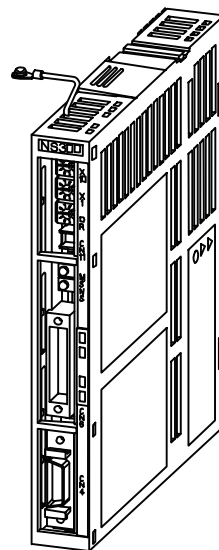




YASKAWA

Σ -II Series SGDh
DeviceNet
APPLICATION MODULE
USER'S MANUAL

MODEL: JUSP-NS300
JUSP-NS300-E



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Overview

■ About this Manual

This manual provides the following information for the Σ -II Series SGM□H/SGDH Servodrives with a JUSP-NS300 DeviceNet Application Module (hereinafter called the NS300 Module) mounted.

- Procedures for installing and wiring the NS300 Module
- Specifications and methods for SERVOPACK DeviceNet communications
- Procedures for setting parameters
- Information on the NS□□□ Setup Tool
- Troubleshooting procedures

■ Intended Audience

This manual is intended for the following users.

- Those designing Servodrive systems using DeviceNet.
- 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:

- **NS300 Module** = JUSP-NS300 or JUSP-NS300-E
- **Servomotor** = Σ -II Series SGMAH, SGMPH, SGMGH, or SGMSH servomotor.
- **SERVOPACK** = Σ -II Series SGD□-□□□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.

IMPORTANT

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



Indicates supplemental information.

EXAMPLE

Indicates application examples.



Indicates definitions of difficult 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 | SIEPS8000005 | Provides detailed information on selecting Σ -II Series Servodrives/Servomotors and capacities, and detailed information on installation, wiring, trial operation, using functions, maintenance, and inspection. |
| Linear Σ Series SGL□□/SGDH User's Manual | SIEPS8000019 | Provides detailed information on the specifications and using method for the Linear Σ Series SGL□□/SGDH. |


Registered Trademark

DeviceNet is a registered trademark of the ODVA (Open DeviceNet Vendor Association, Inc.).

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.

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.

■ Storage and Transportation

 **CAUTION**

- If disinfectants or insecticides must be used to treat packing materials such as wooden frames, pallets, or plywood, the packing materials must be treated before the product is packaged, and methods other than fumigation must be used.

Example: Heat treatment, where materials are kiln-dried to a core temperature of 56°C for 30 minutes or more.

If the electronic products, which include stand-alone products and products installed in machines, are packed with fumigated wooden materials, the electrical components may be greatly damaged by the gases or fumes resulting from the fumigation process. In particular, disinfectants containing halogen, which includes chlorine, fluorine, bromine, or iodine can contribute to the erosion of the capacitors.

■ 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.

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Revision History

Checking Products and Part Names

This chapter describes the procedure for checking Σ -II Series products and the NS300 Module upon delivery. It also describes the names of product parts.

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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 NS300 Module. (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 NS300 Module 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 NS300 Module. 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 Example

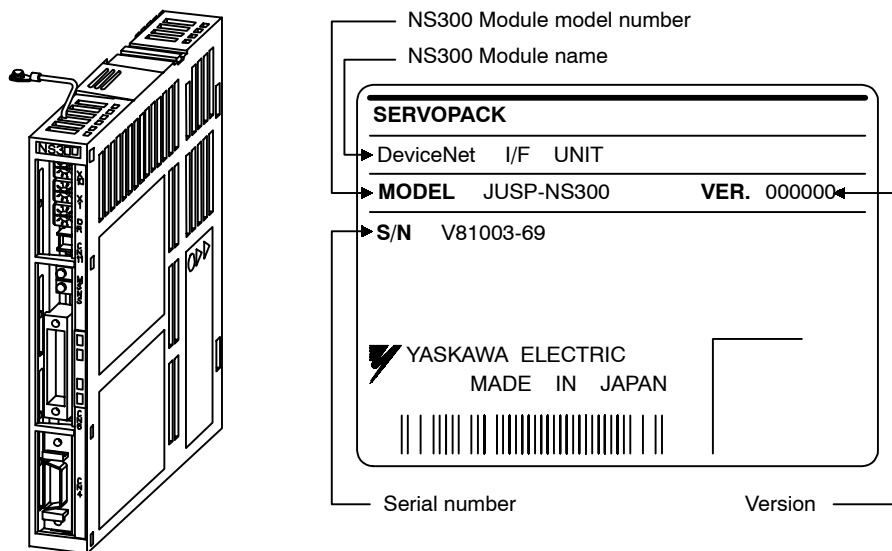


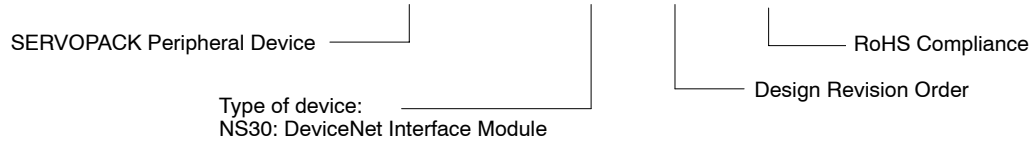
Figure 1.1 External Appearance of the NS300 Module

Figure 1.2 Nameplate Example

■ Model Number

NS300 Module

J S P - NS30 0 - E



1.2 Product Part Names

The following diagram illustrates the part names of the NS300 Module.

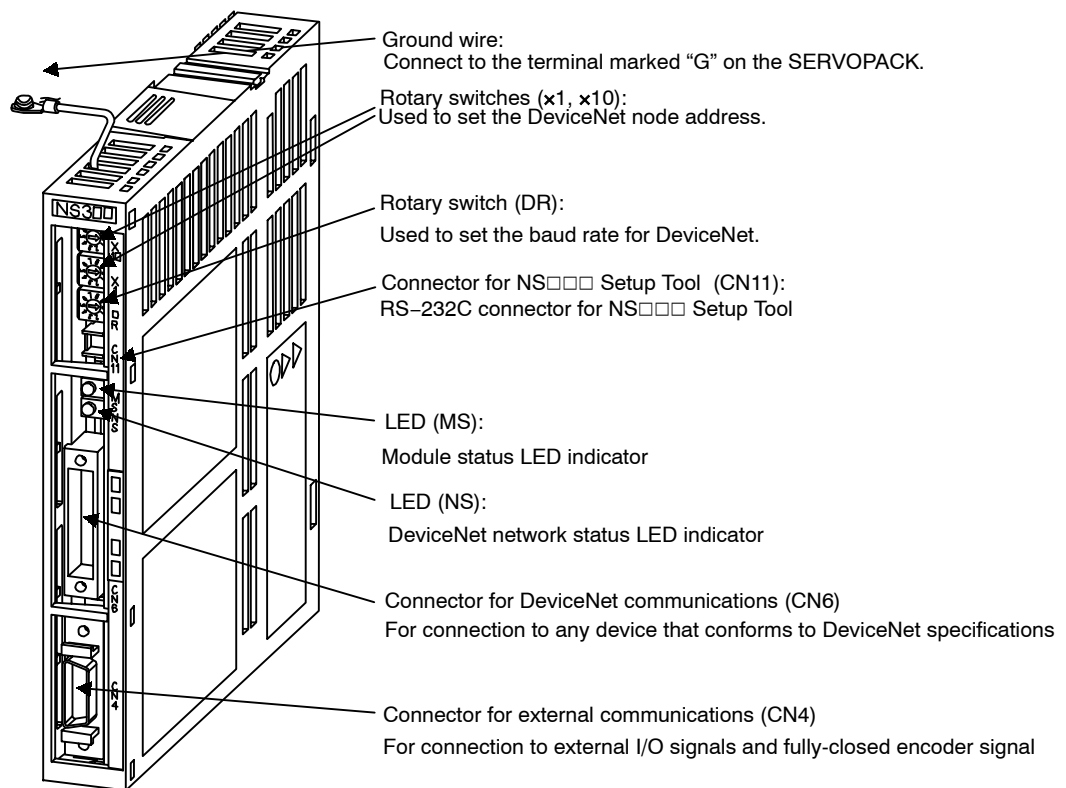


Figure 1.3 NS300 Module

1.3 Mounting the NS300 Module

This section describes how to mount a NS300 Module on the SGDH SERVOPACK.

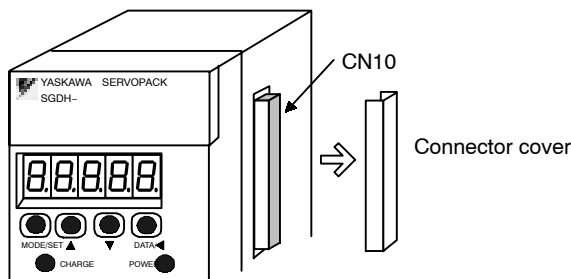
Prepare the screws for connecting the ground wire as shown in the following table:

| Mounting Type | SERVOPACK Models | Screw | Remarks |
|---------------|---|--|---|
| Base Mounted | SGDH-A3 to 02BE SGDH-A3 to 10AE | M3 x 10 round-head screw (spring or flat washer) | Use attached screws on the NS300 Module. |
| | SGDH-15 to 50AE SGDH-05 to 30DE | M4 x 10 round-head screws (spring or flat washer) | Use attached screws on the NS300 Module. |
| | SGDH-60/75AE | M4 x 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 x 6 round-head screws (spring or flat washer) | Use attached screws on the NS300 Module. (see note) |
| Duct Vent | SGDH-60/75AE-P | M4 x 8 round-head screw (spring or flat washer) | Use front panel fixer screws |

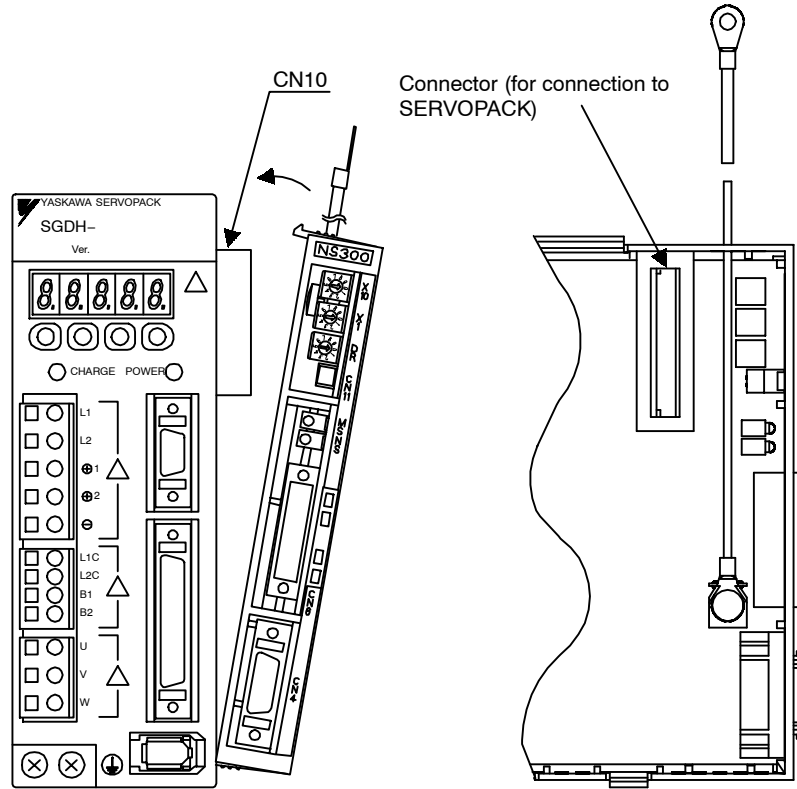
Note: Be sure to use spring washers or flat washers. Failure to do so may result in the screws for connecting the ground wire protruding behind the flange, preventing the SERVOPACK from being mounted.

By mounting NS300 Module, the SGDH SERVOPACK can be used in a DeviceNet network. Use the following procedure to ensure NS300 Modules are mounted correctly.

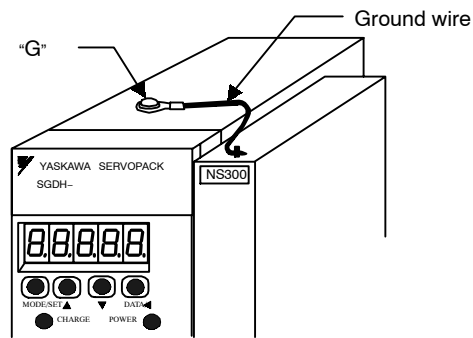
1. Remove the connector cover from the CN10 connector on the SERVOPACK.



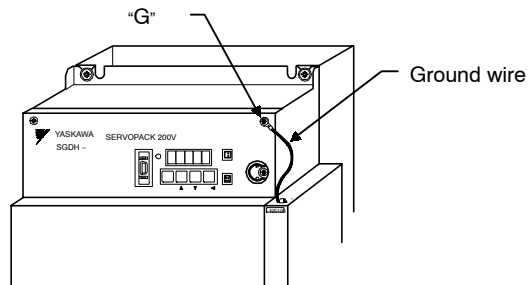
2. Mount the NS300 Module on the SERVOPACK.



3. For grounding, connect a ground wire of the NS300 Module to the point marked “G” on the SERVOPACK.

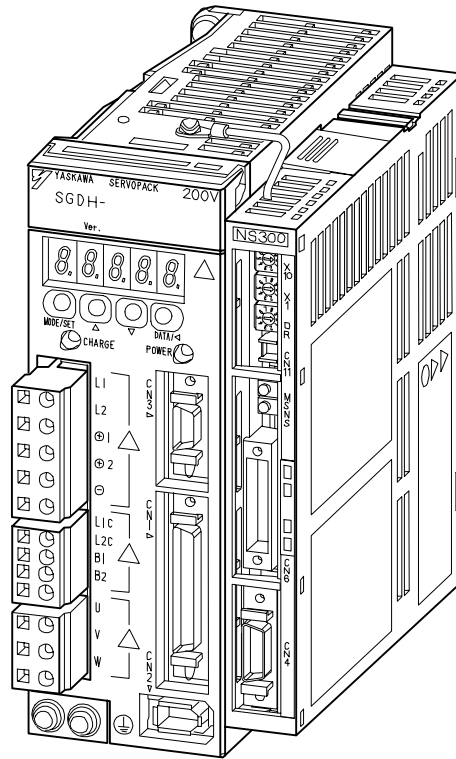


For SERVOPACK 30 W to 5.0 kW



For SERVOPACK 6.0 kW to 7.5 kW

When the NS300 Module has been mounted correctly, the SERVOPACK will appear as shown in the following diagram.



1

2

Installation

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

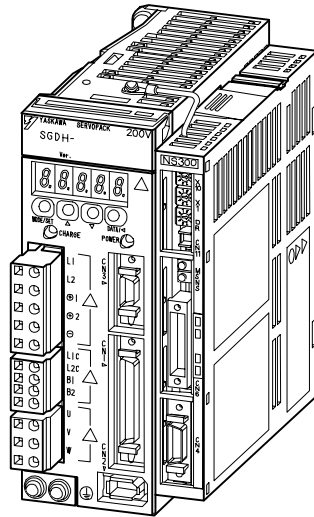
The SGD_H SERVOPACKs are base-mounted servo amplifiers. Incorrect installation will cause problems. Always observe the installation precautions shown in this chapter.

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2.1 Storage Conditions

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

Temperature range: -20 to 85°C



Σ-II Series SGDH SERVOPACK
with NS300 Module mounted

2.2 Installation Site

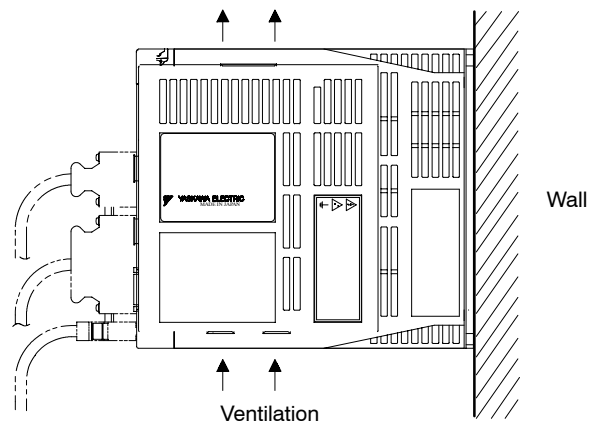
Take the following precautions at the installation site.

| Situation | Installation Precaution |
|--|---|
| Installation in a Control Panel | Design the control panel size, module layout, and cooling method so that the temperature around the SERVOPACK does not exceed 55°C. |
| Installation Near a Heating Module | Minimize heat radiated from the heating module 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

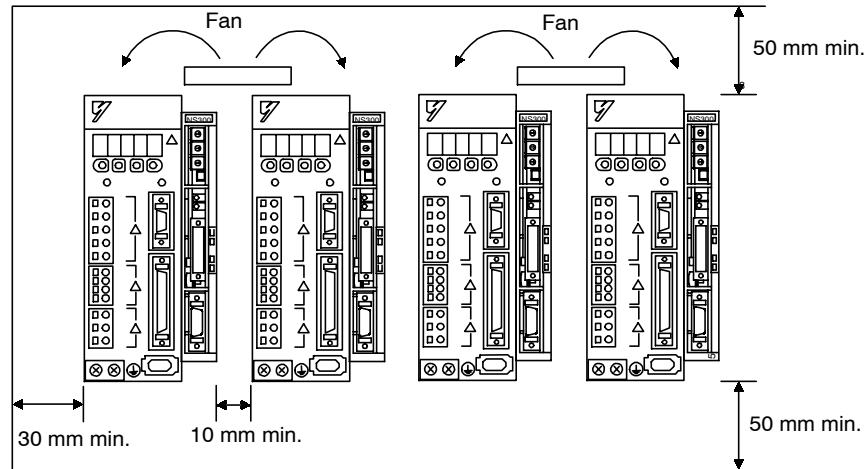
Install the SERVOPACK perpendicular to the wall as shown in the figure. The SERVOPACK must be oriented this way because it is designed to be cooled by natural convection or cooling fan.

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% or less
- Vibration: 4.9 m/s²
- Condensation and Freezing: None
- Ambient Temperature for Long-term Reliability: 45°C max.

3

Connectors

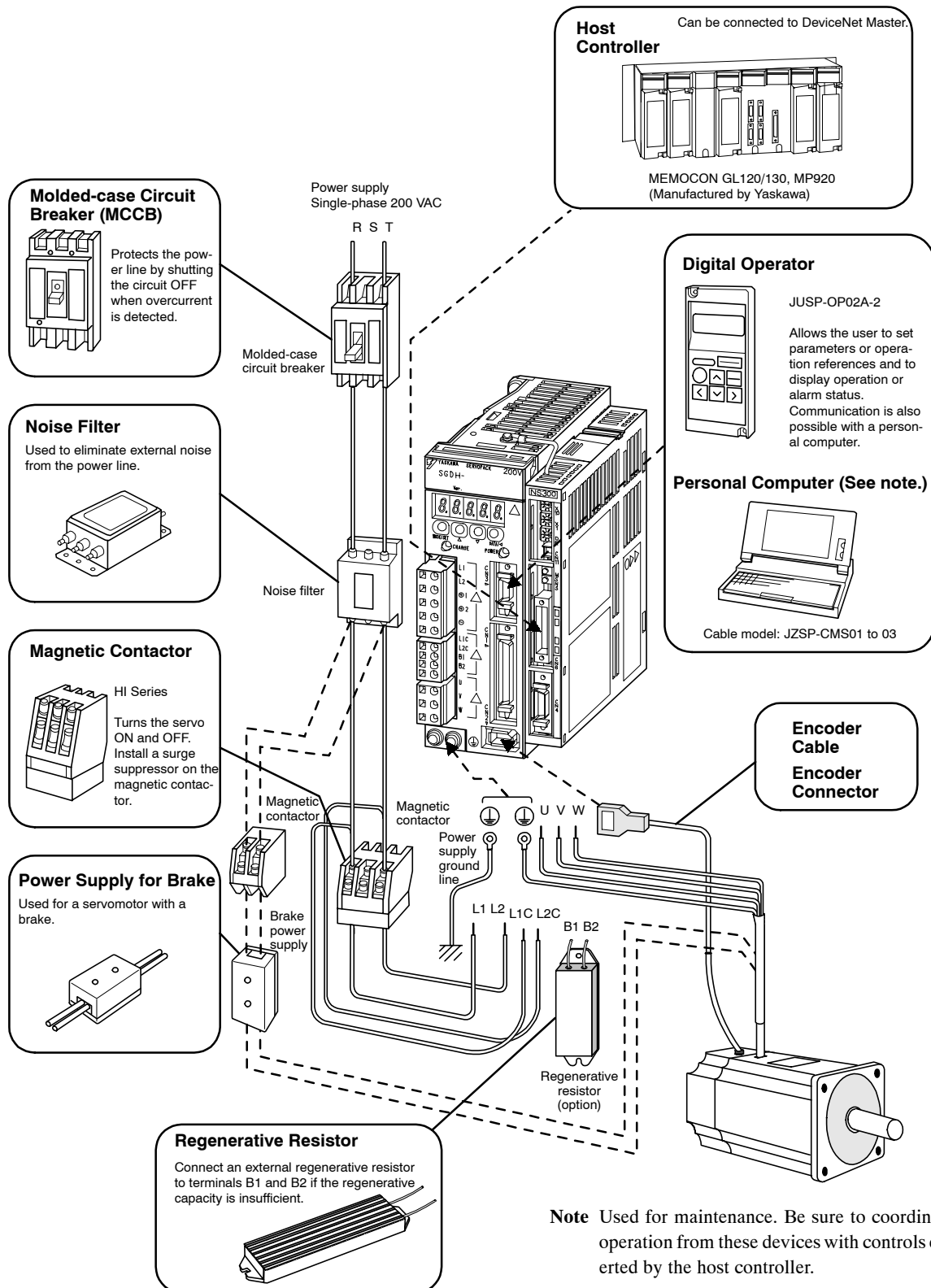
This chapter describes the procedure used to connect Σ -II Series products to peripheral devices when NS300 Module is mounted and gives typical examples of I/O signal connections.

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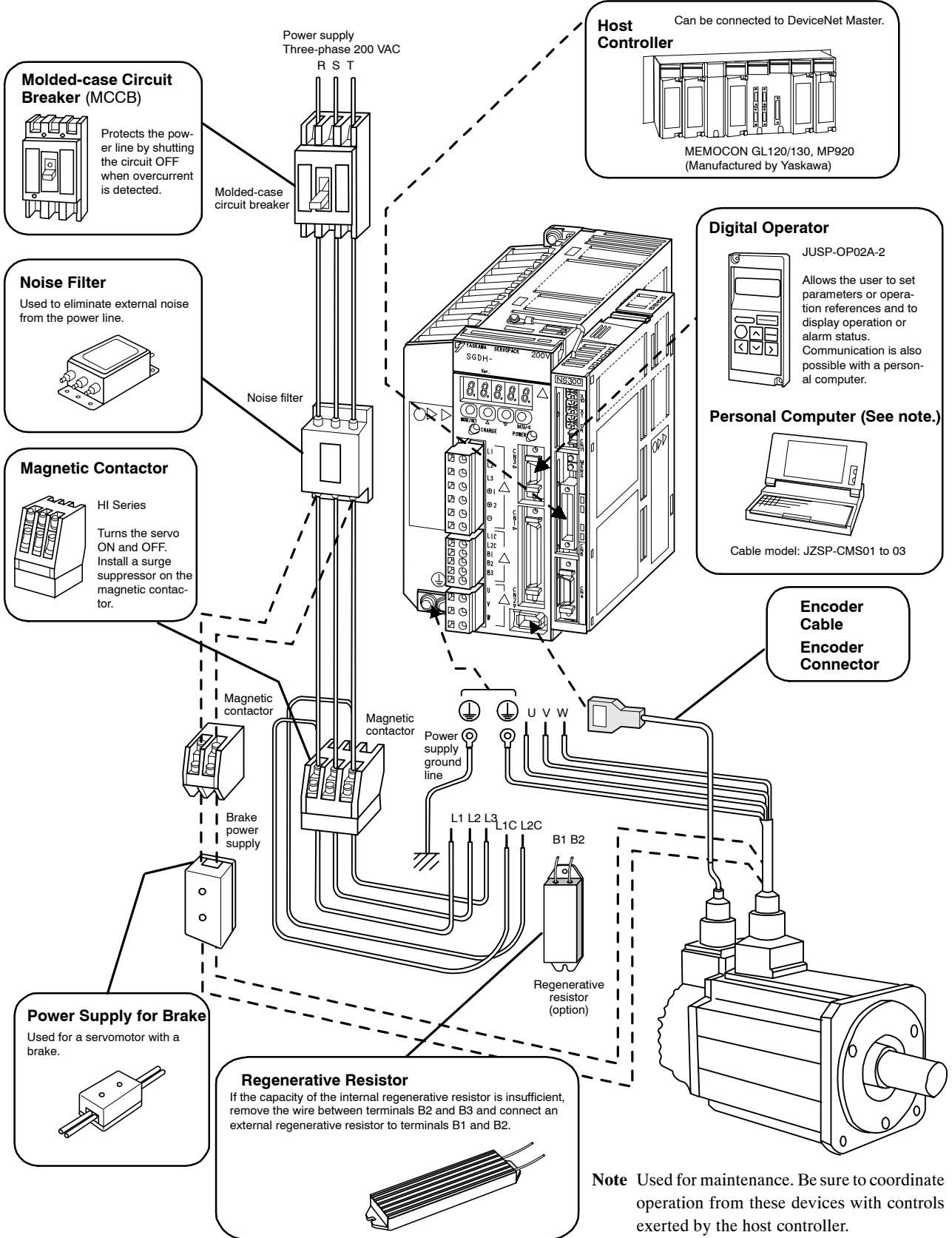
3.1 Connecting to Peripheral Devices

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



Molded-case Circuit Breaker (MCCB)
Protects the power line by shutting the circuit OFF when overcurrent is detected.

Noise Filter
Used to eliminate external noise from the power line.

Magnetic Contactor
HI Series
Turns the servo ON and OFF. Install a surge suppressor on the magnetic contactor.

Power Supply for Brake
Used for a servomotor with a brake.

Regenerative Resistor
If the capacity of the internal regenerative resistor is insufficient, remove the wire between terminals B2 and B3 and connect an external regenerative resistor to terminals B1 and B2.

Host Controller
Can be connected to DeviceNet Master.
MEMOCON GL120/130, MP920
(Manufactured by Yaskawa)

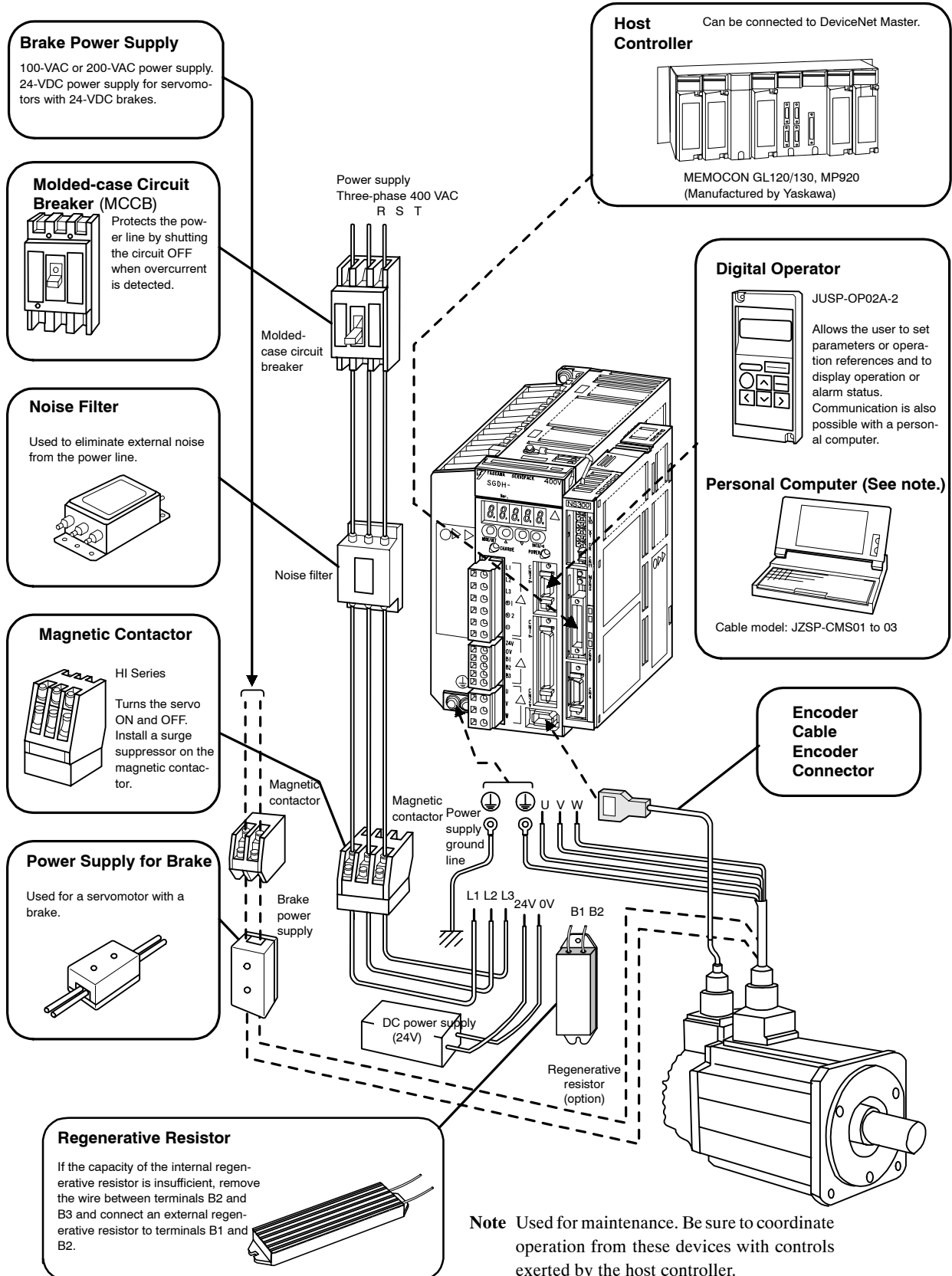
Digital Operator
JUSP-OP02A-2
Allows the user to set parameters or operation references and to display operation or alarm status. Communication is also possible with a personal computer.
Personal Computer (See note.)
Cable model: JZSP-CMS01 to 03

Encoder Cable
Encoder Connector

Note Used for maintenance. Be sure to coordinate operation from these devices with controls exerted by the host controller.

3

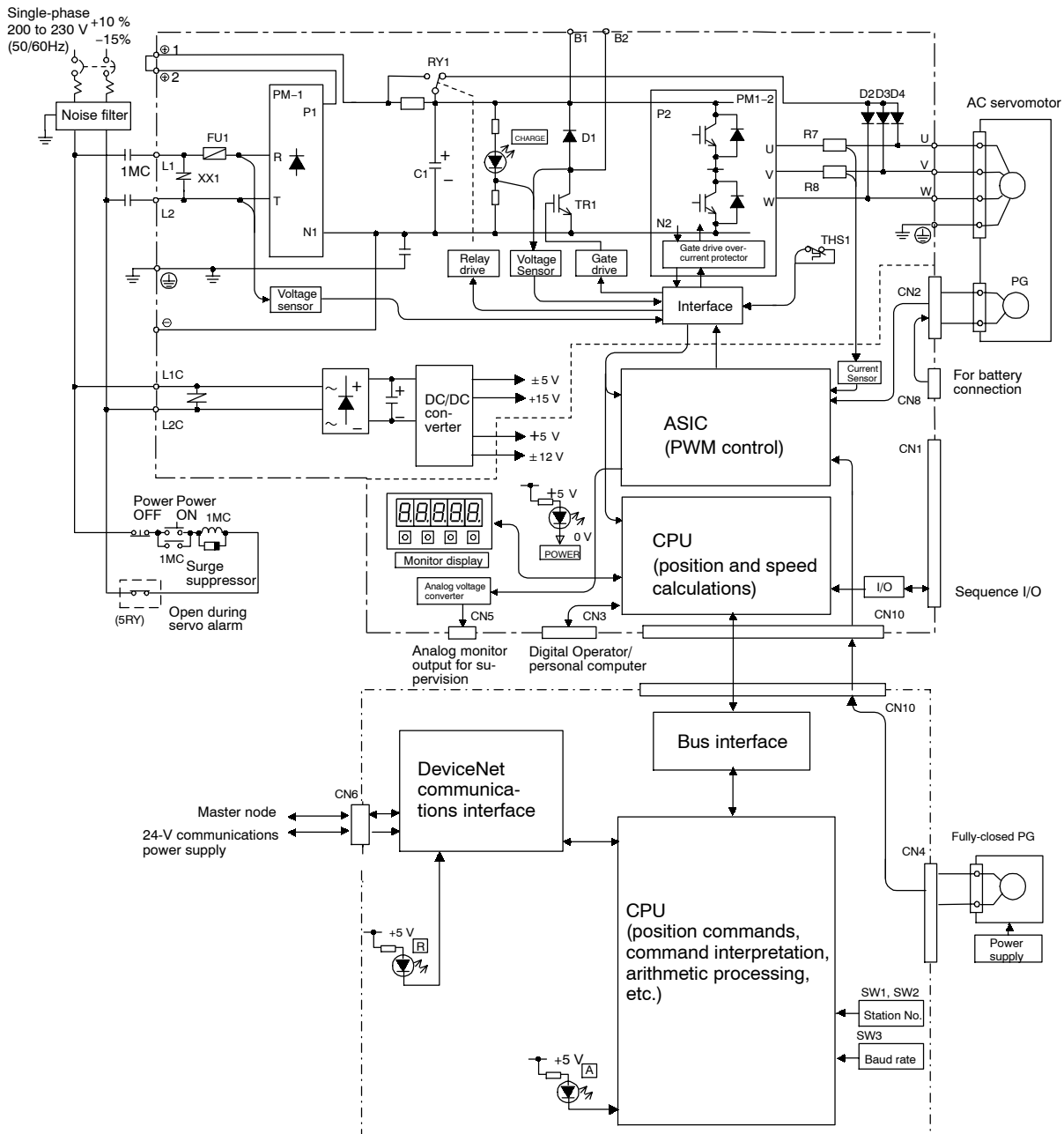
3.1.3 Three-phase, 400-V Main Circuit Specifications



3.2 SERVOPACK Internal Block Diagrams

The following sections show an internal block diagram for the SERVOPACK with the NS300 Module.

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



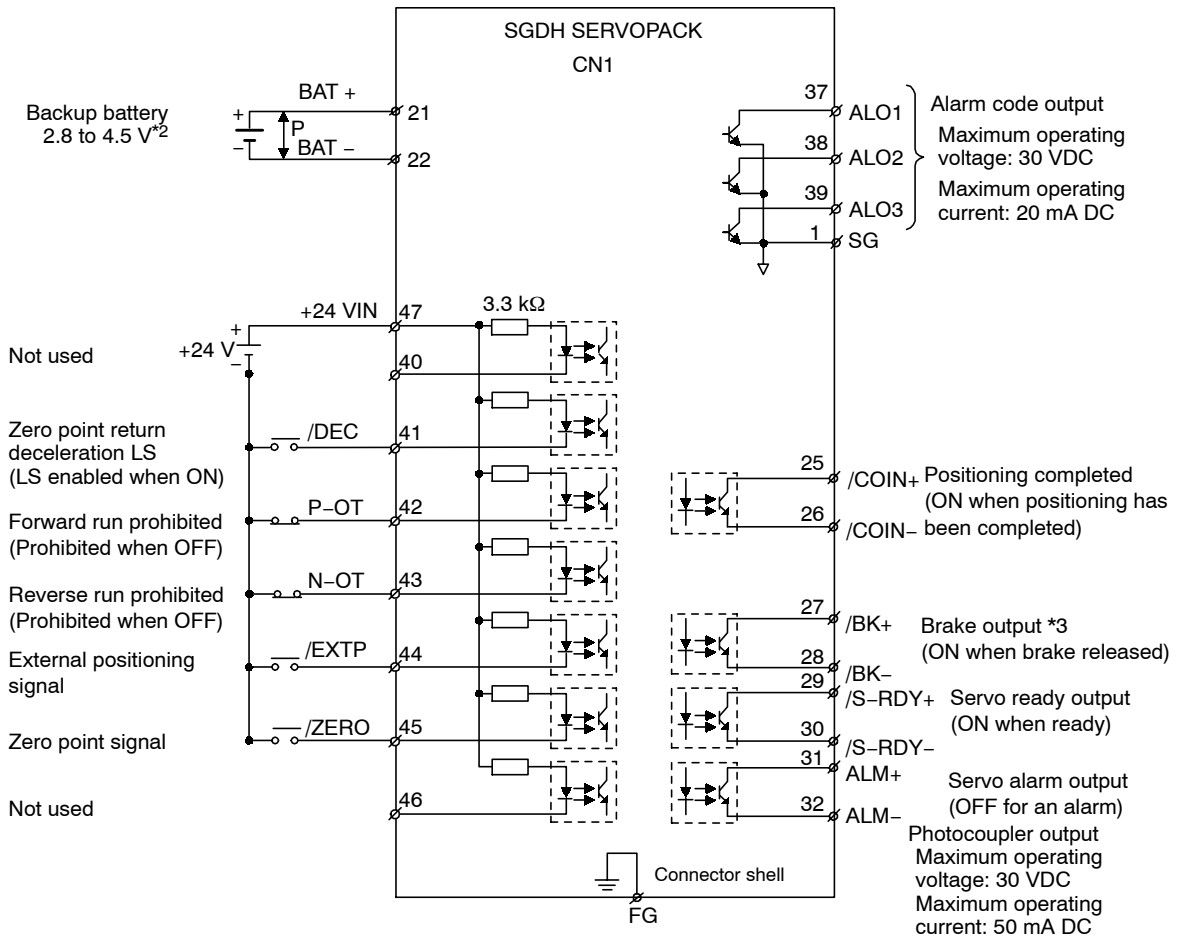
3

3.3 I/O Signals

This section describes I/O signals for the SERVOPACK with the NS300 Module.

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

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



Connect the shield wire to connector shell.

- * 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.)

Figure 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

| | | | | | | | | | | | |
|----|---------|-------------|----|---------|-----------------------------|----|---------------|---|----|---------------|--------------------------------|
| | | | 1 | SG | GND | | | | 26 | /COIN- | Positioning complete output |
| 2 | SG | GND | | | | 27 | /BK+ (Note 3) | Brake interlock output | | | |
| | | | 3 | - | - | | | | 28 | /BK- (Note 3) | Brake interlock output |
| 4 | - | - | | | | 29 | /S-RDY+ | Servo ready output | | | |
| | | | 5 | - | - | | | | 30 | /S-RDY- | Servo ready output |
| 6 | SG | GND | | | | 31 | ALM+ | Servo alarm output | | | |
| | | | 7 | - | - | | | | 32 | ALM- | Servo alarm output |
| 8 | - | - | | | | 33 | - | - | | | |
| | | | 9 | - | - | | | | 34 | - | - |
| 10 | SG | GND | | | | 35 | - | - | | | |
| | | | 11 | - | - | | | | 36 | - | - |
| 12 | - | - | | | | 37 | AL01 | Alarm code output (open-collector output) | | | |
| | | | 13 | - | - | | | | | 38 | AL02 |
| 14 | - | - | | | | 39 | AL03 | | | | |
| | | | 15 | - | - | | | | 40 | - | - |
| 16 | - | - | | | | 41 | /DEC | Zero point return deceleration LS input | | | |
| | | | 17 | - | - | | | | 42 | P-OT | Forward drive prohibited input |
| 18 | - | - | | | | 43 | N-OT | Reverse run prohibited input | | | |
| | | | 19 | - | - | | | | 44 | EXTP | External positioning signal |
| 20 | - | - | | | | 45 | ZERO | Zero point signal | | | |
| | | | 21 | BAT (+) | Battery (+) | | | | 46 | - | - |
| 22 | BAT (-) | Battery (-) | | | | 47 | +24VIN | External power supply input | | | |
| | | | 23 | - | - | | | | 48 | - | - |
| 24 | - | - | | | | 49 | - | - | | | |
| | | | 25 | /COIN + | Positioning complete output | | | | 50 | - | - |

Note 1. Do not use unused terminals for relays.

- 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.
- 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 | 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 NS: Deceleration LS for zero point return connected. |
| | P-OT | 42 Forward run prohibited |
| | N-OT | 43 Reverse run prohibited |
| | /EXTP | 44 External positioning signal: Signal used for external positioning connected. |
| | /ZERO | 45 Zero point |
| | +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. |

■ 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: Turns 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- |

Note 1. Pin numbers in parenthesis () indicate signal grounds.

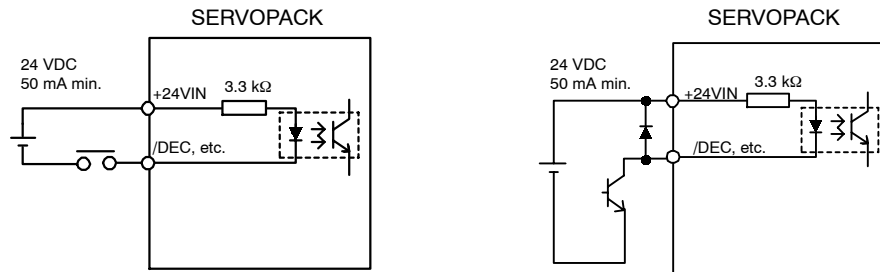
2. The functions allocated to /BK, /S-RDY, and /COIN can be changed via parameters. The /BK, /S-RDY, and /COIN output signals can be changed to /CLT, /VLT, /TGON, /WARN, or /NEAR signals.

3.3.4 Interface Circuits

The following diagram shows an example of connections between a host controller and the I/O signal for a SERVOPACK.

■ 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.



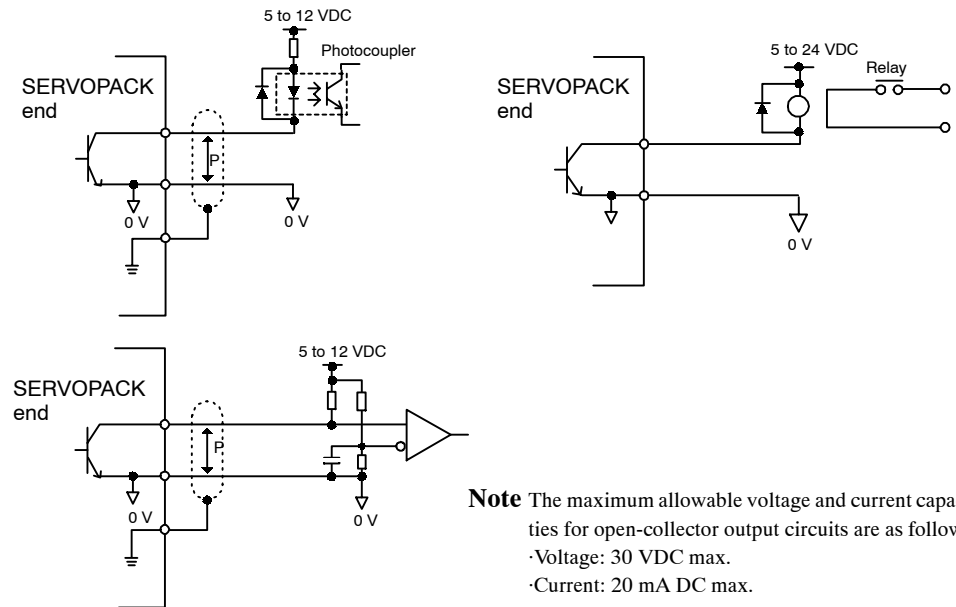
■ Output Circuit Interface

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



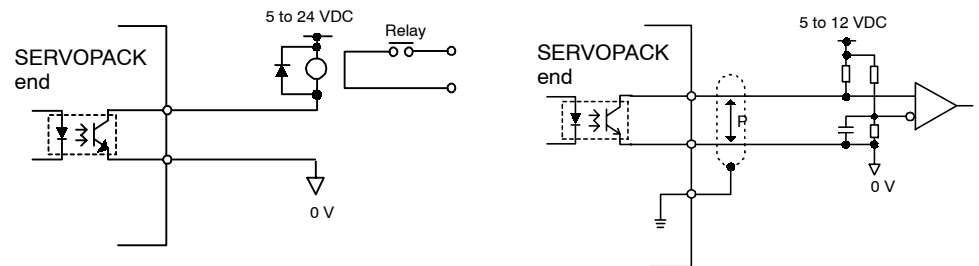
Note The maximum allowable voltage and current capacities for open-collector output circuits are as follows:

- 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 I/O Signal Connections for NS300 Modules (CN4)

The CN4 on an NS300 Module is used for I/O signal and fully-closed encoder signal connections.

3.4.1 Connection Terminal Layout

The terminal layout and specifications for the CN4 are outlined below.

■ CN4 Terminal Layout

| Pin No. | Signal | Description | Pin No. | Signal | Description |
|---------|---------|----------------------|---------|---------|---|
| 1 | PG 0V | Signal ground | 11 | +24VIN | 24-V common terminal for external input |
| 2 | PG 0V | Signal ground | 12 | NOTCH1+ | Notch output 1 |
| 3 | PG 0V | Signal ground | 13 | NOTCH1- | - |
| 4 | - | - | 14 | PC | Phase-C input |
| 5 | - | - | 15 | /PC | - |
| 6 | - | - | 16 | PA | Phase-A input |
| 7 | - | - | 17 | /PA | - |
| 8 | - | - | 18 | PB | Phase-B input |
| 9 | EMSTOP | Emergency stop input | 19 | /PB | - |
| 10 | NOTCH2+ | Notch output 2 | 20 | NOTCH2- | Notch output 2 |

Note 1. The PG power supply and battery must be supplied externally.

2. The FG is connected to the connector shell.

■ Connector Specifications

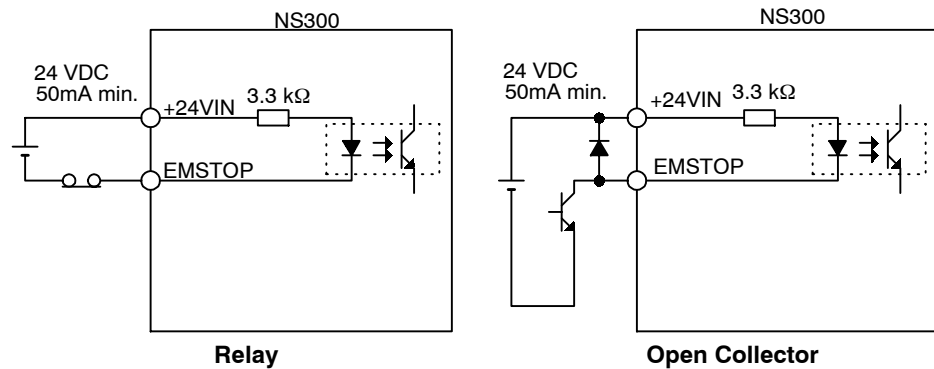
| Part | Signal | Manufacturer |
|------------------------|--------------------|------------------|
| Connector | 10120-3000VE (20P) | Sumitomo 3M Ltd. |
| Connector shell | 10320-52A0-008 | - |

3.4.2 I/O Signal Interface Circuits

The following diagram shows an example of connections between a host controller and the I/O signals for an NS300 Module.

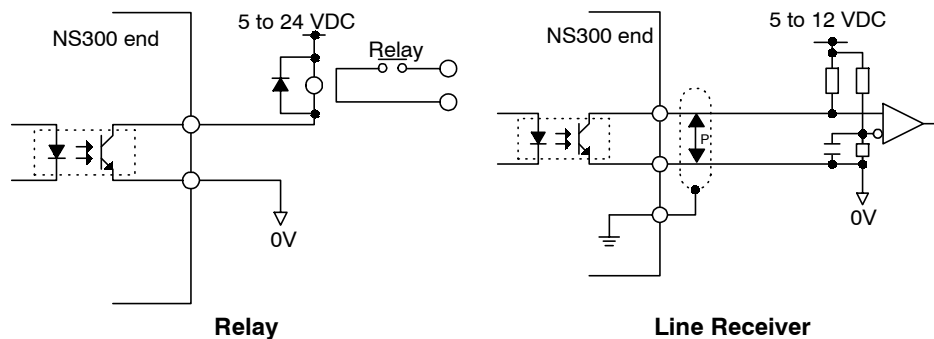
■ Sequence I/O Circuit Interface

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 Interface

Notch output signals are used for photocoupler output circuits. Connect the notch output signals to relays or line receiver circuits.

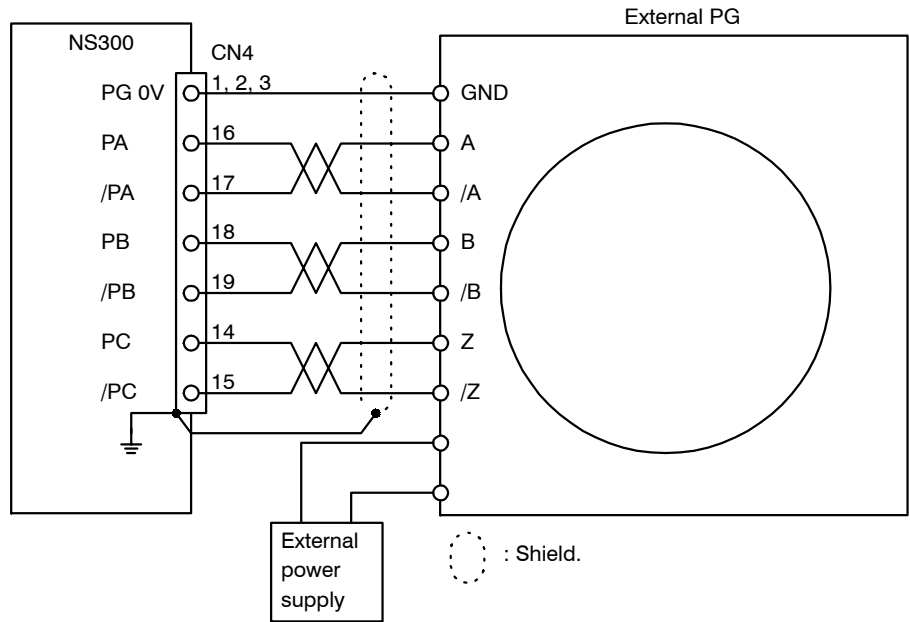


Note The maximum allowable voltage and current capacity for photocoupler output circuits are as follows:

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

3.4.3 Fully-closed Encoder Connection Example

The following diagram shows a connection example for a fully-closed encoder.



