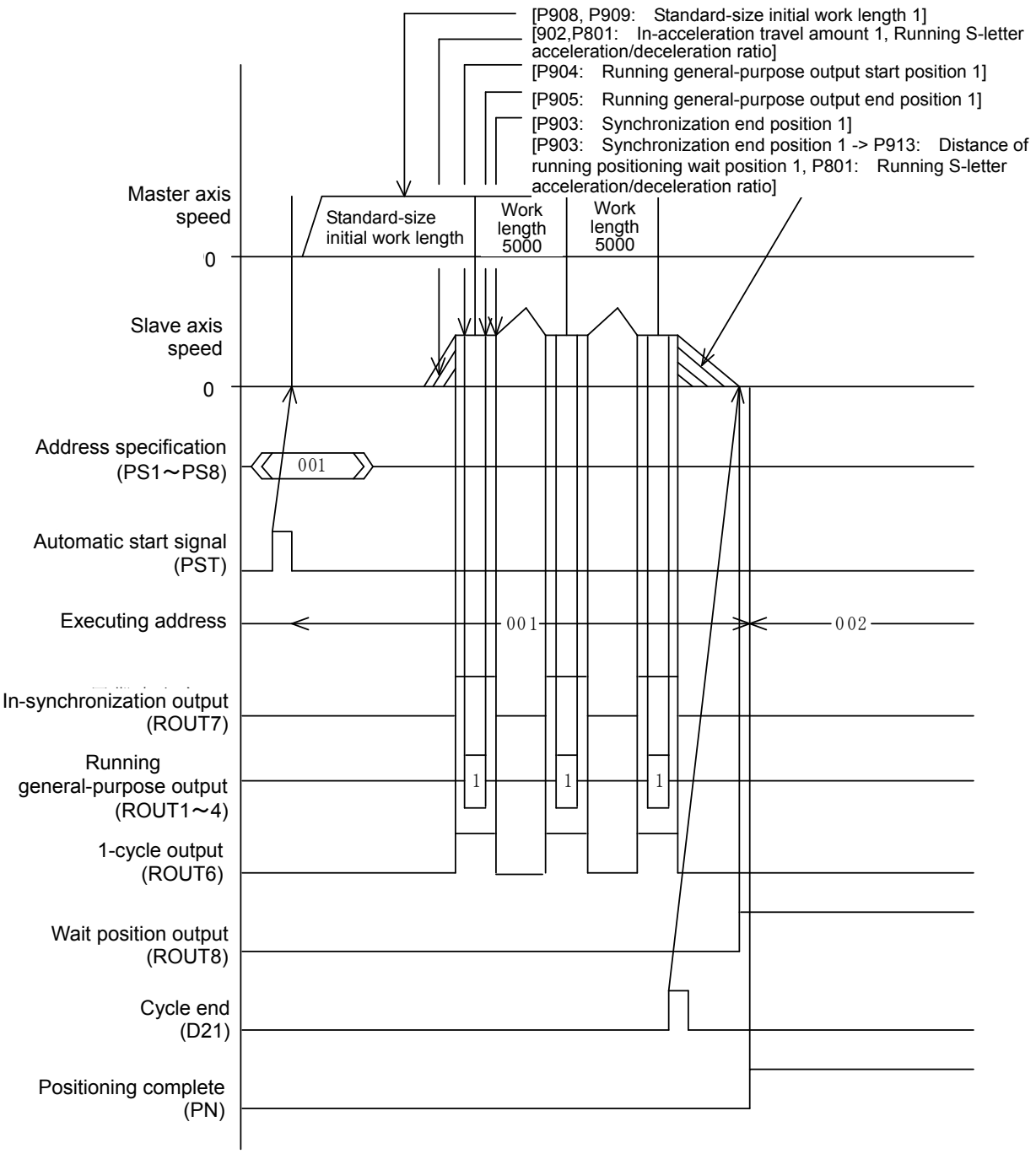
ADDR	CMD	LENG	ROUT	PATN	Remarks
001	RRAS	10000	0001	SEL.1	Standard-size initial work length 1: Other than "0"
002	PEND	----	----	----	



[Operation example]

<<Running positioning operation example_2>> (When the standard-size in the short-size)

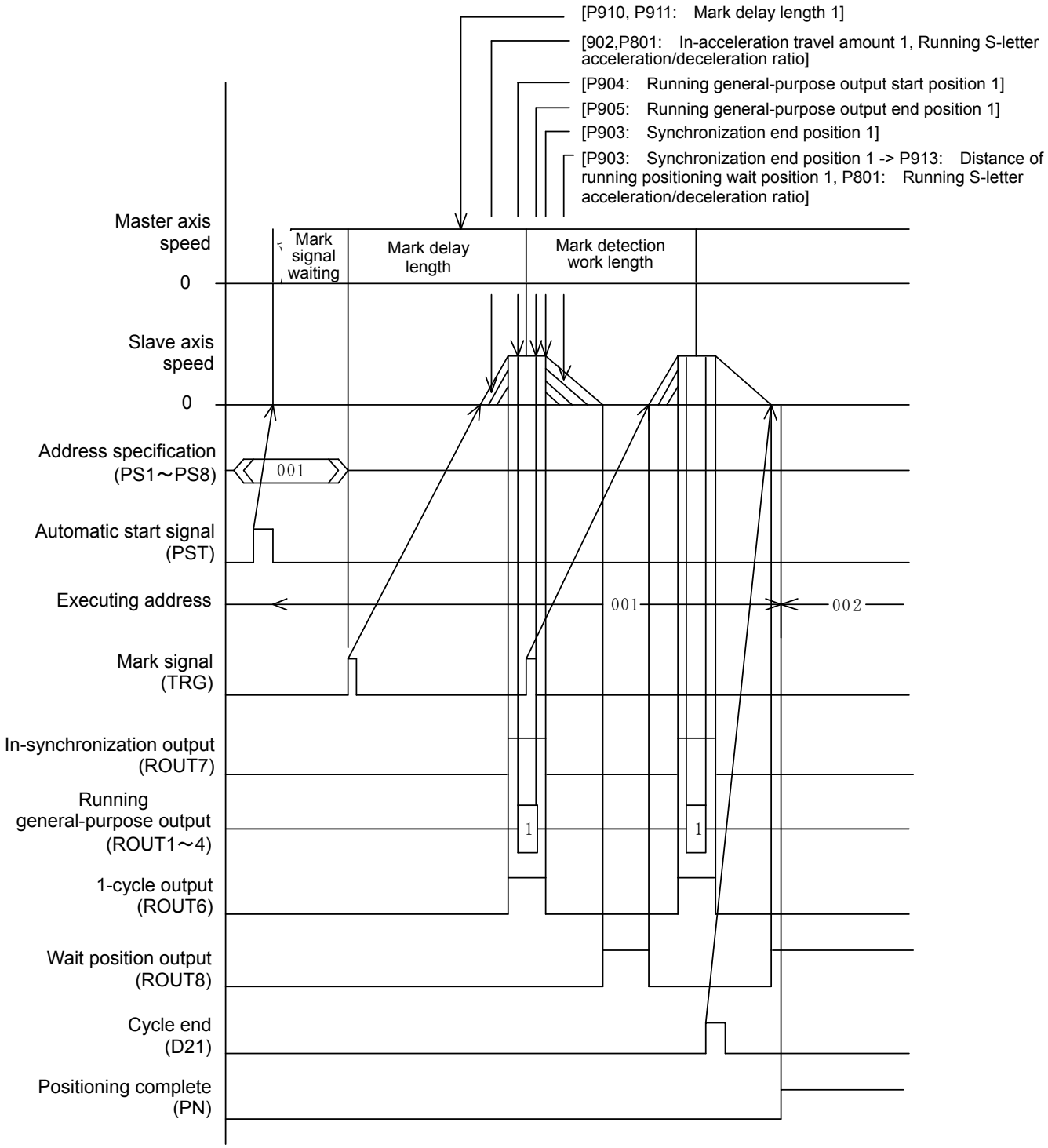
ADDR	CMD	LENG	ROUT	PATN	Remarks
001	RRAS	5000	0001	SEL.1	Standard-size initial work length 1:　Other than "0"
002	PEND	----	----	----	



[Operation example]

<<Running positioning operation example_3>> (When the mark sense)

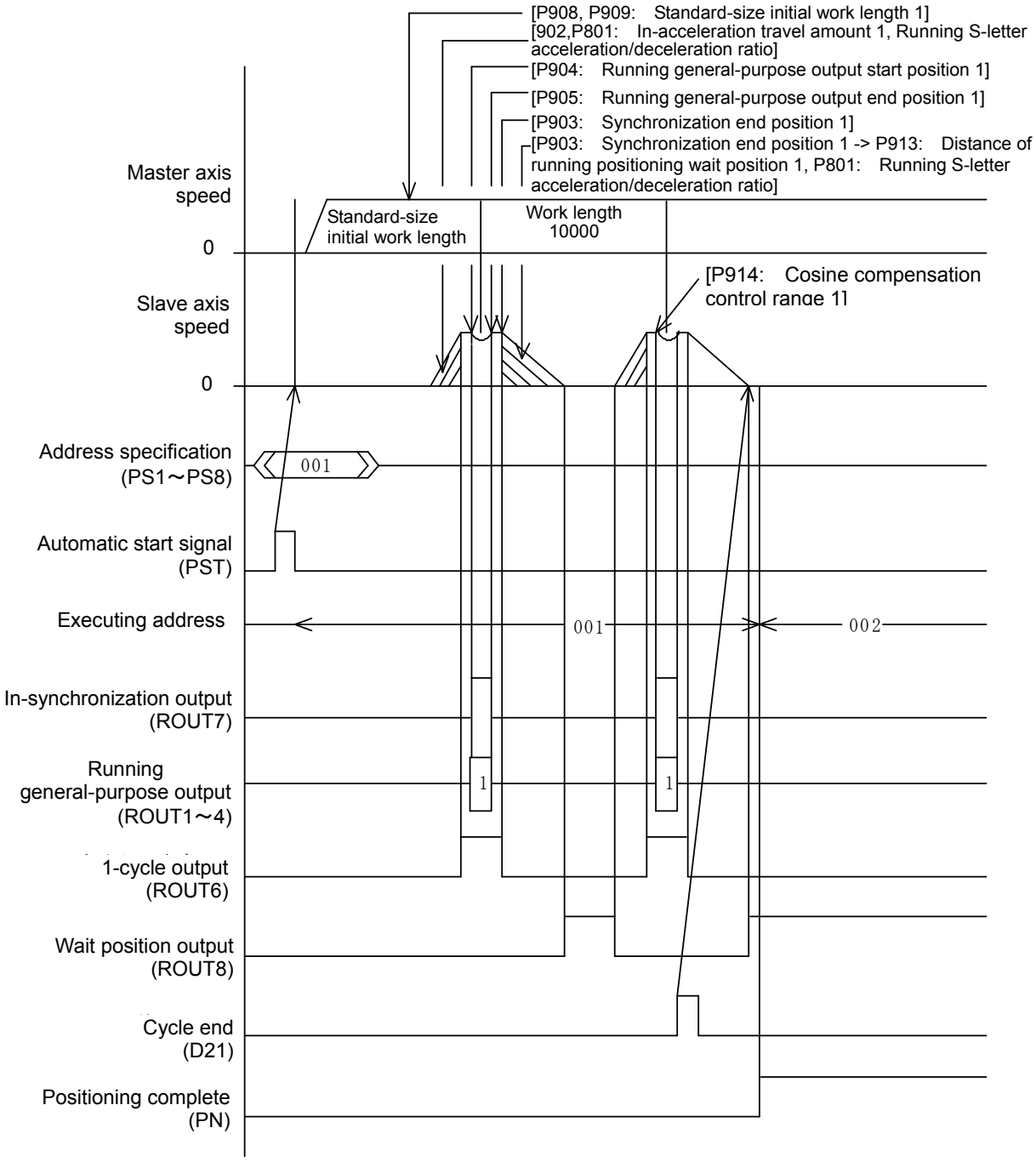
ADDR	CMD	LENG	ROUT	PATN	Remarks
001	RRAS	0	0001	SEL.1	
002	PEND	----	----	----	



[Operation example]

<<Running positioning operation example_4>> (When the standard-size in the cosine compensation control)

ADDR	CMD	LENG	ROUT	PATN	Remarks
001	RRAS	10000	0001	SEL.1	Standard-size initial work length 1: Other than "0" Cosine compensation control range 1: Value other than "0"
002	PEND	----	----	----	



[RRAC] Rotating system running positioning (Continuous)

[Function]

- This command conducts the rotating system running positioning control which has following functions.
  (After the completion of this command, the next address command is conducted.)

(1) In this command, the slave axis follows the master axis speed from the wait position.
In this operation, the slave axis travel amount to follow the master axis speed is set with the in-acceleration travel amount (P902, P922, P942 *1).
The in-acceleration S-letter ratio is specified with the running S-letter acceleration/deceleration ratio (P801).

(2) During the synchronization (next to (1), including the time of cosine compensation control), the in-synchronization output signal becomes ON depending on the synchronization deviation range (P802).
Further, the running general-purpose output becomes ON with the setting of the running general-purpose output start position (P904, P924, P944 *1).
The running general-purpose output signal comes out in the 4-bit binary number (0000-1111).
The running general-purpose output becomes OFF with the setting of the running general-purpose output end position (P905, P925, P945 *1).
The 1-cycle output becomes ON during the last synchronization of the combination patterns.

(3) When the slave axis reaches the synchronization end position (P903, P923, P943 *1), synchronization ends. (To 4)
At the synchronization end, the in-synchronization output signal, the running general-purpose output signal, and the 1-cycle output signal become OFF.

(4) The slave axis is adjusted in speed according to LENG (Work length).
When the long-size: It decelerates at the synchronization end position and returns (positioning) to the wait position.
When other than the long-size: It adjusts the speed to align to the running positioning position, not positioning to the wait position.
The S-letter ratio in the deceleration (Speed adjust) is specified with the running S-letter acceleration/deceleration ratio (P801).

(5) After the wait position returning, only in the long-size, it waits for the below start timing following the LENG (Work length).
To LENG, specify with the index data.
In the mark sense start, set "0" to the index data.
In the standard-size start, set the plus value to the index data.
In the end of the combination patterns, set the minus value to the index data.
The order of operation in the combination patterns follows the index data numbering order (IX**).
The maximum number of the combination patterns is 50 (including the minus of the combination pattern end).

(6) A series of the (1) to (5) operations is repeated.

(7) If the cycle end signal becomes ON while this command is in operation (before synchronization end), after returning to the wait position in 4, the next address command is conducted. At the cycle end, the positioning complete signal (PN) is output.

(8) If the hold signal (HLD) is input while this command is in operation, it decelerates and stops according to the setting of the deceleration time (P214, P215, P216 *1).
When it becomes the restart wait status, the automatic operation ready signal (PRDY) is output.

(9) The restart after the hold completes this command and it outputs the automatic operation ready signal (PRDY) entering the start waiting mode by the next address.

(10) Data for the running general-purpose output can be appointed by the numeric input (Direct data specification) or the index data specification, in the different meaning.
In the numeric input (Direct data specification), same value is reflected to all operations of the combination patterns.
In the index data specification, each individual value can be set to the combination patterns respectively. The setting in this case copes with the order of the work length.

(11) The wait position is set with the running positioning wait position (P913, P933, P953 *1).

(12) In the standard-size operation, the material end edge processing is enabled by the standard-size initial work length (P908&9, P928&9, P948&9 *1).
The general-purpose output in the standard-size initial operation runs on the first data of the combination patterns.

(13) In the mark sense start, it requires the following distance between the mark sensor position and the wait position.
Distance between the mark sensor position and the wait position ≧ Two times of circumference of the slave axis
The positioning adjustment of the mark sensor position and the wait position is made with the mark delay length (P910&1, P930&1, P950&1 *1).

(14) When the cosine compensation control range (P914, P934, P954 *1) is another value than "0", the cosine compensation control is conducted. (For the operation example, refer to RRAS command.)
In the cosine compensation control, the position where the cutter is at the bottom limit refers to the "0" position of the slave position.

(15) This command does not stop with the block stop signal.

(16) When this command is in operation, and if the rotating body position range (P305) is not set, it gives an alarm.

*1: It is selected with the command parameter PATN (Parameter selection).

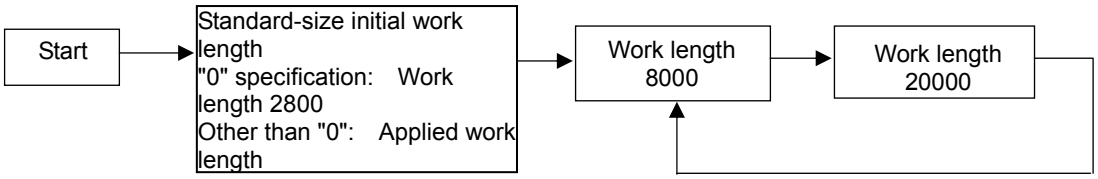
[Setting]

(1) Title display	Setting content		
↑	Setting unit	Setting range (Direct data) (Index data)	Initial value
Display order	Remarks (Details and annotations for setting)		

<<Group 6: RRAC>>

(1) LENG	Work length		
	mm, °,inch	I X 0 0～I X 9 9	I X 0 0
	In the mark sense start, set "0" to the index data value. In the standard-size start, set the plus value to the index data. In the end of the combination patterns, set the minus value to the index data.		
(2) ROUT	Running general-purpose output		
	Binary	0000～1111 IX00～IX99	/0000
	n the index data specification, the using number is not confirmed. When the index data area is exceeded, with the number of patterns specified by 1, it operates referring to the data area which exceeded the number. Thus, pay attention.		
(3) PATN	Parameter selection		
	None	EL.1/SEL.2/SEL.3	SEL.1
	*1, in the RRAC command explanation, is selected.		

[Operation example]
<<Running positioning operation example_1>>
When repeats below operations:

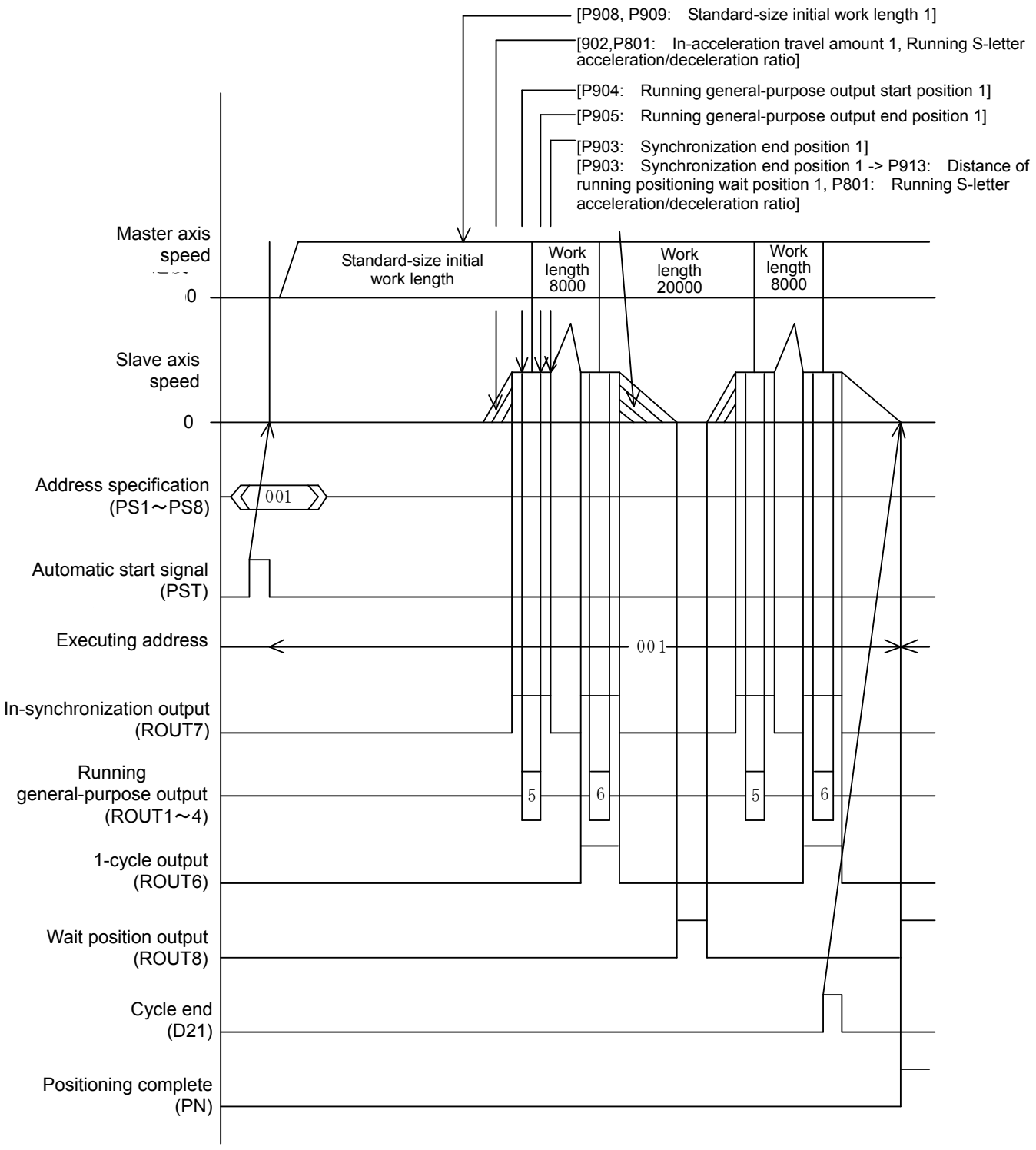


Index data setting

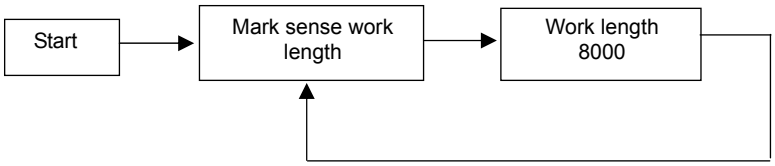
I X * *	Value	Meaning
I X 0 0	20000	Work length with the first pattern standard-size
I X 0 1	8000	Work length with the second pattern standard-size
I X 0 2	-1	Combination pattern end code
I X 1 0	5(0101)	First in-synchronization running general-purpose output
I X 1 1	6(0110)	Second in-synchronization running general-purpose output

Command setting

ADDR	CMD	LENG	ROUT	PATN	Remarks
001	RRAC	I X 0 0	I X 1 0	SEL.1	Standard-size initial work length 1: Other than "0"
002	PEND	----	----	----	


[P908, P909: Standard-size initial work length 1]
[902,P801: In-acceleration travel amount 1, Running S-letter acceleration/deceleration ratio]
[P904: Running general-purpose output start position 1]
[P905: Running general-purpose output end position 1]
[P903: Synchronization end position 1]
[P903: Synchronization end position 1 -> P913: Distance of running positioning wait position 1, P801: Running S-letter acceleration/deceleration ratio]
Master axis speed
0
Slave axis speed
0
Standard-size initial work length
Work length 8000
Work length 20000
Work length 8000
Address specification (PS1～PS8)
001
Automatic start signal (PST)
Executing address
001
In-synchronization output (ROUT7)
Running general-purpose output (ROUT1～4)
5
6
5
6
1-cycle output (ROUT6)
Wait position output (ROUT8)
Cycle end (D21)
Positioning complete (PN)

[Operation example]
<<Running positioning operation example_2>>
When repeats below operations:

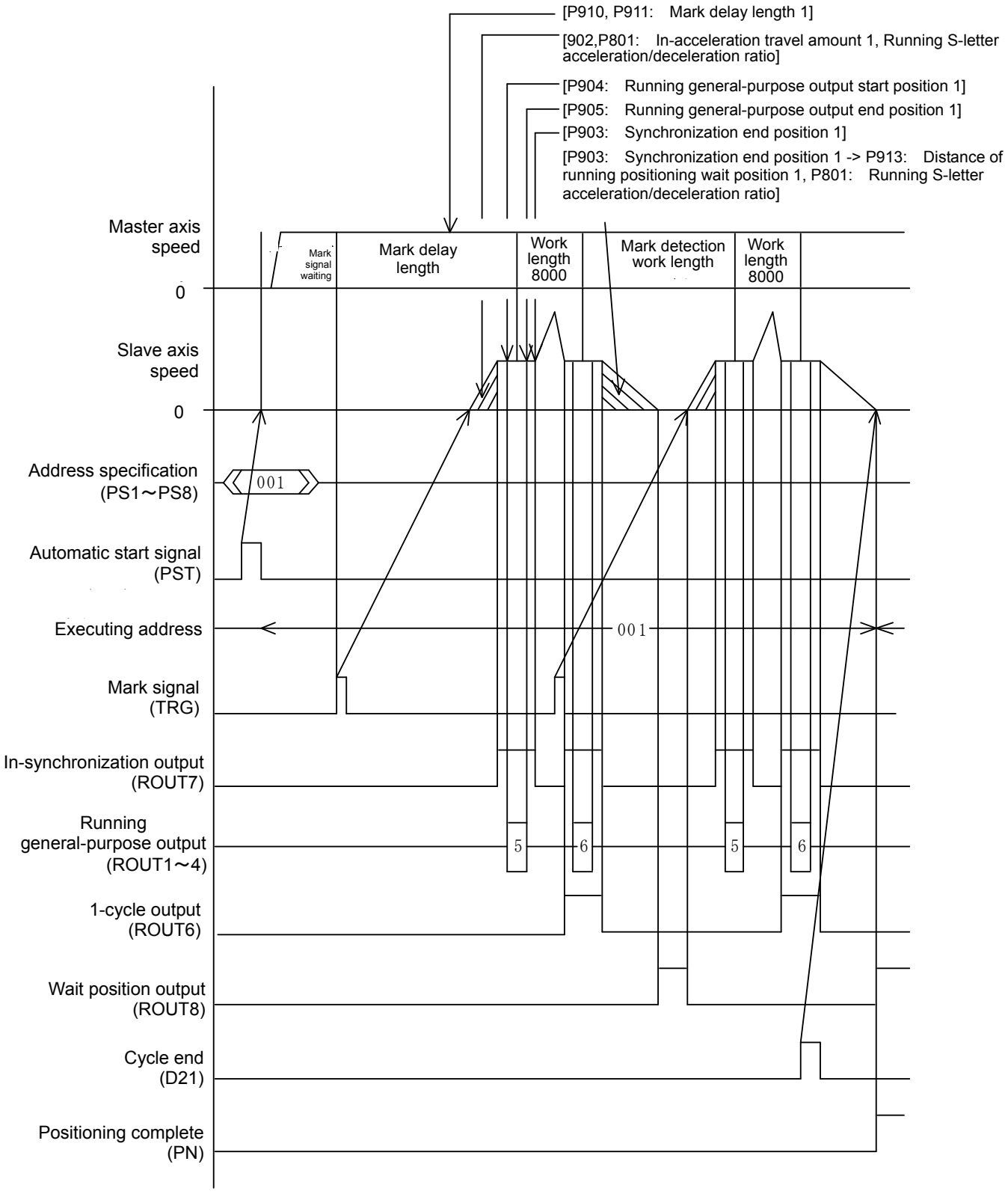


Index data setting

I X * *	Value	Meaning
I X 0 0	0	Work length with the first pattern standard-size
I X 0 1	8000	Work length with the second pattern standard-size
I X 0 2	-1	Combination pattern end code
I X 1 0	5(0101)	First in-synchronization running general-purpose output
I X 1 1	6(0110)	Second in-synchronization running general-purpose output

Command setting

ADDR	CMD	LENG	ROUT	PATN	Remarks
001	RRAC	I X 0 0	I X 1 0	SEL.1	
002	PEND	----	----	----	


[P910, P911: Mark delay length 1]
[902,P801: In-acceleration travel amount 1, Running S-letter acceleration/deceleration ratio]
[P904: Running general-purpose output start position 1]
[P905: Running general-purpose output end position 1]
[P903: Synchronization end position 1]
[P903: Synchronization end position 1 -> P913: Distance of running positioning wait position 1, P801: Running S-letter acceleration/deceleration ratio]
Master axis speed
0
Slave axis speed
0
Address specification (PS1～PS8)
Automatic start signal (PST)
Executing address
Mark signal (TRG)
In-synchronization output (ROUT7)
Running general-purpose output (ROUT1～4)
1-cycle output (ROUT6)
Wait position output (ROUT8)
Cycle end (D21)
Positioning complete (PN)
Mark signal waiting
Mark delay length
Work length 8000
Mark detection work length
Work length 8000
001
001
5
6
5
6

[WBR] Returning system wait position return

[Function]

- This command conducts the positioning control which includes following functions. (After completion of this command, the next address command is executed.)

(1) This command moves the current slave axis position to the wait position. The wait position set here is used for such as the start wait position of the next running positioning control command.

(2) It returns the slave axis to the wait position. Acceleration time follows the acceleration time (P211, P212, P213 *1). Deceleration time follows the deceleration time (P214, P215, P216 *1).

(3) If the hold signal (HLD) is input while this command is in operation, it decelerates and stops according to the setting of the deceleration time (P214, P215, P216 *1). When it becomes the restart wait status, the automatic operation ready signal (PRDY) is output.

(4) With the restart after the hold, it restarts the positioning from the stopped position.

(5) This command does not stop with the block stop signal.

*1: It is selected with the command parameter PATN (Parameter selection).

[Setting]

(1) Title display	Setting content		
↑	Setting unit	Setting range (Direct data) (Index data)	Initial value
Display order	Remarks (Details and annotations for setting)		

<<Group 6: RRAC>>

(1) F□□□□	Return speed		
	mm/sec, ° /sec,inch/sec	00000000～99999999 I X 0 0～I X 9 9	00000000
	When set "0", the current position becomes the wait position.		
(2) PATN□	Parameter selection		
	None	EL.1/SEL.2/SEL.3	SEL.1
	*1 in the WBR command explanation is selected.		

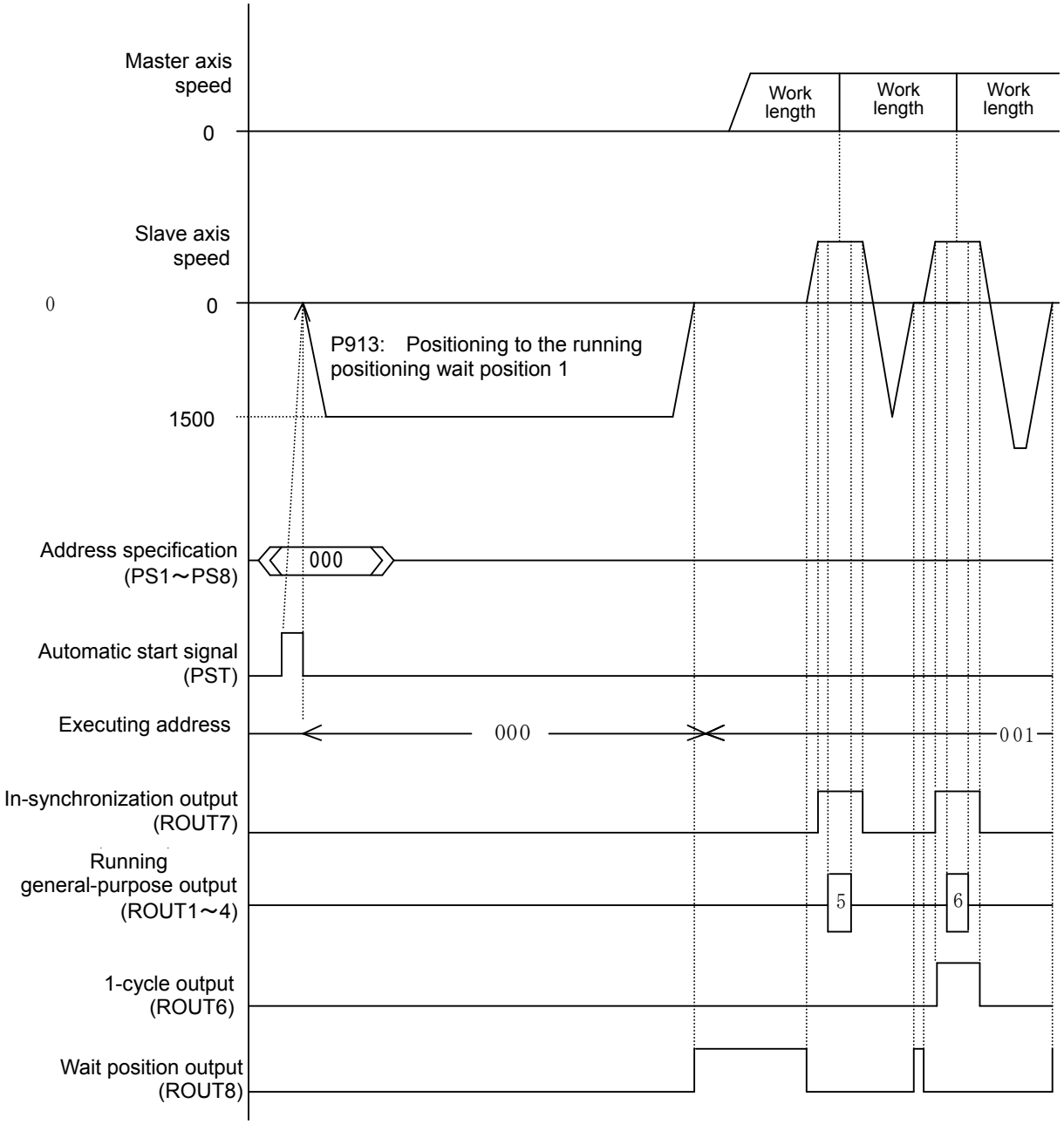
[Operation example]
<<Running positioning operation example_1>>

Index data setting

I X * *	Value	Meaning
I X 0 0	10000	Work length with the first pattern standard-size
I X 0 1	12000	Work length with the second pattern standard-size
I X 0 2	-1	Combination pattern end code
I X 1 0	5(0101)	First in-synchronization running general-purpose output
I X 1 1	6(0110)	Second in-synchronization running general-purpose output

Command setting

ADDR	CMD	LENG	ROUT	F	PATN	Remarks
000	WBR	----	----	1500	SEL.1	
001	BRC	I X 0 0	I X 0 0	----	SEL.1	Initial work length 0
002	PEND	----	----	----	----	


Master axis speed
0
Work length
Work length
Work length
Slave axis speed
0
0
P913: Positioning to the running positioning wait position 1
1500
Address specification (PS1～PS8)
000
Automatic start signal (PST)
Executing address
000
001
In-synchronization output (ROUT7)
Running general-purpose output (ROUT1～4)
5
6
1-cycle output (ROUT6)
Wait position output (ROUT8)

[WRR] Rotating system wait position return

[Function]

- This command conducts the positioning control which includes following functions. Different points from the WBR command include the positioning with the specified rotation direction operation.
  (After completion of this command, the next address command is executed.)

(1) This command moves the current slave axis position to the wait position.
The wait position set here is used for such as the start wait position of the next running positioning control command.

(2) The wait position return direction follows the DIR setting.

(3) It return the slave axis to the wait position.
Wait position follows the running positioning wait position (P913, P933, P953 *1).
Acceleration time follows the acceleration time (P211, P212, P213 *1).
Deceleration time follows the deceleration time (P214, P215, P216 *1).

