NIKKI AC SERVO SYSTEM

ＮＰＳ－ＦＩ
ＮＰＳ－ＦＳ

INSTRUCTION MANUAL

Ｖｅｒ．１．２

NIKKI DENSO CO.,LTD.

Manual No. TIE-12390B

Checking Items

1. Checking of delivered baggages

Please check the following points when you receive our products.

(1) If the products are exactly the ones you ordered (Type、Rated output、Option etc.)

(2) If any damage occurred during transportation. (If packages are not broken or if outlook of products is not abnormal.)

(3) IF accessories are packed together with the main units.

※ If packages as cartons are broken, please do not unpack the packages and inform the status to our sales man. Also, if abnormal points, damage, etc. in the above items are found. please immediately inform the status to our sales man.

2. Precautions (with regard to transportation) before installation

※ When transporting a controller and a motor, handle with care so as not to drop or damage them.

※ Cautions

Do not pile controllers but also putting anything on the controller cover .

Be careful not to add shock to a motor shaft.

→ It could damage an encoder on the motor shaft.

Do not move a controller with having a motor cable.

→ It could break the cable.

3. Cautions of storage

If our products are not used immediately after receiving, please store them under the following conditions in order to prevent deterioration of insulation and rust formation.

And please unpack the packages soon after receiving and check damage and other non-conformance occurred during transportation.

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

Controller and Motor Storage Conditions

4 . Precautions of transportation

When you transport our products after receiving, please comply with following conditions.

Item		Contents
Ambient Condition	Temp.	-20 ℃ ~ +60 ℃
	Humidity	85 % or less (non-condensing)
	Transportation Circumstances	Do not transport in harmful atmosphere as corrosive gas, grinding liquid, metal powder, oil, etc..
Vibration		0.5 G or less (controller, motor)

Controller and Motor Transportation Conditions

⚠ Caution

● Since humidity condition specially affects life of LCD module in the controller, we recommend to keep humidity 65% RH or less 65 % during storageand transportation. If estimated humidity is larger than 65% RH, please consult our sales man.

【 Notice of this manual 】

This manual is corresponding to the soft, version 1.00 and newer.

● This manual describes installation, wiring, operation, maintenance, trouble diagnosis, trouble shooting, etc. of AC servo driver NPS-FI/FS and AC servo motor.
In order to use this unit properly, please deeply understand the contents of this manual.

At the time of installation, wiring, operation, maintenance, etc. please comply with the conditions and procedure of this manual.

● If a special version unit is applied, please use this and special version manuals.
(The described contents in the special version manual is prior to the same item description in this manual.)

[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 disasters or acts of God.
(4) Connection with an other maker's unit which is not approved by us.

When you find a failure or an abnormality during the warranty period, pleases inform our sales man.

Cautions for Safety

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

In this manual, cautions for safety are ranked into (Danger)and (Caution).

Danger

● If this caution is ignored, and mis-handling is made, death or serious injury of a worker could occur.

Caution

● If this caution is ignored, and mis-handling is made, serious injury of a worker could occur. And mechanical damage of machine, equipment, etc. could occur.

Caution marked item also could cause serious results depending on the actual situation.

[Cautions when using]

⚠ Danger

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

- Never touch inside of this unit and terminal blocks.

  ▶ 『 Electric shock may occur. 』

- Be sure to make grounding of an earth terminal or earth lead wire of this unit and a motor. Use larger earth cables for JIS Class 3 or better grounding.

  ▶ 『 Electric shock may occur. 』

- Transportation, wiring, maintenance and inspection shall be conducted after confirming lit off condition of the charge monitor LED by cutting power off or confirming no residual voltage by a tester between DP and DN in the main circuit, or at least 3 minutes after cutting the power off. If a separate power supply is applied, be sure to cut the main power and then control power off.

  ▶ 『Electric shock may occur.』

- Do not damage, apply excessive force, put heav things on, or nip cables.

  ▶ 『Electric shock may occur』

- Never touch rotating section of a running motor.

  ▶ 『Injury may occur.』

⚠ Caution

- Use specified combination of a motor and this unit.

  ▶ 『Fire or failure may occur.』

- Do not use in the atmosphere such as water splash, corrosive or low flashing point gas and near inflammable things.

  ▶ 『Fire or failure may occur.』

- Since temperature of a motor, this unit and peripherals raises quite high, do not touch them.

  ▶ 『Burn of a worker may occur.』

- In supplying power status, or for a while after shutting power off, since a radiator, regenerative unit, a motor , etc. could be very hot, do not touch them.

  ▶ 『Burn of a worker may occur.』

- Never conduct withstand voltage test and megger test.

  ▶ 『Failure may occur.』

[Receiving and Checking of Packages]

⚠ Caution

- When you received ordered units, please check contents. If a 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.**』
- If packages of our products are broken, do not un-pack them and inform the fact to our sales man.
  ▶ 『**Electric shock, injury, damage, fire or failure may occur.**』

[Storage]

⚠ Caution

- Do not store units in a place of raining, water dripping and harmful gas / liquid.
  ▶ 『**Failure may occur.**』
- Store units in a place of no sun-shine but controlled temperature / humidity within specified range.
  ▶ 『**Failure may occur.**』
- If the storage term became quite long, consult purchased sales office or nearest office before using them.
  ▶ 『**Failure may occur.**』

[Transportation]

⚠ Caution

- Do not hold a cable and a motor shaft during transporting units.
  ▶ 『**Injury or failure may occur.**』
- Avoid excess amount transportation which may break the whole package.
  ▶ 『**Injury or failure may occur.**』

[Installation]

⚠ Caution

- Do not climb or put any heavy thing on this unit.
  ▶ 『Injury or failure may occur.』
- Do not disturb or choke intake / outlet air holes with foreign things.
  ▶ 『Fire may occur.』
- Use specified direction for installation.
  ▶ 『Fire or failure may occur.』
- Keep specified distance between this unit and control panel or other equipment.
  ▶ 『Fire or failure may occur.』
- Never apply heavy shock to this unit.
  ▶ 『The unit may be damaged.』
- Conduct proper attachment meeting output or weight of this unit.
  ▶ 『The unit may be damaged.』
- Attach this unit to non-flammable thing as metal.
  ▶ 『Fire may occur.』

[Wiring]

⚠ Caution

- Be sure to conduct correct wiring.
  ▶ 『Running away, burning out of a motor, injury or fire may occur.』
- To prevent this unit from noise influence, use specified length treated (shielded / twisted, etc.) cables.
  ▶ 『Running away of a motor, injury or machine damage may occur.』
- To prevent this unit from noise influence, use separate control I/O cables of this unit from other power cables.
  ▶ 『Running away of a motor, injury or machine damage may occur.』
- To avoid electric shock and noise influence, be sure to make proper grounding (earthing).
  ▶ 『Running away of a motor, electric shock injury or machine damage may occur.』

[Operation · Run]

⚠ Caution

- There is no applicable protection to motors. For the protection, over-current protector, earth leakage breaker, over-heat protector, and emergency stop device shall be provided.
  ▶ 『Injury or failure may occur.』
- Confirm that the power source specification is correct.
  ▶ 『Injury, failure or machine damage may occur.』
- At test run, fix a motor to a place separating from its machine system and confirm the motion, then connect the motor to the machine.
  ▶ 『Injury or machine damage may occur.』
- Since the brake is only for holding machine position, do not use it for safety system of your machine.
  ▶ 『Injury or machine damage may occur.』
- Since excess adjustment may this unit unstable, avoid this situation.
  ▶ 『Injury or machine damage may occur.』
- When an alarm occurs, eliminate the cause, reset the alarm and then re-start this unit.
  ▶ 『Injury or machine damage may occur.』
- When power recovers from black out status, sudden re-start may occur. Therefore, do not approach the machine.
  (Machine system design shall be considered to maintain safety of workers against the sudden re-start.)
  ▶ 『Injury may occur.』
- Do not apply power in the motor running or vibrating status.
  ▶ 『Running away of a motor, injury or machine damage may occur』
- Since the brake installed on a motor is only for holding , do not use it for actual braking.
  ▶ 『Injury or machine damage may occur.』
- Provide external emergency shut down circuit in order to stop running and shut the power off immediately.
  ▶ 『Injury or machine damage may occur.』

[Maintenance · Inspection]

⚠ Caution

- Capacity of condensers in the power line will be deteriorated.
  To prevent secondary damage caused by condenser failure, we recommend to replace them for about every 5 years.
  ▶ 『Failure may occur.』
- Cooling efficiency of the cooling motor will be deteriorated as the time going.
  To prevent secondary damage caused by condenser failure, we recommend to replace them for about every 5 years.
  ▶ 『Failure may occur.』
- Overhaul / repair shall be conducted only by us or suggested shop.
  ▶ 『Failure may occur.』

CONTENTS

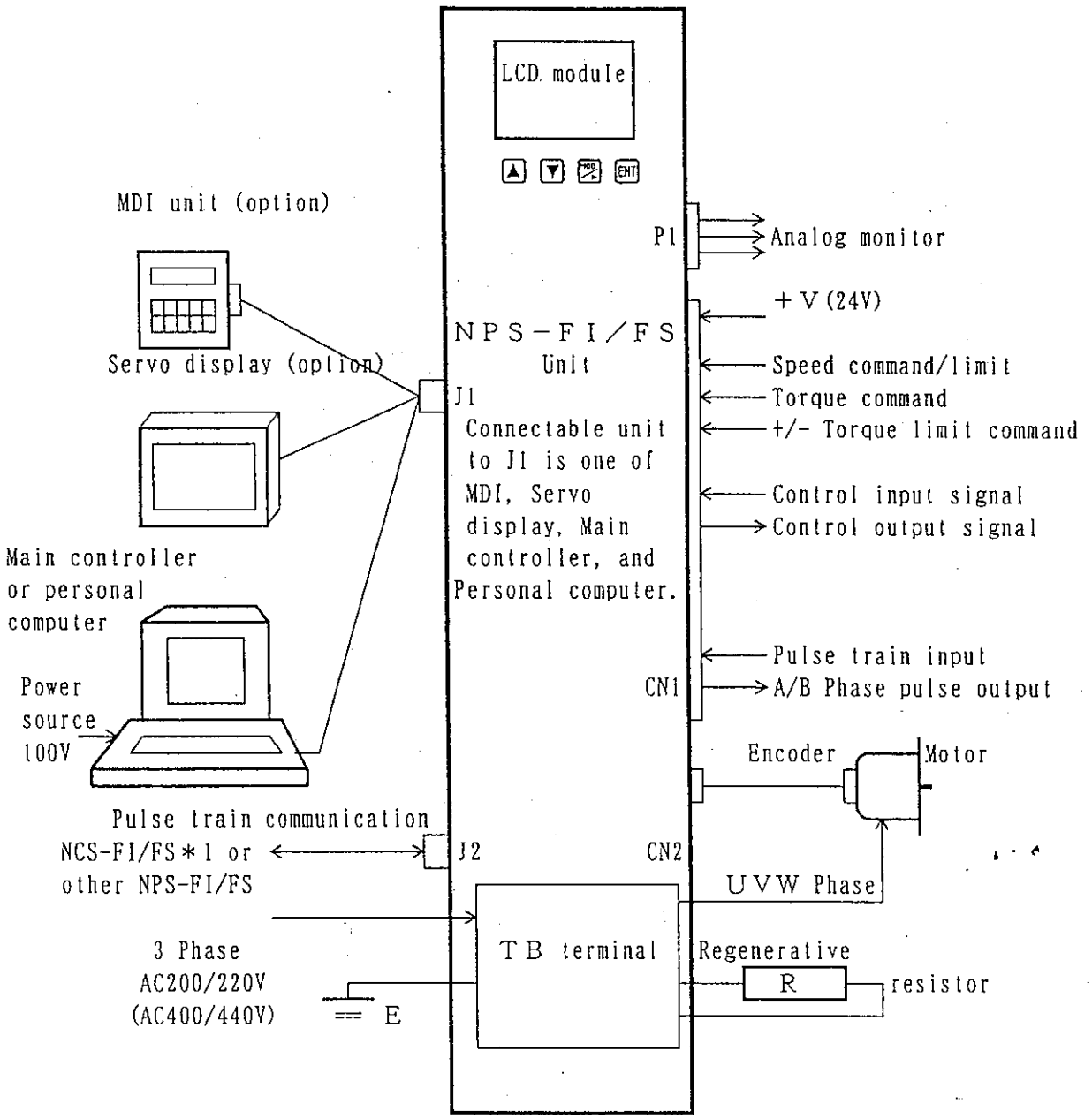
CHAPTER 1 OUTLINE

1－1 Basic Configuration

NPS-FI/FS (Here-after, this unit or controller is used.)unit has the function of speed control, torque control and pulse train control.
And 『NPS-FI/FS』 is a general name of the following 2 types which function and operation are identical.

NPS-FI type : AC servo driver for induction AC servo motor
NPS-FS type : AC servo driver for synchronous AC servo motor

The basic configuration is shown as [Figure 1－1] .
AC servo driver NPS-FI/FS type, AC servo motor, speed / position detecting encoder on the unloaded shaft, and an optional encoder compose a basic system.



＊1:NCS-FI/FS is a general purpose use and multiple function controller, consisting of 1 axis positioning unit and AC servo driver.

[Figure] System Configuration

Component description

(1) ＮＰＳ－ＦＩ／ＦＳ Unit
Speed control, torque control, and pulse control mode of the AC servo driver NPS-FI/FS type can be switch-overed to each other by a parameter or an external control signal. And by a parameter, one controller can be corresponded to various kinds of AC servo motors and encoders.

(2) ＬＣＤ Module
ＮＰＳ－ＦＩ／ＦＳ unit status, I/O signal status display, and parameters are set by the cursor keys.

(3) ＭＤＩ unit (option)
ＮＰＳ－ＦＩ／ＦＳ unit status, I/O signal status display, and parameters are set by the ten keys.
Max. 15 ＮＰＳ－ＦＩ／ＦＳ units can be connected to 1 MDI unit.

(4) Servo Display 1 (option)
- Status data (RPM, Deviation, etc.) can be displayed.
- Parameter setting can be done.
Please note that numbers of allocation at Servo Display side are limited for displaying data and setting parameter.

(5) Servo Display 2 (option) or Main Controller (Personal Computer etc.)
When using the contorol software developed by either customer or us, followings can be done.
- Status data (RPM, Deviation, etc.) can be displayed.
- Control signals of ＮＰＳ－ＦＩ／ＦＳ unit can be controlled.
- It can set up and back up parameter , etc.
Since some of commercial Personal Computer cannot be used as main controller. Please consult our Sales Dept. when you consider using a Personal Computer as main controller.

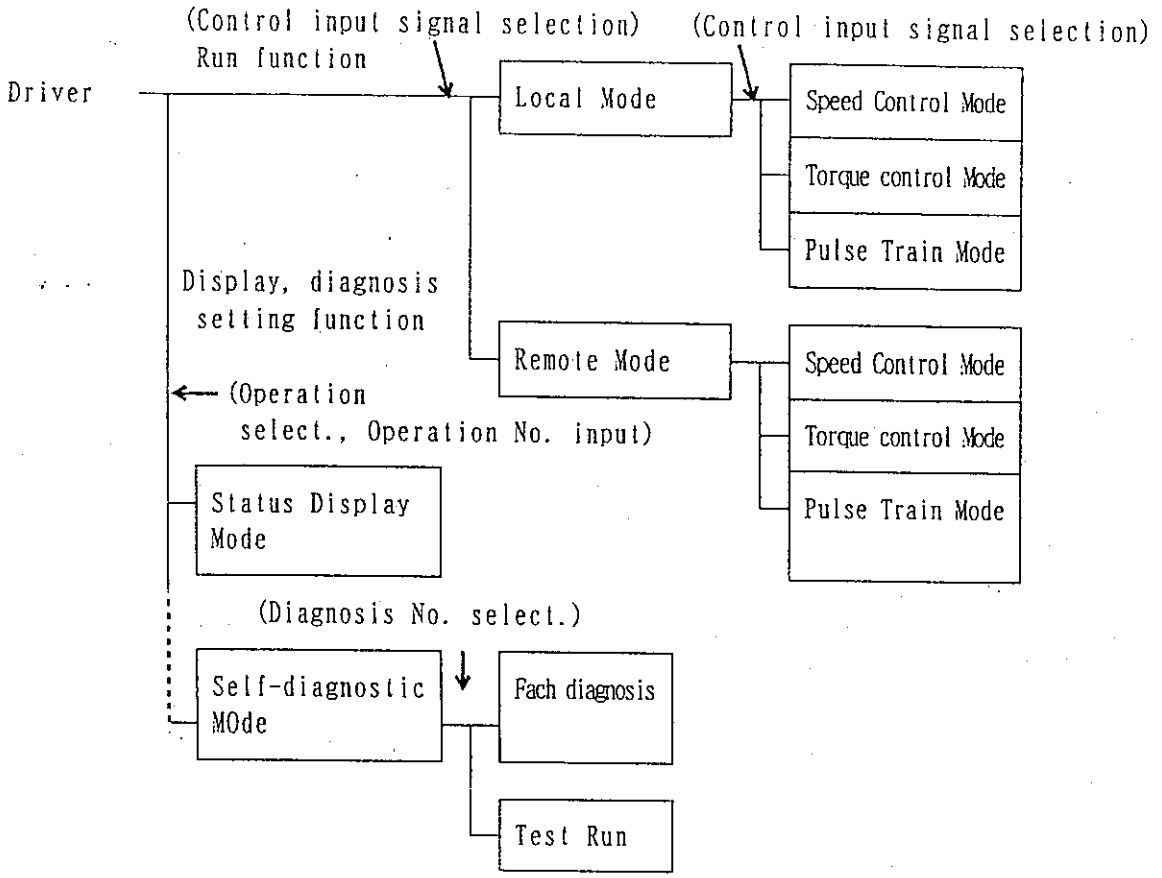
(6) Motor
- As standard, our AC servo motor is connected.

(7) Pulse train communication
It is connected to ＮＣＳ－ＦＩ／ＦＳ or other ＮＰＳ－ＦＩ／ＦＳ and Synchronizing control of max.. 10 axes can be conducted.

Parameters, etc. can be set by the LCD module on the front panel or an optional MDI unit (data input unit), as well as by serial communication with a main controller or personal computer.

1 — 2 Run Mode

Each run mode can be selected by a parameter and a control input signal as described below. Each parameter can be set by the front panel LCD module, an optional MDI unit or the serial communication with a main controller.



[Figure 1 — 2] Mode Configuration

Mode Outline

Mode	Function	Reference
Local Mode	· Each run mode selection, each action start/stop, and other controls are basically executed by control input signals. And also by the parameter (P516)setting, each control signal can be controlled by serial communication.	Selection by control signal PC
Remote Mode	· Each run mode selection, each action start/stop, and other controls are basically executed by serial communication. communication. And also by the parameter (P517)setting, each control signal can be controlled by controlinput signals.	Selection by control signal PC
Speed Control	· Speed Control Mode is executed by an internal / external speed command.	Selection by control signals, MD1 and MD2
Torque Control	· Torque Control Mode is executed by an internal / external torque command.	ditto
Pulse Train Control	· Positioning by a pulse train command is executed.	ditto
Self-diagnostic Mode Status Display Mode	· Each circuit diagnosis and test run of equipment are executed.	Mode selection by front panel LCD module.

When serial communication is selected, regardless to local or remote mode selection, parameter input can be conducted by serial communication.

[Tab. 1 — 1] Mode Outline

CHAPTER 2 SPECIFICATION

2－1 Controller Specification

2－1－1 Controller type

NPS － ① ② ③ － ④

Example : NPS － FI M A － 153

No.	Item	Indication	Contents
	Series name	NPS	Nikki AC servo system series
①	Type name	FI	FI type
		FS	FS type
②	Power source specification		
		M	AC200/220V±10% , 50/60Hz
		H	AC400/440V±10% , 50/60Hz
③	Design sequence	A , B , ···	Starts from A
④	Max. rated capacity or typical motor.	Example 153	Controllable maximum motor capacity 15 3 = 15 × 1000 = 15kw Exponent section of 10 Valid No.

[Tab. 2－1] Controller Type Indication

2－1－2 Controller General Specification

Item		Contents
Outline		See " Controller Outline Drawing ".
Ambient condition	Temp.	Operation 0 ～ 55℃ (Unit circumstances)／ Storage -20～60℃
	Humidity	85% or less , non-condensing
	Altitude	1000m or lower
	Location	Do not install in harmful atmosphere such as corrosive gas, grinding liquid, metal powder or oil, etc..
Power source		3 phase AC180V～242V, 50/60Hz (NPS－FIM＊－＊) or 3 phase AC360V～484V, 50/60Hz (NPS－FIH＊－＊)
Cooling method Installation method		Forced air cooling Panel mounting type
Vibration resist.		0.5G (10～50Hz)
Shock resistance		5G
Noise resistance		Line noise : 2000V (50ns, 1μs) , 1 minute Radiated noise : 1000V (50ns/10cm) , 1minute Electro-static noise : 10KV (Between earth and case)
Accessories		Regenerative resistor (with thermostat)

[Tab. 2－2]

Individual controller electric specification can be referred to 10－1「Electric Specification of Controller」.

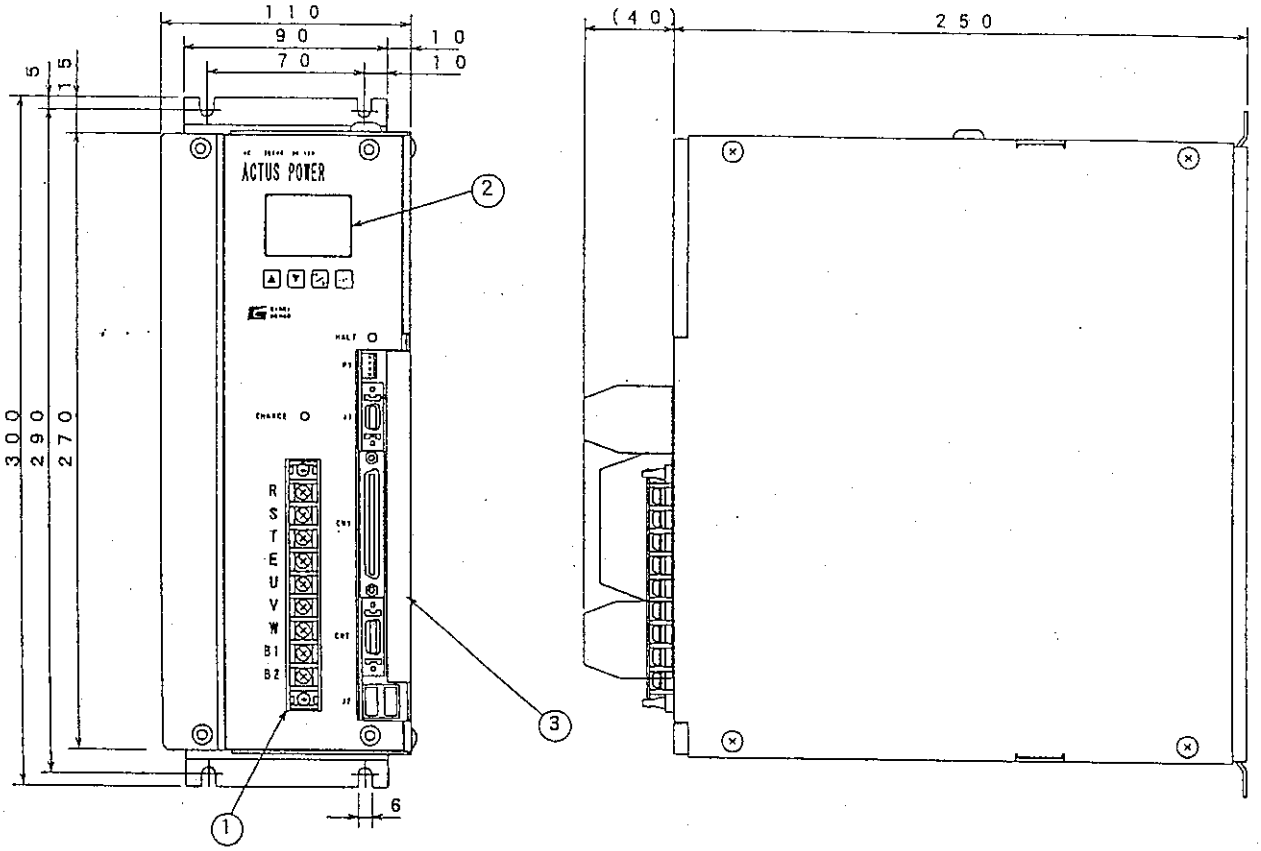
2－1－3 Controller Function Specification
[NPS－F application]

Item	Driver function
Axes	1 axis
Max. speed	10K～1Mpps (Frequency, 4 times of encoder pulse at rated speed.)
Command method	Speed command ┬ Analog voltage (±10V) └ Internal parameter (7 speeds) Torque command ┬ Analog voltage (±10V) └ Internal parameter (3 kinds) Position command — Pulse train ※ By Serial communication, Torque command and Speed command can be set.
Speed command	Analog voltage : DC 0～±10V Internal parameter : Decimal 4 digits ／ 5 digits 0.1 unit(rpm) ※ But less than motor rated speed.
Torque command	Analog voltage : DC 0～±10V (300% torque at ±10V) In case of MAX200% torque motor ±6.6V Internal parameter : Decimal 3 digits (%)
Pulse train command	Forward/ Reverse directional pulse or 90° phase different 2 phase pulses (Max.1Mpps) Corresponds to Line driver method or Open collector output. In order to avoid noise influence, Line driver method is recommended.
Accel./ Decel. pattern	In speed control, Linear accel./decel. (0.01～99.99sec)
Protective function	IPM error, Over voltage, Under voltage, Over speed. Over load (electronic thermal), Encoder failure, Deviation over flow, Radiator over heat, Communication error, Data error, etc. (Last 5 abnormal cause history is retained.)
Monitor function	Individual I/O status and abnormal reason is displayed in the front panel LCD module. In addition to the speed command, 2 data out of speed feedback, torque command, torque limit, and deviation can be chosen and outputted as analog voltage. (analog monitor)
Major function	Speed control run, Torque control run, Pulse train run, Serial communication run Self-diagnosis, Torque limit, Command pulse compensation function, Speed limit, Feed-forward, Feedback pulse deviation output, and Electronic thermal control functions

[Tab. 2－3] Controller Function Specification

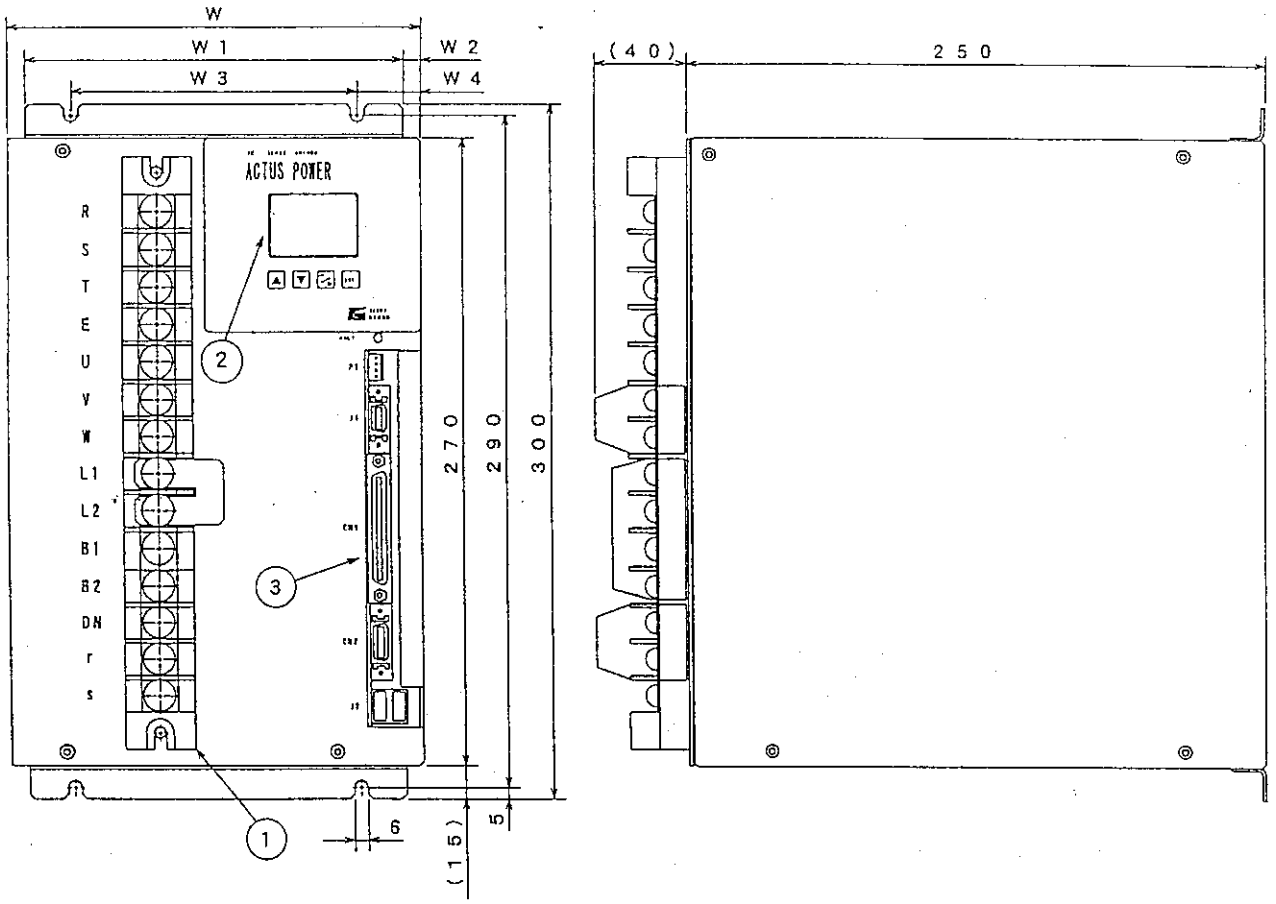
2－2　Controller Outline and Each Component Name

1. Outline drawing of controller



Controller type : NPS-FIM*-401/801

[Figure 2－1]　Controller Outline 1



Controller type : NPS-FIM*-122/242/402/752/113
NPS-FSM*-122/242/402/752/113

Unit : mm

Controller type	W	W1	W2	W3	W4
NPS-FIM*-122/242/402 NPS-FSM*-122/242/402	140	120	10	100	20
NPS-FIM*-752 NPS-FSM*-752	180	165	7.5	125	27.5
NPS-FIM*-113 NPS-FSM*-113	220	165	30	125	50

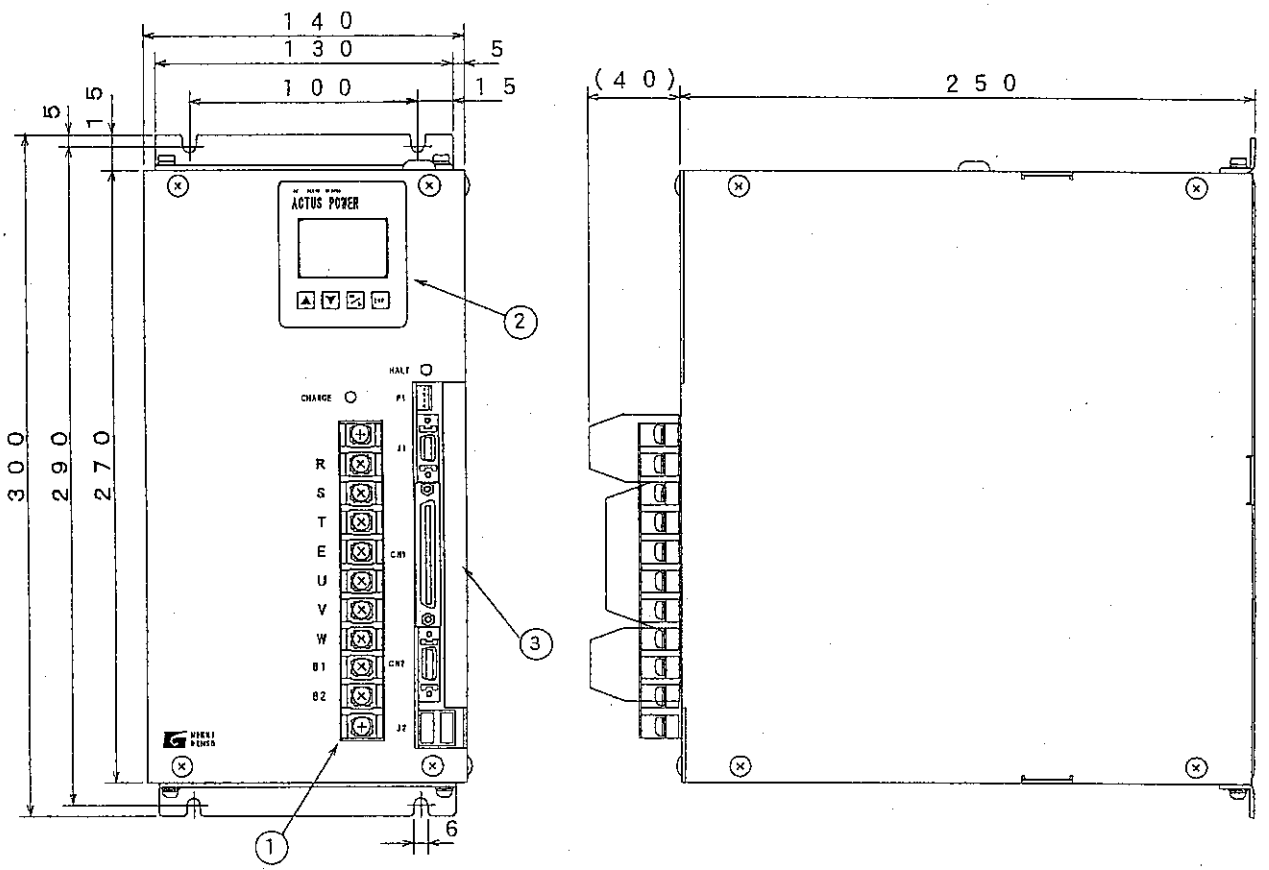
[Figure 2－2] Controller Outline 2

【NPS-FI, NPS-FS INSTRUCTION MANUAL】

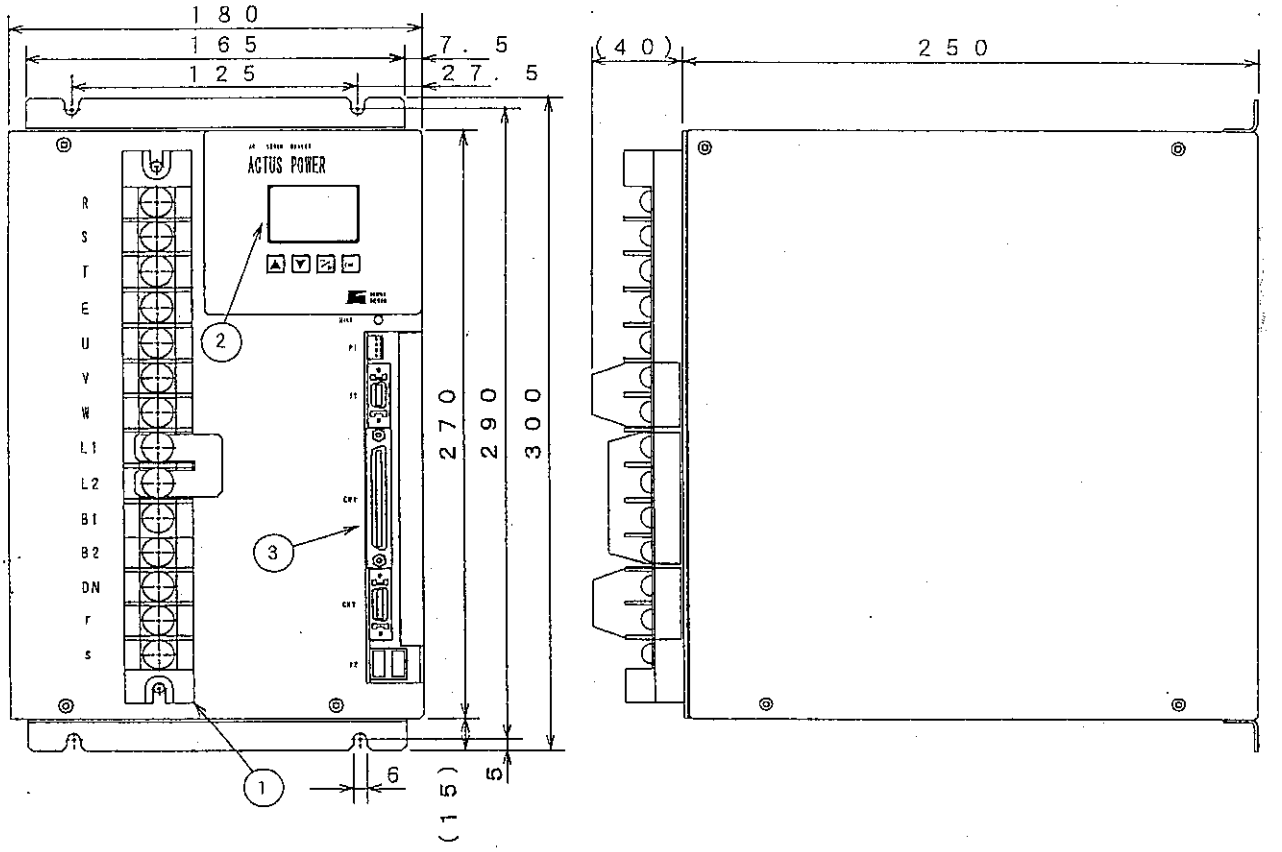
Users are requested to make the corrections given in the errata.

p. 2-4 [Figure2-2] Controller Outline 2

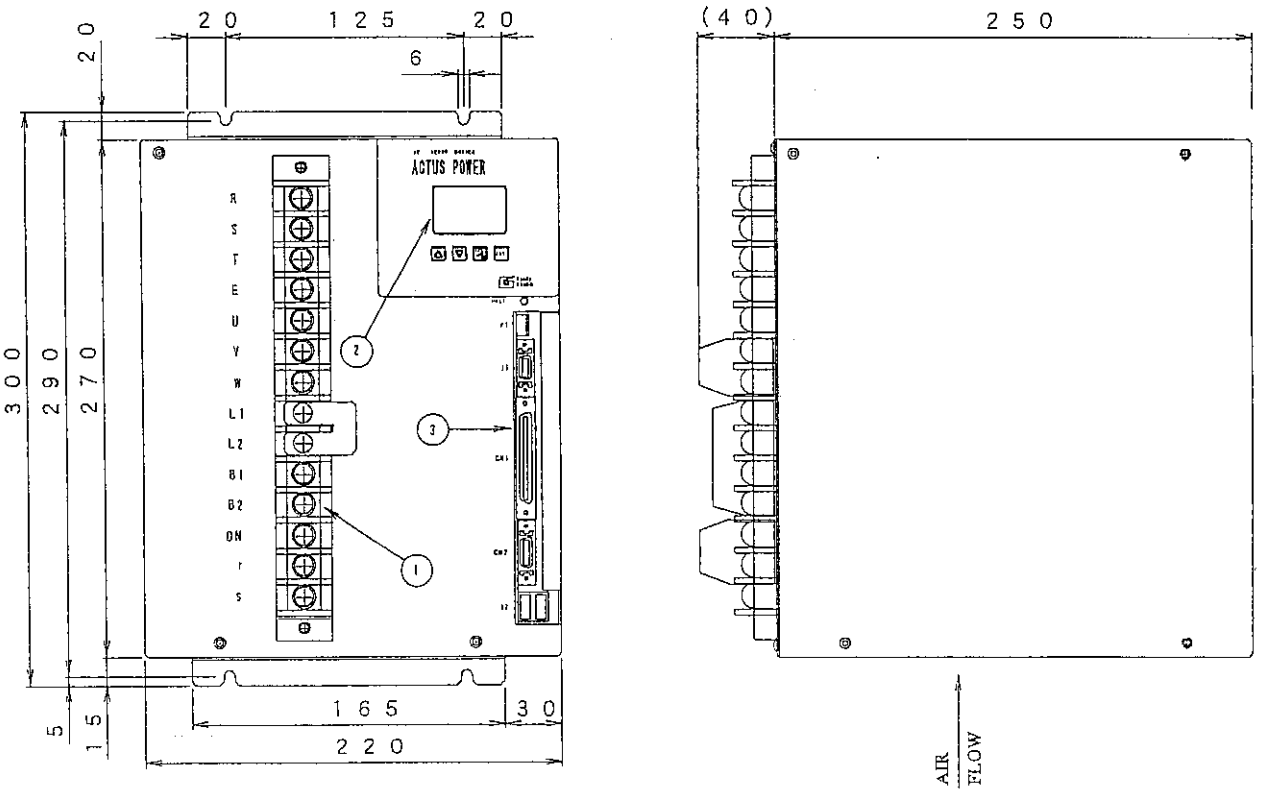
NPS－FIM*－122／242／402
NPS－FSM*－122／242／402

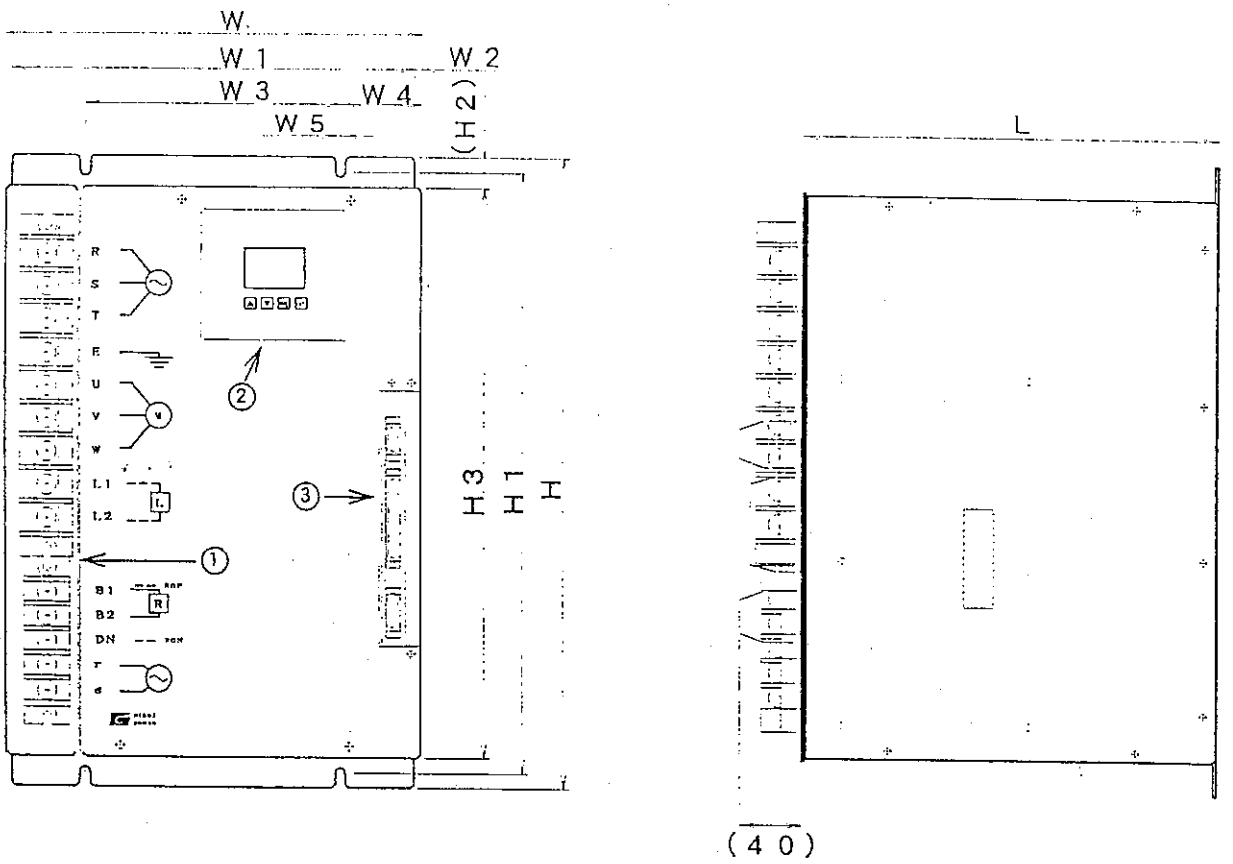


NPS－FIM*－752
NPS－FSM*－752



NPS－FIM*－113
NPS－FSM*－113



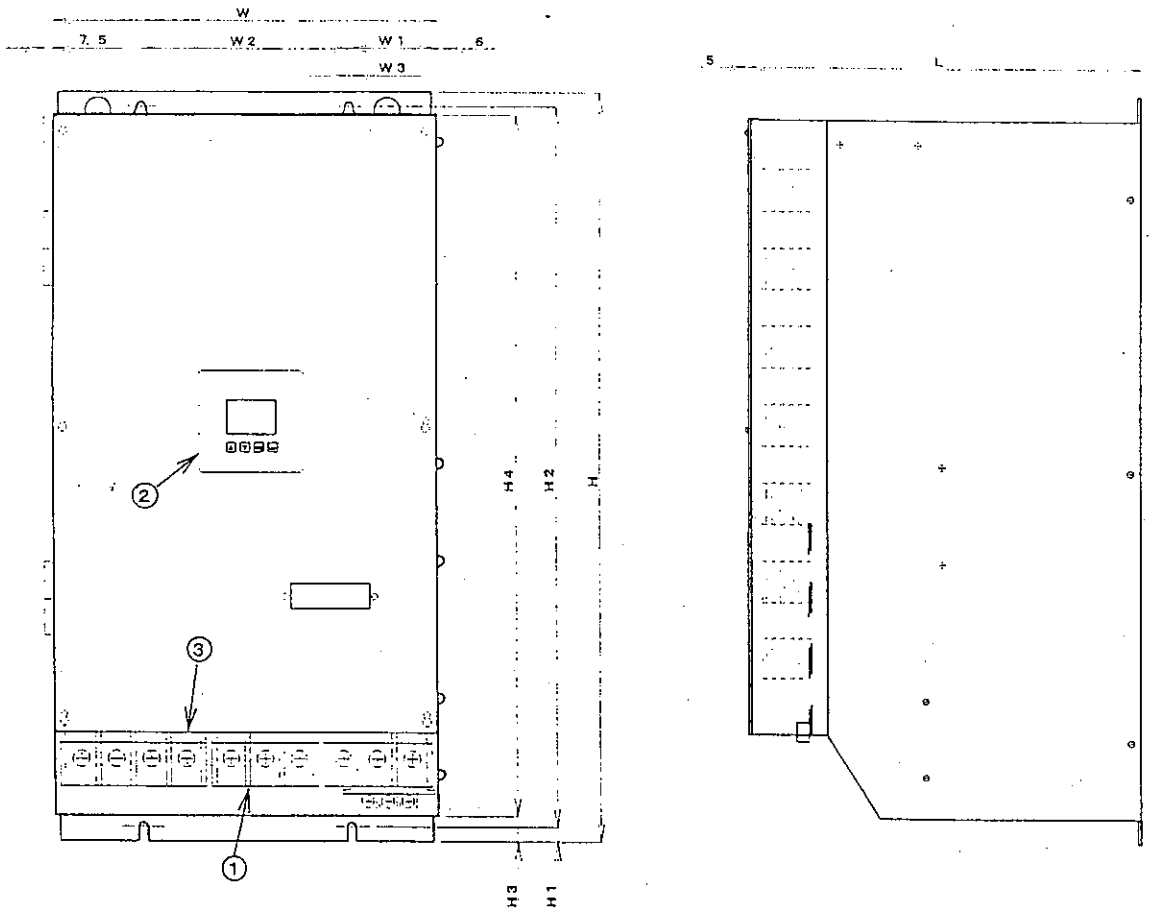


Controller type : NPS-FIM*-153
NPS-FSM*-153
NPS-FIH*-113/153

Unit : mm

Controller type	H	H1	H2	H3	W	W1	W2	W3	W4	W5	L
NPS-FIM*-153 NPS-FSM*-153 NPS-FIH*-113, 153	404	385	20	364	270	266	2	165	52.5	7	266

[Figure 2－3] Controller Outline 3

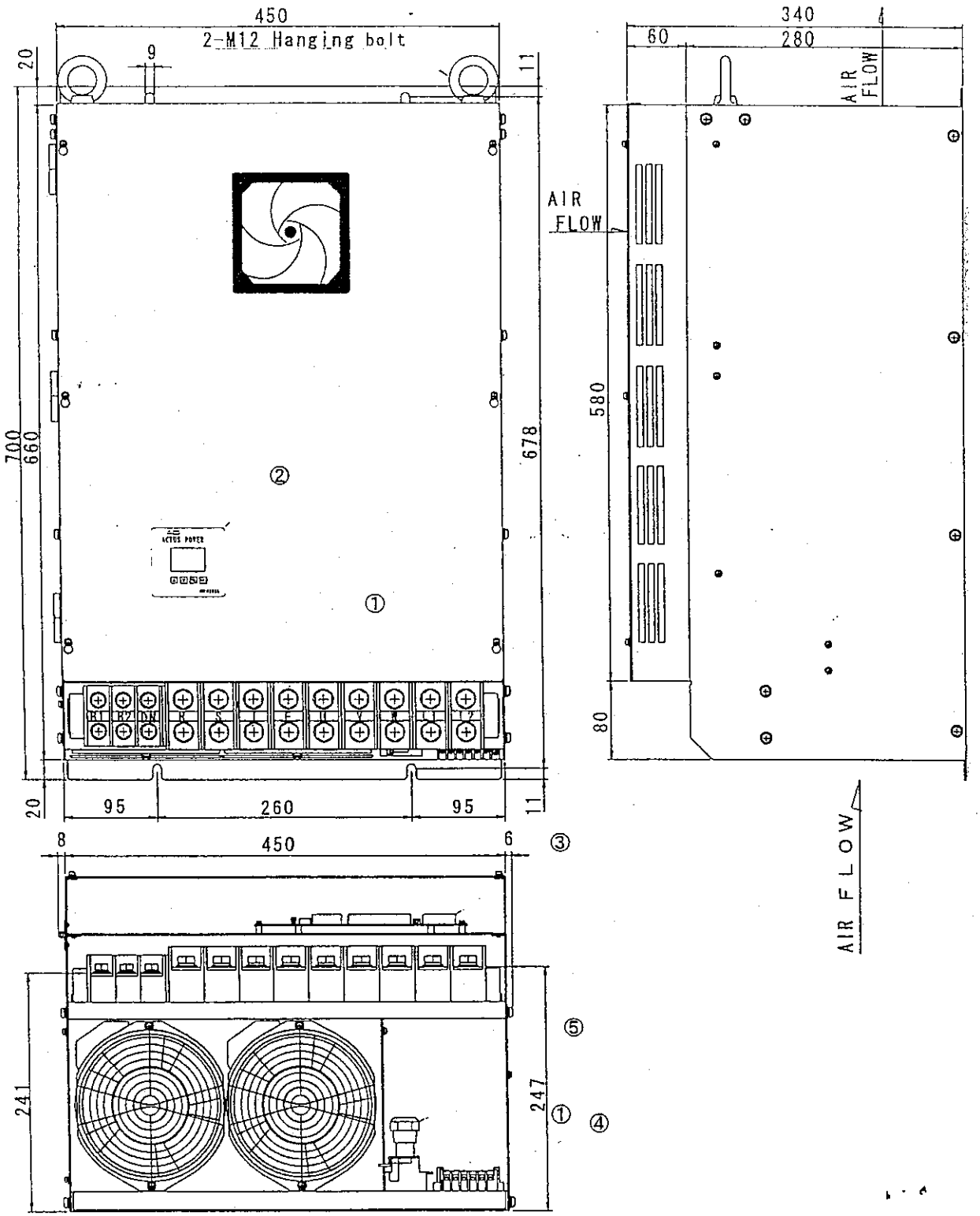


Controller type : NPS-FIM*-223/303/373
NPS-FSM*-223
NPS-FIH*-223/303/373

Unit : mm

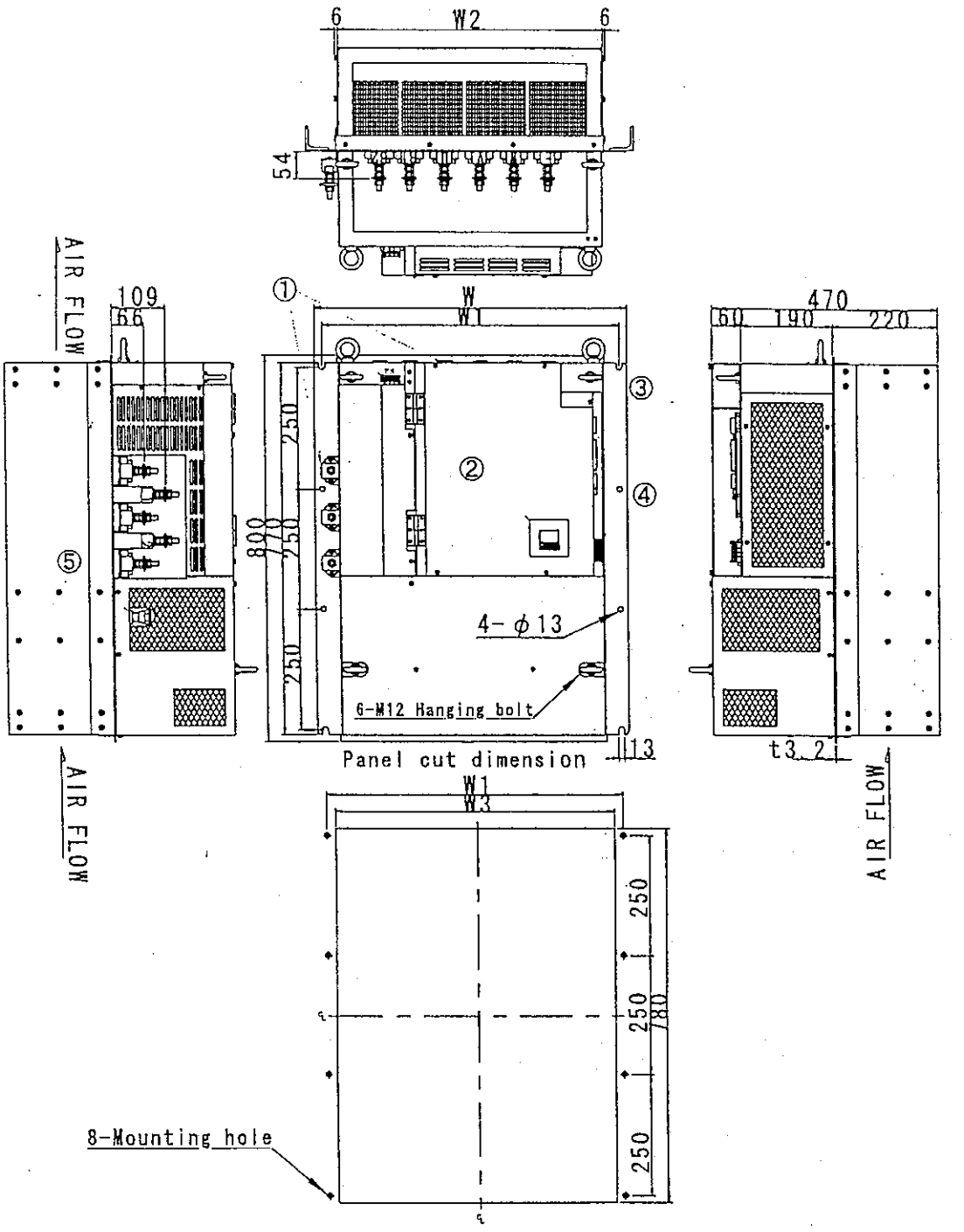
Controller type	H	H1	H2	H3	H4	W	W1	W2	W3	L
NPS-FIM*-223/303 NPS-FSM*-223 NPS-FIH*-223/303	580	11	558	20	540	300	67.5	165	7	305
NPS-FIM*-373 NPS-FIH*-373	700	11	678	20	660	450	95.0	260	9	330

[Figure 2－4] Controller Outlin



Controller type : NPS-FIH*-553

[Figure 2－5] Controller Outline 5



Controller type : NPS-FIH*-753/114

Unit : mm

Control type	W	W1	W2	W3
NPS-FIHQ*-753	645	613	545	577
NPS-FIHQ*-114	795	763	695	727

[Figure 2－6] Controller Outline 6

2. Controller Each Component Function
(Location of No.s ①~⑤ can be referred to outline drawings.)

Type	No.	Name	Function
Common	①	R, S, T	AC power input terminal block
		E	Terminal block for grounding
		U, V, W	Terminal block for motor connection
		B1, B2	Terminal block for Regenerative resistor connection (DN Terminal block is for optional power regenerative unit connection.)
※1		DN	
※2		r, s	Terminal block for control power source connection
※3		L1, L2	Terminal block for reactor connection Reactor is optional.
※4	④	H1, H2	Terminal block for warning signal output of abnormal Radiat or over heat
※5	⑤	A1, A2	Terminal block for detecting signal output of Radiator cooling fan failure
Common	②	LCD Module	Combined module of LCD and key switches Can confirm data, parameter input and various monitors, alarms.
	③	CN1	Connector for control I/O and each command input
		CN2	Connector for encoder feedback pulse input Inputs feedback pulse signals from encoder on motor.
		J1	Connector for Serial communication Conducts Serial communication with external equipment or optional unit.
		J2	Connector for Pulse train communication This in connected to NPS-FI/FS or other NPS-FI/FS and transmits / receives pulse tarin data.
		P1	Connector for Analog monitor Can confirm one of Speed command, Speed feedback, Torque command, External torque limit command, and Deviation as voltage.
		HALT	CPU error LED Lit when CPU error occurs as watch dog timer error, etc..

