AC SERVO DRIVER

VC-D

Instruction Manual

Ver. 2.2

Nikki Denso Co., Ltd

Manual No. TIE-12860L

Preface

Thank you for adopting our AC servo driver <VC-D 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 driver and a motor, please handle with care so as not to damage them.

   ※ Cautions
   Be careful not only to pile drivers but also putting anything on the driver 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°C～+60°C
	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°C～+60°C
	Humidity	85%or less (non-condensing)
	Storage Location	Do not transport in a harmful atmosphere such as corrosive gas, grinding powder, metal powder, oil, etc..
Vibration		0.5G or less (Driver, motor)

Transporting conditions of a driver 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 driver VC-D 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 manual describes Software version 1.40 or newer of AC servo driver VC-D type.
- In case of using a 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 Linear/ 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.』

⃠ 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.
『Failure may occur.』
② If storage term has passed more than 3 years, be sure to consult our sales man.
『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.
『Injury 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. (Machine system design shall be considered to maintain safety of workers against re-start.)
『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.』

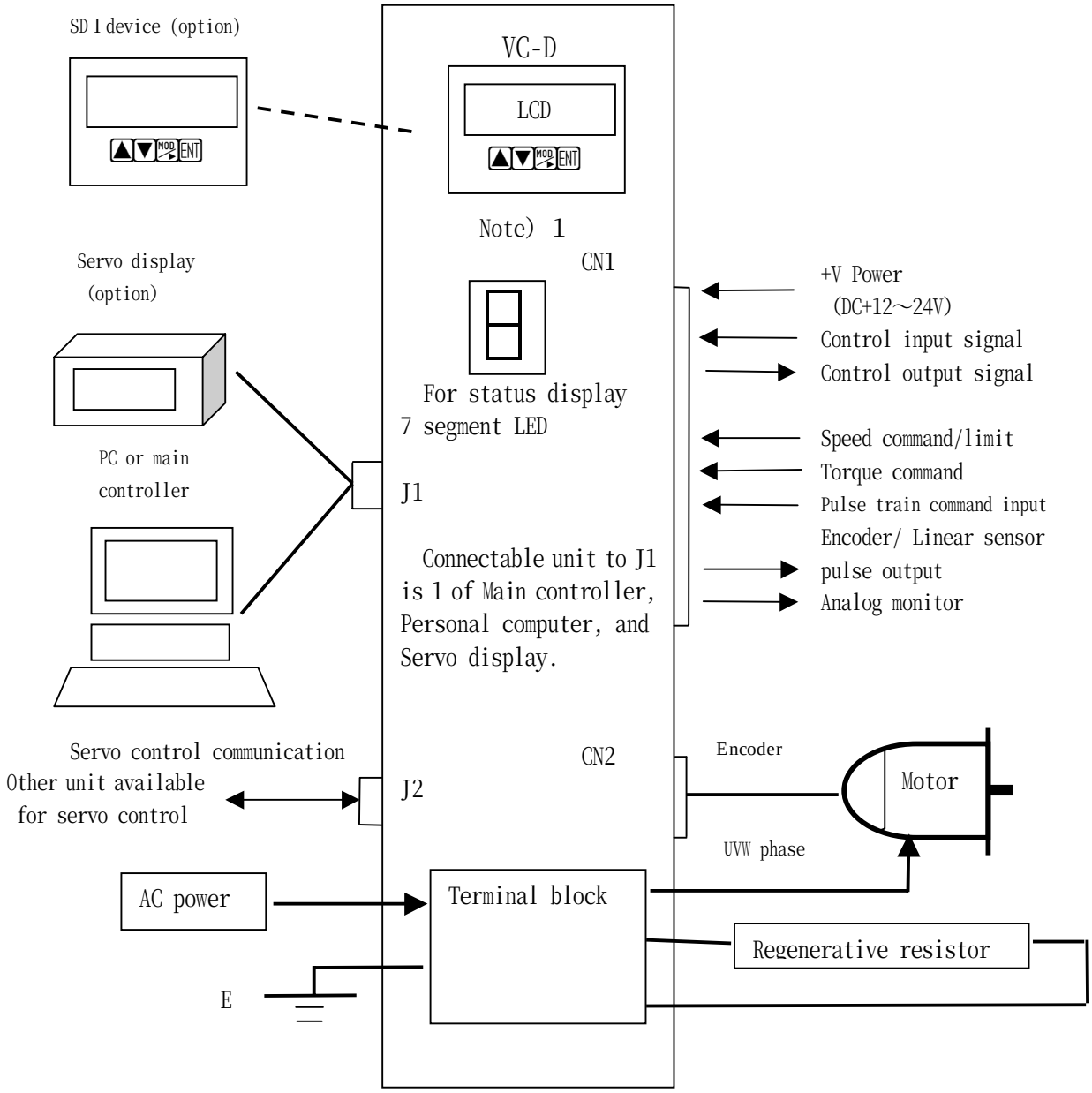
Contents

Chapter 1 Outline

1－1 Basic Configuration

VC-D (Hereafter, this unit or controller is used.) is a unit for Speed control, Torque control and Pulse train control of AC servomotor, Linear motor and Disc motor.

Basic configuration for AC servomotor control by this unit is shown in [Figure 1-1].
VC-D body, a motor, speed/ position detecting encoder/ linear sensors on a motor unloaded shaft, optional encoder/ linear sensor cables, etc. compose a basic system.



[Fig. 1－1] System Basic Configuration

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

Description of each section

(1) VC-D body

This unit conducts Speed control, Torque control and Pulse train control of AC servomotor, Linear motor and Disc motor.

Control mode can be changed by a control signal.

And one unit can be selected and applied to several kinds of AC servomotors and encoders by a parameter.

(2) LCD module

This sets display of VC-D 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-D 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-D body can be controlled.
- Setting and backing up of parameters, etc. can be c onducted.

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

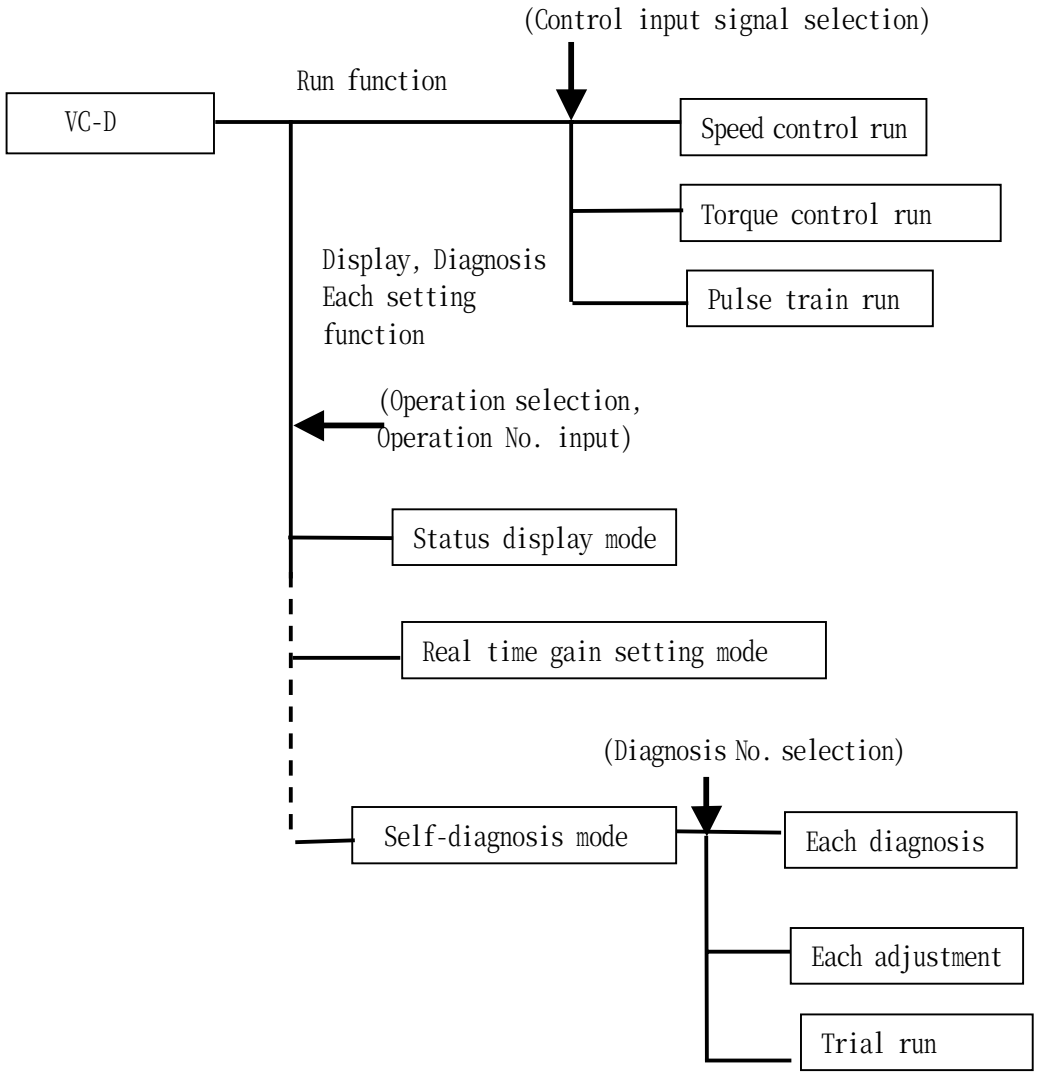
Synchronizing control up to 4 axes can be achieved by one unit which has Servo control communication.

(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.

1－2 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 1-2] Mode Configuration

Individual mode outline

Mode	Function	Reference
Speed control	·It executes Speed control run by Internal/ External speed command.	Selection by control signals MD1 and MD2
Torque control	·It executes Torque control run by Internal/ External torque command.	
Pulse train control	·It executes Positioning by Pulse train command.	
Status display mode	·It displays unit status.	Mode selection by front panel LCD module or optional SDI device
Real time gain setting mode	Referring to actual motor motion, various unit gains are set on real time.	
Self-diagnosis mode	·It executes diagnosis of various circuits of a unit and Trial run.	

[Tab. 1-1] Mode Outline

Chapter 2 Specification

2－1 Type

Types of VC-D series are described as follows.

NCR － ① ② ③ ④ ⑤ ⑥ － ⑦ ⑧ － ⑨

Sample：NCR － D A B 1 A1 A － 201 A

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,800W or less)
		E	Multi-function version (with dynamic brake,800W or less)
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	A,B,···	Starts from A.
⑦	Output capacity	Sample) 201	20 1 = 20 × 10^1 = 200W | └ n of 10^n └── Effective No.
⑧	Motor kind	None	Multi-function version
		A	Linear coreless/ NA70 motor
		B	Linear core/ Disc motor
		C	Linear coreless NLA-S type motor
		D	Linear coreless NVA type motor
⑨	Special specification	S1	None: Standard type S** : Special type

[Tab.2-1] Type description

2－2 General Specification

Item		Contents
Outline		Refer to Chapter 3 (Outline).
Ambient condition	Temperature	In control 0 ～ 55°C(unit circumference)/ in storage -20～60°C
	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 air cooling
Mounting method		Panel mounting type
Vibration resistance		0.5G (10～50Hz)
Shock resistance		5G
Noise resistance		Line noise：2000V (50ns、1μs) , 1 minute Radiation noise：1000V (50ns、10cm) , 1 minute Electro-static noise：10kV (between earth and case)

[Tab. 2-2] General Specification

2－3 Function Specification

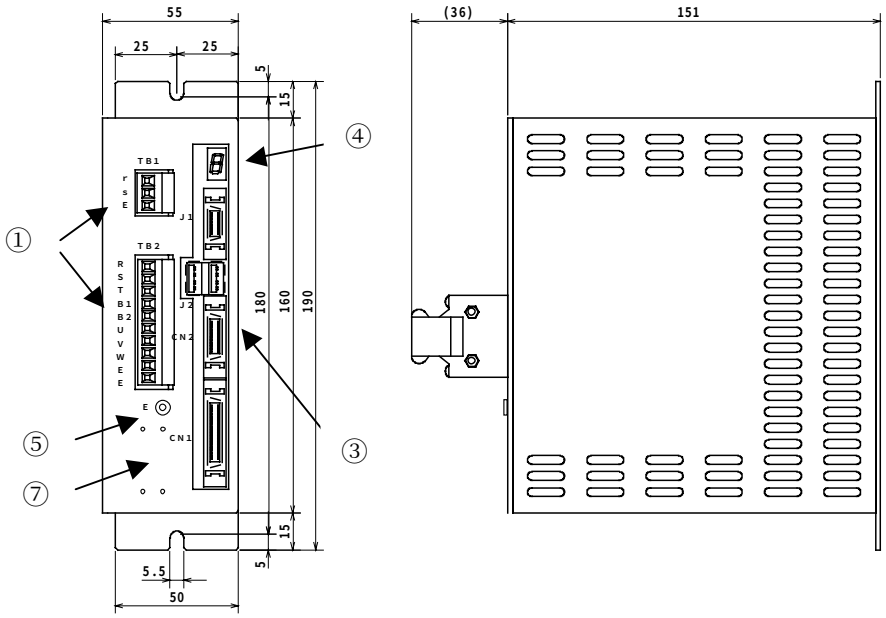
Item	Contents and specification
No. of axes	1 axis
Run mode	·Pulse train run Pulse train command and maximum frequency Standard specification Line driver 1MHz (4MHz, 4times) Open collector 250KHz(1MHz, 4times) High speed Pulse train command receiving unit (option) Line driver 4MHz (16MHz, 4 times only for line driver) F F compensation : Parameter set (common motion, 1 kind) F F shift ratio : Parameter set (1 kind) F F filter : Parameter set (1 kind) Pulse train input style : Parameter set (3 kinds) Pulse train sequence change : Parameter set Pulse train command compensation : Parameter set (setting of Numerator and Denominator of Numerator/ Denominator)
	·Speed control run Analog speed command (option) , Internal speed command (3 points)
	·Torque control run Analog torque command (option) , Internal torque command (3 points)
Torque limit	·Torque limit value : Parameter set (2 kinds× For ward/ Reverse)
Accel./ Decel.	·In Speed control run, acceleration and deceleration can be set by a parameter, separately.
Speed loop gain selection	·2 gain groups set by GSEL signal can be selected. ·Gain at low speed set by a parameter is automatically selected.
Anti-resonance function	·Notch filter : Parameter set (5 kinds) ·Torque command filter : Parameter set (1 kind)
Setting function	·Individual parameter setting can be conducted by Serial communi cation. ·By a front panel LCD and an optional SDI device : Parameters can be set.
Monitor function	·A front panel LCD and an optional SDI device : Motion status display, I/O signal display, Alarm (history of last 5 alarms) ·Analog monitor : Monitor items are set by parameters (Simultaneous monitoring of 2 points can be conducted. Monitor output values are rewritten every 500μs.)
Data memory function	Parameters and Alarm history (last 5 times) are stored in an EEPROM.
Protective function	Over current, Over voltage, Under voltage, Over speed, Over load (electric thermal), Regenerative resistor over load, Encoder fault, Deviation over flow, Data error, Communication error, Hardware OT error, Software OT error, CPU fault, etc.
Self-diagnosis	FB pulse position counter check, FB pulses peed detection counter check, Analog monitor 0V·±10V·±5V check, RAM check, Control output signal chec k, Serial communication I/F check, EEPROM check, Trial run, etc.
Communication function	·Transmission/ Receipt of various data can be conducted by Seria l communication.
External input signal	8 Points RST、SON、DR、CIH、SS1、SS2、MD1、MD2 (initial value) Function of all signals can be changed.
External output signal	4 Points RDY、ALM、WNG、PN (initial value) Function of all signals can be changed.
Option	SDI device, Cables, Regenerative resistor

[Tab. 2-3] Function Specification

Chapter 3 Outline

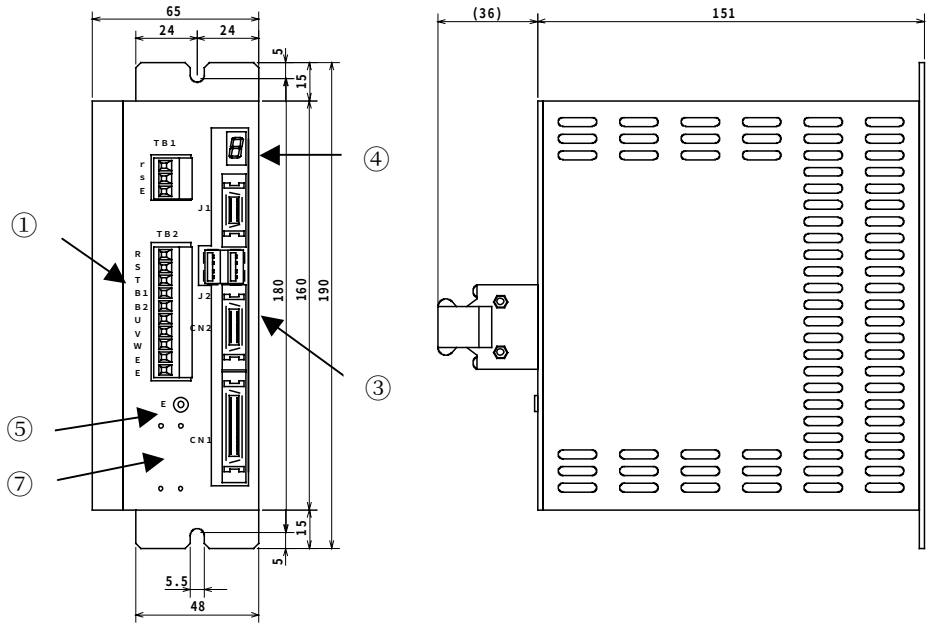
3－1 Outline drawing

3－1－1 NCR－＊A＊－０５１／１０１／２０１※



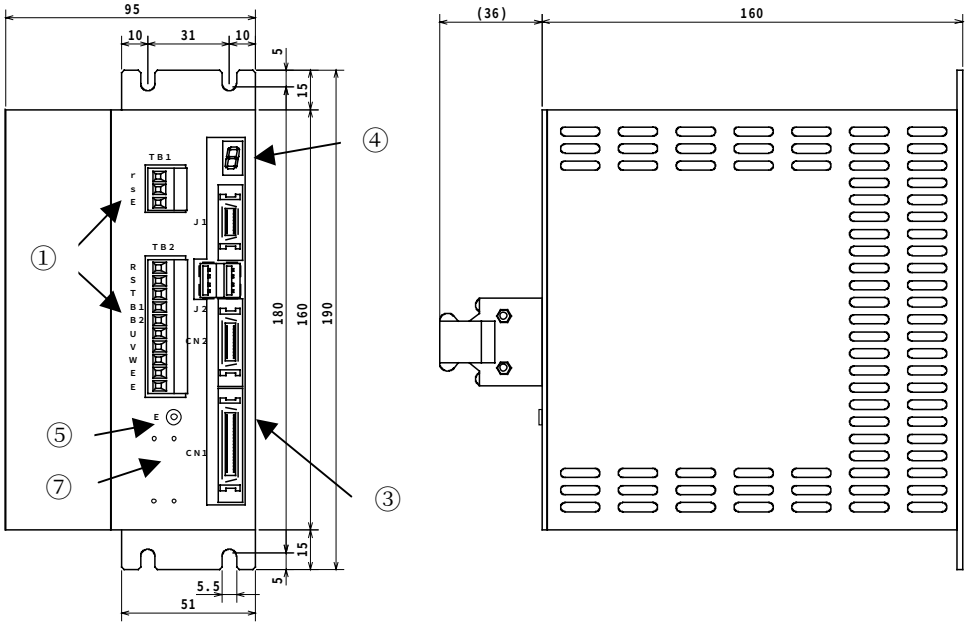
Note) ※marked product is a 200V input type.

3－1－2 NCR－＊A＊－２０１※／４０１



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

3－1－3　NCR－＊A＊－８０１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180
160
190
15
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5.5
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TB1
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J1
TB2
R
S
T
B1
B2
U
V
W
E
E
J2
CN2
E
CN1
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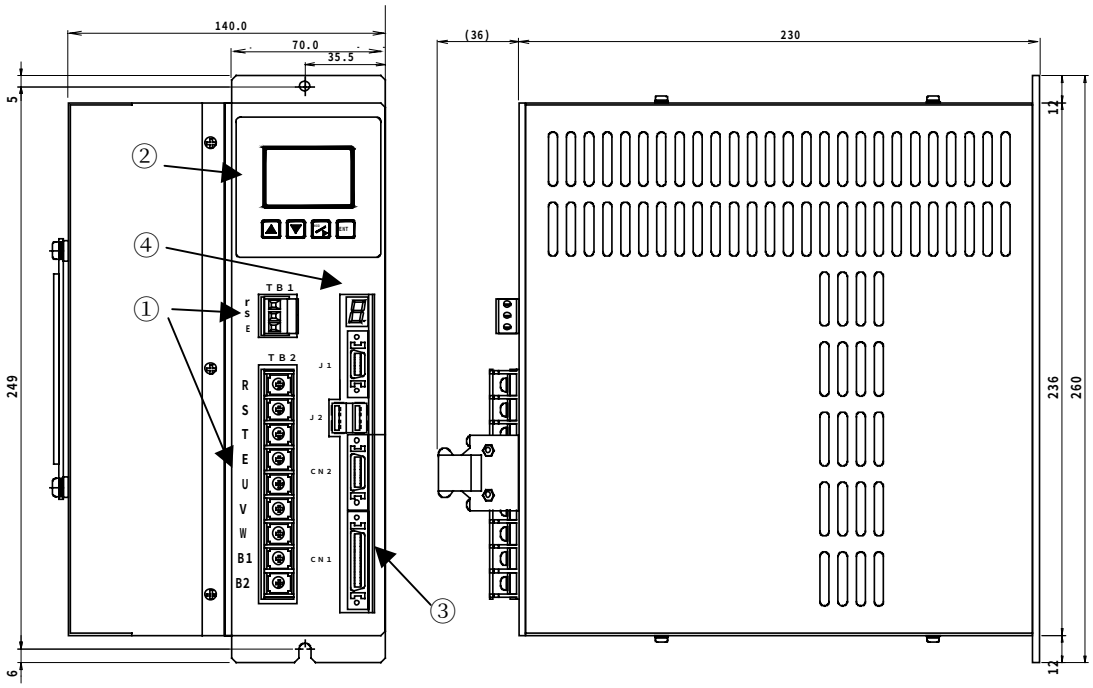
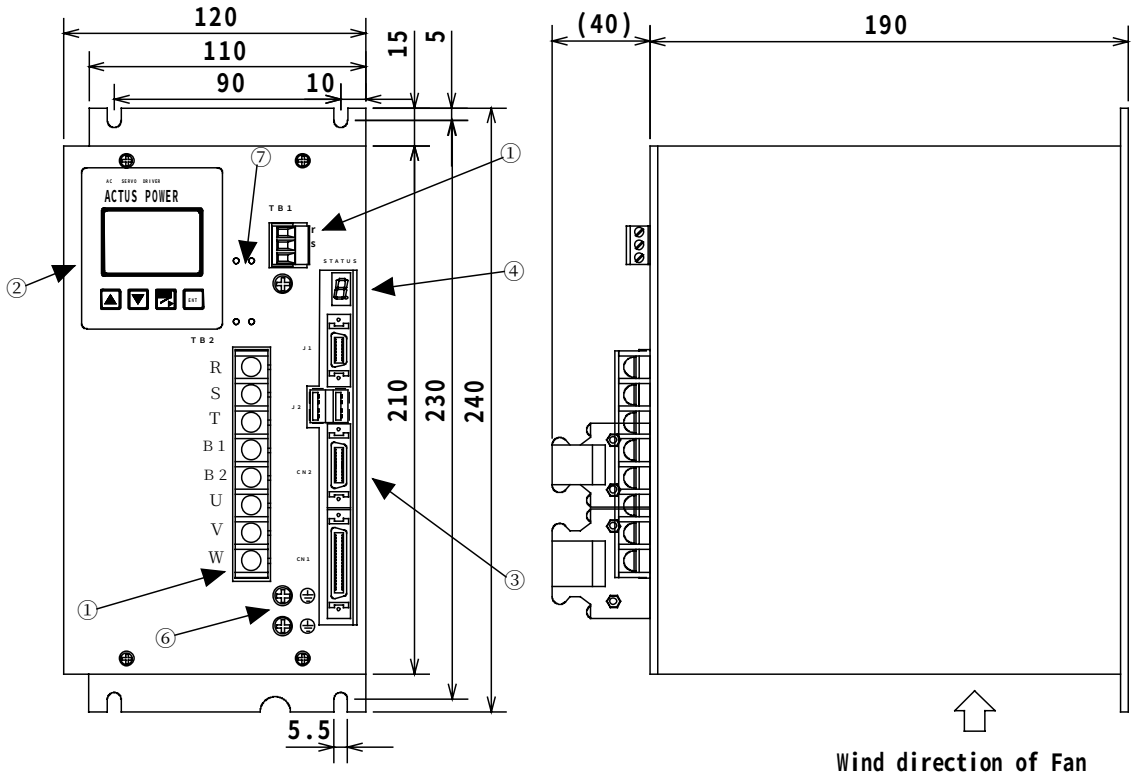
⑤
⑦
③
(36)
160

3－1－4　NCR－＊A＊－１５２／２２２

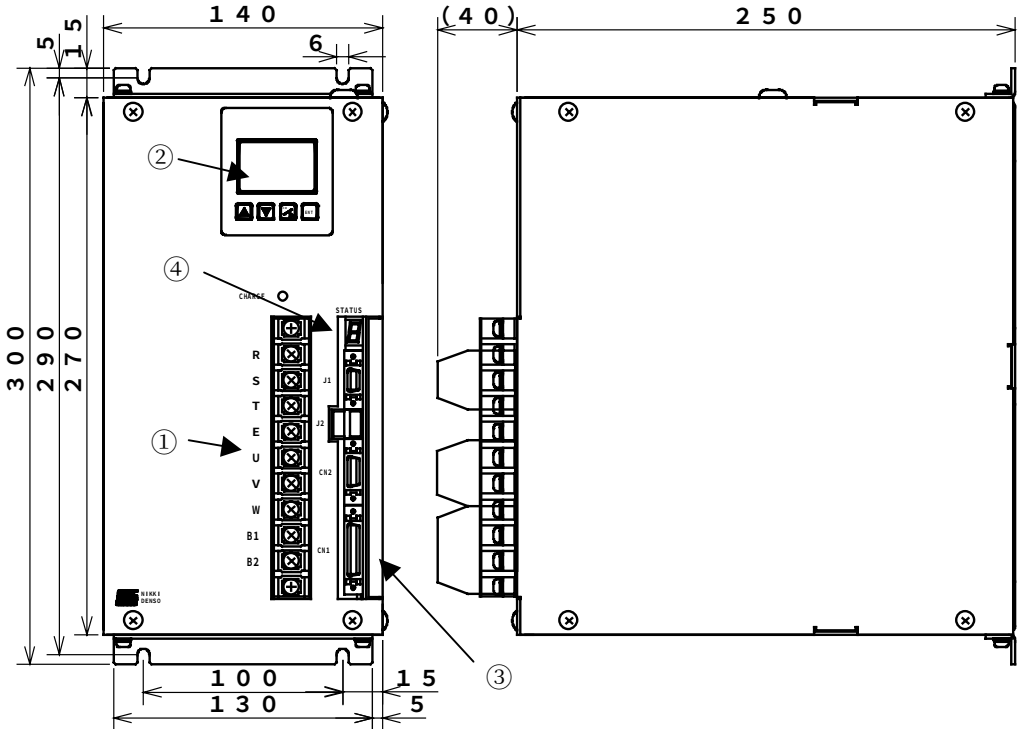


[Design sequence B／C (NCR-DA*0*B-XXX／NCR-DA*0*C-XXX) or before]

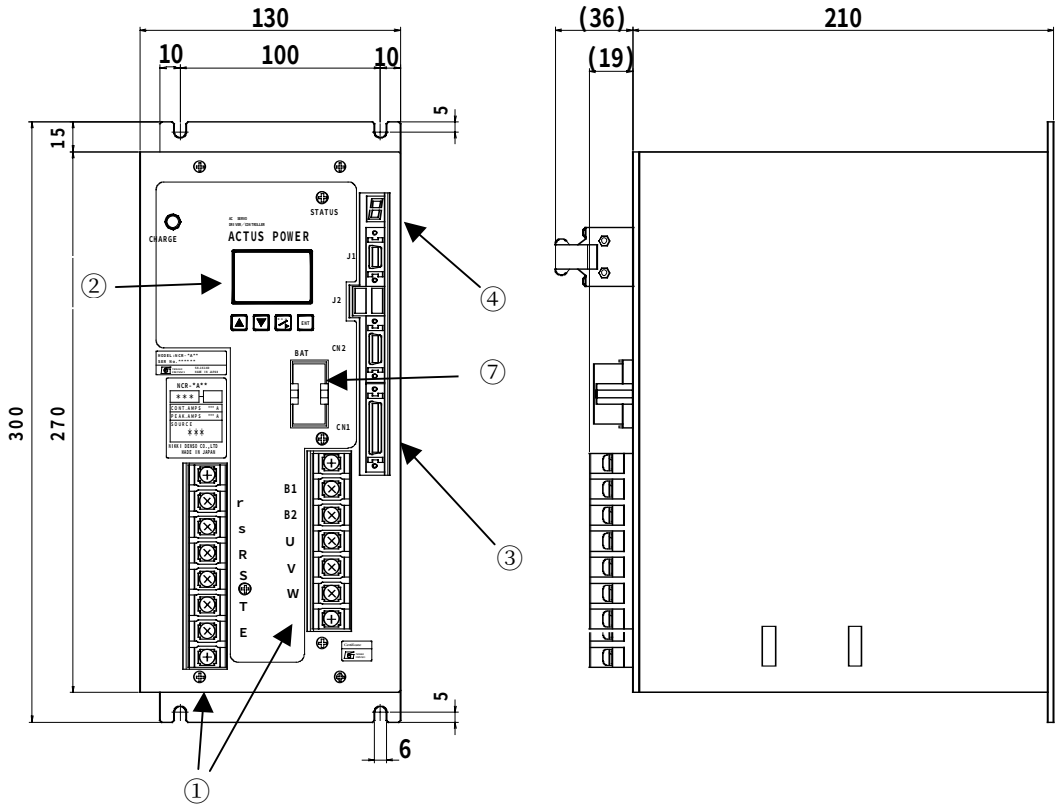


[Design sequence**D**(NCR-DA*0*D-XXX) or higher]

3－1－5　NCR－＊A＊－３０２／４０２

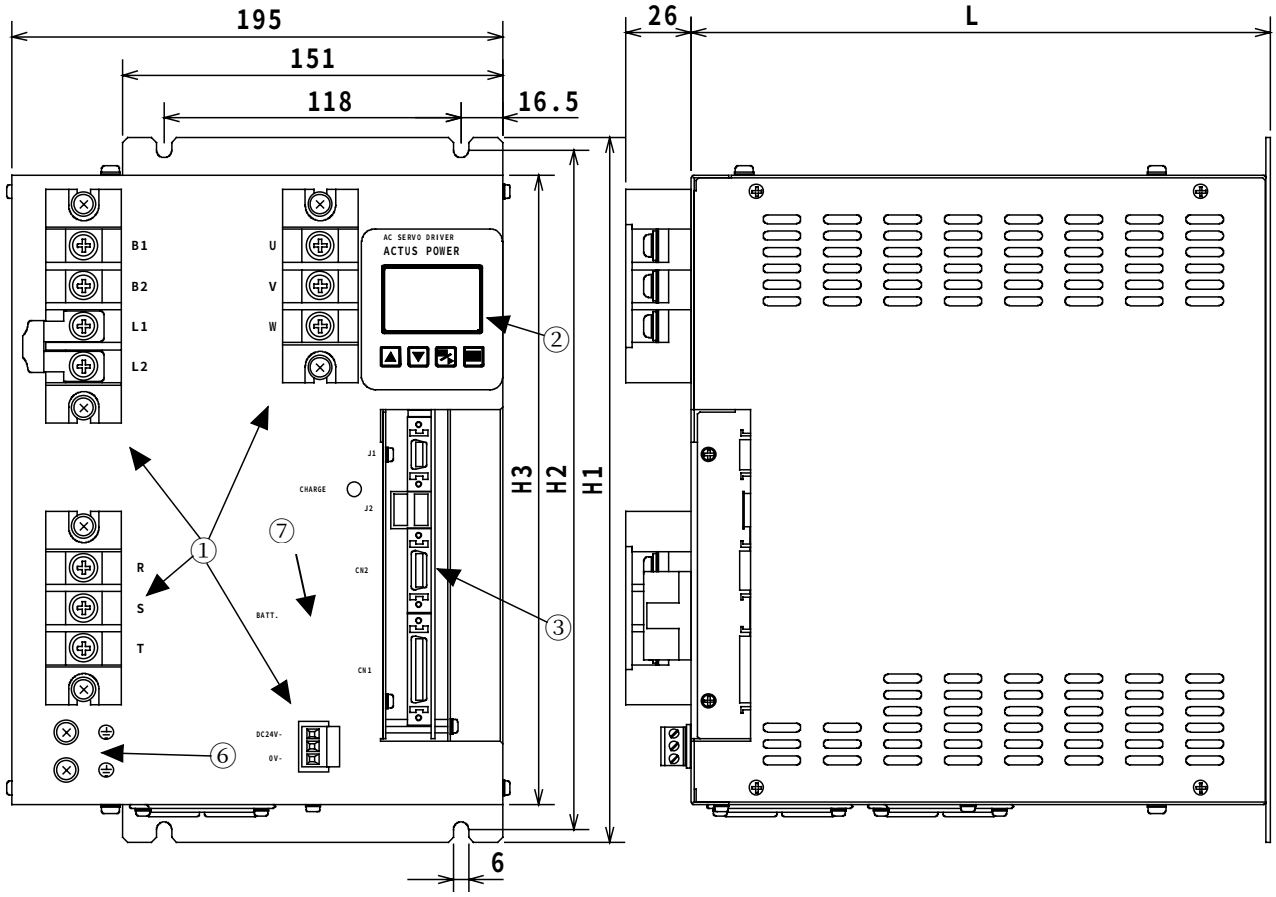


[Design sequence**A**／**B**(NCR-DA*0*A-XXX／NCR-DA*0*B-XXX)]



[Design sequence**C**(NCR-DA*0*C-XXX) or higher]

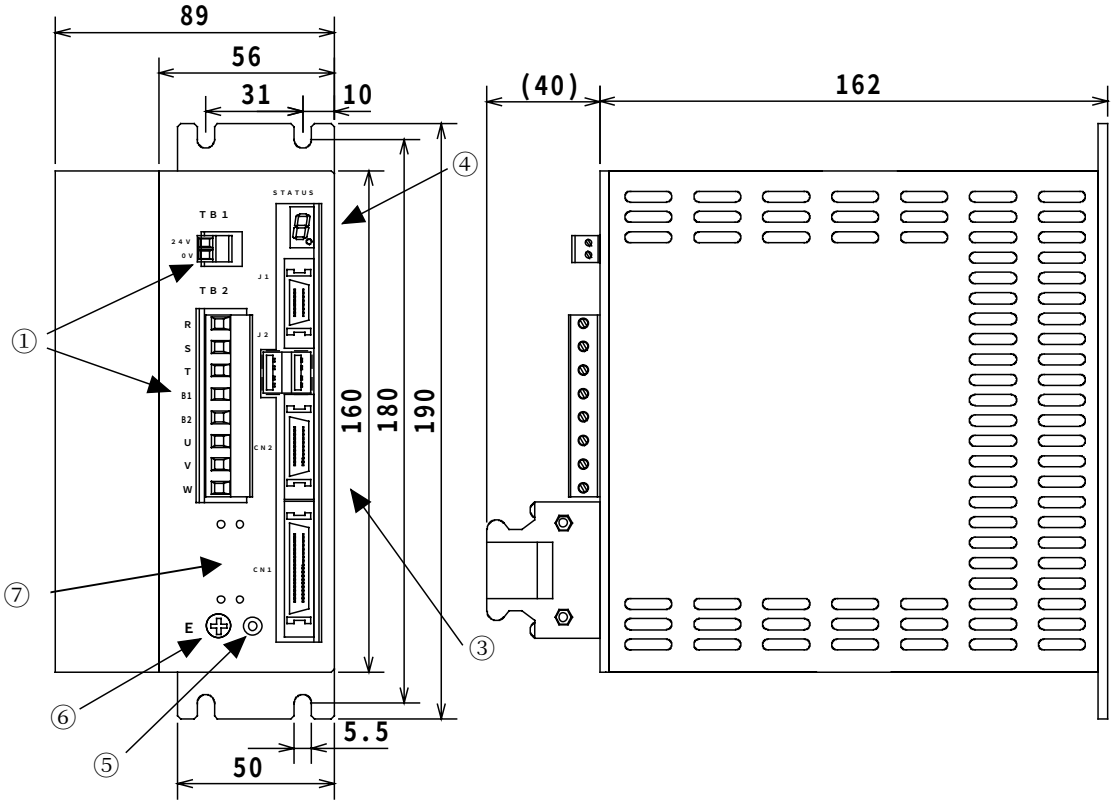
3－1－6　NCR－＊A2（A3）＊－752／113／153



［AC２００／４００Vtype］

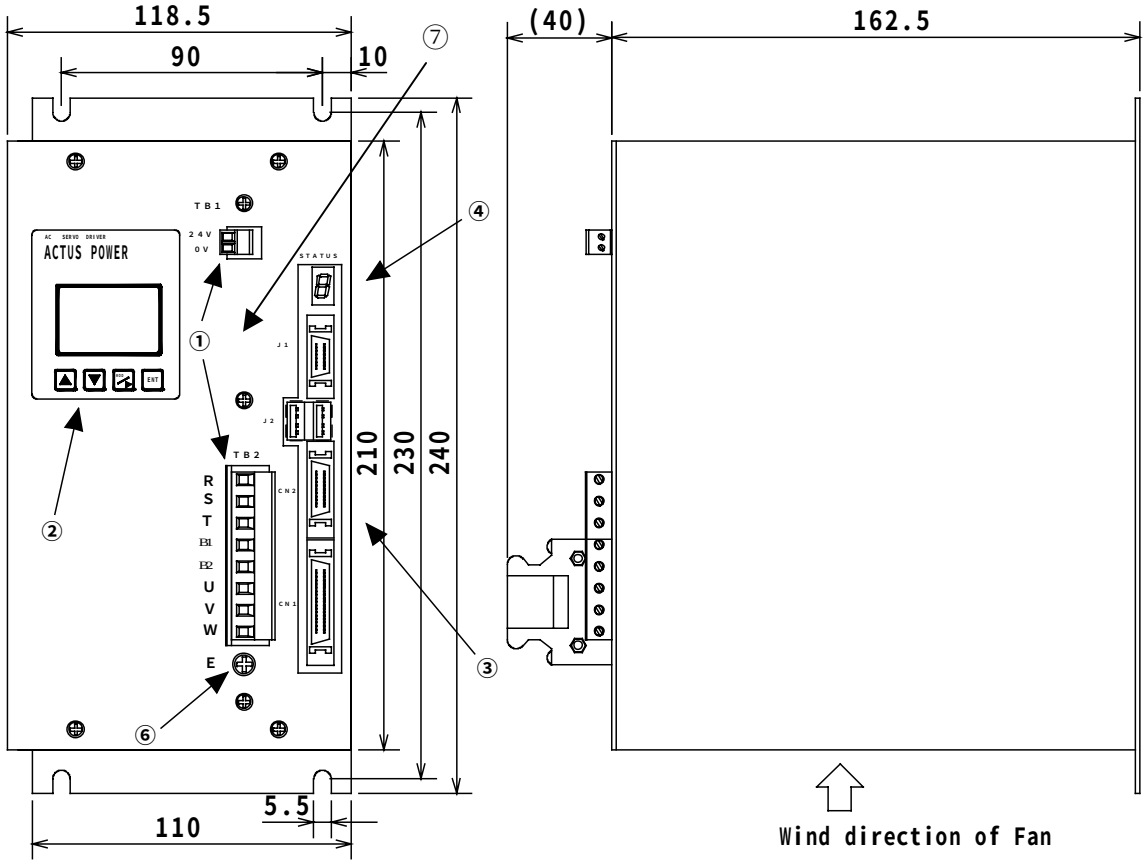
Controller model	L	H1	H2	H3
NCR－＊A2（A3）－752 NCR－＊A2（A3）－113	２２０	２５５	２４５	２２５
NCR－＊A2（A3）－153	２３０	２８０	２７０	２５０

3－1－7　NCR－＊A3－751



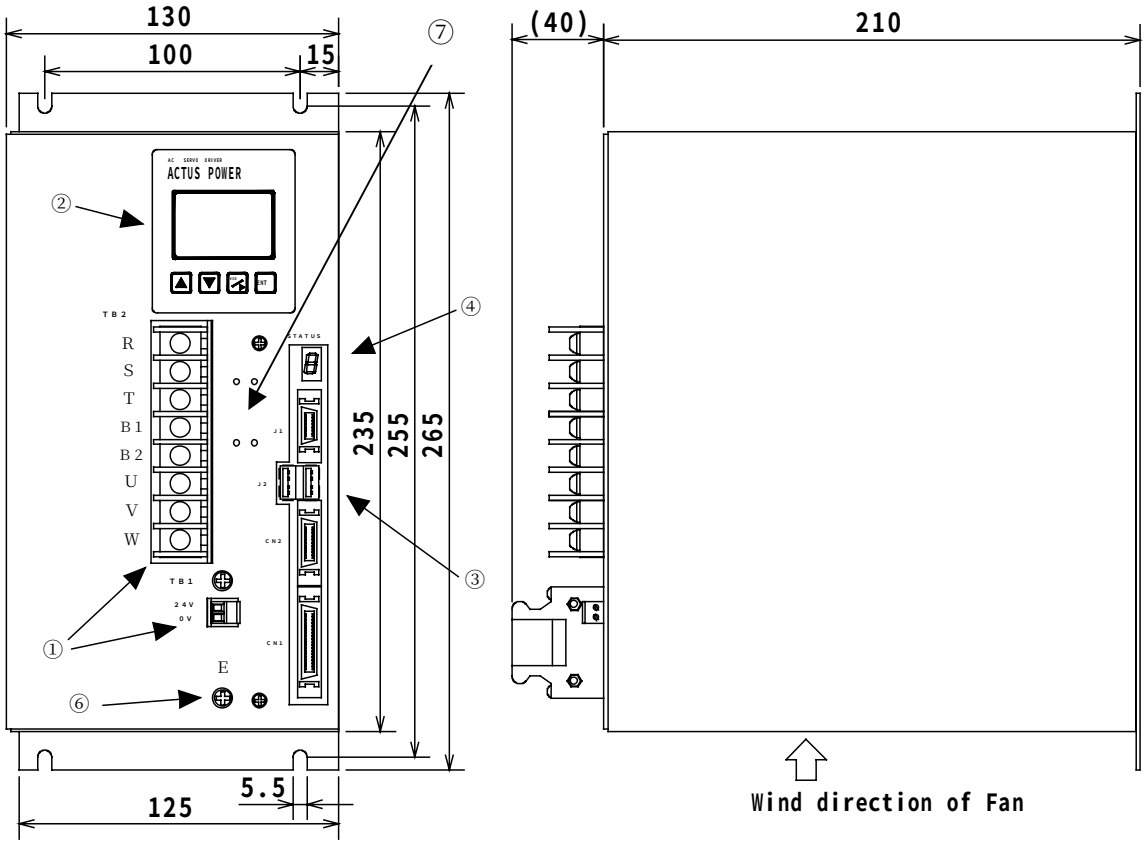
［AC４００Vtype］

3－1－8　NCR－＊A3－262



［AC４００Vtype］

3－1－9　NCR－＊A3－402



［AC４００Vtype］

3－2 Each Component Name and Function

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

(*1) is applied to a type which capacity is 1.5kW or larger.
(*2) For AC400V type device or the device with a such instructions indicated in the body.
(*3) Device with capacity of 750W or higher or the device with a such instructions indicated in the body.