(4) If the hold signal (HLD) is input while this command is in operation, it decelerates and stops according to the setting of the deceleration time (P214, P215, P216 *1). When it becomes the restart wait status, the automatic operation ready signal (PRDY) is output.

(5) With the restart after the hold, it restarts the positioning from the stopped position.

(6) This command does not stop with the block stop signal.

(7) When this command is in operation, and if the rotating body position range (P305) is not set, it gives an alarm.

*1: It is selected with the command parameter PATN (Parameter selection).

[Setting]

(1) Title display	Setting content		
↑	Setting unit	Setting range (Direct data) (Index data)	Initial value
Display order	Remarks (Details and annotations for setting)		

<<Group 6: RRAC>>

(1) F		Return speed	
	mm/sec, ° /sec,inch/sec	00000000～99999999 I X 0 0～I X 9 9	00000000
	When set "0", the current position becomes the wait position.		
(2) PATN		Parameter selection	
	None	EL.1/SEL.2/SEL.3	SEL.1
	*1 in the WRR command explanation is selected.		
(3) DIR		Operation direction selection	
	None	FORWARD/REVERSE/ SHORT DST	FORWARD
	Definition of the rotating direction is same as the rotation direction selection (P300). "SHORT DST" refers to the short cut to the wait position.		

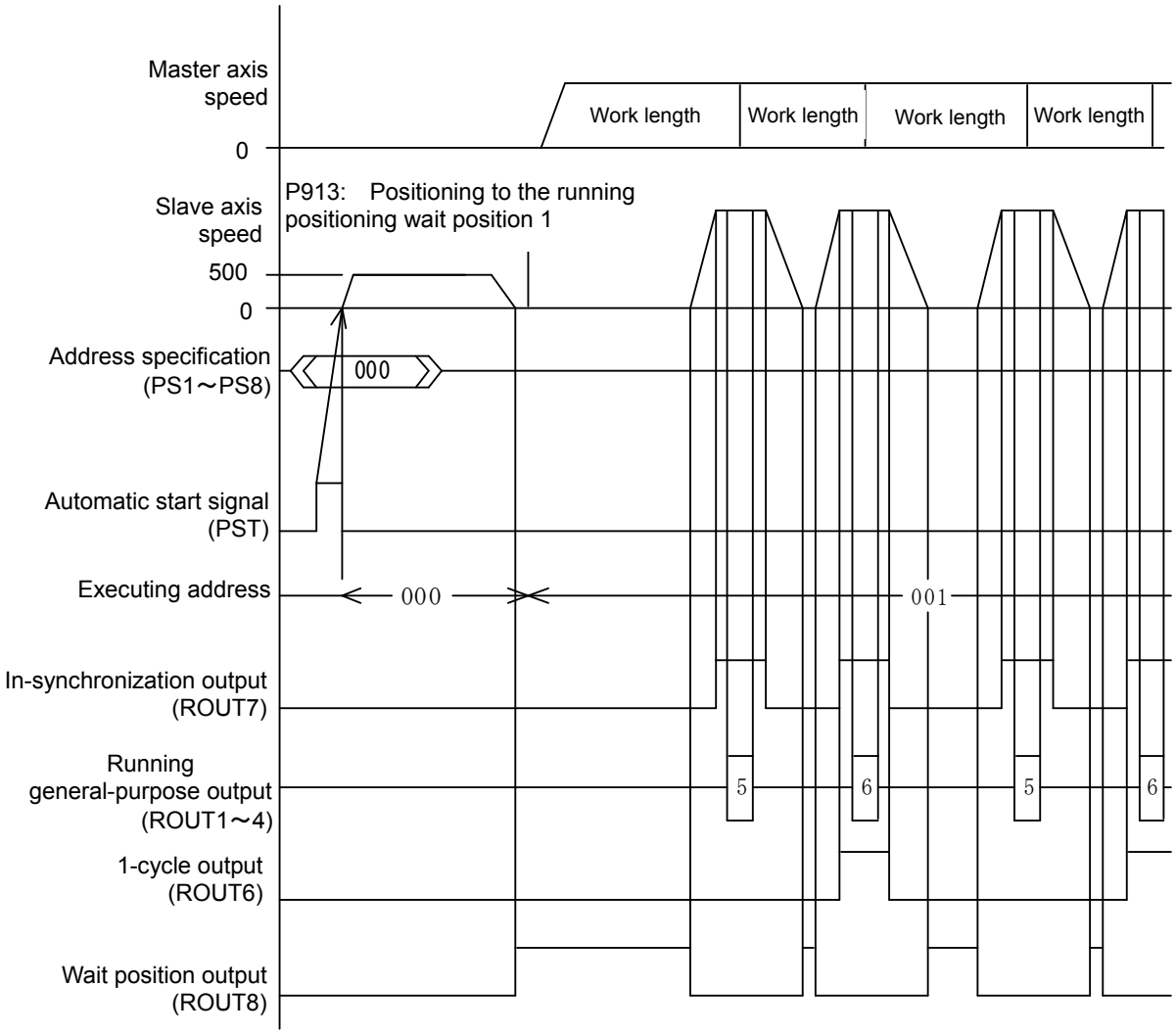
[Operation example]
<<Running positioning operation example_1>>

Index data setting

I X * *	Value	Meaning
I X 0 0	15000	Work length with the first pattern standard-size
I X 0 1	10000	Work length with the second pattern standard-size
I X 0 2	-1	Combination pattern end code
I X 1 0	5(0101)	First in-synchronization running general-purpose output
I X 1 1	6(0110)	Second in-synchronization running general-purpose output

Command setting

ADDR	CMD	LENG	ROUT	F	PATN	DIR	Remarks
000	WRR	----	----	500	SEL.1	FORWARD	
001	RRAC	I X 0 0	I X 0 0	I X 1 0	SEL.1	----	Standard-size initial work length 1: Other than "0"
002	PEND	----	----	----	----	----	


Master axis speed
0
Work length
Work length
Work length
Work length
Slave axis speed
P913: Positioning to the running positioning wait position 1
500
0
Address specification (PS1～PS8)
000
Automatic start signal (PST)
Executing address
000
001
In-synchronization output (ROUT7)
Running general-purpose output (ROUT1～4)
5
6
5
6
1-cycle output (ROUT6)
Wait position output (ROUT8)

9-4 Continuous running positioning

The continuous running positioning is to conduct the below running positioning when resuming the BRS command succeeding to the instantaneous stop of the BRS command (Returning system running positioning, Single).

(1) Running positioning for the standard-size being specified based on the position that was decided in the last running positioning with the finished BRS command.

(2) Running positioning for the mark data that was not completed in the running positioning with the finished BRS command
In addition, accepting the mark input in the BRS command end status, the running positioning is conducted for this accepted mark here in the continuous running positioning.
The number of maximum memories for the mark data is 35.

(3) When you wish to conduct the continuous operation in the power on, store [Device data for continuous running positioning] at the power off using an external equipment such as CC-Link. At the next power on, prior to operation, it is necessary to reset [Device data for continuous running positioning]. (VC unit does not back up [Device data for continuous running positioning].)

(1) Continuous running positioning specification selection data
The continuous running positioning operates according to the set value in the index data [IX61: Continuous running positioning operation] at the starting time of the BRS command (Returning system running positioning, Single).
Setting follows below.

[I X 6 1: Continuous running positioning operation] setting description

Setting	Description
0	Continuous running positioning invalid Running positioning is conducted with the work length from the running positioning start and the mark length.
1	Continuous running positioning valid Continuous running positioning is conducted for the last executed BRS command in the power ON status. At the beginning of the running positioning, if the running positioning position stays ahead of the running positioning start position, it alerts [Running positioning data error].
2	Continuous running positioning valid Continuous running positioning is conducted for the last executed BRS command at the power OFF → ON. Continuous running positioning with the power OFF → ON needs to back up the device data R8002-8086 for the continuous running positioning prior to the power OFF using an external equipment such as CC-Link, and that data R8102-8189 must be retrieved. At the beginning of the running positioning, if the running positioning position stays ahead of the running positioning start position, it alerts [Running positioning data error].
3	Continuous running positioning valid Continuous running positioning is conducted for the last executed BRS command in the power ON status. At the beginning of the running positioning, if the running positioning position stays ahead of the running positioning start position, following operation is conducted. 1) In Mark: It runs canceling a mark which stays ahead of the running positioning start position. 2) In Standard-size: The running positioning starts at the running positioning start position.
4	Continuous running positioning valid Continuous running positioning is conducted for the last executed BRS command at the power OFF → ON. Continuous running positioning with the power OFF → ON needs to back up the device data R8002-8089 for the continuous running positioning prior to the power OFF using an external equipment such as CC-Link, and that data R8102-8189 must be retrieved. At the beginning of the running positioning, if the running positioning position stays ahead of the running positioning start position, following operation is conducted. 1) In Mark: It runs canceling a mark which stays ahead of the running positioning start position. 2) In Standard-size: The running positioning starts at the running positioning start position.

(2) Device data for continuous running positioning

Device No.	Signal name	Content
R008000	Spare	[0] fixed
01		
02	Continuous running positioning last-time cutting position	Last-time running positioning position (Last-time cutting position)
03		
04		
05	Spare	[0] fixed
06	Continuous running positioning mark this-time position	Position to be determined with the running positioning by the mark this time
07		
08		
09	Spare	[0] fixed
10	Continuous running positioning mark final position	Position to be determined with the running positioning by the final mark
11		
12		
13	Spare	[0] fixed
14	Continuous running positioning mark count number	Counter for mark data processing
15		
16	Continuous running positioning mark writing pointer	Pointer for mark data writing
17		
18	Continuous running positioning mark reading pointer	Pointer for mark data reading
19		
20	Continuous running positioning mark data	Mark data and data to manage that mark data
21		
22	Continuous running positioning mark data	Mark data and data to manage that mark data
23		
88	Continuous running positioning mark data	Mark data and data to manage that mark data
89		
90 ～ 99	Spare	[0] fixed

Device No.	Signal name	Content
R008100 01	Spare	[0] fixed
02 03 04	Continuous running positioning(For setting) last-time cutting position	Last-time running positioning position (Last-time cutting position)
05	Spare	[0] fixed
06 07 08	Continuous running positioning(For setting) mark this-time position	Position to be determined with the running positioning by the mark this time
09	Spare	[0] fixed
10 11 12	Continuous running positioning(For setting) mark final position	Position to be determined with the running positioning by the final mark
13	Spare	[0] fixed
14 15	Continuous running positioning(For setting) mark count number	Counter for mark data processing
16 17	Continuous running positioning(For setting) mark writing pointer	Pointer for mark data writing
18 19	Continuous running positioning(For setting) mark reading pointer	Pointer for mark data reading
20 21	Continuous running positioning(For setting) mark data	Mark data and data to manage that mark data
22 23	Continuous running positioning(For setting) mark data	Mark data and data to manage that mark data
88 89	Continuous running positioning(For setting) mark data	Mark data and data to manage that mark data
90 ～ 99	Spare	[0] fixed

Note 1) For each data, there are 48-bit data for 3-device use and 32-bit data for 2-device use.
Note 2) When conducting the continuous operation at the power on, it is necessary to store the above data using an external equipment such as CC-Link and resetting is required prior to the activation.
For the data storage, conduct R8000～, and for the setting, conduct R8100～.

(3) Method of continuous running positioning

<<Power ON status, continuous running positioning example>>

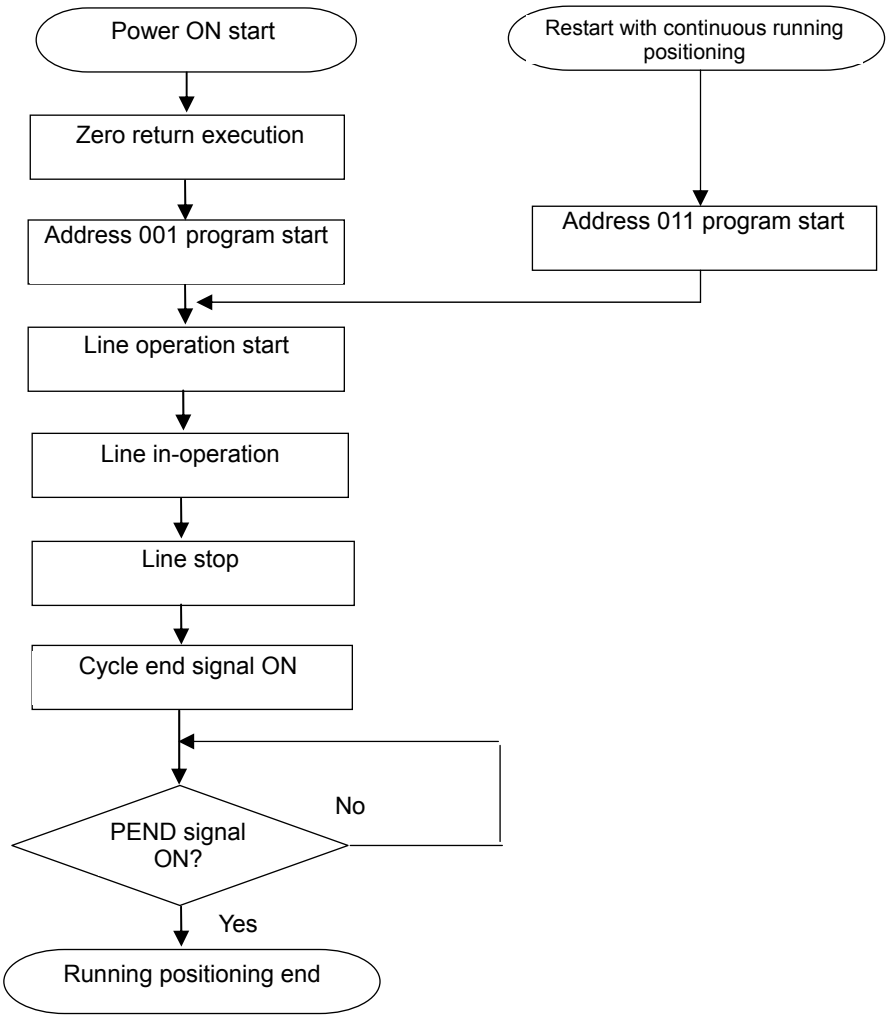
1) At the power ON, first continuous running positioning execution program

ADDR	CMD	LENG	ROUT	PATN	DST	SOC	Remarks
001	IMOV	----	----	----	I X 6 1	0	Setting to the BRS command initiating this time
002	BRS	I X 5 4	0001	SEL.1	----	----	
003	PEND	----	----	----	----	----	

2) Continue running positioning execution program

ADDR	CMD	LENG	ROUT	PATN	DST	SOC	Remarks
001	IMOV	----	----	----	I X 6 1	1	Continuous running positioning is valid for the BRS command executed last time.
002	BRS	I X 5 4	0001	SEL.1	----	----	
003	PEND	----	----	----	----	----	

3) Power ON status continuous running positioning operation sequence



<<Power OFF→ON, continuous running operation execution example>>

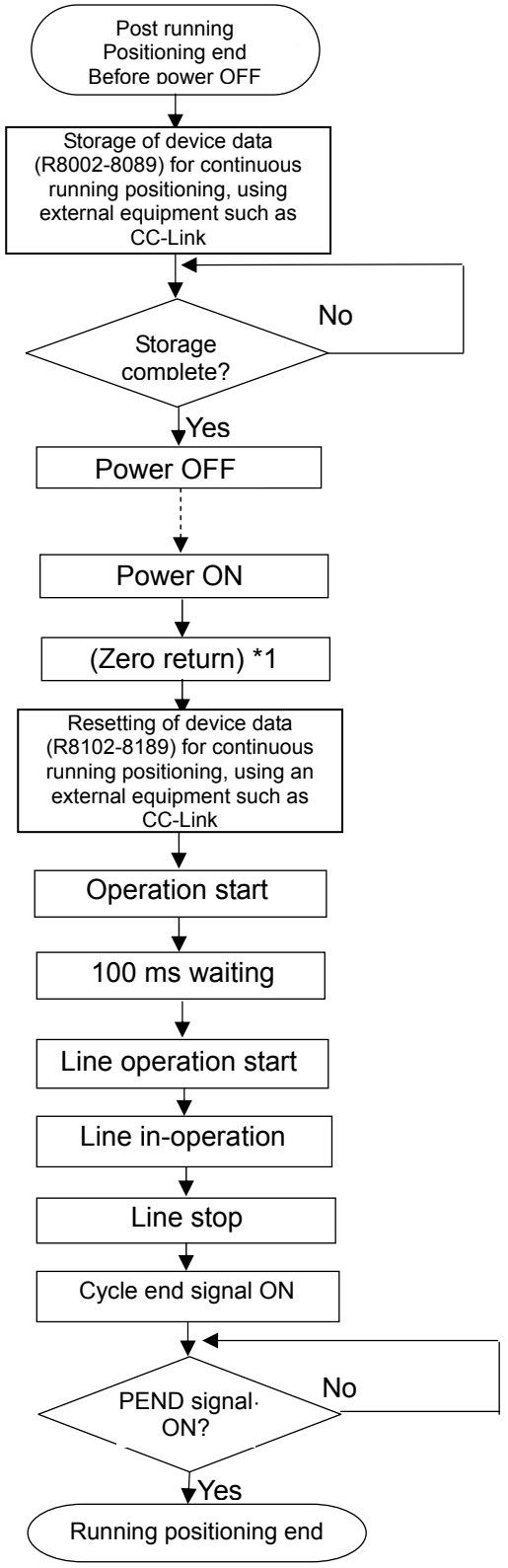
1) After power ON, execution program (After recovering the back up data to the data for continuous running positioning)

ADDR	CMD	LENG	ROUT	PATN	DST	SOC	Remarks
020	IMOV	----	----	----	I X 6 1	2	Continuous running positioning is valid using R8102-8189.
021	BRS	I X 5 4	0001	SEL.1	----	----	
023	PEND	----	----	----	----	----	

Note 1) Before power OFF, back up R8002-8089 data using an external equipment.
Note 2) A recovery of the back up data to R8102-8189, after the next power on, enables the continuous running positioning after power OFF.

2) Power OFF→ON, continuous running positioning operation sequence

Following sequence is executed at the power OFF→ON, from the status of the running positioning end by such as <<Power ON status, continuous running positioning example>>



In this sequence, follow below.

1) Do not run the master axis.
   If run, the continuous running positioning position after power ON is deviated.

2) Switch ON the mark inhibit signal, not to allow the mark signal come in.

*1: If the system requires the zero return, execute the zero return operation after power ON. Then, after completion of the zero return, it is necessary to place the positioning to the power OFF position.

(4) Supplements

1) Mark signal acceptance is as follows.
   - At the power ON, the mark signal is not accepted.
   - After executing the BRS command, the mark signal is always accepted. However, the mark signal is not accepted during and after the zero return.

Do not execute writing on R8002-8089.
Writing on R8002-8089 can result in improper operation of the continuous running positioning.

Chapter 10 Run

10-1 Inspection before start

After installation and wiring is completed, conduct following inspection before starting this unit.

1) Isn't there any mis-wiring?
   Specially, is the power not connected to motor connection terminals U, V, W?
2) Isn't there any place in short-circuit status by cable chips, etc.
3) Isn't there any part of cable where abnormal force is added on?
4) Isn't there any loose fit screw, terminal, etc?
   Are connecters inserted, tightly?
5) Is the power supply source correct?
6) Isn't there any short-circuit or line-to-ground fault in external sequence circuits?
7) Is grounding method correct? And is the earth ground grade JIS Class 3 or better?

⚠ Caution

- Never conduct insulation test as withstand voltage test, meggar test, etc., and noise test by a noise simulator, etc. to this unit.
  [Those tests may damage the unit.]

Before starting this unit, please confirm the following setting.

- Please set motor type data to the standard motor setting parameter P000 in accordance with [10-4 Run Procedure]. In case of setting a dedicated motor, please set [999] to P000 and motor associated parameters to P020～P059 in accordance with the specification sheet [Setting option].
- Input signal: Please confirm that negative logic is inputted to Emergency stop (EMG*), Forward/ Reverse over travel (FOT*, ROT*) (Before start).
- Input signal: Please set negative or positive logic to the parameter of Servo ON (SON(*)).

10-2 Run Mode

Mode selection signal 1, 2 support following Run modes.

Run mode	Mode selection signal 2(MD 2)	Mode selection signal 1(MD 1)
Manual run mode	○	○
Zero return run mode	○	●
Automatic run mode	●	○
Pulse train run mode	●	●

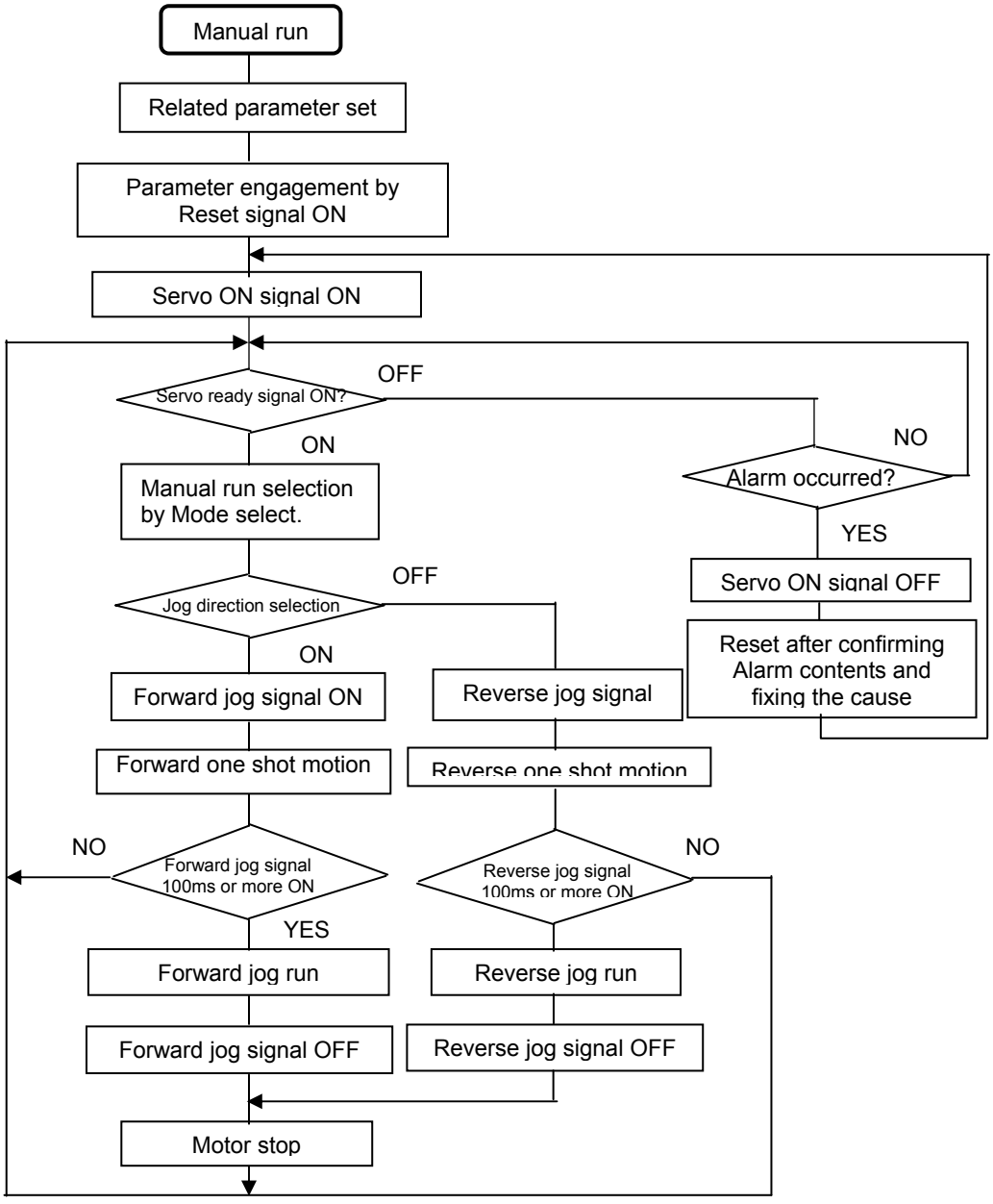
Note) ○: Signal OFF ●: Signal ON

[Tab.10-1] Mode Selection List

10-2-1 Manual Run Mode

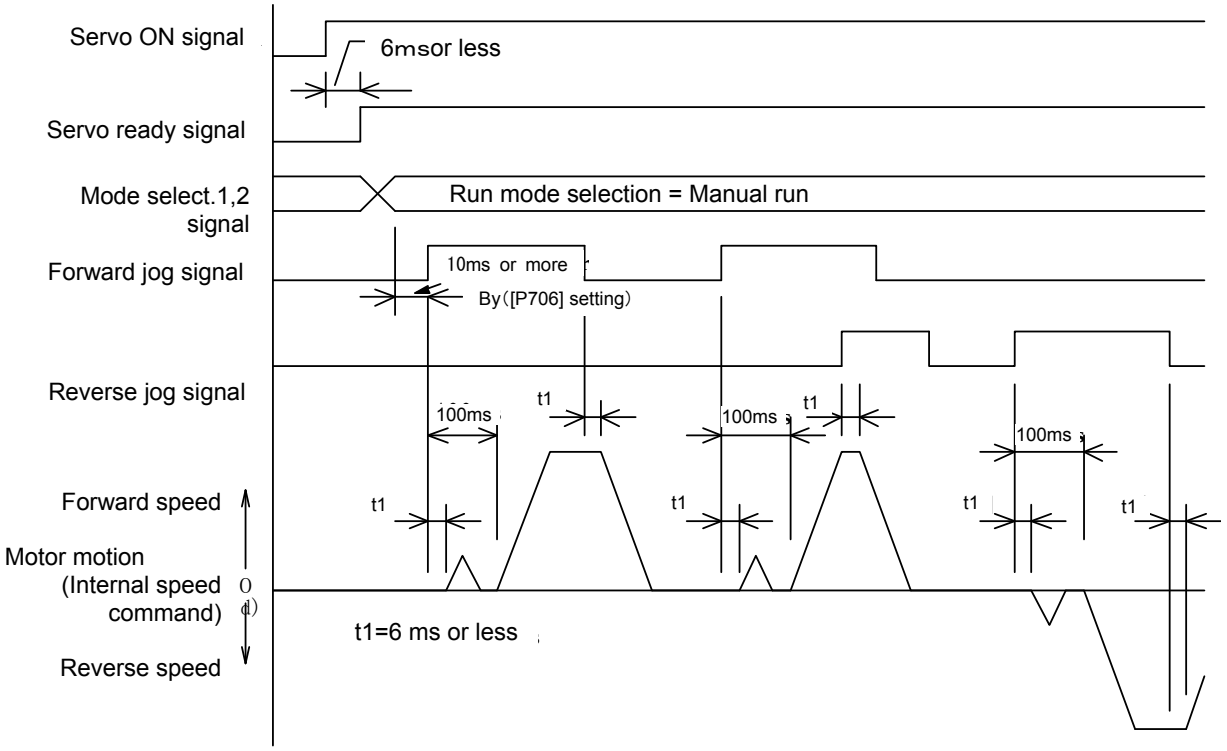
In Manual run mode, if Forward jog signal (F JOG）or Reverse jog signal （R JOG）is ON status for more than 6ms, one shot jog is conducted to Forward/Reverse direction. And if signal ON status continues more than 100ms Jog run is conducted to Forward/Reverse direction.
One shot jog is defined that a motor travels the amount of minimal setting unit (one motion).
Setting value of parameters[P400]or[P401]is selected by Jog Speed change signal （JOSP）for Jog Speed.

1) Operating procedure



[Fig. 10-1] Manual Run Operating Procedure

2) Time chart



Note: If Forward jog signal (F JOG) and Reverse jog signal (R JOG) are simultaneously inputted, a motor conducts deceleration stop. When Forward or Reverse jog signal is inputted after once both signals are turned OFF, One shot jog is conducted, again. Travel amount by one shot is minimal setting unit and fixed.

[Fig. 10-2] Manual Run Time Chart

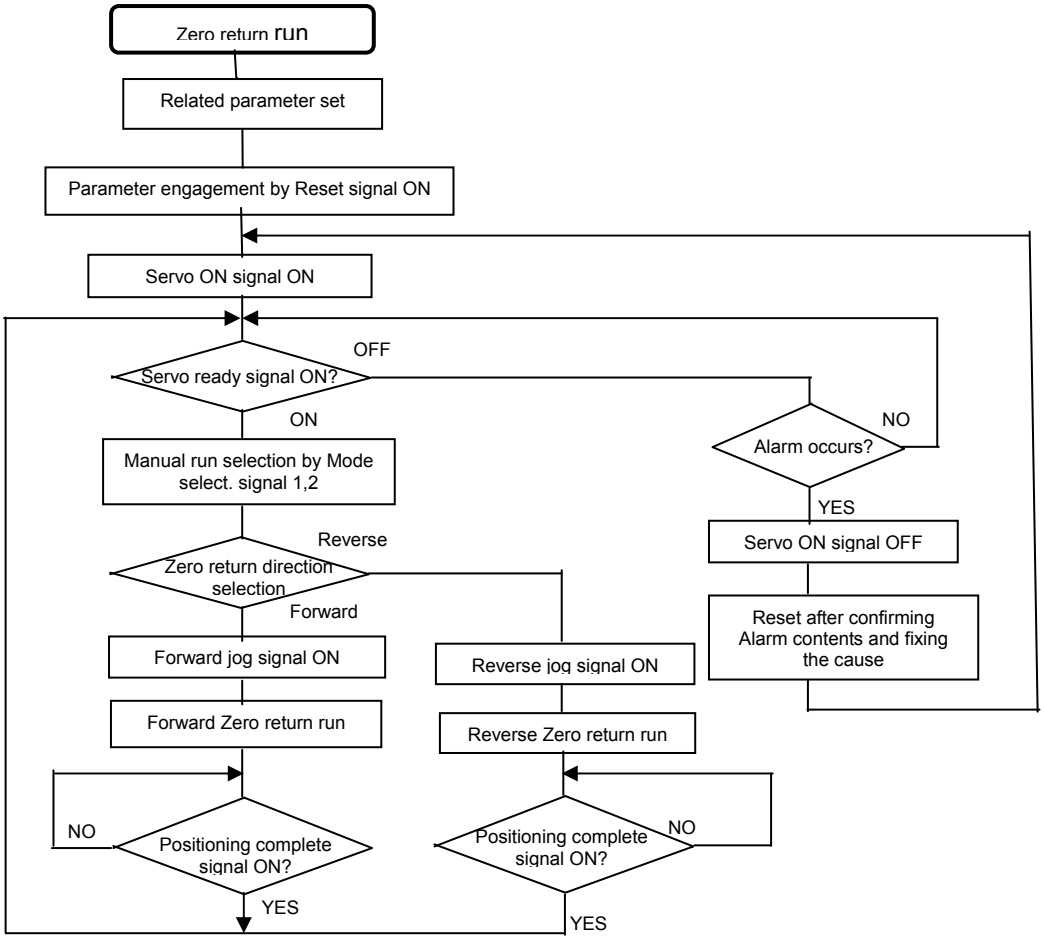
10-2-2 Zero Return Run Mode

In Zero return run mode, Zero return is conducted by Speed control command value set by parameters ［P404: Zero return Speed］and［P405: Zero return creep Speed］.
By 6ms or longer Forward jog signal (F JOG), Forward zero return is conducted.
By 6ms or longer Reverse jog signal (R JOG), Reverse zero return is conducted.
Zero return methods are next types.

Zero return method	Setting of［P402:Zero return method selection］	Motion description
Standard Zero return	STD.HOME	Zero return is conducted by Zero point deceleration LS. Details can be referred to the time chart (a)～(d).
No LS Zero return	LS LESS	Zero return is conducted by Marker without Zero point deceleration or only by ZLS. Details can be referred to the time chart (e).
On the spot Zero return	STOP HOME	No motion is conducted and current position becomes zero point.
OT back Zero return	OT HOME	Reverse action when OT is passed in Zero return. Details can be referred to the time chart (f)～(g).

[Tab. 10-2] Zero Return Mode setting and Motion

1) Operation procedure

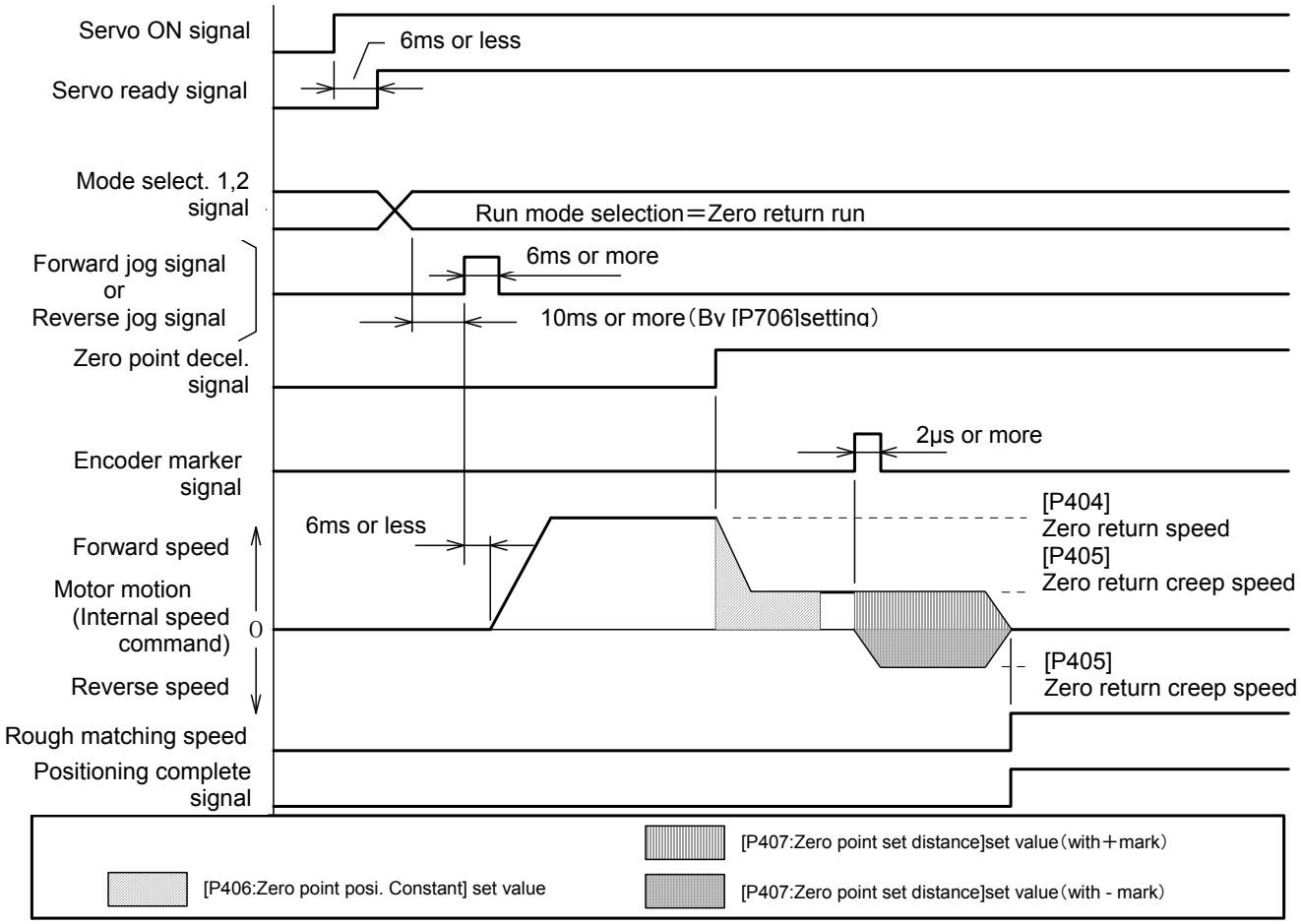


[Fig. 10-3] Zero Return Run Operation Procedure

2) Time chart

Note 1 : If Zero point deceleration limit signal has been already ON when Zero return starts, a motor once moves to reverse against Zero return start direction and then after the signal is OFF, Zero return starts to right direction.
Note 2 : If HOLD signal is inputted in Zero return, a motor stops. And it starts opposite direction to Zero return start direction if Zero point deceleration limit signal is ON at restart, and after when Zero point deceleration limit signal is OFF, starts to right Zero return start direction.
Note 3 : Marker signal selects whether Encoder marker shall be used or not by a parameter.
Note 4 : In Zero return, Software limit switch is not detected.
Note 5 : Speed override does not influence Zero return creep Speed.
Note 6 : When Zero return is stopped improperly before the completion, the applied Forward/ Reverse software limit switches are still valid.

