Σ-Ⅱ SERIES SGDH

MECHATROLINK INTERFACE UNIT

USER'S MANUAL

MODEL: JUSP-NS100

YASKAWA

MANUAL NO. SIE-C718-4B

Overview

■ About this Manual

This manual provides the following information for the Σ-II Series SGM□H/SGDH-□E Servodrives with a JUSP-NS100 MECHATROLINK Interface Unit mounted.

- Procedures for installing and wiring the SERVOPACK and Option Unit.
- Procedures for trial operation of the Servodrive.
- Procedures for using functions and adjusting the Servodrives.
- Precautions for using the built-in Panel Operator and the Hand-held Digital Operator.
- Ratings and specifications for standard models.
- Procedures for maintenance and inspection.
- SERVOPACK MECHATROLINK communications specifications.

■ Intended Audience

This manual is intended for the following users.

- Those designing Servodrive systems using MECHATROLINK.
- Those designing Σ-II Series Servodrive systems.
- Those installing or wiring Σ-II Series Servodrives.
- Those performing trial operation or adjustments of Σ-II Series Servodrives.
- Those maintaining or inspecting Σ-II Series Servodrives.

■ Description of Technical Terms

In this manual, the following terms are defined as follows:

- **Option Unit** = JUSP-NS100
- **Servomotor** = Σ-II Series SGMAH, SGMPH, SGMGH, SGMSH, or SGMDH Servomotor.
- **SERVOPACK** = Σ-II Series SGDH-□□□E SERVOPACK.
- **Servodrive** = A set including a Servomotor and Servo Amplifier.
- **Servo System** = A servo control system that includes the combination of a Servodrive with a host computer and peripheral devices.

■ Indication of Reverse Signals

In this manual, the names of reverse signals (ones that are valid when low) are written with a forward slash (/) before the signal name, as shown in the following examples:

- /S-ON
- /P-CON

Visual Aids

The following aids are used to indicate certain types of information for easier reference.

◀ EXAMPLE ▶ Indicates application examples.

Indicates supplemental information.

IMPORTANT

Indicates important information that should be memorized, including precautions such as alarm displays to avoid damaging the devices.

Indicates definitions of difficult terms or terms that have not been previously explained in this manual.

■ Related Manuals

Refer to the following manuals as required.

Read this manual carefully to ensure the proper use of Σ-II Series Servodrives. Also, keep this manual in a safe place so that it can be referred to whenever necessary.

Manual Name	Manual Number	Contents
Σ-II Series SGM□H/SGDH User's Manual Servo Selection and Data Sheets	SIE-S800-32.1	Describes the procedure used to select Σ-II Series Servodrives and capacities.
Σ-II Series SGM□H/SGDH User's Manual Design and Maintenance	SIE-S800-32.2	Provides detailed information on SGDH SERVOPACKs.
Σ-II Series Servopack Personal Computer Monitoring Software Operation Manual	SIE-S800-35	Describes the applications and operation of software for the Σ-II Series Servodrive monitoring devices for use on personal computers.
Σ-II Series SGM□H/SGDM Digital Operator Operation Manual	TOE-S800-34	Provides detailed information on the operation of the JUSP-OP02A-2 Digital Operator, which is an optional product.
High-speed Field Network MECHATROLINK System User's Manual	SIE-S800-26.1	Provides detailed information on the MECHATROLINK system.
High-speed Field Network MECHATROLINK Servo Command User's Manual	SIE-S800-26.2	Describes the Servo commands for use in a MECHATROLINK system.

Safety Information

The following conventions are used to indicate precautions in this manual. Failure to heed precautions provided in this manual can result in serious or possibly even fatal injury or damage to the products or to related equipment and systems.

⚠ WARNING

Indicates precautions that, if not heeded, could possibly result in loss of life or serious injury.

⚠ CAUTION

Indicates precautions that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

PROHIBITED

Indicates actions that must never be taken.

The warning symbols for ISO and JIS standards are different, as shown below.

ISO	JIS
	

The ISO symbol is used in this manual.

Both of these symbols appear on warning labels on Yaskawa products. Please abide by these warning labels regardless of which symbol is used.

Safety Precautions

The following precautions are for checking products upon delivery, installation, wiring, operation, maintenance and inspections.

■ Checking Products upon Delivery

⚠ CAUTION

- Always use the Servomotor and SERVOPACK in one of the specified combinations.

  Not doing so may cause fire or malfunction.

■ Installation

⚠ CAUTION

- Never use the products in an environment subject to water, corrosive gases, inflammable gases, or combustibles

  Doing so may result in electric shock or fire.

■ Wiring

⚠ WARNING

- Connect the SERVOPACK ground terminal effectively to a system grounding conductor or grounding electrode (100 Ω or less).

  Improper grounding may result in electric shock or fire.

⚠ CAUTION

- Do not connect a three–phase power supply to SERVOPACK U, V, or W output terminals.

  Doing so may result in injury or fire.
- Securely fasten the power supply terminal screws and motor output terminal screws.

  Not doing so may result in fire.

■ Operation

⚠ WARNING

- Never touch any rotating motor parts while the motor is running.

  Doing so may result in injury.

⚠ CAUTION

- Conduct trial operation on the Servomotor alone with the motor shaft disconnected from machine to avoid any unexpected accidents.

  Not doing so may result in injury.
- Before starting operation with a machine connected, change the settings to match the parameters of the machine.

  Starting operation without matching the proper settings may cause the machine to run out of control or malfunction.
- Before starting operation with a machine connected, make sure that an emergency stop can be applied at any time.

  Not doing so may result in injury.
- Do not touch the heat sinks during operation.

  Doing so may result in burns due to high temperatures.

■ Maintenance and Inspection

⚠ WARNING

- Never touch the inside of the SERVOPACKs.

  Doing so may result in electric shock.
- Do not remove the panel cover while the power is ON.

  Doing so may result in electric shock.
- Do not touch terminals for five minutes after the power is turned OFF.

  Residual voltage may cause electric shock.

⚠ CAUTION

- Do not disassemble the Servomotor.

  Doing so may result in electric shock or injury.
- Do not attempt to change wiring while the power is ON.

  Doing so may result in electric shock or injury.

■ General Precautions

Note the following to ensure safe application.
• The drawings presented in this manual are sometimes shown without covers or protective guards. Always replace the cover or protective guard as specified first, and then operate the products in accordance with the manual. • The drawings presented in this manual are typical examples and may not match the product you received. • This manual is subject to change due to product improvement, specification modification, and manual improvement. When this manual is revised, the manual code is updated and the new manual is published as a next edition. The edition number appears on the front and back covers. • If the manual must be ordered due to loss or damage, inform your nearest Yaskawa representative or one of the offices listed on the back of this manual. • Yaskawa will not take responsibility for the results of unauthorized modifications of this product. Yaskawa shall not be liable for any damages or troubles resulting from unauthorized modification.

CONTENTS

4 MECHATROLINK Communications

1

Checking Products and Part Names

This chapter describes the procedure for checking Σ-II Series products and the Option Unit upon delivery. It also describes the names of product parts.

1.1 Checking Products on Delivery

The following procedure is used to check products upon delivery. Check the following items when products are delivered.

Check Items	Comments
Are the delivered products the ones that were ordered?	Check the model numbers marked on the nameplates of the Option Unit. (Refer to the descriptions of model numbers on following pages.)
Is there any damage?	Check the overall appearance, and check for damage or scratches that may have occurred during shipping.
Can the Option Unit be installed on the SERVOPACK used?	Check the model number given on the SERVOPACK nameplate. The model number must contain "SGDH" and "E" as shown below to support the Option Unit. SGDH-□□□E-□

If any of the above items are faulty or incorrect, contact your Yaskawa sales representative or the dealer from whom you purchased the products.

■ External Appearance and Nameplate Examples

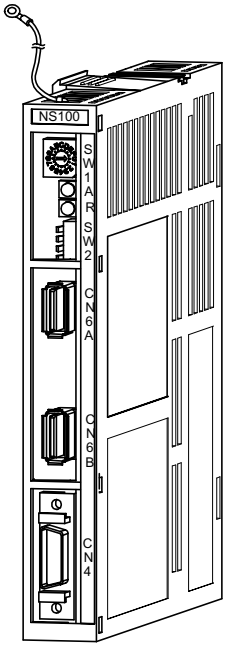


Fig. 1.1 External Appearance of the Option Unit

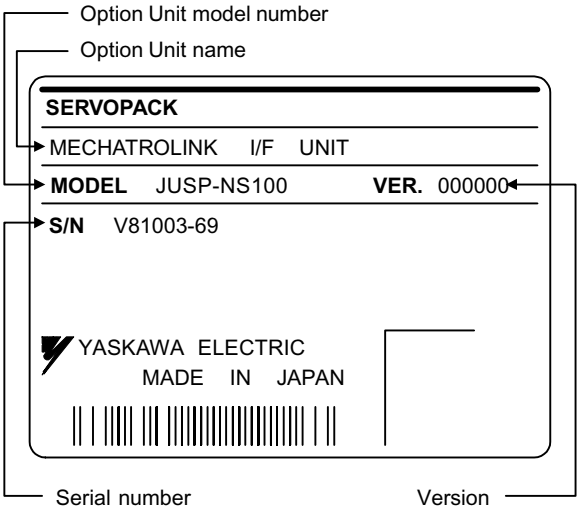
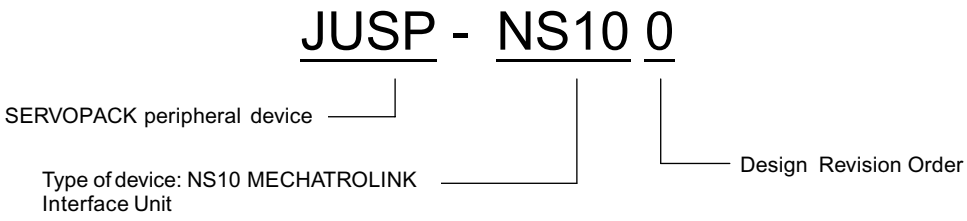


Fig. 1.2 Nameplate

■ Model Numbers

Option Unit



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1.2 Product Part Names

The following diagram illustrates the product part names of the Option Unit.

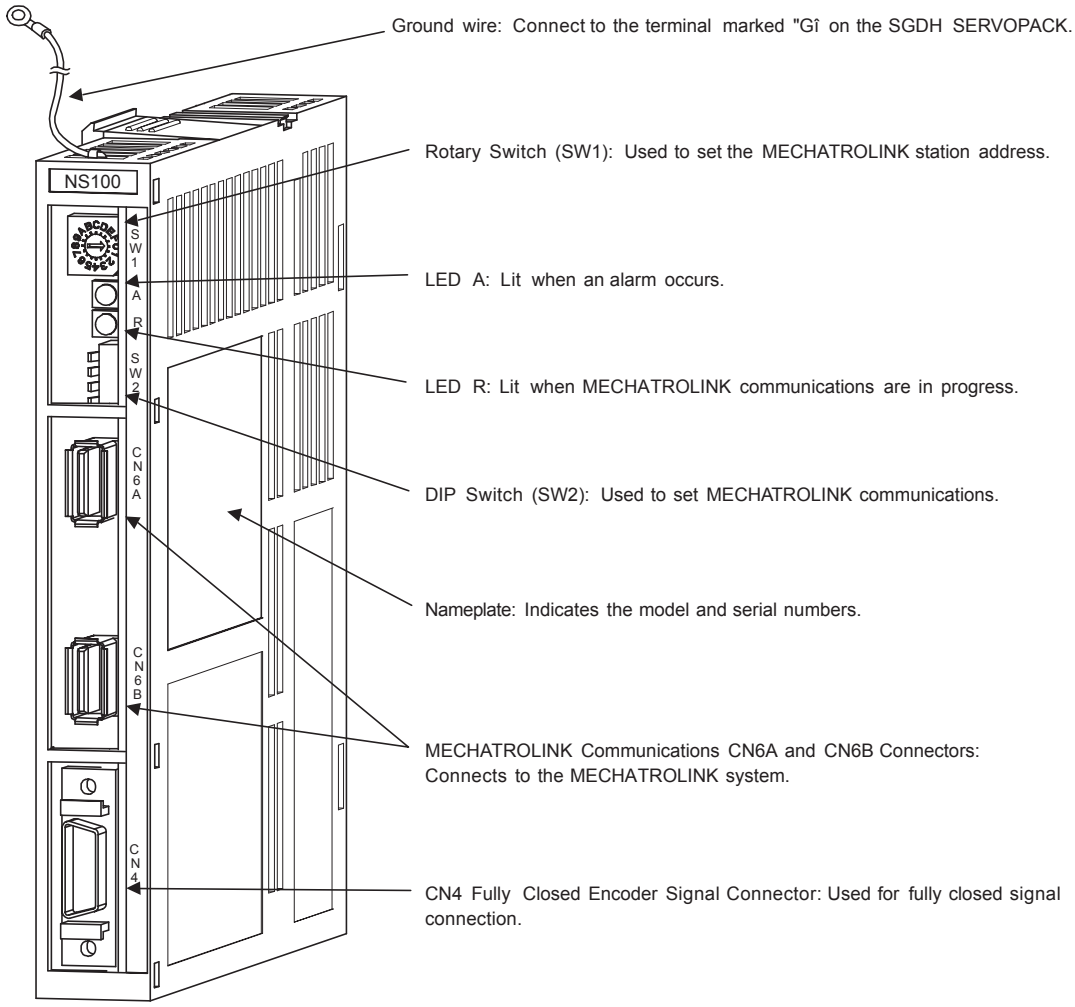


Fig. 1.3 Option Unit

1.3 Mounting the Option Unit

This section describes how to mount a JUSP-NS100 MECHATROLINK Interface Unit (Option Unit) on the SGDH SERVOPACK.

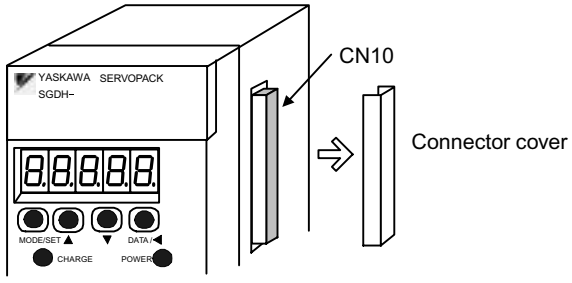
Prepare the screws for connecting the ground wire as shown in the following table:

Mounting Type	SERVOPACK Models	Screw	Remarks
Base Mounted	SGDH-A3 to 02BE SGDH-A3 to 10AE	M3 × 10 round-head screw (spring or flat washer)	Attachments
	SGDH-15 to 50AE SGDH-05 to 30DE	M4 × 10 round-head screw (spring or flat washer)	Attachments
	SGDH-60/75AE	M4 × 8 round-head screw (spring or flat washer)	Use front panel fixer screws
Rack Mounted	SGDH-A3 to 02BE-R SGDH-A3 to 50AE-R SGDH-05 to 30DE-R	M4 × 6 round-head screw (spring or flat washer)	Attachments (see note)
Duct Vent	SGDH-60/75AE-P	M4 × 8 round-head screw (spring or flat washer)	Use front panel fixer screws

Note: Be sure to use spring washers or flat washers. Failure to do so may result in the screws for connecting the ground wire protruding behind the flange, preventing the SERVOPACK from being mounted.

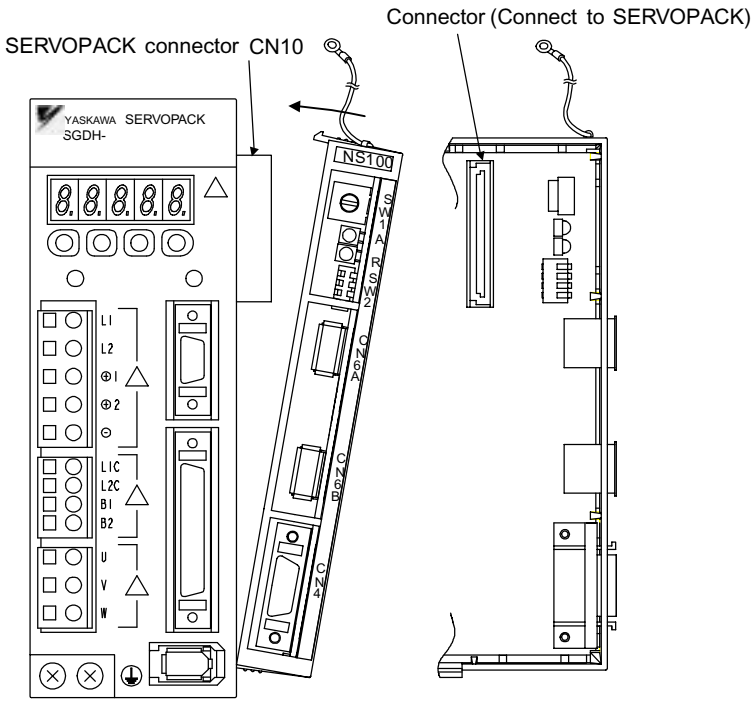
By mounting an Option Unit, the SGDH SERVOPACK can be used in a MECHATROLINK system. Use the following procedure to ensure Option Units are mounted correctly.

1. Remove the connector cover from the CN10 connector on the SERVOPACK.

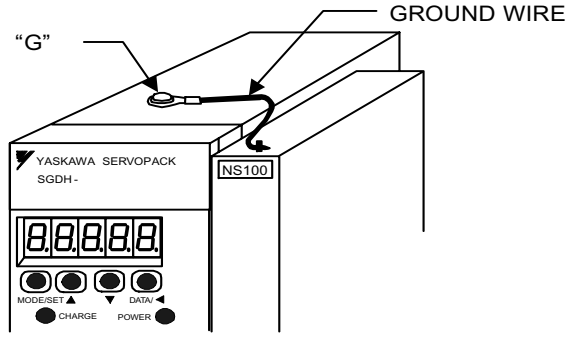


1

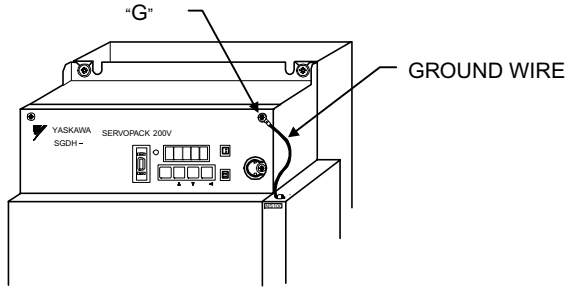
2. Mount the Option Unit on the SERVOPACK.



3. For grounding, connect a ground wire of the Option Unit to the point marked “G” on the SERVOPACK.

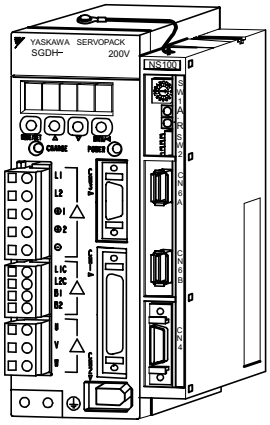


For SERVOPACK（30 W to 5.0 kW ）



For SERVOPACK（6.0 kW to 7.5 kW ）

When the Option Unit has been mounted correctly, the SERVOPACK will appear as shown in the following diagram.



2

Installation

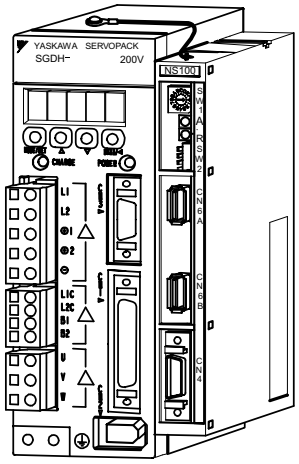
This chapter describes precautions for Σ-II Series product installation.

The SGDH SERVOPACKs are base-mounted servo controller. Incorrect installation will cause problems. Always observe the installation precautions shown in this chapter.

2.1 Storage Conditions

Store the SERVOPACK within the following temperature range when it is stored with the power cable disconnected.

-20 to 85°C



Σ-II Series SGDH SERVOPACK
with Option Unit mounted

2.2 Installation Site

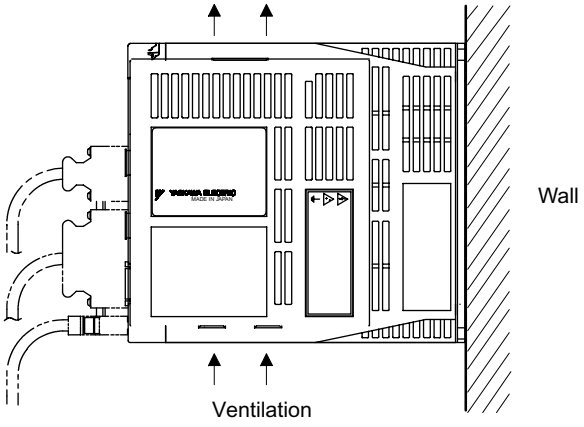
Take the following precautions at the installation site.

Situation	Installation Precaution
Installation in a Control Panel	Design the control panel size, unit layout, and cooling method so that the temperature around the SERVOPACK does not exceed 55°C.
Installation Near a Heating Unit	Minimize heat radiated from the heating unit as well as any temperature rise caused by natural convection so that the temperature around the SERVOPACK does not exceed 55°C.
Installation Near a Source of Vibration	Install a vibration isolator beneath the SERVOPACK to avoid subjecting it to vibration.
Installation at a Site Exposed to Corrosive Gas	Corrosive gas does not have an immediate effect on the SERVOPACK, but will eventually cause electronic components and contactor-related devices to malfunction. Take appropriate action to avoid corrosive gas.
Other Situations	Do not install the SERVOPACK in hot or humid locations, or locations subject to excessive dust or iron powder in the air.

2.3 Orientation

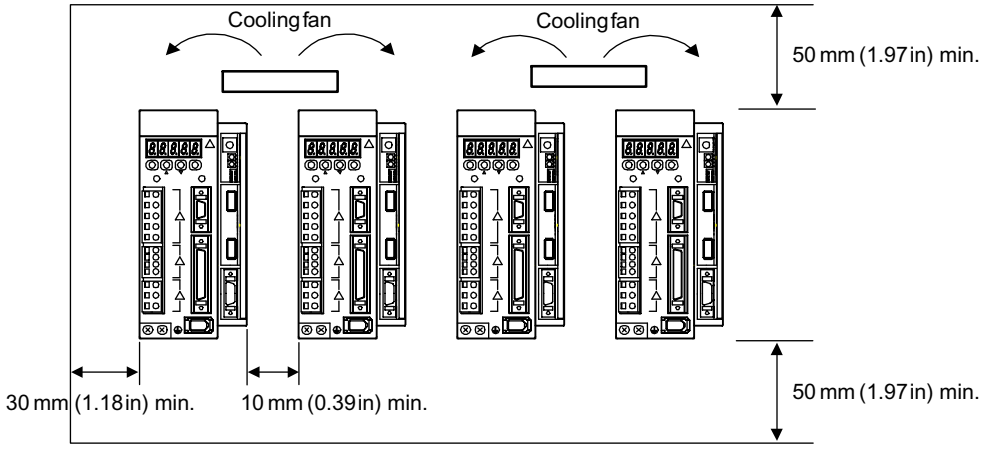
Install the SERVOPACK perpendicular to the wall as shown in the figure. The SERVOPACK must be oriented this way because it is designed to be cooled by natural convection or cooling fan.

Secure the SERVOPACK using 2 to 4 mounting holes. The number of holes depends on the SERVOPACK capacity.



2.4 Installation

Follow the procedure below to install multiple SERVOPACKs side by side in a control panel.



■ SERVOPACK Orientation

Install the SERVOPACK perpendicular to the wall so that the front panel (containing connectors) faces outward.

■ Cooling

As shown in the figure above, provide sufficient space around each SERVOPACK for cooling by cooling fans or natural convection.

■ Side-by-side Installation

When installing SERVOPACKs side by side as shown in the figure above, provide at least 10 mm (0.39 in) between and at least 50 mm (1.97 in) above and below each SERVOPACK. Install cooling fans above the SERVOPACKs to avoid excessive temperature rise and to maintain even temperature inside the control panel.

■ Environmental Conditions in the Control Panel

- Ambient Temperature: 0 to 55°C
- Humidity: 90% RH or less
- Vibration: 0.5 G (4.9 m/s^2)
- Condensation and Freezing: None
- Ambient Temperature for Long-term Reliability: 45°C max.

3

Connectors

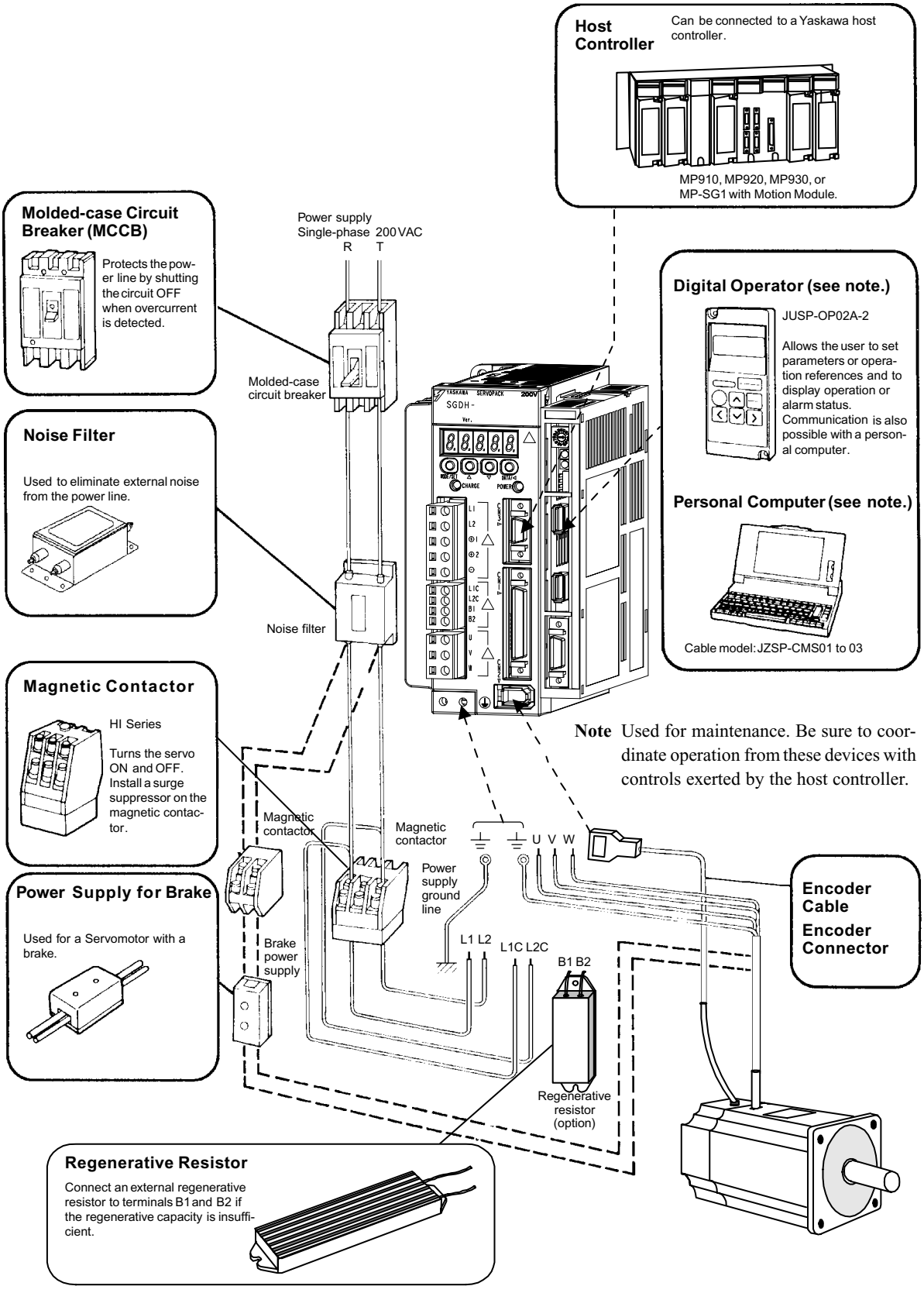
This chapter describes the procedure used to connect Σ-II Series products to peripheral devices when an Option Unit is mounted and gives typical examples of I/O signal connections.

3.1 Connecting to Peripheral Devices

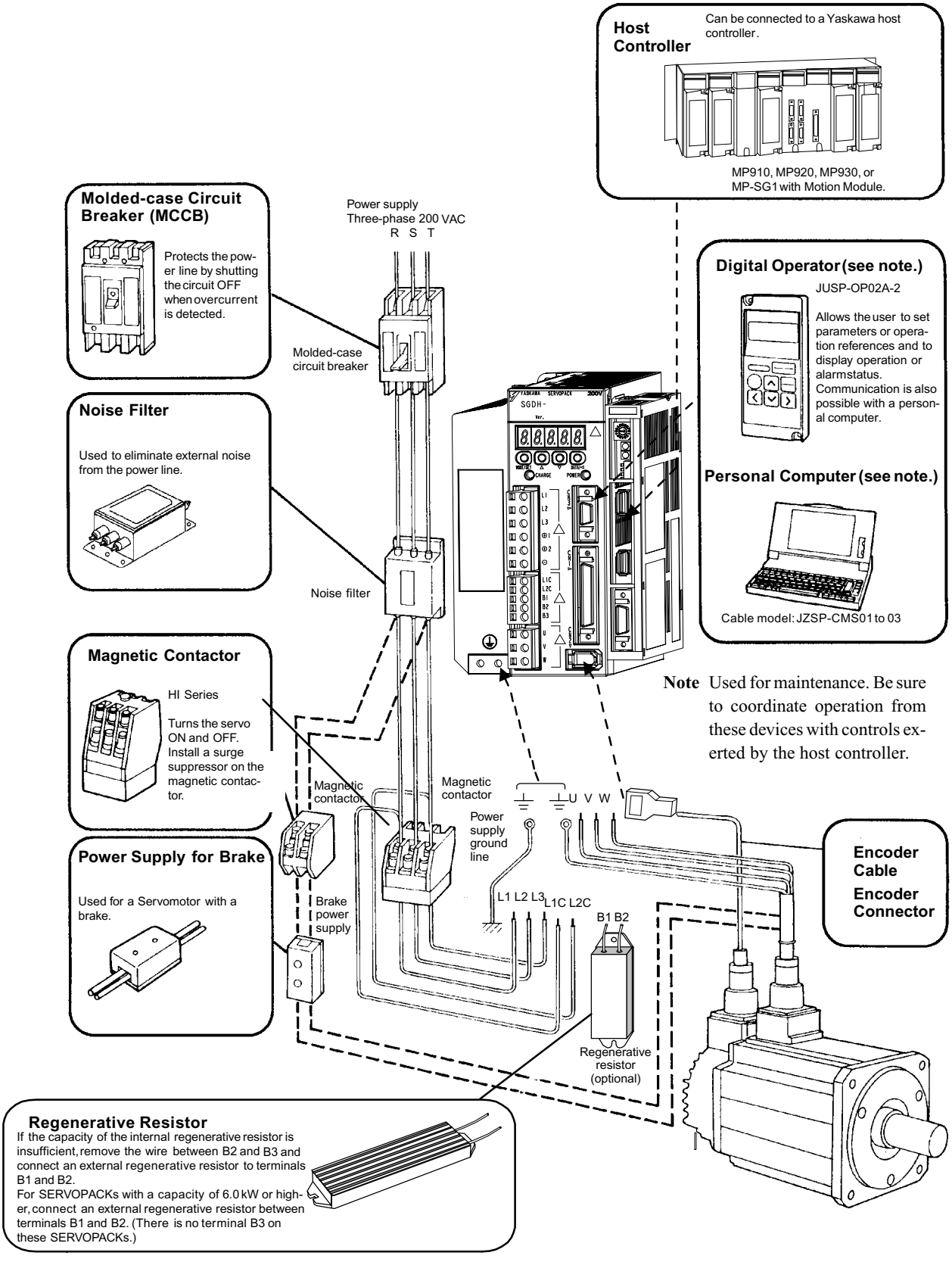
This section provides examples of standard Σ-II Series product connections to peripheral devices.

It also briefly explains how to connect each peripheral device.

3.1.1 Single-phase (100 V or 200 V) Main Circuit Specifications



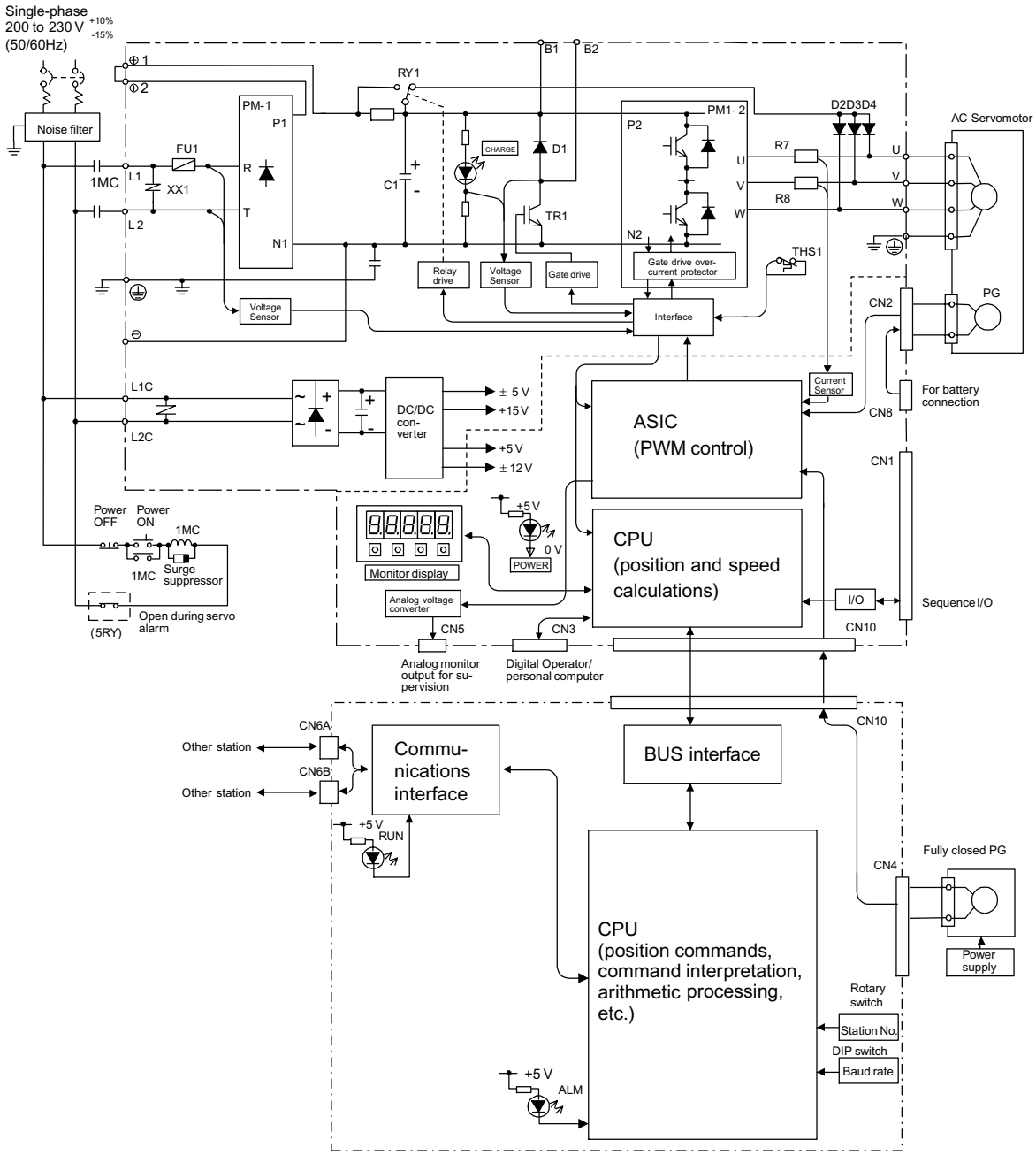
3.1.2 Three-phase (200 V) Main Circuit Specifications



3.2 SERVOPACK Internal Block Diagrams

The following sections show an internal block diagram for the SERVOPACK with an Option Unit.

30 to 400 W 200-V and 30 to 200 W 100-V Models

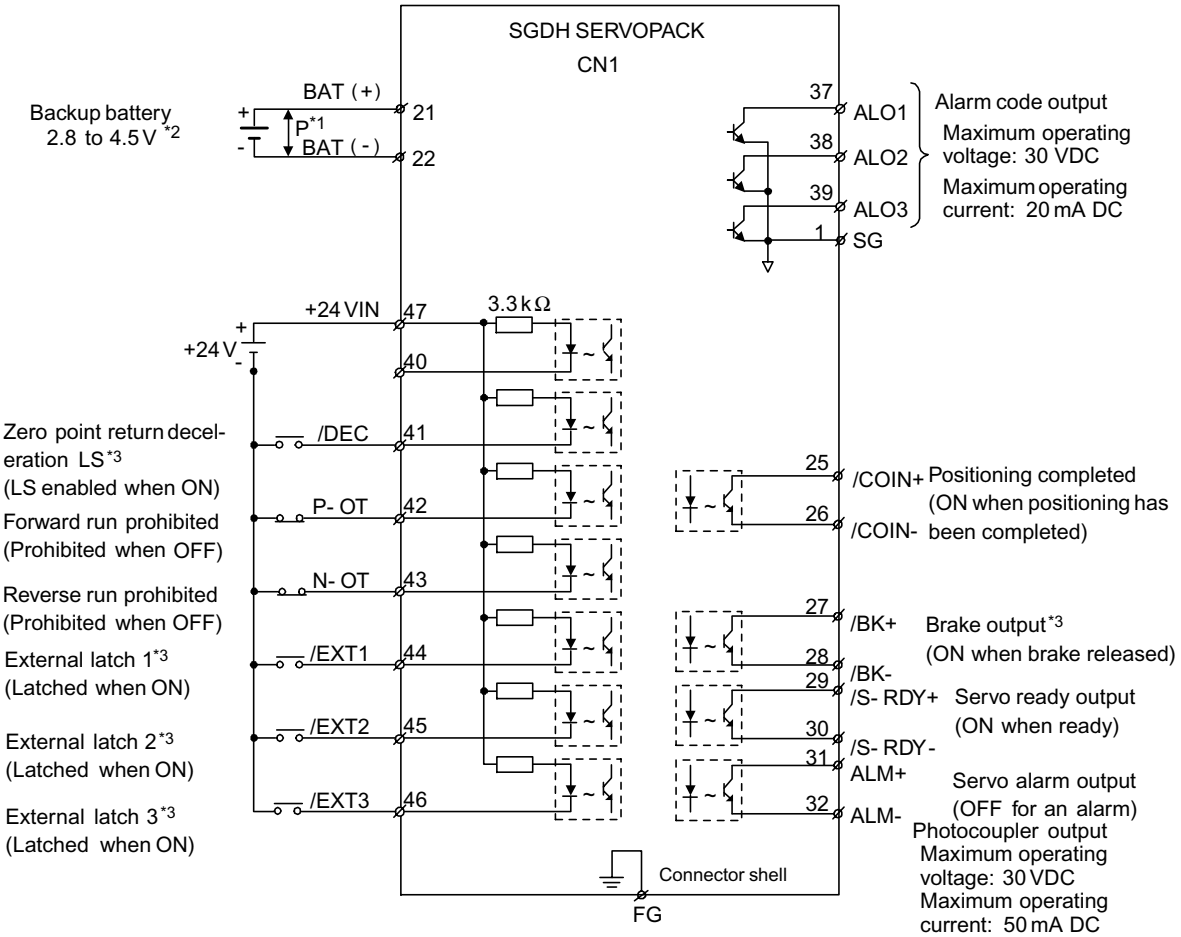


3.3 I/O Signals

This section describes I/O signals for the SERVOPACK with Option Unit.

3.3.1 Connection Example of I/O Signal Connector (CN1)

The following diagram shows a typical example of I/O signal connections.



* 1. ↕P represents twisted-pair wires.
* 2. When using an absolute encoder, connect a backup battery only when there is no battery connected to the CN8.
* 3. Make signal allocations using parameters. (Refer to *6.1.2 Standard Settings for CN1 I/O Signals*.)