3.5 Connections for DeviceNet Communications

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

3.5.1 DeviceNet Communications Connection Example

The following diagram shows an example of connections between a host controller and an NS300 Module (CN6) using DeviceNet communications cables.

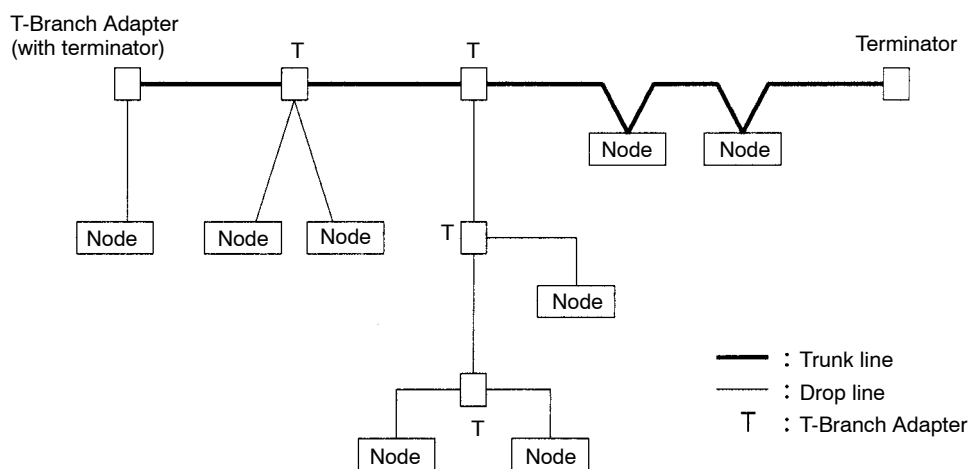


Figure 3.2 Network Connections

■ Configuration Elements

The network is configured from the following elements.

Nodes

A node is either a slave that connects to an NS300 Module or similar Module, or the master that manages the I/O of the slaves. There are no restrictions on the location of the master or slaves. Any node in *Figure 3.2* can be the master or a slave.

Trunk Line and Drop Lines

A cable with a terminator on each end is a trunk line. Any cable branching from the trunk line is a drop line.

Connection Methods

A node is connected using the T-branch method or multi-drop method. A T-Branch Adapter is used to connect a node with the T-branch method. A node is directly connected to the trunk line or a drop line with the multi-drop method. Both T-branch and multi-drop methods can be used together in the same network, as shown in *Figure 3.2*.

Terminator

Both ends of the trunk line must connect to terminating resistance to decrease signal reflection and ensure stable network communications.

Communications Power Supply

The communications connector of each node must be provided with a communications power supply through the communications cable for DeviceNet communications.

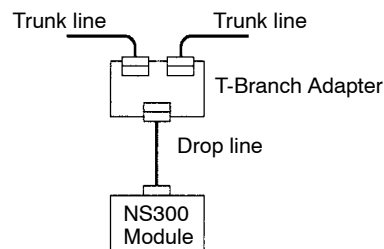
IMPORTANT

1. The communications cable must be a special DeviceNet cable.
2. Both ends of the trunk line must connect to a terminator.
3. Only DeviceNet devices can be connected to the network. Do not connect any other devices, such as a lightning arrester.

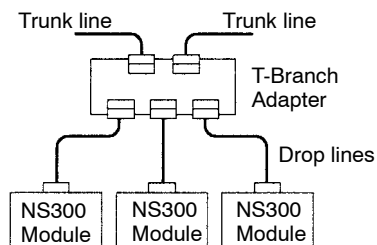
■ Branching from the Trunk Line

There are three methods that can be used to branch from the trunk line.

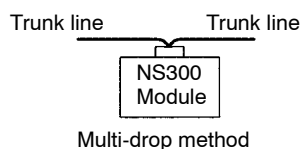
Single Branching



Branching to Three Drop Lines



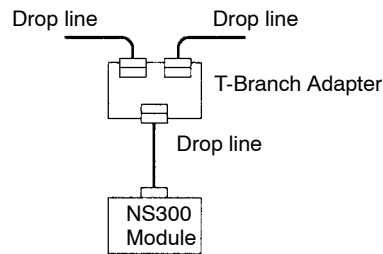
Direct Node Connection



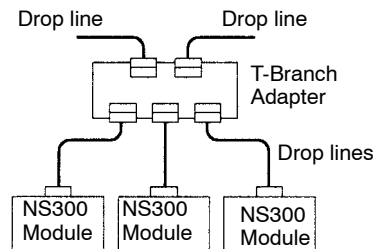
■ Branching from Drop Lines

There are three methods that can be used to branch from drop lines.

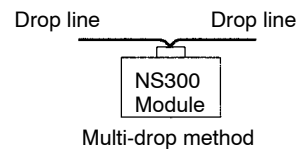
Single Branching



Branching to Three Drop Lines



Direct Node Connection



3.5.2 DeviceNet Communications Connectors (CN6)

The terminal layout and specifications of the CN6 connectors are shown below.

■ Connector Specifications

The following table shows the connector specifications. These connectors are metal plated with a flange attached.

| Name | Model | Manufacturer |
|-----------|----------------------|-----------------|
| Connector | MSTB2.5/5-STF-5.08AU | PHOENIX CONTACT |
| Case | | |

■ Connector Pin Arrangement

The connector pin arrangement is as shown below.

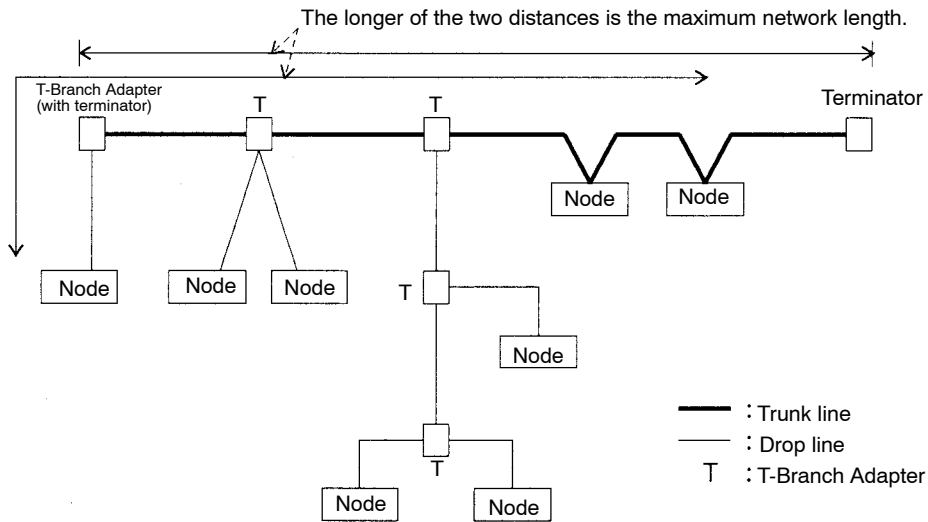
| Pin No. and Code | Symbol | Detail |
|------------------|----------|---|
| 1 | 0 (24 V) | 0 V external communications power supply |
| 2 | CAN L | CAN bus line dominant L |
| 3 | SHIELD | Shield |
| 4 | CAN H | CAN bus line dominant H |
| 5 | 24 V | 24 V external communications power supply |

3.5.3 Precautions for Wiring DeviceNet Cables

Observe the following precautions when wiring DeviceNet cables.

■ Maximum Network Length

The maximum network length is either the line length between two nodes located farthest from each other or the line length between the terminators on the ends of the trunk line, whichever is longer.



Special DeviceNet cables can be either thick cables or thin cables. The characteristics of each type are given in the following table.

| Item | Cable Type | |
|-------------------------|---------------------------|------------------------|
| | Thick Cable | Thin Cable |
| Signal decay | Slight | Considerable |
| Communications distance | Long distance | Short distance |
| Characteristics | Rigid (difficult to bend) | Pliable (bends easily) |

The maximum network length is determined by the type of cable, as shown in the following table.

| Baud Rate (Kbps) | Maximum Network Length (m) | |
|------------------|----------------------------|------------|
| | Thick Cable | Thin Cable |
| 500 | 100 | 100 |
| 250 | 250 | 100 |
| 125 | 500 | 100 |



The line connecting two nodes located farthest from each other can use both thick and thin cables provided that the length of each cable satisfies the conditions in the following table.

| Baud Rate (Kbps) | Maximum Network Length (m) |
|------------------|--|
| 500 | $L_{THICK} + L_{THIN} \leq 100$ |
| 250 | $L_{THICK} + 2.5 \times L_{THIN} \leq 250$ |
| 125 | $L_{THICK} + 5.0 \times L_{THIN} \leq 500$ |

Note L_{THICK} : Thick cable length L_{THIN} : Thin cable length

■ Drop Line Length

The drop line length is the line length between a branch point on the trunk line to the farthest node that is located on the drop line. The maximum drop line length is 6 m. A drop line can be branched out into other drop lines.

■ Total Drop Line Length

The total drop line length is a total of all drop line lengths.

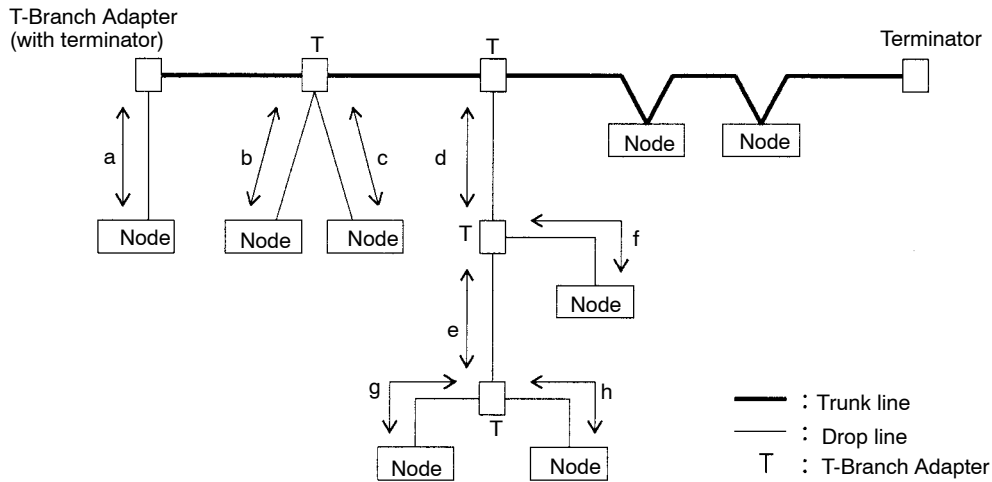
Length Limits

The total drop line length must be within the allowable range and even then, each drop line must be 6 m or less.

The allowable range of total drop line length varies with the baud rate as shown in the following table.

| Baud Rate (Kbps) | Total Network Length (m) |
|------------------|--------------------------|
| 500 | 39 max. |
| 250 | 78 max. |
| 125 | 156 max. |

The following example is for a baud rate of 500 Kbps.



The above example must satisfy the following conditions.

- $a \leq 6 \text{ m}$
- $b \leq 6 \text{ m}$
- $c \leq 6 \text{ m}$
- $d \leq 6 \text{ m}$
- $d+f \leq 6 \text{ m}$
- $d+e+g \leq 6 \text{ m}$
- $d+e+h \leq 6 \text{ m}$

The total drop line length must satisfy the following condition.

- Total drop line length = $a+b+c+d+e+f+g+h \leq 39 \text{ m}$

Basic Precautions

Basic precautions are as follows:

- The communications power supply to the network must be 24 VDC.
- The communications power supply must have a sufficient margin in the capacity.
- Connect the communications power supply to the trunk line.
- If many nodes are provided with power from a single power supply, locate the power supply as close as possible to the middle of the trunk line.
- The allowable current flow in a thick cable is 8 A and that in a thin cable is 3 A.
- The power supply capacity for a drop line varies with the drop line length. The longer a drop line is, the lower the maximum current capacity of the drop line will be regardless of the thickness of the drop line. Obtain the allowable current (I) of the drop line (i.e., the allowable current consumption of the drop line and devices connected to it) from the following equation.

$$I = 4.57/L$$

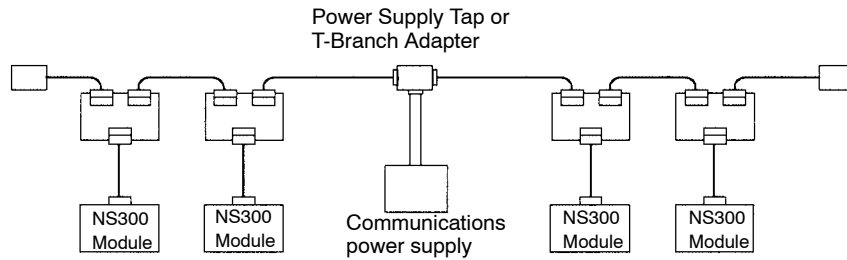
I: Allowable current (A)
L: Drop line length (m)

- If only the communications power supply is turned OFF while the network is operating, errors may occur in the nodes that are communicating at that time.

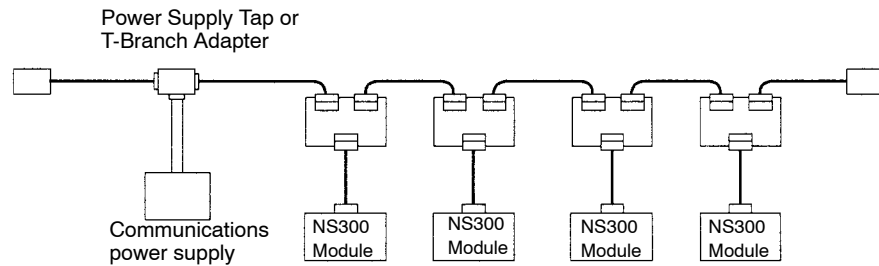
■ Location of Power Supply

The following two types of configuration are possible for the location of the power supply.

Nodes on Both Sides of the Power Supply



Nodes on One Side of the Power Supply

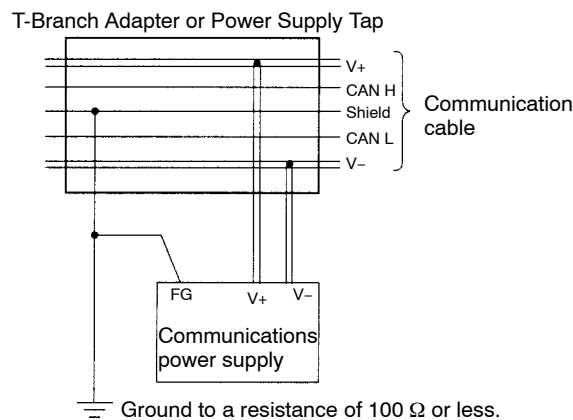


Note The “Nodes on Both Sides of the Power Supply” method is recommended if a single power supply is connected to many nodes.

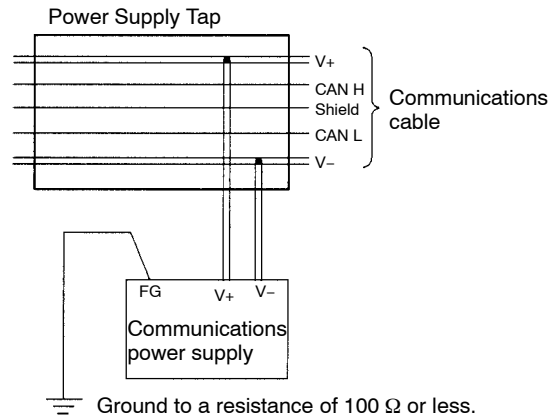
3.5.4 Grounding

As shown below, connect the shield wire of the cable to the FG terminal of the communications power supply and ground the shield wire to a resistance of 100 Ω or less.

■ Power Supply with Single-point Ground



■ Power Supply without Ground



If more than one communications power supply is used, ground only the power supply that is located closest to the middle of the network through the shield wire. Do not ground the power supply through the shield wire at any other point. If more than one communications power supply is connected to the network, connect them using a Power Supply Tap each.

IMPORTANT

1. Power supplies are not counted as nodes.
2. Ground the network to a resistance of 100 Ω or less.
3. Do not ground the network together with servodrivers or inverters.
4. Do not ground the network through the shield wire at more than one point; ground at a single point only.

4

Parameter Settings

This chapter provides an outline and details of NS300 parameters.

| | |
|--|--------------|
| 4.1 Parameters | 4 -2 |
| 4.1.1 Outline of Parameters | 4 -2 |
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4.1 Parameters

4.1.1 Outline of Parameters

Parameters is the name given to the user constants that are required as the settings used to operate the NS300 Module. You must set the optimum values for parameters according to the NS300 Module and the machine to which the SGD H is mounted.

You can edit the NS300 Module parameters using the NS□□□ Setup Tool, DeviceNet Configurator, or host controller.

For parameters, refer to *Chapter 6 Parameter Settings* or the *Σ-II Series SGM□H/SGDH User's Manual Design and Maintenance* (SIE-S800-32.2).

4.1.2 Parameter Types

Parameters are classified depending on their purpose as follows:

- Unit parameters
- Zero Point Return parameters
- Machine system and peripheral device parameters
- Speed, acceleration, and deceleration parameters
- Positioning parameters
- Multi-speed positioning parameters
- Notch output positioning parameters

Parameters are further classified according to the priority of the setting, as shown below.

Table 4.1 Parameter Types

| Type | Meaning |
|----------|--|
| A | Parameters that must be set even when using the NS300 Module in standard mode. |
| B | Parameters that must be set when using the NS300 Module in special mode. |
| C | Parameters whose settings hardly ever need to be changed. |

4.1.3 Editing Parameters

You can edit parameters using the following methods.

Table 4.2 Methods of Editing Parameters

| Tools | Methods | Remarks |
|--|---|--|
| NS□□□ Setup Tool | Select <i>Option Parameter List</i> from the Parameter Menu to read all the NS300 Module parameters. After the parameters have been displayed, select the parameters you want to edit, and click the Edit Button to edit the parameters. | All changed parameters are stored in RAM, so they are erased when the power is turned OFF. Use the <i>Module Reset</i> Command to write the parameter data in RAM to the flash ROM. |
| Master Device or DeviceNet Configurator | You can edit using <i>Explicit Message (Set_Attribute_Single)</i> from the Master Device. | All changed parameters are stored in RAM, so they are erased when the power is turned OFF. Execute the Reset Service for the Identity Object to write the parameter data in RAM to the flash ROM. |

IMPORTANT

Parameters changed from each setting device are stored in RAM.

To save parameters in flash ROM after adjustments have been completed, execute the *Module Reset* Command in the NSxxx Setup Tool or execute the Reset Service to the Identity Object via DeviceNet.

4.1.4 Effective Timing

Not all parameters edited from the NSxxx Setup Tool or Master Device are effective immediately. Changed parameters are effective at one of the following two times.

Table 4.3 Effective Timing for Parameters

| Timing | Control or Processing |
|------------------|---|
| Power-up | The values of all parameters are made effective at the following times. <ul style="list-style-type: none"> When power is turned ON. |
| Immediate | The values of changed parameters are made effective immediately. However, parameters will be stored in the Flash ROM at the following times. <ul style="list-style-type: none"> When the Module is reset from the NS□□□ Setup Tool or via a command message. When the Reset Service to the Identity Object is executed via DeviceNet. |

4.2 Parameter Tables

The following tables list the parameters.

If using the NS□□□ Setup Tool or reading/writing using a command message, edit parameters using Pn□□□. If editing via DeviceNet explicit messages, edit using the object number and attribute number. Refer to 5.6 *Changing Parameters* or the host controller manual for details.

4.2.1 Unit Parameters

The unit parameter table is shown below.

| Object | Attribute | No. | Name | Range | Units | Effective Timing | Default Value | Type |
|--------|-----------|-------|-------------------------------------|-----------------|-------|------------------|---------------|------|
| 0x64 | #30 | Pn810 | Electronic Gear Ratio (Numerator) | 1 to 10,000,000 | --- | Power-up | 1 | B |
| | #31 | Pn811 | Electronic Gear Ratio (Denominator) | 1 to 10,000,000 | --- | Power-up | 1 | B |

4.2.2 Zero Point Return Parameters

The table of zero point return parameters are shown below.

| Object | Attribute | No. | Name | Range | Units | Effective Timing | Default Value | Type |
|--------|-----------|-------|---|-----------------|--------------------------|------------------|---------------|------|
| 0x64 | #10 | Pn800 | Zero Point Return Mode | 0 to 3 | --- | Immediate | 0 | B |
| | #11 | Pn801 | Zero Point Return Function Selection | 0 to 7 | --- | Power-up | 1 | B |
| | #12 | Pn802 | Feed Speed for Zero Point Return | 1 to 240,000 | 1000 reference units/min | Immediate | 10,000 | B |
| | #13 | Pn803 | Approach Speed for Zero Point Return | 1 to 240,000 | 1000 reference units/min | Immediate | 1,000 | B |
| | #14 | Pn804 | Creep Speed for Zero Point Return | 1 to 240,000 | 1000 reference units/min | Immediate | 500 | B |
| | #15 | Pn805 | Final Travel Distance for Zero Point Return | 0 to 99,999,999 | Reference units | Immediate | 0 | B |
| | #16 | Pn806 | Output Width for Zero Point Return | 0 to 32,767 | Reference units | Immediate | 100 | B |

| Object | Attribute | No. | Name | Range | Units | Effective Timing | Default Value | Type |
|--------|-----------|-------|--|---------------------------|-----------------|------------------|---------------|------|
| 0x64 | #17 | Pn809 | Zero Point Offset | -99,999,999 to 99,999,999 | Reference units | Immediate | 0 | C |
| | #18 | Pn80A | Accel/Decel Time for Zero Point Return | 1 to 10,000 | ms | Immediate | 100 | B |

Note: 1. For reference unit details, refer to 4.3.1 Unit Parameters.

2. If you set the reference unit to 0.001 mm, 1,000 reference units/min becomes mm/min.

3. Change the setting of Pn80A if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0.

The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

4.2.3 Machine System and Peripheral Device Parameters

The machine system and peripheral device parameter table is shown below.

| Object | Attribute | No. | Name | Range | Units | Effective Timing | Default Value | Type |
|--------|-----------|-------|--|----------------|-----------------|------------------|---------------|------|
| 0x64 | #32 | Pn812 | Coordinate Type | 0, 1 | --- | Power-up | 0 | C |
| | #33 | Pn813 | Reference units per Machine Rotation | 1 to 1,500,000 | Reference units | Power-up | 360,000 | C |
| | #34 | Pn814 | Backlash Compensation | 0 to 32,767 | Reference units | Immediate | 0 | C |
| | #35 | Pn815 | Backlash Direction | 0, 1 | Reference units | Immediate | 0 | C |
| | #36 | Pn816 | Positive Software Limit | ±99,999,999 | Reference units | Power-up | 99999999 | B |
| | #37 | Pn817 | Negative Software Limit | ±99,999,999 | Reference units | Power-up | -99999999 | B |
| | #38 | Pn818 | Machine Function Selection | 0 to 3 | --- | Immediate | 0 | B |
| | #39 | Pn819 | Hardware Limit Signal Function Selection | 0 to 3 | --- | Immediate | 1 | B |
| | #40 | Pn81A | Hardware Limit Action Selection | 0, 1 | --- | Immediate | 0 | B |
| | #41 | Pn81B | Emergency Stop Signal Function Selection | 0 to 3 | --- | Immediate | 1 | B |
| | #42 | Pn81C | Action Selection on Emergency Stop | 0 | --- | Immediate | 0 | B |

Note: 1. For reference unit details, refer to 4.3.1 Unit Parameters.

2. If you set the reference unit to 0.001 mm, 1,000 reference units/min becomes mm/min.

3. Change the settings of Pn814 and Pn815 if INPOS (Positioning completed range) is set to 1. Do not change these settings if INPOS is set to 0.

The SERVOPACK may not operate correctly if the settings of these parameters and INPOS do not correspond.

4.2.4 Speed, Acceleration, and Deceleration Parameters

A table of speed, acceleration, and deceleration parameters is shown below.

| Object | Attribute | No. | Name | Range | Units | Effective Timing | Default Value | Type |
|--------|-----------|-------|---|--------------|--------------------------|------------------|---------------|------|
| 0x64 | #51 | Pn821 | Feed Speed for Positioning | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | B |
| | #52 | Pn822 | Acceleration Time for Positioning | 1 to 10,000 | ms | Immediate | 100 | B |
| | #53 | Pn823 | Deceleration Time for Positioning | 1 to 10,000 | ms | Immediate | 100 | C |
| | #54 | Pn824 | Switch Speed for Second Accel/Decel for Positioning | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #55 | Pn825 | Accel/Decel Time for Second Accel/Decel for Positioning | 1 to 10,000 | ms | Immediate | 200 | B |
| | #56 | Pn826 | Accel/Decel Type for Positioning | 0 to 3 | --- | Immediate | 0 | B |
| | #57 | Pn827 | Feed Speed for External Positioning | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | B |
| | #58 | Pn829 | Filter Selection | 0 to 3 | --- | Immediate | 0 | B |
| | #59 | Pn830 | Constant Feed Reference Module Selection | 0, 1 | --- | Immediate | 0 | B |
| | #60 | Pn831 | Constant Feed Speed | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | B |
| | #61 | Pn832 | Acceleration Time for Constant Feed | 1 to 10,000 | ms | Immediate | 100 | B |
| | #62 | Pn833 | Deceleration Time for Constant Feed | 1 to 10,000 | ms | Immediate | 100 | C |
| | #63 | Pn834 | Switch Speed for Constant Feed Second Accel/Decel | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #64 | Pn835 | Accel/Decel Time for Constant Feed Second Accel/Decel | 1 to 10,000 | ms | Immediate | 200 | C |

| Object | Attribute | No. | Name | Range | Units | Effective Timing | Default Value | Type |
|-------------|-----------|-------|---|-----------------|--------------------------|------------------|---------------|------|
| 0x64 | #65 | Pn836 | Accel/Decel Type for Constant Feed | 0, 1, 2, 3 | --- | Immediate | 0 | B |
| | #70 | Pn840 | Time Constant for Exponential Accel/Decel | 4 to 1,000 | ms | Immediate | 25 | C |
| | #71 | Pn841 | Bias Speed for Exponential Accel/Decel | 0 to 240,000 | 1000 reference units/min | Immediate | 0 | C |
| | #72 | Pn842 | Time Constant of Travelling Average | 4 to 1,000 | ms | Immediate | 25 | C |
| | #73 | Pn843 | Maximum Feed Speed | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | B |
| | #74 | Pn844 | Step Distance 1 | 0 to 99,999,999 | Reference units | Immediate | 1 | B |
| | #75 | Pn845 | Step Distance 2 | 0 to 99,999,999 | Reference units | Immediate | 10 | B |
| | #76 | Pn846 | Step Distance 3 | 0 to 99,999,999 | Reference units | Immediate | 100 | B |
| | #77 | Pn847 | Step Distance 4 | 0 to 99,999,999 | Reference units | Immediate | 1,000 | B |

Note: 1. For reference unit details, refer to 4.3.1 Unit Parameters.

2. If you set the reference unit to 0.001 mm, 1,000 reference units/min becomes mm/min.

3. Change the settings of Pn822, Pn823, Pn824, Pn825, Pn826, Pn829, Pn832, Pn833, Pn834, Pn835, Pn836, Pn840, Pn841, Pn842, and Pn843 if INPOS (Positioning completed range) is set to 1. Do not change any of these settings if INPOS is set to 0.

The SERVOPACK may not operate correctly if the settings of these parameters and INPOS do not correspond.

4.2.5 Positioning Parameters

The positioning parameter table is shown below.

| Object | Attribute | No. | Name | Range | Units | Effective Timing | Default Value | Type |
|--------|-----------|-------|---|---------------------------|---------------------------|------------------|---------------|------|
| 0x64 | #90 | Pn850 | Positioning Deadband | 0 to 10,000 | Reference units | Immediate | 5 | A |
| | #91 | Pn851 | Positioning Timeout | 0 to 65,535 | ms | Immediate | 0 | C |
| | #92 | Pn852 | Positioning Proximity Detection Width | 0 to 32,767 | Reference units | Immediate | 10 | B |
| | #93 | Pn853 | Direction for Rotation System | 0, 1 | --- | Immediate | 0 | B |
| | #94 | Pn854 | Approach Speed for External Positioning | 1 to 240,000 | 1,000 reference units/min | Immediate | 24,000 | B |
| | #95 | Pn855 | Travel Distance for External Positioning | -99,999,999 to 99,999,999 | Reference units | Immediate | 0 | B |
| | #96 | Pn856 | Function Selection for External Positioning | 0 to 1 | --- | Power-up | 1 | B |
| | #100 | Pn85A | Number of Stations | 1 to 32,767 | --- | Power-up | 1 | B |

Note: 1. For reference unit details, refer to 4.3.1 Unit Parameters.

2. If you set the reference unit to 0.001 mm, 1,000 reference units/min becomes mm/min.

4.2.6 Multi-speed Positioning Parameters

A table of multi-speed positioning parameters is shown below.

| Object | Attribute | No. | Name | Range | Units | Effective Timing | Default Value | Type |
|--------|-----------|-------|--|-----------------|--------------------------|------------------|---------------|------|
| 0x64 | #111 | Pn861 | Number of Points for Speed Switching | 0 to 16 | – | Immediate | 0 | C |
| | #112 | Pn862 | Initial Feed Speed for Multi-speed Positioning | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #113 | Pn863 | Speed Switching Position 1 | 0 to 99,999,999 | Reference units | Immediate | 0 | C |
| | #114 | Pn864 | Speed Switching Position 2 | 0 to 99,999,999 | Reference units | Immediate | 0 | C |

| Object | Attribute | No. | Name | Range | Units | Effective Timing | Default Value | Type |
|--------|-----------|-------------------|-----------------------------|--------------------------|--------------------------|------------------|---------------|------|
| 0x64 | #115 | Pn865 | Speed Switching Position 3 | 0 to 99,999,999 | Reference units | Immediate | 0 | C |
| | #116 | Pn866 | Speed Switching Position 4 | 0 to 99,999,999 | Reference units | Immediate | 0 | C |
| | #117 | Pn867 | Speed Switching Position 5 | 0 to 99,999,999 | Reference units | Immediate | 0 | C |
| | #118 | Pn868 | Speed Switching Position 6 | 0 to 99,999,999 | Reference units | Immediate | 0 | C |
| | #119 | Pn869 | Speed Switching Position 7 | 0 to 99,999,999 | Reference units | Immediate | 0 | C |
| | #120 | Pn86A | Speed Switching Position 8 | 0 to 99,999,999 | Reference units | Immediate | 0 | C |
| | #121 | Pn86B | Speed Switching Position 9 | 0 to 99,999,999 | Reference units | Immediate | 0 | C |
| | #122 | Pn86C | Speed Switching Position 10 | 0 to 99,999,999 | Reference units | Immediate | 0 | C |
| | #123 | Pn86D | Speed Switching Position 11 | 0 to 99,999,999 | Reference units | Immediate | 0 | C |
| | #124 | Pn86E | Speed Switching Position 12 | 0 to 99,999,999 | Reference units | Immediate | 0 | C |
| | #125 | Pn86F | Speed Switching Position 13 | 0 to 99,999,999 | Reference units | Immediate | 0 | C |
| | #126 | Pn870 | Speed Switching Position 14 | 0 to 99,999,999 | Reference units | Immediate | 0 | C |
| | #127 | Pn871 | Speed Switching Position 15 | 0 to 99,999,999 | Reference units | Immediate | 0 | C |
| | #128 | Pn872 | Speed Switching Position 16 | 0 to 99,999,999 | Reference units | Immediate | 0 | C |
| | #129 | Pn873 | Switching Speed 1 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #130 | Pn874 | Switching Speed 2 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| #131 | Pn875 | Switching Speed 3 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C | |
| #132 | Pn876 | Switching Speed 4 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C | |

Parameter Settings

4.2.6 Multi-speed Positioning Parameters

| Object | Attribute | No. | Name | Range | Units | Effective Timing | Default Value | Type |
|--------|-----------|-------|--------------------|--------------|--------------------------|------------------|---------------|------|
| 0x64 | #133 | Pn877 | Switching Speed 5 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #134 | Pn878 | Switching Speed 6 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #135 | Pn879 | Switching Speed 7 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #136 | Pn87A | Switching Speed 8 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #137 | Pn87B | Switching Speed 9 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #138 | Pn87C | Switching Speed 10 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #139 | Pn87D | Switching Speed 11 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #140 | Pn87E | Switching Speed 12 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #141 | Pn87F | Switching Speed 13 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #142 | Pn880 | Switching Speed 14 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #143 | Pn881 | Switching Speed 15 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #144 | Pn882 | Switching Speed 16 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |

Note: 1. For reference unit details, refer to 4.3.1 Unit Parameters.

2. If you set the reference unit to 0.001 mm, 1,000 reference units/min becomes mm/min.

4.2.7 Notch Output Parameters

The notch output parameter table is shown below.

| Object | Attribute | No. | Name | Range | Units | Effective Timing | Default Value | Type |
|--------|-----------|-------|--------------------------------------|-------------|-----------------|------------------|---------------|------|
| 0x64 | #160 | Pn890 | Notch Signal Output Position Setting | 0, 1 | – | Immediate | 0 | C |
| | #161 | Pn891 | Notch Signal Output Setting | 0 to 3 | – | Immediate | 0 | C |
| | #162 | Pn892 | Notch 1 Output Position Lower Limit | ±99,999,999 | Reference units | Immediate | 0 | C |
| | #163 | Pn893 | Notch 1 Output Position Upper Limit | ±99,999,999 | Reference units | Immediate | 0 | C |
| | #164 | Pn894 | Notch 2 Output Position Lower Limit | ±99,999,999 | Reference units | Immediate | 0 | C |
| | #165 | Pn895 | Notch 2 Output Position Upper Limit | ±99,999,999 | Reference units | Immediate | 0 | C |

Note: 1. For reference unit details, refer to 4.3.1 *Unit Parameters*.

2. If you set the reference unit to 0.001 mm, 1,000 reference units/min becomes mm/min.

4.3 Parameter Details

4.3.1 Unit Parameters

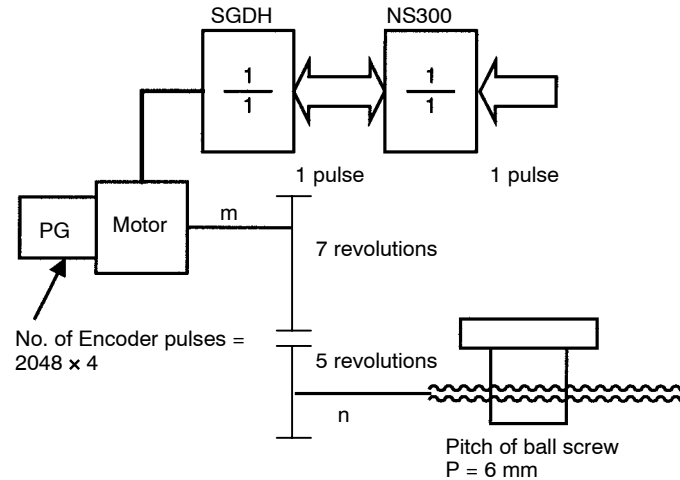
The unit for performing positioning using a NS300 Module is determined by the following two parameters.

| Object | Attribute | No. | Name | Range | Units | Effective Timing | Default Value | Type |
|--------|-----------|-------|-------------------------------|-----------------|-------|------------------|---------------|------|
| 0x64 | #30 | Pn810 | Electronic gear (numerator) | 1 to 10,000,000 | --- | Power-up | 1 | B |
| | #31 | Pn811 | Electronic gear (denominator) | 1 to 10,000,000 | --- | Power-up | 1 | B |

The electronic gear function can be used to set the position command units equal to the amount of encoder pulses. The host controller can generate position commands in more familiar user-defined units such as millimeters or inches.

■ Not Using the Electronic Gear

If not using the electronic gear, set Pn810 and Pn811 to 1. This will set the reference unit to 1 pulse, so you must calculate the scale position units using the host controller.



IMPORTANT

In this manual, the reference unit explained in *Electronic Gear Settings When Using a Ball Screw* in 4.3.1 Unit Parameters is based on a unit of 0.001 mm. The speed and other parameters must be interpreted as follows:

- Pn821: Feed Speed for Positioning (mm/min) → (1000 pulses/min)

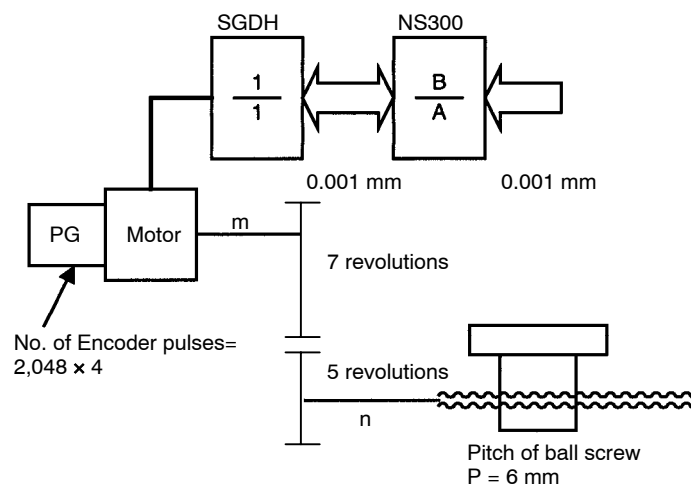
■ Electronic Gear Settings When Using a Ball Screw

If using a ball screw, first check the following specifications.

- Number of Encoder pulses
- Gear ratio
- Ball screw pitch

System Example

The following system example shows the formulas when the reference unit is set to 0.001 mm.



$$\bullet \text{ REV} = \frac{\text{Travel distance of load per revolution (mm)}}{\text{Reference unit (mm)}} = \frac{6 \text{ mm}}{0.001 \text{ mm}} = 6000$$

$$\bullet A = (\text{REV}) \times \{\text{Gear ratio (load rev.)}\} = 6000 \times 5 = 30000$$

$$\bullet B = (\text{Encoder pulses}) \times (\text{Pulse multiplier}) \times \{\text{Gear ratio (motor rev.)}\} = 2048 \times 4 \times 7 = 57344$$

$$\bullet B/A = 57344/30000 = 1.911$$

Data ranges are shown below.

- $A \leq 10,000,000$
- $B \leq 10,000,000$
- $100 \geq B/A \geq 0.01$

By storing the value of A in Pn811 and the value of B in Pn810, you can use the Electronic Gear function. These parameters are enabled when the power is turned ON. After you have changed the parameter, execute the Module Reset Command or the Reset Service to the Identity Object.

IMPORTANT

Setting B/A outside the range 0.01 to 100 may result in a misoperation. Make sure to set B and A within this range.

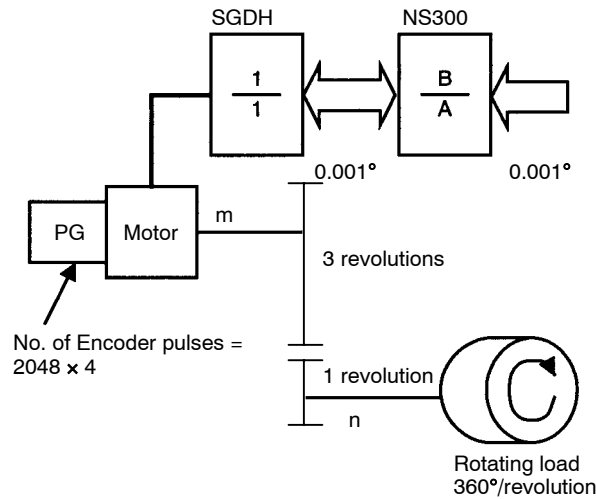
■ Electronic Gear Settings when Using a Rotary Table

If using a rotary table, first check the following specifications.

- Number of Encoder pulses
- Gear ratio

System Example

The following system example shows the formulas when the reference unit is set to 0.001°.



- $REV = 360^\circ / 0.001^\circ = 36000$
- $A = REV \times \{\text{Gear Ratio (load rev.)}\} = 36000 \times 1 = 36000$
- $B = (\text{Encoder pulses}) \times (\text{Pulse multiplier}) \times \{\text{Gear ratio (motor rev.)}\} = 2048 \times 4 \times 3 = 24576$

Data ranges are shown below.

- $A \leq 10,000,000$
- $B \leq 10,000,000$
- $100 \geq B/A \geq 0.01$

By storing the value of A in Pn811 and the value of B in Pn810, you can use the Electronic Gear function. These parameters are enabled when the power is turned ON. After you have changed the parameter, execute the Module Reset Command or the Reset Service to the Identity Object.

IMPORTANT

Setting B/A outside the range 0.01 to 100 may result in a misoperation. Make sure to set B and A within this range.

4.3.2 Zero Point Return Parameters

■ Zero Point Return Types

The following four types of zero point return are supported when the incremental detection system is used.

Type 0

This zero point return type returns to the zero point using the deceleration limit switch signal (DEC signal) and the phase C pulse of the encoder. The outline of the operation is as follows:

1. The axis travels in the direction specified as the zero point direction in the Zero Point Return Function Selection (Pn801) at the Zero Point Return Feed Speed (Pn802).
2. When the deceleration limit switch status changes, the axis decelerates and travels at the Zero Point Return Approach Speed (Pn803).
3. When the deceleration limit switch status changes again, the axis decelerates further when the first encoder phase C pulse is detected and then travels at the Zero Point Return Creep Speed (Pn804).
4. The axis travels the Zero Point Return Final Travel Distance (Pn805) from the position where the phase C was detected, and that position becomes the zero point.

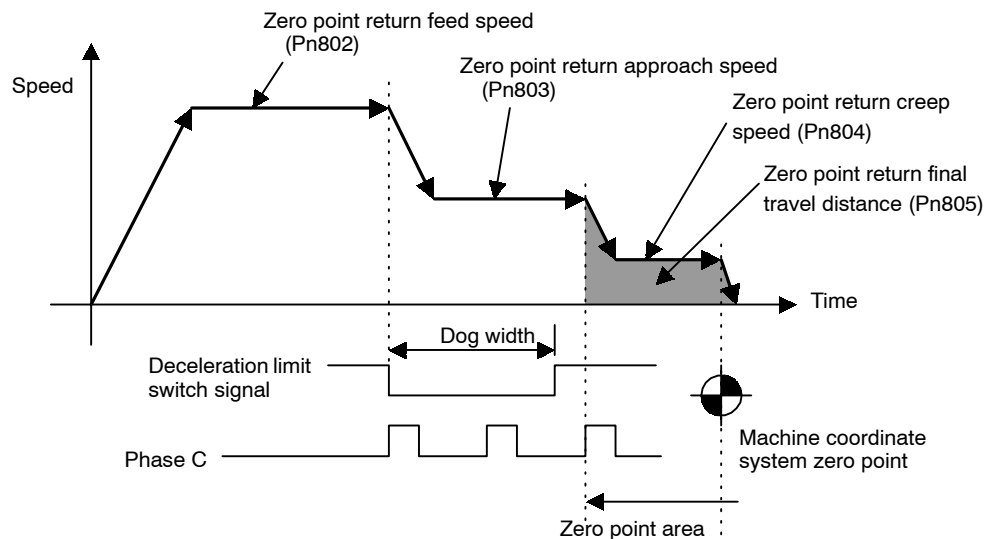


Figure 4.1 Type 0 Zero Point Return

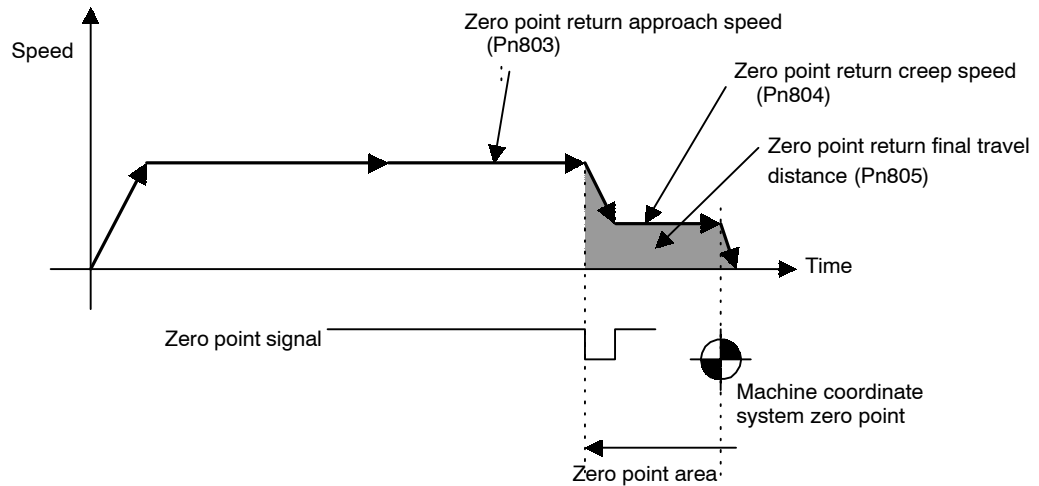
IMPORTANT

When an absolute detection system is being used, the zero point return is not performed and positioning will be performed to the zero point in the machine coordinate system at the Feed Speed for Positioning.

Type 1

This zero point return type returns to the zero point using the zero point signal (ZERO signal). The outline of the operation is as follows:

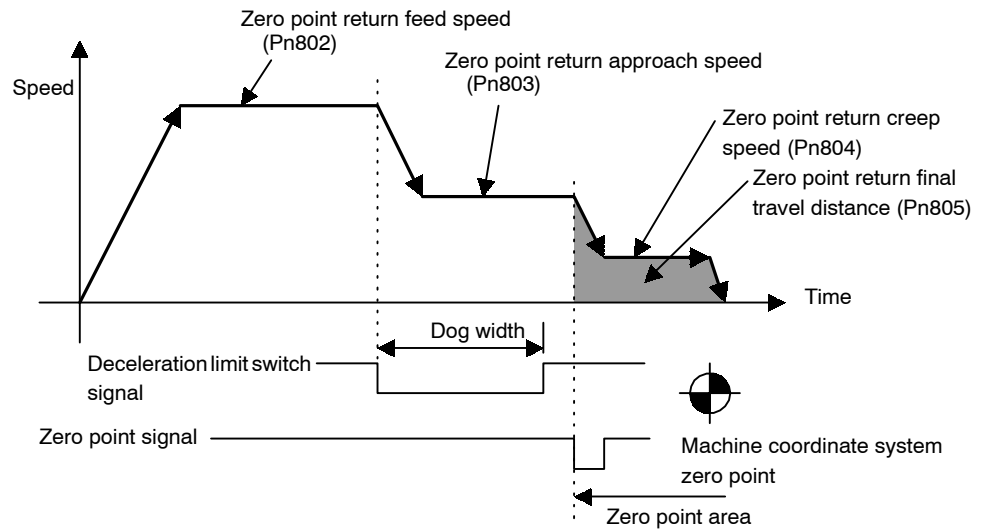
1. The axis travels in the direction specified as the zero point direction in the Zero Point Return Function Selection (Pn801) at the Zero Point Return Approach Speed (Pn803).
2. When the zero point signal status changes, the axis decelerates, and travels at the Zero Point Return Creep Speed (Pn804).
3. The axis travels the Zero Point Return Final Travel Distance (Pn805) from the position that the zero point signal status changed, and that position becomes the zero point.



Type 2

This zero point return type returns to the zero point using the deceleration limit switch (DEC signal) and the zero point signal (ZERO signal). The outline of the operation is as follows:

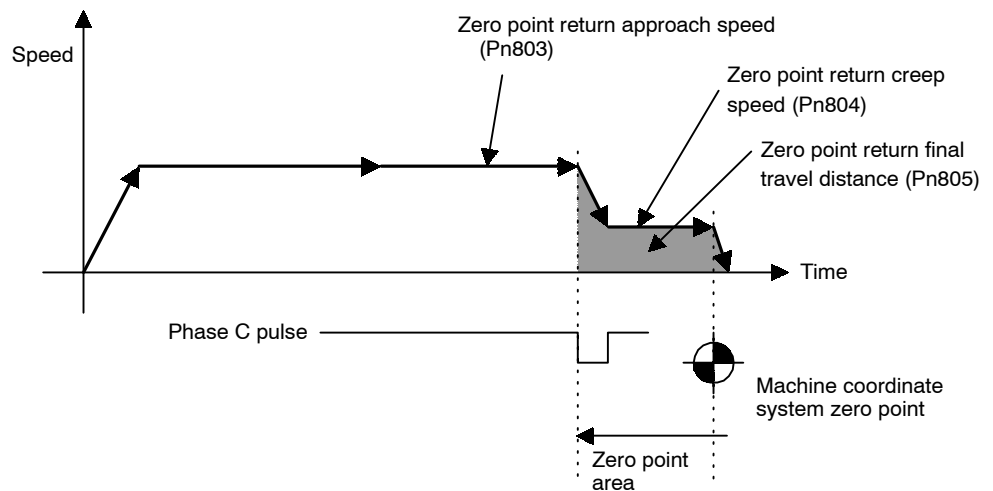
1. The axis travels in the direction specified as zero point direction in the Zero Point Return Function Selection (Pn801) at the Zero Point Return Feed Speed (Pn802).
2. When the deceleration limit switch status changes, the axis decelerates, and travels at the Zero Point Return Approach Speed (Pn803).
3. When the zero point signal changes, the axis decelerates further and travels at the Zero Point Return Creep Speed (Pn804).
4. The axis travels the Zero Point Return Final Travel Distance (Pn805) from the position where the zero point signal changed, and that position becomes the zero point.