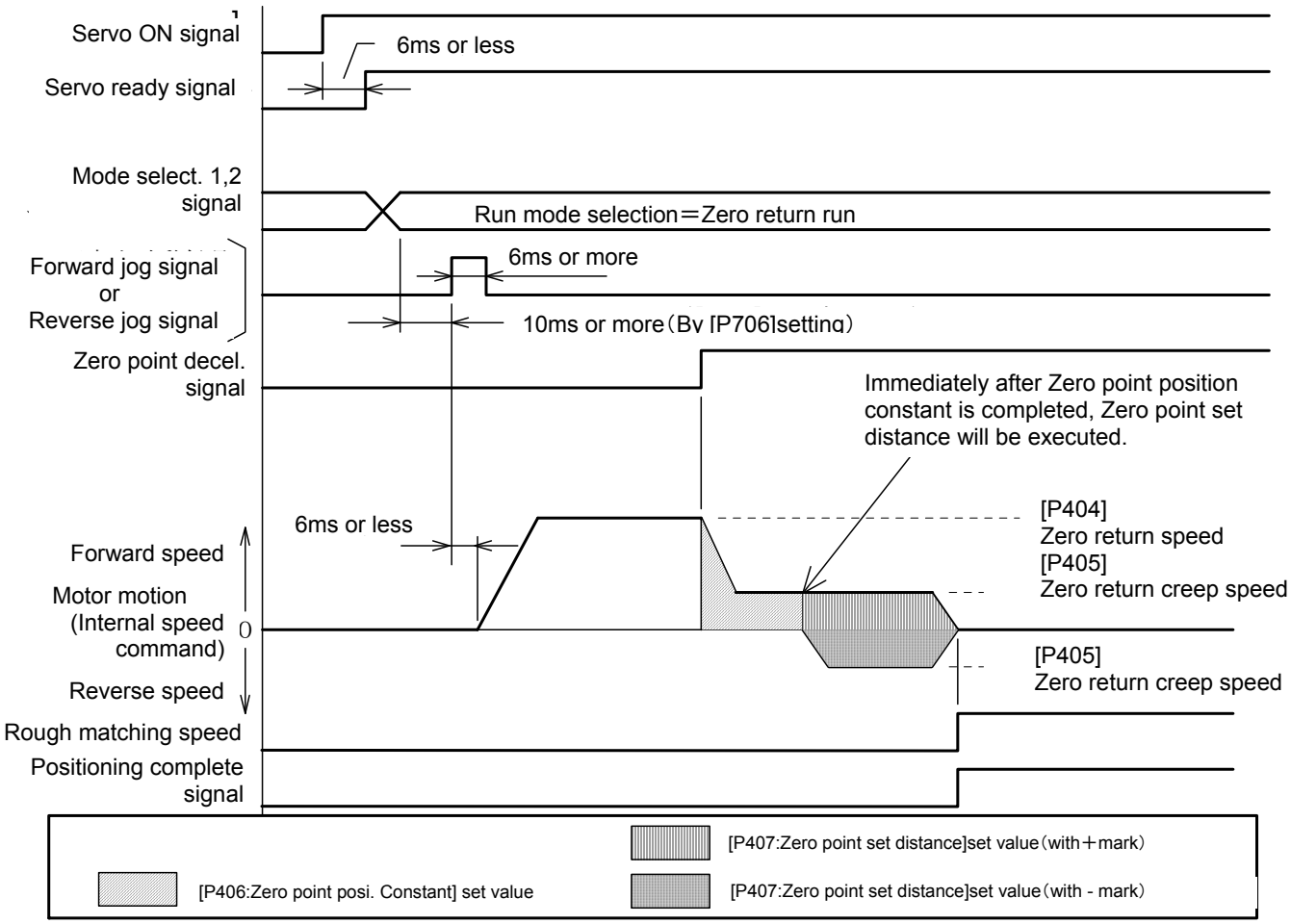
(a) [Standard Zero return]（Encoder marker is used.）
《At the start of Zero return, in case that Zero point deceleration limit is OFF.》



[Fig. 10-4] Standard Zero Return Run Time Chart 1

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

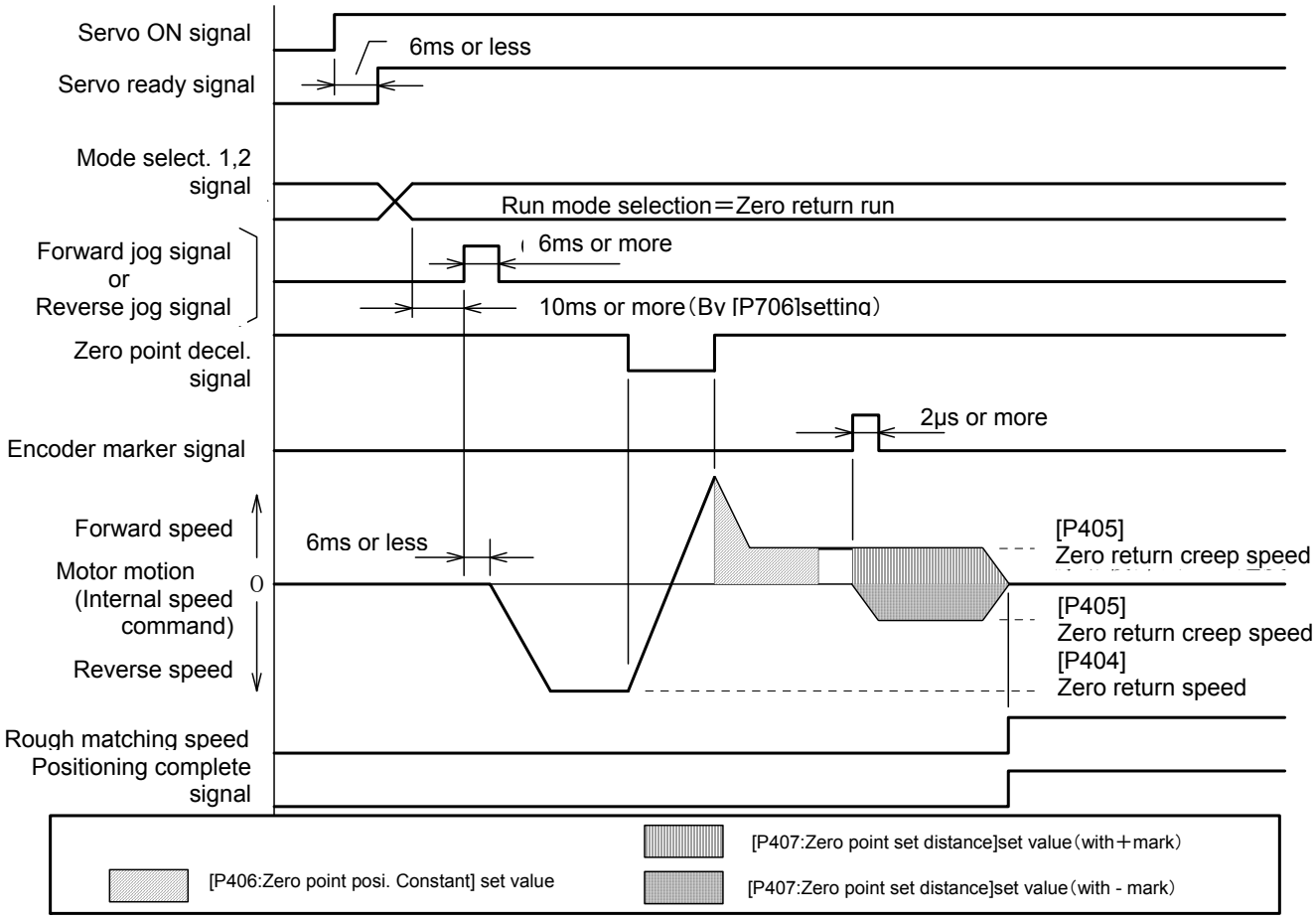
《In case that Hold signal is inputted after Zero point deceleration limit is detected.》



[Fig. 10-5] Standard Zero Return Run Time Chart 2 (Encoder marker is not used.)

(c) [Standard Zero return]

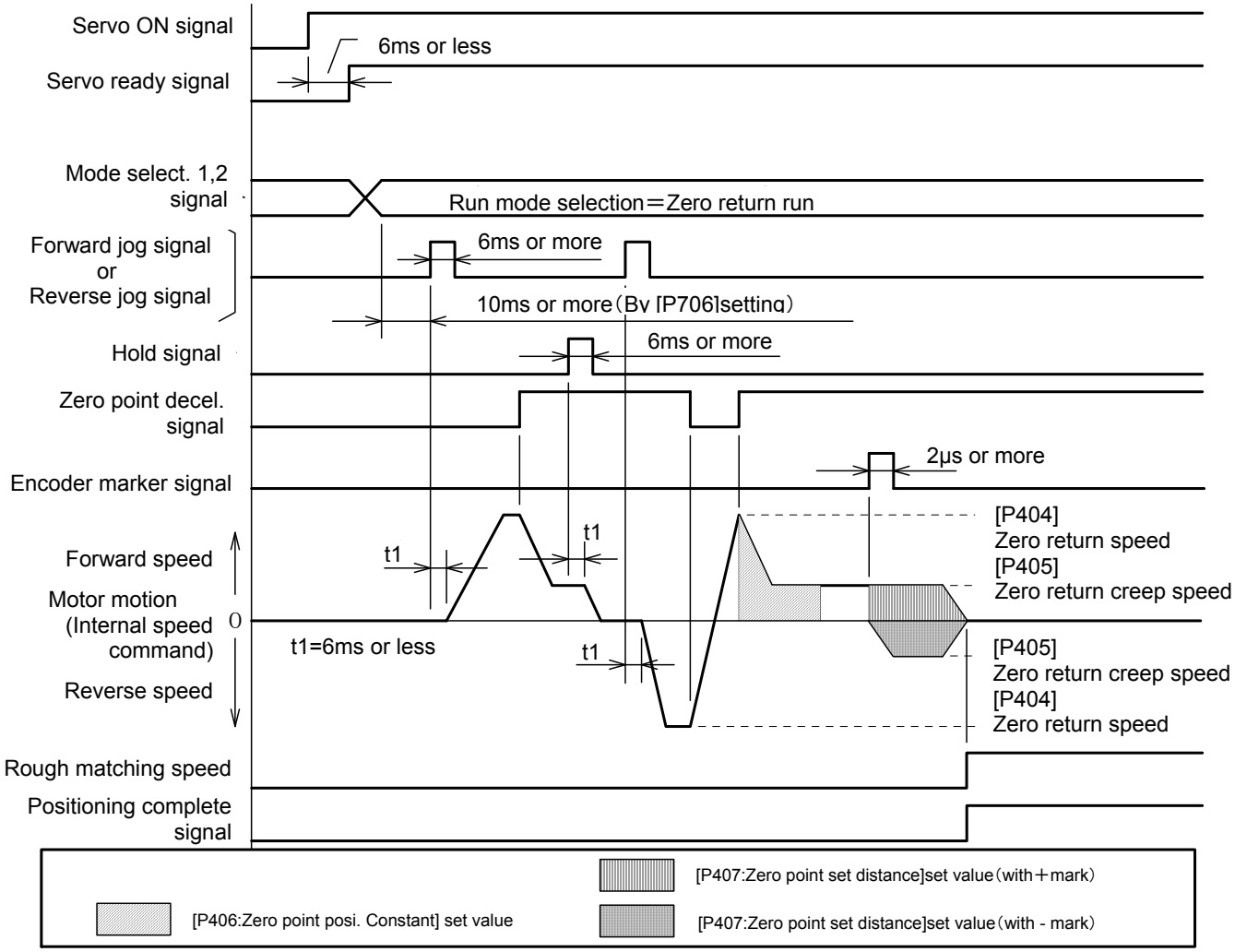
《At the start of Zero return, in case that Zero point deceleration limit is ON.》



[Fig. 10-6] Standard Zero Return Run Time Chart 3

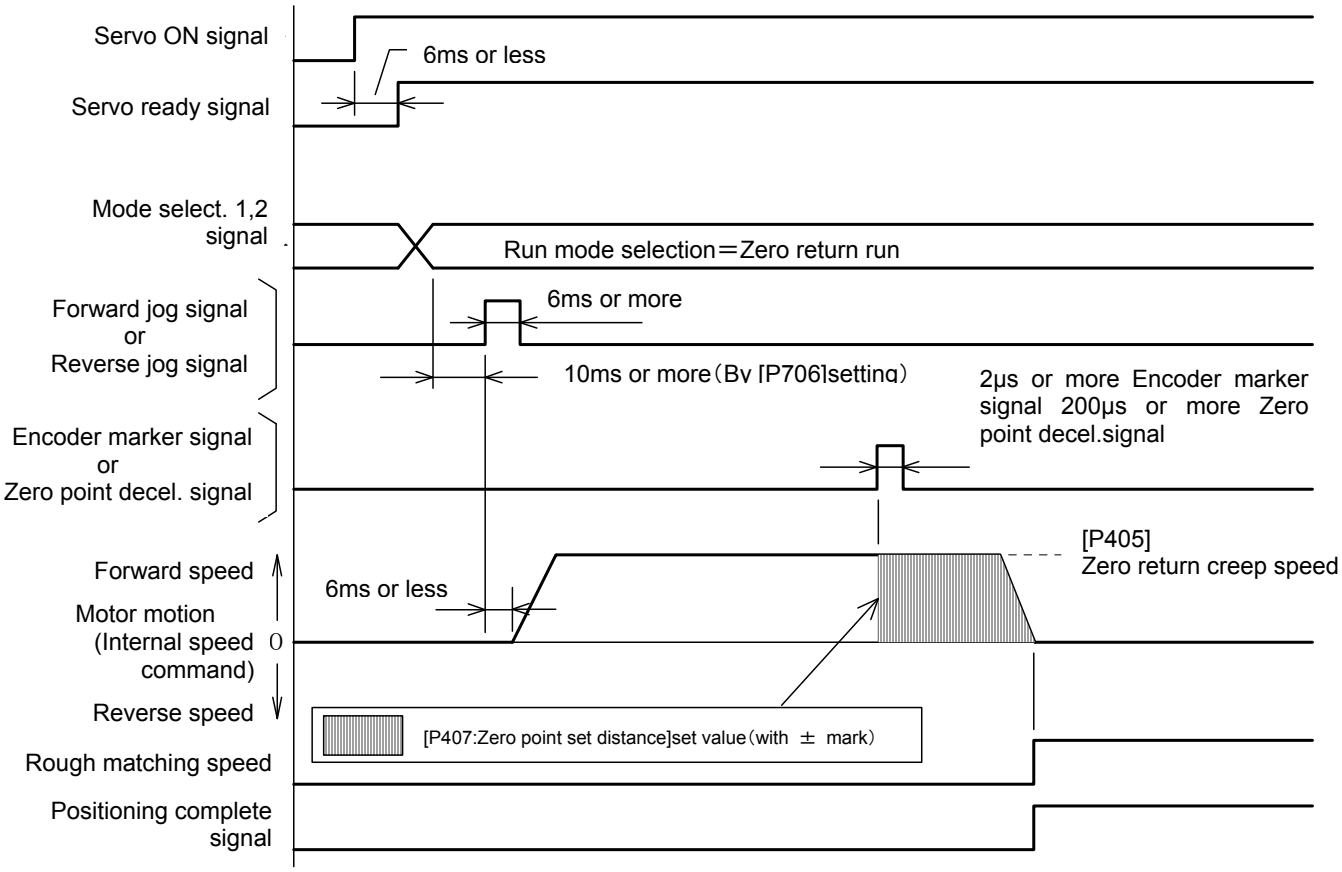
(d) [Standard Zero return]

《At the start of Zero return, in case that Zero point deceleration limit is ON.》



[Fig. 10-7] Standard Zero Return Run Time Chart 4

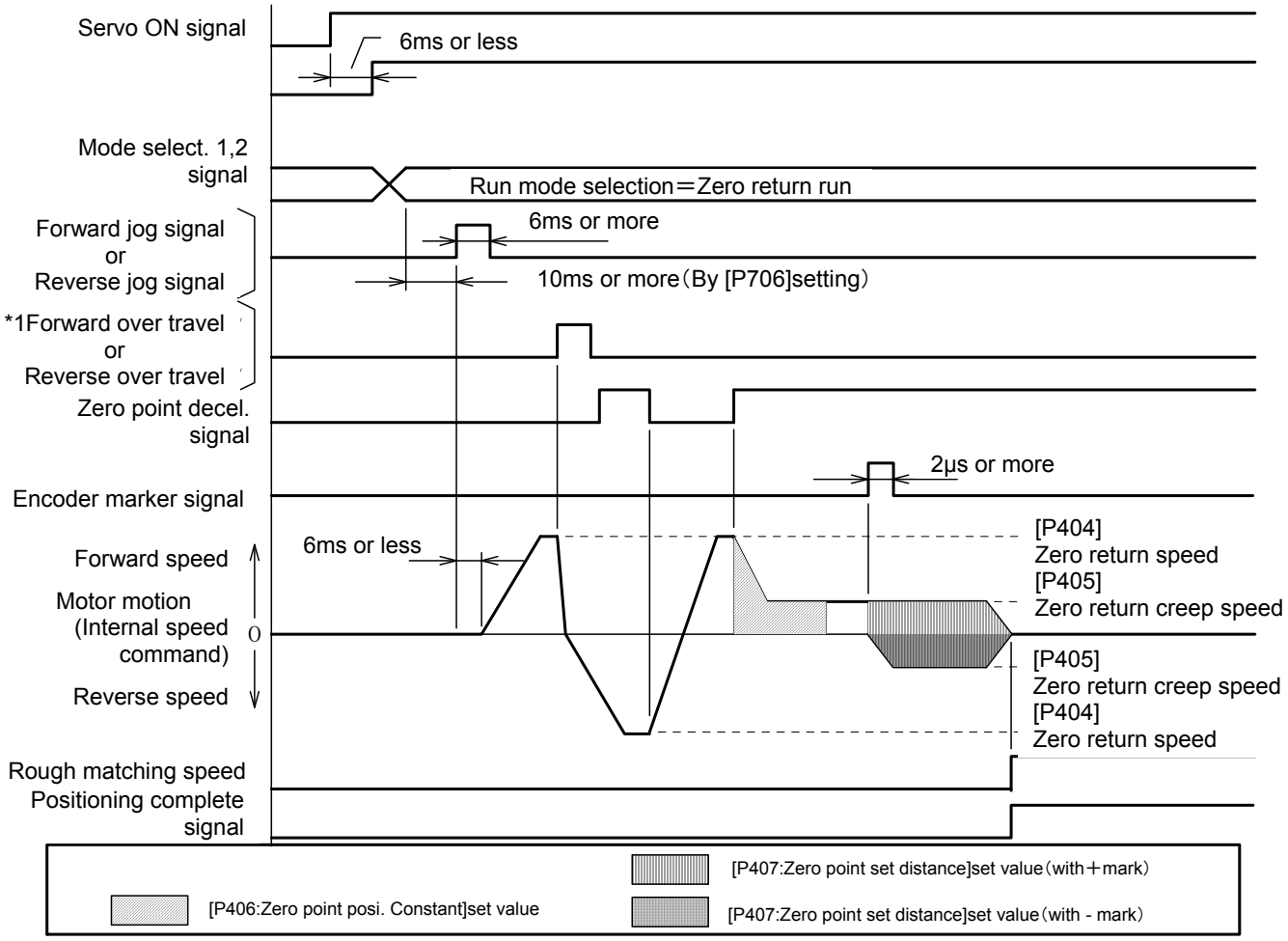
(e) [No LS Zero return]



[Fig. 10-8] No LS Zero Return Run Time Chart 5

(f) [OT back Zero return]

《At the start of Zero return, in case that Forward (Reverse) over travel is ON before Zero point deceleration limit is changed from OFF to ON status.》



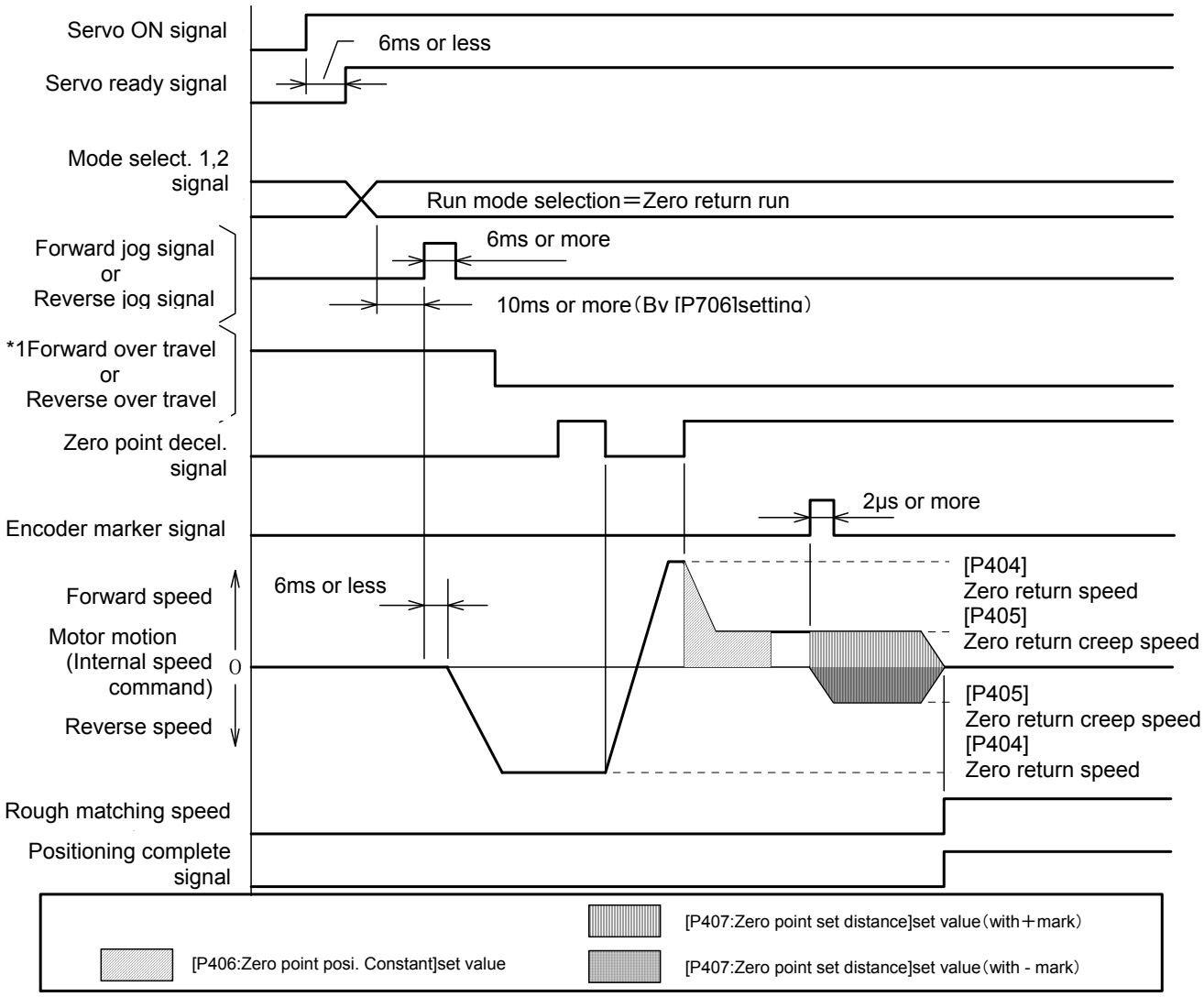
*1：When Zero return direction is ＋：Forward over travel

－：Reverse over travel

[Fig. 10-9] OT Back Zero Return Run Time Chart 6

(g) [OT back Zero return]

《At the start of Zero return, in case that Forward (Reverse) over travel is ON》



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

－：Reverse over travel

[Fig. 10-10] OT Back Zero Return Run Time Chart

(h) [OT back Zero return]

《At the start of Zero return, in case that Zero point deceleration limit is changed from OFF to ON status before Forward (Reverse) over travel is ON.（Encoder marker is used.）》

[Fig. 10-4] Same as Standard Zero Return Run Time Chart 1

《At the start of Zero return, in case that Zero point deceleration limit is changed from OFF to ON status before Forward (Reverse) over travel is ON.（Encoder marker is not used.）》

[Fig. 10-5] Same as Standard Zero Return Run Time Chart 2

《At the start of Zero return, in case that Zero point deceleration is ON》

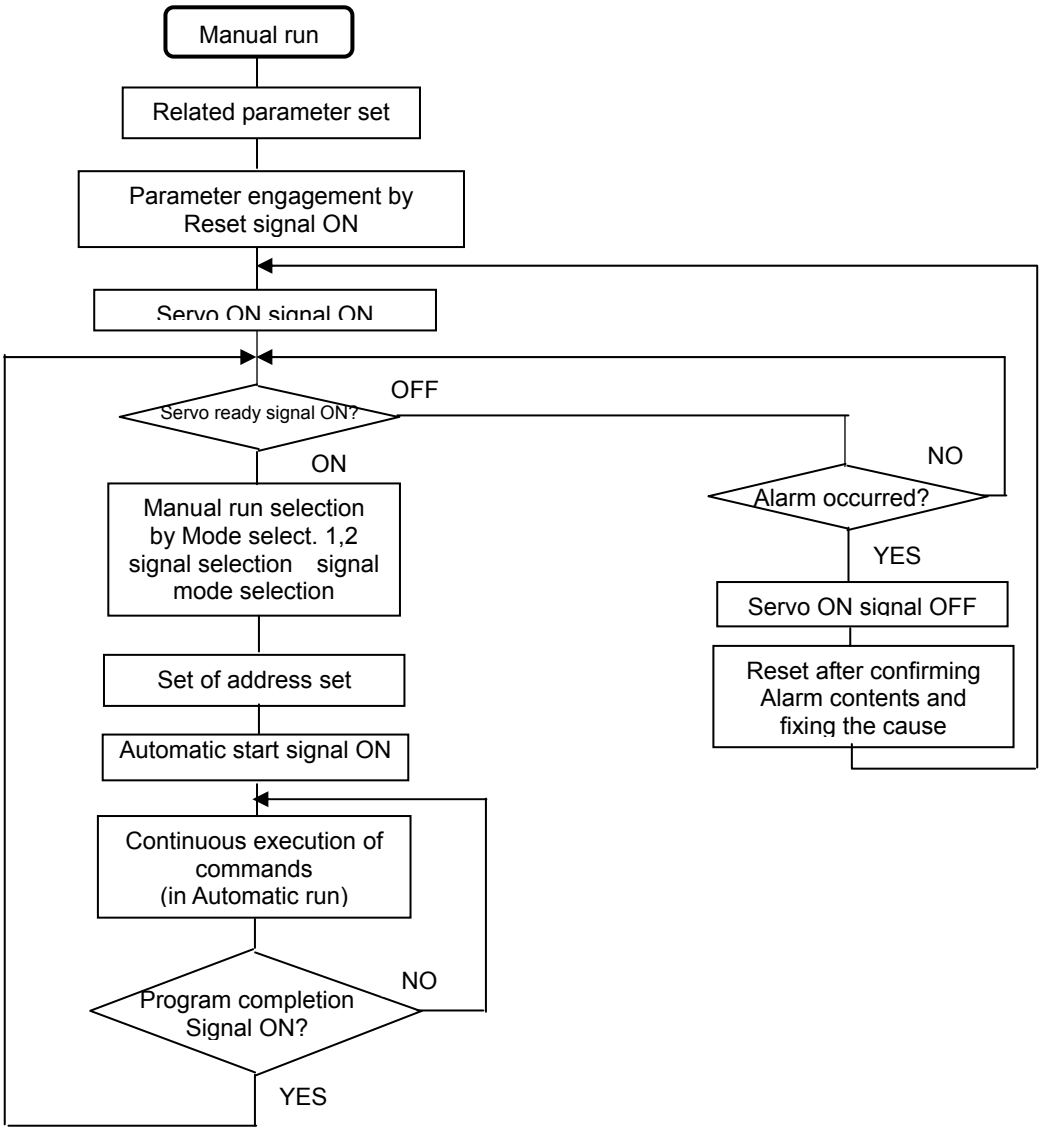
[Fig. 10-6] Same as Standard Zero Return Run Time Chart 3

Note 7：If Over travel is ON when [HOME] command is executed in Automatic run, Error occurs.

10-2-3 Automatic Run Mode

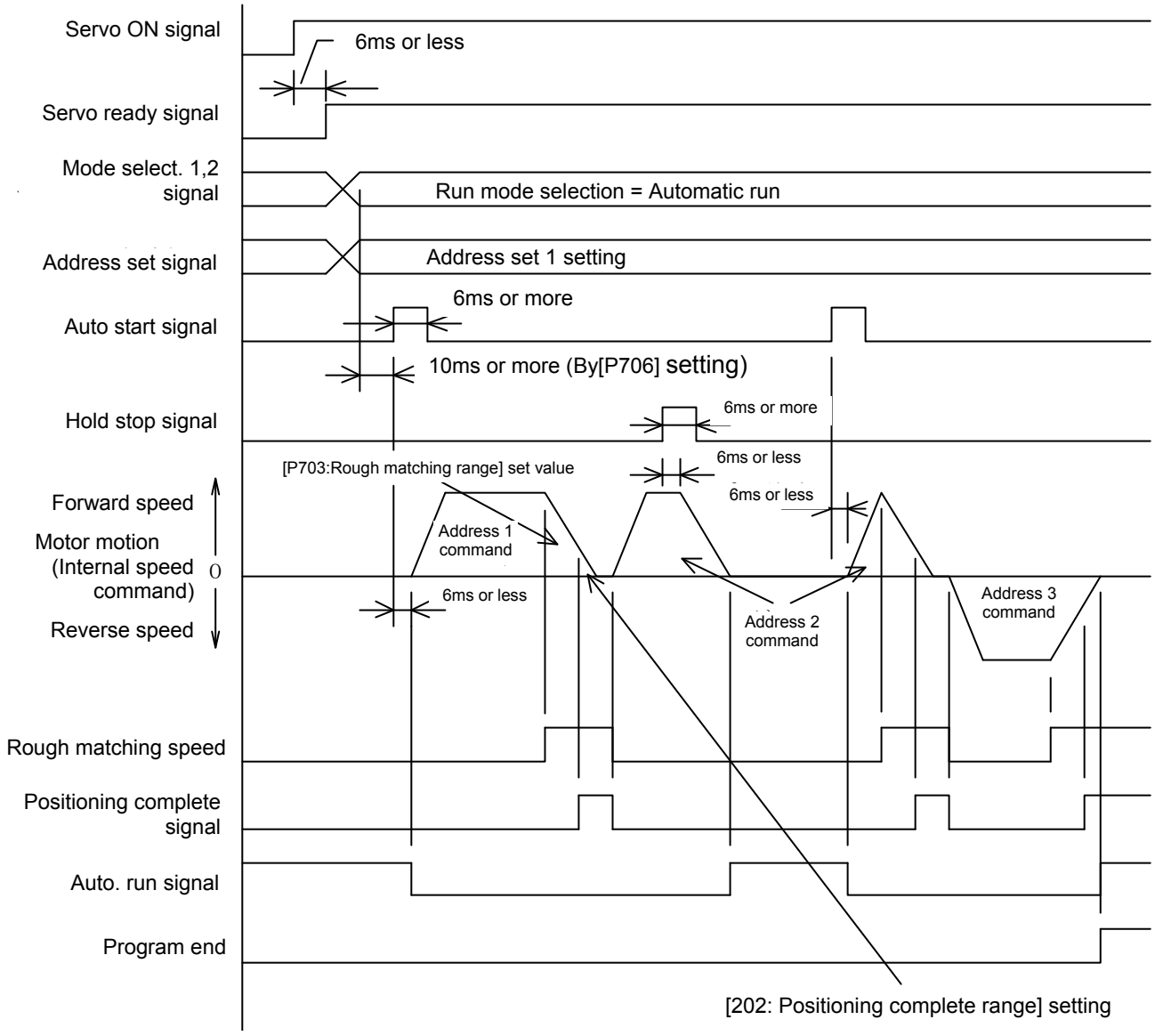
By the parameter [P409: Automatic run permit condition selection], Automatic run can be disabled before run Zero return is completed.
Automatic run executes commands continuously by internal stored commands or external setting data.
By turning Automatic start signal (PST)ON, a command of a specified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

1) Operation procedure



[Fig. 10-11] Automatic Run Operation Procedure

2) Time chart



[Fig. 10-12] Automatic Run Time Chart

Note 1 : When Hold stop is executed in Automatic run and Zero return run, Run mode can be changed. When Speed override signal is inputted, actual Speed becomes Speed command value × Override ratio.

10-2-4 Servo lock mode

In the servo lock mode, operation is not executed.
It always keep the servo lock status.

10-3 Analog Monitor

Contents selected by the parameters [P700: Monitor 1 selection]and[P701: Monitor 2 selection]is outputted by DC voltage at MON 1 and MON I2 terminals of the control I/O connector (p1) terminals.

Monitor motion status (transit, steady status) can be confirmed by monitoring wave of an oscilloscope.

Motion item contents are as follows.