Fig. 3.1 I/O Signal Connections for CN1 Connectors

3.3.2 I/O Signals Connector (CN1)

The following diagram shows the layout of CN1 terminals.

■ CN1 Terminal Layout

2	SG	GND	1	SG	GND	27	/BK+ (Note 3)	Brake interlock output	26	/COIN-	Positioning complete output
4	-	-	3	-	-	29	/S-RDY+	Servo ready output	28	/BK- (Note 3)	Brake interlock output
6	SG	GND	5	-	-	31	ALM+	Servo alarm output	30	/S-RDY-	Servo ready output
8	-	-	7	-	-	33	-	-	32	ALM-	Servo alarm output
10	SG	GND	9	-	-	35	-	-	34	-	-
12	-	-	11	-	-	37	ALO1	Alarm code output (open-collector output)	36	-	-
14	-	-	13	-	-	39	ALO3		38	ALO2	Alarm code output
16	-	-	15	-	-	41	/DEC (Note 3)	Zero point return deceleration LS input	40	-	-
18	-	-	17	-	-	43	N-OT	Reverse run prohibited input	42	P-OT	Forward drive prohibited input
20	-	-	19	-	-	45	/EXT2 (Note 3)	External latch signal 2 input	44	/EXT1 (Note 3)	External latch signal 1 input
22	BAT (-)	Battery (-)	21	BAT (+)	Battery (+)	47	+24VIN	External power supply input	46	/EXT3 (Note 3)	External latch signal 3 input
24	-	-	23	-	-	49	-	-	48	-	-
			25	/COIN +	Positioning complete output				50	-	-

Note: 1. Do not use unused terminals for relays.
2. Connect the shield of the I/O signal cable to the connector shell.
The shield is connected to the FG (frame ground) at the SERVOPACK-end connector.
3. Make signal allocations using parameters. (Refer to *6.1.2 Standard Settings for CN1 I/O Signals.)*

■ CN1 Specifications

Specifications for SERVOPACK Connectors	Applicable Receptacles		
	Soldered	Case	Manufacturer
10250-52A2JL 50-p Right Angle Plug	10150-3000VE	10350-52A0-008	Manufactured by Sumitomo 3M Ltd.

3.3.3 I/O Signal Names and Functions

The following section describes SERVOPACK I/O signal names and functions.

■ Input Signals

Signal Name		Pin No.	Function	
Common	/DEC	41	Zero point return deceleration limit switch: Deceleration LS used when the motor returns to the zero point.	
	P-OT N-OT	42 43	Forward run prohibited Reverse run prohibited	Overtravel prohibited: Stops Servomotor when movable part travels beyond the allowable range of motion.
	/EXT1 /EXT2 /EXT3	44 45 46	External latch signals 1, 2, and 3: External signals for latching the current FB pulse counter.	
	+24VIN	47	Control power supply input for sequence signals: Users must provide the +24-V power supply. Allowable voltage fluctuation range: 11 to 25 V	
	BAT (+) BAT (-)	21 22	Connecting pin for the absolute encoder backup battery. Connect to either CN8 or CN1.	

Note: The functions allocated to /DEC, P-OT, N-OT, /EXT1, /EXT2, /EXT3, P-CL, and N-CL input signals can be changed via parameters.

■ Output Signals

Signal Name		Pin No.	Function
Common	ALM+ ALM-	31 32	Servo alarm: Turns OFF when an error is detected.
	/BK+ /BK-	27 28	Brake interlock: Output that controls the brake. The brake is released when this signal is ON.
	/S-RDY+ /S-RDY-	29 30	Servo ready: ON if there is no servo alarm when the control/main circuit power supply is turned ON.
	ALO1 ALO2 ALO3	37 38 39 (1)	Alarm code output: Outputs 3-bit alarm codes. Open-collector: 30 V and 20 mA rating maximum
	FG	Shell	Connected to frame ground if the shield wire of the I/O signal cable is connected to the connector shell.
Position	/COIN+ /COIN-	25 26	Positioning completed (output in Position Control Mode): Turns ON when the number of error pulses reaches the value set. The setting is the number of error pulses set in reference units (input pulse units defined by the electronic gear).

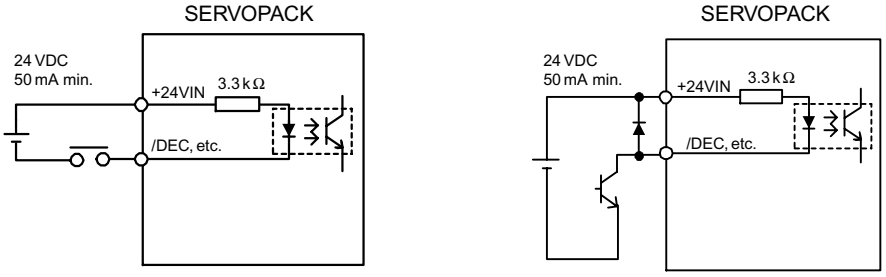
Note: 1. Pin numbers in parenthesis () indicate signal grounds.
2. The functions allocated to /BK, /S-RDY, and /COIN can be changed via parameters. The /BK, /S-RDY, and /COIN output signals can be changed to /CLT, /VCT, /TGON, /WARN, or /NEAR signals.

3.3.4 Interface Circuits

This section shows examples of SERVOPACK I/O signal connection to the host controller.

■ Sequence Input Circuit Interface

The sequence input circuit interface connects through a relay or open-collector transistor circuit. Select a low-current relay, otherwise a faulty contact will result.



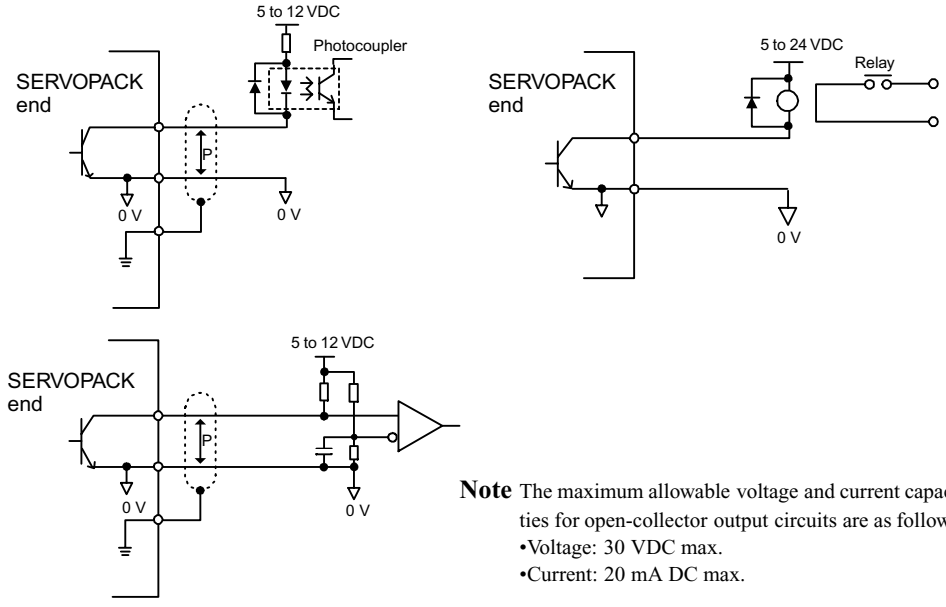
■ Output Circuit Interfaces

Any of the following two types of SERVOPACK output circuits can be used. Form an input circuit at the host controller that matches one of two types.

- Connecting to an Open-collector Output Circuit

  Alarm code signals are output from open-collector transistor output circuits.

  Connect an open-collector output circuit through a photocoupler, relay or line receiver circuit.

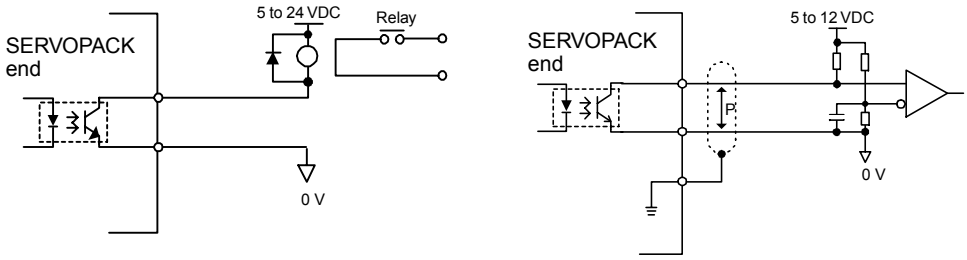


Note The maximum allowable voltage and current capacities for open-collector output circuits are as follows:
•Voltage: 30 VDC max.
•Current: 20 mA DC max.

• Connecting to a Photocoupler Output Circuit

Photocoupler output circuits are used for servo alarm, servo ready, and other sequence output signal circuits.

Connect a photocoupler output circuit through a relay or line receiver circuit.



Note The maximum allowable voltage and current capacities for photocoupler output circuits are as follows:

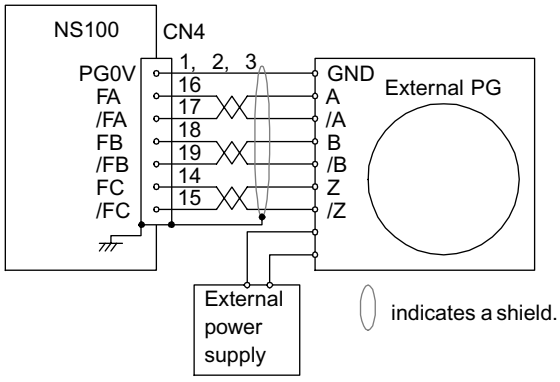
- Voltage: 30 VDC max.
- Current: 50 mA DC max.

3.4 Fully Closed Encoder Signals Connector (CN4)

This section describes the wiring for the fully closed encoder signals connector (CN4).

3.4.1 Fully Closed Encoder Connection Example

The following diagram shows an example of CN4 connections.



3.4.2 CN4 Connector Terminal Layout

The following diagram shows the CN4 connector terminal layout and connector specifications.

■ CN4 Connector Terminal Layout

2	PG0 V	Signal ground	1	PG0 V	Signal ground	12	-	-	11	-	-
4	-	-	3	PG0 V		14	FC	Phase-C input	13	-	-
6	-	-	5	-	-	16	FA	Phase-A input	15	/FC	Phase-C input
8	-	-	7	-	-	18	FB	Phase-B input	17	/FA	Phase-A input
10	-	-	9	-	-	20	-	-	19	/FB	Phase-B input

Note: 1. The connector shell is connected to the FG (frame ground).
2. Do not use unused terminals as relay terminals.

■ CN4 Specifications

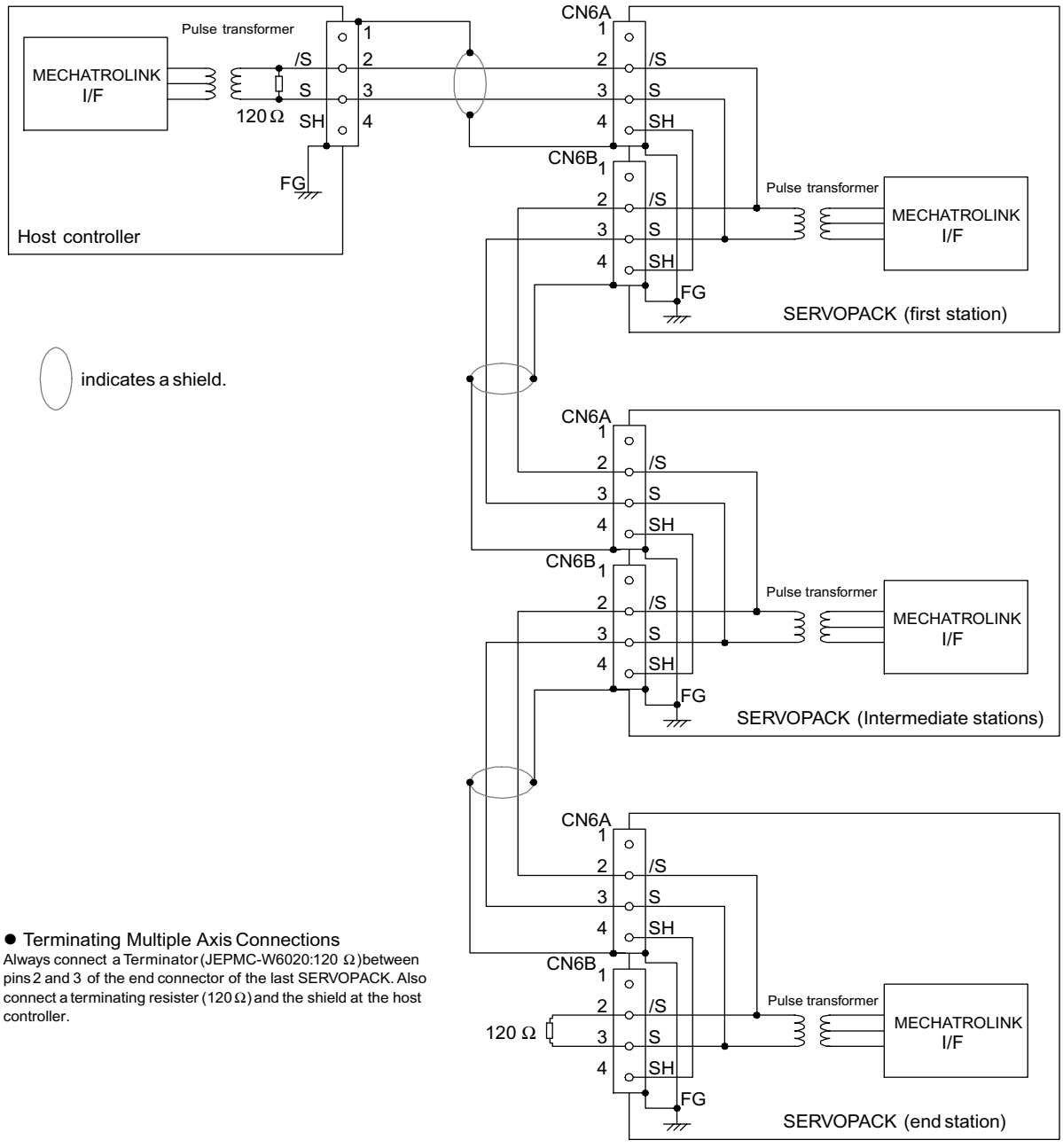
Specifications for SERVOPACK Connectors	Applicable Receptacles		
	Soldered	Case	Manufacturer
10220-52A2JL 20-pin Right Angle Plug	10120-3000VE	10320-52A0-008	SUMITOMO 3M LTD.

3.5 Connections for MECHATROLINK Communications

This section describes the connection and wiring of connectors for MECHATROLINK communications.

3.5.1 MECHATROLINK Communications Connection Example

The following diagram shows an example of connections between a host controller and a SERVOPACK using MECHATROLINK communications cables (CN6A, CN6B).



● Terminating Multiple Axis Connections

Always connect a Terminator (JEPMC-W6020:120 Ω) between pins 2 and 3 of the end connector of the last SERVOPACK. Also connect a terminating resister (120 Ω) and the shield at the host controller.

3.5.2 MECHATROLINK Communications Connectors (CN6A, CN6B)

The terminal layout and specifications of the CN6A and CN6B connectors are shown below.

■ CN6A and CN6B Connectors Terminal Layout

1	2	3	4
-	/S	S	SH
Not connected	Serial data I/O		Not connected

Note: The connector shell is connected to the FG (frame ground).

■ CN6A and CN6B Specifications

Specifications for SERVO-PACK Connectors	Applicable Plug (or Socket)	
	Connector (on Cable)	Manufacturer
DUSB-ARA41-T11	DUSB-APA41-B1-C50	DDK

3.5.3 Precautions for Wiring MECHATROLINK Cables

Observe the following precautions when wiring MECHATROLINK cables.

■ Number of Stations

A maximum of 15 slave stations can be connected.

■ Cables

Be sure to use the specified cables.

For more information on cables, refer to *10.2 MECHATROLINK Communications Cables and Terminator*.

■ Cable Length

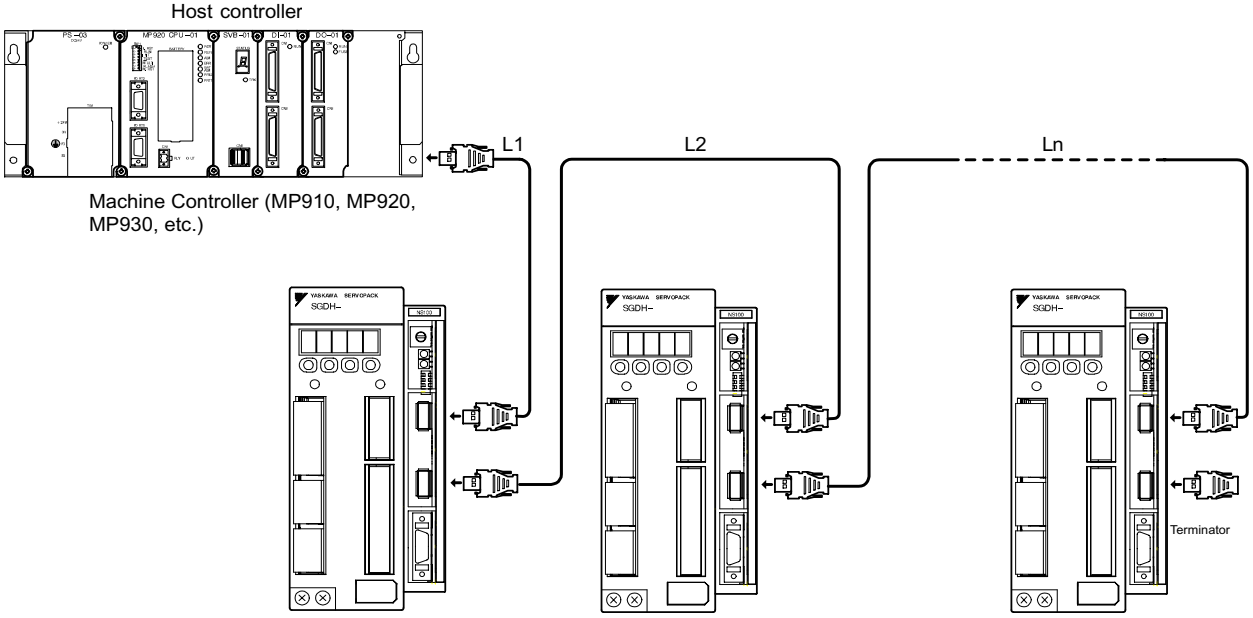
The total cable length must be 50 m or less.
(Station 1 + Station 2 + ... Station n ≤ 50 m)

■ Terminal Processing

Install a Terminator on the last SERVOPACK.

For more information on Terminators, refer to *10.2 MECHATROLINK Communications Cables and Terminator*.

A MECHATROLINK wiring diagram is shown below.

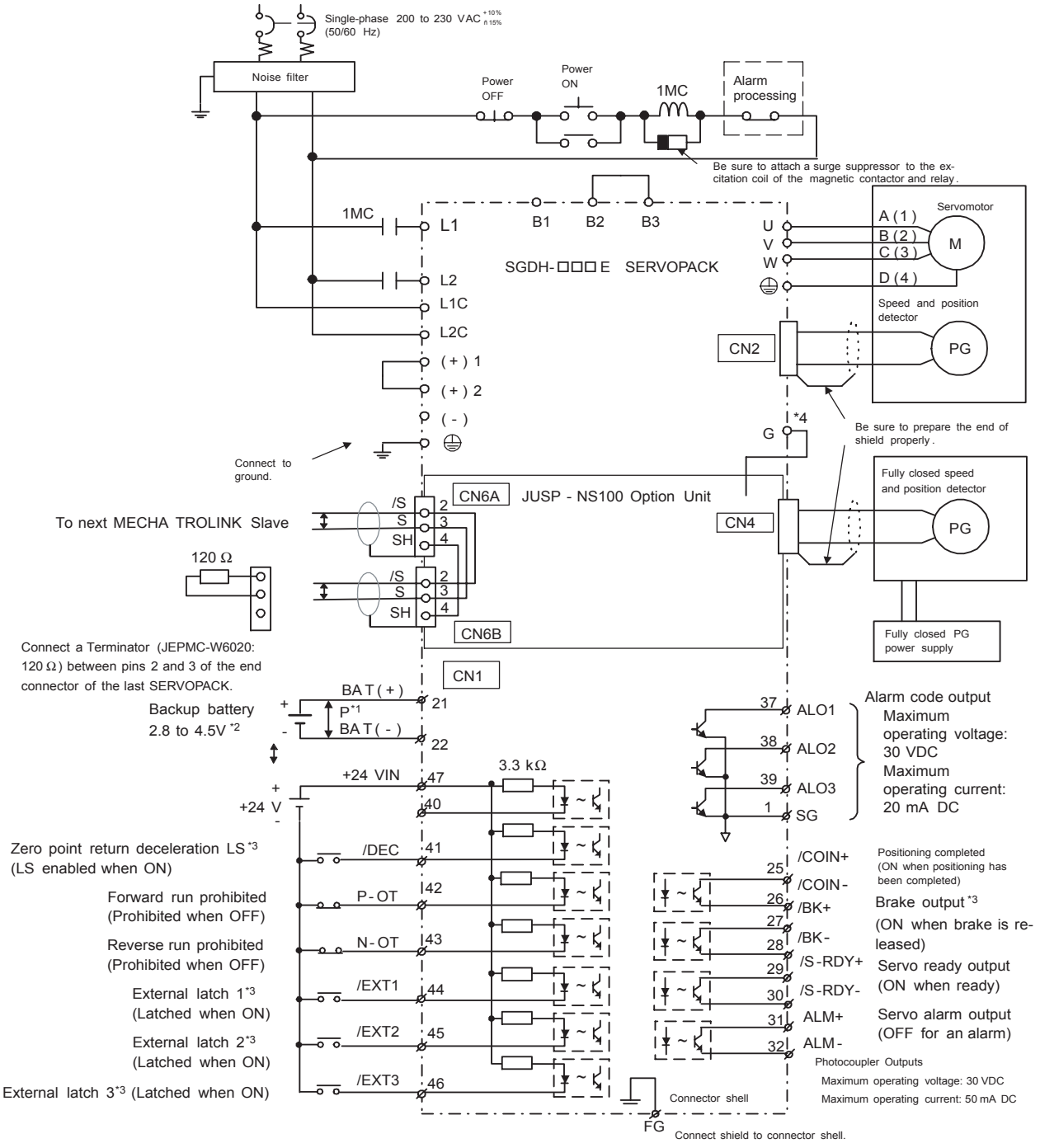


Note: L + L2 ... + Ln must be 50 m or less. A maximum of 15 stations can be connected.

3.6 Examples of Combined Connections (for Fully Closed Encoders)

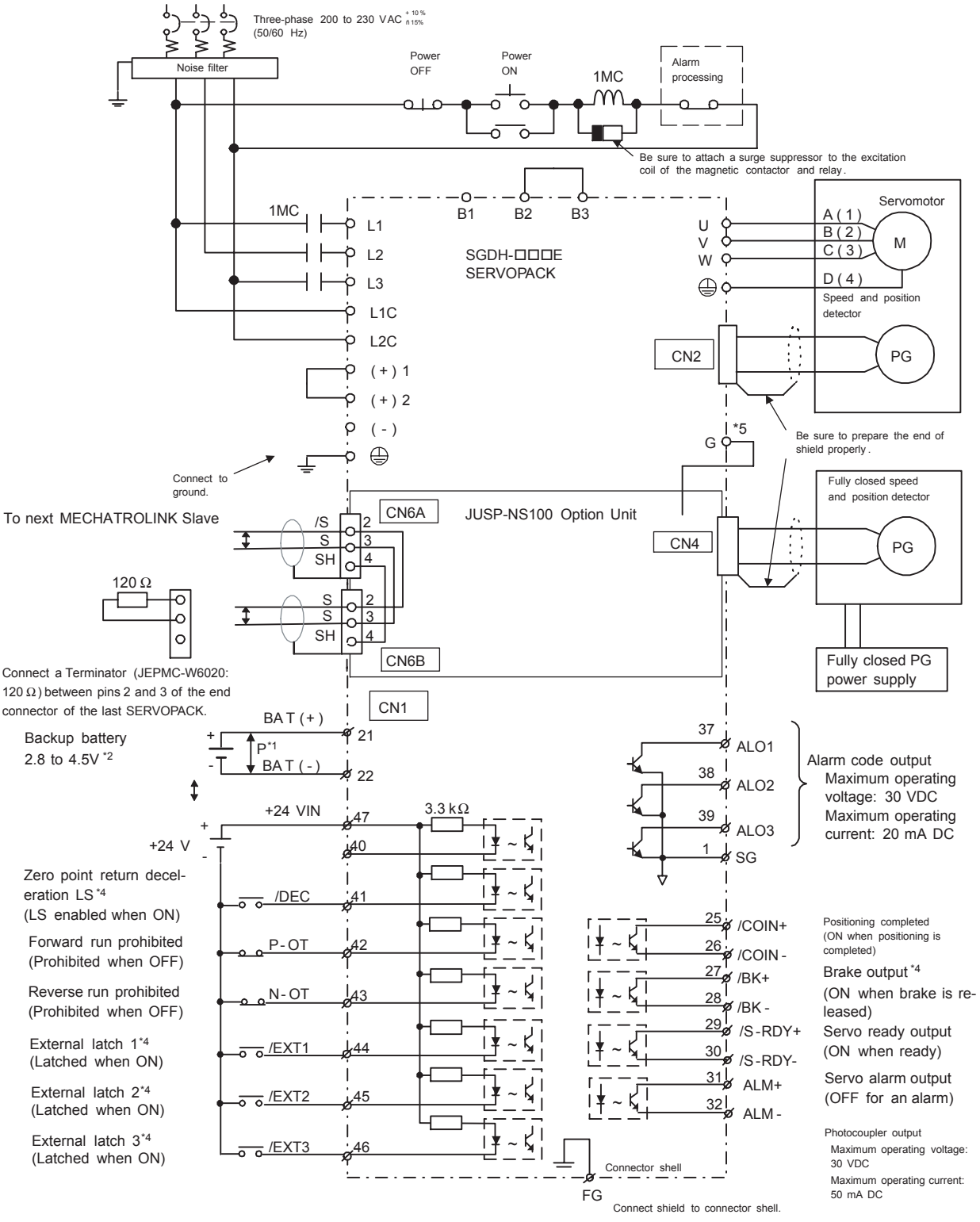
The following diagrams show examples of combined connections.

3.6.1 Single-phase Power Supply Specifications



* 1. ↕P represents twisted-pair wires.
* 2. When using an absolute encoder, connect a backup battery only when there is no battery connected to the CN8.
* 3. Make signal allocations using parameters.(Refer to *6.1.2 Standard Settings for CN1 I/O Signals*.)
* 4. Connect the ground wire of the Option Unit to the marked “G” on the SERVOPACK.(Refer to *1.3 Mounting the Option Unit*.)

3.6.2 Three-phase Power Supply Specifications



* 1. ↕P represents twisted-pair wires.
* 2. When using an absolute encoder, connect a backup battery only when there is no battery connected to the CN8.
* 3. Connect an external regenerative resistor between terminals B1 and B2 for SERVOPACKs with a capacity of 6.0 kW or higher.
* 4. Make signal allocations using parameters.(Refer to *6.1.2 Standard Settings for CN1 I/O Signals*.)
* 5. Connect the ground wire of the Option Unit to the marked "G" on the SERVOPACK.(Refer to *1.3 Mounting the Option Unit*.)

4

MECHATROLINK Communications

This chapter describes MECHATROLINK communications specifications, commands, and power ON sequence.

4.1 Specifications and Configuration

4.1.1 Specifications

Items that are not described in this chapter are based on the MECHATROLINK application layer. For more details, refer to the following manuals.

- *MECHATROLINK System User's Manual* (SIE-S800-26.1)
- *MECHATROLINK Servo Command User's Manual* (SIE-S800-26.2)

4.1.2 Control Configuration

The following illustration shows control configuration. A maximum of 15 axes can be connected.

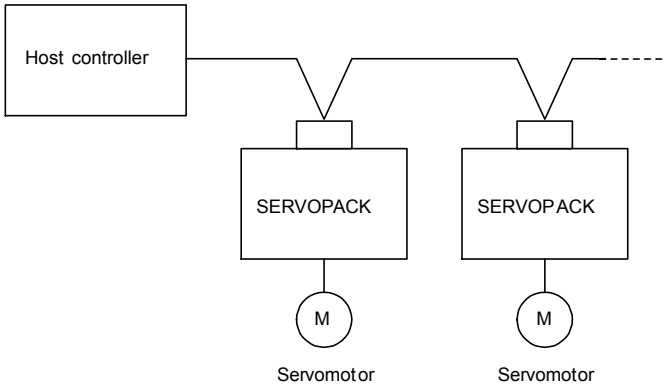


Fig. 4.1 Control Configuration

4.2 Switches for MECHATROLINK Communications Settings

This section describes the switch settings necessary for MECHATROLINK communications.

4.2.1 Rotary Switch (SW1) for MECHATROLINK Station Address Setting

The SW1 switch sets the MECHATROLINK station address. This setting is enabled when the power is turned OFF and ON again after making the setting.

The SW1 setting is used to select one of the following addresses for the JUSP-NS100 Option Unit.

Table 4.1 SW1 Settings

SW1	Station Address
0	Not used*
1	41H
2	42H
3	43H
4	44H
5	45H
6	46H
7	47H
8	48H
9	49H
A	4AH
B	4BH
C	4CH
D	4DH
E	4EH
F	4FH

Note: Do not set.

4.2.2 DIP Switch (SW2) for Communications Settings

The SW2 switch sets the MECHATROLINK communications settings.

Settings that have been changed are enabled when the power is turned OFF and ON.

Table 4.2 SW2 Settings

SW2 Bit	Item	Setting	Setting Format (see note)
Bit 1	Communications settings	Ver. 1.0 (Baud rate: 4 Mbps Transmission cycle: 2 ms)	0: Ver. 1.0
Bit 2	Not used.	Do not set. Set to OFF.	
Bit 3			
Bit 4	Cn number mode		

Note: 0: OFF (Bit switch OFF)
1: ON (Bit switch ON)

■ Setting Bit 1

Set according to the specifications of the MECHATROLINK physical layer used. The Option Unit is compatible with MECHATROLINK Ver. 1.0. Set bit 1 to OFF.

Ver. 1.0: Bit switch OFF (baud rate: 4 Mbps, transmission cycle: 2 ms)

■ Setting Bit 4

Bit 4 can be turned ON to use the same Cn numbers as the Σ Series (SGDB-N, SGD-N) for MECHATROLINK communications parameters.

Refer to *Appendix D.3 Parameters Comparison*.

4.3 Special Command Descriptions

The following sections describes specific items unique to the JUSP-NS100 Option Unit.

4.3.1 No Operation (NOP: 00H)

Byte	Command	Response	Description
1	NOP	NOP	• Returns the status of the ALM and CMDRDY in STATUS bytes only. All other bits are not used. The NOP command will be returned from when the power is turned ON until processing has been completed, and during this time, the following status will be returned: CMDRDY: 0. • Can be used during any phase.
2		ALARM	
3		STATUS	
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

4.3.2 Read Parameter (PRM_RD: 01H)

Byte	Command	Response	Description
1	PRM_RD	PRM_RD	• Reads current operating parameters. The latest setting value, however, is read for offline parameters. • If NO is not within range, a parameter setting warning (A.94) will be generated and the command will be ignored. • If SIZE does not match, a parameter setting warning (A.94) will be generated and the command will be ignored. • For details on NO and SIZE, refer to the parameters list. • If A.94 is generated, PARAMETER will not be dependable. • If communications are in progress with either a Digital Operator or personal computer, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • Can be used during any phase.
2		ALARM	
3		STATUS	
4			
5	NO	NO	
6			
7	SIZE	SIZE	
8		PARAMETER	
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

4.3.3 Write Parameter (PRM_WR: 02H)

Byte	Command	Response	Description
1	PRM_WR	PRM_WR	• Temporarily writes parameters and stores them in EEPROM memory. • If NO is not within range, a parameter setting warning (A.94) will be generated and the command will be ignored. • If SIZE does not match, a parameter setting warning (A.94) will be generated and the command will be ignored. • If PARAMETER is not within range or would result in a calculation overflow, a parameter setting warning (A.94) will be generated and the command will be ignored. • For details on NO, SIZE, and data setting ranges, refer to the parameters list. • If a parameter setting warning (A.94) is generated, the write will not be executed and the command will be ignored. (Parameters will not be changed.) • If communications are in progress with either a Digital Operator or personal computer, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3		STATUS	
4			
5	NO	NO	
6			
7	SIZE	SIZE	
8	PARAMETER	PARAMETER	
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

4.3.4 Read ID (ID_RD: 03H)

Byte	Command	Response	Description
1	ID_RD	ID_RD	• ID_RD reads the corresponding DEVICE_CODE for each type of hardware; 00H: Main device/Product type, 12H: Encoder, 20H: Motor, and 50H: Option Unit. • The following list shows IDs that can be read. • Can be used during any phase.
2		ALARM	
3		STATUS	
4			
5	DEVICE_CODE	DEVICE_CODE	
6	OFFSET	OFFSET	
7	SIZE	SIZE	
8		ID	
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

	DEVICE_CODE	ID Description																
		00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10
SERVOPACK	00H	S	G	D	H	-	*1	*1	*2	E	*5	*5	*5	00				
	02H	Ver.																
Encoder	12H	Ver.																
Motor	20H	S	G	M	*3	H	-	*1	*1	*2	*4	00						
Option Unit	50H	J	U	S	P	-	N	S	1	0	0	*5	*5	*5	00			
	52H	Ver.																

Note: 1. The contents of IDs that can be read are as follows:

- Model numbers appear in ASCII code, with the last section as “00”.
- The software version is binary data.
- *1: Capacity, *2: Power supply voltage, *3: Type of motor, *4: Type of serial encoder, *5: Y specifications number, e.g.: Y123. The standard is “00”.
- Spaces indicate unspecified data.
- Installation options (-R, -P) are not displayed.

2. If the SGDH is not operating (when an alarm (E0, E1, E2, EA, EB, EC) is generated at power ON), the data is as follows:
   - *1: Capacity, *2: Power supply voltage, *3: Type of motor, *4: All serial encoder types will become “?”, *5: 00.
3. If a new type of motor is connected, the data will be as follows:
   - *1: Capacity, *2: Power supply voltage, *3: Type of motor, *4: All serial encoder types will become “?”

4.3.5 Set Up Device (CONFIG: 04H)

Byte	Command	Response	Description
1	CONFIG	CONFIG	• Recalculates all currently set parameters and initializes positions, signals, etc. This operation takes approximately 4 s to execute, during which time the status is as shown in the table below. • The Servo will be turned OFF if this command is received when the Servo is ON. • If communications are in progress with either a Digital Operator or personal computer, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • CMDRDY will remain at 0 until the operation has been completed. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3		STATUS	
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

■ CONFIG Operation

Status, I/O, etc.	Before CONFIG	During CONFIG	After CONFIG
ALM (status)	Alarms currently generated	Alarms currently generated	Current alarms
CMDRDY (status)	1	0	1
Other status	Current status	Not used	Current status
ALARM (code)	Alarms currently generated	Alarms currently generated	Current alarms
ALM (output signal)	Status currently generated	Status currently generated	Current alarms
/S-RDY (output signal)	Current status	OFF	Current status
Other output signals	Current status	Not used	Current status

4.3.6 Read Alarm or Warning (ALM_RD: 05H)

Byte	Command	Response	Description
1	ALM_RD	ALM_RD	• Reads the alarm or warning specified by the ALM_RD_MODE at byte 5 of ALM_RD (read alarm/warning). Specifications can be made for individual products. • The ALM_RD_MODE specifications are shown in the following table. If values other than these set values are used, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • The latest error and warning information is contained from byte 6 onwards of the ALM_DATA. When there are no errors or warnings, the remaining bytes are normal (A.99). • Reading alarm history occurrences takes 2 s or less. CMDRDY will be set to 0 during this time. • If communications are in progress with either a Digital Operator or personal computer, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • Can be used during any phase.
2		ALARM	
3		STATUS	
4			
5	ALM_RD_ MODE	ALM_RD_ MODE	
6		ALM_DATA	
7			
8			
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

■ ALM_RD_MODE

ALM_RD_MODE	Description
0	Read current alarm/warning status 10 items max. (sixth to fifteenth byte)
1	Read alarm status history (Warning history is not preserved) 10 items max. (sixth to fifteenth byte)

Note: Alarm history occurrences are saved on EEPROM, and will not be lost if power goes OFF.

4.3.7 Clear Alarm/Warning (ALM_CLR: 06H)

Byte	Command	Response	Description
1	ALM_CLR	ALM_CLR	• The ALM_CLR_MODE at the fifth byte of ALM_CLR (clear alarm/warning status) is the field used to select objects that will be cleared. Specifications can be made for individual products. • The ALM_CLR_MODE specifications are shown in the following table. If values other than these set values are used, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • It takes approximately 100 ms to execute the clear current alarm/warning status command. During this time, CMDRDY is set to 0. • It takes approximately 2 s to execute the clear alarm status history command. During this time, CMDRDY is set to 0. • If communications are in progress with either a Digital Operator or personal computer, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3		STATUS	
4			
5	ALM_CLR_ MODE	ALM_CLR_ MODE	
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

■ ALM_CLR_MODE

ALM_CLR_MODE	Description
0	Clear current alarm/warning status
1	Clear alarm status history

4.3.8 Start Synchronous Communications (SYNC_SET: 0DH)

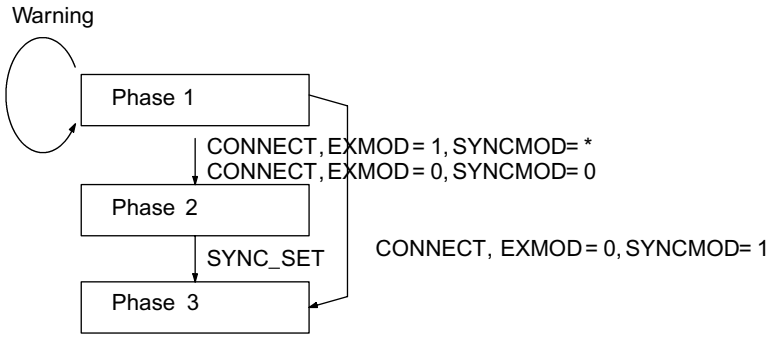
Byte	Command	Response	Description
1	SYNC_SET	SYNC_SET	• Switches from phase 2 to phase 3. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • During phase 3, the command will be ignored (without a warning).
2		ALARM	
3		STATUS	
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

4.3.9 Connection (CONNECT: 0EH)

Byte	Command	Response	Description
1	CONNECT	CONNECT	• VER: Version Set VER to 10H (Ver. 1.0). If any other data is set, a parameter setting warning (A.94) will be generated and the command will be ignored. • COM_MODE: Refer to the following table. • COM_TIME: Communications cycle Ver. 1.0: 2 ≤COM_TIME ≤ 32. Set to an even number. If any other data is set, a parameter setting warning (A.94) will be generated and the command will be ignored. • The command will be ignored in all phases except phase 1 (without a warning).
2		ALARM	
3		STATUS	
4			
5	VER	VER	
6	COM_MODE	COM_MODE	
7	COM_TIME	COM_TIME	
8			
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

■ COM_MODE

D7	D6	D5	D4	D3	D2	D1	D0
				DTMOD		SYNCMOD	EXMOD



- EXMOD:
  0: Standard connection
  1: Extended connection
- SYNCMOD:
  0: Asynchronous (Phase 2 will be entered.)
  1: Start synchronous (Phase 3 will be entered.)
  * Ignores the SYNCMOD setting and switches to phase 2 when EXMOD = 1.
- DTMOD: Data transfer method
  00: Single transfer
  01: Consecutive transfer
  10: Multiple transfers are not supported. If it is selected, a parameter setting warning (A.94) will be generated.
  If any other data is set, a parameter setting warning (A.94) will be generated and the command will be ignored.
- Set all other bits to 0.