※1: Model without DN terminal : NPS-FIM*/FSM*-401/801/122/242/402.
※2: Model without r terminals : NPS-FIM*/FSM*-401/801/122/242/402.
※3: Model without L1 and L2 terminals : NPS-FIM*/FSM*-401/801/122/242/402.
※4: Model without H1 and H2 terminals : NPS-FIH*-553, 753, 114.
※5: Model without A1 and A2 terminals : NPS-FIH*-753, 114.
As for Specification and handling, etc. of H1, H2 and A1, A2, please refer to CHAPTER 9 , respectively.

CHAPTER 3 INSTALLATION, WIRING

3－1 Controller Installation

3－1－1 Installation conditions

(1) Allowable ambient conditions can be referred to 「2－1－2 Controller General Specification」.

(2) Ambient temperature, controller energy loss, and generation loss of equipment in a control cabinet shall be considered to the cabinet inside temperature, and temperature around the controller shall be maintained within the allowable range.
Radiating heat energy loss of the controller is about 7% + 50W of a motor.

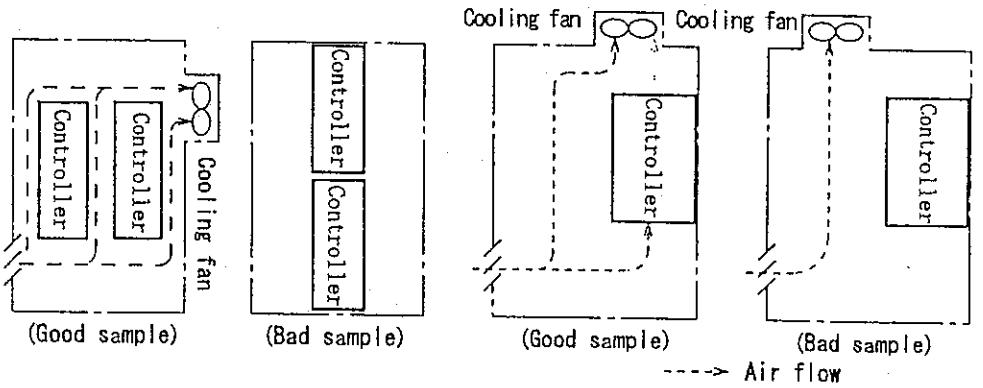
⚠ Caution

● Please be sure to use this controller within the allowable temperature and humidity. Use in the out of range condition, may cause error and failure.

(3) Since this controller is equipped with a radiator cooling fan , make a room not to disturb its ventilation. When multiple controllers are placed in a control cabinet, be sure to locate controllers in the better ventilation for every controller. (Refer to [Figure 3－1] .)

(4) If a heat energy element or vibration source, etc. is near the controller, design the layout to avoid the influence.

(5) Please avoid to install the controller in a location such as high temperature, high humidity, dust, dirt, metal powder, lamp soot, corrosive gas, etc..



[Figure 3－1] Sample locations when plural controllers are installed.

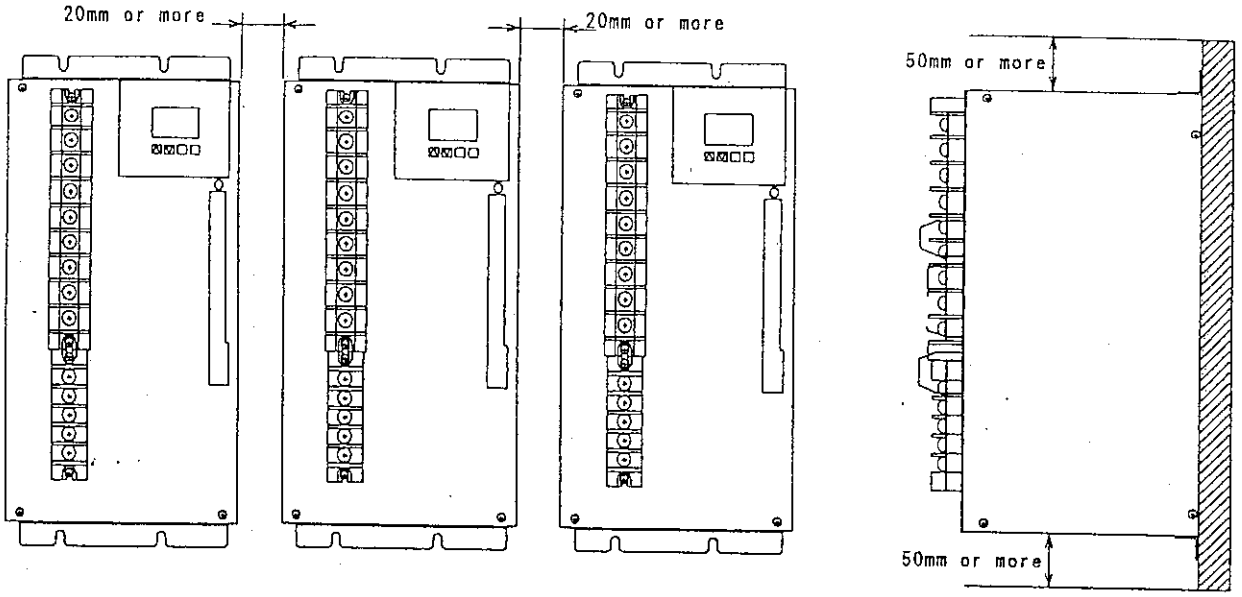
3－1－2 Installation method

(1) To get normal radiation effect, be sure to install the controller, vertically. (Refer to [Figure 3－3] and [Figure 3－5] .)

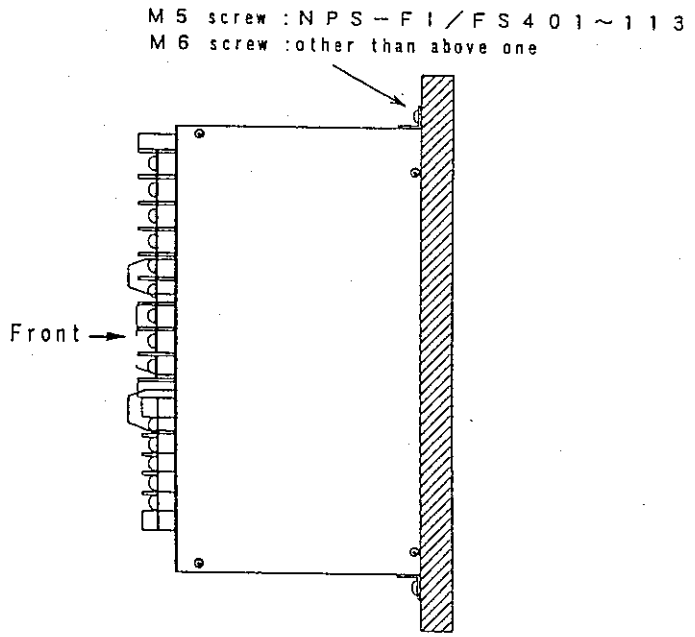
(2) In the points of radiation and maintenance, keep vertical and horizontal space of the controller specified in [Figure 3－2] and [Figure 3－4] (Distance to other equipment, parts, and wall of a control cabinet.

(3) Since a radiator and cooling fan of large capacity controllers are projected from unit installation side, in addition to the space in the above item, get more space for future maintenance. (Refer to [Figure 3－6] .)

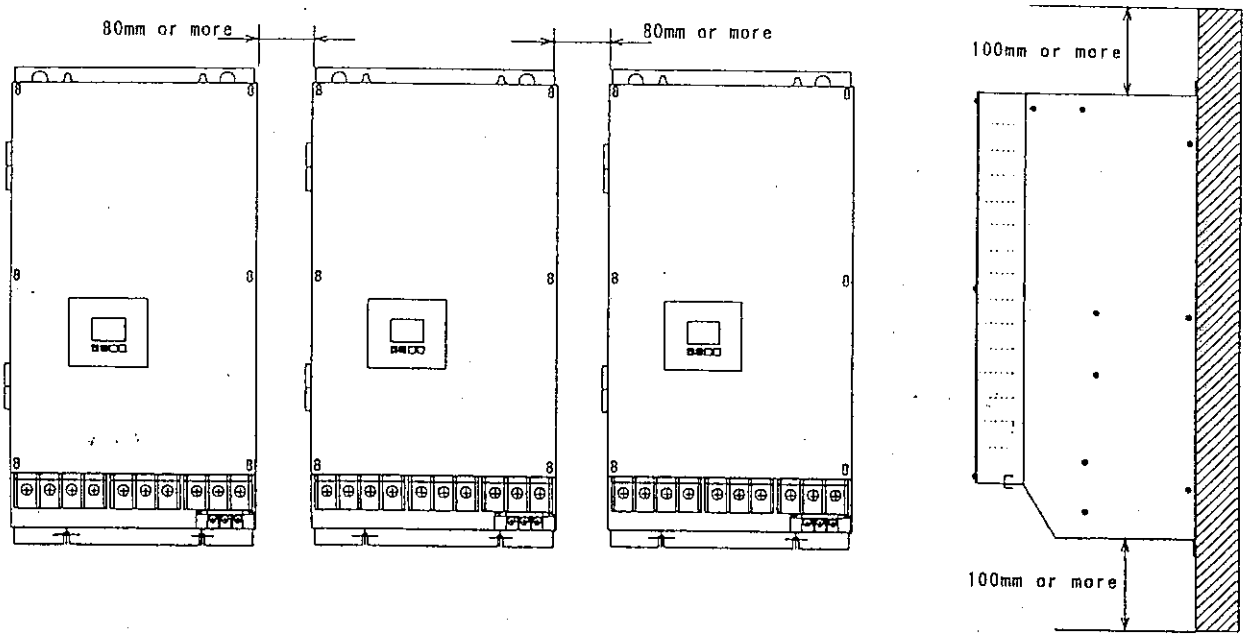
(4) Panel side to install a large capacity controller shall be strengthen from the upper side to bed side by an L shape steel plate or equivalent with fastening M10 or M12 bolts and nuts.
And be sure not to disturb intake / exhaust by the method. (Refer to [Figure 3－6])



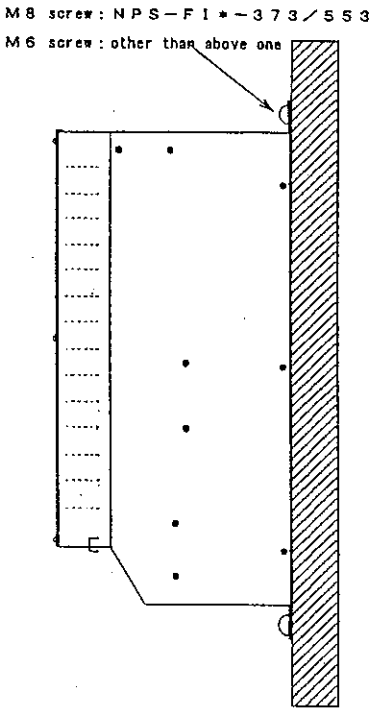
[Figure 3 − 2] NPS-FI**/FSM*-401/801/122/242/402/752/113/153
Controller Installation and Ventilation



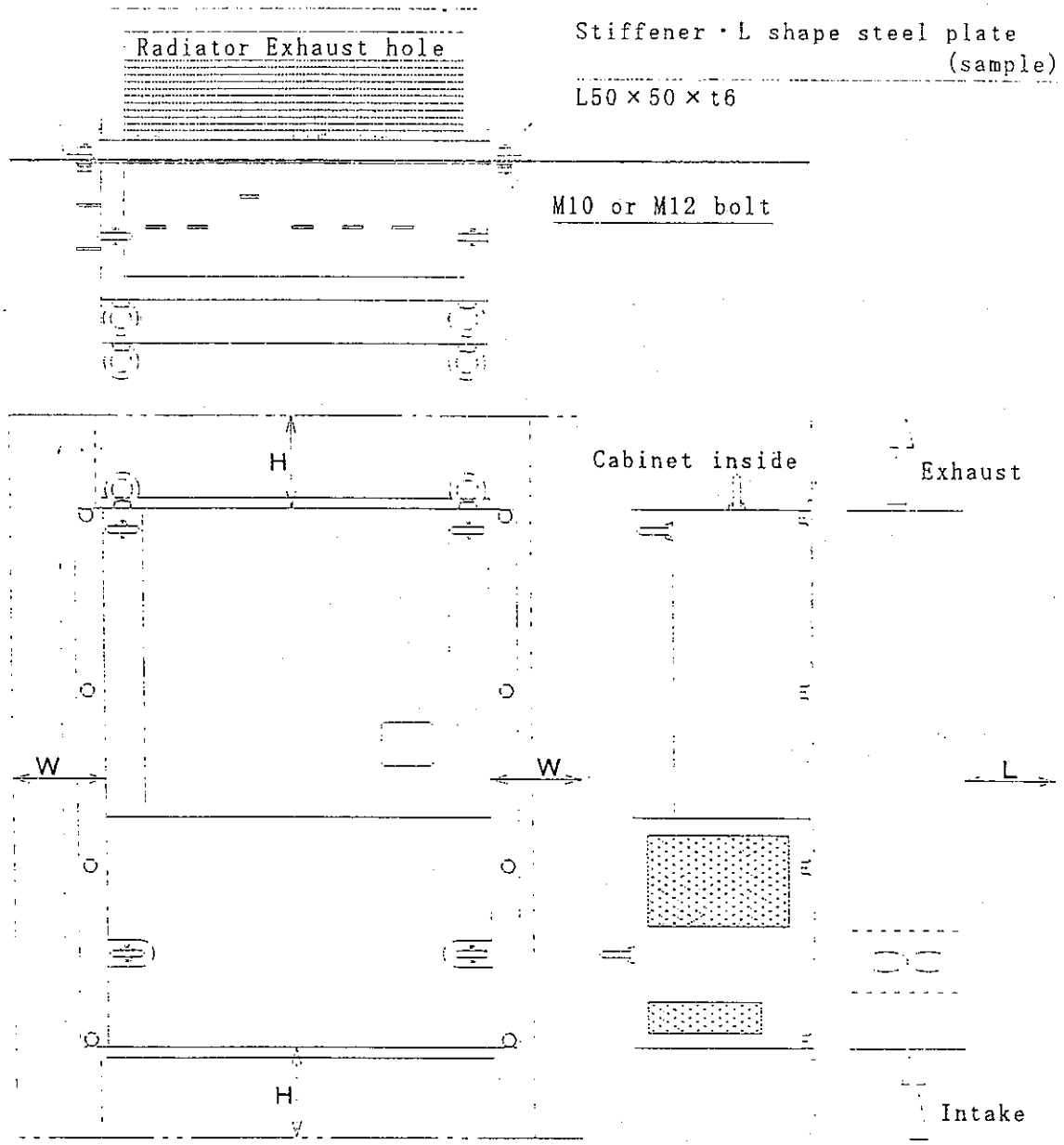
[Figure 3 − 3] NPS-FI**/FSM*-401/801/122/242/402/752/113/153
Controller Installation Method



[Figure 3 － 4] NPS-FI**/FSM*-223/303/373/553
Controller Installation and Ventilation



[Figure 3 － 5] NPS-FI**/FSM*-223/303/373/553
Controller Installation Method



H : 500mm or more ／ W : 200mm or more ／ L : Maintenance space (for worker)

[Figure 3 － 6] NPS-FIH*-753/114
Controller Installation and Ventilation

3－2 Unit Connection

3－2－1 Input power source connection

1. AC input power source wiring

(1) Available AC input power sources are,

NPS－FIM*－* Main power AC180～242V, 50/60Hz 3 phase power
Control power AC180～242V, 50/60Hz Single phase power
(NPS-FIM/FSM-401～402 are not equipped with control power source.)

NPS－FIH*－* Main power AC360～484V, 50/60Hz 3 phase power
Control power AC360～484V, 50/60Hz Single phase power

Connect control power source and main power source separately.
Voltage fluctuation depending on factory production status, shall not exceed these range.

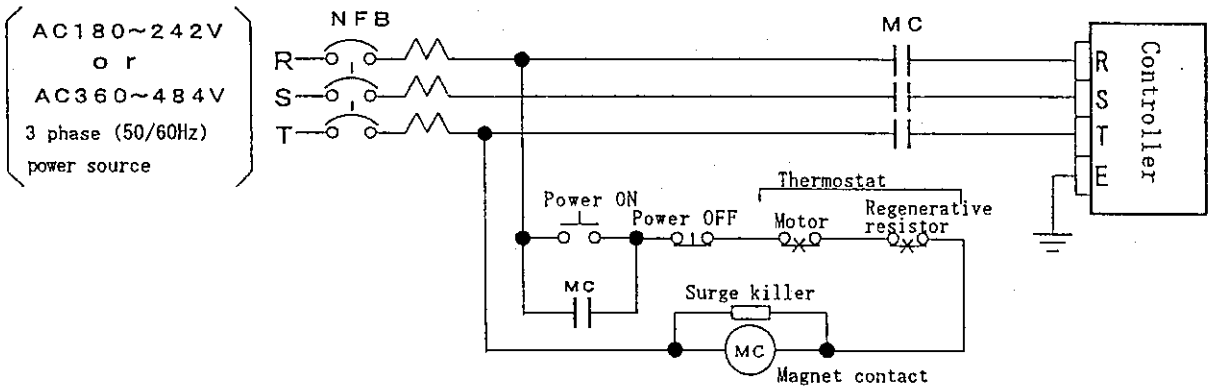
(2) To prevent accident and fire, be sure to install a proper no-fuse breaker or a fuse. And in case of using an earth leakage breaker, please provide an inverter use type modified against high harmonic frequency.

(3) Since a condenser input type main power circuit is used, a large inrush current flows. Depending on power source capacity, or its impedance, large voltage drop may occur. Therefore, please select and apply a little bit larger power source and cable.

(4) Do not mis-connect AC power source (R, S, T, E) to the motor connection terminals (U, V, W, E) of a controller.
If mis-connection is made, the controller may be damaged.

2. Power source circuit

A typical power source circuit is as [Figure 3－7] . (Regenerative resistor thermostat contact will be thermal relay contact for some types.)



[Figure 3－7] Typical Power source Circuit

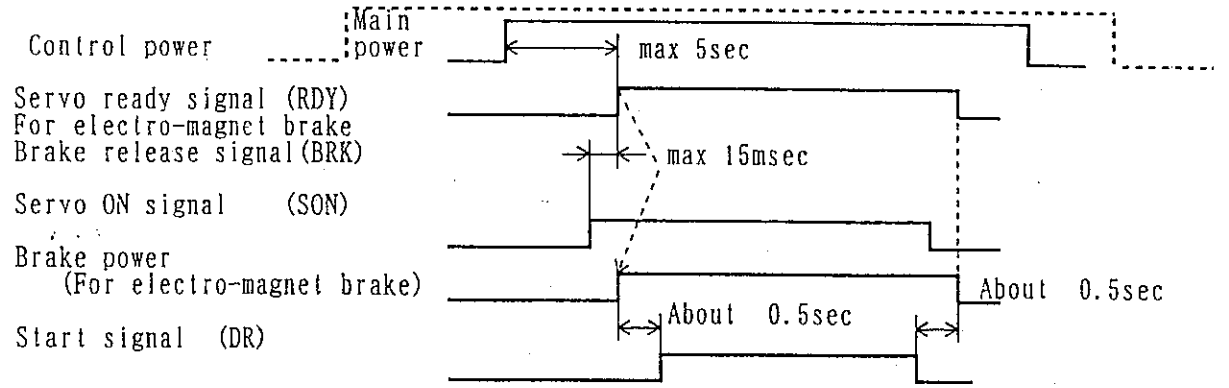
⚠ Caution

- Keep the supply power within the specified range. If not, the controller could be damaged.
- To protect power source line and prevent accident as fire, be sure to install a no-fuse breaker. Breaker capacity can be referred to CHAPTER 10 「DATA」 .
- When a magnetic contact is provided, be sure to install a surge killer.
- We recommend to separate the controller power source from other high power units if possible.

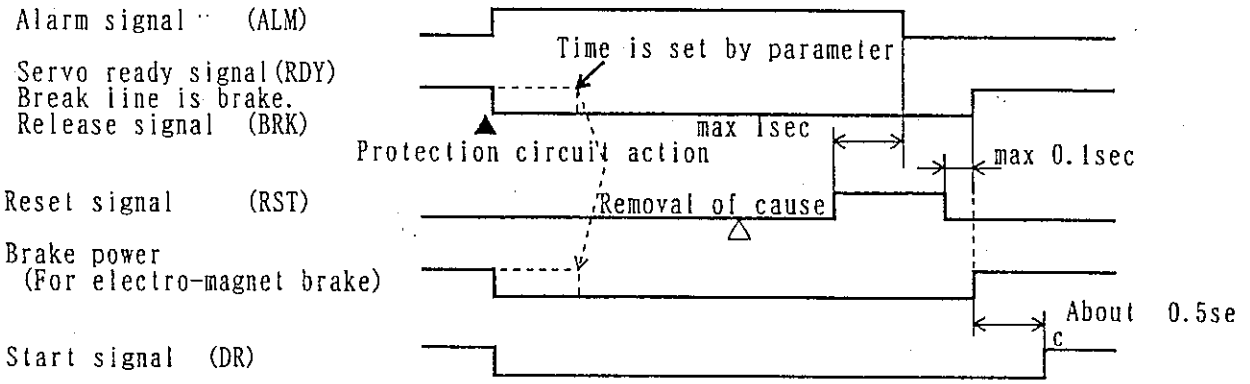
3. Sequence for Power ON

(1) Since controller main circuit is condenser input type, frequent ON-OFF switching causes deterioration of the main circuit elements. Though power re-input after power shut off can be conducted within 10 seconds, please limit ON-OFF switching frequency less than 2 times / 3 minutes.

(2) ON timing of control power shall be before or same as main power ON timing. OFF of control power shall be made after main power OFF.



[Figure 3 – 8] Power ON Timing Chart



[Figure 3 – 9] Time Chart When Problem Occurs

⚠ Caution

- When power re-input is made within 10 seconds after power OFF, the controller may not properly work.
- When over current, or over load protection works, remove the cause and cool the controller for about 30 minutes and then re-start it. Frequent reset in short time, the controller temperature abnormally raises and could be damaged.
- Provide external sequence to turn Start signal OFF and stop the command when an alarm Occurred (outputted) by a protective function. After power OFF occurs (includes black out), when the power recovers, if Start signal and command (Speed command voltage or Pulse train, etc.) are inputted, a motor will run which is very dangerous.

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

Select a proper capacity no-fuse breaker to meet power source capacity in order to protect short-circuit coordination against control failure.

When line capacity (power source capacity) is too large to the control capacity, please insert a reactor for coordinate the power source.

(As for the reactor selection please consult our sales man.)

And when an earth leakage breaker is applied, please comply with next suggestion. Since the controller inverter section is PWM control, the output contains high harmonic components. Therefore, leakage current is generated depending on the ground static capacity of the wiring route from the controller to a motor and floating capacity between the motor coil and the iron core. Since the earth leakage breaker could work by leakage current of the higher harmonic components, select an inverter use type earth leakage breaker to the controller power source circuit.

3－2－2 Motor connection

1. Motor wiring

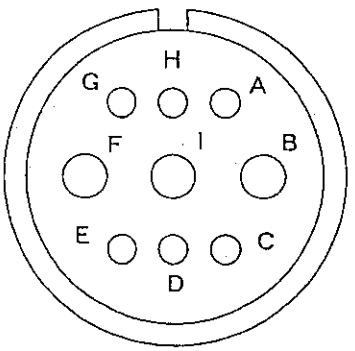
(1) Do not connect motor terminals (U,V,W,E) to controller terminals (U,V,W,E) in the wrong phase sequence. If wrong, the motor will not run correctly, and may vibrate or start regardless to a command input which is quite dangerous.

(2) Motor terminals (U,V,W,E) of synchronous motor type NA720-122/182/242/402 are in a cannon plug (male). The wiring side cannon plug (female) shall be provided by your side or can be our optional plug.

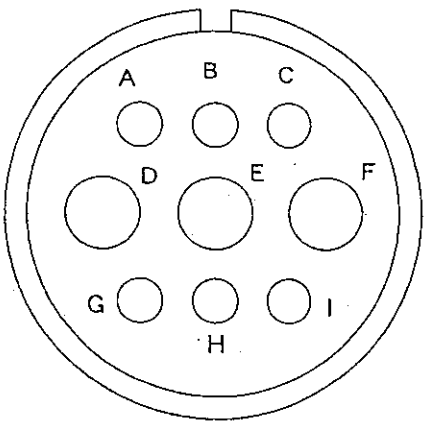
		NA720-122/182/242	NA720-402
Motor side cannon plug		MS3102A20-18P	MS3102A24-11P
Option	Wiring side cannon plug	MS3106B20-18S(Straight type)	MS3106B24-11S(Straight type)
	Cable clamp	MS3057-12A	MS3057-16A

＊Angle type can be also available.

NA720-122/182/242



NA720-402

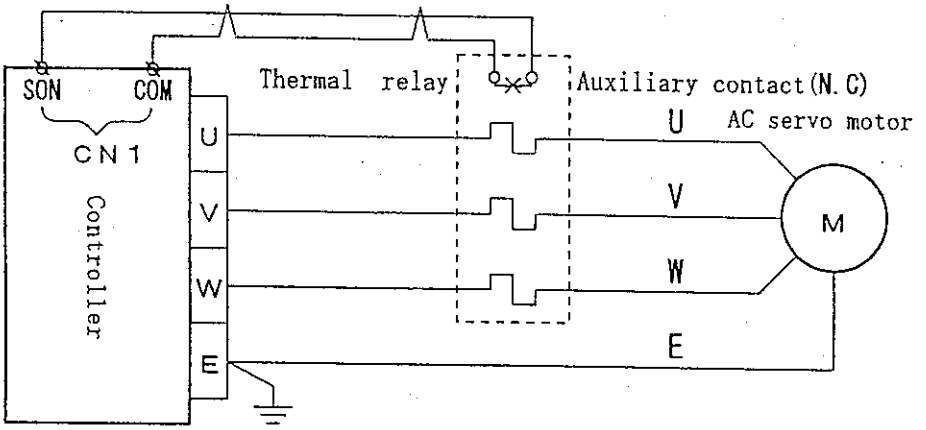


[Figure 3－10] Motor connector pin No. and location

Pin No.	NA720-122/182/242	NA720-402
A	----------	----------
B	W phase	----------
C	----------	----------
D	----------	U phase
E	Frame ground (E)	V phase
F	U phase	W phase
G	----------	Frame ground (E)
H	----------	----------
I	V phase	----------

(3) Do not apply a magnetic relay or no-fuse breaker between a motor and the driver.
(4) If a motor is equipped with a brake, be sure to release it before turning ON the Start signal(DR). Otherwise, the motor may burn out. Refer to [Figure 3 − 8] and be careful of the timing.
(5) An electronic thermal is installed in the controller. In case of adding an external thermal relay, use the value of the motor rated current for the setting. Design sequence to turn OFF the Servo ON signal (SON) by an auxiliary contact of the thermal relay when the the relay is activated. (Refer to [Figure 3 − 10.])
(6) For motor over heat protection, a B contact (normal close) type thermostat is assembled in NA100 series, NA720-372, 552～233 type motors. Referring to [Figure 3 − 7] , conduct wiring to shut main power OFF when this relay is activated. Thermostat contact specification is as follows.

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



[Figure 3 − 11] Motor wiring

⚠ Caution

●Be sure to connect a motor ground terminal(E) to the controller ground terminal (E).

2. Motor rotating direction selection

Relationship between each command and motor rotating direction in case of using standard motors and encoders is shown as the below tabulation.

Command input	Polarity	Motor rotating direction
Speed command	+Voltage	CCW rot.viewd from motor load shaft:Forward rotation
	-Voltage	CW rot.viewd from motor load shaft: Reverse rotation
Directional pulse train command	Forward direct.	CCW rot.viewd from motor load shaft:Forward rotation
	Reverse direct.	CW rot.viewd from motor load shaft:Reverse rotation
90° different phase pulse command	B phase leads	CCW rot.viewd from motor load shaft: Forward rotation
	Z phase leads	CW rot.viewd from motor load shaft: Reverse rotation

[Tab. 3 − 1] Each command and motor rotating direction

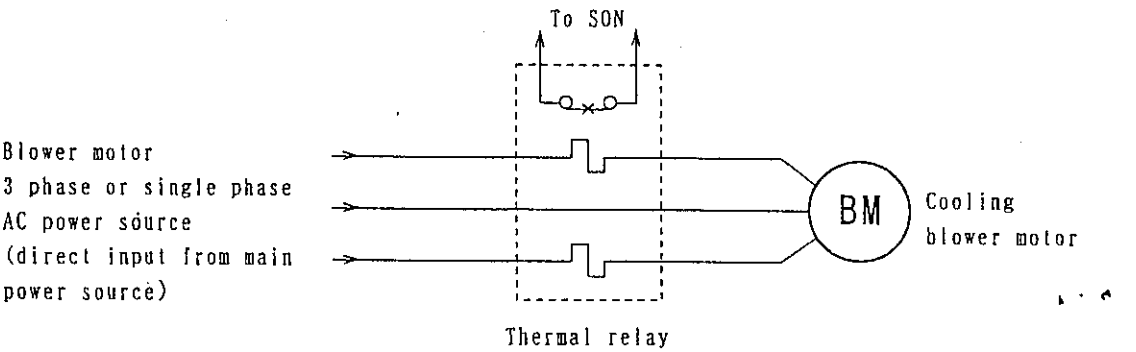
To reverse motor rotation using positive voltage command or forward direction command pulse (pulse train), set 'REVERSE' to the parameter [P300 : Rotating direction select.] . 'FORWARD' is preset at our factory shipment.

※ Motor rotating direction to command input polarity will be effective for all the input command status at the same time of conducting parameter set. Individual rotating direction set for Speed command or Pulse train command input is not possible.

3. Cooling blower motor wiring

(1) A cooling blower motor for a servo motor is assembled on the motor unload shaft. Please provide a thermal relay to the cooling blower motor. The relay is our option. Set the cooling blower motor rated current to a thermal relay. Cooling blower motor rated current can be referred to 「10−3 Electric Specification of Motor Cooling Blower」.

(2) Run a cooling blower motor and confirm that motor rotation and wind flow direction is same as an arrow mark. In case of a 3 phase motor, be careful to make adequate phase sequence wiring, and confirm arrow mark direction is same as the sequence.



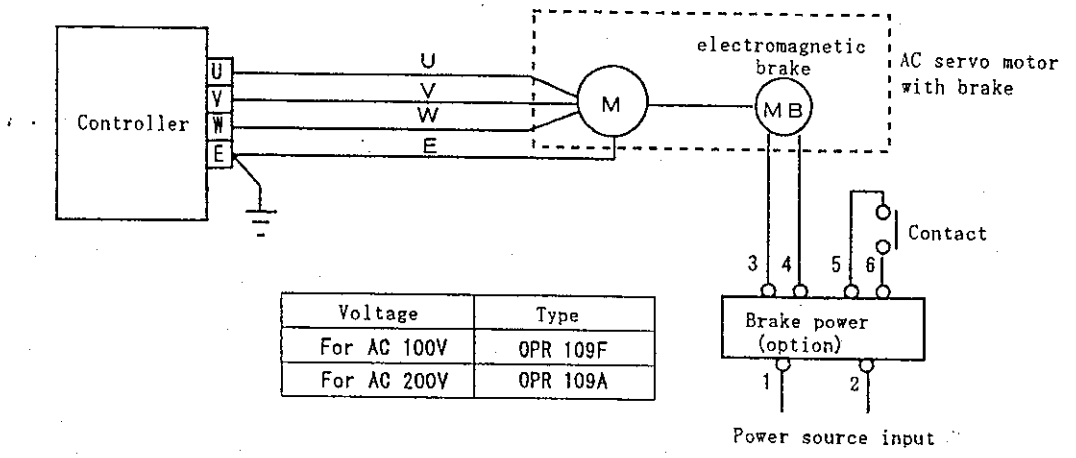
[Figure 3 − 12] Cooling Blower Motor Wiring

⚠ Caution

● Since the controller does not supply power to the blower motor, please provide the power source. Do not mis-connect to U,V,W terminals of the controller.

4. Electromagnetic brake wiring

(1) Our motor brake is for holding purpose at stop status and de-energized type.
(2) The brake action start timing is about 0.4 sec. after voltage is supplied.
(3) [Figure 3 − 1 2] shows connection of optional brake power supply.
(4) Connect the brake terminal P to motor No.3 output terminal and the brake terminal N to motor No.4 output terminal, respectively.
※ Do not short-circuit No.3 and 4 output terminals.
(5) Use contacts having 5 to 6 times capacity of total brake rated capacity for No.5 and 6 output terminals.



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

[Figure 3 − 1 3] Brake Power Source Wiring

⚠ Caution

●Since an electromagnetic brake is released about 0.5 sec. after voltage is added, consider this time lag and turn Start signal (DR) ON.
When an electromagnetic brake worked, be sure to turn Start signal OFF (DR) before releasing the brake.
●Since the brake is only for holding, never apply it whenevr a motor is running .

3 − 2 − 3 Grounding

(1) Be sure to make grounding to prevent electric shock and noise.
(2) Use a larger area cable for grounding than the reference in [Tab. 3 − 2] Applicable Cable and achieve JIS Class 3 or better grounding (grounding resistance 100Ω or less). Connect the cable to a controller ground terminal (E).
(3) Dedicated ground is recommended as much as possible. Also, one point grounding shall be used even if common ground is used.
(4) Be sure to connect a motor ground terminal(E) to the controller ground terminal(E).

⚠ Caution

●To reduce common mode noise and prevent malfunction, provide dedicated ground of Jis Class 3 or better (grounding resistance 100Ω or less).。
●When dedicated ground is not available, split grounding from other units and then use common grounding at final ground point.
●Never try to connect common ground to a large power unit ground, iron structures, etc..

3－2－4 Regenerative resistor wiring

(1) Please use an accessory or optional Regenerative resistor.

(2) Since a regenerative resistor radiates heat, locate the resistor to a place not to affect other units. A regenerative resistor assist to radiate energy, over floated the regenerative condenser capacity generated by large loading inertia (GD^2) at motor braking.

(3) Regenerative resistor is equipped with a thermostat. Since its contact is activated (open) when the resistor is over heated, make wiring to shut the main power OFF at the time.

(Refer to [Figure 3－7] .) Thermostat contact specification is as follows.

Contact V	Contact A
AC200V	1A

The thermostat installation can be referred to [Figure 3－14] .

(4) When plural regenerative resistors are attached, please refer to and comply with 「10－2－1 Regenerative resistor combination」 .

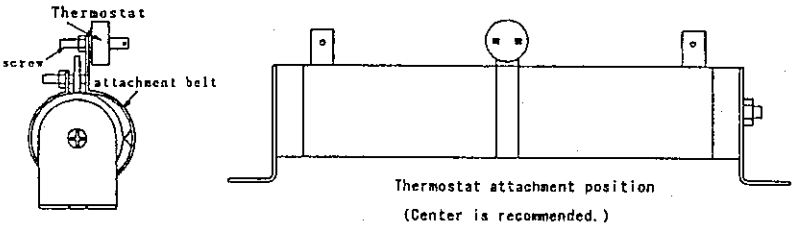
(5) Cable length between a regenerative resistor and a controller shall be 3m or as shorter as possible.
A longer cable generates bigger surging voltage caused by power element switching, which damages the controller.

(6) I case of coil resistance, a thermal relay is attached instead of a thermostat. Since the thermal relay is activated (open) when over current flown in a regenerative resistor, make wiring to shut the main power OFF as the the thermostat.

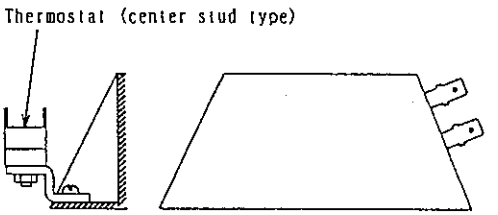
⚠ Caution

●If abnormal high current flows in a regenerative resistor, it becomes quite hot in short time which is dangerous. Be sure to apply main power shut OFF circuit by a thermostat or a thermal relay contact.

Thermostat attachment to an enamel resistor



Thermostat attachment to cement resistor



[Figure 3－14] Thermostat Attachment Position

3－2－5 Control circuit wiring

1. Analog command (Speed, Torque)

(1) Since each analog signal is micro current, use twist-pair shield cable and securely contact one side shield to the shield earth 'FG' terminal of connector CN1. And open the other side shield (for external unit connection).

(2) Cable length shall be 3 m or less.

2. Pulse train input/ output

(1) Since Pulse train inputs and Encoder pulse train outputs are high speed pulse train, use twist-pair shield cable and securely contact shields to the shield earth 'FG' terminal of connector CN1.

(2) Cable length shall be 3 m or less (in case of Open collector output:1.5m or less).

3. Encoder feedback pulse signal

(1) Use twist-pair shield cable and securely contact shields to the shield earth 'FG' terminal of connector CN2.

(2) If a mobile motor is applied, make the cable bending radius as large as possible to avoid excess stress.

(3) Max. allowable cable length is 50 m. Our optional dedicated cable sets can be available. For further information, please contact our sales man.

4. Control input / output signals

(1) For control input / output signals, use micro current relays and switches.

(2) To prevent malfunction caused by noise, be sure to install surge killers, diodes, etc. to relays, magnet switches, solenoids, etc. used around the controller, and reduce noise generation.

(3) Please provide control I/O signal power source+V(+24V, 0.5A).

(4) Cable length shall be 3 m or less.

3－2－6 Noise treatment

External noise invades through 「power line」 and 「signal line」.
By the external noise may cause malfunction and trouble. To avoid noise trouble, it is important to delete noise generation, and block generated noise.
Therefore, be sure to conduct below counter measures and protective measures.

⚠ Caution

- Use specified type and section area cables for I/O signals, and be sure to comply with wiring pre-cautions. Improper cables may cause malfunction due to noise, etc. which is quite dangerous.
- Be sure to separate control I/O signal cables from power lines (power, motor cables, etc.) and never place them in a same duct or bundle.

Installation of surge killer and noise filter

(1) To depress noise generation, install a surge killer (for AC power source) or a diode (for DC power source) on each relay, magnet switch, electro-magnet brake, solenoid, etc. around the controller.

(2) If power line in exceptionally noisy place near noise sources such as welders, electric discharge machines, etc. are operated, as a noise protection of power source, install a noise filter or noise cut transformer in the main power source of the controller.
In case of using a noise filter, be sure to separate input and output cables, and never put them in a same bundle. And avoid to put filter earth cable and filter output in a same bundle and be sure to make wiring (grounding) in the shortest route.

(3) The controller controls a motor by high speed switching. This switching noise may cause adverse affect on other units. In this case insert a noise filter or common mode choke coil to controller main circuit and, and block noise invasion into the power source. Besides put power line and motor line in a metal tube for radiative noise protection.

3－3 Applicable Cable

Please use cables described in [Tab. 3－2].

⚠ Caution

- Cable types and sizes are not common, they are determined by actual conditions and circumference. For further information, please contact our sales man.
- If a longer control cable is used, signals are likely to be affected by noise. Therefore, keep specified length or shorter. Also, be sure to use specified cable types.

Unit : mm²

	Item	Terminal	NPS-FIM/H*-***/NPS-FSM*-***
Control circuit	Analog voltage command Analog monitor (Speed, Torque)	INH, TQH TL+, TL- INHO, MON1, 2	AWG28 or larger twist-pair shield cable length: 2m or less
	Pulse train command	FC/FC*, RC/RC* FC/GND, RC/GND	AWG28 or larger twist-pair shield cable Line driver output : Length 3m or less Open collector output : Length 1.5m or less
	Encoder feedback pulse output	EA/EA*, EB/EB* EM/EM*, GND	AWG28 or larger twist-pair shield cable Length 3m or less (GND 0.5 or more)
	Encoder feedback pulse input	A/A*, B/B* Z/Z* (EP5, GND)	0.2mm² or larger twist-pair shield cable Length 50m or less (Power source 0.5 or more) Use an optional cable.
	Other control inputs/ outputs		AWG28 twist-pair shield cable Length 3m or less (+24V, COM 0.5 or more)

Unit : mm²

	Item	Terminal	NPS-FI M*-401	NPS-FI M*-801	NPS-FI M*-122	NPS-FI M*-242	NPS-FI M*-402	NPS-FI M*-752
Main circuit	AC input power, ground	R, S, T, E	2	2	2	2	3.5	8
	Control AC input power	r, s	------	------	------	------	------	0.75
	Motor	U, V, W	1.25	2	2	2	3.5	14
	Cooling blower motor	u, v, w	------	------	------	0.75	0.75	0.75
	Regenerative resistor	B1, B2	1.25	2	2	2	3.5	3.5

Unit : mm²

	Item	Terminal	NPS-FI M*-113	NPS-FI M*-153	NPS-FI M*-223	NPS-FI M*-303	NPS-FI M*-373
Main circuit	AC input power ground	R, S, T, E	14	22	38	50	60
	Control AC input power	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. 3－2] Applicable Cable(No. 1)

Unit : mm²

	Item	Terminal	NPS-FI H*-113	NPS-FI H*-153	NPS-FI H*-223	NPS-FI H*-303	NPS-FI H*-373	NPS-FI H*-553	NPS-FI H*-753	NPS-FI H*-114
Main circuit	AC input power ground	R,S,T,E	5.5	5.5	14	14	22	50	80	100
	Control AC input power	r,s	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	Motor	U,V,W	8	8	22	22	30	60	100	150
	Cooling blower motor	u,v,w	0.75	0.75	0.75	1.25	1.25	1.25	1.25	1.25
	Regenerative resistor	B1,B2	3.5	3.5	5.5	8	8	14	22	38

[Tab. 3-2] Applicable Cable(No. 2)

Unit : mm²

	Item	Terminal	NPS-FS M*-122	NPS-FS M*-242	NPS-FS M*-402	NPS-FS M*-752	NPS-FS M*-113	NPS-FS M*-153	NPS-FS M*-223
Main circuit	AC input power ground	R,S,T,E	2	2	3.5	8	14	22	30
	Control AC input power	r,s	----	----	----	0.75	0.75	0.75	0.75
	Motor	U,V,W	2	2	3.5	14	14	22	38
	Cooling blower motor	u,v,w	----	-----	-----	-----	-----	-----	-----
	Regenerative resistor	B1,B2	2	2	3.5	3.5	8	8	14

[Tab. 3-2] Applicable Cable(No. 3)

3－4 Input / Output Signals

3－4－1 Input / output signal list

⚠ Caution

●Since COM/COM1(control signal power common) and GND (internal control power common +5V) are isolated, conduct separate wiring and do not place them in a same bundle.

※Please prepare Input / output signal power source +V (+24V, 0.5A).

Signal name	Sym-bol	Termi-nal No.	I／O	Function
Deviation Clear	CLR	CN1-15	I－1	●When this and COM are short-circuited (signal ON) the deviation counter is cleared and a motor stops with Zero speed command status. ●When this is inputted in motor running, the motor stops immediately. ●This signal is effective in Pulse train run mode. ●When this signal inputted, the front panel display [CLR] is it.
Command Pulse Input Inhibit Associated Parameter (P600)	CIH (*)	CN1-13	I－1	●When this and COM are short-circuited (signal ON) Pulse train command becomes invalid and a motor goes into servo lock status. ●When this is inputted in motor running, the motor executes pulses in the deviation counter and stops. ●This signal is effective in Pulse train run mode. ●This signal effective logic can be changed by a parameter. In the case, all the above described conditions of short-circuit/release between COM and are reversed. ●When this signal inputted, the front panel display [CIH] is it.
Start	DR	CN1-3	I－1	●When this and COM are short-circuited (signal ON) any command of Speed, Torque, and Pulse train command can be accepted. ●When this and COM are opened in motor running, each command becomes invalid and the motor stops. (In case of Speed command, the motor stops by the decel. time of a parameter.) ●When this signal inputted, the front panel, display [DR] is it.

*marked signals are negative logic. And (*) marked signal logic can be changed by a parameter .

<table>
<tr><th>Signal name名</th><th>Sym-bol</th><th>Termi-nal No.</th><th>I／O</th><th>Function</th></tr>
<tr><td>Mode Select 1, 2

Associated Parameter (P706)</td><td>MD1

MD2</td><td>CN1-11

CN1-9</td><td>I－1

I－1</td><td>●When this and COM are short-circuited (signal ON), by the combination of MD1 and MD2, Run mode can be selected as below.
<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>
●The shift time to a new mode after switching both modes, can be set in the range of 0～9.99 sec (resolution 10ms) by a parameter.
(initial value : 0.01sec)
However actual mode shifting time is 0.02 sec. longer than this value.
●When this is inputted, front panel display [MD1] and [MD2] are lit respectively.</td></tr>
<tr><td>Local / Remote Select

Associated Parameter (P516) (P517)</td><td>PC</td><td>CN1-7</td><td>I－1</td><td>●When this and COM are short-circuited (signal ON), if this signal is ON, it is Remote mode, if this signal is OFF, it is Local mode.
Current mode can be confirmed in 『Diagnosis Display Mode』.
●This signal can not be controlled by serial communication.
●When this is inputted, front panel display [PC] is lit.</td></tr>
<tr><td>Torque Limit

Associated Parameter (P109) (P110) (P111) (P112)</td><td>TL</td><td>CN1-5</td><td>I－1</td><td>●When this and COM are short-circuited (signal ON), a motor output is limited by the torque limit value2 (+/-) of parameters (P111, P112). When -1 is set, it is limited by External torque limit command voltage (TL+, TL-) value (300% torque ／+10V), and 0～300 is set, torque is limited by the set value.
●When this and COM are opened, only Torque limit value of the parameter (+/-) is effective.
●When this and COM are short-circuited, if Torque limit 1 (+/-)setting of the parameter is lower than (TL+, TL-) or Torque limit 2 setting, it works, preferentially.
●When this is inputted, front panel display [TL] is lit.</td></tr>
</table>

＊marked signals are negative logic. And (＊) marked signal logic can be changed by a parameter .