Code	Monitor item	Monitor contents
MON 1 and MON 2	Speed command [SPD.REF.]	It outputs motor Speed command value. Polarity:Forward; ＋V, Reverse: －V Range:0～±10V ±10% At rated Speed:Full range
	Speed feedback [SPD.FB.]	It outputs motor actual Speed. Polarity:Forward ; ＋V, Reverse: －V Range: 0～±10V ±10% 125% of rated Speed: Full range（At rated Speed:±8V）
	Torque command [TRQ.REF.]	It outputs motor torque value. Polarity:Forward torque drive; ＋V, Reverse torque drive; －V Range:0～±10V ±10% At rated torque drive:±3.3 V
	External ＋torque limit [TRQ.LIM.+] External －torque limit [TRQ.LIM.-]	It outputs External ＋/－ torque limit value. Polarity :Forward torque limit and Reverse torque limit ; Both positive voltage Range :0～＋10V ±10% Rated torque limit:＋3.3V
	Position deviation 1 [P.RANGE.L] Position deviation 2 [P.RANGE.H]	It outputs Position deviation amount. Polarity :＋ deviation; ＋V, －deviation; －V Range:0～±10V ±10% Position deviation 1:255 pulse (4 times); Full range Position deviation 2:4080 pulse (4 times); Full range
	NC speed command [SPD.OUT]	It outputs Speed command value in Positioning or Pulse train run. Polarity:Forward command; ＋V, Reverse command ; －V Range :0～±10V ±10% Rated Speed:Full range
	NC target Speed [SCL.OUT]	It outputs Target Speed internally computed in Positioning, Jog, or Zero return run. Polarity:Forward command; ＋V, Reverse command ; －V Range :0～±10V ±10% Rated Speed:Full range
	Index data 62 [IX62] Index data 63 [IX63]	Outputs, according to the data inside the indirect data 62/63. Polarity: plus voltage at plus data, minus voltage at minus data Range: 0～±10 V, ±10 % At 499: full range
	External master axis speed [EMST.SPD]	Outputs the speed with the external master axis pulse input. Polarity: plus voltage at plus direction speed, minus voltage at reverse direction speed Range: 0～±10 V, ±10 % At slave axis rated speed equivalent: full range
	External master axis acceleration [EMST.ACCL]	Outputs the acceleration with the external master axis pulse input. Polarity: plus voltage at plus direction acceleration, minus voltage at reverse direction acceleration Range: 0～±10 V, ±10 % At 1000 pulse/1 ms: full range
	Reserved[OPT.W]	For our adjustment purpose. Do not set it.
	Reserved [OPT.L]	For our adjustment purpose. Do not set it.

[Tab.10-3] Analog Monitor Contents

Note 1:Since resolution of Analog monitor output is 1000 within ±10V, transit wave status could be step shape. And ripple is generated by ratio 1/1000 against resolution 1000 on the output.

10-4 Run Procedure

Please operate this unit in accordance with the following procedure.

1) Be sure to conduct Trial run.
2) In order to avoid a trouble in the trial run, at first run this unit without any load and after confirming no fault, connect the unit to your machine. And pay your special attention not to cause an accident.
3) In case that a magnetic pole sensor is not used for Linear/ Disc motor, [Automatic magnetic pole detection] is conducted when first ON timing of Servo ON signal after power is turned ON, or Encoder fault is fixed. Since a motor vibrates in this motion, please note it.

   Amplitude and motion in this case depends on value of the parameters P116～119 (Associated parameters of magnetic pole detection). And if this motion can not be completed, Alarm stop by [Encoder fault] occurs. [RDY signal] is not outputted in this case, but outputted after normal completion is achieved.
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 terminal bars of the controller, carelessly. 『Since there is high voltage, it is very dangerous.』 2) Do not use this unit without terminal bar covers. 『It may cause electric shock.』 3) Since some residual voltage exists after power is turned OFF, do not touch terminals and main circuits for 2 to 3 minutes. 4) Power ON/OFF shall be conducted after confirming safety, cautiously. 5) In case of Linear/ Disc motor application, if a machine can not conduct [Automatic magnetic pole detection (Motor vibrating motion)] when power is turned ON (Due to interference of work, etc.), use [magnetic pole sensor]. 6) Since a motor vibrates in Automatic magnetic pole detection, note it.

10-4-1 Confirmation of Power Source Voltage

Please confirm that the power source for the controller satisfies the required specification.

Power source specification can be referred to［14-1 Electric specification of controller］.

10-4-2 Trial Run

Note 1：Following『LCD module』is a standard device of the unit which capacity is 1.5kW or larger.
And for units smaller than 1.5kW capacity, optional 『SDI device』can be available.

(1) Separation of a motor and load
   1) Remove motor connection from the machine system and make no load status.

(2) Servo ON signal（SON(*)）OFF
   1) Before turning power ON, turn Servo ON signal（SON(*)）OFF.

(3) Power ON
   1) When power is turned ON, initial status is displayed in the LCD module.

(4) Parameter setting

1) Set[P000: Motor type], other parameters and Positioning data to coincide with your application.(Refer to Chapter 7 [Parameter].)

* Required parameters for Trial run are as follows.

Parameter No.	Name	Applied motor		
		Linear motor	Disc motor	Rotating motor
P000	Motor type	●	●	●
P001	Encoder type selection	●	●	●
P002	Rotating motor encoder pulse number selection			●
P003	Linear motor Linear sensor resolution	●		
P004	Disc motor Encoder pulse number		●	
P005	Rotating/ Disc motor Maximum Speed		●	●
P006	Linear motor Max. Speed	●		
P007	Linear motor rated Speed	●		
P010	Linear/ Disc motor Magnetic pole sensor type	▲	▲	
P011	Linear/ Disc motor Magnetic pole sensor offset	▲	▲	

Note) ●: Be sure to set them. ▲: Magnetic pole sensor Set only when it is used.

[Tab.10-4] Required parameters for Trial run

(5) Power re-input

1) In order to reflect parameter value on actual motion, re-input the power.

(6) Confirmation of control input signal

1) Turn input signals ON/OFF other than Servo ON signal(SON(*))and confirm if connection and logic of control inputs are correct by ON/OFF status of individual input display in the front panel LCD module and SDI device (I/O display section).
2) As for Speed override signals (OR1～OR4) and Address set signals (PS1～PS8), confirm them by Diagnosis display mode of LCD module.

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

1) After confirming parameter settings and control input signals, turn OFF Over travel signal (FOT*, ROT*), Emergency stop signal (EMG*)and turn ON then OFF Reset signal (RST).(LCD module and SDI device[FOT],[ROT], and[EMG]OFF) Then turn ON Servo ON signal(SON(*)). Before the time, all other control signals shall be turned OFF.
2) When Servo ON signal (SON(*))is turned ON, a motor is ready to generate driving torque and generate resisting torque to external force.
3) If Alarm is displayed or a motor runs at the same time Servo ON signal (SON(*))is turned ON, delete the cause.

(8) Run mode selection

1) Select run mode by Mode selection 1,2 signal (MD1,MD2).

(9) Run motion check

1) Run a motor by low Speed command（as Jog motion, etc.）and confirm if running speed is right, abnormal vibration does not occur, abnormal sound does not exist, etc..
2) Change command speed and confirm motor speed is proportionally changed to the command Speed.
（In case of rotating motor, we recommend to measure the Speed with a tachometer on the motor load shaft.）
3) If motor Speed can not be increased or not proportional to the command Speed and motor vibration or abnormal sound occurs in the above item (2), investigate and delete the cause.
4) In case of Positioning run, confirm if the motor rotating amount is correct to the Positioning data. (We recommend marking on the motor load shaft to confirm the position.)
5) If motor rotating amount is multiplied value by constant ratio or fluctuates in the above item (4), investigate and delete the cause.
6) Run motion confirmation shall be conducted for both forward and reveres directions.

(10) Load run

1) After Trial run in no load is over, connect a motor to the machine and conduct Trial run.
2) Before executing Load run, confirm that Emergency stop, Over travel, etc. surely works.
3) Inspect if abnormal sound, abnormal vibration, abnormal heat, etc. does not occur.
4) If above abnormality occurs or Alarm is displayed, investigate and delete the cause.
5) Motor and load status can be confirmed by LCD module and SDI device (Status and Diagnosis display mode)
6) If machine system travel amount and NC position command is not identical, confirm next parameters.

*Required parameters for matching machine system motion by NC position command are as follows.

Parameter No.	Name	Reference
P301	Setting unit selection	
P302	Command unit	
P303	Electronic gear numerator	*By this parameter, actual machine system travel amount and NC position command are matched.
P304	Electronic gear denominator	
P310	Machine travel amount	

[Tab.10-5] Required Parameters for Position Matching

10-5 Adjustment

10-5-1 Adjustment at Shipment

All the controller adjustment is set by parameters.
Standard setting at our factory shipment（Initial value）can be referred to ［7-2 Parameter specification］.Though a controller has standard adjustment values（Initial value set） at our factory shipment, it may be necessary to re-adjust the controller depending on actual load condition and operating method when it is connected with a machine system .

*1 Automatic adjustment can be conducted by Automatic tuning.
As for Automatic tuning, please refer to [11-4 Automatic tuning].

*2 In some cases, Automatic tuning could not be conducted due to actual load status, play in machine system, etc. . In the case referring to the following description, please set individual parameter, manually.

10-5-2 Adjustment Point of Individual Phenomenon（parameter）

Descriptions and setting methods of parameters can be referred to [7-2 Parameter specification] and [13-3 Operation mode].

Phenomenon	Adjustment point（parameter ）
A motor vibrates in stop status.	［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 ］ Above parameters is valid in Low speed gain range of P100 setting. ［P120:Torque command filter frequency］ ［P201: Servo lock gain］ This is valid in Positioning complete range of P202setting.
A motor vibrates in running.	［P101: Speed loop gain］ ［P102: Speed loop integral time constant］ ［P103: Speed loop derivative time constant］ ［P120: Torque command filter frequency］ ［P200: Position loop gain］
A motor vibrates when GSEL signal is ON.	［P111: Speed loop gain/ GSEL signal ON］ ［P112: Speed loop integral time constant /GSEL signal ON］ ［P113: Speed loop derivative time constant /GSEL signal ON］ ［P120: Torque command filter frequency］
Over-shoot or under-shoot is large at motor start or stop.	［P101: Speed loop gain］ ［P102: Speed loop integral time constant］ ［P103: Speed loop derivative time constant］ ［P200: Position loop gain］ ［P205: Feed forward ratio］ ［P211～213: Acceleration time］ ［P214～216: Deceleration time］
Over Speed error occurs.	
Deviation over flow occurs.	［P200:Position loop gain］ ［P207: Overflow detection pulse］ ［P205: Feed forward ratio ］ ［P211～213: Acceleration time］ ［P214～216: Deceleration time］
Positioning time is long.	［P200: Position loop gain］ ［P202:Positioning complete range］ ［P205: Feed forward ratio ］

[Tab.10-6] Adjustment Point of Individual Phenomenon（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］
   - The larger, the setting value is, the quicker the response is.
   - If setting value is too large, it causes vibration.
   - If setting value is too small, it makes response slow and motion unstable.

2) Speed loop integral time constant［P102］/ Low speed gain range ［P107］/ GSEL signal ON［P112］
   - The smaller, the setting value is, the quicker the response is.
   - If setting value is too small, it causes vibration.
   - If setting value is too large, it makes response slow 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 is, it works on earlier area of motion characteristics. And if the value is set too large, it works on all the motion range and causes vibration.

(2) 《Torque command filter》

1) Torque command　filter frequency［P120］
   - If machine resonance occurs, insert a filter to Torque command to fix it.
   - The larger, the setting value is, the slower the response is.
   - If setting value is too small, it makes response quicker but motion unstable.

(3) 《Position loop gain》

1) Position loop gain［P200］
   - The larger, the setting value is, the quicker the response 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 and Positioning accuracy worse.

2) Servo lock gain［P201］
   - The smaller, the setting value is, the quicker the response is in Servo lock.
   - If setting value is too large, it causes vibration.
   - If setting value is too large, it 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 adjustment is conducted by using Analog monitor and observing the wave of speed feedback in an oscilloscope.

Adjust individual gain parameter of Position loop and Speed loop until Position loop and Speed loop over-shoot and under-shoot and vibration does not occur.

- Conduct below adjustment in running status.

1) Set a little bit 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 an optimum value to［P102: Speed loop integral time constant］and re-adjust［P101: Speed loop gain］to find optimum motor motion.
3) Set［P103: Speed loop derivative time constant］to improve response and reduce over-shoot and under-shoot further more. If large value is set, it causes vibration.
4) If machine resonance occurs, adjust ［P120 :Torque command filter］ as high as possible until resonance disappears.
5) Adjust and set［P200: Position loop gain］as high as possible in the range where over-shoot and under-shoot and vibration does not occur.

- Conduct below adjustment in stop status.

1) Copy parameter setting values in the 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 constant］
   P108 ← P103［Speed loop derivative time constant］
2) If a motor vibrates after setting above parameters, adjust next parameters as adjustment in running status.
   ［P201: Servo lock gain］
   ［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 ］
3) If machine resonance occurs, increase［P120 :Torque command filter］until resonance disappears.

- Conduct below adjustment in GSEL signal ON status.

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

1) Adjust and set［P111: Speed loop gain/ GSEL signal ON］as high as possible in the range where vibration does not occur.
2) Adjust and set an optimum value to［P112: Speed loop integral time constant/ GSEL signal ON］and re-adjust［P111: Speed loop gain/ GSEL signal ON］to find optimum motor motion.
3) Set［P113: Speed loop derivative time constant/ GSEL signal ON］to improve response and reduce over-shoot and under-shoot further more. If large value is set, it causes vibration.
   If machine resonance occurs, increase ［P120 :Torque command filter］until resonance disappears.
4) In case of machine resonance, adjust [P120: Torque command filter] and set the maximum value to avoid the machine resonance.

*Refer to [13-3-4:Real time gain setting].

10-6 Automatic Detection of Magnetic pole

(1) In case that Magnetic pole sensor is not used for Linear/ Disc motor, in order to confirm magnetic pole position of the motor, execute [Automatic magnetic pole detection] in the following motions by this unit.
- At the time when Servo ON works for the first time after power is turned ON.
- At the time when Servo ON works for the first time after Encoder fault is released.

(2) Since a motor may vibrate by this function, please note it.
And amplitude and motion by this function depends on value of the parameters P116～119（Associated parameters of magnetic pole detection）.

(3) If this function is finished correctly, Alarm stop by [Encoder fault] is conducted.
In the case, next factors are supposed.
- Un-equal load exists.
- Friction is large.
- Load inertia is large.
- Load inertia fluctuates.
- Rigidity of a working machine is extremely low.
- Play or backlash of a working machine is large.
- A machine is interfered by a stopper, etc. in Automatic magnetic pole detection (vibration).
- Parameter [《Group 0》[Motor encoder parameter]] is wrong.
- Parameters (P116～119）associated with Magnetic pole detection are not set properly.

(4) [RDY signal] is not outputted by this function. It is outputted after normal stop is conducted.

(5) Automatic magnetic pole detection adjustment

《P116 : Torque limit value at Magnetic pole detection》

- It sets Torque limit value of an applied motor.
- The larger, the setting value is, the larger, the motor output torque is and the quicker the response is.
- If setting value is too large, it causes over-shoot, undershoot, vibration, etc.
- If setting value is too small, it makes response slower and Magnetic pole detection is not perfect.

《P117 : Gain 1 at Magnetic pole detection》

- The larger, the setting value is, the quicker the response is.
- If setting value is too large, it causes vibration.
- If setting value is too small, it makes response slower and Magnetic pole detection is not perfect.

《P118 : Integral time constant》

- The smaller, the setting value is, the quicker the response is.
- If setting value is too small, it causes vibration.
- If setting value is too large, it makes response slower and Magnetic pole detection is not perfect.

《P119 : Gain 2 at Magnetic pole detection》

- The larger, the setting value is, the quicker the response is.
- If setting value is too large, it causes over-shoot, undershoot, vibration.
- If setting value is too small, it makes response slower and Magnetic pole detection is not perfect.

⚠ Caution
In case of Linear/ Disc motor application, if a machine can not conduct [Automatic magnetic pole detection (Motor vibrating motion)] when power is turned ON (Due to interference of work, etc.), use [a magnetic pole sensor]. Since a motor vibrates in Automatic magnetic pole detection, note it.

10-7 Specifications of absolute encoder and Machine positioning

10-7-1 Specifications of absolute encoder

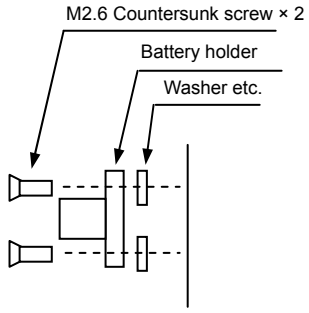
Item	Description
One rotational resolution	2^{17} (131072 Pulse)
Number of multiple rotations	2^{15} ($\pm$16383 rev than the initialization position)
Backup system	Battery backup
Battery used	Lithium battery (Primary battery, Nominal 3.6 V)
Battery backup time	Around 2.5 years. * 1
Battery shelf life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

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

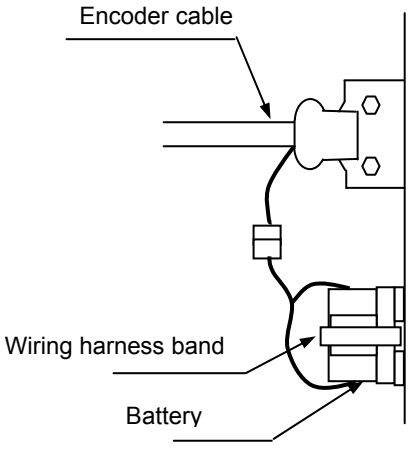
10-7-2 Installation and replacement of battery

(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

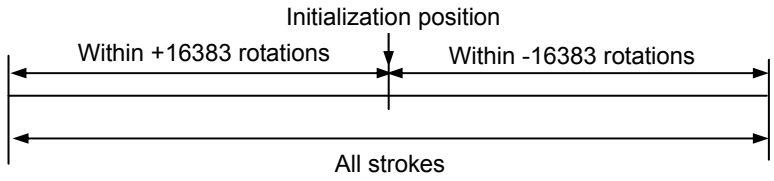
Replace the battery in case of absolute encoder battery error warning (WNG/ABS/BATT.) or when absolute encoder battery error (ALM/ABS/BATT) occurs.
Replace the battery when the control power supply is ON.
Be careful since the backup data in the encoder may get lost if the battery is replaced while the 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

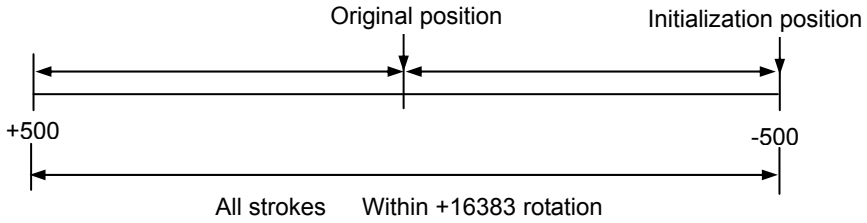
(1) Select the encoder type (P001)
Select “S – ABS”.

(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.



(4) Position adjustment parameter (P300-399)
When changed the position adjustment parameter (P300-399) in the use of the absolute encoder, switch on the power again to make the parameter effective.
If failed to restart the power for the parameter activation, the current position does not follow the parameter.

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”.

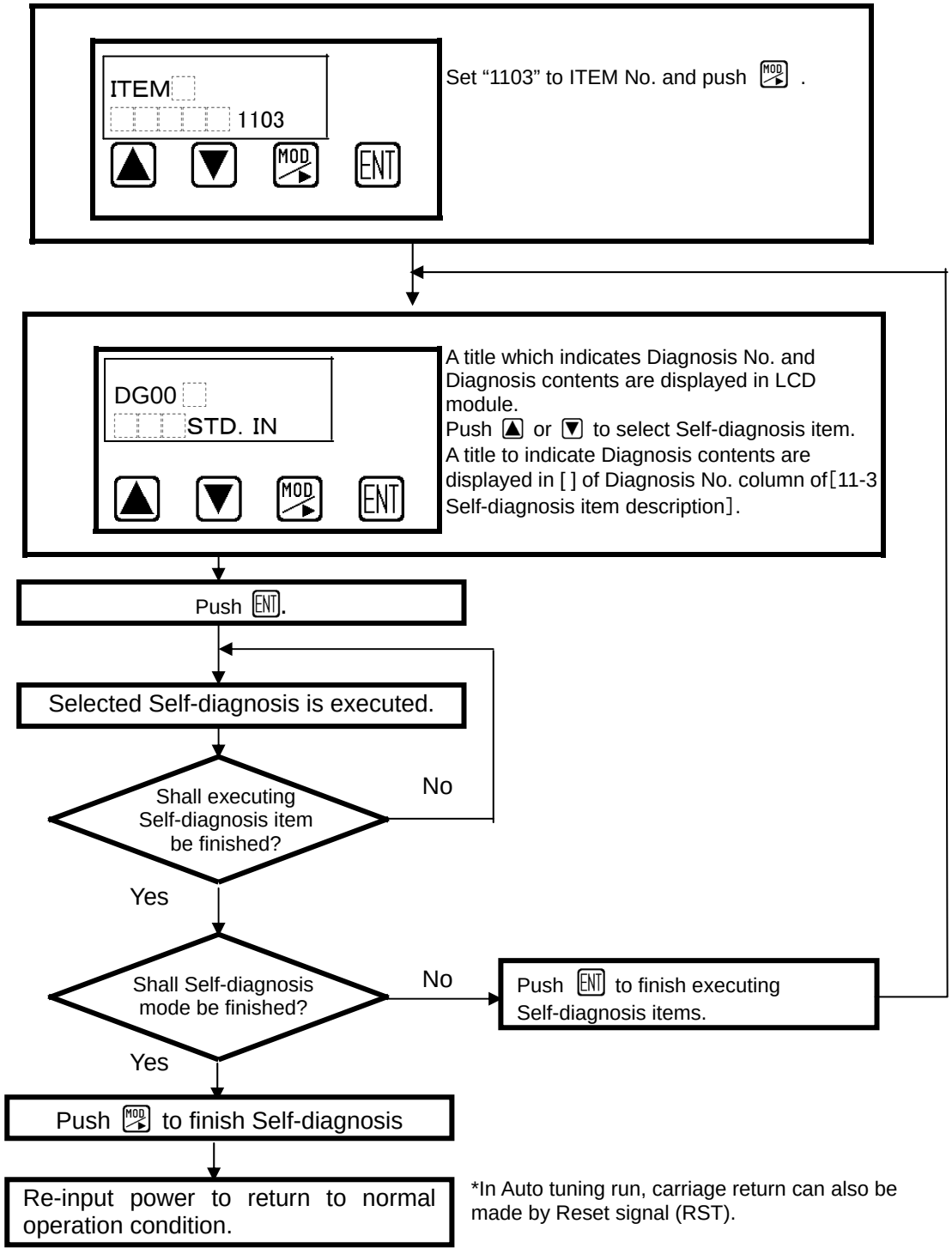
(3) Restart the power supply.

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 Item

DG NO.	Name.	Function
DG00	Basic input signal check	Basic input ports（CN 1-29～36：DI8～DI1）status is displayed in the LCD module.
DG01	Extended input signal check 1	Optional extended input ports（CN 3:EI8～EI1）status is displayed in the LCD module.
DG02	Extended input signal check 2	Optional extended input ports（CN 3:EI16～EI9）status is displayed in the LCD module.
DG03	Extended input signal check 3	Optional extended input ports（CN 3:EI24～EI7）status is displayed in the LCD module.
DG04	Extended input signal check 4	Optional extended input ports（CN 3:EI32～EI25）status is displayed in the LCD module.
DG05	DIPSW check	Status of DIPSW for power ID is displayed in the LCD module.
DG06	Extension interrupt ZLS signal check	Receipt status of ZLS signal from optional control I/ O extension unit is displayed in the LCD module.
DG07	Extension interrupt TRG signal check	Receipt status of TRG signal from optional control I/ O extension unit is displayed in the LCD module.
DG10	Pulse train command check	Motion status of an internal command counter（command counter value）by Pulse train command input is displayed in the LCD module.
DG11	Encoder FB check	Motion status of an internal feedback pulse counter（feedback pulse counter value）by Encoder feedback pulse is displayed in the LCD module.
DG12	Encoder speed detection check	Motion status of an internal speed detection counter（encoder feedback pulse frequency）by Encoder feedback pulse is displayed in the LCD module.
DG13	Serial encoder FB check	1 turn position of a serial encoder is displayed in the LCD module.
DG14	Marker capture check	Receipt status of Encoder marker signal is displayed in the LCD module.
DG20	Analog input speed command check	Input voltage of an optional external speed command（INH）is displayed in the LCD module.
DG21	Analog input torque command check	Input voltage of an optional external torque command（TQH）is displayed in the LCD module.
DG22	Analog input magnetic pole sensor SIN check	Input voltage of an optional magnetic pole sensor (SIN) is displayed in the LCD module.
DG23	Analog input magnetic pole sensor COS check	Input voltage of an optional magnetic pole sensor (COS) is displayed in the LCD module.
DG24	Extended analog input check 1	Input voltage of an optional extended analog input is displayed in the LCD module.
DG25	Extended analog input check 2	Input voltage of an optional extended analog input is displayed in the LCD module.
DG26	Extended analog input check 3	Input voltage of an optional extended analog input is displayed in the LCD module.
DG27	Extended analog input check 4	Input voltage of an optional extended analog input is displayed in the LCD module.
DG30	Basic output signal check	Basic output ports（CN 1-14～17：DO4～DO1）status is displayed in the LCD module.
DG31	Extended output signal check	Optional extended output ports (CN3:EO8～EO1）status is displayed in the LCD module.
DG32	7 segment LED check	Numeric value 0～9 is displayed in 7 segment LED in turns.
DG33	LCD signal display check	All the signal display section of the LCD module flickers.

[Tab. 11-1（a）] Self-diagnosis Item (1/3)

DG NO.	Name.	Function
DG40	Analog monitor 0Vcheck	0V is outputted on Analog monitor terminals（MON 1,MON 2）.
DG41	Analog monitor +5Vcheck	＋5 V is outputted on Analog monitor terminals（MON 1,MON 2）.
DG42	Analog monitor –5Vcheck	－5 V is outputted on Analog monitor terminals（MON 1,MON 2）.
DG43	Analog monitor +10Vcheck	＋10 V is outputted on Analog monitor terminals（MON 1,MON 2）.
DG44	Analog monitor -10Vcheck	－10 V is outputted on Analog monitor terminals（MON 1,MON 2）.
DG50	RAM check	It confirms if an internal RAM is normal by executing Read/ Write. Results are displayed in the LCD module.
DG51	Extension RAM check	It confirms if an optional RAM is normal by executing Read/ Write. Results are displayed in the LCD module.
DG52	EEPROM check	It confirms if an internal EEPROM (non voluntary memory) is normal by executing Read/ Write. Results are displayed in the LCD module.
DG53	Memory initialization	This item is only for adjustment at our factory shipment. Never conduct it. If conducted, parameter contents are changed to the initial status.
DG60	SIO check	Short-circuit TXD(A)-RXD(A) , TXD(B)-RXD(B) and RXD(A)-RLR(A) of the connector J1 , and confirm if Transmission/ Receipt is executed, correctly. Results are displayed in the LCD module.
DG61	Servo control communication transmission check	It conducts transmission check of data through Servo control communication of the connector J2. DG 62 is coupled with this item for the check.
DG62	Servo control communication receipt check	It conducts receipt check of data through Servo control communication of the connector. DG 61 is coupled with this item for the check.
DG80	Trial run	This item is only for adjustment at our factory shipment. Never conduct it.
DG81	DCCT U phase check	This item was adjusted at our factory shipment. Never change the setting. （DCCT　U phase offset shift check）
DG82	DCCT V phase check	This item was adjusted at our factory shipment. Never change the setting. （DCCT　V phase offset shift check）
DG83	DCCT adjustment	This item was adjusted at our factory shipment. Never change the setting. （DCCT offset adjustment is included.）

[Tab. 11-1（b）] Self-diagnosis Item (2/3)

DG NO.	Name.	Function
DG84	Magnetic pole sensor automatic adjustment	When a magnetic pole sensor is used for Linear/ Disc motor, it automatically measures gain and offset value and set next parameters. [P050:magnetic pole sensor sine gain] [P051:magnetic pole sensor sine offset] [P052:magnetic pole sensor cosine gain] [P053:magnetic pole sensor cosine offset]
DG85	Current amplifier adjustment 10V output	This item is only for adjustment at our factory shipment. Never conduct it.
DG86	Current amplifier adjustment 0V output	〃
DG87	Current amplifier adjustment 0.5V output	〃
DG88	DC excitation	〃
DG95	Disc motor automatic adjustment	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.
DG96	Serial Encoder 1turn data initialization	This item is only for adjustment at our factory shipment. Never conduct it.
DG97	Serial Encoder plural turn data initialization	Serial encoder plural turn data are initialized.
DG98	Automatic tuning at GSEL	Speed loop gain set at GSEL signal ON is automatically conducted.
DG99	Automatic tuning	Speed loop gain set (at GSEL signal OFF) is automatically conducted.

[Tab. 11-1(c)] Self-diagnosis Item (3/3)

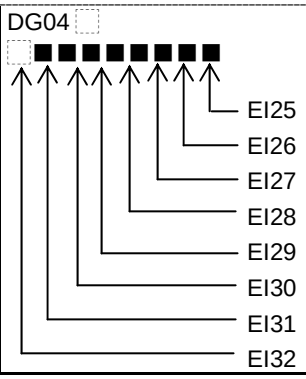
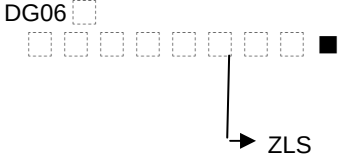
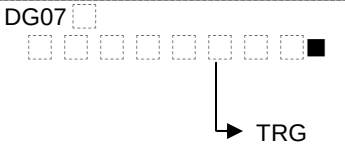
⚠ Caution

1) Self-diagnosis items, DG53, DG80～88(Except DG84), and DG96 are only for adjustment at our factory shipment. Never conduct it.

11-3 Self-diagnosis Item Description

Diagnosis No.	Actual LCD display	Diagnosis contents
Basic input signal check		When a basic input signal through the connector CN 1 is ON , individual signal of [DI8]～[DI1] is displayed in data display section by bit. Individual bit display is [1] when this and COM terminals are short-circuited（ON）and [0] when they are opened（OFF）.
DG00 [___STD.IN]	DG00 ■■■■■■■■ DI1 DI2 DI3 DI4 DI5 DI6 DI7 DI8	
Extended input signal check 1		When a control input signal through the connector CN 3of an optional extension board is ON, individual signal of [EI8]～[EI1] is displayed in data display section by bit. Individual bit display is [1] when this and COM terminals are short-circuited（ON）and [0] when they are opened（OFF）.
DG01 [__EXT.IN1]	DG01 ■■■■■■■■ EI1 EI2 EI3 EI4 EI5 EI6 EI7 EI8	
Extended input signal check 2		When a control input signal through the connector CN 3of an optional extension board is ON, individual signal of [EI16]～[EI9] is displayed in data display section by bit. Individual bit display is [1] when this and COM terminals are short-circuited（ON）and [0] when they are opened（OFF）.
DG02 [__EXT.IN2]	DG02 ■■■■■■■■ EI9 EI10 EI11 EI12 EI13 EI14 EI15 EI16	
Extended input signal check 3		When a control input signal through the connector CN 3of an optional extension board is ON, individual signal of [EI24]～[EI17] is displayed in data display section by bit. Individual bit display is [1] when this and COM terminals are short-circuited（ON）and [0] when they are opened（OFF）.
DG03 [__EXT.IN3]	DG03 ■■■■■■■■ EI17 EI18 EI19 EI20 EI21 EI22 EI23 EI24	

[Tab. 11-2 (a) Self-diagnosis Item Description (1/10)]

Diagnosis No.	Actual LCD display	Diagnosis contents
Extended input signal check 4		When a control input signal through the connector CN 3 of an optional extension board is ON, individual signal of [EI32]～[EI25] is displayed in data display section by bit. Individual bit display is [1] when this and COM terminals are short-circuited（ON）and [0] when they are opened（OFF）.
DG04 [__EXT.IN4]	DG04  	
DIP SW check		It displays setting status of DIPSW for a power ID on a control board by bit.
DG05 [_POWER.ID]	DG05 	
Extension interrupt ZLS signal check		It checks motion status by the interrupt signal（ZLS）through the connector CN 3 of an optional extension board. Bit display is [1] when signal ON edge is received (This and COM terminals are short-circuited（ON）). If once [1] is received, it can not be changed to [0] as long as this function is tested.
DG06 [__ZLS.CAP]	DG06  	
Extension interrupt TRG signal check		It checks motion status by the interrupt signal（TRG）through the connector CN 3 of an optional extension board. Bit display is [1] when signal ON edge is received (This and COM terminals are short-circuited（ON）). If once [1] is received, it can not be changed to [0] as long as this function is tested.
DG07 [__TRG.CAP]	DG07  	

「Tab. 11-2 (b) Self-diagnosis Item Description (2/10)」

Diagnosis No.	Actual LCD display	Diagnosis contents
Pulse train command counter check		It displays an internal counter value of Pulse train command. When 90˚different phase is inputted, 4 times of the pulse value is displayed. Display range is 0～65535 and the value increases by forward commands.
DG10 [_PLS.REF.]	DG10 □ □ □ □ □ ■■■■■	
Feedback pulse position counter check		It displays an internal position counter value of Encoder feedback pulse. Counter value display is 4 times of the input pulse value. Display range is 0～65535 and the value increases by forward commands.
DG11 [__ENC.FB.]	DG11 □ □ □ □ □ ■■■■■	
Feedback pulse speed detection counter check		It displays an internal speed detection counter value of Encoder feedback pulse. Counter value display is 4 times of the input pulse value. [★] in the left figure, a mark〈[－] for reverse motion〉is displayed.
DG12 [SPD.COUNT]	DG12★ □ ■■■■■■■■	
Serial encoder feedback check		It displays 1 turn position of Serial encoder.
DG13 [_S-ENC.FB]	DG13★ □ ■■■■■■■■	
Encoder marker check		It checks input status of Encoder marker signal. Bit display is [1] when signal ON edge is received (This and COM terminals are short-circuited（ON）). If once [1] is received, it can not be changed to [0] as long as this function is tested.
DG14 [__ENC.MK]	DG14 □ □ □ □ □ □ □ □ □ ■ MK	

[Tab. 11-2 (c) Self-diagnosis Item Description (3/10)]

Diagnosis No.	Actual LCD display	Diagnosis contents
Speed command input voltage check		It displays input voltage of an optional external torque command. [★] in the left figure, a mark([−] for negative voltage)is displayed.
DG20 [_SPD.REF.]	DG20★ □□□□■■. ■■	
Torque command input voltage check		It displays input voltage of an optional external speed command. [★] in the left figure, a mark([−] for negative voltage)is displayed.
DG21 [_TRQ.REF.]	DG21★ □□□□■■. ■■	
Analog input magnetic pole sensor SIN check		It displays SIN value of Analog input magnetic pole sensor when an optional magnetic pole sensor is connected.
DG22 [M-SEN.SIN]	DG22★ □□□□■■. ■■	
Analog input magnetic pole sensor COS check		It displays COS value of Analog input magnetic pole sensor when an optional magnetic pole sensor is connected.
DG23 [M-SEN.COS]	DG23★ □□□□■■. ■■	
Extended analog input check 1		It displays Analog input terminal (INH) value of an optional extension board.
DG24 [EXT.A-IN1]	DG24★ □□□□■■. ■■	
Extended analog input check 2		It displays Analog input terminal (TQH) value of an optional extension board.
DG25 [EXT.A-IN2]	DG25★ □□□□■■. ■■	
Extended analog input check 3		It displays Analog input terminal (TL＋) value of an optional extension board.
DG26 [EXT.A-IN3]	DG26★ □□□□■■. ■■	
Extended analog input check 4		It displays Analog input terminal (TL－) value of an optional extension board.
DG27 [EXT.A-IN4]	DG27★ □□□□■■. ■■	