[Tab. 3-1] Controller Name List

Chapter 4 Installation

4－1 Receiving Check of Our Products

Please confirm following points when you receive our products.

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

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

③ If accessories are packed, together.

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

And accessories change depending on a controller type as follows.

【200V system controller and accessory list】

Controller type	Accessory	
	Type	Q'ty
NCR-*2*-101 Capacity ：0.1kW	Control power connector [XW4B-03C1-H1] Main power input/ power line output connector [XW4B-10C1-H1]	1 1
NCR-*2*-201 Capacity ：0.2kW	Control power connector [XW4B-03C1-H1] Main power input/ power line output connector [XW4B-10C1-H1]	1 1
NCR-*2*-401 Capacity ：0.4kW	Control power connector [XW4B-03C1-H1] Main power input/ power line output connector [XW4B－10C1－H1]	1 1
NCR-*2*-801 Capacity ：0.8kW	Cement resistor [CAN60UT 82 OHM J] Thermostat [1NT01L0857L90-10] Thermostat attachment plate Control power connector [XW4B-03C1-H1] Main power input/ power line output connector [XW4B-10C1-H1]	1 1 1 1 1
NCR-*2*-152 Capacity ：1.5kW	Cement resistor [CAN200UT 39 OHM J] Thermostat [1NT01L0857L90-10] Thermostat attachment plate Control power connector [XW4B-03C1-H1]	1 1 1 1
NCR-*2*-222 Capacity ：2.2kW	Cement resistor [CAN200UT 39(24)OHM J] *1 Thermostat [1NT01L0857L90-10] Thermostat attachment plate Control power connector [XW4B-03C1-H1]	1 1 1 1
NCR-*2*-302 Capacity ：3.0kW	Cement resistor [CAN400UR 20 OHM J] Thermostat [1NT01L0857L90-10] Thermostat attachment plate	1 1 1
NCR-*2*-402 Capacity ：4.0kW	Cement resistor [CAN400UR 20 OHM J] Thermostat [1NT01L0857L90-10] Thermostat attachment plate	1 1 1
NCR-*2*-752 Capacity ：7.5kW	Enamel resistor [RGH-300G-0S30J] Thermostat [5003-L-130°CB-1] Thermostat attachment band Control power connector [XW4B-03C1-H1]	3 1 1 1

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

*1: 24 ohm J to be used for design sequence D or higher.

【200V system controller and accessory list】

Controller type	Accessory	
	Type	Q'ty
NCR-*2*-113 Capacity : 11kW	Enamel resistor [RGH500G-0S22J] Thermostat [5003-L-130°CB-1] Thermostat attachment band Control power connector [XW4B-03C1-H1]	3 1 1 1
NCR-*2*-153 Capacity : 15kW	Enamel resistor [RGH500G-0S22J] Thermostat [5003-L-130°CB-1] Thermostat attachment band Control power connector [XW4B-03C1-H1]	4 1 1 1

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

【100V system controller and accessory list】

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

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

【400V system controller and accessory list】

Controller type	Accessory	
	Type	Q'ty
NCR-*3*-751 Capacity : 0.75kW	Cement resistor [CAN60UT 200 OHM J] Thermostat [1NT01L0857L90-10] Thermostat attachment plate Control power connector [XW4B-02B1-H1] Main power input/ power line output connector [GMSTB2.5/8-ST]	1 1 1 1 1
NCR-*3*-262 Capacity : 2.6Kw	Cement resistor [CAN200UT 100 OHM J] Thermostat [1NT01L0857L90-10] Thermostat attachment plate Control power connector [XW4B-02B1-H1] Main power input/ power line output connector [GMSTB2.5/8-ST]	1 1 1 1 1
NCR-*3*-402 Capacity : 4.0Kw	Cement resistor [CAN400UR 51 OHM J] Thermostat [1NT01L0857L90-10] Thermostat attachment plate Control power connector [XW4B-02B1-H1]	1 1 1 1
NCR-*3*-113 Capacity : 11Kw	Enamel resistor [RGH-500-0S82J] Thermostat [5003-L-130°CB-1] Thermostat attachment band Control power connector [XW4B-03C1-H1]	3 1 1 1

NCR-*3*-153 Capacity : 15kW	Enamel resistor [RGH-500-0S82J] Thermostat [5003-L-130°CB-1] Thermostat attachment band Control power connector [XW4B-03C1-H1]	4 1 1 1

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

⚠ Caution

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

4－2 Installation Conditions

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

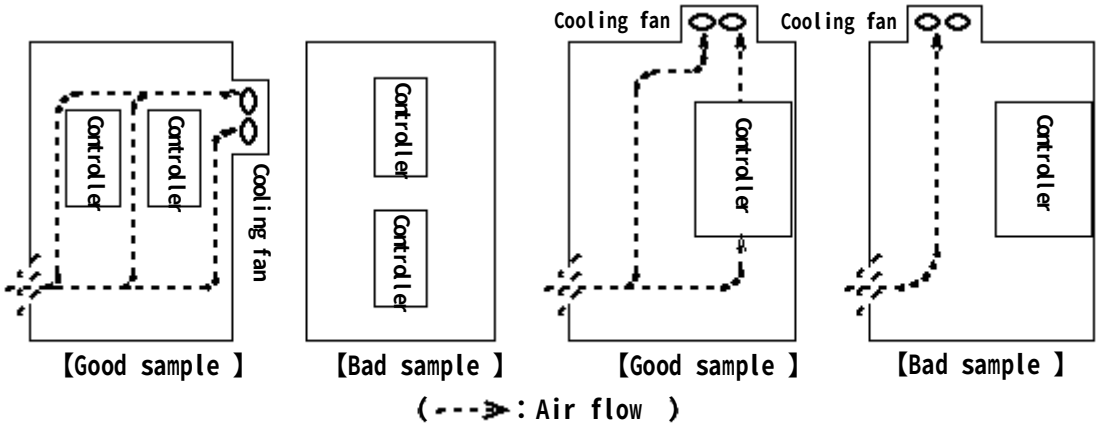
(2) Considering temperature raise by generation loss of equipment and a controller in the control cabinet, keep the temperature around the controller lower than specified allowable range. And heat energy loss of a controller is about 7%＋50W of a motor capacity.

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

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

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

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

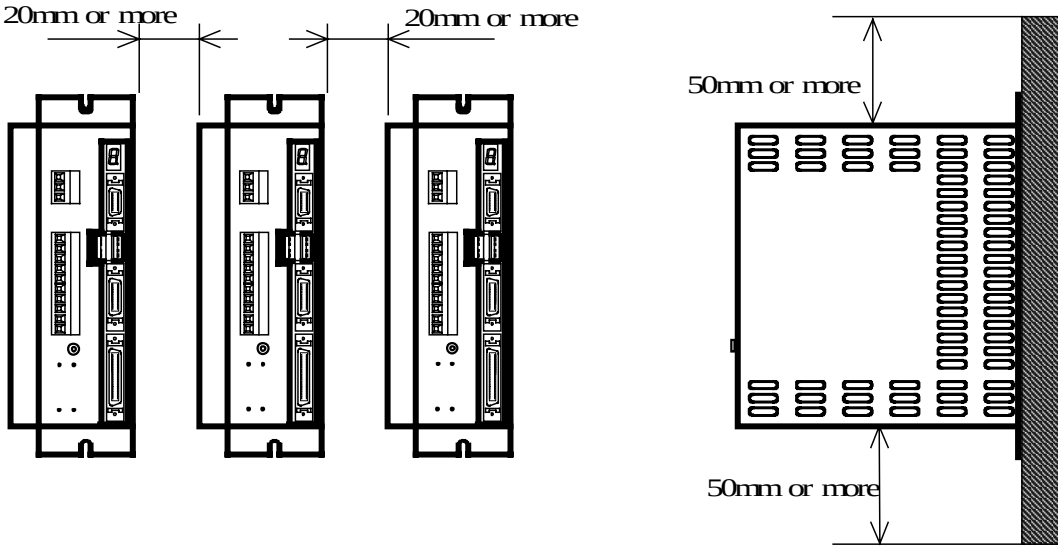


[Figure 4-1] Fan location sample to install plural controllers

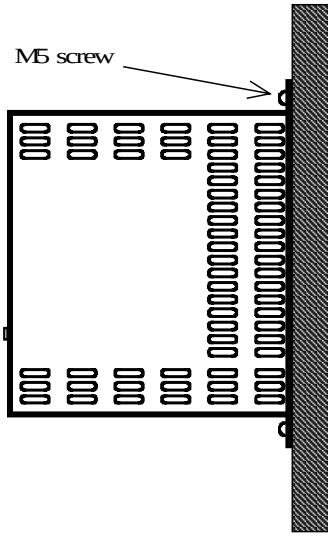
4－3 Installation Method

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

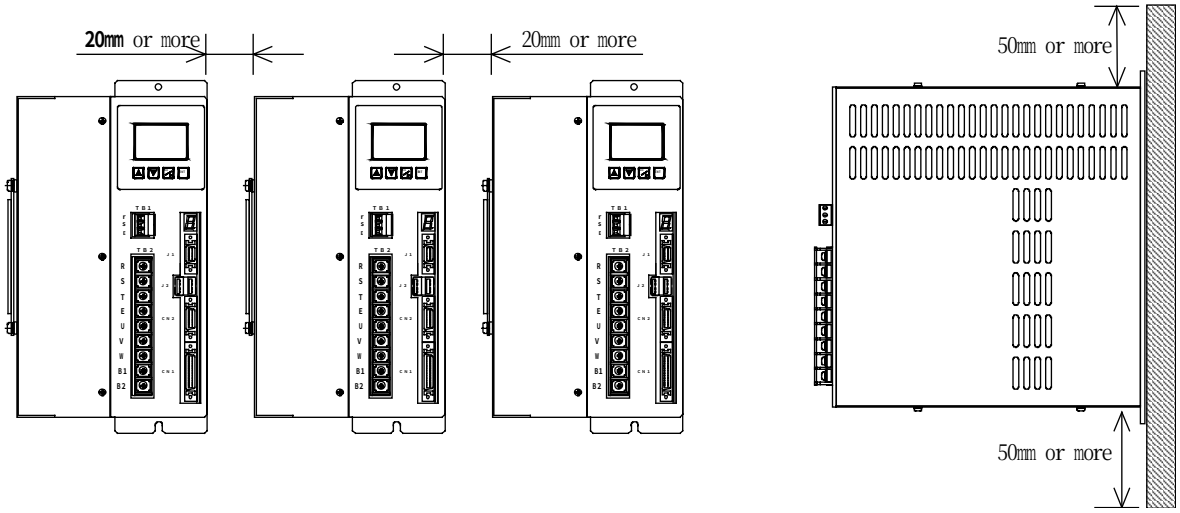
(2) In the points of radiation and maintenance, keep a specified vertical and horizontal distance (distance to other units, parts, and control console walls) to a controller, referring to [Figure 4-2] and [Figure 4-4]



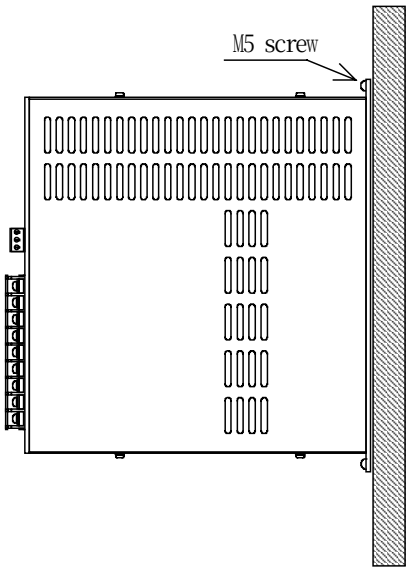
[Figure 4-2] Installation and Ventilation of VC controller 800W or less



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



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



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

Chapter 5 Wiring

5－1 Power Source Wiring

1. AC input power source wiring

(1) AC input power source is as follows.

NCR-*A*A1*	Main power	AC90～121V, 50/60Hz Single Phase power
	Control power	AC90～121V, 50/60Hz Single Phase power
NCR-*A*A2*	Main power	AC180～242V, 50/60Hz 3 Phase power
	Control power	AC180～242V, 50/60Hz Single Phase power
NCR-*A*A3*	Main power	AC360～484V, 50/60Hz 3 Phase power
	Control power	AC360～484V, 50/60Hz Single Phase 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.

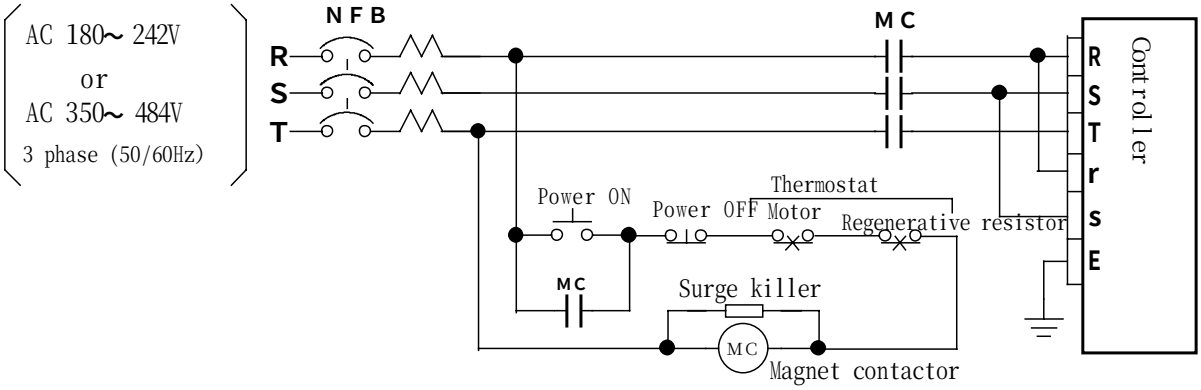
(3) Since main circuits are a capacitor input type, rush current will flow when power is turned on. Depending on power source capacity or impedance, large voltage drop may occur, therefore, apply a sufficiently large capacity power source, and cables.

(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.

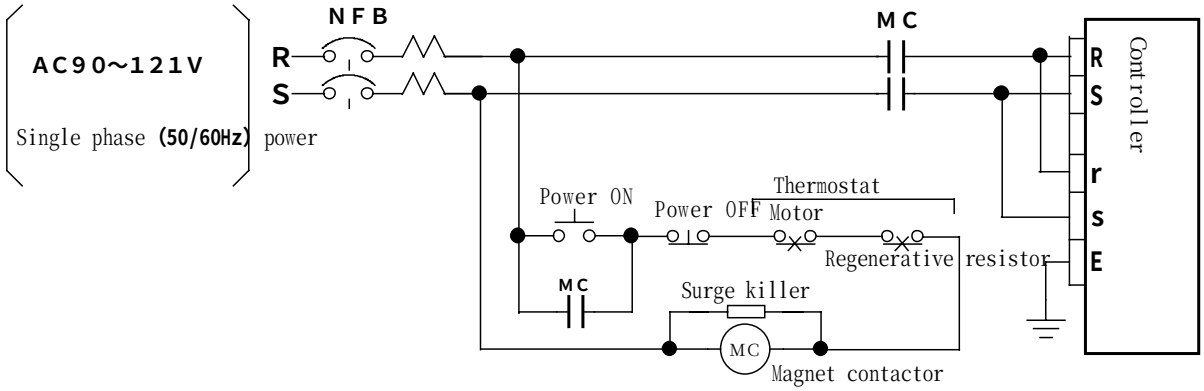
⚠ Caution
Do not make wrong connection of AC power source (R,S,T,E) to motor connection terminals (U,V,W,E) of the controller. If wrong wiring is made, the controller will be damaged.

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

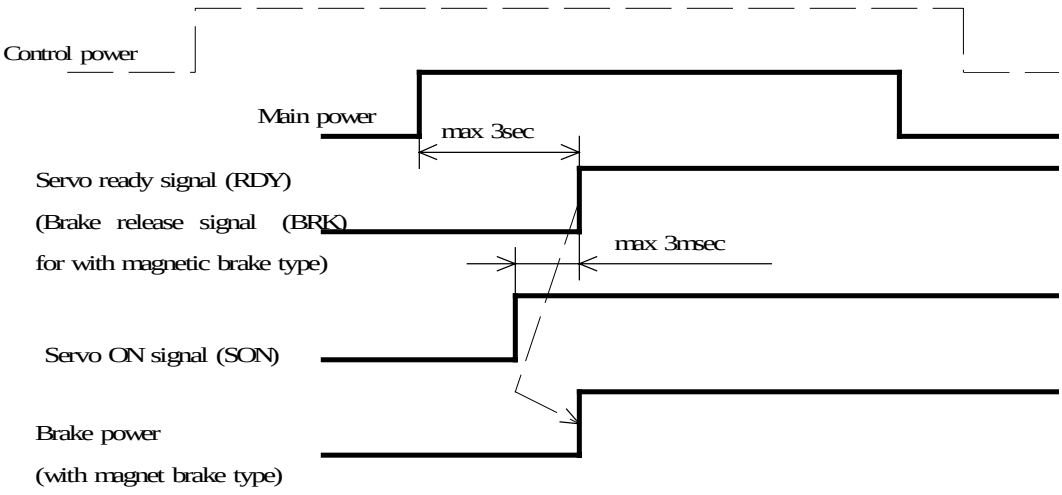
⚠ Caution

- 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.

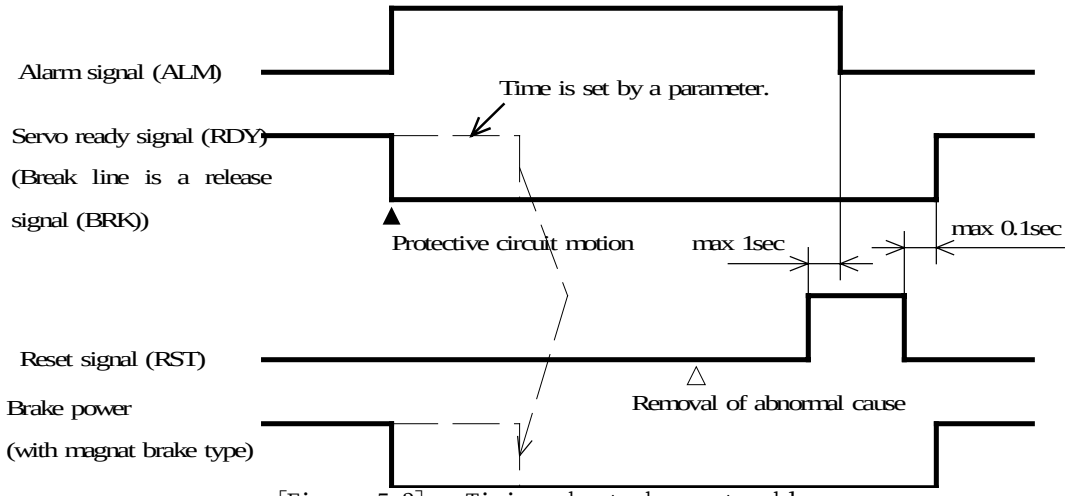
3. Power supply sequence

(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 (12-1 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.

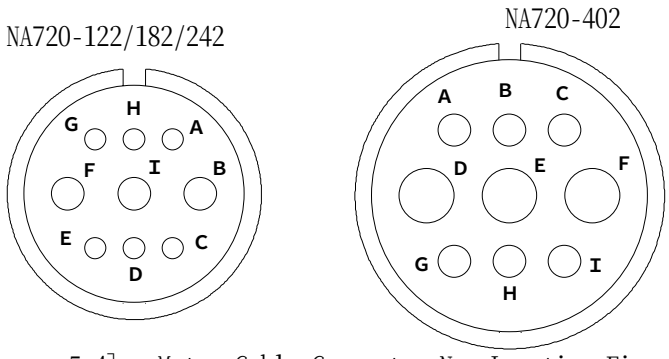
(2) Motor connecting terminals (U,V,W,E) of synchronous type NA720-122/182/242/402 are cannon plug type (male).The wiring side cannon plug shall be provided by customer side or our optional unit. The wiring side cannon plug types (female) are shown in the below tabulation. And motor connector No. and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

BAMKS：Motor type equipped with brake

		NA720-122/182/242 (BAMKS)	NA720-402(BAMKS)
Motor side cannon plug		MS3102A20-18P	MS3102A24-11P
Option	Wiring side	MS3106B20-18S(straight)	MS3106B24-11S(straight)
	Cable clamp	MS3057-12A	MS3057-16A

※ An angle type is optional.

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



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

Pin NO.	NA720-122/182/242(BAMKS)	NA720-402(BAMKS)
A		(Brake)
B	W Phase	(Brake)
C		
D		U Phase
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.

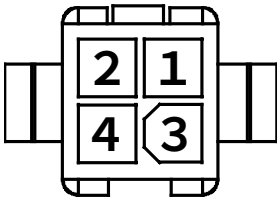
[Tab.5-2] Connector Wiring Tab.

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

Motor type	Rated voltage [V]	Power consumption [W]
NA720-122/182/242 BAMKS	DC 24	20
NA720-402BAMKS	DC 24	33

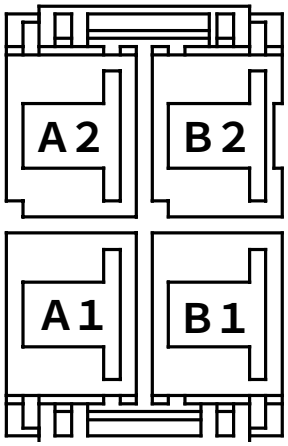
[Tab.5-3] Specification of brake power

(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		

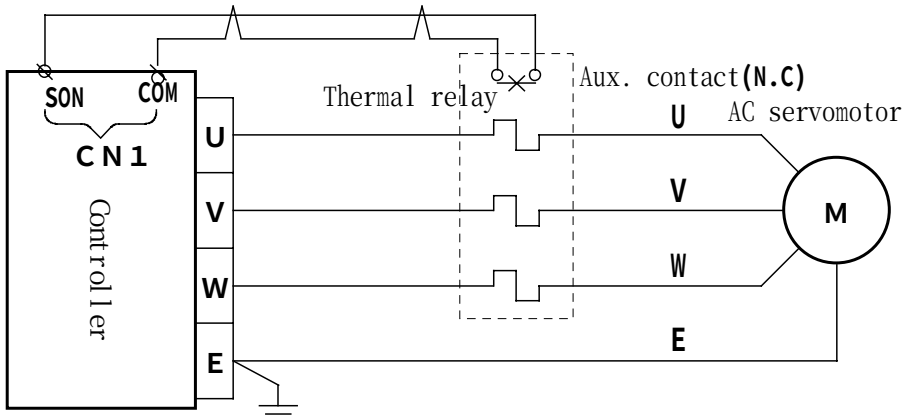
Pin No.	Signal name
B1	U
B2	V
A1	W
A2	E

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

(4) Do not connect a magnet switch or a no-fuse breaker between a controller and a motor.
(5) 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.
(6) 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] .)
(7) For motor over-heat protection. a thermostat (normal close contact) is installed in NA100seriesand NA720-552～223.
Referring to [Figure 5-1] , make wiring to shut main power OFF when the contact opens.
Thermostat contact specification is as follows.

Contact voltage	Contact current (Max. / Min.)
DC 24V	2A／0.05A
AC 240V	1A／0.05A

[Tab. 5-6] Thermostat contact specification



[Figure 5-5] Motor wiring

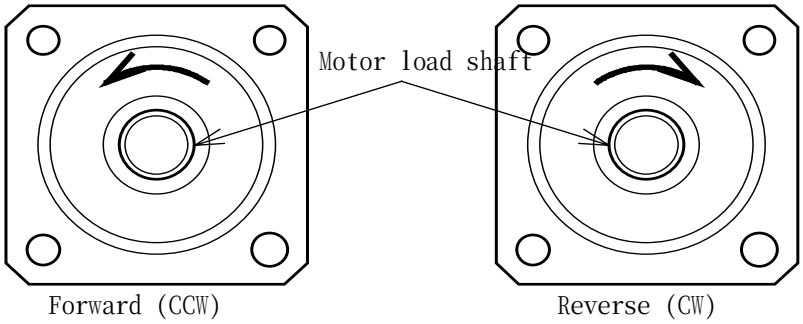
⚠ Caution

● 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

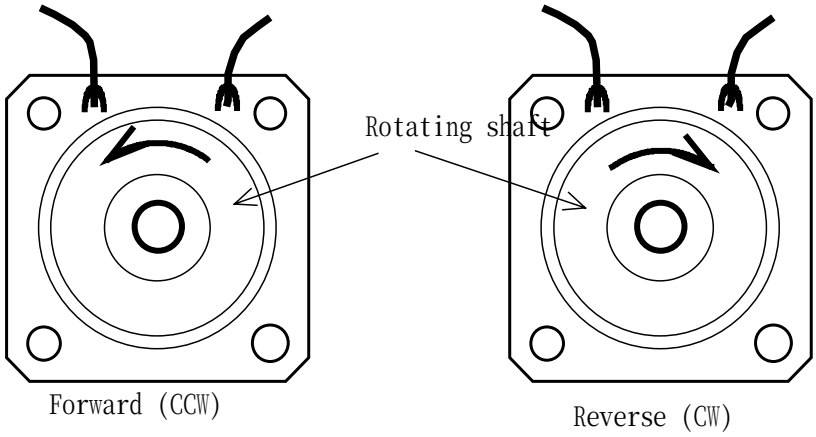


[Figure 5-6] Running motor direction

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
Directional pulse command	Forward	Shaft rotates CCW, viewing to motor load shaft : Forward
	Reverse	Shaft rotates CW, viewing to motor load shaft : Reverse
90° different phase pulse train command	B Phase ahead	Shaft rotates CCW, viewing to motor load shaft : Forward
	A Phase ahead	Shaft rotates CW, viewing to motor load shaft : Reverse

[Tab. 5-7] Each command input and motor rotating direction (in running)

② Disc motor running direction

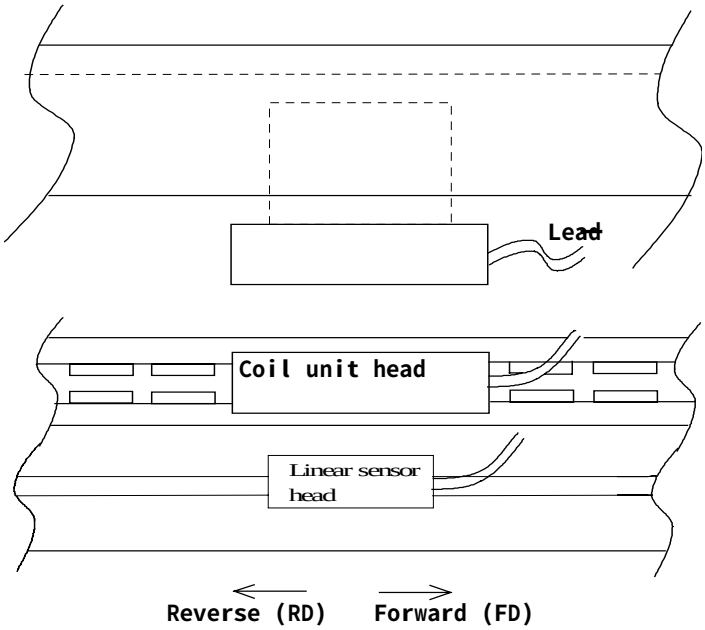


[Figure 5-7] Disc motor running direction

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
Directional pulse command	Forward	Shaft rotates CCW, viewing to motor load shaft : Forward
	Reverse	Shaft rotates CW, viewing to rotating shaft : Reverse
90° different phase pulse train command	B Phase ahead	Shaft rotates CCW, viewing to rotating shaft : Forward
	A Phase ahead	Shaft rotates CW, viewing to rotating shaft : Reverse

[Tab. 5-8] 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)
Directional pulse command	Forward	Forward travel (FD)
	Reverse	Reverse travel (RD)
90 ° different phase pulse train command	B Phase ahead	Forward travel (FD)
	A Phase ahead	Reverse travel (RD)

[Tab.5-9] 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.

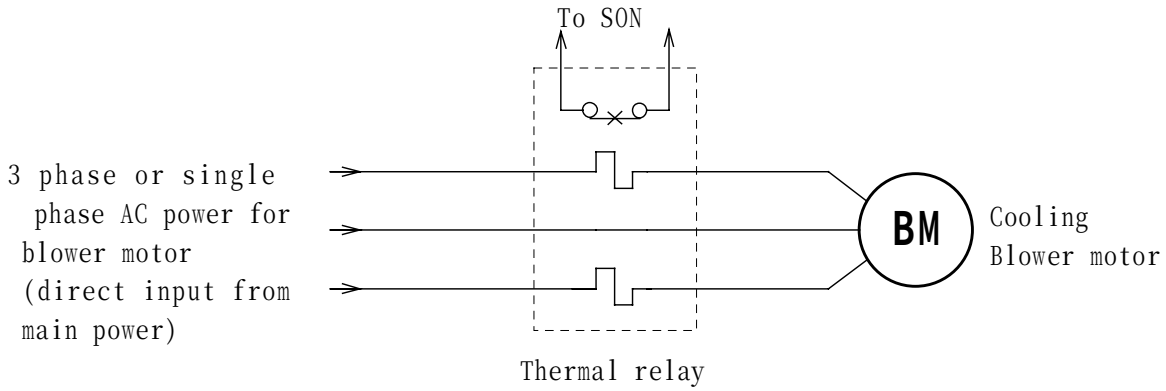
To run a motor opposite direction to positive voltage command or forward command (pulse train), in the standard connection, set ' REVERSE ' to the parameter [P300 : Rotating direction selection] . Factory set is ' FORWARD ' .

※ Motor running direction to a command input polarity is valid at same he time when all the command input styles are set by parameters. Individual running direction setting to Speed command and Pulse train command can not be conducted.

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.



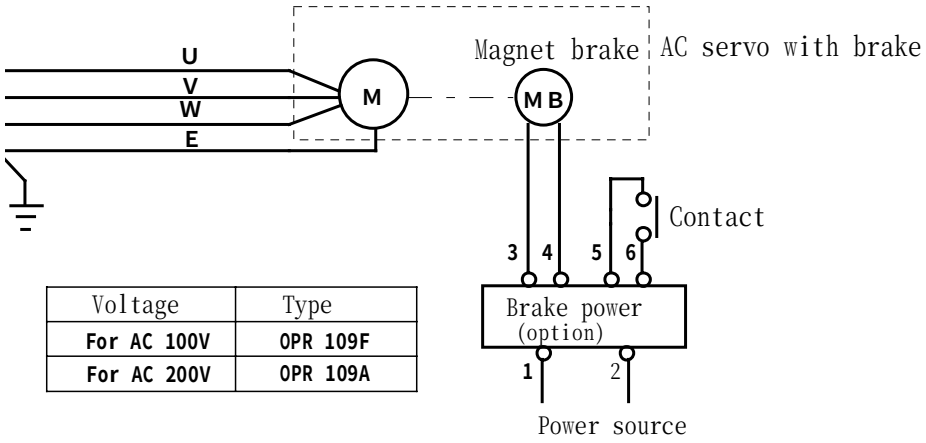
[Figure5-9] Wiring of cooling blower motor

⚠ 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.

5－3 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 Ωor 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 Ωor 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..

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 (GD^2) 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] .

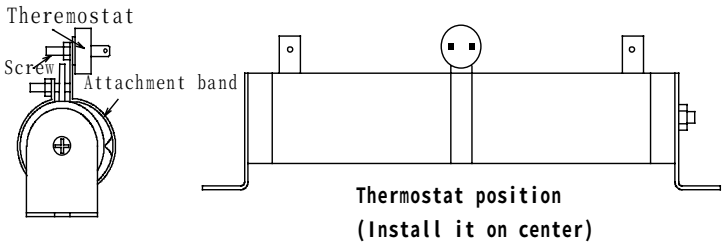
(4) In case of using plural Regenerative resistors, comply with description of (12-2-1 Combination of Regenerative resistor).

(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.

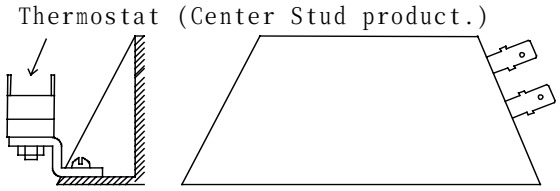
⚠ Caution

● 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. 5-10] .
※ 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 or larger twist pair shield cable, 3 m or less
	Pulse train command	FC/FC*, RC/RC*	Line driver method : AWG28 or larger twist pair shield cable, 3 m or less Open collector method : AWG28 or larger twist pair shield cable, 1.5 m or less
	Encoder pulse output	EA/EA*,EB/EB* EM/EM*,GND	AWG28 or larger twist pair shield cable, 3 m or less (0.5mm^2 or larger for GND)
	Encoder feedback Pulse input	A/A*,B/B* Z/Z* (EP5,GND)	0.2mm^2 or larger twist pair shield cable 0.5mm^2 or larger for EP5,GND Length: 50m or less
	Other control I/O		AWG28 or larger twist pair shield cable, 3 m or less (0.5mm^2 or larger for +24V,COM)

[Tab. 5-10(a)] Applicable Cable 1/3

Unit : mm^2

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

Unit : mm^2

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

Unit : mm^2

	Item	Terminal	NCR-*A*A2*-152	NCR-*A*A2*-222	NCR-*A*A2*-302	NCR-*A*A2*-402	NCR-*A*A2*-752	
Main circuit	AC input power, ground	R,S,T,E	2	2	2	3.5	8	
	Control AC input power, ground	r,s	0.75	0.75	0.75	0.75	0.75	
	Motor	U,V,W	2	2	2	3.5	14	
	Cooling blower motor	u,v,w	0.75	0.75	0.75	0.75	0.75	
	Regenerative resistor	B1,B2	2	2	2	3.5	3.5	

Unit : mm^2

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

[Tab. 5-10(b)] Applicable Cable 2/3

Unit : mm^2

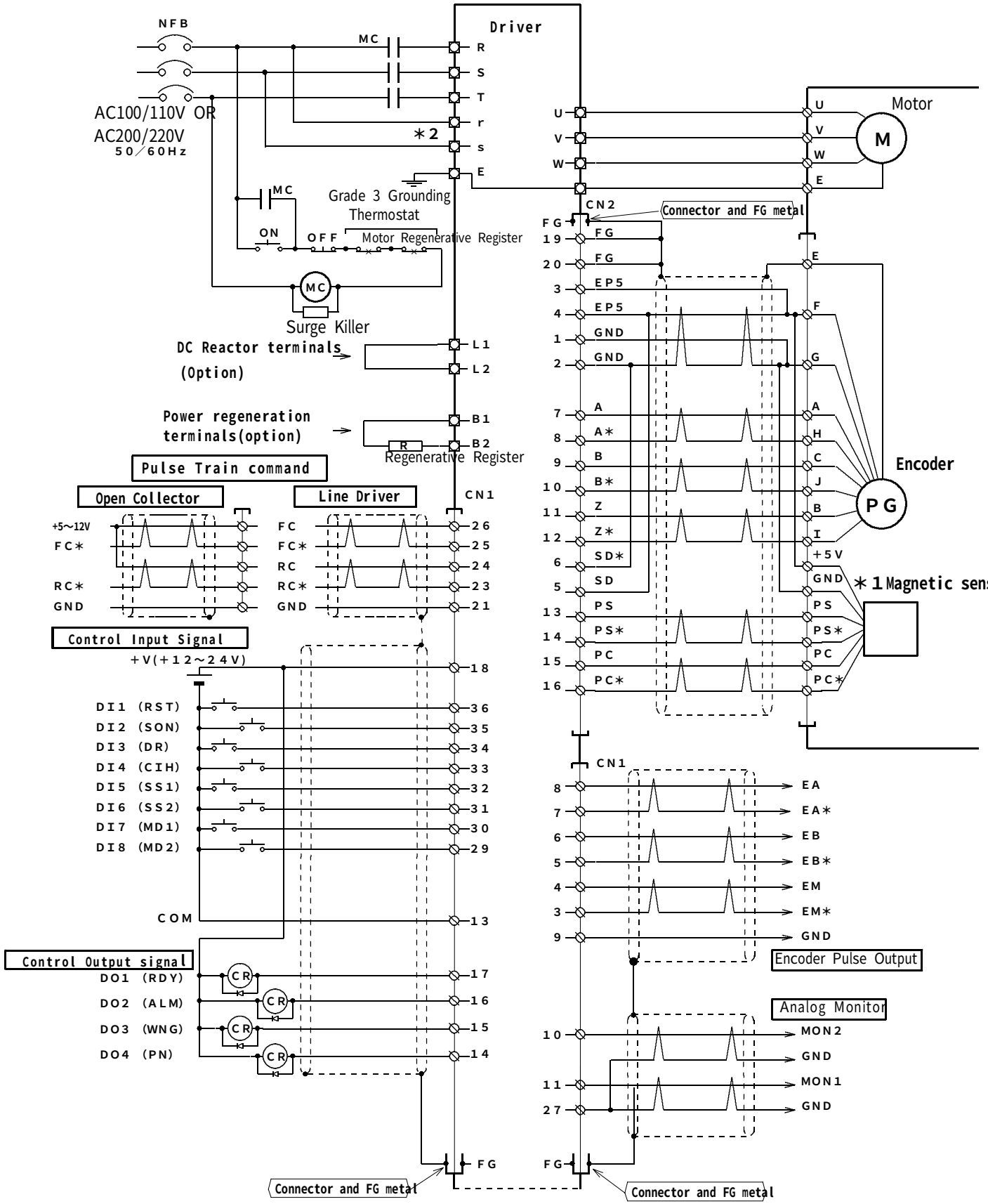
	Item	Terminal	NCR-*A*A3*-113	NCR-*A*A3*-153	NCR-*A*A3*-223	NCR-*A*A3*-303	NCR-*A*A3*-373	NCR-*A*A3*-553
Main circuit	AC input power, ground	R,S,T,E	5.5	5.5	14	14	22	50
	Control AC input power, ground	r,s	0.75	0.75	0.75	0.75	0.75	0.75
	Motor	U,V,W	8	8	22	22	30	60
	Cooling blower motor	u,v,w	0.75	0.75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

Unit : mm^2

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

[Tab. 5-10(c)] Applicable Cable 3/3

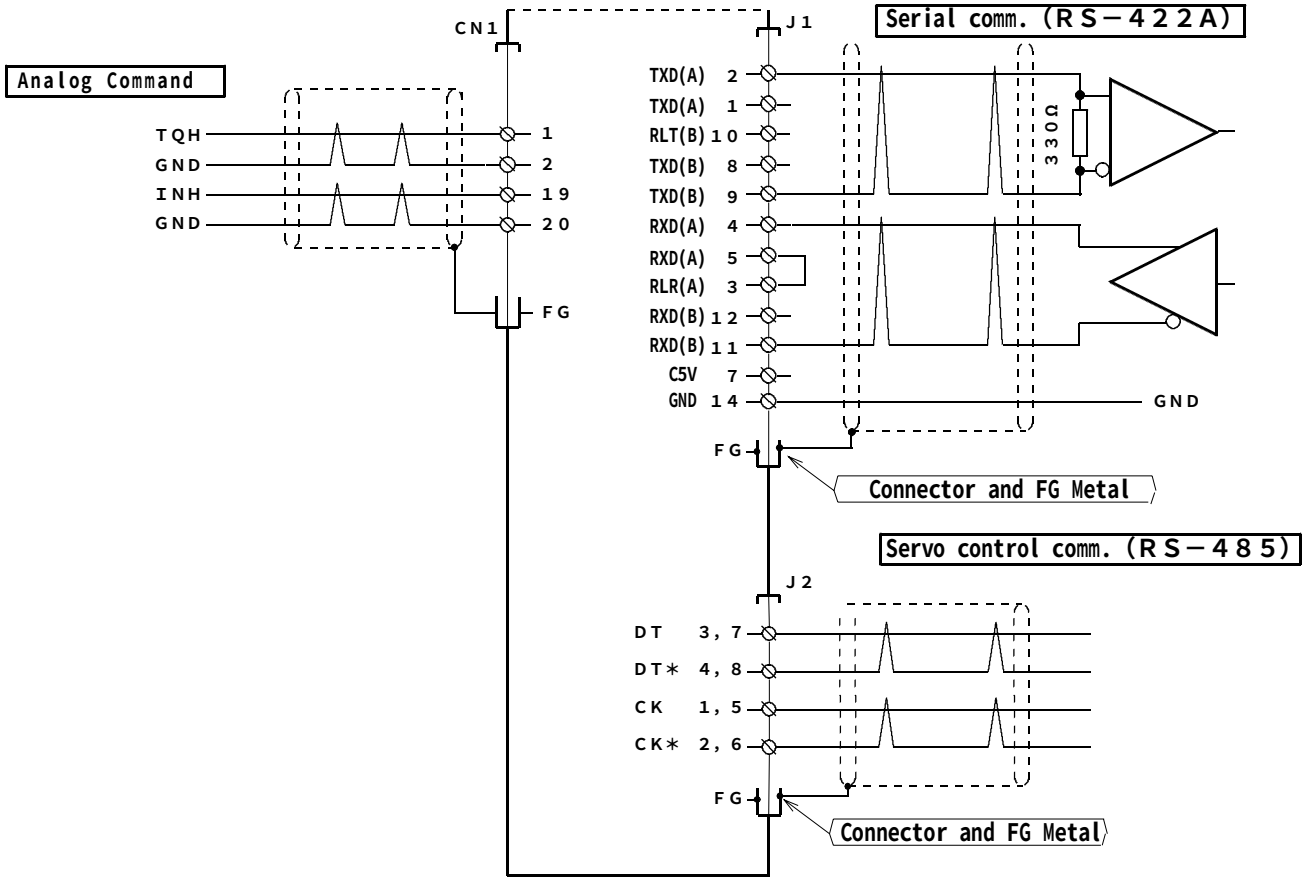
6－1 External Wiring Diagram



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

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

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



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

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

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

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

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

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

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

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

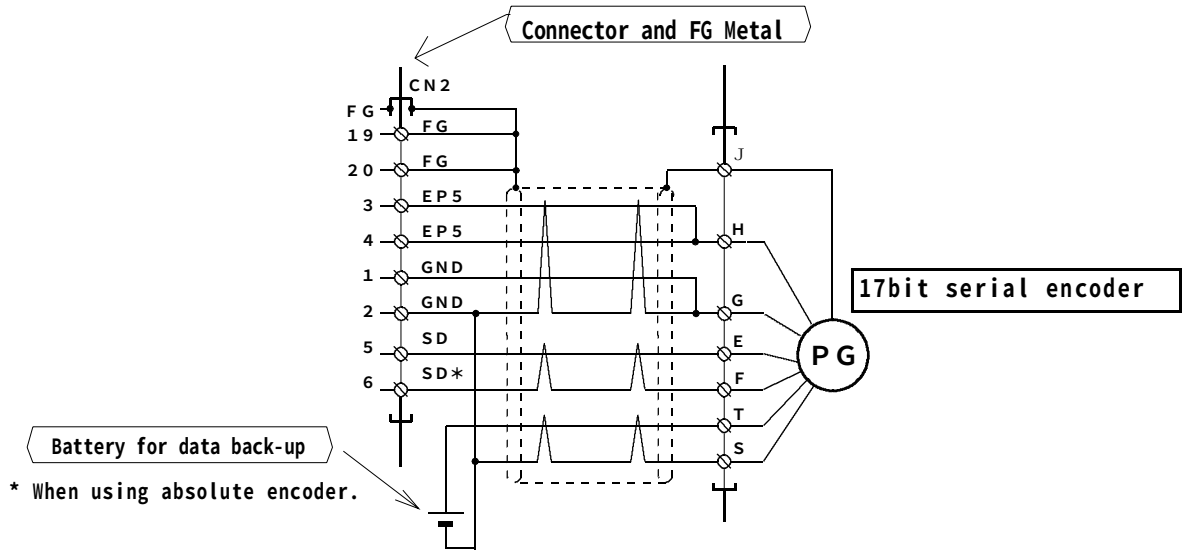
Note 9: () in a signal I/O name,is initial setting value of parameter.