<table>
<tr><th>Signal name</th><th>Sym-bol</th><th>Termi-nal No.</th><th>I／O</th><th>Function</th></tr>
<tr><td>Speed/ Torque Select

Associated Parameter
P129～P135
P136～P138
(P737)</td><td>SS1

SS2

SS3</td><td>CN1-20

CN1-18

CN1-16</td><td>I－1

I－1

I－1</td><td>※ In Speed control run
●When this and COM are short-circuited (signal ON), each speed command can be selected by the combination of SS1, SS2, and SS3 as below.
<table>
<tr><th>SS3</th><th>SS2</th><th>SS1</th><th>Selected speed command</th></tr>
<tr><td>OFF</td><td>OFF</td><td>OFF</td><td>External speed command</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ON</td><td>Internal speed command 1 (P129)</td></tr>
<tr><td>OFF</td><td>ON</td><td>OFF</td><td>Internal speed command 2 (P130)</td></tr>
<tr><td>OFF</td><td>ON</td><td>ON</td><td>Internal speed command 3 (P131)</td></tr>
<tr><td>ON</td><td>OFF</td><td>OFF</td><td>Internal speed command 4 (P132)</td></tr>
<tr><td>ON</td><td>OFF</td><td>ON</td><td>Internal speed command 5 (P133)</td></tr>
<tr><td>ON</td><td>ON</td><td>OFF</td><td>Internal speed command 6 (P134)</td></tr>
<tr><td>ON</td><td>ON</td><td>ON</td><td>Internal speed command 7 (P135)</td></tr>
</table>
※In Torque control run
●When this and COM are short-circuited (signal ON), each torque command can be selected by the combination of SS1 and SS2 as below.
<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 (P136)</td></tr>
<tr><td>ON</td><td>OFF</td><td>Internal torque command 2 (P137)</td></tr>
<tr><td>ON</td><td>ON</td><td>Internal torque command 3 (P138)</td></tr>
</table>
● This external input signal can be converted to other input signal by a parameter.
● Current command No. (0, 1, 2, 3, 4, 5, 6, 7) , Speed command data and torque command data can be confirmed by 『Diagnosis Display Mode』 .</td></tr>
<tr><td>Reverse Over Travel

Associated Parameter
(P705)</td><td>ROT*</td><td>CN1-4</td><td>I－1</td><td>※This is reverse travel limit (stroke end) signal.
●When this and COM are opened (signal ON), the controller judges that a motor reached travel limit point and the motor stops suddenly and becomes servo lock status. In Speed control run, the motor stops with zero speed command status. In Torque control run, the motor is in torque free status.
●When this and COM are opened, only forward direction run can be conducted.
●When this and COM are short-circuited, the control judges travel is in the normal range and can perform, properly.
●This signal is effective in all modes.
●This signal can be selected 「Enable／ Disable」 logic by a parameter.
●When this and COM are opened, front panel display [ROT] is lit.</td></tr>
</table>

*marked signals are negative logic. And (*) marked signal logic can be changed by a parameter .

Signal name	Sym-bol	Termi-nal No.	I／O	Function
Forward Over travel Associated Parameter (P705)	FOT*	CN1-2	I - 1	※This is reverse travel limit (stroke ends) signal. ●When this and COM are opened (signal ON), the controller judges that a motor reached travel limit point and the motor stops suddenly and becomes in servo lock. In Speed control run, the motor stops with zero speed command status. In Torque control run, the motor is in torque free. ●When this and COM are opened, only reverse direction run can be conducted. ●When this and COM are short-circuited, the control judges travel is in the normal range and can perform, properly. ●This signal is effective in all modes. ●This signal can be selected 「Enable／ Disable」 logic by a parameter.。 ●When this and COM are opened, front panel display [FOT] is lit.
Speed Override Associated Parameter (P129～P135) (P739)	OR1 OR2 OR3 OR4	CN1-55 CN1-53 CN1-51 CN1-49	I - 1 I - 1 I - 1 I - 1	●This signal is effective when an internal speed command 1～7 is selected specially by Speed/Torque select signal (SS1～SS3). ●This signal can set 10%～150% by 10% rate and 15 steps (10% resolution). ●OR4～OR1 are handled as binary data (4bits) and corresponding to bit 3～0 respectively. ●When all of OR4～OR1 are opened between COM terminal, Override is invalid (100%). ●When this and COM are short-circuited, this signal is ON. And override data are read as 4 bit data, and motion speed changes in real time. ●Motion speed can be get by next formula. Motion speed = Internal speed command×Override ratio. However if speed after override is more than 120% of motor rated speed, it is clamped at 120% of the rated speed. ●This signal can be converted to other input signal by a parameter. ●In [Diagnosis display mode] ,currently selected override ratio (10～150%) is displayed.

*marked signals are negative logic. And (*) marked signal logic can be changed by a parameter.

Signal name	Sym-bol	Termi-nal No.	I／O	Function
Reset Associated Parameter (P742)	RST	CN1-1	I - 1	●When this and COM are short-circuited (signal ON) the detecting alarm is released and the alarm output signal is turned OFF. ●During this signal inputted, a motor is in torque free, and Break release signal (BRK) and Servo ready signal (RDY) are not outputted. When this signal is turned OFF, again, above signals are outputted and the control returns to normal control condition . ●This signal is effective in all modes. ●This signal can be activated by a 20 msec. or longer pulse signal. ●This signal can be also used as a release signal of emergency stop. ●Alarm reset can be conducted also by re-inputting power to the controller. ●This signal can be converted to Power reset signal by a parameter. ●When this is inputted, front panel display [RST] is lit. [Caution] Alarm reset shall be made after removing the cause.
Emergency Stop Associated Parameter (P710) (P711) (P712)	EMG*	CN1-37	I - 1	●When this and COM are opened (signal ON), a motor stops in accordance with the method and decel. time specified by parameters. At the time, Servo ready signal (RDY) is OFF. ●After a motor stops, and a parameter set time passes, the motor becomes in torque free and Brake signal (BRK) is OFF. ●To release Emergency stop, short-circuit this signal and COM and input Reset signal (RST). ●When this and COM are short-circuited, normal operation can be made. ●This signal is effective in all modes. ●This signal can be activated by a 20 msec. or longer pulse signal. ●When this and COM are opened, front panel display [EMG] is lit and when Emergency stop is released, the display is lit OFF.
Servo ON Associated Parameter (P704)	SON (*)	CN1-35	I - 1	●When this and COM are short-circuited (signal ON), power transistors are driven and power is supplied to a motor. ●When this and COM are opened, the motor becomes in torque free. ●When this and COM are opened in motor running, the motor conducts free run stop. ●When this and COM are opened, Brake release signal (BRK) and Servo ready signal (RDY) are not outputted. ●This signal is effective in all modes. ●This signal effective logic can be changed by a parameter. In the case, all the above described conditions of short-circuit/release between COM and are reversed. ●When this signal is inputted by effective logic, front panel display [SON] is lit.

*marked signals are negative logic. And (*) marked signal logic can be changed by a parameter .

Signal name	Sym-bol	Termi-nal No.	I／O	Function
Speed Command Associated Parameter (P124) (P125) (P127) (P128) (P143) (P211) (P214) (P300)	INH	CN1-34	I - 5 Analog	●When an external speed command is effective in Speed control run, a motor runs at speed proportional to the speed command Voltage. ●At DC±10V input, a motor runs at rated speed. ●By a parater, speed command voltage ±6～100V can be set to rated speed. However, input voltage range is Max. ±10V. ●Based on GND terminal, by positive voltage input, a motor runs forward and by negative voltage input it runs reverse direction. ●Motor accel./decel. time can be set respectively by parameters. ●In Torque control run, this signal functions as an external speed limit.
Torque Command Associated Parameter (P126) (P300)	TQH	CN1-33	I - 6 Analog	●When an external torque command is effective in Torque control run, a motor outputs torque proportional to the command voltage. ●At DC±10V input, the motor outputs 300% torque. ●Based on GND terminal by positive voltage input, a motor generates forward drive torque and by negative voltage input it generates reverse drive torque. ●Speed limit is made by external command INH.
Torque Limit Command +, — Associated Parameter (P111) (P112)	TL+ TL-	CN1-30 CN1-29	I - 7 I - 7 Analog	●When Torque limit (TL) is inputted in Speed/ Torque control run, a motor output is limited to lower value of torque limit command or parameter torque limit. ●Forward drive torque is limited by TL+ command. ●Reverse drive torque is limited by TL- command. ●Based on GND terminal, positive voltage is inputted to both of TL+, TL-. Input range is DC 0～+10V. And at DC+10V input, limit value of any case is 300% torque.

*marked signals are negative logic. And (*) marked signal logic can be changed by a parameter .

Signal name	Sym-bol	Termi-nal No.	I／O	Function
Speed Gain Selection Associated Parameter P105～P108 P101～P104 P116～P119 (P737) (P739)	GSEL	― ― ―	I - 1	●When this and COM terminals are short-circuited (signal ON), control is conducted with speed loop gain setting, P116 ～ 119. ●When this and COM terminals are opened (signal OFF), control is conducted with speed loop gain setting, P101 ～ 104 or P105 ～ P108. (In this manual, since OFF status of this signal is described, unless (GSEL signal ON) is mentioned, please read as OFF status.) ●This signal can be converted to an external input signal. ●This signal is effective in all modes. ●When this signal is inputted, a signal allocated to (SSIN) or (ORIN) of [Diagnosis display mode] becomes "1".
Forced brake ON Associated Parameter (P737) (P739)	BRON	― ― ―	I - 1	●When this and COM terminals are short-circuited (signal ON), brake release signal (BRK) is forced to be brake status. (In this manual, OFF status of this signal is described.) ●This signal can be converted to an external input signal. ●This signal is effective in all modes. ●When this signal is inputted, a signal allocated to (SSIN) or (ORIN) of [Diagnosis display mode] becomes "1".

*marked signals are negative logic. And (*) marked signal logic can be changed by a parameter .

<table>
<tr><th>Signal name</th><th>Sym-bol</th><th>Termi-nal No.</th><th>I／O</th><th>Function</th></tr>
<tr><td>Pulse
Train
Command

Associated
Parameter
(P300)
(P601)
(P602)</td><td>FC
FC*

RC
RC*</td><td>CN1-59
CN1-57

CN1-65
CN1-63</td><td>I − 3

I − 3</td><td>●Input directional or 90° different phase Pulse train command. Both can applied to Line driver method and Open collector method.
●In case of Line driver method, connect line driver output between FC−FC* and RC−RC*.
●In case of Open collector method, connect +V (external power source for Open collector circuit) to FC and RC, and individual Open collector output 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 when 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 it is inputted to RC-RC* or RC*, the motor runs reverse.
●In case of directional + Pulse train command, input a directional signal to RC-RC* or RC* and input a feed pulse to FC-FC* or FC*.
Logic of directional signals is as below.
<table>
<tr><th>Connecting method and signal name</th><th>Forward command</th><th>Reverse command</th></tr>
<tr><td>Line driver RC-RC*</td><td>"L"-"H"</td><td>"H"-"L"</td></tr>
<tr><td>Open collector RC*</td><td>0V open</td><td>0V short-circuit</td></tr>
</table>
●By the parameter「Pulse train command phase sequence selection」, a motor can run reverse by a forward Pulse train command.
●Pulse train command max. input frequency is as below.
Line driver method
・ 90° different phase pulse : 250kpps (4 times 1Mpps)
・ Directional pulse : 250kpps
Open collector method : 200kpps
●The pulse width shall be 2μs or more.</td></tr>
<tr><td>Encoder
Feedback
Pulse

Associated
Parameter
(P001)
(P002)</td><td>A, A*
B, B*
Z, Z*</td><td>CN2</td><td>I − 4</td><td>●Feedback pulse signal input from an encoder on a motor.
●Inputs of two 90° different phase pulse (A phase, B phase) of Line driver output (26LS31 or equivalent) and marker signals (Z phase).</td></tr>
</table>

*marked signals are negative logic. And (*) marked signal logic can be changed by a parameter .

Signal name	Sym-bol	Termi-nal No.	I/O	Function
Alarm Associated Parameter (P115) (P715)	ALM (*)	CN1-44	O — 1	●When an alarm occurs, a motor stops suddenly, or conduct torque free stop. (Depends on the alarm) ●When an alarm occurs, this signal is ON (This and COM1 terminals are opened.) and simultaneously Servo ready signal (RDY) is OFF. In case that a motor is in torque free, Brake release signal (BRK) is OFF. ●At normal condition, this signal is OFF. (This and COM1 terminals are short-circuited.) ●An alarm is reset by Reset signal (RST) input or power re-input and at the time when Reset signal is inputted, this signal is OFF. ●This signal is an open collector output isolated to the internal power source. ●When this signal outputted, the front panel display [ALM] is lit, and alarm contents are shown in the display module.
Servo Ready Associated Parameter (P716)	RDY	CN1-42	O — 1	●When the motor control is ready to function, this signal is ON. (This and COM1 terminals are closed.) ●When an alarm occurs, Servo ON signal (SON) is OFF and a motor is in torque free, this signal is OFF. (This and COM1 terminals are opened.) ●When an alarm occurs, If the alarm is reset by Reset signal (RST) input or power re-input, this signal recovers. ●During Reset signal (RST) is inputted, this signal is OFF and at the time when Reset signal (RST) is OFF again, this signal is ON. ●When power is inputted, due to reset time of the control internal power source, this signal output will be delayed max. 5.0 seconds. And the delay time at Servo ON signal (SON) input is max. 20msec and at Reset signal (RST) input it is max. 1.0sec.. ●The external power on and trouble treatment sequence shall be considered above described timing. ●This signal is an open collector output isolated to the internal power source. ●When this signal is outputted, the front panel display [RDY] is lit.

*marked signals are negative logic. And (*) marked signal logic can be changed by a parameter .

Signal name	Sym-bol	Termi-nal No.	I/O	Function
Warning Associated Parameter (P715)	WNG (*)	CN1-46	O－2	●If it is supposed to detect an error and stop a motor when current control is continued, this signal is ON as a warning signal. (This and COM1 terminals are closed.) ●When this signal is outputted, running status does not change. ●When it is confirmed that the abnormal cause will not occur, this signal is OFF. (This and COM1 terminals are opened.) ●This signal is outputted by the following warnings. ① Over load warning ② Deviation abnormal warning ③ Main power low voltage warning Contents can be referred to Tab. 9－3「Warning list」. ●This signal is an open collector output isolated to the internal power source. ●When this signal is outputted, the front panel display [WNG] is lit, and alarm contents are shown in the display module.
In Speed/ Torque Limit Associated Parameter (P127) (P128)	LIM	CN1-48	O－2	●In Torque control run, when motor speed goes into the limit range, this signal is ON (This and COM1 terminals are closed.) and when out of the range, this signal is OFF (This and COM1 terminals are opened.). ●In any Run mode other than Torque control run, when motor torque goes into the limit range, this signal is ON. (This and COM1 terminals are closed.) and when out of the range, this signal is OFF. (This and COM1 terminals are opened.) ●This signal is an open collector output isolated to the internal power source. ●When this signal is outputted, the front panel display [LIM] is lit.
Speed Zero Associated Parameter (P702)	SZ	CN1-50	O－2	●In all modes, when motor speed is lower than the parameter (P702)「Speed zero range」, this signal is ON. (This and COM1 terminals are closed.) and when out of the range, this signal is OFF. (This and COM1 terminals are opened.) ●This signal is an open collector output isolated to the internal power source. ●When this signal is outputted, the front panel display [SZ] is lit.

*marked signals are negative logic. And (*) marked signal logic can be changed by a parameter .

Signal name	Sym-bol	Termi-nal No.	I/O	Function
Position-ing Complete Associated Parameter (P202)	PN	CN1-52	O－2	●In Pulse train run, when deviation counter is in the parameter (P202) 「Positioning complete range」, this signal is ON. (This and COM1 terminals are closed.) ●In Pulse train run, during deviation counter value is satisfying above conditions, this signal is ON. ●This signal is also OFF at any condition of Emergency stop, Servo OFF, and Reset signal input. ●This signal is an open collector output isolated to the internal power source. ●When this signal is outputted, the front panel display [PN] is lit.
Brake Release Associated Parameter (P734)	BRK	CN1-54	O－2	●Design an external sequence to release a motor brake when this signal is ON. (This and COM1 terminals are closed.) ●This signal is OFF in motor torque free condition, when Alarm, Emergency stop, or Servo occurs and when Reset signal is inputted. (This and COM1 terminals are opened.) ●This signal is compulsory OFF by Forced brake ON signal (BRON). ●Time when this signal is OFF after a motor becomes torque free can be set by a parameter. ●This signal is an open collector output isolated to the internal power source. ●When this signal is outputted, the front panel display [BRK] is lit.
Encoder Pulse Output Associated Parameter (P004)	EA EA* EB EB* EM EM*	CN1-17 CN1-19 CN1-21 CN1-23 CN1-22 CN1-24	O－3	●Encoder feedback pulse input (CN2) is divided to 1/N (N=1～32) by the parameter (P004) 「Encoder pulse output deviation ratio」 set, and outputted. ●Regardless to the division value set, Marker signal is outputted 1 pulse per encoder revolution. (Also, pulse width is retained.) ●Outputs are two 90° different phase signals of Line driver output (26LS31 or equivalent) and Marker signal. Be sure to interface with Line receiver. (26LS32 or equivalent)

*marked signals are negative logic. And (*) marked signal logic can be changed by a parameter.

Signal name	Sym-bol	Termi-nal No.	I/O	Function
Monitor Associated Parameter (P700) (P701)	INHO MON1 MON2 GND	P1- 3 P1- 2 P1- 1 P1- 4	O－4	●Analog monitor outputs to confirm the controller and a motor running status. ●INHO terminal outputs Speed command voltage (INH). MON1 and MON2 terminals can be allocated to monitor outputs by parameters (P700, P701) 「Monitor 1, 2 selection」 as below. ①Speed command, ②Speed feedback, ③Torque command, ④External＋Torque limit, ⑤External－Torque limit, ⑥Position deviation 1 (Range : ±255 pulses) ⑦Position deviation 2 (Range : ±4080 pulses) ⑧NC speed output ●Monitor voltage can be referred to 6-2-2 「Analog monitor」. ●Output impedance is 1KΩ.
Serial Communi-cation Associated Parameter (P500～599)		J 1	I O-1	●By connecting an external unit or option unit, Sserial communication (RS-422A can be conducted. ●Communication condition can be selected by a parameter.
Pulse Train Communi-cation Associated Parameter (P602) (P608)		J 1	I O-1	●This is connected to NCS-FI/FS or other NPS-FI/FS and transmits / receives pulse train 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 received Pulse train data.

＊marked signals are negative logic. And (＊) marked signal logic can be changed by a parameter .

3－4－2　Input / Output Interface

Input / Output signal type and equivalent circuit is listed as below. Input / Output signal type can be referred to I/O terminal and circuit column of 3-4-1 「Input/output signal list」.

Circuit No. I－1

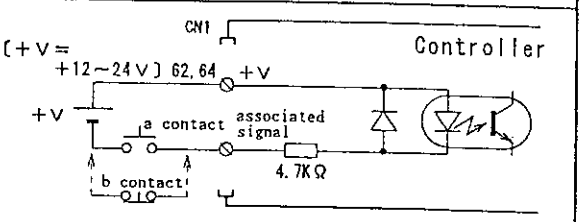
Associated signal

PC
EMG＊
FOT＊
ROT＊
SON,(＊)
RST, CLR
DR
TL
SS1～SS3
OR1～OR4
MD1, MD2
CIH (＊)

Electric specification

Isolation type	Photo coupler
Voltage range	DC10.2～26.4V
Ripple rate	5 % or less
Rated input current (/ 1point)	2.5mA／DC12V 5.0mA／DC24V
Input resistance	About 4.7kΩ
Input filter time constant	About 1.5 ms

Circuit



Use micro current open/close relay or open collector transistor for contact.
Signals without "＊" mark at the right end are positive logic.
When a contact is closed, it is defined ON and opened, defined OFF.
Signals with "＊" mark at the right end are negative logic.
When a contact is opened, it is defined ON and closed, defined OFF
Signals with " (＊) " mark at the right end can be changed those signal logic by parameters.

Circuit No. I－3

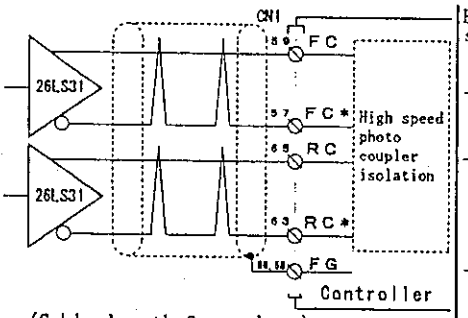
Associated signal

FC, FC＊
RC, RC＊

Elec. Spec.

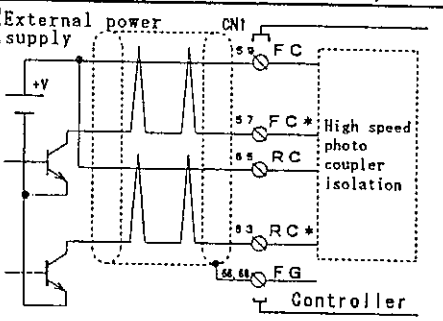
Isolation method	Photo coupler isolation	
Min. in. pulse width	1 μs	
Input method	Line driver method	Open collector method
Max. inp. frequency	250kpps	200kpps
	26LS31 or equivalent	－－－－－－－
Line driver tarnsi-stor saturation V	－－－－－ －－－－－	0.9 V or less
Voltage range		DC4.75～26.4V
Rated inp. current		About 10mA／1point

Circuit



(Cable length 3m or less)

[Line driver method]

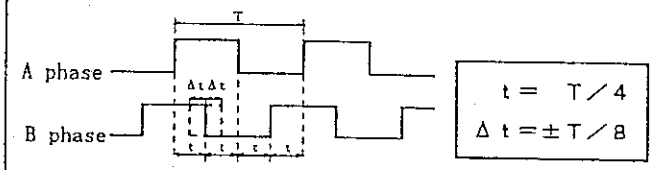


(Cable length 1.5m or less)

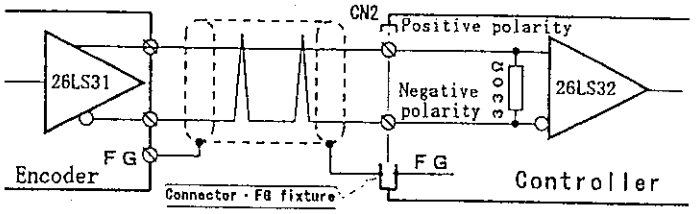
[Open collector method]

※In some case, it is better to connect Pulse train command output side and controller GND.

Circuit No.	Spec.	When a motor runs forward, B phase leads A phase.
I－4		
Associ. signal		
Encoder Feedback Pulse I put A, A＊ B, B＊ Z, Z＊ . . .		



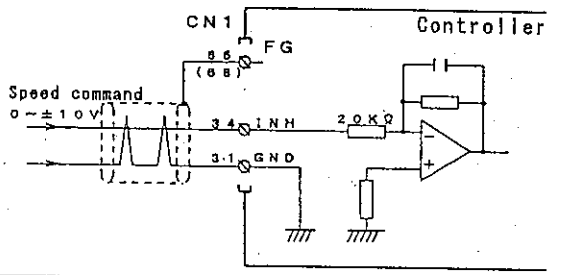
Circuit



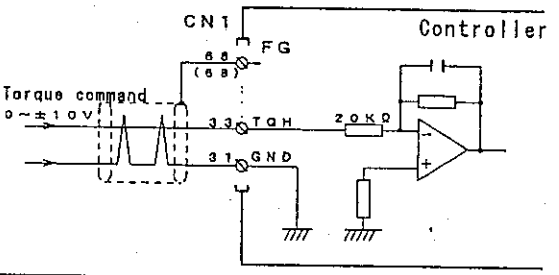
	+ Sigl	− Sigl
A phs	A	A＊
B pha	B	B＊
Z phs	Z	Z＊

Encoder feedback pulse shall be Line driver output (26LS31 or equivalent).

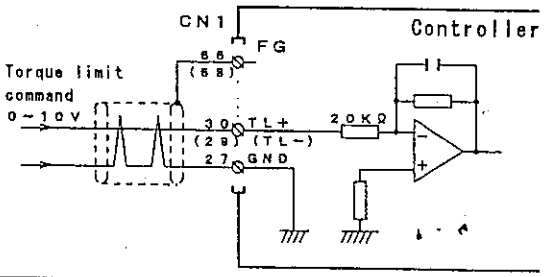
Circuit No.	Electric specification		Circuit
I－5	Voltage range	DC −10～10V	
Associ. signal	Use twist-pair shield cable and be sure to connect it to shield connection terminal (FG).		
INH			



Circuit No.	Electric specification		Circuit
I－6	Voltage range	DC −10～10V	
Associ. signal	Use twist-pair shield cable and be sure to connect it to shield connection terminal (FG).		
TQH			



Circuit No.	Electric specification		Circuit
I－7	Voltage range	DC 0～10V	
Associ. signal	Use twist-pair shield cable and be sure to connect it to shield connection terminal (FG).		
TL＋ TL－			



Circuit No. O－1

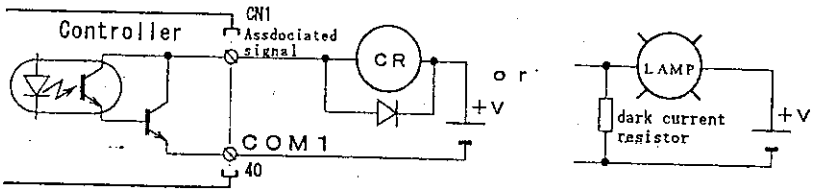
Associated signal

RDY
ALM (*)

Electric specification	
Isolat. method	Photo coupler
Max. load V	DC30V
Max. load I	50mA/1 point
Leakage curre.	0.1mA or less
Saturation voltage	1.0V or less

Signals without "*" mark at the right end are positive logic. It is ON when this and COM1 terminals are closed. Signals with " (*) " mark at the right end can be changed those signal logic by parameters. COM1 terminal is isolated to circuit No. O-2, COM terminal.

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 applying a lamp load, insert a dark current resistor to keep the current (including inrush current) lower than rated current.

Circuit No. O－2

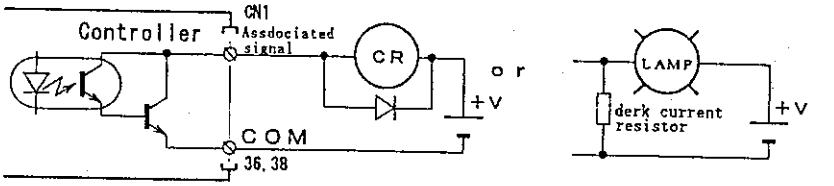
Associated signal

WNG (*)
SZ
PN
LIM
BRK

Electric specification	
Isolat. method	Photo coupler
Max. load V	DC30V
Max. Load I	50mA / 1point
Leakage curre.	0.1mA or less
Saturation voltage	1.0V or less

Signals without "*" mark at the right end and COM1 terminals are closed. Signals with " (*) " mark at the right end can be changed those signal logic by parameters. COM1 terminal is isolated to circuit No. O-1, COM terminal.

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 applying a lamp load, insert a dark current resistor to keep the current (including inrush current) lower than rated current.

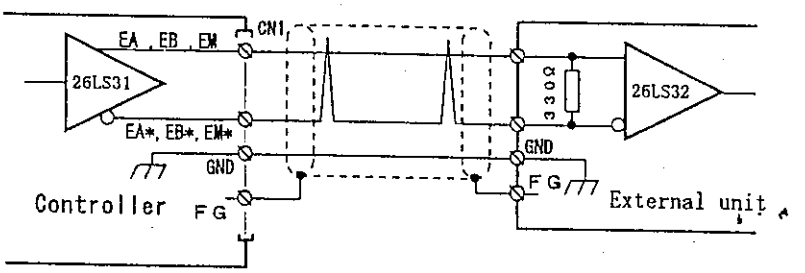
Circuit No. O－3

Associ. signal

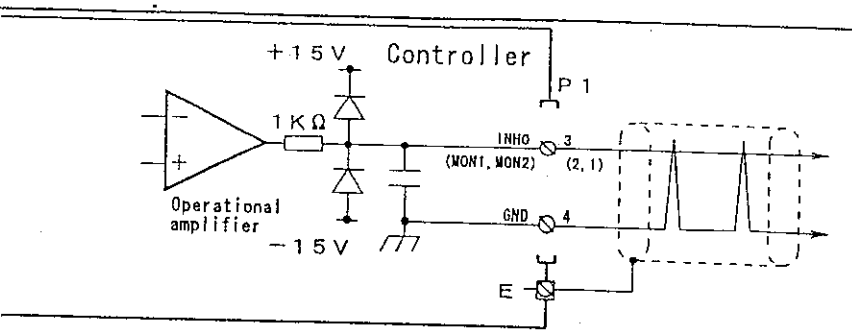
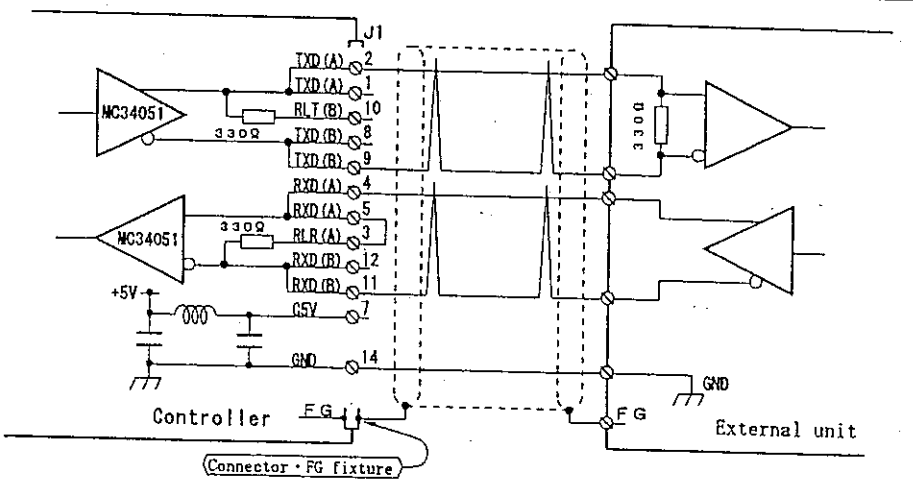
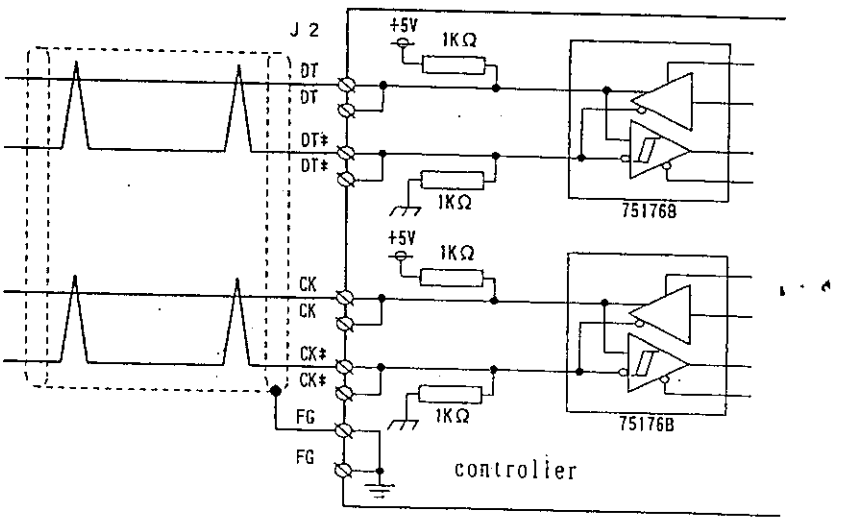
Encoder Pulse Output

EA
EA*
EB
EB*
EM
EM*

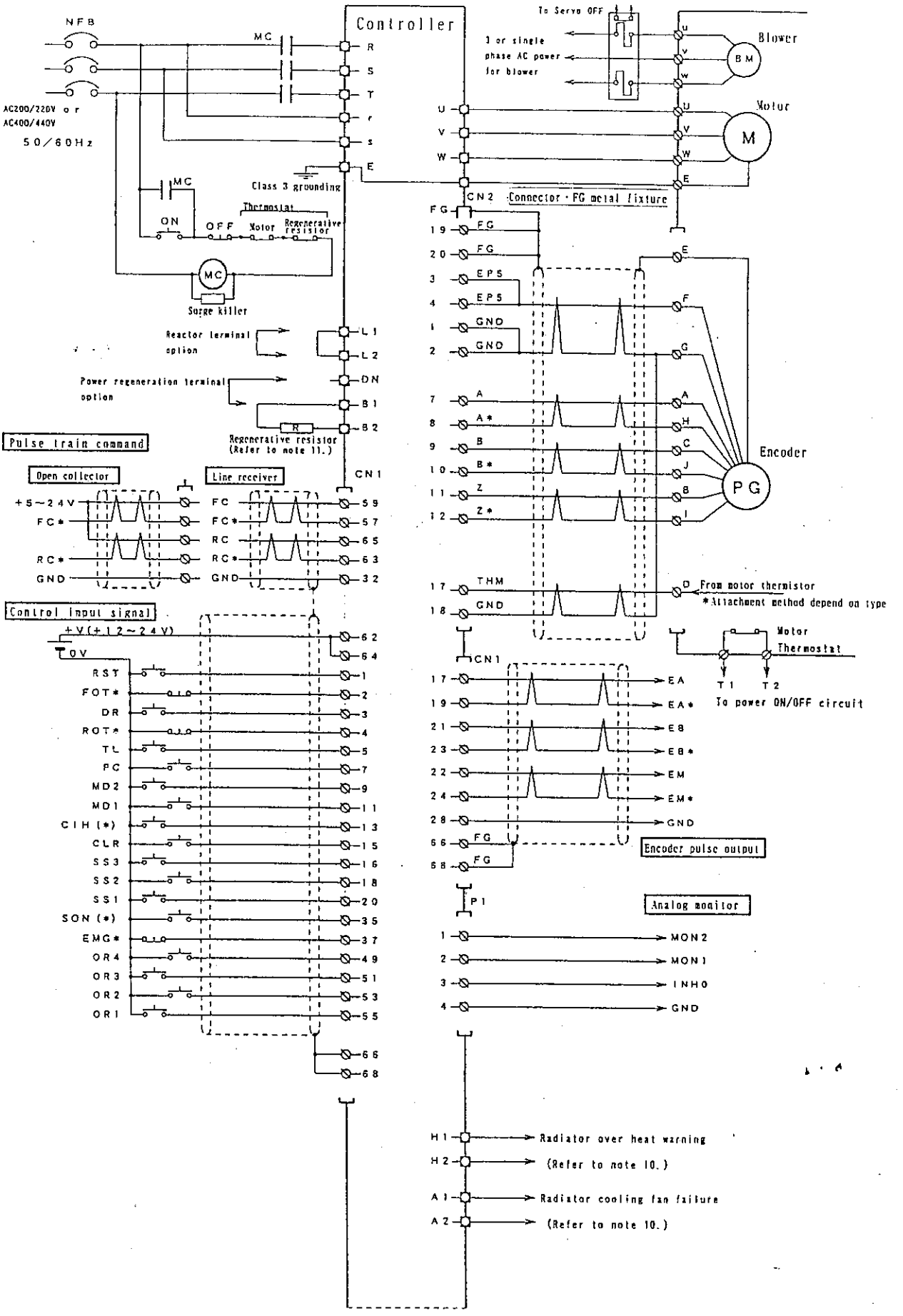
Circuit



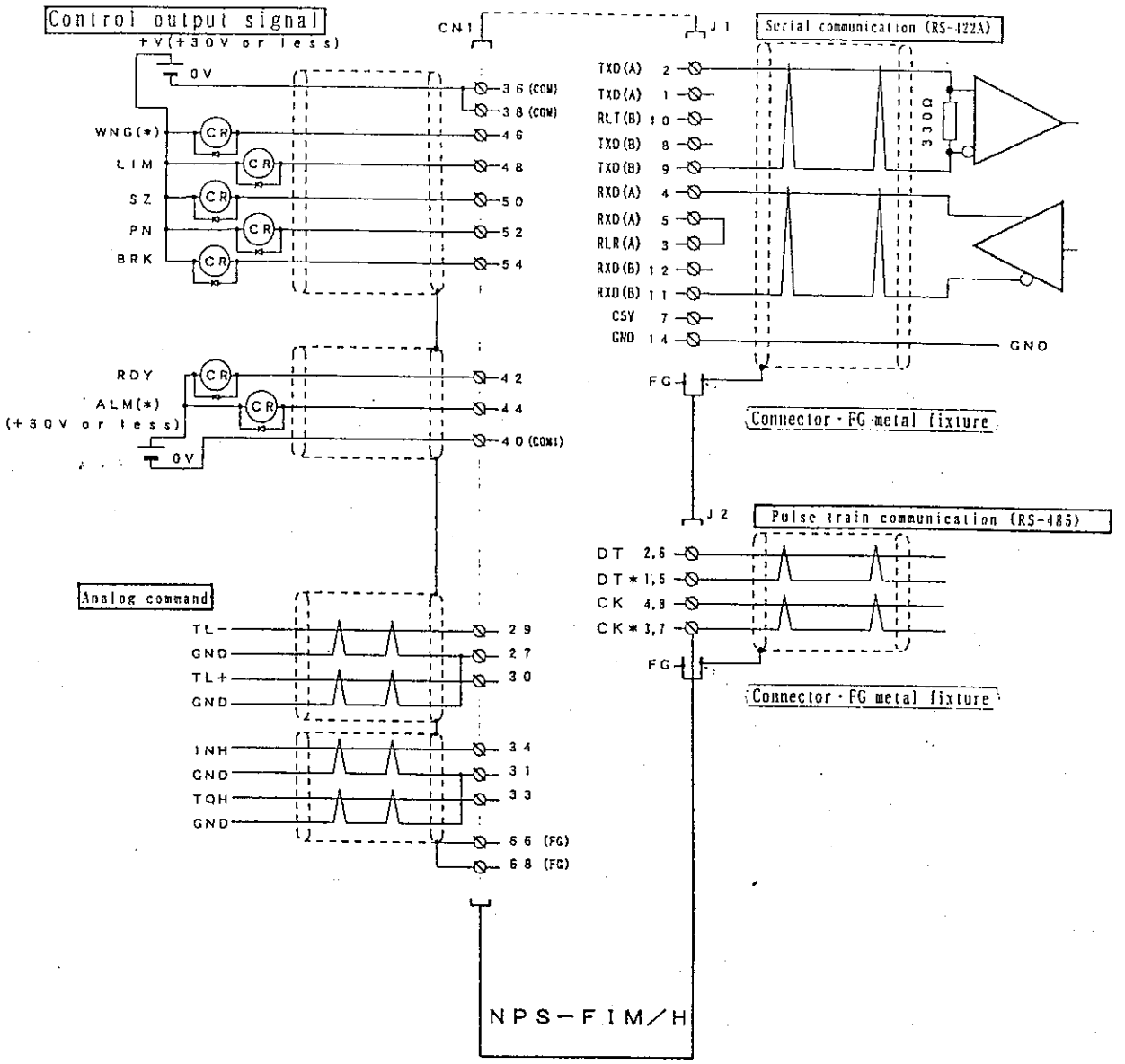
Since Line driver is used for output (26LS31 or equivalent), please interface with Line receiver (26LS32 or equivalent).
Apply 330Ω (1/2W or more) terminating resistor to Receiver side.
When a motor runs CCW, B phase is outputted ahead of A phase.
Phase relation between A phase and B phase is always same as motor running direction and is not affected by direction set parameter.
For Max. 2 seconds, output is unstable after power is turned ON.

Circuit No.	Circuit
O－4 Associ. signal Analog Monitor (INH0 MON1 MON2)	
In case of using a longer cable than 1 m, please use twist-pair shield cable and connect the shield to the controller ground terminal (E).	
Circuit No. IO－1 Associ. signal Serial communication (TXD(A) TXD(B) RXD(A) RXD(B) RLR(A))	
Communication method is RS－422A. A terminating resistor shall be connected between RLR (A) and RXD (A) terminals to the end controller internally. And also, please connect terminating resistors to external units.	
Circuit No. IO－2 Associ. signal Pulse train communication (DT DT* CK CK*)	
Communication method is RS-485. A terminal resistor shall be connected to the communication end controller.	

3－5 External Connecting Diagram



[Fig.3-14a] NPS-FIM/H*-*** External Connecting Diagram



Note 1. : Please provide specified voltage and current for the control input signal power source.

Note 2. : COM of CN1 connector is common to the control output signals (except Servo ready, Alarm, and Encoder marker). COM of CN2 connector is common to Servo ready, and Alarm. GND is common to control power source (+5V) in the controller. COM of CN1 is isolated to COM1.

Note 3. : Since [COM of CN1, COM1] are isolated to GND, please do not put them in common cables and bundles.

Note 4. : <Serial communication> Please connect the internal terminating resistor to end controller as above described. (Connection between 3pin and 5pin of connector J1 is for using the terminating resistor.)

Note 5. : Dedicated encoder cables can be optionally available.

Note 6. : Status of a switch connected with a control input signal indicates OFF condition of each input signal. However, signals with "(*)" mark at the right end can be changed those signal logic by parameters.

Note 7. : Motor and encoder connection can be referred to individual motor manual.

Note 8. : Pins without description in this diagram are NC.

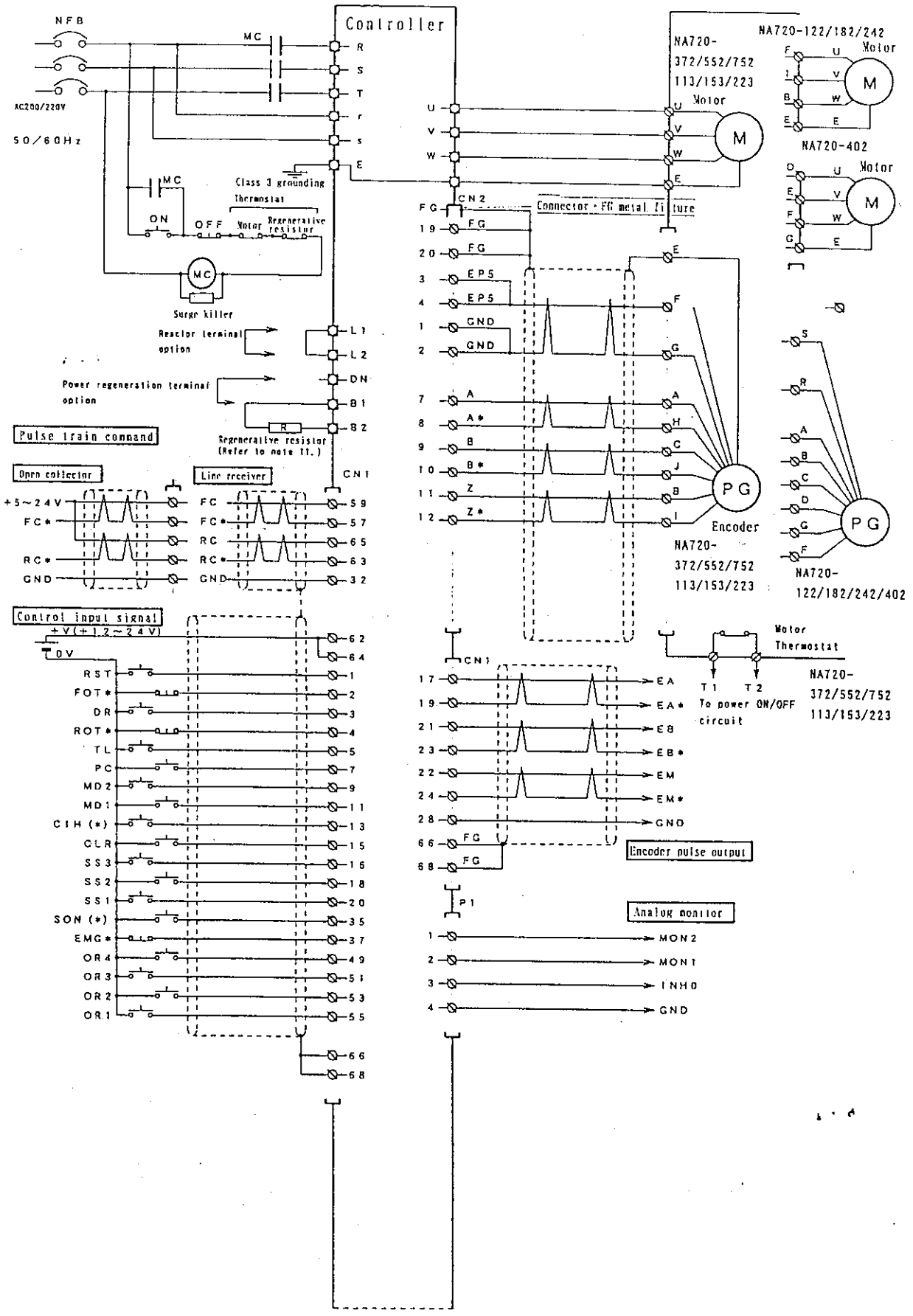
Note 9. : Connect all shields of CN1 connector to 66 and 68 pins (FG), altogether.

Note 10. : terminal blocks H1, H2 and A1, A2 are only for large capacity motors (NPS-FIH*-553 or larger) For further information, please refer to CHAPTER 9 「PROTECTIVE FUNCTION」.

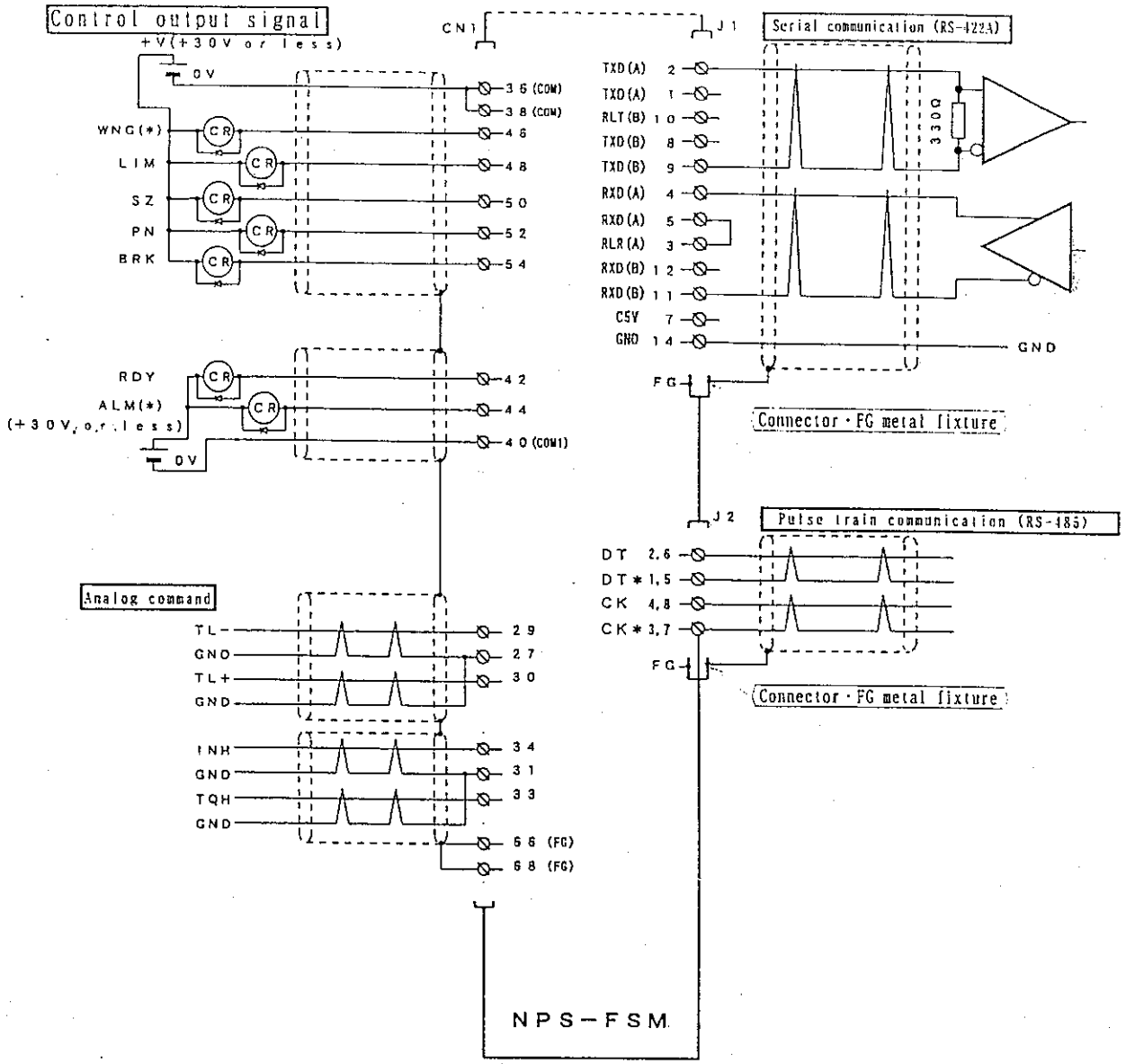
Note 11. : NPS-FIM*401 and 402 are not equipped with terminal boxes r, s, L1, L2, and DN.

Note 12. : Motor types NA series and NA100-20F, 40F, 75F are not equipped with a blower.

[Fig. 3-14b] NPS-FIM/H*-*** External Connecting Diagram



[Fig.3-15a] NPS-FSM*-*** External Connecting Diagram



Note 1. : Please provide specified voltage and current for the control input signal power source.

Note 2. : COM of CN1 connector is common to the control output signals (except Servo ready, Alarm, and Encoder marker). COM of CN2 connector is common to Servo ready, and Alarm. GND is common to control power source (+5V) in the controller. COM of CN1 is isolated to COM1.

Note 3. : Since [COM of CN1, COM1] are isolated to GND, please do not put them in common cables and bundles.

Note 4. : <Serial communication> Please connect the internal terminating resistor to end controller as above described. (Connection between 3pin and 5pin of connector J1 is for using the terminating resistor.)

Note 5. : Dedicated encoder cables can be optionally available.

Note 6. : Status of a switch connected with a control input signal indicates OFF condition of each input signal. However, signals with "(*)" mark at the right end can be changed those signal logic by parameters.

Note 7. : Motor and encoder connection can be referred to individual motor manual.

Note 8. : Pins without description in this diagram are NC.

Note 9. : Connect all shields of CN1 connector to 66 and 68 pins (FG), altogether.

Note 10. : NPS-F1M*122~402 are not equipped with terminal boxes r, s, L1, L2, and DN.