[Tab. 11-2 (d) Self-diagnosis Item Description (4/10)]

Diagnosis No.	Actual LCD display	Diagnosis contents
Basic output signal check		Control output signal through the connector CN 1 is turned ON every 1 second in the sequence as the next flow. During the output signal is ON, [■]of the left figure, output signal No. is displayed.
DG30 [__I/ O_OUT]	DG30 □ S. OUT■ □ ON	
Start → S. OUT1 → S. OUT2 → S. OUT3 → S. OUT4 → (S. OUT1)		
Extended output signal check		Control output signal through the connector CN 3 of an optional extension board is turned ON every 1 second in the sequence as the next flow. During the output signal is ON, [■]of the left figure, output signal No. is displayed. A type without an extension board displays [No □ I/F].
DG31 [EXI/ O OUT]	DG31 □ □E. OUT■ ! !	
Start → E. OUT1 → E. OUT2 → E. OUT3 → E. OUT4 → E. OUT5 → E. OUT6 → E. OUT7 → E. OUT8 →		
7 segment LED check		7 segment LED of the front panel is displayed in the sequence as the next flow. Start → 0 → 1 → 2 → 3 → 4 → 5 → 6 → 7 → 8 → 9 [■]of the left figure, display contents are displayed.
DG32 [__SEG.DSP]	DG32 □ □ □ □ □ □ □ □ □ ■	
LCD signal display check		Signal display section of LCD module flickers.
DG33 [___LCD.IO]	DG33 □ □ □ R U N N I N G	

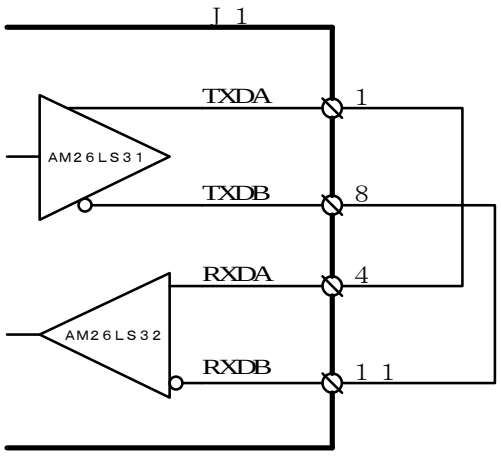
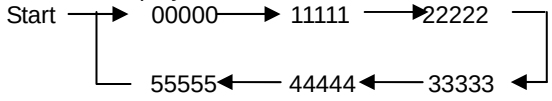
[Tab. 11-2 (e) Self-diagnosis Item Description (4/10)]

Diagnosis No.	Actual LCD display	Diagnosis contents
Analog monitor 0V output check		0 [V] is outputted on Analog monitor output terminals (MON 1, MON 2).
DG40 [A.MON . 0V]	DG40 □ □ □ □ □ □ 0. 0 0	
Analog monitor +5V output check		+5 [V] is outputted on Analog monitor output terminals (MON 1, MON 2).
DG41 [A.MON .+5V]	DG41 □ □ □ □ □ □ 5. 0 0	
Analog monitor 5V output check		−5 [V] is outputted on Analog monitor output terminals (MON 1, MON 2).
DG42 [A.MON .-5V]	DG13− □ □ □ □ □ 5. 0 0	
Analog monitor +10V output check		+10 [V] is outputted on Analog monitor output terminals (MON 1, MON 2).
DG43 [A.MON +10V]	DG43 □ □ □ □ 10. 0 0	
Analog monitor 10V output check		−10 [V] is outputted on Analog monitor output terminals (MON 1, MON 2).
DG44 [A.MON -10V]	DG44− □ □ □ □ 10. 0 0	

[Tab. 11-2 (f) Self-diagnosis Item Description (6/10)]

<table>
<tr><th>Diagnosis No.</th><th>Actual LCD display</th><th>Diagnosis contents</th></tr>
<tr><td colspan="2">RAM check
DG50
[_____RAM]</td><td>DG50
RUNNING
It checks an internal extension RAM of this unit, and displays Diagnosis results for the tabulation.
<table>
<tr><th>Display</th><th>Diagnosis results</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 colspan="2">Extension RAM check
DG51
[__EXT RAM]</td><td>DG51
RUNNING
It checks an internal extension RAM of this unit, and displays Diagnosis results for the tabulation.
<table>
<tr><th>Display</th><th>Diagnosis results</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>Origin data
return error</td></tr>
</table></td></tr>
<tr><td colspan="2">EEPROM check
DG52
[___EEPROM]</td><td>DG52
RUNNING
It checks an internal extension EEPROM of this unit, and displays Diagnosis results for the tabulation.
<table>
<tr><th>Display</th><th>Diagnosis results</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>Origin data
return error</td></tr>
</table></td></tr>
<tr><td colspan="2">Memory initialization
DG53
[___MEM.INI]</td><td>DG53
RUNNING
This item is only for adjustment at our factory shipment. Never conduct it. If this is conducted, since the parameter returns to the value of the factory shipment status, please note it.
<table>
<tr><th>Display</th><th>Adjustment results</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 is not permitted.</td></tr>
<tr><td>[_ERROR2!!]</td><td>Abnormal end</td><td>Initialization can not be conducted.</td></tr>
</table></td></tr>
</table>

[Tab. 11-2 (g) Self-diagnosis Item Description (7/10)]

<table>
<tr><th>Diagnosis No.</th><th>Actual LCD display</th><th>Diagnosis contents</th></tr>
<tr><td colspan="2">Serial communication I/ F check</td><td rowspan="2">At normal end [OK ! !], and at abnormal end [ERROR ! !] is displayed.
Please short-circuit TXD (A)-RXD (A), TXD (B)-RXD (B) and RXD (A)- RLR (A)of connector J1 before executing this check. Connection is as follows.
 
</td></tr>
<tr><td>DG60
[__S.COM M.]</td><td>DG60
RUNNING</td></tr>
<tr><td colspan="2">Servo control communication transmission check</td><td rowspan="2">Data are transmitted by Servo control communication through the connector J2 every 0.5 second in the sequence as the next flow.
And [■■■■■] of the left figure, transmission data contents are displayed.
 
</td></tr>
<tr><td>DG61
[_PLS.TRS.]</td><td>DG61
■■■■■</td></tr>
<tr><td colspan="2">Servo control communication receipt check</td><td rowspan="2">Data are received by Servo control communication through connector J2.
In order to conduct this check, VC series type used for the transmission by DG61 shall be connected. Received data are transmitted from VC series type by executing DG61.
Diagnosis results of received data are displayed below.
<table><tr><th>Display</th><th>Diagnosis results</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 error of communication data</td></tr><tr><td>[_TIME.OUT]</td><td>Abnormal end</td><td>Communication data can not be received at all.</td></tr></table></td></tr>
<tr><td>DG62
[_PLS.RCV.]</td><td>DG62
RUNNING</td></tr>
</table>

[Tab. 11-2 (h) Self-diagnosis Item Description (8/10)]

<table>
<tr><th>Diagnosis No.</th><th>Actual LCD display</th><th>Diagnosis contents</th></tr>
<tr><td colspan="2">Trial run
DG80
[TST.DRIVE]</td><td>DG80
■■■■■■■■■
This item is only for adjustment at our factory shipment.
Never conduct it.
If it is conducted, a motor runs. It is dangerous.</td></tr>
<tr><td colspan="2">For DCCT offset adjustment
DG81 ～ DG83</td><td>This item was adjusted at our factory shipment.
Never change the setting.</td></tr>
<tr><td colspan="2">Magnetic pole sensor automatic adjustment
DG84
[M-SEN.ADJ]</td><td>DG84
RUNNING
It measures gain and offset of a magnetic pole sensor and set the value to [P050～P053].
⚠ Caution
When this adjustment is conducted, a motor travels max. 3 times of [P058: Distance between poles for Linear / Disc motor] by the speed and travel direction set by [P145: magnetic pole sensor automatic adjustment].
<table>
<tr><th>Display</th><th>Adjustment results</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>• Linear/ Disc motor is not used.
• A magnetic pole sensor is not used.</td></tr>
<tr><td>[_ERROR2!!]</td><td>Abnormal end</td><td>・Error occurred.</td></tr>
</table></td></tr>
<tr><td colspan="2">Current amplifier adjustment
10V output
DG85
[CURCK. 10]</td><td>DG85
10. 00
This item is only for adjustment at our factory shipment.
Never conduct it.
If it is conducted, a motor runs. It is dangerous.</td></tr>
<tr><td colspan="2">Current amplifier adjustment
0V output
DG86
[CURCK. 0]</td><td>DG86
0. 00
This item is only for adjustment at our factory shipment.
Never conduct it.
If it is conducted, a motor runs. It is dangerous.</td></tr>
<tr><td colspan="2">Current amplifier adjustment
0. 5V output
DG87
[CURCK.0.5]</td><td>DG87
0. 50
This item is only for adjustment at our factory shipment.
Never conduct it.
If it is conducted, a motor runs. It is dangerous.</td></tr>
<tr><td colspan="2">DC excitation
DG88
[DC.EXCT]</td><td>DG88
RUNNING
This item is only for adjustment at our factory shipment.
Never conduct it.
If it is conducted, a motor runs. It is dangerous.</td></tr>
</table>

[Tab. 11-2 (i) Self-diagnosis Item Description (9/10)]

<table>
<tr><th>Diagnosis No.</th><th>Actual LCD display</th><th>Diagnosis contents</th></tr>
<tr><td colspan="2">Disc motor automatic adjustment</td><td rowspan="2">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>DG95
[DISC.INI]</td><td>DG95
RUNNING</td></tr>
<tr><td colspan="2">Serial encoder 1 turn data initialization</td><td rowspan="2">This item is only for adjustment at our factory shipment. Never conduct it.</td></tr>
<tr><td>G96
[S-INC.INI]</td><td>DG96
RUNNING</td></tr>
<tr><td colspan="2">Serial encoder plural turn data initialization</td><td rowspan="2">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>DG97
[S-INC.CLR]</td><td>DG97
RUNNING</td></tr>
<tr><td colspan="2">Automatic tuning at GSEL</td><td rowspan="2">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>DG98
[_GSELTUNE]</td><td>DG98
RUNNING
Display in Trial run
↓
DG98
CALCULATE
Display in calculating</td></tr>
<tr><td colspan="2">Automatic tuning</td><td rowspan="2">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>
<tr><td>DG99
[_AUTOTUNE]</td><td>DG99
RUNNING
Display in Trial run
↓
DG99
CALCULATE
Display in calculating</td></tr>
</table>

[Tab. 11-2 (j) Self-diagnosis Item Description (10/10)]

11-4 Automatic Tuning

Automatic tuning is the function that the unit itself sets or supports setting of adequate Servo control parameters for a machine (motor load). Automatic tuning consists of 2 functions [Automatic tuning function] and [Tuning level adjustment function].
Automatic tuning function sets Servo control parameters in accordance with the actual machine action when a motor is rotated in Trial run (internal run pattern).
Tuning level adjustment function supports setting of more adequate Servo control parameters by increasing or decreasing gain in accordance with machine characteristics measured by , Automatic tuning.
And this unit has change function of Servo control parameters (Selection by GSEL signal) and Automatic tuning at 2 kinds of motor load status can be used for the purpose.

⚠ Caution

(1) Since in Automatic tuning run, a motor shaft runs in accordance with the setting of parameters [P140]and[P141], please confirm that a load machine stays in the movable range. And if Over travel signals (FOT*/ ROT*)are not connected, this function becomes error (FOT* and ROT* can be disabled by the parameter [P705]setting.).

(2) In Automatic tuning run, input signals except FOT* and ROT* are accepted.
Reset signal(RST), Emergency stop signal(EMG*), etc. can not hold (or stop).

(3) If a trouble as vibration, etc. occurs in Automatic tuning run, stop the tuning immediately by ENT key. In the case, a motor goes into torque free status and moves by its inertia.

(4) In the below case, Automatic tuning may not tune gain correctly and oscillation or runaway could occur. In the case, please set gain manually.
1) Un-equal load exists.
2) Friction is large.
3) Load inertia fluctuates.
4) Rigidity of a working machine is low.
5) Play or backlash of a working machine is large.
6) Load inertia is 3 times or less of motor inertia.

❗ Compulsion

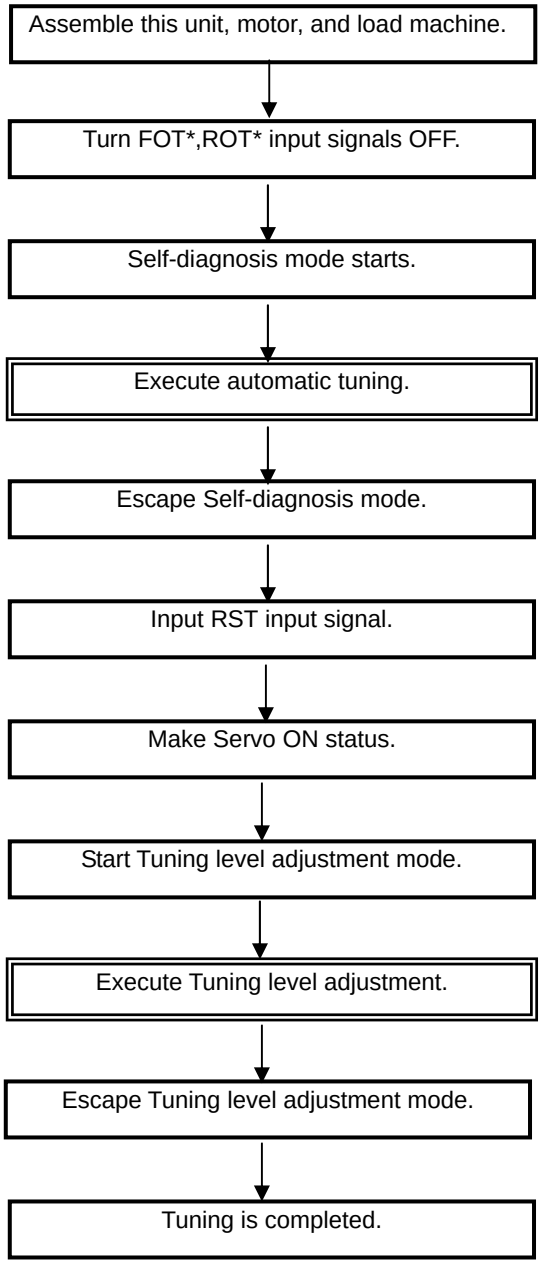
(1) Automatic tuning and Tuning level adjustment compute optimum speed loop gain based on measured load characteristics. If load changes due to fine adjustment, etc. of a load machine after Automatic tuning and Tuning level adjustment are over, be sure to again conduct Automatic tuning and measure new load characteristics. If Automatic tuning is not executed, again against the load change, oscillation or runaway of a load machine may occur.

⃠ Prohibition

(1) Do not conduct Automatic tuning of a motor which has a vertical shaft, etc. where external torque always loaded. When Self-diagnosis is selected for conducting Automatic tuning, a motor becomes in torque free status and is driven by external torque.

11-4-1 Automatic Tuning Execution Procedure

Automatic tuning execution procedure is as follows.



- In Automatic tuning run, only FOT* and ROT* are valid for input. RST and EMG* etc. can not hold (or stop).
  （Parameter [P705] can disables FOT* and ROT*.）
- Do not carelessly start Self-diagnosis other than automatic tuning.

*Refer to［11-4-2 Automatic tuning function］.

* Refer to［11-4-3 Tuning level adjustment function］.

[Fig.11-2] Automatic Tuning Execution Procedure

11-4-2 Automatic tuning function

Automatic tuning is operated by Diagnosis No. DG 98 and DG99 of Self-diagnosis mode.

- DG99 measures machine characteristics in Trial run and sets adequate values to parameters of the following Servo control.
  Therefore, be sure to connect a motor to load and execute DG99.

No.	Parameter name.	Reference
P101	Speed loop gain	It sets adequate value.
P102	Speed loop Integral time constant	It sets adequate value.
P104	Speed loop Proportional gain Division ratio	It sets 0. (Normally 0 is adequate value.)
P105	Speed loop Derivative gain Division ratio	It sets 0. (Normally 0 is adequate value.)
P106	Speed loop gain/ Low speed gain range	Same setting value as P101
P107	Speed loop Integral time constant / Low speed gain range	Same setting value as P102
P109	Speed loop Proportional gain Division ratio / Low speed gain range	It sets 0. (Normally 0 is adequate value.)
P110	Speed loop Derivative gain Division ratio / Low speed gain range	It sets 0. (Normally 0 is adequate value.)
P146	Mass/ Inertia	It sets adequate value.
P147	Viscosity friction	It sets adequate value.

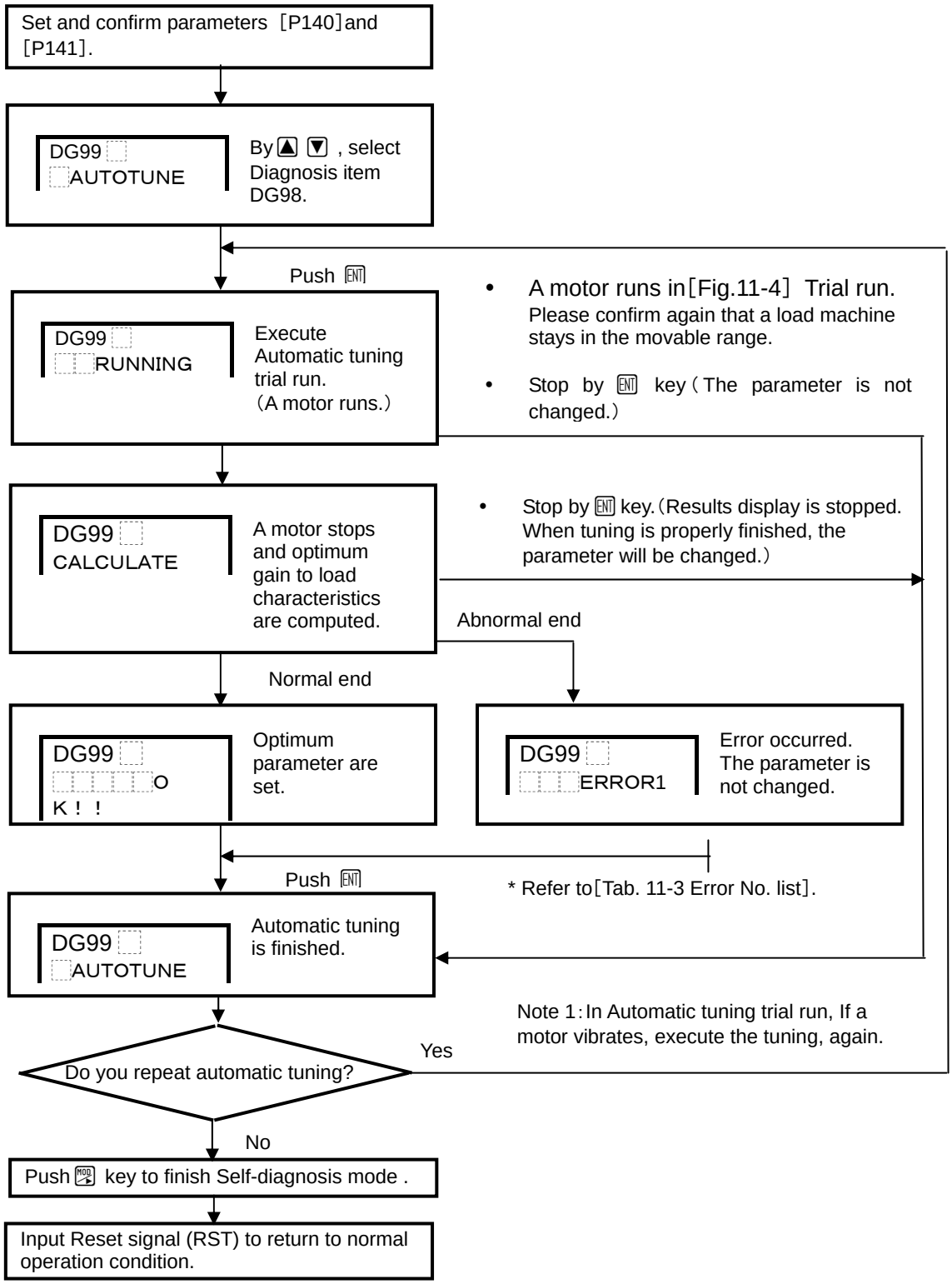
- DG98 sets following Servo control parameters when GSEL signal is ON.
  Therefore, since machine characteristics are measured in Trial run, be sure to connect a motor to load when GSEL signal is ON, and execute DG98.

No.	Parameter name.	Reference
P111	Speed loop gain/ GSEL signal ON	It sets adequate value.
P112	Speed loop Integral time constant / GSEL signal ON	It sets adequate value.
P114	Speed loop Proportional gain Division ratio / GSEL signal ON	It sets 0. (Normally 0 is adequate value.)
P115	Speed loop Derivative gain Division ratio / GSEL signal ON	It sets 0. (Normally 0 is adequate value.)

And when machine load or other load characteristics are changed, be sure to again measure load characteristics by Automatic tuning.
Automatic tuning can set adequate gain when load inertia is in the range of 3～30 times of motor inertia. If load inertia exceeds 30 times, since gain setting is a little bit low, please confirm safety and then readjust it by Tuning level adjustment.

1) Automatic tuning execution procedure

Operation in automatic tuning is as follows.(DG98 operation is same.)



[Fig.11-3] Automatic Tuning Execution Procedure

2) Parameter setting

In order to conduct Automatic tuning, please set and confirm parameters [P140]and [P141].

[P140] Direction selection in Automatic tuning trial run

1. Function

It sets Trial run direction of a motor in Automatic tuning.

- BOTH: The motor rotates forward and then reverse direction.
- +ONLY: The motor rotates only forward direction.
- -ONLY: The motor rotates only reverse direction.

Normally, select “Both”. When a load machine can move only one direction either forward or reverse, change this parameter.

And since the parameter[P300 Rotating direction selection]set can reverse rotating direction, please note it.

2. Unit, setting range

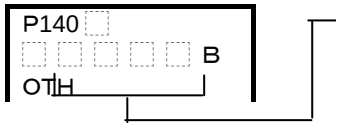
(1) Unit: Menu selection

(2) Setting range : BOTH/ +ONLY/ -ONLY

(3) Initial value : BOTH

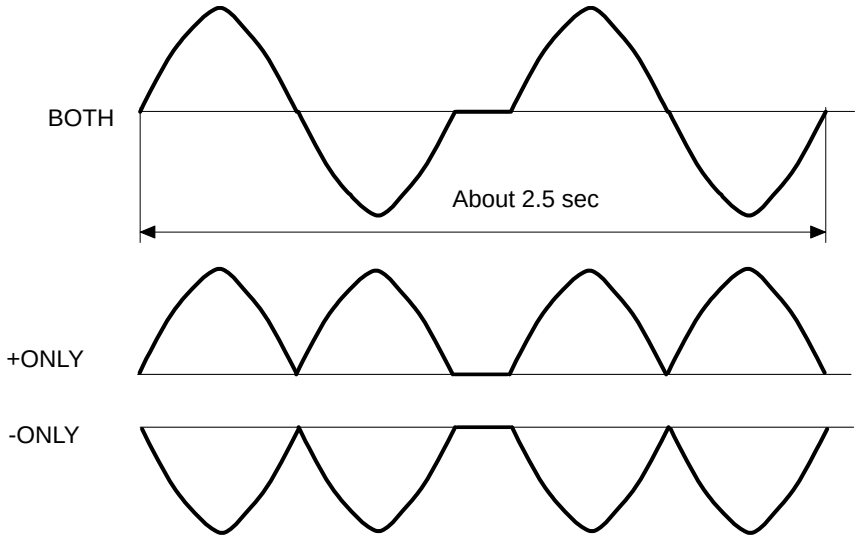
3. Display

[Direction selection in Automatic tuning trial run]



Trial run direction selection in Automatic tuning is displayed in turns. (BOTH/ +ONLY/ -ONLY)
Sample of left figure shows both directions are selected.

Motor motion pattern in Automatic tuning trial run is shown as follows.



[Fig.11-4] Automatic Tuning Trial Run

[P141] Speed ratio of Automatic tuning trial run

1. Function

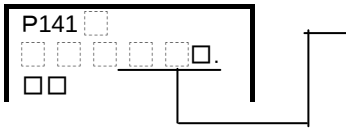
In Automatic tuning run, Trial run speed of a motor is set by some ratio of rated speed.
When 0.00 is set, a motor does not run and Error occurs.
When 1.00 is set, a motor runs at rated speed.
Normally, set the initial value. And since this parameter value can change motor travel amount, please note it.

2. Unit, setting range

(1) Unit : None
(2) Setting range : 0. 00～1. 00
(3) Initial value : 0. 30

3. Display

[Speed ratio of Automatic tuning trial run]



Automatic tuning trial run speed ratio is displayed.

⚠ Caution

By parameters［P140］and［P141］ values, motor travel amount is determined as follows.
Please surely confirm that a load machine stays in the movable range before executing Automatic tuning.

(1) When [P140] is [BOTH],
Rotating motor ：
(Motor shaft rotating amount [turns])=(P141 setting value)×(Rated speed)×0.005
Linear motor：
(Motor travel amount [Setting unit])=(P141 setting value)×(Rated speed)×0.3

[Sample 1]In case of Rotating motor which [P141] is [0.30] and rated speed is 3000rpm
(Motor shaft rotating amount [turns])=0.30×3000×0.005=4.5 [turns]
The motor runs forward about 4.5 turns and then reverse 4.5 turns.

［Sample 2］In case of Linear motor which [P141] is [0.30] and rated speed is 1000rpm
(Motor travel amount [Setting unit])=0.30×1000×0.3=90[mm]
The motor runs forward about 90mm and then reverse about 90mm.

(2) When [P140] is [＋ONLY] or [－ONLY],
Rotating motor ：
(Motor shaft rotating amount [turns])=(P141 setting value)×(Rated speed)×0.020
Linear motor：
(Motor travel amount [Setting unit])=(P141 setting value)×(Rated speed)×1.2

[Sample 1]In case of Rotating motor which [P141] is [0.30] and rated speed is 3000rpm
(Motor shaft rotating amount [turns])=0.30×3000×0.020=18 [turns]
The motor runs forward about 18 turns and then reverse 18 turns.

[Sample 2]In case of Linear motor which [P141] is [0.30] and rate speed is 1000rpm
(Motor travel amount [Setting unit])=0.30×1000×1.2=360[mm]
The motor runs forward about 360mm and then reverse about 360mm.

(3) Reference sample
Reference sample of a rotating motor which [P141] is [0.30（initial value）] is shown as below.

Rated speed	P140 setting		
	BOTH	＋ONLY	－ONLY
2000	Forward/ Reverse 3 turns	Forward 12 turns	Reverse 12 turns
3000	Forward/ Reverse 4.5 turns	Forward 18 turns	Reverse 18 turns
4000	Forward/ Reverse 6 turns	Forward 24 turns	Reverse 24 turns

3) Automatic tuning error

Error in Automatic tuning run is as follows.

Error No.	Contents
ERROR1	Measured data were [0]. Confirm [P141] is not [0.00] and execute tuning again.
ERROR2	Speed loop Integral time constant [P102] or [P112] is out of the range. Since Automatic tuning can not be executed, set the parameter , manually.
ERROR3	Measured data were abnormal. Confirm if play, etc. does not exist in a load machine.
ERROR4	It has been stopped caused by [FOT*, ROT*] and [Alarm (Servo error or Encoder error, etc.). Even if caused by Alarm, it is not displayed on the 7-segment LED at the front of the unit. After confirming the cause of alarm with the LCD module or the editor [Status/Diagnosis display], remove the causes then reset the alarm.

[Tab. 11-3] Error No. List

11-4-3 Tuning Level Adjustment Function

Tuning level adjustment function is conducted in ＜Tuning level adjustment mode＞.
＜Tuning level adjustment mode＞ can be conducted after Automatic tuning is completed.
And even after Automatic tuning is completed, if load changes, please conduct Automatic tuning, again.
Tuning level adjustment mode is selected by next ITEN No.

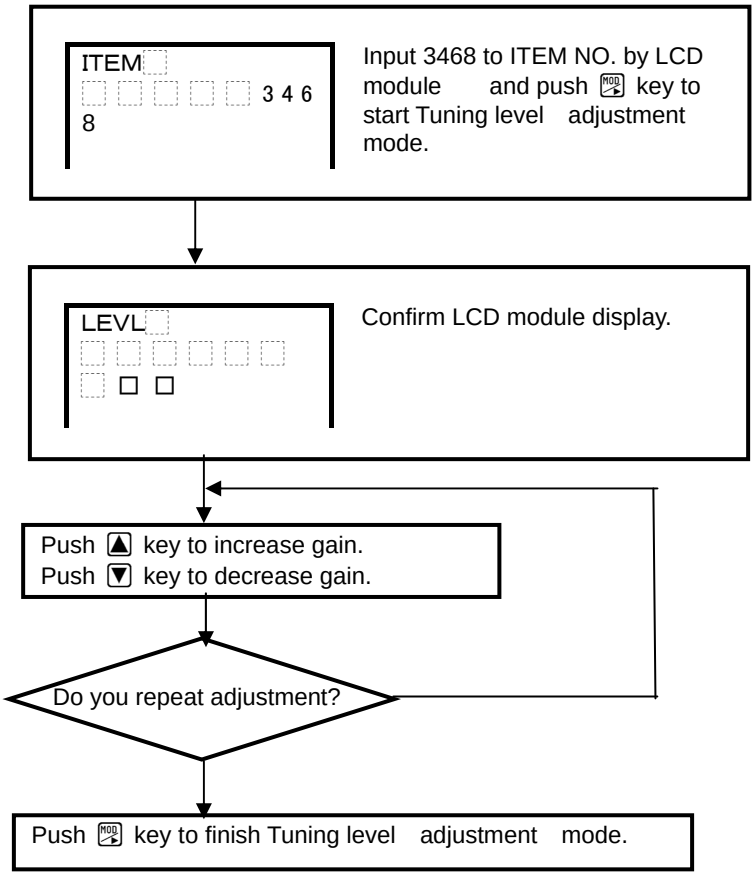
- Adequate higher or lower gain value for the next Servo control parameter is set by ITEM No.[3468]. At the time, adjust gain by watching machine action.

No.	Parameter name.	Reference
P101	Speed loop gain	Set adequate value
P102	Speed loop Integral time constant	Set adequate value.
P106	Speed loop gain/ Low speed gain range	Setting value is same as P101
P107	Speed loop Integral time constant/ Low speed gain range	Setting value is same as P102.

- Adequate higher or lower gain value for the next Servo control parameter when GSEL signal is ON, is set by ITEM No. [3467]. I n the case, turn GSEL signal ON and adjust gain by watching machine action.

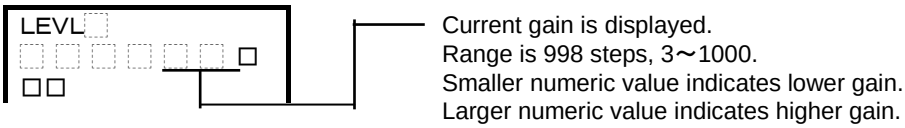
No.	Parameter name.	Reference
P111	Speed loop gain/ GSEL signal ON	Set adequate value
P112	Speed loop Integral time constant/GSEL signal ON	Set adequate value.

1) Tuning level adjustment function execution procedure
Operation in Tuning level adjustment run is as follows.（ITEM[3467] operation is same.）



[Fig.11-5]Tuning Level Adjustment Function Execution Procedure

2) Display in Forced jog mode



- By pushing ▲ key, numeric value of the level is large, i.e. high gain.
- By pushing ▼ key, numeric value of the level is small, i.e. low gain.

11-5 Forced Jog Mode

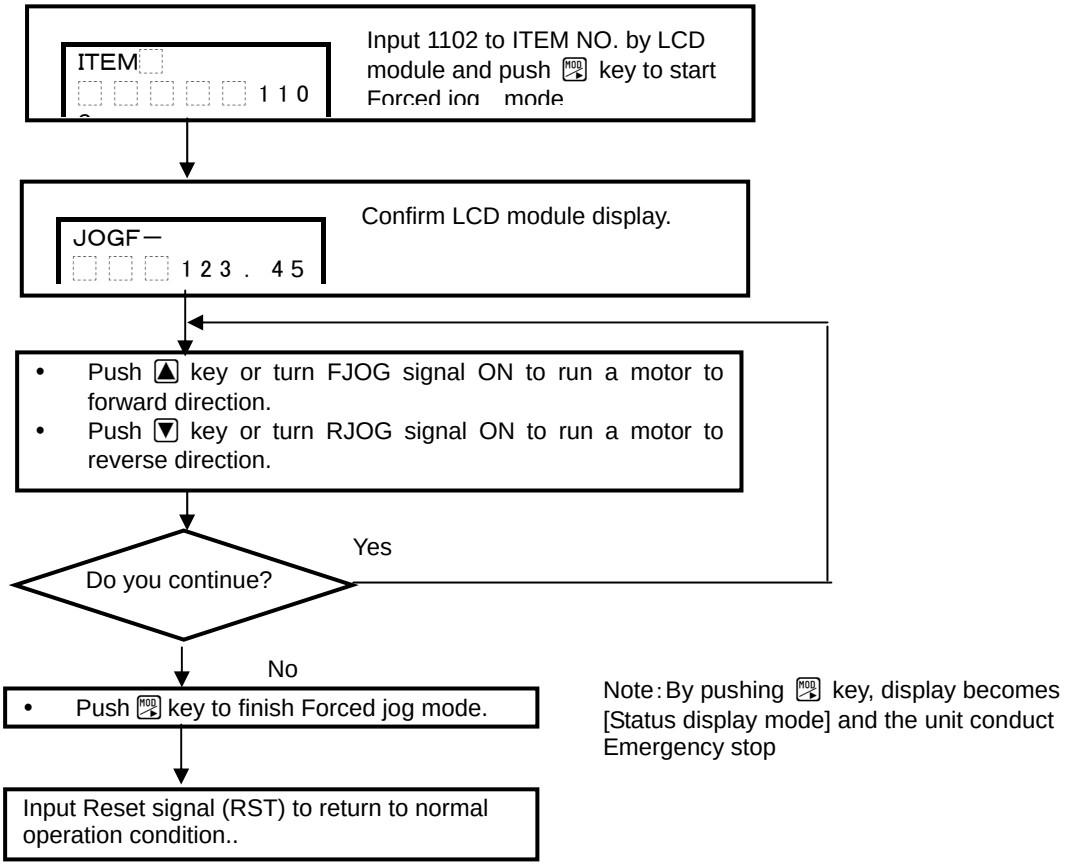
Forced jog mode conducts Jog motion of a motor to execute Trial run, return from error, etc..

Motor speed is setting value of the parameter[P400: Jog speed 1].

In Forced jog mode, control input signals other than FJOG, RJOG, FOT*, and ROT* are ignored.

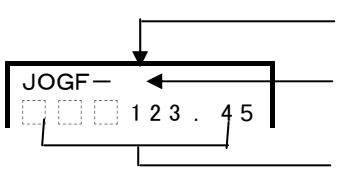
1) Forced jog execution procedure

Operation in Forced jog is as follows.



[Fig. 11-6] Forced Jog Execution Procedure

2) Display in Forced jog mode



Motor run direction F:Forward/ R: reverse

Current position mark(□/ －)

Current position
(Display is machine position and decimal point depends on[P302: Command unit].)