4.3.10 Disconnection (DISCONNECT: 0FH)

Byte	Command	Response	Description
1	DISCONNECT	DISCONNECT	• This command can be received at any time. • When this command is received, the following operations will be performed. • Phase 1 will be entered. • The Servo will be turned OFF. • The reference point setting will become invalid. • Can be used during any phase.
2		ALARM	
3		STATUS	
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

4.3.11 Read EEPROM Parameters (PPRM_RD: 1BH)

Byte	Command	Response	Description
1	PPRM_RD	PPRM_RD	• This command is not supported. • When this command is received, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3		STATUS	
4			
5	NO		
6			
7	SIZE		
8			
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

4.3.12 Write EEPROM Parameters (PPRM_WR: 1CH)

Byte	Command	Response	Description
1	PPRM_WR	PPRM_WR	• Saves data in EEPROM. If parameters are for online parameters, those parameters will become effective. • If NO is not within range, a parameter setting warning (A.94) will be generated and the command will be ignored. • If SIZE does not match, a parameter setting warning (A.94) will be generated and the command will be ignored. • If PARAMETER is not within range or would result in a calculation overflow, a parameter setting warning (A.94) will be generated and the command will be ignored. • For details on NO and SIZE, refer to the parameters list. • If a parameter setting warning (A.94) is generated, the write will not be executed and the command will be ignored. • If communications are in progress with either a Digital Operator or personal computer, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3		STATUS	
4			
5	NO	NO	
6			
7	SIZE	SIZE	
8	PARAMETER	PARAMETER	
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

4.3.13 Set Coordinates (POS_SET: 20H)

Byte	Command	Response	Description
1	POS_SET	POS_SET	• Sets coordinates as follows: POS_SET: 0:POS 3: APOS If any other setting is used, a parameter setting warning (A.94) will be generated and the command will be ignored. REFE: 0: Reference point disabled 1: Reference point enabled • Set all other bits to 0. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3		STATUS	
4			
5	PS_SUBCMD	PS_SUBCMD	
6	POS_DATA	POS_DATA	
7			
8			
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

■ PS_SUBCMD

D7	D6	D5	D4	D3	D2	D1	D0
REFE				POS_SEL			

4.3.14 Apply Brake (BRK_ON: 21H)

Byte	Command	Response	Description
1	BRK_ON	BRK_ON	• Effective when the parameter is set for the activated BRK-ON/OFF command (Pn005.0 = 1). In all other cases, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. The brake interlock at the Servo will no longer be used. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3		STATUS	
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

4.3.15 Release Brake (BRK_OFF: 22H)

Byte	Command	Response	Description
1	BRK_OFF	BRK_OFF	• Effective when the parameter is set for the activated BRK-ON/OFF command (Pn005.0 = 1). In all other cases, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. The brake interlock on the Servo side will no longer be used. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3		STATUS	
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

4.3.16 Turn Sensor ON (SENS_ON: 23H)

Byte	Command	Response	Description
1	SENS_ON	SENS_ON	• Obtains the initial position data when an absolute encoder is used. • Multi-turn data is received from the encoder and the current position is created. • The reference point will be effective when an absolute encoder is used. • If communications are in progress with either a Digital Operator or personal computer, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • If a parameter is masking SENS_ON (Pn802.1 = 1), the command will be ignored (without a warning). • If an incremental encoder is being used, the command will be ignored (without a warning). • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3		STATUS	
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

4.3.17 Turn Sensor OFF (SENS_OFF: 24H)

Byte	Command	Response	Description
1	SENS_OFF	SENS_OFF	• Makes the encoder ineffective without turning OFF the power. After the SENS_OFF command has been issued, position data is not used. • If the Servo is ON, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • If a parameter is masking SENS_ON (Pn802.1 = 1), a MECHATROLINK command warning (A.95) will be generated and the command will be ignored (without a warning). • If an incremental encoder is being used, the command will be ignored (without a warning). • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3		STATUS	
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

4.3.18 Stop Motion (HOLD: 25H)

Byte	Command	Response	Description
1	HOLD	HOLD	• From current motion status, performs a deceleration stop and positioning according to the deceleration value set in the parameters. • The acceleration/deceleration filter and P/PI control can be specified using OPTION, but be sure that the acceleration/deceleration filter is set the same as for the previous command. (The acceleration/deceleration filter will be changed for DEN = 1.) • Latch processing, which is dependent on LATCH, EX_POSING, and SVCTRL will be cancelled. • ZRET latch processing and ZRET zero point alignment will be canceled. • A warning is not issued even when the Servo is OFF (not operating). • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3	OPTION	STATUS	
4			
5		MONITOR1	
6			
7			
8			
9		MONITOR2	
10			
11			
12			
13	MON_SEL	MON_SEL	
14		I/O	
15			
16	WDT	RWDT	

4.3.19 Status Monitoring (SMON: 30H)

Byte	Command	Response	Description
1	SMON	SMON	• Reads the current status of the Servo. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3		STATUS	
4			
5		MONITOR1	
6			
7			
8			
9		MONITOR2	
10			
11			
12			
13	MON_SEL	MON_SEL	
14		I/O	
15			
16	WDT	RWDT	

4.3.20 Servo ON (SV_ON: 31H)

Byte	Command	Response	Description
1	SV_ON	SV_ON	• Turns ON the Servo when the following conditions are met. • The main power supply is ON (PON = 1 in STATUS) • There are no alarms (ALM = 0 in STATUS) • If an absolute encoder is being used, SENS_ON is effective. If the above conditions are not met, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • CMDRDY will be 0 during the time it takes for the command to be received until the Servo is turned ON. • P/PI control is possible using OPTION. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3		STATUS	
4	OPTION		
5		MONITOR1	
6			
7			
8			
9		MONITOR2	
10			
11			
12			
13	MON_SEL	MON_SEL	
14		I/O	
15			
16	WDT	RWDT	

4.3.21 Servo OFF (SV_OFF: 32H)

Byte	Command	Response	Description
1	SV_OFF	SV_OFF	• Turns OFF the Servo. If SV_ON is being masked by parameter (Pn802.0 = 1), a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3		STATUS	
4			
5		MONITOR1	
6			
7			
8			
9		MONITOR2	
10			
11			
12			
13	MON_SEL	MON_SEL	
14		I/O	
15			
16	WDT	RWDT	

4.3.22 Interpolation Feed (INTERPOLATE: 34H)

Byte	Command	Response	Description
1	INTERPOLATE	INTERPOLATE	• The target position (TPOS) is distributed each transmission cycle. • The acceleration/deceleration filter and P/PI control can be specified using OPTION. • FF (feed forward) can be executed. • If the interpolation feed speed for the INTERPOLATE command exceeds 131068000 reference units/s, a parameter setting warning (A.94) will be generated and the command will be ignored. Processing will stop at the previous target position (TPOS). • If the Servo is OFF, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • In all other phases except phase 3, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3	OPTION	STATUS	
4			
5	TPOS	MONITOR1	
6			
7			
8			
9	FF	MONITOR2	
10			
11			
12			
13	MON_SEL	MON_SEL	
14		I/O	
15			
16	WDT	RWDT	

4.3.23 Positioning (POSING: 35 H)

Byte	Command	Response	Description
1	POSING	POSING	• Accelerates towards the target position (TPOS) up to the target speed (TSPD) and continues to move at the target speed until deceleration starts, when it decelerates towards the target position and stops there. • Acceleration and deceleration are controlled by the parameter settings or the acceleration/deceleration filter. • The acceleration/deceleration filter and P/PI control can be specified using OPTION. • Changes can be made to the target position and speed during movement. • The target speed (TSPD) is an unsigned 4 bytes. • If the target speed (TSPD) for the POSING command exceeds 131068000 reference units/s, a parameter setting warning (A.94) will be generated and the command will be ignored. • If the Servo is OFF, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3	OPTION	STATUS	
4			
5	TPOS	MONITOR1	
6			
7			
8			
9	TSPD	MONITOR2	
10			
11			
12			
13	MON_SEL	MON_SEL	
14		I/O	
15			
16	WDT	RWDT	

4.3.24 Constant Speed Feed (FEED: 36H)

Byte	Command	Response	Description
1	FEED	FEED	• Accelerates to the target speed in the direction indicated by the target speed (TSPD) and continues to move at the target speed. • Acceleration and deceleration are controlled by the parameter settings or the acceleration/deceleration filter. • Changes can be made to both direction and speed. • The acceleration/deceleration filter and P/PI control can be specified using OPTION. • Stop is performed using HOLD. • The FEED target speed (TSPD) is a signed 4 bytes. The direction is determined by the sign. • If the target speed (TSPD) for the FEED command exceeds 131068000 reference units/s, a parameter setting warning (A.94) will be generated and the command will be ignored. • If the Servo is OFF, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2		ALARM	
3	OPTION	STATUS	
4			
5		MONITOR1	
6			
7			
8			
9	TSPD	MONITOR2	
10			
11			
12			
13	MON_SEL	MON_SEL	
14		I/O	
15			
16	WDT	RWDT	

4.3.25 Interpolation Feeding with Position Detection (LATCH: 38H)

Byte	Command	Response	Description
1	LATCH	LATCH	• Starts the latch operation and the target position (TPOS) is distributed each transmission cycle. • If the latch signal is input, the position when the input is received is recorded as the counter latch position (LPOS) and LPOS will be indicated as the MONITOR 2 value for one communications cycle. • The acceleration/deceleration filter and P/PI control can be specified using OPTION. • FF (feed forward) can be executed. • A latch signal can be selected using LT_SGNL. • If the target speed (TSPD) for the LATCH command exceeds 131068000 reference units/s, a parameter setting warning (A.94) will be generated and the command will be ignored. Processing will stop at the previous target position (TPOS). • If the Servo is OFF, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • In all other phases except phase 3, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2	LT_SGNL	ALARM	
3	OPTION	STATUS	
4			
5	TPOS	MONITOR1	
6			
7			
8			
9	FF	MONITOR2	
10			
11			
12			
13	MON_SEL	MON_SEL	
14		I/O	
15			
16	WDT	RWDT	

4.3.26 External Input Positioning (EX_POSING: 35H)

Byte	Command	Response	Description
1	EX_POSING	EX_POSING	• Starts the latch operation and accelerates at the target speed (TSPD) towards the target position (TPOS). • Once the latch signal has been input, positioning is performed according to the travel distance specified in the parameters. • When no latch signal is input, positioning is performed for the target position. • Acceleration and deceleration are controlled by the parameter settings or the acceleration/deceleration filter. • The acceleration/deceleration filter and P/PI control switching can be specified using OPTION. • Once the latch operation has been completed, changes can be made to the target position during motion, but these changes will be ignored. • The target speed (TSPD) is an unsigned 4 bytes. • If the target speed (TSPD) for the EX_POSING command exceeds 131068000 reference units/s, a parameter setting warning (A.94) will be generated and the command will be ignored. • If the Servo is OFF, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2	LT_SGNL	ALARM	
3	OPTION	STATUS	
4			
5	TPOS	MONITOR1	
6			
7			
8			
9	TSPD	MONITOR2	
10			
11			
12			
13	MON_SEL	MON_SEL	
14		I/O	
15			
16	WDT	RWDT	

4.3.27 Zero point return (ZRET: 3AH)

Byte	Command	Response	Description
1	ZRET	ZRET	• Accelerates to the target speed (TSPD) in the direction specified in the parameters and continues to move at the target speed. • Decelerates to approach speed 1 at the first DEC* = 1. • DEC* will be 0, and when the signal has been latched, approach speed 2 is used and positioning is performed from the latched position for the travel distance specified in the parameters. That position is the zero point. • Acceleration and deceleration are controlled by the parameter settings or the acceleration/deceleration filter. DEC* = 1: Operation is started at approach speed 2. Until DEC* = 1 is reached, the speed can be changed. • The acceleration/deceleration filter and P/PI control can be specified using OPTION. • The target speed (TSPD) is an unsigned 4 bytes. • If the target speed (TSPD) for the ZRET command exceeds 131068000 reference units/s, a parameter setting warning (A.94) will be generated and the command will be ignored. • If the Servo is OFF, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2	LT_SGNL	ALARM	
3	OPTION	STATUS	
4			
5		MONITOR1	
6			
7			
8			
9	TSPD	MONITOR2	
10			
11			
12			
13	MON_SEL	MON_SEL	
14		I/O	
15			
16	WDT	RWDT	

* DEC is zero point return deceleration LS.

4.3.28 Adjusting (ADJ: 3EH)

Byte	Command	Response	Description
1	ADJ	ADJ	• If SUBCMD = 00H, the following processes are performed. For details on processing, refer to *Appendix C Using the Adjusting Command (ADJ: 3EH)*. • Autotuning • Absolute encoder setup • Multi-turn limit settings • The basic settings and references for field data are shown in the following tables. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2	SUBCMD	ALARM	
3		STATUS	
4			
5	CMD	ANS	
6	ADDRESS	ADDRESS	
7			
8	DATA	DATA	
9			
10			
11			
12			
13			
14			
15			
16	WDT	RWDT	

■ Basic Procedure

Data references and settings are made when the following commands are sent. Commands will not be processed when the response is not normal. If this occurs, set the ADDRESS and DATA correctly and resend.

Table 4.3 Data References

	Command	Response
CMD/ANS	CMD = 00H (data reference)	ANS: 00H: Normal, 08H: Address error
ADDRESS	Reference address	Reference address
DATA	(Not used)	Reference data

Table 4.4 Data Settings

	Command	Response
CMD/ANS	CMD = 01H (data settings)	ANS: 01H: Normal, 09H: Address error, 05H: Data error
ADDRESS	Set address	Set address
DATA	Set data	Set data

4.3.29 General-purpose Servo Control (SVCTRL: 3FH)

Byte	Command	Response	Description
1	SVCTRL	SVCTRL	• Latch Processing: Supported. Select the latch signal using L_SGN in the sub-command (SUBCMD) and set SET_L to 1. When the selected latch signal is input, L_CMP in STATUS will become 1. To perform latch processing again, set SET_L to 0 once more and start again. The latch signal cannot be changed while SET_L is set to 1. If it is changed, there will be no warning. • Motion: Any of the motions listed in the following table can be selected. Refer to each item for operating specifications. • Sequence Signals: Refer to each sequence item for operating specifications. A warning may not be generated, however, depending on the ON/OFF status of the signals. For example, even if PON in STATUS is ON, if SON = 1 in SQ_CMD, a warning will not be given. • During phase 1, a MECHATROLINK command warning (A.95) will be generated and the command will be ignored.
2	SUBCMD	ALARM	
3	OPTION	STATUS	
4			
5	TPOS	MONITOR1	
6			
7			
8			
9	TSPD or FF	MONITOR2	
10			
11			
12			
13	MON_SEL	MON_SEL	
14	SQ_CMD	I/O	
15			
16	WDT	RWDT	

■ Sub-command: SUBCMD

D7	D6	D5	D4	D3	D2	D1	D0
RESERVE 0	MOTION Select motion			RESERVE 0	SET_L Latch command	L_SGN Select latch signal	

Select Latch Signal: L_SGN

D1	D0	Latch Signal
0	0	Phase C
0	1	EXT1
1	0	EXT2
1	1	EXT3

Motion: MOTION

D6	D5	D4	Motion	
0	0	0	HOLD	• During phase 1, a parameter setting warning (A.94) will be generated for POSING and FEED, and the commands will be ignored. • For INTERPOLATE, in all other phases except phase 3, a parameter setting warning (A.94) will be generated and the command will be ignored. • A warning may not be given depending on the sequence signal status.
0	0	1	INTERPOLATE	
0	1	0	FEED	
0	1	1	POSING	

Sequence Signals: SQ_CMD

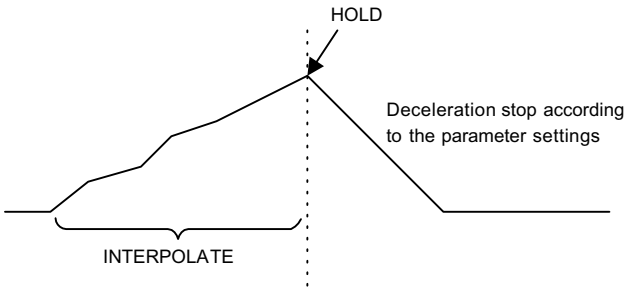
D7	D6	D5	D4	D3	D2	D1	D0
RESERVE 0				ACLR Alarm clear	SEN Sensor ON	BRK Brake ON	SON Servo ON

4.3.30 Motion Command Specifications

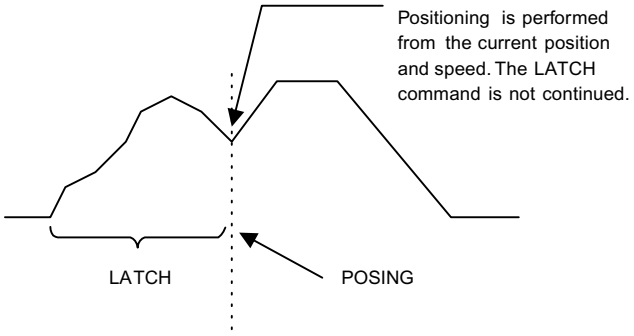
After a change is made during a motion, the new command becomes effective and the previous command is cancelled.

After a change has been made, movement will continue from the new position and speed.

■ Example 1



■ Example 2



4.4 Field Special Descriptions

The following describes specific items unique to the Option Unit.

4.4.1 Latch Signal Field Specifications: LT_SGNL

1	Command	Description
2	LT_SGNL	• The second byte of the reference data field for motion commands is reserved as a latch signal field and used to select latch signals for position data. • The applicable commands for latch signals are: • LATCH • EX_POSING • ZRET • Signals that can be selected are shown in the following table.
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16	WDT	

■ Latch Signal Field

D7	D6	D5	D4	D3	D2	D1	D0
						Latch signal*	

* Latch Signal Selection (0 to 3)

Latch Signal Selection

Name	Code	Contents
CPHAS	0	Phase-C encoder
EXT1	1	First external signal
EXT2	2	Second external signal
EXT3	3	Third external signal

4.4.2 Option Field Specifications

1	Command	Description
2		• The third and fourth bytes of the reference data field for motion commands are reserved as an option field used to add motion command functions for individual products. • Option fields are used for speed loop P/PI control switching and acceleration/deceleration filter selection. • Appropriate commands for options are: • SV_ON • INTERPOLATE • POSING • FEED • LATCH • EX_POSING • ZRET • SVCTRL Acceleration/deceleration filter selection cannot be used with SV_ON.
3	OPTION	
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16	WDT	

4

■ Option Fields

Option fields are as shown in the table below. The third byte is used for acceleration/deceleration filter type selection and the fourth byte is used for speed loop P/PI control.

3	Acceleration/deceleration filter type selection
4	Speed loop P/PI control switching

■ Acceleration/Deceleration Filter Selection

D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	*	*	0	0	0

* Acceleration/deceleration selection (0 to 2)

Acceleration/Deceleration Selection (D3 and D4)

Three types of acceleration and deceleration can be selected.

Type	Acceleration/Deceleration Type	Related Parameters
0	Linear acceleration/deceleration (no filter)	-
1	Exponential acceleration/deceleration	Pn810, Pn811
2	Simple S-curve acceleration/deceleration (running average)	Pn812

IMPORTANT

1. All bits except D3 and D4 must be set to 0.
2. Acceleration/deceleration types can only be switched when DEN (output complete) is set to 1. Never switch acceleration/deceleration types when DEN is set to 0.
   Yaskawa cannot guarantee how the SERVOPACK will act if the two items above are not followed exactly.

■ Speed Loop P/PI Control Switching

D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	*	0	0	0	0

* Speed loop P/PI control switching (0: PI control, 1: P control)

Speed Loop P/PI Control Switching (D4)

Speed loop can be switched between PI and P control in real time.

D4	Speed Loop Control
0	PI control (switches to P control via mode switch settings)
1	P control

This function suppresses undershooting and shortens positioning adjustment time when the Servomotor is stopped.

IMPORTANT

All bits except D4 must be set to 0, otherwise Yaskawa cannot guarantee how the SERVOPACK will act.

4.4.3 Speed Feed Forward (FF) Field Specifications

1	Command	Description

2		• The ninth to twelfth bytes of the reference data field for motion commands are reserved as a speed feed forward field and used to control the extent of speed feed forward.
		• Speed feed forward is set using 4-byte signed data. Unit: Reference units/s
		• The applicable commands for speed feed forward are:
		  • INTERPOLATE
		  • LATCH

3		
4		
5		
6		
7		
8		
9	FF	
10		
11		
12		
13		
14		
15		
16	WDT	

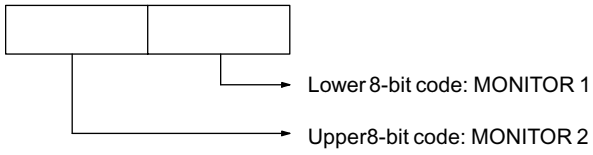
4.4.4 Monitor 1/2 Type Field Specifications

1	Command	Response	Description

2			• The thirteenth byte of the reference data field of commands is reserved for monitor 1/2 used to select monitor data that will be returned.
			• The applicable commands for monitor 1/2 type are:
			  • SMON
			  • SV_ON
			  • SV_OFF
			  • INTERPOLATE
			  • POSING
			  • FEED
			  • LATCH
			  • EX_POSING
			  • ZRET
			  • SVCTRL
			  • HOLD

3			
4			
5		MONITOR1	
6			
7			
8			
9		MONITOR2	
10			
11			
12			
13	MON_SEL*	MON_SEL*	
14			
15			
16	WDT	WDT	

* The selection options are as shown below.



■ Monitor 1/2 Selection Modes

Name	Code	Description	Units
POS	0	Position in the reference coordinate system	Reference units
MPOS	1	Position in the mechanical coordinate system	Reference units
PERR	2	Position error	Reference units
APOS	3	Absolute position	Reference units
LPOS	4	Counter latch position	Reference units
IPOS	5	Internal position in the reference coordinate system	Reference units
TPOS	6	Final target position	Reference units
-	7	-	-
FSPD	8	Feedback speed	Reference units/s
CSPD	9	Reference speed	Reference units/s
TSPD	A	Final target reference speed	Reference units/s
TRQ	B	Torque reference	%
-	C	-	-
-	D	-	-
OMN1	E	Option monitor 1*	-
OMN2	F	Option monitor 2*	-

* Monitor data is selected using parameter Pn813.

Note: The minus (-) sign indicates unused bits. Do not use them.

4.5 Power ON Sequence

This section describes the recommended power ON sequence.

4.5.1 Typical Power ON Sequence

The following is a typical power ON sequence.

1. Turn ON the power supply.
   ↓
2. Make communications connection (CONNECT command).
   ↓
3. Check equipment ID, etc. (ID_RD command).
   ↓
4. Write required parameters with PRM_WR command.
   ↓
5. Set up the equipment (CONFIG command).
   ↓
6. Turn encoder (sensor) power ON (SENS_ON command).
   ↓
7. Main circuits ON (SV_ON command).
   ↓
8. Operation starts.
   :
9. Main circuits OFF (SV_OFF command).
   ↓
10. Communications disconnected (DISCONNECT command)
   ↓
11. Turn power supply OFF.

    The controller always maintains required parameters and transfers the parameters at power ON. We recommend using this method at all times because the controller can then manage operation even if the SERVOPACK or motor is replaced.

4.5.2 Alternative Power ON Sequence

When the SERVOPACK maintains all parameters (non-volatile parameters), the power ON sequence is as shown on the following page. Non-volatile parameters are saved on EEPROM and the number of times they can be changed is limited (10,000 times maximum). Also ,when absolute encoder is being used, the encoder cannot be changed to an incremental encoder without turning power OFF and ON again.

■ Writing Parameters

First write parameters to the SERVOPACK offline.

1. Turn power ON.
   ↓
2. Communications connection (CONNECT command)
   ↓
3. Check equipment ID, etc. (ID_RD command).
   ↓
4. Write required non-volatile parameters with PPRM_WR command.
   ↓
5. Communications disconnected (DISCONNECT command)
   ↓
6. Turn OFF power.

■ Typical Sequence

The following is a typical example sequence (no parameters transferred).

1. Turn ON power supply.
   ↓
2. Communications connection (CONNECT command)
   ↓
3. Check equipment ID, etc. (ID_RD command).
   ↓
4. Turn ON encoder (sensor) power (SENS_ON command).
   ↓
5. Main circuits ON (SV_ON command).
   ↓
6. Operation starts.
   :
7. Turn OFF the main circuit (SV_OFF command).
   ↓
8. Communications disconnected (DISCONNECT command)
   ↓
9. Turn OFF power supply.

5

Trial Operation

This chapter describes the procedure for trial operation of the Option Unit.

5.1 Check Items before Trial Operation

Conduct trial operation after wiring has been completed.

Inspect and check the following items when performing trial operation, and be sure to conduct trial operation safely.

5.1.1 Servomotors

Inspect the following items before conducting trial operation. Also conduct the inspections according to *Chapter 9 Inspection, Maintenance, and Troubleshooting* in the *Σ-II Series SGM□H/SGDH User's Manual for Design and Maintenance (SIE-S800-32.2)* if conducting trial operation on Servomotors that have been stored for a long period of time.

- Connection to machines or devices, wiring and grounding are correct.
- Are bolts and nuts securely tightened?
- Is the oil seal undamaged and oiled?

Take appropriate actions immediately if one of the items above is incorrect.

5.1.2 SERVOPACKs

Inspect the following items before conducting trial operation.

- Parameters are properly set for the applicable Servomotor and specifications.
- Terminal connections and wiring leads are tightened securely and connectors are inserted securely.
- The power supply turns OFF if a servo alarm occurs.
- The power supplied to the SERVOPACK is the correct voltage.
- The Option Unit is installed correctly.

Take appropriate actions immediately if an alarm occurs or one of the items above is incorrect.

5.2 Trial Operation for MECHATROLINK Communications

This section describes the trial operation procedure for MECHATROLINK communications.

5.2.1 Preparations for Trial Operation

IMPORTANT

To prevent accidents, initially conduct trial operation with no load connected to the Servomotor. Before starting operation with a connected load, make sure emergency-stop procedures are in place.

Prepare for operation using the following procedure.

1. Check that wiring has been performed correctly and then connect the signals (CN1 connector).
2. Turn ON the power.

   If power is being supplied correctly, the CHARGE or POWER indicator on the SERVOPACK and the R indicator on the Option Unit will light.

   If the R indicator on the Option Unit does not light, check to make sure the switches on the Option Unit (SW1 and SW2) are set correctly and then turn the power OFF then ON again. For information on switch settings, refer to *4.2 Switches for MECHATROLINK Communications Settings.*
3. Execute the CONNECT (start connection) command to start communications.

   The status of the SERVOPACK can be checked using the SMON (Status Monitor) command. The response data from the SERVOPACK will be alarm code 99 (normal).
4. Confirm the model number using the ID_RD (Read ID) command.

   "SGDH-***E" will be returned from the SERVOPACK.

   Alternatively, for the Option Unit, "JUSP-NS100" will be returned.
5. Write the parameters necessary for trial operation using the PRM_WR (parameter write) command.

   Refer to *5.4.1 Minimum Parameters and Input Signals*, for information on the necessary preparations.
6. Execute the SV_ON (Servo ON) command. The power circuit in the SERVOPACK will be activated and the Servomotor will be ready to operate. At this point, SVON = 1 (base block currently being released) in STATUS will be returned.

5.2.2 Operating the Servomotor

Only the main circuit can be operated while the base block is being released. Run the Servomotor at low speed.

■ Command Transmission Example

POSING (rapid traverse positioning) command

Option = 0

Positioning setting = 10000 (current position +10000 with absolute encoders)

Rapid traverse speed = 400

Make sure the Servomotor is operating in the proper direction according to the reference.

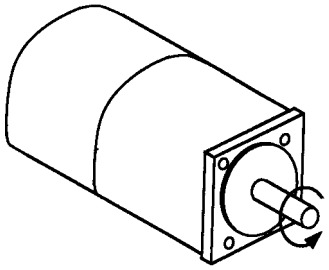


Fig. 5.1 Motor Forward Rotation

If the reference and rotational direction do not match, refer to *5.4.1 Minimum Parameters and Input Signals* and set correctly.

5.3 Trial Operation Inspection

Inspect the following items during the trial operation.

- Unusual vibration
- Abnormal noise
- Excessive temperature rise

Take actions according to *Chapter 9 Troubleshooting* if an alarm occurs. Also note that the Servomotor may overload during the trial operation if the load system is not suitably broken in.

5.4 Supplementary Information on Trial Operation

5.4.1 Minimum Parameters and Input Signals

This section describes the minimum parameters and input signals required for trial operation.

■ Parameters

Turn OFF power once after changing any parameter. The change will be valid when power is turned ON again.

Pn202	Electronic Gear Ratio (Numerator)	See *6.3.2*
Pn203	Electronic Gear Ratio (Denominator)	See *6.3.2*

Changing Servomotor Rotation Direction

Use the following parameter to reverse the direction of rotation.

Pn000.0	Function Selection Basic Switches: Direction Selection	See *6.2.1*

■ Input Signals

Refer to the relevant page for details on each input signal.

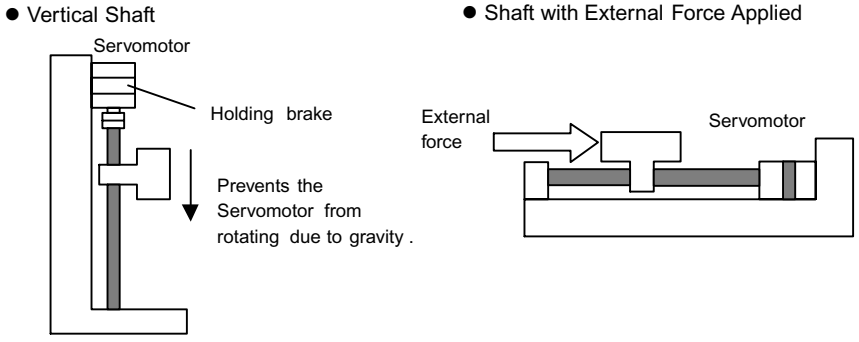
Input signal selection settings through parameters can be used to eliminate the need for external short circuits.

Signal Name		Pin Number	Description
P-OT	Forward run prohibited	CN1-42	The Overtravel Limit Switch Refer to 6.2.2
N-OT	Reverse run prohibited	CN1-43	

5.4.2 Servomotors with Brakes

Use Servomotors with brakes for vertical shaft applications or when external force is applied to the shaft to prevent the shaft from rotating due to gravity or external force when power is lost.

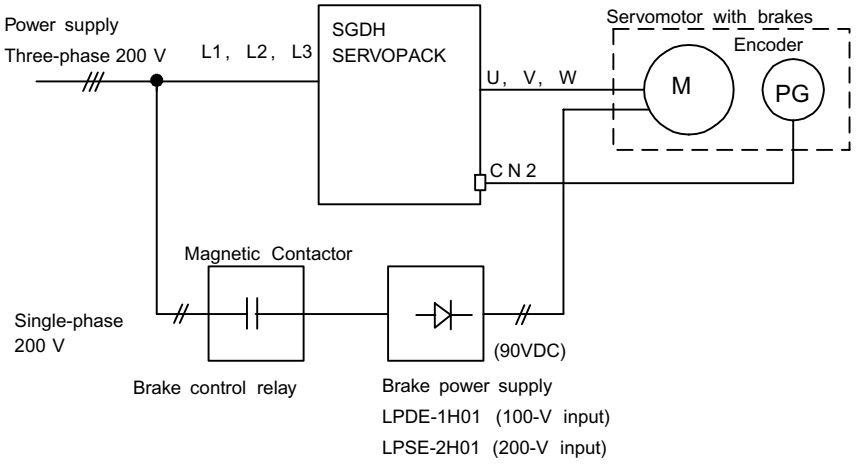
The SERVOPACK uses the brake interlock output (/BK) signal to control holding brake operation when using Servomotors with brakes.



IMPORTANT

To prevent faulty operation due to gravity or external force, make sure that the Servomotor and holding brake operate normally with the Servomotor disconnected from the equipment. When both of them operate normally, connect the Servomotor to the equipment to start trial operation.

The following figure shows wiring for a Servomotor with brakes. Refer to *6.5.2 Using the Holding Brake* for details on wiring.



6

Parameter Settings and Functions

This chapter describes the procedure for setting and applying parameters.

■ Before Reading this Chapter

This chapter describes the use of each CN1 I/O signal for the SGDH SERVOPACK with the Option Unit. It also describes the procedure for setting the related parameters for the intended purposes.

The following sections can be used as references for this chapter.

- CN1 I/O signal list: Refer to *3.3.3 I/O Signal Names and Functions*.
- CN1 I/O signal terminal layout: *3.3.2 I/O Signals Connector (CN1) Terminal Layout*.
- Parameter list: Refer to *Appendix B List of Parameters*.

The CN1 connector is used to exchange signals with external circuits.

■ Parameter Configurations

Parameters are comprised of the types shown in the following table. Refer to *Appendix B List of Parameters*.

Type	Parameter No.	Description
Function Selection Parameters	Pn000 to Pn005	Select basic and application functions such as the type of function or the stop mode used when an alarm occurs.
Servo Gain and Other Parameters	Pn100 to Pn123	Set numerical values such as speed and position loop gains.
Position Parameters	Pn200 to Pn208 Pn804 to Pn808	Set position parameters such as the reference pulse input form and gear ratio.
Speed Parameters	Pn300 to Pn308	Set speed parameters such as speed reference input gain and soft start deceleration time.
Torque Parameters	Pn400 to Pn409	Set torque parameters such as the torque reference input gain and forward/reverse torque limits.
Acceleration/Deceleration Parameters	Pn80A to Pn812	Set acceleration/deceleration parameters, such as selecting an acceleration/deceleration filter.
Sequence Parameters	Pn500 to Pn512 Pn801 to Pn803	Set output conditions for all sequence signals and changes I/O signal selections and allocations.
Motion Parameters	Pn814 to Pn819	Set motion parameters, such as the zero point return direction.
MECHATROLINK Parameters	Pn800 to Pn802 Pn813, Pn816	Set parameters for MECHATROLINK communications settings.
Others	Pn600 to Pn601	Specify the capacity for an external regenerative resistor and reserved parameters.
Auxiliary Function Execution	Fn000 to Fn013	Execute auxiliary functions such as JOG Mode operation.
Monitor Modes	Un000 to Un00D	Enable speed and torque reference monitoring, as well as monitoring to check whether I/O signals are ON or OFF.

6.1 Parameter Limits and Standard Settings with Option Unit

This section explains the limits for parameters and I/O signals standard settings with the Option Unit mounted.

6.1.1 Parameter Limits

When an Option Unit is mounted on an SGDH SERVOPACK and it is used for MECHATROLINK communications, the following parameters are automatically set. The following parameters will be treated as “reserved for system use,” so do not change them. The SGDH SERVOPACK will be set for position control. It is not necessary to set parameters for speed and torque control, so do not change the settings.

Table 6.1 List of Parameters for System Use with the JUSP-NS100

Pn No.	Digit	Parameter Name	Set Value	Contents
Pn000	1	Select control method	1	Position control
Pn004	1	Reserved	0	-
Pn200	2	Clear signal status	1	Deviation counter is not cleared.
Pn204	-	Position command acceleration/deceleration parameter	0	Time constant = 0
Pn207	1	Select position command filter	0	Uses the position command acceleration/deceleration filter.
Pn50A	0	Input signal allocation mode	1	User set
	1	/S-ON signal mapping	8	Not used
	2	/P-CON signal mapping	8	Not used
Pn50B	1	/ALM-RST signal mapping	8	Not used
Pn50C	-	Select input signal 3	8888	Not used
Pn50D	-	Select input signal 4	8888	Not used

These parameters are set automatically the first time the power to the SERVOPACK is turned ON after the Option Unit has been mounted. Startup will take approximately 6 seconds when these parameters are being set.

6.1.2 Standard Settings for CN1 I/O Signals

The standards settings for CN1 I/O signals when the Option Unit is mounted are described below. The parameters can be set as described for standard applications.

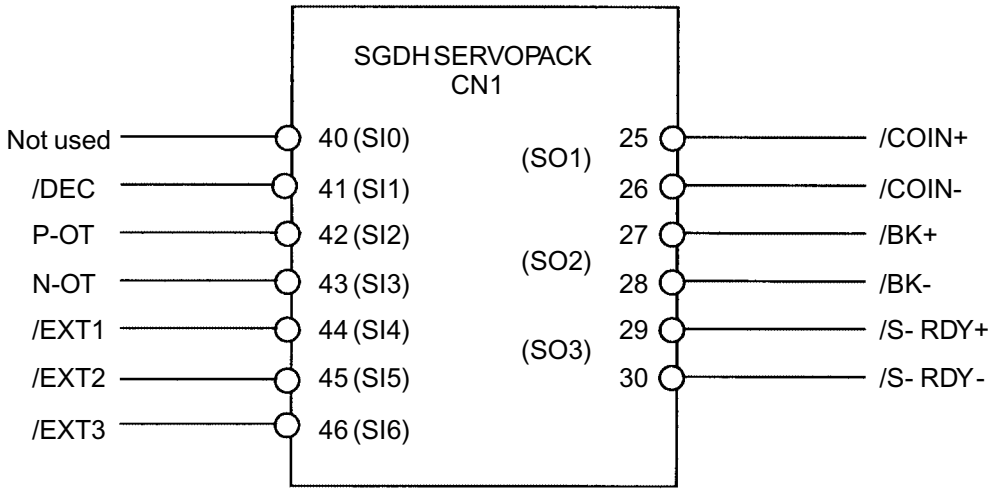


Fig. 6.1 Standard CN1 I/O Signal Settings

Table 6.2 Factory Settings and Standard Settings for CN1 I/O Signals

Parameter	Description	Factory Setting	Standard Setting
Pn50A	Input signal selections 1	2881	Same as left
Pn50B	Input signal selections 2	6583	8883
Pn511	Input signal selections 5	8888	6541
Pn50E	Output signal selections 1	3211	3001
Pn50F	Output signal selections 2	0000	0200
Pn510	Output signal selections 3	0000	Same as left

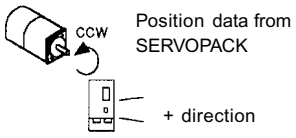
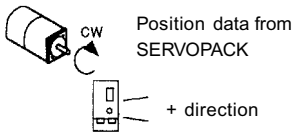
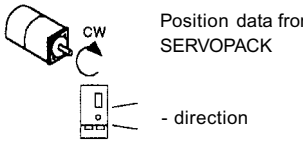
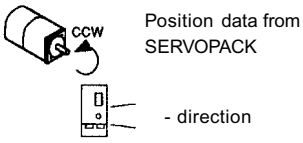
6.2 Settings According to Device Characteristics

This section describes the procedure for setting parameters according to the dimensions and performance of the equipment used.

6.2.1 Switching Servomotor Rotation Direction

The SERVOPACK has a Reverse Rotation Mode that reverses the direction of Servomotor rotation without rewiring. Forward rotation in the standard setting is defined as counterclockwise as viewed from the load.

With the Reverse Rotation Mode, the direction of Servomotor rotation can be reversed without changing other items. The direction (+, -) of shaft motion is reversed.

	Standard Setting	Reverse Rotation Mode
Forward Reference		
Reverse Reference		

■ Setting Reverse Rotation Mode

Use parameter Pn000.0.

Pn000.0	Direction Selection	Factory Setting: 0	Position Control

Use the following settings to select the direction of Servomotor rotation.

Setting	Description	
0	Forward rotation is defined as counterclockwise (CCW) rotation as viewed from the load.	(Standard setting)
1	Forward rotation is defined as clockwise (CW) rotation as viewed from the load.	(Reverse Rotation Mode)

6.2.2 Setting the Overtravel Limit Function

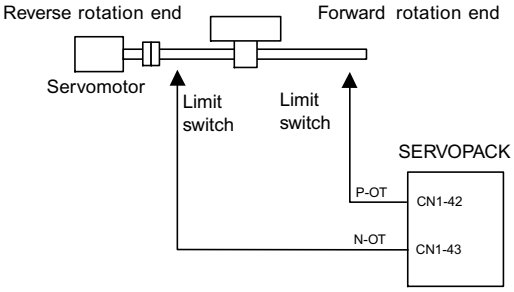
The overtravel limit function forces movable equipment parts to stop if they exceed the allowable range of motion.

■ Using the Overtravel Function

To use the overtravel function, connect the overtravel limit switch input signal terminals shown below to the correct pins of the SERVOPACK CN1 connector.