Type 3

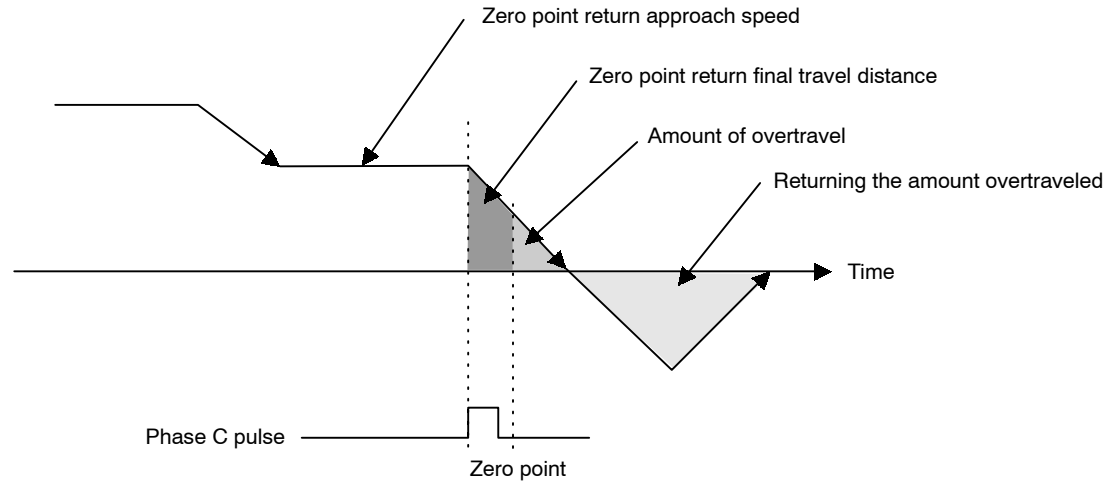
This zero point return type returns to the zero point using the phase C pulse of the encoder only. The outline of the operation is as follows:

1. The axis travels in the direction specified as zero point direction in the Zero Point Return Function Selection (Pn801) at the Zero Point Return Approach Speed (Pn803).
2. When the first phase C pulse of the encoder is detected, the axis decelerates, and travels at the Zero Point Return Creep Speed (Pn804).
3. The axis travels the Zero Point Return Final Travel Distance (Pn805) from the position where the phase C pulse was detected, and that position becomes the zero point.





When the setting for the Zero Point Return Final Travel Distance (Pn805) is small (when the distance is shorter than the distance required for the deceleration from approach speed), the axis will travel past the zero point and then return to it from the other direction.



4

Parameter Details (Object 0x64)

The details of parameters relating to zero point return are shown below.

Zero Point Return Mode (Object: 0x64, Attribute: #10; Pn800)

The zero point return type is specified in the zero point return mode.

| Zero Point Return Mode | Zero Point Return Type |
|------------------------|---|
| 0 | 3-step deceleration using deceleration limit switch and phase C pulse |
| 1 | Double-step deceleration using zero point signal |
| 2 | 3-step deceleration using deceleration limit switch and zero point signal |
| 3 | Double-step deceleration using phase C pulse |

Zero Point Return Function Selection (Object: 0x64, Attribute: #11; Pn801)

The zero point return function selection has the following bit settings.

| Bit | Name | Description |
|---------|--|---|
| 0 | Zero Point Return Direction Setting* | 0: Positive direction 1: Negative direction |
| 1 | Deceleration Limit Switch Signal Setting | 0: Enabled on Low 1: Enabled on High |
| 2 | Zero Point Signal Setting | 0: Enabled on trailing edge 1: Enabled on leading edge |
| 3 to 15 | Reserved | – |

Zero Point Return Feed Speed (Object: 0x64, Attribute: #12; Pn802)

Use the Zero Point Return Feed Speed to set the initial feed speed for 3-step deceleration zero point return.

The setting unit is 1,000 reference units/min.

Zero Point Return Approach Speed (Object: 0x64, Attribute: #13; Pn803)

Use the Zero Point Return Approach Speed to set the approach speed for zero point return.

The setting unit is 1,000 reference units/min.

Zero Point Return Creep Speed (Object: 0x64, Attribute: #14; Pn804)

Use the Zero Point Return Creep Speed to set the creep speed for zero point return.

The setting unit is 1,000 reference units/min.

Zero Point Return Final Travel Distance (Object: 0x64, Attribute: #15; Pn805)

Use the Zero Point Return Final Travel Distance to set the distance from the position where the encoder phase C and zero point signal were detected to the machine zero point.

The setting unit is reference units.

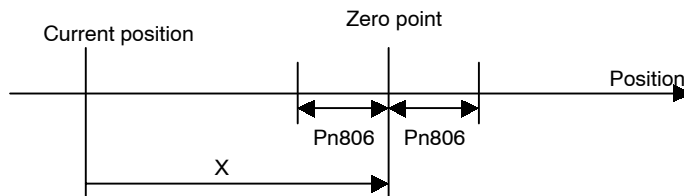
Zero Point Output Width (Object: 0x64, Attribute: #16; Pn806)

Use the Zero Point Output Width to set the area that will be regarded as the zero point.

The setting unit is reference units.

In the following diagram, if the conditions outlined below are met, the Zero Point Flag in the response message will be set to 1.

- $X = | \text{Zero point} - \text{Current position} | \leq \text{Pn806}$



Zero Point Offset (Object: 0x64, Attribute: #17; Pn809)

The system automatically writes to the Zero Point Offset the value of the offset from the zero point on the encoder when the zero point setting in the absolute value detection system has been completed. Normally, this parameter does not need to be set.

When using an absolute value detection system, set this value to enable adjustment of the zero point.

Zero Point Return Acceleration/Deceleration Time (Object: 0x64, Attribute: #18; Pn80A)

Use the Zero Point Return Acceleration/Deceleration Time to set the acceleration/declaration time constant used during zero point return. The setting unit is ms. Single-step linear acceleration/deceleration is used for zero point return. Refer to 4.3.4 *Speed, Acceleration, and Deceleration* for information on this acceleration/deceleration type.

Note: Change the setting of Pn80A if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0.

The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

4.3.3 Machine System and Peripheral Devices

The details of parameters relating to the machine system and peripheral devices are shown below.

Coordinate Type (Object: 0x64, Attribute: #32; Pn812)

Use the Coordinate Type to set whether to use the NS300 Module as a linear axis or rotary axis.

| Pn812 | Description |
|-------|---|
| 0 | The linear axis is designated. The unit of current value data: reference units |
| 1 | The rotary axis is designated. The unit of current value data: degrees |

Reference Units per Machine Rotation (Object: 0x64, Attribute: #33; Pn813)

Use the Reference Units per Machine Rotation to set the reference unit for one machine rotation. This parameter is enabled only when the coordinate type is set to rotary axis. If this parameter is not set correctly, when the machine performs a 360° rotation, the current position will not be reset to 0°, so be careful.

The setting unit is reference units. The initial value is 360,000.

Backlash Compensation (Object: 0x64, Attribute: #34; Pn814)

Use the Backlash Compensation to set the amount of compensation when backlash compensation is used. The setting unit is reference units.

Backlash Compensation Direction (Object: 0x64, Attribute: #35; Pn815)

Use the Backlash Compensation Direction to set the direction of the backlash compensation.

Normally, set this parameter in the opposite direction to the zero point direction.

| Pn815 | Description |
|-------|--------------------|
| 0 | Positive Direction |
| 1 | Negative Direction |

Positive Software Limit (Object: 0x64, Attribute: #36; Pn816)

Use the Positive Software Limit to set the software limit in the positive direction.

The setting unit is reference unit. Make the setting between -99,999,999 and 99,999,999.

Negative Software Limit (Object: 0x64, Attribute: #37; Pn817)

Use the Negative Software Limit to set the software limit in the negative direction.

The setting unit is reference unit. Make the setting between -99,999,999 and 99,999,999.

Machine Function Selection (Object: 0x64, Attribute: #38; Pn818)

Use the Machine Function Selection to set whether or not to use the software limit functions and the backlash compensation functions.

| Bit | Description |
|-----|---|
| 0 | 0: Software Limit is disabled. 1: Software Limit is enabled. |
| 1 | 0: Backlash Compensation is disabled. 1: Backlash Compensation is enabled. |

Note: 1. The software limit is enabled only in the following cases.

- If Bit 0 of Pn 818 is set to 1, or
 - After a zero point return is successfully completed when using an incremental encoder.
2. If Pn812 is set to 1 and the rotational axis is used with the coordinate system, set this parameter to zero.

Hardware Limit Signal Function Selection (Object: 0x64, Attribute: #39; Pn819)

Use the Hardware Limit Signal Function Selection to set whether or not to use the hardware limit and to set the signal polarity.

| Bit | Name | Description |
|---------|--------------------------------|---|
| 0 | Enable/Disable Hardware Limit | 0: Disabled 1: Enabled |
| 1 | Hardware Limit Signal Polarity | 0: Enabled on Low 1: Enabled on High |
| 2 to 15 | Reserved | – |

Hardware Limit Action (Object: 0x64, Attribute: #40; Pn81A)

Use the Hardware Limit Action to set the operation of the NS300 Module when a hardware limit is detected.

| Pn81A | Description |
|----------|--|
| 0 | Servo OFF |
| 1 | Hard Stop: Stops at the specified maximum torque without acceleration or deceleration. |
| 2 to 255 | Reserved |

Emergency Stop Signal Function Selection

(Object: 0x64, Attribute: #41: Pn81B)

Use the Emergency Stop Signal Function Selection to set whether or not to use the emergency stop function and to set the polarity of the signal.

| Bit | Name | Description |
|---------|-----------------------------------|---|
| 0 | Enable/disable Emergency Stop | 0: Disabled 1: Enabled |
| 1 | Emergency Stop Signal Polarity | 0: Enabled on Low 1: Enabled on High |
| 2 to 15 | Reserved | – |

Operation Selection at Emergency Stop

(Object: 0x64, Attribute: #42: Pn81C)

Use the Operation Selection at Emergency Stop to set the operation at emergency stop when the emergency stop signal has been enabled. The currently supported setting is 0: Turn OFF Servo.

4.3.4 Speed, Acceleration, and Deceleration

■ Acceleration and Deceleration Patterns

The following acceleration and deceleration patterns are possible by combining acceleration/ deceleration types (Pn826 or Pn836) and filters (Pn829).

| - | | Acceleration/Deceleration Type (Pn826 or Pn836) | | | |
|--------------------------|-----------------------|--|--|--|--|
| | | 0: None | 1: Single-step Linear | 2: Double-step Linear | 3: Asymmetric |
| Filter Selection (Pn829) | 0: None | No acceleration and deceleration | Single-step Linear Accel/Decel Constant Accel/Decel* ¹ | Double-step Linear Accel/Decel Constant Accel/Decel* ¹ | Asymmetric Linear Accel/Decel Constant Accel/Decel* ¹ |
| | 1: Exponent | Exponential Accel/Decel Constant Accel/Decel time* ² | --- | --- | --- |
| | 2: Exponent with Bias | Exponential Accel/Decel with Bias Constant Accel/Decel time* ² | --- | --- | --- |
| | 3: Travelling Average | Single-step Linear Accel/Decel Constant Accel/Decel time* ² | S-curve Accel/Decel Time Constant Accel/Decel* ¹ | --- | Asymmetric S-curve Accel/Decel Constant Accel/Decel* ¹ |

* 1. With Constant Accel/Decel, the time required for acceleration and deceleration changes with the feed speed changes.

* 2. With Constant Accel/Decel time, the time required for acceleration and deceleration does not change even if the feed speed changes.

Note: 1. Combinations other than those given above may result in incorrect acceleration and deceleration.

2. Change the settings of Pn826, Pn829, and Pn836 if INPOS (Positioning completed range) is set to 1. Do not change these settings if INPOS is set to 0.

The SERVOPACK may not operate correctly if the settings of these parameters and INPOS do not correspond.

Single-step Linear Acceleration/Deceleration with Constant Acceleration/Deceleration

For Single-step Linear Acceleration/Deceleration with Constant Acceleration/Deceleration, the acceleration/deceleration is determined by two parameters: the Maximum Feed Speed and the Acceleration Time for Positioning.

The time T required to reach the Feed Speed for Positioning can be calculated as follows:

$$T [\text{ms}] = \text{Pn822} \times (\text{Pn821}/\text{Pn843})$$

If this acceleration/deceleration pattern is used, the acceleration/deceleration will remain constant even if the Feed Speed for Positioning is changed.

Table 4.4 Related Parameters

| Object | Attribute | Pn□□□ | Name |
|--------|-----------|-------|--|
| 0x64 | #56 | Pn826 | Acceleration/Deceleration Type for Positioning (= 1) |
| | #58 | Pn829 | Filter Selection (= 0) |
| | #51 | Pn821 | Feed Speed for Positioning |
| | #52 | Pn822 | Acceleration Time for Positioning |
| | #73 | Pn843 | Maximum Feed Speed |

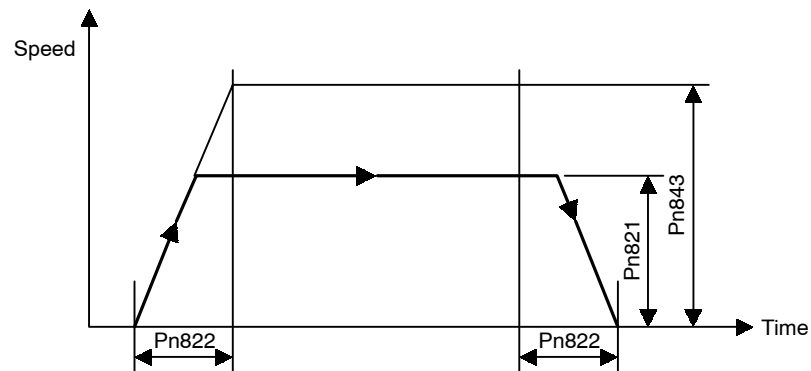


Figure 4.2 Single-step Linear Acceleration/Deceleration with Constant Acceleration/Deceleration

Double-step Linear Acceleration/Deceleration with Constant Acceleration/Deceleration

For Double-step Acceleration/Deceleration, the acceleration/deceleration will change when the Switch Speed for Second Acceleration/Deceleration is reached. The acceleration/deceleration for step 1 is determined by two parameters: the Maximum Feed Speed and the Acceleration Time for Positioning. The acceleration/deceleration for step 2 is determined by three parameters: the Maximum Feed Speed, the Switch Speed for the Second Acceleration/Deceleration, and the Acceleration/Deceleration Time Constant of the Second Acceleration/Deceleration.

The time T required to reach a constant speed for positioning can be calculated as follows:

$$T1 [ms] = Pn822 \times (Pn824/Pn843)$$

$$T2 [ms] = Pn825 \times (Pn821 - Pn824)/(Pn843 - Pn824)$$

$$T [ms] = T1 + T2$$

If this acceleration/deceleration pattern is used, the acceleration/deceleration will remain constant even if the Feed Speed for Positioning is changed.

Table 4.5 Related Parameters

| Object | Attribute | Pn□□□ | Name |
|--------|-----------|-------|--|
| 0x64 | #56 | Pn826 | Acceleration/Deceleration Type for Positioning (= 2) |
| | #58 | Pn829 | Filter Selection (= 0) |
| | #51 | Pn821 | Feed Speed for Positioning |
| | #52 | Pn822 | Acceleration Time Constant for Positioning |
| | #54 | Pn824 | Switch Speed for Second Accel/Decel |
| | #55 | Pn825 | Accel/Decel Time Constant of Second Accel/Decel |
| | #73 | Pn843 | Maximum Feed Speed |

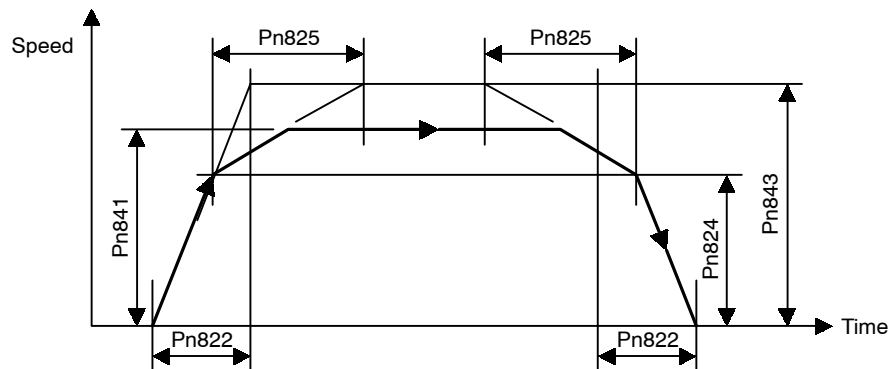


Figure 4.3 Double-step Linear Acceleration/Deceleration with Constant Acceleration/Deceleration

Asymmetric Linear Acceleration/Deceleration with Constant Acceleration/Deceleration

For Asymmetric Linear Acceleration/Deceleration, the acceleration and deceleration can be set separately in Single-step Linear Acceleration/Deceleration.

For example, for deceleration, the time T required to stop from the Feed Speed for Positioning can be calculated as follows:

$$T [\text{ms}] = \text{Pn823} \times (\text{Pn821}/\text{Pn843})$$

If this acceleration/deceleration pattern is used, the acceleration/deceleration will remain constant even if the Feed Speed for Positioning is changed.

Table 4.6 Related Parameters

| Object | Attribute | Pn□□□ | Name |
|--------|-----------|-------|--|
| 0x64 | #56 | Pn826 | Acceleration/Deceleration Type for Positioning (= 3) |
| | #58 | Pn829 | Filter Selection (= 0) |
| | #51 | Pn821 | Feed Speed for Positioning |
| | #52 | Pn822 | Acceleration Time for Positioning |
| | #53 | Pn823 | Deceleration Time for Positioning |
| | #73 | Pn843 | Maximum Feed Speed |

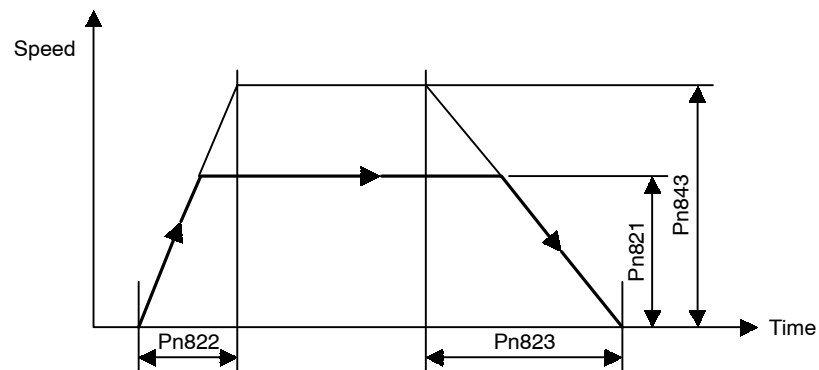


Figure 4.4 Asymmetric Linear Acceleration/Deceleration with Constant Acceleration/Deceleration

Exponential Acceleration/Deceleration with Constant Acceleration/Deceleration Time

For Exponential Acceleration/Deceleration, the acceleration/deceleration is determined by two parameters: the Feed Speed for Positioning and the Time Constant for Exponential Acceleration/Deceleration. Set the time required to reach 63.2% of the Feed Speed for Positioning to Time Constant for Exponential Acceleration/Deceleration. The acceleration/deceleration time will be $3.91 \times Pn840$ ms.

If this acceleration/deceleration pattern is used, the acceleration/deceleration will remain constant even if the Feed Speed for Positioning is changed.

Table 4.7 Related Parameters

| Object | Attribute | Pn□□□ | Name |
|--------|-----------|-------|---|
| 0x64 | #56 | Pn826 | Acceleration/Deceleration Type for Positioning (= 0) |
| | #58 | Pn829 | Filter Selection (= 1) |
| | #51 | Pn821 | Feed Speed for Positioning |
| | #70 | Pn840 | Time Constant for Exponential Acceleration/Deceleration |

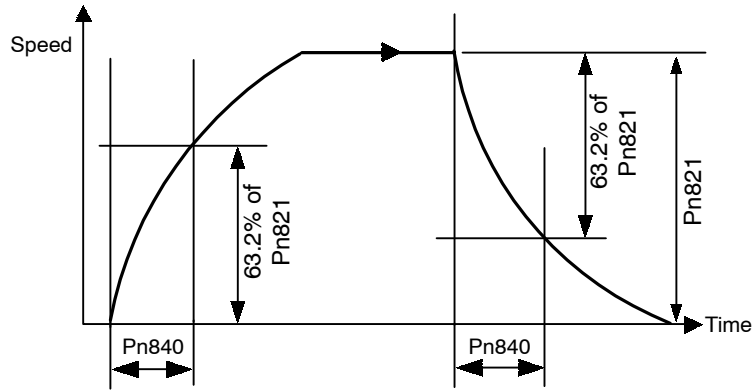


Figure 4.5 Exponential Acceleration/Deceleration with Constant Acceleration/Deceleration Time

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Exponential Acceleration/Deceleration with Bias with Constant Acceleration/Deceleration Time

For Exponential Acceleration/Deceleration with Bias, a bias is applied to the Exponential Acceleration/Deceleration.

Feed speed = Bias Speed for Exponential Acceleration/Deceleration +

(Feed Speed for Positioning – Bias Speed for Exponential Acceleration/Deceleration) \times 0.632

The acceleration/deceleration time can be calculated as $3.91 \times Pn840$ ms.

If this acceleration/deceleration pattern is used, the acceleration/deceleration will remain constant even if the Feed Speed for Positioning is changed. If the Bias Speed for Exponential Acceleration/Deceleration is set to 0 (zero), this Acceleration/Deceleration pattern will be the same as the Exponential's pattern.

Table 4.8 Related Parameters

| Object | Attribute | Pn□□□ | Name |
|--------|-----------|-------|---|
| 0x64 | #56 | Pn826 | Acceleration/Deceleration Type for Positioning (= 0) |
| | #58 | Pn829 | Filter Selection (= 2) |
| | #51 | Pn821 | Feed Speed for Positioning |
| | #70 | Pn840 | Time Constant for Exponential Acceleration/Deceleration |
| | #71 | Pn841 | Bias Speed for Exponential Acceleration/Deceleration |

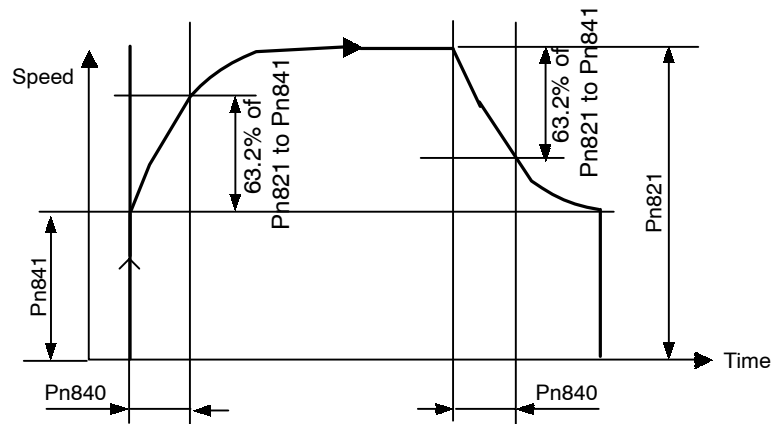


Figure 4.6 Exponential Acceleration/Deceleration with Bias with Constant Acceleration/Deceleration Time

Single-step Linear Acceleration/Deceleration with Constant Acceleration/Deceleration Time

For Single-step Linear Acceleration/Deceleration with Constant Acceleration/Deceleration Time, the acceleration/deceleration is determined by two parameters: the Feed Speed for Positioning and the Time Constant of Travelling Average.

If this acceleration/deceleration pattern is used, the acceleration/deceleration will remain constant even if the Feed Speed for Positioning is changed.

Table 4.9 Related Parameters

| Object | Attribute | Pn□□□ | Name |
|--------|-----------|-------|--|
| 0x64 | #56 | Pn826 | Acceleration/Deceleration Type for Positioning (= 0) |
| | #58 | Pn829 | Filter Selection (= 3) |
| | #51 | Pn821 | Feed Speed for Positioning |
| | #72 | Pn842 | Time Constant of Travelling Average |

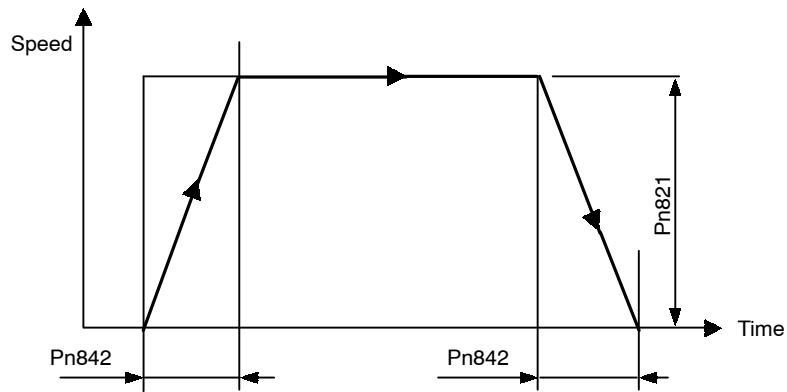


Figure 4.7 Single-step Linear Acceleration/Deceleration with Constant Acceleration/Deceleration Time

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S-curve Acceleration/Deceleration with Constant Acceleration/Deceleration

For S-curve Acceleration/Deceleration with Constant Acceleration/Deceleration, the acceleration/deceleration is determined by two parameters as same as Single-step Linear Acceleration/Deceleration: the Maximum Feed Speed and the Acceleration Time for Positioning. For S-curve Acceleration/Deceleration, however, a filter is applied when starting and just before reaching the Feed Speed for Positioning to smooth the corners. The time for rounding the corners is set in the Time Constant of the Travelling Average.

The time T required to reach the Feed Speed for Positioning for positioning can be calculated as follows:

$$T [\text{ms}] = \text{Pn842} + \text{Pn822} \times (\text{Pn821}/\text{Pn843})$$

If this acceleration/deceleration pattern is used, the acceleration/deceleration will remain constant even if the Feed Speed for Positioning is changed.

Table 4.10 Related Parameters

| Object | Attribute | Pn□□□ | Name |
|--------|-----------|-------|--|
| 0x64 | #56 | Pn826 | Acceleration/Deceleration Type for Positioning (= 1) |
| | #58 | Pn829 | Filter Selection (= 3) |
| | #51 | Pn821 | Feed Speed for Positioning |
| | #52 | Pn822 | Acceleration Time for Positioning |
| | #72 | Pn842 | Time Constant of Travelling Average |
| | #73 | Pn843 | Maximum Feed Speed |

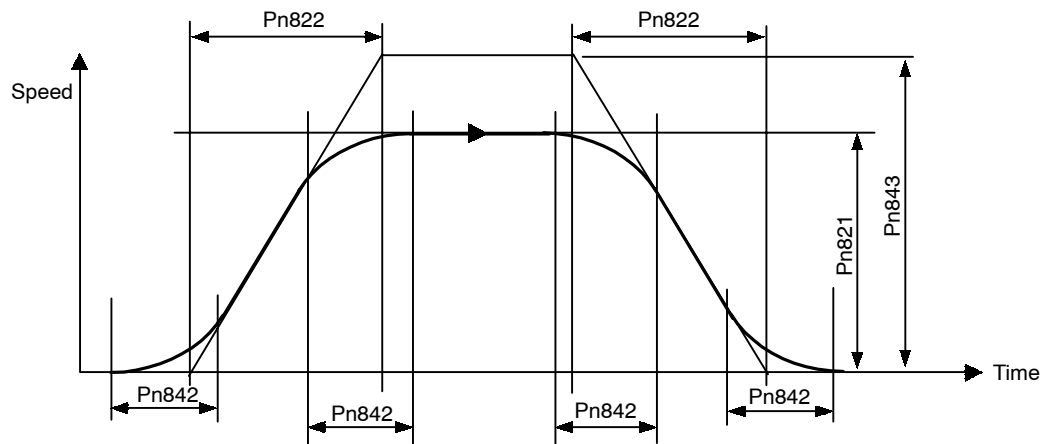


Figure 4.8 S-curve Acceleration/Deceleration with Constant Acceleration/Deceleration

Asymmetric S-curve Acceleration/Deceleration with Constant Acceleration/Deceleration

For Asymmetric S-curve Acceleration/Deceleration with constant Acceleration/Deceleration, the acceleration and deceleration can be set separately to the S-curve Acceleration/Deceleration.

Same as for Asymmetric Linear Acceleration/Deceleration, the acceleration and deceleration are determined by the Maximum Feed Speed, Acceleration Time for Positioning, and Deceleration Time for Positioning. For Asymmetric S-curve Acceleration/Deceleration, however, a filter is applied when starting, ending, and just before reaching the Feed Speed for Positioning to smooth the corners. The time for rounding the corners is set in the Time Constant of the Travelling Average.

The time T required to reach the Feed Speed for Positioning can be calculated as follows:

$$T \text{ [ms]} = Pn842 + Pn822 \times (Pn821/Pn843)$$

If this acceleration/deceleration pattern is used, the acceleration/deceleration will remain constant even if the Feed Speed for Positioning is changed.

Table 4.11 Related Parameters

| Object | Attribute | Pn□□□ | Name |
|--------|-----------|-------|--|
| 0x64 | #56 | Pn826 | Acceleration/Deceleration Type for Positioning |
| | #58 | Pn829 | Filter Selection |
| | #51 | Pn821 | Feed Speed for Positioning (mm/min) |
| | #52 | Pn822 | Acceleration Time for Positioning |
| | #53 | Pn823 | Deceleration Time for Positioning |
| | #72 | Pn842 | Time Constant for Travelling Average |
| | #73 | Pn843 | Maximum Feed Speed |

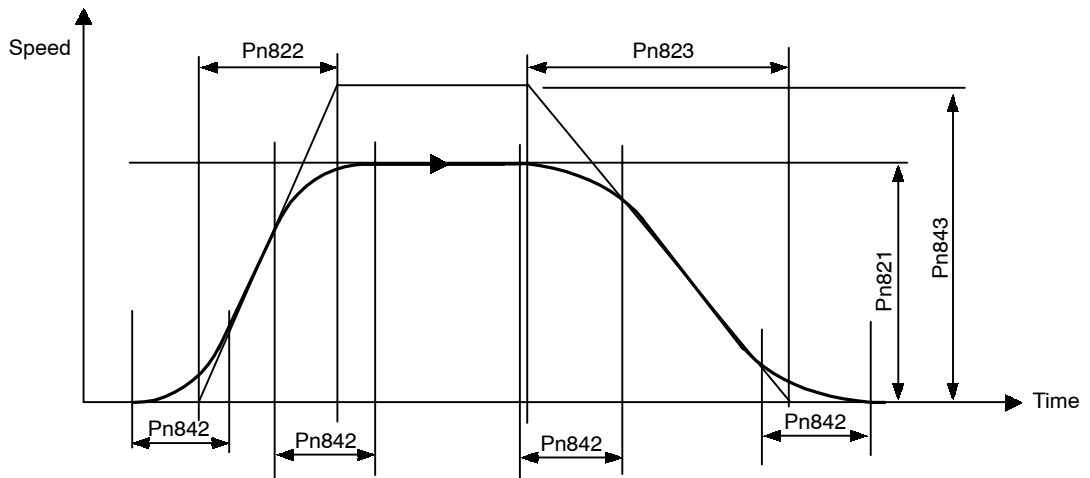


Figure 4.9 Asymmetric S-curve Acceleration/Deceleration with Constant Acceleration/Deceleration

■ Parameter Details

Feed Speed for Positioning (Object: 0x64, Attribute: #51; Pn821)

Use the Feed Speed for Positioning to set the feed speed of the positioning.

The setting unit is 1,000 reference units/min.

Acceleration Time for Positioning (Object: 0x64, Attribute: #52; Pn822)

Use the Acceleration Time for Positioning to set the acceleration time for the positioning.

The setting unit is ms.

Note: Change the setting of Pn822 if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0.
The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

Deceleration Time for Positioning (Object: 0x64, Attribute: #53; Pn823)

Use the Deceleration Time for Positioning to set the deceleration time for positioning.

The setting unit is ms.

This parameter is enabled only when the Acceleration/Deceleration Type for Positioning (Object: 0x64, Attribute: #56; Pn826) is set to the asymmetrical linear acceleration and deceleration.

Note: Change the setting of Pn823 if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0.
The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

Switch Speed for Second Acceleration/Deceleration for Positioning (Object: 0x64, Attribute: #54; Pn824)

Use the Switch Speed for Second Acceleration/Deceleration for Positioning to set the switching speed to acceleration and deceleration of the second step when using double-step linear acceleration and deceleration. The setting unit is 1,000 reference units/min.

This parameter is enabled only when the Acceleration/Deceleration Type for Positioning (Object: 0x64, Attribute: #56; Pn826) is set to double-step linear acceleration and deceleration.

Note: Change the setting of Pn824 if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0.
The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

Acceleration/Deceleration Time for Second Acceleration/Deceleration for Positioning (Object: 0x64, Attribute: #55; Pn825)

Use the Acceleration/Deceleration Time for Second Acceleration/Deceleration for Positioning to set the acceleration and deceleration time for the second step when using double-step linear acceleration and deceleration. The setting unit is ms.

This parameter is enabled only when the Acceleration/Deceleration Type for Positioning (Object: 0x64, Attribute: 56; Pn826) is set to double-step linear acceleration and deceleration.

Note: Change the setting of Pn825 if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0.

The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

Acceleration/Deceleration Type for Positioning (Object: 0x64, Attribute: #56; Pn826)

Use the Acceleration/Deceleration Type for Positioning to set the type of acceleration and deceleration for the positioning.

You can set eight different acceleration and deceleration patterns using different combinations of Acceleration/Deceleration Type for Positioning and Filter Selection (Object: 0x64, Attribute: #58; Pn829).

| Setting | Description |
|---------|--------------------|
| 0 | None |
| 1 | Single Step Linear |
| 2 | Double Step Linear |
| 3 | Asymmetric |

Note: Change the setting of Pn826 if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0. The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

External Positioning Feed Speed (Object: 0x64, Attribute: #57; Pn827)

Use the External Positioning Feed Speed to set the feed speed for external positioning.

The setting unit is 1,000 reference units/min.

Filter Selection (Object: 0x64, Attribute: #58; Pn829)

Use the Filter Selection to set the acceleration and deceleration filter type. This parameter is used in common by the positioning, constant feeding, and zero point return operations.

| Setting | Description |
|---------|-----------------------|
| 0 | None |
| 1 | Exponential |
| 2 | Exponential with Bias |
| 3 | Travelling Average |

Note: Change the setting of Pn829 if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0.
The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

Constant Feed Reference Module Selection (Object: 0x64, Attribute: #59; Pn830)

Use the Constant Feed Reference Module Selection to set the reference unit for the speed setting for a constant feed Command message.

| Setting | Description |
|---------|--|
| 0 | Sets an override value (%) for the feed speed for FEED (Pn831) in the command message. |
| 1 | Speed set directly in the command message. The setting unit is 1,000 reference units/min. |

Constant Feed Speed (Object: 0x64, Attribute: #60; Pn831)

Use the Constant Feed Speed to set the feed speed when using the FEED operation.
The setting unit is 1,000 reference units/min.

Acceleration Time for Constant Feed (Object: 0x64, Attribute: #61; Pn832)

Use the Acceleration Time for Constant Feed to set the acceleration time when using the feed operation. The setting unit is ms.

Note: Change the setting of Pn832 if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0.
The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

Deceleration Time for Constant Feed (Object: 0x64, Attribute: #62; Pn833)

Use the Deceleration Time for Constant Feed to set the deceleration time when using asymmetrical acceleration and deceleration with the constant feed operation. The setting unit is ms.

This parameter is enabled only when the Acceleration/Deceleration Type for Constant Feed (Object: 0x64, Attribute: #65; Pn836) is set to asymmetrical linear acceleration and deceleration.

Note: Change the setting of Pn833 if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0.
The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

Switch Speed for Constant Feed Second Accel/Decel (Object: 0x64, Attribute: #63; Pn834)

Use the Switch Speed for Constant Feed Second Acceleration/Deceleration to set the switching speed to double-step acceleration and deceleration when using double-step linear acceleration and deceleration with the constant feed operation. The setting unit is 1,000 reference units/min.

This parameter is enabled only when the Acceleration/Deceleration Type for Constant Feed (Object: 0x64, Attribute: #65; Pn836) is set to double-step linear acceleration and deceleration.

Note: Change the setting of Pn834 if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0.
The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

Accel/Decel Time for Constant Feed Second Accel/Decel (Object: 0x64, Attribute: #64; Pn835)

Use the Acceleration/Deceleration Time for Constant Feed Second Acceleration/Deceleration to set the second acceleration/deceleration time when using double-step linear acceleration and deceleration with the constant feed operation. The setting unit is ms.

This parameter is enabled only when the Acceleration/Deceleration Type for Constant Feed (Object: 0x64, Attribute: #65; Pn836) is set to double-step linear acceleration and deceleration.

Note: Change the setting of Pn835 if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0.
The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

Acceleration/Deceleration Type for Constant Feed (Object: 0x64, Attribute: #65; Pn836)

Use the Acceleration/Deceleration Type for Constant Feed to set the acceleration and deceleration type with the constant feed operation.

You can set eight different acceleration and deceleration patterns using different combinations of Acceleration/Deceleration Type for Constant Feed and Filter Selection (Object: 0x64, Attribute: #58; Pn829).

| Setting | Description |
|---------|--------------------|
| 0 | None |
| 1 | Single Step Linear |
| 2 | Double Step Linear |
| 3 | Asymmetric |

Note: Change the setting of Pn836 if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0.
The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

Time Constant for Exponential Acceleration/Deceleration (Object: 0x64, Attribute: #70; Pn840)

Use the Time Constant for Exponential Acceleration/Deceleration to set the time constant when using exponential acceleration and deceleration. This parameter is used in common by the positioning and the continuous rotary operation. The setting unit is ms.

Note: Change the setting of Pn840 if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0.
The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

Bias Speed for Exponential Acceleration/Deceleration (Object: 0x64, Attribute: #71; Pn841)

Use the Bias Speed for Exponential Acceleration/Deceleration to set the bias speed of the exponential acceleration and deceleration. The setting unit is 1,000 reference units/min.

Note: Change the setting of Pn841 if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0.
The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

Time Constant of Travelling Average (Object: 0x64, Attribute: #72; Pn842)

Use the Time Constant of Travelling Average to set the time constant of the average travel speed of the acceleration and deceleration. This parameter is used in common by the positioning and the continuous rotary operation. The setting unit is ms.

Note: Change the setting of Pn842 if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0.
The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

Maximum Feed Speed (Object: 0x64, Attribute: #73; Pn843)

Make sure that the maximum feeding speed is set to a value greater than that of all speed parameters. Acceleration/Deceleration is calculated with this data and each constant. The setting unit is a reference unit. Speed parameters: Pn802, Pn803, Pn804, Pn821, Pn824, Pn827, Pn831, Pn834, Pn841, Pn854, Pn862, Pn873 to Pn882, and Pn940 to Pn971.

Note: Change the setting of Pn843 if INPOS (Positioning completed range) is set to 1. Do not change the setting if INPOS is set to 0.

The SERVOPACK may not operate correctly if the settings of this parameter and INPOS do not correspond.

Step Distance 1 (Object: 0x64, Attribute: #74; Pn844)

Use the Step Distance 1 to set the amount of travel when executing step operation. This value is used when the 0 has been specified as the command data in a command message.

The setting unit is reference units.

Step Distance 2 (Object: 0x64, Attribute: #75; Pn845)

Use the Step Distance 2 to set the amount of travel when executing step operation. This value is used when the 1 has been specified as the command data in a command message.

The setting unit is reference units.

Step Distance 3 (Object: 0x64, Attribute: #76; Pn846)

Use the Step Distance 3 to set the amount of travel when executing step operation. This value is used when the 2 has been specified as the command data in a command message.

The setting unit is reference units.

Step Distance 4 (Object: 0x64, Attribute: #77; Pn847)

Use the Step Distance 4 to set the amount of travel when executing step operation. This value is used when the 3 has been specified as the command data in a command message.

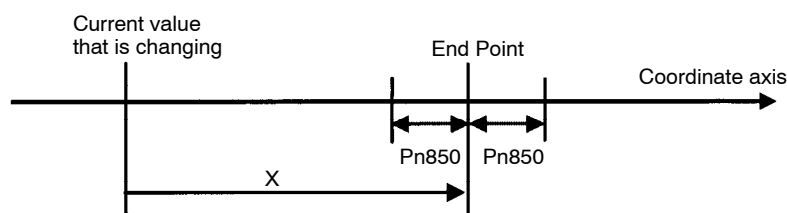
The setting unit is reference units.

4.3.5 Positioning

■ Parameter Details

Positioning Deadband (Object: 0x64, Attribute: #90; Pn850)

Use the Positioning Deadband to set the positioning completed range, i.e., to determine if the axis is on-target position. The setting unit is reference units. When the positioning deadband is set to 0, no on-target position check will be performed.



Positioning Deadband

When the following condition is satisfied in the above figure, the axis is viewed as being at the on-target position and the On-target Flag in the response message will be set to 1.

- $X = (\text{End point} - \text{Current value}) \leq \text{Pn850}$

Positioning Timeout (Object: 0x64, Attribute: #91; Pn851)

Use the Positioning Timeout to set the time for performing on-target position check. The setting unit is ms. If, after the move command distribution has been completed, the positioning completed range is not entered within the time set, A.9A positioning a completion timeout warning will be sent.

If this parameter is set to 0, the timeout check is not executed.

Positioning Proximity Detection Width (Object: 0x64, Attribute: #92; Pn852)

Use the Positioning Proximity Detection Width to set the range for positioning area proximity to be detected. If the difference between the current position and the target position are within this parameter range, the proximity signal in the response message will be set to 1. The setting unit is reference units.

Direction for Rotation System (Object: 0x64, Attribute: #93; Pn853)

Use the Direction for Rotation System to set the rotation direction for when Station Commands or rotation commands using absolute values are used.

| Setting | Description |
|---------|---|
| 0 | Uses the rotation direction in command message. |
| 1 | Uses the direction for the shortest travel. |

Approach Speed for External Positioning

(Object: 0x64, Attribute: #94; Pn854)

Use the Approach Speed for External Positioning to set the approach speed after the external signal has reversed status for an external positioning command.

The setting unit is 1,000 reference units/min.

Travel Distance for External Positioning

(Object: 0x64, Attribute: #95; Pn855)

Use the Travel Distance for External Positioning to set the travel distance after the external signal has reversed status for an external positioning command.

The setting unit is reference units.

Function Selection for External Positioning

(Object: 0x64, Attribute: #96; Pn856)

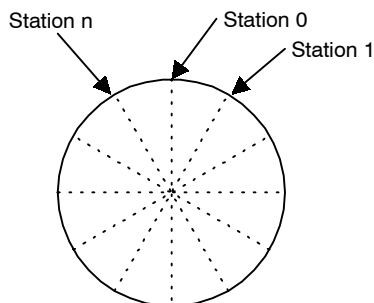
Use the Function Selection for External Positioning to select the polarity of the external signal.

| Bit | Name | Description |
|---------|--------------------------|---|
| 0 | External Signal Polarity | 0: Enabled on low 1: Enabled on high |
| 2 to 15 | Reserved | – |

Number of Stations (Object: 0x64, Attribute: #100; Pn85A)

Use the Number of Stations to set how many stations one revolution of the servomotor will be evenly split into when Station Commands are used.

In Station Commands, equally divided stations are numbered in order from 0 and positioning is performed by specifying a station number.

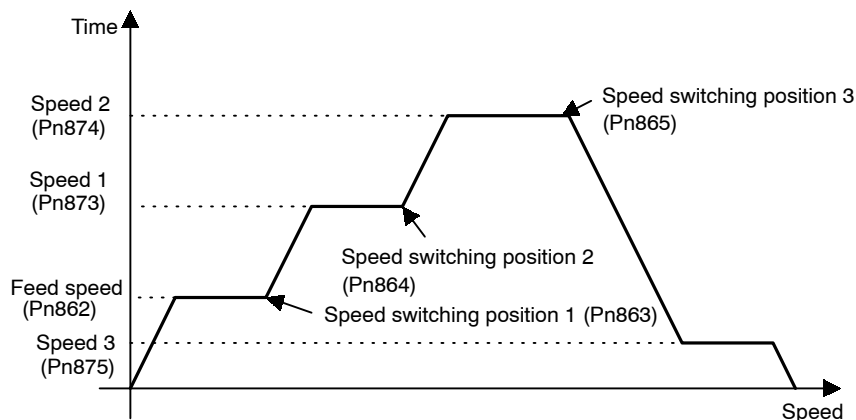


4.3.6 Multi-speed Positioning

By using multi-speed positioning, the speed can be changed in stages during positioning.

Up to 16 speed change stages are possible.

When the axis reaches a specified position, the speed switches to the speed for the next stage and the axis travels to the specified position in that next stage.



■ Parameter Details

Number of Points for Speed Switching

(Object: 0x64, Attribute: #111; Pn861)

Use the Number of Points for Speed Switching to set the number of points at which the speed will be switched. If, for example, the parameters for speed switching positions were set from 1 to 16 but this setting for the number of points was set to 3, the speed switching would be enabled for 3 points only.

Initial Feed Speed for Multi-speed Positioning

(Object: 0x64, Attribute: #112; Pn862)

Use the Initial Feed Speed for Multi-speed Positioning to set the initial feed speed when performing speed multi-step positioning. This speed will be enabled until the position in the speed switching position 1 parameter is reached.

The setting unit is 1,000 reference units/min.

Speed Switching Positions 1 to 16

(Object: 0x64, Attribute: #113 to #128; Pn863 to Pn872)

Use the Speed Switching Position to set the position at which the speed is to change at a position relative to the start position. The speed switching position xx and switching speed xx are used together. For example, the axis will travel from speed switching position 1 to speed switching position 2 at speed 1.

The setting unit is reference units.

Switching Speeds 1 to 16

(Object: 0x64, Attribute: #129 to #144; Pn873 to Pn882)

Use the Switching Speed to set the feed speed between specified speed switching positions. For example, the axis will travel at speed 2 between speed switching position 2 and speed switching position 3.

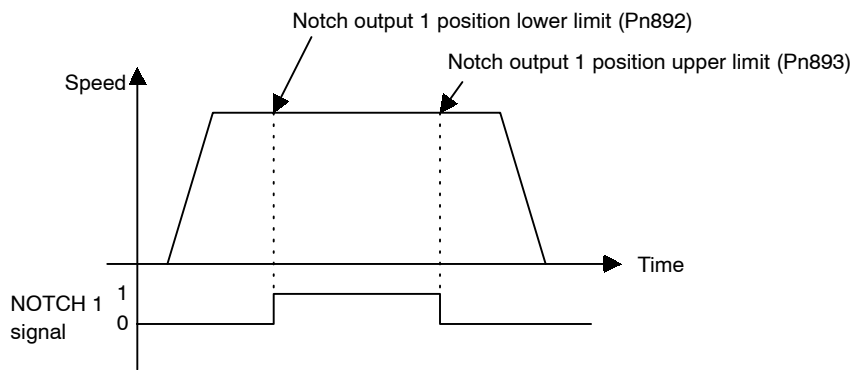
The setting unit is 1,000 reference units/min.

4

4.3.7 Notch Signal Output Positioning

During the positioning, notch signals (NOTCH 1 and NOTCH 2) are output when specified points are passed.

Two notch signals, NOTCH 1 and NOTCH 2, can be output.



■ Parameter Details

Notch Signal Output Position Setting (Object: 0x64, Attribute: #160; Pn890)

Use the Notch Signal Output Position Setting to set whether absolute or relative positions are set for the notch signal output position parameters.

| Setting | Description |
|---------|------------------------------|
| 0 | Setting absolute position. |
| 1 | Specifies relative position. |

Notch Signal Output Setting (Object: 0x64, Attribute: #161; Pn891)

Use the Notch Signal Output Setting to set the polarity of the notch signal output.

Table 4.12 Notch Signal Output Setting

| Setting | Description |
|---------|-----------------------------|
| 0 | Sets NOTCH 1 output signal. |
| 1 | Sets NOTCH 2 output signal. |

Table 4.13 Bit Meanings

| Bit 0/ Bit 1 | Description |
|--------------|-------------------------------|
| 0 | Normally: OFF When passed: ON |
| 1 | Normally: ON When passed: OFF |

Notch 1 Output Position Lower Limit (Object: 0x64, Attribute: #162; Pn892)

Notch 1 Output Position Upper Limit (Object: 0x64, Attribute: #163; Pn893)

Use the Notch 1 Output Position Upper/Lower Limits to set the output position range for notch signal (NOTCH 1). When the current position is inside this range, the status of the NOTCH 1 signal output is reversed based on the notch signal output setting.

Notch 2 Output Position Lower Limit (Object: 0x64, Attribute: #164; Pn894)

Notch 2 Output Position Upper Limit (Object: 0x64, Attribute: #165; Pn895)

Use the Notch 2 Output Position Upper/Lower Limits to set the output position range for notch signal (NOTCH 2). When the current position is inside this range, the status of the NOTCH 2 signal output is reversed based on the notch signal output setting.

5

DeviceNet Communications

This chapter explains using DeviceNet communications to execute commands and editing parameters for an NS300 Module.

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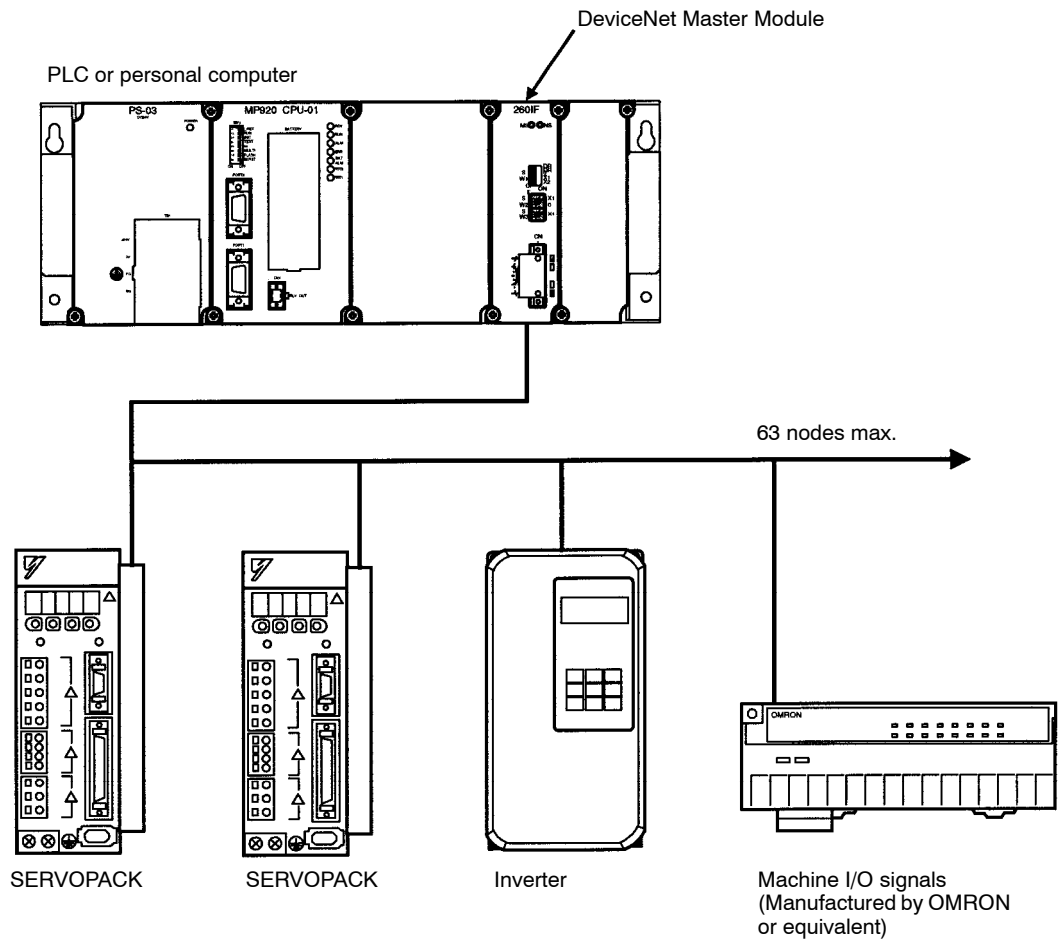
5.1 Specifications and Configuration

5.1.1 Specifications

Refer to *DeviceNet Specification Release 2.0* for details not specified in this manual.