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

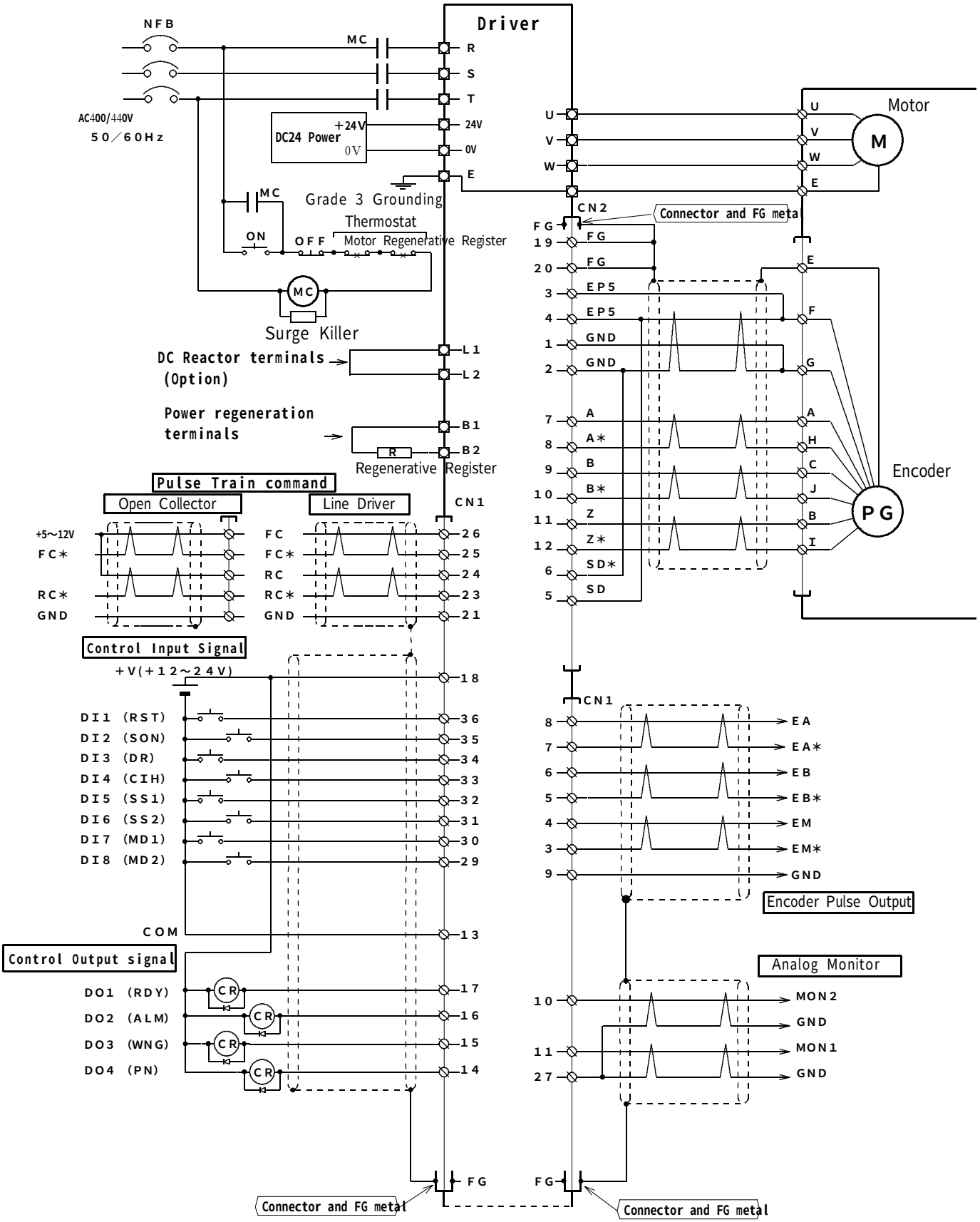
Note 11: DC reactor connection terminal is available for the device capacity 752 or higher
(DC reactor is option)

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

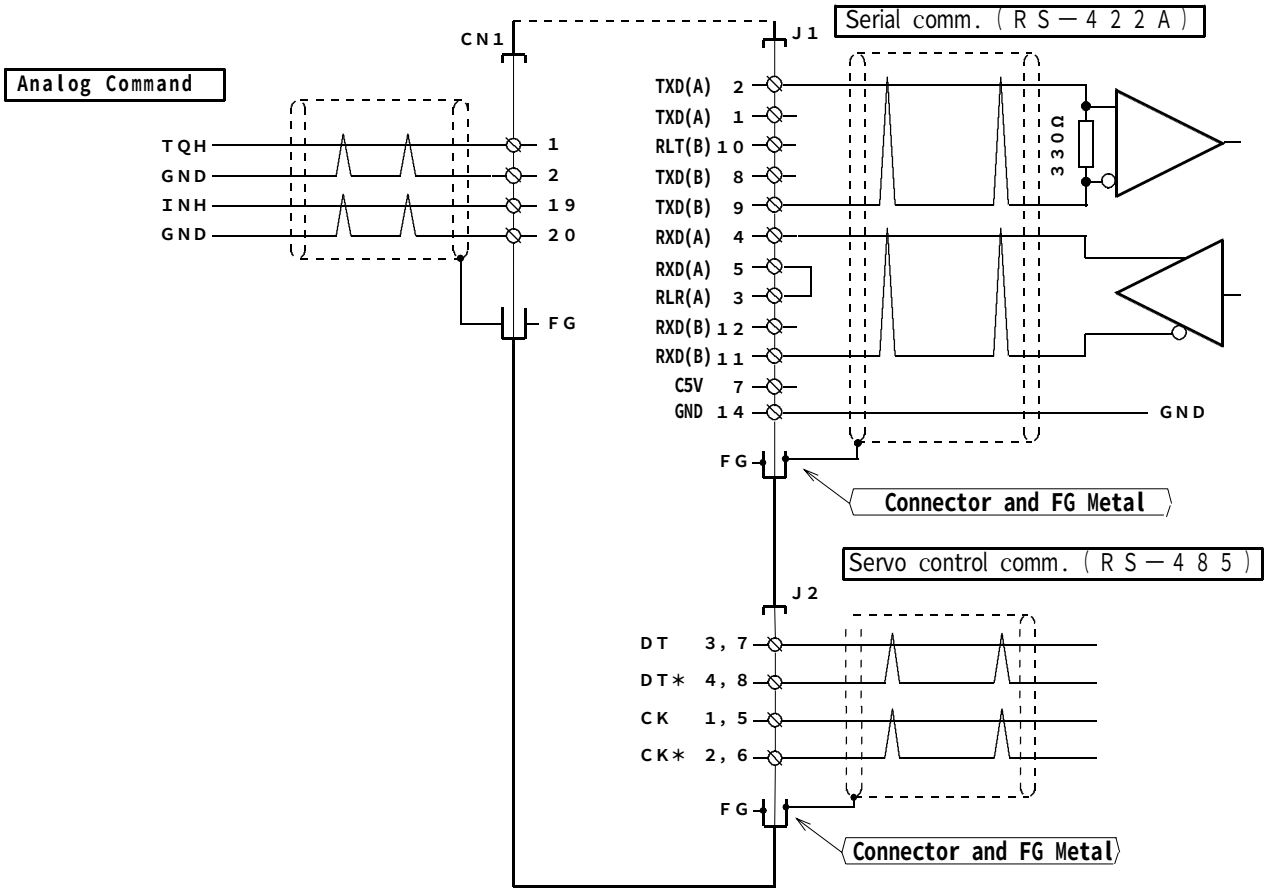
Note 12: Connection of 17 bit serial encoder is as follows:



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



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



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

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

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

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

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

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

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

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

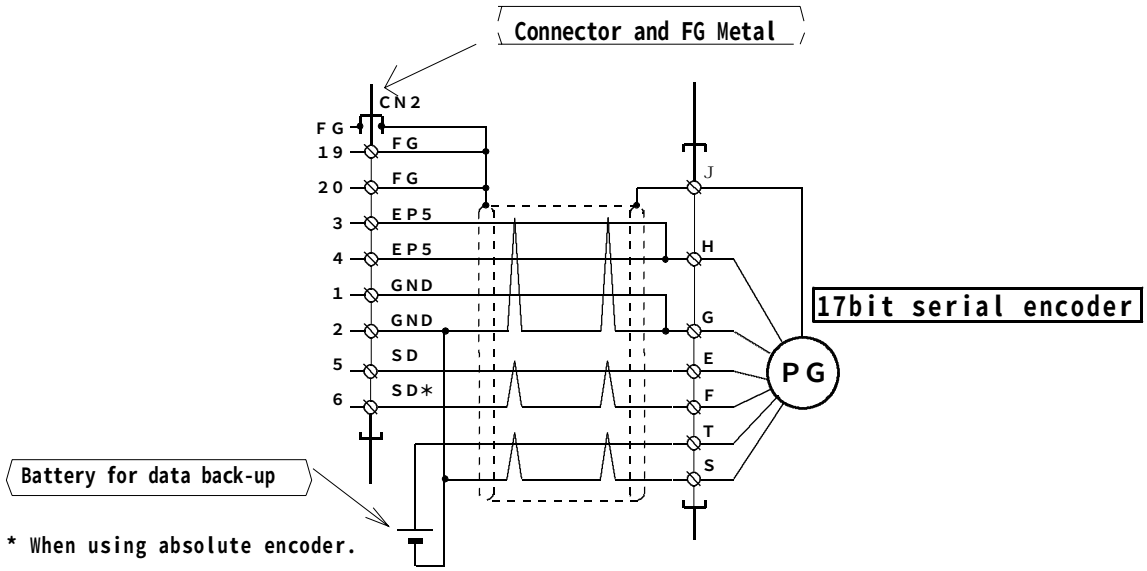
Note 9: () in a signal I/O name,is initial setting value of parameter.

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

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

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

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



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

6—2 Input 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. ●This signal is valid in Pulse train run. ● 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 (*)	CN1-33	I - 1	●When this and COM terminals are short-circuited (signal ON), Pulse train command is invalidated and a motor goes into servo lock condition. ●If it is inputted in running of a motor, the motor consumes deviation pulses of Position deviation counter and stops. ●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, it is allocated to an external signal「DI4」. ●When it is inputted, [CIH] is lit in the LCD module display.
Start	DR	CN1-34	I - 1	●When this and COM terminals are short-circuited (signal ON), Speed, Torque and Pulse train commands can be accepted. ●When this and COM terminals are opened in running of a motor, every command is enabled and the motor stops. (In case of Speed command, the motor stops by the deceleration time of the parameter.) ●In initial status, it is allocated to an external signal「DI3」. ●When it is inputted, [DR/FJ] is lit in the LCD module display.
Proportional control selection	PC	———	———	●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 other than Torque command. ●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.

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 №</th><th>I/O</th><th>Function</th></tr>
<tr><td>Mode selection 1, 2 related parameter (P706)</td><td>MD1

MD2</td><td>CN1-30

CN1-29</td><td>I - 1

I - 1</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></th><th>MD2</th><th>MD1</th><th>Run mode</th></tr>
<tr><td rowspan="4">Driver mode</td><td>OFF</td><td>OFF</td><td>Speed control run</td></tr>
<tr><td>OFF</td><td>ON</td><td>Torque control run</td></tr>
<tr><td>ON</td><td>OFF</td><td>Pulse train run</td></tr>
<tr><td>ON</td><td>ON</td><td>Error status (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, it is allocated to the next signal.
MD1：External input signal「DI7」
MD2：External input signal「DI8」
●When it is inputted, [MD1] or [MD2] is lit in the LCD module display, respectively.</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. An external limit command voltage (TL+,TL-) method is optional set at our factory.
●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>
<tr><td>Command direction selection</td><td>SSD</td><td>———</td><td>——
—</td><td>●When a selected command is an “ internal command”, if this and COM terminals are short-circuited (signal ON), run direction command is reversed against a command direction.
●This signal is valid in Speed control and Torque control run.
●This signal is invalid to Analog 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".</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.

<table>
<tr><th>Signal name</th><th>Mark</th><th>Terminal №</th><th>I/O</th><th>Function</th></tr>
<tr><td>Speed/ Torque selection
Related parameter

(P134～P136)
(P137～P139)</td><td>SS1

SS2</td><td>CN1-32

CN1-31</td><td>I - 1

I - 1</td><td>※ In Speed control run
●When this and COM terminals are short-circuited (signal ON), by the combination of SS1,SS2, each speed command can be selected as follows.
<table>
<tr><th>SS2</th><th>SS1</th><th>Selected speed command</th></tr>
<tr><td>OFF</td><td>OFF</td><td>External speed command (analog voltage)</td></tr>
<tr><td>OFF</td><td>ON</td><td>Internal speed command 1 (P134)</td></tr>
<tr><td>ON</td><td>OFF</td><td>Internal speed command 2 (P135)</td></tr>
<tr><td>ON</td><td>ON</td><td>Internal speed command 3 (P136)</td></tr>
</table>
※In torque control run
●When this and COM terminals are short-circuited (signal ON), by the combination of SS1,SS2, each torque command can be selected as follows.
<table>
<tr><th>SS2</th><th>SS1</th><th>Selected torque command</th></tr>
<tr><td>OFF</td><td>OFF</td><td>External torque command (analog voltage)</td></tr>
<tr><td>OFF</td><td>ON</td><td>Internal torque command 1 (P137)</td></tr>
<tr><td>ON</td><td>OFF</td><td>Internal torque command 2 (P138)</td></tr>
<tr><td>ON</td><td>ON</td><td>Internal torque command 3 (P139)</td></tr>
</table>
●In initial status, allocation is as follows.
ＳＳ１：External input signal「DI5」
ＳＳ２：External input signal「DI6」
●A currently selected command № (0,1,2,3) , Speed command data and Torque command data can be confirmed by 『Diagnosis display mode』 of the LCD module.</td></tr>
<tr><td>Forward over travel related parameter
(P705)</td><td>FOT*</td><td>———</td><td>——
—</td><td>※※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. In Speed control, the motor stops by 0 speed command. In Torque control, the motor becomes in torque free.
●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.</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 №	I/O	Function
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. In Speed control, the motor stops by 0 speed command. In Torque control, the motor becomes in torque free. ●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 related parameter (P134～P136)	OR1 OR2 OR3 OR4	——— ——— ——— ———	—— — —— — —— — —— —	●This signal is valid when Internal speed commands 1～3 are selected by Speed/ Torque selection signals (SS1～SS2) in Speed control. ●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 №	I/O	Function
Reset	RST	CN1-36	I - 1	● 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, it is allocated to an external signal「DI1」. ●When it is inputted, [RST] is lit in the LCD module display. 【Note】Alarm reset shall be made after removing the cause.
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 3msec. 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 (*)	CN1-35	I - 1	●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, it is allocated to an external signal「DI2」. ●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.

Signal name	Mark	Terminal №	I/O	Function
Speed command related parameter (P005) (P006) (P129) (P130) (P132) (P133) (P211) (P214) (P300)	INH	CN1-19	I - 4 Analog	●This is a dedicated signal when our option unit (Analog input unit) is selected at shipment of our factory. ●When an external speed command is effective in Speed control command run, a motor runs at the speed proportional to the speed command voltage. ●When DC±10V is inputted, a motor runs at the rated speed. ●By a parameter, command voltage of motor rated speed can be varied in the range of±6～10V. However max. input range is ±12V. ●Referring to GND terminal voltage, a motor runs forward by positive voltage input and reverse by negative voltage. ●Motor acceleration and deceleration time can be set by parameters, respectively. ● In Torque control command, it works as external speed limit.
Torque command related parameter (P131) (P300)	TQH	CN1-1	I - 4 Analog	●This is a dedicated signal when our option unit (Analog input unit) is selected at shipment of our factory. ●When an external torque command is effective in Torque control command run, a motor outputs torque proportional to the torque command voltage. ●When DC±10V is inputted, 300% torque is outputted. ●Referring to GND terminal voltage, a motor outputs forward drive torque by positive voltage input and reverse by negative voltage. ●Speed limit is conducted by external command INH.
Torque limit command +, − related parameter (P127) (P128)	TL+ TL−	——— ———	I - 4 I - 4 ｱﾅﾛｸﾞ	●This is an optional set 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.
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".

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 №	I/O	Function
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 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 parameters (P001) (P002)	A,A* B,B* Z,Z*	CN2	I – 3	●It inputs feedback pulse signals from an encoder or a linear sensor on a motor. ●It inputs 90 ° different phase 2 signals (A phase, B phase) of Line driver output (26LS31 or equivalent) and Marker signal (Z phase).

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 №</th><th>I/O</th><th>Function</th></tr>
<tr><td>Pulse train command related parameter (P300) (P601) (P602)</td><td>FC
FC*

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

CN1-24
CN1-23</td><td>I－2
I－3 can be selected by option.

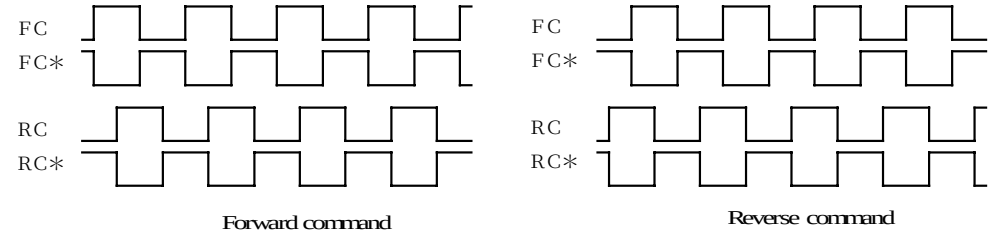
I－2
I－3 can be selected by option.</td><td>●It inputs Directional or 90° different phase Pulse train. Outputs can be applied to Line driver and Open corrector method.
●In case of Line driver method, connect Line driver outputs to FC－FC* and RC－RC*, respectively.
●In case of Open collector method, connect +V (External power source for Open collector circuits) to FC and RC, and connect Open collector outputs to FC* and RC*, respectively.
●In case of 90° different phase Pulse train command, when Pulse train (B phase) between FC－FC* or FC* is 90° ahead of Pulse train (A phase) between RC－RC* or RC*, a motor runs forward, and if 90° behind, the motor runs reverse.
●In case of directional Pulse train command, when Pulse train is inputted to FC－FC* or FC*, a motor runs forward, and when Pulse train is inputted to RC－RC* or RC*, a motor runs reverse.
●In case of Direction+Feed pulse command, input Direction signal to RC-RC* or RC* and input Feed pulse signal to FC－FC* or FC*.
Logic of Direction signal is as follows.
<table>
<tr><th>Connection method</th><th>Signal name</th><th>Forward command</th><th>Reverse command</th></tr>
<tr><td>Line driver</td><td>RC-RC*</td><td>"L"-"H"</td><td>"H"-"L"</td></tr>
<tr><td>Open collector</td><td>RC*</td><td>0V released</td><td>0V short-circuited</td></tr>
</table>
●By the parameter「Pulse train command sequence select.」, a motor can run reverse by a forward pulse train command.
●Max. input frequency of Pulse train command for standard specification is as follows.
Line driver output:
・ 90° different phase pulse：1Mpps (4 times: 4Mpps)
・ Directional pulse：1Mpps
・ Min. pulse width：500ns or longer
Open collector (applied voltage 5～12V)output
・ 90° different phase pulse：250kpps (4 times: 1Mpps)
・ Directional pulse ：250kpps
・ Min. pulse width ：2μs or longer
●In case of selecting our optional High speed pulse train receipt unit (Line receiver), max. frequency is as follows.
Line driver output
・ 90° different phase：4Mpps (4 times:16Mpps)
・ Directional pulse ：4Mpps
・ Min. pulse width ：125ns以上
●Signal of each pulse command when Line driver is used can be referred to the next page.
●Signal of each pulse command when Open collector is used can be referred to one page after the next page.</td></tr>
</table>

Note 1)＊ Marked signal is negative logic. And (*) Marked signal can be changed its logic by a parameter.

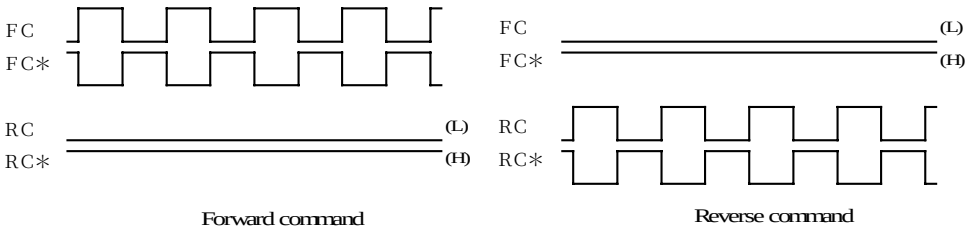
Note 2) Terminal No. is allocated in the initial status of a parameter.

●Input pulse style when Line driver is used.

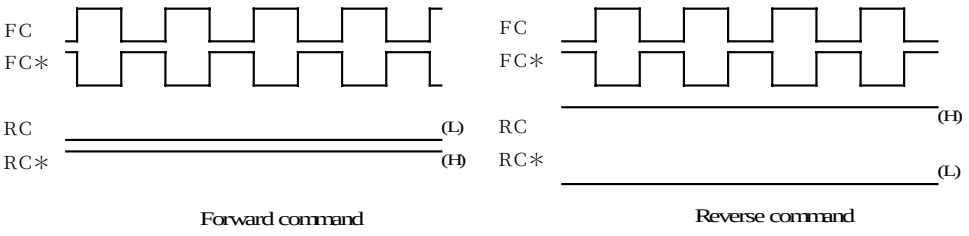
90°different phase



Directional pulse

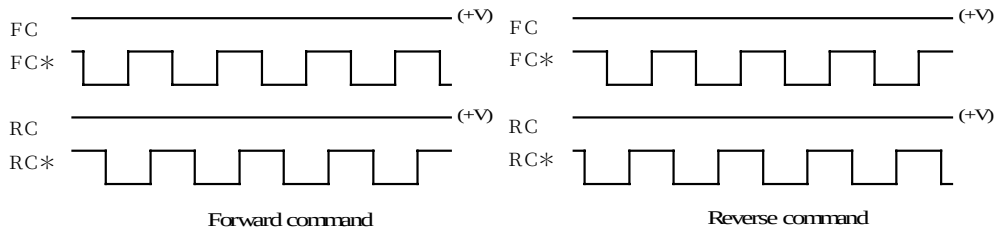


Direction + Feed pulse

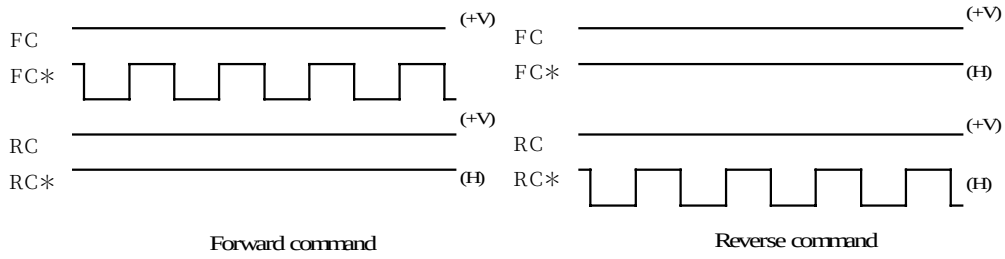


●Input pulse style when Open collector is used.

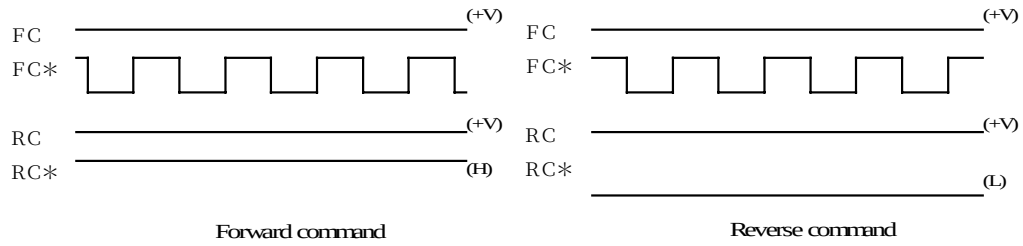
90° different phase signal



Directional pulse



Direction+ Feed signal



Note) +V is +5~12V power source

Signal name	Mark	Terminal №	I/O	Function
Positioning complete related parameter (P202)	PN	CN1-14	0 - 1	●In Pulse train Run, when value of Position deviation counter goes in the setting range of the parameter [P202] , this signal is ON. (This and COM terminals are closed.) ●In Pulse train Run, during Position deviation counter value satisfies the above condition, this signal is ON status. ●This signal is also OFF at Emergency stop, Servo OFF or by Reset input. ●This signal is an open collector output isolated to the internal power supply. ●This signal is an open collector output isolated to the internal power supply. ●In initial status, it is allocated to the external output signal「DO4」. ●When it is outputted, [PN] is lit in the LCD module display.
Warning related parameter (P715)	WNG (*)	CN1-15	0 - 1	●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.10—4「Warning list」. ●This signal is an open collector output isolated to the internal power supply. ●In initial status, it is allocated to the external output signal「DO3」. ●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.
Alarm related parameter (P142) (P715)	ALM (*)	CN1-16	0 - 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「DO2」. ●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.

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 №	I/O	Function
Servo ready related parameter (P716)	RDY	CN1-17	0 - 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 「DO1」. ●When it is outputted, [RDY] is lit in the LCD module display.
In speed/ Torque limit related parameter (P125) (P126) (P127) (P128)	LIM	———	———	●In Torque control, when speed goes into Speed limit area, this signal is turned ON (This and COM terminals are closed.), and when goes out of the area, this signal is turned OFF (This and COM terminals are opened.) ●When Run modes conducted by commands other than Torque control run goes into Torque limit area, this signal is turned ON (This and COM terminals are closed.), and when goes out of the area, 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, [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.) ●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 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.

Signal name	Mark	Terminal №	I/O	Function
Brake release related parameter (P734)	BRK	———	—— —	●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. ●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 it is outputted, [BRK] is lit in the LCD module display.
Encoder pulse output	EA EA* EB EB* EM EM*	CN1-8 CN1-7 CN1-6 CN1-5 CN1-4 CN1-3	0 – 2 0 – 2 0 – 2	●Encoder feedback pulse input (CN2) is outputted. ●Outputs of EA/EA* and EB/EB* are two 90 ° different phase signals of Line driver output (26LS31 or equivalent) . Be sure to interface them with Line receiver (26LS32 or equivalent) . ●Marker output of EM/EM* is Line driver (26LS31 or equivalent) . Open collector output (0-4) interface isolated to the internal control power can be selected at our factory shipment, optionally.
In Speed control mode	SMOD	———	—— —	●In Speed control run, this signal is ON (This and COM terminals are closed.) . ●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 it is outputted, [SPEED] is lit in [Mode display screen] of the LCD module display.
In Torque control mode	TMOD	———	—— —	●In Torque control run, this signal is ON (This and COM terminals are closed.) . ●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 it is outputted, [TRQ] 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 №	I/O	Function
In Pulse train control run	PMOD	———	———	●In Pulse train control run, this signal is ON (This and COM terminals are closed.) . ●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 it is outputted, [PULSE] is lit in [Mode display screen] of the LCD module display.
In Servo lock	SVLK	———	———	●In Servo lock status, this signal is ON (This and COM terminals are closed.) . ●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.
Analog monitor related parameter (P700) (P701)	MON1 MON2 GND	CN1-11 CN1-10 CN1-27	0 – 3	●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」. ①Speed command, ②Speed feedback,③ torque command, ④External+ Torque limit, ⑤External− Torque limit, ⑥Position deviation 1 (Range：±255 pulses) ⑦Position deviation 2 (Range：±4080 pulses) ⑧ NC speed output And monitor outputs are, MON1：Selection by P700 MON2：Selection by P701 ●Monitor voltage value can be referred to「8−3 Analog monitor」. ●Output impedance is 1kΩ.
Serial communication related parameter (P500-599)		J 1	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)		J 2	IO – 2	●Connecting this with an communication unit of other servo control, this conducts Transmission/ Receipt of the servo control data. ●When Pulse train is transmitted, this selects Pulse train data to be transmitted by a parameter. ●When Receipt is selected by a parameter, Pulse train run can be conducted by the received Pulse train data.

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
Start	DR		X0003	M9147	Ymn03
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
Speed/ Torque selection	SS1		X0008	M9152	Ymn10
Speed/ Torque selection	SS2		X0009	M9153	Ymn11
Command direction selection	SSD		X000A	M9154	Ymn12
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 select.	PC		X0010	M9160	Ymn20
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
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
Brake release	BRK		X0066	M9214	Xmn06
In Speed/ Torque limit	LIM		X0067	M9215	Xmn07
In Speed control mode	SMOD		X006A	M9218	Xmn12
In Torque control mode	TMOD		X006B	M9219	Xmn13
In Pulse train control mode	PMOD		X006C	M9220	Xmn14
In Servo lock	SVLK		X006F	M9223	Xmn17

※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".

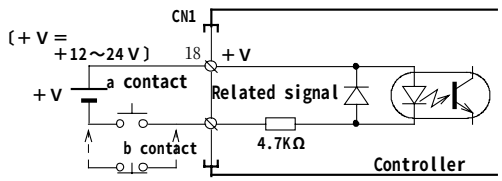
※3　mn of Ymn device is 2 digit number displaying interfaced node ID number by an octal number .

※4　mn of Xmn device is 2 digit number displaying interfaced node ID number by an octal number .

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

6－2－3 Input and Output Interface

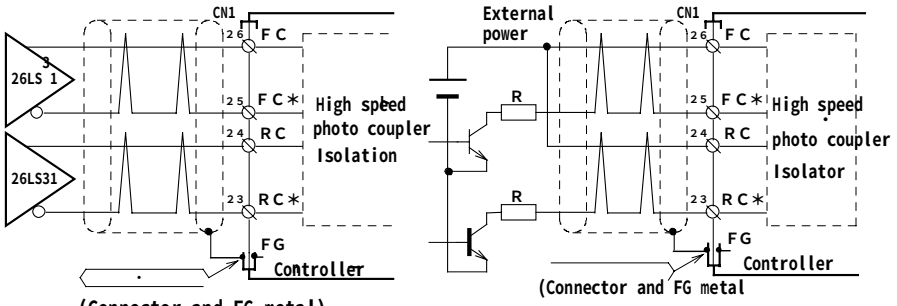
I/O signal type and its equivalent circuit is shown as follows. Individual I/O signal type is described in I/O terminal and circuit number columns of [Tab. 6-2-1 I/O signal list] .

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 pos itive 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 negati ve logic signal. When the contact is opened, this signal is defined ON and when closed it is OFF.

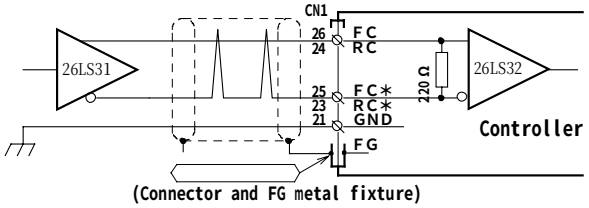
Circuit No.	Electric specification	Input method	Photo coupler		Line receiver ※High speed Pulse train command in case of an option, Receipt unit
I-2		Pulse train output	Line driver	Open collector	Line driver
Related signal		Min. input pulse width	500ns	2μs	125ns
Pulse train. command		Max. input frequency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

Circuit



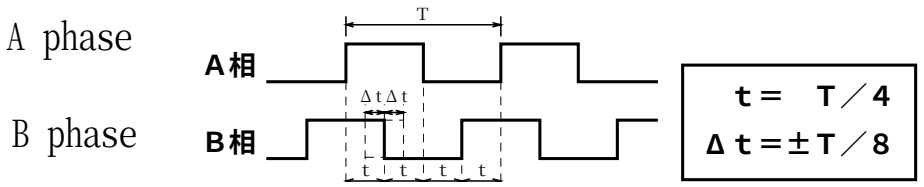
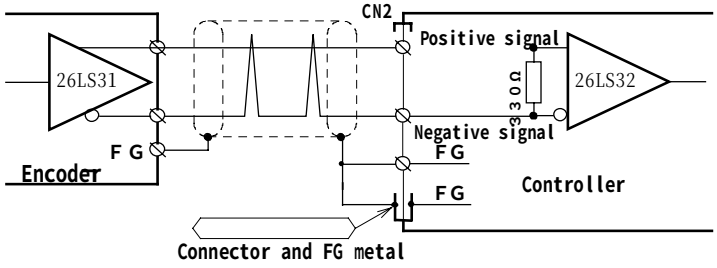
Ext.power	R value
V	0
12V	1kΩ (1/4W)

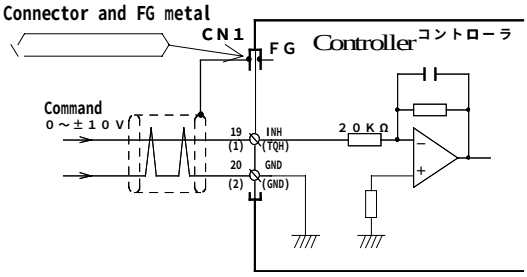
※In some cases, it is better to connect Pulse train command output to each controller GND.



(Line receiver input method) (Facttory option)

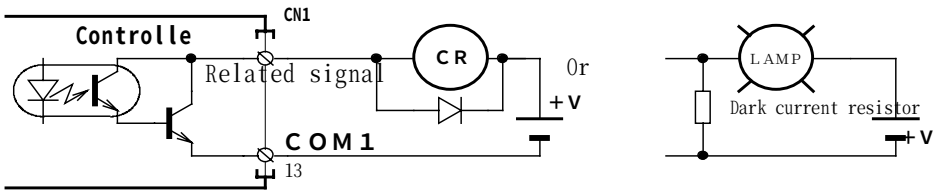
*1 Please delete noise on supply voltage from an external power supply unit.

Circuit No.		
I-3	Electric specification	In forward run of a motor, B phase is ahead to A phase. 
Related signal Encoder feedback pulse input A,A* B,B* Z,Z* SD,SD*	Circuit	 | | + signal | - signal | |---|---|---| | A phase | A | A* | | B phase | B | B* | | Z phase | Z | Z* | | | SD | SD* | ·Encoder feedback pulse shall be outputted through Line driver (26LS31 or equivalent).

Circuit No.	Electric specification		Circuit
I-4	Applied voltage range	DC -10～10V	
Related signal INH TQH	·Use twist pair shield cables and be sure to connect the shields to FG metal of CN1 connector. ※Factory option (Analog input unit)		

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

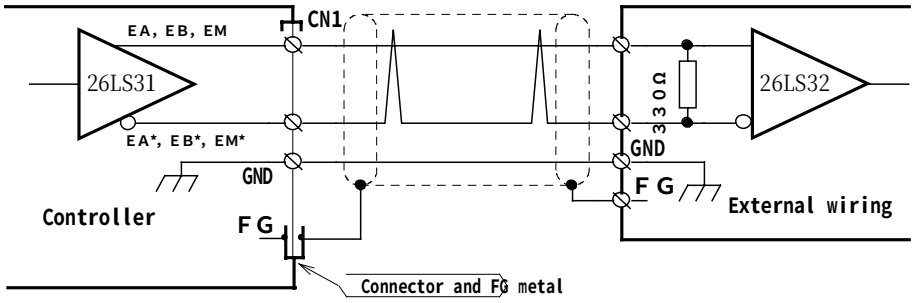
Circuit



·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 c urrent (including rush current) lower than rated value.

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

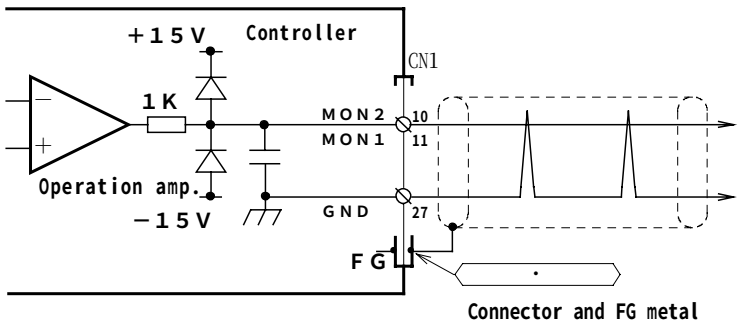
Circuit



·Since outputs use a Line driver (26LS31 or equivalent) , interfac e them with Line receiver (26LS32 or equivalent) .
·In forward run of a motor, A phase is outputted ahead of B phas e.
·Phase relation of A and B phases is always corresponding to moto r 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.