By ▲/ ▼ keys, a motor can rotate.
When ▲ key is pushed or FJOG signal is ON, a motor runs forward and when ▼ key is pushed or RJOG signal is ON, a motor runs reverse.
When a motor runs by ▲/ ▼ keys or FJOG or RJOG signal, same display is used.

⚠ Caution
1) If motor speed shall be changed, once finish Forced jog mode and change the value of the parameter [P400: Jog speed1].
2) If Forced jog mode starts when Control input signal, FJOG or RJOG is already ON, a motor immediately starts to run. Please note it.

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] …

7segment 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 loss (*1)
			Overheat
		9	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
			Linear sensor resolution 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 turn data no setting
		4	Program end command no setting
		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
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
		3	ABS.PRE.L
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 line-to-ground of a motor or same trouble and short-circuit of U,V,W cables between a controller and a motor, over current flew in the main circuit transistors. Or a cooling heat sink for power element is over-heated.	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. □ U N D R V O L T 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. □ U N D R V O L T 2	Main circuit DEC bus voltage dropped less than 180[90] 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.)	Motor torque 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. □ O V E R □ 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]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
Encoder fault ALM. □ □ □ ENCODER	(3) Encoder fault (4) Break or disconnection of an encoder cable or loose fitting of a connector (5) Wrong encoder selection by the parameter, etc. occurred. (6) First magnetic pole detection is not completed, correctly when a linear sensor is used.	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 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. P W. O N E N C	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	Re-input power. When [P001] is other than [INC3] setting, input Reset (RST) signal.
Over speed error ALM. O V E R S P E E D	Motor speed is more than about 130% of the rated speed. Applicable maximum rotation number (Speed) is set with [P005: Rotation / Disk motor applicable maximum rotation number] [P006: Linear motor applicable maximum speed].	Motor torque free 7segment 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. O V E R L O A D	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. I P M 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. R G. 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. A C DOWN	AC power voltage dropped less than about 60[30]V.(Black out occurred.) (*1) 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) Status when [RDY1] is selected by[P716: RDY signal specification selection].
If other is selected, status could be different.

[Tab. 12-3 (b)] Alarm List 2/11

Name Display	Contents	Motion and output signal status	Way to release
Deviation 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 	Position deviation exceeds setting of [P208 : Deviation error detection pulse]. (*1) 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 	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 	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 	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 	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. □ M O T R T Y P E 1	[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. □ M O T R T Y P E 2	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.
EEPROM (Non-voluntary memory) Write error ALM. □ W R. E E P R O M	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. □ S T D. S P D. 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. □ S T D. S P D. 2	Speed at motor rated speed set by [P303,P304: electronic gear ratio] and [P310：Machine travel amount] is less than 40 M(Setting unit/ sec).		
Address setting error ALM. □ A D D R □ E R R.	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. T I M E O U T	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. D A T A O V E R	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. P 3 0 5 E R R.	Index positioning command or Spin command was executed without [P305: Index position range] setting, i.e. it was [0] status. INDX, SIND, SPNS, RRAS, RRAC, WRR	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. P E N D. E R R.	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. C A L L O V E R	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. R E T E R R.	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

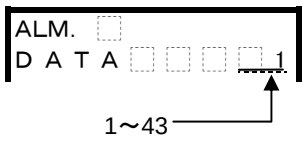
(*1) Status when [RDY1] is selected by[P716: RDY signal specification selection].
If other is selected, status could be different.

[Tab. 12-3 (e)] Alarm List 5/11

Name Display	Contents	Motion and output signal status	Way to release
Jump address error ALM. J U M P E R R.	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. S P N. E R R.	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. 0 D I V. E R R.	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. P O S O V E R	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. C M N D. E R R.	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 №. error ALM. I X N O. E R R.	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 release of DATA39 and DATA43 errors are impossible, consult us.

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.
DATA 39	Adjustment data contents for factory shipment of this unit were broken.
DATA 40	Parameter (Group 8/ P800～899) contents were broken.
DATA 41	Parameter (Group 9/ 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 	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 	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 	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 	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.
Linear 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) Reinput 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 motor	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 cause is resolved, (1) Reinput 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) Reinput 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) Re-input 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) Re-input power. (2) Replace the unit or repair the unit by us.

[Tab. 12-3 (j)] Alarm List 10/11

Name Display	Contents	Motion and output signal status	Way to release
Forced synchronization end, No-input ALM. NON ANS.	When the forced synchronization end function is valid, the slave axis reached the synchronization end position before detecting the forced synchronization end input signal	Motor Servo lock 7 segment display [b0] Alarm ON Warning OFF Servo ready ON (*1) Brake release ON	(1) Reinput power (2) Reset signal (RST) input
Combination pattern error ALM. PTN. ERR.	In the running positioning command (BRC, RRAC), the number of combination patterns is greater than 50 or "0"	Motor Servo lock 7 segment display [b1] Alarm ON Warning OFF Servo ready ON (*1) Brake release ON	Input correct combination patterns, then (1) Reinput power (2) Reset signal (RST) input
Running positioning data error ALM. DATA ERR.	The next start is activated during the wait position returning of the running positioning command execution (Detection after the wait position returning) in the rotating system short-size operation, the work length is shorter than the synchronization amount	Motor Servo lock 7 segment display [b2] Alarm ON Warning OFF Servo ready ON (*1) Brake release ON	Correct the parameter (bigger return speed or correct synchronization range), then (1) Reinput power (2) Reset signal (RST) input
Parameter calculation overflow ALM. CALC. OVER	Setting value for acceleration/deceleration time (P916&7, P936&7, P956&7 *2) of the returning system running positioning command is too big, against the motor speed	Motor torque-free 7 segment display [b3] Alarm ON Warning OFF Servo ready ON(*1) Brake release ON	Correct the data, then 1) Reinput power 2) Reset signal (RST) input
Servo control communication off error ALM. M. COMM. ER	A wire cut (communication shutoff) is happened, during the servo control communication. Note) This alarm occurs when [ALM] is selected in [P523: Servo control communication loss]	Motor immediately stops, and after stop, it becomes torque-free 7 segment display [A4] Alarm ON Warning OFF Servo ready ON(*1) Brake release ON	Remove the cause of wire cut, then (1) Reinput power (2) Reset signal (RST) input
Servo control communication error ALM. BCC. ERR	Communication error (Data abnormal, etc.) is happened, during the servo control communication. Note) This alarm occurs when [ALM] is selected in [P523: Servo control communication loss].	Motor immediately stops, and after stop, it becomes torque-free 7 segment display [A5] Alarm ON Warning OFF Servo ready ON(*1) Brake release ON	Remove the cause of communication errors, then (1) Reinput 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.
(*2): The returning system running positioning command parameter PATN (Parameter selection) is used for select

[Tab. 12-3 (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. O V E R. L O A D	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 cause of Over load.
Deviation error warning WNG. V A R I. O V E R	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 cause of Deviation error (Load crease, wrong setting of Gain or Accel./ decel. time, etc.)
Main power under voltage detection warning WNG. U N D R V O L T 2	Main circuit DC bus voltage dropped lower than about 180[90](360)V. A value of 100V type is in[ ]. A value of 400V type 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. H O M E. E R R.	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. A B S. B A T T.	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. N E T □ N O R D Y	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 WNG. □ □ □ N E T □ SW	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 cause and delete it.
As for error inspection and corrective measures, referring to [121-5 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 cause, the unit will be damaged. Therefore be sure to delete the cause 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 causes 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 cause 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.

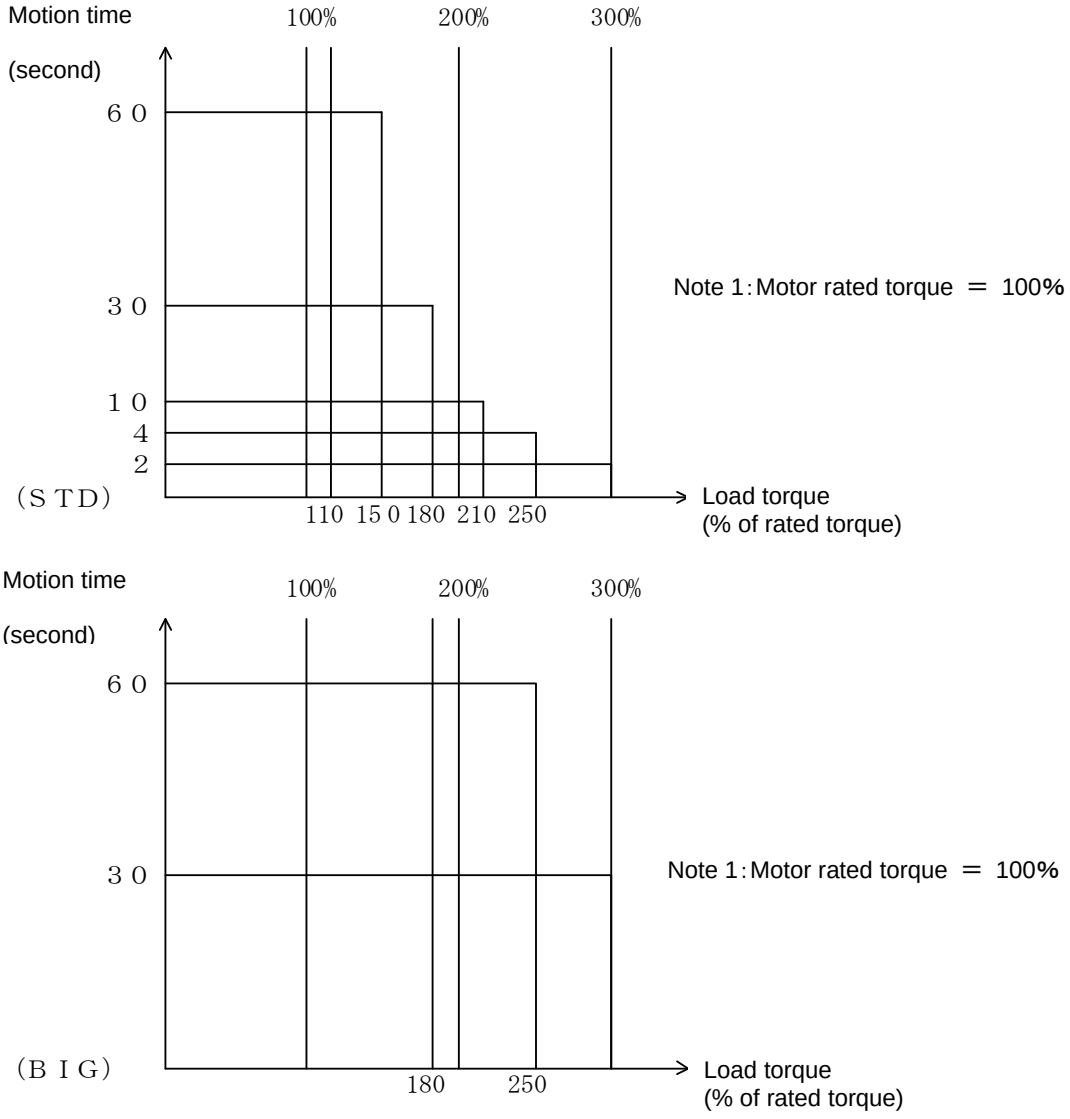
(4) Encoder fault(ENCODER)

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 cause 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%.



Note) 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 cause 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 mega 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 cause 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 cause before releasing Alarm.
If an error repeatedly occurs, a unit may be damaged.

Error contents	Cause	Corrective measures
[IPM fault] • Due to line-to-ground of a motor 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.	• Line-to-ground of a motor	• Replace the motor.
	• Line-to-ground or short-circuit of cables (U,V,W) between a controller and a motor.	• Correct the wiring.
	• Ground fault or short circuit in wiring (B1, B2) between controller and 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	Cause	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. Applicable maximum rotation number (speed) is set with [P005: Rotating/disc motor applicable maximum rotation number][P006: Linear motor applicable maximum 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.
	• Parameter setting error	• Check related parameters and reset the correct value.
[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	Cause	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	Cause	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 cause and resume Run.

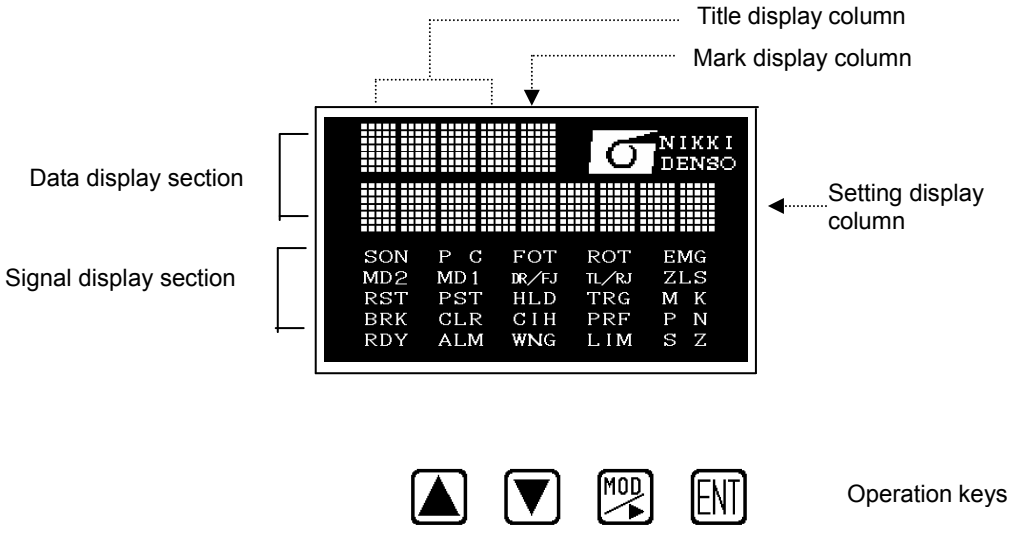
Chapter 13 Setting and Display

13-1 LCD Module Operation

13-1-1 Sectional Function of LCD Module

Various parameters and data can be set by key input of [Font panel LCD module for 1.5kW or larger unit] or [Optional SDI device for 0.8kW or smaller unit].
Since parameters are deeply related with motions of a machine system and a system, pay special attention to the setting.

(1) LCD module outlook



[Fig. 13-1] LCD Module Outlook

(2) Display contents of each display section

Display section		Display contents
Data display section	Title display column	Subject item title(Name, No.) or message (ALM/ WNG/ ERR), etc. when Protective function works, are displayed.
	Mark display column	Contents as a mark, etc. of a subject item data are displayed. [ ] display : indicates positive direct data. [-] display : indicates negative direct data. [*] display : indicates Index data set. [/] display : indicates setting data are invalid.
	Setting value display column	Subject item data(setting value/ status/ diagnosis results/ Alarm Name, etc.)are displayed.
Signal display section		Input/ output signal status is displayed. When a signal is inputted or outputted, a corresponding letter is lit ON.

[Tab. 13-1] Display Contents of Each Display Section

(3) Each operation key function

Key	Function.	
▲	At item selection	It displays next item.
	At data setting	It raises a number(0～9)and changes a mark (, -, *, /). It displays a next menu in menu data run.
▼	At item selection	It displays back item.
	At data setting	It lowers a number(0～9)and changes a mark (, -, *, /). It displays a back menu in menu data run.
MOD	At item selection	It displays a top item of a next subject mode.
	At data setting	It selects data setting column.
ENT	At power ON	It eliminates Alarm history.
	At item selection	It changes a subject item to data setting status.
	At data setting	It enters display data(all columns)as new data.
▲▼	At power ON	It initializes all the stored data. ※Refer to the following caution.
	At data setting	It finishes data setting, compulsorily. (Data are not changed but back data are retained.)

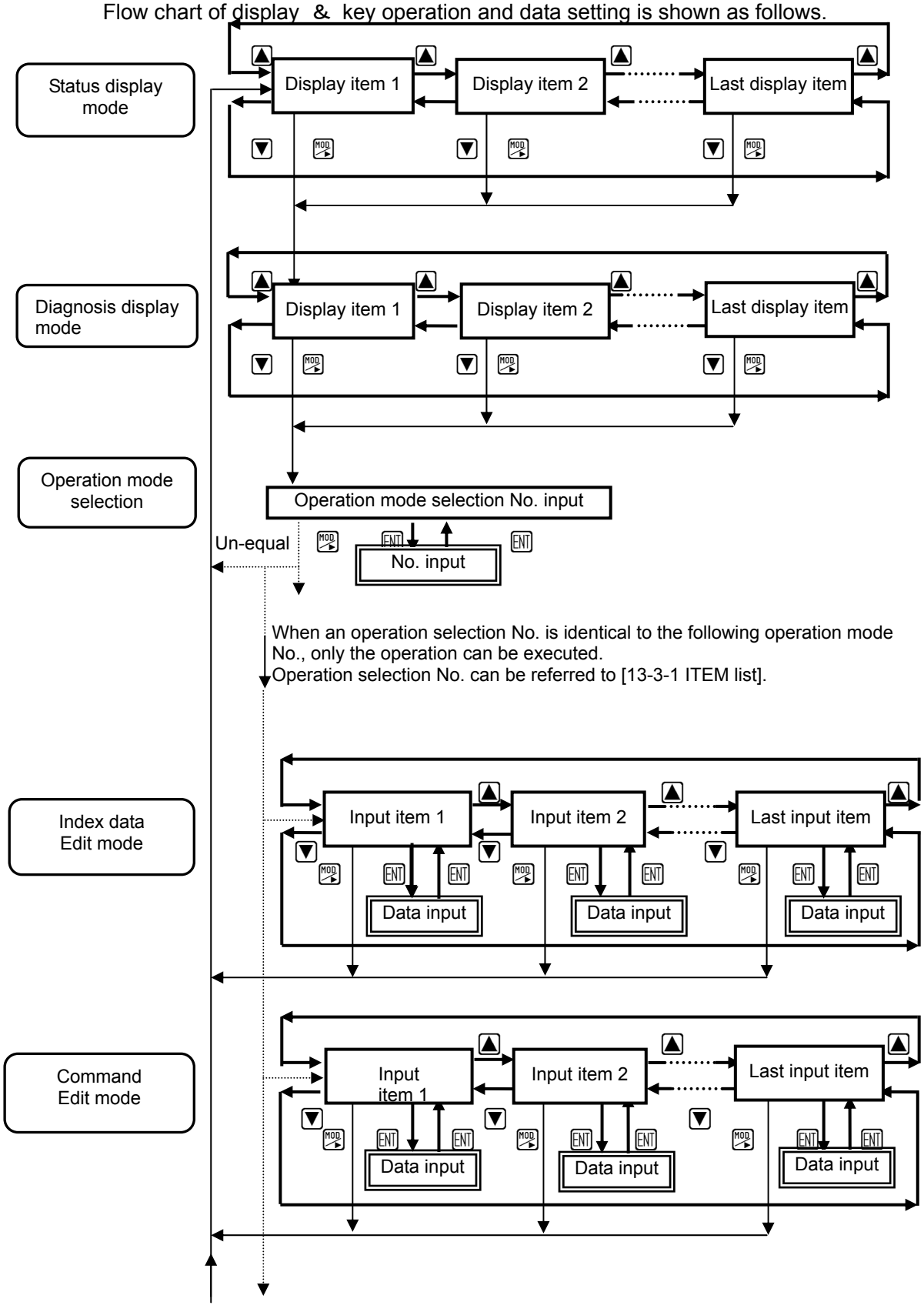
[Tab. 13-2] Each Operation Key Function

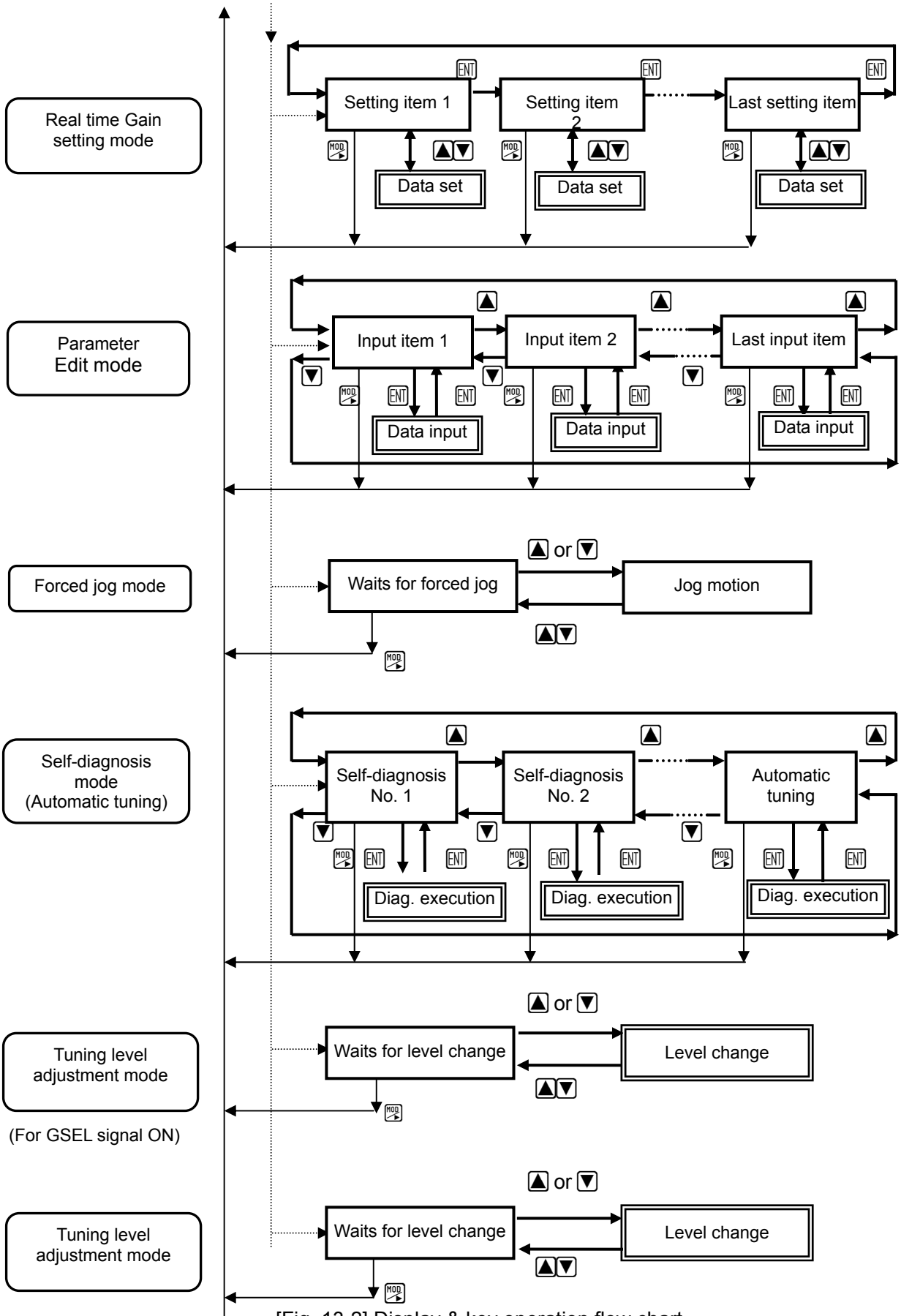
[Caution]
When unit power is turned ON by pushing ▲ and ▼ keys, simultaneously, all the stored data(parameters, etc.) are initialized. And then, following figures are displayed in the data display section of LCD module.

We recommend saving data before initializing a unit.
Backup of data option by a personal computer can be conducted by our optional Data edit software.

13-1-2 LCD Module Operation Procedure

Flow chart of display & key operation and data setting is shown as follows.



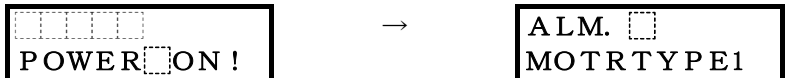


[Fig. 13-2] Display & key operation flow chart

13-2 Display Mode

13-2-1 Initial Status Display

- During a unit is initialized when power source is turned ON, [POWER ON !]is displayed.
- Initial values were set to various parameters and data at the time of unit shipment.
- Since an applied motor not selected by the parameter can not run, at first various parameters of [P000：Motor type selection], etc. shall be set to fit applied conditions before setting various data.
- In order to confirm parameters and request re- setting, Alarm of no motor selection [ALM MOTOR TYPE1]is displayed soon after power is turned ON for the first time. At the same time Alarm signal is outputted.
- Initial status display can be cleared by any of ▲/ ▼/ MOD/ ENT key inputs. After display is cleared, contents can be confirmed by Alarm history.



[Fig. 13-3] Initial Status Display

Display sample

《Motor torque is displayed.》
Actual torque is displayed by the status display (ST10).

1) By MOD a display mode changes in turns as the status display (ST00)→ diagnosis display(TYPE)→ operation selection (ITEM)→ status display (ST00)→
It selects status display mode(ST00).

2) By ▲ ▼ a display item changes in turns as the(ST00)→(ST01)→・・・.
It selects display item(ST10).

3) Selected data of (ST10) display running motor torque.

《Alarm status is confirmed.》
When Alarm occurs, Alarm contents are displayed in Diagnosis display (ALM 0).

1) By MOD a display mode changes in turns as status display(ST00)→ diagnosis display (TYPE)→operation selection (ITEM)→ status display (ST00)→.
It selects Diagnosis display mode (TYPE).

2) By ▲ ▼ a display item changes in turns as (TYPE)→(MODE))→・・・.
It selects display item(ALM 0).

3) Selected data of(ALM 0)display activated Alarm contents.

13-2-2 Status Display Mode

- In the title display column, status №(ST××), in the setting value display column, status data, and in the mark display column, a mark are displayed, respectively.

Display sequence	Display sample	Unit	Display contents
1	ST00- □ □ □ 1 0 0. 0 0	%	It displays actual motor speed. Forward : □, reverse : - Display range : -120.00 ～ 120.00
2	ST01- 1 0 0 0 0. 0 0 0	*1	It displays current position. Display range: -99999999 ～ 99999999 *2
3	ST02- □ 0 0 0 1 0 0 0 0	pulse	It displays Position deviation pulse. ＋ deviation : □, - deviation : - Display range : -99999999 ～ 99999999
4	ST05- 0 0 0 1 0 0. 0 0	Kpps	It displays an input frequency of Pulse train command. Forward command : □, reverse command : - Display range : -999999.99 ～ 999999.99
5	ST06- □ 1 0 0 0 0 0 0 0	pulse	It displays an accumulated input pulse number of Pulse train command. Forward command : □, reverse command : - Display range : -99999999 ～ 99999999
6	ST07 □ □ □ □ □ 1 0 0. 0	%	It displays command input value of Forward external torque limit by % of rated torque. Display range : 0.0 ～ 300.0
7	ST08 □ □ □ □ □ 1 0 0. 0	%	It displays command input value of Reverse external torque limit by % of rated torque. Display range : 0.0 ～ 300.0

[Tab. 13-3 (a)] Display Contents of Status Display Mode 1/ 3

- In this display mode, when ENT key is pushed once, display data are retained for 1 when ENT key is continuously pushed, display data are retained.

*1 : Unit can be set one of [mm] ,[°],[in(inch)] by the parameter [P301].
*2 : A decimal point position depends on [P302 : command unit].

Display sequence	Display sample	Unit	Display contents
8	ST09 □ □ □ □ □ □ 0 8 0	%	It displays Thermal trip ratio by %. This display is selected by a setting value of [P144 : Selection of Electronic thermal detection] as follows. • STD/ BIG : It displays Over load ratio when Over load error or IPM Over Load error occurs. • O.L. XXX% : It displays Over load ratio when IPM Over load occurs. Display range : 0 ～ 100 Over load alarm is ON by 100(100%) display.
9	ST10 □ □ □ □ 1 0 0. 0	%	It displays actual torque command by % of rated torque. Display range : 0.0 ～ 799.9
10	ST11 □ □ □ □ 1 0 0. 0	%	It displays peak torque command by % of rated torque.([000]by RST signal) Display range : 0.0 ～ 799.9
11	ST12 □ □ □ □ 0 1 5 0 0	rpm	It displays actual speed of a turning work. Forward : □, reverse : - Display range : -99999 ～ 99999
12	ST13- 0 0 0 0 1. 0 0 0	*3	It displays actual speed of a machine. Forward : □, reverse : - Display range : -99999999 ～ 99999999 *4
13	ST14- □ □ □ □ 0 2 0 0 0	rpm	It displays actual speed of a motor by rpm. Forward : □, reverse : - Display range : -99999 ～ 99999
14	ST15 □ □ □ □ □ □ 1 0 0	%	It displays load ratio of a motor (actual value). At motor rated load, it displays 100%. When [O.L. XXX%]is set by [P144 : Selection of Electronic thermal detection], Over load error occurs by XXX%. Display range : 0 ～ 300
15	ST16 □ □ □ □ □ □ 1 0 0	%	It displays load ratio of Regenerative resistor. This display is selected by a setting value of [P158 : Rated power of Regenerative resistor] as follows. • Not 0 : 100% is displayed at Rated power of Regenerative resistor • 0 : 100% is displayed when regenerative power is fully accumulated in a unit, internally. And since Over voltage error may occur when this display is more than 50%, please attach Regenerative resistor. Display range : 0 ～ 999

[Tab. 13-3 (b)] Display Contents of Status Display Mode 2/ 3

- In this display mode, when ENT key is pushed once, display data are retained for 1 when ENT key is continuously pushed, display data are retained.

*3 : Unit can be set one of [mm/s] ,[° /s],[in(inch) /s] by the parameter [P301].

*4 : A decimal point position depends on [P302 : command unit].

Display sequence	Display sample	Unit	Display contents
16	ST17 □ □ □ □ □ □ □ 100	%	The maximum value of the servo control error occurrence ratio is displayed in %. Servo control error occurs above 100%. This error rate can be set according to [P747: Servo control error detection setting value]. Further, error rate is 0 clear in the following cases. • When the RST signal is ON after servo control error occurs. • When the Setting value of P747 is changed. Display range 0 ~999
17	ST18 □ 1 0 0 0 0 0 . 0 0	*5	It displays a cutting length at the cutting length measuring position (P803). *7 Display range: 00000000 ～ 99999999 *6
18	ST19 □ 1 0 0 0 0 0 . 0 0	*5	It displays a current cutting length for the cutting length measurement at the cutting length measuring position (P803). *7 Display range: 00000000 ～ 99999999 *6
19	ST20 □ 1 0 0 0 0 0 . 0 0	*5	It displays a current cutting length for the cutting length measurement at the cutting length measuring position (D24). *7 Display range: 00000000 ～ 99999999 *6
20	ST21 □ 0 0 0 0 1 . 0 0 0	*5	It displays a cutting length at the cutting length measuring position (D24). *7 Display range: 00000000 ～ 99999999 *6

[Tab. 13-3 (c)] Display Contents of Status Display Mode 3/3

- In this display mode, when ENT key is pushed once, display data are retained for 1 when ENT key is continuously pushed, display data are retained.

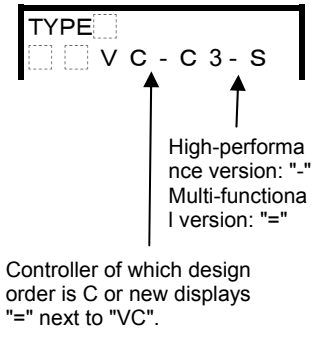
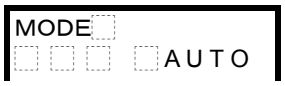
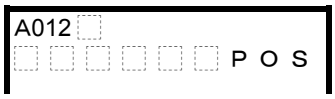
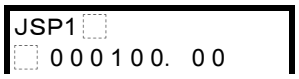
*5 : Unit can be set one of [mm] ,[°],[in(inch)] by the parameter [P301].

*6 : A decimal point position depends on [P302 : command unit].

*7 : Correct cutting length measurement can not be done in the first cutting after the running positioning operation start; thus, the display of the cutting length indicates an incorrect value.

13-2-3 Diagnosis Display Mode

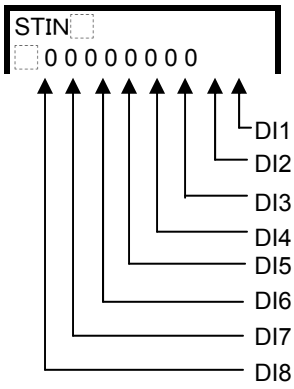
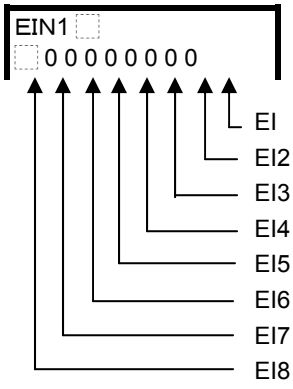
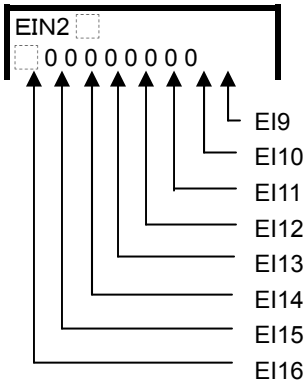
- Message and data are displayed in the data display section.

Display sequence	Display sample	Unit	Display contents
1		-	It displays a unit type. Controller : VC-C3-X X is an applied motor type. L : Linear motor S : SM motor I : IM motor R : Disc motor Display sample : SM motor selection
2		-	It displays Run mode. JOG : Manual run mode ORG : Zero return run mode AUTO : Automatic run mode INVALID : Invalid (servo lock status)
3		-	It displays a command and an address of starting Automatic run or executing Automatic run. Display sample : command POS, address 012
4		*1	It displays Jog speed selected by Jog speed change signal. Display range : 0 ～ 99999999 *2
5		%	It displays input status of Speed override signal by % override ratio. Display range : 0 ～ 150

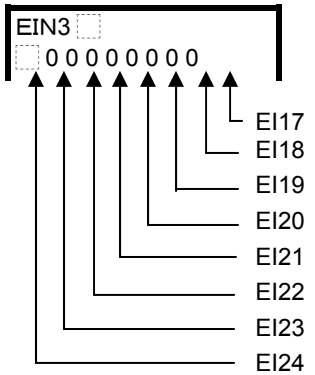
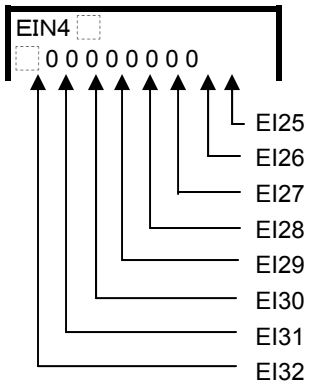
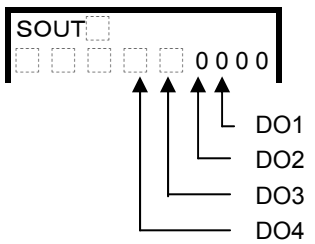
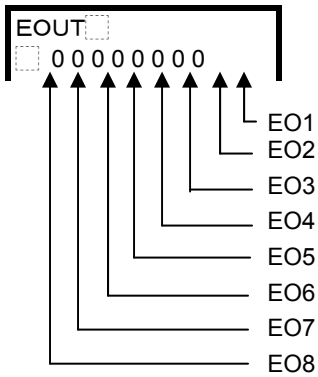
[Tab. 13-4 (a)] Display contents of Diagnosis Display Mode 1/4

*1: Unit can be set one of [mm/s] ,[° /s],[in(inch)/s] by the parameter [P301].
*2: A decimal point position depends on [P302 : command unit].