[Fig. 3-15b] NPS-FSM*-*** External Connecting Diagram

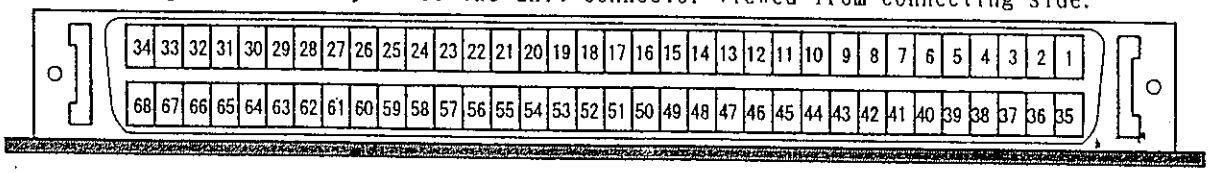
3 – 6 Connector Pin Location, Signal Name

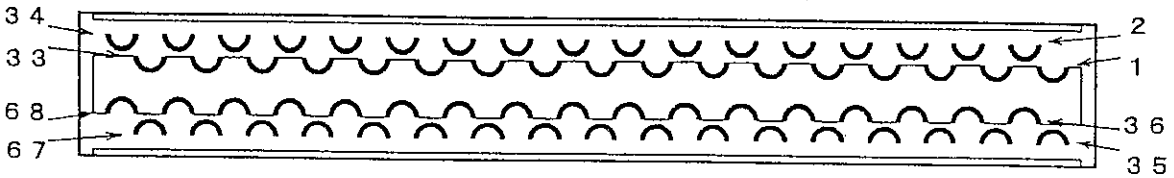
3 – 6 – 1 Control Input / Output Connector (CN1)

No.	Symbol	Signal name	No.	Symbol	Signal name
1	RST	Reset	35	SON (*)	Servo ON
2	FOT*	Forward over travel	36	COM	Output signal common
3	DR	Start	37	EMG*	Emergency stop
4	ROT*	Reves over travel	38	COM	Output signal common
5	TL	Torque limit	39	PST	Not used (reserved)
6	PS8	Not used (reserved)	40	COM1	Out. sgnl cmmn1(ALM, RDY)
7	PC	Remote / Local	41	HLD	Not used (reserved)
8	PS7	Not used (reserved)	42	RDY	Servo ready output
9	MD2	Mode select 2	43	ZLS	Not used (reserved)
10	PS6	Not used (reserved)	44	ALM (*)	Alarm output
11	MD1	Mode select 1	45	NC	Not used (reserved)
12	PS5	Not used (reserved)	46	WNG (*)	Warning output
13	CIH (*)	Cmmnd pulse inp. inhibit	47	TRG	Not used (reserved)
14	PS4	Not used (reserved)	48	LIM	In Spd/trq limit output
15	CLR	Deviation clear	49	OR4	Speed override 4
16	SS3	Speed select 3	50	SZ	Speed zero output
17	EA	Encdr pls A phs out. (+)	51	OR3	Speed override 3
18	SS2	Speed select 2	52	PN	Positioning complete out.
19	EA*	Encdr pls A phs out. (-)	53	OR2	Speed override 2
20	SS1	Speed select 1	54	BRK	Brake release output
21	EB	Encdr pls B phs out. (+)	55	OR1	Speed override 1
22	EM	Encdr marker output (+)	56	PRF	Not used (reserved)
23	EB*	Encdr pls B phs out. (-)	57	FC*	Forward pls trn cmmnd (-)
24	EM*	Encdr marker output (-)	58	NC	Not used (reserved)
25	NC	Not used (reserved)	59	FC	Forward pls trn cmmnd (+)
26	NC	Not used (reserved)	60	NC	Not used (reserved)
27	GND	Intrnl cntrl pwr cmmn	61	NC	Not used (reserved)
28	GND	Intrnl cntrl pwr cmmn	62	V+	Extrnl pwr (DC+12~+24V)
29	TL-	Reverse trq limit cmmnd	63	RC*	Reverse pls trn cmmd (-)
30	TL+	Forward trq limit cmmn	64	V+	Extrnl pwr (DC+12~+24V)
31	GND	Intrnl cntrl pwr cmmn	65	RC	Reverse pls trn cmmd (+)
32	GND	Intrnl cntrl pwr cmmn	66	FG	Frame ground
33	TQH	Torque command	67	NC	Not used (reserved))
34	INH	Speed command	68	FG	Frame ground

* marked signals are negative logic. Signals with (*) mark can be changed those logic by parameters. Note) Do not connect pins with "NC" description.

Below figure is the layout of the unit connector viewed from connecting side.





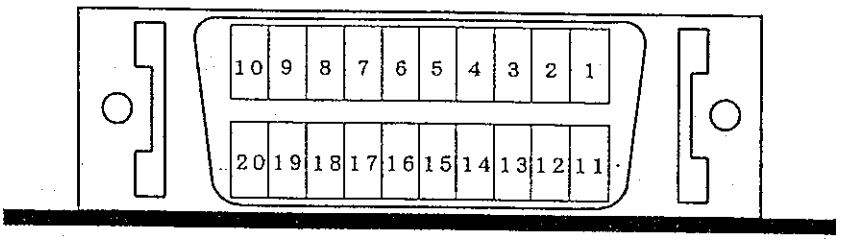
Below figure is the layout of the cable connector viewed from soldering terminal side.
Applied connector / receptacle : DX10A-68S
Cable connector / Plug : DX40-68P Shell : DX-68-CV1 (Hirose Electric product)

[Tab. 3 – 3] Connector CN1 Pin Location

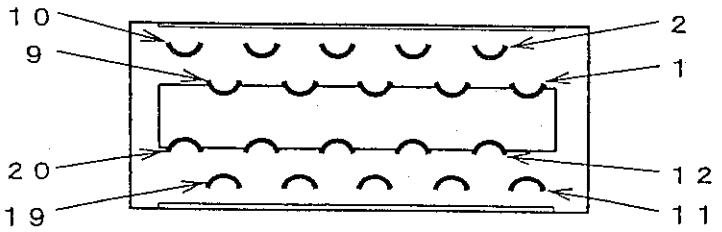
3－6－2 Encoder feedback pulse input connector (CN2)

No.	Symbol	Signal name	No.	Symbol	Signal name
1	GND	Encoder power common	11	Z	Encoder mrkr signl in(+)
2	GND	〃	12	Z*	〃 (-)
3	EP5	Encoder power (+5V)	13	NC	Not used (reserved))
4	EP5	〃	14	NC	Not used (reserved))
5	SD	ABS position data (+)	15	NC	Not used (reserved))
6	SD*	〃 (-)	16	NC	Not used (reserved))
7	A	Encoder pls A phs in. (+)	17	THM	Thermistor input
8	A*	〃 (-)	18	GND	Thermistor input common
9	B	Encoder pls B phs in. (+)	19	FG	Shield earth
10	B*	〃 (-)	20	FG	〃

* marked signals are negative logic.
Note) Do not connect pins with "NC" description.
Below figure is the layout of the unit connector viewed from connecting side.



Below figure is the layout of the cable connector viewed from soldering terminal side.



Applied connector : receptacle ／10220－52A2JL (3M product)
Applied cable connector : soldering plug ／10120－3000VE
: Case (shell)／10320－52AO－008

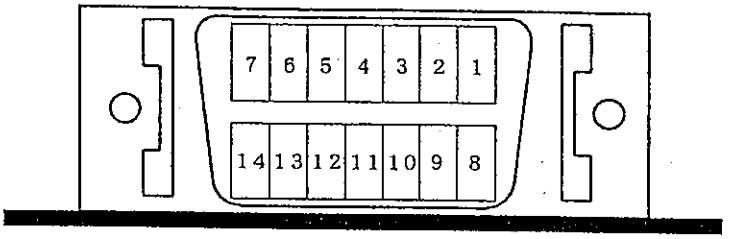
[Tab. 3－4] Connector CN2 Pin Location

3－6－3 Serial communication connector (J 1)

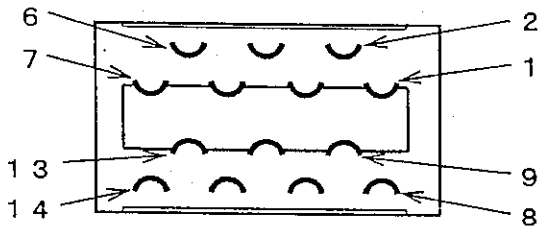
No.	Symbol	Signal name	No.	Symbol	Signal name
1	TXD(A)	Trans.data (pair TXD(B))	8	TXD(B)	Trans.data (pair TXD(A))
2	TXD(A)	〃	9	TXD(B)	〃
3	RLR(A)	Rcipt line term. resist.	10	RLT(B)	Trans.line term. resist.
4	RXD(A)	Rcipt data (pair RXD(A))	11	RXD(B)	Rcipt data (pair RXD(B))
5	RXD(A)	〃	12	RXD(B)	〃
6	——	Not used (reserved))	13	——	Not used (reserved))
7	C5V	Intnl cntrl power +5V	14	GND	Intnl cntrl power cmmn

Applied connector : receptacle ／10214－52A2JL (3M product)
Applied cable connector : soldering plug ／10114－3000VE
: Case (shell)／10314－52AO－008

Below figure is the layout of the unit connector viewed from connecting side.



Below figure is the layout of the cable connector viewed from soldering terminal side.



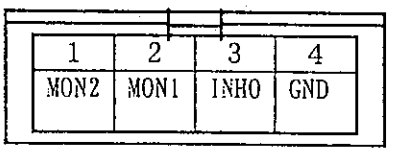
[Tab. 3－5] Connector J 1 Pin Location

3－6－4 Analog monitor connector (P 1)

No.	Symbol	Signal name	No.	Symbol	Signal name
1	MON2	Analog monitor output signal 1	3	INHO	Speed command voltage output
2	MON1	Analog monitor output signal 2	4	GND	Internal control power common

Applied connector : receptacle ／IL－4P－S3FP2 (JAE product))
Applied cable connector : (Compressive type) ／IL－4S－S3L

Below figure is the layout of the unit connector viewed from connecting side.



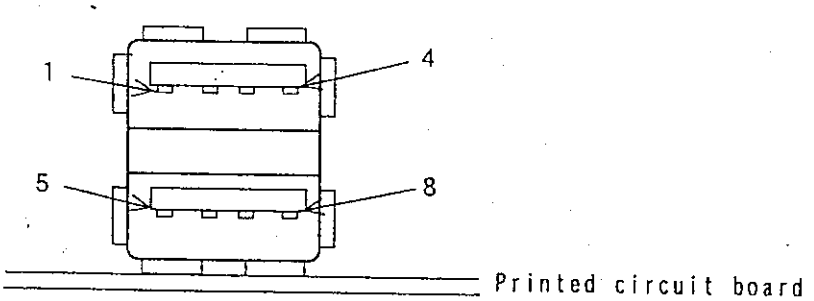
[Tab. 3－6] Connector P 1 Pin Location

3－6－5 Pulse train communication connector (J 2)

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

Applied connector : receptacle /DUSB-ARB-T111A(D2) (DDK product)
Mating cable side connector : plug harness/DUSB-HAA23-FA** (DDK product)

*1 Below figure is the layout of the unit connector viewed from connecting side.



*2 Please use our optional connector for the terminal end resistor.

[Tab. 3－7] Connector P 2 Pin Location

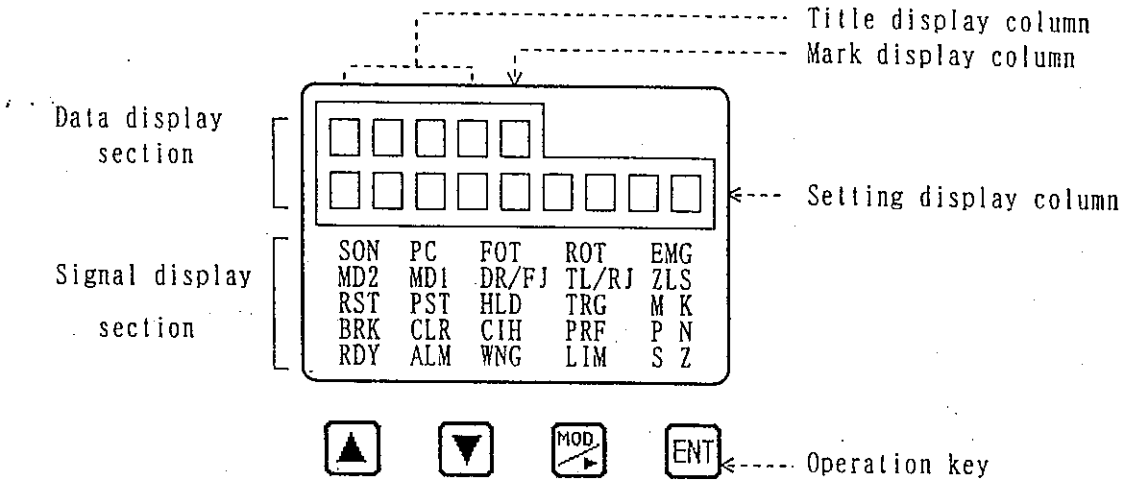
CHAPTER 4 SETTING and DISPLAY

4－1　LCD Module Operation

4－1－1　LCD module sectional function

Each Parameter and data can be set by key input of the front panel LCD module. Since parameters deeply influence machine system and system performance, please pay special attention to set them.

[1] LCD module outlook



[Fig. 4－1]　LCD Module Outlook

[2] Each display section contents

Display section		Display contents
Data display section	Title display column	Displays object item title (name, No.) or message of protective function (ALM/WNG/ERR) when they occur.
	Mark display column	Displays a mark, etc. of object item data. No display : Positive direct data 「－」display : Negative direct data
	Setting value display column	Displays object item data (Set value/Status/ Diagnosis results, Alarm name, etc.)
Signal display section		Displays I/O signal status. When a signal inputted or outputted, object letters are lit. Refer to 6-2 「Display and Monitor function」 for further information.

[Tab. 4－1] Each Display Section Contents

[3] Each operation key function

Key	Function	
▲	At item select	Displays next item.
	At data set	Increases data No. (0～9) and switches marks (□, −) . At menu data, displays next menu.
▼	At item select	Displays back item.
	At data set	Decreases data No. (0～9) and switches marks (□, −) . At menu data, displays back menu.
MOD	At item select	Displays first item of next object mode.
	At data set	Selects number of digits of data set
ENT	At power ON	Elimination of Alarm history
	At item select	Moves to data setting status of object item.
	At data set	Registers displayed data (all digits) as new data.
▲▼	At power ON	Initializes all memorized data. ※Refer to the below caution.
	At data set	Aborts data setting. (Data are not re-written, and preset data are retained.)
▲ MOD ENT	Fixed	CPU is reset when these keys are pushed simultaneously for 3 seconds. 【 Caution 】 ①In case of NPS-FS type, since CPU reset causes (Encoder failure), this can not be used. ②In Self-diagnosis and HALT, this can not be accepted.

[Tab. 4 − 2] Each Operation Key Function

【Caution】

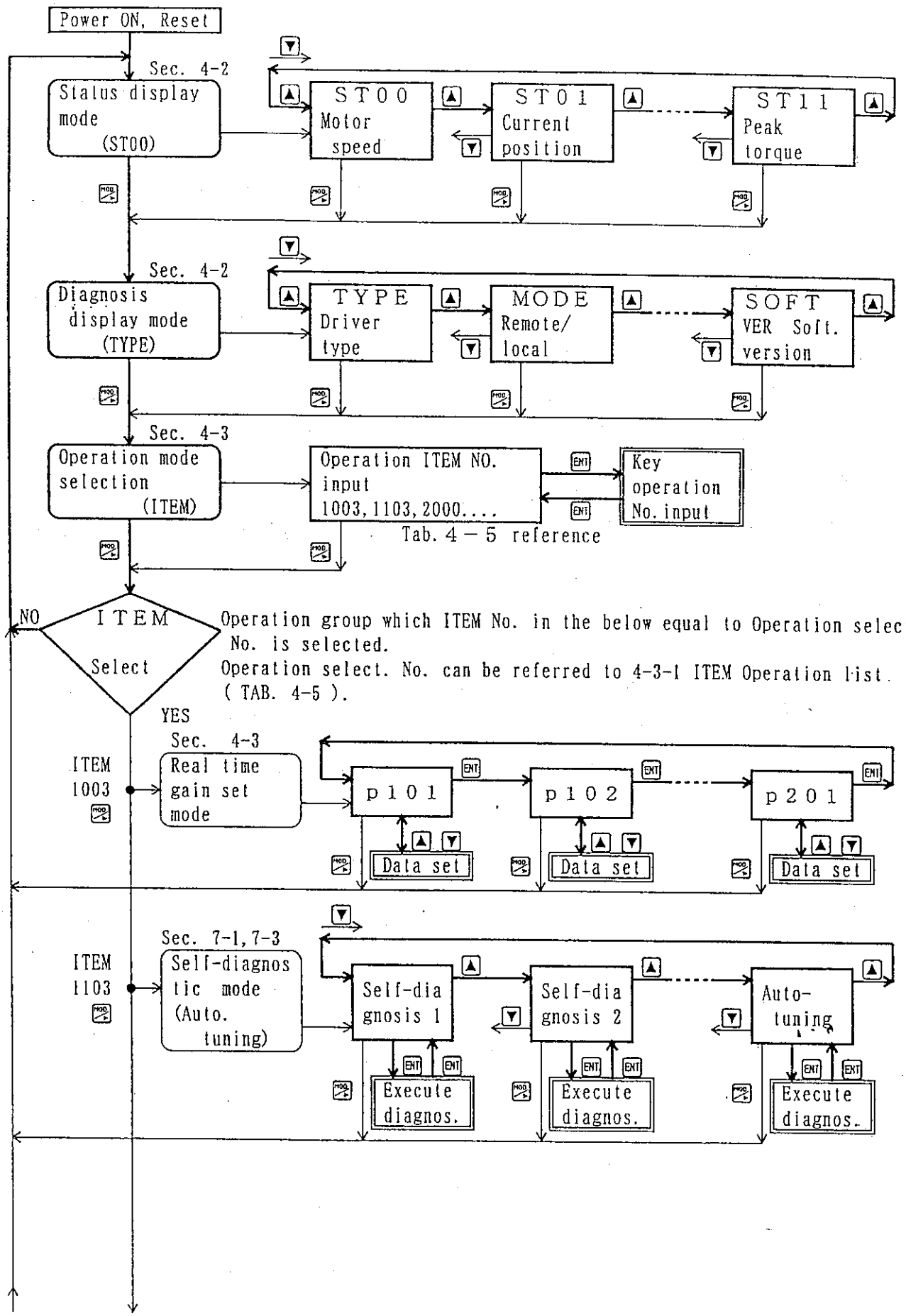
If ▲and▼are simultaneously pressed when unit power is turned ON, all the memorized data (parameter etc.) are initialized.
And at the time, the below is displayed in LCD data display section.

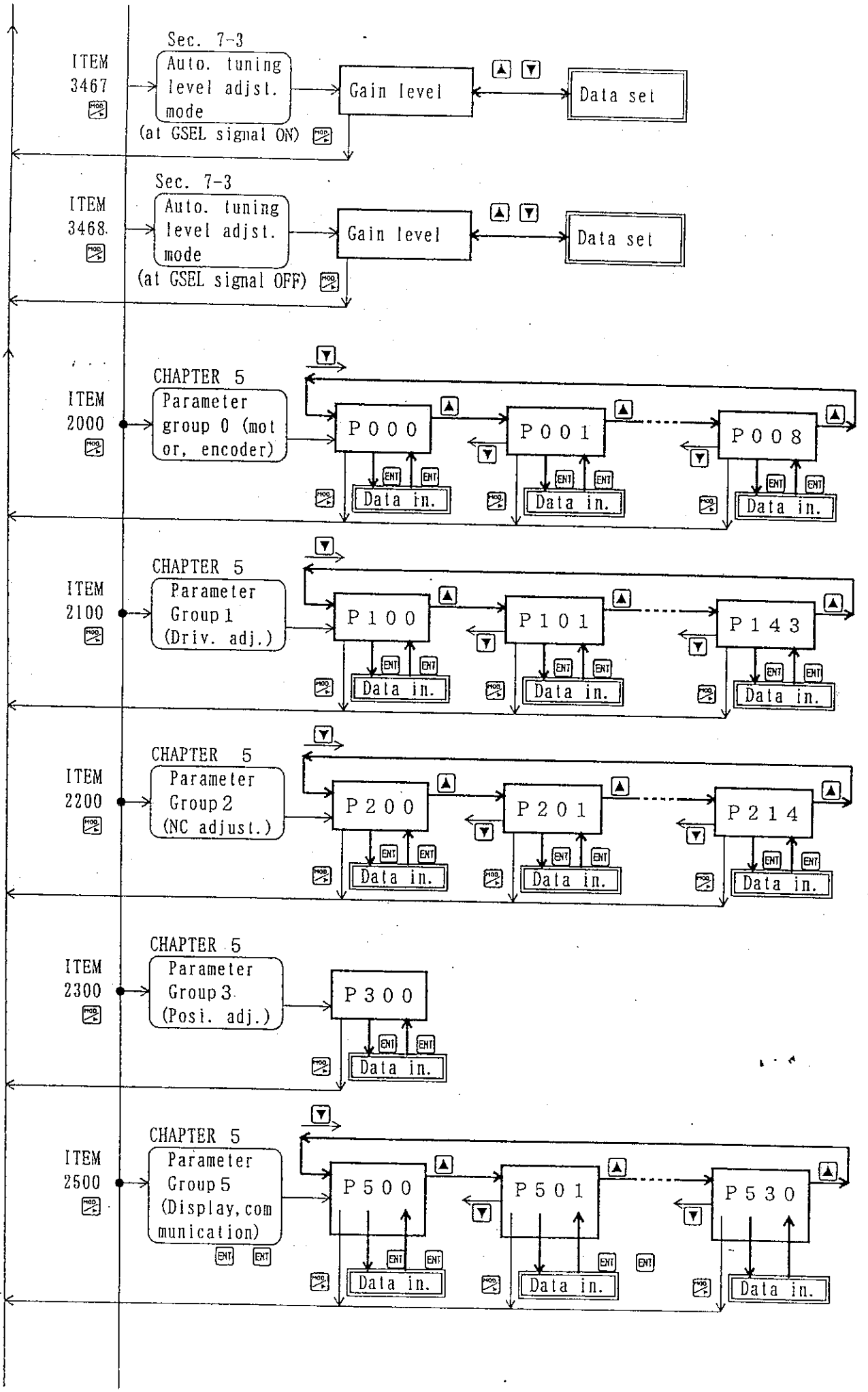
INIT DATA

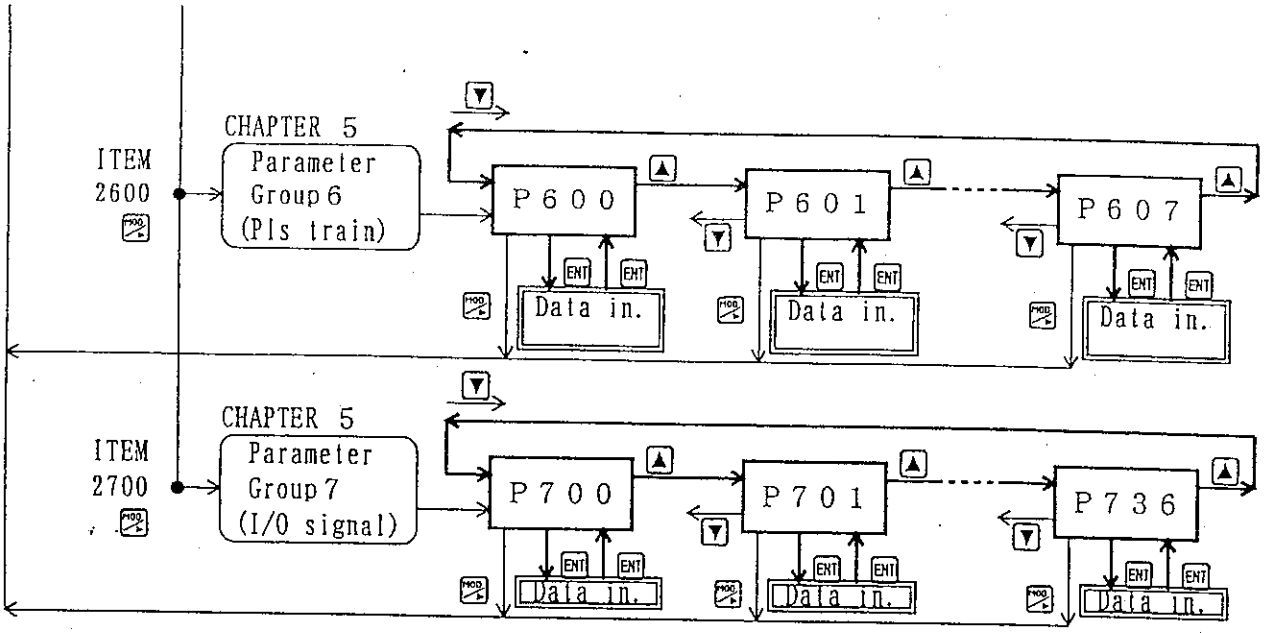
Our optional Data edit software can be used for data back up by a personal computer.

4－1－2　LCD Module Operation Procedure

Flow charts of display & key operation and data setting are as follows.




ITEM 3467
Sec. 7-3
Auto. tuning level adjst. mode
(at GSEL signal ON)
Gain level
Data set
ITEM 3468
Sec. 7-3
Auto. tuning level adjst. mode
(at GSEL signal OFF)
Gain level
Data set
ITEM 2000
CHAPTER 5
Parameter group 0 (motor, encoder)
P000
P001
P008
Data in.
ITEM 2100
CHAPTER 5
Parameter Group 1 (Driv. adj.)
P100
P101
P143
Data in.
ITEM 2200
CHAPTER 5
Parameter Group 2 (NC adjust.)
P200
P201
P214
Data in.
ITEM 2300
CHAPTER 5
Parameter Group 3 (Posi. adj.)
P300
Data in.
ITEM 2500
CHAPTER 5
Parameter Group 5 (Display, communication)
P500
P501
P530
Data in.



[Tab. 4－2]　Display and Key Operation Flow Chart

4－2　Display Mode

4－2－1　Initial display status

- During initializing the unit when power is ON, 『POWER ON ! 』 is displayed.
- At our factory shipment, initial values are set for each parameter and data.
- Since it is impossible to drive a motor whithout selecting applied motor type, at first, please be sure to set (P000 : Motor and type selection) and other parameters to meet your application conditions.
- In order to notify confirming and re-setting of parameters, when power source is turned ON for the first time, Alarm 『ALM MOTOR TYPE !』 is displayed.
  At the same time, Alarm signal is outputted.
  However, other alarm could be displayed first.
- Initial display status is cleared by any of ▲／▼／SHIFT／ENT input.
  After display is cleared, contents can be confirmed by alarm history.

[Fig. 4－3]　Initial Display Status

Display sample

《Motor torque display》

Actual torque is displayed by Status display (ＳＴ１０) .

1) By SHIFT , display mode can be shifted from Status display (ＳＴ００) → Diagnosis display (TYPE) → Operation selection (ＩＴＥＭ) → Status display (ＳＴ００) →.
   First select Status display mode (ＳＴ００) .
2) Displayed item will be shifted by ▲ ▼ to (ＳＴ００) → (ＳＴ０１) → . . . .
   Select Status display mode (ＳＴ１０) .
3) Selected (ＳＴ１０) data indicates running motor torque.

《Confirmation of alarm status》

When Alarm occurs, Alarm contents are displayed by Diagnosis display (ＡＬＭ０) .

1) By SHIFT , display mode can be shifted from Status display (ＳＴ００) → Diagnosis display (TYPE) → Operation selection (ＩＴＥＭ) → Status display (ＳＴ００) →.
   First select Diagnosis display mode (ＴＹＰＥ) .
2) Displayed item will be shifted by ▲ ▼ , from (ＴＹＰＥ) → (ＭＯＤＥ) → . . . .
   Select display item (ＡＬＭ０) .
3) Selected (ＡＬＭ０) data indicates the activated Alarm.

4 − 2 − 2 Status display mode

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

Display turn	Display sample	Unit	Display contents
1	ST00− □□□2000.0	rpm	Actual motor speed Forward rot. : □, Reverse. rot. : − Display range : -99999 ~ 99999 ※1
2	ST01− □10000000	Pulse	Current position Display range :-99999999 ~ 99999999
3	ST02− □□□□01000	Pulse	Position deviation pulse +deviation : □, −deviation : − Display range : -32767 ~ 32767
4	ST03− □□□2000.0	rpm	Rpm display of External speed command input value Forward command : □, Reverse command− Display range: -99999 ~ 99999 ※1
5	ST04− □□□□□100	%	External torque command input % rate of rated torque Forward command : □, : Reverse command− Display range : -300 ~ 300
6	ST05− □□□100.00	Kpps	Pulse train command input frequency Forward command : □, Reverse command : − Display range : -500.00 ~ 500.00
7	ST06− □10000000	Pulse	Sum of Pulse train command input pulses Forward command : □, Reverse command : − Display range :-99999999 ~ 99999999
8	ST07□ □□□□□100	%	Forward torque limit command input % rate of rated torque Display range : 0 ~ 300
9	ST08□ □□□□□100	%	Reverse torque limit command input % rate of rated torque Display range : 0 ~ 300
10	ST09□ □□□□□080	%	Thermal trip % rate Display range : 0 ~ 100 90(90%)or more: Over load warning 100(100%): Over load alarm
11	ST10□ □□□□□100	%	Actual torque command % rate of rated torque Display range : 0 ~ 300
12	ST11□ □□□□□100	%	Peak torque command % rate of rated torque (RST signal is 「000」.) Display range : 0 ~ 300

[Tab. 4 − 3] Status Display Mode Contents

- In this display mode. when [ENT] is pressed once. display data are retained for 1 second and as long as the key is continuously pressed, the display data are retained.

※1 : A decimal point position depends on parameter [PI23 : Speed command unit] setting.

4 − 2 − 3 Diagnosis display mode

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

Display turn	Display sample	Unit	Display contents
1	TYPE□ FIm□□STD.	—	Controller type Sample : NPS−FI
2	MODE□ □□□□LOCAL	—	Remote / Local mode selection status display Sample : Local mode
3	SPD1− □□□2000. 0	rpm	Selected Speed command No. and speed data Display range :-99999 ～ 99999 ※1
4	TRQ1− □□□□□□100	%	Selected Torque command No. and torque data. Display range : -300 ～ 300
5	O. R. □ □□□□□□150	%	Speed override signal input status display by % rate Display range : 0 ～ 150
6	SSIN□ □00000101 (SS1, SS2, SS3)	—	Display of external input signal status SS1～SS3. Input signal status confirmation when SS1～SS3 are allocated to other signals can be done. Sample:SS1 and SS3 ON, SS2 OFF
7	ORIN□ □□□□□0110 (OR1, OR2, OR3, OR4)	—	Display of external input signal status OR1～OR4. Input signal status confirmation when OR1～OR4 are allocated to other signals can be done. Sample:OR2 and OR3 ON, OR1 and OR4 OFF
8	CN1O□ □00000000	—	Reserved.

[Tab. 4 − 4 (a)] Diagnosis Display Mode Contents 1/2

※1 : A decimal point position depends on parameter (P123 : Speed command unit) setting.

Dis-play turn	Display sample	Unit	Display contents
9	ALM0□ □□IPM□ERR	—	Latest Alarm contents Sample : IPM failure
10	ALM1□ □□ENCODER	—	1 time old Alarm contents Sample : Encoder failure
11	ALM2□ OVER□LOAD	—	2 time old Alarm contents Sample : Over load error
12	ALM3□ OVER□VOLT	—	3 time old Alarm contents Sample : Over voltage error
13	ALM4□ OVERSPEED	—	4 time old Alarm contents Sample : Overspeed error
14	WNG0□ OVER□LOAD	—	Latest warning contents Sample : Over load warning
15	HARD□ Ver□□0.00	—	Hardware version
16	SOFT□ Ver□□1.00	—	Software version

[Tab. 4 — 4 (b)] Diagnosis Display Mode Contents 2/2

4－3　Operation Mode

4－3－1　ＩＴＥＭ (Operation mode) list

Selectable ＩＴＥＭ (Operation mode) is in the Tab. 4－5.
Please refer to Figure 4－2 「Display and Key operation Flow Chart」

ＩＴＥＭ Selection No.	Operation mode		
1003	Real time gain mode set		
1103	Self-diagnostic 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	
3467	Auto. tuning level adjustment mode (GSEL signal on mode)		
3468	Auto. tuning level adjustment mode		

[Tab. 4－5]　ＩＴＥＭ (Operation Mode) List

Operation sample

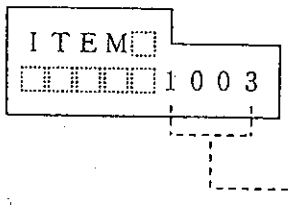
《Driver speed loop gain set》

Speed loop gain adjustment can be set by the parameter (P101) of parameter operation Group 1 (ITEM No.2100). (Tab. 5 − 1)

1) In display mode, select operation mode (ITEM) by [POS].

2) Displayed data in operation mode are initial value (0 0 0 0) or last setting data. (1 0 0 3) is displayed as a sample.

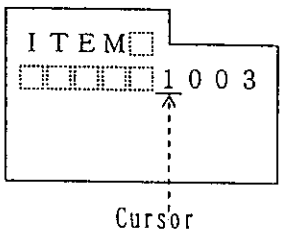
Display sample



3) Input operation selection No. (ITEM No. (2 1 0 0)).

Setting

1 ITEM No. input 1



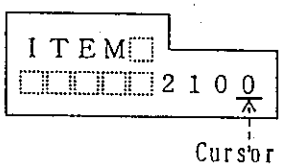
When ● [ENT] key is pressed, a cursor appears and it is ready to input.

When ● [▲] or [▼] keys are pressed. numeric value or a mark in the cursor column changes.

When ● [POS] is pressed, the cursor moves.

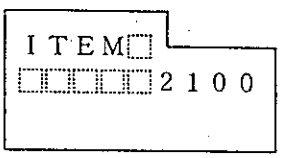
● To cancel input data, press [▲][▼] keys at the same time.

2 ITEM No. input 2



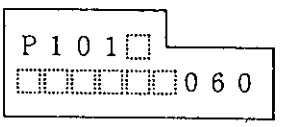
● Input ITEM No. 「Sample : 2 1 0 0」 by the above way.

3 ITEM No. set



When ● [ENT] keys are pressed, the cursor disappears and ITEM No. is set.

4) Set ITEM No. (2 1 0 0) and press [POS] which selects parameter Group 1 operation mode and parameter item (P 1 0 0) is displayed.
Select (P 1 0 1) by [▲][▼], and set gain data.
Please refer to CHAPTER 5 (5 − 2) Parameter set to input following operation.



Sample display is Speed loop gain 60.

4－3－2 Real time gain set

[1] Function

Real time gain set is defined that in a dedicated mode, individual unit gain is adjusted in 'Real time' referring to motor motion.
In parameter Edit mode, new gain works in actual motion by pressing [ENT] key.
However in Real time gain set mode, gain changes ±1 unit by one shot on [▲] or [▼] key and simultaneously the new value works in actual motion.

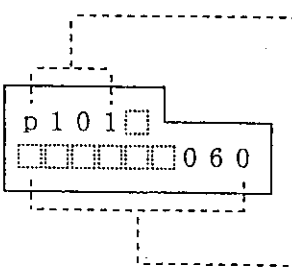
[2] Setting method

Parameters which Real time gain set is available, is as Tab. 4－6.

parameter No.	parameter	Initial value
p101	Speed loop gain	025
p102	Speed loop integral time constant	020 [ms]
p103	Speed loop derivative time constant	0000 [us]
p104	Torque command filter frequency	000 [Hz]
p105	Speed loop gain／low speed gain range	025
p106	Speed loop integral time constant／low speed gain range	020 [ms]
p107	Speed loop derivative time constant／low speed gain range	0000 [us]
p108	Torque command filter frequency／low speed gain range	000 [Hz]
p116	Speed loop gain／GSEL signal on	025
p117	Speed loop integral time constant／GSEL signal on	020 [ms]
p118	Speed loop derivative time constant／GSEL signal on	0000 [us]
p119	Torque command filter frequency／GSEL signal on	000 [Hz]
p200	Position loop gain	020 [1/S]
p201	Servo lock gain	020 [1/S]

[Tab. 4－6] Real Time Gain Set Parameter

①ITEM [ENT]→1003 (Real time・gain set mode selection) →[ENT]→[POS]
②p＊＊＊ [ENT] (Setting parameter selection)
'---'--- ＊mark is a parameter No. (Refer to Tab.4－6.)
③Data set (gain adjustment) of selected parameter
Every one shot of [▲] key : +1 is added.
Every one shot of [▼] key : -1 is subtracted.
④ When [POS] key is pressed, this mode is cancelled. (At the time the display becomes 「Situation display mode」 .)
⑤ Display sample



※ To identify same name item of parameter Edit mode, a small letter 'p' is added to the top of this parameter No. .

[Caution]

Though value in gain setting, immediately work in the actual motion, it is not written in a non-volatile memory. Setting data are written when [ENT] or [POS] key is pressed.

CHAPTER 5 PARAMETER

5 — 1 Parameter List

No.	Name.
P000	Motor type
P001	Encoder type selection
P002	Encoder pulse selection
P004	Encoder Pulse output devising ratio
P008	Carrier frequency selection
*P020	Motor type & No. of poles
*P021	Rated torque current
*P022	Rated speed(magnet flux base speed)
*P023	Max. momentary torque ratio
*P024	Exciting current
*P026	Current loop coefficient
*P028	R 2 compensation change ratio
*P030	Phase compensation angle
*P037	Torque command change amount limit value
*P040	Primary resistance
*P041	Secondary resistance
*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	Curr. loop derivative time constant
*P049	Torque constant
*P050	Special encoder pulse number

No.	Name.
P100	Low speed gain speed range
P101	Speed loop gain
P102	Speed loop integral time constant
P103	Speed loop derivative time constant
P104	Torque command filter frequency
P105	Speed loop gain/Low speed gain range
P106	Speed loop integral time constant/ Low speed gain range
P107	Speed loop derivative time constant/ Low speed gain range
P108	Torque command filter frequency/ Low speed gain range
P109	Torque limit value 1 +
P110	Torque limit value 1 —
P111	Torque limit value 2 +
P112	Torque limit value 2 —
P113	Auto. tuning trial run dire. select.
P114	Auto. tuning trial run speed ratio
P115	Torque limit select. at Alarm stop
P116	Speed loop gain/at GSEL signal ON
P117	Speed loop integral time constant/ at GSEL signal ON
P118	Speed loop derivative time constant /at GSEL signal ON
P119	Torque command filter frequency/ at GSEL signal ON
P120	R 2 compensation selection
P121	Electro. thermal detection select.
P122	Non interacting cont. Enable/Disable
P123	Speed command unit
P124	Speed command gain
P125	Speed command offset
P126	Torque command offset
P127	Ext. speed limit Enable/Disable
P128	Speed limit value
P129	Speed command value 1
P130	Speed command value 2
P131	Speed command value 3
P132	Speed command value 4
P133	Speed command value 5
P134	Speed command value 6
P135	Speed command value 7
P136	Torque command value 1
P137	Torque command value 2
P138	Torque command value 3
P139	Speed loop P gain distribution ratio
P140	Inertia
P141	Viscosity friction
P142	Speed loop FF2 compensation ratio
P143	Magnet flux control max. speed
P144	Notch filter center frequency
P145	Notch filter band width

[Caution] Parameter with (*) in No. item is displayed only when 999 is set to P000 motor type.

[Tab. 5 — 1 (a)] Parameter List 1/2

No.	Name.
P200	Position loop gain
P201	Servo lock gain
P202	Positioning complete range
P207	Overflow detecting pulse
P208	Deviation error detecting pulse
P209	Motion selection at deviation error
P211	Acceleration time 1
P214	Deceleration time 1
P300	Rotating direction selection
P500	Reserved
P501	Reserved
P510	Communication function selection
P512	Communication I D No.
P513	Data length selection (Serial communication)
P514	Parity selection (Serial communication)
P515	Baud rate select. (Serial communication)
P516	External input disable selection at Local mode
P517	External input enable selection at Remote mode
P521	Communication group I D set 1
P522	Communicat. group response yes/no 1
P523	Communication group I D set 2
P524	Communicat. group response yes/no 2
P525	Communication group I D set 3
P526	Communicat. group response yes/no 3
P527	Communication group I D set 4
P528	Communicat. group response yes/no 4
P529	Communication group I D set 5
P530	Communicat. group response yes/no 5
P600	CIH signal specification selection
P601	Pulse train command sequence change
P602	Pulse train command multiplication ratio selection
P603	Pulse train command comp. numerator
P604	Pulse train command comp. 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 communication Receipt/ Transmit data selection

No.	Name.
P700	Monitor 1 selection
P701	Monitor 2 selection
P702	Speed zero range
P704	SON signal logic selection
P705	Hardware OT Enable/Disable select.
P706	Mode change confirmation delay time
P710	Stop method at Emergency stop
P711	Decel. tome at Emergency stop
P712	Servo OFF delay time after Emergency stop
P713	Stop method at AC power OFF
P715	ALM/WNG signal logic selection
P716	RDY signal specification selection
P730	Reserved
P731	Reserved
P732	Reserved
P733	Reserved
P734	Brake output delay time
P736	Motor overheat error detection Enable/Disable selection
P737	External input signal input allocation 1
P738	Reserved
P739	External input signal input allocation 3
P740	Reserved
P741	Reserved
P742	RST signal specification selection

[Tab. 5 — 1 (b)] Parameter List 2/2

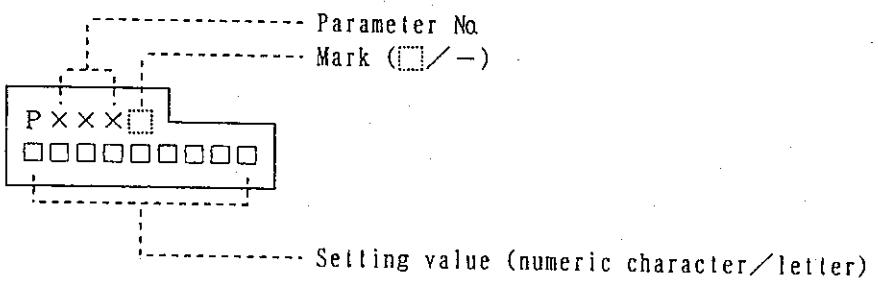
5－2　Parameter Set

[1] Parameter configuration

Group No.	Parameter No.	Group Name
0	P000～	Motor and encoder parameter
1	P100～	Driver adjustment parameter
2	P200～	NC adjustment parameter
3	P300～	Position adjustment parameter
5	P500～	Display, Edit, and Communication parameter
6	P600～	Pulse train input parameter
7	P700～	I/O signal parameter

[Tab. 5－2]　Parameter Configuration

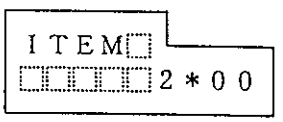
[2] Display



[3] Setting method

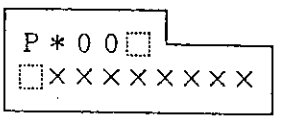
Procedure of parameter edit (Numeric value input or menu selection) is as follows.

① ITEM No. set



- Please set ITEM No.「2＊00」.
  ＊mark is group No.. (Refer to Tab.5－2.)
- When [SET] key is pressed after setting, it moves to ②.

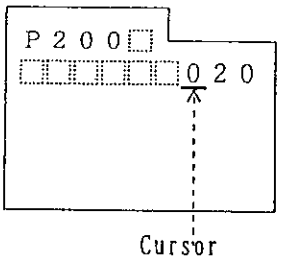
② Parameter selection



- Please select a parameter for Edit.
  When [▲] key is pressed a parameter No. increases.
  When [▼] key is pressed a parameter No. decreases.
- At the time current setting data are displayed.

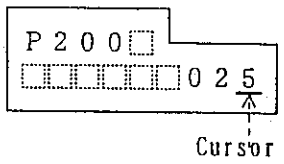
Ⓐ [In case of setting by numeric data input]

③Data input 1



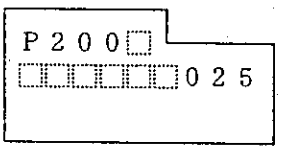
- When [ENT] key is pressed a cursor appears and input can be made.
- When [▲]or[▼]key is pressed, numeric value or mark in the columns where the cursor stays changes.
- When [SHIFT]key is pressed the cursor moves.
- To cancel input data, [▲][▼]keys shall be pressed simultaneously.

④Data input 2



- By the above operation, setting data can be inputted.

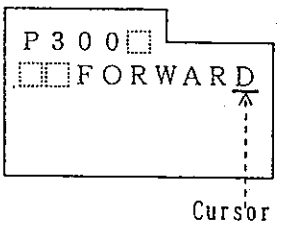
⑤Data storage



- When [ENT]key is pressed, the cursor disappears and setting data are stored.

Ⓑ [In case of setting by menu selection]

③Data selection 1



- When [ENT]key is pressed the cursor appears and selection can be made.
- When [▲]or[▼]key is pressed, menu item changes.
- To cancel selected data, [▲][▼]keys shall be pressed simultaneously.

④Data selection 2

- By the above operation, setting data are selected.

⑤Data storage

- When [ENT]key is pressed the cursor disappears and setting data are stored.

Parameter No.	Parameter name	Act. timing	Run mode (Spd / Torq / Pls / S T P)	Level	Setting unit	Setting range	Standard set (initial)
					Function		
《Group 0 》 [Motor, Encoder Parameter]							
P000	Motor type	P	S T P	Y	None	000 ～ 731,999	000
					This sets an applied motor type. Refer to 「10-4 Applicable motor List」 and set correctly. [Caution] If this setting is wrong, running away and burning may occur which is very dangerous. **To select a dedicated motor, input 【999】 to setting No. . At the time of setting, input dedicated motor parameter data to P020～P059 referring to 【Option set Specification】 .** (Motor type details can be referred to 『Motor data』 .)		
P001	Encoder type selection	P	S T P	Y	none	Menu select. INC／C-ABS／ABS	INC
					This selects an encoder type.		
P002	Encoder pulse selection	P	S T P	Y	PPR	Menu select. 1000／2000／2048／2500／4096／6000	6000
					This selects applied encoder pulses per revolution. [Caution] In case of high speed motor and high speed feature by field control, since some encoder pulse number could not be used, please confirm our sales man.		
P004	Encoder pulse output division value	P	S T P	G	none	01 ～ 32	01
					This sets Denominator (N of 1/N) of encoder pulse division ratio.		
P008	Carrier frequency selection	P	S T P	G	Hz	Menu select. 7.5K／10K／15K	10K
					This selects carrier frequency of PWM.		

Set	Encoder type
INC	Incremental
C-ABS	Compact-Absolute (Reserved)
ABS	Absolute(Reserved)

※item explanation [Active timing] I : immediate ／R : Reset or Power source ON ／P : Power source ON ／S : At motor stop

※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Parameter No.	Parameter name	Act. timing	Run mode: Spd / Trq / Pls	Run mode: S T P	Level	Setting unit	Setting range	Standard set (initial)
						Function		
《Group 0 》 [Motor, Encoder parameter]								
P020	Motor type number of poles	P		S T P	Y	none	00000000 ～ 99999999	
						【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】		
P021	Rated torque current	P		S T P	Y	10mA	00001 ～ 65535	
						【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】		
P022	Rated speed (magnet flux control base speed)	P		S T P	Y	rpm	00100～20000	
						【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】		
P023	Max. momentary torque ratio	P		S T P	Y	%	100 ～ 300	
						【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】		
P024	Exciting current	P		S T P	Y	10mA	00000 ～ 65535	
						【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】 ※It is effective only for NPS-FI type.		
P026	Current loop coefficient	P		S T P	Y	None	00000 ～ 65535	
						【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】		

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※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Para-meter No.	Parameter name	Act. timing	Run mode	Level	Setting unit	Setting range	Standard set (initial)
			Spd Torq Pls		Function		
			STP				
《Group 0 》 [Motor, Encoder parameter]							
P028	R 2 compensation change ratio	P	STP	Y	0.01%	00000 ～ 65535	
					【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】 ※It is effective only for NPS-FI type.		
P030	Phase compensation angle	P	STP	Y	deg	-100 ～ 100	
					【When motor type 999 is set to the parameter P000, please input value referring to option set specification.】 ※It is effective only for NPS-FS type.		
P037	Torque command change amount limit value	P	STP	Y	None	00000 ～ 65535	
					【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】		
P040	Primary resistance	P	STP	Y	μΩ	00000000 ～ 99999999	
					【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】		
P041	Secondary resistance	P	STP	Y	μΩ	00000000 ～ 99999999	
					【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】 ※It is effective only for NPS-FI type.		
P042	Primary inductance	P	STP	Y	μH	00000000 ～ 99999999	
					【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】		
P043	Secondary inductance	P	STP	Y	μH	00000000 ～ 99999999	
					【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】 ※It is effective only for NPS-FI type.		

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Parameter No.	Parameter name	Act. timing	Run mode			Level	Setting unit	Setting range	Standard set (initial)
			Spd	Torq	Pls				
			S	T	P			Function	
《Group 0 》 [Motor, Encoder parameter]									
P044	Mutual inductance	P	S T P			Y	μH	00000000 ～ 99999999	00000000
							【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】 ※It is effective only for NPS-FI type.		
P045	Leakage coefficient	P	S T P			Y	10^{-6}	00000000 ～ 99999999	00000000
							【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】 ※It is effective only for NPS-FI type.		
P046	Dead time compensation time	P	S T P			Y	10^{-7}sec	00000 ～ 65535	00000
							【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】		
P047	Current loop cut off frequency	P	S T P			Y	rad/s	00000 ～ 65535	04000
							【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】		
P048	Current loop derivative time constant	P	S T P			Y	μsec	00000 ～ 65535	00000
							【When motor type 999 is set to the parameter P000 please input value referring to option set specification.】		
P049	Torque constant	P	S T P			Y	10^{-6}N·m/A	00000000 ～ 99999999	00000
							【When motor type 999 is set to the parameter P000, please input value referring to option set specification.】 ※It is effective only for NPS-FS type		
P059	Special encoder pulse number	P	S T P			Y	PPR	00000000 ～ 99999999	00000
							【When motor type 999 is set to the parameter P000, please input value referring to option set specification.】 When set is 「0」, set of P002 「Encoder pulse selection」 is effective.		

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Para-meter No.	Parameter name	Act. timing	Run mode	Level	Setting unit	Setting range	Standard set (initial)
			Spd Torq Pls / STP		Function		
《Group 1 》 [Driver adjustment parameter]							
P100	Low speed gain range	I	STP	G	rpm	000 ～ 999	000
					This sets speed range of Low speed gain. (When GSEL signal is ON, this set can not be changed.) When motor speed is less than this setting value, 「Speed loop gain」 「Speed loop integral time constant」 「Speed loop derivative time constant」 and 「Torque command filter frequency」 control is changed to the control set by parameters ([P105], [P106], [P107], [P108]) in Low speed gain range. However, when setting value is 「0」, it is not changed. And when motor speed is larger than this setting value, it is controlled by parameters ([P101], [P102], [P103], [P104]) .		
P101	Speed loop gain	I.	STP	G	None	000 ～ 499	025
					This sets speed loop gain. Though larger set shortens response time, depending on machine rigidity vibration may occur. When set is 「0」, a motor becomes in torque free.		
P102	Speed loop integral time constant	I	STP	G	m sec	000 ～ 999	020
					This sets Speed loop integral compensation time constant. Though smaller set shortens response time, in case of too small value, vibration may easily occur. When set is 「0」, integral compensation does not work.		
P103	Speed loop derivative time constant	I.	STP	G	μ sec	0000 ～ 9999	0000
					This sets Speed loop derivative compensation time constant. Though larger set shortens response time, in case of too large value, vibration may occur. When set is 「0」, derivative compensation does not work.		
P104	Torque command filter frequency	I.	STP	G	Hz	0000 ～ 1000 (unit:1Hz)	0500
					This sets Torque command filter (low pass filter) frequency. If resonance is induced by combination with a machine, insert a Torque command filter. (anti-resonance) When set is 「0」, filter is disabled.		
P105	Speed loop gain /Low speed gain range	I.	STP	G	None	000 ～ 499	025
					This sets Speed loop gain in Low speed gain range. (For further information, refer to [P101].)		
P106	Speed loop integral time constant /Low speed gain range	I.	STP	G	m sec	000 ～ 999	020
					This sets Speed loop integral compensation time constant in Low speed gain range. (For further information, refer to [P102].)		