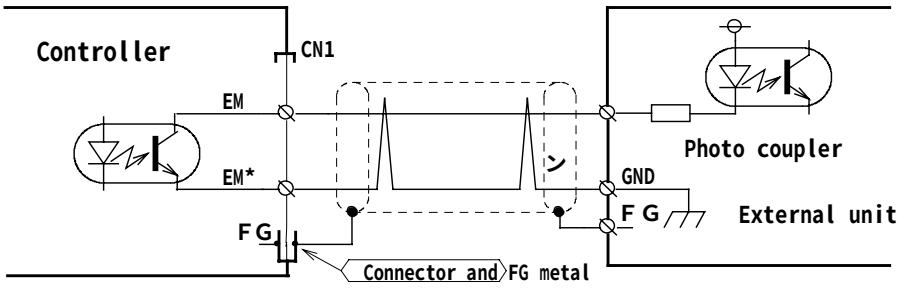
Circuit No.
O-3
Related signal
Analog Monitor MON1 MON2

Circuit

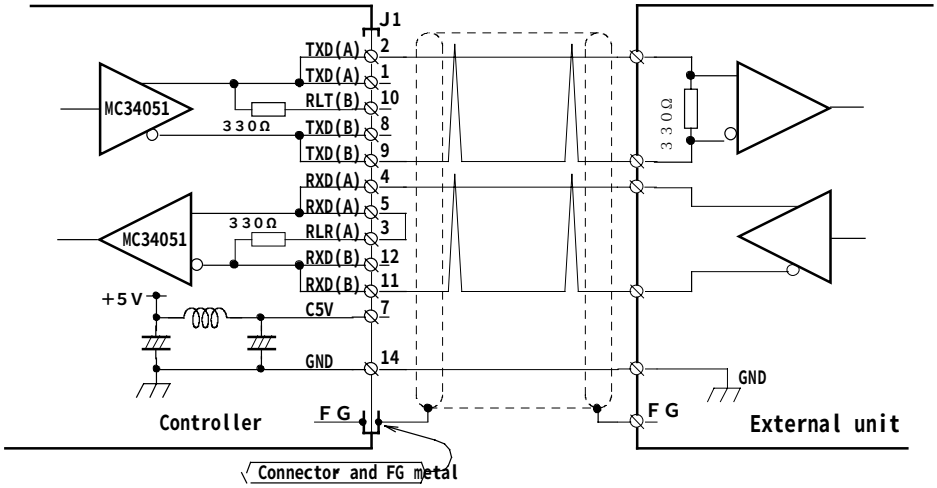


·If cable length is longer than 1m, use twist pair shield cables and connect the shields to a connector and FG metal.

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

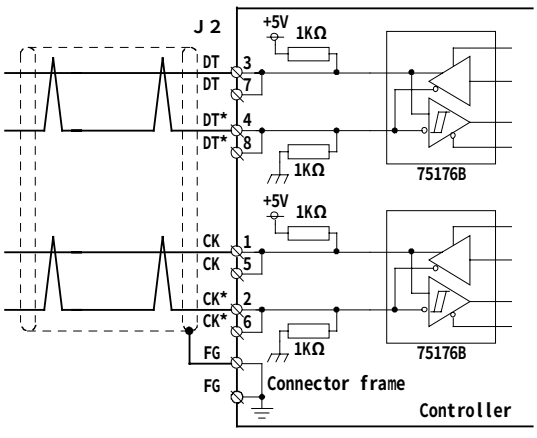


Circuit No.	Circuit
IO-1	
Related signal	
Serial communication TXD(A) TXD(B) RXD(A) RXD(B) RLR(A)	



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.	Circuit
IO-2	
Related signal	
Servo control communication DT DT* CK CK*	



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

6－3 Connector Pin Layout

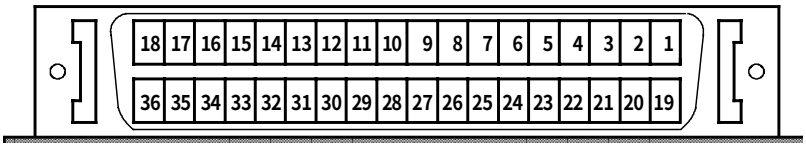
6－3－1 Control I/O Signal Connector (CN1)

No.	Mark	Signal name	No.	Mark.	Signal name
1	TQH	Torque command Note 1	19	INH	Speed command Note 1
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		Reserved (Do not use it.)
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 (MD2)
12		(Not used/ Reserved)	30	D17	〃 7(MD1)
13	COM	External power－common 1	31	DI6	〃 6(SS2)
14	DO4	External output4 (PN)	32	DI5	〃 5(SS1)
15	DO3	〃 3(WNG)	33	DI4	〃 4(CIH)
16	DO2	〃 2(ALM)	34	DI3	〃 3(DR)
17	DO1	〃 1(RDY)	35	DI2	〃 2(SON)
18	+24V	External power＋common 1	36	DI1	〃 1(RST)

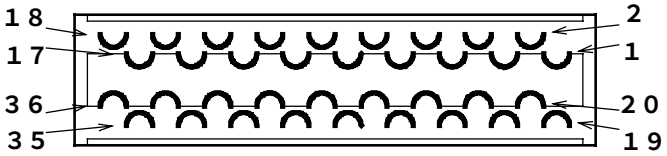
Applied connector : Receptacle / 10236-52A2JL (3M product)
Applicable cable side connector : Soldered plug / 10136-3000VE
: Case (shell) / 10336-52A0-008

※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.



Note 1. Analog input is optional.

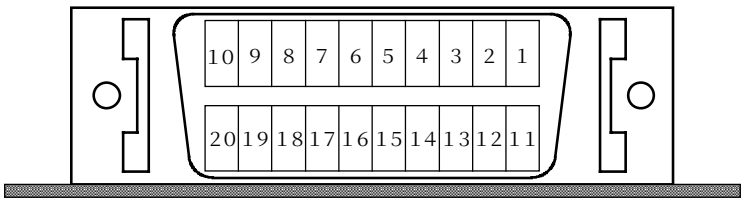
[Tab. 6-2] Connector CN1 Terminal Layout

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

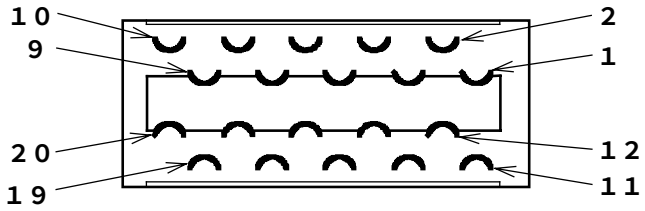
No.	Mark.	Signal name	No.	Mark.	Signal name
1	GND	Encoder power common 1	11	Z	Encoder marker signal input(+)
2	GND	〃	12	Z*	〃 (-)
3	EP5	Encoder power (+5V)	13		Un-used
4	EP5	〃	14		Un-used
5	SD	ABS position data (+)	15		Un-used
6	SD*	〃 -)	16		Un-used
7	A	Encoder pulse A phase input (+)	17		Un-used
8	A*	〃 (-)	18		Un-used
9	B	Encoder pulse B phase input (+)	19	FG	Shield earth
10	B*	〃 (-)	20	FG	Shield earth

Applied connector : Receptacle / 10220-52A2JL (3M product)
Applicable cable side connector : Soldered plug / 10120-3000VE
: Case (shell) / 10320-52A0-008

※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.



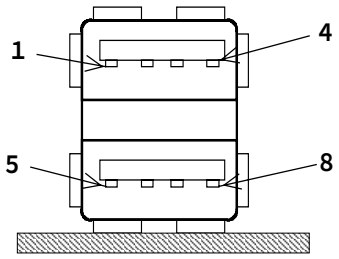
[Tab. 6-3] Connector CN2 Terminal Layout

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.



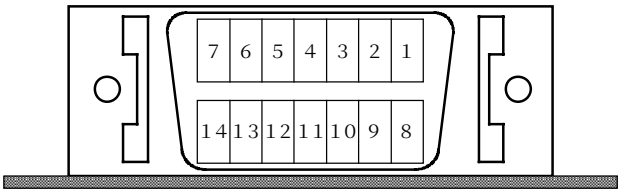
[Tab. 6-4] Connector J2 Terminal Layout

6－3－4 Serial Communication Connector (J1)

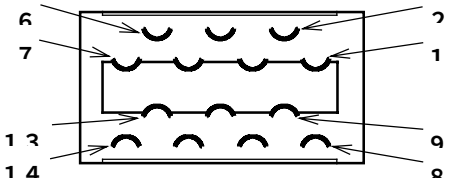
No.	Mark	Signal name	No.	Mark	Signal name
1	TXD(A)	Transmission data Pair with (TXD(B)	8	TXD(B)	Transmission data Pair with (TXD(A)
2	TXD(A)	〃	9	TXD(B)	〃
3	RLR(A)	Receipt line terminating resistor	10	RLT(B)	Transmission line terminating resistor
4	RXD(A)	Receipt data Pair with (RXD(B)	11	RXD(B)	Receipt 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) / 10314-52A0-008

※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.



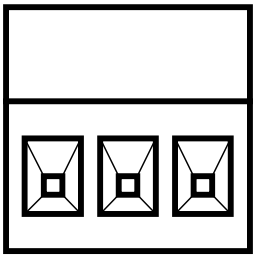
[Tab. 6-5] Connector J1 Terminal Layout

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

Applied connector XW4B-03C1-H1 (OMRON product, used for 2.2kW or less unit)

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



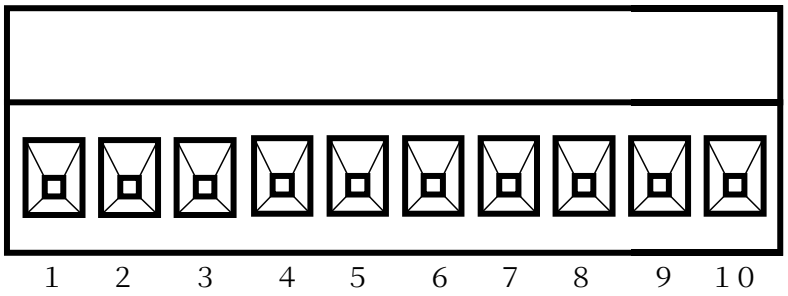
[Tab. 6-6] Connector TB1 Terminal Layout

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 (OMRON product, used for 0.8kW unit)

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



[Tab. 6-7] Connector TB2 Terminal Layout

Chapter 7 Parameter

7－1 Parameter List

No.	Name
P000	Motor type
P001	Encoder type selection
P002	Rotating motor Encoder pulse number
P003	Linear motor Linear sensor resolution
P004	Disc motor Encoder pulse number
P005	Rotating/ Disc motor·A pplicable max.speed
P006	Linear motor Applicable max. speed
P007	Linear motor Rated Speed
P009	Carrier frequency selection
P010	Linear/ Disc motor Magnetic pole sensor
P011	Linear/ Disc motor Magnetic pole sensor
P012	Only for maker
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 Derivat. time constant/ Low speed gain range
P109	Speed loop Proport. gain division ratio/ 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 Derivative 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－
P129	Speed command gain
P130	Speed command offset
P131	Torque command offset
P132	External speed limit Enable/ Disable
P133	Speed limit value
P134	Speed command value1
P135	Speed command value2
P136	Speed command value3
P137	Torque command value1
P138	Torque command value2
P139	Torque command value3
P140	Selection of Auto. tuning test run direction

No.	Name
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
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
P207	Over flow detection pulse
P208	Deviation error detection pulse
P209	Motion selection at Deviation error
P211	Acceleration time
P214	Deceleration time
P217	Only for maker
P218	Pulse train 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
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)
P511	Communication group ID set 1
P512	Communication group response Yes/ No 1
P513	Communication group ID set 2

No.	Name
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 OFF アラーム
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.
P600	Selection of CIH signal specification
P601	Pulse train command sequence change
P602	Pulse train command type selection
P603	Pulse train command compensation numerator
P604	Pulse train command compensation denominator
P605	Pulse train Feed forward ratio
P606	Pulse train Feed forward shift ratio
P607	Pulse train Feed forward filter time constant
P608	Pulse train delay compensation time selection
P609	Pulse train averaging filter time
P610	Pulse train command input selection of extension board
P700	Monitor 1 selection
P701	Monitor 2 selection
P702	Speed zero range
P704	SON signal logic selection
P705	Hardware OT Enable/ Disable selection
P706	Delay time of mode change confirmation
P710	Stop method at Emergency stop
P711	Deceleration time at Emergency stop
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
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

No.	Name
P737	Basic external input signal: Input allocation 1
P738	Basic external input signal: Input allocation 2
P739	Extended external input signal: Input allocation
P740	Extended external input signal: Input allocation
P741	Extended external input signal: Input allocation
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	Servo control abnormality detection adjustment
	value

No.	Name

7－2 Parameter Specification

Parameter No.	Parameter name	Activating Timing	Run mode method: Speed (S)	Torque (T)	Pulse train (P)		Level	Setting unit	Setting range	Standard ship. set (Initial value)
								Function		
《Group 0》 [Motor, Encoder Parameter]										
P000	Motor type	P	S	T	P	·	S	None	000 ～ 999	000
								It sets an applied motor type. Referring to [12-4 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	S	T	P	·	S	None	INC1/INC2/INC3/L-SEN/ S-INC/S-ABS/C-SEN1/C-SEN2	INC3
								It sets an applied encoder type. Referring to [12-4 applicable motor list], correctly set it. Set: Encoder type INC1: For Induction motor·Incremental INC2: For Synchronous motor ·Not less wiring type · Incremental INC3: For Synchronous motor ·Less wiring type · Incremental L-SEN: Linear ·sensor S-INC: Serial·Incremental (Option) S-ABS: Serial·Absolute (Option) C-SEN1: For Disc motor·Without a marker C-SEN2: For Disc motor·With a marker		
P002	Rotating motor Encoder pulse selection	P	S	T	P	·	S	PPR	1000／2000／6000／17bit	6000
								It sets number of pulses per one revolution of an applied encoder. 【Caution】·When [INC1/ INC2/ INC3] is selected by P001, pulse number is this parameter set value×4 (4times). ·When [S-INC/ S-ABS] is selected by P001, set[17bit]. In this case, pulse number is 17bit＝131072 pulse. ·If wrong value is set, running away or fire could occur. Since it is very dangerous, be sure to set it, correctly.		
P003	Linear motor Linear sensor Resolution	P	S	T	P	·	S	μm	0.00001 ～ 100.00000	001.00
								It sets resolution (4times) per 1 pulse of an applied linear sensor.		
P004	Disc motor Encoder pulse number	P	S	T	P	·	S	PPR	00000001 ～ 99999999	00000001
								It sets encoder pulse number (4times) per 1 turn of a motor when Disc motor is applied.		

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

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 0》 [Motor, Encoder Parameter]										
P005	Rotating/ Disc motor applicable max. speed	P	S	T	P	·	S	rpm	00000 ~ 20000	00000
								It sets applicable max. speed of Rotating/ Disc motor. Rated speed is selected when [0] is set. Complying with the next notice, set this parameter. Synchronous motor : Set lower speed than rated speed. Disc motor: Referring to [12-4 Applicable motor list], set the parameter lower speed than a value in the list.		
P006	Linear motor applicable max. speed	P	S	T	P	·	S	mm/sec	0.00 ~ 100000.00	000000.00
								It sets applicable max. speed of Linear motor. Rated speed is selected when [0.00] is set. Referring to [12-4 Applicable motor list], set this parameter, correctly. The value shall be lower speed than the list.		
P007	Linear motor rated speed	P	S	T	P	·	S	mm/sec	0.01 ~ 100000.00	000000.01
								It sets rated speed of Linear motor. Referring to [12-4 Applicable motor list], set this parameter, correctly.		
P009	Carrier frequency selection	P	S	T	P	·	S	Hz	10K/16K/20K/24K	16K
								It selects carrier frequency of PWM. 【Caution】 · Since this function is not used for high performance version, do not change the parameter set. · As carrier frequency is higher, frequency characteristics become better. On the other hand, heat loss of a unit becomes large which may cause a trouble of the unit. For reference: 2.2kW or smaller 16K/ 20K/ 24KHz 3kW or larger 10KHz		
P010	Linear Disc motor Magnetic pole sensor type	P	S	T	P	·	F	None	0~9	0
								It sets a Magnetic pole sensor used for a Linear/ Disc motor. Referring to [12-4 Applicable motor list], set this parameter, correctly.		
P011	Linear/ Disc motor Magnetic poles sensor offset	P	S	T	P	·	F	mm	0.00 ~ 100.00	028.50
								It sets offset value of a Magnetic pole sensor used for Linear/ Disc motor. Referring to [12-4 Applicable motor list], set this parameter, correctly.		
P012	Only for maker	—	·	·	·	·	F			00000000
								Be sure to set [0] to this Parameter.		

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

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
《Group 0》 [Motor, Encoder Parameter]										
P014	Only for maker	—	·	·	·	·	F			050
			Be sure to set [0] 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	S	T	P	·	F	Pulse	-99999999 ～ 99999999	00000000
			It sets absolute data at machine reference position.							
P019	ABS reference machine position	P	S	T	P	·	F	mm/ °/ in	-99999999 ～ 99999999	00000000
			It sets machine position against machine reference position. (A decimal point position depends on [P302 : command unit].)							
P020	Motor type, Number of poles	P	S	T	P	·	S	None	00000000～99999999	00000000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P021	Rated torque current	P	S	T	P	·	S	10mA	00000～65535	00000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P022	Rated speed (Field control base speed)	P	S	T	P	·	S	rpm	00001～20000	02000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P023	Momentary max. torque ratio	P	S	T	P	·	S	%	100～799	100
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P024	Excitation current	P	S	T	P	·	S	10mA	00000～65535	00000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P025	Rated output	P	S	T	P	·	S	KW	000.000～999.999	000.000
			It sets motor rated output value when [999]is set to[P000 : Motor type]. When 0 is set, unit power capacity is identical to motor rated output value.							
P026	Current loop coefficient	P	S	T	P	·	S	None	000～300	000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							

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

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Zero return	Pulse train		Function		
			A	M	Z	P				
《Group 0》 [Motor, Encoder Parameter]										
P030	Phase compensation angle	P	S	T	P	•	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	S	T	P	•	S	10mA	00000～65535	00000
			Referring to Setting option specification, input it when [999]is set to【P000 : Motor type】.							
P032	Unit momentary max. torque ratio	P	S	T	P	•	S	%	100～799	100
			Referring to Setting option specification, input it when [999]is set to【P000 : Motor type】.							
P033	Unit power capacity	P	S	T	P	•	S	KW	000.000～999.999	000.000
			It sets unit rated power capacity when [999]is set to[P000 : Motor type].							
P037	Torque command value change amount limit value	P	S	T	P	•	S	None	00000～65535	00000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P040	Primary resistor	P	S	T	P	•	S	μΩ	00000000～99999999	00000000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P041	Secondary resistor	P	S	T	P	•	S	μΩ	00000000～99999999	00000000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P042	Primary self inductance	P	S	T	P	•	S	μH	00000000～99999999	00000000
			Referring to Setting option specification, input it when [999]is set to[P000 : Motor type].							
P043	Secondary self inductance	P	S	T	P	•	S	μH	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)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 0》 [Motor, Encoder Parameter]										
P044	Mutual inductance	P	S	T	P	·	S	μH	00000000～99999999	00000000
								Referring to Setting option specification, input it when [999]is set to【P000：Motor type】.		
P045	Leakage coefficient	P	S	T	P	·	S	10^{-6}	00000000～99999999	00000000
								Referring to Setting option specification, input it when [999]is set to【P000：Motor type】.		
P046	Dead time compensation time	P	S	T	P	·	S	10^{-7}sec	00000～65535	00000
								Referring to Setting option specification, input it when [999]is set to【P000：Motor type】.		
P047	Current loop cut off frequency	P	S	T	P	·	S	rad/s	00000～65535	04000
								Referring to Setting option specification, input it when [999]is set to【P000：Motor type】.		
P048	Current loop Derivative time constant	P	S	T	P	·	S	μsec	00000～65535	00000
								Referring to Setting option specification, input it when [999]is set to【P000：Motor type】.		
P049	Torque constant	P	S	T	P	·	S	10^{-4}Nm/A	00000000～99999999	00000000
								Referring to Setting option specification, input it when [999]is set to【P000：Motor type】. In case of a Linear motor, setting unit is10^{-4}N/ A.		
P050	Magnetic pole sensor sine gain	P	S	T	P	·	S	None	0～4096	0512
								【This is automatically set by Self-diagnosis [Magnetic pole sensor adjustment]. 】		
P051	Magnetic pole sensor sine offset	P	S	T	P	·	S	None	-999～999	000
								【This is automatically set by Self-diagnosis [Magnetic pole sensor adjustment]. 】		
P052	Magnetic pole sensor Cosine gain	P	S	T	P	·	S	None	0～4096	0512
								【This is automatically set by Self-diagnosis [Magnetic pole sensor adjustment]. 】		
P053	Magnetic pole sensor cosine offset	P	S	T	P	·	S	None	-999～999	000
								【This is automatically set by Self-diagnosis [Magnetic pole sensor adjustment]. 】		
P054	Disc motor encoder compensation	P	S	T	P	·	S	pulse	-99999999～99999999	00000000
								【This is automatically set by Self-diagnosis [Dick motor adjustment]. 】		
P058	Linear motor Distance between poles	P	S	T	P	·	S	mm	0.01 ～ 1000.00	0032.00
								Referring to Setting option specification, input it when [999]is set to【P000：Motor type】		
P059	Special encoder pulse number	P	S	T	P	·	S	PPR	00000000～99999999	00000000
								Referring to Setting option specification, input it when [999]is set to【P000:Motor type】. When [0] is set, either [P002：Rotating motor encoder pulse selection] or [P004: Disc motor encoder pulse] setting value is effective.		

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

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 1》 [Driver adjustment parameter]										
P100	Low speed gain range	I	S	T	P	·	F	%	000.00 ～ 100.00	000.00
								It sets speed range ratio of Low speed gain area against rated speed or max. speed when GSEL signal is OFF. When motor speed is less than this setting value, [Speed loop gain],[Speed loop Integral time constant],[Speed loop Derivative time constant], [Speed loop Proportional gain division ratio], [Speed loop Derivative gain division ratio]are switched to the control set by Parameters ([P106],[P107],[P108],[P109],[P110]) 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	S	T	P	·	F	None	0000 ～ 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	S	T	P	·	F	msec	0000.00 ～ 9999.99	0020.00
								It sets time constant of Speed loop Integral compensation. When it is set smaller, though response becomes faster, if the value is too small, vibration may easily occur. If set value is [0], Integral compensation is not conducted.		
P103	Speed loop Derivative time constant	I	S	T	P	·	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	S	T	P	·	F	%	-100.0 ～ 100.0	000.0
								It sets Proportional compensation gain division ratio of 2 free degree PID speed control system. When it is set larger, over shoot to a speed command is depressed, response to load change of Speed control system becomes better. If it is too large, response to Speed command becomes worse.		
P105	Speed loop Derivative gain division ratio	I	S	T	P	·	F	%	-100.0 ～ 100.0	000.0
								It sets Derivative compensation gain division ratio of 2 free degree PID speed control system. When it is set larger, over shoot to a speed command is depressed, response to load change of Speed control system becomes better. If it is too large, response to Speed command becomes worse.		
P106	Speed loop gain / Low speed gain range	I	S	T	P	·	F	None	0000 ～ 9999	0025
								It sets Speed loop gain in Low speed gain range. (Description can be referred to [P101].)		

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※ 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)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 1》 [Driver adjustment parameter]										
P107	Speed loop Integral time constant/ Low speed gain range	I	S	T	P	·	F	msec	0000.00 ～ 9999.99	0020.00
								It sets time constant of Speed loop Integral compensation in Low speed gain range. (Description can be referred to [P102].)		
P108	Speed loop Derivative time constant/ Low speed gain range	I	S	T	P	·	F	μsec	0000 ～ 9999	0000
								It sets time constant of Speed loop Derivative compensation in Low speed gain range. (Description can be referred to [P103].)		
P109	Speed loop Proportional gain division ratio/ Low speed gain range	I	S	T	P	·	F	%	-100.0 ～ 100.0	000.0
								It sets Proportional compensation gain division ratio of 2 free degree PID speed control system in Low speed gain range. (Description can be referred to [P104].)		
P110	Speed loop Derivative gain division ratio/ Low speed gain range	I	S	T	P	·	F	%	-100.0 ～ 100.0	000.0
								It sets Derivative compensation gain division ratio of 2 free degree PID speed control system in Low speed gain range. (Description can be referred to [P105].)		
P111	Speed loop gain/ GSEL signal ON	I	S	T	P	·	F	None	0000 ～ 9999	0025
								It sets Speed loop gain when GSEL signal ON. (Description can be referred to [P101].)		
P112	Speed loop Integral time constant/ GSEL signal ON	I	S	T	P	·	F	msec	0000.00 ～ 9999.99	0020.00
								It sets time constant of Speed loop Integral compensation when GSEL signal is ON. (Description can be referred to [P102].)		
P113	Speed loop Derivative time constant/ GSEL signal ON	I	S	T	P	·	F	μsec	0000 ～ 9999	0000
								It sets time constant of Speed loop Derivative compensation when GSEL signal is ON. (Description can be referred to [P1053.)		
P114	Speed loop Proportional gain division ratio/ GSEL signal ON	I	S	T	P	·	F	%	-100.0 ～ 100.0	000.0
								It sets Proportional compensation gain division ratio of 2 free degree PID speed control system when GSEL signal is ON. (Description can be referred to [P104].)		
P115	Speed loop Derivative gain division ratio/ GSEL signal ON	I	S	T	P	·	F	%	-100.0 ～ 100.0	000.0
								It sets Derivative compensation gain division ratio of 2 free degree PID speed control system when GSEL signal is ON. (Description can be referred to [P105].) (		
P116	Torque limit value/ Magnetic pole detection	I	S	T	P	·	F	%	000.0 ～ 799.9	300.0
								It sets Torque limit value when Magnetic pole is detected But same limit value is applied to both directions (+/-).		
P117	Magnetic pole detection gain 1	I	S	T	P	·	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.		

※ 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)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 1》 [Driver adjustment parameter]										
P118	Magnetic pole detection Integral time constant	I	S	T	P	·	F	msec	00000 ~ 65535	00200
								It sets Integral compensation gain when Magnetic pole is detected. When it is set smaller, though response becomes faster, if the value is too small, vibration may easily occur. If set value is [0], Integral compensation is not conducted.		
P119	Magnetic pole detection gain 2	I	S	T	P	·	F	S^{-1}	0000 ~ 9999	0020
								It sets Position loop gain when Magnetic pole is detected. When it is set larger, though response becomes faster, if the value is too large, vibration may easily occur. If set value is [0], since Position loop opens, Magnetic pole detection can not be conducted.		
P120	Torque command filter frequency	I	S	T	P	·	F	Hz	0000 ~ 4999 (1Hz unit)	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	S	T	P	·	F	Hz	0000 ~ 4999 (1Hz unit)	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	S	T	P	·	F	Hz	0000 ~ 4999 (1Hz unit)	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	S	T	P	·	F	Hz	0000 ~ 4999 (1Hz unit)	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	S	T	P	·	F	Hz	0000 ~ 4999 (1Hz unit)	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	S	T	P	·	F	%	000.0 ~ 799.9 (0.1%unit)	300.0
								It sets limit value of motor forward output torque. If set is larger than peak torque, output is clamped at the peak torque. And if set is [0], forward torque is not generated.		
P126	Torque limit value 1−	I	S	T	P	·	F	%	000.0 ~ 799.9 (0.1% unit)	300.0
								It sets limit value of motor reverse output torque. If set is larger than peak torque, output is clamped at the peak torque. And if set is [0], reverse torque is not generated.		

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

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 1》 [Driver adjustment parameter]										
P127	Torque limit value 2+	I	S	T	P	·	F	%	−000.1,000.0 ~799.9 (0.1%unit)	300.0
								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.		
P128	Torque limit value 2−	I	S	T	P	·	F	%	−000.1,000.0~799.9 (0.1%unit)	300.0
								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.		
P129	Speed command gain (Voltage) ⚠Caution : Regardless to this setting DC voltage input range is ± 10V.	I	S	T	·	·	F	V	06.00~10.00 (10.01~00.00)	010.00
								It sets full scale value (Motor rated rotating speed command) of External speed command voltage (DC). When set value command voltage is inputted, a motor runs at rated speed. Though value more than [10.00] can be inputted, max. input voltage is ±10V. Though motor regeneration can be conducted in the speed range more than [10.00] but less than max. speed, motor drive can not be done. Sample) When set value is [100.00] and rated speed is 2000rpm by Speed command voltage input 10V, motor drive speed is 2000*10V/ 100.00=200rpm. Speed command resolution is highest at 10V. When [06.00] is set, speed command resolution is 6/10 of [10.00] set.		
P130	Speed command offset	I	S	T	·	·	F	mV	−999 ~ 999	000
								It sets offset voltage value of External speed command (DC) . When External speed command voltage has offset by the offset voltage, a motor slowly runs. Set this parameter to stop the motor caused by offset voltage.		

※ 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)
			Speed	Torque	Pulse train			Function		
《Group 1》 [Driver adjustment parameter]										
P131	Torque command offset	I	· T · ·				F	mV	−999 ～ 999	000
								It sets offset voltage value of External torque command (DC) .		
P132	External speed limit Enable/ Disable selection	R	· T · ·				F	None	SPD.LIM.N/ SPD.LIM.Y	SPD.LIM.N
								It selects whether motor shall be limited or not by External speed command (DC) in Torque control command. ◎ SPD.LIM.N : No Motor speed is limited by [P133 : Speed limit value]. ◎ SPD.LIM.Y : Yes Motor speed is limited by lower value of [P133 : Speed limit value] and External speed command.		
P133	Speed limit value	I	· T · ·				F	%	000.00 ～ 120.00	120.00
								It sets motor speed limit value in Torque command control by ratio to rated speed or applicable max. speed.		
P134	Speed command value 1	I	S · · ·				F	%	−100.00 ～ 100.00	050.00
								It sets motor speed and command direction by internal Speed command 1 in Speed command control by ratio to rated speed or applicable max. speed.		
P135	Speed command value 2	I	S · · ·				F	%	−100.00 ～ 100.00	040.00
								It sets motor speed and command direction by internal Speed command 2 in Speed command control by ratio to rated speed or applicable max. speed.		
P136	Speed command value 3	I	S · · ·				F	%	−100.00 ～ 100.00	030.00
								It sets motor speed and command direction by internal Speed command 3 in Speed command control by ratio to rated speed or applicable max. speed.		
P137	Torque command value 1	I	· T · ·				F	%	−799.9 ～ 799.9	030.0
								It sets command value and command direction by internal Torque command 1 in Torque command control.		
P138	Torque command value 2	I	· T · ·				F	%	−799.9 ～ 799.9	050.0
								It sets command value and command direction by internal Torque command 2 in Torque command control.		
P139	Torque command value 3	I	· T · ·				F	%	−799.9 ～ 799.9	080.0
								It sets command value and command direction by internal Torque command 3 in Torque command control.		
P140	Auto. tuning trial run direction selection	R	· · · ·				F	None	BOTH/ +ONLY/ −ONLY	BOTH
								It selects trial run direction in Auto. tuning. Set: BOTH — Contents: Both Set: +ONLY — Contents: Forward Set: −ONLY — Contents: Reverse ※ Operation method can be referred to [9−4 Auto. tuning].		

※ 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)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 1》 [Driver adjustment parameter]										
P141	Auto. tuning trial run speed ratio	R	・ ・ ・ ・				F	None	0.00 ～ 1.00	0.30
			It sets ratio to rated speed when trial run of a motor is conducted in Auto. tuning run. When set is [1.00], the motor runs at rated speed. ※ Operation method can be referred to [9−4 Auto. tuning].							
P142	Torque limit selection at Alarm stop	I	S T P ・				F	None	ALM.TL N/ALM.TL Y	ALM.TL N
			It selects Torque limit function to conduct sudden motor stop when Alarm occurs. ◎ ALM.TL N: It conducts torque limit in accordance with [P125/126 : Torque limit value 1±] . ◎ ALM.TL Y: It conducts torque limit in accordance with [P127/128 : Torque limit value 2±] .							
P143	R2 compensation selection	I	S T P ・				F	None	R2 OFF/ R2 ID	R2 OFF
			It selects a method of R2 compensation (Output torque error compensation caused by motor temperature) . ◎ R2 OFF : R2 compensation is not conducted. R2 ID : It identifies R2 by motor current and voltage and R2 compensation is conducted. **※Since this function is not applied now, please do not edit it.**							
P144	Electronic thermal detection selection	R	S T P ・				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	S T P ・				F	%	−100 ～ 100 (1%unit)	005
			It sets motion direction and speed when Self-diagnosis [DG84: Magnetic pole sensor automatic adjustment] is executed. Relation of set value and motion is as follows. Plus : Forward motion Minus: Reverse motion Speed : Ratio setting to rated (max.) speed							

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※ 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)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 1》 [Driver adjustment parameter]										
P146	Mass/ Inertia	I	S	T	P	·	F	See refer.	00000000～99999999	00000000
								It sets [Mass] or [Inertia] of a control system. Its unit is as follows. For Linear motor : Mass (10^{-4} Kg) For other than Linear motor : Inertia (10^{-6} Kg·m^2) 【Caution】 If the value is not clear, do not set it.		
P147	Viscosity friction	I	S	T	P	·	F	See refer.	00000000～99999999	00000000
								It sets [Viscosity friction of a control system. Its unit is as follows. For Linear motor : 10^{-4} N/m/s For other than Linear motor : 10^{-6} N·m/rad/s 【Caution】 If the value is not clear, do not set it.		
P148	Noise compensation filter frequency	I	S	T	P	·	F	Hz	0000 ～ 4999 (1Hz unit)	0000
								It sets filter frequency of Noise compensation. When set is [0], Noise compensation is disabled.		
P149	Disc motor initialization	R	S	T	P	·	F	%	−100 ～ 100 (1% unit)	005
								It sets motion direction and speed when Self-diagnosis [DG95 : Disc motor auto. adjustment] is executed. Relation and setting value is as follows. Plus : Forward motion Minus: Reverse motion Speed : Ratio setting to rated (max.) speed		
P150	Noise compensation invalid range	I	S	T	P	·	F	%	000.00 ～ 100.00	005.00
								It sets invalid speed of Noise compensation . Noise compensation is disabled at the speed less than this setting value.		
P151	Notch filter center frequency 3	I	S	T	P	·	F	Hz	0000 ～ 4999 (1Hz unit)	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	S	T	P	·	F	Hz	0000 ～ 4999 (1Hz unit)	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	S	T	P	·	F	Hz	0000 ～ 4999 (1Hz unit)	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	S	T	P	·	F	Hz	0000 ～ 4999 (1Hz unit)	0000
								It sets band width of Notch filter 4. If set is [0], the Notch filter 4 is disabled.		

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

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 1》 [Driver adjustment parameter]										
P155	Notch filter center frequency 5	I	S	T	P	·	F	Hz	0000 ~ 4999 (1Hz unit)	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	S	T	P	·	F	Hz	0000 ~ 4999 (1Hz unit)	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
								Be sure to set [0] to this Parameter..		
P158	Rated power for Regenerative resistor	R	S	T	P	·	F	KW	—999.999~999.999	000.000
								It sets Rated power value for Regenerative resistor connected with this unit. In accordance with this power value, display of Display status [ST16] (Regenerative load ratio) and detection of Regenerative over load error are conducted. If any Regenerative resistor is not connected, set [0]. When this setting is 0, · Display of [ST16] (Regenerative load ratio) indicates regenerative power ratio accumulated in this unit. · If this display becomes more than 50%, since Over voltage error could occur, attach Regenerative resistor. · Regenerative over load error detection is disabled. When a thermostat is used for Regenerative resistor protection, set negative (—) value to Regenerative resistor power. When this setting is negative, Display of [ST16] (Regenerative load ratio) is indicated based on this value, but Regenerative over load error detection is disabled.		

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

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 2》 [NC adjustment parameter]										
P200	Position loop gain	I	· · P ·				F	S^{-1}	0000 ~ 9999	0020
								It sets Position loop gain in 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 Pulse train run can not be conducted.		
P201	Servo lock gain	I	· · P ·				F	S^{-1}	0000 ~ 9999	0020
								It sets Position loop gain in Servo lock status, when position deviation is within [P202:Positioning complete range]. When it is set larger, though response becomes faster, vibration may easily occur. If set value is [0], Position loop opens and Servo lock is not conducted.		
P202	Positioning complete range	R	· · P ·				F	000 ~ 999	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/C-SEN1/C-SEN2] 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].		
P207	Overflow detection pulse	R	· · P ·				F	pulse	00001000 ~ 99999999	00024000
								It sets Overflow detection value of Position deviation. Setting is identical to [P202: Positioning complete range].		
P208	Deviation error detection pulse	R	· · P ·				F	pulse	00000000 ~ 99999999	00000000
								It sets allowable range of Position deviation. Setting is identical to [P202: Positioning complete range]. If set value is [0.00], Deviation error is not detected.		

※ 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: Speed	Torque	Pulse train		Level	Setting unit	Setting range	Standard ship. set (Initial value)
			S	T	P			Function		
《Group 2》 [NC adjustment parameter]										
P209	Motion selection at Deviation error	I	· · P ·				F	None	Menu selection 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 Pulse train run from Deviation error detection to stop of motion, Warning signal (WNG) is outputted. And in case of CONTINUE (Motion continues.), next points shall be noticed. · Positioning time becomes long. · Over load error may easily occur. · When excessive deviation exists at deceleration, set · [000] to the p arameters [P605 : Pulse train feed forward ratio].		
P211	Acceleration time	R	S · · ·				F	sec	00.000 ~ 99.999 (1msec unit)	00.000
								It sets Acceleration time of a motor from zero to rated speed in Speed control.		
P214	Deceleration time	R	S · · ·				F	sec	00.000 ~ 99.999 (1msec unit)	00.000
								It sets Deceleration time of a motor from rated speed to stop in Speed control.		
P217	Only for maker	—	· · · ·				F			00
								Be sure to set [0] to this Parameter.		
P218	Pulse train feed forward Derivative addition ratio	R	· · P ·				F	None	—1 ~ 31	00
								It sets addition amount of Derivative to Feed forward data in Pulse train 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.		
P220	Position loop Derivative time constant	I	· · P ·				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	· · P ·				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.		

※ 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)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 2》 [NC adjustment parameter]										
P222	Only for maker	—	· · · ·				F			00000
			Be sure to set [0] to this Parameter.							
P223	Only for maker	—	· · · ·				F			00000
			Be sure to set [0] to this Parameter.							

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

<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>Speed</td><td>Torque</td><td>Pulse train</td><td></td><td colspan="3">Function</td></tr>
<tr><td></td><td></td><td></td><td>S</td><td>T</td><td>P</td><td></td><td></td><td colspan="3"></td></tr>
<tr><td colspan="11">《Group 3》 [Position adjustment parameter]</td></tr>
<tr><td rowspan="2">P300</td><td rowspan="2">Rotating direction selection</td><td rowspan="2">R</td><td rowspan="2">S T P ·</td><td rowspan="2">F</td><td colspan="6">None / FORWARD／REVERSE / FORWARD</td></tr>
<tr><td colspan="6">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</td></tr>
<tr><td rowspan="2">P301</td><td rowspan="2">Setting unit selection</td><td rowspan="2">R</td><td rowspan="2">S T P ·</td><td rowspan="2">F</td><td colspan="6">None / [mm]/[°]/[in] / [mm]</td></tr>
<tr><td colspan="6">It selects basic unit for setting of Positioning data, etc.. All the position and speed setting use this unit.
([mm]: mm/[°]: degree/ [in]: inch)</td></tr>
<tr><td rowspan="2">P302</td><td rowspan="2">Command unit</td><td rowspan="2">R</td><td rowspan="2">S T P ·</td><td rowspan="2">F</td><td colspan="6">mm/°/in | 0.000001/0.0001/0.0001/ 0. 01/0.1/1/0.000001/ 0.0000001 | 0.01</td></tr>
<tr><td colspan="6">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.
(Caution) If the setting value is 1 when using linear motor, it will be “the positiong of 1 command 1 feed back ”.</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.

<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>Speed</td><td>Torque</td><td>Pulse train</td><td></td><td colspan="3" rowspan="2">Function</td></tr>
<tr><td>S</td><td>T</td><td>P</td><td></td></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 colspan="3">· · · ·</td><td>F</td><td colspan="3">00000
Be sure to set [0] to this Parameter.</td></tr>
<tr><td>P501</td><td>Only for maker</td><td>—</td><td colspan="3">· · · ·</td><td>F</td><td colspan="3">00000
Be sure to set [0] to this Parameter.</td></tr>
<tr><td>P502</td><td>LCD current position display selection</td><td>I</td><td colspan="3">S T P ·</td><td>F</td><td colspan="3">None | ABSOLUTE/MACHINE/INCREMENT /ABS.ENC. | ABSOLUTE
It selects contents of current position displayed in LCD status display mode 『ST01』.
◎ ABSOLUTE (Absolute position) It displays distance (position) from position data at power ON.
◎ MACHINE (Machine position)
Same as absolute position is displayed.
◎ INCREMENT (Relative position)
Same as absolute position is displayed.
◎ ABS.ENC. (ABS encoder data)
Position managed by ABS encoder is displayed.</td></tr>
<tr><td>P505</td><td>Communication function selection</td><td>R</td><td colspan="3">S T P ·</td><td>F</td><td colspan="3">None | 0 ～ 9 | 5
It sets an external unit (protocol) interfaced through Serial communication.
Set № | External unit | Set № | External unit
0 | Reserved(MDI) | 5 | Dedicated PC software
1 | Reserved | 6 | Reserved
2 | Computer | 7 | Reserved
3 | Touch panel | 8 | Reserved
4 | Reserved | 9 | Reserved</td></tr>
<tr><td>P506</td><td>Communication ID No.</td><td>R</td><td colspan="3">S T P ·</td><td>F</td><td colspan="3">None | 00 ～ 16 | 01
It sets ID No.(Office code) when digital chain is used for connection in Serial Communication.(When only 1 unit is connected, set [01].)</td></tr>
<tr><td>P507</td><td>Data length selection (Serial communication)</td><td>R</td><td colspan="3">S T P ·</td><td>F</td><td colspan="3">BITS | 7 BITS/8 BITS | 8 BITS
It selects Transmission/ receipt data length of Serial communication.</td></tr>
<tr><td>P508</td><td>Parity selection (Serial communication)</td><td>R</td><td colspan="3">S T P ·</td><td>F</td><td colspan="3">None | NONE/ODD/EVEN | ODD
It selects Parity of Serial communication.
◎ NONE : No parity
◎ ODD : Odd parity
◎ EVEN : Even parity</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)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 5》 [Display, Edit, Communication parameter]										
P509	Baud rate selection (Serial communication)	R	S	T	P	·	F	BPS	4.8K/9.6K/19.2K/56K/115.2K	9.6K
								It selects baud rate of Serial communication. **※Since currently [115.2KBPS] can not be available, do not select this.**		
P511	Communication group ID set 1	R	S	T	P	·	F	None	000 ~ 255	000
								When this unit is connected with plural units and broadcast communication is executed, it sets ID No. allocated to a same group. ◎ 0 : Communication group is not set. ◎ 1~255 : A unit attends to set No. group. When ID is set area of 1~5, a unit attends to same group No. group. In the case, set area No. (1~5) is neglected.		
P512	Communication group response yes/no 1	R	S	T	P	·	F	None	RESP.OFF/ RESP. ON	RESP.OFF
								Using this and Communication group ID set 1, it sets yes/no response to a parent office when Broadcast communication is conducted to an attended group. ◎ RESP.OFF : Response is not made to a parent office. ◎ RSEP. ON : Response is returned to a parent office in Broadcast communication.		
P513	Communication group ID set 2	R	S	T	P	·	F	None	000 ~ 255	000
								It is a second area to set Communication group ID No.. Setting method is same as Communication group ID set 1.		
P514	Communication group response yes/no 2	R	S	T	P	·	F	None	RESP.OFF/ RESP. ON	RESP.OFF
								Set this together with Communication group ID set 2. Setting method is same as Communication group response yes/ no 1.		
P515	Communication group ID set 3	R	S	T	P	·	F	None	000 ~ 255	000
								It is a third area to set Communication group ID No.. Setting method is same as Communication group ID set 1.		
P516	Communication group response yes/no 3	R	S	T	P	·	F	None	RESP.OFF/ RESP. ON	RESP.OFF
								Set this together with Communication group ID set 3. Setting method is same as Communication group response yes/ no 1.		
P517	Communication group ID set 4	R	S	T	P	·	F	None	000 ~ 255	000
								It is a fourth area to set Communication group ID No.. Setting method is same as Communication group ID set 1.		
P518	Communication group response yes/no 4	R	S	T	P	·	F	None	RESP.OFF/ RESP. ON	RESP.OFF
								Set this together with Communication group ID set 4. Setting method is same as Communication group response yes/ no 1.		