* Diagnosis display (TYPE XX) and a unit type are displayed in the title display column.

Display sequence	Display sample	Unit	Display contents
6		-	It displays basic external input signal status in the P737 and P738 * The input signal and the display position set in 2 digits "○○" changes as shown below. Signal ON : 1, OFF : 0 DI1 : P737 (XXXXXX○○) DI2 : P737 (XXXX○○XX) DI3 : P737 (XX ○○XXXX) DI4 : P737 (○○ XXXXXX) DI5 : P738 (XXXXXX○○) DI6 : P738 (XXXX ○○XX) DI7 : P738 (XX○○XXXX) DI8 : P738 (○○XXXXXX)
7		-	It displays extended external input signal status. Signal ON : 1, OFF : 0 EI1 : RST EI2 : EMG EI3 : SON EI4 : PST EI5 : HLD EI6 : CLR EI7 : FOT EI8 : ROT
8		-	It displays extended external input signal status in the P739 and P740. ※ The input signal and the display position set in 2 digits "○○" changes as shown below. Signal ON : 1, OFF : 0 EI9 : P739(XXXXXX ○○) EI10 : P739(XXXX○○XX) EI11 : P739(XX○○XXXX) EI12 : P739(○○XXXXXX) EI13 : P740(XXXXXX○○) EI14 : P740(XXXX○○XX) EI15 : P740(XX○○XXXX) EI16 : P740(○○XXXXXX)

[Table 13-4 (b)] Display contents of Diagnosis Display Mode 2/4

Display sequence	Display sample	Unit	Display contents
9		-	It displays extended external input signal status. ※ The input signal and the display position of EI17 ~ EI20 set in 2 digits "○○" changes as shown below. Signal ON : 1 OFF : 0 EI17 : P741(XXXXXX○○) EI18 : P741(XXXX○○XX) EI19 : P741(XX○○XXXX) EI20 : P741(○○XXXXXX) EI21 : CIH EI22 : ZLS EI23 : TRG EI24 : Not used
10		-	It displays extended external input signal status. Signal ON : 1, OFF : 0 EI25 : MD 1 EI26 : MD 2 EI27 : PC EI28 : FJOG EI29 : RJOG EI30 : Not used EI31 : Not used EI32 : Note used
11		-	It displays basic external output signal status in P742. ※ The output signal and the display position set in 2 digits "○○" changes as shown below. Signal ON : 1, OFF : 0 DO1 : P742 (XXXXXX○○) DO2 : P742 (XXXX ○○XX) DO3 : P742 (XX○○XXXX) DO4 : P742 (○○XXXXXX)
12		-	It displays basic external output signal status in P743 and P744. ※ The output signal and the display position set in 2 digits "○○" changes as shown below. Signal ON : 1, OFF : 0 EO1 : P743 (XXXXXX○○) EO2 : P743(XXXX○○XX) EO3 : P743(XX○○XXXX) EO4 : P743(○○XXXXXX) EO5 : P744(XXXXXX○○) EO6 : P744(XXXX○○XX) EO7 : P744(XX○○XXXX) E08 : P744(○○XXXXXX)

[Tab. 13-4 (c)] Display contents of Diagnosis Display Mode 3/4

Display sequence	Display sample	Unit	Display contents
13	ALM 0 O V E R C U R R. _	-	It displays latest Alarm contents. Display sample: Over current error
14	ALM 1 E N C O D E R	-	It displays previous Alarm contents. Display sample: Linear sensor/ encoder fault
15	ALM 2 O V E R L O A D	-	It displays 2 times before the current Alarm contents. Display sample: Over load error
16	ALM 3 O V E R V O L T	-	It displays 3 times before the current Alarm contents. Display sample: Over voltage error
17	ALM 4 O V E R S P E E D	-	It displays 4 times before the current Alarm contents. Display sample: Over speed error
18	WNG 0 O V E R. L O A D	-	It displays latest Warning contents. Display sample: Over load warning
19 *3	SQB S T No. 6 2 0 3	-	It displays SQB status information. *4 Display range:0 ～ 9999 Display sample:[Sum check error]occurs.
20 *3	SQB V e r 1. 0 0	-	It displays SQB software version. Display sample: Software version 1.00 Maximum display :9.99
21	HARD V e r 1. 0 0	-	It displays hardware version. Each display indicates below meaning. <HARD display block> HARD･: Product before the design order C HARD*: Product after the design order D <Ver display block> Display example: Hard version 1.00 Maximum display: 9.99
22	SOFT V e r 1. 0 0	-	It displays software version. Display sample: Software version 1.00 Maximum display :9.99

[Tab. 13-4 (d)] Display contents of Diagnosis Display Mode 4/4

*3: Units without SQB connection do not display them.
*4: SQB status information can be referred to the separate manual [Volume: SQB].

13-3 Operation Mode

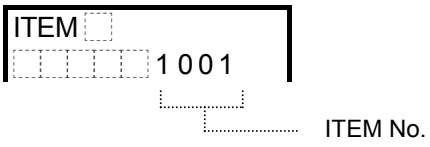
13-3-1 ITEM (Operation mode) List

Selectable ITEM (Operation mode)is as Tab. 13-5.

ITEM selection No.	Operation mode		
1001	Index data edit mode (IX00～IX99)		
1002	Command edit mode		
1102	Forced jog mode		
1103	Self-diagnosis mode		
2000	Group0	Motor, encoder parameter	Parameter edit mode
2100	Group1	Driver adjustment parameter	
2200	Group2	NC adjustment parameter	
2300	Group3	Position adjustment parameter	
2400	Group4	Run motion parameter	
2500	Group5	Display, edit, communication parameter	
2600	Group6	Pulse train input parameter	
2700	Group7	Input/ output signal parameter	
2800	Group8	Running positioning parameter 1	
2900	Group9	Running positioning parameter 2	
3001	Real time gain setting 1 (Speed loop gain adjustment)		Real time gain setting mode
3002	Real time gain setting 2 (Speed loop gain adjustment at low speed range)		
3003	Real time gain setting 3 (Speed loop gain adjustment at GSEL ON)		
3004	Real time gain setting 4 (Position loop gain adjustment)		
3467	Automatic tuning level adjustment mode (at GSEL signal ON)		
3468	Automatic tuning level adjustment mode		

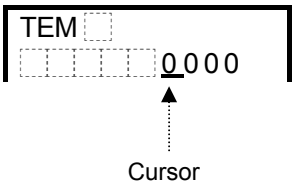
[Tab. 13-5] ITEM (Operation mode) List

(1) Display sample



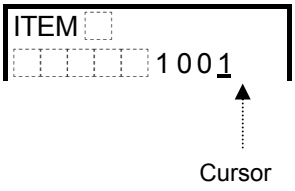
(2) Setting

- ITEM No. input1



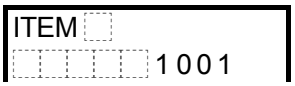
- When ENT key is pushed, a cursor appears and input can be conducted.
- When ▲ or ▼ key is pushed, a value or a mark in a column on a cursor changes.
- When MOD key is pushed, a cursor moves.
- To cancel inputted data, push ▲▼ keys at the same time.

- ITEM No. Input2



- By the above operation, input ITEM No. [Sample:1001].

- ITEM No. setting



- When ENT key is pushed, a cursor disappears and ITEM No. is set.

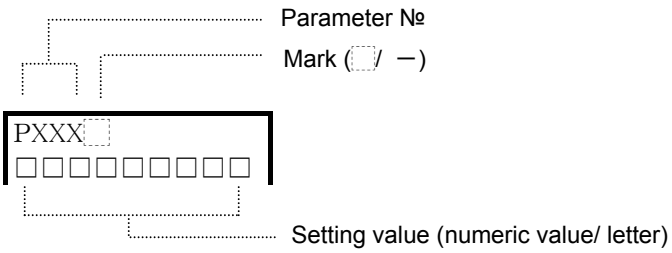
13-3-2 Parameter Setting

(1) Parameter construction

Group No.	parameter №.	Group Name
0	P000～	Motor, encoder parameter
1	P100～	Driver adjustment parameter
2	P200～	NC adjustment parameter
3	P300～	Position adjustment parameter
4	P400～	Run motion parameter
5	P500～	Display, edit, communication parameter
6	P600～	Pulse train input parameter
7	P700～	Input/ output signal parameter
8	P800～	Running positioning parameter 1
9	P900～	Running positioning parameter 2

[Tab. 13-6] Parameter Construction

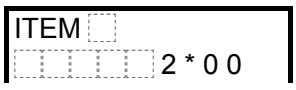
(2) Display



(3) Setting method

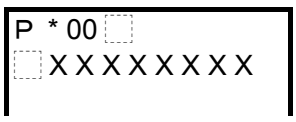
Parameter edit (numeric value input or menu selection) procedure is as follows.

1) ITEM No. setting



- ITEM No. [2 * 0 0] is set.
- Mark is group No.(Refer to Tab. 14-6.)
- When MOD key is pushed after setting, it moves to (2).

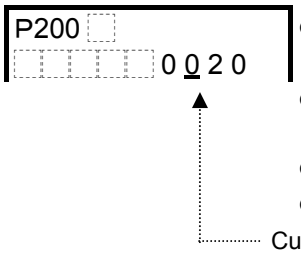
2) Parameter selection



- Edit parameter is selected.
  - When ▲ key is pushed, parameter No. is increasing.
  - When ▼ key is pushed, parameter No. is decreasing.
- At the time, current setting data are displayed.

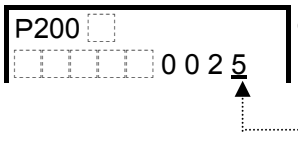
(A) [Setting by numeric value data input]

3) Data input 1



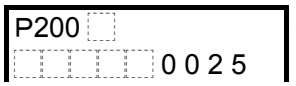
- When [ENT] key is pushed, a cursor appears and input can be conducted.
- When [▲] or [▼] key is pushed, a value or a mark in a column on a cursor changes.
- When [MOD] key is pushed, a cursor moves.
- To cancel inputted data, push [▲][▼] keys at the same ime.

4) Data input 2



- By the above operation, input setting data.

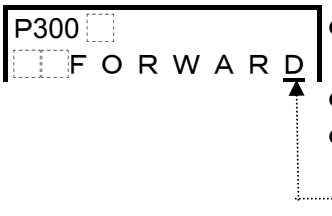
5) Data memory



- When [ENT] key is pushed, a cursor disappears and setting data are stored.

(B) [Setting by menu selection]

3) Data selection 1



- When [ENT] key is pushed, a cursor appears and input can be conducted.
- When [▲] or [▼] key is pushed, a menu item changes.
- To cancel selected data, push [▲][▼] keys at the same time.

4) Data selection 2

- By the above operation, select setting data.

5) Data memory

- When [ENT] key is pushed, a cursor disappears and setting data are stored.

13-3-3 Command Setting

(1) Common setting item

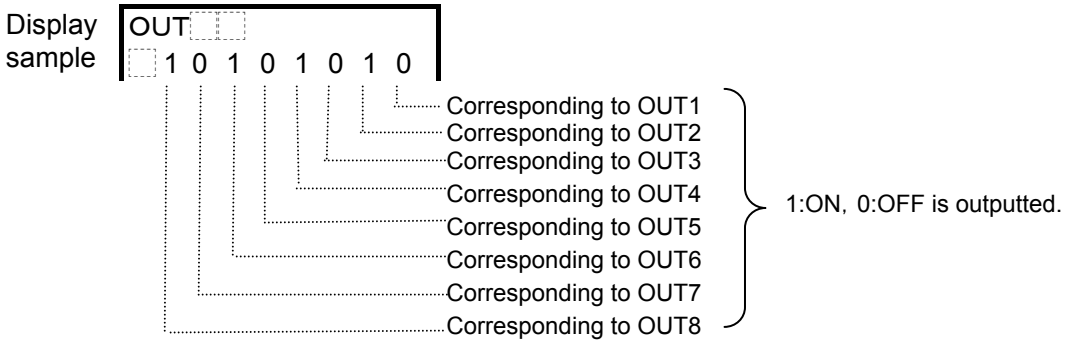
1) Acceleration/Deceleration time selection

Acceleration time and Deceleration time is set by a parameter. Select a combination from the next tabulation.

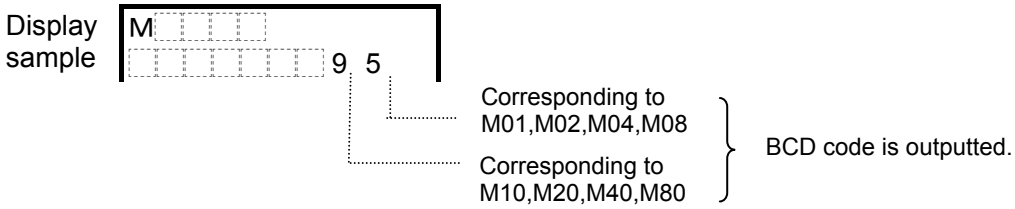
Acceleration/ Deceleration time selection	Acceleration / Deceleration time setting (parameter)
SEL. 1	Acceleration time is set by [P211:Acceleration time1]. Deceleration time is set by [P214:Deceleration time 1].
SEL. 2	Acceleration time is set by [P212:Acceleration time2]. Deceleration time is set by [P215:Deceleration time2].
SEL. 3	Acceleration time is set by [P213:Acceleration time3]. Deceleration time is set by [P216:Deceleration time3].

[Tab. 13-7]Combination of Acceleration / Deceleration time

2) General output



3) M output



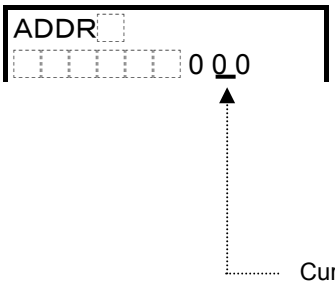
(2) Setting method

Command edit procedure is as follows.

1) ITEM No. setting

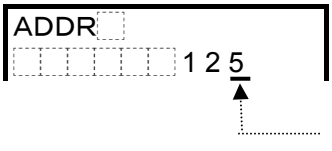
- It sets ITEM No. [1002].
- When MOD key is pushed after setting, it moves to (2).

2) Edit address input 1



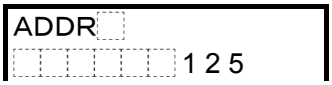
- When ENT key is pushed, a cursor appears and input can be conducted.
- When ▲ or ▼ key is pushed, a value in a column on a cursor changes.
- When MOD key is pushed, a cursor moves.
- To cancel inputted data, push ▲▼ keys at the same time.

3) Edit address input 2



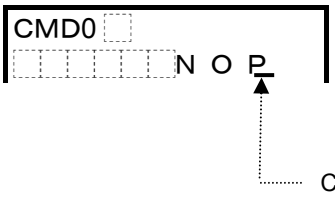
- By the above operation, input an edit address.

4) Edit address final set



- When ENT key is pushed a cursor disappears and an edit address is determined.
- When ▲ key is pushed after the decision, it moves to (5).

5) Edit command selection



- When ENT key is pushed, a cursor appears and input can be conducted.
- Push MOD key to select a command group.
- Push ▲ or ▼ key to select an edit command.

6) Edit command final set

- When ENT key is pushed, a cursor disappears and an edit command is determined.
- When ▲ or ▼ key is pushed after the decision, it moves to (7).

7) Individual setting item edit of an selected command
→ Refer to the command specification described in the following pages.
Individual setting item edit(numeric value input or menu selection)procedure is identical to Parameter edit.

13-3-4 Real Time Gain Setting

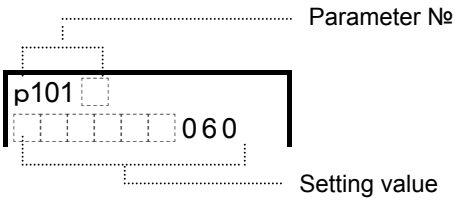
(1) Function.
Real time gain setting adjusts various unit gains in a dedicated mode in real time, watching motor motion status. In Parameter edit mode, when [ENT] key is pushed, new gain works on actual motion but in Real time gain setting mode, when [▲] or [▼] key is pushed, ±1 step of gain changes and new gain immediately works on actual motion.

(2) Setting Method
Parameters for Real time gain setting are as Tab. 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 Derivative time constant	0000[μs]
	P104	Speed loop Proportional gain division ratio	000. 0[%]
	P105	Speed loop Derivative gain division 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 Derivative time constant/ Low speed gain range	0000[μs]
	P109	Speed loop Proportional gain division ratio / Low speed Gain range	000. 0[%]
	P110	Speed loop Derivative gain division ratio / Low speed Gain range	000. 0[%]
3003	P111	Speed loop gain / GSEL signal ON	0025
	P112	Speed loop Integral time constant / GSEL signal ON	20. 00[ms]
	P113	Speed loop Derivative time constant/ GSEL signal ON	0000[μs]
	P114	Speed loop Proportional gain division ratio / GSEL signal ON	000. 0[%]
	P115	Speed loop Derivative gain division ratio / GSEL signal ON	000. 0[%]
3004	P200	Position loop gain	0020[1/ S]
	P201	Servo lock	0020[1/ S]

[Tab. 13-9] Real Time Gain Setting Parameter

1) ITEM [ENT]→3001(Selection of Real time gain setting mode)→[ENT]→[MOD]
2) P * * * [ENT](Selection of setting parameter)
   * mark is parameter №.(Refer to Tab. 13-9.)
3) Data setting (Gain adjustment)of a selected parameter
   +1is added every time when [▲] key is pushed once.
   -1is deducted every time when [▼] key is pushed once.
4) When [MOD] key is pushed, this mode is escaped. (At the time, display becomes [Status display mode]).
5) Display sample



* In the display, in order to identify same item of Parameter edit mode, at the top of parameter №, small letter ‘p’ is used.

[Caution]

Though a value in Gain setting immediately works on an actual motion, it is not written in a backup memory. Write of setting data is conducted when [ENT] or [MOD] key is pushed.

Chapter 14 Materials

14-1 Electric Specification of Controller

[100V System controller]

Item		Contents		
Series name（Type）		NCR-*A*A1		
		-051	-101	-201
Input power source	Voltage specifications	AC100～115V, 50/60Hz Single phase		
	Allowable voltage fluctuation	AC90～121V, 50/60Hz		
Output capacity[W]		50	100	200
Drive method		3 phase sine wave PWM		
Power capacity (at rated output) [kVA]*2		0.3	0.6	1.1
Continuous output current[Arms]		1.1	2.0	3.4
Momentary output current[Arms]		3.3	6.0	9.9
Control method		Semi-closed loop by encoder（Linear sensor）feedback		
Brake method		Regenerative brake：External Regenerative resistor		
Carrier frequency		High performance version：25kHz/ Plural function version：Parameter selection(10K/16K/20K/24K)		
Speed control range		1：5000 *1		
Maximum speed frequency		16Mpps		
No fuse breaker (rated current) [A]*3		5	5	5
Weight [kg]*4		1.0	1.0	1.4
Shape		Refer to Chapter 3 Outline.		
Accessory		Regenerative resistor（400W or smaller, option） Refer to 14-2 [Outline of Regenerative resistor, combination].		
Applicable motor		Refer to 14-4 [Applicable motor list].		

*1: A motor may not run smoothly at 1/5000 of rated speed.
Speed control range is defined that a motor will not stop with 100% load in the range.
*2: It changes according to power source impedance.
*3: Please be sure to select sufficient shut down capacity type of a no fuse breaker to conduct protective coordinate with power source capacity.
*4: Weight does not include weight of options.

[Tab. 14-1(a)] Electric Specification 1/3

[200V System controller]

Item		Contents							
Series name（Type）		NCR-*A*A2*							
		-101	-201	-401	-801	-152	-222	-302	-402
Input power source	Voltage specifications	AC200～230V, 50/60Hz, 3 phase							
	Allowable voltage fluctuation	AC180～242V, 50/60Hz							
Output capacity［W］		100	200	400	800	1.5K	2.2K	3.0K	4.0K
Drive method		3 phase sine wave PWM							
Power capacity (at rated output) ［kVA］*2		0.3	0.6	1.1	1.8	3.0	4.7	4.8	7.8
Continuous output current［Arms］ *6		1.1	2.0	3.4	6.8	10.0	16.0	16.0	27.0
Momentary output current［Arms］ *7		3.3	6.0	9.9	17.0	30.0	48.0	48.0	78.0
Control method		Semi-closed loop by encoder（Linear sensor）feedback							
Brake method		Regenerative brake：External Regenerative resistor							
Carrier frequency		High performance version：25kHz/10kHz (output capacity 3.0KW or larger) Plural function version：Parameter selection (10K/16K/20K/24K) * 5							
Speed control range		1：5000 *1							
Maximum speed frequency		16Mpps							
No fuse breaker (rated current) ［A］*3		5	5	5	10	15	20	20	30
Weight ［kg］*4		1.0	1.0	1.4	2.4	4.0	4.0	6.0	6.0
Shape		Refer to Chapter 3 Outline.							
Accessory		Regenerative resistor（400W or smaller, option） Refer to 14-2 [Outline of Regenerative resistor, combination].							
Applicable motor		Refer to 14-4 [Applicable motor list].							

*1: A motor may not run smoothly at 1/5000 of rated speed.
Speed control range is defined that a motor will not stop with 100% load in the range.
*2: It changes according to power source impedance.
*3: Please be sure to select sufficient shut down capacity type of a no fuse breaker to conduct protective coordinate with power source capacity.
*4: Weight does not include weight of options.
*5: Please set「10kHz」to a unit which output capacity is larger than 3.0 kW.

［Tab. 14-1(b)］ Electric Specification 2/3

[200 V System controller]

Item		Contents							
Series name（Type）		NCR-*A*A2*							
		-752	-113	-153	-203	-	-	-	-
Input power source for power section	Voltage specifications	AC200 ～230V, 50/60Hz, 3 phase							
	Allowable voltage fluctuation	AC180 ～242V, 50/60Hz							
DC24V control power	Voltage specifications	DC24V							
	Allowable voltage fluctuation	DC20.4～27.6V							
Output capacity [W]		7.5K	11.0K	15.0K	20.0K				
Drive method		3 phase sine wave PWM							
Power capacity (at rated output) of power section [kVA] *2		15	20	25	30				
Control power capacity[W］*5		26	26	26	40				
Continuous output current [Arms]		41.8	47.7	62.6	87.3				
Momentary output current [Arms]		83.6	95.4	125.2	174.6				
Control method		Semi-closed loop by encoder (Linear sensor) feedback							
Brake method		Regenerative brake: External Regenerative resistor							
Carrier frequency		10 kHz							
Speed control range		1 : 5000 *1							
Maximum speed frequency		16 Mpps							
No fuse breaker (rated current) ［A］*3		60	75	100	125				
Weight [kg] *4		7.4	7.7	10.0	18.5				
Shape		Refer to Chapter 3 Outline							
Accessory		Refer to 14-2 [Outline of Regenerative resistor, combination]							
Applicable motor		Refer to 14-4 [Applicable motor list].							

*1: A motor may not run smoothly at 1/5000 of rated speed.
Speed control range is defined that a motor will not stop with 100% load in the range.
*2: It changes according to power source impedance.
*3: Please be sure to select sufficient shut down capacity type of a no fuse breaker to conduct protective coordinate with power source capacity.
*4: Weight does not include weight of options.
*5: At the time of inserting the power, above the moment rated capacity flow provides the power supply.

[Tab. 14-1(c)］Electric Specification 3/3

[400 V System Controller]

Item		Contents							
Series name（Type）		NCR-*A*A3*							
		-	-751	-262	-402	-752	-113	-153	-203
Input power source for power section	Voltage specifications	AC400～460V, 50/60Hz, 3 phase							
	Allowable voltage fluctuation	AC360～484V, 50/60Hz							
DC24V control power	Voltage specifications	DC24V							
	Allowable voltage fluctuation	DC20.4～27.6V							
Output capacity [W]			750	2.6K	4.0K	7.5K	11.0K	15.0K	20.0K
Drive method		3 phase sine wave PWM							
Power capacity (at rated output)of power section [kVA] *2			1.8	5.2	7.8	15	20	25	30
Control power capacity [W] *5			15	20	24	26	26	26	40
Continuous output current [Arms]			2.5	8.0	15.0	20.9	23.4	31.3	40.7
Momentary output current [Arms]			7.5	24.0	45.0	41.8	46.8	62.6	80.4
Control method		Semi-closed loop by encoder（Linear sensor）feedback							
Brake method		Regenerative brake：External Regenerative resistor							
Carrier frequency		10kHz							
Speed control range		1：5000 *1							
Maximum speed frequency		16 M p p s							
No fuse breaker (rated current) ［A］*3			5	10	15	30	40	50	60
Weight [kg] *4			1.9	4.0	6.0	7.4	7.7	10.0	18.5
Shape		Refer to Chapter 3 Outline.							
Accessory		Refer to 14-2 [Outline of Regenerative resistor, combination].							
Applicable motor		Refer to 14-4 [Applicable motor list].							

*1: A motor may not run smoothly at 1/5000 of rated speed.
Speed control range is defined that a motor will not stop with 100% load in the range.
*2: It changes according to power source impedance.
*3: Please be sure to select sufficient shut down capacity type of a no fuse breaker to conduct protective coordinate with power source capacity.
*4: Weight does not include weight of options.
*5: At the time of inserting the power, above the moment rated capacity flow provides the power supply.

[Tab. 14-1(d)] Electric Specification 4/4

14-2 Regenerative Resistor Outline and Combination

14-2-1 Regenerative Resistor Combination

[Accessory Regenerative resistor list of 200 V system controller]

Controller type	Accessory Regenerative resistor type
NCR-*2*-101 Capacity : 0.1kw	None If required, please consult our sales man.
NCR-*2*-201 Capacity : 0.2kw	None If required, please consult our sales man.
NCR-*2*-401 Capacity : 0.4kw	None If required, please consult our sales man.
NCR-*2*-801 Capacity : 0.8kw	CAN60UT 82 ohms J 60 W, 82Ω x 1 piece Cement resistor, exterior shape 1
NCR-*2*-152 Capacity : 1.5kw	CAN200UT 39 ohms J 200 W, 39Ω x 1 piece Cement resistor, exterior shape 2
NCR-*2*-222 Capacity : 2.2kw	CAN200UT 24 ohms J 200 W, 24Ω x 1 piece Cement resistor, exterior shape 2
NCR-*2*-302 Capacity : 3.0kw	CAN400UR 20 ohms J 400 W, 20Ω x 1 piece Cement resistor, exterior shape 3
NCR-*2*-402 Capacity : 4.0kw	CAN400UR 20 ohms J 400 W, 20Ω x 1 piece Cement resistor, exterior shape 3
NCR-*2*-752 Capacity : 7.5kw	RGH-300-OS30J 300 W, 30Ω x 3 pieces (parallel connection, total 900 W, 10Ω) Enamel resistor, exterior shape 4
NCR-*2*-113 Capacity : 11kw	RGH-500-OS22J 500 W, 22Ω x 3 pieces (parallel connection, total 1.5 KW, 7.3Ω) Enamel resistor, exterior shape 5
NCR-*2*-153 Capacity : 15kw	RGH-500-OS22J 500 W, 22Ω x 4 pieces (parallel connection, total 2.0 KW, 5.5Ω) Enamel resistor, exterior shape 5
NCR-*2*-203 Capacity : 20kw	RGH-500-OS22J 500 W, 22Ω x 6 pieces (parallel connection, total 3.0KW, 3.7Ω) Enamel resistor, exterior shape 5

[Accessory Regenerative resistor list of 100 V system controller]

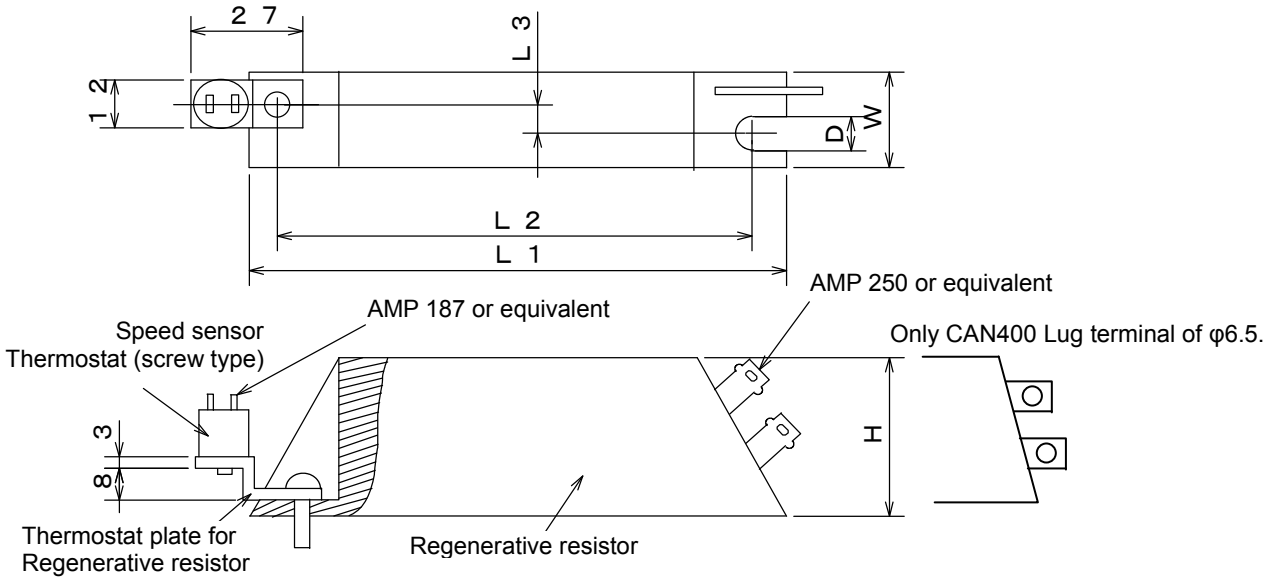
Controller type	Accessory Regenerative resistor type
NCR-*1*-051 Capacity : 0.05kw	None If required, please consult our sales man.
NCR-*1*-101 Capacity : 0.1kw	None If required, please consult our sales man.
NCR-*1*-201 Capacity : 0.2kw	None If required, please consult our sales man.

[Accessory Regenerative resistor list of 400 V system controller]

Controller type	Accessory Regenerative resistor type
NCR-*3*-751 Capacity :0.75kw	CAN60UT 200 Ohm J 60W, 200Ω-1 pieces Cement resistor Outline 1
NCR-*3*-262 Capacity :2.6kw	CAN200UT 100 Ohm J 200W, 100Ω-1 pieces Cement resistor Outline 2
NCR-*3*-402 Capacity :4.0kw	CAN400UR 51 Ohm J 400W, 51Ω-1 pieces Cement resistor Outline 3
NCR-*3*-752 Capacity :7.5kw	RGH-300-OS120J 300 W, 120Ω x 3 pieces (parallel connection, total 900 W, 40Ω) Enamel resistor, exterior shape 4
NCR-*3*-113 Capacity :11kw	RGH-500-OS82J 500 W, 82Ω x 3 pieces (parallel connection, total 1.5 KW, 27.3Ω) Enamel resistor, exterior shape 5
NCR-*3*-153 Capacity :15kw	RGH-500-OS82J 500 W, 82Ω x 4 pieces (parallel connection, total 2.0 KW, 20.5Ω) Enamel resistor, exterior shape 5
NCR-*3*-203 Capacity :20kw	RGH-500-OS82J 500 W, 82Ω x 5 pieces (parallel connection, total 2.5 KW, 16.4Ω) Enamel resistor, exterior shape 5

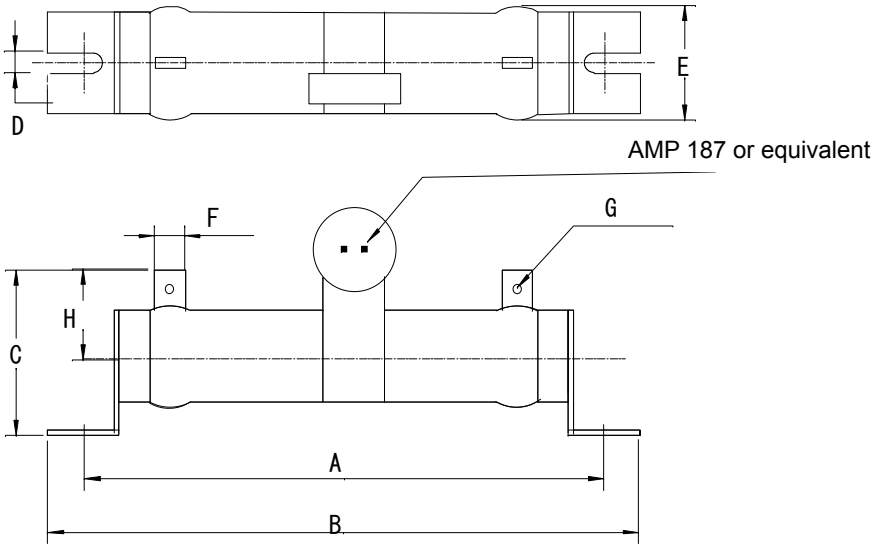
14-2-2 Regenerative Resistor Outline

Outline and dimension of Regenerative resistor and attachment position of a thermostat is shown as below.



(Attach a thermostat and fasten it with attachment screws of Regenerative resistor.)

Type	Rating	L1	L2	W	H	L3	D	Outline
CAN60	60W	115	100	20	40	5	4.3	Outline 1
CAN200	200W	215	200	26	50	8	5.3	Outline 2
CAN400	400W	265	250	33	61	13	5.3	Outline 3



Type	Rating	A	B	C	D	E	F	G	H	Outline
RGH200	200W	282	304	54	6	32	7	2.2	31	
RGH300	300W	304	334	84	10	46	13	6.0	44	Outline 4
RGH500	500W	350	380	99	10	57	13	6.0	49	Outline 5

［Fig. 14-1］ Outline of Regenerative Resistor

14-3 Electric Specification of Motor Cooling Blower

[Motor cooling blower AC 200V system]

Motor type	Input power source						Number of electric 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	

[Motor Cooling blower AC 400V system]

Motor type	Input power source				Number of electric 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 type	Input power source				Number of electric 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 motors applicable

Note 1) The applicable maximum speed is a speed when using a 1.0 μm or 5.0 μm sensor. When using other sensors than the above ones, apply the sensor feedback pulse of 16Mpps or less.
Note 2) When not using the magnetic pole sensor, set the magnetic pole sensor type 0 (P010=0).
Note 3) This motor copes with a unit of which software version is 2.4 or new.