→ Input P-OT CN1-42	Forward Run Prohibited (Forward Overtravel)	Position Control
→ Input N-OT CN1-43	Reverse Run Prohibited (Reverse Overtravel)	Position Control

Connect limit switches as shown below to prevent damage to the devices during linear motion.



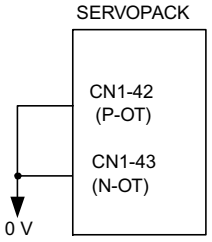
Drive status with an input signal ON or OFF is shown in the following table.

P-OT	CN1-42 at low level when ON	Forward rotation allowed. Normal operation status.
	CN1-42 at high level when OFF	Forward run prohibited (reverse rotation allowed).
N-OT	CN1-43 at low level when ON	Reverse rotation allowed. Normal operation status.
	CN1-43 at high level when OFF	Reverse run prohibited (forward rotation allowed).

■ Enabling/Disabling Input Signals

Set the following parameters to specify whether input signals are used for overtravel or not. The factory setting is "used."

Pn50A.3	P-OT Signal Mapping (Forward Run Prohibited Input Signal)	Factory Setting: 2	Position Control
Pn50B.0	N-OT Signal Mapping (Reverse Run Prohibited Input Signal)	Factory Setting: 3	Position Control



The short-circuit wiring shown in the figure can be omitted when P-OT and N-OT are not used.

Parameter	Setting	Item
Pn50A.3	2 (Factory setting)	Uses the P-OT input signal for prohibiting forward rotation. (Forward rotation is prohibited when CN1-42 is open and is allowed when CN1-42 is at 0 V.)
	8	Does not use the P-OT input signal for prohibiting forward rotation. (Forward rotation is always allowed and has the same effect as shorting CN1-42 to 0 V.)
Pn50B.0	3 (Factory setting)	Uses the N-OT input signal for prohibiting reverse rotation. (Reverse rotation is prohibited when CN1-43 is open and is allowed when CN1-43 is at 0 V.)
	8	Does not use the N-OT input signal for prohibiting reverse rotation. (Reverse rotation is always allowed and has the same effect as shorting CN1-43 to 0 V.)

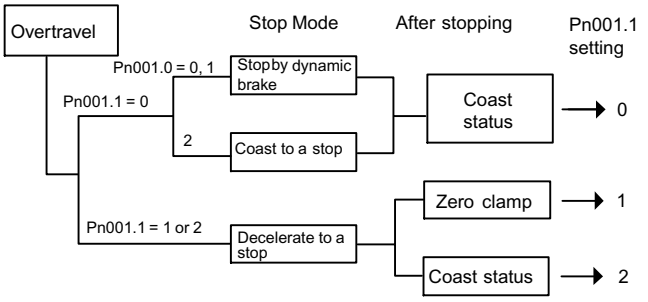
■ Servomotor Stop Mode for P-OT and N-OT Input Signals

Set the following parameters to specify the Servomotor Stop Mode when P-OT and N-OT input signals are used.

Specify the Servomotor Stop Mode when either of the following signals is input during Servomotor operation.

- Forward run prohibited input (P-OT, CN1-42)
- Reverse run prohibited input (N-OT, CN1-43)

Pn001.1	Overtravel Stop Mode	Factory Setting: 0	Position Control

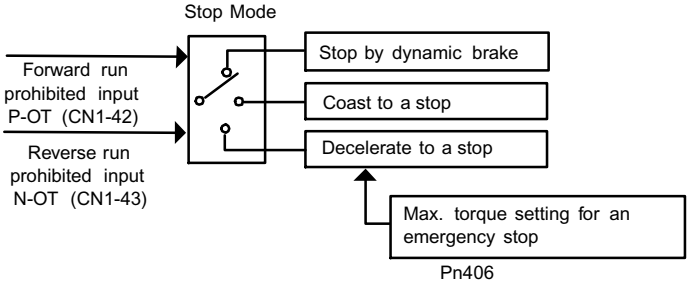


Parameter	Setting	Item
Pn001.1	0	Stops the Servomotor the same way as turning the servo OFF (according to Pn001.0).
	1	Decelerates the Servomotor to a stop at the preset torque, and then locks the Servomotor in Zero Clamp Mode. Torque setting: Pn406 emergency stop torque
	2	Decelerates the Servomotor to a stop at the preset torque, and puts the Servomotor in coast status. Torque setting: Pn406 emergency stop torque

Pn406 specifies the stop torque applied for overtravel when the input signal for prohibiting forward or reverse rotation is used.

The torque limit is specified as a percentage of rated torque.

Pn406	Emergency Stop Torque	Unit: %	Setting Range: 0 to Max. Torque	Factory Setting: 800	Valid when Pn001.1 is 1 or 2



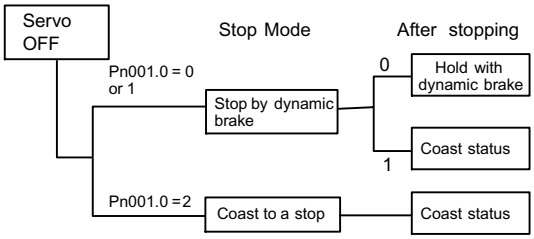
■ Servo OFF Stop Mode Selection

The SGDH SERVOPACK turns OFF under the following conditions:

- The SV_OFF command is transmitted.
- Servo alarm occurs.
- Power is turned OFF.

Specify the Stop Mode if any of these occurs during Servomotor operation.

Pn001.0	Servo OFF or Alarm Stop Mode	Factory Setting: 0	-



The dynamic brake electrically applies a brake by using a resistor to consume Servomotor rotation energy.

Refer to *6.5.1 Using the Dynamic Brake.*

Parameter	Setting	Item
Pn001.0	0 (Factory setting)	Uses the dynamic brake to stop the Servomotor, and maintains dynamic brake status after stopping.
	1	Uses the dynamic brake to stop the Servomotor, and cancels dynamic brake status after stopping to go into coast status.
	2	Coasts the Servomotor to a stop. The Servomotor is turned OFF and stops due to equipment friction.

Note: If the Servomotor is stopped or rotating at extremely low speed when the item above is set to 0 (dynamic brake status after stopping with the dynamic brake), then braking power is not generated and the Servomotor will stop the same as in coast status.

6.2.3 Software Limit Settings

The software limits set limits in software for machine movement that do not use the overtravel signals (P-OT and N-OT). If a software limit is exceeded, an emergency stop will be executed in the same way as it is for overtravel.

■ Software Limit Function

The software limits can be enabled or disabled.

The software limit function parameter is used to enable the software limit function.

The software limits can be enabled under the following conditions. Under all other circumstances, the software limits will not be enabled even if a software limit is exceeded.

- The ZRET command has been executed.
- REFE = 1 using the POS_SET command.

The software limits are also enabled after the SENS_ON command is executed for an absolute encoder.

Pn801.0	Software Limit Function	Factory Setting: 0	Position Control

Enable or disable the software limits using one of the following settings.

Pn801.0 Setting	Meaning
0 (Factory setting)	Software limits enabled.
1	Forward software limit disabled.
2	Reverse software limit disabled.
3	Both software limits disabled.

■ Selecting Software Limit Operation

Software limit operation is selected by setting the following parameter.

Pn801.1	Software Limit Operation Selection	Factory Setting: 0	Position Control

Select the operation using one of the following settings.

Pn801.1 Setting	Meaning
0 (Factory setting)	Operation from the machine coordinate system absolute position (APOS)
1	Operation from the absolute position (APOS) converted according to the reference coordinate system.

■ Software Limit Check using Commands

Enable or disable software limit checks when target position commands such as POSING or INTERPOLATE are input. When the input target position exceeds the software limit, a deceleration stop will be performed from the software limit set position.

Pn801.2	Software Limit Check using Commands	Factory Setting: 0	Position Control

Pn801.2 Setting	Meaning
0 (Factory setting)	No software limit check for commands.
1	Software limit check for commands. The checking method for a software limit check using input target position commands is determined by the Pn801.1 setting. When Pn801.1 = 0, a software limit check is performed on the target position for the machine coordinate system. When Pn801.1 = 1, a software limit check is performed on the target position for the reference coordinate system.

■ Software Limit Setting

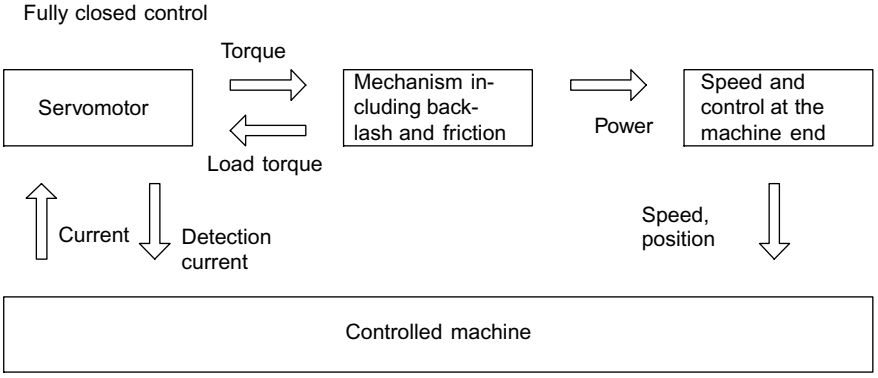
Set software limits in the positive and negative directions.

Pn804	Forward Software Limit	Unit	Setting Range: -1073741823 to 1073741823	Factory Setting: 81911808	Position Control
Pn806	Reverse Software Limit	Unit	Setting Range: -1073741823 to 1073741823	Factory Setting: -81911808	Position Control

The negative limit must be less than the positive limit.

6.2.4 Fully Closed Control

A fully closed loop can be formed using the parameter settings on the SGDH SERVOPACK. In previous SERVOPACKs, a semi-closed method was used to control the motor, but with this function even more precise control is achieved because control involves the detection of the position and speed of actual machine operation.



Parameters must be set when using fully closed control. Refer to *6.2.6 Parameter Settings* for details.

6.2.5 Fully Closed System Specifications

This section describes the fully closed system specifications of the SGDH SERVOPACK when an Option Unit is mounted.

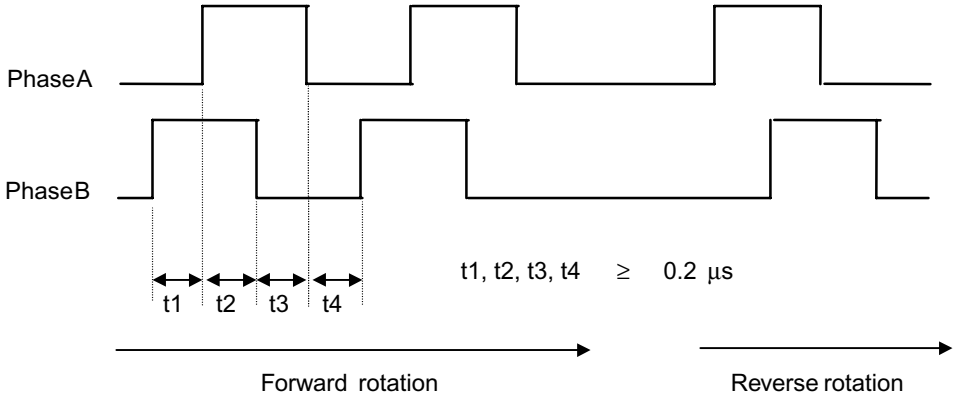
■ Fully Closed Encoder Pulse Output Form

5-V Differential line driver output (complies with EIA Standard RS-422A)

■ Fully Closed Encoder Pulse Signal Form

90° Phase difference 2-phase differential pulse: phase A, phase B

Maximum receivable frequency for SERVOPACK: 1 Mbps



6.2.6 Parameter Settings

This section describes the parameters that must be set when using an Option Unit.

■ Overflow Level

For information on parameter contents, refer to *6.2.1 Servo Gain Settings* of the *Σ-II Series SGM□H/SGDH User's Manual : Design and Maintenance* (SIE-S800-32.2). The factory setting is made to minimize the chance of the motor going out of control due to wiring errors or other causes. After performing a trial operation at a low speed, change the setting to a higher value if necessary.

■ Fully Closed Encoder

Set the method for using the fully closed encoder.

Pn002.3	Fully Closed Encoder Usage Method	Factory Setting: 0	Position Control

The setting details are as follows:

Parameter	Setting	Meaning
Pn002.3	0 (Factory setting)	Fully closed encoder is not used.
	1	Fully closed encoder is used without phase C.
	2	Fully closed encoder is used with phase C.
	3	Fully closed encoder is used in Reverse Rotation Mode without phase C.
	4	Fully closed encoder is used in Reverse Rotation Mode with phase C.

When changes have been made to this parameter, turn OFF the power once. The set value will become effective when the power is turned ON again.

■ Number of Fully Closed Encoder Pulses

Set the number of fully closed encoder pulses for each motor rotation.

When the number of fully closed encoder pulses per motor rotation is not an integer, set the closest integer.

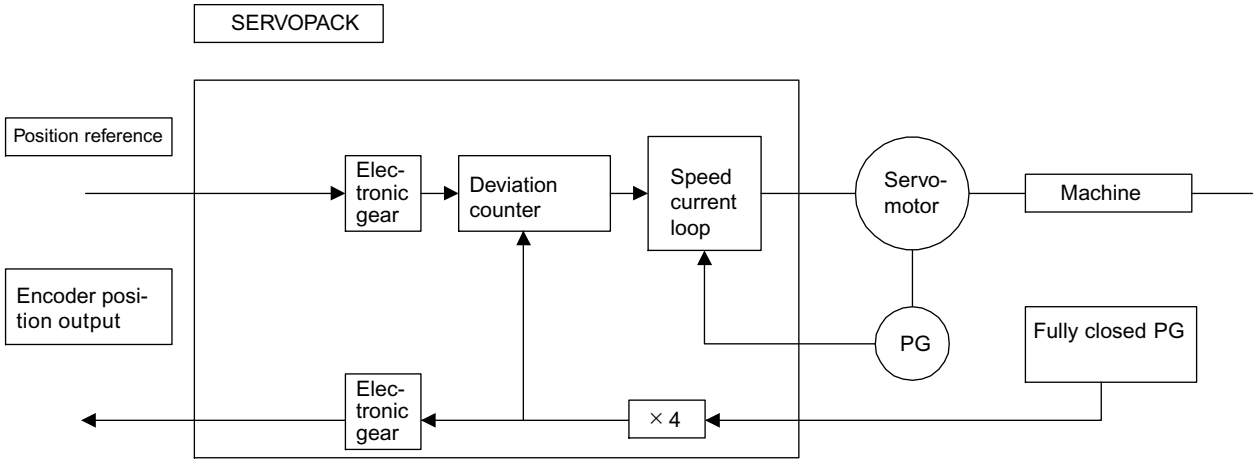
Error will occur in the speed monitor for position loop gain, feed forward, and reference pulse, but no position displacement will occur. Set the number of pulses with a multiplication factor of 1.

Pn206	Number of Fully Closed Encoder Pulses	Unit P/R	Setting Range: 513 to 32768	Factory Setting: 16384	Position Control

When changes have been made to this parameter, turn OFF the power once. The set value will become effective when the power is turned ON again.

■ Electronic Gears

For information on the parameters, refer to *6.3.2 Using the Electronic Gear Function*.



■ Reverse Rotation Settings

The settings shown in the following table must be made in order to used the Reverse Rotation Mode.

Making the settings carefully. Errors may cause the motor to run out of control.

Direction of Motor as Viewed from Load for Forward Rotation	Relation between Fully Closed PG during Forward Rotation Input Phase	Pn000.0 Setting	Pn002.3 Setting	Relation Between Fully Closed PG during CCW Rotation as Viewed from Motor load Input Phase
CCW direction	Figure 6.2	0	1, 3	Figure 6.2
	Figure 6.3		2, 4	Figure 6.3
CW direction	Figure 6.2	1	1, 3	Figure 6.2
	Figure 6.3		2, 4	Figure 6.3

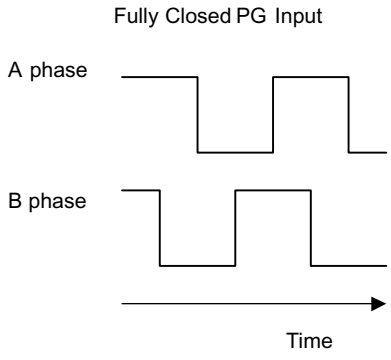


Fig. 6.2

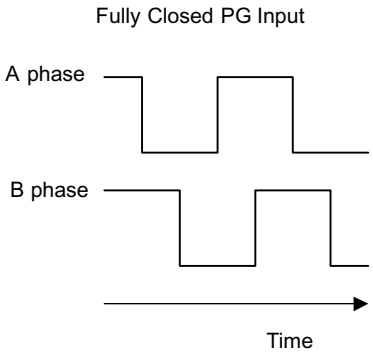


Fig. 6.3

Both Pn000.0 and Pn002.3 can be used to change the rotational direction during normal operation. If the motor runs out of control, change either Pn000.0 or Pn002.3.

6.3 Settings According to Host Controller

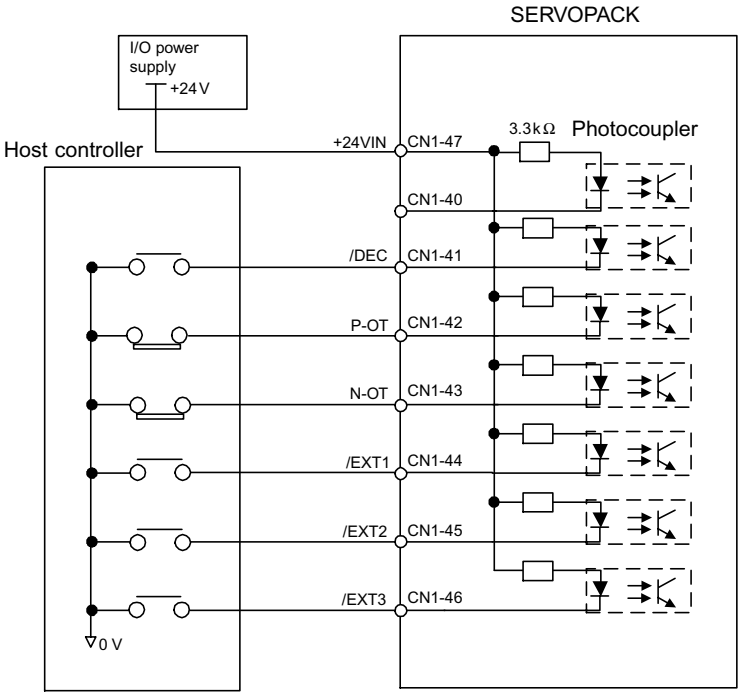
This section describes the procedure for connecting a Σ-II Series Servo to a host controller, including the procedure for setting related parameters.

6.3.1 Sequence I/O Signals

Sequence I/O signals are used to control SERVOPACK operation. Connect these signal terminals as required.

■ Input Signal Connections

Connect the sequence input signals as shown below. (Standard settings)



IMPORTANT

Provide an external input power supply; the SERVOPACK does not have an internal 24-V power supply.

- External power supply specifications: 24 ± 1 VDC, 50 mA min.

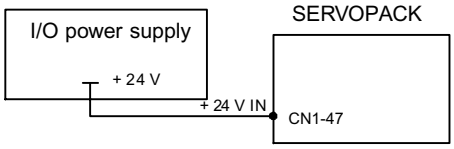
Yaskawa recommends using the same external power supply as that used for output circuits. The allowable voltage range for the 24-V sequence input circuit power supply is 11 to 25 V. Although a 12-V power supply can be used, contact faults can easily occur for relays and other mechanical contacts under low currents. Confirm the characteristics of relays and other mechanical contacts before using a 12-V power supply.

The function allocation for sequence input signal circuits can be changed.

Refer to *6.4.2 Input Circuit Signal Allocation* for more details.

→ Input +24VIN CN1-47	External I/O Power Supply Input	Position Control

The external power supply input terminal is common to sequence input signals.

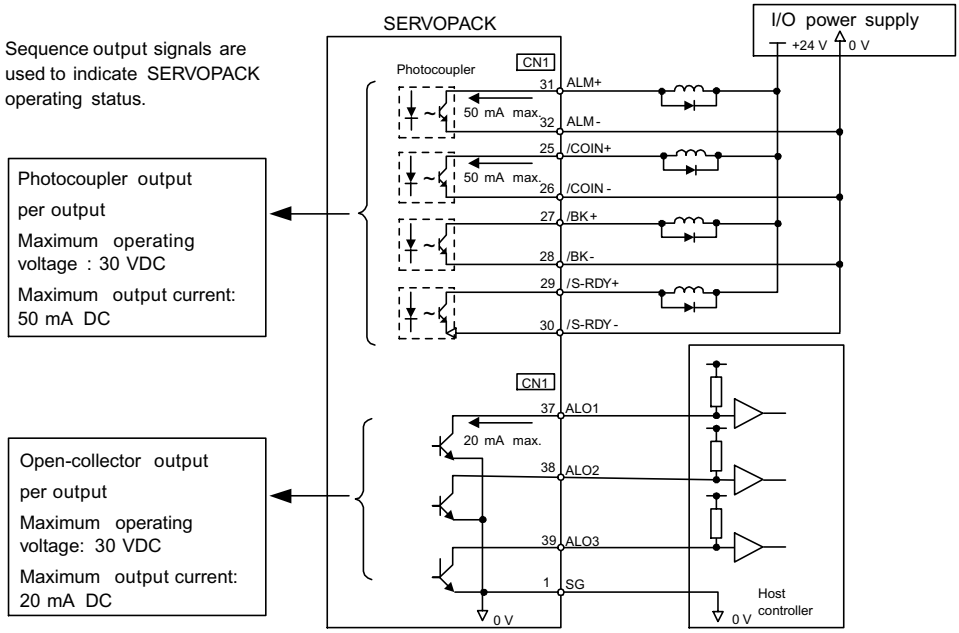


Connect an external I/O power supply.

Contact input signals: /DEC (CN1-41)
P-OT (CN1-42)
N-OT (CN1-43)
/EXT1 (CN1-44)
/EXT2 (CN1-45)
/EXT3 (CN1-46)

■ Output Signal Connections

Connect the sequence output signals as shown in the following figure. (Standard settings)



IMPORTANT

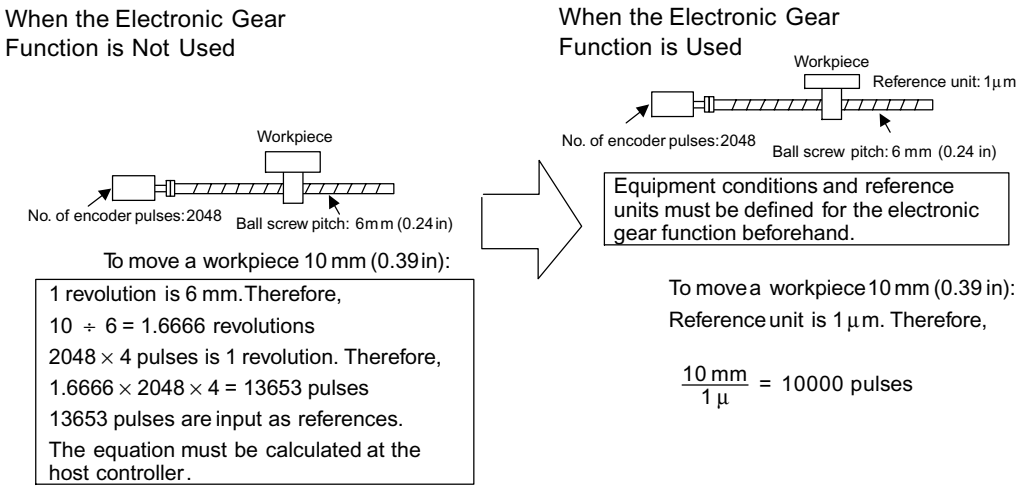
Provide a separate external I/O power supply; the SERVOPACK does not have an internal 24-V power supply. Yaskawa recommends using the same type of external power supply as that used for input circuits.

Function allocation for some sequence output signal circuits can be changed.

Refer to *6.4.3 Output Circuit Signal Allocation* for more details.

6.3.2 Using the Electronic Gear Function

The electronic gear function enables the Servomotor travel distance per input reference pulse to be set to any value. It allows the host controller generating pulses to be used for control without having to consider the equipment deceleration ratio or the number of encoder pulses.



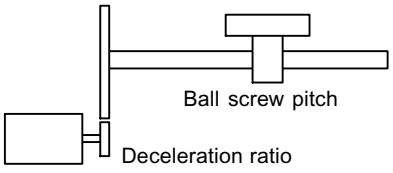
■ Setting the Electronic Gear

Calculate the electronic gear ratio (B/A) using the following procedure, and set the values in parameters Pn202 and 203.

1. Check equipment specifications.

   Items related to the electronic gear:

   - Deceleration ratio
   - Ball screw pitch
   - Pulley diameter

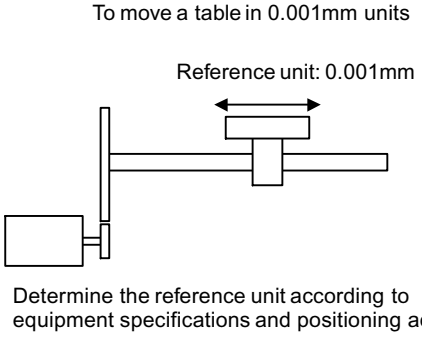


2. Check the number of encoder pulses for the SGM□H Servomotor.

Servomotor Model and Encoder Specifications	Encoder Type	Number of Encoder Pulses Per Revolution (P/R)	
A	Incremental encoder	13-bit	2048
B		16-bit	16384
C		17-bit	32768
1	Absolute encoder	16-bit	16384
2		17-bit	32768

3. Determine the reference unit used.

   A reference unit is the minimum position data unit used to move a load. (Minimum unit of reference from the host controller.)



◀ EXAMPLE ▶

- 0.01 mm (0.0004 in), 0.001 mm (0.00004 in), 0.1°, 0.01 inch.
  A reference unit of one pulse moves the load by one reference unit.
- When the reference unit is 1 μm
  If a reference of 50000 units is input, the load moves 50 mm (1.97 in) (50000 x 1μm).

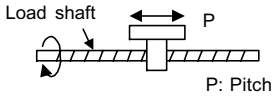
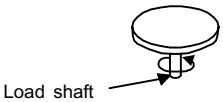
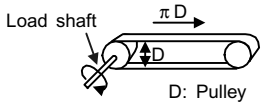
4. Determine the load travel distance per load shaft revolution in reference units.

$$\text{Travel distance per load shaft revolution (reference unit)} = \frac{\text{Travel distance per load shaft revolution}}{\text{Reference unit}}$$

◀ EXAMPLE ▶

- When the ball screw pitch is 5 mm (0.20 in) and the reference unit is 0.001 mm (0.00004 in)

$$\frac{5}{0.001} = 5000 \text{ (reference unit)}$$

Ball Screw	Disc Table	Belt and Pulley
 1 revolution = $\frac{P}{\text{reference unit}}$	 1 revolution = $\frac{360^\circ}{\text{reference unit}}$	 1 revolution = $\frac{\pi D}{\text{reference unit}}$

5. Electronic gear ratio is given as $\left(\frac{B}{A}\right)$.

   If the decelerator ratio of the motor and the load shaft is given as $\frac{n}{m}$

   where m is the rotation of the motor and n is the rotation of the load shaft,

$$\text{Electronic gear ratio}\left(\frac{B}{A}\right) = \frac{\text{No. of encoder pulses} \times 4}{\text{Travel distance per load shaft revolution (reference unit)}} \times \frac{m}{n}$$

IMPORTANT

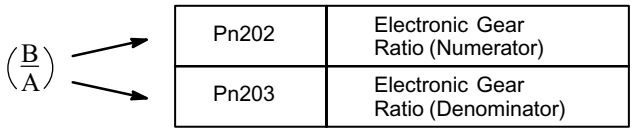
Make sure the electronic gear ratio satisfies the following condition:

$$0.01 \leq \text{Electronic gear ratio}\left(\frac{B}{A}\right) \leq 100$$

The SERVOPACK will not work properly if the electronic gear ratio is outside this range. In this case, modify the load configuration or reference unit.

6. Set the parameters.

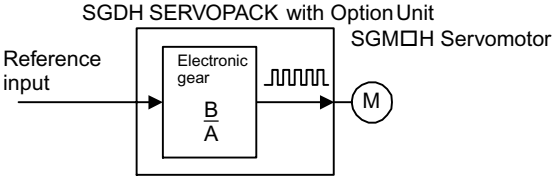
Reduce the electronic gear ratio $\left(\frac{B}{A}\right)$ to the lower terms so that both A and B are integers smaller than 65535, then set A and B in the respective parameters.



That is all that is required to set the electronic gear ratio.

Pn202	Electronic Gear Ratio (Numerator)	Unit: None	Setting Range: 1 to 65535	Factory Setting: 4	Position Control
Pn203	Electronic Gear Ratio (Denominator)	Unit: None	Setting Range: 1 to 65535	Factory Setting: 1	Position Control

Set the electronic gear ratio according to equipment specifications.



$$\text{Electronic gear ratio}\left(\frac{B}{A}\right) = \frac{Pn202}{Pn203}$$

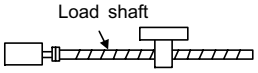
- B = [(Number of encoder pulses) × 4] × [motor speed]
- A = [Reference units (travel distance per load shaft revolution)] × [load shaft revolution speed]

■ Electronic Gear Setting Examples

The following examples show electronic gear settings for different load mechanisms.

Ball Screws

Reference unit: 0.001 mm (0.00004 in)

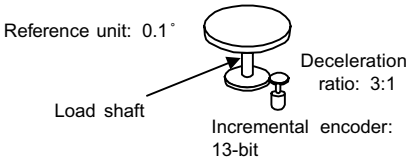


$$\text{Travel distance per load shaft revolution} = \frac{6\,\text{mm}}{0.001\,\text{mm}} = 6000$$

$$\text{Electronic gear ratio}\left(\frac{B}{A}\right) = \frac{2048 \times 4 \times 1}{6000 \times 1} = \frac{Pn202}{Pn203}$$

Preset Values	Pn202	8192
	Pn203	6000

Circular Tables



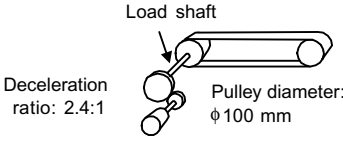
$$\text{Travel distance per load shaft revolution} = \frac{360^\circ}{0.1^\circ} = 3600$$

$$\text{Electonic gear ratio}\left(\frac{B}{A}\right) = \frac{2048 \times 4 \times 3}{3600 \times 1} = \frac{Pn202}{Pn203}$$

Preset Values	Pn202	24576
	Pn203	3600

Belts and Pulleys

Reference unit: 0.0254 mm (0.0010 in)



Set a PG dividing ratio equivalent to 1024 P/R for the absolute encoder.

$$\text{Travel distance per load shaft revolution} = \frac{3.14 \times 100\,\text{mm}}{0.0254\,\text{mm}} = 12362$$

$$\text{Electronic gear ratio}\left(\frac{B}{A}\right) = \frac{1024 \times 4 \times 2.4}{12362 \times 1} = \frac{Pn202}{Pn203}$$

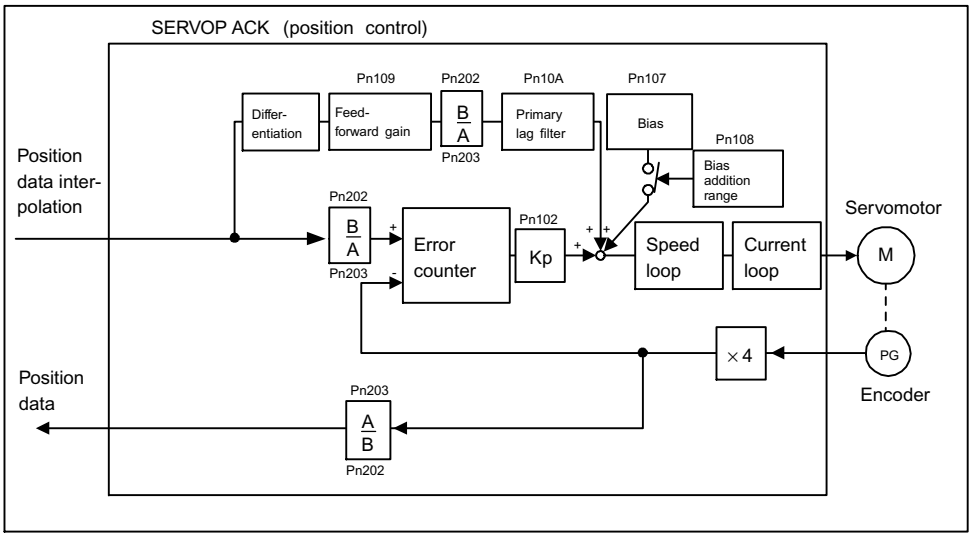
$$= \frac{9830.4}{12362} = \frac{49152}{61810}$$

Preset Values	Pn202	49152
	Pn203	61810

6

■ Control Block Diagram

The following diagram illustrates a control block for position control.



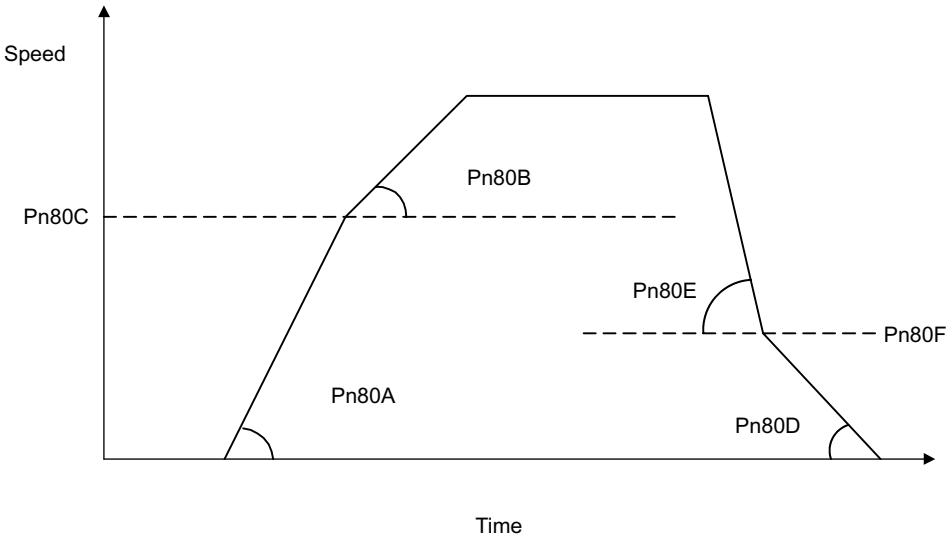
6.3.3 Acceleration/Deceleration Function

Acceleration and deceleration can be performed by setting the following parameters.

Use only after you have fully understood the meaning of each parameter. Settings are changed using MECHATROLINK communications.

Related parameters

Type	Parameter Number	Outline
Acceleration/deceleration	Pn80A	First-step linear acceleration parameter
	Pn80B	Second-step linear acceleration parameter
	Pn80C	Acceleration switching speed
	Pn80D	First-step linear deceleration parameter
	Pn80E	Second-step linear deceleration parameter
	Pn80F	Deceleration switching speed
Acceleration/deceleration filter	Pn810	Exponential acceleration/deceleration bias
	Pn811	Exponential acceleration/deceleration time parameter
	Pn812	Movement average time



■ First-step Linear Acceleration Parameter

Set the first-step linear acceleration when 2-step acceleration is used.

Pn80A	First-step Linear Acceleration Parameter	Unit 10,000 reference units/s^2	Setting Range: 1 to 65535	Factory Setting: 100	Position Control

■ Second-step Linear Acceleration Parameter

Set the second-step linear acceleration.

Pn80B	Second-step Linear Acceleration Parameter	Unit 10,000 reference units/s^2	Setting Range: 1 to 65535	Factory Setting: 100	Position Control

■ Acceleration Switching Speed

Set the speed for switching between first-step and second-step acceleration when 2-step acceleration is used. When 2-step acceleration is not used, set the acceleration switching speed (Pn80C) to 0.

Pn80C	Acceleration switching speed	Unit 100 reference units/s	Setting Range: 0 to 65535	Factory Setting: 0	Position Control

■ First-step Linear Deceleration Parameter

Set the first-step linear deceleration when 2-step deceleration is used.

Pn80D	First-step Linear Deceleration Parameter	Unit 10,000 reference units/s^2	Setting Range: 1 to 65535	Factory Setting: 100	Position Control

■ Second-step Linear Deceleration Parameter

Set the second-step deceleration.

Pn80E	Second-step Linear Deceleration Parameter	Unit 10,000 reference units/s^2	Setting Range: 1 to 65535	Factory Setting: 100	Position Control

■ Deceleration Switching Speed

Set the speed for switching between first-step and second-step deceleration when 2-step deceleration is used. When 2-step deceleration is not used, set the deceleration switching speed (Pn80F) to 0.

Pn80F	Deceleration Switching Speed	Unit 100 reference units/s	Setting Range: 0 to 65535	Factory Setting: 0	Position Control

■ Exponential Acceleration/Deceleration Bias

Set the bias speed for exponential acceleration/deceleration.

Pn810	Exponential Acceleration/ Deceleration Bias	Unit Reference unit/s	Setting Range: 0 to 32767	Factory Setting: 0	Position Control

■ Exponential Acceleration/Deceleration Time Parameter

Set the time constant for exponential acceleration/deceleration.

Pn811	Exponential Acceleration/ Deceleration Time Constant	Unit 0.1 ms	Setting Range: 0 to 5100	Factory Setting: 0	Position Control

■ Movement Average Time

Set the time over which to average movement when using S-curve acceleration/deceleration by applying a movement average to the acceleration/deceleration.

Pn812	Movement Average Time	Unit 0.1 ms	Setting Range: 0 to 5100	Factory Setting: 0	Position Control

6.3.4 Motion Settings

Motion settings are performed using the following parameters.

Set them according to the machine system.

■ Positioning Completed Width

Set the width for positioning completed (PSET) in STATUS. When distribution has been completed (DEN = 1) and the position is within the positioning completed width of the target position (TPOS), PSET will be set to 1.

Pn500	Positioning Completed Width	Unit Reference unit	Setting Range: 0 to 250	Factory Setting: 7	Position Control

INFO

This parameter is usually used to set the COIN output signal width, but can also be used as the MECHATROLINK PSET width in STATUS. The COIN output signal width will also be changed.

■ Positioning Proximity Width

Set the width for positioning proximity (NEAR) in STATUS. Regardless of whether or not distribution has been completed (DEN = 1), when the position is within the positioning proximity width of the target position, NEAR will be set to 1.

Pn504	Positioning Proximity Width (NEAR signal width)	Unit Reference unit	Setting Range: 0 to 250	Factory Setting: 7	Position Control

INFO

This parameter is usually used to set NEAR output signal width, but can also be used as the MECHATROLINK NEAR width in STATUS. The NEAR output signal width will also be changed.

■ Zero Point Width

Set the zero point position detection (ZPOINT) width.

Pn803	Zero Point Width	Unit Reference unit	Setting Range: 0 to 65535	Factory Setting: 10	Position Control

■ Final Travel Distance for External Positioning

Set the distance to move after the external signal input when external positioning is used. When the direction is negative or the distance very short, a deceleration stop will be performed before movement begins again in the reverse direction.

Pn814	Final Travel Distance for External Positioning	Unit Reference unit	Setting Range: -1073741823 to 1073741823	Factory Setting: 100	Position Control

■ Zero point Return Direction

Set the zero point return direction. Set to 0 to return in the forward direction and set to 1 to return in the reverse direction.

Pn816.0	Zero point Return Direction	Factory Setting: 0	Position Control

The setting details are as show below.

Pn816.0 Setting	Meaning
0	Forward direction
1	Reverse direction

■ Zero point Return Approach Speed 1

Set the speed for searching for the zero point after the deceleration limit switch signal turns ON for zero point returns.

Pn817	Zero point Return Approach Speed 1	Unit 100 reference units/s	Setting Range: 0 to 65535	Factory Setting: 50	Position Control

■ Zero point Return Approach Speed 2

Set the speed for searching for the zero point after the deceleration limit switch signal turns ON or OFF for zero point returns.