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※item explanation [Level] Y : Setting is required. /G : Run can be conducted by initial values /R : Reserved

Parameter No.	Parameter name	Act. timing	Run mode (Spd / Torq / Pls)	Level	Setting unit	Setting range	Standard set (initial)
			S T P		Function		
《Group 1 》 [Driver adjustment parameter]							
P107	Speed loop derivative time constant /Low speed gain range	I.	S T P	G	μ sec	0000 ～ 9999	0000
					This sets Speed loop derivative compensation time constant in Low speed gain range. (For further information, refer to [P103].)		
P108	Torque command filter frequency /Low speed gain range	I.	S T P	G	Hz	0000 ～ 1000 (unit:1Hz)	0500
					This sets Torque command filter (low pass) frequency in Low speed gain range. (For further information, refer to [P104].)		
P109	Torque limit value 1+	I.	S T P	G	%	000 ～ 300 (unit:1%)	300
					This sets forward motor output torque limit value. In case of setting more than motor peak torque, output is clamped to the peak torque. When set is 「0」, forward torque is generated.		
P110	Torque limit value 1-	I.	S T P	G	%	000 ～ 300 (unit:1%)	300
					This sets reverse motor output torque limit value. In case of setting more than motor peak torque, output is clamped to the peak torque. When set is 「0」, reverse torque is generated.		
P111	Torque limit value 2+	I.	S T P	G	%	-001、0 ～ 300 (unit:1%)	-001
					When Torque limit signal (TL) is inputted, this sets forward motor output torque limit value. When set is 「-001」, analog Torque limit command + (TL+) is enabled. When set is 「0～300」, it is limited to the setting value. In case of setting more than motor peak torque, output is clamped to the peak torque, and more than the set of [P109], it is clamped to the limit value of [P109].		
P112	Torque limit value 2-	I.	S T P	G	%	-001、0 ～ 300 (unit:1%)	-001
					When Torque limit signal (TL) is inputted, this sets reverse motor output torque limit value. When set is 「-001」, analog Torque limit command- (TL-) is enabled. When set is 「0～300」, it is limited to the setting value. In case of setting more than motor peak torque, output is clamped to the peak torque, and more than the set of [P110], it is clamped to the limit value of [P110].		

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※item explanation [Level] Y : Setting is required. /G : Run can be conducted by initial values /R : Reserved

Parameter No.	Parameter name	Activating	Run mode (Spd / Torq / Pos / STP)	Level	Setting unit	Setting range	Standard set (initial)
					Function		
《Group 1 》 [Driver adjustment parameter]							
P113	Auto. tuning trial run direction selection	R	・・・	G	None	Menu select. BOTH／+ONLY／-ONLY	BOTH
					In Auto. tuning run, this selects trial run direction of a motor. Set: BOTH — Bilateral; +ONLY — Forward; -ONLY — Reverse		
P114	Auto. tuning trial run speed ratio	R	・・・	G	None	0.00 ～ 1.00	0.30
					This sets trial run motor speed by the ratio of rated speed in Auto. tuning run. When [1.00] is set, the motor runs at rated speed.		
P115	Torque limit selection at Alarm stop	I.	STP	G	None	Menu select. ALM.TL N／ALM.TL Y	ALM.TL N
					This selects torque limit function to conduct sudden motor stop when Alarm occurs. ◎ALM.TL N : This conducts torque limit according to Torque limit signal(TL) ON/OFF status. ◎ALM.TL Y : This conducts torque limit to ON condition of Torque limit signal (TL) regardless to its ON/OFF status.		

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Para-meter No.	Parameter name	Act. timing	Run mode (Spd / Trq / Pls / STP)	Level	Setting unit	Setting range	Standard set (initial)
					Function		
《Group 1 》 [Driver adjustment parameter]							
P116	Speed loop gain / at GSEL signal ON	I	STP	G	None	000 ～ 499	025
					It sets Speed loop gain at GSEL signal ON. (Details can be referred to 「P101」.)		
P117	Speed loop integral time constant / at GSEL signal ON	I	STP	G	m sec	000 ～ 999	020
					It sets Speed loop integral time constant / at GSEL signal ON. (Details can be referred to 「P102」.)		
P118	Speed loop derivative time constant / at GSEL signal ON	I	STP	G	μ sec	0000 ～ 9999	0000
					It sets Speed loop derivative time constant / at GSEL signal ON. (Details can be referred to 「P103」.)		
P119	Torque command filter frequency /at GSEL signal ON	I	STP	G	Hz	0000 ～ 1000 (unit:1Hz)	0500
					It sets Torque command filter frequency (low pass filter) at GSEL signal ON. (Details can be referred to 「P104」.)		
P120	R2 compensation selection	R	STP	G	None	Menu select. R2 OFF／R2 ID／R2 TH	R2 OFF
					【This set is effective only for NPS-FI type.】 This selects R2 compensation (Output torque error compensation due to temperature drift) . ◎R2 OFF : R2 compensation is not conducted. ◎R2 ID : It identifies R2 by motor current and voltage and conducts compensation. ◎R2 TH : It measures motor temperature and conducts compensation. However if a thermister(temp. sensor) is not equipped, Alarm occurs.		

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※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Para-meter No.	Parameter name	Act. timing	Run mode: Spd / Torq / Pls	Run mode: STP	Level	Setting unit	Setting range	Standard set (initial)
						Function		
《Group 1 》 [Driver adjustment parameter]								
P121	Electronic thermal detection selection	R		STP	G	None	Menu select. STD／BIG	STD
						This selects electronic thermal detection method. ◎STD : Standard ◎BIG : Large capacity ⚠Caution : When BIG is used, add a thermister to a motor and enable of (P736 : Motor over speed error detection Enable/Disable) or connect a thermostat or a thermal for protection.		
P122	Non-interacting control Enable／Disable selection	R		STP	G	None	Menu select. DECUP OFF／DECUP ON	DECUP ON
						This selects Enable/Disable of Non-interaction control. ◎DECUP OFF : Disable ◎DECUP ON : Enable		
P123	Speed command unit	I.		S・・	G	rpm	Menu select. 1／0.1	1
						This sleets Speed data min. setting unit. By this parameter, decimal point of Speed data is determined and is shown in the data display.		
P124	Speed command gain (Voltage) ⚠Caution : DC voltage input range is±10V regardless to this set.	I.		ST・	G	V	06.00 ～ 10.00(10.01～100.00)	010.00
						This sets Speed command voltage (DC voltage) full scale value (motor rated speed command) . When set value command voltage is inputted, a motor runs at rated speed. Setting value can be more than 10.0, however max. input voltage is ±10V. Though motor regenerative motion can be made by the 10.0 or more voltage range within the max. speed, power running can not be made. Sample) When set value is 100.00/2000rpm(P022 set) motor power running speed is 2000*10V/100.00=200rpm by 10V Speed command input. Speed command revolution is max. at 10V. When 6.00 is set, Speed command resolution is 6/10 of case 10.00 set.		

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※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Para-meter No.	Parameter name	Act. timing	Run mode (Spd / Trq / Pls / S T P)	Level	Setting unit	Setting range	Standard set (initial)
					Function		
《Group 1 》 [Driver adjustment parameter]							
P125	Speed command offset	I.	S T ·	G	mV	-999 ～ 999	000
					This sets offset voltage of External speed command (DC voltage). When there is offset of External speed command voltage, by this voltage, a motor runs slowly. This parameter shall be set so as to stop the motor.		
P126	Torque command offset	I.	· T ·	G	mV	-999 ～ 999	000
					This sets offset voltage of External torque command (DC voltage).		
P127	External speed limit Enable/Disable selection	R	· T ·	G	None	Menu select. SPD.LIM.N／SPD.LIM.Y	SPD.LIM.N
					Its selects whether External speed command (DC voltage) limits motor speed or not in Torque control run. ◎SPD.LIM.N : No Motor speed is limited by (P128 : Speed limit value) . ◎SPD.LIM.Y : Yes Motor speed is limited by lower value of (P128 : Speed limit value) and External speed command.		
P128	Speed limit value	I.	· T ·	G	rpm	00000 ～ 99999	1000
					It sets motor speed limit value in Torque control run. When motor speed is set 120% or more of the rated speed, limit valueは motor is 120% of rated speed.		
P129	Speed command value 1	I.	S · ·	G	rpm	-99999 ～ 99999	1000
					It sets motor speed and command direction of Speed command 1 in Speed control run. (A decimal point depends on P123 : Speed command unit) .)		
P130	Speed command value 2	I.	S · ·	G	rpm	-99999 ～ 99999	0500
					It sets motor speed and command direction of Speed command 2 in Speed control run. (A decimal point depends on P123 : Speed command unit) .)		
P131	Speed command value 3	I.	S · ·	G	rpm	-99999 ～ 99999	0100
					It sets motor speed and command direction of Speed command 3 in Speed control run. (A decimal point depends on P123 : Speed command unit) .)		

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Parameter No.	Parameter name	Act. timing	Run mode (Spd / Torq / Pls / S T P)	Level	Setting unit	Setting range	Standard set (initial)
					Function		
《Group 1 》 [Driver adjustment parameter]							
P132	Speed command value 4	I.	S・・	G	rpm	-99999 ～ 99999	0050
					It sets motor speed and command direction of Speed command 4 in Speed control run. (A decimal point depends on P123 : Speed command unit) .)		
P133	Speed command value 5	I.	S・・	G	rpm	-99999 ～ 99999	0010
					It sets motor speed and command direction of Speed command 5 in Speed control run. (A decimal point depends on P123 : Speed command unit) .)		
P134	Speed command value 6	I.	S・・	G	rpm	-99999 ～ 99999	0005
					It sets motor speed and command direction of Speed command 6 in Speed control run. (A decimal point depends on P123 : Speed command unit) .)		
P135	Speed command value 7	I.	S・・	G	rpm	-99999 ～ 99999	0001
					It sets motor speed and command direction of Speed command 7 in Speed control run. (A decimal point depends on P123 : Speed command unit) .)		
P136	Torque command value 1	I.	・T・	G	%	-300 ～ 300	030
					It sets command value and command direction of internal Torque command 1 in Torque control run.		
P137	Torque command value 2	I.	・T・	G	%	-300 ～ 300	050
					It sets command value and command direction of internal Torque command 2 in Torque control run.		
P138	Torque command value 3	I.	・T・	G	%	-300 ～ 300	080
					It sets command value and command direction of internal Torque command 3 in Torque control run.		
P139	Speed loop proportional gain division ratio	I.	STP	G	%	000 ～ 100	000
					It sets proportional gain division ratio of 2 free degree control in speed loop. When setting large, even though high gain is set, over shoot can be reduced.		

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Parameter No.	Parameter name	Act. timing	Run mode: Spd / Torq / Pls	Level	Setting unit	Setting range	Standard set (initial)
			STP		Function		
《Group 1 》 [Driver adjustment parameter]							
P140	Inertia	I.	STP	G	10^{-6}Kg·m²	00000000 ～ 99999999	00000000
					It set control system inertia. 【Caution】 If it is unknown, do not set.		
P141	Viscosity friction	I.	STP	G	10^{-6}N·m/rad/s	00000000 ～ 99999999	00000000
					It sets viscosity friction of control system. 【Caution】 If it is unknown, do not set.		
P142	Speed loop FF2 compensation ratio	I.	STP	G	%	000 ～ 100	000
					It sets FF2 compensation ratio in Speed loop. 【Caution】 If proper values are not set to [P140 : Inertia] and [P141 : Viscosity] , do not set.		
P143	Max. speed	P	STP	G	rpm	00000 ～ 20000	00000
					It sets motor maximum speed. When 「0」 is set, motor rated speed is maximum. ◎For NPS-FI type When value other than 「0」 is set, field control is conducted. ◎For NPS-FS type Be sure to set 「0」 . 【Caution】 ·In the high speed area than motor rated speed, motor output torque characteristic and max. speed are different and depending on motor type. ·When value other than 「0」 is set, standard (described as rated speed in this manual) of Analog monitor and analog speed command is this setting speed.		

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※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Parameter No.	Parameter name	Act. timing	Run mode (Spd / Torq / Pls / STP)	Level	Setting unit	Setting range	Standard set (initial)
					Function		
《Group 1 》 [Driver adjustment parameter]							
P144	Notch filter center frequency	I.	STP	G	Hz	0000 ～ 4999	0000
					When resonance occurs by some machine system and unit combination, to eliminate the resonance, please set the resonance frequency to this parameter. When value other than 「0」 is set, notch filter is not effective.		
P145	Notch filter band width	I.	STP	G	Hz	0000 ～ 4999	0000
					It sets band width of P144 「Notch filter center frequency 」.		

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※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Para-meter No.	Parameter name	Act. timing	Run mode (Spd / Torq / Pos / STP)	Level	Setting unit	Setting range	Standard set (initial)
					Function		
《Group 2 》 [NC adjustment parameter]							
P200	Position loop gain	I	・・P	G	S^{-1}	000 ～ 199	020
					This sets Position loop gain in Pulse train run. Though larger set shorten response time, vibration may easily occur. When set is 「0」, Position loop is open, and Pulse train run can not be conducted.		
P201	Servo lock gain	I	・・P	G	S^{-1}	000 ～ 199	020
					It sets Position loop gain when position deviation is in the parameter 〔P202 : Positioning complete range〕 and a motor is in Servo lock. Though larger set shorten response time, vibration may easily occur. When set is 「0」, Position loop is open, and Servo lock function does not work.		
P202	Positioning complete range	R	・・P	G	Pulse	000 ～ 999	010
					It sets output range of Positioning complete signal (PN). Setting unit is 4 times of applied encoder pulse number. 《Sample》 When ±10 pulse of an applied encoder is determined Positioning complete range, setting value is 「040」.		

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Parameter No.	Parameter name	Act. timing	Run mode: Spd / Trq / Pls / STP	Level	Setting unit	Setting range	Standard set (initial)
					Function		
《Group 2 》 [NC adjustment parameter]							
P207	Overflow detecting pulse	R	・・P	G	Pulse	01000 ～ 32767	24000
					It sets Overflow detecting value of position deviation. Setting unit is 4 times of applied encoder pulse number.		
P208	Deviation error detecting pulse	R	・・P	G	Pulse	00000 ～ 32767	00000
					It sets allowable range of position deviation. Setting unit is 4 times of applied encoder pulse number. When set is 「0」, deviation error function does not work.		
P209	Motion selection at deviation error	I	・・P	G	None	Menu select. STOP／CONTINUE	CONTINUE
					It selects motion when position deviation exceeds setting value of [P208 : Deviation error detecting pulse] ◎STOP(Alarm stop) Alarm (ALM) signal is outputted and a motor suddenly stops. ◎CONTINUE(Continuous motion) At the time of detecting deviation error, the controller controls the position deviation to be under Deviation error detecting pulse and continues the motor motion. Until stop motion is conducted, Warning signal (WNG) is outputted. When (Continuos motion) is conducted, please pay attention to next points. ①It is likely to cause Over load error. ②If deviation exists in deceleration, set「000」to the parameter [P605] Feed forward ratio.		
P211	Acceleration time 1	R	S・・	G	sec	00.000 ～ 99.999 (Unit:1msec)	00.000
					It sets acceleration time from stop condition to max. speed in Speed control. Though setting unit is 1msec, control is conducted by rounded up value to unit 10msec. (Sample) 00.011 → 00.02		
P214	Declaration time 1	R	S・・	G	sec	00.000 ～ 99.999 (unit:1msec)	00.000
					It sets deceleration time from max. speed to stop condition in Speed control. Though setting unit is 1msec, control is conducted by rounded up value to unit 10msec. (Sample) 00.011 → 00.02		

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※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Parameter No.	Parameter name	Act. timing	Run mode: Spd / Torq / Pls	Run mode: STP	Level	Setting unit	Setting range	Standard set (initial)
						Function		
《Group 3 》 [Rotating direction adjustment parameter]								
P300	Rotating direction selection	R		STP	G	None	Menu select. FORWARD／REVERSE	FORWARD

This sets motor rotating direction to each command.

FORWARD		Forward motor rotation to forward direction or positive data command.
REVERSE		Reverse motor rotation to forward direction or positive data command.

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※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Parameter No.	Parameter name	Act. timing	Run mode: STP poldrsq / STP	Level	Setting unit	Setting range	Standard set (initial)
					Function		
《Group 5 》 [Display, Edit, Communication parameter]							
P500	Reserved	—	・・・	R			00000
					【Caution】 Be sure to set 「0」 to this parameter.		
P501	Reserved	—	・・・	R			00000
					【Caution】 Be sure to set 「0」 to this parameter.		
P510	Communication function selection	R	STP	G	None	0 ～ 9	0
					It selects an external unit(protocol) to be connected in Serial communication.		

SetNo.	External unit	Set No.	External unit
0	MDI unit	5	Dedicat. personal computer soft
1	Reserved	6	Reserved
2	Computer	7	Reserved
3	Touch panel	8	Reserved
4	Reserved	9	Reserved

P512	Communication IDNo.	R	STP	G	None	00 ～ 16	01
					It sets ID No. (office No.) in Serial communication when digital chain connection is used. (When only 1 unit is used, set 「01」.) When setting value is 「00」, MDI can not be used.		
P513	Data length selection (serial communication)	R	STP	G	BITS	Menu select. 7 BITS／8 BITS	8 BITS
					It selects data length of transmitted and received data of Serial communication.		
P514	Parity selection (serial communication)	R	STP	G	None	Menu select. NONE／ODD／EVEN	ODD
					It selects parity of Serial communication. ◎NONE : Parity None ◎ODD : Odd parity ◎EVEN : Even parity		
P515	Baud rate selection (serial communication)	R	STP	G	BPS	Menu select. 2400／4800／9600／19200／56000	9600
					It selects baud rate of Serial communication.		

※item explanation [Active timing] I : immediate ／R : Reset or Power source ON ／P : Power source ON ／S : At motor stop

※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Parameter No.	Parameter name	Act. timing	Run mode: STP pol drs .q	Run mode: STP	Level	Setting unit	Setting range	Standard set (initial)
						Function		
《Group 5 》 [Display, Edit, Communication parameter]								
P516	External input disable selection at Local mode	R	STP		G	None	000000000 ～ 268435455	000000000
						It sets External input signals to be disabled in Local mode. Enable/ Disable of each signal is displayed by 1 bit 0/1 and converted to decimal number for setting. (0: Enable/ 1: Disable) Remote input is enabled for signals which setting was done. ※Signal names and set bit relation can be referred to below tabulation. ※And relation with [P517] can be referred to below 《sample》.		
P517	External input enable selection at remote mode	R	STP		G	None	000000000 ～ 268435455	000000192
						It sets External input signals to be enabled in Remote mode. Enable/ Disable of each signal is displayed by 1 bit 0/1 and converted to decimal number for setting. (0: Enable/ 1: Disable) ※ Out of initial values, 「ROT, FOT」 are active. ※Signal names and set bit relation can referred to below tabulation. ※And relation with [P516] can be referred to below 《sample》.		

P516
P517 <Signal names and set bit relation>

B31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
／	／	／	／	—	—	—	CIH	MD2	MD1	OR4	OR3	OR2	OR1	TL	DR

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
PS8	PS7	PS6	PS5	PS4	SS3	SS2	SS1	ROT	FOT	CLR	HLD	PST	SON	EMG	—

《Sample》 [P516]and[P517]relation (Signal 「EMG」 case is as below.)

[P516]		[P517]		Enable/ Disable status of signal 「EMG」	
Set value	Contents	Set value	Contents	In local mode	In Remote mode
000000000	no set	000000000	no set	Only external inputs signals are enabled.	Only remote input is enabled.
000000000	no set	000000002	Enable =EMG	Only external input signals are enabled.	External input signal + remote input are enabled.
000000002	Disable =EMG	000000000	no set	Only remote input is enabled.	Only remote input is enabled.
000000002	Disable =EMG	000000002	Enable =EMG	Only remote input is enabled.	External input signal + remote input are enabled.

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※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Para-meter No.	Parameter name	Actl. timing	Run mode	Level	Setting unit	Setting range	Standard set (initial)
			STP poldrsq / STP		Function		
《Group 5 》 [Display, Edit, Communication parameter]							
P521	Communication group ID set 1	R	STP	G	None	000 ～ 255	000
					When the plural units are connected, and multi-destination communication is conducted, it allocates ID No. to the same group. ◎ 0 : It does not set communication group. ◎1～255 : It attends set No. group. When ID is set in some area of 1～5, it means to attend the same ID No. group. However it does not directly correspond to exact set area No. (1～5) .		
P522	Communication group response yes/ no 1	R	STP	G	None	Menu select. RESP.OFF／RESP. ON	RESP.OFF
					Paired with Communication group ID set 1, it sets yes/ no response to master office when multi-destination communication is conducted to the attending group. ◎RESP.OFF : No response to master office ◎RESP. ON : Response to master office in multi-destination communication.		
P523	Communication group ID set 2	R	STP	G	None	000 ～ 255	000
					It is second area to set Communication group ID No.. Setting method is same as Communication group ID set 1.		
P524	Communication group response yes/no 2	R	STP	G	None	Menu select. RESP.OFF／RESP. ON	RESP.OFF
					Paired with Communication group ID set 2, it is set. Setting method is same as Communication group response yes/ no 1.		
P525	Communication group ID set 3	R	STP	G	None	000 ～ 255	000
					It is third area to set Communication group ID No.. Setting method is same as Communication group ID set 1.		
P526	Communication group response yes/ no 3	R	STP	G	None	Menu select. RESP.OFF／RESP. ON	RESP.OFF
					Paired with Communication group ID set 3, it is set. Setting method is same as Communication group response yes/ no 1.		

※item explanation [Active timing] I : immediate ／R : Reset or Power source ON ／P : Power source ON ／S : At motor stop

※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Parameter No.	Parameter name	Act. timing	Run mode: STP pol drs q. / STP	Level	Setting unit	Setting range	Standard set (initial)
					Function		
《Group 5 》 [Display, Edit, Communication parameter]							
P527	Communication group ID set 4	R	STP	G	None	000 ～ 255	000
					It is fourth area to set Communication group ID No.. Setting method is same as Communication group ID set 1.		
P528	Communication group response yes/ no 4	R	STP	G	None	Menu select. RESP.OFF／RESP. ON	RESP.OFF
					Paired with Communication group ID set 4, it is set. Setting method is same as Communication group response yes/ no 1.		
P529	Communication group ID set 5	R	STP	G	None	000 ～ 255	000
					It is fifth area to set Communication group ID No.. Setting method is same as Communication group ID set 1.		
P530	Communication group response yes/ no 5	R	STP	G	None	Menu select. RESP.OFF／RESP. ON	RESP.OFF
					Paired with Communication group ID set 5, it is set. Setting method is same as Communication group response yes/ no 1.		

※item explanation [Active timing] I : immediate ／R : Reset or Power source ON ／P : Power source ON ／S : At motor stop

※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Para-meter No.	Parameter name	Acti. timing	Run mode: Spd / Torq / Pls	Run mode: S T P	Level	Setting unit	Setting range	Standard set (initial)
						Function		
《Group 6 》 [Pulse train input parameter]								
P600	CIH signal specification selection.	R	・・P		G	None	Menu select. CIH CLOSE／CIH OPEN／	CIH CLOSE
						It select effective logic of control input signal (CIH). (CIH-COM terminals Short-circuited:ON, Open: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		G	None	Menu select. FORWARD／REVERSE	FORWARD
						It selects motor rotating direction by Pulse train command input. ◎FORWARD (Forward selection) A motor runs forward by forward direction or B phase leading Pulse train command. ◎REVERSE(Reverse selection) A motor runs reverse by forward direction or B phase leading Pulse train command. However by setting 「REVERSE」 to (P300 : Rotating direction selection) , motor runs opposite to the above description.		
P602	Pulse train command multi-plication ratio selection.	P	・・P		G	None	Menu select. X1／X2／X4／ F/R PULSE／ P + F/R ／EXT1. PLS／EXT2. PLS	X1
						It selects signal input style and multiplication ratio of Pulse train command. ◎ X1 : 90°different phase pulse 1 time ◎ X2 : 90°different phase pulse 2 times ◎ X4 : 90°different phase pulse 4 times ◎F/R PULSE: Directional pulse (1 time only) ◎P + F/R : Directional signal+ Feed pulse (1 time only) ◎EXT1. PLS: Pulse train command by Pulse train communication ◎EXT2. PLS: Pulse train command by Pulse train communication As for setting method of 「EXT1. PLS」 and 「EXT2. PLS」 , please refer to 「What is Pulse train communication ?」 of P608 「Pulse train communication Transmitted data /received data selection 」		

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※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Para-meter No.	Parameter name	Act. timing	Run mode	Level	Setting unit	Setting range	Standard set (initial)
			Spd Torq Pls / STP		Function		
《Group 6 》 [Pulse train input parameter]							
P603	Pulse train command compensation numerator	I	・・P	G	None	00001 ～ 65535	00001
					Paired with [P604 : Pulse train command compensation denominator] , it sets Pulse train command input pulse number (=Pulse train compensation ratio) per motion command unit. When motion command amount is m and, Pulse train command input pulse number is n, this parameter sets n value.		
P604	Pulse train command compensation denominator	I	・・P	G	None	00001 ～ 65535	00001
					Paired with [P603 : Pulse train command compensation numerator] , it sets Pulse train command input pulse number (=Pulse train compensation ratio) per motion command unit. When motion command amount is m and, Pulse train command input pulse number is n, this parameter sets m value.		
P603 P604	《Pulse train compensation ratio set sample》 Motion command amount (load traveling amount) 1000 pulses are corresponding to Pulse train command input 1500 pulses by the following setting, Setting value { [P603]= [Pulse train command input pulse number] = 1500 [P604]= [Motion command amount] = 1000 (Motion command amount) × [P603 : Pulse train command compensation numerator] / [P604 : Pulse train command compensation denominator] = [Pulse train command input pulse number]						

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※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Para-meter No.	Parameter name	Act. timing	Run mode: Spd / Torq / Pls / S T P	Level	Setting unit	Setting range	Standard set (initial)
					Function		
《Group 6 》 [Pulse train input parameter]							
P605	Pulse train feed forward ratio	R	・・P	G	%	000 ～ 120	080
					It sets Speed command feed forward ratio in Pulse train run. Though larger set shorten response time, depending on matching with machine system, vibration may occur. In the case, reduce the setting amount a little bit to have some deviation allowance, so that stable motion can be achieved. When set is 「0」, Feed forward control does not work.		
P606	Pulse train feed forward shift ratio	R	・・P	G	%	000 ～ 100	001
					It reduces feed forward amount in Pulse train run. Feed forward amount= Input pulse speed－(Rated speed*set value(%)) If results are － to input pulse speed in the expression, it is clamped at 0.		
P607	Pulse train feed forward filter time constant	R	・・P	G	sec	0.00 ～ 0.10	0.02
					It sets filter time constant to adjust response of feed forward control in Pulse train run.		

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Para-meter No.	Parameter name	Act. timing	Run mode	Level	Setting unit	Setting range	Standard set (initial)
			Spd Torq Pls / S T P		Function		
《Group 6 》 [Pulse train input parameter]							
P608	Pulse train communication Transmitted /received data selection	P	・・P	G	None	Menu select. RECEIVE／FC.RC／CMND.P／MT.ENC	CIH CLOSE

It selects Pulse train type which this unit transmits or receives in Pulse train communication.
◎ RECEIVE : It receives by Pulse train communication. And when Pulse train communication is mot used, select this item.
◎ FC.RC : It transmits external pulse train (Pulse train input through FC/RC of CN1). (In case of 90° phase different pulse, it transmits 4 times of Pulse train.)
◎CMND.P: Reserved (Do not set this.)
◎MT.ENC: It transmits Pulse train, 4 times of motor encoder.

What is Pulse train communication ?
①Pulse train communication is defined to Transmitted /received pulse data between NCS-FI/FS series or NPS-FI/FS (other unit, hereafter).
②Next functions are achieved by this communication.
・This unit receives pulse data of other unit, convert them to Pulse train command and can conduct Pulse train run.
And since 1 transmitted data can be received by up to 10 axes, plural axis control to follow 1 pulse data is possible.
・This unit can conduct Pulse train run by external Pulse train command inputted to this unit and simultaneously transmit the Pulse train command to other unit.
By this function, plural axis Pulse train run by this or other units complying with 1 master axis command can be conducted.
・This unit can transmit this unit motor motion pulse data to drive other unit, which is called twin drive motion.
③Transmission of Pulse train communication is defined to transmit pulse data. Transmission data are selected by P608 Transmission data.
④Receipt of Pulse train communication is defined to receive pulse data from other unit. For Receipt, set 「RECEIVE」 to P608 and 「EXT1.PLS」 to P602.
However, when P608 of Transmission unit in Pulse train communication is・・・ 「CMND.P」 , set 「EXT2.PLS」 to P602 of this unit.

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※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Para-meter No.	Parameter name	Act. timing	Run mode	Level	Setting unit	Setting range	Standard set (initial)
			Spd Torq Pos		Function		
			STP				
《Group 7 》 [I/O signal parameter]							
P700	Monitor 1 selection	I	STP	G	None	Menu select. SPD.REF.／SPD.FB.／TRQ.REF.／TRQ.LIM.+／TRQ.LIM.-／P.RANGE.L／P.RANGE.H／SPD.OUT／SCL.OUT／IX62／IX63／OPT.W／OPT.L	SPD.FB.
					It selects output data of analog monitor 「MON1」. ◎SPD.REF. : Speed command ◎SPD.FB. : Speed feedback ◎TRQ.REF. : Torque command ◎TRQ.LIM.+ : External+torque limit ◎TRQ.LIM.- : External-torque limit ◎P.RANGE.L : position deviation 1 ◎P.RANGE.H : position deviation 2 ◎SPD.OUT : NC Speed command ◎SCL.OUT : Reserved (Do not set.) ◎IX62 : Reserved (Do not set.) ◎IX63 : Reserved (Do not set.) ◎OPT.W : Reserved (Do not set.) ◎OPT.L : Reserved (Do not set.)		
P701	Monitor 2 selection	I	STP	G	None	Menu select. SPD.REF.／SPD.FB.／TRQ.REF.／TRQ.LIM.+／TRQ.LIM.-／P.RANGE.L／P.RANGE.H／SPD.OUT／SCL.OUT／IX62／IX63／OPT.W／OPT.L	TRQ.REF.
					It selects output data of analog monitor 「MON2」. ※ Selectable items are same as [P700] .		
P702	Speed zero range	R	STP	G	rpm	00 ～ 99	10
					It sets output range of Speed zero signal(SZ).		
P704	SON signal logic selection	R	STP	G	None	Menu select. SERVO ON／SHUT OFF	SERVO ON
					It selects effective logic of Servo ON signal(SON). (SON-COM terminals Short-circuitted:ON, Open:OFF) ◎SERVO ON: Signal ON: Servo ON (Motor in control) ◎SHUT OFF: Signal ON: Servo OFF (Motor torque free)		

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※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Para-meter No.	Parameter name	Act. timing	Run mode: Spd / Torq / Pls	Run mode: STP	Level	Setting unit	Setting range	Standard set (initial)
						Function		
《Group 7 》 [I/O signal parameter]								
P705	Hardware OT Enable/Disable selection	R		STP	G	None	Menu select. 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		STP	G	sec	0.00 ～ 9.99 (Unit:10msec)	0.01
						It sets delay time from Mode selection signal (MD1, MD2) change input to establishment of new mode . This parameter is to neglect any signal induced by uncertain status during mode is changing. [Caution] Actual change time is this setting value plus internal processing time about 20 msec..		

※item explanation [Active timing] I : immediate ／R : Reset or Power source ON ／P : Power source ON ／S : At motor stop

※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Para-meter No.	Parameter name	Act. timing	Run mode (Spd Torq Pos / S'T'P')	Level	Setting unit	Setting range	Standard set (initial)
					Function		
《Group 7 》 [I/O signal parameter]							
P710	Stop method at Emergency stop	I	S・P	G	None	Menu select. QUICK／FREE RUN	QUICK
					It selects motor stop method at Emergency stop. ◎QUICK (Brake stop) Brake stop is conducted when deceleration time setby [P711] passes and then after setting time of [P712] , Servo is OFF (Torque free). ◎FREE RUN (Free run stop) Torque free run stop is conducted. In Torque control run, regardless to this setting, the motor conducts free run stop.		
P711	Deceleration time at Emergency stop	R	S・P	G	sec	00.00 ～ 50.00 (Unit:10msec)	0.00
					It sets the motor decel. time from rated speed to stop when brake stop is selected by [P710] . When set is 「0」 , the motor suddenly stops with maximum torque (Torque limit value) . When Free run stop is selected by [P710] , this parameter is disabled.		
P712	Servo OFF delay time after Emergency stop	R	S・P	G	sec	0.00 ～ 9.99 (Unit:10msec)	0.00
					It sets time from motor stop status to Servo OFF (Torque free) when brake stop is selected by [P710] .When set is 「0」 , Servo is OFF (Torque free) at the same time of motor stop. When Free run stop is selected by [P710] , this parameter is disabled.		
P713	Stop method at AC power OFF	I	S・P	G	None	Menu select. QUICK／FREE RUN	FREE RUN
					It selects motor stop method when AC power OFF is detected (Power OFF). ◎QUICK(Brake stop) The motor conducts brake stop. ◎FREE RUN (Free run stop) The motor conducts Torque free run stop. In Torque control run, regardless to this setting, the motor conducts free run stop. [Caution] In case of Brake stop, depending on controller status and load conditions, brake stop torque changes. Specially if AC power OFF is detected in acceleration, Free run stop may occur.		

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※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Para-meter No.	Parameter name	Act. timing	Run mode: Spd / Torq / Pls	Run mode: STP	Level	Setting unit	Setting range	Standard set (initial)
						Function		
《Group 7 》 [I/O signal parameter]								
P715	ALM/WNG signal logic selection	R		STP	G	None	Menu select. ALM/WNG1 ～ ALM/WNG4	ALM/WNG1
						It selects output logic of control output signal (ALM, WNG). ◎ALM/WNG1 ALM-COM1 terminals Opened:ON／WNG-COM terminals Closed:ON ◎ALM/WNG2 ALM-COM1 terminals Closed:ON／WNG-COM terminals Closed:ON ◎ALM/WNG3 ALM-COM1 terminals Opened:ON／WNG-COM terminals Opened:ON ◎ALM/WNG4 ALM-COM1 terminals Closed:ON／WNG-COM terminals Opened:ON		
P716	RDY signal specification selection	R		STP	G	None	Menu select. RDY1／RDY2／RDY3／RDY4	RDY1
						It selects output specification of control output signal (RDY). ① : Hardware OT alarm, Software OT alarm ② : Alarm which needs Reset signal (RST) to release Servo lock conducted when the alarm was detected. ◎RDY1 In motor drive(includes ①②) : Close RDY-COM1 terminals. In motor free : Open RDY-COM1 terminals. ◎RDY2 In motor drive (includes ①) and not ② condition : Close RDY-COM1 terminals. In motor free or ② condition : Open RDY-COM1 terminals. ◎RDY3 In motor drive (includes ②) and not ① condition : Close RDY-COM1 terminals. In motor free or ① condition : Open RDY-COM1 terminals. ◎RDY4 In motor drive and not ①② conditions : Close RDY-COM1 terminals. In motor free or ①② conditions : Open RDY-COM1 terminals. Above 「In motor free」 is defined in none control status. Torque 0 (Final results are motor free.) in some control as Torque control, etc. is included in 「In motor drive」.		

※item explanation [Active timing] I : immediate ／R : Reset or Power source ON ／P : Power source ON ／S : At motor stop

※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Parameter No.	Parameter name	Act. timing	Run mode (Spd / Torq / Pls / STP)	Level	Setting unit	Setting range	Standard set (initial)
					Function		
《Group 7 》 [I/O signal parameter]							
P730	Reserved	I	・・・	R			00000
					【Caution】 Be sure to set 「0」 to this parameter .		
P731	Reserved	I	・・・	R			00000000
					【Caution】 Be sure to set 「0」 to this parameter .		
P732	Reserved	I	・・・	R			00000
					【Caution】 Be sure to set 「0」 to this parameter .		
P733	Reserved	I	・・・	R			00000000
					【Caution】 Be sure to set 「0」 to this parameter .		
P734	Brake output delay time	R	STP	G	sec	0.00 ～ 9.99 (Unit:10msec)	0.00
					It sets delay time from motor torque free status to control output signal (BRK) OFF when Alarm, Emergency stop, Servo OFF occurs and Reset is made.		
P736	Motor over heat error detection Enable/Disable selection	R	STP	G	None	Menu select. ALM.OH2.N／ALM.OH2.Y	ALM.OH2.N
					It selects Enable/Disable of motor over heat error alarm detection. ◎ALM.OH2.N : Disable ◎ALM.OH2.Y : Enable Enable selction if a motor is not equipped with a thermister (Temp. sensor), Thermister cable disconnection alarm is activated.		

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※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Para-meter No.	Parameter name	Act. timing	Run mode: Speed control	Run mode: Position control	Run mode: STP	Level	Setting unit	Setting range	Standard set (initial)
							Function		
《Group 7 》 [I/O signal parameter]									
P737	External input signal input allocation 1	R			STP	G	None	00000000 ～ 99999999	00000000
							It allocates external signals of Speed select. 1～3 (SS1～3) to other input signals. In this allocation setting, 2 digits are 1 pair for each signal as below, and to the 2 digits, allocated No. in the tab.(input signal allocation) will be set. When 「0」 is set, they return to the original SS1～3 signals. Sample) 00 00 02 01 00 00 → Reserved (Set 00.) 02 → SS3 → allocated to BRON signal 01 → SS2 → allocated to GSEL signal 00 → SS1 → SS1 signal (Allocation not changed)		
P738	Reserved	—	. . .			R			00000000
							【Caution】 Be sure to set 「0」 to this parameter.		
P739	External input signal input allocation 3	R			STP	G	None	00000000 ～ 99999999	00000000
							It allocates external signals of Speed override 1～4 (OR1～4) to other input signals. In this allocation setting, 2 digits are 1 pair for each signal as below, and to the 2 digits, allocated No. in the input signal allocation tab. will be set. When 「0」 is set, they return to the original OR1～4 signals. Sample) 01 02 00 00 00 → OR4 → allocated to GSEL signal 00 → OR3 → allocated to BRON signal 02 → OR2 → OR1 signal (Allocation not changed) 01 → OR1 → OR1 signal (Allocation not changed)		
P737 P739	Input signal allocation tab.								

Allocated No.	Symbol	Signal Name	Allocated No.	Symbol	Signal Name
01	GSEL	Speed gain select.	03		Reserved
02	BRON	Forced Brake ON	04		Reserved

Supplement 1) If allocated No. to P737 and P739 is duplicated, duplicated signal is treated by OR gate.
2) A signal not allocated to any input signal is always OFF status.

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※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

Para-meter No.	Parameter name	Act. timing	Run mode (Spd / Torq / Pos / STP)	Level	Setting unit	Setting range	Standard set (initial)
					Function		
《Group 7 》 [I/O signal parameter]							
P740	Reserved	—	・・・	R			00000000
					[Caution] Be sure to set 「0」 to this parameter.		
P741	Reserved	—	・・・	R			00000000
					[Caution] Be sure to set 「0」 to this parameter.		
P742	RST signal spec. select.	R	S T P	G	None	Menu select. RST／CPU RST	RST
					It selects specification of Control input signal (RST). ◎RST When RST is ON, 「RST」 spec. in 3-4-1 I/O signal list is selected. ◎CPU RST When RST is ON, it resets CPU. [Caution] Do not select 「CPU RST」 for NPS-FS type. If selected, 「Encoder fault」 occurs when RST sign al is ON.		

※item explanation [Active timing] I : immediate ／R : Reset or Power source ON ／P : Power source ON ／S : At motor stop

※item explanation [Level] Y : Setting is required. ／G : Run can be conducted by initial values ／R : Reserved

CHAPTER 6 RUN

6 — 1 Inspection n Before Start

After installation and wiring, conduct following inspection before start.

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

⚠ Caution

● Never conduct an insulation test as withstand voltage test, meggar test, etc. and noise test by noise simulator. Those test may damage the unit.

Before starting Run, confirm next setting.

●According to 6-4 「Run procedure」 , set motor type data to standard motor setting parameter P000.
In case of using a dedicated motor, set data 「999」 to P000 and referring to [Option setting] specification, input associated motor parameter to P020～P059.
●Input signal: Confirm negative logic input of Emergency stop (EMG*), Forward/Reverse over travel (FOT*, ROT*).
●Input signal: Set the parameter corresponding to positive or negative logic motion of Servo ON (SON(*)).

6 － 2　Display, Monitor Function

・ By the display of front panel LCD module, I/O signal / monitor motion status , Alarm / error contents, etc. can be confirmed.
・ By analog monitor connector （P 1） , Status of Speed command, Torque command, Speed feedback, Position deviation, etc. can be confirmed as analog voltage.

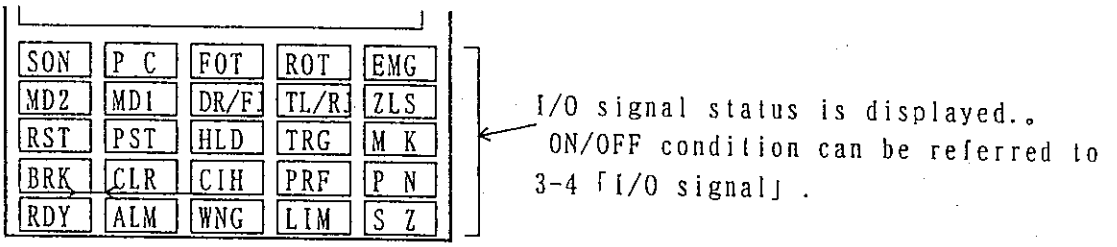
6 － 2 － 1　L C D module display

（1） Status display

Status display and parameter setting can be referred to CHAPTER 4 「Setting and display」 and CHAPTER 5 「Parameter set」 .
As for Self-diagnosis, please refer to CHAPTER 7 「Self-diagnosis」 .

（2） I/O signal display

I/O signal status is displayed in I/O signal display section.



[Fig. 6 － 1]　I/O Signal Status Display

6 − 2 − 2　Analog Monitor

At MON1 and MON2 terminals of the analog monitor connector (P 1), DC voltage of the signals selected by parameter P 700 「Monitor 1 selection」 and P 701 「Monitor 2 selection」 are outputted, respectively.
And at INHO terminal, actual external Speed command voltage is outputted.
By observing the wave in oscilloscope, motor motion status (momentary, steady state) can be confirmed.

Analog monitor contents

Symbol	Monitor item	Monitor contents
INH 0	External speed command	It outputs actual External speed command input voltage. Polarity : Forward command , Plus voltage, Reverse command , Negative voltage Range : 0～±10V ±10%
MON 1 and MON 2	Speed command	It outputs Speed command value in each motion mode. Polarity : Forward command , Plus voltage, Reverse command , Negative voltage Range : 0～±10V ±10% (Rated speed command, ±10V)
	Torque command	It outputs motor output torque value. Polarity : Forward drive torque, Plus voltage, Reverse drive torque, Minus voltage Range : 0～±10V ±10% (Rated torque, ±3.3V)
	Speed feedback	It outputs actual motor speed. Polarity : Forward rotation, Positive voltage, Reverse rotation, Negative voltage Range : 0～±10V ±10% (Motor rated speed, ± 8 V)
	External+ Torque limi External− Torque limi	It outputs External +/- torque limit command value. Polarity : Forward torque limit and Reverse torque limit, Both positive voltage Range : 0～+10V ±10% (Rated torque limit, +3.3V)
	Position deviation1 Position deviation2	It outputs position deviation amount. Polarity : + deviation, Positive voltage, − deviation, Negative voltage Range : 0～±10V ±10% (Position deviation 1: deviation±255 pulse, ±10V , Position deviation 2: deviation±4080 pulse, ±10V)
	NC Speed output (pulse train speed command)	It outputs Speed command value in Pulse train run. Polarity : Forward command, Positive voltage, Reverse command, Negative voltage Range : 0～±10V ±10% (Rated speed command, ±10V)

[Tab. 6 − 1]　Analog Monitor Contents

6 — 3 Running Motion

Run motion mode can be selected out of Speed control, Torque control, and Pulse train position control modes by input signals MD1 and MD2.
Refer to Fig. 1 — 2 「Mode Configuration」, Tab. 1 — 1 「Mode outline」.
Remote run or Local run is selected by input signal PC.

Local run

Individual control run mode selection, individual run start/stop, etc. control is conducted by control input signals.
And using parameter P516, any control can be conducted by Serial communication.

Remote run

Individual control run mode selection, individual run start/stop, etc. control is basically conducted by serial communication.
And using parameter P517, any control input signal can be conducted.

I/O signal list for Run motion is as follows.

Signal name	Symbol	Driver function			
		Speed control	Torque control	Pulse train control	Remote un*
Mode selection 1, 2	MD1, MD2	●	●	●	●
Remote/Local selection	PC	●	●	●	●
Reset	RST	●	●	●	●
Servo ON	SON	●	●	●	●
Emergency stop	EMG	●	●	●	●
Start	DR	●	●	●	●
Torque limit	TL	●		●	●
Command pulse inhibit	CIH			●	●
Deviation clear	CLR			●	●
Speed select, 1, 2, 3	SS1, SS2, SS3	●	●		●
Forward over travel	FOT	●	●	●	●
Reverse over travel	ROT	●	●	●	●
Speed Override	OR1～OR4	●			●
Speed gain selection	GSEL	●	●	●	●
Forced brake ON	BRON	●	●	●	●
Positioning complete	PN			○	○
Servo ready	RDY	○	○	○	○
Alarm	ALM	○	○	○	○
Warning	WNG	○	○	○	○
Brake release	BRK	○	○	○	○
Speed zero	SZ	○	○	○	○
IN Speed/ Torque limit	LIM	○	○	○	○

[Tab. 6 — 2] I/O Signal Motion List

● : Input, ○ : Output

Run mode

6 − 3 − 1 Speed control motion

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

1. Operation procedure

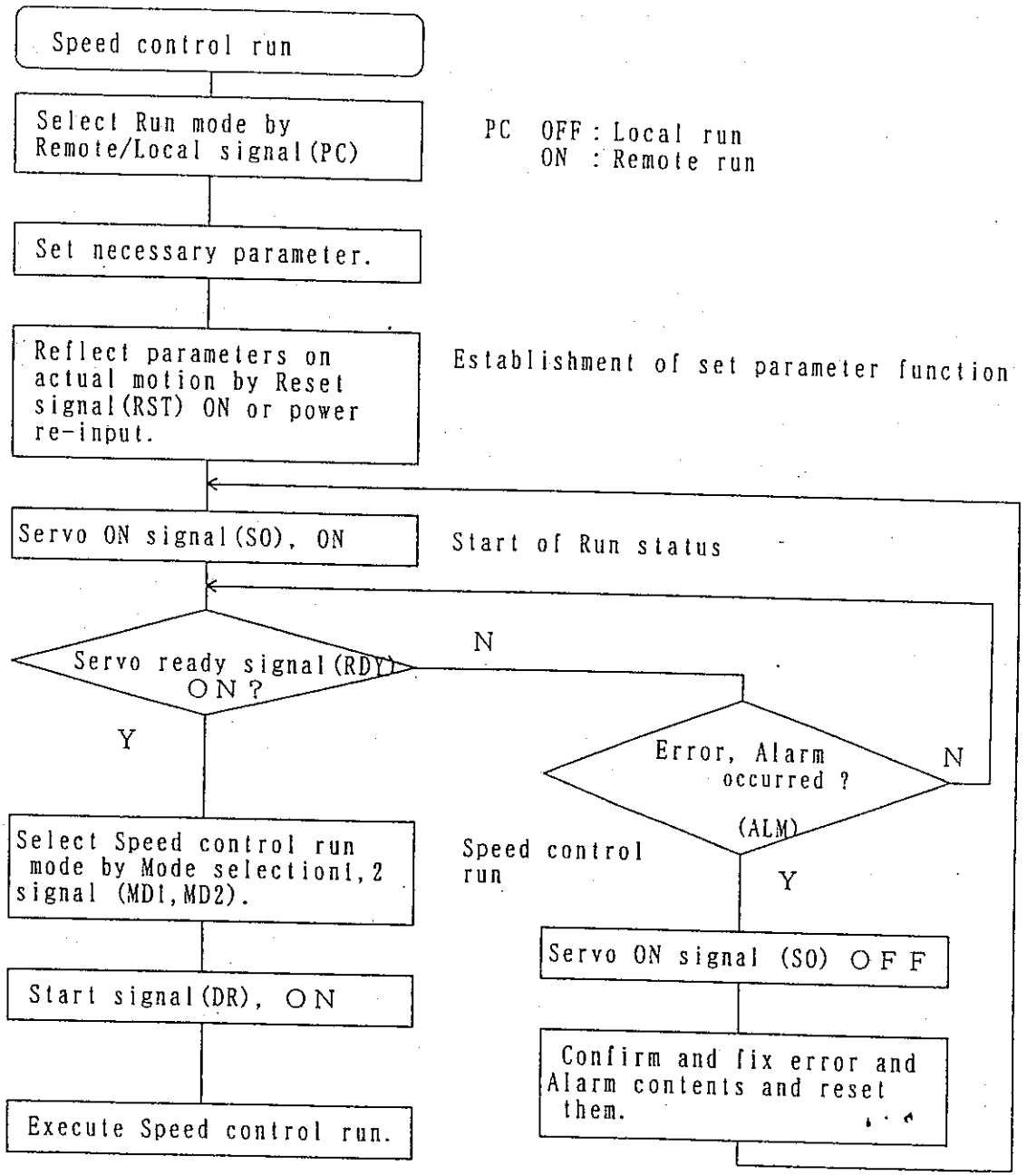
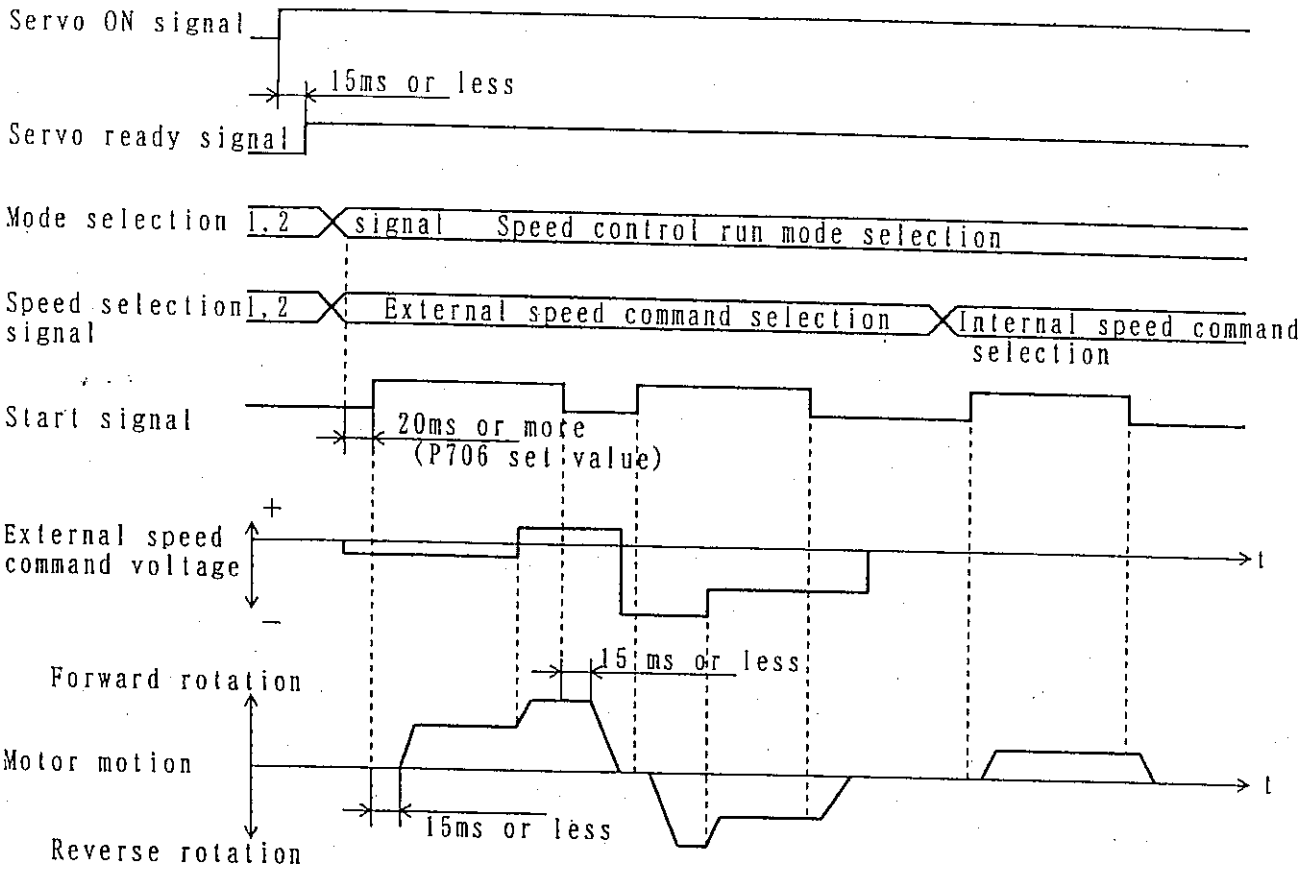


Fig. 6 − 2 Speed Control Run Operation Procedure

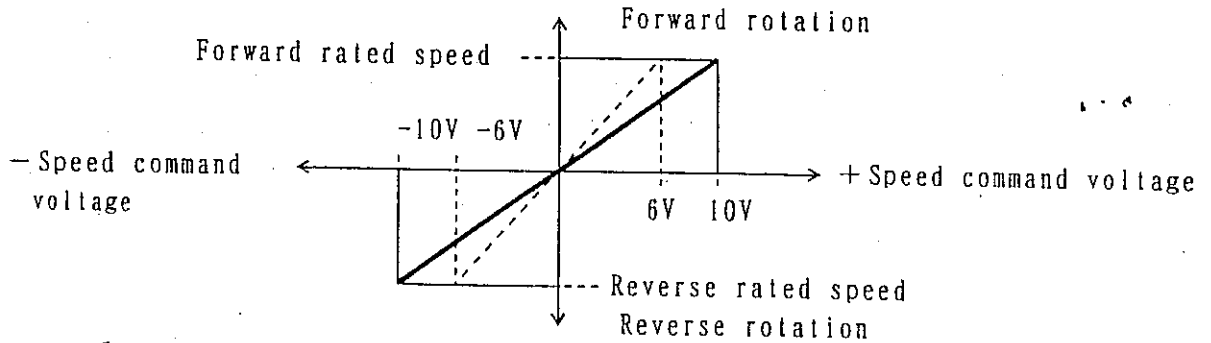
2. Time chart



[Fig. 6 − 3] Speed Control Run Time Chart

3. Relation of External speed command and Motor speed

- Motor speed is proportional to External speed command voltage, and rated speed is DC±10V.
  And by the parameter P124 「Speed command gain」, Motor rated speed command voltage can be set between DC±6V and ±10V.
- A motor runs forward by positive External speed command voltage.
  By the parameter P300 「Rotating direction selection」 setting, the motor can run reverse by positive External speed command voltage.