[Parameter selection list of applicable τ linear motors 1/2]

Controller capacity	Motor selection		Applicable Motor						
	P000	P001			P006	P007		P010	P011
	Setting value		Motor type	Rated thrust	Rated speed	Maximum speed	Peak thrust	Magnetic pole sensor	
								Type	Offset
				[N]	[m/s]	[m/s]	[%]		[mm]
NCR-*1*-051 Capacity :0.05kW Input voltage:100V	001	L-SEN	NLA-7SL	7	3000.00	3000.00	300	1	28.50
	021	L-SEN	NLA-25AL	25	3000.00	3000.00	300	1	28.50
NCR-*1*-101 Capacity:0.1kW Input voltage:100V	002	L-SEN	NLA-13SL	13	3000.00	3000.00	300	1	28.50
	022	L-SEN	NLA-50AL	50	3000.00	3000.00	300	1	28.50
NCR-*1*-201 Capacity:0.2kW Input voltage:100V	023	L-SEN	NLA-100AL	100	3000.00	3000.00	290	1	28.50
NCR-*2*-101 Capacity:0.1kW Input voltage:200V	024	L-SEN	NLA-50AM	50	3000.00	3000.00	300	1	28.50
	061	L-SEN	NVA-AMA	23	3000.00	3500.00	300	2	0.00
	071	L-SEN	NVA-BMA	50	3000.00	3500.00	300	2	0.00
	091	L-SEN	NVA-DMA	30	3000.00	3500.00	300	2	0.00
NCR-*2*-201 Capacity:0.2kW Input voltage:200V	025	L-SEN	NLA-100AM	100	3000.00	3000.00	300	1	28.50
	041	L-SEN	NLA-100BM	100	3000.00	3000.00	300	1	28.50
	062	L-SEN	NVA-AMB	45	3000.00	3500.00	300	2	0.00
	072	L-SEN	NVA-BMB	100	3000.00	3500.00	300	2	0.00
	092	L-SEN	NVA-DMB	60	3000.00	3500.00	300	2	0.00
NCR-*2*-401 Capacity:0.4kW Input voltage:200V	026	L-SEN	NLA-150AM	150	3000.00	3000.00	300	1	28.50
	042	L-SEN	NLA-200BM	200	3000.00	3000.00	290	1	28.50
	063	L-SEN	NVA-AMC	68	3000.00	3500.00	300	2	0.00
	064	L-SEN	NVA-AMD	90	3000.00	3500.00	290	2	0.00
	073	L-SEN	NVA-BMC	150	3000.00	3500.00	300	2	0.00
	093	L-SEN	NVA-DMC	90	3000.00	3500.00	300	2	0.00
	101	L-SEN	NLA-250MM	250	3000.00	2500.00	290	2	0.00
NCR-*2*-801 Capacity:0.8kW Input voltage:200V	043	L-SEN	NLA-300BM	300	3000.00	3000.00	280	1	28.50
	065	L-SEN	NVA-AME	135	3000.00	3000.00	300	2	0.00
	074	L-SEN	NVA-BMD	200	3000.00	3500.00	300	2	0.00
	075	L-SEN	NVA-BME	300	3000.00	3500.00	300	2	0.00
	094	L-SEN	NVA-DMD	120	3000.00	3500.00	300	2	0.00
	095	L-SEN	NVA-DME	180	3000.00	3500.00	280	2	0.00
	102	L-SEN	NLA-500MM	500	3000.00	2500.00	250	2	0.00
	121	L-SEN	NLA-500NM	500	3000.00	3000.00	250	2	0.00

[Parameter selection list of applicable τ linear motors 2/2]

Controller capacity	Motor selection		Applicable Motor						
	P000	P001			P006	P007		P010	P011
	Setting value		Motor type	Rated thrust	Rated speed	Maximum 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 Capacity:2.2kW Input voltage:200V	103	L-SEN	NLA-750MM	750	3000.00	2500.00	300	2	0.00
	122 Note3)	L-SEN	NLA-1000MM	1000	3000.00	3000.00	300	2	0.00
NCR-*2*-302 Capacity:3.0kW Input voltage:200V	122	L-SEN	NLA-1000NM	1000	3000.00	3000.00	300	2	0.00
NCR-*2*-402 Capacity:4.0kW Input voltage:200V	123	L-SEN	NLA-1500NM	1500	3000.00	3000.00	300	2	0.00

14-4-2 Applicable τ DISC Servo Motor List

Note 1) Magnetic sensor
Before using τ DISC servo motor, which is not mentioned in the above table, consult our sales In-charge and then set the sensor type (P010) and sensor offset (P011).
Note 2) When using with this motor number, it becomes "Decreased rating". For details, consult our sales personnel.
Note 3) This motor copes with a unit of which design order D (NCR-CA*3*D-XXX) or new.
Note 4) This motor copes with a unit of which software version is 2.4 or new.

[Parameter selection list of applicable τ DISC servo motor (Disc-shaped motor)] 1/2

Controller capacity	Motor selection		Applicable Motor							
	P000	P001			P006	P007		P010	P011	
	Setting value		Motor type	Rated thrust	Rated speed	Maximum speed	Peak thrust	Magnetic pole sensor		
								Type	Offset	
				[N]	[m/s]	[m/s]	[%]		[mm]	
NCR-*1*-101 Capacity :0.1kW Input Voltage: 100V	263 *2	C-SEN2	NMR-FADBA2*-061	2.0	5	300	300	0	0.00	
	281 *2	C-SEN2	NMR-FADBA2*-061	2.0	5	300	300	0	0.00	
NCR-*1*-201 Capacity :0.2kW Input Voltage: 100V	207	C-SEN2	NMR-FADBA2*-201 NMR-FSDRA2*-201	7,5	5	300	300	2	0.00	
	264	C-SEN2	NMR-FAEBA2*-121 NMR-FPEBA2*-121	4.0	5	300	300	0	0.00	
NCR-*2*-201 Capacity :0.2kW Input Voltage:200V	261	C-SEN2	NMR-FADBA2*-061 NMR-FPDBA2*-061	20.0	5	300	300	0	0.00	
	282	C-SEN2	NMRNAMBA2*-071	20.0	5	300	300	0	0.00	
NCR-*2*-401 Capacity :0.4kW Input Voltage:200V	201	C-SEN2	NMR-FDDB	7.5	5	300	300	1	0.00	
	205	C-SEN2	NMR-FDDBA2*-201 NMR-FSDBA2*-201	7.5	5	300	300	2	0.00	
	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 Capacity :0.8kW Input Voltage:200V	203	C-SEN2	NMR-FDFB	22.5	5	300	300	1	0.00	
	206	C-SEN2	NMR-FDFBA2*-701 NMR-FSFBA2*-701	22.5	5	300	300	2	0.00	
	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	
	311	C-SEN2	NMR-FCHBA2*-661 NMR-FRHBA2*-661	21	5	300	280	0	0.00	

[Parameter selection list of applicable τ DISC servo motor (Disc-shaped motor)] 2/2

Controller capacity	Motor selection		Applicable Motor						
	P000	P001			P006	P007		P010	P011
	Setting value		Motor type	Rated thrust	Rated speed	Maximum speed	Peak thrust	Magnetic pole sensor	
								Type	Offset
				[N]	[m/s]	[m/s]	[%]		[mm]
NCR-*2*-152	222	C-SEN2	NMR-FEFB	62	3	180	300	1	0.00
Capacity :1.5kW Input Voltage: 200V	224	C-SEN2	NMR- FEFBA2*-122 NMR- FTFBA2*-122	62	5	180	300	2	0.00
	312 *3	C-SEN2	NMR- FCIBA2*-751 NMR- FRIBA2*-751	24	5	300	280	0	0.00
NCR-*2*-222	242 *4	C-SEN2	NMR-FFFB	200	2	120	200	1	0.00
Capacity :2.2kW Input Voltage: 200V	244 *4	C-SEN2	NMR- FFFBA2*-252 NMR- FUFBA2*-252	200	2	120	200	2	0.00
NCR-*2*-302	242	C-SEN2	NMR-FFFB	200	2	120	200	1	0.00
Capacity 3.0kW Input Voltage:200V	244	C-SEN2	NMR- FFFBA2*-252 NMR- FUFBA2*-252	200	2	120	200	2	0.00
NCR-*2*-402	271	C-SEN2	NMR- FVGBA2*-322	500	1	60	200	2	0.00
Capacity :4.0kW Input Voltage:200V	291	C-SEN2	NMR- FTJBA2*-302	115	4.16	250	300	2	0.00
	301	C-SEN2	NMR- FUIBA2*-212	500	0,67	40	200	2	0.00
NCR-*2*-752	302	C-SEN2	NMR- FUIBA2*-472	500	1.5	90	200	2	0.00
Capacity :7.5kW Input Voltage:200V									
NCR-*2*-113	272	C-SEN2	NMR- FVIBA2*-672	1000	1	60	200	2	0.00
Capacity :11kW Input Voltage:200V									

14-4-3 Applicable Synchronous Motor List

Note 1) Motor above 20 KW is under development.
Note 2) This motor is compatible to the device of Design sequence C (NCR-CA*3*C-XXX) or higher.
Note 3) This motor is compatible to the device of Design sequence C (NCR-CA*3*C-XXX) or earlier.
Note 4) This motor is compatible to the device of Design sequence D (NCR-CA*3*D-XXX) or higher.
Note 5) In the NA80/NA820/NA830 motors, only the [ABS/INC common-use] encoder (Encoder type "D" product of the encoder model) can be applied.
Note 6)This motor copes with a unit of which software version is 2.4 or new.

[Parameter selection list of applicable synchronous motor 1/3]

Controller Capacity	P000	P001	Applicable Motor			
	Setting value		Motor type	Rated output [kW]	Rated rotations [rpm]	Peak output [%]
NCR-*1*-051 Capacity :0.05kW Input Voltage:100V	701	INC3	NA70-05*Z	0.05	3000	300
	704	S-INC or S-ABS	NA80-05*DZ	0.05	3000	300
NCR-*1*-101 Capacity :0.1kW Input Voltage:100V	702	INC3	NA70-10*Z	0.1	3000	300
	705	S-INC or S-ABS	NA80-10*DZ	0.1	3000	300
NCR-*1*-201 Capacity :0.2kW Input Voltage:100V	703	INC3	NA70-20*L	0.2	3000	300
	706	S-INC or S-ABS	NA80-20*DL	0.2	3000	300
NCR-*2*-101 Capacity :0.1kW Input Voltage:200V						
NCR-*2*-201 Capacity :0.2kW Input Voltage:200V	601	INC3	NA70-10*Z	0.1	3000	300
	602	INC3	NA70-20*M	0.2	3000	300
	603	S-INC or S-ABS	NA80-10*DM	0.1	3000	300
	604	S-INC or S-ABS	NA80-20*DM	0.2	3000	300
NCR-*2*-401 Capacity :0.4kW Input Voltage:200V	611	INC3	NA70-40*M	0.4	3000	300
	614	S-INC or S-ABS	NA80-40*DM	0.4	3000	300
NCR-*2*-801 Capacity :0.8kW Input Voltage:200V	612	INC3	NA70-60*M	0.6	3000	300
	613	INC3	NA70-80*M	0.8	3000	300
	615	S-INC or S-ABS	NA80-75*DM	0.75	3000	300
	616	S-INC or S-ABS	NA80-60*DM	0.6	3000	300
NCR-*2*-152 Capacity :1.5kW Input Voltage:200V	621 *4)	INC3	NA720-122	1.2	2000	300
	622 *4)	S-INC or S-ABS	NA830-162*DM	1.6	3000	300

[Parameter selection list of applicable synchronous motor 2/3]

Controller Capacity	P000 Setting value	P001 Setting value	Applicable Motor: Motor type	Rated output [kW]	Rated rotations [rpm]	Peak output [%]
NCR-*2*-222 Capacity :2.2kW Input Voltage:200V	631 *3)	INC3	NA720-122	1.2	2000	300
	632 *3)	S-INC or S-ABS	NA830-162*DM	1.6	3000	300
	633 *4)	INC3	NA720-182	1.8	2000	300
	634 *4)	INC3	NA720-242	2.4	2000	300
	641 *6)	INC3	NA720-182	1.8	2000	300
	642 *6)	INC3	NA720-242	2.4	2000	300
NCR-*2*-302 Capacity :3.0kW Input Voltage:200V	641 *3)	INC3	NA720-182	1.8	2000	300
	642 *2)	INC3	NA720-242	2.4	2000	300
NCR-*2*-402 Capacity :4.0kW Input Voltage:200V	651	INC3	NA720-242	2.4	2000	300
	652 *2)	INC3	NA720-402	4.0	2000	250
	653	S-INC or S-ABS	NA830-332*DM	3.3	3000	300
	654	S-INC or S-ABS	NA820-402*DM	4.0	2000	250
NCR-*2*-752 Capacity :7.5kW Input Voltage:200V	664	S-INC or S-ABS	NA820-602*DM	6.0	2000	250
	665	S-INC or S-ABS	NA820-752*DM	7.5	2000	200
NCR-*2*-113 Capacity :11kw Input Voltage:200V	672	S-INC or S-ABS	NA820-113*DM	11.0	2000	200
NCR-*2*-153 Capacity :15kw Input Voltage:200V	682	S-INC or S-ABS	NA820-153*DM	15.0	2000	200

[Parameter selection list of applicable synchronous motor 3/3]

Controller Capacity	P000	P001	Applicable Motor			
	Setting value		Motor type	Rated output	Rated rotations	Peak output
				[kW]	[rpm]	[%]
NCR-*3*-751	711	S-INC or S-ABS	NA80-60*DH	0.6	3000	300
	712	S-INC or S-ABS	NA80-75*DH	0.75	3000	300
Capacity :0.75kW						
Input Voltage:400V						
NCR-*3*-262	742	INC3	NA820-162*DH	1.6	2000	300
	743	INC3	NA820-222*AH	2.2	2000	300
Capacity :2.6kw	744	INC3	NA820-262*AH	2.6	2000	300
Input Voltage:400V	746	S-INC or S-ABS	NA830-162*DH	1.6	3000	300
NCR-*3*-402	751	S-INC or S-ABS	NA820-402*DH	4.0	2000	250
	751	INC3	NA820-402* A H	4.0	2000	250
Capacity :4.0kw	752	S-INC or S-ABS	NA830-332*DH	3.3	3000	300
Input Voltage:400V						
NCR-*3*-752	761	S-INC or S-ABS	NA820-752*DH	7.5	2000	200
	762	S-INC or S-ABS	NA820-602*DH	6.0	2000	250
Capacity :7.5kw						
Input Voltage:400V						
NCR-*3*-113	771	S-INC or S-ABS	NA820-113*DH	11.0	2000	200
Capacity :11.0kw						
Input Voltage:400V						
NCR-*3*-153	781	S-INC or S-ABS	NA820-153*DH	15.0	2000	200
Capacity :15.0kw						
Input Voltage:400V						

14-4-4 Applicable induction motor list

Note 1) This motor copes with a unit of which software version is 2.4 or new.

[Parameter selection list of applicable induction motors]

Controller capacity	P000	P001	Applicable Motor			
	Setting value		Motor type	Rated output	Rated speed	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
	441 *2	INC1	NA100-180F 10	1.9	1000	300
Capacity :2.2kW	442 *2	INC1	NA30-110F-15	1.6	1500	300
Input Voltage:200V	443 *2	INC1	NA100-75F	1.5	2000	300
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						
NCR-*2*-203	Reserved	S-INC	NA100-750AF	15	2000	200
Capacity :20.0kW						
Input Voltage:200V						

14-5 Built-in options

14-5-1 List of the unit build-in options

Option	Product model name	Produce code	Overlap installation not-allowed	
Control I/O extension unit 1	NCR-XAA2D1A-201/401	226-3870	○	△
	NCR-XAA2D1A-801	226-3860	○	△
	NCR-XAA2D1A-152	226-3950	○	△
	NCR-XAA2D1B-152/222	226-3951	○	△
	NCR-XAA2D1A-302/402	226-3960	○	△
	NCR-XAA2D1B-302/402	226-3961	○	△
	NCR-XAA2D1A-153	253-9520	○	△
	NCR-XAA2D1A-203	254-4640	○	△
	NCR-XAA2D1A-751	253-9390	○	△
	NCR-XAA2D1A-262	253-9400	○	△
	NCR-XAA2D1A-402	253-9410	○	△
Control I/O extension unit 2	NCR-XAA3D1A-201-401	226-3900	○	△
	NCR-XAA3D1A-801	226-3890	○	△
	NCR-XAA3D1B-152/222	253-9841	○	△
	NCR-XAA3D1A-751	253-9420	○	△
	NCR-XAA3D1A-262	253-9430	○	△
	NCR-XAA3D1A-402	253-9440	○	△
	NCR-XAA3D1A-203	254-4650	○	△
CC-Link I/F unit	NCR-XAB7D1A-201/401	253-8541	○	
	NCR-XAB7D1A-801	253-8531	○	
	NCR-XAB7D1A-222	253-8823	○	
	NCR-XAB7D1B-152/222	253-8822	○	
	NCR-XAB7D1A-402	253-8841	○	
	NCR-XAB7D1A-751	253-9361	○	
	NCR-XAB7D1A-262	253-9371	○	
	NCR-XAB7D1A-402	253-9381	○	
	NCR-XAB7D1A-153	253-9501	○	
	NCR-XAB7D1A-203	254-4580	○	
Device Net I/F unit	NCR-XAB6D1A-201/401	253-7951	○	
	NCR-XAB6D1A-801	253-7941	○	
	NCR-XAB6D1A-152/222	253-8092	○	
	NCR-XAB6D1B-152/222	253-8093	○	
	NCR-XAB6D1A-302/402	253-8101	○	
	NCR-XAB6D1A-751	253-9451	○	
	NCR-XAB6D1A-262	253-9461	○	
	NCR-XAB6D1A-402	253-9471	○	
	NCR-XAB6D1A-153	253-9511	○	
	NCR-XAB6D1A-203	254-4630	○	
Analog input unit	NCR-XAA4D1A	253-7460		△
High-speed pulse train command receiving unit	NCR-XAB1D1A	253-7800		
Encoder marker / open collector output unit	NCR-XAB2D1A	253-7810		
Absolute position compensation option *1	NCR-XABID1	254-3780	●	
	NCR-XABJD1	254-3930	●	
Response ability 1 option	NCR-XAC4A	254-1900		

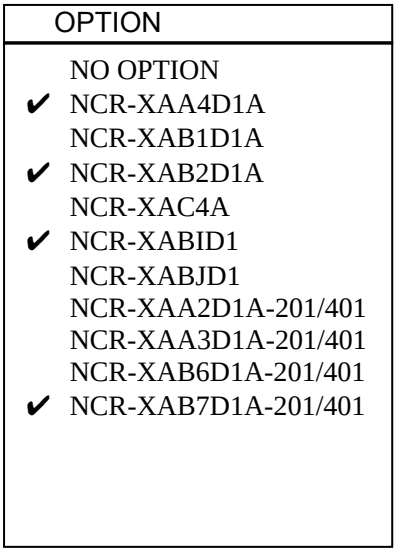
*1 As for the absolute position compensation option, either of the above two types is pasted to this unit. Therefore, other types are not listed.

* Any identical mark in the column of [Overlap installation not-allowed] is not allowed to install in parallel or in an overlapping manner.

14-5-2 Name plate of options

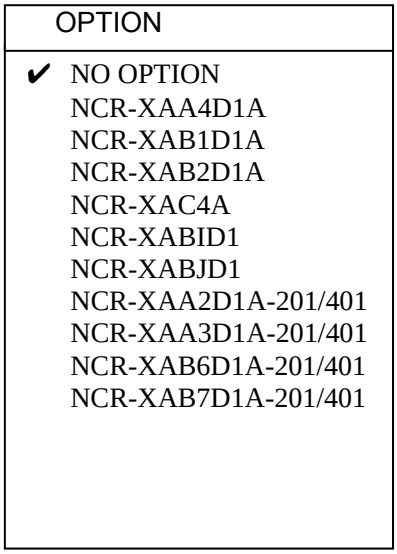
(1) When in built-in options

A name plate with [✓] marks at the top of installed option types, as show in figure, is pasted at the right side panel of the unit.



(2) When in no built-in options

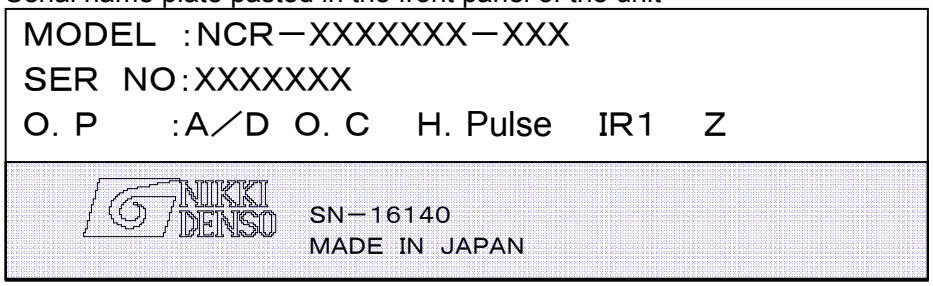
A name plate with a [✓] mark at the top of [NO OPTION], as shown in figure, is pasted at the right side panel of the unit.



(3) About old expressions

In the case of a unit which has no name plate of the option (1) or (2), a serial name plate at the front panel of the unit expresses in codes.

Serial name plate pasted in the front panel of the unit



Options are expressed in the above line of [O.P], and meanings are as follows.

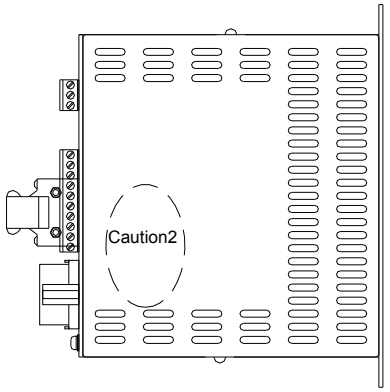
A/D	: Analog input unit (NCR-XAA4D1A)
O.C	: Encoder marker open collector output unit (NCR-XAB1D1A)
H. Pulse	: High-speed pulse command receiving unit (NCR-XAB1D1A)
IR1	: Response ability 1 option (NCR-XAC4A)
Z	: Absolute position compensation option (NCR-XABID1 or NCR-XABJD1)
N	: No options ("N" expression only)

These are installed inside the control board of a unit body.
There are no codes for a control I/O extension unit 1 or 2, CC-Link, and/or for DeviceNet.

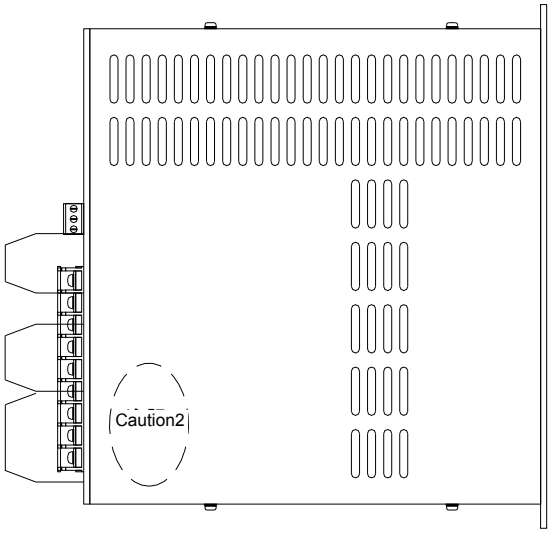
14-5-3 Pasting position for a name plate of options

A name plate of options is pasted around the position of Note-2, a right side panel of the unit, as shown in figure.

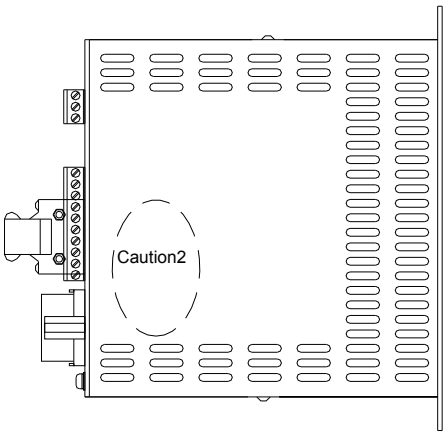
NCR-＊A＊＊A1＊-051~201＊
NCR-＊A＊＊A2＊-101~401＊



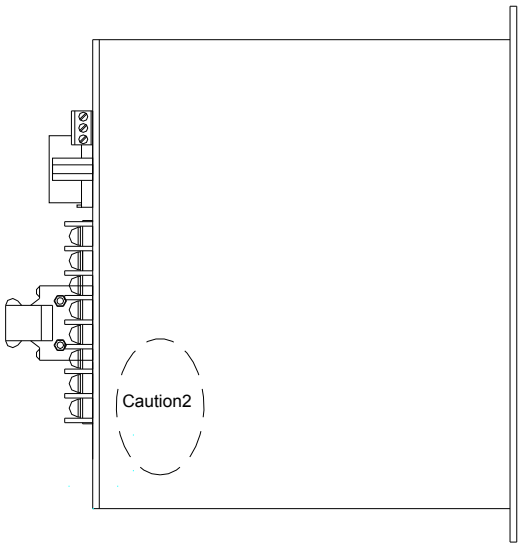
NCR-＊A＊＊A2C-152＊~222＊



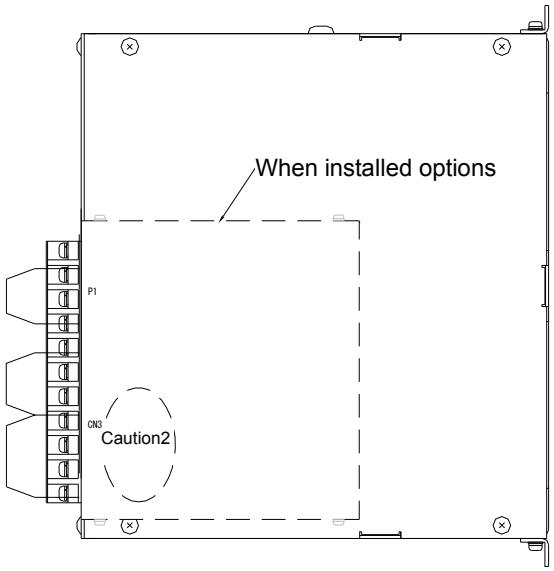
NCR-＊A＊＊A2＊-801＊



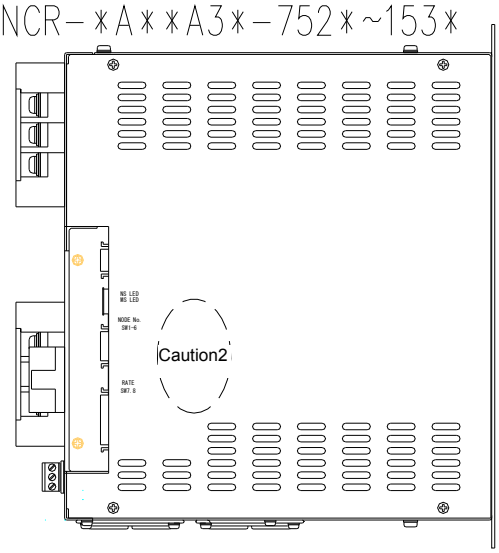
NCR-＊A＊＊A2D-152＊~222＊



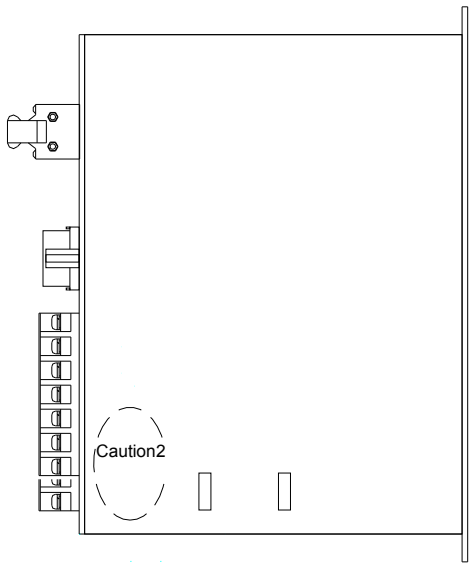
NCR-＊A＊＊A2B-302＊~402＊



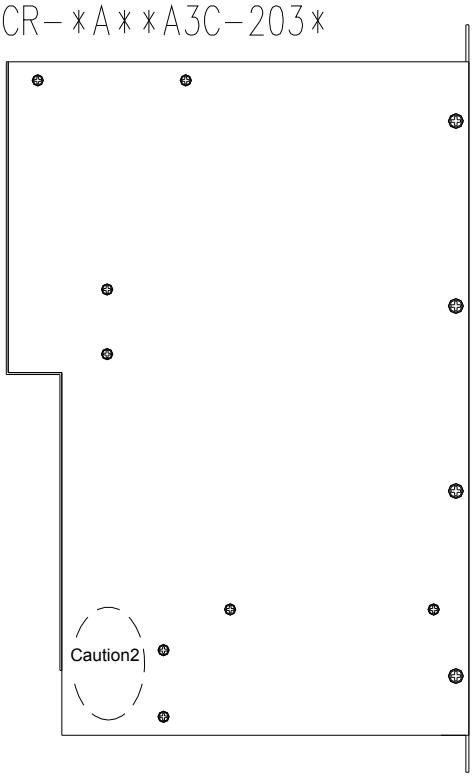
NCR-＊A＊＊A2＊-752＊~153＊
NCR-＊A＊＊A3＊-752＊~153＊

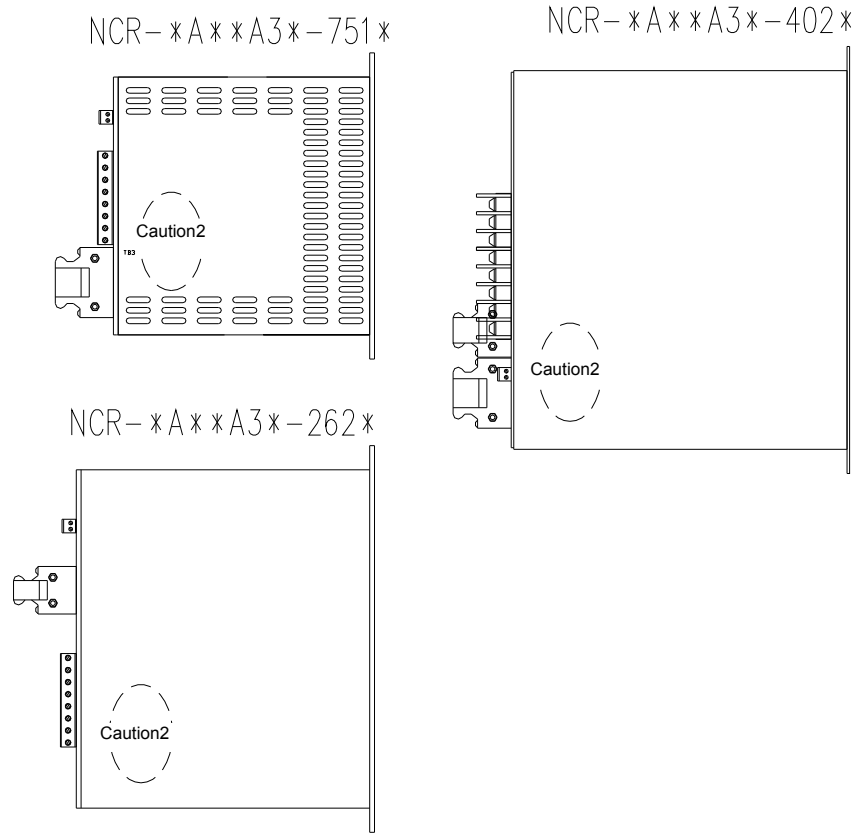


NCR-＊A＊＊A2C-302＊~402＊



NCR-＊A＊＊A2C-203＊
NCR-＊A＊＊A3C-203＊




NCR-*A**A3*-751*
Caution2
NCR-*A**A3*-402*
Caution2
NCR-*A**A3*-262*
Caution2

14-6 Maintenance

The controller and motor need no maintenance, however, inspect it periodically to avoid the damage due to the change in the environment.

⚠ Caution
1) The operator should always check the ON/OFF status of the power before operation. 2) Although the power is cut OFF, the condenser of the main circuit is charged with high voltage. Start operating after the interval of 2 to 3 minutes from the power cut OFF (after the LED is turned off in the machine where "CHARGE" LED is set on the front side of the device) 3) Never perform the insulation test of the controller with the mega-tester. "Controller is damaged." Moreover, measure the insulation of the motor after dividing the entire connection of the wires (U, V, W) between the motor and controller.

14-6-1 Daily inspection

Following items come under daily inspection.
[Items to be inspected]

(1) Whether the motor operating normally.
(2) Whether the environment of the installation location normal? (Power supply, temperature, humidity, dust etc.).
(3) Whether the cooling system is normal.
(4) Whether there is any loose terminal or connector and the connector.
(5) Whether there is any abnormal sound or abnormal vibrations.
(6) Whether there is abnormal overheating or color change.
(7) Whether the regenerative resistance is abnormal.

14-6-2 Periodic inspection

Execute periodic inspection for the following items depending on the constant operating time or period (6 months, 1 year).
[Items to be checked]

(1) Whether there is a loose power connection, slackness in the belt, shape of shaft key and abnormal sound in the motor bearing.
(2) Whether the environment of the location where the device is installed normal (Power supply, temperature, humidity, dust etc.).
(3) Whether the cooling system is normal.
(4) Whether there is any loose terminal or connector.
(5) Whether there is any abnormal sound or abnormal vibrations.
(6) Whether there is abnormal overheating or color change.
(7) Whether any foreign particles or dust has accumulated in the controller.
(8) Whether there is any damage or heavy load on the cable.
(9) Whether the regenerative resistance is abnormal.
(10) Inspection of cooling fan of the control board, cleaning of air filter, inspection or replacement of relay.

14-6-3 Other inspections

1) Gear

For the geared motor, oiling of the gear parts is very important.
Change the oil every 3000 hours.
Since lubricant is very important for the functioning, use the specified lubricant only. (Never use machine oil or engine oil etc.)
If the lubricant is not specified, then contact our sales in charge.
In case of waste oil in the lubrication system, do not mix it with other type of oil or make sure that there is no oil leakage.
Also, execute oiling of the parts up to the decided level.
Further, check whether the bolts of the gear are not loosened.

2) Oil Seal

Change the oil seals every 5,000 hours.
A standard motor does not have the oil seal and specify "With oil seal" separately whenever it is necessary.

3) Motor bearing

It is exclusive motor bearing.
The bearing life differs as per the usage status, however, it is around 20,000 hours.
Durability of the motor cooling blower is also same as that of a bearing.

4) Controller

The replacement of all the part of controller is indicated.
The electronics parts are used in the controller, however, its durability depends on these parts.

[The parts to be replaced are specified in the following table]

Name of the part	Standard replacement period	Replacement method / Others
Smoothing condenser and other aluminum electrolytic condenser (On the print board)	5 Years	New board / replacement (As per the inspection result)
Breaker, Relay	-	As per the inspection result
Cooling fan	2 to 3 Years	New product and replacement
Fuse	10 Years	New product and replacement

[Tab.1 Parts to be replaced]

Conditions

- The ambient temperature: It is average 30□ in a year.
- Load factor: 80% or less
- Capacity utilization: 20 hours or less/ day

Note 1: It is based on The Japan Electrical Manufacturers' Association “Advancement in periodic inspection of the general-purpose inverter”
The standard replacement period specified above is targeted and heavy duty is imposed on the product.

The other parts to be replaced are shown in the following table.

Name of the parts	Standard replacement period	Replacement method / Others	Conditions
LCD and SDI Device	7 Years	New product and replacement	Below 25 ± 10° C, 65 % RH
EEPROM	10 Years	New board and replacement (As per the inspection result)	Frequency to change the parameter, indirect data, command etc. Thrice/day
Lithium battery *1	-	-	-

*1 Refer to "10-7-1 Absolute Encoder Specifications" for the details of lithium battery.

Since the durability of the product mainly depends on the temperature and humidity conditions, avoid using it in high temperature and high humidity conditions.