5.1.2 Control Configuration

An outline of the control configuration is shown below. A maximum of 63 NS300 Modules or other slave devices can be connected to one DeviceNet Master.



5.2 DeviceNet Communications Setting Switches

This section explains the switch settings required for DeviceNet communications.

5.2.1 Rotary Switch Settings for Setting Node Address

Use the rotary switches (x1, x10) to set the DeviceNet node address. After making the settings, cycle the communications power to enable the settings.

The node address can be set between 0 and 63. If you make a setting outside this range, a setting error will occur.

Select the node address of the NS300 Module using the switch settings as shown in the following table.

| x 10 | x 1 | Node Address | x 10 | x 1 | Node Address | x 10 | x 1 | Node Address |
|------|-----|--------------|------|-----|---------------|------|-----|---------------|
| 0 | 0 | 0 | 3 | 4 | 34 | 6 | 8 | Setting error |
| 0 | 1 | 1 | 3 | 5 | 35 | 6 | 9 | Setting error |
| 0 | 2 | 2 | 3 | 6 | 36 | 7 | 0 | Setting error |
| 0 | 3 | 3 | 3 | 7 | 37 | 7 | 1 | Setting error |
| 0 | 4 | 4 | 3 | 8 | 38 | 7 | 2 | Setting error |
| 0 | 5 | 5 | 3 | 9 | 39 | 7 | 3 | Setting error |
| 0 | 6 | 6 | 4 | 0 | 40 | 7 | 4 | Setting error |
| 0 | 7 | 7 | 4 | 1 | 41 | 7 | 5 | Setting error |
| 0 | 8 | 8 | 4 | 2 | 42 | 7 | 6 | Setting error |
| 0 | 9 | 9 | 4 | 3 | 43 | 7 | 7 | Setting error |
| 1 | 0 | 10 | 4 | 4 | 44 | 7 | 8 | Setting error |
| 1 | 1 | 11 | 4 | 5 | 45 | 7 | 9 | Setting error |
| 1 | 2 | 12 | 4 | 6 | 46 | 8 | 0 | Setting error |
| 1 | 3 | 13 | 4 | 7 | 47 | 8 | 1 | Setting error |
| 1 | 4 | 14 | 4 | 8 | 48 | 8 | 2 | Setting error |
| 1 | 5 | 15 | 4 | 9 | 49 | 8 | 3 | Setting error |
| 1 | 6 | 16 | 5 | 0 | 50 | 8 | 4 | Setting error |
| 1 | 7 | 17 | 5 | 1 | 51 | 8 | 5 | Setting error |
| 1 | 8 | 18 | 5 | 2 | 52 | 8 | 6 | Setting error |
| 1 | 9 | 19 | 5 | 3 | 53 | 8 | 7 | Setting error |
| 2 | 0 | 20 | 5 | 4 | 54 | 8 | 8 | Setting error |
| 2 | 1 | 21 | 5 | 5 | 55 | 8 | 9 | Setting error |
| 2 | 2 | 22 | 5 | 6 | 56 | 9 | 0 | Setting error |
| 2 | 3 | 23 | 5 | 7 | 57 | 9 | 1 | Setting error |
| 2 | 4 | 24 | 5 | 8 | 58 | 9 | 2 | Setting error |
| 2 | 5 | 25 | 5 | 9 | 59 | 9 | 3 | Setting error |
| 2 | 6 | 26 | 6 | 0 | 60 | 9 | 4 | Setting error |
| 2 | 7 | 27 | 6 | 1 | 61 | 9 | 5 | Setting error |
| 2 | 8 | 28 | 6 | 2 | 62 | 9 | 6 | Setting error |
| 2 | 9 | 29 | 6 | 3 | 63 | 9 | 7 | Setting error |
| 3 | 0 | 30 | 6 | 4 | Setting error | 9 | 8 | Setting error |
| 3 | 1 | 31 | 6 | 5 | Setting error | 9 | 9 | Setting error |
| 3 | 2 | 32 | 6 | 6 | Setting error | --- | --- | --- |
| 3 | 3 | 33 | 6 | 7 | Setting error | --- | --- | --- |

5.2.2 Rotary Switch Settings for Setting Baud Rate

Use the DR rotary switches to set the DeviceNet baud rate. After making the settings, cycle the communications power supply to enable the settings.

Table 5.1 DR Settings

| DR | Baud Rate Setting |
|--------|-----------------------------|
| 0 | 125 Kbps |
| 1 | 250 Kbps |
| 2 | 500 Kbps |
| 3 to 9 | A setting error will occur. |

5.2.3 LED Indicators

NS300 Modules are equipped with two LED indicators, the Module Status indicator to indicate the Module status, and the Network Status indicator to indicate the DeviceNet communications status.

The LED indicator specifications conform to *DeviceNet Specification Release 2.0*.

■ Module Status (MS) Indicator

The MS indicator shows the status of the NS300 Module.

| Status | Indicator |
|--|----------------------------------|
| SGDH control power supply is turned OFF. | Not lit. |
| Module is operating normally. | Lit green. |
| Module is warming up. | Flashes green. |
| Minor Module failure. | Flashes red. |
| Major Module failure. | Lit red. |
| Module is performing self-diagnosis. | Red and green flash alternately. |

Refer to the alarm codes in *Appendix C* for details on the malfunction if the the Module Status indicator is either flashing red or lit red.

■ Network Status (NS) Indicator

The NS indicator shows the status of DeviceNet communications.

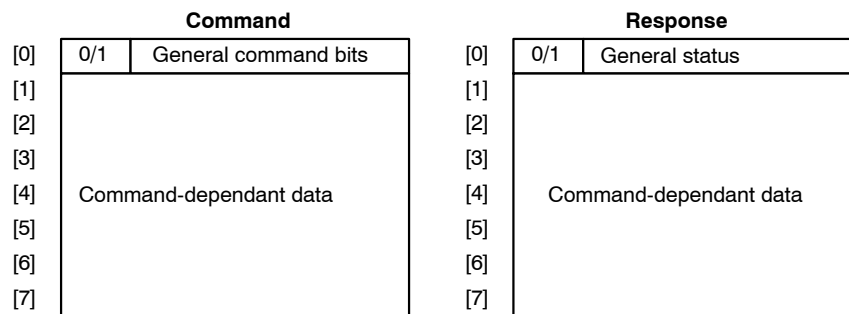
| Status | Indicator |
|--|----------------|
| SGDH control power supply is turned OFF or Module is not online. | Not lit. |
| Module is online, but is not connected to the master device. | Flashes green. |
| Module is online, and is connected to the master device. | Lit green. |
| Connection to the master device has timed out. | Flashes red. |
| A fatal error has occurred in DeviceNet communications. | Lit red. |

5.3 Command/Response Format

This section explains command messages sent to an NS300 Module from the master device and the response messages sent from the NS300 Module.

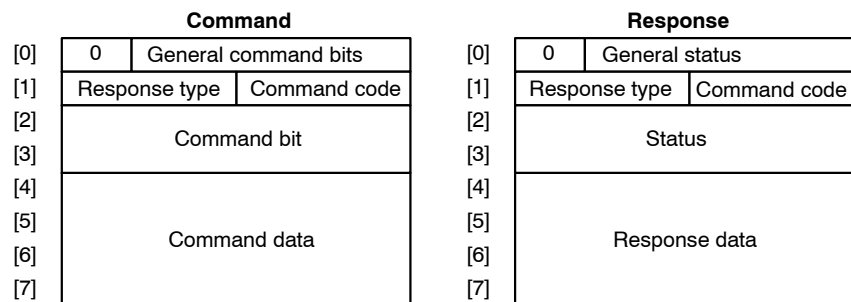
5.3.1 Command Format

This section explains the basic format of command messages sent to an NS300 Module from the master device and the response messages sent from the NS300 Module to the master device. Command and response messages are in an 8-byte data format.

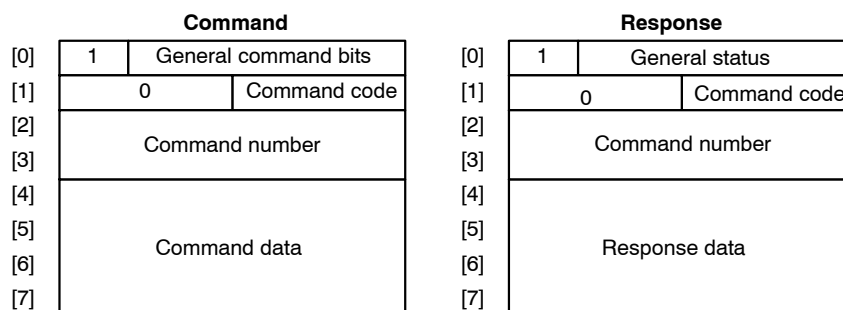


Both the command and response data are separated into two sections. Byte 0 is a general area and bytes 1 to 7 make up the command-dependant data area. The command-dependant data area depends on the two types of commands, move commands and set/read commands. The type of command is defined by the most-significant bit of byte 0.

■ Format for Move Commands



■ Format for Set/Read Commands



5.3.2 General Command Bits and Status

■ General Command Bits

The general command bit area is detailed below.

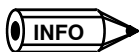
Table 5.2 General Command Bits

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|-------|-------|-------|-------|-------|-------|-------|--------|
| 0 | MOD | 0 | ALRST | ESTP | 0 | 0 | SVON | C_STRT |

Mode: MOD

Use the MOD bit to specify the data format for bytes 1 to 7.

- 0: Move command format
- 1: Set/read command format



The MOD bit alters the data format for bytes 1 to 7. Set it carefully.

Alarm Reset Command: ALRST

Set the ALRST bit to 1 to reset the current alarm/warning. When an alarm or warning occurs in the NS300 Module or SGDh, remove the cause of the alarm before setting this bit to 1. The alarm/warning will be cleared.

Always make sure this bit is set to 0 during normal operation and after an alarm has been cleared.

- 0: NOP
- 1: Requests to reset alarm.

Emergency Stop Command: ESTP

When the ESTP bit is changed from 1 to 0, a move command is canceled and the SGDh servo is turned OFF. If the axis is travelling, axis travel is stopped immediately and the SGDh servo is turned OFF as soon as the servomotor stops.

The ESTP Command has negative logic to confirm that DeviceNet communications have been established. Therefore, set the bit to 1 for normal operation and set it to 0 for emergency stops.

The emergency stop status will continue while this bit is set to 0. To release the emergency stop status, set the bit to 1. To turn ON the servo after releasing an emergency stop, set the Servo ON Command bit to 0 and then set it to 1.

- 0: Requests emergency stop.
- 1: Releases emergency stop.

Servo ON Command: SVON

Set the SVON bit to 1 to turn ON the SGD servo. When the leading edge of the bit is detected, the SGD servo is turned ON and remains ON while the command bit is set to 1. When the command bit setting changes to 0, the servo is turned OFF.

If an alarm turns OFF the SGD servo, the command bit must be set to 0 and then set to 1 again.

- 0: Requests Servo OFF (Requests not to turn ON the motor)
- 1: Requests Servo ON (Requests to turn ON the motor)

Command Start Command: C_STRT

Set the C_STRT bit to 1 to start execution of the command specified by the command code. Always set the command code and command area data before (or at the same time as) setting the C_STRT bit to 1.

Refer to 5.3.3 *Move Command Messages* and 5.3.4 *Set/Read Command Messages* for details on using command codes.

- 0: NOP
- 1: Requests to start command.

■ General Status

Details on the general status area are shown below.

Table 5.3 General Status Bits

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|-------|-------|-------|--------|-------|-------|--------|----------|
| 0 | MOD_R | READY | PWRON | ESTP_R | ALRM | WARN | SVON_R | C_STRT_R |

Mode: MOD_R

The MOD_R bit specifies the data format of bytes 1 to 7.

This bit will be the same as the mode given in the command message.

- 0: Response format for move commands
- 1: Response format for set/read commands

Command Ready: READY

The READY bit will be set to 1 when the NS300 Module is ready to receive commands from the host device. The READY status will be 0 when the Servo ON Command is being executed, when the Parameter Read Command is being executed, when the Parameter Write Command is being executed, when the power is turned ON, when the Module Reset Command in the command message has been received and when the NS300 Module is initializing.

- 0: Disable to accept commands.
- 1: Enable to accept commands.

Main Power Supply Status: PWRON

The PWRON bit will be set to 1 when the SGDH main power supply is turned ON. If the main power supply is turned OFF, the bit will be 0 and the Servo ON and other commands cannot be executed.

- 0: Turns OFF the main power.
- 1: Turns ON the main power.

Emergency Stop: ESTP_R

The ESTP_R bit will be set to 1 when the Emergency Stop Command in the command message has been set to 0 and the NS300 Module is in emergency stop status. Set the Emergency Stop Command in the command message to 1 to clear the emergency stop status, and this bit will change to 0.

- 0: Releases from emergency stop.
- 1: During emergency stop.

Alarm: ALRM

The ALRM bit will be set to 1 when the NS300 Module has detected an alarm. When all alarms have been cleared by the Alarm Reset Command in the command message, this bit will change to 0.

- 0: Normal operation.
- 1: During alarms.

Warning: WARN

The WARN bit will be set to 1 when the NS300 Module has detected a warning. When all warnings have been cleared by the Alarm Reset Command in the command message, this bit will change to 0.

When a warning has occurred, the command that generated the warning and commands other than data setting commands can still be executed normally.

- 0: Normal operation.
- 1: During alarms.

Servo ON: SVON_R

The SVON_R bit will be set to 1 when the Servo ON Command in the command message is set to 1 and the SGDH servo is ON.

- 0: Requests Servo OFF. (Requests to turn OFF the motor.)
- 1: Requests Servo ON. (Requests to turn ON the motor.)

The SVON_R bit will be 0 in the following circumstances.

- When the Servo ON Command in the command message has been set to 0
- When the Emergency Stop Command has been set to 0
- When the Module Reset Command has been set to 1
- When an alarm has occurred

Command Start Response: C_STRT_R

The C_STRT_R bit will be set to 1 when the Command Start Command in the command message has been set to 1. The host device can recognize that the NS300 Module has received a command from the host device by checking that this bit is 1.

- 0: C_STRT not received.
- 1: Receiving C_STRT.

5.3.3 Move Command Messages

■ Command Messages

Details on command messages for move commands are shown below.

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|---------------|-------|-------|-------|--------------|-------|-------|--------|
| 0 | 0 | 0 | ALRST | ESTP | 0 | 0 | SVON | C_STRT |
| 1 | Response type | | | | Command code | | | |
| 2 | HOME | PTBL | STN | STEP | FEED | 0 | HOLD | CANCEL |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | DIR | INC |
| 4 | Command data | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

Command Codes

Command codes are used to specify positioning and other commands. To start execution of a command, set the command code and command data first, and then change the Command Start Command from 0 to 1.

| Command Codes (Binary) | Description |
|------------------------|---------------------------------------|
| 0000 | No operation |
| 0001 | Simple positioning |
| 0010 | External positioning |
| 0011 | Positioning with notch signal outputs |
| 0100 | Multi-speed positioning |

Response Types

The response type in the command message specifies the type of data that will be stored as the response data in the response message. The NS300 Module creates response data in the response messages based on the specified response type.

| Response Type (Binary) | Response Data |
|------------------------|--|
| 0000 | Command position (reference units) |
| 0001 | Current position (reference units) |
| 0010 | Position error (reference units) |
| 0011 | Command speed (1000 reference units/min) |
| 0100 | Current speed (1000 reference units/min) |
| 0101 | Torque (%) |
| 1010 | Station number |
| 1011 | Point table number |

Cancel Command: CANCEL

If the Cancel Command is set to 1 during execution of a move command, the execution of the move command will be stopped and the servomotor will decelerate to a stop. The remaining travel distance will be canceled.

- 0: Enable to execute movement command.
- 1: Requests to cancel movement command.

If the command has been executed, INPOS is set to 1 and PRGS is set to 0.

Hold Command: HOLD

If the Hold Command is set to 1 during execution of a move command, the execution of the move command will be held and the servomotor will decelerate to a stop. The NS300 Module will wait for command execution to be restarted. Set the Hold Command to 0 again to restart the execution of a move command.

- 0: Enable to execute movement command.
- 1: Requests to temporarily stop movement command.

If the command has been executed, INPOS and PRGS is set to 1.

Constant Feed Command: FEED

The NS300 Module will start feeding at a constant speed when it detects the leading edge of the FEED bit. Constant feeding will continue while this bit is set to 1.

When the FEED bit is set to 0, the servomotor will decelerate to a stop. The direction for feeding is determined by the Movement Direction set in the command data area.

An override can be set for this command in the command data area. The override can be from 0% to 200% of the parameter speed or a specific speed can be set in the command data. Which method is used depends on Pn830 (Constant Feed Reference Unit Selection).

| Settings Data Area | Description | |
|--------------------|-----------------------|---|
| Movement direction | 0: Forward 1: Reverse | |
| Command data | When Pn830 = 0 | Set an override value (0 to 200). Set to 100 when not using the override function. |
| | When Pn830 = 1 | Set the feed speed. |

- 0: Stops feed operation.
- 1: Requests feed operation.

Step Command: STEP

The NS300 Module will start step operation when it detects the leading edge of the STEP bit. While the STEP bit is set to 1, the axis will travel only the distance set in the specified parameter. If the STEP bit is set to 0 during step operation, the servomotor will decelerate to a stop and the step operation will end. The remaining travel distance will be canceled.

The direction of movement for step operations is determined by the Movement Direction set in the command data area. The number of the step travel distance (0 to 3) is also set in the command data area. The parameter data set in Pn844 to Pn847 will be used for the step travel distance.

| Settings Data Area | Description |
|--------------------|--|
| Movement direction | 0: Forward 1: Reverse |
| Command data | Set the selection number for step travel distance. 0: Uses Pn844 data. 1: Uses Pn845 data. 2: Uses Pn846 data. 3: Uses Pn847 data. |

- 0: Stops step operation.
- 1: Requests step operation.

Station Command: STN

The NS300 Module will start station operation when it detects the leading edge of the STN bit. If this command is set to 0 while the axis is travelling, the servomotor will decelerate to a stop and the station operation will end. The remaining travel distance will be cancelled.

| Settings Data Area | Description |
|----------------------------|---|
| Movement direction | 0: Forward 1: Reverse |
| Absolute/incremental value | Specify whether the station number is an absolute value or incremental value. |
| Command data | Specify the target station number. |

- 0: Stops station operation.
- 1: Requests station operation.

Point Table Command: PTBL

The NS300 Module will start point table operation when it detects the leading edge of the PTBL bit. If this command is set to 0 while the axis is travelling, the servomotor will decelerate to a stop and the point table operation will end. The remaining travel distance will be cancelled.

| Settings Data Area | Description |
|----------------------------|---|
| Absolute/incremental value | Specify whether the position data in the point table is an absolute value or incremental value. |
| Command data | Specify the point table number to be used. |

- 0: Stops point table positioning.
- 1: Requests point table positioning.

Zero Point Return Command: HOME

The NS300 Module will start a zero point return when it detects the leading edge of the HOME bit. If this command is set to 0 while the axis is travelling, the servomotor will decelerate to a stop and the zero point return operation will end. The zero point return operation will not restart even if the HOME bit is set to 1 again.

The type of zero point return depends on the zero point return mode setting in Pn800.

- 0: Stops zero point return.
- 1: Requests zero point return.

Incremental Specification: INC

The INC bit specifies whether the data that indicates a position is used as an absolute value or an incremental value. Set this bit to 0 to specify an absolute position and to 1 to specify an incremental position.

- 0: Specifies absolute value.
- 1: Specifies incremental value.

This setting is used for the following commands.

- Station Command
- Point Table Command
- Positioning Command

Movement Direction: DIR

The DR bit specifies the movement direction. Set this bit to 0 for forward and to 1 for reverse operation.

- 0: Forward direction
- 1: Reverse direction

This specification is used for the following commands.

- Feed Command
- Step Command
- Station Command

The movement direction specification is disabled during normal positioning.

■ Response Messages

The response messages for move commands are shown below.

Table 5.4 Responses for Move Commands

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|-----------------|--------|-------|--------|--------------|-------|--------|----------|
| 0 | 0 | READY | PWRON | ESTP_R | ALRM | WARN | SVON_R | C_STRT_R |
| 1 | Response type | | | | Command code | | | |
| 2 | HOME_R | PTBL_R | STN_R | STEP_R | FEED_R | 0 | HOLD_R | PRGS |
| 3 | POT | NOT | INPOS | NEAR | HOME_P | 0 | DIR_R | INC_R |
| 4 | Command message | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

Progressing Flag: PRGS

The PRGS bit is set to 1 during the execution of a command. For move commands, this flag will be set to 1 while outputting to the SGDH.

When command execution has been completed or when a Cancel Command or other stop command has been received, the Progressing Flag is set to 0.

- 0: Completes command execution.
- 1: During command execution.

Holding Flag: HOLD_R

The HOLD_R bit is set to 1 when a Hold Command is received from the host device and for the duration of the hold.

The host device can confirm that the NS300 Module correctly received the Hold Command by checking that the Holding Flag is set to 1.

- 0: Not receiving request to temporarily stop moving command.
- 1: Receives request to temporarily stop moving command.

Constant Feed Flag: FEED_R

The FEED_R bit reflects the status of the Constant Feed Command in the command message. The host device can confirm that the NS300 Module correctly received the Constant Feed Command by checking that the Feed Flag is set to 1.

This flag is set to 1 even if constant feeding cannot be executed because of a Servo OFF status, for example. The user must monitor for alarms during constant feeding for the Constant Feed Command.

The movement direction during constant feeding can be checked using the Movement Direction Flag: DIR_R.

- 0: Not receiving request for feed operation.
- 1: Receives request for feed operation.

Step Flag: STEP_R

The STEP_R bit reflects the status of the Step Command in the command message. The host device can confirm that the NS300 Module correctly received the Step Command by checking that the Step Flag is set to 1.

This flag is set to 1 even if the step operation cannot be executed because of a Servo OFF status, for example. The user must monitor for alarms during step operation.

- 0: Not receiving request for step operation.
- 1: Receives request for step operation.

Station Flag: STN_R

The STN_R bit reflects the status of the Station Command in the command message. The host device can confirm that the NS300 Module correctly received the Station Command by checking that the Station Flag is set to 1.

This flag is set to 1 even if the station operation cannot be executed because of a Servo OFF status, for example. The user must monitor for alarms during station operation.

- 0: Not receiving request for station operation.
- 1: Receives requests for station operation.

Point Table Flag: PTBL_R

The PTBL_R bit reflects the status of the Point Table Command in the command message. The host device can confirm that the NS300 Module correctly received the Point Table Command by checking that the Point Table Flag is set to 1.

This flag is set to 1 even if the point table operation cannot be executed because of a Servo OFF status, for example. The user must monitor for alarms during point table operation.

- 0: Not receiving request for point table positioning.
- 1: Receives request for point table positioning.

Zero Point Return Flag: HOME_R

The HOME_R bit reflects the status of the Zero Point Return Command in the command message. The host device can confirm that the NS300 Module correctly received the Zero Point Return Command by checking that the Zero Point Return Flag is set to 1.

This flag is set to 1 even if the zero point return cannot be executed because of a Servo OFF status, for example. The user must monitor for alarms during zero point return.

- 0: Not receiving zero point return command.
- 1: Receives zero point return command.

Incremental Specification Flag: INC_R

The INC_R bit reflects the status of the Incremental Specification in the command message. The host device can confirm by the change of status of this flag that the NS300 Module has correctly received change in the incremental specification.

- 0: Receives absolute specification.
- 1: Receives incremental specification.

Movement Direction Flag: DIR_R

The DIR_R bit reflects the status of the Movement Direction Specification in the command message. This flag is set to 0 to indicate forward, and to 1 to indicate reverse.

- 0: Receives forward rotation specification.
- 1: Receives reverse rotation specification.

Zero Point Flag: HOME_P

The HOME_P bit is set to 1 when the servomotor is within the zero point range. The zero point range is set in Pn806 (Zero Point Return Output Width).

When an incremental position detection system is used, this flag cannot be set to 1 for the period from when power is turned ON to the SGDH until the initial zero point return has been completed.

- 0: Outside zero point range.
- 1: Within zero point range.

Near Signal Flag: NEAR

The NEAR bit is set to 1 when the current position is within the On-target position range. When the current position is outside the On-target position range, the flag is set to 0. The On-target position range is set in Pn852 (Positioning Proximity Detection Width).

- 0: Outside target position range.
- 1: Within target position range.

In-position Flag: INPOS

The INPOS bit is set to 1 when the current position is within the positioning completed range of the target position. The flag is set to 0 when the current position is outside the positioning completed range. The On-target position range is set in Pn850 (Positioning Deadband).

- 0: Outside positioning completed range.
- 1: Within positioning completed range.

Negative Overtravel Flag: NOT

The NOT bit indicates the status of the negative overtravel signal for the external input connected to CN1 on the SGDH.

- 0: Without negative overtravel signal input.
- 1: With negative overtravel signal input.

Positive Overtravel Flag: POT

The POT bit indicates the status of the positive overtravel signal for the external input connected to CN1 on the SGDH.

- 0: Without positive overtravel signal input.
- 1: With positive overtravel signal input.

5.3.4 Set/Read Command Messages

■ Command Messages

Details on bytes 1 to 7 of the command messages for set/read commands (MOD = 1) are shown below.

The response type does not need to be specified for set/read commands.

Table 5.5 Set/Read Commands

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|---------------------------------------|-------|-------|-------|--------------|-------|-------|--------|
| 0 | 1 | 0 | ALRST | ESTP | 0 | 0 | SVON | C_STRT |
| 1 | 0 | | | | Command code | | | |
| 2 | Command number (Lower byte) | | | | | | | |
| 3 | Command number (Upper byte) | | | | | | | |
| 4 | Command data (Lowest byte) | | | | | | | |
| 5 | Command data (Least significant byte) | | | | | | | |
| 6 | Command data (Upper byte) | | | | | | | |
| 7 | Command data (Most significant byte) | | | | | | | |

5

Command Codes

A list of command codes is shown in the following table. Set “No operation” for commands that will not be executed.

The command codes in the response messages will basically be a copy of the command codes in the command messages. A warning for parameter setting error will be returned when the parameter number is different or the data is outside the setting range for the parameter.

Table 5.6 Command Codes

| Command Code (Binary) | Description |
|-----------------------|----------------------|
| 0000 | No operation |
| 1000 | Read parameter |
| 1001 | Write parameter |
| 1010 | Set current position |
| 1011 | Set zero point |
| 1100 | Read alarm |
| 1110 | Reset Module |

■ Response Messages

Details on bytes 1 to 7 of the response messages for set/read commands (MOD = 1) are shown below.

Table 5.7 Responses for Set/Read Commands

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|---------------------------------------|-------|-------|--------|--------------|-------|--------|----------|
| 0 | 1 | READY | PWRON | ESTP_R | ALRM | WARN | SVON_R | C_STRT_R |
| 1 | 0 | | | | Command code | | | |
| 2 | Command number (Lower byte) | | | | | | | |
| 3 | Command number (Upper byte) | | | | | | | |
| 4 | Command data (Least significant byte) | | | | | | | |
| 5 | Command data (Lower byte) | | | | | | | |
| 6 | Command data (Upper byte) | | | | | | | |
| 7 | Command data (Most significant byte) | | | | | | | |

Parameter Read Command

The Parameter Read Command reads SGDH and NS300 Module parameters.

To use the Parameter Read Command, make the following settings and then change the Command Start Command (C_START) from 0 to 1.

- Command code
- Parameter number

Table 5.8 Parameter Read Command

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|------------------|-------|-------|-------|-------|-------|-------|---------|
| 0 | 1 | 0 | ALRST | ESTP | 0 | 0 | SVON | C_START |
| 1 | 0 | | | | 8 | | | |
| 2 | Parameter number | | | | | | | |
| 3 | | | | | | | | |
| 4 | 0 | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

Table 5.9 Response for Parameter Read Command

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|------------------|-------|-------|--------|-------|-------|--------|-----------|
| 0 | 1 | READY | PWRON | ESTP_R | ALRM | WARN | SVON_R | C_START_R |
| 1 | 0 | | | | 8 | | | |
| 2 | Parameter number | | | | | | | |
| 3 | | | | | | | | |
| 4 | Parameter data | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

EXAMPLE

When Reading Pn821 (Feed Speed for Positioning)

| Command | | | | | | | | | Response | | | | | | | | | |
|---------|-----|---|---|---|---|---|---|---|----------|-----|---|---|---|---|---|---|---|--|
| Byte | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Byte | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 0 | | | | | | | | | 0 | | | | | | | | | |
| 1 | 0 | | | | 8 | | | | 1 | 0 | | | | 8 | | | | |
| 2 | 21h | | | | | | | | 2 | 21h | | | | | | | | |
| 3 | 08h | | | | | | | | 3 | 08h | | | | | | | | |
| 4 | 00h | | | | | | | | 4 | C0h | | | | | | | | |
| 5 | 00h | | | | | | | | 5 | 5Dh | | | | | | | | |
| 6 | 00h | | | | | | | | 6 | 00h | | | | | | | | |
| 7 | 00h | | | | | | | | 7 | 00h | | | | | | | | |

} Pn821
} Pn821
} 24,000 [Decimal]
} (5DC0 [Hexadecimal])

Parameter Write Command

The Parameter Write Command writes SGDh and NS300 Module parameters.

To use the Parameter Write Command, make the following settings and then change the Command Start Command (C_START) from 0 to 1.

- Command code
- Parameter number
- Parameter data

Table 5.10 Parameter Write Command

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|------------------|-------|-------|-------|-------|-------|-------|--------|
| 0 | 1 | 0 | ALRST | ESTP | 0 | 0 | SVON | C_STRT |
| 1 | 0 | | | | 9 | | | |
| 2 | Parameter number | | | | | | | |
| 3 | | | | | | | | |
| 4 | Parameter data | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

Table 5.11 Response for Parameter Write Command

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|------------------|-------|-------|--------|-------|-------|--------|----------|
| 0 | 1 | READY | PWRON | ESTP_R | ALRM | WARN | SVON_R | C_STRT_R |
| 1 | 0 | | | | 9 | | | |
| 2 | Parameter number | | | | | | | |
| 3 | | | | | | | | |
| 4 | Parameter data | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

EXAMPLE

When Writing Pn821 (Feed Speed for Positioning)

| Command | | | | | | | | | Response | | | | | | | | |
|---------|---|---|---|---|---|---|---|---|----------|---|---|---|---|---|---|---|---|
| Byte | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Byte | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 0 | | | | | | | | | 0 | | | | | | | | |
| 1 | | 0 | | | | | | 9 | 1 | | 0 | | | | | | 9 |
| 2 | | | | 2 | 1 | | | | 2 | | | | 2 | 1 | | | |
| 3 | | | | 0 | 8 | | | | 3 | | | | 0 | 8 | | | |
| 4 | | | | 0 | C | | | | 4 | | | | C | 0 | | | |
| 5 | | | | 5 | D | | | | 5 | | | | 5 | D | | | |
| 6 | | | | 0 | 0 | | | | 6 | | | | 0 | 0 | | | |
| 7 | | | | 0 | 0 | | | | 7 | | | | 0 | 0 | | | |

Pn821
 24,000 [Decimal]
 (5DC0 [Hexadecimal])

■ Current Position Setting Command

The Current Position Setting Command sets the specified value as the current position of the servomotor.

To use the Current Position Setting Command, make the following settings and then change the Command Start Command (C_START) from 0 to 1.

- Command code
- Current position data

Table 5.12 Current Position Setting Command

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|-----------------------|-------|-------|-------|--------------|-------|-------|--------|
| 0 | 1 | 0 | ALRST | ESTP | 0 | 0 | SVON | C_STRT |
| 1 | 0 | | | | 10 (decimal) | | | |
| 2 | 0 | | | | | | | |
| 3 | | | | | | | | |
| 4 | Current position data | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

Table 5.13 Response for Current Position Setting Command

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|-----------------------|-------|-------|--------|--------------|-------|--------|----------|
| 0 | 1 | READY | PWRON | ESTP_R | ALRM | WARN | SVON_R | C_STRT_R |
| 1 | 0 | | | | 10 (decimal) | | | |
| 2 | 0 | | | | | | | |
| 3 | | | | | | | | |
| 4 | Current position data | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

■ Setting the Zero Point

If using an absolute encoder, the current position of the motor is set as the zero point. To execute the Zero Point Setting Command, set the command code and then change the Command Start Command (C_START) from 0 to 1. It is not necessary to make any settings in the data area.

If the Zero Point Setting Command is completed successfully, an offset will be set in Pn809 (Zero Point Offset). The setting of this parameter will be deleted when the power supply to the NS300 Module is turned OFF. After carrying out the Zero Point Setting Command, always use the Module Reset Command to store the parameters in flash ROM.

Table 5.14 Zero Point Setting Command

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|-------|-------|-------|-------|--------------|-------|-------|--------|
| 0 | 1 | 0 | ALRST | ESTP | 0 | 0 | SVON | C_STRT |
| 1 | 0 | | | | 11 (decimal) | | | |
| 2 | 0 | | | | | | | |
| 3 | 0 | | | | | | | |
| 4 | 0 | | | | | | | |
| 5 | 0 | | | | | | | |
| 6 | 0 | | | | | | | |
| 7 | 0 | | | | | | | |

Table 5.15 Response for Zero Point Setting Command

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|-------|-------|-------|--------|--------------|-------|--------|----------|
| 0 | 1 | READY | PWRON | ESTP_R | ALRM | WARN | SVON_R | C_STRT_R |
| 1 | 0 | | | | 11 (decimal) | | | |
| 2 | 0 | | | | | | | |
| 3 | 0 | | | | | | | |
| 4 | 0 | | | | | | | |
| 5 | 0 | | | | | | | |
| 6 | 0 | | | | | | | |
| 7 | 0 | | | | | | | |

■ Alarm Read Command

The Alarm Read Command reads the last four alarms that have occurred on the SGDH and the NS300 Module.

To use the Alarm Read Command, make the command code settings and then change the Command Start Command (C_START) from 0 to 1.

Table 5.16 Alarm Read Command

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|-------|-------|-------|-------|--------------|-------|-------|--------|
| 0 | 1 | 0 | ALRST | ESTP | 0 | 0 | SVON | C_STRT |
| 1 | 0 | | | | 12 (decimal) | | | |
| 2 | 0 | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | 0 | | | | | | | |
| 7 | | | | | | | | |

Table 5.17 Response for Alarm Read Command

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|------------------------|-------|-------|--------|--------------|-------|--------|----------|
| 0 | 1 | READY | PWRON | ESTP_R | ALRM | WARN | SVON_R | C_STRT_R |
| 1 | 0 | | | | 12 (decimal) | | | |
| 2 | 0 | | | | | | | |
| 3 | | | | | | | | |
| 4 | Last alarm code | | | | | | | |
| 5 | Second last alarm code | | | | | | | |
| 6 | Third last alarm code | | | | | | | |
| 7 | Fourth last alarm code | | | | | | | |

5

■ Module Reset Command

The Module Reset Command restarts the SGDH and NS300 Module software. When this command is executed, the NS300 Module parameters are stored in flash ROM and then the NS300 Module is restarted.

To use the Module Reset Command, make the command code settings and then change the Command Start Command (C_START) from 0 to 1.

When the NS300 Module is resetting the Module, the Command Ready Flag (READY) is set to 0. When the reset has been completed, the flag is set to 1.

Table 5.18 Module Reset Command

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|-------|-------|-------|-------|--------------|-------|-------|---------|
| 0 | 1 | 0 | ALRST | ESTP | 0 | 0 | SVON | C_START |
| 1 | 0 | | | | 14 (decimal) | | | |
| 2 | 0 | | | | | | | |
| 3 | 0 | | | | | | | |
| 4 | 0 | | | | | | | |
| 5 | 0 | | | | | | | |
| 6 | 0 | | | | | | | |
| 7 | 0 | | | | | | | |

Table 5.19 Response for Module Reset Command

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|-------|-------|-------|--------|--------------|-------|--------|-----------|
| 0 | 1 | READY | PWRON | ESTP_R | ALRM | WARN | SVON_R | C_START_R |
| 1 | 0 | | | | 14 (decimal) | | | |
| 2 | 0 | | | | | | | |
| 3 | 0 | | | | | | | |
| 4 | 0 | | | | | | | |
| 5 | 0 | | | | | | | |
| 6 | 0 | | | | | | | |
| 7 | 0 | | | | | | | |

5.4 Motion Command Methods

5.4.1 Constant Feed Command

■ Function

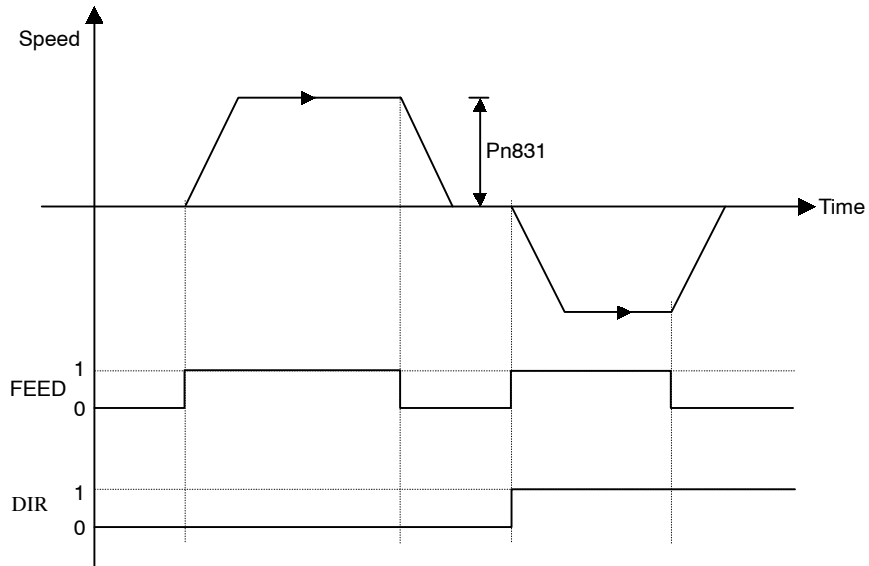
While the Constant Feed Command is set to 1, the axis travels in the direction specified as the movement direction at the speed specified in the parameters. Parameter settings are used for acceleration/deceleration speeds, acceleration/deceleration types, etc.

The speed during movement can be changed by changing the override value.

■ Related Parameters

| Object | Attribute | No. | Name | Setting Range | Unit | Effective Timing | Factory Setting | Type |
|--------|-----------|-------|---|---------------|--------------------------|------------------|-----------------|------|
| 0x64 | #58 | Pn829 | Filter Selection | 0, 1, 2, 3 | – | Immediate | 0 | B |
| | #59 | Pn830 | Constant Feed Reference Unit Selection | 0, 1 | – | Immediate | 0 | B |
| | #60 | Pn831 | Constant Feed Speed | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | B |
| | #61 | Pn832 | Acceleration Time for Constant Feed | 1 to 10,000 | ms | Immediate | 100 | B |
| | #62 | Pn833 | Deceleration Time for Constant Feed | 1 to 10,000 | ms | Immediate | 100 | C |
| | #63 | Pn834 | Switch Speed for Constant Feed Second Accel/Decel | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #64 | Pn835 | Accel/Decel Time for Constant FEED Second Accel/Decel | 1 to 10,000 | ms | Immediate | 200 | C |
| | #65 | Pn836 | Accel/Decel Type for Constant Feed | 0, 1, 2, 3 | – | Immediate | 0 | B |
| | #70 | Pn840 | Time Constant for Exponential Accel/Decel | 4 to 1,000 | ms | Immediate | 25 | C |
| | #71 | Pn841 | Bias Speed for Exponential Accel/Decel | 1 to 240,000 | 1000 reference units/min | Immediate | 0 | C |
| | #72 | Pn842 | Time Constant of Travelling Average | 4 to 1,000 | ms | Immediate | 25 | C |
| | #73 | Pn843 | Maximum Feed Speed | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | B |

■ Operation



■ Command Method

1. Set the Servo ON Command (byte 0, bit 1) to 1.
2. Set the movement direction (byte 3, bit 1).
3. Set the override value. The Pn830 setting determines whether the override will be set as a ratio (%) or as a speed (1000 reference units/min).
4. Set the Feed Command (byte 2, bit 3) to 1.

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|--|-------|-------|-------|-------|-------|-------|-------|
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 1 | Response type | | | | 0 | | | |
| 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | DIR | 0 |
| 4 | Override value (% or 1000 reference units/min) | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

5.4.2 Step Command

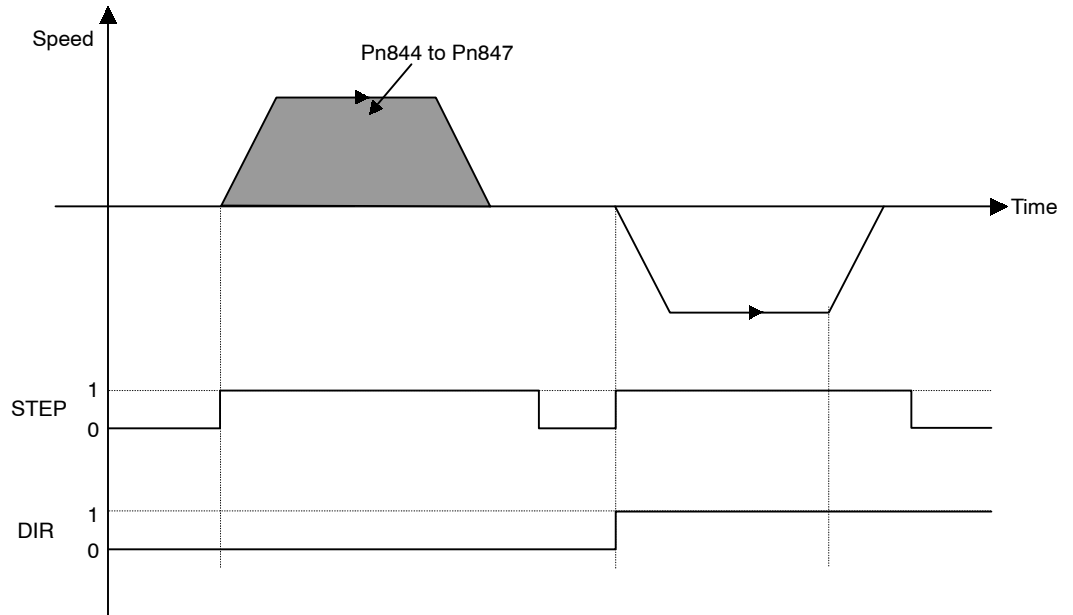
■ Function

When the Step Command is set to 1, the axis will travel in the set direction for the set travel distance and then stop. The travel distance can be selected from four parameters.

■ Related Parameters

| Object | Attribute | No. | Name | Setting Range | Unit | Effective Timing | Factory Setting | Type |
|--------|-----------|-----------------|---|-----------------|--------------------------|------------------|-----------------|------|
| 0x64 | #51 | Pn821 | Feed Speed for Positioning | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | B |
| | #52 | Pn822 | Acceleration Time for Positioning | 1 to 10,000 | ms | Immediate | 100 | B |
| | #53 | Pn823 | Deceleration Time for Positioning | 1 to 10,000 | ms | Immediate | 100 | C |
| | #54 | Pn824 | Switch Speed for Positioning Second Accel/Decel | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #55 | Pn825 | Accel/Decel Time for Positioning Second Accel/Decel | 1 to 10,000 | ms | Immediate | 200 | B |
| | #56 | Pn826 | Accel/Decel Type for Positioning | 0, 1, 2, 3 | – | Immediate | 0 | B |
| | #58 | Pn829 | Filter Selection | 0, 1, 2, 3 | – | Immediate | 0 | B |
| | #70 | Pn840 | Time Constant for Exponential Accel/Decel | 4 to 1,000 | ms | Immediate | 25 | C |
| | #71 | Pn841 | Bias Speed for Exponential Accel/Decel | 1 to 240,000 | 1000 reference units/min | Immediate | 0 | C |
| | #72 | Pn842 | Time Constant of Travelling Average | 4 to 10,000 | ms | Immediate | 25 | C |
| | #73 | Pn843 | Maximum Feed Speed | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | B |
| | #74 | Pn844 | Step Distance 1 | 0 to 99,999,999 | Reference Units | Immediate | 1 | C |
| | #75 | Pn845 | Step Distance 2 | 0 to 99,999,999 | Reference Units | Immediate | 10 | C |
| | #76 | Pn846 | Step Distance 3 | 0 to 99,999,999 | Reference Units | Immediate | 100 | C |
| #77 | Pn847 | Step Distance 4 | 0 to 99,999,999 | Reference Units | Immediate | 1,000 | C | |

■ Operation



■ Command Method

1. Set the Servo ON Command (byte 0, bit 1) to 1.
2. Set the movement direction (byte 3, bit 1).
3. Select the travel distance to be used for step operation from within the range from Pn844 (=0) to Pn847 (=3). Set bit5 to bit 7 to 0.
4. Set the Step Command (byte 2, bit 4) to 1.

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|---|-------|-------|-------|-------|-------|-------|-------|
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 1 | Response type | | | | 0 | | | |
| 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | DIR | 0 |
| 4 | Step travel distance selection (0 to 3) | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

5.4.3 Station Command

■ Function

The Station Command can be used when the NS300 Module is used in a rotating system.

One rotation of the servomotor is divided into a specified number of stations and station numbers are allocated.

When a station number is specified, the axis travels in the specified direction to specified position.

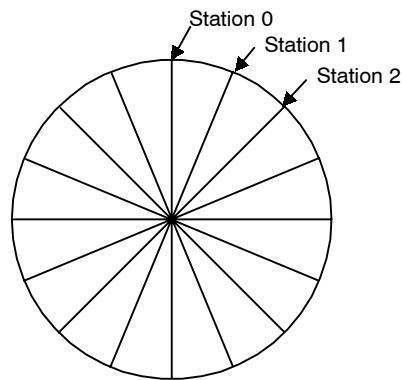
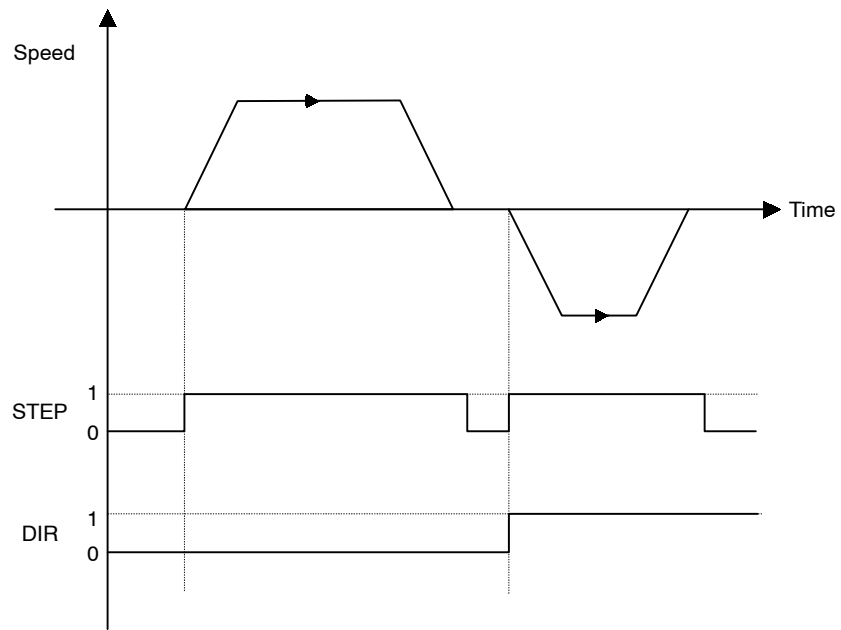
■ Related Parameters

The same speed and acceleration/deceleration data is used as for the Positioning Command.

| Object | Attribute | No. | Name | Setting Range | Unit | Effective Timing | Factory Setting | Type |
|--------|-----------|-------|---|---------------|--------------------------|------------------|-----------------|------|
| 0x64 | #32 | Pn812 | Coordinate Type | 0, 1 | – | Immediate | 0 | C |
| | #51 | Pn821 | Feed Speed for Positioning | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | B |
| | #52 | Pn822 | Acceleration Time for Positioning | 1 to 10,000 | ms | Immediate | 100 | B |
| | #53 | Pn823 | Deceleration Time for Positioning | 1 to 10,000 | ms | Immediate | 100 | C |
| | #54 | Pn824 | Switch Speed for Positioning Second Accel/Decel | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #55 | Pn825 | Accel/Decel Time for Positioning Second Accel/Decel | 1 to 10,000 | ms | Immediate | 200 | B |
| | #56 | Pn826 | Accel/Decel Type for Positioning | 0, 1, 2, 3 | – | Immediate | 0 | B |
| | #58 | Pn829 | Filter Selection | 0, 1, 2, 3 | – | Immediate | 0 | B |
| | #70 | Pn840 | Time Constant for Exponential Accel/Decel | 4 to 1,000 | ms | Immediate | 25 | C |
| | #71 | Pn841 | Bias Speed for Exponential Accel/Decel | 1 to 240,000 | 1000 reference units/min | Immediate | 0 | C |
| | #72 | Pn842 | Time Constant of Travelling Average | 4 to 1,000 | ms | Immediate | 25 | C |
| | #73 | Pn843 | Maximum Feed Speed | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | B |

| Object | Attribute | No. | Name | Setting Range | Unit | Effective Timing | Factory Setting | Type |
|--------|-----------|-------|-------------------------------|---------------|------|------------------|-----------------|------|
| 0x64 | #93 | Pn853 | Direction for Rotation System | 0, 1 | - | Immediate | 0 | B |
| | #100 | Pn85A | Number of Stations | 1 to 32, 767 | - | Immediate | 1 | B |

■ Operation



■ Command Method

1. Set the Servo ON Command (byte 0, bit 1) to 1.
2. Set the movement direction (byte 3, bit 1).
The movement direction setting is disabled when the Pn853 setting is 1 (travel the shortest distance).
3. Set absolute/incremental (byte 3, bit 0). If an incremental position has been specified, set the value corresponding to (target station number) – (current station number) in bytes 4 to 7.
4. Set the target station number. Set bit 6 and bit 7 to 0.
5. Set the Station Command (byte 2, bit 5) to 1.