Pn818	Zero point Return Approach Speed 2	Unit 100 reference units/s	Setting Range: 0 to 65535	Factory Setting: 5	Position Control

■ Final Travel Distance to Return to Zero Point

Set the distance from the encoder zero point (phase C) and the zero point for zero point returns. When the direction is negative or the distance very short, a deceleration stop will be performed before movement begins again in the reverse direction.

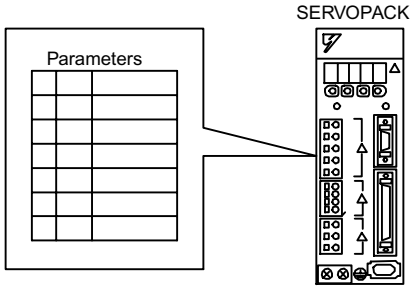
Pn819	Final Travel Distance to Return to Zero Point	Unit Reference unit	Setting Range: -1073741823 to 1073741823	Factory Setting: 100	Position Control

6.4 Setting Up the SERVOPACK

This section describes the procedure for setting parameters to operate the SERVOPACK.

6.4.1 Parameters

The Σ-II Series SERVOPACK provides many functions and has parameters called parameters that allow the user to specify functions and perform fine adjustments.



A Panel Operator, Digital Operator, or MECHATROLINK commands are used to set parameters.

Parameters are divided into the following three groups.

Parameter	Function
Pn000 to Pn819	Specify SERVOPACK functions, set servo gains, etc.
Fn000 to Fn013	Execute auxiliary functions such as JOG Mode operations and origin searches.
Un000 to Un00D	Enable monitoring the motor speed and torque reference on the panel display.

Refer to *Appendix B List of Parameters*.

6.4.2 Input Circuit Signal Allocation

The functions allocated to sequence input signal circuits can be changed. CN1 connector input signals are allocated with the factory settings as shown in the following table.

In general, allocate signals according to the standard settings in the following table.

CN1 Connector Terminal Numbers	Input Terminal Name	Factory Setting		Standard Setting	
		Symbol	Name	Symbol	Name
40	SI0	-	-	-	-
41	SI1	-	-	/DEC	Zero point return deceleration LS
42	SI2	P-OT	Forward run prohibited	P-OT	Forward run prohibited
43	SI3	N-OT	Reverse run prohibited	N-OT	Reverse run prohibited
44	SI4	-	-	/EXT1	External latch signal 1
45	SI5	/P-CL	Forward run external torque control	/EXT2	External latch signal 2

CN1 Connector Terminal Numbers	Input Terminal Name	Factory Setting		Standard Setting	
		Symbol	Name	Symbol	Name
46	SI6	/N-CL	Reverse run external torque control	/EXT3	External latch signal 3

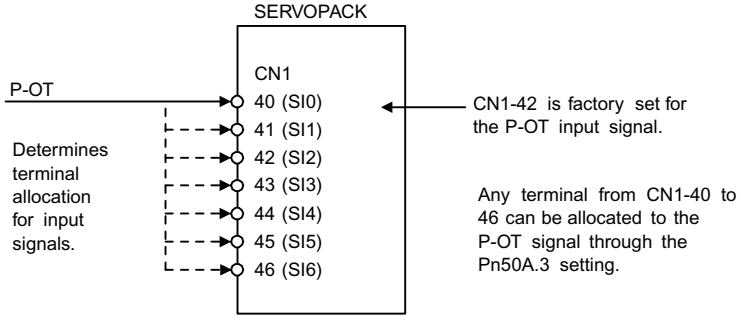
The following parameter is used to enable input signal allocations. Usually this parameter is set to 1. Do not change this setting.

Pn50A.0	Input Signal Allocation Mode	Factory Setting: 1	Position Control

Pn50A.0 Setting	Meaning
0	Reserved
1	Enables any sequence input signal settings.

■ Input Signal Allocation

The following signals can be allocated.



The following table shows the parameter factory settings for input signal selections 1 to 5.

Pn50A	Input Signal Selections 1	Factory Setting: 2881	Standard Setting: 2881
Pn50B	Input Signal Selections 2	Factory Setting: 6583	Standard Setting: 8883
Pn511	Input Signal Selections 5	Factory Setting: 8888	Standard Setting: 6541

Select the input terminal on the CN1 connector that will be used for each input signal.

• Examples of Input Signal Allocation

The procedure used to allocate sequence input signals is described using the P-OT (forward run prohibited) signal as a typical example.

Pn50A.3 Setting	Description	Remarks
0	Inputs the P-OT signal from the SI0 (CN1-40) input terminal.	Signal Polarity: Normal Example: Forward run prohibited signal (P-OT) is valid when high (OFF).
1	Inputs the P-OT signal from the SI1 (CN1-41) input terminal.	
2	Inputs the P-OT signal from the SI2 (CN1-42) input terminal.	
3	Inputs the P-OT signal from the SI3 (CN1-43) input terminal.	
4	Inputs the P-OT signal from the SI4 (CN1-44) input terminal.	
5	Inputs the P-OT signal from the SI5 (CN1-45) input terminal.	
6	Inputs the P-OT signal from the SI6 (CN1-46) input terminal.	
7	Sets P-OT signal so that it is always valid.	Set the Forward run prohibited signal (P-OT) so that it is always valid or always invalid.
8	Sets P-OT signal so that it is always invalid.	
9	Inputs the P-OT signal from the SI0 (CN1-40) input terminal.	Signal Polarity: Reversed (See note.) Example: Forward run prohibited signal (P-OT) is valid when low (ON).
A	Inputs the P-OT signal from the SI1 (CN1-41) input terminal.	
B	Inputs the P-OT signal from the SI2 (CN1-42) input terminal.	
C	Inputs the P-OT signal from the SI3 (CN1-43) input terminal.	
D	Inputs the P-OT signal from the SI4 (CN1-44) input terminal.	
E	Inputs the P-OT signal from the SI5 (CN1-45) input terminal.	
F	Inputs the P-OT signal from the SI6 (CN1-46) input terminal.	

Note: Settings 9 through F can be used to reverse signal polarity.

6

IMPORTANT

If reverse polarity is set for the Forward Run Prohibited or Reverse Run Prohibited signals, safe operation may not occur when troubles, such as broken signal lines, occur. You must confirm operational safety if setting reverse polarity is necessary for one or more of these signals.

As shown in the table above, the P-OT signal can be allocated to any input terminal from SI0 to SI6. P-OT is always input when Pn50A.3 is set to 7, and so the SERVOPACK will always be in forward run prohibited status.

The P-OT signal is not used when Pn50A.3 is set to 8. This setting is used in the following instances.

- When the factory set input signals are to be replaced by another input signal.
- When the forward run prohibited (P-OT) and the reverse run prohibited (N-OT) input signals are not required in the system configuration for trial or normal operation.

The forward run prohibited (P-OT) and the reverse run prohibited (N-OT) input signals are valid when OFF (high level). The input terminals must therefore be wired so that these signals remain ON (low level) in systems where they are not required. The need to wiring these terminals can be eliminated by setting the parameters to 8.

INFO

Signals are input with OR logic when multiple signals are allocated to the same input circuit.

- Allocating Other Input Signals

  Input signal allocation can be changed as shown below.

Input Signal		Parameter		Description
Name	Applicable Logic	Number	Setting	
Forward Run Prohibited (P-OT)	OFF (high level)	Pn50A.3	0	Inputs the signal on the left from SI0 (CN1-40).
			1	Inputs the signal on the left from SI1 (CN1-41).
			2	Inputs the signal on the left from SI2 (CN1-42).
			3	Inputs the signal on the left from SI3 (CN1-43).
			4	Inputs the signal on the left from SI4 (CN1-44).
			5	Inputs the signal on the left from SI5 (CN1-45).
			6	Inputs the signal on the left from SI6 (CN1-46).
			7	Sets the signal on the left to always enabled.
			8	Sets the signal on the left to always disabled.
			9	Inputs the reverse of the signal on the left from SI0 (CN1-40).
			A	Inputs the reverse of the signal on the left from SI1 (CN1-41).
			B	Inputs the reverse of the signal on the left from SI2 (CN1-42).
			C	Inputs the reverse of the signal on the left from SI3 (CN1-43).
			D	Inputs the reverse of the signal on the left from SI4 (CN1-44).
			E	Inputs the reverse of the signal on the left from SI5 (CN1-45).
			F	Inputs the reverse of the signal on the left from SI6 (CN1-46).
Reverse Run Prohibited (N-OT)	OFF (high level)	Pn50B.0	0 to F	Same as above.
Forward Current Limit (/P-CL)	ON (low level)	Pn50B.2	0 to F	Same as above.
Reverse Current Limit (/N-CL)	ON (low level)	Pn50B.3	0 to F	Same as above.
Zero point Return Deceleration LS (/DEC)	ON (low level)	Pn511.0	0 to F	Same as above.

Input Signal		Parameter		Description
Name	Applicable Logic	Number	Setting	
External Latch Signal 1 (/EXT1)	ON (low level)	Pn511.1	0 to 3	Sets the signal on the left to always disabled.
			4	Inputs the signal on the left from SI4 (CN1-44).
			5	Inputs the signal on the left from SI5 (CN1-45).
			6	Inputs the signal on the left from SI6 (CN1-46).
			7	Sets the signal on the left to always enabled.
			8	Sets the signal on the left to always disabled.
			D	Inputs the reverse of the signal on the left from SI4 (CN1-44).
			E	Inputs the reverse of the signal on the left from SI5 (CN1-45).
			F	Inputs the reverse of the signal on the left from SI6 (CN1-46).
			9 to F	Sets the signal on the left to always disabled.
External Latch Signal 2 (/EXT2)	ON (low level)	Pn511.2	0 to F	Same as above.
External Latch Signal 3 (/EXT3)	ON (low level)	Pn511.3	0 to F	Same as above.

6.4.3 Output Circuit Signal Allocation

Output signal functions can be allocated to the sequence signal output circuits shown below.

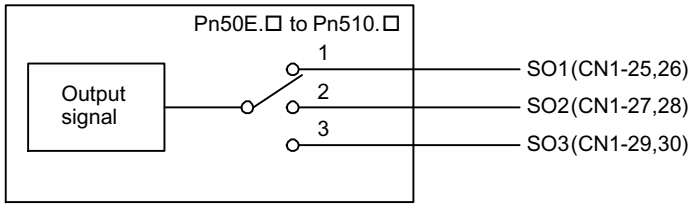
In general, allocate signals according to the standard settings in the following table.

CN1 Connector Terminal Numbers	Output Terminal Name	Factory Setting		Standard Setting	
		Symbol	Name	Symbol	Name
25	SO1	/COIN+	Positioning completed	/COIN+	Positioning completed
26		/COIN-		/COIN-	
27	SO2	/TGON+	Rotation detection	/BK+	Brake interlock
28		/TGON-		/BK-	
29	SO3	/S-RDY+	Servo ready	/S-RDY+	Servo ready
30		/S-RDY-		/S-RDY-	

The output signal selection parameters and their factory settings and standard settings are shown below.

Pn50E	Output Signal Selections 1	Factory Setting: 3211	Standard Setting: 3001
Pn50F	Output Signal Selections 2	Factory Setting: 0000	Standard Setting: 0200
Pn510	Output Signal Selections 3	Factory Setting: 0000	Standard Setting: 0000

Select the CN1 connector terminals that will output the signals.



Output Signal	Parameter		Description
	Number	Setting	
Positioning Completed (/COIN)	Pn50E.0	0	Disabled (Not used for the output signal on the left.)
		1	Outputs the signal on the left from the SO1 (CN1-25 and 26) output terminal.
		2	Outputs the signal on the left from the SO2 (CN1-27 and 28) output terminal.
		3	Outputs the signal on the left from the SO3 (CN1-29 and 30) output terminal.
Speed Coincidence Detection (/V-CMP)	Pn50E.1	0 to 3	Same as above*
Rotation Detection (/TGON)	Pn50E.2	0 to 3	Same as above
Servo Ready (/S-RDY)	Pn50E.3	0 to 3	Same as above
Torque Limit Detection (/CLT)	Pn50F.0	0 to 3	Same as above
Speed Limit Detection (/VLT)	Pn50F.1	0 to 3	Same as above
Brake Interlock (/BK)	Pn50F.2	0 to 3	Same as above
Warning (/WARN)	Pn50F.3	0 to 3	Same as above
Near (/NEAR)	Pn510.0	0 to 3	Same as above
Phase C Detection (/C-PULS)	Pn510.1	0 to 3	Same as above

* Always OFF when an Option Unit is mounted.

Note: "Same as above" means output signals are disabled or allocated to output terminals SO1 to SO3 through parameter settings 0 to 3.

Signals are output with OR logic when multiple signals are allocated to the same output circuit. Signals that are not detected are invalid.

■ Output Signal Reversal

The following parameter can be used to reverse the signals output on output terminals SO1 to SO3.

Pn512	Output Signal Reversal Settings	Factory Setting: 0000	Position Control

The settings specify which of the connector CN1 output signals are to be reversed.

Output Terminals	Parameter		Description
	Number	Setting	
SO1 (CN1-25, 26)	Pn512.0	0	Output signal not reversed.
		1	Output signal reversed.
SO2 (CN1-27, 28)	Pn512.1	0	Output signal not reversed.
		1	Output signal reversed.
SO3 (CN1-29, 30)	Pn512.2	0	Output signal not reversed.
		1	Output signal reversed.
Not used.	Pn512.3	-	-

6.4.4 Command Masking Function

The command mask setting (Pn802) can be used to mask SV_ON and SENS_ON MECHATROLINK communications commands.

■ SV_ON Command Mask

Set to 1 to disable the SV_ON command.

Pn802.0	SV_ON Command Mask	Factory Setting: 0	Position Control

Settings are shown in the following table.

Pn802.0 Setting	Description
0 (Factory setting)	SV_ON, SV_OFF commands enabled.
1	The Servo is always ON.

■ SENS_ON Command Mask

Set to 1 to disable the SENS_ON command.

Pn802.1	SENS_ON Command Mask	Factory Setting: 0	Position Control

Settings are shown in the following table.

Pn802.1 Setting	Description
0 (Factory setting)	SENS_ON, SENS_OFF commands enabled.
1	Absolute PG is always ON.

6.4.5 Debug Function

The following parameter is used for the debug function.

■ Communications Control Function

Used to perform MECHATROLINK communications without using the communications check for debugging.

For normal operating conditions, set to 0 (with check).

Pn800.0	MECHATROLINK Communications Check Mask	Factory Setting: 0	Position Control

Settings are shown in the following table.

Pn800.0 Setting	Description
0 (Factory setting)	Check performed.
1	Ignore communications errors. When a communications error occurs, data will be discarded.
2	Ignore WDT errors. Data will be received even if a WDT error occurs.
3	Ignore both communications and WDT errors.

6.4.6 Monitoring

The monitoring function allows monitor data to be read using the MECHATROLINK communications monitoring function and the results displayed on a host controller for adjustment.

■ Option Monitor

Using the MECHATROLINK option monitor (OMN1, OMN2), all signals not covered by MECHATROLINK can be monitored.

Use the following parameter settings.

Pn813.0	Option Monitor 1	Factory Setting: 0	Position Control
Pn813.1	Option Monitor 2	Factory Setting: 1	Position Control

Settings are as shown in the following table.

Pn813.0, Pn813.1 Settings	Description
0	According to Analog Monitor 1 (Pn003.0).
1	According to Analog Monitor 2 (Pn003.1).
2	Monitors initial multiturn data.
3	Monitors the encoder count value.

■ Analog Monitor

Analog monitor and option monitor (OMN1, OMN2) can be selected with parameters Pn003.0 and Pn003.1.

Pn003.0	Analog Monitor 1	Factory Setting: 2	Position Control
Pn003.1	Analog Monitor 2	Factory Setting: 0	Position Control

The option monitor (OMN1, OMN2) and analog monitor (CN5) signals can be observed are shown in the following table, along with the monitor signal, unit, and gain.

Settings in Pn003.0 and Pn003.1	Monitor Signal	Analog Monitor Gain	Option Monitor Unit
0	Motor speed	1 V/1000 min^{-1}	min^{-1}
1	Speed reference	1 V/1000 min^{-1}	min^{-1}
2	Torque reference	1 V/100% rated torque	%
3	Position error	0.05 V/1 reference unit	Reference unit
4	Position error	0.05 V/100 reference units	Reference unit
5	Reference pulse frequency (converted to min^{-1})	1 V/1000 min^{-1}	min^{-1}
6	Motor speed	1 V/250min^{-1}	min^{-1}
7	Motor speed	1 V/125min^{-1}	min^{-1}
8 to F	Reserved monitor signals	-	-

INFO

Refer to *6.5 Analog Monitor* of the Σ-*II Series SGM□H/SGDH User's Manual : Design and Maintenance* (SIE-S800-32.2) for information on the analog monitor.

6.5 Setting Stop Functions

This section describes the procedure used to stop the SERVOPACK stably.

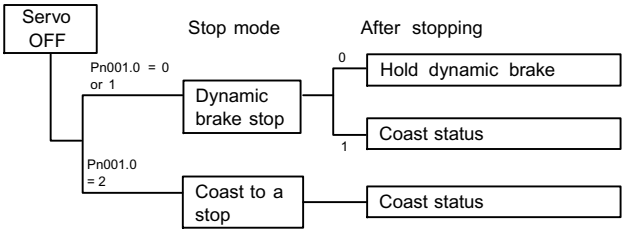
6.5.1 Using the Dynamic Brake

To stop the Servomotor by applying the dynamic brake (DB)[1], set the desired mode in the following parameter. The Servomotor will stop due to equipment friction if the dynamic brake is not applied.

Pn001.0	Servo OFF or Alarm Stop Mode	Factory Setting: 0	Position Control

The SERVOPACK turns OFF under the following conditions:

- When the SV_OFF command is issued.
- A Servo alarm occurs.
- Power is turned OFF.



Specify the Stop Mode if any of these occurs during operation.

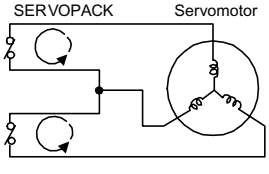
Pn001.0 Setting	Description
0	Uses the dynamic brake to stop the Servomotor. Maintains dynamic brake after the Servomotor stops. *1
1	Uses the dynamic brake to stop the Servomotor. Releases dynamic brake after the Servomotor stops, and the servomotor coasts to a stop.
2	Coasts the Servomotor to a stop. *2 The Servomotor is turned OFF and motion stops due to equipment friction.

* 1. If the Servomotor is stopped or moving at extremely low speed, it will coast to a stop.
* 2. A dynamic brake is used when the control power and main power are turned OFF.

TERMS

[1] Dynamic brake (DB)

The dynamic brake is a common way of suddenly stopping a Servomotor.Built into the SERVOPACK, the dynamic brake suddenly stops a Servomotor by electrically shorting its electrical circuit.

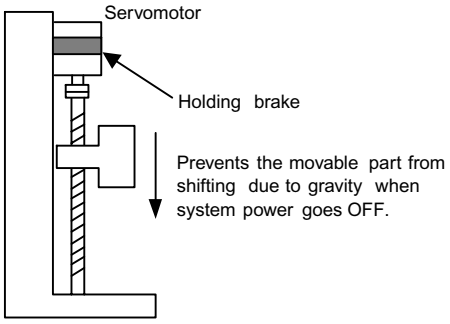


IMPORTANT

The dynamic brake is an emergency stop function. Do not repeatedly start and stop the Servomotor using the SV_ON/SV_OFF command or by repeatedly turning power ON and OFF.

6.5.2 Using the Holding Brake

The holding brake is used when a Servodrive controls a vertical axis. In other words, a Servomotor with brake prevents the movable part from shifting due to gravity when system power goes OFF.



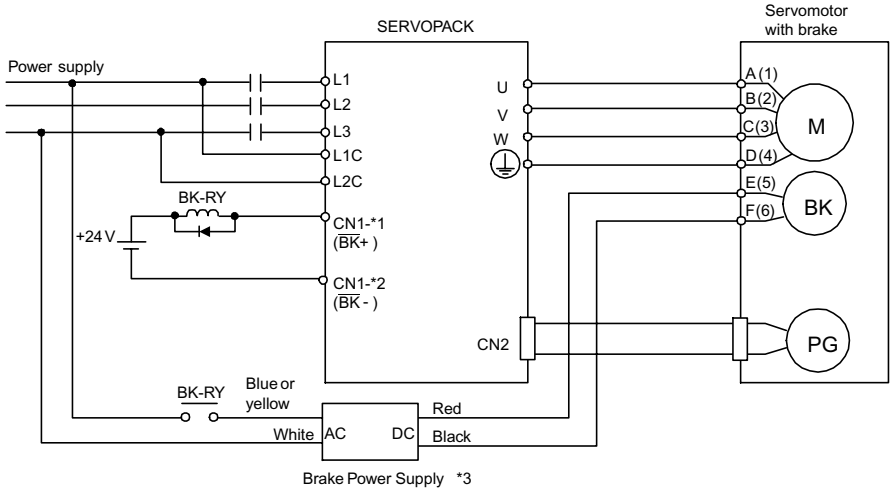
IMPORTANT

The brake built into the Servomotor SGM□H with brakes is a de-energization brake, which is used only to hold and cannot be used for braking. Use the holding brake only to hold a stopped motor. Brake torque is at least 120% of the rated motor torque.

6

■ Wiring Example

Use the SERVOPACK sequence output signal /BK and the brake power supply to form a brake ON/OFF circuit. The following diagram shows a standard wiring example.



BK-RY: Brake control relay

*1, *2: The output terminal allocated with Pn50F.2

*3: Brake power supplies are available in 200-V and 100-V models.

Output → /BK	Brake Interlock Output	Position Control

This output signal controls the brake when using a Servomotor with a brake and does not have to be connected when using a Servomotor without a brake.

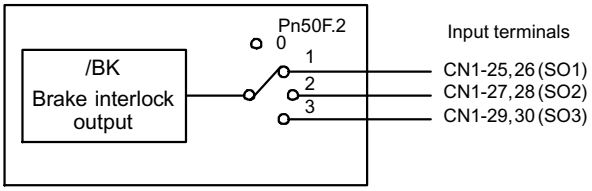
ON: Closed or low level	Releases the brake.
OFF: Open or high level	Applies the brake.

Related Parameters

Pn505	Brake operation
Pn506	Time Delay from Brake Reference until Servo OFF
Pn507	Speed Level for Brake Reference Output during Motor Operation
Pn508	Timing for Brake Reference Output during Motor Operation

The output signal in the following parameter must be selected when the /BK signal is used.

Pn50F	Output Signal Selections 2	Factory Setting: 0000	Position Control



Select the /BK output terminal.

Parameter	Setting	Output Terminal (CN1)	
		*1	*2
Pn50F.2	0	-	-
	1	25	26
	2	27	28
	3	29	30

Note: Signals are output with OR logic when multiple signals are allocated to the same output circuit. Set other output signals to a value other than that allocated to the /BK signal in order to output the /BK signal alone. Refer to *6.4.3 Output Circuit Signal Allocation.*

■ Brake Operation

Set whether the brake is applied using the SERVOPACK parameter brake command or the controller's BRK_ON/BRK_OFF commands.

Pn005.0	Brake Operation	Factory Setting: 0	Position Control

Pn005.0 Setting	Description
0	Brake operation using the SERVOPACK parameter.
1	Brake operation using the controller's BRK_ON/BRK_OFF commands.

IMPORTANT

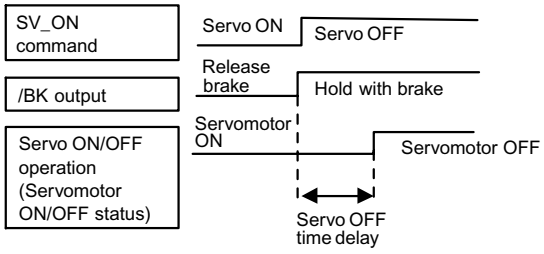
When brake operation is controlled using the controller's BRK_ON/BRK_OFF commands, the SERVOPACK's parameters (Pn506, Pn507, Pn508) settings will be ignored.

■ Brake ON Timing

If the equipment moves slightly due to gravity when the brake is applied, set the following parameter to adjust brake ON timing.

Pn506	Brake Reference Servo OFF Delay Time	Unit: 10 ms	Setting Range: 0 to 50	Factory Setting: 0	Position Control

This parameter is used to set the output time from the brake control output signal /BK until the servo OFF operation (Servomotor output stop) when a Servomotor with a brake is used.



With the standard setting, the servo is turned OFF when the /BK signal (brake operation) is output. The equipment may move slightly due to gravity depending on equipment configuration and brake characteristics. If this happens, use this parameter to delay servo OFF timing.

This setting sets the brake ON timing when the Servomotor is stopped. Use Pn507 and 508 for brake ON timing during operation.

IMPORTANT

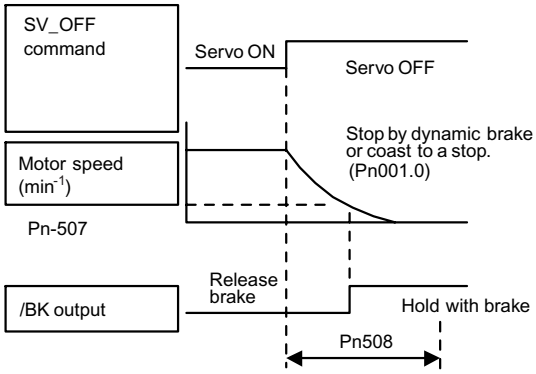
The Servomotor will turn OFF immediately if an alarm occurs. The equipment may move due to gravity in the time it takes for the brake to operate.

■ Holding Brake Setting

Set the following parameters to adjust brake ON timing so the holding brake is applied when the Servomotor stops.

Pn507	Brake Reference Output Speed Level during Motor Operation	Unit: min^{-1}	Setting Range: 0 to 10000	Factory Setting: 100	Position Control
Pn508	Timing for Brake Reference Output during Motor Operation	Unit: 10 ms	Setting Range: 10 to 100	Factory Setting: 50	Position Control

Set the brake timing used when the servo is turned OFF by the SV_OFF command or when an alarm occurs during Servomotor with brake operation.



Brake ON timing when the Servomotor stops must be adjusted properly because Servomotor brakes are designed as holding brakes. Adjust the parameter settings while observing equipment operation.

/BK Signal Output Conditions During Servomotor Operation

The circuit is open under either of the following conditions:

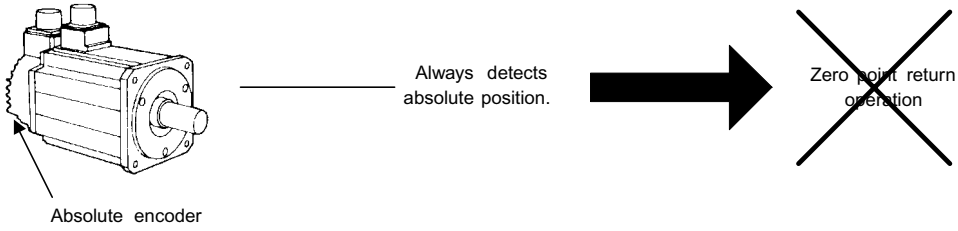
1	Motor speed drops below the setting at Pn507 after servo OFF.
2	The time set at Pn508 has elapsed since servo OFF.

The actual setting will be the maximum speed even if Pn507 is set higher than the maximum speed.

6.6 Absolute Encoders

If a motor with an absolute encoder is used, a system to detect the absolute position can be made in the host controller. Consequently, operation can be performed without zero point return operation immediately after the power is turned ON.

Motor SGM□H-□□□1□···With 16-bit absolute encoder
SGM□H-□□□2□···With 17-bit absolute encoder



6.6.1 Selecting an Absolute Encoder

Select the absolute encoder usage with the following parameter.

Pn002.2	Absolute Encoder Usage	Factory Setting: 0	Position Control

"0" in the following table must be set to enable the absolute encoder.

Pn002.2 Setting	Description
0	Use the absolute encoder as an absolute encoder.
1	Use the absolute encoder as an incremental encoder.

Note: This parameter setting goes into effect when the power is turned OFF and ON again after the change has been made.

6.6.2 Absolute Encoder Setup

Perform the setup operation for the absolute encoder in the following circumstances:

- When starting the machine for the first time.
- When an encoder backup alarm is generated.
- When the SERVOPACK's power supply is turned OFF and the encoder's cable is removed.

Perform the setup operation in one of the following ways.

- Refer to the Σ-*II Series SGM□H/SGDH User's Manual : Design and Maintenance (*SIE-S800-32.2*)* for details on the absolute encoder setup operation (Fn008) when a Digital Operator is used.
- Refer to *Appendix C.2* for details on the setup operation when the adjust command (ADJ: 3EH) is used.

Setup can also be performed using personal computer monitor software.

INFO

The absolute encoder setup operation is only possible when the servo is OFF. After the setup processing is finished, turn the power back ON again.

IMPORTANT

If the following absolute encoder alarms are displayed, the alarms must be cleared using the method described above for the setup operation. They cannot be cleared by the SERVOPACK alarm clear (ALM-CLR) command.

- Encoder backup alarm (A.81)
- Encoder sum check alarm (A.82)

In addition, if a monitoring alarm is generated in the encoder, the alarm must be cleared by turning OFF the power.

6.6.3 Multiturn Limit Setting

⚠ WARNING

- The multiturn limit value must be changed only for special applications. Changing it inappropriately or unintentionally can be dangerous.

- If the Multiturn Limit Disagreement alarm occurs, check the setting of parameter Pn205 in the SERVOPACK to be sure that it is correct.

  If Fn013 is executed when an incorrect value is set in Pn205, an incorrect value will be set in the encoder. The alarm will disappear even if an incorrect value is set, but incorrect positions will be detected, resulting a dangerous situation where the machine will move to unexpected positions.

When implementing absolute detection systems for machines that turn m times in response to n turns in the load shaft, such as round tables, it is convenient to reset the multiturn data from the encoder to 0 every m turns. The Multiturn Limit[1] Setting allows the value m to be set for the encoder.

Select the absolute encoder usage with the following parameter.

Pn002.2	Absolute Encoder Usage	Factory Setting: 0	Position Control

"0" in the following table must be set in order to enable the absolute encoder.

Pn002.2 Setting	Description
0	Use the absolute encoder as an absolute encoder.
1	Use the absolute encoder as an incremental encoder.

Σ-*II Series SGM□H/SGDH User's Manual : Design and Maintenance (*SIE-S800-32.2*)*The multiturn limit is set in the SERVOPACK using the following parameter.

Pn205	Multiturn Limit Setting	Unit: rev	Setting Range: 0 to 65535	Factory Setting: 65535	Position Control

If the Multiturn Limit Setting is set to 65535 (factory setting), the multiturn data will vary from -32768 to 32767. If any other value is set, the multiturn data will vary from 0 to the setting of Pn205.

If the Servomotor rotates in the negative direction from 0, the multiturn data will change to the value set for Pn205. If the Servomotor rotates in the positive direction from the value set in Pn205, the multiturn data will change to 0. Set Pn205 to m - 1.

TERMS

[1] Multiturn limit

The upper limit of multiturn data. The multiturn data will vary between 0 and the value of Pn205 (multiturn limit setting) when Pn002.2 is set to 0.

INFO

Turn the power OFF and then back ON after changing the setting of parameter Pn002.2 or Pn205.

The multiturn limit value in the encoder is factory set to 65535, the same as the SERVOPACK. If the multiturn limit value in the SERVOPACK is changed with Pn205 and then the SERVOPACK power is turned OFF and ON, the following alarm will occur.

Alarm Name: Multiturn Limit Disagreement

Alarm Display	Alarm Code Outputs			Description of Alarm
	ALO1	ALO2	ALO3	
A.CC	ON	OFF	ON	The multiturn limit value is different in the encoder and SERVOPACK.

Note: ON signals are low level; OFF signals are high level.

When this alarm occurs, the multiturn limit in the encoder must be changed. This operation is performed in one of the following ways.

- Refer to the Σ-*II Series SGM□H/SGDH User's Manual : Design and Maintenance (*SIE-S800-32.2*)* for details on changing the multiturn limit setting (Fn013) using a Digital Operator.
- Refer to *Appendix C.3* for details on changing the value using the adjust command (ADJ: 3EH).

Setup can also be performed using the personal computer monitor software.

6

INFO

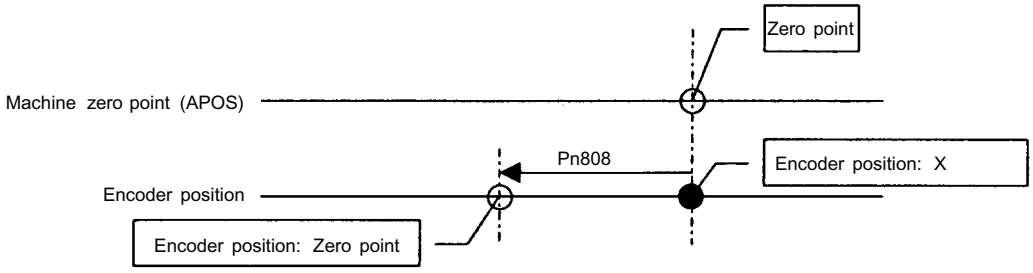
The multiturn limit setting in the encoder can be changed only when the Multiturn Limit Disagreement alarm has occurred. After changing the setting, turn the power supply OFF and then back ON.

6.6.4 Absolute Encoder Zero Point Position Offset

When an absolute encoder is used, the offset between the encoder position and the machine zero point (APOS) can be set.

Pn808	Absolute Encoder Zero Point Position Offset	Unit: Refer-ence unit	Setting Range: -1073741823 to 1073741823	Factory Setting: 0	Position Control

Settings are as shown in the following figure. To set encoder position (X) as the machine zero point (0), set Pn808 to -X.



7

Digital Operator

This chapter describes limitations when using a SERVOPACK with an Option Unit mounted and Digital Operator connected. It also describes Panel Operator indicator operation.

7.1 Connecting the Digital Operator

There are two types of Digital Operator. One is a built-in operator incorporating a panel indicator and switches located on the front panel of the SERVOPACK. This type of Digital Operator is also called a Panel Operator. The other one is a Hand-held Digital Operator (i.e., the JUSP-OP02A-2 Digital Operator), which can be connected to the SERVOPACK through connector CN3 of the SERVOPACK.

There is no need to turn OFF the SERVOPACK to connect the Hand-held Digital Operator to the SERVOPACK. For details on how to use the Hand-held Digital Operator, refer to the Σ-*II Series SGM□H/SGDH User's Manual : Design and Maintenance (*SIE-S800-32.2*)*.

7.2 Limitations in Using a Hand-held Digital Operator

When an Option Unit is mounted, the Hand-held Digital Operator has the following limitations.

Disconnect the Hand-held Digital Operator during normal operation.

Do not perform communications with a personal computer during normal operation

Normal Operation

When a Hand-held Digital Operator is connected or communications with a personal computer started during normal operation, the following commands are not supported (command warning A.95).

Furthermore, when a Hand-held Digital Operator is connected or communications with a personal computer started while any of the following commands are being executed, a command execution incomplete (A.ED) warning will be generated and the commands will be ignored.

PRM_RD, PRM_WR

PPRM_WR

CONFIG

ALM_RD, ALM_CLR

SENS_ON

ADJ

7.3 Panel Operator Indicators

The Panel Operator indicator (LED) will not be lit in any of the following circumstances.

1. The indicator will not be lit for approximately 3 seconds when the power is turned ON.
2. The indicator will not be lit when the Hand-held Digital Operator is connected.
   It will be lit when the Hand-held Digital Operator is disconnected.
3. The indicator will not be lit for approximately 3 minutes when the following commands are received.
   - PRM_RD command
   - PRM_WR/PPRM_WR command
   - CONFIG command
   - SENS_ON command
   - ADJ command (See Note.)
   - ALM_RD/ALM_CLR command for the error history

   Note: The indicator will be lit when the ADJ command has been executed to enable the Panel Operator. Refer to *Appendix C.5 Enabling the Panel Operator* for details.

8

Ratings, Specifications, and Dimensional Drawings

This chapter provides the ratings, specifications, and dimensional drawings of the Option Unit.

8.1 Ratings and Specifications

The following table shows ratings and specifications for the Option Unit.

Table 8.1 Option Unit Ratings and Specifications

Item		Details
Applicable SERVOPACK		All SGDH-□□□E models
Installation Method		Mounted on the SGDH SERVOPACK.
Basic Specifications	Power Consumption [W]	2
	External Dimensions [mm]	20 × 142 × 128 (W × H × D)
	Approx. Mass [kg] (lb)	0.2 (0.441)
MECHATROLINK Communications	Baud Rate/ Transmission Cycle	4 MHz/2 ms
Command Format	Operation Specifications	Positioning using MECHATROLINK communications
	Reference Input	MECHATROLINK communications Commands: Motion commands (position, speed), Interpolation commands, Parameter read/write, Monitor output
Position Control Functions	Acceleration/ Deceleration Method	Linear first/second-step, asymmetric, exponential, S-curve
	Fully Closed Control	Position control with fully closed feedback is possible.
Fully Closed System Specifications	Fully Closed Encoder Pulse Output Form	5-V differential line driver output (complies with EIA Standard RS-422A)
	Fully Closed Encoder Pulse Signal Form	90° Phase difference 2-phase differential pulse (phase A, phase B)
	Maximum Receivable Frequency for SERVOPACK	1 Mbps
	Power Supply for Fully Closed Encoder	To be prepared by customer
Input Signals	Signal Allocation Changes Possible	Forward/reverse run prohibited, zero point return deceleration LS External latch signals 1, 2, 3 Forward/reverse torque control
Internal Functions	Position Data Latch Function	Position data latching is possible using phase C and external latch signals 1, 2, and 3.
	Protection	Parameters damage, parameter setting errors, communications errors, WDT errors, fully closed encoder open circuit detection, etc.
	LED Indicators	A: Alarm R: MECHATROLINK communications in progress

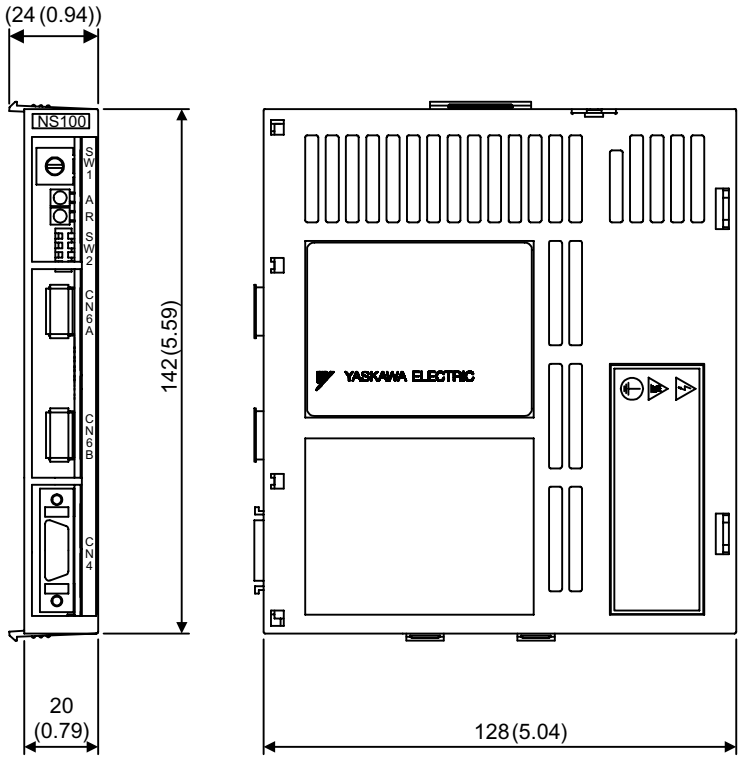
8.2 Dimensional Drawings

Dimensional drawings of the Option Unit and SERVOPACKs are shown below.

8.2.1 Option Unit

Dimensions of the Option Unit are shown below.