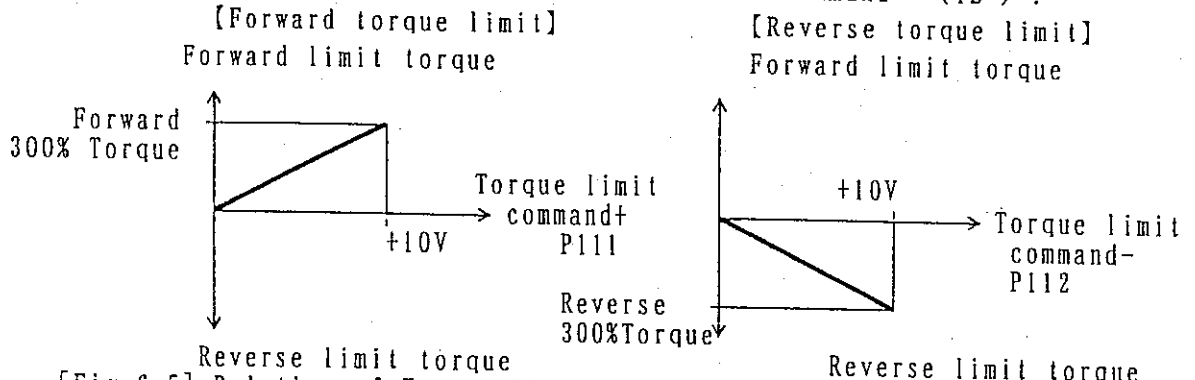


[Fig. 6 − 4] Relation of External Speed Command and Motor Speed

4. Relation of torque limit command and motor max. output torque

- In Speed control mode by Torque limit signal (TL) motor max.output torque is limited.
- When - 1 is set to the data of parameters P111 and P112 Torque limit value 2 (+/-), External torque limit command (TL+, TL-) becomes the limit value.

  When limit value 0～300 is set to the data of parameters P111 and P112 Torque limit value 2 (+/-), the set value becomes the limit value.
- When limit value data of parameters P109 and P110 Torque limit value 1 (+/-) is set lower than (TL+, TL-) or Torque limit value 2 (+/-) priority of output torque is Torque limit value 1.
- Motor max. output torque is proportional to External torque limit command, and 300% torque of both TL+ and TL- is DC+10V.
- Forward torque is limited by Torque limit command+ (TL+) and Reverse torque is limited by Torque limit command- (TL-).



[Fig.6-5] Relation of Torque Limit Command and Motor Max. Output Torque

● Motor max.output torque limit function by External torque limit command is effective in Speed control run and Pulse train run.

5. Field system control run(NPS－FI type only)

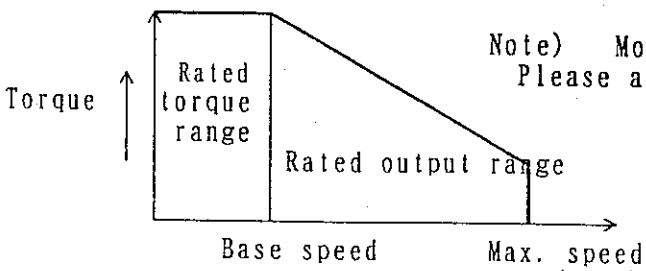
By the motor field system control, range larger than base rated speed can be achieved at constant torque.

Base rated speed is rated speed in constant torque range (peak torque output range).

In case of Field control run, base rated speed is determined by setting parameter P000 「Motor type」, and max. speed in constant output range is set by parameter P143 「Max. speed」.

When 999 is set to parameter P000, base speed shall be set to P022 「Rated speed(Field control base speed)」.

And when P143 is 「0」, Field control can not be conducted.



Note) Motor output depends on its type. Please ask our sales man.

[Fig. 6－6] Motor Torque－Speed Features (Forward, Reverse common features)

6 − 3 − 2 Torque control mode

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

1. Operation procedure

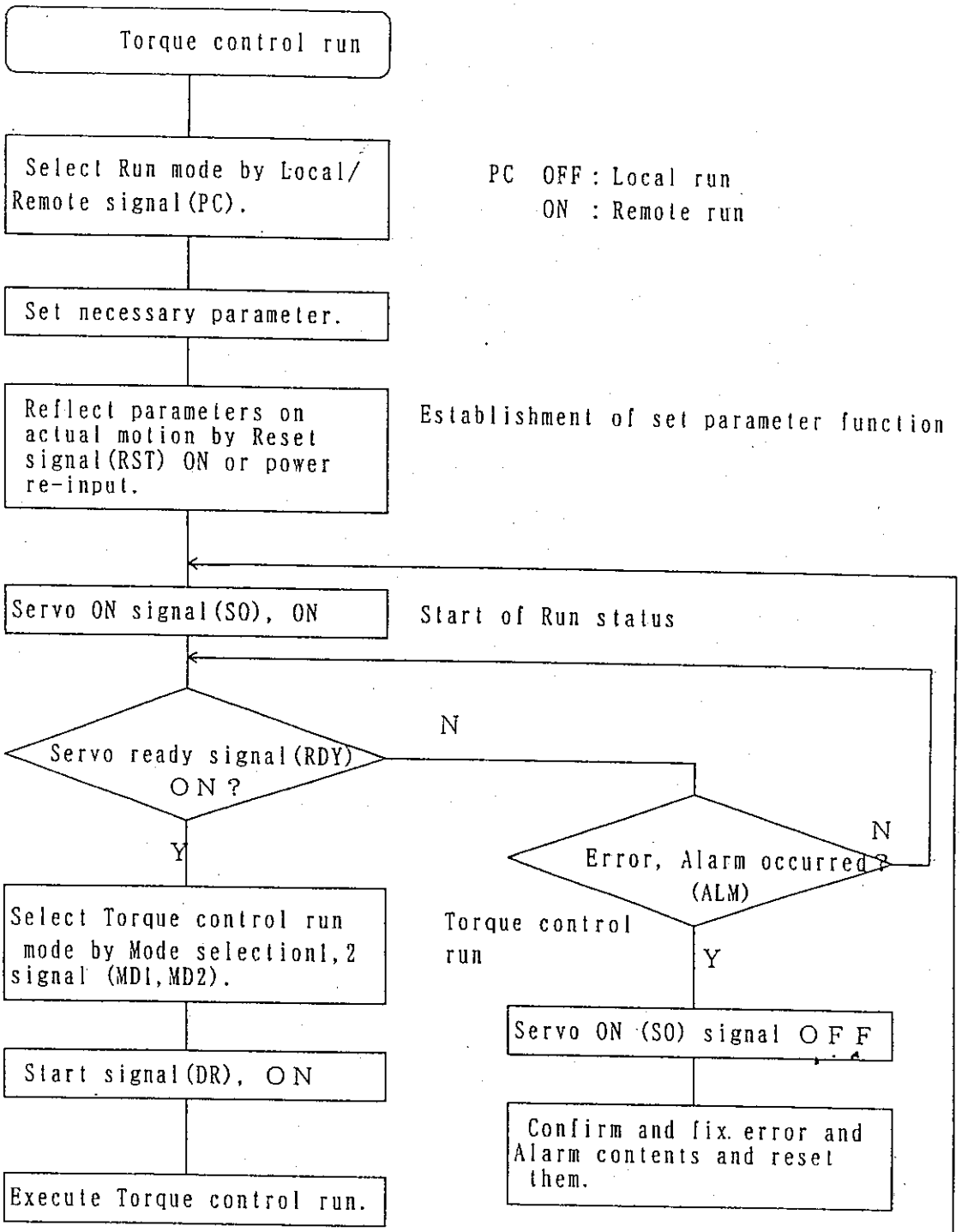
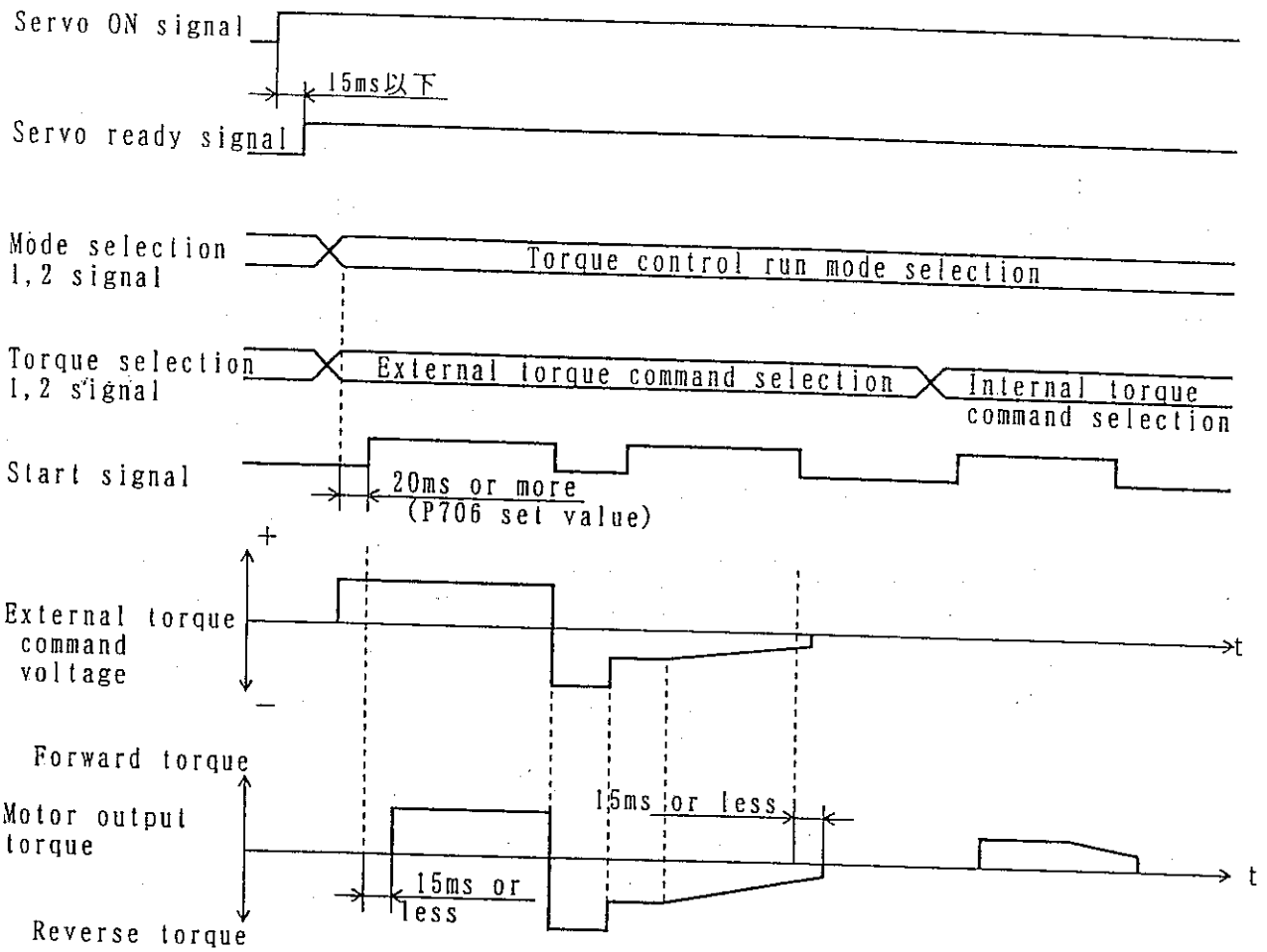


Fig. 6 − 7 Torque Control Run Operation Procedure

2. Time chart

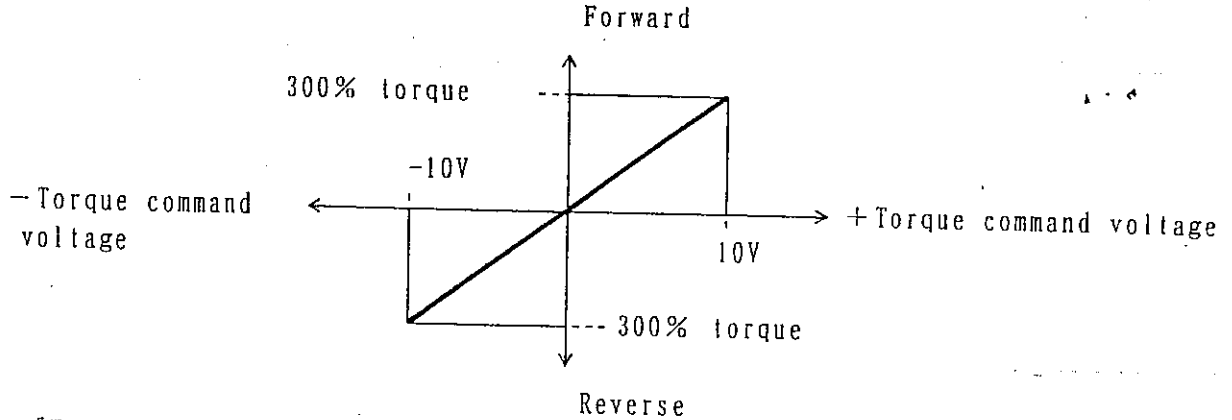


[Fig. 6 − 8] Torque Control Run Time Chart

3. Relation of External speed command and Motor torque

- Motor torque is proportional to External torque command voltage, and 300 % output torque is DC±10V (When rated torque is 100%.).
- A motor generates forward torque by positive External torque command voltage.

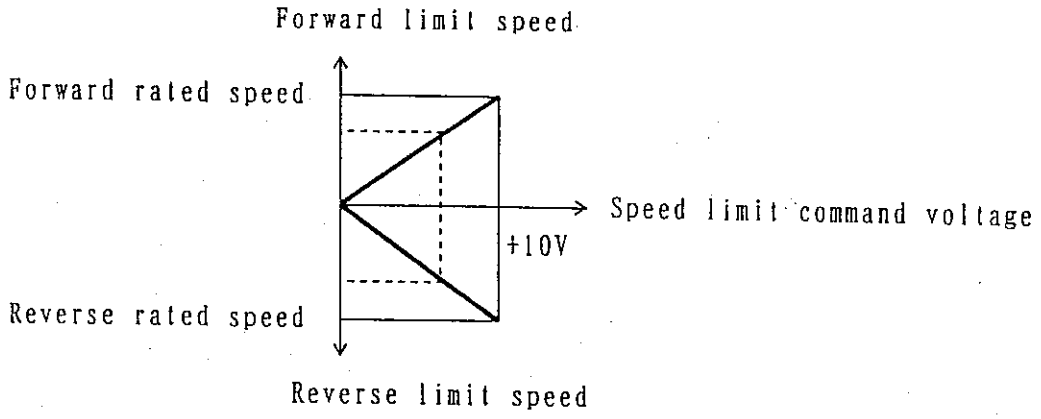
A motor generates reverse torque by negative External torque command voltage.



[Fig. 6 − 9] Relation of External Torque Command and Motor Output Torque

4. Relation of Speed limit command and Motor max. speed

- To depress increase of motor speed at low load , etc. in Torque control, Motor max. speed can be limited.
- Limit is lower value of External speed limit command (common to External speed command INH) value or parameter P128 「Speed limit value」 .
- Motor max. speed is proportional to External speed limit command value, and rated speed is DC±10V.
- External speed limit command and P128 「Speed limit value」 are common set to forward and reverse rotation.
- External speed limit command can be enabled/disabled by the parameter P127 「 External speed limit Enable/Disable selection」 .

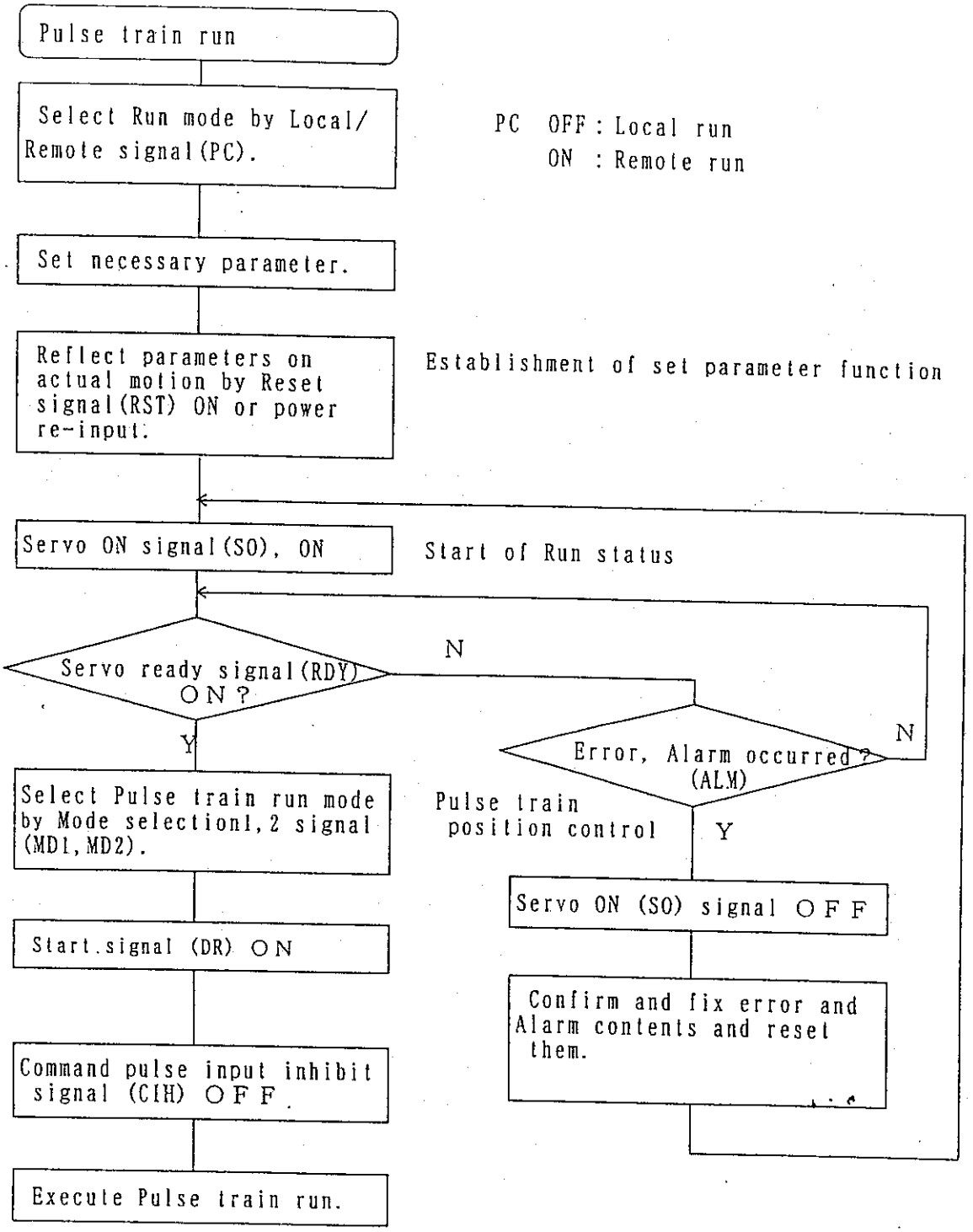


[Fig. 6 — 1 0] Relation of Speed Limit Command and Motor Speed

6 − 3 − 3　Pulse train position control motion

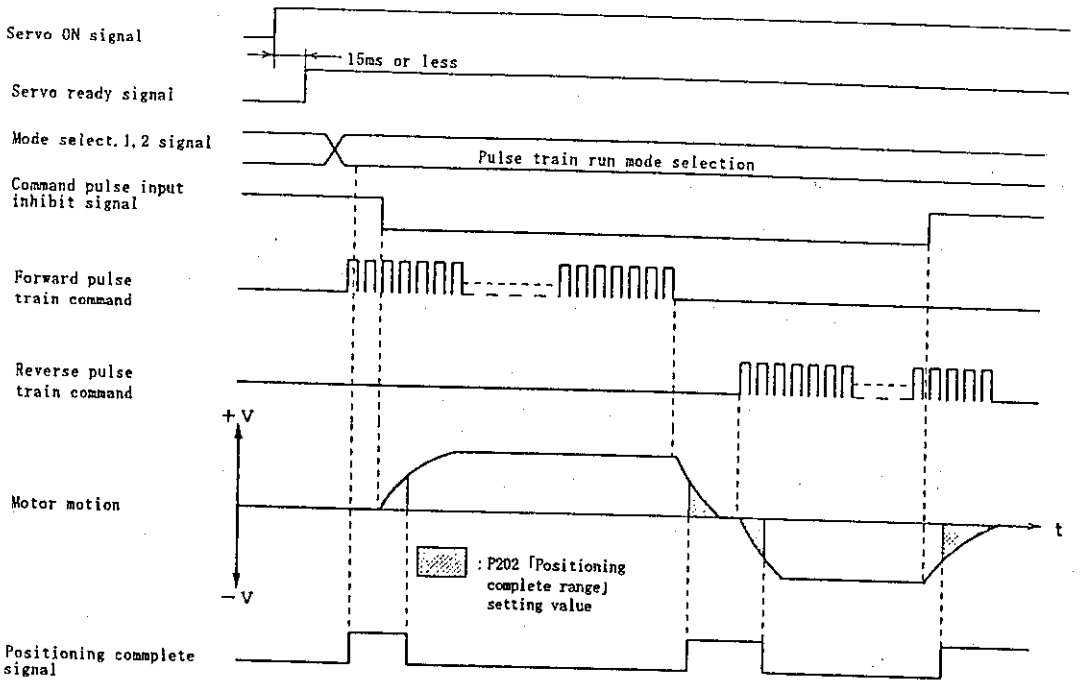
In Pulse train mode, Pulse train run is executed by Pulse train command.

1. Operation procedure



[Fig. 6 − 1 1] Pulse Train Run Operation Procedure

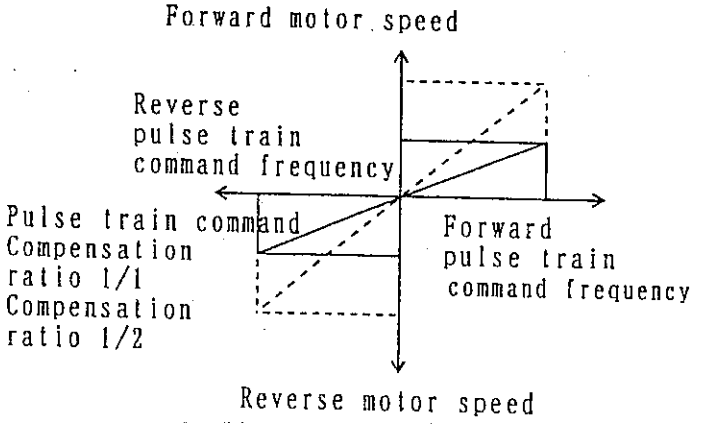
2. Time chart

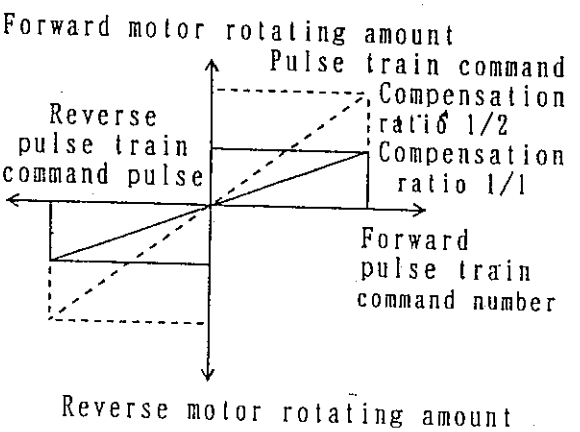


[Fig. 6 − 1 2] Pulse Train Run Time Chart

3. Relation of Pulse train command and Motor speed/ rotating amount

- Motor speed is determined by Pulse train command input frequency and P603/P604 「Pulse train command compensation Numerator/Denominator」. And motor rotating amount is determined by Pulse train command input pulse number and P603/P604 「Pulse train command compensation Numerator /Denominator」.
- A motor runs forward by Forward pulse train command (Directional pulse train command) or leading B phase pulse train command (90° different phase pulse train command).
  A motor can run reverse forward against Forward pulse command or B phase pulse train command (leading phase) by the parameter P300 「Rotating direction selection」 and P601 「Pulse train phase sequence selection」 set.





[Fig. 6 − 1 3] Relation of Pulse Train Command and Pulse Train Command Compensation

4. Selection of Pulse train command input

In Pulse train command, next pulse can be selected by P604 「Pulse train commandmagnification select.」.

① 90° phase different pulse input (1, 2, and 4 times can be selected) through FC, $\overline{FC}$, RC, and $\overline{RC}$ of CN1.

② Directional pulse input through FC, $\overline{FC}$, RC, and $\overline{RC}$ of CN1.

③ Directional signal + feed pulse input through FC, $\overline{FC}$, RC, and $\overline{RC}$ of CN1.

④ Pulse train communication input through J2.
As for Pulse train communication, please refer to the description of P608.

6 − 4 Run Procedure

Please operate the unit in accordance with the following procedure.
Be sure to conduct trial run. At the trial run, in order to avoid a trouble, at first run the unit without any load.
After confirming no fault, connect the unit to machine system and pay special attention not to induce any accident.

⚠ Danger

- Do not touch controller terminal blocks, carelessly. There is high voltage which is quite dangerous.
- Do not use the unit in the condition that the terminal block cover is removed. Otherwise, it may cause electric shock.
- Since residual voltage is left after power source is turned OFF, do not touch terminals and main circuit for 2 to 3 minutes. (Please confirm that the NPS-FI/FS*-401～402 front panel LED 「CHARGE」 is lit OFF and do the next step.)
- Power source ON/OFF shall be made after cautiously confirming safety.

6 − 4 − 1 Confirmation of power source voltage

Please confirm that the power source voltage for the controller and motor cooling blower satisfies the required specification.

6 − 4 − 2 Trial run

1. Separation of motor and load
   Disconnect a motor and machine system and make no load condition.
2. Servo ON signal (SON) OFF
   Before turning power source ON, turn OFF Servo ON signal (SON).
3. Power source ON
   When power source is turned ON, initial status is displayed in the front panel LCD module. (Refer to Fig. 4 − 2 「Initial status display」.)
4. Parameter set
   (1) Set P000 「Motor selection」, other parameters and Positioning data to meet actual application condition.
   (Refer to CHAPTER 4 「Setting and display」 and CHAPTER 5 「Parameter」.
   * Next parameters have to be set for trial run.

Parameter No.	Name	Reference
P000	Motor type	When setting No. (data) are selected within P000-001～998 range, standard motors can be chosen. In case of 999 input, dedicated motors shall be chosen, referring to 【Option set specification】 set P020～P059.
P001	Encoder type	
P002	Encoder pulse No.	

(2) To execute trial run, select 『Local mode』 by input signal (PC) 「Local/Remote selection」.

5. Reset signal (RST) ON (one shot)

(1) In order to reflect parameter values on actual motion, turn ON (one shot) Reset signal (RST) after inputting parameters.
(Motor and encoder parameter group 0 / ITEM 2000 are not reflected by Reset (RST). It can be conducted by power source ON-OFF reset.)

(2) During Reset signal (RST) is inputted, in the front panel LCD module (I/O signal display section)
RST is lit on.
(Refer to Fig. 6 − 1 「I/O signal status display」.

6. Confirmation of control input signal

(1) Turn ON/OFF all the control input signals except Servo ON signal (SON), and by ON/OFF status of the individual input display in the front panel LCD module (I/O signal display section), confirm if connection and logic of control input signals is correct.
(Refer to Fig. 6 − 1 「I/O signal status display」)

(2) As for selected No. of 1, 2, 3 signals (SS1, SS2, SS3) and speed data, confirm them by Diagnostic mode display.
(Refer to Tab. 4 − 4 Diagnostic mode display contents.)

7. Servo ON signal (SON) ON

(1) After confirming parameter set and control input signals, short-circuit over travel signal (FOT, ROT) , Emergency stop signal (EMG) and common, then turn Servo ON signal (SON) ON.
LCD module display FOT, ROT, EMG is lit off.
At the time, all the input signals shall be OFF.

(2) When Servo ON signal (SON) is ON, a motor is ready to generate torque and resisting torque to external force.
(3) If Alarm is displayed or a motor runs at the time when Servo ON signal (SON) is ON, investigate and remove the cause in accordance with CHAPTER 9 「Protective function」.

8. Run mode selection

(1) Select Run mode by Mode selection1, 2 signal (MD1, MD2).
(2) In case of selecting Torque control run, at no load condition, the motor runs at high speed at the time of Start signal (DR) is ON. Since it is quite dangerous, please set low speed to the parameter P128 「Speed limit value」.

9. Start signal (DR) ON

(1) By turning Start signal (DR) ON, the unit is ready to accept Speed, Torque, and Pulse train command.
(2) If Alarm is displayed or a motor runs at the time when Start signal (DR) is ON, investigate and remove the cause in accordance with CHAPTER 9 「Protective function」

10. Running motion confirmation

(1) Rotate a motor by low speed command, and check if speed is correct and there is neither abnormal vibration nor abnormal sound.
(2) Then change the command input and confirm motor speed changes proportionally to the command input.
(It is recommended to measure speed with a tachometer on the motor load shaft.)
(3) If in the above item, motor speed can not be increased or is not proportional to the command input, or motor vibration and abnormal sound occurs, investigate and remove the cause in accordance with CHAPTER 9 「Protective function」.
(4) In case of Positioning run, confirm if motor rotating amount is correct to command pulse number.
(It is recommended to mark on the motor load shaft to confirm position.)
(5) If in the above item, the motor rotating amount is not multiplied value by constant ratio or fluctuates, investigate and remove the cause in accordance with CHAPTER 9 「Protective function」.
(6) Running motion confirmation shall be conducted for both forward and reverse directions.

11. Load run

(1) After trial run in no load condition is completed, connect the motor to the machine system and conduct trial run.
(2) Load run shall be conducted after confirming the complete performance of Emergency stop, Over travel, etc..
(3) Inspect if abnormal sound, vibration, or heat is not generated.
(4) If the above trouble occurs or Alarm is displayed, investigate and remove the cause in accordance with CHAPTER 9 「Protective function」.
(5) Motor motion and load status can be confirmed by the display of the front panel LCD module (Status display mode).
(Refer to Tab. 4 − 3 「Status display mode display contents」.)

● Load inertia ratio to the motor inertia shall be within the specified range. Applied load GD^2 can be referred to 10-1 「Electric specification controller」.

6 − 5 Adjustment

Since this controller has Auto. tuning function, at first please set P101, P102, P105, and P106 by the function.
(When Speed gain select. (GSEL signal) is used, be sure to set P116 and P117.)
Auto. tuning operation can be conducted in accordance with 7-3 「Auto. tuning」.
Then adjust 6 − 5 − 2 「Adjustment method」 item 2～7.

6 − 5 − 1 Adjustment point for individual phenomenon (Parameter)

Individual parameter details and setting method can be referred to 5 − 2 「Parameter set」, 4 − 3 「Operation mode」, and 4 − 3 − 2 「Real time gain set」.

Phenomenon	Adjustment point (Parameter)
Motor vibrates in stop status.	P105 「Speed loop gain／Low speed gain range」 P106 「Speed loop integral time constant／Low gain range」 P107 「Speed loop derivative time constant／Low speed gain range」 P108 「Torque command filter frequency ／Low speed gain range」 Effective in Low speed gain range set by P100 P201 「Servo lock gain」 * Effective in Positioning complete range set by P202
Motor vibrates in running.	P101 「Speed loop gain」 P102 「Speed loop integral time constant」 P103 「Speed loop derivative time constant」 P104 「Torque command filter frequency」 P200 「Position loop gain」 * P605 「Pulse train feed forward ratio」 *
A motor vibrates when GSEL signal is ON.	P116 「Speed loop gain / at GSEL signal ON」 P117 「Speed loop integral time constant / at GSEL signal ON」 P118 「Speed loop derivative time constant / at GSEL signal ON」 P119 「Torque command filter frequency / at GSEL signal ON」
Over shoot and 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」 * P605 「Pulse train feed forward ratio」 * P211 「Acceleration time」 P214 「Deceleration time」
Over speed error occurs.	
Deviation over flow occurs.	P200 「Position loop gain」 * P207 「Over flow detection pulse」 * P605 「Pulse train feed forward ratio」 * P211 「Acceleration time」 P214 「Deceleration time
Position time is long.	P200 「Position loop gain」 * P202 「Positioning complete range」 * P605 「Pulse train feed forward ratio」 *
Motor speed does not increase to the rated speed against Speed command voltage 10V.	P124 「Speed command gain」
Motor rotates slowly at Speed command voltage 0 V.	P125 「Speed command offset」

* Pulse train command control item

[Tab. 6 − 3] Adjustment Point for Individual Phenomenon (Parameter)

6－5－2　Adjustment method

1. Speed loop gain

(1) Speed loop gain (P101／P105／P116)

- The larger the setting value is, the quicker the response is.
- Too large set causes vibration.
- Too low set makes response slow and motion unstable.

(2) Speed loop integral time constant (P102／P106／P117)

- The smaller the setting value is, the quicker the response is.
- Too low set causes vibration.
- Too large set makes response slow and motion unstable.

(3) Speed loop derivative time constant (P103／P107／P118) ※1

- When this is set, response becomes quicker.
- Smaller value works in the early stage of motion and larger value works on whole range and vibration occurs.

2. Torque command filter

(1) Torque command filter frequency (P104／P108／P119) ※1

- If machine resonance occurs, insert a filter to Torque command to fix.
- The larger the setting value is, the quicker the response is.
- Too low set makes response slow and motion unstable.

3. Position loop gain

(1) Position loop gain (P200)

- The larger the setting value is, the quicker the response is.
- Too large set causes over shoot, under shoot and vibration.
- Too low set makes Positioning time longer and Positioning accuracy wrong.

(2) Servo lock gain (P201)

- The larger the setting value is, the quicker the response is at Servo lock.
- Too large set causes vibration.
- Too low set makes Servo lock weak and stop position moves by external force.

4. Feed forward ratio

(1) Pulse train command feed forward ratio (P605)

- The larger the setting value is, the smaller time lag is to Pulse train command.
- Too large set causes over shoot, under shoot and vibration.
- Too low set makes Positioning time longer.

▒▒ is individual parameters in Speed zero range.
____ is individual parameters in GSEL siganl on.
※1 : Normally the initial value is used and adjustment is not required.

5. Gain adjustment

(1) Gain can be adjusted by using analog monitor (connector P 1) and observing the wave of Speed feedback in an oscilloscope.
Adjust Position loop and Speed loop gain parameters until so as to fix over shoot/under shoot and stop vibration.

● Conduct below adjustment in running status.
① Set a little bit low value to P200/P201 「Position loop gain」, and adjust P101 「Speed loop gain」 as high as possible unless a motor vibrates.
②Adjust to set the optimum value to P102 「Speed loop integral time constant」 and re-adjust P101 「Speed loop gain」 to find motor optimum motion.
③P203 「Speed loop derivative time constant」 is used when higher response is required to depress over shoot and under shoot. Too large set causes vibratio
④ Adjust P200 「Position loop gain」 as high as possible within the range where motor vibration, over shoot and under shoot does not occur.

● Conduct next adjustment in stop status.
① Copy setting value of the above running status to parameters in stop status
P201 ← P200 「Position loop gain」
P105 ← P101 「Speed loop gain」
P106 ← P102 「Speed loop integral time constant」
P107 ← P103 「Speed loop derivative time constant」
②If the motor vibrates after setting above, adjust P201/P105/P106/107 as the adjustment method in running status.

6. Speed adjustment

(1) In case of External speed command, motor speed becomes rated speed at Speed command input voltage DC±10V.
In case of using auxiliary power source or External power source, rated speed command could not be exactly DC±10V.
To get motor rated speed at rated speed command input, adjust the parameter P124 「Speed command gain」 value.
Speed input command voltage to the rated speed can be adjusted in DC±6～10V range by setting [6.00～10.00] to P124 「Speed command gain」.
In case of setting in [10.01～100.00] range, refer to 5－3 「Parameter specification」, P124.

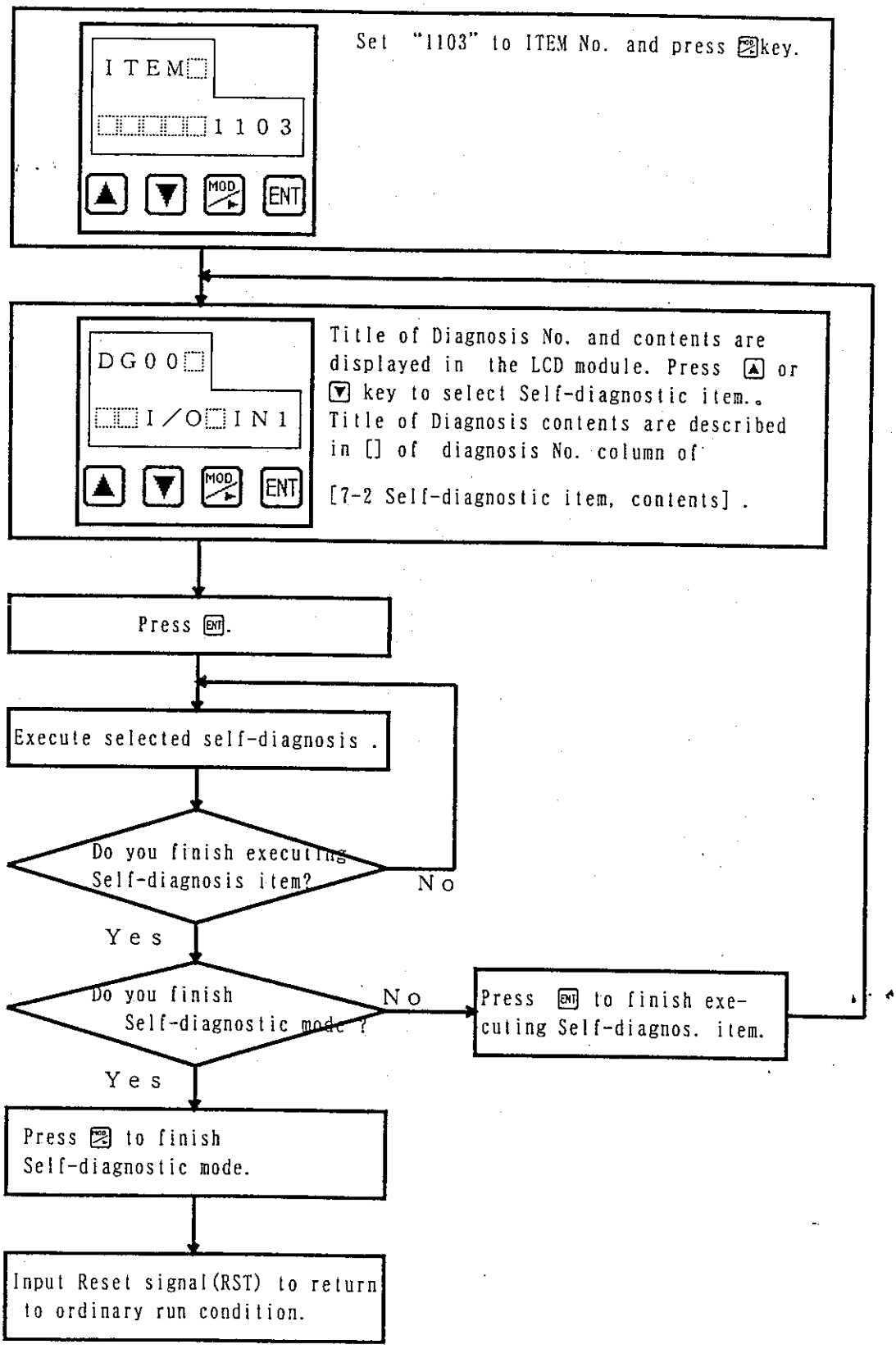
7. Speed command offset adjustment

(1) In case of External speed command, the motor could slightly rotate against Speed command input voltage 0V.
To stop the motor, adjust the parameter P125 「Speed command offset」 value.
(2) Also motors can be stopped by Start signal (DR) OFF.

CHAPTER 7 SELF-DIAGNOSIS

7 — 1 Self-diagnostic Operation Procedure

This unit is equipped with Self-diagnostic function to check external I/O and internal circuits. Self-diagnostic mode can be selected by keys on the front panel LCD module.
Self-diagnostic mode operation procedure is as follows.



[Fig. 7 — 1] Self-diagnosis Mode Operation Procedure

7－2 Self-diagnosis item, contents

Diag.No.	Diagnosis item	Diagnosis contents
DG00 DG01	Control input signal check 1	Displays control input signal status of connector CN1.
DG02	Pulse train command counter check	Displays the internal command counter action status (Command counter value) in the front panel LCD module by Pulse train command input.
DG03	Feedback pulse position counter check	Displays the internal feedback pulse counter action status (Feedback pulse counter value in the front panel LCD module by Encoder feedback pulse.
DG04	Feedback pulse speed detection counter check	Displays the internal speed detection counter action statues (Encoder feedback pulse frequency) in the front panel LCD module by Encoder feedback pulse.
DG05	Speed command input voltage check	Displays External speed command (Analog voltage) input voltage in the front panel LCD module.
DG06	Torque command input voltage check	Displays External torque command (Analog voltage) input voltage in the front panel LCD module.
DG07	Torque limit+ command input voltage check	Displays External torque limit+ command (Analog voltage) input voltage in the front panel LCD module.
DG08	Torque limit− command input voltage check	Displays External torque limit− command (Analog voltage) input voltage in the front panel LCD module.
DG09	Analog monitor 0V output check	Outputs 0V to Analog monitor terminals. (MON1, MON2).
DG10	Analog monitor +10V output check	Outputs +10V to Analog monitor terminals. (MON1, MON2).
DG11	Analog monitor −10V output check	Outputs -10V to Analog monitor terminals. (MON1, MON2).
DG12	Analog monitor +5V output check	Outputs +5V to Analog monitor terminals. (MON1, MON2).
DG13	Analog monitor −5V output check	Outputs -5V to Analog monitor terminals. (MON1, MON2).
DG14	Control input signal check 2	Un-used
DG15～ DG22	Digital switch input signal check	Un-used
DG30	Thermister input check	This item is for our factory adjustment of this unit at shipment.
DG50	RAM check	Confirms if the internal RAM is normal by conducting Read/Write. The results are displayed in the front panel LCD module.
DG51	Control output signal check 1	Outputs Control output signal of CN1 in turns. Output status is displayed in the front panel LCD module.
DG52	Serial communication I／F check	Confirms if transmission/receipt is normal by short-circuiting TXD(A)−RXD(A), TXD(B)−RXD(B), and RXD(A)−RLR(A) of J1. Results are displayed in the front panel LCD module.
DG53	Control output signal check 2	Un-used
DG55	Display unit output	Un-used
DG56	EEPROM check	Confirms if the internal EEPROM (none-volatile memory) is normal by conducting Read/Write. The results are displayed in the front panel LCD module.

[Tab. 7－1 (a)] Self-diagnosis Item (1/2)

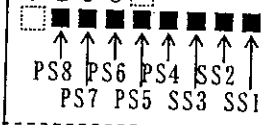
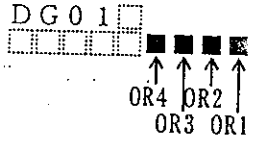
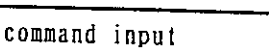
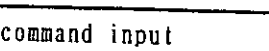
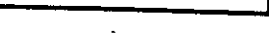
Diag.No.	Diagnosis item	Diagnosis contents
DG57	Pulse train communication transmission check	It conducts transmitted data check by Pulse train communication throughconnector J2. DG 58 is used together for the check.
DG58	Pulse train communication receipt check	It conducts received data check by Pulse train communication through connector J2. DG 57 is used together for the check.
DG90	Trial run	This item is for our factory adjustment of this unit at shipment. Never execute this.
DG91～DG95	DCCT offset adjustment	This item is for our factory adjustment of this unit at shipment. Never execute this.
DG97	Auto. tuning at GSEL signal ON	It automatically sets Speed loop gain when GSEL signal is ON.
DG98	Auto. tuning	It automatically sets Speed loop gain. (When GSEL signal is OFF.)

[Tab. 7－1 (b)] Self-diagnosis item (2/2)

⚠ Caution

① Self-diagnosis items DG90～95 are for our factory adjustment of this unit. Never execute this.

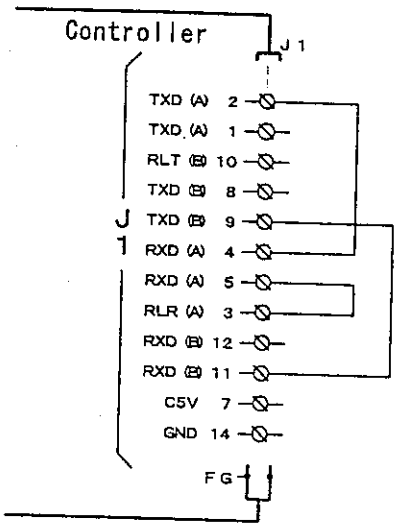
Self-diagnosis item contents

Diagnosis No.	LCD display in execution	Diagnosis contents
Control input signal check 1		When Control input signal of connector CN1 is ON, input signal name in LCD module signal display section is lit. When Diagnosis No. is DG00, individual signal data of [PS8]～[PS4], [SS3]～[SS1] are displayed by bit in the data display position. When Diagnosis No. is DG01, individual signal data of [OR4]～[OR1] are displayed by bit in the data display position. Individual bit display is 「1」 when the signal is ON, and 「0」 when the signal is OFF. Rule of ON/OFF can be referred to3-4-2 「Input/ Output interface」.
DG00 [__I/O_IN1]	DG00□ 	
DG01 [__I/O_IN2]	DG01□ 	
Pulse train command counter check		Displays internal counter value of Pulse train command. When 90° different phase pulse is inputted, Counter value is displayed by 4 times value of the input pulse. Display range is 0～65535 and value increases at forward command.
DG02 [_PLS.REF.]	DG02□ 	
Feedback pulse position counter check		Displays internal position counter value of Encoder feedback pulse. Counter value is displayed by 4 times value of the input pulse. Display range is 0～65535 and value increases at forward command.
DG03 [__ENC.FB.]	DG03□ 	
Feedback pulse speed detection counter check		Displays internal speed detection counter value of Encoder feedback pulse. Counter value is displayed by 4 times value of the input pulse. In left Fig.「★」, a mark (In reverse motion :「−」) is displayed.
DG04 [SPD.COUNT]	DG04★ 	
Speed command input voltage check		Displays External speed command input voltage. In left Fig.の「★」, a mark (Negative voltage:「−」) is displayed.
DG05 [_SPD.REF.]	DG05★ 	
Torque command input voltage check		Displays External torque command input voltage. In left Fig.の「★」, a mark (Negative voltage:「−」) is displayed.
DG06 [_TRQ.REF.]	DG06★ 	
Torque limit+ command input voltage check		Displays External torque limit+ command input voltage. In left Fig.の「★」, a mark (Negative voltage:「−」) is displayed.
DG07 [_TRQ.LIM+]	DG07★ 	
Torque limit− command input voltage check		Displays External torque limit− command input voltage. In left Fig.の「★」, a mark (Negative voltage:「−」) is displayed.
DG08 [_TRQ.LIM-]	DG08★ 	

Diagnosis No.	LCD display in execution	Diagnosis contents
Analog monitor 0V output check		Outputs 0V to Analog monitor output terminals. (MON1, MON2).
DG09 [_A.MON.0V]	DG09□ □□□□0.00	
Analog monitor+10V output check		Outputs +10V to Analog monitor output terminals. (MON1, MON2).。
DG10 [A.MON+10V]	DG10□ □□□10.00	
Analog monitor−10V output check		Outputs -10V to Analog monitor output terminals. (MON1, MON2).
DG11 [A.MON-10V]	DG11− □□□10.00	
Analog monitor+5V output check		Outputs +5V to Analog monitor output terminals. (MON1, MON2).
DG12 [A.MON.+5V]	DG12□ □□□□5.00	
Analog monitor−5V output check		Outputs -5V to Analog monitor output terminals. (MON1, MON2).
DG13 [A.MON.-5V]	DG13− □□□□5.00	
control input signal check2		Un-used
DG14 [___EXT.IN]	DG14□ □00000000	
Digital switch input signal check		Un-used
DG15 [__DIG.SW1]	DG15− □FFFFFFFF	
≀	≀	
DG22 [__DIG.SW8]	DG22− □FFFFFFFF	

Diagnosis No.	LCD display in execution	Diagnosis contents
Thermister input check		This item is for our factory adjustment of this unit at shipment.
DG30 [_THERMIST]	DG30□ ■■■■■■■■	
RAM check		Checks unit internal RAM and displays Diagnosis results shown in the next tabulation.
DG50 [_____RAM]	DG50□ □□RUNNING	

Display	Diagnos. results	Error contents
[_____OK!!]	Normal	
[_ERROR1!!]	Error No.1	Data「0000」Read/Write error
[_ERROR2!!]	Error No.2	Data「5555」Read/Write error.
[_ERROR3!!]	Error No.3	Data「AAAA」Read/Write error.
[_ERROR4!!]	Error No.4	Data「FFFF」Read/Write error.