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

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

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

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

※ 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)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 6》 [Pulse train input parameter]										
P600	CIH signal specification selection	R	· · P ·				F	None	CIH CLOSE/CIH OPEN	CIH CLOSE
								It selects effective logic of a control input signal (CIH) . 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		
P601	Pulse train command sequence change	R	· · P ·				F	None	FORWARD／REVERSE	FORWARD
								It selects motor rotating direction by Pulse train command input. ◎ FORWARD (Forward selection) A motor runs forward by Forward or lead B phase Pulse train command. ◎ REVERSE (Reverse selection) A motor runs reverse by Forward or lead B phase Pulse train command. But when [REVERSE] is selected by [P300 : Rotating direction selection], rotating direction is reversed to the above direction.		

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

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 6》 [Pulse train input parameter]										
P602	Pulse train command type selection	P	S	T	P	·	F	None	X1/X2/X4/F/RPULSE/P+F/R/ ID0.FCRC/ID0.CMNDP/ID0.MTENC	X1

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

What is Servo control communication?
① Servo control communication receives/ transmits motion data between this unit and other units (Hereafter, other VC is used.) equipped with Servo control communication.
This unit only supports **[Pulse train communication]** which handles only Transmission/ Receipt of Pulse train data out of all the Servo control communication functions.
② Following functions can be achieved by [Pulse train communication].
·Received pulse data from other VC can be used as Pulse train co mmand of this unit to conduct Pulse train run. And since max. 8 axes can receive one transmitted data simultaneously, plural axis control following to 1 pulse data can be achieved.
·This unit can conducts Pulse train run by external Pulse train commands and transmits the Pulse train commands to other VC, simultaneously. By this method, this unit and other VCs can follow 1 master axis command and in the other word, plural pulse train run can be achieved.
· This unit can transmit motor motion pulse data of this unit to drive other VC which can conduct highly accurate twin drive motion. In the case, select [ID0.CMND.P]for 〔P602 : Pulse train command type selection〕 of this unit. Synchronous accuracy is improved better than when [ID0.MTENC] is selected.
③ Transmission of Pulse train communication means to transmit pulse data.
Transmission unit can be selected by setting [0] to 〔P521: Servo control communication ID No.〕.
④ Receipt of Pulse train communication means to receive pulse data from other VC. In the case, select [8] (Receipt) for 〔P521:Servo control communication ID No.〕 and Receipt data [ID0.FCRC/ ID0.CMNDP/ ID0.TENC] for 〔P602 : Pulse train command type selection〕.

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

Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 6》 [Pulse train input parameter]										
P603	Pulse train command compensation numerator	I	· · P ·				F	None	00000001 ～ 99999999	00000001
								Together with [P604 : Pulse train command compensation numerator], it sets Pulse train command input pulse number (=Pulse train compensation ratio) per motion command unit. (Motion command unit is determined by parameters [P301] and [P302].) When motion command amount is 'm 'and Pulse train command input pulse number is 'n', 'm' value is set by this parameter.		
P604	Pulse train command compensation denominator	I	· · P ·				F	None	00000001 ～ 99999999	00000001
								Together with [P603 : Pulse train command compensation denominator], it sets Pulse train command input pulse number (=Pulse train compensation ratio) per motion command unit. (Motion command unit is determined by parameters [P301] and [P302].) When motion command amount is 'm 'and Pulse train command input pulse number is 'n', 'n' value is set by this parameter		

《Setting sample of Pulse train compensation ratio 》

● Linear motion (linear motor) system

In order to coincide to motion command amount (Work travel amount) 10.000 mm(A decimal point position depends on [P302 : command unit].) with Pulse train command input 15000 pulses, setting is

Setting value

$$[P603] = [\text{Pulse train command input pulse number}] = 15000$$

$$[P604] = \frac{[\text{Motion command amount}]}{[\text{P302 : command unit}]} = \frac{10.000\ [\text{mm}]}{0.001[\text{mm}]} = 10000$$

$$[\text{Motion command amount}] \times \frac{[\text{P603 : Pulse train command compensation numerator}]}{[\text{P604 : Pulse train command compensation denominator}]}$$

$$[\text{P302 : Command unit}]$$

= [Pulse train command input pulse number]

● Rotating (Disc/ Rotating motor) system

When a 2000ppr (8000ppr, 4times) encoder is used, in case of setting motor 1 turn (8000 pulse motion) by 36000 pulse Pulse train command input, setting is,

[P603] = [Pulse train command input number] = 36000

[P604] = [Motor motion pulse number] = 8000

$$[\text{Motor motion pulse number}] \times \frac{[\text{P603 : Pulse train command compensation numerator}]}{[\text{P604 : Pulse train command compensation denominator}]}$$

= [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)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 6》 [Pulse train input parameter]										
P605	Pulse train Feed forward ratio	R	· · P ·				F	%	000 ~ 120	080
								It sets Feed forward ratio to Speed command in Pulse train run. When it is set larger, though compliance becomes better, in some cases due to mis- matching 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.		
P606	Pulse train Feed forward shift ratio	R	· · P ·				F	%	000 ~ 100	001
								It decreases Feed forward amount in Pulse train run. Feed forward amount = Input pulse speed − (rated speed ×set value (%)) But if a mark to input pulse speed changes in the above expression, it is clamped at [0].		
P607	Pulse train Feed forward filter time constant	R	· · P ·				F	msec	000.0 ~ 100.0	020.0
								It sets Filter time constant to adjust response of Feed forward control in Pulse train run.		
P608	Pulse train delay compensation time	R	· · P ·				F	msec	0000.0~1000.0 0.1msec unit)	0000.0
								It sets compensation time of control delay in Pulse train run.		
P609	Pulse train Averaging filter time	R	· · P ·				F	msec	0000.0~1000.0 (0.1msec unit)	0000.0
								It sets averaging filter time to commands in Pulse train run. Actual motion is conducted by Pulse train command as follows. ◎ At step response Linear Accel./ Decel. by this time ◎ At linear Accel./ Decel. S shape Accel./ Decel. by setting time plus this time		
P610	Pulse train command input selection when an extension board is connected	P	· · P ·				F	None	EXT/STD	EXT
								It selects connector CN3 or basic connector CN1 for Pulse train command input when an extension board is connected. ◎ EXT Optional extension board connector CN3 ◎ STD Basic connector CN1		

※ 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)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 7》 [I/O signal parameter]										
P700	Monitor 1 selection	I	S	T	P	・	F	None	SPD.REF./SPD.FB./TRQ.REF./TRQ.LIM.＋/TRQ.LIM./P.RANGE.L/P.RANGE.H/SPD.OUT/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 ◎ OPT.W : Only for maker (Do not set this.) ◎ OPT.L : Only for maker (Do not set this.)		
P701	Monitor 2 selection	I	S	T	P	・	F	None	SPD.REF./SPD.FB./TRQ.REF./TRQ.LIM.+/TRQ.LIM.-/P.RANGE.L/P.RANGE.H/SPD.OUT/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	S	T	P	・	F	%	000.00 ～ 100.00	000.10
								It sets output range of Speed zero signal (SZ).		
P704	SON signal logic selection	R	S	T	P	・	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.)		
P705	Hardware OT Enable/ Disable selection	R	S	T	P	・	F	None	OT.CHK.Y/OT.CHK.N	OT.CHK.Y
								It selects Enable/ Disable of Over travel signal (FOT,ROT). ◎ OT.CHK.Y : Enable ◎ OT.CHK.N : Disable		
P706	Mode change confirmation delay time	R	S	T	P	・	F	sec	0.00 ～ 9.99 (10msec unit)	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 10msec (internal processing time).		

※ 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)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 7》 [I/O signal parameter]										
P710	Stop method at Emergency stop	I	S	T	P	·	F	None	QUICK/FREE RUN	QUICK
								It selects motor stop method at Emergency stop, ◎ QUICK (Brake stop) A motor stops by a brake for decel. time set by 〔P711 : Deceleration time at Emergency stop〕 and after setting time 〔P712 : Servo OFF delay time after Emergency stop〕 passes Servo is OFF (torque free). ◎ FREE RUN (Free run stop) A motor conducts Torque free run stop. **※In Torque control, a motor conducts free run stop regardless to this parameter setting value.**		
P711	Deceleration time at Emergency stop	R	S	T	P	·	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	S	T	P	·	F	sec	0.00 ～ 9.99 (10msecunit)	0.00
								It sets time from motor stop to Servo OFF (torque free) when Brake stop is selected by 〔P710 : Stop method at Emergency stop〕. When set value is [0], a motor stops and at the same time Servo is OFF (torque free). When Free run stop is selected by 〔P710 : Stop method at Emergency stop〕, this parameter is invalid.		
P713	Stop method at AC power loss	I	S	T	P	·	F	None	QUICK/ FREE RUN	FREE RUN
								It selects motor stop method when AC power is lost. (at power OFF). ◎ QUICK (Brake stop) A motor stops by a brake. ◎ FREE RUN (Free run stop) A motor conducts Torque free run stop. 【Caution】 ① When AC power is OFF, to output Alarm signal (ALM), set [ALM.ON] to [P714 : ALM output selection at AC power loss]. (Alarm signal is not outputted by ([ALM.OFF] set). ② In case of brake stop, brake stop torque varies depending on controller status and load conditions. Specially, if AC power loss is detected in acceleration, Free run stop may occur.		

※ 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)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 7》 [I/O signal parameter]										
P714	ALM output selection at AC power loss	I	S	T	P	·	F	None	ALM.OFF/ALM.ON	ALM.OFF
								It selects whether Alarm signal (ALM) shall be outputted or not when AC power loss is detected (at power OFF). ◎ ALM.OFF : Alarm signal (ALM) is not outputted. ◎ ALM.ON : Alarm signal (ALM) is outputted. ＊ Motor stop method at AC power loss detection is set by [P713 : Stop method at AC power loss].		
715	ALM/ WNG signal logic selection	R	S	T	P	·	F	None	ALM/WNG1 ～ ALM/WNG4	ALM/WNG1
								It selects output logic of Control output signals (ALM, WNG). ◎ ALM/WNG1 Open ALM—COM1 : ON/Close WNG—OM : ON ◎ ALM/WNG2 Close ALM—COM1 : ON/ Close WNG—COM : ON ◎ ALM/WNG3 Open ALM—COM1 : ON/ Open WNG—COM : ON ◎ ALM/WNG4 Close ALM—COM1 : ON/ Open WNG—COM : ON		
716	RDY signal specification selection	R	S	T	P	·	F	None	RDY1/RDY2/RDY3/RDY4	RDY1
								It selects output spec. of Control output signal (RDY). ① : Hardware OT alarm, Software OT alarm ② : Alarm which motion at error detection is Servo lock and requires Reset signal (RST) for release it. ◎ RDY1 At motor drive (includes ①②) : Close RDY—COM1. At motor free : Open RDY—COM1. ◎ RDY2 At motor drive (includes ①) and not ② : Close RDY-COM1 At motor free or ② : Open RDY-COM1. ◎ RDY3 At motor drive (includes ②) and not ① : Close RDY-COM1 At motor free or ① : Open RDY-COM1. ◎ RDY4 At motor drive and not ①② : Close RDY—COM1. At motor free or ①② : Open RDY—COM1		

※ 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)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 7》 [I/O signal parameter]										
P730	Only for maker	—	· · · ·				F			00000
								Be sure to set [0] to this Parameter.		
P731	Only for maker	—	· · · ·				F			00000000
								Be sure to set [0] to this Parameter.		
P732	Only for maker	—	· · · ·				F			00000
								Be sure to set [0] to this Parameter.		
P733	Only for maker	—	· · · ·				F			00000000
								Be sure to set [0] to this Parameter.		
P734	Brake output delay time	R	S	T	P	·	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.

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

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

Bit

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
—	—	—	—	—	—	—	—	—	—	—	—	—	—	PC	

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
BRON	CIH	TL	MD2	MD1	SSD	SS2	SS1	ROT	FOT	CLR	GSEL	—	SON	EMG	RST

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

Bit

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
—	—	—	—	OR4	OR3	OR2	OR1	—	—	—	—	—	—	—	—

※ 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)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 7》 [I/O signal parameter]										
P737	Basic external input signal input allocation 1	R	S	T	P	·	F	None	00000000 ~ 99999999	15040301
								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 7-35) is set to the 2 digits. When [00] is set, a set input signal is disabled. Sample) 15 04 03 01 DI1: Allocates to RST signal. DI2: Allocates to SON signal. DI3: Allocates to DR signal. DI4: Allocates to CIH signal.		
P738	Basic external input signal input allocation 2	R	S	T	P	·	F	None	00000000 ~ 99999999	13121009
								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 7-35) is set to the 2 digits. When [00] is set, a set input signal is disabled. Sample) 13 12 10 09 DI5: Allocates to SS1 signal. DI6: Allocates to SS2 signal. DI7: Allocates to MD1 signal. DI8: Allocates to MD2 signal.		
P739	Extended external input signal input allocation 1	R	S	T	P	·	F	None	00000000 ~ 99999999	00000000
								It allocates External input signals, EI9~EI12 of an optional extension board connector CN1. This allocation setting is as a below sample which divides a signal by 2 digits, and allocation No. in input signal allocation list (page 7-35) is set to the 2 digits. When [00] is set, a set input signal is disabled. (Initial value: All are disabled.) Sample) 14 11 06 05 EI9: Allocates to GSEL signal. EI10: Allocates to CLR signal. EI11: Allocates to SSD signal. EI12: Allocates to TL 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)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 7》 [I/O signal parameter]										
P740	Extended external input signal input allocation 2	R	S	T	P	·	F	None	00000000 ~ 99999999	00000000
								It allocates External input signals, EI3~EI16 of an optional extension board connector CN3. This allocation setting is as a below sample which divides a signal by 2 digits, and allocation No. in input signal allocation list (page 7-35) is set to the 2 digits. When [00] is set, a set input signal is disabled. (Initial value: All are disabled.) Sample) 17 16 08 07 EI13: Allocates to FOT signal. EI14: Allocates to ROT signal. EI15: Allocates to BRON signal EI16: Allocates to PC signal.		
P741	Extended external input signal input allocation 3	R	S	T	P	·	F	None	00000000 ~ 99999999	00000000
								It allocates External input signals, EI7~EI20 of an optional extension board connector CN3. This allocation setting is as a below sample which divides a signal by 2 digits, and allocation No. in input signal allocation list (page 7-35) 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 OR1 signal. 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)
			Speed	Torque	Pulse train			Function		
			S	T	P					

《Group 7》 [I/O signal parameter]

P737
P738
P739
P740
P741

Input signal allocation list

Allocat. No.	Code	Signal name	Allocat. No.	Code	Signal name
00	----	Disable	25		Reserved
01	RST	Reset	26		〃
02	EMG	Emergency stop	27		〃
03	SON	Servo ON	28		〃
04	DR	Start	29		〃
05	GSEL	Speed gain selection	30		〃
06	CLR	Deviation clear	31		〃
07	FOT	Forward over travel	32		〃
08	ROT	Reverse over travel	33		〃
09	SS1	Command selection 1	34		〃
10	SS2	Command selection 2	35		〃
11	SSD	Command direction selection	36		〃
12	MD1	Mode selection 1	37		〃
13	MD2	Mode selection 2	38		〃
14	TL	Torque limit	39		〃
15	CIH	Command pulse input inhibit	40		〃
16	BRON	Forced brake ON	41	OR1	Speed override 1
17	PC	Proportional control	42	OR2	Speed override 2
18		Reserved	43	OR3	Speed override 3
19		〃	44	OR4	Speed override 4
20		〃	45		Reserved
21		〃	46		〃
22		〃	47		〃
23		〃	48		〃
24		〃	49		〃

※ 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)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 7》 [I/O signal parameter]										
P742	Basic external output signal output allocation	R	S	T	P	·	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 (Refer to next page.) is set to the 2 digits. When [00] is set, a set output signal is disabled. Sample) 05 02 01 03 DO1: Allocates to RDY signal. DO2: Allocates to ALM signal. DO3: Allocates to WNG signal. DO4: Allocates to PN signal.		
P743	Extended external output signal output allocation 1	R	S	T	P	·	F	None	00000000 ～ 99999999	00000000
								It allocates External output signals, EO1～EO4 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 (Refer to next page.) 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	S	T	P	·	F	None	00000000 ～ 99999999	00000000
								It allocates External output signals, EO5～EO8 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 (Refer to next page.) is set to the 2 digits. When [00] is set, a set output signal is disabled. (Initial value: All are disabled.) Sample) 08 07 16 05 EO5: Allocates to PN signal. EO6: Allocates to SVLK signal. EO7: Allocates to BRK signal. EO8: 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)
			Speed	Torque	Pulse train			Function		
			S	T	P					

《Group 7》 [I/O signal parameter]

P742
P743
P744

Output signal allocation list

Allocat. No.	Code	Signal name	Allocat. No.	Code	Signal name
00	----	Disable	25		Reserved
01	ALM	Alarm	26		〃
02	WNG	Warning	27		〃
03	RDY	Servo ready	28		〃
04	SZ	Speed zero	29		〃
05	PN	Positioning complete	30		〃
06		Reserved	31		〃
07	BRK	Brake release	32		〃
08	LIM	In Torque limit	33		〃
09		Reserved	34		〃
10		〃	35		〃
11	SMOD	In Speed control mode	36		〃
12	TMOD	In Torque control mode	37		〃
13	PMOD	In Pulse train control mode	38		〃
14		Reserved	39		〃
15		〃	40		〃
16	SVLK	In Servo lock	41		〃
17		Reserved	42		〃
18		〃	43		〃
19		〃	44		〃
20		〃	45		〃
21		〃	46		〃
22		〃	47		〃
23		〃	48		〃
24		〃	49		〃

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

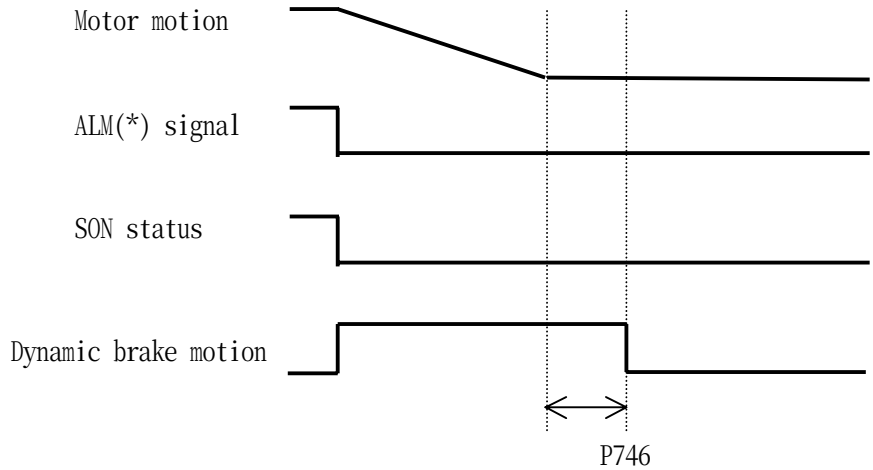
Parameter No.	Parameter name	Activating Timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Speed	Torque	Pulse train			Function		
			S	T	P					
《Group 7》 [I/O signal parameter]										
P745	Dynamic brake specification selection	R	S	T	P	·	F	None	INVALID/DMB ON/DMB OFF	INVALID
								It selects specification of Dynamic brake. ◎ INVALID (No connection) Dynamic brake is not conducted. ◎ DMB (Dynamic brake) Normal Dynamic brake is conducted. ◎ OFF (Motion invalid) After power is turned ON, Dynamic brake keeps ON until first Servo ON is conducted and then always keeps OFF.		
P746	Servo ON ready delay time at Dynamic brake	R	S	T	P	·	F	msec	0 ～ 10	01
								It sets time from confirming motor stop status by Dynamic brake to releasing the brake.		

P745
P746

《Dynamic brake motion》

① This function is set by [P745 : Dynamic brake specification selection].
② Dynamic brake is enabled in Servo OFF status when a motor is running, and disabled when the time 〔P746 Servo ON ready delay time at Dynamic brake] passes after confirming motor stop.
③ This brake is an emergency brake for emergency stop. In motor stop status, this brake does not work.
④ This function is a factory option.

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



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

Parameter No.	Parameter name	Activating timing	Run mode method				Level	Setting unit	Setting range	Standard ship. set (Initial value)
			Automatic	Manual	Function	Pulse train		Function		
			A	M	Z	P				
《Group 7》 [Display, Edit, Communication parameter]										
P747	Servo control abnormality detection adjustment value	I	S	T	P	•	F	None	-1000 ~ 1000	0000
			This is the adjustment value to make servo control abnormality detection easier. Also, it sets the servo control abnormality detection ineffective. In case it is the servo system receiving the power externally to run its motor, it may detect servo control abnormality even if it is properly functioning. In such a case, please set the value to adjust the ST17 display to be around 50%. Also, the servo control abnormality detection would be easier if the setting value is larger. Please note that servo control abnormality detection may be ineffective in following cases: 1. When setting value is - (minus) In this case, ST17 is displays the value according to the set value. 2. Connecting to the induction type motor, and the setting value is 0 (zero). ST17 displays the value.				

※ 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 Run

8－1 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 Isn't there any short-circuit or line-to-ground fault in external sequence circuits?
⑥ 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 [8-4 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(*)).

8－2 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)
Speed Control run mode	○	○
Torque control run mode	○	●
Pulse train run mode	●	○
Error status (Servo lock)	●	●

Note) ○: Signal OFF ●: Signal ON

[Tab. 8－1] Mode Selection List

I/O list for Run motion is shown below.

Signal name	Mark	Driver function		
		Speed control	Torque control	Pulse train control
Mode selection 1,2	MD1,MD2	●	●	●
Proportional control selection	PC	●		●
Reset	RST	●	●	●
Servo ON	SON	●	●	●
Emergency stop	EMG	●	●	●
Start	DR	●	●	●
Torque limit	TL	●	●	●
Command pulse input inhibit	CIH			●
Deviation clear	CLR			●
Speed/ Torque selection 1,2	SS1,SS2	●	●	
Command direction selection	SSD	●	●	
Forward over travel	FOT	●	●	●
Reverse over travel	ROT	●	●	●
Speed override	OR1～OR4	●		
Speed gain selection	GSEL	●	●	●
Forced brake	BRON	●	●	●
Positioning complete	PN			○
Servo ready	RDY	○	○	○
Alarm	ALM	○	○	○
Warning	WNG	○	○	○
Brake release	BRK	○	○	○
Speed zero	SZ	○	○	○
In Speed/ Torque control	LIM	○	○	○

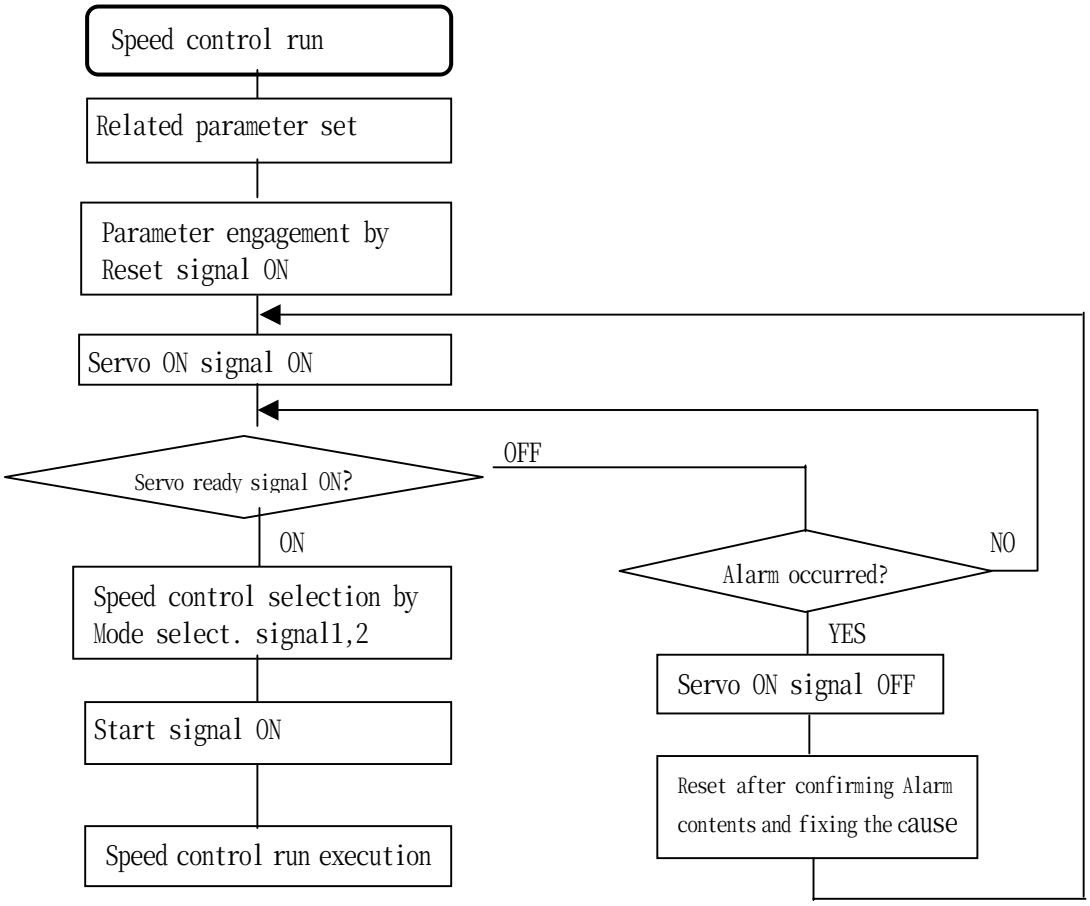
Note) ●: Input ○: Output

[Tab. 8－2] I/O Signal Motion List

8－2－1 Speed Control Run

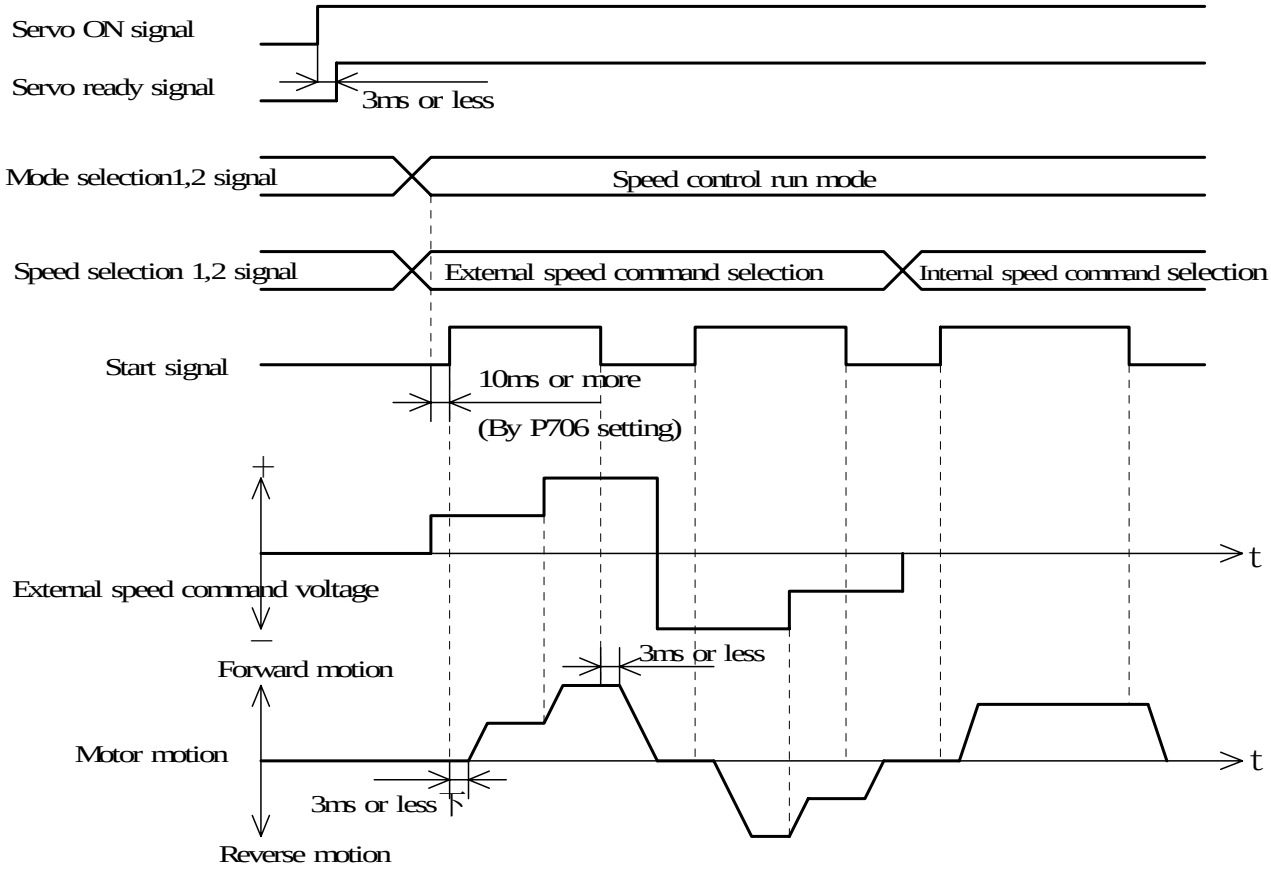
In Speed control run, Speed control is executed by External speed command voltage (DC±10V) or Speed command value set by a parameter.

1) Operating procedure



[Fig. 8－1] Speed Control Run Operation Procedure

2) time chart

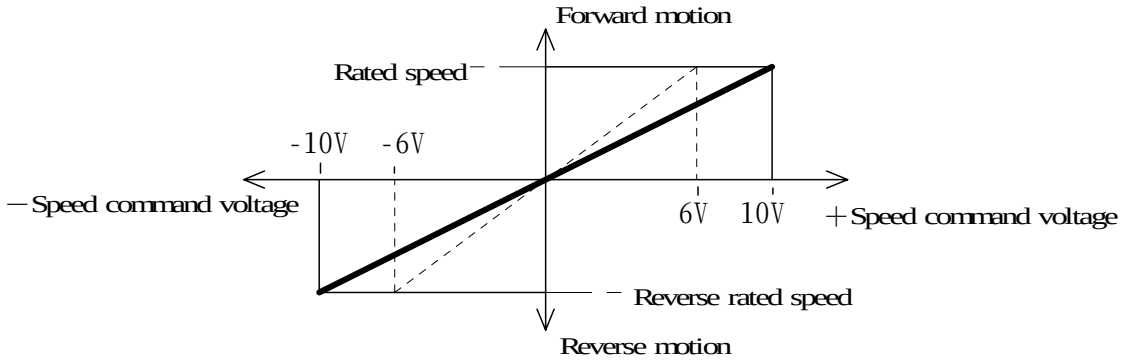


[Fig. 8－2] Speed Control Run Time Chart

3) Relation of External speed command and motor speed

·Motor speed is proportional to External Speed command voltage a nd rated speed to DC±10V. And the speed command voltage of motor rated speed can be set in DC±6V～±10V range by the parameter [P129 : Speed command gain].

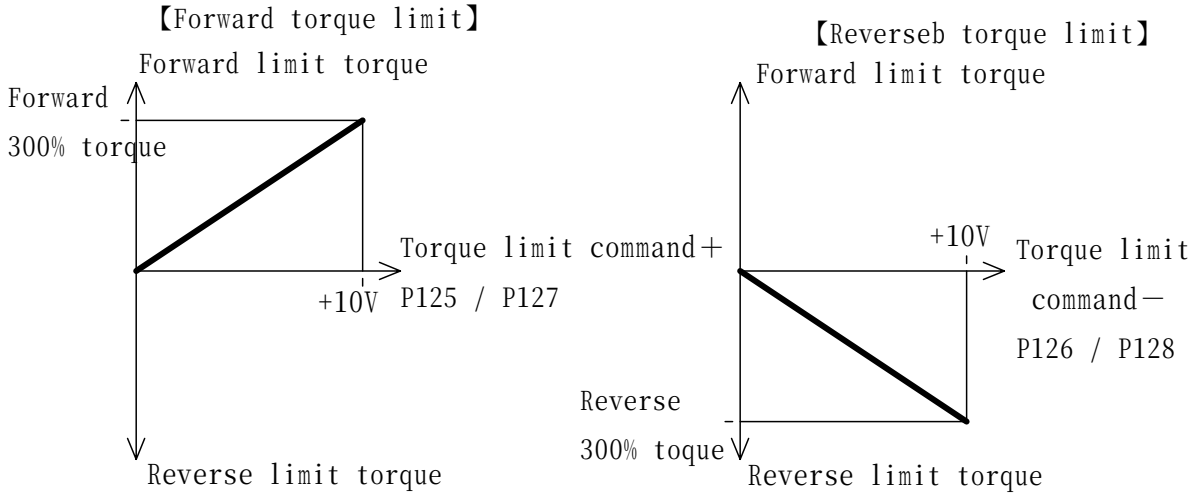
·A motor runs forward by positive voltage of External Speed comm and. However by setting of the parameter [P300 : Rotating direction selection], a motor can run reverse by positive voltage of External Speed command.



[Fig. 8－3] Speed control run time chart

4) Relation of Torque limit command and motor maximum output torque

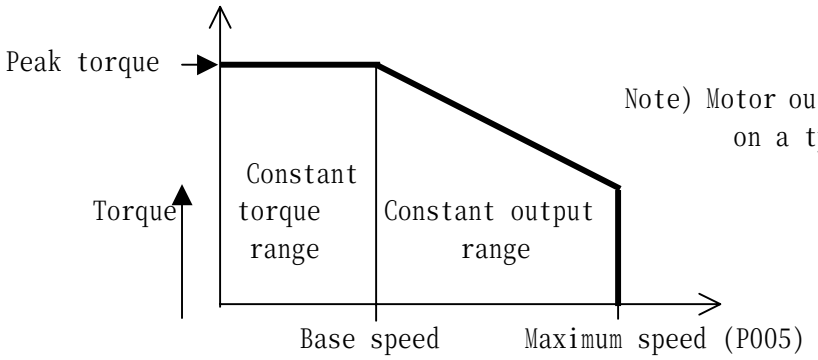
·In Speed control run, motor maximum output torque can be limite d by turning ON Torque limit signal (TL) .
·When [-0.1]is set to data of parameters [P127,P128 : Torque limit value 2 (+/-)] , limit value is set by External Torque limit command (TL+,TL-) value.
·When limit value[0.0～799.9]is set to data of parameters [P127,P128 : Torque limit value 2 (+/-)] , torque is limited by External Torque limit command (TL+,TL-) value.
·When limit value data of parameters [P125,P126 Torque limit valu e 1 (+/-)] is set lower than External Torque limit command (TL+,TL-)or Torque limit value 2(+/-), output torque is controlled by Torque limit value 1.
·Motor maximum output torque is proportional to External torque limit command value and becomes 300% torque by DC+10V of TL+ or TL-.
·Forward torque is limited by Torque limit command + (TL+) and rev erse torque is limited by Torque limit command − (TL-) .



[Fig. 8－4] Relation of Torque Limit Command and Motor Maximum Output Torque

5) Field control run (Rotating motor, induction type)

Constant output control at higher than base rated speed can be conducted by controlling field of a motor.
Base rated speed is the rated speed within constant torque range (up to peak torque output).
In Field control, base rated speed is determined by the parameter [P000 : Motor type] ,
Maximum speed within constant output range is set by the parameter [P005 : Rotating/Disc motor maximum speed] . When [999]is set to the parameter P000, base rated speed will be set to [P022 : Rated speed (base rated speed of field control)] . And when P005 is [0], field control can not be conducted.



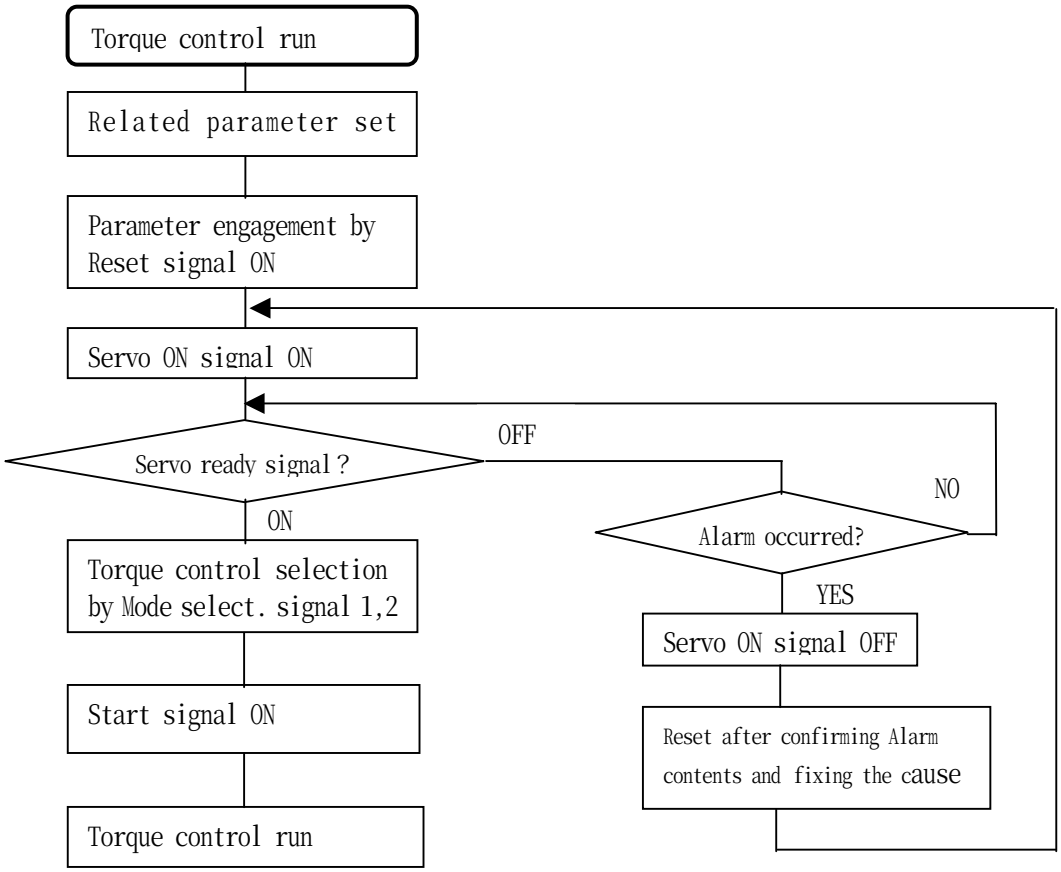
Note) Motor output characteristics depend on a type. Ask our sales man.