Unit: mm (in)



Approx. mass: 0.2 kg (0.44 lb)

8

8.2.2 SERVOPACKs

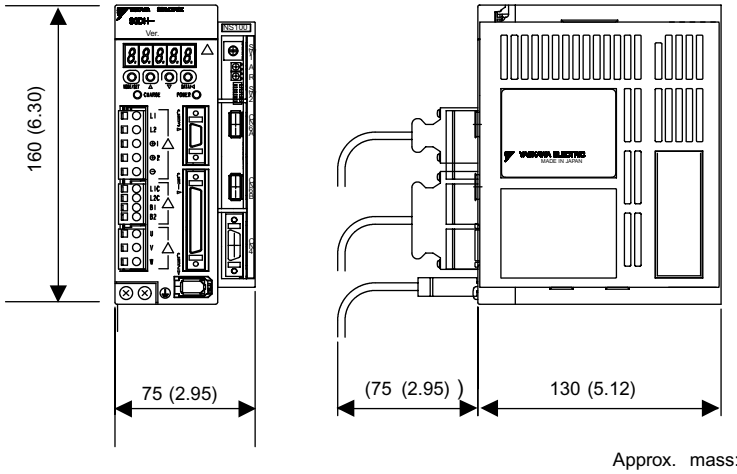
Dimensional drawings of the Base-mounted Standard SERVOPACKs (with Option Unit mounted) are shown below. For detailed dimensional drawings, refer to Σ-*II Series SGM□H/SGDH User's Manual : Servo Selection and Data Sheets (*SIE-S800-32.1*).*

For details of the Rack-mounted and Duct-ventilated SERVOPACKs, refer also to Σ-*II Series SGM□H/SGDH User's Manual : Servo Selection and Data Sheets (*SIE-S800-32.1*).*

■ Base-Mounted Models

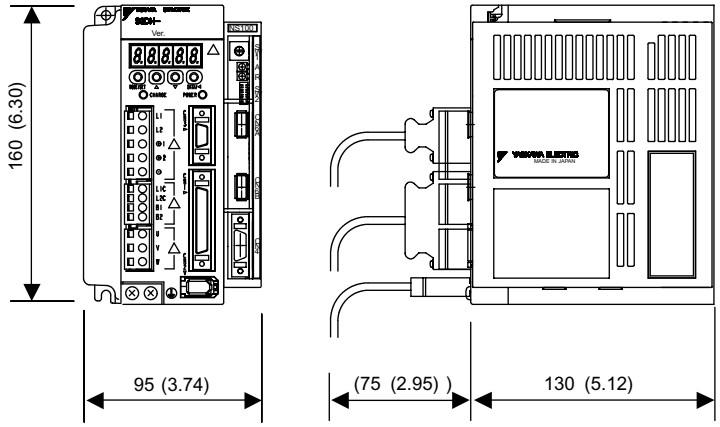
Unit: mm (in)

SGDH-A3AE to -02AE (Single-phase, 200 V, 30 to 200 W)
SGDH-A3AE to -01BE (Single-phase, 100 V, 30 to 100 W)



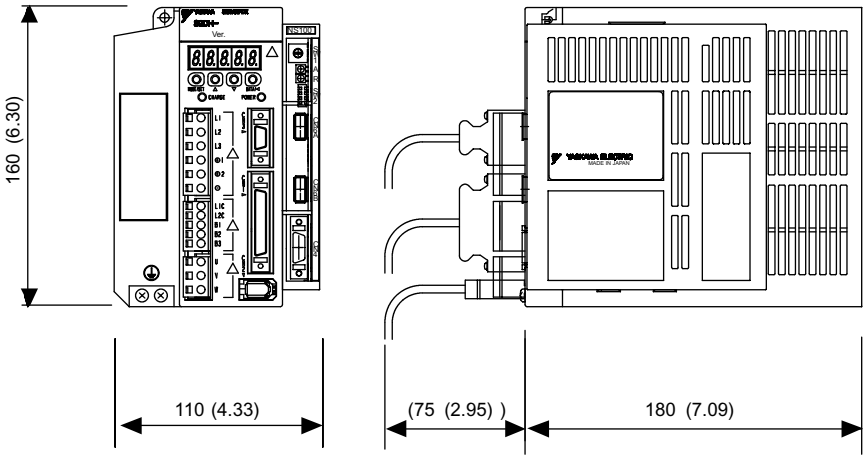
Approx. mass: 1.0 kg (2.21 lb)

SGDH-04AE (Single-phase, 200 V, 400 W)
SGDH-02BE (Single-phase, 100 V, 200 W)



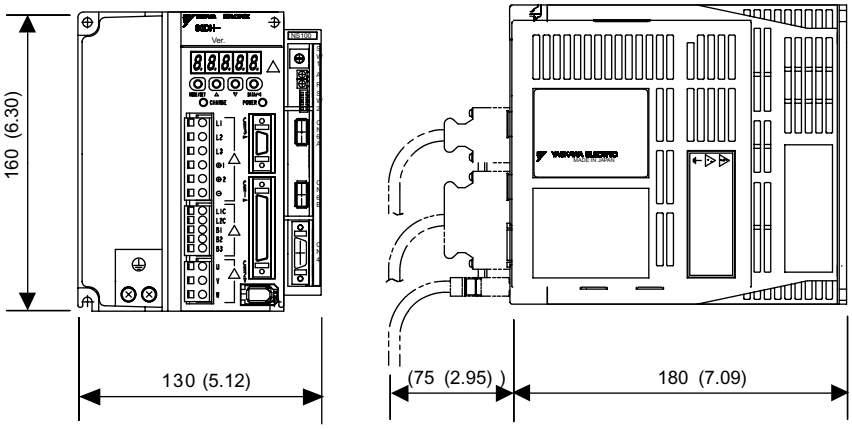
Approx. mass: 1.3 kg (2.87 lb)

SGDH-05AE to-10AE (Three-phase, 200 V, 0.5 to 1.0 kW)



Approx. mass: 1.9 kg (4.19 lb)

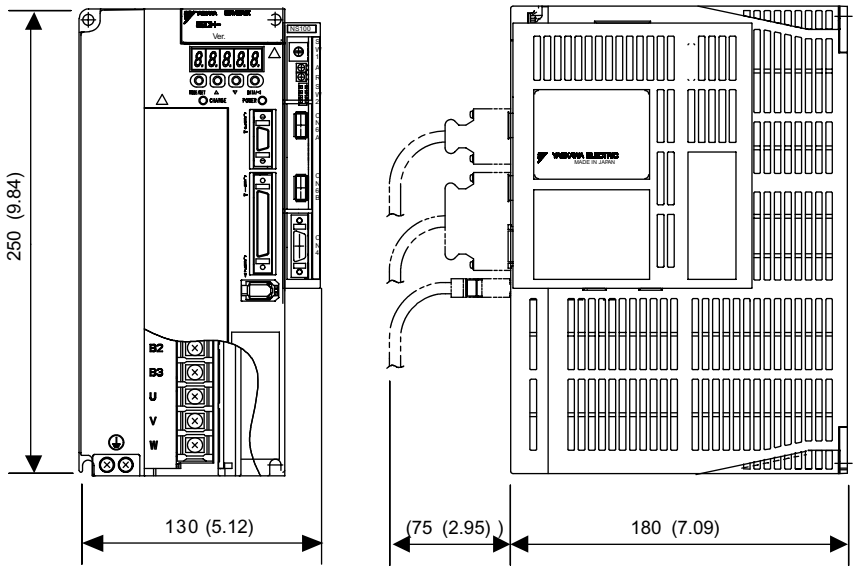
SGDH-15AE (Three-phase, 200 V, 1.5 kW)



Approx. mass: 3.0 kg (6.61 lb)

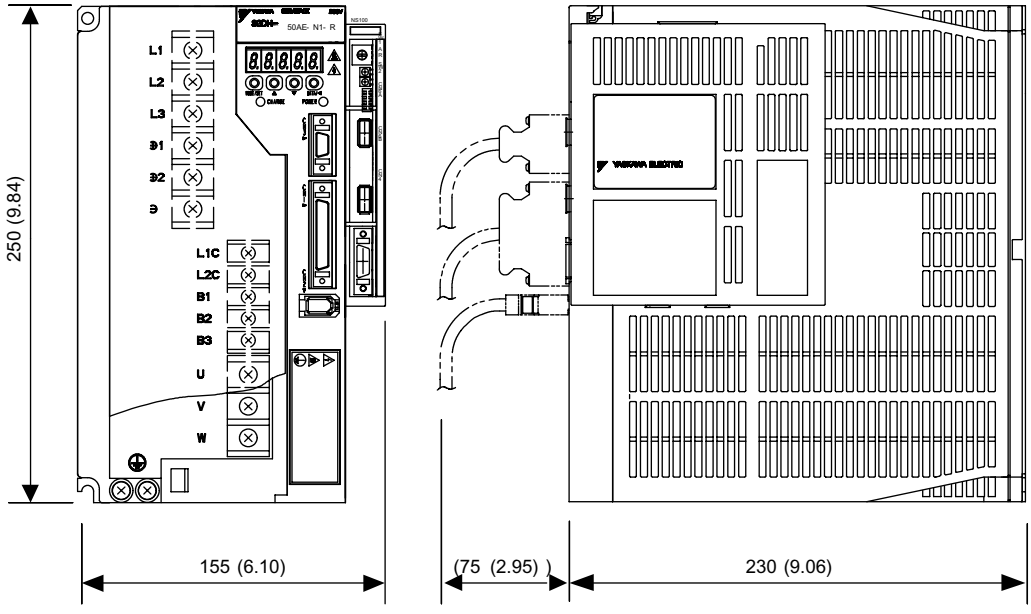
8

SGDH-20AE, -30AE (Three-phase, 200 V, 2.0 kW, 3.0 kW)



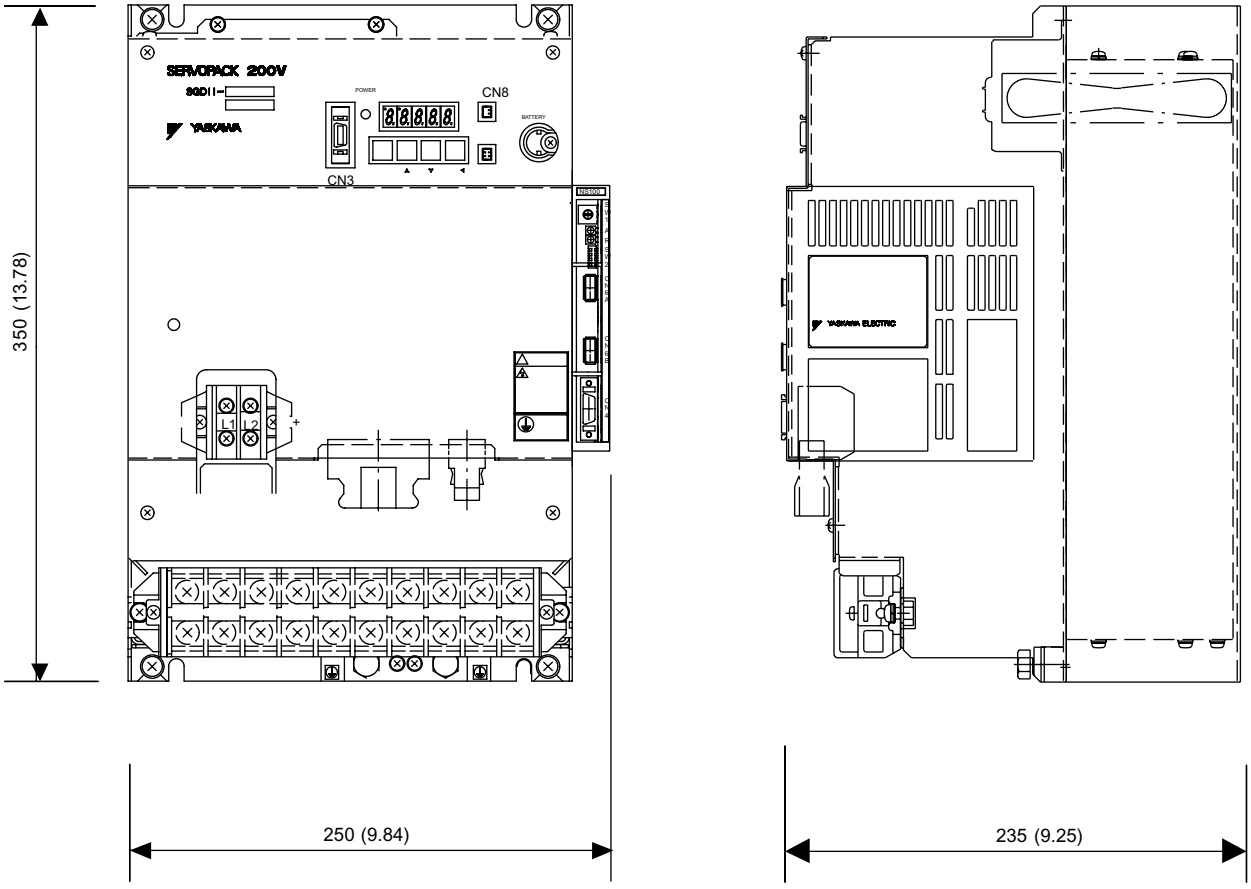
Approx. mass: 4.0 kg (8.82 lb)

SGDH-50AE (Three-phase, 200 V, 5.0 kW)



Approx. mass: 5.7 kg (12.57 lb)

SGDH-60AE, -75AE (Three-phase, 200 V, 6.0 kW, 7.5 kW)



Approx. mass: 15.0 kg (33.07 lb)

9

Troubleshooting

This chapter describes troubleshooting procedures for problems which cause an alarm indication and for problems which result in no alarm indication.

9.1 Troubleshooting Problems with Alarm Displays

Problems that occur in the Servodrives are displayed on the panel operator as "A.□□" or "CPF□□". "A.– –", however, does not indicate an alarm. Refer to the following sections to identify the cause of an alarm and the action to be taken.

Contact your Yaskawa representative if the problem cannot be solved by the described procedures.

■ A.02

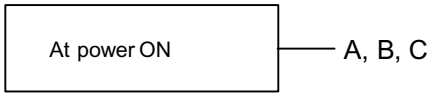
A.02: Parameters Breakdown

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm



Cause		Remedy
A	Power turned OFF during parameter write. Alarm occurred at next power ON.	• Initialize parameters using Fn005 and reinput user settings. • Replace SERVOPACK.
B	Circuit board (1PWB) is defective.	Replace SERVOPACK.
C	Option Unit is defective.	Replace Option Unit.

■ A.04

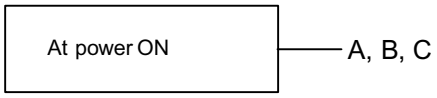
A.04: Parameter Setting Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm



Cause		Remedy
A	An out-of-range parameter was previously set or loaded.	• Reset all parameters in range. • Otherwise, re-load correct parameter.
B	Circuit board (1PWB) is defective.	Replace SERVOPACK.
C	Option Unit is defective.	Replace Option Unit.

■ A.81

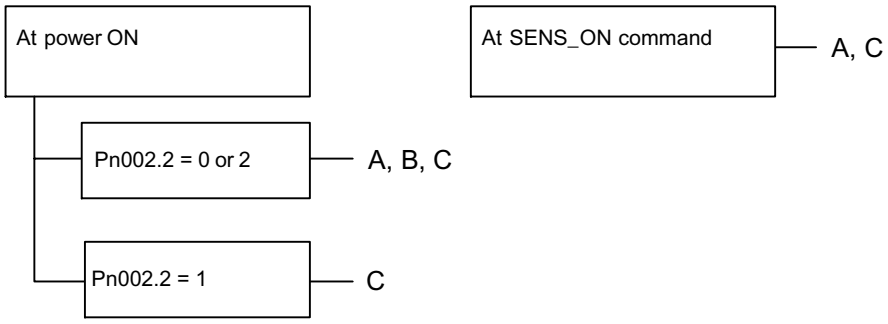
A.81: Absolute Encoder Backup Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm



Cause		Remedy
A	The following power supplies to the absolute encoder all failed: • +5 V supply • Battery power	Follow absolute encoder set-up procedure.
B	Absolute encoder malfunctioned.	Replace Servomotor.
C	Circuit board (1PWB) is defective.	Replace SERVOPACK.

■ A.82

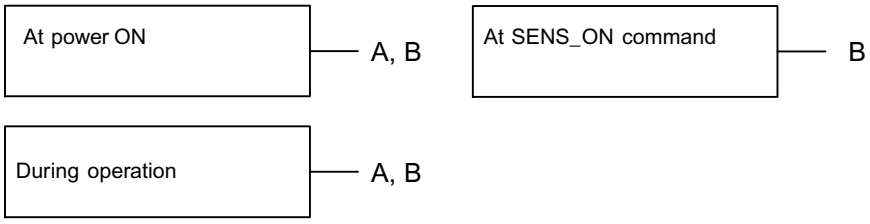
A.82: Encoder Checksum Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm



Cause		Remedy
A	Error during encoder memory check	• Follow absolute encoder set-up procedure. • Replace Servomotor if the error occurs frequently.
B	Circuit board (1PWB) is defective.	Replace SERVOPACK.

■ A.83

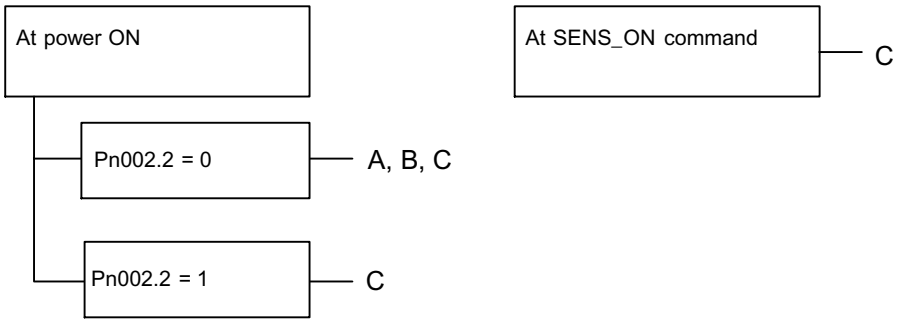
A.83: Absolute Encoder Battery Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm



Cause		Remedy
A	• Battery not connected • Battery connection defective	Check and correct battery connection.
B	Battery voltage below specified value. Specified value: 2.7 V.	Install a new battery while the control power to SERVOPACK is ON. After replacement, turn ON the power again.
C	Circuit board (1PWB) is defective.	Replace Servomotor.

Note: No alarm will occur at the SERVOPACK if the battery error that occurs during operation.

■ A.84

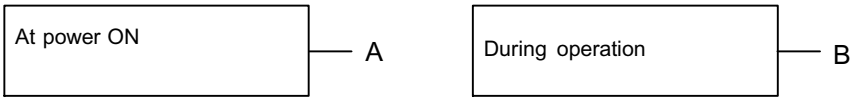
A.84: Absolute Encoder Data Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm



Cause		Remedy
A	Faulty encoder.	Replace the Servomotor if the error occurs frequently.
B	Operational error in encoder caused by external noise.	Check and correct wiring around the encoder as follows: • Grounding of the Servomotor • Separation between the encoder cable and the Servomotor power cable • Insertion of toroidal cores onto cables

■ A.85

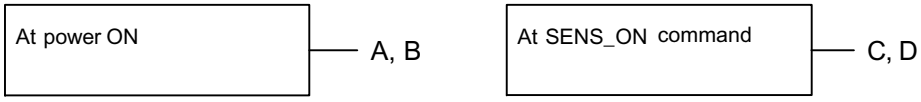
A.85: Absolute Encoder Overspeed

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm



Cause		Remedy
A	Absolute encoder turned ON at a speed exceeding 200 min^{-1}.	Turn ON power supply again with the Servomotor stopped.
B	Circuit board (1PWB) is defective.	Replace SERVOPACK.

■ A.86

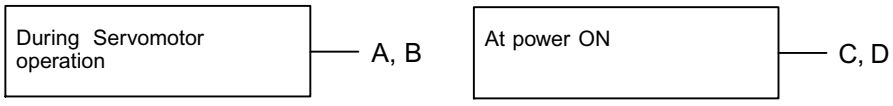
A.86: Encoder Overheated

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm



Cause		Remedy
A	The ambient temperature of the Servomotor is high.	Alter conditions so that the ambient temperature goes below 40°C.
B	Servomotor is operating under overload.	Reduce load.
C	Circuit board (1PWB) is defective.	Replace SERVOPACK.
D	Encoder is defective.	Replace Servomotor.

■ A.94

A.94: Parameter Setting Warning

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	ON	OFF	ON

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

Occurred when the command was issued — A

Cause		Remedy
A	A value outside the MECHATROLINK communications setting range was set.	Reset correctly.

■ A.95

A.95: MECHATROLINK Command Warning

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	ON	OFF	ON

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

Occurred when the command was issued — A, B

Cause		Remedy
A	Presently unable to receive the issued command.	Adjust conditions to match the command. Refer to the specifications for each command.
B	Unsupported command.	Do not issue unsupported commands.

■ A.96

A.96: MECHATROLINK Communications Warning.

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	OFF	OFF	ON

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

During MECHATROLINK communications — A, B

Cause		Remedy
A	Contact between the cable and the connector is faulty.	Correct the connector wiring.
B	Malfunction due to noise.	Take noise prevention measures.

■ A.b6

A.b6: Communications LSI Error Alarm

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm

At power ON — A

Cause		Remedy
A	Option Unit is defective.	Replace Option Unit.

■ A.C6

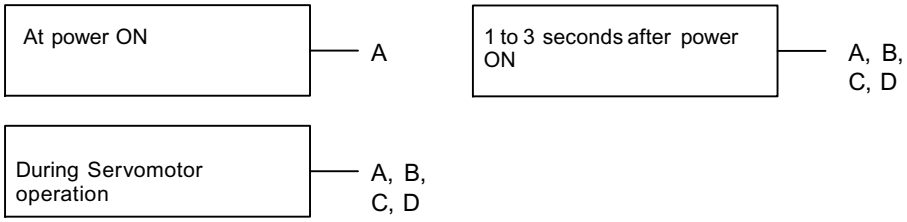
A.C6: Fully-closed Encoder A-, B-phase Disconnection Alarm

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	OFF	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm



Cause		Remedy
A	Circuit board (1PWB) is defective.	Replace SERVOPACK.
B	Encoder wiring error or faulty contact.	Check the wiring and check that the connector is fully inserted on the encoder side.
C	There is noise in the encoder wiring.	Separate the encoder wiring from the main circuit.
D	The encoder is defective.	Replace Servomotor.

■ A.C7

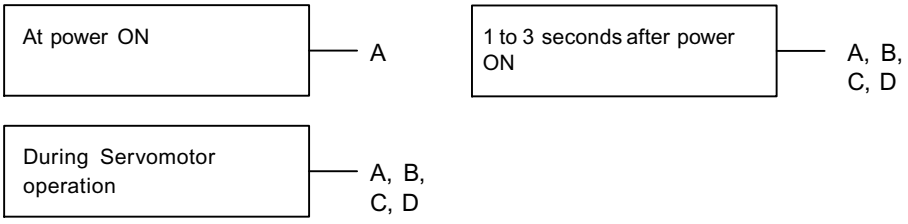
A.C7: Fully-closed Encoder C-phase Disconnection Alarm

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	OFF	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm



Cause		Remedy
A	Circuit board (1PWB) is defective.	Replace SERVOPACK.
B	Encoder wiring error or faulty contact.	Check the wiring and check that the connector is fully inserted on the encoder side.
C	There is noise in the encoder wiring.	Separate the encoder wiring from the main circuit.
D	The encoder is defective.	Replace Servomotor.

■ A.CC

A.CC: Multiturn Limit Disagreement Alarm

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	OFF	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

Cause		Remedy
A	The setting of the Multiturn Limit Setting (Pn205) parameter in the SERVOPACK is incorrect.	Change parameter Pn205.
B	The multiturn limit has not been set in the encoder.	Check to be sure the Multiturn Limit Setting (Pn205) parameter in the SERVOPACK is correct, and then execute the encoder multiturn limit setting change (Fn013) when a Multiturn Limit Disagreement Alarm (A.CC) occurs.

■ A.d0

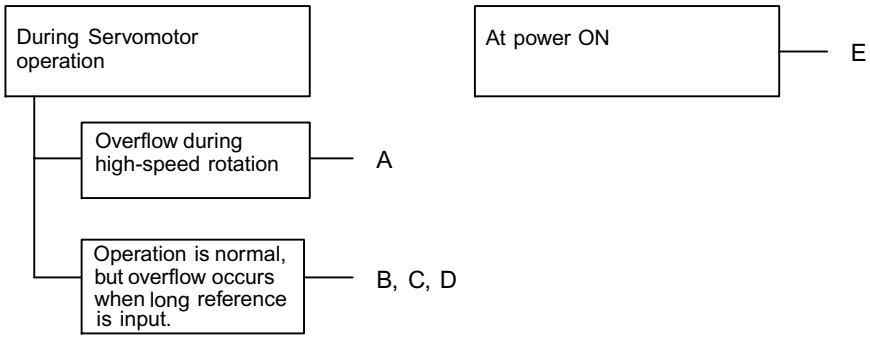
A.d0: Position Error Pulse Overflow

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	ON	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm



Cause		Remedy
A	Servomotor wiring incorrect or poor connection.	Check wiring and connectors at Servomotor.
B	SERVOPACK was not correctly adjusted.	Increase speed loop gain (Pn100) and position loop gain (Pn102).
C	Motor load was excessive.	Reduce load torque or inertia. If problem not corrected, replace with a motor with larger capacity.
D	Position reference is too high.	• Reduce the acceleration/deceleration rate. • Correct electronic gear ratio.

■ A.E0

A.E0: Option Unit No Response Alarm

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

Cause		Remedy
A	Option Unit is defective.	Replace Option Unit.

■ A.E1

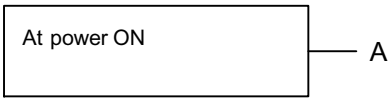
A.E1: Option Unit Time Out Alarm

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm



Cause		Remedy
A	Option Unit is defective.	Replace Option Unit.

■ A.E2

A.E2: Option Unit WDC Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

Cause		Remedy
A	Option Unit is defective.	Replace Option Unit
B	MECHATROLINK communications interrupted.	Turn the power ON again.

■ A.E5

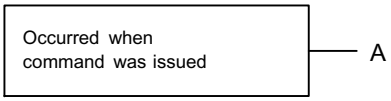
A.E5: MECHATROLINK Synchronization Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm



Cause		Remedy
A	WDT data does not match.	Update WDT data every communications cycle.

■ A.E6

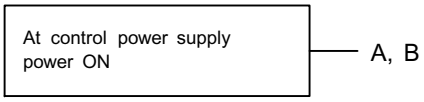
A.E6: MECHATROLINK Communications Error (Twice Consecutively)

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm



Cause		Remedy
A	Contact between the cable and the connector is faulty.	Correct the connector wiring.
B	Malfunction due to noise.	Take noise prevention measures.

■ A.EA

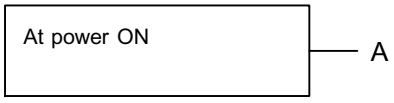
A.EA: SERVOPACK Malfunction

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm



Cause		Remedy
A	SERVOPACK is defective.	Replace SERVOPACK.

■ A.EB

A.EB: SERVOPACK Initial Access Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

Cause		Remedy
A	SERVOPACK is defective.	Replace SERVOPACK.

■ A.EC

A.EC: SERVOPACK WDC Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

Cause		Remedy
A	SERVOPACK is defective.	Replace SERVOPACK.
B	MECHATROLINK communications interrupted.	Turn the power ON again.

■ A.ED

A.ED: Command Execution Incomplete

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

During MECHATROLINK communications — A

	Cause	Remedy
A	Command was interrupted.	Do not connect a Hand-held Digital Operator or commence communications with a personal computer while any of the following commands are executing. PRM_RD, PRM_WR PPRM_WR CONFIG ALM_RD, ALM_CLR SENS_ON ADJ

9.2 Troubleshooting Problems with No Alarm Display

Refer to the tables below to identify the cause of a problem which causes no alarm display and take the remedy described.

Turn OFF the servo system power supply before commencing the shaded procedures.

Contact your Yaskawa representative if the problem cannot be solved by the described procedures.

Table 9.1 Troubleshooting Table No Alarm Display

Symptom	Cause	Inspection	Remedy
Servomotor Does Not Start	Power not connected	Check voltage between power supply terminals.	Correct the power circuit.
	Loose connection	Check terminals of connectors (CN1, CN2).	Tighten any loose parts.
	Connector (CN1) external wiring incorrect	Check connector (CN1) external wiring	Refer to connection diagram and correct wiring.
	Servomotor or encoder wiring disconnected.	---	Reconnect wiring
	Overloaded	Run under no load.	Reduce load or replace with larger capacity Servomotor.
	Encoder type differs from parameter setting.	Check the type of encoder being used.	Set parameter Pn002.2 to the encoder type being used.
	P-OT and N-OT inputs are turned OFF.	Refer to section *6.2.2*.	Turn P-OT and N-OT input signals ON.
	Software limits P-SOT and N-SOT are 1.	Refer to section *6.2.3*.	Operate the Servomotor within the software limits.
Servomotor Does Not Run	Motion commands have not been sent.	Check using MECHAROLINK communications or the MECHATROLINK monitor.	Send the motion commands.
	SV_ON command has not been sent.		Send the SV_ON command.
	SENS_ON command has not been sent.		Send the SENS_ON command.
Servomotor Moves Instantaneously, then Stops	Servomotor or encoder wiring incorrect.	---	Refer to chapter *3* and correct wiring.
Servomotor Speed Unstable	Wiring connection to motor defective.	Check connection of power lead (U, V, and W phases) and encoder connectors.	Tighten any loose terminals or connectors.
Servomotor Vibrates at Approximately 200 to 400 Hz.	Speed loop gain value too high.	---	Reduce speed loop gain (Pn100) preset value.
High Rotation Speed Overshoot on Starting and Stopping.	Speed loop gain value too high.	---	Reduce speed loop gain (Pn100) preset value. Increase integration time constant (Pn101).
	Speed loop gain is too low compared to position loop gain.	---	Increase speed loop gain (Pn100). Reduce the integration time constant (Pn101).

Table 9.1 Troubleshooting Table No Alarm Display

Symptom	Cause	Inspection	Remedy
Servomotor Overheated	Ambient temperature too high	Measure Servomotor ambient temperature.	Reduce ambient temperature to 40°C max.
	Servomotor surface dirty	Visual check	Clean dust and oil from motor surface.
	Overloaded	Run under no load.	Reduce load or replace with larger capacity Servomotor.
Abnormal Noise	Mechanical mounting incorrect	Check Servomotor mounting screws.	Tighten mounting screws.
		Check couplings not centered.	Center coupling.
		Check coupling balance.	Balance coupling.
	Bearing defective	Check noise and vibration near bearing.	Consult your Yaskawa representative if defective.
	Machine causing vibrations	Check foreign object intrusion, damage or deformation of sliding parts of machine.	Consult with machine manufacturer.

9.3 Alarm Display Table

A summary of alarm displays and alarm code outputs is given in the following table.

Table 9.2 Alarm Display Table

Alarm Display	Alarm Code Outputs			ALM Output	Alarm Name	Description
	ALO1	ALO2	ALO3			
A.02	OFF	OFF	OFF	OFF	Parameter Breakdown*3	EEPROM data of SERVOPACK is abnormal.
A.03					Main Circuit Encoder Error	Detection data for power circuit is abnormal.
A.04					Parameter Setting Error*3	The parameter setting is outside the allowable setting range.
A.05					Combination Error	SERVOPACK and Servomotor capacities do no match each other.
A.10	ON	OFF	OFF	OFF	Overcurrent or Heat Sink Overheated*3	An overcurrent flowed through the IGBT. Heat sink of SERVOPACK was overheated.
A.30	ON	ON	OFF	OFF	Regeneration Error Detected	• Regenerative circuit is faulty. • Regenerative resistor is faulty.
A.32					Regenerative Overload	Regenerative energy exceeds regenerative resistor capacity.
A.40	OFF	OFF	ON	OFF	Overvoltage*4	Main circuit DC voltage is excessively high.
A.41					Undervoltage*4	Main circuit DC voltage is excessively low.
A.51	ON	OFF	ON	OFF	Overspeed	Rotational speed of the motor is excessively high.
A.71	ON	ON	ON	OFF	Overload: High Load	The motor was operating for several seconds to several tens of seconds under a torque largely exceeding ratings.
A.72					Overload: Low Load	The motor was operating continuously under a torque largely exceeding ratings
A.73					Dynamic Brake Overload	When the dynamic brake was applied, rotational energy exceeded the capacity of dynamic brake resistor.
A.74					Overload of Surge Current Limit Resistor	The main circuit power was frequently turned ON and OFF.
A.7A					Heat Sink Overheated *2	The heat sink of SERVOPACK is overheated.

Table 9.2 Alarm Display Table

Alarm Display	Alarm Code Outputs			ALM Output	Alarm Name	Description
	ALO1	ALO2	ALO3			
A.81	OFF	OFF	OFF	OFF	Encoder Backup Error*3	All the power supplies for the absolute encoder have failed and position data was cleared.
A.82					Encoder Checksum Error*3	The checksum results of encoder memory is abnormal.
A.83					Absolute Encoder Battery Error	Battery voltage for the absolute encoder has dropped.
A.84					Encoder Data Error*3	Data in the encoder is abnormal.
A.85					Encoder Overspeed	The encoder was rotating at high speed when the power was turned ON.
A.86					Encoder Overheated	The internal temperature of encoder is too high.
A.b1					Reference Speed Input Read Error	The A/D converter for reference speed input is faulty.
A.b2					Reference Torque Input Read Error	The A/D converter for reference torque input is faulty.
A.b6					Gate array error	Communications LSI error
A.bF					System Alarm*3	A system error occurred in the SERVOPACK.
A.C1	ON	OFF	ON	OFF	Servo Overrun Detected	The Servomotor ran out of control.
A.C6					Fully closed loop phase A/B disconnected.	The phase A/B of the fully closed encoder was disconnected.
A.C7					Fully closed loop phase C disconnected	The phase C of the fully closed encoder was disconnected.
A.C8					Absolute Encoder Clear Error and Multiturn Limit Setting Error*3	The multiturn for the absolute encoder was not properly cleared or set.
A.C9					Encoder Communications Error*3	Communications between SERVOPACK and encoder is not possible.
A.CA					Encoder Parameter Error*3	Encoder parameters are faulty.
A.Cb					Encoder Echoback Error*3	Contents of communications with encoder is incorrect.
A.CC					Multiturn Limit Disagree-ment	Different multiturn limits have been set in the encoder and SERVOPACK.
A.d0	ON	ON	OFF	OFF	Position Error Pulse Over-flow	Position error pulse exceeded parameter (Pn505).

Table 9.2 Alarm Display Table

Alarm Display	Alarm Code Outputs			ALM Output	Alarm Name	Description
	ALO1	ALO2	ALO3			
A.E0	OFF	ON	ON	OFF	No option *3.	No Option Unit installed.
A.E1					Option time out *3.	No response from the board in the Option Unit.
A.E2					Option WDC error *3.	WDC error in the board in the Option Unit
A.E5					WDT error	MECHATROLINK synchronization error
A.E6					Communications error	MECHATROLINK communications error
A.EA					SERVOPACK damaged *3.	SERVOPACK is defective.
A.EB					SERVOPACK initial access error *3.	Initial processing failed.
A.EC					SERVOPACK WDC error	SERVOPACK WDC error
A.ED					Command execution incomplete	Command was interrupted.
A.F1	OFF	ON	OFF	OFF	Power Line Open Phase	One phase is not connected in the main power supply.
CPF00	Not specified				Hand-held Digital Operator Transmission Error	The Hand-held Digital Operator (JUSP-OP02A-2) fails to communicate with SERVOPACK (e.g., CPU error).
CPF01						
A.– –	OFF	OFF	OFF	ON	Not an error	Normal operation status

Note: 1. OFF: Output transistor is OFF (high). ON: Output transistor is ON (low).
2. This alarm display appears only within the range of 30 W to 1000 W.
3. These alarms are not reset for the alarm clear (ALM-CLR) command. Eliminate the cause of the alarm and then turn OFF the power supply to reset the alarms.
4. For SERVOPACKs with a capacity of 6.0 kw or more, A.40 indicates a main circuit voltage error alarm. This means that either an overvoltage or an undervoltage has occurred at some stage.

9.4 Warning Displays

The relation between warning displays and warning code outputs are shown in the following table.

Warning code are not normally output, but when warning code output is specified in the parameter, they are as shown in the following table.

Table 9.3 Warning Displays and Outputs

Warning Display	Warning Code Outputs			ALM Output	Warning Name	Description of Warning
	ALO1	ALO2	ALO3			
A.91	OFF	ON	ON	ON	Overload	This warning occurs before the overload alarms (A.71 or A.72) occur. If the warning is ignored and operation continues, an overload alarm may occur.
A.92	ON	OFF	ON	ON	Regenerative Overload	This warning occurs before the regenerative overload alarm (A.32) occurs. If the warning is ignored and operation continues, a regenerative overload alarm may occur.
A.94	ON	ON	OFF	ON	Setting Warning	A value outside the setting range was set using MECHATROLINK communications.
A.95	OFF	ON	OFF	ON	Command Warning	A command not supported in the product specifications was issued. The command reception conditions were not met.
A.96	ON	OFF	OFF	ON	Communications Warning	A communications error occurred. (Once)

Note: OFF: Output transistor is OFF (high). ON: Output transistor is ON (low).

10

Option Unit Peripheral Devices

This chapter describes the peripheral devices for MECHATROLINK and the fully closed encoder.

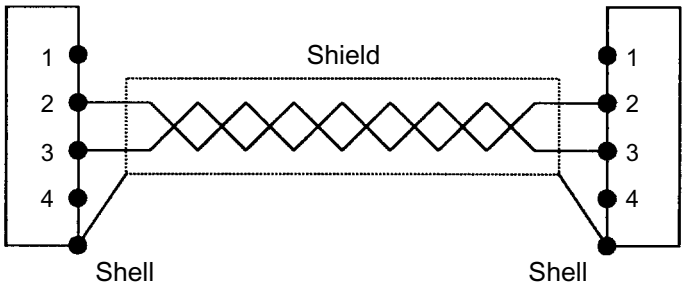
10.1 Fully Closed Encoder Connector Kit

Name	Connector Kit Model Number	Manufacturer Model Number
Encoder Connector (CN4) Plug	JZSP-VEP02	Manufacturer: Sumitomo 3M LTD. Plug connector: 10120-3000VE Shell system: 10320-52S0-00S

10.2 MECHATROLINK Communications Cables and Terminator

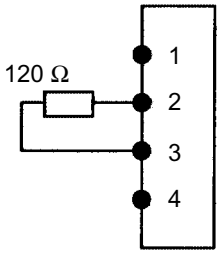
■ Communications Cables (With Connectors on both Ends)

Name	Model Number	Cable Length
MECHATROLINK Communications Cables	JEPMC-W6000-A3	0.3 m
	JEPMC-W6000-A5	0.5 m
	JEPMC-W6000-01	1.0 m



■ Terminator

Name	Model Number
MECHATROLINK Communications Terminator	JEPMC-W6020



Appendix A

List of MECHATROLINK Commands and Command Formats

This appendix provides a list of MECHATROLINK commands and command formats.

A.1 MECHATROLINK Command List

MECHATROLINK common commands, motion common commands, and servo standard commands are shown in the following tables.

■ MECHATROLINK Common Command List

Code	Command	Function	Processing Classification*2	Synchronization Classification*2	Remarks
00	NOP	No Operation	N	A	-
01	PRM_RD	Read parameters	D	A	*1
02	PRM_WR	Write parameters	D	A	*1
03	ID_RD	Read ID	D	A	*1
04	CONFIG	Set up devices	D	A	*1
05	ALM_RD	Read alarm or warning	D	A	*1
06	ALM_CLR	Clear alarm or warning	C	A	*1
07	-	-	-	-	-
08	-	-	-	-	-
09	-	-	-	-	-
0A	-	-	-	-	-
0B	-	-	-	-	-
0C	-	-	-	-	-
0D	SYNC_SET	Start synchronous communications	N	A	
0E	CONNECT	Establish connection	N	A	*1
0F	DISCONNECT	Release connection	N	A	-
10	-	-	-	-	-
11	-	-	-	-	-
12	-	-	-	-	-
13	-	-	-	-	-
14	-	-	-	-	-
15	-	-	-	-	-
16	-	-	-	-	-
17	-	-	-	-	-
18	-	-	-	-	-
19	-	-	-	-	-
1A	-	-	-	-	-
1B	PPRM_RD	Read EEPROM parameters	D	A	Not supported.
1C	PPRM_WR	Write EEPROM parameters	D	A	-
1D	-	-	-	-	-
1E	-	-	-	-	-
1F	-	-	-	-	-

* 1. For details, refer to *4.3 Special Command Descriptions*.