Control output signal check1		Control output signals of connector CN1 are ON every 2 minutes in next turns. (Alarm and Warning signal output logic is determined by the parameter [P715].) During an output signal is ON, the output signal name in the LCD module signal display is lit. And in the left Fig.「■■■」, the output signal name is displayed.
DG51 [_I/O_OUT]	DG51□ □■■■□ON!!	Start → Alarm (ALM) → Warning (WNG) → Servo ready (RDY) → Speed zero (SZ) → Positioning complete (PN) → Rough matching (PRF) → Brake release (BRK) → In Speed/Torque limit (LIM) ↑
Serial communication I／F check		A Normal stop,「□□□□□□OK!!」, and at Abnormal stop,「□□ERROR!!」is displayed.
DG52 [_S.COMM.]	DG52□ □□RUNNING	 Before executing, short-circuit TXD(A)－RXD(A), TXD(B)－RXD(B), and RXD(A)－RLR(A) of connector J3. Wiring is as the above.
Ccontrol output signal check2		Un-used
DG53 [_EXT.OUT]	DG53□ □□□NO□I／F	

<table>
<tr><th>Diagnosis No.</th><th>LCD display in execution</th><th>Diagnosis contents</th></tr>
<tr><td colspan="2">Display unit output check</td><td>Un-used</td></tr>
<tr><td>DG55
[EXT.DISP.]</td><td>DG55□
□□□NO□I/F</td><td></td></tr>
<tr><td colspan="2">EEPROM check</td><td>Checks unit internal EEPROM and displays Diagnosis results shown in the next tabulation.
<table><tr><th>Display</th><th>Diagnos. results</th><th>Error contents</th></tr><tr><td>[_____OK!!]</td><td>Normal</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>Return to Original data error.</td></tr></table></td></tr>
<tr><td colspan="2">Pulse train communication transmission check</td><td>It transmits data every 0.5 second in the below described sequence by Pulse train communication through connector J2.
And in the left figure 「■■■■■」, numbers corresponding to transmitted data are displayed.
Start → 00000 → 11111 → 22222 → 33333 ← 44444 ← 55555</td></tr>
<tr><td>DG57
[_PLS.TRS.]</td><td>DG57□
□□□□■■■■■</td><td></td></tr>
<tr><td colspan="2">Pulse train communication receipt check</td><td>It receives data by Pulse train communication through connector J2.
To conduct this check, connection of NCS-FI/FS or other NPS-FI/FS which data are transmitted by DG56 is required.
Received data are transmitted data by DG57 from NCS-FI/FS or other NPS-FI/FS.
Diagnosis results of received data are displayed as below.
<table><tr><th>Display</th><th>Diagnosis results</th><th>Abnormal contents</th></tr><tr><td>[_____OK!!]</td><td>Normal end</td><td></td></tr><tr><td>[_SUM.ERROR]</td><td>Abnormal end</td><td>Sum check of communication data is abnormal.</td></tr><tr><td>[_TIME.OVER]</td><td>Abnormal end</td><td>Communication data could not be received at all.</td></tr></table></td></tr>
<tr><td>DG58
[_PLS.RCV.]</td><td>DG58□
□□□RUNNING</td><td></td></tr>
<tr><td colspan="2">Trial run</td><td>This item is for our factory adjustment of this unit at shipment. Never execute this.
Otherwise, a motor starts to run and it is dangerous.</td></tr>
<tr><td>DG90
[TST.DRIVE]</td><td>DG90□
■■■■■■■■■</td><td></td></tr>
<tr><td colspan="2">DCCT offset adjustment</td><td>This item of the unit was already adjusted at our factory at shipment.
Never change the setting unit.</td></tr>
<tr><td>DG91 ~ DG95</td><td></td><td></td></tr>
</table>

Diagnosis No.	LCD display in execution	Diagnosis contents
Auto. tuning		This item has the function to measure load characteristics (machine system) and set suitable servo control parameters automatically when GSEL signal is ON. Refer to [7-3 Auto. tuning] and operate this unit.
DG97 [_AUTOTUNE]	DG97□ □□RUNNING Displayed in Test run ↓ DG97□ CALCULATE Displayed in calicu-lating of parameter	
Auto. tuning		This item has the function to measure load characteristics (machine system) and set suitable servo control parameters automatically when GSEL signal is ON. Refer to [7-3 Auto. tuning] and operate this unit.
DG98 [_AUTOTUNE]	DG98□ □□RUNNING Displayed in Test run ↓ DG98□ CALCULATE Displayed in calicu-of parameter	

7 — 3 Auto. tuning

Auto. tuning is the function that unit itself sets or supports to set servo control parameters adequate to machine system (motor load).
Auto. tuning consists of 2 functions, 「Auto. tuning function」 and 「Tuning level adjustment function」 .
Auto. tuning function is the function to determine adequate servo control parameter values, referring to response of the machine system by running a motor in Test run.
Tuning level adjustment function is the function to support more adequate servo control parameter setting to the machine system by increasing or decreasing gain depending on machine characteristics measured by Auto. tuning function.
And the unit has servo control parameter switching function (GSEL signal select.), and Auto. tuning for 2 motor load conditions corresponding to this function can be conducted.

⚠ Caution

① Since in Auto. tuning function run, a motor shaft rotates in accordance with the set of parameters [P113], [P114], please confirm the load machine can move in the range. And if Over travel signal (FOT*/ROT*) is not connected, this function is error status. (By the parameter [P705] setting, FOT*, ROT* can be disabled.)
② In Auto.tuning function run, signal input other than FOT*, ROT* is invalid. Reset signal (RST) , Emergency stop signal (EMG*) , etc. can not stop the function.
③ If vibration or other trouble occurs in Auto. tuning function run, immediately stop the run by [SET] key.
And when the run is stopped, the motor becomes free and runs by the inertia.
④ In the following cases, Auto. tuning function can not calculate correct gain, and may cause oscillation or runaway. In the case, please set the gain manually,
(1) Un-even load is large.
(2) Friction is large.
(3) Load inertia fluctuates.
(4) load machine rigidity is low.
(5) Looseness or backlash exists in the load machine,
(6) Load inertia is 3 times or less of the motor inertia.

❗ Compulsion

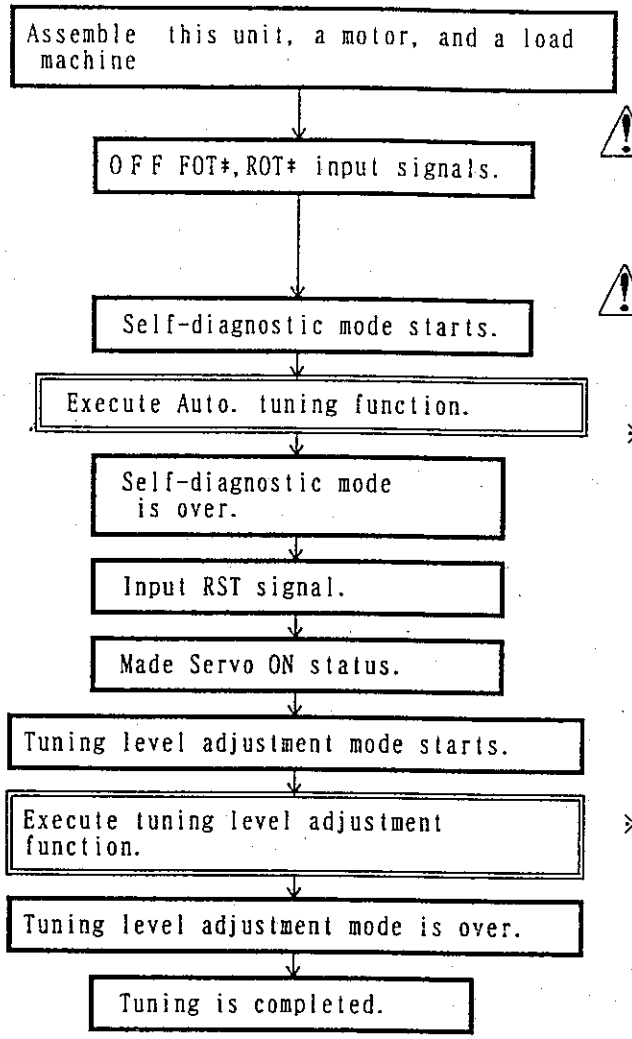
① Auto. tuning function and tuning level adjustment function calculate optimum Speed loop gain based on the measured load characteristics.
After executing Auto.tuning function and tuning level adjustment function, if load changes by the load machine fine adjustment, etc. , be sure to repeat Auto. tuning function and measure the load characteristics, again. If this is not conducted against load change, the load machine may cause oscillation or runaway.

⃠ Inhibition

① Please do not conduct Auto. tuning to the motor shaft with consistent external side force. If Self-diagnosis is selected when Auto. tuning function is executed, a motor becomes in Torque free and driven by external torque.

7 − 3 − 1　Auto. tuning operation procedure

Auto. tuning operation procedure is as follows.



⚠ In Auto. tuning function run, only FOT*, and ROT* input signals are effective. RST, EMG*, etc. can not stop. (Parameter [P705] can disable FOT* and ROT*)

⚠ Do not start Self-diagnostic function other than Auto. tuning function, carelessly.

※Refer to [7-3-2 Auto. tuning function] .

※ Refer to [7-3-3 tuning level adjustment function] .

[Fig. 7 − 2]　Auto. Tuning Operation Procedure

7 − 3 − 2 Auto. tuning function

Auto. tuning is operated by Diagnosis numbers, DG97 and DG98 of Self-diagnostic mode.

● DG 98 measures machine characteristics in Test run, and sets adequate values to the following servo control parameters.
Therefore, be sure to connect a motor and load before executing DG98.

No.	Parameter name	Reference
P101	Speed loop gain	Sets adequate value.
P102	Speed loop integral time constant	Sets adequate value.
P103	Speed loop derivative time constant	Sets 0 (Normally 0 is adequate value.)
P105	Speed loop gain / Low speed gain range	Same setting value to P101
P106	Speed loop integral time constant / Low speed gain range	Same setting value to P102
P107	Speed loop derivative time constant / Low speed gain range	Same setting value to P103
P139	Speed loop proportional gain division ratio	Sets 0 (Normally 0 is adequate value.)
P140	Inertia	Sets adequate value.
P141	Viscosity friction	Sets adequate value.
P142	Speed loop FF2 compensation ratio	Sets 0 (Normally 0 is adequate value.)

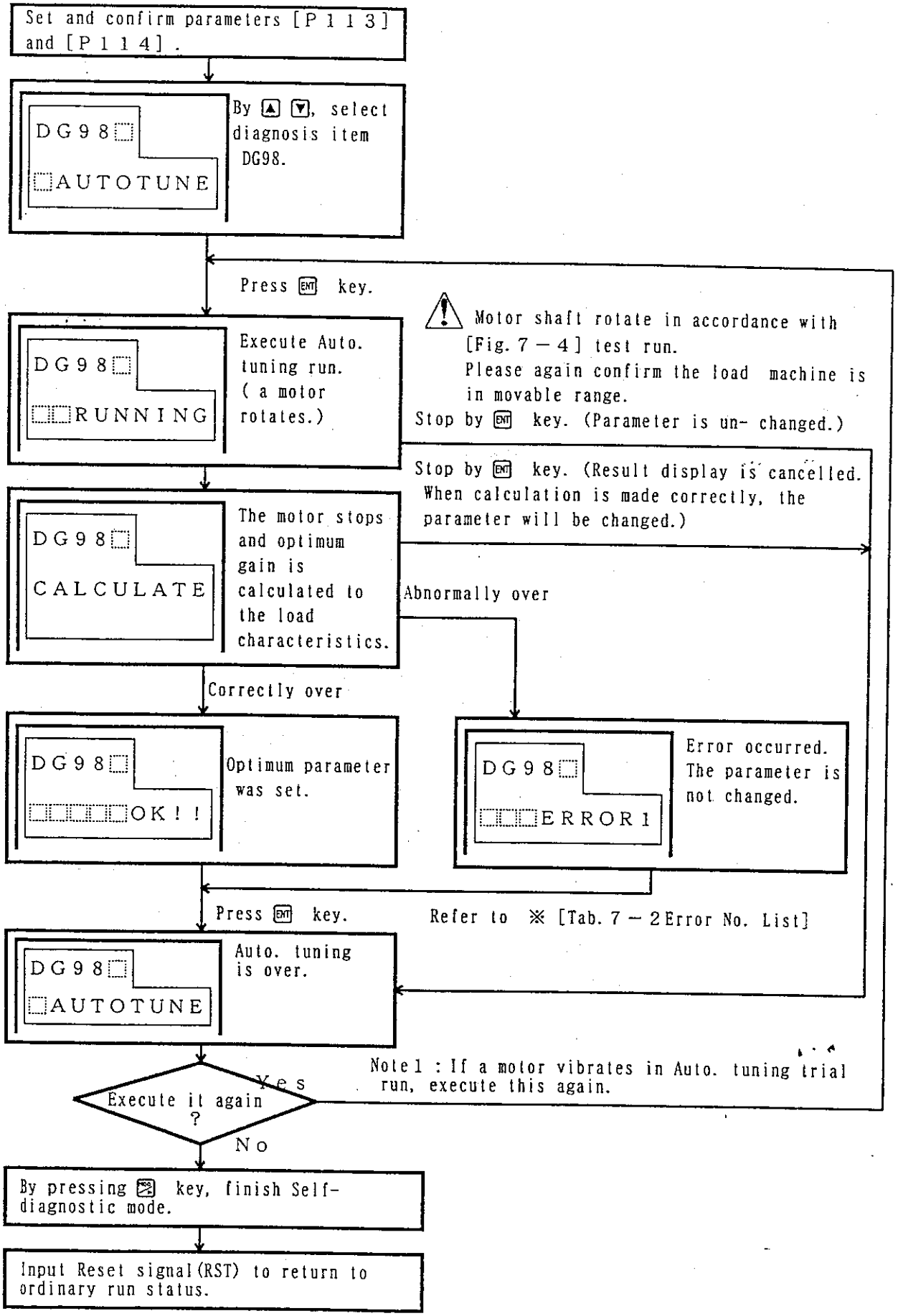
● DG97 sets following servo control parameters when GSEL signal is ON.
Therefore, since machine characteristics are measured in Test run, be sure to connect a motor and load at GSEL signl ON before executing DG97.

No.	Parameter name	Reference
P116	Speed loop gain / at GSEL signal ON	Sets adequate value.
P117	Speed loop integral time constant / at GSEL signal ON	Sets adequate value.
P118	Speed loop derivative time constant / at GSEL signal ON	Sets 0 (Normally 0 is adequate value.)

And when the load machine is changed, or load characteristics changed, etc., **be sure to measure the load characteristics, again by Auto. tuning function.**
Auto. tuning function can set optimum gain when the load inertia is within 3～30 times range of the motor inertia. If the load inertia exceeds 30 times, gain will be set a little bit low. In the case, adjust tuning level adjustment function, confirming safety.

1) Auto. tuning function operation procedure

Operation procedure in Auto. tuning function is as follows. (DG 97 operation is identical.)



[Fig. 7 − 3] Auto. Tuning Function Operation Procedure

2) Parameter setting

Before executing Auto. tuning function, set and confirm parameters [P113] and [P114].

[P113] Auto. tuning trial run direction selection

1. function

It sets motor trial run direction in Auto. tuning function run.

- ●BOTH : The motor first run forward and then reverse.
- ●+ONLY : The motor rotates only forward.
- ●−ONLY : The motor rotates only reverse.

Normally select "BOTH". Forward or reverse shall be applied to a load machine which can move one direction only.

And since rotating direction reverses by the parameter [P300 Rotating direction selection], please note it.

2. Unit and setting range

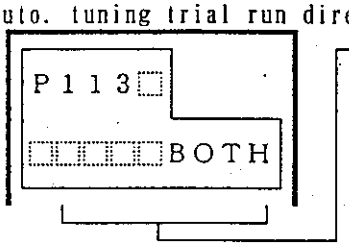
(1) Unit : Menu selection

(2) Setting range : BOTH/+ONLY/−ONLY

(3) Initial value : BOTH

3. display

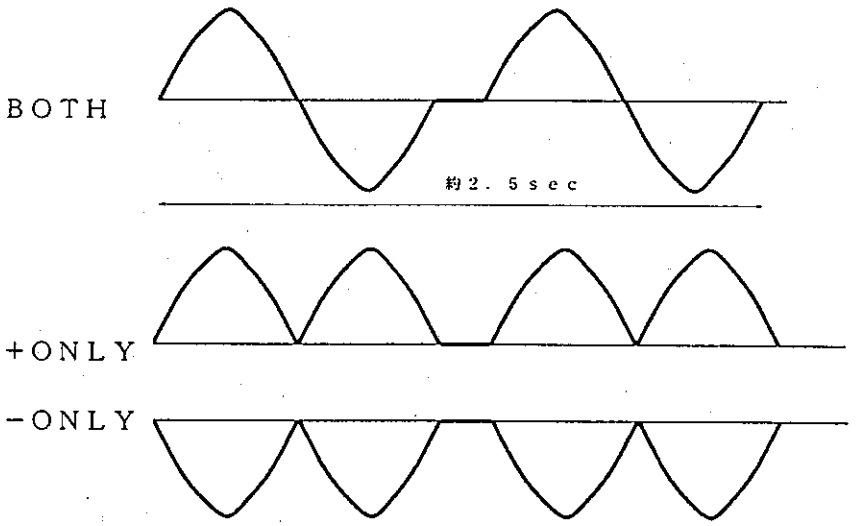
[Auto. tuning trial run direction selection]



Auto. tuning test run direction is displayed in turns. (BOTH/+ONLY/-ONLY)

Left Fig. shows selection of both directions.

Motion pattern in Auto. tuning trial run is as follows.



[Fig. 7−4] Auto. Tuning Motion Pattern

[P 1 1 4] Auto. tuning trial run speed ratio

1. Function

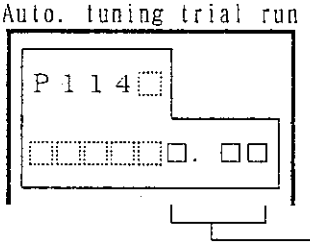
It sets motor trial run speed by ratio of rated speed in Auto. tuning function run.
When 0. 0 0 is set, the motor does not rotates and an error occurs.
When 1. 0 0 is set, the motor rotates at rated speed.
Normally set initial value. And since by this parameter motor rotating amount changes, please note it.

2. Unit and setting range

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

3. display

[Auto. tuning trial run speed ratio]



—Auto. tuning trial run speed ratio is displayed.

⚠ Caution

Motor rotating amount depends on parameters [P 1 1 3] and [P 1 1 4] values as follows. Before executing Auto. tuning function, confirm that the load machine is in the movable range.

(1) Case: P 1 1 3 "BOTH"

(Motor shaft amount [rotation])=(P 1 1 4 set value)×(Rated speed)×0.003

[Sample] P 1 1 4 is 0.30, rated speed is 3000rpm

(Motor shaft amount [rotation])=0.30×3000×0.005=4.5[rotation]

First the motor rotates forward about 4.5 turns and then reverse about 4.5 turns, also.

(2) Case:e P 1 1 3 "+ONLY" or "−ONLY"

(Motor shaft amount [rotation] motor])=(P 1 1 4 set value)×(Rated speed)×0.020

[Sample] P 1 1 4 is 0.30, rated speed is 3000rpm,

(Motor shaft amount [rotation]])=0.30×3000×0.020=18[rotation]

The motor rotates forward or reverse about 11 turns.

(3) Reference

As reference sample case that P 1 1 4 is 0.30 (initial value) is shown.

rated speed	P 1 1 3 setting		
	BOTH	+ONLY	−ONLY
2000	Both directions 3 turns	Forward 12turns	Reverse 12turns
3000	Both directions 4.5 turns	Forward 18turns	Reverse 18turns
4000	Both directions 6 turns	Forward 24turns	Reverse 24turns

3) Auto. tuning error

It shows errors in Auto. tuning function run.

Error No.	Contents
ERROR1	Measured data were 0. Please confirm P114 is not 0.00 and execute it.
ERROR2	Speed loop integral time constant P102 and P117 were out of the range. Auto. tuning can not be conducted. Set the parameters manually.
ERROR3	Measured data were abnormal, .confirm that looseness, etc. does not exist in the load machine.
ERROR4	Either FOT* or ROT* stopped it.

[Tab. 7 − 2] Error No. List

7－3－3 Tuning level adjustment function

Tuning level adjustment function is executed by 〈Tuning level adjustment mode〉. 〈Tuning level adjustment mode〉 can be conducted after Auto. tuning function is executed. And even after Auto. tuning function is executed, if load changes, please execute Auto. tuning function, again.

Tuning level adjustment mode is selected by the following items.

- Please judge gain is high or low when GSEL signal is ON, and set adequate value to the following servo control parameters by ITEM NO.「3468」. At the time, please adjust them, watching actual response of a machine.

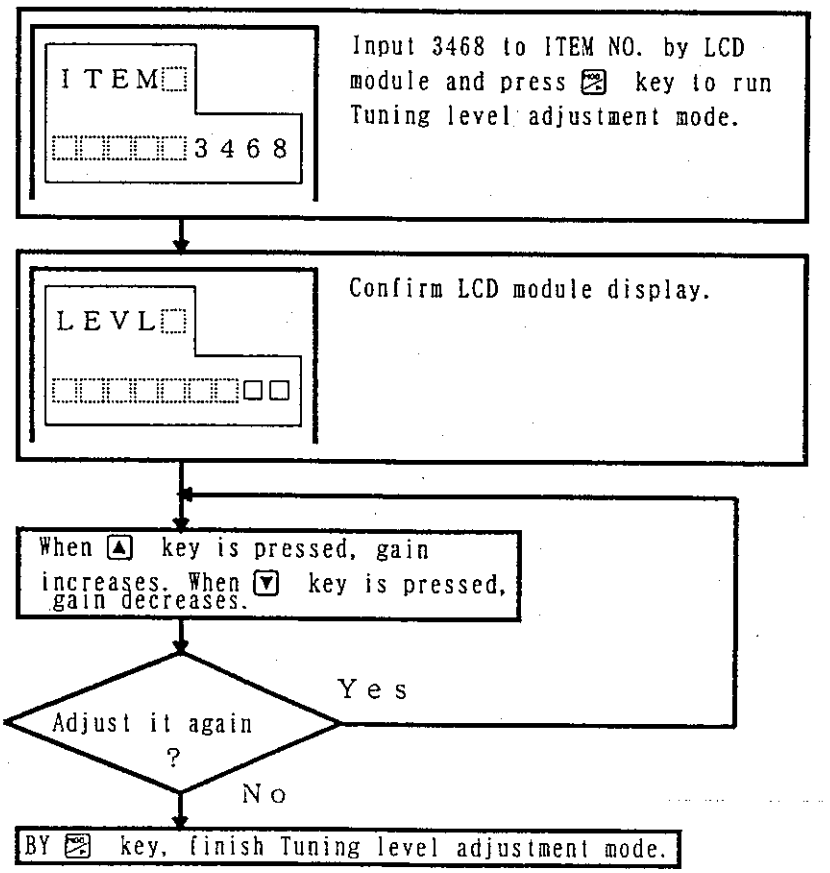
No.	Parameter name	Reference
P101	Speed loop gain	Sets adequate value.
P102	Speed loop integral time constant	Sets adequate value.
P105	Speed loop gain / Low speed gain range	Same setting value to P101
P106	Speed loop integral time constant / Low speed gain range	Same setting value to P102

- Judge whether gain is stronger or weaker, and please set suitable value to the servo control parameter by ITEM No.「3467」. At the time, turn GSEL ON and adjust gain by watching machine response.

No.	Parameter name	Reference
P116	Speed loop gain / at GSEL signal ON	Sets adequate value.
P117	Speed loop integral time constant / at GSEL signal ON	Sets adequate value.

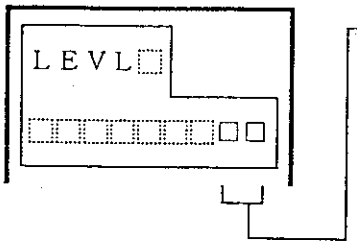
1) Tuning level adjustment function operation procedure

Operation in Tuning level adjustment function run is as follows. (ITEM「3467」operation is identical.).



[Fig. 7－5] Tuning Level Adjustment Function Operation Procedure

2) Display in Tuning level adjustment mode



Current gain is shown.
The rangeは is 3～50, 48 steps.
The smaller the value is, the lower the gain is.
The larger the value is, the higher the gain is.

By pressing ▲ key, level numeric value increases i.e. gain becomes high.
By pressing ▼ key, level numeric value decreases i.e. gain becomes low.

CHAPTER 8 MAINTENANCE

Though our controller and motors are maintenance free, in order to prevent them from unexpected troubles caused by unit circumstances change, etc., periodic inspection is recommended.

⚠ Caution

- During conducting maintenance, the worker in charge should confirm power ON/OFF status by himself.
- Even though power supply is shut OFF, since high voltage is charged in main circuit condensors, please resume work 3minutes or more after shutting OFF (In case of NPS-FI/FSM*-401～402, confirm front panel LED display 「CHARGE」 is lit OFF).
- Never conduct an insulation test with a megger tester because it may damage the controller. In case of measuring insulation of a motor, first disconnect cables (U,V,W) between the motor and controller, completely and conduct it.

8－1 Daily Inspection

Conduct daily inspection of the following items.

【Inspection item】

(1) Inspect if the motor runs correctly.
(2) Inspect if the installation circumstances is normal. (Power source, temperature, humidity, dust, etc.)
(3) Inspect if codling system is normal.
(4) Inspect if Regenerative resistor, etc. are normal.
(5) Inspect if terminals and connectors are not loose.
(6) Inspect if there is no abnormal sound or vibration.
(7) Inspect if there is no over heat or discoloration.

8－2 Periodic inspection

Inspect the following items periodically after routine operation or certain period (Every 6 months , 1 year).

【Inspection item】

(1) Inspect if there is no loose load connection, loose belt, large shaft key backlash, or abnormal bearing sound.
(2) Inspect if the installation circumstances is normal. (Power source, temperature, humidity, dust, etc.)
(3) Inspect if codling system is normal.
(4) Inspect if Regenerative resistor, etc. are normal.
(5) Inspect if terminals and connectors are not loose.
(6) Inspect if there is no abnormal sound or vibration.
(7) Inspect if there is no over heat or discoloration.
(8) Inspect if there is no alien substance or dust lamp.
(9) Inspect if cables are free from flaws and fatigue.
(10) Inspect the control cabinet radiation fans, clean air filters and inspect or replace relays, etc. .

8 − 3 Other inspection

8 − 3 − 1 Gear

It is necessary to supply and replace oil of gears of geared motors.
Replace oil every 3,000 hours.
Since lubricating oil has very important function , use only designated type.
(Never use machine oil, engine oil, etc. .)
If name of the designated lubricating oil is not indicated, contact our sales man.
In case of supplying or replacing oil of lubricating oil system be careful not to mix oils or leak oil. Supply the oil to the specified level.
And confirm if bolts for gears are not loose.

8 − 3 − 2 Oil seal

Replace oil seals every 5,000 hours.
Since an oil seal is not supplied to standard motors, if required, describe 「With oil seal」 on your order sheet.

8 − 3 − 3 Motor bearing

Motor bearings are specific types for motors.
Bearing life time depends on working conditions but generally is about 20,000 hours.
Motor cooling blower life time is as well.

8 − 3 − 4 controller

Controller part replacement guidance is described here.
Though used parts of the controller are mainly electric parts, some of them have life time.
Part replacement guidance is described in Tab.8-1.

Parts name	Standard life	Replacement method, others
Cooling fan	2 ～ 3 years	Replace with new one.
Smoothing capacitor	5 years	Replace with new one. (Decide after investigation.)
Breaker, relay, etc.	—	Decide after investigation.
Fuse	10 years	Replace with new one.
Aluminum electrolytic capacitor on PC board	5 years	Replace with new PC board. (Decide after investigation.)

[Tab. 8 − 1] Guide Tabulation of Parts Replacement

Working conditions

- Ambient temperature : Mean temperature in a year 30℃
- Load ratio : 80% or less
- Availability : 20 hour or less ／ day

There are in conformity to the corporate judicial party Japan Electric Industries Association 「Recommendation of Periodic Inspection of General Converters」.

However, above replacement period is just guidance and in general, our products were designed with heavy duty parts.

Replacement guidance of other parts which have life time is described in Tab.8-2.

Part name	Standard life	Replacement method, others	Conditions
LCD	7 years	Replace with new one.	25±10℃, 65%RH or less
EEPROM	10 years	Replace with new PC board. (Decide after investigation.)	Change frequency of Parameter : 3 times / day

[Tab. 8 − 2] Guide Tabulation of Parts Replacement 2

Since life time varies depending on temperature and humidity conditions, do no use the controller in high temperature and humidity atmosphere.

※ In addition, please periodically inspect below fuses for controller types : NPS-FIH*-553,753,114 (3 kinds).

Part name : FUSE (Refer to outline and individual function of CHAPTER 2 「Specification」.)
Function : If internal anti-surge parts, etc. of the controller are damaged and in 「Short circuit mode」 by thunder, etc., the fuse melts and protect main circuits
Replacement : When the fuse melts, the top of the fuse jumps out by an internal spring.
In the case, since anti-surge parts should be replaced, together, contact our sales man.

CHAPTER 9 PROTECTIVE FUNCTION

9－1 Protective Function and Error Treatment

In order to avoid damage of units and motors by abnormal situation, the controller internally has Protective function and Error treatment to notify operation mistake, etc. .

Protective function consists of 「Alarm treatment」 and 「Warning treatment」 , and Error treatment function consists of 「Error display」 .

①Alarm treatment

When a fault is detected, a motor stops (Sudden stop or torque free depends on the reason.) , Alarm signal is outputted and Alarm message is displayed simultaneously.

②Warning treatment

When it is highly anticipated to be faulty if the present running status is continued, Warning of fault notice will be made.

When Warning occurs, Warning signal is outputted, and Warning message is displayed, however the motor does not stop.

③Error display

When operation mistake, input data error, etc. occurs, Error message is displayed.

	Treatment description when a fault occurs (detected).		
	Motor motion	Control output signal	LCD display
Alarm treatment	Sudden stop or torque free	Alarm signal output	Alarm message
Warning treatment	Current motion continues.	Warning signal output	Warning message
Error display	Current motion continues.	No output signal	Error message

[Tab. 9－1] Fault and Treatment

9－1－1 Alarm list

Name / Display	Contents	Motion and output signal status	Way to release *1
IPM error ALM. □ IPM ERR.	Due to line-to-ground fault of a motor and short-circuit of U, V, W cables between a controller and a motor, over current flows in main circuit power element. Or Radiator function of power element are faulty, and over heat occurs.	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Reset signal (RST) input or power re-input
Control power under voltage ALM. □ UNDRVOLT1	Control voltage (+5V, +15 V) falls down. DC+5V : About+4.75V or less DC+15V : about+13.5V or less	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Reset signal (RST) input or power re-input
Main power under voltage ALM. □ UNDRVOLT2	Main circuit DC bus voltage dropped less than about 180[370]V. [ ] is value for 400V type(In case of integral power source type, this alarm is detected.)	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Reset signal (RST) input or power re-input
Over voltage error ALM. □ OVER□VOLT	Due to excess load inertia, etc., Regenerative resistor treatment capacity at motor stop and in accel. is short. And main circuit DC volt. is more than about 400 [820]V. [ ]is value for 400V type	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Reset signal (RST) input or power re-input
Encoder fault ALM. □ □□ENCODER	An encoder is faulty, an encoder cable is broken / not connected or a connector comes out. Wrong setting was made to P000～P002. CPU reset was done to NPS-FS type.	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Power re-input

*1 : Release method 「Power re-input」 can be also conducted by 「Press of front panel reset switch」.

[Tab. 9－2 (a)] Alarm Lis 1/6

Name / Display	Contents	Motion and output signal status	Way to release
Over speed error ALM. □ OVERSPEED	Motor speed is more than about 130% of rated speed.	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Reset signal (RST) input or power re-input
Over load error ALM. □ OVER□LOAD	Due to over load or excess repeat (loading) frequency than allowable value, the internal electronic thermal worked.	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Reset signal (RST) input or power re-input
AC power OFF detection error ALM. □ □□AC□DOWN	AC power source becomes lower than about 145V [290V] for more than about 50msec. (Black out occurred.) [ ] is value for 400V type.	A motor stops by 〔P713 : Stop method at AC power OFF〕 and Alarm of torque ON Warning OFF Servo ready OFF Brake release OFF	Reset signal (RST) input or power re-input
Deviation over flow ALM. □ □OVERFLOW	Position deviation exceeds the set value of 〔P207 : Overflow detection pulse〕.	A motor sudden stops and in torque free. Alarm ON Warning OFF Servo ready OFF Brake release OFF	Reset signal (RST) input or power re-input
Motor shaft fault at power ON ALM. □ PW. ON□ENC	A motor shaft turns or vibrates when power is turned ON. If a motor shaft turns or vibrates when power is turned ON, an encoder can not be initialized. 〔Only NPS-FS type can detect.〕	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Power re-input
Deviation error ALM. □ VARI. OVER	Position deviation exceeds the set value of 〔P208 : Deviation error detection pulse〕. ※But it is applicable when 「STOP:Alarm stop」 is selected for 〔P209 : Motion selection at deviation error〕.	A motor sudden stops and in servo lock. Aarm ON Warning OFF Servo ready ON *1 Brake release ON	Reset signal (RST) input or power re-input

*1 : Status when 「RDY1」 is selected by 〔P716 : RDY signal specification selection〕.
If other one is selected, different status may happen.

[Tab. 9 — 2 (b)] Alarm List 2/6

Name / Display	Contents	Motion and output signal status	Way to release
Forward over travel ALM. □ +HARD□OT.	Forward over travel (FOT) is detected.	A motor sudden stops and in servo lock. *1Alarm ON Warning OFF Servo ready ON *2 Brake release ON	Move the motor reverse and release Forward over travel.
Reverse over travel ALM. □ −HARD□OT.	Reverse over travel (ROT) is detected.	A motor sudden stops and in servo lock. *1Alarm ON Warning OFF Servo ready ON *2 Brake release ON	Move the motor forward and release Reverse over travel
Absolute encoder communication error ALM. □ ABS. COMM.	Data from an absolute encoder can not be received. ※If 「ABS1/2」 is selected by 〔P001 : Encoder type selection〕 it occurs and the absolute encoder can not be used.	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Correct the parameter and reinput power.

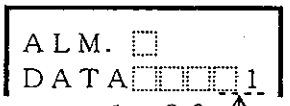
*1 : A motor sudden stops and becomes 0 speed in Speed control run.
The motor is in torque free in Torque control run.

*2 : Status when 「RDY1」 is selected by 〔P716 : RDY signal specification selection〕.
If other one is selected, different status may happen.

[Tab. 9 −2 (c)] Alarm List 3/6

Name / Display	Contents	Motion and output signal status	Way to release
No set of motor type ALM. □ MOTRTYPE1	Set of [P000 : motor type] is [000].	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Set motor type and re-input power.
Motor type error ALM. □ MOTRTYPE2	Combination of the motor selected by [P000 : Motor type] and the controller is wrong.	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Set correct motor type and reinput power.
EEPROM (Non-volatile memory) write error ALM. □ WR. EEPROM	Data can not be written in a controller EEPROM.	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Reset signal (RST) input or power re-input
Illegal rated speed command 1 ALM. □ STD. SPD. 1	Encoder pulse frequency at rated speed exceeded 2 Mpps	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Correct the parameter and reinput power.
Illegal rated speed command 2 ALM. □ STD. SPD. 2	Encoder pulse frequency at rated speed lowered less than 100pps.		

[Tab. 9－2 (d)] Alarm List 4/6

Name / Display	Contents	Motion and output signal status	Way to release
Hold data error 1～39 	Held data is broken.	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Reset data and input reset signal (RST) or reinput power. But since DATA39 error can not be released, ask our service man.

Display	Description
DATA□□□□1	Contents of parameters (Group 0／P000～99) are broken.
DATA□□□□2	Contents of parameters (Group 1／P100～199) are broken.
DATA□□□□3	Contents of parameters (Group 2／P200～299) are broken.
DATA□□□□4	Contents of parameters (Group 3／P300～399) are broken.
DATA□□□□6	Contents of parameters (Group 5／P500～599) are broken.
DATA□□□□7	Contents of parameters (Group 6／P600～699) are broken.
DATA□□□□8	Contents of parameters (Group 7／P700～799) are broken.
DATA□□□39	Contents of adjustment data for shipment are broken.

Breaking of thermister cable 	Cables of a thermister for motor temperature detection are broken or not connected.	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Set motor type and reinput power. Reset signal (RST) input or power re-input
Motor over heat error 	Motor temperature detected by a thermister exceeds 150℃.	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Wait until the motor becomes cool and then input Reset signal or reinput power.
CPU fault Front panel LED (HALT) lights. 	Due to fault of CPU, Memories (ROM, RAM) etc., Watch dog timer worked.	Motor torque free Alarm ON Warning OFF Servo ready OFF Brake release OFF	Power re-input

[Tab. 9－2 (e)] Alarm List 5/6

Name / Display	Contents	Motion and output signal status	Way to release
Hardware fault ALM. □ CPU RAM ALM. □ EX RAM ALM. □ DSP BOOT ALM. □ DSP BOOT1 ALM. □ DSP PARA	Unit failure	Motor torque free Alarm flashing Warning OFF Servo ready OFF Brake release OFF	Replace or repair the unit by us.

[Tab. 9 − 2 (f)] Alarm List 6/6

9－1－2　Warning list

Name / Display	Contents	Motion and output signal status	Way to release
Over load warning WNG. □ OVER. LOAD	If present running conditions are continued, Over load error will occur.	Present motion is continued. Alarm OFF Warning ON Servo ready ON Brake release ON	Remove Overload cause.
Deviation error warning WNG. □ VARI. OVER	Position deviation exceeds set of 〔P208 : Devia-tion error detection pulse〕. ※It is applied when 「CONTINUE: Continuous motion」 is selected by 〔P209 : Motion selection at deviation error 〕.	Present motion is continued. Alarm OFF Warning ON Servo ready ON Brake release ON	Remove Deviation error cause. (Increase of load or improper set of gain, accel. time, etc.)
Main power under voltage detection warning WNG. □ UNDRVOLT2	Main circuit DC voltage dropped less than about 180[370]V. [ ] is value for 400V type In case of separate power source type, this warning is detected.)	Motor torque Alarm OFF free Servo ready OFF Brake release OFF	Recover the main power source.

〔Tab. 9－3〕　Warning List

9－1－3　Error list

Name / Display	Contents	Motion and output signal status	Way to release
Data input range error ERR. □ □□□EDIT□1	Inputted parameter and data values are out of setting range.	In Edit mode, the motor continues present motion and output signal is not changed.	Release the error by input of any key, and input reset correct data.

〔Tab. 9－4〕　Error List

9 − 2 Confirmation When Protective Function Works

When Protective function worked, it means some error occurred.
Before releasing Alarm, be sure to investigate the error cause and eliminate it.
As for the fault error investigation and corrective measures, refer to 9 − 3 「Error diagnosis and corrective measures」 and conduct proper trouble shooting.

(1) IPM error (IPM ERR.)

When IPM error occurs, it is supposed that over-current flew in the power transistor of the unit main circuit (power section). Therefore, if this error and reset are repeated before eliminating the cause completely, the unit could be damaged.

Be sure to eliminate the error cause and resume operation.

And when radiation function of heat, generated by power elements is abnormal, over heat by this condition is also recognized as this error and protective function works.

Abnormal causes can be supposed one of, ① Over rated load or over load status continued more than allowable repeat frequency , ② Ambient temperature of the unit increased, ③ Radiator is choked, ④ Radiator cooling fan is failed or capacity was decreased.

Therefore, when this error occurs, please confirm if ambient temperature is in 0 ～55℃ range, if ventilation is not located to collect heat, if a radiator is not choked, if a fan runs correctly, etc..

And when Over heat error occurs, eliminate the error cause, wait until radiator temperature goes down (about 30 minutes cooling time) and then resume operation.

(2) CONTROL POWER／MAIN POWER UNDER VOLTAGE error

When AC power source voltage falls down and Under voltage error occurs, it is supposed that voltage dropped due to short of power source capacity or momentary power black out (10msec or more) occurred.

If momentary black out continues after Protective function of the unit worked against it, the control voltage is exhausted and the protective circuit is reset. And then when the power source recovers, if Start signal and each command (Speed command, Pulse train command, etc.) are inputted, a motor runs. Since it is dangerous, design an external sequence to turn OFF each signal and commands at the time of Alarm is generated (outputted) by Protective function.

(3) OVER VOLTAGE error

If Over voltage error occurs when a motor stops or is in deceleration, it is supposed that Regenerative energy is too large due to big load inertia. In the case, increase decel. time or lower the motor speed to fix it.

And confirm if the applied voltage is not too high (AC200/220V±10%, AC400/440V±10%) .

(4) Encoder fault (ENCODER)

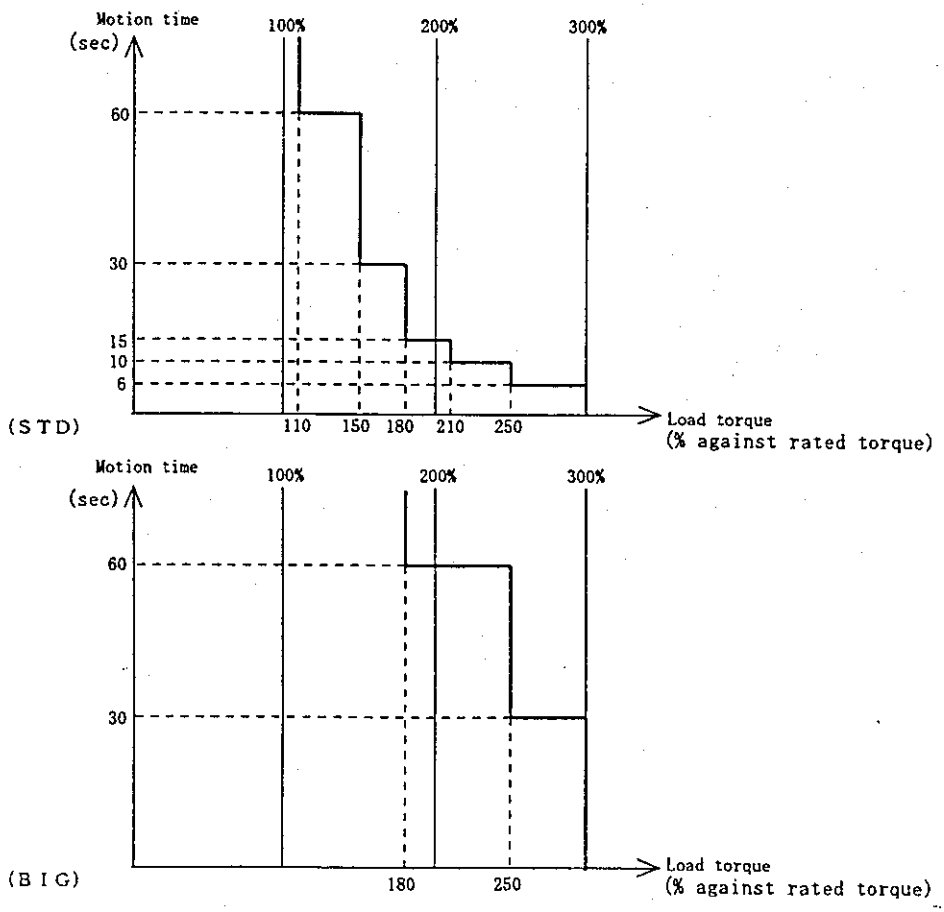
When Encoder fault occurs, it is supposed that an encoder cable is broken / not connected, a connector comes out, noise on encoder signal exists, wrong setting of the encoder selection parameters (P001, P002) is made, etc.. And when CPU reset is conducted to NPS-FS type, Encoder fault occurs. And when an encoder itself is faulty, Encoder failure may not be detected. In the case, over load error occurs when a motor runs.

(5) OVER SPEED error

When Over Speed error occurs, it is supposed that over shoot of speed is too large at motor start due to large inertia, etc. .
In the case, adjust speed loop and position loop gain, or increase accel. time to fix it.
Each gain adjustment method can be referred to 6-5 「Adjustment」 .

(6) OVER LOAD error

When Over load error occurs, it is supposed that the internal thermal relay was activated due to Over load or frequent load ON/ OFF more than allowed times. If Alarm reset and motor run is repeated in a short time, radiator and motor temperature abnormally increases and they will be damaged.
Be sure to eliminate the cause, wait for about 30 minute until they become cool and start RUN, again.
Relation of the internal electronic thermal motion time and load torque in case of 100% motor rated torque is as Fig. 9 − 1 .
And select 「STD」 or 「BIG」 by the parameter (P121).



[Fig. 9 - 1] Internal Electronic Thermal Motion Time

9－3 Error Diagnosis and Corrective Measures

When any error occurs, conduct the following inspection and error diagnosis in order to investigate the cause and take proper corrective measures.
When the followings are not be found, or parts or controllers are supposed out of order or broken, please contact our sales man, promptly.
When conducting corrective measures, the worker in charge should check power ON/OFF by himself. Even after turning power OFF, residual voltage remains in the unit, therefore, wait to start corrective measures for 2～3 minutes.
(In case of NPS-FI/FSM-401～402 Confirm that front panel LED display 「CHARGE」 is lit OFF.)
And when touching unit inside be careful not to damage the unit by static electricity.。
Never conduct as insulation test with a megger tester as it may damage the controller.
In case of measuring the motor insulation, before conducting it disconnect cables (U, V, W) between the motor and controller perfectly.

9－3－1 Item of inspection and confirmation

When an error occurs, inspect and confirm the next items.
If same type controller or motor is available, replace the suspected unit and run it to confirm whether the controller or motor is out of order or any external factor exists.

[Item of inspection and confirmation]

(1) Inspect what Alarm is displayed.
(2) Inspect no error is found by visual check.
(3) Inspect if the error is reproduced or occurs in a particular motion.
(4) Inspect how often the fault occurs.
(5) Inspect how long the unit is used.
(6) Inspect if the power source is normal and if it fluctuate greatly during particular time.
(7) Inspect if power black out did not occur.
(8) Inspect if temperature of the motor and controller is normal as well as ambient temperature.
(9) Inspect if installation circumstances of the motor and controller is normal. (water, oil, , iron powder, paper fragment, corrosive gas, etc.)
(10) Inspect when the error occurs, during acceleration, deceleration, or at constant speed run of the motor.
(11) Inspect if the error occurs at load fluctuation. (at load increase or decrease)
(12) Inspect if there is no difference between forward and reverse rotation.
(13) Inspect if there is no error in no load run.

⚠ Caution

●If Reset is repeatedly conducted when IPM error, Over load error occurs the controller could be damaged and the motor could burn out.
Be sure to completely eliminate the error cause and re-start them, again.

9－3－2 Inspection method and corrective measures when Alarm occurs

When an error occurs, confirm the error description by the Alarm display and take proper corrective measures. Be sure to eliminate the error cause to release Alarm. If errors occur repeatedly the unit could be damaged.

Error description	Cause	Corrective measures
[IPM error] ・Due to line-to-ground fault of a motor or same fault and short-circuit, mis-wiring, etc. of U,V, W cables between a controller and motor, over current flows in the main circuit power element. ・The temp. of the main circuit power element are over heated due to fault of radiation function.	・Line-to-ground of the motor ・Line-to-ground fault and short-circuit of cables U,V,W between the controller and a motor ・Current fluctuation due to unstable motor motion and vibration ・Malfunction due to noise ・Stop of the fan in the controller ・Choke of a radiator ・High ambient temp. or bad ventilation	・Replace motor. ・Correct wiring. ・Adjust stability. (gain adjustment, machine system backlash etc. improvement) ・Remove noise source. Take anti-noise measures. ・Replace the fan in the controller. ・Clean air blows ,etc. and radiators. ・Decrease ambient temperature. Improve ventilation.
[Under voltage error] ・Power source or control voltage drops.。 AC power : about AC165V or less (AC power : about AC 340V or less) DC+5V : about +4.75V or less DC+15V : about +13.5V or less ( ) value is for 400V type	・Fuse in power sec. is disconnected. ・Source voltage is low. (Includes insufficient capacity.) ・Power black out occurred for 10ms or more. ・The power cable is thin. ・Loose fit of a screw in power terminal ・Malfunction due to noise	・Supply correct power and reconsider power supply system, capacity and cable diameter. ・Remove noise source. Take anti-noise measures.
[Over voltage error] ・Due to excess load inertia, etc. at motor stop status and decel., regenerative energy is beyond the treatment capacity and DC voltage of main circuits becomes about 400V or more (about 800V). ( ) value is for 400V type.	・Source voltage is high. ・Excessive regenerative energy by too large load inertia. ・Malfunction due to noise	・Supply correct power. ・Reduce load inertia , decrease motor speed, or set longer decel. time. ・Remove noise source. Take anti-noise measures.

[Tab. 9－5 (a)] Inspection Method and Corrective Measures when Alarm Occurs

Error description	Cause	Corrective measures
【Over load error】 ・Due to over load or excess Start/Stop frequency than allowed time, the internal thermal is activated.	・Excess load	・Reduce load.
	・Start/stop of a motor is too frequent.	・Reduce start/stop frequency.
	・Incorrect wiring (U,V,W) between a controller and motor.	・Correct wiring.
	・Encoder feedback signal is affected by noise.	・Remove noise source. Take anti-noise measures.
	・Encoder failure	・Replace the encoder.
	・Mechanical locking by brake, etc.	・Release brake. If there is a trouble in machine system, fix it.
	・Current fluctuation due to unstable motor motion and vibration	・Adjust stability (Adjust gain and improve backlash, looseness of connecting sec. and weak rigidity, etc. of machine system.)
【Over speed error】 ・Motor speed exceeds 130% of rated speed.	・Incorrect wiring (U,V,W) between a controller and motor.	・Correct wiring.
	・Incorrect wiring of encoder feedback signal	
	・Encoder failure	・Replace the encoder.
	・Load inertia is excessive, or over shoot is large due to wrong gain adjustment.	・Reduce load inertia or set long accel./decel. time. ・Adjust stability (Adjust gain and improve backlash, looseness of connecting sec. and weak rigidity, etc. of machine system.)
	・Encoder feedback signal is affected by noise.	・Remove noise source. Take anti-noise measures.