[Fig. 8－5] Motor torque rotating characteristics
(same characteristics, both of forward and reverse)

8－2－2 Torque control run

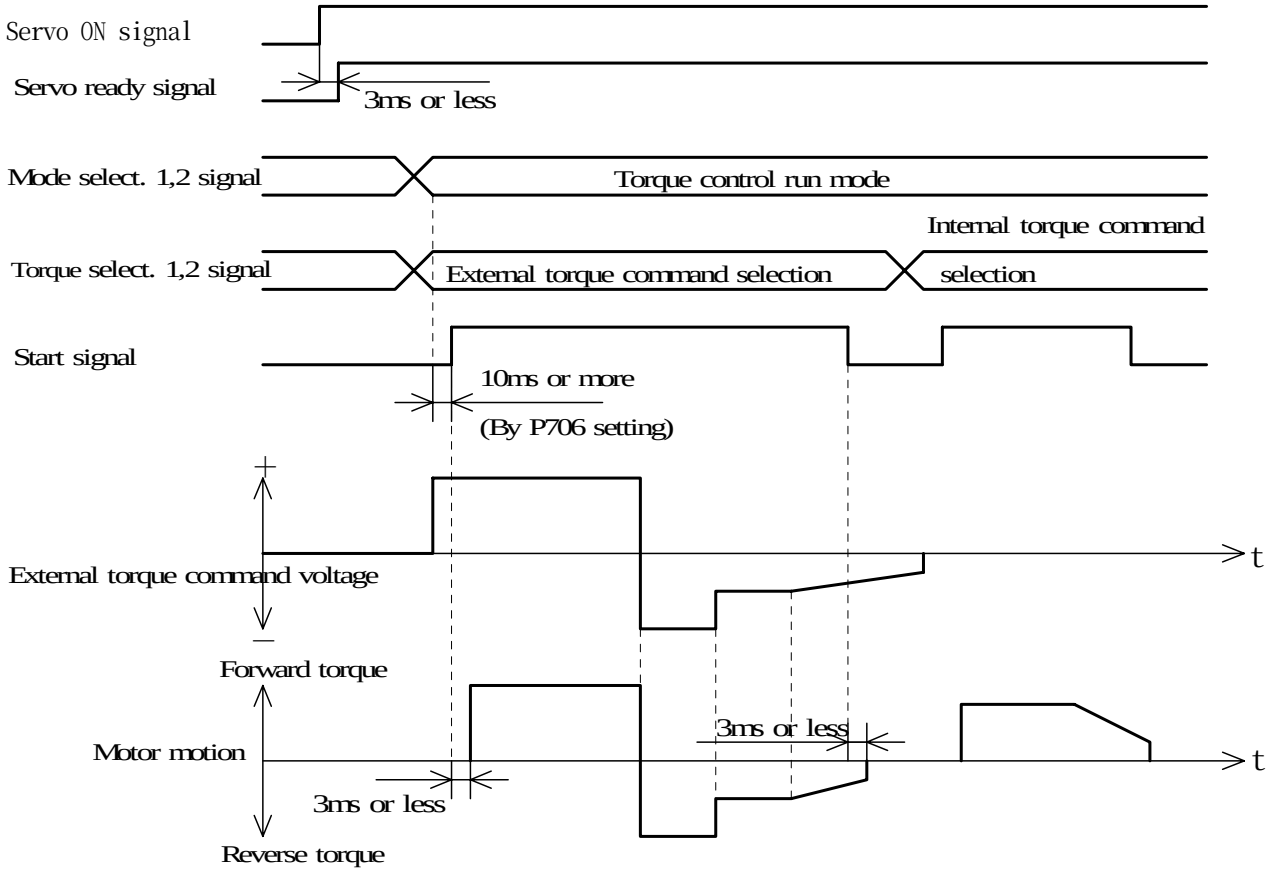
In Torque control, Torque control is executed by Torque command value by External torque command voltage (DC±10V) or Torque command value set by the parameter.

1) Operating procedure



[Fig. 8－6] Torque Control Run Operating Procedure

2) Time chart

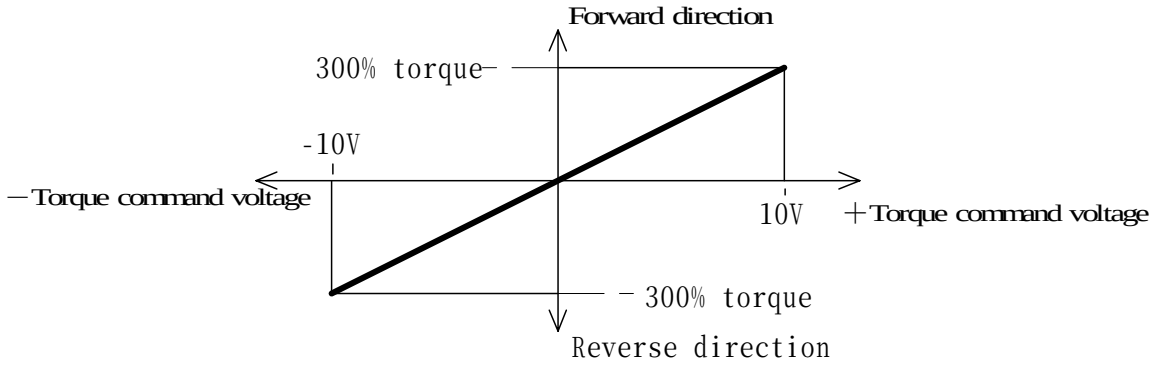


[Fig. 8－7] Torque Control Run Time Chart

3) Relation of External torque command and motor output torque

· Motor output torque is proportional to External Torque command voltage and 300% output torque to DC±10V. (Rated torque is 100%.)

·A motor runs forward by positive voltage of External Tor que command.

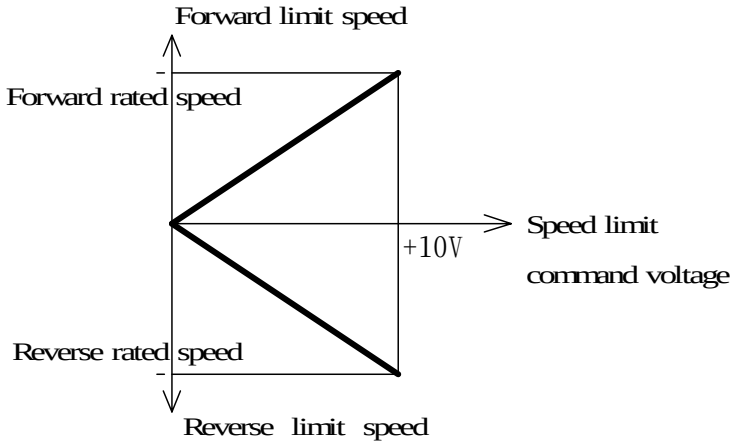


·A motor runs reverse by negative voltage of External Torque com mand.

[Fig. 8－8] External Torque Command and Motor Output Torque

4) Relation of Speed limit command and motor maximum speed

·To depress motor speed increase at light load, etc. in Torque c ontrol, motor maximum speed can be limited.
·Lower value of External Speed limit command (common to External speed command INH) value or parameter [P133 : Speed limit value] is applied to the limit value.
·Motor maximum speed is proportional to External speed limit com mand value and rated speed to DC±10V.
·External Speed limit command and [P133 : Speed limit value] are com mon setting to forward and reverse directions.
·Enable/ Disable of External speed limit command can be selected by the parameter [P132 : External Speed limit Enable/ Disable selection] .

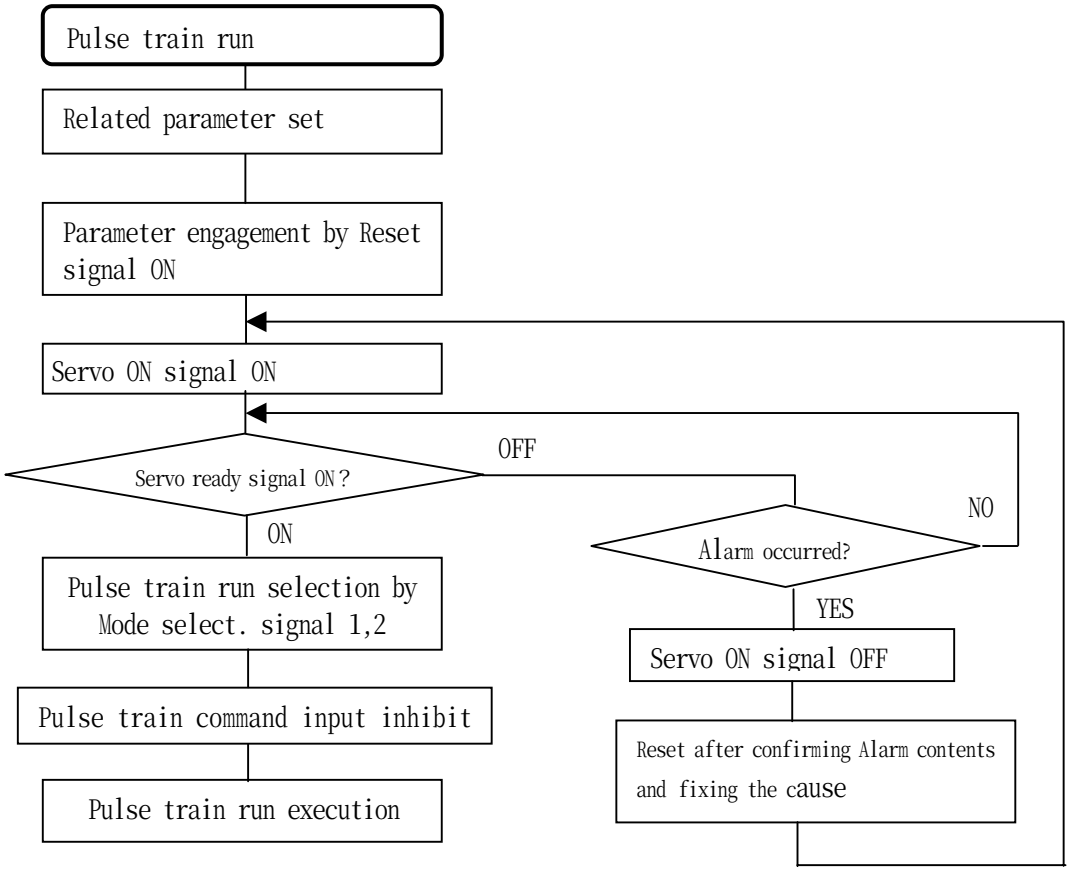


[Fig. 8－9] Relation of Speed Limit Command and Motor Speed

8－2－3 Pulse Train Run

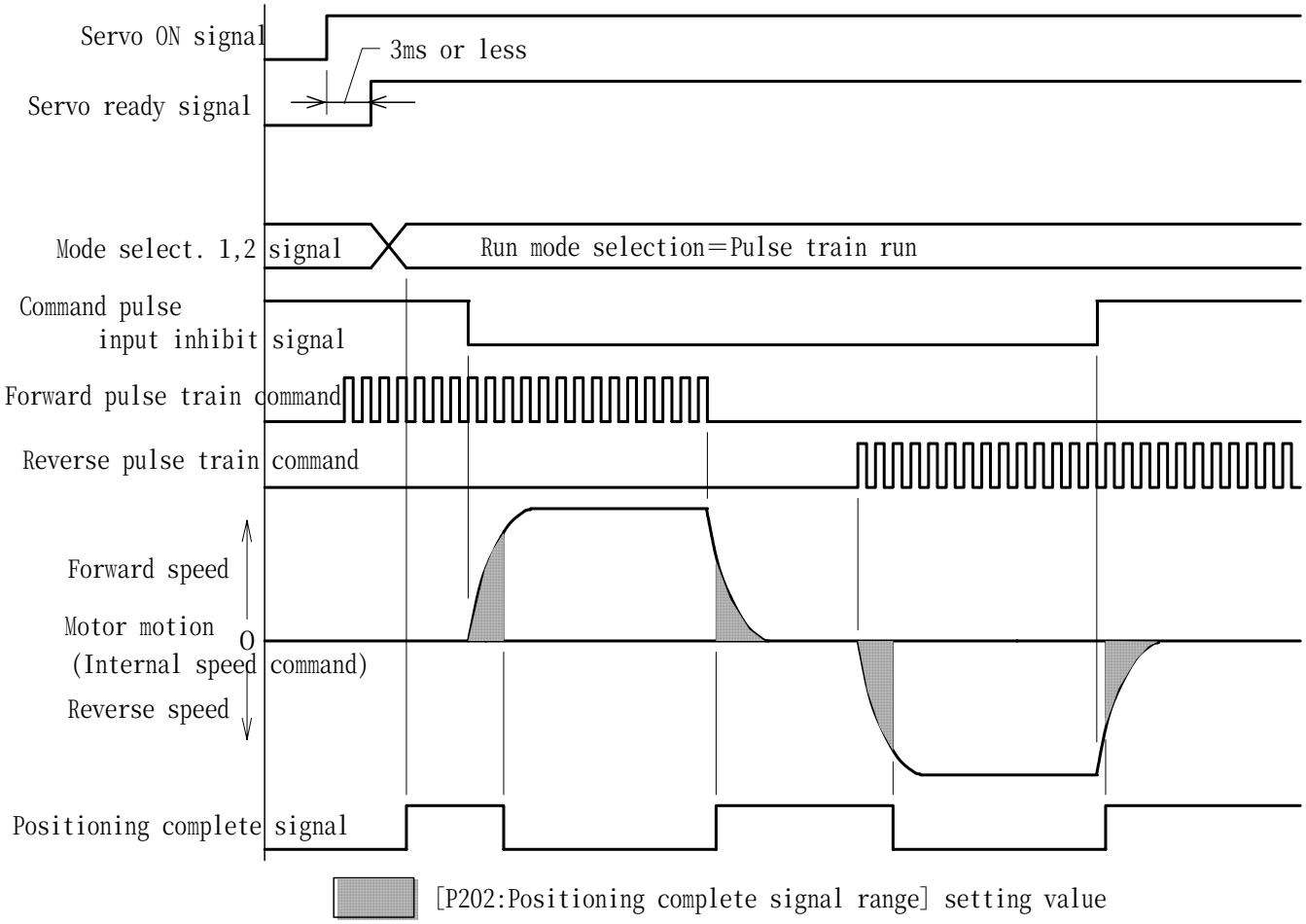
In Pulse train mode, Pulse train run is conducted by Pulse train command (Line driver method or Open collector method) or Pulse train communication.

1) Operating procedure



[Fig. 8－10] Pulse train run Operating procedure

2） Time Chart



[Fig. 8－11] Pulse Train Run Time Chart

Caution 1：Travel amount by a pulse command after 1 command pulse ([603: Pulse train command compensation numerator]/[P604: Pulse train command compensation denominator] is inputted , is minimal setting unit amount.
Output signal conditions of [Positioning complete signal] is determined by the parameter [P202: Positioning complete range] setting and deviation amount at the time.
In special case, [Positioning complete signal] may be turned ON during a motor is running if large value is set to [P202].

8－3 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
MON1 and MON2	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 Pulse train run. Polarity : Forward command; +V, Reverse command ; −V Range : 0～±10V ±10% Rated Speed : 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. 8－3] Analog Monitor Contents

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

8－4 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.

⚠ 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.

8－4－1 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 [12-1 Electric specification of controller] .

8－4－2 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.

(When value other than [999]is set to [P000: Motor type] .)

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. 8－4] 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 Speed/ Torque command No. selected by Speed/ Torque selection signal (SS1,SS2), data and Override ratio set by Speed override signal (OR1～OR4) shall be confirmed by Diagnosis display mode.

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*) (if ON) 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).

② If Torque control run is selected and any load is not applied, since a motor runs at high speed at the same time Start signal (DR) is turned ON, it is very dangerous. Be sure to set low speed to the parameter [P133：Speed limit value] .

9) Start signal (DR) ON

① By turning Start signal (DR) ON, individual command of Speed, Torque, and Pulse train can be received.

② If Alarm is displayed or a motor runs at the same time Start signal (DR) is turned ON, referring to Chapter 10 [Protective function], inspect and delete the cause.

10) Run motion check

① Run a motor by low Speed command 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, investigate and delete the cause.

⑥ Run motion confirmation shall be conducted for both forward and reveres directions.

11) 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)

8－5 Adjustment

8－5－1 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 [9－4 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.

8－5－2 Adjustment Point of Individual Phenomenon (parameter)

Descriptions and setting methods of parameters can be referred to [7-2 Parameter specification] and [11-3 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] [P605: Pulse train feed forward ratio]
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] [P211: Acceleration time] [P214: Deceleration time] [P605: Pulse train feed forward ratio] ＊
Over Speed error occurs.	
Deviation over flow occurs.	[P200:Position loop gain] [P207: Overflow detection pulse] [P211: Acceleration time] [P214: Deceleration time] [P605: Pulse train feed forward ratio]
Positioning time is long.	[P200: Position loop gain] [P202:Positioning complete range] [P605: Pulse train feed forward ratio]
Motor Speed does not reach rated Speed by Speed command voltage 10V.	[P129：Speed command gain]
Motor runs slowly by Speed command voltage 0V.	[P130：Speed command offset]

Note) ＊：Pulse train control item

[Tab. 8－5] Adjustment Point of Individual Phenomenon (parameter)

8－5－3 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 are a 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 com mand to fix it.
- ·The larger, the setting value is, the slower the response is.
- ·If setting value is too small, it makes response quicker b ut 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, under shoot, 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 Pulse train feed forward ratio [P605]
- · The larger, the setting value is, the higher compliance t o a command is.
- · If setting value is too large, it causes over-shoot, undershoo t, vibration, etc..
- · If setting value is too small, it makes Positioning time longe r.

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.

[P2: 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.

※ Refer to [11－3－3 Real time gain setting].

6）Speed adjustment

① In case of External Speed command, motor rated speed is determined by DC±10V of Speed command input voltage. When an auxiliary power source is used or quality of an external power source is not good, Rated speed command could not be exactly DC±10V. Adjust value of the parameter [P129: Speed command gain] to set rated speed to a motor when Rated speed command is inputted. [P129: Speed command gain] can be adjusted by [6.00～10.00] to set rated speed in the range of Speed command input voltage DC±6～10V. When the setting is conducted by[10.01～100.00] range, refer to the function in [P129] of [7-2 Parameter specification].

7） Speed command offset adjustment

① In case of External Speed command, a motor could run slightly by 0V of Speed command input voltage. Adjust value of the parameter P130 [Speed command offset] to stop the motor.

② A motor can be stopped by turning Drive signal (DR) OFF.

8－6 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 p ower is turned ON.
- At the time when Servo ON works for the first time after E ncoder 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 not 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 magnet ic 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 out put torque is and the quicker the response is.
- If setting value is too large, it causes over-shoot, unders hoot, 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 respons e 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, unders hoot, vibration.
- If setting value is too small, it makes response slower and Magnetic pole detection is not perfect.

⚠ Caution
① 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]. ② Since a motor vibrates in Automatic magnetic pole detection, note it.

8 – 7 Specifications of absolute encoder and Machine positioning

8 – 7 – 1 Specifications of absolute encoder

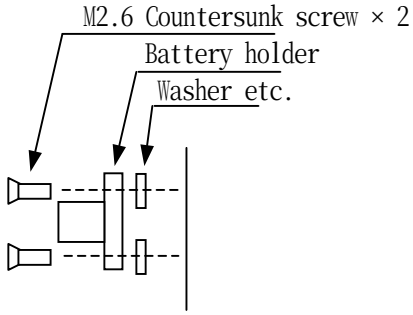
Item	Description
One rotational resolution	2^{17} (131072 Pulse)
Number of multiple rotations	2^{15} (±16383 rev than the initialization position)
Backup system	Battery backup
Battery used	Lithium battery (Primary battery, Nominal 3.6 V)
Battery backup time	Around 2.5 years. * 1
Battery shelf life	5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

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

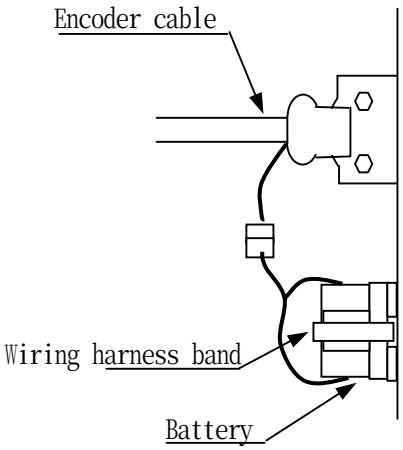
8 – 7 – 2 Installation and replacement of battery

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.

8 – 7 – 3 Parameter setting

1) Select the encoder type (P001)

Select "S – ABS".

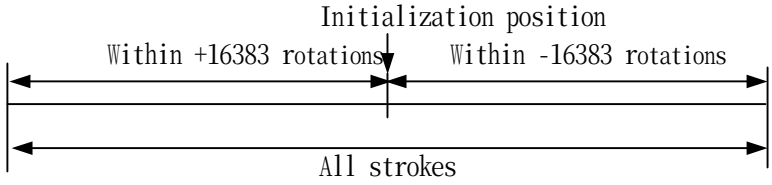
2) Select the motor rotations encoder pulse (P002)

Select "17 bit".

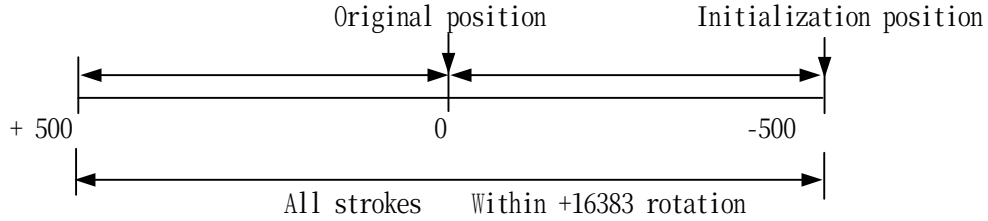
3) ABS standard machine position (P019)

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.



8 – 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.

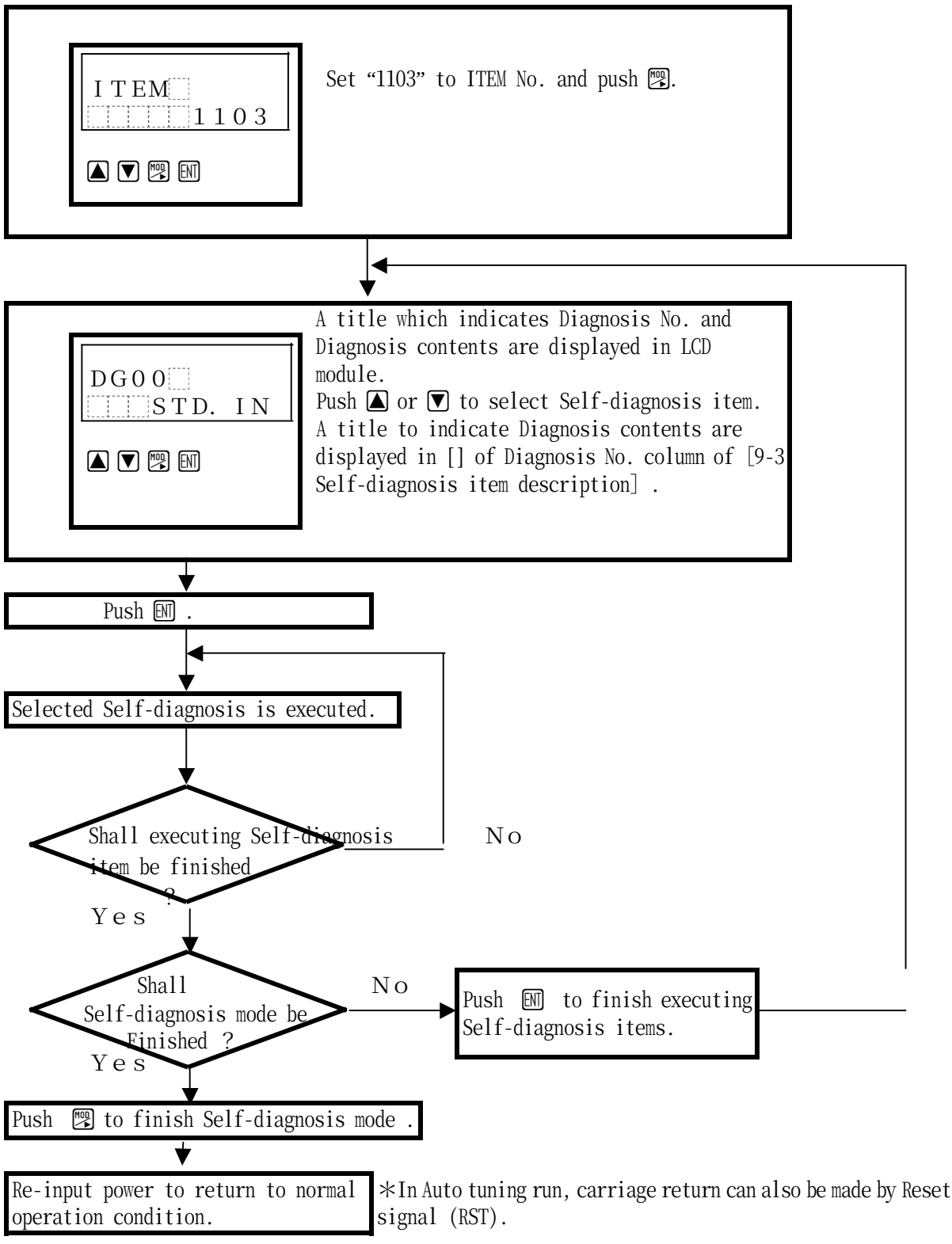
2) Execute DG97 (S-INC/CLR) of self-diagnostic mode. If "OK !!" is displayed, it is considered as completed. During self-diagnostic mode, the motor works as free torque. Therefore, set such that the machine position is not moved by any external force etc.
   * For the operation procedure of self-diagnostic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

3) Restart the power supply
   For the method of reading from the mater sequencer, etc., it is possible to use CC-Link or serial communication. You are required to have the option unit when using CC-Link. Incase of using the serial communication, it is necessary to have a program to communicate the data by the Teletype protocol at the master side. Please refer to "VC series communication protocol" and "Data communication" for the details.

Chapter 9 Self-diagnosis

9－1 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.)



＊In Auto tuning run, carriage return can also be made by Reset signal (RST).

[Fig. 9－1] Self-diagnosis Mode Execution Procedure

9－2 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.
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 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.

[Tab. 9－1 (a)] Self-diagnosis Item (1/3)

DG NO.	Name.	Function
DG30	Basic output signal check	Basic output ports (CN 1-14～17：D04～D01) status is displayed in the LCD module.
DG31	Extended output signal check	Optional extended output ports (CN3:E08～E01) 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.
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.

[Tab. 9－1(b)] Self-diagnosis Item (2/3)

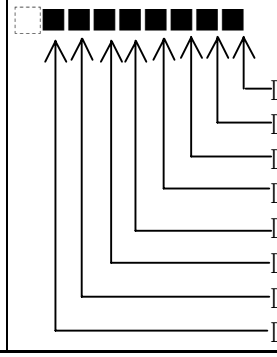
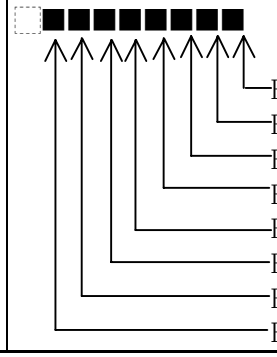
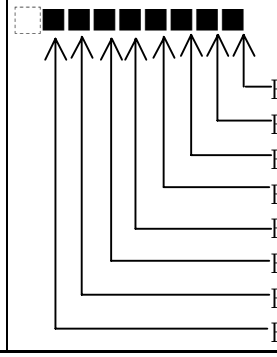
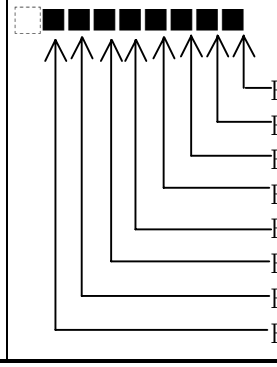
DG NO.	Name.	Function
DG80	Trial run	This item is only for adjustment at our factory shipment. **Never conduct it.**
DG81	DCCT U phase check	This item was adjusted at our factory shipment. **Never change the setting.** (DCCT U phase offset shift check)
DG82	DCCT V phase check	This item was adjusted at 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.)
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. 9－1(c)] Self-diagnosis Item (3/3)

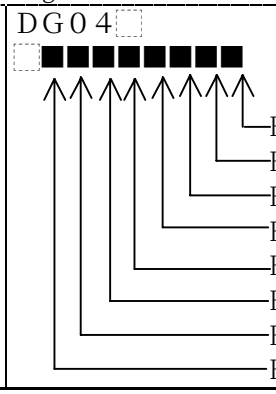
⚠ Caution

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

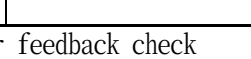
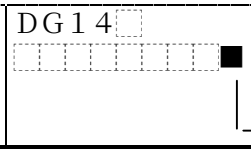
9－3 Self-diagnosis Item Description

Diagnosis No.	Actual LCD display	Diagnosis contents
Basic input signal check DG00 [___STD.IN]	DG00□  	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) .
Extended input signal check 1 DG01 [__EXT.IN1]	DG01□  	When a control input signal through the connector CN 3 of 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) .
Extended input signal check 2 DG02 [__EXT.IN2]	DG02□  	When a control input signal through the connector CN 3 of 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) .
Extended input signal check 3 DG03 [__EXT.IN3]	DG03□  	When a control input signal through the connector CN 3 of 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) .

[Tab. 9－2(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 	

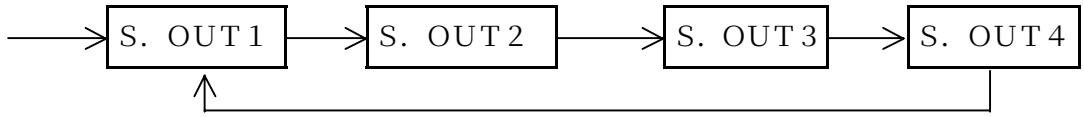
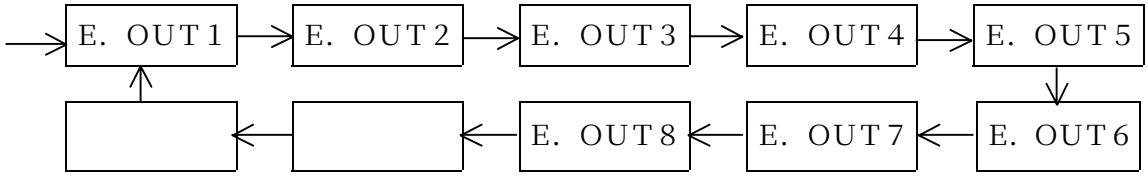
[Tab. 9－2(b) Self-diagnosis Item Description (2/10)]

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 	

[Tab. 9－2(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. 9－2(d) Self-diagnosis Item Description (4/10)]

Diagnosis No.	Actual LCD display	Diagnosis contents
Basic output signal check DG30 [__I/O_OUT]	DG30□ S. OUT■□ON	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.
Start  		
Extended output signal check DG31 [EXI/O OUT]	DG31□ □E. OUT■!!	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].
Start  		
7 segment LED check DG32 [__SEG.DSP]	DG32□ □□□□□□□□■	7 segment LED of the front panel is displayed in the sequence as the next flow. また、 Start→ 0 → 1 → 2 → 3 → 4 9 ← 8 ← 7 ← 6 ← 5 In「■」of the left figure, display contents are displayed.
LCD signal display check DG33 [___LCD.IO]	DG33□ □□RUNNING	Signal display section of LCD module flickers.

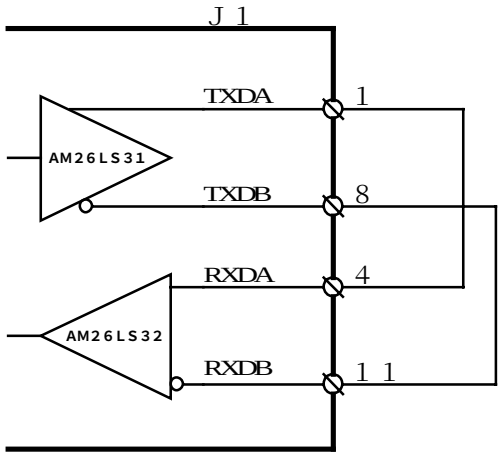
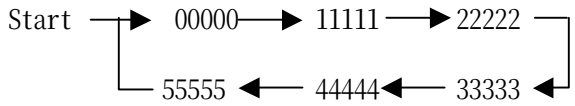
[Tab. 9－2(e) Self-diagnosis Item Description (5/10)]

Diagnosis No.	Actual LCD display	Diagnosis contents
Analog monitor 0V output check DG40 [A.MON. 0V]	DG40□ □□□□0. 00	0 [V] is outputted on Analog monitor output terminals (MON 1, MON 2) .
Analog monitor ＋5V output check DG41 [A.MON.+5V]	DG41□ □□□□5. 00	＋5 [V] is outputted on Analog monitor output terminals (MON 1, MON 2) .
Analog monitor －5V output check DG42 [A.MON.-5V]	DG13－ □□□□5. 00	－5 [V] is outputted on Analog monitor output terminals (MON 1, MON 2) .
Analog monitor ＋10V output check DG43 [A.MON+10V]	DG43□ □□□10. 00	＋10 [V] is outputted on Analog monitor output terminals (MON 1, MON 2) .
Analog monitor 10V output check DG44 [A.MON-10V]	DG44－ □□□10. 00	－10 [V] is outputted on Analog monitor output terminals (MON 1, MON 2) .

[Tab. 9－2(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>RAM check
DG50
[_____RAM]</td><td>DG50□
□□RUNNING</td><td>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>Extension RAM check
DG51
[__EXT RAM]</td><td>DG51□
□□RUNNING</td><td>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>EEPROM check
DG52
[___EEPROM]</td><td>DG52□
□□RUNNING</td><td>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>Memory initialization
DG53
[___MEM.INI]</td><td>DG53□
□□RUNNING</td><td>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. 9－2 (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
DG60
[__S.COMM.]</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□
□□RUNNING</td></tr>
<tr><td colspan="2">Servo control communication transmission check
DG61
[_PLS.TRS.]</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□
□□□□■■■■■</td></tr>
<tr><td colspan="2">Servo control communication receipt check
DG62
[_PLS.RCV.]</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□
□□RUNNING</td></tr>
</table>

[Tab. 9－2(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</td><td rowspan="2">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>DG80
[TST.DRIVE]</td><td>DG80□
■■■■■■■■</td></tr>
<tr><td colspan="2">For DCCT offset adjustment</td><td rowspan="2">This item was adjusted at our factory shipment.
Never change the setting.</td></tr>
<tr><td colspan="2">DG81 ～ DG83</td></tr>
<tr><td colspan="2">Magnetic pole sensor automatic adjustment</td><td rowspan="2">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</td><td rowspan="2">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>DG85
[CURCK. 10]</td><td>DG85□
□□□□10. 00</td></tr>
<tr><td colspan="2">Current amplifier adjustment
0V output</td><td rowspan="2">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>DG86
[CURCK. 0]</td><td>DG86□
□□□□0. 00</td></tr>
<tr><td colspan="2">Current amplifier adjustment
0. 5V output</td><td rowspan="2">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>DG87
[CURCK.0.5]</td><td>DG87□
□□□□0. 50</td></tr>
<tr><td colspan="2">DC excitation</td><td rowspan="2">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>DG88
[DC.EXCT]</td><td>DG88□
□□RUNNING</td></tr>
</table>

[Tab. 9－2(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>Disc motor automatic adjustment
DG95
[DISC.INI]</td><td>DG95□
□□RUNNING</td><td>It measures sensor pulse number per 1 turn of Disc motor and set difference between the setting value of [P004: Disc motor ·Encoder pulse number] and [P054: Disc motor · Encoder compensation] as compensation value.

⚠Caution
① When this adjustment is conducted, a motor runs max. 9 turns by the speed and for travel direction set by [P149: Disc motor automatic adjustment].
② Start this adjustment from OFF position of a reference marker. (If adjustments starts from the ON position, correct adjustment value can not be detected.)
③ If a reference marker is not connected, a motor continuously runs. (Alarm does not occur.)
<table><tr><th>Display</th><th>adjustment results</th><th>Contents</th></tr><tr><td>[Pulse number]</td><td>Normal end</td><td>Display of 1 turn pulse number</td></tr><tr><td>[_ERROR1!!]</td><td>Abnormal end</td><td>Disc motor is not used.</td></tr><tr><td>[_ERROR2!!]</td><td>Abnormal end</td><td>Data are out of range.</td></tr><tr><td>[_ERROR3!!]</td><td>Abnormal end</td><td>Duplicate read error</td></tr></table></td></tr>
<tr><td>Serial encoder 1 turn data initialization
DG96
[S-INC.INI]</td><td>DG96□
□□RUNNING</td><td>This item is only for adjustment at our factory shipment. Never conduct it.</td></tr>
<tr><td>Serial encoder plural turn data initialization
DG97
[S-INC.CLR]</td><td>DG97□
□□RUNNING</td><td>Counter for Serial encoder plural data are initialized.
<table><tr><th>Display</th><th>Adjustment results</th><th>Abnormal contents</th></tr><tr><td>[_____OK!!]</td><td>Normal end</td><td></td></tr><tr><td>[__ERROR!!]</td><td>Abnormal end</td><td>Serial encoder is not used</td></tr></table></td></tr>
<tr><td>Automatic tuning at GSEL
DG98
[_GSELTUNE]</td><td>DG98□
□□RUNNING
Displays “in Trial run”
↓
DG98□
CALCULATE
Displays “in calculating”</td><td>This item measures load characteristics (machine system) for GSEL signal ON status and sets a proper parameter for Servo control automatically.
Operate this item referring to 9-4 Automatic tuning] .</td></tr>
<tr><td>Automatic tuning
DG99
[_AUTOTUNE]</td><td>DG99□
□□RUNNING
Displays “in Trial run”
↓
DG99□
CALCULATE
Displays “in calculating”</td><td>This item measures load characteristics (machine system) for GSEL signal ON status and sets a proper parameter for Servo control automatically.
Operate this item referring to 9-4 Automatic tuning] .</td></tr>
</table>

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

9－4 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 [P113] and [P114] , 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

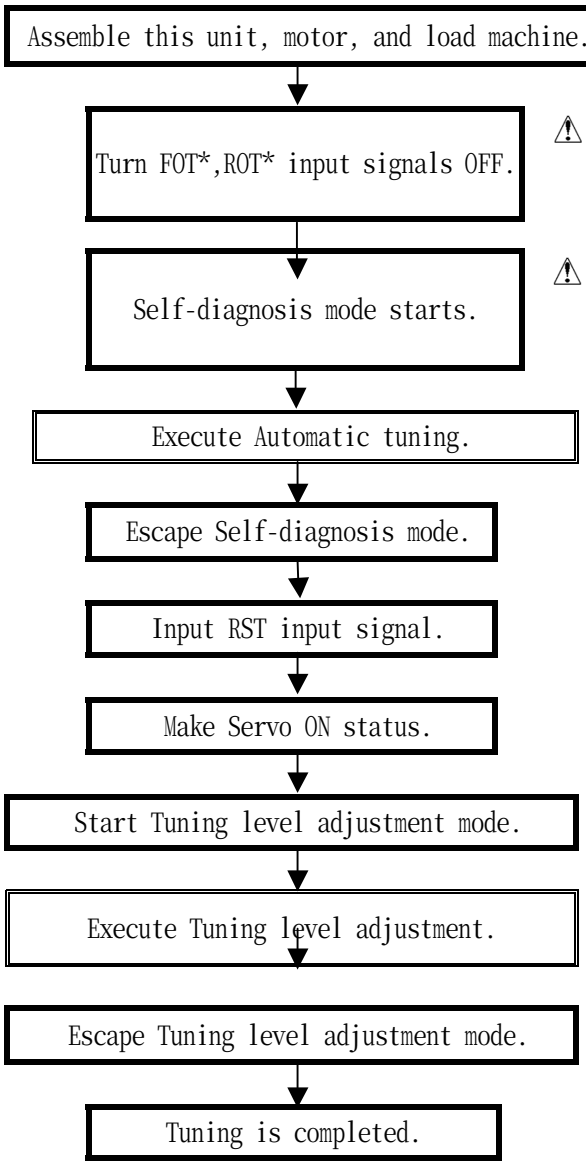
① Automatic tuning and Tuning level adjustment compute optimum speed loop gain based on measured load characteristics.
If load changes due to fine adjustment, etc. of a load machine after Automatic tuning and Tuning level adjustment are over, be sure to again conduct Automatic tuning and measure new 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.

9－4－1　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 [9-4-2　Automatic tuning function] .

※Refer to [9-4-3　Tuning level adjustment function]

[Fig. 9－2] Automatic Tuning Execution Procedure

9－4－2 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.