* 2. The following abbreviations are used for processing and synchronization classifications.

Processing Classifications		Synchronization Classifications	
N	Network command	A	Asynchronous command
D	Data communications command	S	Synchronous command
C	Control command		
M	Motion command		
X	Compound command		

■ MECHATROLINK Common Motion Command List

Code	Command	Function	Processing Classification *2	Synchronization Classification *2	Remarks
20	POS_SET	Set coordinates	D	A	*1
21	BRK_ON	Apply brake	C	A	*1
22	BRK_OFF	Release brake	C	A	*1
23	SENS_ON	Turn ON sensor	C	A	*1
24	SENS_OFF	Turn OFF sensor	C	A	*1
25	HOLD	Stop motion	M	A	-
26	-	-	-	-	-
27	-	-	-	-	-
28	-	-	-	-	-
29	-	-	-	-	-
2A	-	-	-	-	-
2B	-	-	-	-	-
2C	-	-	-	-	-
2D	-	-	-	-	-
2E	-	-	-	-	-
2F	-	-	-	-	-

* 1. For details, refer to *4.3 Special Command Descriptions*.

* 2. The following abbreviations are used for processing and synchronization classifications.

Processing Classifications		Synchronization Classifications	
N	Network command	A	Asynchronous command
D	Data communications command	S	Synchronous command
C	Control command		
M	Motion command		
X	Compound command		

A

■ MECHATROLINK Servo Standard Command List

Code	Command	Function	Processing Classification*2	Synchronization Classification*2	Remarks
30	SMON	Status monitoring	D	A	-
31	SV_ON	Servo ON	C	A	-
32	SV_OFF	Servo OFF	C	A	-
33	-	-	-	-	-
34	INTERPOLATE	Interpolation feed	M	S	-
35	POSING	Positioning	M	A	-
36	FEED	Constant speed feed	M	A	-
37	-	-	-	-	-
38	LATCH	Interpolation feeding with position detection	M	S	-
39	EX_POSING	External input positioning	M	A	-
3A	ZRET	Parameter return	M	A	-
3B	-	-	-	-	-
3C	-	-	-	-	-
3D	-	-	-	-	-
3E	ADJ	Adjusting	X	A	*1
3F	SVCTRL	General-purpose servo control	X	A, S	-

* 1. For details see *Chapter 4.3 Special Command Descriptions*.

* 2. The following abbreviations are used for processing and synchronization classifications.

Processing Classifications		Synchronization Classifications	
N	Network command	A	Asynchronous command
D	Data communications command	S	Synchronous command
C	Control command		
M	Motion command		
X	Compound command		

A.2 MECHATROLINK Command Format List

The command formats for MECHATROLINK commands are shown in the following list.

■ Common Commands: Command/Response Format

Table A.1 Common Commands: Command Format 1

1	NOP (00H)	CONNECT (0EH)	DISCONNECT (0FH)	SYNC_SET (0DH)	ID_RD (03H)	CONFIG (04H)
2						
3						
4						
5		VER			DEVICE_CODE	
6		COM_MOD			OFFSET	
7		COM_TIME			SIZE	
8						
9						
10						
11						
12						
13						
14						
15						
16	WDT	WDT		WDT	WDT	WDT

Table A.2 Common Commands: Response Format 1

1	NOP	CONNECT	DISCONNECT	SYNC_SET	ID_RD	CONFIG
2	ALARM	ALARM		ALARM	ALARM	ALARM
3	STATUS	STATUS		STATUS	STATUS	STATUS
4						
5		VER			DEVICE_CODE	
6		COM_MOD			OFFSET	
7		COM_TIME			SIZE	
8					ID	
9						
10						
11						
12						
13						
14						
15						
16	RWDT	RWDT		RWDT	RWDT	RWDT

A

Table A.3 Common Commands: Command Format 2

1	PRM_RD (01H)	PRM_WR (02H)	ALM_RD (05H)	ALM_CLR (06H)	PPRM_RD (1BH)	PPRM_WR (1CH)
2						
3						
4						
5	NO	NO	ALM_RD_MOD	ALM_CLR_MOD	NO	NO
6						
7	SIZE	SIZE			SIZE	SIZE
8		PARAMETER				PARAMETER
9						
10						
11						
12						
13						
14						
15						
16	WDT	WDT	WDT	WDT	WDT	WDT

Table A.4 Common Commands: Response Format 2

1	PRM_RD	PRM_WR	ALM_RD	ALM_CLR	PPRM_RD	PPRM_WR
2	ALARM	ALARM	ALARM	ALARM	ALARM	ALARM
3	STATUS	STATUS	STATUS	STATUS	STATUS	STATUS
4						
5	NO	NO	ALM_RD_MOD	ALM_CLR_MOD		NO
6			ALM_DATA			
7	SIZE	SIZE				SIZE
8	PARAMETER	PARAMETER				PARAMETER
9						
10						
11						
12						
13						
14						
15						
16	RWDT	RWDT	RWDT	RWDT	RWDT	RWDT

■ Common Motion Commands: Command/Response Format

Table A.5 Common Motion Commands: Command Format 1

1	HOLD (25H)	POS_SET (20H)	SENS_ON (23H)	SENS_OFF (24H)	BRK_ON (21H)	BRK_OFF (22H)
2						
3	OPTION					
4						
5		PS_SUBCMD				
6		POS_DATA				
7						
8						
9						
10						
11						
12						
13	MON_SEL					
14						
15						
16	WDT	WDT	WDT	WDT	WDT	WDT

Table A.6 Common Motion Commands: Response Format 1

1	HOLD	POS_SET	SENS_ON	SENS_OFF	BRK_ON	BRK_OFF
2	ALARM	ALARM	ALARM	ALARM	ALARM	ALARM
3	STATUS	STATUS	STATUS	STATUS	STATUS	STATUS
4						
5	MONITOR1	PS_SUBCMD				
6		POS_DATA				
7						
8						
9	MONITOR2					
10						
11						
12						
13	MON_SEL					
14	I/O					
15						
16	RWDT	RWDT	RWDT	RWDT	RWDT	RWDT

■ Standard Servo Commands: Command/Response Format

Table A.7 Servo Standard Commands: Command Format 1

1	SMON (30H)	SV_ON (31H)	SV_OFF (32H)		INTERPOLATE (34H)	POSING (35H)
2						
3		OPTION			OPTION	OPTION
4						
5					TPOS	TPOS
6						
7						
8						
9					FF	TSPD
10						
11						
12						
13	MON_SEL	MON_SEL	MON_SEL		MON_SEL	MON_SEL
14						
15						
16	WDT	WDT	WDT		WDT	WDT

Table A.8 Servo Standard Commands: Response Format 1

1	SMON	SV_ON	SV_OFF		INTERPOLATE	POSING
2	ALARM	ALARM	ALARM		ALARM	ALARM
3	STATUS	STATUS	STATUS		STATUS	STATUS
4						
5	MONITOR1	MONITOR1	MONITOR1		MONITOR1	MONITOR1
6						
7						
8						
9	MONITOR2	MONITOR2	MONITOR2		MONITOR2	MONITOR2
10						
11						
12						
13	MON_SEL	MON_SEL	MON_SEL		MON_SEL	MON_SEL
14	I/O	I/O	I/O		I/O	I/O
15						
16	RWDT	RWDT	RWDT		RWDT	RWDT

Table A.9 Servo Standard Commands: Command Format 2

1	FEED (36H)		LATCH (38H)	EX_POSING (39H)	ZRET (3AH)	
2			LT_SGNL	LT_SGNL	LT_SGNL	
3	OPTION		OPTION	OPTION	OPTION	
4						
5			TPOS	TPOS		
6						
7						
8						
9	TSPD		FF	TSPD	TSPD	
10						
11						
12						
13	MON_SEL		MON_SEL	MON_SEL	MON_SEL	
14						
15						
16	WDT		WDT	WDT	WDT	

Table A.10 Servo Standard Commands: Response Format 2

1	FEED		LATCH	EX_POSING	ZRET	
2	ALARM		ALARM	ALARM	ALARM	
3	STATUS		STATUS	STATUS	STATUS	
4						
5	MONITOR1		MONITOR1	MONITOR1	MONITOR1	
6						
7						
8						
9	MONITOR2		MONITOR2	MONITOR2	MONITOR2	
10						
11						
12						
13	MON_SEL		MON_SEL	MON_SEL	MON_SEL	
14	I/O		I/O	I/O	I/O	
15						
16	RWDT		WDT	WDT	WDT	

Table A.11 Servo Standard Commands: Command Format 3

1			ADJ (3EH)	SVCTRL (3FH)		
2			00	SUBCMD		
3				OPTION		
4						
5			CMD	TPOS		
6			ADDRESS			
7						
8			DATA			
9				TSPD or FF		
10						
11						
12						
13				MON_SEL		
14				SQ_CMD		
15						
16			WDT	WDT		

Table A.12 Servo Standard Commands: Response Format 3

1			ADJ	SVCTRL		
2			ALARM	ALARM		
3			STATUS	STATUS		
4						
5			ANS	MONITOR1		
6			ADDRESS			
7						
8			DATA			
9				MONITOR2		
10						
11						
12						
13				MON_SEL		
14				I/O		
15						
16			RWDT	RWDT		

Appendix B

List of Parameters

This appendix lists the parameters, memory switches, input signal selections, and output signal selections for SGDH SERVOPACKs with an Option Unit mounted.

B.1 Parameters

The following list shows parameters and their settings.

IMPORTANT

- Parameters marked as “reserved parameters” are used internally by the SERVOPACK. As a general rule, access is denied to users.
- SERVOPACK operation cannot be guaranteed if settings other than initial values are made to the “reserved parameters.” Be sure to use adequate caution if any of these settings is changed.

Table B.1 Parameters List

Category	Parameter No.	Name	Size	Unit	Setting Range	Factory Setting	Reference
Function Selection Parameters	Pn000	Function Selection Basic Switches (See note 3.)	2	-	-	0010	6.2.1
	Pn001	Function Selection Application Switches 1 (See notes 1 and 3.)	2	-	-	0000	6.2.2, 6.5.1
	Pn002	Function Selection Application Switches 2 (See note 3.)	2	-	-	0000	6.2.4, 6.6.1
	Pn003	Function Selection Application Switches 3	2	-	-	0002	6.4.6, H-6.5
	Pn004	Reserved parameters (Do not change.)	2	-	-	0000	-
	Pn005	Function Selection Application Switches 5 (See note 3.)	2	-	-	0000	6.5.2
Gain-related Parameters	Pn100	Speed Loop Gain	2	Hz	1 to 2000	40	H-6.2.1
	Pn101	Speed Loop Integral Time Constant	2	0.01 ms	15 to 51200	2000	H-6.2.1
	Pn102	Position Loop Gain	2	1/s	1 to 2000	40	H-6.2.1
	Pn103	Inertia Ratio	2	%	0 to 10000	0	H-6.2.1, H-6.3.3
	Pn104	Reserved parameters (Do not change.)	2	Hz	1 to 2000	40	-
	Pn105		2	0.01 ms	15 to 51200	2000	-
	Pn106		2	1/s	1 to 2000	40	-
	Pn107	Bias	2	min^{-1}	0 to 10000	0	H-6.2.4
	Pn108	Bias Width Addition	2	Reference units	0 to 250	7	H-6.2.4
	Pn109	Feed-forward	2	%	0 to 100	0	H-6.2.2
	Pn10A	Feed-forward Filter Time Constant	2	0.01 ms	0 to 6400	0	H-5.2.5
	Pn10B	Gain-related Application Switches	2	-	-	0000	H-6.2.5
	Pn10C	Mode Switch Torque Reference	2	%	0 to 800	200	H-6.2.5

Note: The prefix “H-” of the section number in the reference column refers to the *Σ-II Series SGM□H/SGDH User’s Manual: Design and Maintenance (SIE-S800-32.2)*.

Category	Parameter No.	Name	Size	Unit	Setting Range	Factory Setting	Reference
Gain-related Parameters	Pn10D	Mode Switch Speed Reference	2	min^{-1}	0 to 10000	0	H-6.2.5
	Pn10E	Mode Switch Acceleration	2	10 min^{-1}/s	0 to 3000	0	H-6.2.5
	Pn10F	Mode Switch Error Pulse	2	Reference units	0 to 10000	0	H-6.2.5
	Pn110	Online Autotuning Switches	2	-	-	0010	H-6.3.4
	Pn111	Speed Feedback Compensation (See note 2.)	2	-	1 to 100	100	H-6.2.6
	Pn112	Reserved parameters (Do not change.)	2	%	0 to 1000	100	-
	Pn113		2	-	0 to 10000	1000	-
	Pn114		2	-	0 to 400	200	-
	Pn115		2	-	0 to 1000	32	-
	Pn116		2	-	0 to 1000	16	-
	Pn117		2	%	20 to 100	100	-
	Pn118		2	%	50 to 100	100	-
	Pn119		2	1/S	1 to 2000	50	-
	Pn11A		2	0.1%	1 to 2000	1000	-
	Pn11B		2	Hz	1 to 150	50	-
	Pn11C		2	Hz	1 to 150	70	-
	Pn11D		2	%	0 to 150	100	-
	Pn11E		2	%	0 to 150	100	-
	Pn11F		2	ms	0 to 2000	0	-
	Pn120		2	0.01 ms	0 to 51200	0	-
	Pn121		2	Hz	10 to 250	50	-
	Pn122		2	Hz	0 to 250	0	-
	Pn123		2	%	0 to 100	0	-
Position-related Parameters	Pn200	Reserved parameters (Do not change.)	2	-	-	0100	-
	Pn201		2	P/R	16 to 16384	16384	-
	Pn202	Electronic Gear Ratio (Numerator) (See note 3.)	2	-	1 to 65535	4	6.3.2
	Pn203	Electronic Gear Ratio (Denominator) (See note 3.)	2	-	1 to 65535	1	6.3.2
	Pn204	Reserved parameters (Do not change.)	2	0.01 ms	0 to 6400	0	-
	Pn205	Multi-turn Limit Setting (See notes 1 and 3.)	2	rev	0 to 65535	65535	6.6.3
	Pn206	Number of Fully Closed Encoder Pulses	2	P/R	513 to 65535	16384	6.2.4
	Pn207	Reserved parameters (Do not change.)	2	-	-	0010	-
	Pn208		2	0.01 ms	0 to 6400	0	-

Note: The prefix "H-" of the section number in the reference column refers to the *Σ-II Series SGM□H/SGDH User's Manual : Design and Maintenance (SIE-S800-32.2)*.

Category	Parame-ter No.	Name	Size	Unit	Setting Range	Factory Setting	Refer-ence
Speed-related Parameters	Pn300	Reserved parameters (Do not change.)	2	0.01 V/ rated speed	150 to 3000	600	-
	Pn301		2	min^{-1}	0 to 10000	100	-
	Pn302		2	min^{-1}	0 to 10000	200	-
	Pn303		2	min^{-1}	0 to 10000	300	-
	Pn304	Jog Speed	2	min^{-1}	0 to 10000	500	H-5.3.2
	Pn305	Soft Start Acceleration Time	2	ms	0 to 10000	0	H-6.1.1
	Pn306	Soft Start Deceleration Time	2	ms	0 to 10000	0	H-6.1.1
	Pn307	Reserved parameters (Do not change.)	2	0.01 ms	0 to 65535	40	-
	Pn308	Speed F/B Filter Time Constant	2	0.01 ms	0 to 65535	0	-
Torque-related Parameters	Pn400	Reserved parameters (Do not change.)	2	0.1 V/rated torque	10 to 100	30	-
	Pn401	Torque Reference Filter Time Constant	2	0.01 ms	0 to 65535	100	H-6.1.5
	Pn402	Forward Torque Limit	2	%	0 to 800	800	H-5.1.3
	Pn403	Reverse Torque Limit	2	%	0 to 800	800	H-5.1.3
	Pn404	External Input Forward Torque Limit	2	%	0 to 800	100	H-5.1.3
	Pn405	External Input Reverse Torque Limit	2	%	0 to 800	100	H-5.1.3
	Pn406	Emergency Stop Torque	2	%	0 to 800	800	6.2.2
	Pn407	Reserved parameters (Do not change.)	2	min^{-1}	0 to 10000	10000	-
	Pn408	Torque Control Function Switches	2	-	-	0000	H-6.1.6
	Pn409	Notch Filter Frequency	2	Hz	50 to 2000	2000	H-6.1.6

Note: The prefix "H-" of the section number in the reference column refers to the *Σ-II Series SGM□H/SGDH User's Manual : Design and Maintenance (SIE-S800-32.2)*.

Category	Parameter No.	Name	Size	Unit	Setting Range	Factory Setting	Reference
Sequence-related Parameters	Pn500	Positioning Completed Width	2	Reference units	0 to 250	7	H-6.3.4
	Pn501	Reserved parameters (Do not change.)	2	min^{-1}	0 to 10000	10	-
	Pn502	Rotation Detection Level	2	min^{-1}	1 to 10000	20	H-5.5.5
	Pn503	Reserved parameters (Do not change.)	2	min^{-1}	0 to 100	10	-
	Pn504	NEAR Signal Width	2	Reference units	1 to 250	7	H-6.3.4
	Pn505	Overflow Level	2	256 reference units	1 to 32767	1024	H-6.2.1
	Pn506	Brake Reference Servo OFF Delay Time	2	10 ms	0 to 50	0	6.5.2
	Pn507	Brake Reference Output Speed Level	2	min^{-1}	0 to 10000	100	6.5.2
	Pn508	Timing for Brake Reference Output during Motor Operation	2	10 ms	10 to 100	50	6.5.2
	Pn509	Momentary Hold Time	2	ms	20 to 1000	20	H-5.5.9
	Pn50A	Input Signal Selections 1 (See note 3.)	2	-	-	2881	6.2.2, 6.4.2
	Pn50B	Input Signal Selections 2 (See note 3.)	2	-	-	6583	6.4.2
	Pn50C	Reserved parameters (Do not change.)	2	-	-	8888	-
	Pn50D		2	-	-	8888	-
	Pn50E	Output Signal Selections 1	2	-	-	3211	6.4.3
	Pn50F	Output Signal Selections 2	2	-	-	0000	6.4.3
	Pn510	Output Signal Selections 3	2	-	-	0000	6.4.3
	Pn511	Input Signal Selections 5 (See note 3.)	2	-	-	8888	6.4.2
	Pn512	Output Signal Reversal	2	-	-	0000	6.4.3
Other Parameters	Pn600	Regenerative Resistor Capacity (See note 4.)	2	10 W	0 to capacity (See note 5.)	0	H-5.6.1
	Pn601	Reserved parameter (Do not change.)	2	-	0 to capacity (See note 5.)	0	-
MECHATROLINK Parameters	Pn800	Communications Control	2	-	-	0000	6.4.5
Sequence-related Parameters	Pn801	Function Selection Application (Software Limits)	2	-	-	0000	6.2.3
	Pn802	Command Mask	2	-	-	0000	6.4.4
	Pn803	Zero Point Width	2	Reference units	0 to 250	10	6.3.4

Note: The prefix "H-" of the section number in the reference column refers to the *Σ-II Series SGM□H/SGDH User's Manual : Design and Maintenance (SIE-S800-32.2)*.

Category	Parameter No.	Name	Size	Unit	Setting Range	Factory Setting	Reference
Position-related Parameters	Pn804	Forward software limit	4	Reference units	$-2^{30}+1$ to $2^{30}-1$	8192 ×99999	6.2.3
	Pn806	Reverse software limit	4	Reference units	$-2^{30}+1$ to $2^{30}-1$	-8192 ×99999	6.2.3
	Pn808	Absolute encoder zero point position offset	4	Reference units	$-2^{30}+1$ to $2^{30}-1$	0	6.6.4
Acceleration/ Deceleration	Pn80A	First-step linear acceleration parameter	2	10000 reference units/s^2	0 to 65535	100	6.3.3
	Pn80B	Second-step linear acceleration parameter	2	10000 reference units/s^2	0 to 65535	100	6.3.3
	Pn80C	Acceleration parameter switching speed	2	100 reference units/s	0 to 65535	0	6.3.3
	Pn80D	First-step linear deceleration parameter	2	10000 reference units/s^2	0 to 65535	100	6.3.3
	Pn80E	Second-step linear deceleration parameter	2	10000 reference units/s^2	0 to 65535	100	6.3.3
	Pn80F	Deceleration parameter switching speed	2	100 reference units/s	0 to 65535	0	6.3.3
Acceleration/ Deceleration Filter	Pn810	Exponential acceleration/ deceleration bias	2	100 reference units/s	0 to 65535	0	6.3.3
	Pn811	Exponential acceleration/ deceleration time constant	2	0.1 ms	0 to 5100	0	6.3.3
	Pn812	Running average time	2	0.1 ms	0 to 5100	0	6.3.3
Monitor	Pn813	Option monitor	2	-	-	0000	6.4.6
Supplementary Commands	Pn814	Final travel distance for external positioning	4	Reference units	$-2^{30}+1$ to $2^{30}-1$	100	6.3.4
	Pn816	Zero point return direction	2	-	-	0000	6.3.4
	Pn817	Zero point return approach speed 1	2	100 reference units/s	0 to 65535	50	6.3.4
	Pn818	Zero point return approach speed 2	2	100 reference units/s	0 to 65535	5	6.3.4
	Pn819	Final travel distance to return to zero point	4	Reference units	$-2^{30}+1$ to $2^{30}-1$	100	6.3.4

Note: The prefix "H-" of the section number in the reference column refers to the Σ-*II Series SGM□H/SGDH User's Manual : Design and Maintenance (SIE-S800-32.2)*.

* 1. The multiturn limit must be changed only for special applications. Changing this limit inappropriately or unintentionally can be dangerous.
* 2. The setting of parameter Pn111 is valid only when parameter Pn110.1 is set to 0.
* 3. After changing these parameters, turn OFF the main circuit and control power supplies and then turn them ON again to enable the new settings.
* 4. Normally set to "0." When using an External Regenerative Resistor, set the capacity (W) of the regenerative resistor.
* 5. The upper limit is the maximum output capacity (W) of the SERVOPACK.

B.2 Memory Switches

The following list shows the memory switches and their factory settings.

Table B.2 Memory Switches List

Parameter	Digit Place	Name	Setting	Contents	Factory Setting
Pn000 Function Selection Basic Switches	0	Direction Selection	0	Sets CCW as forward direction.	0
			1	Sets CW as forward direction (reverse rotation mode).	
	1	Reserved (Do not change.)	0 to B	-	1
	2	Axis Address	0 to F	-	0
	3	Not used.	-	-	0
Pn001 Function Selection Application Switches	0	Servo OFF or Alarm Stop Mode	0	Stops the motor by applying dynamic brake (DB).	0
			1	Stops the motor by applying dynamic brake (DB) and then releases DB.	
			2	Makes the motor coast to a stop state without using the dynamic brake (DB).	
	1	Overtravel Stop Mode	0	Same setting as Pn001.0 (Stops the motor by applying DB or by coasting.)	0
			1	Sets the torque of Pn406 to the maximum value, decelerates the motor to a stop, and then sets it to servolock state.	
			2	Sets the torque of Pn406 to the maximum value, decelerates the motor to a stop, and then sets it to coasting state.	
	2	DC Power Applications	0	Not applicable to DC power input: Input AC power supply through L1, L2, and (L3) terminals.	0
			1	Applicable to DC power input: Input DC power supply through (+)1 and (-) terminals.	
	3	Warning Code Output Selection	0	ALO1, ALO2, and ALO3 output only alarm codes.	0
			1	ALO1, ALO2, and ALO3 output both alarm codes and warning codes. While warning codes are output, ALM signal output remains ON (normal state).	
Pn002 Function Selection Application Switches	0	Reserved (Do not change.)	0 to 2	-	0
	1	Reserved (Do not change.)	0, 1	-	0
	2	Absolute Encoder Usage	0	Uses absolute encoder as an absolute encoder.	0
			1	Uses absolute encoder as an incremental encoder.	
	3	Fully Closed Encoder Usage	0	Do not use.	0
			1	For use without phase C	
			2	For use with phase C	
			3	For use in Reverse Rotation Mode without phase C.	
			4	For use in Reverse Rotation Mode with phase C.	

Table B.2 Memory Switches List

Parameter	Digit Place	Name	Setting	Contents	Factory Setting
Pn003 Function Selection Application Switches	0, 1	Analog Monitor 1 Torque Reference Monitor Analog Monitor 2 Speed Reference Monitor	0	Motor speed: 1 V/1000 min^{-1}.	0, 2
			1	Speed reference: 1 V/1000 min^{-1}.	
			2	Torque reference: 1 V/100%	
			3	Position error: 0.05 V/1 pulse	
			4	Position error: 0.05 V/100 pulse	
			5	Reference pulse frequency (converted to min^{-1}): 1 V/1000 min^{-1}.	
			6	Motor speed × 4: 1 V/250 min^{-1}.	
			7	Motor speed × 8: 1 V/125 min^{-1}.	
			8	Reserved parameters (Do not change.)	
			9		
			A		
			B		
			C		
			D		
			E		
			F		
	2	Not used.	-	-	0
	3	Not used.	-	-	0
Pn10B Gain Application Switches	0	Mode Switch Selection	0	Uses internal torque reference as the condition (Level setting: Pn10C)	0
			1	Uses speed reference as the condition (Level setting: Pn10D)	
			2	Uses acceleration as the condition (Level setting: Pn10E)	
			3	Uses error pulse as the condition (Level setting: Pn10F)	
			4	No mode switch function available	
	1	I-P Control	0	Performs speed loop using PI control.	0
			1	Performs speed loop using I-P control.	
	2	Not used.	0	-	0
	3	Not used.	0	-	0

Table B.2 Memory Switches List

Parameter	Digit Place	Name	Setting	Contents	Factory Setting
Pn110 Online Autotuning Switches	0	Online Autotuning Method	0	Tunes only at the beginning of operation.	0
			1	Always tunes.	
			2	Does not perform autotuning.	
	1	Speed Feedback Compensation Selection	0	Enabled	1
			1	Disabled	
	2	Friction Compensation Selection	0	Friction compensation: Disabled	0
			1	Friction compensation: Small	
			2	Friction compensation: Large	
	3	Reserved parameters (Do not change.)	0 to 3	-	0
Pn200 Position Control References Selection Switches	0	Reserved (Do not change.)	0 to 9	-	0
	1	Reserved (Do not change.)	0 to 3	-	0
	2	Reserved (Do not change.)	0 to 2	-	1
	3	Reserved (Do not change.)	0, 1	-	0
Pn408 Torque Function Switches	0	Notch Filter Selection	0	Disabled.	0
			1	Uses a notch filter for torque reference.	
	1	Not used.	-	-	0
	2	Not used.	-	-	0
	3	Not used.	-	-	0

B.3 Input Signal Selections

The following list shows input signal selections and their factory settings.

Table B.3 Input Signal Selections List

Parameter	Digit Place	Name	Setting	Contents	Factory Setting
Pn50A	0	Reserved (Do not change.)	0, 1	-	1
	1	Reserved (Do not change.)	0 to F	-	8: OFF
	2	Reserved (Do not change.)	0 to F	-	8: OFF
	3	P-OT Signal Mapping (Overtravel when high.)	0	Inputs from the SI0 (CN1-40) input terminal.	2: SI2
			1	Inputs from the SI1 (CN1-41) input terminal.	
			2	Inputs from the SI2 (CN1-42) input terminal.	
			3	Inputs from the SI3 (CN1-43) input terminal.	
			4	Inputs from the SI4 (CN1-44) input terminal.	
			5	Inputs from the SI5 (CN1-45) input terminal.	
			6	Inputs from the SI6 (CN1-46) input terminal.	
			7	Sets signal ON.	
			8	Sets signal OFF.	
			9	Inputs the reverse signal from the SI0 (CN1-40) input terminal.	
			A	Inputs the reverse signal from the SI1 (CN1-41) input terminal.	
			B	Inputs the reverse signal from the SI2 (CN1-42) input terminal.	
			C	Inputs the reverse signal from the SI3 (CN1-43) input terminal.	
			D	Inputs the reverse signal from the SI4 (CN1-44) input terminal.	
			E	Inputs the reverse signal from the SI5 (CN1-45) input terminal.	
			F	Inputs the reverse signal from the SI6 (CN1-46) input terminal.	
Pn50B	0	N-OT Signal Mapping (Overtravel when high.)	0 to F	Same as above.	3: SI3
	1	Reserved parameters (Do not change.)	0 to F	Same as above.	8: OFF
	2	/P-CL Signal Mapping (Torque control when low.)	0 to F	Same as above.	5: SI5
	3	/N-CL Signal Mapping (Torque control when low.)	0 to F	Same as above.	6: SI6

Table B.3 Input Signal Selections List

Parameter	Digit Place	Name	Setting	Contents	Factory Setting
Pn50C	0	Reserved (Do not change.)	0 to F	-	8: OFF
	1	Reserved (Do not change.)	0 to F	-	8: OFF
	2	Reserved (Do not change.)	0 to F	-	8: OFF
	3	Reserved (Do not change.)	0 to F	-	8: OFF
Pn50D	0	Reserved (Do not change.)	0 to F	-	8: OFF
	1	Reserved (Do not change.)	0 to F	-	8: OFF
	2	Reserved (Do not change.)	0 to F	-	8: OFF
	3	Reserved (Do not change.)	0 to F	-	8: OFF

Table B.3 Input Signal Selections List

Parameter	Digit Place	Name	Setting	Contents	Factory Setting
Pn511	0	/DEC Signal Mapping (Deceleration when low.)	1	Inputs from the SI1 (CN1-41) input terminal.	8: OFF
			2	Inputs from the SI2 (CN1-42) input terminal.	
			3	Inputs from the SI3 (CN1-43) input terminal.	
			4	Inputs from the SI4 (CN1-44) input terminal.	
			5	Inputs from the SI5 (CN1-45) input terminal.	
			6	Inputs from the SI6 (CN1-46) input terminal.	
			7	Sets signal ON.	
			8	Sets signal OFF.	
			9	Inputs the reverse signal from the SI0 (CN1-40) input terminal.	
			A	Inputs the reverse signal from the SI1 (CN1-41) input terminal.	
			B	Inputs the reverse signal from the SI2 (CN1-42) input terminal.	
			C	Inputs the reverse signal from the SI3 (CN1-43) input terminal.	
			D	Inputs the reverse signal from the SI4 (CN1-44) input terminal.	
			E	Inputs the reverse signal from the SI5 (CN1-45) input terminal.	
			F	Inputs the reverse signal from the SI6 (CN1-46) input terminal.	
	1	/EXT1 Signal Mapping (EXT1 when low.)	0 to 3	Sets signal OFF.	8: OFF
			4	Inputs from the SI4 (CN1-44) input terminal.	
			5	Inputs from the SI5 (CN1-45) input terminal.	
			6	Inputs from the SI6 (CN1-46) input terminal.	
			7	Sets signal ON.	
			8	Sets signal OFF.	
			D	Inputs the reverse signal from the SI4 (CN1-44) input terminal.	
			E	Inputs the reverse signal from the SI5 (CN1-45) input terminal.	
			F	Inputs the reverse signal from the SI6 (CN1-46) input terminal.	
			9 to F	Sets signal OFF.	
	2	/EXT2 Signal Mapping (EXT2 when low.)	0 to F	Same as above.	8: OFF
	3	/EXT3 Signal Mapping (EXT3 when low.)	0 to F	Same as above.	8: OFF

B.4 Output Signal Selections

The following list shows output signal selections and their factory settings.

Table B.4 Output Signal Selections List

Parameter	Digit Place	Name	Setting	Contents	Factory Setting
Pn50E	0	/COIN Signal Mapping	0	Disabled.	1: SO1
			1	Outputs from the SO1 output terminal.	
			2	Outputs from the SO2 output terminal.	
			3	Outputs from the SO3 output terminal.	
	1	Reserved (Do not change.)	0 to 3	-	1: SO1
	2	/TGON Signal Mapping	0	Disabled.	2: SO2
			1	Outputs from the SO1 output terminal.	
			2	Outputs from the SO2 output terminal.	
			3	Outputs from the SO3 output terminal.	
	3	/S-RDY Signal Mapping	0 to 3	Same as above.	3: SO3
Pn50F	0	/CLT Signal Mapping	0 to 3	Same as above.	0: Not used
	1	/VLT Signal Mapping	0 to 3	Same as above.	0: Not used
	2	/BK Signal Mapping	0 to 3	Same as above.	0: Not used
	3	/WARN Signal Mapping	0 to 3	Same as above.	0: Not used
Pn510	0	/NEAR Signal Mapping	0 to 3	Same as above.	0: Not used
	1	/C-PULS Signal Mapping	0 to 3	Same as above.	0: Not used
	2	Reserved (Do not change.)	-	-	0
	3	Reserved (Do not change.)	-	-	0
Pn512	0	Output Signal Reversal for SO1	0	Output signal is not reversed.	0: Not reversed
			1	Output signal is reversed.	
	1	Output Signal Reversal for SO2	0	Output signal is not reversed.	0: Not reversed
			1	Output signal is reversed.	
	2	Output Signal Reversal for SO3	0	Output signal is not reversed.	0: Not reversed
			1	Output signal is reversed.	
	3	Reserved (Do not change.)	-	-	0

Note: 1. When more than one signal is allocated to the same output circuit, data is output using OR logic.
2. Depending on the control mode, undetected signals are treated as OFF. For example, in the speed control mode, the /COIN signal is treated as OFF.
3. Types of /WARN signals: Overload, regenerative overload, communications warnings, data settings warnings, and command warnings.

B.5 MECHATROLINK Communications Setting Parameters

The following table is a list of parameters for MECHATROLINK communications settings.

Table B.5 MECHATROLINK Communications Settings Parameters List

Parameter	Digit Place	Name	Setting	Contents	Factory Setting
Pn800	0	MECHATROLINK Communications Check Mask	0	Normal.	0
			1	Ignore communications error.	
			2	Ignore WDT error.	
			3	Ignore both communications and WDT errors.	
	1	Not used.	-	-	0
	2	Not used.	-	-	0
	3	Not used.	-	-	0
Pn801	0	Soft Limit Function	0	Soft limit enabled.	0
			1	Forward soft limit disabled.	
			2	Reverse soft limit disabled.	
			3	Soft limit disabled in both directions.	
	1	Soft Limit Operation Selection	0	Operation from the machine coordinate system absolute position (APOS)	0
			1	Operation from the reference coordinate system absolute position (APOS)	
	2	Soft Limit Check Using Commands	0	No soft limit check using commands.	0
			1	Soft limit check using commands.	
	3	Not used.	-	-	0
Pn802	0	SV_ON Command Mask	0	SV_ON/SV_OFF commands enabled.	0
			1	Servo always ON.	
	1	SENS_ON Command Mask	0	SENS_ON/SENS_OFF commands enabled.	0
			1	Servo always ON.	
	2	Not used.	-	-	0
	3	Not used.	-	-	0
Pn813	0	Option Monitor 1	0	As for Analog Monitor 1. (Pn003.0)	0
			1	As for Analog Monitor 2. (Pn003.1)	
			2	Monitors initial multi-rotation data. (IMTDATA)	
			3	Monitors the encoder count value. (PGCNT)	
	1	Option Monitor 2	0 to 3	Same as above.	1
	2	Not used.	-	-	0
	3	Not used.	-	-	0
Pn816	0	Return to Zero point Direction	0	Forward.	0
			1	Reverse.	
	1	Not used.	-	-	0
	2	Not used.	-	-	0
	3	Not used.	-	-	0

Appendix C

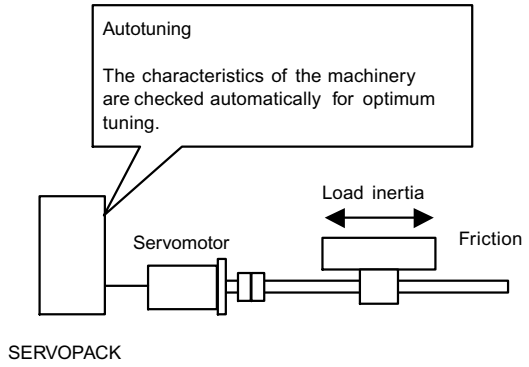
Using the Adjusting Command (ADJ: 3EH)

C

This appendix describes how to use the Adjusting command (ADJ: 3EH).

C.1 Autotuning

If positioning is taking a long time, the speed loop gain or position loop gain of the servo system may not be set properly. If the gain settings are wrong, set them properly in accordance with the configuration and rigidity of the machinery.



C

The SERVOPACK incorporates an online autotuning function, which checks the characteristics of the machinery automatically and makes the necessary servo gain adjustments. The function is easy to use and makes it possible for even beginners to perform servo gain tuning and set all servo gains as parameters.

The following parameters can be set automatically by using the online autotuning function.

Parameter	Content
Pn100	Speed loop gain
Pn101	Speed loop integral time constant
Pn102	Position loop gain
Pn401	Torque reference filter time constant

C.1.1 Online Autotuning

Online autotuning is a control function which enables the Servoamp to check changes in the load inertia during operation in order to maintain the target value for speed loop gain or position loop gain.

Online autotuning may not work well in the following cases.

- When the cycle for load inertia change is 200 ms or shorter (when the load changes rapidly).
- When the application has slow acceleration or deceleration using the soft start function, and the speed error of the Servomotor being driven is small.
- When adjusting the Servomotor manually and operating at low gain (a machine rigidity of 1 or less).

Disable the online autotuning function if tuning is not possible. Refer to 6.4.3 Making Manual Adjustments of the Σ-*II Series SGM□H/SGDH User's Manual : Design and Maintenance (SIE-S800-32.2)*.

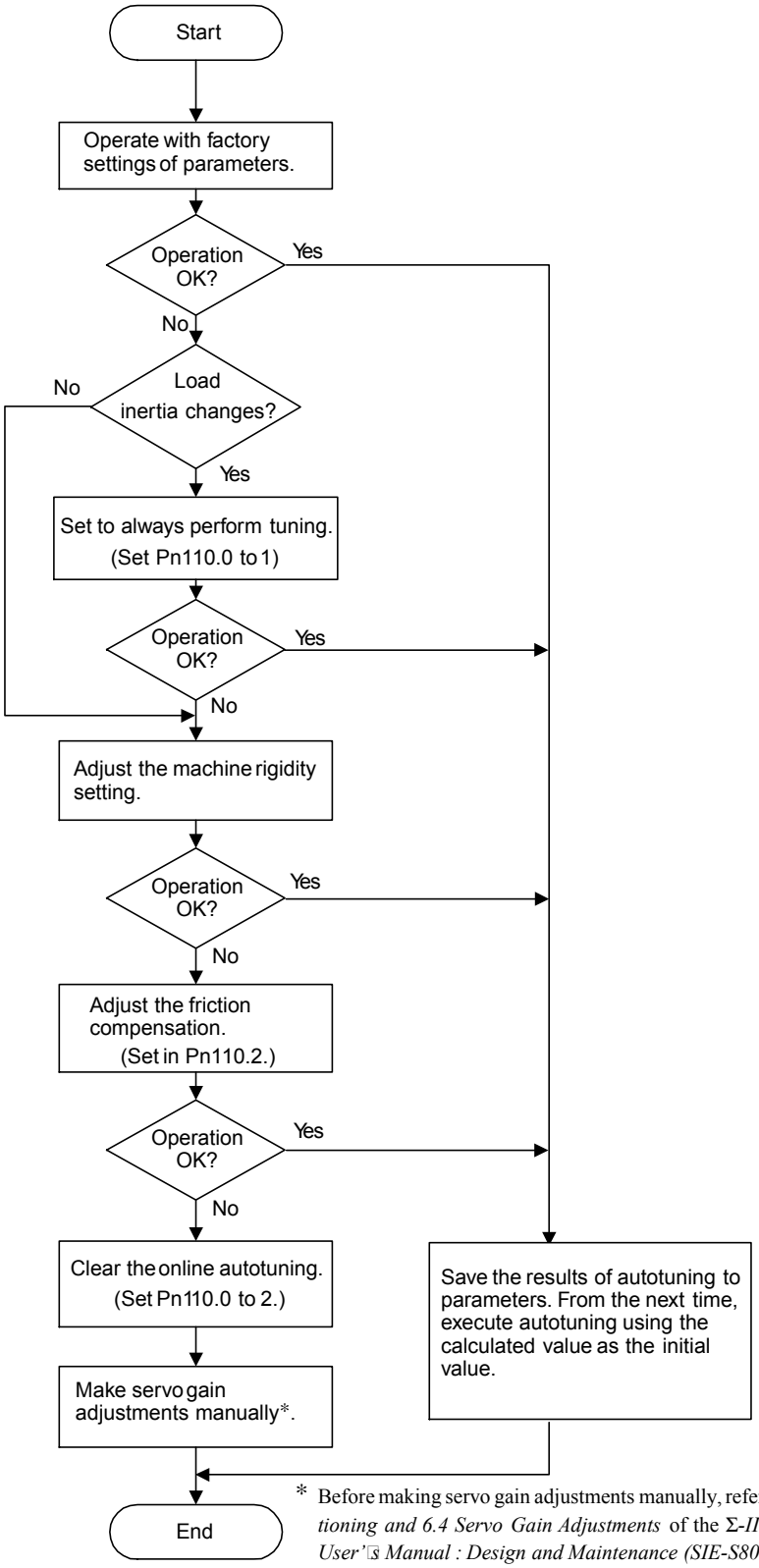
IMPORTANT

Do not use online autotuning in the following cases.