[Tab. 9 − 5 (b)] Inspection Method and Corrective Measures when Alarm Occurs

Error description	Cause	Corrective measures
【Encoder fault】 ・An encoder is faulty, an encoder cable is broken /not connected, a connector comes out, noise on encoder signal exists, wrong parameter setting is made, etc..	・An encoder cable is broken, not connected or mis-connected. ・A connector is inserted, incorrectly. ・Encoder failure ・Wrong setting of the encoder selection parameter. ・CPU reset was done to NPS-FS type.	・Correct wiring ・Insert the connector, securely. ・Replace the encoder. ・Correct setting of the parameter (P000～P002) data. ・CPU reset action can not be done to NPS-FS type.
【Deviation over flow】 【Deviation error】 ・Position deviation exceeds the set of the parameter P207 「Over flow detecting pulse」. ・Position deviation exceeds the set of the parameter P208 「Deviationerror detecting pulse」.	・Excess load ・Load inertia is excessive, or over shoot is large due to wrong gain adjustment. ・Incorrect wiring (U,V,W) between a controller and motor. ・Incorrect wiring of encoder feedback signal ・Encoder feedback or command pulse signal is affected by noise. ・Encoder failure ・Mechanical locking by brake, etc. ・Wrong parameter setting	・Reduce load. ・Reduce load inertia or set long accel./decel. time. ・Adjust stability (Adjust gain and improve backlash, looseness of connecting sec. and weak rigidity, etc. of machine system.) ・Correct wiring. ・Remove noise source. Take anti-noise measures. ・Replace the encoder. ・Release brake. If there is a trouble in machine system, fix it. ・Check associated parameters and again set correct values.

[Tab. 9－5 (c)] Inspection Method and Corrective Measures when Alarm Occurs

Error description	Cause	Corrective measures
[Hold data error] ・An error occurs in parameter contents.。	・Parameter or positioning data contents are broken.	・Remove noise source. Take anti-noise measures.
[Forward over travel] [Reverse over travel] ・Forward over travel is detected. ・Reverse over travel is detected.	・Control signal cable is mis-contacted/ broken/not connected or mis-wired. ・A connector is inserted, incorrectly. ・Wrong Positioning data setting. ・External sequence is wrong.	・Correct wiring. ・Insert the connector, securely. ・Again set correct value. ・Correct the external sequence.
[EEPROM write error] ・Data can not be written in EEPROM.	・Data can not be written in EEPROM due to noise. ・Unit failure	・Remove noise source. Take anti-noise measures. ・Replace the unit.
[CPU fault] ・Due to fault of CPU, memories, etc., Watch dog timer works.	・Malfunction due to noise ・Unit failure	・Remove noise source. Take anti-noise measures. ・Replace the unit.

[Tab. 9－5 (d)] Inspection Method and Corrective Measures when Alarm Occurs

⚠ Caution

●If Reset is repeatedly conducted when IPM error, Over load error occurs the controller could be damaged and the motor could burn out. Be sure to completely eliminate the error cause and re-start them, again.

9－3－3 Other protective function

In addition to the above described protective function, next ① and ② functions are available for large capacity units.
① Radiator over heat error detection (Warning) : 3 types NPS-FIH*-553/753/114
② Radiator cooling fan error detection : 2 types NPS-FIH*-753/114

①Radiator over heat error detection (Warning)
When a main circuit radiator is over heated by some reason, and the temperature increases about 90℃ or more, a temperature sensor works and Radiator over heat error Warning signal is outputted through the terminal block H1－H2.

This signal specification is as follows.
Stipulated temperature of temperature sensor action : 90±5℃
(Radiator temperature is normally ambient temperature＋30℃ or less.
※The contact (between H1-H2) is normal close type and opened at stipulated temperature or more.
Contact capacity : Max. rated 110V, 0.3A, 6W (AC/DC)
※The contact is no-voltage type.

Since this signal is Warning purpose, it does not compulsory stop a motor in control. Therefore, please stop the motor before Over current error by radiator over heat occurs and inspect the radiator, cooling fan, ambient temperature, and ventilation, and then eliminate the over heat cause. And after confirming this signal is OFF re-start Run.

② Radiator cooling fan error detection
When a radiator cooling fan stops or its speed drops by some reason, a speed sensor works at about 1,800 rpm , and Radiator cooling fan error signal is outputted through terminal block A1－A2.

This signal specification is as follows.
Stipulated speed of speed sensor action : 1800±300rpm
(Fan normal speed is around 3000rpm.)
※The contact (between A1-A2) is normal open type and closed at stipulated speed or less.
Contact capacity : Max. rated 100V, 0.5A, 10VA (AC/DC)
※The contact is no-voltage type.

Since this signal is outputted at stipulated speed or less, it is outputted until the unit starts and the fan speed reaches stipulated speed or more. Therefore, if this error detection・treatment sequence is planned, please add time lag in it.

When this error occurs, it does not compulsory stop a motor in control. However, please stop the motor before Over current error by radiator over heat occurs. And be sure to turn OFF the power source, inspect or replace the cooling fan. And after confirming this signal is OFF, continue Run.

CHAPTER 10 DATA

10－1 Electric Specification of Controller

10－1－1 NPS－FIM＊－＊＊＊ controller Specification

Item		Unit	NPS－FIM＊					
			－401	－801	－122	－242	－402	－752
Input power			Integrated control power source type					Separate control power source type
			Main power AC200V/220V, 50/60Hz, 3 phase					
Voltage range			AC180V～AC242V ＊2					
Main crcit mthd			IPM 4 quadrant bridge sine wave PWM control					
Continuous out. current (rms)		A	3.4	6.4	10.5	15	27	54
Instant. output current (rms)		A	8.8	17.4	25.6	39	55	98
Instantaneous output torque		%	200% (Some motor combination 300%, Refer to 10-4 「Applicable motor list」)					
Control method			Semi-closed loop by encoder feedback					
Brake method			Regenerative braking (option: power regeneration)					
Carrier frequency		Hz	10k (7.5k 10k 15k selectable)					
Speed Control	Speed regulation	%	±0.01 (Digital set, Average value; Temp./0～40℃, load/voltage fluctuation) ±0.05 (Analog set, Average value; load/voltage fluctuation) ±0.3 (Analog set, Average value; Temp./0～40℃)					
	Spd control range		1：5000 ＊1					
	Field control range		1：3 (Max. speed 6000rpm) / rated output (some motor type: reduced rated output)					
	Speed command		External analog speed command :DC 0～±10V(±10V/ rated speed) Input resistance about 20kΩ (resolution 12bit) Internal digital speed command : 7 speeds (parameter)					
	Torque limit		External analog torque limit command: DC 0～+10V (+3.3V/ rated / torque) Input resistance about 20kΩ (resolution 10bit), Forward/ reverse each 1 (2ch) Internal digital torque limit value : Forward/ reverse each 1 (parameter)					
Torque Control	Torque command		External torque command: DC 0～±10V (±3.3V/rated torque) Input resistance about 20kΩ (resolution 12bit) Internal Torque command : 3 command (parameter)					
	Linearity		±3% (up to rated torque, repeatability)					
	Cmmnd resolu.		Resolution 1：500					
	Speed limit		External speed limit (DC voltage) : common to external speed command +10V/rated speed (common to forward and reverse) Internal speed limit : 1 point (parameter)					
Positioncontrol	Pulse train control		Max. frequency 1 Mpps					
	Pulse command method		┌Line driver method (directional pulse) :Max. 250Kpps ├Line driver method (90° different 2 phase pulse) :Max. 250Kpps └Open collector method (direction judge. pulse) :Max. 200Kpps					
	Pulse train compensation		1/100 ≦ A/B ≦ 100 (A,B : 1～65535)					
	Position detecting pulse output		90° different 2 phase pulse signal, Marker signal ┌Output style : Line driver method └Division ratio : 1/N (N=1～32)					

Item	Unit	NPS−FIM*					
		−401	−801	−122	−242	−402	−752
Serial communication		RS-422A, Start/stop synchro. Multi-drop wiring is possible. (Communication condition parameter set is possible.) 56kbbs					
Monitor function		LCD module (installed) : Status display, Diagnostic display, Input/Output signal display Alarm display (last 5 cause history) Analog monitor : Speed, Torque, Deviation, etc. (selection by parameter)					
Control function		2 free degree control, FF control, Vibration filter, R2 compensation, Auto. tuningNon-interacting compensation, Dead time compensation					
Protective function		IPM error, Under voltage, Over voltage, Over load, Over speed, Encoder failure, Deviation over flow, Communication error Each data and parameter error, etc. (Last 5 cause history is stored.)					
Input signal		Deviation clear (CLR), Command pulse input inhibit (CIH), Mode selection 1,2(MD1,2) Local/Remote (PC), Start (DR/FJ), Reset (RST), Emergency stop (EMG) Speed selection 1～3(SS1,SS2,SS3), Torque limit (TL/RJ), Servo ON (SON) Forward over travel (FOT), Reverse over travel (ROT)					
Output signal		Servo ready (RDY), Alarm (ALM), Warning (WNG), Speed zero (SZ) Positioning complete (PN), In Speed/ Torque limit (LIM), Brake release (BRK)					
Option		Data input unit (MDI unit), Servo display, Cables , etc.					
Applicable encoder		6000 (2000) ppr (selection by parameter)					
Load inertia		10 times or less of motor rotor inertia					
Power capacity *3	kVA	1.1	1.8	3.0	4.7	7.8	15.3
No fuse breaker (rated current) *4	A	5	10	15	20	30	60
Applicable motor *5		NA30- 13F-15 25F-15	NA100- 20F 40F 75F-10 NA30- 50F-15	NA100- 75F 110F-10	NA100- 110F 180F-10 NA30- 110F-15	NA100- 180F 270F-10 370F-10 NA30- 180F-15	NA100- 180F 270F 370AF 370F-10 550F-10 750F-10
Weight	kg	3.8	3.8	7.0	7.0	8.0	12.5
Dimension		Refer to Section 2-2 outline drawing.					
Accessories		Regenerative resistor Refer to Section 10-2.					

* 1: A motor may not run smoothly as low speed as 1/5000 of rated speed.
Speed control range is defined that in the range a motor does not stop with 100% load.
In case of combination with NA20 series motor, Speed control range is 1:3000.
* 2: When power source voltage drops, rated output and rated speed is not guaranteed.
* 3: It changes according to power source impedance.
* 4: Please choose sufficient shut down capacity type to conduct protective coordinate with power source capacity.
* 5: As for applicable motor speed and peak torque, please refer to 「10-4

10－1－2 NPS－FIM＊－＊＊＊ Controller Specification

Item		Unit	NPS－FIM＊				
			－113	－153	－223	－303	－373
Input power			Separate control power source type Main power AC200V/220V, 50/60Hz, 3phase				
Voltage range			AC180V～AC242V ＊2				
Main crcit mthd			IPM 4quadrant bridge sine wave PWM control				
Continuous out. current (rms)		A	59	81	117	161	174
Instant. output current (rms)		A	107	143	206	309	329
Instantaneous output torque		%	200% (Some motor combination 300%, Refer to 10-4 「Applicable motor list」)				
Control method			Semi-closed loop by encoder feedback				
Brake method			Regenerative braking (option: power regeneration)				
Carrier frequency		Hz	10k			7.5k	
			(7.5k 10k 15k selectable)				
Speed Control	Speed regulation	%	±0.01 (Digital set, Average value; Temp./0～40℃, load/voltage fluctuation) ±0.05 (Analog set, Average value; load/voltage fluctuation) ±0.3 (Analog set, Average value; Temp./0～40℃)				
	Spd control range		1：5000 ＊1				
	Field control range		1：3 (Max. speed 6000rpm) / rated output (some motor type: reduced rated output)				
	Speed command		External analog speed command :DC 0～±10V(±10V/ rated speed) Input resistance about 20kΩ (resolution 12bit) Internal digital speed command : 7 speeds (parameter)				
	Torque limit		External analog torque limit command: DC 0～+10V (+3.3V/ rated / torque) Input resistance about 20kΩ (resolution 10bit), Forward/ reverse each 1 (2ch) Internal digital torque limit value: Forward/ reverse each 1 (parameter)				
Torque Control	Torque command		External torque command: DC 0～±10V (±3.3V/rated torque) Input resistance about 20kΩ (resolution 12bit) Internal Torque command : 3 command (parameter)				
	Linearity		±3% (up to rated torque, repeatability)				
	Cmmnd resolu.		Resolution 1：500				
	Speed limit		External speed limit (DC voltage) : common to external speed command +10V/rated speed (common to forward and reverse) Internal speed limit : 1 point (parameter)				
Position Control	Pulse train control		Max. frequency 1 Mpps				
	Pulse command method		Line driver method (directional pulse) :Max. 250Kpps Line driver method (90° different 2 phase pulse) :Max. 250Kpps Open collector method (direction judge. pulse) :Max. 200Kpps				
	Pulse train compensation		1/100 ≦ A/B ≦ 100 (A,B : 1～65535)				
	Position detecting pulse output		90° different 2 phase pulse signal, Marker signal Output style : Line driver method Division ratio : 1/N (N=1～32)				

Item	Unit	NPS−FIM*				
		−113	−153	−223	−303	−373
Serial communication		RS-422A, Start/stop synchro. Multi-drop wiring is possible. (Communication condition parameter set is possible.) 56kbbs				
Monitor function		LCD module (installed) : Status display, Diagnostic display, Input/Output signal display Alarm display (last 5 cause history) Analog monitor : Speed, Torque, Deviation, etc. (selection by parameter)				
Control function		2 free degree control, FF control, Vibration filter, R2 compensation, Auto. tuning Non-interacting compensation, Dead time compensation				
Protective function		IPM error, Under voltage, Over voltage, Over load, Over speed, Encoder failure, Deviation over flow, Communication error Each data and parameter error, etc. (Last 5 cause history is stored.)				
Input signal		Deviation clear (CLR), Command pulse input inhibit (CIH), Mode selection 1,2(MD1,2) Local/Remote (PC), Start (DR/FJ), Reset (RST), Emergency stop (EMG) Speed selection 1～3(SS1,SS2,SS3), Torque limit (TL/RJ), Servo ON (SON) Forward over travel (FOT), Reverse over travel (ROT)				
Output signal		Servo ready (RDY), Alarm (ALM), Warning (WNG), Speed zero (SZ) Positioning complete (PN), In Speed/ Torque limit (LIM), Brake release (BRK)				
Option		Data input unit (MDI unit), Servo display, Cables , etc.				
Applicable encoder		6000 (2000) ppr (selection by parameter)				
Load inertia		10 times or less of motor rotor inertia				
Power capacity *3	kVA	21	30	41	58	70
No fuse breaker (rated current) *4	A	100	125	200	225	250
Applicable motor *5		NA100- 270F 550AF 550F-10 750F-10 1100F-10	NA100- 370F 750AF 550F NA20- 1500-10	NA100- 1100AF 750F NA20- 2200-10	NA100- 1100F NA20- 1500 2700-10	NA20- 1800 3700-10
Weight	kg	13.5	26.0	35.0	35.0	62.5
Dimension		Refer to Section 2-2 outline drawing.				
Accessories		Regenerative resistor Refer to Section 10-2.				

* 1: A motor may not run smoothly as low speed as 1/5000 of rated speed.
Speed control range is defined that in the range a motor does not stop with 100% load.
In case of combination with NA20 series motor, Speed control range is 1:3000.
* 2: When power source voltage drops, rated output and rated speed is not guaranteed.
* 3: It changes according to power source impedance.
* 4: Please choose sufficient shut down capacity type to conduct protective coordinate with power source capacity.
* 5: As for applicable motor speed and peak torque, please refer to 「10-4 Applicable motor list」.

10－1－3 NPS－FIH*－*** Controller Specification

Item		Unit	NPS－FIH*				
			－113	－153	－223	－303	－373
Input power source			Separate control power source type Main power AC400V/440V, 50/60Hz, 3 phase				
Voltage range			AC360V～AC484V *2				
Main crcit mthd			IPM 4quadrant bridge sine wave PWM control				
Continuous out. current (rms)		A	34	46	65	89	115
Instant. output current (rms)		A	62	81	112	154	210
Instantaneous output torque		%	200% (Some motor combination 300%, Refer to 10-4 「Applicable motor list」)				
Control method			Semi-closed loop by encoder feedback				
Brake method			Regenerative braking (option: power regeneration)				
Carrier frequency		Hz	10k			7.5k	
			(7.5k 10k 15k selectable)				
Speed Control	Speed regulation	%	±0.01 (Digital set, Average value; Temp./0～40℃, load/voltage fluctuation) ±0.05 (Analog set, Average value; load/voltage fluctuation) ±0.3 (Analog set, Average value; Temp./0～40℃)				
	Spd control range		1：5000 *1				
	Field control range		1：3 (Max. speed 6000rpm) / rated output (some motor type: reduced rated output)				
	Speed command		External analog speed command :DC 0～±10V(±10V/ rated speed) Input resistance about 20kΩ (resolution 12bit) Internal digital speed command : 7 speeds (parameter)				
	Torque limit		External analog torque limit command: DC 0～+10V (+3.3V/ rated / torque) Input resistance about 20kΩ (resolution 10bit), Forward/ reverse each 1 (2ch) Internal digital torque limit value : Forward/ reverse each 1 (parameter)				
Torque Control	Torque command		External torque command: DC 0～±10V (±3.3V/rated torque) Input resistance about 20kΩ (resolution 12bit) Internal Torque command : 3 command (parameter)				
	Linearity		±3% (up to rated torque, repeatability)				
	Cmmnd resolu.		Resolution 1：500				
	Speed limit		External speed limit (DC voltage) : common to external speed command +10V/rated speed (common to forward and reverse) Internal speed limit : 1 point (parameter)				
Position Control	Pulse train control		Max. frequency 1 Mpps				
	Pulse command method		Line driver method (directional pulse) :Max. 250Kpps Line driver method (90° different 2 phase pulse) :Max. 250Kpps Open collector method (direction judge. pulse) :Max. 200Kpps				
	Pulse train compensation		1/100 ≦ A/B ≦ 100 (A,B : 1～65535)				
	Position detecting pulse output		90° different 2 phase pulse signal, Marker signal Output style : Line driver method Division ratio : 1/N (N=1～32)				

Item	Unit	NPS-FIH*				
		-113	-153	-223	-303	-373
Serial communication		RS-422A, Start/stop synchro. Multi-drop wiring is possible. (Communication condition parameter set is possible.) 56kbbs				
Monitor function		LCD module (installed) : Status display, Diagnostic display, Input/Output signal display Alarm display (last 5 cause history) Analog monitor : Speed, Torque, Deviation, etc. (selection by parameter)				
Control function		2 free degree control, FF control, Vibration filter, R2 compensation, Auto. tuning Non-interacting compensation, Dead time compensation				
Protective function		IPM error, Under voltage, Over voltage, Over load, Over speed, Encoder failure, Deviation over flow, Communication error Each data and parameter error, etc. (Last 5 cause history is stored.)				
Input signal		Deviation clear (CLR), Command pulse input inhibit (CIH), Mode selection 1,2(MD1,2) Local/Remote (PC), Start (DR/FJ), Reset (RST), Emergency stop (EMG) Speed selection 1~3(SS1,SS2,SS3), Torque limit (TL/RJ), Servo ON (SON) Forward over travel (FOT), Reverse over travel (ROT)				
Output signal		Servo ready (RDY), Alarm (ALM), Warning (WNG), Speed zero (SZ) Positioning complete (PN), In Speed/ Torque limit (LIM), Brake release (BRK)				
Option		Data input unit (MDI unit), Servo display, Cables , etc.				
Applicable encoder		6000 (2000) ppr (selection by parameter)				
Load inertia		10 times or less of motor rotor inertia				
Power capacity *3	kVA	21	30	41	58	70
No fuse breaker (rated current) *4	A	50	75	100	125	150
Applicable motor		NA100-550F-20H 1100F-10H	NA100-750F-20H NA20-1500-10H	NA100-750F-20H 1100F-20H NA20-2200-10H	NA20-1500-20H 2700-10H NA100-1100F-20H	NA20-1800-20H 3700-10H
Weight	kg	14.5	27.0	36.0	36.0	63.5
Dimension		Refer to Section 2-2 outline drawing.				
Accessories		Regenerative resistor Refer to Section 10-2.				

* 1: A motor may not run smoothly as low speed as 1/5000 of rated speed.
Speed control range is defined that in the range a motor does not stop with 100% load.
In case of combination with NA20 series motor, Speed control range is 1:3000.
* 2: When power source voltage drops, rated output and rated speed is not guaranteed.
* 3: It changes according to power source impedance.
* 4: Please choose sufficient shut down capacity type to conduct protective coordinate with power source capacity.
* 5: As for applicable motor speed and peak torque, please refer to 「10-4 Applicable motor list」.

10－1－4　NPS－FIH＊－＊＊＊ Controller Specification

Item		Unit	NPS－FIH＊				
			－553	－753	－114	－154＊5	－224＊5
Input power source			Separate control power source type Main power　AC400V/440V,　50/60Hz, 3 phase				
Voltage range			AC360V～AC484V ＊2				
Main crcit mthd			IPM　4 quadrant bridge sine wave PWM control				
Continuous out. current (rms)		A	170	220	355		
Instant. output current (rms)		A	310	375	520		
Instantaneous output torque		%	200		150		
Control method			Semi-closed loop by encoder feedback				
Brake method			Regenerative braking (option: power regeneration)				
Carrier frequency		Hz	7．5k				
			(7.5k　10k　15k　selectable)				
Speed Control	Speed regulation	%	±0.01 (Digital set, Average value; Temp./0～40℃, load/voltage fluctuation) ±0.05 (Analog set, Average value; load/voltage fluctuation) ±0.3　(Analog set, Average value; Temp./0～40℃)				
	Spd control range		1：3000　＊1				
	Field control range		1：3 (Max. speed 6000rpm) / rated output (some motor type: reduced rated output)				
	Speed command		External analog speed command :DC 0～±10V(±10V/ rated speed) Input resistance about 20kΩ (resolution 12bit) Internal digital speed command　：7 speeds (parameter)				
	Torque limit		External analog torque limit command: DC 0～+10V (+3.3V/ rated / torque)　Input resistance about 20kΩ (resolution 10bit), Forward/ reverse each 1 (2ch)　Internal digital torque limit value：Forward/ reverse each 1 (parameter)				
Torque Control	Torque command		External torque command: DC 0～±10V (±3.3V/rated torque) Input resistance about 20kΩ (resolution 12bit) Internal Torque command ：3 command (parameter)				
	Linearity		±3％ (up to rated torque, repeatability)				
	Cmmnd resolu.		Resolution　1：500				
	Speed limit		External speed limit (DC voltage) ：common to external speed command　+10V/rated speed (common to forward and reverse) Internal speed limit ：1 point (parameter)				
Position Control	Pulse train control		Max. frequency　1　Mpps				
	Pulse command method		Line driver method (directional pulse)　:Max. 250Kpps Line driver method (90° different 2 phase pulse):Max. 250Kpps Open collector method (direction judge. pulse)　:Max. 200Kpps				
	Pulse train compensation		1/100 ≦ A/B ≦ 100　(A,B ：1～65535)				
	Position detecting pulse output		90° different 2 phase pulse signal, Marker signal Output style：Line driver method Division ratio　：1/N　(N=1～32)				

Item	Unit	NPS−FIH*				
		−553	−753	−114	−154*5	−224*5
Serial communication		RS-422A, Start/stop synchro. Multi-drop wiring is possible. (Communication condition parameter set is possible.) 56kbbs				
Monitor function		LCD module (installed) : Status display, Diagnostic display, Input/Output signal display Alarm display (last 5 cause history) Analog monitor : Speed, Torque, Deviation, etc. (selection by parameter)				
Control function		2 free degree control, FF control, Vibration filter, R2 compensation, Auto. tuning Non-interacting compensation, Dead time compensation				
Protective function		IPM error, Under voltage, Over voltage, Over load, Over speed, Encoder failure, Deviation over flow, Communication error Each data and parameter error, etc. (Last 5 cause history is stored.)				
Input signal		Deviation clear (CLR), Command pulse input inhibit (CIH), Mode selection 1,2(MD1,2) Local/Remote (PC), Start (DR/FJ), Reset (RST), Emergency stop (EMG) Speed selection 1～3(SS1,SS2,SS3), Torque limit (TL/RJ), Servo ON (SON) Forward over travel (FOT), Reverse over travel (ROT)				
Output signal		Servo ready (RDY), Alarm (ALM), Warning (WNG), Speed zero (SZ) Positioning complete (PN), In Speed/ Torque limit (LIM), Brake release (BRK)				
Option		Data input unit (MDI unit), Servo display, Cables , etc.				
Applicable encoder		6000 (2000) ppr (selection by parameter)				
Load inertia		10 times or less of motor rotor inertia				
Power capacity *3	kVA	118	160	257		
No fuse breaker (rated current) *4	A	225	300	500		
Applicable motor		NA20- 2700-20H 5500-10H	NA20- 3700-20H 7500-10H	NA20- 5500-20H 11000-10H		
Weight	kg	80	135	165		
Dimension		Refer to Section 2-2 outline drawing.				
Accessories		None				

* 1: A motor may not run smoothly as low speed as 1/3000 of rated speed. Speed control range is defined that in the range a motor does not stop with 100% load.
  In case of combination with NA20 series motor, Speed control range is 1:3000.
* 2: When power source voltage drops, rated output and rated speed is not guaranteed.
* 3: It changes according to power source impedance.
* 4: Please choose sufficient shut down capacity type to conduct protective coordinate with power source capacity.
* 5: Future plan

10－1－5 NPS－FSM＊－＊＊＊ Controller Specification

Item		Unit	NPS－FSM＊			
			－122	－242	－402	－752
Input power			Integrated control power source type			Separate control powersource type
			Main power AC200V/220V, 50/60Hz, 3phase			
Voltage range			AC180V～AC242V ＊2			
Main crcit mthd			IPM 4quadrant bridge sine wave PWM control			
Continuous out. current (rms)		A	8.3	15.2	26	
Instant. output current (rms)		A	24.9	45.6	52	
Instantaneous output torque		%	200% (Some motor combination 300%, Refer to 10-4 「Applicable motor list」)			
Control method			Semi-closed loop by encoder feedback			
Brake method			Regenerative braking (option: power regeneration)			
Carrier frequency		Hz	10k (7.5k 10k 15k selectable)			
Speed Control	Speed regulation	%	±0.01 (Digital set, Average value; Temp./0～40℃, load/voltage fluctuation) ±0.05 (Analog set, Average value; load/voltage fluctuation) ±0.3 (Analog set, Average value; Temp./0～40℃)			
	Spd control range		1：5000 ＊1			
	Speed command		External analog speed command :DC 0～±10V(±10V/ rated speed) Input resistance about 20kΩ (resolution 12bit) Internal digital speed command : 7 speeds (parameter)			
	Torque limit		External analog torque limit command: DC 0～+10V (+3.3V/ rated / torque) Input resistance about 20kΩ (resolution 10bit), Forward/ reverse each 1 (2ch) Internal digital torque limit value: Forward/ reverse each 1 (parameter)			
Torque Control	Torque command		External torque command: DC 0～±10V (±3.3V/rated torque) Input resistance about 20kΩ (resolution 12bit) Internal Torque command : 3 command (parameter)			
	Linearity		±3% (up to rated torque, repeatability)			
	Cmmnd resolu.		Resolution 1：500			
	Speed limit		External speed limit (DC voltage) : common to external speed command +10V/rated speed (common to forward and reverse) Internal speed limit : 1 point (parameter)			
Position Control	Pulse train control		Max. frequency 1 Mpps			
	Pulse command method		┌Line driver method (directional pulse) :Max. 250Kpps ├Line driver method (90° different 2 phase pulse):Max. 250Kpps └Open collector method (direction judge. pulse) :Max. 200Kpps			
	Pulse train compensation		1/100 ≦ A/B ≦ 100 (A,B : 1～65535)			
	Position detecting pulse output		90° different 2 phase pulse signal, Marker signal ┌Output style : Line driver method └Division ratio : 1/N (N=1～32)			

Item	Unit	NPS−FSM*			
		−122	−242	−402	−752
Serial communication		RS-422A, Start/stop synchro. Multi-drop wiring is possible. (Communication condition parameter set is possible.) 56kbbs			
Monitor function		LCD module (installed) : Status display, Diagnostic display, Input/Output signal display Alarm display (last 5 cause history) Analog monitor : Speed, Torque, Deviation, etc. (selection by parameter)			
Control function		2 free degree control, FF control, Vibration filter, R2 compensation, Auto. tuningNon-interacting compensation, Dead time compensation			
Protective function		IPM error, Under voltage, Over voltage, Over load, Over speed, Encoder failure, Deviation over flow, Communication error Each data and parameter error, etc. (Last 5 cause history is stored.)			
Input signal		Deviation clear (CLR), Command pulse input inhibit (CIH), Mode selection 1,2(MD1,2) Local/Remote (PC), Start (DR/FJ), Reset (RST), Emergency stop (EMG) Speed selection 1～3(SS1,SS2,SS3), Torque limit (TL/RJ), Servo ON (SON) Forward over travel (FOT), Reverse over travel (ROT)			
Output signal		Servo ready (RDY), Alarm (ALM), Warning (WNG), Speed zero (SZ) Positioning complete (PN), In Speed/ Torque limit (LIM), Brake release (BRK)			
Option		Data input unit (MDI unit), Servo display, Cables , etc.			
Applicable encoder		6000 (2000) ppr (selection by parameter)			
Load inertia		10 times or less of motor rotor inertia			
Power capacity *3	kVA	2. 6	5. 0	8. 3	15. 7
No fuse breaker (rated current) *4	A	15	20	30	60
Applicable motor *5		NA720-122	NA720-182 -242	NA720-372 -402	NA720-372 -402 -552 -752
Weight	kg	7. 0	7. 0	8. 0	12. 5
Dimension		Refer to Section 2-2 outline drawing.			
Accessories		Regenerative resistor Refer to Section 10-2.			

* 1: A motor may not run smoothly as low speed as 1/5000 of rated speed. Speed control range is defined that in the range à motor does not stop with 100% load.
In case of combination with NA20 series motor, Speed control range is 1:3000.
* 2: When power source voltage drops, rated output and rated speed is not guaranteed.
* 3: It changes according to power source impedance.
* 4: Please choose sufficient shut down capacity type to conduct protective coordinate with power source capacity.
* 5: As for applicable motor speed and peak torque, please refer to 「10-4 Applicable motor list」.

10－1－6　NPS－FSM＊－＊＊＊ Controller Specification

Item		Unit	NPS－FSM＊		
			－113	－153	－223
Input power			Separate control power source type		
			Main power　AC200V/220V,　50/60Hz,　3 phase		
Voltage range			AC180V～AC242V　＊2		
Main crcit mthd			IPM　4 quadrant bridge sine wave PWM control		
Continuous out. current (rms)		A	45	62	94
Instant. output current (rms)		A	88	121	183
Instantaneous output torque		%	200% (Some motor combination 300%, Refer to 10-4 「Applicable motor list」)		
Control method			Semi-closed loop by encoder feedback		
Brake method			Regenerative braking (option: power regeneration)		
Carrier frequency		Hz	10k (7.5k　10k　15k　selectable)		
Speed Control	Speed regulation	%	±0.01 (Digital set, Average value; Temp./0～40℃, load/voltage fluctuation) ±0.05 (Analog set, Average value; load/voltage fluctuation) ±0.3　(Analog set, Average value; Temp./0～40℃)		
	Spd control range		1：5000　＊1		
	Speed command		External analog speed command :DC 0～±10V(±10V/ rated speed) Input resistance about 20kΩ (resolution 12bit) Internal digital speed command　: 7 speeds (parameter)		
	Torque limit		External analog torque limit command: DC 0～+10V (+3.3V/ rated / torque)　Input resistance about 20kΩ (resolution 10bit), Forward/ reverse each 1 (2ch)　Internal digital torque limit value : Forward/ reverse each 1 (parameter)		
Torque Control	Torque command		External torque command: DC 0～±10V (±3.3V/rated torque) Input resistance about 20kΩ (resolution 12bit) Internal Torque command : 3 command (parameter)		
	Linearity		±3% (up to rated torque, repeatability)		
	Cmmnd resolu.		Resolution　1：500		
	Speed limit		External speed limit (DC voltage) : common to external speed command　+10V/rated speed (common to forward and reverse) Internal speed limit : 1 point (parameter)		
Position Control	Pulse train control		Max. frequency　1　Mpps		
	Pulse command method		┌Line driver method (directional pulse)　:Max.250Kpps ├Line driver method (90° different 2 phase pulse):Max.250Kpps └Open collector method (direction judge. pulse)　:Max.200Kpps		
	Pulse train compensation		1/100 ≦ A/B ≦ 100　(A,B : 1～65535)		
	Position detecting pulse output		90° different 2 phase pulse signal, Marker signal ┌Output style : Line driver method └Division ratio　: 1/N　(N=1～32)		

Item	Unit	NPS-FSM*		
		-113	-153	-223
Serial communication		RS-422A, Start/stop synchro. Multi-drop wiring is possible. (Communication condition parameter set is possible.) 56kbbs		
Monitor function		LCD module (installed) : Status display, Diagnostic display, Input/Output signal display Alarm display (last 5 cause history) Analog monitor : Speed, Torque, Deviation, etc. (selection by parameter)		
Control function		2 free degree control, FF control, Vibration filter, R2 compensation, Auto. tuningNon-interacting compensation, Dead time compensation		
Protective function		IPM error, Under voltage, Over voltage, Over load, Over speed, Encoder failure, Deviation over flow, Communication error Each data and parameter error, etc. (Last 5 cause history is stored.)		
Input signal		Deviation clear (CLR), Command pulse input inhibit (CIH), Mode selection 1,2(MD1,2) Local/Remote (PC), Start (DR/FJ), Reset (RST), Emergency stop (EMG) Speed selection 1~3(SS1,SS2,SS3), Torque limit (TL/RJ), Servo ON (SON) Forward over travel (FOT), Reverse over travel (ROT)		
Output signal		Servo ready (RDY), Alarm (ALM), Warning (WNG), Speed zero (SZ) Positioning complete (PN), In Speed/ Torque limit (LIM), Brake release (BRK)		
Option		Data input unit (MDI unit), Servo display, Cables , etc.		
Applicable encoder		6000 (2000) ppr (selection by parameter)		
Load inertia		10 times or less of motor rotor inertia		
Power capacity *3	kVA	2 1	3 0	4 1
No fuse breaker (rated current) *4	A	1 0 0	1 2 5	2 0 0
Applicable motor *5		NA720-552 -113	NA720-752 -153	NA720-223
Weight	kg	1 3. 5	2 6. 0	3 5. 0
Dimension		Refer to Section 2-2 outline drawing.		
Accessories		Regenerative resistor Refer to Section 10-2.		

* 1: A motor may not run smoothly as low speed as 1/5000 of rated speed. Speed control range is defined that in the range a motor does not stop with 100% load.
In case of combination with NA20 series motor, Speed control range is 1:3000.
* 2: When power source voltage drops, rated output and rated speed is not guaranteed.
* 3: It changes according to power source impedance.
* 4: Please choose sufficient shut down capacity type to conduct protective coordinate with power source capacity.
* 5: As for applicable motor speed and peak torque, please refer to 「10-4 Applicable motor list」.

１０－２　Regenerative Resistor Combination

１０－２－１　Regenerative Resistor Combination

【２００Ｖ system controller Regenerative resistor】

Controller type	Applicable motor	Regenerative resistor (kind)
NPS-FIM*-401	NA30-13F-15	RGH-60-FV-80　60w, 80Ω-1pc
	NA30-25F-15	
		Cement resistor outline : TYPE 1
NPS-FIM*-801	NA100-20F	RGH-60-FV-80　60w, 80Ω-1pc
	NA100-40F	
	NA100-75F-10	Cement resistor outline : TYPE 1
	NA30-50F-15	
NPS-FIM*-122	NA100-75F	RGH-200-FV-40　200w, 40Ω-1pc
	NA100-110F-10	
		Cement resistor outline : TYPE 2
NPS-FIM*-242	NA100-110F	RGH-200-FV-40　200w, 40Ω-1pc
	NA100-180F-10	
	NA30-110F-15	Cement resistor outline : TYPE 2
NPS-FIM*-402	NA100-180F	RGH-400-FV-20　400w, 20Ω-1pc
	NA100-270F-10	
	NA100-370F-10	Cement resistor outline : TYPE 3
	NA30-180F-15	
NPS-FIM*-752	NA100-180F	RGH-200G-0S　200w, 40Ω-3pcs
	NA100-270F	(Parallel connect. total 600w 13.3Ω)
	NA100-370AF	Enamel resistor outline : TYPE 4
	NA100-370F-10	
	NA100-550F-10	
	NA100-750F-10	

【２００Ｖsystem controller Regenerative resistor】

Controller type	Applicable motor	Regenerative resistor (kind)
NPS-FIM*-113	NA100-550AF	RGH-500-0S 500w, 24Ω-3pcs
	NA100-1100F-10	(Parallel connect. total 1.5 kw 8Ω)
	NA100-550F-10	Enamel resistor outline : TYPE 5
	NA100-750F-10	
	NA100-270F	
NPS-FIM*-153	NA100-750AF	RGH-500-0S 500w, 24Ω-4pcs
	NA100-550F	(Parallel connect. total 2.0 kw 6Ω)
	NA20-1500-10	Enamel resistor outline : TYPE 5
	NA100-370F	
NPS-FIM*-223	NA100-1100AF	RGH-500-0S 500w, 24Ω-6pcs
	NA100-750F	(Parallel connect. total 3.0 kw 4Ω)
	NA20-2200-10	Enamel resistor outline : TYPE 5
NPS-FIM*-303	NA100-1100F	RGH-500-0S 500w, 24Ω-8pcs
	NA20-1500	(Parallel connect. total 4.0 kw 3Ω)
	NA20-2700-10	Enamel resistor outline : TYPE 5
NPS-FIM*-373	NA20-1800	RGH-500-0S 500w, 24Ω-10pcs
	NA20-3700-10	(Parallel connect. total 5.0kw 2.4Ω)
		Enamel resistor outline : TYPE 5

[４００Ｖsystem controller Regenerative resistor]

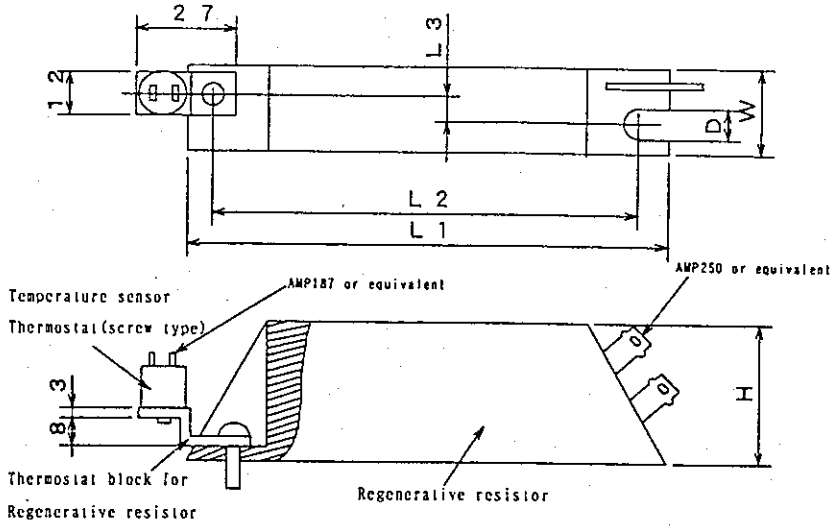
Controller type	Applicable motor	Regenerative resistor (kind)
NPS-FIH*-113	NA100-550F-20H NA100-1100F-10H	RGH-500-0S 500w, 100Ω-3pcs (Parallel connect. total 1.5 kw 33Ω) Enamel resistor outline : TYPE 5
NPS-FIH*-153	NA100-750F-20H NA20-1500-10H	RGH-500-0S 500w, 100Ω-4pcs (Parallel connect. total 2.0 kw 25Ω) Enamel resistor outline : TYPE 5
NPS-FIH*-223	NA100-1100F-20H NA20-2200-10H NA100-750F-20H	RGH-500-0S 500w, 100Ω-6pcs (Parallel connect. total 3.0kw 16.6Ω) Enamel resistor outline : TYPE 5
NPS-FIH*-303	NA20-1500-20H NA20-2700-10H NA100-1100F-20H	RGH-500-0S 500w, 100Ω-8pcs (Parallel connect. total 4.0 kw 12.5Ω) Enamel resistor outline : TYPE 5
NPS-FIH*-373	NA20-1800-20H NA20-3700-10H	RGH-500-0S 500w, 100Ω-10pcs (Parallel connect. total 5.0kw 10Ω) Enamel resistor outline : TYPE 5
NPS-FIH*-553	NA20-2700-20H NA20-5500-10H	Option
NPS-FIH*-753	NA20-3700-20H NA20-7500-10H	Option
NPS-FIH*-114	NA20-5500-20H NA20-11000-10H	Option

【２００Ｖsystem controller Regenerative resistor

Controller type	Applicable motor	Regenerative resistor (kind)
NPS-FSM*-122	NA720-122	RGH-60-FV-80 60w, 80Ω-1pc
		Sement resistor outline : TYPE 2
NPS-FSM*-242	NA720-182	RGH-200-FV-40 200w, 40Ω-1pc
	NA720-242	
		Semet resistor outline : TYPE 2
NPS-FSM*-402	NA720-372	RGH-400-FV-20 400w, 20Ω-1pc
	NA720-402	
		Sement resistor outline : TYPE 3
NPS-FSM*-752	NA720-372	RGH-200G-0S 200w, 40Ω-3pcs
	NA720-402	(Parallel connect. total 600w 13.3Ω)
	NA720-552	Enamel resistor outline : TYPE 4
	NA720-752	
NPS-FSM*-113	NA720-552	RGH-500-0S 500w, 24Ω-3pcs
	NA720-113	(Parallel connect. total 1.5kw 8Ω)
		Enamel resistor outline : TYPE 5
NPS-FSM*-153	NA720-752	RGH-500-0S 500w, 24Ω-4pcs
	NA720-153	(Parallel connect. total 2.0 kw 6Ω)
		Enamel resistor outline : TYPE 5
NPS-FSM*-223	NA720-223	RGH-500-0S 500w, 24Ω-6pcs
		(Parallel connect. total 3.0 kw 4Ω)
		Enamel resistor outline : TYPE 5

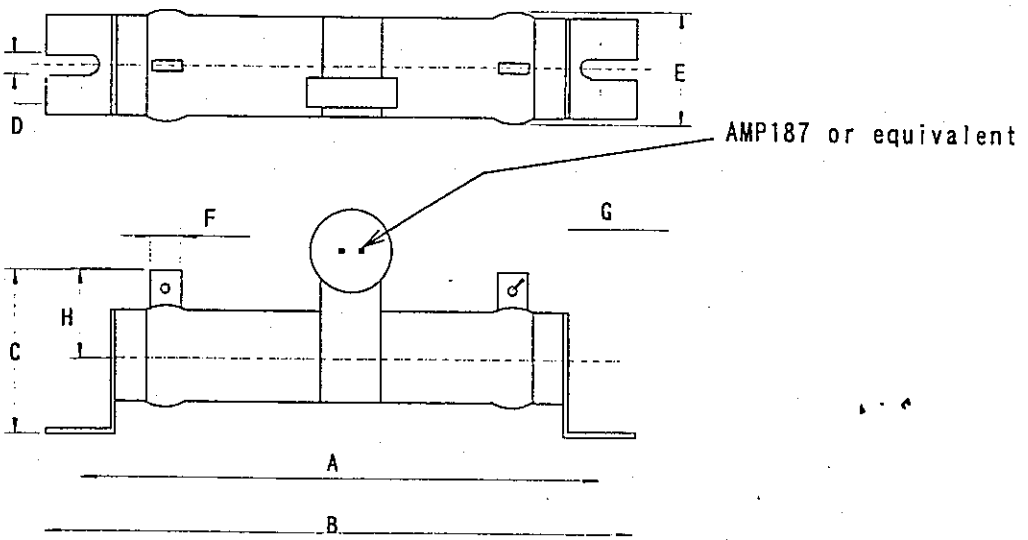
10－2－2 Regenerative resistor outline drawing

Enamel resistor outline, dimension and thermostat install place si as follows.



(Attach the thermostat and tighten it with a screw common to Regenerative resistor installation.)

Type	Rated power	L 1	L 2	W	H	L 3	D	Outline
RGH60	60W	115	100	20	40	5	4．3	TYPE 1
RGH200	200W	215	200	25	50	8	5．3	TYPE 2
RGH400	400W	265	250	30	60	13	5．3	TYPE 3



Type	Rated power	A	B	C	D	E	F	G	H	Outline
RGH200	200w	282	304	54	6	32	7	2.2	29	TYPE 4
RGH500	500w	350	380	99	10	57	13	5.2	49	TYPE 5

10－3 Electric Specificaton of Motor cooling Blowers

【AC200V system motor cooling blower】

Motor type	Input power source						Power source poles
	200V／50Hz		200V／60Hz		220V／60Hz		
	Power consump. (W)	Rated current (A)	Power consump. (W)	Pated current (A)	Power consump. (W)	Pated 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	

【AC400Vsystem motor cooling blower】

Motor type	Input power source				3Φ 2P
	100V／50Hz		100V／60Hz		
	Power consump. (W)	Rated current (A)	Power consump. (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				3Φ 2P
	400V／50Hz		400V／60Hz		
	Power consump. (W)	Rated current (A)	Power consump. (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					

10－4　Applicable Motor List

10－4－1　NPS－FIM＊－＊＊＊ controller

【200V system controller applicable motor selection list】

Controller capasity	P000 set value	Applicable motor Motor type	Rate out.	Rated speed	Peak torque
NPS－FIM＊－401	211	NA30-13F-15	0.2 Kw	1500 rpm	300 %
Capacity：0.4kw	212	NA30-25F-15	0.4 Kw	1500 rpm	300 %
In.voltage：200V					
NPS－FIM＊－801	221	NA100-20F	0.6 Kw	3000 rpm	300 %
Capacity：0.8kw	222	NA100-40F	0.8 Kw	2000 rpm	300 %
In.voltage：200V	223	NA100-75F-10	0.8 Kw	1000 rpm	300 %
	224	NA30-50F-15	0.8 Kw	1500 rpm	300 %
NPS－FIM＊－122	231	NA100-75F	1.5 Kw	2000 rpm	300 %
Capacity：1.5kw	232	NA100-110F-10	1.2 Kw	1000 rpm	200 %
In.voltage：200V					
NPS－FIM＊－242	241	NA100-110F	2.2 Kw	2000 rpm	300 %
Capacity：2.2kw	242	NA100-180F-10	1.9 Kw	1000 rpm	300 %
In.voltage：200V	243	NA30-110F-15	1.6 Kw	1500 rpm	300 %
NPS－FIM＊－402	251	NA100-180F	3.7 Kw	2000 rpm	200 %
Capacity：3.7kw	252	NA100-270F-10	2.8 Kw	1000 rpm	300 %
In.voltage：200V	253	NA100-370F-10	3.7 Kw	1000 rpm	200 %
	254	NA30-180F-15	2.8 Kw	1500 rpm	300 %
NPS－FIM＊－752	011	NA100-180F	3.7 Kw	2000 rpm	300 %
Capacity：7.5kw	012	NA100-270F	5.5 Kw	2000 rpm	200 %
In.voltage：200V	013	NA100-370AF	7.5 Kw	2000 rpm	200 %
	014	NA100-370F-10	3.7 Kw	1000 rpm	300 %
	015	NA100-550F-10	5.5 Kw	1000 rpm	200 %
	016	NA100-750F-10	7.5 Kw	1000 rpm	200 %
NPS－FIM＊－113	023	NA100-270F	5.5 Kw	2000 rpm	300 %
Capacity：11kw	024	NA100-550F-10	5.5 Kw	1000 rpm	300 %
In.voltage：200V	025	NA100-750F-10	7.5 Kw	1000 rpm	290 %
	021	NA100-550AF	11 kw	2000 rpm	200 %
	022	NA100-1100F-10	11 kw	1000 rpm	200 %
NPS－FIM＊－153	034	NA100-370F	7.5 Kw	2000 rpm	300 %
Capacity：15kw	031	NA100-750AF	15 kw	2000 rpm	200 %
In.voltage：200V	032	NA20-1500-10	15 kw	1000 rpm	200 %
	033	NA100-550F	11 kw	2000 rpm	300 %
NPS－FIM＊－223	041	NA100-1100AF	22 kw	2000 rpm	200 %
Capacity：22kw	042	NA20-2200-10	22 kw	1000 rpm	200 %
In.voltage：200V	043	NA100-750F	15 kw	2000 rpm	290 %
NPS－FIM＊－303	051	NA20-1500	30 kw	2000 rpm	200 %
Capacity：30kw	052	NA20-2700-10	30 kw	1000 rpm	200 %
In.voltage：200V	053	NA100-1100F	22 kw	2000 rpm	300 %
NPS－FIM＊－373	061	NA20-1800	37 kw	2000 rpm	200 %
Capacity：37kw	062	NA20-3700-10	37 kw	1000 rpm	190 %
In.voltage：200V					

10－4－2 NPS－FIH＊－＊＊＊ controller

【400V system controller applicable motor selection list】

Controller capasity	P000 set value	Applicable motor Motor type	Rate out.	Rated speed	Peak torque
NPS－FIH＊－113	121	NA100-550F-20H	11 kw	2000 rpm	200 %
Capacity：11kw	122	NA100-1100F-10H	11 kw	1000 rpm	200 %
In.voltage：400V	123	NA100-550F-20H	11 kw	2000 rpm	300 %
NPS－FIH＊－153	131	NA100-750F-20H	15 kw	2000 rpm	200 %
Capacity：15kw	132	NA20-1500-10H	15 kw	1000 rpm	200 %
In.voltage：400V					
NPS－FIH＊－223	141	NA100-1100F-20H	22 kw	2000 rpm	200 %
Capacity：22kw	142	NA20-2200-10H	22 kw	1000 rpm	200 %
In.voltage：400V	143	NA100-750F-20H	15 kw	2000 rpm	300 %
NPS－FIH＊－303	151	NA20-1500-20H	30 kw	2000 rpm	200 %
Capacity ：30kw	152	NA20-2700-10H	30 kw	1000 rpm	200 %
In.voltage：400V	153	NA100-1100F-20H	22 kw	2000 rpm	300 %
NPS－FIH＊－373	161	NA20-1800-20H	37 kw	2000 rpm	200 %
Capacity：37kw	162	NA20-3700-10H	37 kw	1000 rpm	200 %
In.voltage：400V					

10－4－3 NPS－FSM＊－＊＊＊ controller

【200V system controller applicable motor selection list】

Controller capasity	P000 set value	Applicable motor Motor type	Rate out.	Rated speed	Peak torque
NPS－FSM＊－122 Capacity1．2kw In.voltage：200V	551	NA720-122	1．2 kw	2000 rpm	300 %
NPS－FSM＊－242 Capacity：2．4kw In.voltage：200V	571	NA720-182	1．8 kw	2000 rpm	300 %
	572	NA720-242	2．4 kw	2000 rpm	300 %
NPS－FSM＊－402 Capacity：4．0kw In.voltage：200V	581	NA720-372	3．7 kw	2000 rpm	200 %
	582	NA720-402	4．0 kw	2000 rpm	200 %
NPS－FSM＊－752 Capacity：7．5kw In.voltage：200V	701	NA720-372	3．7 kw	2000 rpm	300 %
	702	NA720-402	4．0 kw	2000 rpm	300 %
	703	NA720-552	5．5 kw	2000 rpm	200 %
	704	NA720-752	7．5 kw	2000 rpm	200 %
NPS－FSM＊－113 Capacity：11kw In.voltage：200V	711	NA720-552	5．5 kw	2000 rpm	300 %
	712	NA720-113	11 kw	2000 rpm	200 %
NPS－FSM＊－153 Capacity：15kw In.voltage：200V	721	NA720-752	7．5 kw	2000 rpm	300 %
	722	NA720-153	15 kw	2000 rpm	200 %
NPS－FSM＊－223 Capacity：22kw In.voltage：200V	731	NA720-223	22 kw	2000 rpm	200 %

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