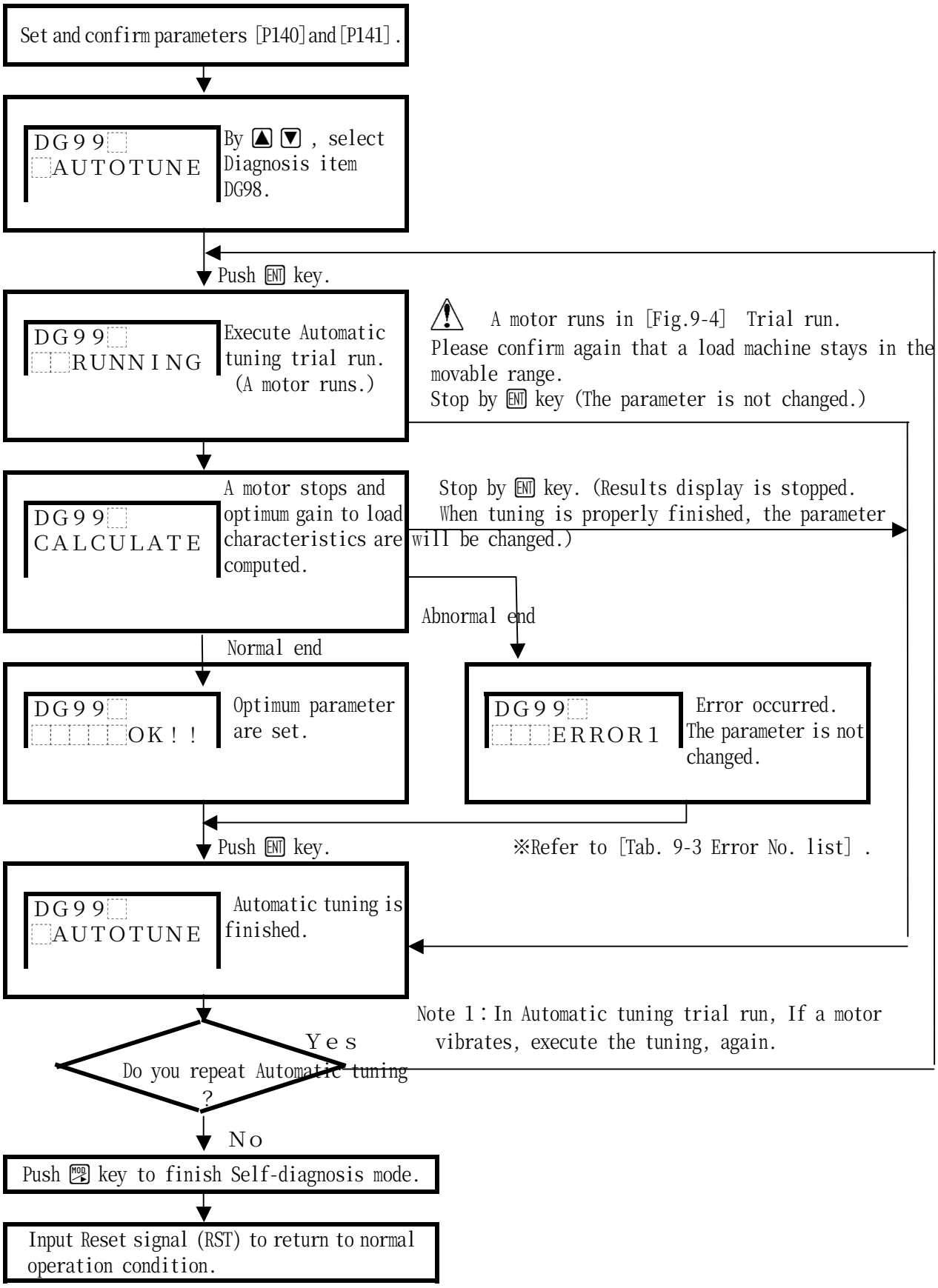
● DG98 sets following Servo control parameters when GSEL signal is ON.
Therefore, since machine characteristics are measured in Trial run, **be sure to connect a motor to load when GSEL signal is ON, and execute DG98.**

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. 9－3] 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

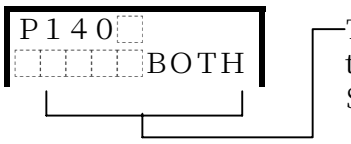
(1) Unit: Menu selection

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

(3) Initial value : BOTH

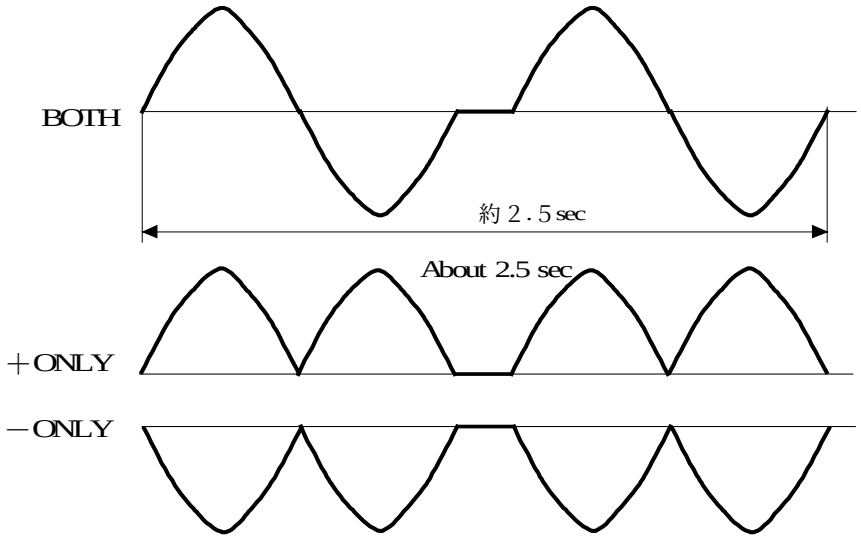
3. Display

【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. 9－4] Automatic Tuning Trial Run

[P141] Speed ratio of Automatic tuning trial run

1. Function

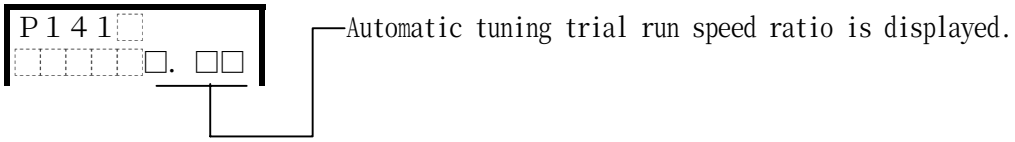
In Automatic tuning run, Trial run speed of a motor is set by some ratio of rated speed.
When 0.00 is set, a motor does not run and Error occurs.
When 1.00 is set, a motor runs at rated speed.
Normally, set the initial value. And since this parameter value can change motor travel amount, please note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



⚠ 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	Either FOT* or ROT* is the cause of the stop.

[Tab. 9－3] Error No. List

9－4－3 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.

[Tab. 9－4] Tuning Parameters

● 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.

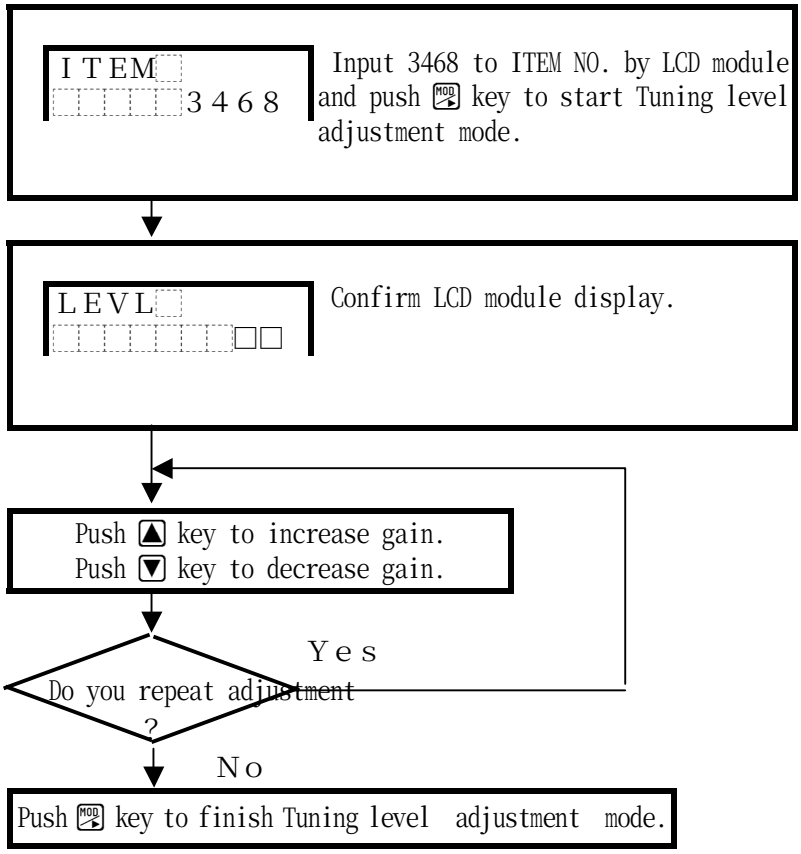
I

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

[Tab. 9－5] Tuning Parameters

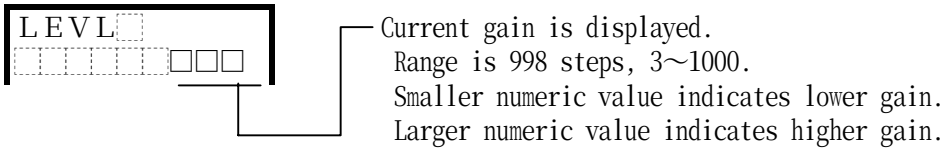
1) Tuning level adjustment function execution procedure

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



[Fig. 9－5] Tuning Level Adjustment Function Execution Procedure

2) Display in Tuning level adjustment mode



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

Chapter １０ Protective Function

１０－１ 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.１０－１] 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].

１０－２　7 Segment Display

Next status is displayed by 2 digits in 7 segment LED of the front panel.
And the display is 2 bits with [－] in the middle.

● Display sample

1 digit (high order bit) sample: 0 display　　2 digits　sample: 12 display
「０」　　「１」→「－」→「２」→「　」→「１」…

7 segment display when Alarm occurs is as follows.

High order Display	Status	Lower order displa y	Error contents
None	Normal	None	
0	RDY OFF	None	Alarm / Warning do 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
		9	Over-heat
		A	Servo control abnormal
2	Motor error	0	Motor type is not set yet.
		1	Motor type is not proper.
3	Encoder error	0	Encoder error
		1	Motor shaft error at power ON
		2	Serial encoder count error
		3	Serial encoder communication error
		4	Linear sensor encoder abnormal
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

[Tab. １０－２(a)]　7 Segment Display 1/2

(*1) If you use DC 24V for the control, it will detect the control voltage abnormality when the voltage of 24V-power source goes down to 18V or lower.

High order Display	Status	Lower order display	Error contents
6	Un-defined	None	
7	Stored data 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	Remote sequence communication reception time out
A	Other error	0	Extension memory battery low voltage error
		1	EEPROM (Non-voluntary memory) Write error
		2	Rated speed command error 1
		3	Rated speed command error 2
		4	Servo control communication OFF error
		5	Servo control communication error
		6	S.COMM.ER
b	Un-defined	None	
C	Un-defined	None	
d	Un-defined	None	
E	Absolute related error	0	Absolute encoder battery error
		1	Absolute encoder back up error
		2	Absolute encoder overflow error
		3	Absolute encoder count error
F	Warning	0	Over load warning
		1	Deviation error warning
		2	Main power under voltage detection warning
		3	Zero return incomplete at Automatic start warning
		4	Absolute encoder battery error warning
		5	Waiting warning for Remote sequence control communication
		6	SW change warning for Remote sequence control communication

[Tab. 10－2 (b)] 7 Segment Display 2/2

１０－３ Protective Function List

１２－３－１ Alarm List

Name / Display	Contents	Motion and output signal status	Way to release
I PM error ALM. I PM 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. UNDRVOLT1	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. UNDRVOLT2	Main circuit DEC bus voltage dropped less than 180[90] V. A value of 100V 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. OVER VOLT	Due to excessive load inertia, etc., regenerative energy at motor stop or decel. is beyond the treatment capacity and DC power voltage of main circuits exceeded about 400[200]V or more. A value of 100V 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	① Encoder fault ② Break or disconnection of an encoder cable or loose fitting of a connector ③ Wrong encoder selection by the parameter, etc. occurred. ④First 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.１０－３(a)] Alarm List 1/7

Name Display	Contents	Motion and output signal status	Way to release
Motor shaft fault at power ON ALM. PW. ON ENC	Motor shaft has been rotated or vibrated when power is turned ON. In the case, an encoder can not be initialized.	Motor torque free 7 segment display [31] Alarm ON Warning OFF Servo ready OFF Brake release OFF	① Re-input power. ② When [P001] is other than [INC3] setting, input Reset (RST) signal.
Over speed error ALM. OVERSPEED	Motor speed is more than about 130% of the rated speed.	Motor torque free 7 segment display [14] Alarm ON Warning OFF Servo ready OFF Brake release OFF	① Re-input power. ② Reset signal (RST) input
Over load error ALM. OVER LOAD	Due to over load or too frequent ON/OFF than allowable times, an internal electronic thermal is activated. Detection method can be selected by [P144 : Electronic thermal detection selection].	Motor torque free 7 segment display [15] Alarm ON Warning OFF Servo ready OFF Brake release OFF	① Re-input power. ② Reset signal (RST) input
I PM over load error ALM. I PM O. L.	Load exceeds capacity of power elements of a unit. 180% or more current of motor or unit rated current was flown for more than specified time.	Motor torque free 7 segment display [16] Alarm ON Warning OFF Servo ready OFF Brake release OFF	① Re-input power. ② Reset signal (RST) input
Regenerative resistor over load error ALM. RG. O. L.	Regenerative electric power generated at deceleration of load inertia, etc. exceeds allowable range of Regenerative resistor power capacity. This error is detected referring to [P158 : Regenerative resistor power].	Motor torque free 7 segment display [17] Alarm ON Warning OFF Servo ready OFF Brake release OFF	① Re-input power. ② Reset signal (RST) input
AC loss detection error ALM. AC DOWN	AC power voltage dropped less than about 60[30]V. (Black out occurred.) ※ But it is available when [ALM.ON: Alarm signal output] is selected by [P714 : AC loss ALM output selection] . A value of 100V type is in[ ].	Motor stops and is in torque free after by [P713 : AC loss stop method]. 7 segment display [18] Alarm ON Warning OFF Servo ready OFF Brake release OFF	① Re-input power. ② Reset signal (RST) input

[Tab. 10－3 (b)] Alarm List 2/7

Name / Display	Contents	Motion and output signal status	Way to release
Deviation overflow ALM. □ □OVERFLOW	Position deviation exceeds setting of [P207 : Overflow detection pulse].	Suddenly a motor stops and is in torque free. 7 segment display [40] Alarm ON Warning OFF Servo ready OFF Brake release OFF	① Re-input power. ② Reset signal (RST) input
Deviation error ALM. □ VARI. OVER	Position deviation exceeds setting of [P208 : Deviation error detection pulse]. ※ But it is applied when [STOP: Alarm stop] is selected by [P209:Motion selection at Deviation error].	Suddenly a motor stops and is in Servo lock. 7 segment display [41] Alarm ON Warning OFF Servo ready ON *1 Brake release ON	① Re-input power. ② Reset signal (RST) input
Forward over travel ALM. □ +HARD□OT.	Forward over travel signal (FOT) is detected.	Suddenly a motor stops and is in Servo lock. 7 segment display [50] Alarm ON Warning OFF Servo ready ON *1 Brake release ON	① A motor moves reverse by Jog motion and release Forward over travel.
Reverse over travel ALM. □ −HARD□OT.	Reverse over travel signal (ROT) is detected.	Suddenly a motor stops and is in Servo lock. 7 segment display [51] Alarm ON Warning OFF Servo ready ON *1 Brake release ON	① A motor moves forward by Jog motion and release Reverse over travel.

*1 : In Speed control, a motor suddenly stops and stays at 0 speed.
In Torque control, a motor becomes torque free status.

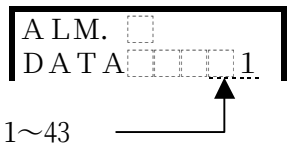
*2 : Status when [RDY1] is selected by [P716: RDY signal specification selection] .
If other is selected, status could be different

[Tab. 10－3(c)] Alarm List 3/7

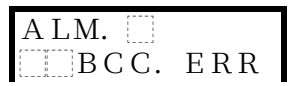
Name Display	Contents	Motion and output signal status	Way to release
No set of motor type ALM. □ MOTRTYPE1	[P000:Motor type] setting is [000].	Motor torque free 7 segment display [20] Alarm ON Warning OFF Servo ready OFF Brake release OFF	Set motor type, then, ① Re-input power.
Motor type error ALM. □ MOTRTYPE2	Combination of a motor and a controller selected by [P000: Motor type] is wrong.	Motor torque free 7 segment display [21] 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. □ WR. EEPROM	Write of data to EEPROM in a controller was failed.	Suddenly a motor stops and is in Servo lock. 7 segment display [A1] Alarm ON Warning OFF Servo ready ON *1 Brake release ON	① Re-input power. ② Reset signal (RST) input
Rated speed command error 1 ALM. □ STD. SPD. 1	Speed at motor rated speed 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	Adjust speed at motor rated speed in the range of 100～40M(Setting unit/ sec) and then, ① Re-input power. ② Reset signal (RST) input
Rated speed command error 2 ALM. □ STD. SPD. 2	Speed at motor rated speed is less than 100 (Setting unit/ sec) .		

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

[Tab. 10－3(d)] Alarm List 4/7

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 error is 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 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 39	Adjustment data contents for factory shipment of this unit were broken.

Servo control communication loss error 	In Servo control communication run, break of a cable (Communication loss) occurred. Note) This Alarm occurs when [ALM] is selected by [P523 : Alarm stop selection at Servo control communication loss] .	Motor Torque free 7 segment display [A4] Alarm ON Warning OFF Servo ready OFF Brake release OFF	Remove the cause of break of the cable, then, ①Reinput power. ②Reset signal (RST) input
Servo control communication error 	In Servo control communication, Communication error (Data error, etc.) occurred. Note) This Alarm occurs when [ALM] is selected by [P523 : Alarm stop selection at Servo control communication loss] .	Motor Torque free 7 segment display [A5] Alarm ON Warning OFF Servo ready OFF Brake release OFF	Remove the cause of the communication error, then, ①Reinput power. ②Reset signal (RST) input

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

[Tab. 10－3(e)] Alarm List 5/7

Name / Display	Contents	Motion and output signal status	Way to release
Serial encoder count error ALM. □ SER. COUNT	Serial encoder count error occurred. ※ It is applied when Serial encoder is set. ([P001] setting is [S-INC] or [S-ABS].)	Motor Torque free 7 segment display [32] Alarm ON Warning OFF Servo ready OFF Brake release OFF	① Re-input power. ② Reset signal (RST) input
Serial encoder communication error ALM. □ SER. COMM.	Data from Serial encoder can not be received. ※ It is applied when Serial encoder is set. ([P001] setting is [S-INC] or [S-ABS].)	Motor Torque free 7 segment display [33] Alarm ON Warning OFF Servo ready OFF Brake release OFF	① Re-input power. ② Reset signal (RST) input.
Absolute encoder battery error ALM. □ ABS. BATT.	External battery voltage for Absolute encoder data back up dropped. 『It is detected only once when power is turned ON.』 ※It is applied when Absolute encoder is set. ([P001] setting is [S-ABS].)	Motor Torque free 7 segment display [E0] Alarm ON Warning OFF Servo ready OFF Brake release OFF	Replace the external battery, then, ① Re-input power. ② Reset signal (RST) input.
Absolute encoder back up error ALM. □ ABS. BAKUP.	Plural turn data back upped by Absolute encoder are gone. ※It is applied when Absolute encoder is set. ([P001] setting is [S-ABS].)	Motor Torque free 7 segment display [E1] Alarm ON Warning OFF Servo ready OFF Brake release OFF	Replace the external battery, then, ①Initialize Absolute encoder setting, then reinput power.
Absolute encoder overflow error ALM. □ □ABS. OVER	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	①Initialize Absolute encoder setting, then reinput power.
Absolute encoder count error ALM. □ ABS. COUNT	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	①Initialize Absolute encoder setting, then reinput power.

Linear sensor resolution abnormal ---------- ALM. P0003 ERR.	When using linear motor, the calculation result if "P058 Linear motor distance between poles / P003Linear motor sensor resolution" goes beyond 32 bit. * It is effective when Linear sensor (P001 setting is "L-SEN").	Motor Torque free 7 segment display [34] Alarm ON Warning OFF Servo ready OFF Brake release OFF	①Review the linear sensor to be used. ②Check the parameter P003 and power ON.

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

[Tab. 1 0 − 3 (f)] Alarm List 6/8

Name Display	Contents	Motion and output signal status	Way to release
Remote sequence control IC fault ALM. NET IC ER	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 ALM. NET ERR.	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	Re-input power to whole system where Sequence control is remotely connected.
Remote sequence control communication receipt time out ALM. NET OFF	Transmission abnormality occurred in remote sequence control and the reception was time out. .	Motor Torque free 7 segment display [91] Alarm ON Warning OFF Servo ready OFF Brake release OFF	After resolving problem, 1. Power ON again 2. Input Reset signal (RST).

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

[Tab. 10－3 (g)] Alarm List 7/8

Name / Display	Contents	Motion and output signal status	Way to release
Servo control abnormality ALM. □ SRV□ □CNTRL	The motor moves the reverse direction against the toque of the device output. If this abnormality is detected while it is functioning properly, please adjust P747: Servo control abnormality detection.	Motor Torque free 7 segment display [1A] Alarm ON Warning OFF Servo ready OFF Brake release OFF	① Re-input power. ② Input the reset signal (RST).
CPU fault ALM. □ □□CPU□RAM ALM. □ □□□EX□RAM ALM. □ □DSP□BOOT ALM. □ DSP□BOOT1 ALM. □ □DSP□PARA	A unit is out of order.	Motor Torque free 7 segment display [8] Alarm flickering Warning OFF Servo ready OFF Brake release OFF	① Reinput power. ② Replace the unit or repair the unit by us.
CPU fault	Due to fault of CPU, memory (ROM, RAM), etc., Watch dog timer is activated.	Motor Torque free 7 segment display [Uncertain] Alarm ON Warning OFF Servo ready OFF Brake release OFF	① Reinput power. ② Replace the unit or repair the unit by us.

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

[Tab. 10－3(g)] Alarm List 7/7

１０－３－２　Warning List

Name Display	Contents	Motion and output signal status	Way to release
Over load warning WNG. OVER. LOAD	If current running condition is continued, Over load error will occur.	Current motion is continued. 7 segment display [F0] Alarm OFF Warning ON Servo ready ON Brake release ON	①Delete cause of Over load.
Deviation error warning WNG. VARI. OVER	Position deviation exceeded setting of [P208：Deviation error detection pulse]. ※ It is applied when 『Continuous motion』 is selected by [P209：Motion selection at Deviation error] .	Current motion is continued. 7 segment display [F1] Alarm OFF Warning ON Servo ready ON Brake release ON	①Delete cause of Deviation error (Load crease, wrong setting of Gain or Accel./ decel. time, etc.)
Main power under voltage detection warning WNG. UNDRVOLT2	Main circuit DC bus voltage dropped lower than about 180[90] V. A value of 100V 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.
Absolute encoder battery error warning WNG. ABS. BATT.	External battery voltage for Absolute encoder data back up dropped. 『Consistent detection』 ※ It is applied when Absolute encoder is used.	Current motion is continued. 7 segment display [F4] Alarm OFF Warning ON Servo ready ON Brake release ON	① Replace the external battery.
Remote sequence control communication waiting warning WNG. NET NORDY	Communication for Remote sequence control is not started. This occurs when a controller for Remote sequence control is not functioning.	Current motion is continued. 7 segment display [F5] Alarm OFF Warning ON Servo ready ON Brake release ON	Turn ON power of a controller for Remote sequence control.

[Tab.１０－４] Warning　List

１０－３－３　Error　List

Name Display	Contents	Motion and output signal status	Way to release
Data input range error ERR. EDIT 1	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.

[Tab.１０－５] Error　List

１０－４ 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 [10-5 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)

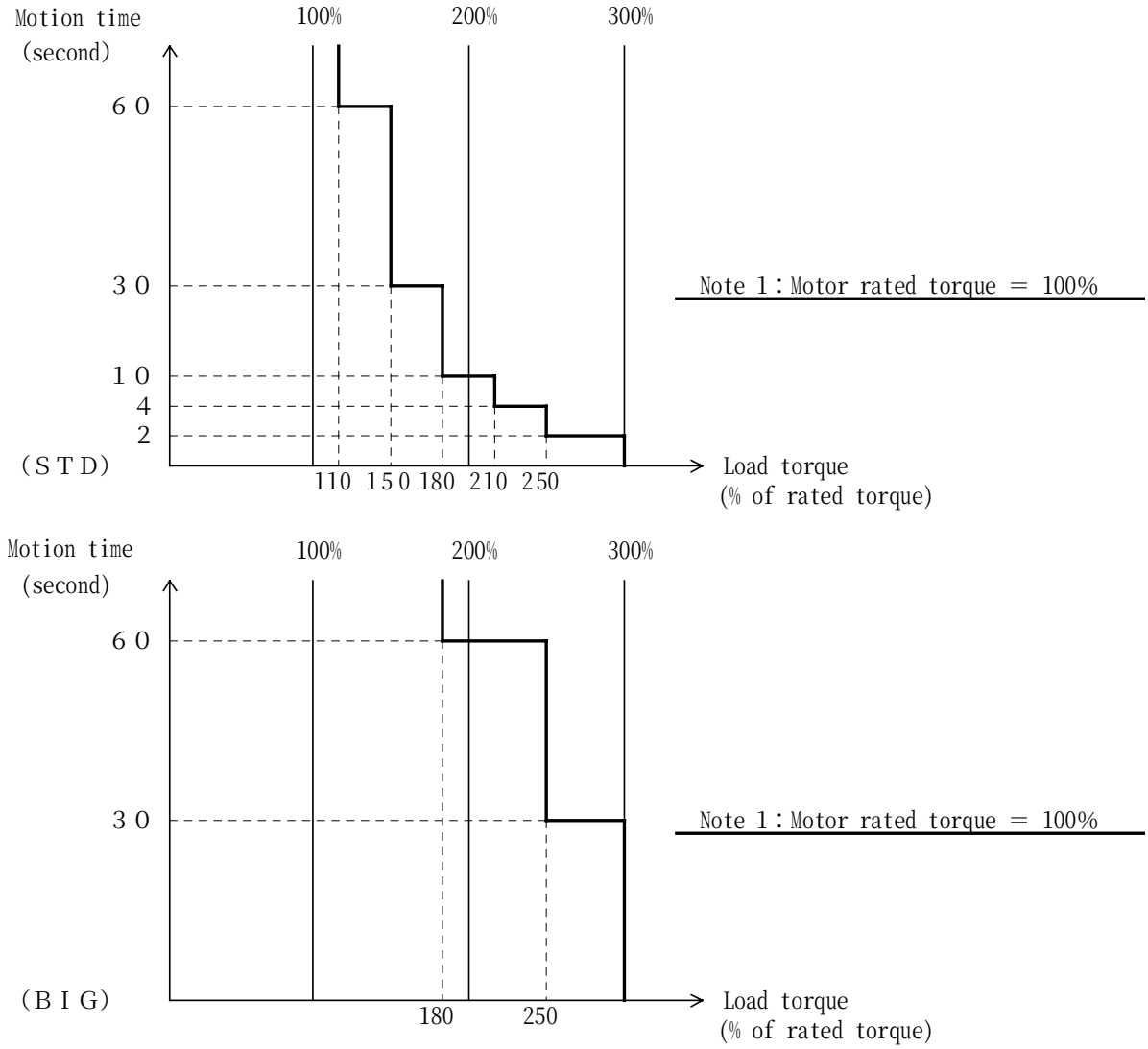
When Over speed error occurs, it is assumed that over-shoot of speed at starting of a motor is excessive due to large load inertia, etc.. In the case, adjust Gain of Speed loop or Position loop or increase acceleration time. As for individual Gain adjustment, please refer to [8-5 Adjustment].

(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 a t 100% motor rated torque as [Fig. 10-1].

·[O.L. XXX%] : It is detected by actual load value XXX% or more when a motor rated torque is defined 100%.



Notice) In order to protect a unit, above electronic thermal can not be used when BIG is selected.

[Fig. 10-1] Internal Electronic Thermal Working Time

１０－５ 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 meggar tester as it may damage a controller.
In case of measuring motor insulation, disconnect cables (U,V,W) between a motor and a controller, completely and measure it.

１０－５－１ 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.

１０－５－２ 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	·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,
	·High ambient temperature or bad ventilation	· Lower ambient temperature. · Improve the cooling method.
	·Wrong setting of [P0 00～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.１０－６(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]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 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]V or more. A value of 100V type is in [ ] .	·Power source voltage is high.	·Supply correct power source.
	·Excessive regenerative energy due to too large load inertia.	·Attach Regenerative resistor.。 · Lower the load inertia. · Decrease speed or increase Deceleration time.
	·Malfunction due to noise	·Delete the noise source and take corrective measures.
【Over speed error】 · Motor speed exceeds 130% of rated speed.	·Incorrect wiring (U,V,W) between a controller and a motor. · Incorrect wiring of en coder feedback cables	·Correct the wiring.
	· Encoder failure	· Replace the encoder.
	· Due to excessive load inertia or Gain setting error, Over-shoot is large.	· Lower the load inertia or increase Acceleration time. ·Adjust stability. (Gain adjustment and improvement of play in a machine system, looseness of connecting section, weak machine rigidity, etc.)
	· Encoder feedback signal is influenced by noise.	·Delete the noise source and take corrective measures.
【Encoder fault】 · Encoder fault, break or disconnection of an encoder cable or loose fitting of a connector, noise on an encoder signal, wrong parameter setting, etc. occurred. · Automatic 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. 10－6 (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.

[Tab.10－6 (c)] 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.
【Servo control abnormal】 ·The motor moves reverse direction against the torque of the device output. .	· Incorrect wiring (U.V.W) between controller and motor. · Incorrect wiring in encoder feed back cable.	Correct wiring
	· Broken encoder · Incorrect encoder parameter setting.	· Exchange the encoder Review and correct the parameter (P001--P004, P059)
	· Broken encoder · Incorrect encoder parameter setting.	Review and correct the parameter (P001 to P004, P059)
	·Motor parameter setting is incorrect	Review and correct the parameter (P000 to P020, P058)
	· Magnetic sensor is broken · Parameters related to the magnetic sensor is incorrect	Exchange the magnetic sensor Review and correct the parameter (P010 to P011 (050 to P053)
	·Automatic magnetic sensor parameter value is not proper.	· Review and correct the parameter (P116 to P119) and adjust the value..
	·Unstable movement and severe vibration in motor..	·Stability adjustment (gain tuning and mechanical adjustment)
	· Motor moved by external force. Such as Workload, or pulling force of the gravity.	·To ease the servo load by using parameter P747 .

Error contents	Cause	Corrective measures
【Stored data error】 ·Error of parameter contents occurred.	·Parameter contents were broken due to noise.	· Delete the noise source and take corrective measures.
【Forward over travel】 【Reverse over travel】 ·Forward over travel was detected. Reverse over travel was detected.	·L oose 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.
【EEPROM Write error】 ·Write can not be conducted to data 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.
【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.

[Tab.10－6 (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.

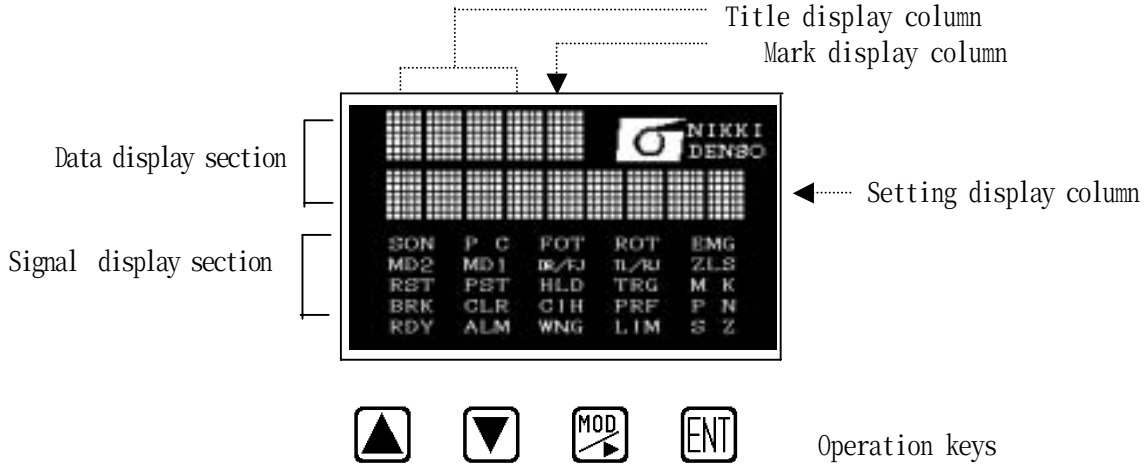
Chapter 11 Setting and Display

11－1 LCD Module Operation

11－1－1 Sectional Function of LCD Module

Various parameters and data can be set by key input of the Front panel LCD module.
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. 11－1] 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. 11－1] 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. 1 1－2］ Each Operation Key Function

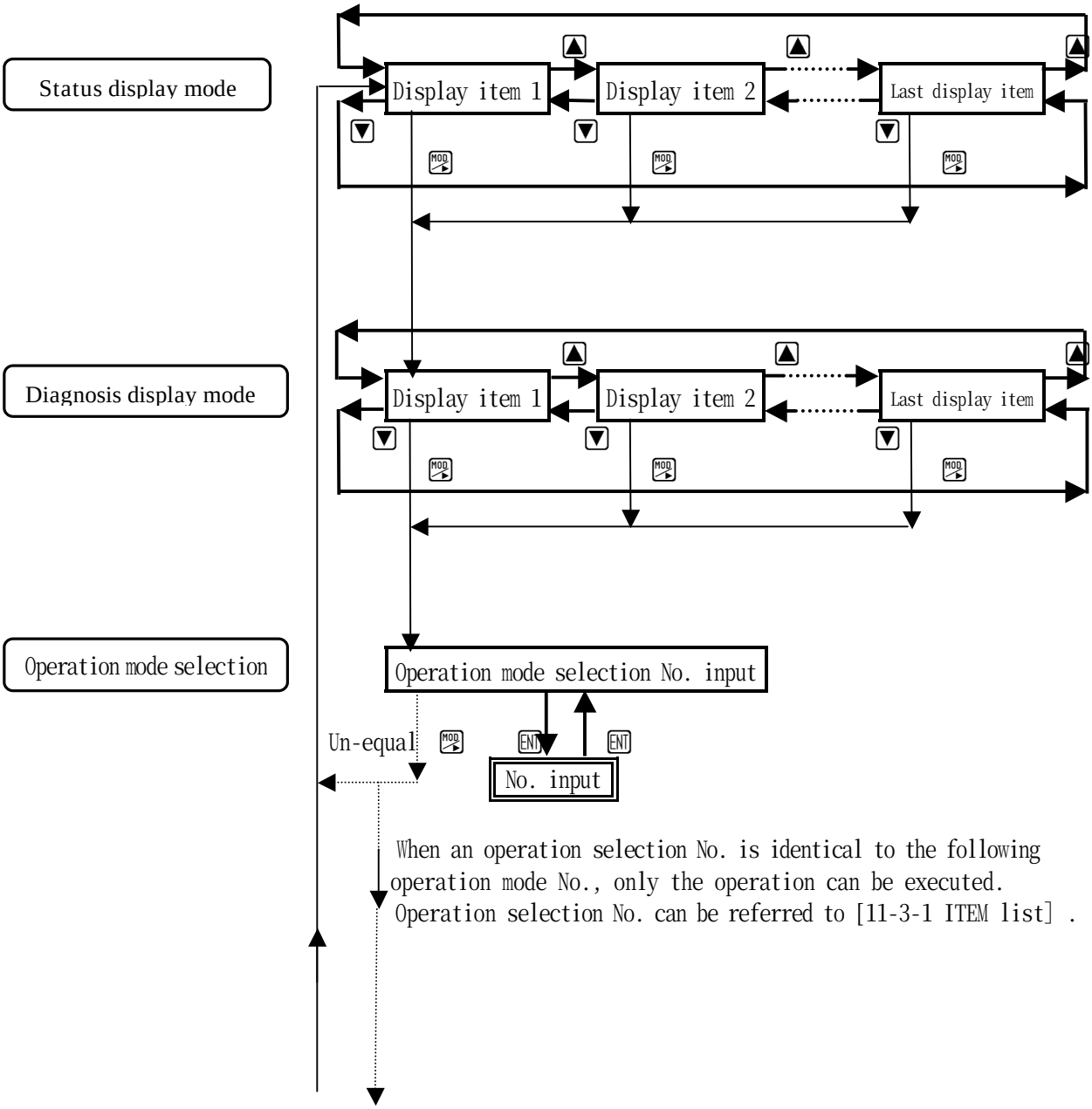
【Caution】

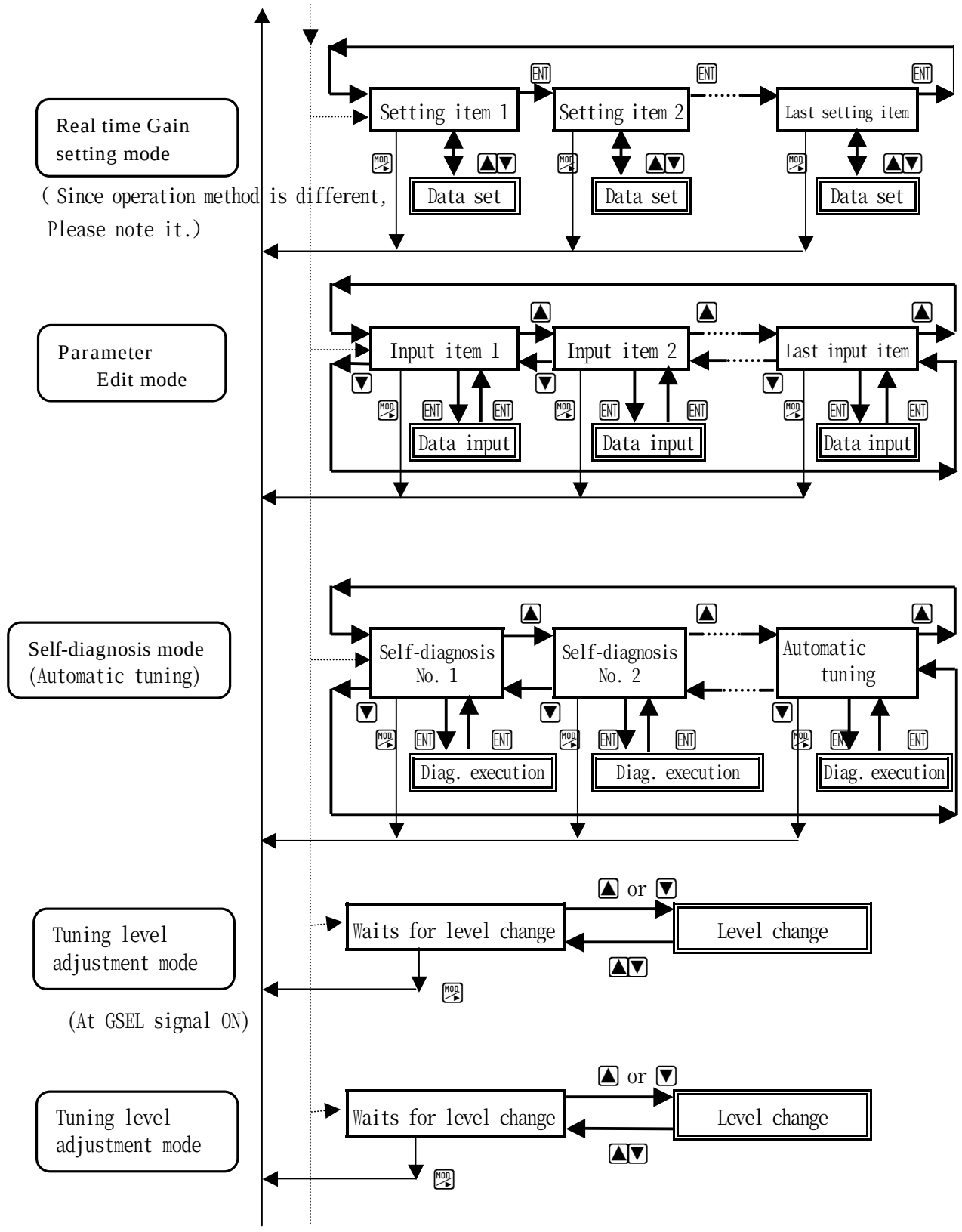
When unit power is turned ON by pushing ▲ and ▼ keys, simultaneously, all the stored data (parameters, etc.) are initialized.
And then, following figures are displayed in the data display section of LCD module.

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.

11－1－2 LCD Module Operation Procedure

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



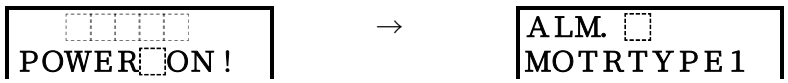


[Fig. 1 1－2] Flow Chart of Display & Key Operation

１１－２ Display Mode

１１－２－１ 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 for 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.１１－３] 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.

11－2－2 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－ □□□100. 00	%	It displays actual motor speed. Forward : □, reverse : － Display range : -120.00 ～ 120.00
2	ST01－ □10000000	pulse *1	It displays current position. Display range: -99999999 ～ 99999999 ※2
3	ST02－ □00010000	pulse	It displays Position deviation pulse. ＋ deviation : □, － deviation : － Display range : -99999999 ～ 99999999
4	ST03－ □□□100. 00	%	It displays External speed command input value by % of maximum speed. Forward command : □, reverse command : － Display range : -999.99～999.99
5	ST04－ □□□□100. 0	%	It displays External torque command input value by % of rated torque. Forward command : □, reverse command : － Display range : -300.0 ～ 300.0
6	ST05－ 000100. 00	kpps	It displays an input frequency of Pulse train command. Forward command : □, reverse command : － Display range : -999999.99 ～ 999999.99
7	ST06－ □10000000	pulse	It displays an accumulated input pulse number of Pulse train command. Forward command : □, reverse command : － Display range : -99999999 ～ 99999999
8	ST07□ □□□□100. 0	%	It displays command input value of Forward external torque limit by % of rated torque. Display range : 0.0 ～ 300.0
9	ST08□ □□□□100. 0	%	It displays command input value of Reverse external torque limit by % of rated torque. Display range : 0.0 ～ 300.0

[Tab. 11－3(a)] Display Contents of Status Display Mode 1/ 2

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

※1 : When Linear motor is applied, position is determined by parameters [P301,P302] .

Display sequence	Display sample	Unit	Display contents
10	ST09 □□□□□080	%	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.
11	ST10□ □□□□100. 0	%	It displays actual torque command by % of rated torque. Display range : 0.0 ～ 799.9
12	ST11□ □□□□100. 0	%	It displays peak torque command by % of rated torque.([000] by RST signal) Display range : 0.0 ～ 799.9
13	ST12□ □□□□02000	rpm	It displays actual speed of a turning work. Forward : □, reverse : － Display range : -99999 ～ 99999
14	ST13□ 12345. 678	mm/s *2	It displays actual speed of a machine. Forward : □, reverse : － Display range : -99999999 ～ 99999999
15	ST14－ □□□□02000	rpm	It displays actual speed of a motor by rpm. Forward : □, reverse : － Display range : -99999 ～ 99999
16	ST15 □□□□□100	%	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
17	ST16 □□□□□100	%	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. 11－3(b)] Display Contents of Status Display Mode 2/2

＊2 : (A decimal point position depends on [P302 : command unit].)