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|-------------------------------------|-------|-------|-------|-------|-------|-------|-------|
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 1 | Response type | | | | 0 | | | |
| 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | DIR | INC |
| 4 | Target station number (0 to 32,767) | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

5.4.4 Point Table Command

■ Function

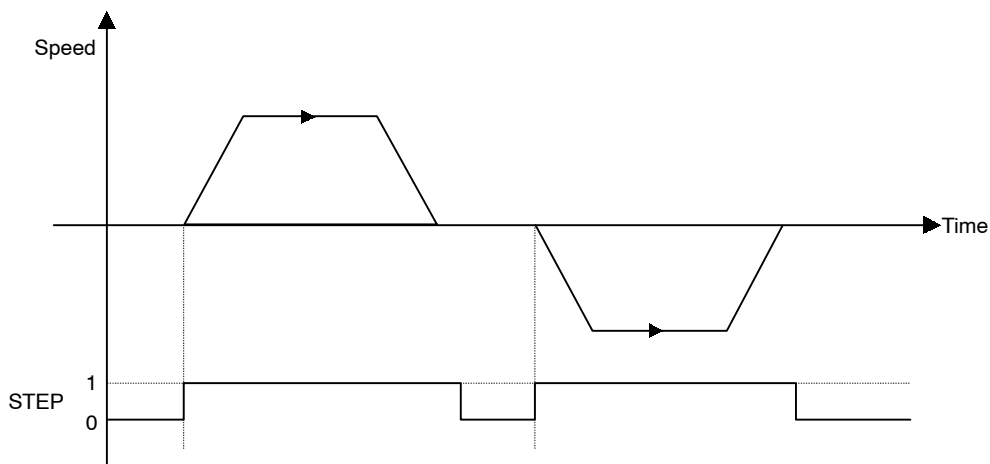
The Point Table Command performs positioning at the position and speed stored in advance in the point table.

■ Related Parameters

| Object | Attribute | No. | Name | Setting Range | Unit | Effective Timing | Factory Setting | Type |
|--------|-----------|-------|---|---------------|--------------------------|------------------|-----------------|------|
| 0x64 | #52 | Pn822 | Acceleration Time for Positioning | 1 to 10,000 | ms | Immediate | 100 | B |
| | #53 | Pn823 | Deceleration Time for Positioning | 1 to 10,000 | ms | Immediate | 100 | C |
| | #54 | Pn824 | Switch Speed for Positioning Second Accel/Decel | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |

| Object | Attribute | No. | Name | Setting Range | Unit | Effective Timing | Factory Setting | Type |
|-------------|-----------|-------|---|---------------|--------------------------|------------------|-----------------|------|
| 0x64 | #55 | Pn825 | Accel/Decel Time for Positioning Second Accel/Decel | 1 to 10,000 | ms | Immediate | 200 | B |
| | #56 | Pn826 | Accel/Decel Type for Positioning | 0, 1, 2, 3 | – | Immediate | 0 | B |
| | #58 | Pn829 | Filter Selection | 0, 1, 2, 3 | – | Immediate | 0 | B |
| | #70 | Pn840 | Time Constant for Exponential Accel/Decel | 4 to 1,000 | ms | Immediate | 25 | C |
| | #71 | Pn841 | Bias Speed for Exponential Accel/Decel | 1 to 240,000 | 1000 reference units/min | Immediate | 0 | C |
| | #72 | Pn842 | Time Constant of Travelling Average | 4 to 1,000 | ms | Immediate | 25 | C |
| | #73 | Pn843 | Maximum Feed Speed | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | B |
| 0x65 | #50 | Pn900 | Target Position 1 | ±99, 999, 999 | Reference Units | Immediate | 0 | B |
| | #51 | Pn901 | Target Position 2 | ±99, 999, 999 | Reference Units | Immediate | 0 | B |
| | | : | : | | | | | |
| | #99 | Pn931 | Target Position 50 | ±99, 999, 999 | Reference Units | Immediate | 0 | B |
| | #150 | Pn940 | Target Speed 1 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | B |
| | #151 | Pn941 | Target Speed 2 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | B |
| | | : | : | | | | | |
| | #199 | Pn971 | Target Speed 50 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | B |

■ Operation



■ Command Method

1. Set the Servo ON Command (byte 0, bit 1) to 1.
2. Set absolute/incremental (byte 3, bit 0). If an incremental position has been specified, the target position will be (current position) + (position stored in point table).
3. Set the point table number to be specified. Set bit 5 to bit 7 to 0.
4. Set the Point Table Command (byte 2, bit 6) to 1.

5

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|--|-------|-------|-------|-------|-------|-------|-------|
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 1 | Response type | | | | 0 | | | |
| 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | DIR | INC |
| 4 | Point table number to be specified (1 to 50) | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

5.4.5 Zero Point Return Command

■ Function

The Zero Point Return Command moves the axis in the specified direction, and sets the zero point based on the specified zero point return mode.

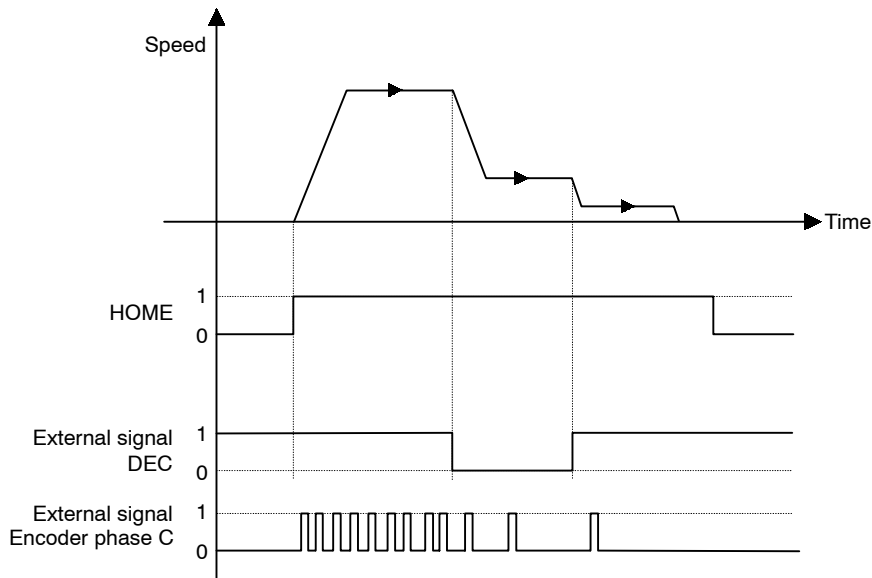
When an absolute position detection system has been selected, the positioning will be performed to the zero point.

■ Related Parameters

| Object | Attribute | No. | Name | Setting Range | Unit | Effective Timing | Factory Setting | Type |
|--------|-----------|-------|---|---------------------------|--------------------------|------------------|-----------------|------|
| 0x64 | #10 | Pn800 | Zero Point Return Mode | 0 to 3 | – | Immediate | 0 | B |
| | #11 | Pn801 | Zero Point Return Function Selection | 0 to 7 | – | Power-up | 1 | B |
| | #12 | Pn802 | Feed Speed for Zero Point Return | 1 to 240,000 | 1000 reference units/min | Immediate | 10,000 | B |
| | #13 | Pn803 | Approach Speed for Zero Point Return | 1 to 240,000 | 1000 reference units/min | Immediate | 1,000 | B |
| | #14 | Pn804 | Creep Speed for Zero Point Return | 1 to 240,000 | 1000 reference units/min | Immediate | 500 | B |
| | #15 | Pn805 | Final Travel Distance for Zero Point Return | 0 to 99,999,999 | Reference Units | Immediate | 0 | B |
| | #16 | Pn806 | Output Width for Zero Point Return | 0 to 32, 767 | Reference Units | Immediate | 100 | B |
| | #17 | Pn809 | Zero Point Offset | –99,999,999 to 99,999,999 | Reference Units | Immediate | 0 | C |
| | #18 | Pn80A | Accel/Decel Time for Zero Point Return | 1 to 10,000 | ms | Immediate | 100 | B |

■ Operation

The Zero Point Return Command performs zero point return based on each zero point return mode.



■ Command Method

Set the Servo ON Command (byte 0, bit 1) to 1.

Set the Zero Point Return Command (byte 2, bit 7) to 1.

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|---------------|-------|-------|-------|-------|-------|-------|-------|
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 1 | Response type | | | | 0 | | | |
| 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 0 | | | | | | | |
| 5 | 0 | | | | | | | |
| 6 | 0 | | | | | | | |
| 7 | 0 | | | | | | | |

5.4.6 Positioning Command

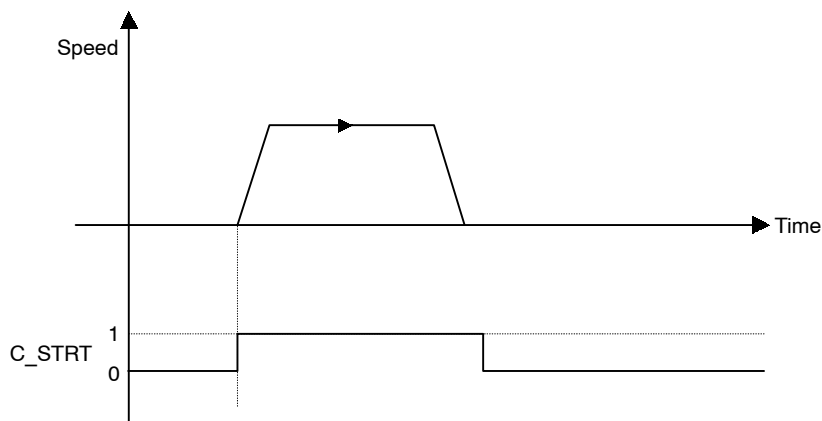
■ Function

The Positioning Command performs positioning to the specified target position.

■ Related Parameters

| Object | Attribute | No. | Name | Setting Range | Unit | Effective Timing | Factory Setting | Type |
|--------|-----------|-------|---|---------------|--------------------------|------------------|-----------------|------|
| 0x64 | #51 | Pn821 | Feed Speed for Positioning | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | B |
| | #52 | Pn822 | Acceleration Time for Positioning | 1 to 10,000 | ms | Immediate | 100 | B |
| | #53 | Pn823 | Deceleration Time for Positioning | 1 to 10,000 | ms | Immediate | 100 | C |
| | #54 | Pn824 | Switch Speed for Positioning Second Accel/Decel | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #55 | Pn825 | Accel/Decel Time for Positioning Second Accel/Decel | 1 to 10,000 | ms | Immediate | 200 | B |
| | #56 | Pn826 | Accel/Decel Type for Positioning | 0, 1, 2, 3 | – | Immediate | 0 | B |
| | #58 | Pn829 | Filter Selection | 0, 1, 2, 3 | – | Immediate | 0 | B |
| | #70 | Pn840 | Time Constant for Exponential Accel/Decel | 4 to 1,000 | ms | Immediate | 25 | C |
| | #71 | Pn841 | Bias Speed for Exponential Accel/Decel | 1 to 240,000 | 1000 reference units/min | Immediate | 0 | C |
| | #72 | Pn842 | Time Constant of Travelling Average | 4 to 1,000 | ms | Immediate | 25 | C |
| | #73 | Pn843 | Maximum Feed Speed | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | B |

■ Operation



■ Command Method

1. Set the command code (byte 1, bits 0 to 3) to no operation (= 0) if it is not already set to 0.
2. Set the Servo ON Command (byte 0, bit 1) to 1.
3. Set absolute/incremental (byte 3, bit 0). If an incremental position has been specified, the target position will be (current position) + (position specified from bytes 4 to 7).
4. Set the target position in the command message (bytes 4 to 7).
5. Set simple positioning (=1) in the command code (byte 1, bits 0 to 3).
6. Change the Command Start Command (byte 0, bit 0) from 0 to 1.

5

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|----------------------|-------|-------|-------|-------|-------|-------|-------|
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 1 | Response type | | | | 1 | | | |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | Target position data | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

5.4.7 External Positioning

■ Function

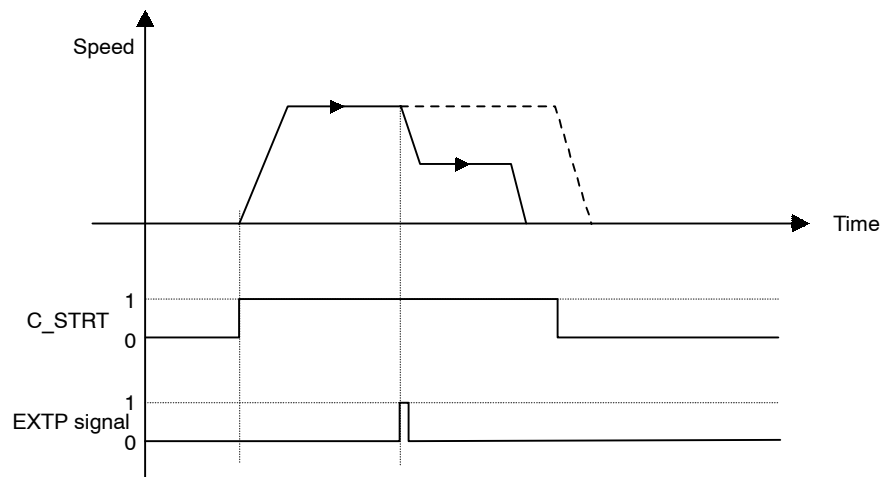
The External Positioning Command performs positioning at the specified target position. If the status of the external signal changes during movement, the axis will decelerate to the external positioning approach speed from the position where the status changed and travel the distance specified in the parameter.

■ Related Parameters

The same speed and acceleration/deceleration data is used as for the Positioning Command.

| Object | Attribute | No. | Name | Setting Range | Unit | Effective Timing | Factory Setting | Type |
|--------|-----------|-------|--|-------------------------------|---------------------------|------------------|-----------------|------|
| 0x64 | #94 | Pn854 | Approach Speed for External Positioning | 1 to 240,000 | 1,000 reference units/min | Immediate | 24,000 | B |
| | #95 | Pn855 | Travel Distance for External Positioning | -99, 999, 999 to 99, 999, 999 | Reference Units | Immediate | 0 | B |

■ Operation



■ Command Method

1. Set the command code (byte 1, bits 0 to 3) to no operation (= 0), if it is not already set to 0.
2. Set the Servo ON Command (byte 0, bit 1) to 1.
3. Set absolute/incremental (byte 3, bit 0). If an incremental position has been specified, the target position will be (current position) + (position specified from bytes 4 to 7).

4. Set the target position in the command message (bytes 4 to 7).
5. Set external positioning (=2) in the command code (byte 1, bits 0 to 3).
6. Change the Command Start Command (byte 0, bit 0) from 0 to 1.

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|----------------------|-------|-------|-------|-------|-------|-------|-------|
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 1 | Response type | | | | 2 | | | |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | Target position data | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

5.4.8 Notch Output Positioning Command

5

■ Function

The Notch Output Positioning Command performs positioning to the specified position.

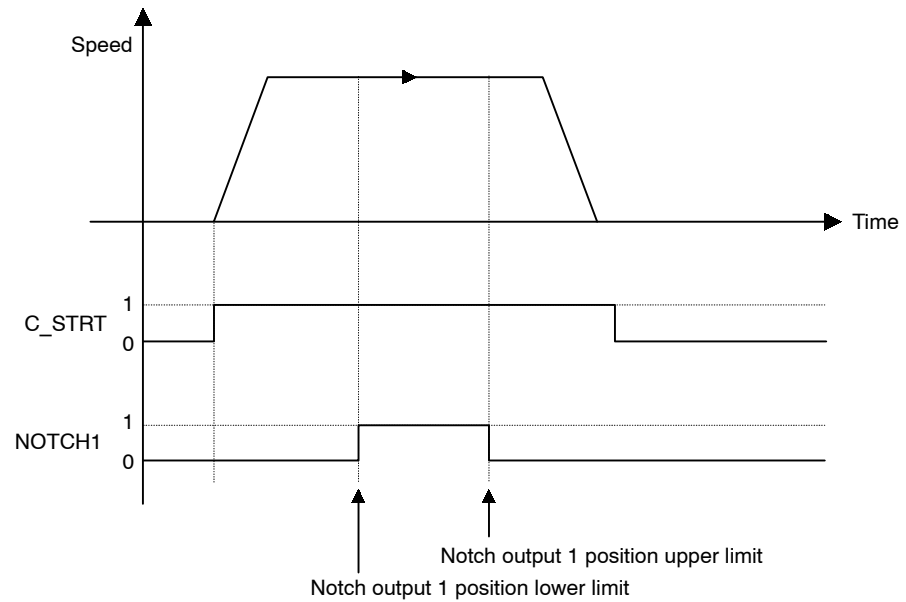
If a specified position is passed during the positioning, a notch output signal (notch signal) will be output.

Two notch signals can be used in the NS300 Module.

■ Related Parameters

| Object | Attribute | No. | Name | Setting Range | Unit | Effective Timing | Factory Setting | Type |
|--------|-----------|-------|--------------------------------------|---------------|-----------------|------------------|-----------------|------|
| 0x64 | #160 | Pn890 | Notch Signal Output Position Setting | 0, 1 | – | Immediate | 0 | C |
| | #161 | Pn891 | Notch Signal Output Setting | 0 to 3 | – | Immediate | 0 | C |
| | #162 | Pn892 | Notch 1 Output Position Lower Limit | ±99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #163 | Pn893 | Notch 1 Output Position Upper Limit | ±99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #164 | Pn894 | Notch 2 Output Position Lower Limit | ±99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #165 | Pn895 | Notch 2 Output Position Upper Limit | ±99, 999, 999 | Reference Units | Immediate | 0 | C |

■ Operation



■ Command Method

1. Set the command code (byte 1, bits 0 to 3) to no operation (= 0), if it is not already set to 0.
2. Set the Servo ON Command (byte 0, bit 1) to 1.
3. Set absolute/incremental (byte 3, bit 0). If an incremental position has been specified, the target position will be (current position) + (position specified from bytes 4 to 7).
4. Set the target position in the command message (bytes 4 to 7).
5. Set positioning with notch signal output (=3) in the command code (byte 1, bits 0 to 3).
6. Change the Command Start Command (byte 0, bit 0) from 0 to 1.

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|----------------------|-------|-------|-------|-------|-------|-------|-------|
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 1 | Response type | | | | 3 | | | |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | Target position data | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

5.4.9 Multi-speed Positioning Command

■ Function

The Multi-speed Positioning Command changes the speed in stages and performs positioning to specified positions.

When the positions specified in the parameters are reached during axis travel, the axis switches to the next set speed and travels to the position specified in the next stage. Up to 16 speed switching positions can be set.

Set the speed switching positions as increments from the position where the Multi-speed Positioning Command is carried out.

■ Related Parameters

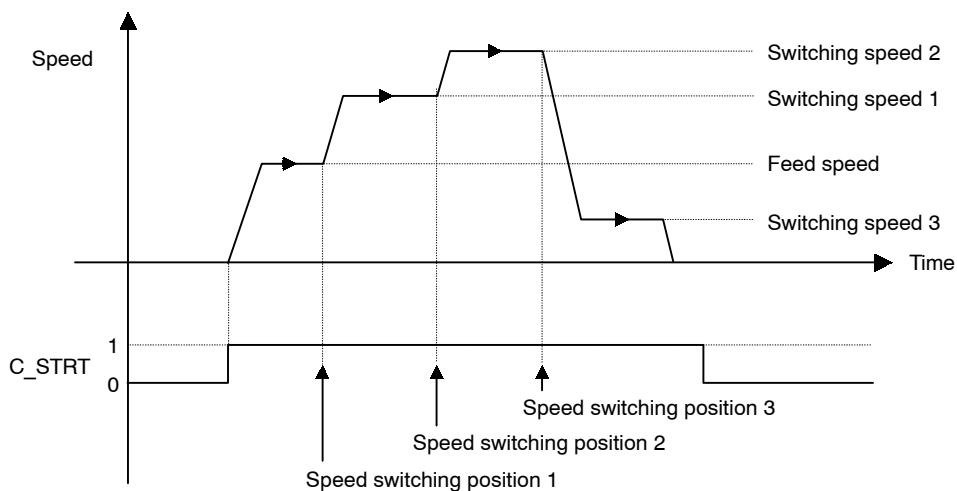
| Object | Attribute | No. | Name | Setting Range | Unit | Effective Timing | Factory Setting | Type |
|--------|-----------|-------|--|-------------------|--------------------------|------------------|-----------------|------|
| 0x64 | #111 | Pn861 | Number of Points for Speed Switching | 0 to 16 | – | Immediate | 0 | C |
| | #112 | Pn862 | Initial Feed Speed for Multi-speed Positioning | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #113 | Pn863 | Speed Switching Position 1 | 0 to 99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #114 | Pn864 | Speed Switching Position 2 | 0 to 99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #115 | Pn865 | Speed Switching Position 3 | 0 to 99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #116 | Pn866 | Speed Switching Position 4 | 0 to 99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #117 | Pn867 | Speed Switching Position 5 | 0 to 99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #118 | Pn868 | Speed Switching Position 6 | 0 to 99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #119 | Pn869 | Speed Switching Position 7 | 0 to 99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #120 | Pn86A | Speed Switching Position 8 | 0 to 99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #121 | Pn86B | Speed Switching Position 9 | 0 to 99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #122 | Pn86C | Speed Switching Position 10 | 0 to 99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #123 | Pn86D | Speed Switching Position 11 | 0 to 99, 999, 999 | Reference Units | Immediate | 0 | C |

| Object | Attribute | No. | Name | Setting Range | Unit | Effective Timing | Factory Setting | Type |
|--------|-----------|-------|-----------------------------|-------------------|--------------------------|------------------|-----------------|------|
| 0x64 | #124 | Pn86E | Speed Switching Position 12 | 0 to 99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #125 | Pn86F | Speed Switching Position 13 | 0 to 99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #126 | Pn870 | Speed Switching Position 14 | 0 to 99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #127 | Pn871 | Speed Switching Position 15 | 0 to 99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #128 | Pn872 | Speed Switching Position 16 | 0 to 99, 999, 999 | Reference Units | Immediate | 0 | C |
| | #129 | Pn873 | Switching Speed 1 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #130 | Pn874 | Switching Speed 2 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #131 | Pn875 | Switching Speed 3 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #132 | Pn876 | Switching Speed 4 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #133 | Pn877 | Switching Speed 5 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #134 | Pn878 | Switching Speed 6 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #135 | Pn879 | Switching Speed 7 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #136 | Pn87A | Switching Speed 8 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #137 | Pn87B | Switching Speed 9 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #138 | Pn87C | Switching Speed 10 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #139 | Pn87D | Switching Speed 11 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |

| Object | Attribute | No. | Name | Setting Range | Unit | Effective Timing | Factory Setting | Type |
|--------|-----------|-------|--------------------|---------------|--------------------------|------------------|-----------------|------|
| 0x64 | #140 | Pn87E | Switching Speed 12 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #141 | Pn87F | Switching Speed 13 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #142 | Pn880 | Switching Speed 14 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #143 | Pn881 | Switching Speed 15 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |
| | #144 | Pn882 | Switching Speed 16 | 1 to 240,000 | 1000 reference units/min | Immediate | 24,000 | C |

■ Operation

5



■ Command Method

1. Set the command code (byte 1, bits 0 to 3) to no operation (= 0), if it is not already set to 0.
2. Set the Servo ON Command (byte 0, bit 1) to 1.
3. Set absolute/incremental (byte 3, bit 0). If an incremental position has been specified, the target position will be (current position) + (position specified from bytes 4 to 7).
4. Set the target position in the command message (bytes 4 to 7).
5. Set multi-speed positioning (=4) in the command code (byte 1, bits 0 to 3).
6. Change the Command Start Command (byte 0, bit 0) from 0 to 1.

| Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------|----------------------|-------|-------|-------|-------|-------|-------|-------|
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 1 | Response type | | | | 4 | | | |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | Target position data | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

5.5 Commands from the Host Controller

5.5.1 Basic Operation

The basic operation of the NS300 Module is shown below.

1. After DeviceNet communications have started, check that the Command Ready (READY) is set to 1.
2. Set the Emergency Stop Command (ESTP) to 1 to clear emergency stop status.
3. Set the Servo ON Command (SVON) to 1 to turn ON the servo.
4. Confirm that the SERVOPACK servo is ON by checking the status of SVON_R.
5. Set a command.
6. Confirm that the Progressing Flag (PRGS) has changed to 1.
7. Monitor the Progressing Flag (PRGS). When it changes to 0 again, the operation has been completed.
8. Set another command.

5.5.2 Command Method

For the following commands that involve movement, always wait until one command has been completed before executing another command. If commands are executed simultaneously or while the axis is travelling, a command error warning will occur (A.95).

- Feed Command
- Step Command
- Station Command
- Point Table Command
- Zero Point Return Command
- Move command based on a Command Start Command

The Emergency Stop, Servo ON, Cancel, and Hold Commands are effective any time.

■ Servo ON/OFF Command

When the Servo ON Command (SVON) is changed from 0 to 1, current is supplied to the SGDH. When it is changed from 1 to 0, the current is not supplied.

If DeviceNet communications time out, the NS300 Module automatically enters Servo OFF status. To restart communications, the Servo ON Command must be changed from 0 to 1.

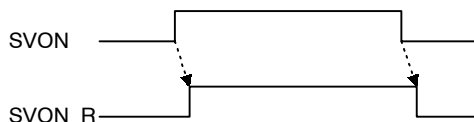


Figure 5.1 Servo ON/OFF Signal

■ Emergency Stop Command

While the Emergency Stop Command (ESTP) is set to 0, the SGDh is in emergency stop status. During this status, the Emergency Stop Flag (ESTP_R) is 1.

The emergency stop status can be released by setting the Emergency Stop Command (ESTP) to 1 and changing the Servo ON Command (SVON) from 0 to 1.

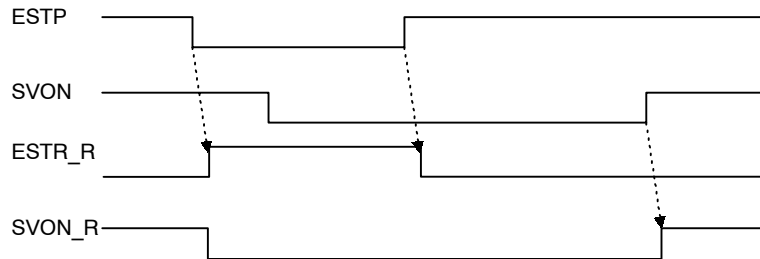


Figure 5.2 Emergency Stop Command

■ Alarm Reset Command

When an alarm occurs, use the following procedure to restart the NS300 Module.

1. Set the Servo ON Command (SVON) to 0 and set the Cancel Command (CANCEL) to 1.
2. Remove the cause of the alarm.
3. Clear any move commands that have been set.
4. Execute the Alarm Reset Command.
5. Check that the Alarm Flag (ALRM) is 0.

Alarm reset is executed by changing the Alarm Reset Command (ALRST) from 0 to 1. When execution of the alarm reset has been completed and all alarms have been cleared, the alarm bit (ALRM) will change to 0.

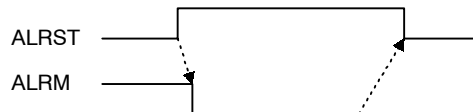


Figure 5.3 Alarm Rest Command

■ **Constant Feed Command**

While the Constant Feed Command (FEED) is set to 1, the axis travels in the direction specified as the movement direction (DIR) at the feed speed.

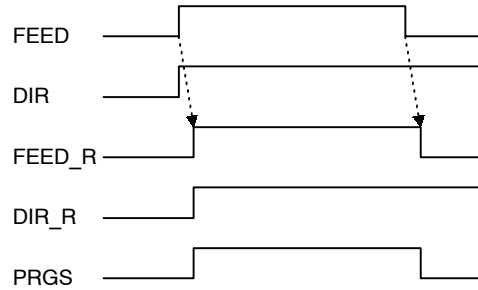


Figure 5.4 Constant Feed Command

■ **Step Command**

While the Step Command (STEP) is set to 1, the axis travels in the direction specified as the movement direction (DIR) at the feed speed for the step travel distance.

If the Step Command is set to 0 during the step operation, the step operation stops and the remaining travel distance is canceled.

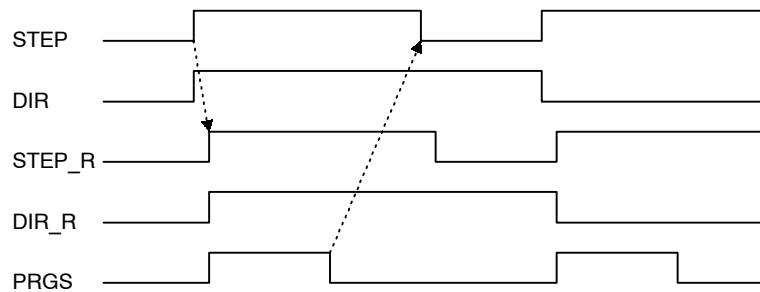


Figure 5.5 Step Command

■ **Station Command**

The station operation starts when the Station Command (STN) is changed from 0 to 1. The following data must be set before the station operation is started.

- Rotation direction: Specified in the byte 3 area.
- Station number: Specified at the word 1 of bytes 4 and 5.
- Absolute/incremental : Specify whether the station number is an absolute value or an incremental value.

■ **Point Table Command**

The point table operation starts when the Point Table Command (PTBL) is changed from 0 to 1. The following data must be set before the operation is started.

- Point table number: Specified in bytes 4 and 5 of word 1.

■ Zero Point Return Command

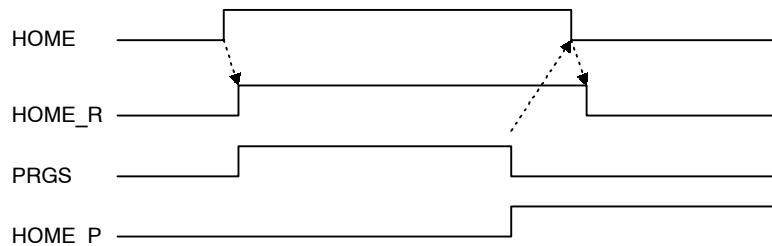
When the Zero Point Return Command (HOME) is changed from 0 to 1, the axis travels in the direction specified in the zero point return direction parameter. If the Zero Point Return Command is changed from 1 to 0 during zero point return, the zero point return stops. Therefore, the Zero Point Return Command must be maintained to 1 until the zero point return has been completed.

Using an Incremental Detection System

When the power is turned ON, the current position is 0 and the Zero Point Flag (HOME_P) is 0. When the zero point return has been completed, the Zero Point Flag changes to 1.

Using an Absolute Value Detection System

When the Zero Point Return Command is changed from 0 to 1, the zero point return is not performed but the axis is positioned to the machine coordinate zero point based on the positioning feed speed parameter.



**Figure 5.6 Zero Point Return Command
(When using an incremental detection system)**

■ Positioning Command

When the Command Start Command (C_STRT) is changed from 0 to 1, positioning starts according to the command code.

If the Hold Command (HOLD) is changed from 0 to 1 during execution of positioning, axis travel is held. Confirm that the Hold Command has been received by checking that the Holding Flag (HOLD_R) is set to 1. Change the Hold Command from 1 to 0 to restart the remaining axis travel.

If the Cancel Command (CANCEL) is changed from 0 to 1 during execution of the positioning, the moving axis decelerates to stop and the remaining travel distance is discarded. Confirm that the Cancel Command has been received by checking that the Progressing Flag (PRGS) has changed from 1 to 0.



Figure 5.7 Positioning Command

■ Module Reset Command

The Module is reset by setting the Module Reset Command and changing the Command Start Command (C_STRT) from 0 to 1. When the Module Reset Command is executed, the Command Ready Flag (READY) is changed from 1 to 0. When NS300 Module and SGDH reset processing has been completed, the Command Ready Flag changes from 0 to 1.

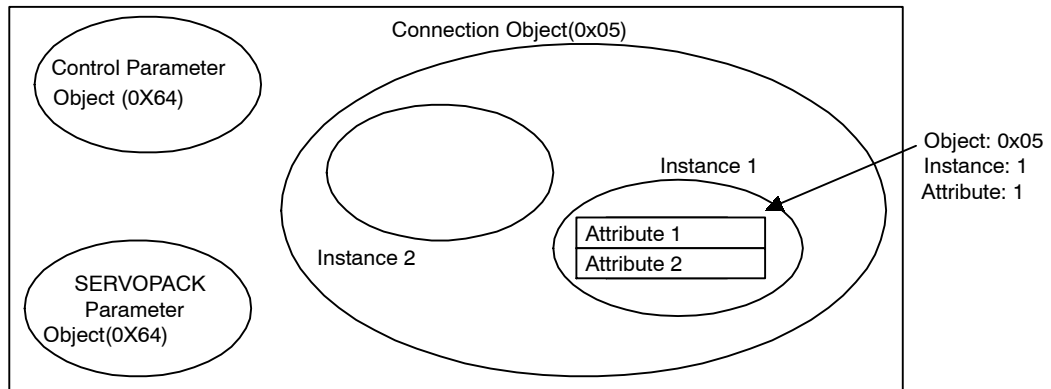
The Module reset operation process is outlined below.

- If the axis is travelling, it decelerates to stop and the remaining travel distance is discarded.
- If the current status is servo ON, it changes to servo OFF.
- If an alarm has occurred, the alarm is reset.
- All of the latest NS300 Module parameters are stored in flash memory.

5.6 Changing Parameters

5.6.1 Managing DeviceNet Data

In DeviceNet, all parameters and point tables are managed as objects, instances, and attributes. A conceptual diagram is given below.



NS300 Modules have the following objects.

| Object Name | No. of Instances | Description |
|----------------------------|------------------|--|
| Identity Object | 1 | Manages device types and serial numbers. |
| Message Router Object | 1 | Acts as a router to distribute explicit messages to objects. |
| DeviceNet Object | 1 | Manages the physical connection to the DeviceNet. |
| Assembly Object | 1 | Manages response messages. |
| | 2 | Manages command messages. |
| Connection Object | 1 | Manages explicit messages. |
| | 2 | Manages I/O messages. |
| Control Parameter Object | 1 | Manages detailed motion settings. |
| Point Table Object | 1 | Manages point table data. |
| SERVOPACK Parameter Object | 1 | Manages SGDH parameters. |

Instances within objects hold data called attributes. The attributes show the settings and status of the NS300 Module. If referencing or changing attributes via DeviceNet, you must specify the object name, instance number, and attribute number.

For example, when referencing via DeviceNet the attribute of the NS300 Module parameter Pn802 (Feed Speed for Zero Point Return) specify the attribute as follows:

- Control Parameter Object (0x64), Instance 1, Attribute 12

Refer to *Appendix B DeviceNet Attributes* for a table of attributes.

5.6.2 Editing Parameters

■ Editing Parameters Using Command Messages

SGDH parameters, NS300 Module parameters, and point table data can be changed using command messages.

Refer to *5.3 Command/Response Format*.

■ Editing Parameters Using Message Communications

DeviceNet supports message communications, called explicit messages. Parameters can be referenced or changed using message communications. To use explicit messages, specify the objects, instances, and attributes explained in *5.6.1 Managing DeviceNet Data* and change the parameters. The basic format of explicit messages is shown below.

Commands (Master Device to NS300 Module)

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------------|--------------|---------------------------|---|---|---|---|---|
| 0 | 0/1 | Master device node number | | | | | |
| 0 | Service code | | | | | | |
| Object number | | | | | | | |
| Instance number | | | | | | | |
| Attribute number | | | | | | | |
| Service data | | | | | | | |

Responses (NS300 Module to Master Device)

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------------|--------------|---------------------------|---|---|---|---|---|
| 0 | 0/1 | Master device node number | | | | | |
| 1 | Service code | | | | | | |
| Object number | | | | | | | |
| Instance number | | | | | | | |
| Attribute number | | | | | | | |
| Service data | | | | | | | |

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The following example shows the Zero Point Return Feed Speed (Object 0x64, instance 1, attribute 12) being read by using the Get_Attribute_Single command (code: 0x0e) when the master device node number is 0.

Command (Master Device to NS300 Module)

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------|------|---|---|---|---|---|---|
| 0 | 0 | 0 | | | | | |
| 0 | 0x0e | | | | | | |
| 0x64 | | | | | | | |
| 0x01 | | | | | | | |
| 0x0C | | | | | | | |

Response (NS300 Module to Master Device)

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------|------|---|---|---|---|---|---|
| 0 | 0 | 0 | | | | | |
| 1 | 0x0e | | | | | | |
| 0x64 | | | | | | | |
| 0x01 | | | | | | | |
| 0x0C | | | | | | | |
| 0x00001234 | | | | | | | |

Refer to the manual for the master device for details on explicit messages.

5.7 Data Trace Function

The data trace function enables to read operating status data and I/O data stored in the memory of the SERVOPACK from a host controller using the explicit message of DeviceNet communications. If tracing has been selected, data will be stored in memory of the SERVOPACK. The stored data can be read from a host controller by reading trace data. The data trace function is outlined in the following table.

IMPORTANT

If the sticker on the side of the NS300 Module shows Ver. OA or later, the trace data function can be used.

Table 5.20 Outline of Trace Function

| Item | Description |
|----------------------|--|
| Traced Items | Data: 2 specifications max. I/O: 2 specifications max. |
| Traced Data | Internal torque reference, speed feedback, reference pulse speed, and position errors |
| Traced I/O | ALM, /COIN, /V-CMP, /TGON, /S-RDY, /CLT, /VLT, /BK, /WARN, /NEAR, ALO1, ALO2, and ALO3 |
| Traced Points | 1,000 for each specification |
| Sampling Time | 250 to 8,191,750 μ s (set in increments of 250 μ s) |

- Note: 1. A few minutes is required to complete tracing.
2. Trace parameters are not saved when the Module is reset. These parameters will revert to their default settings if the Module is reset or the power supply is turned OFF.
 3. The display on the SERVOPACK's Panel Operator will go blank while tracing is being executed.

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5.7.1 Trace Parameters

■ Setting a Trace

The following table lists the parameters used to select the data trace function.

Table 5.21 Parameters for Setting the Data Trace Functions

| Object | Attribute | Access | Name | Data Type | Description |
|--------|-----------|---------|----------------|-----------|----------------------------|
| 0x67 | #10 | Get/Set | Data Trace 1 | UINT | Data trace 1 |
| | #11 | Get/Set | Data Trace 2 | UINT | Data trace 2 |
| | #12 | Get/Set | I/O Trace 1 | UINT | I/O trace 1 |
| | #13 | Get/Set | I/O Trace 2 | UINT | I/O trace 2 |
| | #14 | Get/Set | Sampling Time | UINT | Sampling time |
| | #15 | Get/Set | Trigger Target | UINT | Trigger |
| | #16 | Get/Set | Trigger Target | INT | Trigger level |
| | #17 | Get/Set | Edge Type | UINT | Edge type |
| | #18 | Get/Set | Pre-Trigger | UINT | Amount of pre-trigger data |
| | #19 | Get/Set | Start Trace | UINT | Trace start command |
| | #20 | Get | Trace Status | UINT | Trace status |

■ Description of Parameters

This section describes the parameters used for the data trace function.

Data Trace 1 (Object: 0x67, Instance: 0x01, Attribute: #10)

Select the first type of data to be traced for Data Trace 1.

Table 5.22 Data to be Traced

| Setting | Data | Unit |
|---------|-----------------------|-------------------|
| 0x0 | Torque reference | % |
| 0x1 | Feedback speed | min ⁻¹ |
| 0x3 | Reference pulse speed | min ⁻¹ |
| 0x4 | Position errors | Reference units |

Data Trace 2 (Object: 0x67, Instance: 0x01, Attribute: #11)

Select the second type of data to be traced for Data Trace 2. The settings are the same as those for Data Trace 1.

I/O Trace 1 (Object: 0x67, Instance: 0x01, Attribute: #12)

Select the first type of I/O to be traced for I/O Trace 1.

Table 5.23 I/O to be Traced

| Setting | I/O | Description |
|---------|--------|-----------------------------|
| 0x0080 | ALM | Alarm output |
| 0x0081 | /COIN | Positioning complete output |
| 0x0082 | /V-CMP | Speed coincidence output |
| 0x0083 | /TGON | Rotation detected output |
| 0x0084 | /S-RDY | Servo ready output |
| 0x0085 | /CLT | Torque control output |
| 0x0086 | /VLT | Speed limit detected output |
| 0x0087 | /BK | Brake interlock output |
| 0x0088 | /WARN | Warning output |
| 0x0089 | /NEAR | Near output |
| 0x008B | ALO1 | Alarm code output 1 |
| 0x008C | ALO2 | Alarm code output 2 |
| 0x008D | ALO3 | Alarm code output 3 |

I/O Trace 2 (Object: 0x67, Instance: 0x01, Attribute: #13)

Select the second type of I/O to be traced for I/O Trace 2. The settings are the same as those for I/O Trace 1.

Sampling Time (Object: 0x67, Instance: 0x01, Attribute: #14)

Select the time in which data can be traced for the Sampling Period. The time can be set in multiples of 250 μ s between 250 and 8,191,750 μ s.

Trigger Target (Object: 0x67, Instance: 0x01, Attribute: #15)

Select the item to be used as a trigger for the Trigger Target. Any of the items selected for Data Trace 1, Data Trace 2, I/O Trace 1, or I/O Trace 2 can be assigned, or no trigger can be selected. If no trigger is selected, then sampling will begin as soon as the trace is started, and the Trigger Level, Trigger Edge, and Pre-Trigger settings will be invalid.

Table 5.24 Trigger Settings

| Setting | Description |
|---------|---------------------------|
| 0x0 | No trigger |
| 0x1 | Data set for Data Trace 1 |
| 0x2 | Data set for Data Trace 2 |
| 0x3 | I/O set for I/O Trace 1 |
| 0x4 | I/O set for I/O Trace 2 |

Trigger Level (Object: 0x67, Instance: 0x01, Attribute: #16)

Select the level to use to detect the trigger for the Trigger Level.

The unit for this setting will be the same as that for the Trigger Target. If the Trigger Target is set to I/O Trace 1, I/O Trace 2, or no trigger, this setting is invalid.

Edge Type (Object: 0x67, Instance: 0x01, Attribute: #17)

Select the direction of change to detect the trigger for the Edge Type. If the Trigger Target is set to no trigger, this setting is invalid.

Table 5.25 Edge Types

| Setting | Description | Trace Type | Remarks |
|---------|---------------|------------|--|
| 0x0 | Rising Edge | Data trace | The trigger is detected when the data changes from below the trigger level to the trigger level or higher. |
| | | I/O trace | The trigger is detected when the signal changes from low to high. |
| 0x1 | Falling Edge | Data trace | The trigger is detected when the data changes from above the trigger level to the trigger level or lower. |
| | | I/O trace | The trigger is detected when the signal changes from high to low. |
| 0x2 | Changing Edge | Data trace | The trigger is detected when the data passes the trigger level. |
| | | I/O trace | The trigger is detected when the signal level changes. |

Pre-trigger (Object: 0x67, Instance: 0x01, Attribute: #18)

For the Pre-trigger, select the number of samples that can be saved as part of the 1000 points before the Trigger is activated. Set the number of samples to a value between 0 and 999. If the Trigger Target is set to no trigger, this setting is invalid.

Start trace (Object: 0x67, Instance: 0x01, Attribute: #19)

Set starting and canceling the trace for Start Trace. To start tracing again, specify starting the trace again.

Table 5.26 Start Trace

| Setting | Description |
|---------|--------------------|
| 0x0 | No operation (NOP) |
| 0x1 | Start trace |
| 0x2 | Cancel trace |

Trace Status (Object: 0x67, Instance: 0x01, Attribute: #20)

The trace status is stored in the Trace Status.

Table 5.27 Trace Status

| Setting | Description |
|---------|-----------------|
| 0x0000 | Initial status |
| 0x0001 | Tracing |
| 0x0002 | Trace completed |
| 0x0010 | Trace canceled |
| 0x0011 | Setting error |

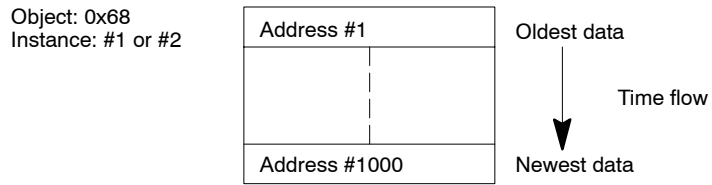
5.7.2 Reading Trace Data**■ Trace Data Object**

The data traced by the SERVOPACK is stored in the trace data object. The trace data object has four instances.

| Trace | Data Range | Object and Instance |
|--------------|------------|--------------------------|
| Data Trace 1 | 1 to 1,000 | Object 0x68, Instance #1 |
| Data Trace 2 | 1 to 1,000 | Object 0x68, Instance #2 |
| I/O Trace 1 | 1 to 63 | Object 0x68, Instance #3 |
| I/O Trace 2 | 1 to 63 | Object 0x68, Instance #4 |

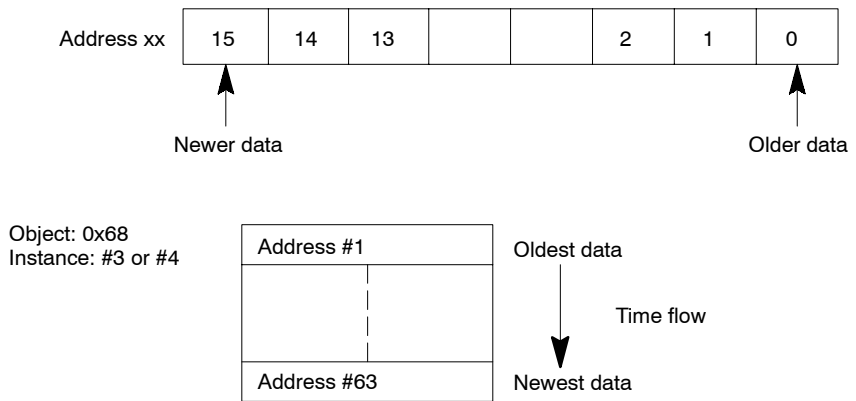
Data Trace 1 and Data Trace 2

The following figure shows how data from a data trace is stored.



I/O Trace 1 and I/O Trace 2

The following figure shows how data from an I/O trace is stored. Zeros are stored in the final eight bits remaining in the 1000 points of data (bits 8 to 15 of address #63).



■ Explicit Messages

This section describes the commands and responses in explicit messages used to read trace data. Trace Data Read is used for Byte Data Read and Word Data Read.

Byte Data Read

Command (Master Device to NS300 Module)

| | | | | | | | |
|-------------------------|---------------------|-------------------------|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| | | Destination node number | | | | | |
| 0 | Service code (0x1C) | | | | | | |
| Object number (0x67) | | | | | | | |
| Instance number | | | | | | | |
| Lower byte of address | | | | | | | |
| Upper byte of address | | | | | | | |
| Number of bytes to read | | | | | | | |

Response (NS300 Module to Master Device)

| | | | | | | | |
|--------------------|---------------------|-------------------------|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| | | Destination node number | | | | | |
| 1 | Service code (0x1C) | | | | | | |
| Upper byte of data | | | | | | | |
| Lower byte of data | | | | | | | |
| : | | | | | | | |
| Upper byte of data | | | | | | | |
| Lower byte of data | | | | | | | |

Read data
(200 bytes max.)

Note: 1. The maximum number of bytes that can be read is 200.

2. Even if the start address plus the number of bytes exceeds the number of items (2,000 bytes for data trace 1 or 2 and 126 bytes for I/O trace 1 or 2), an error will not occur and the number of bytes that can be read will be returned.

Example: If an address of 1000 and 10 bytes are specified, only 2 bytes of data for the address of 1000 bytes will be read.

Error Responses

Response (NS300 Module to Master Device)

| | | | | | | | |
|------------|---------------------|-------------------------|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| | | Destination node number | | | | | |
| 1 | Service code (0x14) | | | | | | |
| Error code | | | | | | | |
| Error code | | | | | | | |

Word Data Read

Command (Master Device to NS300 Module)

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------------------|---------------------|-------------------------|---|---|---|---|---|
| | | Destination node number | | | | | |
| 0 | Service code (0x1D) | | | | | | |
| Object number (0x67) | | | | | | | |
| Instance number | | | | | | | |
| Lower byte of address | | | | | | | |
| Upper byte of address | | | | | | | |
| Number of words to read | | | | | | | |

Response (NS300 Module to Master Device)

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------------|---------------------|-------------------------|---|---|---|---|---|
| | | Destination node number | | | | | |
| 1 | Service code (0x1D) | | | | | | |
| Lower byte of data | | | | | | | |
| Upper byte of data | | | | | | | |
| : | | | | | | | |
| Lower byte of data | | | | | | | |
| Upper byte of data | | | | | | | |

Read data
(200 bytes max.)

5

- Note: 1. The maximum number of words that can be read is 200.
2. Even if the start address plus the number of words exceeds the number of items (2,000 words for data trace 1 or 2 and 63 words for I/O trace 1 or 2), an error will not occur and the number of words that can be read will be returned.
- Example: If an address of 1000 and 10 words are specified, only one word of data for address 1000 bytes will be read.