- When using IP control for the speed loop.
- When using the torque feed-forward function.

■ Setting Parameters for Online Autotuning

The following flowchart shows the procedure for setting the parameters for online autotuning.



* Before making servo gain adjustments manually, refer to *6.2 High-speed Positioning and 6.4 Servo Gain Adjustments* of the Σ-*II Series SGM□H/SGDH User's Manual : Design and Maintenance (SIE-S800-32.2).*

C.1.2 Machine Rigidity Settings for Online Autotuning

For the machine rigidity settings at the time of online autotuning, select the target values for speed loop gain and position loop gain of the servo system. Any of the following ten levels of rigidity can be selected.

Machine Rigidity Setting Fn001	Position Loop Gain [S^{-1}] Pn102	Speed Loop Gain [Hz] Pn100	Speed Loop Integral Time Constant [0.01ms] Pn101	Torque Reference Filter Time Constant [0.01ms] Pn401
1	15	15	6000	250
2	20	20	4500	200
3	30	30	3000	130
4	40	40	2000	100
5	60	60	1500	70
6	85	85	1000	50
7	120	120	800	30
8	160	160	600	20
9	200	200	500	15
10	250	250	400	10

Note: The rigidity value is factory-set to 4.

As the rigidity value is increased, the servo system loop gain increases and the time required for positioning is shortened. If the rigidity is excessively high, however, it may cause the machinery to vibrate. In that case, decrease the set value.

The rigidity value setting automatically changes the parameters in the above table.

If parameters Pn102, Pn100, Pn101, and Pn401 are set manually with the online autotuning function enabled, tuning is performed with the manually set values as target values.

■ Changing the Machine Rigidity Setting

The machine rigidity setting is changed using the Adjusting command (ADJ:3EH).

The procedure for making changes is shown below.

INFO

It is also possible to use a Digital Operator to change settings. Refer to the Σ-*II Series SGM□H/SGDH User's Manual : Design and Maintenance (SIE-S800-32.2)*.

1. By setting byte 1 of the MECHATROLINK command field to ADJ (3EH) and byte 2 to 00H, the following command field can be set.

	Command	Response	
5	CMD	ANS	CMD: Command ANS: Answer ADDRESS: Setting/reference address DATA: Setting/reference data
6	ADDRESS	ADDRESS	
7			
8	DATA	DATA	
9			

2. Send the following data in each command field.

   Set "01H" (Data setting) in the CMD field.

   Set "2003H" in the ADDRESS field.

   Set 1 to 10 in the DATA field.

3. After setting the data, send the command.

   It takes approximately 1 second after sending for setting to be completed.

   Continue to send the same command during this time.

4. Use the following data reference command to check when settings have been completed.

   Set "00H" (Data reference) in the CMD field.

   Set "2003H" in the ADDRESS field.

5. After setting the data, send the command.

   If a response is returned with the rigidity setting that is being made, the rigidity setting has been completed.

This completes changing the machine rigidity setting using online autotuning.

C.1.3 Saving Results of Online Autotuning

Online autotuning always processes the latest load inertia to renew data so that the speed loop gain will reach the target value that has been set. When the SERVOPACK is turned off, all the processed data is lost. Therefore, when the SERVOPACK is turned on again, online autotuning is performed by processing the factory-set values in the SERVOPACK.

To save the results of online autotuning and use them as the initial values set in the SERVOPACK when the SERVOPACK is turned on again, it is necessary to save them according to the procedures for saving the results of online autotuning. In this case, the inertia value set in parameter Pn103 can be changed.

On the basis of the rotor inertia of the Servomotor, the inertia ratio is expressed in percentage terms by the load inertia. The value set in Pn103 is used to calculate the load inertia at the time of online autotuning.

Pn103	Inertia Ratio	Unit: %	Setting Range: 0 to 10000	Factory Setting: 100	Position Control

$$\text{Inertia ratio} = \frac{\text{Motor axis conversion load inertia } (J_L)}{\text{Servomotor rotor of inertia } (J_M)} \times 100(\%)$$

The inertia ratio is factory-set to 0%.

IMPORTANT

Before making servo gain adjustments manually, be sure to set the inertia ratio in Pn103. If the inertia ratio is incorrect, the speed loop gain (in 1-Hz increments) set in Pn100 will be wrong.

■ Procedure for Saving Results of Online Autotuning

The Adjusting command (ADJ: 3EH) is used to save the results of online autotuning.

The procedure for saving results is shown below.

INFO

It is also possible to use a Digital Operator to save settings. Refer to the Σ-*II Series SGM□H/SGDH User's Manual : Design and Maintenance (SIE-S800-32.2)*.

1. By setting byte 1 of the MECHATROLINK command field to ADJ (3EH) and byte 2 to 00H, the following command field can be set.

	Command	Response	
5	CMD	ANS	CMD: Command ANS: Answer ADDRESS: Setting/reference address DATA: Setting/reference data
6	ADDRESS	ADDRESS	
7			
8	DATA	DATA	
9			

2. Send the following data in each command field.
   Set “01H” (Data setting) in the CMD field.
   Set “2000H” in the ADDRESS field.
   Set “1007H” in the DATA field.
3. After setting the data, send the command.
   The Online Autotuning Results Write Mode will be entered.
4. Continue by using the following data setting command.
   Set “01H” (Data setting) in the CMD field.
   Set “2001H” in the ADDRESS field.
   Set “01H” (Execute) in the DATA field.
5. After setting the data, send the command.
   It takes approximately 1 second to save settings.
   Continue to send the same command during this time.

This completes saving the online autotuning results.

C.1.4 Parameters Related to Online Autotuning

This section provides information on a variety of parameters related to online autotuning.

■ Online Autotuning Method

The following parameter is used to set the autotuning conditions.

Pn110.0	Online Autotuning Method	Factory Setting: 0	Position Control

Pn110.0 Setting	Description
0	Autotuning is performed only when the system runs for the first time after the power is turned ON. After the load inertia is calculated, the calculated data is not refreshed.
1	Autotuning is continuously performed (inertia value calculation).
2	The online autotuning function is not used.

This parameter is factory-set to "0." If the load inertia change is minimal or if the application makes few changes, there is no need to continue calculating the inertia while the system is in operation. Instead, continue to use the value that was calculated when the system was first started up.

Set this parameter to "1" if the load inertia always fluctuates due to the load conditions. Then the response characteristics can be kept stable by continuously refreshing the inertia calculation data and reflecting them in the servo gain.

If the load inertia fluctuation results within 200 ms, the inertia calculation data may not be refreshed properly. If that happens, set Pn110.0 to "0" or "2."

Set Pn110.0 to "2" if autotuning is not available or if the online autotuning function is not used because the load inertia is already known and the SERVOPACK is manually adjusted by setting the inertia ratio data in Pn103.

■ Speed Feedback Compensation Selection

Use the following parameter to enable or disable speed feedback compensation. Refer to *6.2.6 Speed Feedback Compensation* of the *Σ-II Series SGM□H/SGDH User's Manual : Design and Maintenance (SIE-S800-32.2)*.

This parameter can be left as it is if online autotuning is performed. If this parameter is set manually, however, the setting is reflected to the operational setting made during online autotuning.

Pn110.1	Speed Feedback Compensation Selection	Factory Setting: 1	Position Control

Pn110.1 Setting	Description
0	Enabled
1	Disabled

■ Friction Compensation Selection

Use the following parameter to enable or disable friction compensation to determine whether or not the friction of the servo system is to be taken into consideration for the calculation of load inertia.

If this compensation function is enabled, select small or large friction compensation according to the extent of friction in order to ensure highly precise load inertia calculation.

Pn110.2	Friction Compensation Selection	Factory Setting: 1	Position Control

Pn110.2 Setting	Description
0	Friction compensation: Disabled
1	Friction compensation: Small
2	Friction compensation: Large

INFO

1. Do not set friction compensation for loads with low friction (10% rated torque/speed or less).
2. Autotuning will be performed as if the load inertia was 30 times the motor inertia when the load inertia exceeds 30 times the motor inertia.

C.2 Absolute Encoder Setup (Initialization)

The Adjusting (ADJ: 3EH) command can be used to setup (initialize) the absolute encoder.

The setup procedure is outline below.

INFO

It is also possible to use a Digital Operator to change settings. Refer to *5.7.4 Absolute Encoder Setup* of the Σ-*II Series SGM□H/SGDH User's Manual : Design and Maintenance (SIE-S800-32.2)*.

1. By setting byte 1 of the MECHATROLINK command field to ADJ (3EH) and byte 2 to 00H, the following command field can be set.

	Command	Response	
5	CMD	ANS	CMD: Serial communications command ANS: Serial communications answer ADDRESS: Setting/reference address DATA: Setting/reference data
6	ADDRESS	ADDRESS	
7			
8	DATA	DATA	
9			

2. Send the following data in each command field.
   Set "01H" (Data setting) in the CMD field.
   Set "2000H" in the ADDRESS field.
   Set "1008H" in the DATA field.
3. After setting the data, send the command.
   The absolute encoder will enter the Setup Mode.
4. Continue by using the following data setting command to save the settings.
   Set "01H" (Data setting) in the CMD field.
   Set "2001H" in the ADDRESS field.
   Set "02H" (Save) in the DATA field.
5. After setting the data, send the command.
6. Send the following command to execute.
   Set "01H" (Data reference) in the CMD field.
   Set "2001H" in the ADDRESS field.
   Set "01H" (Execute) in the DATA field.
7. After setting the data, send the command.
   It approximately 2 seconds after sending for setting to be completed.
   Continue to send the same command during this time.

This completes setting up the absolute encoder.

C.3 Multiturn Limit Setting

The Adjusting command (ADJ: 3EH) can be used to set the multiturn limit.

Use the following setting procedure.

INFO

It is also possible to use a Digital Operator to make settings. Refer to *5.7.6 Multiturn Limit Setting* of the *SGM□H/SGDH User's Manual : Design and Maintenance (SIE-S800-32.2)*.

1. By setting byte 1 of the MECHATROLINK command field to ADJ (3EH) and byte 2 to 00H, the following command field can be set.

	Command	Response	
5	CMD	ANS	CMD: Command ANS: Answer ADDRESS: Setting/reference address DATA: Setting/reference data
6	ADDRESS	ADDRESS	
7			
8	DATA	DATA	
9			

2. Send the following data in each command field.
   Set "01H" (Data setting) in the CMD field.
   Set "2000H" in the ADDRESS field.
   Set "1013H" in the DATA field.
3. After setting the data, send the command.
   The Multiturn Limit Setting Mode will be entered.
4. Continue by using the following data setting commands to save the settings.
   Set "01H" (Data setting) in the CMD field.
   Set "2001H" in the ADDRESS field.
   Set "02H" (Save) in the DATA field.
5. After setting the data, send the command.
6. Send the following command to execute.
   Set "01H" (Data reference) in the CMD field.
   Set "2001H" in the ADDRESS field.
   Set "01H" (Execute) in the DATA field.
7. After setting the data, send the command.
   It takes approximately 2 seconds after sending for setting to be completed.
   Continue to send the same command during this time.

This completes setting the multiturn limit.

C.4 Automatic Offset Adjustment of Motor Current Detection Signals

The offset adjustment of the motor current detection signals has already been made before shipping the product. Therefore, it is not necessary for the users to make any adjustment. Use the automatic offset adjustment only if the torque ripple due to current offset is considered abnormally high or the torque ripple needs to be reduced to achieve higher accuracy.

The adjustment procedure is outlined below.

The automatic adjustment is possible only when the Servo is set to OFF with the main circuit power turned ON.

1. By setting byte 1 of the MECHATROLINK command field to ADJ (3EH) and byte 2 to 00H, the following command field can be set.

	Command	Response	
5	CMD	ANS	CMD: Command ANS: Answer ADDRESS: Setting/reference address DATA: Setting/reference data
6	ADDRESS	ADDRESS	
7			
8	DATA	DATA	
9			

2. Send the following data in each command field.

   Set “01H” (Data setting) in the CMD field.

   Set “2000H” in the ADDRESS field.

   Set “100EH” in the DATA field.

3. After setting the data, send the command.

   The automatic offset adjustment of motor current detection signals will be enabled.

4. Continue by using the following data setting command to execute the settings.

   Set “01H” (Data setting) in the CMD field.

   Set “2001H” in the ADDRESS field.

   Set “01H” (Execute) in the DATA field.

5. After setting the data, send the command.

   It takes approximately 2 seconds after sending for setting to be completed.

   Continue to send the same command during this time.

This completes setting up the automatic offset adjustment of the motor current detection signals.

C.5 Enabling the Panel Operator

If the Panel Operator indicator (LED) is turned OFF (refer to *7.3 Panel Operator Indicators*) by receiving a MECHATROLINK command, it can be lit by using an adjustment command (ADJ: 3EH) provided that no Hand-held Digital Operator is connected or no communications is taking place with personal computers.

Use the following setting procedure.

1. By setting byte 1 of the MECHATROLINK command field to ADJ (3EH) and byte 2 to 00H, the following command field can be set.

	Command	Response	
5	CMD	ANS	CMD: Command ANS: Answer ADDRESS: Setting/reference addresses DATA: Setting/reference data
6	ADDRESS	ADDRESS	
7			
8	DATA	DATA	
9			

2. Send the following data to each command field.

   Set “01H” (Data setting) in the CMD field.

   Set “2002H” in the ADDRESS field.

   Set “Desired data” in the DATA field.

3. When the settings are completed, send the command to enable the Panel Operator.

Appendix D

Σ-II Series Command Compatibility

This appendix describes the differences between the Σ-II Series and Σ Series products. Here, the Σ-II Series refers to the SGDH-□□□E + JUSTP-NS100 (referred to as simply the "SGDH"). The Σ Series refers to the SGDB-□□□N (referred to as simple the "SGDB-N") and the SGD-□□□N (referred to as simple the "SGD-N").

D.1 Command Comparison

Command specifications vary as shown in the following table.

Table D.1 Command Comparison

Command or Command Data	SGDB-N, SGD-N	SGDH
PRM_RD RPM_WR	Processing time: 2 ms	Processing time for SGDH parameters (Pn000 to Pn601): 2 to 6 ms (typ: 4ms) CMRDY in STATUS will become 0. Processing time for NS100 parameters (Pn8□□): 2 ms
ID_RD	Main unit only. DEVICE_CODE 00H SGDN-□□□N □: No capacity, voltage (SGDB-N) SGD-□□□N □: No capacity, voltage (SGD-N)	Specifications differ for the SGDH (Main unit) and the NS100 Option Unit. DEVICE_CODE: 00H: SDGH-□□□E □: Capacity, no voltage 50H: JUSP-NS100
CONFIG	CMDRDY stays at 1.	CMDRDY becomes 0 for approximately 4 s.
PPRM_RD	Supported.	Not supported. MECHATROLINK command warning (A.95) will be generated.
INTERPOLATE LATCH	Without feedforward.	With feedforward.
ADJ	Not supported.	Supported. See *Appendix C*.
SVCTRL	Not supported.	Supported.
External Latch Signal	EXT1 only. EXT1 monitoring is not possible with the SGD-N.	EXT2 and EXT 3 also supported.
Latch Processing Time	500 µs max.	3 ms max.
Option Monitor 1/2 Type	Option Monitor 1, 2 cannot be set.	Option Monitor 1, 2 can be set.
I/O Monitor	P-OT and N-OT use soft limit and logical OR.	P-OT and N-OT do not use soft limit and logical OR.
Status during Phase 1	ALARM in STATUS: 1 ALARM: 99H ALM output signal in CN1: Open	STATUS ALARM: 0 ALARM: 99H CN1 ALM output signal: Closed
Motion Command Activation Time (Start Distribution)	After 750 µs	After 1 ms
Motion Command Resolution (Same Command Method)	Speed resolution: 1.953 (reference units/s) Acceleration/deceleration: 15,625 (reference units/s^2)	Speed resolution: 0.488 (reference units/s) Acceleration/deceleration: 244 (reference units/s^2)

D.2 Absolute Encoder Comparison

Absolute encoder multiturn values differ as shown in the following table.

Table D.2 Multiturn Values Comparison

Item	SGDB-N, SGD-N	SGDH
Number of multiturns	0 to +99999 -99999 to 0	-32768 to +32767 (When Pn205 = 65535)
Multiturn limit function	None	Setting possible using Pn205 between 0 and 65534.

D.3 Parameters Comparison

The standard setting is for parameters to be expressed as Pn numbers, but by setting pin 4 ON the DIP switch (SW2) of the JUSP-NS100, parameters can be expressed as Cn numbers in the same manner as SGDB-N (SGD-N) SERVOPACKs. This is called Cn Number Mode.

■ Cn Number Mode

- Cn numbers are used as the parameter numbers.
- Units of the Cn numbers are used.

  Because the units differ, there may be some discrepancies in reading/writing values. Set to a number that can be divided by units of the Pn numbers when writing.
- The data setting ranges are the same as for Pn numbers.
- The conditions under which parameters are enabled are the same as for Pn numbers.
- Some Pn numbers may not have corresponding Cn numbers.

  If these numbers are written, a parameter setting warning (A.94) will not be generated but read data will be returned as 0.
- Only Pn numbers can be used with the Digital Operator.

■ Pn Numbers with Corresponding Cn Numbers

Appendix D.3 provides a comparative list of Cn numbers and their Pn number equivalents.

Using the List

If the parameter No. column is blank, there is no corresponding parameter.

If columns other than the Pn number are blank, they are the same as for the Cn number. Only differences are listed.

Cn/Pn sizes are the same.

1. Characters on the upper-right of the Pn number.

   S: Reserved for system use (Do not change). (These numbers are used for the MECHATROLINK SERVOPACK.)

   N: Not used (Do not change). (Not used by MECHATROLINK)
2. Validity

   ◎: Can be changed during operation

   ○: Can be changed when DEN = 1. (Do not change while DEN = 0. Operation cannot be guaranteed if changes are made.)

   ●: Can be changed while the Servo is OFF. (Do not change while the Servo is ON. Operation can not be guaranteed if changes are made during Servo ON.)

   Δ: Enabled once the power is turned OFF then ON again or after the CONFIG command is executed.

×: Read-only (A warning will not be generated if a write is attempted and the data written will not be read. The currently set data will be read.)

R: 0 when read.

Table D.3 SGDB-N, SGD-N, and SGDH Parameters Comparison

SGDB-N and SGD-N Cn Numbers									SGDH Pn Numbers								
Parameter No.	Bit	Name	Size	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Parameter No.	Digit	Name	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Remarks SGDH operation for corresponding Cn number
Cn001		Memory Switch 1	2	-	-	-	0080H	-									
	0	SV_ON Mask			0	1	0	●	Pn802	0						Δ	
	1	SENS_ON Mask			0	1	0	●		1						Δ	
	2	P-OT Mask			0	1	0	●	Pn50A	3	P-OT Signal Mapping		0	F	2	Δ	
	3	N-OT Mask			0	1	0	●	Pn50B	0	N-OT Signal Mapping		0	F	3	Δ	
	4	-			-	-	0	-									
	5	-			-	-	0	-									
	6	Stop Method for Base Block			0	1	0	●	Pn001	0	Servo OFF or Alarm Stop Mode		0	2	0	Δ	
	7	Status After DB Stop			0	1	1	●									
	8	Operation During OT			0	1	0	●		1	Overtravel Stop Mode		0	2	0	Δ	
	9	Operation after Deceleration Stop with OT Emergency Stop Torque			0	1	0	●									
	A	-			-	-	0	-									
	B	Mode Switch Function			0	1	0	●	Pn10B	0	Mode Switch Selection		0	4	0	Δ	
	C	Mode Switch Selection			0	1	0	●									
	D	Mode Switch Selection			0	1	0	●									
	E	Encoder Selection			0	1	0	Δ	Fn011 → E*		Encoder Type		0	1	Depends on machine type	×	
	F	Power Generation Unit			0	1	0	Δ	Pn001	2	DC Power Applications						

* Refer to *7.2.6 Checking the Motor Model* in the *Σ-II Series SGM□H/SGDH User's Manual for Design and Maintenance (SIE-S800-32.2)*.

Table D.3 SGDB-N, SGD-N, and SGDH Parameters Comparison

SGDB-N and SGD-N Cn Numbers									SGDH Pn Numbers								
Parameter No.	Bit	Name	Size	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Parameter No.	Digit	Name	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Remarks SGDH operation for corresponding Cn number
Cn002		Memory Switch 2	2	-	-	-	0000H	-									
	0	Reverse Rotation Mode			0	1	0	●	Pn000	0	Direction Selection					Δ	
	1	Zero point Error Detection Mask			0	1	0	●									
	2	-			-	-	0	-									
	3	-			-	-	0	-									
	4	-			-	-	0	-									
	5	-			-	-	0	-									
	6	Software Limit Check using Reference Target Position			0	1	0	●	Pn801	2	Software Limit Reference Range						
	7	-			-	-	0	-									
	8	-			-	-	0	-									
	9	-			-	-	0	-									
	A	-			-	-	0	-									
	B	-			-	-	0	-									
	C	-			-	-	0	-									
	D	-			-	-	0	-									
	E	-			-	-	0	-									
	F	-			-	-	0	-									
Cn003		Load Inertia	2	%	0	65535	100	◎	Pn103		Inertia Ratio			10000	0		
Cn004		Speed Loop Gain	2	0.1Hz	0	20000	400	◎	Pn100			Hz	1	2000	40		Differs for Read or Write
Cn005		Differential Speed Loop Parameter	2	0.01ms	100	65535	2000	◎	Pn101				15	51200			

Table D.3 SGDB-N, SGD-N, and SGDH Parameters Comparison

SGDB-N and SGD-N Cn Numbers								SGDH Pn Numbers							
Parameter No. / Bit	Name	Size	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Parameter No. / Digit	Name	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Remarks SGDH operation for corresponding Cn number
Cn006	Emergency Stop Torque	2	%	0	MAX	MAX	◎	Pn406				800	800		
Cn007	Positioning Proximity Width	2	Reference unit	1	10000	10	◎	Pn504	NEAR Signal Width			250	7		
Cn008	Forward Torque Limit	2	%	0	MAX	MAX	◎	Pn402				800	800		
Cn009	Reverse Torque Limit	2	%	0	MAX	MAX	◎	Pn403				800	800		
Cn00A	Reserved	2	-	-	-	0	-								When read:0
Cn00B	Reserved	2	-	-	-	0	-								When read:0
Cn00C	Mode Switch (Torque reference)	2	%	0	32767	200	◎	Pn10C				800			
Cn00D	Reserved	2	-	-	-	0	◎								
Cn00E	Mode Switch (Acceleration)	2	10 min^{-1}/s	0	3000	0	◎	Pn10E							
Cn00F	Mode Switch (Error Pulse)	2	Pulse	0	10000	0	◎	Pn10F		Reference unit					As reference unit
Cn010	Reserved	2	-	-	-	0									When read:0
Cn011	Number of Encoder Pulses	2	-	513	32767	-	●	Fn011→E*	Encoder Resolution	Bits/R	13	20	Depends on machine type	×	
Cn012	Servo OFF Delay Time for Brake Reference	2	10 ms	0	50	0	●	Pn506							

Table D.3 SGDB-N, SGD-N, and SGDH Parameters Comparison

SGDB-N and SGD-N Cn Numbers									SGDH Pn Numbers								
Parameter No.	Bit	Name	Size	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Parameter No.	Digit	Name	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Remarks SGDH operation for corresponding Cn number
Cn013		Memory Switch 3	2	-	-	-	0000H	-									
	0	-			-	-	0	-									
	1	-			-	-	0	-									
	2	-			-	-	0	-									
	3	-			-	-	0	-									
	4	-			-	-	0	-									
	5	-			-	-	0	-									
	6	-			-	-	0	-									
	7	-			-	-	0	-									
	8	-			-	-	0	-									
	9	-			-	-	0	-									
	A	MECHATROLINK Communications Error Mask			0	1	0	◎	Pn800	0	Communications Controls		0	3	0		
	B	MECHATROLINK WDT Error Mask			0	1	0	◎									
	C	-			-	-	0	-									
	D	-			-	-	0	-									
	E	-			-	-	0	-									
	F	-			-	-	0	-									

Table D.3 SGDB-N, SGD-N, and SGDH Parameters Comparison

SGDB-N and SGD-N Cn Numbers									SGDH Pn Numbers								
Parameter No.	Bit	Name	Size	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Parameter No.	Digit	Name	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Remarks SGDH operation for corresponding Cn number
Cn014		Memory Switch 4	2	-	-	-	0000H	-									
	0	-			-	-	0	-									
	1	Return to Zero point Direction			0	1	0	○	Pn816	0							
	2	P-SOT Mask			0	1	0	●	Pn801	0	Software Limit Operation		0	3	0		
	3	N-SOT Mask			0	1	0	●									
	4	-			-	-	0	-									
	5	DEC Signal Mask			0	1	0	●	Pn511	0	DEC Signal Mapping		0	F	1	Δ	
	6	EXT Signal Mask			0	1	0	●	Pn511	1	EXT1 Signal Mapping		0	F	4	Δ	
	7	-			-	-	0	-									
	8	-			-	-	0	-									
	9	Brake Operation			0	1	0	●	Pn005	0						Δ	Factory setting Servo operation
	A	P-OT Logic Return			0	1	0	●	Pn50A	3	P-OT Signal Mapping		0	F	2	Δ	
	B	N-OT Logic Return			0	1	0	●	Pn50B	0	N-OT Signal Mapping		0	F	3	Δ	
	C	DEC Logic Return			0	1	0	●	Pn511	0	DEC Signal Mapping		0	F	1	Δ	
	D	-			-	-	0	-									
	E	-			-	-	0	-									
	F	-			-	-	0	-									
Cn015		Brake Reference Output Speed Level	2	min^{-1}	0	MAX	100	●	Pn507					10000			
Cn016		Reference Wait Time after Servo OFF	2	10 ms	10	100	50	●	Pn508								
Cn017		Torque Reference Filter Parameter	2	0.001 ms	0	25000	400	◎	Pn401			0.01 ms		65535	100		Differs for Read or Write

Table D.3 SGDB-N, SGD-N, and SGDH Parameters Comparison

SGDB-N and SGD-N Cn Numbers								SGDH Pn Numbers							
Parameter No. / Bit	Name	Size	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Parameter No. / Digit	Name	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Remarks (SGDH operation for corresponding Cn number)
Cn018	Torque Reference Filter Parameter (2nd)	2	-	-	-	0	◎								
Cn019	Reserved	2	-	-	-	0	-								When read:0
Cn01A	Position Loop Gain	2	0.01/s	1	50000	4000	◎	Pn102		1/s	1	2000	40		
Cn01B	Positioning Completed Width	2	Reference unit	0	250	7	◎	Pn500							
Cn01C	Bias	2	100 reference units/s	0	MAX	0	◎	Pn107		min^{-1}		10000			Differs for Read or Write
Cn01D	Feed forward	2	%	0	100	0	◎	Pn109							
Cn01E	Position Error Overflow Value	2	Reference unit or 128 reference units	1	65535	65535	◎	Pn505	Overflow level	256 Reference units		32767	1024		Differs for Read or Write
Cn01F	First-step Linear Acceleration/ Deceleration Parameter	2	10000 reference units/s^2	0	65535	0	○	Pn80A	First-step Linear Acceleration Parameter		1		100		
								Pn80D	First-step Linear Deceleration Parameter		1		100		
Cn020	Second-step Linear Acceleration/ Deceleration Parameter	2	10000 reference units/s^2	0	65535	100	○	Pn80B	Second-step Linear Acceleration Parameter		1		100		
								Pn80E	Second-step Linear Deceleration Parameter		1		100		
Cn021	Acceleration/ Deceleration Parameter Switching Speed	2	100 reference units/s	0	65535	0	○	Pn80C	Acceleration Parameter Switching Speed		0		0		
								Pn80F	Deceleration Parameter Switching Speed		0		0		

Table D.3 SGDB-N, SGD-N, and SGDH Parameters Comparison

SGDB-N and SGD-N Cn Numbers								SGDH Pn Numbers							
Parameter No. Bit	Name	Size	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Parameter No. Digit	Name	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Remarks SGDH operation for corresponding Cn number
Cn022	Zero point Return Approach Speed 1	2	100 Reference units/s	0	65535	50	○	Pn817							
Cn023	Zero point Return Approach Speed 2	2	100 Reference units/s	0	65535	5	○	Pn818							
Cn024	Electronic Gear Ratio (Numerator)	2	-	1	32768	4	●	Pn202				65535		Δ	
Cn025	Electronic Gear Ratio (Denominator)	2	-	1	32768	1	●	Pn203				65535		Δ	
Cn026	Movement Average Time	2	0.1 ms	0	5100	0	○	Pn812							
Cn027	Feed Forward Filter Time Constant	2	0.001 ms	0	64000	0	◎	Pn10A		0.01 ms		6400			
Cn028	Final Travel Distance to Return to Zero point	4	Reference unit	-2^{31}	$2^{31}-1$	100	○	Pn819			$-2^{30}+1$	$2^{30}-1$			
Cn02A	Zero Point Range	2	Reference unit	0	65535	10	◎	Pn803				250			
Cn02B	Final Travel Distance for External Positioning	4	Reference unit	-2^{31}	$2^{31}-1$	100	○	Pn814			$-2^{30}+1$	$2^{30}-1$			
Cn02D	Exponential Acceleration/ Deceleration Bias	2	500 Reference units/s	0	32767	0	○	Pn810		100 Reference units/s					
Cn02E	Exponential Acceleration/ Deceleration Time Constant	2	0.1 ms	0	5100	0	○	Pn811							

Table D.3 SGDB-N, SGD-N, and SGDH Parameters Comparison

SGDB-N and SGD-N Cn Numbers								SGDH Pn Numbers							
Parameter No. / Bit	Name	Size	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Parameter No. / Digit	Name	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Remarks SGDH operation for corresponding Cn number
Cn02F	Forward Software Limit	4	Reference unit	-2^{31}	$2^{31}-1$	8192 ×99999	●	Pn804			$-2^{30}+1$	$2^{30}-1$			
Cn031	Reverse Software Limit	4	Reference unit	-2^{31}	$2^{31}-1$	-8192 ×99999	●	Pn806			$-2^{30}+1$	$2^{30}-1$			
Cn033	Absolute Encoder Zero Point Positioning Offset	4	Reference unit	-2^{31}	$2^{31}-1$	0	Δ	Pn808			$-2^{30}+1$	$2^{30}-1$			
Cn035	Speed Loop Interpolation Parameter	2	-	0	100	0	●								
Cn036	Reserved	2	-	-	-	0	-								When read:0
Cn037	Motor Selection	2	-	0	255	Capacity	●								When read:0
Cn038	PG Power Supply/Voltage Adjustment	2	-	52000	58000	52500	●								When read:0
Cn039	Reserved	2	-	-	-	0	-								When read:0
Cn03A	Reserved	2	-	-	-	0	-								When read:0
Cn03B	Reserved	2	-	-	-	0	-								When read:0
Cn03C	Reserved	2	-	-	-	0	-								When read:0
Cn03D	Reserved	2	-	-	-	0	-								When read:0
Cn03E	Reserved	2	-	-	-	0	-								When read:0
Cn03F	Reserved	2	-	-	-	0	-								When read:0

Table D.3 SGDB-N, SGD-N, and SGDH Parameters Comparison

SGDB-N and SGD-N Cn Numbers								SGDH Pn Numbers								
Parameter No.	Name	Size	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Parameter No.	Name	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Remarks	
Bit								Digit							SGDH operation for corresponding Cn number	
								Pn000	Function Selection Basic Switches 1	-	-	-	0010	Δ		
								1 S	Control Method (Reserved)		-	-	1	Δ		
								2	Axis Address		0	F	0	Δ		
								3	Reserved		-	-	0	Δ		
								Pn001	Function Selection Application Switches	-	-	-	0000	Δ		
								3	Warning Code Output Selection		0	1	0	Δ		
								Pn002	Function Selection Application Switches 2	-	-	-	0000	Δ		
								0	Speed Control Option (Reserved)		-	-	0	Δ		
								1	Torque Control Option N		-	-	0	Δ		
								2	Absolute Encoder Usage		0	2	0	Δ		
								3	Position Control		-	-	1	Δ		
								Pn003	Function Selection Application Switches 3	-	-	-	0002	◎		
								Pn004 S	Function Selection Application Switches 4	-	-	-	0001	Δ		
								Pn104 N	Second Speed Loop Gain	Hz	1	2000	40	◎		
								Pn105 N	Second Speed Loop Integer Parameter	0.01ms	15	51200	2000	◎		
								Pn106 N	Second Position Loop Gain	1/s	1	2000	40	◎		

Table D.3 SGDB-N, SGD-N, and SGDH Parameters Comparison

SGDB-N and SGD-N Cn Numbers								SGDH Pn Numbers							
Parameter No. / Bit	Name	Size	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Parameter No. / Digit	Name	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Remarks: SGDH operation for corresponding Cn number
								Pn108	Bias Width Addition	Reference unit	0	250	7	◎	
								Pn10D	Mode Switch (Speed Reference)	min^{-1}	0	10000	0	◎	
								Pn110	Online Autotuning Switches	-	-	-	0000	◎	
								Pn111	Speed Feedback Compensation	-	1	100	100	◎	
								Pn112	Reserved parameter (Do not change.)	%	0	1000	100	◎	
								Pn113	Reserved parameter (Do not change.)	0.1 Hz	0	10000	1000	◎	
								Pn114	Reserved parameter (Do not change.)	-	0	400	200	◎	
								Pn115	Reserved parameter (Do not change.)	0.1 ms	0	1000	32	◎	
								Pn116	Reserved parameter (Do not change.)	0.1 ms	0	1000	16	◎	
								Pn117	Reserved parameter (Do not change.)	%	20	100	100	Δ	
								Pn118	Reserved parameter (Do not change.)	%	50	100	100	Δ	
								Pn119	Reserved parameter (Do not change.)	1/s	1	2000	60	◎	
								Pn11A	Reserved parameter (Do not change.)	0.1 %	1	2000	1000	◎	
								Pn11B	Reserved parameter (Do not change.)	Hz	1	150	50	◎	

Table D.3 SGDB-N, SGD-N, and SGDH Parameters Comparison

SGDB-N and SGD-N Cn Numbers								SGDH Pn Numbers							
Parameter No. / Bit	Name	Size	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Parameter No. / Digit	Name	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Remarks: SGDH operation for corresponding Cn number
								Pn11C	Reserved parameter (Do not change.)	Hz	1	150	70	◎	
								Pn11D	Reserved parameter (Do not change.)	%	0	150	100	◎	
								Pn11E	Reserved parameter (Do not change.)	%	0	150	100	◎	
								Pn11F	Reserved parameter (Do not change.)	ms	0	2000	0	◎	
								Pn120	Reserved parameter (Do not change.)	0.01ms	0	51200	0	◎	
								Pn121	Reserved parameter (Do not change.)	Hz	1	250	50	◎	
								Pn122	Reserved parameter (Do not change.)	Hz	0	250	0	◎	
								Pn123	Reserved parameter (Do not change.)	%	0	100	0	◎	
								Pn200^{S}	Position Control Reference Status Selection Switches	-	-	-	0000	-	
								Pn201^{N}	PG Differential Ratio	-	16	16384	16384	Δ	
								Pn204^{S}	Position Reference Acceleration/ Deceleration Parameter	0.01ms	0	6400	0	◎	
								Pn205	Multiturn Limit Setting	rev	0	65535	65535	Δ	
								Pn206	Number of Fully Closed Pulses	P/R	513	32768	16384	Δ	
								Pn207^{S}	Position Reference Function Switches	-	-	-	0010	Δ	

Table D.3 SGDB-N, SGD-N, and SGDH Parameters Comparison

SGDB-N and SGD-N Cn Numbers								SGDH Pn Numbers							
Parameter No. / Bit	Name	Size	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Parameter No. / Digit	Name	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Remarks: SGDH operation for corresponding Cn number
								Pn208^{N}	Position Reference S-curve Filter Parameter	0.01 ms	0	6400	0	Δ	
								Pn300^{N}	Speed Reference Input Gain	0.01 V/ Rated speed	15	300	30	◎	
								Pn301^{N}	Internal Set Speed 1	min^{-1}	0	10000	100	◎	
								Pn302^{N}	Internal Set Speed 2	min^{-1}	0	10000	200	◎	
								Pn303^{N}	Internal Set Speed 3	min^{-1}	0	10000	300	◎	
								Pn304	Jog Speed	min^{-1}	0	10000	500	◎	
								Pn305	Soft Start Acceleration Time	ms	0	10000	0	◎	
								Pn306	Soft Start Deceleration Time	ms	0	10000	0	◎	
								Pn307^{N}	Speed Reference Filter Parameter	0.01 ms	0	65535	40	◎	
								Pn308	Speed Feed-forward Filter Time Constant	0.01 ms	0	65535	0	◎	
								Pn400^{N}	Torque Reference Input Gain	0.1 V/ Rated torque	10	100	30	◎	
								Pn404	External Input Forward Torque Limit	%	0	800	100	◎	
								Pn405	External Input Reverse Torque Limit	%	0	800	100	◎	
								Pn407^{N}	Torque Control Speed Limit	min^{-1}	0	10000	10000	◎	
								Pn408	Torque Control Function Switches	-	-	-	0000	◎	

Table D.3 SGDB-N, SGD-N, and SGDH Parameters Comparison

SGDB-N and SGD-N Cn Numbers								SGDH Pn Numbers								
Parameter No. / Bit	Name	Size	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Parameter No. / Digit	Name	Unit	Lower Limit	Upper Limit	Factory Setting	Validity	Remarks: SGDH operation for corresponding Cn number
								Pn409	Notch Filter Frequency	Hz	50	2000	2000	◎	
								Pn501[N]	Zero Clamp Level	min^{-1}	0	10000	10	◎	
								Pn502	Rotation Detection Level	min^{-1}	1	10000	20	◎	
								Pn503[N]	Speed Matching Signal Detection Width	min^{-1}	0	100	10	◎	
								Pn509	Momentary Hold Time	ms	20	1000	20	◎	
								Pn50A[S]	Input Signal Selections 1	-	-	-	2881	Δ	
								Pn50C[S]	Input Signal Selections 3	-	-	-	8888	Δ	
								Pn50D[S]	Input Signal Selections 4	-	-	-	8888	Δ	
								Pn50E	Output Signal Selections 1	-	-	-	3001	Δ	
								Pn50F	Output Signal Selections 2	-	-	-	0200	Δ	
								Pn510	Output Signal Selections 3	-	-	-	0000	Δ	
								Pn511	Input Signal Selections 5	-	-	-	6541	Δ	
								Pn512	Output Signal Reversal	-	-	-	0000	Δ	
								Pn600	Regenerative Resistor Capacity	10 W	0	1000	0	Δ	
								Pn601	Reserved parameter (Do not change.)	-	0	1000	0	Δ	
								Pn801 / 1	Software Limit Operation Selection	-	0	1	0	●	
								Pn813	Option Monitor	-	-	-	0010	◎	

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Σ-Ⅱ SERIES SGDH
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