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

Display sequence	Display sample	Unit	Display contents
18	ST 17□ □□□□□□100	%	To display the maximum value of the occurrence of servo control abnormality in percentage. Servo abnormality occurs when it goes over 100%. The rate of abnormality will be 0 (zero) cleared when: · RST signal is ON after servo control abnormality occurred. · When changing P747 setting Display range: 0 to 999

[Tab. 1 1 −3 (c)] Contents of the status display mode 3/3

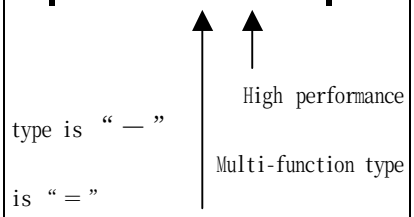
By this display:

· Press **ENT** key once, it holds the display data for 1 second.

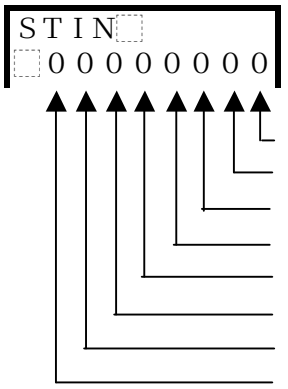
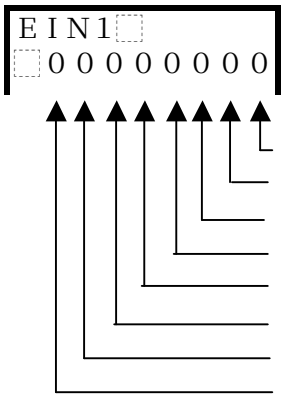
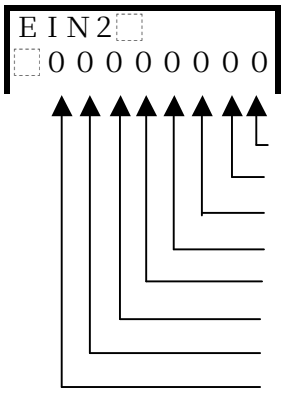
· While pressing **ENT** key, it holds the display data.

11－2－3 Diagnosis Display Mode

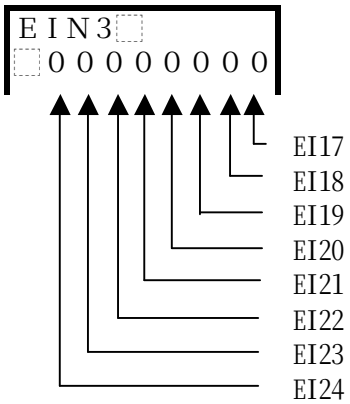
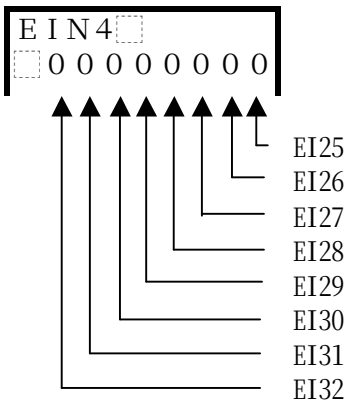
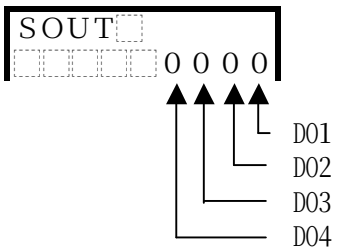
● Message and data are displayed in the data display section.

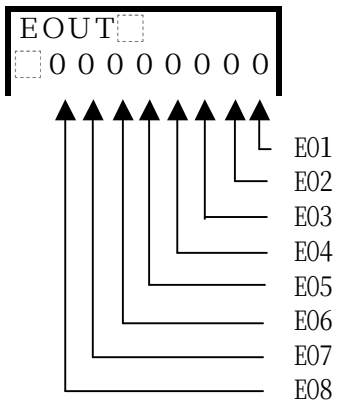
Display sequence	Display sample	Unit	Display contents
1	TYPE□ □□□VC－D－L  Servo driver of the design sequence class C shows “＝”after “VC”.	—	It displays a unit type. Driver : VC－D－x X is an applied motor type. L : Linear motor S : SM motor I : IM motor R : Disc motor Display sample : Linear motor driver
2	MODE□ □□□□PULSE	—	It displays Run mode. SPEED : Speed control run mode TRQ : Torque control run mode PULSE : Pulse train run mode INVALID : Invalid mode
3	SPD1－ □□□□100. 00	%	It displays selected Speed command No. and Speed data. Forward command : □, Reverse command : － Display range : -120.00 ～ 120.00
4	TRQ1□ □□□□100. 0	%	It displays selected Torque command No. and Torque data. Forward command : □, Reverse command : － Display range : -799.9 ～ 799.9
5	O. R. □ □□□□□100	%	It displays input status of Speed override signal by% override ratio. Display range : 0 ～ 150

[Tab. 11－4 (a)] Display contents of Diagnosis Display Mode 1/ 4

Display sequence	Display sample	Unit	Display contents
6		—	It displays basic external input signal status set at P737 and P738. * " Input signal and display position set by "○○" 2 digits numbers will be: 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: Not using EI5: Not using EI6: CLR EI7: FOT EI8: ROT
8		—	It displays basic external input signal status set at P739 and P740. * Input signal and display position set by "○○" 2 digits numbers will be: 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)

[Tab.１１－４ (b)] Display contents of Diagnosis Display Mode 2/4

Display sequence	Display sample	Unit	Display contents
9		—	It displays the status of expansion external input signal. * From EI17 to EI20 , the Input signal and display position set by "○○" 2 digits numbers will be: Signal ON：1, OFF：0 EI17: P741 (XXXXXX○○) EI18: P741 (XXXX○○XX) EI19: P741 (XX○○XXXX) EI20: P741 (○○XXXXXX) EI21: CIH EI22: Not using EI23: Not using EI24: Not using
10		—	It displays the status of expansion external input signal. Signal ON：1, OFF：0 EI25: MD1 EI26: MD2 EI27: PC EI28: DR EI29: TL EI30: Not using EI31: Not using EI32: Not using
11		—	It displays basic external input signal status set at P742. *Input signal and display position set by "○○" 2 digits numbers will be: Signal ON：1, OFF：0 DO1: P742 (XXXXXX○○) DO2: P742 (XXXX○○XX) DO3: P742 (XX○○XXXX) DO4: P742 (○○XXXXXX)

12		—	It displays basic external input signal status set at P743 and P744. * Input signal and display position set by "○○" 2 digits numbers will be: Signal ON：1, OFF：0 E01: P743 (XXXXXX○○) E02: P743 (XXXX○○XX) E03: P743 (XX○○XXXX) E04: P743 (○○XXXXXX) E05: P744 (XXXXXX○○) E06: P744 (XXXX○○XX) E07: P744 (XX○○XXXX) E08: P744 (○○XXXXXX)

[Tab.１１－４ (c)]　Display contents of Diagnosis Display Mode 3/4

Display sequence	Display sample	Unit	Display contents
13	ALM0 OVERCURR.	—	It displays latest Alarm contents. Display sample : Over current error
14	ALM1 ENCODER	—	It displays previous Alarm contents. Display sample : Linear sensor/ encoder fault
15	ALM2 OVER LOAD	—	It displays 2 times before the current Alarm contents. Display sample : Over load error
16	ALM3 OVER VOLT	—	It displays 3 times before the current Alarm contents. Display sample : Over voltage error
17	ALM4 OVERSPEED	—	It displays 4 times before the current Alarm contents. Display sample : Over speed error
18	WNG0 OVER. LOAD	—	It displays latest Warning contents. Display sample : Over load warning
19	HARD Ver 1. 00	—	It displays hardware version. Display sample : Hardware version 1.00
20	SOFT Ver 1. 00	—	It displays software version. Display sample : Software version 1.00 Maximum display : 9.99

[Tab. 11－4 (d)] Display contents of Diagnosis Display Mode 4/4

１１－３ Operation Mode

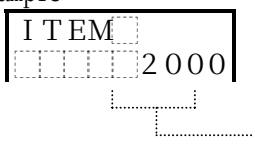
１１－３－１ ITEM (Operation mode) List

Selectable ITEM (Operation mode) is as Tab. 11-5

ITEM selection No.	Operation mode		
1103	Self-diagnosis mode		
2000	Group 0	Motor, encoder parameter	Parameter edit mode
2100	Group 1	Driver adjustment parameter	
2200	Group 2	NC adjustment parameter	
2300	Group 3	Position adjustment parameter	
2500	Group 5	Display, edit, communication parameter	
2600	Group 6	Pulse train input parameter	
2700	Group 7	Input/ output signal parameter	
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		

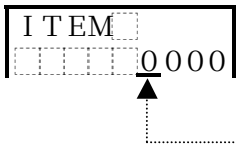
[Tab.１１－５] ITEM (Operation mode) List

① Display sample



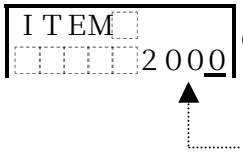
② Setting

･ITEM No. input 1



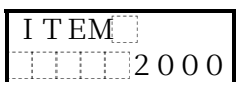
● When ENT key is pushed, a cursor appears and input can be conducted.
● When ▲ or ▼ key is pushed, a value or a mark in a column on a cursor changes.
● When MOD key is pushed, a cursor moves.
● To cancel inputted data, push ▲▼ keys at the same time.

･ITEM No. input 2



● By the above operation, input ITEM No. [Sample：1001］.

･I TEM No. setting



● When ENT key is pushed, a cursor disappears and ITEM No. is set.

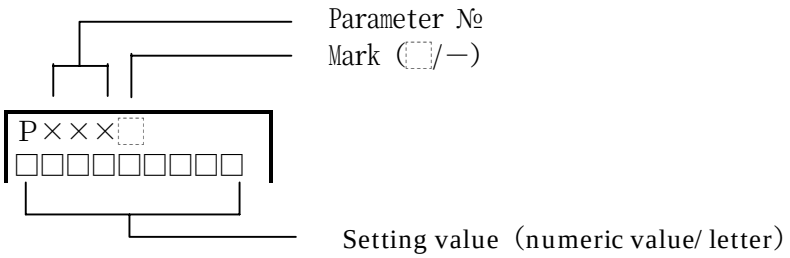
１１－３－２ Parameter Setting

［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
5	P500～	Display, edit, communication parameter
6	P600～	Pulse train input parameter
7	P700～	Input/ output signal parameter

［Tab.１１－６］Parameter Construction

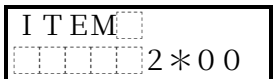
［2］Display



［3］Setting method

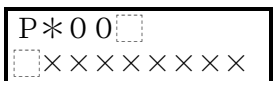
Parameter edit（numeric value input or menu selection）procedure is as follows.

① ITEM No. setting



● ITEM No.［２＊００］ is set.
＊ mark is group No.（Refer to Tab. 12-6.）
● When MOD key is pushed after setting, it moves to ②.

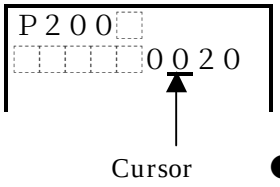
② Parameter selection



● 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.

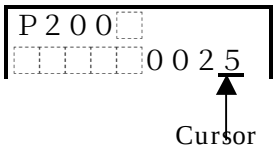
A【Setting by numeric value data input】

③ Data input 1



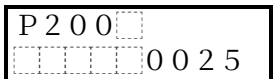
●When ENT key is pushed, a cursor appears and input can be conducted.
● When ▲ or ▼ key is pushed, a value or a mark in a column on a cursor changes.
● When MOD key is pushed, a cursor moves.
● To cancel inputted data, push ▲▼ keys at the same time.

④ Data input 2



● By the above operation, input setting data.

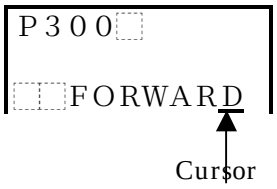
⑤ Data memory



●When ENT key is pushed, a cursor disappears and setting data are stored.

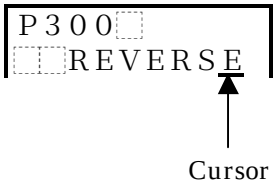
B【Setting by menu selection】

③ Data input 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 input 2



● By the above operation, select setting data.

⑤ Data memory

● When ENT key is pushed, a cursor disappears and setting data are stored.

１１－３－３ Real Time Gain Setting

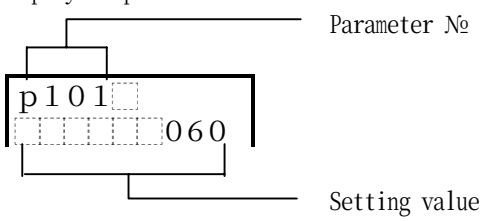
［1］Function.

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.

ITEM	Parameter №	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. １１－７］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. 11-7.)
③ Data setting (Gain adjustment) of a selected parameter
＋1 is added every time when ▲ key is pushed once.
－1 is 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 12 Materials

12－1 Electric Specification of Controller

100V type controller

Item	Contents		
Series name (Type)	NCR-*A*A1		
	-051	-101	-201
Input power source	AC90～121V、50／60Hz Single phase		
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 12-2 [Outline of Regenerative resistor, combination].		
Applicable motor	Refer to 12-4 [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. 12－1(a)] Electric Specification 1/2

200V type controller

Item	Contents							
Series name (Type)	NCR-*A*A2*							
	-101	-201	-401	-801	-152	-222	-302	-402
Input power source	AC180～242V、50／60Hz 3 phase							
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	6.4 7.8
Continuous output current [Arms] *6	1.1	2.0	3.4	6.8	8.0	10.2	14.0 16.0	21.0 26.0
Momentary output current [Arms] *7	3.3	6.0	9.9	17.0	24.0	30.6	42.0 48.0	63.0 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	5.8	5.8	7.7 6.0	7.7 6.0
Shape	Refer to Chapter 3 Outline.							
Accessory	Regenerative resistor (400W or smaller, option) Refer to 12-2 [Outline of Regenerative resistor, combination].							
Applicable motor	Refer to 12-4 [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.
*6. For 3.0KW and 4.0KW, the upper column shows the Continuous output current for the design sequence A/B (NCR-DA*0*A-XXX/NCR-DA*0*B). The lower column shows the Continuous output current for the design sequence C to up (NCR-DA*0*C-XXX/NCR-DA*0*B).
*7. For 3.0KW and 4.0KW, the upper column shows the Momentary output current for the design sequence A/B (NCR-DA*0*A-XXX/NCR-DA*0*B). The lower column shows the Momentary output current for the design sequence C to up (NCR-DA*0*C-XXX/NCR-DA*0*B).

[Tab. １２－１(b)] Electric Specification 2/2

200V type controller

Item	Contents							
Series name (Type)								
	-752	-113	-153					
Input power source	AC180～242V、50／60Hz 3 phase							
Output capacity [KW]	7.5	11.0	15.0					
Drive method	3 phase sine wave PWM							
Power capacity (at rated output) [kVA] *2	15	20	25					
Continuous output current [Arms]	26	26	26					
Momentary output current [Arms]	41.8	46.6	62.6					
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	１６Ｍｐｐｓ							
No fuse breaker (rated current) [A] *3	60	75	100					
Weight [kg] *4	7.4	7.7	10.0					
Shape	Refer to Chapter 3 Outline.							
Accessory	Regenerative resistor (400W or smaller, option) Refer to 12-2 [Outline of Regenerative resistor, combination].							
Applicable motor	Refer to 12-3 [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(c)] Electric Specification 3/3

400V type controller

Item	Contents							
Series name (Type)								
	-751	-262	-402	-752	-113	-153		
Input power source	AC360～484V、50／60Hz 3 phase							
Output capacity [KW]	0.75	2.60	4.0	7.5	11.0	15.0		
Drive method	3 phase sine wave PWM							
Power capacity (at rated output) [kVA] *2	1.8	5.2	7.8	15	20	25		
Continuous output current [Arms]	15	20	24	26	26	26		
Momentary output current [Arms]	2.5	8.0	15.0	20.9	23.4	31.3		
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	１６Ｍｐｐｓ							
No fuse breaker (rated current) [A] *3	5	105	15	30	40	50		
Weight [kg] *4	1.9	4.0	6.0	7.4	7.7	10.0		
Shape	Refer to Chapter 3 Outline.							
Accessory	Refer to 12-2 [Outline of Regenerative resistor, combination].							
Applicable motor	Refer to 12-3 [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(c)] Electric Specification 3/3

*１２－２　Regenerative Resistor Outline and Combination

１２－２－１　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 ohm J　60W, 80Ω－1 piece Cement resistor　Outline 1
NCR-*2*-152 Capacity　：1.5kw	CAN200UT 39 ohm J　200W, 40Ω－1 pieces Cement resistor　Outline 2
NCR-*2*-222 Capacity　：2.2kw	CAN200UT 39 ohm J　200W, 40Ω－1 piece Cement resistor　Outline 2
NCR-*2*-302 Capacity　：3.0kw	CAN400UT 20 ohm J　400W, 20Ω－1 piece Cement resistor　Outline 3
NCR-*2*-402 Capacity　：4.0kw	CAN400UT 20 ohm J　400W, 20Ω－1 piece Cement resistor　Outline 3
NCR-*2*-752 Capacity　：7.5kw	RGH-300-0S30J　300W, 30Ω－3 pieces (parallel connection　total 900W　10Ω) Enamel resistor　Outline 4
NCR-*2*-113 Capacity　：11kw	RGH-500-0S22J　500W, 22Ω－3 pieces (parallel connection　total 1.5KW　7.3Ω) Enamel resistor　Outline 5
NCR-*2*-153 Capacity　：15kw	RGH-500-0S22J　500W, 22Ω－3 pieces (parallel connection　total 2.0KW　5.5Ω) Enamel resistor　Outline 5

【Accessory Regenerative resistor list of 100 V system controller】

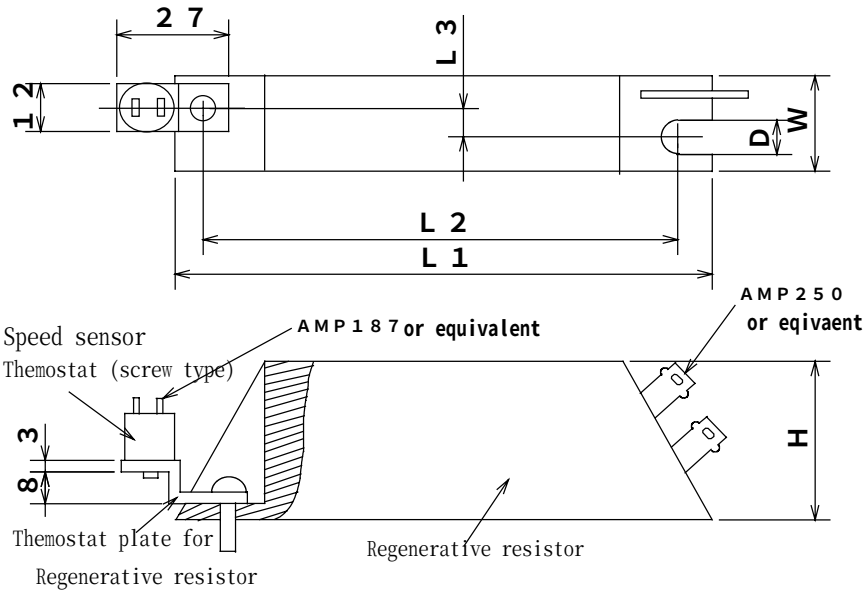
Controller type	Accessory Regenerative resistor type
NCR-*1*-051 Capacity : 0.05kw	None If required, please consult our sales man.
NCR-*1*-101 Capacity : 0.1kw	None If required, please consult our sales man.
NCR-*1*-201 Capacity : 0.2kw	None If required, please consult our sales man.

【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 piece Enamel resistor Outline 1
NCR-*3*-262 Capacity : 2.6kw	CAN200UT 100ohm J 200W, 100Ω−1 piece Enamel resistor Outline 2
NCR-*3*-402 Capacity : 4.0kw	CAN400UT 51 ohm J 400W, 51Ω−1 piece Enamel resistor Outline 3
NCR-*3*-752 Capacity : 7.5kw	RGH-500-0S100J 500W, 100Ω−3 pieces (parallel connection total 1.5KW 33Ω) Enamel resistor Outline 5
NCR-*3*-113 Capacity : 11kw	CAN60UT 200 ohm J 500W, 82Ω−3 pieces (parallel connection total 1.5KW 27.3Ω) Enamel resistor Outline 5
NCR-*3*-153 Capacity : 15kw	RGH-500-0S82J 500W, 82Ω−4 pieces (parallel connection total 2.0KW 20.5Ω) Enamel resistor Outline 5

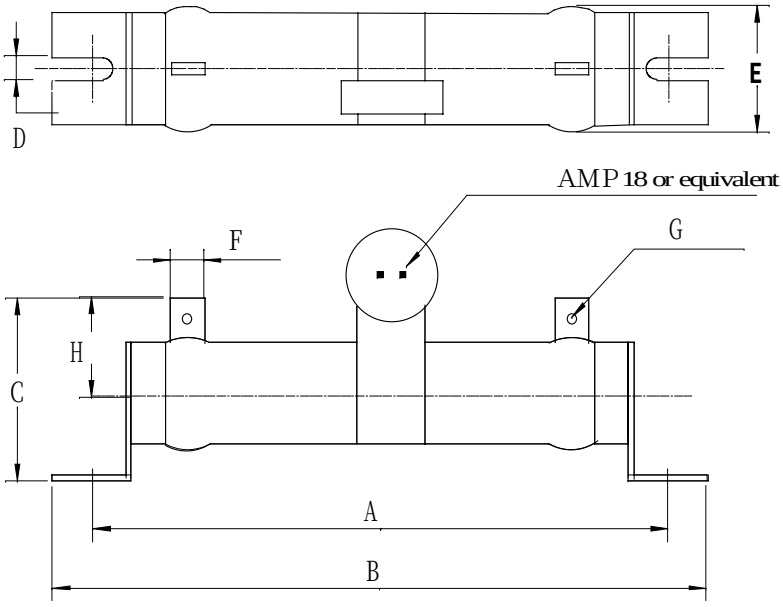
12－2－2　Regenerative Resistor Outline

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	29	
RGH300	300W	304	334	84	10	46	13	6.0	44	Outline 4
RGH500	500W	350	380	99	10	57	13	5.2	49	Outline 5

[Fig. 12－1] Outline of Regenerative Resistor

12－3 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					

12-4 Applicable Motor List

12-4-1 Applicable Linear Motor List

【Parameter selection list of applicable Linear motor 】

Controller capacity	P000	P001	Applicable Motor						
	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	001	L-SEN	NLA-7SL	7	3.0	3.0	300	1	28.50
Capacity :0.05kW	021	L-SEN	NLA-25AL	25	3.0	3.0	300	1	28.50
Input									
voltage:100V									
NCR-*1*-101	002	L-SEN	NLA-13SL	13	3.0	3.0	300	1	28.50
Capacity:0.1kW	022	L-SEN	NLA-50AL	50	3.0	3.0	300	1	28.50
Input									
voltage:100V									
NCR-*1*-201	023	L-SEN	NLA-100AL	100	3.0	3.0	290	1	28.50
Capacity:0.2kW									
Input									
voltage:100V									
NCR-*2*-101	024	L-SEN	NLA-50AM	50	3.0	3.0	300	1	28.50
Capacity:0.1kW	061	L-SEN	NVA-AMA	23	3.0	3.5	300	2	0.00
Input	071	L-SEN	NVA-BMA	50	3.0	3.5	300	2	0.00
voltage:200V	091	L-SEN	NVA-DMA	30	3.0	3.5	300	2	0.00
NCR-*2*-201	025	L-SEN	NLA-100AM	100	3.0	3.0	300	1	28.50
Capacity:0.2kW	041	L-SEN	NLA-100BM	100	3.0	3.0	300	1	28.50
Input	062	L-SEN	NVA-AMB	45	3.0	3.5	300	2	0.00
voltage:200V	072	L-SEN	NVA-BMB	100	3.0	3.5	300	2	0.00
	092	L-SEN	NVA-DMB	60	3.0	3.5	300	2	0.00
NCR-*2*-401	026	L-SEN	NLA-150AM	150	3.0	3.0	300	1	28.50
Capacity:0.4kW	042	L-SEN	NLA-200BM	200	3.0	3.0	290	1	28.50
Input	063	L-SEN	NVA-AMC	68	3.0	3.5	300	2	0.00
voltage:200V	064	L-SEN	NVA-AMD	90	3.0	3.5	290	2	0.00
	073	L-SEN	NVA-BMC	150	3.0	3.5	300	2	0.00
	093	L-SEN	NVA-DMC	90	3.0	3.5	300	2	0.00
	101	L-SEN	NLA-250MM	250	3.0	2.5	290	1	28.50
NCR-*2*-801	043	L-SEN	NLA-300BM	300	3.0	3.0	280	1	28.50
Capacity:0.8kW	065	L-SEN	NVA-AME	135	3.0	3.5	300	2	0.00
Input	074	L-SEN	NVA-BMD	200	3.0	3.5	300	2	0.00
voltage:200V	075	L-SEN	NVA-BME	300	3.0	3.5	300	2	0.00
	094	L-SEN	NVA-DMD	120	3.0	3.5	300	2	0.00
	095	L-SEN	NVA-DME	180	3.0	3.5	300	2	0.00
	102	L-SEN	NLA-500MM	500	3.0	2.5	250	1	28.50
	121	L-SEN	NLA-500NM	500	3.0	3.0	250	1	28.50

【Parameter selection list of applicable Linear motor 2/2】

NCR-*2*-152									
Capacity:1.5kW									
Input									
voltage:200V									
NCR-*2*-222	103	L-SEN	NLA-750MM	750	3.0	2.5	300	1	28.50
Capacity:2.2kW									
Input									
voltage:200V									
NCR-*2*-302	122	L-SEN	NLA-1000NM	1000	3.0	3.0	300	1	28.50
Capacity:3.0kW									
Input									
voltage:200V									
NCR-*2*-402	123	L-SEN	NLA-1500NM	1500	3.0	3.0	300	1	28.50
Capacity:4.0kW									
Input									
voltage:200V									

12-4-2 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).

[Parameter selection list of applicable τ DISC servo motor (Disc-shaped motor)]

Controller capacity	P000	P001	Applicable Motor						
	Setting value		Motor type	Rated torque	Rated speed	Maximum speed	Peak output	Magnetic sensor	
								Type	Offset
				[N·m]	[rps]	[rpm]	[%]		[mm]
NCR-*2*-201	261	C-SEN2	NMR-FADBA2*-061 NMR-FPDBA2*-061	2.0	5	300	300	0	0.00
Capacity :0.2kW Input Voltage: 200V									
NCR-*2*-401	201	C-SEN2	NMR-FDDB	7.5	5	300	300	1	0.00
	205	C-SEN2	NMR-FDDBA2*-201 NMR-FSDBA2*-201	7.5	5	300	300	2	0.00
Capacity :0.4kW Input Voltage:200V	221	C-SEN2	NMR-FEDB	20.7	3	180	290	1	0.00
	223	C-SEN2	NMR-FEDBA2*-401 NMR-FTDBA2*-401	20.7	3	180	290	2	0.00
	262	C-SEN2	NMR-FAEBA2*-121 NMR-FPEBA2*-121	4.0	5	300	300	0	0.00
NCR-*2*-801	203	C-SEN2	NMR-FDFB	22.5	5	300	300	1	0.00
	206	C-SEN2	NMR-FDFBA2*-701 NMR-FSFBA2*-701	22.5	5	300	300	2	0.00
Capacity :0.8kW Input Voltage:200V	241	C-SEN2	NMR-FFDB	67	2	120	200	1	0.00
	243	C-SEN2	NMR-FFDBA2*-801 NMR-FUDBA2*-801	67	2	120	200	2	0.00
NCR-*2*-152	222	C-SEN2	NMR-FEFB	62	3	180	300	1	0.00
	224	C-SEN2	NMR-FEFBA2*-122 NMR-FTFBA2*-122	62	3	180	300	2	0.00
Capacity :1.5kW Input Voltage:200V									
NCR-*2*-222									
Capacity :2.2kW Input Voltage:200V									
NCR-*2*-302	242	C-SEN2	NMR-FFFB	200	2	120	200	1	0.00
	244	C-SEN2	NMR-FFFBA2*-252 NMR-FUFBA2*-252	200	2	120	200	2	0.00
Capacity :3.0kW Input Voltage:200V									
NCR-*2*-402									
Capacity :4.0kW Input Voltage:200V									

12-4-3 Applicable Synchronous Motor List

Note 1) Motor above 22 KW is under development.

Note 2) This motor is compatible to the device of **Design sequence C** (NCR-CA*1*C-XXX) **or higher**.

Note 3) This motor is compatible to the device of **Design sequence C** (NCR-CA*1*C-XXX) **or earlier**.

Note 4) This motor is compatible to the device of **Design sequence D** (NCR-CA*1*D-XXX) **or higher**.

[Parameter selection list of applicable synchronous motor 1/3]

Controller Capacity	P000	P001	Applicable Motor			
	Setting value		Motor type	Rated output	Rated rotations	Peak output
				[kW]	[rpm]	[%]
NCR-*1*-051	701	INC3	NA70-05*Z	0.05	3000	300
	704	S-INC	NA80-05*Z	0.05	3000	300
Capacity :0.05kW						
Input Voltage:100V						
NCR-*1*-101	702	INC3	NA70-10*Z	0.1	3000	300
	705	S-INC	NA80-10*Z	0.1	3000	300
Capacity :0.1kW						
Input Voltage:100V						
NCR-*1*-201	703	INC3	NA70-20*L	0.2	3000	300
	706	S-INC	NA80-20*L	0.2	3000	300
Capacity :0.2kW						
Input Voltage:100V						
NCR-*2*-101						
Capacity :0.1kW						
Input Voltage:200V						
NCR-*2*-201	601	INC3	NA70-10*Z	0.1	3000	300
	602	INC3	NA70-20*M	0.2	3000	300
Capacity :0.2kW	603	S-INC	NA80-10*M	0.1	3000	300
Input Voltage:200V	604	S-INC	NA80-20*M	0.2	3000	300
NCR-*2*-401	611	INC3	NA70-40*M	0.4	3000	300
	614	S-INC	NA80-40*M	0.4	3000	300
Capacity :0.4kW						
Input Voltage:200V						
NCR-*2*-801	612	INC3	NA70-60*M	0.6	3000	300
	613	INC3	NA70-80*M	0.8	3000	300
Capacity :0.8kW	615	S-INC	NA80-75*M	0.75	3000	300
Input Voltage:200V	616	S-INC	NA80-60*M	0.6	3000	300
NCR-*2*-152	621 Note 4)	INC3	NA720-122	1.2	2000	300
	622 Note 4)	S-INC	NA830-162	1.6	3000	300
Capacity :1.5kW						
Input Voltage:200V						

[Parameter selection list of applicable synchronous motor 2/3]

Controller Capacity	P000	P001	Applicable Motor			
	Setting value		Motor type	Rated output	Rated rotations	Peak output
				[kW]	[rpm]	[%]
NCR-*2*-222 Capacity :2.2kW Input Voltage:200V	631 Note 3)	INC3	NA720-122	1.2	2000	300
	632 Note 3)	S-INC	NA830-162	1.6	3000	300
	633 Note 4)	INC3	NA720-182	1.8	2000	300
	634 Note 4)	INC3	NA720-242	2.4	2000	300
NCR-*2*-302 Capacity :3.0kW Input Voltage:200V	641 Note 3)	INC3	NA720-182	1.8	2000	300
	642 Note 2) Note 3)	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 Note 2)	INC3	NA720-402	4.0	2000	250
	653	S-INC	NA830-332	3.3	3000	300
	654	S-INC	NA820-402	4.0	2000	250
NCR-*2*-752 Capacity :7.5kW Input Voltage:200V	664	S-INC	NA820-602	6.0	2000	250
	665	S-INC	NA820-752	7.5	2000	200
NCR-*2*-113 Capacity :11kw Input Voltage:200V	672	S-INC	NA820-113	11.0	2000	200
NCR-*2*-153 Capacity :15kw Input Voltage:200V	682	S-INC	NA820-153	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	NA80-60*H	0.6	3000	300
	712	S-INC	NA80-75*H	0.75	3000	300
Capacity :0.75kW						
Input Voltage:400V						
NCR-*3*-262	746	S-INC	NA830-162*H	1.6	3000	300
Capacity :2.6kw						
Input Voltage:400V						
NCR-*3*-402	751	S-INC	NA820-402*H	4.0	2000	250
	752	S-INC	NA830-332*H	3.3	3000	300
Capacity :4.0kw						
Input Voltage:400V						
NCR-*3*-752	761	S-INC	NA820-752*H	7.5	2000	200
	762	S-INC	NA820-602*H	6.0	2000	250
Capacity :7.5kw						
Input Voltage:400V						
NCR-*3*-113	771	S-INC	NA820-113*H	11.0	2000	200
Capacity :11.0kw						
Input Voltage:400V						
NCR-*3*-153	781	S-INC	NA820-153*H	15.0	2000	200
Capacity :15.0kw						
Input Voltage:400V						

12-4-4 Applicable Synchronous Motor List

Caution) Since units of 7.5 kW or larger output are under development, do not set them.

[Parameter selection list of applicable Synchronous motor 1/2]

Controller capacity	P000	P001	Applicable Motor			
	Setting value		Motor type	Rated output [kW]	Rated speed [rpm]	Peak output [%]
NCR-*2*-201	401	INC1	NA30-13F-15	0.2	1500	300
Capacity :0.2kW						
Input Voltage:200V						
NCR-*2*-401	411	INC1	NA30-25F-15	0.4	1500	300
Capacity :0.4kW						
Input Voltage:200V						
NCR-*2*-801	412	INC1	NA100-20F	0.6	3000	300
	413	INC1	NA100-40F	0.8	2000	300
Capacity :0.8kW	414	INC1	NA100-75F-10	0.8	1000	300
Input Voltage:200V	415	INC1	NA30-50F-15	0.8	1500	300
NCR-*2*-222	431	INC1	NA100-110F-10	1.2	1000	300
Capacity :2.2kW						
Input Voltage:200V						
NCR-*2*-302	441	INC1	NA100-180F-10	1.9	1000	300
	442	INC1	NA30-110F-15	1.6	1500	300
Capacity :3.0kW	443	INC1	NA100-75F	1.5	2000	300
Input Voltage:200V						
NCR-*2*-402	451	INC1	NA100-110F	2.2	2000	300
	452	INC1	NA100-270F-10	2.8	1000	300
Capacity :4.0kW						
Input Voltage:200V						

【Parameter selection list of applicable Synchronous motor 2/2】

Controller capacity	P000	P001	Applicable Motor			
	Setting value		Motor type	Rated output [kW]	Rated speed [rpm]	Peak output [%]
NCR-*2*-752 容量 :7.5kW 入力電圧:200V	461	INC1	NA30-180F-15	2.8	1500	
	462	INC1	NA100-180F	3.7	2000	
	463	INC1	NA100-370AF	7.5	2000	
	464	INC1	NA100-370F-10	3.7	1000	
	465	INC1	NA100-550F-10	5.5	1000	
	466	INC1	NA100-750F-10	7.5	1000	
NCR-*2*-113 容量 :11kw 入力電圧:200V	471	INC1	NA100-270F	5.5	2000	
	472	INC1	NA100-550F-10	5.5	1000	
	473	INC1	NA100-750F-10	7.5	1000	
	474	INC1	NA100-550AF	11	2000	
	475	INC1	NA100-1100F-10	11	1000	
NCR-*2*-153 容量 :15kw 入力電圧:200V	481	INC1	NA100-370F	7.5	2000	
	482	INC1	NA100-750AF	15	2000	
	483	INC1	NA20-1500-10	15	1000	
	484	INC1	NA100-550F	11	2000	
NCR-*2*-223 容量 :22kw 入力電圧:200V	491	INC1	NA100-1100AF	22	2000	
	492	INC1	NA20-2200-10	22	1000	
	493	INC1	NA100-750F	15	2000	
NCR-*3*-113 容量 :11kw 入力電圧:400V	571	INC1	NA100-550F-20H	11	2000	
	572	INC1	NA100-1100F-10H	11	1000	
	573	INC1	NA100-550F-20H	11	2000	
NCR-*3*-153 容量 :15kw 入力電圧:400V	581	INC1	NA100-750F-20H	15	2000	
	582	INC1	NA20-1500-10H	15	1000	
NCR-*3*-222 容量 :22kw 入力電圧:400V	591	INC1	NA100-1100F-20H	22	2000	
	592	INC1	NA20-2200-10H	22	1000	
	593	INC1	NA100-750F-20H	15	2000	

12-5 Maintenance

Although the controller and motor are basically maintenance - free, please conduct the maintenance periodically in order to prevent the problems caused by the change in using environment.

⚠ Caution
① Please make sure the worker himself to check the power is off before starting the maintenance work. ② Even if the power is off, the high voltage may be remained in capacitor. Before starting the maintenance, please wait 2 to 3 min. after power is off. (The device with 「CHARGE」 LED, make sure that LED is off before starting the maintenance work. ③ Never try the insulation test of controller by using Mega Tester. **『The controller may be broken』** When conducting the motor insulation test, make sure to completely separate the wiring between motor and controller (U, V, W).

12-5-1 Daily Maintenance

Please conduct following items as daily maintenance:

【Checking items】

(1) Motor is running properly
(2) Any abnormalities in the installation environment (Power, Temperature, Humidity, Dust, etc.)
(3) Any abnormalities in the cooling devices
(4) Check if there are any loosen terminal or connector.
(5) Check if there is any abnormal noise or vibration.
(6) Check if there is any abnormal heat or changes in color
(7) Check if there are any abnormalities in the regenerative resistors

(7) Check if there are any abnormalities in the regenerative resistors

12-5-2 Periodical Maintenance

Please conduct the periodical maintenance for certain operation period (1/2, 1 year), and check following items:

【Checking items】

(1) If there are any loosen parts in between the connection area the load, belt, shaft key, and check if there is any abnormal noise from motor bearing.
(2) Any abnormalities in the installation environment (Power, Temperature, Humidity, Dust, etc.)
(3) Any abnormalities in the cooling devices
(4) Check if there are any loosen terminal or connector.
(5) Check if there is any abnormal noise or vibration.
(6) Check if there is any abnormal heat or changes in color
(7) Check if there are any foreign object or dust inside of controller.
(8) Check if cables are in good condition and check if there are any damages in the cables
(9) Check if there are any abnormalities in the regenerative resistors
(10) Check relies and the damaged one if necessary

12-5-3 The other maintenance

1) Gear

Motor with gearhead need to change the oil for every 3,000 hours of operation. In order to maintain the proper performance, please make sure to use the genuine lubrication oil that we recommend. (Never use the machine oil, gasoline, or the others). In case, the lubrication oil is not listed, please contact our Sales Dept.

Please make sure avoid mixing the oil and do not pour the oil to the motor or gear.

Also, please fill the lubrication oil to the designated level. Make sure the all bolts are properly tighten when installing the gearhead.

2) Oil seal

Please not that oil seal needs to be replaced every 5,000 hours of operation.

Since the standard type motors do not have oil seal, please specify if the oil seal is necessary.

3) Motor bearing

Please note that our motor bearings are the specialized bearing for the motors.

The expected life of bearing is 20,000 hours even if it is depend on the using conditions.

The life of cooling blower for motor is about 20,000 hours.

4) Controller

Please note the table in the below for the timing of when the parts of controller should be changed. Some of the electric parts used in the controller have life as listed in the table in the below:

Parts	Standard Life	Exchange methods
Flat condensers and the other aluminum electrolysis condenser (On PCB)	5 years	Exchange to new PCB (Inspection is necessary)
Breaker、Relies	—	Inspection is necessary
Cooling fans	2～ years	Exchange to new one
Fuse	10 years	Exchange to new one

Table for the timing of parts exchange 1

Using conditions

- Surrounding temperature: Annual average 30°C
- Load ratio: 80% or lower
- Operation rate: 20 hours / day or lower

Caution 1 : This maintenance manual was based on the "The periodical maintenance for general inverter" written by Japan Electric Industrial Association.

The standard exchange period mentioned in the above are only for rough standard. Our products are designed for heavy-duty usage.

The exchange period for the other parts.

Parts	Exchange period	Exchange method	Conditions
LCD and SDI device	7 years	Exchange to new one	25±10°C, 65%RH or lower
EEPROM	10 years	Exchange to new PCB (Inspection required)	Numbers of the Parameter、Index data、Commands changes 3 times/day
Lithium battery	10 years	Exchange to new PCB (Inspection required)	25±10°C, 65%RH or lower Operation rate: 2000 hours/year

Parts exchange period table 2

Because life changes largely by temperature and also humidity condition, please avoid using under the high temperature/high humid condition.

Caution!! ●

In order to use this unit properly, please deeply
understand the contents of this manual

※ Due to production improvement, some rating, specification, dimension of this catalog could be changed without any notice.

Creates Intelligent Machine System

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Central Japan sales office: 32 Shinmyo Ufukuji Nishiharu-cho Kasugaigun, Aichi, Japan Zip 481-0035 (key No.) Phone 0586-24-1311 Fax. 0586-24-1141
West Japan sales office: 1-4-30 Esaka Yamazaki Bldg. Minami kaneda Suitashi Osaka, Japan Zip 564-0044 (key No.) Phone 06-6337-2061 Fax. 06-6337-2064
Overseas sales office: 1-4-2 Osaku Sakurashi, Chiba, Japan Zip 285-0802
(key No.) Phone 043-498-2315 Fax. 043-498-4654
CE (customer service center): 1-4-2 Osaku Sakurashi, Chiba, Japan Zip 285-0802
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