Error Responses

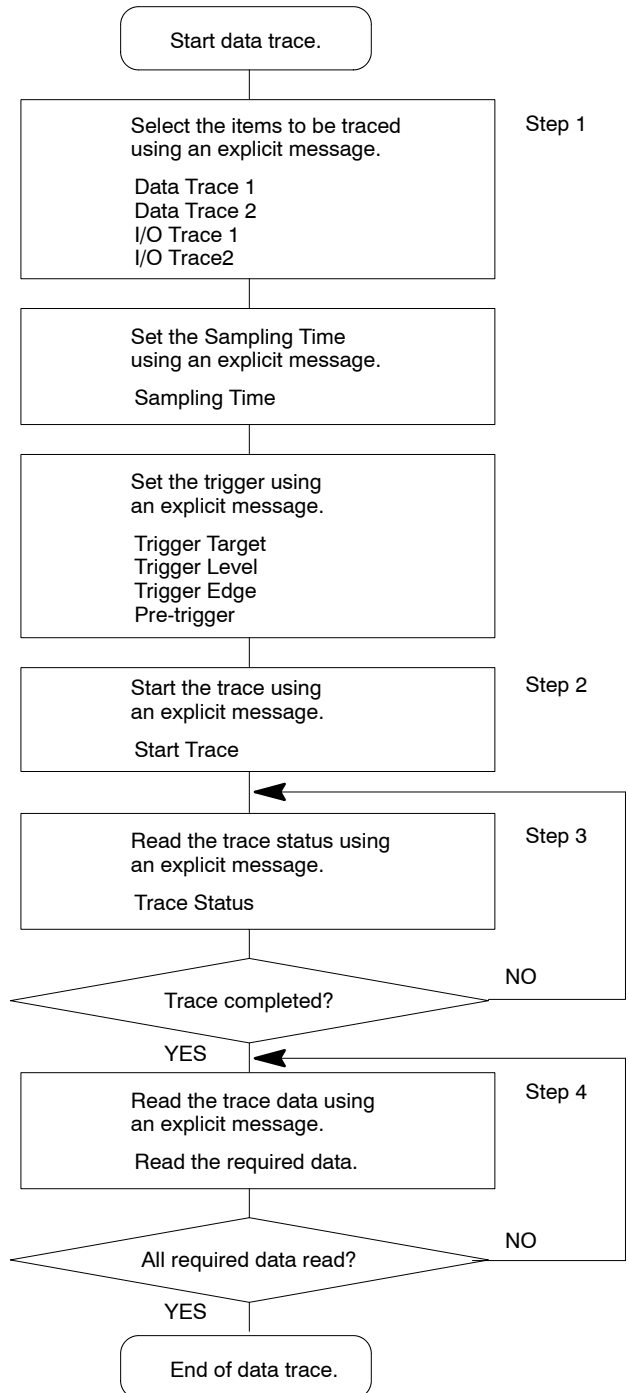
Response (NS300 Module to Master Device)

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------|---------------------|-------------------------|---|---|---|---|---|
| | | Destination node number | | | | | |
| 1 | Service code (0x14) | | | | | | |
| Error code | | | | | | | |
| Error code | | | | | | | |

5.7.3 Executing Data Traces

Use the following procedure to execute a data trace from the host controller.

1. Select the items to be traced and other parameters.
2. Start the trace.
3. Read the trace status.
4. Read the trace data.



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5.8 EDS File

An EDS file is required when using DeviceNet setting tool to make settings or monitor the NS300 Module. After installing the EDS file in the setting tool, settings and monitoring can be done. The EDS file differs in accordance with the product used.

Table 5.28 EDS File and Corresponding model

| Product Model | ESD File Name |
|----------------------|----------------------|
| JUSP-NS300 | NS300.eds |
| JUSP-NS300-E | NS300E.eds |

Download the EDS File from the ODVA's homepage of Yaskawa's e-mechatronics site (<http://www.e-mechatronics.com/>).

6

Parameter Settings

This chapter describes parameters and standard settings for I/O signals (CN1) when an NS300 Module is mounted.

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6.1 Parameters and Standard Settings for NS300 Modules

6.1.1 Automatically Set Parameters

When an NS300 Module is mounted on an SGD H SERVOPACK and it is used for DeviceNet communications, the following parameters are automatically set. The following parameters will be treated as “reserved for system use,” so do not change them. The SGD H 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.

| Pn No. | Digit | Parameter Name | Set Value | Description |
|--------|-------|--|-----------|---|
| Pn000 | 1 | Select control method | 1 | Position control |
| Pn004 | 1 | Reserved | 0 | Not used. |
| Pn200 | 1 | Clear signal status | 0 | Clear the error counter with an H-level signal. |
| | 2 | Clear motion | 1 | Error counter is not cleared. |
| Pn202 | --- | Electric gear ratio (Numerator) | 1 | Not used. Use Pn810. |
| Pn203 | --- | Electric gear ratio (Denominator) | 1 | Not used. Use Pn811. |
| Pn204 | --- | Position command acceleration/deceleration time constant | 0 | Not used. |
| Pn207 | 0 | Select position command filter | 0 | Acceleration/deceleration filter |
| | 1 | Position control option | 0 | Not used. |
| Pn50A | 0 | Allocate input signals | 1 | Enables allocations. |
| | 1 | /S-ON | 8 | Not used. |
| | 2 | /P-CON | 8 | Not used. |
| | 3 | /P-OT | 8 | Not used. NS300 detects P-OT. |
| Pn50B | 0 | /N-OT | 8 | Not used. NS300 detects N-OT. |
| | 1 | /ALM-RST | 8 | Not used. |
| Pn50C | 0 | /SPD-D | 8 | Not used. |
| | 1 | /SPD-A | 8 | Not used. |
| | 2 | /SPD-B | 8 | Not used. |
| | 3 | /C-SEL | 8 | Not used. |

| Pn No. | Digit | Parameter Name | Set Value | Description |
|--------|-------|----------------|-----------|-------------|
| Pn50D | 0 | /Z-CLAMP | 8 | Not used. |
| | 1 | /INHIBIT | 8 | Not used. |
| | 2 | /G-SEL | 8 | Not used. |
| | 3 | Reserved. | 8 | Not used. |
| Pn511 | 0 | Reserved. | 8 | Not used. |



These parameters are set automatically the first time the power to the SERVOPACK is turned ON after the NS300 Module has been mounted. Startup will take approximately six 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 NS300 Module is mounted are described below. To use the standard settings, change the parameters to the standard setting as shown below. The input signal setting from the NS300 Module will be force-changed, so the user cannot change this setting.

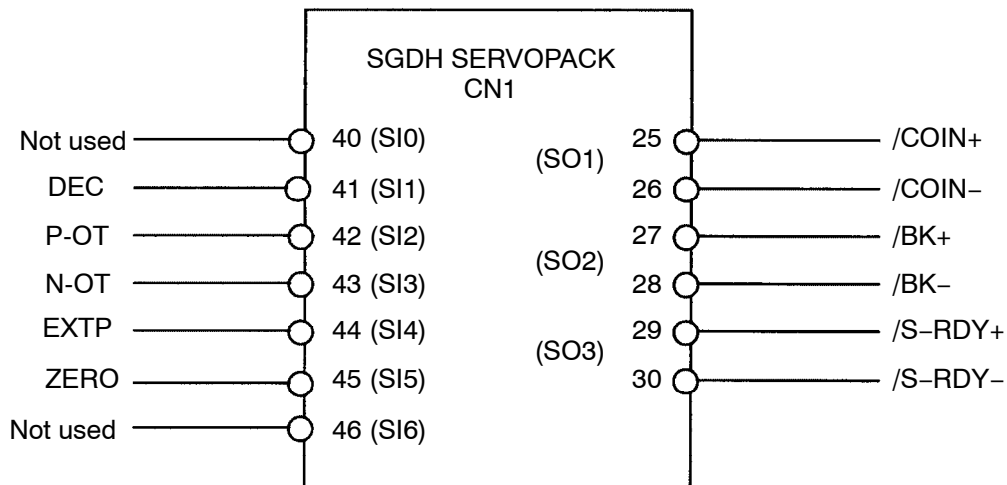


Figure 6.1 Standard CN1 I/O Signal Settings

Table 6.1 Factory Settings and Standard Settings for I/O Signals

| Parameter | Description | Factory Setting | Standard Setting |
|-----------|----------------------------|-----------------|------------------|
| Pn50E | Output signal selections 1 | 3211 | 3001 |
| Pn50F | Output signal selections 2 | 0000 | 0200 |
| Pn510 | Output signal selections 3 | 0000 | 0000 |

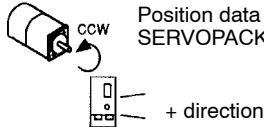
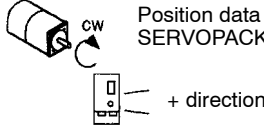
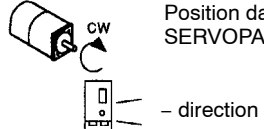
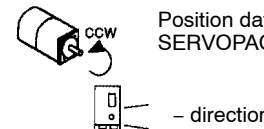
6.2 Settings According to Equipment Characteristics

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. There are no other changes.

| | Standard Setting | Reverse Rotation Mode |
|--------------------------|---|---|
| Forward Reference |  Position data from SERVOPACK |  Position data from SERVOPACK |
| Reverse Reference |  Position data from SERVOPACK |  Position data from SERVOPACK |

■ Setting Reverse Rotation Mode

Use parameter Pn000.0.

| Pn000.0 | Direction Selection | Factory Setting: | Position Control |
|---------|---------------------|------------------|------------------|
| | | 0 | |

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) |

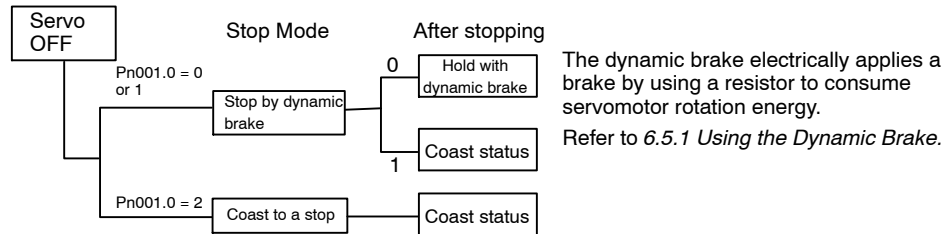
6.2.2 Stop Mode Selection at Servo OFF

The SGD H SERVOPACK turns OFF under the following conditions:

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

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

| | | | |
|----------------|----------------------------|-------------------------------------|-------------------------|
| Pn001.0 | Servo OFF Stop Mode | Factory Setting: 0 | Position Control |
|----------------|----------------------------|-------------------------------------|-------------------------|



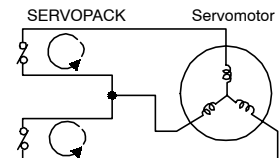
| Parameter | Setting | Item |
|-----------|------------------------|---|
| Pn001.0 | 0 (Factory setting) | Uses the dynamic brake to stop the servomotor, and maintains dynamic brake status after stopping. |
| | 1 | Uses the dynamic brake to stop the servomotor, and cancels dynamic brake status after 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 coast to a stop the same as in coast status.



◆ 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.



6.2.3 Setting the Hardware Limit

The hardware limit forces movable machine parts to stop if they exceed the allowable range of motion.

IMPORTANT

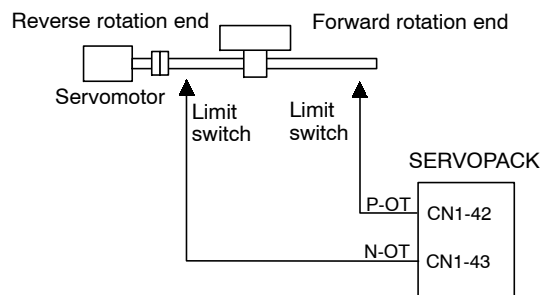
The hardware limit function uses software to stop the SERVOPACK. This method may not satisfy the standards, depending on the safety specifications for the application. If necessary, add an external safety circuit.

■ Using the Hardware Limit Function

To use the hardware limit function, connect the hardware 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 Hardware Limit) |
| → Input N-OT CN1-43 | Reverse Run Prohibited (Reverse Hardware Limit) |

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



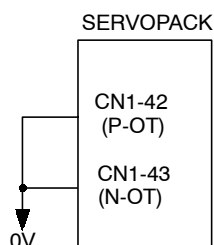
Drive status with an input signal ON or OFF is shown in the following table.

| | | |
|------|-------------------------------|--|
| 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 hardware limit or not. The factory setting is “Enable.”

| No. | Bit | Name | Description | Factory Setting |
|-------|---------|--------------------------------|--|-----------------|
| Pn819 | 0 | Hardware Limit Enable/Disable | 0: Disable 1: Enable | 1 |
| | 1 | Hardware Limit Signal Polarity | 0: Disable when Low 1: Enable when High | 1 |
| | 2 to 15 | For future use | – | 0 |



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

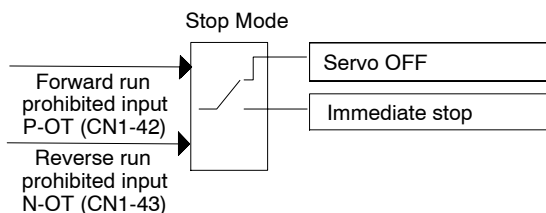
■ Servomotor Stop Mode When Using Hardware Limit

Set the following parameters to specify the servomotor Stop Mode when setting the hardware limit to “Enable.”

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)

| No. | Setting | Description |
|-------|----------|---|
| Pn81A | 0 | Servo OFF |
| | 1 | Immediate stop: The servomotor stops at maximum torque that is set without acceleration and deceleration. |
| | 0 to 255 | Reserved |



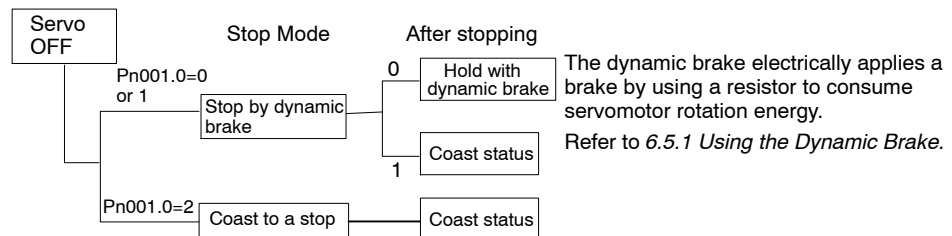
■ Servo OFF Stop Mode Selection

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 |
|----------------|-------------------------------------|-------------------------------------|



| Parameter | Setting | Meaning |
|----------------|------------------------|---|
| 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 machine friction. |

Note If the servomotor is stopped or rotating at extremely low speed when the Pn001.0 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.

6.2.4 Software Limit Settings

The software limits set limits in software for machine movement without hardware limit 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 hardware limit.

■ 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 software limit is disabled.
- The ZRET command has been executed.

| No. | Bit | Name | Description | Factory Setting |
|-------|-----|-----------------------------------|-------------------------|-----------------|
| Pn818 | 0 | Software Limit Function Selection | 0: Disable 1: Enable | 0 |

■ Software Limit Setting

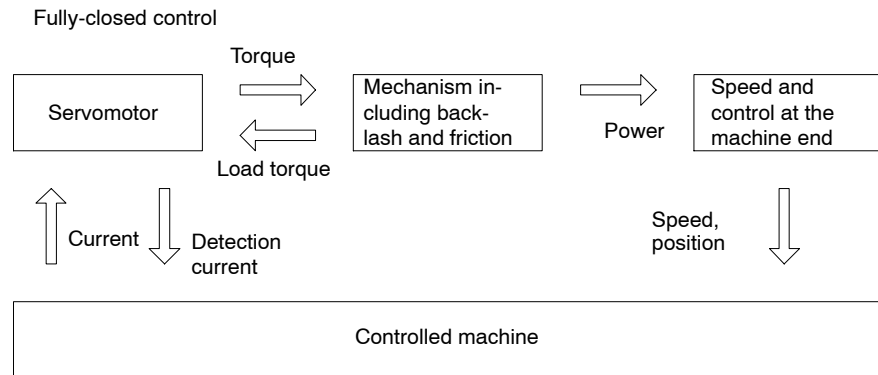
Set software limits in the positive and negative directions.

| | | | | |
|--------------|-------------------------------|----------------------------|---|---|
| Pn816 | Forward Software Limit | Unit Reference Unit | Setting Range: ±99,999,999 | Factory Setting: 99,999,999 |
| Pn817 | Reverse Software Limit | Unit Reference Unit | Setting Range: ±99,999,999 | Factory Setting: -99,999,999 |

The negative limit must be less than the positive limit.

6.2.5 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 6.2.7 *Parameter Settings* for details.

6.2.6 Fully-closed System Specifications

This section describes the fully-closed system specifications of the SGDH SERVOPACK when an NS300 Module is mounted.

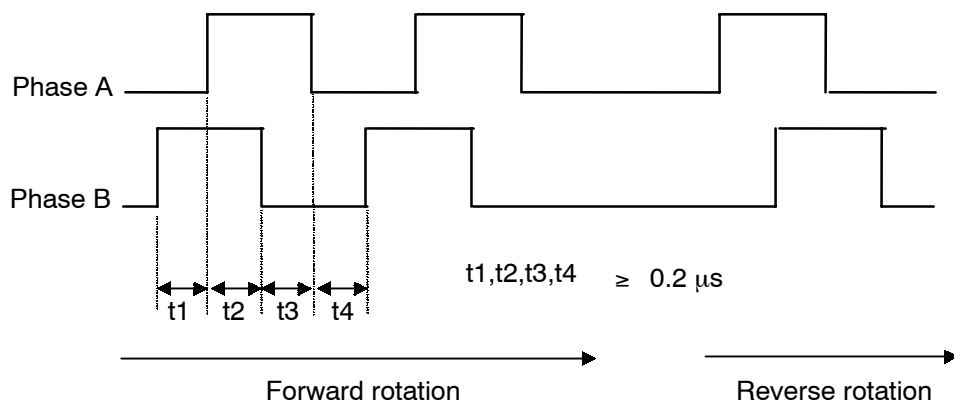
■ Fully-closed Encoder Pulse Output Form

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



6.2.7 Parameter Settings for the Fully-closed System

This section describes the parameters that must be set when using an NS300 Module.

■ 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 65535 | 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.

6.3 Settings According to Host Controller

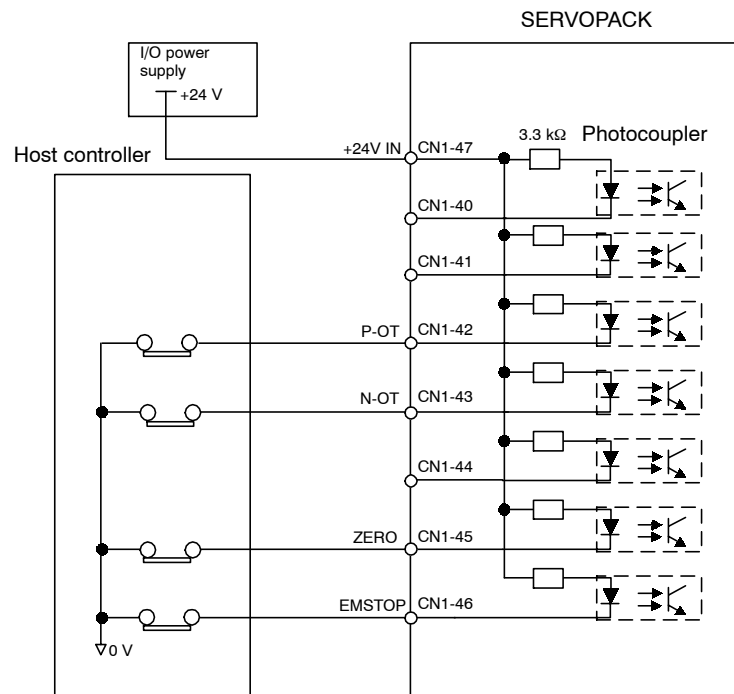
This section describes the procedure for connecting the SERVOPACK to the host controller and provides details on related parameters.

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

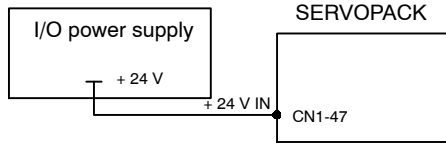
Provide an external input power supply; the SERVOPACK does not have an internal 24-V power supply.

- Sequence input signal 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.

→ Input +24V IN CN1-47 **24 V External I/O Power Supply Input** **Position Control**

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

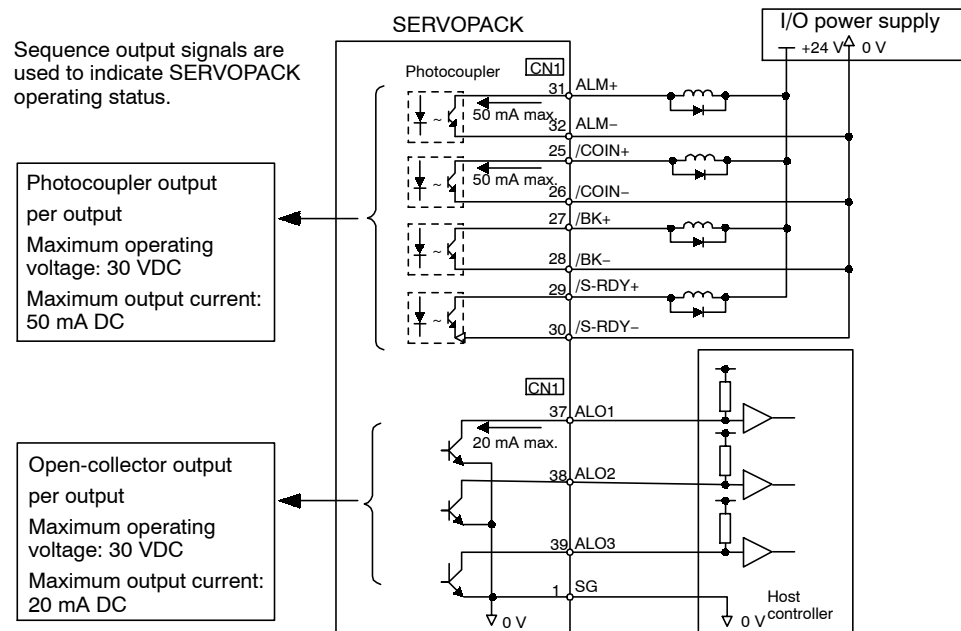


Connect an external I/O power supply.

- Contact input signals:
- DEC (CN1-41)
 - P-OT (CN1-42)
 - N-OT (CN1-43)
 - EXTP (CN1-44)
 - ZERO (CN1-45)

■ **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 allocations for some sequence output signal circuits can be changed.

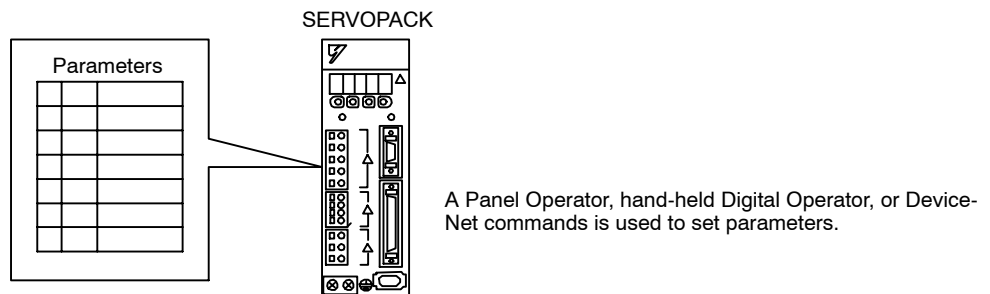
Refer to 6.4.3 *Output Circuit Signal Allocations* for more details.

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 that allow the user to specify functions and perform fine adjustments.



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 FEED operations and zero point searches. |
| Un000 to Un00D | Monitor the motor speed and torque reference value on the panel display. |

6.4.2 Input Circuit Signal Allocation

The allocation of the sequence input signal circuit when the NS300 Module is mounted on the SGDh SERVOPACK is not changed. It will be as follows:

| Terminal Numbers | Input Terminal Name | Symbol | Name |
|------------------|---------------------|--------|-----------------------------|
| 40 | SI0 | --- | --- |
| 41 | SI1 | DEC | Deceleration limit switch |
| 42 | SI2 | P-OT | Forward run prohibited |
| 43 | SI3 | N-OT | Reverse run prohibited |
| 44 | SI4 | EXTP | External signal positioning |
| 45 | SI5 | ZERO | Zero point signal |
| 46 | SI6 | --- | --- |

6.4.3 Output Circuit Signal Allocations

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

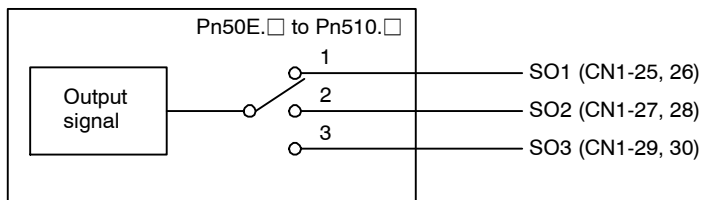
In general, allocate signals according to the standard settings in the following table.

| 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 following table shows the output signal selection parameters and their factory settings and standard settings.

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

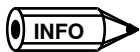
Select the CN1 connector terminals that will output the signals.



| 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 Pn50E.0* |
| Rotation Detection (/TGON) | Pn50E.2 | 0 to 3 | Same as Pn50E.0 |
| Servo Ready (/S-RDY) | Pn50E.3 | 0 to 3 | Same as Pn50E.0 |
| Torque Limit Detection (/CLT) | Pn50F.0 | 0 to 3 | Same as Pn50E.0 |
| Speed Limit Detection (/VLT) | Pn50F.1 | 0 to 3 | Same as Pn50E.0 |
| Brake Interlock (/BK) | Pn50F.2 | 0 to 3 | Same as Pn50E.0 |
| Warning (/WARN) | Pn50F.3 | 0 to 3 | Same as Pn50E.0 |
| Near (/NEAR) | Pn510.0 | 0 to 3 | Same as Pn50E.0 |
| Phase C Detection (/C-PULS) | Pn510.1 | 0 to 3 | Same as Pn50E.0 |

* Always OFF when an NS300 Module is mounted.

Note “Same as Pn50E.0” 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: | Position Control |
|-------|---------------------------------|------------------|------------------|
| | | 0000 | |

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. |
| Reserved | Pn512.3 | --- | --- |

6.4.4 Analog Monitors

The analog monitors can be changed by changing the Pn003.0 and Pn003.1 parameter settings.

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

The monitor signals and units and the observation gains when observing using the analog monitor (CN5) are shown on the following table.

| Pn003.0 and Pn003.1 Settings | Monitor Signal | Analog Monitor (CN5) Observed Gain |
|-------------------------------------|---|---|
| 0 | Servomotor speed | 1 V/1000 min ⁻¹ |
| 1 | Speed reference | 1 V/1000 min ⁻¹ |
| 2 | Torque reference | 1 V/100 % rated torque |
| 3 | Position error | 0.05 V/1 reference units |
| 4 | Position error | 0.05 V/100 reference units |
| 5 | Reference pulse frequency (Servomotor speed conversion) | 1 V/1000 min ⁻¹ |
| 6 | Servomotor speed | 1 V/250 min ⁻¹ |
| 7 | Servomotor speed | 1 V/125 min ⁻¹ |
| 8 to F | Reserved motor signal | — |



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

6.5 Setting Stop Functions

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

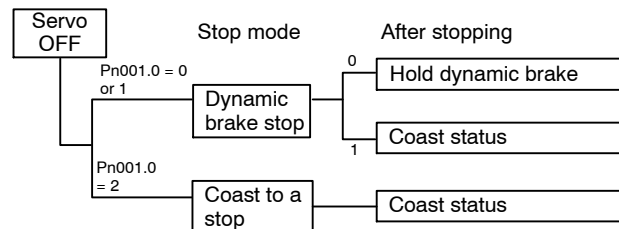
6.5.1 Using the Dynamic Brake

To stop the servomotor by applying the dynamic brake (DB), 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 sent.
- A servo alarm occurs.
- Power is turned OFF.



Specify the Stop Mode if any of these occurs during servomotor 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 stops due to equipment friction. |

* 1. If the servomotor is stopped or moving at extremely low speed, it will coast to a stop.

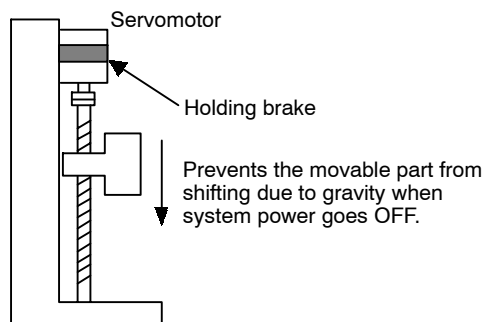
* 2. A dynamic brake is used when the control power and main power are turned OFF.

IMPORTANT

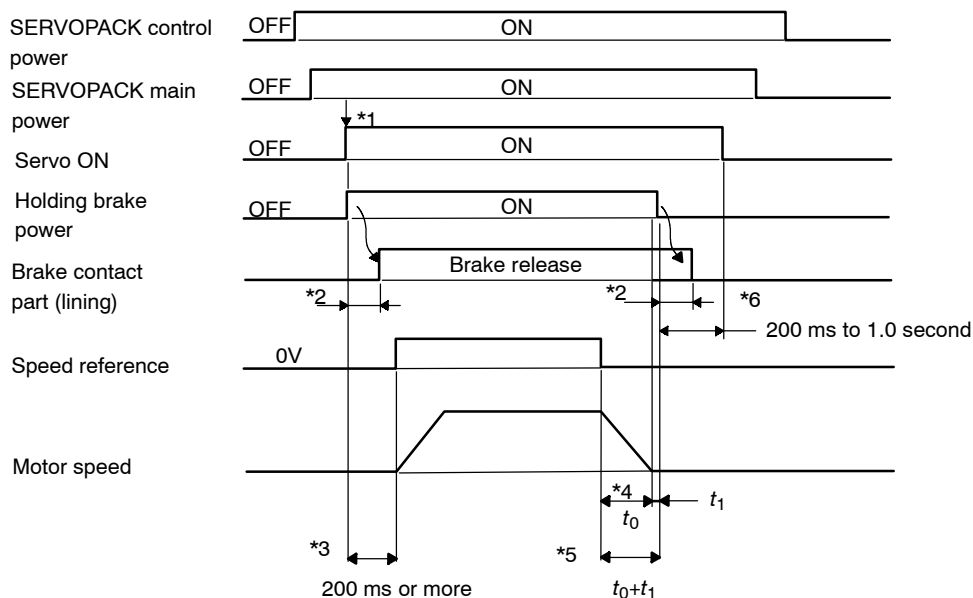
The dynamic brake is an emergency stop function. Do not repeatedly start and stop the servomotor using the SV_ON/SV_OFF command or by repeatedly turning power ON and OFF.

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.



Holding brakes have a motion delay time. The ON and OFF timing for each motion is as follows. Brake interlock output easily enables the timing function.



- * 1. It is possible to input the Servo-On signal and to turn the holding brake's power on at the same time.
- * 2. The holding brake delay time will vary depending on the servomotor model. For more details, refer to Manuals for the SERVOPACK.
- * 3. Input the speed reference after an interval of at least 200 ms after the brake power supply is turned ON.
- * 4. t_0 shows the stop time of the motor. Refer to Table 6.2 *Formulas of motor stop time for the formulas* for t_0 .
- * 5. Turn OFF the brake power supply only after the motor is stopped. Usually, $t_0 + t_1$: 1 to 2 s.
- * 6. Turn OFF the Servo-On signal 0.2 to 1.0 s after the brake power supply is turned OFF.

Table 6.2 Calculation Method for Servomotor Stop Time

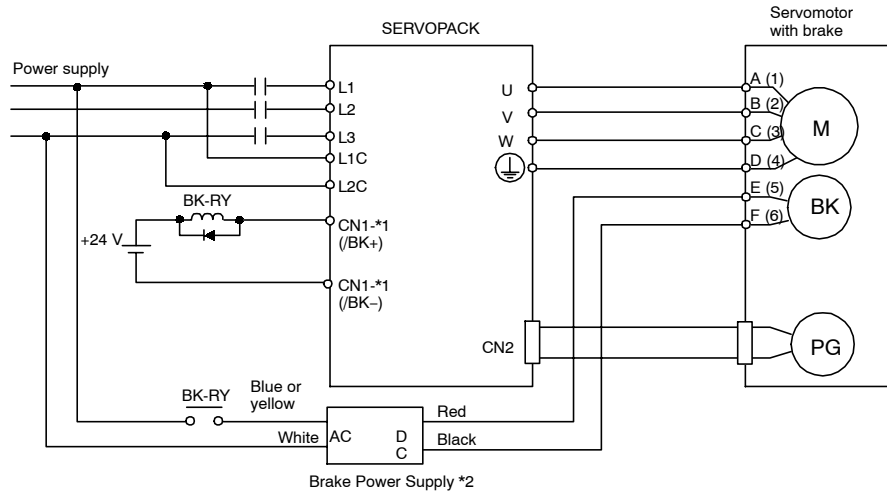
| Using SI Units | Conventional Method |
|---|---|
| $t_o = \frac{(J_M + J_L) \times N_M}{(T_P + T_L)} \times \frac{2\pi}{60} \text{ (s)}$ | $t_o = \frac{(GD_M^2 + GD_L^2) \times N_M}{375 \times (T_P + T_L)} \text{ (s)}$ |
| J_M : Rotor moment of inertia (kg·m ²) | GD_M^2 : Motor GD ² (kgf·m ²) |
| J_L : Load moment of inertia (kg·m ²) | GD_L^2 : Load inertia GD ² (kgf·m ²) |
| N_M : Motor rotational speed (min ⁻¹) | N_M : Motor rotational speed (min ⁻¹) |
| T_P : Motor deceleration torque (N·m) | T_P : Motor deceleration torque (kgf·m) |
| T_L : Load torque (N·m) | T_L : Load torque (kgf·m) |

IMPORTANT

The brake built into the SGM□H servomotor 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 servomotor torque.

■ 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: The output terminal signal is allocated with Pn50F.2

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

| | | |
|---------------|------------------------|------------------|
| Output to /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.

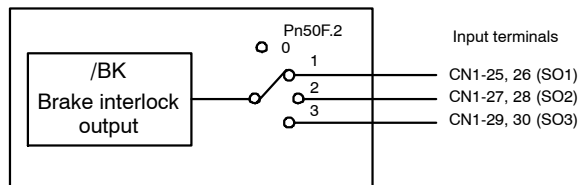
| | |
|--------------------------------|---------------------|
| ON: Closed or low level | Releases the brake. |
| OFF: Open or high level | Applies the brake. |

Related Parameters

| | |
|--------------|---|
| Pn005 | 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 Selection 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.

| | | | |
|----------------|------------------------|-------------------------------------|-------------------------|
| Pn005.0 | Brake Operation | Factory Setting: 0 | Position Control |
|----------------|------------------------|-------------------------------------|-------------------------|

| Pn005.0 Setting | Description |
|------------------------|---|
| 0 | Performs brake operation using the SERVOPACK parameter. |
| 1 | Does not perform brake operation using the SERVOPACK parameter. |

IMPORTANT

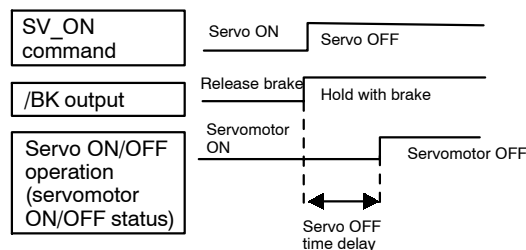
When setting the Pn005.0 to 1, the SERVOPACK's parameters (Pn506, Pn507, Pn508) settings will be ignored.

■ 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 | Time Delay from Brake Reference until Servo OFF | 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

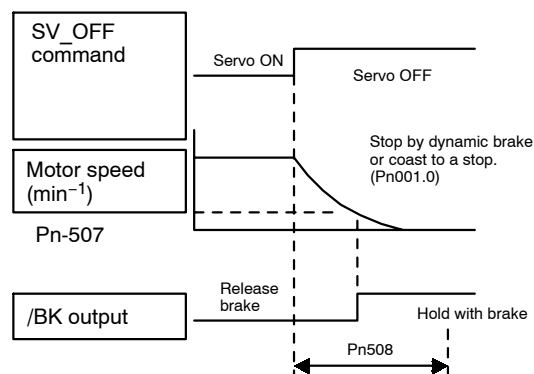
The servomotor will turn OFF immediately if an alarm occurs. The equipment may move due to gravity in the time it takes for the brake to operate.

■ 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. |

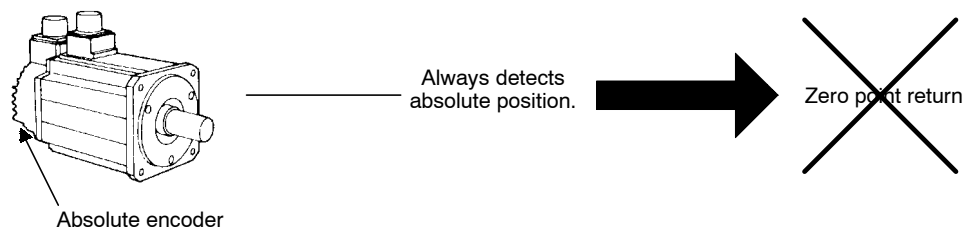
The actual setting will be the maximum speed if Pn507 is set higher than the maximum speed.

6.6 Absolute Encoders

If a servomotor 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 performing a zero point return 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.

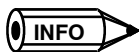
6.6.2 Absolute Encoder Setup

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.

- Perform the operation by the absolute encoder (Fn008) using the Digital Operator. (Refer to the *Σ-II Series SGM□H/SGDH User's Manual*.)
- Perform the operation by personal computer monitor software.



The absolute encoder setup operation is only possible when the servo is OFF. After the setup processing is finished, turn the power OFF and then 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 using the Alarm Reset Command.

- Encoder backup alarm (A.81)
- Encoder checksum alarm (A.82)

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

6.6.3 Multiturn Limit Setting

When implementing absolute position 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 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 |
|----------------|-------------------------------|-------------------------------------|-------------------------|

Set Pn002.2 to 0 to enable the absolute encoder.

| Pn002.2 Setting | Description |
|------------------------|--|
| 0 | Uses the absolute encoder as an absolute encoder. |
| 1 | Uses the absolute encoder as an incremental encoder. |

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 $m - 1$.



Turn the power OFF and then 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.

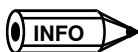
Alarm Name: Multiturn Limit Disagreement

| 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 (manual no. : SIEPS80000005) for details on changing the multiturn limit setting (Fn013) using a Digital Operator.
- Setup can also be performed using the personal computer monitor software.



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 ON.

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

 **WARNING** 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 in a dangerous situation where the machine will move to unexpected positions.



◆ 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.

6.7 Digital Operator

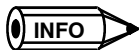
6.7.1 Connecting the Digital Operator

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 (manual no. : SIEPS80000005) .

6.7.2 Limitations in Using a Hand-held Digital Operator

When an NS300 Module is mounted, the Hand-held Digital Operator has the following limitations.



Disconnect the Hand-held Digital Operator during normal operation.

During Normal Operation

If the following command is sent via DeviceNet with a Hand-held Digital Operator connected to the SERVOPACK during normal operation, the following commands are not executed.

- Writing SGD parameters
- SGD parameters reading out
- Module reset
- Servo ON

IMPORTANT

After using the panel operator or the digital operator to execute a JOG operation, be sure to turn the power of the SERVOPACK OFF and then ON again before using DeviceNet.

6.7.3 Panel Operator Indicators

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

1. The indicators 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 momentarily when the following commands are received via DeviceNet or from a setup tool.
 - Writing SGD parameters
 - Reading SGD parameters

7

Using the NS□□□ Setup Tool

This chapter describes how to set parameters and monitor basic operation of the NS300 Module using the NS□□□ Setup Tool.

| | | |
|------------|------------------------------------|-------------|
| 7.1 | Connection and Installation | 7 -2 |
| 7.1.1 | Connecting the NS300 Module | 7 -2 |
| 7.1.2 | Installing the Software | 7 -2 |
| 7.2 | How to Use | 7 -3 |
| 7.2.1 | Screen Configuration at Startup | 7 -3 |
| 7.2.2 | Functions Configuration | 7 -6 |

7.1 Connection and Installation

7.1.1 Connecting the NS300 Module

■ Connector Cables

Connect the CN11 port on the NS300 Module and the RS-232C port on the personal computer using the following cable.

| Model | Name | Remarks |
|------------------------|----------------------|---------------------------------------|
| DE9404559 | SGD Monitor Cable | Loose wires on personal computer side |
| JZSP-CP00-02, -03, -05 | Cable for setup tool | – |

■ Cable Wiring

Wire the cables as follows:

| CN11 Pin number | Symbol | Details | Personal computer pin number (9 pins) |
|--------------------|-------------|--------------------|--|
| 1 | TXD (red) | Serial data output | 2 |
| 2 | RXD (white) | Serial data input | 3 |
| 3 | GND (black) | Ground | 5 |
| 4 | GND (black) | Ground | 5 |

7.1.2 Installing the Software

The following files are stored on the floppy disk for the NS□□□ Setup Tool.

- NS_MMI.EXE (Execution module)
- ParmDef.CFG (Data files)
- RES_JPN.DLL (DLL in Japanese)
- RES_ENG.DLL (DLL in English)
- ParmDef(Jpn).CFG (Data files in Japanese)
- ParmDef(Eng).CFG (Data files in English)

Copy these files to any directory on the personal computer.

IMPORTANT

To use the files in English, copy ParmDef(Eng).CFG to ParmDef.CFG.

7.2 How to Use

7.2.1 Screen Configuration at Startup

Start the Setup Tool as follows:

1. Double-click the *NS_MMI.exe* file. The following communications setting screen will be displayed.

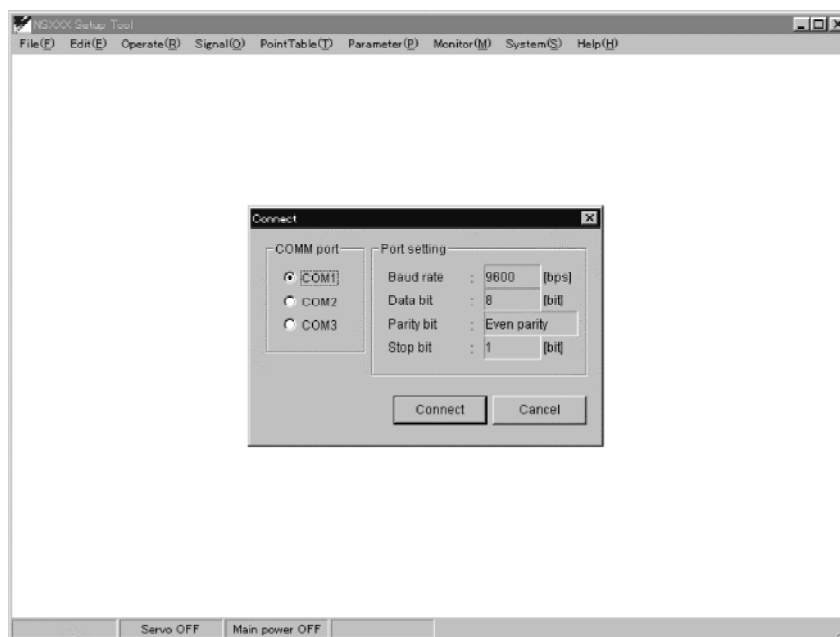


Figure 7.1 Communications setting screen

2. Perform one of the following operations.
 - If using any COM port other than COM1 on the personal computer, change the COMM PORT setting.
 - To use COM1, just click the *Connect* Button directly.

Next, check the following:

- a) The communications power supply is being supplied via the SGDh control power supply to the NS300 Module.
- b) The CN11 port on the NS300 Module is connected to the personal computer via a communications cable.

The following startup screen will be displayed.

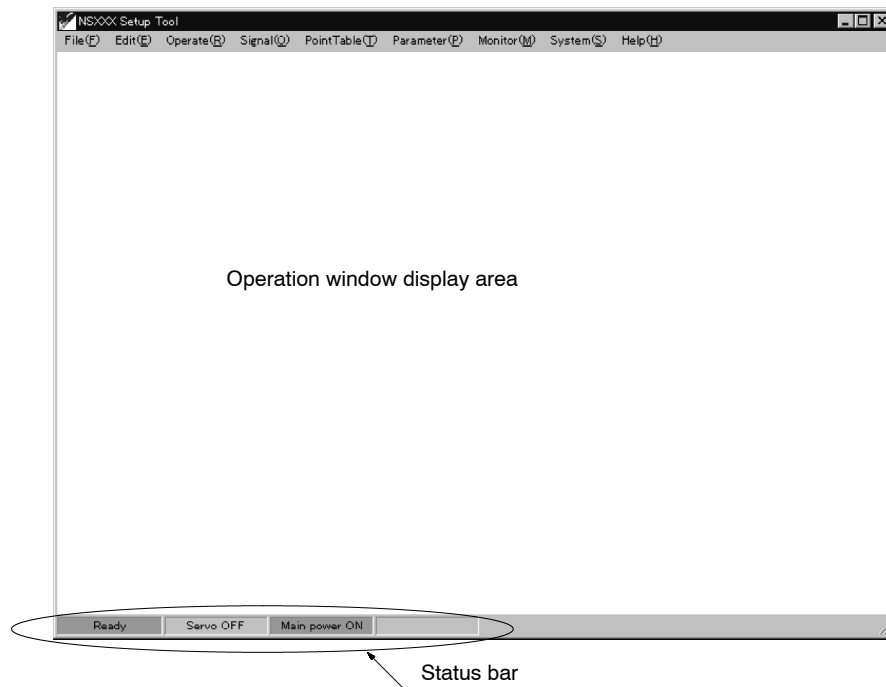
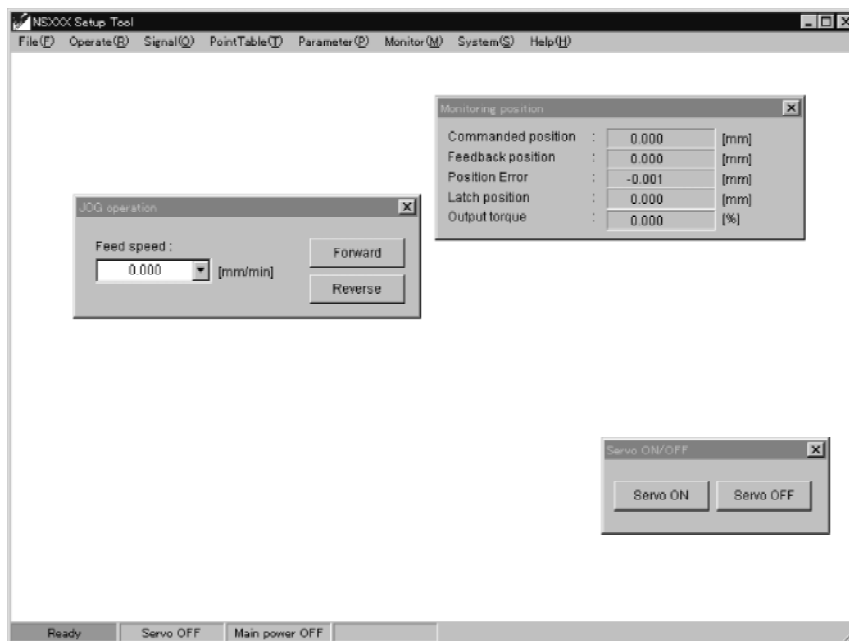


Figure 7.2 Startup Screen

The following information is normally displayed on the status bar.

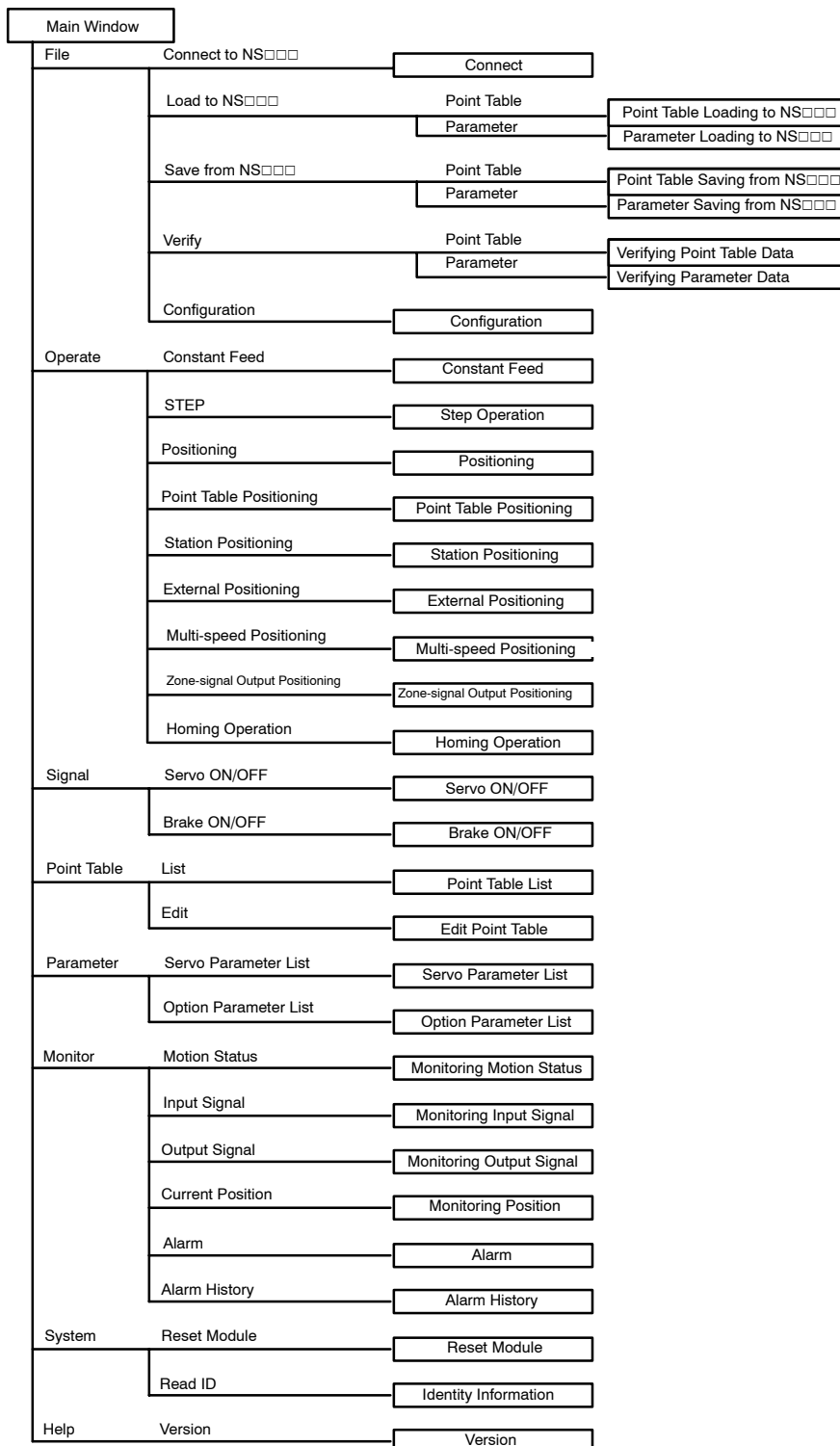
- Ready
Displays whether or not the NS300 Module is ready.
If the Module is ready, this icon will be lit green.
- Servo ON/OFF
Displays if the SGDh servo is ON or OFF.
If the servo is ON, this icon will be lit green.
- Main Power ON
Displays if the main power supply to the SGDh is ON.
If the main power supply is being supplied normally, this icon will be lit green.
- Alarm
Displays if an alarm has occurred in the NS300 Module or SGDh.
If an alarm has occurred, this icon will be lit red.

Select an item from the menu bar and make NS300 Module settings or perform simple operation, as shown below



7.2.2 Functions Configuration

The functional configuration of the Setup Tool is shown in the following diagram.



■ File Menu

1. Connect to NS□□□
Starts communications with the NS300 Module.
2. Load to NS□□□
Loads the parameter file stored in the personal computer to the NS300 Module.
3. Save from NS□□□
Saves the parameter data or point table data within the NS300 Module in the personal computer.
4. Verify
Compares the data stored in the personal computer and the data in the NS300 Module.
5. Configuration
Sets the units and other settings.

■ Operate Menu

1. Constant Feed
Performs constant feed speed.
2. STEP
Performs step operation.
3. Positioning
Sets the target position and performs positioning.
4. Point Table Positioning
Performs positioning based on the specified data in the point table.
5. Station Positioning
Performs positioning to the specified station.
6. External Positioning
Sets the target position and performs positioning. If the external signal changes, the axis moves the distance set in the parameter and then stops.
7. Multi-speed Positioning
Performs multi-speed positioning based on the set parameters.
8. Zone-signal Output Positioning
Performs positioning while making notch outputs based on the set parameters.
9. Homing Operation
Performs the zero point return.

■ Signal Menu

1. Servo ON/OFF
Turns ON and OFF the SGDH servo.
2. Brake ON/OFF
Turns ON and OFF the SGDH brake signal.

■ Point Table Menu

1. List
Displays a list of the point table currently registered.
2. Edit
Edits the point table.

■ Parameter Menu

1. Servo Parameter List
Displays a table of SGDH parameters, which can be edited using the cursor.
2. Option Parameter List
Displays a table of NS300 Module parameters, which can be edited using the cursor.

■ Monitor Menu

1. Motion Status
Displays the current execution status.
2. Input Signal
Displays the status of the external input signals connected to the CN1 port on the SGDH and the CN4 port on the NS300 Module.
3. Output Signal
Displays the status of the external output signals connected to the CN1 port on the SGDH and the CN4 port on the NS300 Module.
4. Current Position
Displays the current position of the servomotor in reference units.
5. Alarm
Displays any alarms that are currently occurring. You can also clear the alarms using this function.
6. Alarm History
Displays to a maximum of 10 the most recent alarms that have occur. You can also clear the alarm history using this function.

■ System Menu

1. Reset Module

Resets the NS300 Module and the SGDh.

When you reset the Module, the parameters that have been changed will be stored in flash ROM.

2. Read ID

Displays version information for the NS300 Module, SGDh, and so on.

■ Help Menu

- Version

Displays version information for the Setup Tool.

8

Ratings, Specifications, and Dimensions

This chapter provides the ratings, specifications, and dimensions of SGD H SERVOPACKs.

| | |
|--------------------------------------|------|
| 8.1 Ratings and Specifications | 8 -2 |
| 8.2 Dimensional Drawings | 8 -3 |
| 8.2.1 NS300 Module | 8 -3 |

8.1 Ratings and Specifications

The following table lists the rating and specifications of NS300 Module.

Table 8.1 NS300 Module Ratings and Specifications

| Item | | Details |
|-----------------------------------|--|---|
| Applicable SERVOPACK | | All SGDH-□□□E models |
| Installation Method | | Mounted on the SGDH SERVOPACK |
| Basic Specifications | Power Supply Method | Supplied from the SGDH control power supply. |
| | Power Consumption | 1.3 W |
| | Consumption Current | 250 mA |
| | External Dimensions [mm] | 20 x 142 x 128 (W x H x D) |
| | Approx. Mass [kg] (lb) | 0.2 (0.441) |
| DeviceNet Communications | Baud Rate Setting | Select from 125 Kbps, 250 Kbps, or 500 Kbps using a rotary switch. |
| | Node Address Setting | Select the address from 0 to 63 using the rotary switches. |
| | Communications Power Supply | 24 VDC (11 VDC to 25 VDC) |
| | Consumption Current | 20 mA or less |
| Command Format | Operation Specifications | Positioning using DeviceNet communications |
| | Reference Input | DeviceNet communications Commands: Motion commands (position, speed), and reading and writing parameters |
| Position Control Functions | Acceleration/Deceleration Method | Linear single/double-step, asymmetric, exponential, S-curve |
| | Fully-closed Control | Possible |
| Input Signals | Fixed Allocation to CN1 Connector | Forward/reverse run prohibited, zero point signal, emergency stop signal |

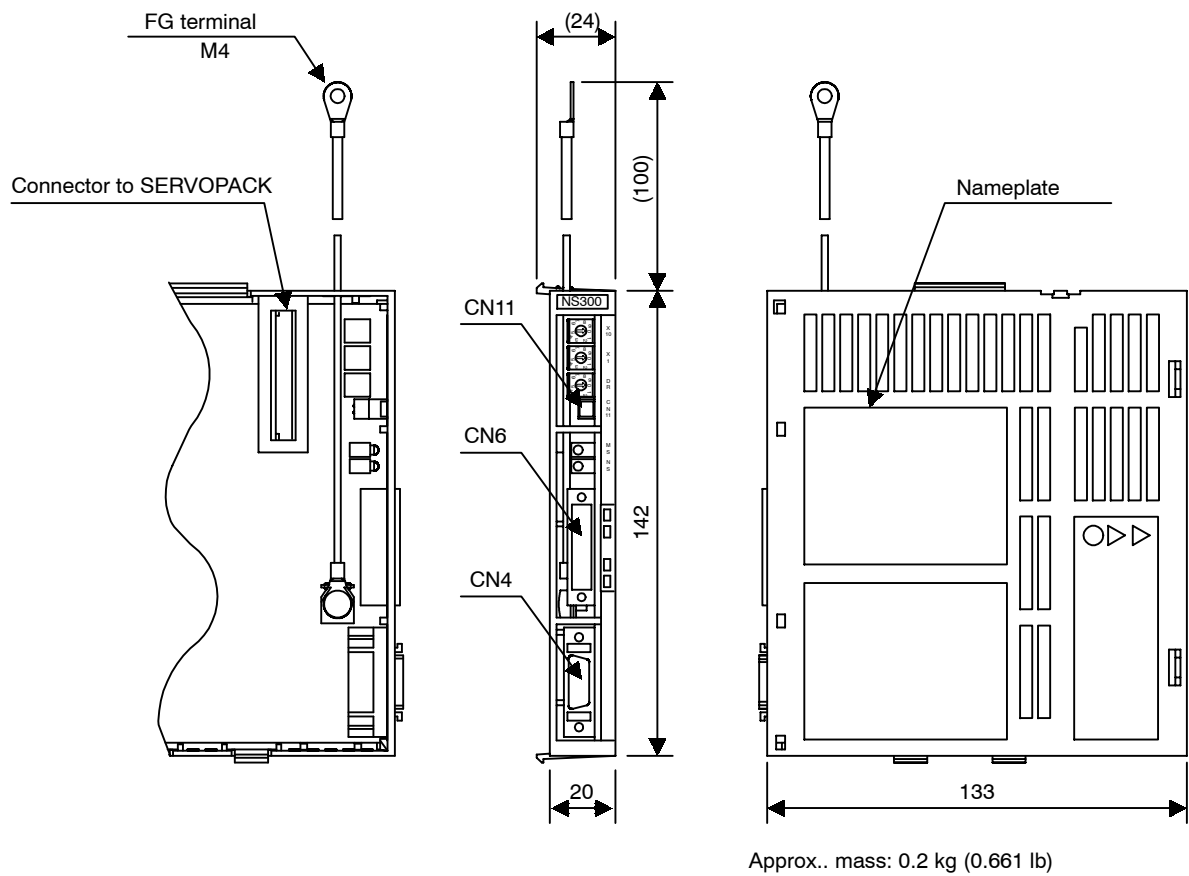
| Item | | Details |
|---------------------------|-------------------------------------|---|
| Internal Functions | Position Data Latch Function | Position data latching is possible using phase C, zero point signals, and external signals. |
| | Protection | Parameters damage, parameter setting errors, communications errors, etc. |
| | LED Indicators | MS: Module Status NS: Network Status |

8.2 Dimensional Drawings

Dimensional drawings of the NS300 Module and SERVOPACKs are shown below.

8.2.1 NS300 Module

Dimensions of the NS300 Module are shown below.



9

Error Diagnosis and Troubleshooting

This chapter describes error diagnosis and troubleshooting.

In addition, troubleshooting procedures are described for problems which cause an alarm display and for problems which result in no alarm display.

| | |
|---|-------|
| 9.1 Troubleshooting with Alarm Displays | 9 -2 |
| 9.2 Troubleshooting with No Alarm Display . . . | 9 -36 |
| 9.3 Alarm Display Table | 9 -38 |
| 9.4 Warning Codes | 9 -41 |

9.1 Troubleshooting 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: Parameter 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 the next power ON. | <ul style="list-style-type: none"> Initialize parameters using Fn005 and reinput user settings. Replace SERVOPACK. |
| B | Circuit board (1PWB) is defective. | Replace SERVOPACK. |
| C | The NS300 Module is defective. | Replace the NS300 Module. |

■ A.03

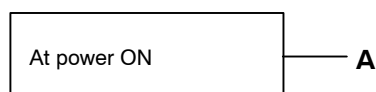
A.03: Main Circuit Encoder Error

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 | Circuit board (1PWB or 2PWB) is defective. | Replace SERVOPACK. |

■ 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. | <ul style="list-style-type: none"> Reset all parameters in range. Otherwise, re-load the correct parameter. |
| B | Circuit board (1PWB) is defective. | Replace SERVOPACK. |
| C | The NS300 Module is defective. | Replace the NS300 Module. |

■ **A.05**

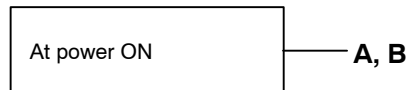
A.05: Combination Error

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 range of servomotor capacities that can be combined has been exceeded. | Replace the servomotor so that a suitable combination is achieved. |
| B | Encoder parameters have not been written properly. | Replace the servomotor. |

■ **A.10**

A.10: Overcurrent or Heat Sink Overheated

Display and Outputs

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

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

Status and Remedy for Alarm



| Cause | | Remedy |
|----------|--|---|
| A | Wiring shorted between SERVOPACK and servomotor. | Check and correct wiring. |
| B | Servomotor phase U, V, or W shorted. | Replace servomotor. |
| C | <ul style="list-style-type: none"> • Circuit board (1PWB) is defective. • Power transistor is defective. | Replace SERVOPACK. |
| D | Current feedback circuit, power transistor, DB relay, or circuit board defective. | Replace SERVOPACK. |
| E | The ambient temperature of the SERVO-PACK exceeded 55°C. | Alter conditions so that the ambient temperature goes below 55°C. |
| F | The air flow around the heat sink is bad. | Follow the installation method and provide sufficient space as specified. |
| G | Fan stopped. | Replace SERVOPACK. |
| H | SERVOPACK is operating under an overload. | Reduce load. |

Note: E to H can occur with all 400-V SERVOPACK models and 200-V SERVOPACK models for 1.5 to 5 kW.

■ **A.30**

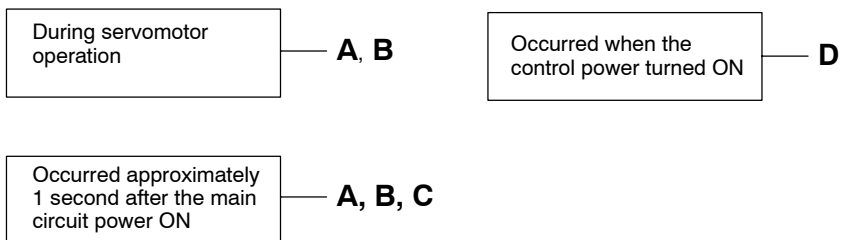
A.30: Regenerative Error Detected

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 | Regenerative transistor is abnormal. | Replace SERVOPACK. |
| B | Disconnection of the regenerative resistor. | Replace SERVOPACK or regenerative resistor. |
| C | Regenerative unit disconnected (for an external regenerative resistor). | Check wiring of the external regenerative resistor. |
| D | SERVOPACK is defective. | Replace SERVOPACK. |

■ A.32

A.32: Regenerative Overload

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

During servomotor
operation

— A, B

| Cause | | Remedy |
|----------|---|---|
| A | Regenerative power exceeds the allowable value. | Use an external regenerative resistor that matches the regenerative power capacity. |
| B | Alarm occurs although an external regenerative resistor is used and the temperature rise of the regenerative resistor is small. | Reset the incorrect Pn600 parameter setting. |

■ **A.40**

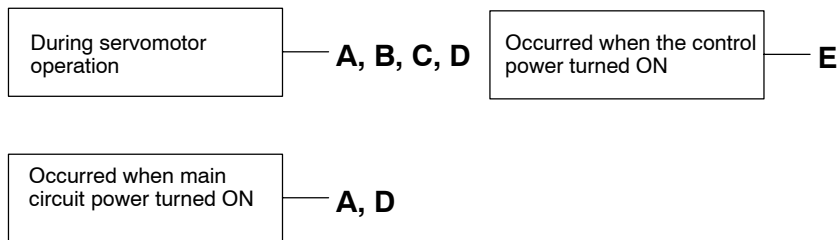
A.40: Main Circuit DC Voltage Error Detected: overvoltage

Display and Outputs

| Alarm Outputs | | | |
|--------------------|------|------|------------|
| Alarm Code Outputs | | | ALM Output |
| ALO1 | ALO2 | ALO3 | |
| OFF | 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 power supply voltage is not within the range of specifications. | Check power supply. |
| B | Load exceeds capacity of the Regenerative unit. | Check specifications of load inertia moment and overhanging load. |
| C | Regenerative transistor is abnormal. | Replace SERVOPACK. |
| D | Rectifying diode is defective. | |
| E | SERVOPACK is defective. | |

■ **A.41**

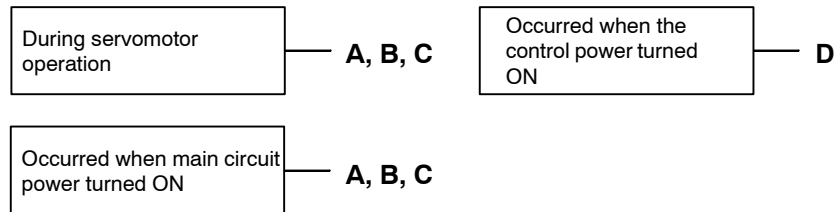
A.41: Main Circuit Voltage Error Detected: Undervoltage

Display and Outputs

| Alarm Outputs | | | |
|--------------------|------|------|------------|
| Alarm Code Outputs | | | ALM Output |
| ALO1 | ALO2 | ALO3 | |
| OFF | 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 power supply voltage is not within the range of specifications. | Check power supply voltage. |
| B | Fuse blown. | Replace SERVOPACK. |
| D | Rectifying diode is defective. | |
| E | SERVOPACK is defective. | |

■ **A.51**

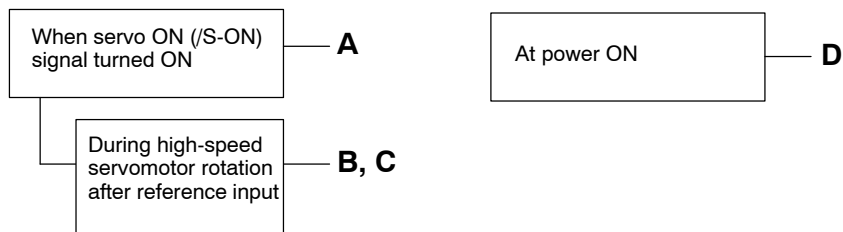
A.51: Overspeed

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 | Servomotor wiring is incorrect. | Check and correct wiring. (Check phase-U, -V, and -W motor wiring errors.) |
| B | Position or speed reference input is too large. | Lower the reference input values. |
| C | Incorrect reference input gain settings. | Check and correct the parameter settings. |
| D | Circuit board (1PWB) is defective. | Replace SERVOPACK. |

■ **A.71**

A.71: Overload: Instantaneous Maximum Load

The alarm output, the status when LEDs are lit, and the remedy procedure are identical to those of A.72 below.

■ **A.72**

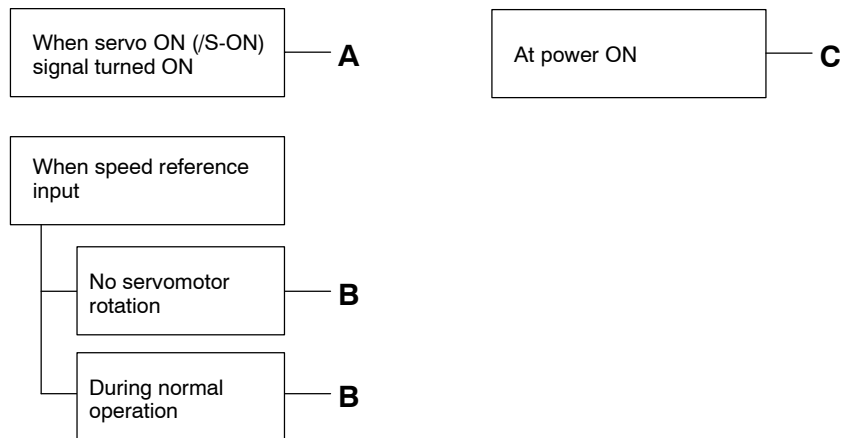
A.72: Overload: Continuous Maximum Load

Display and Outputs

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

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

Status and Remedy for Alarm



| Cause | | Remedy |
|----------|--|---|
| A | Servomotor wiring is incorrect or disconnected | Check wiring and connectors at servomotor. |
| B | Load greatly exceeds rated torque. | Reduce load torque and moment of inertia. Otherwise, replace with larger capacity servomotor. |
| C | Circuit board (1PWB) is defective. | Replace SERVOPACK. |

■ **A.73**

A.73: Dynamic Brake Overload

Display and Outputs

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

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

Status and Remedy for Alarm



| Cause | | Remedy |
|----------|---|--|
| A | The product of the square of rotational motor speed and the combined moment of inertia of the motor and load (rotation energy) exceeds the capacity of the dynamic brake resistor built into SERVOPACK. | <ul style="list-style-type: none"> • Lower the rotational speed. • Lower the load moment of inertia. • Do not frequently use dynamic braking. |
| B | Circuit board (1PWB) is defective. | Replace SERVOPACK. |

■ **A.74**

A.74: Overload of Surge Current Limit Resistor

Display and Outputs

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

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

Status and Remedy for Alarm



| Cause | | Remedy |
|----------|---|---|
| A | Frequently turning the main circuit power ON/OFF. | Do not repeatedly turn ON/OFF the main circuit power. |
| B | Circuit board (1PWB) is defective. | Replace SERVOPACK. |

■ **A.7A**

A.7A: Heat Sink Overheated

Display and Outputs

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

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

Status and Remedy for Alarm



| Cause | | Remedy |
|----------|--|---|
| A | The ambient temperature of the SERVOPACK exceeds 55°C. | Alter conditions so that the ambient temperature goes below 55°C. |
| B | The air flow around the heat sink is bad. | Follow installation method and provide sufficient surrounding space as specified. |
| C | Fan stopped. | Replace SERVOPACK. |
| D | SERVOPACK is operating under overload. | Reduce load. |
| E | SERVOPACK is defective. | Replace SERVOPACK. |

Note: This alarm display tends to occur only with a SERVOPACK of 30 W to 1,000 W.

■ **A.81**

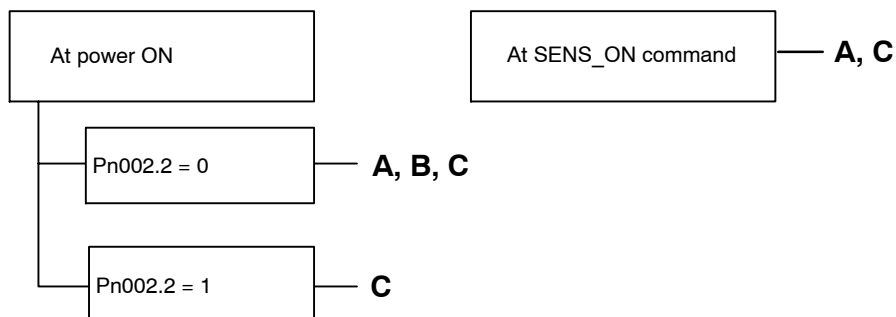
A.81: Absolute Encoder Backup Error

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: <ul style="list-style-type: none"> • +5 V supply (supplied from SERVO-PACK) • Battery | Follow absolute encoder set-up procedure. |
| B | Absolute encoder malfunctioned | Replace servomotor. |
| C | Circuit board (1PWB) is defective. | Replace SERVOPACK. |

■ **A.82**

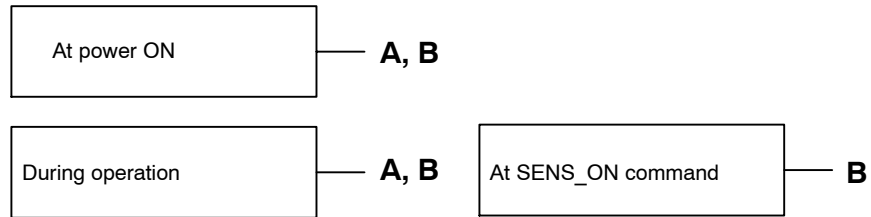
A.82: Absolute Encoder Checksum Error

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 | <ul style="list-style-type: none"> Follow absolute encoder setup procedure. Replace servomotor if error occurs frequently. |
| B | Circuit board (1PWB) is defective. | Replace SERVOPACK. |

■ **A.83**

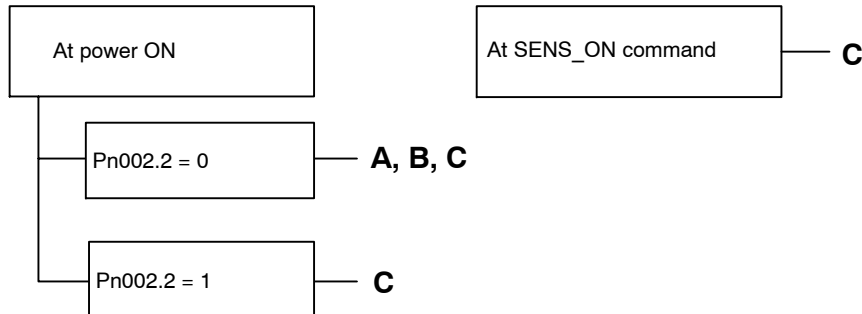
A.83: Absolute Encoder Battery Error

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 | <ul style="list-style-type: none"> Battery is not connected. Battery connection is 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 the power OFF and ON. |
| C | Circuit board (1 PWB) is defective. | Replace SERVOPACK. |

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

■ A.84

A.84: 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 | Encoder is defective. | 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: <ul style="list-style-type: none"> • 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 servo-motor stopped. |
| B | Circuit board (1PWB) is defective. | Replace SERVOPACK. |

■ **A.86**

A.86: Absolute 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**

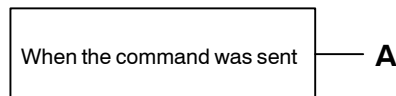
A.94: Parameter Setting Error

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



| Cause | | Remedy |
|----------|---|------------------|
| A | A value outside the DeviceNet communications setting range was set. | Reset correctly. |

■ **A.95**

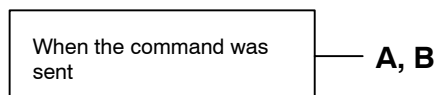
A.95: Command Error

Display and Outputs

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

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

Status and Remedy for Alarm



| Cause | | Remedy |
|----------|---|---|
| A | Presently unable to receive the command that has been sent. | Adjust conditions to match the command. Refer to the specifications for each command. |
| B | Unsupported command. | Do not send unsupported commands. |

■ **A.96**

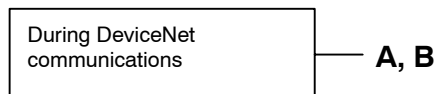
A.96: DeviceNet Communications Warning

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



| 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.98

A.98: Main Power OFF

Display and Outputs

| Alarm Outputs | | | |
|--------------------|------|------|------------|
| Alarm Code Outputs | | | ALM Output |
| ALO1 | ALO2 | ALO3 | |
| ON | ON | ON | ON |

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

Status and Remedy for Alarm

When main power supply
OFF

— A, B

| | Cause | Remedy |
|----------|---|-------------------------------|
| A | Contact between the power supply cable and the connector is faulty. | Correct the connector wiring. |
| B | Power Supply Unit is defective. | Check the Power Supply Unit. |

■ A.9A

A.9A: Not Completed within the Time Set in Pn851

Display and Outputs

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

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

Status and Remedy for Alarm

During servomotor operation

— A, B

| | Cause | Remedy |
|----------|--|---|
| A | Positioning Completed Timeout setting is too small. | Correct the Positioning Completed Timeout setting. |
| B | Positioning Loop Gain or Speed Loop Gain setting is too small. | Correct the Positioning Loop Gain or Speed Loop Gain setting. |

■ **A.b1**

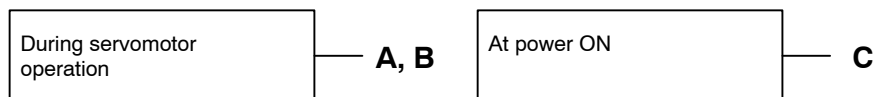
A.b1: Reference Speed Input Read Error

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 in reference read-in unit (A/D convertor, etc.) | Reset alarm and restart operation. |
| B | Reference read-in unit is defective. (A/D convertor, etc.) | Replace SERVOPACK. |
| C | Circuit board (1PWB) is defective. | Replace SERVOPACK. |

■ **A.b6**

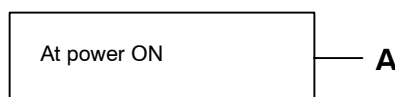
A.b6: Communications LSI Error

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 NS300 Module is defective. | Replace the NS300 Module. |

■ **A.C6**

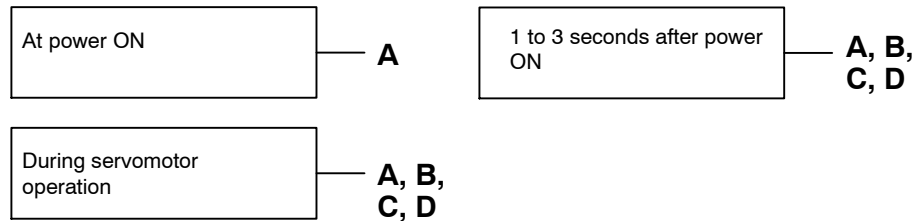
A.C6: Fully-closed Encoder Phase-A, -B Disconnection

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. |
| C | There is noise in the encoder wiring. | Separate the encoder wiring from the main circuit. |
| D | Encoder is defective. | Replace servomotor. |

■ **A.C7**

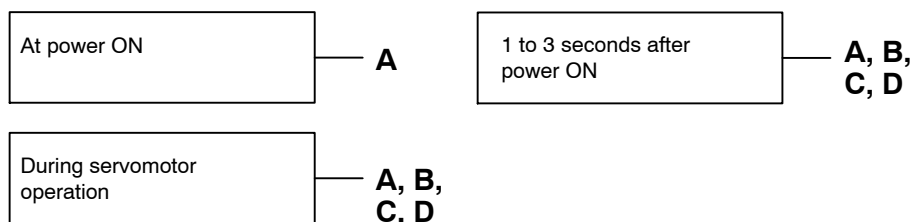
A.C7: Fully-closed Encoder Phase-C Disconnection

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. |
| C | There is noise in the encoder wiring. | Separate the encoder wiring from the main circuit. |
| D | Encoder is defective. | Replace servomotor. |

■ A.CC

A.CC: Multiturn Limit Disagreement.

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 that 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 (A.CC) occurs. |

■ **A.d0**

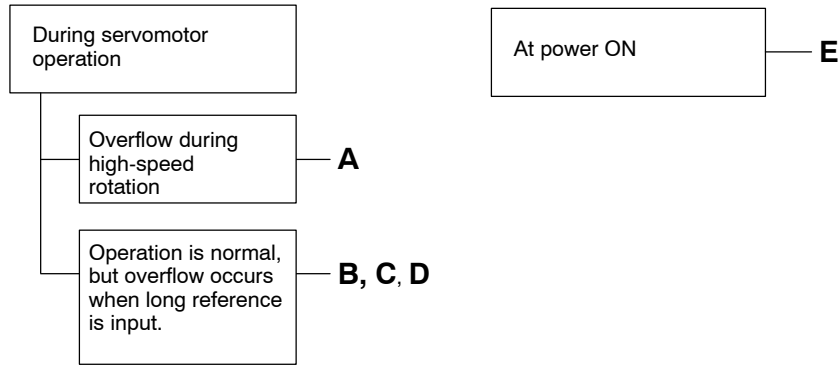
A.d0: Position Error Pulse Overflow

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 is incorrect or connection is poor. | Check wiring 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 moment of inertia. If problem not corrected, replace with a motor with larger capacity. |
| D | Position reference is too high. | <ul style="list-style-type: none"> • Reduce the acceleration/deceleration rate. • Change electronic gear ratio. |

■ **A.E0**

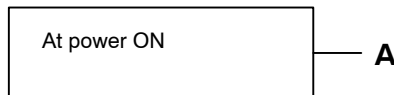
A.E0: No NS300 Module

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 | The NS300 Module is defective. | Replace the NS300 Module. |

■ **A.E1**

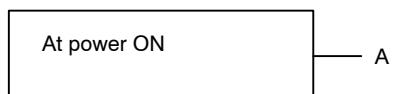
A.E1: NS300 Module Timeout

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 | The NS300 Module is defective. | Replace the NS300 Module. |

■ **A.E2**

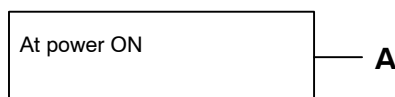
A.E2: Watchdog Counter Error in NS300 Module

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 | The NS300 Module is defective. | Replace the NS300 Module. |

■ **A.E6**

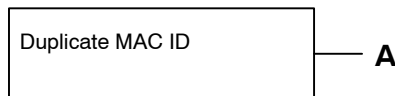
A.E6: DeviceNet Duplicate MAC ID Error

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 | Duplicate node address | Check node addresses of all Modules on the DeviceNet network. |

■ A.E7

A.E7: NS300 Module Detection Error when SGDh power is ON

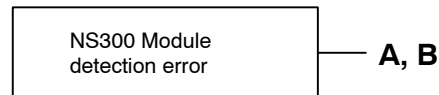
A.E7 occurs when the SGDh is used without the NS300 Module after it has been used with the NS300 Module.

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 | The NS300 Module is not mounted properly. | Check that NS300 Module mounted correctly. |
| B | The NS300 Module is not mounted. | Execute Fn014 from Digital Operator. |

■ **A.E8**

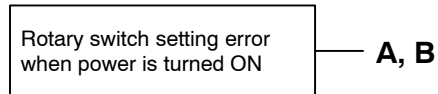
A.E8: Rotary Switch Setting Error on NS300 Module Front Panel

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 | Baud rate setting is incorrect. | Be sure the setting is between 0 and 2. |
| B | Node address setting is incorrect. | Be sure the setting is between 0 and 63. |

■ A.E9

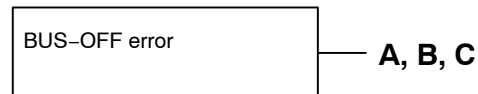
A.E9: DeviceNet BUS-OFF Error

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 | There is no terminating resistance in the network. | Check that a terminator is mounted to both ends of the DeviceNet network. |
| B | There is noise in network wiring. | Separate the network wiring from the power supply circuit. |
| C | The baud rate is incorrect. | Check the communications settings of the rotary switches mounted on the front panel of the NS300 Module. |

■ **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**

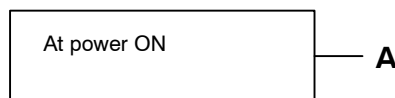
A.EB: SERVOPACK Initial Access Error

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 | DeviceNet communications interrupted. | Turn the power ON again. |

■ **A.ED**

A.ED: NS300 Module 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 | Command was interrupted. | Do not connect a Hand-held Digital Operator or start communications with a personal computer during command execution. |

■ **CPF00**

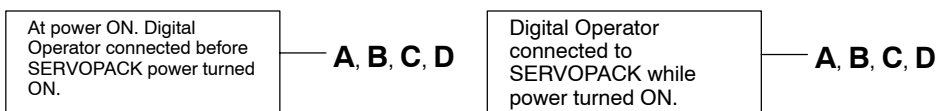
CPF00: Digital Operator Transmission Error 1

This alarm is not stored in the alarm trace-back function memory.

Display and Outputs

| Alarm Outputs | | | |
|--------------------|------|------|------------|
| Alarm Code Outputs | | | ALM Output |
| ALO1 | ALO2 | ALO3 | |
| Not specified | | | |

Status and Remedy for Alarm



| Cause | | Remedy |
|----------|--|--|
| A | Cable defective or poor contact between Digital Operator and SERVOPACK | <ul style="list-style-type: none"> • Check connector connections. • Replace cable. |
| B | Malfunction due to external noise | Separate Digital Operator and cable from noise source. |
| C | Digital Operator is defective. | Replace Digital Operator. |
| D | SERVOPACK is defective. | Replace SERVOPACK. |

■ CPF01

CPF01: Digital Operator Transmission Error 2

This alarm is not stored in the alarm trace-back function memory.

Display and Outputs

| Alarm Outputs | | | |
|--------------------|------|------|------------|
| Alarm Code Outputs | | | ALM Output |
| ALO1 | ALO2 | ALO3 | |
| Not specified | | | |

Status and Remedy for Alarm



| Cause | | Remedy |
|----------|--|--|
| A | Cable defective or poor contact between Digital Operator and SERVOPACK | <ul style="list-style-type: none"> • Check connector connections. • Replace cable. |
| B | Malfunction due to external noise | Separate Digital Operator and cable from noise source. |
| C | Digital Operator is defective. | Replace Digital Operator. |
| D | SERVOPACK is defective. | Replace SERVOPACK. |

■ A.--

A.--: Normal Operation

This is not an alarm display.

Display and Outputs

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

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

9.2 Troubleshooting 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 with 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 6.3. | Turn P-OT and N-OT input signals ON. |
| | Software limit reached | Refer to 4.3.3. | Operate the servomotor within software limits. |
| Servomotor does not run. | Motion commands have not been sent. | Check using DeviceNet communications or the DeviceNet monitor. | Send the motion commands. |
| | | | Send Servo ON command. |
| Servomotor moves instantaneously, then stops. | Servomotor or encoder wiring incorrect. | – | Refer to <i>Chapter 3 Connectors</i> and correct wiring. |
| Servomotor speed unstable | Wiring connection to motor is defective. | Check connection of phase-U, -V, and -W power leads encoder connectors. | Tighten any loose terminals or connectors. |

| Symptom | Cause | Inspection | Remedy |
|--|---|--|---|
| Servomotor vibrates at approximately 200 to 400 Hz. | Speed loop gain value is too high. | – | Reduce speed loop gain (Pn100) preset value. |
| High rotation speed overshoot on starting and stopping | Speed loop gain value is too high. | – | Reduce speed loop gain (Pn100) preset value. Increase integration time constant (Pn101). |
| | Speed loop gain value too low compared to position loop gain value. | – | Increase speed loop gain (Pn100) preset value. Reduce the integration time constant (Pn101). |
| Servomotor overheated | Ambient temperature is too high. | Measure servomotor ambient temperature. | Reduce ambient temperature to 40°C max. |
| | Servomotor surface is 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 is incorrect. | Check if servomotor mounting screws loose. | Tighten mounting screws. |
| | | Check if coupling not centered. | Center coupling. |
| | | Check if coupling unbalanced. | Balance coupling. |
| | Bearing is defective. | Check noise and vibration near bearing. | Consult your Yaskawa representative if defective. |
| | Machine causing vibrations | Check foreign object intrusion, damage or deformation of driving parts of machine. | Consult with machine manufacturer if defective. |

9.3 Alarm Display Table

Table 9.2 Alarm Display Table

| Alarm Display | Alarm Code Outputs | | | ALM Output | Alarm Name | Description |
|---------------|--------------------|-------|-------|------------|---|--|
| | ALO 1 | ALO 2 | ALO 3 | | | |
| A.02 | OFF | OFF | OFF | OFF | Parameter Breakdown* ² | EEPROM data of SERVOPACK is abnormal. |
| A.03 | | | | | Main Circuit Encoder Error | Detection data for power circuit is abnormal. |
| A.04 | | | | | Parameter Setting Error* ² | The parameter setting is out of the allowable setting range. |
| A.05 | | | | | Combination Error | SERVOPACK and servomotor capacities do not match each other. |
| A.10 | ON | OFF | OFF | OFF | Overcurrent or Heat Sink Overheated* ² | An overcurrent flowed through the IGBT. Heat sink of SERVOPACK was overheated. |
| A.30 | ON | ON | OFF | OFF | Regeneration Error | <ul style="list-style-type: none"> Regenerative resistor is defective. Regenerative transistor is defective. |
| A.32 | | | | | Regenerative Overload | Regenerative energy exceeds regenerative resistor capacity. |
| A.40 | OFF | OFF | ON | OFF | Overvoltage* ³ | Main circuit DC voltage is excessively high. |
| A.41 | | | | | Undervoltage* ³ | 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 for Instantaneous Maximum Load | The motor was operating for several seconds to several tens of seconds under a torque largely exceeding ratings. |
| A.72 | | | | | Overload for Continuous Maximum Load | The motor was operating continuously under a torque largely exceeding rating. |
| 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* ¹ | The heat sink of SERVOPACK is overheated. |

| Alarm Display | Alarm Code Outputs | | | ALM Output | Alarm Name | Description |
|---------------|--------------------|-------|-------|------------|--|--|
| | ALO 1 | ALO 2 | ALO 3 | | | |
| A.81 | OFF | OFF | OFF | OFF | Absolute Encoder Backup Error* ² | All the power supplies for the absolute encoder have failed and position data was cleared. |
| A.82 | | | | | Absolute Encoder Checksum Error* ² | The checksum results of the absolute encoder memory are abnormal. |
| A.83 | | | | | Absolute Encoder Battery Error | Battery voltage for the absolute encoder has dropped. |
| A.84 | | | | | Encoder Data Error* ² | Data in the encoder is abnormal. |
| A.85 | | | | | Absolute Encoder Overspeed | The absolute 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 defective. |
| A.b2 | | | | | Reference Torque Input Read Error | The A/D converter for reference torque input is defective. |
| A.b6 | | | | | Gate Array Error | Communications LSI error |
| A.bF | | | | | System Alarm * ² | 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 | Phase A or B of the fully closed encoder was disconnected. |
| A.C7 | | | | | Fully-closed Loop Phase-C Disconnected | Phase C of the fully closed encoder was disconnected. |
| A.C8 | | | | | Absolute Encoder Clear Error and Multi-turn Limit Setting Error * ² | The multi-turn for the absolute encoder was not properly cleared or set. |
| A.C9 | | | | | Encoder Communications Error * ² | Communications between SERVOPACK and encoder is not possible. |
| A.CA | | | | | Encoder Parameter Error * ² | Encoder parameters are incorrect. |
| A.Cb | | | | | Encoder Echoback Error * ² | Contents of communications with encoder are incorrect. |
| A.CC | | | | | Multi-turn Limit Disagreement | Different multi-turn limits have been set in the encoder and SERVOPACK. |
| A.d0 | ON | ON | OFF | OFF | Position Error Pulse Overflow | Position error pulse exceeded parameter (Pn505). |

| Alarm Display | Alarm Code Outputs | | | ALM Output | Alarm Name | Description |
|---------------|--------------------|-------|-------|------------|---|---|
| | ALO 1 | ALO 2 | ALO 3 | | | |
| A.E0 | OFF | ON | ON | OFF | No NS300 Module *2 | No NS300 Module installed. |
| A.E1 | | | | | NS300 Module Timeout *2 | No response from the NS300 Module. |
| A.E2 | | | | | Watchdog Counter Error of NS300 Module *2 | WDC error in the NS300 Module |
| A.E6 | | | | | DeviceNet Duplicate MAC ID Error | Same node address already exists on the DeviceNet network. |
| A.E7 | | | | | NS300 Module Detection Error | No NS300 Module was detected when was power supplied to the SGD.H. |
| A.E8 | | | | | Rotary Switch Setting Error | Module rotary switch setting error |
| A.E9 | | | | | DeviceNet BUS-OFF Error | Fatal communications error has occurred in DeviceNet communications. |
| A.EA | | | | | SERVOPACK Malfunction*2 | SERVOPACK is defective. |
| A.EB | | | | | SERVOPACK Initial Access Error *2 | Initial processing failed. |
| A.EC | | | | | SERVOPACK WDC Error | SERVOPACK WDC error |
| A.ED | | | | | NS300 Module Error | Command was interrupted. |
| A.F1 | OFF | ON | OFF | | OFF | Power Line NS300 Phase |
| CPF00 | Not specified | | | | Hand-held Digital Operator Transmission Error | Communications not possible between Hand-held Digital Operator (JUSP-OP02A-2) and the SERVOPACK (CPU error) |
| CPF01 | | | | | | |
| A.-- | OFF | OFF | OFF | ON | Not an error | Normal operation status. |

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

* 1. This alarm display appears only within the range of 30 W to 1,000 W.

* 2. These alarms are not reset for the Alarm Reset Command. Eliminate the cause of the alarm and then turn OFF the power supply to reset the alarms.

* 3. 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 Codes

The warning codes and the relationship between ON/OFF warning code outputs are shown on the following table.

Normally, warning codes are not output. However, if the parameters are set for warning codes to be output, those outputs will be as indicated in table 9.3.

Table 9.3 Warning Codes and Warning Code Outputs

| Warning Code | Warning Code Output | | | Servo Alarm Output | Warning Name | Description |
|--------------|---------------------|------|------|--------------------|--|---|
| | 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 | Parameter Setting Warning | A value outside the setting range was set using DeviceNet 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 DeviceNet communications error occurred (once). |
| A.98 | ON | ON | ON | ON | Main Power OFF | The main power supply is not being supplied. |
| A.9A | ON | OFF | ON | ON | Not Completed within the Time Set in Pn851 | Positioning was not completed within the set time. |

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

A

DeviceNet Object Model

A.1 DeviceNet Object Model A -2

A.1 DeviceNet Object Model

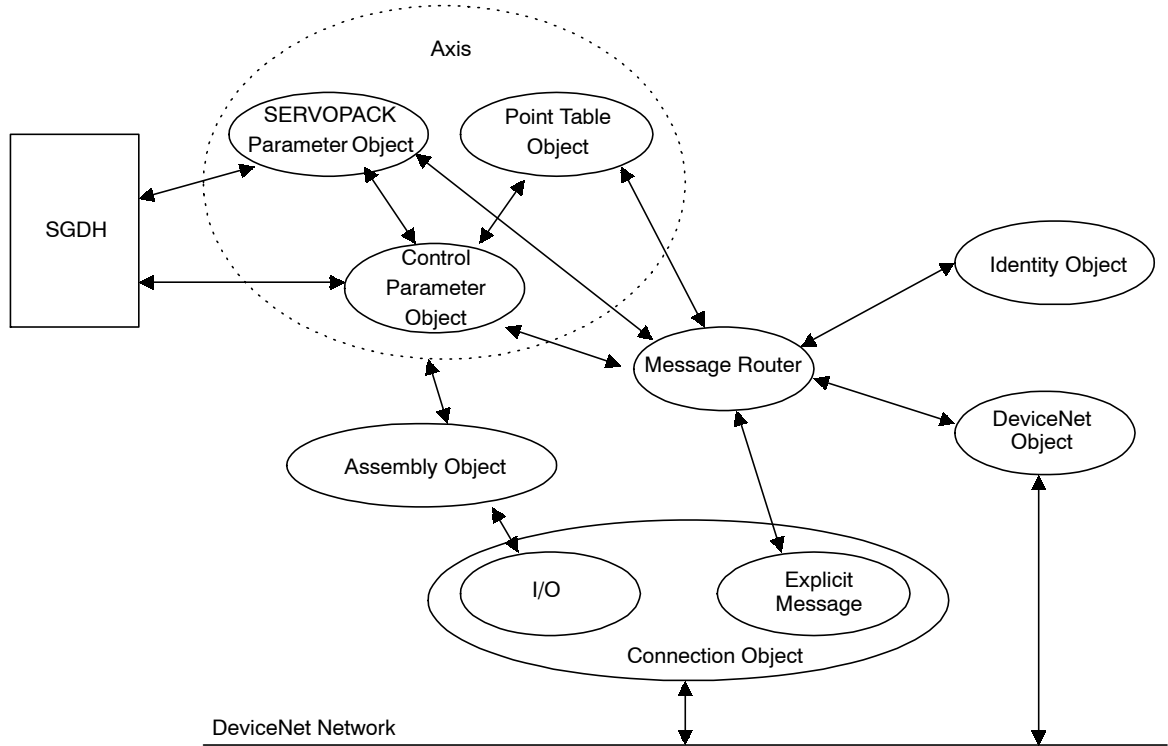


Figure A.1 DeviceNet Object Model

| Object Class | Class Code | Instance No. | Function |
|-------------------|------------|--------------|---|
| Identity | 0x01 | 1 | Manages ID information, such as the device type, serial number, vendor, and ID. |
| Message Router | 0x02 | 1 | Routes explicit messages to the appropriate object. |
| DeviceNet | 0x03 | 1 | Manages the physical connection to the DeviceNet, and performs Master/Slave connection set and release demands. |
| Assembly | 0x04 | 1 | Manages I/O output messages for Slave to Master. |
| | | 2 | Manages I/O input messages from Master to Slave. |
| Connection | 0x05 | 1 | Manages explicit messages attributes. |
| | | 2 | Manages I/O message (polled I/O) attributes. |
| Control Parameter | 0x64 | 1 | Manages position controller engine parameters. |
| Point Table | 0x65 | 1 | Manages point table data. |
| Servo Parameter | 0x66 | 1 | Manages parameters within SGDh SERVOPACK. |

B

DeviceNet Attributes

B

This appendix lists the objects and attributes that can be used in DeviceNet.

| | |
|---|-------|
| B.1 Identity Object (0x01) | B -2 |
| B.2 Message Router Object (0x02) | B -3 |
| B.3 DeviceNet Object (0x03) | B -4 |
| B.4 Assembly Object (0x04) | B -5 |
| B.5 Connection Object (0x05) | B -6 |
| B.6 Control Parameter Object (0x64) | B -9 |
| B.7 Point Table Object (0x65) | B -17 |
| B.8 SERVOPACK Parameter Object (0x66) .. | B -22 |

B.1 Identity Object (0x01)

■ Class

Attributes: Not supported

Services: Not supported

■ Instances

Attributes

| No | Access | Name | Data Type | Description | Value |
|----|--------|---------------|-----------|--|---|
| 1 | Get | Vendor ID | UINT | Identification of each vendor by number | 0x2C (44 [Decimal]) |
| 2 | Get | Device Type | UINT | Identification of general type of product | 0x00 |
| 3 | Get | Product Code | USINT | Identification of a particular product of an individual vendor | Varies in accordance with model. |
| 4 | Get | Revision | --- | Revision of the item the Identity Object represents | 1.0 |
| 5 | Get | Status | WORD | Summary status of NS300 Module | --- |
| 6 | Get | Serial Number | UDINT | Serial number of NS300 Module | Each module |
| 7 | Get | Product Name | STRING | Human readable identification | JUSP-NS300 (When the NS300 is used.) JUSP-NS300-E (When the NS300E is used.) |

* The product codes differ in accordance with the product used.

- When the NS300 is used: 0x50
- When the NS300-E is used: 0x254.

Services

| Service Code | Service | Description |
|--------------|----------------------|--|
| 0x05 | Reset | Invokes the Reset Service for the NS300 Module. |
| 0x0E | Get_Attribute_Single | Returns the contents of the specified attribute. |

B.2 Message Router Object (0x02)

- **Class**

Attributes: Not supported

Services: Not supported

- **Instances**

Attributes: Not supported

Services: Not supported

B.3 DeviceNet Object (0x03)

■ Class

Attributes: Not supported

Services: Not supported

■ Instances

Attributes

| No. | Access | Name | Data Type | Description | Value |
|-----|--------|------------------------|------------------------------------|---|----------------|
| 1 | Get | MAC ID | USINT | Node address | Range 0 to 63 |
| 2 | Get | Baud Rate | USINT | Baud rate | Range 0 to 2 |
| 3 | Get | BOI | BOOL | BUS-OFF interrupt | 0x00 |
| 4 | Get | Bus-Off Counter | USINT | Number of times CAN went to the BUS-OFF state | Range 0 to 255 |
| 5 | Get | Allocation Information | Structure including byte and USINT | --- | --- |
| --- | --- | Allocation Choice Byte | Byte | Connection type for Master/Slave connection | --- |
| --- | --- | Master's MAC ID | USINT | Node address of Master | Range 0 to 63 |

Services

| Service Code | Name | Description |
|--------------|--------------------------------------|---|
| 0x0E | Get_Attribute_Single | Returns the contents of the specified attribute. |
| 0x4B | Allocate_Master/Slave_Connection_Set | Requests the use of the Predefined Master/Slave Connection Set. |
| 0x4C | Release_Master/Slave_Connection_Set | Opens the Master/Slave connection. |

B.4 Assembly Object (0x04)

■ Class

Attributes: Not supported

Services: Not supported

■ Instances

Attributes

| No. | Access | Name | Data Type | Description | Value |
|-----|---------|------|-----------|-------------|-------|
| 3 | Get/Set | Data | Array | I/O data | --- |

Services

| Service Code | Name | Description |
|--------------|----------------------|--|
| 0x0E | Get_Attribute_Single | Returns the contents of the specified attribute. |

B.5 Connection Object (0x05)

■ Class

Attributes: Not supported

Services: Not supported

■ Instances

Attributes, Instance 1: Explicit Message

| No. | Access | Name | Data Type | Description | Value |
|-----|---------|---------------------------------|-------------|---|--------|
| 1 | Get | State | USINT | Defines the state of the object. | --- |
| 2 | Get | Instance_type | USINT | Defines either I/O or messaging connection. | 0x0000 |
| 3 | Get | TransportClass_Trigger | Byte | Defines behavior of the connection. | 0x8300 |
| 4 | Get/Set | Produced_Connection_ID | UINT | Placed in CAN Identifier Field when the connection transmits | --- |
| 5 | Get/Set | Consumed_Connection_ID | UINT | CAN Identifier Field value that denotes message to be received | --- |
| 6 | Get/Set | Initial_Comm_Characteristics | USINT | Defines the message group across which productions and consumption associated with this connection occur. | 0x2100 |
| 7 | Get | Produced_Connection_Size | UINT | Maximum number of bytes transmitted across this connection | 0xff00 |
| 8 | Get | Consumed_Connection_Size | UINT | Maximum number of bytes received across this connection | 0xff00 |
| 9 | Get/Set | Expected_Packet_Rate | UINT | Defines timing associated with this connection. | --- |
| 12 | Get | Watchdog_Timeout_Action | USINT | Defines how to handle timeouts. | 0x0100 |
| 13 | Get | Produced_Connection_Path_Length | UINT | Number of bytes in the produced connection path attribute | 0x0000 |
| 14 | Get | Produced_Connection_Path | USINT Array | Specified the application object whose data is to be sent by this connection object | --- |

| No. | Access | Name | Data Type | Description | Value |
|-----|--------|---------------------------------|-------------|--|--------|
| 15 | Get | Consumed_Connection_Path_Length | UINT | Number of bytes in the consumed connection path attribute | 0x0000 |
| 16 | Get | Consumed_Connection_Path | USINT Array | Specified the application object that are to receive the data received by this connection object | --- |

Attributes, Instance 2: Polled I/O

| No. | Access | Name | Data Type | Description | Value |
|-----|---------|---------------------------------|-------------|---|--------------------|
| 1 | Get | State | USINT | Defines the state of the object. | --- |
| 2 | Get | Instance_type | USINT | Defines either I/O or messaging connection. | 0x0001 |
| 3 | Get | Transport_Class_Trigger | Byte | Defines behavior of the connection. | 0x8200 |
| 4 | Get/Set | Produced_Connection_ID | UINT | Placed in CAN Identifier Field when the connection transmits | --- |
| 5 | Get/Set | Consumed_Connection_ID | UINT | CAN Identifier Field value that denotes message to be received | --- |
| 6 | Get/Set | Initial_Comm_Characteristics | USINT | Defines the message group across which productions and consumption associated with this connection occur. | 0x0100 |
| 7 | Get | Produced_Connection_Size | UINT | Maximum number of bytes transmitted across this connection | 0x0800 |
| 8 | Get | Consumed_Connection_Size | UINT | Maximum number of bytes received across this connection | 0x0800 |
| 9 | Get/Set | Expected_Packet_Rate | UINT | Defines timing associated with this connection. | --- |
| 12 | Get | Watchdog_Timeout_Action | USINT | Defines how to handle timeouts. | 0x0100 |
| 13 | Get | Produced_Connection_Path_Length | UINT | Number of bytes in the produced connection path attribute | 0x0000 |
| 14 | Get | Produced_Connection_Path | USINT Array | Specified the application object whose data is to be sent by this connection object | 00_00_00_00_00_00_ |

| No. | Access | Name | Data Type | Description | Value |
|-----|--------|---------------------------------|-------------|--|----------------------------|
| 15 | Get | Consumed_Connection_Path Length | UINT | Number of bytes in the consumed connection path attribute | 0x0000 |
| 16 | Get | Consumed_Connection_Path | USINT Array | Specified the application object that are to receive the data received by this connection object | 00_00_ 00_00_ 00_00_ |

Services

| Service Code | Name | Description |
|--------------|----------------------|---|
| 0x05 | Reset | Resets the specified instance. |
| 0x0E | Get_Attribute_Single | Returns the contents of the specified attribute. |
| 0x10 | Set_Attribute_Single | Modifies the contents of the specified attribute. |

B

B.6 Control Parameter Object (0x64)

■ Class

Attributes: Not supported

Services: Not supported

■ Instances

Attributes

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|--------------------------------------|-----------|--|----------------------------|-----------------|
| 10 | Get/Set | Zero Point Return Mode | UINT | Sets the type of zero point return. | 0 to 3 | 0 |
| 11 | Get/Set | Zero Point Return Function Selection | UINT | Sets the function selection for zero point return. Bit 0: Direction of zero point return Bit 1: Zero point limit switch reversal Bit 2: Zero point pulse polarity selection | 0 to 7 | 1 |
| 12 | Get/Set | Feed Speed for Zero Point Return | DINT | Sets the feed speed for zero point return. Unit: 1000 reference units/min | 1 to 240,000 | 10,000 |
| 13 | Get/Set | Approach Speed | DINT | Sets the approach speed for zero point return. Unit: 1000 reference units/min | 1 to 240,000 | 1,000 |
| 14 | Get/Set | Creep Speed | DINT | Sets the creep speed for zero point return. Unit: 1000 reference units/min | 1 to 240,000 | 500 |
| 15 | Get/Set | Final Travel Distance | DINT | Sets the final travel distance for zero point return. Unit: Reference units | 0 to 99,999,999 | 0 |
| 16 | Get/Set | Zero Position Output Width | DINT | Sets the output width of the zero point. Unit: Reference units | 0 to 32,767 | 100 |
| 17 | Get/Set | Zero Position Offset | DINT | Sets the offset from the encoder coordinate system. Unit: Reference units | -99,999,999 to +99,999,999 | 0 |

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|--|-----------|--|-------------------------------|-----------------|
| 18 | Get/Set | Acceleration/ Deceleration Time Constant for Zero Point Return | DINT | Sets the acceleration/deceleration for zero point return. Unit: ms | 1 to 10,000 | 100 |
| 30 | Get/Set | Electric Gear (Numerator) | DINT | Sets the numerator of electric gear. | 1 to 10,000,000 | 1 |
| 31 | Get/Set | Electric Gear (Denominator) | DINT | Sets the denominator of electric gear. | 1 to 10,000,000 | 1 |
| 32 | Get/Set | Coordinate Type | BOOL | Sets the coordinate type. 0: Linear axis; 1: Rotary axis | 0, 1 | 0 |
| 33 | Get/Set | Command Resolution/R | DINT | Sets the reference unit per one machine rotation for rotary axis. Unit: Reference units | 0 to 1,500,000 | 360,000 |
| 34 | Get/Set | Backlash Compensation | UINT | Sets the compensated value for backlash. Unit: Reference units | 0 to 32,767 | 0 |
| 35 | Get/Set | Backlash Compensation Direction | UINT | Sets the direction for backlash compensation. | 0, 1 | 0 |
| 36 | Get/Set | Positive Software Limit | DINT | Sets the limit position for positive direction. Unit: Reference units | -99,999,999 to +99,999,999 | 99,999,999 |
| 37 | Get/Set | Negative Software Limit | DINT | Sets the limit position for negative direction. Unit: Reference units | -99,999,999 to +99,999,999 | -99,999,999 |
| 38 | Get/Set | Function Selection | UINT | Bit 0 0: Software Limit is disabled. 1: Software Limit is enabled. Bit 1 0: Backlash Compensation is disabled. 1: Backlash Compensation is enabled. | 0 to 3 | 0 |
| 39 | Get/Set | Hardware Limit Selection | UINT | B0: Hardware Limit Enable 0: Disable 1: Enable B1: Hardware Limit Input Logic 0: Active low 1: Active high | 0 to 3 | 0 |
| 40 | Get/Set | Hardware Limit Action | UINT | Sets the action when using hardware limit. | 0 to 3 | 0 |

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|--|-----------|--|---------------|-----------------|
| 41 | Get/Set | Emergency Stop Selection | UINT | Sets the polarity and other settings for the emergency stop signal. | 0 to 3 | 0 |
| 42 | Get/Set | Emergency Stop Action | UINT | Sets the action when emergency stop. | 0 | 0 |
| 51 | Get/Set | Feed Speed | DINT | Sets the feed speed for positioning. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 52 | Get/Set | Acceleration/Deceleration Time Constant | UINT | Sets the acceleration/deceleration time for positioning. Unit: ms | 1 to 10,000 | 100 |
| 53 | Get/Set | Deceleration Time Constant for Asymmetric | UINT | Sets the deceleration time for asymmetric acceleration/deceleration. Unit: ms | 1 to 10,000 | 100 |
| 54 | Get/Set | Switch Speed | DINT | Sets the switch speed for positioning second acceleration/deceleration time. Unit: 1000 reference units/min | 1 to 240,000 | 12,000 |
| 55 | Get/Set | Second A/D Time Constant | UINT | Sets the acceleration/deceleration time of second acceleration/deceleration for positioning. Unit: ms | 1 to 10,000 | 200 |
| 56 | Get/Set | Profile Type | UINT | Sets acceleration/deceleration type before interpolation. 0: None 1: Single-step linear 2: Double-step linear 3: Asymmetric linear | 0 to 3 | 0 |
| 57 | Get/Set | Feed Speed for External Positioning | DINT | Sets the feed speed for external positioning. Unit: 1000 reference units/min | 1 to 240,000 | 10,000 |
| 58 | Get/Set | Filter | UINT | Sets the type of filter. 0: None 1: Exponent 2: Exponent with bias 3: Travelling average | 0 to 3 | 0 |
| 59 | Get/Set | FEED Function Selection | UINT | Sets the reference unit for the speed setting for FEED. | 0, 1 | 0 |
| 60 | Get/Set | Feed Speed for FEED | DINT | Sets the constant feed speed for FEED. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 61 | Get/Set | Acceleration/Deceleration Time Constant For FEED | UINT | Sets the acceleration/deceleration time for the constant feeding. Unit: ms | 1 to 10,000 | 100 |

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|-------------------------------------|-----------|--|-----------------|-----------------|
| 62 | Get/Set | Deceleration Time Constant for FEED | UINT | Sets the deceleration time for asymmetric acceleration/deceleration for the constant feeding. Unit: ms | 1 to 10,000 | 100 |
| 63 | Get/Set | Switch Speed for FEED | DINT | Sets the switch speed for second acceleration/deceleration for the constant feeding. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 64 | Get/Set | Second AD Time Constant for FEED | UINT | Sets the acceleration/deceleration time for the second acceleration/deceleration for the constant feeding. Unit: ms | 1 to 10,000 | 200 |
| 65 | Get/Set | Profile Type for FEED | UINT | Sets the pre-interpolation acceleration/deceleration type for the constant feeding. 0: None 1: Single-step linear 2: Double-step linear 3: Asymmetric linear | 0 to 3 | 0 |
| 70 | Get/Set | Time Constant for Exponential Curve | UINT | Sets the time constant of exponential acceleration/deceleration. Unit: ms | 4 to 1,000 | 25 |
| 71 | Get/Set | Bias Speed | DINT | Sets the bias speed of exponential acceleration/deceleration. Unit: 1000 reference units/min | 0 to 240,000 | 0 |
| 72 | Get/Set | Time Constant of Moving Average | UINT | Sets the time constant of travelling average. Unit: ms | 4 to 1,000 | 25 |
| 73 | Get/Set | Maximum Feed Speed | DINT | Sets the maximum feed speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 74 | Get/Set | Step Distance 1 | DINT | Sets step distance 1 for STEP operation. Unit: Reference units | 0 to 99,999,999 | 1 |
| 75 | Get/Set | Step Distance 2 | DINT | Sets step distance 2 for STEP operation. Unit: Reference units | 0 to 99,999,999 | 10 |
| 76 | Get/Set | Step Distance 3 | DINT | Sets step distance 3 for STEP operation. Unit: Reference units | 0 to 99,999,999 | 100 |
| 77 | Get/Set | Step Distance 4 | DINT | Sets step distance 4 for STEP operation. Unit: Reference units | 0 to 99,999,999 | 1,000 |

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|--|-----------|---|-----------------|-----------------|
| 90 | Get/Set | Positioning Deadband | UINT | Sets the positioning completion range. Unit: Reference units | 0 to 10,000 | 5 |
| 91 | Get/Set | Positioning Timeout | UINT | Sets the timeout value when positioning is completed. Unit: ms | 0 to 65535 | 0 |
| 92 | Get/Set | Near Signal | UINT | Sets the width for the positioning proximity signal. Unit: Reference units | 0 to 32767 | 10 |
| 93 | Get/Set | Direction | BOOL | Sets the direction of rotation for station positioning. | 0, 1 | 0 |
| 94 | Get/Set | Approach Speed for External Positioning | DINT | Sets the approach speed for external positioning. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 95 | Get/Set | Final Travel Distance for External Positioning | DINT | Sets the final travel distance for external positioning. Unit: Reference units | 0 to 99,999,999 | 0 |
| 100 | Get/Set | Stations | UINT | Sets the number of stations. | 1 to 32767 | 1 |
| 111 | Get/Set | Point Speed Switch Point | UINT | Sets the number of speed switching points. | 0 to 16 | 0 |
| 112 | Get/Set | Initial Speed | DINT | Sets the initial speed for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 113 | Get/Set | Position 1 for Multi-speed | DINT | Sets speed-switching position 1 for multi-speed. Unit: Reference units | 0 to 99,999,999 | 0 |
| 114 | Get/Set | Position 2 for Multi-speed | DINT | Sets speed-switching position 2 for multi-speed. Unit: Reference units | 0 to 99,999,999 | 0 |
| 115 | Get/Set | Position 3 for Multi-speed | DINT | Sets speed-switching position 3 for multi-speed. Unit: Reference units | 0 to 99,999,999 | 0 |
| 116 | Get/Set | Position 4 for Multi-speed | DINT | Sets speed-switching position 4 for multi-speed. Unit: Reference units | 0 to 99,999,999 | 0 |
| 117 | Get/Set | Position 5 for Multi-speed | DINT | Sets speed-switching position 5 for multi-speed. Unit: Reference units | 0 to 99,999,999 | 0 |

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|-----------------------------|-----------|--|-----------------|-----------------|
| 118 | Get/Set | Position 6 for Multi-speed | DINT | Sets speed-switching position 6 for multi-speed. Unit: Reference units | 0 to 99,999,999 | 0 |
| 119 | Get/Set | Position 7 for Multi-speed | DINT | Sets speed-switching position 7 for multi-speed. Unit: Reference units | 0 to 99,999,999 | 0 |
| 120 | Get/Set | Position 8 for Multi-speed | DINT | Sets speed-switching position 8 for multi-speed. Unit: Reference units | 0 to 99,999,999 | 0 |
| 121 | Get/Set | Position 9 for Multi-speed | DINT | Sets speed-switching position 9 for multi-speed. Unit: Reference units | 0 to 99,999,999 | 0 |
| 122 | Get/Set | Position 10 for Multi-speed | DINT | Sets speed-switching position 10 for multi-speed. Unit: Reference units | 0 to 99,999,999 | 0 |
| 123 | Get/Set | Position 11 for Multi-speed | DINT | Sets speed-switching position 11 for multi-speed. Unit: Reference units | 0 to 99,999,999 | 0 |
| 124 | Get/Set | Position 12 for Multi-speed | DINT | Sets speed-switching position 12 for multi-speed. Unit: Reference units | 0 to 99,999,999 | 0 |
| 125 | Get/Set | Position 13 for Multi-speed | DINT | Sets speed-switching position 13 for multi-speed. Unit: Reference units | 0 to 99,999,999 | 0 |
| 126 | Get/Set | Position 14 for Multi-speed | DINT | Sets speed-switching position 14 for multi-speed. Unit: Reference units | 0 to 99,999,999 | 0 |
| 127 | Get/Set | Position 15 for Multi-speed | DINT | Sets speed-switching position 15 for multi-speed. Unit: Reference units | 0 to 99,999,999 | 0 |
| 128 | Get/Set | Position 16 for Multi-speed | DINT | Sets speed-switching position 16 for multi-speed. Unit: Reference units | 0 to 99,999,999 | 0 |
| 129 | Get/Set | Speed 1 for Multi-speed | DINT | Sets speed 1 for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 130 | Get/Set | Speed 2 for Multi-speed | DINT | Sets speed 2 for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|----------------------------|-----------|--|---------------|-----------------|
| 131 | Get/Set | Speed 3 for Multi-speed | DINT | Sets speed 3 for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 132 | Get/Set | Speed 4 for Multi-speed | DINT | Sets speed 4 for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 133 | Get/Set | Speed 5 for Multi-speed | DINT | Sets speed 5 for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 134 | Get/Set | Speed 6 for Multi-speed | DINT | Sets speed 6 for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 135 | Get/Set | Speed 7 for Multi-speed | DINT | Sets speed 7 for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 136 | Get/Set | Speed 8 for Multi-speed | DINT | Sets speed 8 for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 137 | Get/Set | Speed 9 for Multi-speed | DINT | Sets speed 9 for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 138 | Get/Set | Speed 10 for Multi-speed | DINT | Sets speed 10 for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 139 | Get/Set | Speed 11 for Multi-speed | DINT | Sets speed 11 for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 140 | Get/Set | Speed 12 for Multi-speed | DINT | Sets speed 12 for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 141 | Get/Set | Speed 13 for Multi-speed | DINT | Sets speed 13 for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 142 | Get/Set | Speed 14 for Multi-speed | DINT | Sets speed 14 for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 143 | Get/Set | Speed 15 for Multi-speed | DINT | Sets speed 15 for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 144 | Get/Set | Speed 16 for Multi-speed | DINT | Sets speed 16 for multi-speed. Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 160 | Get/Set | Increment for Notch Output | UINT | Sets notch output position. 0: Specifies absolute value 1: Specifies relative value | 0, 1 | 0 |
| 161 | Get/Set | Notch Signal | UINT | Sets notch output polarity reversal. Bit 0: Set to 1 to enable notch output 0 Bit 1: Set to 1 to enable notch output 1 | 0 to 3 | 0 |

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|-------------------|-----------|--|---------------------------|-----------------|
| 162 | Get/Set | Notch Position 00 | DINT | Sets notch output position 1. Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 163 | Get/Set | Notch Position 01 | DINT | Sets notch output position 2. Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 164 | Get/Set | Notch Position 10 | DINT | Sets notch output position 3. Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 165 | Get/Set | Notch Position 11 | DINT | Sets notch output position 4. Unit: Reference units | -99,999,999 to 99,999,999 | 0 |

Services

| Service Code | Name | Description |
|--------------|----------------------|-----------------------------------|
| 0x0E | Get_Attribute_Single | Returns the specified attribute. |
| 0x10 | Set_Attribute_Single | Modifies the specified attribute. |

B.7 Point Table Object (0x65)

■ Class

Attributes: Not supported

Services: Not supported

■ Instances

Attributes

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|-------------|-----------|---|------------------------------|-----------------|
| 50 | Get/Set | Position 1 | DINT | Target position 1 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 51 | Get/Set | Position 2 | DINT | Target position 2 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 52 | Get/Set | Position 3 | DINT | Target position 3 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 53 | Get/Set | Position 4 | DINT | Target position 4 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 54 | Get/Set | Position 5 | DINT | Target position 5 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 55 | Get/Set | Position 6 | DINT | Target position 6 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 56 | Get/Set | Position 7 | DINT | Target position 7 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 57 | Get/Set | Position 8 | DINT | Target position 8 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 58 | Get/Set | Position 9 | DINT | Target position 9 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 59 | Get/Set | Position 10 | DINT | Target position 10 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 60 | Get/Set | Position 11 | DINT | Target position 11 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 61 | Get/Set | Position 12 | DINT | Target position 12 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 62 | Get/Set | Position 13 | DINT | Target position 13 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 63 | Get/Set | Position 14 | DINT | Target position 14 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 64 | Get/Set | Position 15 | DINT | Target position 15 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 65 | Get/Set | Position 16 | DINT | Target position 16 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|-------------|-----------|---|------------------------------|-----------------|
| 66 | Get/Set | Position 17 | DINT | Target position 17 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 67 | Get/Set | Position 18 | DINT | Target position 18 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 68 | Get/Set | Position 19 | DINT | Target position 19 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 69 | Get/Set | Position 20 | DINT | Target position 20 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 70 | Get/Set | Position 21 | DINT | Target position 21 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 71 | Get/Set | Position 22 | DINT | Target position 22 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 72 | Get/Set | Position 23 | DINT | Target position 23 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 73 | Get/Set | Position 24 | DINT | Target position 24 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 74 | Get/Set | Position 25 | DINT | Target position 25 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 75 | Get/Set | Position 26 | DINT | Target position 26 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 76 | Get/Set | Position 27 | DINT | Target position 27 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 77 | Get/Set | Position 28 | DINT | Target position 28 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 78 | Get/Set | Position 29 | DINT | Target position 29 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 79 | Get/Set | Position 30 | DINT | Target position 30 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 80 | Get/Set | Position 31 | DINT | Target position 31 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 81 | Get/Set | Position 32 | DINT | Target position 32 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 82 | Get/Set | Position 33 | DINT | Target position 33 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 83 | Get/Set | Position 34 | DINT | Target position 34 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 84 | Get/Set | Position 35 | DINT | Target position 35 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 85 | Get/Set | Position 36 | DINT | Target position 36 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 86 | Get/Set | Position 37 | DINT | Target position 37 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 87 | Get/Set | Position 38 | DINT | Target position 38 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|-------------|-----------|---|------------------------------|-----------------|
| 88 | Get/Set | Position 39 | DINT | Target position 39 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 89 | Get/Set | Position 40 | DINT | Target position 40 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 90 | Get/Set | Position 41 | DINT | Target position 41 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 91 | Get/Set | Position 42 | DINT | Target position 42 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 92 | Get/Set | Position 43 | DINT | Target position 43 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 93 | Get/Set | Position 44 | DINT | Target position 44 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 94 | Get/Set | Position 45 | DINT | Target position 45 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 95 | Get/Set | Position 46 | DINT | Target position 46 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 96 | Get/Set | Position 47 | DINT | Target position 47 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 97 | Get/Set | Position 48 | DINT | Target position 48 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 98 | Get/Set | Position 49 | DINT | Target position 49 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 99 | Get/Set | Position 50 | DINT | Target position 50 Unit: Reference units | -99,999,999 to 99,999,999 | 0 |
| 150 | Get/Set | Speed 1 | DINT | Target speed 1 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 151 | Get/Set | Speed 2 | DINT | Target speed 2 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 152 | Get/Set | Speed 3 | DINT | Target speed 3 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 153 | Get/Set | Speed 4 | DINT | Target speed 4 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 154 | Get/Set | Speed 5 | DINT | Target speed 5 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 155 | Get/Set | Speed 6 | DINT | Target speed 6 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 156 | Get/Set | Speed 7 | DINT | Target speed 7 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 157 | Get/Set | Speed 8 | DINT | Target speed 8 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 158 | Get/Set | Speed 9 | DINT | Target speed 9 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 159 | Get/Set | Speed 10 | DINT | Target speed 10 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|----------|-----------|---|---------------|-----------------|
| 160 | Get/Set | Speed 11 | DINT | Target speed 11 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 161 | Get/Set | Speed 12 | DINT | Target speed 12 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 162 | Get/Set | Speed 13 | DINT | Target speed 13 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 163 | Get/Set | Speed 14 | DINT | Target speed 14 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 164 | Get/Set | Speed 15 | DINT | Target speed 15 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 165 | Get/Set | Speed 16 | DINT | Target speed 16 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 166 | Get/Set | Speed 17 | DINT | Target speed 17 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 167 | Get/Set | Speed 18 | DINT | Target speed 18 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 168 | Get/Set | Speed 19 | DINT | Target speed 19 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 169 | Get/Set | Speed 20 | DINT | Target speed 20 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 170 | Get/Set | Speed 21 | DINT | Target speed 21 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 171 | Get/Set | Speed 22 | DINT | Target speed 22 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 172 | Get/Set | Speed 23 | DINT | Target speed 23 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 173 | Get/Set | Speed 24 | DINT | Target speed 24 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 174 | Get/Set | Speed 25 | DINT | Target speed 25 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 175 | Get/Set | Speed 26 | DINT | Target speed 26 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 176 | Get/Set | Speed 27 | DINT | Target speed 27 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 177 | Get/Set | Speed 28 | DINT | Target speed 28 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 178 | Get/Set | Speed 29 | DINT | Target speed 29 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 179 | Get/Set | Speed 30 | DINT | Target speed 30 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 180 | Get/Set | Speed 31 | DINT | Target speed 31 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 181 | Get/Set | Speed 32 | DINT | Target speed 32 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|----------|-----------|---|---------------|-----------------|
| 182 | Get/Set | Speed 33 | DINT | Target speed 33 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 183 | Get/Set | Speed 34 | DINT | Target speed 34 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 184 | Get/Set | Speed 35 | DINT | Target speed 35 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 185 | Get/Set | Speed 36 | DINT | Target speed 36 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 186 | Get/Set | Speed 37 | DINT | Target speed 37 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 187 | Get/Set | Speed 38 | DINT | Target speed 38 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 188 | Get/Set | Speed 39 | DINT | Target speed 39 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 189 | Get/Set | Speed 40 | DINT | Target speed 40 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 190 | Get/Set | Speed 41 | DINT | Target speed 41 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 191 | Get/Set | Speed 42 | DINT | Target speed 42 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 192 | Get/Set | Speed 43 | DINT | Target speed 43 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 193 | Get/Set | Speed 44 | DINT | Target speed 44 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 194 | Get/Set | Speed 45 | DINT | Target speed 45 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 195 | Get/Set | Speed 46 | DINT | Target speed 46 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 196 | Get/Set | Speed 47 | DINT | Target speed 47 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 197 | Get/Set | Speed 48 | DINT | Target speed 48 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 198 | Get/Set | Speed 49 | DINT | Target speed 49 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |
| 199 | Get/Set | Speed 50 | DINT | Target speed 50 Unit: 1000 reference units/min | 1 to 240,000 | 24,000 |

B

Services

| Service Code | Name | Description |
|--------------|----------------------|-----------------------------------|
| 0x0E | Get_Attribute_Single | Returns the specified attribute. |
| 0x10 | Set_Attribute_Single | Modifies the specified attribute. |

B.8 SERVOPACK Parameter Object (0x66)

■ Class

Attributes: Not supported

Services: Not supported

■ Instances

Attributes

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|--|-----------|--|---------------|-----------------|
| 10 | Get/Set | Basic Function Selection | UINT | Sets function selection basic switches. | --- | 0000 |
| 11 | Get/Set | Application Switch 1 | UINT | Sets function selection application switches 1. | --- | 0000 |
| 12 | Get/Set | Application Switch 2 | UINT | Sets function selection application switches 2. | --- | 0000 |
| 13 | Get/Set | Application Switch 3 | UINT | Sets function selection application switches 3. | --- | 0002 |
| 14 | Get/Set | Application Switch 4 | UINT | Sets function selection application switches 4. | --- | 0000 |
| 15 | Get/Set | Application Switch 5 | UINT | Sets function selection application switches 5. | --- | 0000 |
| 30 | Get/Set | Bias Acceleration Width *2 | UINT | Sets the bias acceleration width. Unit: Reference units | 0 to 250 | 7 |
| 50 | Get/Set | Speed Loop Gain | UINT | Sets the speed loop gain. Unit: Hz | 1 to 2000 | 40 |
| 51 | Get/Set | Integral Time Constant for Speed Loop | UINT | Sets the integral time constant for speed loop. Unit: 0.01ms | 15 to 51200 | 2000 |
| 52 | Get/Set | Position Loop Gain | UINT | Sets the position loop gain. Unit: 1/s | 1 to 2000 | 40 |
| 53 | Get/Set | Inertia Ratio | UINT | Sets the inertia ratio. Unit: % | 0 to 10000 | 0 |
| 54 | Get/Set | Second Speed Loop Gain | UINT | Sets the second speed loop gain. Unit: Hz | 1 to 2000 | 40 |
| 55 | Get/Set | Integral Time Constant for Second Speed Loop | UINT | Sets the integral time constant for second speed loop. Unit: 0.01ms | 15 to 51200 | 2000 |

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|----------------------------------|-----------|---|---------------|-----------------|
| 56 | Get/Set | Second Position Loop Gain | UINT | Sets the second position loop gain. Unit: 1/s | 1 to 2000 | 40 |
| 57 | Get/Set | Bias *1 | UINT | Sets the bias. Unit: min ⁻¹ | 0 to 450 | 0 |
| 58 | Get/Set | Bias Width Addition | UINT | Sets the bias width addition. Unit: pulse | 0 to 250 | 7 |
| 59 | Get/Set | Feedforward | UINT | Sets the feed forward. Unit: % | 0 to 100 | 0 |
| 60 | Get/Set | Feedforward Filter Time Constant | UINT | Sets the feed forward filter time constant. Unit: 0.01 ms | 0 to 6400 | 0 |
| 61 | Get/Set | Gain-related Application Switch | UINT | Sets the gain-related application switch. | --- | 0000 |
| 62 | Get/Set | Mode Switch Torque Reference | UINT | Sets the mode switch torque reference. Unit: % | 0 to 800 | 200 |
| 63 | Get/Set | Mode Switch Speed Reference *1 | UINT | Sets the mode switch speed reference. Unit: min ⁻¹ | 0 to 10000 | 0 |
| 64 | Get/Set | Mode Switch Acceleration *1 | UINT | Sets the mode switch acceleration. Unit: 10 min ⁻¹ /s | 0 to 3000 | 0 |
| 65 | Get/Set | Mode Switch Error Pulse | UINT | Sets the mode switch error pulse. Unit: pulse | 0 to 10000 | 0 |
| 66 | Get/Set | Online Autotuning | UINT | Sets the online autotuning switches. | --- | 10 |
| 67 | Get/Set | Speed Feedback Compensation | UINT | Sets the speed feedback compensation. Unit: % | 0 to 500 | 100 |
| 68 | Get/Set | Fixed Parameter | UINT | Fixed parameter Unit: % | 0 to 1000 | 100 |
| 69 | Get/Set | Fixed Parameter | UINT | Fixed parameter | 0 to 1000 | 1000 |
| 70 | Get/Set | Fixed Parameter | UINT | Fixed parameter | 0 to 1000 | 200 |
| 71 | Get/Set | Fixed Parameter | UINT | Fixed parameter | 0 to 65535 | 32 |
| 72 | Get/Set | Fixed Parameter | UINT | Fixed parameter | 0 to 65535 | 16 |
| 73 | Get/Set | Fixed Parameter | UINT | Fixed parameter Unit: % | 20 to 100 | 100 |

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|--|-----------|--|---------------|-----------------|
| 74 | Get/Set | Fixed Parameter | UINT | Fixed parameter Unit: % | 20 to 100 | 100 |
| 75 | Get/Set | Fixed Parameter | UINT | Fixed parameter Unit: 1/s | 1 to 2000 | 50 |
| 76 | Get/Set | Fixed Parameter | UINT | Fixed parameter Unit: 0.1% | 1 to 2000 | 1000 |
| 77 | Get/Set | Fixed Parameter | UINT | Fixed parameter Unit: Hz | 1 to 150 | 50 |
| 78 | Get/Set | Fixed Parameter | UINT | Fixed parameter Unit: Hz | 1 to 150 | 70 |
| 79 | Get/Set | Fixed Parameter | UINT | Fixed parameter Unit: % | 0 to 150 | 100 |
| 80 | Get/Set | Fixed Parameter | UINT | Fixed parameter Unit: % | 0 to 150 | 100 |
| 81 | Get/Set | Fixed Parameter | UINT | Fixed parameter Unit: ms | 0 to 2000 | 0 |
| 82 | Get/Set | Fixed Parameter | UINT | Fixed parameter Unit: 0.01 ms | 0 to 51200 | 0 |
| 83 | Get/Set | Fixed Parameter | UINT | Fixed parameter Unit: Hz | 10 to 250 | 50 |
| 84 | Get/Set | Fixed Parameter | UINT | Fixed parameter Unit: Hz | 0 to 250 | 0 |
| 85 | Get/Set | Fixed Parameter | UINT | Fixed parameter Unit: % | 0 to 100 | 0 |
| 90 | Get/Set | Bias ^{*2} | UINT | Sets the bias. Unit: mm/s | 0 to 450 | 0 |
| 91 | Get/Set | Mode Switch (Speed Reference) ^{*2} | UINT | Sets the mode switch for speed refer- ence. Unit: mm/s | 0 to 5000 | 0 |
| 92 | Get/Set | Mode Switch (Acceleration) ^{*2} | UINT | Sets the mode switch for accelera- tion. Unit: mm/s ² | 0 to 3000 | 0 |

B

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|-------------------------------------|-----------|---|---------------|-----------------|
| 100 | Get/Set | Position Control Reference Switches | UINT | Sets the position control reference selection switches. | --- | 0000 |
| 101 | Get/Set | PG Divider *1 | UINT | Sets the PG divider. Unit: p/r | 16 to 16384 | 16384 |
| 102 | Get/Set | Numerator Gear Ratio | UINT | Sets the electric gear ratio numerator. | 1 to 65535 | 4 |
| 103 | Get/Set | Denominator Gear Ratio | UINT | Sets the electric gear ratio denominator. | 1 to 65535 | 1 |
| 104 | Get/Set | Position A/D Constant | UINT | Sets the position reference acceleration/deceleration time constant. Unit: 0.01 ms | 0 to 6400 | 0 |
| 105 | Get/Set | Multi-turn Limit *1 | UINT | Sets the multi-turn limit setting. Unit: rev | 0 to 65535 | 65535 |
| 106 | Get/Set | Fixed Parameter *1 | UINT | Fixed parameter Unit: P/rev | 513 to 65535 | 16384 |
| 107 | Get/Set | Position Control Switches | UINT | Sets the position control function switches. | --- | 0000 |
| 108 | Get/Set | Position Move Average Time | UINT | Sets the position reference travelling average time. Unit: 0.01 ms | 0 to 6400 | 0 |
| 112 | Get/Set | Linear Scale Pitch *2 | UINT | Sets the linear scale pitch. Unit: μm | 0 to 65535 | 0 |
| 113 | Get/Set | Encoder Resolution *2 | UINT | Sets the encoder resolution. Unit: Pulse/Scale Pitch | 1 to 256 | 20 |
| 120 | Get/Set | Speed Reference Input Gain | UINT | Sets the speed reference input gain. Unit: 0.01 V/rated speed | 150 to 3000 | 600 |
| 121 | Get/Set | Speed 1 *1 | UINT | Sets the internal speed 1. Unit: min^{-1} | 0 to 10000 | 100 |
| 122 | Get/Set | Speed 2 *1 | UINT | Sets the internal speed 2. Unit: min^{-1} | 0 to 10000 | 200 |
| 123 | Get/Set | Speed 3 *1 | UINT | Sets the internal speed 3. Unit: min^{-1} | 0 to 10000 | 300 |
| 124 | Get/Set | FEED Speed *1 | UINT | Sets the FEED speed. Unit: min^{-1} | 0 to 10000 | 500 |
| 125 | Get/Set | Soft Start Accel Time | UINT | Sets the soft start acceleration time. Unit: ms | 0 to 10000 | 0 |

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|--------------------------------|-----------|--|---------------|-----------------|
| 126 | Get/Set | Soft Start Decel Time | UINT | Sets the soft start deceleration time. Unit: ms | 0 to 10000 | 0 |
| 127 | Get/Set | Speed Reference Time Constant | UINT | Sets the speed reference filter time constant. Unit: 0.01 ms | 0 to 65535 | 40 |
| 128 | Get/Set | Speed Feedback Time Constant | UINT | Sets the speed feedback filter time constant. Unit: 0.01 ms | 0 to 65535 | 0 |
| 132 | Get/Set | Internal Setting Speed 1 *2 | UINT | Sets the internal setting speed 1. Unit: mm/s | 0 to 5000 | 10 |
| 133 | Get/Set | Internal Setting Speed 2 *2 | UINT | Sets the internal setting speed 2. Unit: mm/s | 0 to 5000 | 20 |
| 134 | Get/Set | Internal Setting Speed 3 *2 | UINT | Sets the internal setting speed 3. Unit: mm/s | 0 to 5000 | 30 |
| 135 | Get/Set | Jog Speed *2 | UINT | Sets the jog speed. Unit: mm/s | 0 to 5000 | 50 |
| 140 | Get/Set | Torque Reference Input Gain | UINT | Sets the torque reference input gain. Unit: 0.01 V/rated speed | 10 to 100 | 30 |
| 141 | Get/Set | Torque Reference Time Constant | UINT | Sets the torque reference filter time constant. Unit: 0.01 ms | 0 to 65535 | 100 |
| 142 | Get/Set | Forward Torque Limit *1 | UINT | Sets the forward torque limit. Unit: % | 0 to 800 | 800 |
| 143 | Get/Set | Reverse Torque Limit *1 | UINT | Sets the reverse torque limit. Unit: % | 0 to 800 | 800 |
| 144 | Get/Set | Forward External Torque Limit | UINT | Sets the forward external torque limit. Unit: % | 0 to 800 | 100 |
| 145 | Get/Set | Reverse External Torque Limit | UINT | Sets the reverse external torque limit. Unit: % | 0 to 800 | 100 |
| 146 | Get/Set | Emergency Stop Torque | UINT | Sets the emergency stop torque. Unit: % | 0 to 800 | 800 |
| 147 | Get/Set | Speed Limit *1 | UINT | Sets the speed limit during torque control. Unit: min ⁻¹ | 0 to 10000 | 10000 |
| 148 | Get/Set | Torque Function Switches | UINT | Sets the torque function switches. | --- | 0000 |

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|--|-----------|---|---------------|-----------------|
| 149 | Get/Set | Notch Filter Frequency | UINT | Sets the notch filter frequency. Unit: Hz | 50 to 2000 | 2000 |
| 152 | Get/Set | Speed Limit During force Control *2 | UINT | Sets the speed limit during force control. Unit: mm/s | 0 to 5000 | 5000 |
| 153 | Get/Set | Polarity Detection Speed Loop Gain *2 | UINT | Sets the polarity detection speed loop gain. Unit: Hz | 1 to 2000 | 40 |
| 154 | Get/Set | Integral Time Constant for Polarity Detection Speed Loop Gain *2 | UINT | Sets the integral time constant for polarity detection speed loop gain. Unit: 0.01ms | 15 to 51200 | 3000 |
| 155 | Get/Set | Forward Force Limit *2 | UINT | Sets the forward force limit. Unit: % | 0 to 800 | 30 |
| 156 | Get/Set | Reverse Force Limit *2 | UINT | Sets the reverse force limit. Unit: % | 0 to 800 | 30 |
| 161 | Get/Set | Zero Clamp Level *1 | UINT | Sets the zero clamp level. Unit: min ⁻¹ | 0 to 10000 | 10 |
| 162 | Get/Set | Rotation Detection Level *1 | UINT | Sets the rotation detection level. Unit: min ⁻¹ | 0 to 10000 | 20 |
| 163 | Get/Set | Speed Coincidence Signal Width *1 | UINT | Sets the speed coincidence signal detection width. Unit: min ⁻¹ | 0 to 100 | 10 |
| 165 | Get/Set | Overflow Level | UINT | Sets the overflow level. Unit: 0.256 mm | 1 to 32767 | 1024 |
| 166 | Get/Set | Brake Reference Servo Off Delay Time | UINT | Sets the brake signal servo off delay time. Unit: 10 ms | 0 to 50 | 0 |
| 167 | Get/Set | Brake Reference Output Speed Level *1 | UINT | Sets the brake signal output speed level. Unit: min ⁻¹ | 0 to 10000 | 100 |
| 168 | Get/Set | Wait Time for Brake | UINT | Sets the waiting time for servo-OFF brake reference. Unit: 10 ms | 10 to 100 | 50 |
| 169 | Get/Set | Hold Time | UINT | Sets the momentary hold time. Unit: ms | 20 to 1000 | 20 |
| 170 | Get/Set | Input Signal 1 | UINT | Sets the input signal selection 1. | --- | 2100 |
| 171 | Get/Set | Input Signal 2 | UINT | Sets the input signal selection 2. | --- | 6543 |

| No. | Access | Name | Data Type | Description | Setting Range | Default Setting |
|-----|---------|---|-----------|--|---------------|-----------------|
| 172 | Get/Set | Input Signal 3 | UINT | Sets the input signal selection 3. | --- | 8888 |
| 173 | Get/Set | Input Signal 4 | UINT | Sets the input signal selection 4. | --- | 8888 |
| 174 | Get/Set | Output Signal 1 | UINT | Sets the output signal selection 1. | --- | 3211 |
| 175 | Get/Set | Output Signal 2 | UINT | Sets the output signal selection 2. | --- | 0000 |
| 176 | Get/Set | Output Signal 3 | UINT | Sets the output signal selection 3. | --- | 0000 |
| 177 | Get/Set | Fixed Parameter | UINT | Fixed parameter | --- | 8888 |
| 178 | Get/Set | Output Signal Reversal Setting | UINT | Sets the output signal reversal settings. | --- | 0000 |
| 184 | Get/Set | Zero Clamp Level *2 | UINT | Sets the zero clamp level. Unit: mm/s | 0 to 5000 | 10 |
| 185 | Get/Set | Zero Speed Level *2 | UINT | Sets the zero speed level. Unit: mm/s | 1 to 5000 | 20 |
| 186 | Get/Set | Speed Coincidence Signal Output Band *2 | UINT | Sets the speed coincidence signal output band. Unit: mm/s | 0 to 100 | 100 |
| 187 | Get/Set | Barke Command Output Speed Level *2 | UINT | Sets barke command output speed level. Unit: mm/s | 0 to 5000 | 100 |
| 190 | Get/Set | Regenerative Register Capacity | UINT | Sets the regenerative register capacity. Unit: 10 W | --- | 0 |
| 191 | Get/Set | Fixed Parameter | UINT | Fixed parameter | --- | 0 |

* 1. These parameters are for the exclusive use of the rotary motor system.

* 2. These parameters are for the exclusive use of the linear motor system.

Services

| Service Code | Name | Description |
|--------------|----------------------|-----------------------------------|
| 0x0E | Get_Attribute_Single | Returns the specified attribute. |
| 0x10 | Set_Attribute_Single | Modifies the specified attribute. |

C

Alarm and Warning Codes

This appendix lists the alarm and warning codes within DeviceNet.

| | |
|-------------------------|------|
| C.1 Alarm Codes | C -2 |
| C.2 Warning Codes | C -5 |



C.1 Alarm Codes

Alarm codes are displayed on the front of the SGDH and, at the same time, can also be read as response message data at the host device connected via DeviceNet. Alarms are also displayed using the MS and NS indicators on the NS300 Module.

The MS indicator is the module status; the NS indicator is the network status. The required indicator responses are shown in the table.

The alarm codes are shown below.

Table C.1. Alarm Codes

| Code | MS | NS | Alarm Name | Description |
|------|--------------|----|--|--|
| A.02 | Flashes Red. | – | Parameter Breakdown | EEPROM data of SERVOPACK is abnormal. |
| A.03 | Lit Red. | – | Main Circuit Encoder Error | Detection data for power circuit is abnormal. |
| A.04 | Flashes Red. | – | Parameter Setting Error | The parameter setting is out of the allowable setting range. |
| A.05 | Flashes Red. | – | Combination Error | SERVOPACK and servomotor capacities do not match each other. |
| A.10 | Flashes Red. | – | Overcurrent or Heat Sink Overheated | An overcurrent flowed through the IGBT. Heat sink of SERVOPACK was overheated. |
| A.30 | Lit Red. | – | Regeneration Error | <ul style="list-style-type: none"> Regenerative resistor is defective. Regenerative transistor is defective. |
| A.32 | Flashes Red. | – | Regenerative Overload | Regenerative energy exceeds regenerative resistor capacity. |
| A.40 | Flashes Red. | – | Overvoltage | Main circuit DC voltage is excessively high. |
| A.41 | Flashes Red. | – | Undervoltage | Main circuit DC voltage is excessively low. |
| A.51 | Flashes Red. | – | Overspeed | Rotational speed of the motor is excessively high. |
| A.71 | Flashes Red. | – | Overload for Instantaneous Maximum Load | The motor was operating for several seconds to several tens of seconds under a torque largely exceeding ratings. |
| A.72 | Flashes Red. | – | Overload for Continuous Maximum Load | The motor was operating continuously under a torque exceeding ratings. |
| A.73 | Flashes Red. | – | Dynamic Brake Overload | When the dynamic brake was applied, rotational energy exceeded the capacity of dynamic brake resistor. |
| A.74 | Flashes Red. | – | Overload of Surge Current Limit Resistor | The main circuit power was frequently turned ON and OFF. |
| A.7A | Flashes Red. | – | Heat Sink Overheated | The heat sink of SERVOPACK is overheated. |
| A.81 | Flashes Red. | – | Absolute Encoder Backup Error | All the power supplies for the absolute encoder have failed and position data was cleared. |
| A.82 | Flashes Red. | – | Absolute Encoder Checksum Error | The checksum results of the absolute encoder memory are abnormal. |
| A.83 | Flashes Red. | – | Absolute Encoder Battery Error | Battery voltage for the absolute encoder has dropped. |

| Code | MS | NS | Alarm Name | Description |
|------|--------------|----------|---|---|
| A.84 | Lit Red. | – | Encoder Data Error | Data in the encoder is abnormal. |
| A.85 | Flashes Red. | – | Absolute Encoder Overspeed | The absolute encoder was rotating at high speed when the power was turned ON. |
| A.86 | Flashes Red. | – | Encoder Overheated | The internal temperature of encoder is too high. |
| A.B1 | Flashes Red. | – | Reference Speed Input Read Error | The A/D converter for reference speed input is defective. |
| A.B2 | Flashes Red. | – | Reference Torque Input Read Error | The A/D converter for reference torque input is defective. |
| A.B6 | Flashes Red. | – | Gate Array Error | Communications LSI error |
| A.BF | Flashes Red. | – | System Alarm | A system error occurred in the SERVOPACK. |
| A.C1 | Flashes Red. | – | Servo Overrun Detected | The servomotor ran out of control. |
| A.C6 | Flashes Red. | – | Fully-closed Loop Phase-A/B Disconnected | Phase A or B of the fully-closed encoder was disconnected. |
| A.C7 | Flashes Red. | – | Fully-closed Loop Phase-C Disconnected | Phase C of the fully-closed encoder was disconnected. |
| A.C8 | Lit Red. | – | Absolute Encoder Clear Error and Multi-turn Limit Setting Error | The multi-turn for the absolute encoder was not properly cleared or set. |
| A.C9 | Flashes Red. | – | Encoder Communications Error | Communications between SERVOPACK and encoder is not possible. |
| A.CA | Lit Red. | – | Encoder Parameter Error | Encoder parameters are incorrect. |
| A.CB | Flashes Red. | – | Encoder Echoback Error | Contents of communications with encoder are incorrect. |
| A.CC | Flashes Red. | – | Multi-turn Limit Disagreement | Different multi-turn limits have been set in the encoder and SERVOPACK. |
| A.D0 | Flashes Red. | – | Position Error Pulse Overflow | Position error pulse exceeded parameter (Pn505). |
| A.E0 | – | – | No NS300 Module | No NS300 Module installed. |
| A.E1 | – | – | NS300 Module Timeout | No response from the NS300 Module. |
| A.E2 | – | – | Watchdog Counter Error of NS300 Module | WDC error in the NS300 Module |
| A.E6 | – | Lit Red. | DeviceNet Duplicate MAC ID Error | Same node address already exists on the DeviceNet network. |
| A.E7 | – | Lit Red. | NS300 Module Detection Error | No NS300 Module was detected when was power supplied to the SGDH. |
| A.E8 | Flashes Red. | – | Rotary Switch Setting Error | Module rotary switch setting error |
| A.E9 | – | Lit Red. | DeviceNet BUS-OFF Error | Fatal communications error has occurred in DeviceNet communications. |
| A.EA | Flashes Red. | – | SERVOPACK Malfunction | SERVOPACK is defective. |
| A.EB | Flashes Red. | – | SERVOPACK Initial Access Error | Initial processing failed. |
| A.EC | Flashes Red. | – | SERVOPACK WDC Error | SERVOPACK WDC error |
| A.ED | Lit Red. | – | NS300 Module Error | Command was interrupted. |

| Code | MS | NS | Alarm Name | Description |
|-------------|--------------|-----------|------------------------|--|
| A.EE | Flashes Red. | – | Option Parameter Error | The parameters of the NS300 Module contain abnormalities. |
| A.F1 | Flashes Red. | – | Power Line Open Phase | One phase in the 3-phase main power supply is not connected. |

C

C.2 Warning Codes

The warning codes are shown below.

| Warning Code | MS LED | NS LED | Warning Name | Description |
|--------------|--------------|--------|--|---|
| A.91 | Flashes Red. | – | 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 | Flashes Red. | – | 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 | Flashes Red. | – | Parameter Setting Warning | A value outside the setting range was set using DeviceNet communications. |
| A.95 | Flashes Red. | – | Command Warning | A command not supported in the product specifications was issued. The command reception conditions were not met. |
| A.96 | Flashes Red. | – | Communications Warning | A DeviceNet communications error occurred (once). |
| A.98 | Flashes Red. | – | Main Power OFF | The main power supply is not being supplied. |
| A.9A | Flashes Red. | – | Not Completed within the Time Set in Pn851 | Positioning was not completed within the set time. |

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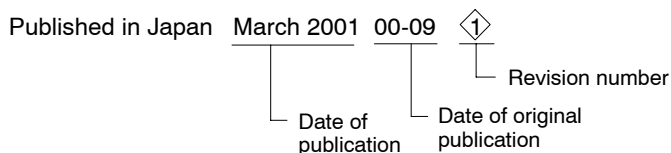
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